Operation for 30 GHz Production and Results

- 30 GHz operation
- 30 GHz results
- Plans for 2008

30 GHz operation

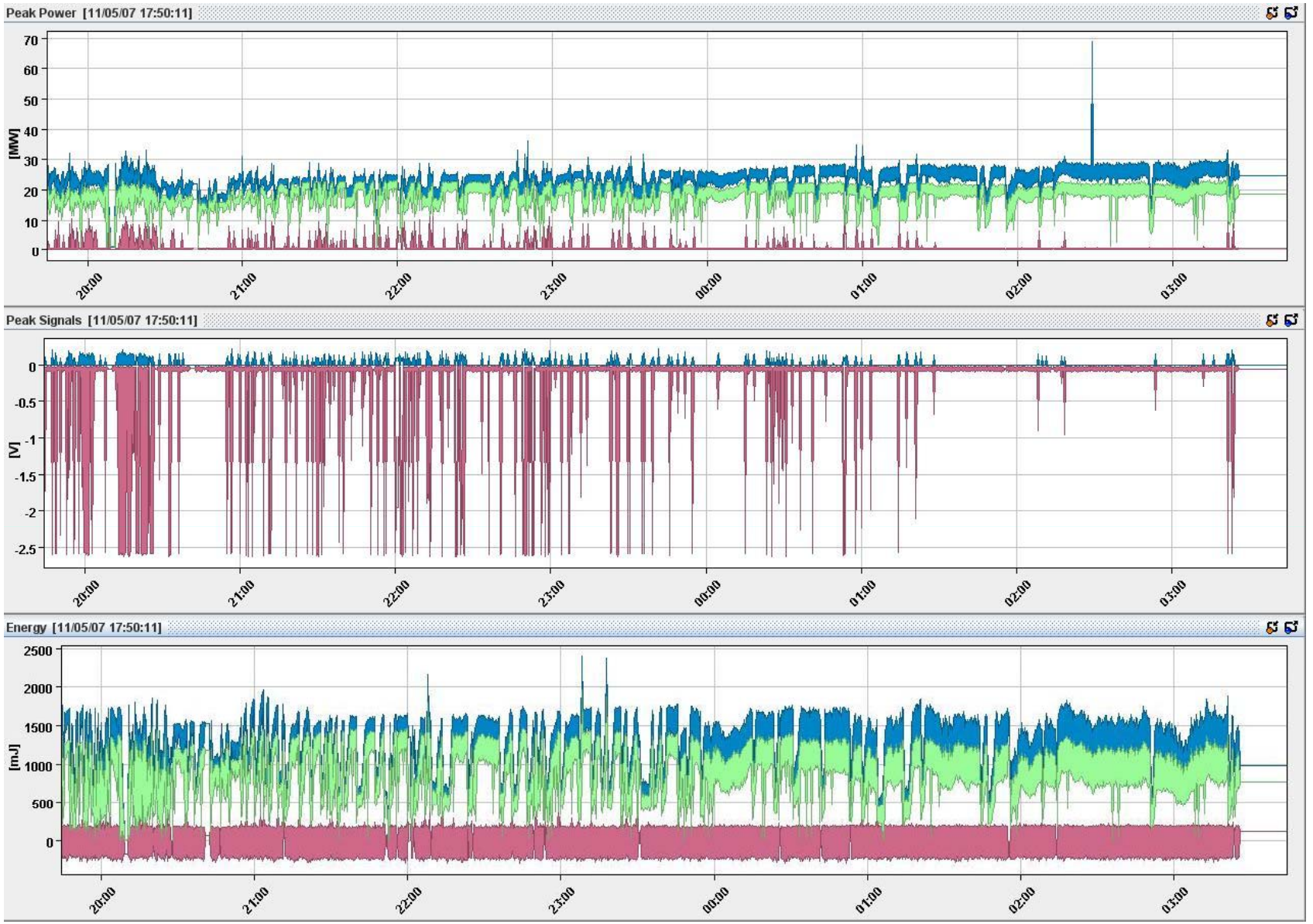
- Many technical problems in CTF3 (leaks, gun, klystrons, controls, safety)
- Unstable conditions
- More time used for CTF3 commissioning
- Only 3 structures tested in 2007 (medium data quality)

- We operated all year with the automatic conditioning system and night and weekend support from the CCC
- First structure test with the new Aquiris data acquisition only
- We got nevertheless some useful data
- We activated much less the PETS area
- New innovative breakdown diagnostics tested

