Solenoid Discussion

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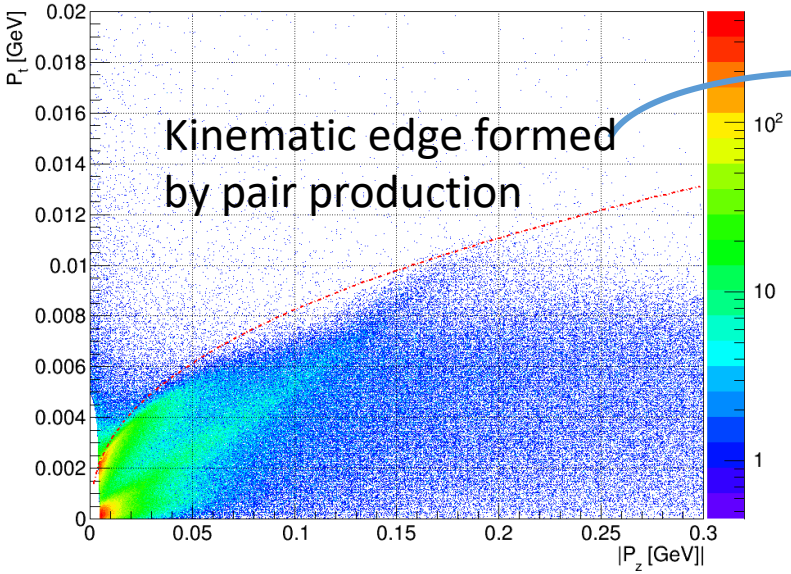
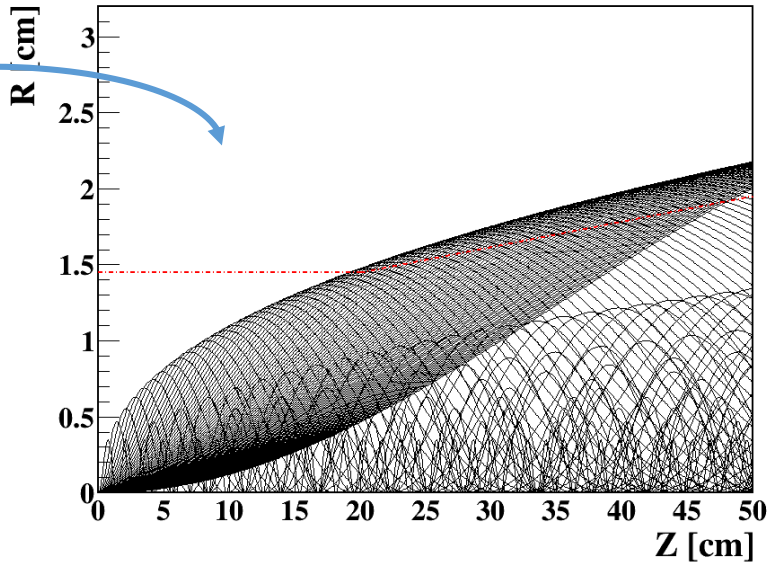
Machine Parameters

