

Status Report

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1 Nov. 2019

mPMT-Japan meeting

New

- Solved the software issues
 - Benjamin-san fixed the WCSim and FitVertexLE
- Calculated miss-reconstruction rate
 - Energy dependency

Remind

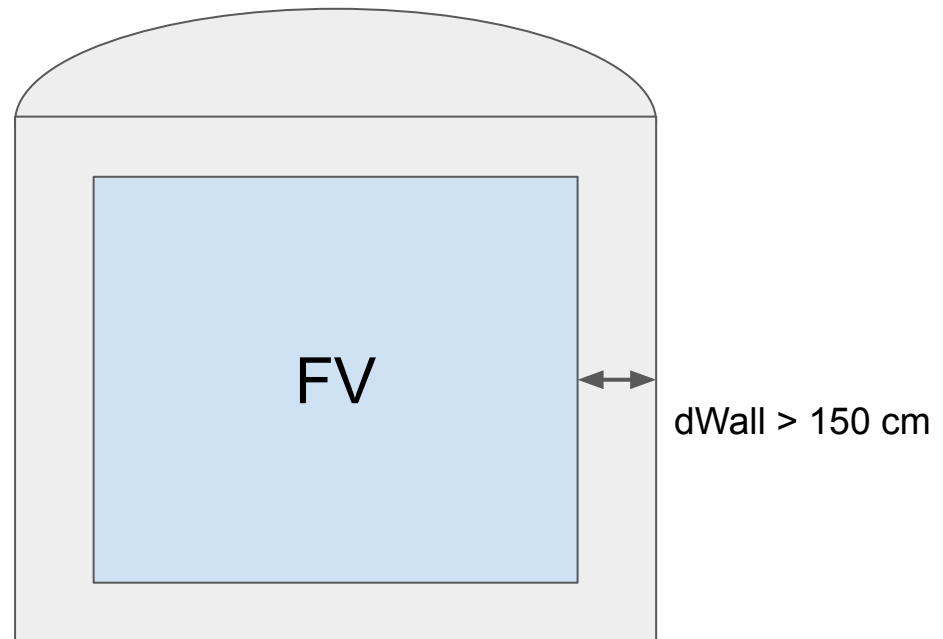
- WCSim MC generation
 - Detector: HK mPMT Hybrid
 - B&L: 20 k (20PC)
 - D.R. : 4.2 kHz
 - mPMT: 10 k (10PC)
 - D.R. : 100 Hz
 - Particle: electrons
 - Energy: 3, 4, 5, 6, 8, 10, 15 MeV
 - # of events: 10k for each energy
 - Position: uniform in the water tank
 - Direction: isotropy

