

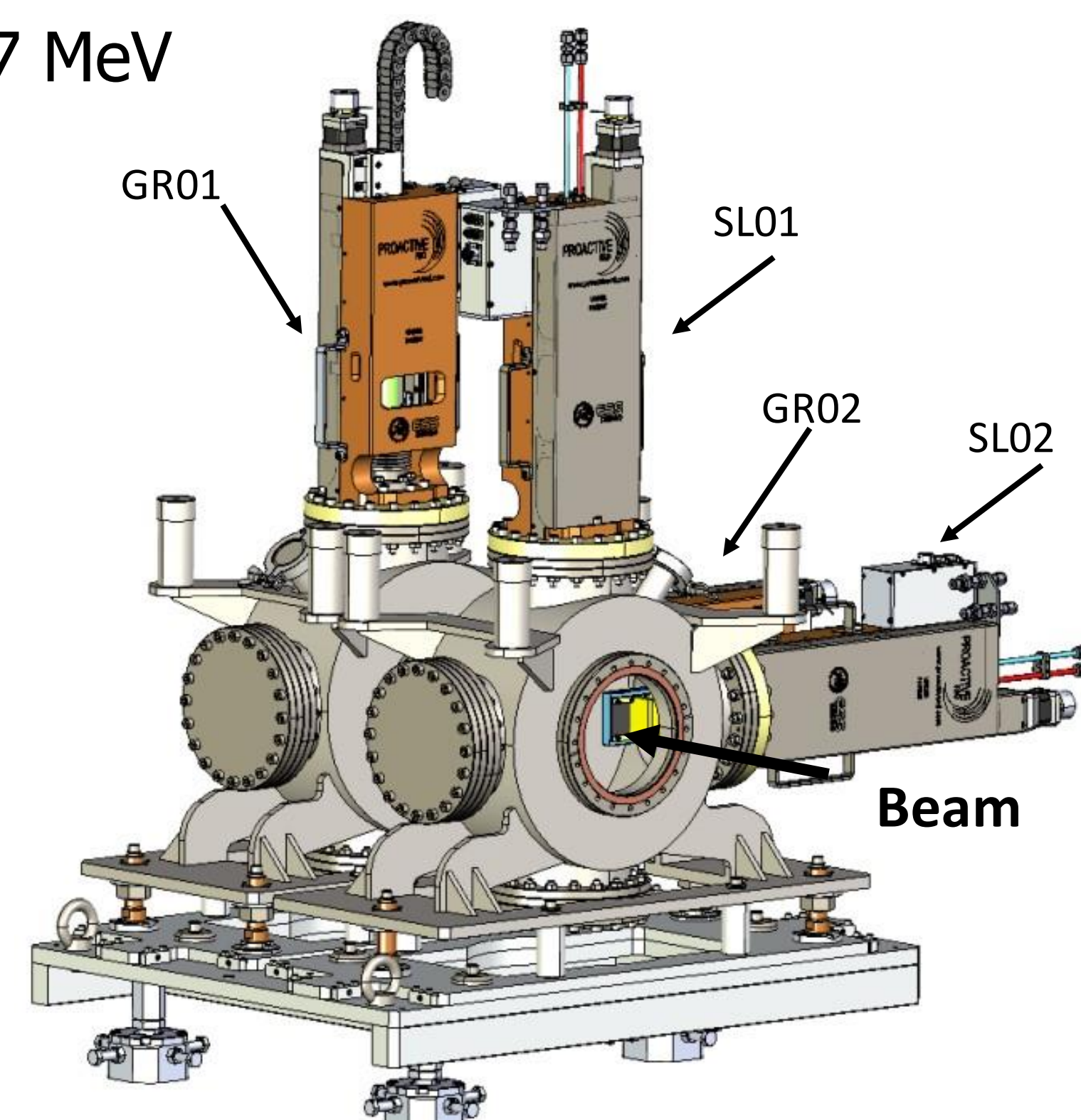
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Introduction

- Emittance Meter for MYRRHA based on a slit/grid system
- Designed with graphite slit and tungsten wires to withstand beam irradiation with short pulses of 100 μ s at 10 Hz
- Installed in test bench for Linac commissioning at different energies 1.5, 6 and 17 MeV

