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SOLARNET

HIGH-RESOLUTION SOLAR PHYSICS NETWORK

1ST REPORTING PERIOD

1st April 2013 – 30th September 2014

30 November 2014

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0. PROJECT GENERAL INFORMATION

Grant Agreement number:	312495
Project acronym:	SOLARNET
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Funded under:	FP7-INFRASTRUCTURES: INFRA-2012-1.1.26 - Research Infrastructures for High-Resolution Solar Physics
Funding scheme:	Combination of Collaborative Project and Coordination and Support Action for Integrating Activities
From:	2013-04-01 to 2017-03-31

Date of latest version of Annex I against which the assessment will be made: **13/02/2013**

Periodic report:	1st **X** 2nd □ 3rd □ 4th □
Period covered:	from **01/04/2013** to **30/09/2014**
Project's coordinator:	Dr. Manuel Collados Vera, IAC. Tel: (34) 922 60 52 00 Fax: (34) 922 60 52 10 E-mail: mcv@iac.es
Project website address:	www.solarnet-eu

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1. PROJECT OBJECTIVES FOR THE PERIOD

SOLARNET is integrating the vast majority of European efforts in the research area of high-resolution solar physics with the objective to significantly enhance the scientific output by fostering a vital collaboration between the research groups active in this scientific area in Europe.

SOLARNET provides access to leading world-class ground-based research infrastructures, aims at equipping those with advanced instrumentation, and prepares for the next generation of high-resolution telescopes, which the European Solar Telescope (EST) is the most prominent example.

All *Networking Activities* have significantly impacted solar physics over the first 18 months of the project. Through its networking activities SOLARNET has organized a total of four workshops and one international conference. Already now it is clearly visible that the organised schools and the mobility programme raise a large interest by the young researchers in the field. All those events and opportunities were overbooked.

The *Joint Research Activities* have resulted in first designs and concepts for improved instrumentation and technology developments for solar physics.

The *Access and Service Programme* has also attracted a large number of scientists from the students to the senior researcher's level. The Swedish Solar Telescope (SST) has already offered a large fraction of its complete access time, and will try to offer more. The service-mode observations on those EU instruments installed at facilities in the USA have been a new attraction for European solar physics.

The installation of the SOLARNET IT-platform has been completed. It provides an internet-based forum for exchanging material, knowledge, and news. This platform now assumes one of its major purposes for disseminating data and information material to the broader community.

The management of SOLARNET has been very efficient in coordinating the activities of 32 partners working in a diverse set of areas and subjects. The SOLARNET Board has met twice during this reporting period and has approved this Periodical Report. The Executive Board has met three times in the last 18 months to monitor the start and the first progress of the project.

- **Deliverables and milestones**

All milestones and deliverables, which were due in this period where completed on time. In summary, there were no deviations from the work planned in the contract.

- **Impact**

The organized events and the European wide availability of information on SOLARNET had an important impact on the European and international scientific community:

  - The objectives of SOLARNET were transmitted to the community. SOLARNET has already become well known in the respective research community.
  - An integrative effect of SOLARNET is already visible:
    - The scientific community showed great interest in the planned activities by SOLARNET.

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- SOLARNET allowed bringing together a large number of European scientists at the workshops. In total 173 scientists participated at the organized workshops and the international conference. The interest and number of international participants at the workshops and conference was high. There were 52 scientists from non-EU countries participating at the workshops.
- Collaborations started between the groups of the SOLARNET consortium.

- **List of meetings and events organized in 2013-2014**

Date	WP	Title/subject of meeting	Location	Nr of attendees	Website address
10 – 11 April, 2013	10	**Kick-Off Meeting**	Brussels	48	www.solarnet-east.org
11 April, 2013	10	**1st Executive Committee Meeting**	Brussels	15	www.solarnet-east.org
22-24 April, 2013	80	**Synoptic Network Workshop**	Boulder	36	https://www2.hao.ucar.edu/docs/2013-synoptic-network
22 July, 2013	10	**2nd Executive Committee Meeting**	Teleconference	10	www.solarnet-east.org
5-8 August, 2013	30	**1st SOLARNET Conference**	Oslo,	67	http://folk.uio.no/matsc/oslo-13/
7 November, 2013	20	**1st FAS Meeting**	Stockholm	11	www.solarnet-east.org
25 – 28 November, 2013	80	**1st SOLARNET/SPRING Workshop**	Titisee	35	http://bit.ly/1rK2cHu
18 – 20 February, 2014	50	**1st CASSDA-SOLARNET Workshop**	Freiburg	46	http://www.kis.uni-freiburg.de/index.php?id=829&L=1
24 March – 4 April, 2014	30	**1st SOLARNET School**	Wroclaw	30 (10 lect. + 20 stud.)	http://school.astro.uni.wroc.pl/index.php
1-2 April, 2014	30	**1st SOLARNET Workshop**	Wroclaw	25	http://school.astro.uni.wroc.pl/index.php
28 April, 2014	10	**EAST General Assembly**	Madrid	14	www.astro-east.org
29 April, 2014	10	**3rd Executive Committee Meeting**	Madrid	19	www.solarnet-east.org
30 April, 2014	10	**2nd Board Meeting**	Madrid	27	www.solarnet-east.org
28 April, 2014	20	**2nd FAS Meeting**	Madrid	16	www.solarnet-east.org
17 – 19 June, 2014	20	**Spectropolarimeter Pipeline Workshop**	Stockholm	12	
2 October, 2014	40	**1st SOLARNET Technology Transfer Workshop**	San Sebastian	23	http://bit.ly/1vYK185

More specific information on progress of the project is detailed in following sections.

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2. WORK PROGRESS AND ACHIEVEMENTS DURING THE PERIOD

WP20: Integrated operation and exploitation of solar physics facilities and coordination with other research infrastructures

Lead Beneficiary: KIS

Participants: IAC, INAF, CNRS, MPG, UiO, AIP, SU, UPS, QUB, UCL-MSSL, AISAS, AIASCR, HVAR, ROB, IGAM, UWR, IAA-CSIC, NSO, CfA-SAO

Objectives: The focus of this WP is to optimize the use of the existing solar facilities and research structures. To achieve this we work on a number of objectives: (sWP 20.1) we coordinate and implement the Transnational ACCESS and Service program, (sWP 20.2) we attempt to make available proper data pipelines for existing instruments, (sWP 20.3) we develop guidelines for meta data, aiming at a standard for archived solar data, (sWP 20.4) we plan to coordinate observations with our facilities with non-European and/or non optical infrastructures, (sWP 20.5) we study new ways of operating our telescopes, in particular we gather experience with performing observations in service mode.

The main body of the work package is the Forum for Access and Services (FAS). At the meetings of the FAS all objectives of this work package, in particular its sub work packages, are monitored and discussed. All telescope and instrument owners are part of the FAS, and participate at its meetings. Moreover, the meeting are open to all people that are involved in one of the relevant SOLARNET work packages.

In the first 18 months of SOLARNET, the FAS held two meetings. The minutes of both meetings are attached to this report as Annex I and Annex II *(`1st_FAS_minutes.pdf', `2nd_FAS_minutes.pdf').*

The **first FAS** took place in Stockholm on November 8, 2013, and had the following **participants:** Manolo Collados (SOLARNET coordinator, IAC), Dan Kiselman (SU), Göran Scharmer (SU), Jaime de la Cruz Rodriquez (SU), Rolf Schlichenmaier (KIS), Markus Roth (Technical Manager, KIS), Nazaret Bello Gonzalez (KIS), Mats Carlsson (UiO), Stein Haugan (UiO), Gianna Cauzzi (INAF), Francesca Zuccarello (INAF), Mihalis Mathioudakis (QUB), Bernard Gelly (CNRS), Carsten Denker (AIP), Robbe Vansintjan (ROB), Mats Löfdahl (SU), Rickard Castillus (SU).

The **second FAS** was held in Madrid on April 28, 2014 and was **attended by:** Andrés Asensio (IAC), Dan Kiselman (SU), Rolf Schlichenmaier (FAS chair, KIS), Markus Roth (Technical Manager, KIS), Mats Carlsson (UiO), Francesca Zuccarello (INAF), Bernard Gelly (CNRS), Carsten Denker (AIP), Robbe Vansintjan (ROB), Michal Sobotka (AIASCR), Francesco Berrilli (INAF), Manolo Collados (SOLARNET coordinator, IAC), Raymond Burston (MPS), Alberto Escobar (IAC, Project Manager), Jesus Burgos (IAC), Ales Kucera (AISAS).

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The discussions and results of these meetings are summarized in the report of each sub-workpackge below.

WP 20.1 Oversight of the TAS Programme; Common Time Allocation Committee (TAC) – in relation with WP 90

Common Time Allocation Committee (TAC): Within the EU FP7 OPTICON project, EAST (European Association for Solar Telescopes) formed a common solar time allocation committee – the EAST TAC – to allocate European observing time to the major European solar telescopes. Today, SOLARNET takes advantage of the expertise of the EAST TAC as a common TAC, and the EAST TAC allocates jointly all SOLARNET ACCESS time to the various telescopes and instruments. In order to adopt the EAST TAC to its new challenges, the FAS decided at its first meeting to assign the following **EAST TAC members**: Mihalis Mathioudakis (QUB), Manolo Collados (IAC, until March 2014), Andres Asensio Ramos (IAC, since March 2014), Bernard Gelly (CNRS), Dan Kiselman (SU), Gianna Cauzzi (INAF), Han Uitenbroek (NSO), & Rolf Schlichenmaier (KIS, chair). EAST approved this assignment at its General Assembly 2013.

The EAST TAC granted observing time in PI mode as well as in the 'service' mode. The PI mode is the traditional observing mode, in which the principal investigator and parts of his/her team goes to the telescope and performs the observations. The technical support is typically limited to the telescope, while the instruments need to be operated by the observing team. The service mode is a novel observing mode in solar physics. In this mode the proposers describe the scientific objective and give a detailed explanation on what data they need. The data is acquired by a service team at the telescope following the requirements that the proposers have specified.

The EAST TAC announced the call for proposals for the two observing seasons in 2013 and 2014. The calls were issued in 'SOLAR NEWS', which is subscribed by most Solar Physicists worldwide. Also, the EAST TAC informed all 'known' people that could be interested in the ACCESS program. In addition the Project office implemented a web page within the SOLARNET Internet portal to promote the ACCESS program, and distributed a poster on the TAS (Annex III, *`TAS_POSTER1.pdf'*)). The proposal deadline was in mid January of each observing season. The number of submitted proposal was higher than expected. The EAST TAC checked the proposals for eligibility and contacted the telescope operators for checking the technical feasibility. The EAST TAC selected two independent referees who rated the proposals according to their scientific merit. Based on the scientific merit, the EAST TAC granted the observing time. Since GREGOR was not available in 2013 and 2014, the SST received more observing days than planned. For that reason the SST has already now provided 97% of the contracted observing days. The total amount of ACCESS provided corresponds to 55%, such that the ACCESS program is well on track. Therefore, we consider the ACCESS program a success. The granted observing time of the first two seasons was assigned to the following principal investigators:

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VTT, SST, and THEMIS:

PI mode 2013: SST: Antolin et al., Mathiousdakis et al., Gallagher et al., Berlicki et al.; VTT: Gömöry et al.; THEMIS: Mangano et al.; Fedun et al.; Wiehr et al.;

PI mode 2014: SST: Vissers et al.; Henriques et al.; Doyle et al.; Mathioudakis et al.; VTT: Gömöry et al.; THEMIS: Koza et al.; Labrosse et al.; Fedum et al.;

IBIS and ROSA at DST:

Service mode 2013: High priority: Fletcher et al.; Morton et al.; Calvo Santamaria et al.; Medium priority: Fischer et al.; Jurcak et al.; Löhner-Böttcher et al.; Low priority: Stangalini et al.; Scullion et al.

Service mode 2014: Highest priority: Morton et al.; Cristaldi et al.; Fletcher et al.; Medium priority: Kiess et al.; Erdelyi et al.

PI mode 2014: Highest priority: Asensio Ramos et al.

One of the positive results consists in the fact that 14 out of 30 observers, that were supported with travel & subsistence grants were **new users**. Also the ACCESS program was able to attract a large number of UK astronomers to solar telescopes who previously did not do such observations. In the UK, there is a large solar community that works on data acquired in space, studying predominantly the outer atmosphere of the Sun. As the inner layers of the Sun, namely the photosphere and chromosphere, become more and more important to understand the processes in the outer layers, namely transition layer and corona, UK scientists took advantage of the SOLARNET program to access relevant data to study photosphere and chromosphere. Within the SOLARNET ACCESS program some of them gather first experience in ground-based data by applying for service mode observations, but many of applied for observing time at the European solar telescopes at the Canary Islands (VTT, THEMIS, SST) in the PI mode.

The project office at the IAC then took the responsibility to organize the travel and accommodation of the observers. One or two observers per campaign received funding through the travel & subsistence grants of the ACCESS program. The Project Office also distributed User questionnaires to assess the User's experience with the ACCESS program. These assessments are attached: Annex IV and Annex V ('*1st_SOLARNET_TAS_USERS_ASSESSMENT_2013.pdf*', and '*2nd_SOLA*RNET_TAS_USERS_ASSESSMENT_2014.pdf'.

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The TAS reports 2013 and 2014 (cf. attachments: `TAS_REPORT_2013.pdf', `TAS_REPORT_2014.pdf') summarize the relevant numbers and give statistics on our transnational ACCESS program. In their Sections 3, comments and remark are given.

The Deliverable D20.1 reports on the TAC tasks and the TAS Programme. In summary, the ACCESS program is considered very successful. The first Service mode observations have been conducted, and delivered very good data, which will certainly lead to first scientific results soon. Many lessons have been learned from the first Service mode campaigns. These experiences will be discussed at the next FAS meetings to improve this novel queue-observing mode. The PI mode ACCESS program faces a lot of demand, which reflects the strong solar community within Europe. One problem of the ACCESS program is that GREGOR could not yet be offered to the community. This shortcoming will be overcome in 2015, as GREGOR is planned to offer time to the community.

WP 20.2 Guidelines for pipeline development

The leader (CNRS) of this sub-work package made a survey of existing pipelines for the instruments being part of the WP50 action, to identify duplication and analyse possible merging of processing tools. This included a survey of existing observing procedures for the instruments being part of the WP50 activity. The results of this survey are reported on in the deliverable D20.2: „Survey document - State of the art of existing pipelines and procedures - Preliminary report on pipeline guidelines".

As a next step, we will need to reflect this survey and to discuss how to proceed in order to work out the guidelines for the pipeline developments. This will be done at the next FAS meeting which is planned for early spring 2015. Then we will collect the opinion of the community on those aspects that should be integrated in the software. As a result we plan to define and propose standard observing procedures and pipeline for WP50 instruments that do not have one already and propose modifications for those already existing, if considered necessary. In the course of this action item we will define documentation guidelines of pipelines.

Pipeline workshops

When it comes to joint activities, notable events are two workshops of different scopes that were arranged during the project period.

1st CASSDA-SOLARNET workshop:

This workshop (Motto: The challenge of retrieving ready-for-science data from ground-based solar observations. Getting the most out of your data.) took place in Freiburg on 18 – 20 February, 2014 in collaboration with the activities under WP50. The workshop had 45 participants from many institutes in Europe and the US representing IAC, CNRS, UCL, ESA, UiO, NSO, HAO, MPS, IAG, Valencia University, SU, ASU, INAF, IAA, CASSDA/KIS.

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There were presentations and discussion sessions on a broad range of subjects, such as calibrations, image reconstruction, data pipelines, and data dissemination.

Spectropolarimeter pipeline workshop:

A workshop on pipelines for imaging spectropolarimeters was hosted by the Institute for Solar Physics (SU) at the AlbaNova University Centre in Stockholm, Sweden 17 – 19 June, 2014.

The idea was to convene a subset of the instrument teams representing imaging spectropolarimeters. They could be seen as a spearhead that would come up with solutions that could serve also the other instruments.

There were a total of 12 participants representing ISP/SU, CASSDA/KIS, NSO, and INAF. Seven of the participants (from ISP/SU, CASSDA/KIS, and NSO) were physically present and five were connecting through the meeting's web interface.

WP 20.3 Data archives and Solar Virtual Observatory

A group with the experienced partners (UiO –chair–, ROB, UCL-MSSL, INAF, IGAM, AISAS, HVAR, AIP, UPS, UWR, NSO and CfA-SAO) was formed at the kick-off meeting of SOLARNET and all partners were included in a mailing list. Additional interested individuals were added on demand to this mailing list. The first discussion of the goals was held at the TAS meeting in Stockholm on November 8th 2013 and a face-to-face meeting was held in Dorking, England November 25-27 2013. A Google-document was created where all participants on the mailing list were invited to comment and edit. The discussions were thereafter held over email and through comments in the Google document. This document forms the deliverable D20.4: "Document on standards for data archiving and VO" where the above points are addressed with the exception of the last point on synoptic solar databases. Both this point and the work towards pilot partial archives serving data to existing solar VOs require the implementation of the recommendations of D20.4 in the pipeline work. These aspects of the DoW are to take place between now and the end of month 48 and will be reported on in the deliverable D20.5: "Report on the VO tools prototype".

WP 20.4 Coordination with other infrastructures

The objective of this task is to optimize coordinated observations with different infrastructures around the world. To this end, it is planned to execute a coordinated two-week observing campaign, focused on a commonly agreed-to region of interest, with as many collaborators as possible in the last year of this project. Data obtained during this common campaign shall be shared by all participants on an equal access basis, with general results jointly published. The details of this collaboration still need to be worked out.

We have identified several non-European high-resolution ground-based telescopes whose

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coordination with the key European high-resolution ground-based infrastructures is of interest. An initial survey of possible participants resulted in eight high-resolution telescopes within European member states, five of which are located on the Canaries. Non-European potential partners are four telescopes in the United States and three telescopes in Japan, China and Russia. Initial contacts with some of the potential partners resulted in positive responses.

In addition, a preliminary survey of synoptic observing stations which regularly monitor the Sun and will be asked to provide context data of the solar disk and the solar corona during the joint campaign include nine optical observing stations around the world and the global helioseismology network GONG. Most of these stations support on-going regular synoptic campaigns.

There are several radio telescopes in Europe, USA, Russia, China and Japan, which carry out regular measurements of the solar corona. They will be contacted to provide context data during the campaign. Specific joint observing proposals will be submitted to the European coordinating bodies of ALMA and LOFAR.

At the same time we identified the space missions whose coordination with the key European high-resolution ground-based infrastructures is of interest. An attempt will be made to include the Japanese space telescope HINODE into the targeted program. All other space observatories such as SDO and Stereo provide direct access to their data without the need for special arrangements.

We contacted some of these infrastructures in the United States and in China in order to prepare coordinated campaigns. The result of these joint observation campaigns will be used to recommend actions to the telescope operators to improve the coordination, once the weaknesses are identified.

A detailed report on the facilities for coordination can be found as deliverable D20.6.

WP 20.5 Novel queue observing mode in solar physics

The object of this task is to study the feasibility of implementing and testing a service observation mode, which does not exist on any solar telescope prior to SOLARNET. This study shall go to the point of setting a prototype service mode observing campaign (limited in time and telescope participation).

Several campaigns in the novel service mode have been performed within the ACCESS program using IBIS and ROSA at DST. The results have been discussed at the FAS meetings, and are summarized in the deliverable D20.1 “Report on the TAC tasks and the TAS Programme”. The service mode is a success and delivers state-of-the-art data to scientists, who are not instrument experts. These scientists in turn focus on the science, and are experts in their field of research.

With IBIS and ROSA we have gathered quite some experience in how to organize, schedule, and perform a service mode observation campaign. Some preliminary planning has been made for a test observation run with the SST in service mode that will take place in 2015.

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WP30: Solar physics networking

Lead Beneficiary: INAF

Participants: IAC, KIS, INAF, UiO, QUB, UCL-MSSL, AISAS, UWR, IAA-CSIC

Objectives: Aim of this work-package is to foster collaborations among different solar physics groups, promote the interaction and cooperation among researchers of different level of expertise, as well as to encourage and promote synergies with other fields.

Some of the actions foreseen under this work-package are: exploitation of ground- and space-based data; enhancement of collaborations with other communities and Projects; promotion of collaborations between the new generation of scientists and experienced researchers through short stays and training actions to acquire competences in relevant fields of solar physics.

WP30 has three Tasks (or sWPs):

- 30.1 Meetings
- 30.2 Mobility
- 30.3 Training (Schools and Thematic Workshops)

Achievements

In agreement with the decisions taken at the WP30 splinter session during the SOLARNET Kick-off Meeting held in Brussels on April 2013, and with the help of J. Burgos (IAC), F. Zuccarello (INAF) distributed to the contact persons of the other participants of WP30 a document containing some useful information for the Meetings/Schools organization.

The main guidelines of this document is reported below:

- ***EU support:*** *make sure you recognize EU support in all publications and announcements related to the meeting (posters, etc).*
- ***Conference fee:*** *it has to be declared in the EU annual financial reports as a "receipt". It is expected that the costs associated to the organization of the meeting will be partially covered by these conference fees and only the rest should be charged against the EU contribution. Conference fees are considered as an income, and EU contribution is limited to the amount of costs not covered by these conference fees.*
- ***Sponsors:*** *any amount of money provided by sponsors to cover in total or partially some of the costs related to the event should be declared also as receipts (same treatment as for the conference fees).*
- ***Support on EU issues:*** *You can contact the SOLARNET Project Office at the IAC (solarnet@iac.es) in case you want to clarify any particular issue related to the EU contribution supporting the event: eligibility of costs, reporting, etc.*

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- ***Proceedings:*** *some journals will be contacted, but the decision on whether or not to have published, refereed proceedings will be taken by the meeting's organizers.*
- ***Website:*** *Meetings and Schools must be duly advertised through the website. Specific sections/pages for every event must include practical information, agenda, training program, contact person, etc. Once the event is finished presentations can be available on the website. The SOLARNET Project Office at the IAC can support you on this, by providing templates, etc.*
- ***Outreach:*** *when possible, public talks or general lectures should be organized, for instance in schools or other public venue; some educational material could be distributed in schools. The SOLARNET Project Office at the IAC will produce some general material on solar physics (audiovisuals, etc) in support of these outreach activities. Apart from that, some other specific actions can be also supported from the IAC upon request.*
- ***Young researchers:*** *Young Researchers involved in the SOLARNET Mobility Program should be encouraged to attend the SOLARNET Schools and/or to present the results obtained during the training period at the SOLARNET Meetings. These meetings will be very useful to promote career advice and mentoring from senior researchers.*
- ***Some practical details***
  - *The Schools should be organized with 7 days of lectures (6 teachers on average) and 3 days workshop.*
  - *Number of attendees to Schools: 15 – 20 students.*
  - *During the Schools some time should be allocated to provide complementary skills (how to write an article, how to write a competitive proposal, how to write the CV, how to apply for a job, project management, media and outreach training, etc.). Private partners are especially welcome here to contribute towards this training.*
  - *School's conference fee: it could be of approximately 50 Euros.*

WP 30.1: Meetings on solar physics

The objective of this task is to put in contact different solar physics communities and researchers involved in different fields of research. In particular, this task is aimed at achieving the following goals:

- Periodic meetings on topics related to solar physics and solar – stellar connections, where the participants can show the results of their research and profit from discussion time slots devoted to exchange of experience and competences.
- The fostering of collaborations aimed at improving the interaction between theoreticians, experts in numerical simulations and observers.
- The sharing of pipelines and software for solar data reduction and analysis.
- The consolidation of high-resolution MHD simulations to analyse the performance of advanced instrumentation for high –resolution solar observations.
- Promotion of seismological studies as a way to understand solar/ stellar interiors.

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These international meetings are also a very appropriate environment for the dissemination of knowledge. Four meetings are planned for attendance of a wide audience. The four events focus on key topics of high-resolution solar research and related fields. These events are being organized as detailed in the following Table.

Table WP30.1 – Meetings

Status	Timing	Title	Location	Org.
Done	Year 1 **5-8 August 2013**	Synergies between ground- and space-based solar research	Norway (Oslo)	UiO
Organization in progress	Year 2 **2-5 February 2015**	Solar and stellar magnetic activity	Italy (Palermo)	INAF
Organization in progress	Year 3, Q3 **Sept 2015**	Helio- and astero-seismology	Germany (Freiburg)	KIS
	Year 4, Q3 **Nov-Dec 2016**	The physics of the Sun from the interior to the outer atmosphere	Spain	IAC

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The **1st SOLARNET Meeting**: "Synergies between ground- and space-based solar research" was held in Oslo on 5 – 8 August 2013 (http://folk.uio.no/matsc/oslo-13/index.html) together with the 3rd EAST / ATST Meeting, and it was organized by UiO.

Fig. WP30.1: Poster of the 1st SOLARNET – 3rd EAST/ATST Meeting.

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In agreement with the description provided in the DoW, the goal of the meeting was to foster collaborations between ground and space solar projects, and in particular:

- to provide a forum to discuss the use of current and future observational solar facilities, and how to optimise their scientific returns;
- to identify the potentially paradigm-shifting observations that will become possible with the next generation ground- and space-based solar telescopes and their advanced instrumentation;
- to foster collaborations between researchers working at the development of ground- and space-based projects and creation of synergies between research programs at different wavelength bands.

Scientific Organizing Committee:

Mats Carlsson, University of Oslo, Norway
Tom Berger, NSO, Tucson, AR, USA
Gianna Cauzzi, INAF-Osservatorio Astrofisico di Arcetri, Italy
Jonathan Cirtain, NASA, Huntsville, USA
Bernhard Fleck, NASA/GSFC, Greenbelt, MD, USA
Alexandra Trischler, NSO, Sunspot, NM, USA
Francesca Zuccarello, INAF and Università di Catania, Italy

Local Organizing Committee: Ada Ortiz Carbonnel (Chair), Mats Carlsson, Thomas Golding, Eamon Scullion, Gregal Vissers.

The meeting was very successful, with 67 participants from both European and non-European countries. The program of the meeting was characterized by both oral presentations and e-poster presentations (17 invited talks, 28 contributed talks, 15 e-posters). The on-line proceedings of the meeting are available at http://folk.uio.no/matsc/oslo-13/program.html. (Deliverable 30.1).

Exemption of the registration fee was given to 26 young participants.

The budget allocated to the Meeting was 20 keuro and 1 p/m (UiO). To organize the Meeting UiO used 0.88 p/m.

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The **2nd SOLARNET Meeting**, "Solar and stellar magnetic activity" will take place in Palermo, Italy, on 2 - 5 February 2015 (http://www.astropa.inaf.it/Solarnet2015/Solarnet2015.html). Specific aims of this meeting are to review the current understanding of magnetic fields in the Sun and similar stars and to discuss future directions of research, in agreement with the description provided in the DoW.

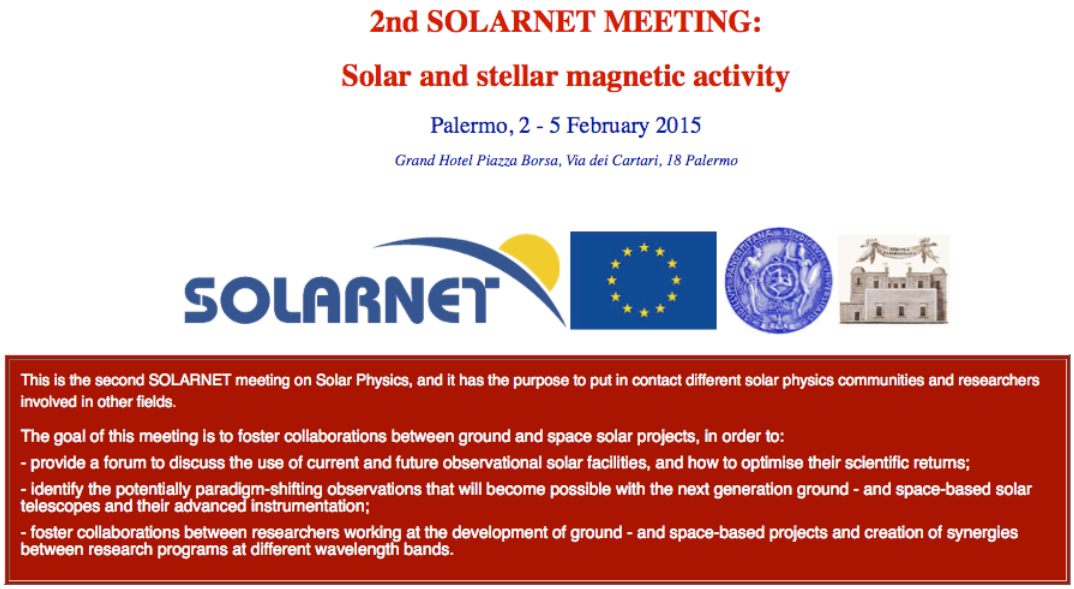

Fig. WP30.2: Snapshot of the webpage of the 2nd SOLARNET Meeting.

This workshop is expected: to provide a forum to review the advances of solar and stellar magnetic activity studies; to discuss future directions of research on solar and stellar magnetic field; to foster collaborations between researchers working in solar and stellar physics and creation of synergies between different research programs.

The scientific program includes the following topics:

1) Global properties of the solar magnetic field;
2) Solar dynamo and its applications to other stars;
3) Solar differential rotation and meridional flow, stellar rotation;
4) Solar and stellar magnetic fields;
5) Activity and stellar properties;
6) Stellar activity derived from high accuracy photometry;
7) Sources of spectral and total solar irradiance variations.

and two splinter sessions:

S1) Effect of magnetic activity and internal rotation on solar and stellar pulsations
S2) Synergies between solar and stellar research

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

Scientific Organizing Committee:
Mats Carlsson, University of Oslo, Norway
Manuel Collados Vera, Universidad de La Laguna, Tenerife, Spain
Maria Pia Di Mauro, INAF-Istituto di Astrofisica e Planetologia Spaziale, Roma, Italy
Jeremy J. Drake, Smithsonian Astrophysical Observatory, USA
Fabio Reale, Università di Palermo, Italy (Co-Chair)
Markus Roth, Kiepenheuer Institut fuer Sonnenphysik, Freiburg, Germany
Guenther Ruediger, Leibniz-Institut fuer Astrophysik, Potsdam, Germany
Francesca Zuccarello, INAF and Università di Catania, Italy (Co-Chair)

Local Organizing Committee:
Angela Ciaravella, Laura Daricello, F. Morale, Salvatore Orlando, A. Petralia, Fabio Reale (chair), S. Speziale, E. Tajfirouze

Financial support from INAF has been received (2500 Euro) and a request of support has been submitted to the European Physical Society (EPS): an answer is expected in the next months.

Announcements of the meeting have been posted on SolarNews, Loop Mailing List, SOHO meetings and events.

Preliminary list of invited speakers:

(1) Global properties of the solar magnetic field
- Duncan Mackay (UK)

(2) Solar dynamo and its applications to other stars
- Axel Brandenburg (SWE)
- Dario Passos (POR)

(3) Solar differential rotation and meridional flow, stellar rotation
- Sacha Brun (FRA)

(4) Solar and stellar magnetic fields
- Maria Jesus Martinez Gonzalez (SPA)
- Ansgar Reiners (GER)

(5) Activity and stellar properties
- Paola Testa (US)
- Philippe Gondoin (ESA)

(S1) Effect of magnetic activity and internal rotation on solar and stellar pulsations
- Laurent Gizon (GER)

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

(6) Stellar activity derived from high accuracy photometry
- Rafael Garcia (FRA)
- Antonino (Nuccio) Lanza (ITA)

(7) Sources of spectral and total solar irradiance variations
- Sami Solanki (GER)
- Ilaria Ermolli (ITA)

(S2) Synergies between solar and stellar research
- Alexander Shapiro (SWI)

The organization of the **3rd SOLARNET Meeting** will start soon. For the moment the KIS contact person is M. Roth (mroth@kis.uni-freiburg.de). Some e-mails discussing the date (most probably 31 August – 4 September 2015) and the location in Freiburg were exchanged in order to fix them. In agreement with the DoW, the title of the meeting will be related to helio- and astero-seismology.

WP 30.2: Mobility of Young Researcher

SOLARNET is supporting the mobility of young researchers as part of the networking activities in WP30. The mobility programme has been designed, as an additional aspect of the training program, with the goal to reinforce the contacts between different groups and to allow young researchers to begin early to establish international collaborations.

This task is carried out based on the following items:

- Availability of institutions to host young researchers for short stays (up to 2-3 months).
- Periodic calls aimed at selecting a number of candidates preferentially directed at Ph.D. students and young researchers from EU countries.
- The selection of the granted proposals is announced each year on March 31st and Sept 30th (see, e.g., Fig. 3).
- The mobility has to start during the 6-month periods starting in July 1st and Jan 1st
- This task is being supervised by the Mobility Evaluation Committee (MEC), which evaluates and selects the submitted applications. The MEC is composed by: Andres Asensio Ramos (Chair) (IAC), Ales Kucera (AISAS), Markus Roth (KIS), Mihalis Mathiudakis (QUB), Francesca Zuccarello (INAF).

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

SOLARNET

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement number 312495.

Mobility of Young Researchers

www.solarnet-east.eu

SOLARNET brings together and integrate the major European research infrastructures in the field of high-resolution solar physics, in order to promote their coordinated use and development. Networking activities, access to first-class infrastructures and joint research and development activities will be carried out under this major collaboration, where all pertinent European research institutions are involved, as well as private companies and other non-EU organizartions. SOLARNET achievements will be of paramount relevance to contribute towards the realisation of the European Solar Telescope (EST).

SOLARNET is pleased to announce its Mobility of Young Researchers Programme. This Programme aims to contribute to the professional development of researchers at their first steps of their careers, by offering short stays (up to 3 months) preferably at one of the SOLARNET member institutions, public or private entities. Other host institutions from anywhere will be also considered, as far as they are aligned with the scientific interests and objectives of this European initiative. It is expected also that this Programme will promote the integration of this new generation of researchers into the European solar physics community with long-lasting effects.

Applications from young researchers are welcome, and can be submitted at any time until March 15th 2016. Intermediate deadlines are issued to allow the evaluation of applications received until a specific date:

September 15th 2013
SECOND DEADLINE
for stays to be carried out within the period
January 1st – June 30st 2014

Following deadlines will be March 15th and September 15th, for stays within the period July-Dec and Jan-Jun respectively. Last deadline will be March 15th 2016.

There are up to 4 grants available for this second period of visits. EC funds will cover travel and accommodation costs for stays from a minimum of 1 month to a maximum of 3 months. Travel costs will be supported up to 600 €/fellow, and accommodation and subsistence costs up to 200 €/week.

Interested applicants are invited to complete the on-line form available at: www.solarnet-east.eu (application forms >> Mobility of Young Researchers).

A motivation letter and a brief summary of the proposed work at the host institution, together with a brief CV, need to be attached to the on-line form. Applicants are encouraged to contact the host institution in advance.

More information:

www.solarnet-east.eu solarnet-MEC@iac.es

Fig. WP30.3: The poster announcing the 2nd Call of the Mobility Program.

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

The initial objectives of the program was to have funds available to cover travel and accommodation costs for about 16 young researchers staying for a minimum of 1 month to a maximum of 3 months hosted by, preferably, one of the institutions involved in SOLARNET. The program supports travel costs up to 600 EUR per fellow, and accommodation and subsistence costs up to 200 EUR per week. The application is always open and a deadline is set every six months, when the MEC meets and decides, based on a combination of curricula and quality of the project, the young students whose visit will be funded.

The program has been a definite success, with the number of applicants increasing at every deadline. One of the big successes of the program has been to use the available funds to cover more young researchers than initially expected. In the following we list the number of proposals and the number of funded young researchers:

Oversubscription factor	Funded proposals	Initially proposed	Received proposals	Call
1	2	4	2	**July-December 2013**
1.2	5	2	6	**January-June 2014**
1.3	3	2	4	**July-December 2014**
3.6	3	2	11	**January-June 2015**

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

In the following Table we list those young researchers who got the mobility grant, with some details related to the stay.

Name	Nationality	Host Institution	Topic	Duration
Christopher Nelson	United Kingdom	National Solar Observatory	Ellerman bombs	4 weeks
Eamon Scullion	United Kingdom	The Queen's University of Belfast	Alignment DST-ROSA	10 weeks
Iker Sánchez Requerey	Spain	Instituto de Astrofísica de Canarias	Inversions with SIR	8 weeks
Ivan Milic	Serbia	Centre National de la Recherche Scientifique	2D/3D radiative transfer	8 weeks
Petros Syntelis	Greece	University of St. Andrews	MHD models of flux emergence	14 weeks
Rebecca Hewitt	United Kingdom	Università degli Studi di Roma Tor Vergata	Magnetic bright points	8 weeks
Mariachiara Falco	Italy	Kiepenheuer-Institut fuer Sonnenphysik	Magnetoconvection in sunspots	14 weeks
David Mactaggart	United Kingdom	Istituto Nazionale di Astrofisica	Study of ephemeral active regions	9 weeks
Alice Cristaldi	Italy	Instituto de Astrofísica de Canarias	Inversion of CRISP data	6 weeks
Richard Morton	United Kingdom	Stockholm University	Modelling and observations of Halpha/Hbeta	4 weeks
Rohan Louis	India	Instituto de Astrofísica de Andalucía	HR chromospheric transients in sunspots	7 weeks
Illa Rivero Losada	Spain	Kiepenheuer Institute for Solar Physics	Helioseismology	12 weeks
René Kiefer	Germany	NSO	p-mode parameters and solar activity	12 weeks

Note: Those Young Researchers whose name is given in bold letters in the above table have not yet started their Mobility Program, but grant has been already awarded.

