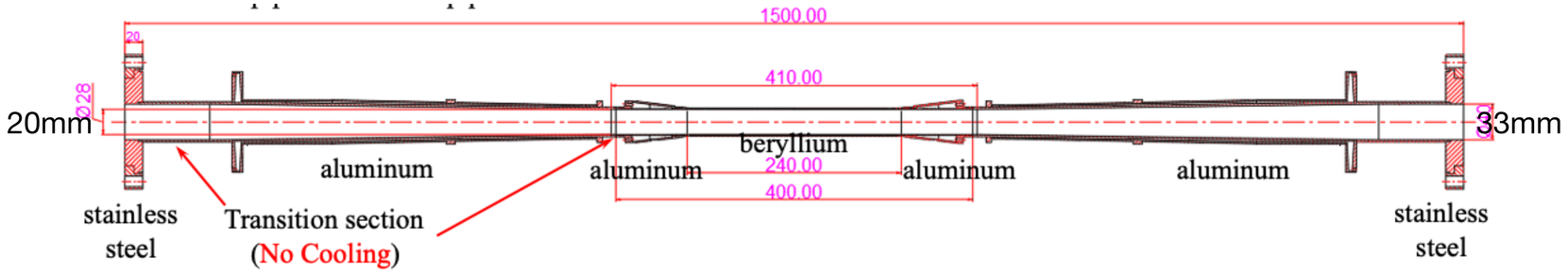
Backgrounds with Radius Changing

Shi Haoyu, 2020.6.10, CEPC MDI Regular Meeting

Agenda

By Changing the Radius of Be Pipe, from 14mm to 10mm

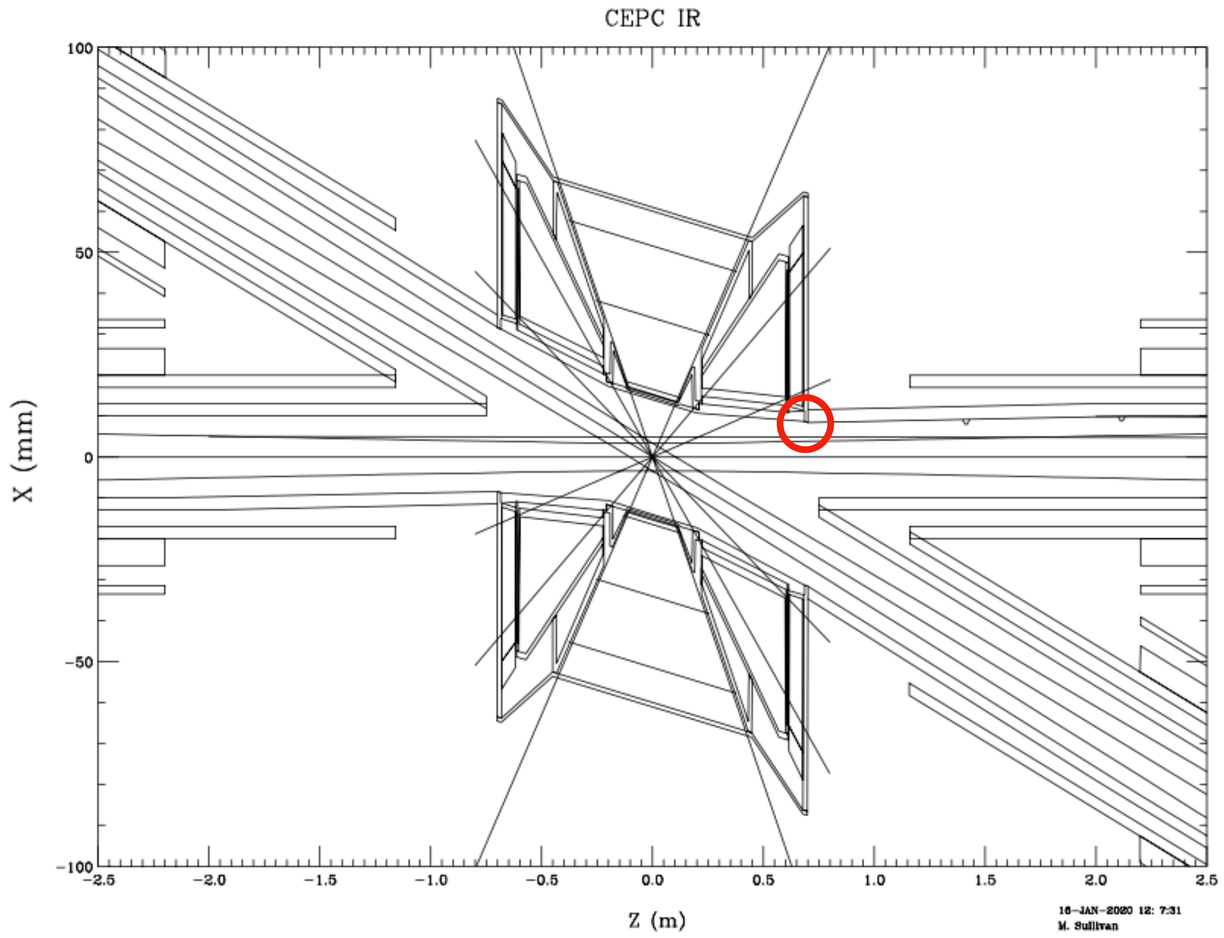
- Synchrotron Radiation
- Pair Production
- Off-Momentum Beam Particle
  - Beam Gas Bremsstrahlung
  - Radiative Bhabha



Assuming No Change on Lost Distribution (No more loss)

