



**High
Luminosity
LHC**

WP6.4 – Dose and Dpa studies on SC Links in P7.



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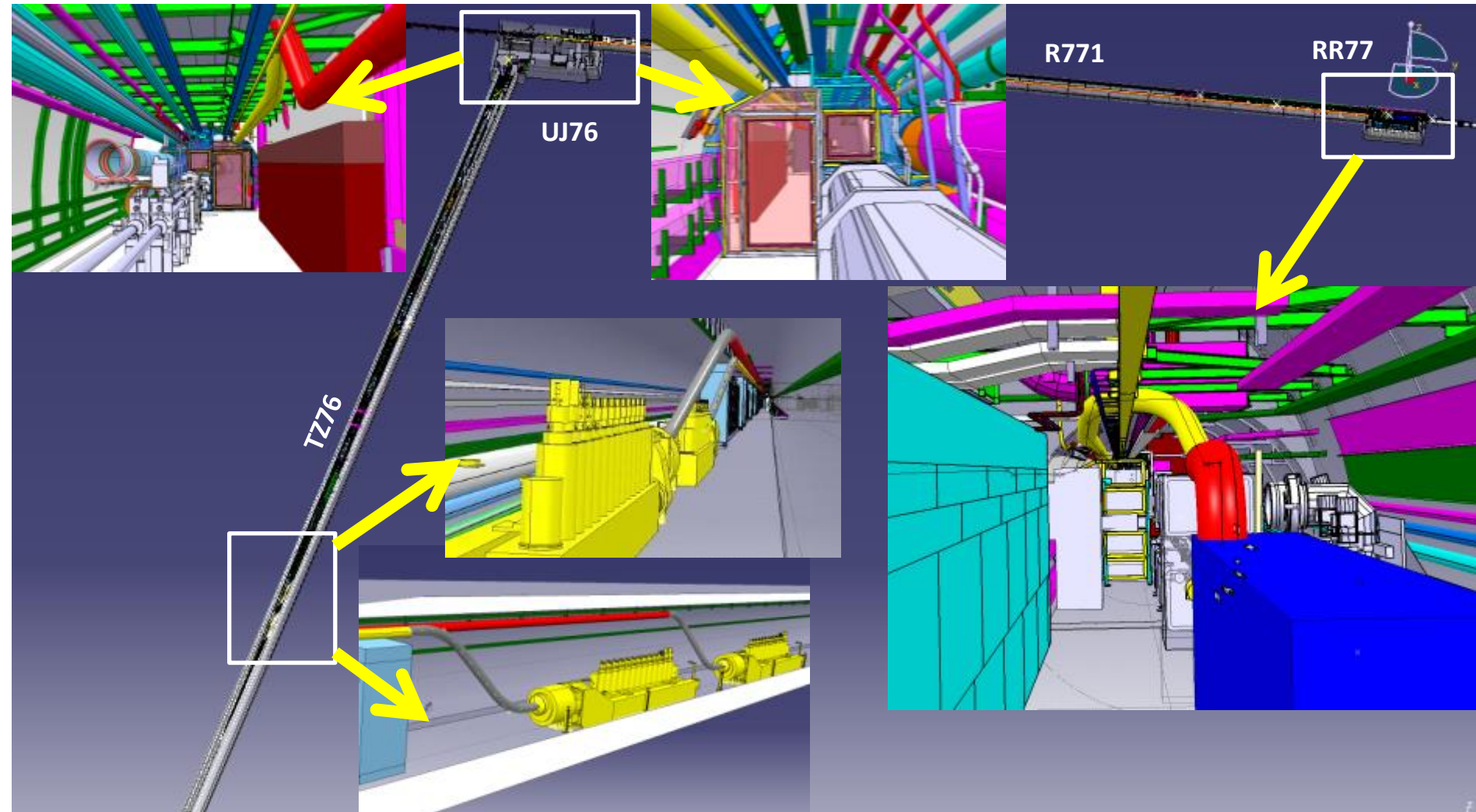
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Outline

- Definition of SC Link position in P7
- Identification of the maximum dose region
- Implementation of the SC Link in the peak region
- Dpa and Dose in the Link
- Particles fluences in the Link
- Conclusion and future perspectives

Sc Link in P7



First Attempt

- Creation of a bulk composition of the cable
- Implementation of the geometry in FLUKA
- Simulation with the proton loss maps

