CEPC SR background Study

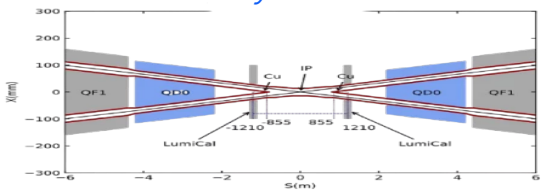
Motivation

To reduce the effect of the synchrotron back ground in the central region, additional mas k shielding of synchrotron photons is require d!

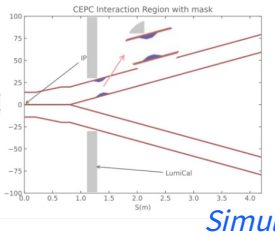
CDR Parameter

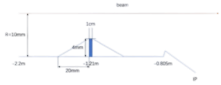
	Higgs	Z(2T)
Number of IPs	2	
Beam energy(Gev)	120	45.5
Circumference(km)	100	
Synchrotron radiation loss/turn(Gev)	1.73	0.036
Half Crossing angle at IP(mrad)	16.5	
Number of particles/bunch $N_e(10^{10})$	15	8.0
Bunch number (bunch spacing)	242 (0.68μs)	12000 (25ns+10%gap)
Beam current (mA)	17.4	461.0
SR power /beam (MW)	30	16.5
Bending radius (km)	10.7	
Momentum compact (10^{-5})	1.11	
Natural energy spread (%)	0.1	0.038
Energy acceptance requirement (%)	1.35	0.23
Lifetime (hour)	0.67	2.1
Luminosity/IP L ($10^{34}cm^{-2}s^{-1}$)	2.93	32.1

Layout

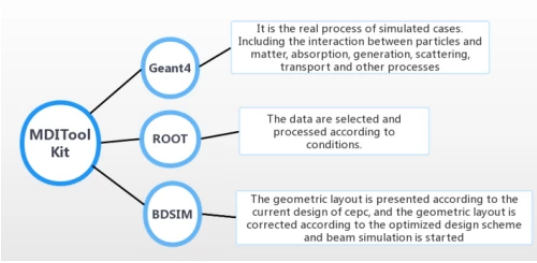


Mask Design



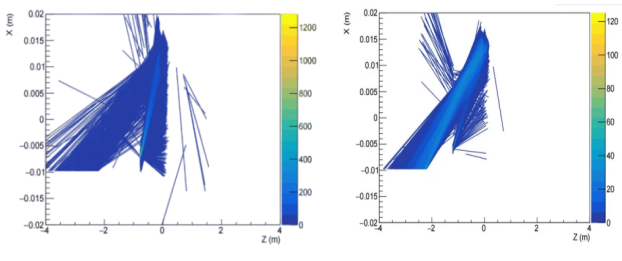


Simulation Tools



Design Schemes

Masking effect



Simulation data

position	Number of photons hit	Hit power(W)
upstream	494180070	34871.5
Be	8980	1.034
downstream	297837	18.348

design	Number of photons hit	Hit power(W)
1.21-mask-Cu	474	0.012
1.21-mask-W	468	0.011

design	Number of photons hit	Hit power(W)
1.21-mask-Cu	474	0.012
2.2-mask-Cu	300	0.07

design	Number of photons hit	Hit power(W)
1.21-mask-Cu	474	0.012
1.21-mask-5Au-Be	59	0.003

Summary

Setting the mask effectively reduces the numbe r of photons that hit Be (8980 to 474)
where the material has little effect,
Position has some effect (deposition powe r
Gold coating solution to further reduce the nu mber of Be tube hits (474 to 59)

Data Summary

option	photon number of hit Be(N)	Deposition power(W)
1.21-mask-Cu	1736.0	1.45*e-5
1.21-mask-W	1698.0	1.36*e-5
2.2-mask-Cu	1147.0	0.94*e-5
cons-no mask-Cu	257364.0	206*e-5
cons-no mask-W	148030.0	99.7*e-5
1.21-mask-Cu-5μmAu	216.0	0.273*e-5
nomask	39400.0	30.57*e-5

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Research Progress

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