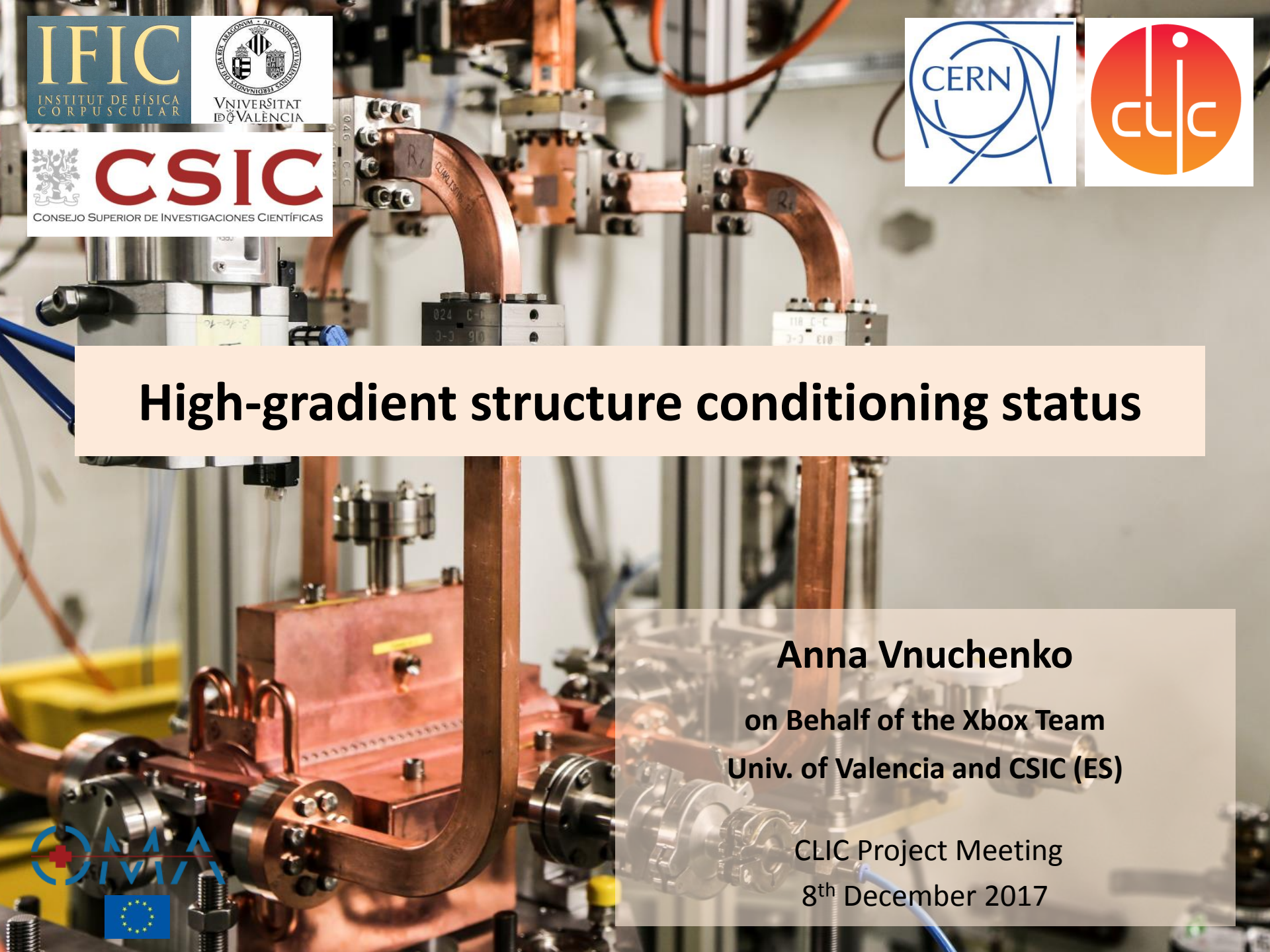


High-gradient structure conditioning status

Anna Vnuchenko

on Behalf of the Xbox Team

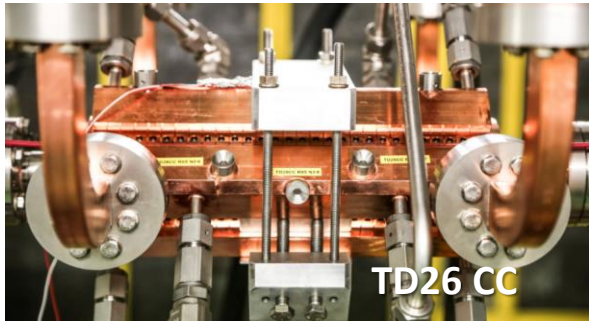
Univ. of Valencia and CSIC (ES)