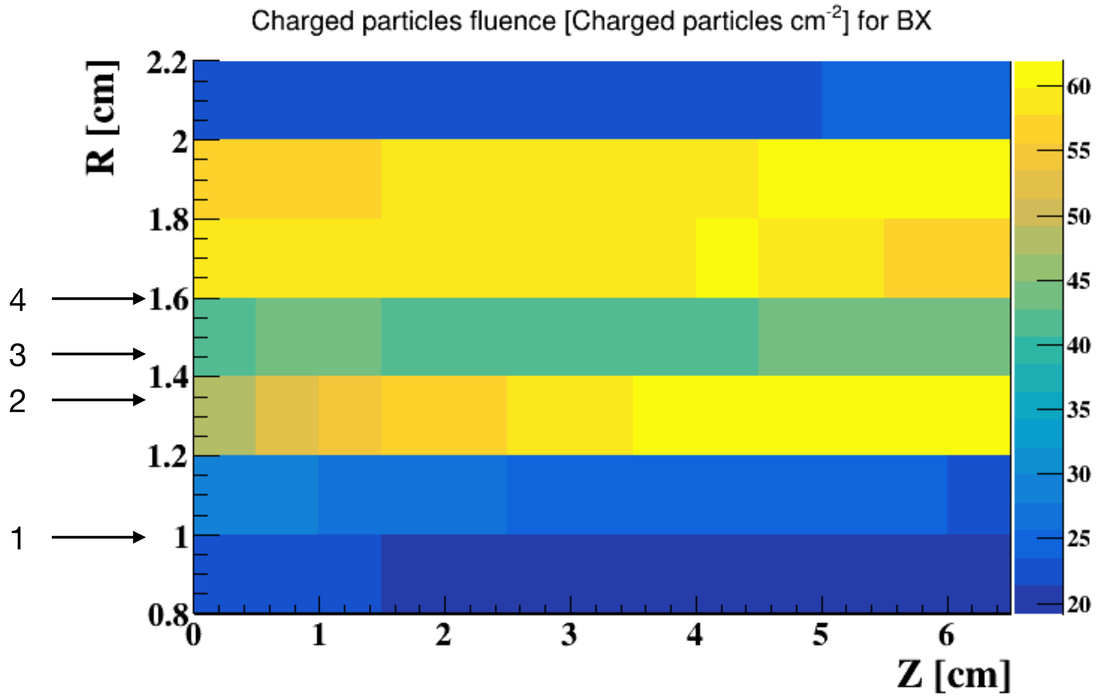
Synchrotron Radiation

- Hit: No Effect
- Heat: Under Estimation



Ways of Estimation

- We read the flux number from the charged particles fluence figure of the prior simulation
  - 1 is 1.0cm
  - 2 is 1.35cm(represent 1.4cm, inner surface of the beampipe)
  - 3 is 1.45cm(outer surface of the beampipe)
  - 4 is 1.6cm(represent 1.59cm, inner surface of 1st layer vertex)
- We get the ratio of 3/2 and 4/3, to estimate the change due to beampipe and gap between beampipe and 1st vertex layer
- Then put the ratio to the numbers (should be) in 1, to estimate the impacts.



Pair Production

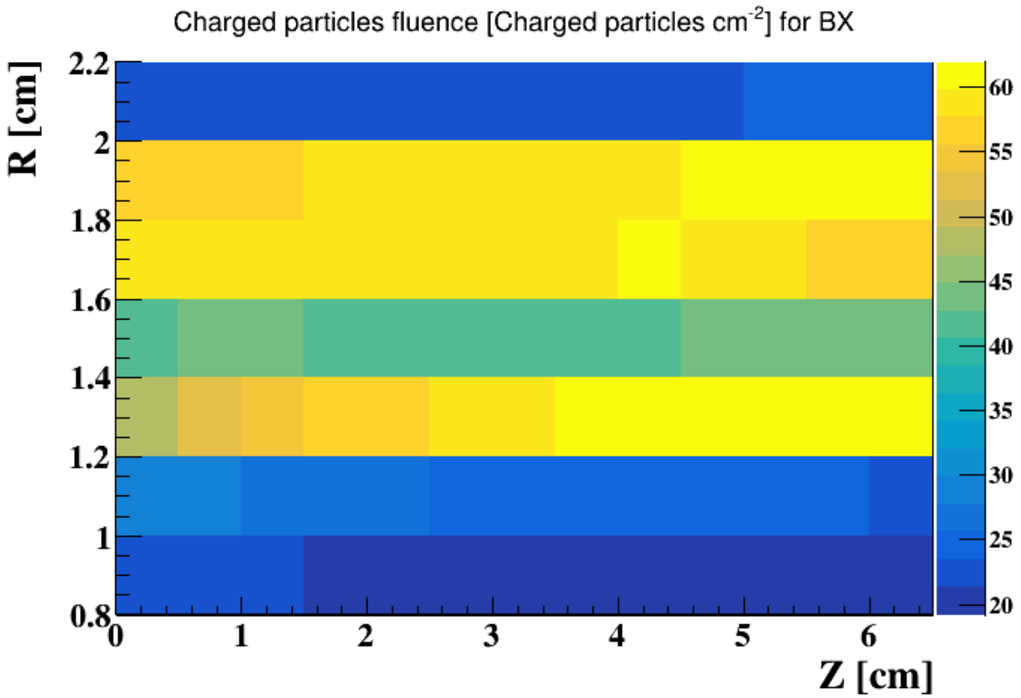
	Flux
10 mm	56.34
13.5 mm	32.49
14.5 mm	5.96
16 mm	6.04

- TID in 12mm:
  - +~75%
  - ~1034.50 kRad/yr
- NIEL in 12mm:
  - +~75%
  - ~$1.94 \times 10^{12} n_{eq} \cdot cm^{-2} \cdot yr^{-1}$

