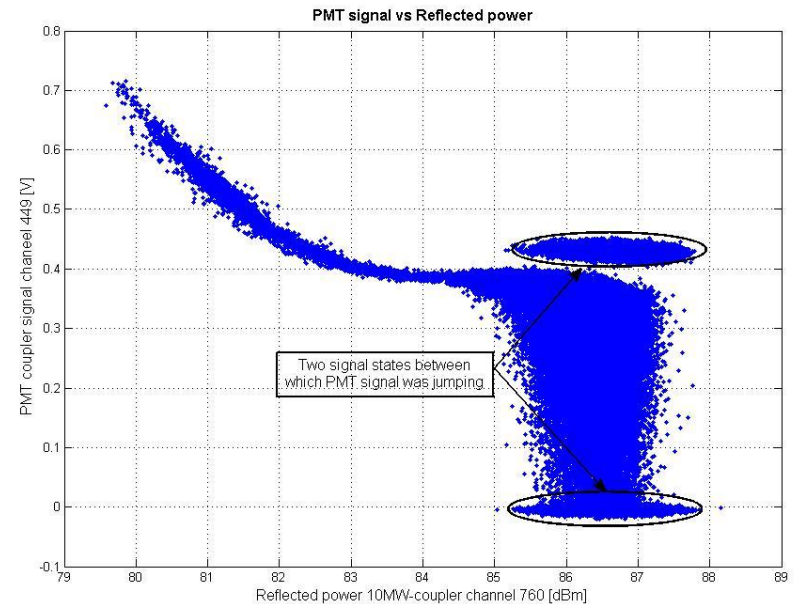


PITZ RC, 31.01.2013

M.Krasilnikov



Weeks 4-5: Plans

- Gun-3.1 + RF Window conditioning
 - Solenoid sweep for higher peak power levels (>5MW). Start: 10us
 - Try to condition MP region (I_{main}<40A)
 - Stability tests (night runs):
 - 10Hz x 650us x 6.5MW(or >) I_{main}=0A;315A;400A
 - 10Hz x 830us x 5MW(4MW) I_{main}=0A (315A)
- Cathode box exchange – Mo, 28.01.2013 (short1 is installed)
- CDS booster test run → Tue, 29.01.2013A
- Cs2Te cathode conditioning – Wed, 30.01.2013
- PE production– Wed, 30.01.2013
- Longitudinal momentum measurements (LMM)
 1. Preparation (resonance and RF FB tuning, laser BBA)
 2. Gun characterization -> Pz vs. gun phase for various gun gradients
 3. LPS tomography (DM program)

Fri Jan-25	Sat Jan-26	Sun Jan-27	Mon Jan-28	Tue Jan-29	Wed Jan-30	Thu Jan-31	Fri Feb-01	Sat Feb-02	Sun Feb-03	
Khojoyan Kalantaryan	Khojoyan Kalantaryan	Khojoyan Kalantaryan	Cathode box exchange	CDS test run?	Cond. Cs2Te	Stephan LMM-1	Stephan LMM-2	Stephan Pathak	Stephan Pathak	
Vashchenko Gross	Vashchenko Gross	Otevrel Kourkafas			PE	Otevrel LMM-2	Malyutin LMM-2,3	LMM-3	Malyutin Kourkafas	Malyutin Kourkafas
Automatic Conditioning	Automatic Conditioning	Automatic Conditioning			Automatic Conditioning	Automatic Conditioning	Automatic Conditioning	Automatic Conditioning	Automatic Conditioning	Automatic Conditioning
Vashchenko	Vashchenko	Vashchenko	Otevrel	Otevrel	Otevrel	Otevrel	Malyutin	Malyutin	Malyutin	

Gun-3.1 + RF Window conditioning

Stability tests

Stability LT tests

CDS booster test run 29.01.2013A

date	time	RF pulse length	<Prf> (MW)				SPT (degC)	<DC> meas. at DCM1 (uA)		<DC> meas. at WS1	meas. dose rate (uSv/h)		remark	
			SPPforw	Pboo	Prfl	refl		no atten.	20dB		BOOST.V1	BOOST.V2		
29.01.2013	16:45		0	0	0						2.52	0.65		
	16:56	130	5										start ramp	
	17:13	130	15.3	1.06	0.055	5%	47.2	saturated	500uA				MP	
	17:46	130	15.3	1.06	0.055	5%	47.2	saturated	500uA				end of run	
	17:48										2.49	0.66		
	17:50										2.49	0.66		
	17:55										2.49	0.66		
	17:56	130	5											
	18:00	130	22.5	2.05	0.11	5%	47.3		1mA					MP
	18:31	130	22.5	2.05	0.11	5%	47.3		1mA					MP
	18:34											2.51	0.65	
	18:37											2.50	0.65	
	18:41	130	5											
	18:48	130	28.5	3.03	0.2	6%	47.4		16uA					only MP spike
	19:00	130	28.4	3.02	0.23	6%	47.4		13uA					main DC regular
	19:25	130	28.4	3.02	0.23	6%	47.4		13uA					
	19:28											2.50	0.65	
	19:31											2.49	0.65	
	19:35	130	5											
	19:47	130	32.5	4	0.21	5%	47.4		95uA					
	20:18	130	32.5	4	0.21	5%	47.4		95uA					
	20:20											2.52	0.67	
	20:25											2.50	0.66	
	20:29	130	5				47.5							
	20:43	130	37.4	5			47.5		350uA	20uA				
	21:15	130	37.4	4.95			47.5		350uA	20uA				
	21:17											2.75		
	21:18												0.85	
	21:20											2.68		
	21:22												0.82	
21:23											2.65			
21:24												0.78		
21:25											2.64			
21:30	130	5				47.5								
21:37	130	37.4	5			47.5		350uA	20uA					
21:55	260	37.4	5			47.9		350uA	20uA					
21:20	260	37.4	5			47.9		350uA	20uA					
21:22											3.01			
21:23												1.08		
21:24											2.93			
21:25												1.00		
21:26											2.87	0.97		

CDS booster test run conditions:

- Gun is off for these tests
- Vacuum valves between gun and booster are opened
- HV=10.5kV, 130us flat length, 10us filling and decay time
- SPTemperature to be tuned for the reflection of ~4-6%
- Run time (30min) to be counted after the ramping time (both should be recorded)

Results of CDS test run:

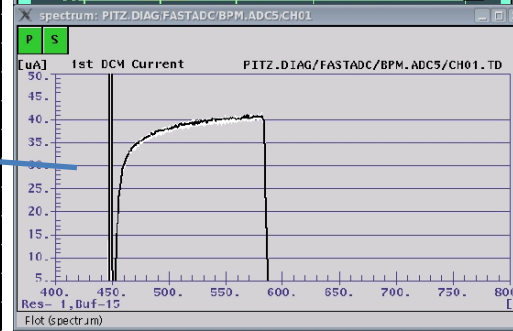
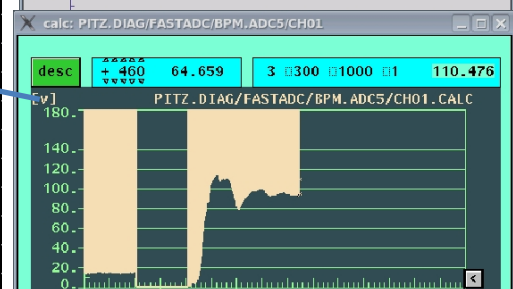
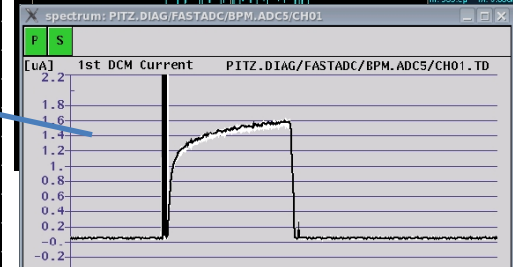
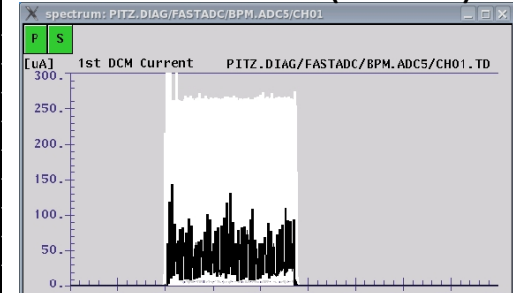
- Up to 4MW for 130us pulses -> no activation increase observed (DC up to 100 uA) after 30min run at each power level
- At 5MW (DC:350uA) -> small activation increase, 10-27% to the remnant level (at the beginning of the shift)
- Double rf pulse duration (130us->260us) pulses at 5MW -> activation is approximately doubled

