30 GHZ HIGH-GRADIENT ACCELERATING STRUCTURE TEST RESULTS

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- Typical testing history of a structure
- Brief description of the structures tested
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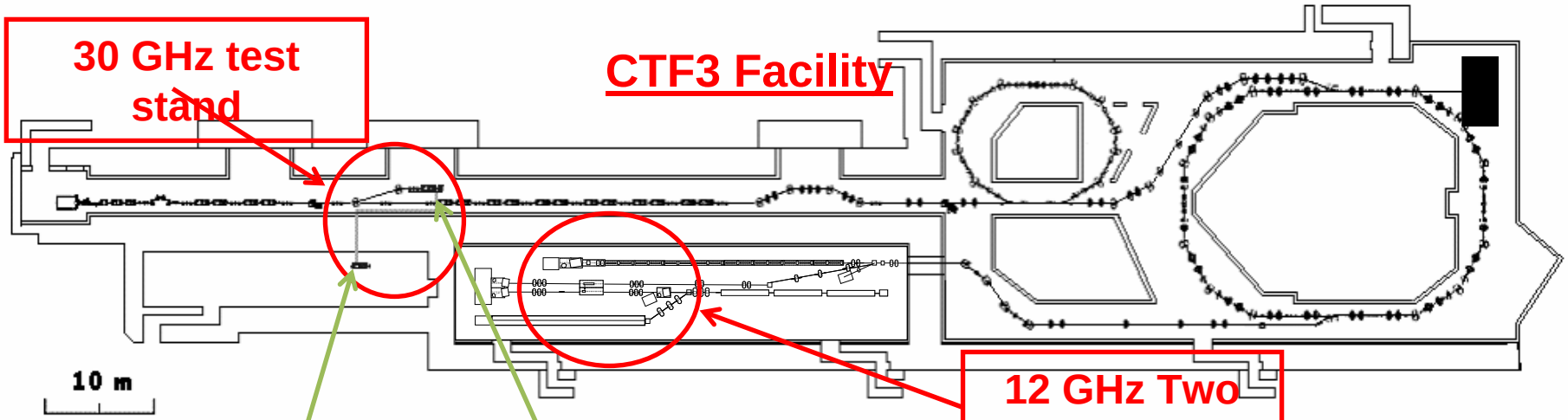
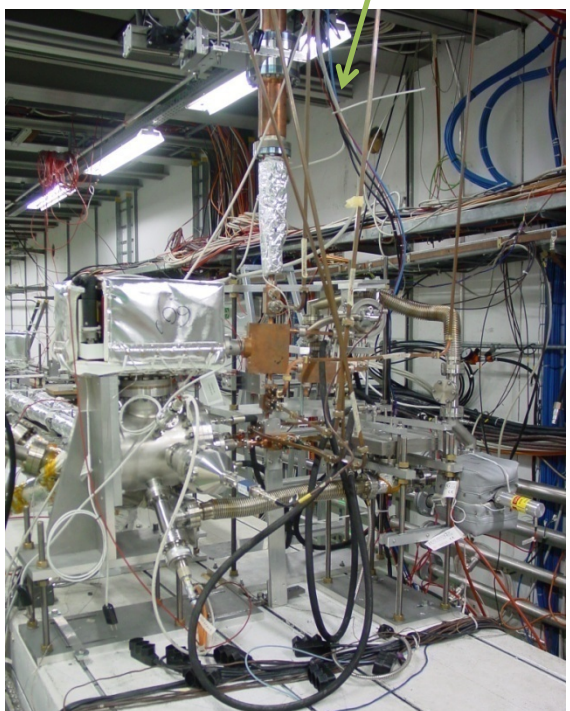
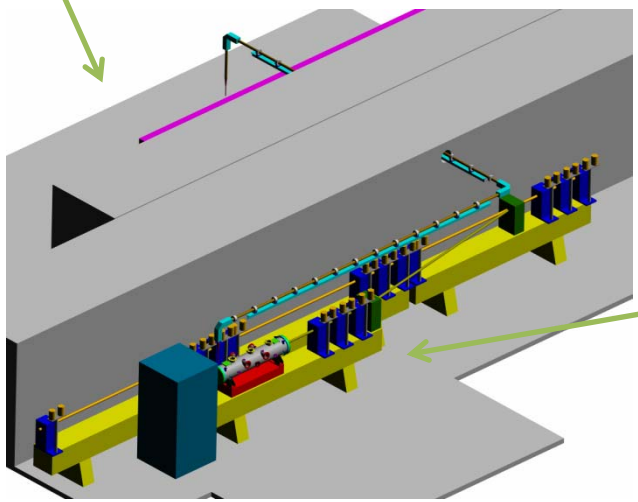
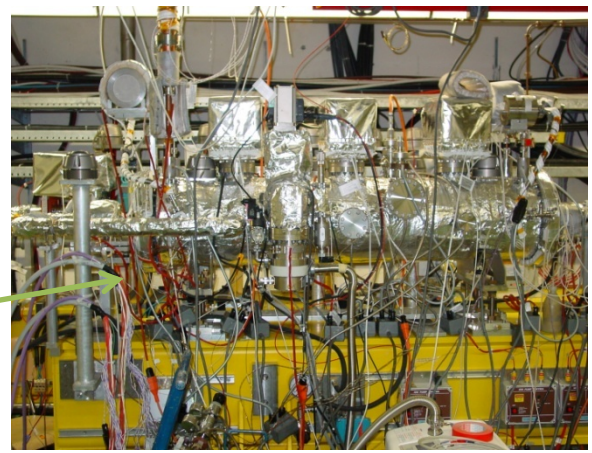
- Conclusions

