

Abstract

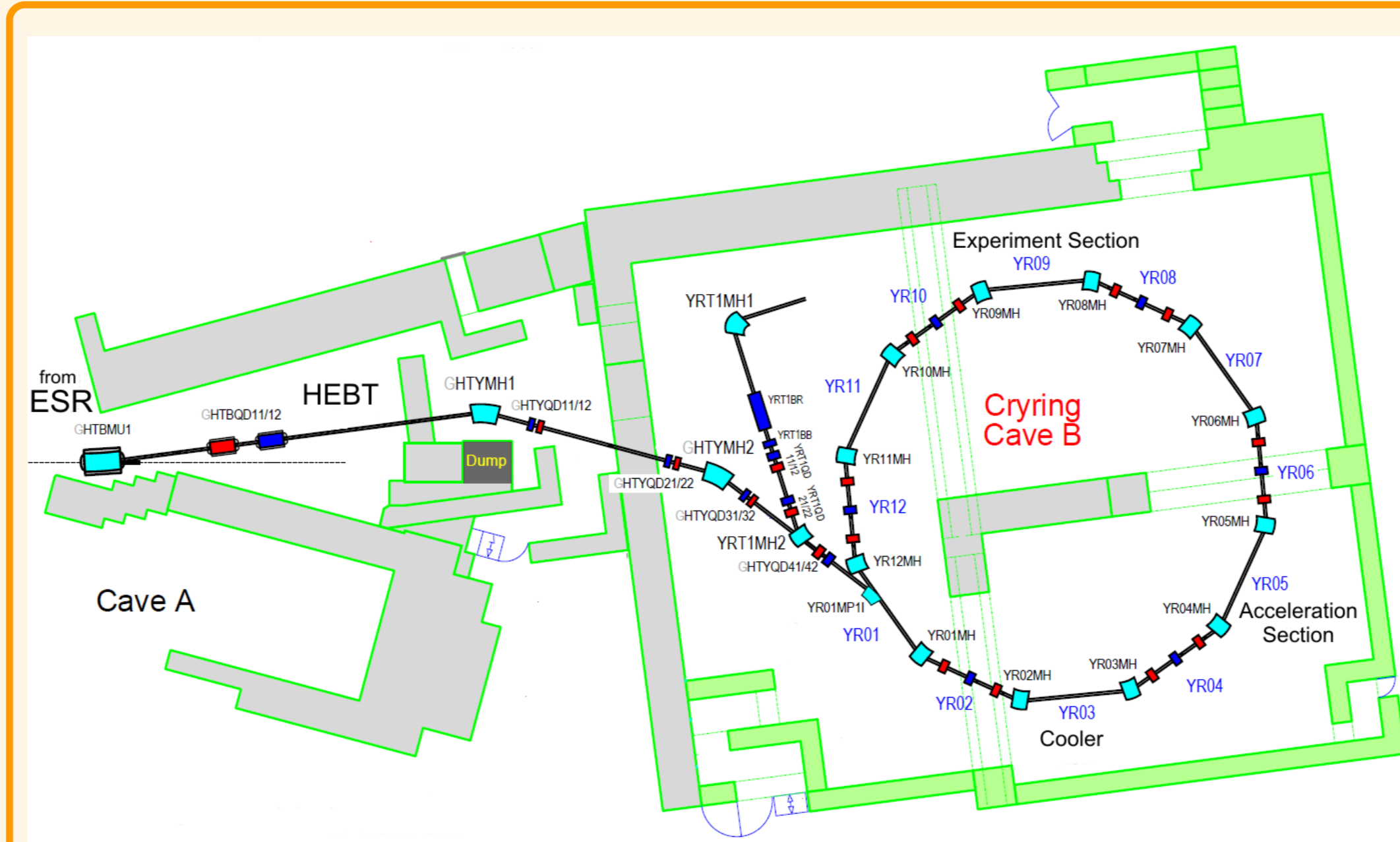
At FAIR the re-assembly of the well-known **CRYRING** accelerator, formerly hosted by Manne Siegbahn Laboratory (MSL) Stockholm, is currently in progress. This compact low energy heavy ion synchrotron and experimental storage ring will be a testing platform for all control system (CS) concepts decided 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 9/2015

