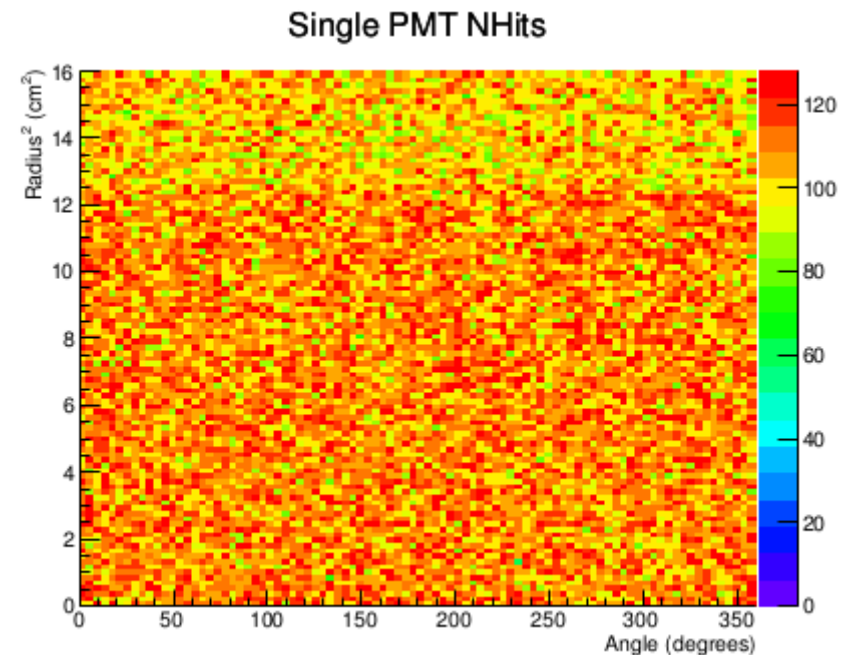
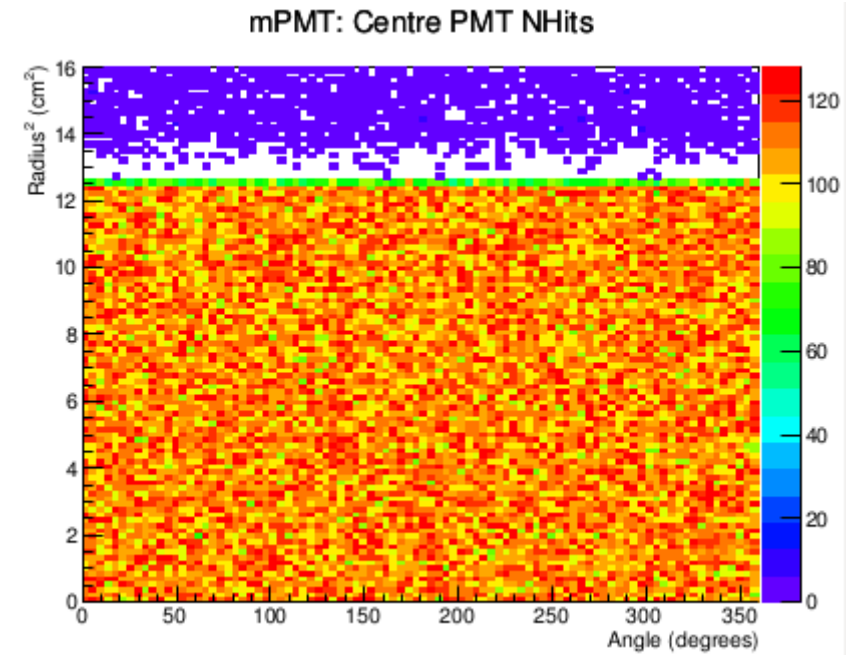


