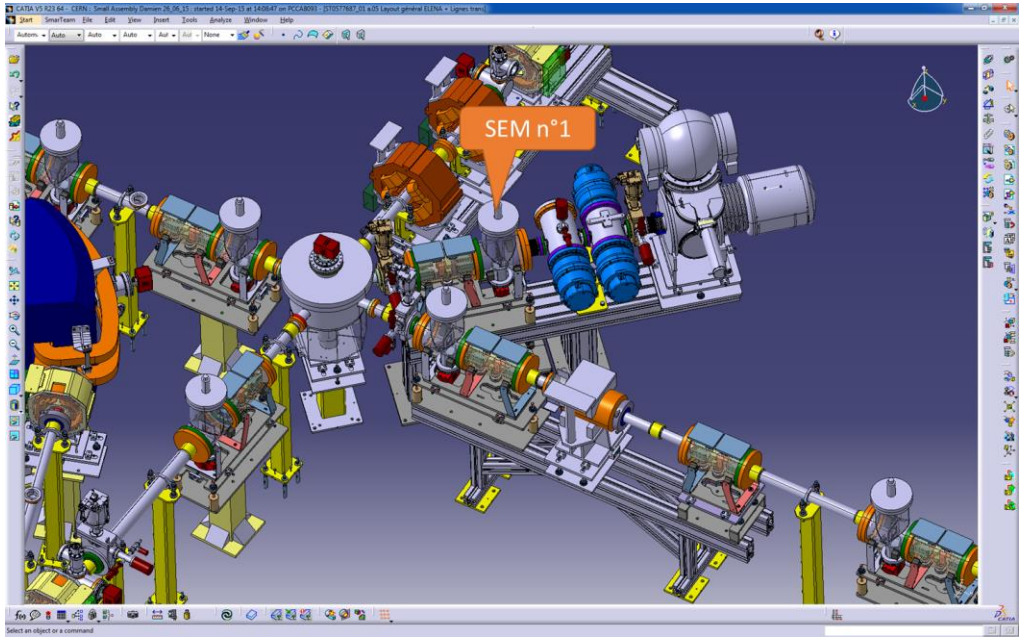
# Secondary Emission MonitorS for ELENA (from a BI perspective)

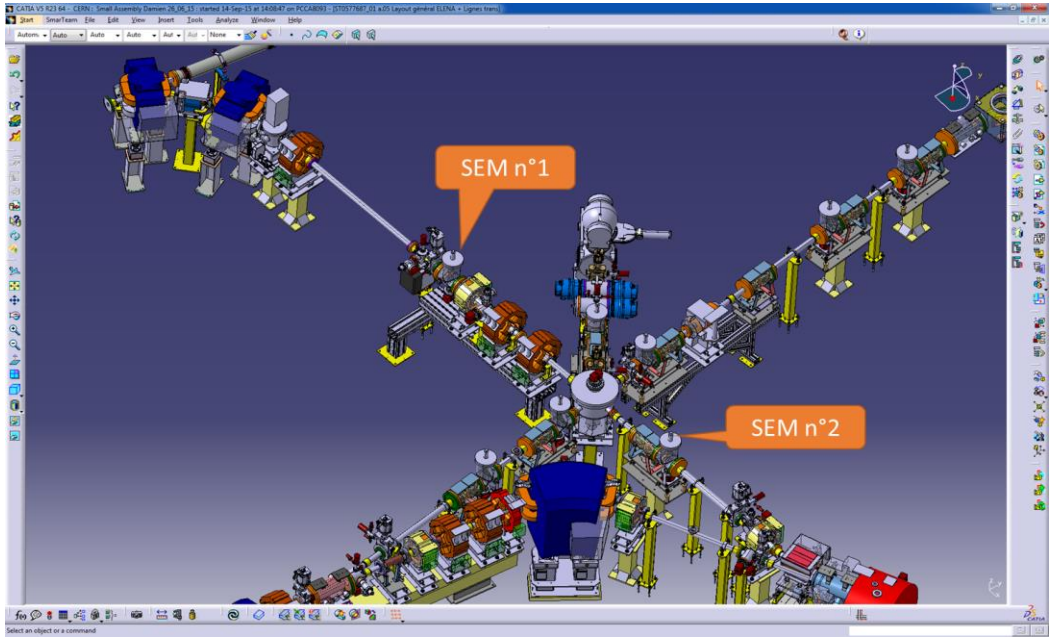

Gerard Tranquille BE-BI-EA

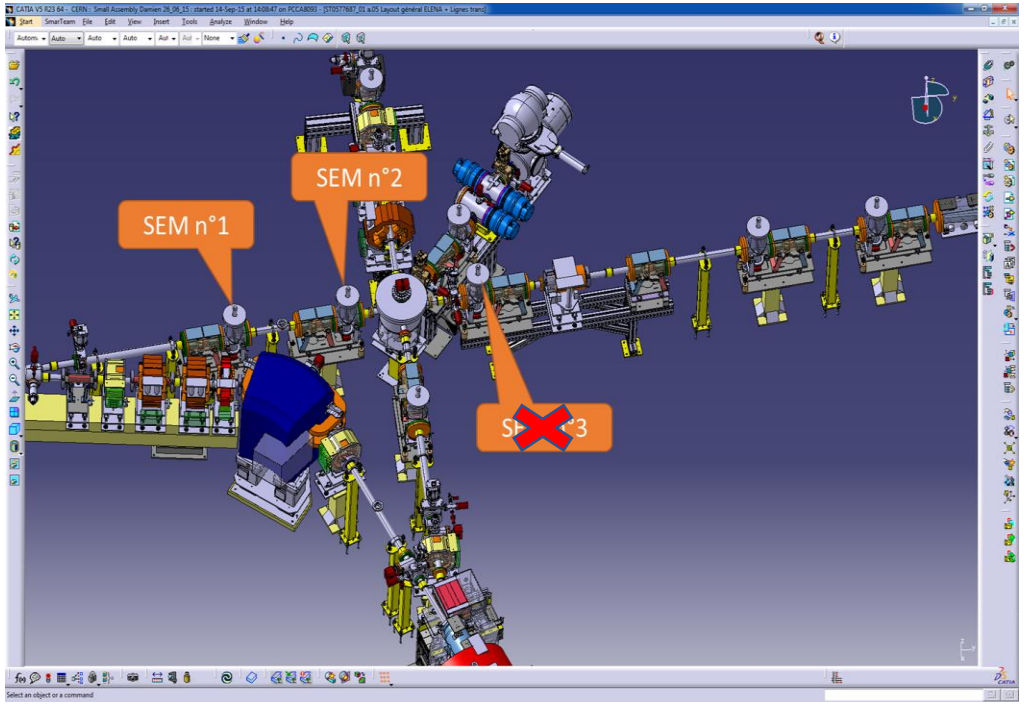
- 8 monitors have been installed for beam commissioning with $H^-$/protons/pbars:
  - One in LNS
  - Two in LNI
  - Two in LNE00
  - Two in LNE50
  - One for the GBAR experiment (taken from LNE00)