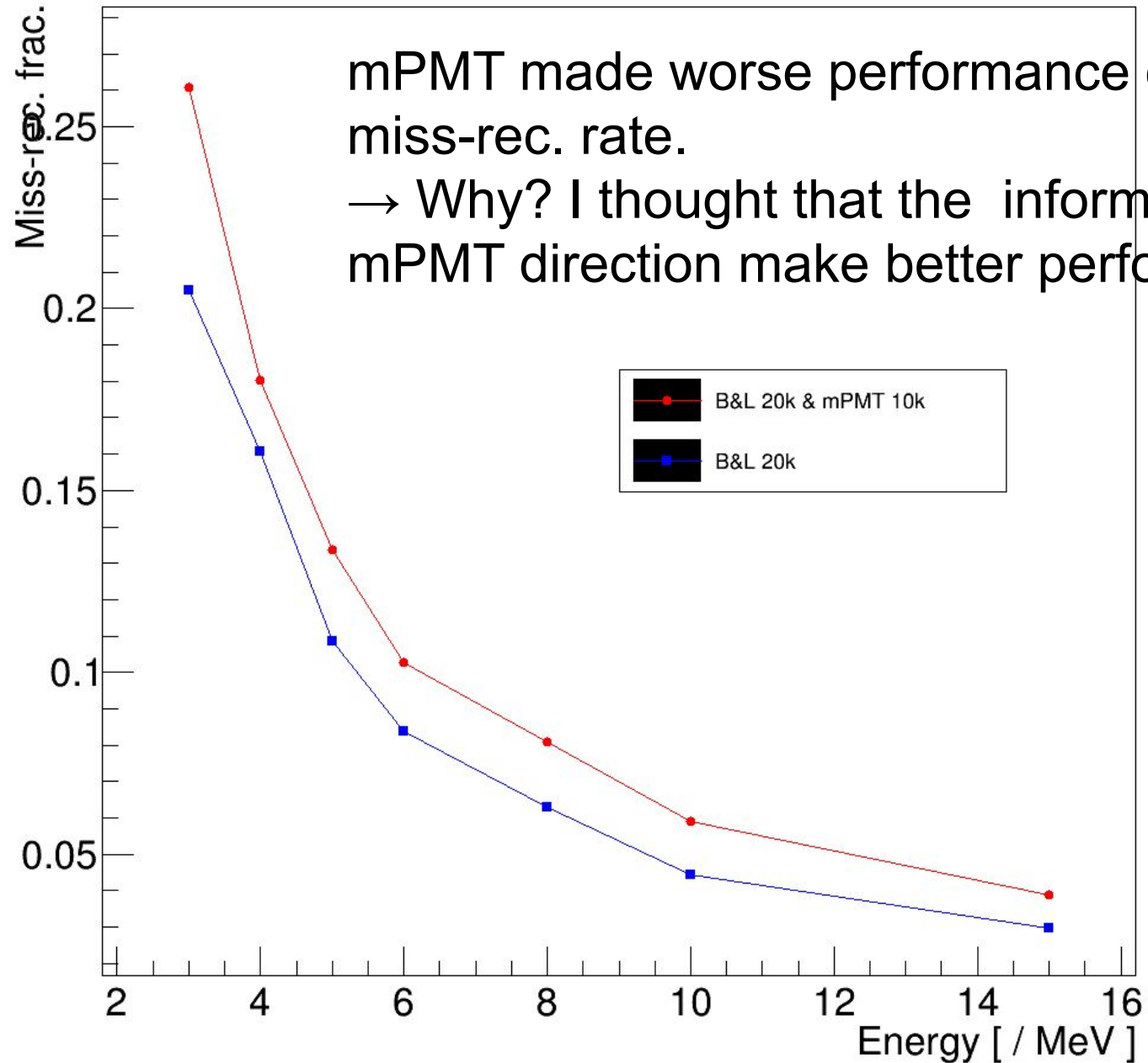
Miss-reconstruction rate

- Calculated the miss-rec. rate: how many events are reconstructed inner volume.

