

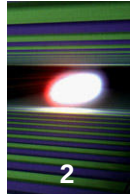


Thales MBK testing

Vladimir Vogel,

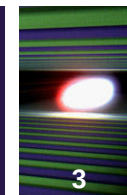
Stefan Choroba, Andrey Cherepenko and Jens Hartung





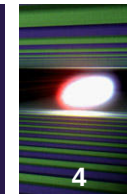
- Test setup
- Test result
- First example of CM for the tunnel installation
- Plans

Horizontal MBK status

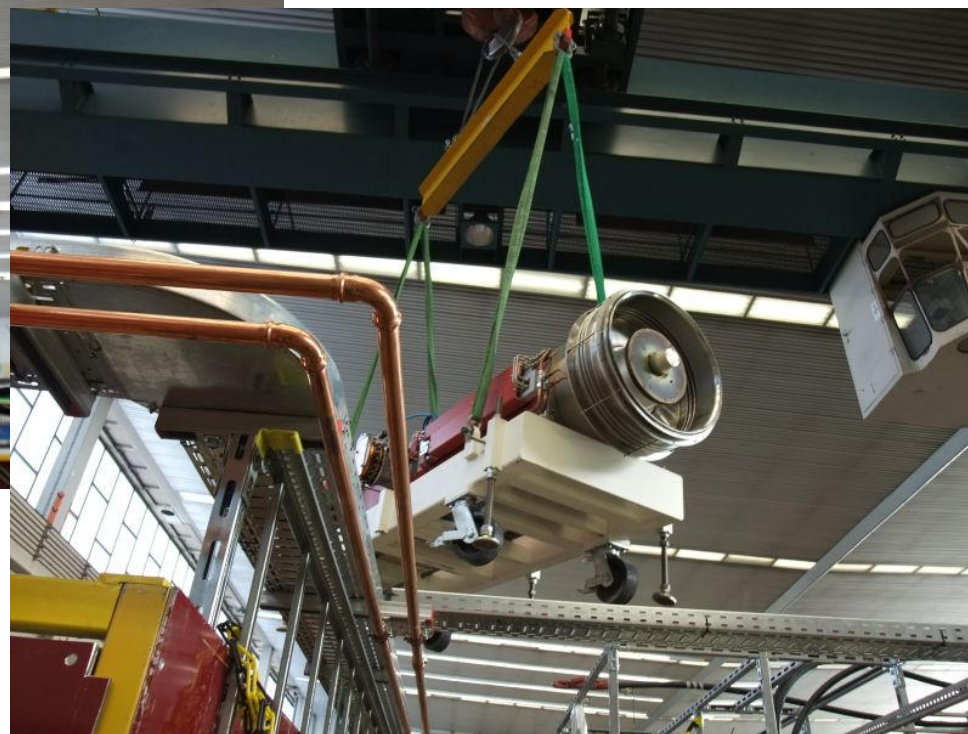


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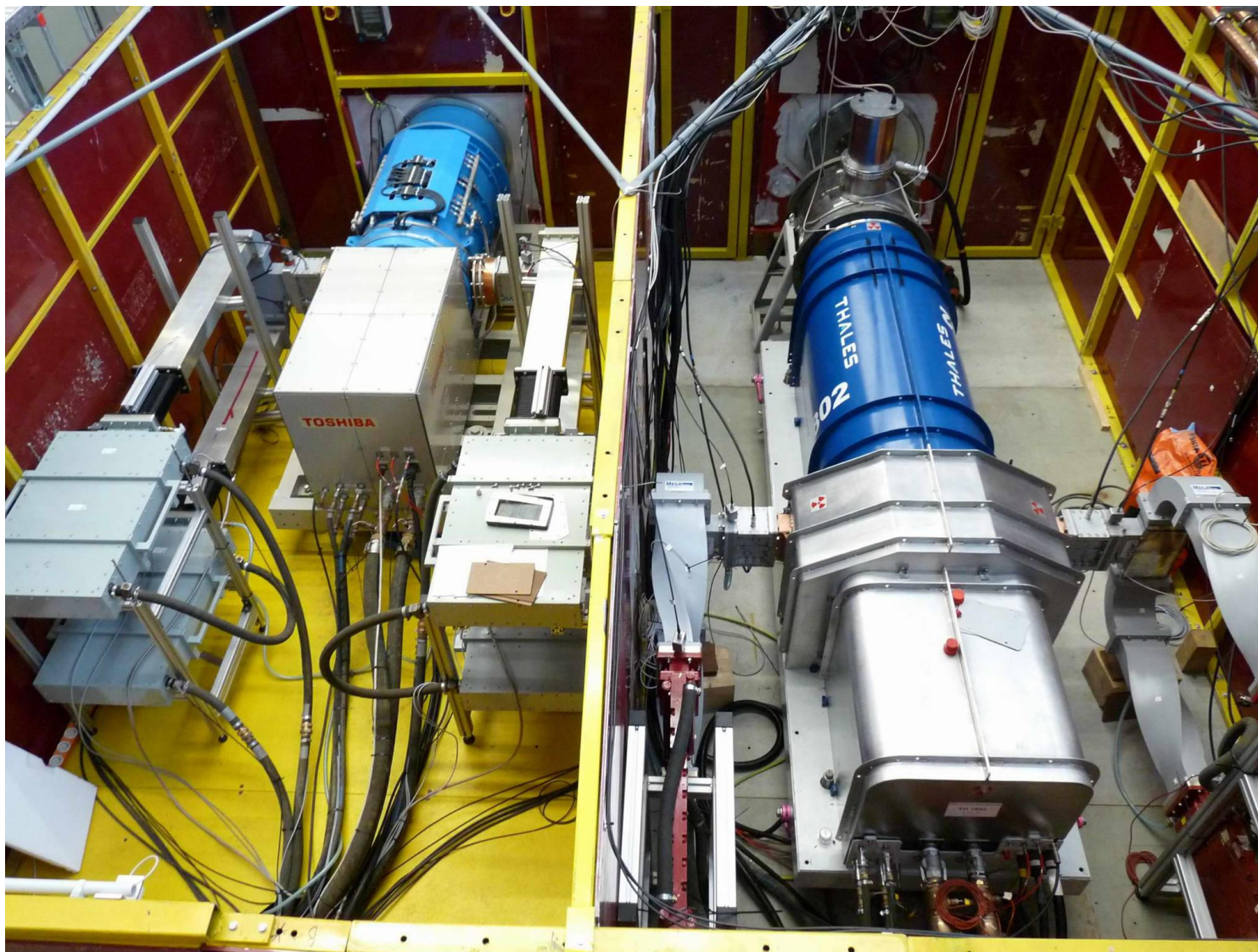
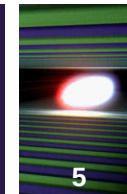
<i>Company name</i>	<i>Factory test</i>	<i>Delivery to DESY</i>	<i>DESY Acceptance test</i>	<i>Working time: October 2010</i>
Toshiba, E3736H	23.08.2007	18.09.2007	27.02.2008	1250 hours, heater on
CPI, VKL-8301B	02.04.2009	14.05.2009	10.07.2009	260 hours + 100 hours with CM
Thales, TH 1802	20.10.2008 17.02.2010	05.03.2010	19.03.2010	820 hours with CM full RF power



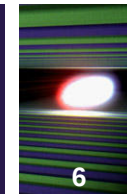
■ 09.03.2010
Halle 2, Klystron test stand



