# Trigger system of BESIII

Liu Kai

Introduction

- understanding of trigger system is important in the charmonium invisible decays,especially for those events having less final detectable particles

- give a basic introduction of the big picture of BESIII trigger system.

Event Rate(1)

- **BEPC for BESI and BESII**

  – single bunch

- **BESIII**

  – luminosity ~ 100 times higher

  – ~93 bunches
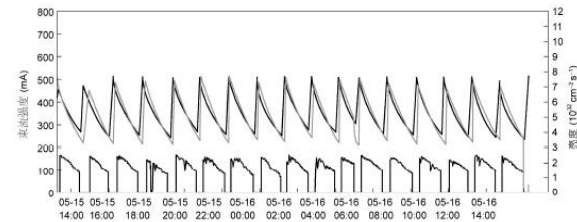

The Layout of BEPC storage ring

BEPCII
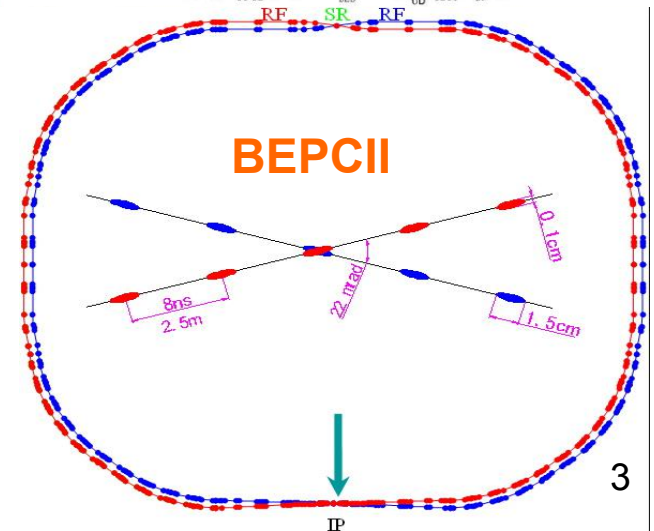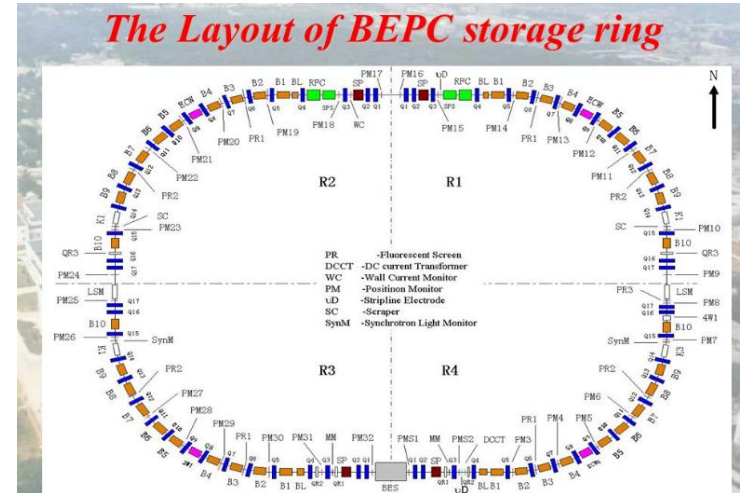
Event Rate(2)

- **Good Event rate at Jpsi peak**
  - 2000Hz
- **cosmic ray**
  - 2000 Hz
- **beam loss background**
  - 125MHz

- DAQ capability
 - 4000Hz

"Fermi quiz"

- **Try to estimate the event rate of beam loss**
  - tips: beam current && beam current decrease roughly in exp. function.