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

Main results – Mobility Programme (2013 + 2014; only finished stays)	
Young reseachers:	8 (4 UK, 1 IT, 1 SP, 1 GR, 1 RS)
Host Institutions:	8 (2 UK, 1 SP, 2 IT, 1 DE, 1 FR, 1 USA)
Total expenses:	17.878,71 € (2.878,71 Travel + 16.000,00 Subsistence)
Total weeks:	75
Average cost per week:	aprox. 250 € / week.

All funded young researchers and the host institutions that they have visited have submitted brief reports summarizing the work carried out during the stay. This was one of the deliverables planned for SOLARNET (D30.2). The high level of the collaborations clearly demonstrates the success of the program.

WP 30.3: Training (Schools and Thematic Workshops)

This task will be achieved by means of a dedicated program that foresees:

- The organization of summer/winter schools for PhD students and novel post-doc researchers on topics related to the development of new instrumentation for solar observations, diagnostic tools, hot solar research topics and fields of mutual interest for solar and stellar physicists.
- The organization of thematic workshops matched with the training schools (i.e., immediately after or in splinter sessions).

This task foresees five schools and thematic workshops, as reported in the following Table:

Table WP3O.2 Training Schools and Thematic Workshops

	Timing	School	Workshop	Location	Org.
Done	Y1 **(24 March – 4 April 2014)**	***Introduction to Solar Physics***	Radiative processes in the Sun and the stars	Poland (Wroclaw)	UWRO
	Y2 **(5-15 Oct 2014)**	Ground- and space- based instruments	Methods in high resolution and synoptic solar physics	Slovakia (Tatranska Lomnica)	AISAS
	Y2/Q4 **(May 2015)**	***Solar magnetic fields: modeling and measuring techniques***	Polarization as a tool to study the Sun, the Solar System, and beyond	Spain (Granada)	IAA-CSIC
	Y3/Q2 **(Jan 2016)**	MHD waves and oscillations in the solar atmosphere	Heating mechanisms in the solar atmosphere	UK	QUB
	Y4/Q2 **(Sept 2016)**	***Solar MHD and magnetic reconnection theory***	Solar eruptive events: observations and modelling	UK	MSSL/UCL

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1st SOLARNET School and Thematic Workshop (Wroclaw, Poland)

The 1st SOLARNET School was held in Wroclaw (Poland) from March 24 to April 4, 2014 (http://school.astro.uni.wroc.pl) and was dedicated to PhD students and novel post-doc researchers who wanted to broaden their knowledge on solar physics.

Scientific Organizing Committee:

Arkadiusz Berlicki, Uniwersytet Wroclawski, Poland
Manuel Collados Vera, Universidad de La Laguna, Tenerife, Spain
Francesca Zuccarello, INAF and Università di Catania, Italy.

Local Organizing Committee: A. Berlicki, U. Bąk-Stęślicka, M. Stęślicki, S. Kołomański, E. Niemczura.

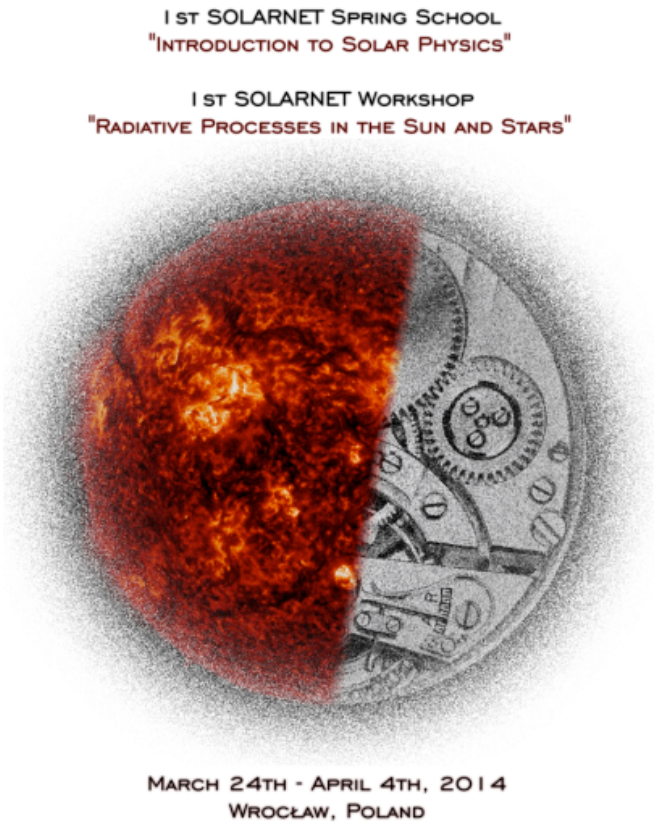

Fig. WP30.4: Poster of the 1st SOLARNET School and 1st SOLARNET Workshop

The lectures, carried out by experienced scientists (see the Program in Fig. 5 - 6), covered different solar topics:

- Instrumentation for solar observations
- The solar interior and dynamo
- The Solar Standard Model and helioseismology
- Active region formation and evolution
- Introduction to radiative transfer and NLTE line formation
- Solar Flares and coronal mass ejections (CME)
- Coronal heating
- Physics of solar prominences and radiative transfer
- Solar and stellar activity
- Solar wind

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

In addition to the lectures, several "hands-on" sessions were planned, coupled to the appropriate lectures, in order to allow the participants to develop their practical skills.

There were 40 applications for the school participation submitted to the Scientific Organizing Committee and 20 young researchers were finally selected. All of selected participants had attended the school.

SOLARNET SCHOOL: INTRODUCTION TO SOLAR PHYSICS
SOLARNET WORKSHOP: Radiative processes in the Sun and the Stars,
March 24 - April 4, 2014, Wroclaw, POLAND

1st Week	Mon. 24/3	Tue. 25/3	Wed. 26/3	Thu. 27/3	Fri. 28/3	Sat. 29/3	Sun. 30
08:00-09:00							
09:00-10:00		Opening	M. Collados Vera The EST and SOLARNET Projects	M. Carlsson High-resolution observations of photospheric and chromospheric features	M. Carlsson Introduction to radiative transfer	Jesús Burgos Martín Lecture on Complementary skill	
10:00-11:00		A. Berlicki Ground-based and space instrumentation for solar observations		M. Carlsson Chromospheric diagnostics	M. Carlsson NLTE line formation	Jesús Burgos Martín Lecture on Complementary skill	
11:00-11:30		Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break	
11:30-13:30		S. Regnier The solar interior and dynamo. Magnetic flux emergence	S. Regnier Active region formation and evolution	S. Regnier Spectro-polarimetry and data inversion	M. Carlsson Hands on Session on radiative transfer	S. Regnier Hands on Session	Free day
13:30-15:00		Lunch time	Lunch time	Lunch time	Lunch time	Lunch time	
15:00-16:30	Arrival of participants at the hotel & Registration	Student´s Introduction and joint discussion	Student´s presentation (15 min each)	Student´s presentation (15 min each)	Student´s presentation (15 min each)	Free afternoon	
16:30-17:00		Coffee Break	Coffee Break	Coffee Break	Coffee Break		
17:00-18:00		Student´s presentation (15 min each)	S. Regnier Hands on Session	S. Regnier Hands on Session	M. Carlsson Hands on Session: Working with IRIS data		
18:00-18:30							
19:00-	Welcome reception & dinner						

2nd Week	Mon. 31/3	Tue. 1/4	Wed. 2/4	Thu. 3/4	Fri. 4/4
08:00-09:00					
09:00-11:00	L. Fletcher Solar Flares	L. Fletcher Coronal mass ejections	M. Velli Coronal heating	P. Heinzel Physics and radiative transfer of solar prominences	M. Velli Solar Wind
11:00-11:30	Coffee Break	Coffee Break	Coffee Break	Coffee Break	Coffee Break
11:30-13:30	J. Molenda-Żakowicz How to write an Observational Proposal - lecture and practical excercises on complementary skill	A. Kosovichev The Solar Standard Model Helioseismology	A. Kosovichev Helioseismology The New Solar Telescope	P. Heinzel Solar and stellar activity	J. Molenda-Żakowicz Discussion on the observing proposals written by students Closure
13:30-15:00	Lunch time	Lunch time	Lunch time	Lunch time	Lunch time
15:00-16:30	L. Fletcher Hands on Session on solar flares	Workshop 6 Speakers (20 min each) Coffee Break	Workshop 5 Speakers (20 min each)	P. Heinzel Hands on Session on solar prominences	
16:30-17:00	Coffee Break		Coffee Break	Coffee Break	
17:00-17:30	L. Fletcher Hands on Session on Solar flares and CMEs	Coffee Break	Workshop 3 Speakers (20 min each)	J. Molenda-Żakowicz Discussion on the observing proposals written by students	
17:30-18:00		A. Kosovichev Hands on Session on helioseismology			Departure
18:00-18:30			A. Kosovichev Hands on Session on helioseismology		
18:30-19:00					
19:00-		School/Workshop Dinner (19:30)			

Legend:
Orange: School's Lecturers
Green: Student's contributions (Introduction: each student presents him/herself and the main interests; Presentation: a ppt on her/his own research)

Fig. WP30.6: Program of the 1st SOLARNET School (continued).

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

During the School, some lectures on complementary skills were provided, in order to describe the practical aspects in the work of researcher (see Figs. 5 and 6). The presentations and the materials provided by the lecturers are available at http://school.astro.uni.wroc.pl/materials.php (Deliverable 30.3).




Fig. WP30.7: The students attending the 1st SOLARNET School in Wroclaw (Poland).

During the School each student gave a short presentation on her/his scientific work (around 15 minutes); all the presentations are available at http://school.astro.uni.wroc.pl/presentations.php.

Some funds were available to cover the travel expenses and/or accommodation for lecturers and some students.

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

In parallel with the spring school, the SOLARNET workshop "Radiative processes in the Sun and stars" was also organized in order to allow the young researchers to participate in splinter sessions and to discuss their research with experienced scientists. The main aim of the workshop was to present and discuss the recent scientific results concerning different aspects of solar and stellar phenomena.

During the School, the attendants were asked to fill a questionnaire in order to provide an evaluation on the School and the Workshop. Some results of the questionnaire are reported below.

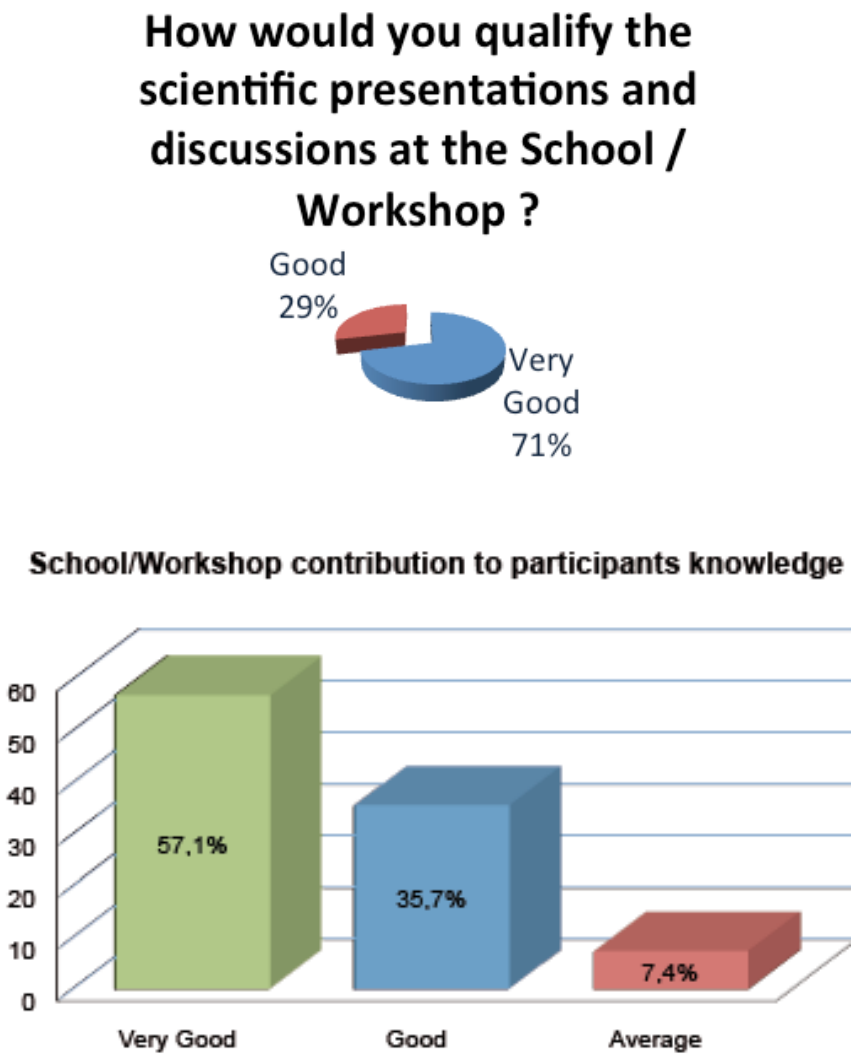

Fig. WP30.8: Results of the evaluation questionnaires.

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

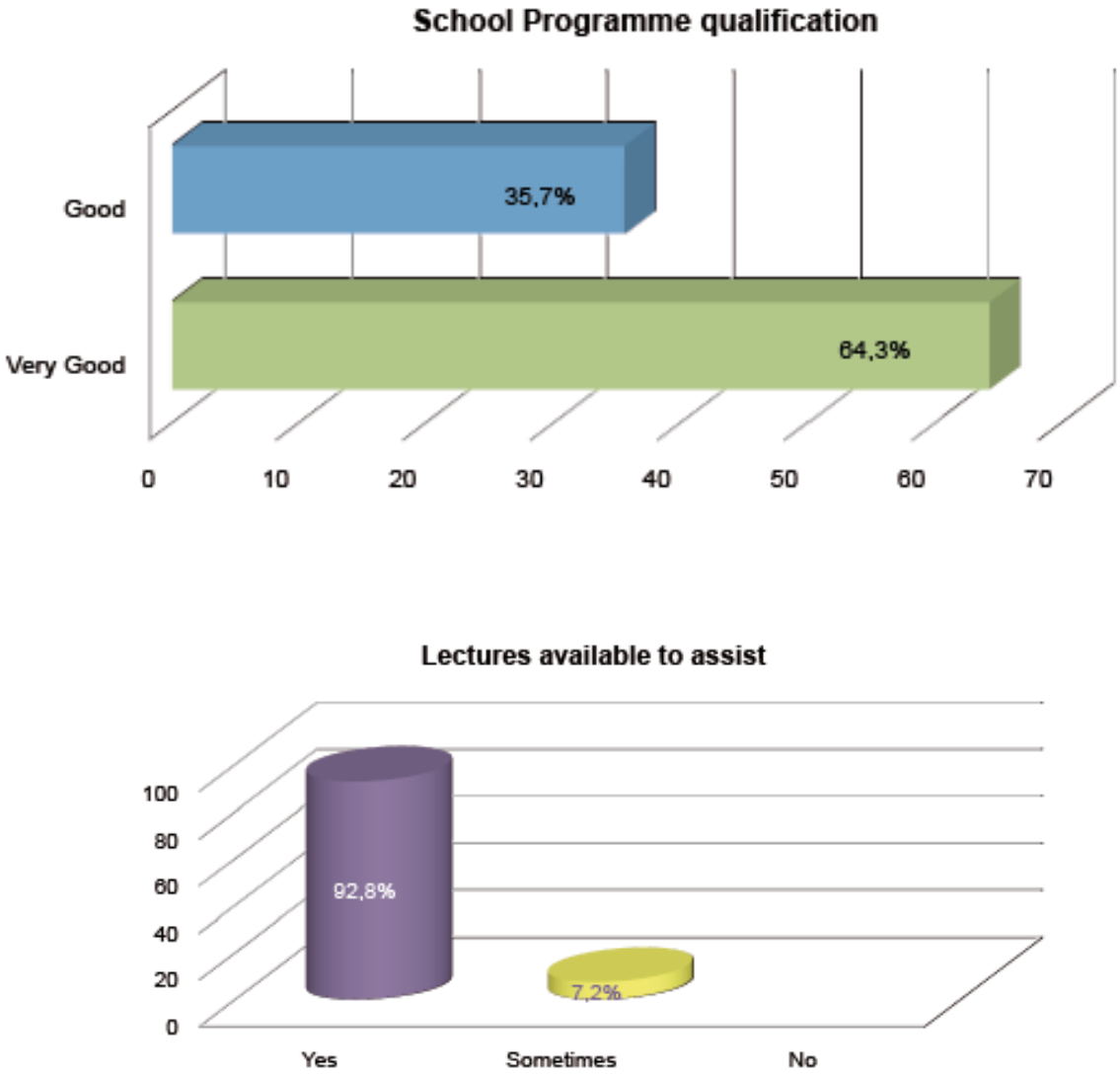

Fig. WP30.8: Results of the evaluation questionnaires (cont).

These evaluations indicate therefore a very high standard and quality of the School and Workshop organization.

The budget initially allocated to the School was 24 kEuro and 1 p-m (UWR). The final expenses were:

- Personnel costs: 1519.72 Euro
- Subcontracting: 6850.30 Euro
- Other: 12278.93 Euro
- TOTAL: 20648.95 Euro

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

2nd SOLARNET School and Thematic Workshop (Tatranska Lomnica, Slovakia)

The 2nd SOLARNET School: "Ground- and space- based solar instruments" (http://www.astro.sk/SOLARNET_2ND_SCHOOL/solarnet) is scheduled in Tatranska Lomnica (Slovakia), October 5-16, 2014 (immediately after the end of the first SOLARNET reporting period).

Scientific Organizing Committee:

Arkadiusz Berlicki, Uniwersytet Wroclawski, Poland
Luis Ramón Bellot Rubio, Instituto de Astrofísica de Andalucía, Spain
Mats Carlsson, University of Oslo, Norway
Manuel Collados Vera, Universidad de La Laguna, Tenerife, Spain
Aleš Kučera (chair), Astronomical Institute of the Slovak Academy of Sciences, Slovak Republic
Sarah Matthews, University College London, UK
Mihalis Mathioudakis, Queen's University Belfast, UK
Markus Roth, Kiepenheuer-Institut für Sonnenphysik, Freiburg, Germany
Francesca Zuccarello (co-chair), INAF and Università di Catania, Italy.

Local Organizing Committee: Jaroslav AMBRÓZ, Anna BOBULOVÁ, Marcela BODNÁROVÁ, Milena ECCLES, Peter GÖMÖRY, Marián JAKUBÍK, Július KOZA, Matúš KOZÁK, Aleš KUČERA, (chair), Pavol SCHWARTZ, Ján RYBÁK.

The lectures, carried out by experienced scientists, are aimed at giving students knowledge on current and future Ground- and space- based solar instruments, observational strategies, post-focus instrumentation and data acquisition. The hands-on sessions will be carried out also at Lomnický štít Observatory on the Double Solar Coronagraph and Coronal Multi-channel Polarimeter. There will be given information on the European Solar Telescope (EST) project and on the FP7 SOLARNET project, as well as lectures on complementary skills.

The program includes lectures focused on the following topics:

Past, Current and Future Ground-based Solar Instrumentation:

- Telescopes
- Post-focus instruments
- Adaptive optics and other methods for image stabilization and post facto image corrections
- Detectors
- Data handling data archives
- Observations availability and accessibility
- Daniel K. Inouye Solar Telescope (ATST)
- EST European Solar Telescope

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

Past, Current and Future Space Solar Instrumentation:

- Past solar missions, data policy and availability, archives (Orbiting Solar Observatories, Skylab, P78-1, SMM, Hinotori, Ulysses, CGRO, Yohkoh, CORONAS, TRACE)
- Current solar missions and experiments (GOES, SOHO, RHESSI, SORCE, Hinode, STEREO, SDO, IRIS), data handling & data archives, observations availability and accessibility
- Future solar missions (Solar Probe+, Solar Orbiter, Solar Sentinels, Solar-C)

Lectures on complementary skills

- SOLARNET Project and future HORIZON 2020 calls connected with solar physics
- How to write an observational proposal,
- How to write a scientific paper.

The number of applications was 19 and 12 students were selected to attend the School.

In parallel with the 2nd SOLARNET School the Workshop: "Methods in high resolution and synoptic solar physics" and 2nd SPRING (Solar Physics Research Integrated Network Group) workshop, 12 - 16 October, 2014 has been organized in Tatranska Lomnica, Slovakia (http://www.astro.sk/SOLARNET_2ND_WORKSHOP/).

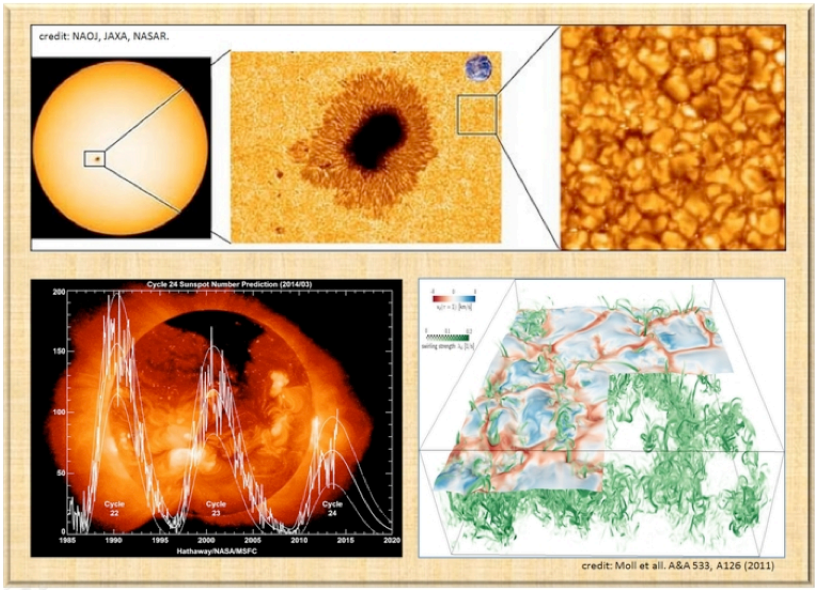

Fig. WP30.9: Screenshot of the webpage of the 2nd SOLARNET thematic workshop

The budget allocated to the School was 30 keuro and 1 p/m (AISAS).

The details of the expenses incurred at AISAS till 30 September 2014 are: 1889.36 Euro and 0.76 p/m.

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

3rd SOLARNET School and Thematic Workshop (Granada, Spain)

The 3rd SOLARNET School "Solar magnetic fields: Modeling and Measuring Techniques" is scheduled in Granada (Spain) in May 18 – 23, 2015, in connection with the Thematic Workshop "Polarization in the Sun, the Solar System, and Beyond" that will take place on 25 – 28 May (contact person Luis Ramon Bellot Rubio lbellot@iaa.es).

The following activities have already been carried out:

1. Organization of the 3rd SOLARNET School "Solar magnetic fields: Modeling and Measuring Techniques"
   1a. Dates and program defined
   1b. Budget distributed
   1c. Lecturers contacted and confirmed
   1d. Conference Room booked
   1e. Accommodation for School participants arranged

2. Organization of 3rd SOLARNET Workshop "Polarization in the Sun, the Solar System, and Beyond"
   2a. Dates fixed (25 – 28 May 2015, Granada)
   2b. Scientific Organizing Committee contacted and confirmed
   2c. Invited speaker list drafted
   2d. Conference room booked
   2e. Conference Organization Company contacted

The budget allocated to this event is 30 keuro and 1 p/m (IAA-CSIC): about 0.25 p/m was spent in the preparatory activities until September 30.

Summary of WP 30.3

All the activities carried out in this WP are therefore in agreement with the description provided in Annex I of the Grant Agreement.

Concerning the schedule, one point to mention is that, apart from the first international meeting, which was held in Oslo in August 2013, the dates of all the Schools and other Meetings have been postponed because the partner institution (UWR, Poland) hosting the first School could not respect the expected date because of other commitments (conferences and meetings) in the first year of SOLARNET. As a consequence, the dates of all the other events were shifted. The new calendar has been formulated in such a way that all the events (Meetings and Schools) will take place during the SOLARNET period and no impact on other tasks or available resources and planning will occur.

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

WP40: Innovation towards Industry

Lead Beneficiary: TECNALIA

Participants: IAC, KIS, INAF, CNRS, UCL-MSSL, AISAS, ROB

Overall Objectives: The overall objectives of WP40 can be defined as follows:

- Identification and analysis of technologies, techniques and new concepts already in use at the forefront of solar physics' developments with potential interest for other sectors.
- Dissemination of the innovative aspects and findings of the project towards industry, through the existing and highly successful industrial associations and related high-tech companies at EU level.
- Assessment of space technologies of most interest for solar physics developments, and identification of common needs and opportunities.
- Extension of the effort of collaboration between high-tech companies, universities and public organisations on solar physics and related fields, oriented to the transfer of knowledge using well proven methodologies.
- Increase of the potential for innovation of research infrastructures on solar physics.
- Promotion of synergies with other I3 initiatives on this same topic.

Objectives for the period

The main objectives for the reporting period were the following:

- Identification and analysis of technologies, techniques and new concepts
  - Development of a database for:
    - Technologies Offers
    - Consortium knowledge base
    - Technology Needs identified by the solar astrophysics community
  - The database(s) will continue to expand as more information is made available by the partners

- Dissemination of the innovative aspects and findings of the project towards industry
  - Dissemination of the project and specifically the technology offer and needs listings through:
    - International/European Events
    - SOLARNET workshops
    - European networks
    - Other

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- Organisation of one workshop related to technology transfer
  - 1st SOLARNET Technology Transfer Workshop was held during this period.
  - Linked with SOFT 2014 Fusion Conference (San Sebastian, Spain) after analysis of database showed several technologies/needs with potential solutions/collaborations within the fusion industry.

- Assessment of space technologies
  - Tecnalia has access to the ESA European Technology Transfer Network database
  - Continuous monitoring of space technologies for potential application in solar astrophysics community
  - Monitoring of opportunities for transfer out from ground based solar telescopes to space based or other sector applications
  - Monitoring of Invitation To Tender (ITT) opportunities through the ESA EMITS portal

Summary of work progress

To date the WP has achieved the following (further details for each topic are described in later sections):

The *Initial Technology Offer* database currently comprises 14 Technology Offers from the consortium members. This was achieved through a series of email requests from partners and then a series of interviews with staff based at IAC, Canary Islands. The data has been developed through further intensified contacts. This database will continue to be expanded throughout the duration of the project as more technologies are defined by partners. In many cases there will be technologies that have not yet been considered and Tecnalia recognizes the need to focus on further extraction before M24.

The *Initial Technology Need* database currently includes 21 Technology Needs identified by the consortium members. As with the Offer database, this will continue to be expanded throughout the remainder of the project. However, as with the Technology Offer database, it is clearly recognized that an effort is needed over the months prior to M24 to further engage with the partners. This is particularly true for those partners directly involved with WP40, in order to achieve the defined level of activity in this work package.

Analysis of Technology Offers and preparation of Technology Offer forms (see below).

These forms follow the common format used to present technologies in the Enterprise Europe Network (EEN) database. It is also the same format adopted by the European Space Agency Technology Transfer Network (ESA TTN) for its online technology database. Using a common format assures the ease of interaction with existing networks.

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The document provides a template for the presentation of the technology as well as an assessment of the sectors in which the technology may be applicable in order to focus the presentation of the technology to these sectors.

Dissemination of SOLARNET activities and more specifically technology specific dissemination continue to increase in regularity as more technology information becomes available. During the period the following events were attended:

- "Encuentros Astrofísica – Empresa" (Meetings between Astophyiscs and Companies), Astrofísica y de las Ciencias del Espacio, Bilbao, Spain, 15 July 2013
  - Tecnalia presented details of SOLARNET project as well as several examples of previous technology transfers from space observatory missions to non-space applications.

- SPIE 2014, Montreal, Canada
  - Tecnalia prepared a Technology Offer and Needs brochure for the SOLARNET technologies. This was presented on the Spanish ICEX stand at the event. Tecnalia did not attend the event, however representatives of INEUSTAR (Spanish Science Association) and ICEX (Spanish Institute for Foreign Trade) presented the brochures during the trade fair.

  - SOFT 2014, San Sebastian, Spain

  - 1st SOLARNET Technology Transfer Workshop – Astrophysics to Fusion
  - Tecnalia participated throughout the week at the International conference and trade fair focused on global fusion activities.
  - Tecnalia stand presented details of SOLARNET activities and specifically the listed technology offers and needs
  - Workshop was held to specifically present the SOALRNET project and discuss areas of potential collaboration between the two communities
  - Technology transfer specific meetings were held with Fusion 4 Energy, ESA and the European Commission representatives to discuss current and future activities in fusion related technology transfer extraction, but also potential areas for collaboration.

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The overall work progress by the WP leader is in line with work package timescale. Next, the other WP partners need to be involved to a much greater extent. Tecnalia will engage the other partners in the period up to M24 to ensure that their level of involvement increases. The established databases and responses from other networks will help this process as the consortium now has clear examples of the type of information currently available to the consortium as well as to external networks.

WP40 Achievements during the period

Identification of technology Offers and Needs

Technology Needs and Offers templates were sent out to partners in June/July 2013. The technology description profiles were prepared in a format compatible with existing European networks including:

- ESA Technology Transfer Program Office (ESA TTPO)
- Enterprise Europe Network (EEN)
- TTO Circle (Technology Transfer Offices of large EU public research organisations)

Initially only two technology offers were highlighted and presented by University Rome Tor Vergata. These were:

- FORS: a prediction-based servo loop control algorithm for adaptive optics systems (SO-01)
- Fabry-Perot Interferometer Prototype (SO-02)

The limited response across the SOLARNET consortium members was later clarified as resulting from:

- Complex nature of request forms
- Many consortium members have had little/no previous experience with technology transfer concepts and procedures and were therefore not in a position to provide the relevant information
- The initial Tecnalia request for information from partners focused mainly on the extraction of Technology Offers and less on identifying and extracting SOLARNET consortium Needs
- The request for Needs was later seen as being more critical for the purposes of the project and related projects.

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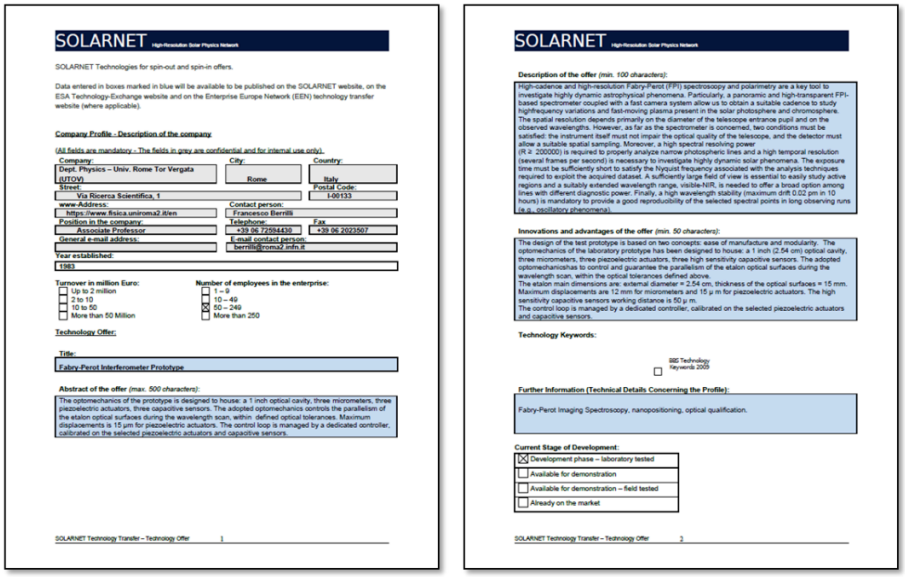

SOLARNET

SOLARNET Technologies for spin-out and spin-in offers.

Data entered in boxes marked in blue will be available to be published on the SOLARNET website, on the ESA Technology Exchange website and on the Enterprise Europe Network (EEN) technology transfer website (where applicable).

Company Profile - Description of the company

(All fields are mandatory - The fields in grey are confidential and for internal use only)

Company:	City:	Country:
Dept. Physics – Univ. Rome Tor Vergata (INTOV)	Rome	Italy
Street:		Postal Code:
Via Ricerca Scientifica, 1		I-00133
www-Address:	Contact person:	
https://www.fisica.uniroma2.it/een	Francesco Berrilli	
Position in the company:	Telephone:	Fax
Associate Professor	+39 06 72594430	+39 06 2023507
General e-mail address:	E-mail contact person:	
	berrilli@roma2.infn.it	
Year established:		
1983		

Turnover in million Euro:
- ☐ Up to 2 million
- ☐ 2 to 10
- ☐ 10 to 50
- ☐ More than 50 Million

Number of employees in the enterprise:
- ☐ 1 – 9
- ☐ 10 – 49
- ☒ 50 – 249
- ☐ More than 250

Technology Offer:

Title:

Fabry-Perot Interferometer Prototype

Abstract of the offer *(max. 500 characters)*:

The optomechanics of the prototype is designed to house: a 1 inch optical cavity, three micrometers, three piezoelectric actuators, three capacitive sensors. The adopted optomechanics controls the parallelism of the etalon optical surfaces during the wavelength scan, within defined optical tolerances. Maximum displacements is 15 μm for piezoelectric actuators. The control loop is managed by a dedicated controller, calibrated on the selected piezoelectric actuators and capacitive sensors.

SOLARNET Technology Transfer – Technology Offer 1

SOLARNET

Description of the offer *(min. 100 characters)*:

High-cadence and high-resolution Fabry-Perot (FPI) spectroscopy and polarimetry are a key tool to investigate highly dynamic astrophysical phenomena. Particularly, a panoramic and high-transparent FPI-based spectrometer coupled with a fast camera system allow us to obtain a suitable cadence to study highfrequency variations and fast-moving plasma present in the solar photosphere and chromosphere. The spatial resolution depends primarily on the diameter of the telescope entrance pupil and on the observed wavelengths. However, as far as the spectrometer is concerned, two conditions must be satisfied: the instrument itself must not impair the optical quality of the telescope, and the detector must allow a suitable spatial sampling. Moreover, a high spectral resolving power (R ≥ 200000) is required to properly analyze narrow photospheric lines and a high temporal resolution (several frames per second) is necessary to investigate highly dynamic solar phenomena. The exposure time must be sufficiently short to satisfy the Nyquist frequency associated with the analysis techniques required to exploit the acquired dataset. A sufficiently large field of view is essential to easily study active regions and a suitably extended wavelength range, visible-NIR, is needed to offer a broad option among lines with different diagnostic power. Finally, a high wavelength stability (maximum drift 0.02 pm in 10 hours) is mandatory to provide a good reproducibility of the selected spectral points in long observing runs (e.g., oscillatory phenomena).

Innovations and advantages of the offer *(min. 50 characters)*:

The design of the test prototype is based on two concepts: ease of manufacture and modularity. The optomechanics of the laboratory prototype has been designed to house: a 1 inch (2.54 cm) optical cavity, three micrometers, three piezoelectric actuators, three high sensitivity capacitive sensors. The adopted optomechanicshas to control and guarantee the parallelism of the etalon optical surfaces during the wavelength scan, within the optical tolerances defined above.
The etalon main dimensions are: external diameter = 2.54 cm, thickness of the optical surfaces = 15 mm. Maximum displacements are 12 mm for micrometers and 15 μ m for piezoelectric actuators. The high sensitivity capacitive sensors working distance is 50 μ m.
The control loop is managed by a dedicated controller, calibrated on the selected piezoelectric actuators and capacitive sensors.

Technology Keywords:

☐ BBS Technology Keywords 2009

Further Information (Technical Details Concerning the Profile):

Fabry-Perot Imaging Spectrosopy, nanopositioning, optical qualification.

Current Stage of Development:

☒	Development phase – laboratory tested
☐	Available for demonstration
☐	Available for demonstration – field tested
☐	Already on the market

SOLARNET Technology Transfer – Technology Offer 2

Figure. WP40.1: Example of technology offer template (Fabry Perot Interferometer)

To fully understand the needs of the consortium members, a series of discussions was held between IAC and Tecnalia (Nov 2013 – Jan 2014), in order to identify the key technology transfer requirements within SOLARNET. These discussions identified the need for a greater focus on the technology Needs of the consortium. This was particularly important as this activity was linked to the need to generate solutions to a large number of critical technology requirements/inputs. These relate to critical tasks in key Solarnet tasks or linked projects such as Gregor, EST, others

From the initial discussions via teleconference two days of interviews were arranged at the IAC facilities in March 2014. Interviews were held between Tecnalia and the following groups:

- IAC management
- Technical staff of key departments
  - Instrumentation
  - Electronics
  - GRANTECAN.