Beam Gas Bremsstrahlung

Previous Results

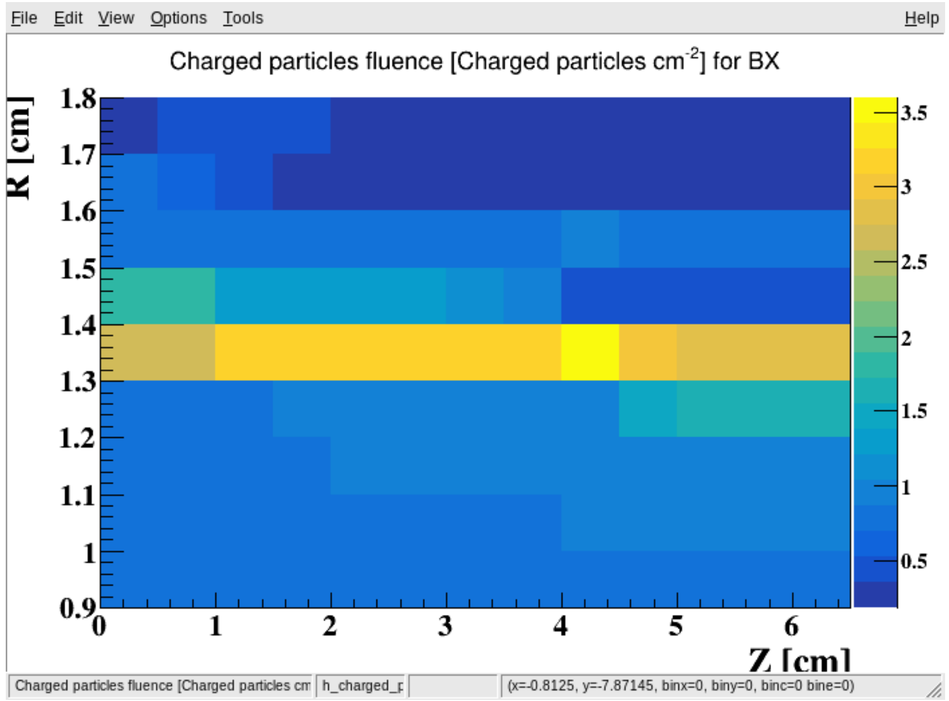
- We may scale the results using the ratio of different positions.



	Flux
10 mm	25.3151
13.5 mm	57.8439
14.5 mm	42.6009
16 mm	58.5107

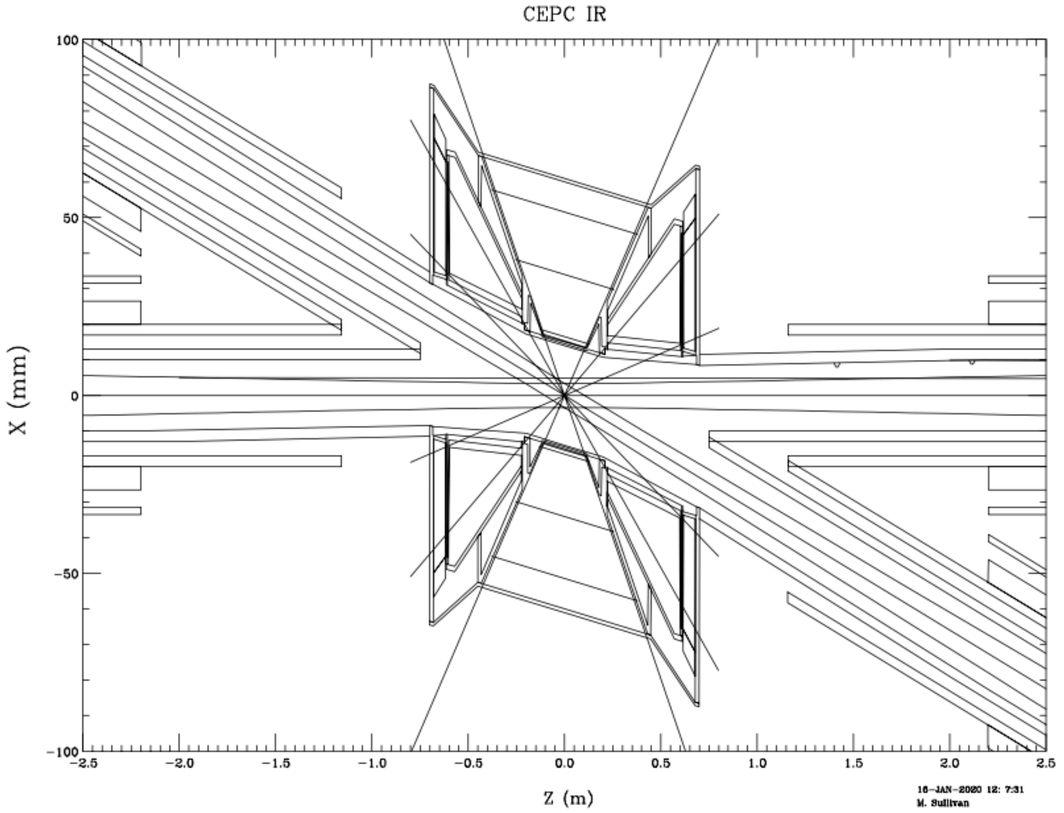
Radiative Bhabha

- We may scale the results using the ratio of different positions.

