

Detector Simulations

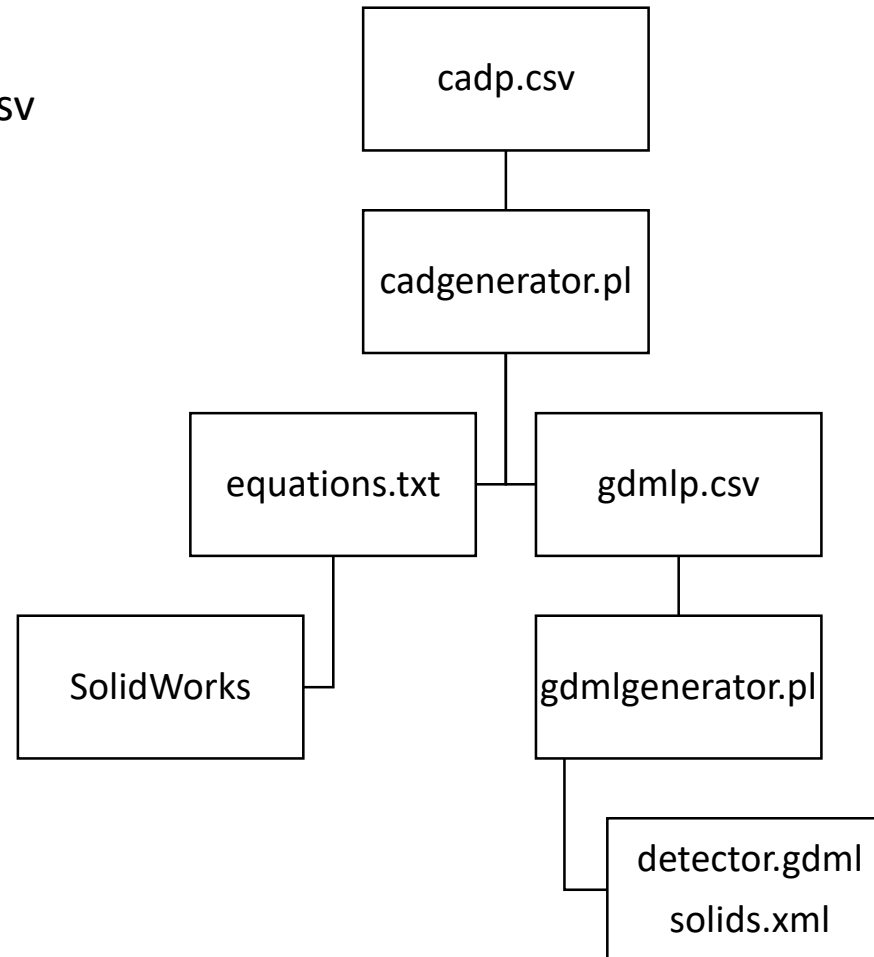
Sakib Rahman

Parametrization Scripts

```
perl cadgenerator.pl -F cadp.csv
```

```
perl gdmlgenerator.pl -D gdmlp.csv  
-M gdmlmp.csv
```

```
<structure>  
  <volume name="logicMother">  
    <materialref ref="Vacuum"/>  
    <solidref ref="boxMother"/>  
  
    <physvol>  
      <file name="geometry_sculpt/targetDaughter.gdml"/>  
      <positionref ref="targetCenter"/>  
      <rotationref ref="identity"/>  
    </physvol>  
    <!--<physvol>  
      <file name="geometry_sculpt/detectorDaughter.gdml"/>  
      <positionref ref="detectorCenter"/>  
      <rotationref ref="identity"/>  
    </physvol-->  
    <physvol>  
      <file name="geometry_sculpt/detector.gdml"/>  
      <positionref ref="detectorCenter"/>  
      <rotation name="detectorRot" x="0" y="pi/2" z="0"/>  
    </physvol>  
    <physvol>  
      <file name="geometry_sculpt/upstreamDaughter.gdml"/>  
      <positionref ref="upstreamCenter"/>  
      <rotationref ref="identity"/>  
    </physvol>  
    <physvol>  
      <file name="geometry_sculpt/hybridDaughter.gdml"/>  
      <positionref ref="hybridCenter"/>  
      <rotationref ref="identity"/>  
    </physvol>  
  </volume>  
</structure>
```