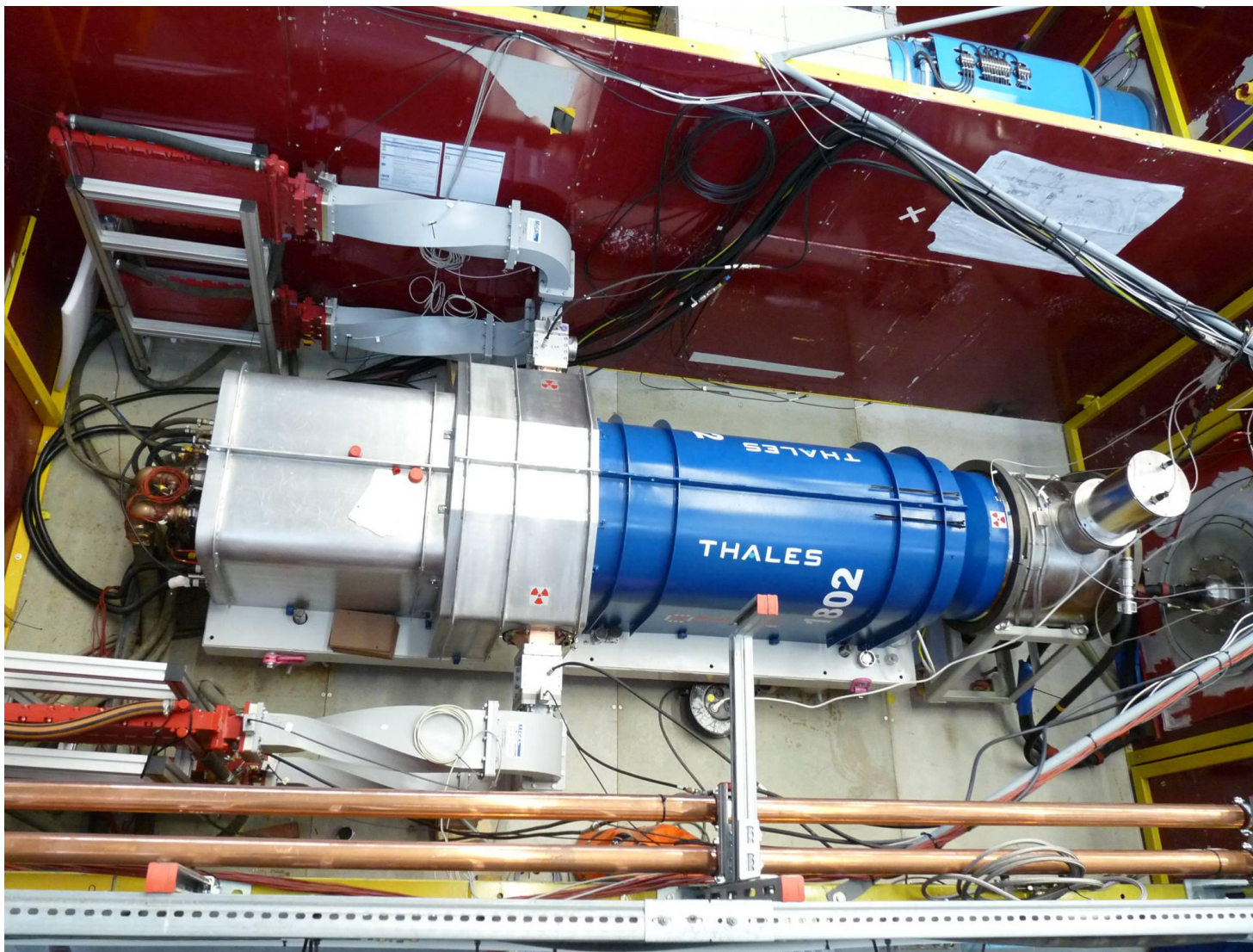
Halle 2, horizontal MBK test stands



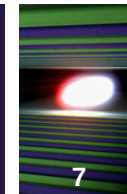
Thales horizontal MBK + CM, exterior view



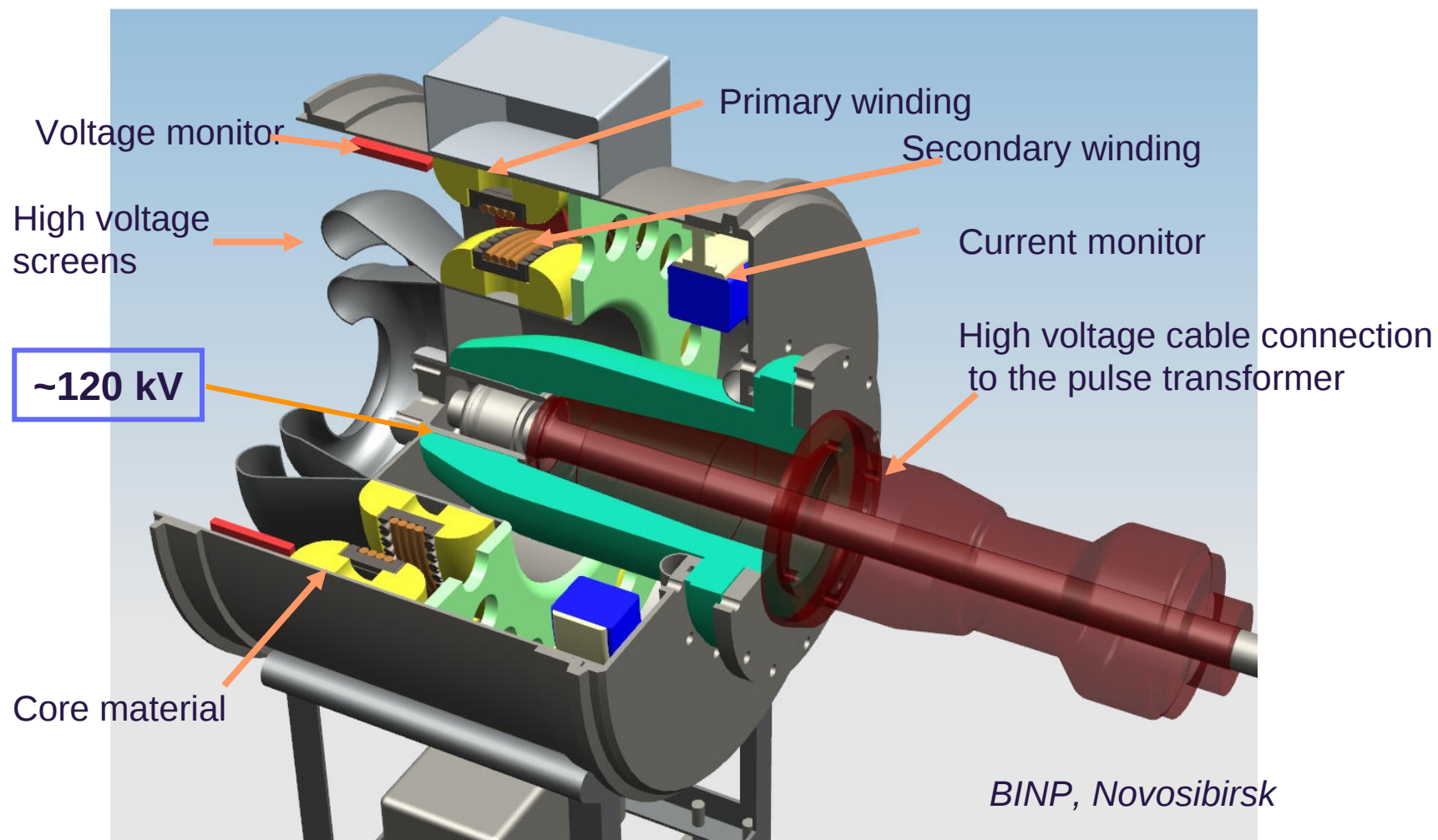
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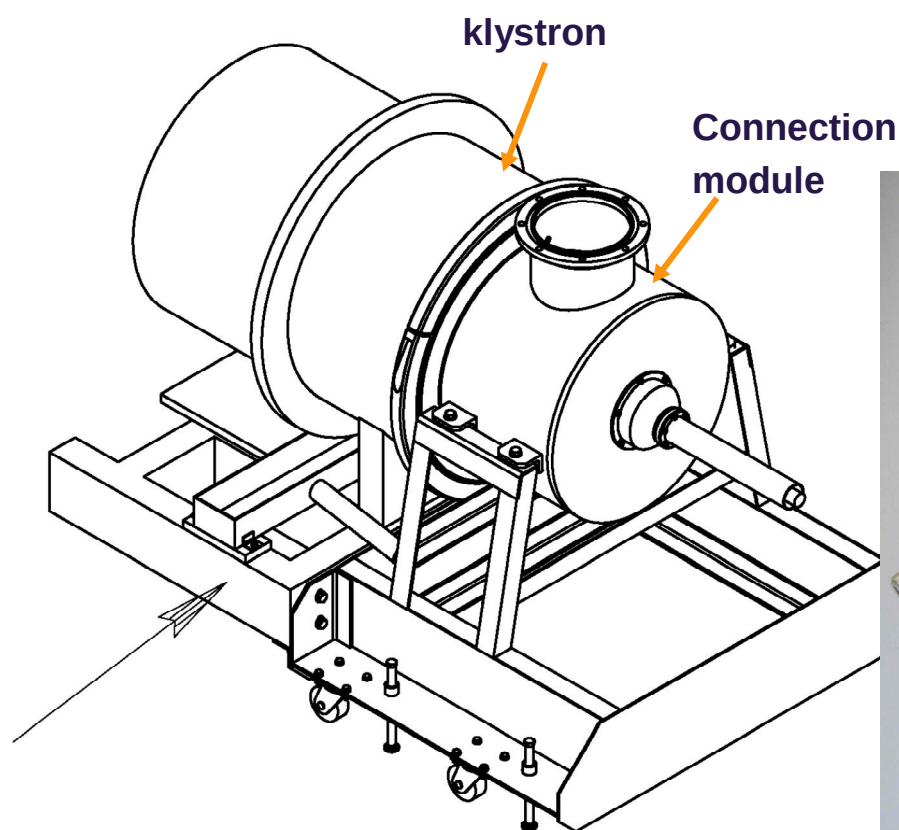
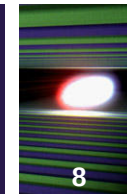


