

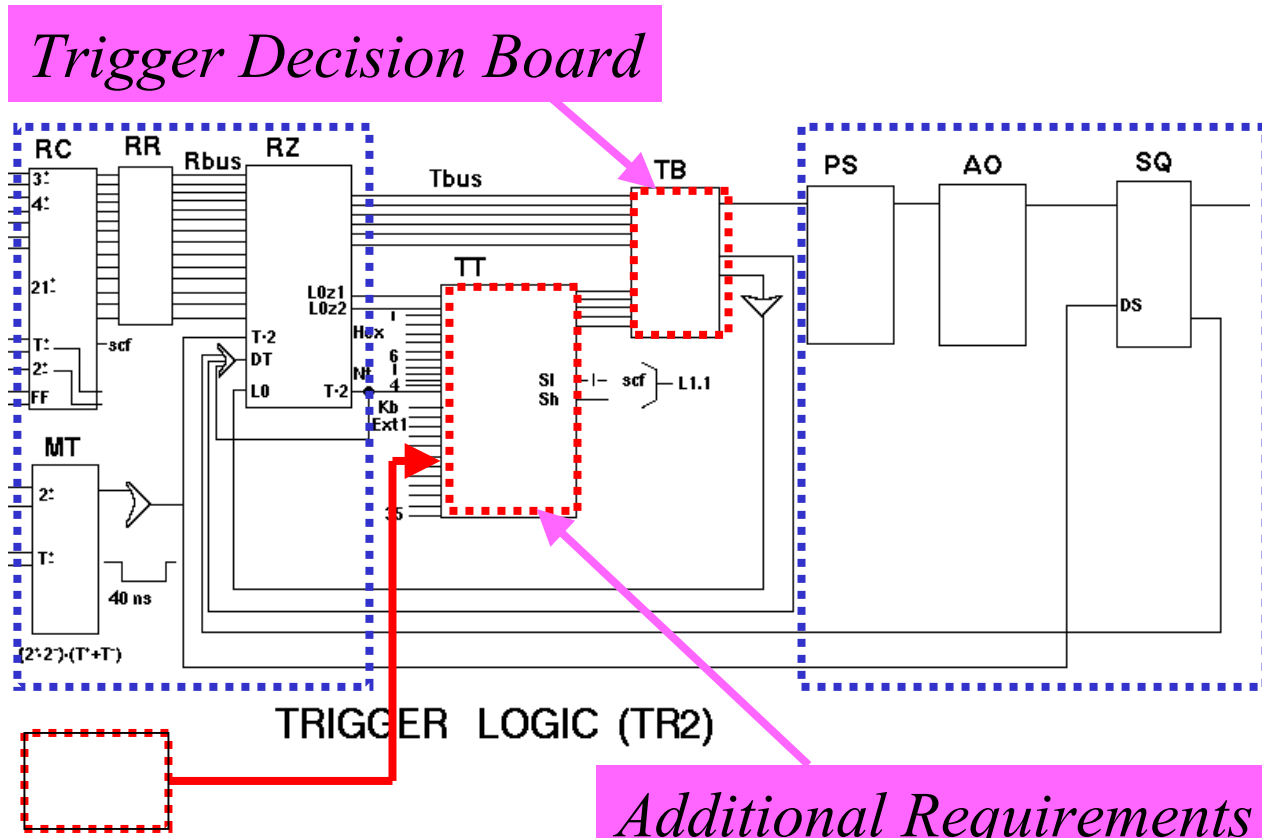
*Stopped K^+ Experiment using
New Trigger System*
(BNL-E949 Experiment)

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- Introduction
- New Trigger System
 - Trigger Decision Board
 - Discriminator Module
 - Logic Module
- Summary

E787/E949 Trigger System

- entirely composed of FASTBUS modules and operated on ECL signals.



detector

Additional Requirements

DAQ

New Trigger System for E949

- *We have developed following modules for E949.
All of them have Complex PLD produced by ALTERA.*
- Trigger Decision Board
 - More flexibility.
 - ✓ develop byproduct trigger
 - Another application.
 - ✓ On-chip monitor system.
 - ✓ prescaler → reduce online dead time.
- Discriminator Module
 - Optimize $\pi^+ \nu \bar{\nu}$ trigger in higher intensity.
 - ✓ Mean Timing of the online Photon Veto signals.
 - ✓ Online Z-position cut.
- Logic Module
 - Combinational logic.

