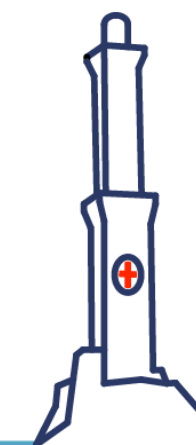


MBRDS1 Mechanical Measurements

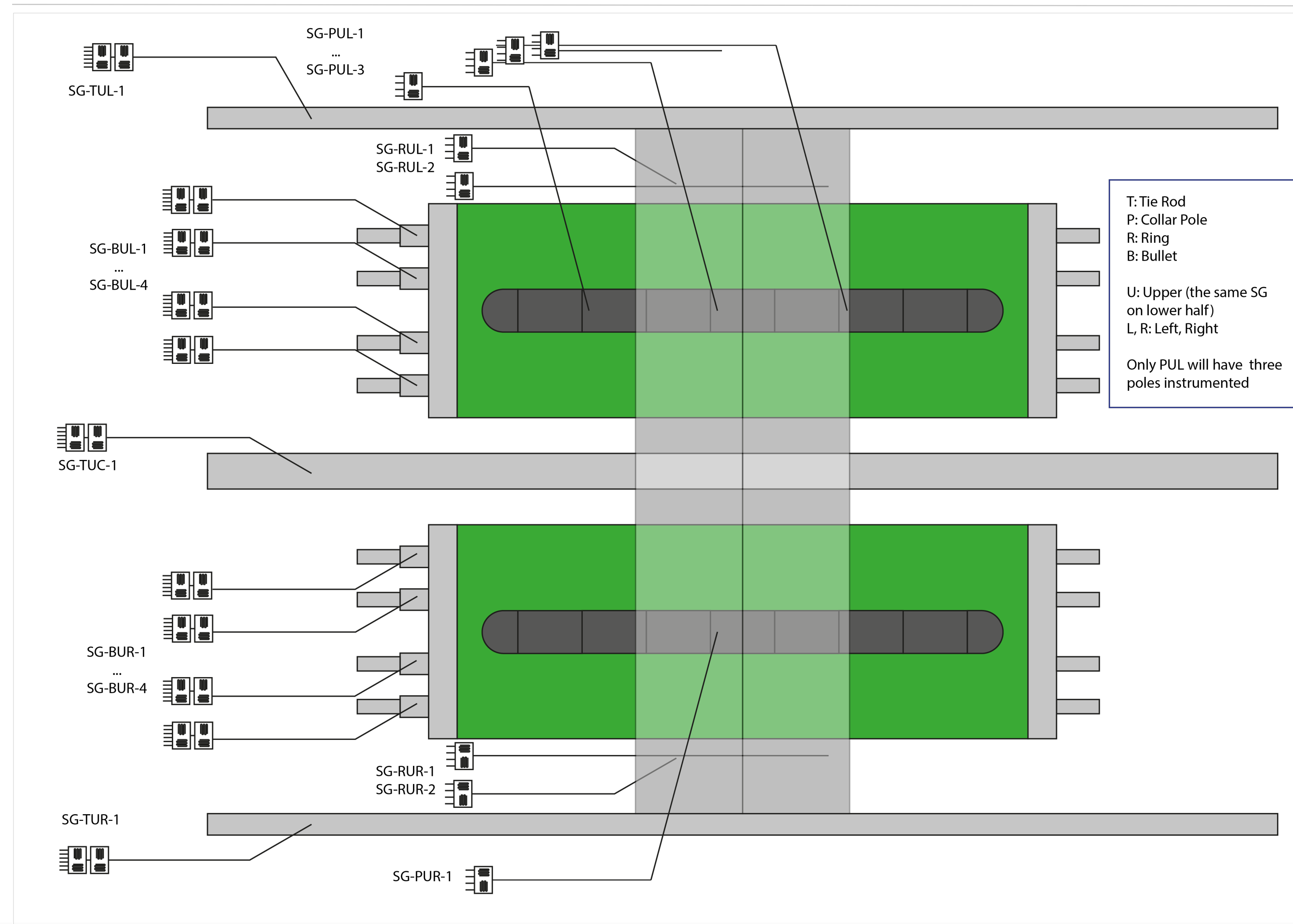
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Summary of Strain Gauges



Pre-collaring

- ↪ Involved SGs are the "P" ones
- ↪ No measurement has been performed during operation
- ↪ SGs were zeroed before
- ↪ "Small" pressure was applied to insert temporary keys
- ↪ Some initial stress is foreseen on the poles