Bulk Definition

Cable composition:

- MgB₂ 16%
- Copper 25%
- Kapton 4%
- Helium 52%
- AISI304 3%

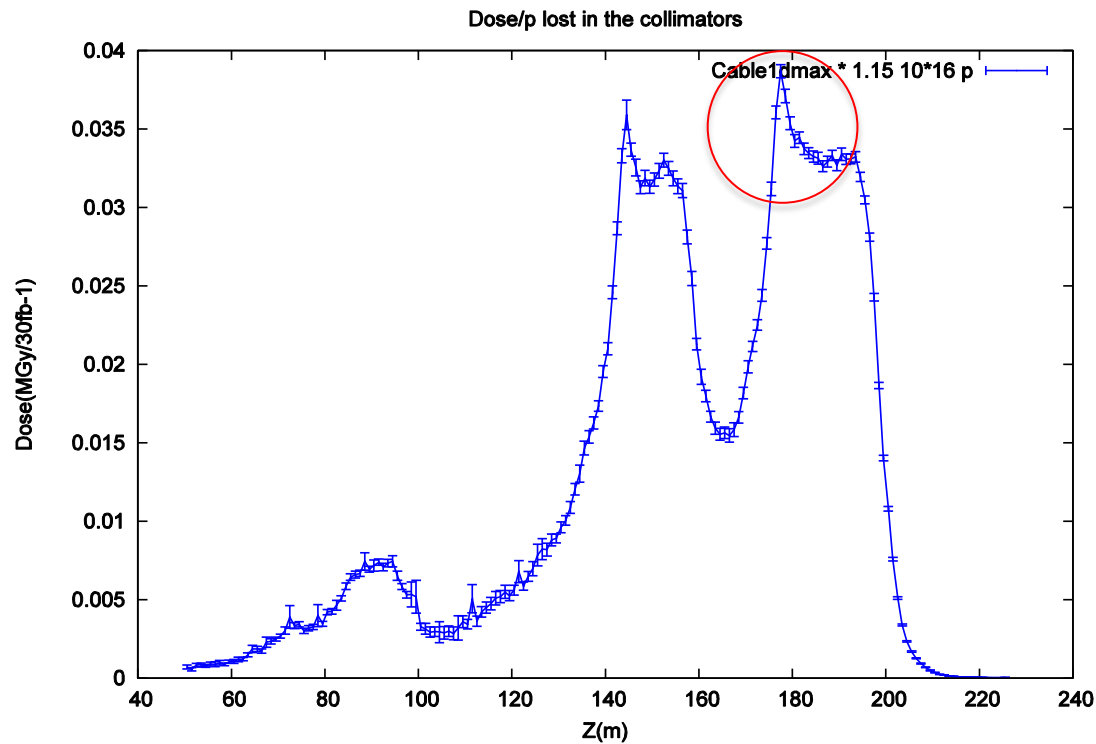
Kapton:

- Hydrogen 2.5%
- Carbon 69%
- Nitrogen 7.5%
- Oxygen 21%

AISI304:

