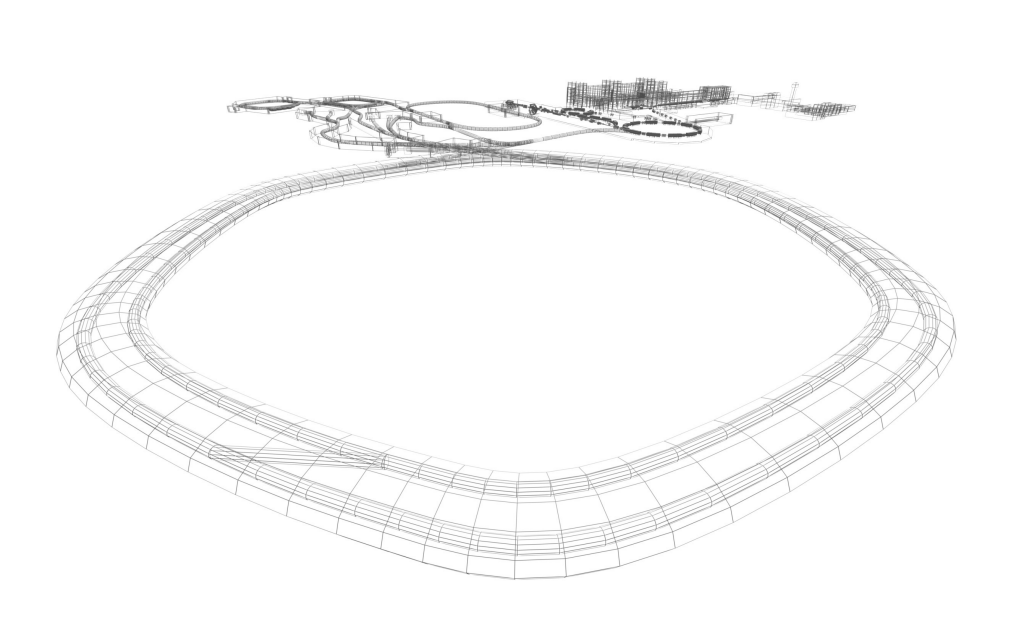
THOR (Test in HORizontal): SIS 100 SAT quadrupole modules



A description of the infrastructure and its purposes in the framework of SIS100

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With the support of
GSI test & Measurement Team

External contribution:
Mechanical engineering: Buonora engineering office
Workshop: G. Fiore, INFN Lecce

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Where we come from

Unione Europea

FONDI STRUTTURALI EUROPEI

PON 2007-2013

MIUR

Ministero dell'Istruzione, dell'Università e della Ricerca
Dipartimento per la Programmazione
D.G. per gli Affari Internazionali - Ufficio IV
Programmazione e gestione dei fondi strutturali europei e nazionali per lo sviluppo e la coesione sociale

COMPETENZE PER LO SVILUPPO (FSE) - AMBIENTI PER L' APPRENDIMENTO (FESR)