Dimension Parameters

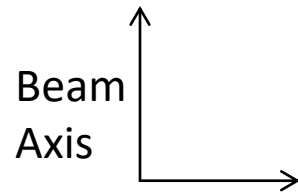
Other Parameters

t_m = thickness of mirror

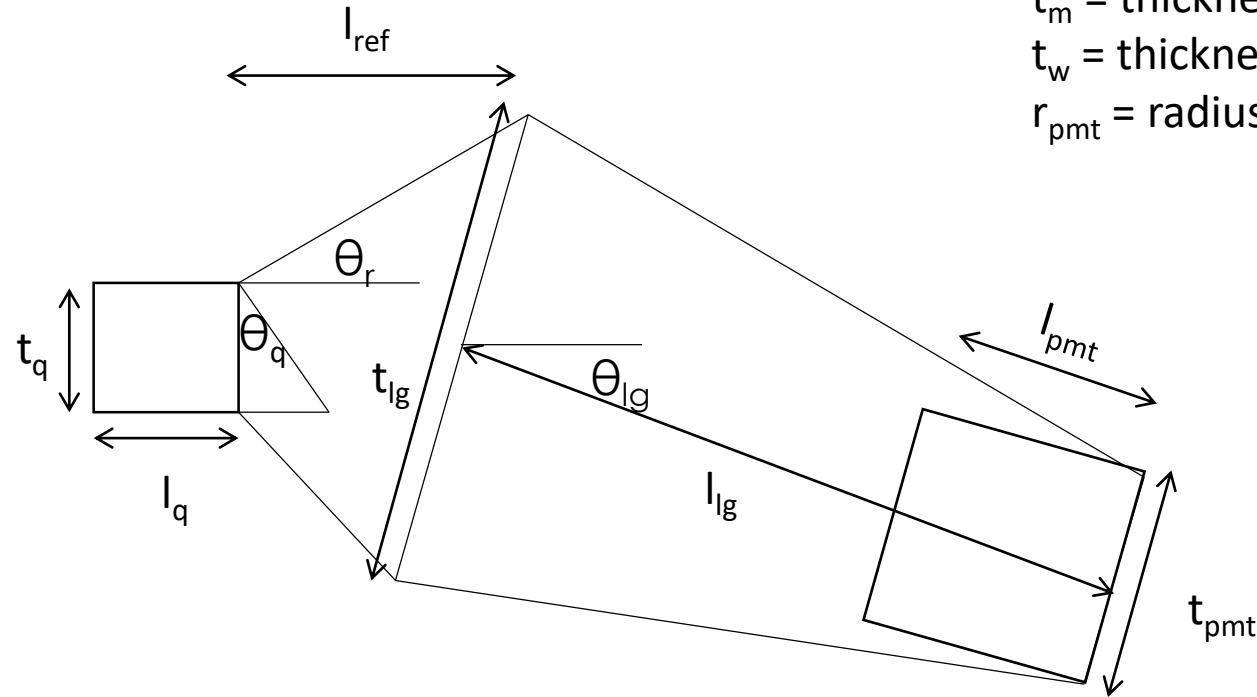
t_w = thickness of wall

r_{pmt} = radius of pmt window

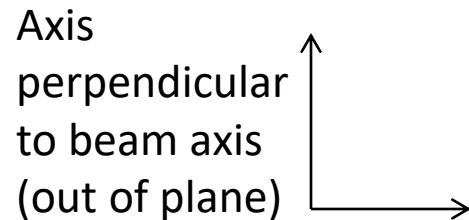
Side View



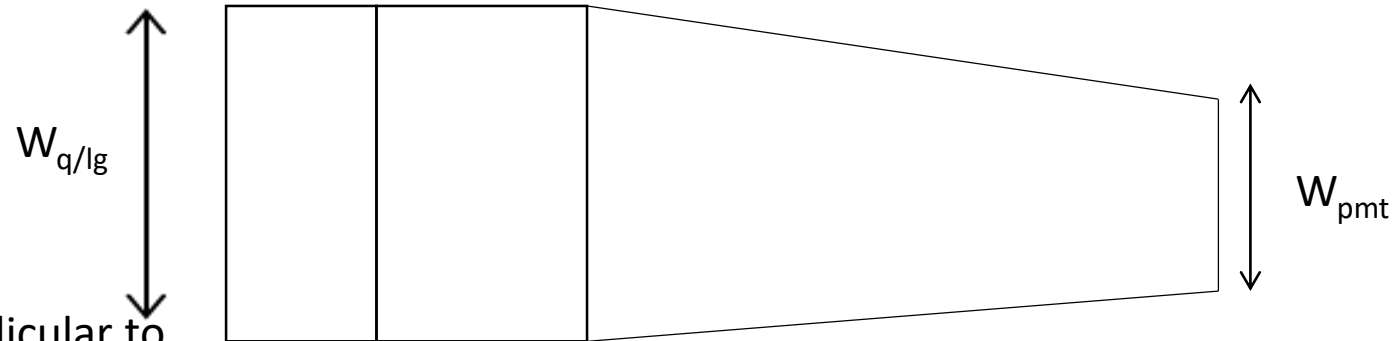
Axis perpendicular to beam axis (in plane)