The outputs of these interviews provided the data needed for the initial listings of the identified Technology Offers and Needs. These related not only to IAC related technologies, but also joint collaborations with the majority of the SOLARNET partners.

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Following the interviews

- SOLARNET Technology Needs and Offers databases created to assist data extraction
- Database output formats are designed for SOLARNET members but also for presentation of technologies to other European networks (inc ESA TTN, EEN, TTO Circle etc)
- Based on identified technologies, Tecnalia will now contact relevant partners to confirm details and to add required data to highlighted technologies – both Offers and Needs
- Additionally, partner discussions will likely highlight further needs and offers for addition to relevant databases that will then require assessment.

Technology Offers listing

The following table lists the brief description of the main Technology Offers extracted to date. The third column lists sectors in which the technology might be applicable and the assessment of these potential applications is currently on going. Several of the technologies have been presented to other networks.

Reference number:	Technology Description	Potential application sectors
SO-01	Prediction-based servo closed loop control algorithm for adaptive optics systems	EO data processing
SO-02	High-cadence high-spectral resolution Fabry-Perot Interferometer prototype	Aeronautics, machine tools
SO-03	Precision optics design methodology (10^{-4} positioning)	Space, Defense
SO-04	Primary mirror with cavities for advanced cooling	Space
SO-05	Mirror cooling system for reduction of optical aberration-perturbation	Fusion
SO-06	Hexapod mechanism with integrated cooling system	Space, machine tools, test bench, inertial bench, sports
SO-07	Continuous rotary mechanism with integrated optics transfer for large telescope structures	Medical, fusion
SO-08	Coating with high polarimetric performance and reflectivity	Aeronautics
SO-09	Data control loop for multi mirrors and their actuation mechanism	Space, digital cameras
SO-10	Correlating Wave front Sensor (CWS) for image stabilisation and fine guiding	Space
SO-11	High resolution multi-slicers	Space, MEMS
SO-12	Image acquisition and processing (syncronisation at microsecond level)	Photography
SO-13	CCD sensors	Photography
SO-14	Method for optical design with polarimetry compensation.	Optics, space, medical

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Technology Needs listing

Similarly the interviews enabled the extraction of the following technology Needs has provided an initial listing of 21 technologies of which 14 are shown here. The remaining technology Needs are under analysis.

No:	Technology Request Description	Potential sectors
SN-01	Multi micro actuator network	
SN-02	Primary mirror: Novel high stability material	Space
SN-03	Radiative-convective thermal analysis	Space, Fusion
SN-04	Large structure rotation stabilitation (including optical part)	Space
SN-05	Integration of multiple actuators for adaptive optics	MEMS
SN-06	Solutions for manufacturing and mounting large (200mm diameter, 7kg) etalon glass mirror to required precision	Optics
SN-07	Micro-machining of microlenses	Machine tools
SN-08	Thin image slicer (30 microns) for 2D spectroscopy	Space,
SN-09	Visible and near infrared detectors capable of integrating multi-image signals on chip	Space
SN-10	Ferroelectric liquid crystal for optical and near-infrared polarimetry	Space
SN-15	IR detector - close to visible range (2,5 µm)	Defence, space, security
SN-17	Neural network for fast data processing	Big data, Fusion
SN-18	Big data signal management and video data compression solution without degradation or data perturbation losses	Space, ESA IP database
SN-19	Common data base for standardisation of big data processing and management	Fusion, Telecommunications

Note: Missing Needs from list are currently under assessment for suitability, particularly with regards to technology need requests outside of the sector.

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In this period, Tecnalia sent out an initial request for information from all ESA brokers related to 5 selected technology key Needs from the SOLARNET community. Tecnalia is now directly contacting technology providers and project partners to request further information. Several Needs and Offers have been determined to be of interest to Space (as well as Fusion) activities and will be presented to ESA TTN brokers when further information can be provided.

Five initial technology Needs were identified from the list and a request was sent to ESA TTN brokers for analysis, as follows:

1. SN-02 Alternative lightweight material to Zerodur.
2. SN-07 Micromachining capabilities (to 50microns) for glass and metals.
3. SN-15 IR detector (2,5 micron range).
4. SN-17 Neural network for faster data processing
5. SN-18 IP video compression solutions

SN-02 Primary mirror: Novel high stability material

An alternative lightweight material to Zerodur for a large astrophysics mirror

Zerodur has a high density and low thermal conductivity, which affects the mechanical stability of movable mirrors.

Zerodur properties:

Property	Value
Dispersion:	(nf − nc) = 0.00967
Density:	2.53 g/cm3 at 25 °C
Young's Modulus:	9.1 x 1010 Pa
Poisson Ratio:	0.24
Specific heat capacity at 25 °C:	0.196 cal/(g·K) = 0.82 J/(g·K)
Coefficient of thermal expansion (20 °C to 300 °C) :	0.05 ± 0.10 × 10−6/K
Thermal conductivity: at 20 °C:	1.46 W/(m·K)
Maximum application temperature:	600 °C
Impact resistance behavior	Similar to other glasses

Currently alternative SiC material is fragile and breaks during the mirror polishing process.

- Possible alternative highlighted by Tecnalia: carbon fibre reinforced SiC.
- Request: Suppliers of alternative materials to Zerodur

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Response from brokers

France

- Reference 1200: Bolts based on ceramic matrix composites (Alfresco)
- Reference 1210: Fibre ceramic high temperature friction bearing (Alfresco)
- CESIC: Carbon Fibers reinforced SiC (Esa-tec)
- Reference 1320: Production of complex systems made of silicon carbide components --> Boostec is a French company specialized in complex systems made of SiC components and provides strong knowledge on micromachining for heat exchangers and optics (Herschel mirrors 2009)

Belgium

AMOS (Belgium) www.amos.be – capabilities in handling/machining/polishing of lightweight materials for mirror applications (3m diameter max.)

SN-07 Micro-machining of microlenses

Spanish and German institutes need to produce a spectropolarimeter grating for integral field spectroscopy (for the planned European Solar Telescope). The institutes request a machining-manufacturing solution for the adaptive optics lenselets based on a 50 microns layered design. These microlayer lenselets will be arranged in a datacube format.

- Request: Service providers for micro machining of glass or metal to produce the lenselet layers.

Response from brokers

UK

STFC has capabilities for sub-micron micromachining. The Precision Development Facility at Harwell has this capability as well as capabilities at the Astronomy Technology Centre (ATC) in Edinburgh.

http://www.stfc.ac.uk/RALSpace/Facilities/Precision+Development+Facility/11282.aspx

France

- Reference 1320: Production of complex systems made of silicon carbide components --> Boostec is a French company specialized in complex systems made of SiC components and provides strong knowledge on micromachining for heat exchangers and optics (Herschel mirrors 2009)
- Duqueine Group: Design and manufacture of radio-telescope antennae with submillimeter precision: we don't have any technology descriptions yet but they're working for the space industry (negotiation on going)

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Belgium

AMOS (BE) – micromachining capabilities.

SN-15 IR detector - close to visible range (2,5 µm)

A European IR detector in the range close to visible (2,5 microns range).

Tecnalia comments: Possible solutions may have a common interest on security industry. A possibility is the detector with additive signals. Possible application in medical images too.

- Request: IR detector with FPGA processor, random projection methods, wavefront correction methods and adaptive optics.

Response from brokers

UK

ATC have world-class expertise in the design, development and delivery of IR detectors and electronics (as well as other optical bands). The capabilities of the Astronomy Technology Centre are also best described on the following website:

http://www.atcinnovations.com/

France

- HGH IR Systems: Vacuum Blackbodies for testing and calibration of IR sensors and cameras embedded on satellites (validation process in progress --> esa-tec) For 30 years, HGH Infrared Systems have specialized in the development of optronics, IR systems for security, industrial and civil applications.
- Real-time inspection and monitoring of water infrastructure with remote sensing (esa-tec)
- Testing facilities for large parts of composites materials (among the test provided: infrared and arc image radiant facilities): esa-tec
- Reference 1300: High Definition CDD Sensor (Alfresco): Based on its extensive know-how in CCD technology for visible-spectrum and very-near-infrared imaging and detection, the company has developed a wide range of CCD area arrays. CCD area arrays have been space-qualified through various European and worldwide other space programmes, with applications including: • laser link tracking in the Satellite Laser Link EXperiment (SILEX) • attitude sensing through Star Trackers • space exploration mission

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Belgium

- Xenics (Flanders) - IR solutions : "Xenics is the leading developer of innovative infrared solutions for a wide range of applications."

SN-17 Neural network for fast data processing

Neural network for fast data processing.

- Request: Systems capable of learning to improve large data handling in order to increase data processing speed.

Tecnalia (Spain)

- GAMCO Neural Engine (Nuclear fusion related engines for handling of large data sets)

France

- Reference 1229: Software to optimize experiments by non-linear models (Alfresco): Concerning knowledge-based models, the results are spectacular: the number of experiments can be reduced down to the number of coefficients of the model. For neural-network-based models, the number of experiments can be reduced down to three times, or sometimes even down to twice the number of coefficients of the model. Much time, as well as money, can thus be saved. In any circumstance, the accuracy of the models is improved.

SN-18 Big data signal management and video data compression solution without degradation or data perturbation losses

IP video compression solutions.

- **Request: Big data signal management and IP video data compression solutions without degradation or data perturbation losses.**

Tecnalia (Spain)

- ESA IP 576 Method, device and system for compressing time series data **[Tecnalia]**
- DAPCOM – FAPEC lossless compression software **[Tecnalia]**

Belgium

Deltatec (Wallonia) www.deltatec.be offers video systems for the following:

- Hardware, software and mechanics engineering
- Space segment: (Cameras, Video acquisition subsystems, Storage subsystems)
- Ground segment: (Dedicated testbeds, Video processing)
- Other markets: aeronautics, TV broadcast, multimedia, industry

France

- Reference 1351: Complex images treatment software for cartography (Alfresco) This software exploits the image processing knowledge developed by an innovative French company. This development platform includes various libraries, especially for space activities and standard image processing applications, allowing the treatment: • Very large amount of format supported (input and output) • Many cartographic and sensor models • Projection conversion supported • Image filtering • Image and vector simultaneous display and analysis • Vector management This software allows to build applications regarding customers' needs.

- Reference 1443: ESA Signal Power Measurement (Alfresco): A well-known international agency has developed a multipath discriminator module for navigation and communication systems, allowing an accurate positioning determination and reducing bit error rate in data transmission. The navigation system including this module is a part of the technology. The organization seeks license agreements and industrial partners.

The responses are being analysed to determine the suitability of the proposed solutions. Once an analysis has been made, Tecnalia will contact the relevant partner to discuss the potential solution in more detail.

Assessment of technology Offers and Needs

The assessment of the technologies has started in this period. Based on initial technology Offers and Needs listings an assessment of technologies is underway to determine the following:

- Technology priority
- Suitability for transfer to other industry
- Intellectual Property (if applicable)
- Degree of competitiveness
- Benefits over other technologies
- Specific examples of potential applications
- Entities/companies/agents relevant for each application
- Markets and technology acquirers
- Recommendations
- Availability of solutions from other industries

Annexes VIII and IX in this report lists the current technology databases from ESA – including both the Technology Exchange (European supplier technology database).

Dissemination and Events

The following events were attended and/or organized by Tecnalia or alternatively SOLARNET literature was sent to the event.

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"Encuentros Astrofísica – Empresa" (Meetings between Astophyiscs and Companies), Astrofísica y de las Ciencias del Espacio, Bilbao, Spain, 15 July 2013

Tecnalia presented details of SOLARNET project as well as several examples of previous technology transfers from space observatory missions to non-space applications. The following slides serve as examples of the potential transfers that can and have occurred from (in these cases) space based astrophysics technologies.

X-ray snapshots: from big black holes to tiny viruses

Spacecraft: XMM-Newton (X-ray Multi-Mirror)

Mission: X-ray detection of hot objects ranging from black holes to the formation of galaxies.

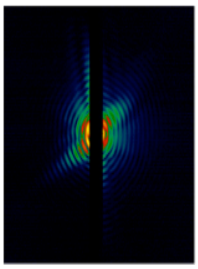
Technology: Complex X-ray cameras for ESA's XMM-Newton satellite were developed in the early 1990s at University of Leicester, UK.

In order to capture an image in space, you often need many detectors, so the mechanical camera head on a satellite's X-ray telescope is a very complicated item. It needs to hold and handle the detectors in an array, but must also be lightweight.

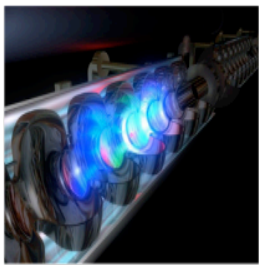
All components must be built so the area around the detector stays extremely clean, and all must function in a space vacuum.

Special electronics are also required to drive and operate the detectors.

XMM-Newton spacecraft



Mimi virus



DESY acceleration

Technology transfer to earth:

The developed technologies are helping us to analyze viruses on Earth, opening the door to solving medical problems.

A spin off company from the development of the mission technologies have developed a new type of X-ray camera that produces better images for terrestrial applications, with smaller pixels at higher resolution.

Cameras have been supplied to the X-ray Free Electron Laser at the DESY German Electron Synchrotron centre in Hamburg, Germany, to take very precise pictures of viruses.

Understanding the virus structure could lead to better medicines and healthier people.

X-ray telescope technology enabled greater precision in the capture of virus images

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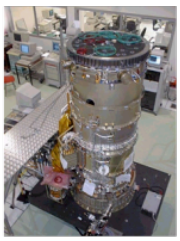
Detecting "dirty" bombs with gamma-ray technology

Spacecraft: INTEGRAL - International Gamma-Ray Astrophysics Laboratory

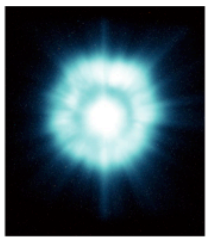
Mission: Investigate black holes, neutron stars, active galactic nuclei and supernovae, formation of new chemical elements and gamma-ray bursts.

Technology: Gamma-ray detection sensors. Most radioactive sources produce gamma rays of various energies and intensities. By detecting and analysing them, a gamma-energy spectrum can be produced – a kind of radiation fingerprint – to identify the substance and the quantity.

INTEGRAL spacecraft



SPI spectrometer



Gamma ray burst

Technology transfer to earth: Security screening systems

Detection of illicit traffic in radioactive materials that could be used to make dirty bombs is a high priority for national security.

Dirty' bomb refers to a radiological weapon that combines radioactive material with conventional explosives.

Effective screening devices are required for personnel and freight at ports and borders. The detection and identification of dangerous radioactive material has to be reliable and quick so as not to disrupt the normal flow of commerce.

Symetrica and Smiths Detection are developing a handheld and backpack Human Portable Radiation Detection System (HPRDS) tailored to meet these criteria.

The detectors can determine the location of incoming radiation and reliably discriminate between normally occurring radioactive material and potential threats.

Gamma ray detector technology (INTEGRAL) for security screening system

Star image storage helping to save Vatican books

Spacecraft: Herschel, Integral, XMM-Newton and SOHO

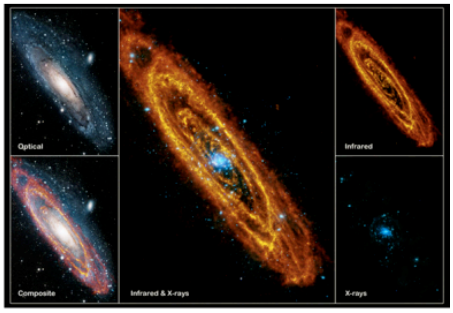
Missions: Space observatories

Technology: "FITS" – flexible image transport system.

In the 1970s ESA and NASA scientists developed 'FITS', the flexible image transport system format, stemming from radio astronomy.

FITS is now used to store data from many space missions and any kind of data you can use for astronomy can fit inside this format. This made it ESA's top choice for storing the mountains of information from almost all of the agency's astronomy missions.

In this digital era, finding a storage format for the ages is a big challenge facing researchers, archivists and librarians the world over. FITS is the answer.



Andromeda: infrared: ESA/Herschel/PACS/SPIRE; X-ray: ESA/XMM-Newton/EPIC; optical

Technology transfer to earth: Vatican Library book digitization

Antique books in the Vatican Library are being digitized to preserve them for future generations using the FITS technique developed through ESA to store the vast numbers of satellite images of the sky.

The Library needed a way of scanning the delicate old manuscripts and storing the files so that they could still be read in hundreds of years. The answer was the special file format used by ESA for most of its scientific satellites.

Vatican Library's reading room

Flexible image transport system (FITS) adapted for digitized manuscript storage

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SPIE 2014, Montreal, Canada, 22-27 June 2014

Tecnalia prepared a Technology Offer and Needs brochure for the SOLARNET technologies. This was presented on the Spanish ICEX stand at the event. Tecnalia did not attend the event, however representatives of INEUSTAR (Spanish Science Association) and ICEX (Spanish Institute for Foreign Trade) presented the brochures during the trade fair.

SOFT 2014 - 28th Symposium on Fusion Technology (29 Sep-02 Oct, San Sebastian)

The Symposium on Fusion Technology is the leading event to exchange information on design, construction and operation of fusion experiments and on the technology for present fusion machines and future power plants.

- 1st SOLARNET Technology Transfer Workshop – Astrophysics to Fusion
- Tecnalia participated throughout the week at the International conference and trade fair focused on global fusion activities.
- Tecnalia stand presented details of SOLARNET activities and specifically the listed technology offers and needs
- Workshop was held to specifically present the SOALRNET project and discuss areas of potential collaboration between the two communities
- Technology transfer specific meetings were held with Fusion 4 Energy, ESA and the European Commission representatives to discuss current and future activities in fusion related technology transfer extraction, but also potential areas for collaboration.

Tecnalia discussed collaboration between different EU technology transfer initiatives (FUTTA – Fusion, SOLARNET – Solar Astrophyiscs). In general there is currently a low level of interest towards tech transfer in the Fusion industry. The main focus is on the development of the ITER and other experimental systems, with tech transfer being an interesting (but not critical) side development. ESA and F4E are trying to create critical mass through technology offer extraction (and are going through a similar process to SOLARNET at this moment).

Tecnalia presented the details of SOLARNET to ESA, F4E, JRC and DG RTD (Simon WEBSTER – Head of Unit K6) to generate interest in collaboration between sectors. There was considerable interest due to the potential for increasing critical mass between the studies and Tecnalia will continue to liase with ESA, as well as the UK and German fusion brokers, for further exchange of data.

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Following discussion with the UK broker for FUTTA, Tecnalia will discuss both fusion and solar astrophysics in greater detail with the UK STFC's Astronomy Technology Centre in Edinburgh as well as RAL Space's Solar Physics Group in Harwell. They have developed a large array of different technologies & instruments for astrophysics applications and are more closely linked with technology transfer programs and can therefore offer recommendations for development steps.

Full details of the Workshop event are presented in Deliverable D40.1.

WP40 Status of Work versus Planning

In this period the following work was planned:

- Identification and analysis of technologies
  - This work has identified 14 Technology Offers and 21 Technology Needs. Work will continue throughout remainder of contract.
- Dissemination of the innovative aspects and findings of the project towards industry
  - Promotion occurred at three events.
  - Promotion continues through European networks (ESA, EEN, TTO Circle, Fusion tech transfer etc.).
  - Other industrial sectors need to be approached. Tecnalia is currently contacting similar initiatives to the fusion industry project FUTTA, in order to establish collaborative links with other relevant sectors (e.g. medical, optics etc)
  - 1st workshop held in Month 18 (originally planned for M15)
- Assessment of space technologies of most interest for solar physics developments, and identification of common needs and opportunities.
  - This has started but will continue in greater detail based on the technology offer and need listings.
- Extension of the effort of collaboration between high-tech companies, universities and public organizations on solar physics and related fields, oriented to the transfer of knowledge using well proven methodologies.
  - Initial work has started through the extraction of technology data but more emphasis needs to be placed on this task over the coming months. This activity will need the input from the other WP40 partners. Related activities will start immediately.
- Increase of the potential for innovation of research infrastructures on solar physics.
  - Tecnalia
- Promotion of synergies with other I3 initiatives on this same topic.

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- This final task is the responsibility of IAC. Both Tecnalia and IAC need to discuss this in further detail to determine:
  - How available data can help the process
  - What further information is required

Overall the WP is on schedule, although an emphasis on greater interaction with WP partners over the coming 6 month period is essential to better involve them in the development.

The main tasks of the period have been started and/or achieved:

- Technology databases available (further development will continue in next 6 month period)
- Assessment of technologies for suitability in other sectors – on going.
- Dissemination of activities – on going.
- 1st transfer workshop was organized and achieved 3 months after the scheduled date. This was mainly due to the selected topic for the workshop (fusion) and the relevant conference dates.

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WP50: Tools for innovative data handling: Pipelines, data-bases and SVO

Lead beneficiary: SU

Participants: AIP, IAC, CNRS, KIS, INAF, QUB, NSO

Objectives:

- Develop data-reduction pipelines for the most important European ground-based high-resolution solar instruments. Enhancement of observational procedures for increased productivity and easier coobserving and combination of data. The pipelines will produce data and meta-data fulfilling the requirements of a Solar Virtual Observatory (SVO).
- Set up a prototype for a SVO archive.

Achievements

WP50.1.1 General pipeline work

Lead beneficiary: SU

Participants: AIP, IAC, CNRS, KIS, INAF, QUB, NSO

Data pipelines are to be developed for a number of instruments, which are in different stages of development as were the reduction software at the start of the project. Here we comment on the most significant developments for each instrument during the project period. Some of the pipelines are essentially ready but all are awaiting final recommendations from WP20.2 and WP20.3 regarding output data and metadata formats. For a comprehensive summary of the status of the pipelines we refer to the deliverable report D50.1.

BLISS (AIP) and **CHROMIS** (SU)

These instruments are under development and no dedicated resources have been directed to their pipelines yet. It is however envisaged that **CHROMIS** will make use of much of the **CRISP** pipeline software. The reduction software written for **GFPI** will to a large extent be used also for **BLISS**.

TESOS (KIS) and **MTR** (CNRS)

Somewhat mature instruments for which some improvement work on existing pipelines has been made.

TUNIS (CNRS)

Recently operational instrument for which a basic pipeline exists and improvements are being made.

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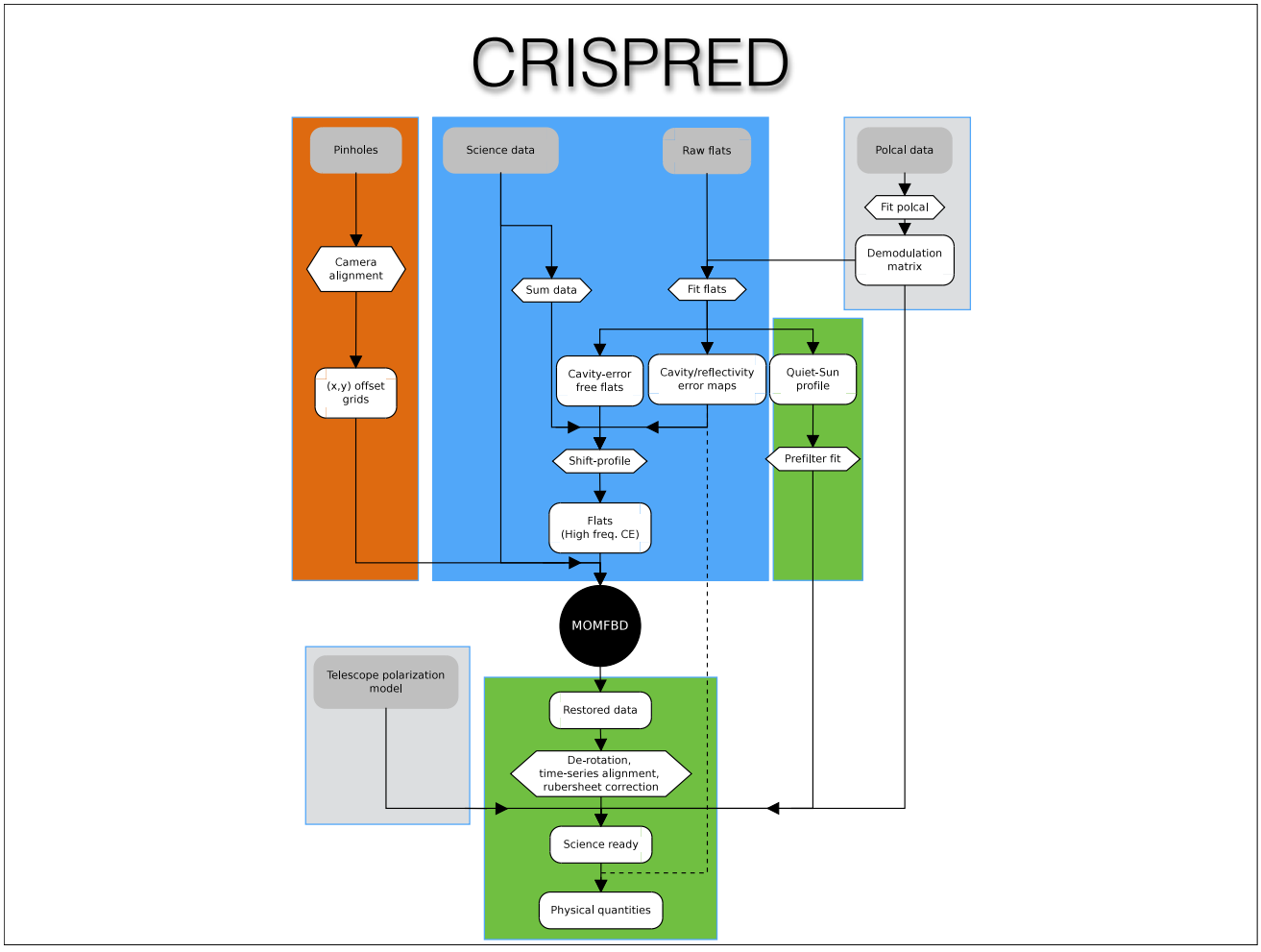
GFPI (AIP)

The instrument is now operational. Development of reduction software called sTools has started and an initial version will soon be presented.

CRISP (SU)

Pre-existing pieces of code have been incorporated into an object-oriented IDL structure with computationally demanding parts performed in C subprograms called as dynamically loadable modules (DLMs). With several improvements and enhancements, the result is called CRISPRED. The work with **CRISPRED** represents a significant effort and a paper to Astronomy & Astrophysics has been submitted (de la Cruz 2014, in press).



Flowchart illustrating the CRISPRED data pipeline

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TRIPPEL (SU)

Work has begun during 2014 to bring the existing somewhat rudimentary reduction software to a state more similar to that of CRISPRED.

GRIS-TIP (IAC)

During the ``Science Verification Phase'' of GREGOR (started in April 2014), an automatic pipeline for the reduction of GRIS spectropolarimetric data has been constructed and incrementally improved as different wavelength intervals were observed.

LARS (KIS)

The instrument is in a testing phase, used by developers only. Work on a data pipeline started in July 2014 and reached a stage where there is now a prototype version of a complete level-1 pipeline for the spectroscopic data.

ROSA (QUB)

In the report period work has been done on improving the accuracy of the co-alignment of the different frames produced by ROSA. Recently the co-aligning procedure has been improved to require less user input in the process. Also, steps have been taken to further automate the procedure.

IBIS (INAF)

Since the beginning of this project, the IBIS pipeline has been distributed more widely to users and several modifications have been implemented to accommodate for broader ways of data acquisition and to make it more accessible and user-friendly. A manual has been released.

WP50.1.2 Data Compression

Lead beneficiary: INAF

Participants: UToV

This sWP consists of the evaluation and development of 3D compression algorithms for solar spectropolarimetric data. Since high resolution spectroscopic and spectropolarimetric solar observations consist of time series of data with small changes from one frame to the next, or from one wavelength to the next, multi-dimensional compression algorithms are expected to achieve high compression factors, while preserving data quality.

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Information has been gathered about the 'state-of-the-art' multi-dimensional compression algorithms available 'on-the-shelf'.

The preliminary tests performed so far confirm an approximate doubling of compression efficiency on solar spectropolarimetric data by 3-D algorithms with respect to 2-D methods on same data, with apparently no information loss.

So far, the work proceeds as expected.

WP50.1.3 Image restoration

Leader: SU

Participants: KIS, INAF, CNRS, AIP, NSO

There are two kinds of image restoration methods in regular use for high-resolution solar imaging, particularly data sets with multiple wavelengths and/or polarization states. They are called Multi-object multi-frame blind deconvolution (MOMFBD) and Speckle interferometry with Speckle deconvolution, e.g., with the Kiepenheuer-institute speckle interferometry package (KISIP).

The work on improving the existing codes have been performed in connection with work on the data pipelines of which they are in effect a part. The 1st CASSDA-SOLARNET Workshop (see WP20.2) had image reconstruction as one of its subjects. In preparation for the workshop's discussion session on image reconstruction, an experiment was conducted. Two spectropolarimetric data sets were formed, one with real data from the VTT and one with artificial data using a simulation of both the atmosphere and the adaptive optics of the VTT. The idea was to use several different image restoration methods and parameter settings and restore the data, followed by atmospheric inversion. The output to be compared and evaluated was that of the inversion.

The image reconstruction was performed with the following methods:

- MOMFBD, using a number of different wavefront parametrizations and NB weights.
- The KISIP speckle code.
- The Göttingen speckle code.
- Waldmann's short-exposure WB/long-exposure NB speckle restoration method.

The restored images were demodulated to Stokes images, which were processed with an atmospheric inversion code producing maps of physical quantities.

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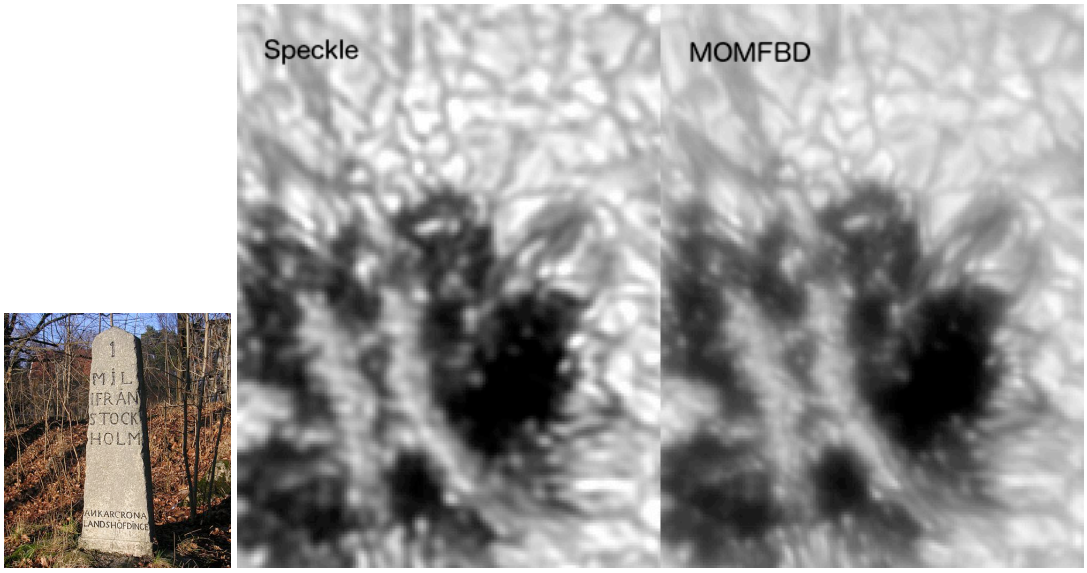
It was found that the difficulties in designing the experiment had been somewhat underestimated, since it had to test something relevant and at the same time conform to assumptions made in the standard processing with the different methods. So mostly it was useful as a precursor for a more carefully designed experiment. Further efforts are needed to isolate image restoration effects from other steps in the pipelines.

The work will thus continue, but the fact that this comparison actually has been made for the first time is such an unprecedented and important step that the Executive Committee during its meeting in Madrid in April 2014 declared that it does indeed fulfill the requirements of MILESTONE M50.1.



Milestone 50.1. Representations of image restorations made from identical input data (VTT/TESOS) using the Göttingen speckle code (left) and MOMFBD (right). Stokes I, i.e., ordinary light intensity is shown. The target is a small sunspot.

WP50.2 Solar Virtual Observatory

Leader: UiO

Participants: ROB

The aim of this sWP is to produce a prototype Solar Virtual Observatory (SVO) for ground-based data. The work during the reporting period has been performed by ROB.

After receiving preliminary input from WP20.3, it was decided to logically split the development of the virtual observatory into two parts. The first is an archive of metadata named the SOLARNET Data Archive (SDA). The second part, the SVO, will be built on top of the SDA, allowing cross-instrument searches, as requested.

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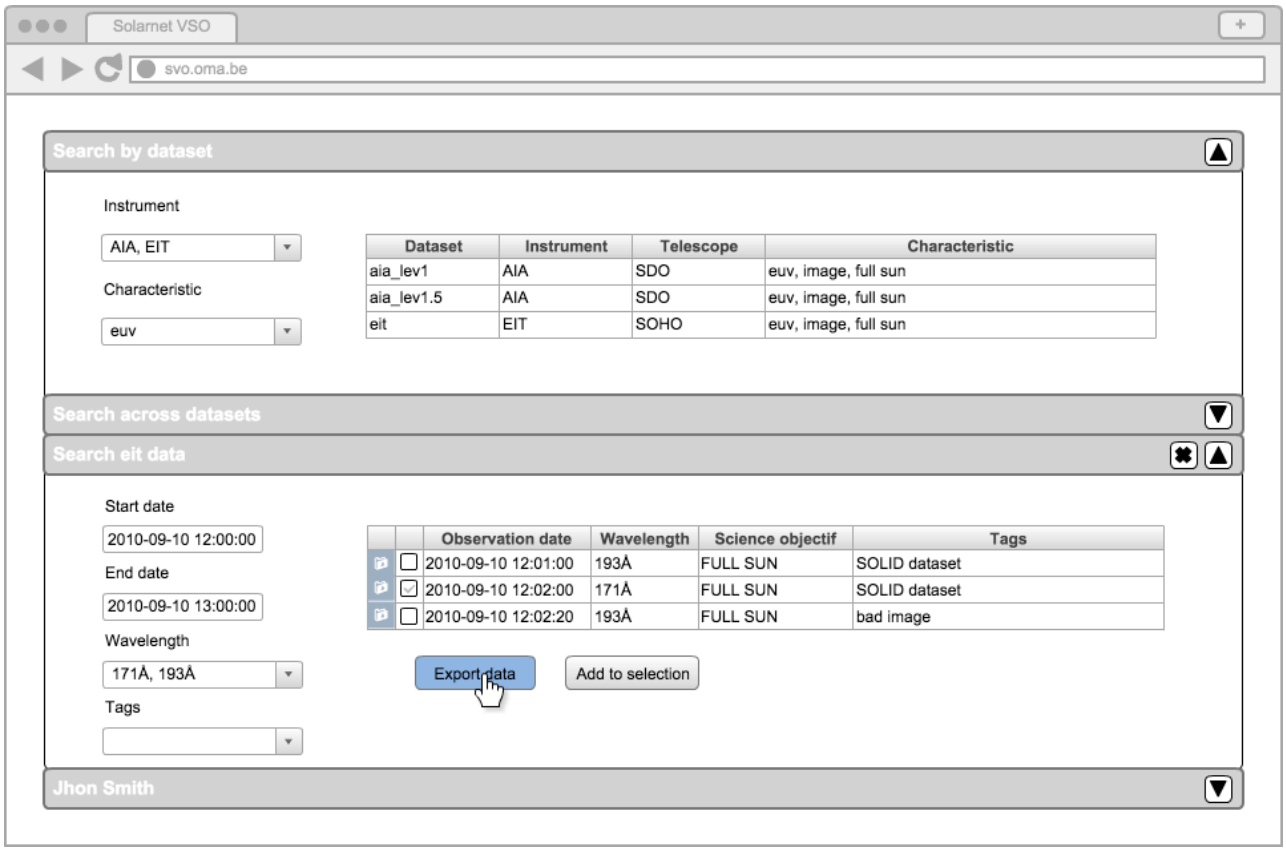
Of the various technologies and methods tested in the experiments, the following were chosen:

- The SDA will be an SQL database, which will be Boyce-Codd Normalized to preserve integrity of the data once there is a good overview of all the metadata. The SOLARNET partners have already provided some sample data.
- The interface will be built with the Python web framework Django.
- The API interface will be implemented with the Representational state transfer (REST) architectural protocol which can be interfaced with IDL, Python and URL

During the reporting period, development has mostly focused on the SDA as it forms the basis on which the SVO will be built. To see the latest state of the SDA and its development history you can use the following link to the GitHub repository: https://github.com/bmampaey/SDA



Screen shot of the user interface of the Solar Virtual Observatory prototype

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WP60: Advanced instrumentation development

Lead Beneficiary: IAC

Participants: IAC, KIS, INAF, UToV, MPG, AIP, FIRSOL, CNR-INO, PNSensor, WO

Objectives: Work Package 60 aims at the development of new instrumentation for existing solar telescopes, enhancing their capabilities and scientific potential. Some of the novel concepts and designs explored in this WP may be applicable to future large-aperture telescopes, as well. WP60 is divided into four different sub-WPs, corresponding to different instrumental developments.

sWP 60.1: Large Diameter Etalon development

sWP 60.2: Image Slicer for 2D Spectroscopy

sWP 60.3: Microlens-fed Spectrograph

sWP 60.4: Fast Imaging Polarimeter

Achievements:
All tasks are progressing according to expectations and no noteworthy problems have been detected. Use of resources and development is generally according to schedule. Only a minor delay has been identified in sWP 60.2 as one of the milestones, the Gregor slicer design, was produced three months later than expected. Even in this case, the milestone was still reached within the reporting period and it is not anticipated that it will result in significant overall delays. No correction measures have been deemed necessary.