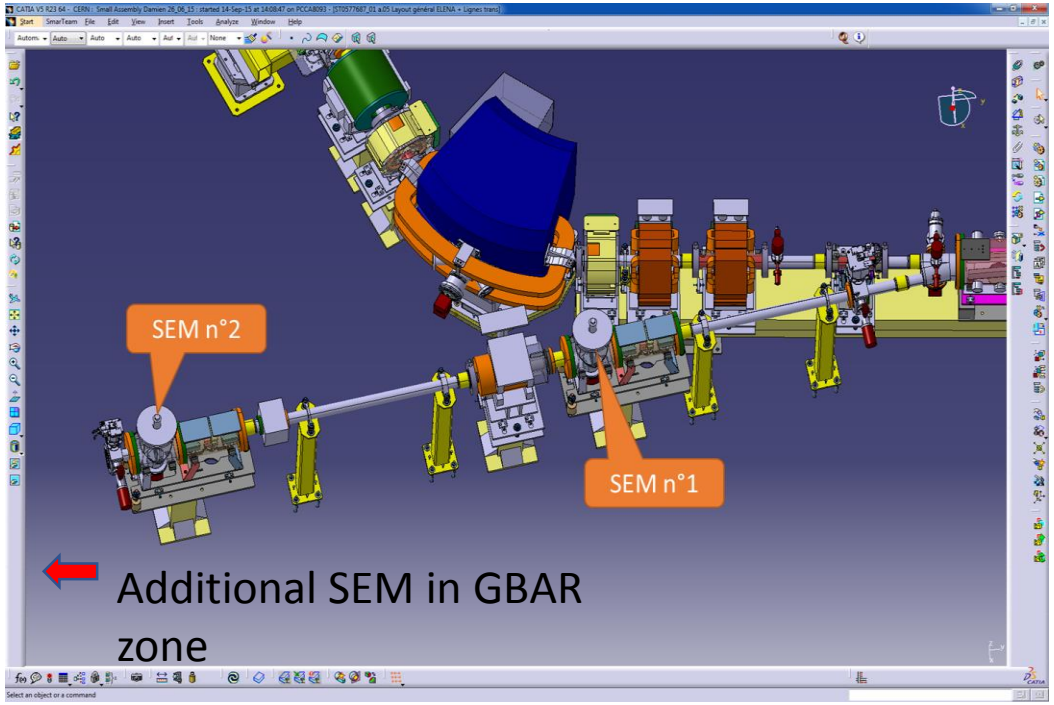
- Electronics not fully debugged. Only one functional set available at the moment.

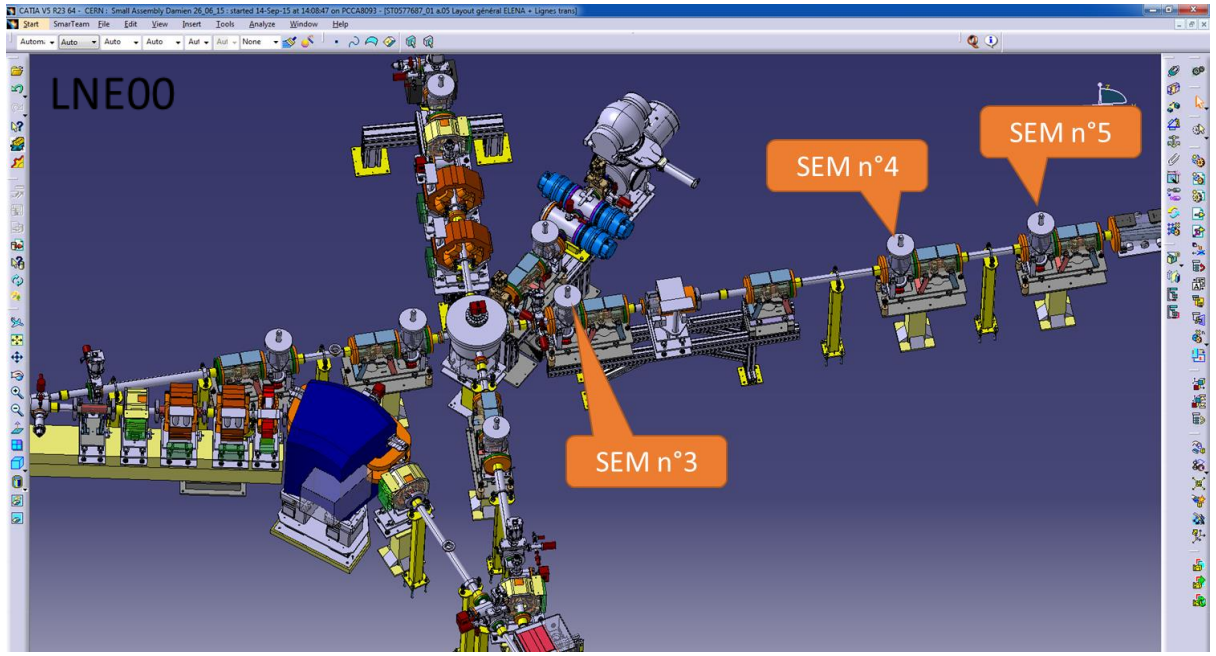
- During LS2 we have to build and install another 36 complete monitors:
  - LNE00: 3
  - LNE01: 8*
  - LNE02: 2
  - LNE03: 5*
  - LNE04: 4
  - LNE05: 6
  - LNE06: 5
  - LNE07: 3
- LNE01 and 03 will have 4 special SEMs (no IN/OUT, compact design) for ATRAP

