

Debriefing – 18.11.2019

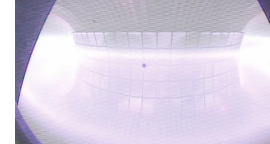
F18 – RUNAWAY CONTROL

FTU Experimental Campaign 2019-C2

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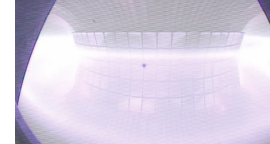


EUROfusion



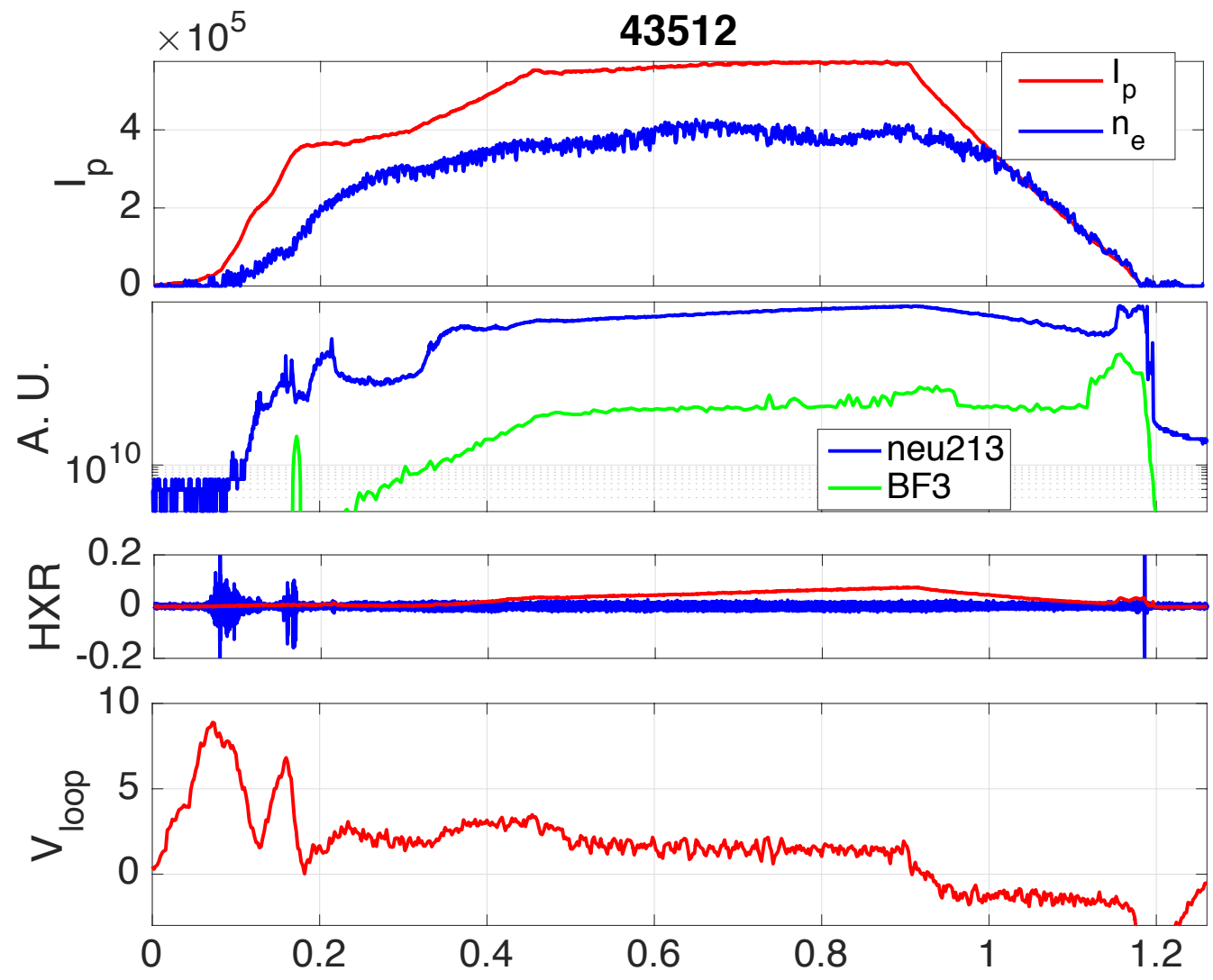
Results

SHOT	Btor	Ip	M1.1	M1.2	M2.1	M2.2	neu213	deltaTdisr	neu213Post	Disruption	Vsaddle	Note	RAMP	Cqonset	PlateauOns	IpreCQ	Iplateau
43349	5.3	5	0.315		0.304		3,00E+11	38	1,00E+09	0,00							
43356	5.3	5	0.303		0.315		9,00E+12	67	1,00E+12	0,00							
43357	5.3	5	0.604	0.654	0.625		9,00E+12	58	2,00E+11	0,00							
43358	5.3	5	1.2	1.254	1.225		2,00E+12	70	8,00E+10	0,00							
43407	5.3	3.6	0.305		0.314		5,00E+12	10	6,00E+10	0,00							
43410	5.3	3.6	0.305	0.306	0.304		6,00E+12	5	1,00E+11	0,00							
43255	5.3	5	0.453				2,00E+12	12	2,00E+10	0,00							
43256	5.3	5	0.454				2,00E+13	28	6,00E+10	0,00	1,00						
43257	5.3	5	0.454				3,30E+13	35	2,00E+11	0,00	1,00						
43258	5.3	5	0.455				4,00E+12	22	3,00E+11	0,00	0,00						
43259	5.3	5	0.454				1,00E+13	143	0	0.595	1,00	no scillations					
43156	5.3	5	0.454				1,00E+12	4	2,00E+10	0,00	0,00						
53149	5.3	5	0.454				2,00E+11	12	1,00E+10	0,00	0,00						
43435	5.3	5	0.904				3,00E+11	69	2,00E+10	0.973		no scillatio					