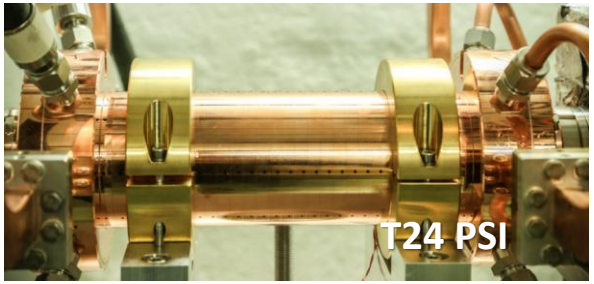
CLIC Project Meeting

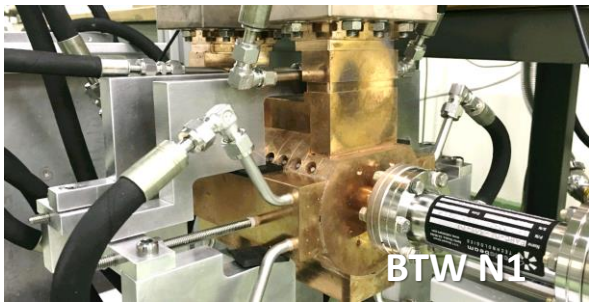
8th December 2017

Outline

- X-band testing facilities:
  - Xbox1 - TD26CC R05 N2
  - Xbox2 - TD24 PSI N1 (move from XBox3)
  - Xbox3:
    - Line 3: TD24 R05 SIC N2
    - Line 4: TD24 PSI N2
- S-band test stand:
  - Sbox - BTW N1
- Summary and future plan

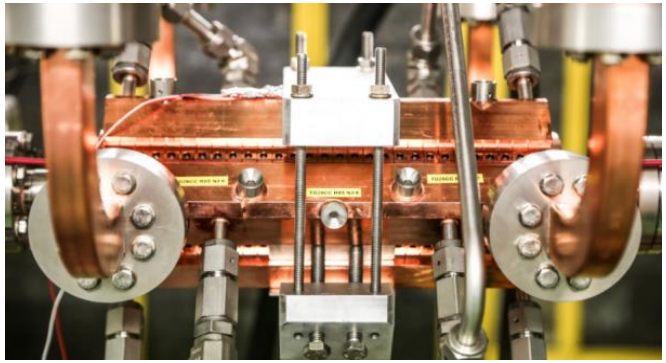


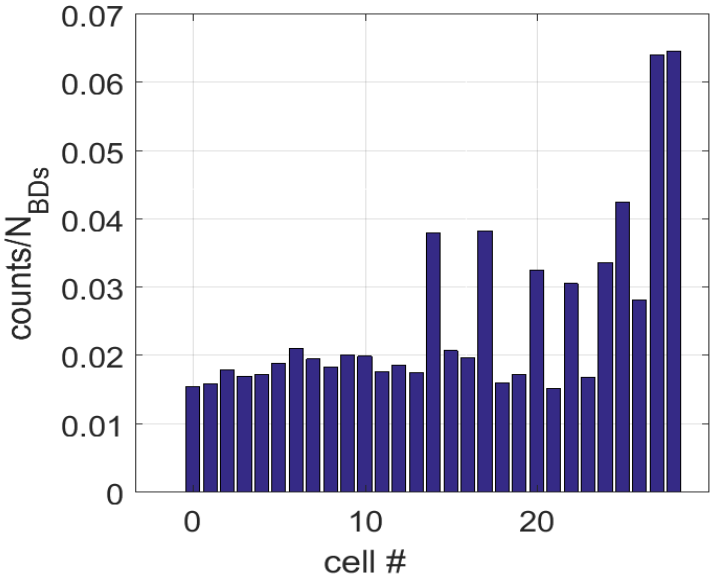


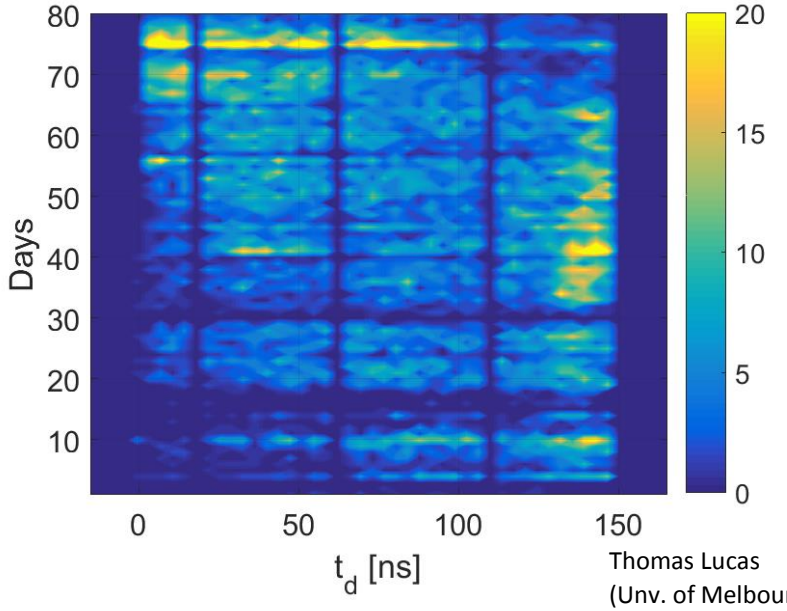


Xbox 1: TD26CC R05 N2

- High power test: 7.03.17-21.06.17.
- Description: CLIC Baseline Design, HOM Dampers, Compact Couplers.
- Reached 95 MV/m at 50ns pulse.
- Flat BD distribution across structure.