Connection module (CM)



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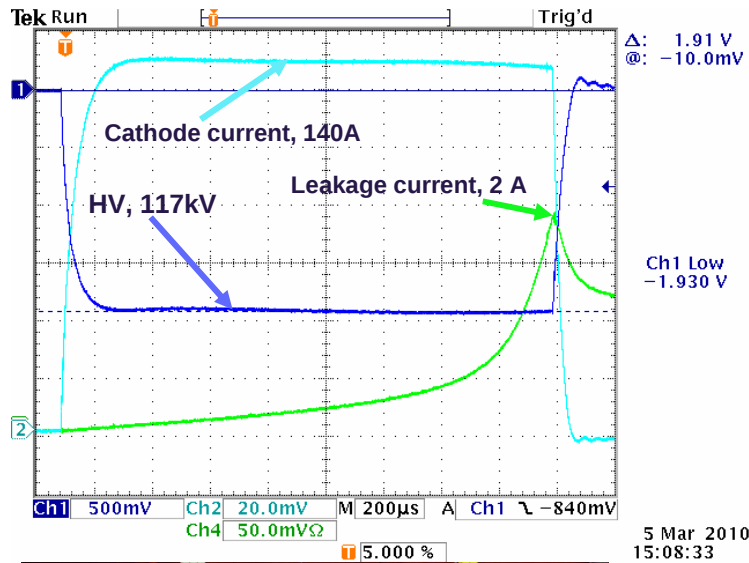
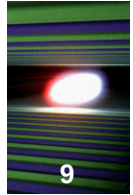
Nadezhda Evmenova, BINP Novosibirsk

