Energy deposition in Q0

Elena Wildner

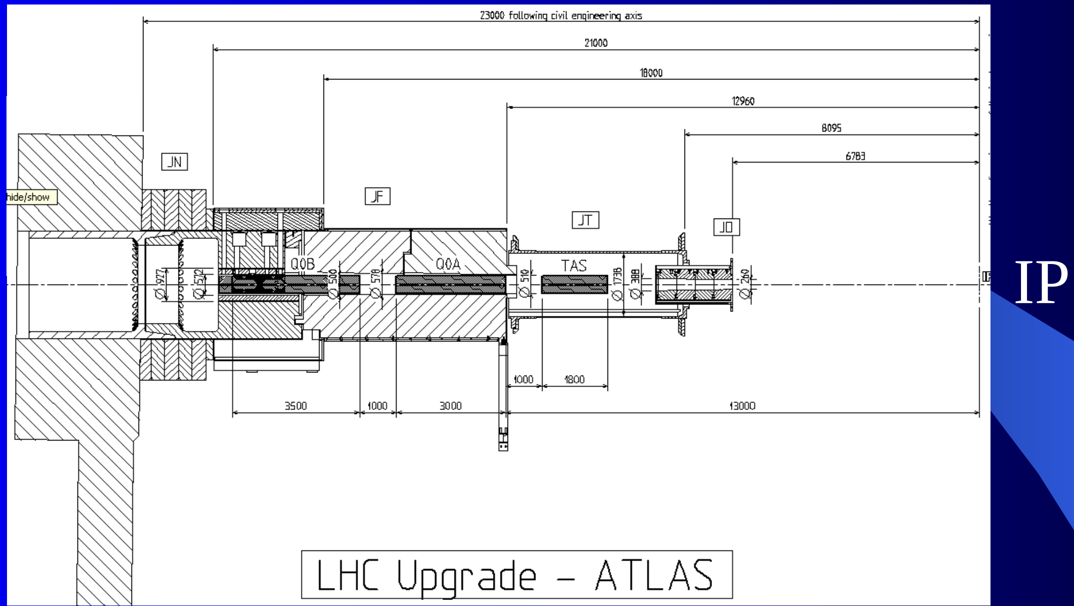
19/04/07

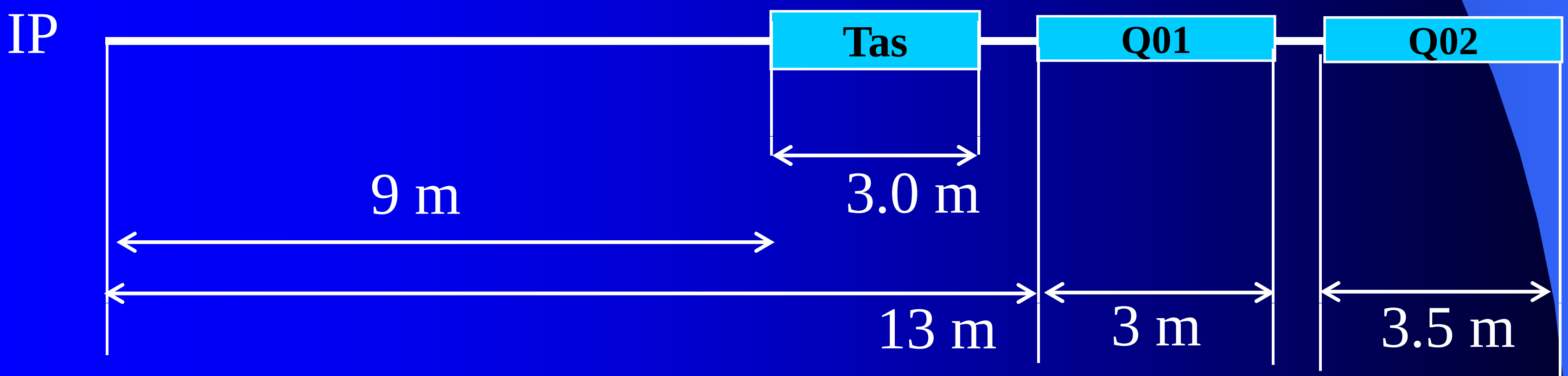
Strategy

1. Define a TAS to protect the Q0
2. Optics: $\beta^*= 0.25m$
3. Calculate, with some optimization of the TAS layout, the heat deposition in the Q0 magnets
4. Check experiment

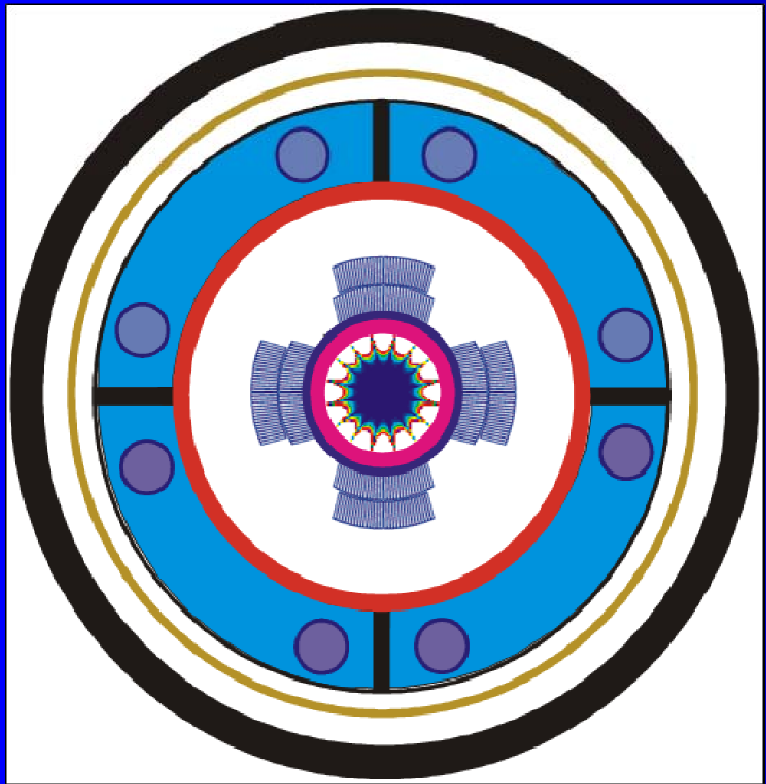
Point 4 still to be treated

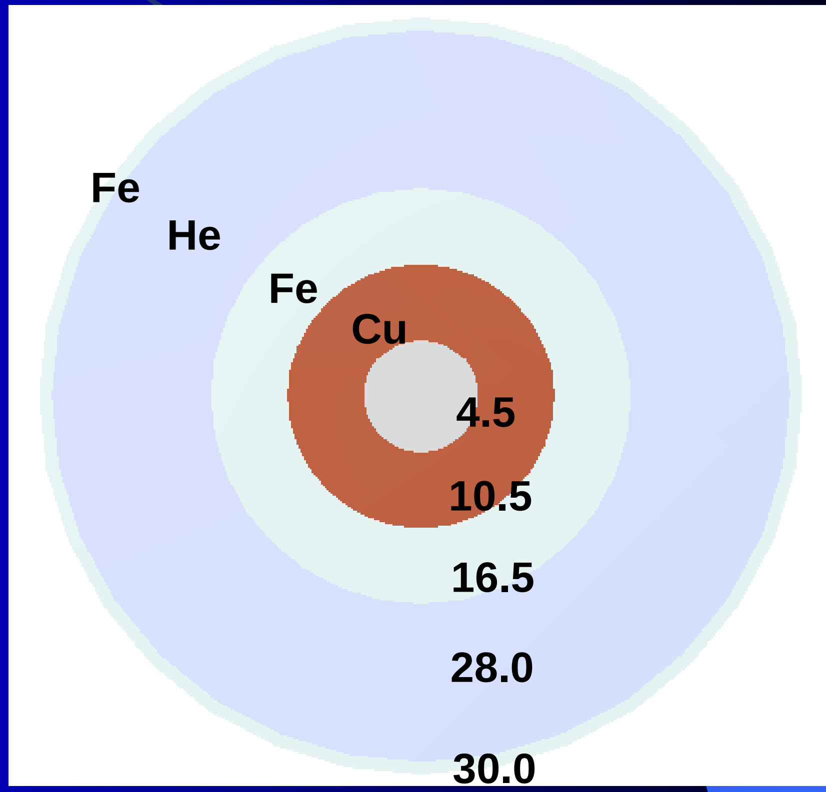
Layout of scenario





Modeling the Quads





P. Limon, G. Kirby

Define the efficient TAS opening

Depends on β

$$D_{\min} = 1.1 \cdot (9.5 + 2 \cdot 7.5)\sigma + 2(d + 3mm) + 2 \cdot 1.6mm$$

β beating

Beam sep.

