Absorbed doses on super-conducting magnets

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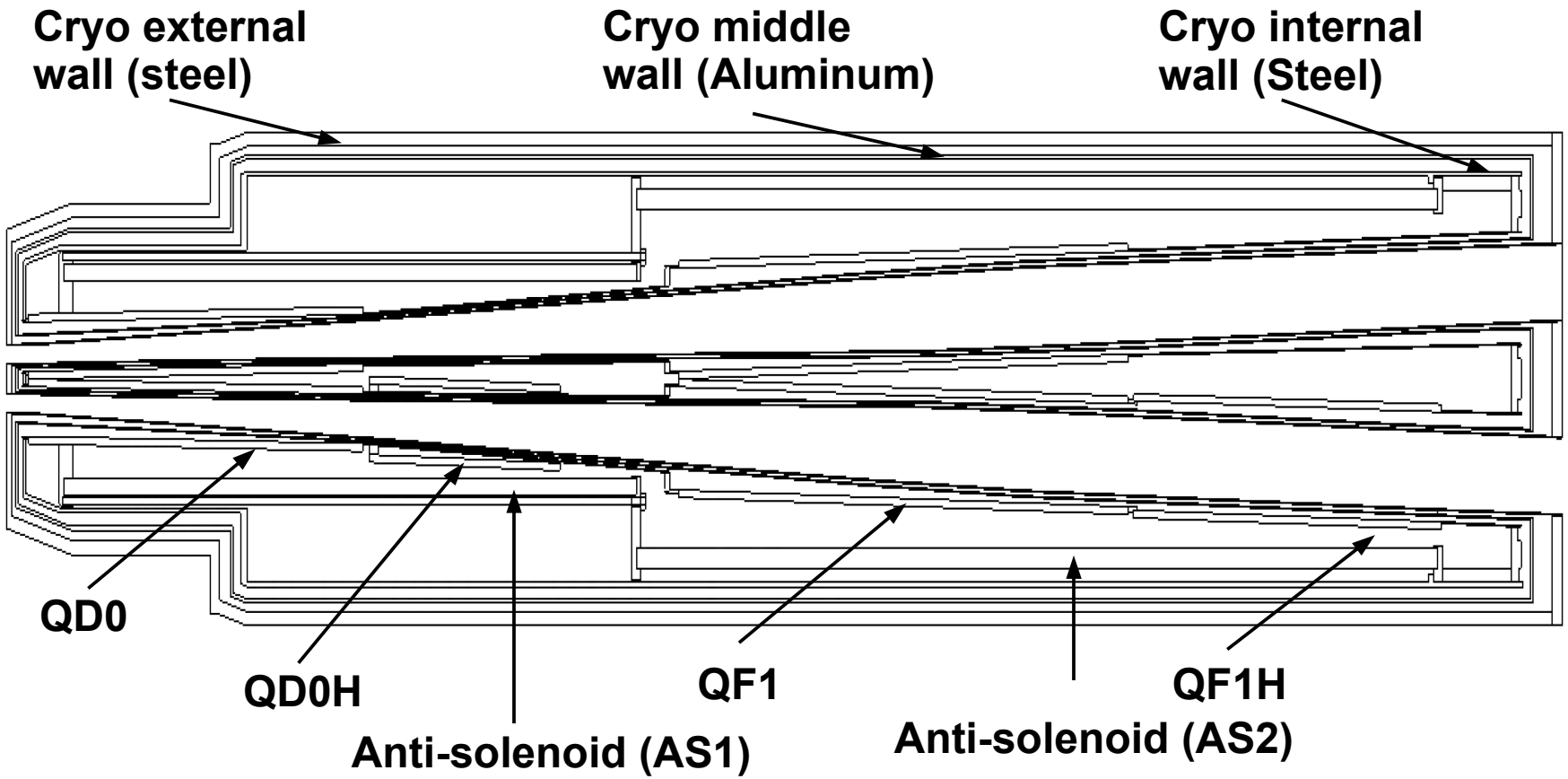
LNF SuperB Collaboration Meeting

Outline

- **New final focus (FF) model**
  - Geometry: Super-conducting magnets and Cryostat
  - Magnetic model: detector solenoidal field inside FF
- **November 2011 full-simulation production**
  - Requested samples and production summary
- **Absorbed doses on the super-conducting magnets**
  - The method
  - Results
- **Summary**

New FF model: Cryostat and Magnets (I)