CDS booster test run 29.01.2013A

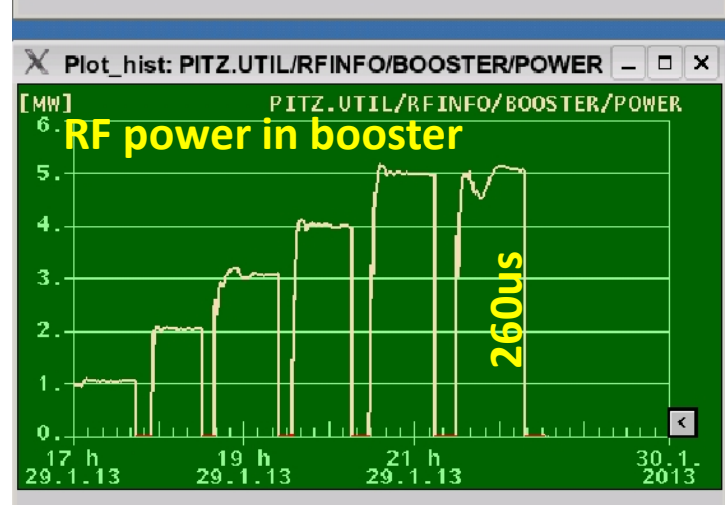
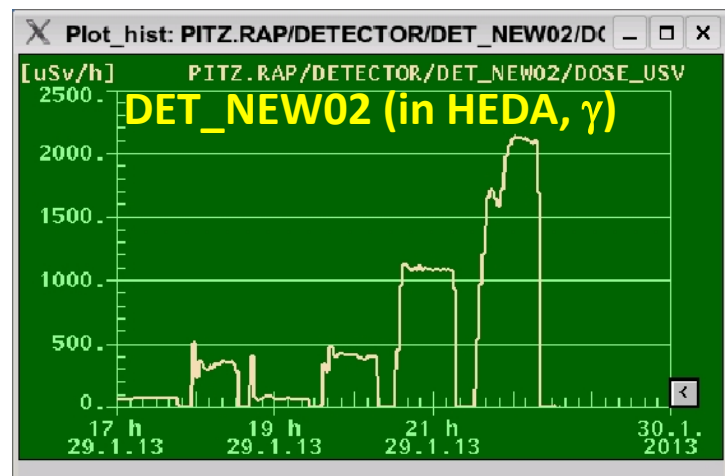
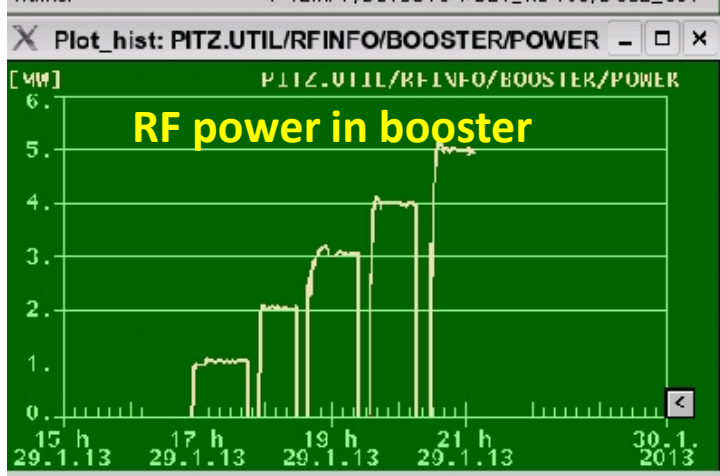
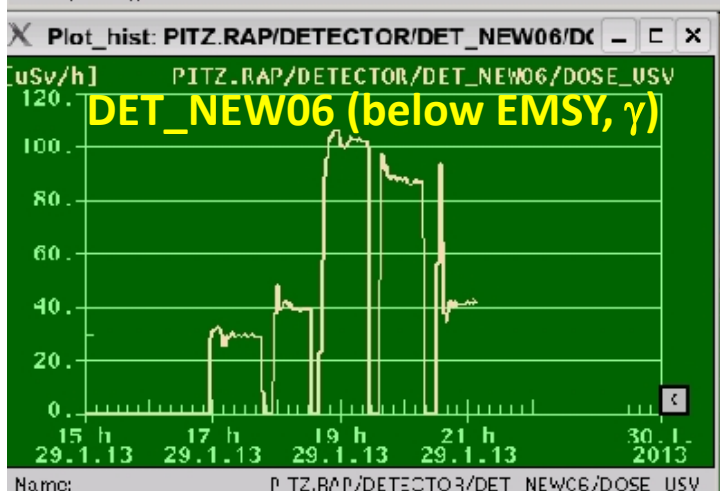
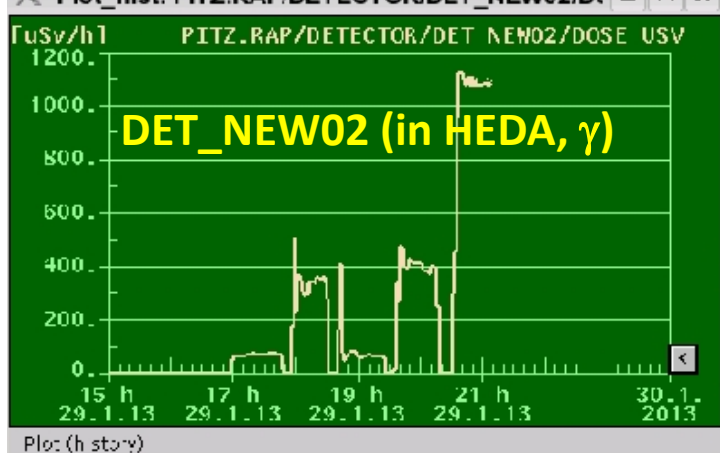
date	time	RF pulse length	<Prf> (MW)				SPT (degC)	<DC> meas. at DCM1 (uA)		<DC> meas. at WS1	meas. dose rate (uSv/h)		remark
			SPPforw	Pboo	Prefl	refl		no atten.	20dB		uA	BOOST.V1	
	16:45		0	0	0						2.52	0.65	
	16:56	130	5										start ramp
	17:13	130	15.3	1.06	0.055	5%	47.2	saturated	500uA				MP
	17:46	130	15.3	1.06	0.055	5%	47.2	saturated	500uA				end of run
	17:48										2.49	0.66	
	17:50										2.49	0.66	
	17:55										2.49	0.66	
	17:56	130	5										
	18:00	130	22.5	2.05	0.11	5%	47.3		1mA				MP
	18:31	130	22.5	2.05	0.11	5%	47.3		1mA				MP
	18:34										2.51	0.65	
	18:37										2.50	0.65	
	18:41	130	5										
	18:48	130	28.5	3.03	0.2	6%	47.4		16uA				only MP spike
	19:00	130	28.4	3.02	0.23	6%	47.4	13uA					main DC regular
	19:25	130	28.4	3.02	0.23	6%	47.4	13uA					
	19:28										2.50	0.65	
	19:31										2.49	0.65	
	19:35	130	5										
	19:47	130	32.5	4	0.21	5%	47.4	95uA					
	20:18	130	32.5	4	0.21	5%	47.4	95uA					
	20:20										2.52	0.67	
	20:25										2.50	0.66	
	20:29	130	5				47.5						
	20:43	130	37.4	5			47.5		350uA	20uA			
	21:15	130	37.4	4.95			47.5		350uA	20uA			
	21:17										2.75		
	21:18											0.85	
	21:20										2.68		
	21:22											0.82	
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	21:24											0.78	
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	21:55	260	37.4	5			47.9		350uA	20uA			
	21:20	260	37.4	5			47.9		350uA	20uA			
	21:22										3.01		
	21:23											1.08	
	21:24										2.93		
	21:25											1.00	
	21:26										2.87	0.97	

29.01.2013

Dark current (DCM1)