Automatic conditioning using CTF3

Check out the online results: http://cern.ch/project-clic-rfcond30/

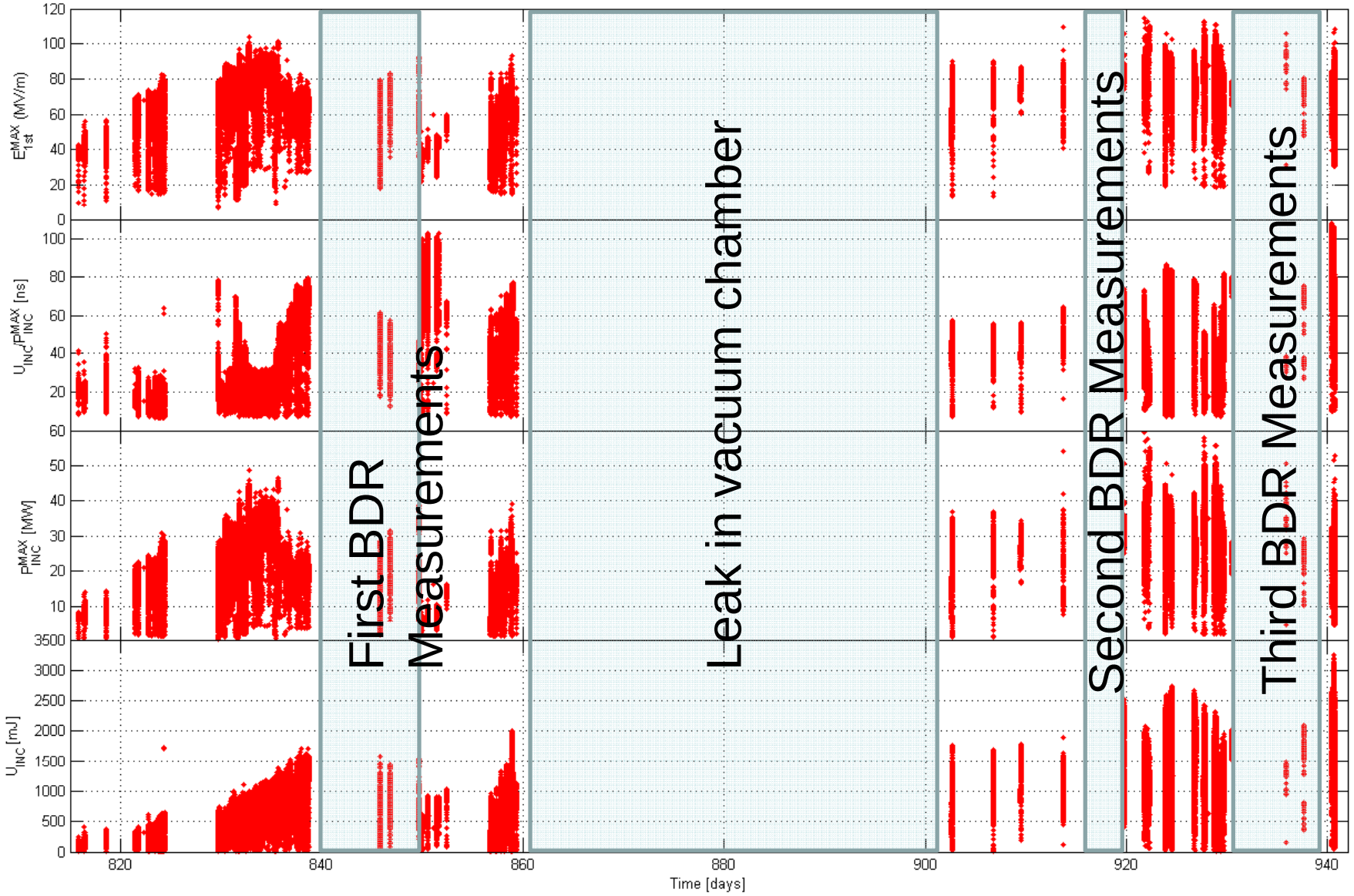
Automatic conditioning, history



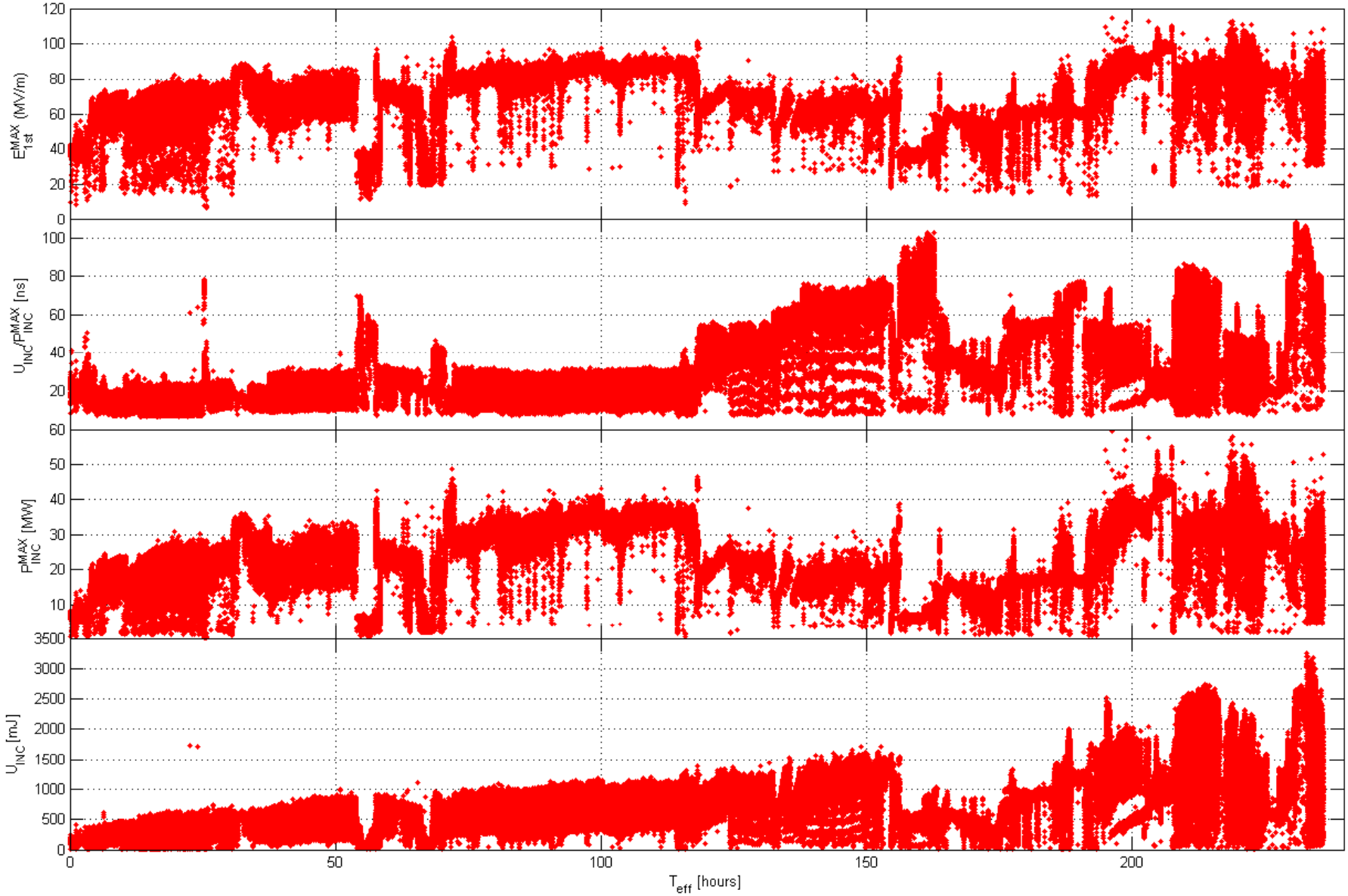
Automatic conditioning, interlocks

Enable / Name	Number events	Pulse length	Stepping Motor	Wait	Threshold	Enable Threshold	Incid. Power Threshold
☑ FC	1	60.00 %	100.00 %	10.00 sec	-0.50		
☐ Missing energy	1	50.00 %	50.00 %	0.00 sec	25.00 %		0.10
☐ Reflected energy	0	50.00 %	50.00 %	0.00 sec	25.00 %		0.10
☑ Vacuum AST		55.00 %	100.00 %	10.00 sec		50.00 %	
☑ Vacuum PT		55.00 %		10.00 sec		50.00 %	
☑ Vacuum FB		55.00 %		10.00 sec		50.00 %	
☑ Vacuum SB		55.00 %		10.00 sec		50.00 %	
☑ Vacuum TB		55.00 %		10.00 sec		50.00 %	
☑ CPI Loss		100.00 %	100.00 %	180.00 sec			
☐ Gun Inhibit		100.00 %	100.00 %	30.00 sec			
☐ Pulse OFF		100.00 %	100.00 %	5.00 sec			
☐ No pulses		100.00 %	100.00 %	60.00 sec	10.00 sec		