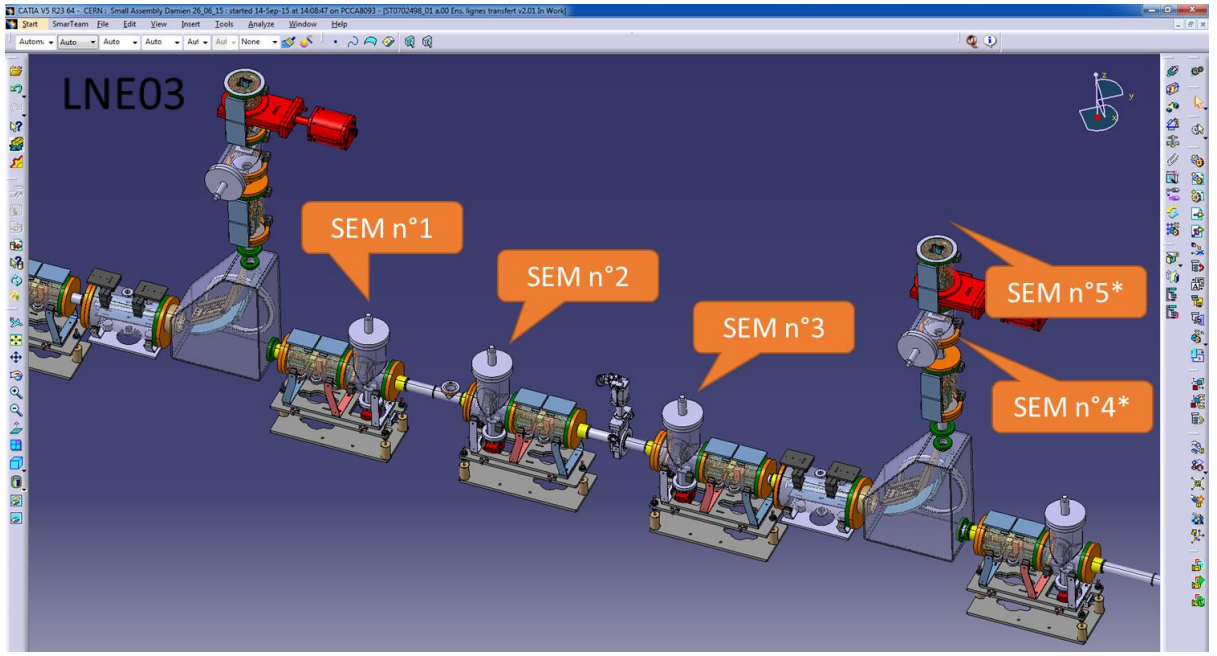

SEM n°1

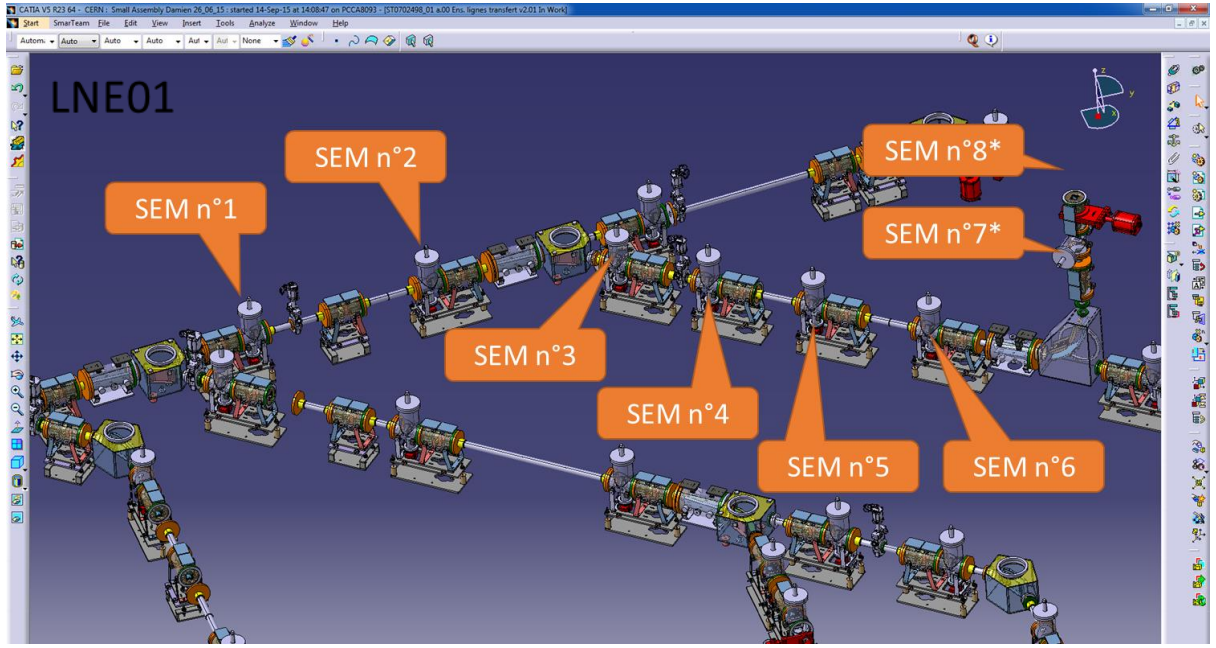

SEM n°1
SEM n°2

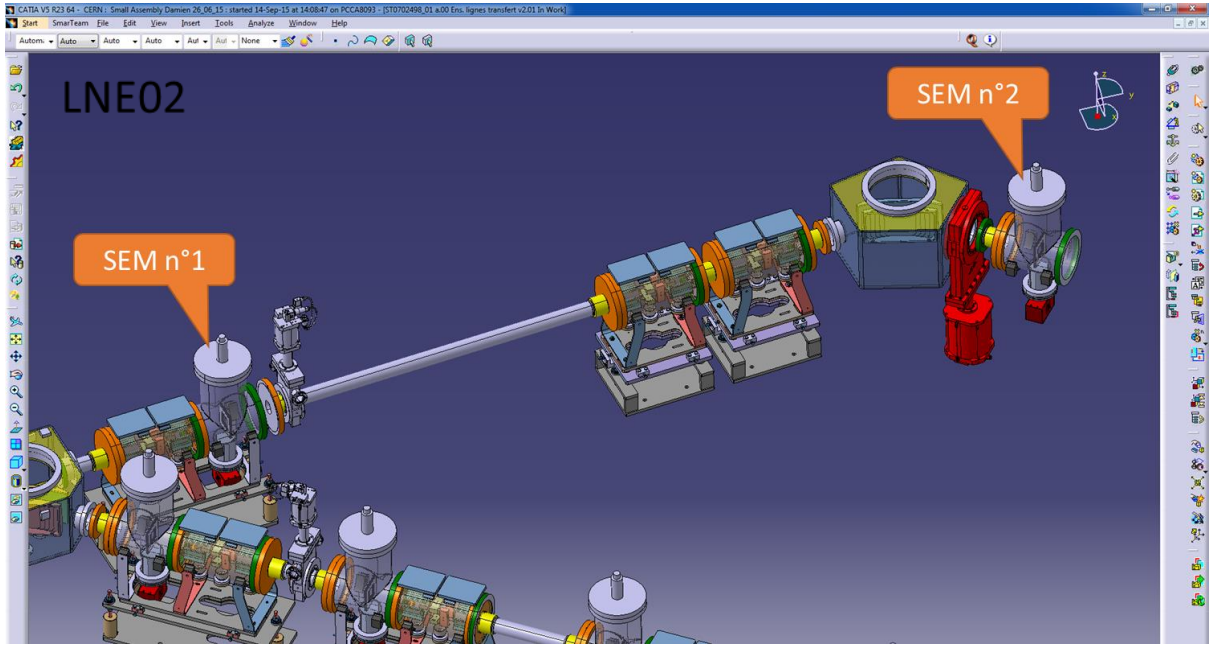

SEM n°1
SEM n°2

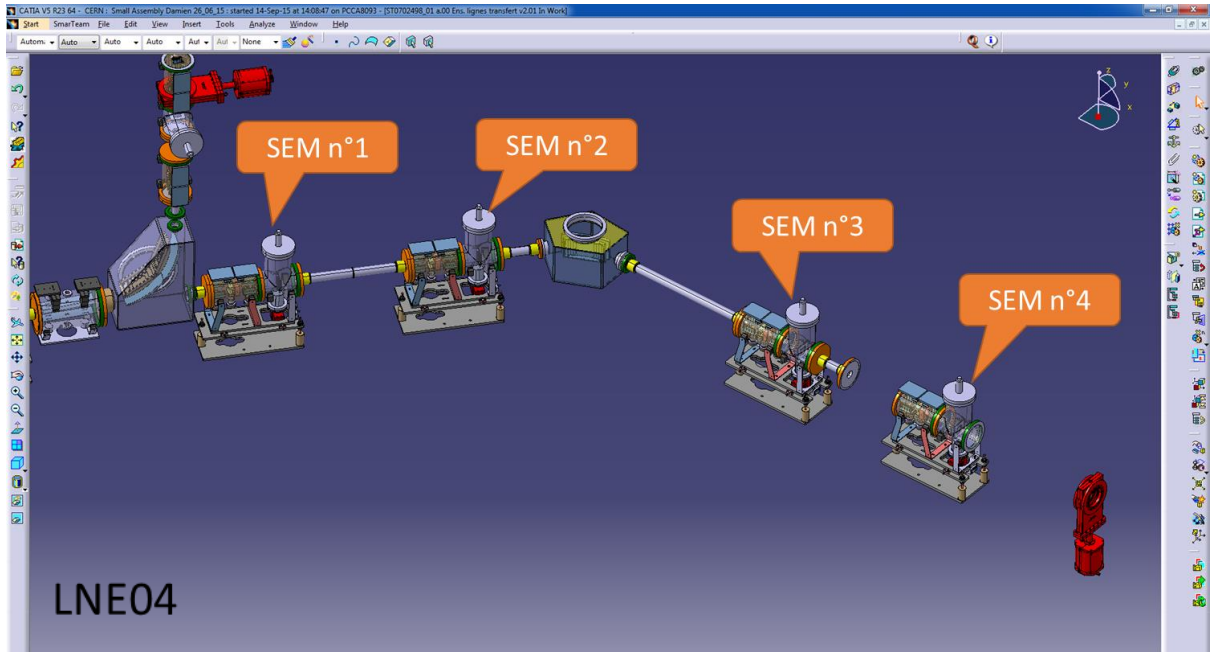

SEM n°2
SEM n°1
Additional SEM in GBAR zone

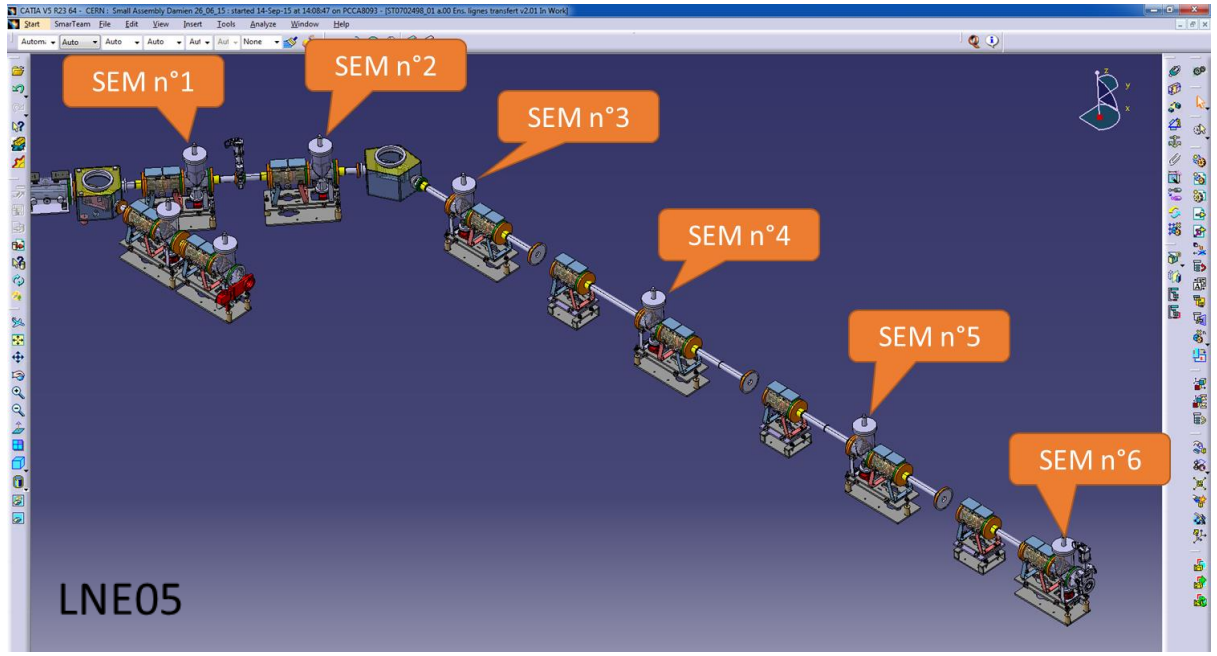

LNE00
SEM n°5