CDS booster test run 29.01.2013A

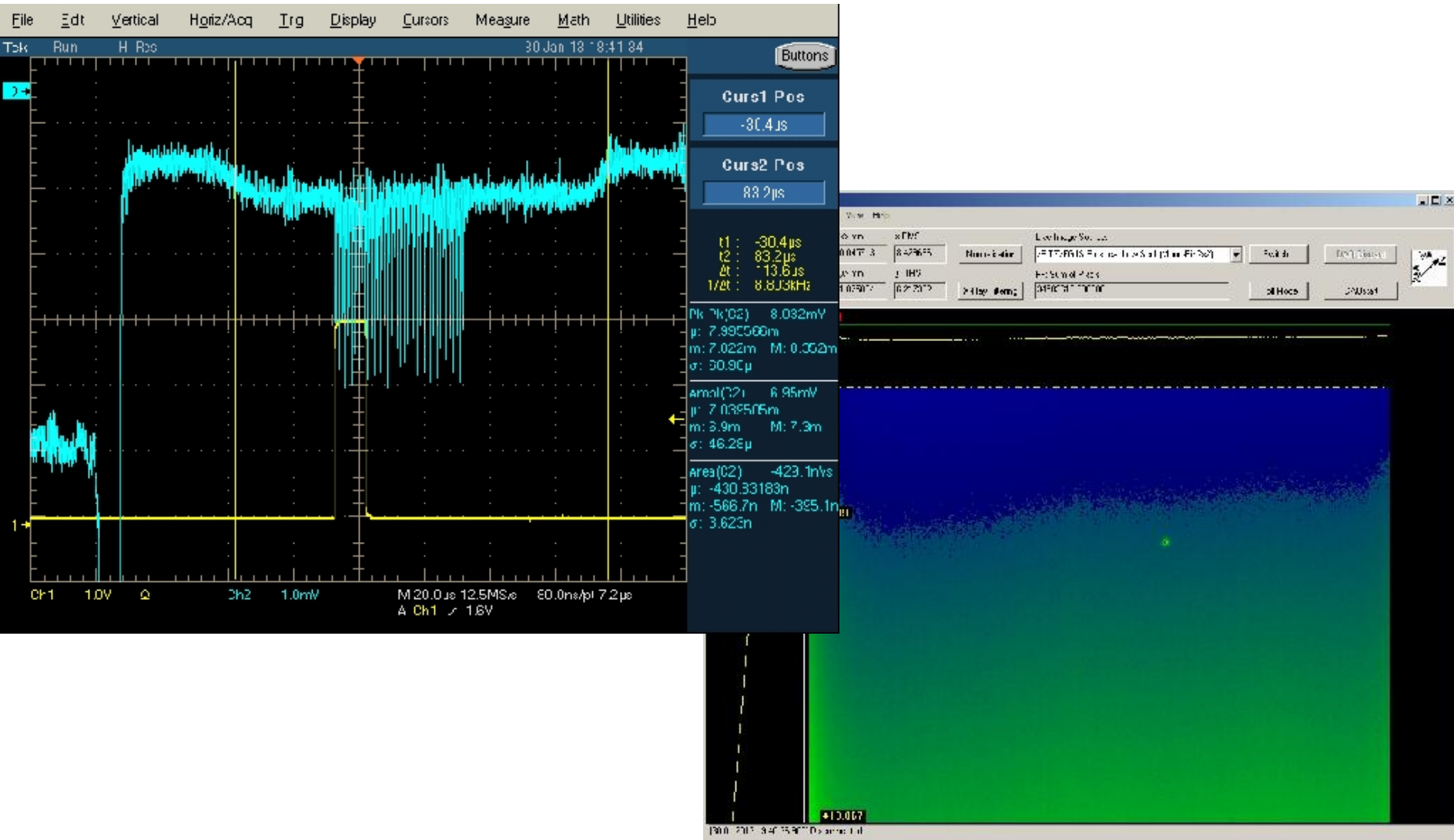


CDS booster test run: next steps

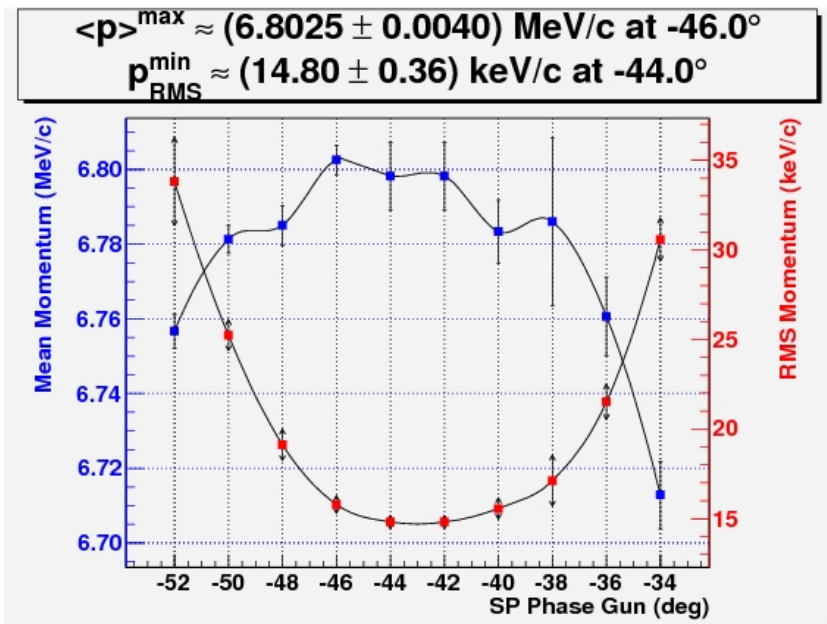
1. This week – booster up to 4MW + monitor the rad. dose after a long run (1shift, 1 day??)
2. Future (?) → 5MW run to find a saturation in the dose rate
3. Future(???) 2 weeks of conditioning?
4. ...

First photoelectrons from this run

- Cathode box exchange – Mo, 28.01.2013 (short1 is installed) → the cathode #149 (Cs2Te standard) inserted on 30.01
- Cs2Te cathode short conditioning – 30.01.2013A
- PE production– Wed, 30.01.2013



New MAMA (OMA) Tests

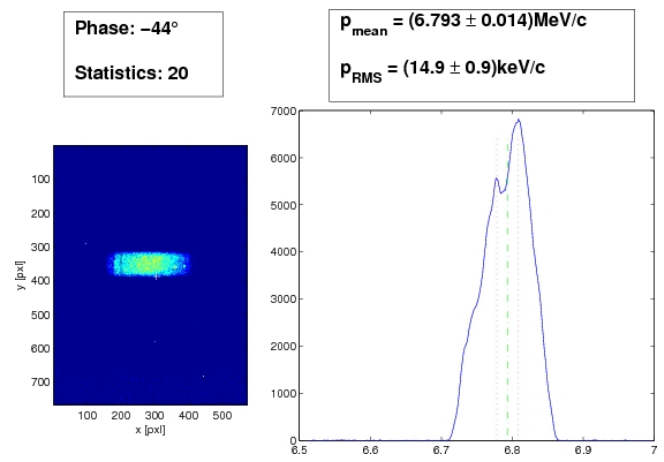
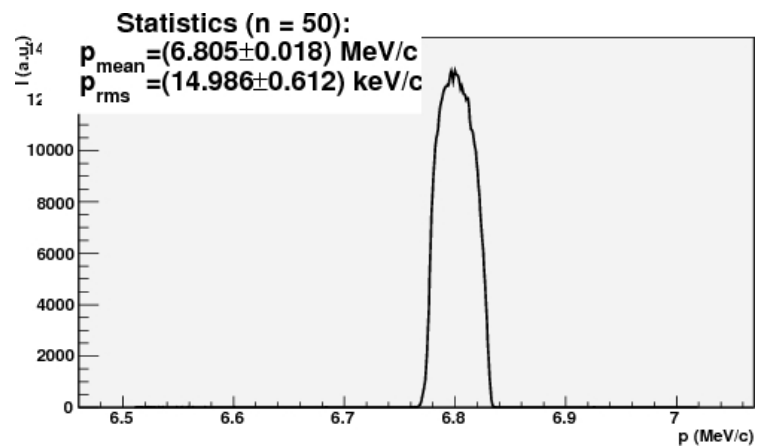
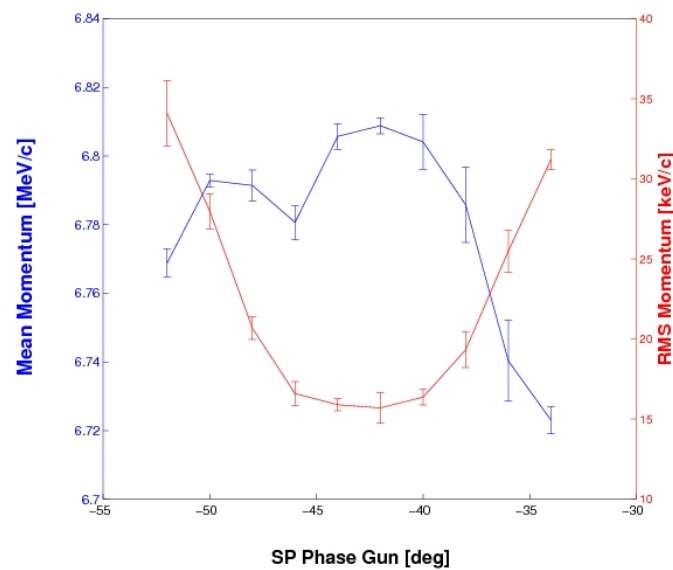


Measured at: LEDA

$\langle p \rangle^{\max} = (6.809 \pm 0.002) \text{ MeV/c at } -42^\circ$

$p_{\text{min}}^{\text{RMS}} = (16 \pm 1) \text{ keV/c at } -42^\circ$

Imain = 479.6A
 Idip = -1.8A
 10 statistics
 -88 pulses
 LT = -888%
 SP-Pforw = 65.0
 Power = 7.37MW
 Reflection = 72%



