

Hodoscope setup for RPC Testing

M.Usman

National Centre for Physics

<http://musman.home.cern.ch/musman>

Our Commitment

- ⇒ Pakistan has to prepare 288 RPC's for CMS
- ⇒ 10% in excess for backup purposes
- ⇒ Bulk RPC production is in progress
- ⇒ Final Quality Assurance Test will be necessary before shipping to CERN

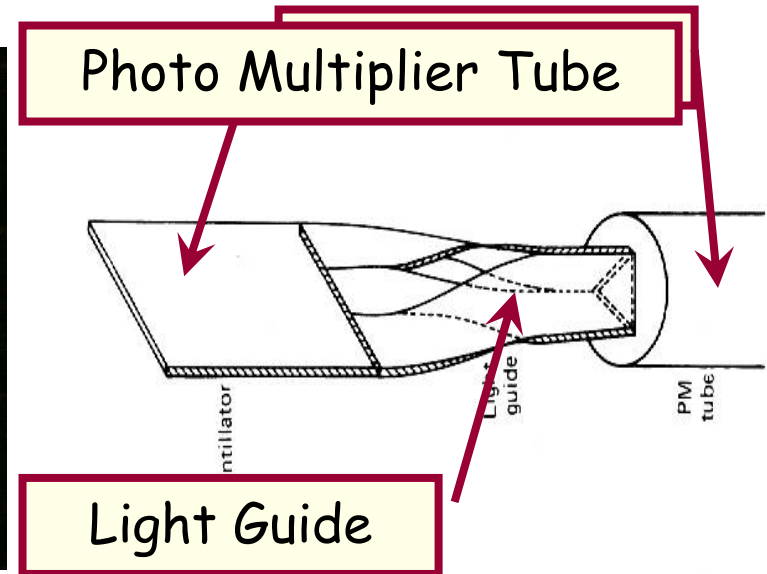
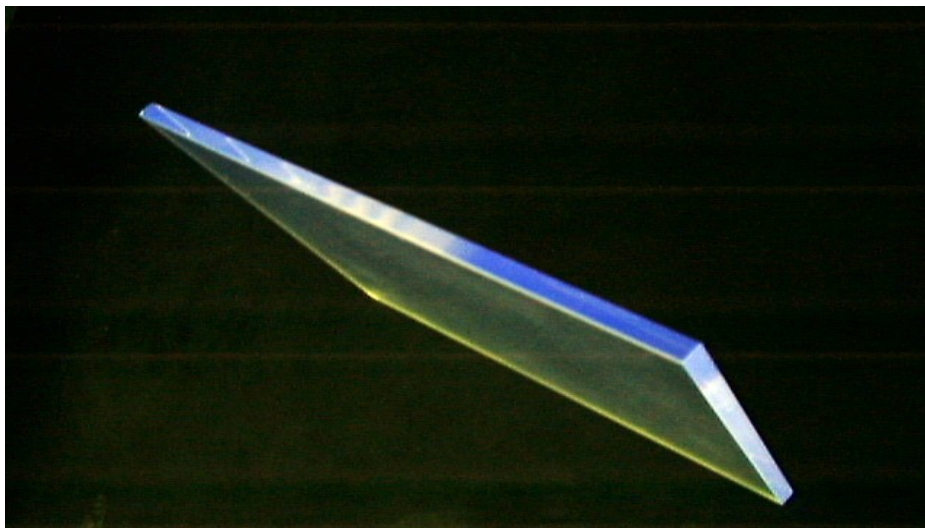
Test Setup

Main elements of test setup are:

- ⇒ Scintillator Counters
- ⇒ Rack for RPC testing
- ⇒ Trigger Electronics
- ⇒ Readout Electronics
- ⇒ H.V. Power supplies
 1. For scintillators (2-3kV)
 2. For RPCs (10kV)

Scintillator Counters

- ⇒ Scintillators are made of Polystyrol with scintillation compound
- ⇒ Ends of the scintillators were heated, compressed and then attached with PMT



Scintillators for Hodoscope



- ⇒ We need **16** scintillators for hodoscope
- ⇒ **8** of them are placed on top and **8** on bottom
- ⇒ Scintillator counters are got from old DELPHI experiment
- ⇒ Made in Russia
- ⇒ Original length was 350cm

Scintillators for Hodoscope

- ⇒ Counters were cut, polished and light isolated
- ⇒ Now the length of each scintillator is **190cm**
- ⇒ Width of each scintillator is **20cm**
- ⇒ Forming area of top and bottom surfaces of Hodoscope **160cm X 190cm**



