

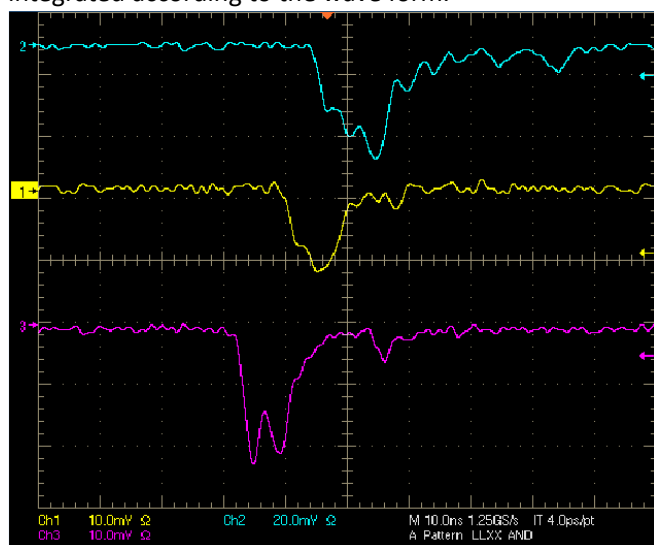
## Scintillator test

### 1 Setup



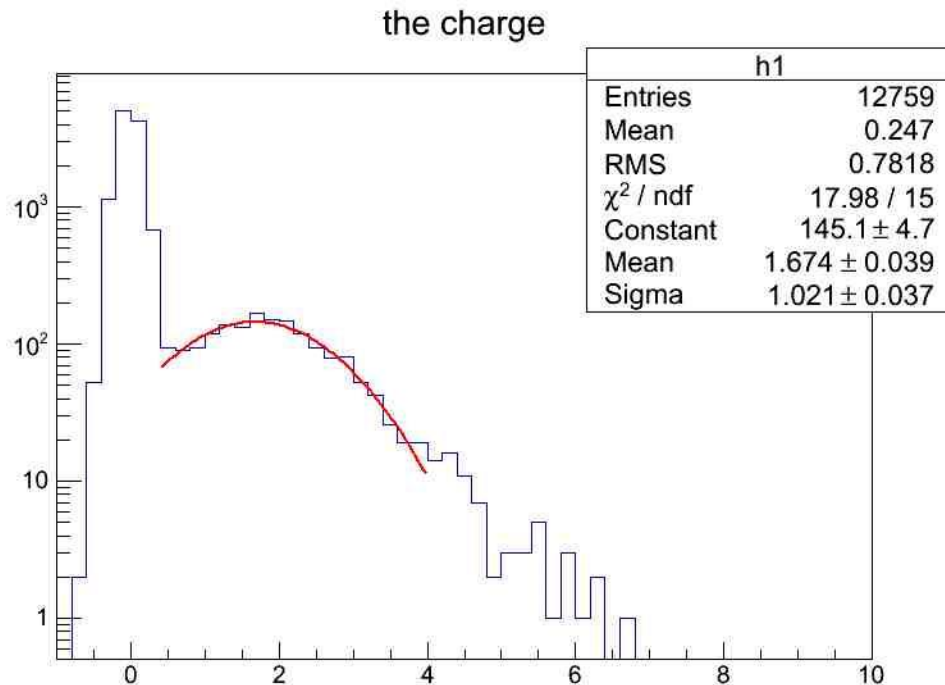
The test was setup as above picture. Three scintillators were put together as a tower. The top and bottom ones are used as trigger detectors. For the early test results (before hadron 2014 conf.), three scintillators are put together closely. Now, the distance of each scintillator was set to 5cm. The test results presented here are based on this new setup.

The signals are read out by one oscilloscope. When top and bottom channels were triggered coincidentally, the waveforms were record by computer. The charge of the PMT output was integrated according to the wave form.