Measurement program 2013/1

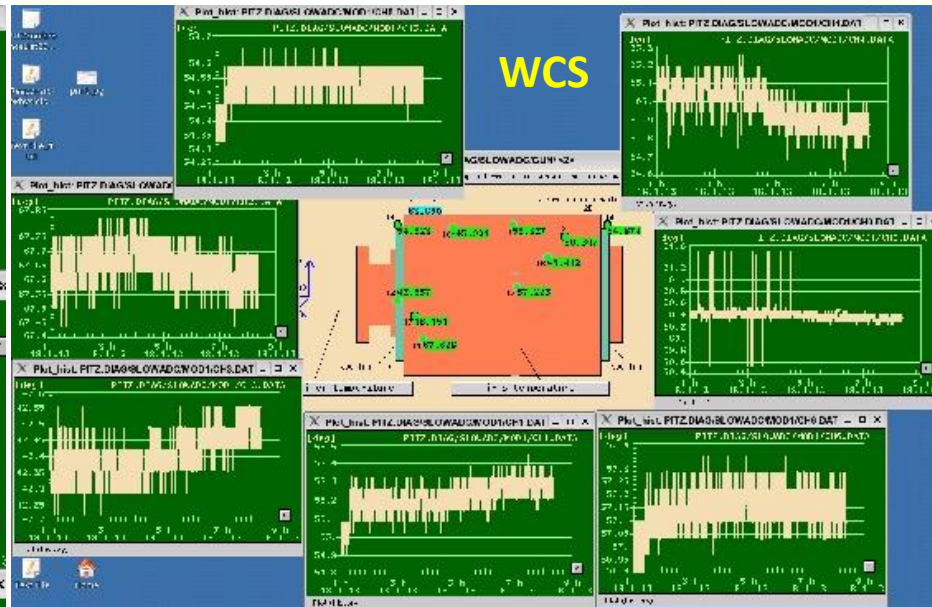
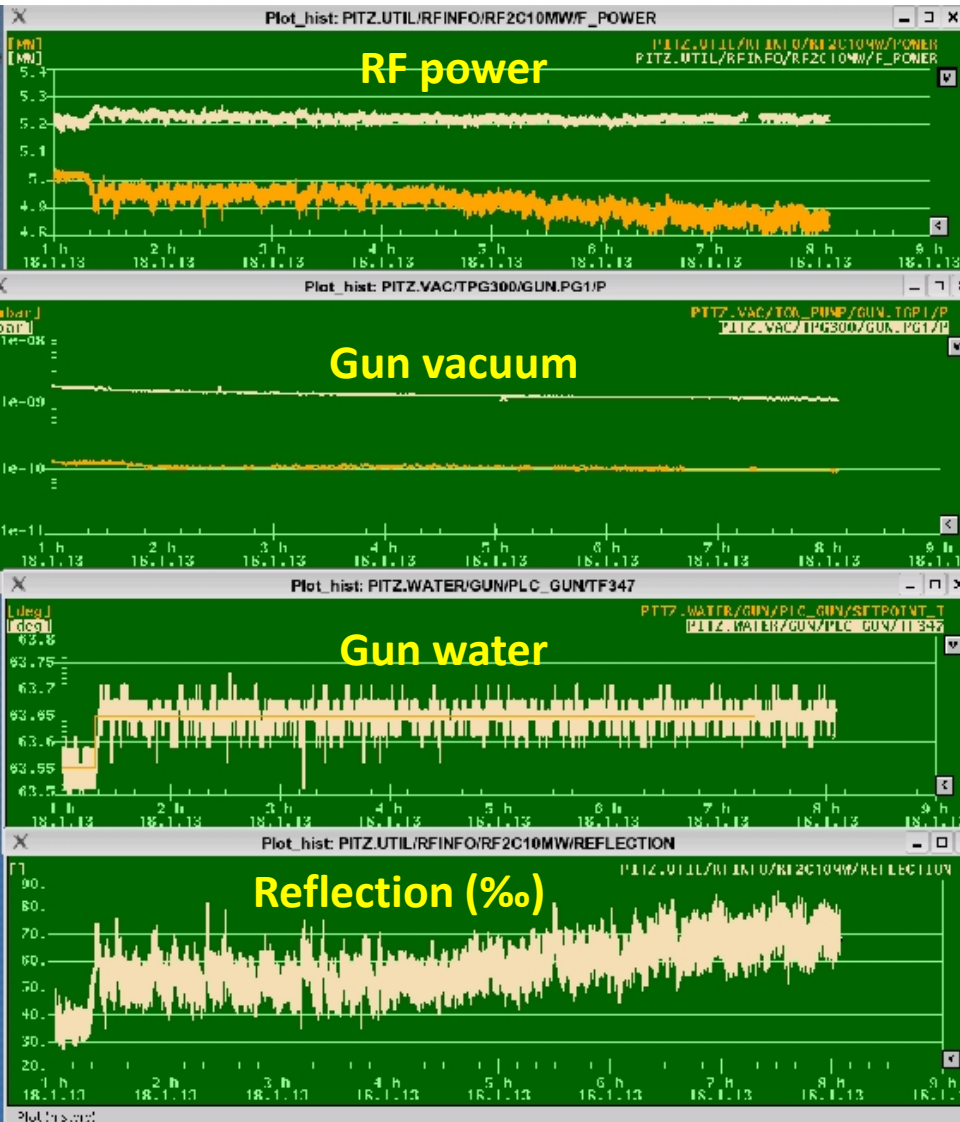
item	Task	Description	Responsible	program available?
1	Gun-3.1 conditioning	+Cs2Te cathode	MK	+
2	CDS booster test run		? , MK	+
3	Long. momentum measurements	Gun characterization + data for LPS tomography trial	DM, MK	+
4	Gun stability measurements	Amplitude and phase, + pulse train flatness	Igl	+
5	Emittance measurements	Min emittance for 0.02; 0.1; 0.25;1;2 and 3nC (new), slit scan	MK, GV	
6	Emittance vs. booster gradient	100pC	GV	
7	Emittance vs gun gradient	45 vs. 60MV/m		
8	Emittance vs. laser rt		+MG, GK	
9	Emittance optimization for Gaussian	laser pulse length variation		
10	Emittance along the beam line and tomography	100pC?	GeK	
11	RF gun coupler kick studies	???	MK, Igl	
12	Studies for PWA	Kapton window tests	MG	
13	Solenoid BBA	Still magnetizable parts	MK	+
14	BPM commissioning	Timing + calibration	MK	+
15	Low charge studies	short pulse characterization	BM	+
16	Laser shapes adjustment	Temporal and transverse	GK, MG	

Problems observed

Problems observed

Slow drift observed during high average power run:

- 18.01.2013 (N-M): 150kW drop of the rf power in the cavity whereas the forward power was stably running at 5.2MW ($\sim 5\text{MW} \times 830\mu\text{s} \times 10\text{Hz}$)

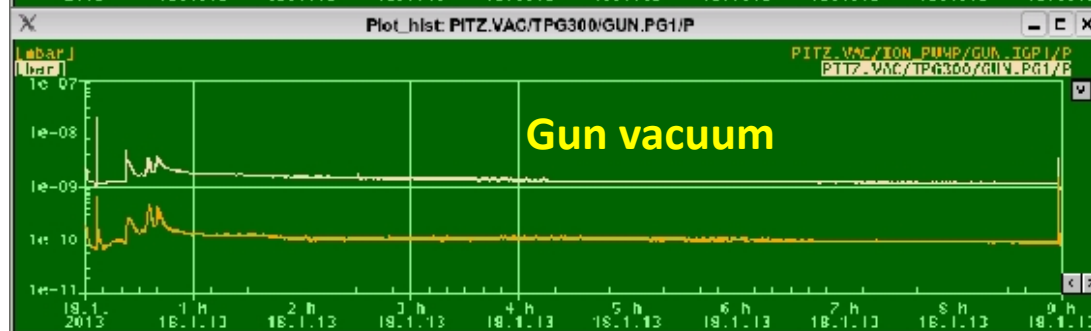
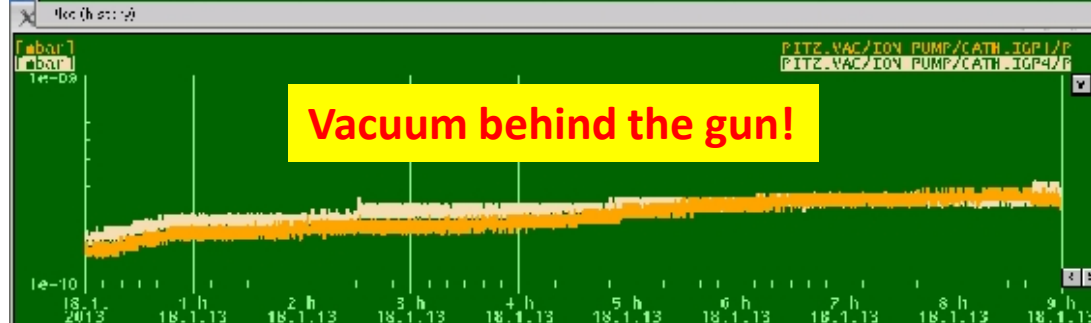
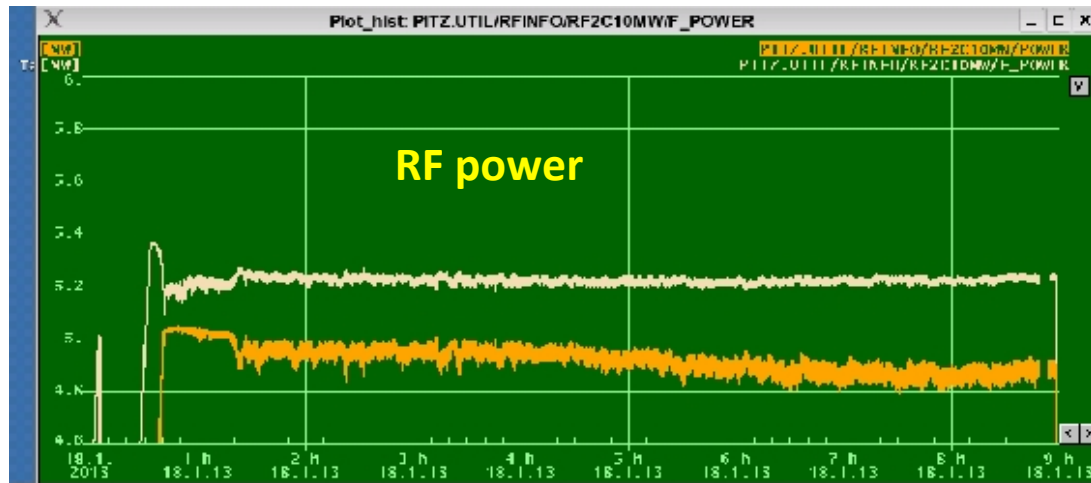


?redistribution (drift) of the gun (effective) temperature?