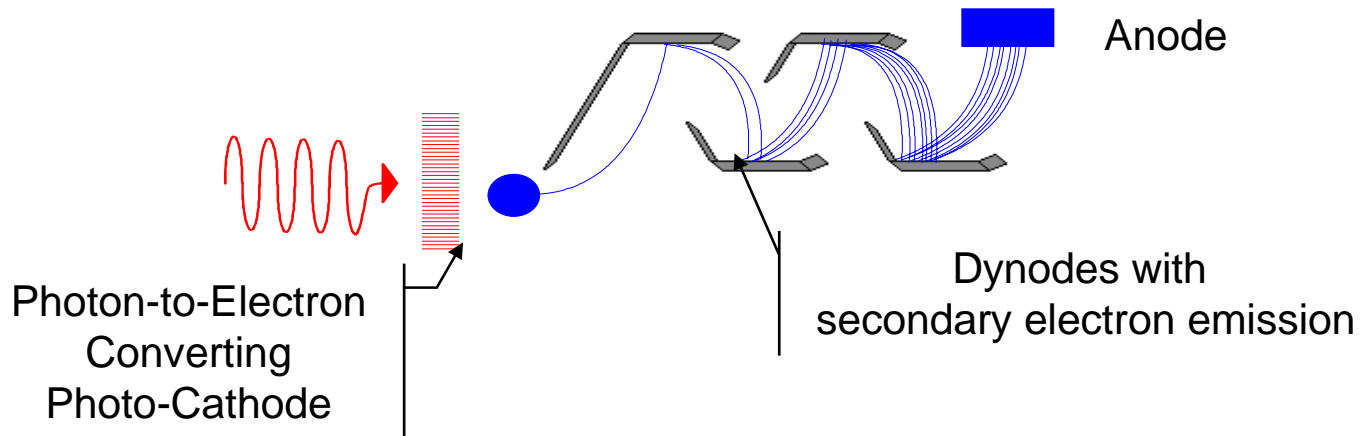
Photomultiplier Tube (PMT)

- ⇒ Multi-alkaline photo-cathodes (FEU-118) with an area of sensitivity **46mm** in diameter
- ⇒ **11 dynodes** in each PMT
- ⇒ Placed in a housing for light insulation

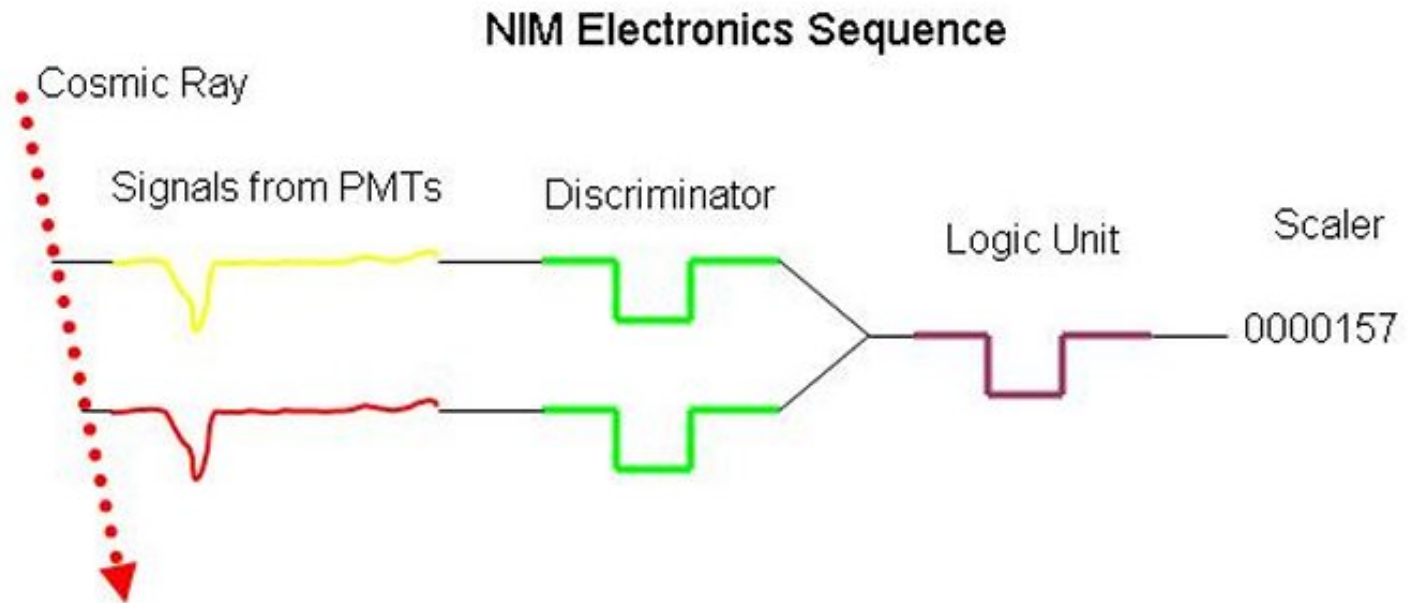


Photomultiplier Tube (PMT)