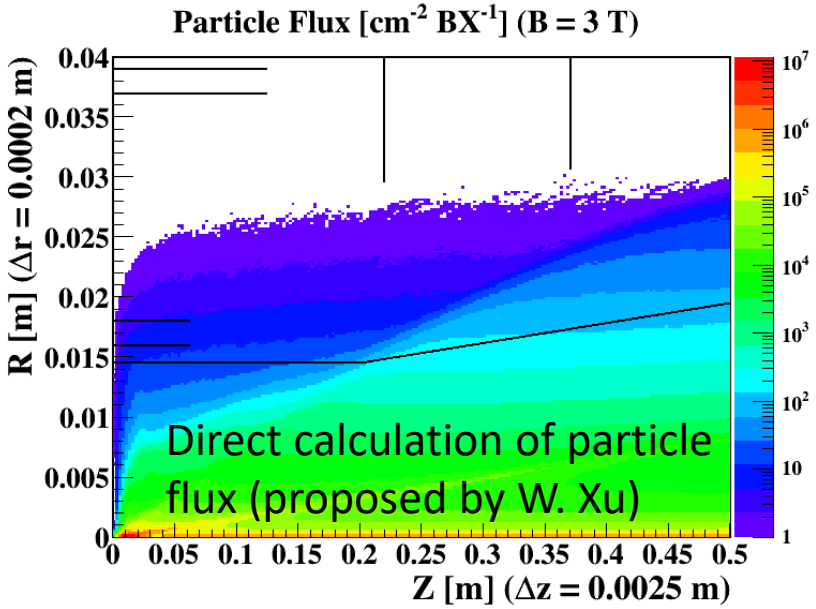
	Higgs	*W*	*Z*
Number of IPs		2	
Energy (GeV)	120	80	45.5
Circumference (km)		100	
SR loss/turn (GeV)	1.73	0.34	0.036
Half crossing angle (mrad)		16.5	
Piwinski angle	2.58	4.29	16.4
N_e/bunch (10^{10})	15	5.4	4.0
Bunch number (bunch spacing)	242 (0.68us)	3390 (98ns)	8332 (40ns)
Beam current (mA)	17.4	88.0	160
SR power /beam (MW)	30	30	5.73
Bending radius (km)		10.6	
Momentum compaction (10^{-5})		1.11	
β_{IP} x/y (m)	0.36/0.0015	0.36/0.0015	0.2/0.0015
Emittance x/y (nm)	1.21/0.0031	0.54/0.0016	0.17/0.004
Transverse σ_{IP} (um)	20.9/0.068	13.9/0.049	5.9/0.078
ξ_x/ξ_y/IP	0.031/0.109	0.0148/0.076	0.0043/0.04
V_{RF} (GV)	2.17	0.47	0.054
f_{RF} (MHz) (harmonic)		650 (216816)	
Nature bunch length σ_z (mm)	2.72	2.98	3.67
Bunch length σ_z (mm)	3.26	3.62	6.0
HOM power/cavity (kw)	0.54 (2cell)	0.47(2cell)	0.49(2cell)
Energy spread (%)	0.1	0.066	0.038
Energy acceptance requirement (%)	1.52		
Energy acceptance by RF (%)	2.06	1.47	0.76
Photon number due to beamstrahlung	0.29	0.16	0.28
Lifetime due to beamstrahlung (hour)	1.0		
Lifetime (hour)	0.67 (40 min)	2	4
F (hour glass)	0.89	0.94	0.99
L_{max}/IP ($10^{34}cm^{-2}s^{-1}$)	2.93	7.31	4.1

