

Drive Beam losses in CLIC module

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Outlook

- Goals of the study
- Simulated geometry
(drawings and dimensions - Alexandre Samochkine)
- Loss pattern
- Spectra of particles after quadrupole –
comparison with FLUKA
(Sophie Mallows, very advanced study)

Goals

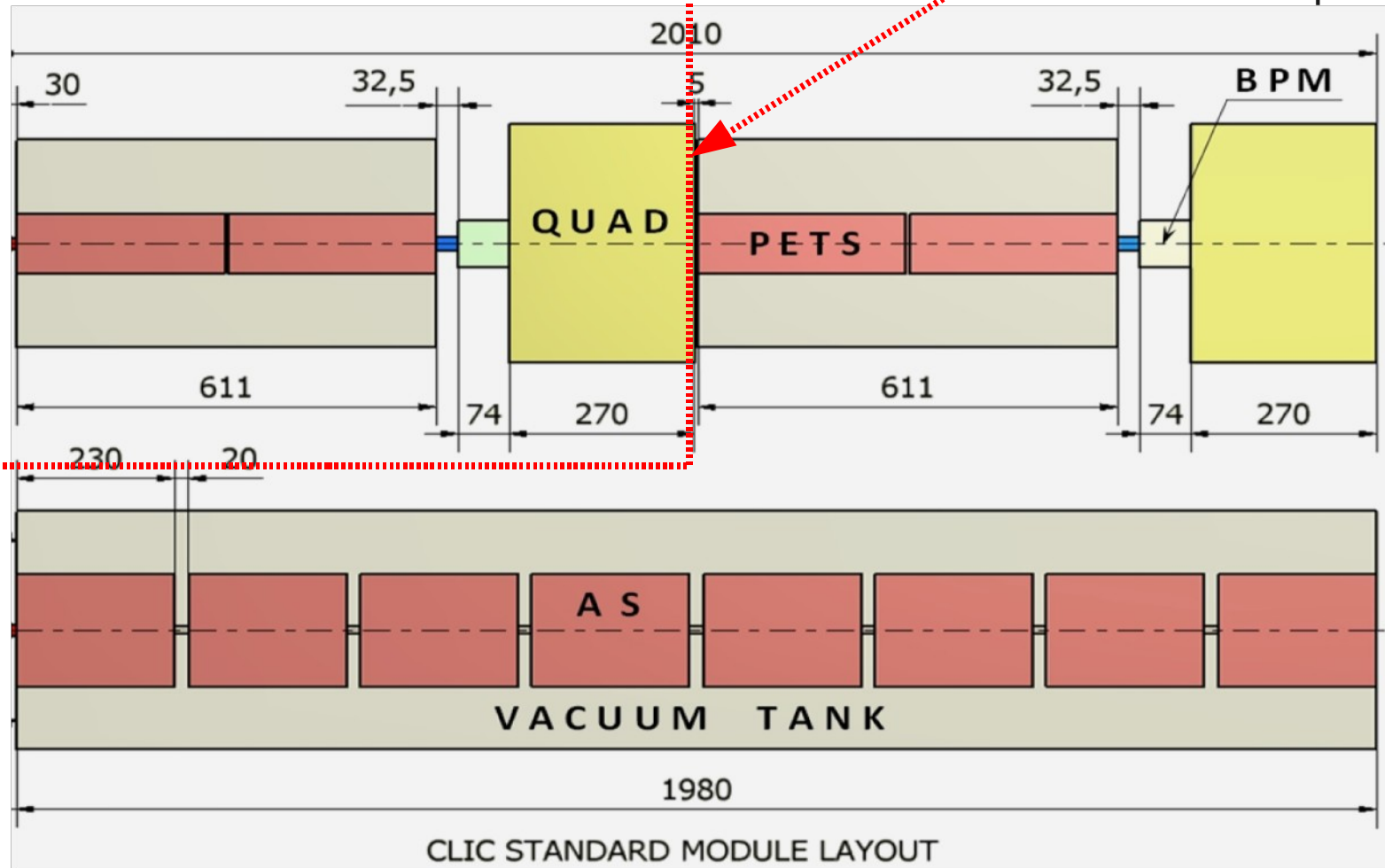
- Wider perspective: determine detector technology to monitor beam losses on CLIC
- Method to distinguish between Main/Drive beam losses

