

ASTRID2 – the new light source in Denmark (**now funded**)

- ASTRID, history and new development
- ASTRID2
- Schedule and status

History and new development

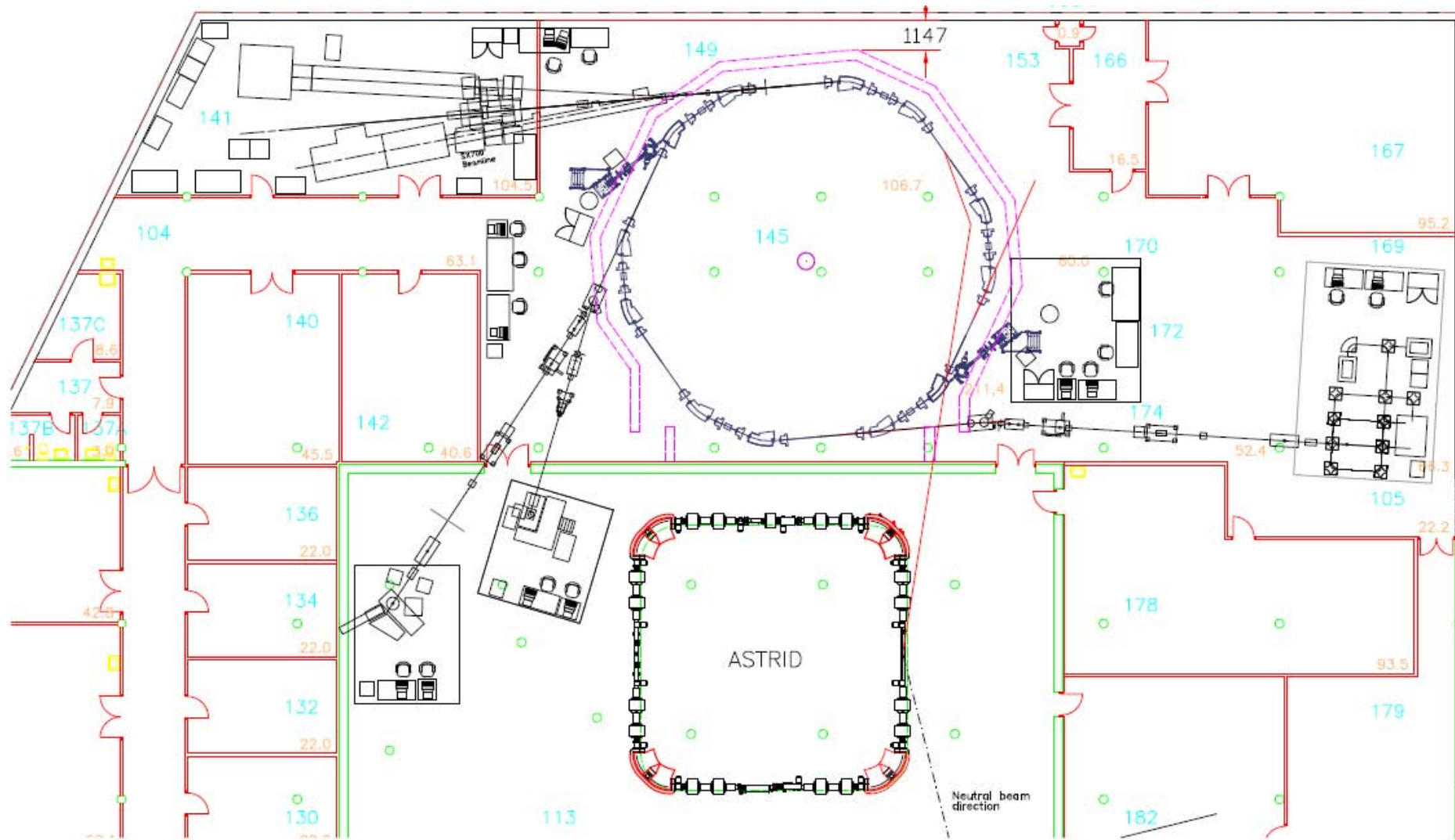
- The synchrotron/storage ring ASTRID has been in operation since 1990, in the last 5 years as a UV/soft x-ray source only.
- A new underground building for a new ring was made several years ago, including infrastructure as stable concrete floor, water cooling, air-conditioning, power etc.
- Dec. 2008: Grant of ~5 M€ for
 1. ASTRID2, 2. transfer beamline, 3. ASTRID modifications, 4. beamline modifications