- Iron 69.5%
- Carbon 1.5%
- Nickel 10%
- Chromium 19%

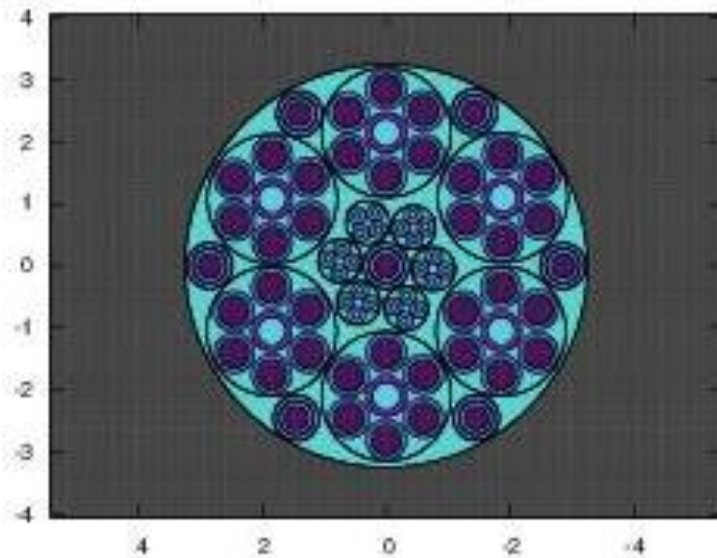
Finding the Maximum



The maximum proton loss is after the primary collimators of the Beam 2

In this region we located the model of the cable

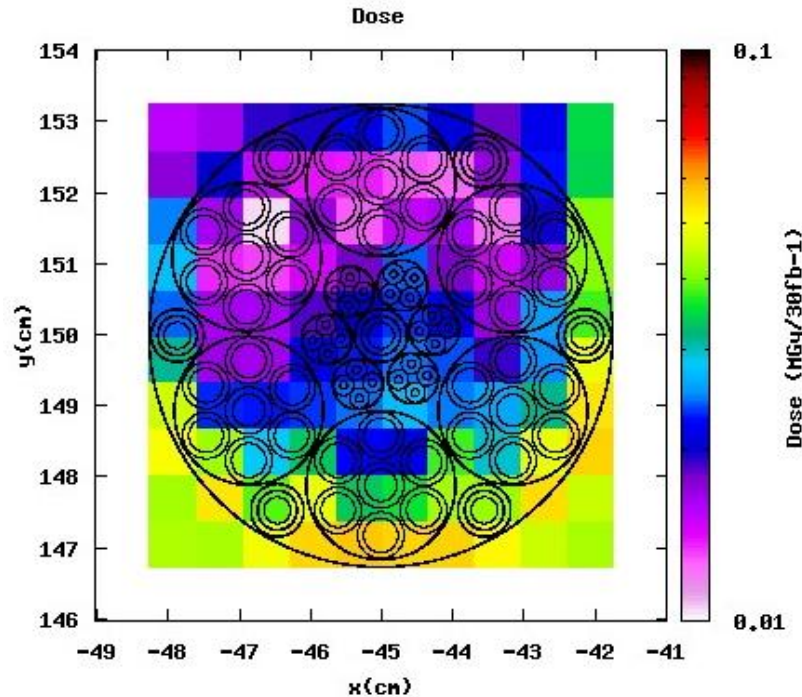
Real Link



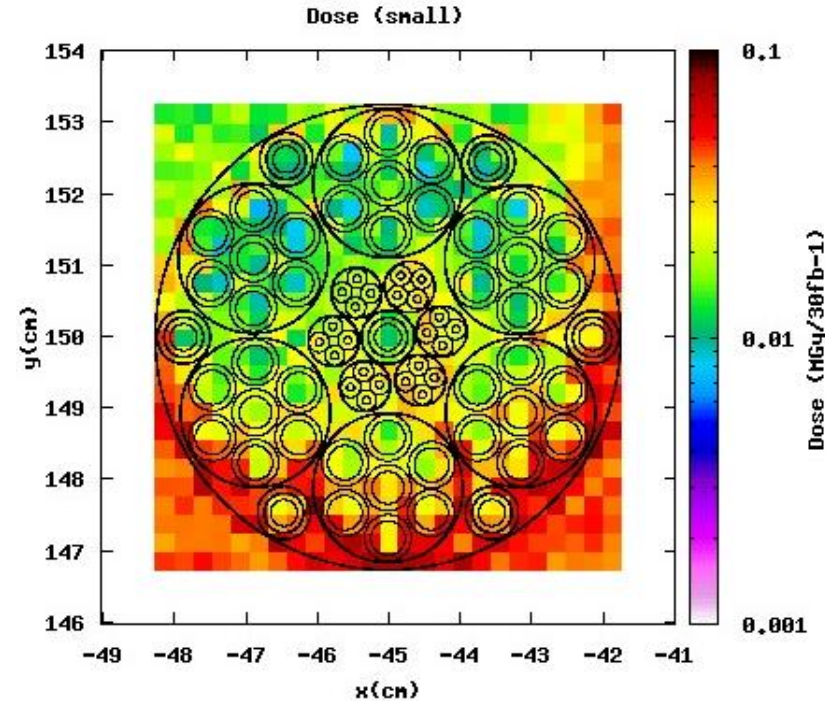
In the maximum point we put 3 meters long SC Link model (the same of IP1).