INFN

Istituto Nazionale di Fisica Nucleare

HIPPOCRATICA CIVITAS STUDIUM SALERNI

ENEA

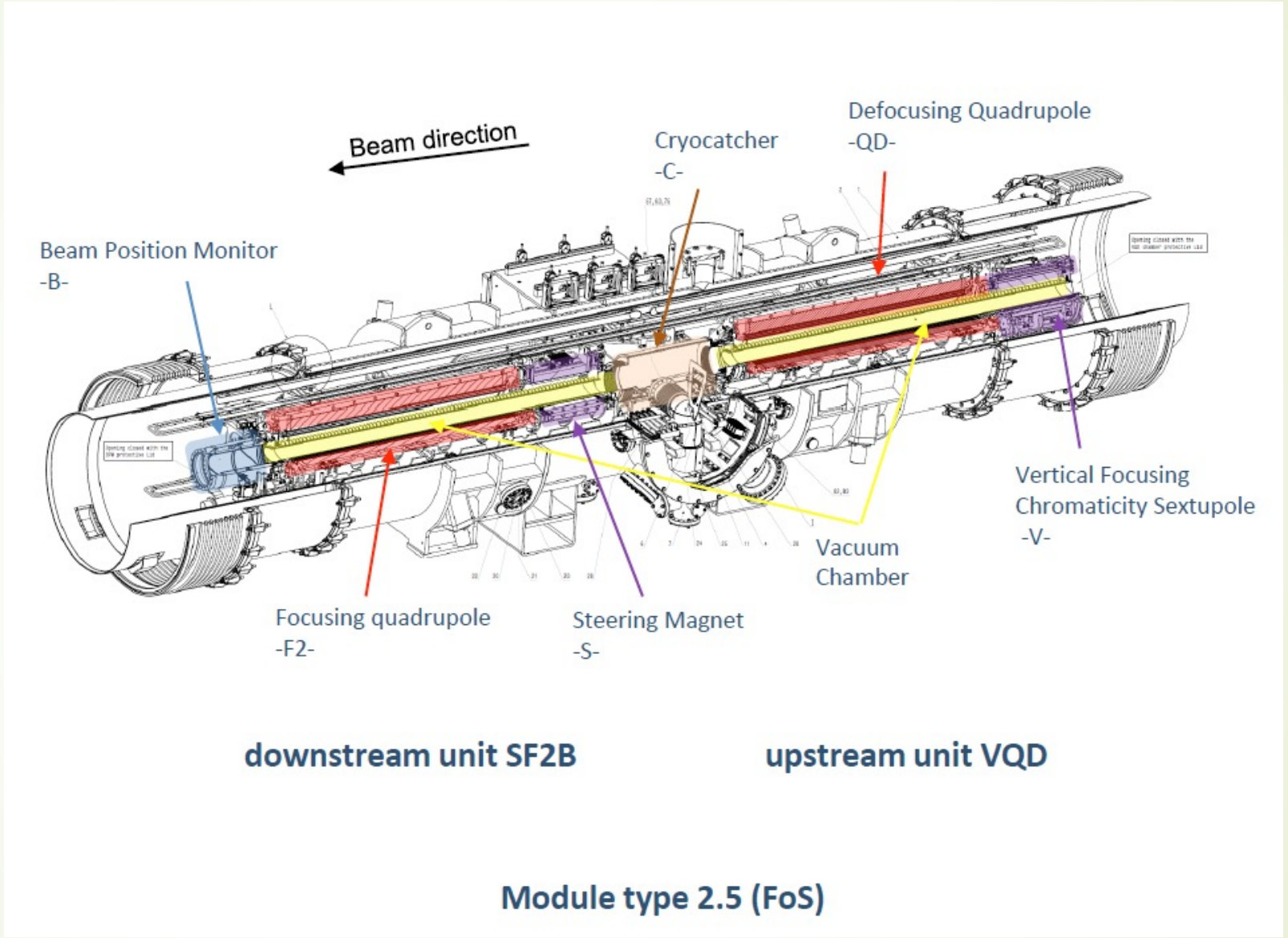
AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE

We took the opportunity of PON funding to put the basic core of the infrastructure.

MoU

- On May 31st, 2019 the MoU was approved
- It contains an Annex with 38 pages describing the SoW, i.e. the description of the work to be done in order to realize a SAT of the integrated modules. We will perform the SAT on behalf of GSI, and after this SAT the QDM will be ready to be installed into the SIS100 tunnel.
- In summary we have to check both the basic features (mechanical collisions, leak tests, pressure test, isolation of all the parts and components, integrity of cables, etc.) and specific items, like LCL and Cryocatcher which have never been tested as a single item.
- The power test are limited to the corrector magnets, being the quadrupole units fully tested by the manufacturer in Dubna.

QDM


Beam direction
Cryocatcher
-C-
Defocusing Quadrupole
-QD-
Beam Position Monitor
-B-
Vertical Focusing
Chromaticity Sextupole
-V-
Vacuum
Chamber
Focusing quadrupole
-F2-
Steering Magnet
-S-
downstream unit SF2B
upstream unit VQD
Module type 2.5 (FoS)

The path

Development work

Development of the facility

From 2019 .....