Main design parameters for MYRRHA EMI

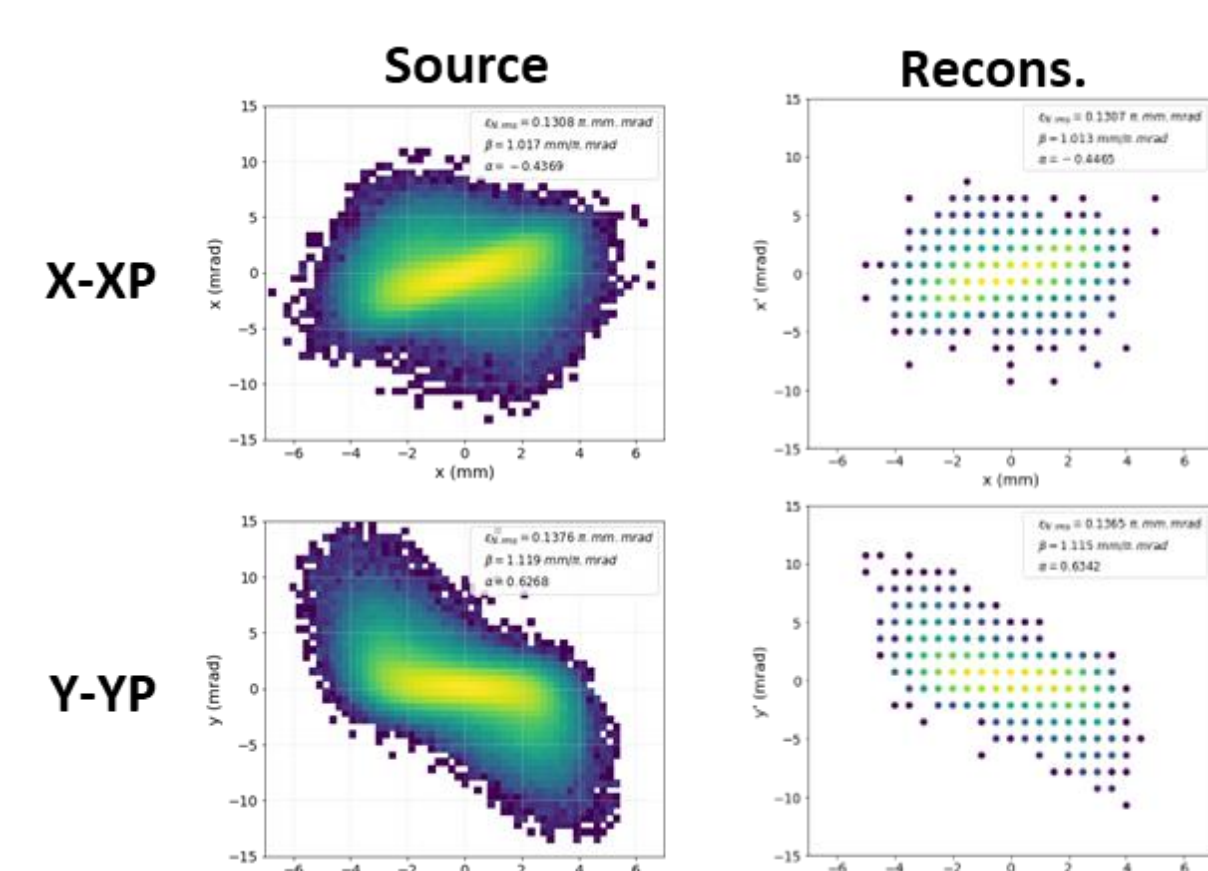
Parameter	Value
Current	4 mA
Pulse duration	100 μ s
Freq.	10 Hz
Duty Cycle	0.1 %
Minimum Beam Size, rms	1 mm
Max. Beam Extension	± 20 mm
Max. Beam Divergence	± 20 mrad
Beam Energy	1.5 / 6 / 17 MeV
Beam Power	6 / 24 / 68 kW
Average Power	6 / 24 / 68 W