Beam size

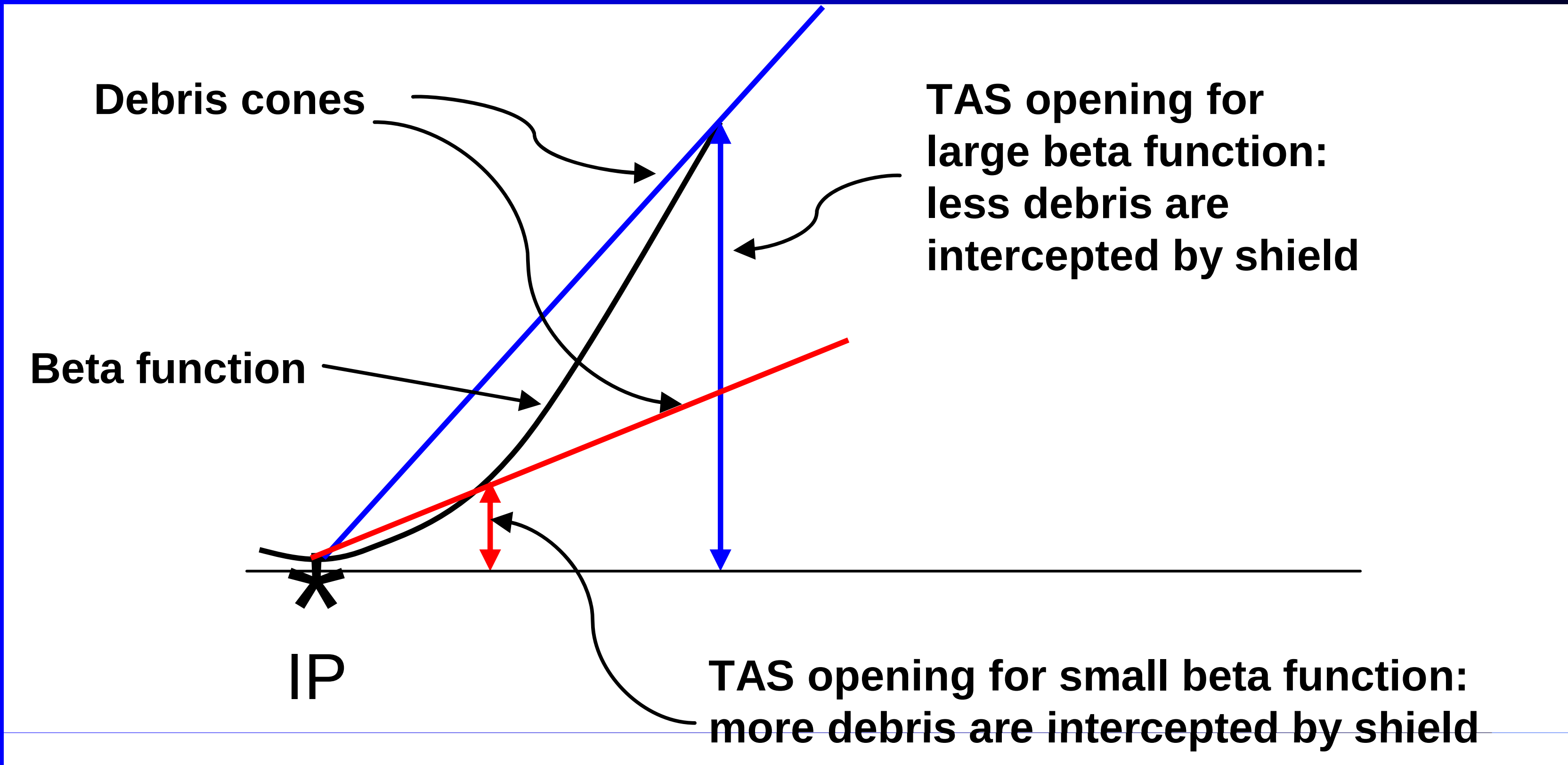
Spurious disp. orbit

orbit

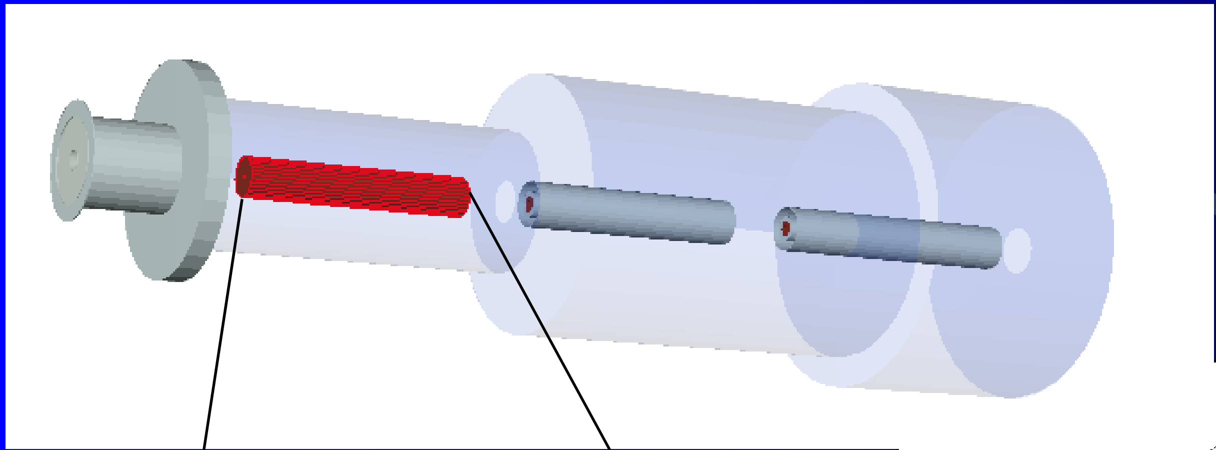
Mech. tol. and alignment

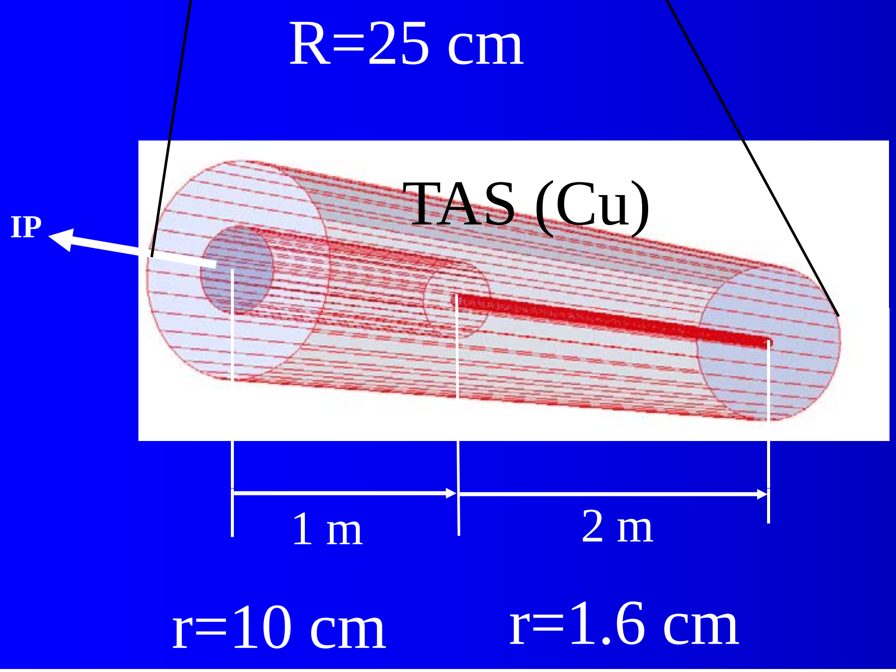
L= 10 E 35

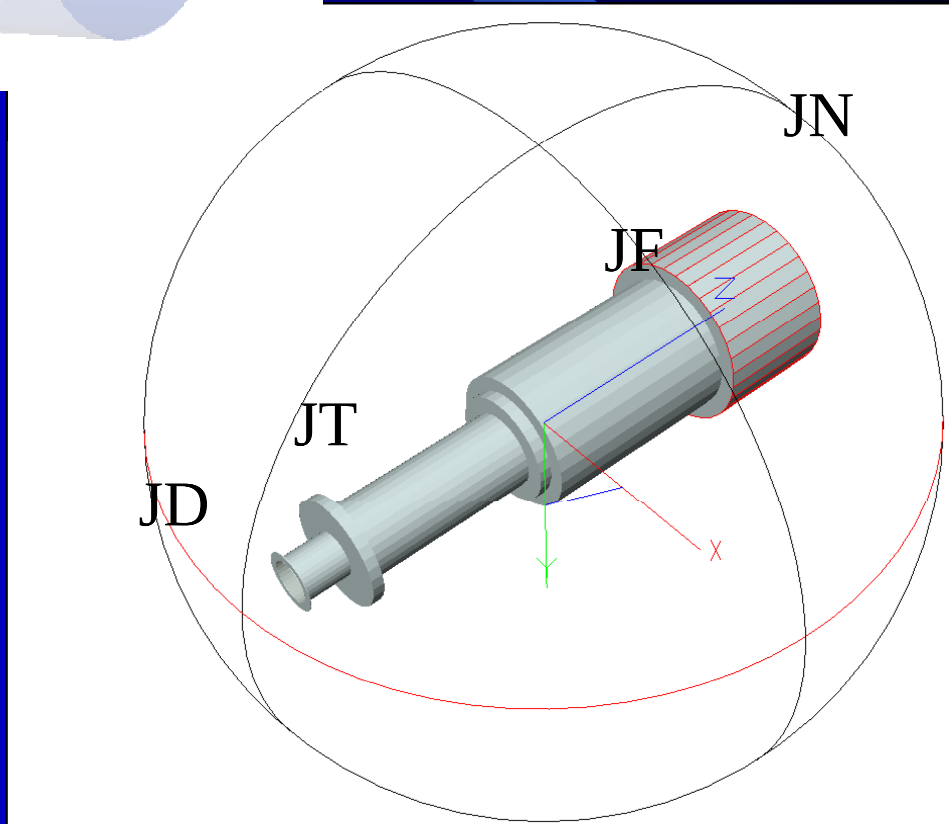