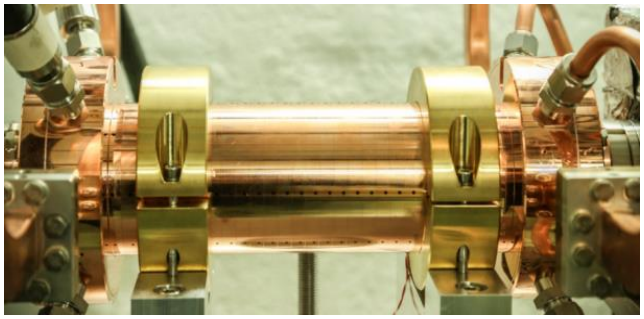


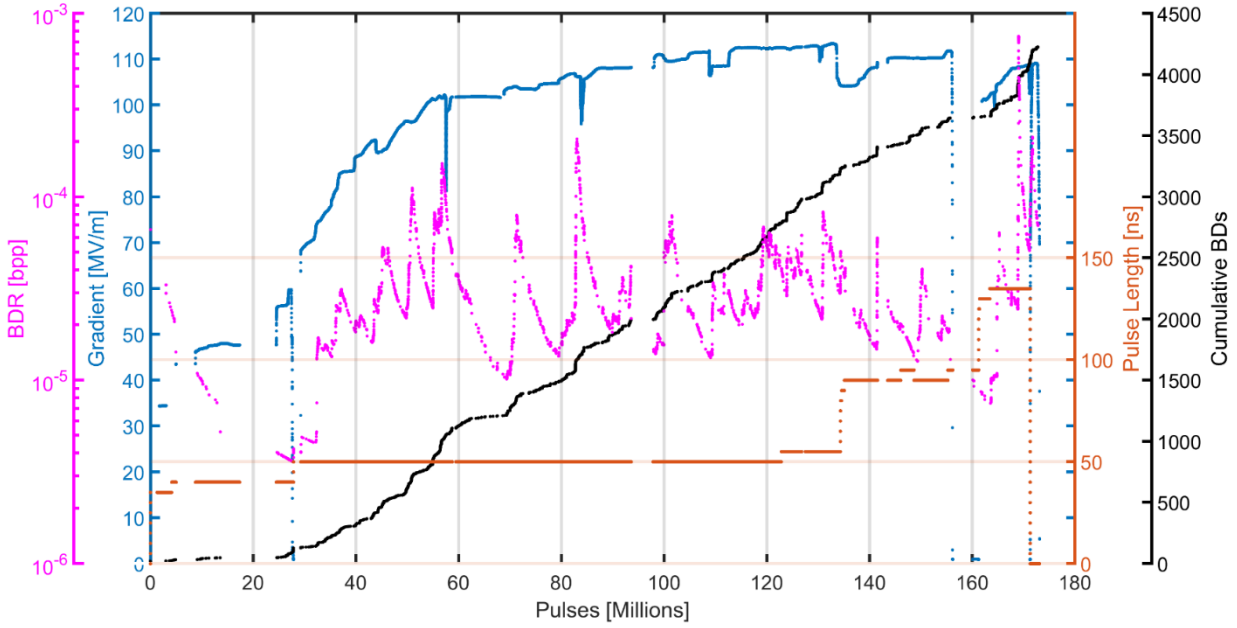


Thomas Lucas
(Unv. of Melbourne)

Xbox 2: TD24 PSI N1

- Moved from Xbox 3.
- Ongoing test since **5.10.2017**.
- Reached 117 MV/m at 50ns pulse.
- Conditioning limited due to BDR (2e-5 bpp).

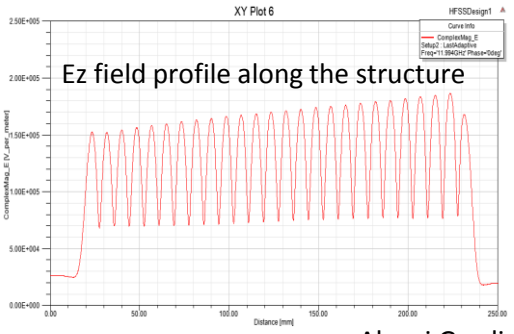




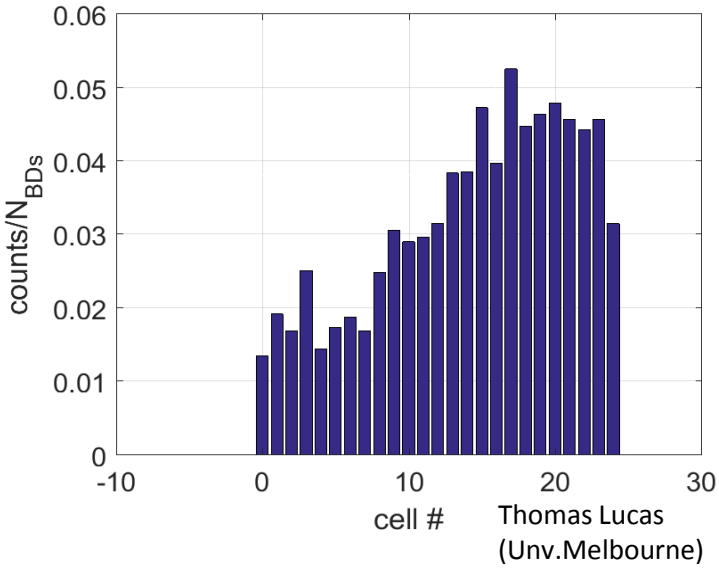
Conditioning History

Xbox 2: TD24 PSI N1

- **Before (Xbox 3):** BD distribution increases along the structure following the field distribution.

