

Status of the ASTRID/ ASTRID2 RF systems

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ASTRID2

- ▶ ASTRID2 is the new synchrotron light source being built in Århus, Denmark
- ▶ ASTRID2 main parameters
 - Electron energy: 580 MeV
 - Emittance: 12 nm
 - Beam Current: 200 mA
 - Circumference: 45.7 m
 - 6-fold symmetry
 - lattice: DBA with 12 combined function dipole magnets
 - Integrated quadrupole gradient
 - 4 straight sections for insertion devices
 - Will use ASTRID as booster (full energy injection)
 - Allows top-up operation

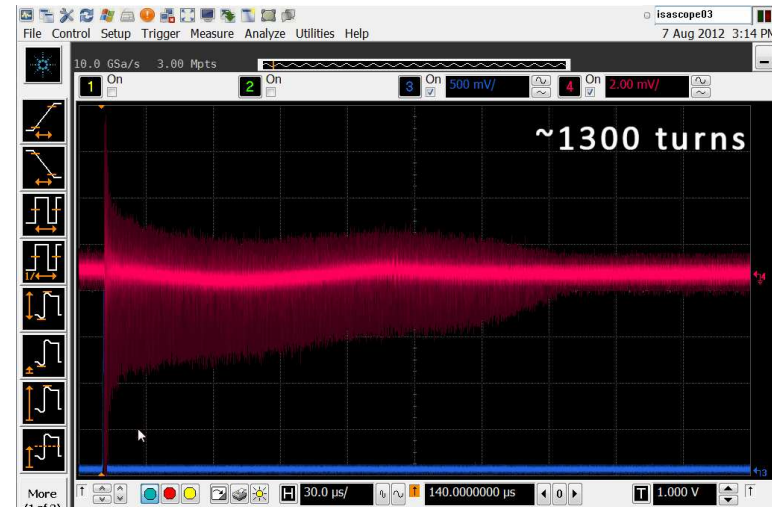


ASTRID2 Layout



ASTRID2 Status

- ▶ August 2012: Beam circulated for ~1300 turns
- ▶ Limitation: RF not ready



- ▶ Timeline
 - Week 44: First beam commissioning with RF
 - End of 2012: First beamline on ASTRID2
 - 2013: All beamlines transferred to ASTRID2



ASTRID2



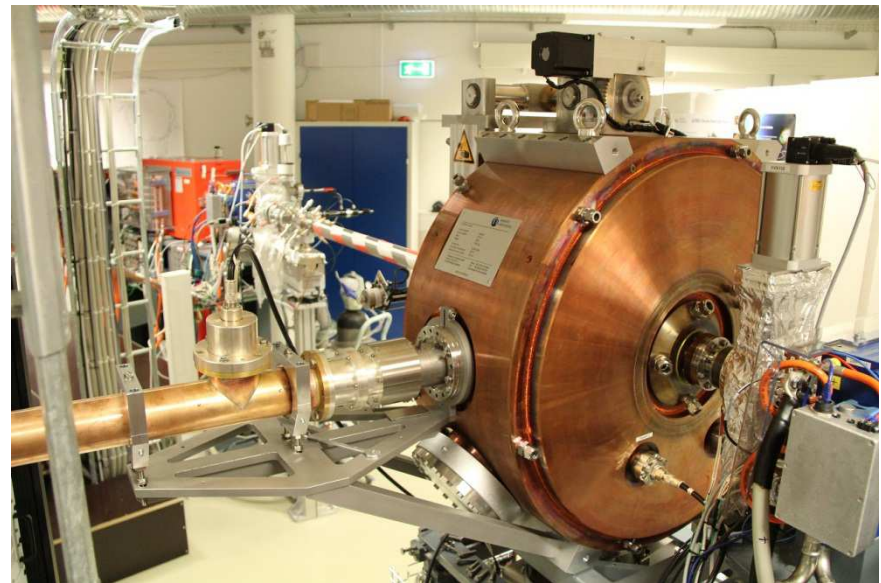
ASTRID2 RF

- ▶ 105 MHz (like ASTRID)
- ▶ Main RF parameters
 - Harmonic: 16
 - RF voltage: 50–150 kV
 - Synchrotron frequency: 10–20 kHz
 - Synchrotron radiation power: ~1.4 kW
 - Cavity power: 0.5–7 kW
- ▶ 8 kW solid state amplifier from Tomco Technologies (Australia)
 - 8 pcs. 1 kW amplifier modules (each with circulators) combined 2x(4x1)