Poles Strain

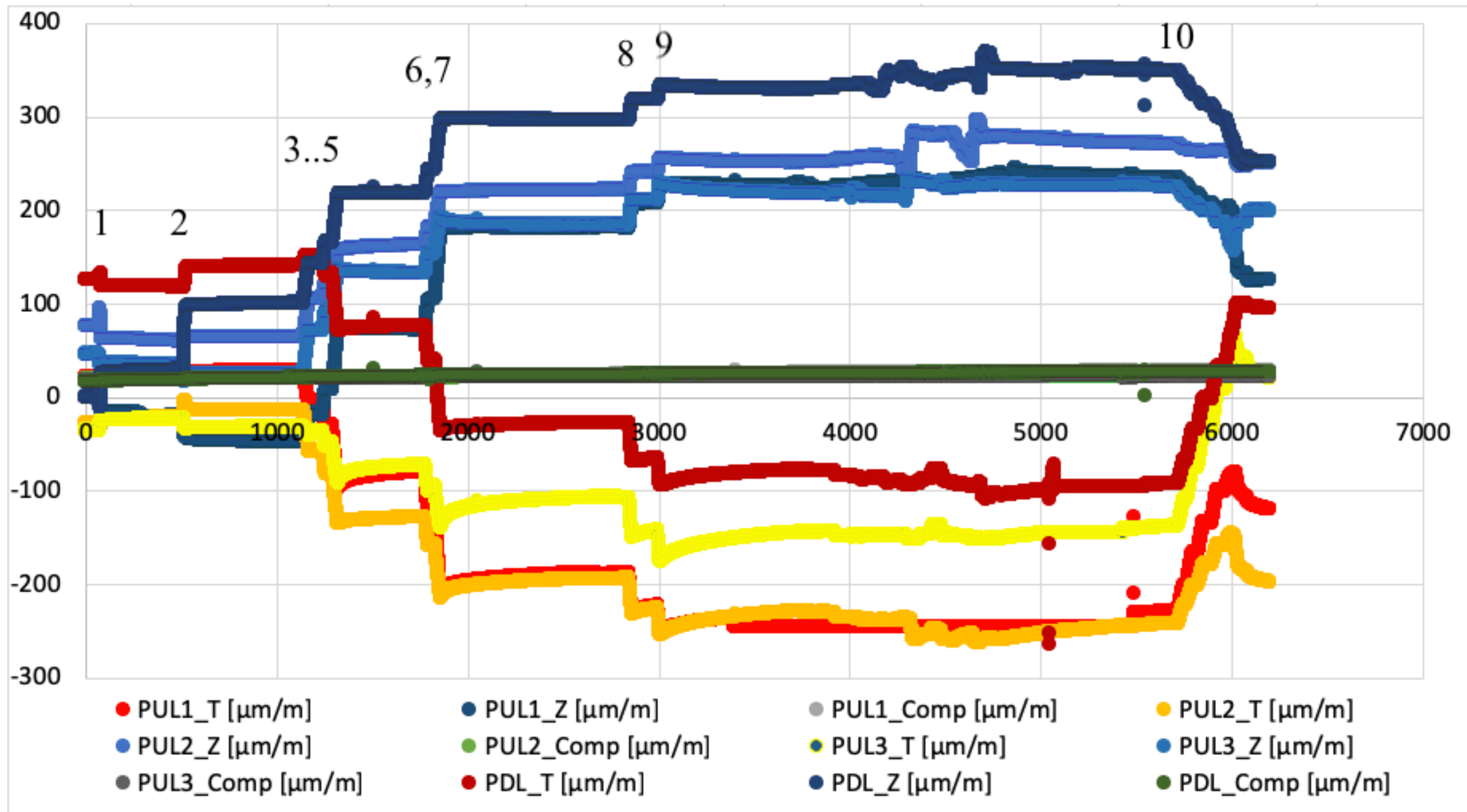
$\mu\text{m/m}$	PUL1T	PUL1Z	PUL1C	PUL2T	PUL2Z	PUL2C	PUL3T	PUL3Z	PUL3C	PDLT	PDLZ	PDLC	PURT	PURZ	PURC	PDRT	PDRZ	PDRC
t = 0	21	19	17	-28	76	19	-35	46	18	125	0	17	58	-52	25	16	-5	25
final	-120	126	28	-198	251	22	21	200	23	95	251	27	52	77	21	75	179	16

$\mu\text{m/m}$	average T	average Z	average C
t = 0	26	14	11
final	-1.3	181	23
exp	-500	150	0