Schedule for ASTRID2

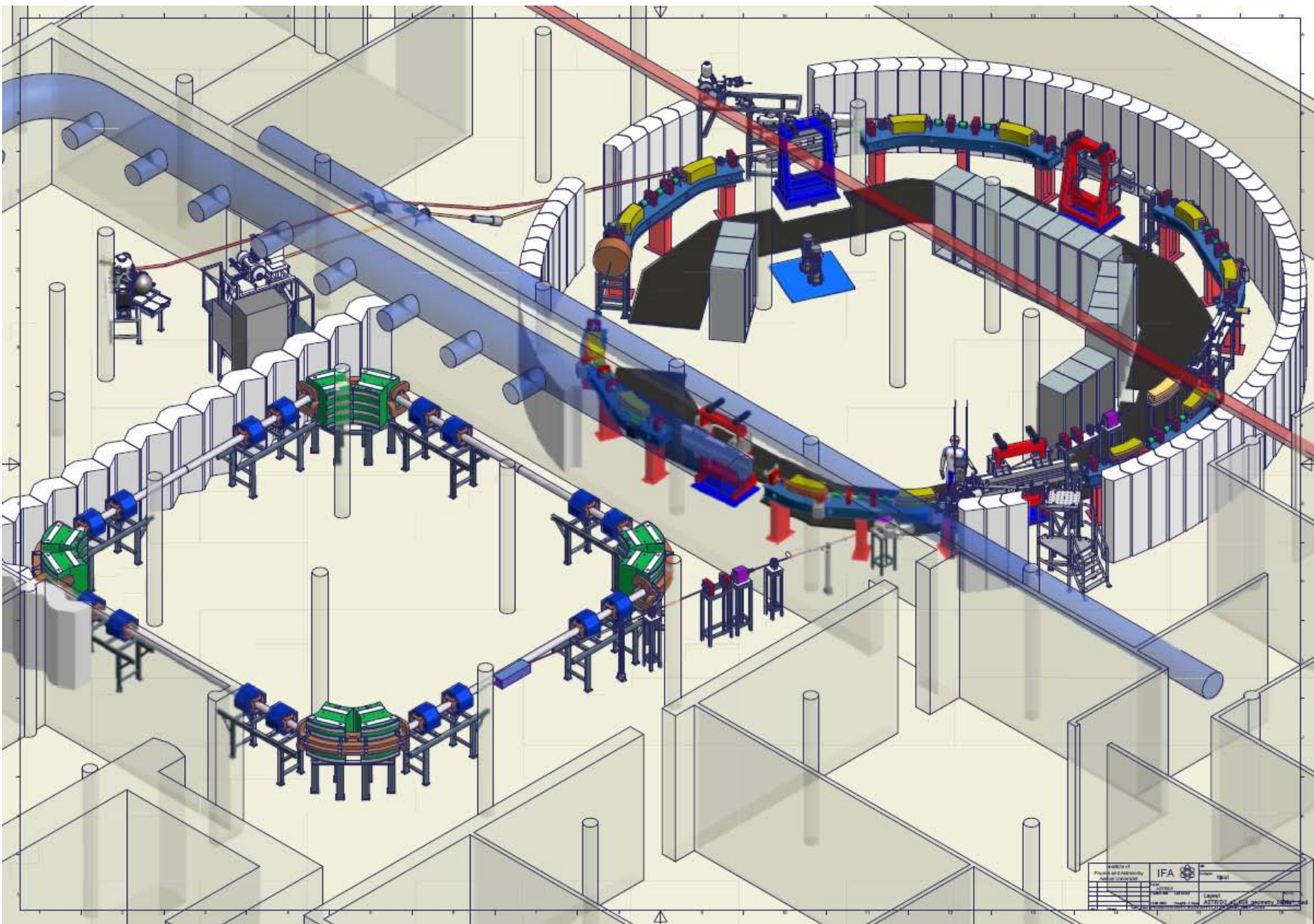
- Nov. 2009:
 - ✓ Theoretical design finished, parameters frozen
 - ✓ detailed engineering design going on
 - ✓ order/tender most accelerator components
- Beginning 2011 first injection in ASTRID2
- 2012 First beamline operational on ASTRID2
- 2013 All beamlines transferred to ASTRID2
- A new AMO beamline and a new materials/nano beamline is being considered