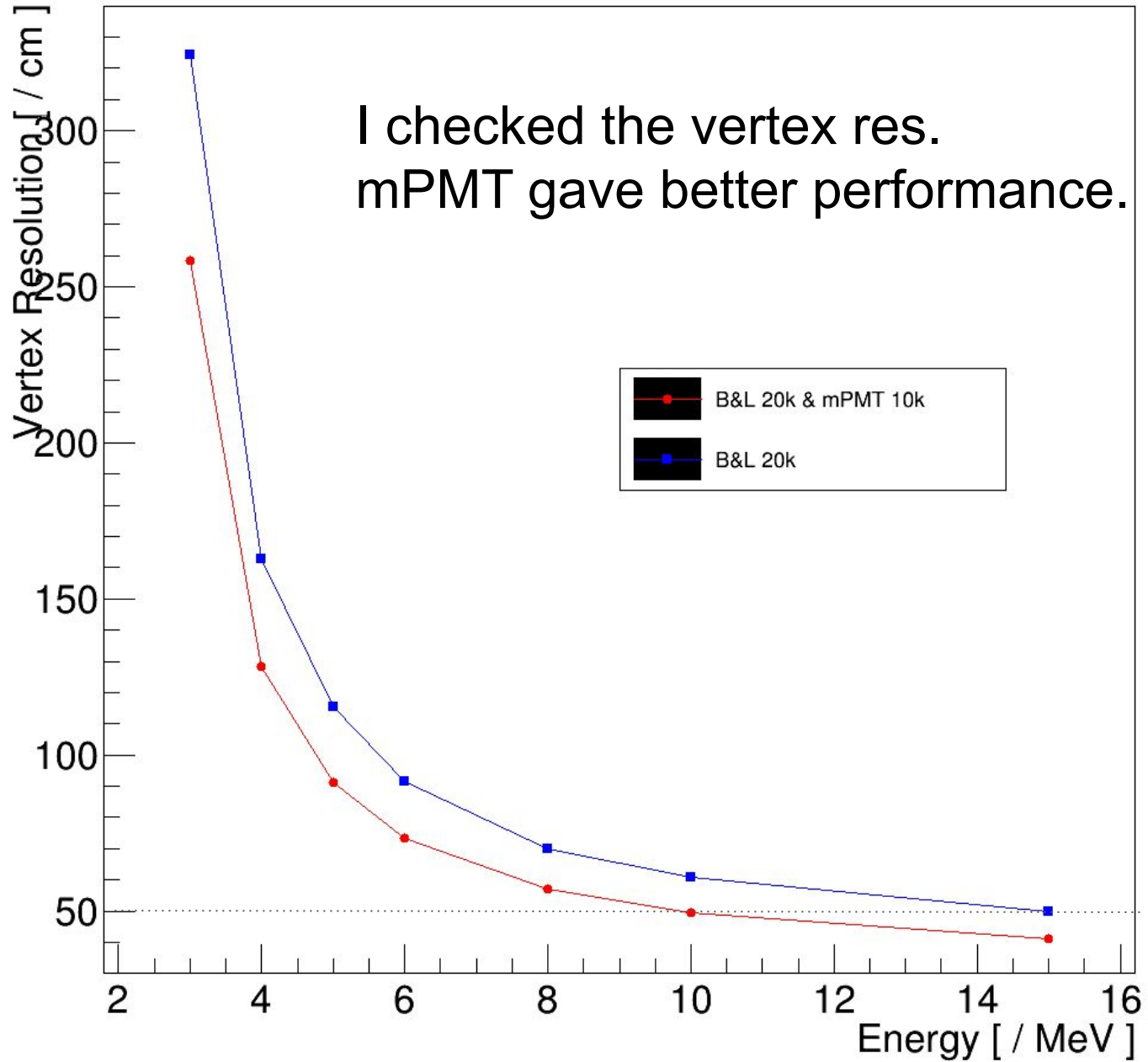
$$(\text{miss-rec. rate}) = \frac{(\# \text{ of events generated out of FV and reconstructed in FV})}{(\# \text{ of events generated out of FV})}$$

- FV := {volume | dWall > 150 cm}
- Calculated it at some energies: 3,4,5,6,8,10,15 MeV