High power Test-stand









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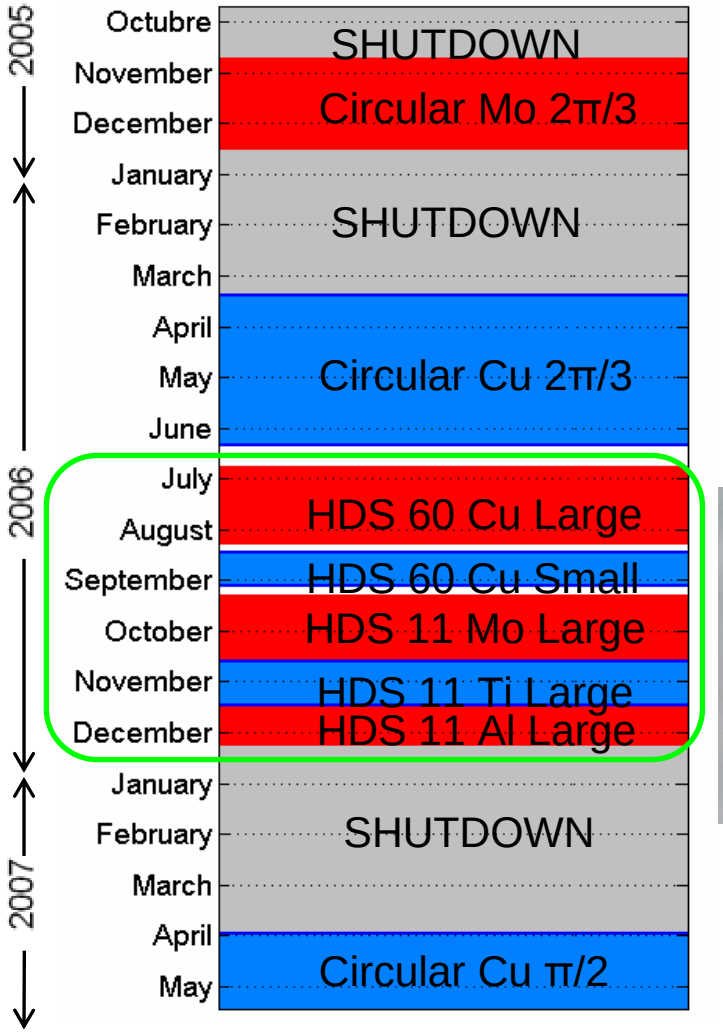
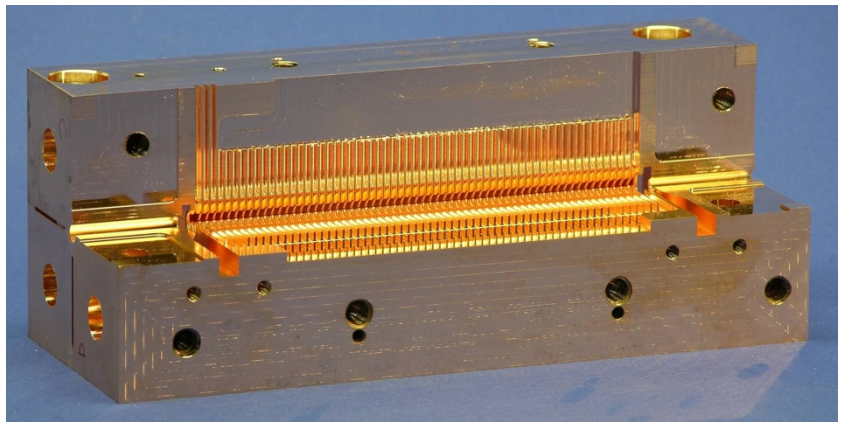
Testing history of a structur

- Installation …….. 7 days
  - Low level rf measurements
  - Leak checking
  - Pumping
- Initial conditioning …….. 7 days
- Intermediate characterization…….. 7 days
  - Breakdown rates vs. gradient @ 70 ns
- Final conditioning …….. 3 days
- Final characterization……... 20 days
  - Breakdown rates vs. gradient @ 70 ns
  - Breakdown rates vs. gradient @ 40 ns
  - Pulse length dependence
  - Dark currents and ion currents measurements
  - Investigation of dark current capture

Structures tested





	HDS60L [S]	HDS11
Frequency [GHz]	29.985	
Number of cells	60	11
Phase advance per cell	60º	
Beam aperture [mm]	1.9 [1.6]	1.9
v_g/c [%]	8 [5]	8
Fill time [ns]	5.2	0.8
E_{surf} / E_{acc}	1.8 [1.7]	1.8
P_{INC} [MW] for 100 MV/m in first cell	43.6 [24.0]	43.6

