Flange Background Simulation

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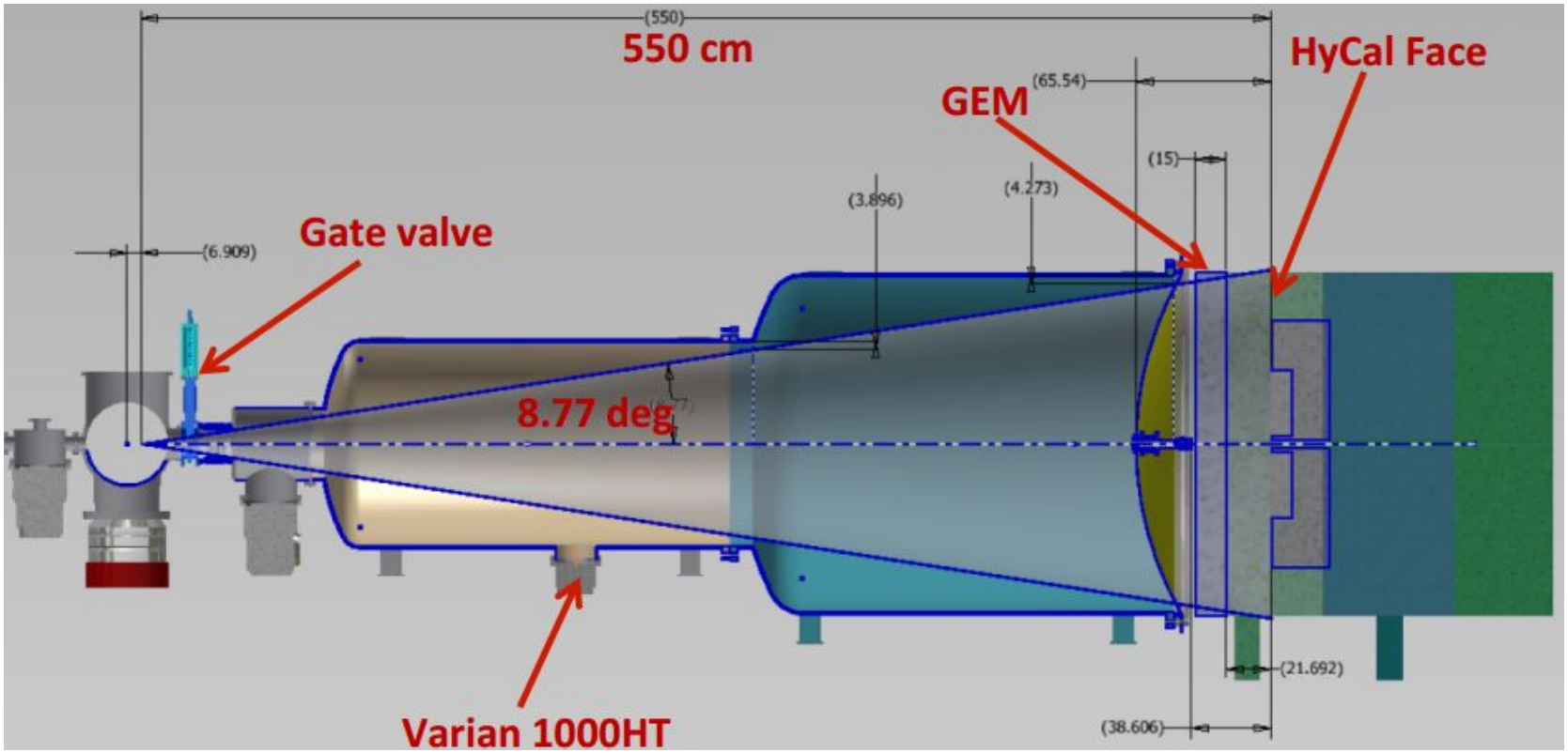
Geometry setup in the simulation

distance from flange to HyCal crystals surface is 65 cm



Geometry update in the simulation

Simulation geometry update :