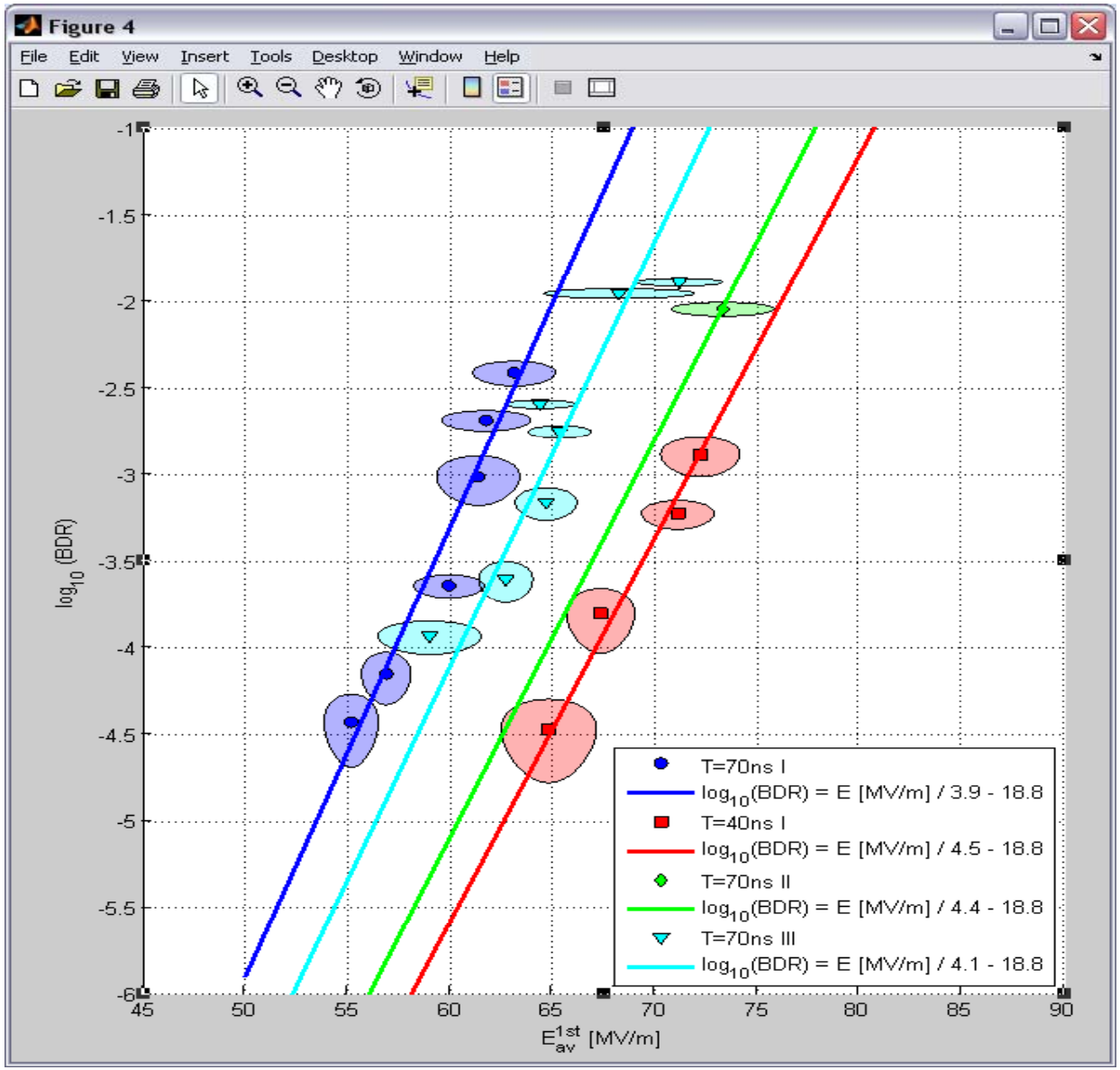
Conditioning history C40vg8_pi/2



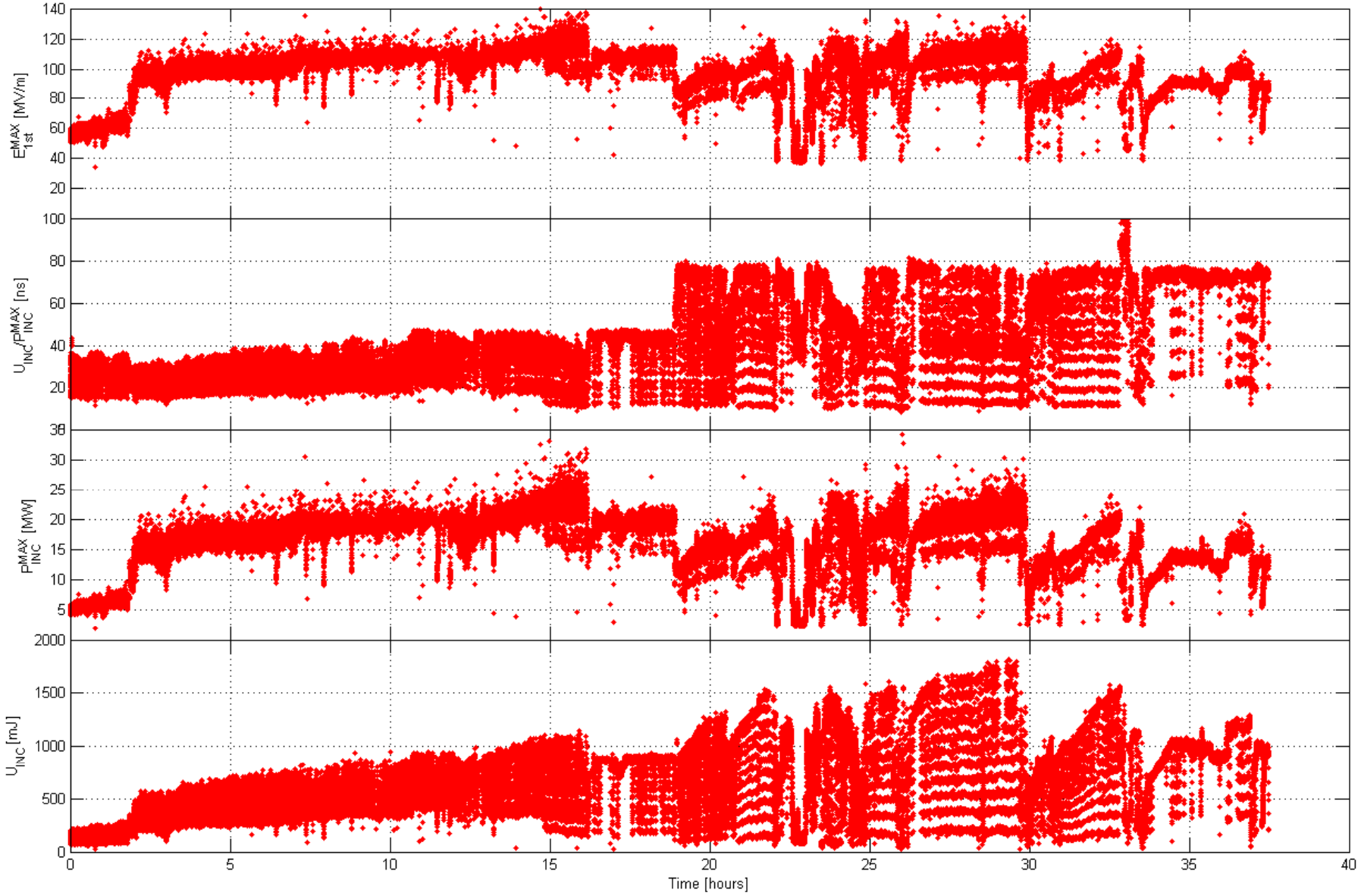
Conditioning history C40vg8_pi/2