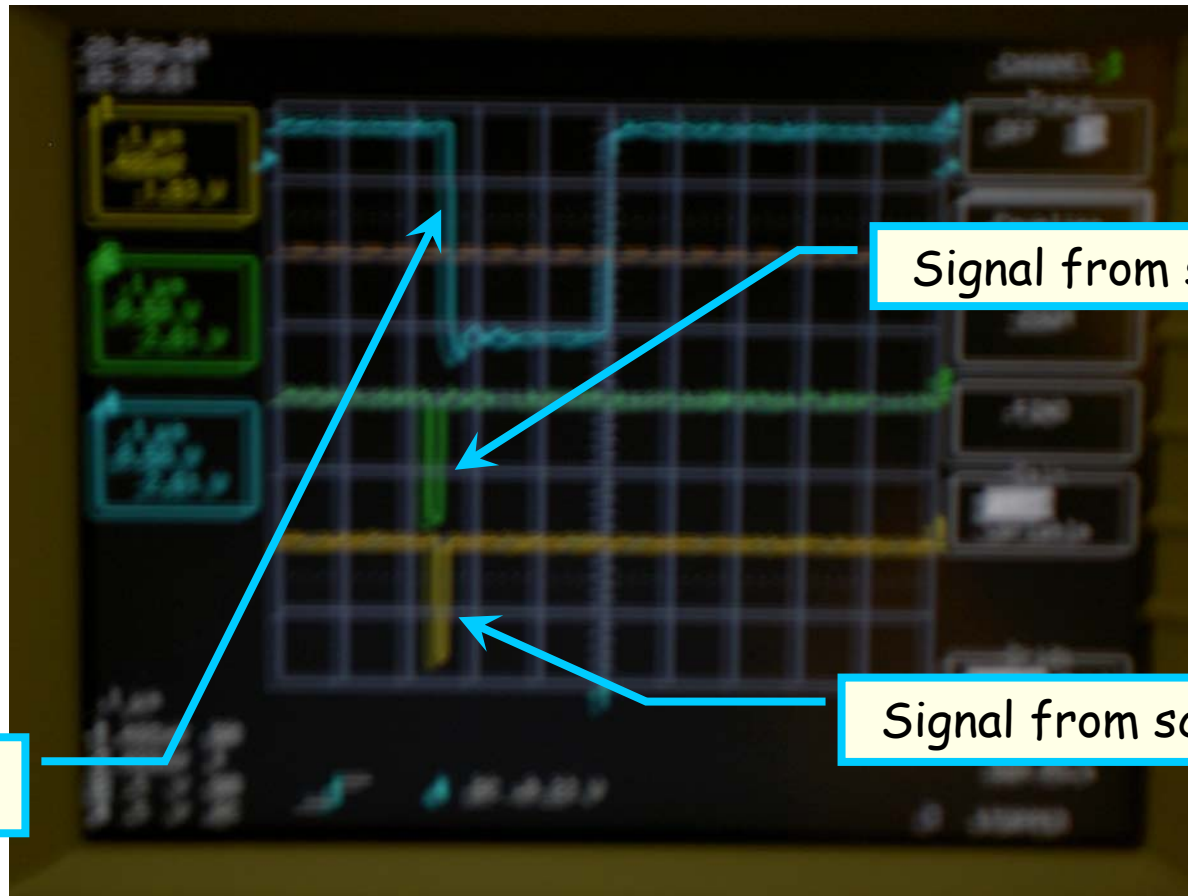
- ⇒ Excitation and de-excitations in scintillator
- ⇒ Photon in visible range emits
- ⇒ Falls on photocathode and emits electrons
- ⇒ Electrons are accelerated by dynodes and secondary electrons are emitted
- ⇒ An analog signal is produced in the output