Flange(winoow Coupling) :

material Al, outer diameter 2.3" , inner diameter 1.3",

Adapter:

material Fe, outer diameter 1.62" , inner diameter 1.245",

Quick Disconnect big:

material Fe, outer diameter 2" , inner diameter 1.39",

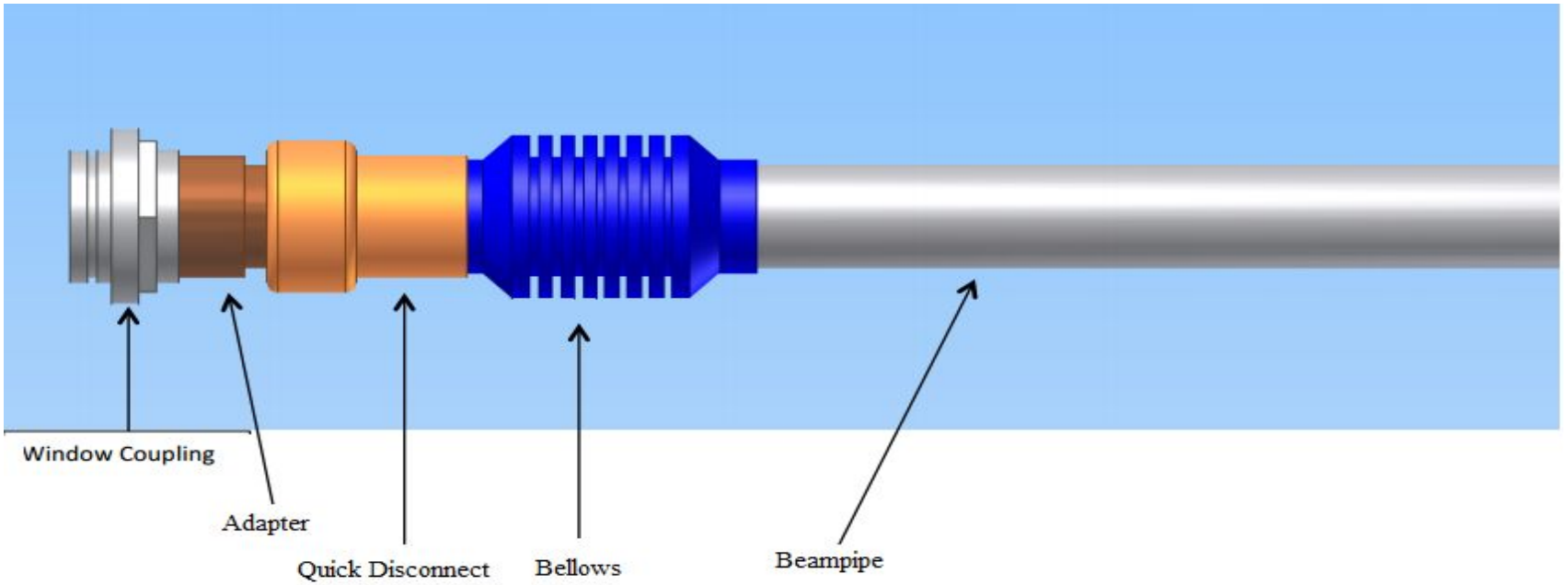
Quick Disconnect small:

material Fe, outer diameter 1.62" , inner diameter 1.39",

Beam Pipe:

material Fe, outer diameter 1.375", inner diameter1.245",

note: the beam pipe is all the way connect to the Adapter in the simulation



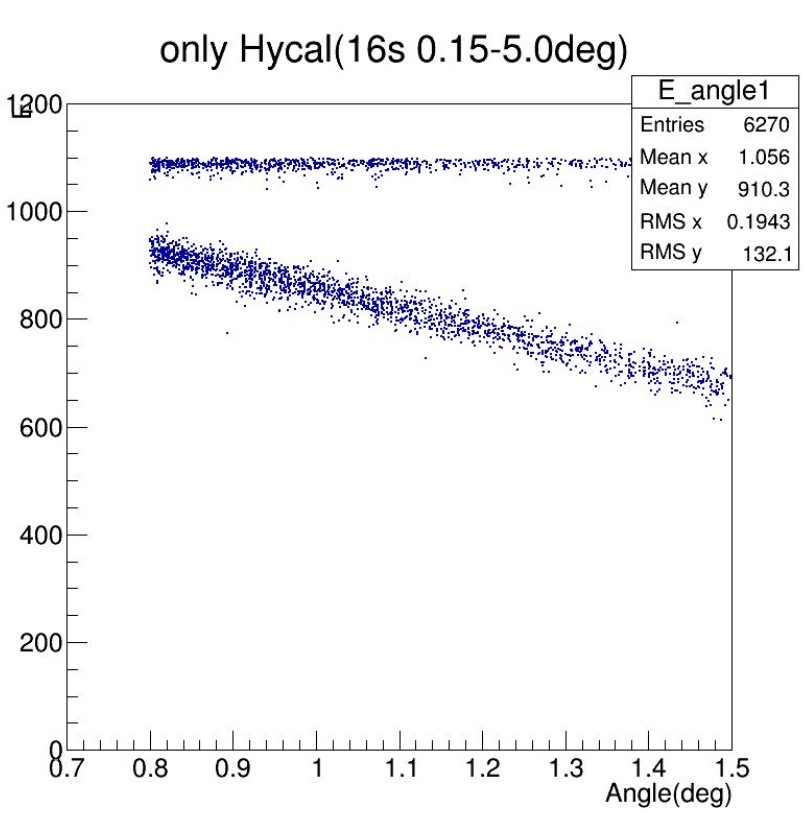
2 setups in the simulation

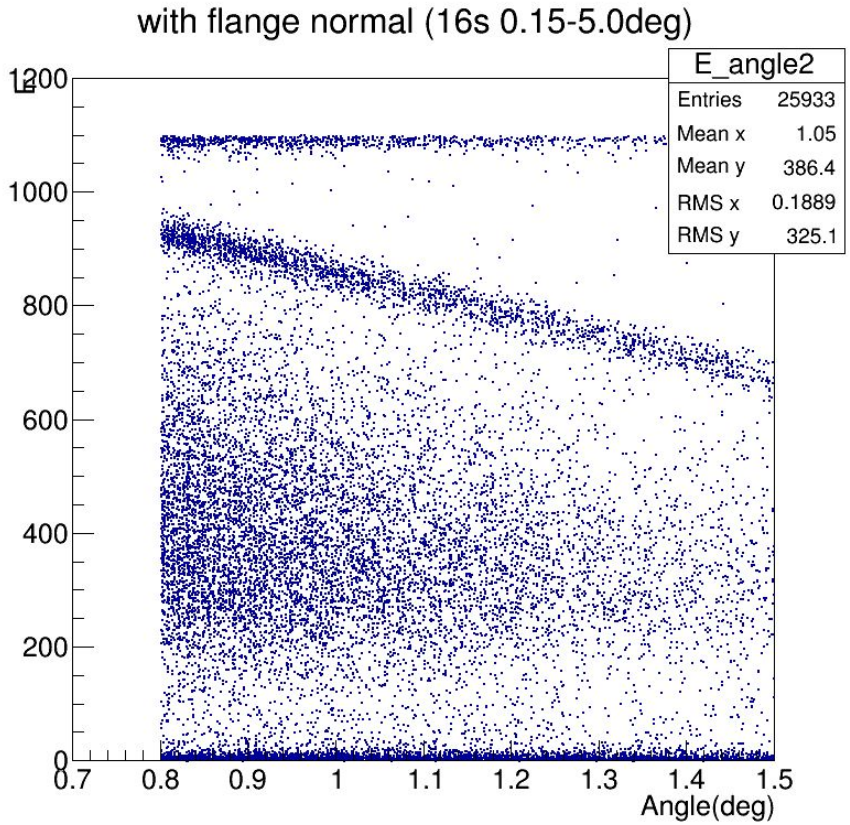
To determine the flexibilities and safe range of these part's diameters , u sed two setups in the simulation.

