

FCC-hh General Design Meeting

Notes from the meeting held on 31th March 2016

In preparation for the FCC week in Rome, a website will be set up for uploading drafts of the talks (<https://indico.cern.ch/event/516016/>). The consistency and the conclusions from these talks will be discussed in next weeks GDM meeting.

Robert Barrie Appleby - Collision debris from IP into the machine

R. Appleby presented studies on the collision debris from the IP to the machine, to understand if it can become an issue for FCC-hh. Collisions were simulated in IPA and inelastic and elastic protons that stay in the beam pipe were tracked to IPB. The pp event generator DPMHET-III was used, which agrees well with experimental data from LHC. The outcome of this generator was input to MADX and tracked to the next IP. Post processing with python was used to compute particle transmissions and loss rates. The $L^*=45\text{m}$ lattice was used with a β^* of 30cm. Up to now no crossing angles were used but it will be done for Rome.

Loss patterns were presented for inelastic protons. As for LHC also here the elastic protons stay in the beam pipe.

It was furthermore studied if muons could reach the next IP through rock. First calculations suggest that only few muons are expected as they need to travel through 5.92km of rock while the range for the muons through rock was calculated to 2.2km. Further Monte-Carlo simulations will be done as a check and to include fluctuations and straggling.

Further studies for Rome will cover decay muons to tunnelling, crossing angle to proton transport and detector spectrometer and compensator magnets.

Updates from JAI

L. van Riesen-Haupt presented the status of the triplet optimisation using thin lenses. It allows for a fast parameter scan, which can be used to find start parameters for the thick lens triplet design.

E. Cruz presented updates on the orbit correction studies. Orbit correctors were used before Q2, after Q3 and before Q4. BPMs were installed and the correction of triplet misalignments was studied using the 'correct' procedure in MADX. Different numbers of additional correctors and their positions were tested as well. All cases showed an achievable correction with fields below 1Tm and a maximum horizontal orbit deviation after correction of 0.5mm.

For the FCC-hh local crab cavity scheme with two crab cavities on each side of the IP, the necessary voltages have been calculated, which shows similar values as for HL-LHC.

J. Abelleira presented studies of an alternative final focusing design. Instead of a common aperture triplet, twin aperture quadrupoles would be used. It would allow for larger bunch intensity and larger beam separation while requiring less aperture in the triplets. Disadvantages are the lower luminosity due to the crossing angle and challenges in the quadrupole design + the potential need for crab-waist sextupole magnets.

T. Pieloni - Discussion on crossing angles

T. Pieloni reminds that in a previous presentation, DA studies suggested the need for a larger crossing angle. However, as these results were preliminary, the current baseline crossing angle should be kept until further studies show why a larger crossing angle could be needed or not. Also for the spectrometer further studies are needed before drawing conclusions, as it is not yet understood why current simulations show little sensitivity to polarity changes.