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Development of Trigger Control System for Beam Diagnostics at KOMAC

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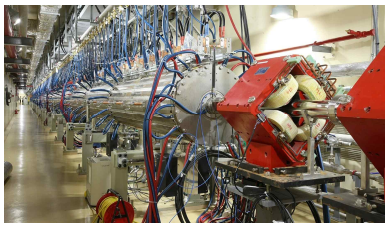
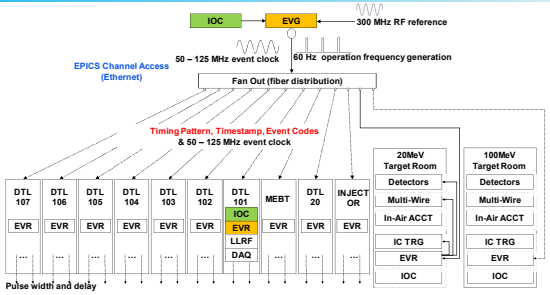
100MeV Linac of KOMAC and Timing System



Features of KOMAC 100MeV linac

- 50-keV Injector (Ion source + LEBT)
- 3-MeV RFQ (4-vane type)
- 20 & 100-MeV DTL
- RF Frequency : 350 MHz
- Beam Extractions at 20 or 100 MeV
- 5 Beamlines for 20 MeV & 100 MeV



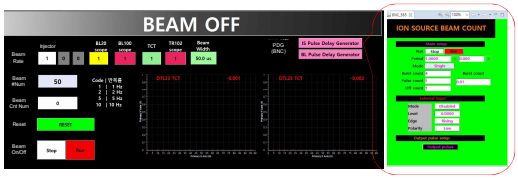
: KOMAC provide 20 & 100 MeV proton beam through the 3 kind of irradiation facility

Timing System Based Beam Trigger

❖ Main Feature

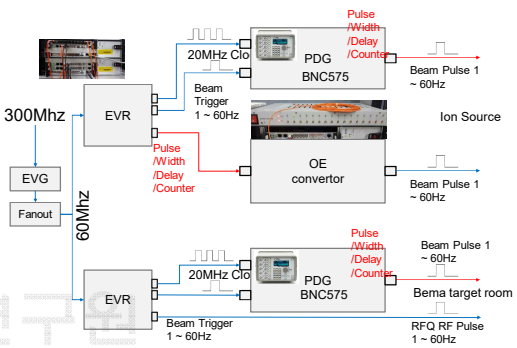
- Distributed timing system hardware and software
- Independently operated timing system
- Providing triggers, timestamps, event codes
- Beam rate synchronized to RF repetition rate
- Timing patterns to support beams to irradiation facility
- Timing patterns to support data acquisition

❖ Timing System Overview



- Beam Run/Stop : Beam permission with PPS & MPS
- Pulse Delay Generator (BNC565)
  - Burst mode
  - External clock ← EVR Prescaler 20 MHz
  - External trigger ← EVR Pulser output (Event Trigger)
- Beam rate is limited to RF repetition rate

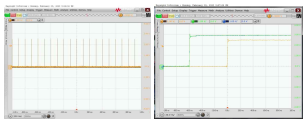
❖ Beam Trigger

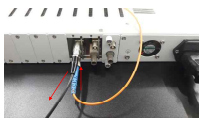


Setting up the Beam Trigger System

❖ OE convertor for Injector

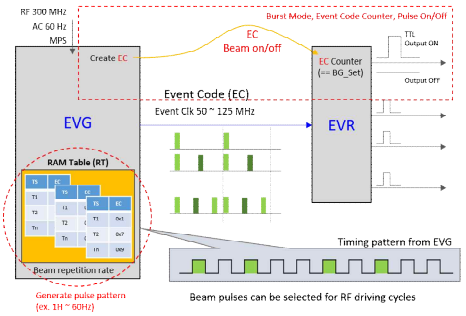
OE convertor



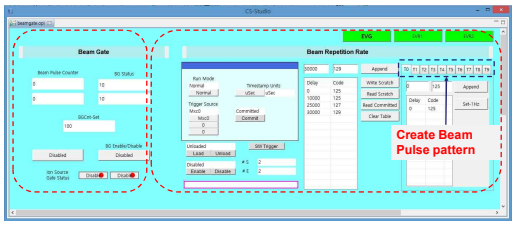


- Convert Optic to TTL Signal
- Pulse Delay : 60 ns
  - EVR pulse delay control
- No Pulse Counter

❖ Beam Trigger Control



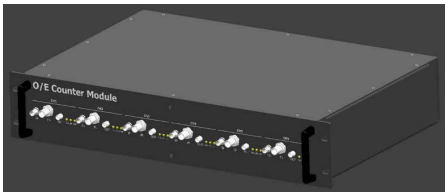
❖ User Interface



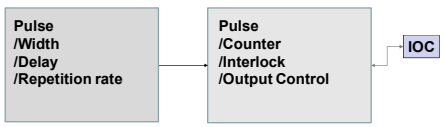
- Generating waveforms of the determined beam rate
- trasferArray copies Evlist and TimeList waveforms to sequencer RAM

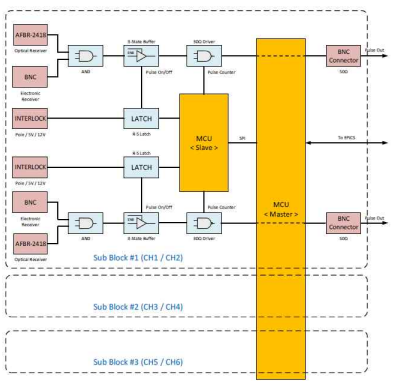
New Beam Trigger & Counter Control System

- Stabilization: Reduced unplanned shutdown, increased utilization
- Adding communication capabilities for remote control and monitoring
- Beam interlock function in conjunction with external interlock



- Separate the role of timing and beam trigger system





Schematic diagram for beam trigger and counter control

- Input / Output
  - I/O 6 channels, up to 60Hz signal conversion rate
  - Input
    - : Intput1 – receive optical signal through HFBR-1414 module
    - : Intput2 – receive TTL signal through BNC connector
    - : Intput3 – receive external interlock signal (5v/12v)
  - Output : LEMO connector type
  - LED display for checking input status
- Control
  - Using MCU with 16Bit or higher performance
  - Add serial communication (RS232)
  - LED for checking output status
  - EPICS IOC and MCU controller
    - : Enter the number of each channel user settings counter
    - : Output control when counter setting value is reached
    - : Check the current status of each channel