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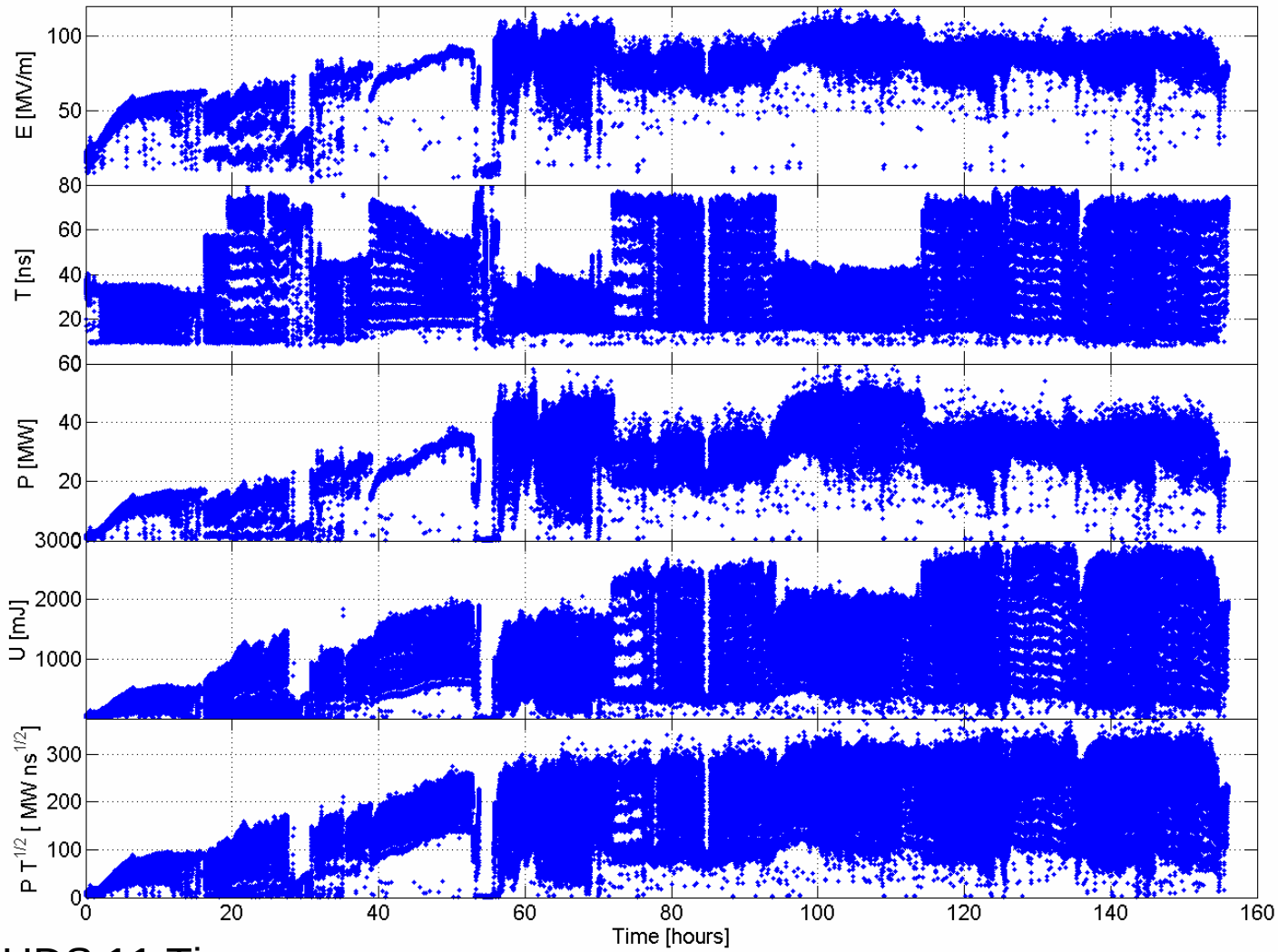
Conditioning history



HDS 11 Ti

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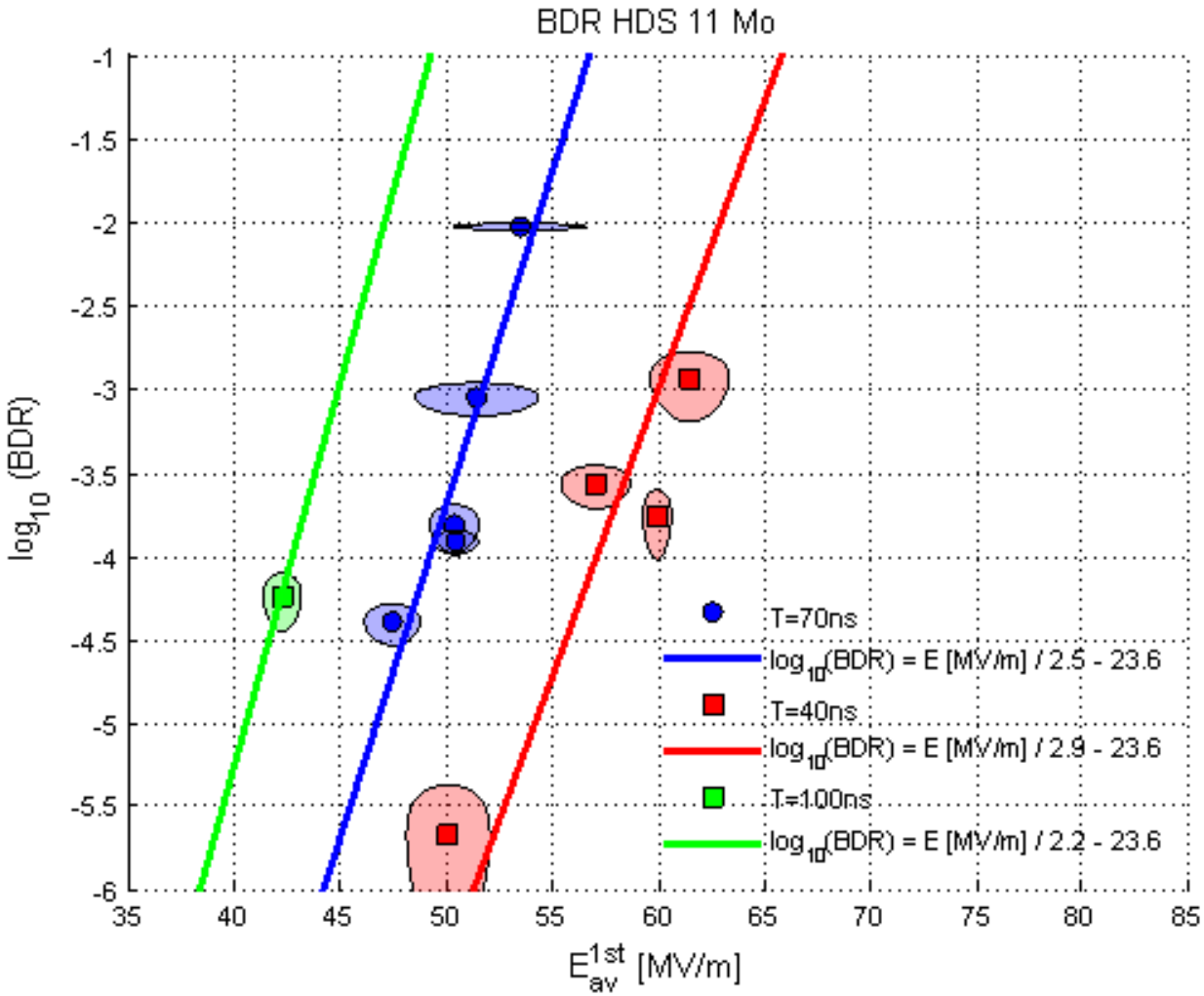
Breakdown rates