β-dependence of opening



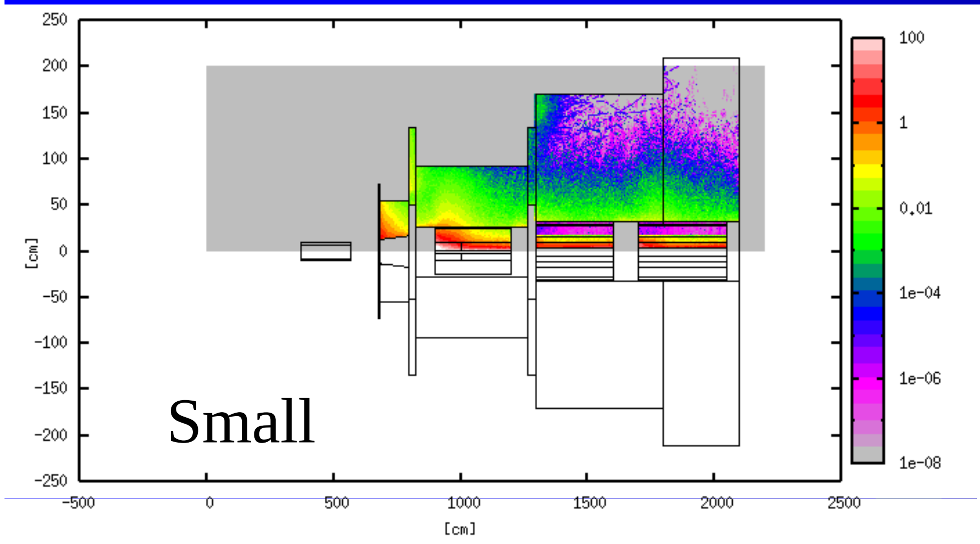
Model

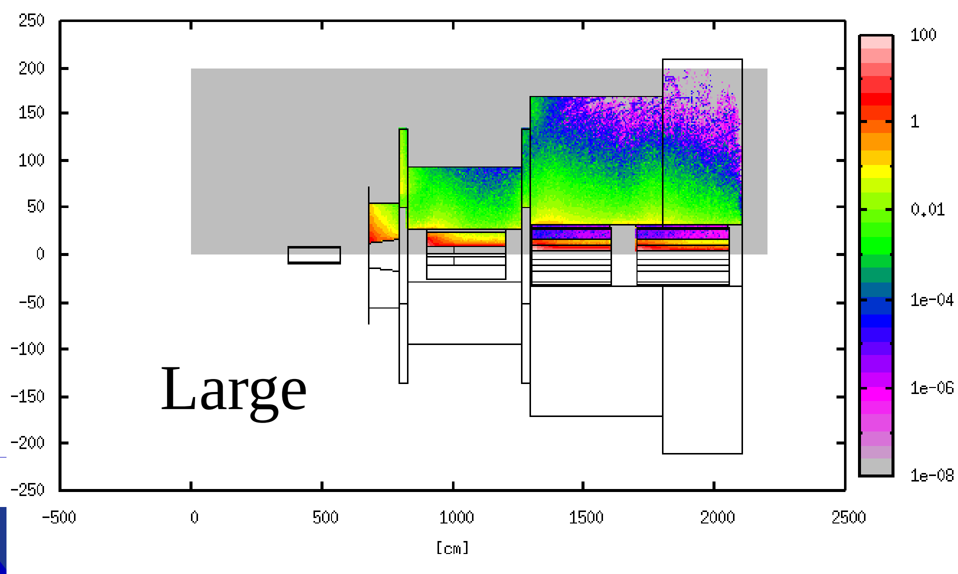


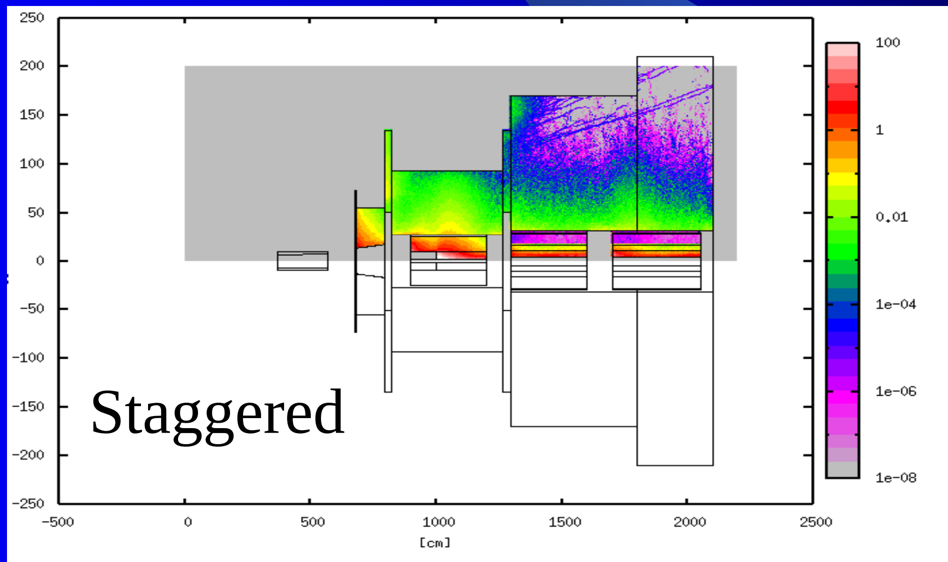




TAS Aperture, 3 cases chosen





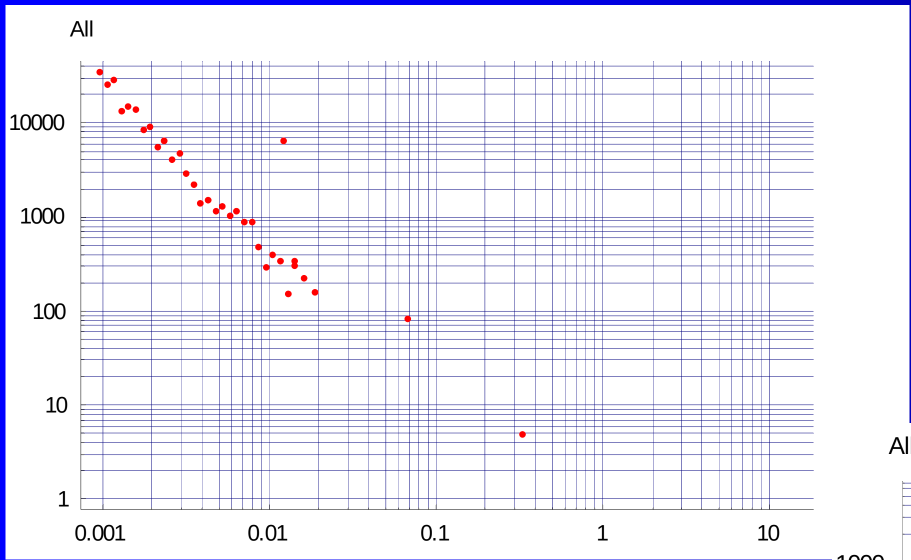


