DP102-briefing mechanics

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Mechanical instrumentation and measurements where carried out by our colleagues from EN-MME
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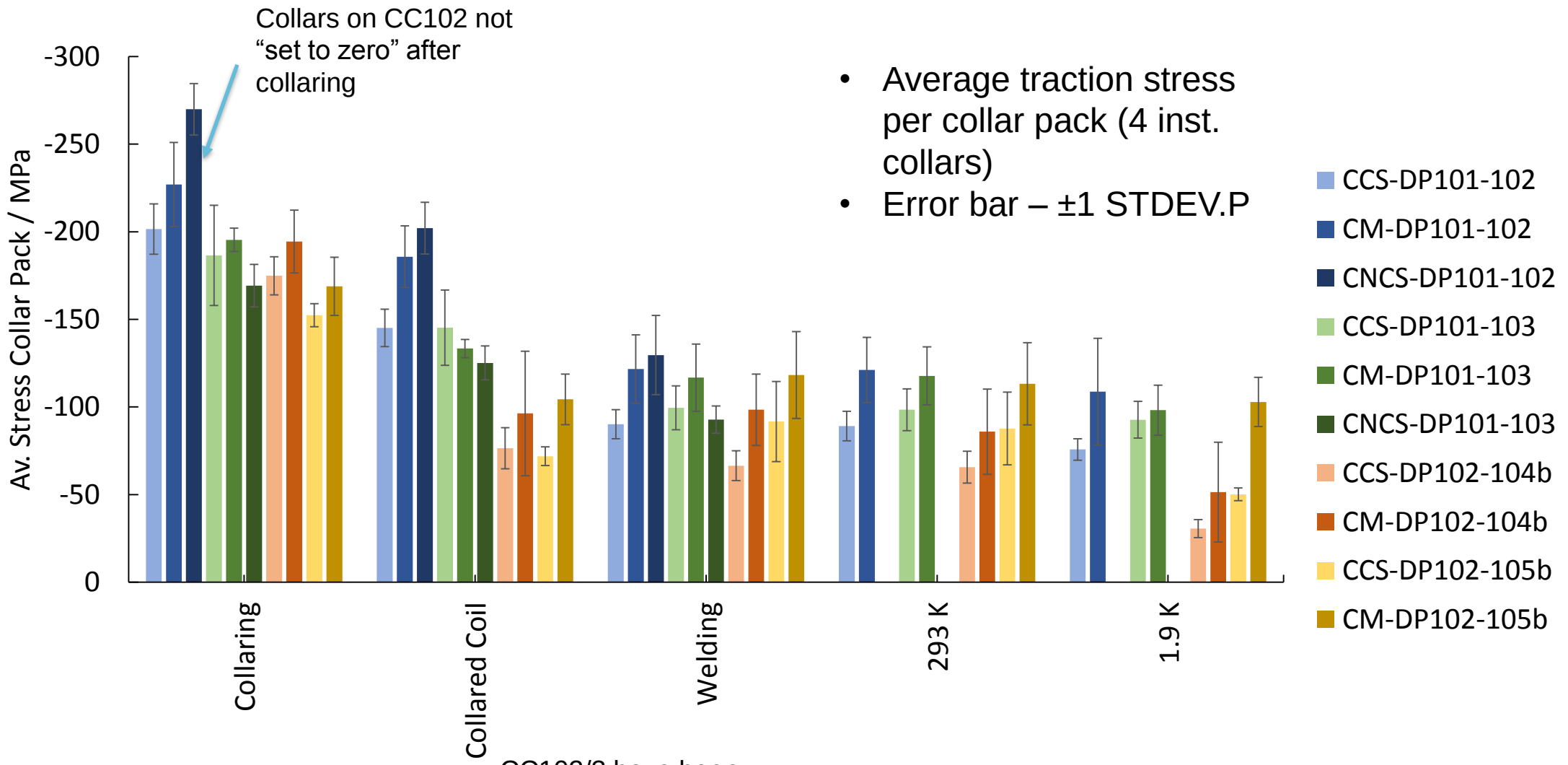
content

- Collars
  - Assembly
  - Cold Test
- Shell
  - Comparison with DP101
  - Cold Test
- Bullets