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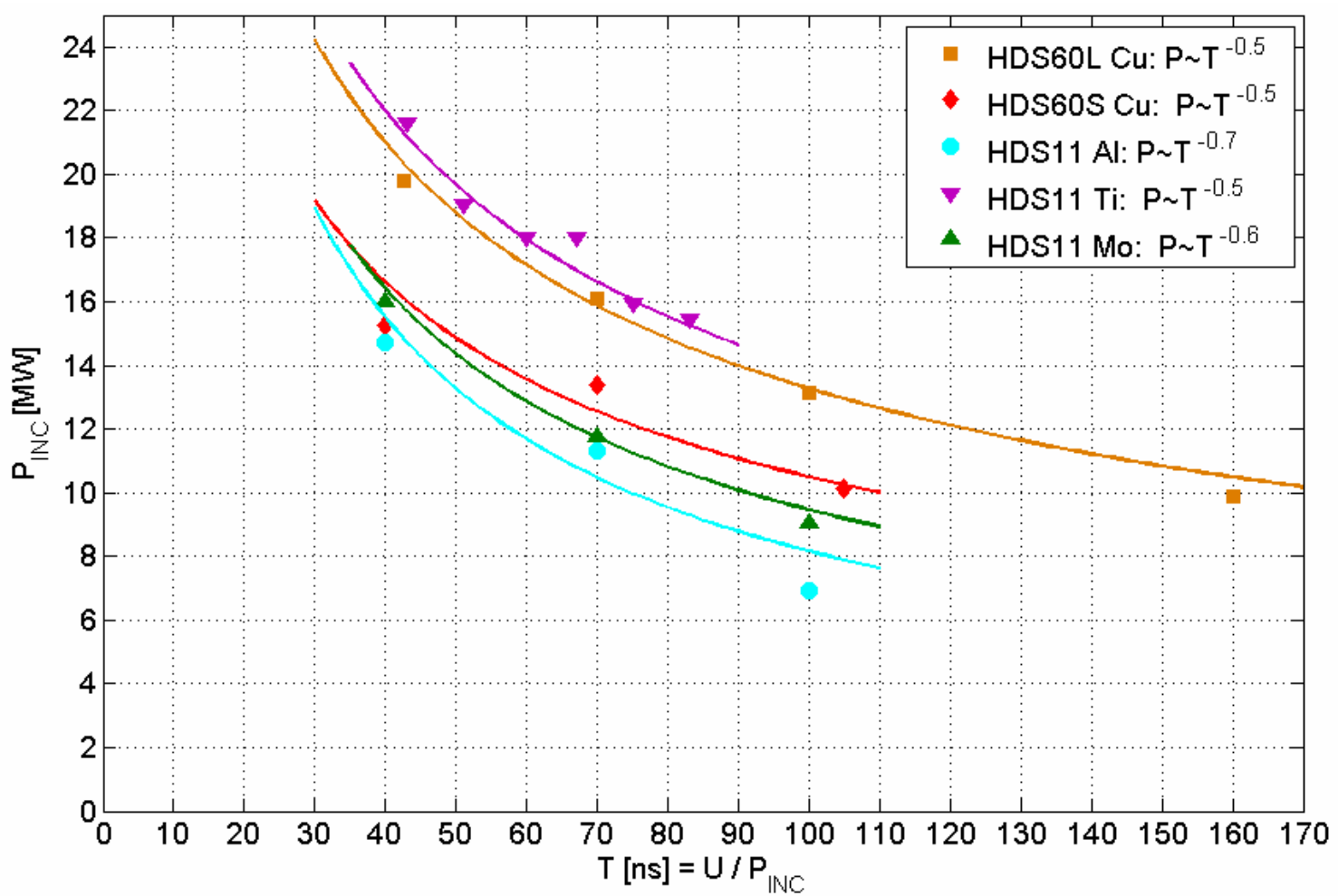
Pulse length dependance