Development work

... to now

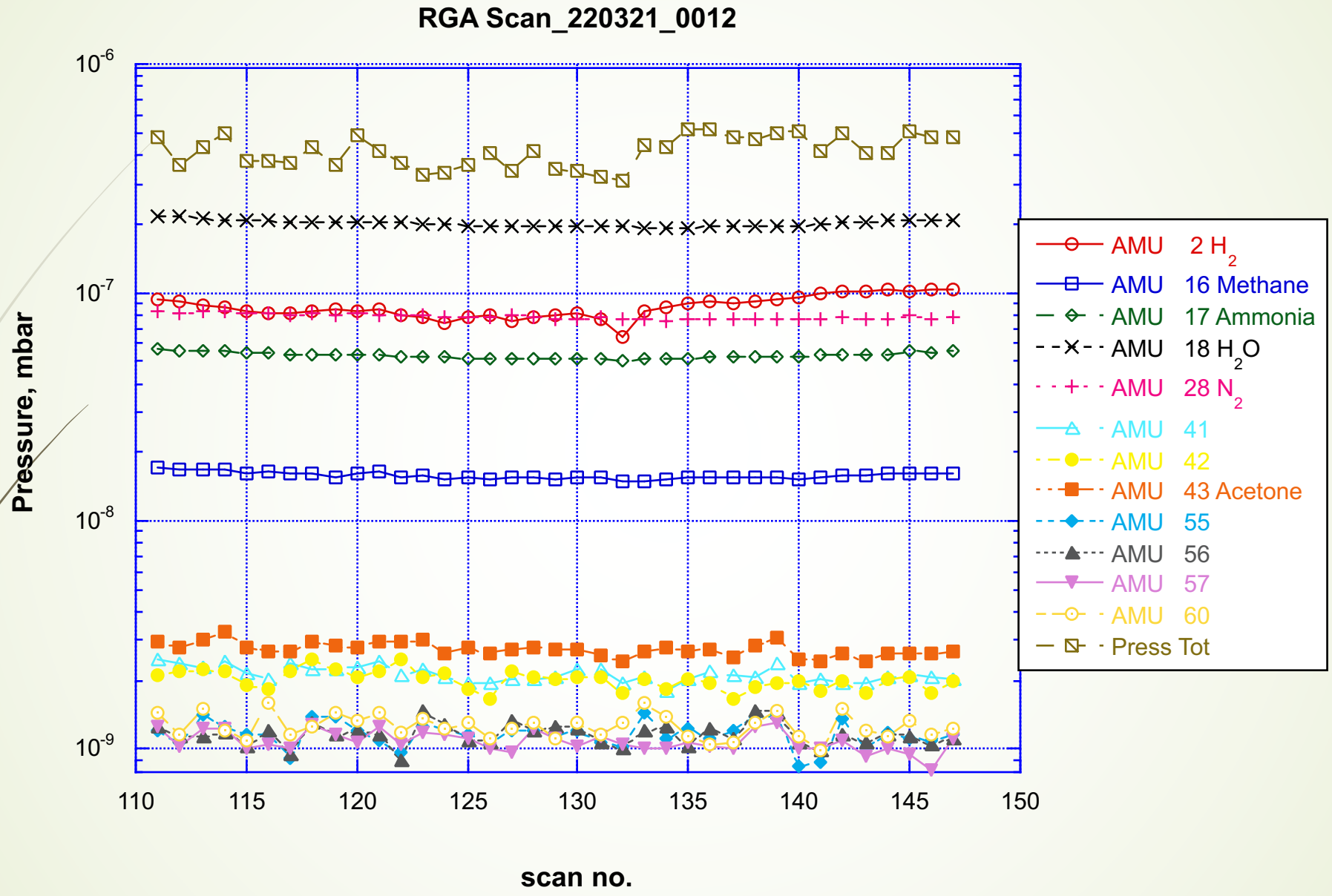
Development work

Pumping systems and quality controls from the end box for either the beam pipe vacuum and for the isolation vacuum

