Comparison of CAD and GDML Detector Geometry

Comparison:

Criteria	CAD	GDML
Constituent	Quartz, LG, PMT, Lead Donut	Quartz, Ref, LG, PMT window, PMT
Radial Extent	Same for Both	
Relative Z-Positioning	Same for Both	
Absolute Z-Positioning	28323 mm DS from Target	28330 mm DS from Target

GDML Parameter Values

- All lengths are in millimeters and all angles in degrees. Columns in black likely differ from CAD model awaiting confirmation from Cameron.
- Sources: Ref, Lg & PMT Parameter Values (Peiqing's Slides, Pg-12), Radial Extent (YuXiang's Link) and Relative Z-Positioning (Cameron's slides , last page)

Ring No.	Radial Position of Center	Relative Z-Position of Center	Quartz Dim (dr x dϕ x dz)	Ref Opening Angle	Ref Length	PMT Win-dow Size	Lg Length
1a	710	655	40x146x10	19	35	77.2	200
1b	710	680	40x146x10	19	35	77.2	200
2a	755	515	50x156x10	19	35	77.2	385
2b	755	540	50x156x10	19	35	77.2	385
3a	817.5	375	55x171x10	19	35	77.2	325
3b	817.5	399.724	55x171x10	19	35	77.2	325
4a	892.5	265	75x190x10	19	35	77.2	285
4b	892.5	290	75x190x10	19	35	77.2	285

Ring No.	Radial Position of Center	Relative Z-Position of Center	Quartz Dim (dr x dϕ x dz)	Ref Opening Angle	Ref Length	PMT Win-dow Size	Lg Length
5o a	987.5	165	105x53x10	19	35	77.2	165
5o b	987.5	115	105x53x10	19	35	77.2	165
5o c	987.5	170	105x53x10	19	35	77.2	165
5t a	1017.5	190	115x54x10	19	35	77.2	165
5t b	1017.5	140	115x54x10	19	35	77.2	165
5t c	1017.5	200	115x54x10	19	35	77.2	165
5c a	1030	165	140x55x10	19	35	77.2	165
5c b	1030	115	140x55x10	19	35	77.2	165
5c c	1030	170	140x55x10	19	35	77.2	165
6a	1150	25	100x249x10	19	35	77.2	265
6b	1150	0	100x249x10	19	35	77.2	265