The following paragraphs summarize the works that have been conducted in each sWP:

sWP 60.1: Large Diameter Etalon Development

The goal of this task is to design and characterize large-diameter etalons, in the range of 100 to 300mm, including mechanical mounts. A 150mm prototype will be manufactured and characterized using interferometry. In this reporting period, a candidate design of the 150mm etalon prototype has been produced, resulting from the iteration between FE simulations of the design and checks with the manufacturer of the optics and control electronics. It has been found that a symmetric, horizontal plate design offers the best compromises to meet the specifications. The current design is viable for manufacturing.

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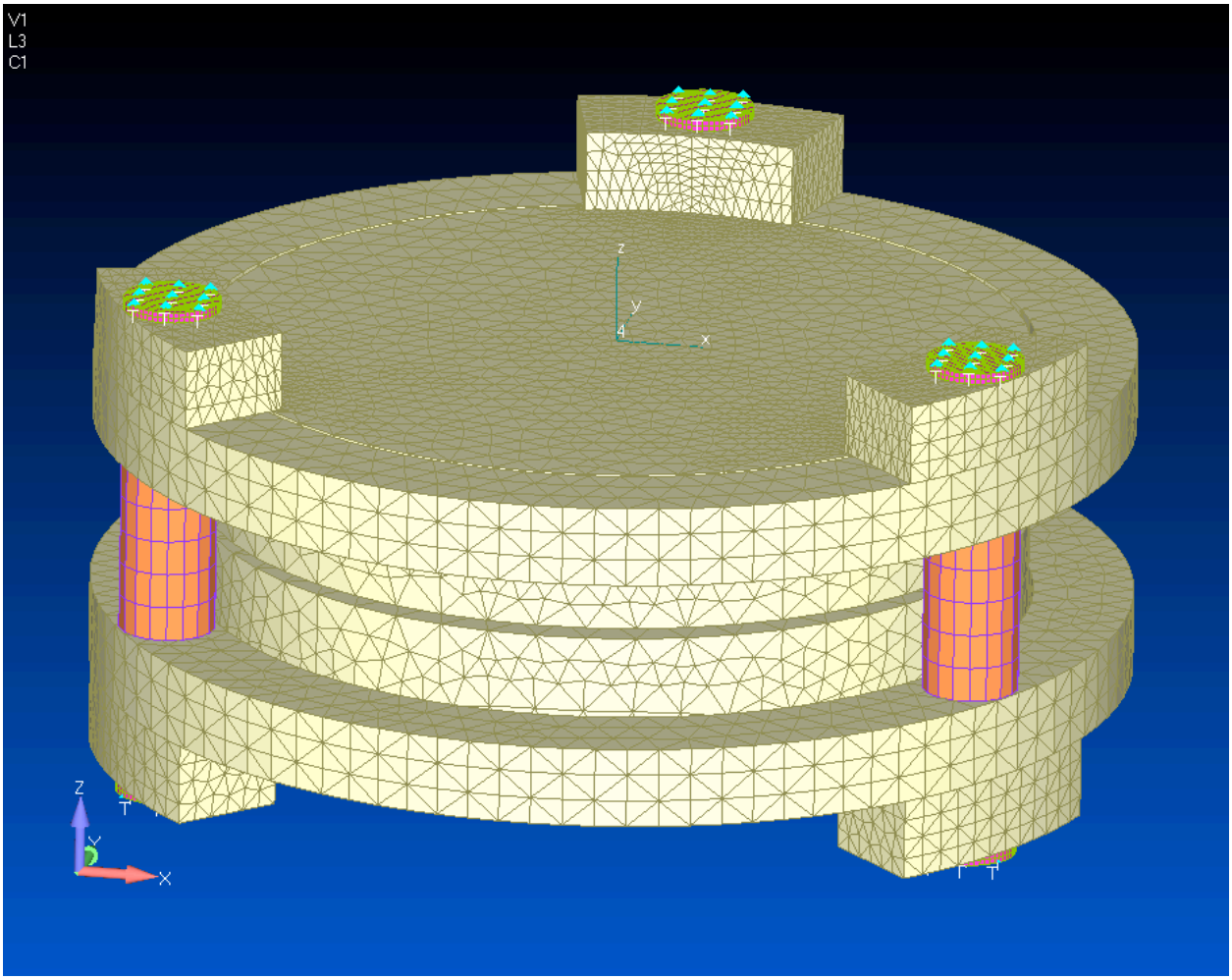

Large etalon design

sWP 60.2: Image Slicer for 2D Spectroscopy

Integral Field Units (IFUs) will become an extremely useful tool for next generation solar telescopes, allowing slit spectrographs to observe a two-dimensional (2D) field of view. This is even more important as solar physics emphasizes higher spatial resolution. This task has the goal of building MuSICa, a IFU prototype using the image slicer concept for GRIS, the infrared spectrograph of the Gregor telescope. The concept will be validated for the European Solar Telescope (EST).

The MuSICa design is now complete. Its image quality satisfies diffraction-limited resolution and the minislit pupils overlap on the diffraction grating. This design was a Solarnet deliverable scheduled for September 30th 2014. It was produced with a slight two-month delay which is not expected to impact the development.

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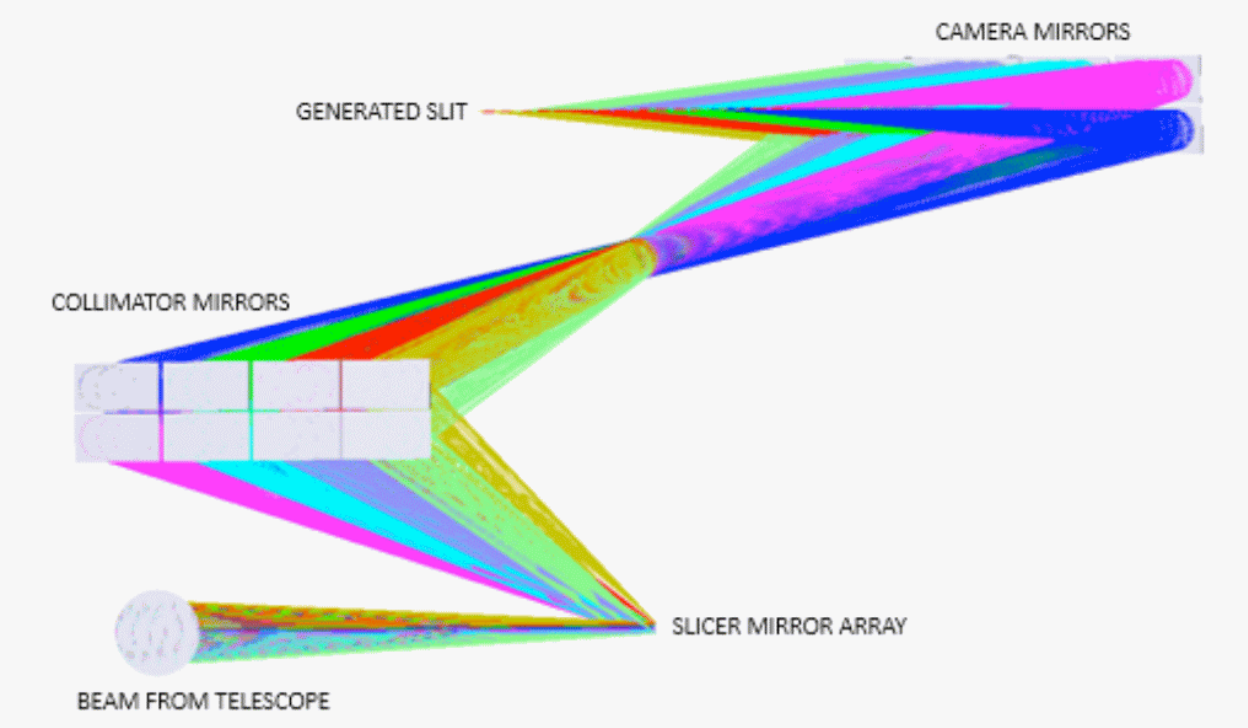

MuSICa optical design

sWP 60.3: Microlens-fed spectrograph

This sWP has the goal of building a prototype spectrograph with a microlens array in place of slit for 2D spectroscopy. The microlenses focus each resolution element into a single pixel, which is then dispersed in a slightly oblique direction so that the various spectra do not overlap in the free spectral range. The prototype will be characterized in the laboratory and then integrated and tested in an existing solar telescope to assess the viability of this technique as an alternative to IFUs.

The design of the microlens array system has been completed in this reporting period. The design has been made to fit the TRIPPEL spectrograph at the SST telescope.

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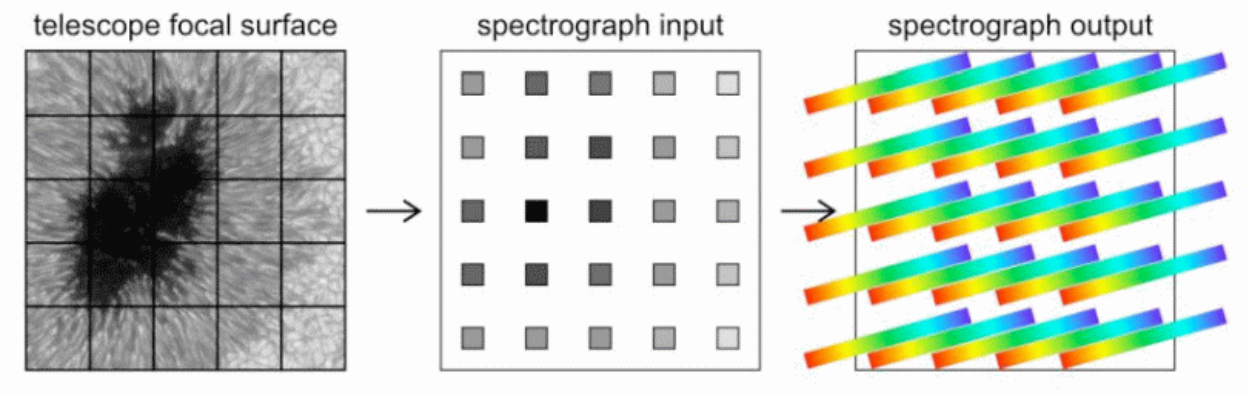

Microlens-fed spectrograph operation

sWP 60.4: Fast Solar Polarimeter

Polarimetry is a differential technique, based on the measurement of differences between successive images acquired with the polarization modulator at different configurations. In order to drastically improve the polarimetric accuracy of high-resolution observations, it is mandatory to improve the speed at which images are acquired thus minimizing the differential image distortion caused by the atmosphere. This sWP has the task of developing a Fast Solar Polarimeter (FSP) prototype for current telescopes, which might also serve as a proof-of-concept for more advanced future instrumentation.

During this reporting period, this sWP has developed a small FSP evaluation model using a fast 264x264 pixel CCD from the company pnSensor. This prototype has been tested and characterized in the lab, and then later at the VTT telescope. For the larger 1kx1k format polarimeter, two competitive conceptual design studies were requested from pnSensor and HLL following different technical approaches. Based on technical and financial considerations, the HLL design has been selected as the preferred alternative.

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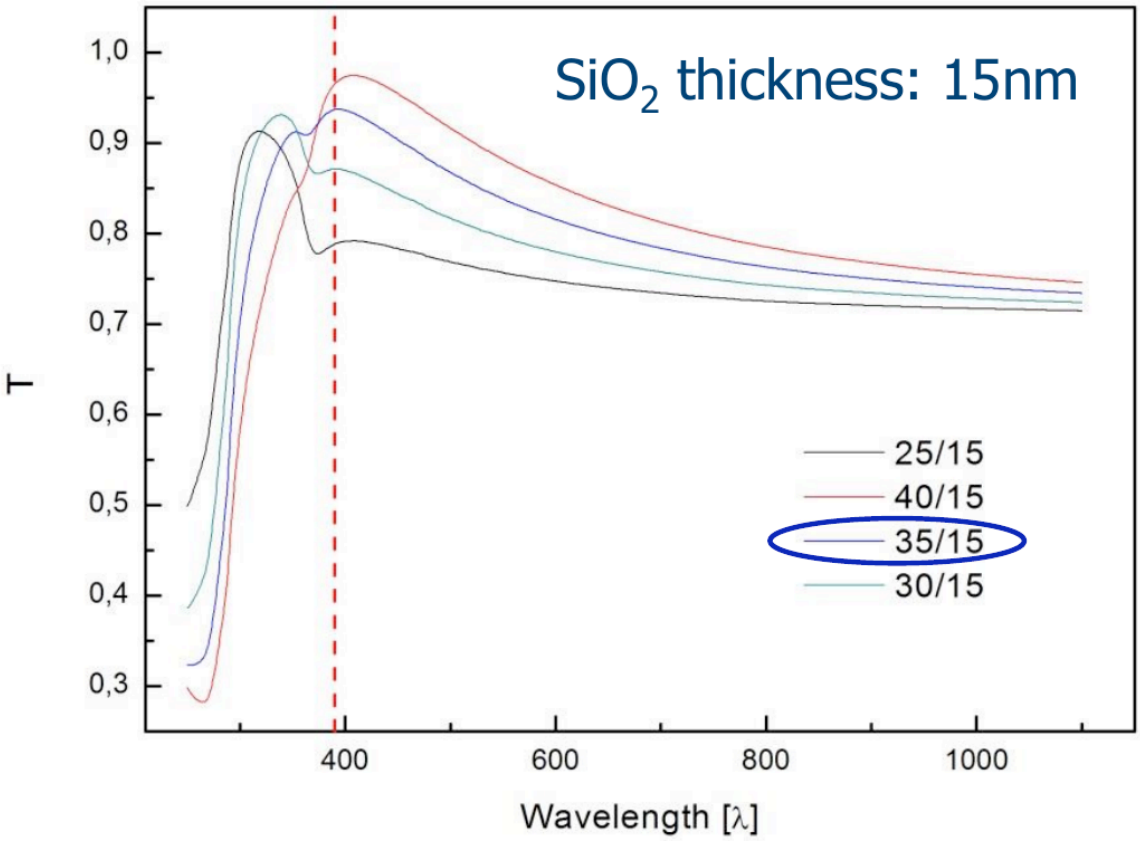

Quantum Efficiency of the HLL detector design

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WP70: Wavefront control: Turbulence characterization and correction

Lead Beneficiary: IAC

Participants: KIS, CNRS, UToV, SU, UCAL, WU, HANKOM, CIMNE, SRS

Objectives: WP70 is divided into 3 sWPs, with a total of 5 tasks, two related with adaptive optics issues (sWP70.1), one related to seeing measurements (sWP70.2), and the other two related to seeing effects minimization (sWP70.3):

1. Adaptive Optics (AO)
   1.1 Multiconjugate Adaptive Optics (MCAO) Simulations and Tests
   1.2 Implementation of an AO prototype for THEMIS telescope
2. Atmospheric Seeing Characterization
3. Local Seeing
   3.1 Application of CFD techniques for local seeing optimization
   3.2 Development of an innovative heat rejecter prototype for GREGOR telescope

All tasks progress according to the project schedule and consequently no correcting measures are needed. In the following, a summary of the work done in the different issues included in WP70 is given. More details are presented in the corresponding deliverables.

Task 1.1 Multiconjugate Adaptive Optics (MCAO) Simulations and Tests (IAC lead, UToV)

During 2013 and 2014 the effects of correlation wide field sensors have on the AO performance have been studied.

Collecting a wide field of view has several implications, i.e. averaging wavefront information from different sky directions, making the Strehl ratio drop for low elevation observations. So far these effects have not been studied in MCAO and we dedicated 2013 to that study. We have analyzed this effect by using the Fractal Iterative Method (FrIM), which incorporates a wide field Shack-Hartmann, and we have performed simulations of the EST MCAO system to analyse the performance for a large range of elevations, as required in solar observations, and depending on the asterism geometry and number and height of DMs, in order to find the best system configuration.

During 2014, we modelled the correlating wide field sensor and the way it senses the high altitude turbulence. Thanks to this improved modelling, we made an analysis of the influence of this sensing on the performance of each AO configuration, conventional AO and MCAO. In addition to the analytical study, simulations similar to the case of the EST AO systems with FRiM-3D (the Fractal Iterative Method for Atmospheric Tomography) were used in order to highlight the relative influence of design parameters. In particular, the results showed the performance evolution when increasing the telescope diameter. We analysed the effect of high altitude turbulence correlation

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showing that increasing the diameter of the telescope does not degrade the performance when correcting on the same spatial and temporal scales

Although multi-conjugate adaptive optics (MCAO) has been proven for night astronomy at infrared wavelengths, there are important differences with respect to solar astronomy that must be considered. Non-linear effects due to phase propagation in infrared wavelengths are negligible while become important for visible wavelengths. MCAO systems for night astronomy conjugate the deformable mirrors (DM) in the same order of turbulence layer occurrence. However, it has been claimed in the literature (Flicker, RD.2), that at optical wavelengths and at low elevation angles, this correction must be done in the inverse order of turbulence layers occurrence to avoid the non-linear effect of phase propagation.

As a second aspect of the work done in this task, we have analyzed two different approaches using the ZEMAX tool with the aim of verifying the influence of the DMs sequence in a MCAO system,. We also developed a script in YORICK, which includes the effects of amplitude and phase propagation.

One of the priority goals to attain within the frame of SOLARNET work package WP70.1 is to build a simulation environment suitable for Solar MCAO. We benefit from the expertise on MCAO for night astronomy. We are currently adapting two existing MCAO codes, YAO and FRiM for the Solar case.

The results of these studies, fully carried out the IAC, are presented in the sections *Deliverable70_1a* and *Deliverable70_1b* of the document *Deliverable70_1.*

UToV dedicated efforts to forecasting the MCAO correction. To that aim, a hardware demonstrator was constructed to test our forecasting algorithm FORS (closed loop FORcasting System). We studied the outcomes of introducing both a simple periodic defocus aberration and a real open loop defocus time sequence acquired at the VTT solar telescope. In both cases, FORS grants a significant performance increase, improving the stability of the system in closed loop conditions, and decreasing the amplitude of the residual uncorrected wavefront aberrations. The results of the test were presented in: "Improvements on Adaptive Optics control approaches: experimental tests of wavefront correction forecasting" in press Journal of Atronomical telescopes, Instruments, and Systems (JATIS). In the Acknowledgments, the following sentence was included: This study has been partially supported by the SOLARNET project (www.solarnet-east.eu), funded by the European Commision's FP7 Capacities Programme under the Grant Agreement 312495.

Task 1.2 Implementation of an AO prototype for THEMIS telescope (CNRS lead)

AO systems are installed at most existing solar telescopes to improve their image quality, with excellent results in imaging observing modes, but the combination of polarimetric measurements with adaptive optics is extremely challenging and it is not usually fully addressed. Being THEMIS a solar telescope, which provides high polarimetric performance, the implementation of an AO prototype to improve its image quality retaining its unique spectropolarimetric capabilities, would open the possibility to specialize this telescope in high resolution in polarimetry. The possibility of

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performing very high quality polarimetric measurements using AO is one of the challenges of the future large aperture European Solar Telescope (EST) and the implementation of an AO system at THEMIS will provide an excellent bench to test these observing techniques for EST. This sWP includes the following tasks:

- Design of the AO system (CNRS-THEMIS, CNRS)
- Construction and installation of the AO system (CNRS)
- Tests of the AO system (CNRS)

During the first 18 months of SOLARNET, a full conceptual study has been conducted to explore the possibility to implement an adaptive optics system for the THEMIS telescope, taking into account the current technical state of the telescope and the scientific goals derived from the polarimetric usage of the long slit spectrograph attached to the telescope. It shall be clear from the beginning that THEMIS has been specifically designed to be a "calibration-free" polarimetric telescope and that the AO design has been done keeping this important specification valid.

The result of this conceptual study is 3 technical reports, which are presently under study to verify the performance of the design:

- WP7.1.2_TAOP_001_AO_System_Design_Specification_V1.0 doc #1
- WP7.1.2_TAOP_002_Polar_System_Design_Specification_V1.0 doc #2
- WP7.1.2_TAOP_003_Optics_System_Design_Specification_V1.0 doc #3

The first document describes an adaptive optics system suitable for a 1m class telescope like THEMIS, under the (assumed) considerations of atmospheric quality and sky conditions relative to our site. This document does not put the emphasis on polarimetry but rather on the benefit on imaging of an AO correction. It describes the hardware and software components needed to build the system up to the commercial evaluation and pre-selection of these components. Specifications of the system output are given, again with the assumption that the Tenerife site shall be of the same nature than the La Palma site, where SHABAR and S-DIMM data do exist and were used for this study. An error budget of the system is computed. Finally constraints are derived from all that precedes on the use of the use of the AO system and a preliminary optical scheme suitable for implementation is given.

Document #2 studies a number of alternatives based on not only the optical components but also coatings that are to be applied to the surfaces. The reader can refer to the full study for all the details. To summarize a long and very detailed development, the currently preferred solution requires:

- to replace each of the elevation axis M4 and M5 45° incidence mirrors by 2 mirrors at 22.5° incidence coated with phase enhanced silver coatings (4 mirrors instead of 2).
- to replace the current de-rotator by a new concept de-rotator made of 4 glued RAP prisms at 100° in a 5 reflections design. This element is by far the worst one in its current implementation, and the one with a larger impact on the polarimetric budget.

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- for a general simplification of all the former changes, and although it does not affect the polarimetric budget, the M2 shall be lightly reshaped (or changed) to modify the f/63 telescope beam to a f/62.9 and move up the F2 focus.

Document #3 details the changes required to implement the new optical path of THEMIS that has been specified in the former 2 documents. This opto-mechanical preliminary study is done from the telescope entrance and moving downward.

A faithful summary of those 3 documents is presented in the document *Deliverable70_2*.

Task 2 Atmospheric Seeing Characterization (IAC lead, HANKOM, SU, UCAL, WU)

Two long-baseline SHadow BAnd Rangers (SHABAR) instruments were deployed by the IAC in the Canary Islands during 2011, one in Observatorio del Teide (OT), in Tenerife Island, and another in Observatorio del Roque de los Muchachos (ORM), in La Palma island. The instruments acquire sunlight signal data that can be reduced to produce C_n^2 and r_0 profiles for the lower atmosphere layers up to some 5 Kms height. The mission of these instruments, together with other daytime turbulence measurement instruments, is the characterization of the daytime sky in both sites, OT and ORM, in order to select the best location for the European Solar Telescope.

Section *Deliverable70_3a* of the document *Deliverable70_3* describes the current status and the main tasks developed for work package WP7.2 related with the operation of the long-baseline SHABARs, including all work regarding instrument operation, acquisition and reduction software corrections and enhancements, and acquired data preliminary analysis. All these maintenance and improvement tasks have been performed by IAC.

In addition, several short-baseline SHABARs have been also constructed to measure daytime seeing at existing and prospective telescope sites on La Palma and Tenerife. These SHABARs can work in concert with other seeing instruments such as the previously mentioned long-baseline SHABARs and wide-field wavefront sensors (WFWFS). The short-baseline SHABAR measures seeing in the lower part of the atmosphere, up to about 1km height, and operates completely independent from a telescope. The advantage of the short-baseline SHABAR is its small size and automatic operation. Consequently, a number of locations at the observatories can be investigated simultaneously. After the start of the Solarnet project, the short-baseline SHABARs were inspected after a stop of a couple of years. In October 2013, the SHABARs were dismounted and the status of the equipment was investigated, checked and repaired. In June 2014, the instruments on the towers of the Swedish Solar Telescope (SST) and Dutch Open Telescope (DOT) were brought into operation, and in July 2014 the instruments were installed on the roof of the building of the GREGOR telescope. These tasks have been performed by HANKOM and are described in section *Deliverable70_3b* of the document *Deliverable70_3.*

The role of the rest of partners participating in this task is:

SU: daily operation of the short and long SHABARs in La Palma

WU, UCAL: Their contribution to SOLARNET will focus on the analysis of the SHABAR (SHadow BAnd Ranger) datasets collected at telescope sites on La Palma and Tenerife. The main goal is to retrieve profiles of the structure parameter of the refractive index, C_n^2, also referred to as 'seeing' of the atmosphere. In the initial stage of the project, which covers the First Report Period, the

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emphasis of the Atmospheric Seeing studies have been on getting the SHABAR operational again and collecting a first data-set. Now that the first year of data has become available, the data analysis can be started. The contribution of these two partners will therefore be strongly skewed towards the second part of the project.

Task 3.1 Application of CFD techniques to the local seeing optimization (IAC lead, CIMNE)

This task addresses a number of related issues.

CIMNE

CIMNE's contribution to Task 3.1 of WP70 can be divided into three different parts: the development of numerical methods to estimate the atmospheric seeing, the simulation of some test cases proposed by IAC of certain configurations of the EST and the development of an interface code to translate CAD data to a format suitable for our CFD code.

Development of numerical methods for the estimation of the atmospheric seeing

We have worked in the development of an improved numerical formulation to estimate the atmospheric seeing. The resulting method has been described in a paper entitled paper "Variational multiscale based dissipation models for the estimation of atmospheric seeing", by J. Baiges and R. Codina, and that has accepted for publication in the journal Computers & Fluids (acknowledgement of SOLARNET is made in the paper).

In this work we have presented a numerical model for the estimation of atmospheric seeing in observation sites. The main feature of the proposed model is that it is based on the numerical dissipations, which arise from a particular version of the Variational Multiscale Method, the Orthogonal Subgrid Scale method. It is a finite element method where one assumes that the solution can be split into large and small scales. The former are considered those captured by the finite element mesh, whereas the latter are considered L2-orthogonal to the former and modelled approximately.

The advantage of using this kind of models relies on the fact that, by decomposing the fields of interest into coarse and fine scales, they are able to deal simultaneously with the sources of numerical instabilities and the modelling of turbulent effects. In the present work we have summarized the properties of our variational multiscale method, which is based on modelling the numerical subscales in an as complete as possible manner: the subscales are considered to be transient in time, non-linear, and orthogonal to the finite element space. This leads not only to the resolution of numerical stability issues (advection and the use of arbitrary interpolations for velocity and pressure), but also to a rich representation of turbulent phenomena. Based on this turbulence model, we have developed the expressions for the viscous and thermal dissipations, which have been used for evaluating the constant of structure of the refraction index Cn2 following the classical model developed by Tatarski.

In the numerical examples section we have tested the performance of the method in three practical cases, namely a convective boundary layer, the flow inside a transfer optics room, and the flow around a telescope enclosure. In all three cases we have compared our model with the

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results obtained by using a Smagorinsky and WALE models for evaluating the viscous and thermal dissipations, and, in the convective boundary layer case, with the results presented in the literature. The numerical examples show that the method is capable of doing an accurate estimation of the Cn2 coefficients. This fact does not only provide us with a new numerical tool for the evaluation of the atmospheric seeing but it also adds arguments in favour of the viability of implicit LES methods which rely on the numerical stabilization mechanisms for the modelling of turbulence.

Simulation of some EST configurations

Several simulations of some EST configurations proposed by IAC to CIMNE have been carried out. The main objective of these simulations is to analyse the seeing degradation produced by the EST facilities and summarize their main results. This analysis consists in obtaining the Cn2 distribution for each case.

The main target is to obtain the temperature distributions in different moments in the day. In order to evaluate the seeing degradation produced by telescope facilities, three different configurations, under the same conditions, have been generated:

- Site without facilities (Site)
- Site with facilities without telescope structure (Facilities)
- Site with facilities and telescope structure (Telescope)

The analyses have been performed in different moments in the day, since the ambient temperature, the ground temperature and the temperature of the facilities changes along the day, hence the seeing degradation will change also. The site models (Tenerife and La Palma) include the topography and roughness of the selected site.

CAD data translation

Even if it was not originally planned, a code has been developed to translate CAD data to our CFD software. The need for such a code arises because of the difficulty of prescribing different boundary conditions on temperatures on surfaces that are very close. A general strategy has been developed to transfer CAD data to the prescription of boundary conditions of our CFD code. The main ingredients are an octree search followed by a least-squares interpolation to avoid the inconsistencies found in the CAD data. Likewise, there is the possibility to incorporate restrictions to the interpolation. These ingredients make the code developed original from the scientific point of view.

The document *Deliverable70_4* (section *Deliverable70_4a)* describes the details of these works.

IAC

IAC's contribution to Task 3.1 of WP70 can be divided into three different parts

EST telescope environment preliminary thermal analysis

The aim of this task is to describe the results of the thermal analysis of the EST environment conventional dome, platform, pier, building, ground…), as a continuation of the analysis

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performed during the Conceptual Design Study of this infrastructure, in order to evaluate the local seeing effects produced by the telescope facilities.

Different configurations are analyzed for the telescope facilities with a conventional dome (Closed Configuration) and facilities with windshield (Open Configuration), in summer, for North wind of 5 m/s, in order to select the optimal configuration. The objective is to keep the temperature of the surfaces of the facility as close as possible to the ambient temperature so as to minimize the local seeing effect.

Once the temperature maps are obtained for the selected configurations, CFD analyses will be performed by CIMNE (see previous task) to evaluate the local seeing degradation. The CFD results obtained for these environment configurations will be compared during the next SOLARNET periods with the previous configurations analyzed.

The results of these thermal studies are described in the document *Deliverable70_4 (*section *Deliverable70_4b).*

EST thermal analysis - observations out of the sun

The aim of this task is to compare the effect of observations out of the sun between the open configuration and the closed configuration, for the EST telescope. The results of the thermal analysis of the telescope structure and the secondary mirror are described, when the telescope is pointed out of the sun, either in nearly positions to the limb or in positions far away from the sun.

In previous analysis with the telescope in open configuration important issues arose to take into account when the telescope is pointing to positions more distant from the sun than the effective size of the heat rejecter. The light from the sun reflected by M1 could reach directly M2 or the structure without passing through the heat rejecter. This situation would increase dramatically the heat load on the structure, if the incidence is produced close to the M1 focus.

Starting from these findings, this analysis performed during this first SOLARNET period evaluates the influence of the dome when pointing off-sun. A large number of positions have been studied, covering an angle ranging from 0 ° (telescope pointed to the sun) to 45º (telescope pointing out of the sun) in order to identify areas that reduce the quality of observation, as well as the points that create a high risk to the telescope structure, for which safety systems should be implemented.

Section *Deliverable70_4c* of the document *Deliverable70_4* describes the main results obtained after these analyses.

EST telescope structure - analysis report

This task covers the main developments made in the field of the telescope structure, showing current state of progress from the previous conceptual design study.

The analyses have been performed considering the models studied in the previous stage, i.e., Rocking-Chair and Gantry Models, as well as the Yoke Model, an alternative not studied in details in the first study. The model performance is evaluated according to the dynamic behaviour, as well as to the errors due to gravity and wind loads acting on the structure. An alternative configuration for the upper section of the telescope tube has also considered, as well as the

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possibility of changing the current Nasmyth platform position from the right side of the telescope to the rear side.

The results of these studied are described in section *Deliverable70_4*d of the document *Deliverable70_4.*

Task 3.2 Development of an innovative heat rejecter prototype for GREGOR telescope (UToV lead, KIS, SRS, INAF)

Task 3.2 is devoted to the design and construction of heat rejecter (HR) prototype fpr the GREGOR telescope. This HR follows the concept of the design proposed for EST, and, consequently, represents a proof of concept for the technical solution.

The technical characteristics of the GREGOR solar telescope optical scheme (limited to M1, M2, F1, and F2) have been checked together with the GREGOR Team. The heat rejecter “Bounding Box” (i.e. the space available for the HR installation) has been determined. In agreement with the GREGOR Team a more conservative (i.e. smaller) volume has been adopted which consists of a cylindrical shape with a diameter of 65mm, equal to the outer diameter of the HR currently installed. For similar safety reasons, a value of 35° has been assumed for the internal “no fly” cone. Regarding reflecting surface, an attempt was made to preserve the initial value of 37.5°, but, due to strong asymmetry, the internal part arrangement resulted to be quite critical, and a compromise value of 35° was chosen.

Cooling System: the present HR features a double coolant circuit. The most important and critical one serves the First Wall (FW - the face illuminated by the sun light), which is cooled by the double-helical. Another important aspect is the presence of the four Feeders (“Feeder Cross”), that is the pipes which feed/drain the water to/from the HS. Those Feeders have a fixed outer diameter (4 [mm]), which cannot be increased (they stay in the path of the reflected light from M2 to F2). If an increase of the Coolant Flow Rate were necessary (as it will be), in order to limit the coolant velocity inside the Feeders, only their number will be increased (doubled) by overlapping a second “Feeder Cross” in the shadow of the first one. Since the cooling concept adopted in the new HS is different from the actual one, substantial changes have been introduced (discussed later on).

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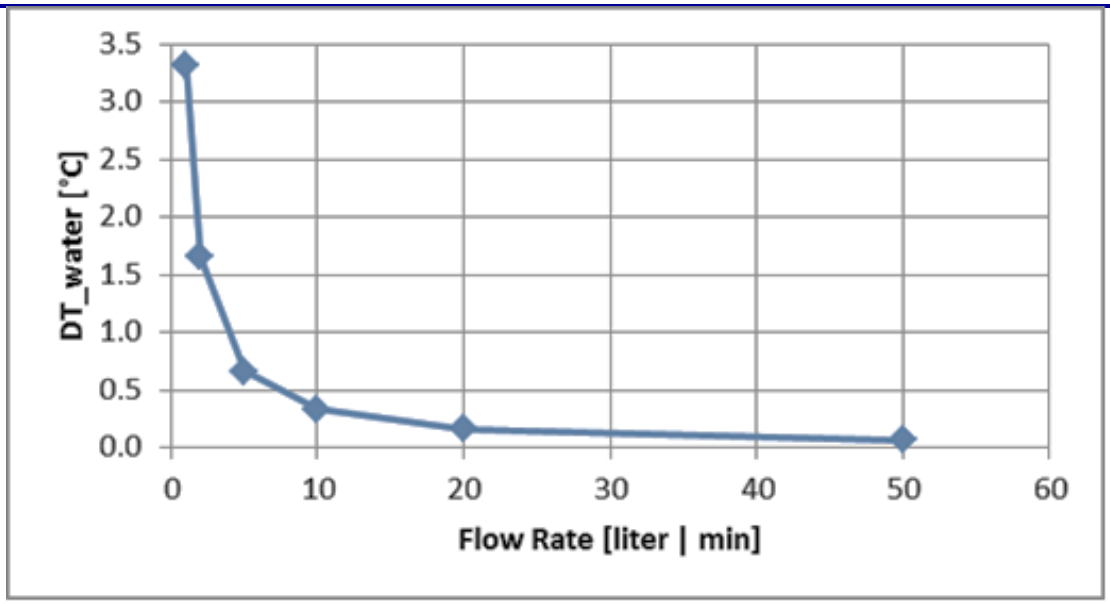

Safety System: the purpose of the Safety System is to preserve the HR structure from the high temperatures, which may be reached due to bad telescope pointing, or Cooling System Failure (LOCA: Loss of Coolant Accident, LOFA: Loss of Flow Accident). In both cases the telescope cover must be rapidly be closed (Shutdown). The closure is commanded by Temperature Sensors located inside the HR and on its Support Structure (the Ring). An additional security if provided by a Flow Meter on the HR outlet. Sensors are monitored via Software (control program) and Hardware (Temperature and Flow Rate switch).

HR Thermal-hydraulic design: the First Wall is the key part of the entire HR Thermal and Hydraulic Design. It is heavily irradiated by the Sun light concentrated by M1. The whole design process is aimed at keeping the FW temperature at reasonable low value. This implies reaching a very high Heat Transfer Coefficient (HTC), which can be attained by the adoption of the Jet Impingement technique.

Design Thermal Load: we will define the Thermal Load as the heat flux (heat flow per unit area), which must be sustained by the HR FW for an indefinite amount of time. For its own nature, no more than the defined thermal load will affect the component (i.e. it's the maximum conceivable). It has been conservatively assumed that a heat flux of 418 [W|m2] is applied on the part covered by the solar image, which corresponds (under additional conservative assumptions) to a Heat Flow of 232 [W] to be removed from the HS. The increment of the coolant temperature through the HS has been calculated. The corresponding chiller required performance is absolutely not critical.