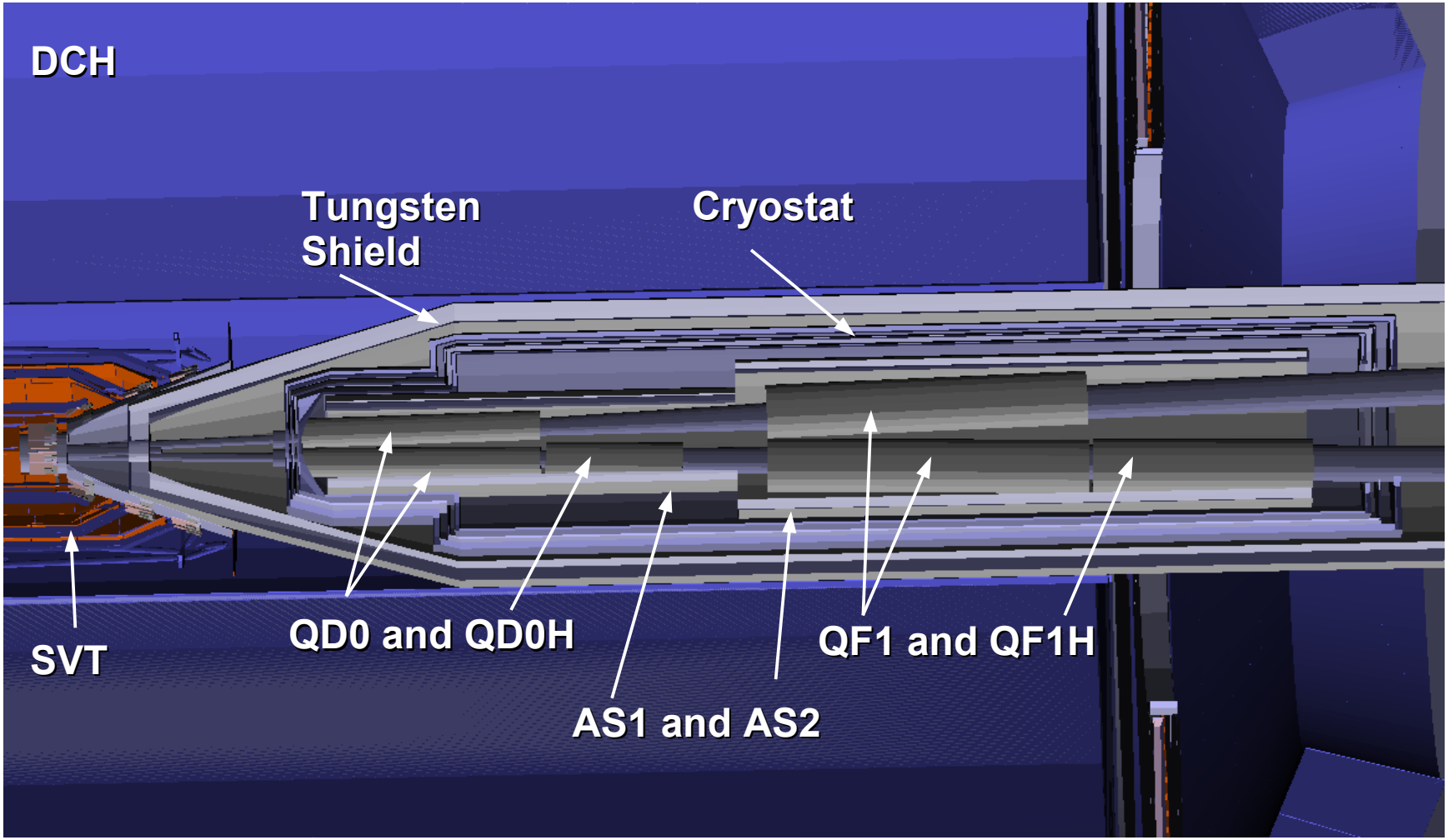
Filippo Bosi Drawings



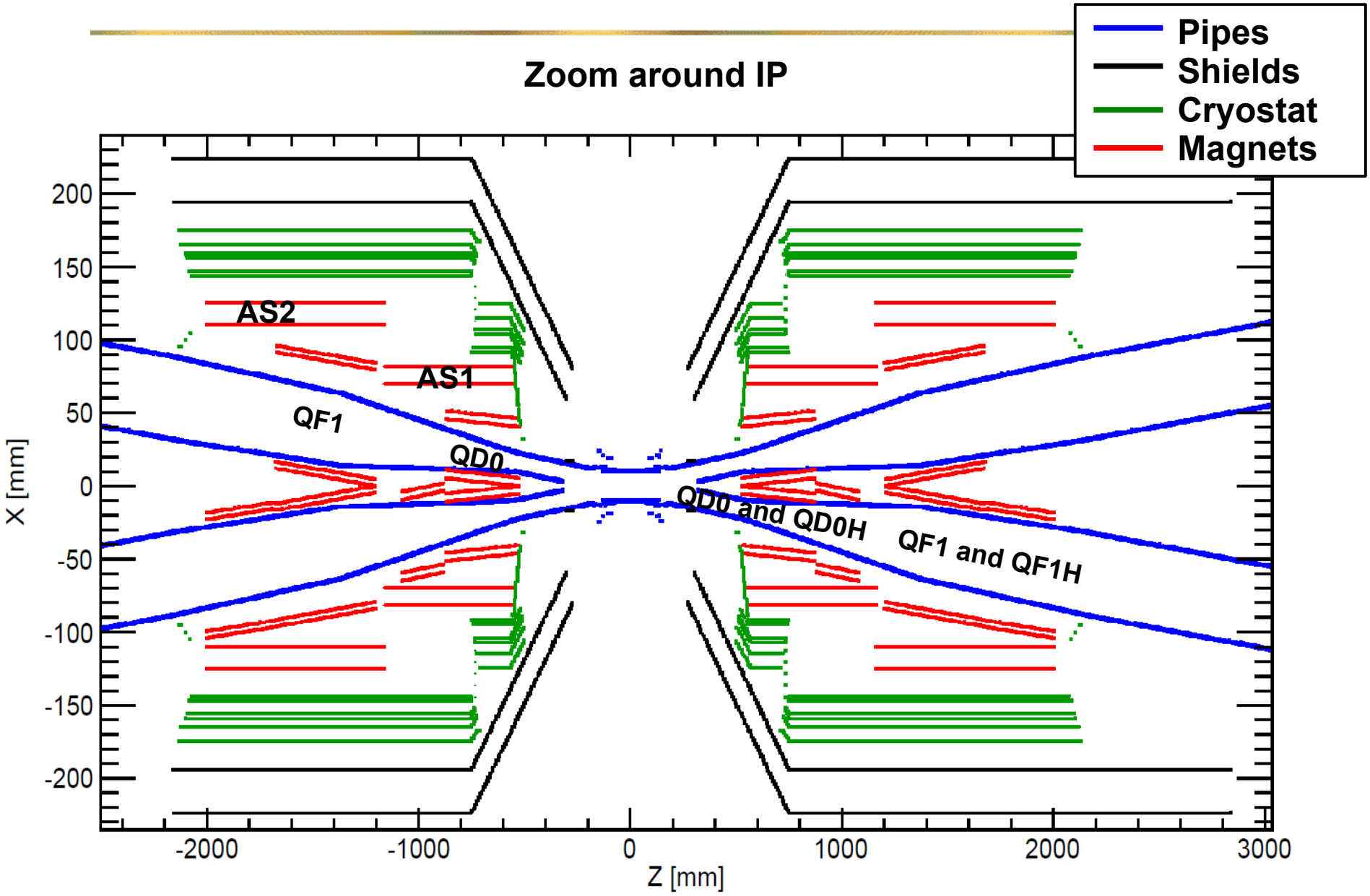
- **All magnetic elements are made of the same material (QD0_mixture):**
  - Density: 7.57 gr/cm^3
  - Composition: Niobium (0.106), Titanium (0.119), Cooper (0.347) and Iron (0.428)

New FF model: Cryostat and Magnets (II)

BRN implementation



New FF model: Cryostat and Magnets (III)

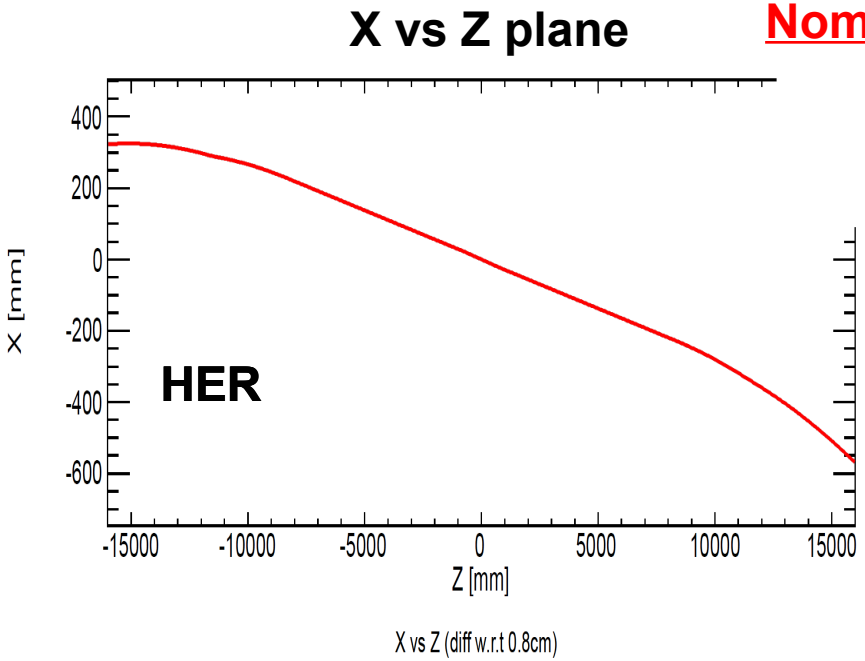


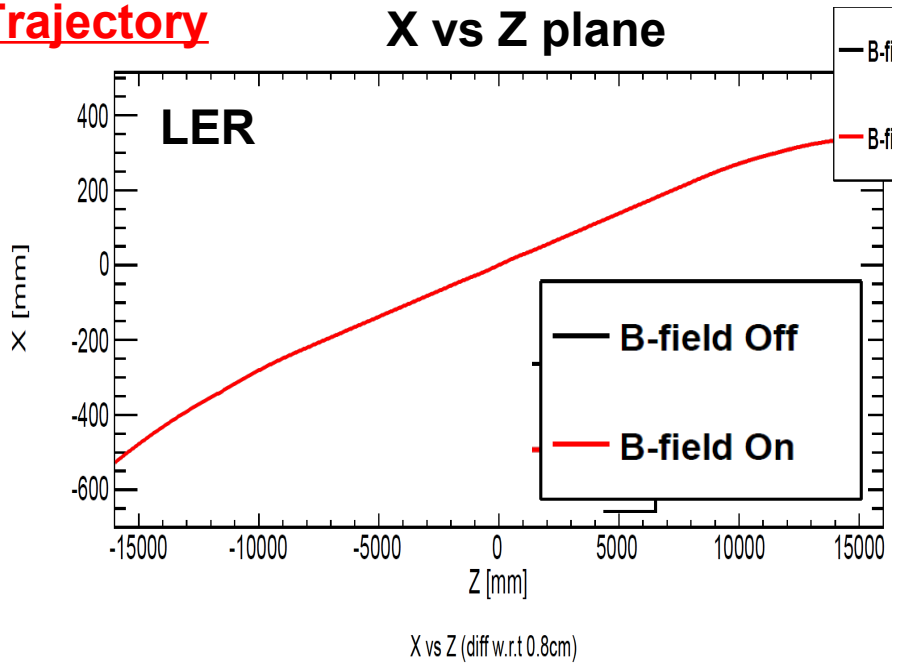
New FF model: Magnetic model (I)