Cable connection between
klystron and pulse transformer



250 kV DC cable

Leakage current

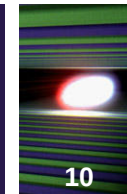


HV cable #1, leakage current ~ 2A

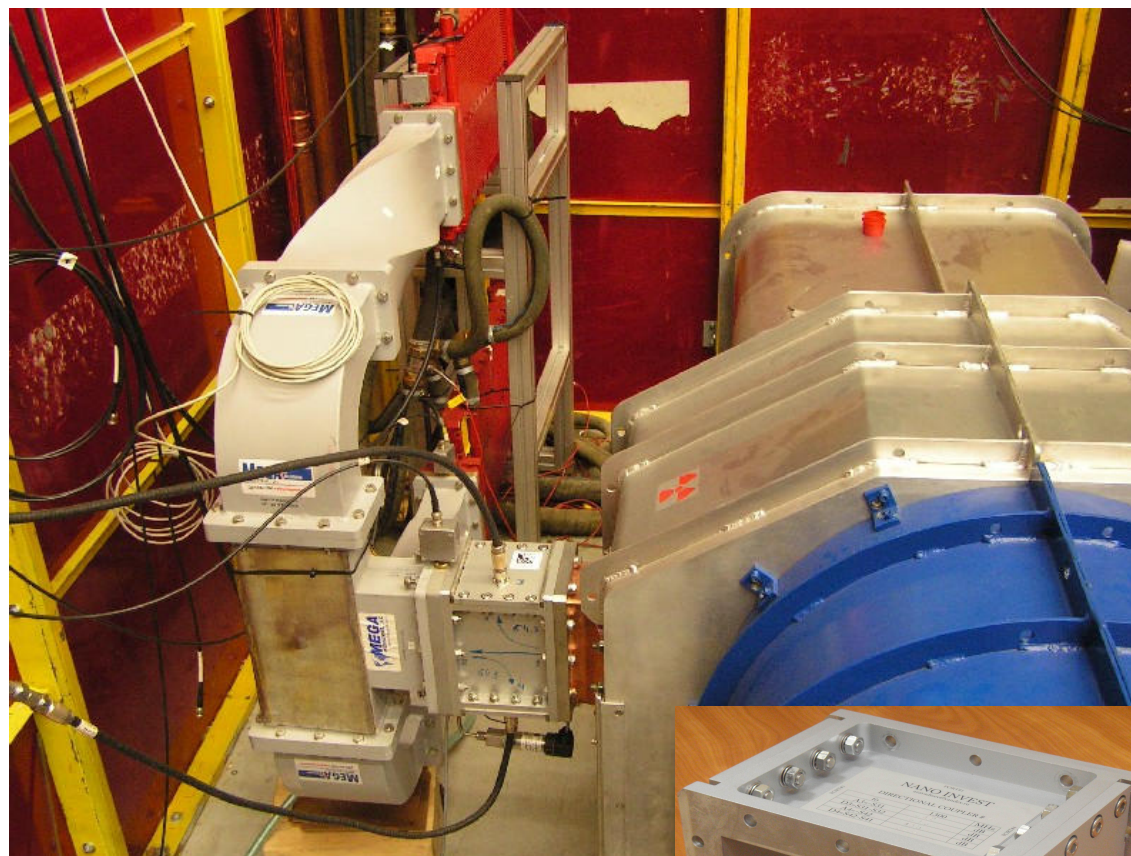


HV cable #2, leakage current ~ 50mA

Connection between MBK and waveguide distribution system



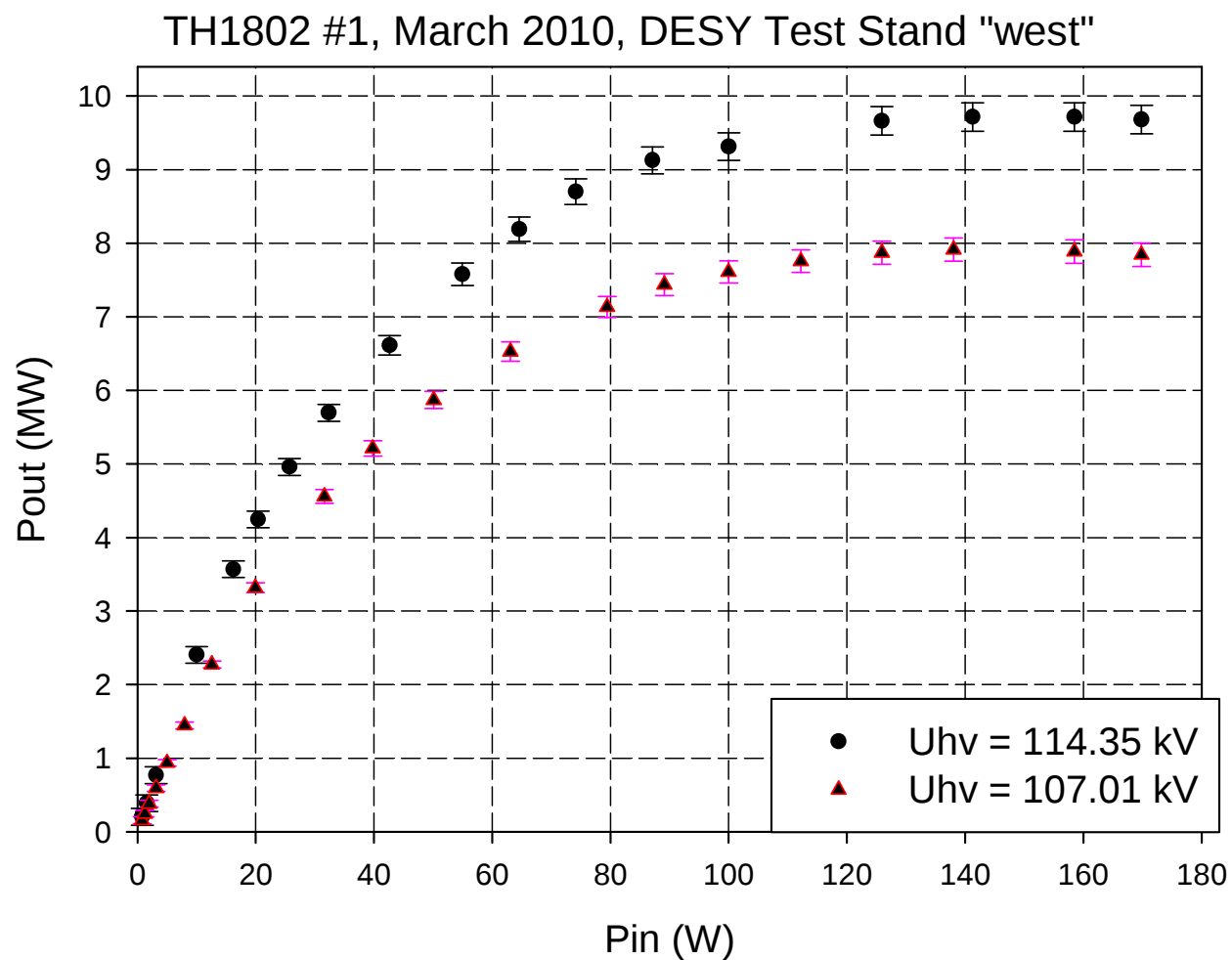
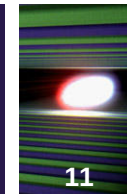
Old DC



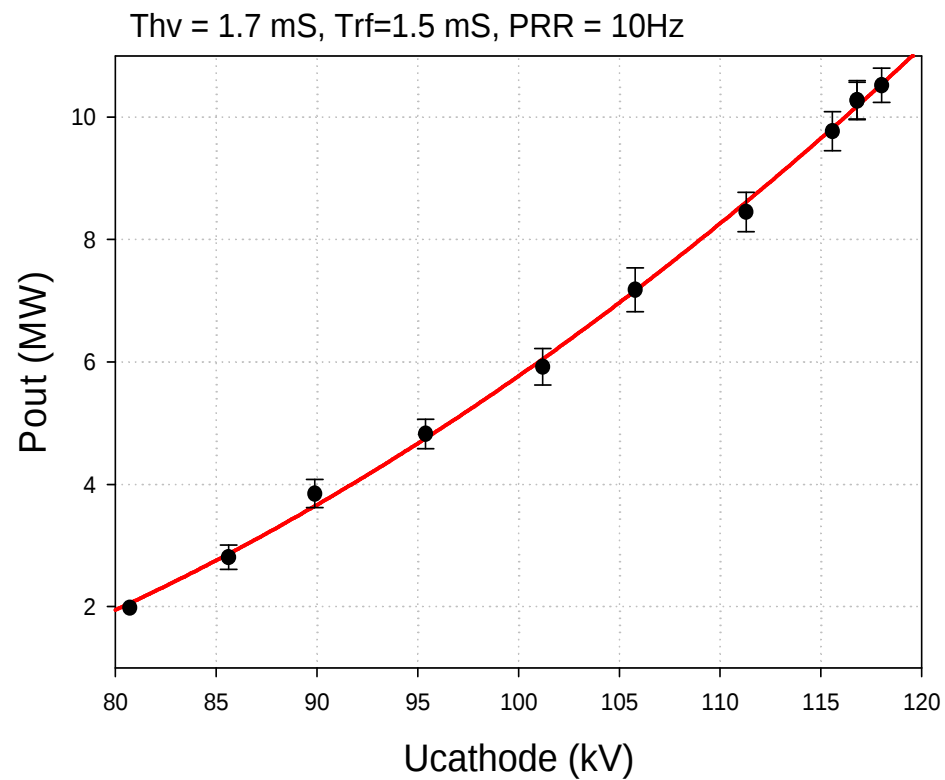
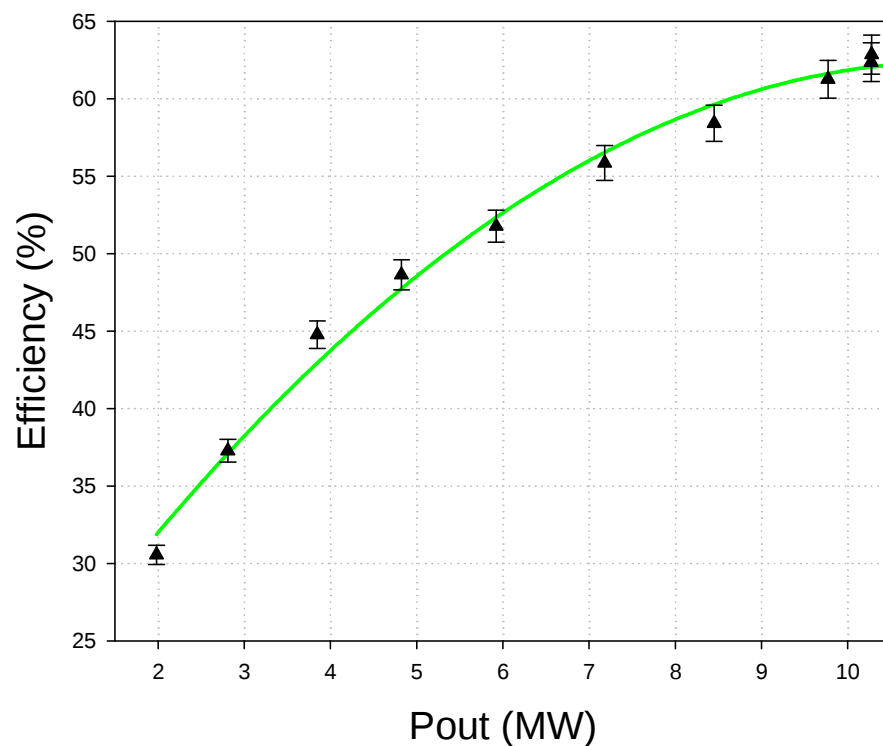
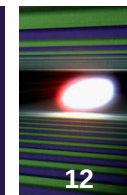
New DC

- the WG volume, where is 5 MW power level, should be minimized.
- new DC without holes on the wide waveguide wall