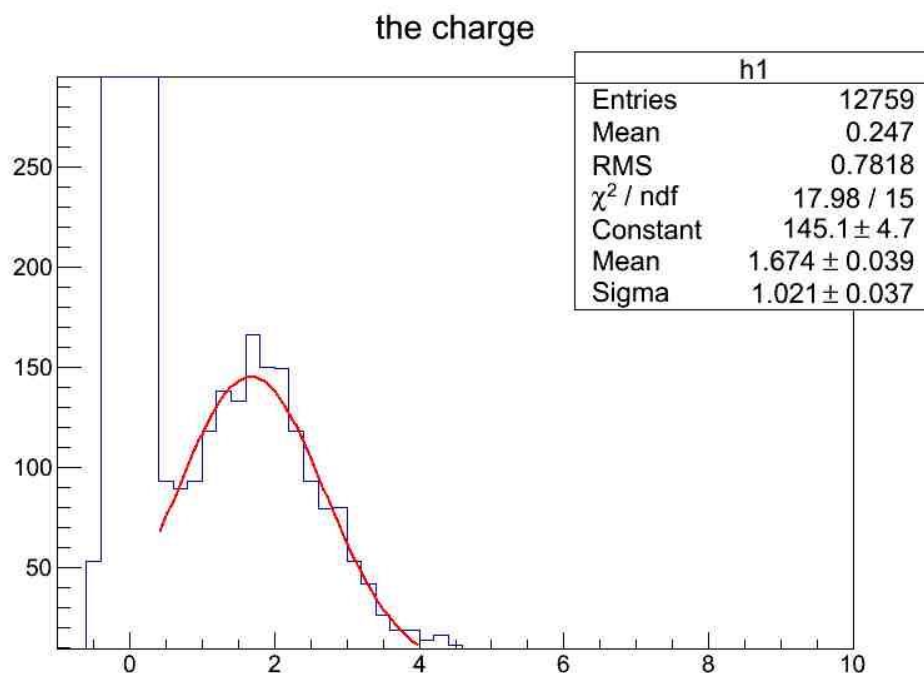


## 2 SPE spectrum of the PMT

One LED light source was used to measure the SPE spectrum. One pulse generator was used to drive the LED and also used as trigger signal for oscilloscope. In order to read the Single photoelectron clearly from the oscilloscope, the gain of the PMT was set to  $10^7$ . One test result is as follows:



The SPE charge spectrum.



Part of the SPE charge spectrum with maximum y cutting.

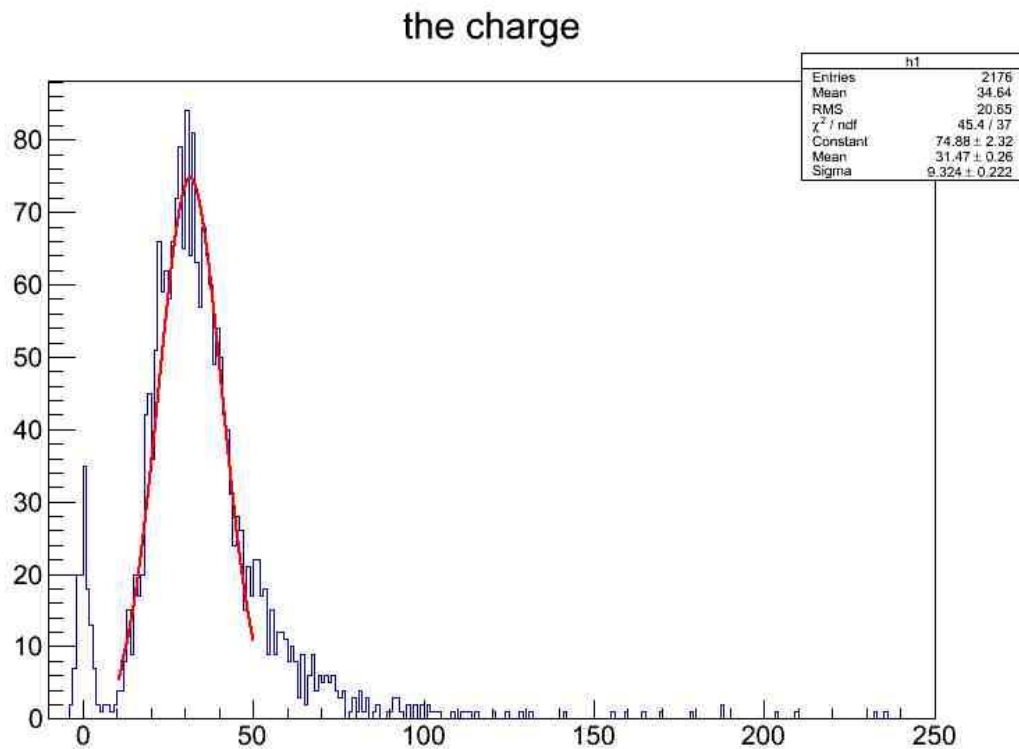
The mean charge value of SPE is 1.67 pC. This value is just corresponding to one photoelectron at gain  $10^7$  following the formula:

$$N_{\text{photon}} = \frac{Q}{\text{Gain} \times e}$$

### 3 The MIPs spectrum of detector

#### 3.1 one turn fiber

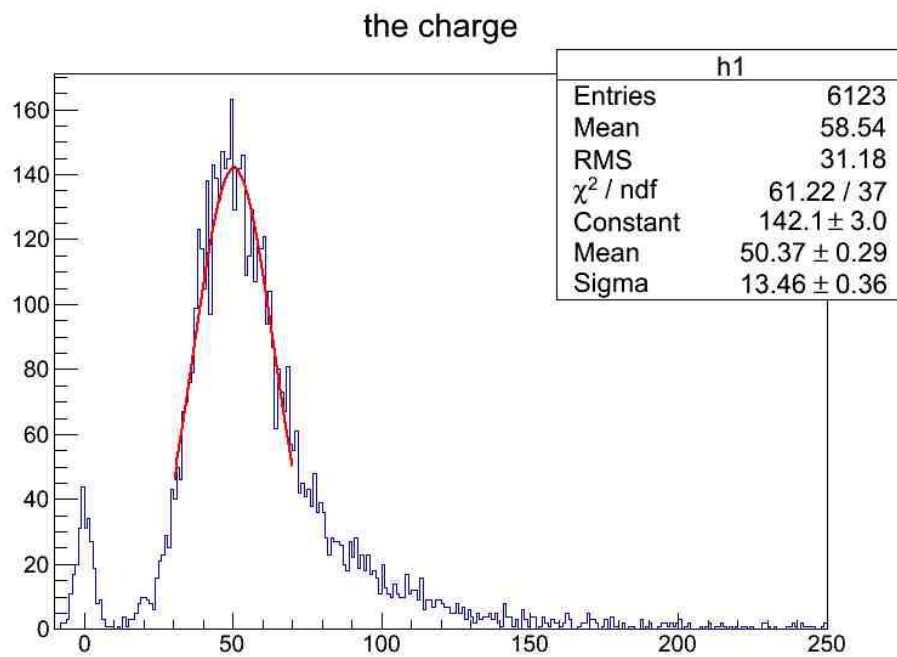
The following is the charge spectrum of MIPs for the scintillator with only one turn of fiber. The work voltage of the PMT is same as above.



The MIP spectrum fitted by gauss function, the mean value is 31.47. It equals to 18.8 (31.47/1.67) photoelectrons. This value is less than which we report in Lanzou conference (31 photoelectrons). One reason is the top and bottom trigger detectors keep 5cm distance from the candidate detector. Another reason, the mean value of the peak fitting was used, which less than the mean value of all entries.

#### 3.2 two turn fiber

Similar test was done also for the detector with two-turn fiber. The test results are as follows.



The MIP peak value is 50.37 pC according to the fitting, which equals to 30 ( $50.37/1.67$ ) photoelectrons. This value is also less than last report (48 photoelectrons)

The following plot is same as above, but in log x axis. We can't find the SPE spectrum as in your test.

