

Status of the ASTRID2 project

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ASTRID2

- ▶ ASTRID2 is the new synchrotron light source presently being built in Aarhus, Denmark
- ▶ Dec 2008: Received 37 MDKr (5 M€) to
 - Build a new SR light source
 - Convert ASTRID into a booster
 - Move existing beam lines
 - New 2 T Multi Pole Wiggler
- ▶ The project should be finished in 2013

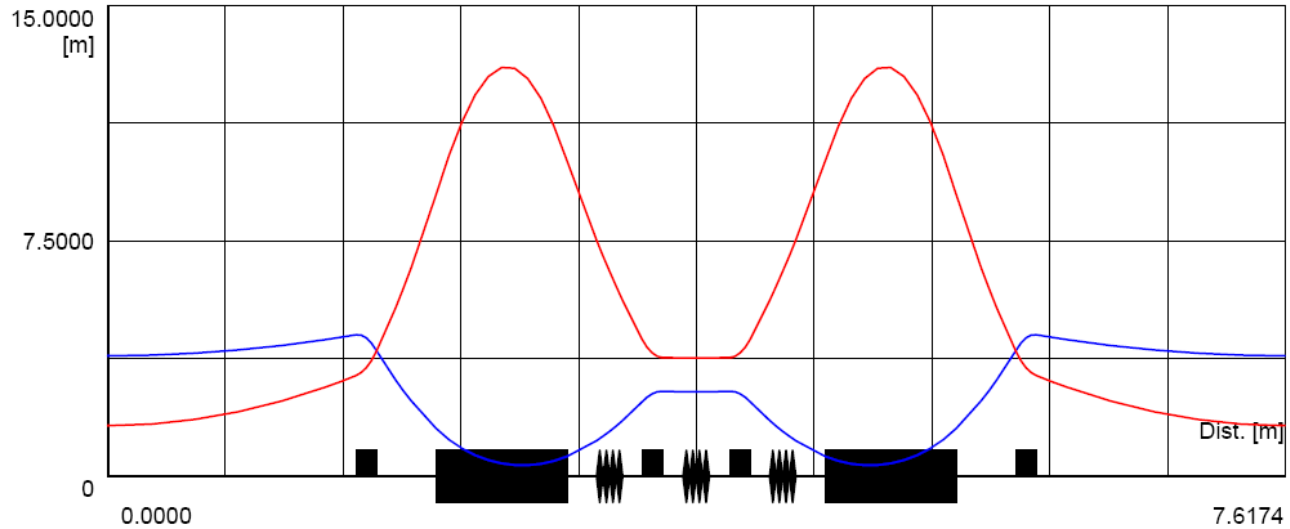
ASTRID2

▶ ASTRID2 main parameters

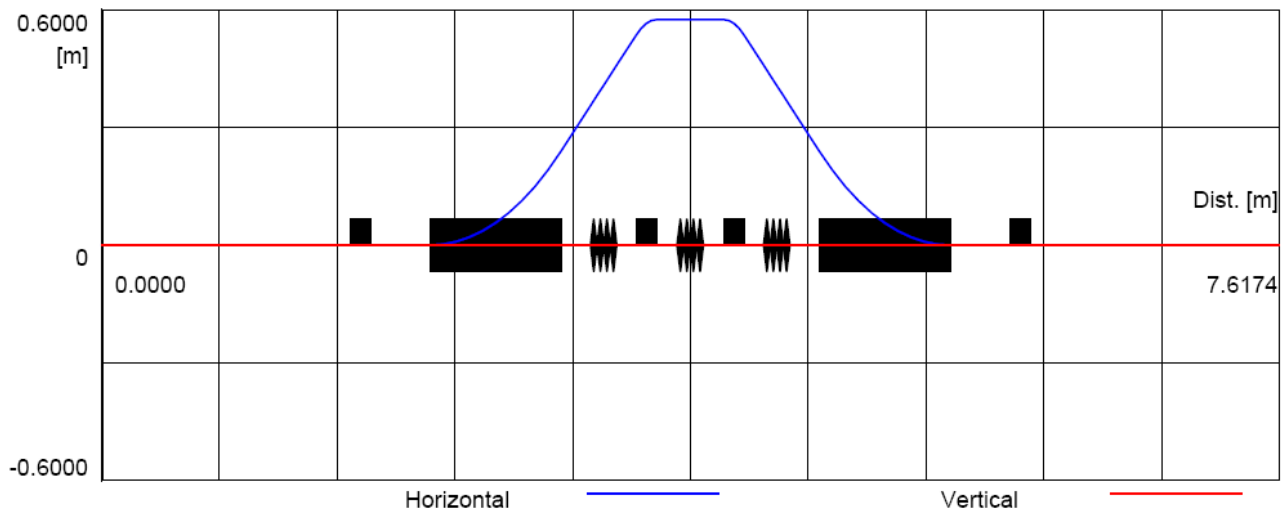
- Electron energy: 580 MeV
- Emittance: 12 nm
- Beam Current: 200 mA
- Circumference: 45.7 m
- 6-fold symmetry
 - lattice: DBA with 12 combined function dipole magnets
 - Integrated quadrupole gradient
- 4 straight sections for insertion devices
- Will use ASTRID as booster (full energy injection)
 - Allows top-up operation

