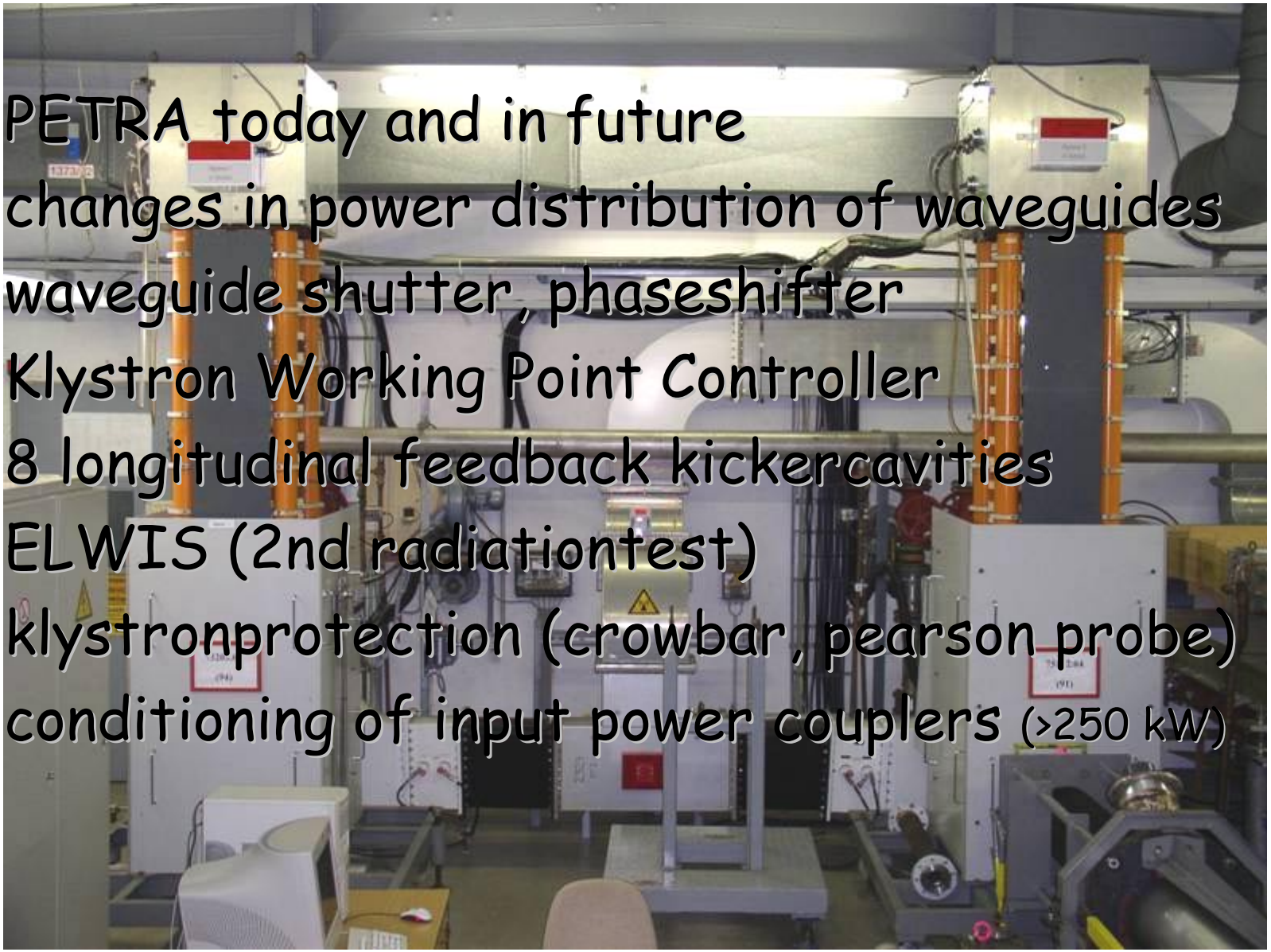
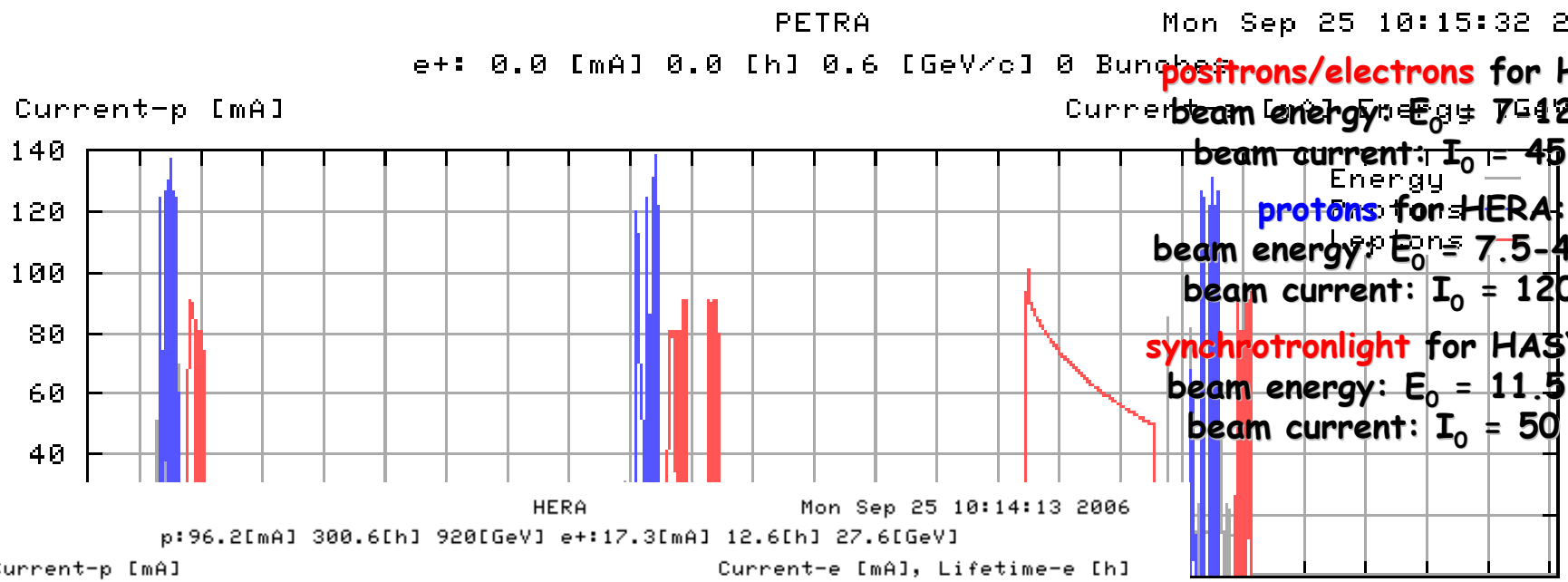
