Status of the ASTRID2 facility

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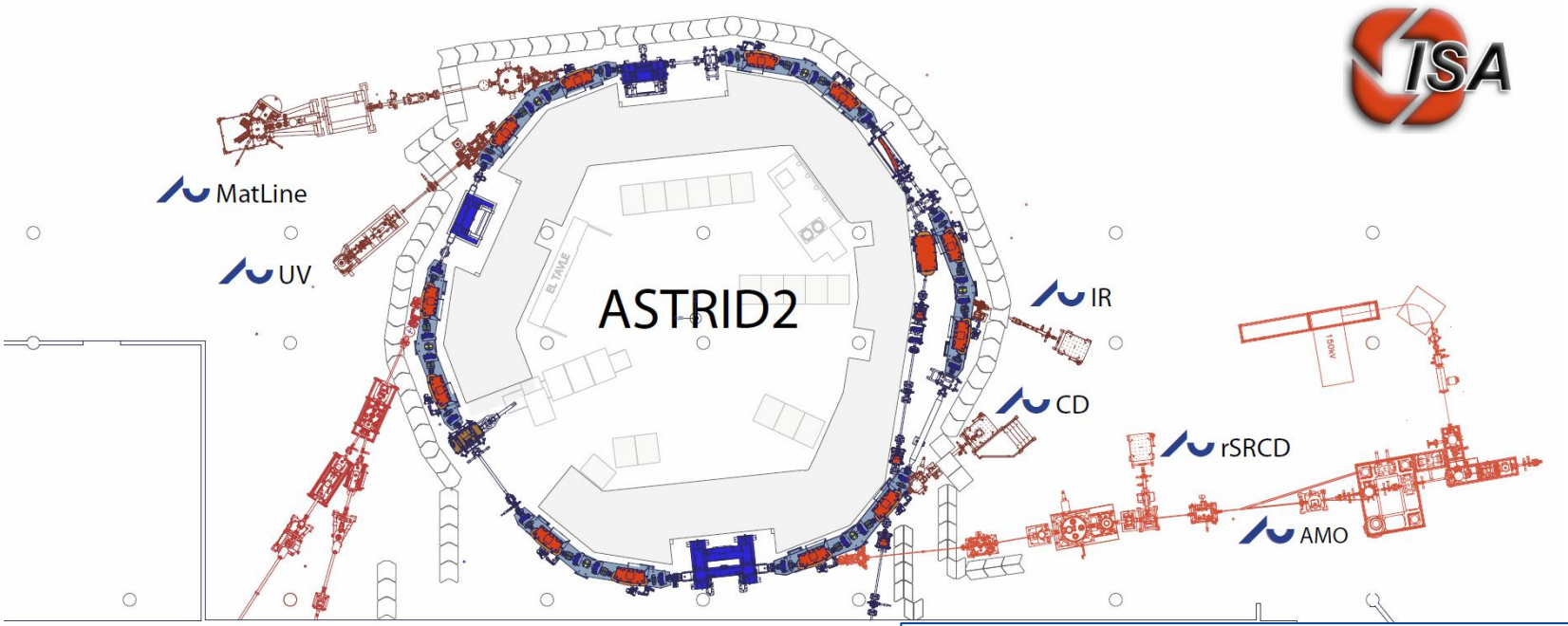
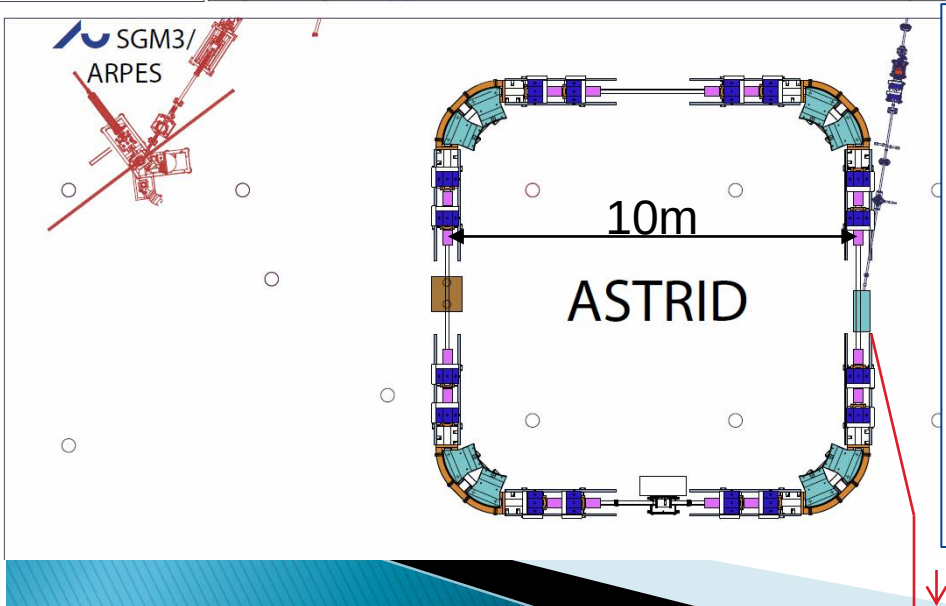
The ASTRID 2 facility