Trigger Decision Board

INPUT

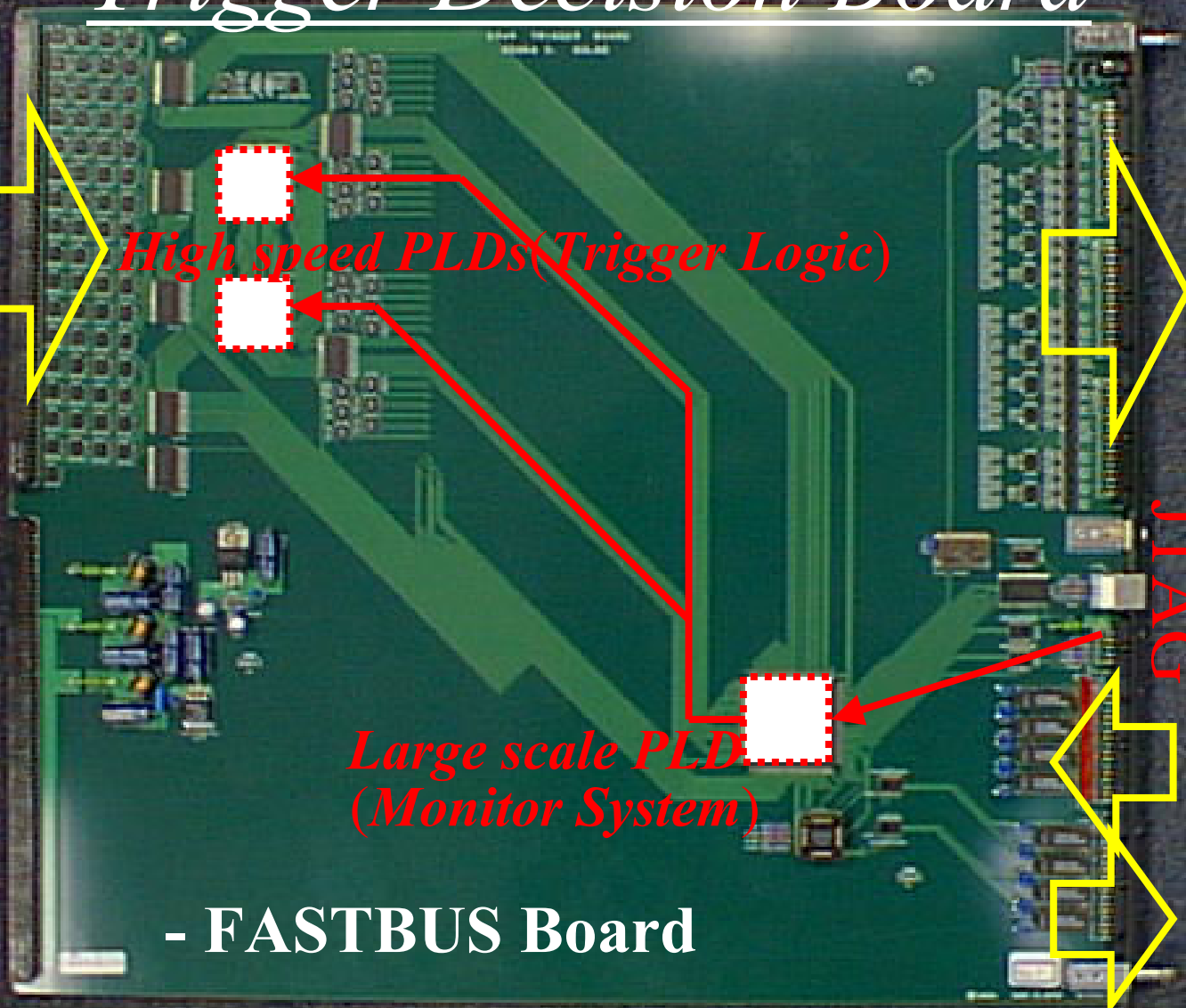
High speed PLDs (Trigger Logic)

OUTPUT

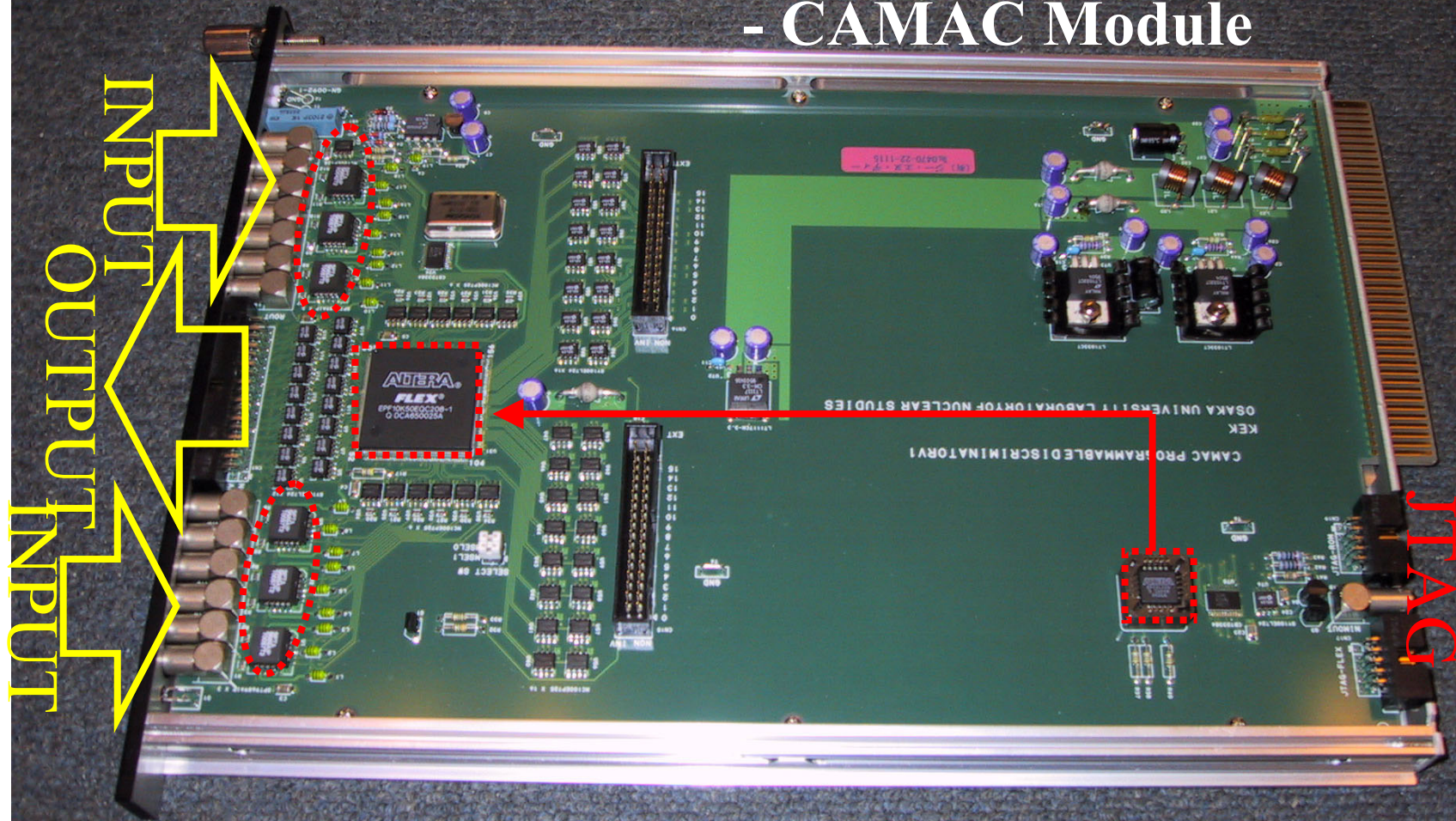
Large scale PLD (Monitor System)

