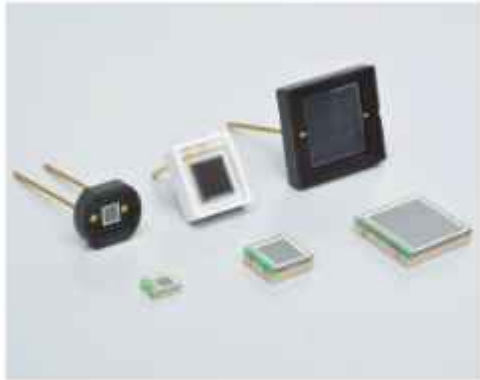# VN-neutrino meeting

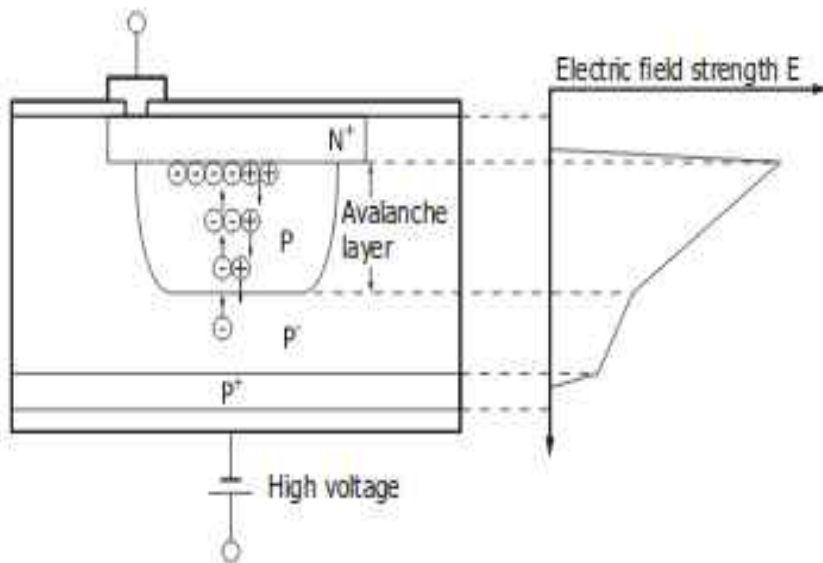Nguyen Minh Truong
Sept 29th 2017

MPPC

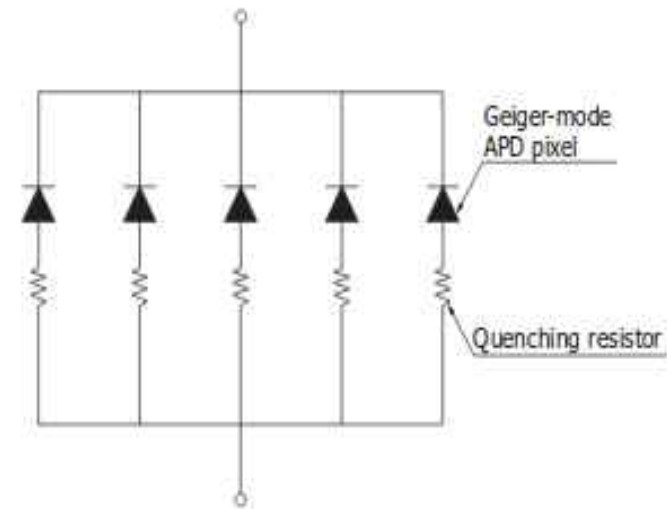(https://www.hamamatsu.com/resources/pdf/ssd/mppc_kapd0004e.pdf)

- mppc(multi-pixel photon counter) is called silicon photomultipliers (SiPM)
- a photon-counting device using multiple APD (avalanche photodiode) pixels operating in Geiger mode
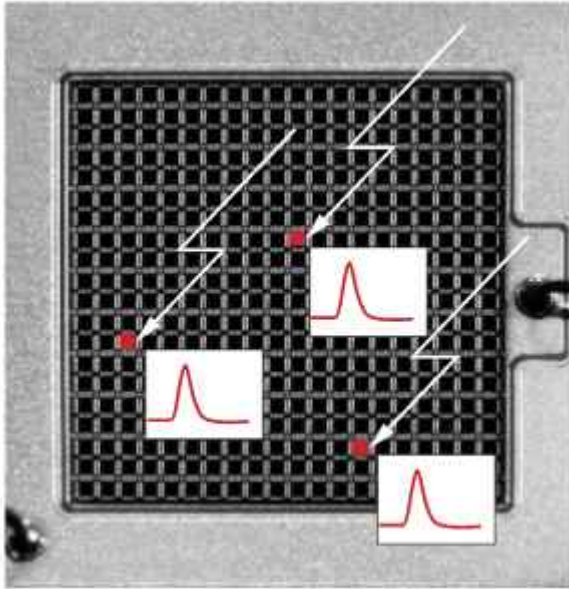
APD