Coincidence



Coincidence



Coincidence

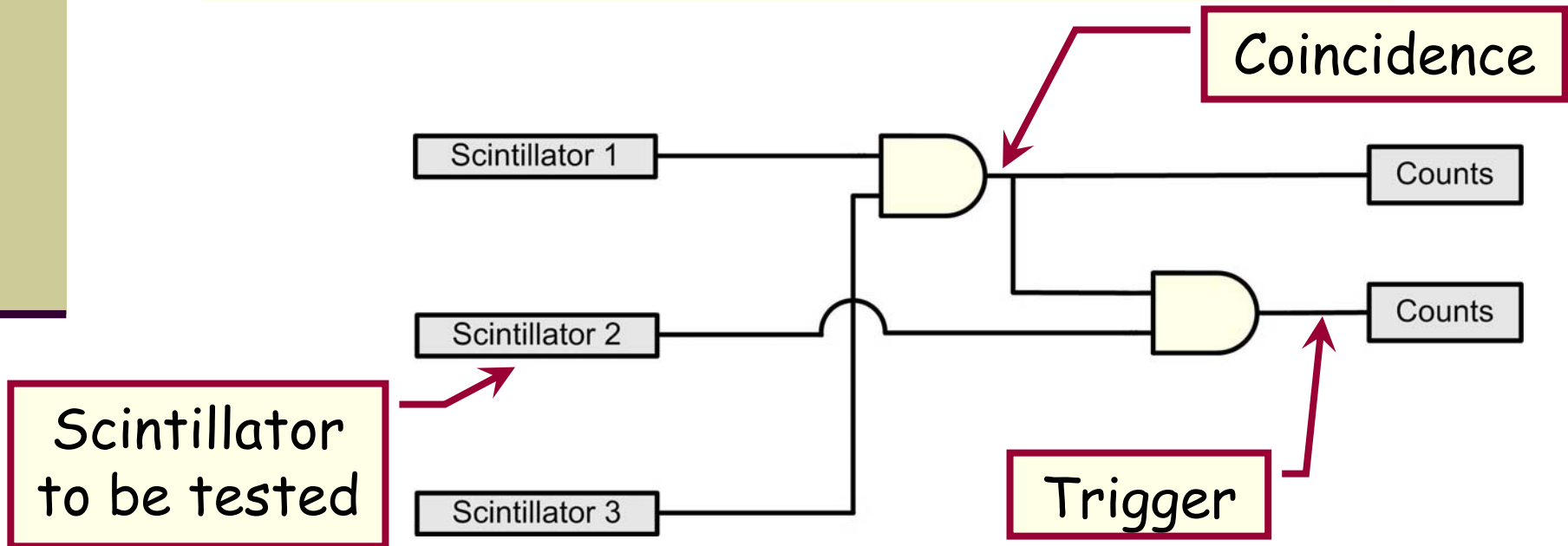
Signal from scintillator 1

Signal from scintillator 2

Efficiency Measurement

⇒ $\eta(\%) = \frac{\textit{Trigger}}{\textit{Coincidence}} \times 100$ 1 by age

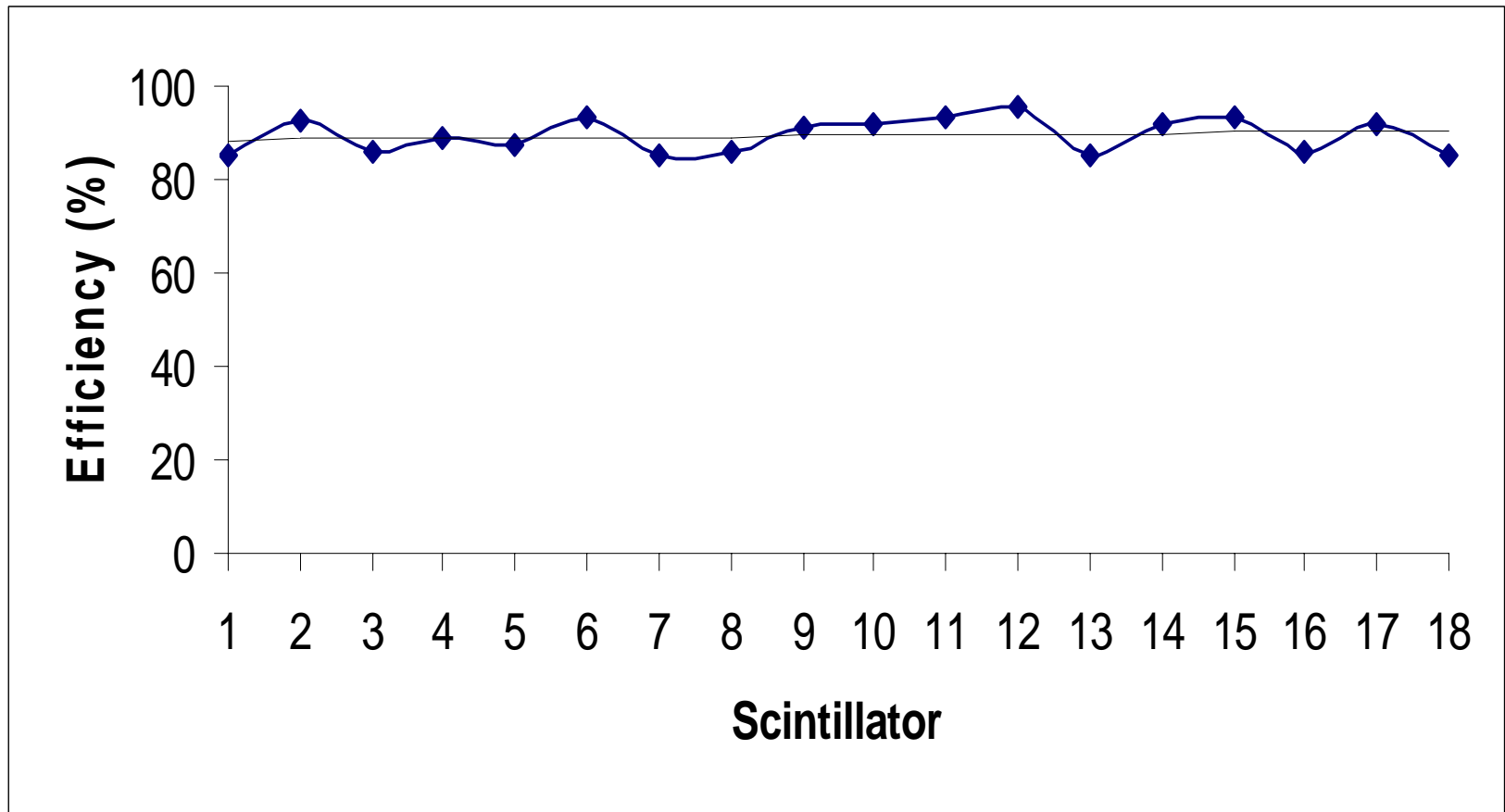