Top View

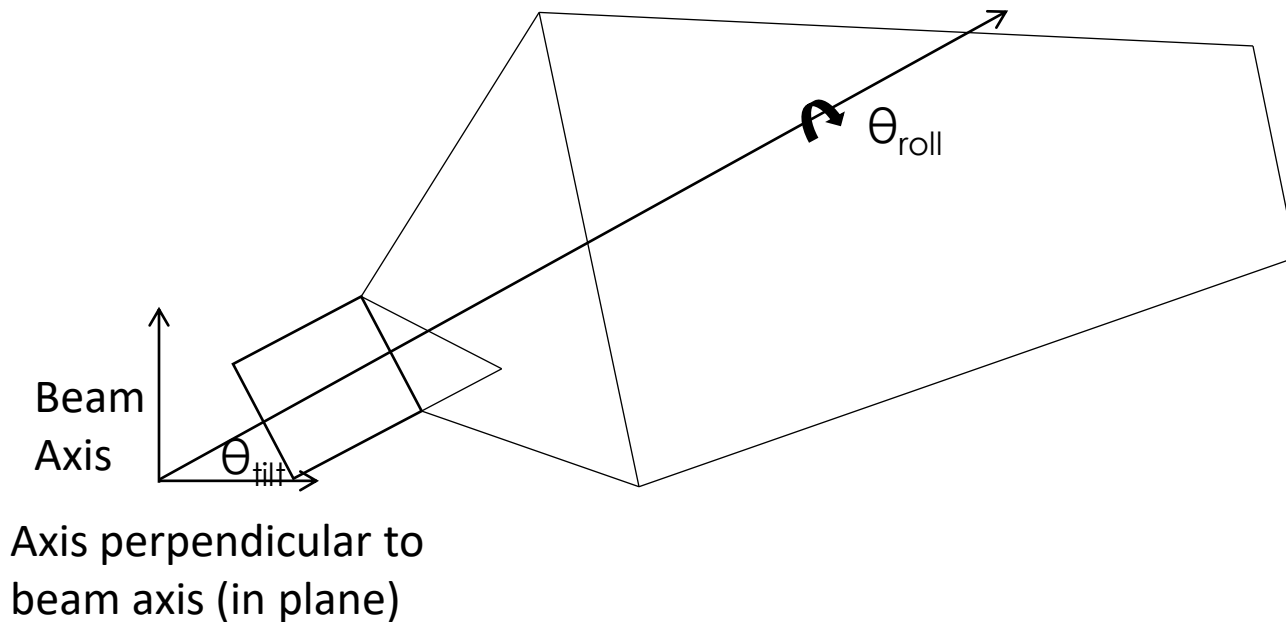


Axis perpendicular to beam axis (in plane)



Position Parameters

- Cylindrical Coordinates
- Tilt Angle of detector along beam axis
- Rotation angle about detector body axis



CAD Generator

Ring Index	r (mm)	l_q (mm)	Over Lap (0-1)	t_q (mm)	θ_{fill} (deg)	θ_{roll} (deg)	l_{ref} (mm)	θ_r (deg)	θ_{lg} (deg)	t_{lg} (mm)	l_{lg} (mm)	$2*r_{pmt}$ (in)	l_{pmt} (in)	t_{wall} (mm)	z (mm)	zstagger (mm)
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1	1	710	40	0.5	10	5	90	100	15	20	75	525	3	6	3	550	570
2	2	755	50	0.5	10	5	90	100	15	20	75	475	3	6	3	430	440
3	3	817.5	75	0.5	10	5	90	100	15	20	75	400	3	6	3	300	310
4	4	892.5	75	0.5	10	5	90	100	15	20	75	312.5	3	6	3	170	180
5	5.0	1017.5	115	0.5	10	5	90	100	15	20	75	150	2	6	3	-15	15
6	5.1	987.5	105	0.5	10	5	90	100	15	20	75	200	2	6	3	-15	15
7	5.2	1030	140	0.5	10	5	90	100	15	20	75	125	2	6	3	-10	10
8	6	1150	100	0.5	10	5	90	50	15	20	75	75	3	6	3	-140	-130