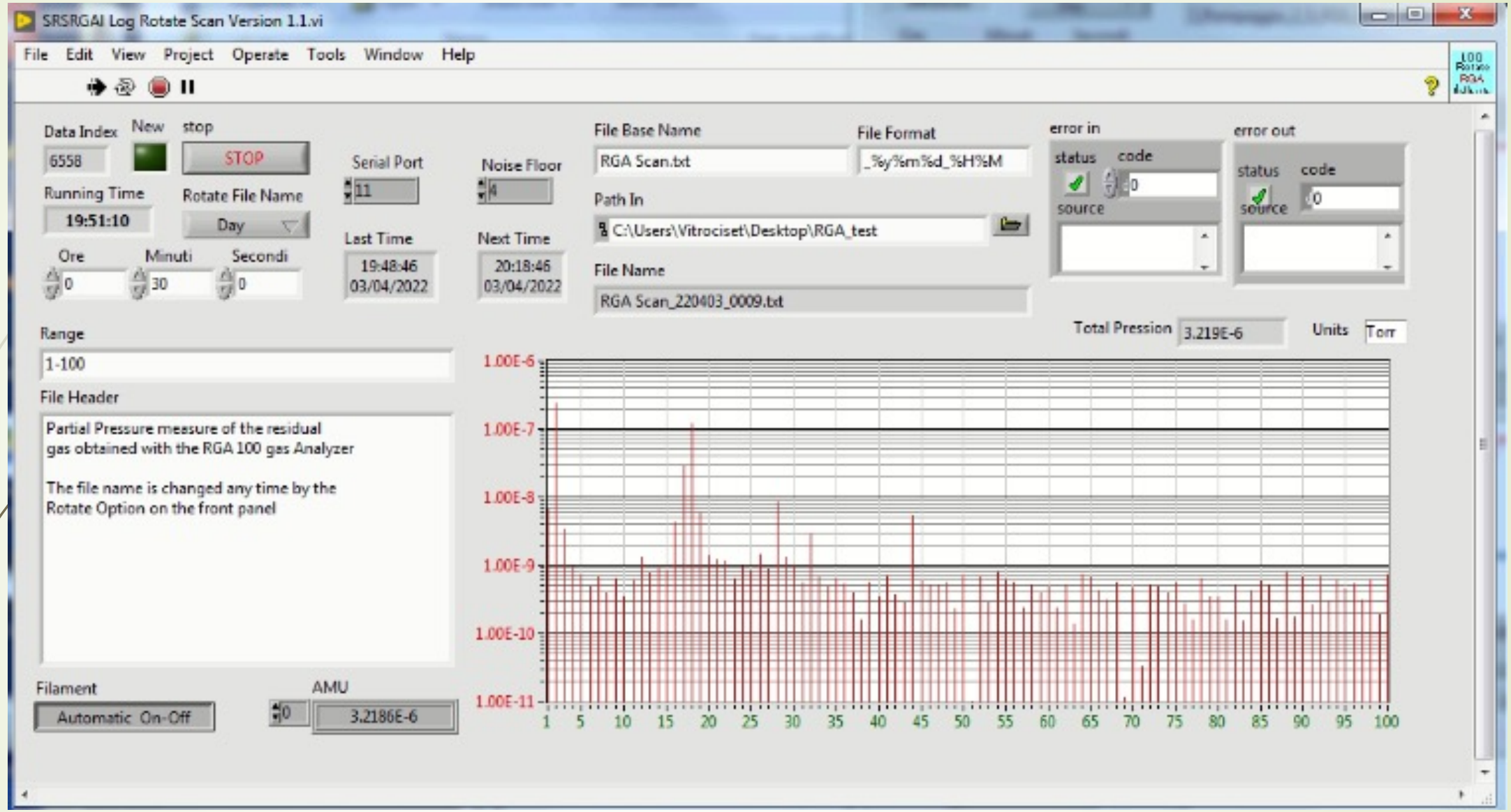
-300K situation-

Presently we are at 10^{-5} mbar in the isolation vacuum (leak detected at 10^{-9} mbar*l*s^{-1}). The beam pipe pressure is at 10^{-8} mbar.