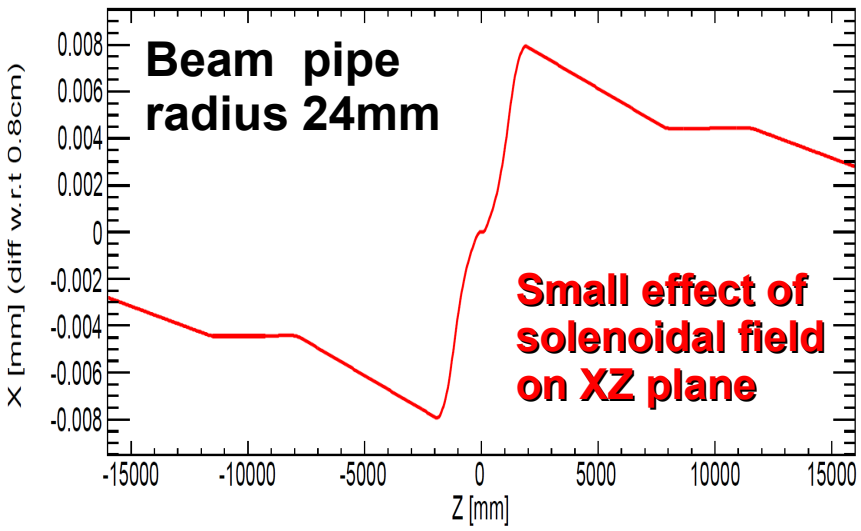
- **Previously:**
  - detector solenoidal field turned off in final focus magnetic model
- **This field is important for an accurate model of two-photon (pairs) backgrounds on SVT. Less important for Rad-Bhaha and Touschek**
- **Implementation:**
  - Magnitude: 1.5 Tesla
  - Direction: Z>0 (0.0,0.0,1.0)
  - Volume: field different from zero only inside a cylinder of length 40cm and radius 40cm.

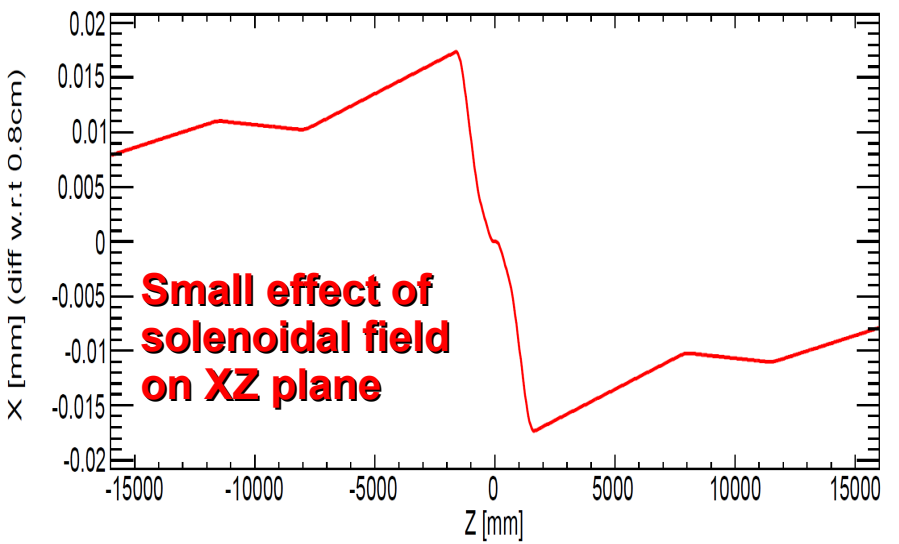
New FF model: Magnetic model (II)