⇒



Efficiency Measurement Setup



Efficiency of Scintillators

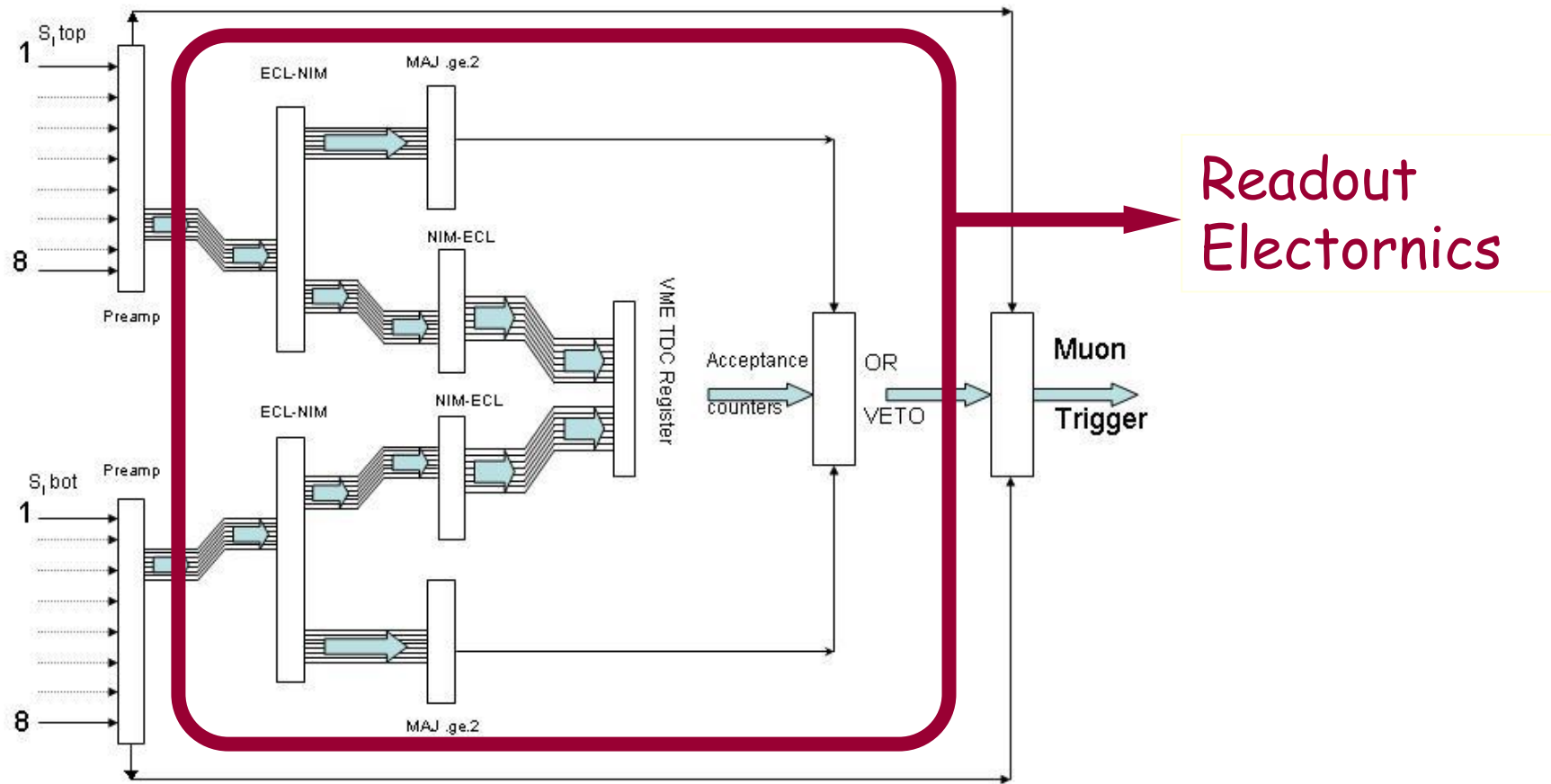


Setup for Hodoscope

Hodoscope setup is based on two types of Electronics.

1. Trigger Electronics
2. Readout Electronics

Trigger Logic for Hodoscope



Trigger Electronics for Hodoscope