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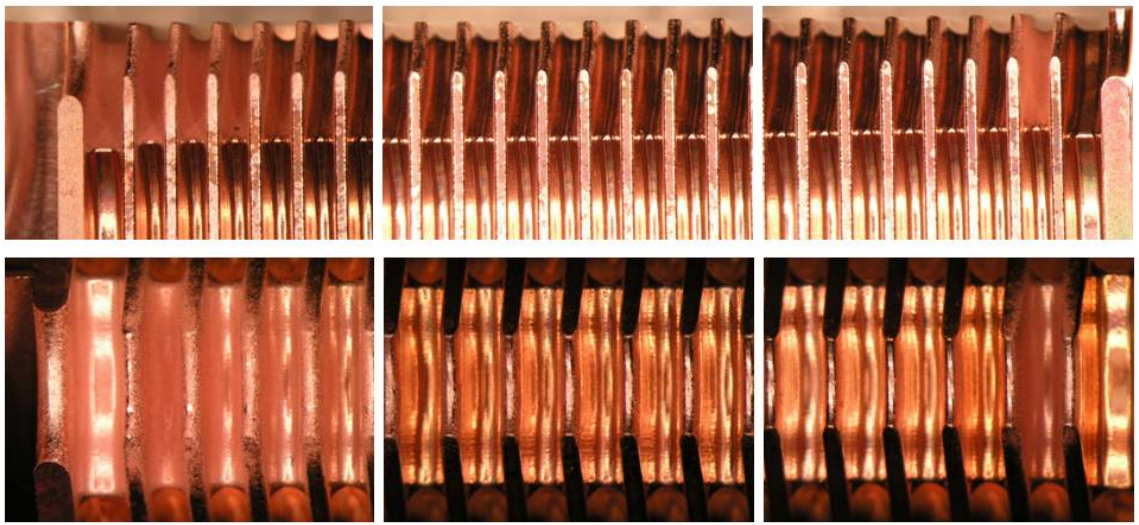
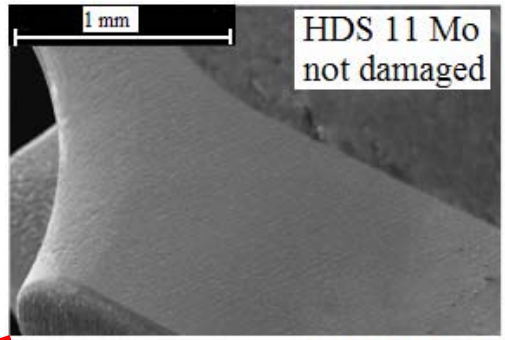
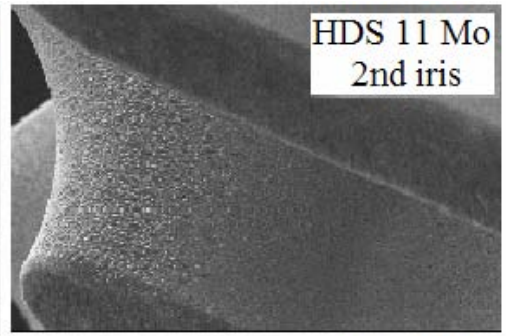
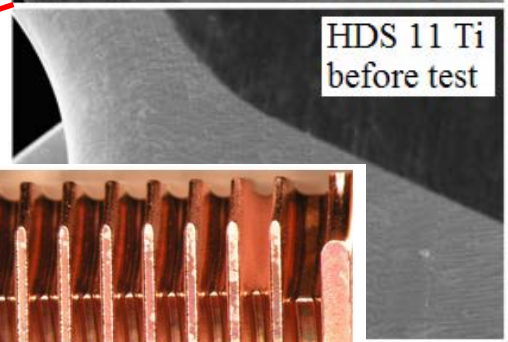
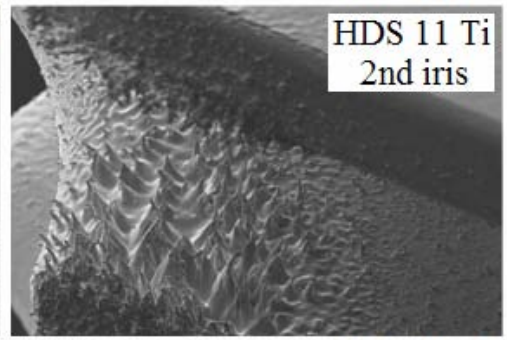
Inspection of the surface