JTAG MONITOR

- FASTBUS Board



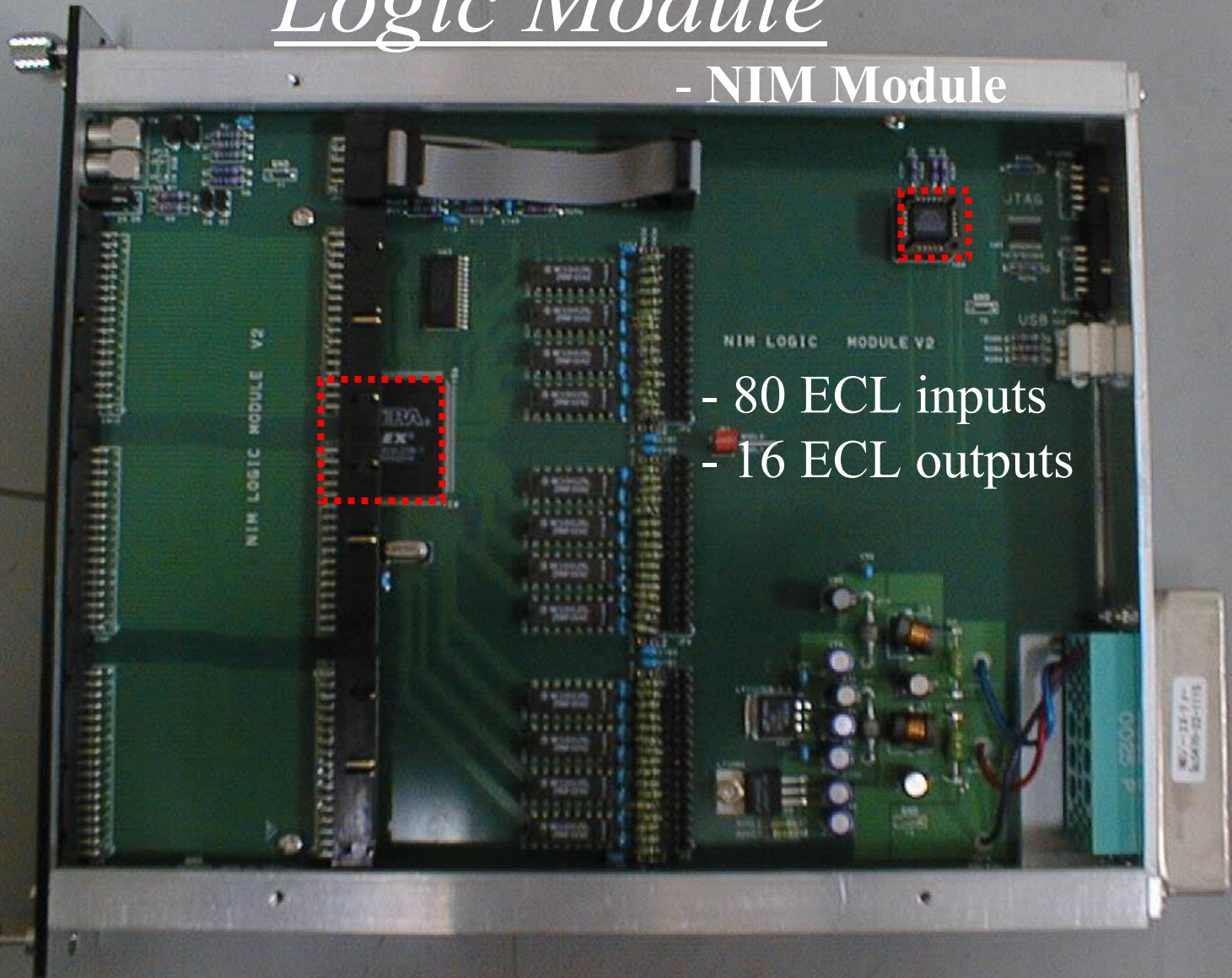
Discriminator Module - CAMAC Module



- Mean Timer Logic