KAPDC0008EC

One pixel of MPPC

KAPDC0029EA

MPPC

- Each pixel in the MPPC outputs a pulse at the same amplitude when it detects a photon
- Pulses generated by multiple pixels are output while superimposed onto each other
- Each pixel outputs only one pulse and this does not vary with the number of incident photons
- select an MPPC having enough pixels to match the number of incident photons
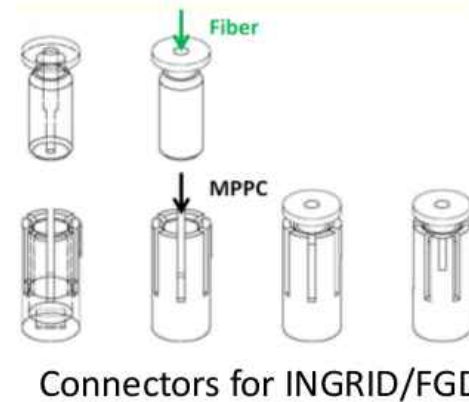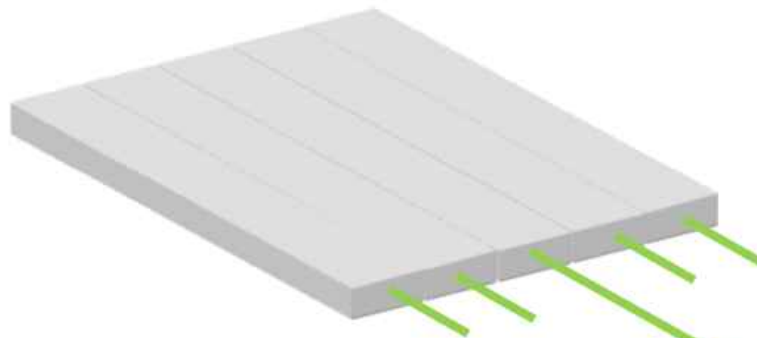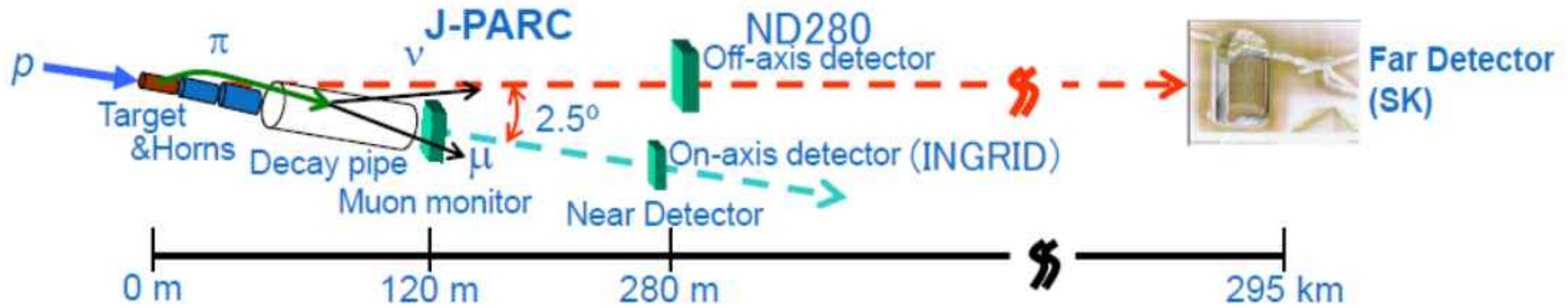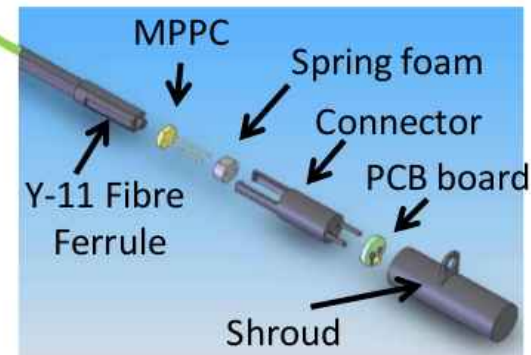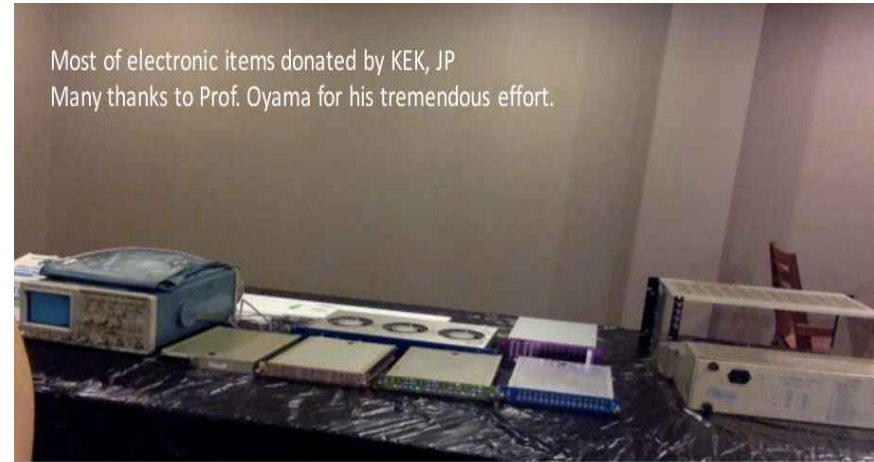
Raw signal
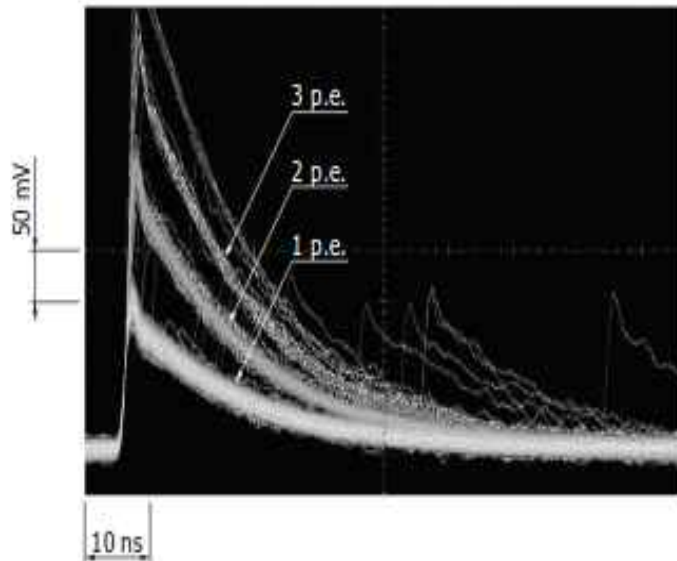
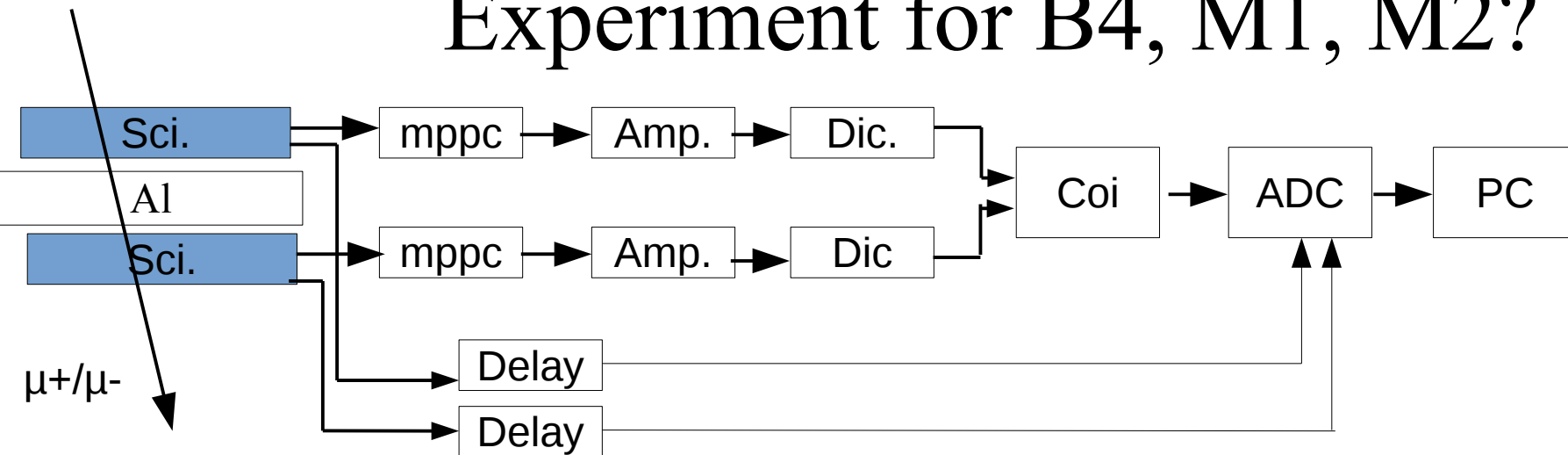### Pulse high spectrum
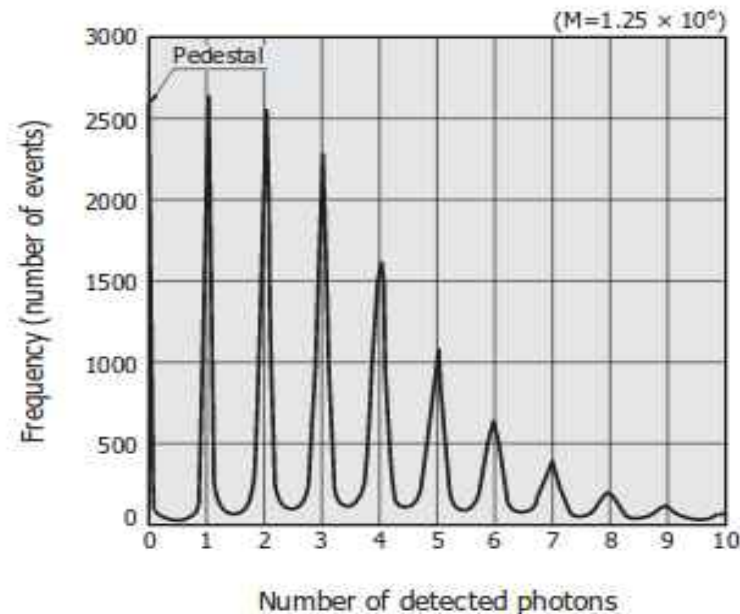
MPPC at T2K