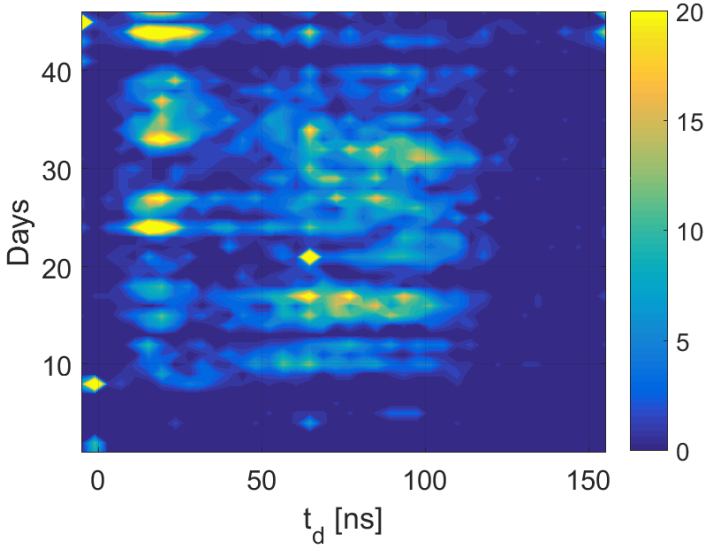


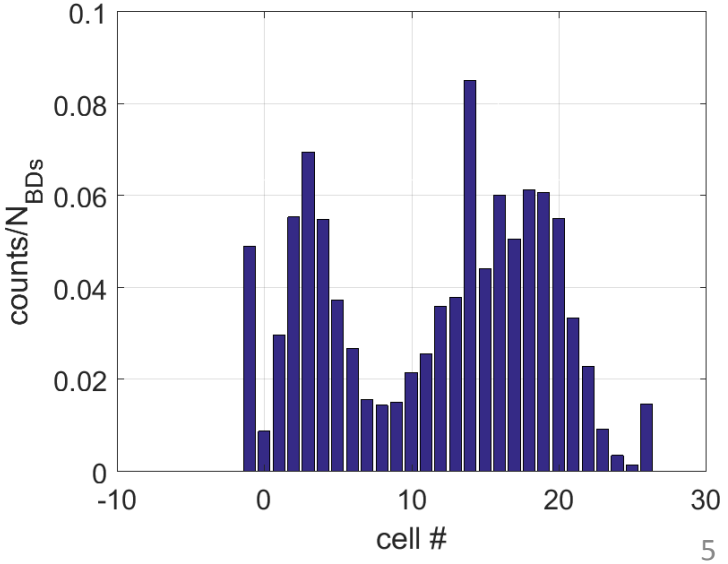
Alexej Grudiev (CERN)



Thomas Lucas (Unv.Melbourne)

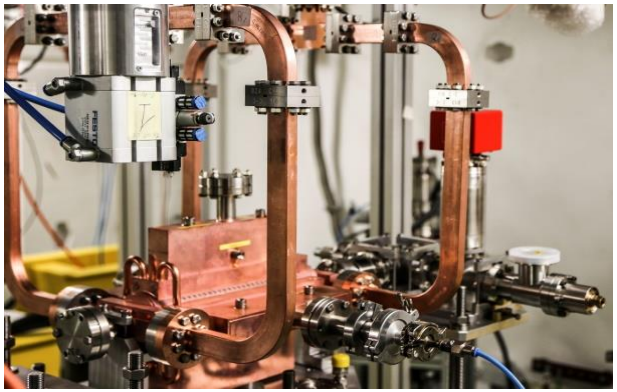
- **Now (Xbox 2):** well conditioning structure.