- Z-position finder

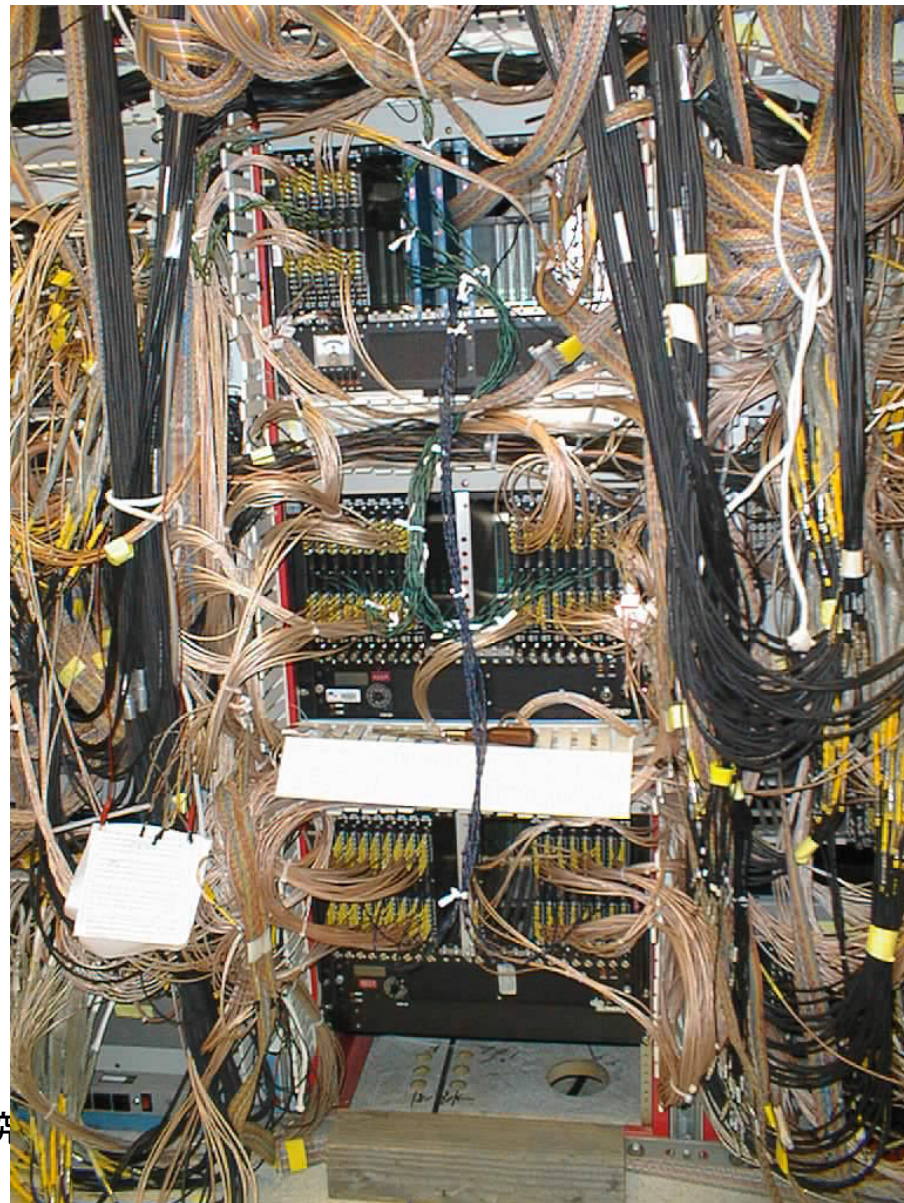
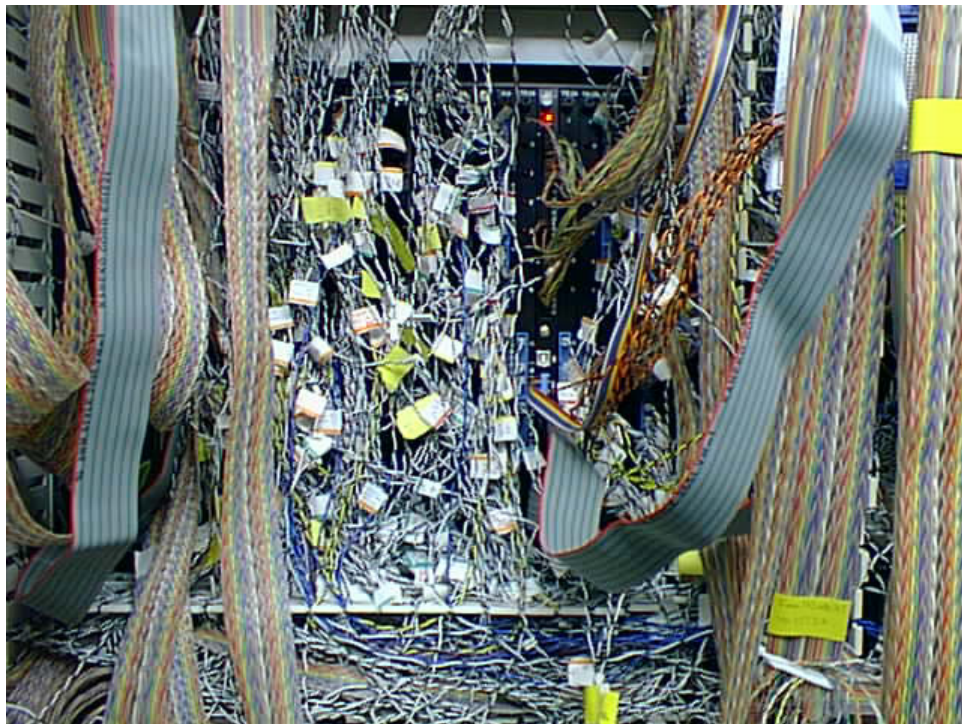
Logic Module