- A first look on the radiation field in the tunnel using similar approach as for LHC BLMs
- Plot spectra of particles exiting the quadrupole magnet of the drive beam
- Comparison with FLUKA results

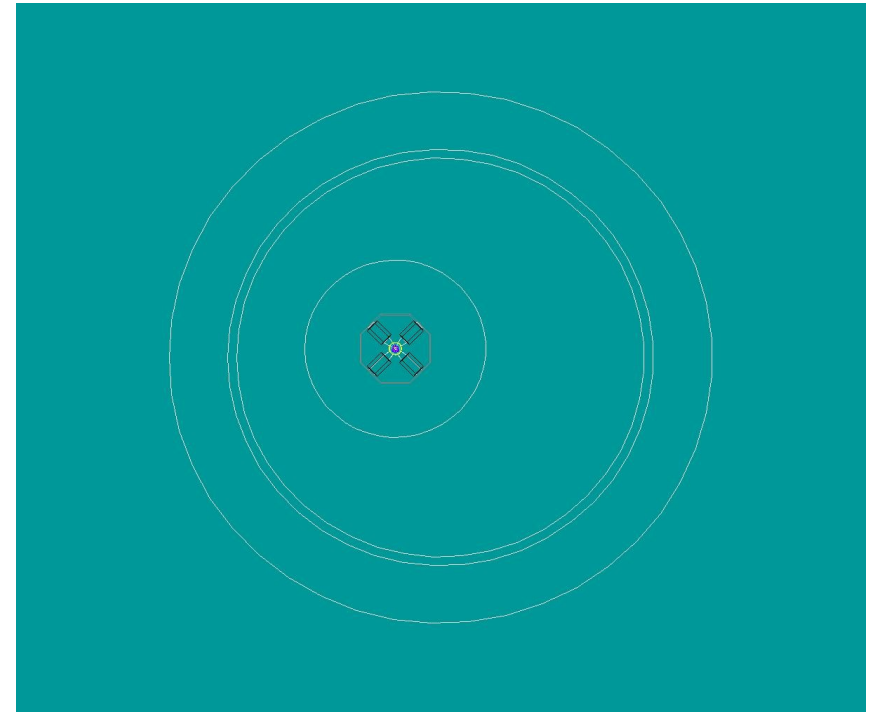
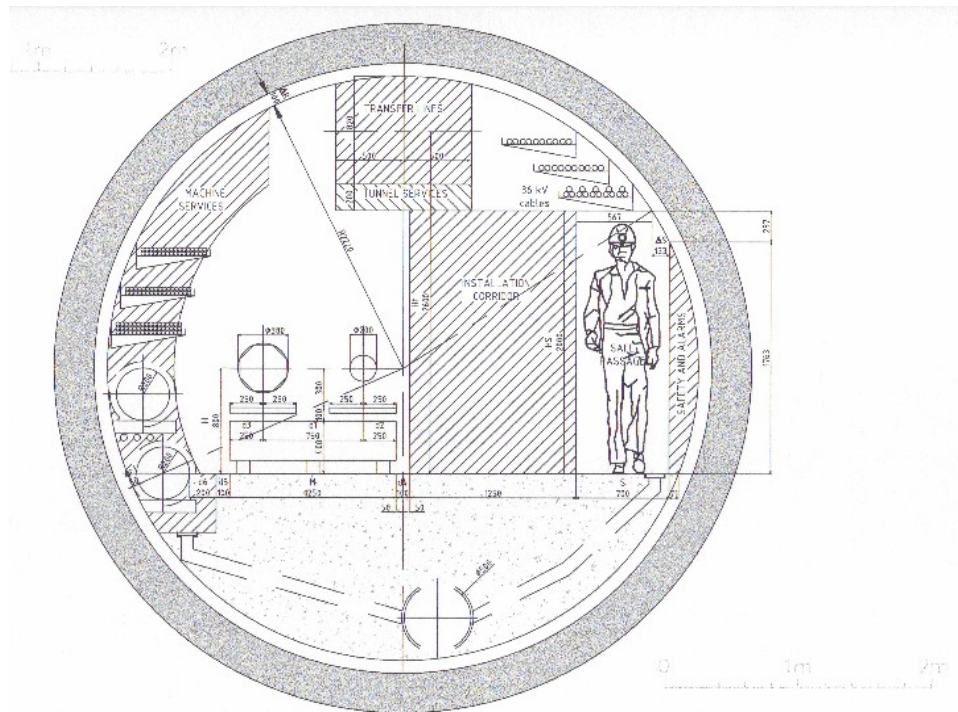
Geometry (I)