ASTRIDs below ground





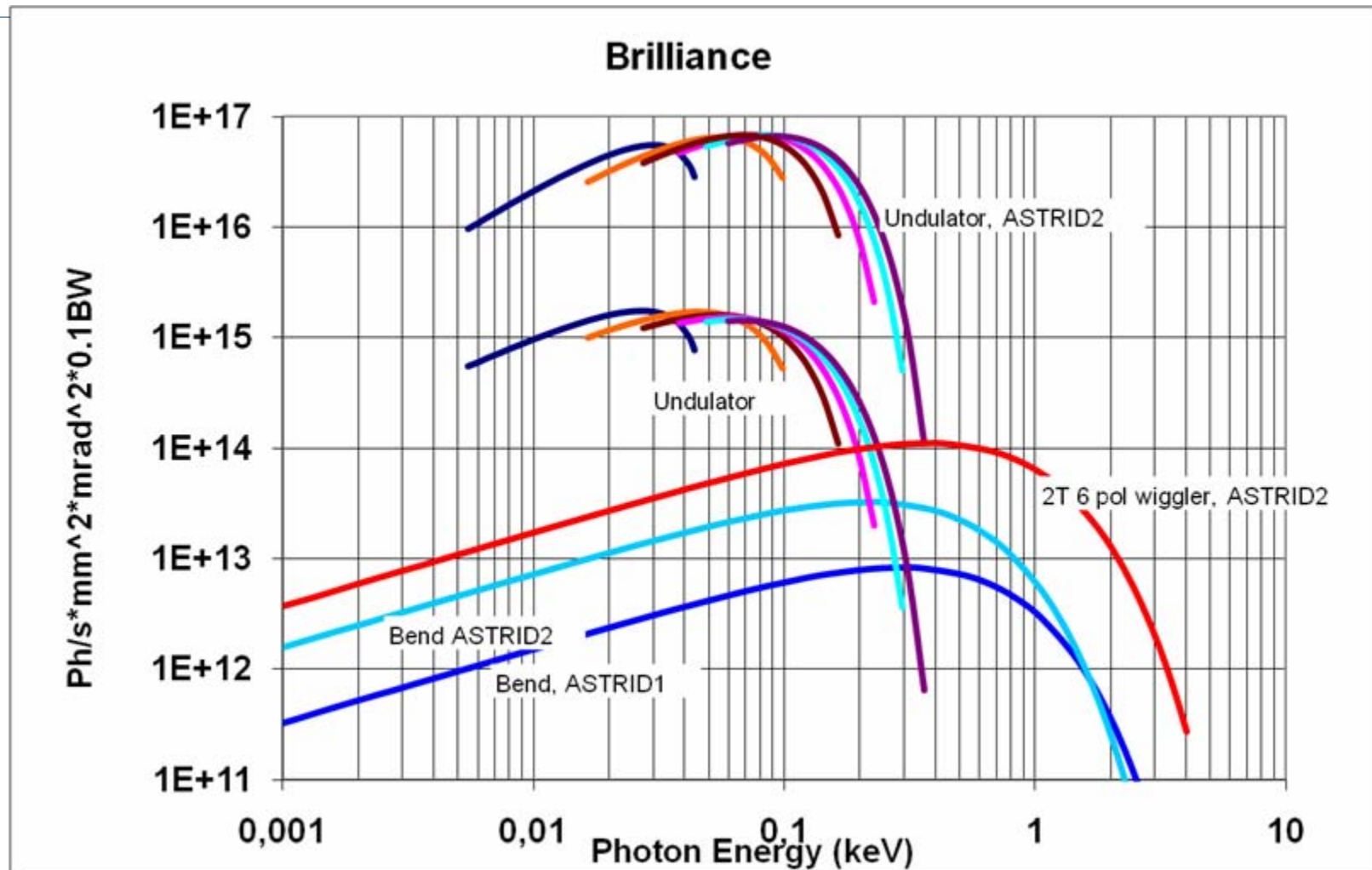
Underground laboratory



ASTRID2

Parameter	ASTRID2	ASTRID
Energy	580 MeV	580 MeV
Circumference	45.7 m	40.0 m
Current	200 mA	200 mA
Lifetime	Top-up (~2hours)	~100 hours
Horizontal emittance	12 nm	140 nm
Characteristic energy Dipole/MPW	0.24/0.45 keV	0.36 keV
Characteristic wavelength	5.2/2.8 nm	3.5 nm
Straight sections (number and length)	4x3.0 m	1x2.0 m