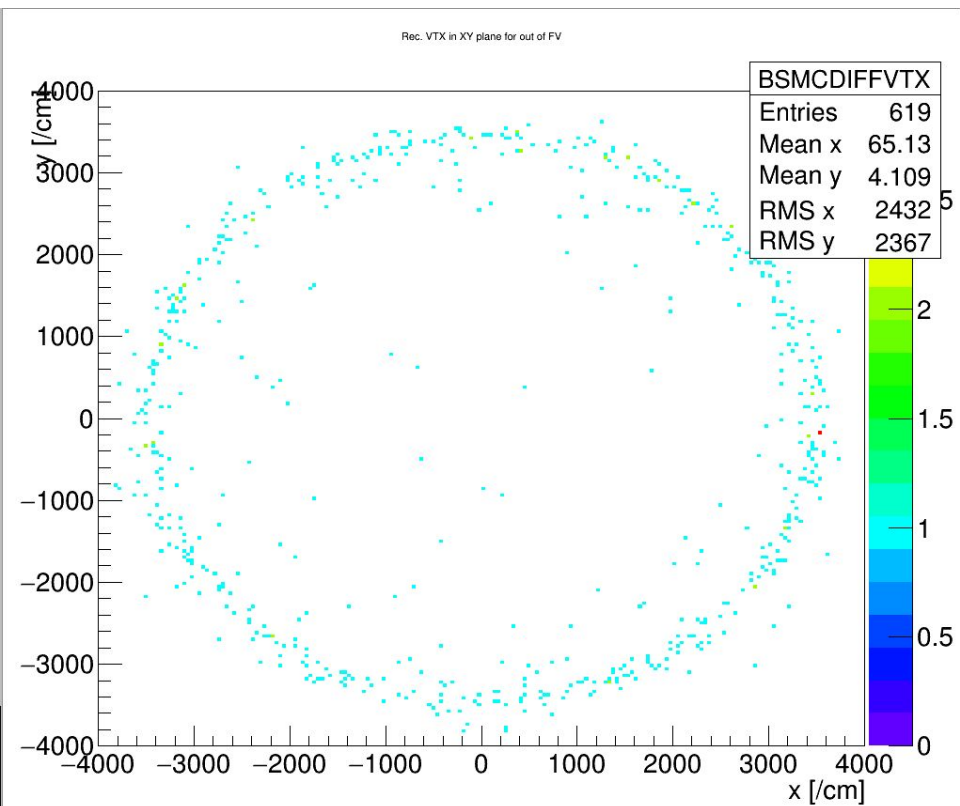
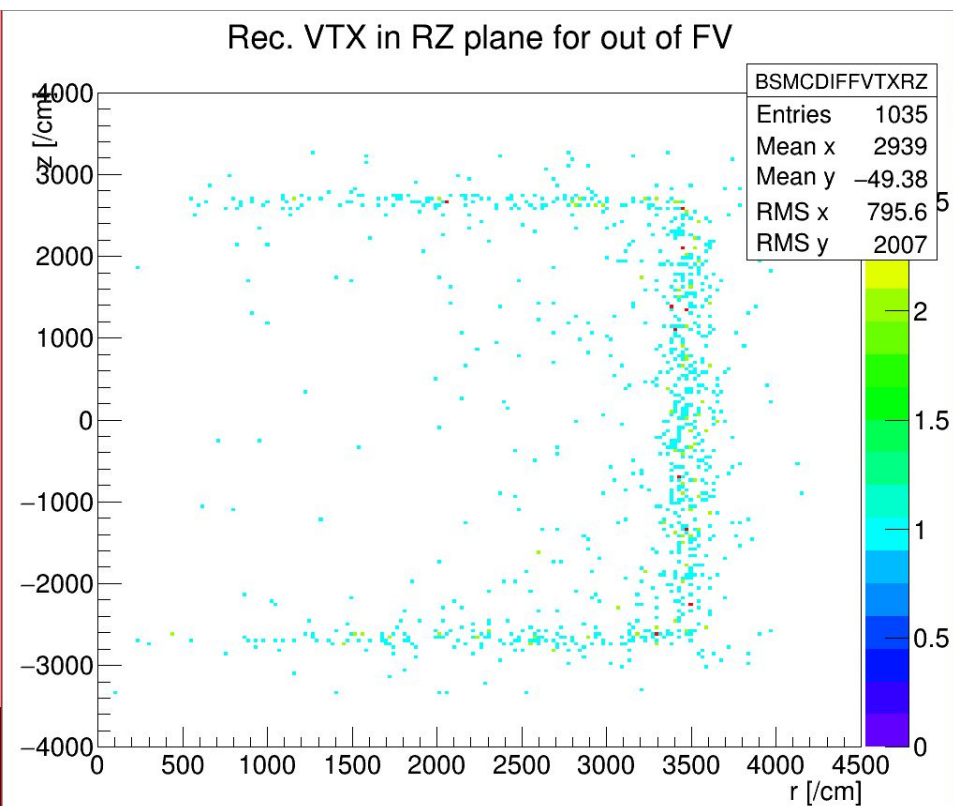