Collars – comparison DP101-DP102



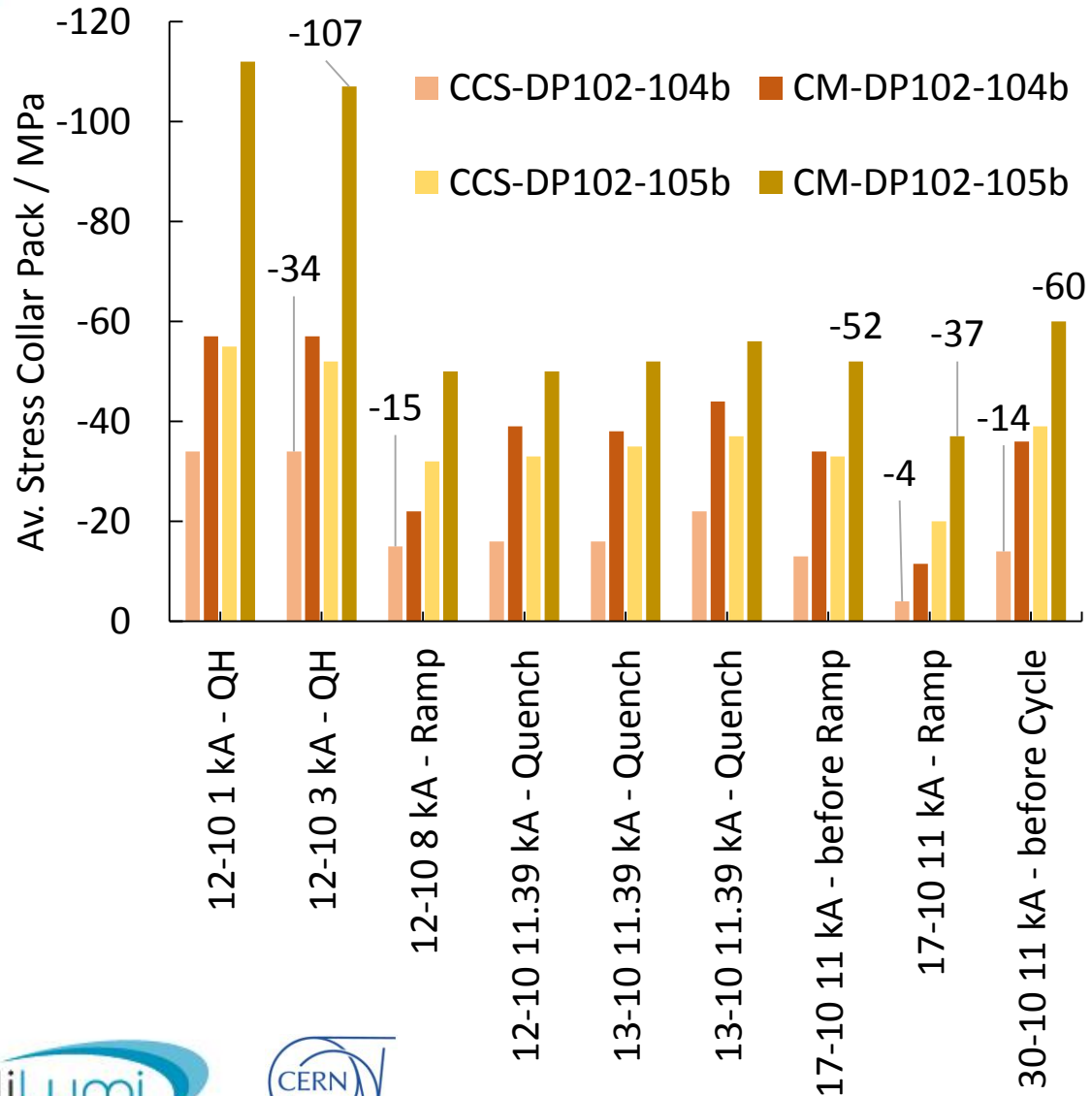
- Average traction stress per collar pack (4 inst. collars)
- Error bar – ±1 STDEV.P

CC102/3 have been prior tested in a 1in1 structure

Collars – DP102

- Showing the average per collar pack
  - CCS_104_Mean = av(CCS1+CCS2+CCS3+CCS4)
  - One pole is carried by 40 collar noses
  - We don’t know the sensitivity of single collars to their surrounding structure
- Measuring system was switch form AC to DC, AC data will not be shown