GDMML Generator

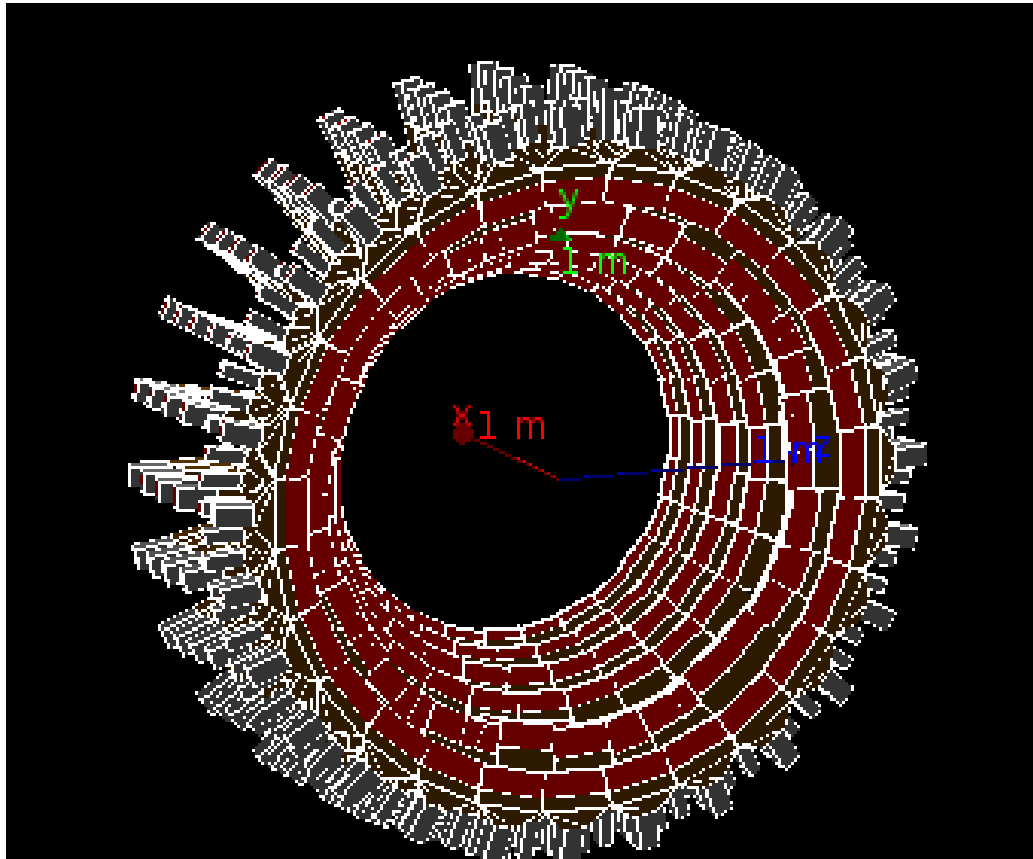
Det Index	z (mm)	x (mm)	y (mm)	t_q (mm)	w_q (mm)	l_q (mm)	Θ_{rot} (rad)	Θ_{tilt} (rad)	Θ_{roll} (rad)	Θ_q (rad)	Θ_r (rad)
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1	1001	550	0	710	10	159.323627432054	40	0	0.0872664625997165	0	0.7	0.26179938779914
2	1002	570	157.989863108983	692.198817649095	10	159.323627432054	40	0.224399475256414	0.0872664625997165	0	0.7	0.26179938779914

l_{ref} (mm)	t_{lg} (mm)	w_{lg} (mm)	l_{lg} (mm)	Θ_{lg} (rad)	t_{pmt} (mm)	w_{pmt} (mm)	l_{pmt} (mm)	r_{pmt} (mm)	t_{wall} (mm)	t_m (mm)
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100	75	159.323627432054	525	0.349065850398866	76.581	76.581	152.4	38.1	3	0.6
100	75	159.323627432054	525	0.349065850398866	76.581	76.581	152.4	38.1	3	0.6

