

BRIEFING: PETRA III Swedish Node

Research infrastructure use

The PETRA III synchrotron, and its Swedish Material Science beamline, is typically used each year by 200 Swedish researchers representing all of Sweden's universities as well as e.g. RISE, Swerim and companies.

Demand for access is oversubscribed by a factor 2-7.

Research data is contributing leading scientific knowledge in several fields of materials research, with application examples including:

- Solar panels - material efficiency and robustness
- Rechargeable batteries and battery materials
- Catalysis removal of noxious gases - process effectiveness and catalysis recovery
- Steel resistance to hydrogen embrittlement - relevant for offshore energy applications
- Additive manufacturing - real time studies of the component's material during component production processes

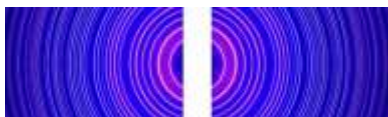
These, and other examples, are similarly relevant for the United Nation's 2030 Sustainable Development Goals (4, 7, 8, 9 and 13).

Background of Swedish-German collaboration

The background to the PETRA III Swedish Node was a memorandum of understanding between the Swedish and German governments to cooperate in infrastructure development and research [1].

When assessing how to implement this agreement, a key consideration for Sweden was ensuring complementarity to MAX IV and ESS [1, 2]. Such infrastructure complementary matched the measurement needs of material science researchers [1, 2]. Accordingly, Sweden decided to finance the building and operation of a Swedish Material Science beamline at PETRA III [3, 4].

The construction of the Swedish Material Science beamline was a substantial infrastructure investment [4]. The beamline become operational for Swedish researchers during 2019 [5]. Sweden pays annually for the operations of the Swedish Material Science beamline as well as privileged access to all DESY operated beamlines at PETRA III [6].



The current operational contract [6] is valid until 31 July 2022 and states Sweden's intent to finance operations of the Swedish Material Science beamline for an additional four year period, i.e. until 31 July 2026.

Continued complementary

The PETRA III Swedish Node currently is, and will continue to be, a complement to the MAX IV and ESS infrastructures as well as other synchrotron and neutron facilities: the Swedish Material Science beamline is distinctive in its capability to obtain signals deep inside materials with high measurement time resolution (see illustration below).

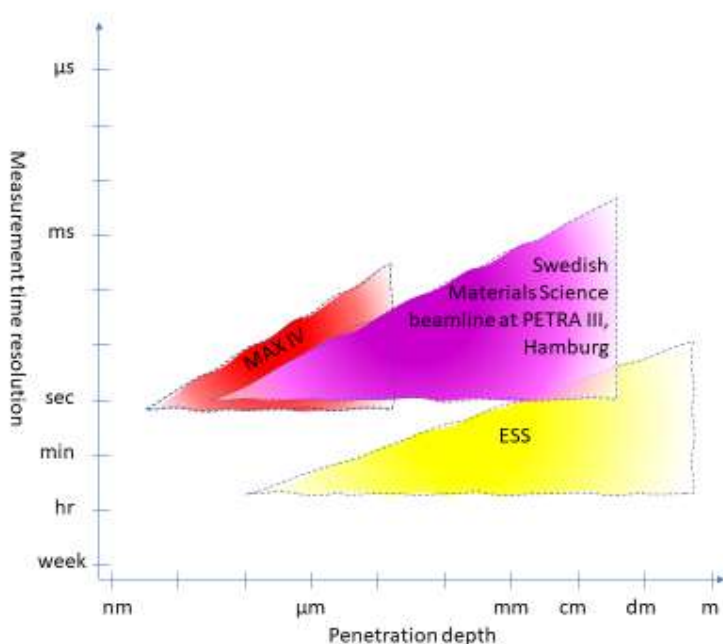


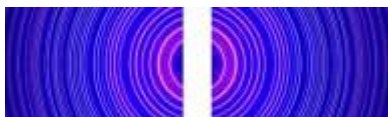
Illustration of the Swedish Material Science beamline's complementarity with MAX IV and ESS.

Center for X-rays in Swedish Materials Science (CeXS) role and its contribution

The CeXS part of the PETRA III Swedish Node has the assignments to safeguard Swedish interests at PETRA III and to act as the academic host of the Swedish Material Science beamline.

CeXS is co-hosted by KTH and LiU - with CeXS acting on the interests of the entire Swedish material science research community (all of Sweden's universities, institutes and companies).

A key contribution of CeXS is ensuring a use perspective is taken in decision making about ongoing operational developments and upgrade planning.



References

- [1] Memorandum of Understanding between the Government of the Kingdom of Sweden and the Federal Ministry of Education and Research of the Federal Republic of Germany. “Cooperation in materials research and structural biology using neutron and synchrotron radiation” This collaboration was given the name "Röntgen-Angstrom Cluster [RÅC]”. Regeringskansliet. Dnr U2009/447/F. 15 June 2009.
- [2] Interview. Professor Ulf Karlsson. History of the Swedish material science beamline. KTH. 22 September 2020.
- [3] Decision to sign the Memorandum of Understanding “Realization of the high energy materials science beamline at the storage ring PETRA III, DESY [Hamburg]” to the effect that Sweden should finance the construction and operations of a Swedish Material Science beamline, where that Swedish Material Science beamline was described more fully in Dnr 813-2011-23. Official signing ceremony held 25 February 2011. The Swedish Research Council. GD-2011-17. 22 February 2011.
- [4] Decision to enter into a Cooperation Agreement on the Construction phase of the Swedish Material Science beamline at PETRA III situated at the port P21 [SMS]. The Swedish Research Council. GD-2018-75. 4 April 2018.
- [5] Academic hosting of the Swedish Materials Science Beamline at PETRA III, Hamburg, Germany. 2019 Organisational Report to The Swedish Research Council concerning grant 2018-6942. The Center for X-Rays in Swedish Material Science. April 2020.
- [6] Decision to enter into a contractual agreement [Dnr 823-2010-06911] with DESY for operations of the Swedish Material Science beamline at PETRA III. The Swedish Research Council. GD-2019-124. 17 June 2019.