Geometry Optimization

1. Reducing collimator 2 outer acceptance

- 103-> 101

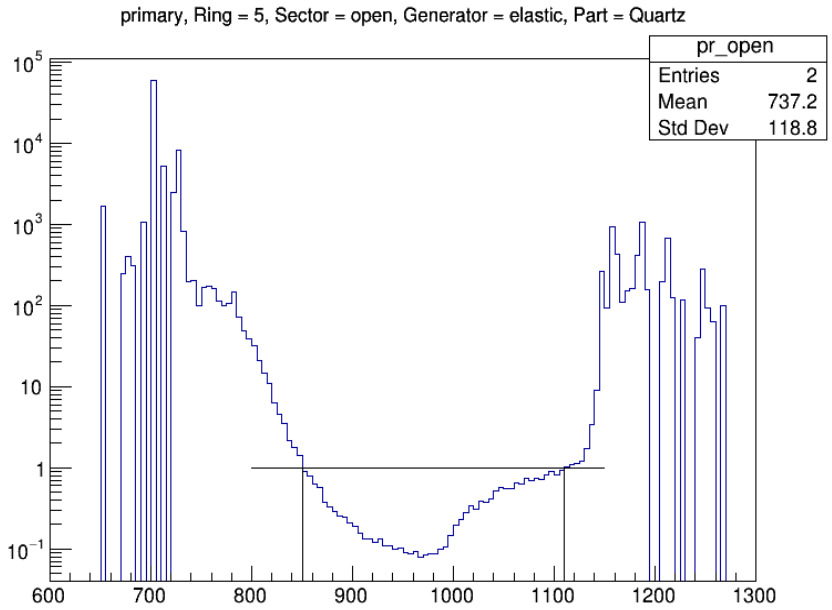
Cuts to determine radial ranges of detectors in ring 5:

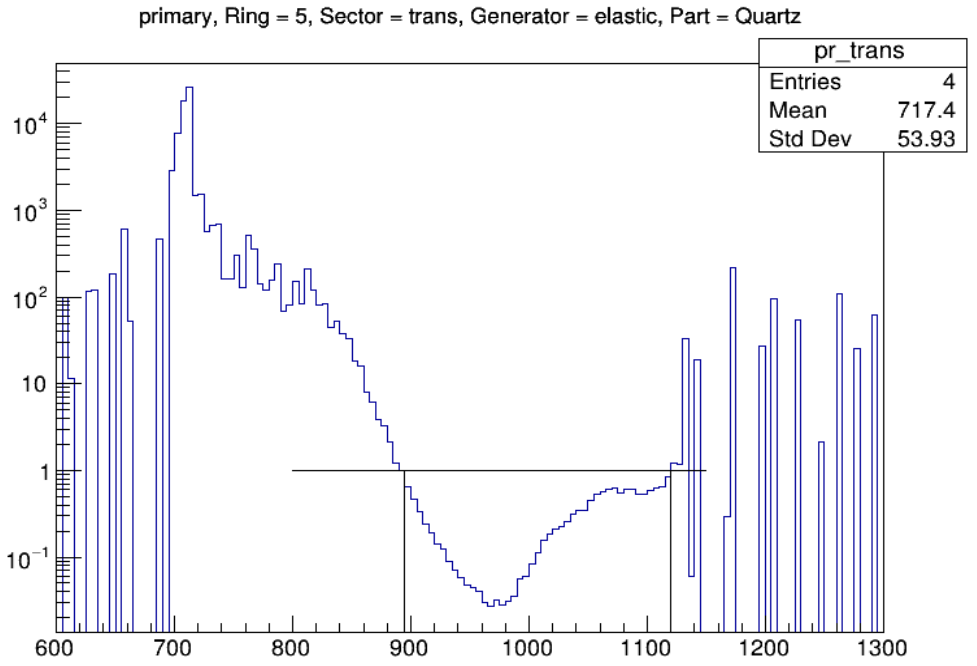
1) Relative ratio of ep/ee <=1

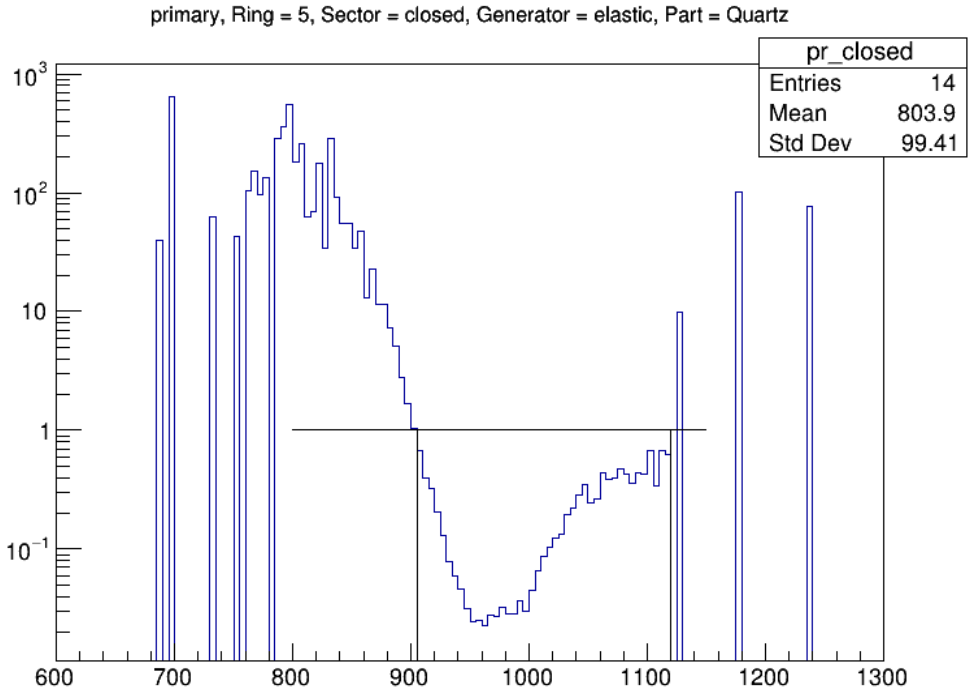
2) FOM=Rate*A^2 (GHz-ppb^2/sep/5mm) >=35 for open and trans, >=10 for closed

		Open	Trans	Closed
103	Cut1	855-1105	890-1105	905-1105
	Cut 2	855-1070	900-1060	915-1055
101	Cut1	850-1110	895-1120	905-1120
	Cut 2	855-1070	900-1060	915-1055