43436	5.3	5	0.904				7,00E+11	35	4,00E+09	0.935							
43437	5.3	5	0.904	0.905	0.906		2,50E+13	4	1,00E+10	0.908							
43438	5.3	3.6	0.255				1,60E+12	45	1,50E+12	0,00							
43441	5.3	3.6	0.594				1,00E+13	30	1,00E+10	0.625	1,00		1,00				
43443	5.3	4.2	0.254				9,00E+12	9	1,00E+12	0,00			1,00				
43452	4	4.8	0.454				3,50E+13	4	3,00E+11	0,00	1,00	On a Lock mode RE are expelled, a discharge that usually leads to RE beam?					
43455	4	5	0.454				3,40E+13	24	9,00E+11	0.496	1,00						
43457	5.3	5	0.639				3,20E+13	11	1,00E+11	0.655	1,00		1,00				
43459	5.3	5			0,904		4,00E+12	2	1,00E+10	0.912							
43517	5.3	5			0.444		9,00E+11	5	1,00E+10	0.675			1,00				
43520	5.3	3.6	1.18		1.174		3,50E+13	2	1,00E+10	1226,00	1,00						
43521	5.3	3.6	0.889		0.888		3,50E+13	2		0,00	1,00	SOFT-stop					
43524	5.3	3.6	0.184				3,00E+11	4	2,00E+12	0,00			1,00				
43525	5.3	3.6	0.5479	0.552	0.505		1,00E+13	40	5,00E+13	-0,55	1,00	RE beam		0.5412	0.5513	3.45	2.4
43526	5.3	3.6			0.505		3,00E+12	6	5,00E+10	0,00	0,00						
43527	5.3	3.6			0.505		4,00E+12	6	5,00E+10	0,00	0,00						
43539	5.3	3.6	0.703		0.704		3,00E+12	66	5,00E+13	-0,66	1,00	RE beam		0.769	0.778	3.20	2.5
43540	5.3	5	0.289	0.29	0.288		3,50E+13	0	5,00E+13	-0,29	1,00	RE beam, k	1,00	0.29	0.298	4.40	0.4