- NIM Module



- 80 ECL inputs
- 16 ECL outputs

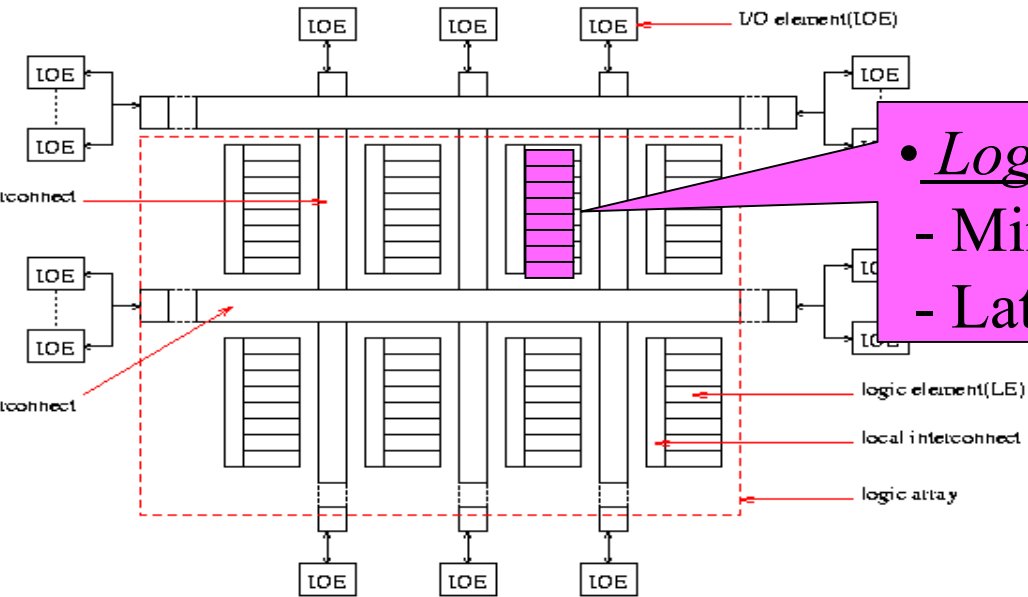
After Installation...



