Development of mPMT modules for E61 and Photosensor Test Facility at TRIUMF.

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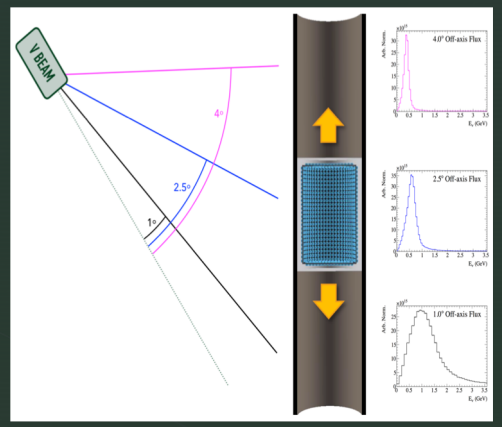
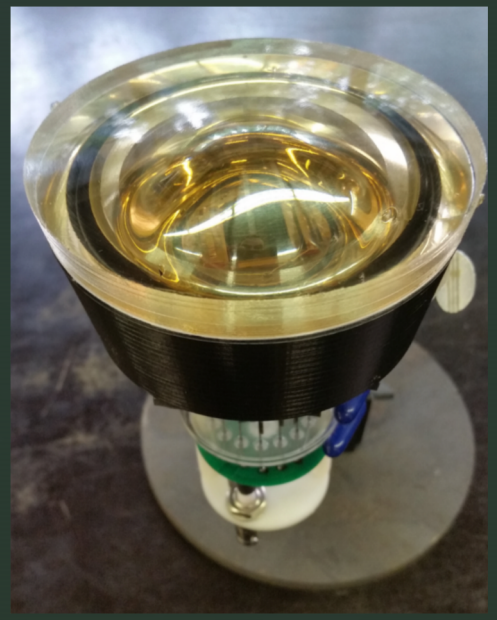
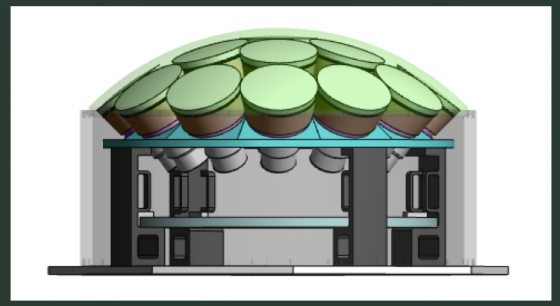
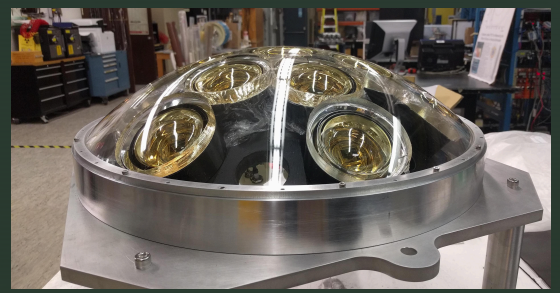
E61

- E61 is an intermediate water Cherenkov detector for the Hyper-Kamiokande experiment that will be instrumented with multi-PMTs (mPMTs).
- mPMTs are modules containing an array of 3” PMTs.

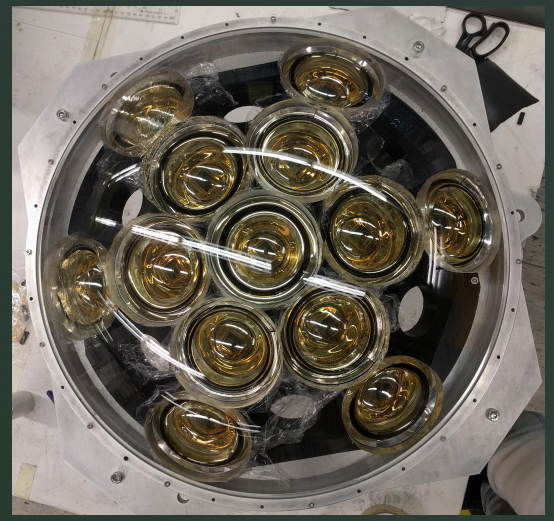








mPMT prototype



Advantages of mPMT modules:

- Reduces the pixel size of the detector, improving the granularity
- Better timing resolution
- Each PMT images the different part of the tank improving directionality
- Improves vertex resolution
- Reduce cabling
- Allows for simpler installation
- Protect PMTs underewater

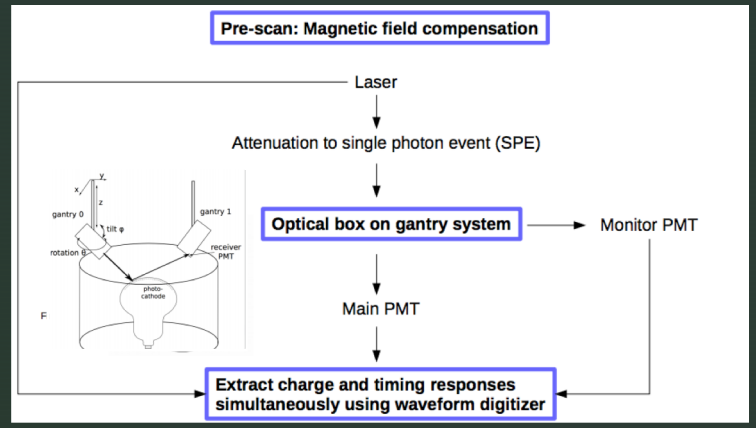
First mPMT prototype under construction at TRIUMF.