Nominal Trajectory



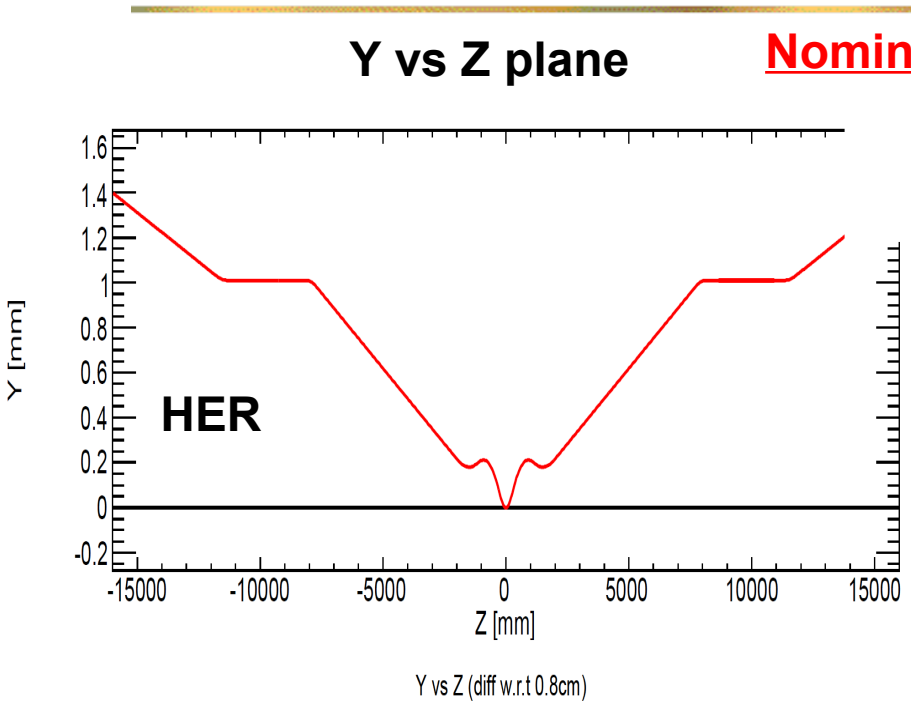


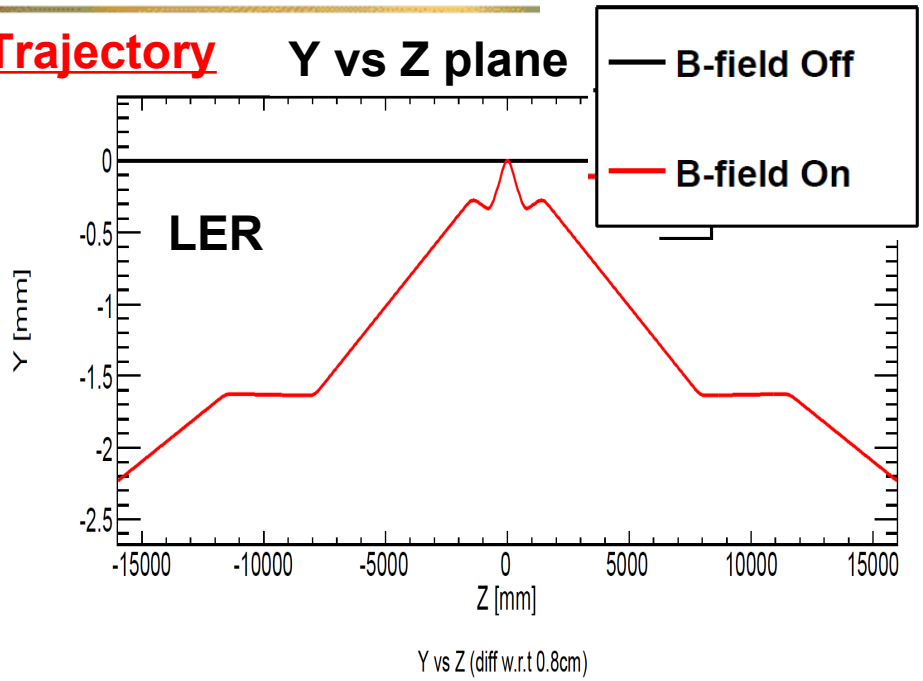


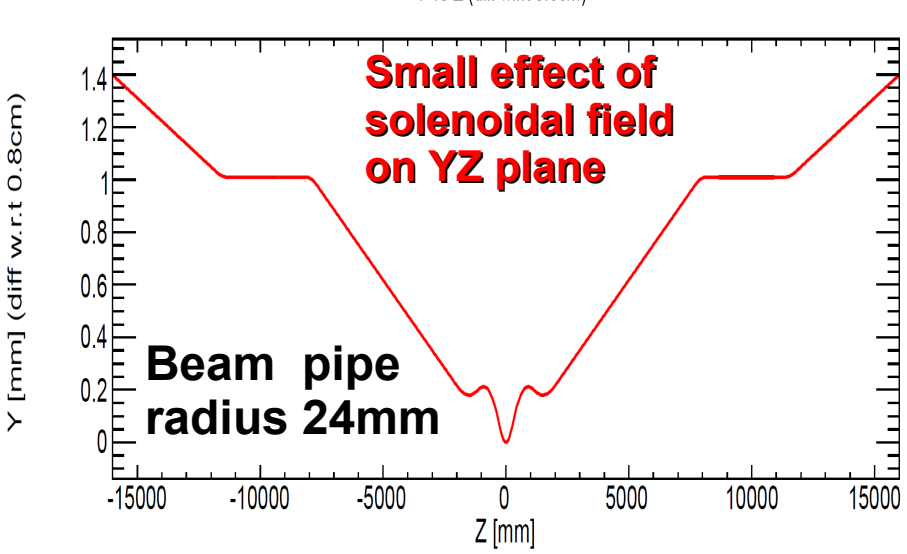


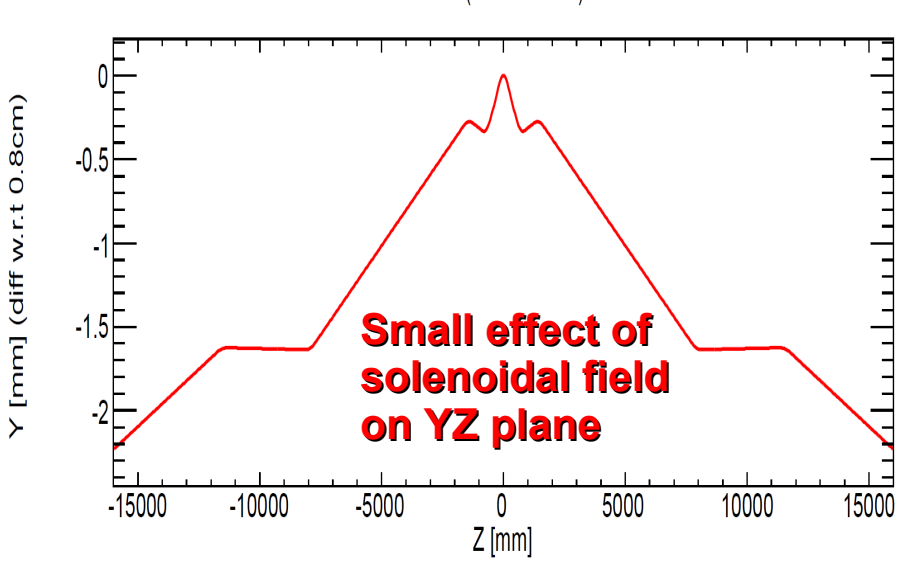
New FF model: Magnetic model (III)

Nominal Trajectory







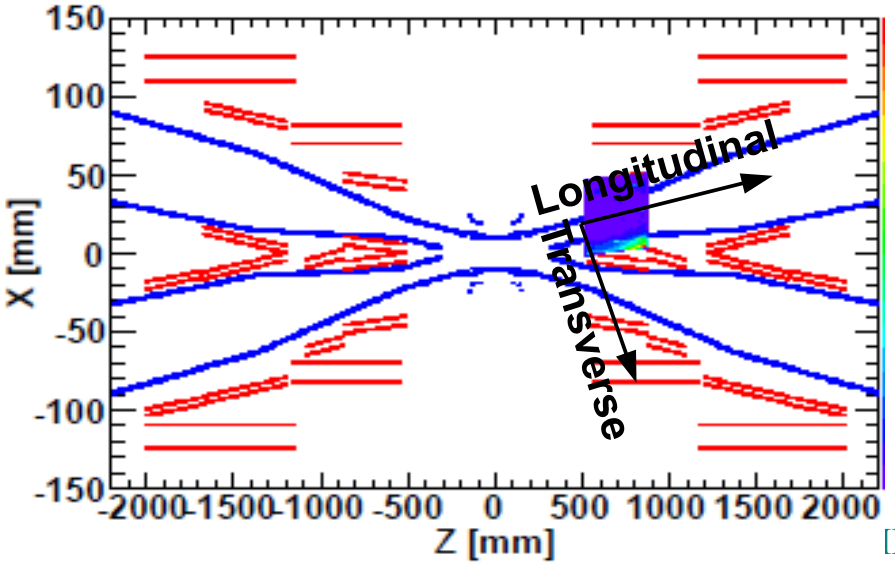


November 2011 Full-simulation production

- **Rad-bhabha:** ~10k bunch crossings
- **Pairs:** ~100k bunch crossings
- **Touschek:**
  - LER: ~180k primaries (losses at beam pipe)
  - HER: ~85k primaries (losses at beam pipe)
- **See more details about these samples in my report on Parallel Parallel VII: Computing – FullSim & Background (Thursday, 15 December at 9am)**