Design Constraints

The design constraints are imposed on the following temperature difference which account for the Heat Exchange phenomena across the HR FW:

- Difference between the FW outer temperature and the ambient air. It must be kept to a minimum in order to avoid the development of hot air plumes, which degrade the Local Seeing. A value of 3.4 [°C] has been assumed.

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- Difference between Ambient and Bulk (coolant) temperatures. It must be enough small to avoid condensation of moisture over the feeders (coolant pipes) a value of 8 [°C] has been assumed.
- Difference between Outer and Inner FW temperatures. It must be enough small to avoid that the corresponding Thermal Gradient be harmful (Thermal Fatigue) for the FW structure. A value of 6 [°C] has been assumed.

The material chosen for the First Wall is GLIDCOP™ Al-15, and the assumed FW thickness (t) is 3 [mm]. GLIDCOP is widely used for high-heat-load components, such as photon absorbers, masks, and shutters of the third-generation light sources are subjected to intense thermal stress cycles from the high intensity x-ray beams. Having already determined the reference q" Flux, FW material, and thickness, a target HTC of 40,000 [W|m2 °C] has been chosen. This value is extremely high will require special techniques to be achieved (see next section).

Single and Multiple Jet Impingement: reaching the required HTC by simply increasing the Reynolds number (i.e., high turbulence) in the current case is not a practical solution since it implies reaching an extremely high coolant velocity. An alternative solution is to create very high turbulence (just where it is needed, that is on the backside of the FW) by sweeping away the laminar boundary layer. This can be done by means of a single nozzle, which convoys the coolant against the backside of the heated plate. This technique is named "Jet Impingement" (JP). In the present case we speak of "Submerged Jet Impingement" since only the liquid phase is involved. High HTC is obtained, but it quickly decreases with the distance from the impinging jet axis. In order to cover wider areas (such as the FW backside plate) multiple nozzles are used. The Design Parameters for of this arrangement are Nozzle diameter, Nozzle length, Height of the impingement chamber, and Cell Area. It was demonstrated that very high HTC can be reached (200,000 [W|m2°C]) at the price of extremely high coolant velocity in the nozzles (50 [m/s]) which results in impinged plate erosion and high coolant flow rates.

		Sol	A	B	C	D	E
		id	8	6	5	2	1
		u	7	7	6	4	4
		H	0.004	0.003	0.004	0.004	0.003
		d	0.001	0.001	0.001	0.001	0.001
		R	0.006	0.006	0.005	0.004	0.004
		HTC	41031	41751	43133	39773	40847
		Nozzles	27	27	40	62	62
Feeders	Inner Diam.	Flow rate [kg | s]	0.15	0.15	0.19	0.19	0.19
[ ]	[mm]	[liter | min]	8.89	8.89	11.29	11.67	11.67
4	3	velocity [m | s]	5.2	5.2	6.7	6.9	6.9

The moderate performance needed in the present case (40,000 [W/m2°C]) will prevent such problems, because the expected velocity is lower by an order of magnitude.

A number of correlations (Chang, Garimella, Rice, Martine, etc.) are available for the HTC evaluation in a single jet environment, while a few ones deals with multiple jets. All correlations

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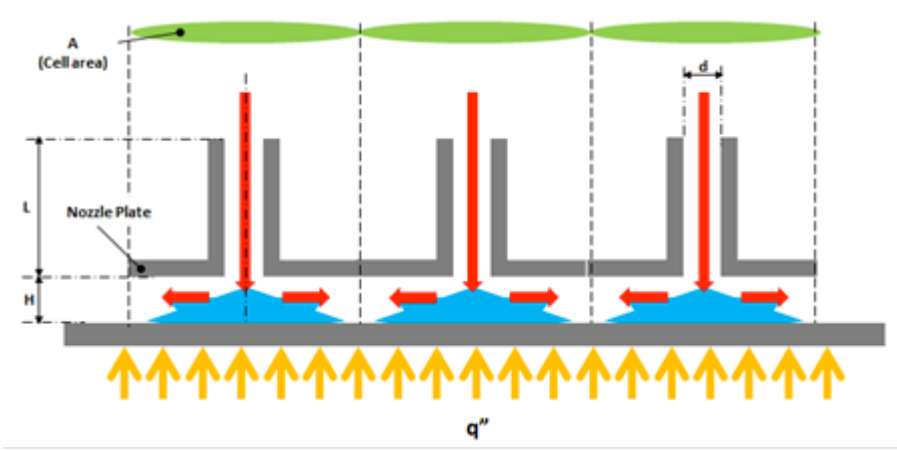
provide averaged Nusselt number (Nu) as a function of Reynolds (Re) and Prandtl (Pr) number, and of the impingement zone geometry. After a trade-off among the cited correlations, the most conservative Martin equation has been adopted. The Design Variables are u (water velocity inside the nozzle), d (nozzle diameter), H (distance between the nozzle plate and FW backside), r (radius of the Cell). Additionally, the number of Feeders (the pipes running from the Supporting Ring to HR which feeds the HR itself) must be decided and must be considered a Design Variable too. Many tuples {U, d, H, r} can lead to a theoretically valid result, but only a few choices are valid under a technical point of view (feasibility).



In order to refine the search for a valid technical solution, we assumed that such variables can assume only some prescribed. In addition, by assuming that coolant velocity inside the Feeders must not exceed the value of 7 [m/s], and that the number of tubes, in parallel, which feed water to the HS must be 4, five possible Design Solutions have been identified (see table).

HS Pressure Drop: the Pressure Drop across the HS for the various solutions has been evaluated and summarized in the table below. Even in the worst case (B, where Delta_P = 0.36 [bar]) the Pressure Drop is not critical.

Sol.	Flow Rate [liter|min]	u [m|s]	H [m]	d [m]	R [m]	ΔP [Pa]	ΔP [bar]
A	8.9	7	0.004	0.001	0.006	36260	**0.36**
B	8.9	7	0.003	0.001	0.006	36260	**0.36**
C	11.3	6	0.004	0.001	0.005	26504	**0.27**
D	11.7	4	0.004	0.001	0.004	11668	**0.12**
E	11.7	4	0.003	0.001	0.004	11668	**0.12**

All these issues are described in the document Deliverable70_5.

List of expected deliverables after the first period:

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Delive-rable Number [61]	Deliverable Title	Lead benefi-ciary number	Estimated indicative person-months	Nature [62]	Dissemi-nation level [63]	Delivery date [64]
D70.1	Results of MCAO correction simulations	1	1.00	R	PP	18
D70.2	AO prototype for THEMIS and tests report	4	1.00	R	PP	18
D70.3	Results of site-testing campaign at ORM and OT	1	1.00	R	PP	18
D70.4	Results of the optimization of EST design based on CFD analysis	4	1.00	R	PP	18
D70.5	GREGOR Heat Rejecter prototype and tests report	5	1.00	R	PP	18

Deliverables generated

Deliverable 70_1, composed of the following sections:

Deliverable70_1a (IAC)

Deliverable70_1b (CNRS)

Deliverable70_2 (IAC)

Deliverable70_3, composed of the following sections:

Deliverable70_3a (IAC)

Deliverable70_3b (HANKOM)

Deliverable70_4, composed of the following sections:

Deliverable70_4a (CIMNE)

Deliverable70_4b (IAC)

Deliverable70_4c (IAC)

Deliverable70_4d (IAC)

Deliverable70_5 (UToV)

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WP80: SYNOPTIC OBSERVATIONS: SOLAR PHYSICS RESEARCH INTEGRATED NETWORK GROUP (SPRING)

Lead Beneficiary: KIS

Participants: IAC, INAF, MPG, QUB, AISAS, AIASCR, IGAM, UoB, NSO

Objectives: High-resolution telescopes (such as SST, GREGOR and the future EST and ATST) allow observations of only a small fraction of the solar surface. Real-time context data showing the large-scale dynamics and magnetism at different layers of the solar atmosphere are crucial to understand the global behaviour of solar phenomena. However, despite the amount of information coming from space and ground-based full-Sun telescopes, real-time information about the variation of important parameters such as velocities, magnetic field and intensity at different solar layers is still lacking. To this aim, a network of telescopes with a small aperture but a large field-of-view can provide useful data to prepare observing campaigns with large-aperture high-resolution telescopes and complement the data taken with them. Distributed in a worldwide network, these small apertures can represent an invaluable supporting tool for coordinated observations with the major infrastructures.

Tasks:

The project work was divided into three phases:

Phase 1: Science Requirement Study

This sWP includes all the tasks related to describe the supporting data required by high-resolution observing programs, the scientific objectives to be achieved by high-quality synoptic observations, and the study of the relation with other existing ground-based solar observation networks:

• List of small aperture telescopes and other ground-based solar observations networks available

• Develop a strawman document discussing the goals and preliminary support instrumental concepts (KIS, IAC, INAF, AIASCR, MPG, BiSON) (all participants).

• Write a Science Requirement Document (SRD) which shall be consistent, tangible and in accordance with other plans for the next 25 years (commissioning of large-aperture telescopes, space missions, etc) (all participants).

Currently WP80 is in the middle of this Science Requirement Study.

Afterwards the two phases

Phase 2: Feasibility Study

Phase 3: Development and Operation Study

will follow.

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Achievements:

During the first reporting period, the work concentrated only on Phase 1: Science Requirement Study. This required engaging the scientific community to discuss scientific goals and observational needs for a future network of solar synoptic telescopes.

Workshops

Two workshops took place:

1. “Synoptic Network Workshop”, Boulder, USA

Strong Contributions to the SPRING research activity are coming from NSO. Further institutions in the USA show strong interest in SPRING, too. Therefore the High Altitude Observatory invited for holding a workshop to discuss scientific questions for future synoptic observations at the premises of the High-Altitude Observatory in Boulder, USA.

In total 36 scientists – mainly from the USA – attended the workshop discussing scientific requirements for a future network of synoptic telescopes.

The results of this workshop are published as workshop summery in the journal SPACE WEATHER, VOL. 11, 1–2, doi:10.1002/swe.20068, 2013.

A list of the workshop participants and the workshop programme can be found below.

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NCAR UCAR HAO High Altitude Observatory — sun • earth • connections

2013 Synoptic Workshop Participant List

First name	Last name	Institution name
Luca	Bertello	NSO
Joan	Burkepile	HAO/NCAR
Rebecca	Centeno	HAO/NCAR
Gary	Chapman	SFO/CSU, Northridge
Thierry	Corbard	Observatoire de la Côte d'Azur
Giuliana	de Toma	HAO/NCAR
Alfred	de Wijn	HAO/NCAR
Dale	Gary	NJIT
Sarah	Gibson	HAO/NCAR
Sanjay	Gosain	NSO
Jerald	Harder	University of Colorado
Jack	Harvey	NSO
Frank	Hill	NSO
Todd	Hoeksema	Stanford
Rachel	Howe	School of Physics & Astronomy, University of Birmingham
Neal	Hurlburt	Lockheed Martin Advanced Technology Center
Greg	Kopp	CU/LASP
Larisza	Krista	NOAA/SWPC
K.D.	Leka	NorthWest Research Associates, Inc. (CORA)
Haosheng	Lin	Institute for Astronomy, University of Hawaii
Charles	Lindsey	NWRA
Jon	Linker	Predictive Science Inc.
Scott	McIntosh	HAO/NCAR
Pere	Palle	Instituto de Astrofisica de Canarias (IAC)
Vic	Pizzo	Space Weather Prediction Center
Mark	Rast	University of Colorado
Alysha	Reinard	CU & NOAA/SWPC
Markus	Roth	Kiepenheuer-Institut für Sonnenphysik
Leonard	Sitongia	HAO/NCAR
Dirk	Soltau	Kiepenheuer-Institut für Sonnenphysik
Joachim	Staiger	Kiepenheuer-Institut, Freiburg
Kim	Streander	NSO
Ken	Tapping	National Research Council
Michael	Thompson	HAO/NCAR
Steven	Tomczyk	HAO/NCAR
Oskar	von der Lühe	Kiepenheuer-Institut für Sonnenphysik

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MONDAY 22 April, 2013

08:30-09:15	Badge Pick-up in Mesa Lab Mezzanine Area	
09:15-09:25	Introduction to the Workshop	Michael Thompson
Session 1	**Introduction**	
		Chairman: Michael Thompson
09:25-10:10	Keynote: The Purposes of Synoptic Observations	Oskar von der Lühe
Session 2	**Existing synoptic observations**	
		Chairman: Vic Pizzo
10:10-10:30	The NSO Integrated Synoptic Program	Jack Harvey
10:30-11:00	Coffee break	
11:00-11:20	Synoptic Observations from Mauna Loa Solar Observatory	Joan Burkepile
11:20-11:40	Synoptic Observations from Mt. Wilson Observatory	Luca Bertello
11:40-12:00	Photometric Observations of Solar Irradiance Variations from the San Fernando Observatory	Gary Chapman
12:00-13:00	*Lunch on your own at Mesa Lab Cafeteria*	
13:00-13:20	Wilcox Solar Observatory and Space-based Synoptic Observations	Todd Hoeksema
13:20-13:40	Radio Observations	Ken Tapping
13:40-14:00	SODISM-2: A ground based multi-wavelength full disk solar imager	Thierry Corbard
14:00-14:20	Contributed Talk	
14:20-14:40	Coffee break	
Session 3	**Scientific topics: requirements for space weather, solar magnetism, helioseismology, irradiance, and other scientific targets and opportunities**	
		Chairman: Markus Roth
14:40-15:00	Space Weather and Synoptic Observations	Vic Pizzo
15:00-15:20	Helioseismology with Synoptic Network Observations	Rachel Howe
15:20-15:40	Potential of Helioseismology to Predict Space Weather Events	Alysha Reinard
15:40-16:30	Discussion	

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16:30	*Welcome Reception at Mesa Lab Damon Room*

TUESDAY 23 April, 2013

09:10-09:30	Sweet Promises (and some Sour Realities) of Synoptic Full-Disk Vector Magnetogram Data	K.D. Leka
09:30-09:50	A Modeler's Requirements for Synoptic Observations	Jon Linker
09:50-10:10	Synoptic Observations of the Solar Cycle	Giuliana de Toma
10:10-10:30	Science with Synoptic Irradiance Measurements	Mark Rast
10:30-11:00	*Coffee break*	
11:00-11:20	Long-term Solar Synoptic Measurements with Implications for the Solar Cycle	Leif Svalgaard/Todd Hoeksema
11:20-11:40	Forty (Thirty) Years of Observations of the Fe XIV (and Fe X) Corona	Richard Altrock
11:40-12:00	Monitoring and Understanding the Solar Cycle Using Synoptic Observations	Scott McIntosh
12:00-13:00	*Lunch on your own at Mesa Lab Cafeteria*	
Session 4	**Instrumentation concepts**	
		Chairman: Todd Hoeksema
13:00-13:20	Instrumental and Technical Requirements	Frank Hill
13:20-13:45	Chromospheric Magnetometer ChroMag	Alfred de Wijn
13:45-14:10	VTT Helioseismology Concept with HELLRIDE and CARMA	Joachim Staiger
14:10-14:35	Scanning Multi-Slit Spectrograph	Haosheng Lin
14:35-15:00	SPRING - Solar Physics Research Integrated Network Group	Markus Roth
15:00-15:20	*Coffee break*	
15:20-15:45	PSI: Polarimetric Spectroscopic Imager – A Simple, High Efficiency, High Resolution Spectro-Polarimeter	Sam Barden / Frank Hill
15:45-16:10	Instrument Concepts for New Synoptic Network	Sanjay Gosain
16:10-16:35	The Value of Solar Radio Monitoring in a Synoptic Network	Dale Gary
16:35-17:00	The Coronal Solar Magnetism Observatory (COSMO)	Steve Tomczyk
17:00-17:20	Some General Considerations on Wide-field Telescopes	Dirk Soltau

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WEDNESDAY 24 April, 2013

09:10-09:35	Multi-height observations with MOTH II	Stuart Jefferies
09:35-10:00	Data Delivery, Archiving and Curation of Synoptic Observations	Neil Hurlbert
Session 5	**Next steps**	**Chairman:** Frank Hill
10:00-10:30	Discussion	
10:30-10:50	*Coffee break*	
10:50-11:50	Discussion Continues	
	End of Workshop	

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"1st SPRING Workshop", Titisee, Germany

Participants at the 1st SPRING Workshop in Titisee, Germany

The first workshop funded by Solarnet to discuss the Science Requirements for SPRING took place on November 25-28, 2013 in Titisee, Germany.

In total 35 scientists, mainly from Europe, but also from India, China, and USA participated in the meeting. The workshop programme and the list of participants can be found below.

The main result of the meeting was the foundation of four working groups:

1. Synoptic Magnetic Fields – chaired by Alexei Pevtsov, Tucson, USA

2. Solar Seismology – chaired by Rekha Chain, Sheffield, UK

3. Transient Events – chaired by Michal Sobotka, Ondrejov, CZ

4. Solar Awareness – chaired by Ilaria Ermolli, Rome, I

These four working groups were formed, as each of these groups has different requirements for synoptic observations. The four groups were asked to elaborate on their individual scientific goals and requirements for future instrumentation. A third workshop to bring together the results of the four working groups was agreed to be held in Tatranska Lomnica, Slovakia in October 2014.

This project is supported by the European Commission´s
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1st Solarnet/SPRING Workshop
Brugger's Hotelpark by Titisee
Seminar Room "Seeterrasse"

Monday, November 25, 2013

18:00 Informal get-together in the "Orangerie" (possibility for registration)

Tuesday, November 26, 2013

08:30 Registration

Chair: Oskar v.d. Lühe

09:00 Welcome Markus Roth

Session I Introduction

09:10 Markus Roth: SOLARNET & SPRING

Session II Science drivers for a new synoptic network

09:30 Hector Socas-Navarro: Scientific requirements for a network of synoptic observatories - context data for the future high-resolution telescopes

10:00 Ales Kucera, Peter Gömöry: Solar local and global magnetism - new challenge for long-lasting synoptic observations

10:30 Coffee Break

11:00 Rolf Schlichenmaier: Science with synoptic sunspot observations
11:30 Juan Manuel Borrero: Requirements for future synoptic measurements of the Sun's magnetic field
12:00 Rekha Jain: P-mode power supression

12:30 Lunch

Chair: Frank Hill

14:00 Michael Thompson: Science requirements for chromospheric science
14:30 Frank Hill: Science requirements for future helioseismology
15:00 Ilaria Ermolli: Requirements from irradiance studies

15:30 Coffee Break

16:00 Discussion
16:30 Work on the Scientific Requirement Document
18:00 Adjourn

Wednesday, November 27, 2013

Chair: Michael Thompson

09:00 Wolfgang Finsterle: Space weather forecasting with radio observations
09:30 Dario Del Moro: Multi-height observations with MOTH

Session III Instrument Concepts

10:00 Dirk Soltau: General Considerations on Wide-Field Telescopes and Image Stabilisation

10:30 Coffee Break

11:00 Mirsolav Klvaňa: Optimised data archiving for a synoptic telescope
11:30 Joachim Staiger: Spectrometer HELLRIDE as a Testing System for Fulldisk Velocity Mapping

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12:00 Haosheng Lin: Demonstration of a 31-slit Full-DIsk Spectroheligraph

12:30 Lunch

Chair: Michal Sobotka

14:00 Siraj Hasan: NLST and Solarnet
14:30 Toufik Abdelatif: A new Space Weather Observatory in Tamanrasset
15:00 Salvatore Scuderi: Conceptual design study of a Broad Band Imager for the European Solar Telescope

15:30 Coffee Break

16:00 Discussion
16:30 Work on the Scientific Requirement Document
18:00 Adjourn

19:00 Workshop Dinner

Thursday, November 28, 2013

Session IV Existing infrastructures **Chair: Markus Roth**

09:00 Ganghua Lin: Solar Physics Observation and Research in China
09:30 Ales Kucera: Existing solar physics facilities and data bases at Astronomical institute of the Slovak Academy of Sciences
10:00 Salvatore Scuderi: Infrastructure and facilities available at INAF – Catania Astrophysical Observatory

10:30 Coffee Break

11:00 Alexei Pevtsov: Status of the SOLIS instrument and recent research based on SOLIS data
11:30 Peter Gömöry: Solar Chromospheric Detector for the Lomnicky peak Observatory – towards synoptic imaging spectroscopy and spectro-polarimetry.
12:00 Discussion

12:30 Lunch

Session V Organisation

14:00 Jesper Schou: Dos and don'ts when developing a helioseismology instrument
14:30 Alexei Pevtsov: Current status of the IAU Working Group on Coordination of Synoptic Observations of the Sun
15:00 Guy Davis: Learning from over 30 years of BiSON operations

15:30 Coffee

16:00 Discussion
16:30 Work on Scientific Requirement Document
17:30 Workshop Close

18:00 Possibility for a joint visit of the Christmas market in Freiburg

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1st SPRING Workshop, November 26 – 28, 2013

Registered Participants:

	Name	Surname	Institute
1.	Gisela	Baumann	Kiepenheuer-Institut für Sonnenphysik, Freiburg
2.	Nazaret	Bello Gonzalez	Kiepenheuer-Institut für Sonnenphysik, Freiburg
3.	Francesco	Berilli	Universita` di Roma Tor Vergata
4.	Juan M.	Borrero	Kiepenheuer-Institut für Sonnenphysik, Freiburg
5.	Robertus	Erdelyi	University of Sheffield
6.	Ilaria	Ermolli	INAF Osservatorio Astronomico di Roma
7.	Ales	Kucera	Astronomical Institute of Slovak Academy of Sciences
8.	Guy	Davis	University of Birmingham
9.	Dario	Del Moro	Universita` di Roma Tor Vergata
10.	Wolfgang	Finsterle	World Radiation Center / PMOD, Davos
11.	Kolja	Glogowski	Kiepenheuer-Institut für Sonnenphysik, Freiburg
12.	Peter	Gomery	Astronomical Institute of Slovak Academy of Sciences
13.	Siraj	Hasan	Indian Institute of Astrophysics, Bangalore
14.	Frank	Hill	National Solar Observatory, Tucson
15.	Rekha	Jain	University of Sheffield
16.	Peter	Keys	Queen's University Belfast

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17.	Mirsolav	Klvana	Solar Department of the Astronomical Institute, Academy of Sciences of the Czech Republic
18.	John	Leibacher	National Solar Observatory, Tucson
19.	Ganghua	Lin	National Astronomical Observatories Chinese Academy of Sciences, Beijing
20.	Haosheng	Lin	Institute for Astronomy, University of Hawaii
21.	Mattheo	Munari	INAF - Osservatorio Astrofisico di Catania
22.	Alexei	Pevtsov	National Solar Observatory, Sunspot
23.	Wolfgang	Polanec	Observatorium Kanzelhöhe, Graz
24.	Markus	Roth	Kiepenheuer-Institut für Sonnenphysik, Freiburg
25.	Rolf	Schlichenmaier	Kiepenheuer-Institut für Sonnenphysik, Freiburg
26.	Jesper	Schou	Max-Planck-Institut für Sonnensystemforschung, Katlenburg-Lindau
27.	Salvatore	Scuderi	INAF - Osservatorio Astrofisico di Catania
28.	Michael	Sigwarth	Kiepenheuer-Institut für Sonnenphysik, Freiburg
29.	Michal	Sobotka	Solar Department of the Astronomical Institute, Academy of Sciences of the Czech Republic
30.	Hector	Socas-Navarro	Instituto de Astrofísica de Canarias, LaLaguna
31.	Dirk	Soltau	Kiepenheuer-Institut für Sonnenphysik, Freiburg
32.	Joachim	Staiger	Kiepenheuer-Institut für Sonnenphysik, Freiburg
33.	Michael J.	Thompson	High-Altitude Observatory, Boulder
34.	Abedlatif	Toufik	CRAAG, Solar Physics Division, Algiers
35.	Oskar	v.d.Lühe	Kiepenheuer-Institut für Sonnenphysik, Freiburg

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Study of existing instrumentation

A multi-instrument platform

The study includes an analysis of existing instrumentation. The first two meetings raised a variety of requirements on the instruments, which can probably only be realized by an observing platform that hosts several instruments. To study the advantages and disadvantages of existing telescopes, instruments, and network Sanjay Gusain, was hired jointly by KIS and NSO. During summer 2014 the SOLIS telescope (formerly at Kitt Peak) was intensively studied by KIS and NSO. First designs for a 1m telescope on the SOLIS design were made. Further concepts are currently studies.

Ground-based networks and expected duty cycle

The partner UoB contributed an estimation of the duty cycle from an *n* station ground-based network of telescopes. A model for weather interruptions was defined using the data collected by a number of different ground based telescopes. The model selected is formed from a simple power law and parameters for given sites were defined using an iterative approach to match the histogram of real weather interruptions to the model. Multi-year observational window functions for *n* stations were generated for a spread of longitudes to estimate the resulting duty cycle. A Monte Carlo approach was implemented to estimate duty-cycle and its variance for different *n*. Results were presented at the first SPRING workshop in Titisee. On going work may reveal a way to define the parameters of weather interruption for each site in terms of historical global cloud maps, thus removing the need for knowledge from an existing station.

Differential Extinction

A project on the impact of differential extinction across the solar disk caused by the terrestrial atmosphere and extended nature of the solar disk. Work carried out defined the problem in a numerical simulation and then demonstrated a correction for the effect applied to the Birmingham Solar Oscillations Network (BiSON). The correction as it has been defined is applicable to any full disk imaging or photon counting system. The project resulted in the publication Davies et al. 2014.

PySPRING

A project to develop a pure Python object oriented program to quickly define a network of ground-based solar telescopes. The ongoing development work has so far produced a program that describes a basic network in terms of it sites. Given the definition of *n* sites the program produces a map of the network and a set of observational window functions (without weather interruption) and an estimate of the terrestrial atmospheric extinction given some value of the atmospheric absorption coefficient. The code also produces "Pale Blue Dot Movies" of the network projected onto a rotating globe together with atmospheric extinction information. The work is ongoing and it is hoped that the code can be linked to the cloud cover maps of the earlier project.

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Estimating the evolution of observing site quality from BiSON

This is a project to estimate how the properties of observing sites vary over tens of years. So far we have defined the parameters to be extracted from the data. A full run on the 30 years of BiSON data will be made in due course.

Summary and further planning

The work package is ahead of its plan. There have been two meetings so far to involve the European and US solar physics communities in detailing the scientific requirements for a new network of telescopes for synoptic observations of the Sun.

The following requirements were set:

- Future solar networks should provide:
  - Full-disk Doppler velocity images
  - Full-disk vector magnetic field images
  - Full-disk intensity images
  - Measurements of quantities relevant for space weather
  - With high sensitivity to velocity and magnetic fields

Complement space missions

- Provide the above data products
  - In a variety of wavelengths
  - At a high cadence (≤ 60 seconds)
  - At a spatial resolution of 1” (0.5” pixels)
  - At least 90% of the time
  - Provide the above data products for at least 25 years.

It is now the aim to complete the science requirement study within one year. Four working groups have been formed to discuss the needs for synoptic observations in the areas: Synoptic magnetic fields, Solar seismology, Transient events, and Solar awareness. The discussions are still open to the science community.

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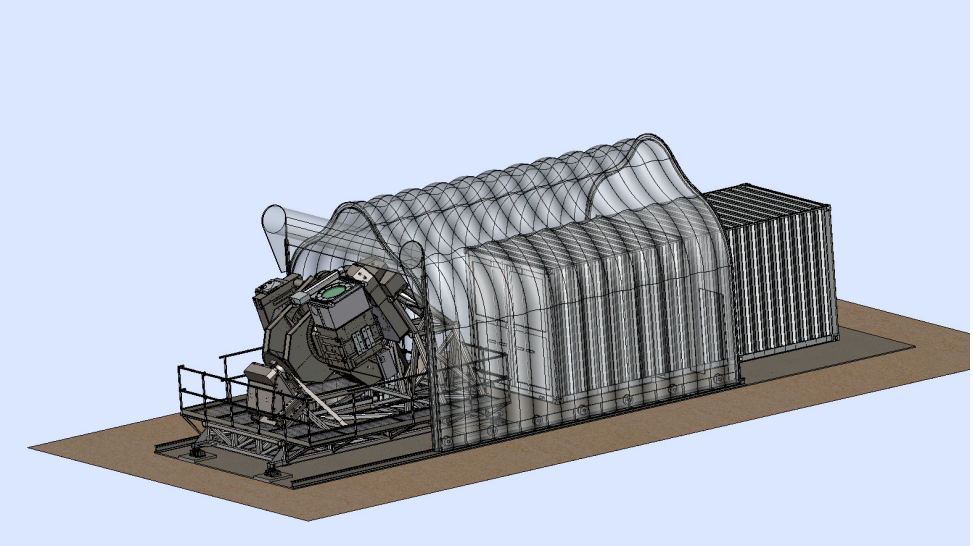

A possible configuration of a new synoptic solar observing network site providing a multi-instrument platform for space weather operations, magnetic field research, and helioseismology.

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WP90: Transnational Access Programme

Lead Beneficiary: KIS

Participants: IAC, KIS, INAF, CNRS, SU, QUB

Objectives: Support to the Trans-national Access Programme.

Achievements:

Under work-packages WP90, WP91, WP92, WP93, WP94, WP95 and WP96, access to the most-advanced, largest and first-class infrastructures for high-resolution ground-based solar physics is offered to external users.

For a description of the work carried out during this reporting period to coordinate this support action we refer to the description of the activities on the Forum for Access and Service and the Transnational Access Programme given earlier under WP20 and to Deliverable D90.1.

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WP100: Access to Science Data Centres. Space missions.

Lead Beneficiary: UiO

Participants: MPG, ROB

Objectives: Support to the Access to Science Data Centres.

Achievements:

Access to the most demanded European Science Data Centre, providing data gathered by the solar satellite HINODE, and the Solar Dynamics Observatory (SDO), is offered under WP 100, WP 101, WP 102, and WP103.

For a description of the work carried out during this reporting period to coordinate this support action we refer to the description of the activities provided earlier in this report under WP20 in the Forum for Access and Services (FAS) and in the description of Deliverable D100.1.

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

PROJECT MANAGEMENT DURING THE PERIOD – WP10.

SOLARNET is a project funded by the European Commission's FP7 Capacities Programme under the Grant Agreement 312495. SOLARNET started on April 1st, 2013 and should finish on March 31st, 2017.

This initiative brings together and integrates the major European research infrastructures in the field of high-resolution solar physics, in order to promote their coordinated use and development. This network involves all pertinent European research institutions, infrastructures, and data repositories. Together, these represent first-class facilities. The additional participation by private companies and non-European research institutions maximizes the impact on the worldwide scale.

Networking activities, access to first-class infrastructures and joint research and development activities are being covered under SOLARNET to improve, in quantity and quality, the service provided by this European community.

The total budget of the project is above 8 million € and the EC contribution is 6 million €. On May 27th 2013 the EC advanced the first payment (2,9 million €).

SOLARNET involves 32 partners from 16 countries: 24 EU research institutions, 6 EU private companies and 2 USA research institutions.

SOLARNET PARTNERS / BENEFICIARIES

Participant nr.	Participant organisation name	Participant short name	Country
1	Instituto de Astrofísica de Canarias	IAC	Spain
2	Kiepenheuer-Institut für Sonnenphysik	KIS	Germany
3	Istituto Nazionale di Astrofisica	INAF	Italy
4	Centre National de la Recherche Scientifique	CNRS	France
5	Università degli Studi di Roma Tor Vergata	UToV	Italy
6	Max-Planck-Gesellschaft	MPG	Germany
7	Universitetet i Oslo	UiO	Norway
8	Leibniz Institute for Astrophysics	AIP	Germany
9	Stockholm Universitet	SU	Sweden
10	Université Paul Sabatier (Toulouse III)	UPS	France
11	The Queen's University of Belfast	QUB	United Kingdom
12	University College London	UCL-MSSL	United Kingdom
13	Astronomical Institute of the Slovak Academy of Sciences	AISAS	Slovakia
14	Astronomicky ustav ASCR vvi	AIASCR	Czech Republic
15	Sveuciliste u Zagrebu - Geodetski Fakultet	HVAR	Croatia
16	Koninklijke Sterrenwacht van Belgie	ROB	Belgium
17	Universitaet Graz	IGAM	Austria
18	Uniwersytet Wroclawski	UWRO	Poland
19	Università della Calabria	UCAL	Italy
20	Wageningen University	WU	The Netherlands

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Participant nr.	Participant organisation name	Participant short name	Country
21	Fondazione Istituto Ricerche Solari Locarno	IRSOL	Switzerland
22	Agencia Estatal Consejo Superior de Investigaciones Científicas - Instituto de Astrofísica de Andalucía	IAA-CSIC	Spain
23	University of Birmingham	UoB	United Kingdom
24	Consiglio Nazionale delle Ricerche - Istituto Nazionale di Ottica	CNR-INO	Italy
25	HANKOM Engineering	HANKOM	The Netherlands
26	Centre Internacional de Mètodes Numèrics en Enginyeria	CIMNE	Spain
27	S.R.S. Engineering Design S.R.L	SRS	Italy
28	PNSensor GMBH	PNSensor	Germany
29	Winlight Optics	WO	France
30	Fundación Tecnalia Research & Innovation	TECNALIA	Spain
31	Association of Universities for Research in Astronomy - National Solar Observatory	NSO	USA
32	Smithsonian Institution - Center for Astrophysics	CfA-SAO	USA

The following actions are being carried out under the auspices of SOLARNET:

- Transnational Access to external European users.
- Enhancing and spreading data acquisition and processing expertise to the Europe-wide community.
- Increasing the impact of high-resolution data by offering science-ready data and facilitating their retrieval and usage.
- Encouraging combination of space and ground-based data by providing unified access to pertinent data repositories.
- Fostering synergies between different research communities by organising meetings where each presents state-of-the-art methodologies.
- Training a new generation of solar researchers through setting up schools and an ambitious mobility programme.
- Developing prototypes for new-generation post-focus instruments.
- Studying local and non-local atmospheric turbulence, their impact on image quality, and ways to negate their effects.
- Improving the performance of existing telescopes.
- Improving designs of future large European ground-and space-based solar telescopes.
- Laying foundations for combined use of facilities around the world and in space.
- Reinforcing partnership with industry to promote technology transfer through existing networks.
- Disseminating activities towards society.

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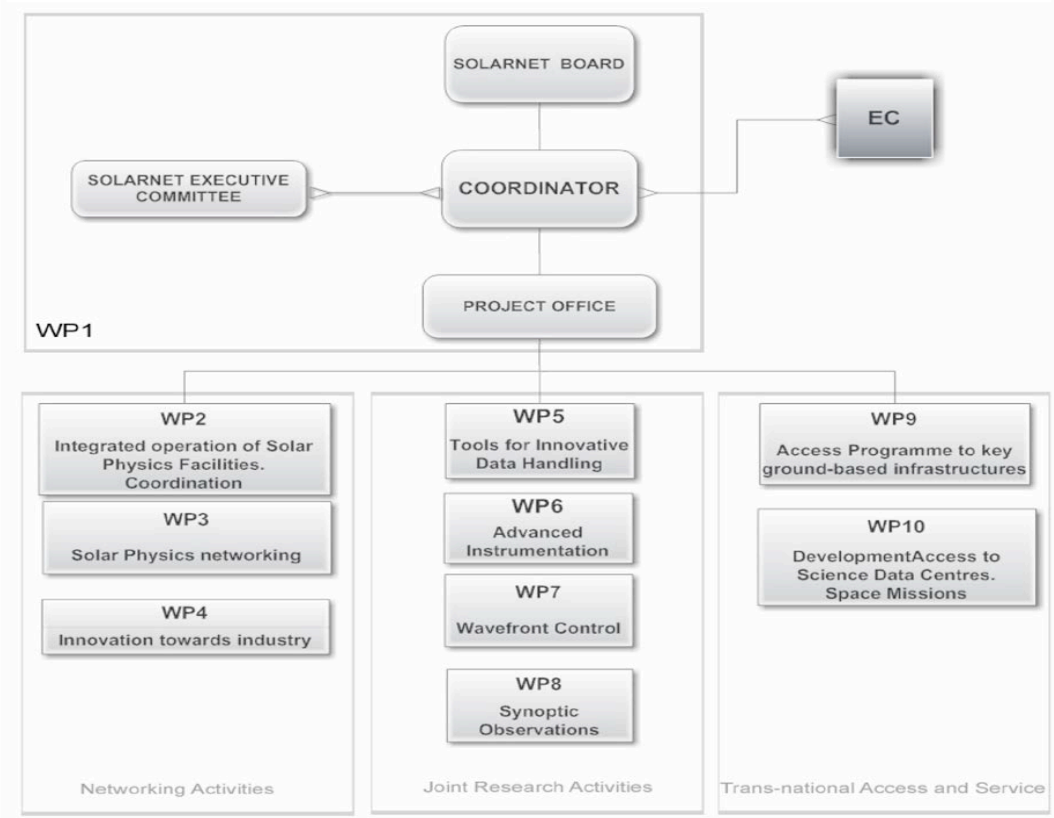
In order to guarantee an appropriate management structure and administration of the Project and its tasks and activities, an elaborated management structure was set up.