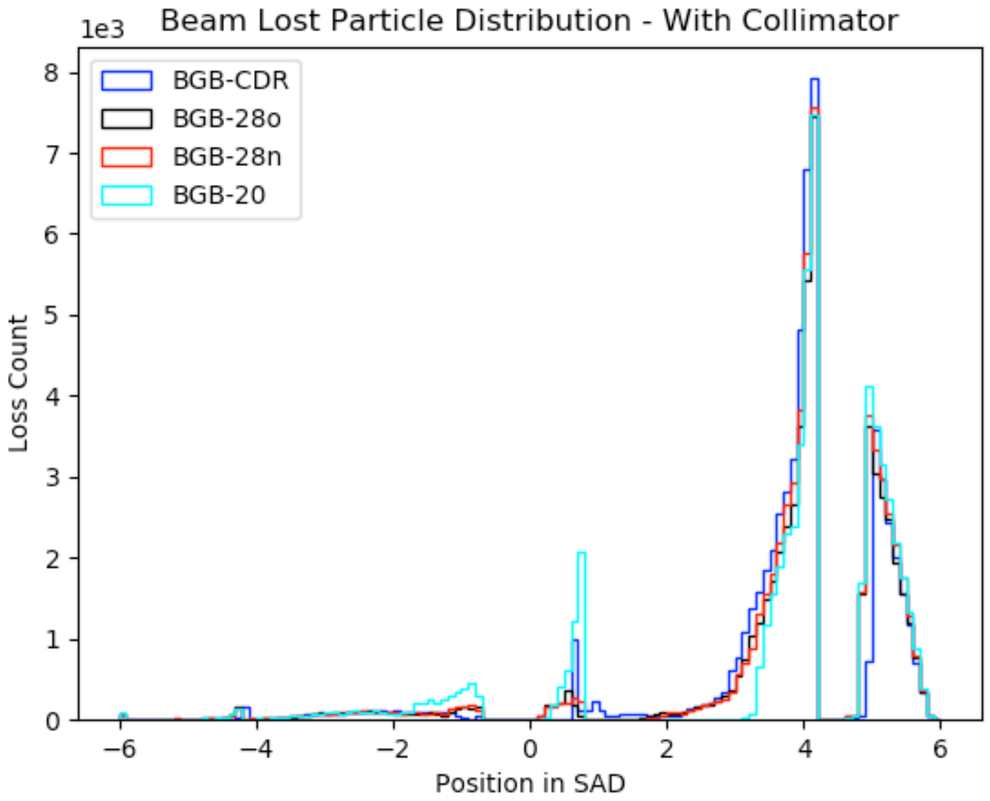


	Flux
10 mm	0.84
13.5 mm	3.06
14.5 mm	1.00
16 mm	0.35

Changing of Lost Distribution

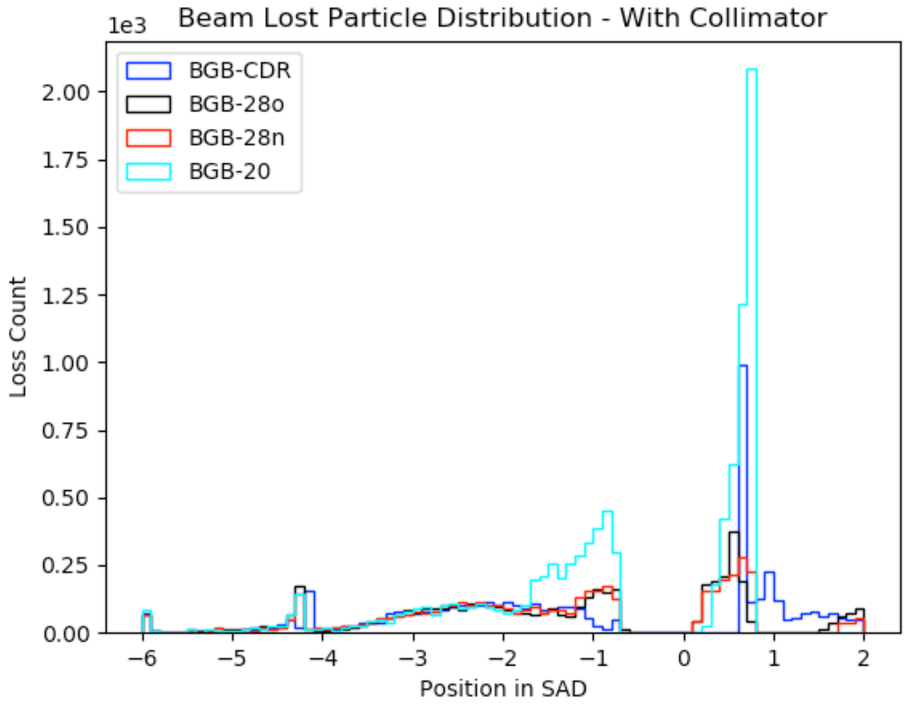


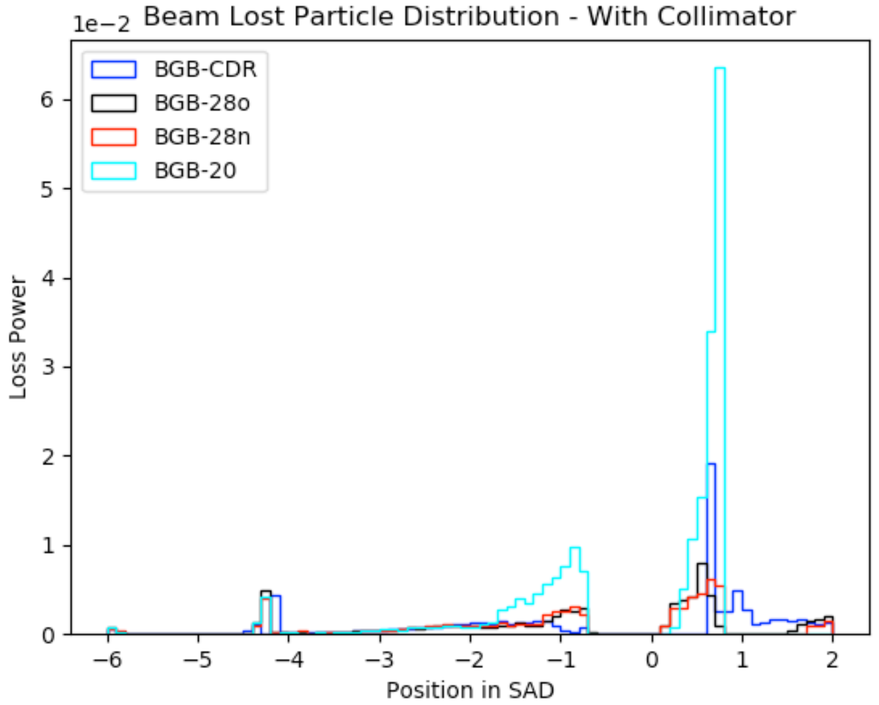
Beam Gas Bremsstrahlung



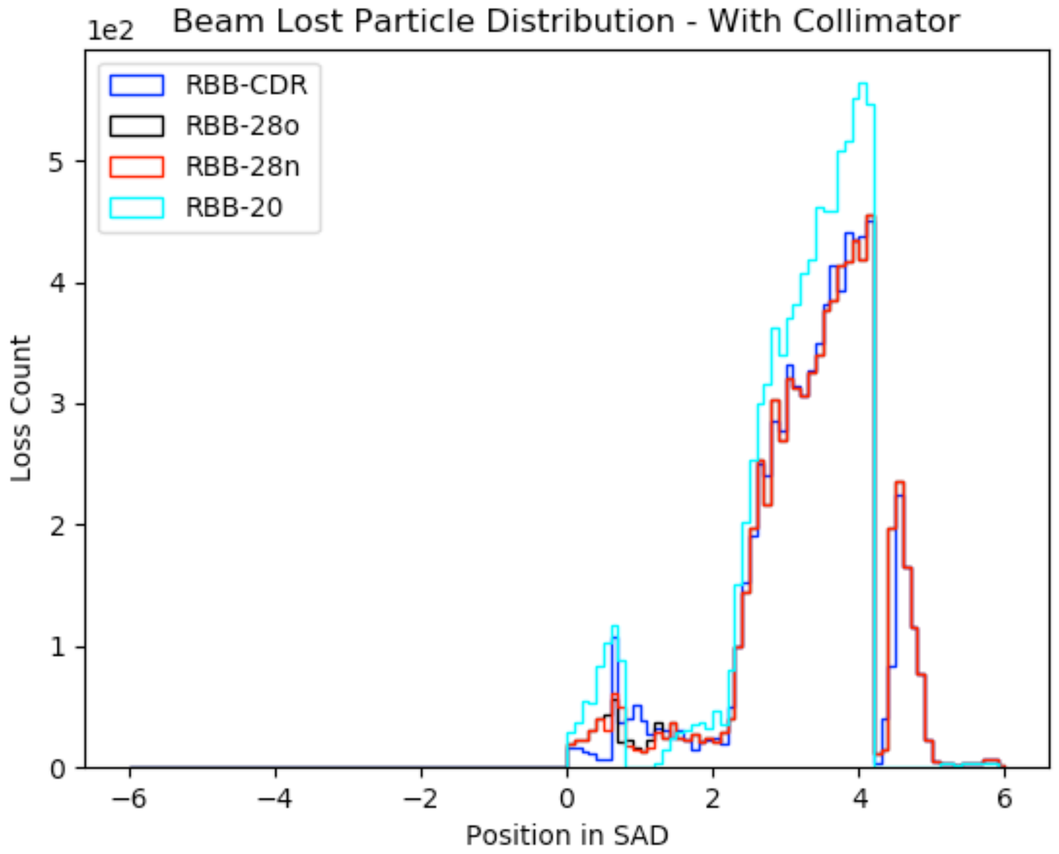