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
- ¹²C⁶⁺ from ESR: 24.7MeV/u
- ²³⁸U⁹²⁺ from ESR: 14.8 MeV/u
- Magnet ramp rates: (7T/s), 4 T/s, 1 T/s



Scheme of CRYRING installation in Cave B, injection from ESR (left)

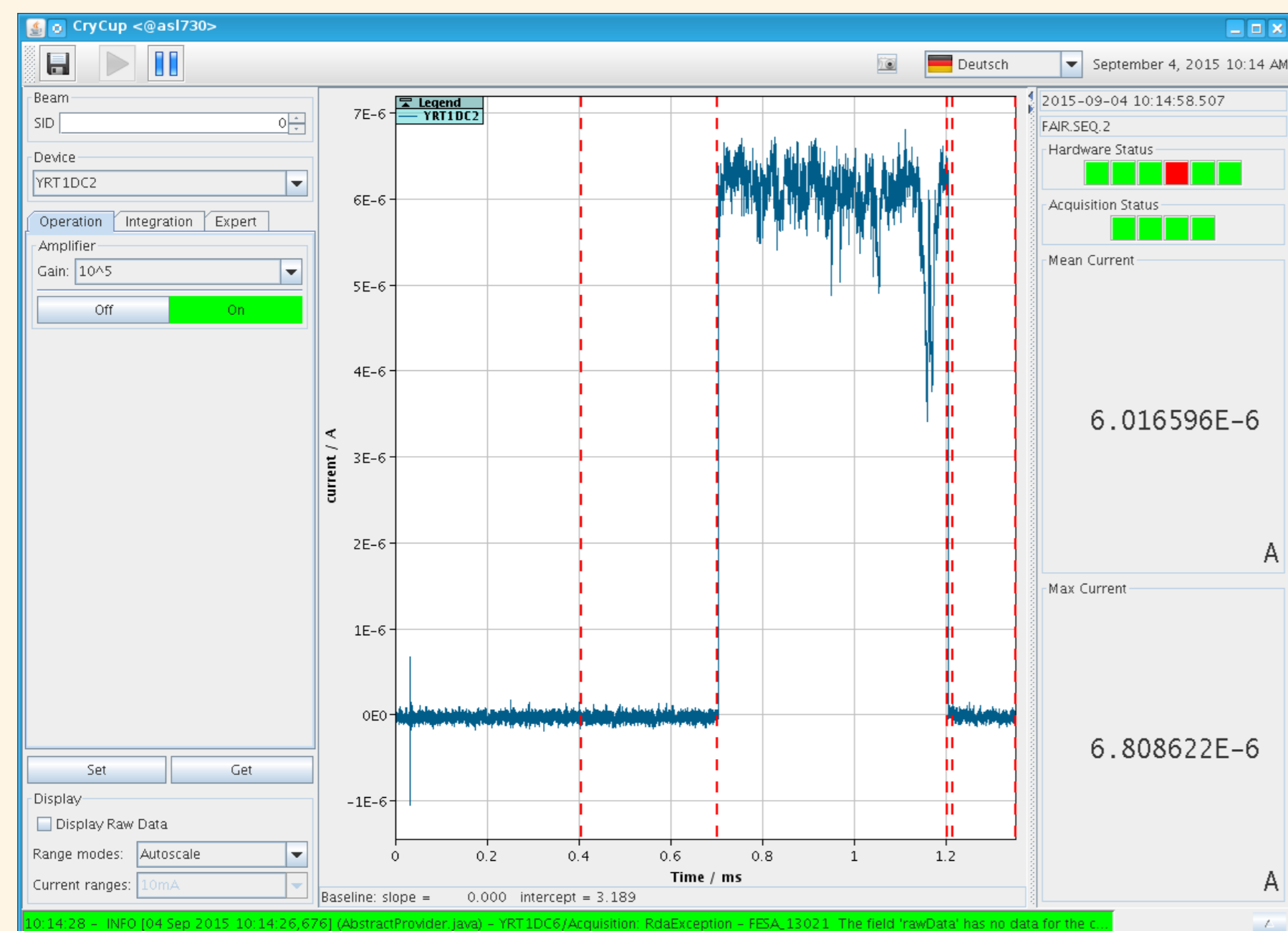
Control- and Data Acquisition System:

- 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

Beam Instrumentation

Faraday Cups

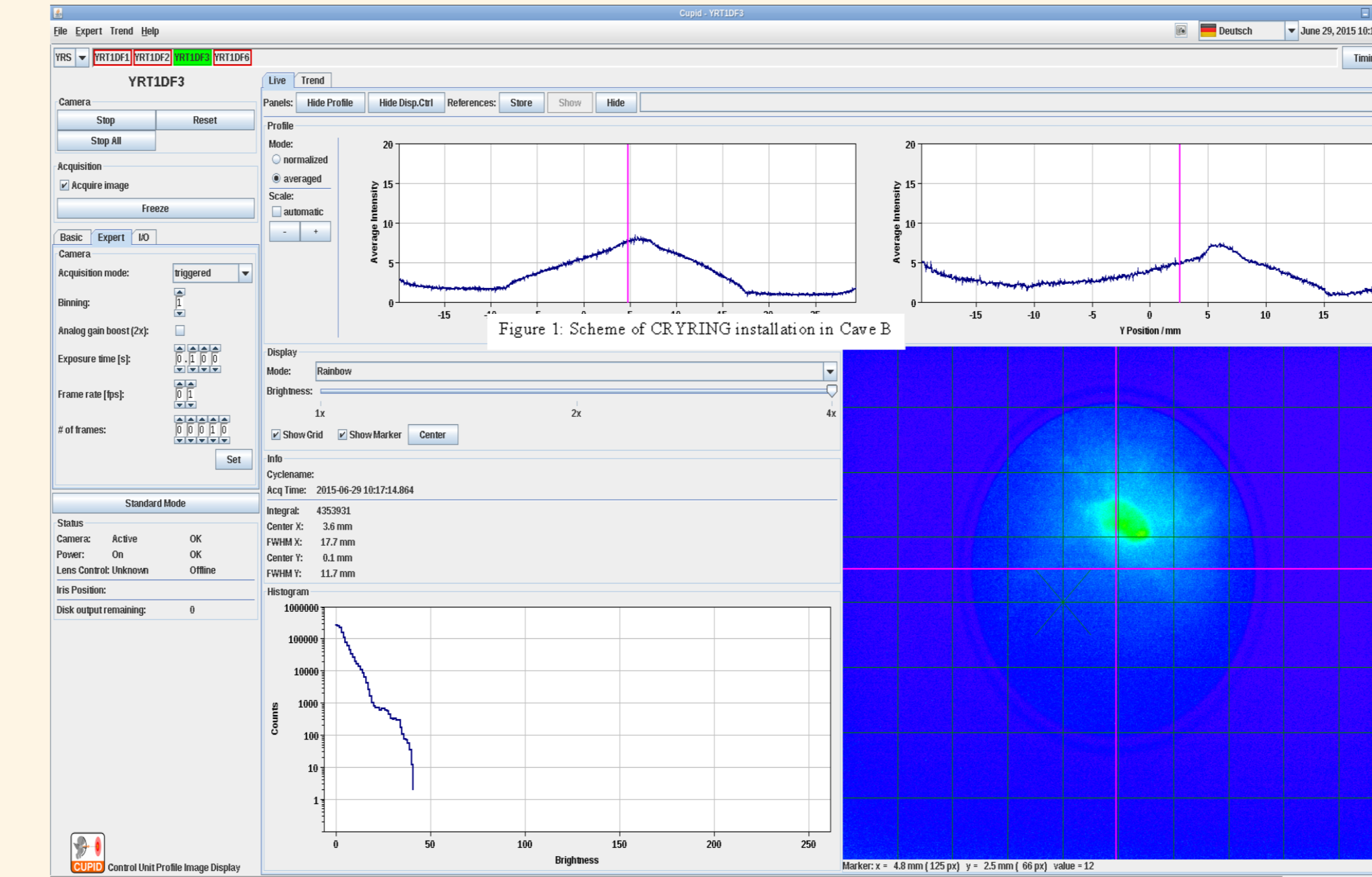
- Beam stop and intensity measurement
- ADC: VME SIS3302, 100MSa/s, 16Bit



Intensity measurement of a chopped 500µs D⁺ beam pulse with a Faraday cup.