SEM n°4
SEM n°3

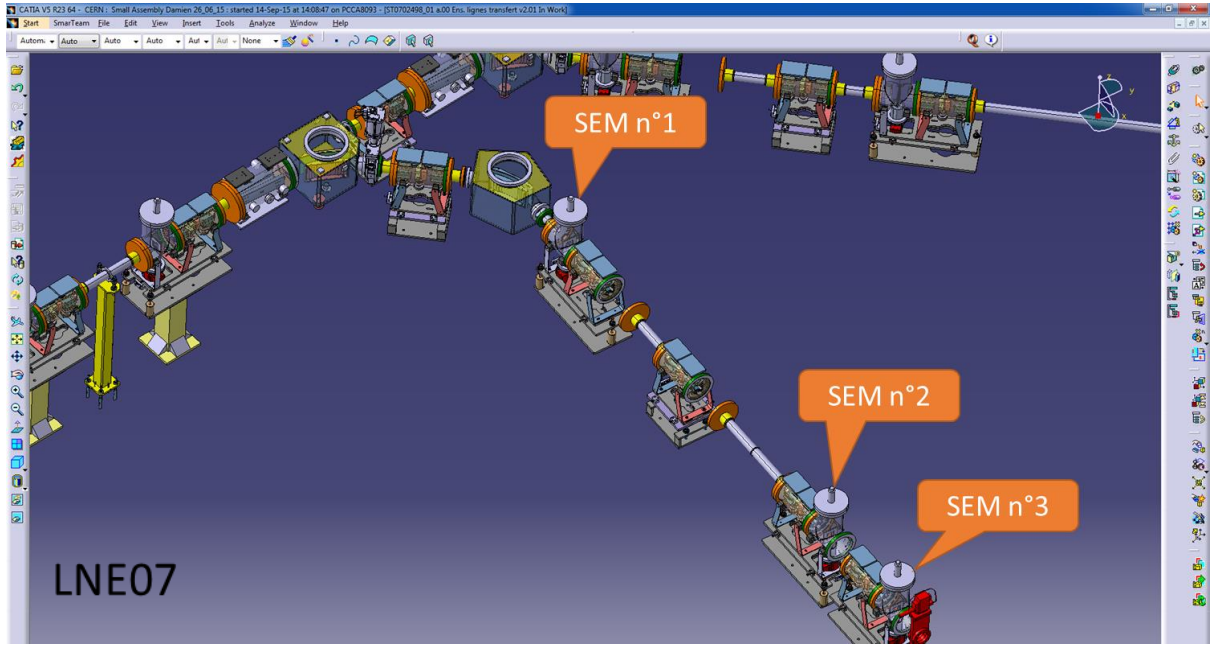

LNE03
SEM n°1
SEM n°2
SEM n°3
SEM n°5*
SEM n°4*

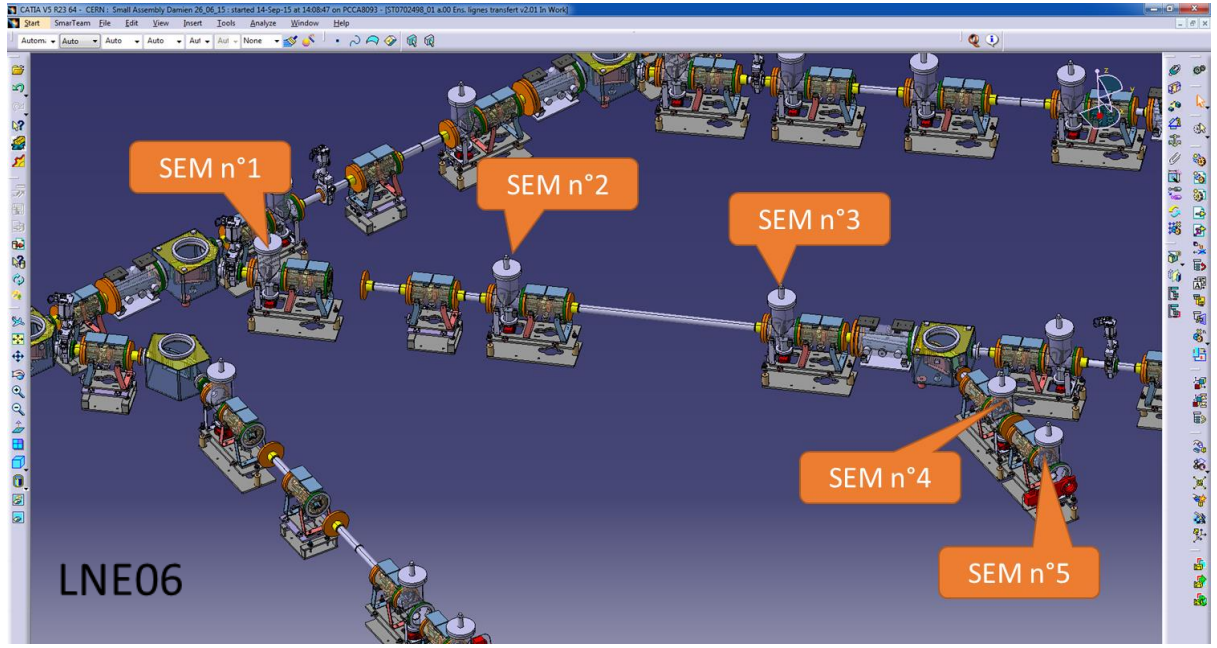

LNE01
SEM n°1
SEM n°2
SEM n°3
SEM n°4
SEM n°5
SEM n°6
SEM n°7*
SEM n°8*


LNE02
SEM n°1
SEM n°2


SEM n°1
SEM n°2
SEM n°3
SEM n°4
LNE04


SEM n°1
SEM n°2
SEM n°3