Problems observed

Slow drift observed during high average power run:

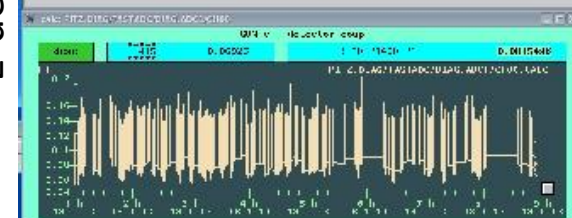
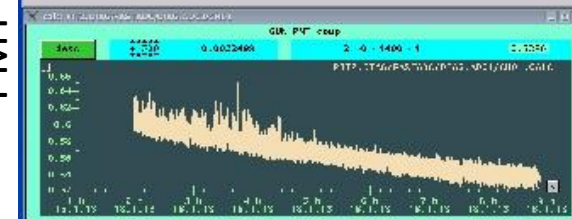
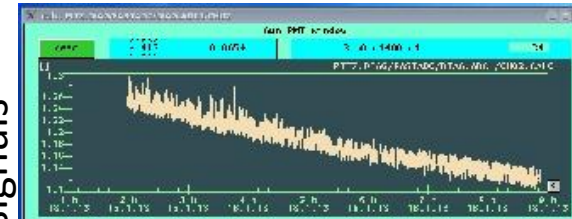
- 18.01.2013 (N-M): 150kW drop of the rf power in the cavity whereas the forward power was stably running at 5.2MW ($\sim 5\text{MW} \times 830\mu\text{s} \times 10\text{Hz}$)



PMT signals

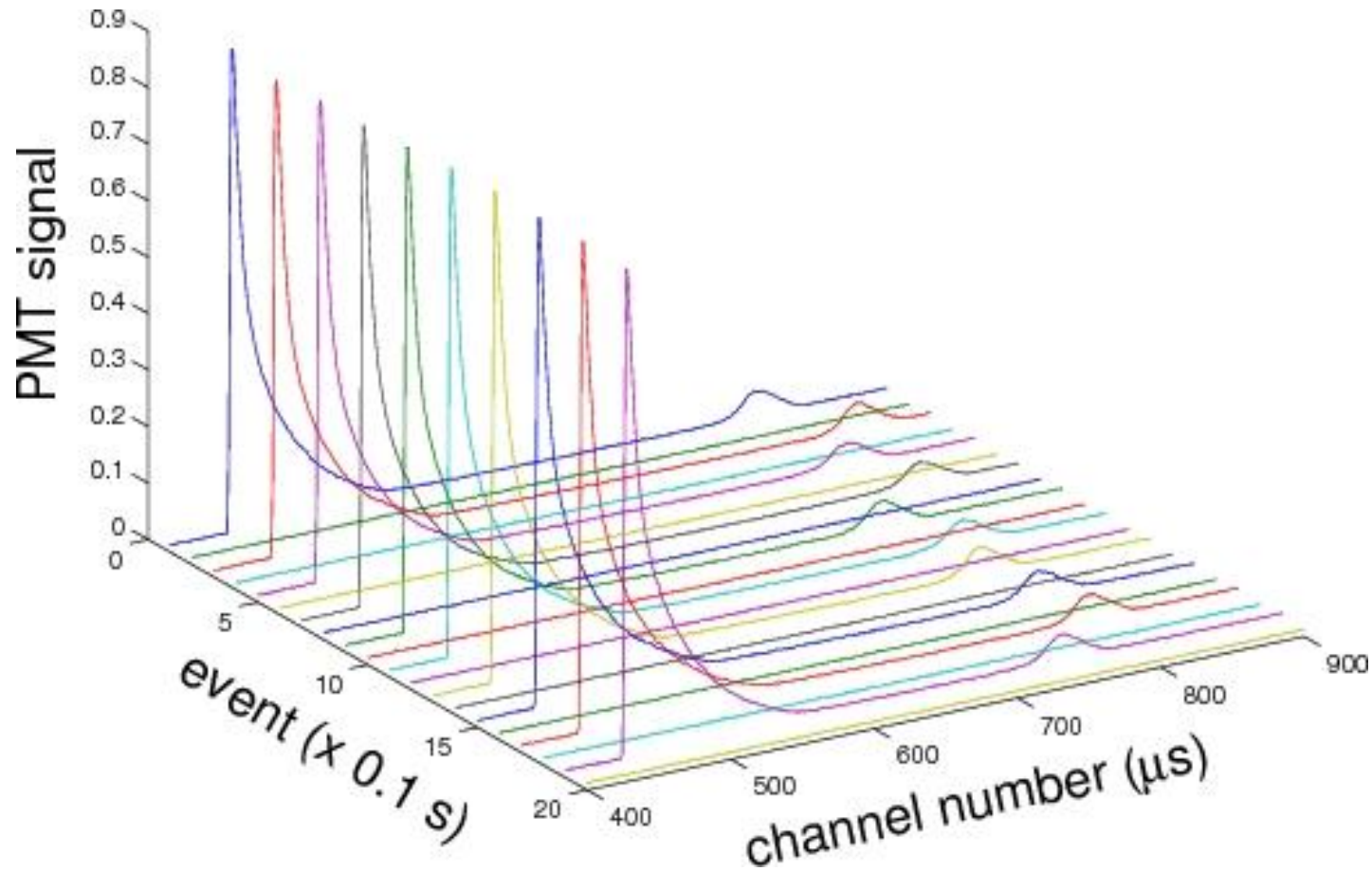
E-detectors

γ -detect.



Problems observed

PMT signals are unstable at long rf pulses (830us, 4MW) → observed 20.01.2013M



1. Regular PMT signal is missing for each second event (not 0, but noise!)
2. This happens with both PMTs simultaneously
3. This (up to now) was observed only for 830us rf pulse length
4. The second (small) bump is "traveling" along the pulse.

Studies of unstable PMT signal (week 3 2013)