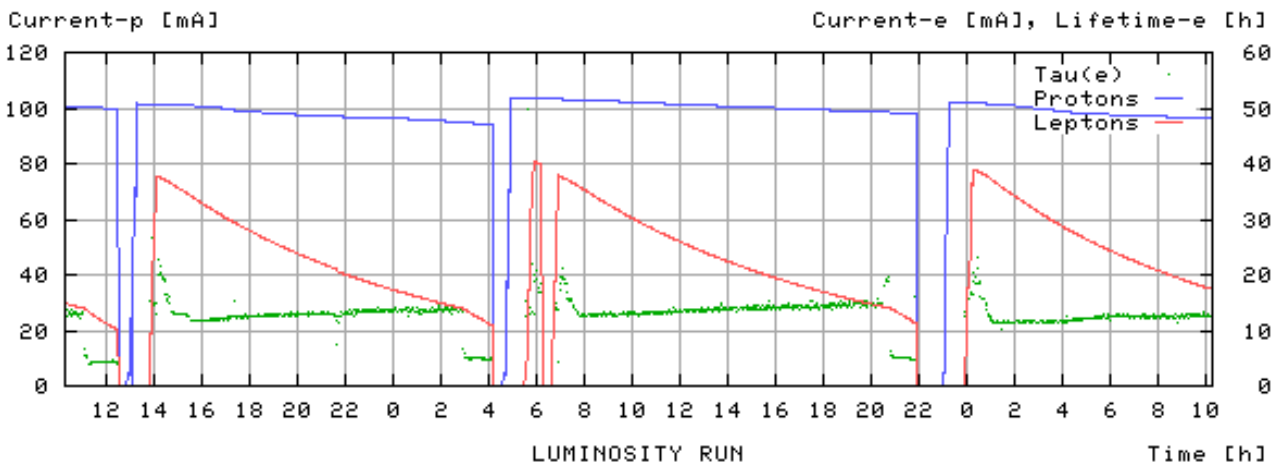
Good morning!