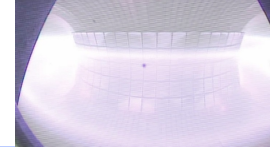


Pulses with Double Ramp for REIS

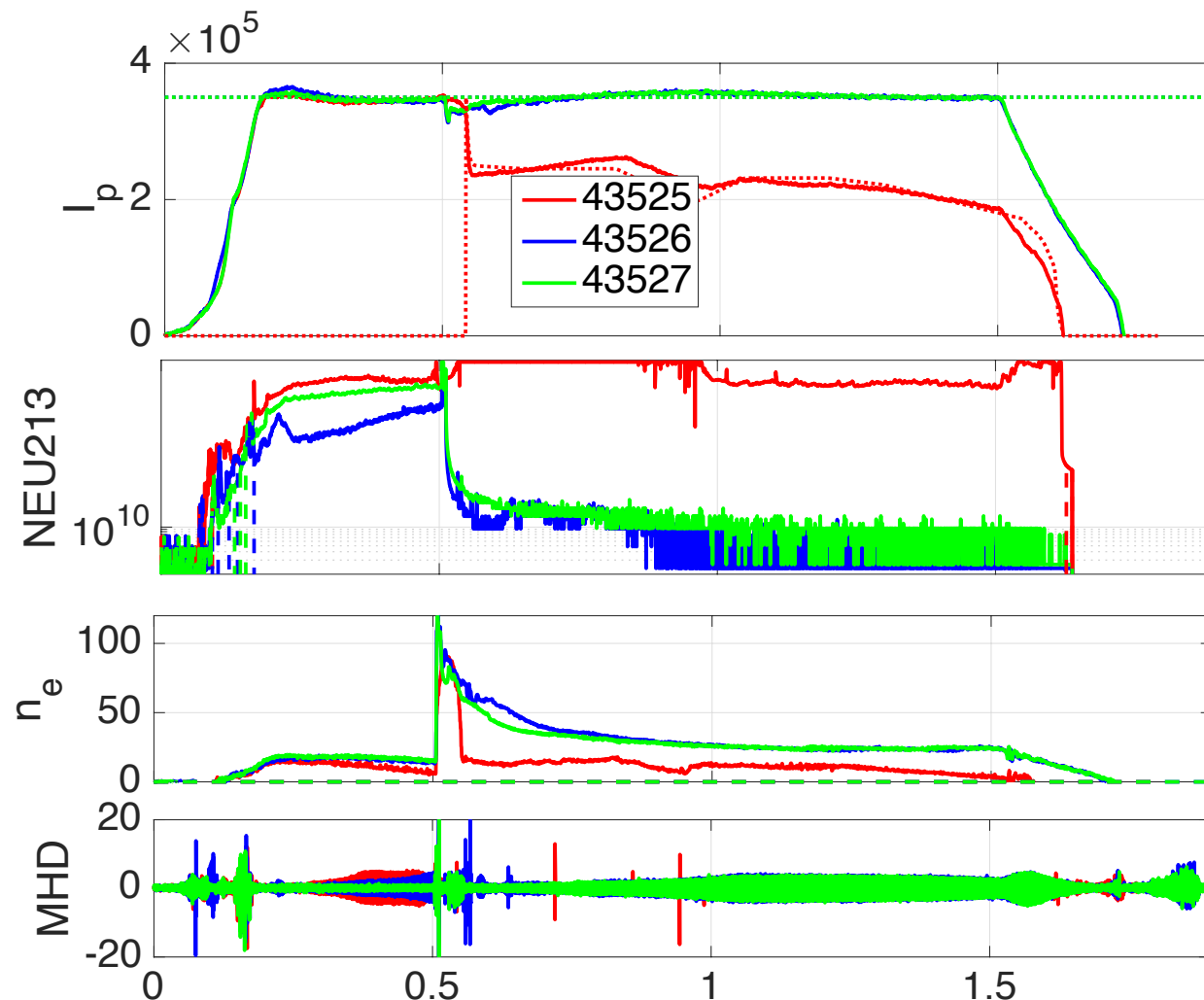
5.3T, 360kA-650kA, for RE energy evolution modelling via REIS spectra.



