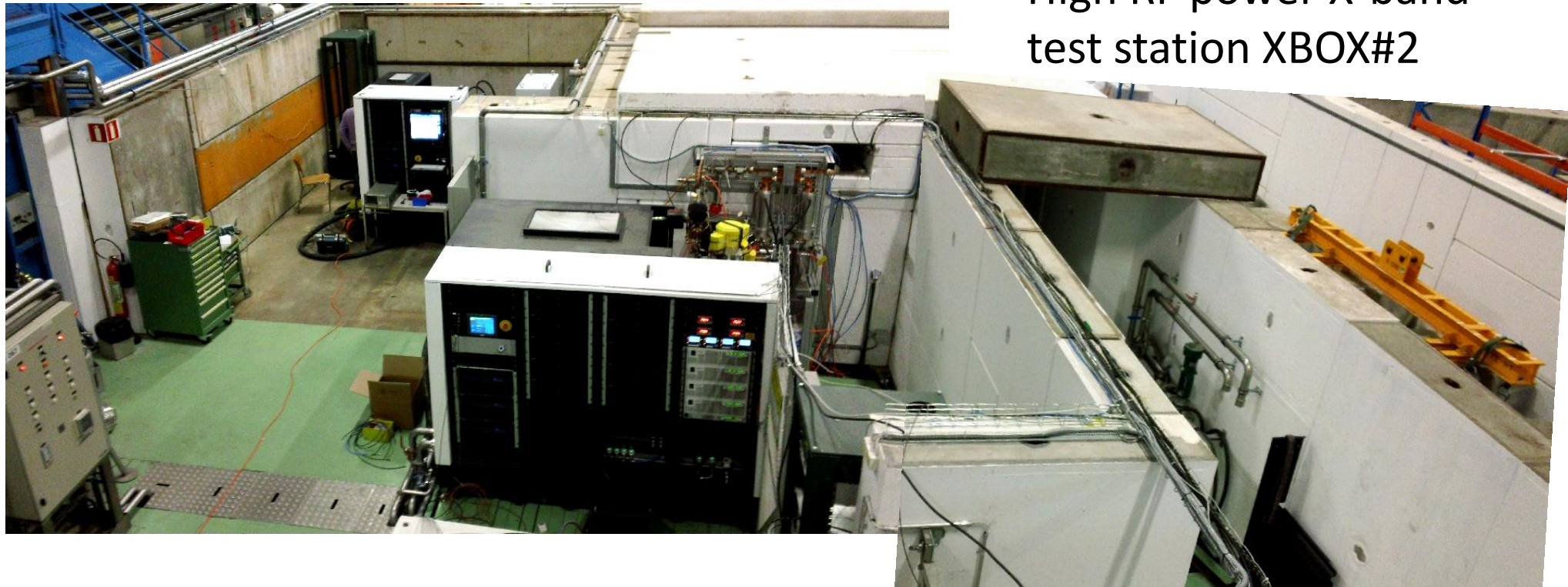


Status of X-band high RF power test stands (XBOX#2 and XBOX#3)

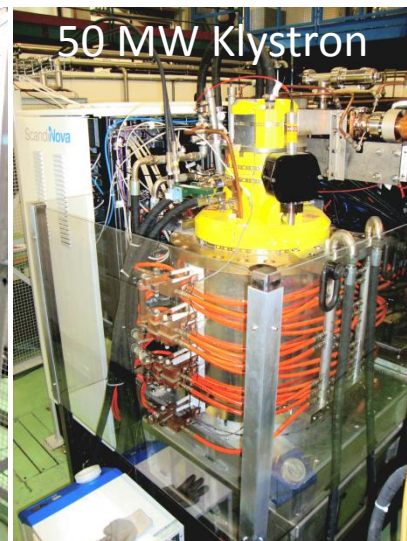
I. Syratchev for XBOX's team.

CLIC project meeting 16.12.2014

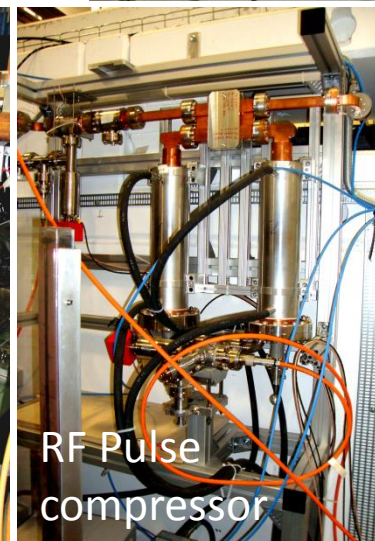
High RF power X-band test station XBOX#2