Collaring: Aperture 2

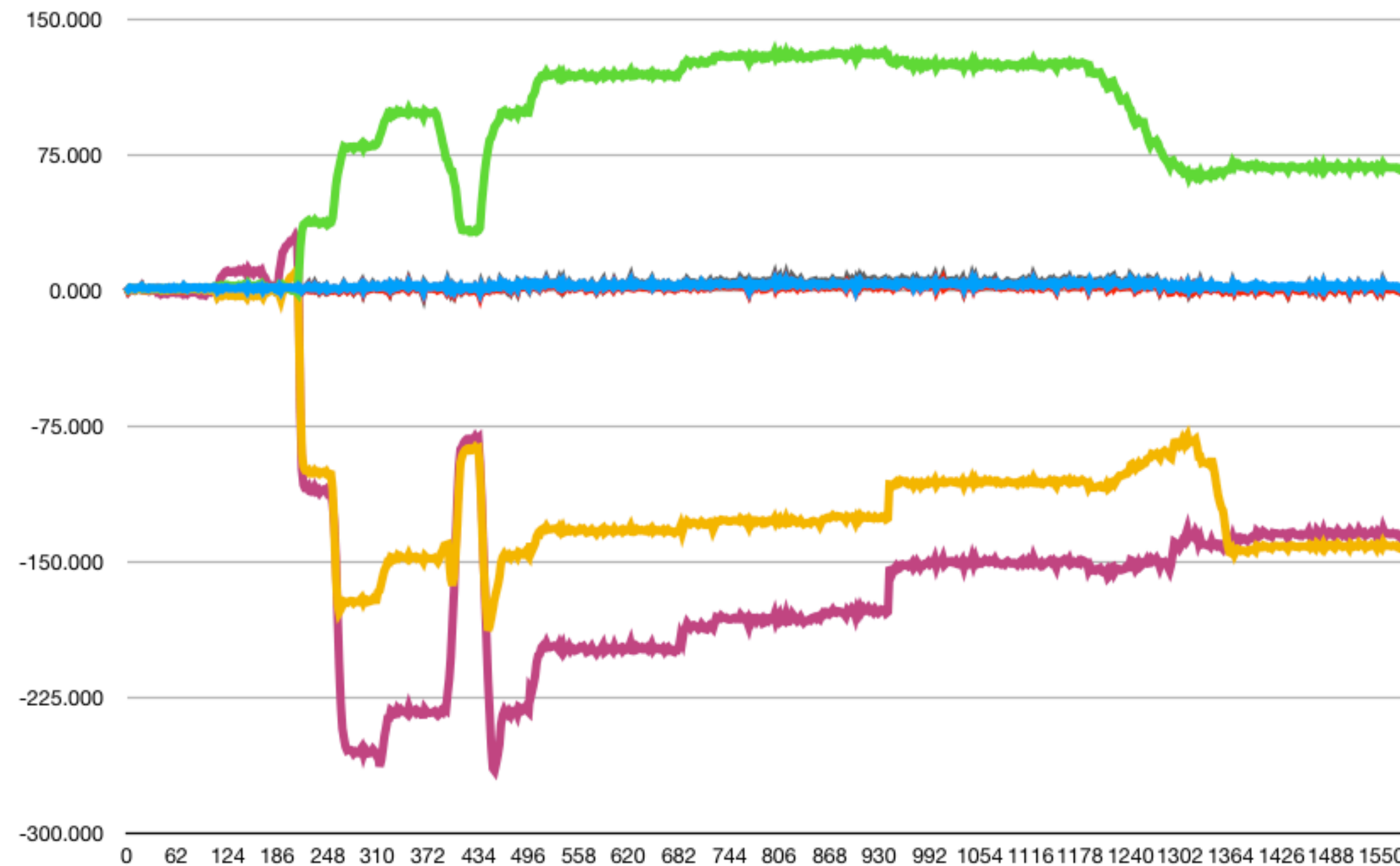
- ↪ 1 – press is in touch
- ↪ 2 – 100 bar (stop for electrical tests)
- ↪ 3 – 200 bar
- ↪ 4 – 250 bar
- ↪ 5 – 350 bar (stop for electrical tests)
- ↪ 6 – 400 bar
- ↪ 7 – 500 bar (first keys insertion, stop for electrical tests)
- ↪ 8 – 550 bar (calculated collaring pressure)
- ↪ 9 – 600 bar (insertion of most of the keys)
- ↪ 10 – press release – 100 bar steps

