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The CEPC radiation protection issues

Thursday 8 June 2023 17:11 (1 minute)

My poster has three topics: the dump designs for the CPEC collider and linac, the synchrotron radiation shielding for magnet insulations, and the estimation for radioactivity production in the surrounding materials.

A design for the collider dump including a dilution system is updated. The material of the dump core is made of graphite while this core is surrounded with iron. The maximum temperature rises in the collider dump are obtained for Z pole, WW, Higgs, and ttbar operations. These maximum temperature rises are lower than the graphite melting point. The Linac dump designs are also finished. The dimensions of the collider dump and Linac dumps are optimized so that the dose equivalent next to the dumps surfaces are lower than 5.5mSv/h. The response time of the collider dump is about 1 ms, which means if the beam loss happens in a time scale less than 1 ms, the collider dump cannot respond in time. So collimators are needed.

The second part shows synchrotron radiation simulation and shielding design for magnet insulations. The FLUKA simulations are performed for Z pole, WW threshold, Higgs, and ttbar operations. Lead shielding can reduce the absorbed doses to insulations. We optimize the thickness of the lead shielding according to the upper limit of the absorbed dose to the insulations. The dose distribution in the collider tunnel is also obtained.

The third part shows radioactivity production in the tunnel's air, cooling water, and rocks surrounding the tunnel. The major element compositions of rocks are used in our simulations. We shall work more carefully to make sure these results meet the requirement of the mandatory Chinese standards.

Primary authors: Dr TANG, Guangyi (Institute of High Energy Physics, Chinese Academy of Science); Dr SHI, Haoyu (IHEP, CAS); Dr LIU, Qiongyao (IHEP, CAS); Dr MA, Zhongjian (IHEP, CAS)

Presenter: Dr TANG, Guangyi (Institute of High Energy Physics, Chinese Academy of Science)

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