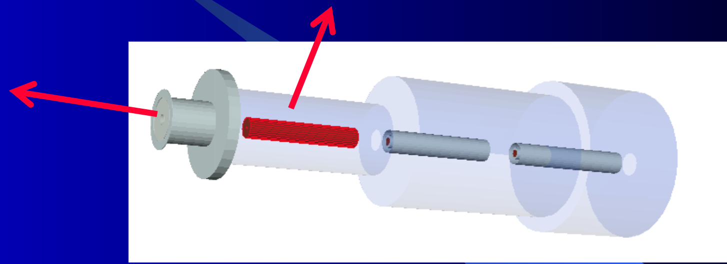
mW/cm3

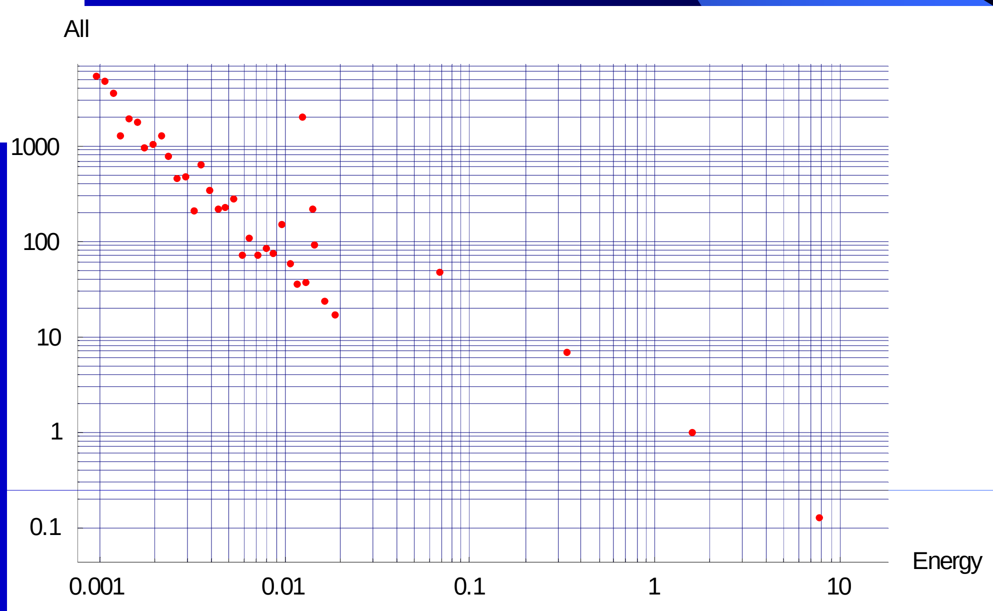
TAS opening: results

Deposition [W]	Q01	Q02	TAS
Small Aperture	123	151	1518
Large Aperture	821	377	253
Staggered Aperture	114	150	1582