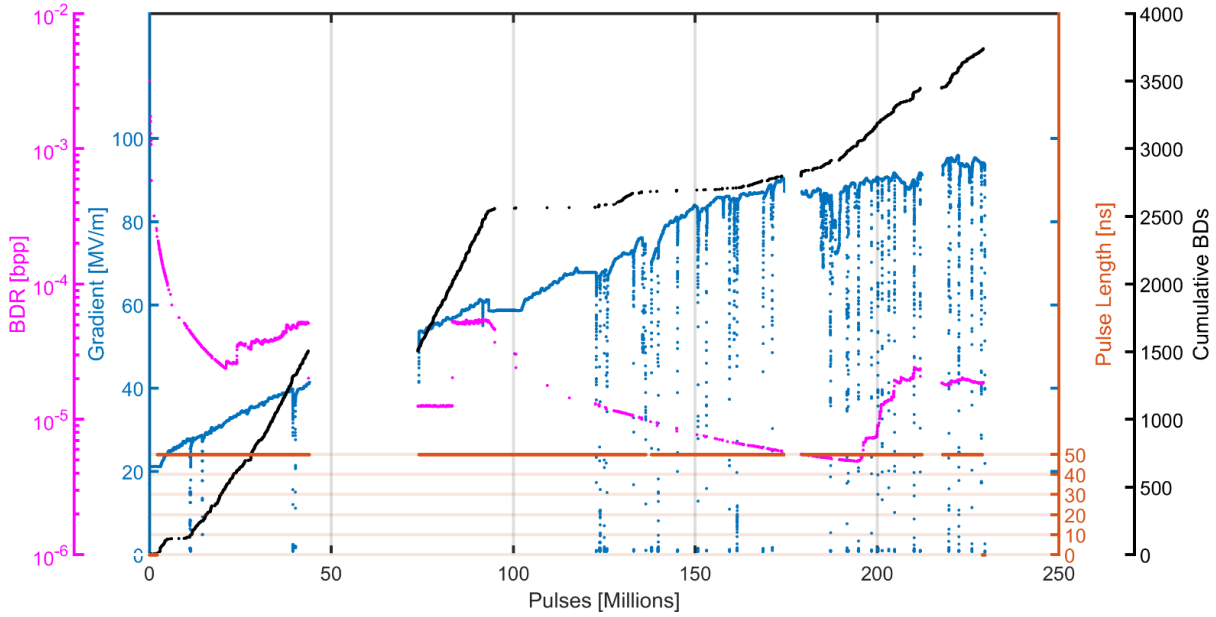




Xbox3 Line 3: TD24 R05 SiC 2

- Conditioning since **18.10.2017.**
- **Description:** Silicon Carbide accelerating structure (TD24 with HOM damping material).
- Reached 97 MV/m at 50ns pulse.

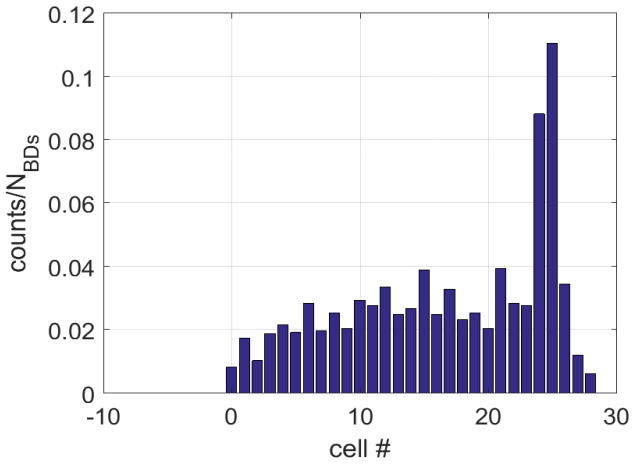


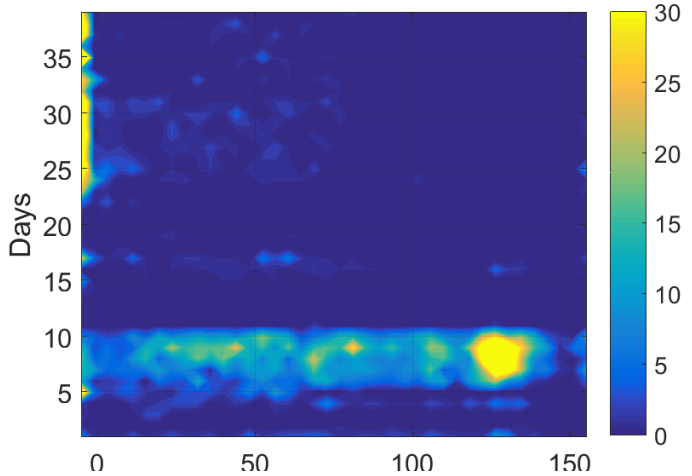


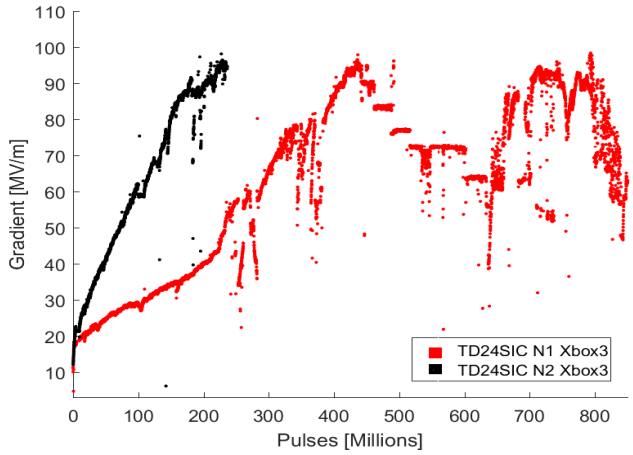
Conditioning History

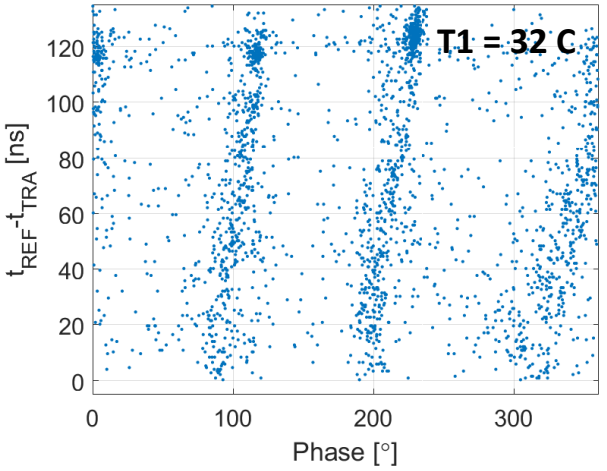
BD location: TD24 R05 SiC N2

- Not evidence of hot spot at this moment.
- Detuning of the structure due to high temperature.