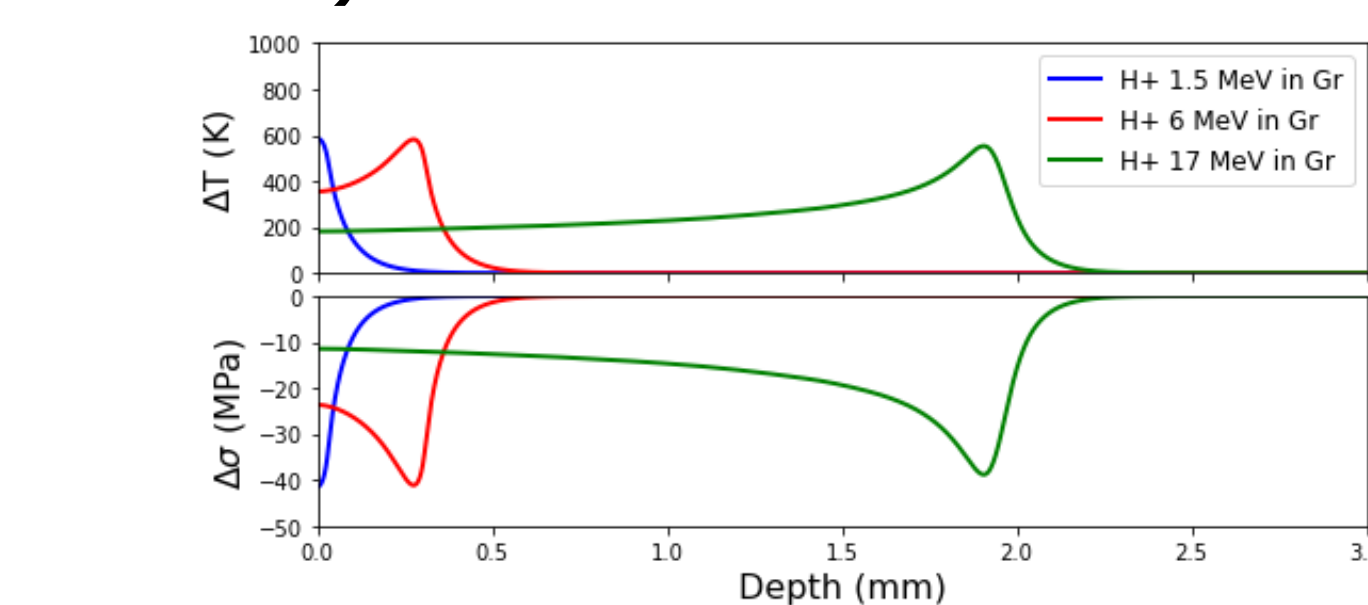
MYRRHA EMI assembly with slit & grids in the x/y planes.

Design

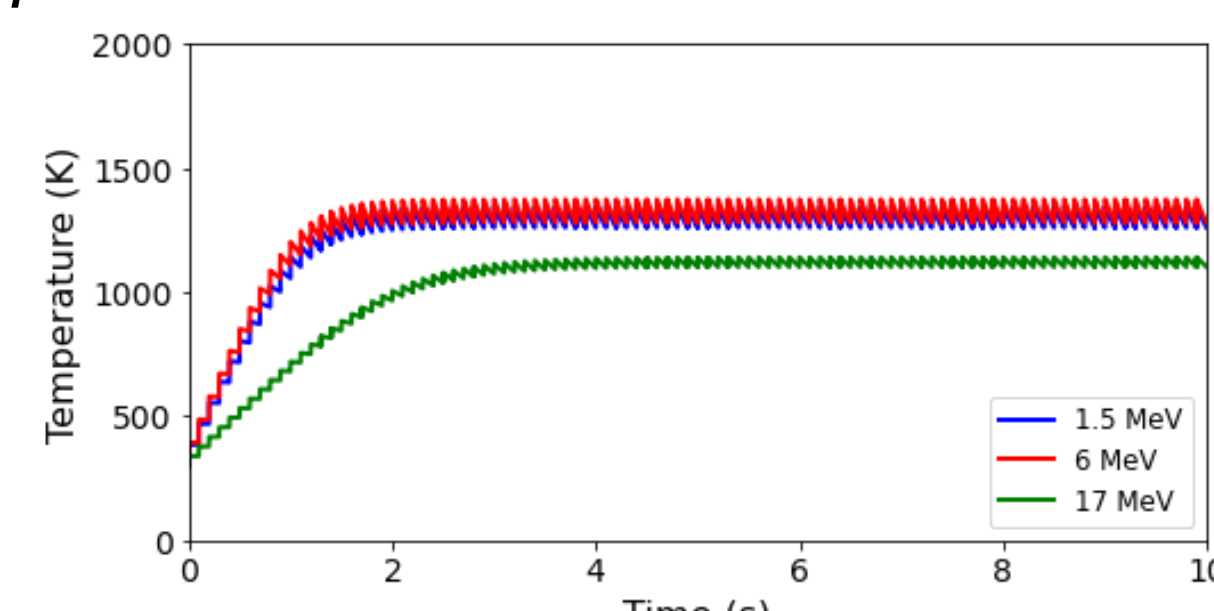
- Emittance simulations using linear tracing with python
- Slits irradiation analysis Fenics keeping stresses below graphite strength ($\sigma < 130$ MPa)
- Grid wires heating solving heat equation keeping temperature below thermionic emission ($T < 2000$ K)