Collaring: Aperture 2



Yoking

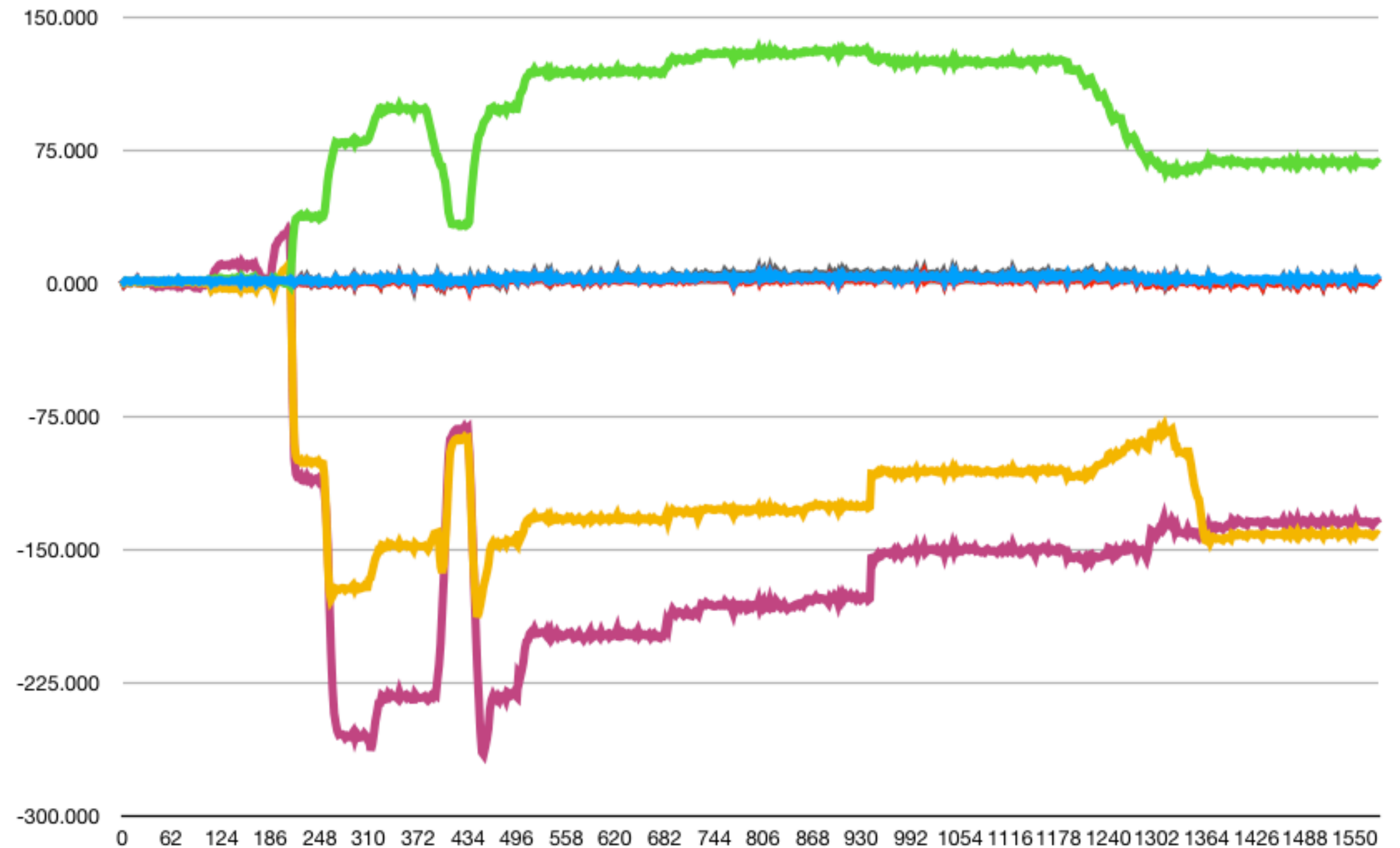
- Involved SGs are the "R" ones
- We had MANY problems with the readout
- Thanks to redundancy we had some readout during yoking



$\mu\text{m/m}$	average T	average Z	average C
t = 0	0	0	0
final	-138	68	1.3
exp	-130	40	0

Yoking Operations

- ↪ start: 11:10
- ↪ up @step 50bar to 150bar
- ↪ 11:13 down to 50bar
- ↪ 11:14 up to 150bar
- ↪ 11:15 up to 200bar
- ↪ 11:18 up to 225bar
- ↪ 11:19 up to 250bar
- ↪ 11:20 up to 275bar
- ↪ 11:25 down
- ↪ 11:30: free, operation ended



