Status Report: at MEMPHYNO

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Update

- Development of analysis framework
- Gain tuning
- Fixed light leak

Fitter development

- Developed the fitter to calculate gain (ped. and 1 pe position):
 - Used 3 component: ped. gaussian, 1pe gaussian and exp. curve 0
 - 1. Fit the shoulder and the peak with only one gaussian for each region (red / blue)
 - 2. Using the 1st result, fit with 3 components in region of [second bin from maximum bin, 1000.] (pink and green)
- Gain and 1pe position are shown in the plots
 - The values are calculated 0 with red and blue gauusian
 - Hits / bin / TS The values between "()" are 0 calculated by the result of fitting with 3 components
- Two are not consistent: difficulty of fitting of the ped.
 - \rightarrow Decided to align the 1pe positions for ch. by ch.



Gain tuning

- Took data with 3 different HVs:
 - 1300, V1 (different by ch.), 1450 [V]
- Plotted 1pe position
 Q vs HV and fitted with

 $Q = A \times V^k$

- Estimated the proper HV for Q in order to be aligned for each ch.
 and applied estimated HV
 → 1 pe positions are aligned for all channels at
 - 430 within 15 precision



Investigation for leak points

 Took the data with flashing light around the corner of the tank by smart phones in last week



First fixing: only one corner

- Correlation between the direction of light and the channel having increase.
 - \rightarrow Covered the corner with sheet



6

8

13

3

the leak for $x^{\text{H}}_{\text{H}} = 4$ $x^{2.7}$ ch 2 & 8! $y^{\text{H}}_{\text{O}} = 4$ $x^{1.2}$ But: still high $x^{\text{H}}_{\text{O}} = 4$ $x^{1.2}$ for ch 5,16,18 x^{O} $x^$

16

18

Second fix: edge of the tank

- Further investigation: spotlight of phones along the gap between top and side wall of the water tank
 - We confirmed the dark rate increased significantly (below spikes) for all ch.
- Reason: there are only one layer of the black tape for binding the gap \rightarrow not enough to block light
 - Need 4 or more layers of the black tape
- Added new 4 layers of the sheets of the tapes on all edge of the tank





After second fix

• Some channels have been improved, but there are still the effect of light ON/OFF: blue, brown, green



Third fix: drainage pipe on bottom

- · Found another leak point: a drainage pipe on the bottom
 - Saw spikes when turn the spotlight on
 - Covered the pipe with the sheets







After all fix

• Succeeded to fix all light leak except for ch. 18



Summary

- There were some light leak:
 - Gap between the plate of top and the barrel wall
 - Connection of drainage pipe on the bottom
- Covered with black tape and sheets
 - 1 layer of the tape is not enough to block the light leak
 nood 4 or more layers
 - \rightarrow need 4 or more layers
- After all covering, the difference of light ON/OFF was suppressed significantly and it became negligible except for ch. 18
 - Now under investigation
- Started taking data for long term test (~ 1 week), yesterday

Backup

Goal at MEMPYNO test

- To understand behaviour of the darkrate
 - Decreasing the dark rate along time
 - Dependencies with the temperature of the environment



↑Slide of MEMPHYNO status from 10th HKPCM

MEMPHYNO setup

 1 Italian mPMT (and 1 KM3Net dom) in MEMPYNO water tank of 2 x 2 x 2 m with hodo-scope



Light leakage

- At last HKPCM, the dark rate is correlated with day/night time → seems to be the light leakage
- Checking the light leakage point with light source.
 - Investigating the light leakage from the 4 corners of MEMPHYNO.
- Took the date, then we are analyzing it.



Light source directions