Back to experiment, JD hole and Flange

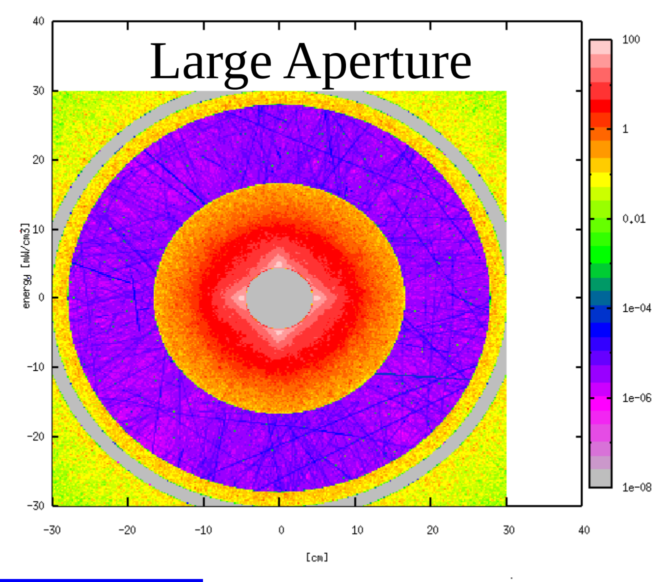


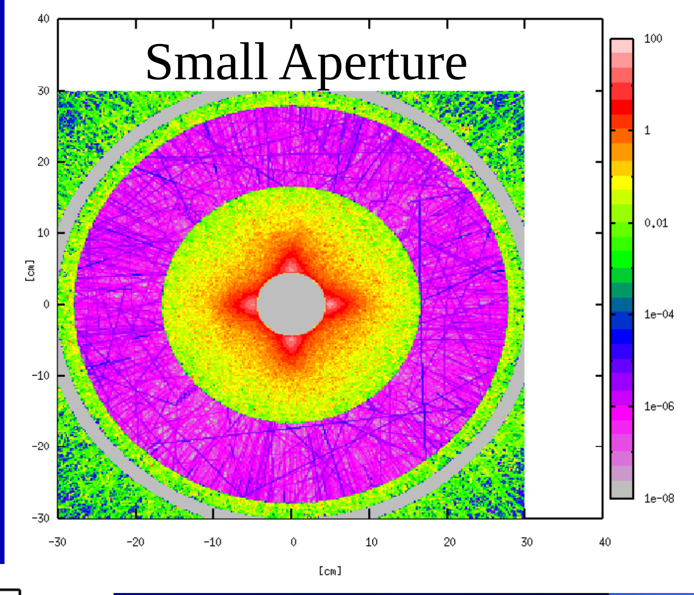


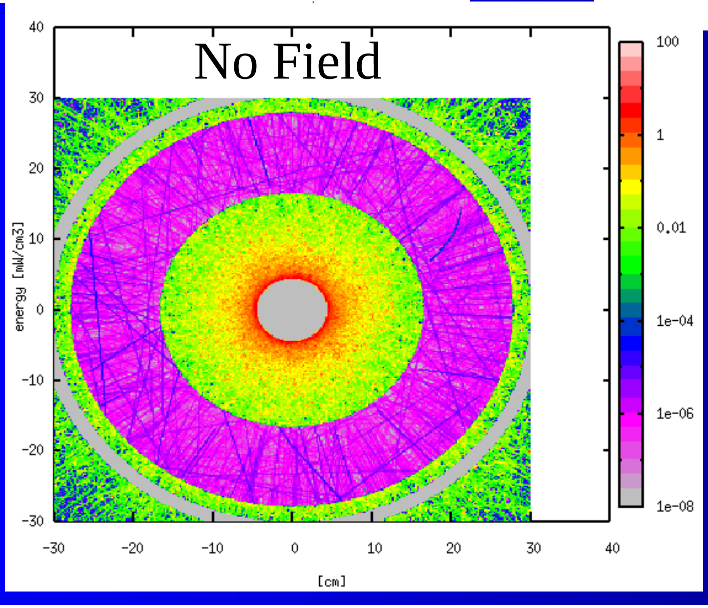


Has to be evaluated with complete ATLAS model. Scoring in the specific sensitive ATLAS regions!