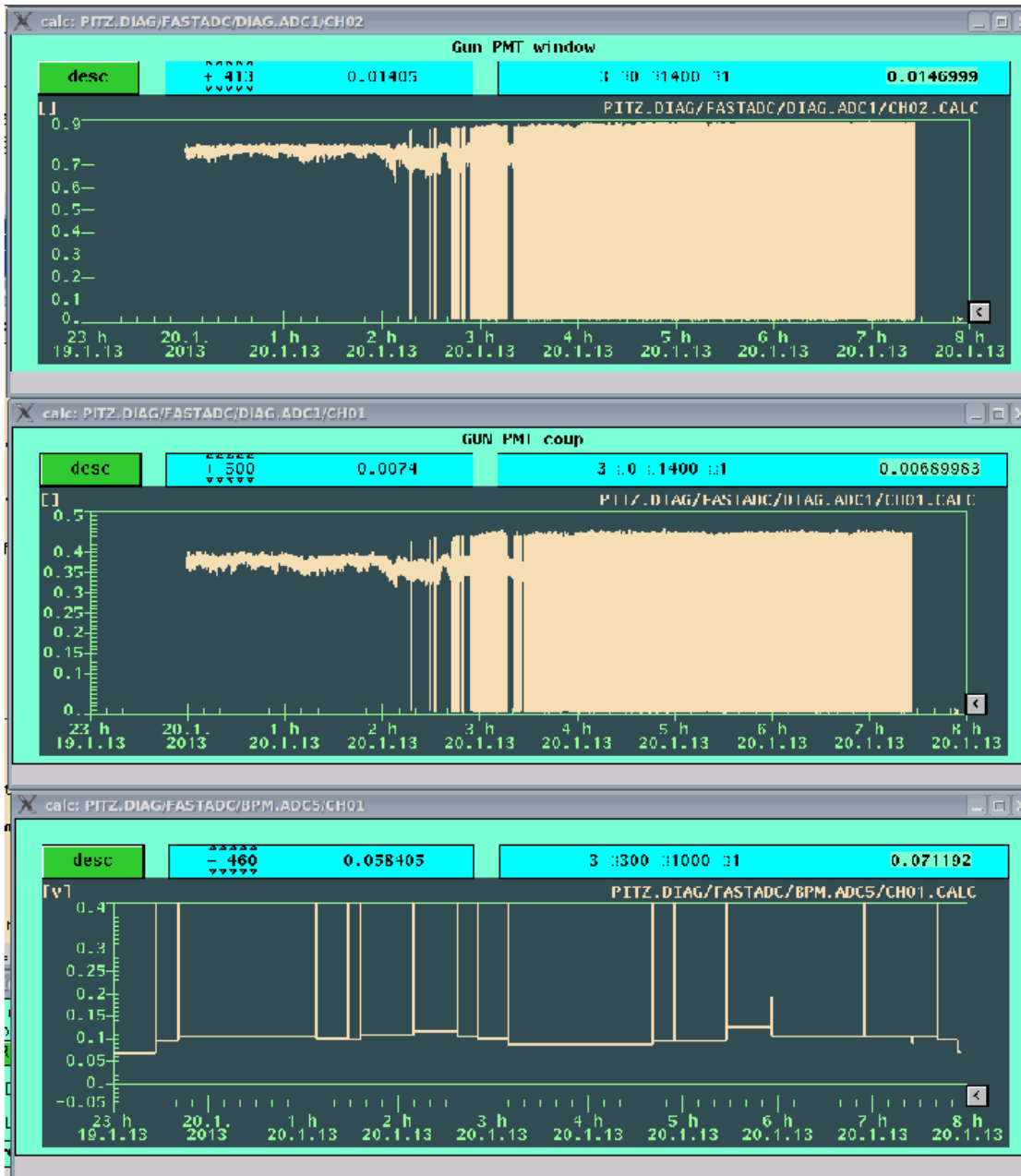
I.Isaev

Time: 19.01.2013 23:30 – 20.01.2013 07:30

Power ~ 4.15 MW in the gun cavity

Timing settings: 50us/830us\20us

History from GUI

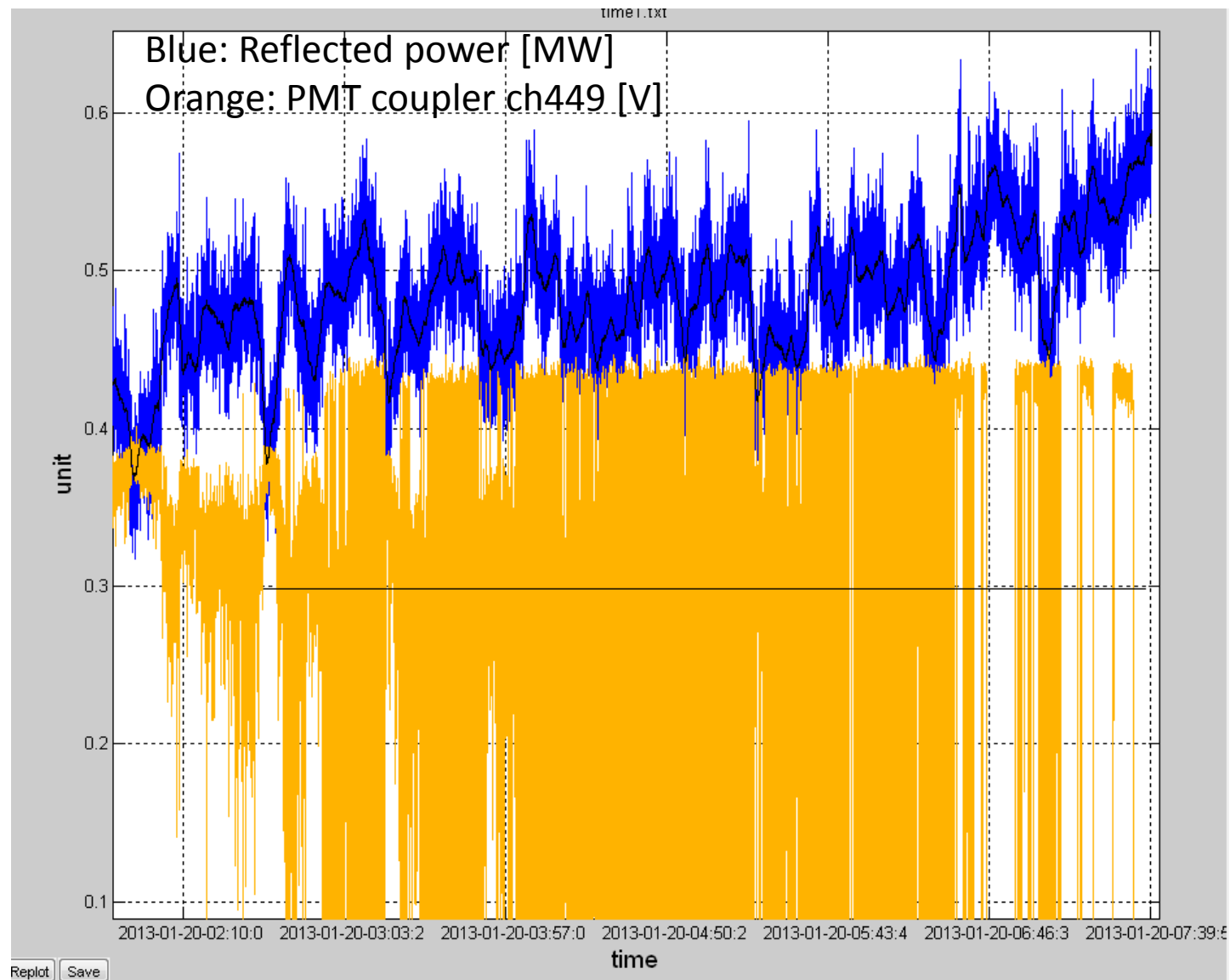


No correlations between PMTs signals jumps and RF signals, DCM signal, PD_gamma, Gun e-det coupler /window and Booster PMT in cell1 were found.

Some correlation between reflected power and PMT signal could be observed (see next slides).

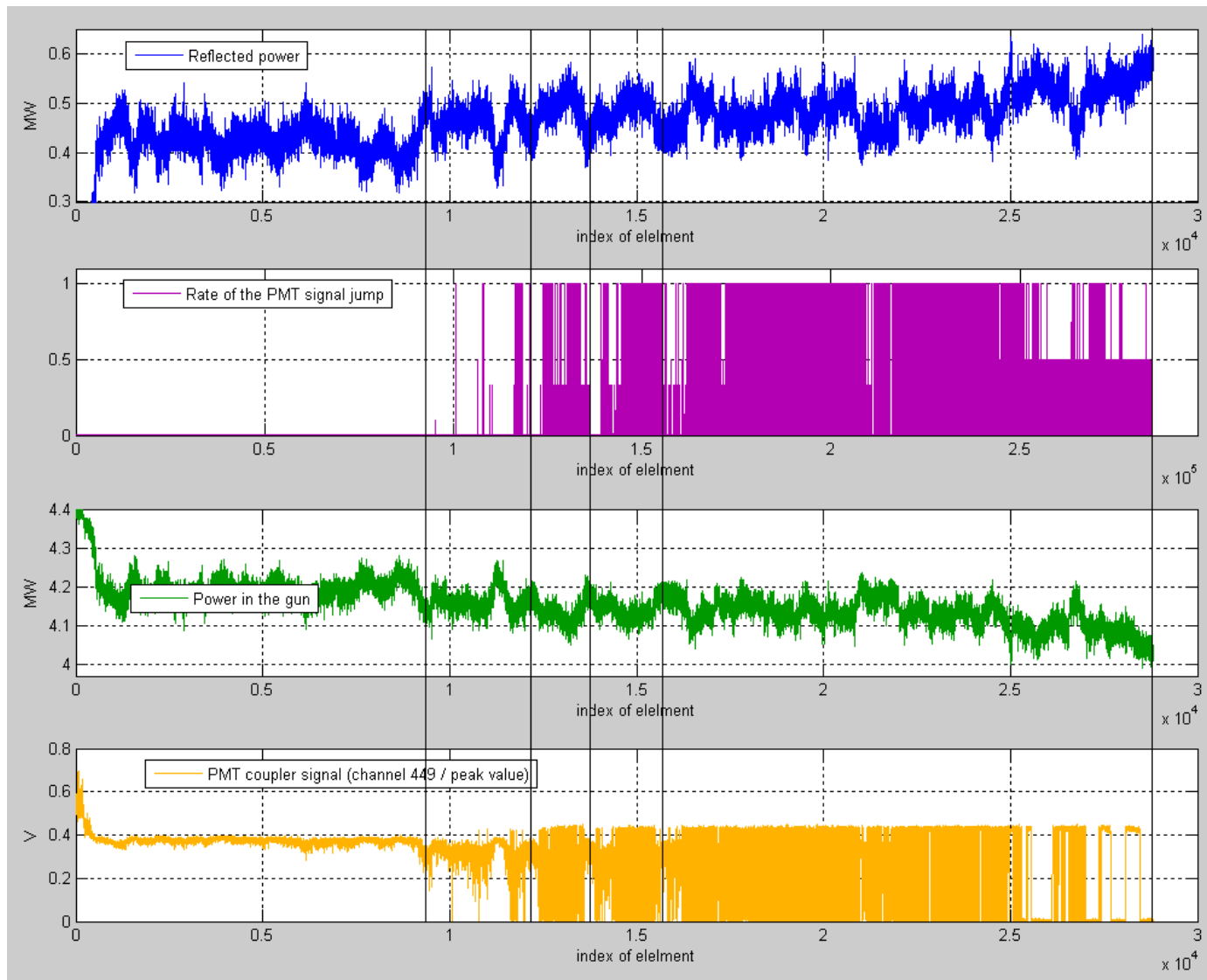
Correlation of reflected power and signal of PMT coupler.