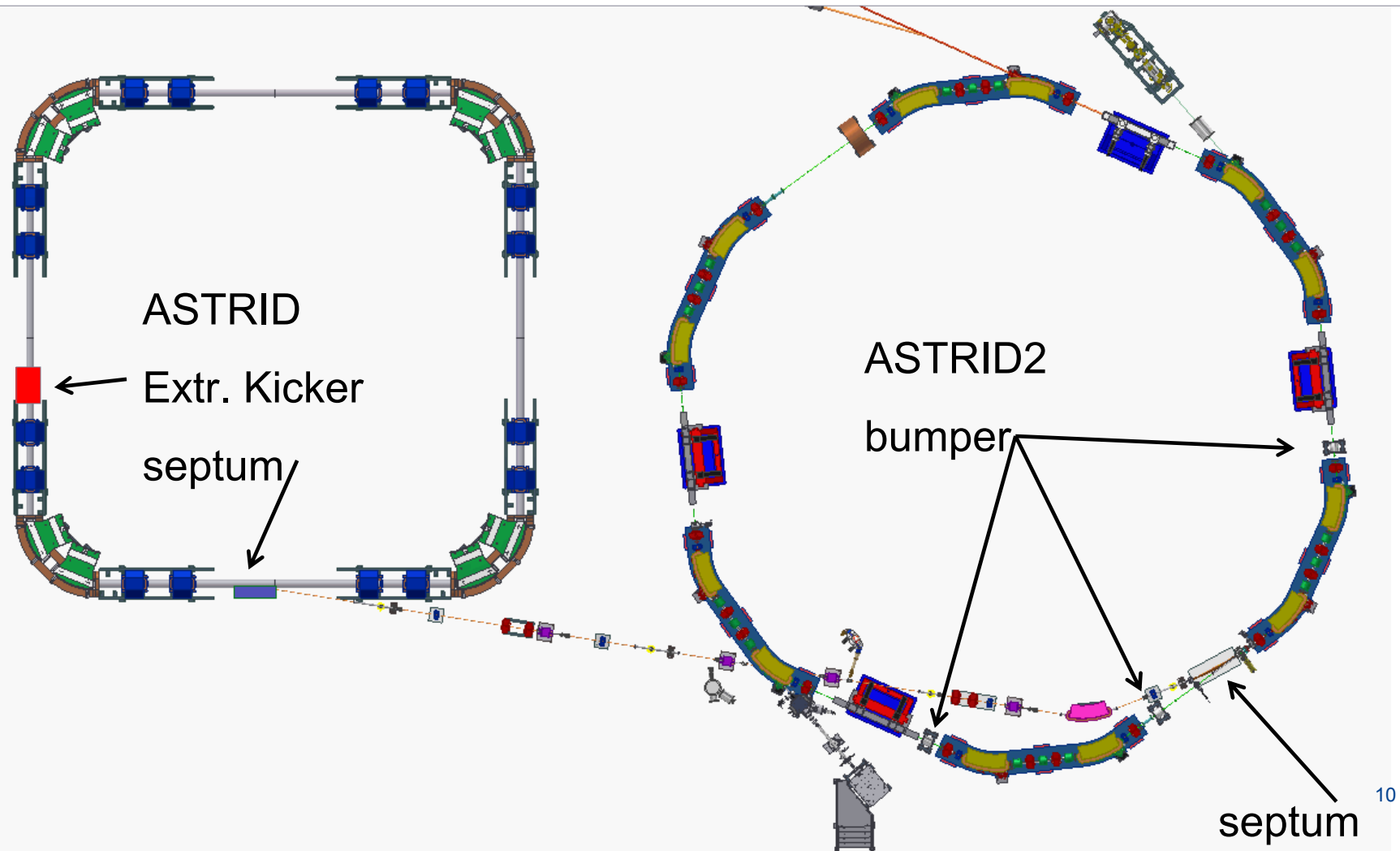
ASTRID-ASTRID2 comparison



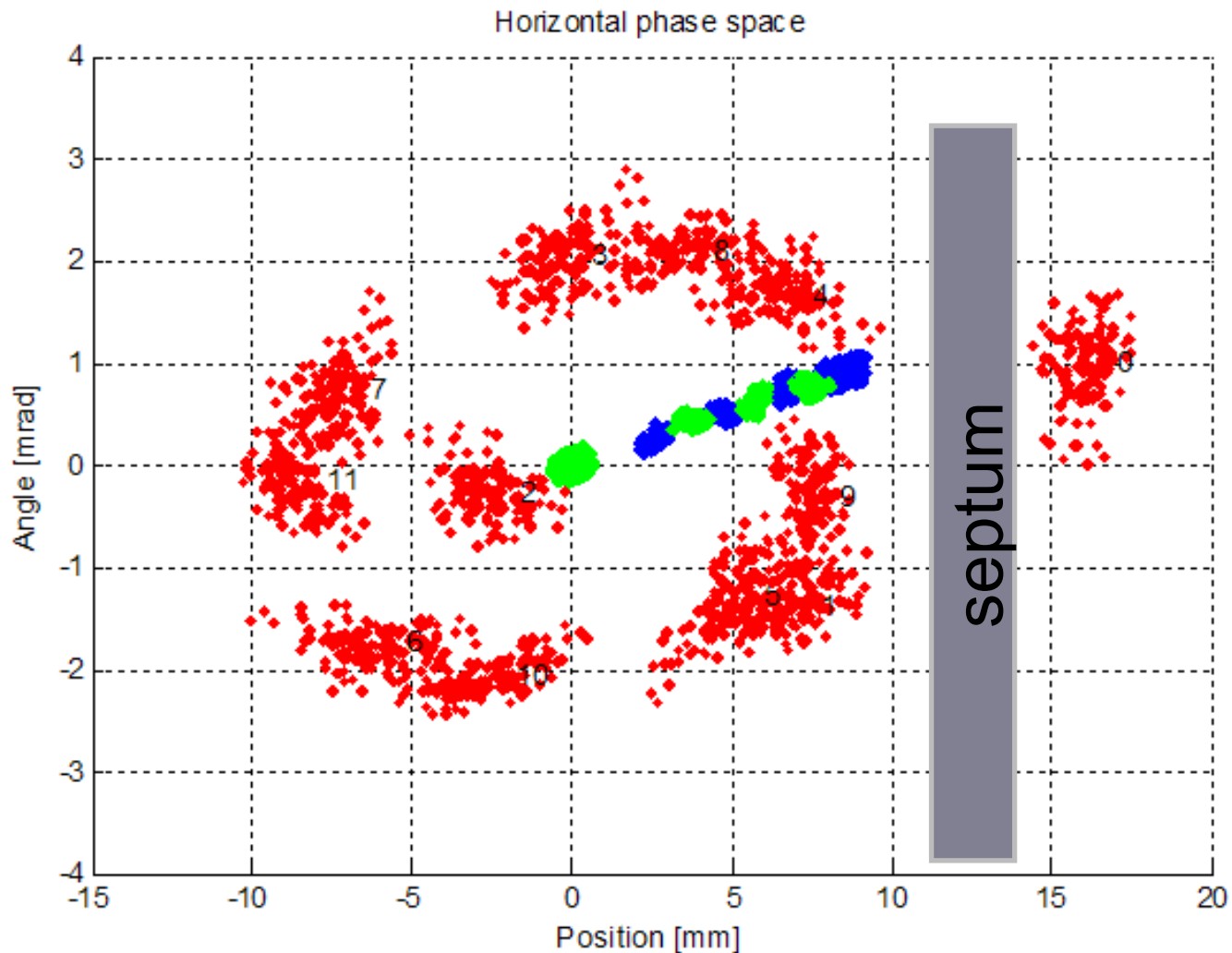
ASTRID → ASTRID2

- ASTRID2 will be operated in top-up mode using ASTRID as a booster
- The cycle time of ASTRID is relatively slow, ~ 10 s
- The beam will be extracted from ASTRID with a fast extraction kicker (2 mrad, 580 MeV, < 50 ns) extracting the beam after $1 \frac{1}{4}$ turn using the ASTRID DC injection septum
- A transfer line has been designed to take the beam below ASTRID2 injecting into ASTRID2 from the inside.
- Beam is injected into ASTRID2 with a 3 kicker local bump

