MDI Status Report

Hongbo Zhu

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MAJOR UPDATES/PROGRESS

- Updated detector background estimation
    - Pair production
    - Radiative Bhabha scattering
    - Beam-Gas interaction
    - Beam Thermal Photon interaction
   - Synchrotron radiation

    Bi-weekly meetings: https://indico.ihep.ac.cn/event/9677/

- Design modifications to the LumiCal

BACKGROUND ESTIMATION

- Estimation based on machine design closed to the final version presented in the accelerator CDR

- Updates to the CDR machine design and to include missing background sources (or not properly estimated)

PAIR PRODUCTION

W. Xu, Z. Ke

PAIR PRODUCTION

- Process simulated with GuineaPig (caveat: external magnetic field not allowed, applied with customized code)

- **NEW:** results cross-checked with CAIN
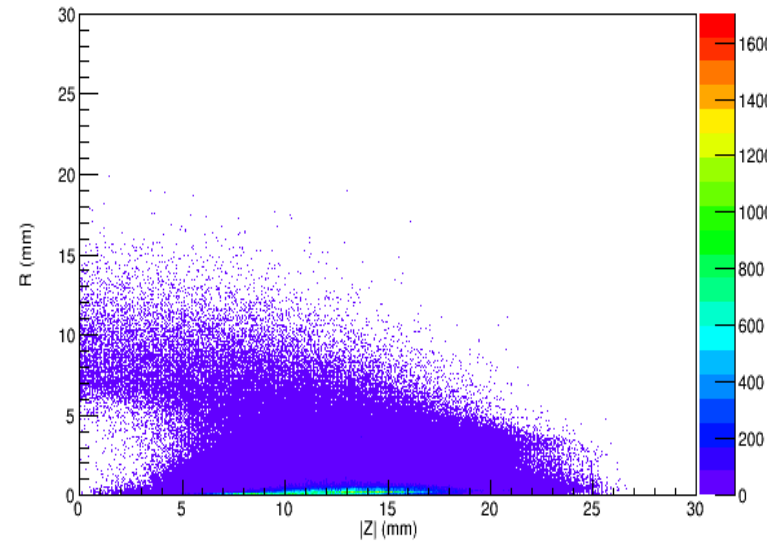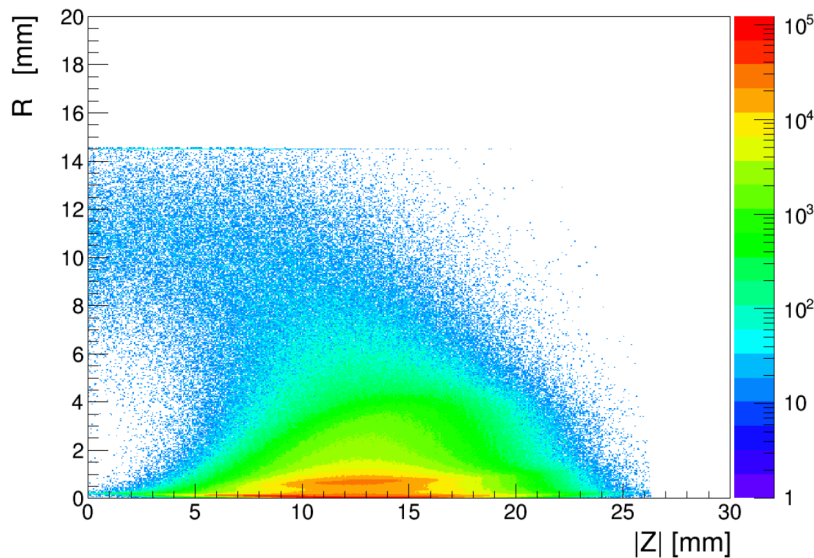
- Results consistent within 30%, known due to the under-estimated cross section in CAIN
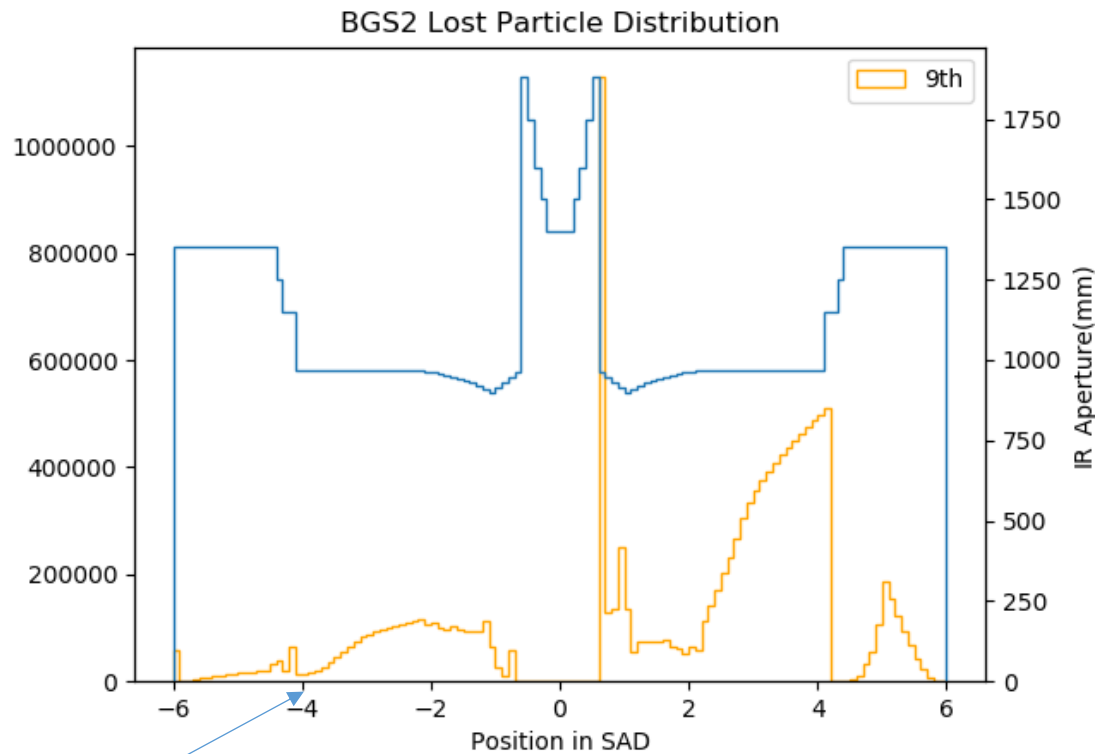
H. Shi, W. Xu, S. Bai