- PETRA today and in future
- changes in power distribution of waveguides
- waveguide shutter, phaseshifter
- Klystron Working Point Controller
- 8 longitudinal feedback kickercavities
- ELWIS (2nd radiationtest)
- klystronprotection (crowbar, pearson probe)
- conditioning of input power couplers (>250 kW)

PETRA today





positrons/electrons for HERA:
beam energy: E_0 = 7-12 GeV
beam current: I_0 = 45 mA

protons for HERA:
beam energy: E_0 = 7.5-40 GeV
beam current: I_0 = 120 mA

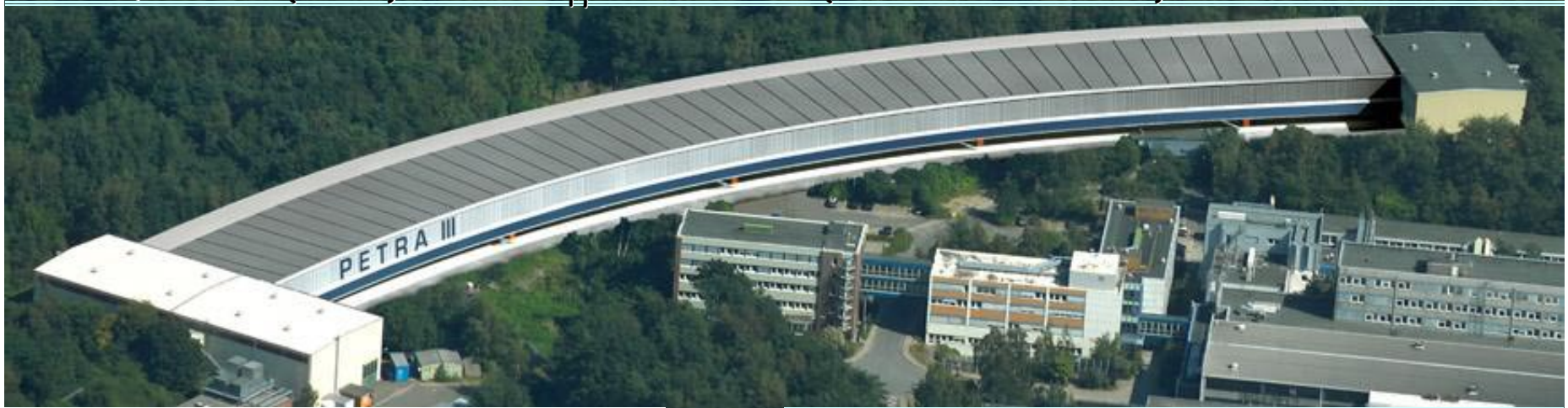
synchrotronlight for HASYLAB:
beam energy: E_0 = 11.5 GeV
beam current: I_0 = 50 mA

positrons/electrons in HERA:
beam energy: E_0 = 12-27 GeV
beam current: I_0 = 40 mA

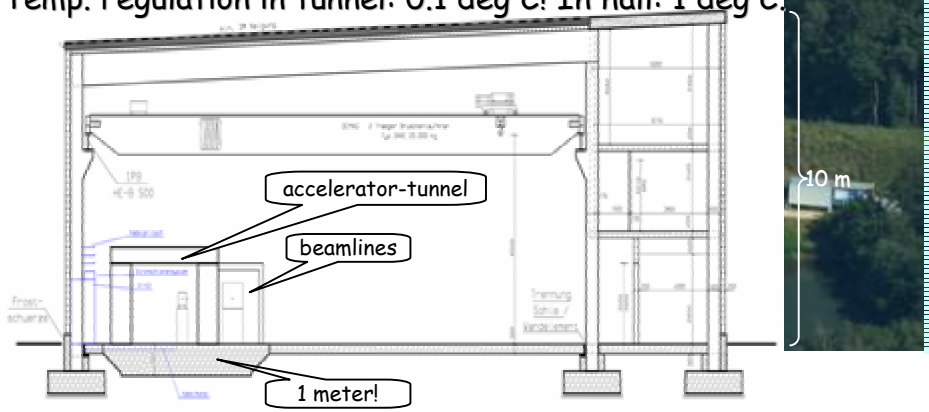
protons in HERA:
beam energy: E_0 = 40-920 GeV
beam current: I_0 = 105 mA