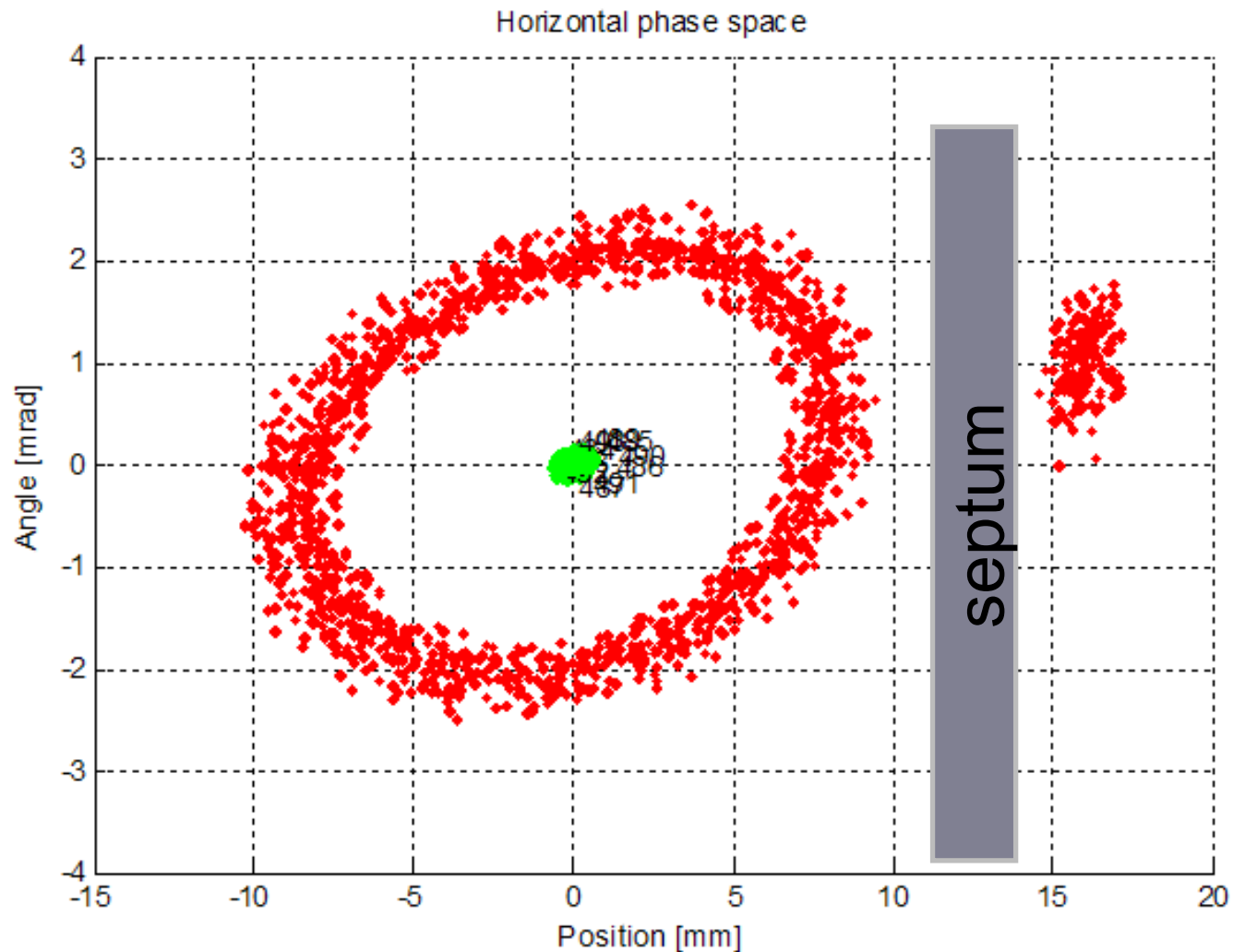
ASTRID → ASTRID2



ASTRID2 injection

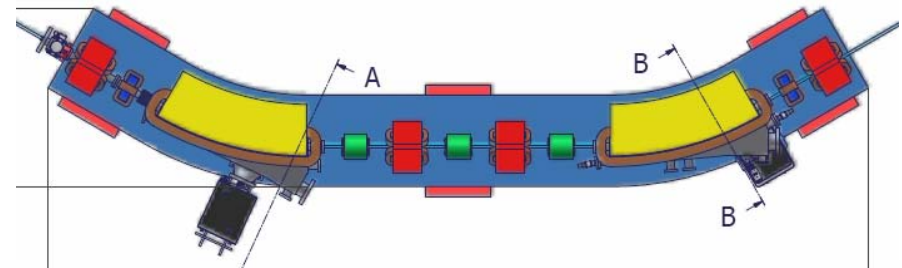


ASTRID2 injection

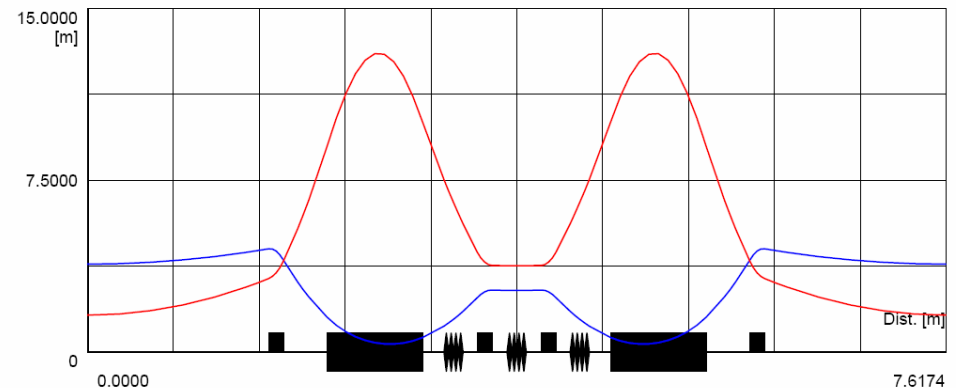


ASTRID2 – lattice

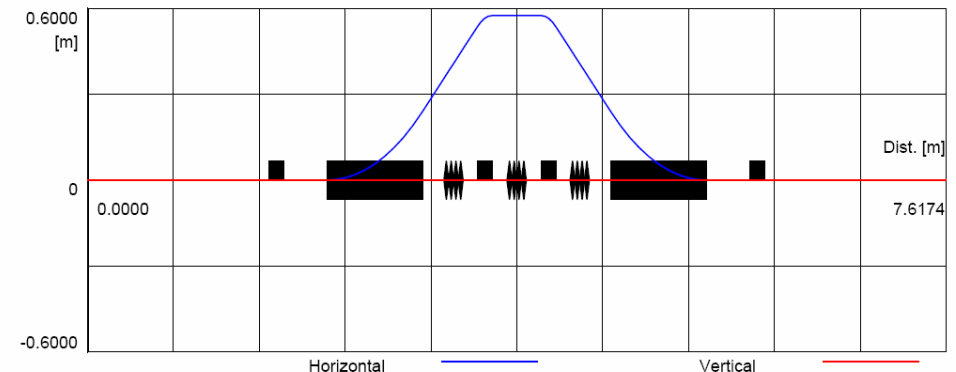
- DBA
- 6-fold symmetry
- Each period:
 - 2 combined function dipole magnets (+ pole-face winding)
 - 2 quadrupole families
 - 2 sextupole families
 - 4 H/V correctors
 - 4 BPM's



Betatron amplitude functions



Dispersion functions



ASTRID2 – insertion devices

› Undulator

60 poles, 55 mm period, 0.6 T, 22 mm gap, ($K=2.87$)