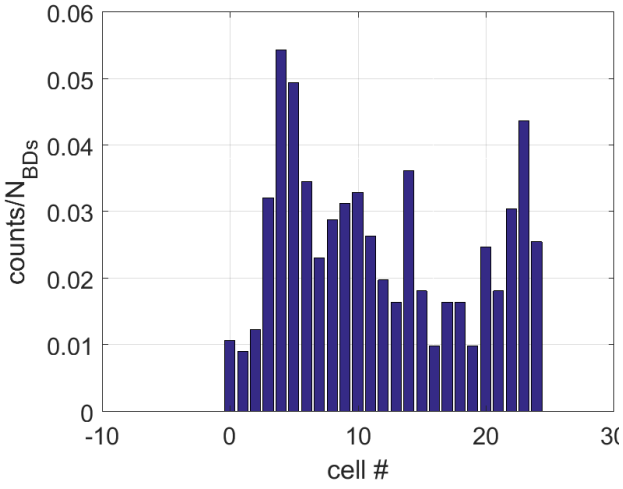


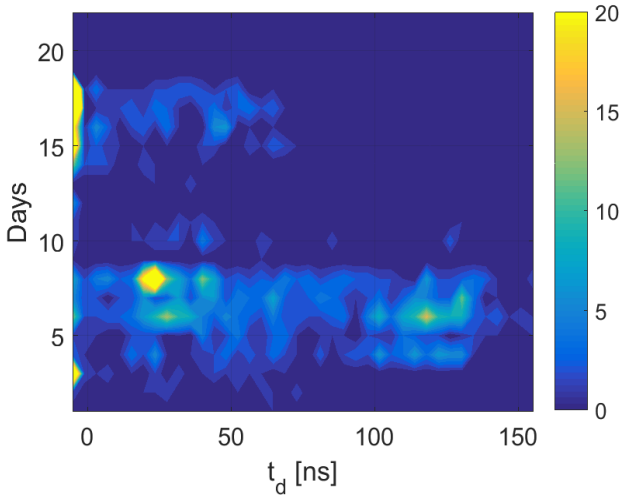


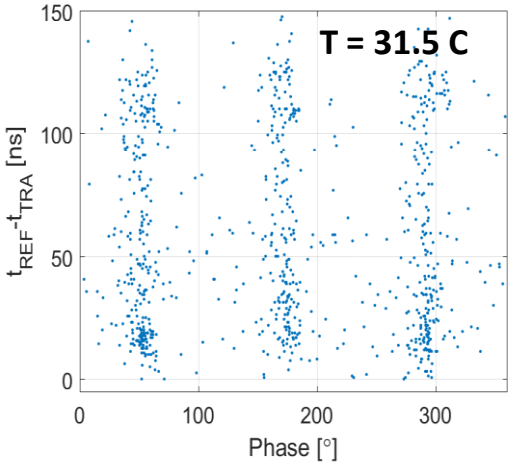


Xbox3 Line 4: TD24 PSI N2

- Conditioning since **18.10.2017**
- Description: Fabricated using PSI's new brazing technique.
- Reached 105 MV/m at 50ns pulse
- Pulsing at constant power (35MW) for BDR vs. pulse length measurements.