- Basic element of the near detector scintillator subsystem (INGRID, P0D, FGD, ECAL, SMRD)
  - Extruded scintillator bar with embedded Y-11 fibre read out by individual MPPC in coupler
  - 56000 channels in total

Connectors for INGRID/FGD

Connectors for P0D/ECAL/SMRD

MPPC at IFIRSE

Most of electronic items donated by KEK, JP
Many thanks to Prof. Oyama for his tremendous effort.

Experiment for B4, M1, M2?

μ+/μ-

- Muon life time
- muon flux
- muon precession

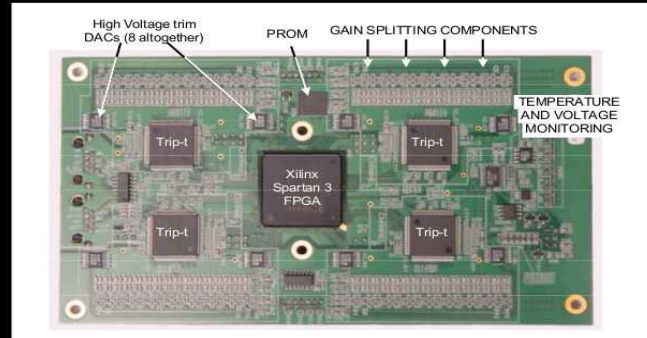- Calibrate with led
- light yield
- gain

- noise rate
- cross talk
- efficiency
…..

- Need ADC, TDC ?