Longitudinal Pre-Stress

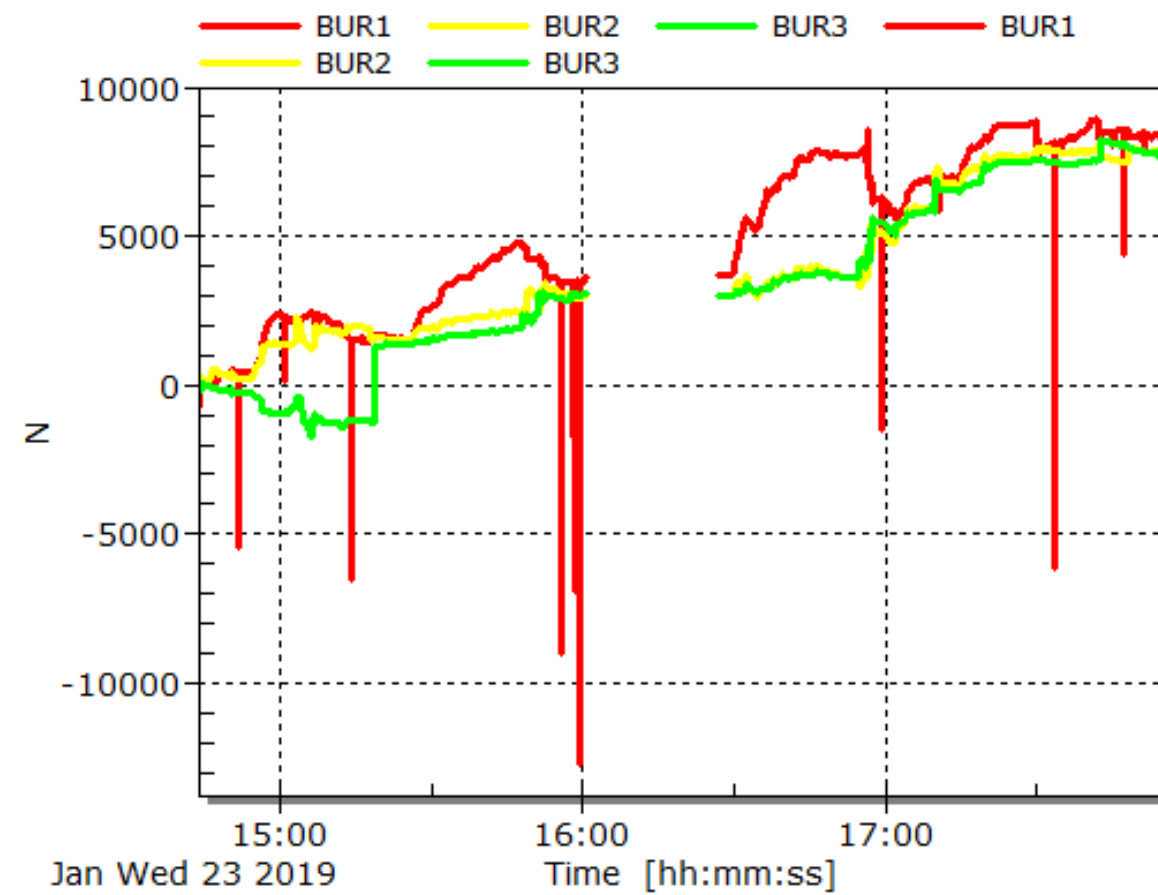
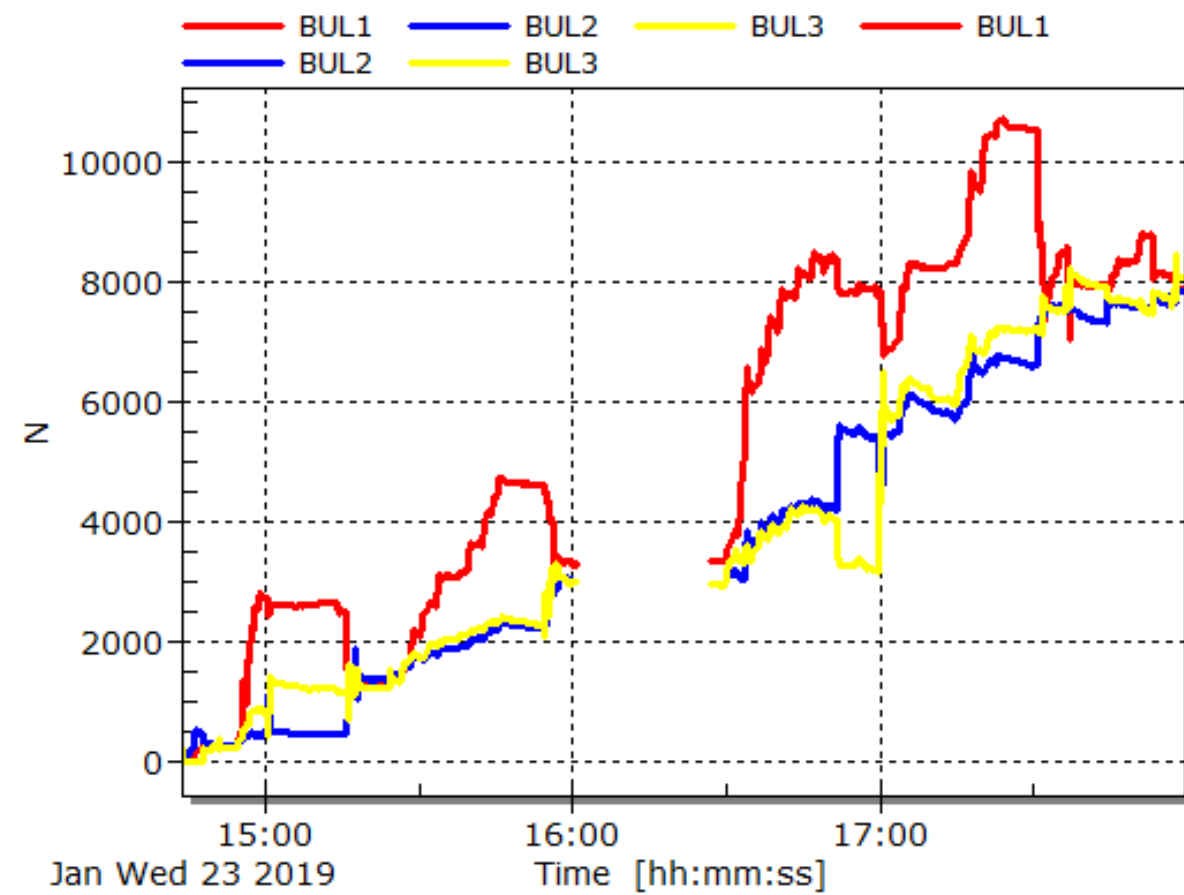
- ↪ Involved SGs are the "B" and "T" ones
- ↪ Measurements have been performed at CERN with Sohrab
- ↪ 13 out of 16 "B"s were readable
- ↪ 5 out of 6 "T"s were readable