Data has taken from DAQ

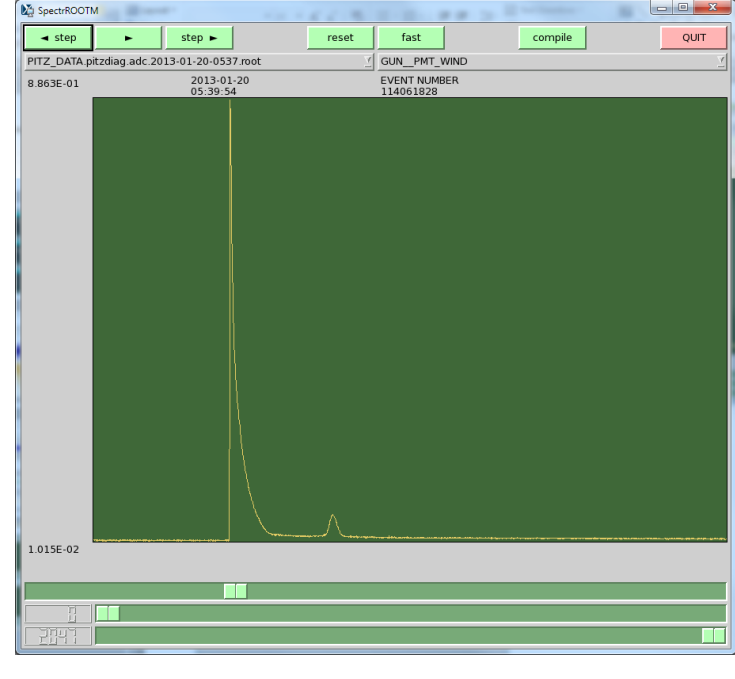
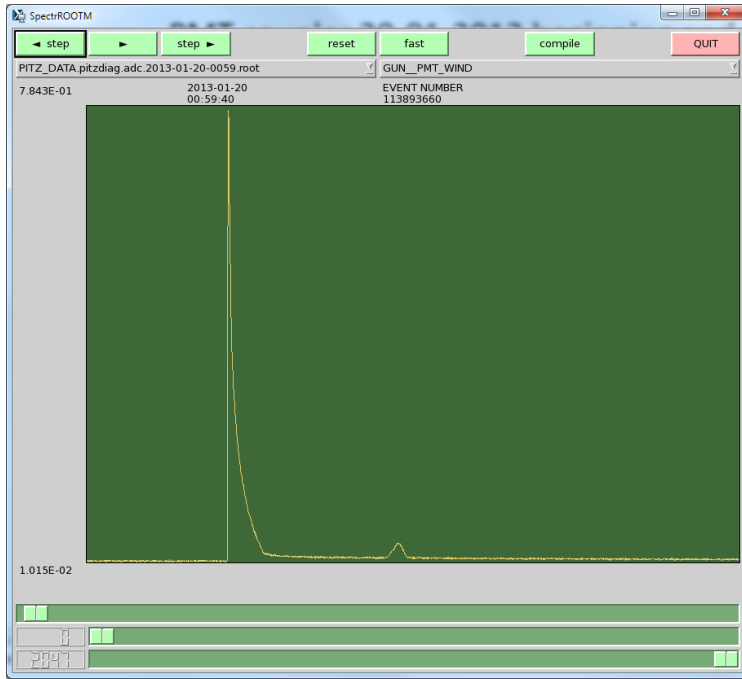
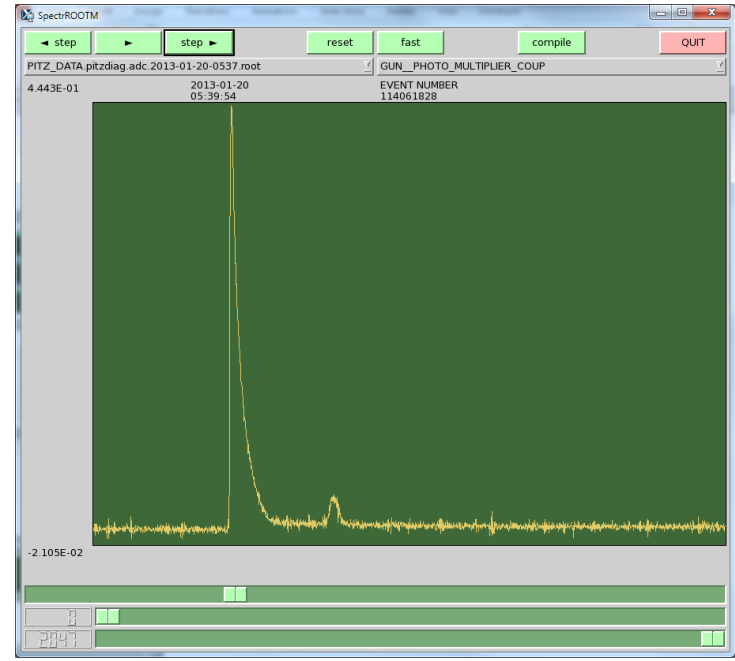
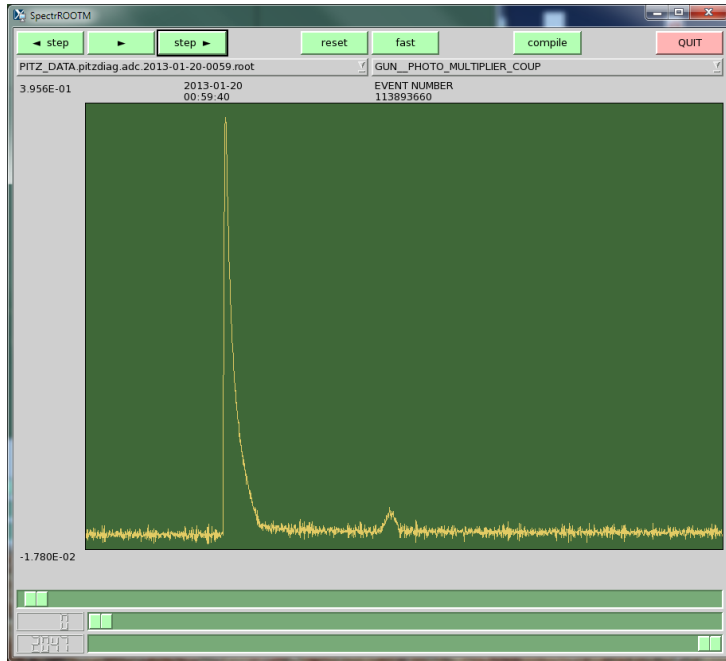


Correlation of power (in the cavity and reflected) and PMT coupler signal ch449 (peak value)
Rate of the PMT signal jump means difference between current and previous jump of the PMT signal.

It looks that these jumps started when reflected power crossed some level of ~ 0.43 MW