Beam Pipe

Pair production @Higgs





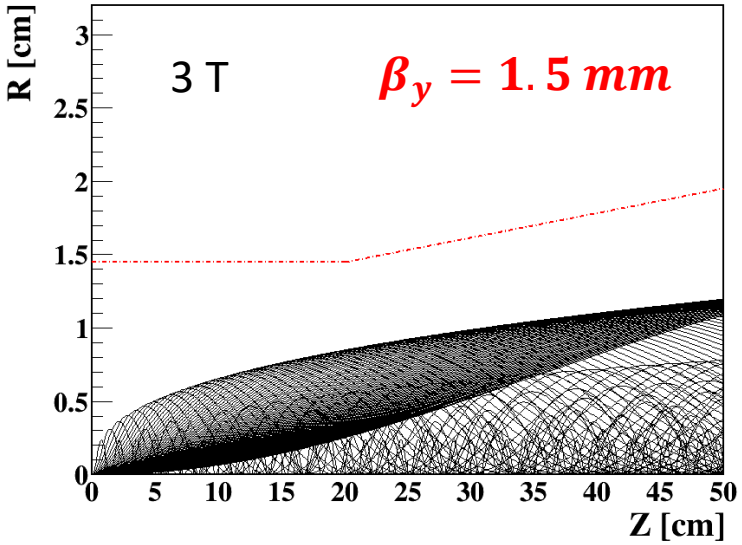


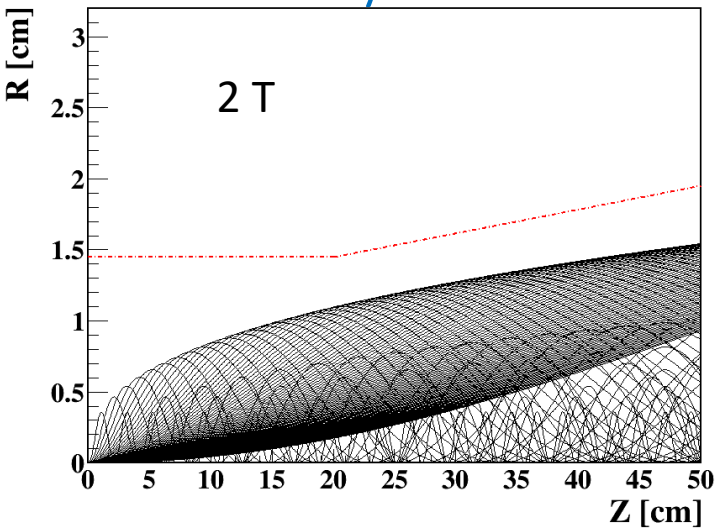
Current beam pipe position not ideal → increased backgrounds

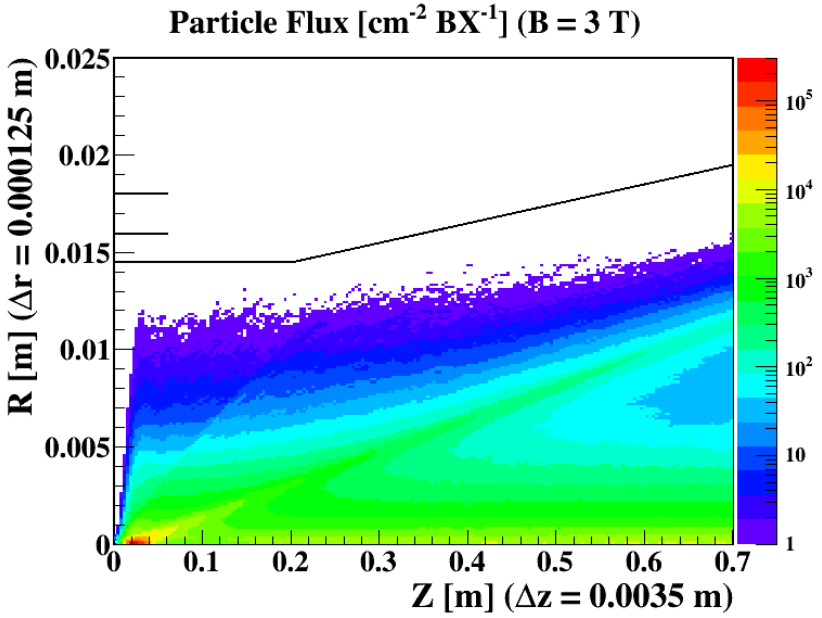
Beam Pipe

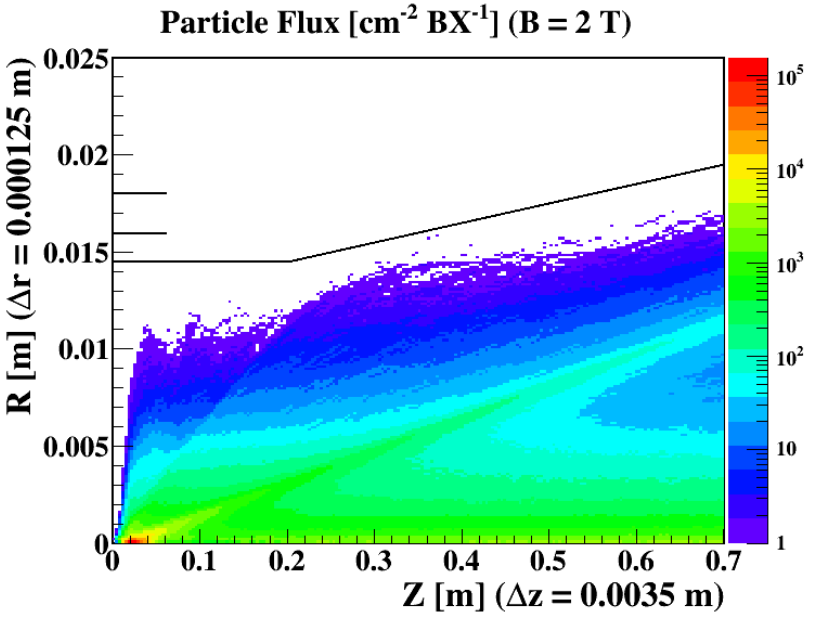
Sufficient safety margin even with the current imperfect beam pipe location!