SEM n°4
SEM n°5
SEM n°6
LNE05


SEM n°1
SEM n°2
SEM n°3
LNE07

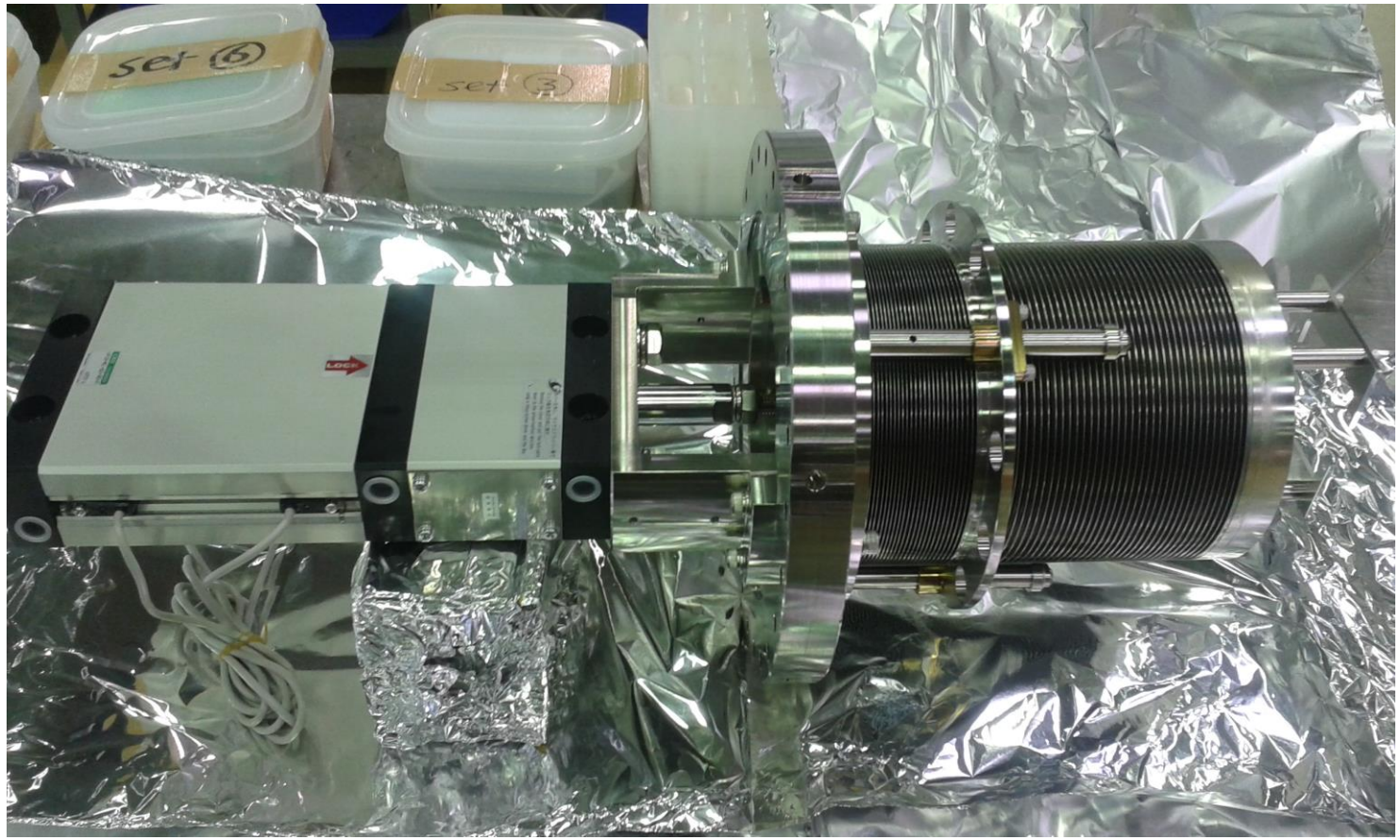

SEM n°1
SEM n°2
SEM n°3
SEM n°4
SEM n°5
LNE06

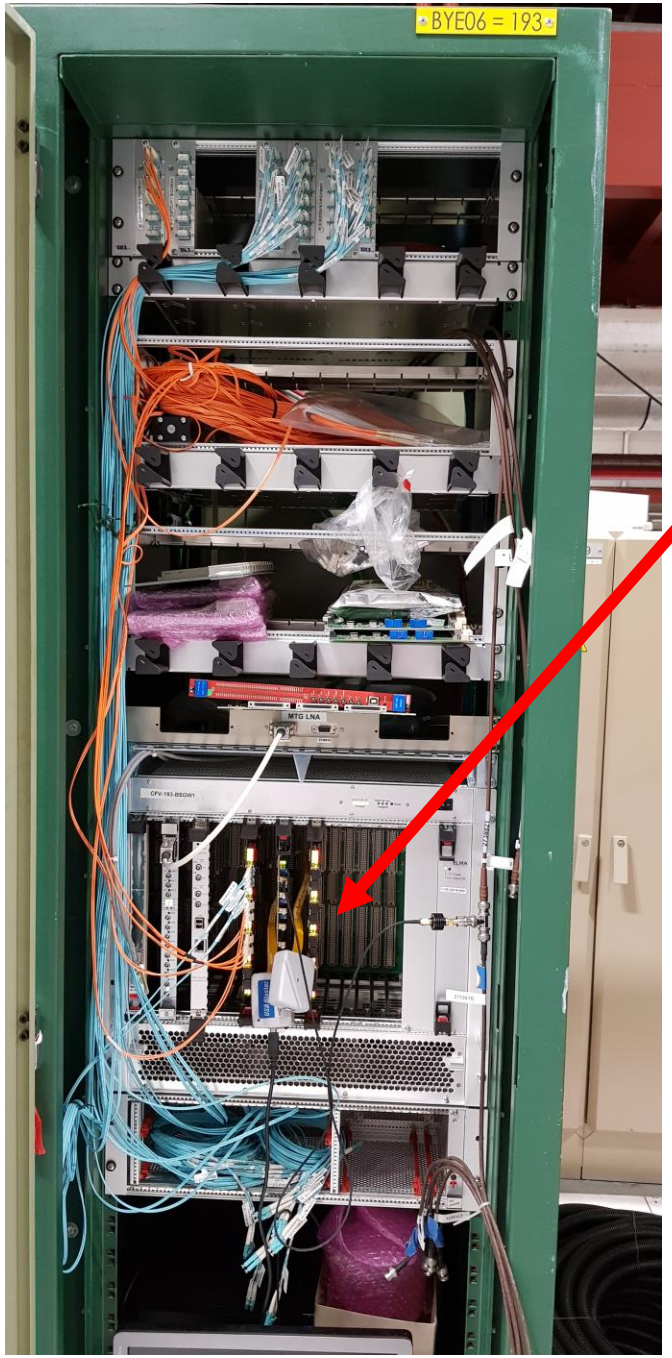
Mechanical problems:

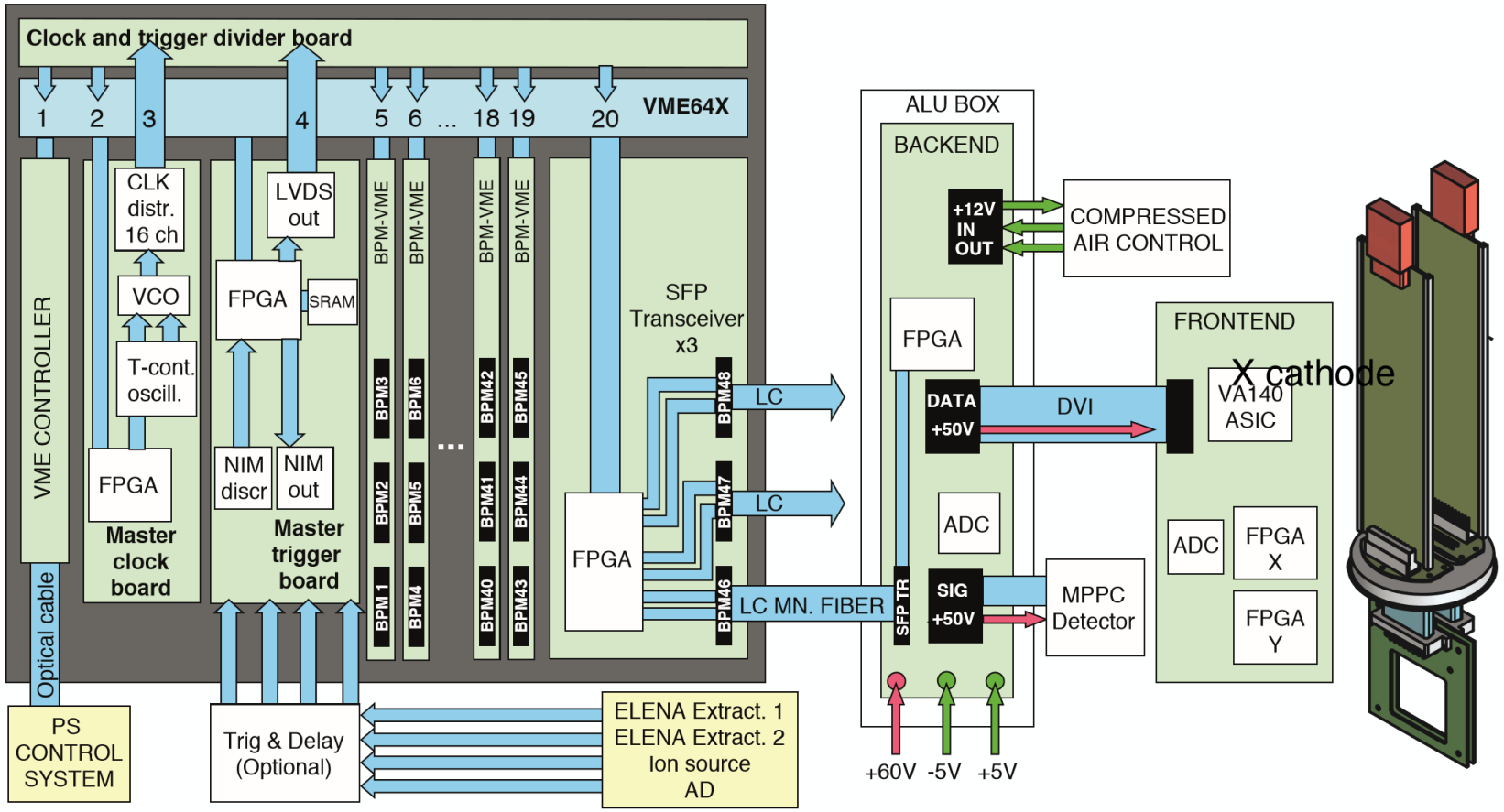
Wire bonding
Damaged bellows
Leaking SUB-D connectors