RADIATIVE BHABHA SCATTERING

- Corrected lattice and beam pipe size implemented in SAD simulation


RBB Lost Particle Distribution
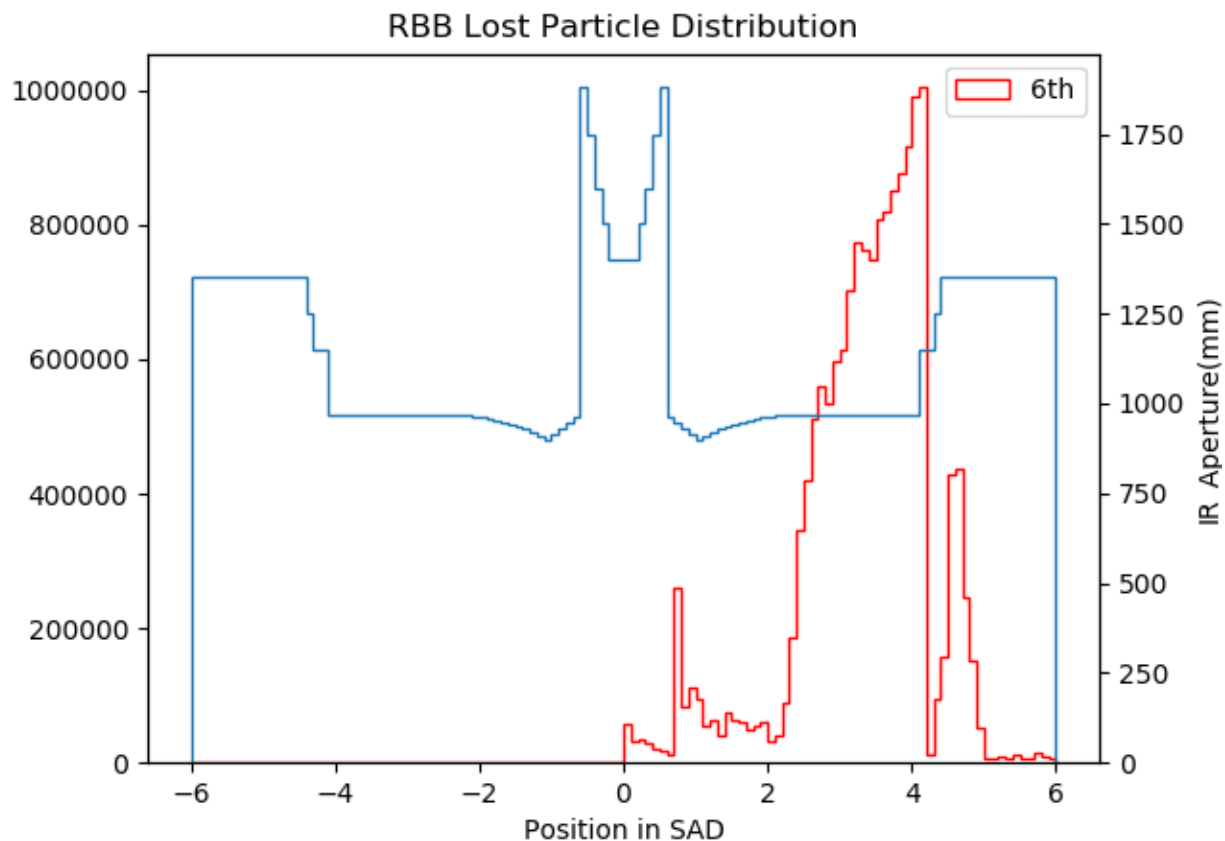
BEAM GAS INTERACTION