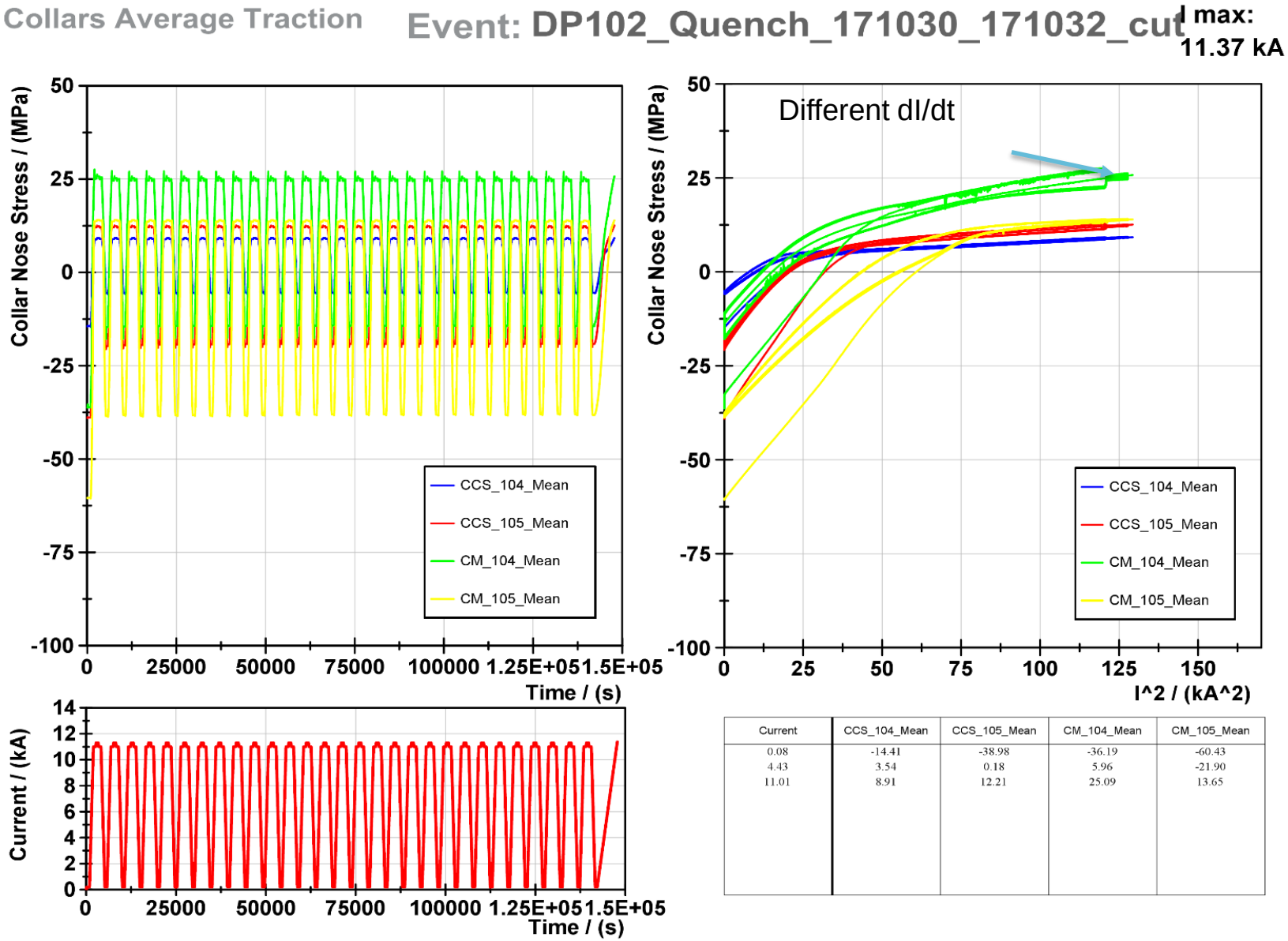
Collars – DP102



- All data shown is **after** the event
- Highest reduction of stress after first ramp to 8 kA
- Influence of previous events also confirmed for DP102
- *Is the system stable?*

Collars – DP102

- *Yes*
- after 29 cycles to 11 kA no change is visible
- The magnet was quenched before the cycling
- Measured signals are sensitive to the ramp rate