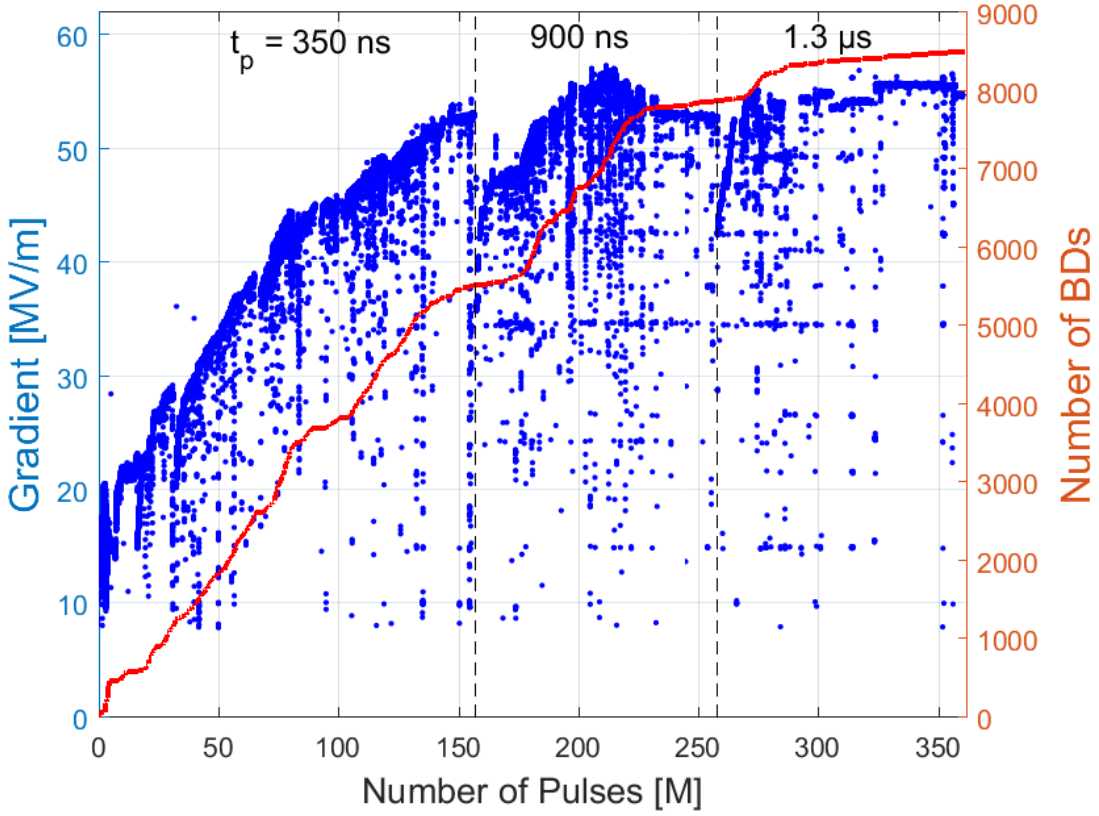




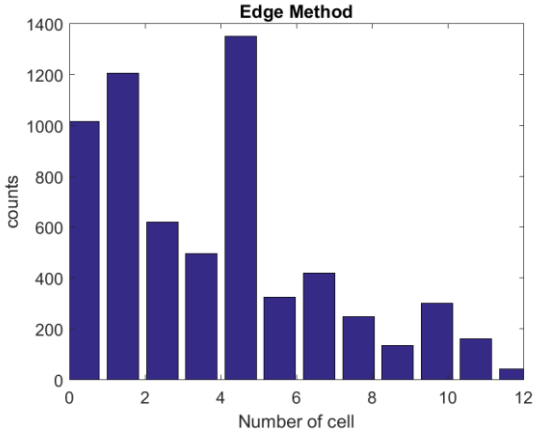


Sbox: BTW N1

- Backward Travelling Wave (BTW) structure tested at Sbox since November 2016.



KT medical proton structure

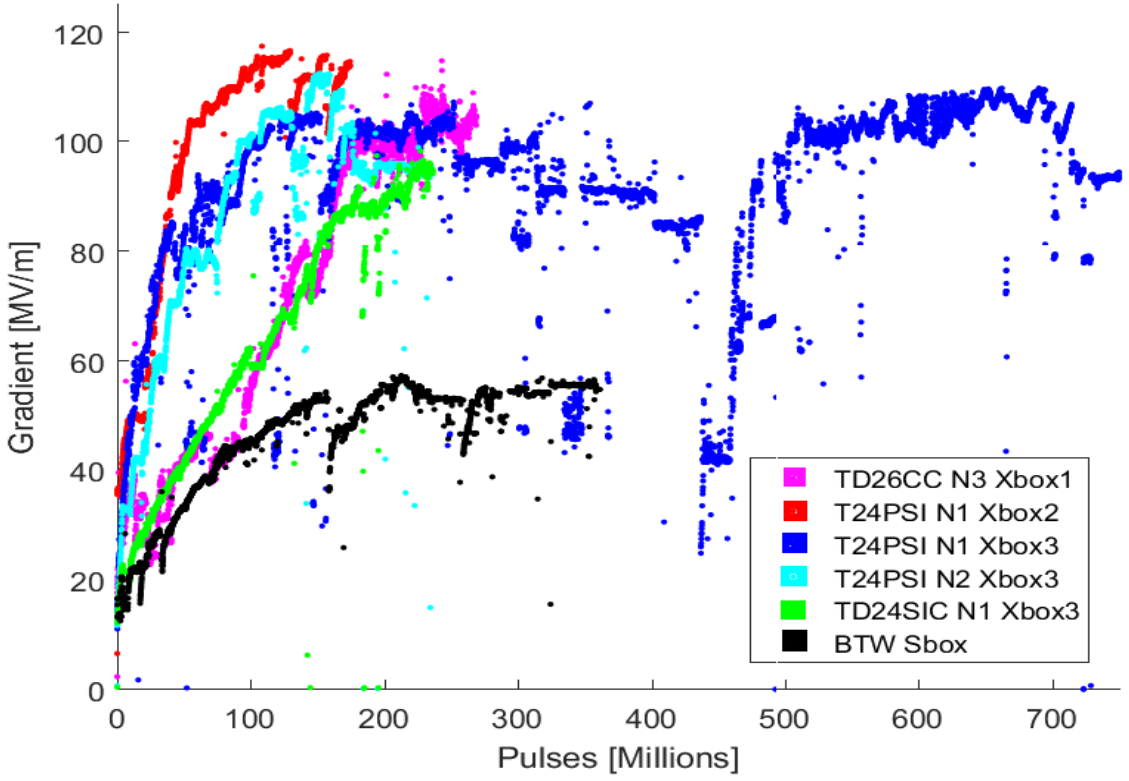


BD distribution

BTW: 350 ns 52 MV/m | 900 ns 55.6 MV/m | 1300 ns 54 MV/m

Comparison conditioning

- Conditioning algorithm strongly affects the conditioning progress.