and the future...
an impression of the new hall

Frequency: f_{RF} = 499.66 MHz
Beam Power (100mA): P_{beam} = 759 kW (dipol, undulators, damping wigglers and HOM losses)
Circumferencial Voltage: U_c = 20 MV (in 12 7-cell cavities, power per coupler: 124 kW)
rf-Power (100mA): P_{rf} = 1573 kW (2 transmitter á 786 kW)

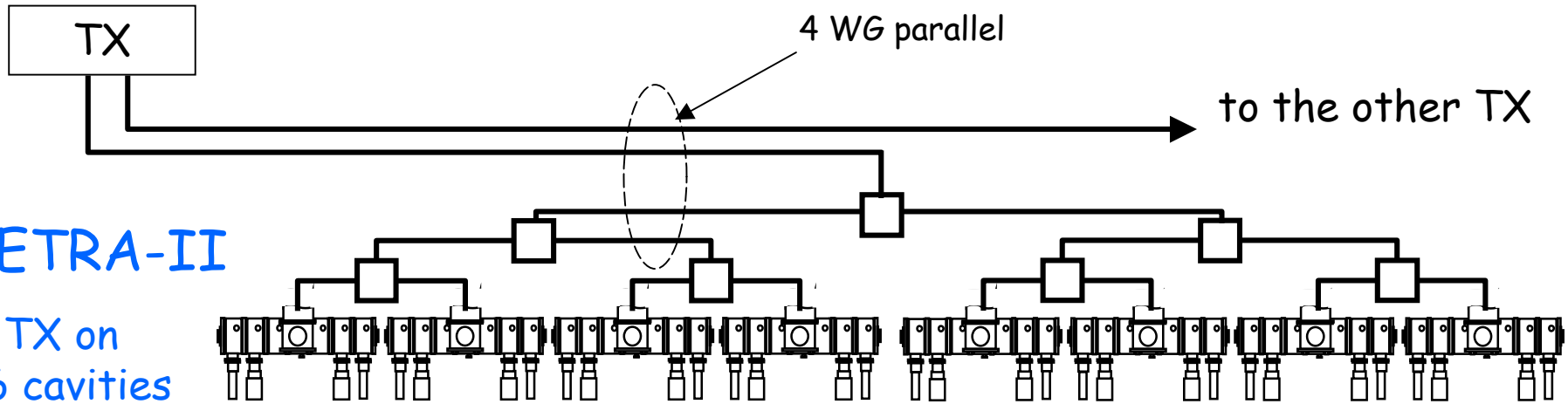


Temp. regulation in tunnel: 0.1 deg C! In hall: 1 deg C.



Beam Energy:	E_0 = 6 GeV
Length:	l = 2304 m
Arc radius	191.73 m and 22.918 m
Beam Current:	I_0 = 100 mA (200 mA)
loss per turn	U_l = 7.590 MeV
Emittance (hor)	ε = 1 nmrad !
Topping up	