beam pipe RGA warm test

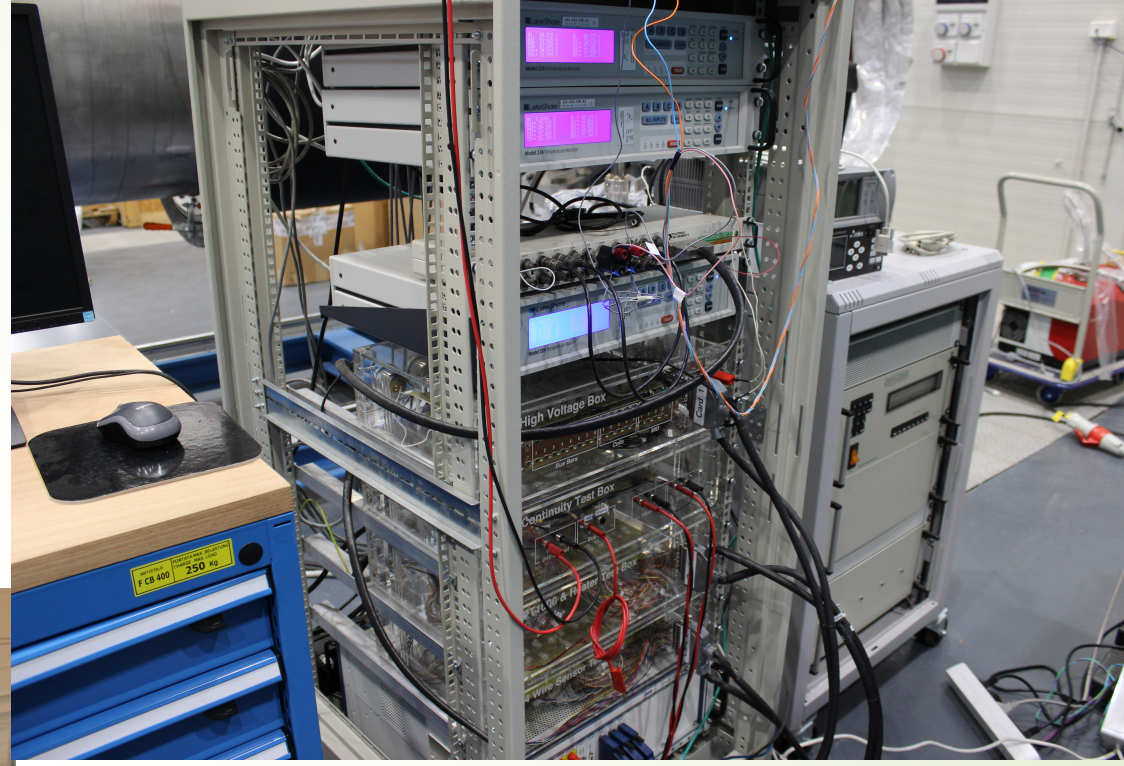


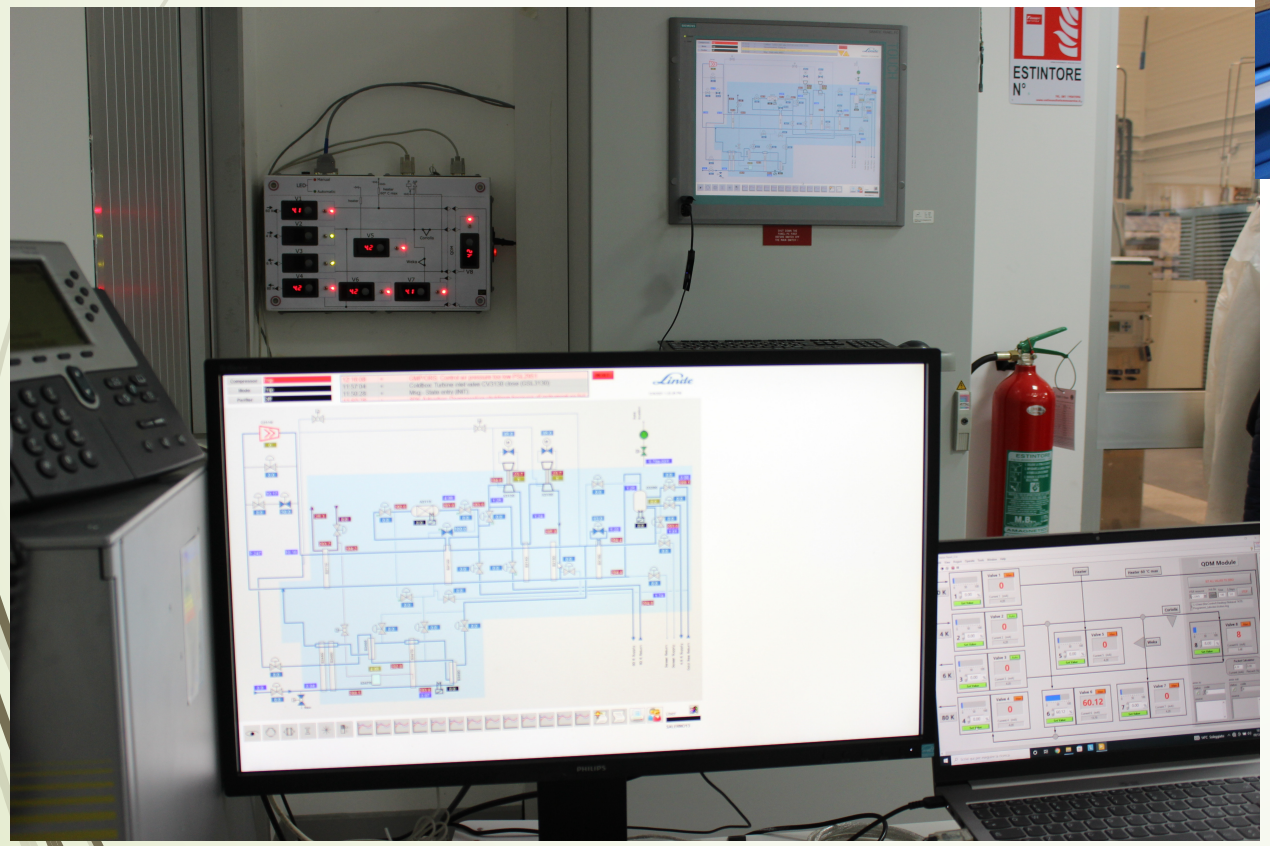
Isolation vacuum
RGA warm test



Development work