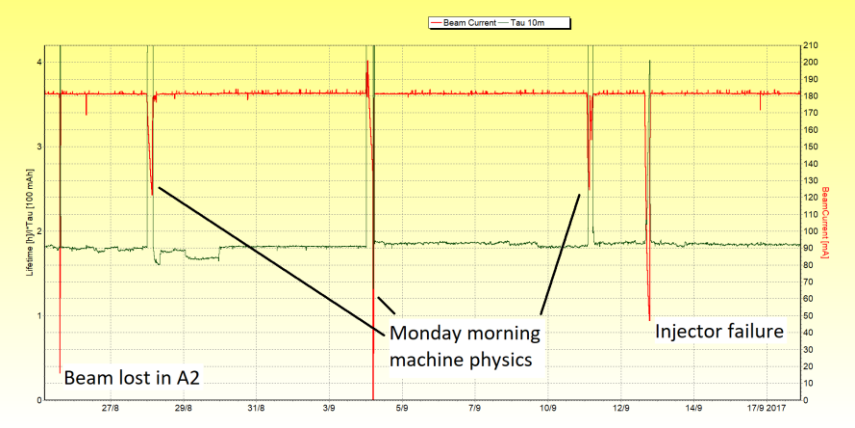
ASTRID2 main parameters

Circumference	45.71m
Energy	580MeV
Current	200mA
Characteristic energy	257eV
RF frequency	105MHz
Harmonic	16
Horiz. emittance	12nmrad
#Straight sections	6
Length of straight sections	2.82m
#ID's	3

ASTRID2 Status

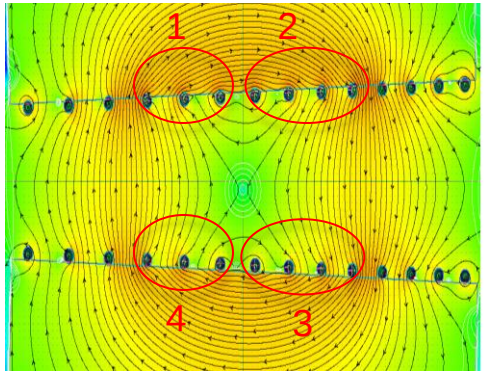
- Normal operation
  - 180 mA continuous TopUp
    - Vertical beam is not completely stable at higher beam currents
    - 250 mA TopUp during machine physics (for conditioning)
  - 6 beam lines in operation
    - With 7 experiments
- MTBF (estimates)
  - ASTRID2: >~1 month
  - Injector chain: >~1 week
    - Power supply replacement has increased reliability of the microtron preinjector

3 weeks of user beam



Ongoing development

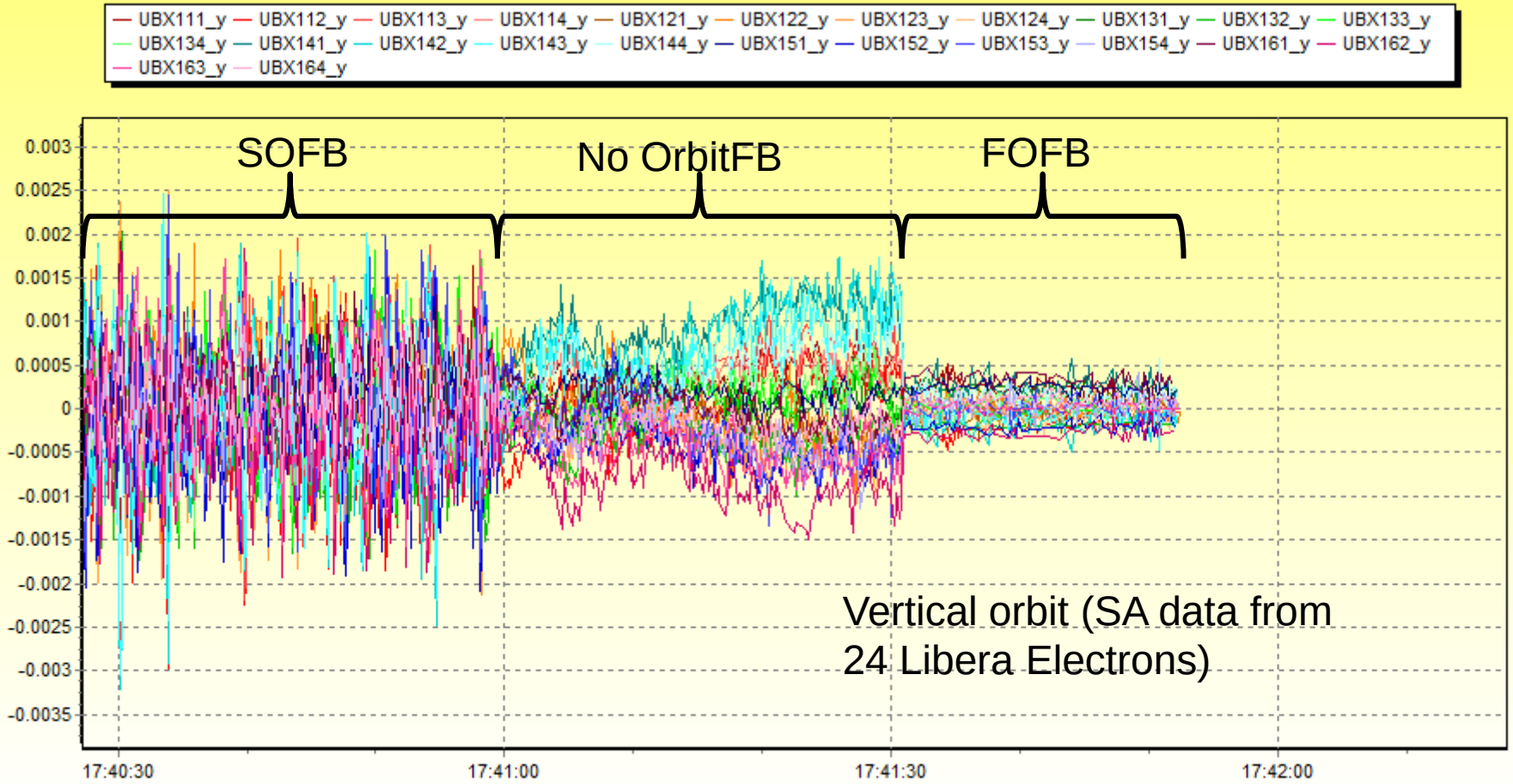
- Implemented a Fast Orbit FeedBack system
- Master student: LOCO studies on ASTRID using MatLab Middle Layer
  - Using shunts in quadrupoles to get additional BPM's
- 2018: Will add more power supplies for our Pole Face Strips
  - 4 power supplies per unit (12 units)
    - Quadrupole corrector
      - Tune correction and ID compensation
    - Vertical and horizontal corrector
      - Correct errors in position of combined function dipoles
    - Skew quadrupole
      - Idea: Vary coupling around the ring