2003/3/5

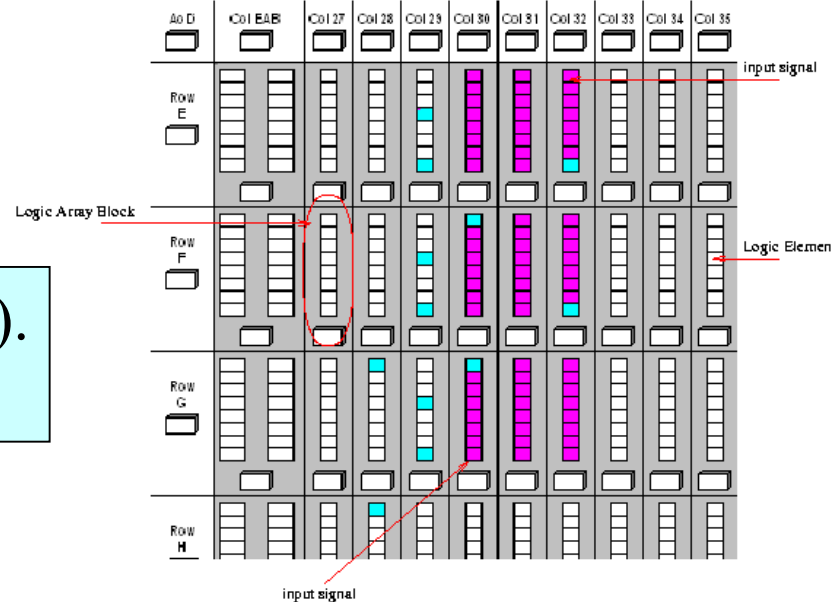
科研費特定領域研究

ALTERA Complex PLD

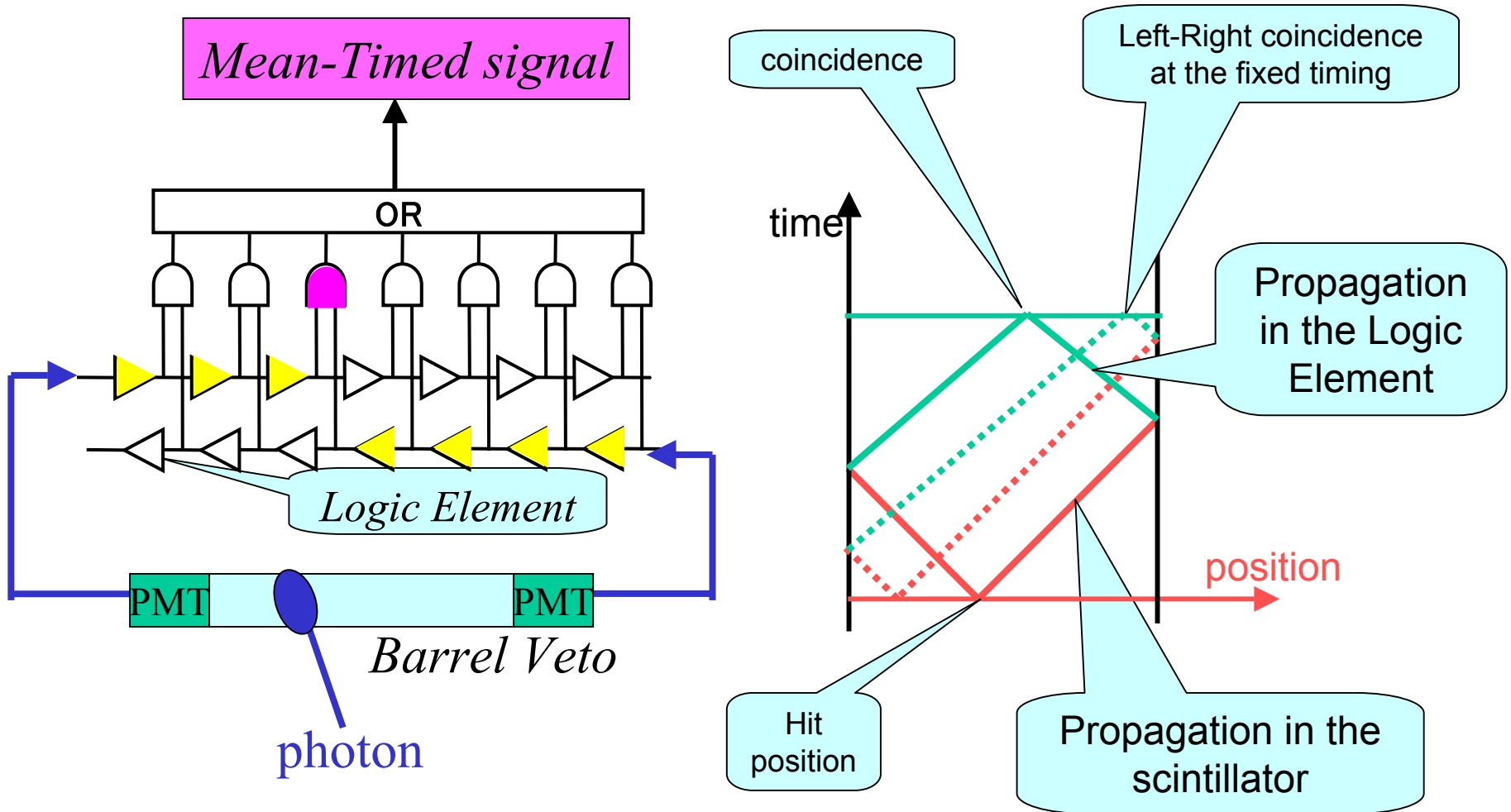


- Logic Element
- Minimum constitution of the CPLD.
- Latency : ~1nsec.

- Hardware Description Language(HDL).
- Download through JTAG link.