Beam Gas Bremsstrahlung

Loss Count vs Loss Power





Radiative Bhabha



Radiative Bhabha

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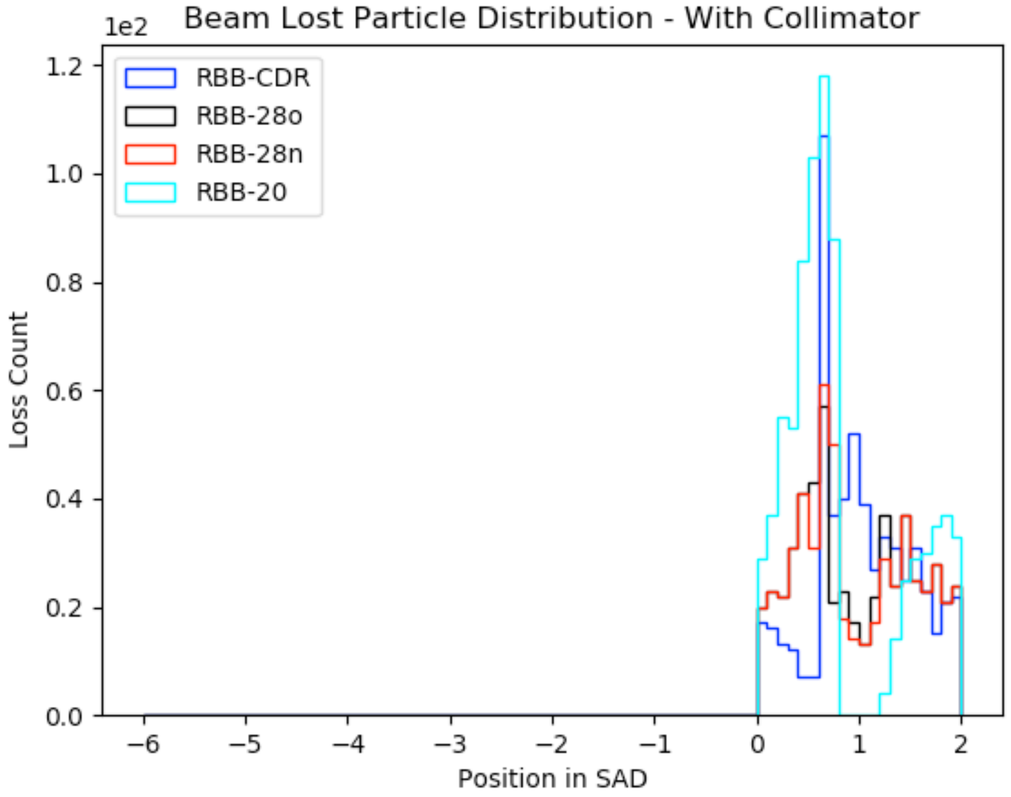
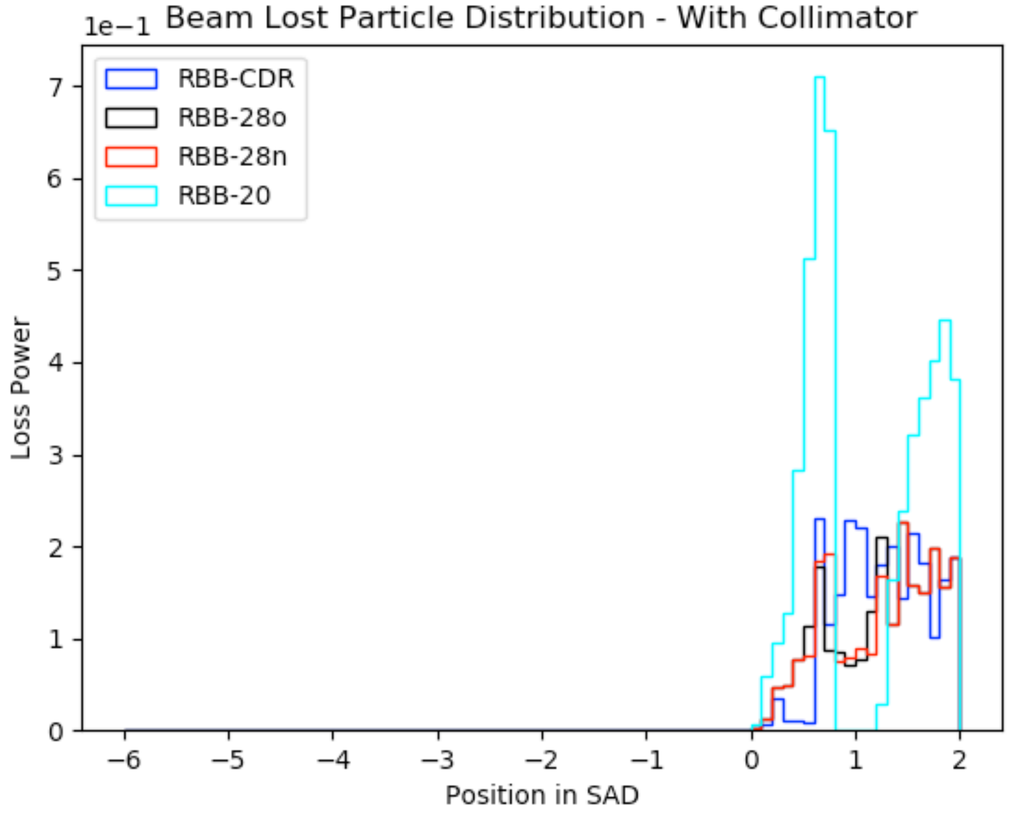
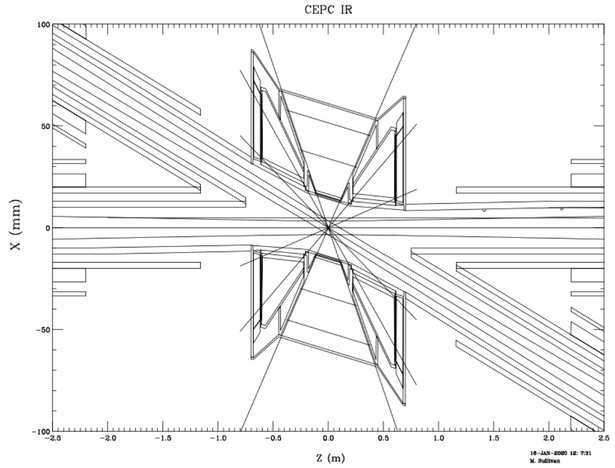