a module – can be cloned

Spectra measured at the exit of Quadrupole



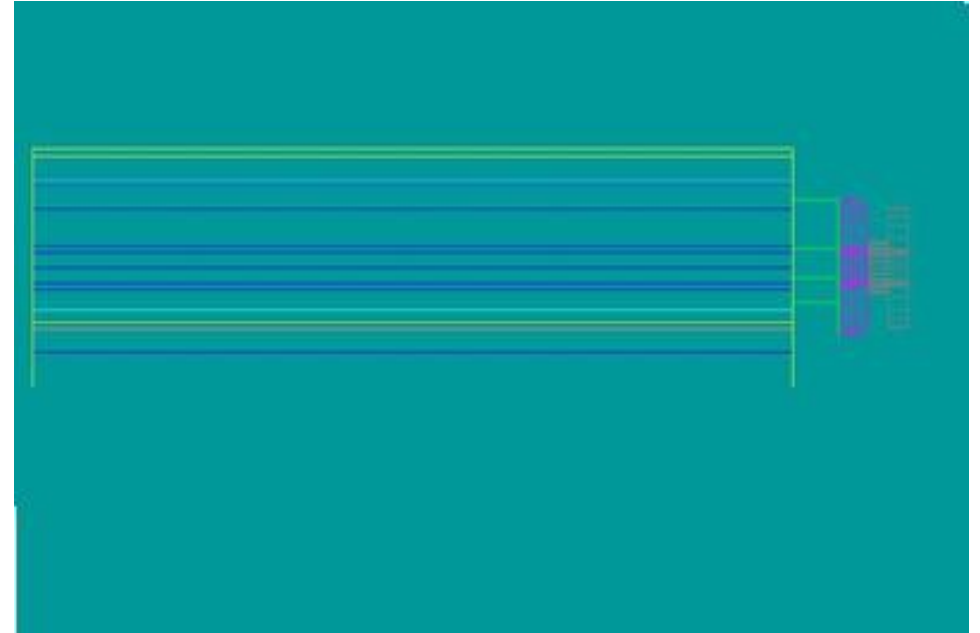
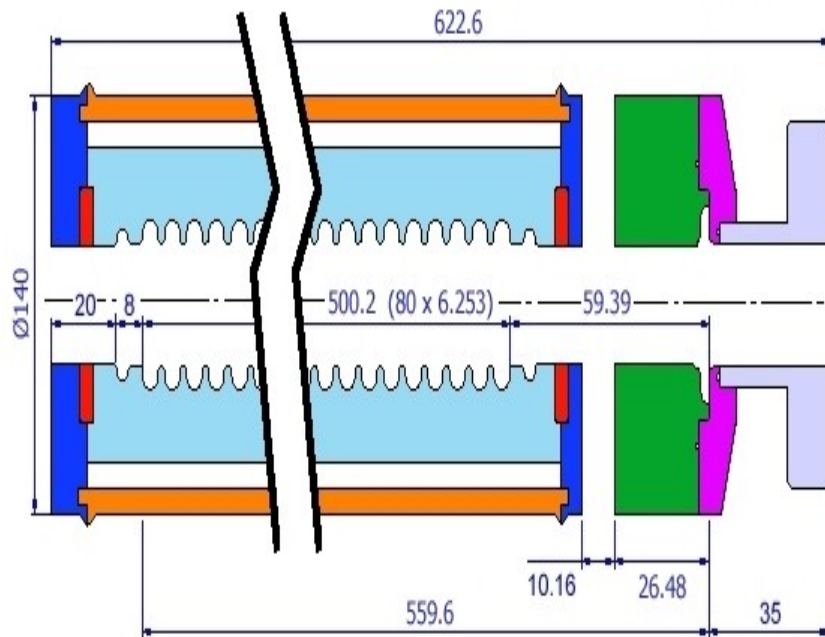
Geometry (II) – transverse section



Upgrades: main beam
tunnel floor

...