Progress Update

Trevor Towstego
UofT Neutrino/DM Meeting
February 21, 2017

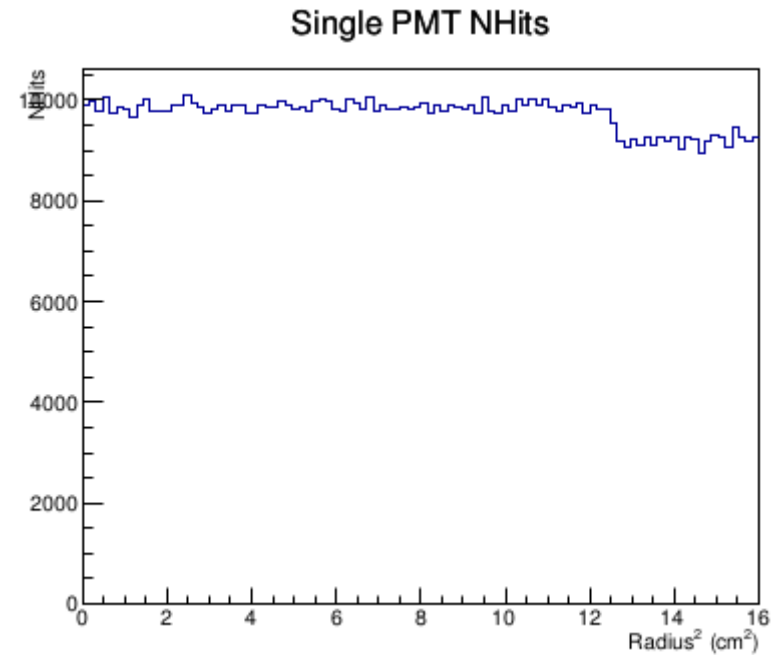
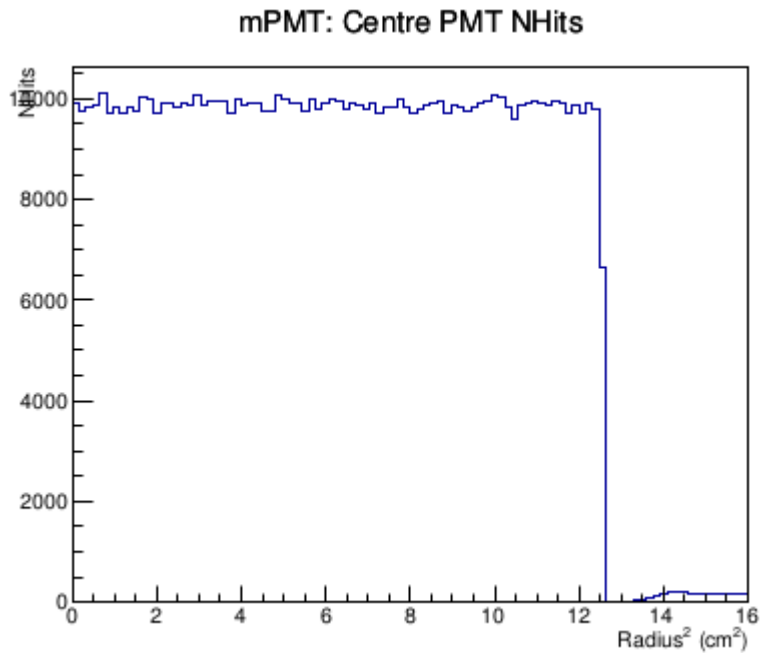
mPMT Missing Hits

- Plot NHits in radius² and angle from 4cm radius circular source
- 10⁶ events
- Top plot shows NHits on the centre PMT of a full 19 mPMT
- Bottom plot shows NHits on a single 3" PMT
- Notice feature around R² = 12.5cm²
 - Drastic for full mPMT, subtle for single PMT