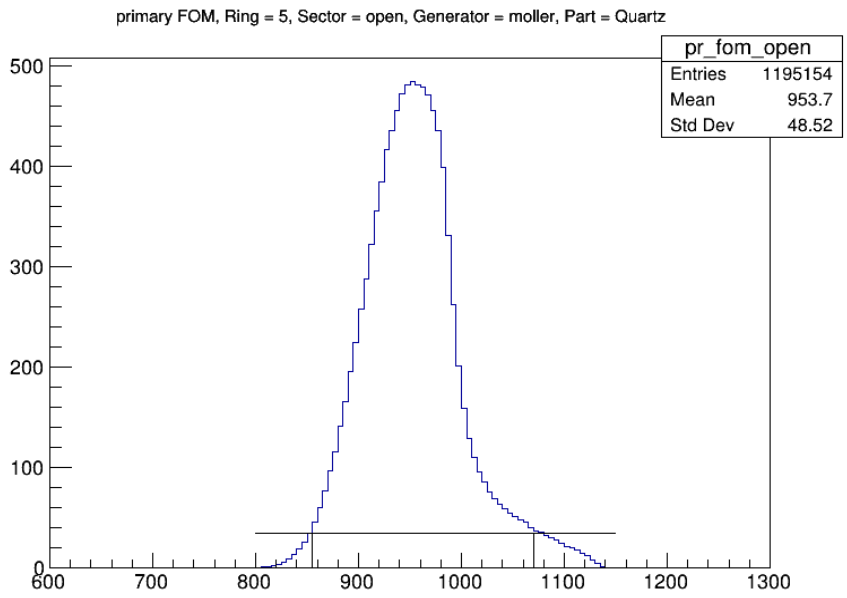
Cut 1: ep/ee ratio

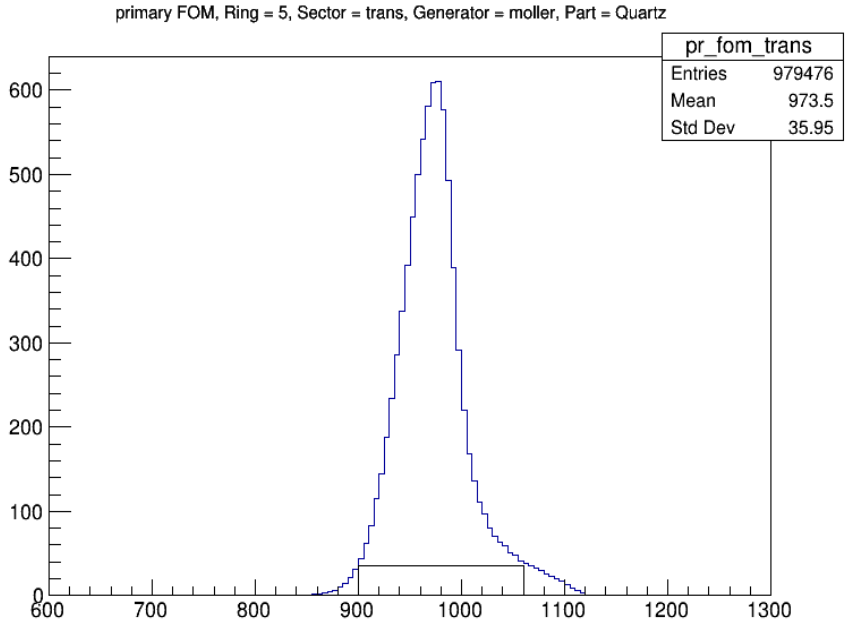


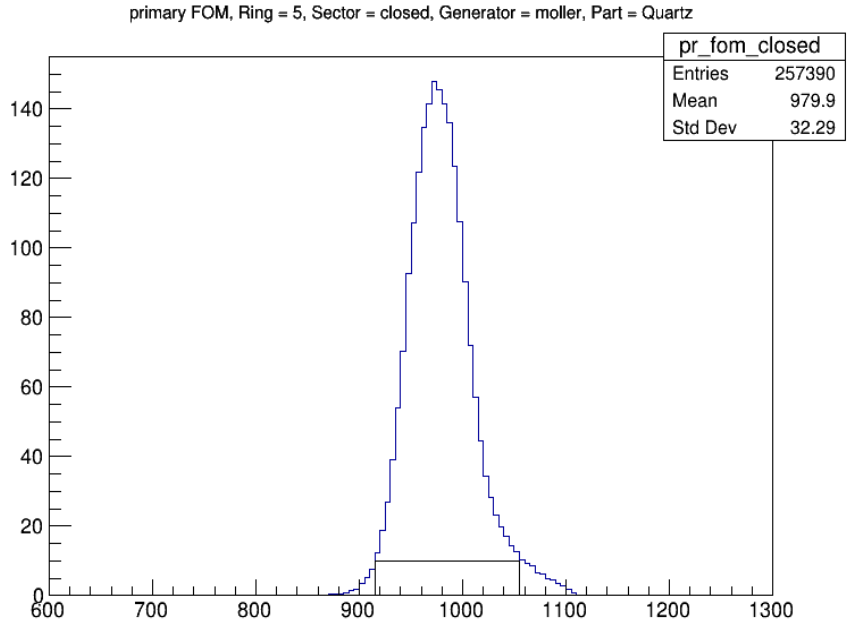




Cut 2: FOM


primary FOM, Ring = 5, Sector = open, Generator = moller, Part = Quartz
pr_fom_open
Entries 1195154
Mean 953.7
Std Dev 48.52
500
400
300
200
100
0
600
700
800
900
1000
1100
1200
1300


primary FOM, Ring = 5, Sector = trans, Generator = moller, Part = Quartz
pr_fom_trans
Entries 979476
Mean 973.5
Std Dev 35.95
600
500
400
300
200
100
0
600
700
800
900
1000
1100
1200
1300


primary FOM, Ring = 5, Sector = closed, Generator = moller, Part = Quartz
pr_fom_closed
Entries 257390
Mean 979.9
Std Dev 32.29
140
120
100
80
60
40
20
0
600
700
800
900
1000
1100
1200
1300