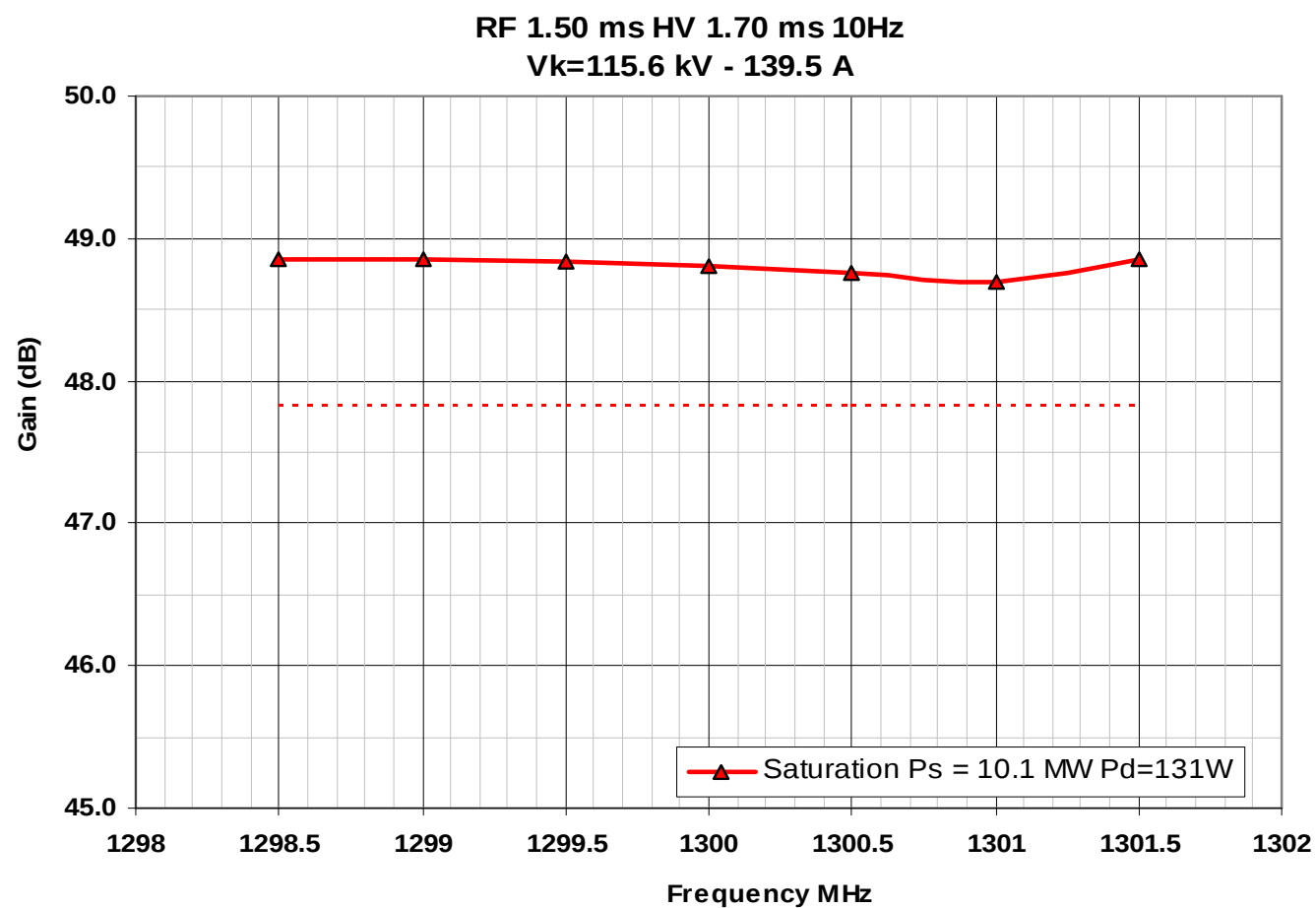
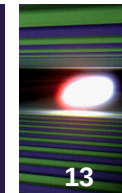
Thales MBK, Gain



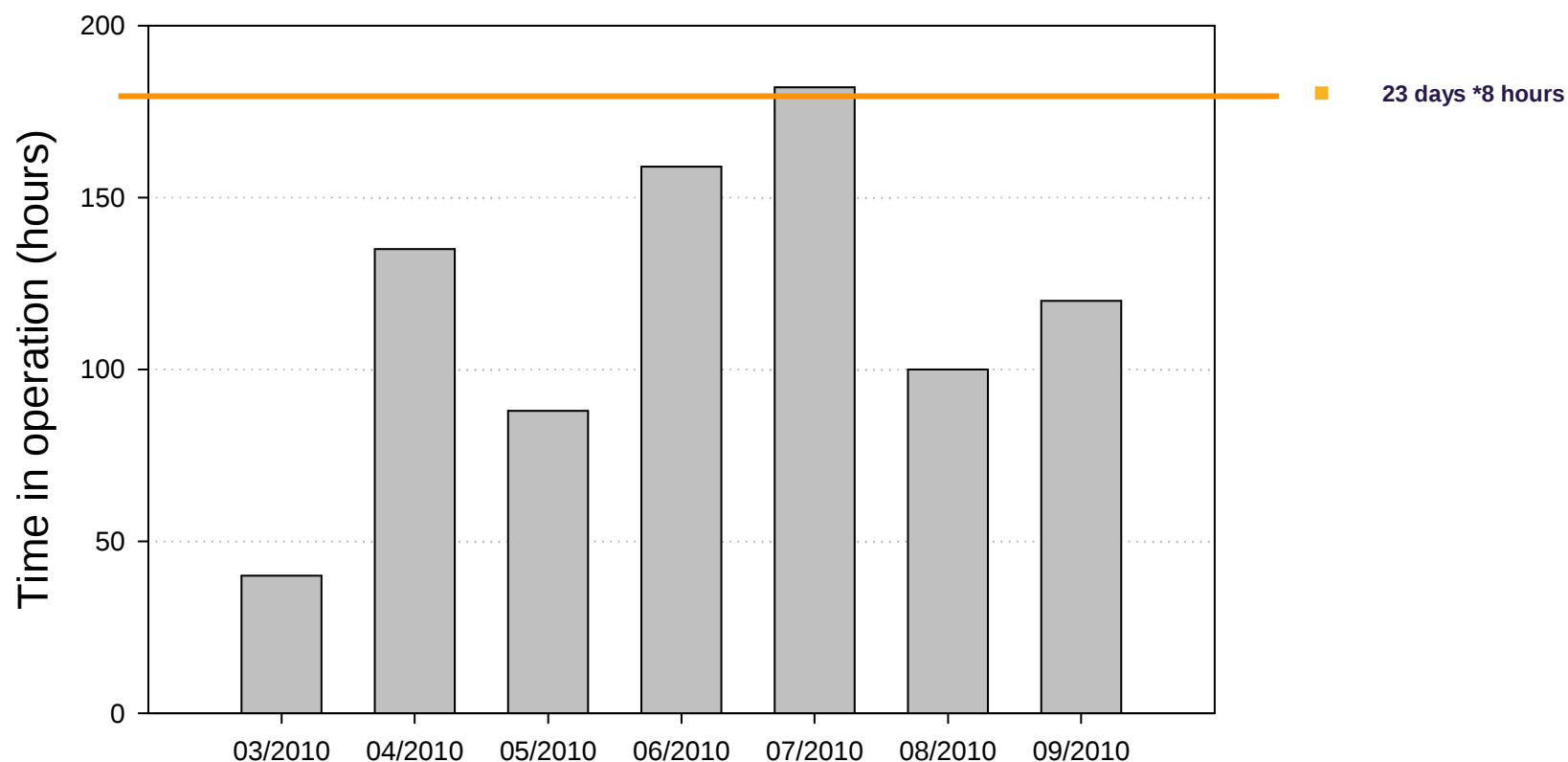
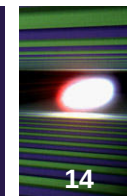
Thales MBK, Efficiency



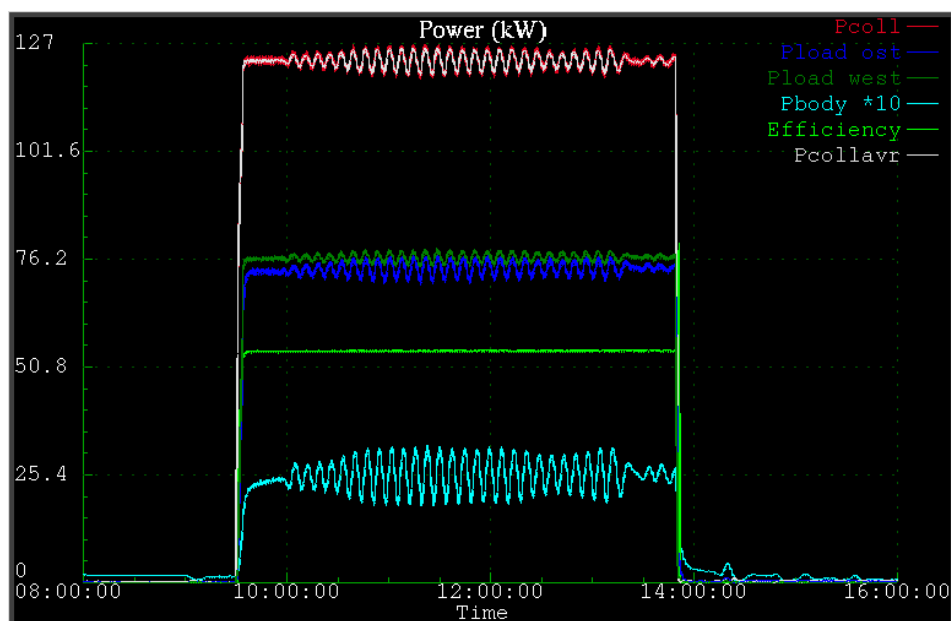
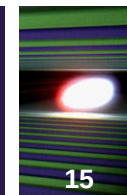
Thales MBK, bandwidth