Can we deal with β_y=1.0mm? Jobs are still running but the answer will be likely YES.









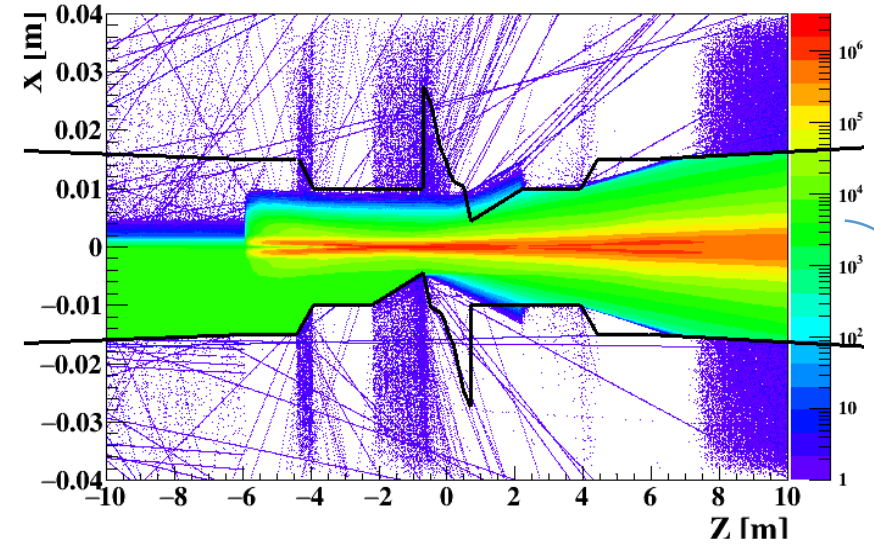
Off-Energy Particle

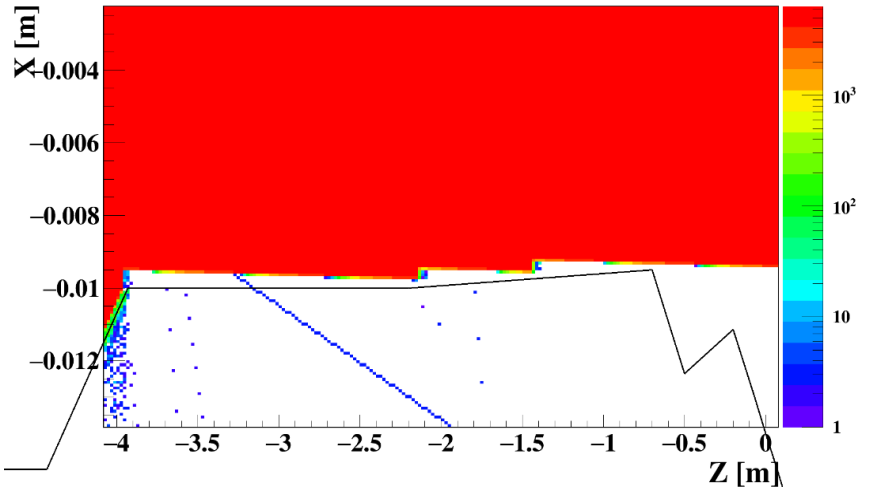
Challenges from more aggressive machine design

- With proper collimation system, backgrounds from off-energy particles (radiative Bhabha scattering, beamstrahlung, beam-gas interaction, etc.) can be controlled to an acceptable level → observation with Higgs parameters/design
  - *LEP claimed difficult to collimator off-energy particles; SuperKEKB adopted complicated collimation system – to be checked*

- Should be less critical for lower energy operation

Synchrotron Radiation





Being updated …

Small amount of SR photons hitting the central region after introducing mask tips

Less critical for the Z operation