Graph



Events out of FV

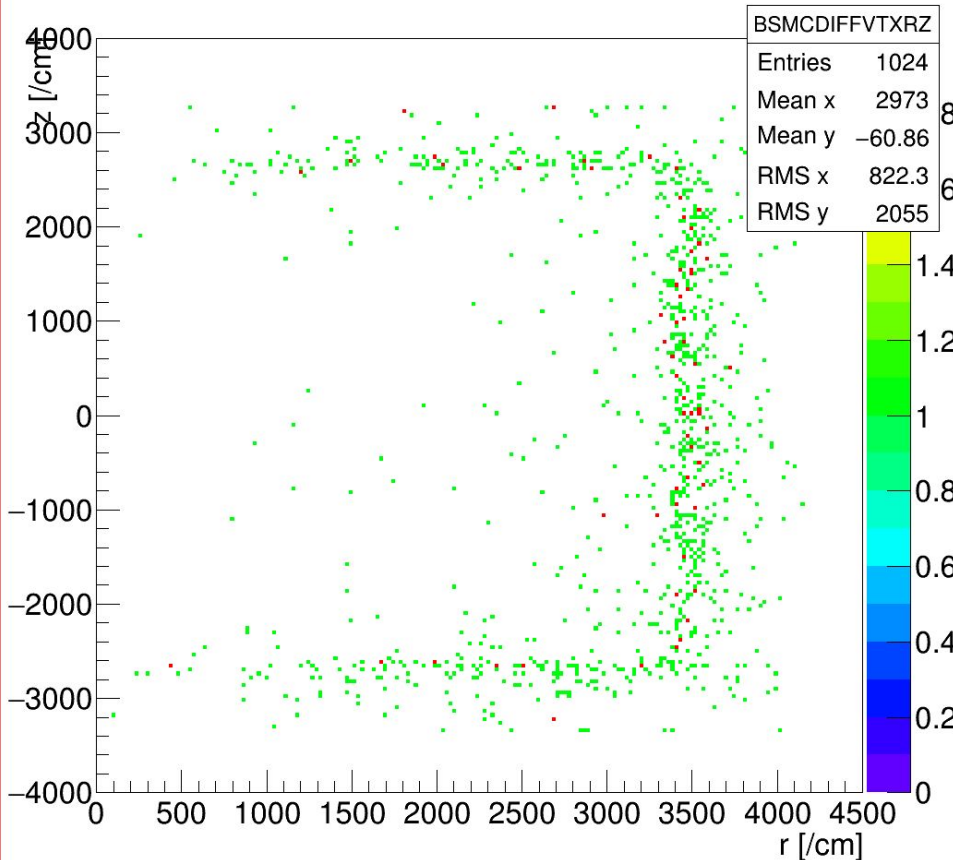
- I plot the reconstructed events which generated out of FV (3MeV)
- These are **w/ mPMT**
- Right plot shows only barrel events



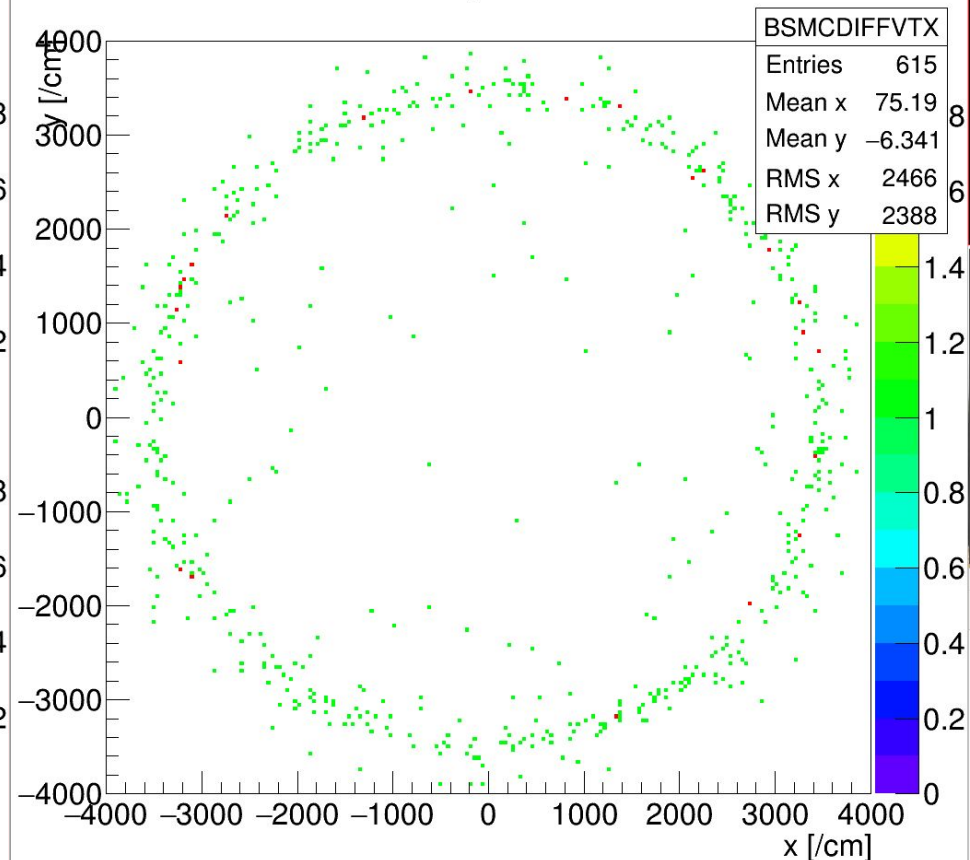
Events out of FV

- I plot the reconstructed events which generated out of FV (3MeV)
- These are **w/o mPMT** (right plot shows only barrel).