For the simulation we used 30000 protons lost in the collimators (SixTrack output) and then we normalized the data for 30 fb^{-1}

Dose



Bin Dimension: 0.65cm x 0.65cm x 10cm
30 Runs of 1000 p lost in the collimators

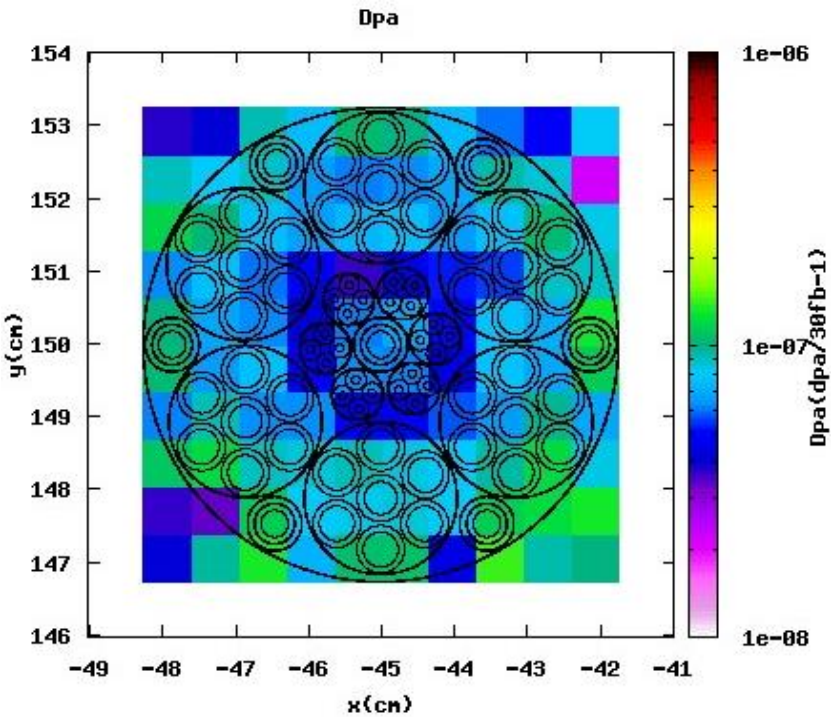


Bin Dimension: 0.26cm x 0.26cm x 10cm
30 Runs of 1000 p lost in the collimators

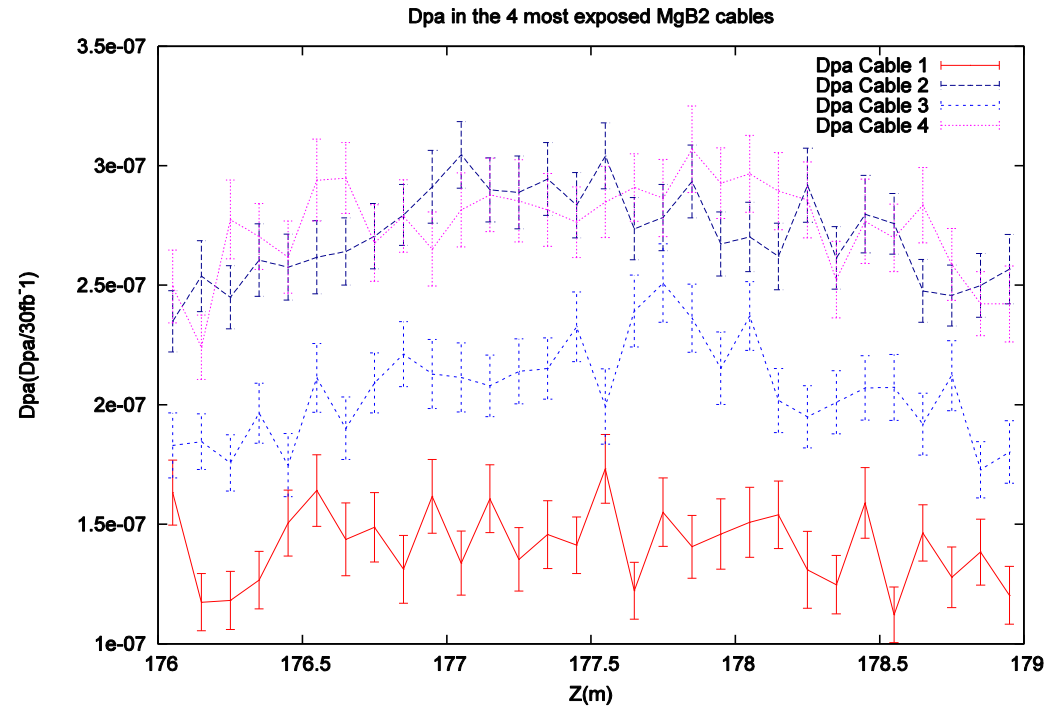
The maximum dose is about 40 kGy integrated over a period of 30 fb⁻¹

