**MDI study upgrade**

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The machine-detector interface (MDI) issues are one of the most complicate and challenging topics at the Circular Electron Positron Collider (CEPC) and other future high energy colliders.  The MDI region is about 14m (±7m from the IP) in length in the Interaction Region (IR), where many elements from both detector system and accelerator components need to be installed including the detector solenoid, anti-solenoid, luminosity calorimeter (LumiCal), interaction region beam pipe, cryostat, beam position monitors (BPMs) and bellows. The cryostat includes the final doublet superconducting magnets and anti-solenoid. The CEPC detector consists of a cylindrical drift chamber surrounded by an electromagnetic calorimeter, which is immersed in a 2~3T superconducting solenoid of 7.6 m in length. The accelerator components inside the detector without shielding are within a conical space with an opening angle of 6.78 degrees. The crossing angle between electron and positron beams is 33 mrad in horizontal plane. The final focusing quadrupole is 1.9 m (L\*) from the IP. Primary results are got from the assembly, interfaces with the detector hardware, cooling channels, vibration control of the cryostats, supports and so on.

A water cooling structure is required to control the heating problem of HOM in IR vacuum chamber. The diameters of beryllium pipe and the SC quadrupoles are 20mm.

SR photons in the IR are mainly generated from the final upstream bending magnet and the IR quadrupole magnets due to eccentric particles. With 2 mask tips along the inside of the beam pipe to shadow the inner surface of the pipe the number of scattered photons that can hit the central beam pipe is greatly reduced to only those photons which forward scatter through the mask tips. With collimators in the ARC far from IP the SR photons from IR quadrupoles will not damage the detector components and cause background to experiments.

Beam loss background are mainly from Bhabha scattering, beamstrahlung, beam-thermal photon scattering and beam-gas inelastic scattering. With collimators in the ARC and near the IP region, beam loss background can be reduced significantly and can be accepted by the detector. Injection background is also investigated and simulated.

Considering response time and calibration difficulty, two 4 button electrodes BPM at each side of CEPC IR is adopted. And 8 button electrodes BPM are also under design in the detector beam pipe region.

We are updating the design of LumiCal according to the changes of beampipe, also the thermal analysis. The preliminary scheme of detector installation has been proposed. The estimation of beam backgrounds is also performing.