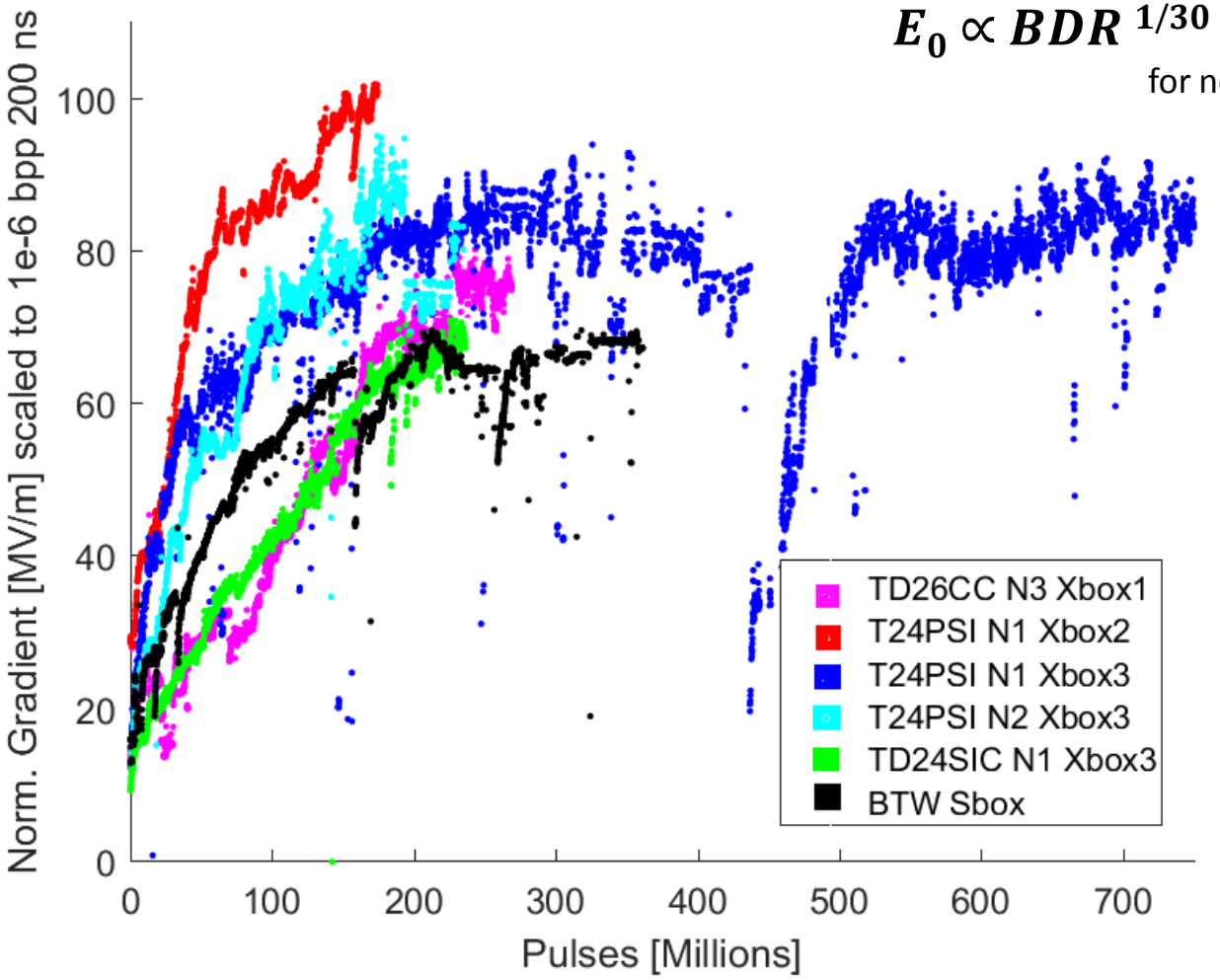


Comparison of the **gradient** of different prototypes tested at CERN.

Scaled gradient summary plot

$$E_0 \propto BDR^{1/30} * \tau^{-1/6}$$

for normalisation



Summery and next plans

- Five structures with 4 separate designs currently under test at CERN.
- Gradient of X band structures above 100 MV/m, S band - 56 MV/m.

- **TD24 PSI N2:**
  - complete the measurement:
    - BDR vs. pulse length measurements,
    - Dark current evolution;
  - move structure to Xbox 2 to complete high power test.

- **BTW N1**: to finish conditioning of the structure with higher power, determine limit of the structures.

- Study thermomechanical behavior of an undamped (PSI design) and a damped structure (CLIC design).

Thank you for your attention!