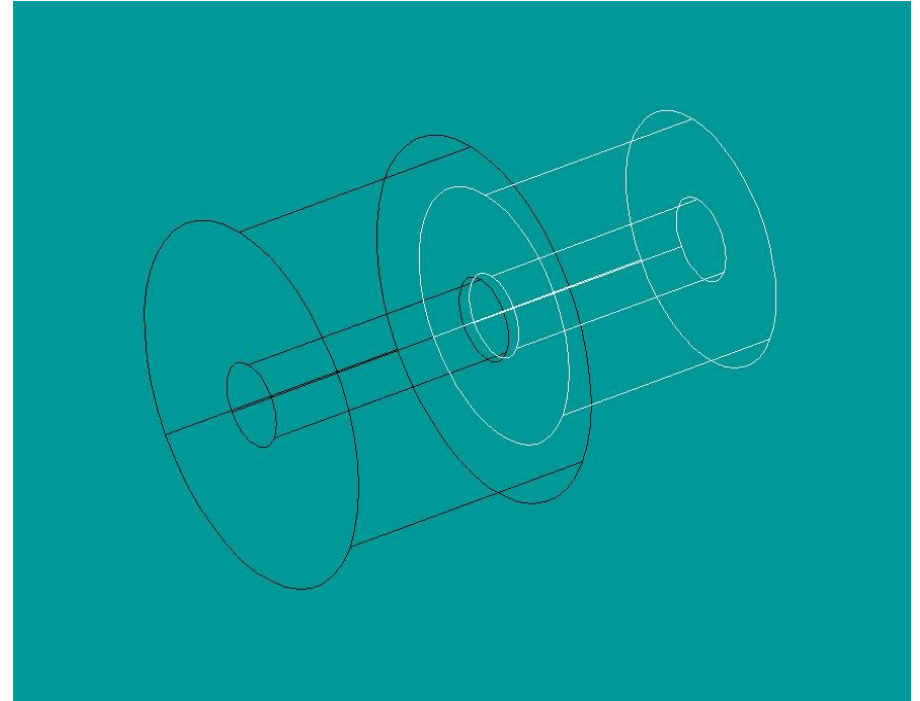
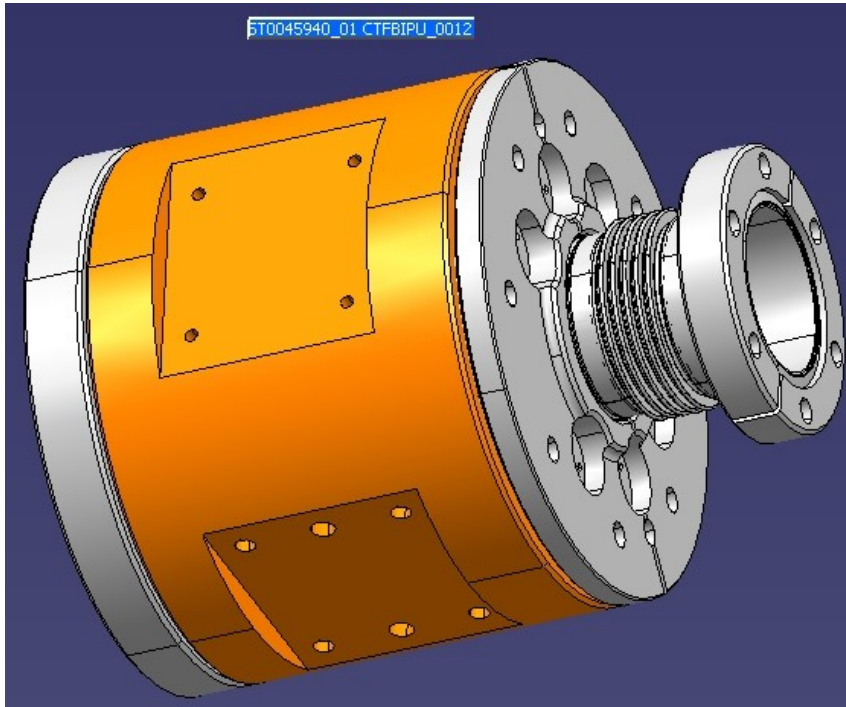
Geometry (III) – PETS



One long PET instead of two connected, no cavity structures + other details are missing in the simulation.

Upgrade: ?