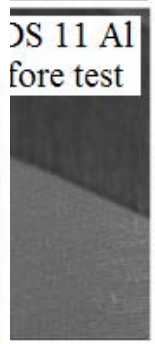


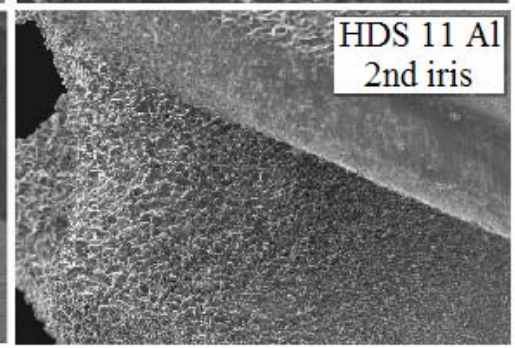












P_{INC} → HDS 60 L

P_{INC} ← HDS 60 S

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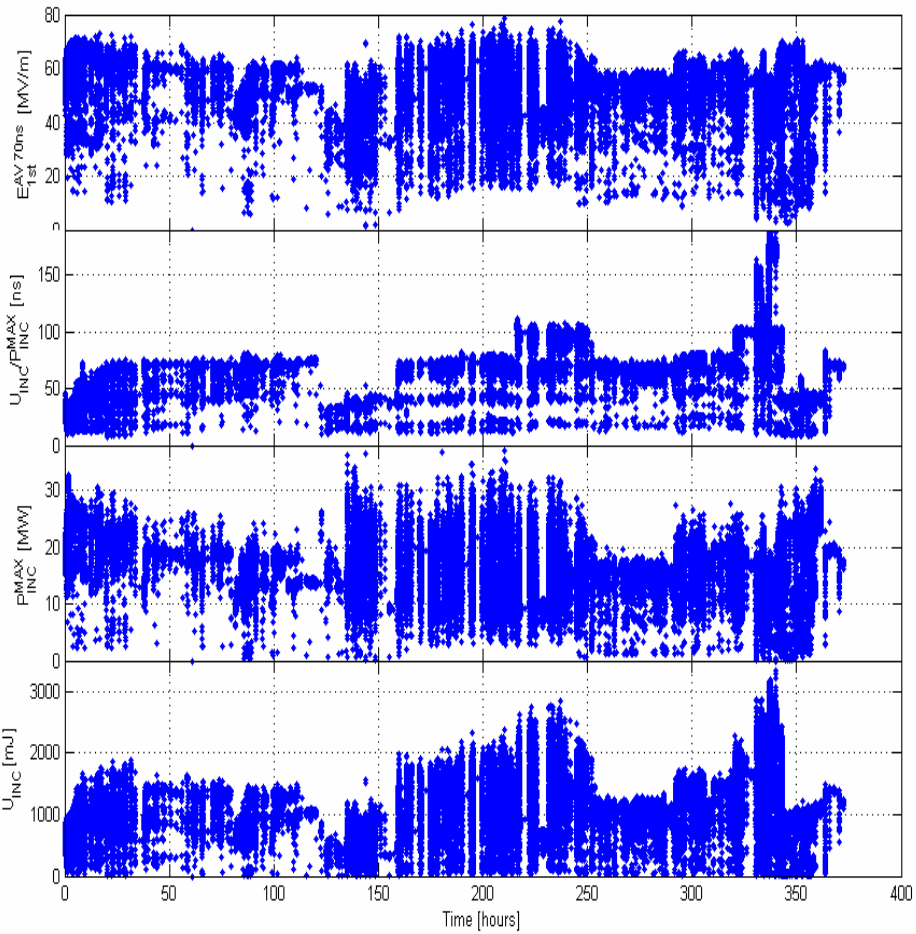
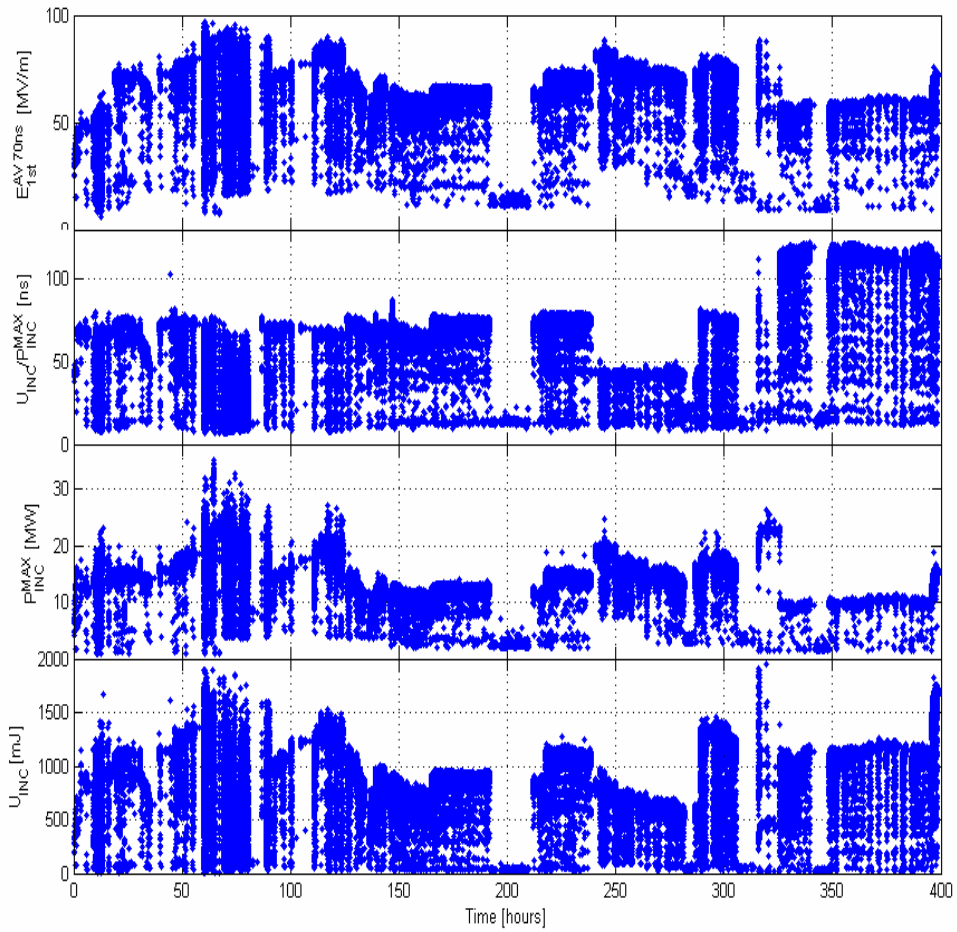
Conclusions