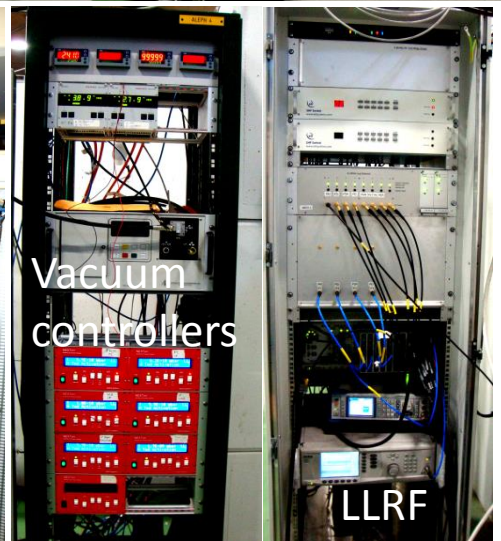
430 kV modulator



50 MW Klystron



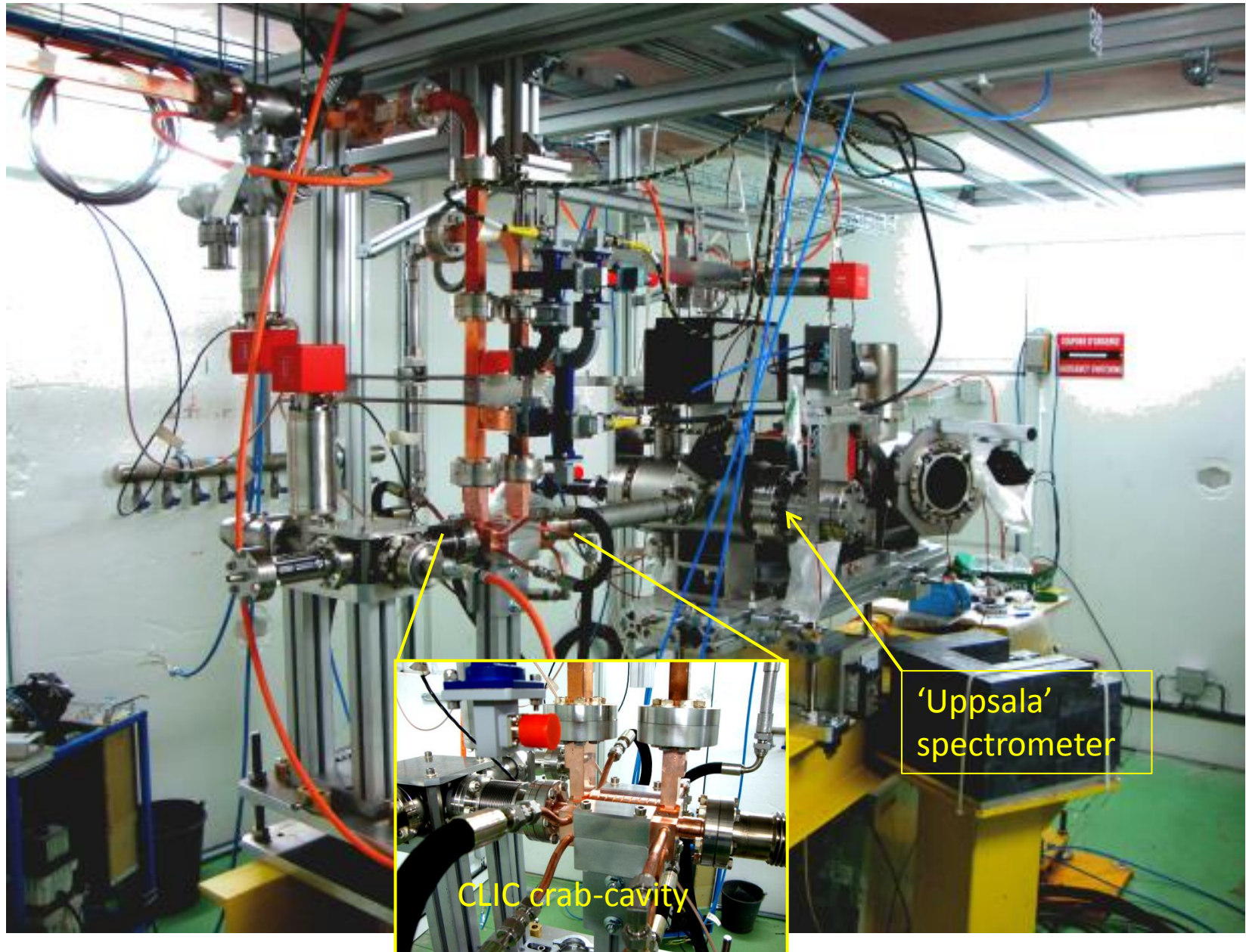
RF Pulse compressor

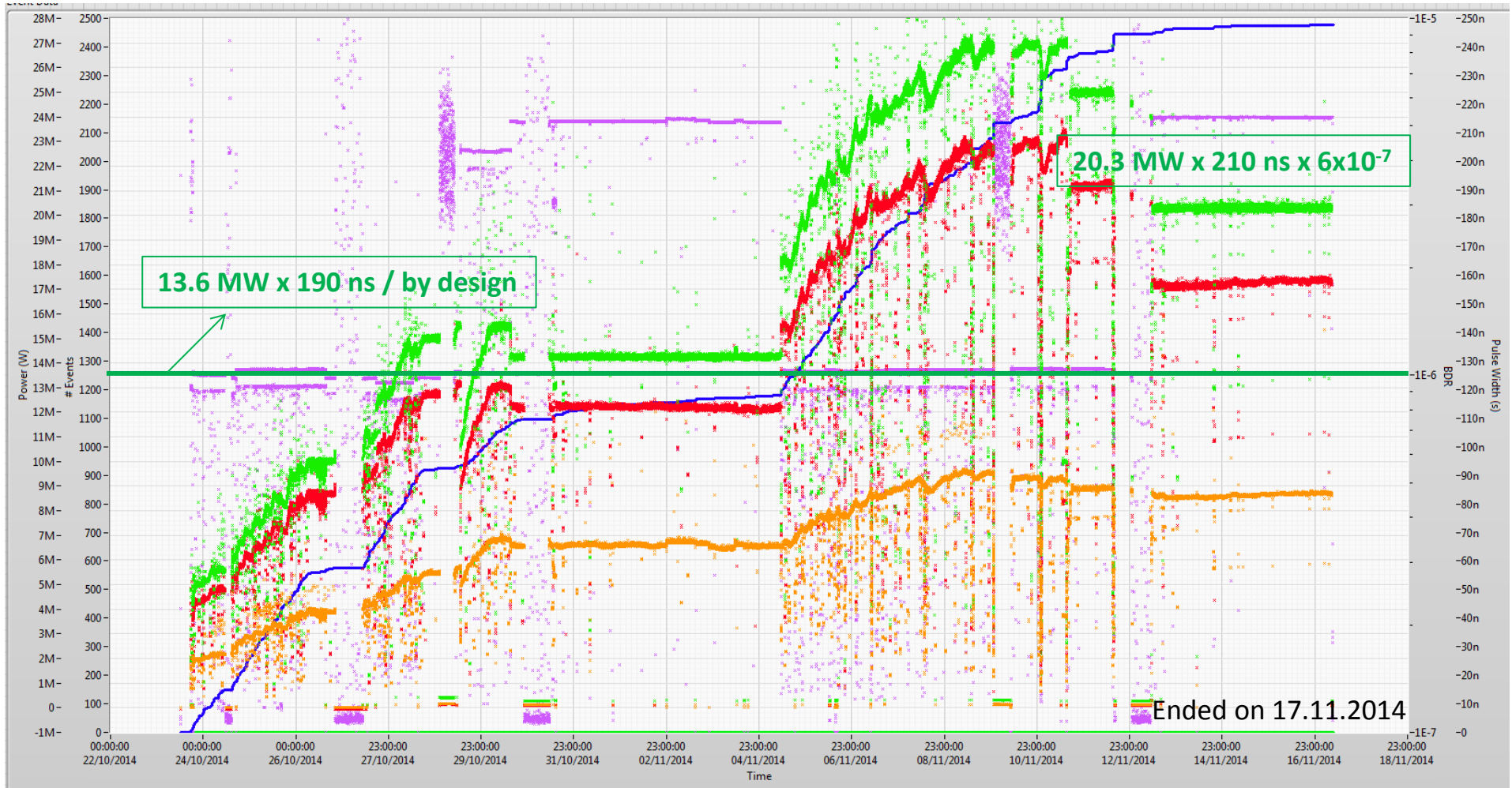


Vacuum controllers

LLRF

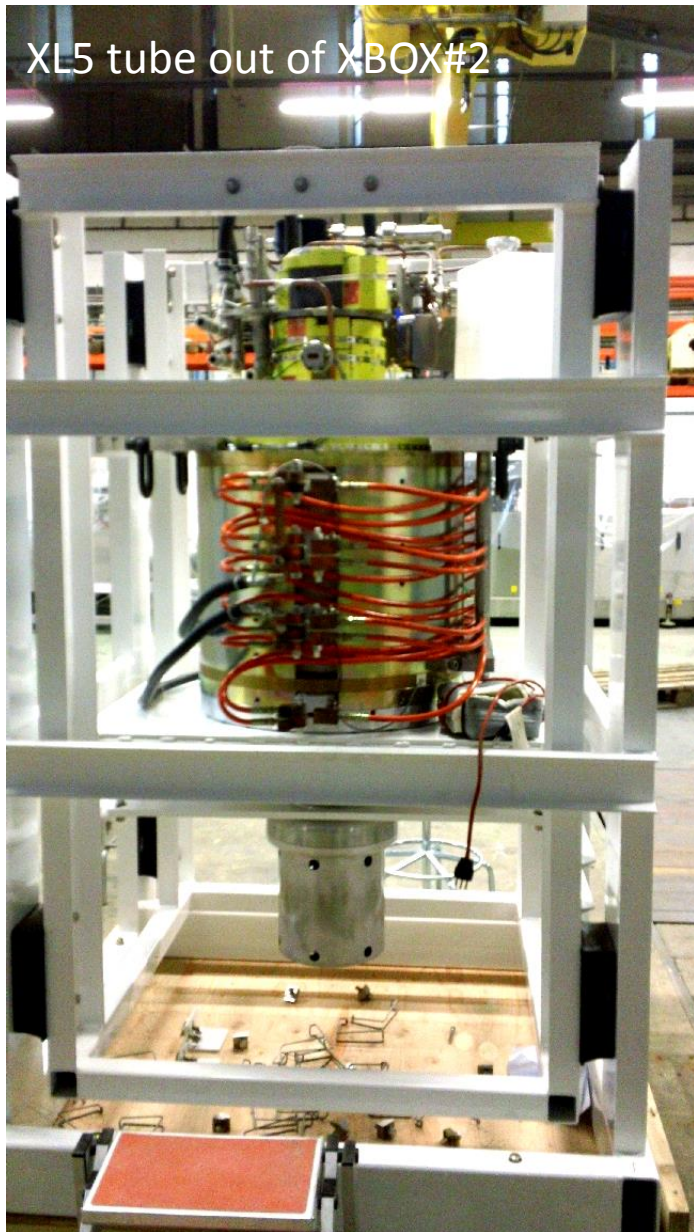
Inside of XBOX#2 test area



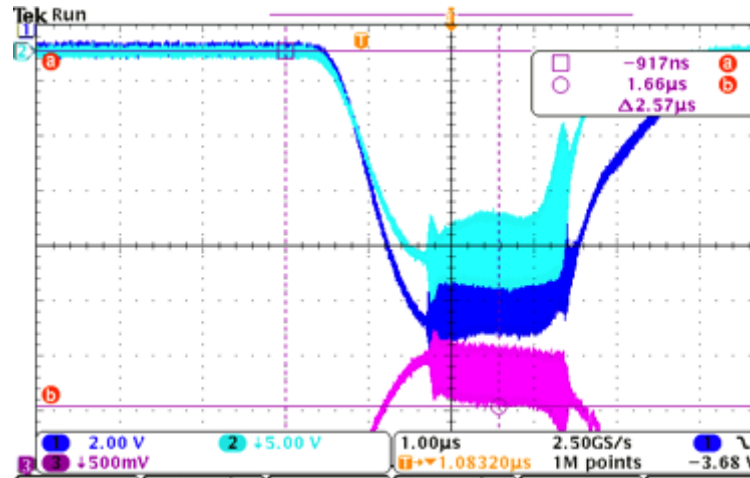


- Successful run for almost 4 week in automatic regime.