The Absorbed Doses: Strategy

- **Local coordinates:**
  - Longitudinal: axis of the magnetic cylinder and pointing away the IP
  - Angular (ϕ): angle w.r.t. the local (transverse) X-axis on the horizontal plane
    - QD0, QD0H, QF1 and QF1H: local X-axis points to the global Z-axis
    - Anti-solenoids: local X-axis is the same as global X-axis



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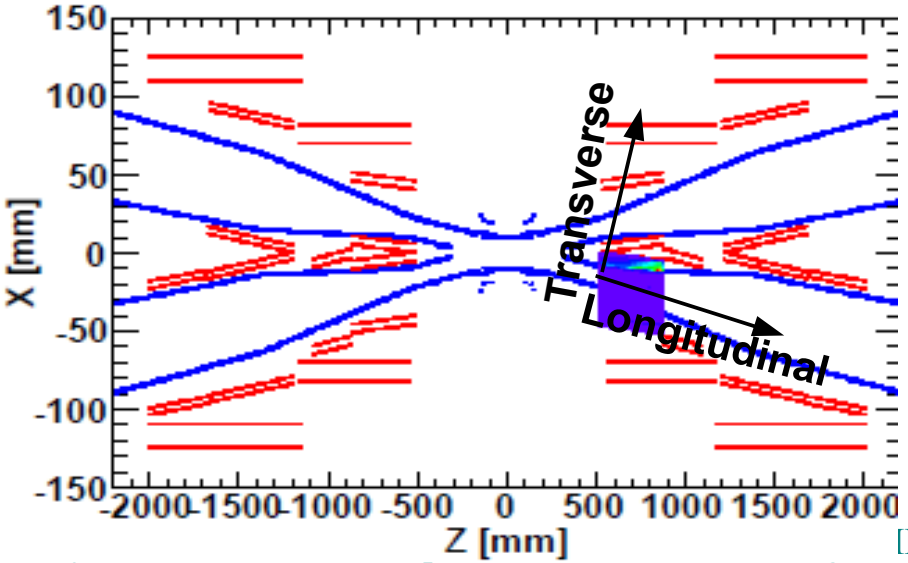

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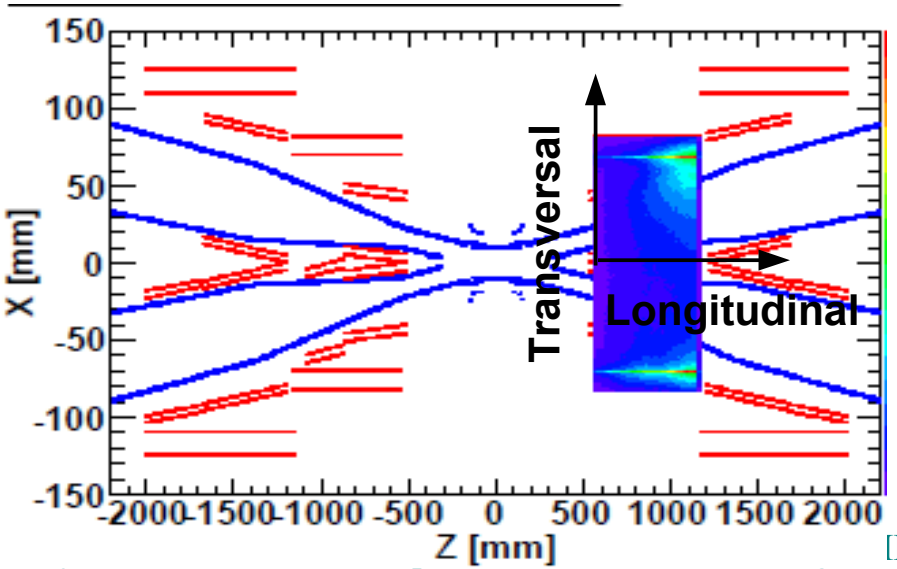