Conclusion

First Fast Estimation

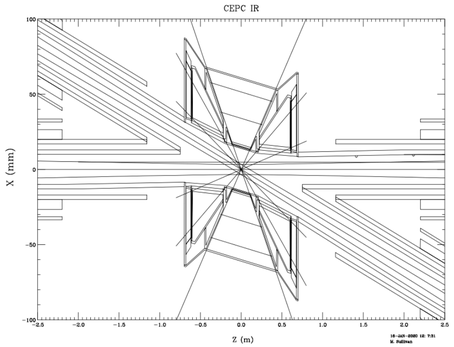


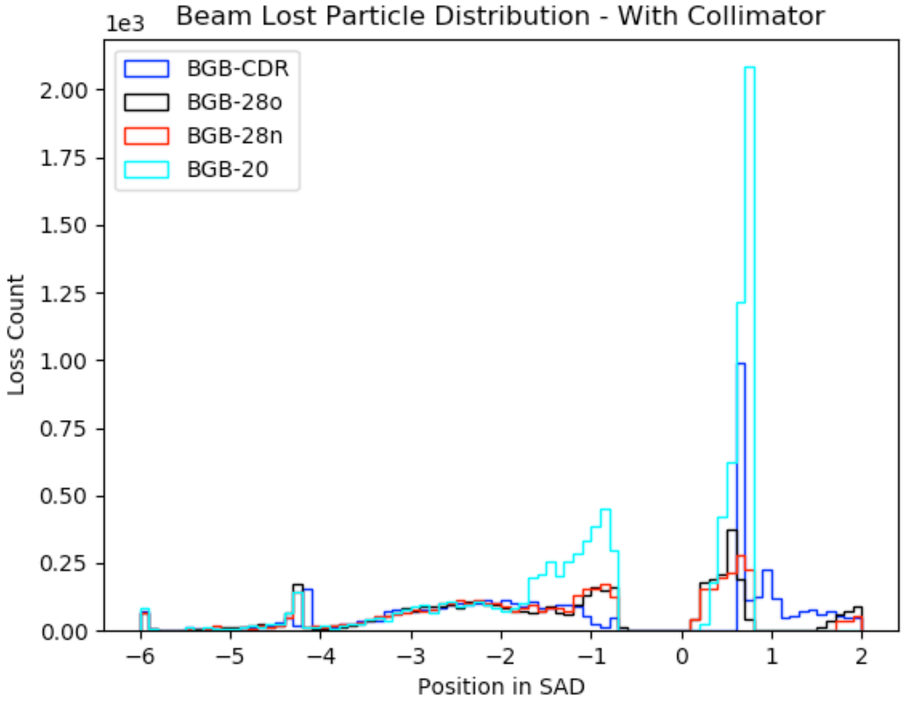
- Pair Production has an increase of ~75%.
- Off-Momentum Beam Particles will get more lost:
  - BGB ~ $\times 2$ in Count, at least $\times 2$ in Power(w/o more tracking)
  - RBB ~ $\times 2$ in Count, at least $\times 2$ in Power(w/o more tracking)
- From fast estimation, totally we may expect $\times 2$ on backgrounds
- More detail rely on more simulation