If also we extrapolate proportionally to 3000 fb⁻¹ we will obtain only 4 MGy over the whole period of exercise

Dpa



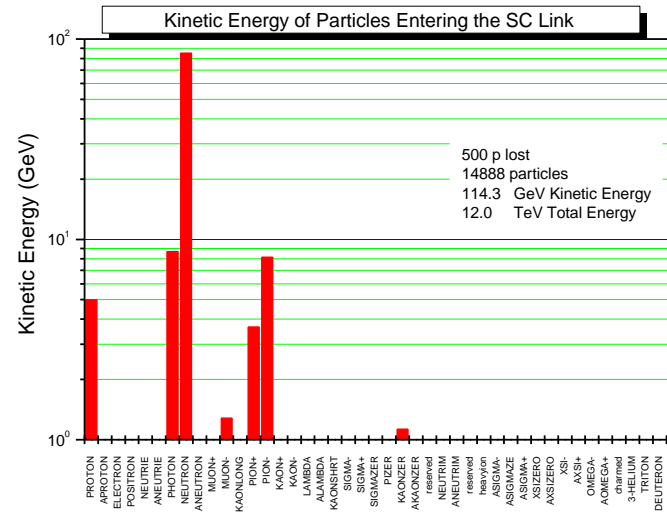
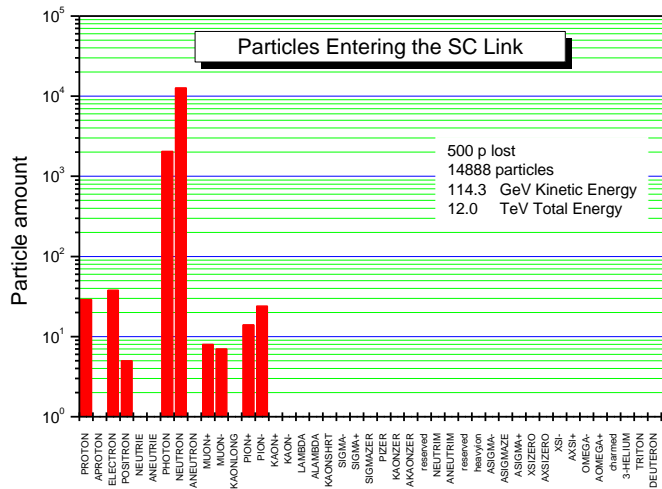
Bin Dimension: 0.65cm x 0.65cm x 10cm
30 Runs of 1000 p lost in the collimators



The dpa is about 10^{-7} over all the cable. This value give us no concern, because it is almost 1 order of magnitude smaller than the one in IP1

Primary Fluences

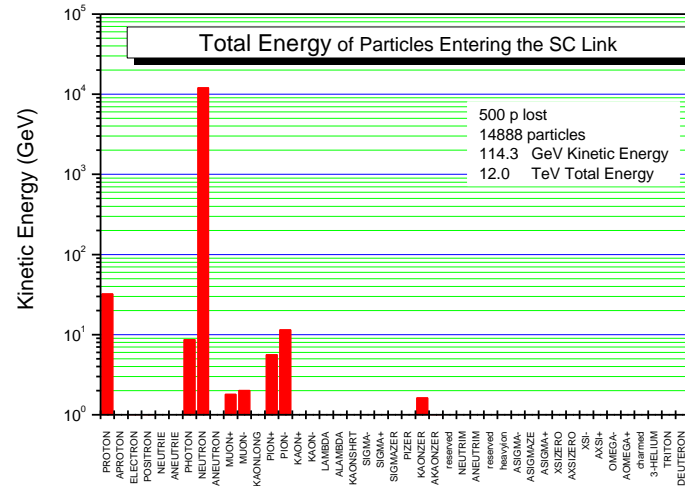
(In SC Link)



14% of the particles are photons
85% are neutrons

8% of the kinetic energy is from photons
74% from neutrons
10% from pions
4% from protons