Ep/ee and integrated FOM for chosen range

		Rate (GHz)	Integrated FOM (GHz-ppb^2)	FOM ratio wrt 103	ep/(ee+ep)
103	Moller	134.9	144517	1	12%
	Elastic	16.1			
101	Moller	129.5	141289	1.01	12%
	Elastic	15.9			

Consequence of smaller staggered quartz in ring 5

- Use different FOM threshhold for inner and outer edge

		Rate (GHz)	Integrated FOM (GHz-ppb^2)	FOM ratio wrt 103	ep/(ee+ep)
103	Moller	134.9	144517	1	12%
	Elastic	16.1			
101	Moller	120.0	134394.39	1.04	10%
	Elastic	12.2			

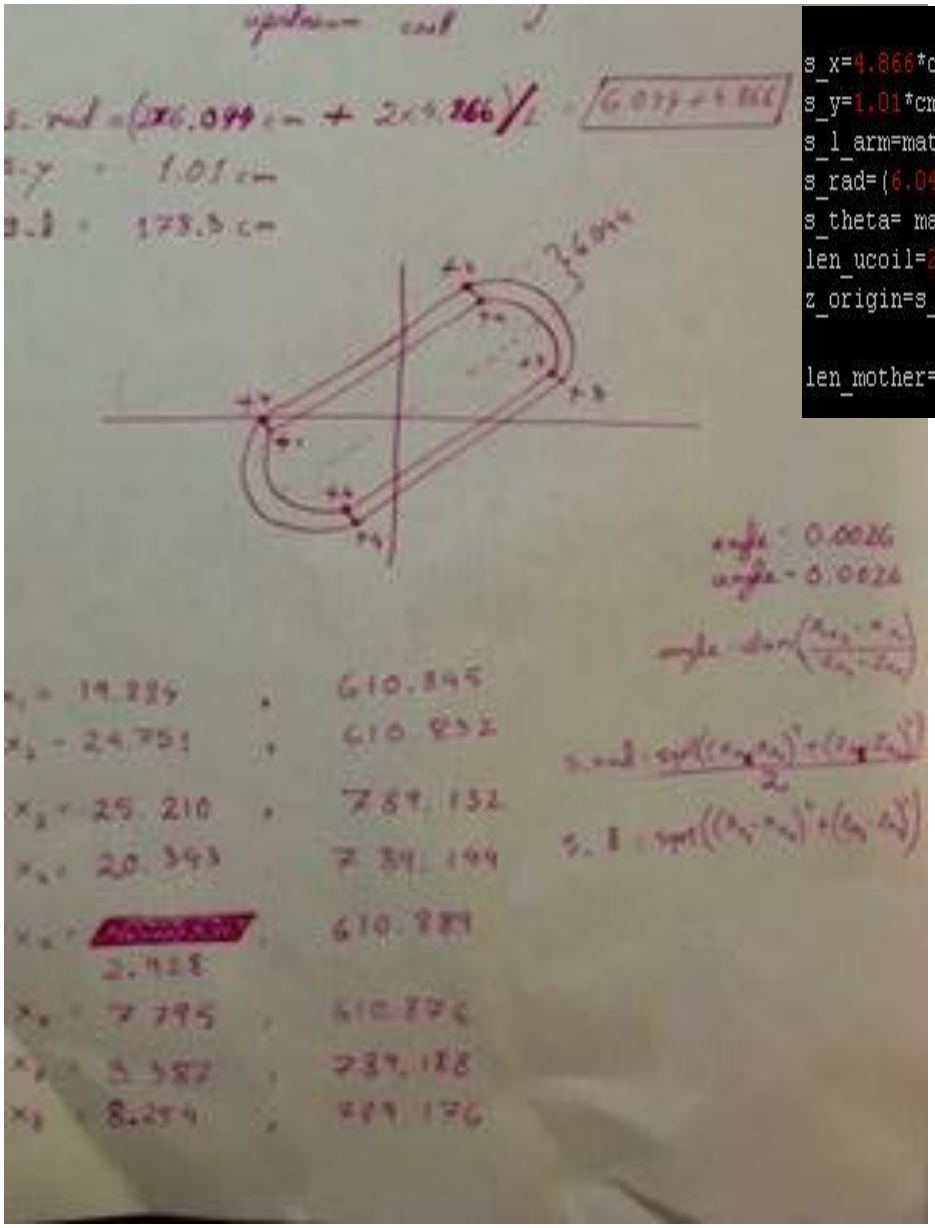
Consequence of smaller uniform quartz in ring 5

		Rate (GHz)	Integrated FOM (GHz-ppb^2)	FOM ratio wrt 103	ep/(ee+ep)
103	Moller	134.9	144517	1	12%
	Elastic	16.1			
101	Moller	120.1	134848	1.04	11%
	Elastic	13.3			

What happens if beam energy is 10.6 instead of 11 GeV?