ASTRID2 lattice

Betatron amplitude functions



Dispersion functions

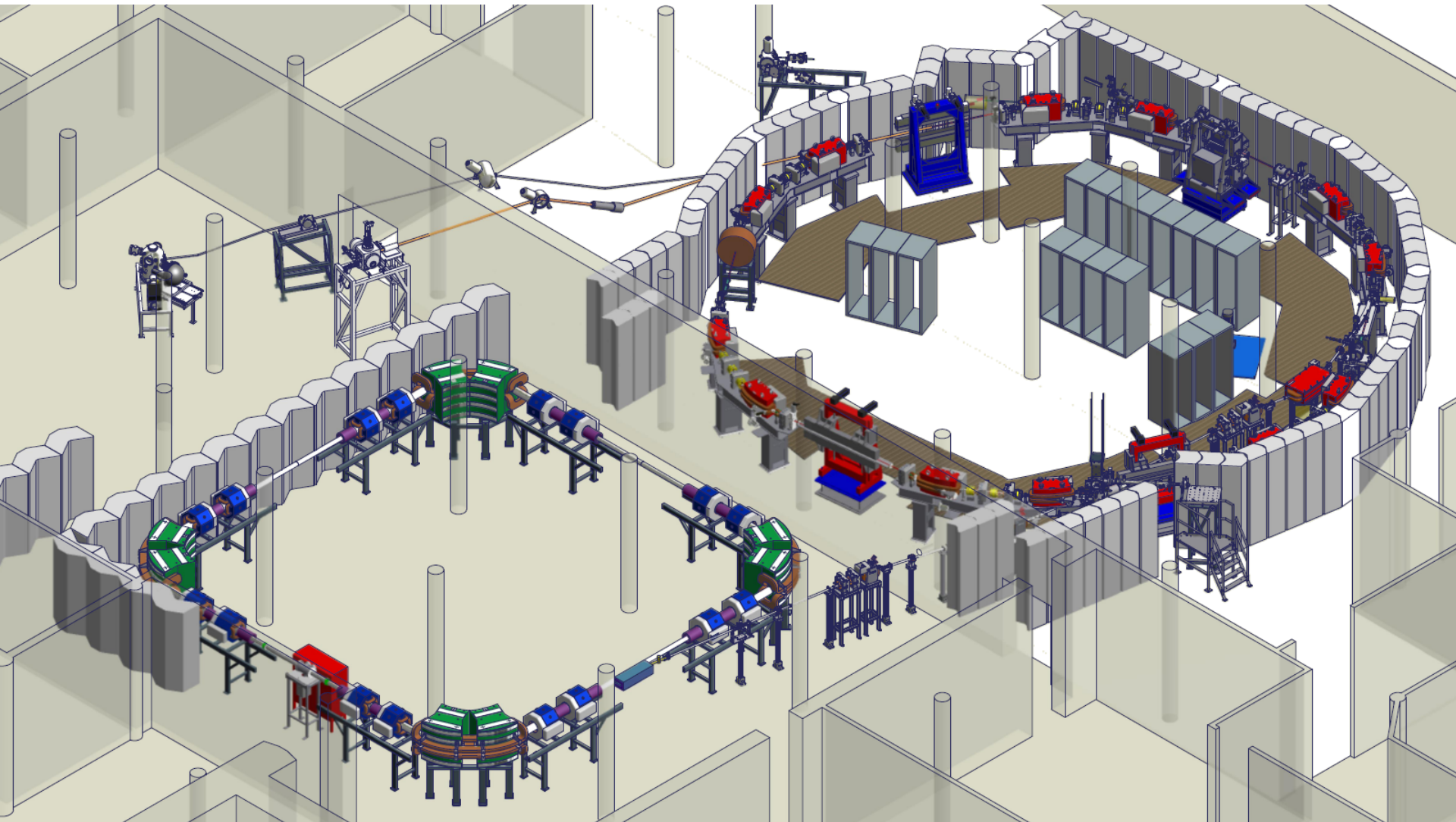


ASTRID2 machine and magnets

ASTRID2 parameters	
Energy	580 MeV
Circumference	45.704 m
Current	200 mA
Straight sections	4x2.7 m
Betatron tunes	5.185, 2.14
Coupling factor	<10%
Horizontal emittance	12 nm
Natural chromaticity	-6, -11
Dynamical aperture	25-30 mm
Energy loss/turn	6.2 keV
RF frequency	105 MHz
Harmonic number	16
RF voltage	50-150 kV