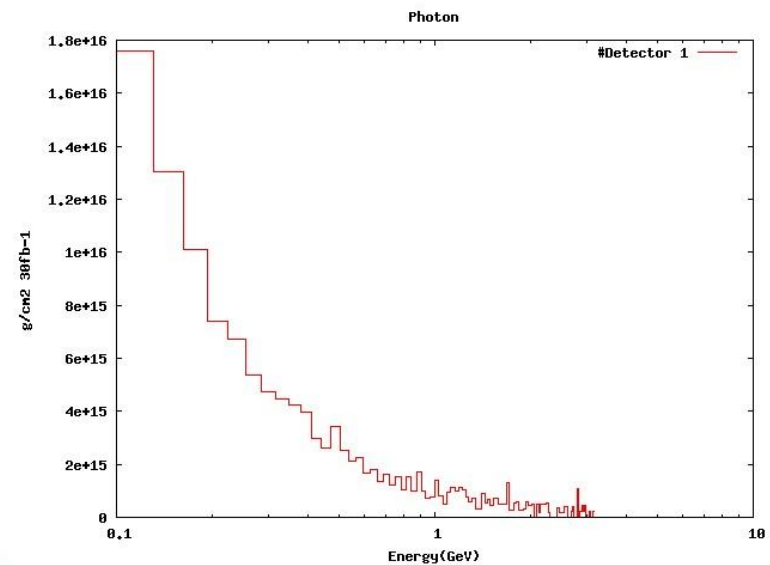
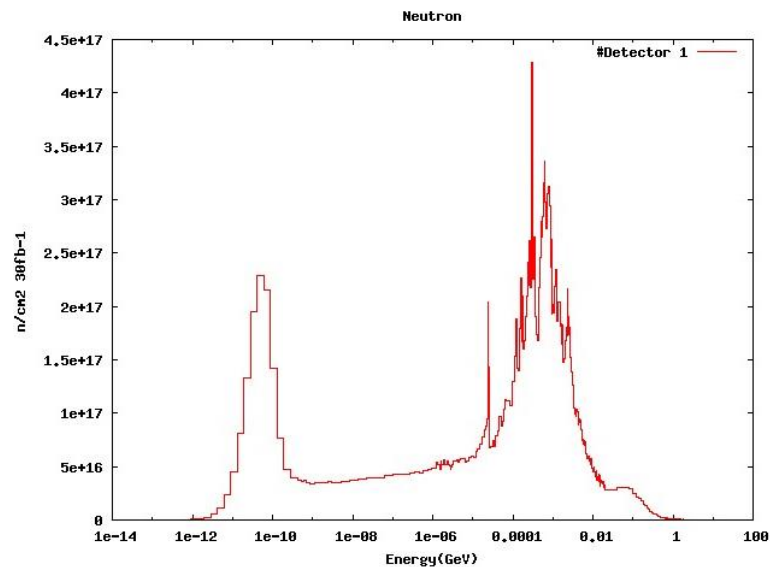
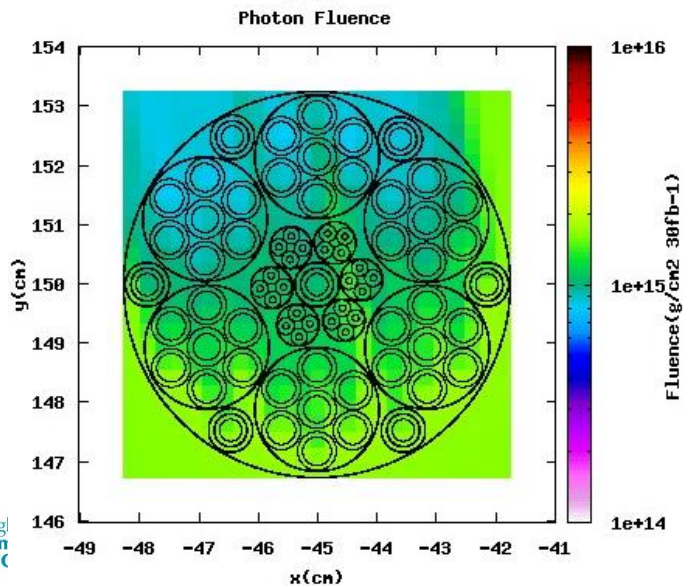
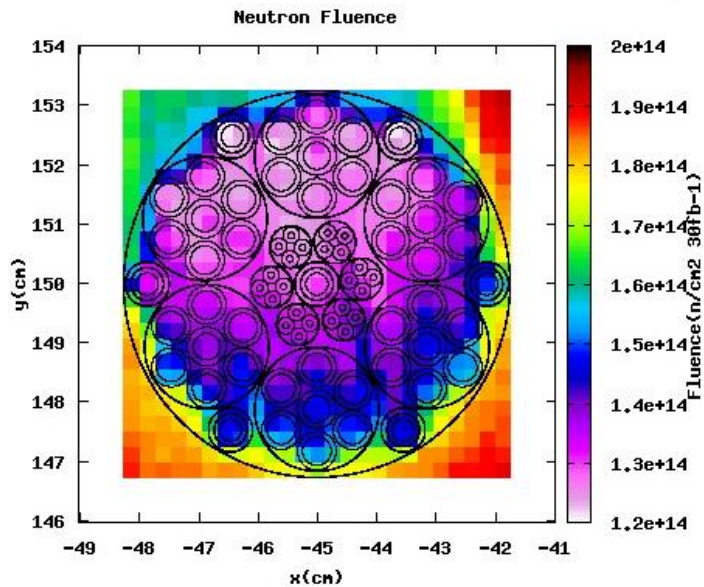
0.3% of the total energy is from protons
99% from neutrons