Trigger electronics is based on the following electronic modules

1. Discriminator
2. Coincidence Unit
3. Scalar
4. Delays (according to their need)
5. Attenuator (according to their need)

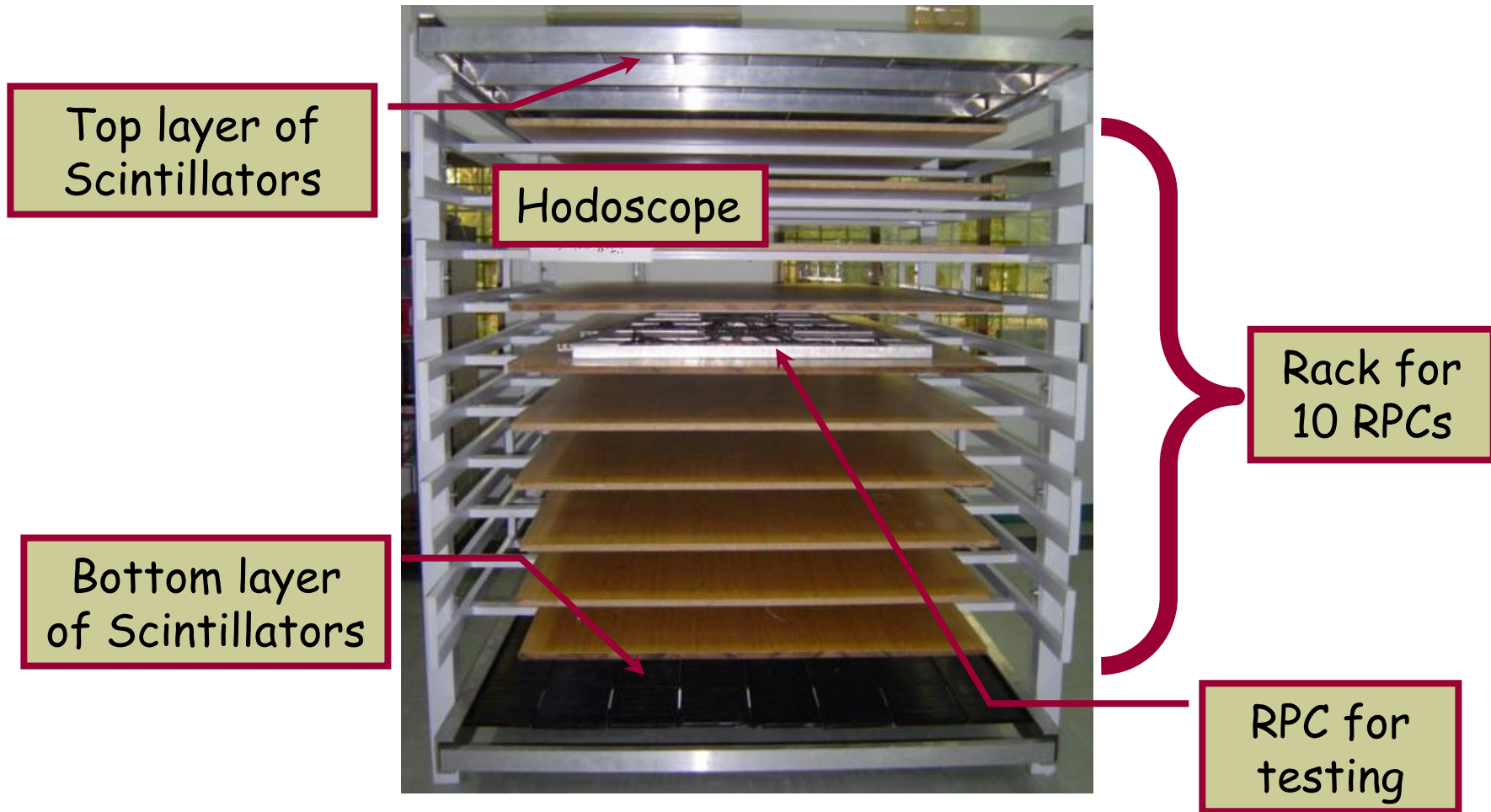
All these modules are of NIM type of electronics