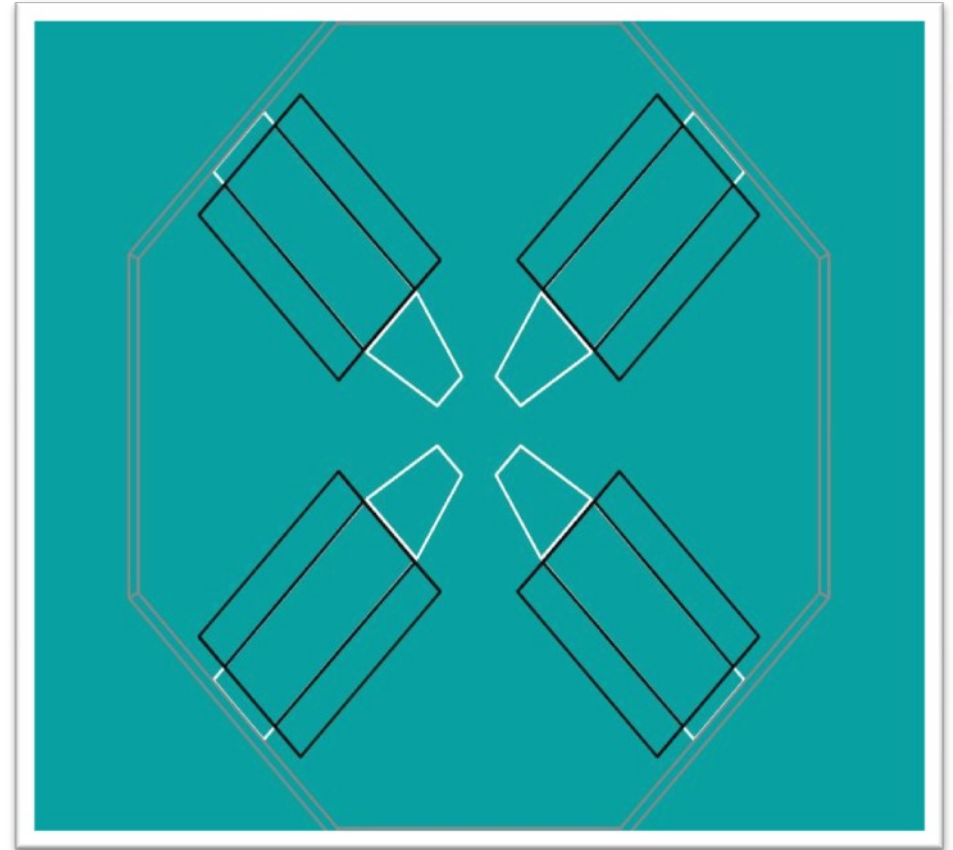
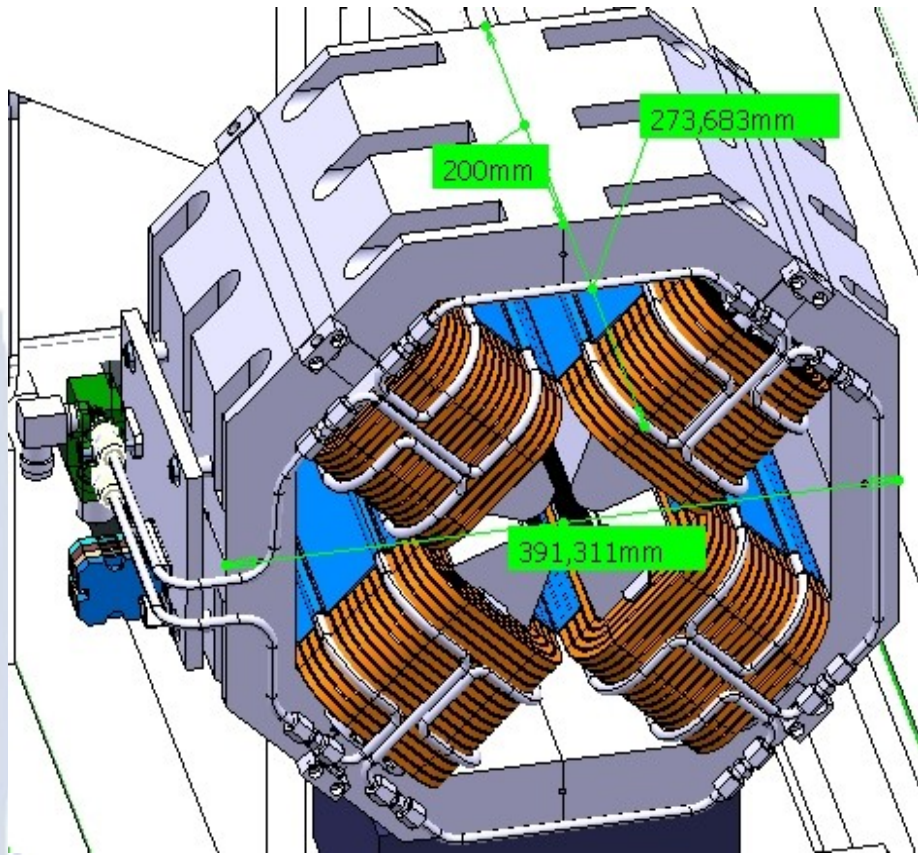
Geometry (IV) – BPM