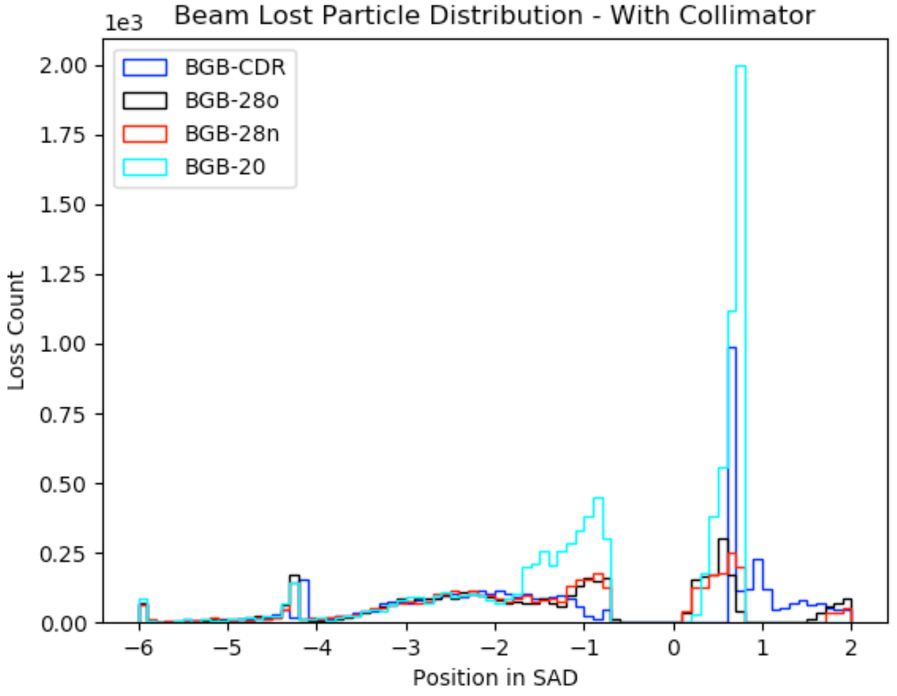
Backup

Beam Gas Bremsstrahlung

More tracking needed, ignore the lost when 0<z<0.75 and X>0







Beam Gas Bremsstrahlung

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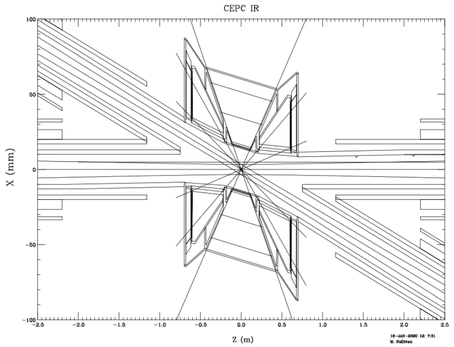

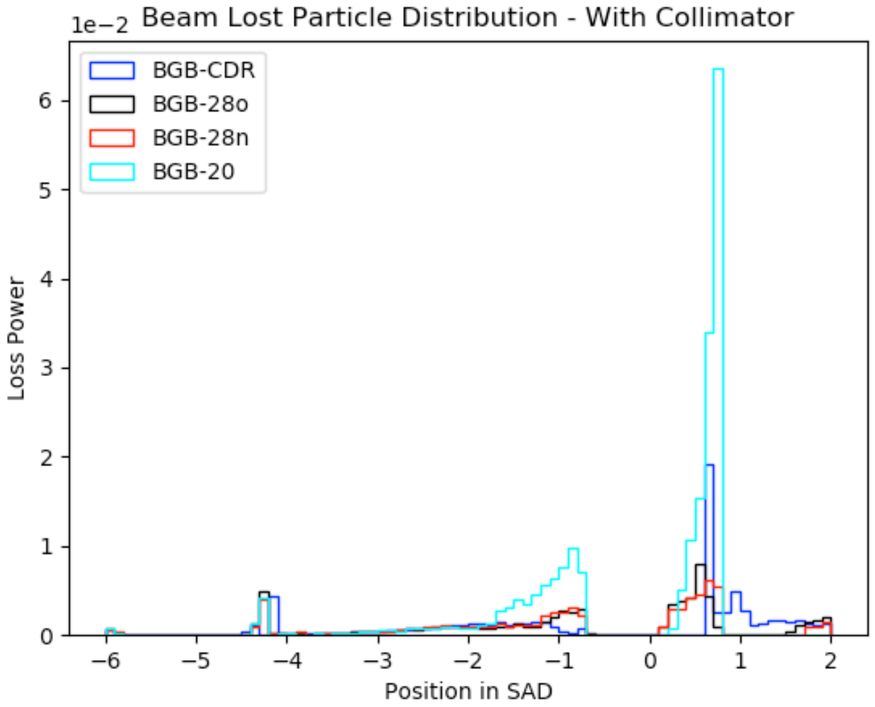

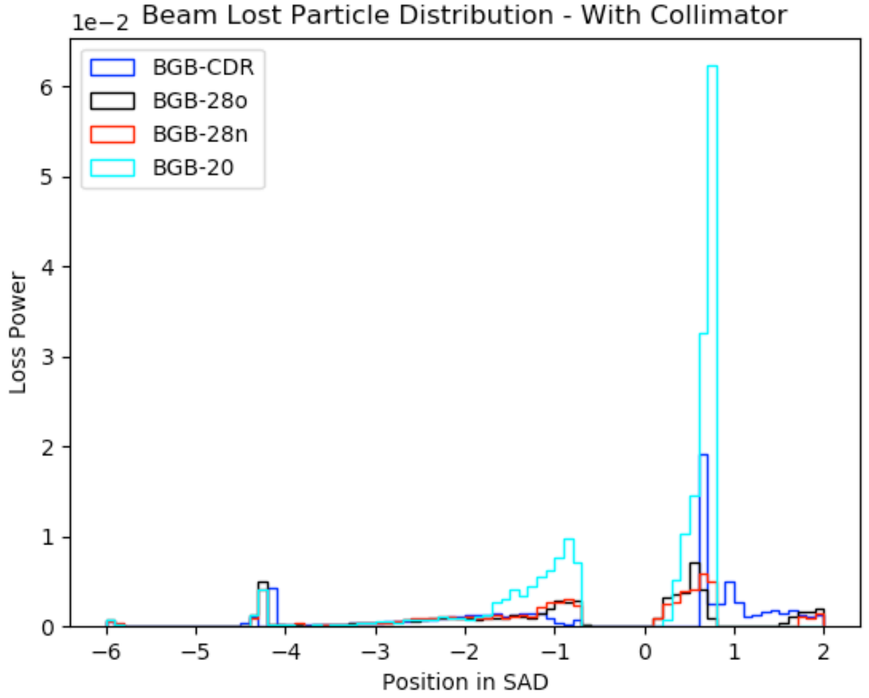

Radiative Bhabha

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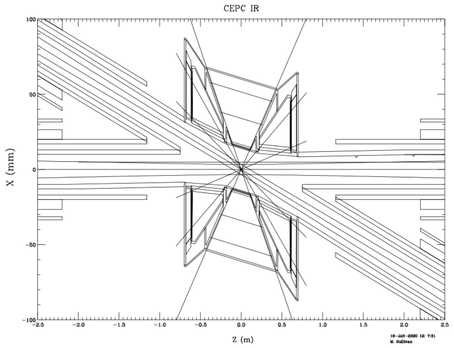