Energy deposition in coil



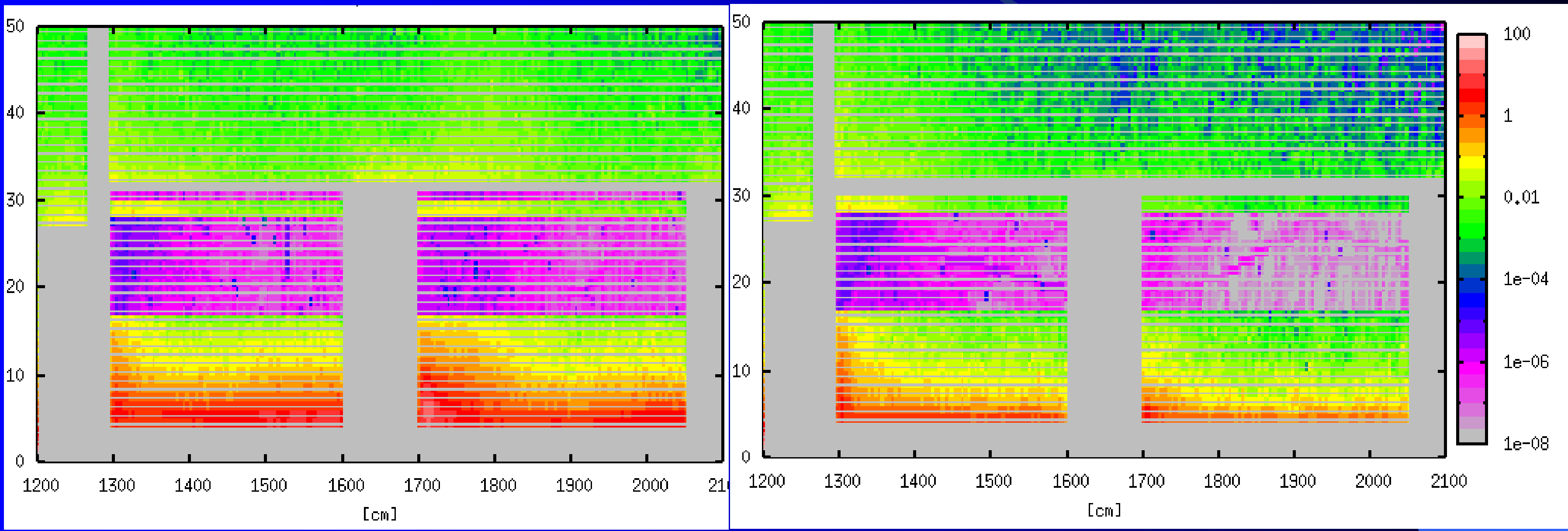




in mW/cm3

Aim: < 39 mW/cm3
Margin to be added

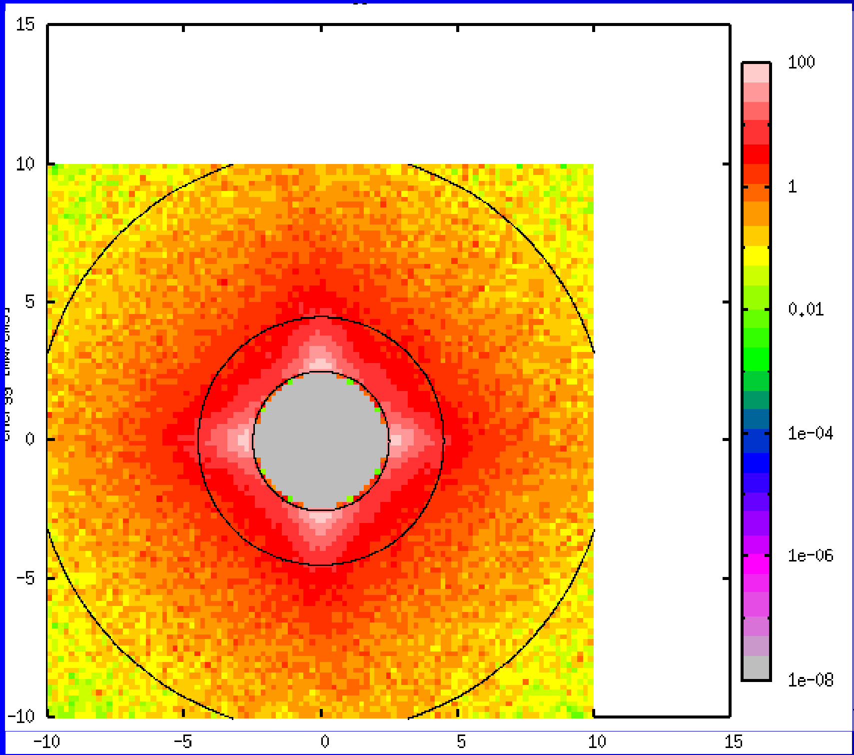
With and without magnetic field

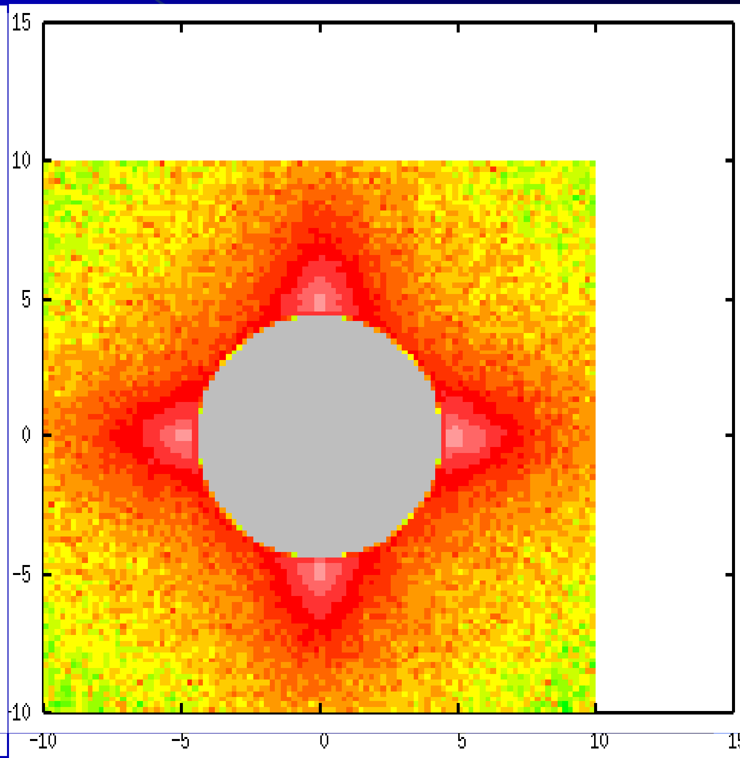


mW/cm3

Liner, 2 cm, iron

mW/cm3



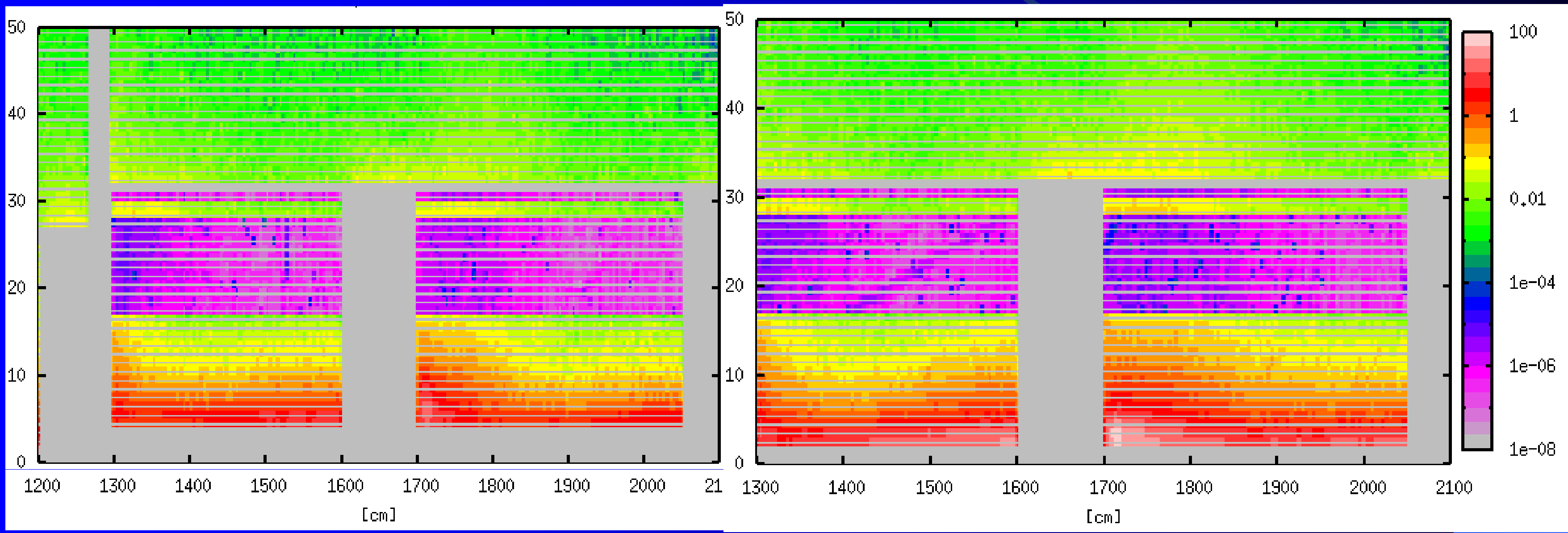


Necessary opening in Q0 for beam (diameter): 3.5 cm
With liner the opening is 5 cm

The TAS Aperture

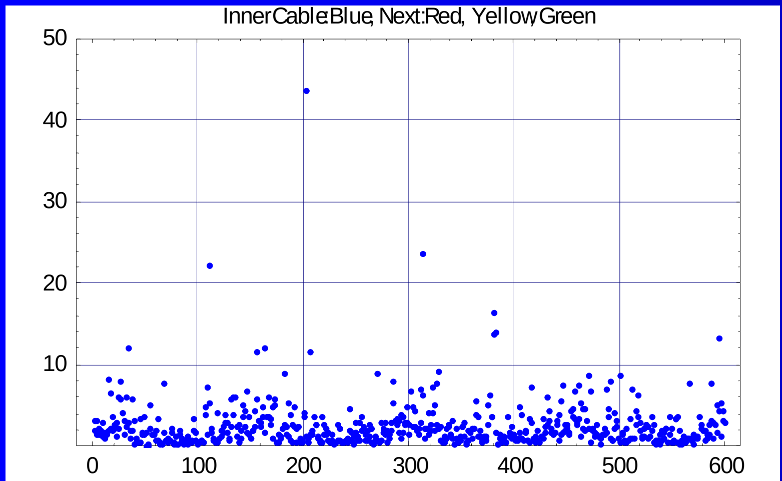
Power Deposition [W]	Q01	Q02	TAS
Staggered Aperture (liner)	198 (100)	331 (150)	1530
Staggered Aperture, liner & solenoid field	197	330	1550
Staggered Aperture, no liner	114	150	1582