Assumed as a simple combination of two tubes of different outer radius but same inner (Vacuum Chamber).

Upgrade: check dimensions

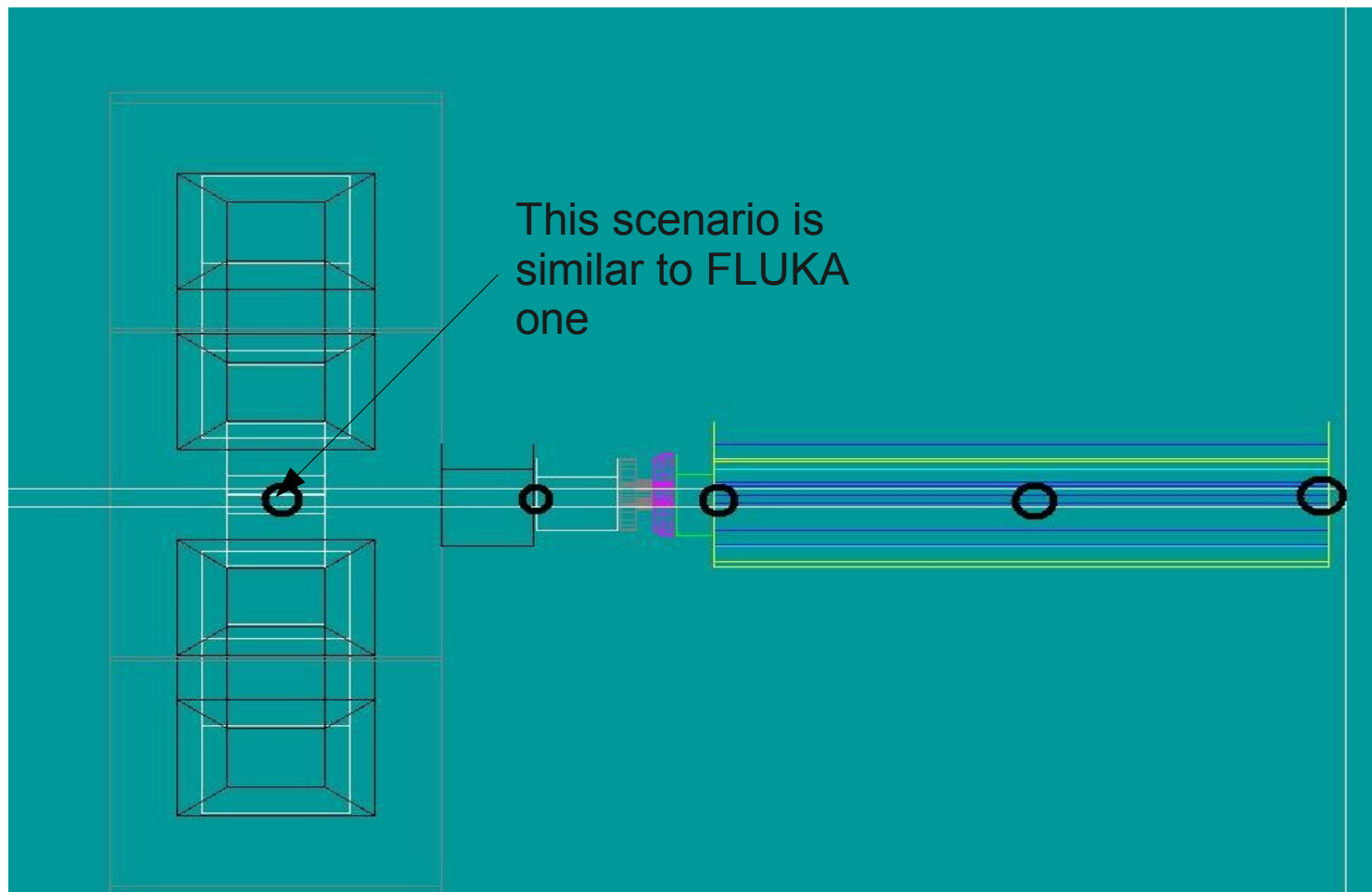
Geometry (V) – Quadrupole



- The amount of material in the simulation visually is smaller than on the technical drawing.