In Simulation



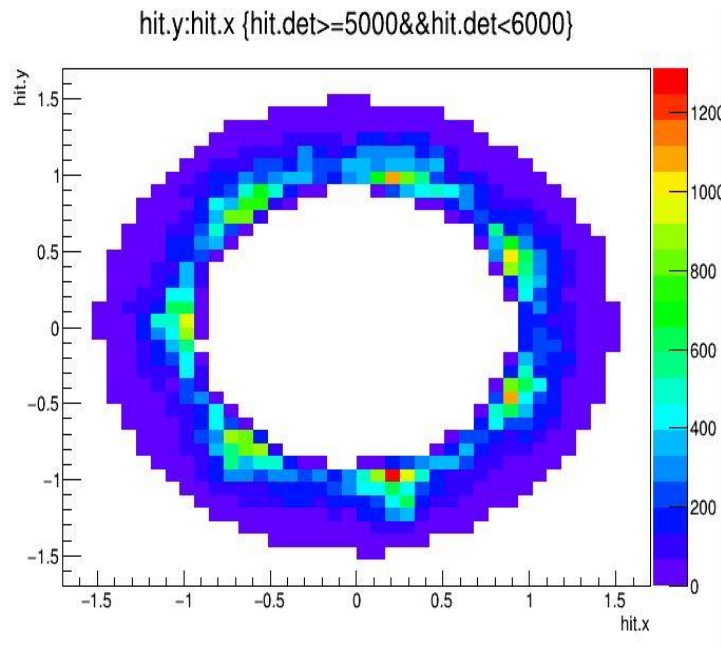
Version 1

PMT Housing Outside
Lightguide

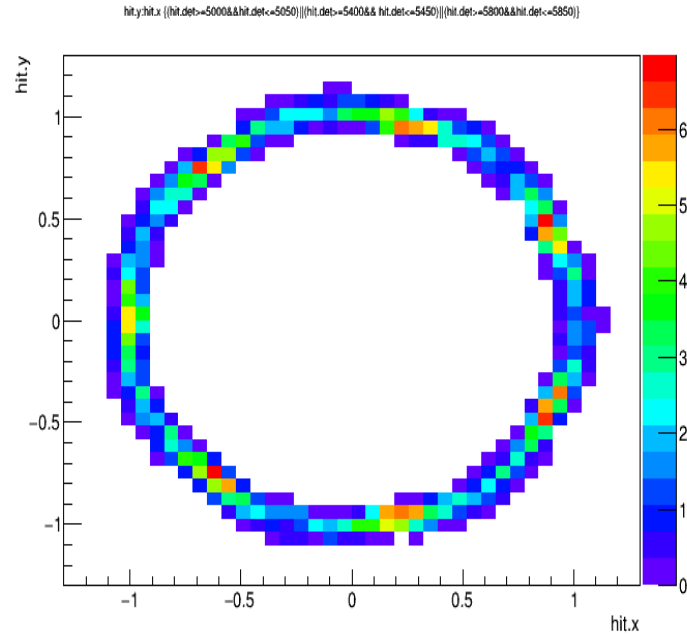
Version 2 (In progress)

PMT Housing Inside
Lightguide

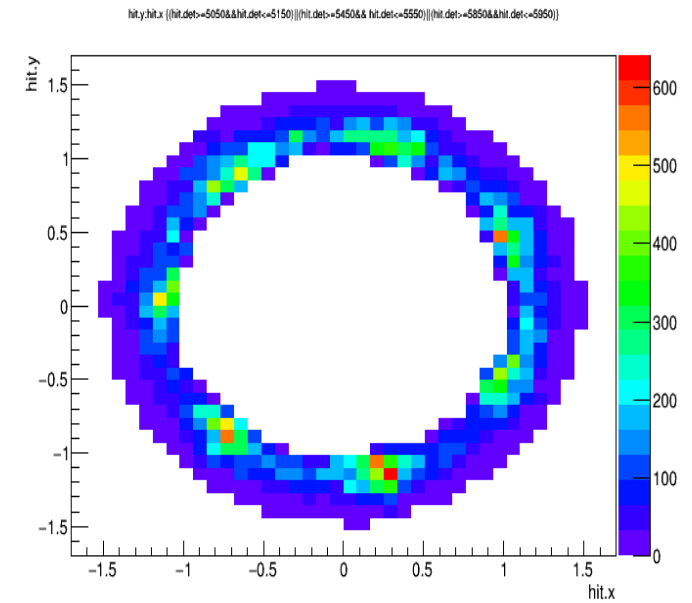
Test Run (10000 events, Ring 5)



Full Ring



Just Quartz



Just LG

Conclusion

- Code available on https://github.com/rahmans1/geometry_test
- Working on ReadMe file that will be uploaded to the repository.
- Ready to run background simulations.