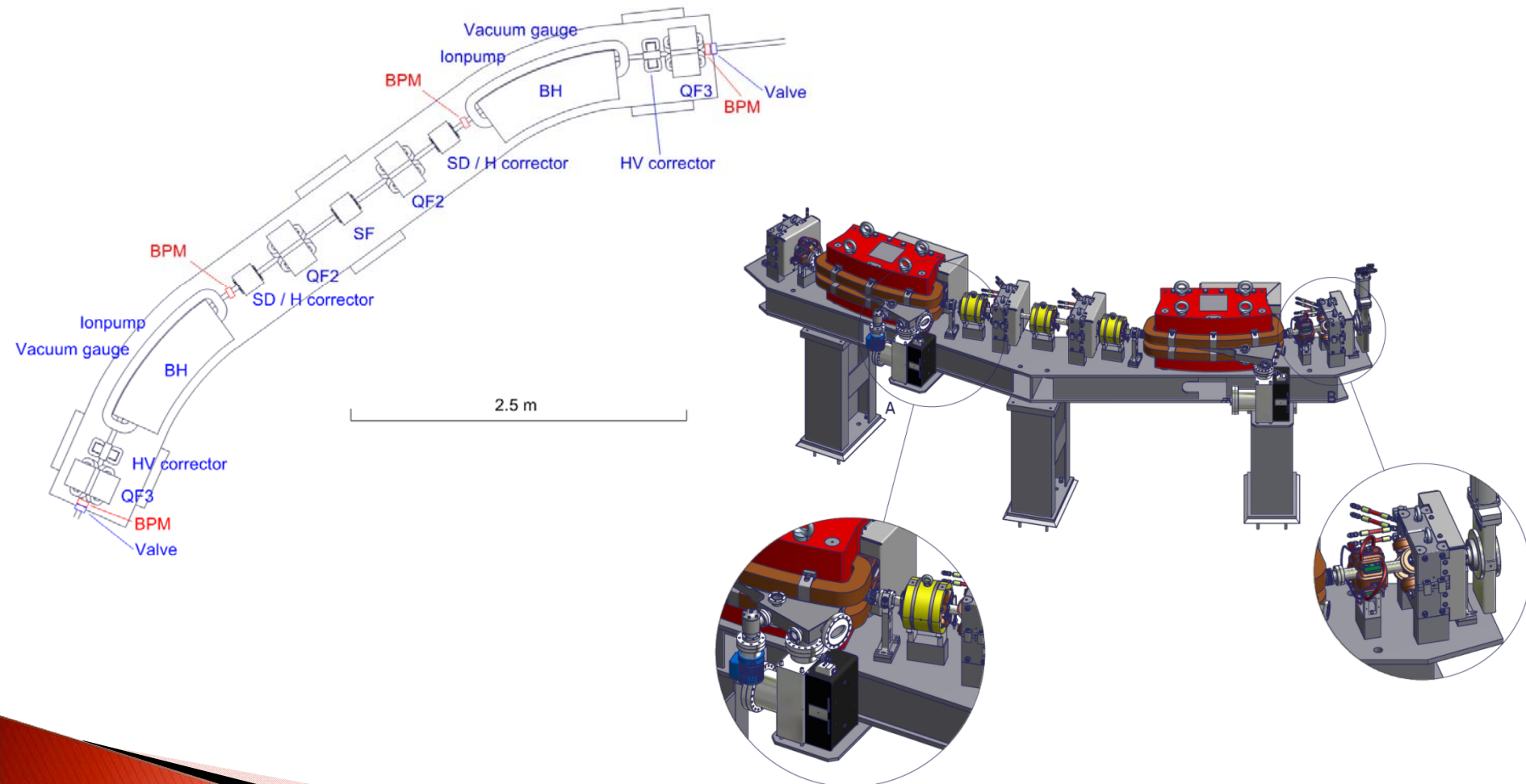
Combined function dipoles	6x2 solid sector
Nominal (max.) dipole field	1.1975 (1.25) T
Bending radius	1.62 m
Nominal quadrupole field	-3.219 T/m
Nominal sextupole field	-8.0 T/m ²
Quadrupoles	6x(2+2)
Magnetic length	0.132 m
Max. gradient	20 T/m
Sextupoles	6x(2+1)
Magnetic length	0.170 m
Max. sextupole field	300 / 180 T/m ²
Nominal sextupole field	249 / 161 T/m ²
Dipole corrector angle	0 / 1.5 mrad
Correctors	6x(1+1)
Corrector angle	3 mrad