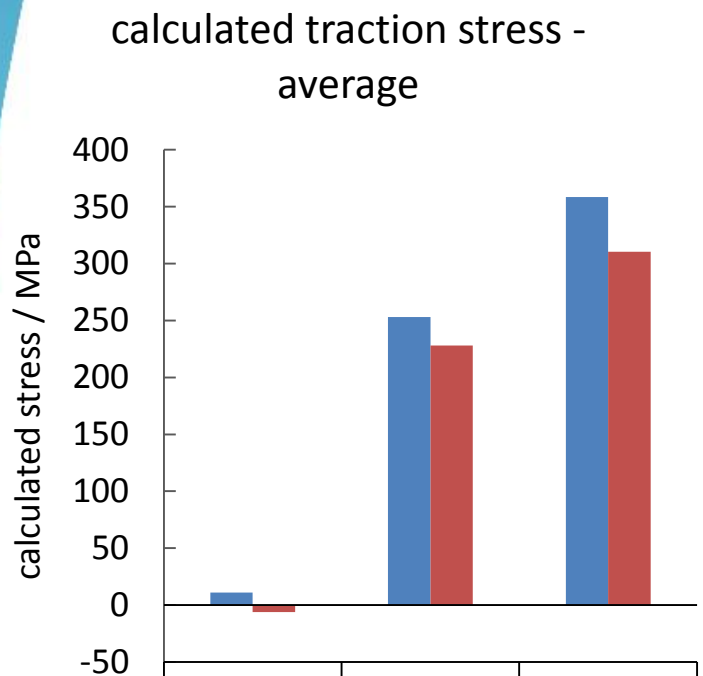


Current	CCS_104_Mean	CCS_105_Mean	CM_104_Mean	CM_105_Mean
0.08	-14.41	-38.98	-36.19	-60.43
4.43	3.54	0.18	5.96	-21.90
11.01	8.91	12.21	25.09	13.65

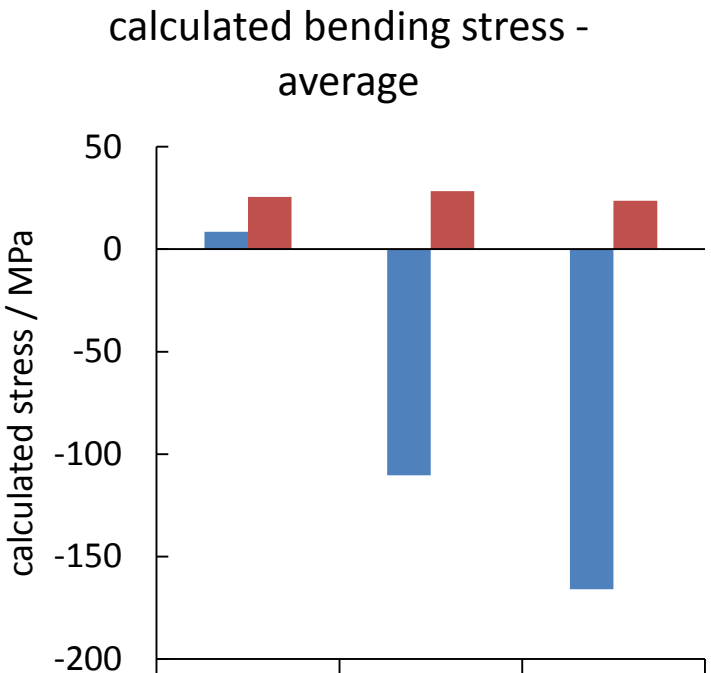
Collars – DP102

- Lowest measured stress levels in the 11T's collar noses until today
- DAQ was changed from AC to DC to remove the "noise" from the signal
- Results should be treated witch care
  - Reason for "noise" unknown
  - Physically impossible for the collar noses to go in traction