Fast Orbit FeedBack

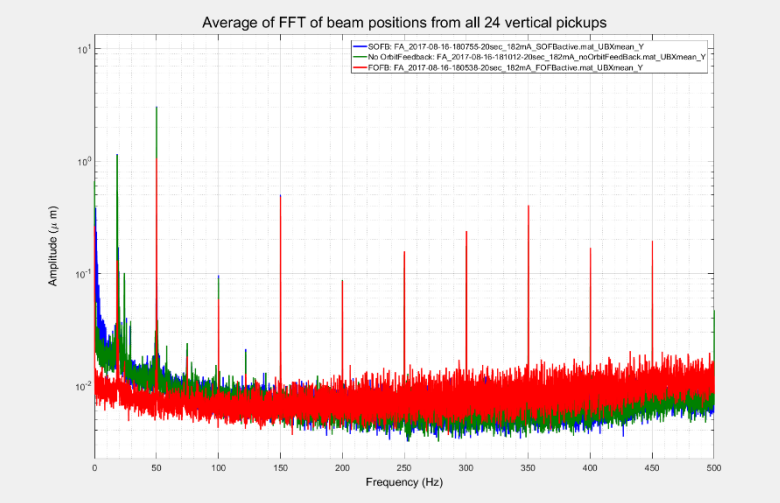
- Beam positions from the 10 kHz Libera Electron FA output
- Using our original window frame correctors
- Upgraded the existing power supplies with a fast (1 kHz) analog input
  - Bandwidth of supply and magnet >~1 kHz
    - But latency (Liberas) is limiting feedback bandwidth
  - Only 1% range => (much) improved resolution
- Use a standard PC running LabVIEW real-time to do the orbit calculations (at 10 kCalc/s)
  - DACs: 4 pcs TI DAC8568 (8 ch, 16 bit) controlled via SPI from a FPGA enabled DAQ-card at a rate of 10 kHz

FOFB results



FOFB results

- Clear improvement below ~100 Hz
- Much improvement below ~10 Hz
  - Where SOFB made noise (partly due to insufficient resolution)
- Disturbance from ASTRID during injections
  - Hor: From ~20 µm (after feedforward) to a few µm
  - Vert: From ~10 µm to not really noticeable
- Cars on parking lot above ASTRID2
  - From ~5 µm to almost not noticeable
- 50 Hz noise peaks
  - 50 Hz: ~3 µm -> ~1 µm
  - 150 Hz: ~0.5 µm -> same
- Very pleased

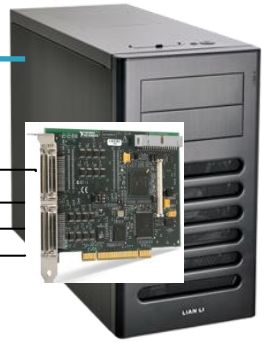


Thank you for your attention

FOFB overview

24 Libera Electron with Grouping
One 10 kHz FA output

Ethernet



Standard PC
with NI PCI-7811R
LabVIEW real-time

SPI-like connections
4 wire each

DAC 8568 — 6 Power supplies

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FOFB results

Average of FFT of FA beam positions from all 24 vertical pickups