- Implementation of the 4-pole structure with empty spaces may explain the difference in spectra between these simulations and FLUKA

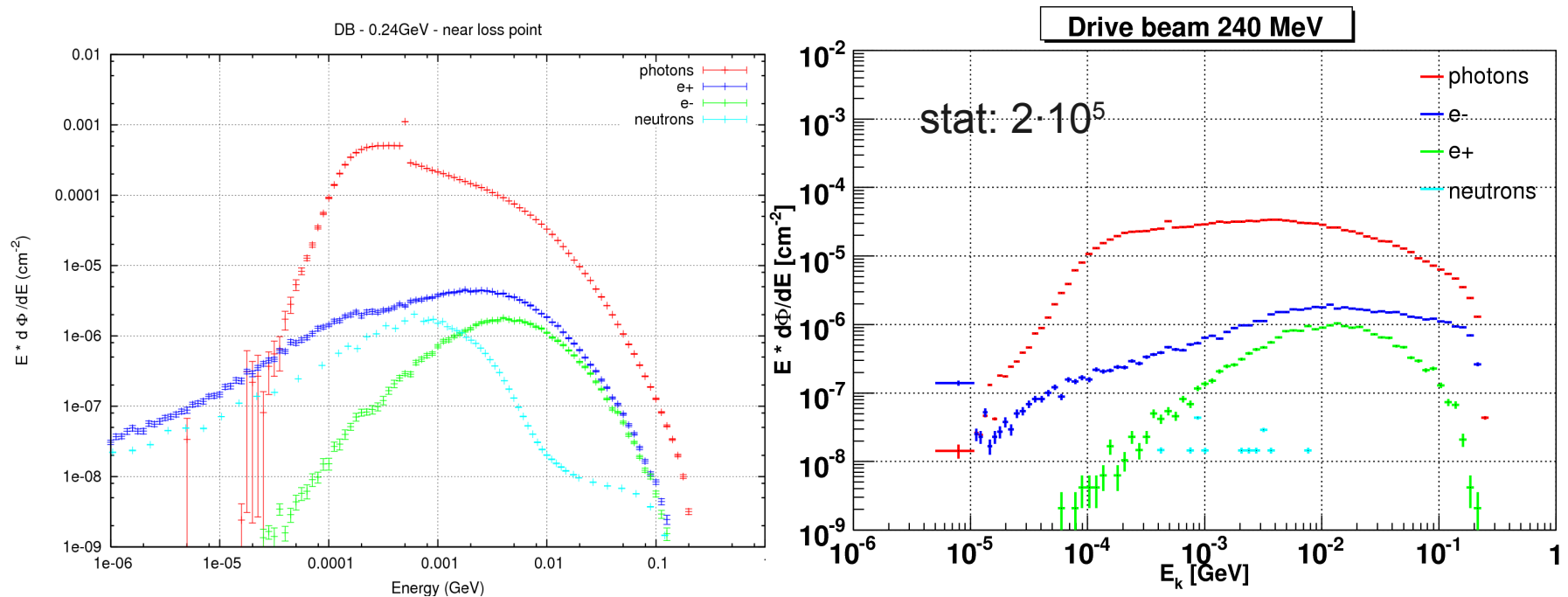
Event generation

- Impact angle: $250 \mu\text{rad}$, $1 \mu\text{m}$ from surface of vacuum pipe, around beam pipe