tuneshift ~ 0.009

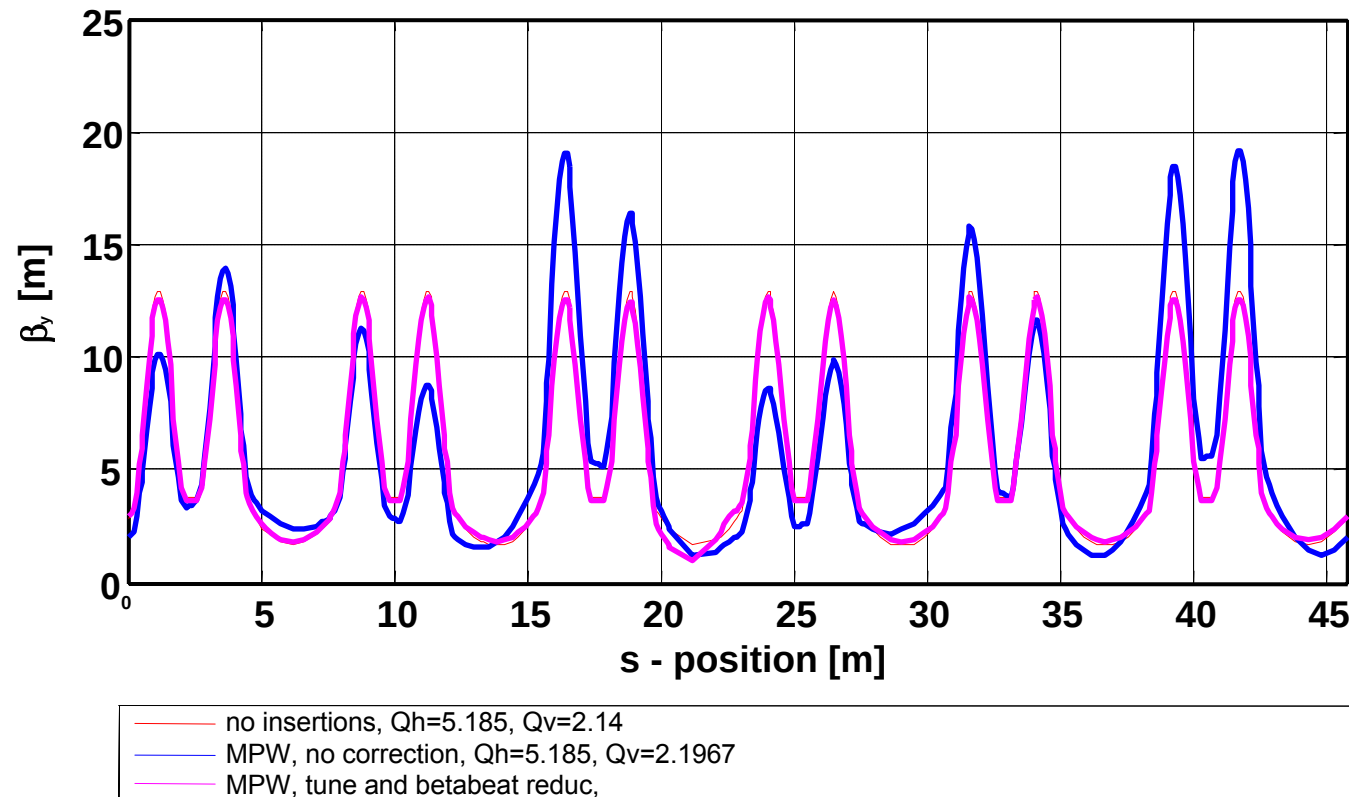
› Multi-Pole Wiggler

12 poles, 116 mm period, 2 T, 12 mm gap, ($K=21.7$)

tuneshift ~ 0.04

ASTRID2 – compensation of insertion devices

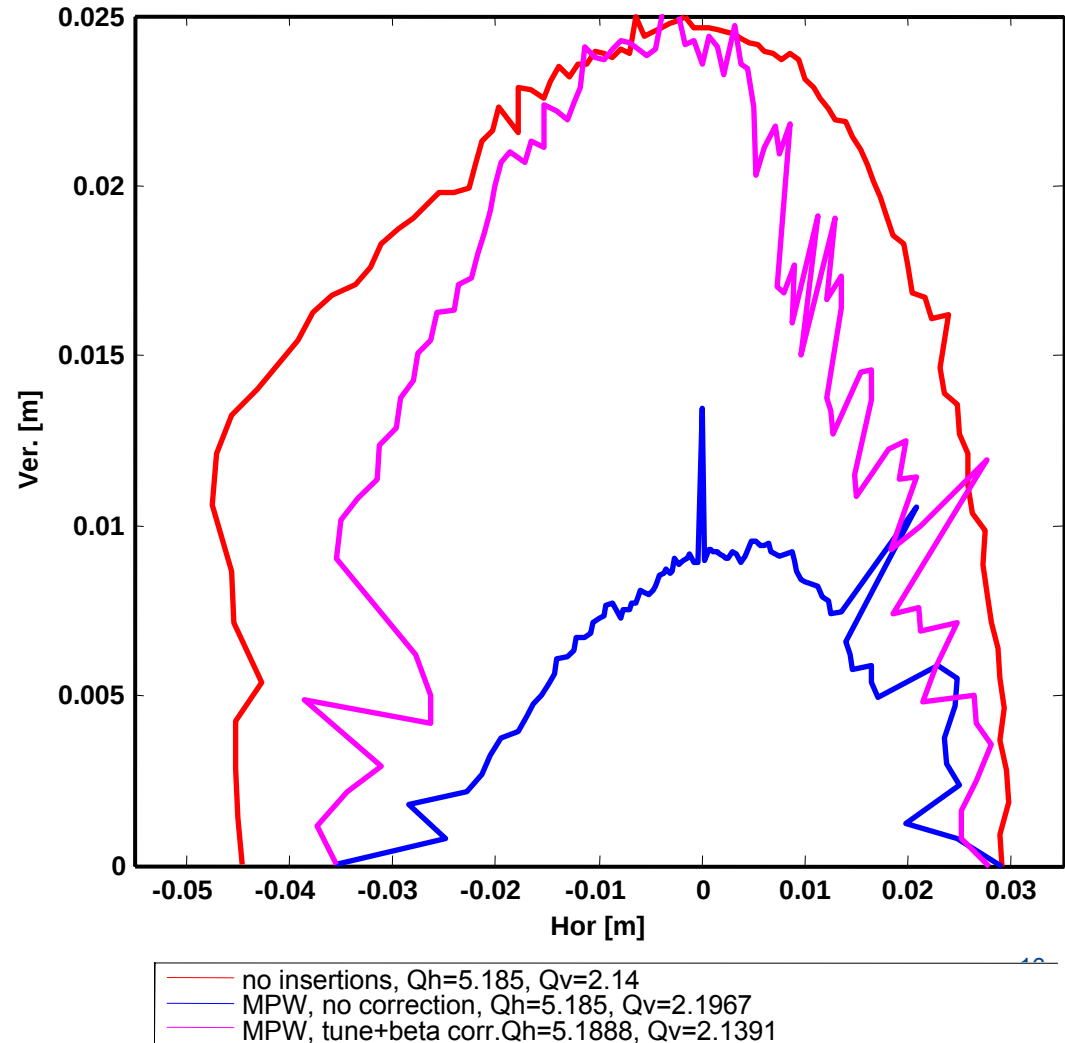
Compensate tune
and beta beat with
global tune
correction and
local beta
correction using
pole-face windings.