The main objectives of the WP10 are:

- Effective coordination and management of the whole project.
- Implementation of an effective and transparent management of the project, ensuring appropriate project control and monitoring: schedule, budget & scope (milestones and deliverables).
- Effective communication among activities and teams.
- Monitoring and reporting of the overall progress and use of the infrastructures for access, assuring the timely delivery of high quality deliverables and milestones.
- Contractual and financial follow-up of the project.
- Coordination of dissemination activities.

A Board runs the SOLARNET network. Each SOLARNET beneficiary has one representative in the Board, which has the authority to make decisions on behalf of their institutions. The Board sets the strategies, reviews the programme, decides on the distribution of the EU contribution, and organizes the work plan. The Board members elect a chairperson. For the current periods Markus Roth (KIS) was elected to be the Board chair.

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SOLARNET BOARD COMMITTEE

Nr	Name and surname	Institution	Country
1	Markus Roth	Kiepenheuer-Institut für Sonnenphysik	Germany - *Elected Chair*
2	Ales Kucera	Astronomical Institut of Slovak Academy of Sciences	Slovakia
3	Alex Feller	Max Planck Institut for Solar System Research	Germany
4	Alisdair R. Davey	Harvard Smithsonian Center for Astrophysics	USA
5	Arkadiusz Berlicki	Uniwersitet Wroclawski	Poland
6	Arnold Hanslmeier	Universitaet Graz	Austria
7	Barbara Titze	PNSensor	Germany
8	Bernard Gelly	Centre National de la Recherche Scientifique	France
9	Carsten Denker	Leibniz-Institut für Astrophysik Potsdam (AIP)	Germany
10	Dan Kiselman	Stockholm University - Institute for Solar Physics	Sweden
11	Fabio Manni	S.R.S. Engineeting Design S.R.L	Italy
12	Francesca Zuccarello	Istituto Nazionale di Astrofisica	Italy
13	Francesco Berrilli	Universita degli Studi di Roma tor Vergata	Italy
14	Frederic Paletou	Universite Paul Sabatier Toulouse III	France
15	Hans Kommers	HANKOM Engineering	Netherlands
16	Jesús Marcos Olaya	Fundación Tecnalia Research & Innovation	Spain
17	Luis Bellot Rubio	CSIC - Instituto de Astrofísica de Andalucía	Spain
18	Mats Carlsson	Universitetet i Oslo	Norway
19	Manuel Collados Vera	Instituto de Astrofísica de Canarias	Spain
20	Michal Sobotka	Astronomický Ústav AV ČR v.v.i	Czech Republic
21	Michele Bianda	Fondazione Istituto Ricerche Solari Locarno	Switzerland
22	Mihalis Mathioudakis	The Queen's University of Belfast	U. Kingdom
23	Oscar Hartogensis	Wageningen Universiteit	Netherlands
24	Oskar von der Lühe	Kiepenheuer-Institut Fuer Sonnenphysik	Germany
25	Philippe Godefroy	Winlight Optics	France
26	Ramón Codina	Centre Int. Mètodes Numèrics en Enginyeria	Spain
27	Robert Hammerschlag	Utrecht University	Netherlands
28	Roman Brajsa	Hvar Observatory (University of Zagreb)	Croatia
29	Sarah Matthews	University College London	U. Kingdom
30	Thomas Rimmele	Assoc. of Universities for Research in Astronomy	USA
31	Veronique de Louille	Royal Observatory of Belgium	Belgium
32	Vincenzo Carbone	Università della Calabria	Italy
33	Vincenzo Greco	Istit. Nazionale di Ottica - Cons. Naz. delle Ricerche	Italy
34	William J. Chaplin	The University Of Birmingham	U. Kingdom

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The Board has installed a smaller Executive Committee, which consists of the WP leaders, the Technical Manager, the Project Manager, and the Coordinator. The Executive Committee is delegated to serve as a review panel to monitor the progress of the Project and to inform the Board about the Project's status.

SOLARNET EXECUTIVE COMMITTEE

Nr	Name and surname	Institution	WP (Leader)
1	Manuel Collados Vera	Instituto de Astrofísica de Canarias	Coordinator
2	Alberto Escobar Rodríguez	Instituto de Astrofísica de Canarias	Project manager
3	Markus Roth	Kiepenheuer-Institut Fuer Sonnenphysik	Technical manager - Chair
4	Rolf Schlichenmaier	Kiepenheuer-Institut Fuer Sonnenphysik	WP20
5	Francesca Zuccarello	Istituto Nazionale di Astrofisica	WP30
6	Richard Seddon	Fundación Tecnalia Research & Innovation	WP40
7	Dan Kiselman	Stockholm Univ. Institute for Solar Physics	WP50
8	Héctor Socas Navarro	Instituto de Astrofísica de Canarias	WP60
9	Manuel Collados Vera	Instituto de Astrofísica de Canarias	WP70
10	Markus Roth	Kiepenheuer-Institut Fuer Sonnenphysik	WP80
11	Rolf Schlichenmaier	Kiepenheuer-Institut Fuer Sonnenphysik	WP90
12	Mats Carlsson	Universitetet i Oslo	WP100

The Board met twice in the reporting period, the Executive Committee has met three times (details are shown below).

The Coordinator, the IAC, who is handling the overall management and interactions within the Consortium and with the European Commission, mainly deals with the day-to-day management.

The Project Coordinator (Manuel Collados, IAC) is supported by a Project Manager (Alberto Escobar, IAC), and by a permanent Project Office to handle the administrational and financial work.

Markus Roth (KIS), as Technical Manager, supervises all technical and scientific activities of the project.

The day-to-day work of the Office is guaranteed from the start of the Project on 1st April 2013. From then, different measures have been taken to set up an internal reporting and accounting system, to foster communication and collaboration between partners, and to prepare this periodical report.

The management and coordination tasks and activities are planned yearly. See below the 2014 planning schedule of the project:

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SOLARNET PLANNING 2014

(Main meetings/tasks/activities/workshops/events)

Nr	Task/Activity	Date	Nature	Status
1	Report on status of the SOLARNET Work Packages	January	-	OK
2	1st CASSDA-SOLARNET Workshop, Freiburg, Germany (WP50/WP20)	18 - 20/02/14	-	OK
3	Mobility of Young Researcher Programme Announcement (WP30)	15/03 & 15/09	-	OK
4	1st SOLARNET School (Introduction to Solar Physics) & 1st Workshop (Radiative processes in the Sun and the Stars), Wroclaw, Poland (WP30)	24/03 - 04/04	-	OK
5	2nd SOLARNET Executive Meeting, Madrid, Spain (all WPs)	April 29th	-	OK
6	2nd SOLARNET Board Meeting, Madrid, Spain (all WPs)	April 30th	-	OK
7	1st SOLARNET Report to EU (First Reporting Period, all WPs)	September 30th	-	OK
	MS7: Analysis of MFBD and Speckle image restoration strategies (WP50)	March	Milestone	OK
	D10.1 Minutes of Board meetings (WP10)	September 30th	Deliv/Report	OK
	D10.2 Report on public outreach (WP10)	"	Deliv/Report	OK
	D20.1 Reports on the TAC tasks and the TAS Programme (WP20)	"	Deliv/Report	OK
	D20.2 Survey document –State of the art of existing pipelines and procedures– Preliminary report on pipelines guidelines (WP20)	"	Deliv/Report	OK
	D20.4 Document on standards for data archiving and VO (WP20)	"	Deliv/Report	OK
	D20.6 Report on the facilities for coordination (WP20)	"	Deliv/Report	OK
	D30.1 On-line meeting proceedings (WP30)	"	Deliv/Other	OK
	D30.2 Progress and final reports issued by host institution concerning short stays (WP30)	"	Deliv/Report	OK
	D30.3 Training schools material (WP30)	"	Deliv/Report	OK
	D40.1 Report on workshops (WP40)	"	Deliv/Report	OK
	D50.1 Status requirements and development of the instruments pipelines (WP50)	"	Deliv/Report	OK
	D60.1 Preliminary report of FEA of large FPI (WP60)	"	Deliv/Report	OK
	D60.2 Image slicer design (WP60)	"	Deliv/Other	OK
	D60.3 Microlens-fed system design (WP60)	"	Deliv/Other	OK
	D60.4 1k x 1k pnCCD conceptual design (WP60)	"	Deliv/Other	OK
	D70.1 Results of MCAO correction simulations (WP70)	"	Deliv/Report	OK
	D70.2 AO prototype for THEMIS and test report (WP70)	"	Deliv/Report	OK
	D70.3 Results of site-testing campaign at ORM and OT (WP70)	"	Deliv/Report	OK
	D70.4 Results of the optimization of EST design base on CFD analysis (WP70)	"	Deliv/Report	OK
	D70.5 GREGOR heat rejecter prototype and test report (WP70)	"	Deliv/Report	OK
	D90.1 Access to ground-based telescopes. Amount of access (WP90)	"	Deliv/Report	OK
	D100.1 Assessment on access to databases (WP100)	"	Deliv/Report	OK
	MS9 PnCCD conceptual study (WP60)	"	Milestone	OK
8	1st SOLARNET Technology Transfer Workshop (WP40)	October 2	-	
9	TAS Announcement for 2015 Observing Time (WP90)	December	-	

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SUMMARY OF ACTIVITIES CARRIED OUT DURING THE FIRST REPORTING PERIOD

1. **Accession of partners to the Grant Agreement.** All related documents were sent to the European Commission. The GA includes partners involved, start and end dates of each WP, person-month in WPs per partners, etc. Finally, 32 beneficiary's institutions accessed to GA.

2. **Distribution of EC advanced payment.** By the beginning of June 2013 a total amount of 2.900.000 euros was received at the IAC. According to the budget and EC distribution per partner, and taking also into account the agreement of the Kick-off Meeting to keep at the IAC accounts a total of 145.000 EUR (for future transfers to partners that have run out of money before the next release of funds), the funds were accordingly distributed.

   During this first reporting period, only one partner requested part of the aforementioned common funds (145.000 EUR): the Universita degli Studi di Roma Tor Vergata (UToV) that required 40.000 EUR to continue working in the sWP60.1 Large Etalon Development. The released amount not represents an increase of the fund approved for UToV, but and advanced payment against the next release of funds.

3. **Recruitment of the project manager.** A project manager was recruited in October 2013; Alberto Escobar. During the first six months, J. Burgos acted as interim project manager. A. Escobar is taking care of all matters related to the day-to-day of the project. J. Burgos is providing some support to the management of the project.

4. **Board and Executive Committees Meetings.** In accordance with the Grant Agreement the SOLARNET Board have met twice in the period:

   - 1st Board Meeting (Kick-off Meeting) – Brussels, April 10-11, 2013
   - 2nd Board Meeting – Madrid, April 30, 2014

   The Executive Committee has met three times:

   - 1st Executive Meeting (during Kick-off Meeting) – Brussels, April 11, 2013
   - 2nd Executive Meeting – Skype Teleconference, July 22, 2013
   - 3rd Executive Meeting – Madrid, April 29, 2014

   All documents regarding these five meetings (minutes and presentations) are available at the private section of the SOLARNET webpage (there is also a deliverable on this).

   An overview of all meetings, workshops, schools, etc. organized by SOLARNET during the first 18 months is provided in Annex X.

5. **Milestones and deliverables.** According to the GA, two milestones were achieved in 2013 and another two in 2014. Twenty two deliverables have been also produced in this period.

   Concerning WP10 (Coordination and Management), the milestones in this period are:

   MS1 - Project Kick-off Meeting (M1). The Kick-off Meeting was held in Brussels on April 10-11, 2013. All related documents – presentations and minutes – can be found at the private area of the SOLARNET webpage (Board Documents section).

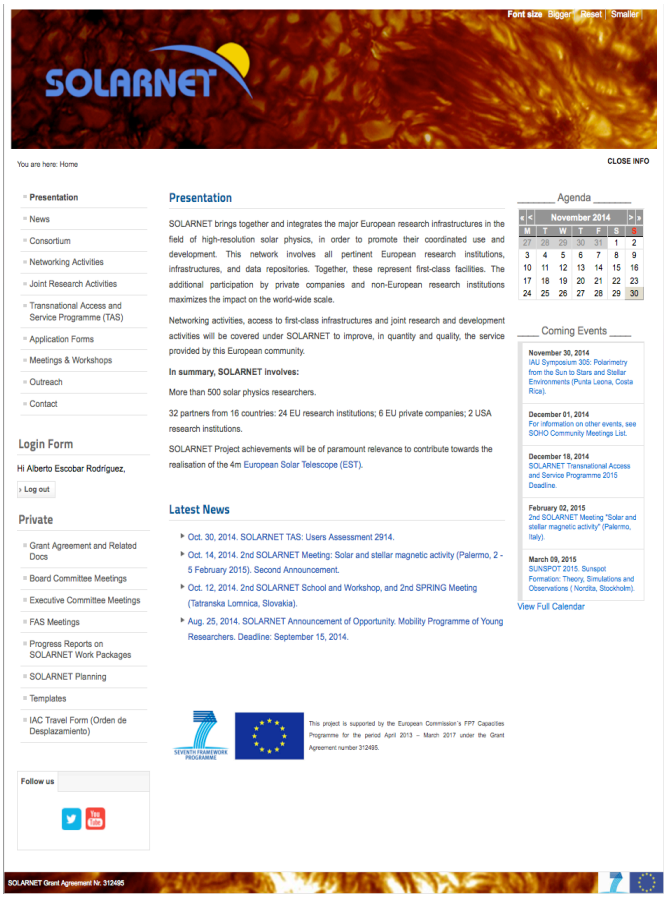
   MS2 - Project Webpage (M3).

   The SOLARNET website was created and is accessible at: www.solarnet-east.eu. The website is continuously updated.

   The webpage has public and private sections, and different access levels. There are documents and other pieces of information for downloading in the public section as well as in the private one.

   The website offers a calendar or agenda, with information about coming events either organized by SOLARNET or other relevant events in solar physics in general. In addition, the website provides a section with presentations from workshops and meetings.

   The webpage is kept updated by contributions from all SOLARNET partners.



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From January 2014 a webpage audience overview shows that:

Sessions:	4700 (total number of visit within the date range).
Users:	2929 (persons that have had at least one session, includes new and returning users).
Page Views:	13587 (the total number of pages viewed; repeated views of a single page are counted).
Pages/Sessions:	2,89 (the average number of pages viewed during a session; repeated views of a single page are counted).
Average Session Duration:	2,4 minutes (the average length of a session).
Bounce Rate:	57,74% (the percentage of single-page visits i.e. visits in which the person left the site from the entrance page without interacting with the page).
% New Session:	62,26 (an estimate of the percentage of first time visits).
Visitor Location:	111 countries

6. **Interaction with SOLARNET partners and WP leaders.** Apart from the standard and official meetings, this interaction is carried out via email, phone, Skype-conference, etc. with the aim of providing them support on management issues and EC guidelines for the fulfillment of the Grant Agreement.

   Between the Technical Manager and the Project Manager, the Skype or telephone calls took place almost bi-weekly.

7. **Activities related to the TAS Programme (WP20 and WP90).** The Project Office continued supporting tasks within TAS (Transnational Access and Service), in particular, the management and payment of travel and accommodation grants for astronomers awarded with observing time at the telescopes located at the Canary Islands. Four reports on this topic were prepared during the reporting period:

   - Two TAS reports with statistics on access to THEMIS, SST and VTT telescopes as well as to IBIS/DST and ROSA/DST instruments in 2013 and 2014. The 2014 report is aggregated over the two years. Annex VI.
   - Two reports containing the results obtained from a user assessment questionnaire sent to the astronomers participating in the 2013 and 2014 TAS campaigns, and answered by the majority of them. Annex IV and V.

   All four reports are available on the SOLARNET webpage. A brief TAS summary shows that:

   - 37 projects from 10 countries were awarded with observing time in the Canary Islands telescopes THEMIS, VTT and SST, as well as in the instruments IBIS/DST and ROSA/DST located in USA.
   - A total of 250 observing days were provided in the aforementioned telescopes and instruments.

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- 179 astronomers from 18 countries have benefited from the access provided under auspicious of SOLARNET as members of the observing team awarded with observing time.
- 30 astronomers were supported with travel and subsistence grants to carry out their observations in situ in the Canary Islands telescopes.
- 14 of these astronomers supported with grants were new users of the infrastructures.

8. **Management activities related to the Solar Physics Network (WP30).**
   - Support to the 1st and 2nd SOLARNET School and Workshop, as part of the Networking Activities of the project (Training of the new generation of scientists). With the support of the Project Office, the leader of the WP30 prepared and distributed a document containing some useful information for the organizers of meetings and schools.
   - Support to the Mobility of Young Researchers Programme. Four announcements of opportunity were published and promoted. As a result of this programme, eight astronomers carried out their stays in this period (four in 2013, and four in 2014).

     The Project Office managed all travel and subsistence requirements of these young astronomers.

     After carried our the stay, all young astronomers prepared and sent a brief report to the Project Office containing the main results of their stays and acknowledging the support of SOLARNET.

     The researchers, acted as tutor of the young astronomers, also prepared and sent a report to the Project Office on behalf of the host institutions.
9. **Activities related to WP40 (Innovation towards Industry).** Coordination and support to the visit of the leader of this WP to the IAC in order to carry out the 'extraction of technology' and other related tasks. Collaboration in preparing some materials to be presented in different workshops, meetings and conferences for promoting.
10. **Support to the organization of several events:**
    - 1st SOLARNET – 3rd EAST/ATST Meeting on "Synergies between ground and space based solar research" (5-8 August 2013, Oslo, Norway).
    - 1st SOLARNET School "Introduction to solar Physics" and Thematic Workshop "Radiative processes in the Sun and stars" (March 2nd - April 4th 2014, Wroclaw, Poland).
    - 1st SPRING Workshop held in Titisee, Freiburg, Germany (26-28 November 2013). SPRING is the acronym of the Solar Physics Research Integrated Network Group.
    - 1st CASSDA – SOLARNET Workshop "The challenge of retrieving ready-for-science data from ground-based solar observations. Getting the most out of your data" (18-20 February 2014, Freiburg, Germany).
    - 1st SOLARNET Technology Transfer Workshop, San Sebastian, Spain, 02 Oct 2014.

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All presentations of these events are available at http://www.solarnet-east.eu/meetandworksh

11. **Elaboration of SOLARNET Communication and Dissemination Plan** (outreach plan), and implementation of several task and activities included in it. This plan contains: main principles, objectives, targeted audiences, actions, tools, responsible, dates, etc. The plan also considers a set of indicator for its assessment.
12. **Supporting to the day-to-day activities of the technology-related work packages lead by the IAC.** Mainly WP60 and WP70.
13. **Use of resources.** The SOLARNET human effort in the first 18 months of the project reached the 32,27% (222,35 p-m) of the total amount of p-m expected for the four-year contract (689 p-m). This amount corresponds to the progress of the work foreseen by the different WPs, apart from some very minor deviations.

    The following partners have a dedication clearly below the expected average 18/48 proportion:

    - AIP: 1.05/29.05

      Their main contribution is expected on WP20 and WP50 for the development of pipelines and a prototype archive containing solar data complying with Solar Virtual Observatory tools. Their participation is based on their responsibility for the operation of one of the instruments (the Gregor Fabry-Pérot Interferometer) offered for the transnational access programme at the German telescope GREGOR, located at the Observatorio del Teide (Tenerife). The delay in the start of the scientific operation of this telescope has caused their reduced dedication. GREGOR has definitely been verified during 2014 and, as a consequence, the contribution of this partner in these two WPs is expected to increase considerably during the second period, especially in terms of the pipeline development. The prototype data archive will mainly be developed during the last phase of the project.

    - UPS: 0.3/9

      This partner is mainly involved in WP50 to implement a SVO archive prototype. This task will mainly be developed during the last phase of the project.

    - UCL-MSSL: 0.92/15

      This partner is mainly involved in WP50 to implement a SVO archive prototype. This task will mainly be developed during the last phase of the project.

    - AISAS: 1.56/12

      This partner participates mainly in WP20 (instrument pipelines, data archive and coordinated observations) and WP80 (synoptic instrument definition) because of the large experience of its members as users at solar telescopes. Its contribution in

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these two WPs will increase during the second period of the project, once the telescope and instrument functionalities have been defined by their operator institutions (WP20). The Science Requirement Document that will define the goals of the synoptic instrument is expected to be delivered at month 36, with the participation of this partner.

- UWRO: 0.92/9

  This partner is mainly involved in WP20 for the definition of the data archive complying with Solar Virtual Observatory tools. This task will mainly be developed during the second period of the project.

- IAA-CSIC: 0.50/3

  This partner participates mainly in WP20 (instrument pipelines, data archive and coordinated observations) because of the large experience of its members as users at solar telescopes. Its contribution in these two WPs will increase during the second period of the project. This partner is also responsible of the School “Solar magnetic fields: modeling and measuring techniques Polarization as a tool to study the Sun, the Solar System, and beyond” that will take place in May 2015.

- WO: 0/16

  This partner is responsible for the fabrication of the prototype image slicer in WP60. Its dedication will be centered in the second period once the design has been accomplished during the first part.

- NSO: 0/20

  This American partner contributes with own staff and no EU funding is involved.

- CfA-SAO: 0/1

  This American partner contributes with own staff and no EU funding is involved.

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In addition, the following partners have a dedication clearly above the average 18/48 proportion:

- SU: 19.4/22

  This partner leads WP50 and has coordinated all the efforts dedicated to the pipeline development. In addition, SU is also responsible for the pipeline for the instrument CRISP installed at the SST. The pipeline is finished and has concentrated most of manpower dedication by this partner.

- IRSOL: 3.5/3

  This partner has contributed to the tests of the "Fast Solar Polarimeter" evaluation model (WP60) carried out at the German VTT of the Observatorio del Teide. These campaigns have made possible to assess the polarimetric performance under realistic observing conditions, which cannot be simulated in the lab. The results of this practical experience at the telescope have constrained the sensor and camera requirements for the second development phase

- HANKOM: 3.2/4

  This partner has been responsible for the installation, maintenance and operation of instruments for turbulence measurements at the Observatorio del Roque de los Muchachos. The initial installation and maintenance works have required efforts that explain this high dedication.

- SRS: 6/8

  This partner has been responsible for the design of the Heat Rejecter prototype for the GREGOR telescope, in which most of its efforts for the project are concentrated.

- PNSENSOR: 10.49/8

  This partner has been responsible for the design of a conceptual sensor study for the Fast Solar Polarimeter (WP60). In addition some PNS resources have been used to support our two VTT observing campaigns in 2013 for the practical evaluation of the design. The tasks expected from this partner are already accomplished.

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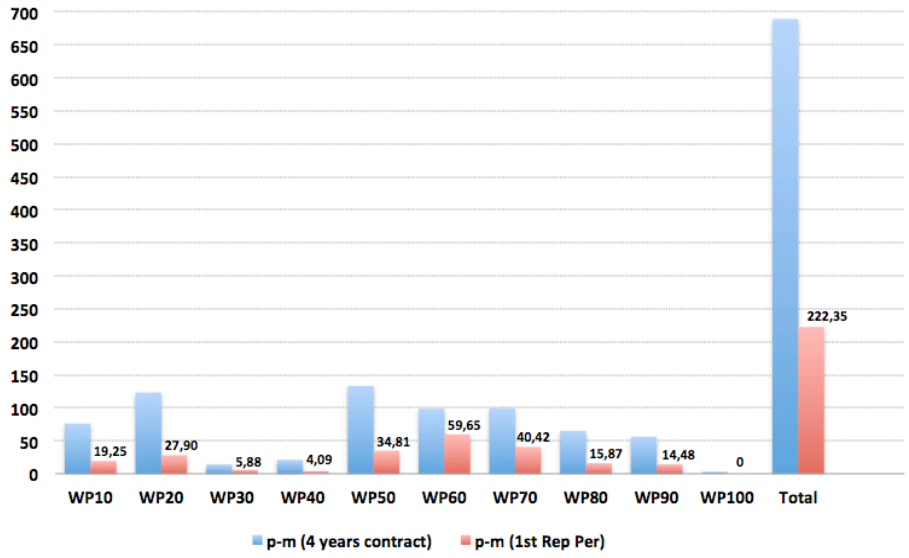
In relation to the distribution of efforts by WP, the following remarks are in order:

- WP10, WP20, WP40, WP50, WP80 and WP90 have received between 20% and 26% of the expected efforts. This dedication is slightly below the expected fraction (18 months out of 48 months) for this first reporting period, but can be considered as normal fluctuation on a long-term basis. The project will nonetheless introduce the necessary correcting measures to increase the dedication in these WPs during the second period.
- WP30 (42%) and WP70 (41%) have the expected proportional dedication.
- WP60 (60.6%) has a clearly larger dedication than expected. This WP requires the most innovative developments and, for this reason, has received the larger efforts. With this, the project has had the possibility to undertake the necessary actions to ensure that the foreseen designs (and the future prototypes to be constructed) meet the desired requirements.
- WP100 (0%) has concentrated its efforts on a networking activity under WP20 for the development of a prototype Solar Virtual Observatory for ground-based data and, consequently, the efforts dedicated to this task appear in this latter WP.

The chart below summarizes the human effort of SOLARNET per work package in this reporting period.



Project effort (number of person-months) broken down per Work-package. In blue, total amount expected for the four-year project, in red human efforts during first 18 months.

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ANNEXES

ANNEX I Minutes of 1st FAS Meeting

ANNEX II Minutes of 2nd FAS Meeting

ANNEX III TAS Poster

ANNEX IV 1st TAS User Assessment - 2013

ANNEX V 2nd TAS User Assessment - 2014

ANNEX VI TAS Report 2013-2014

ANNEX VII Examples of Fusion Related Technologies Developed alongside Space Technology Programs

ANNEX VIII ESA Technology Exchange database (European technology providers)

ANNEX IX ESA IP database (ESA IP – available for transfer to appropriate sectors)

ANNEX X List of SOLARNET Meetings, Schools, Workshops and Events (2013-2014)

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SOLARNET

HIGH-RESOLUTION SOLAR PHYSICS NETWORK

1ST REPORTING PERIOD

1st April 2013 – 30th September 2014

ANNEXES

30 November 2014

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

ANNEX I

Minutes of 1st FAS Meeting

This project is supported by the European Commission's FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement number 312495.

SOLARNET WP 20: Forum for ACCESS and SERVICES (FAS)

1st FAS Meeting in Stockholm, November 8, 2013, 08:30 - 15:00

Minutes

Participants: Manolo Collados (IAC), Dan Kiselman (SU), Göran Scharmer (SU), Jaime de la Cruz Rodriquez (SU), Rolf Schlichenmaier (KIS), Markus Roth (Technical Manager) (KIS), Nazaret Bello Gonzalez (KIS), Mats Carlsson (UiO), Stein Haugan (UiO), Gianna Cauzzi (INAF), Francesca Zuccarello (INAF), Mihalis Mathioudakis (QUB), Bernard Gelly (CNRS), Carsten Denker (AIP), Robbe Vansintjan (ROB), Mats Löfdahl (SU), Rickard Castillus (SU)

8:35 **(1) Election of FAS Chair**. Unanimously, Rolf Schlichenmaier (KIS) was elected.

8:45 **(2) Acceptance of Agenda**

8:46 **(3) WP 20.1 separated in two parts: PI mode and service mode.**

(3a) WP20.1a: ACCESS program for THEMIS, SST, VTT, and GREGOR (PI mode)

Preliminary report prepared by Alberto Escobar (IAC, PM) with statistics. THEMIS, SST, and VTT offered and delivered time in first year of SOLARNET, 2013. (see attachment: *PrelReport_ACCESS_08Nov2013.pdf*)

Good response on the call for observing time: 8 projects (7 different PI countries), 46 users, 82 days (i.e. 28% of expected amount). Access offered at SST (40 days), Themis (30 days) and VTT (12 days). User fees: 260 kEuro (with present estimate of Unit cost, corresponding to 26% of total budget).

Travel and subsistence grants: 15 observers were supported (24 kEuro ~ 21% spent). In average, 2 observers per campaign were supported with travel grants.

Comments and Discussion:

- SST has offered amost half of total expected amount of ACCESS.
- THEMIS will not be able to offer ACCESS in second half of SOLARNET.
- Dan Kiselman: Discussion on the possibility to have data reduction service at Oslo with the Access travel grants. A visit of two weeks is needed. Money cannot be given via the Access programme but via the overall WP20 budget.

9:18 GREGOR: Status Report on GREGOR FPI (C. Denker, AIP)

See presentation by Carsten Denker: *FirstFAS_DenkerGFPI.pdf*

Limitations need to be documented, but for the ACCESS a simple setup as spectroscopy can be provided. No simultaneous observations between GFPI and GRIS. A few issues on the telescope need to be solved. German PIs meet in December.

GREGOR in ACCESS 2014: There is the possibility that GREGOR (BBI, GRIS, GFPI) time is offered in 2014, under certain conditions: (a) an instrument scientist of the used instrument should be Co-I in the proposal. (b) Scientific publications with data from 2014 should have people from the GREGOR onsortium as co-authors.

Discussion: While Markus Roth thinks that the demand of a Co-I and the data policy is not in conflict with EU rules, many participants feel uneasy about such a practise: Demanding such conditions when offering ACCESS is considered to be a 'work around' of the eligibility rules. Since the GREGOR PIs, did not yet have time to perform first science campaigns, and since the campaigns are not feasible without sophisticated support from instrument scientists, it might be too early to offer GREGOR in ACCESS 2014.

10:00 Coffee

10:14 **WP 20.1b ACCESS program with IBIS and ROSA at DST (Service mode)**

(see presentation by Gianna Cauzzi: *FirstFAS_Cauzzi_ServiceMode2013.pdf*)

Report on first campaign:

- Call for proposals on April 15, 2013. (no templates were provided -> necessary for next time)
- 17 days offered in Service Mode in August 2013.
- 8 proposals received. Between 3 and 4 co-Is per proposal. 6 different PI countries. 5 of them new Users.
- The EAST TAC graded the proposals with help of 2 external referees. High priority: 3, middle priority: 2, and low priority: 2.
- Observations: 8 of 17 days were cloudy. 6 programs were executed, 3 are consiered completed. 3 only parital because e.g., required flares didn't happen, or targets didn't appear at several disk positions as required in the proposal.

Discussion:

- This first service-mode campaign was a success.
- The decision which campaign is performs is difficult, and a small level of arbitrariness cannot be removed.
- Next time a template for the proposal is needed. The proposals shall specify a completion criterion.
- The TAC will change the ranking from “high”, “medium”, “low” priority to “high”, “medium”, “reject”. High-priority proposals should allow terminating running lower priority observations, because high-risk means high return.
- Next time IBIS will split the observing time in two parts: spectroscopy and spectro-polarimetry.
- Eligibility problem: E.g., UK users ask for and get granted IBIS time. Then the corresponding ROSA time has to be provided without reimbursement from the TAS programme. As long as there is no apparent abuse of the eligibility rules, there is no problem with UK users receiving IBIS data through the ACCESS program.
- Reimbursement for the service is done if service is provided before, during, and after the observations (on bases of time sheets).
- The referees need to be informed that the refereeing is not anonymous. Conflict of interests need to be taken care of in cases a referee is Co-I on a observing proposal. The EAST TAC will handle this.
- Science-ready can be delivered by IBIS instead of training the researchers to reduce the data themselves, as this is a service of higher quality.
- Should the data be public? All data should be archived as good as possible in order to be able to make it accessible (format, searchability, …). This is a goal of SOLARNET and needs time to be realized.

Decisions:

- The next call should be for SST+VTT+THEMIS including ROSA+IBIS (SOLARNET ACCESS) on December 1, 2013. (Not mentioned at the meeting: CCI/ITP time is also part of the call on December 1, as the EAST TAC allocates SOLARNET ACCESS and CCI/ITP time at the same time.)
- There should be a proposal template for IBIS and ROSA.

- There is the possibility of a later separate call for proposals for GREGOR in 2014 (contingent on the FAS and GREGOR consortium agreeing on the conditions).

13:10 **(4) WP 20.2 Data Pipelines:** Bernard Gelly

Bernard presents the outcome of a survey about all existing data pipelines.
-> see presentation: *FirstFAS_BernardGelly_ WP202survey.pdf*

- B. Gelly asks to be informed about the WP20.3 activities.
- 1st deliverable in Month 18, i.e. in October 2014.

13:50 Jaime de la Cruz: CRISPRED -> see presentation: *FirstFAS_delacruz_crispred.pdf*

- IDL data pipeline for CRISP
- It is possible to have the same software package for all FPIs (IBIS, CRISP, etc.)

14:07 **(5) WP 20.3 Data Archives:** Stein Haugan -> see presentation: *FirstFAS_HauganStein_WP203.pdf*

- Data archives' deliverables in 04/2014 and 10/2015
- Google Doc working document (participation via a Google account).
- VSO requirements meeting @ MSSL on Nov. 26, 2013.
- Data format will be defined for instrument developers.

WP 20.4 No status report.

(6) WP 20.5 Novel queue observing modes: Dan Kiselman

The plan is to discuss and study the problem of queue-mode observing, aiming for a test run on one of the Canary Island telescopes in the observing season of 2016.

According to the Description of Work of WP 20, the FAS should also monitor the developments in the SERVICES. Hence, short status reports of WP 100 were given:

14:23 **(7) WP100.1 Hinode/IRIS data**: Stein Haugan

-> see last slide in presentation: *FirstFAS_HauganStein_WP203.pdf*

- IRIS data integrated; partial release

14:31 **WP 100.2 SDO Data Center at ROB**: Robbe Vansintjan

-> see presentation: *FirstFAS_RobbeVansintjanROB.pdf*

- A user survey is under way.

14:45 **WP 100.3 SDO Data Center at MPS:**

M. Roth on behalf of L. Gizon (MPS) -> see presentation: *FirstFAS_MPS.pdf*

Manolo Collados asks for periodical statistics on the GDC and ROB SDO data center usages to be sent to the Project Office (every 2 months).

14:55 **(8) Any Other Business**

Better relation between WP50 and WP20.3 should be established.

15:00 End of 1st FAS meeting.

Attachments:

- FirstFAS_BernardGelly_ WP202survey.pdf
- FirstFAS_Cauzzi_ServiceMode2013.pdf
- FirstFAS_delacruz_crispred.pdfFirstFAS_DenkerGFPI.pdf
- FirstFAS_HauganStein_WP203.pdf
- FirstFAS_MPS.pdf
- FirstFAS_PrelReport_ACCESS_08Nov2013.pdf
- FirstFAS_RobbeVansintjanROB.pdf

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ANNEX II

Minutes of 2nd FAS Meeting

This project is supported by the European Commission's FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement number 312495.

SOLARNET WP 20: Forum for ACCESS and SERVICES (FAS)

2nd FAS Meeting in Madrid, April 28, 2014, 15:30 - 17:30

Minutes

Participants: Andrés Asensio (IAC), Dan Kiselman (SU), Rolf Schlichenmaier (KIS, chair), Markus Roth (Technical Manager) (KIS), Mats Carlsson (UiO), Francesca Zuccarello (INAF), Bernard Gelly (CNRS), Carsten Denker (AIP), Robbe Vansintjan (ROB), Michal Sobotka (AIASCR), Francesco Berrilli (INAF), Manolo Collados (IAC), Raymond Burston (MPS), Alberto Escobar (IAC, Project Manager), Jesus Burgos (IAC), Ales Kucera (AISAS).

(1) Acceptance of Agenda

(2) WP 20.1 EAST TAC and Allocation of SOLARNET ACCESS Time (leader: Rolf Schlichenmaier)

Discussion of allocation process by the EAST TAC:

- EAST TAC should take more advantage of its expertise to evaluate proposals. In future, not only rankings by two referees, but also by TAC members.
- If referees want to be anonymous, only two members of TAC should know their names (chair + second person).

ACCESS time 2013:

- Report on 'TAS Programme 2013' prepared by Alberto Escobar (IAC, Project Manager) with statistics.

ACCESS time 2014:

- **PI mode 2014:** 14 days at VTT, 40 days at SST, 44 days at THEMIS, 0 days at GREGOR;
- **Service mode with ROSA and IBIS @DST:** 27 days plus one campaign in PI mode.

The TAS report 2013 and the TAS report 2014 will form the basis for deliverable 20.1, which is due in Month 18 (September 2014).

Conclusion of discussion on TAS performance:

- TAS program on track. Good performance.
- Shortcoming: SST has already allocated almost 100% of their contracted number of days, while GREGOR still has not delivered any observing days. Large numbers for THEMIS are OK, as it will not offer days in 2015, due to the installation of the SOLARNET Adaptive Optics test.
    - GREGOR consortium plans to offer observing time in 2015 and 2016.

(3) WP 20.2 Guidelines for data pipeline development (leader Bernard Gelly)

Bernard Gelly is preparing a survey document, which contains the state of existing pipelines and procedures as well as a preliminary report on pipeline guidelines. This document will be the deliverable D20.2, which is due in Month 18 (September 2014).