Shell – DP102



	welding press	after welding	1.9K
DP101	11	253	359
DP102	-6	228	310

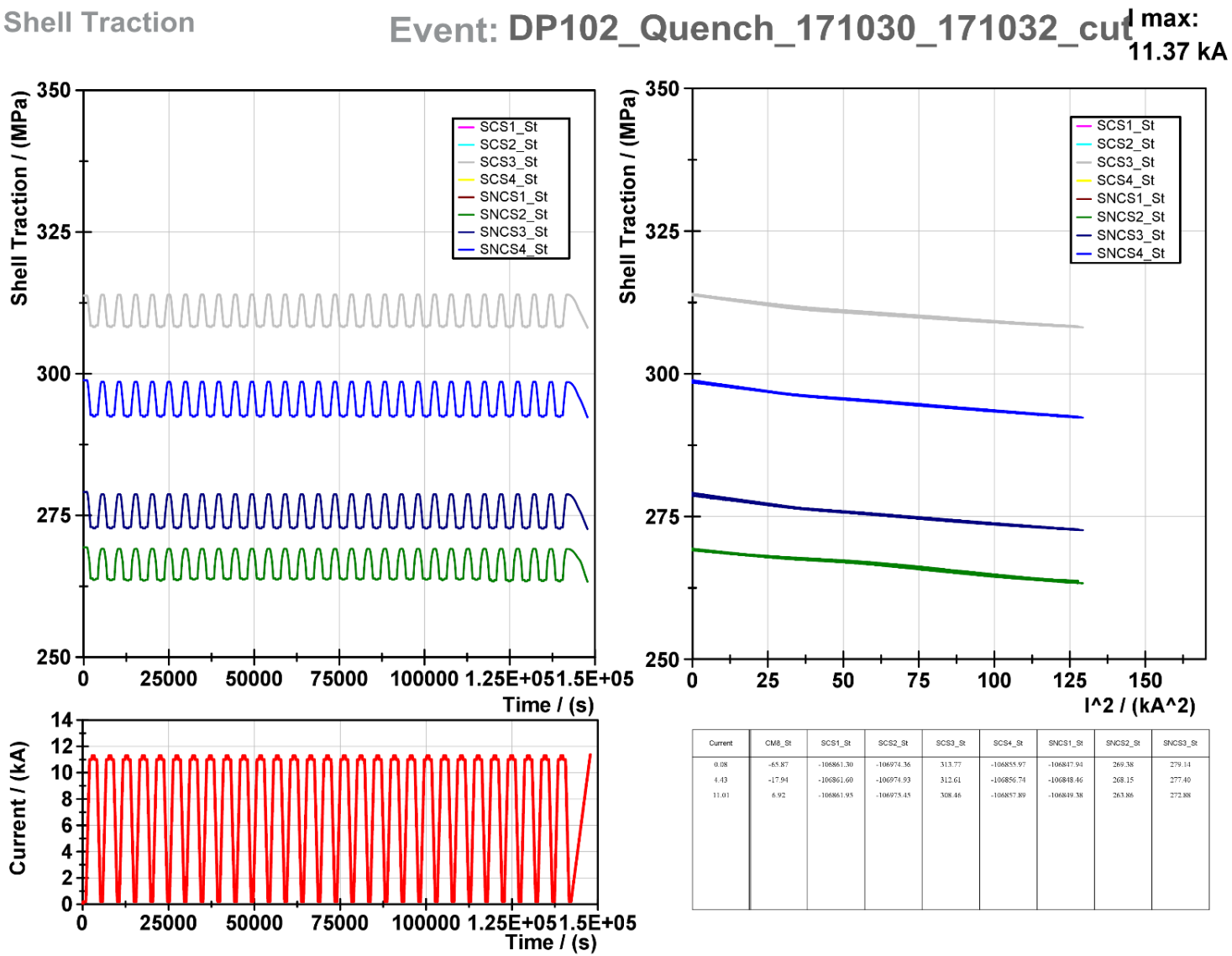


	welding press	after welding	1.9K
DP101	9	-110	-166
DP102	26	28	24

- 8 pairs of strain gauges on the inner and outer shell
- Double quarter bridge with thermal compensator
- Half of the strain gauges are lost
- Shell is “reformed” to fit the yoke diameter of DP102

Shell – DP102

- A traction delta < 8 MPa is measurable due to the Lorentz forces
- No drift over time visible
- No hysteresis
- No memory