[Ref:Letter of intent to construct a new detector in the J-Parc Neutrino Beamline, arXiV: 1412.3086 (2014)]

Photosensor Test Facility (PTF)

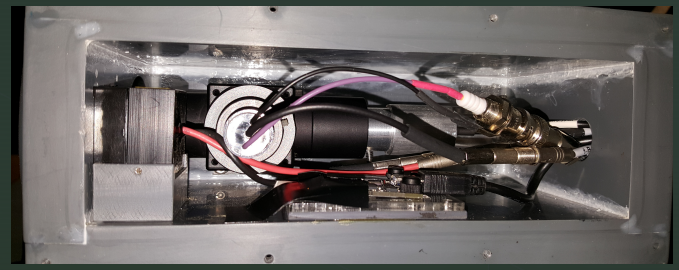
PTF calibrates response of PMTs for E61 mPMTs and far detector PMTs

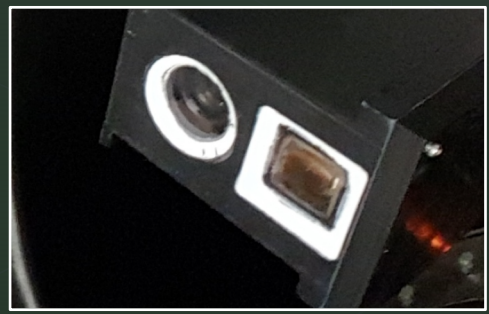
- At the moment a 20 inch SK PMT in the tank
- Tank shielded with G-Iron
- Helmholtz coils framed around the tank to compensate the magnetic field in the tank
- Two gantries cover the complete surface of the PMT



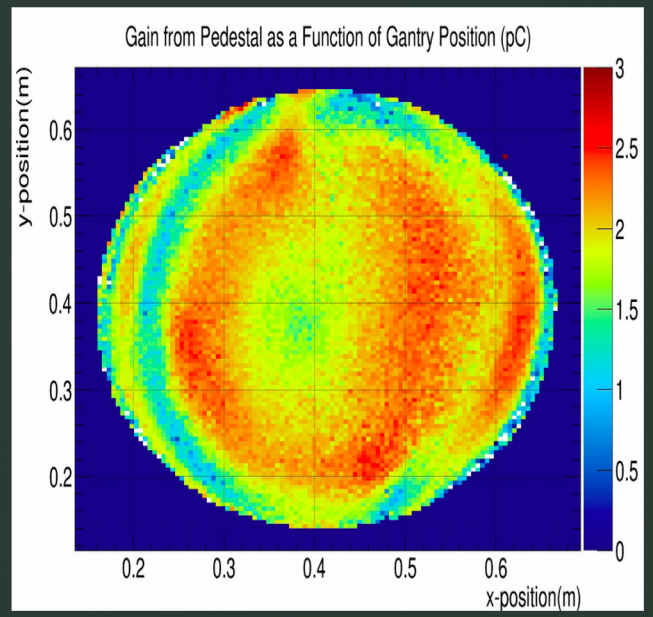
Assembly of Gantries – Optical Box

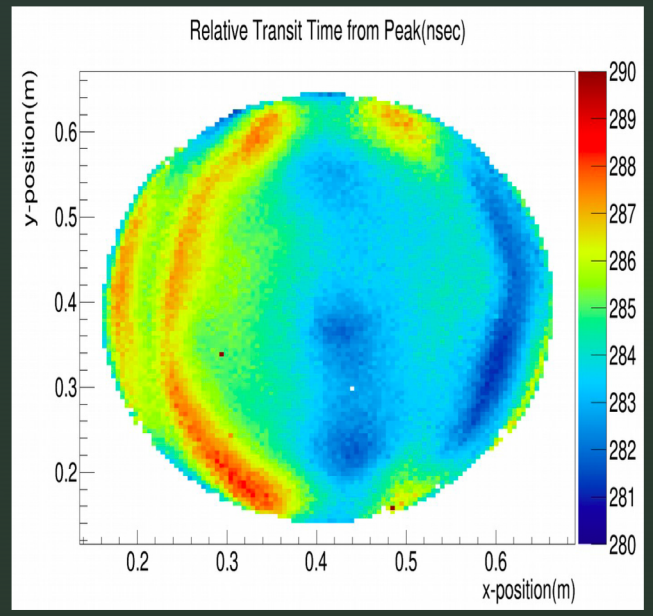
- Optical Fiber Laser injection
- Collimator and Polarizer
- Beam splitter – (half beam passed straight out to SK-PMT and half beam to monitor PMT)
- Receiver PMT





Results for 0mG offset in the tank region of PTF for SK PMT at low Intensity laser light





The gain and efficiency is calculated on the basis of charge recorded by the digitizer.

- Maximum gain at low intensity is 3.
- Maximum efficiency of this PMT 20%.
- Transit time is the time taken between a laser trigger and PMT hit being observed.

These measurements will be taken for the multi-PMT module when the prototype is ready.