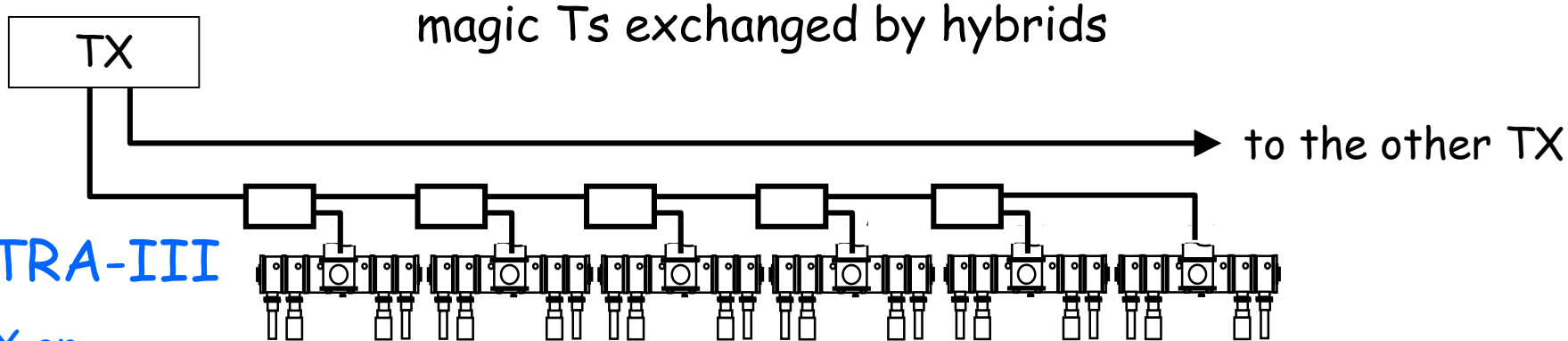
current vs future WG-distribution



PETRA-II

2 TX on
16 cavities

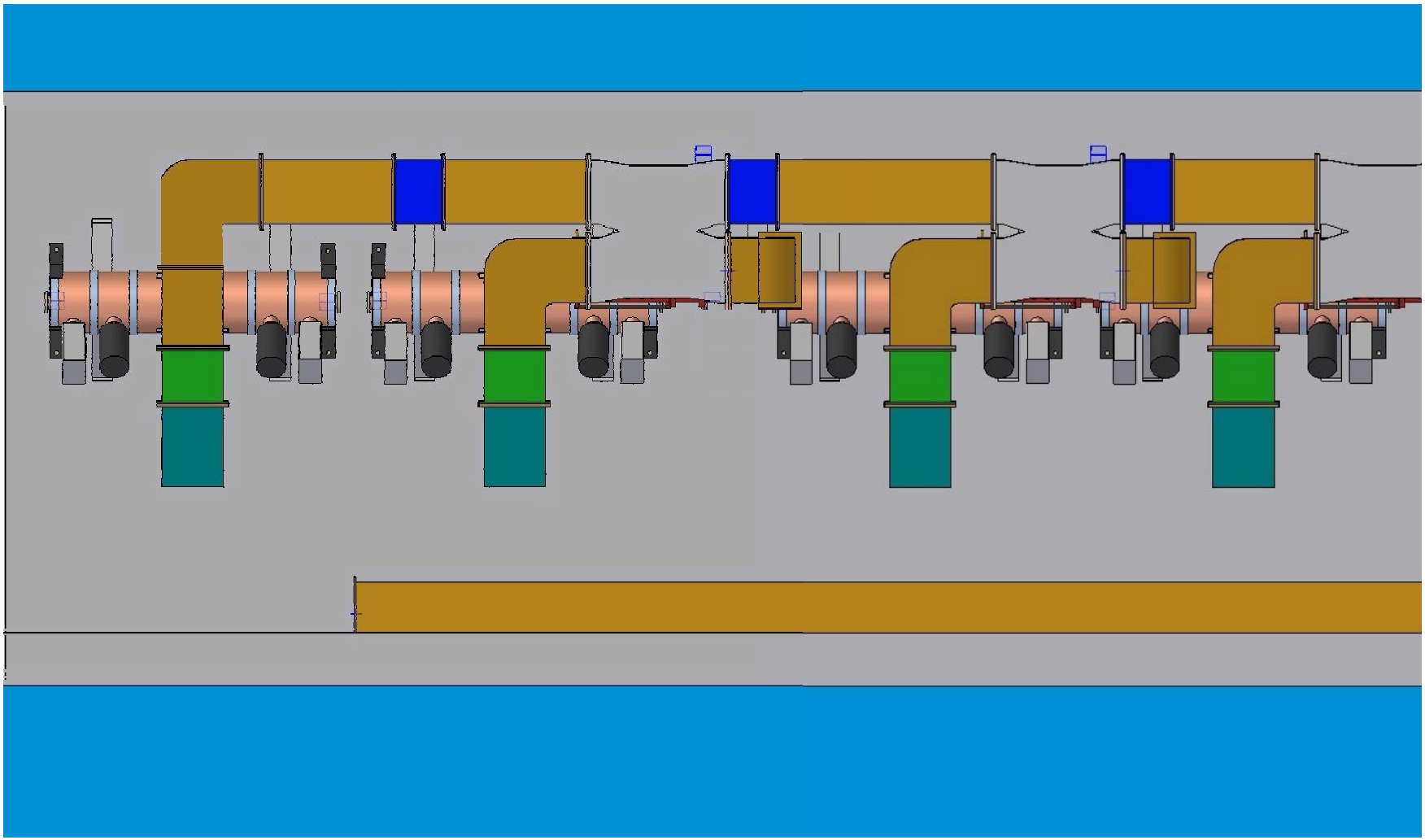
dismounting of 2 cavities on each side,
magic Ts exchanged by hybrids