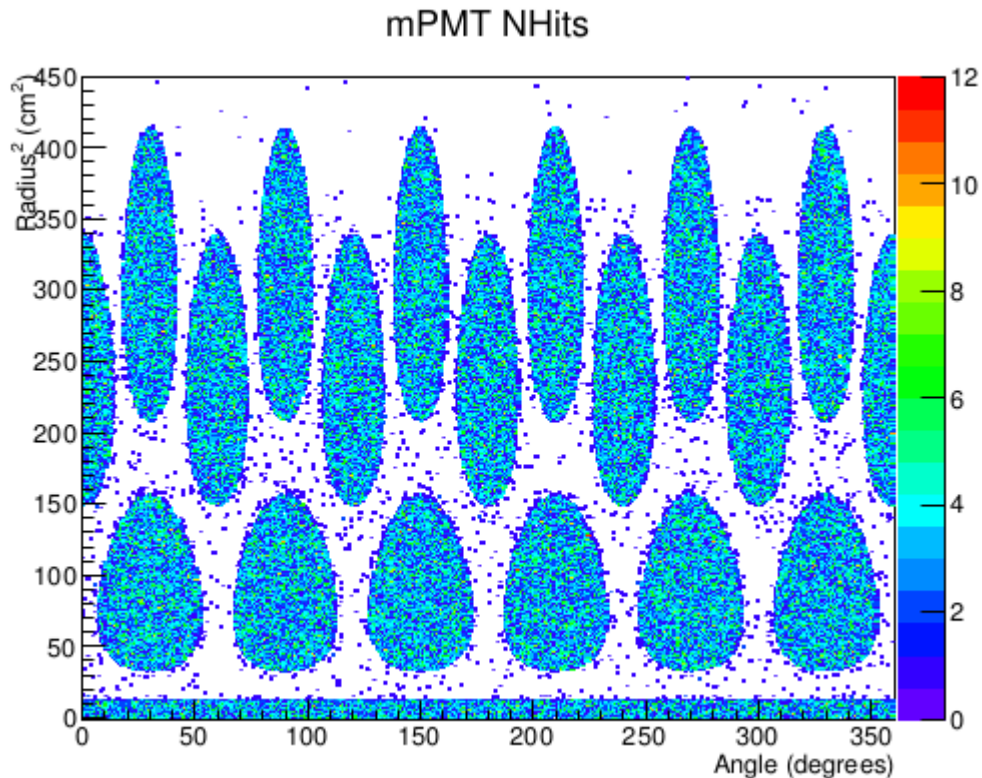


1D NHits Plots

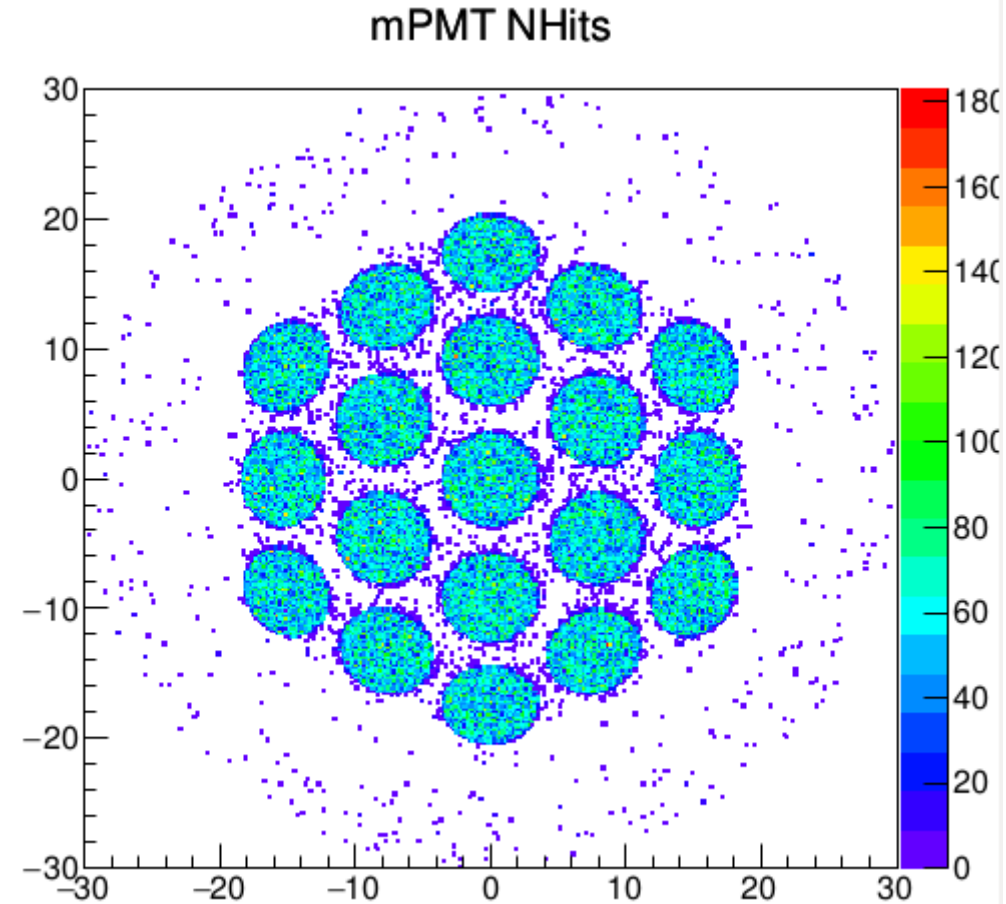
- Plot in R^2 only to see feature more clearly