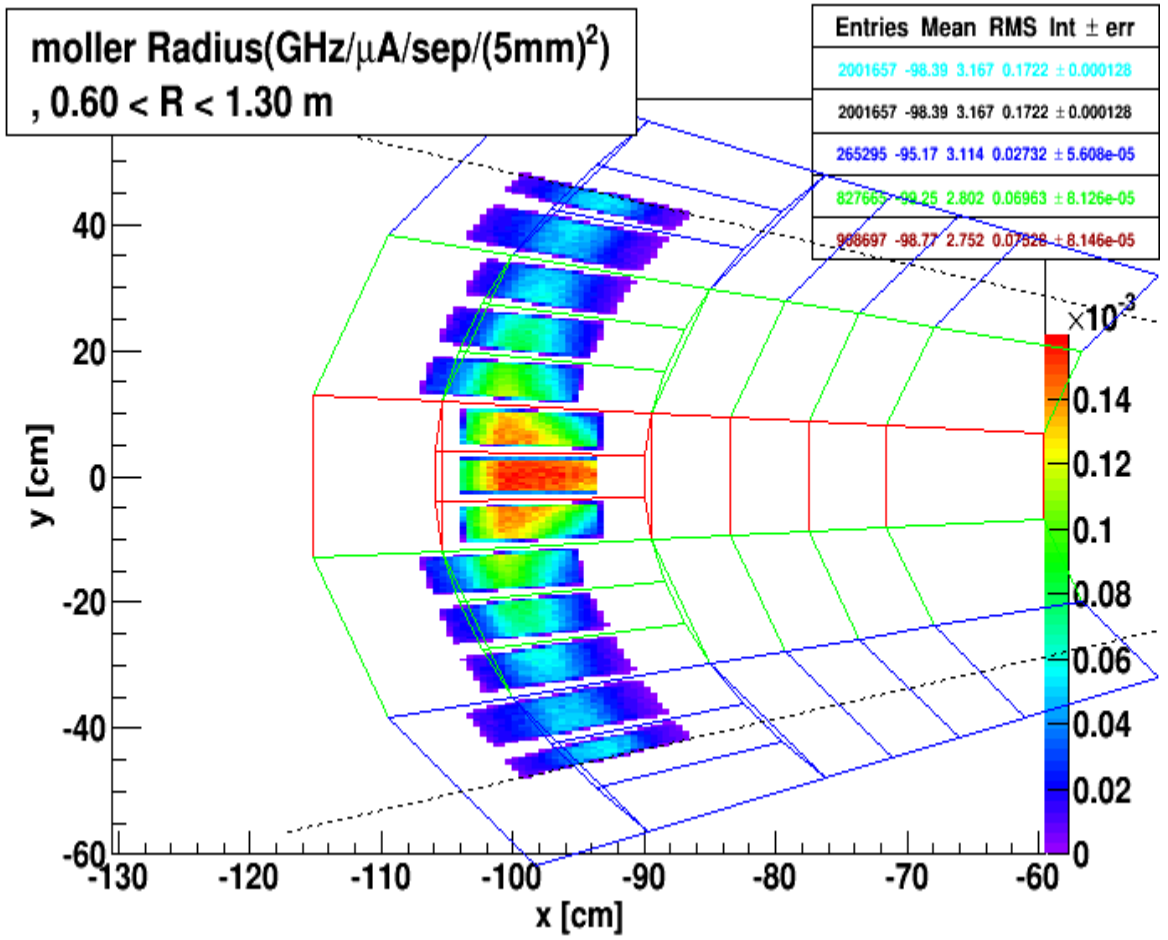
Complication 1

- With the radial extents from YuXiang and relative z-positioning from CAD model, lightguides in moller ring with parameters from Peiqing's slide are overlapping. So, in GDML the azimuthal widths are reduced. This is resulting in ~0.65 times smaller rate than if full azimuthal coverage was attained which is unacceptable.

Complication 1

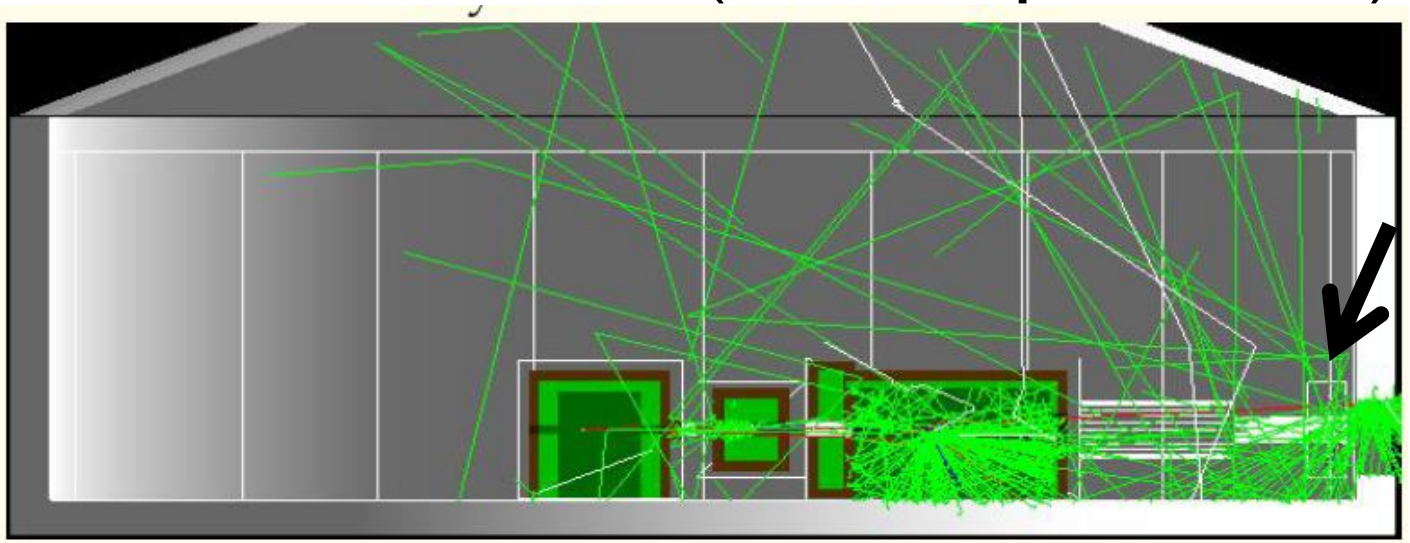
Rate in Moller Ring

Coloured lines represent the azimuthal bins used with plane vacuum detector before



Solution

- Reduce reflector opening angle.
- Reduce lightguide length.
- Increase relative z-spacing. Will be difficult to fit in hall while keeping ring 5 at 28500 mm. Might increase cross-talk which is difficult to examine (see complication 2).