Insertion devices modeled as a
long purely vertically focusing
element (matrix)

ASTRID2 – dynamic aperture

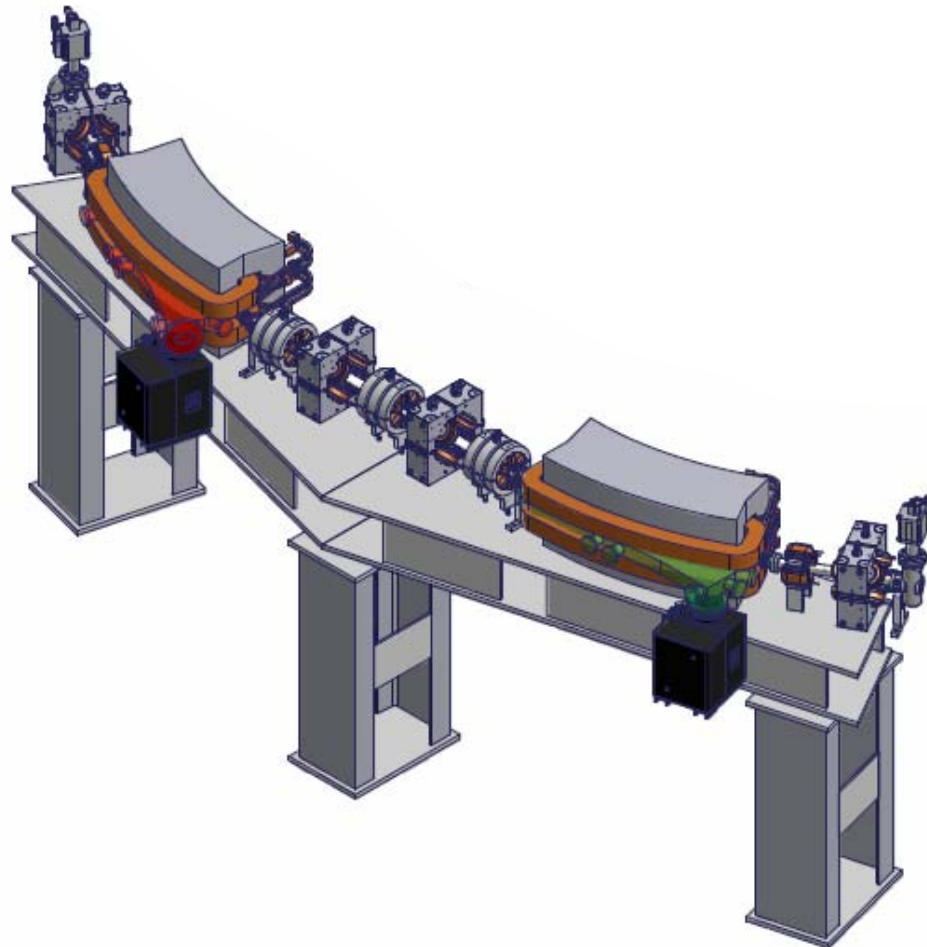
Dynamic aperture
Matlab AT toolbox.



RF system

- 105 MHz (like ASTRID)
- Main RF parameters
 - Harmonic: 16
 - RF voltage: 50-200 kV
 - Synchrotron radiation power: ~1.4 kW
 - Cavity power: <12 kW
- Tube-based FM transmitter (triode), Cheaper, robust
- New LLRF: digital, analog-digital
- We are establishing a collaboration with MAXLAB looking into commercially built 100-MHz EBW cavities
- Also 300 MHz Landau cavity

ASTRID2 Girder design



Vacuum system

- In-situ bake-out system
- We are planning extensive use of NEG coating in
 - straight sections
 - “straight parts” of arc’s

Conclusions

- The ASTRID2 project is now funded since 11 months
- Thanks to the pre-design, parameters have been fixed and most accelerator components have been ordered/tendered
- As building with infrastructure exist,
Injection into ASTRID2 should start in early 2011
- Thanks to everybody in the ESLS community for assistance and useful advice