- Crab cavity processed up to 25 MW x 200 ns. At 20.3 MW, measured BDR $\sim 6 \times 10^{-7}$ Bd/pulse/cavity. Total number of accumulated breakdowns is ~ 2500 .

On 17.11.2014 XL5 was replaced by CPI#2



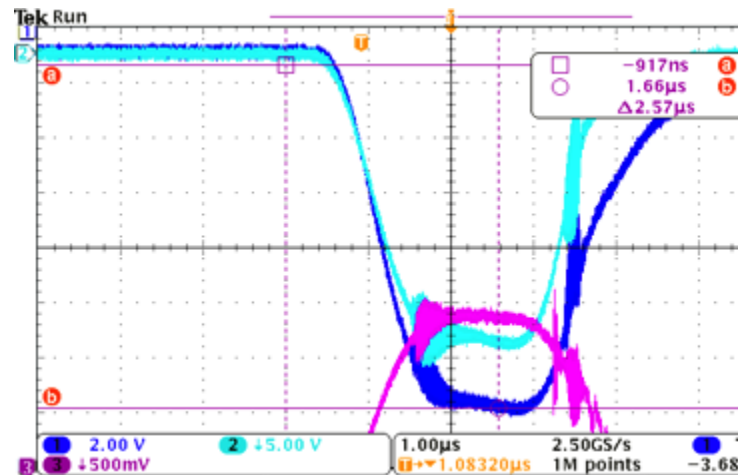
Diode tests (no RF) of CPI#2 tube showed that 0.7 GHz gun oscillations starts at about 240 kV and even generate RF power from the input cavity:

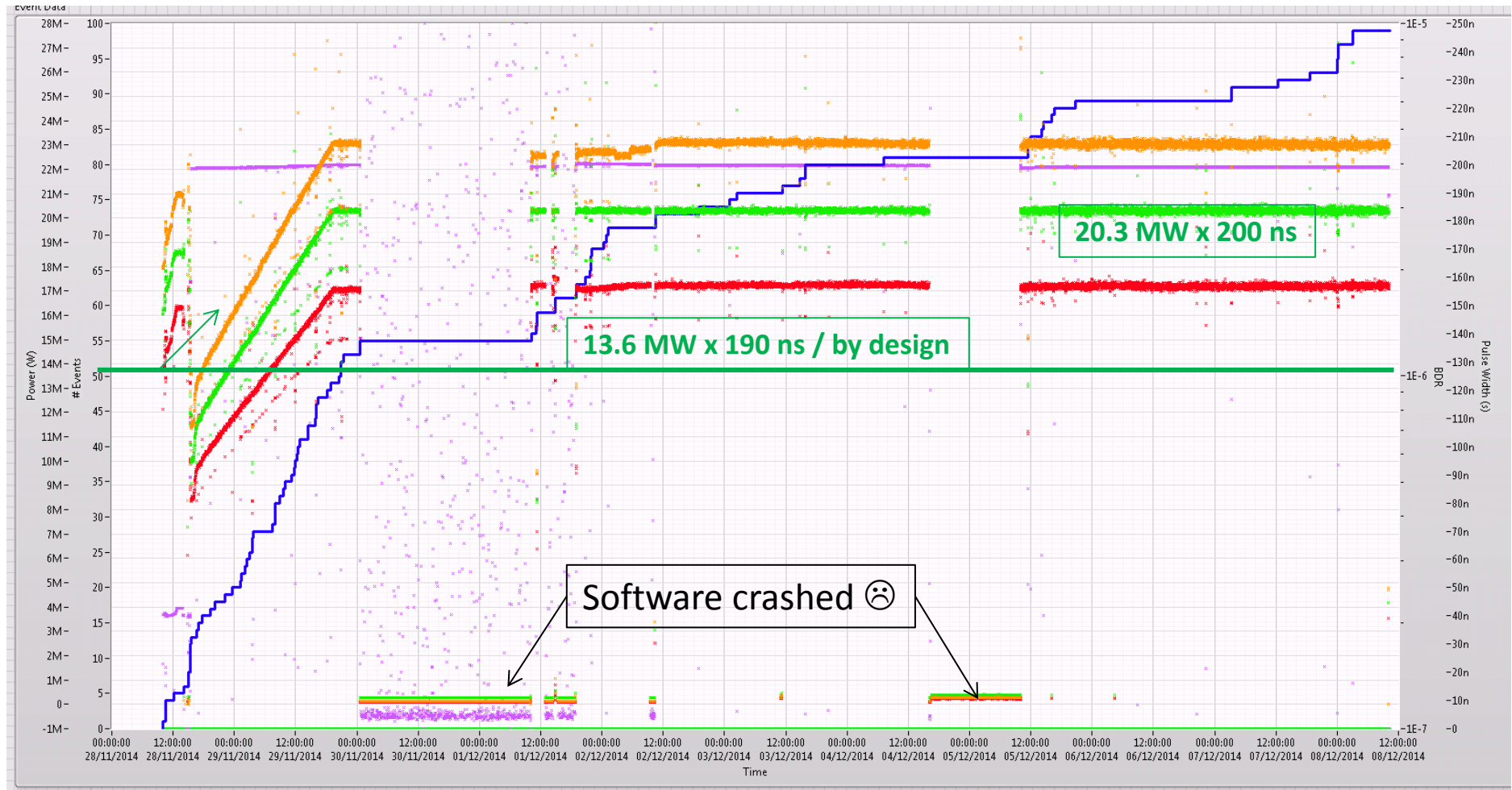


12 GHz pulse from the input cavity

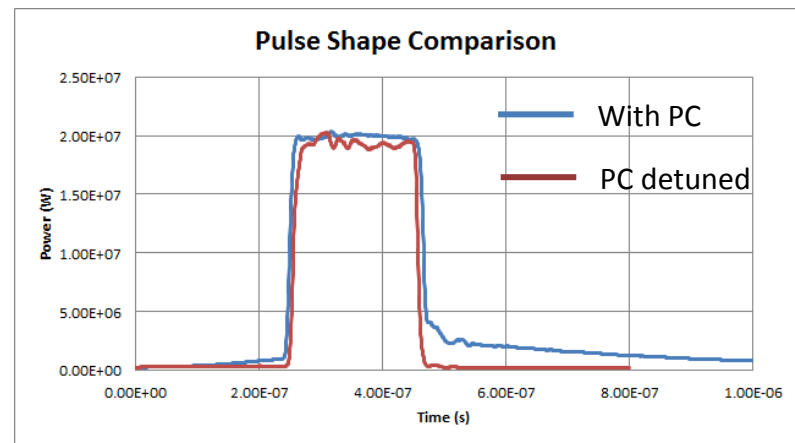
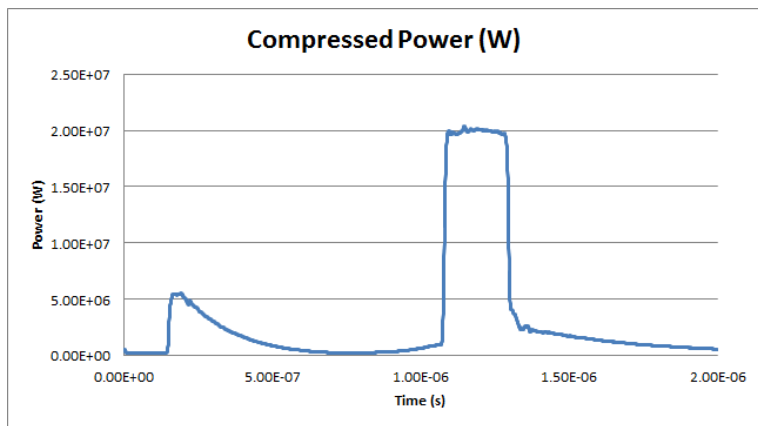
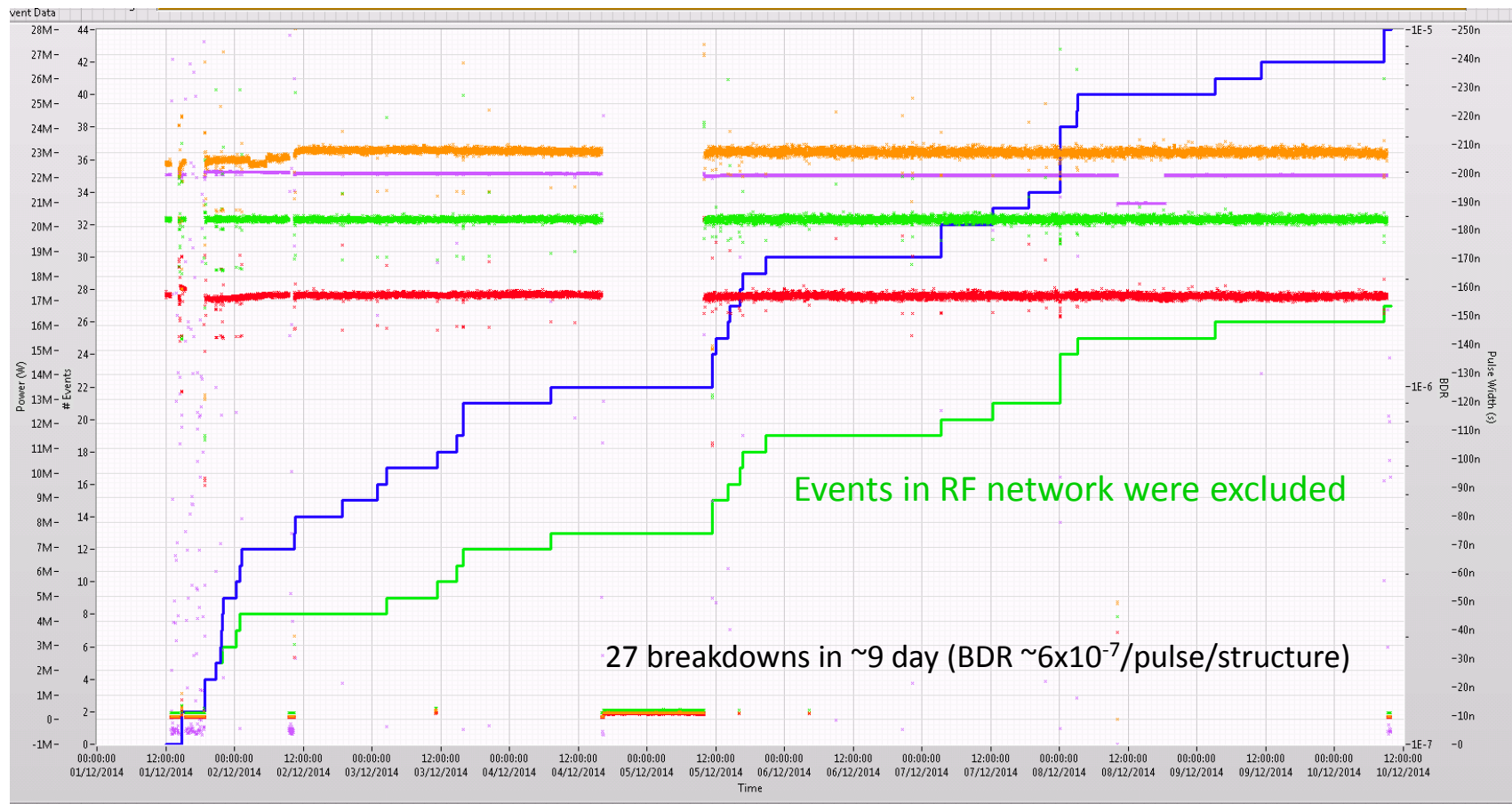


Fortunately, going higher in voltage, the instability zone moves towards the rise/fall time, so the plat top can be used now. Example of the pulse with ~ 5 MW RF peak power expected:

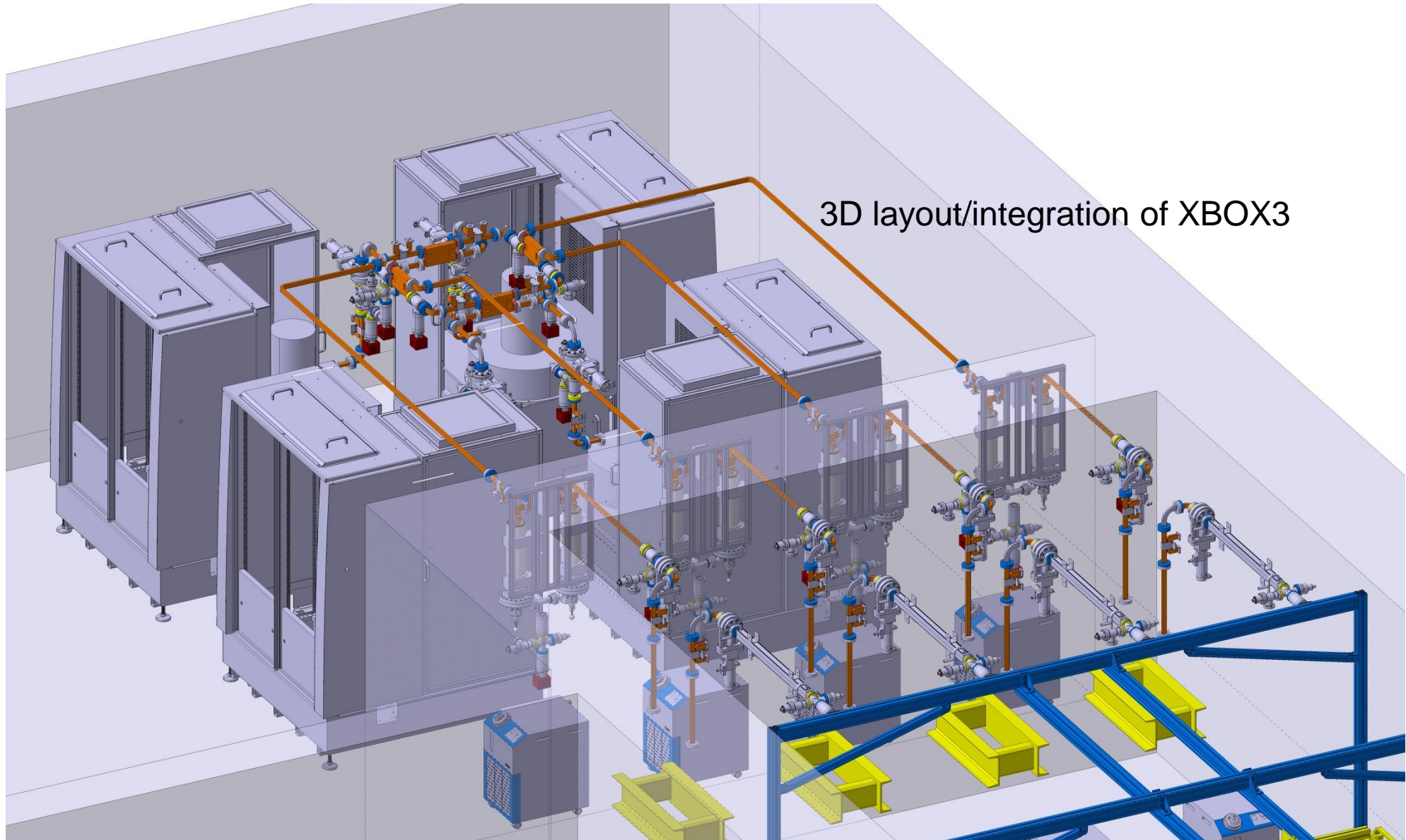


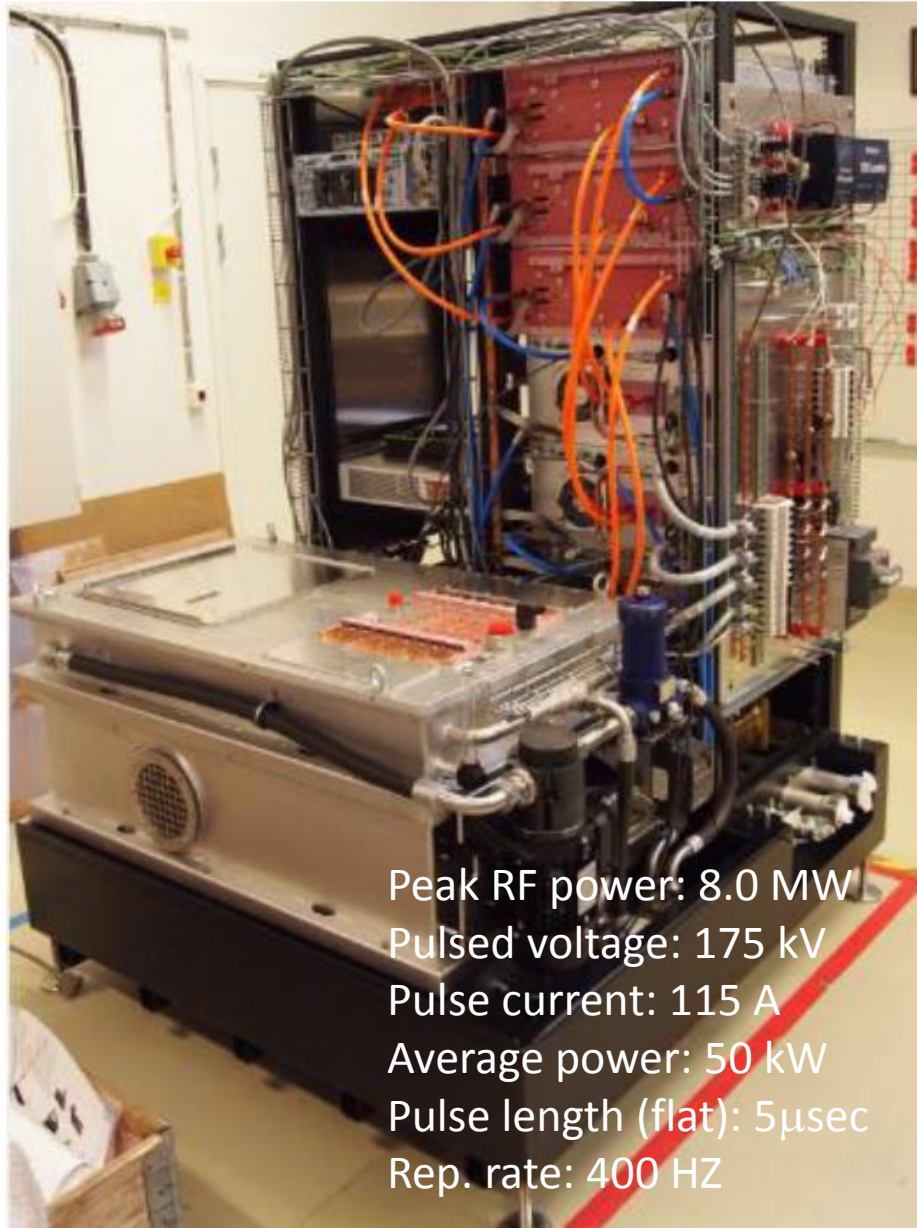


- Successful run for almost 4 week in automatic regime.
- At 20.3 MW. Total number of accumulated breakdowns is ~ 100 .
- The klystron operated with detuned PC, no after-pulse RF discharge.