Source term and emittance reconstruction for 1.5 MeV



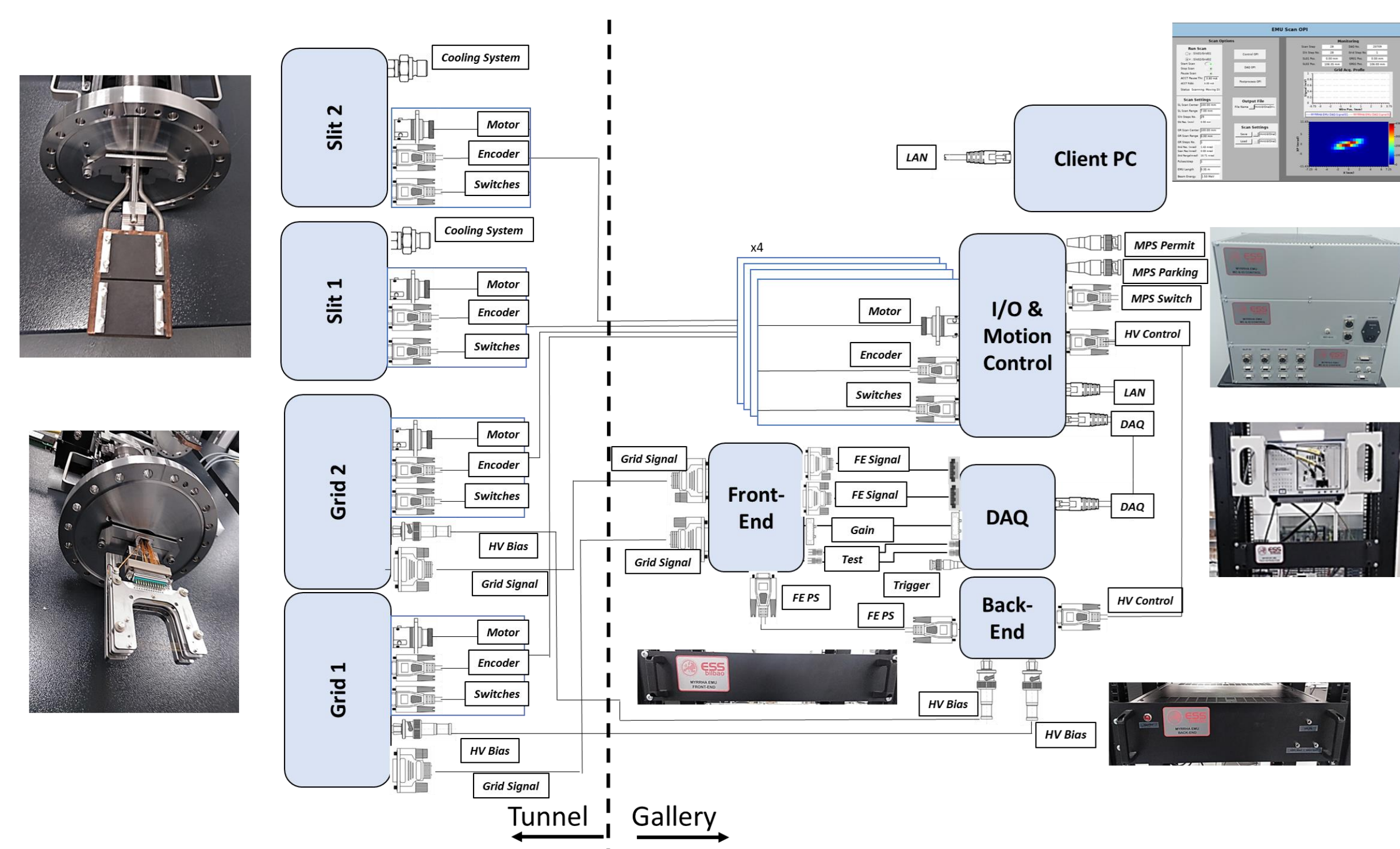
Temperatures and stresses after slit irradiation