- **Try to estimate the rates of cosmic ray**
  - tips:flux of cosmic ray on the sea level could be taken as 1Hz/cm^2

# constrains from Event rate

- **BESI OR BESII**

  - beam bunch interval 800ns

  - multilevel trigger system

- **BESIII**

  - **8ns**. Do not have enough time
    to perform multi-level trigger

BESI/II Trigger System
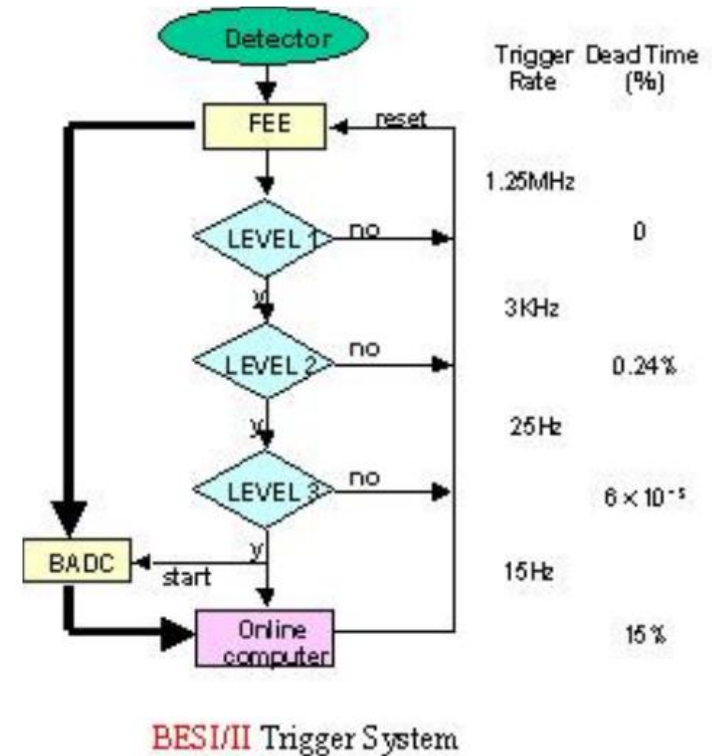
constrains from detector system

- **TOF**:arrival time of signal has intrinsic spread of **30ns**

- **MDC**: drift time is **~400ns**, only after that time, the wire signals could be used for trigger.

- **EMC**:rising time is slow, only after **1.5 us**, signal could be used for trigger

Pipeline and data flow
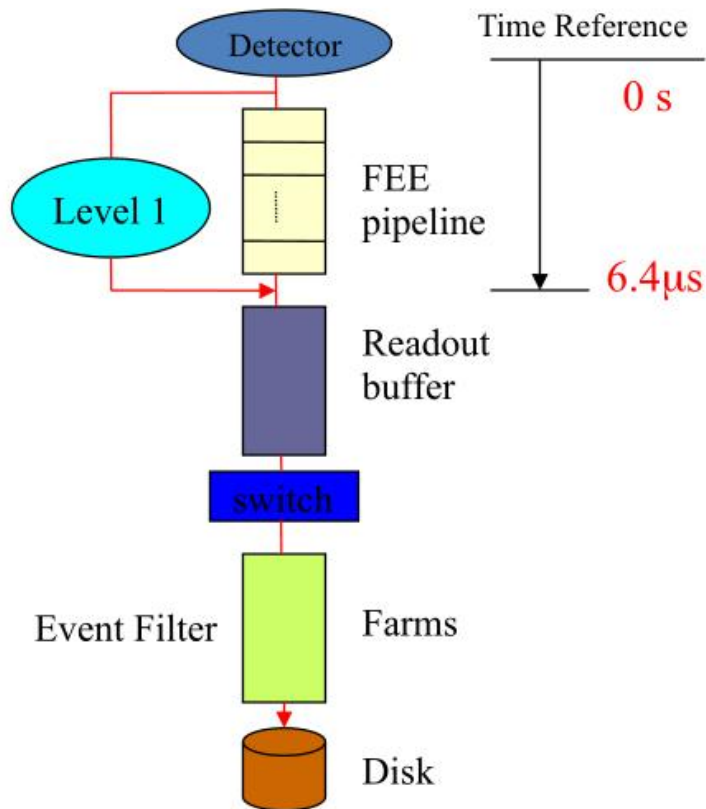
BESIII FEE pipeline and Data flow

- pipeline is used in trigger
- signals from sub-detectors are splitted into two:
  - digitization (TDC,ADC)and stored in pipeline buffer
  - (without digitization) for trigger decision
- When get a **L1** signal, DAQ moves data from pipeline buffer into readout buffer, and packs them into an event, then send to farm server.