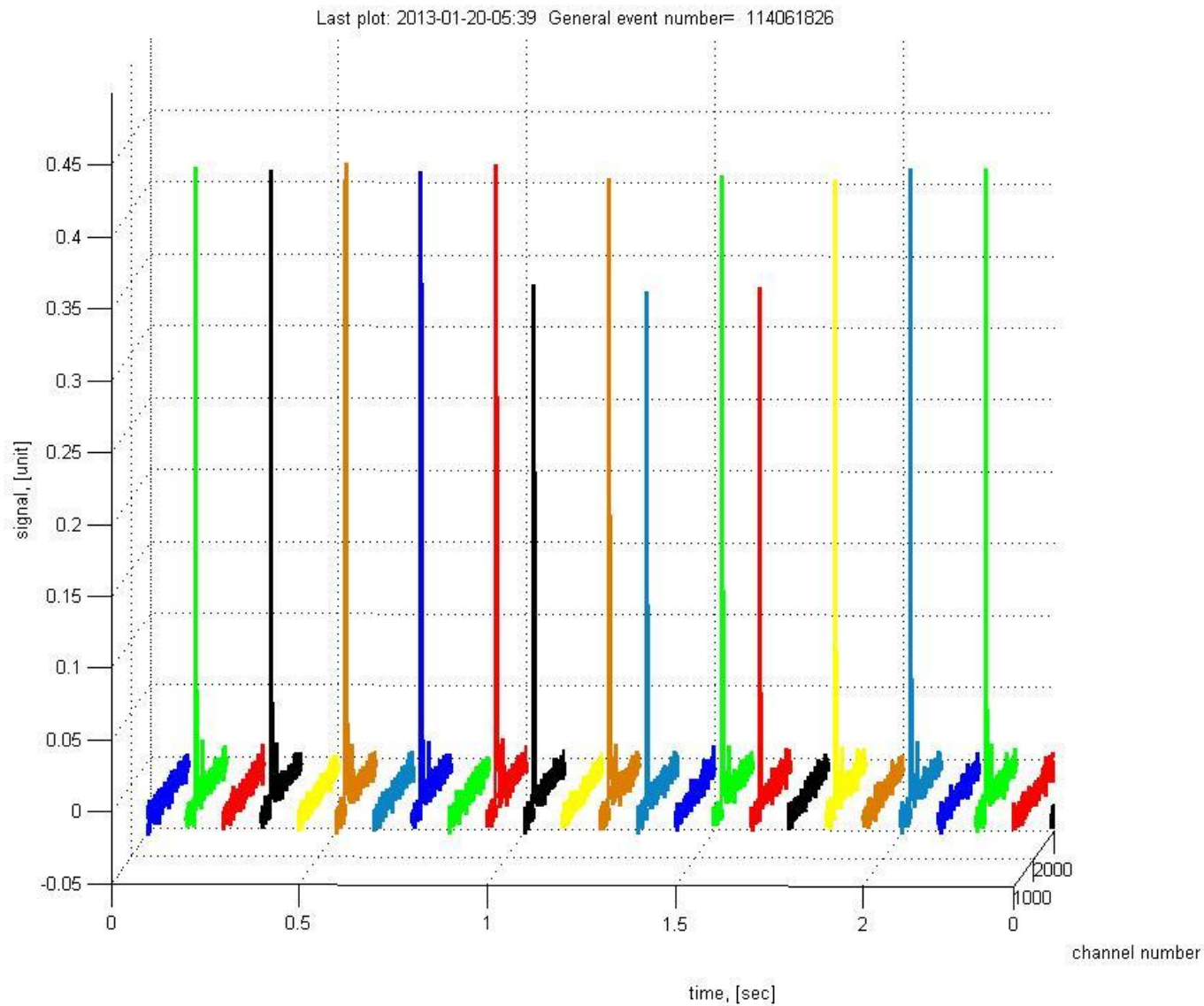


PMT coupler 20-01-2013 beginning and end of 830us run



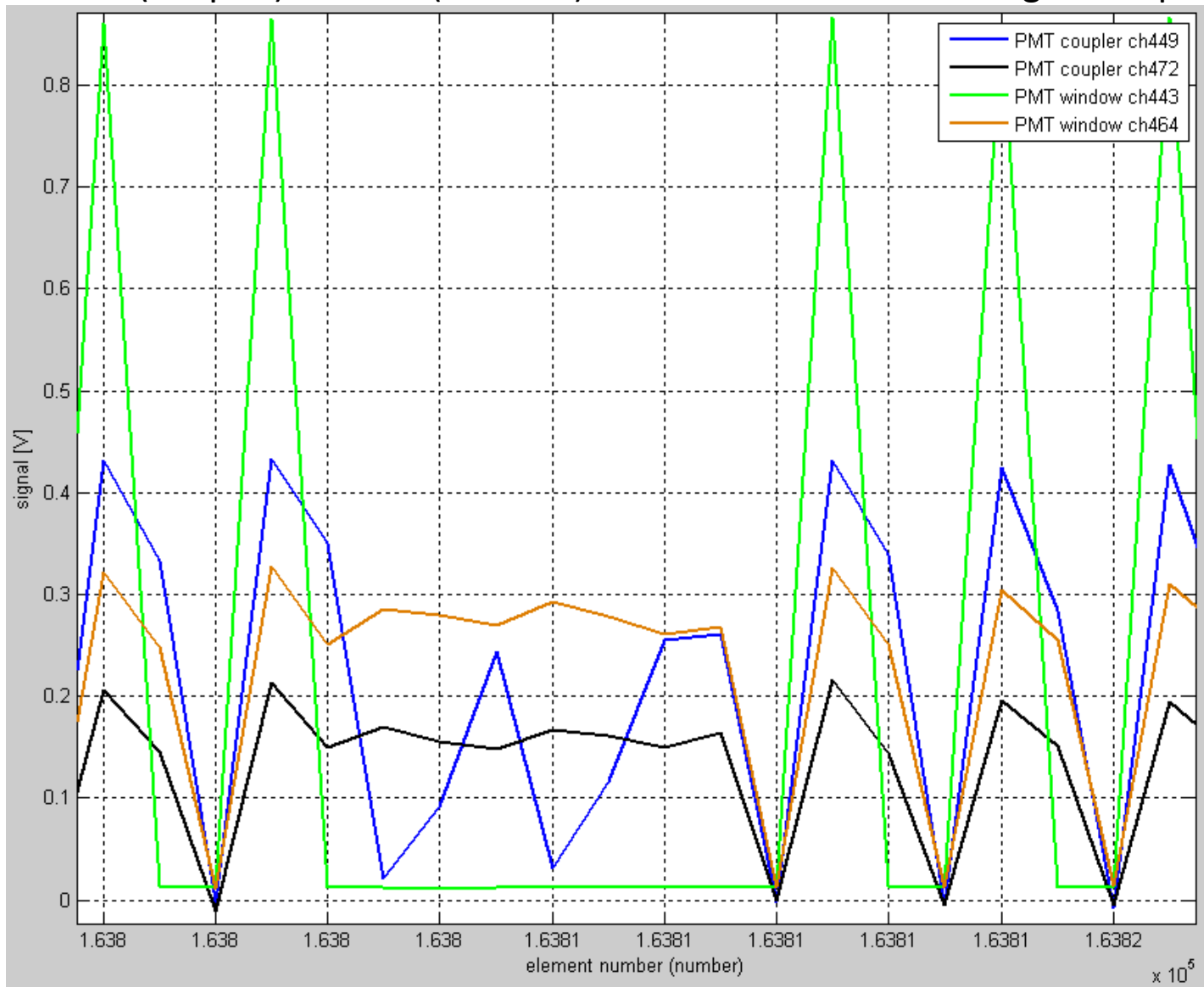
PMT coupler signal in time

Not only each second event is zero level.

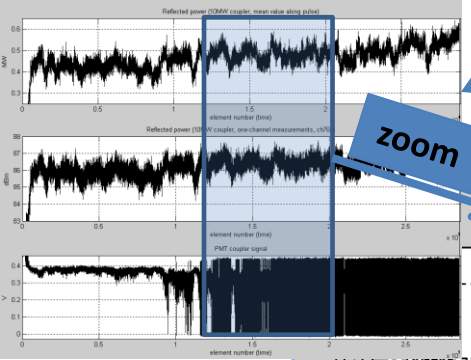


PMT coupler and window signals at the same time.

Channels 449(coupler) and 443(window) are almost at the peak value, channels 472(coupler) and 464(window) are at the middle of the signal shape



PMT coupler signal vs Reflected power from 10MW coupler

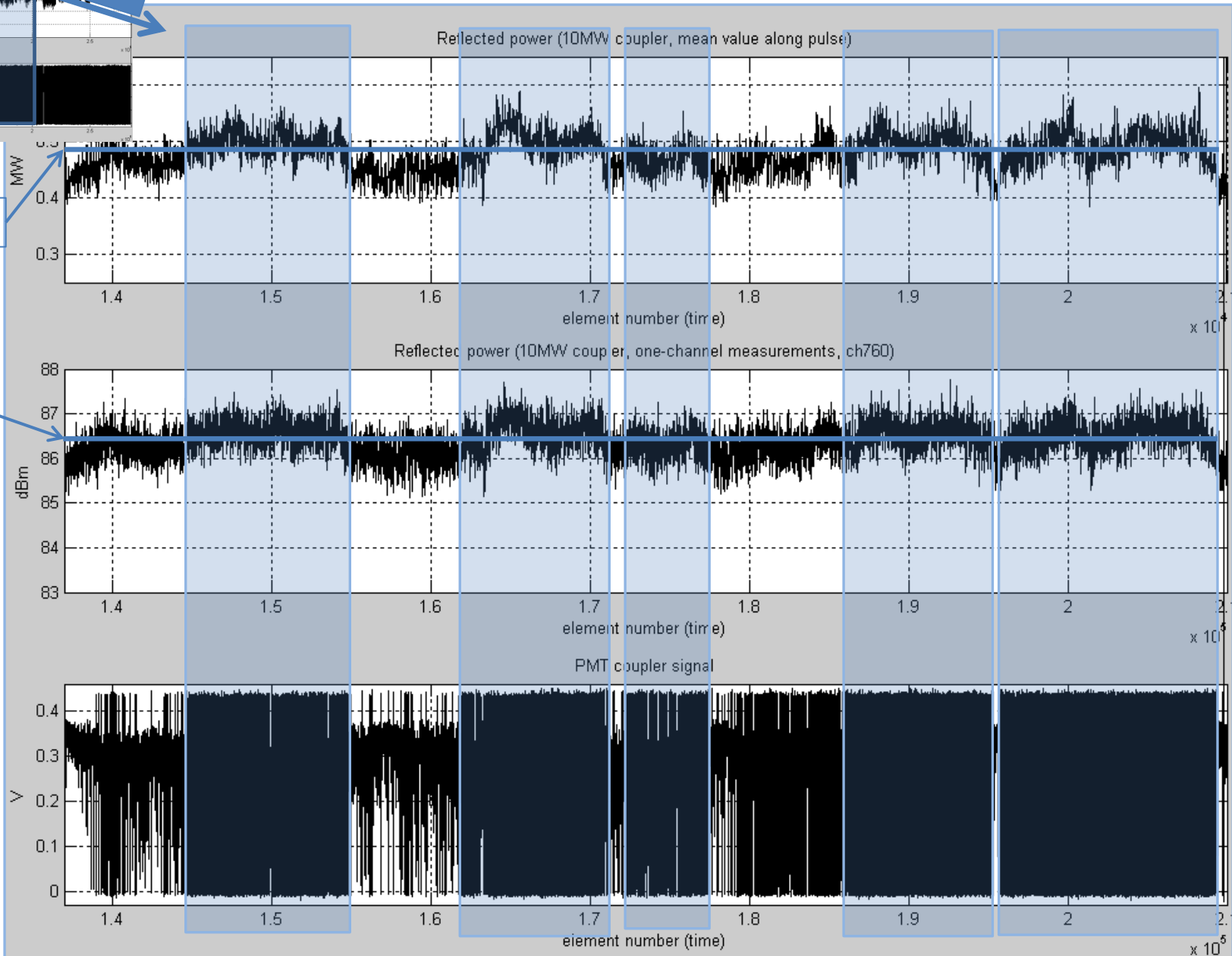


Night run

zoom

~0.49 MW

~86.4 dBm



PMT signal vs Reflected power