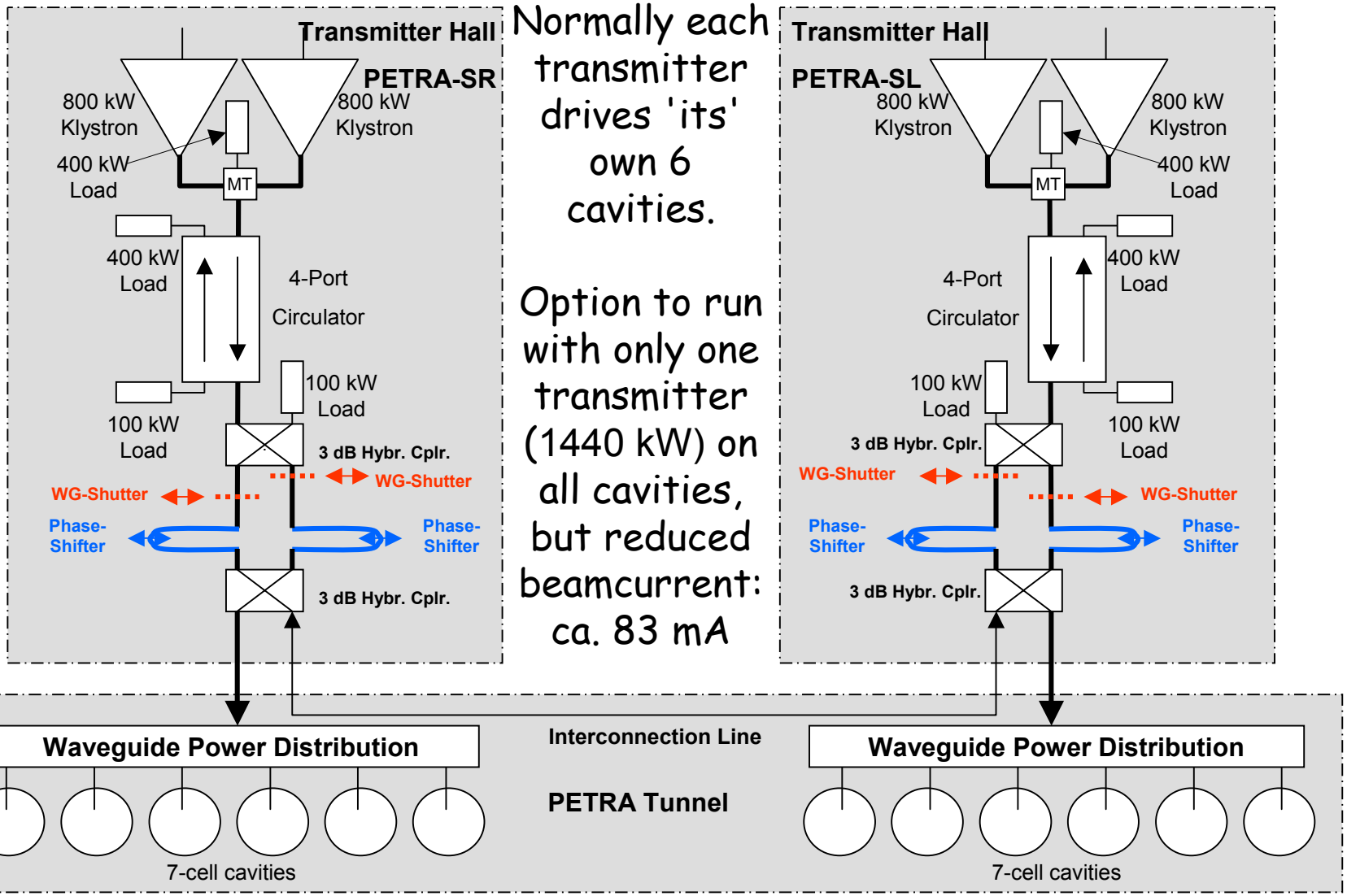
PETRA-III

2 TX on
12 cavities