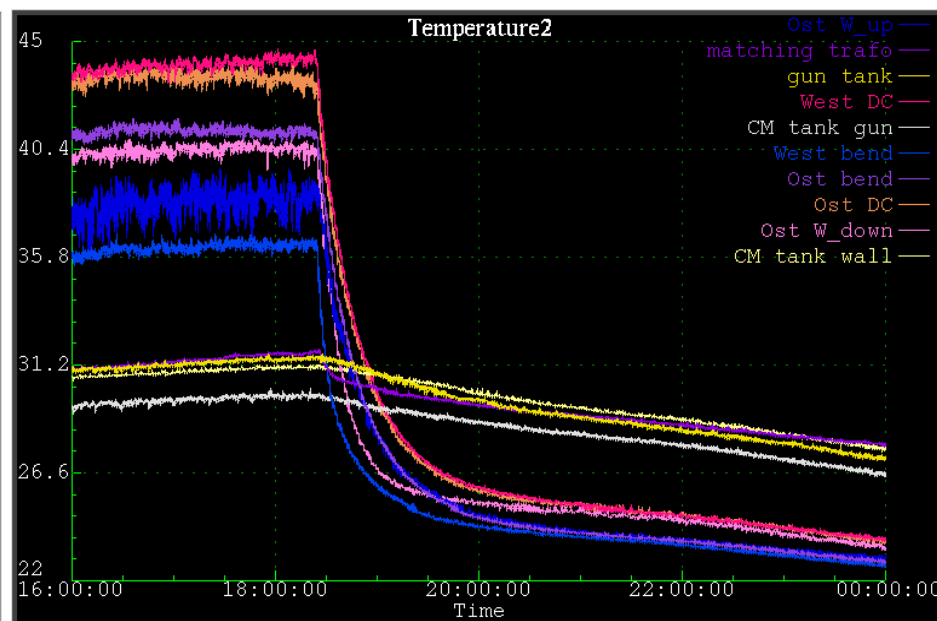
Thales MBK, operation statistic (Full power)



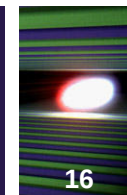
Examples of operation of TH1802



Temperature oscillation of cooling water



waveguide temperature, 10MW, 1.5 mS, 10Hz



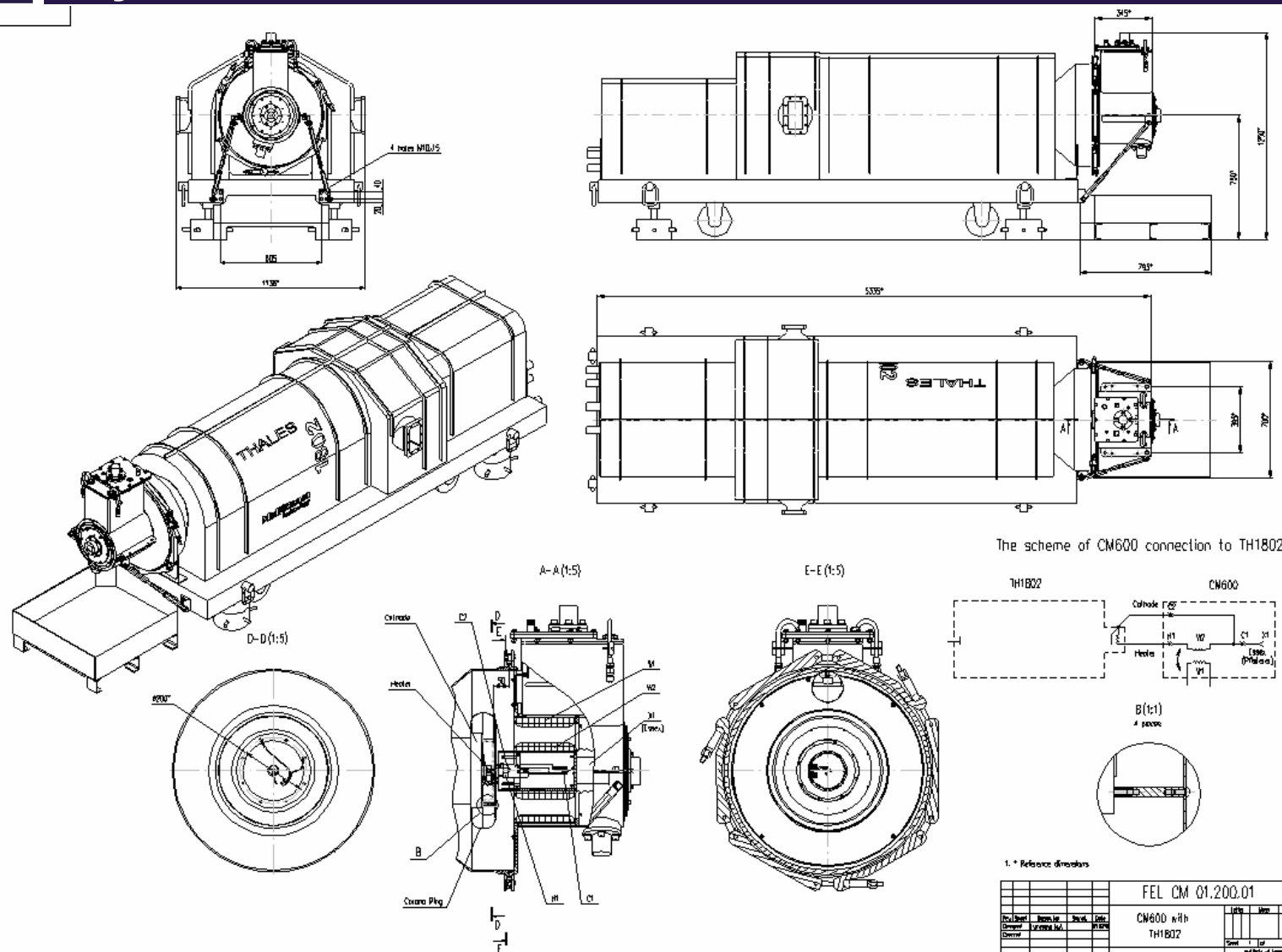
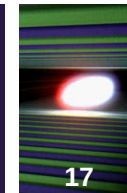
TH1802, RF = 1.5mS, 10 MW, 10Hz

■ Total operation (hours)	820
■ Gun arcing	4 (manual recovery)
■ Arcs in waveguides	7 (auto recovery ~ 10 Sec)
■ Breakdowns in the klystron	4 (auto recovery ~ 3 Sec)