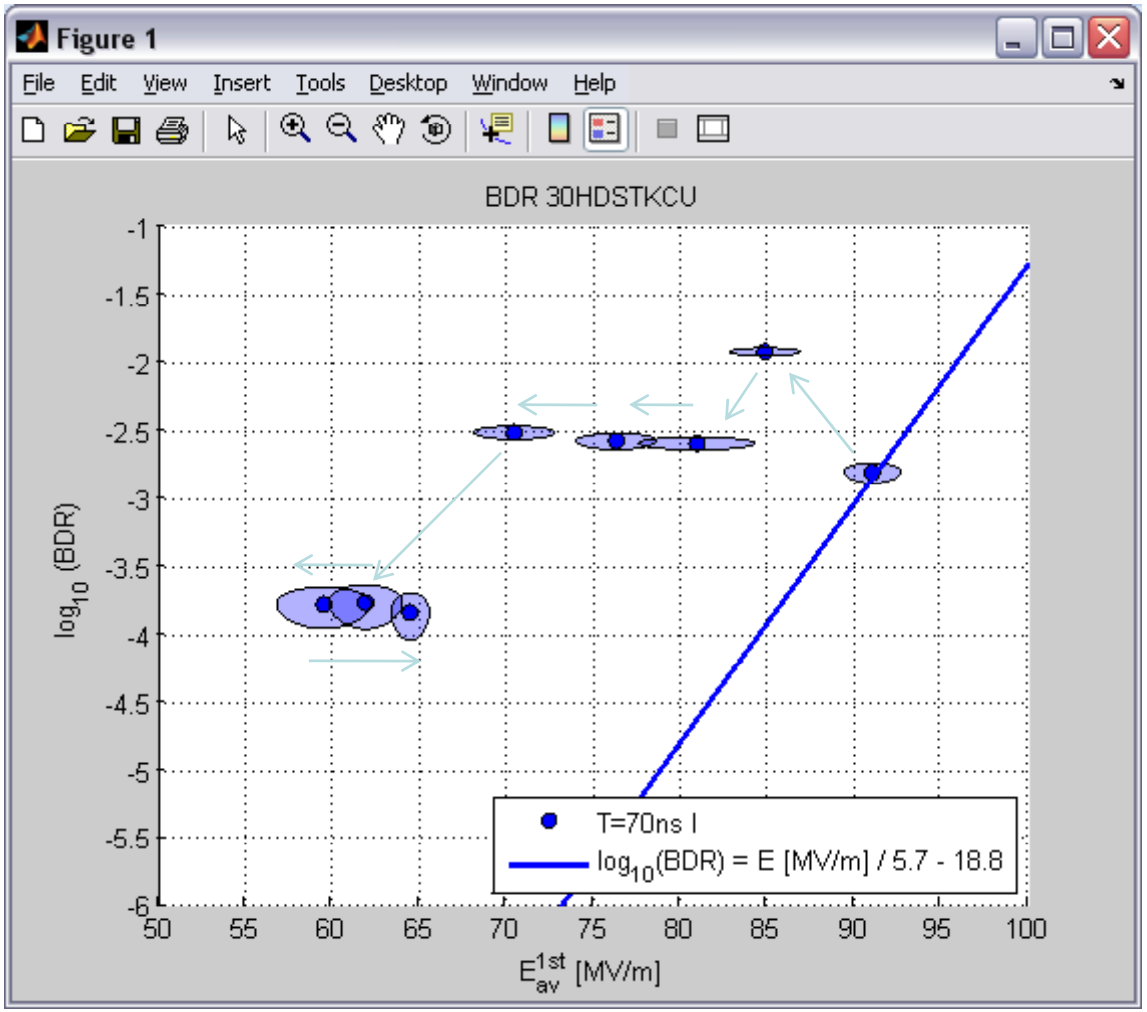
Breakdown rate measurements C40vg8_pi/2



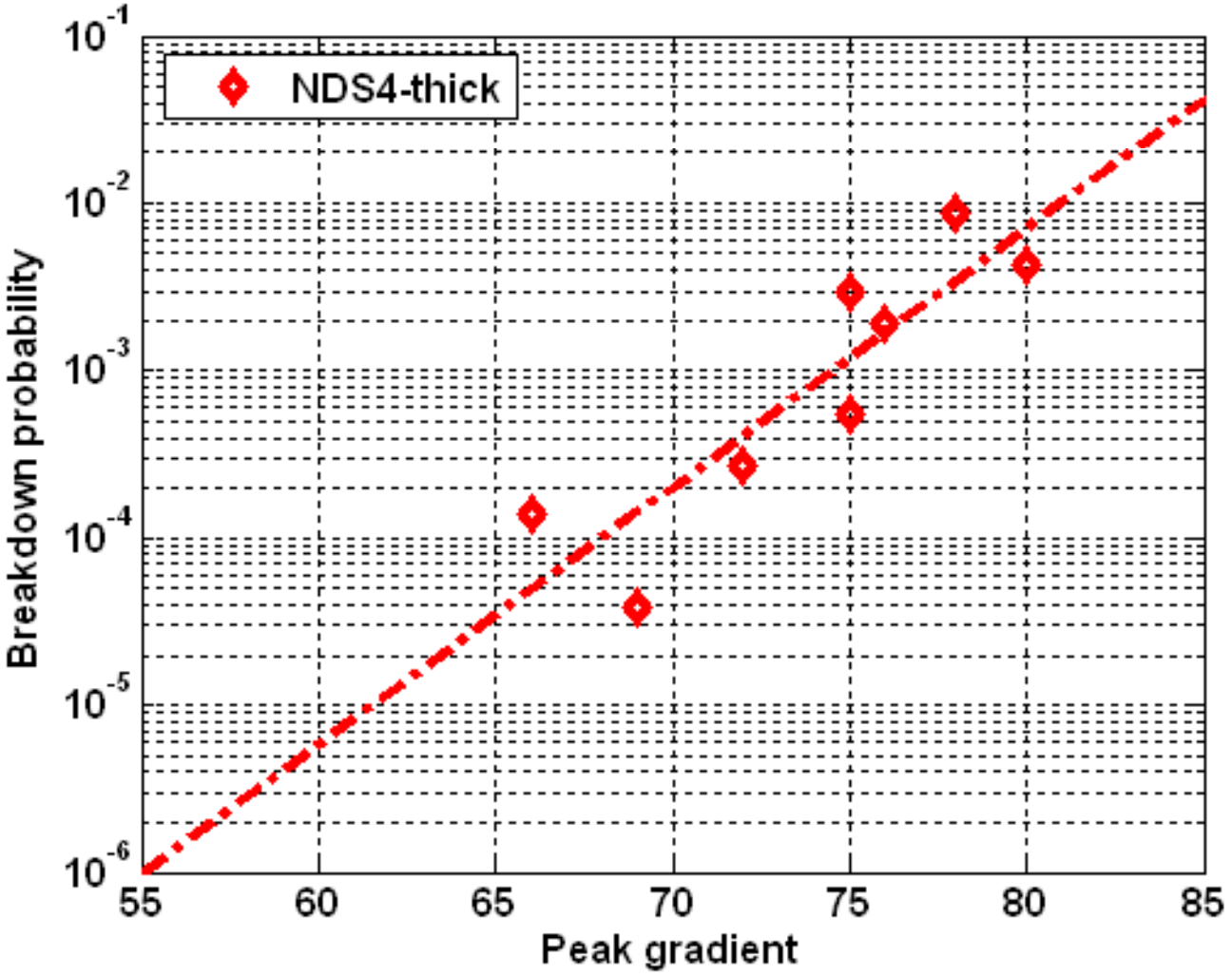