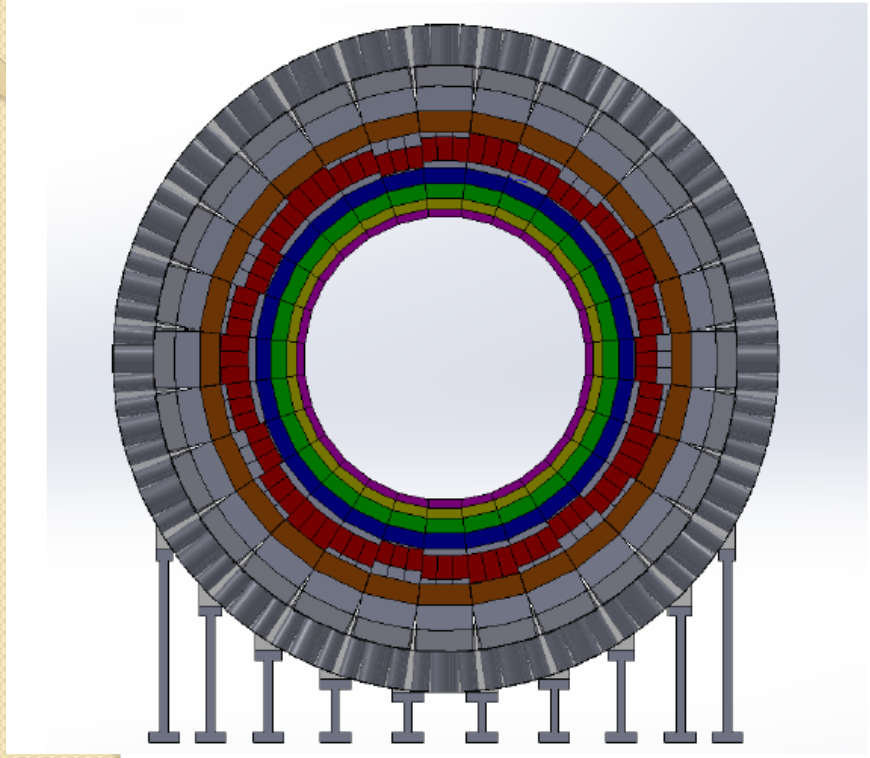
Complication 2

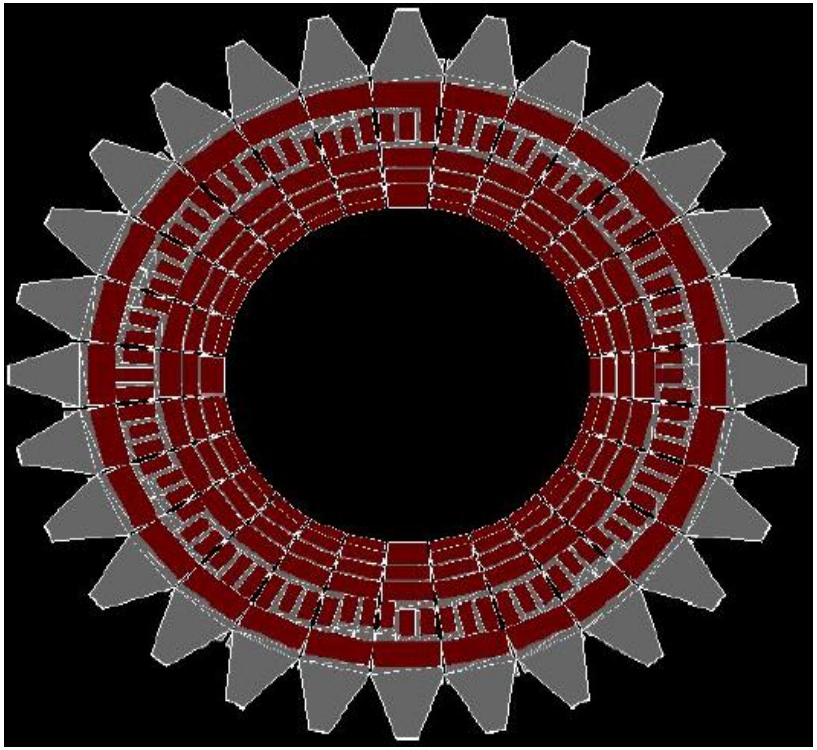
- Can't examine rates in lightguide yet because hits are recorded throughout detector volume in simulation and not just on entry. A z-cut is impractical to set for lightguides like for Quartz pieces since its front surface is not perpendicular to the beam because of the trapezoidal shape.

Solution

- Look at the hits on lightguide on the central z-slice. But this misses angular incidences.

CAD vs GDML Model Front View





CAD vs GDML Model Side View