ASTRID2 Layout



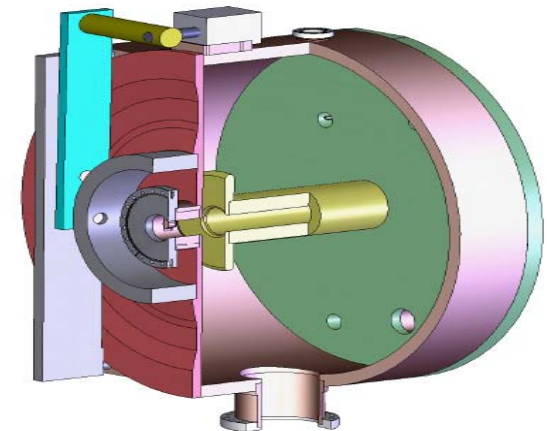
ASTRID2 girder and magnets

- ▶ One arc (1 / 6) of ASTRID2, showing the magnetic elements



ASTRID2 RF

- ▶ 105 MHz (like ASTRID)
- ▶ Main RF parameters
 - Synchrotron radiation power: ~1.4 kW
 - Synchrotron frequency: 10–20 kHz
 - Harmonic: 16
 - RF voltage: 50–150 kV
 - Cavity power: 0.8–7 kW
 - 5–12 kW FM transmitter
 - Most likely a solid-state amplifier, but a tube-based amplifier is not ruled out
 - Cavity: collaboration with MAX-Lab
 - Presently in tendering



ASTRID2 Vacuum

- ▶ Each dipole chamber has
 - one 150 l/s ion pump with integrated TSP
 - All interconnecting tubes (Ø40mm) are NEG coated
- ▶ Insertion straights
 - ID chambers are NEG coated
- ▶ Bake out: In-situ
 - Dipole chambers: ~150°C
 - Interconnecting tubes (NEG): ~200°C
 - Heating: Thin (<0.5 mm) heating foil (like Soleil)
 - Isolation: Thin (~1 mm) ceramic “paper”
 - To prevent excessive heat transfer to magnets

ASTRID2 Status

- ▶ Most major components, except RF cavity, will be delivered 1st quarter 2011
 - magnets on girders, fast magnets, magnet power supplies, vacuum equipment
- ▶ Vacuum chamber is being finalized
 - Design of dipole chambers almost ready
 - Interconnection tubes: manufactured, ready for NEG coating
- ▶ Timeline
 - Spring/summer 2011: Installation
 - Autumn/winter 2011: Commissioning
 - 2012: First beam lines on ASTRID2
 - 2013: All beam lines transferred to ASTRID2

ASTRID Operation

- ▶ No dedicated operation staff
 - I.e. the machine is operated by accelerator physicist (two until now) with the help of a beam line scientist (especially for helping with weekend injections)
- ▶ The control room is only manned during injections
 - One injection every weekday (~½h)
 - Typically one injection in the weekends
 - If beam is lost outside normal working hours the users can try to call an operator, but there is not an operator on call
 - We have an SMS service, which can alert the operator of machine failure
- ▶ Machine physics and repairs:
 - Each Monday morning
 - Once a month: ~3 days of machine physics and repairs
 - Twice a year: ~14 days of machine physics and repairs
 - On a need basis: Longer shutdowns

Expected ASTRID2 Operation

- ▶ No dedicated operation staff
 - Usually no one in the control room
- ▶ The machine should (hopefully) be fully automatic (Top-up)
 - Plan to implement an automatic beam steering system in the transfer beamline between ASTRID and ASTRID2
 - ASTRID will only be able to deliver a new pulse every 10–15 s
 - Expect some trimming of Microtron and injection into ASTRID on a daily basis