Conditioning history HDS4_vg2.6_thick



HDS4_thick results, 70 ns

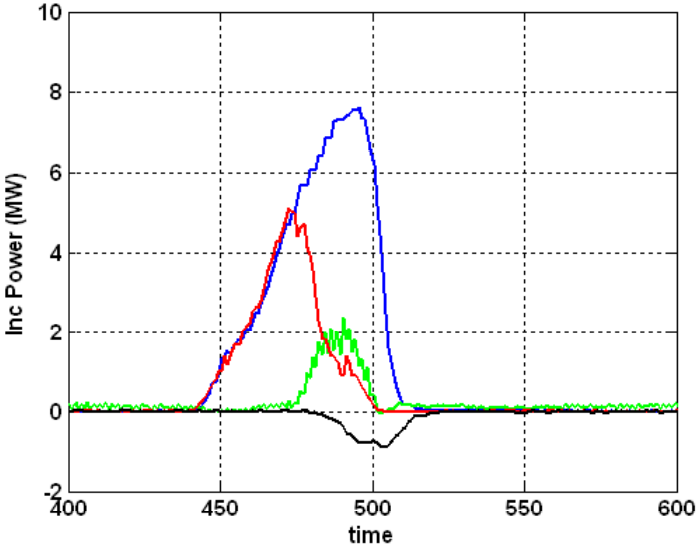


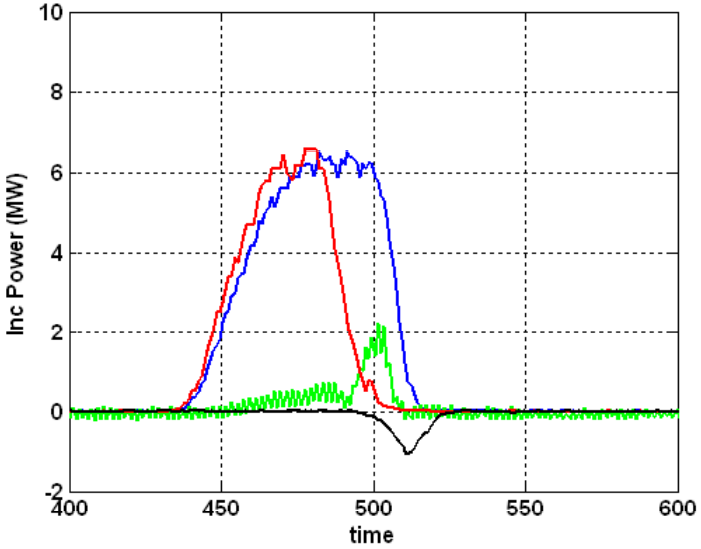