Rec. VTX in RZ plane for out of FV

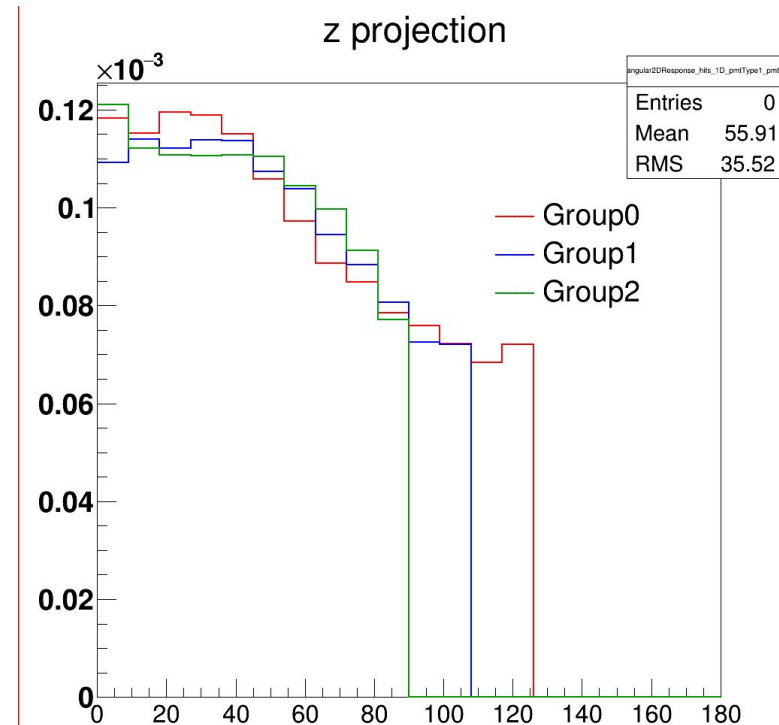
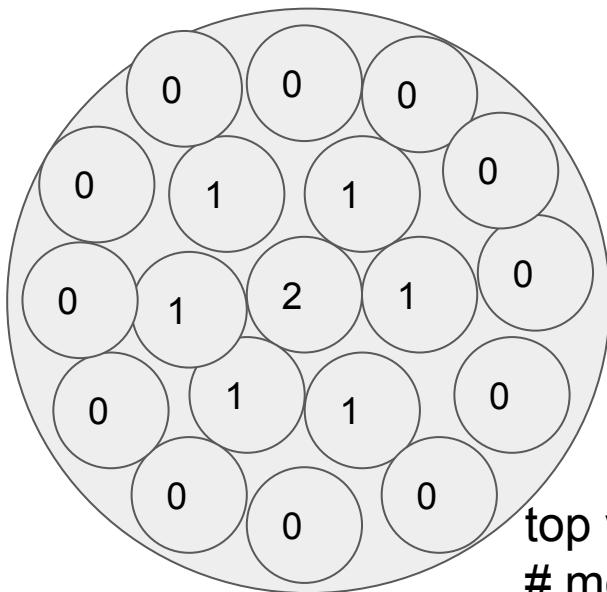


Rec. VTX in XY plane for out of FV



I checked ...

- “findNLLDirectionality(...)”: function giving negative log likelihood of PMT direction information
 - There are non-initialized “pmt_number_in_mpmt” for the direction information. → I added this parameter to the hits information.
 - However this change did not change the result.
- “hPMTDirectionality_1D”: PDF giving NLL for each PMT group in mPMT (right fig.)
 - Does this make sense?



I checked ... (cont.)

- Disabled “useDirectionality”: flag to use “findNLLDirectionality(...)”
 - w/ mPMT: $43/966=0.0445$ (0.059 enabled)
 - w/o mPMT: $43/966=0.0445$
 - \uparrow 10 MeV
 - \rightarrow The result w/o directionality got better.
 - Direction information is not used correctly?

Next...

- Check the source code of directional information