Temperature evolution during grid irradiation

Control & Electronics

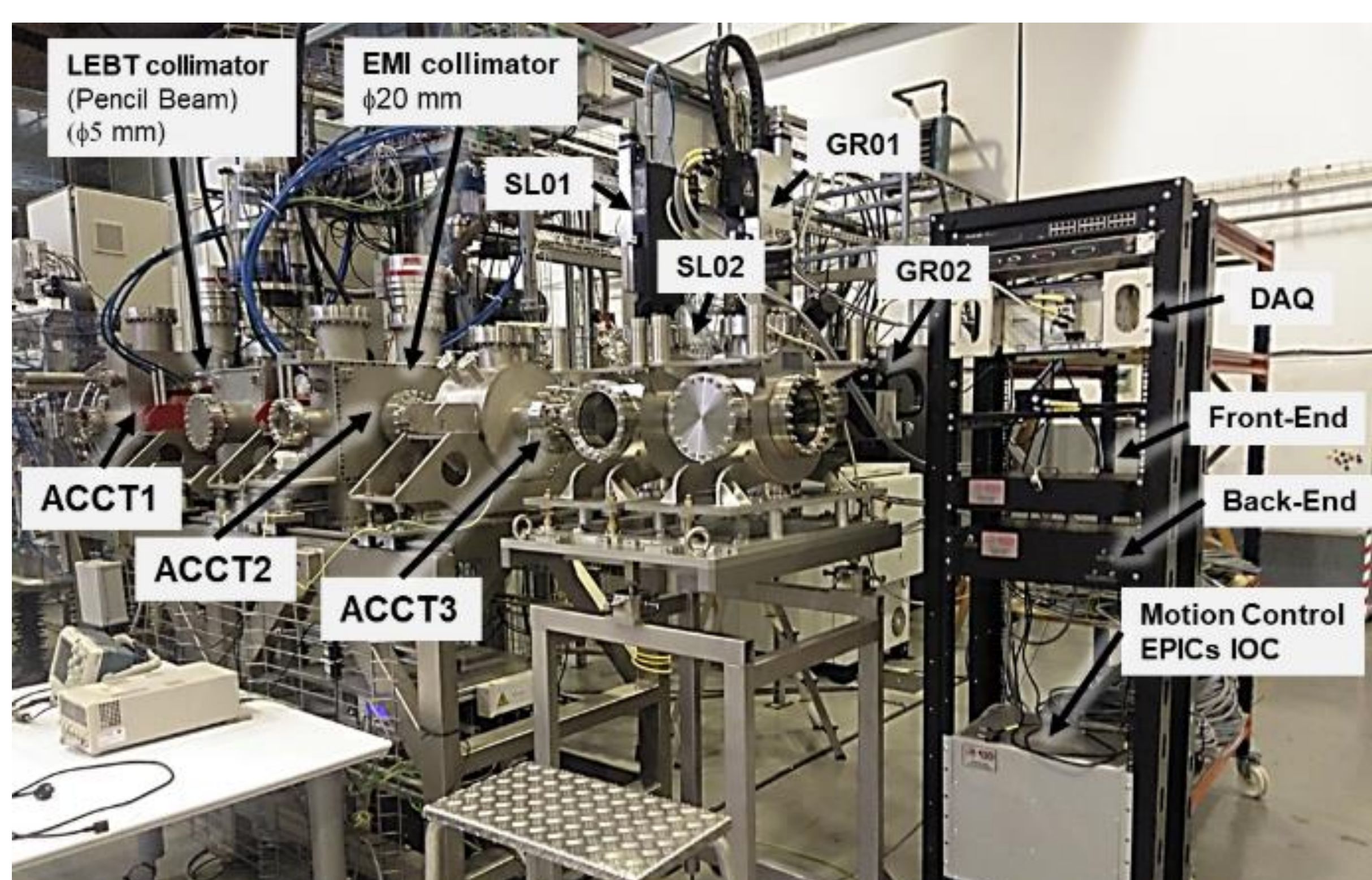
- Front-End for signal amplification, Power Supply for bias voltage, I/O, Motion Control and DAQ systems.
- The software is developed in EPICs and the OPIs with CSS