Full mPMT NHits Plots



This plot is difficult to interpret



- Appears to show same feature for all PMTs in the mPMT
- Need to look closer at each PMT (i.e. individual plots)

Annulus Simulation

- Simulated an annulus
 - $12.4 \text{ cm}^2 < R^2 < 13 \text{ cm}^2$
- 1000 events
- Compare log files for single PMT and mPMT
 - Investigate where photons actually go
- Interesting results – sent to Tom for him to look at

Annulus Simulation

Full mPMT:

- All NHits=1 events end with photon entering “InteriorWCPMT”

```
*** FresnelRefraction ***
Photon at Boundary!
thePrePV: TestSinglemPMT-glassFaceWCPMT
thePostPV: InteriorWCPMT
Old Momentum Direction: (-0.993415,0.0635134,-0.0953597)
Old Polarization: (0.0443251,-0.554443,-0.831041)
New Momentum Direction: (-0.993415,0.0635134,-0.0953597)
New Polarization: (0.0443251,-0.554443,-0.831041)
*** Absorption ***
WCSimWCDigitizerSKI::DigitizeHits START WCHCPMT->entries() = 1
WCSimWCDigitizerSKI::DigitizeHits END DigiStore->entries() 1
WCSimWCTriggerBase::AlgNDigits. Number of entries in input digit collection: 1
```

Single PMT:

- NHits=1 events end with photon entering “InteriorWCPMT”
- OR**
- entering “WCBarrelCellBlack Sheet”

```
*** FresnelRefraction ***
Photon at Boundary!
thePrePV: TestSinglemPMT-glassFaceWCPMT
thePostPV: WCBarrelCellBlackSheet
Old Momentum Direction: (-0.993189,0.0483729,0.105996)
Old Polarization: (0.0660156,-0.515987,0.854049)
New Momentum Direction: (-0.993189,0.0483729,0.105996)
New Polarization: (0.0660156,-0.515987,0.854049)
*** Absorption ***
WCSimWCDigitizerSKI::DigitizeHits START WCHCPMT->entries() = 1
WCSimWCDigitizerSKI::DigitizeHits END DigiStore->entries() 1
WCSimWCTriggerBase::AlgNDigits. Number of entries in input digit collection: 1
```

Sourcing Aluminum Piping for mPMT Modules

- Looking to source aluminum piping for mPMT modules
 - 20" outer diameter
 - 1" thick
 - 30 cm per module
- In contact with Chinese company TTStar
 - ~\$220 US per module
- Possible cheaper alternatives to aluminum
 - PVC?