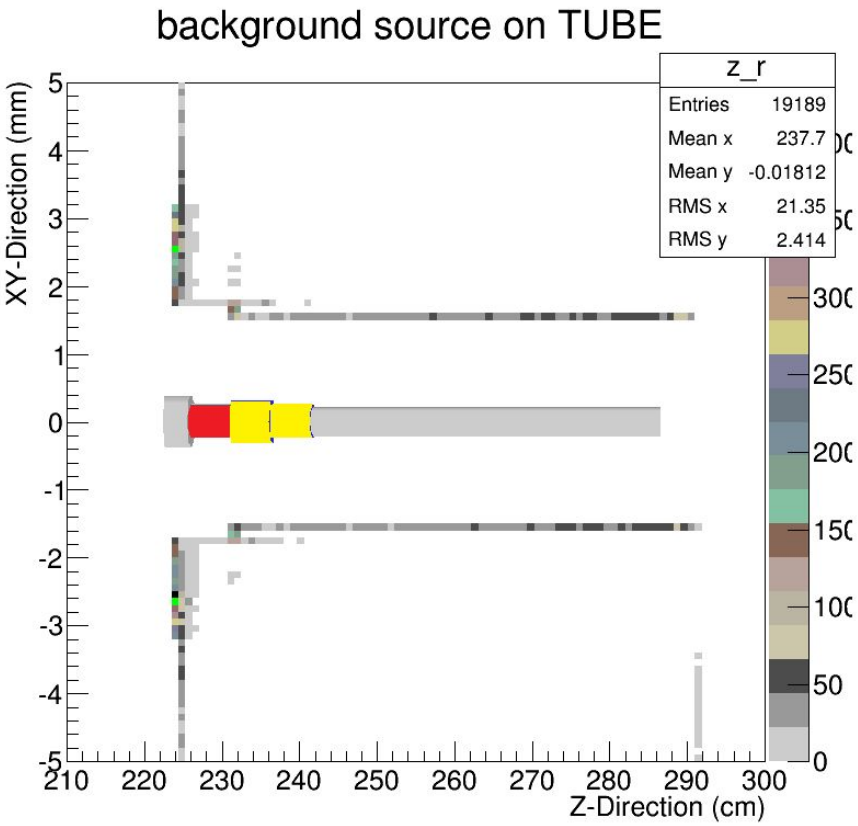
0.8deg ~ 5.5" diameter at flange point

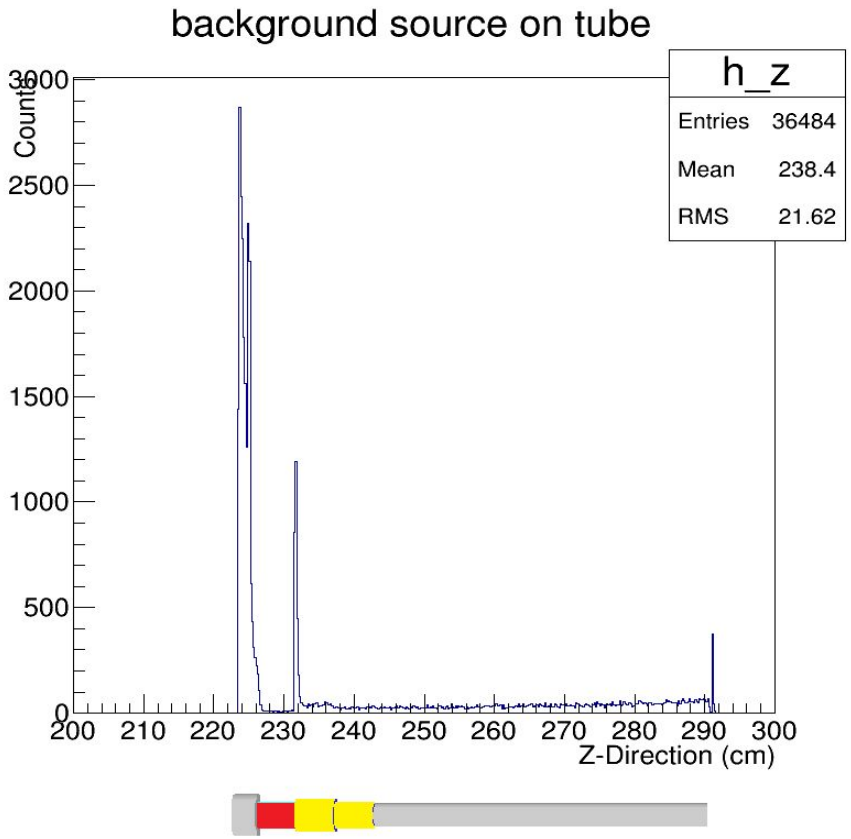
	Setup 1: normal		setup 2: Max	
part	outer	inner	outer	inner
coupling	2.3"	1.3"	4.6"	1.3"
Adapter	1.62"	1.245"	4.0"	1.245"
Quick Disconnect big	2.0"	1.39"	4.6"	1.39"
Quick Disconnect small	1.62"	1.39"	4.0"	1.39"
Beam pipe	1.375"	1.245"	1.375"	1.245"

