First Optics and Beam Dynamics Studies on the MAX IV 3 GeV Storage Ring

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Introduction
- MAX IV 3 GeV storage ring is the first MBA-based light source to go into operation; beam commissioning started Aug 2015.
- First stored beam on Sep 15, stacking achieved Oct 8, first light on Nov 2 (on first of two diagnostic beamlines).
- Since Nov 2015 running with top-up injection and closed SOFB loop.
- First two IDs (2-m long, 18-mm period IVUs) installed Feb 2016, gaps closed to 4.5 mm and first data taken by June 2016.
- Facility inaugurated on June 21, 2016, during summer 2016 installed one IVW and two EPUs.
- So far peak current of 198 mA stored, highly efficient injection/stacking performed with only a single dipole kicker.
- Routine delivery of 50 mA for BL commissioning and first experiments.

First Turns, Stored Beam & Stacking
- First turn achieved with all magnets at nominal settings for 3 GeV according to magnetic measurement data and all ring correctors set to zero.
- Single dipole injection kicker at ~4 mrad, with manual corrector tweaking eventually reached 500 turns.
- After phasing in three cavities (delivering 15-20 kW each) could store beam.
- Reducing injection kicker voltage allowed to accumulate 4.3 mA; after relative phasing (maximized stored f5) increased stored beam current and injection rate.

BPM Offsets & Orbit Correction
- BPM offsets determined with respect to neighboring sextupoles/octupoles (trim windings in upright quad mode).
- Checked BPM offsets over months in terms of reproducibility, drift, temperature stability, current dependence, etc.
- Orbit correction to BPM offsets results in ~1 µm (H) and ~41 µm (V) rms orbit (fewer VCMs than BPMs → introduced weighting across ID straight).