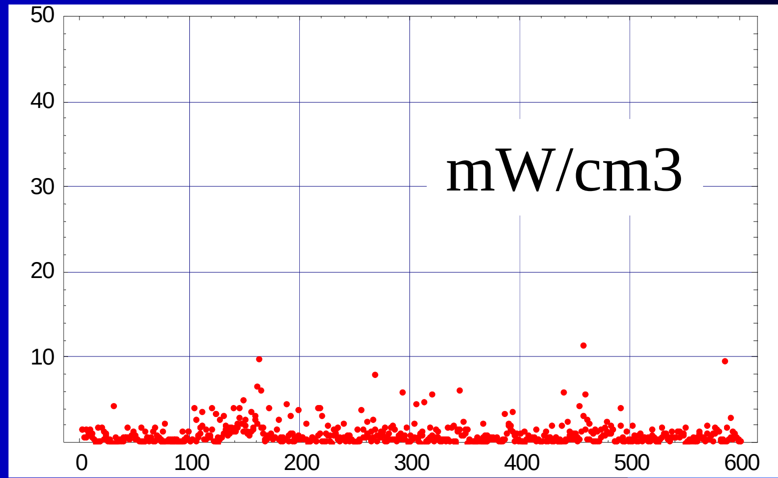
Without and with Liner



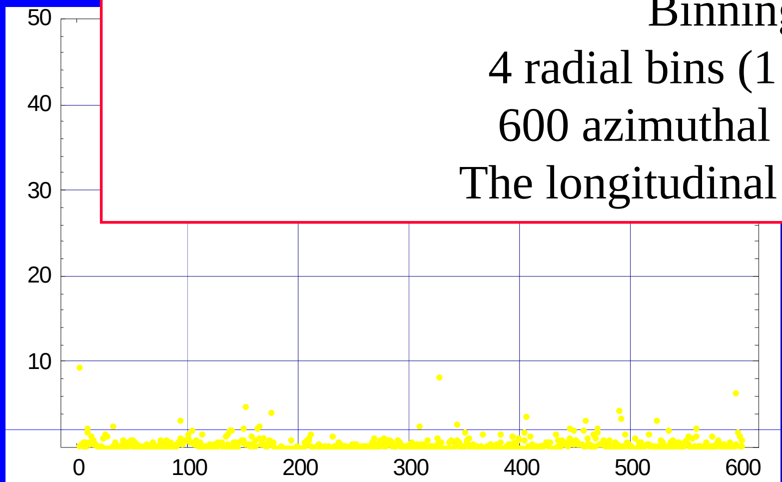
mW/cm3

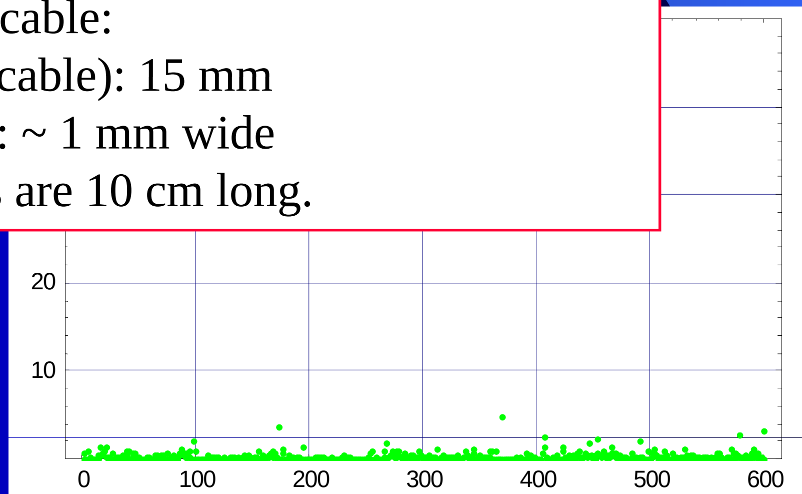
Power in the cables: Q01





Binning as cable:
4 radial bins (1 per cable): 15 mm
600 azimuthal bins: ~ 1 mm wide
The longitudinal bins are 10 cm long.

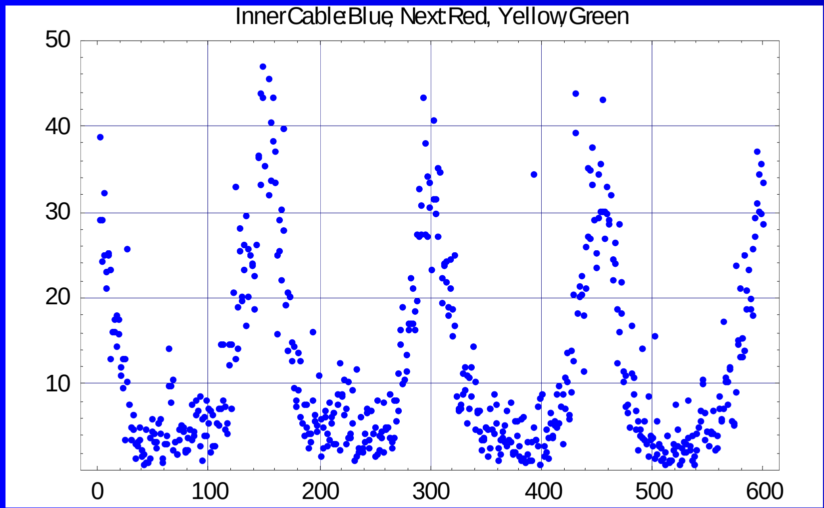


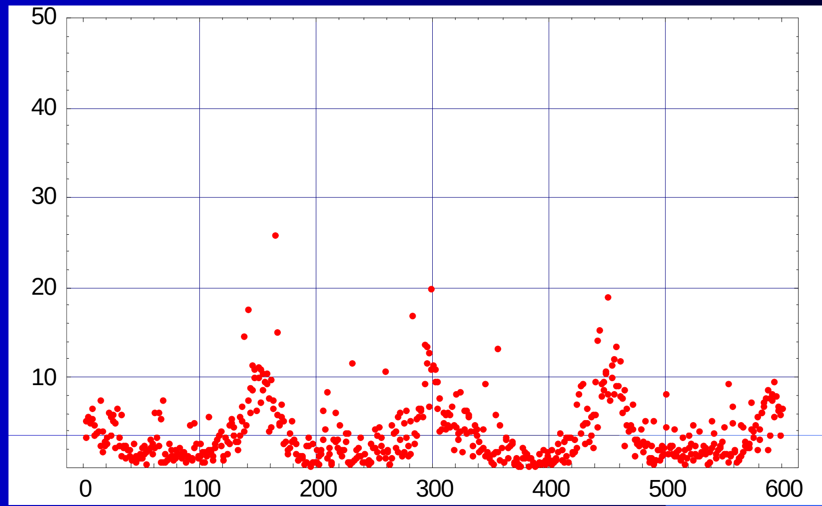


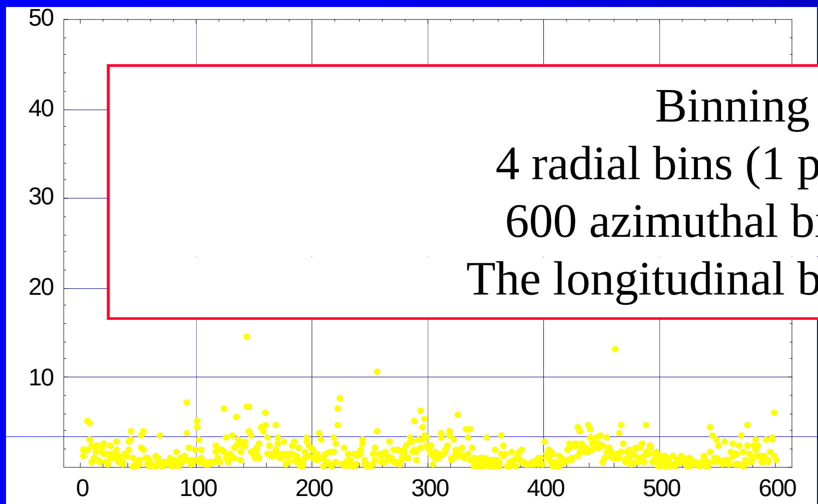
5 x 300 particles !

