

MAX IV: X-Rays for Exploration & Discovery

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Exploration and discovery very often needs visualization. In this respect X-rays have played an important role ever since their discovery. Providing ever higher quality (brightness) of X-rays allows visualizing ever more subtle structures of nature and discovering ever more hidden secrets.

With the aim of building the brightest X-ray source in the world and based on more than 30 years of research and development and on the collaboration with many thousand users, the previous MAX-lab synchrotrons have been replaced by the new MAX IV facility [1].

In its 3 GeV ring MAX IV uses a breakthrough design based on the idea of building a storage ring out of a very large number (140) of weak (0.57T) bending magnets to reach the lowest possible emittance ($<300 \text{ pm}^*\text{rad}$). This will provide the brightest X-ray beams ($\approx 200 - 30 \text{ keV}$) worldwide. In addition MAX IV will operate a 1.5 GeV ring dedicated to soft X-rays ($\approx 5 - 200 \text{ eV}$). For time resolved work these are complemented by a short-pulse facility based on the 3 GeV linac, which produces electron bunches down to 100 fs.

The MAX IV facility has been developed in close collaboration with the user community and has received very substantial intellectual input from Finnish scientists over many decades. This is for example manifested in the FinEstBeaMS [2] beamline, built for electronic structure studies of atoms, molecules and clusters in gas-phase and on surfaces, formation analysis- and nanoscale characterization of surface interphases.

The initial commissioning phase of the 3 GeV ring has successfully been completed in Feb 2016. At present BL installation and commissioning are progressing and first experiments are planned for the summer of 2016.

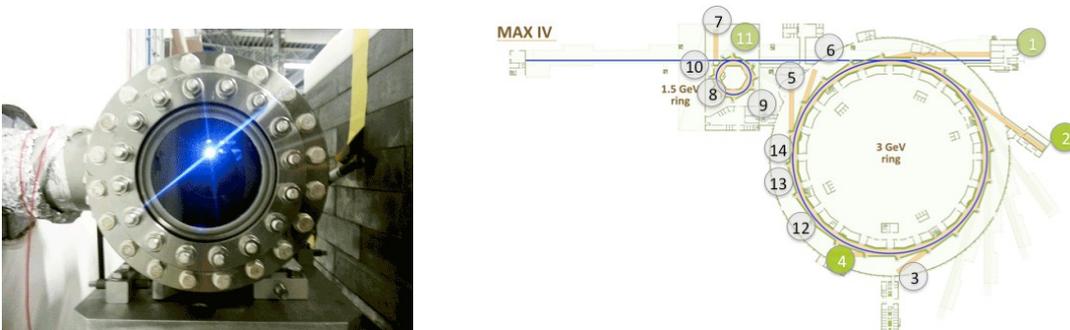


Fig. 1: First light observed at the diagnostic beam line of the 3 GeV ring on Nov 22nd 2016 (left) and layout of the MAX IV facility with funded beamlines (right).

The talk will review the design of the accelerator and beamlines, present the current status, and show opportunities how MAX IV can substantially contribute to exploration and discovery for all areas of natural science.

References

- [1] <https://www.maxlab.lu.se/>
- [2] <https://www.maxlab.lu.se/finestbeams>