A shematic view of Trigger system
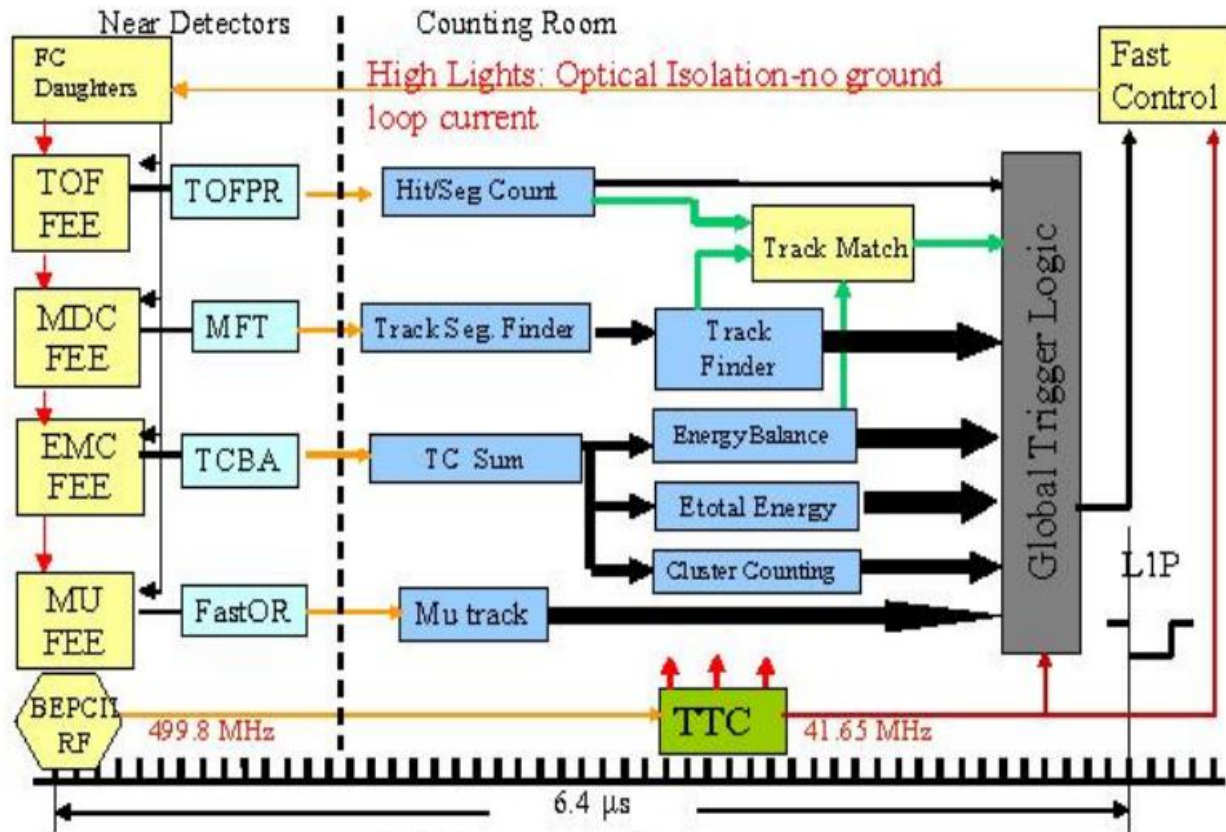
The information from these sub-systems is correlated by global trigger logic (GTL) which generates an LI strobe every time a valid trigger condition is satisfied.

Summary

- a basic introduction is given on some foundamental concepts and the global logic of BESIII trigger system

- sth. else about trigger in the JC plan
  - sub-systems of trigger, especially TOF and EMC for the neutral particle detection
  - trigger efficiency determination method at BESIII

- finish the "Fermi quiz" when having time.

THANKS