Inventory of experimental and theoretical resources available for NanoSpace COST Action	
Country:	Sweden
Name of Institution/Laboratory:	DESIREE (Double ElectroStatic Ion Ring ExpEriment), Stockholm University
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Website:	https://www.desiree-infrastructure.com
Short description **(max 0.5 page)** of available techniques (experiment or theory): If appropriate, please include 1 picture/figure and caption highlighting resources.	DESIREE is a world-unique facility for studies of individual reactions with ions in well-defined quantum states. It is one of only three cryogenic ion-beam storage rings in operation worldwide and the only one where ion-ion interactions, important for e.g. interstellar processes, can be investigated. The facility has two 8.6 m circumference storage rings in a 13-Kelvin chamber where ion beams of atoms, molecules or clusters are stored and merged. This allows for unique studies of quantum-state resolved interactions of individual anion- cation pairs. Furthermore, single ring experiments allow studies of e.g. molecular and cluster cooling processes in new time domains using action spectroscopy techniques. A consortium consisting of Stockholm University (SU), the University of Gothenburg (UGOT) and Malmö University (MaU) operate DESIREE as a national infrastructure since January 2018  The DESIREE storage rings in their cryogenic enclosure.
Sample/target description (e.g. gas, clusters, solid,…):	The cryogenic environment allows for very long storage times for atomic, molecular and cluster cations and anions. Available ion sources include a sputter ion source for negative ions produced from solid and gaseous cathodes, an ECR ion source for singly-charged positive ions, several plasma sources for positive ions produced both from

	gases and from solids. For positive ions a powerful CHORDIS ion source is to be installed and commissioned. Pilot experiments with biomolecular ions have recently been carried out using an electrospray ionization source.
How to access to experimental/computational resources (e.g. through collaboration, user facility proposal calls,….):	The infrastructure provides 30 weeks of beam time per year for external users who want to carry out DESIREE storage ring experiments. Instructions on how to apply and submit a beam time proposal can be found here: https://www.desiree-infrastructure.com/beam-time. The proposal submission deadlines are April 30 and October 31 for experiments to be carried out Sep-Dec and Jan-Jun, respectively. The proposals will be evaluated by external reviewers.
References **(max 5)**:	"Efficient stabilization of cyanonaphthalene by fast radiative cooling and implications for the resilience of small PAHs in interstellar clouds" Mark H. Stockett, James N. Bull, Henrik Cederquist, Suvasthika Indrajith, MingChao Ji, José E. Navarro Navarrete, Henning T. Schmidt, Henning Zettergren and Boxing Zhu, Nature Communications **14**, 395 (2023). https://doi.org/10.1038/s41467-023-36092-0 *"High-precision electron affinity of oxygen"* Moa K. Kristiansson, Kiattichart Chartkunchand, Gustav Eklund, Odd M. Hole, Emma K. Anderson, Nathalie de Ruette, Magdalena Kamińska, Najeeb Punnakayathil, José E. Navarro-Navarrete, Stefan Sigurdsson, Jon Grumer, Ansgar Simonsson, Mikael Björkhage, Stefan Rosén, Peter Reinhed, Mikael Blom, Anders Källberg, John D. Alexander, Henrik Cederquist, Henning Zettergren, Henning T. Schmidt, and Dag Hanstorp, Nature Communications **13**(1):5906 (2022). https://doi.org/10.1038/s41467-022-33438-y *"State-Resolved Mutual Neutralization of Mg+ and D−"* J. Grumer, G. Eklund, A. M. Amarsi, P. S. Barklem, S. Rosén, MC. Ji, A. Simonsson, H. Cederquist, H. Zettergren, and H. T. Schmidt, Phys. Rev. Lett. **128**, 033401 (2022). https://doi.org/10.1103/PhysRevLett.128.033401 "*Survival of polycyclic aromatic hydrocarbon knockout fragments in the interstellar medium*" M. Gatchell J. Ameixa, MC. Ji, M. H. Stockett, A. Simonsson, S. Denifl, H. Cederquist, H. T. Schmidt, and H. Zettergren, Nat. Comm. **12**, 6466 (2021). https://doi.org/10.1038/s41467-021-26899-0

	The double electrostatic ion ring experiment: A unique cryogenic electrostatic storage ring for merged ion-beams studies, R. D. Thomas, H. T. Schmidt, G. Andler, M. Björkhage, M. Blom, L. Brännholm, E. Bäckström, H. Danared, S. Das, N. Haag, P. Halldén, F. Hellberg, A. I. S. Holm, H. A. B. Johansson, A. Källberg, G. Källersjö, M. Larsson, S. Leontein, L. Liljeby, P. Löfgren, B. Malm, S. Mannervik, M. Masuda, D. Misra, A. Orbán, A. Paál, P. Reinhed, K.-G. Rensfelt, S. Rosén, K. Schmidt, F. Seitz, A. Simonsson, J. Weimer, H. Zettergren, and H. Cederquist, Review of Scientific Instruments 82, 065112 (2011). https://doi.org/10.1063/1.3602928