Readout Electronics

Elements of electronic readout system are based on:

- ⇒ VME Standard
- ⇒ Using VME bin
- ⇒ National Instrument Crate Controller which is directly connected with the computer with MXI-2 cable and a PCI card
- ⇒ Libraries and drivers are available both in Linux and Windows for crate controller
- ⇒ At present we are using CAEN TDC to readout the information with 128 channels

Complete Hodoscope at NCP

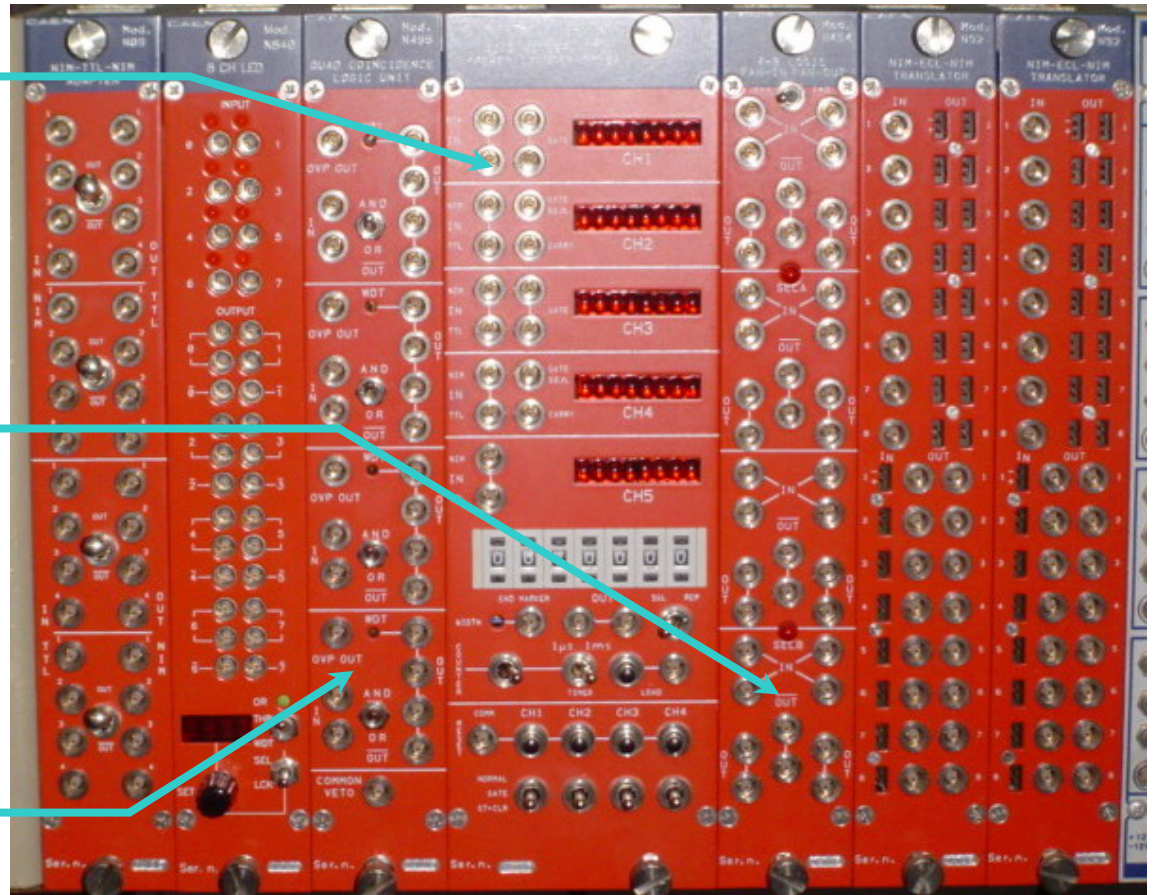


NIM Electronic Modules