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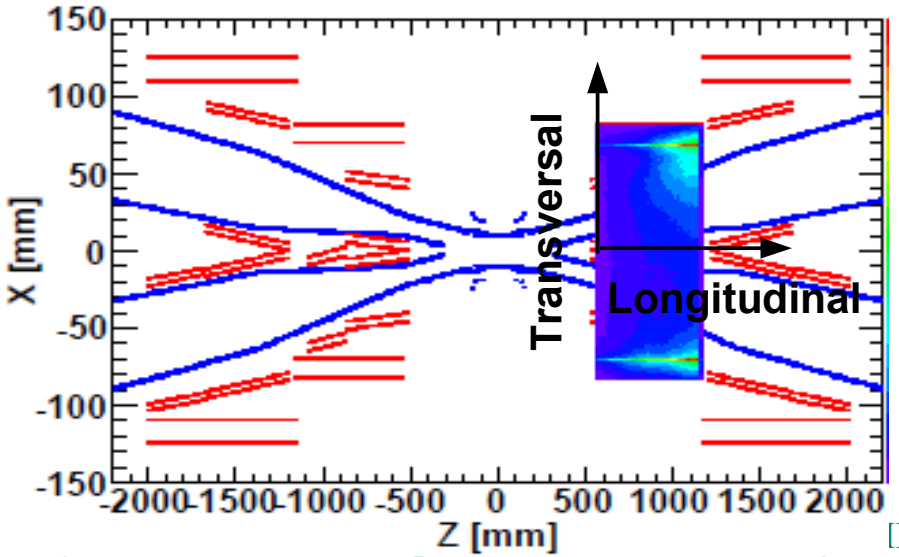
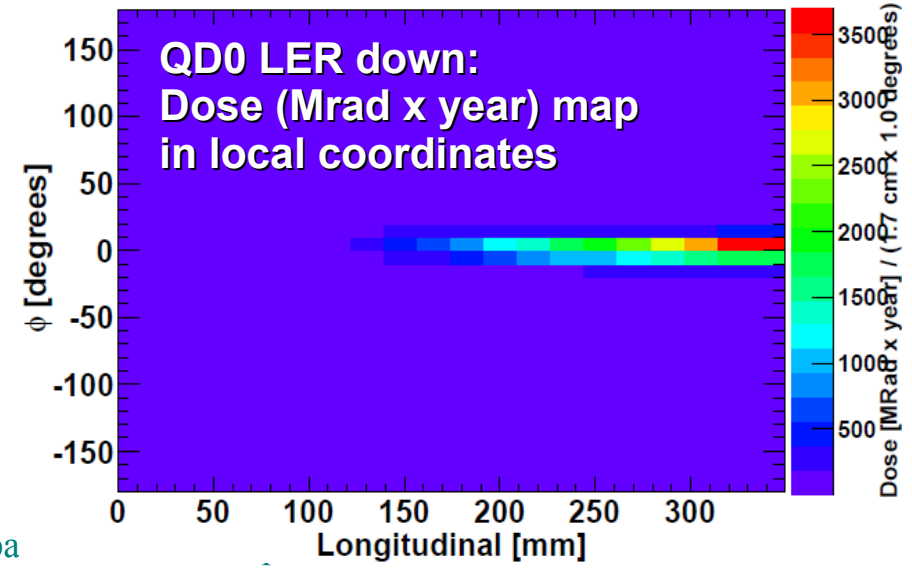
    - Anti-solenoids: local X-axis is the same as global X-axis
- **Using the full-sim production samples compute for every magnet:**
  - Absorber power and doses (per year, i.e. 365 days) in bins of longitudinal vs ϕ local coordinates
  - Total absorbed power
  - Value of the bin with the maximum absorbed dose





Results

- **I will show the results for the Rad-bhabha samples for some of the magnets**
- **The results for all the magnets and samples can be seen at the links below**
  - Rad-bhabha:

http://www.slac.stanford.edu/~aperez/SuperB/SuperB_Pisa/Magnets_Dose_Studies/Plots_RadBhabha_background_AbsDose_FullProduction.pdf

  - Pairs:

http://www.slac.stanford.edu/~aperez/SuperB/SuperB_Pisa/Magnets_Dose_Studies/Plots_Pairs_background_AbsDose_FullProduction.pdf

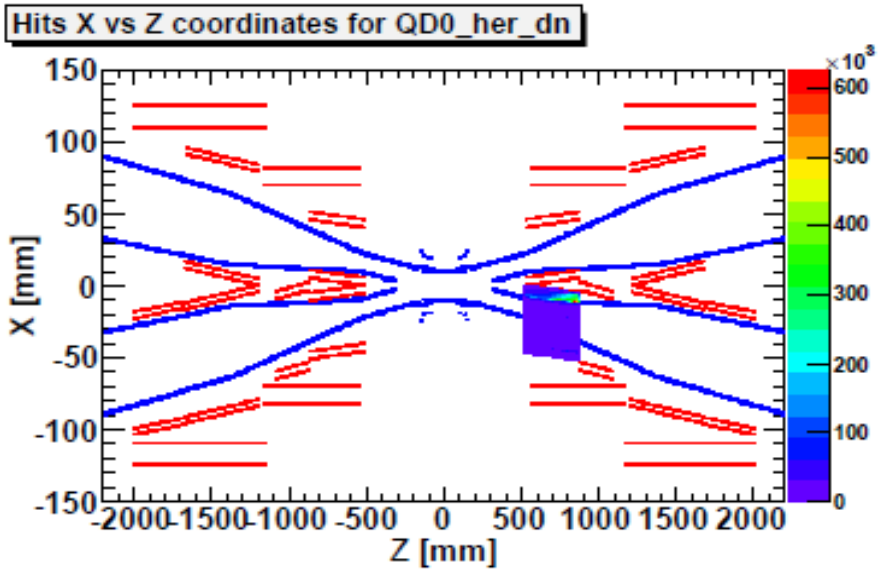
  - Touschek LER:

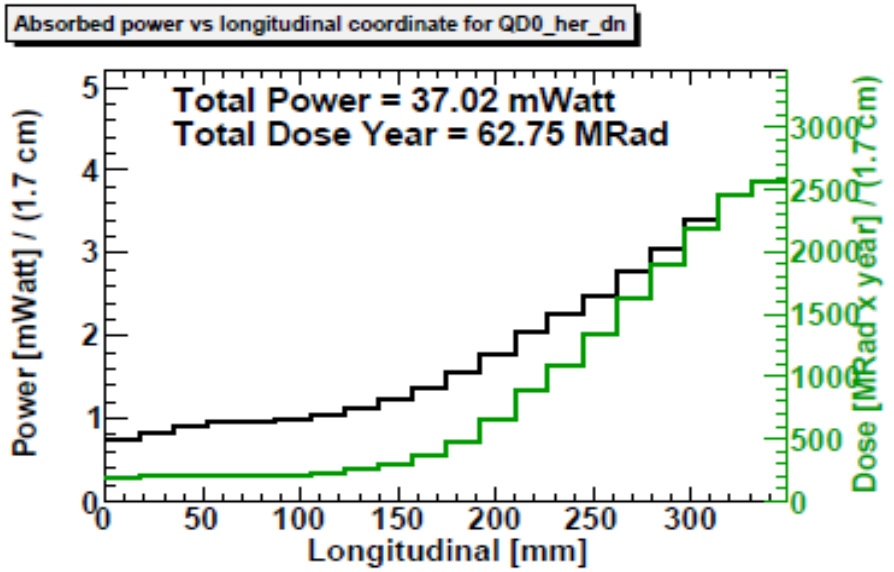
http://www.slac.stanford.edu/~aperez/SuperB/SuperB_Pisa/Magnets_Dose_Studies/Plots_Touschek_LER_background_AbsDose_FullProduction.pdf

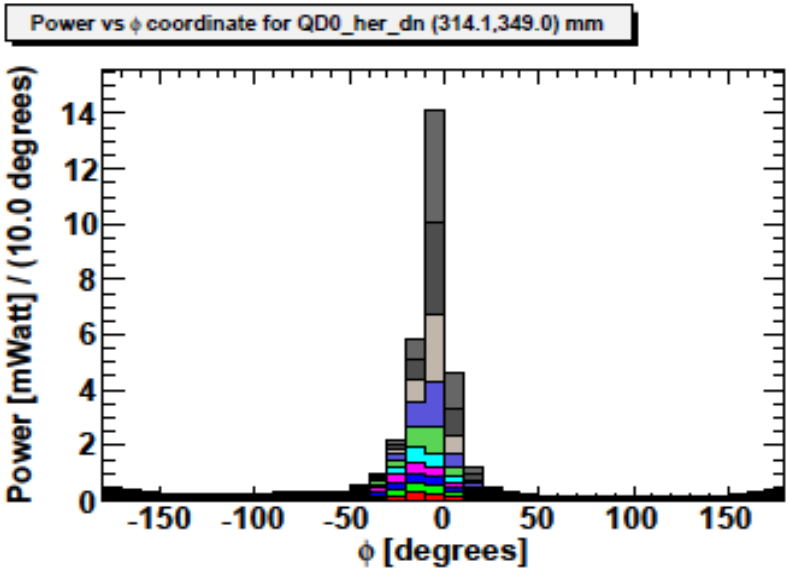
  - Touschek HER:

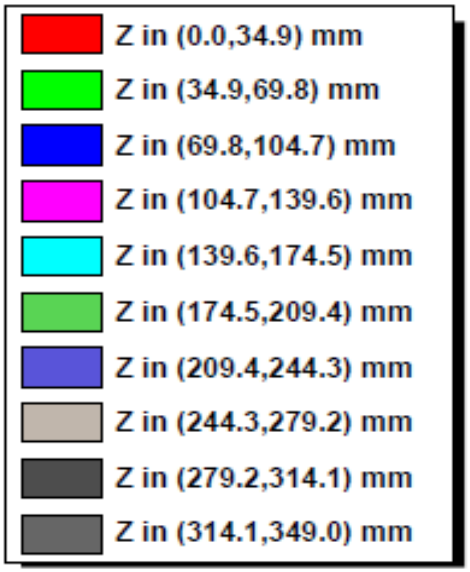
http://www.slac.stanford.edu/~aperez/SuperB/SuperB_Pisa/Magnets_Dose_Studies/Plots_Touschek_HER_background_AbsDose_FullProduction.pdf

Results: Doses on QD0-HER-down

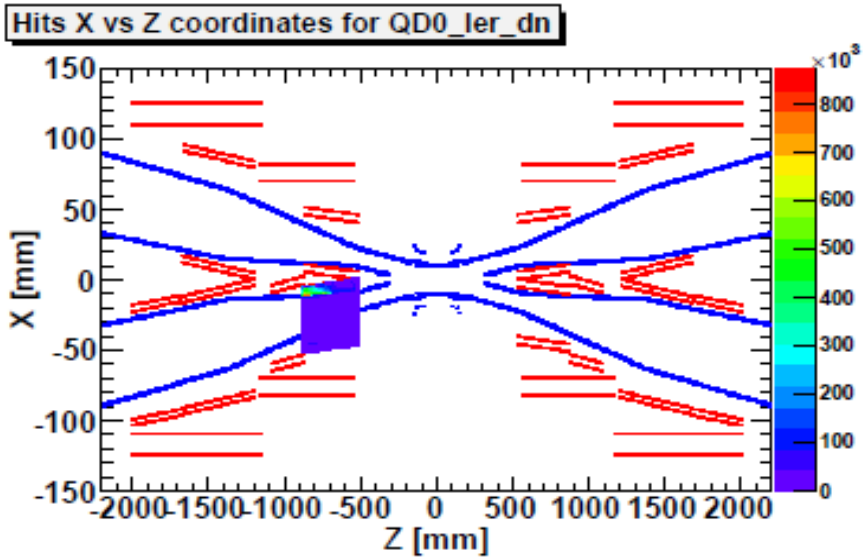


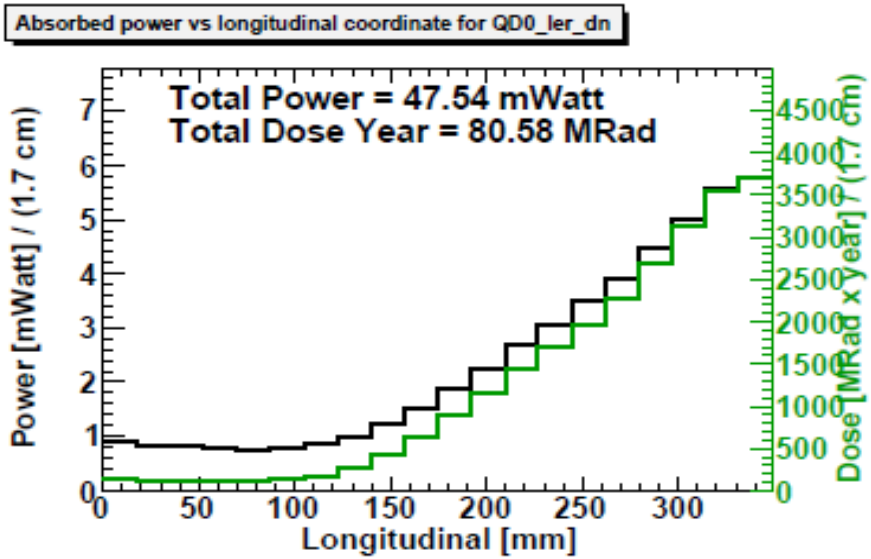


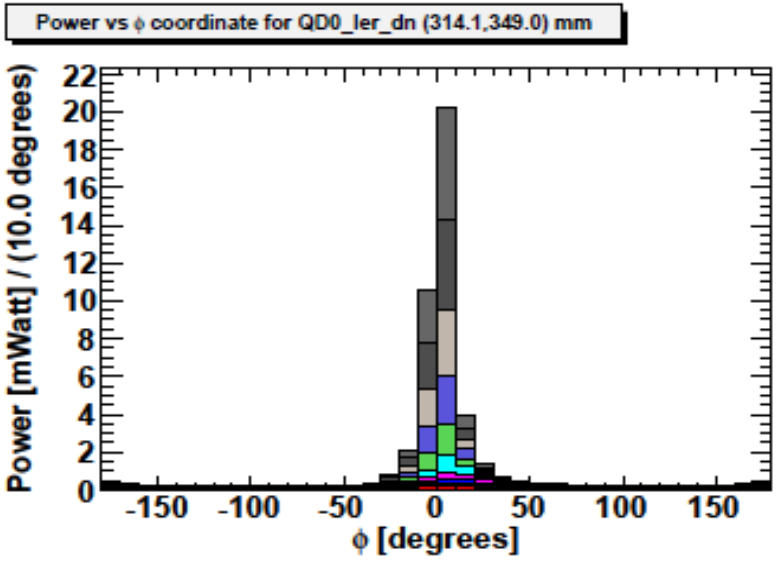


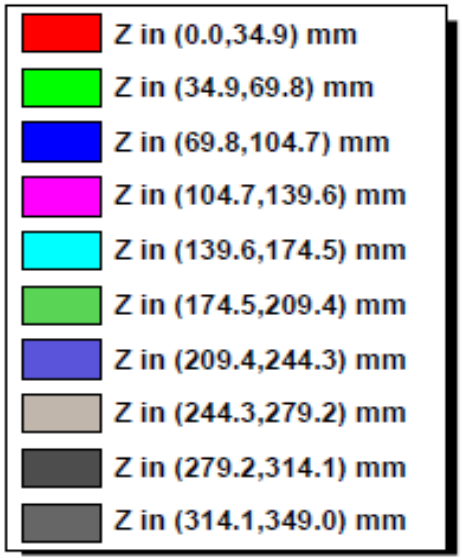


Results: Doses on QD0-LER-down

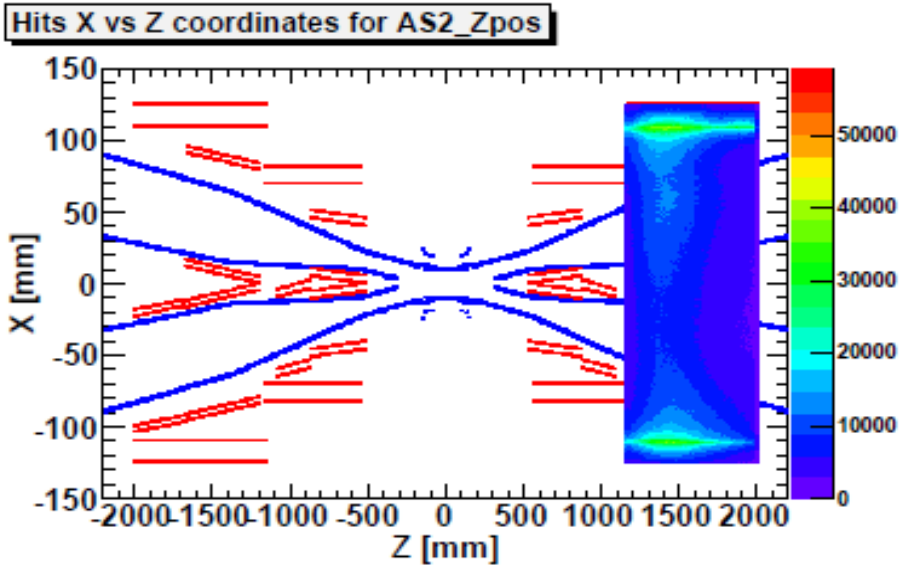


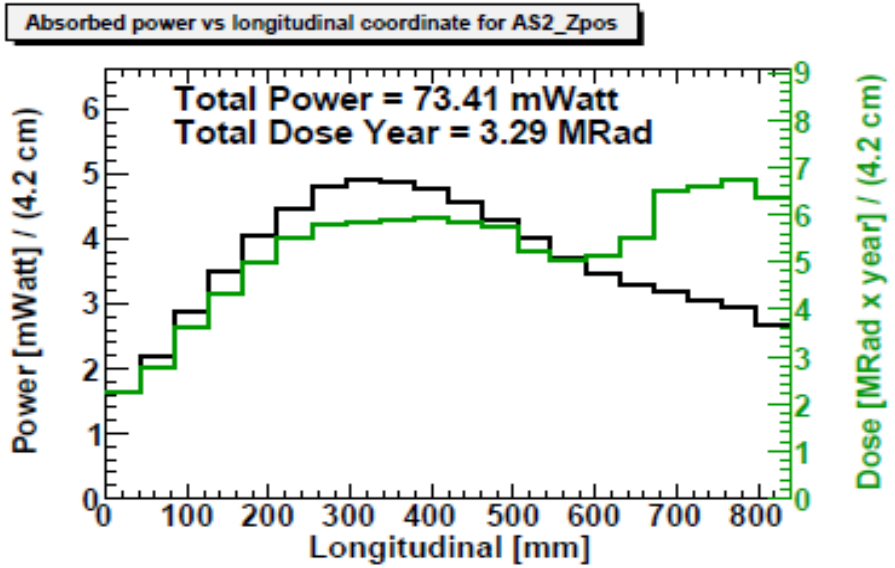


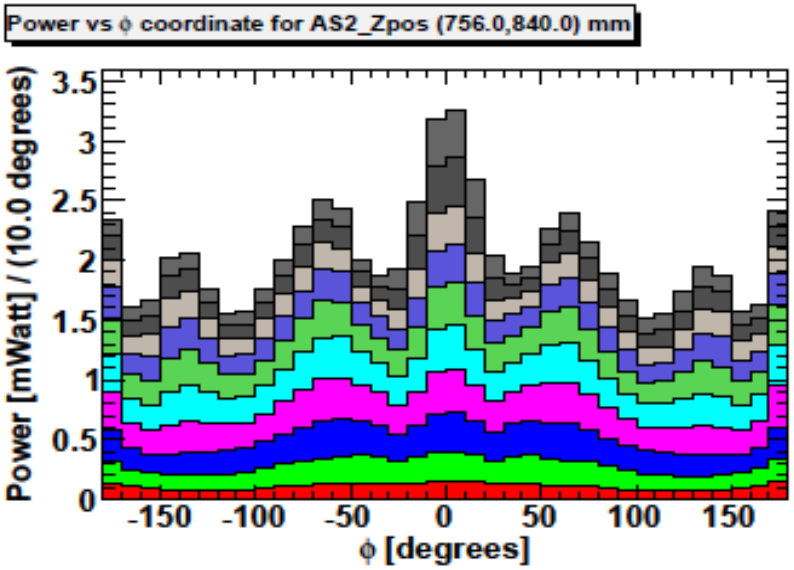


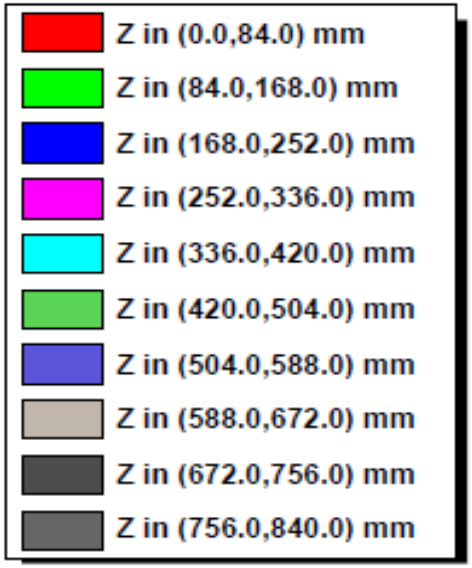


Results: Doses on AS2 (Z>0)