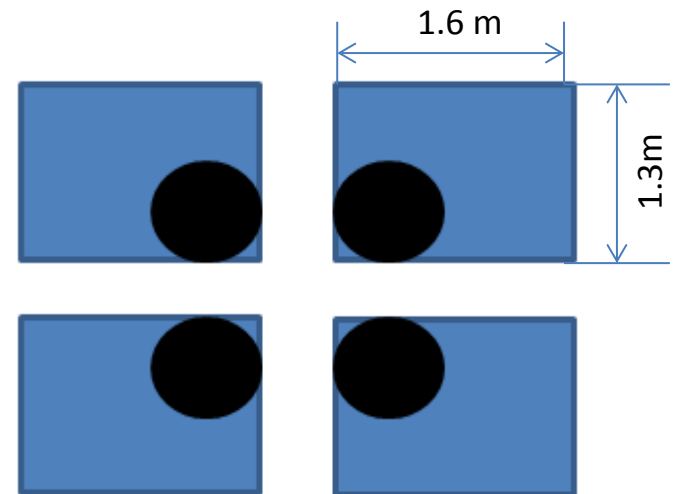


XBOX3 is a 'clever' way to convert the high rep. rate into the bigger number of testing slots with high peak power.





- Doubled width oil tank. To facilitate installation of the Toshiba klystron which has rather wide (\varnothing 0.7 m) solenoid.
- Additional cabinet (comes for free). It can be used for Klystron RF driver amplifier, Solenoid PS, Ion Pump PS etc.
- New Control System that will simplify integration of external parts and offer a lot of new features.
- Flexible design (klystrons positioning) to minimize the length of RF waveguide circuit:



Design:

Peak power: 6 MW
 Beam Voltage: 150 kV
 Beam current: 90 A
 Average power: 12.4 kW
 Efficiency: 42.0 %

TOSHIBA
 Leading Innovation >>>

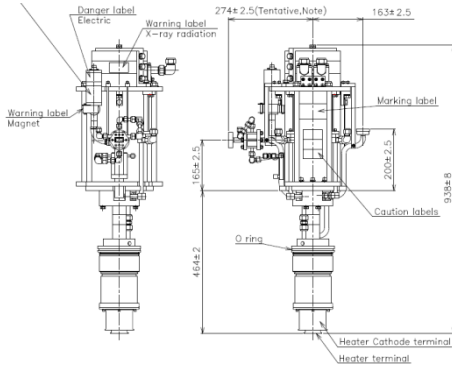
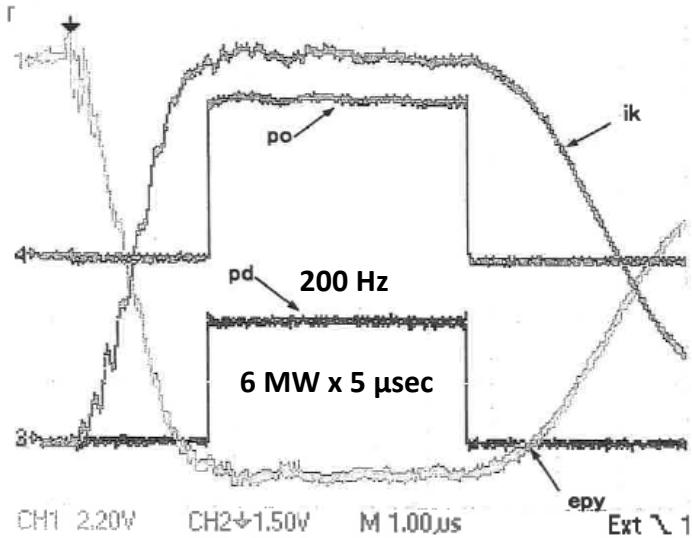


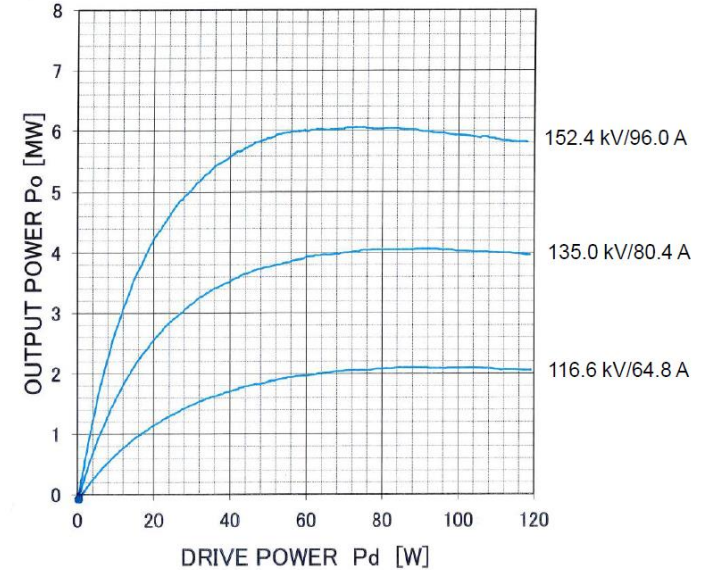
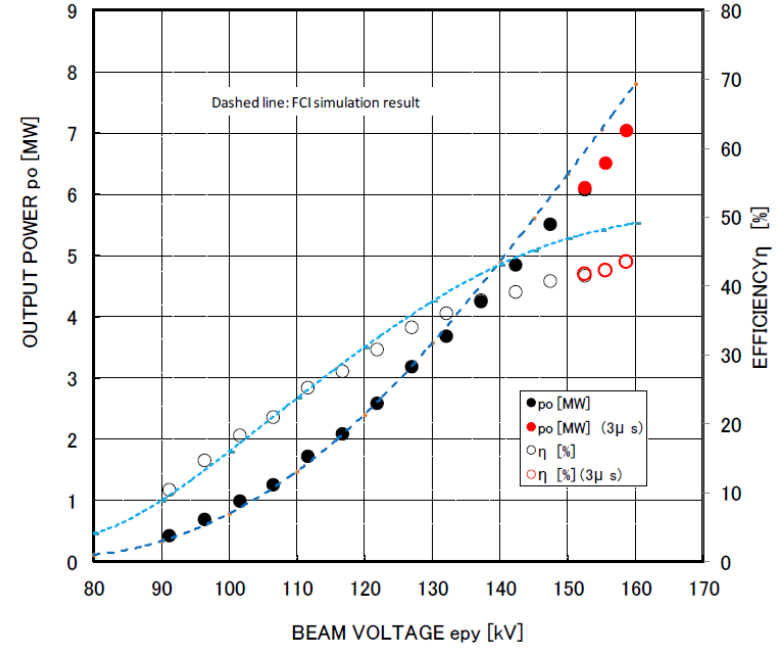
FIG.6 E37113 S/N 14H001 epy, ik, pd, po WAVEFORM