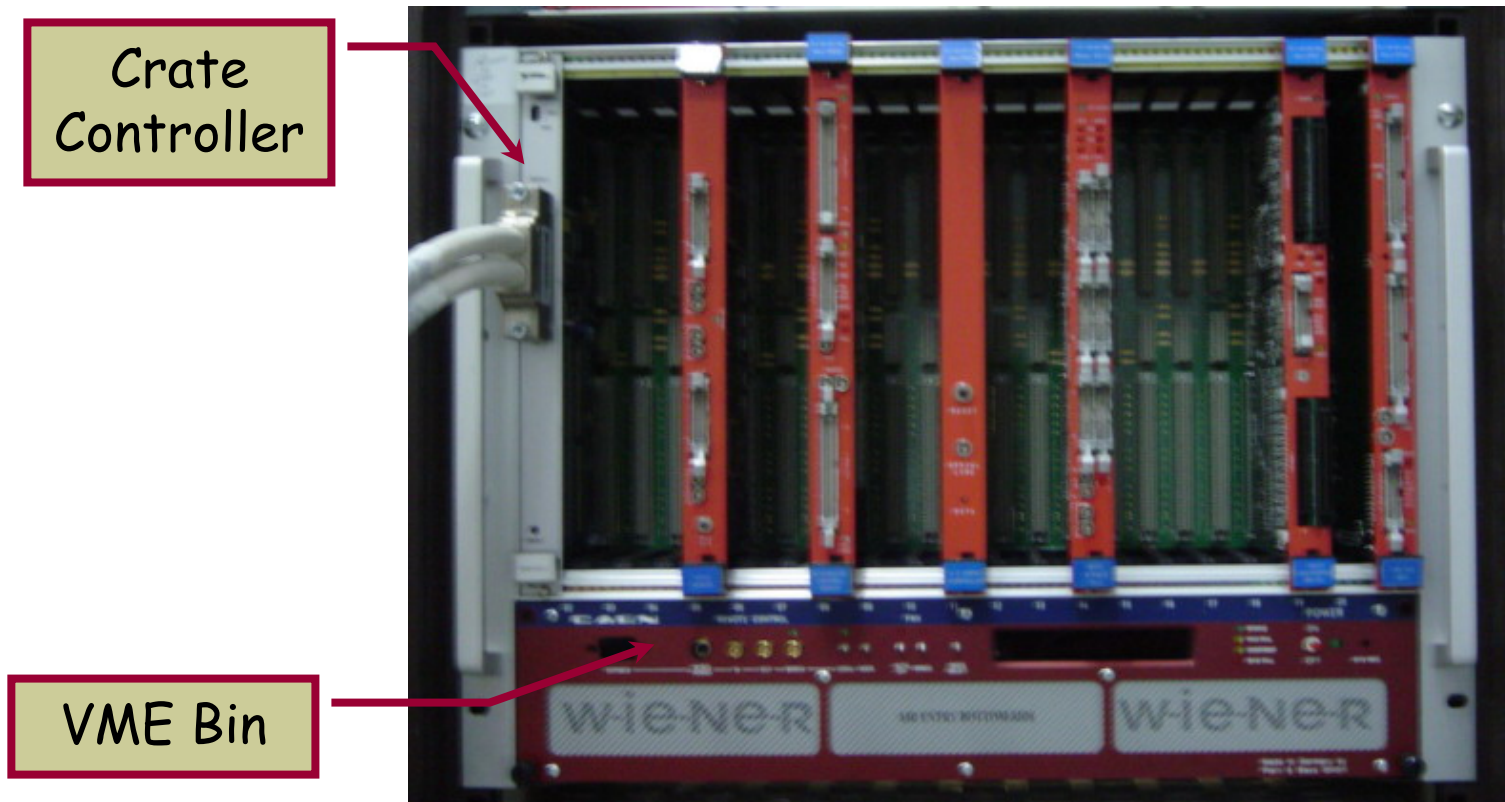
Scalar

Discriminator

Coincidence Unit



Electronics Readout system



Conclusion

- ⇒ Scintillators have been tested
- ⇒ All the NIM modules are available for trigger setup
- ⇒ Only one TDC is available presently
- ⇒ Trigger and Electronics readout system are not functional yet because
 - ⇒ Non availability of signal cables for scintillators
 - ⇒ Power supply connectors are not available
- ⇒ Software for DAQ is not ready for use