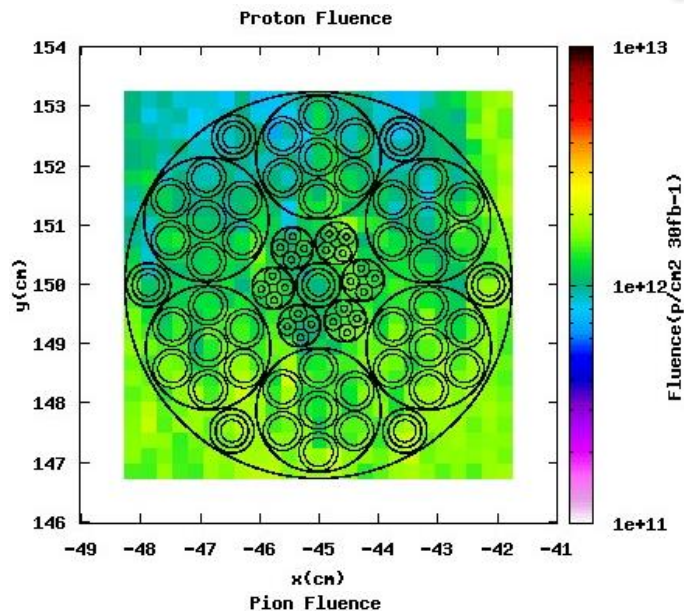
Fluences

Neutron

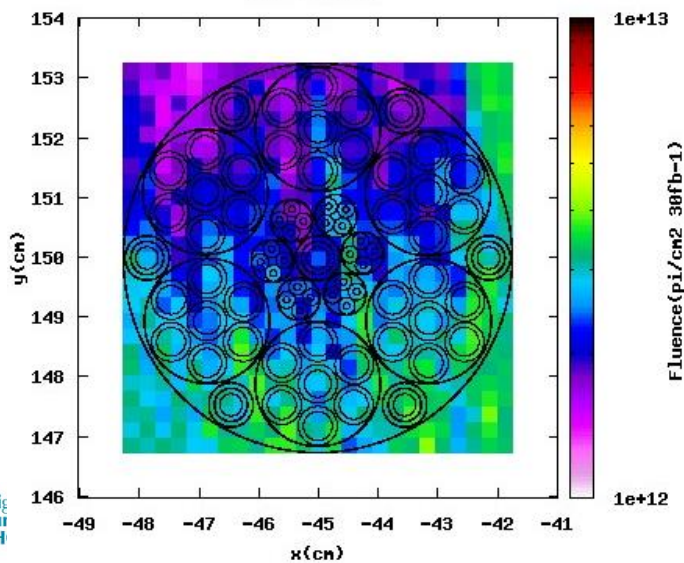
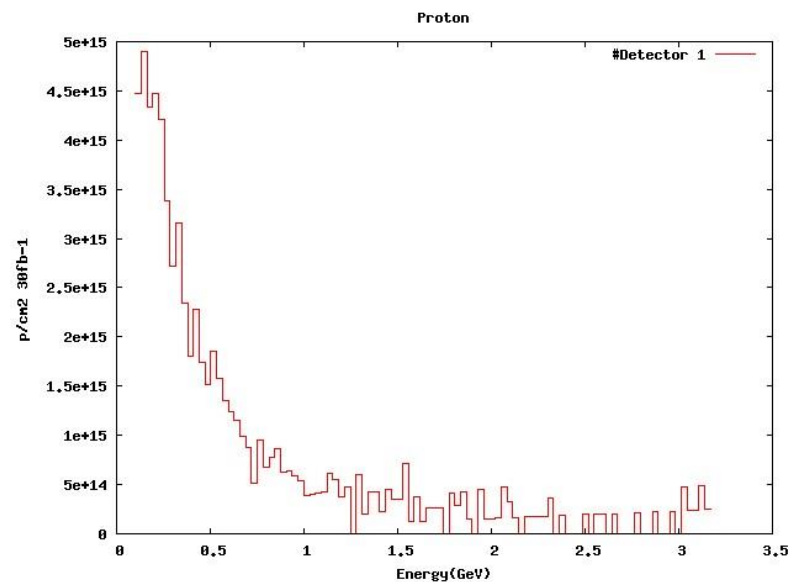
Photon