Ef = 14.4 [V]
 If = 10.0 [A]
 epy = 152 [kV]
 ik = 96 [A]
 f = 11994.2 [MHz]
 prr = 200 [pps]
 tp(epy) = 7 [μs]
 tp(rf) = 4 [μs]
 pd = 64 [W]
 po = 6.04 [MW]
 Isol,m = 25.0 [A]
 Isol,cc = 7.0 [A]

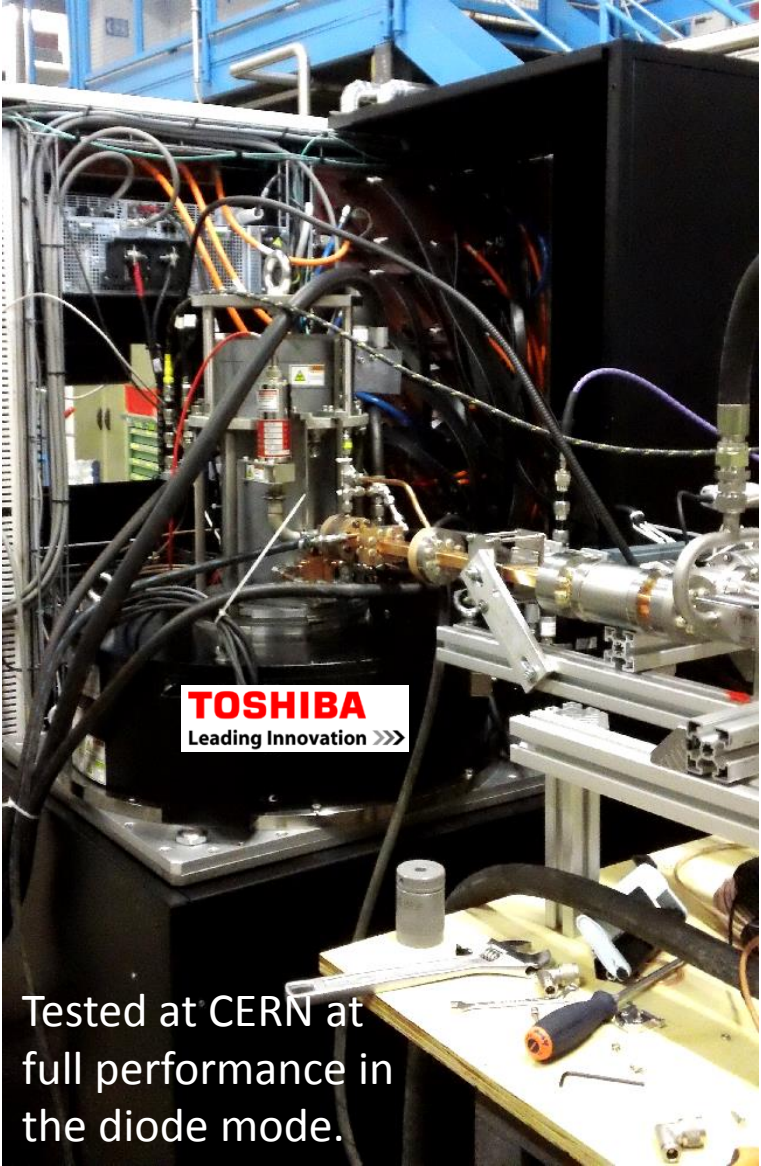
Factory tests results

E37113 S/N 14H001 SATURATED OUTPUT CHARACTERISTICS

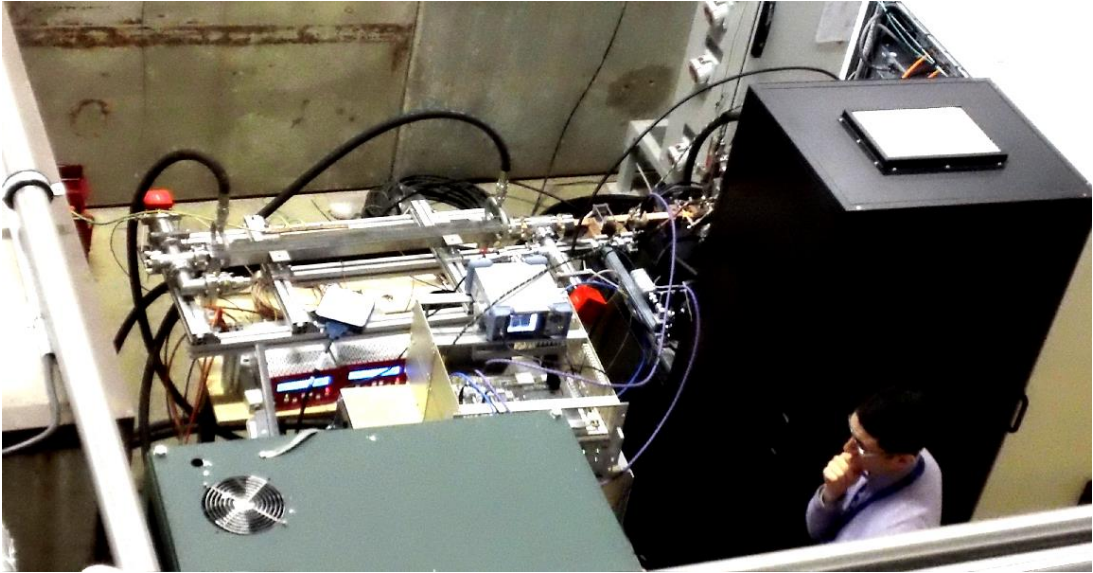


The full delivery of 4 units will be completed before July 2015.

The first 6MW x 400Hz X-band klystron/modulator for XBOX3 is at CERN (still in XBOX2 area):



Tested at CERN at full performance in the diode mode.





XBOX3 area

XBOX2
bunker roof