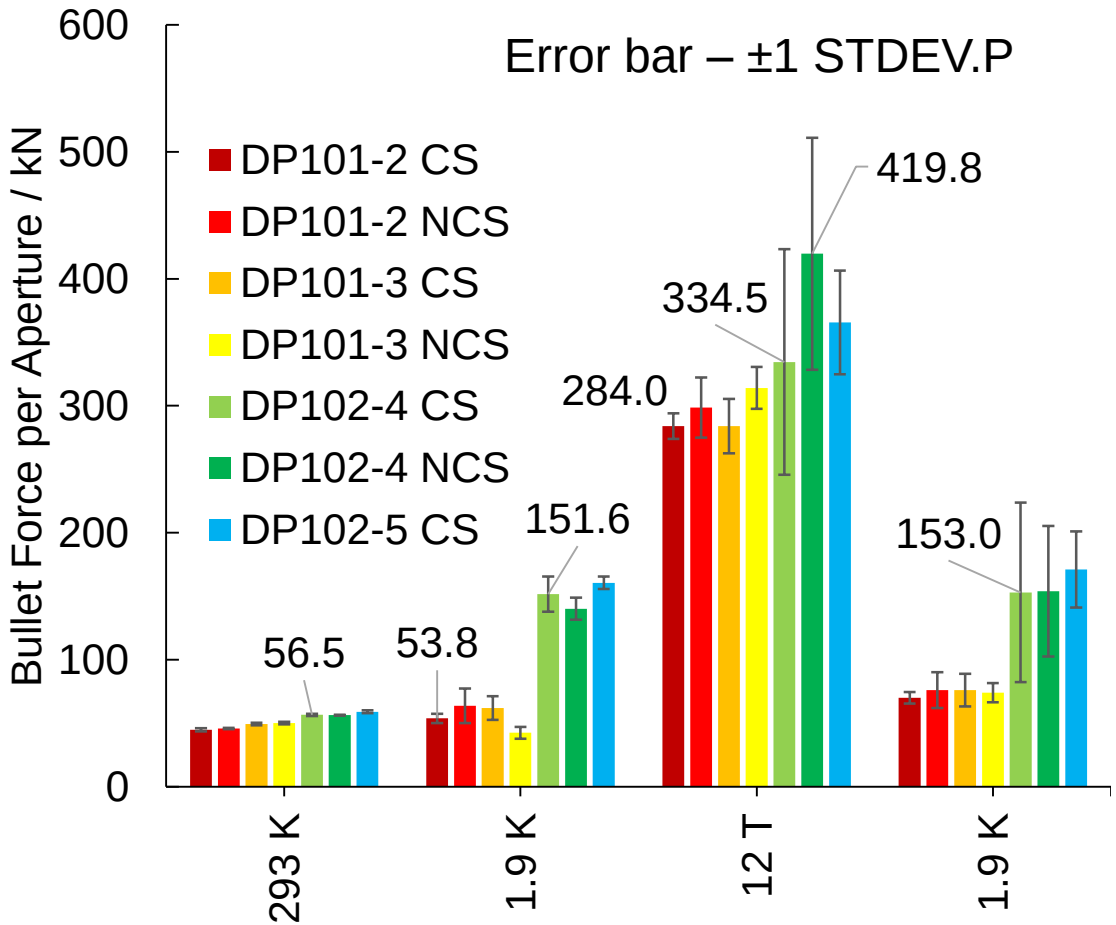


Current	CM8_St	SCS1_St	SCS2_St	SCS3_St	SCS4_St	SNCS1_St	SNCS2_St	SNCS3_St
0.08	-65.87	-106861.30	-106974.36	313.77	-106855.97	-106847.94	269.38	279.14
4.43	-17.94	-106861.60	-106974.93	312.61	-106856.74	-106848.46	268.15	277.40
11.01	6.92	-106861.95	-106975.45	308.46	-106857.89	-106849.38	263.86	272.88

Bullets / extremities – DP102

- In total 16 bullets, four per extremity
- Bullets on NCS of SP105b are dead
- Same assembly procedure as for DP101