NDS4_thick results, 70 ns

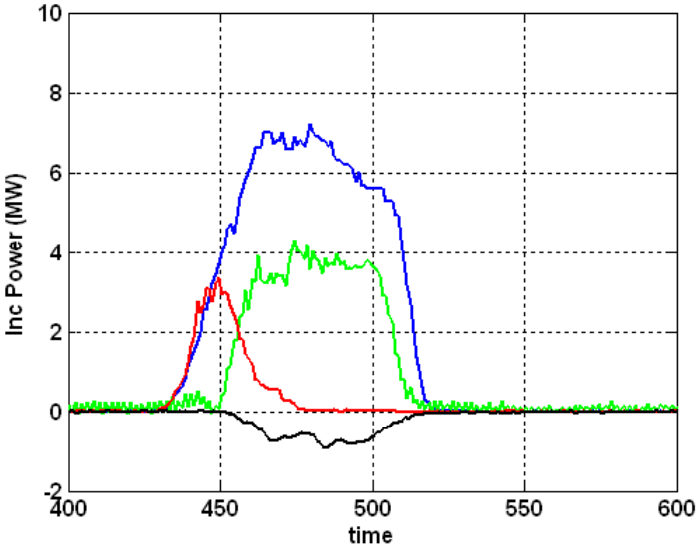


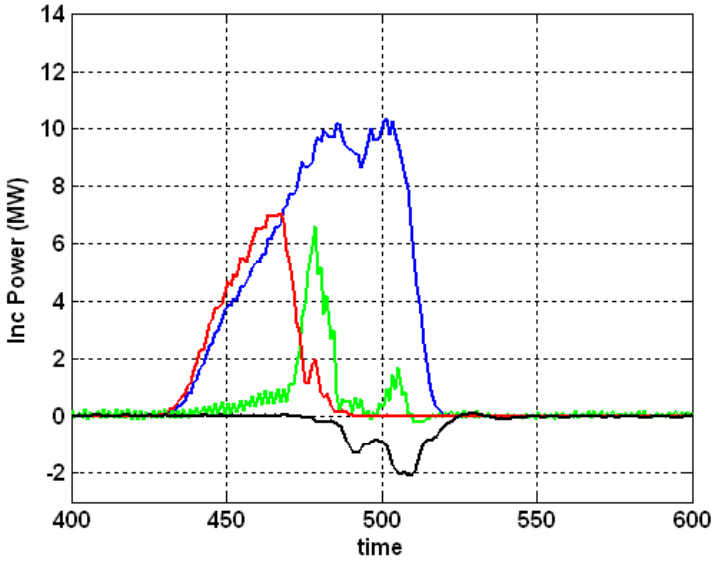
75 MV/m at 70ns 10^{-3} bd-rate; 3.2 wue