Video Imaging (CUPID)

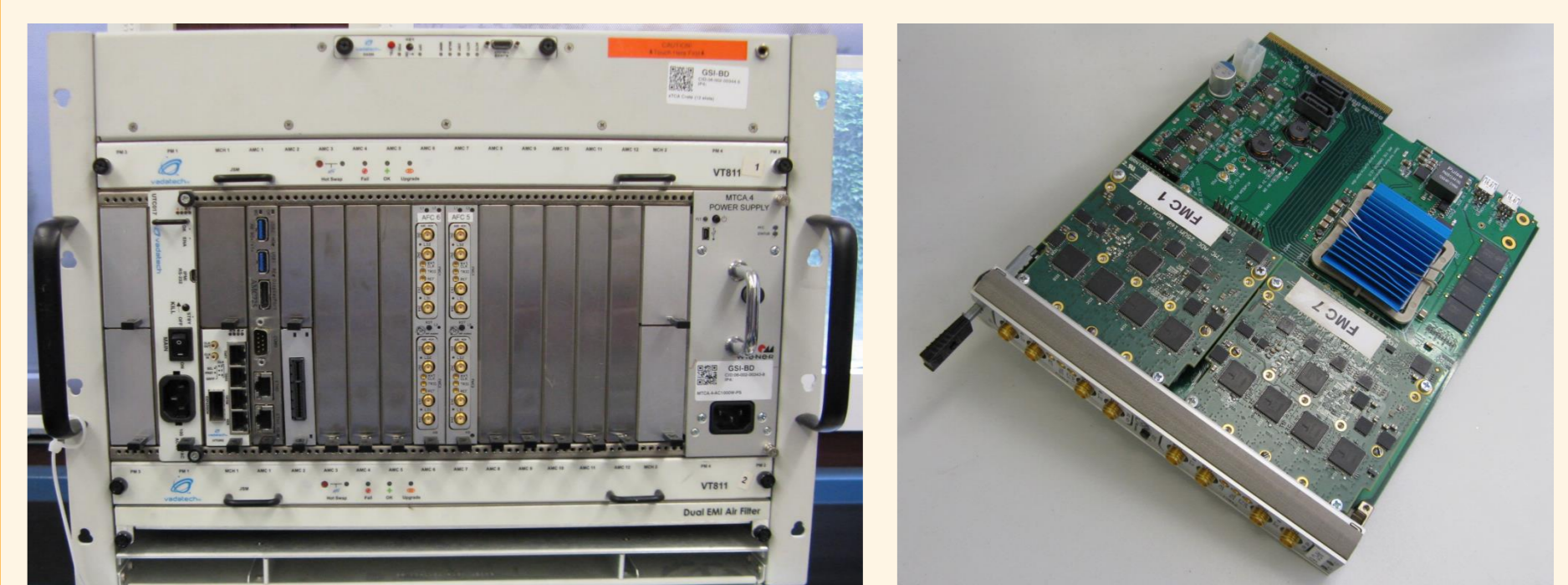
- IDS uEye CMOS GbE Cameras
- 10GbE network, IPC Kontron Kiss



Profile of deuterium beam in the low energy beam transfer (LEBT) during injector commissioning.

Beam Position Monitors (BPM)

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



Vadatech VT811 MTCA.4 Chassis and Creotech AFC Dual FMC-Carrier with 250MSa/s, 16 Bit

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 SY5527 and MPOD (Wiener/ISEG)
- IPM, Faraday Cups, electrostatic elements, scint. screens with MCP



MINIS ion source platform (50kV) and Low Energy Beam Transfer (LEBT) with installed CAEN HV (red) for Einzel lense and electrostatic elements.



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.

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

Schottky and BBQ Tune Measurement

- Σ and Δ 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