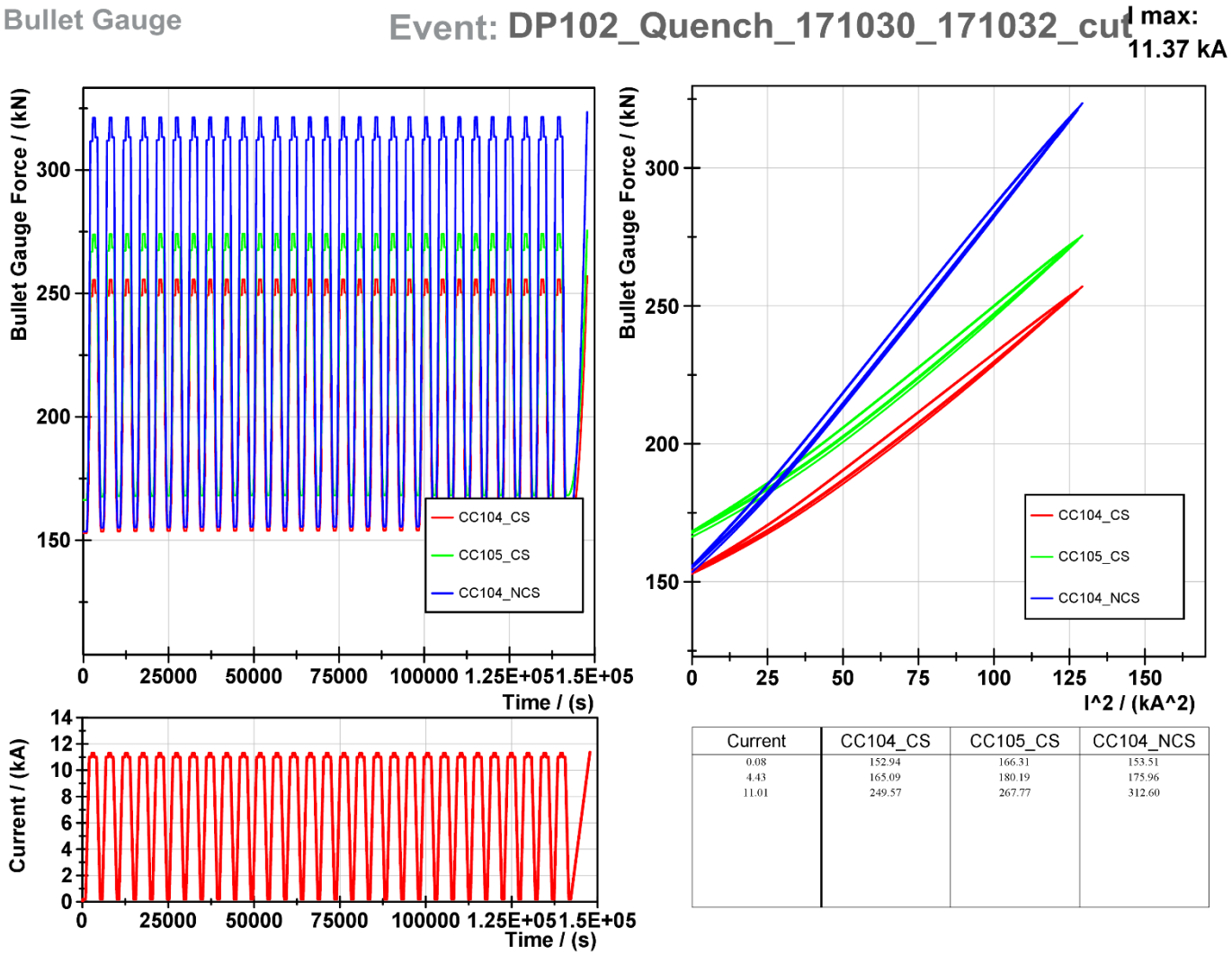
Bullets / extremities – DP102



- Comparison with DP101
- Average per extremity and aperture
- Same pre-compression at RT
- Forces scaled to 12 T
- Factor three increase after cool down of pre-compression
- Small difference between CS and NCS visible for DP101

Bullets / extremities – DP102

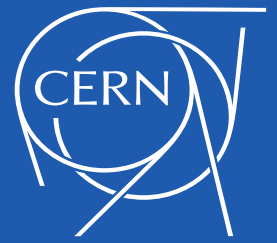
- Bullets are stable
- No permanent movement after the first powering cycles
- No hysteresis
- No memory



Current	CC104_CS	CC105_CS	CC104_NCS
0.08	152.94	166.31	153.51
4.43	165.09	180.19	175.96
11.01	249.57	267.77	312.60