ADC, TDC

- Trip-t (Fermilab) for INGRID/P0D/ECAL/SMRD
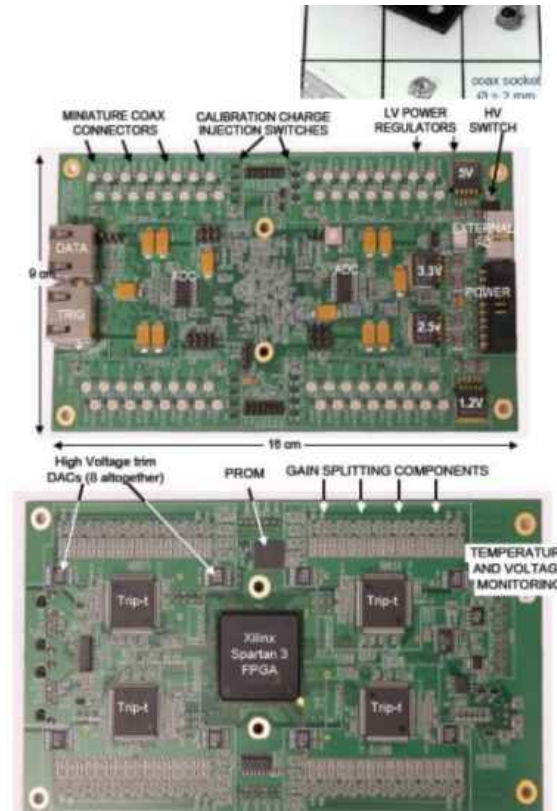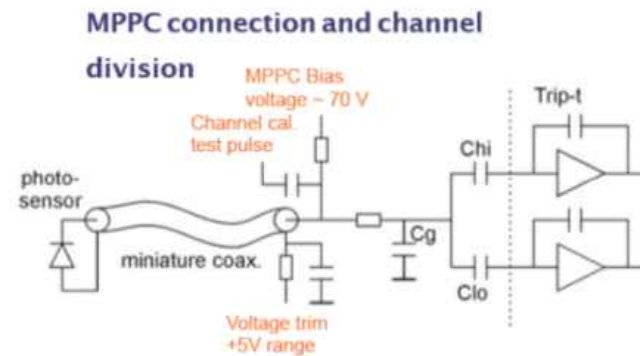- AFTER (Saclay) for FGD
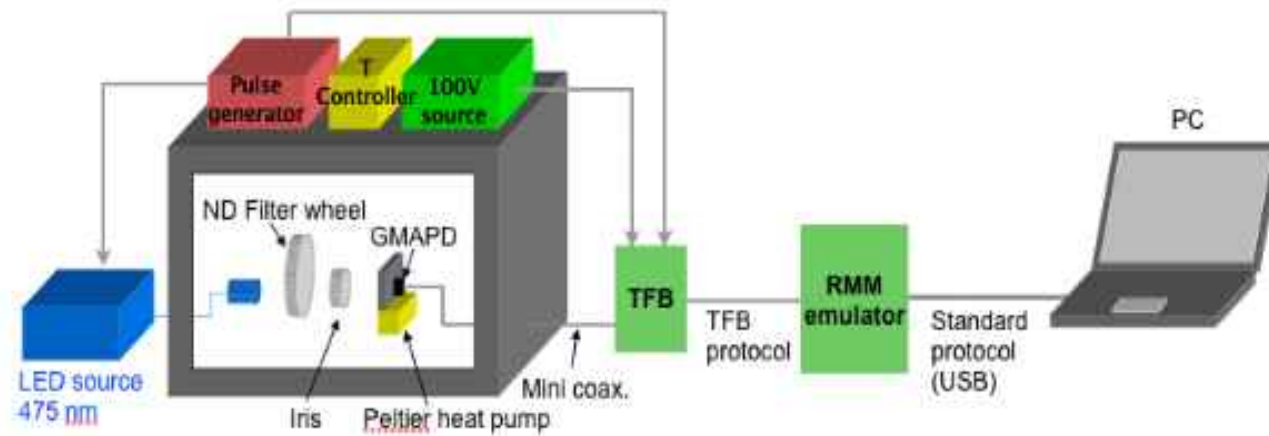
Trip-t frontend board developed in UK

AFTER electronics by Saclay

Trip-T electronics

MPPC connection and channel division

- 64 Hi/Lo gain ADC and TDC
- Individual HV trim (8bit, 5V range)
- On board charge injection circuit
- Temperature sensors

PhD and Future Research ?

- NINJA and WAGASCI experiments
- These experiments hardware have done
- Can contribuite in analysis data

- MPPC in future research ?
- … ?

Thanks for your attention