(4) WP 20.3 Data Archives (leader: Stein Haugan)

Robbe Vansintjan (ROB) presents a report on the SDO data center and the SOLARNET Data Archive (SDA) at ROB. He stresses that for designing the SDA, input from the community is still needed. In particular the following questions are to be answered:

1. To collect the meta-data do we pull or push to the SDA?
   Pulling and pushing are a trade off in management vs efficient. Pushing would be more efficient but would require the institutes to implement the push and pulling would require very little implementation but would be very inefficient. Regular scans of the entire meta-data.
2. Meta-data: do we delete update and version number?
   Yes.
3. Do we put a disclaimer on the website?
   Yes.
4. Is it possible to get some example data?

If you have any input and comments on these questions, please contact Robbe.

Mats Carlsson shortly reported that Stein Haugan is preparing a document on standards for data archiving and VO. A first draft is expected for May 2014. This document will serve as the deliverable D20.4.

(5) WP 20.4 Coordination with other infrastructures (leader: Oskar von der Lühe)

No report was given. The FAS chair will contact Oskar von der Lühe to find out about the status of the work package. A report on the facilities for coordination is a deliverable in month 18 (September 2014, D20.6).

(6) WP 20.5 Novel queue observing modes (leader: Dan Kiselman)

Dan Kiselman reports that a test for the novel queue observing mode is planned for 2015 at the SST. Pit Sütterlin will coordinate this effort.

(**7) Any Other Business: None.**

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ANNEX III

TAS Poster

SOLARNET

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Transnational Access and Service Programme 2013-2017

Overview

As a part of the SOLARNET project, the Transnational Access and Service Programme supports the access of the European solar physics community to some of the best European telescopes. To enhance the efficiency of data usage, external observers will receive also support for post-factum reduction of data, while standard pipelines are not fully developed, with the aim of providing them science-ready data. A successful Programme, which will bring together researchers of different nationalities, forms the basis for a long-term perspective of solar physics in Europe and for the operation of the European Solar Telescope, when it become a reality.

Every facility will offer an average of 20 observing days per year to external observers under this SOLARNET Programme. In addition to the telescopes VTT, GREGOR, THEMIS, and SST, located at Tenerife and La Palma, the IBIS/DST and ROSA/DST instruments, installed at the US Dunn Solar Telescope, are also offered by this programme. This is possible thanks to an agreement with the National Solar Observatory to open the DST to the European community.

SOLARNET is also supporting the access to the most demanded European Science Data Centre, providing data gathered by the solar satellite HINODE (SDC Europe) and the Solar Dynamics Observatory (BE-WISSDOM and GSC-SDO). Travel and subsistence grants to be on-site during the observations are also available

VTT – Tenerife

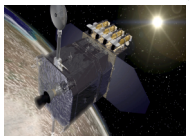
THEMIS – Tenerife

SST – La Palma

GREGOR – Tenerife

DST

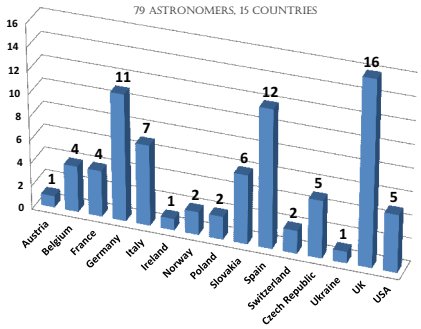
IBIS & ROSA at DST - US



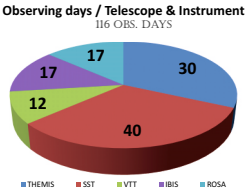
DB repositories: SDC Europe / BE-WISSDOM / GSC-SDO

First results. 2013

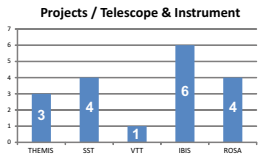
Nr of users / country of home institution



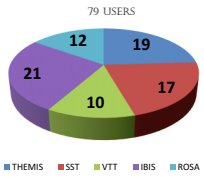
Observing days / Telescope & Instrument



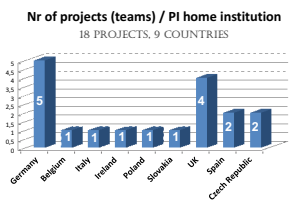
Projects / Telescope & Instrument



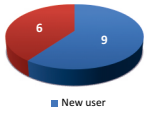
Nr of users / Telescope & Instrument



Nr of projects (teams) / PI home institution



Astronomers supported with travel & subsistence grants: 15



During the first calendar year of the SOLARNET TAS Programme:

- ✓ 116 observing days at THEMIS, SST, VTT, IBIS/DST and ROSA/DST
- ✓ 28% of the total expected amount of access to be provided under this four-year contract
- ✓ 79 astronomers (team members) from 15 countries; 18 groups (projects) were involved
- ✓ 15 users received travel and subsistence grants to be on-site during the observations
- ✓ 60% of these users visiting the facility under the Programme were new users.

EXTERNAL USERS ARE WELCOME TO APPLY FOR OBSERVING TIME AND DATABASE ACCESS

How to apply for Access

Eligible user groups interested in applying for telescope time are invited to do it in response to the specific Announcements of Opportunity that will be published at the SOLARNET web site.

In general terms, these announcements for observing time will published once a year, and potential users have to submit their application following the guidelines available at the SOLARNET website.

On the other hand, access to database repositories supported by SOLARNET is internet-based and completely open. Researchers worldwide are welcome.

Criteria of eligibility

To be eligible to benefit from this access a user group must satisfy the following three conditions:

a) The user group leader and the majority of the users must work in an institution established in an EU Member State[1] or in an EU FP7 Associated State[2]

b) The user group leader and the majority of the users must work in a country other than the country(ies) where the legal entity(ies) operating the infrastructure is(are) established[3]

c) User groups requesting access will submit an application following the conditions and deadlines of the Announcements of Opportunity yearly published by SOLARNET.

The selection will be based on scientific merits and technical feasibility. Special targeted groups (new users, users from countries with no similar facilities, etc.) will be prioritized under equally scored proposals.

Due to the limited amount of funds, those users meeting these criteria of eligibility are not automatically granted with telescope time under the Programme. Successful candidates will be contacted well in advance.

[1]EU 28 Member States: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxemburg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

[2]EU FP7 Associated States: Norway, Switzerland, Israel, Iceland, Turkey, Croatia Liechtenstein, the Former Yugoslav Republic of Macedonia and Serbia, Montenegro, Albania, Bosnia & Herzegovina, Faroe Islands, Republic of Moldova.

[3]EU countries excluded by this condition are: Germany and Spain at GREGOR and at VTT: France and Spain at THEMIS; Sweden and Spain at SST; Italy at IBIS/DST; and UK at ROSA/DST.

Travel & Subsistence Grants

Observing teams awarded with telescope time under the SOLARNET TAS Programme receive free access to the telescope as well as scientific and technical support to carry out the observations. EC funds are also available to cover travel, accommodation and subsistence expenses during the observing run. A maximum of two members from the research team can be supported. We encourage group leaders to involve new users and/or young researchers as beneficiaries for, at least, one of the travel and subsistence grants available. In any case, it is the responsibility of the group leader to decide which member of the team will be supported.

In the event the proposed beneficiary for these grants was not included into the original proposal (i.e. new PhD students, etc), group leader will be requested to justify it. Please, make sure that the inclusion of new members does not turn your team into a non eligible one, according to EC rules.

Once the group leader has received official confirmation of the amount of telescope time awarded, he/she is invited to inform about those team members who will benefit from travel and subsistence support.

Any observer from an eligible and successful team can be supported with these travel and subsistence grants regardless of whether in his/her particular case meets the conditions of eligibility.

More information

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SOLARNET, the high-resolution Solar Physics Network supported by the EC, brings together and integrates the major European research infrastructures in the field of high-resolution solar physics, in order to promote their coordinated use and development. This network is participated by all pertinent European research institutions, infrastructures and data repositories. Private companies and non-European organizations are also involved in this worldwide initiative.

Networking activities, access to first-class infrastructures and joint research and development activities, will be covered under SOLARNET to improve, in quantity and quality, the service provided by this European community. In particular, project achievements will be of paramount relevance to contribute towards the realisation of the 4m European Solar Telescope

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

ANNEX IV

1st TAS User Assessment - 2013

SOLARNET Transnational Access and Service Programme

USERS ASSESSMENT 2013

The SOLARNET Transnational Access and Service Programme (TAS) supports the access to some of the best European telescopes (VTT, GREGOR, THEMIS, and SST). To enhance the efficiency of data usage, the observers will receive support for post-factum reduction of data with the aim of providing them science-ready data. In addition to the aforementioned telescopes, located at Tenerife and La Palma, the IBIS/DST and ROSA/DST instruments, installed at the US Dunn Solar Telescope, are also offered by this programme.

Observing teams awarded with telescope time under the SOLARNET TAS Programme receive free access to the infrastructure/instruments as well as scientific and technical support to carry out the observations. EC funds are also available to cover travel, accommodation and subsistence costs during the observing run.

SOLARNET is also supporting the access to the most demanded European Science Data Centre, providing data gathered by the solar satellite HINODE (SDC Europe) and the Solar Dynamics Observatory (BE-WISSDOM and GSC-SDO). The access to databases is internet-based and completely open.

User teams awarded with telescope time under the 2013 SOLARNET TAS Programme received a brief questionnaire to assess the quality of the access and service provided. A total of 8 observing teams were supported under the 2013 TAS campaign. The questionnaire was distributed among Principal investigators and astronomers supported with travel and subsistence grants. A total of 15 questionnaires were distributed.

12 questionnaires (80%) were completed and returned to the SOLARNET Project Office. The most relevant information from this feedback is as follows:

- The 12 astronomers completing the questionnaire knew about the possibilities of SOLARNET supporting access mainly through personal contacts. Other options were also indicated.

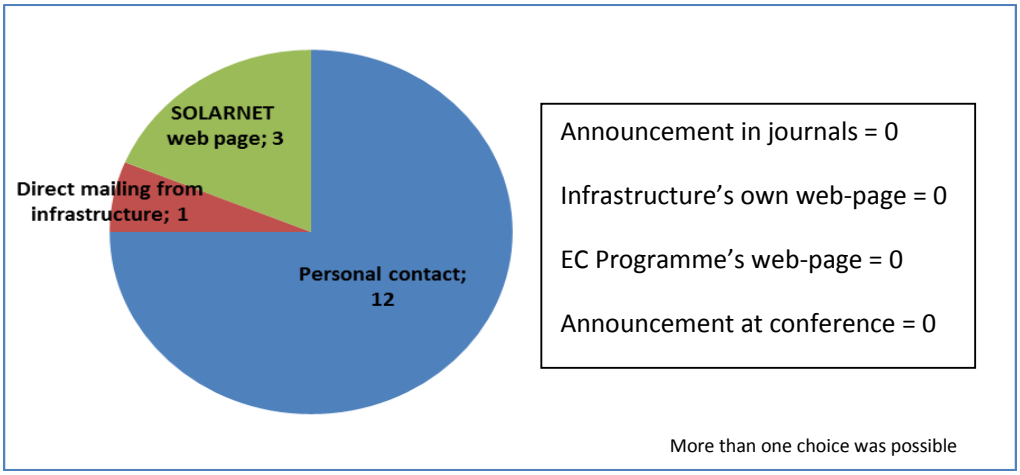

Chart 1: Where did you find out about the possibilities of SOLARNET supporting access?

These results state the need of improving the communicating mechanisms in order to increase the number of astronomers that are informed about the possibilities of the SOLARNET TAS Programme.

- 66% of these astronomers would have not been able to carry out their project without SOLARNET support.

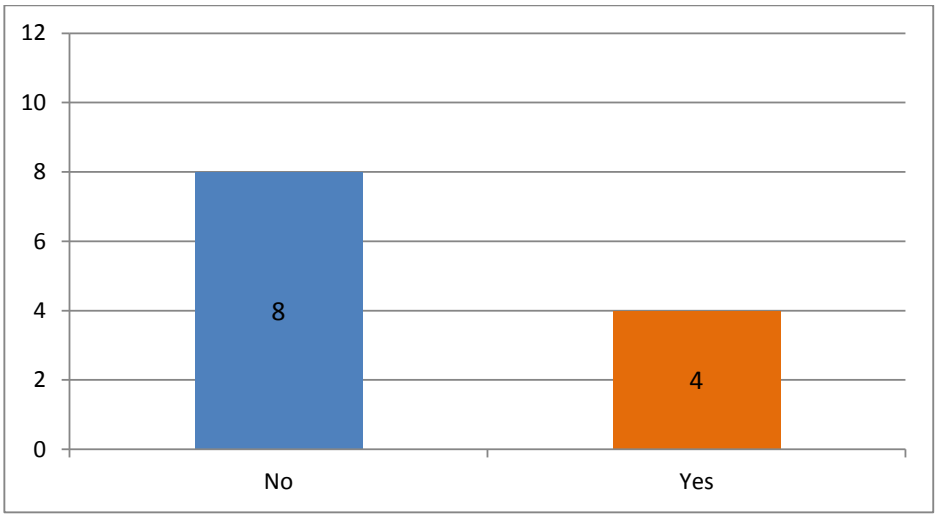

Chart 2: Could you carry out the project without SOLARNET support?

- Astronomers were asked about reasons they would not have been able to carry out the observations without SOLARNET support. Majority of them referred to the travel and subsistence expenses (more than one option was possible).

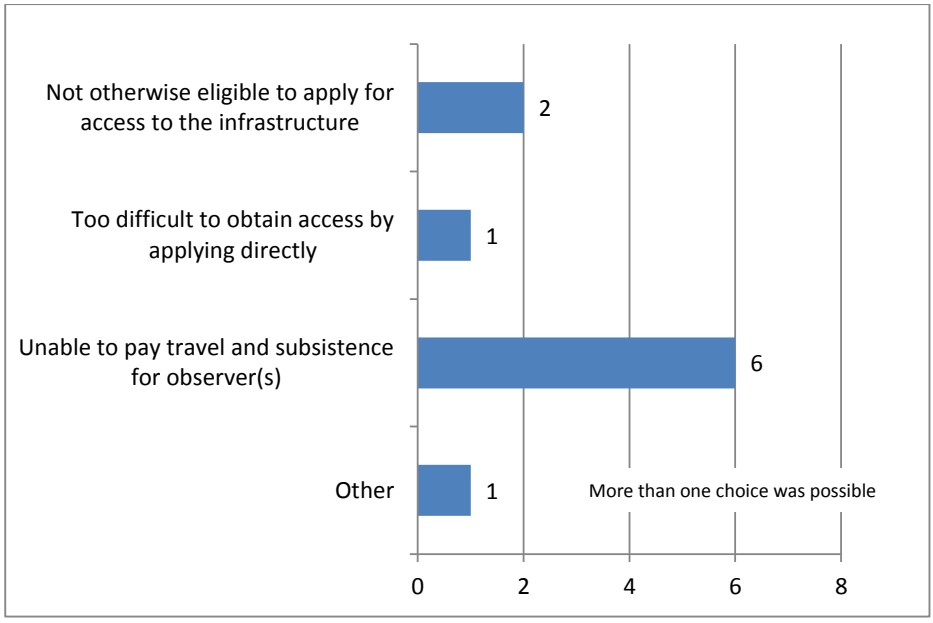

Chart 3: Causes because astronomers could not carry out the project without the support of SOLARNET

- Majority of the specific aspects related to the services provided by the infrastructure were assessed with the highest rating. The overall appreciation of the services provided was considered as 'very good' by 8 astronomers, and 'good' by the other 4.

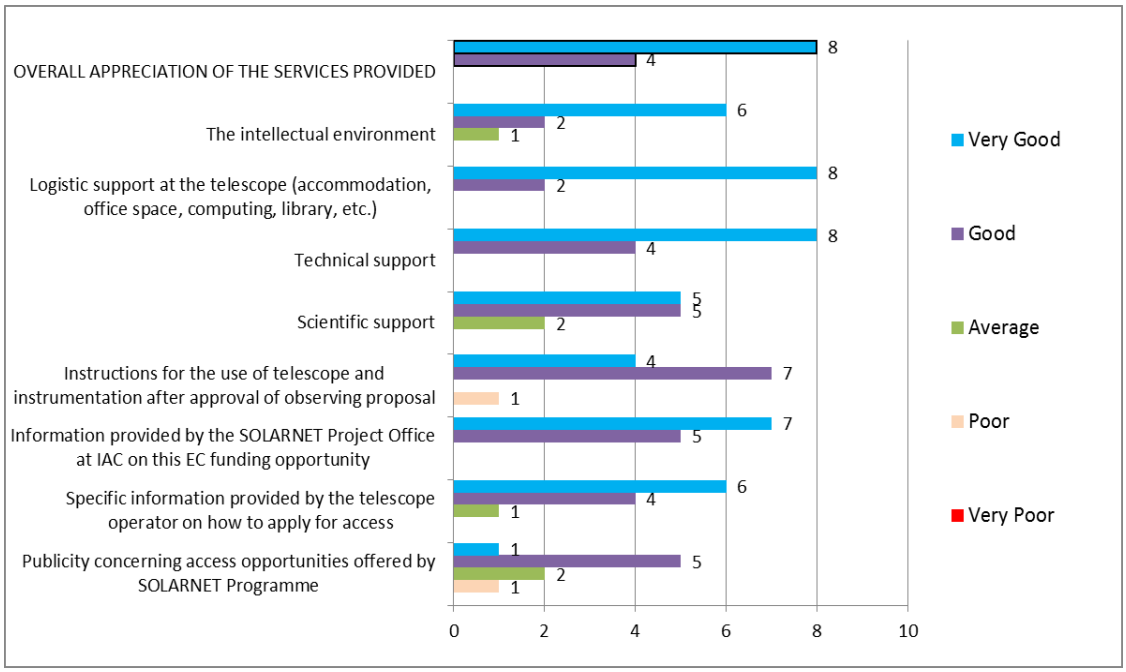

Chart 4: Assessment of the services provided by the infrastructure

- Other services, mainly provided by the SOLARNET Project Office, were assessed as "very good" or "good".

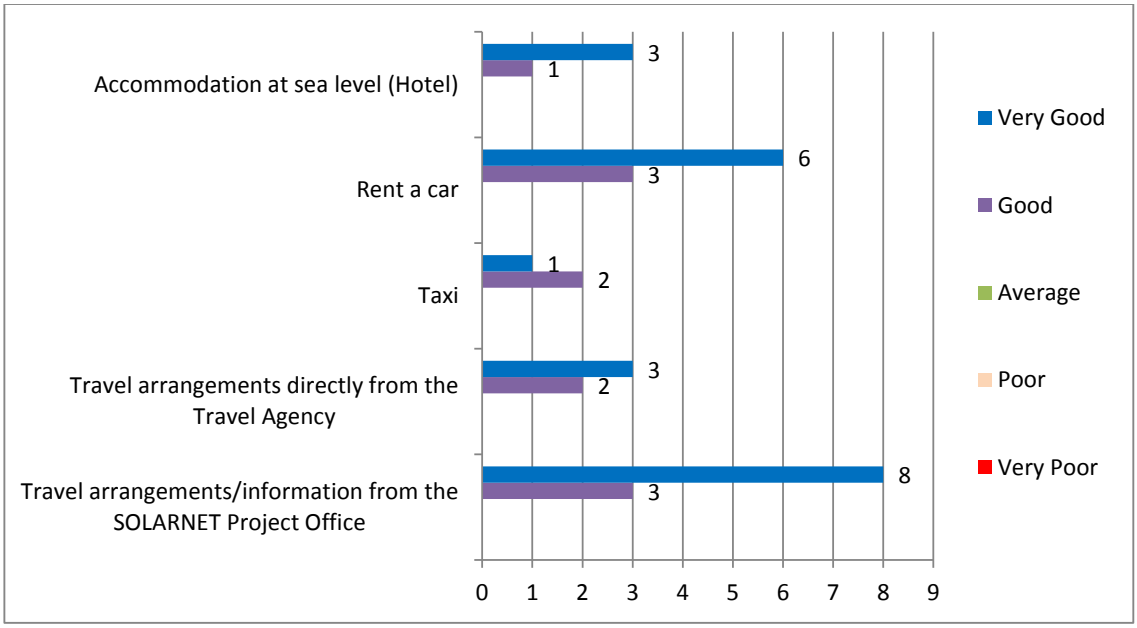

Chart 5: Other services assessment (provided by the Project Office)

- Concerning accommodation at OT and ORM Residences, astronomers are very satisfied in general, but some aspects could be analyzed for improvement, specially "meals" and "reception".

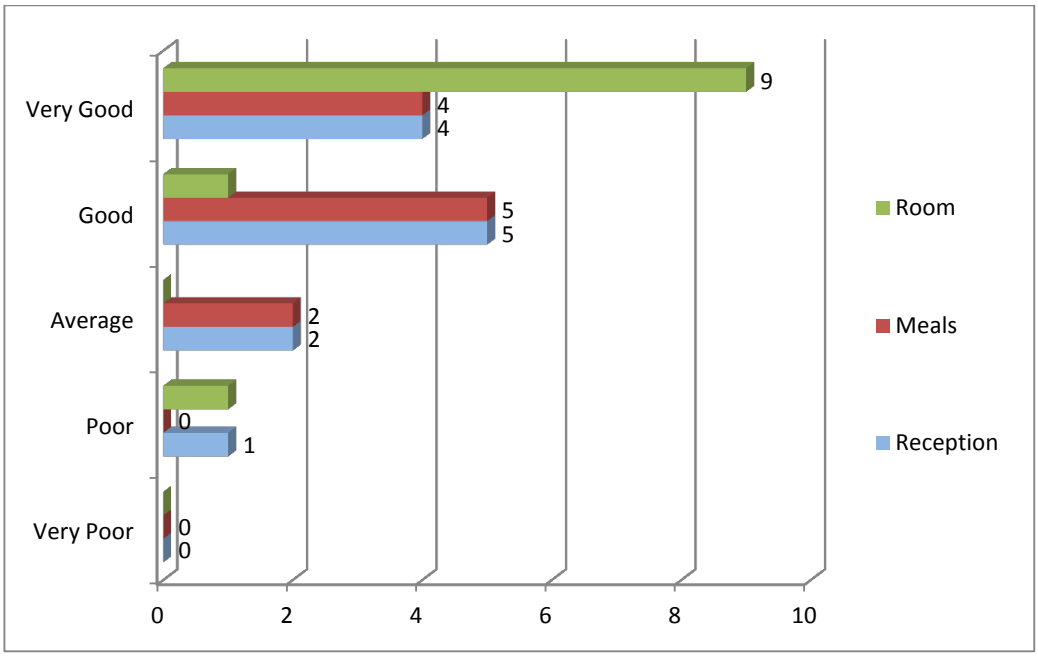

Chart 6: Other services assessment (accommodation at OT and ORM Residences)

- Comments added by these astronomers at the end of the questionnaire:
  - "The only thing that I can think of for improving would be the publicity that SOLARNET grants/observing time exists, possibly with more announcements in newsletters, etc."
  - "Would be good to have instruction on using the <*telescope*> (step by step), written in English, printed and available on site."
  - "The personnel in the ORM residence were not informed about our arrival. There was a problem to pay Taxi ORM – airport for my student (second observer). "
  - "Nieves provided fantastic support throughout our campaign in scheduling, etc."
  - "The technical assistance by Claude Lemen was outstandingly good! Other assistants were, unfortunately, not very familiar with the CCDs."
  - "SOLARNET has been a great occasion for me to carry on my research by myself. Organization of SOLARNET from my point of view has been very good."

SOLARNET Project Office
January 2013

This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

ANNEX V

2nd TAS User Assessment - 2014

This project is supported by the European Commission's FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement number 312495.
www.solarnet-east.eu

SOLARNET TAS PROGRAMME

USERS ASSESSMENT

2014

October 2014

Prepared by

A. Escobar
SOLARNET Project Manager

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This project is supported by the European Commission's FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement number 312495.

SOLARNET Transnational Access and Service Programme

USERS ASSESSMENT 2014

The SOLARNET Transnational Access and Service Programme (TAS) supports the access to some of the best European telescopes (VTT, THEMIS, SST and GREGOR). To enhance the efficiency of data usage, the observers receive support for post-factum reduction of data with the aim of providing them science-ready data. In addition to the aforementioned telescopes, located at Tenerife and La Palma, the IBIS/DST and ROSA/DST instruments, installed at the US Dunn Solar Telescope, are also offered by this programme.

Observing teams awarded with telescope time under the SOLARNET TAS Programme receive free access to the infrastructure/instruments as well as scientific and technical support to carry out the observations. EC funds are also available to cover travel, accommodation and subsistence costs during the observing run.

SOLARNET is also supporting the access to the most demanded European Science Data Centre, providing data gathered by the solar satellite HINODE (SDC Europe) and the Solar Dynamics Observatory (BE-WISSDOM and GSC-SDO). The access to databases is internet-based and completely open.

User teams awarded with telescope time under the 2014 SOLARNET TAS Programme received a brief questionnaire to assess the quality of the access and service provided. A total of 8 observing teams were supported under the 2014 TAS campaign.

The questionnaire was distributed among astronomers supported with travel and subsistence grants. A total of 16 questionnaires were distributed. 15 questionnaires (93,8%) were completed and returned to the SOLARNET Project Office. The most relevant information from this feedback is as follows:

- Most of the astronomers completing the questionnaire knew about the possibilities of SOLARNET supporting access mainly through personal contacts (13) and SOLARNET Webpage (6). Other two options were also indicated.

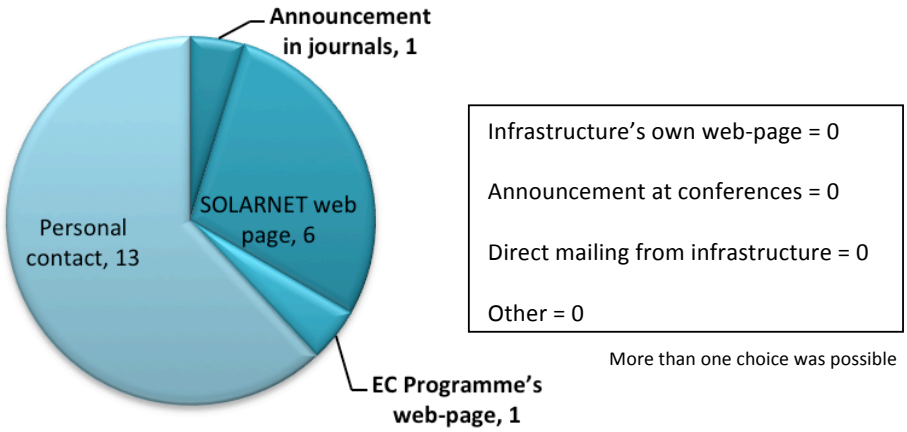

Chart 1: Where did you find out about the possibilities of SOLARNET supporting access?

These results state the need of continuing improving the communicating mechanisms in order to increase the number of astronomers that are informed about the possibilities of the SOLARNET TAS Programme.

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This project is supported by the European Commission's FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement number 312495.

- 14 astronomers would have not been able to carry out their project without SOLARNET support.
- Astronomers were asked about reasons they would not have been able to carry out the observations without SOLARNET support. Majority of them referred to the travel and subsistence expenses.

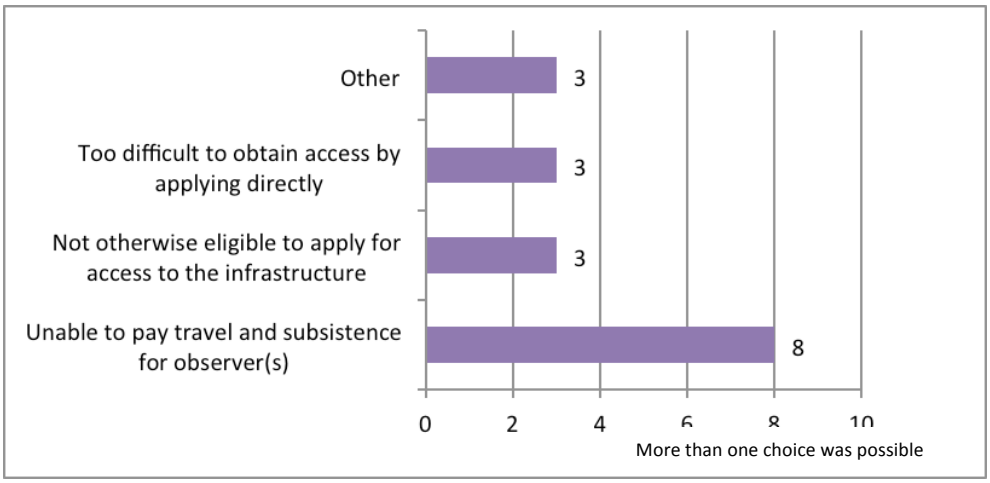

Chart 2: Causes because astronomers could not carry out the project without the support of SOLARNET

- Majority of the specific aspects related to the services provided by the infrastructure were assessed with the highest rating. The overall appreciation of the services provided was considered 'very good' by 9 astronomers, and 'good' by the other 5.

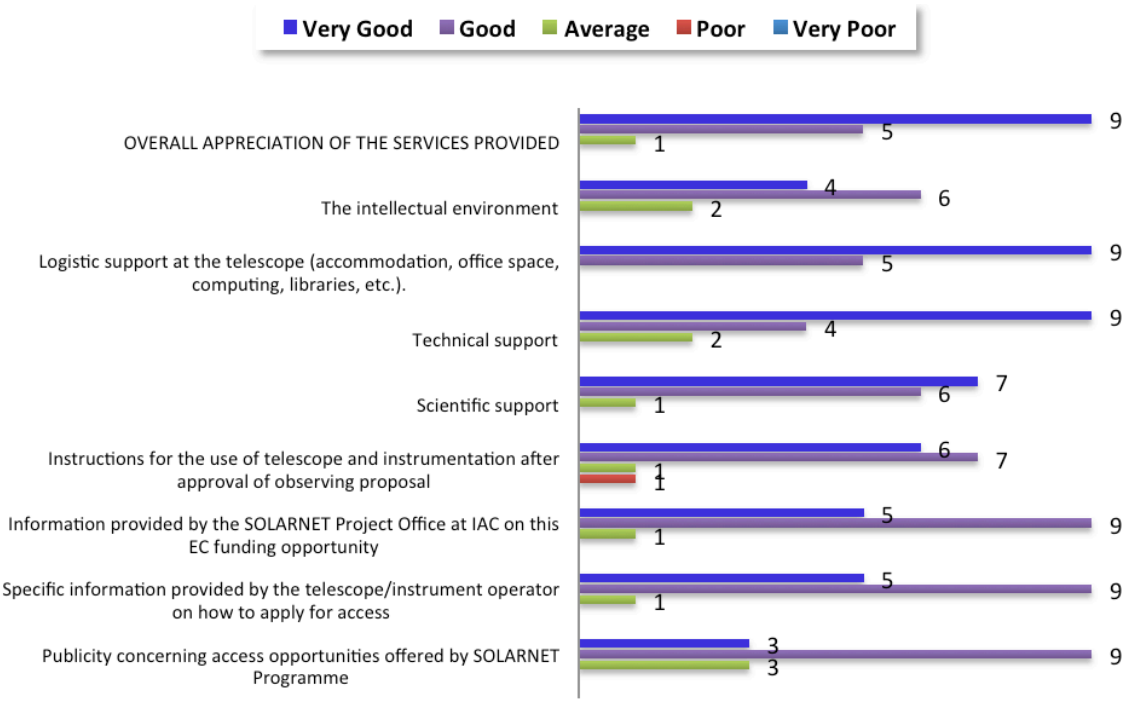

Chart 3: Assessment of the services provided by the infrastructure

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- Other services, mainly provided by the SOLARNET Project Office, were also assessed as 'very good' or 'good'.

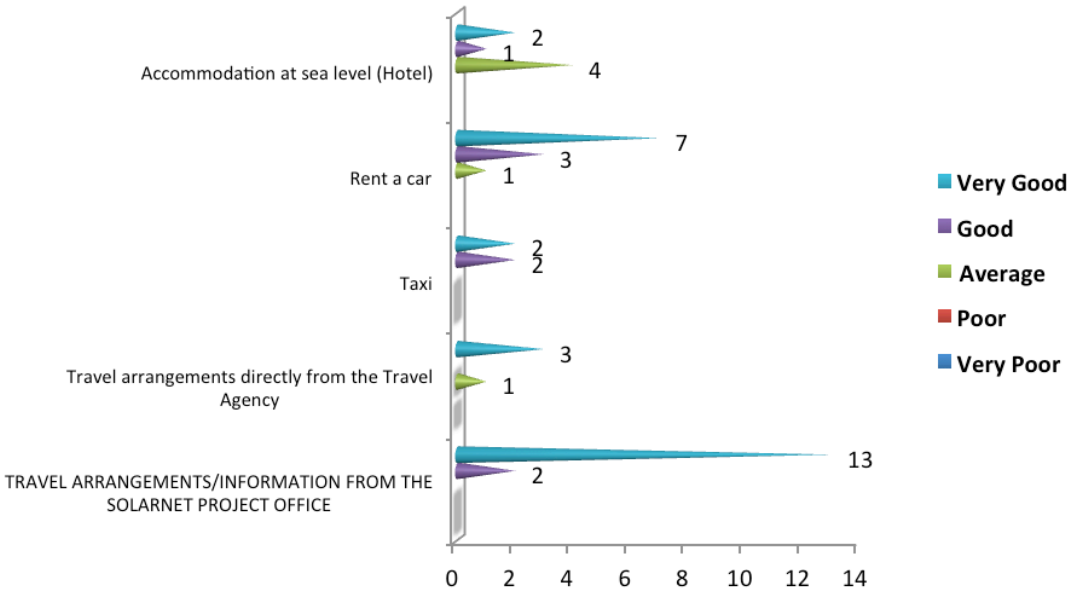

Chart 4: Other services assessment (provided by the Project Office)

- Concerning accommodation at OT and ORM Residences, astronomers are very satisfied in general, but some aspects could be analyzed for improvement, specially "meals".

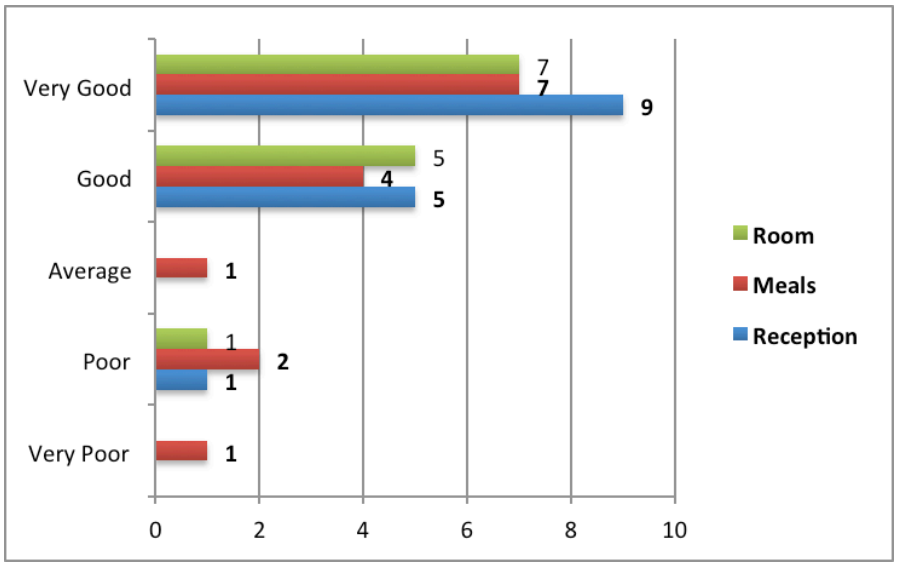

Chart 5: Other services assessment (accommodation at OT and ORM Residences)

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- Comments added by the astronomers at the end of the questionnaire:
  - "I believe that the SOLARNET TAS program is an excellent program for European researchers and provides invaluable access to some of the best facilities in the world for solar physics research."
  - "None. The whole process was seamless."
  - "Some of the everyday equipment at the SST should be renewed. This concerns especially chairs (we were 4 up there and there were only 3 roughly ok chairs). Also, we had several difficulties concerning the motor controlling the azimuth and declination angle of the telescope. Due to dirt in the Turret's gear it would fail to move properly and it would go to parking position automatically, especially around noon. Each day we had roughly 5 such incidents."
  - "We would like to pay tribute to the telescope operator at the SST (Pit Sutterlin) for consistently outstanding support during our observation campaign. He did an essential and fantastic job. We would like to pay special tribute to Alberto Escobar for his support and guidance in making the logistics of this campaign incredibly easy and efficient. We are highly impressed with the services provided by the SOLARNET team. Fantastic work."
  - "Because it was just my duty to give the scientific support during the campaign, I would like to leave that question open. There have been replacements of hardware just before this campaign, and some new software was installed, but that was not easy to handle by the people at the site."
  - "None. All the arrangements were excellent... I would like to apply for more SST time within the next 1-2 years... best observing experience to date. Again, I would like to thank the IAC and in particular Alberto."
  - "Instrumental setup of telescope met only partly our demands specified in primary proposal and THEMIS electronic technical proposal submitted well in advance of campaign. However, feasibility of proposed observations was discussed and confirmed by a THEMIS staff member Dr. Lopez Ariste prior submission of the proposal. We experienced only a very short periods of good seeing during observations. Therefore, we plan to repeat the campaign in the future."
  - "Although a side matter, I think it still should be mentioned: I ranked the meals low because, although the quality of the food was good, it was repeatedly lukewarm at best and sometimes outright cold (even when eating as short as half an hour after the canteen opened). Otherwise I had a pleasant experience and am very satisfied with the organizing support SOLARNET offered."