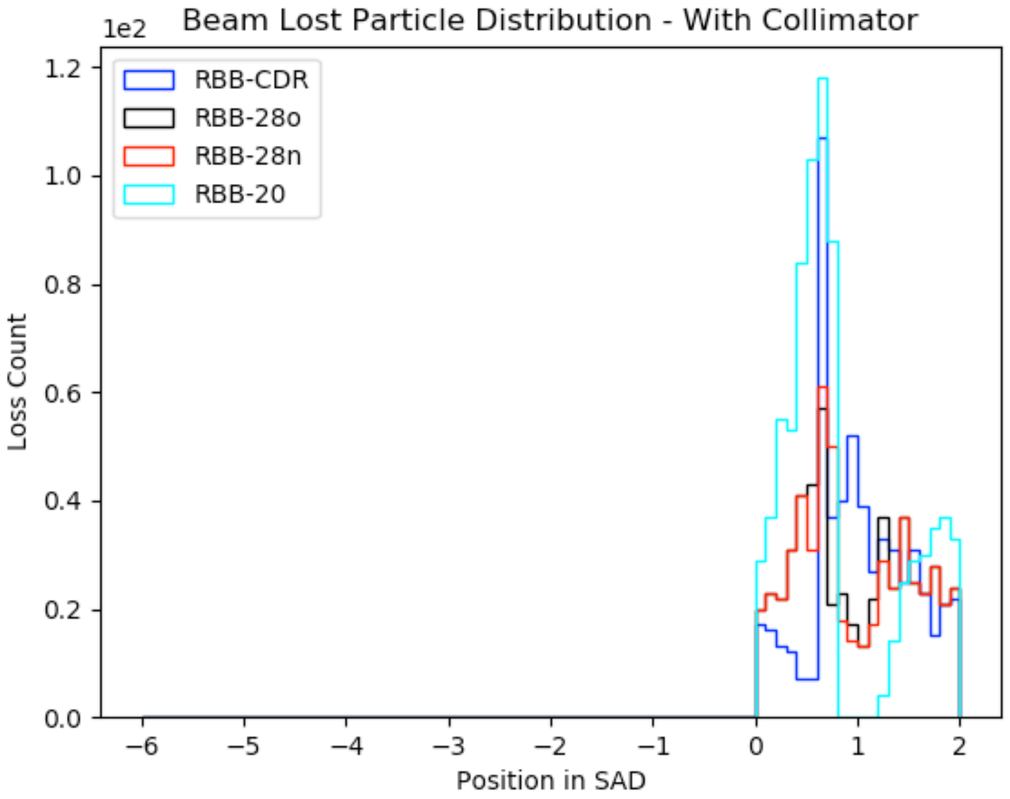

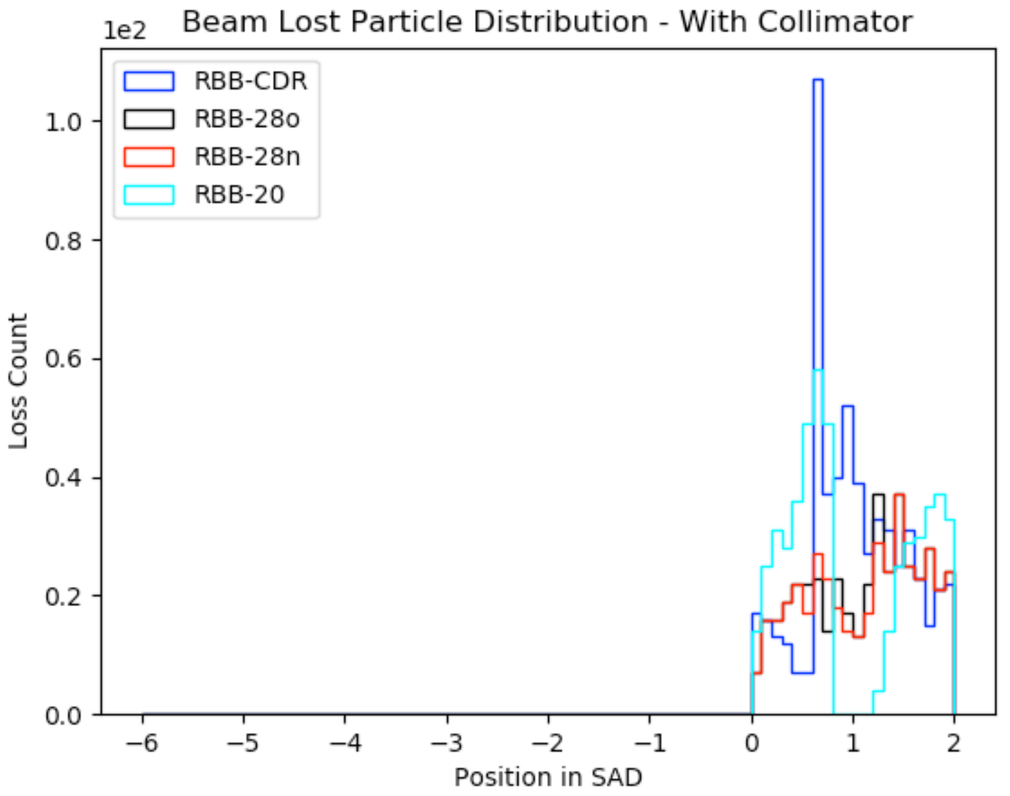

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