normal setup plot use 0.1-5.0deg input for 16s beamtim e









target location is -250cm

1st peak come from the vaccum box window and coupling(at 225cm)

2nd peak come from the Quick Disconnect big part (at 234cm)

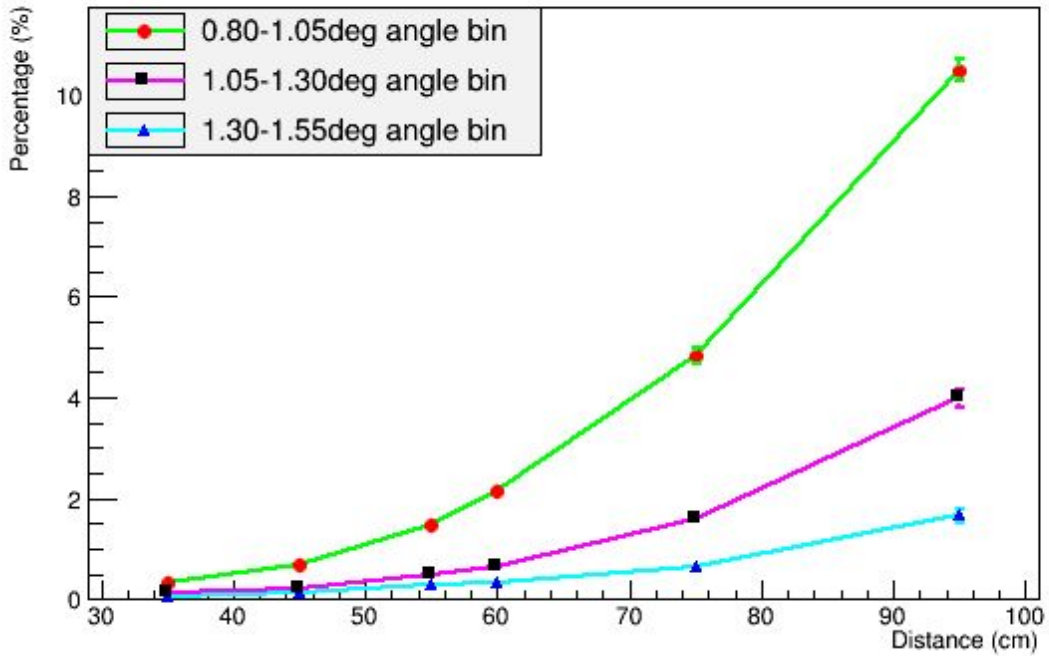
3rd peak come from the HyCal lead glass surface (at 290cm)

back ground check

contamination = $(N_{setup} - N_{onlyHycal})/N_{onlyHycal}$	**16s beam time 0.1-5.0deg input**	**16s beam time 0.1-5.0deg input**
	normal setup contamination	Max setup contamination
total rate (without cut)	1250Hz	1600Hz
after trigger (cut E >500MeV)	70Hz	300Hz
ep (cut E>980 first angle bin)	2%	10%
Moller (cut 820<E<980 first angle bin)	8.5%	33%

the back ground rate after trigger is <100Hz
~ < 5% data rate
the effect for first angle bin is the main part

recall the previous study



The distance from flange to Hycal surface is 65cm for now.