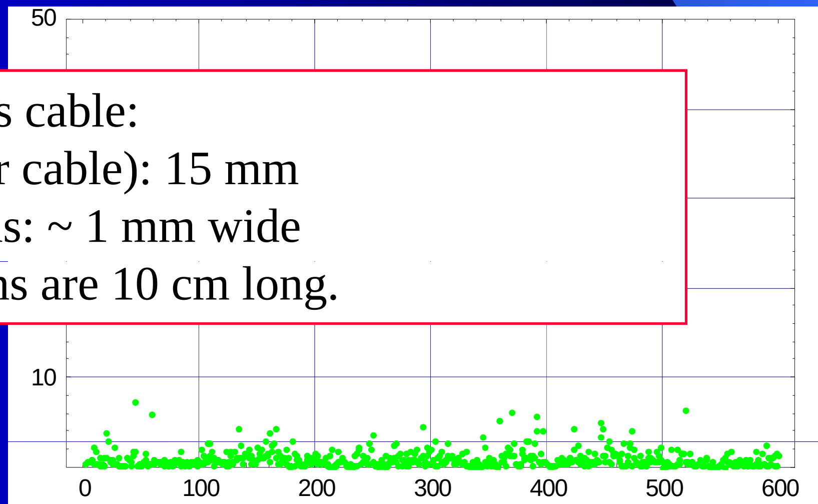
Power in the cables: Q02

mW/cm3





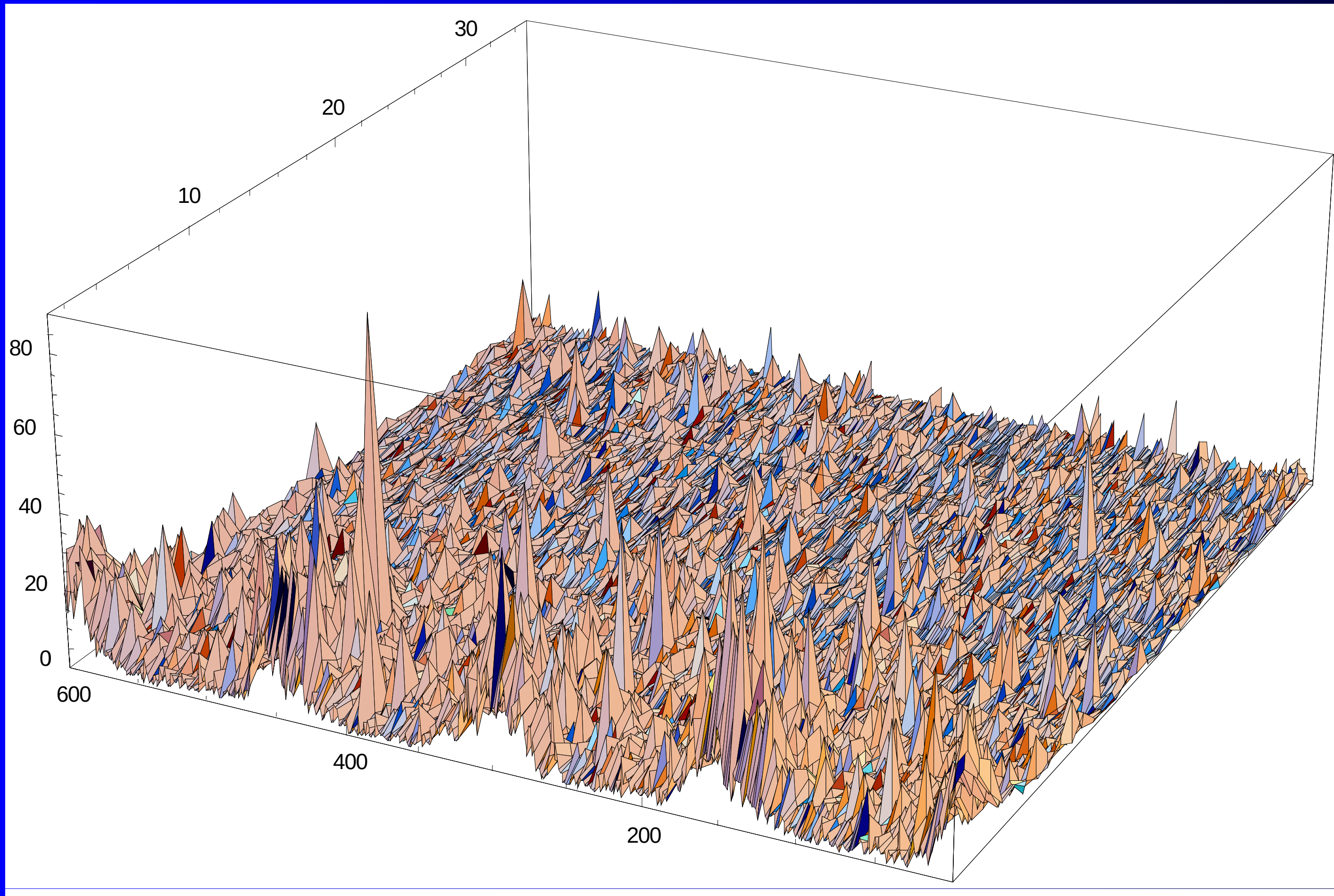




Binning as cable:
4 radial bins (1 per cable): 15 mm
600 azimuthal bins: ~ 1 mm wide
The longitudinal bins are 10 cm long.

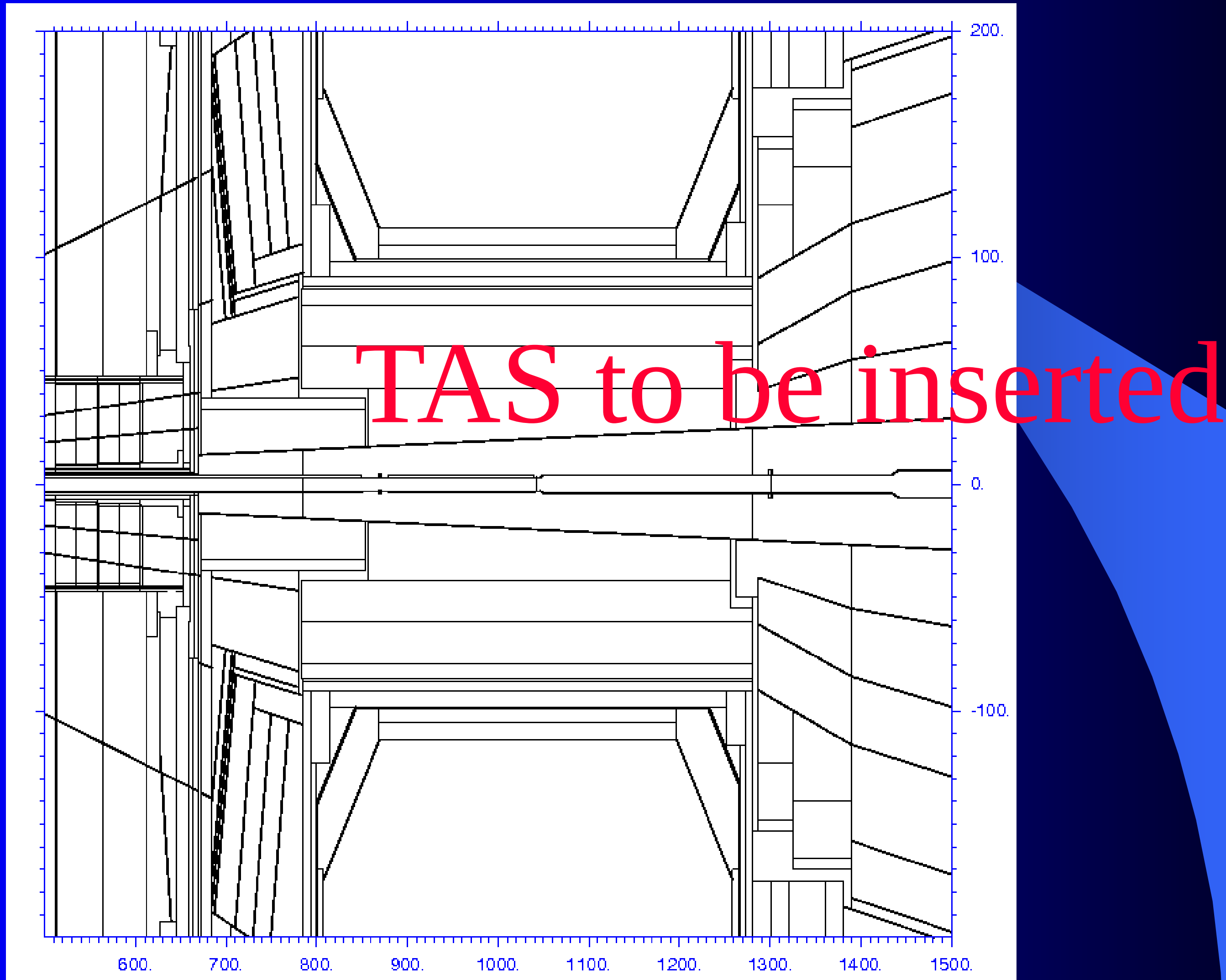
10-20 cm

Inner cable of Q02



mW/cm3

FLUKA model of ATLAS: JT



Summary 1

- Staggered TAS with a liner in the Q0 seems to be a reasonable solution:
  - magnet developers can continue
- Power deposition in the coil will be below 39 mW/cm3 (limit for quench) with some optimization. Margin needed.
- Solenoid field: no significant impact
- Crossing angle: no significant impact
- Tungsten TAS: no significant impact

Summary 2

- Shorter TAS (1 m) put at same distance (back edge) and 2 m closer to IP with adapted opening: more heat in magnet
- After optimization, more particles in FLUKA runs for better statistics necessary
- ATLAS model to be run with their scoring in their regions of interest. Compare:
    - Model without new TAS
    - Model with new TAS