Fluxes (I) 240 MeV

Loss in the middle of quadrupole

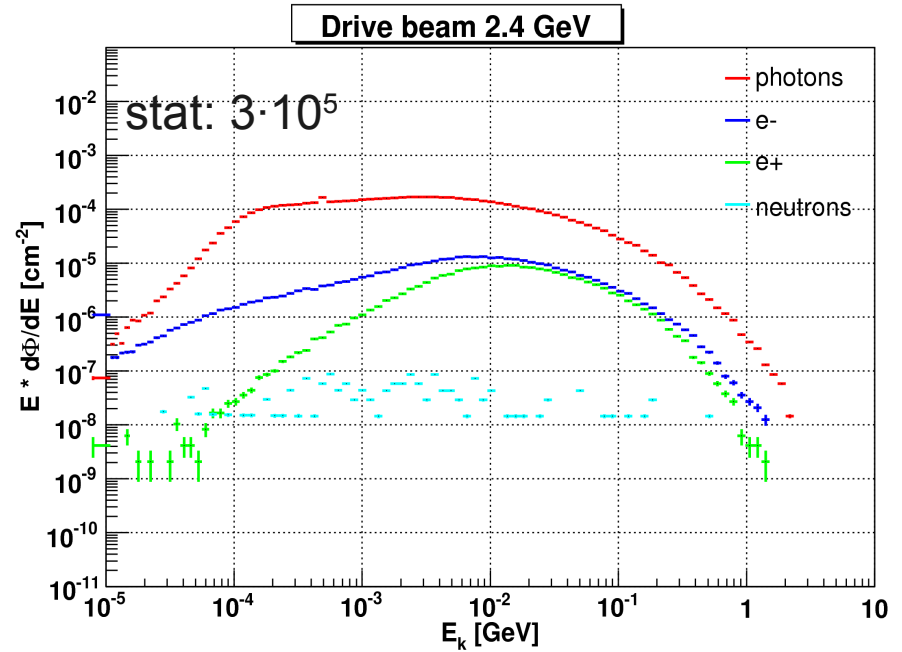
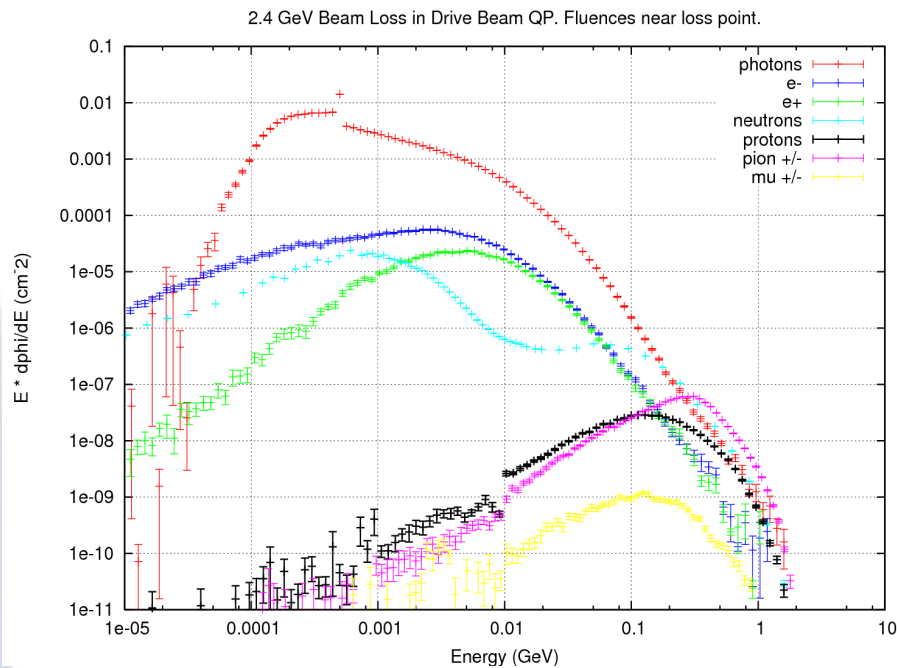


Observations for Geant4 results:

- photons – more flat spectrum, cutoff at 200 MeV
- much less neutrons
- e+/e- - colors switched?

Some of these observations can be explained by the geometry differences (mainly less material between loss location and detection)

Fluxes (II) 2.4 GeV



Comments: similar to 240 MeV case
+ need more stat to see hadrons

Conclusions

- Basic geometry of drive beam has been created
- Geometry is modular
- Obtained preliminary spectra similar to FLUKA results
- Discussion of the differences is ongoing
- Future upgrades in the geometry: tunnel floor (neutrons) and main beam