- Private code to simulate the interaction between beam particles and residual gas particles (vacuum ~ 10^{-9} Torr) and tracked with SAD

BGS2 Lost Particle Distribution

- Collimators not effective enough

BEAM THERMAL PHOTON INTERACTION

- Private code to simulate the interaction between beam particles and emitted thermal photons and tracked with SAD
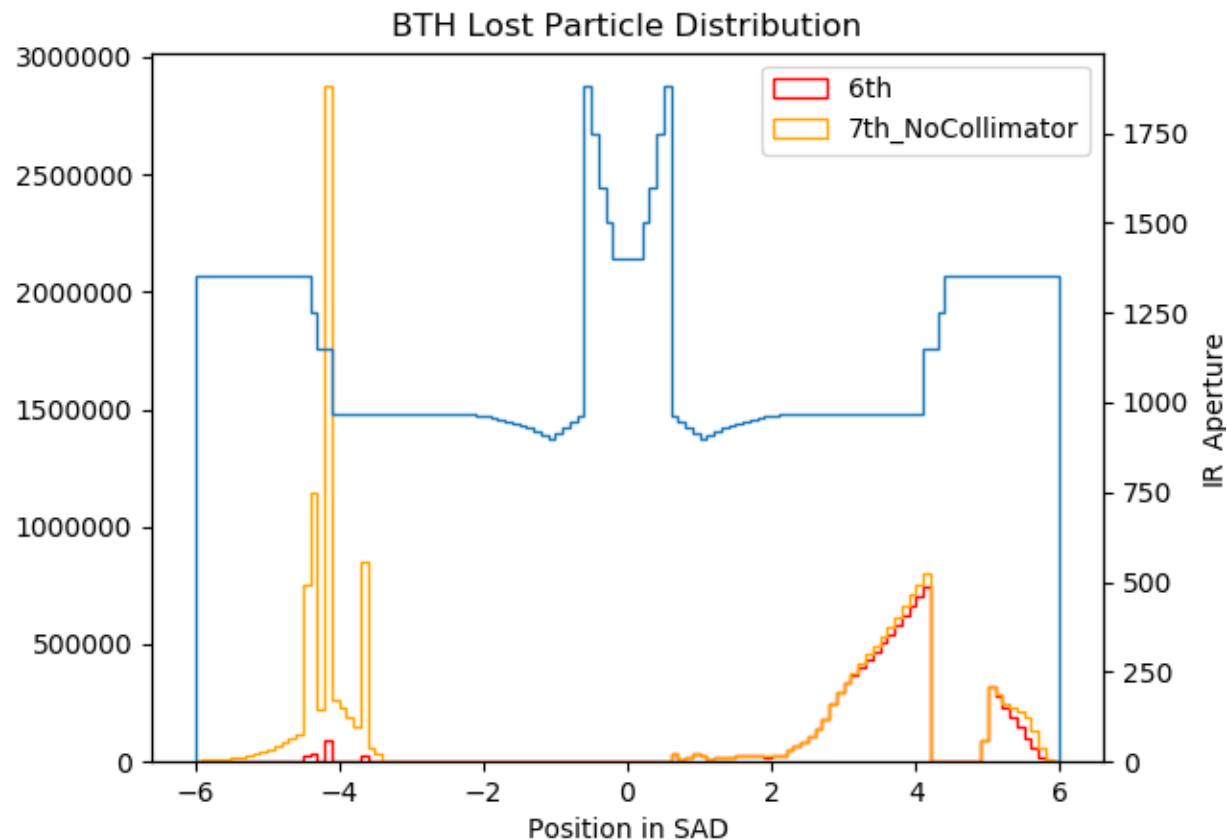
BACKGROUND LEVELS

- Updated radiation background levels (safety factors of 10 applied to all types of background)

Background Type	Hit Density($cm^{-2} \cdot BX^{-1}$)	TID($krad \cdot yr^{-1}$)	1 MeV equivalent neutron fluence ($n_{eq} \cdot cm^{-2} \cdot yr^{-1}$)
Pairs production(Guinea-pig)	2.26	591.14	1.11e+12
Pairs production(Cain)	1.18	334.34	6.10e+11
Radiative Bhabha Scattering	0.16	197.99*2	3.55e+11*2
Beam Gas Scattering	63.04	73515.1*2	1.69e+14*2
Beam Thermal Photon Scattering	10.30	9615.1*2	2.05e+13*2