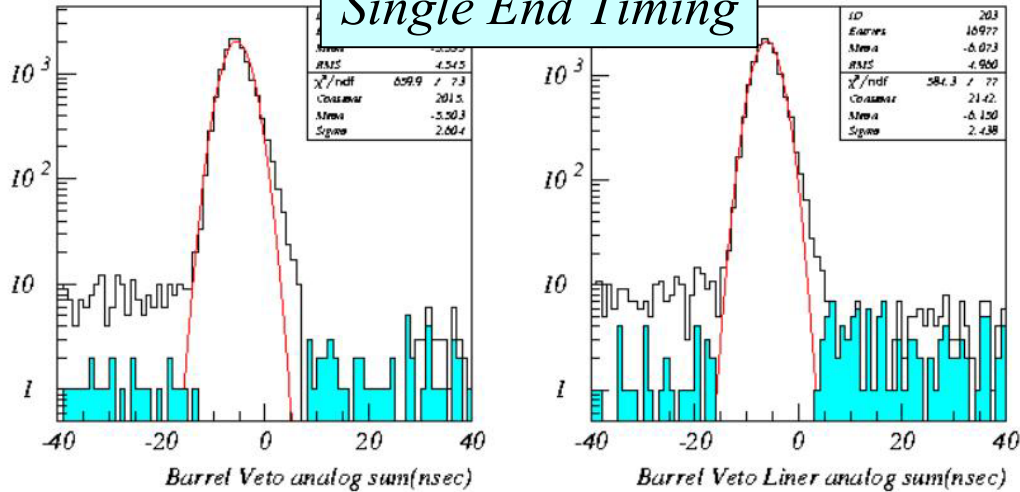
Mean Timer using CPLD



Performance of the Mean Timer

kp2 decays in kp21 trigger - online PV rejection

Single End Timing



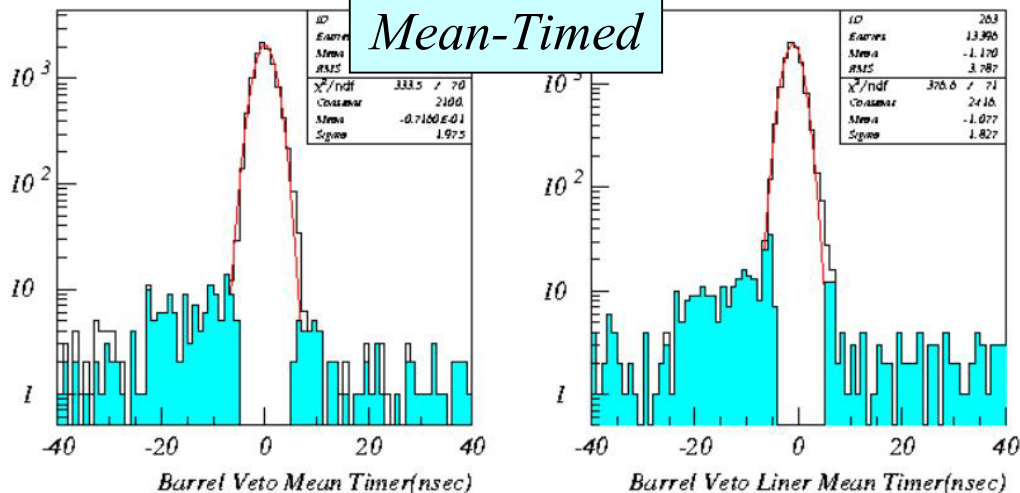
- Sigma

2.6nsec \rightarrow 1.9nsec

- Veto window

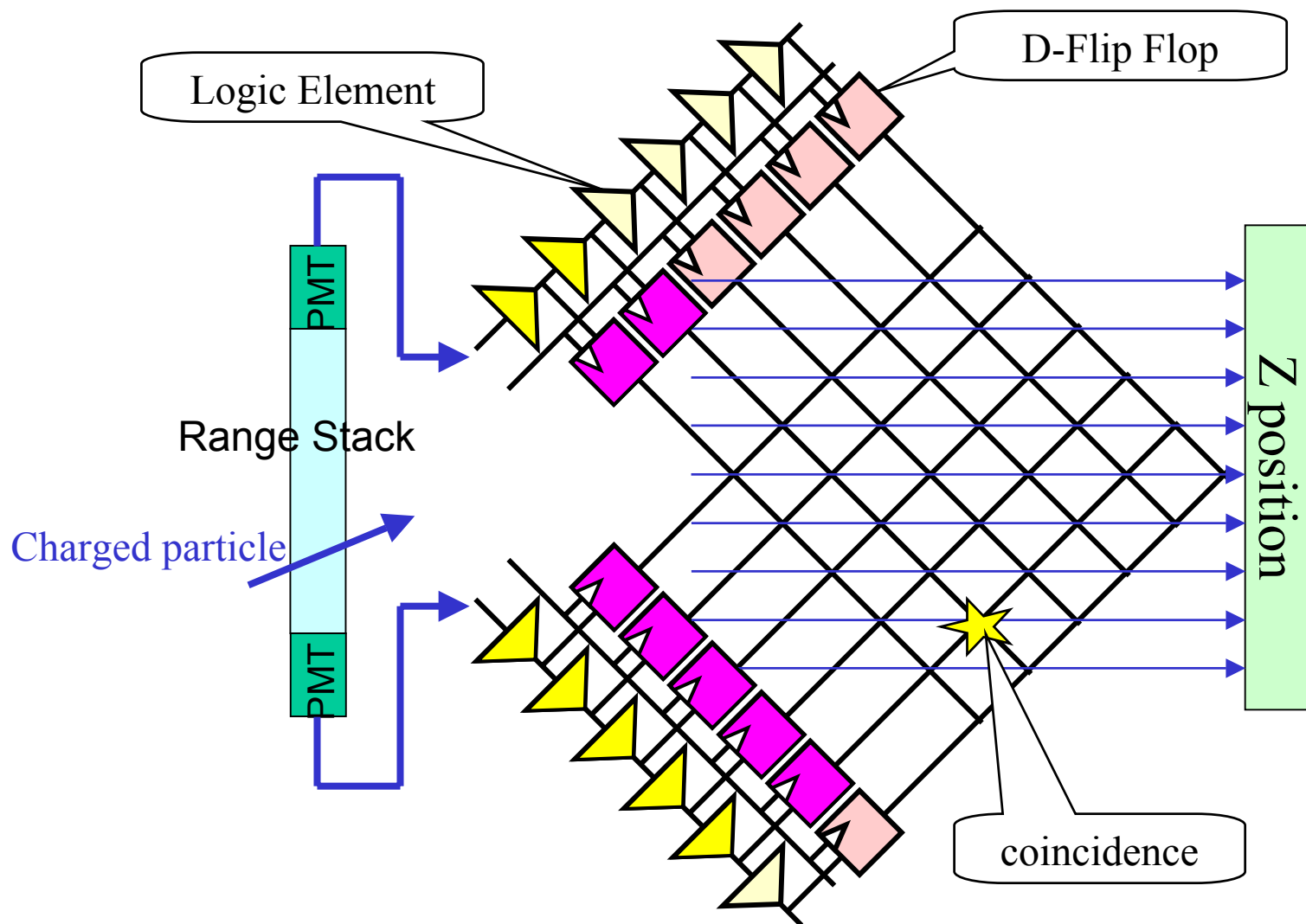
20nsec \rightarrow 10nsec

Mean-Timed



• keep acceptance in higher rate.

Online Z-position finder

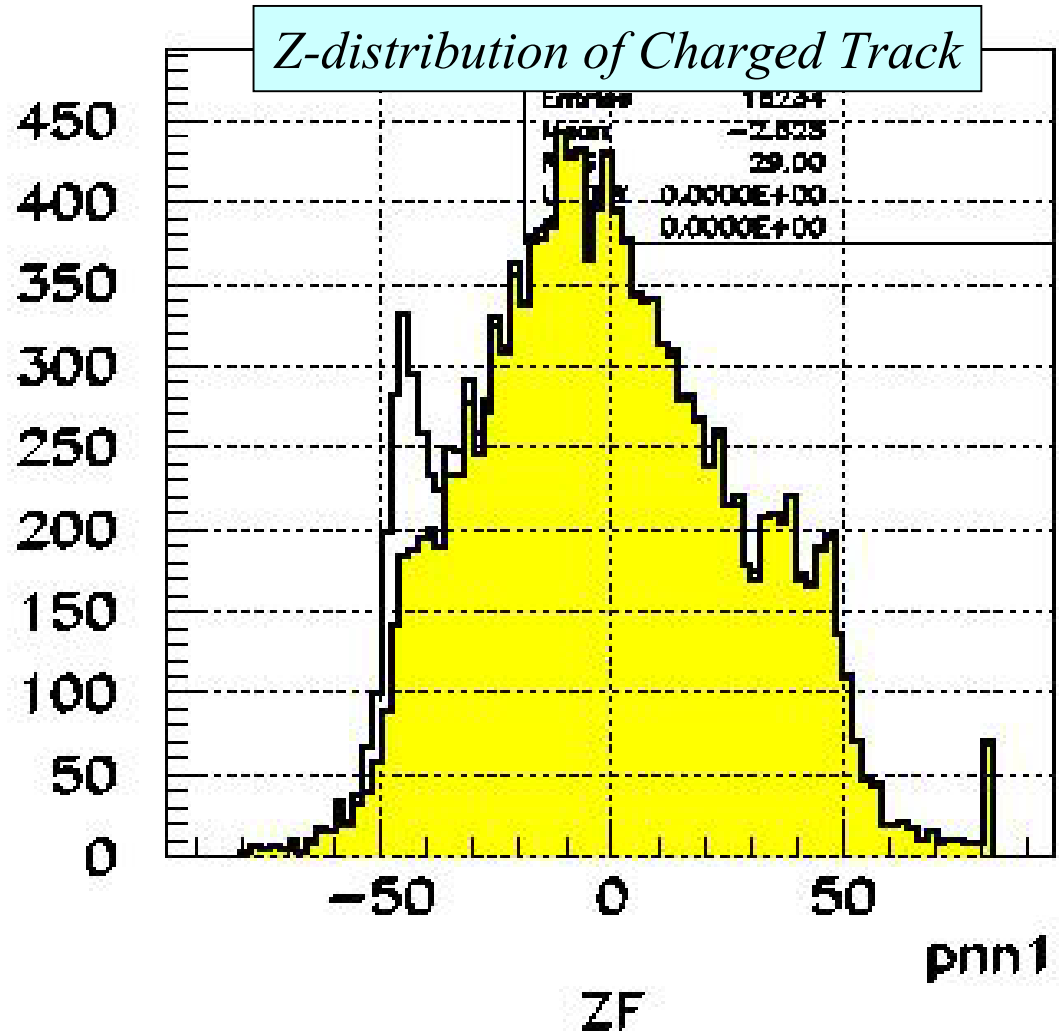


Online Z-position Cut

- muon with high dip angle could make a 'spike' at $Z \sim -40$ cm in RS lay14.

- applied the Z-position cut to $\pi^+ \nu \bar{\nu}$ trigger

- further rejection 1.06
- acceptance loss 0.001



Summary

- We have developed new trigger system based on CPLD for BNL-E949.
- New Trigger Decision board allowed rapid and simple programming of new triggers.
- Discriminator Module and Logic Module provided a new trigger signal to make more efficient trigger in higher intensity.