aslo change the meterial from Al to Fe for beam pipe and other parts

We can use our tracking detector (gem) further cut off these part of back ground

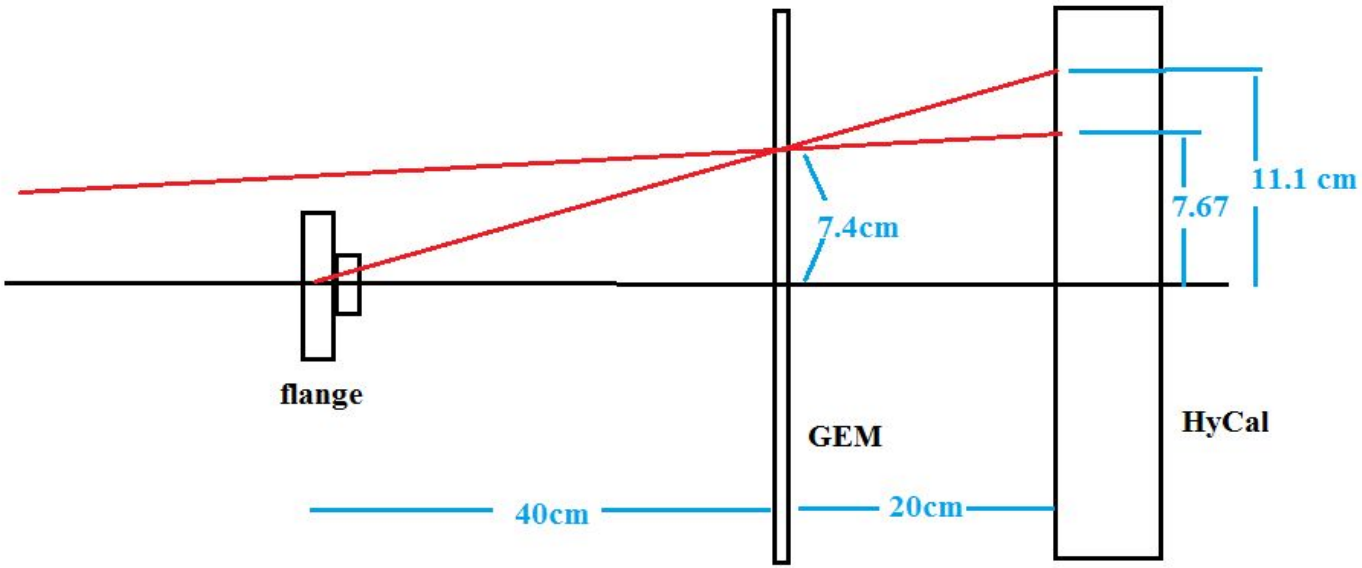
limit the back ground with tracking

0.8deg on Gem is 7.4cm,

events come from flange recording by Gem will be detected on HyCal > 11.1cm , but 7.67 cm for those come from target.

picture shows the minimum separation ~11.1-7.67=3.34cm.

with 2.5cm position resolution of HyCal, we can track these back ground



Conclusion

Current "normal" flange+adepter+.. design will give us:

Back ground : ~1200Hz on GEM .

~70Hz on HyCal (after trigger) .

~ 8.5% N_{data} in first angle bin

if use "Max" setup,

Back ground ~1600Hz on GEM .

~300Hz on HyCal (after trigger) .

~ 33% N_{data} in first angle bin

For both case, by using Gem and HyCal tracking information,

these back ground can be further reduce to less than 1% of N_{data}

Connection components design have plenty room that we can handle, of couse limit its size is always the best option.