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User Interface of operation status and beam permit system for beam service at KOMAC

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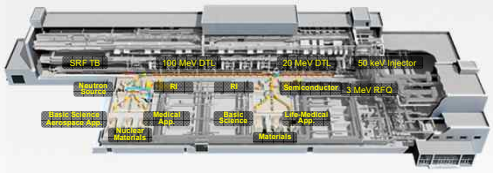
Linac & Beamline Operation

- Started user beam services from July 22, 2013.
- Proton beams delivered to TR23, TR101, TR102, and TR103.



Features of KOMAC 100MeV linac

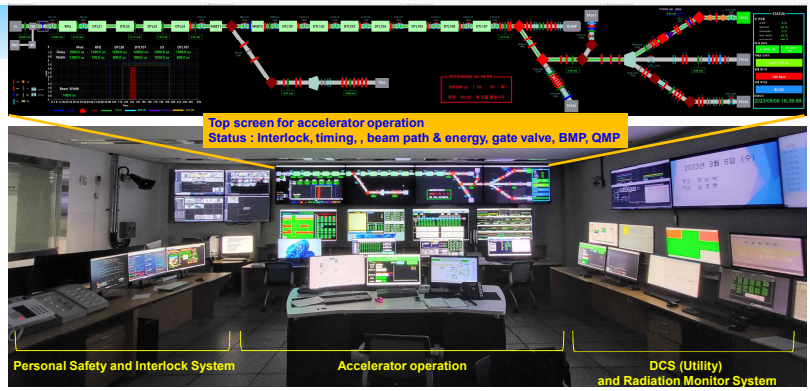
- 50 keV Injector (Ion source + LEBT)
- 3 MeV RFQ (4-vane type)
- 20 & 100 MeV DTL
- RF Frequency : 350 MHz
- Beam Extractions at 20 or 100 MeV
- 5 Beamlines for 20 MeV & 100 MeV

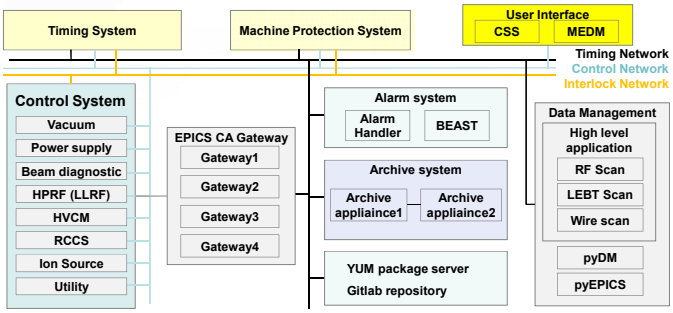
Output Energy (MeV)	20	100
Max. Peak Beam Current (mA)	1 ~ 20	1 ~ 20
Max. Beam Duty (%)	24	8
Avg. Beam Current (mA)	0.1 ~ 4.8	0.1 ~ 1.6
Pulse Length (ms)	0.1 ~ 2	0.1 ~ 1.33
Max. Repetition Rate (Hz)	120	60
Max. Avg. Beam Power (kW)	96	160

- Accelerator division : 21 people
  : Control (3), Nuclear, Electrical, Mechanical, …
- Operated in weekly-based schedule through a yearly plan
  : Beam service: Monday 13:00 ~ Friday 18:00
- Operators/shift
  : 1 for accelerator
  : 2 days a month as operator
- Beam Service : 2 for beam service in target room

Control System & Main Control Room

- Integrated the local system such as VME, PLC, SOM board with EPICS
- Linux-based system except some diagnostic systems
- Different Network: Machine network, Timing network, Interlock network
- EPICS Channel Archiver : operation data management
- Development software: EPICS, Python, Linux (petalinux), vxWorks



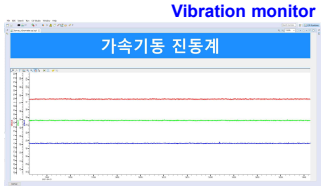


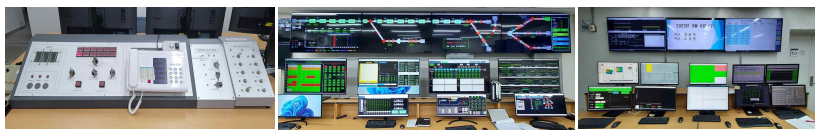
Configuration of KOMAC control system

- Center of operation for linac and beamline
- Operations performed by an integrated operations group in a single control room during commissioning or machine studies periods.
- Improve efficiency by allowing a single operator crew to monitor and control linac and beamlines.

Alarm

Vibration monitor





- Personnel Safety Interlock System
  : shielding door control
  : access control, interlock status
- Key box
  : automatic beam service preparation

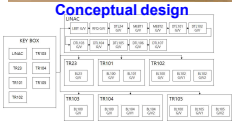
- Control consoles designed with enough flexibility to allow most accelerator programs to be operated from any location in the control room.

- DCS : utility control system
- Radiation monitor system
- Beam tuning system
- Alarm monitor

Beam Permission and Interlock

KEY BOX : for beam ready

Conceptual design

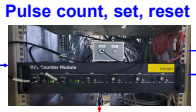


To minimize human error

Target room by key box

MPS

Pulse count, set, reset

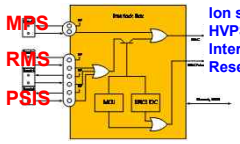


KOMAC Timing system

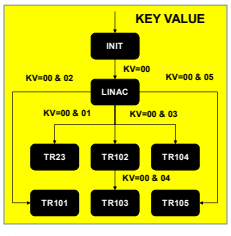
Ion source
Bias PS
High voltage PS

Machine Interlock

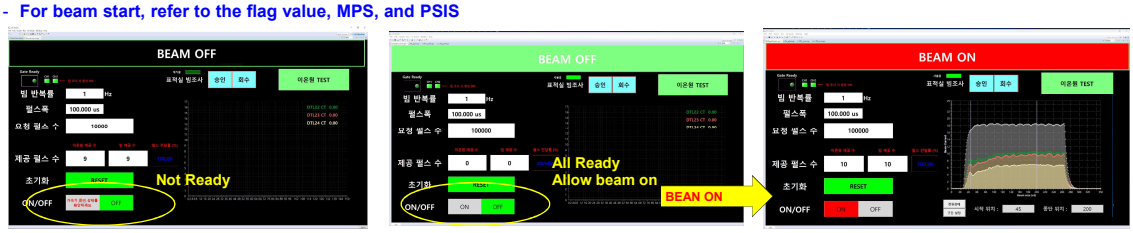
Interlock Box



- Component status monitor : including vacuum pressure and gate valve, rccs, magnet, rf, modulator
- Assign flag value by component and a key value for target room selection
- For beam start, refer to the flag value, MPS, and PSIS



Simple state transition diagram



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