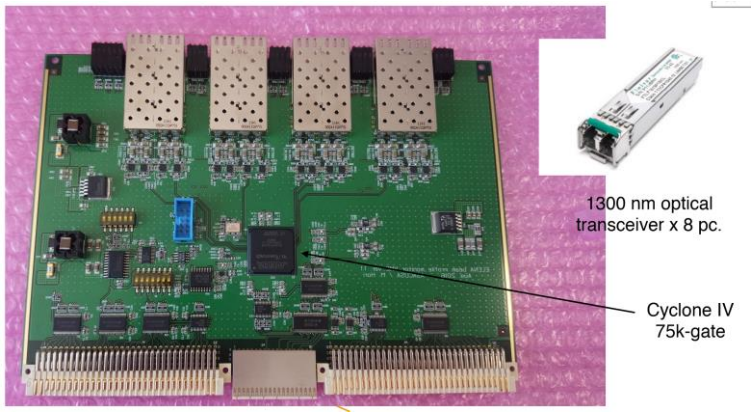
IN/OUT movement blocking
Missing(broken?) wires (from movement?)

Guides re-designed
$MOS_2$ coating of rods

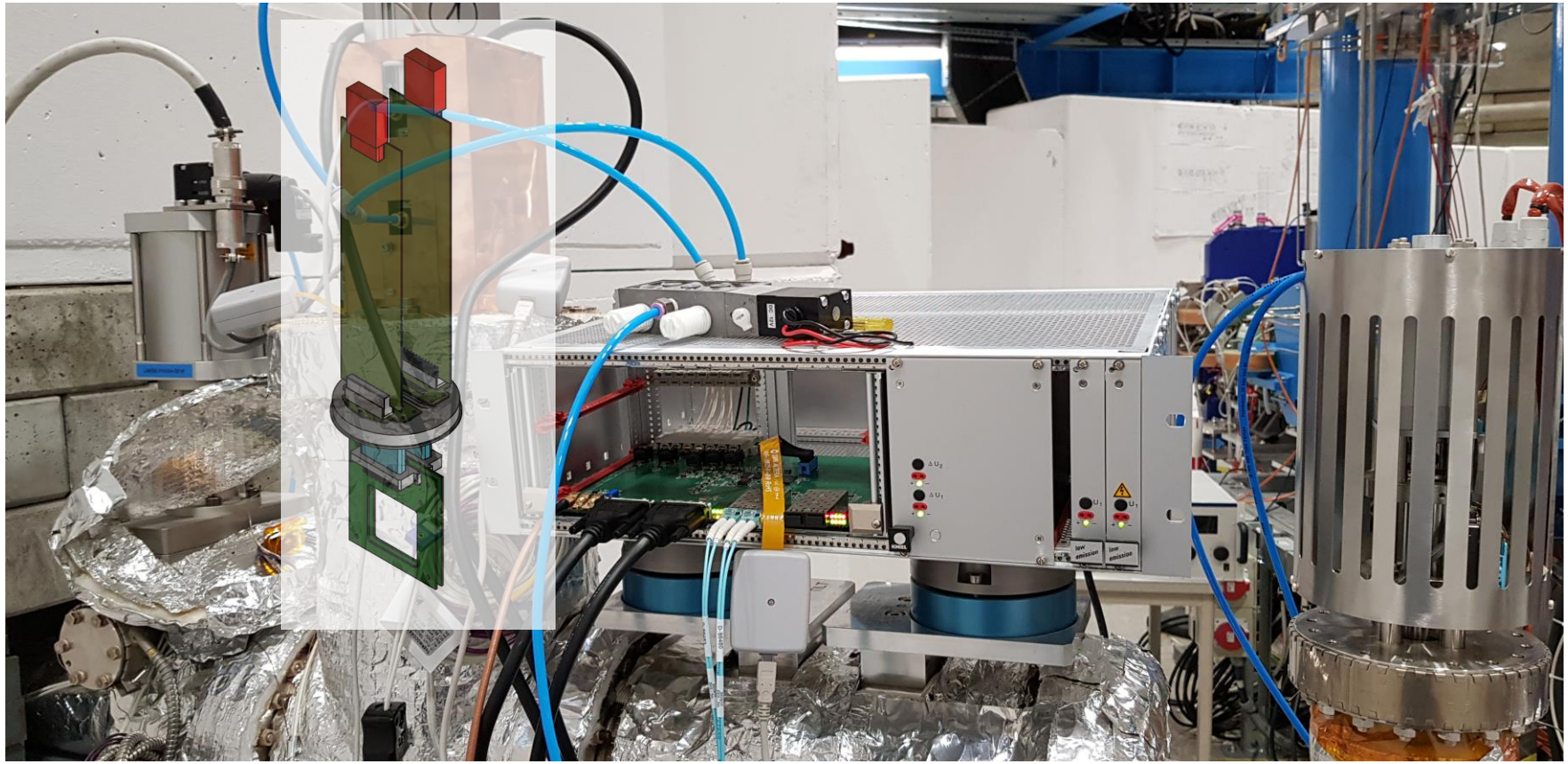


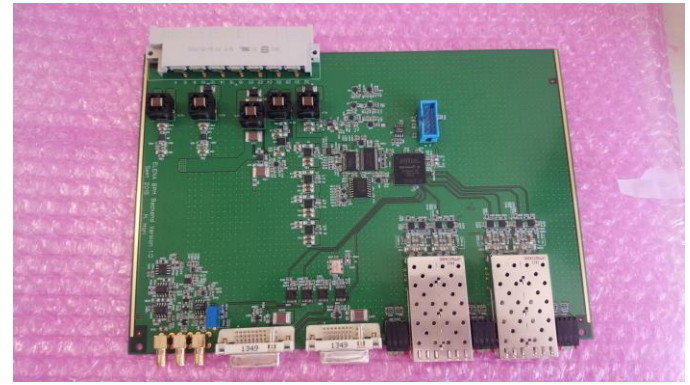

BYE06 = 193

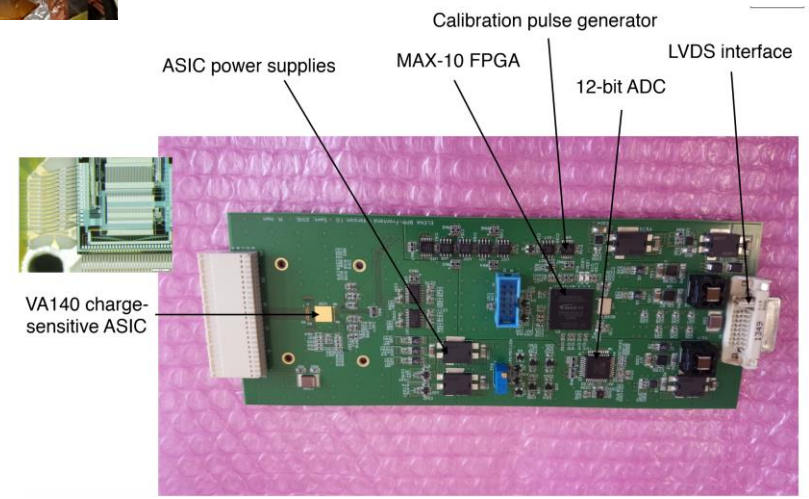

Clock and trigger divider board
1
2
3
4
5
6
...
18
19
20
VME64X
VME CONTROLLER
Optical cable
CLK distr. 16 ch
VCO
T-cont. oscill.
FPGA
Master clock board
LVDS out
FPGA
SRAM
NIM discr
NIM out
Master trigger board
BPM-VME
BPM-VME
BPM-VME
BPM-VME
BPM3
BPM2
BPM1
BPM6
BPM5
BPM4
BPM42
BPM41
BPM40
BPM45
BPM44
BPM43
SFP Transceiver x3
FPGA
BPM48