- The structures were heavily damaged during the high power tests. Therefore, some of the conclusions listed here will need to be verified with additional tests.
- First quadrant based structures were tested.
- The performance was ~ 20% worse than expected from circular structure tests.
- We believe that we understand why this happened and a second generation of quadrant based structures will be tested in the near future.
- Neither Al nor Ti nor Mo performed better than Cu at the required CLIC breakdown rates and pulse lengths.
- Pulse length dependences of HDS type structures may be stronger than for circular structures.
- Results of similar structures tested at 11.4 GHz show weak or no frequency dependence.

Conditioning history



HDS 60 L



HDS 60 S

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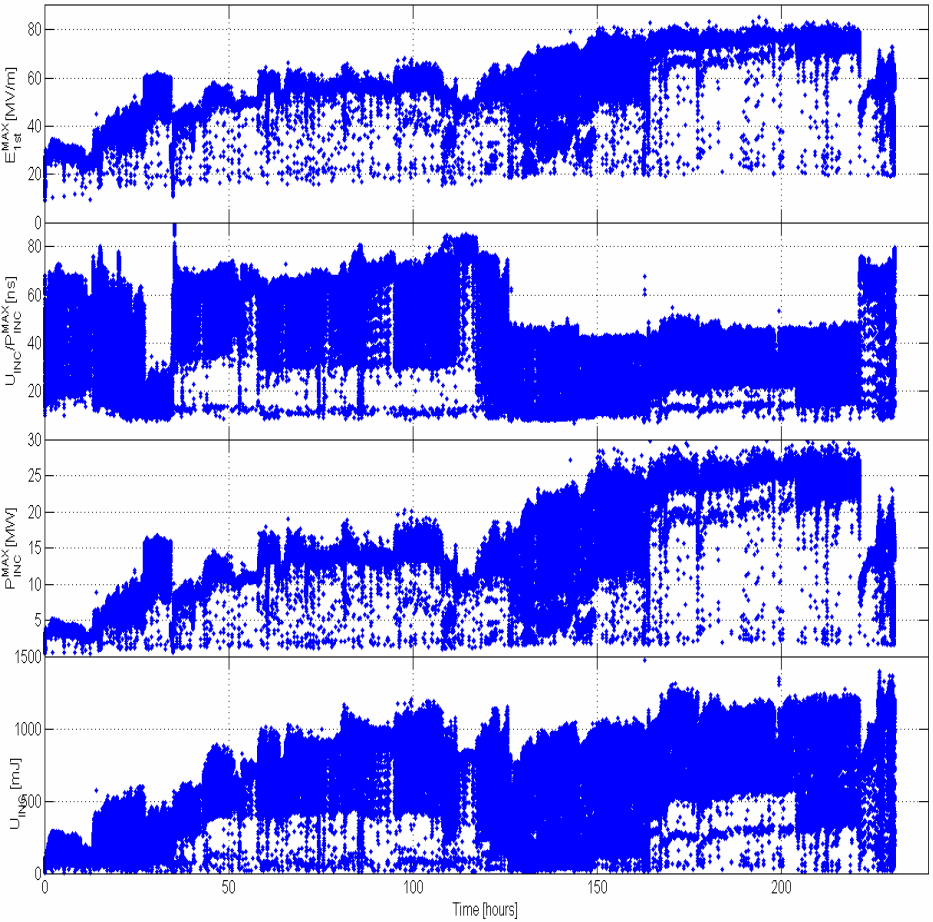
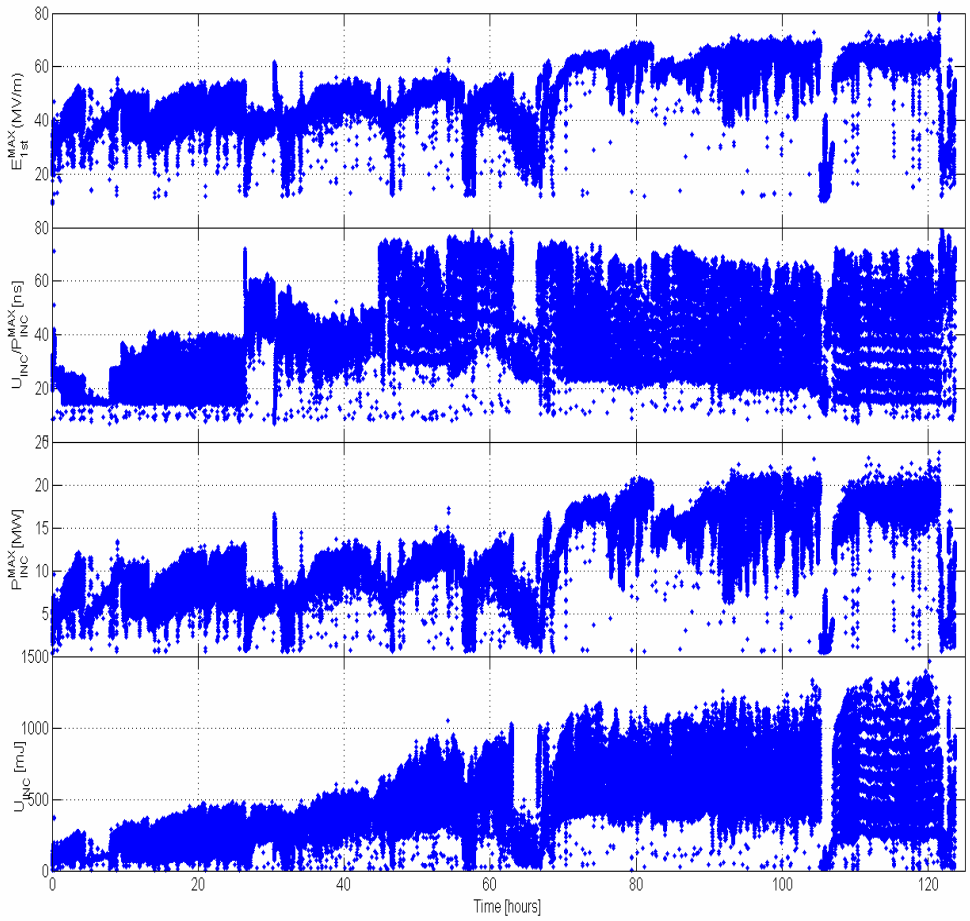
Conditioning history



HDS 11 Mo



HDS 11 Al

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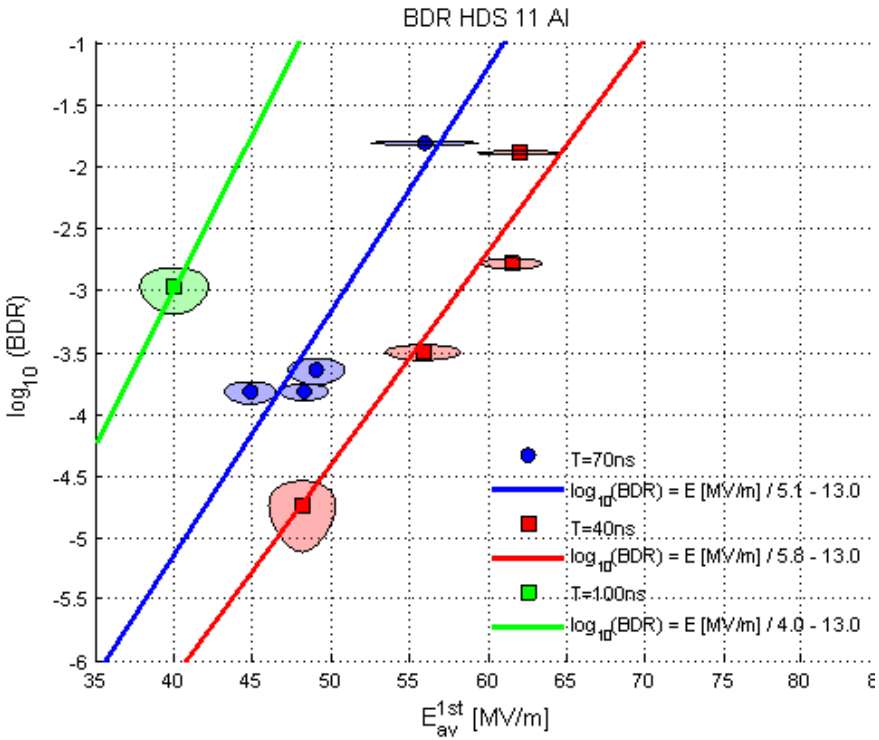
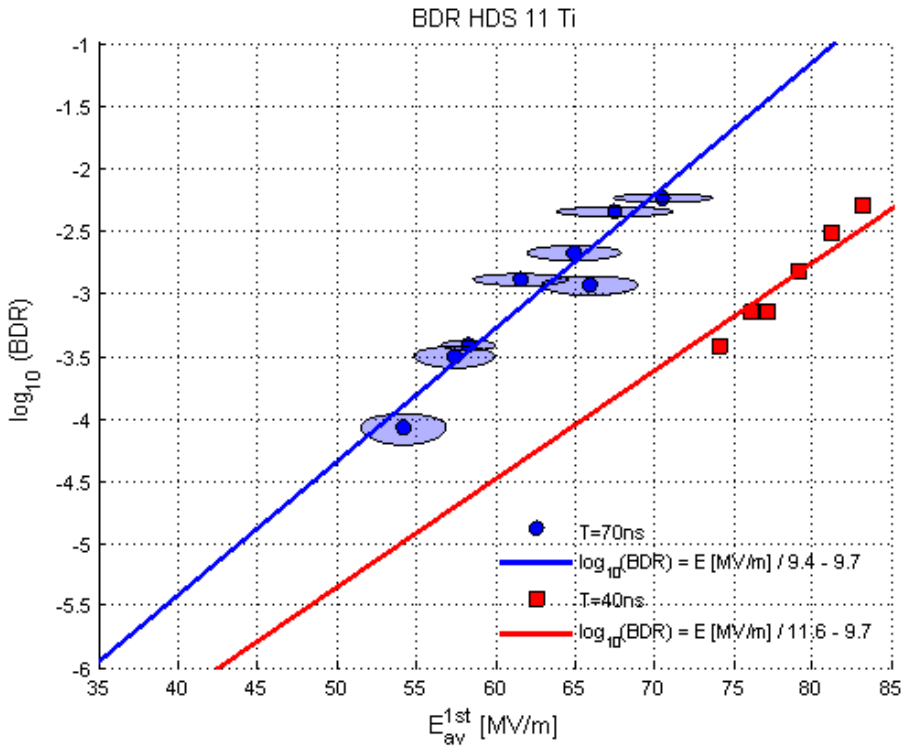
Breakdown rates