Large Pellet: dependency on quiescent REs



5.3T, 360kA, large pellet on different levels of quiescent REs



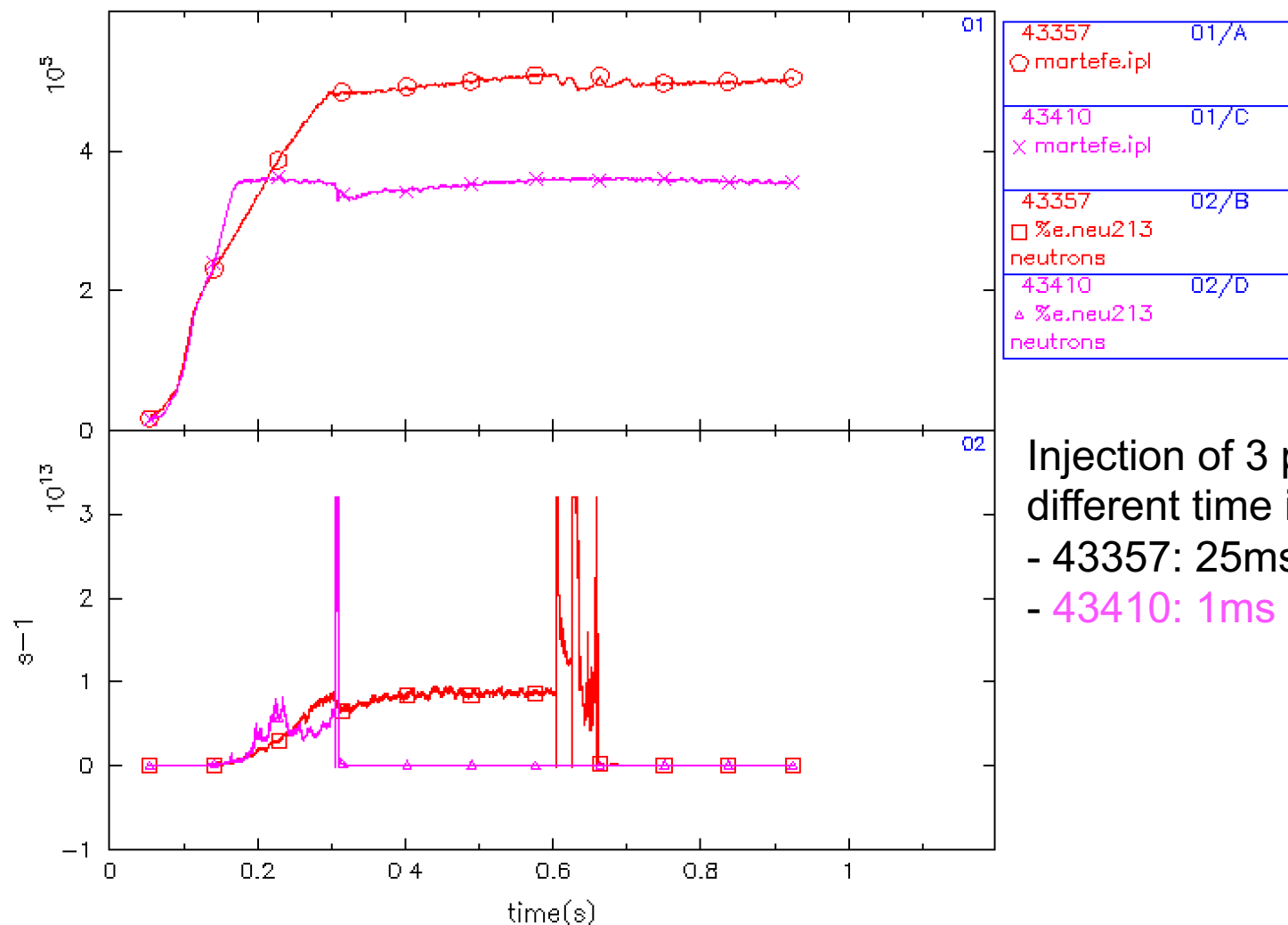
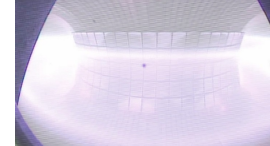
RE SUPPRESSION STRATEGIES

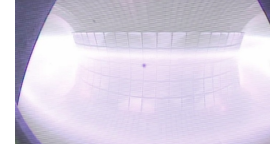
To be analysed:

- Ablation at different level of currents, temperature and runaway electrons
- RE suppression by fast MHD modes or other instabilities (waves?)
- Pellet penetration