BPM47
BPM46
LC
LC
LC MN. FIBER
SFP TR
PS CONTROL SYSTEM
Trig & Delay (Optional)
ELENA Extract. 1
ELENA Extract. 2
Ion source
AD
ALU BOX
BACKEND
+12V IN OUT
COMPRESSED AIR CONTROL
FPGA
DATA +50V
DVI
ADC
SIG +50V
MPPC Detector
+60V
-5V
+5V
FRONTEND
VA140 ASIC
ADC
FPGA X
FPGA Y
X cathode

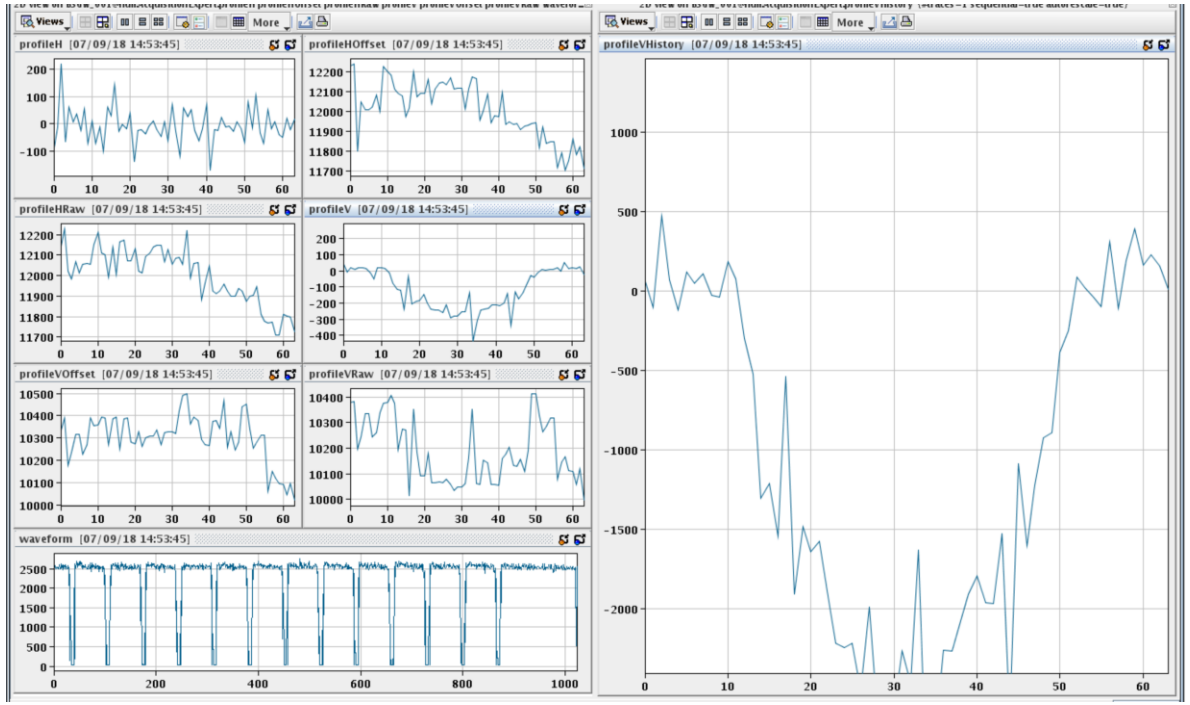

1300 nm optical transceiver x 8 pc.
Cyclone IV 75k-gate


4-channel trigger input TTL, NIM, etc.
Cyclone IV 75k-gate
LVDS trigger distribution

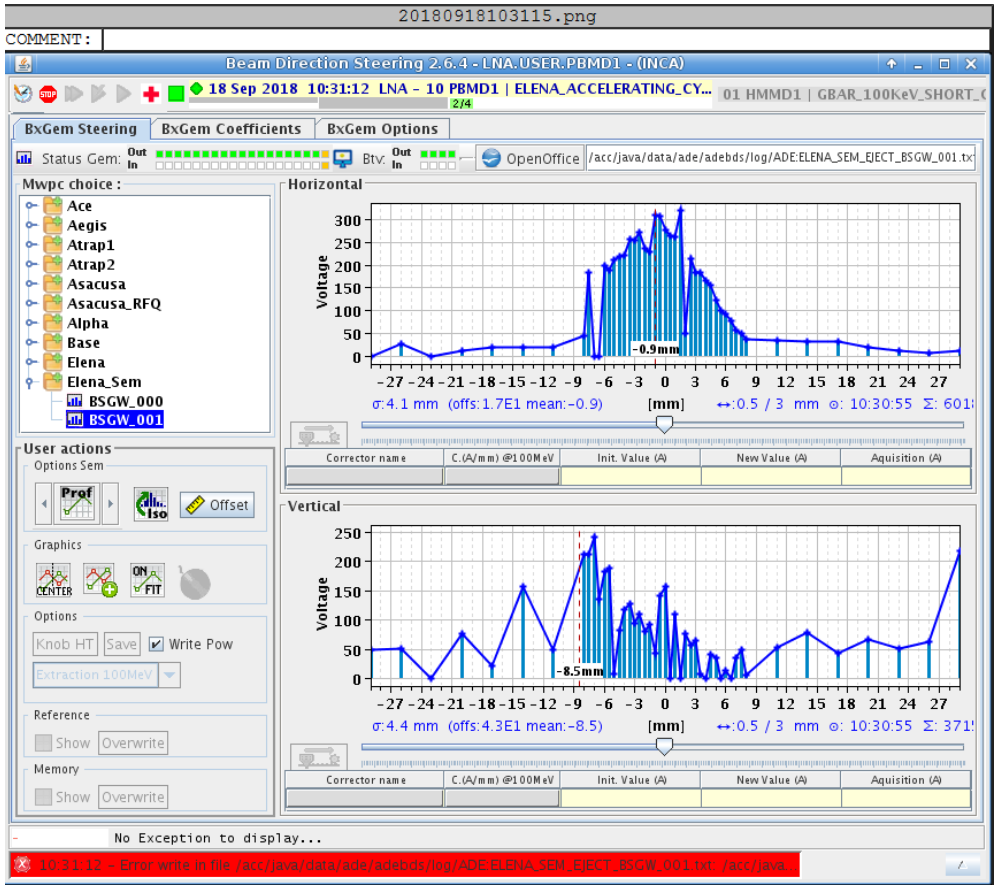





Calibration pulse generator
ASIC power supplies
MAX-10 FPGA
LVDS interface
12-bit ADC
VA140 charge-sensitive ASIC