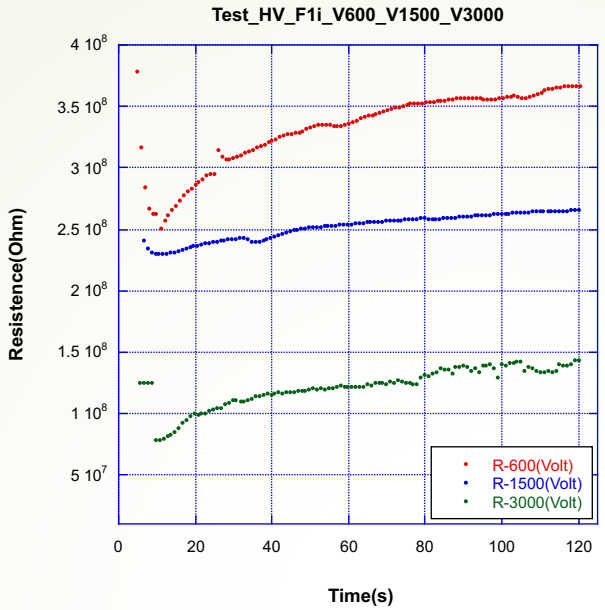
Including special electronics (switch boxes for HV and LV isolation test, continuity & functionality tests) →