ASTRID2 Cavity

- ▶ Same as MAX IV cavities
 - Except for small change in diameter of stub-disc to facilitate 105 MHz
- ▶ Built by RI (RF design by MaxLab)
 - Based on MAX II cavity
 - Use Electron Beam Welding instead of vacuum brazing
- ▶ Have ordered a 315 MHz Landau cavity (also from RI and based on MaxLab design).
 - ▶ Delivery this year



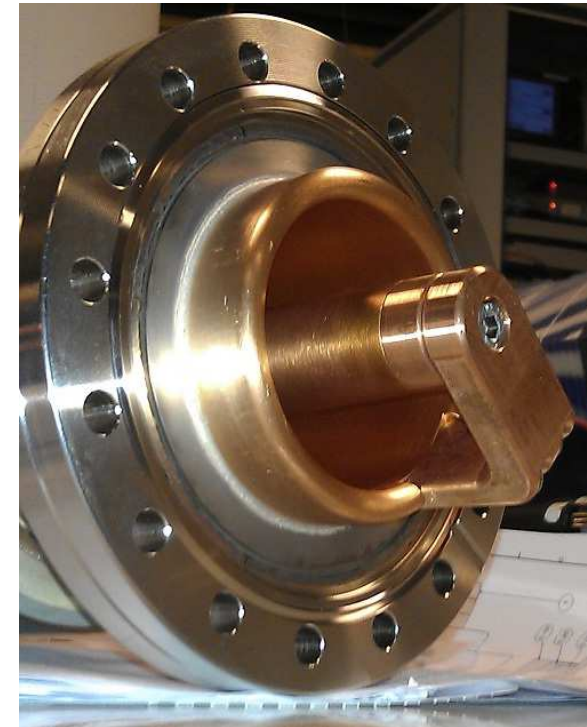
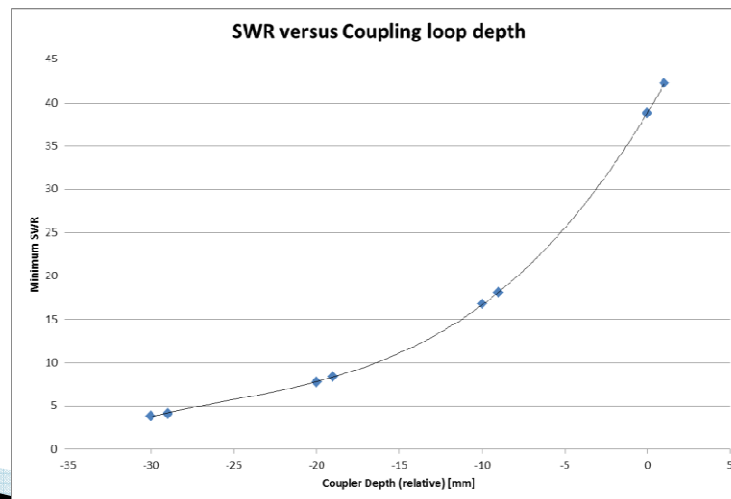
New ASTRIDx LLRF

- ▶ Since Januar 2011: New LLRF in operation at ASTRID
 - Has been working without any problems
 - Same system to be used for ASTRID2 (except for different tuning control)
- ▶ Digital control of baseband signal
 - **Detection:** IQ demodulators with low pass filter
 - $\pm 180^\circ$ phase detection
 - **Control:** Amplitude and Phase (voltage controlled)
 - A computer (PC) running LabVIEW Real-Time with FPGA equipped multifunction card to measure and control the baseband signals
 - NI PCIe-7852R:
 - Virtex 5 FPGA, 8 AI, 750 kS/s/ch, 8 AO, 1 MS/s/ch, 16 bit
 - **Amplitude Loop is implemented on the FPGA**
 - **Tuning Loop and Phase Loop is implemented in the Real-Time program**