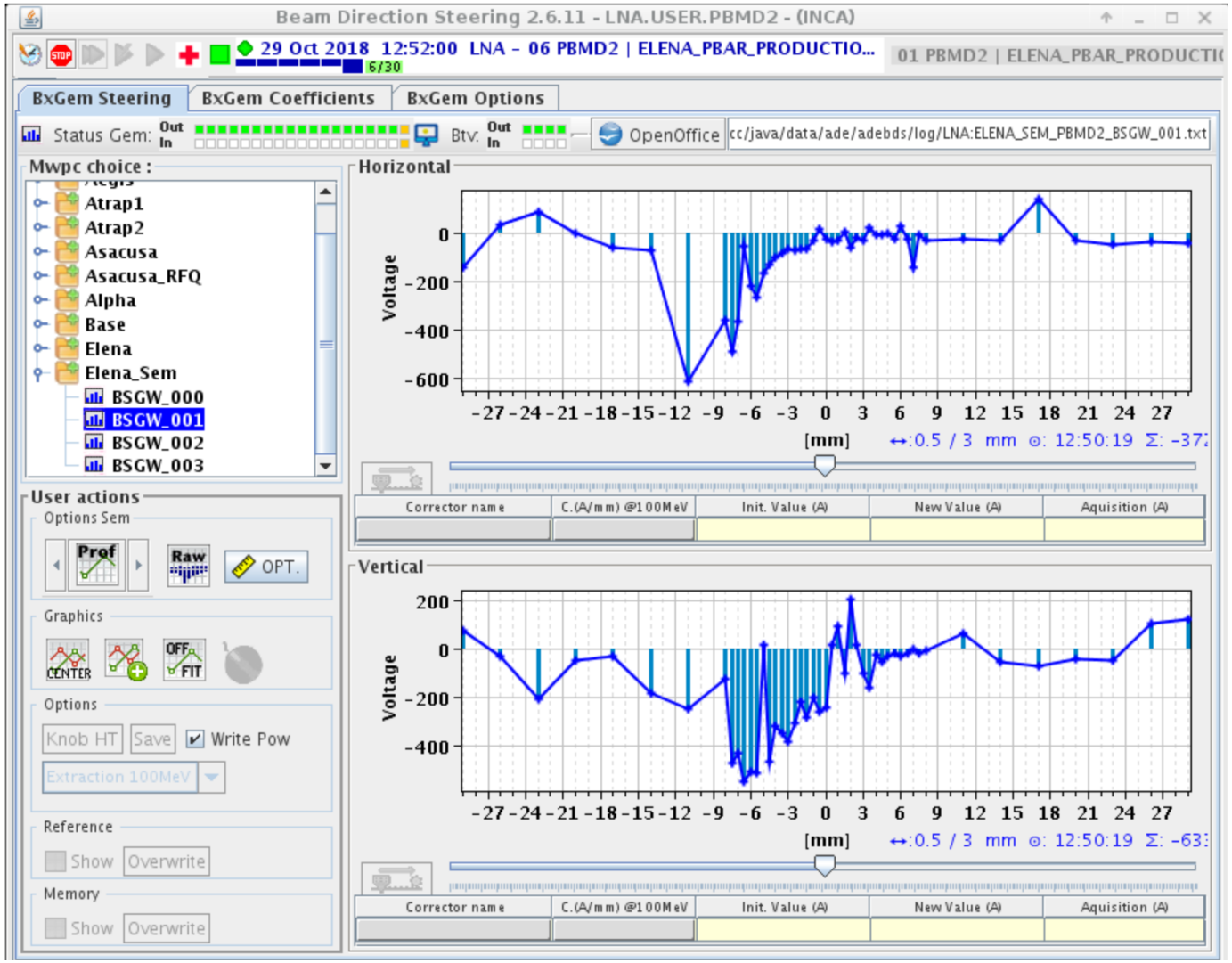



Profile obtained after ten averages and background subtraction (expert GUI)




H- Profile displayed on OP application

# Breaking News

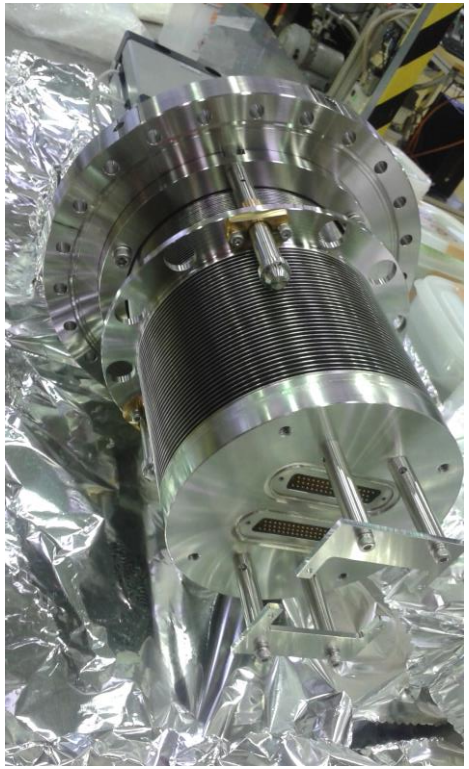


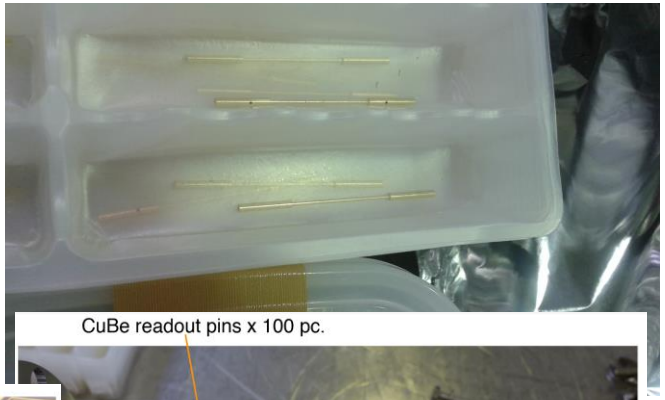

First antiproton beam profiles on BSGW5060

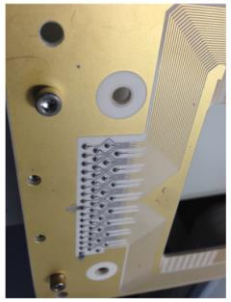
After some steering

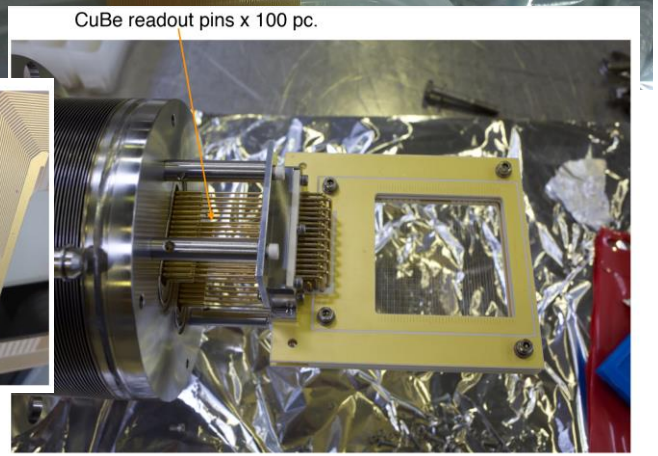
When the material arrives :

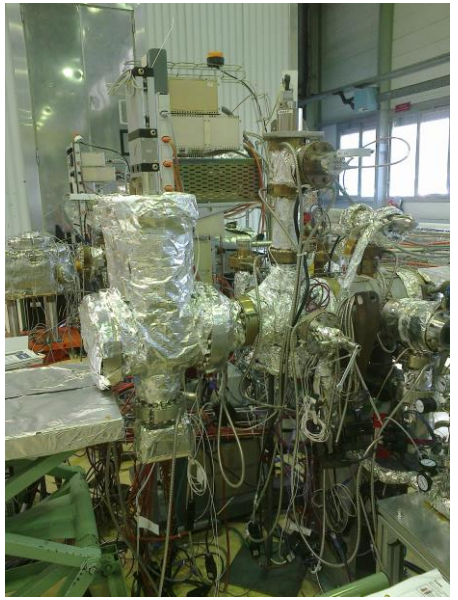
Mount 3 SEMs, install in tanks and send for vacuum acceptance
Labour intensive task (FSU), about 2 days/SEM
Should be able to deliver 3 SEMs every 3 to 4 weeks as of March 2019









Electronics will follow as the boards arrive.
An electronics engineer will be hired to take over this system during LS2.

# To Summarise

Issues with the mechanics have been addressed and solutions have been found.

- Need better QA with deliverables from Japan
- Installation of the remaining monitors will take time (mounting, metrology, vacuum tests…)

Electronics is a black box

- FESA class has been written, expert GUI and user application ready
- Still debugging VME board
- Timing board not tested
- IN/OUT control not tested
- Need a better means to setup the trigger for each monitor
- Electronics engineer will be hired to look into the issues with the electronics