		Rate (GHz)	Integrated FOM (GHz-ppb^2)	FOM ratio wrt 11 GeV	ep/(ee+ep)
10.6 GeV	Moller	133.9	136988.68	1.015	13%
	Elastic	17.5			
11 GeV	Moller	129.5	141289	1	12%
	Elastic	15.9			

2. Toroid Generators



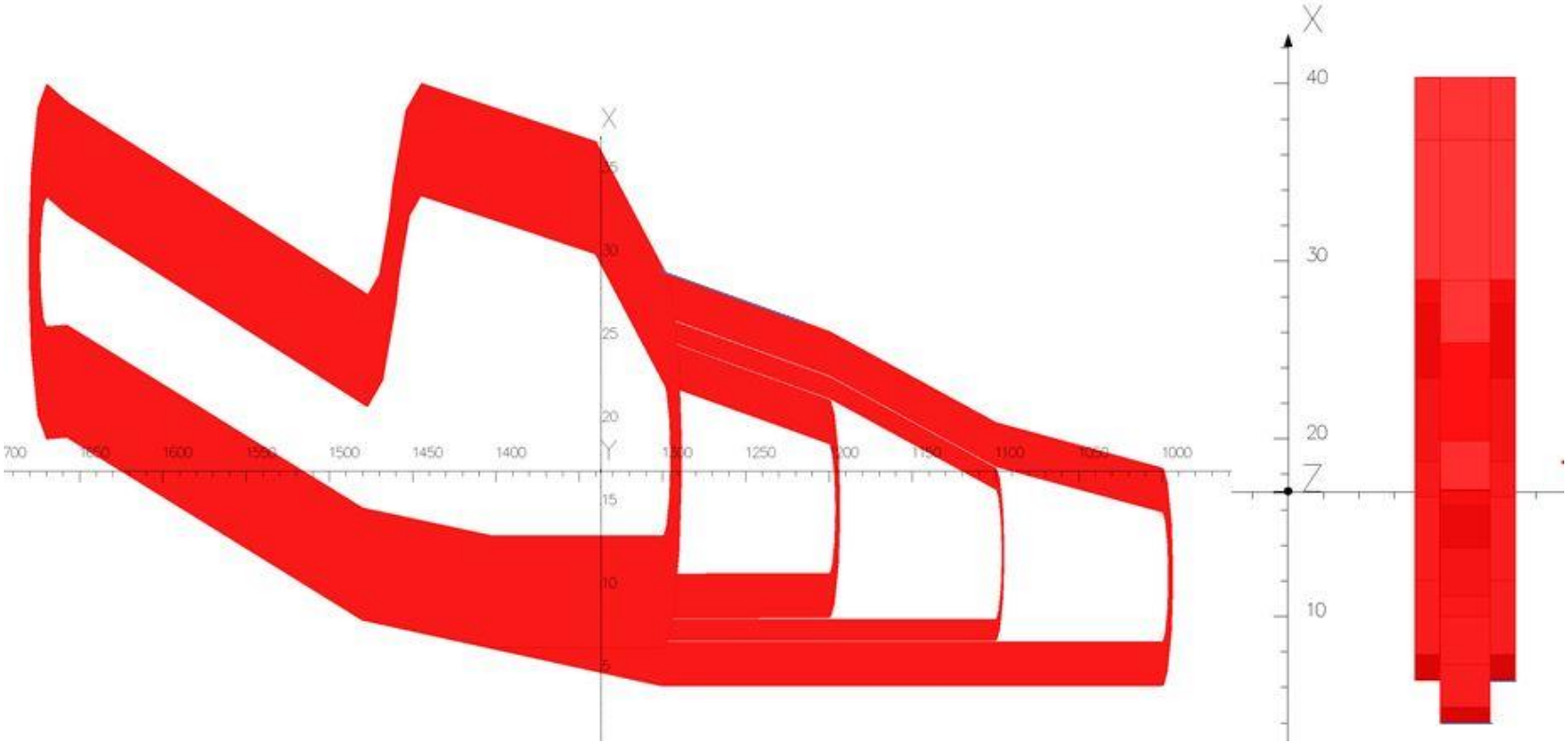
```
s_x=4.866*cm
s_y=1.01*cm
s_l_arm=math.sqrt(math.pow((25.210-24.751),2)+math.pow((789.132-610.832),2))*cm
s_rad=(6.044+4.866)*cm
s_theta= math.atan((25.210-24.751)/(789.132-610.832))
len_ucoil=2*s_rad+s_l_arm
z_origin=s_rad-len_ucoil/2

len_mother=len_ucoil+20
```