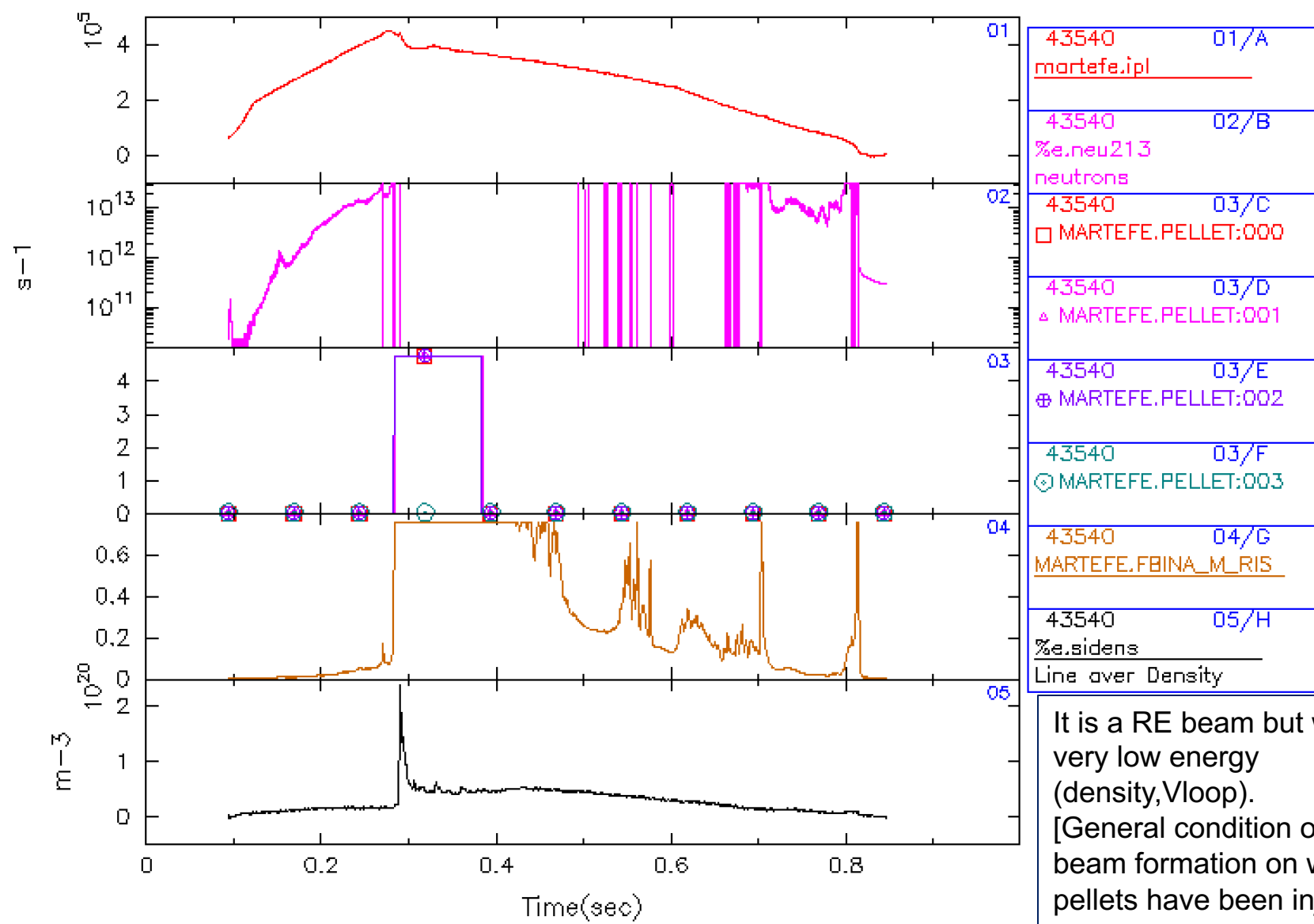
New recipe?
360kA, with large(+small)
pellet to induce RE beam.

Injection times (absolute and inter-times)



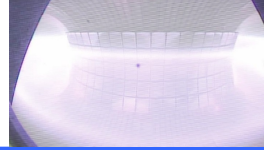


Preemptive suppression?



It is a RE beam but with very low energy (density, Vloop).
 [General condition of RE beam formation on which 3 pellets have been injected] 6

Conclusion



REIS data (also mid-infrared):

- Flat-top
- Double ramp
- RE BEAM (2)

ITER REQUEST TO COLLECT DATA FOR PELLET ABLATION AND PREMPTIVE SUPPRESSION EFFECTS (Nardon, Lehnen)

Sparse scan on Deuterium pellet for RE suppression (ITER):

- Large/small
- Quiescent RE levels
- Inter times (large/small swapped)
- 5.3/4T
- Injection on MHD mode
- Preemptive suppression?!

Future:

- 5.3/4T Long discharge, quiescent REs, density oscillations: REIS – RE modeling
- Preemptive suppression
- Quiescent RE/ beams evolution with ECRH.

Granetz: scan on prefill to form REs (with and without Ne)....Ar?