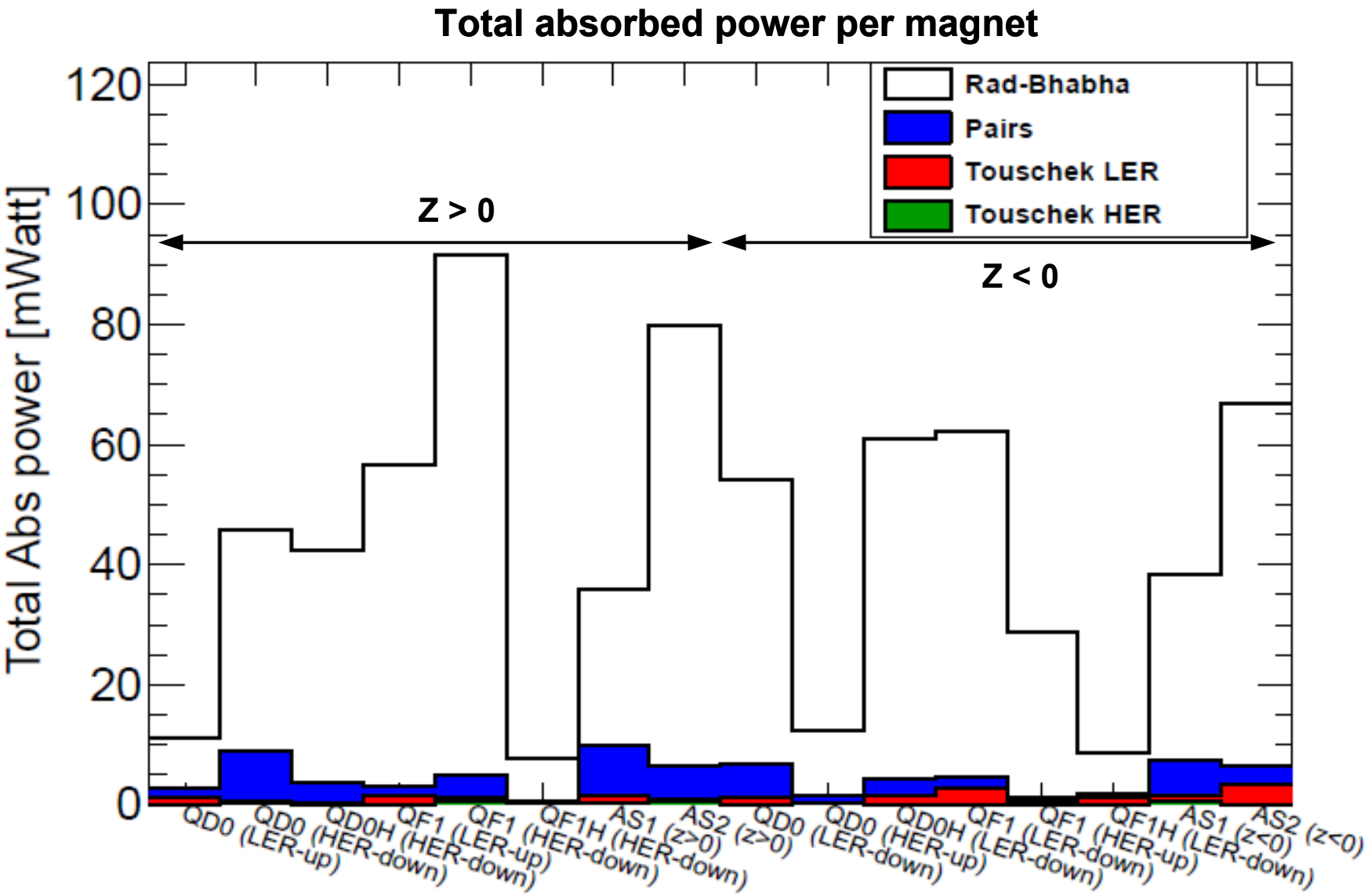




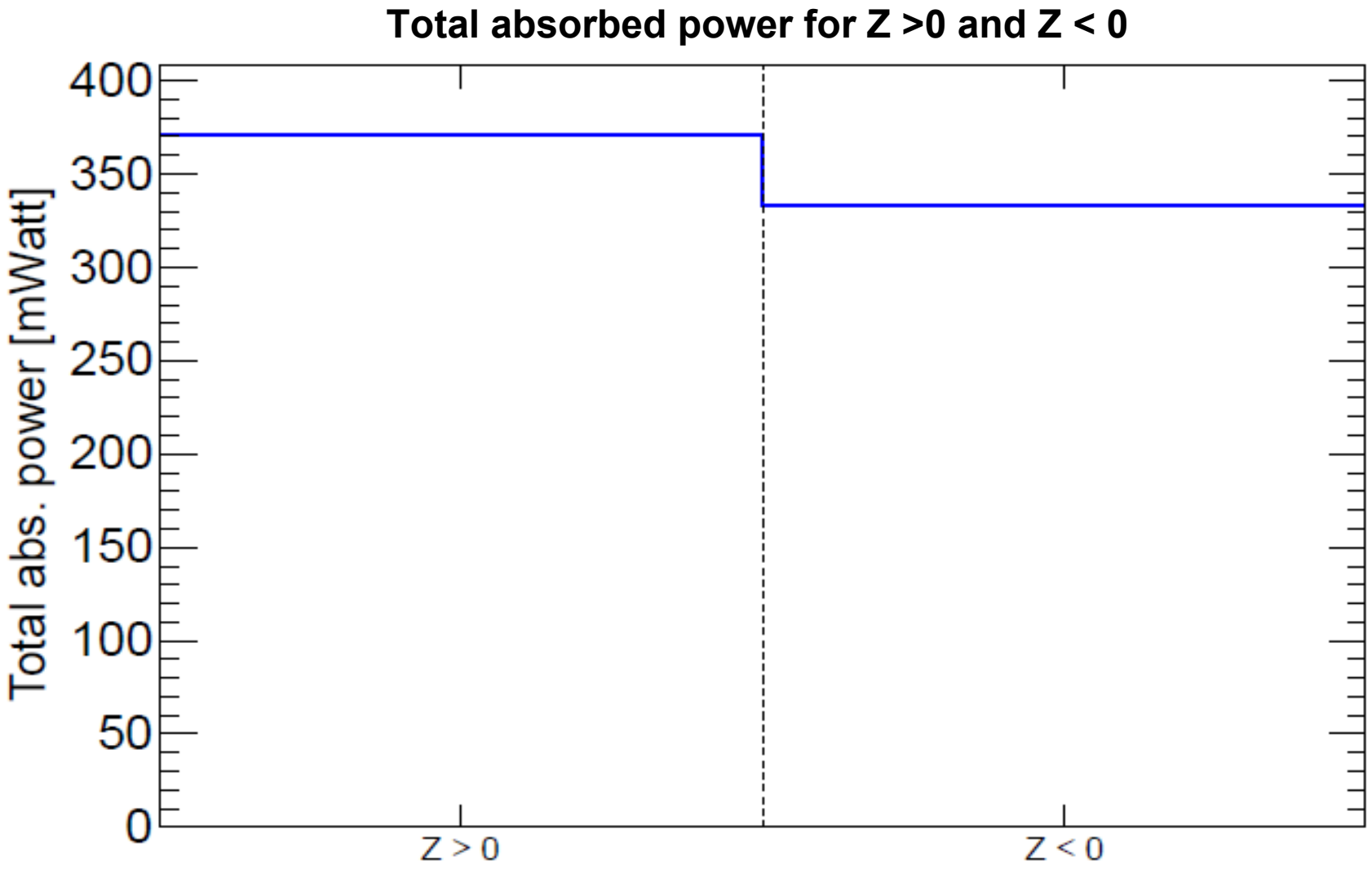




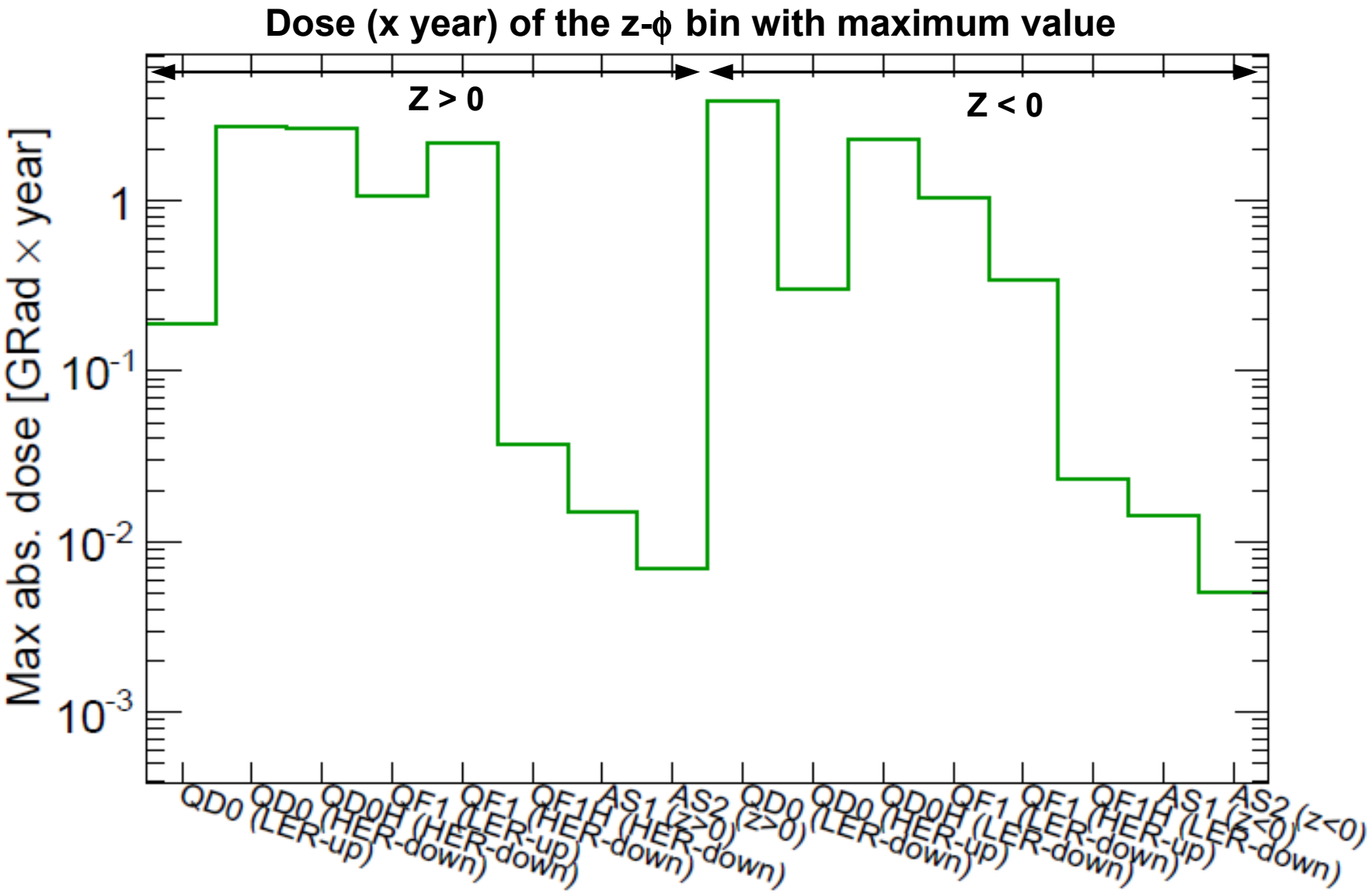
Results: Total absorbed power (I)



Results: Total absorbed power (II)



Results: Maximum absorbed dose



Summary

- **SuperB conducting magnets and cryostat material implemented in Bruno**
- **SuperB conducting magnets instrumented for absorbed doses studies**
- **Performed the analysis with all the full-sim production samples**
  - Main background contribution from Rad-bhabha by around two order of magnitude
  - Absorbed power are from 10 to 90 mWatts
  - Total absorbed power for Z>0 and Z<0 are 370 and 350 mWatt, respectively
- **Ready to provide any other requests of new plots/quantities for this analysis**


Backup