- ↪ Goal on the "B"s was 8kN on each bullet

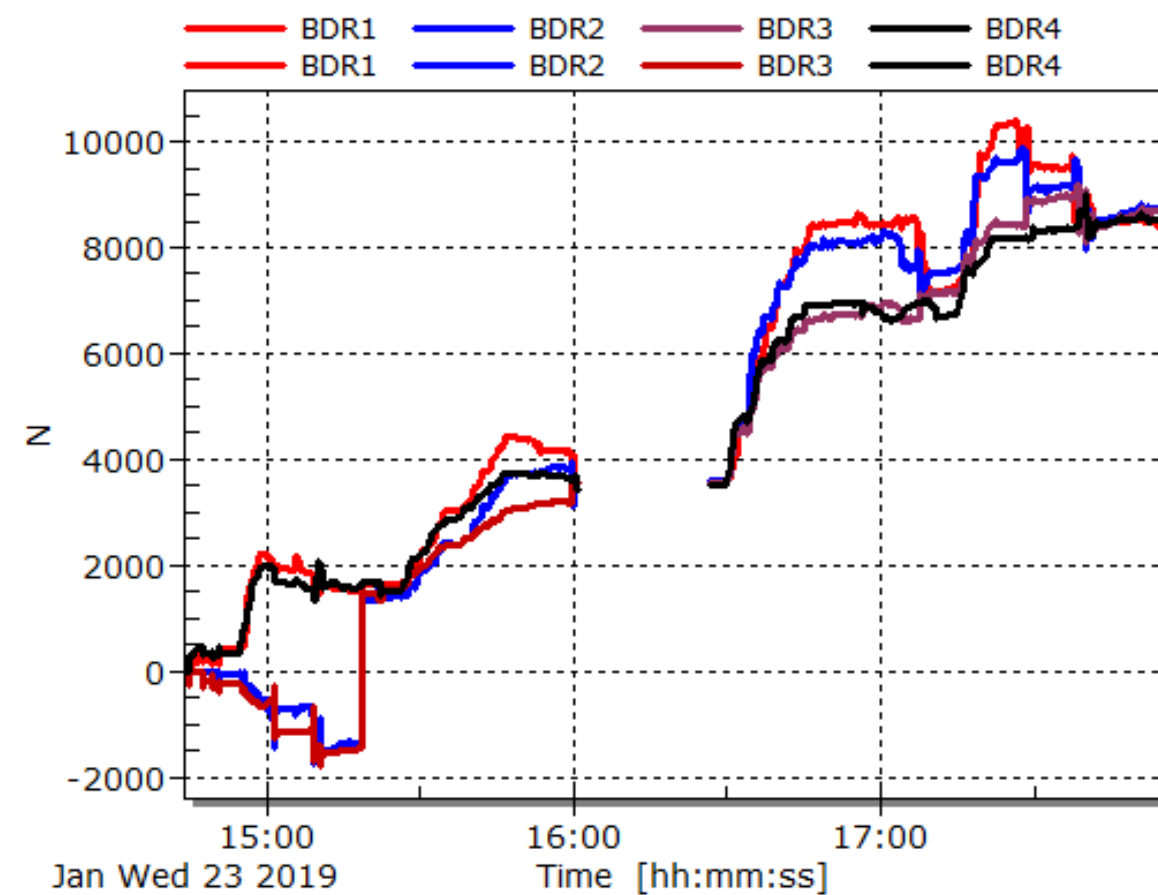