- Results on other silicon layers also calculated

K. Li, M. Sullivan

SYNCHROTRON RADIATION PHOTONS

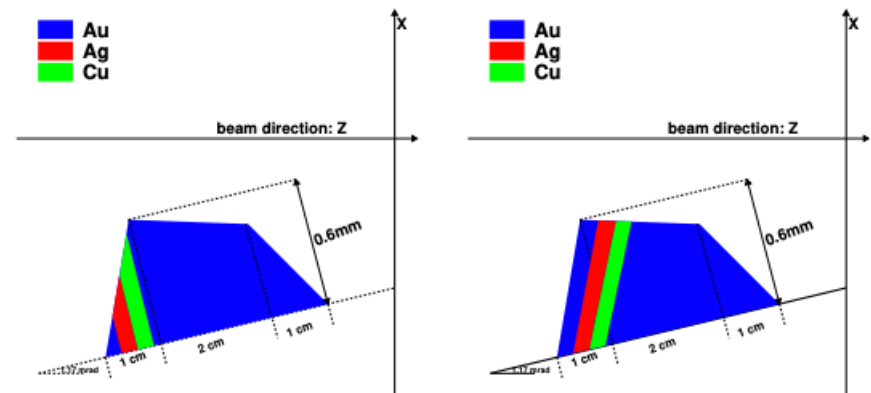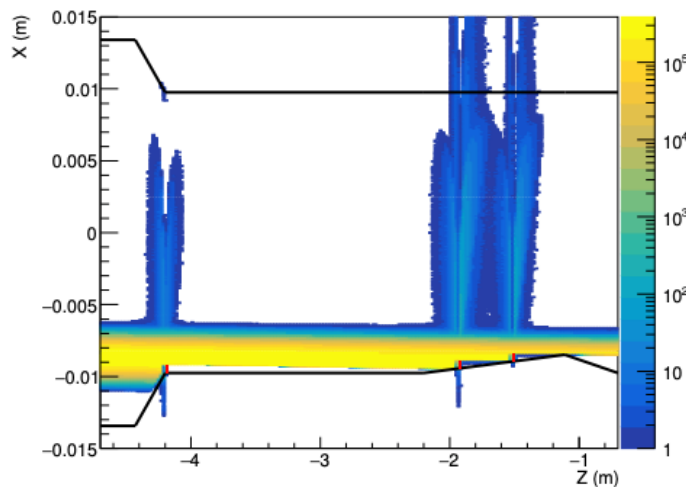- BDSim to simulation SR photon transportation and interaction with the beam pipe

图 9.1   Layouts of two alternative masks, A (left) and B (right).

- SR photons from a single bunch reduced from 80, 000 to ~200 after introducing mask tips, to ~160 with beampipe coated with 10 um Au

LUMICAL

Q. Ji, S. Hou, et. al

- Current design: mounted to the quadruple and inserted into the interaction region – remote vacuum connection;

- Drawbacks: flange and bellow in front will degrade its performance; additional tracking system to recover the position resolution not feasible in the crowded IR.
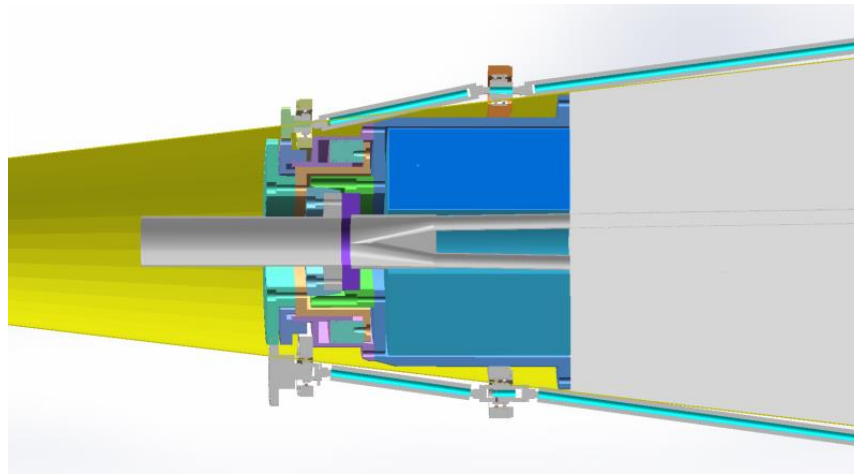
- Alternative design: moving LumiCal closer to IP and mount it on the beampipe supporting structure – mechanical feasibility studies ongoing