Abstract

At FAIR the re-assembly of the well-known CRYRING accelerator, formerly hosted by Manne Siegbahn Laboratory (MSL) Stockholm, is currently in progress. This compact low energy heavy ion synchrotron and experimental storage ring will be a testing platform for all control system (CS) concepts decided on for FAIR. All accelerator parts are equipped with original beam instrumentation systems designed at MSL as well as new FAIR type solutions.

CRYRING@ESR

Injector: 108 MHz 300keV/u RFQ linac with a 50 kV MINIS ion source platform
Synchrotron: 1.44Tm, e- Cooler, acceleration section
Circumference: 54.18m
max. Energy: 96 MeV protons
$^{12}$C$^{6+}$ from ESR: 24.7MeV/u
$^{238}$U$^{6+}$ from ESR: 14.8 MeV/u
Magnet ramp rates: (7 T/s), 4 T/s, 1 T/s

Beam Instrumentation

Faraday Cups
- Beam stop and intensity measurement
- ADC: VME SIS3302, 100MSa/s, 16Bit

Linac Phase and Energy (TOF)
- Capacitive ring pick-ups (3)
- Keithley Switching Matrix 4 x (1x4)
- LeCroy 6100A, 1GHz / 5GSa/s
- LXI readout and remote control

Ionisation Profile Monitor (IPM)
- MCP detector with resistive anode
- Pulse shaping: CAEN N586 Spec.Amp
- Pulse height: VME CAEN V785 ADC

High Voltage (HV)
- CAEN SY527 and MPOD
  (Wiener/ISEG)
- IPM, Faraday Cups, electrostatic elements, scint. screens with MCP

Intensity (LASSIE)
- Integrating- and Parametric Current Transformers (ICT and PCT, Bergoz)
- Hall Sensors (perturbation field corr.)
- PT100 (temp. drift compensation)
- V/f conversion -> SIS3820 Multiscaler System

Video Imaging (CUPID)
- IDS uEye CMOS GbE Cameras
- 10Gbe network, IPC Kontron Kiss

Beam Position Monitors (BPM)
- 18 Linear Cut BPMs
- Vadatech MTCA.4 chassis (VT811)
- Vadatech UTC002 MCH
- Concurrent AM900/412-42 CPU
- Creotec FMC 250MHz 16 Bit ADC and AFC FMC carrier (www.ohwr.org)

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Schottky and BBQ Tune Measurement
- $\Sigma$ and $\Delta$ signals by hybrid trafos
- Trontech low-noise, 200 Ohm input impedance amp,. bandwidth 50 MHz
- Foreseen DAQ: Network analyser (NWA) with LXI readout

Fieldbus for Pneumatic Drives and CUPID Iris Control
- Siemens Profinet with S7-300 PLC
- Controlled via
  - LAN
  - iWLAN@5GHz
- Human Machine Interface (HMI)
- Android tablet

Racks on left side: HV for Faraday Cups and IPM
MCP, Faraday Cup DAQ system (VME), CUPID Video Imaging with Kontron Kiss IPC and 10Gbe HP Switch.

Pictures on right side: S7-300 PLCs as Profinet Master for Distributed I/O system in star topology. Middle and bottom: Remote satellite with HMI panel, to be installed in the tunnel.

Control- and Data Acquisition System:
Three tier architecture (derived from CERN)
- Front-End: FESA
- Middleware: CMW based on ZeroMQ
- Applications:
  - Java/JAPC (Java API for parameter control)
  - LHC Software Architecture (LSA) for settings management
- White Rabbit based timing system
- Timing Receivers in PCIe, VME and Stand-alone available

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