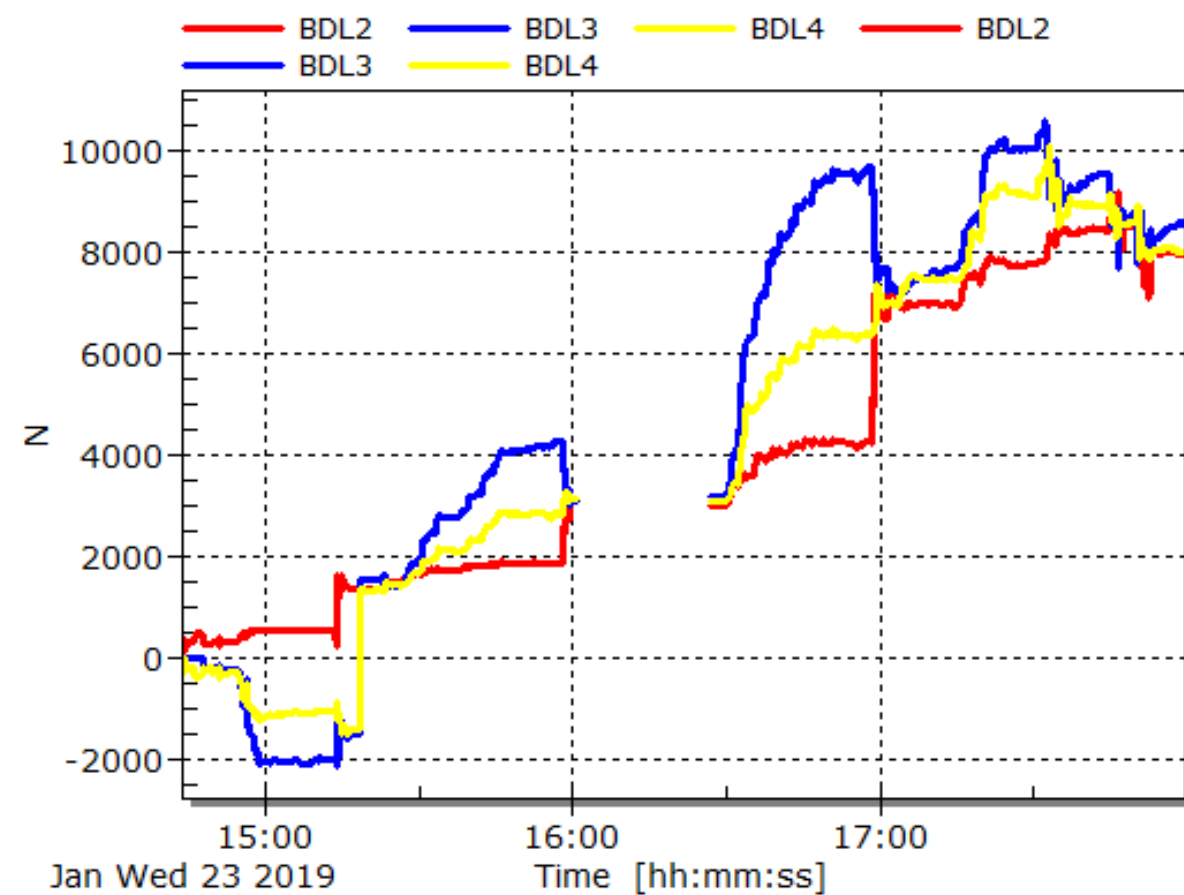
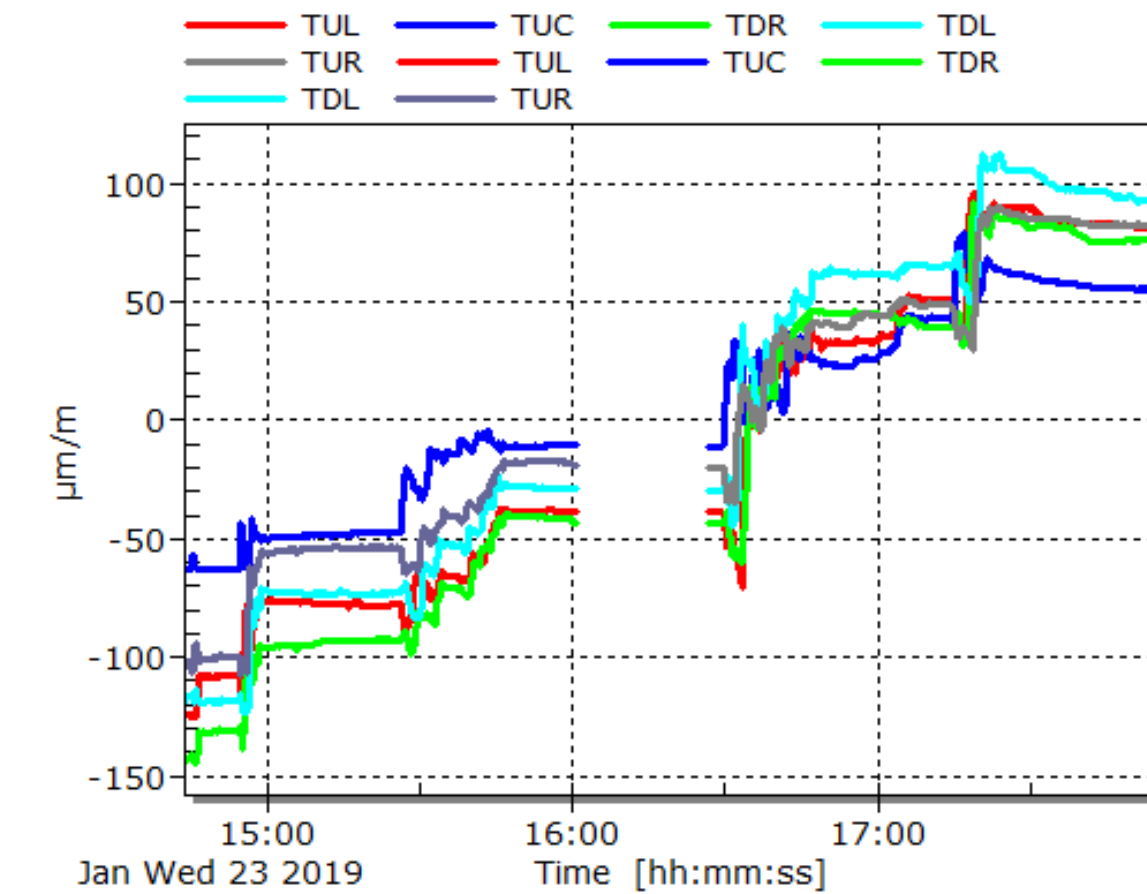
Longitudinal pre-Loading