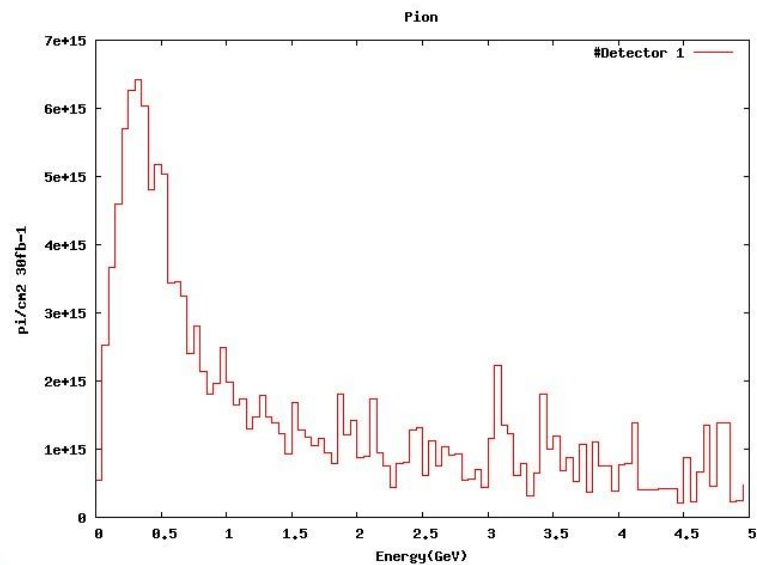
Fluences



Proton

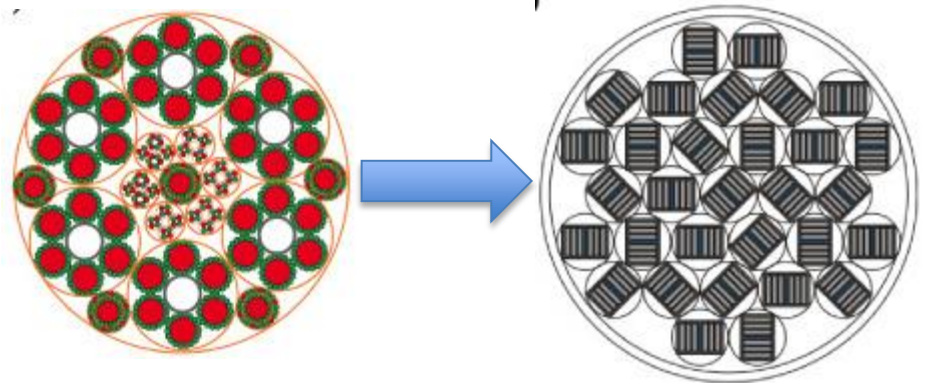


Pions



Conclusions and Perspectives

- Maximum dose on MgB_2 SC links is not a concern in P7. It won't be even if we would consider proportional the relation between integrated luminosity and proton losses
- Implementation of the P7 link geometry for further simulations(??)



Acknowledgments

Thank You for Your attention

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