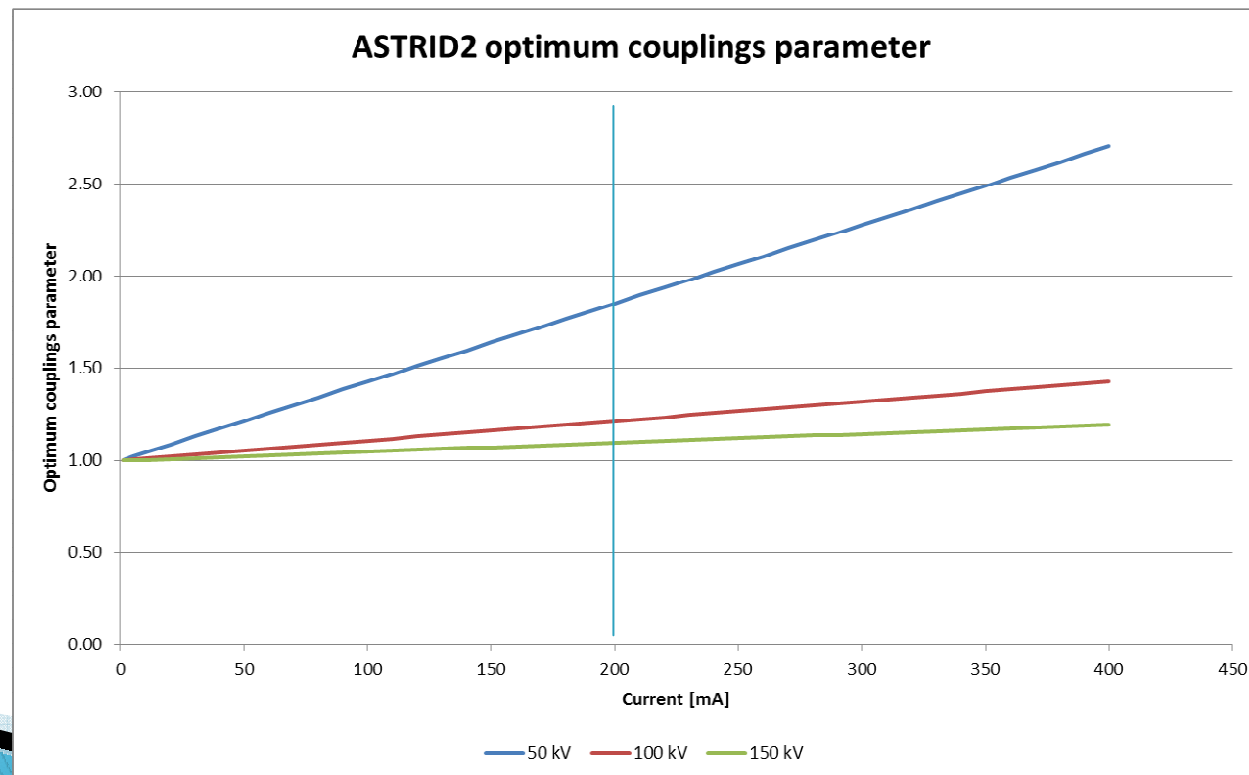
ASTRID2 coupling loop

- ▶ Reusing our old ASTRID spare
- ▶ New ones have been ordered from FMB, Germany
 - Prototype being tested by MaxLab
- ▶ Presently optimizing the depth of the coupling loop
 - Not deep enough yet



ASTRID2 Optimum coupling

- ▶ We need to decide cavity coupling
 - Nominal current: 200 mA
 - Nominal cavity voltage: 50 kV
 - But lifetime calculations suggest benefit from increased voltage



Outlook of ASTRID2 RF system

- ▶ Week 43: Commission the amplitude and tuning loop
- ▶ Week 44: Expecting (hoping) for first beam commissioning with RF
 - Only 100 W since cavity cooling water is not ready