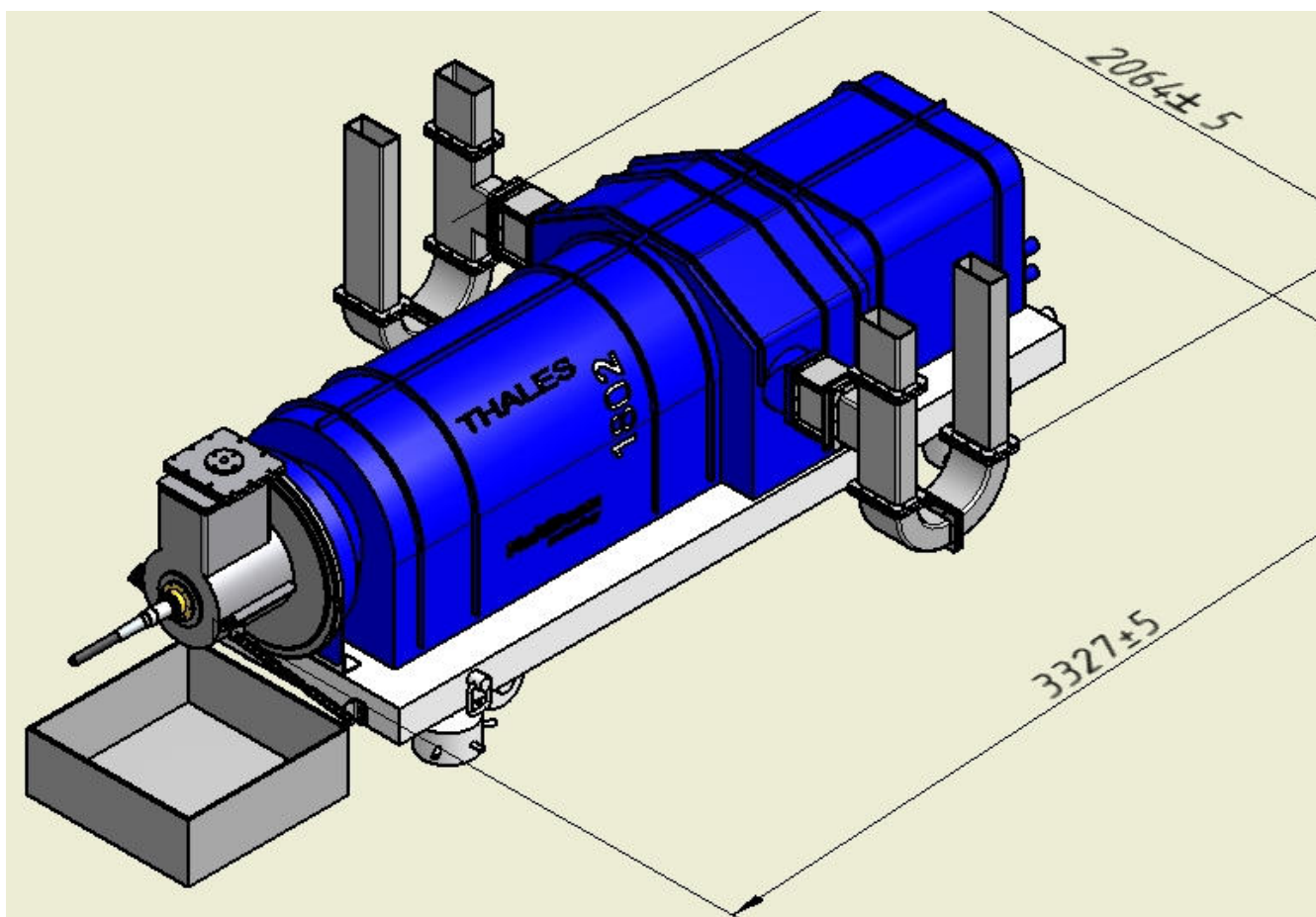
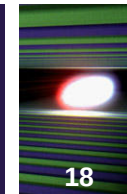
CM, f=1.5kHz, HV = 117kV, I = 140A, T = 1.7mS, 10Hz, (660W, 270W)

■ HFPS, total operation (hours)	2600
■ HFPS, damage	1 (control electronics)
■ HV cable #1 (hours)	500 (without problem)
■ HV cable #2 (hours)	420 (without problem)

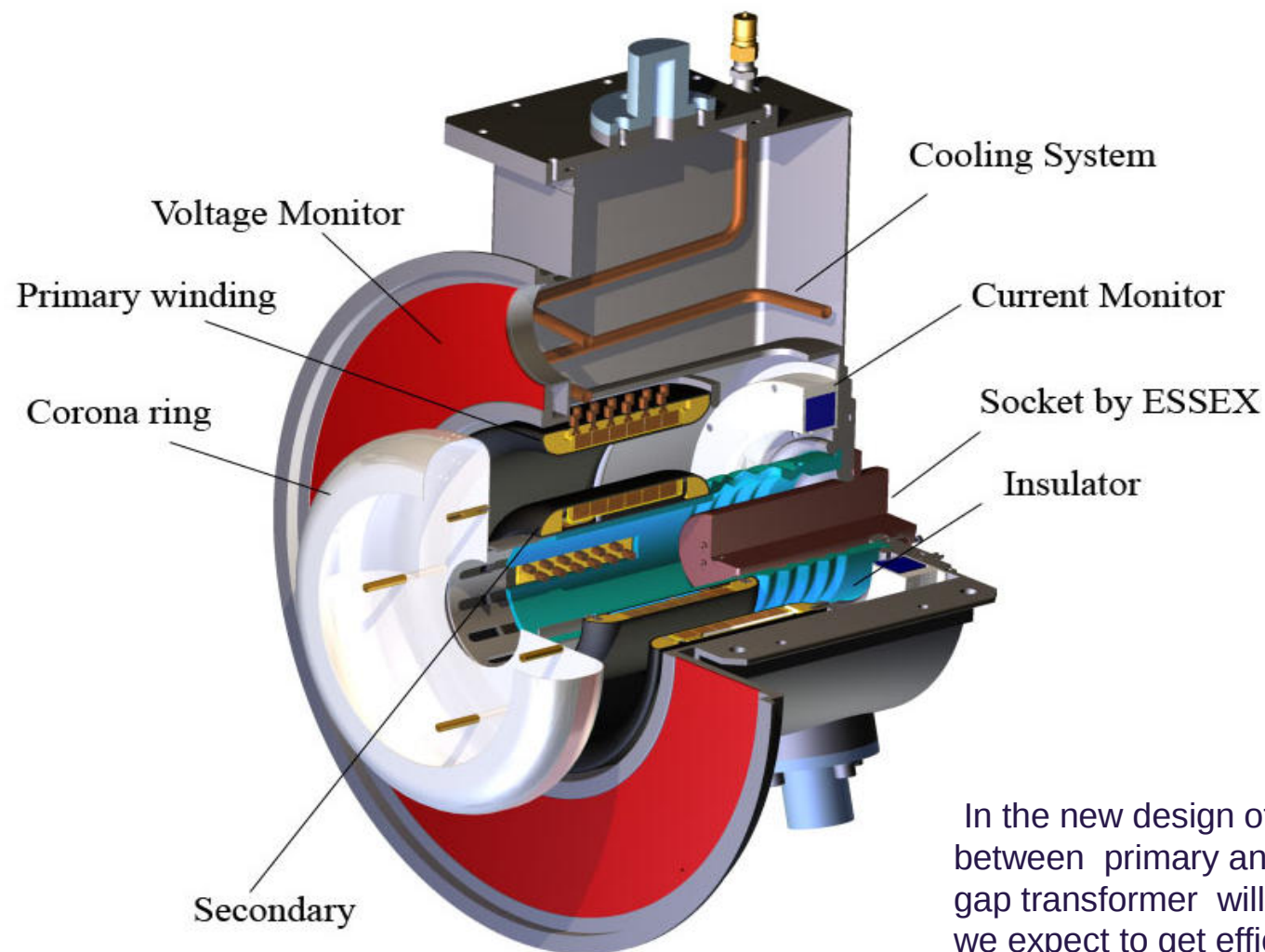
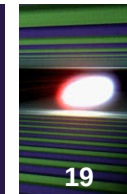
Klystron for the tunnel installation