NDS4_vg2.4_thick conditioning

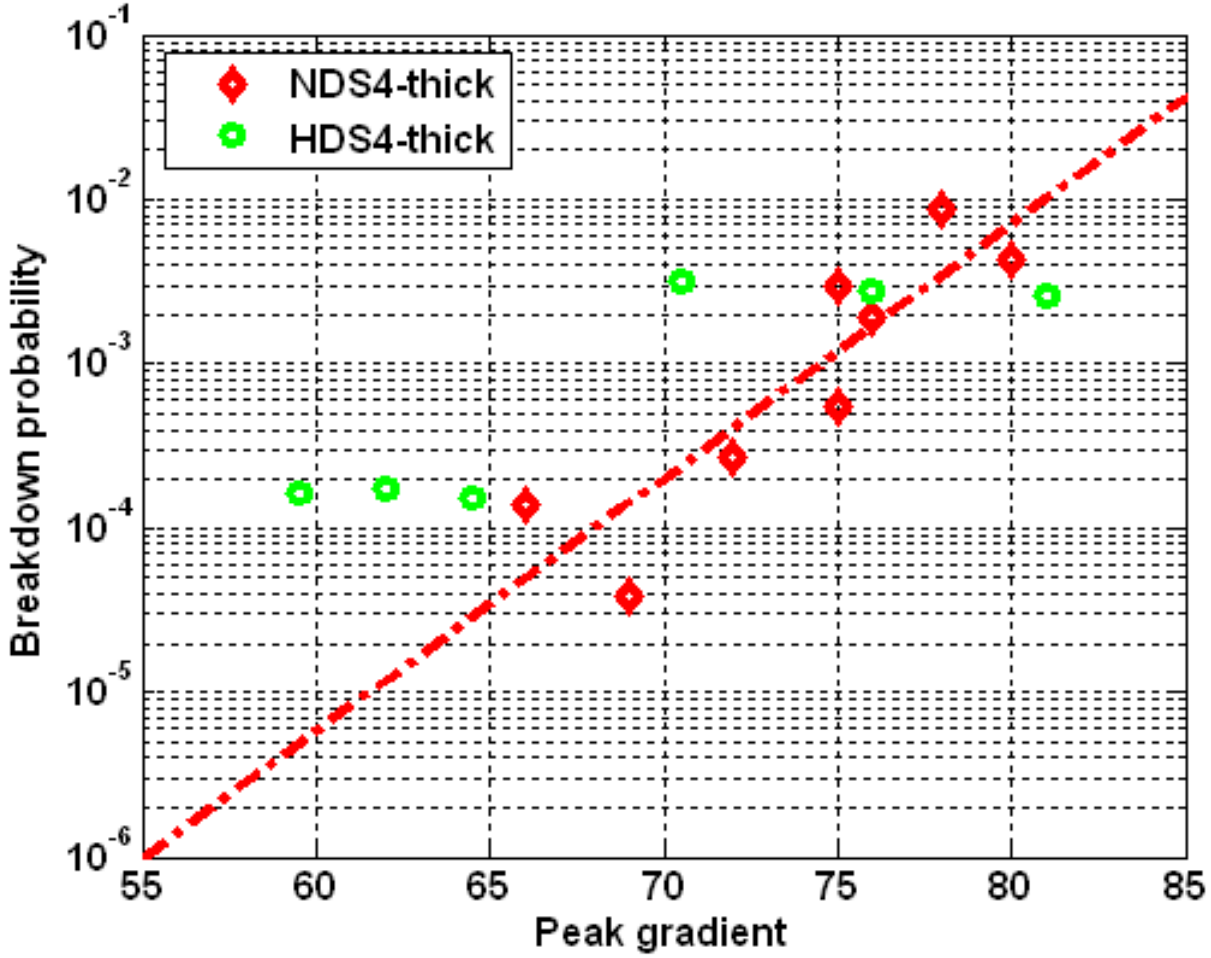








NDS4_thick vs HDS4_thick



Summary of 30 GHz results

All measured data at 70 ns pulse length and 10^{-3} breakdown rate

Structure	2a (mm)	P (MW)	E (MV/m)	$PT^{1/3}/C$ (wue)
C30vg4.7	3.5	20.2	92	7.5
HDS60vg8.0	3.8	16.1	61	5.6
HDS60vg5.1	3.2	13.3	75	5.5
C40vg7.4_pi/2	4.0	19.2	65	6.2
HDS4vg2.6_thick	3.5	7.5	67	2.8
NDS4vg2.5_thick	3.5	8.6	75	3.2

Conclusions

High gradient test conclusions

- Some doubts on P/C theory used to optimize this years structures
- Quadrant technology appears not mature
- Short phase advance seems not beneficial
- Concentrate on round brazed structures and aperture dependence

Operational conclusions

- Need to improve uptime and beam stability (general CTF3 issue)
- Could be more efficient to reserve operational blocs dedicated to 30 GHz
- Automatic conditioning works very well and will be further developed
- 2008 might be the last year of 30 GHz operation

