

MACHINE PROTECTION SYSTEM FOR THE KOMAC 100-MeV PROTON LINAC

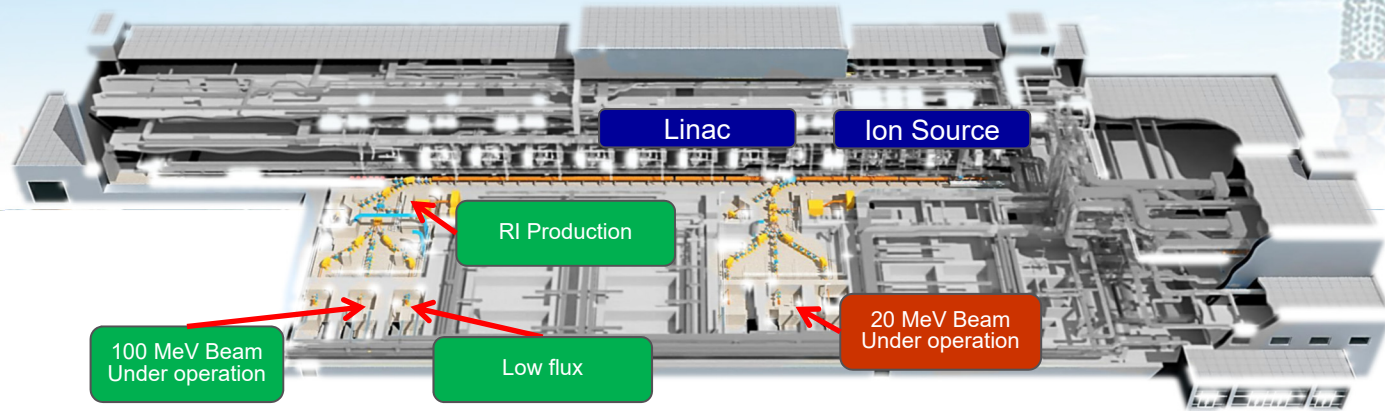
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KOMAC Facility

- Beam power increase goes with target room preparation

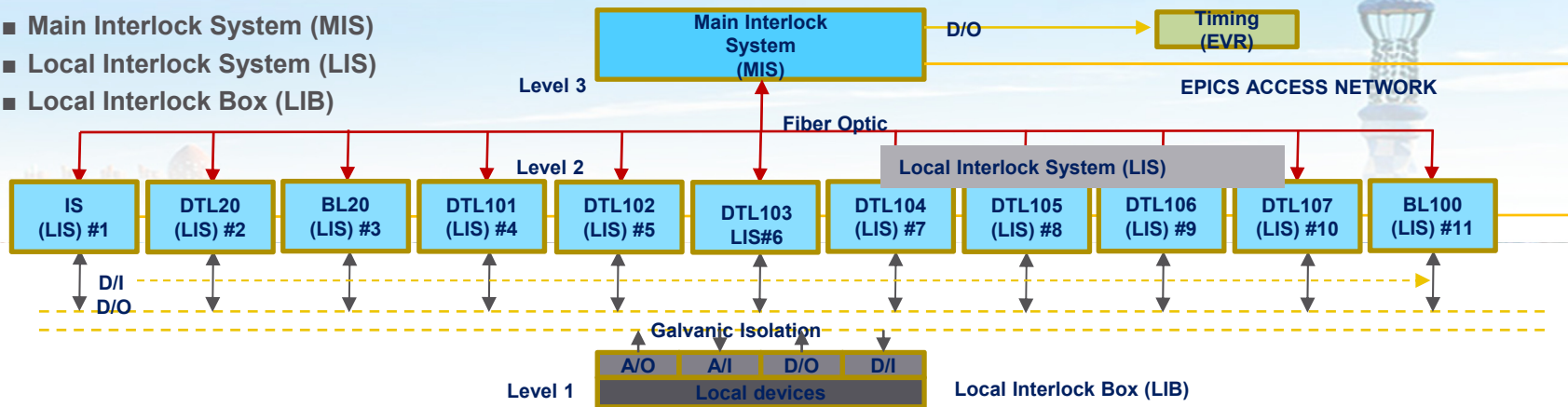


Output Energy (MeV)	20	100
Max. Peak Beam Current (mA)	1 ~ 20	1 ~ 20
Max. Beam Duty (%)	24	8
Avg. Beam Current (mA)	0.1 ~ 4.8	0.1 ~ 1.6
Pulse Length (ms)	0.1 ~ 2	0.1 ~ 1.33
Max. Repetition Rate (Hz)	120	60
Max. Avg. Beam Power (kW)	96	160

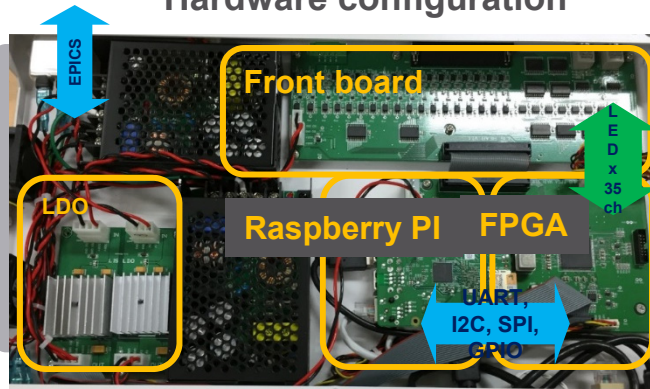
- Goal in 2017 beam service : 3,000 hours
- Beam Service Down time in 2016 : 46.6 hours
 - Ion source : magnetron fault, beam current instability
 - DTL / RF : 20MeV DTL QM failure
 - Modulator : IGBT blast
 - Utility : Shielding door failure

Machine Protection System for KOMAC

- Main Interlock System (MIS)
- Local Interlock System (LIS)
- Local Interlock Box (LIB)



Hardware configuration



- MPS consists of local interlock and main interlock node
- All local interlock nodes are connected to main interlock
- Star topology over a optical fiber connection
- Raspberry Pi processor that runs at 900 MHz and 1 GB of RAM
- UART communication and FPGA using the EPICS Asyn library
- Filtering a few nano seconds for error moment of the bit pattern

Conclusion

- The response time of MIS loopback : 30 μ s (including the LIS loop back time, 25 μ s)
- The MPS is constructed for the safe operation of 100 MeV proton linac at KOMAC.
- Our MPS has been shown to cut off the beam operation within one beam pulse and to improve the reliability of the equipment.