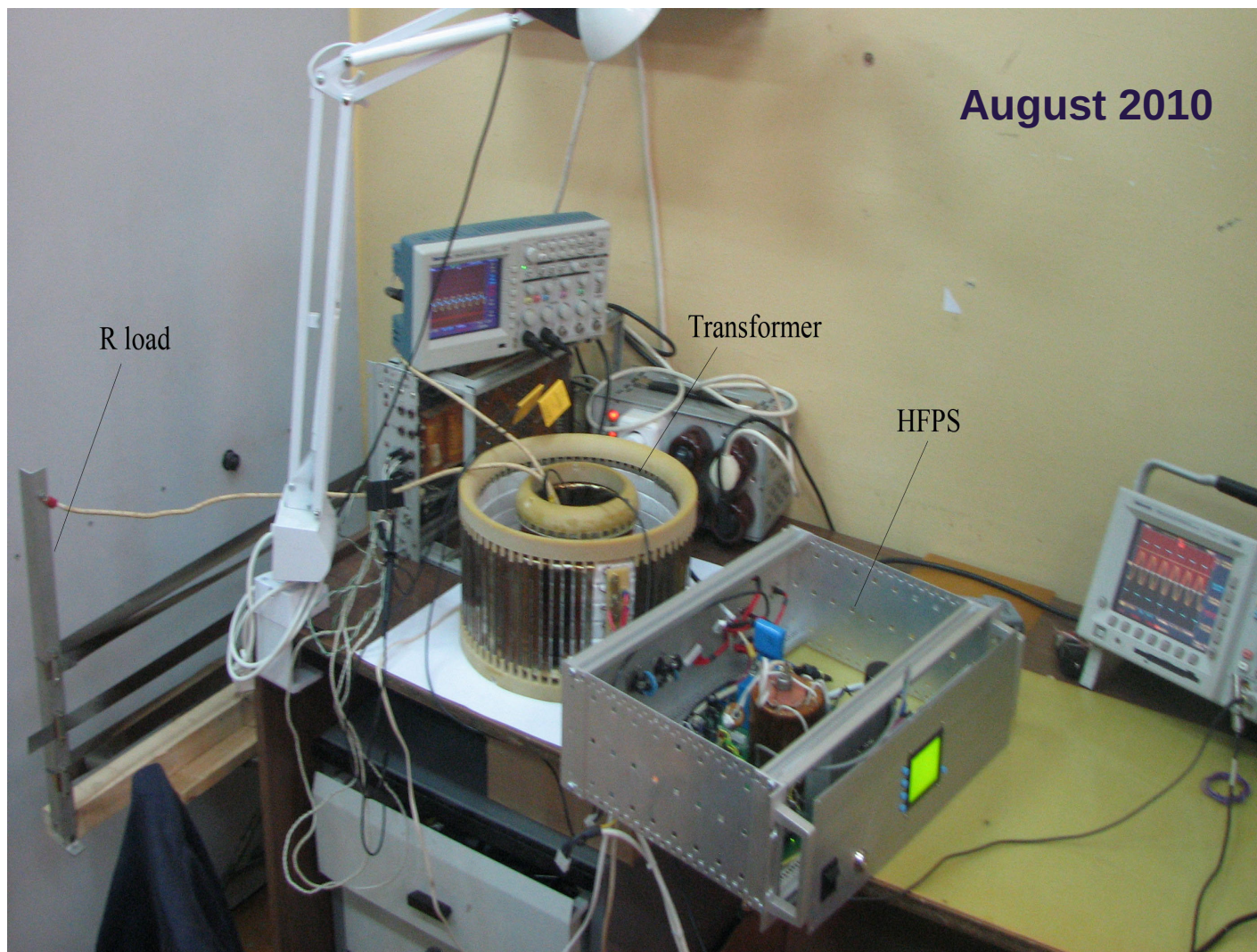
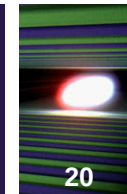
Thales MBK, exterior view



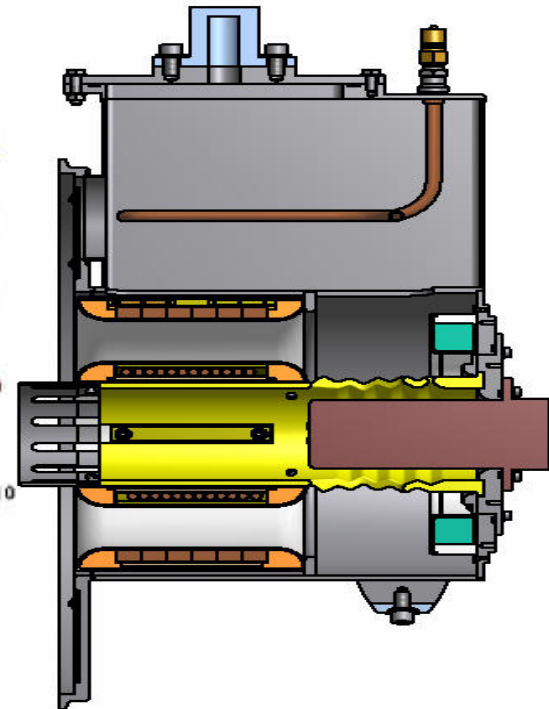
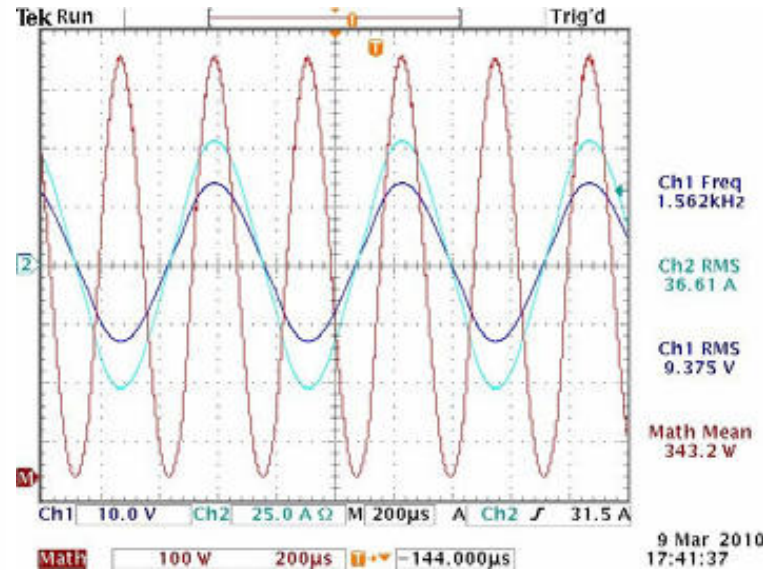
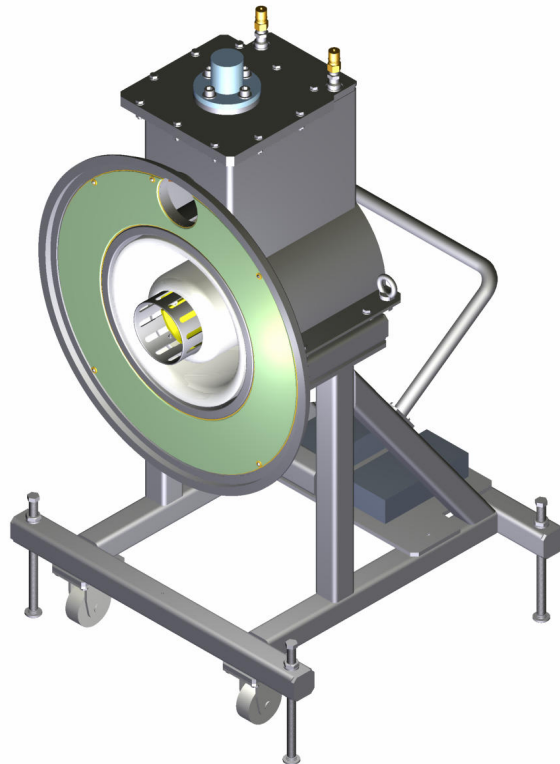
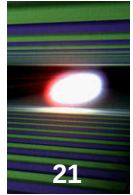
CM, first prototype for tunnel installation



In the new design of CM the coupling factor between primary and secondary winding in the gap transformer will be increased up to 0.607 and we expect to get efficiency of power transfer for the cathode heating about 90%.

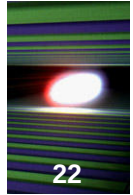


New CM on the support setup

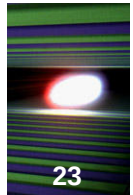


We expect to have weight of CM about 100 kg and about 100 liters of oil inside CM and klystron gun tank. The connection of CM to the klystron gun tank will be done by 600 mm diameter flange and in addition, CM will be supported by two metal rods connected to the main klystron frame.

Delivery time: end of October 2010 (plan)



- TH1802 meet to DESY specification (version 2006)
- New design of output RF window allows us to work on the level of 5 MW power in the one of arms with dry air. (air flow ~ 30 l/min and overpressure of 0.3 bar)
- Now we have in Halle II two test stands which can be operate independent one of the other



- Continue test of TH 1802, E 3736H and VKL 8301B: until the end of 2011
- November 2010: Start operation with first example of CM for the tunnel installation
- November-December 2010: discussion with companies and preparation for call of tender for MBK for XFEL
- Preparation of test stands for testing klystrons+CM, (one klystron+CM per month, starting time: end of 2011)
- Develop methods of klystron parameters measurement and number of parameters what should be measured. What should we know about klystron before we put it in the tunnel ? (together with MSK..)
- Continue development of fast protection system for the klystron.

*Thank you for yours
attention!*