MAX IV – Experience with the first MBA light source

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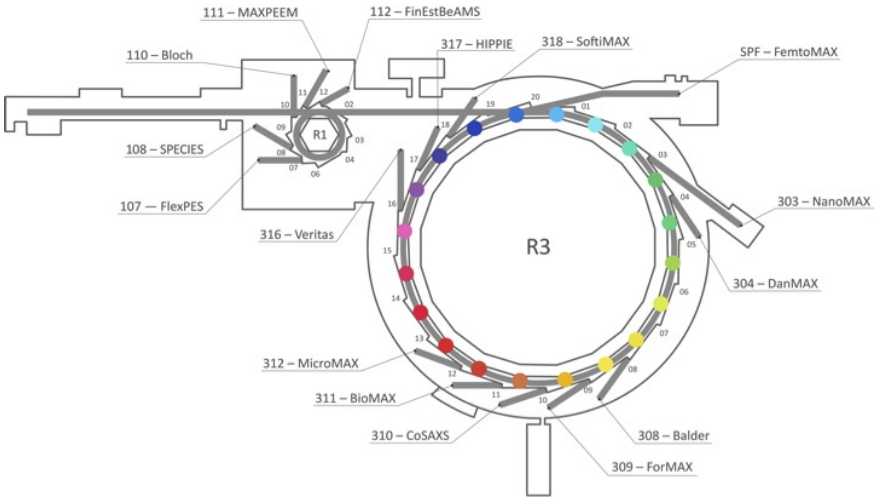
The last decade has seen a push towards the next generation of electron accelerator for X-ray science, the 'diffraction limited storage ring' (DLSR). Such sources will provide photon beams with a brilliance exceeding 10^{22} and several ten percent of coherent radiation at hard X-ray wavelengths [1]. A critical step towards the realization of a DLSR was the successful commissioning of the MAX IV 3 GeV ring, the first worldwide to be based on a multi-bend achromat lattice [2]. Following MAX IV, several other projects using MBA variants are in various phases of design and construction today [3, 4, 5] and many more are expected to come in the next decade.

MAX IV operates a 3 GeV storage ring providing 328 pm rad bare lattice horizontal emittance. This ring can serve up to 19 beamlines of which 10 are in construction and three are in user operation today. In addition, MAX IV operates a 1.5 GeV ring and a 3 GeV linac. The 1.5 GeV ring is optimized for VUV and soft X-ray radiation ($<$ ca 500 eV), while the linac is used to inject into both rings and for supplying ultra-short (ca 100 fs) pulses to a beamline.

The 3 GeV ring received first commissioning experts in 2016 and regular users in 2017. Already today it operates close to design specification in many aspects. The linac can in the future be extended to a FEL.

Producing diffraction limited X-rays and delivering them onto a sample with minimum loss of brightness requires overcoming many challenges in instrumentation. This talk gives examples how such instrumental challenges were overcome at MAX IV in the fields of accelerator, optics and sample environment.



Schematic layout of the MAX IV facility showing the linac together with the 1.5 GeV and 3 GeV storage rings and the beamlines presently in operation or building.

References

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