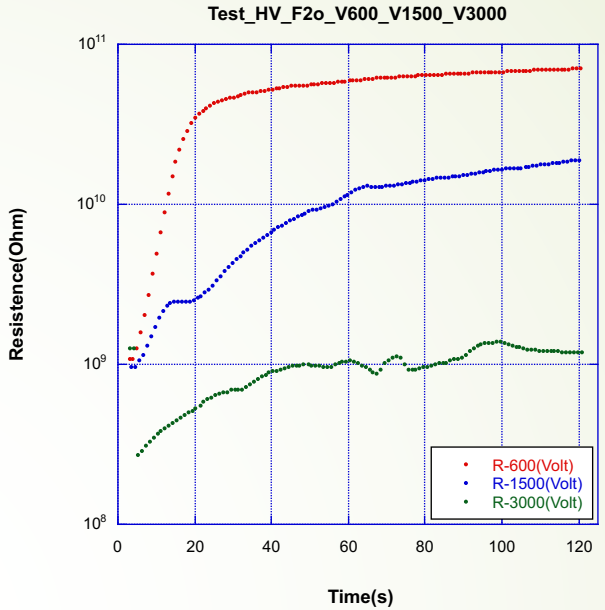


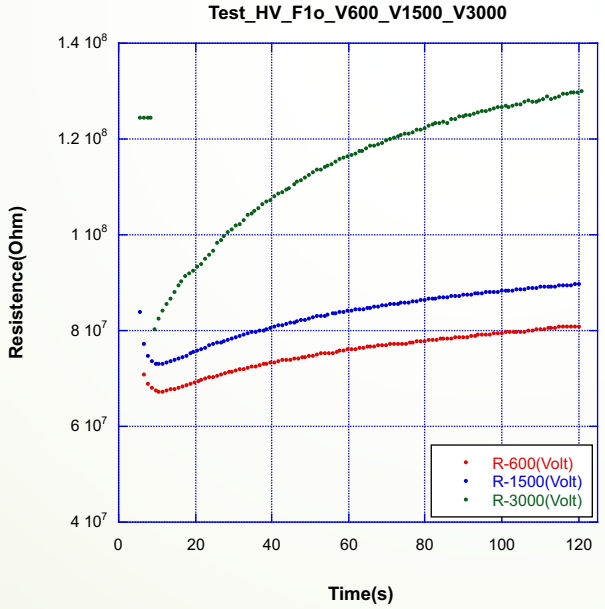


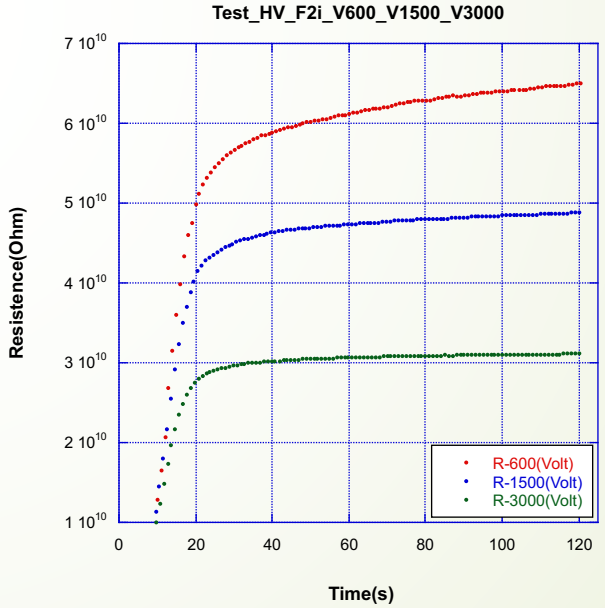
← h/w and s/w development for the Feed Box cryovalves