Schematic of the different systems for the EMI

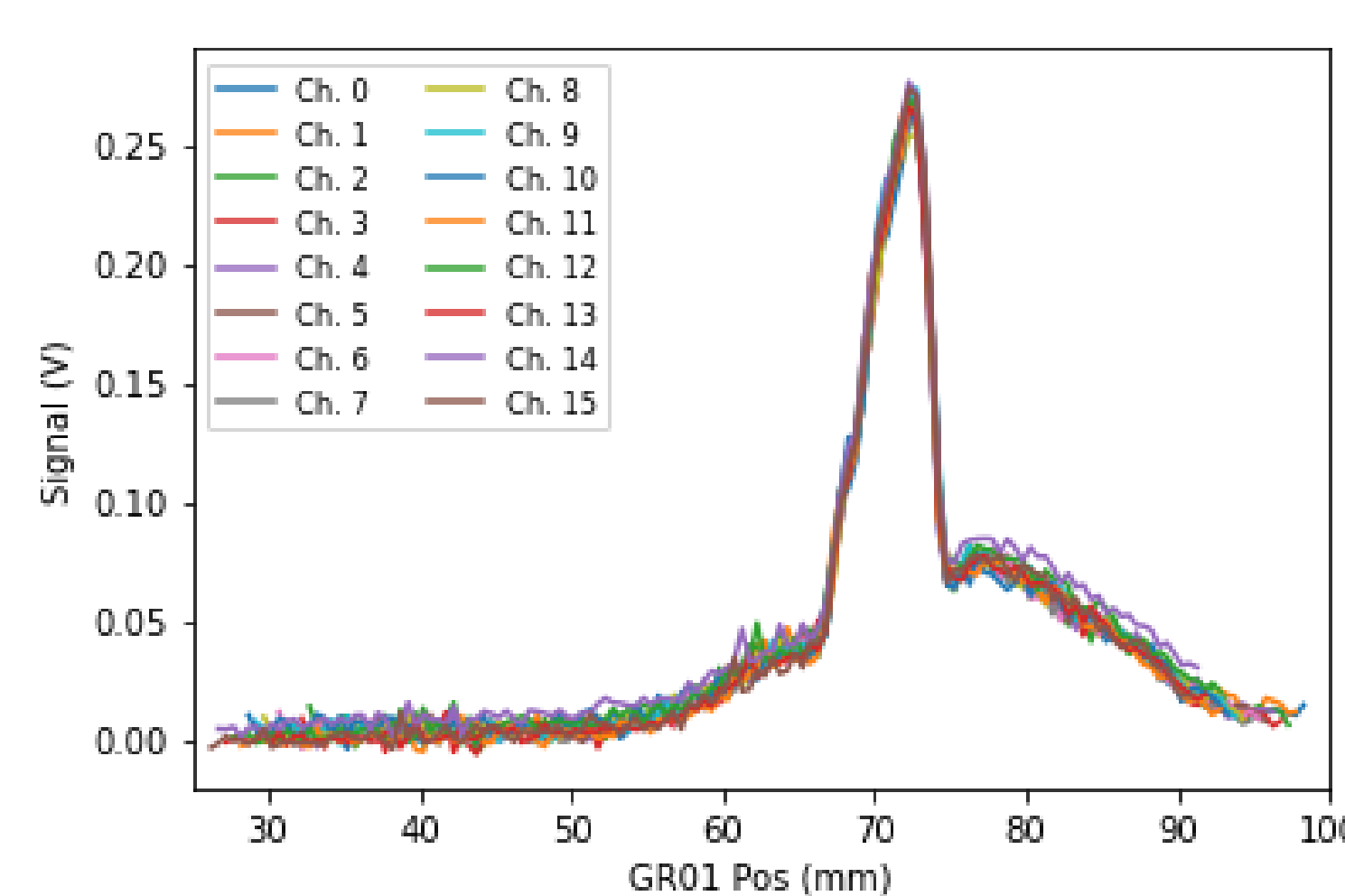
Integration Tests

- Integration test in the 45 keV ESS-Bilbao Injector
- Test with a pencil beam of ~ 150 μ A