conclusion

- Lowest measured pre-stress in the collars
  - Trend of curves suggest that the pre-stress is higher in the center of the magnet
  - Kink clearly visible
- Different bending was measured in the Shell
  - Could be due to lost strain gauges
- Bullets have a massively increased pre-compression after cool down
  - Reason unknown
  - Highest measured force on End-Plate until now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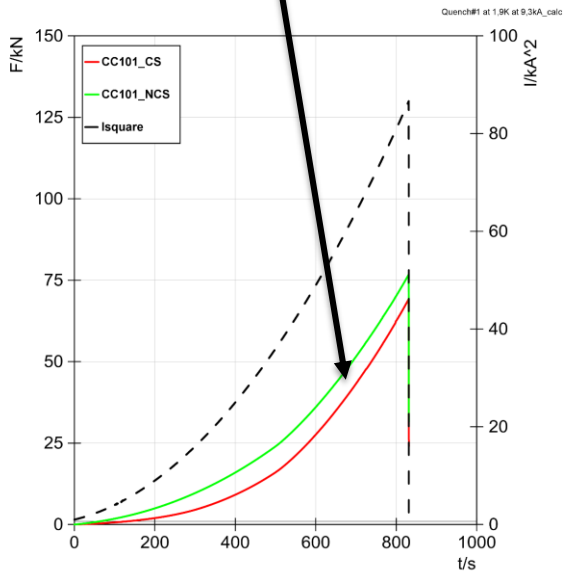
Extremities DS11T – measured force per extremity on the end-plate

Increase of force during excitation



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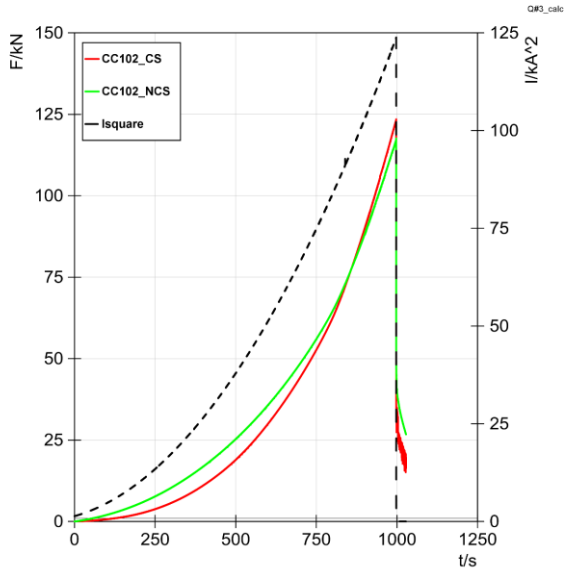

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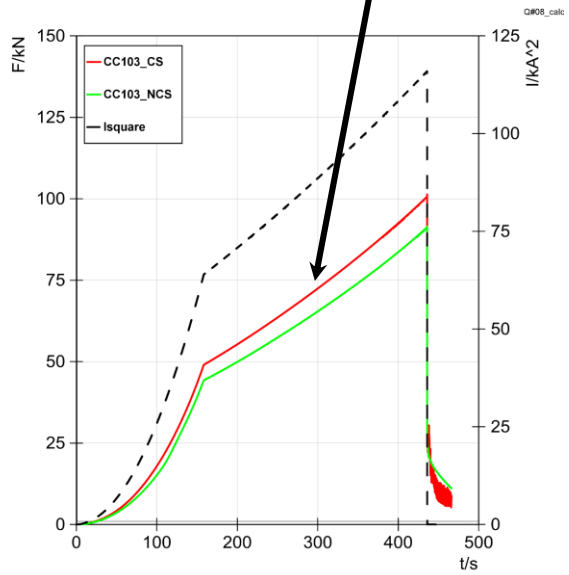
Average of one extremity per aperture



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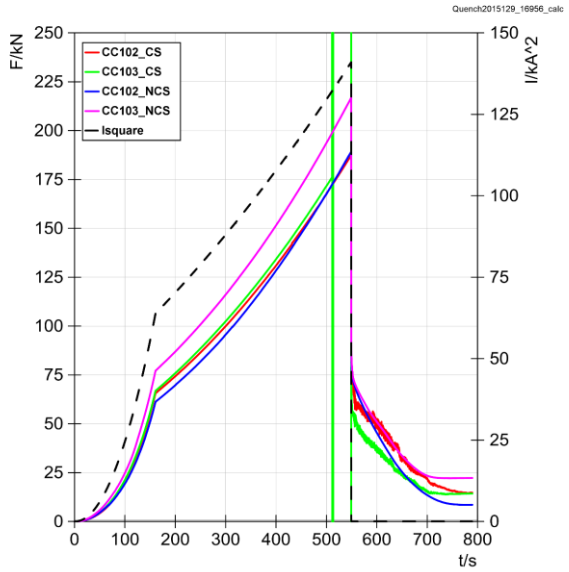

MBHDP101

Bullet response over current – offset to zero - illustrative graphs

Mech. Behaviour in longitudinal direction