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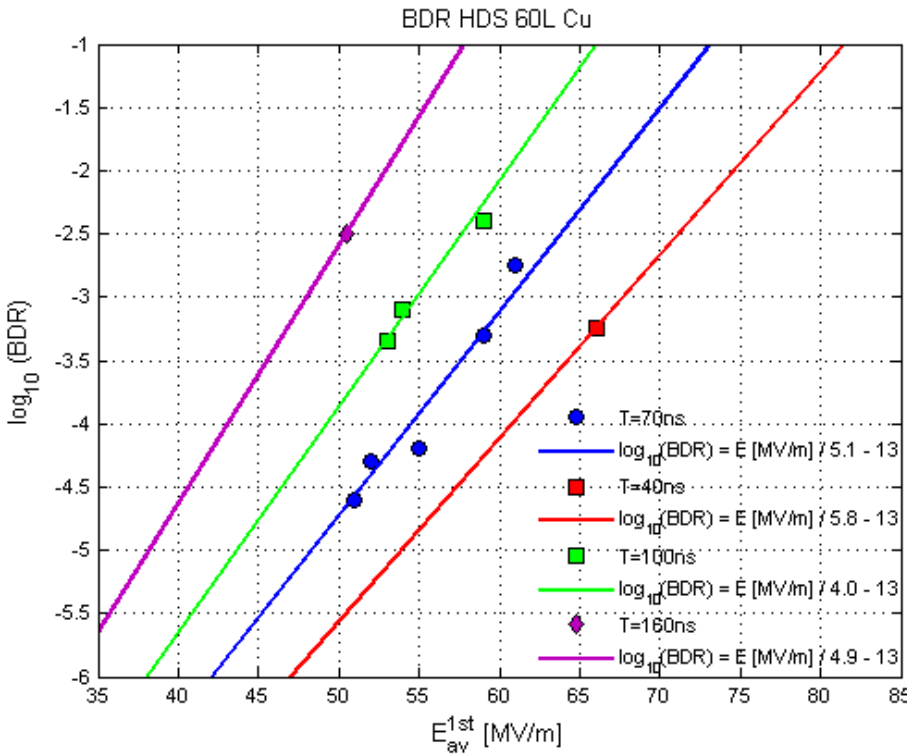
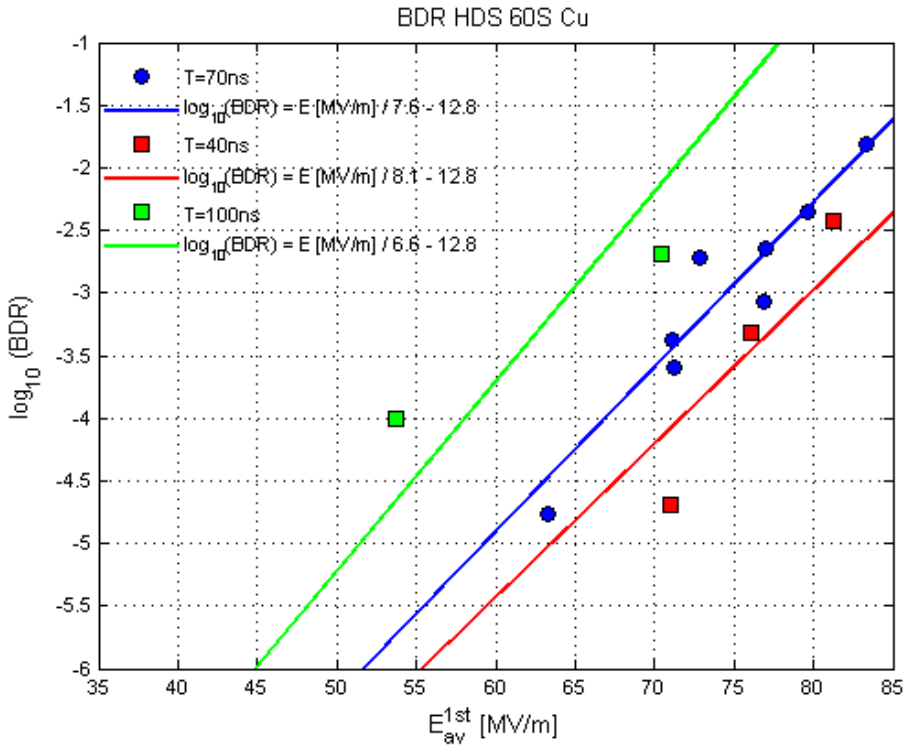
Breakdown rates





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