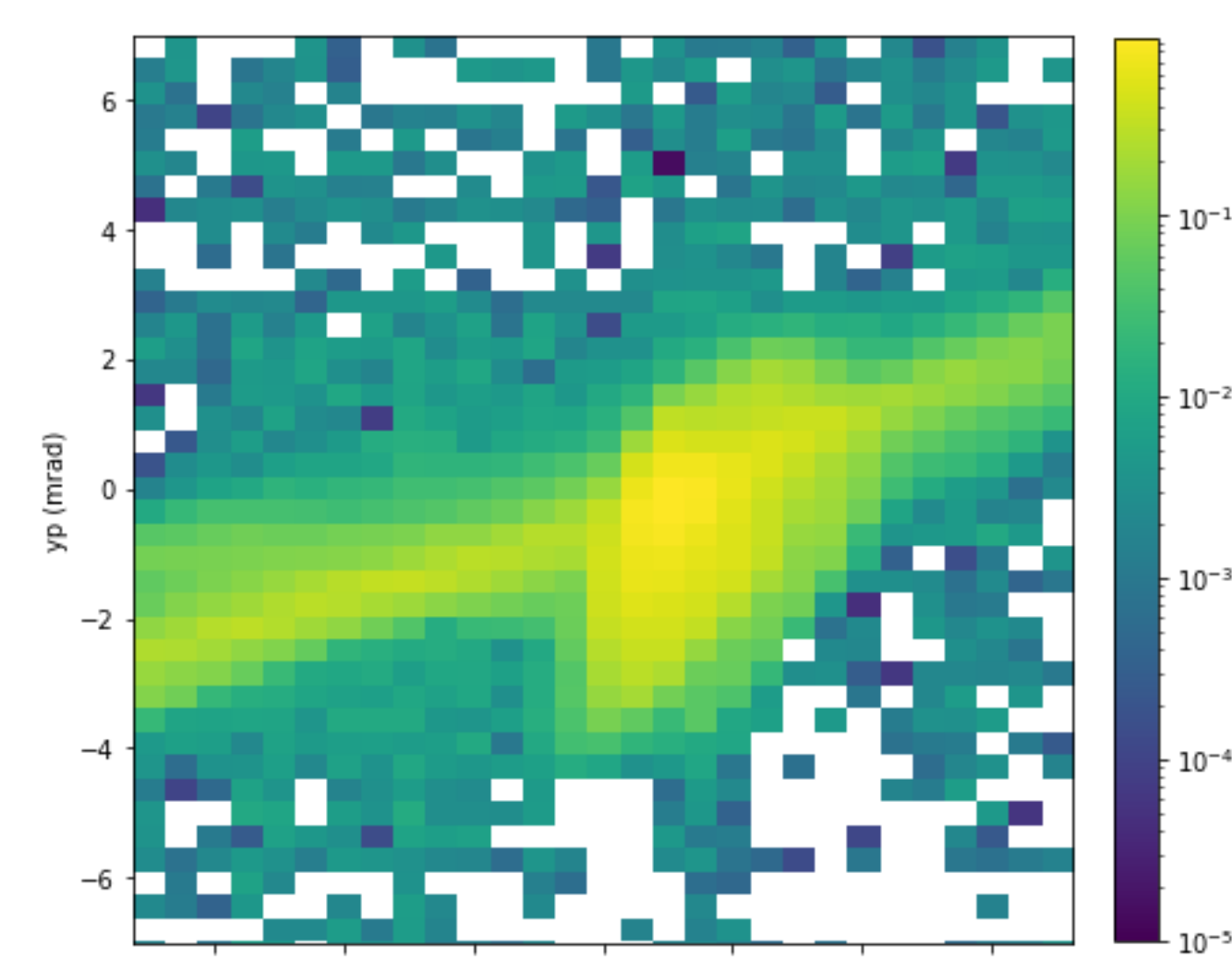


Configuration of the ESS-Bilbao LEPT integration tests

- Scans using a pyepics script with data saved in hdf5
- Pencil Beam Profile with position scan
- Emittance scan in y plane with 29 slit steps of 0.5 mm resolution and 5 grid steps for a resolution of 0.35 mrad



Pencil Profile Scan with GR01



Pencil beam phase-space with GR01