Some warm test

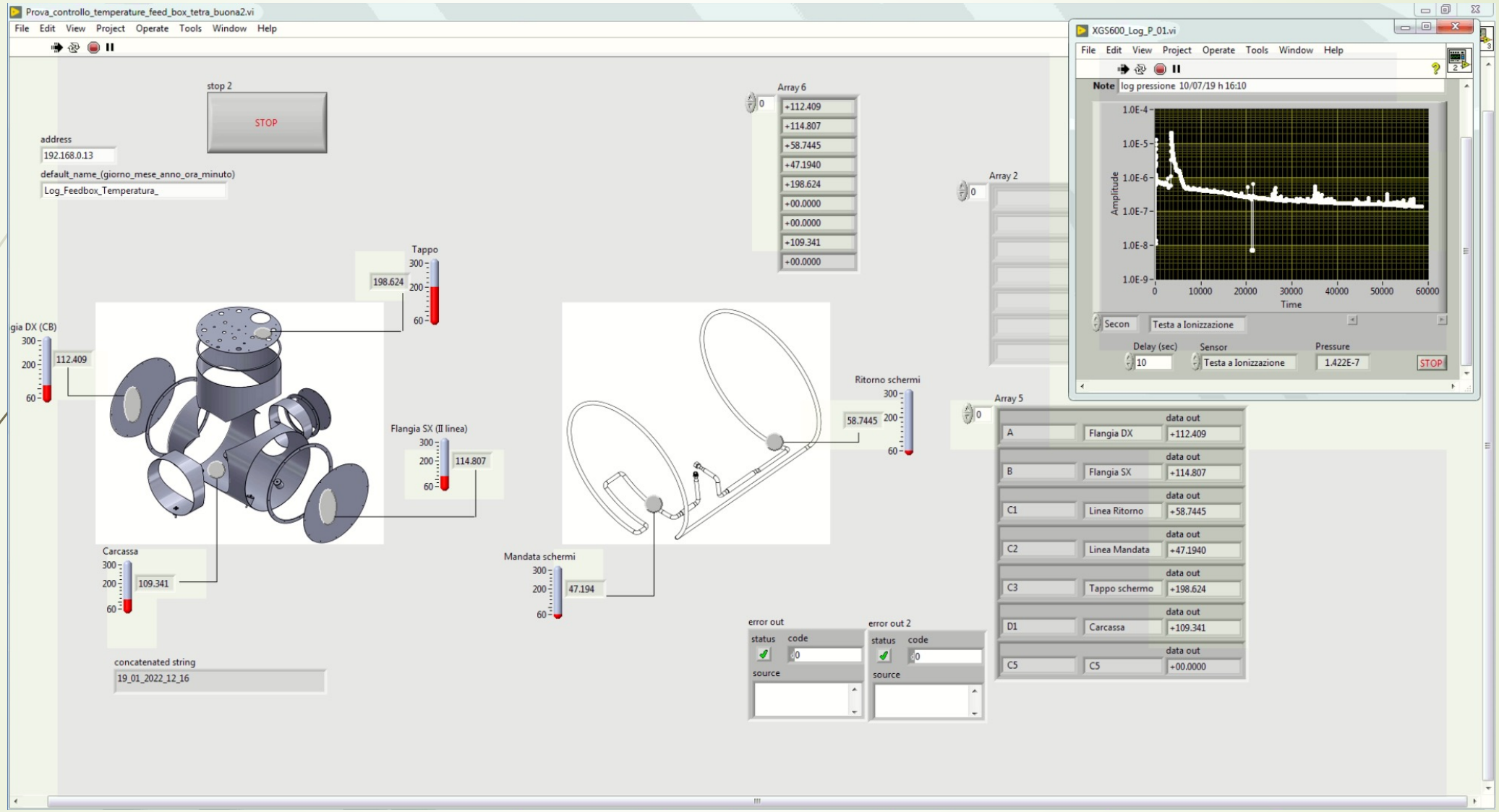








Feed Box
1st cooldown



Conclusion

- We have realized the first test line for the QDM (despite pandemic, war...).
- First cooldown of the FoS module is in progress, with the aim to make a full commissioning of the facility at 4.5 K.
- This month we are going to receive one series module to be tested (with the help of GSI colleagues).
- As agreed we are procuring the 2nd line and related equipment, which is needed to increase the testing rate.
- The 2° line hardware is expected in June, while other parts will be ready by the end of the year.
- We expect to be ready and fully operational in 2023, up to the end of the SIS100 program (but war could actually delay the QDM manufacture).