		2007		2008										
		Nov	Dez	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Facility	Structure													
CTF3 30 GHz	NDS4_vg2.5_thick													
	C30_vg4.7_quad													
	C30_vg2.6													
	C30_vg8.2													
	C30_vg2_TM02													
	HDS11_vg2													
	C30_vg4.7_sb													
CLEX 12 GHz	Pets 12 GHz													
	T18_vg2.4_disk													
NEXTEF 11.4 GHz	KX03													
	Old CLIC vg1.1													
	T18_vg2.4_disk[2]													
	T18_vg2.4_disk[3]													
	TD18_vg2.4_quad[2]													
	TD18_vg2.4_disk[2]													
SLAC Station 1	TD18_vg2.4_quad[1]													
11.4 GHz	C10vg0.7[1]													
	C10vg1.3[1]													
	C10vg3.3[1]													
	C10vg2.2_thick[1]													
	HXD11 Cu big grains													
SLAC Station 2	T28_vg2.9													
	C10vg0.7[2]													
	C10vg1.3[2]													
	C10vg3.3[2]													
	C10vg2.2_thick[2]													
	T53vg3MC													
SLAC Station 3	T18_vg2.4_disk[1]													
	T18_vg2.4_disk[4]													
	PETS 11.4 GHz													
	TD18_vg2.4_disk[1]													

30 GHz break down R&D program in CTF3

List of planned experiments

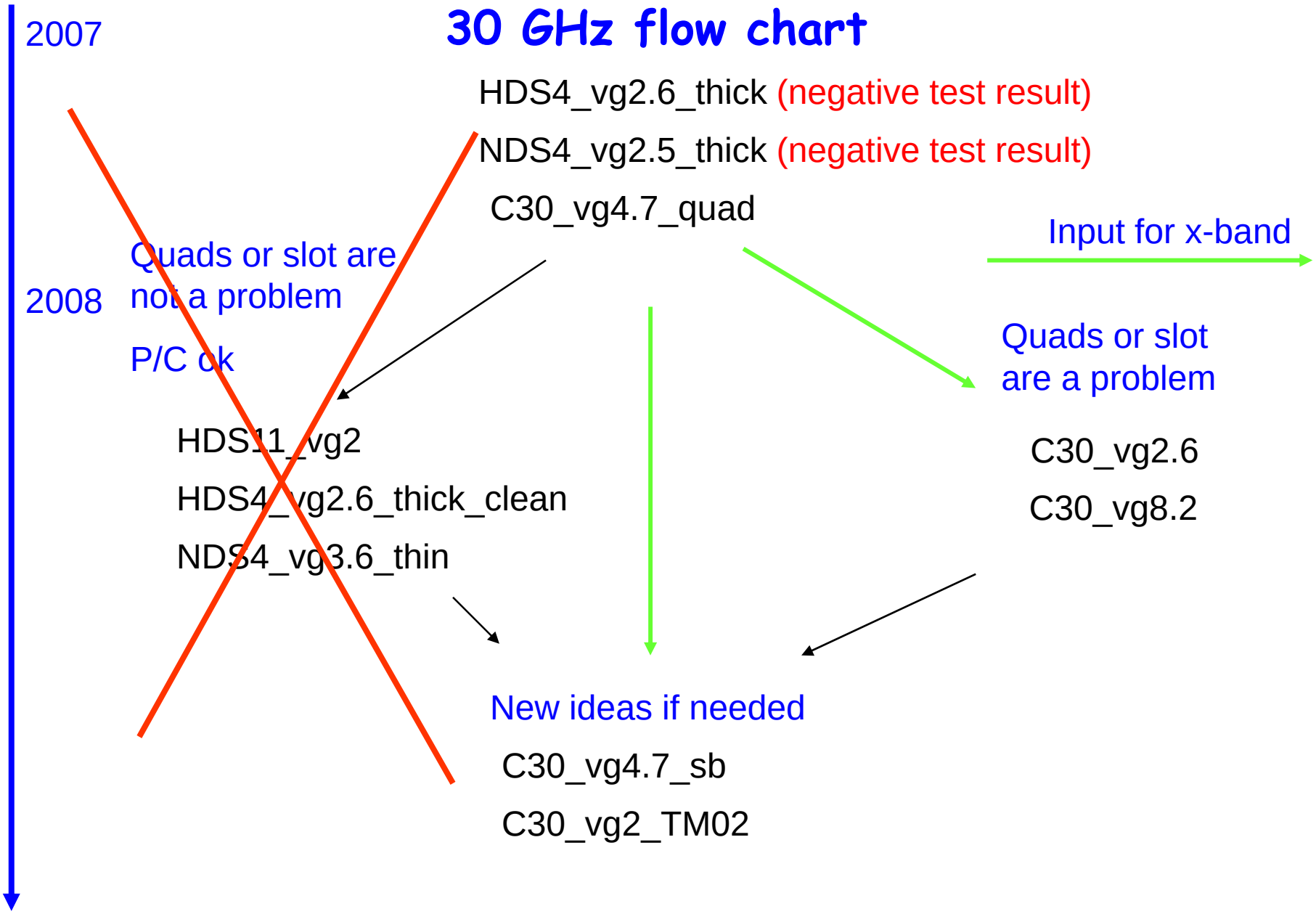
- HDS4_vg2.6_thick (iris thickness, phase advance, P/C) Finished !
- NDS4_vg2.5_thick (Effect of slots and quadrants) Finished !
- C30_vg4.7_quad (clear experiment for fab. Tech.)

Decision point, see flow chart !

- HDS11_vg2 (clear P/C experiment without other changes)
- HDS4_vg2.6_thick_clean (compares cleaning with previous)
- NDS4_vg3.6_thin (iris thickness in comparison with NDS4_thick)
- C30_vg2.6 (P/C)
- C30_vg8.2 (P/C)
- C30_vg4.7_sb (speed bump)
- C30_vg2_TM02 (vg)
- HDS 11 copper/molybdenum (for better statistics)

The end, reserve slides following

30 GHz flow chart



2007 30 GHz results