Magnet arrival at CERN
Measurement 23/01/2019

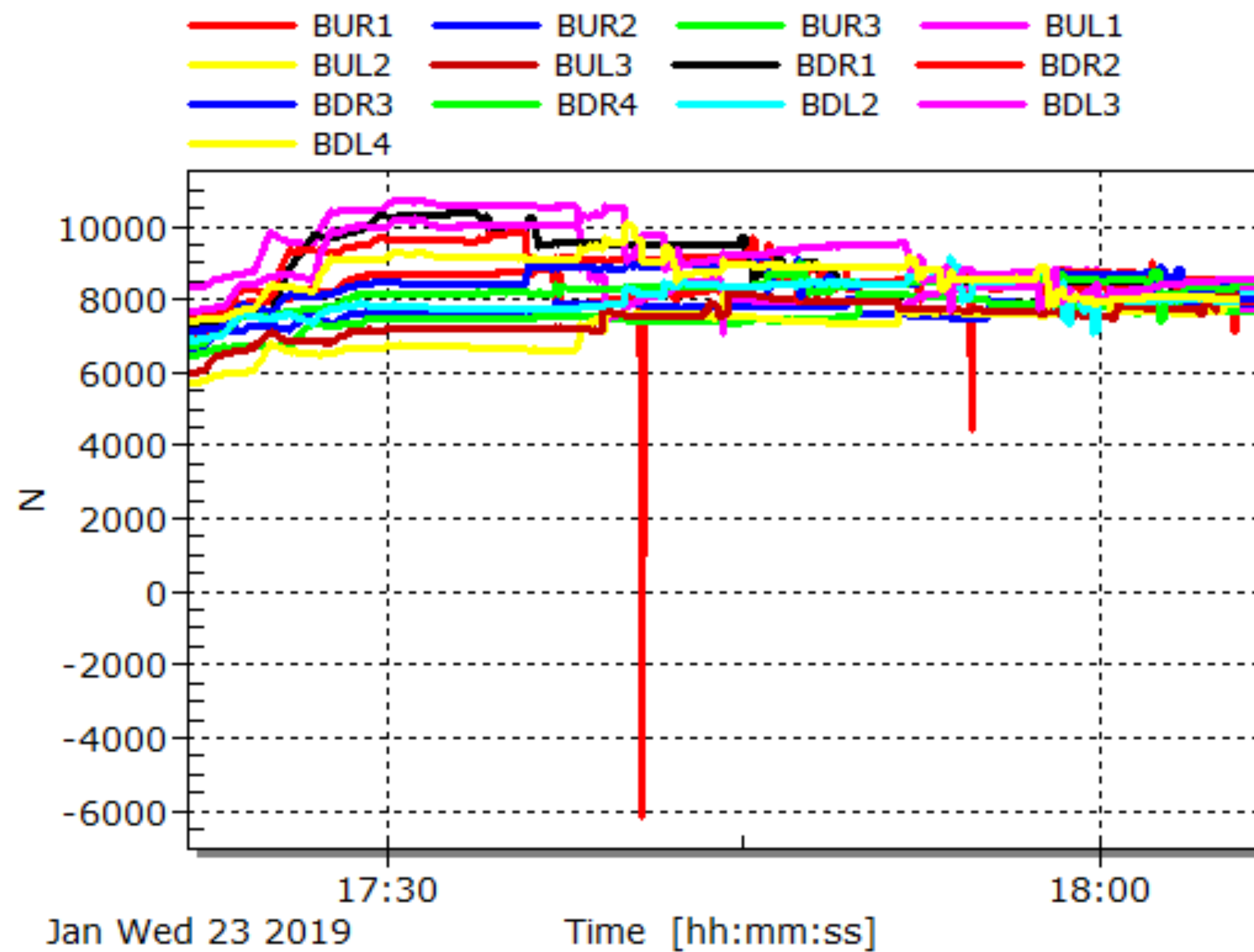
Bullet gages



Tie Rods



Final "B"s Readings



Cursor and Annotations

Cursor Annotations

Snap cursor 2 Auto Format

Channel	Pos	Diff
X	23/01/2019 18:06:22	18:06:22
BUR1_oldBUL4[01]	8132 N	8132 N
BUR2_oldBUL3[01]	8050 N	8050 N
BUR3_oldBUL2[01]	7690 N	7690 N
BUL1_oldBDL1[01]	7891 N	7891 N
BUL2_oldBDR1[01]	7850 N	7850 N
BUL3_oldBDL2[01]	8068 N	8068 N
BDR1_oldBUR1[01]	8494 N	8494 N
BDR2_oldBUR2[01]	8370 N	8370 N
BDR3_oldBUR3[01]	8356 N	8356 N
BDR4_oldBUR4[01]	8340 N	8340 N
BDL2_oldBDR2[01]	7945 N	7945 N
BDL3_old BDR3[01]	8558 N	8558 N
BDL4_oldBDR4[01]	8010 N	8010 N

Summary

- ↪ "P"s readings are controversial
- ↪ "R"s readings are good, but many channels are missing
- ↪ "B"s readings are good, but EXTREMELY sensitive

- ↪ Overall, the information is partial and not always clear, but I see no show-stoppers

- ↪ The interaction between ASG, INFN and CERN for the SGs installation and monitoring was cumbersome and ineffective