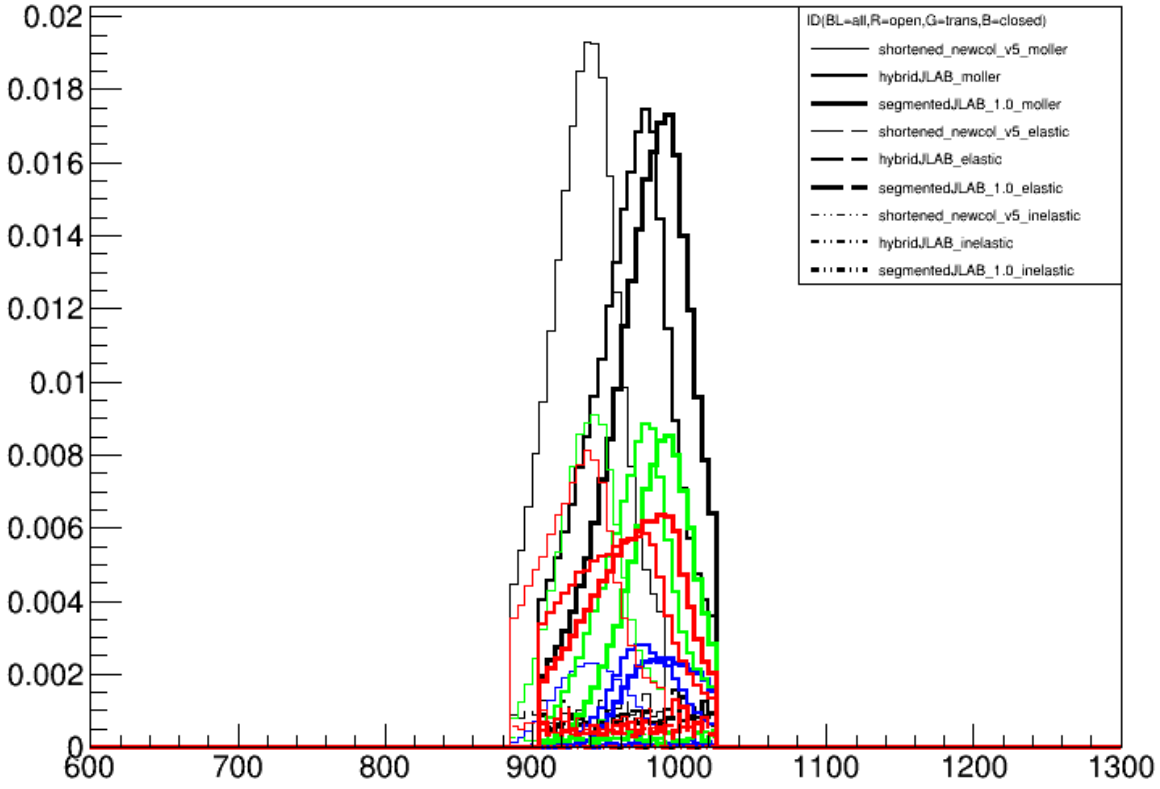
Upstream

Hybrid

```
<material name="Al_CW95" state="solid">
        <D value="10.0" unit="g/cm3"/>
        <fraction n="0.9500" ref="Al_0"/>
        <fraction n="0.015" ref="Al_Cu"/>
        <fraction n="0.035" ref="Al_Mn"/>
</material>
```



Focus in hybrid vs segmented



3. Final Geometry for simulations