SOLARNET Project Office
October 2014

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This project is supported by the European Commission´s FP7 Capacities Programme for the period April 2013 – March 2017 under the Grant Agreement nr. 312495.

ANNEX VI

TAS Report 2013-2014

This project is supported by the European Commission's FP7 Capacities Programme for the period April 2013 - March 2017 under the Grant Agreement number 312495.

www.solarnet-east.eu

SOLARNET

TAS Programme

2013 & 2014

October 2014

Prepared by

A. Escobar
SOLARNET Project Manager

This project is supported by the European Commission's FP7 Capacities Programme for the period April 2013 - March 2017 under the Grant Agreement number 312495.

This report includes information about the amount of access provided in 2013 and 2014 by THEMIS, SST and VTT, and by IBIS/DST and ROSA/DST instruments. No information included about the service provided by databases supported under SOLARNET. No access provided by GREGOR during these years.

INDEX

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1. GENERAL OVERVIEW.

1.1 Access.

Total amount of access offered during 2014:	**134 days**
➢ 98 days offered at THEMIS, SST and VTT, and a total of 36 days have been also allocated by IBIS and ROSA under servicing mode. No access was provided in 2014 by GREGOR.	
Observing time 2014 / expected amount of access 2013-2017 (%):	**29,7 %**
Total amount of access offered during 2013+2014:	**250 days**
Observing time 2013+2014 / expected amount of access 2013-2017 (%):	**55,4 %**
Nr. of telescopes and instruments offering observing time during 2014:	**3 telescopes** **2 instruments**

1.2. Projects, users and observers supported.

1.2.1. Projects.

Total number of projects/teams supported during 2014:	**19**
Nr. of projects 2014 / indicative nr. of projects 2013-2017 (%):	**29,2%**
Total number of projects/teams supported during 2013+2014:	**37**
Nr. of projects 2013+2014 / indicative nr. of projects 2013-2017 (%):	**56,9%**

1.2.2. Users.

Nr. of ***users*** (team members) awarded with observing time during 2014:	**100**
Nr. of ***users*** 2014 / indicative nr. of ***users*** 2013-2017 (%):	**36,8%**
Nr. of ***users*** (team members) awarded with observing time during 2013+2014:	**179 users**
Nr. of ***users*** 2013+2014 / indicative nr. of ***users*** 2013-2017 (%):	**65,8%**

1.2.3. Astronomers supported with travel and subsistence grants (T&S).

Nr. of observers awarded with T&S grants during 2014:	**15**
New observers (awarded with T&S grants during 2014):	**5**
Nr. of observers awarded with T&S grants during 2013+2014:	**30**
New observers (awarded with T&S grants during 2013+2014):	**14**

1.3. User Fees 2014.

		ACCESS 2014		ACCESS 2013-2017	Ratio 2014 / 2013-17
Telescope	**Unit Cost (€/unit of access) A**	**Amount Access awarded during 2014 B**	**User Fees * (€) 2014 A x B**	**Total amount of access to be provided during the contract C**	**Fraction of 2014 user fees and time awarded B / C x100**
VTT	2.900	14	40.600	55	25,5%
THEMIS	3.214	44	141.416	85	51,8%
SST	3.238	40	129.520	85	47,1%
GREGOR	4.351	0	0	66	0%
IBIS/DST	0	23	0	80	28,8%
ROSA/DST	0	13	0	80	16,3%
TOTAL	0	134	311.536	451	29,7%

User Fees 2014:	**311.536 EUR**
User Fees 2014 / expected User Fees 2013-17:	**31,3%**

NB: The expected amount of funding for user fees during this 4-years contract, for SST, THEMIS, VTT and GREGOR is: 995.086 €.

1.3.1. User Fees 2013+2014.

		ACCESS 2013+2014		ACCESS 2013-2017	Ratio 2013+2014 / 2013-2017
Telescope	**Unit Cost (€/unit of access) A**	**Amount Access awarded during 2013+2014 B**	**User Fees * (€) 2013+2014 A x B**	**Total amount of access to be provided during the contract C**	**Fraction of 2013+2014 user fees and time awarded B / C x100**
VTT	2.900	26	75.400	55	42,3 %
THEMIS	3.214	74	237.836	85	87,1 %
SST	3.238	80	259.040	85	94,1 %
GREGOR	4.351	0	0	66	0%
IBIS/DST	0	40	0	80	50%
ROSA/DST	0	30	0	80	33,8%
TOTAL	0	250	572.276	451	55,4 %

*** User fees are calculated based on estimated unit cost.**

User Fees 2013+2014:	**572.276 EUR**
User Fees 2013+2014 / expected User Fees 2013-2017:	**57,5%**

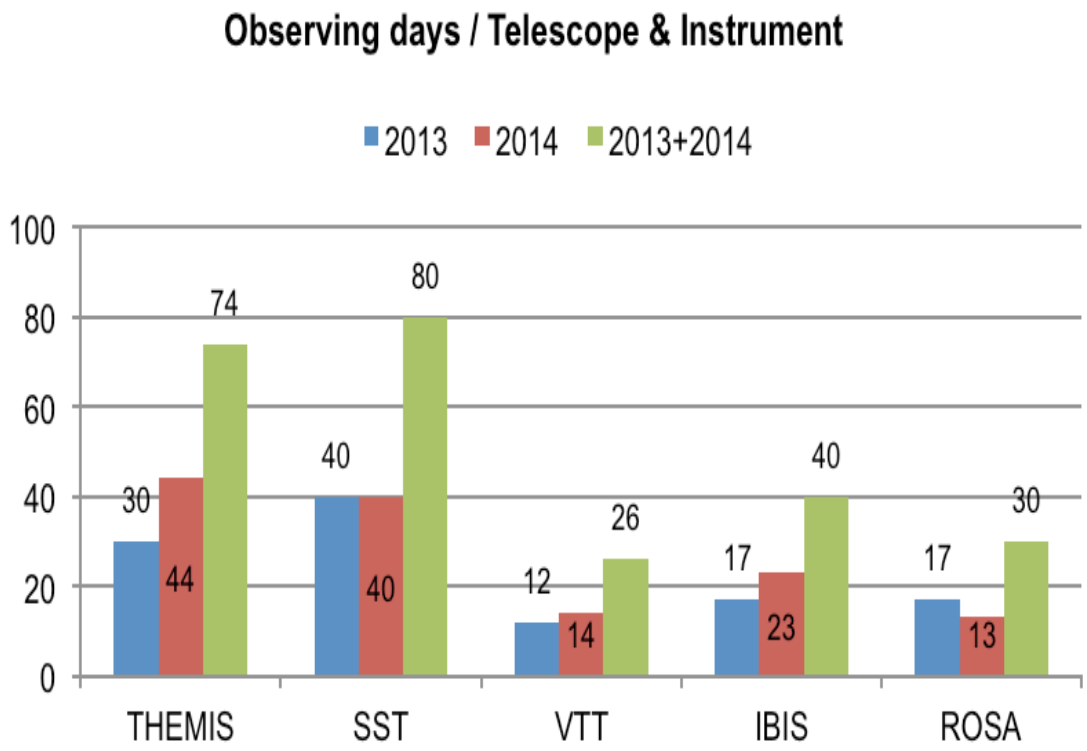
1.4. Travel and Subsistence Grants

Travel and subsistence grants 2014:	Approx. **24.092,23 €**
T&S grants 2014 / expected amount for T&S grants 2013-2017:	**27,4 %**
Travel and subsistence grants 2013:	**22.012,94 €**
Travel and subsistence grants 2013+2014:	**45.495,50 €**
T&S grants 2013+2014 / expected amount for T&S grants 2013-2017:	**40,1 %**

NB: Expected amount of funding for T&S grants during this 4-years contract are: 112.374 €.

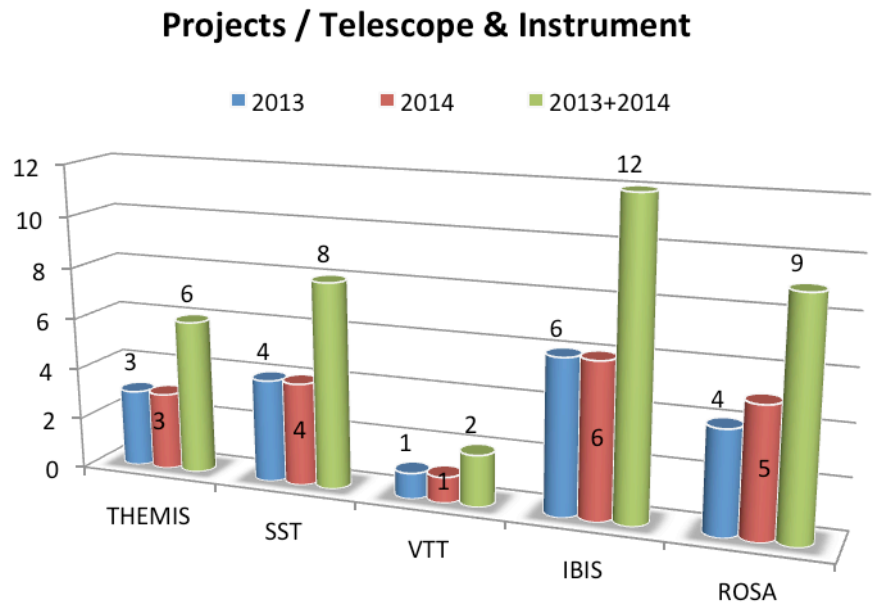
2. DIAGRAMS AND CHARTS.

2.1. Amount of Access:

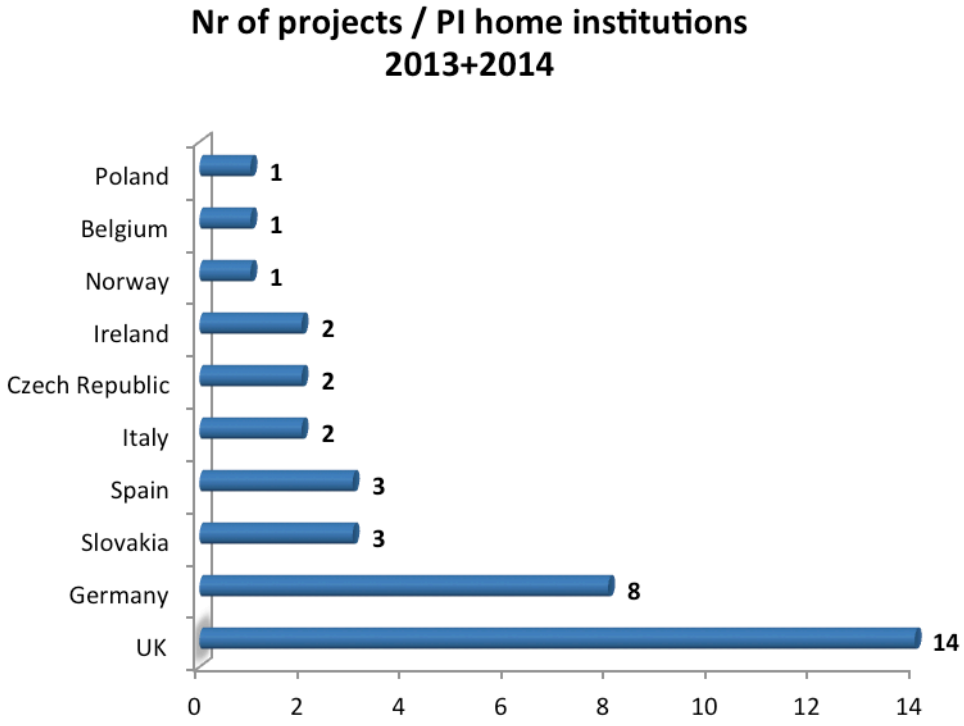


250 observing days

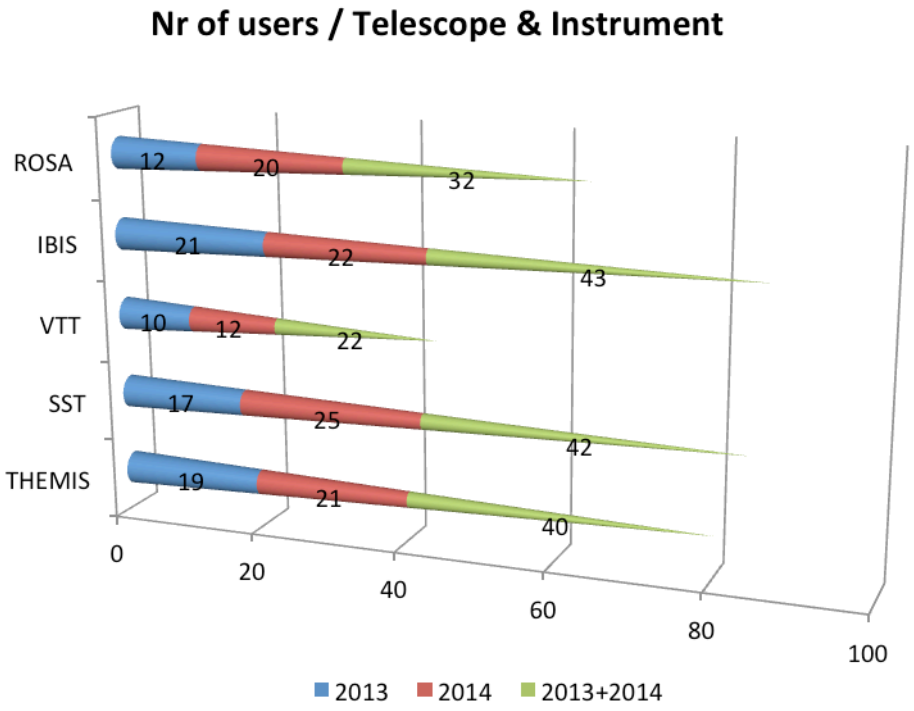
2.2. Projects, users and observers supported:



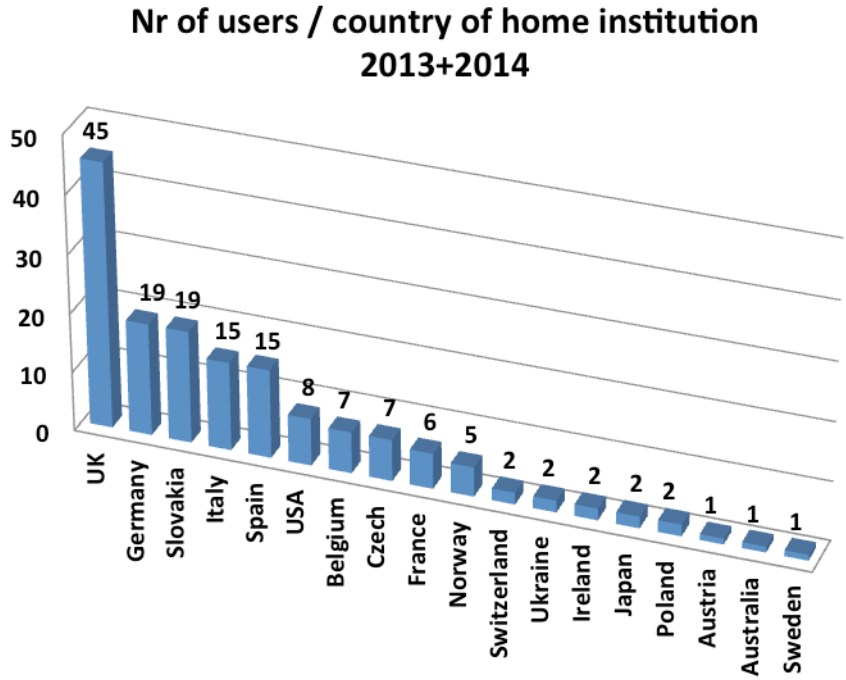
37 projects



37 projects, 10 countries



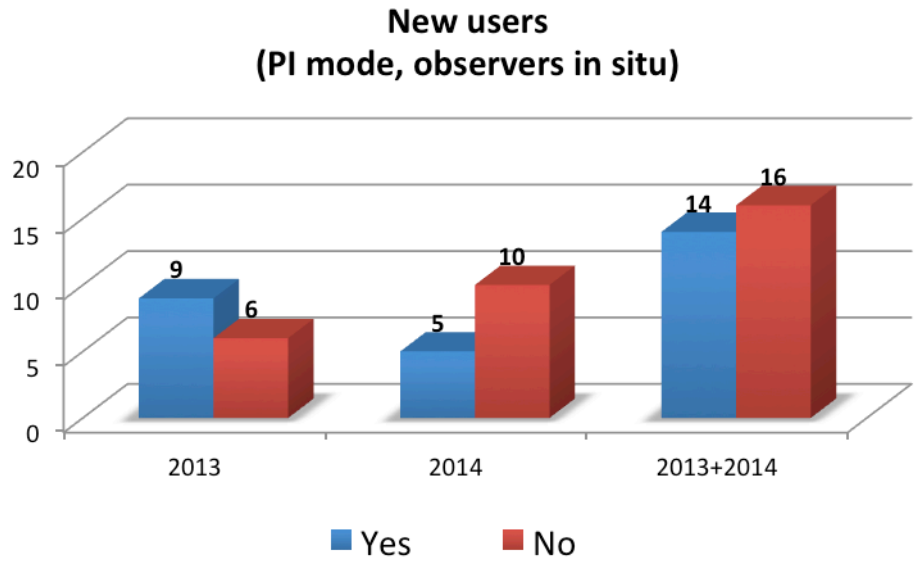
179 users



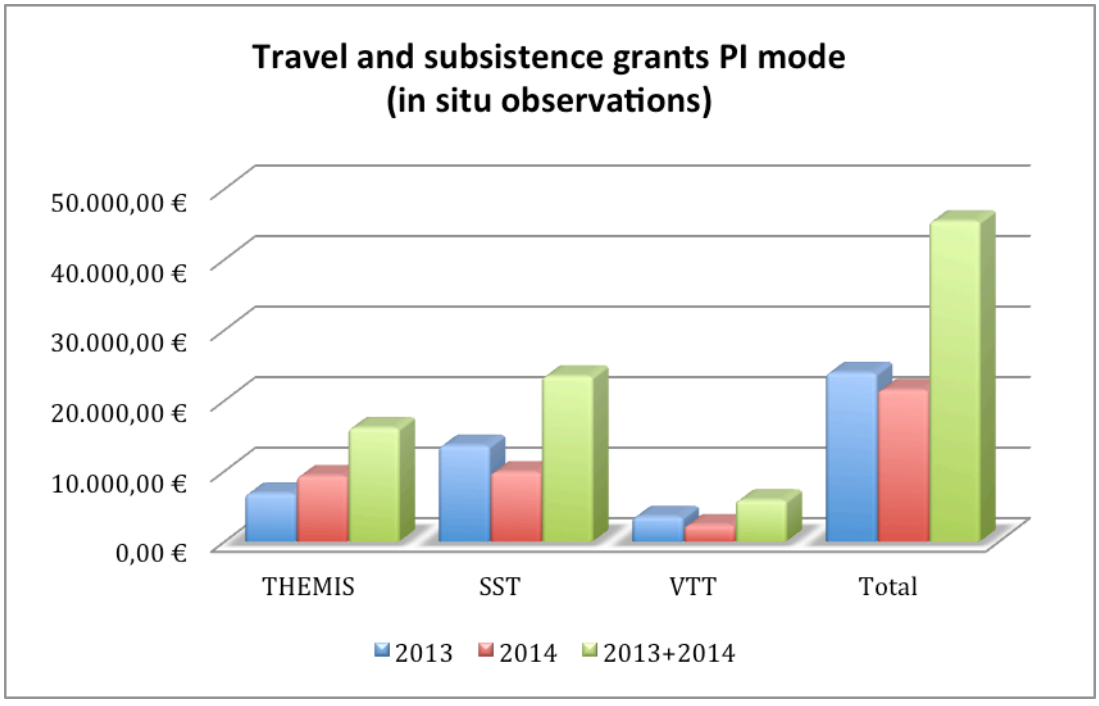
159 users*; 18 countries (14 European, 4 non-European)

*** 20 IBIS&ROSA users were counted only once**

2.3. Astronomers supported with travel and subsistence grants:



30 observers supported with T&S grants; 14 new users



Approx. 45500 €

3. COMMENTS AND GENERAL REMARKS.

• **Amount of access:** In 2014 SOLARNET TAS Programme has provided 29,7% of the expected amount of access for the four-year contract. This amount of access represents 31,3% of the SOLARNET TAS budget for User Fees (slightly lower since GREGOR -higher User Fees-, has not offered time yet).

Considering 2013 and 2014 campaigns, the amount of access provided represents 55,4% and the User Fees 57,5%.

• **Telescopes:** 3 telescopes (VTT, THEMIS, SST), and 2 instruments (IBIS/DST, ROSA/DST) were involved in providing this access.

• It is necessary to mention that in the first 18 months of the project SST has offered 94,1% of the total expected amount of access to be provided during the whole project (only 5 remaining days at SST).

• The other two telescopes have provided 47,3% (VTT) and 87,1% (THEMIS). The instruments IBIS and ROSA have provided 50% and 33,8% respectively.

• **User groups:** It was estimated that 65 user groups (projects) would be supported through the SOLARNET Transnational Access Programme for all contract. During 2014, a total of 19 groups (projects) have accessed to the aforementioned telescopes and instruments. During the two campaigns 37 groups (projects) were supported.

• **Users:** 100 team members integrate the aforementioned 19 groups. The total amount of team members in the two years is of 179.

• **New users:** 50% of astronomers supported with T&S grants in 2014 were new users. Considering 2013 and 2014 the new users represents 46,7%.

• **Countries:** It is remarkable that 45 astronomers of 159 participating in the programme in 2013 and 2014 are from United Kingdom (28,3%). Other 38 astronomers are from Slovakia and Germany (19 each) and other 30 are from Italy and Spain (15 each). These five countries encompass the 71,1% of the total amount of astronomers participating in two campaigns.

• **Travel and subsistence grants:** In providing 29,7% of the expected amount of access we have spent 27,4% of the amount for T&S. Considering both campaigns, 2013 and 2014, the amount of access provided is of 55,4% and T&S grants spent represent 40,10%.

No funds need to be reimbursed to the astronomers, and they do not need to pay in advance any cost. Travel costs (air tickets, train, taxi, etc.) are directly booked and paid by the IAC following the preferences of the astronomers. Accommodation at sea level and at the Observatories is also booked and directly paid by the IAC, as well as subsistence costs at the Observatories. In summary, once the astronomers complete the on-line application, they receive a full service including transport from airport to hotels, to the observatories, rental-car, etc. and they do not need to pay for these services. The SOLARNET Project Office approves the requested expenses, taking into account the best value as well as the astronomers preferences.

• **Website:** The website has proven its feasibility and became a good tool for promoting and supporting the observing campaign.

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ANNEX VII

Examples of Fusion Related Technologies Developed alongside Space Technology Programs

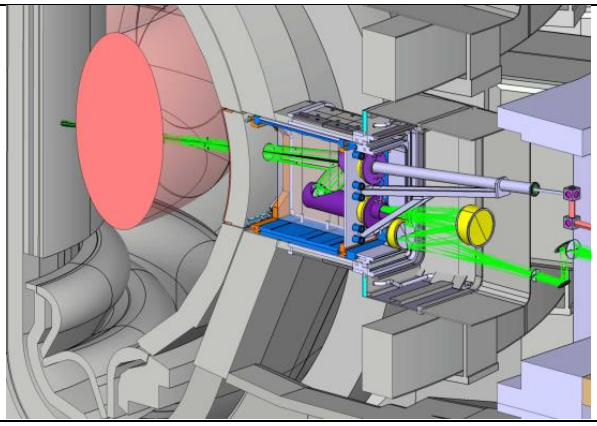
This project is supported by the European Commission's FP7 Capacities Programme for the period April 2013 - March 2017 under the Grant Agreement number 312495.
www.solarnet-east.eu

Examples of Fusion related technologies developed alongside space technology programs

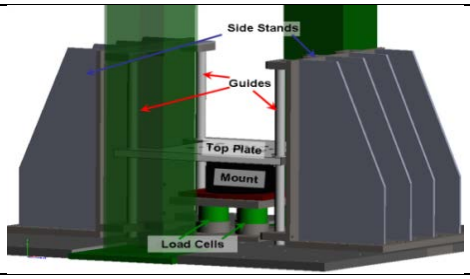
(TNO, The Netherlands)

CXRS Spectrometer
- for ITER
- 2010 - now
- USP: optics instrumentation

Unique 3-band spectrometry for plasma profiling

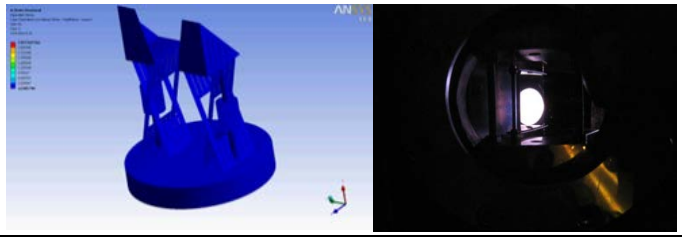


Lidar system
- for ITER
- 2010 - now
- USP: optics instrumentation
- *Measuring particles at half the speed of light over a light path of 30 m*



Structural integrity testing
- for ITER
- 2010 - now
- High pressure testing

-Unique testing facility



Cleaning system & shutter
- for ITER diagnostics
- 2010 - now
- USP: plasma cleaning, precision mechanics
- *Increasing lifetime from days to tens of years*

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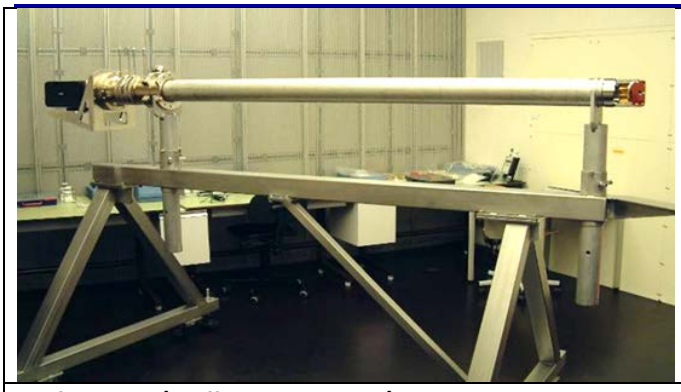
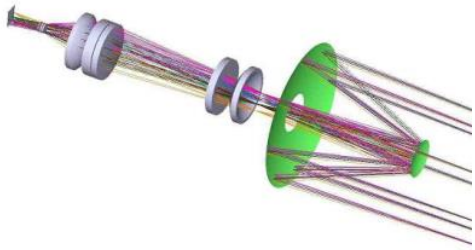
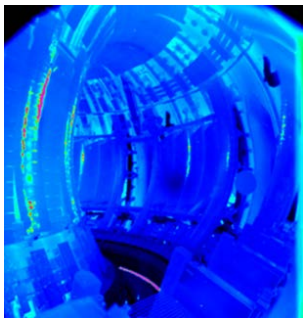
	
Endoscope (wall temperature) - for JET (in use), W7X (10x) and ITER - 2006 - USP: optics instrumentation - *High resolution monitoring of inside of 100 M°C Tokamak*	**Plasma facing mirror** - for ITER - 2009 - USP: optics manufacturing - *World's first concave single crystal Mo mirror*

	
JET Endoscope Opto-mechanical design	Thermal image of reactor wall during operation (note that the plasma (~108 oC) is invisible)

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ANNEX VIII

ESA Technology Exchange database (European technology providers)

ESA Technology Exchange Database (www.esa-tec.eu)

Automation & Robotics

Technology	Originating Country
327: Visual Monitoring Camera	Luxembourg
1310: Autonomous self-adapting and reliable machine vision system for critical 100% uptime applications	Italy
1356: EXOSTATION - Haptic Control Station	Luxembourg
1449: An Open Approach to Robotics and Autonomy	UK
1412: Humanoid Robotic Hand	UK

Communication

Technology	Originating Country
TDO0041: Dual-polarization reflect array antenna with improved cross-polarization properties	Spain
TDO0043: Radio frequency amplifier with fast envelope tracking	Spain
TDO0044: A multibeam antenna based on an active aperiodic lens	Greece
TDO0045: Method and apparatus for accessing data in a data store	Spain
TDO0048: Reconfigurable reflector for antennas and adaptive optics	Italy
TDO0050: Method of processing multipath navigation signals in a multiple antenna receiver.	Spain
TDO0060: Structure for shielding an antenna from radio interference	UK
925: OTN – Open Transport Network 560 Mbps Optical link	Luxembourg
1221: Two-way near Real-Time Data Transfer System	Luxembourg
1259: GTS – Global Transmission Services	Germany
1355: WEAR++ – WEarable Augmented Reality	Luxembourg

Computer Hardware & Software

Technology	Originating Country
TDO0004: Verification and validation of safety-critical systems – Fault Injection	Portugal
TDO0005: IFAS – Intelligent Fault Alarm System	Portugal
TDO0026: Lapsus: Internet network load emulator	France
TDO0035: Miniaturized and robust electronic solutions together with plug-and-play components and systems	Sweden
TDO0038: Modern and flexible test, control and operational system for communication and data presentation	Sweden
TDO0063: FAPEC – Fully Adaptive Prediction Error Coder	Spain
TDO1364: SAR Workbench (SWB), a multi-mission EO data handling tool	
1284: Data Mining technique aimed at creating an index for fog forecasting	Italy
1334: Virtual Reality – Software system CIROS VR	Germany
1363: RBF Morph: a mesh morphing add-on for ANSYS Fluent	Italy
1448: Automated procedure software	UK
1462: BASILES: A software infrastructure to design, develop and implement complex-system simulation	France
1486: EOxServer – Web Server for Large Raster Database Sub-setting & Downloading	Austria
1495: Object-based Image Analysis for Analysing Nanoparticles in Electron Microscope Images	Austria

Electronics & Opto-Electronics

Technology	Originating Country
TDO0002: Ink-jetted Functional Circuits	Italy
TDO0014: GNSS Galileo Code Receiver	Portugal
TDO0016: Electrical Power Supply Converter	UK
TDO0051: Three-dimensional photonic bandgap crystal	France
TDO0054: Microwave electrical filter fabrication method for Chebyshev filters	France
TDO0053: DC-DC voltage converter with short circuit protection, for use to supply travelling wave tubes	France
TDO0062: Regulator for an (AC) Electrical Power Source	UK
219: BRISC, Integrated Processor Designed for Electric Motor and Actuator Control	Luxembourg
1358: THz Shottky Diodes	UK
1392: Low-loss PLC waveguide technology	Netherlands
1463: TES-based microcalorimetry technology: detectors and readout	Italy

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ANNEX IX

ESA IP database (ESA IP – available for transfer to appropriate sectors)

ESA IP Database (http://www.esa.int/Our_Activities/Technology/IP_for_commercialisation)

Electronics & communication

No:	Names
1	ERC32 VMEbus Interface (EVI32 – HDL)
2	CCSDS Unsegmented Code (CUC) & CCSDS Time Manager (CTM) synthesizable VHDL IP Core
3	The Packet Telemetry Encoder (PTME) synthesizable VHDL IP core
5	SpaceWire-AMBA - HDL
367	Receiving device for a navigation system
444	Dual-mode microwave filter
446	Ocean altimetry method and device with improved vertical accuracy
452	Electrical power supply converter
455	Novel method and system for time domain antenna holography
463	Method for determining the position of a transmitting beacon using only one antenna
465	Protection device for a voltage source and a load supplied by the voltage source
467	Multipath discriminator module
471	Power measurement of thermal noise
481	Multi-Beam Satellite Communications Payload with Flexible Power Allocation
482	Method and System for Real-time Navigation using satellite-transmitted three-carrier radio signals and ionospheric corrections
486	Electronic component for microwave frequency systems with control circuit to adjust capacitance
491	Architecture for an iterative decoder
492	Process for pilot-aided carrier phase synchronisation
498	Pulse-Coded Remote Calibration of an Active Phased Array System
500	Minimum phase switch-mode boost converter
501	Electronic Multi-Functional Watch for Navigational Aid
506	Method and device for scheduling and sending data packets
507	Real-Time Synthetic Aperture Radar Processing System and Method
509	Packet data transmission over a shared transmission channel
511	Determination of 2D ocean surface currents using interferometric radar onboard a satellite
513	Microwave bandstop filter for an output multiplexer
515	Novel voltage regulator converter without switching losses
517	Direct voltage switching converter

Electronics & communication (continued)

No:	Names

525	Method of processing positioning signals, in particular for indoor applications
526	Interferometric Radiometer for imaging radiation emission, especially from a geostationary orbit
528	Method of Controlling a Hydraulic Actuator
539	Active pixel sensor apparatus for use in a star tracker device
540	A method of designing and manufacturing an array antenna
541	A method for compensating signal distortion in an emitting payload
542	Method, apparatuses and system for asynchronous spread-spectrum communication
543	Satellite altimetry method and system with Doppler effect compensation
544	Navigation satellite tracking method and receiving station
545	Improved altimetry apparatus based on steerable antennas
547	Reconfigurable beam forming network architecture
550	Solar array regulator based on step-up and down conversion and solar power system comprising the same
551	Automatic identification system receiver and satellite payload comprising the same
552	Sequential Switching Shunt Regulator Cell with Non-Redundant Rectifier
555	Method and apparatus for analysing time series data
557	Method to determine the integrity of positioning information in a Global Positioning System
558	ESA: compact orthomode transducer device
559	Electrical Power Conditioning Unit and System
560	Method and telemetric device for resampling time series data
561	Device to guide light from a curved focal plane to a flat focal plane array
562	Flexible Channel Decoder
567	Aperiodic and non-planar array of electromagnetic scatterers, and reflectarray antenna comprising the same
569	Array antenna with controlled radiation pattern envelope manufacture method
576	Method, device and system for compressing time series data
590	Multibeam satellite communication system and method, and satellite payload for carrying out such a method
597	Beam-forming network for an array antenna and array antenna comprising the same
SW001	SEISOP, Space Environment Information System for Operations
SW002	Virtual Spacecraft
SW003	APSI - Advanced Planning and Scheduling Initiative
SW006	Long term monitoring tool (LTM)
SW007	Mission Utility and Support Tools (MUST)
X24	Multibeam Active Discrete Lens Antenna

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ANNEX X

List of SOLARNET Meetings, Schools, Workshops and Events (2013-2014)

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ANNEX XI
List of SOLARNET Meetings, Schools, Workshops and Events (2013-2014)

Date	WP	Title/subject of meeting	Location	Nr of attendees	Website address
10 – 11 April, 2013	10	**Kick-Off Meeting**	Brussels	48	www.solarnet-east.org
11 April, 2013	10	**1st Executive Committee Meeting**	Brussels	15	www.solarnet-east.org
22-24 April, 2013	80	**Synoptic Network Workshop**	Boulder	36	https://www2.hao.ucar.edu/docs/2013-synoptic-network
22 July, 2013	10	**2nd Executive Committee Meeting**	Teleconference	10	www.solarnet-east.org
5-8 August,	30	**1st SOLARNET Conference**	Oslo,	67	http://folk.uio.no/matsc/oslo-
7 November,	20	**1st FAS Meeting**	Stockholm	11	www.solarnet-east.org
25 – 28 November,	80	**1st SOLARNET/SPRING Workshop**	Titisee	35	http://bit.ly/1rK2cHu
18 – 20 February, 2014	50	**1st CASSDA-SOLARNET Workshop**	Freiburg	46	http://www.kis.uni-freiburg.de/index.php?id=829
24 March – 4 April, 2014	30	**1st SOLARNET School**	Wroclaw	30 (10 lect. + 20	http://school.astro.uni.wroc.pl/index.php
1-2 April, 2014	30	**1st SOLARNET Workshop**	Wroclaw	25	http://school.astro.uni.wroc.pl/index.php
28 April, 2014	10	**EAST General Assembly**	Madrid	14	www.astro-east.org
29 April, 2014	10	**3rd Executive Committee Meeting**	Madrid	19	www.solarnet-east.org
30 April, 2014	10	**2nd Board Meeting**	Madrid	27	www.solarnet-east.org
28 April, 2014	20	**2nd FAS Meeting**	Madrid	16	www.solarnet-east.org
17 – 19 June, 2014	20	**Spectropolarimeter Pipeline Workshop**	Stockholm	12	
2 October, 2014	40	**1st SOLARNET Technology Transfer Workshop**	San Sebastian	23	http://bit.ly/1vYK185