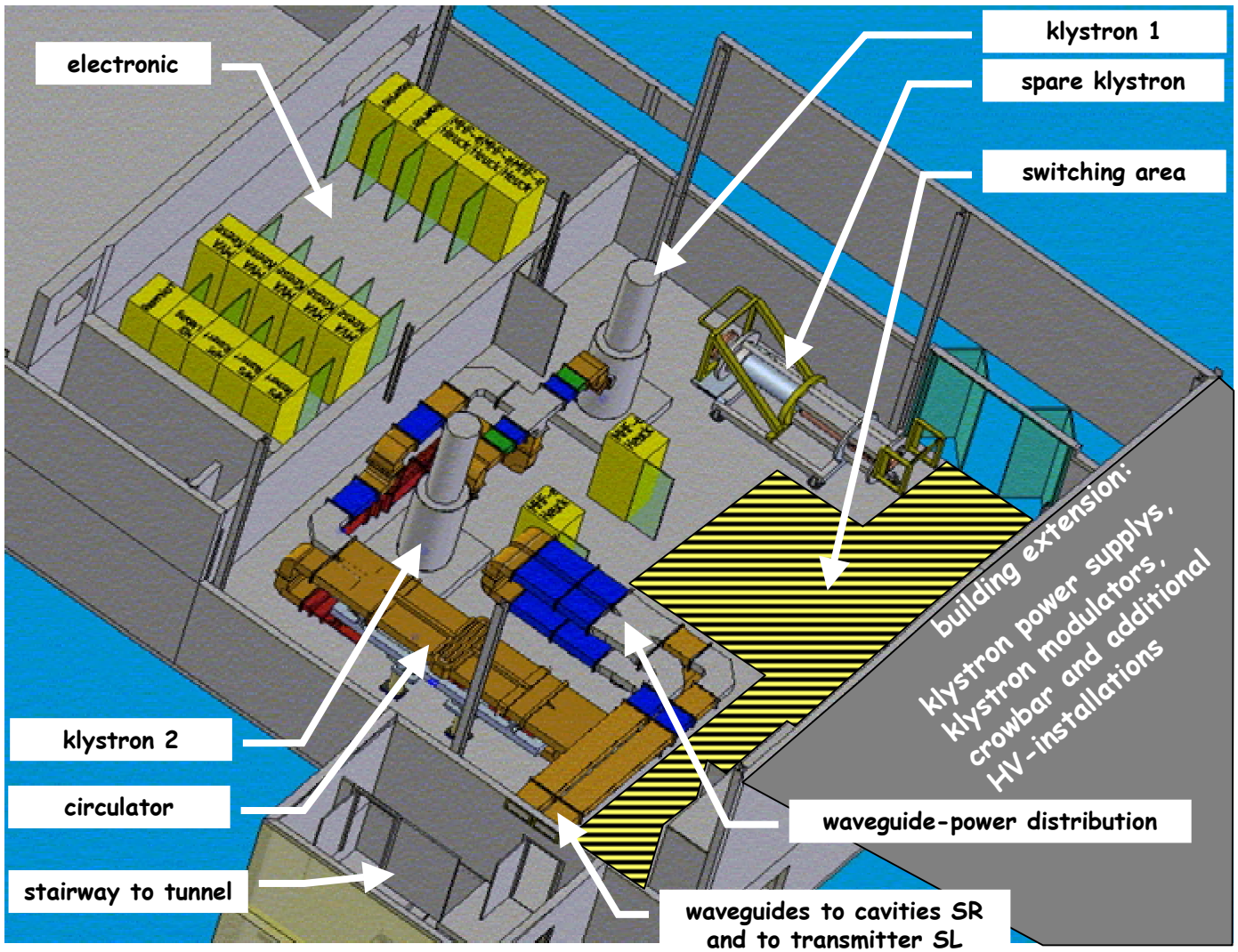
top view in tunnel



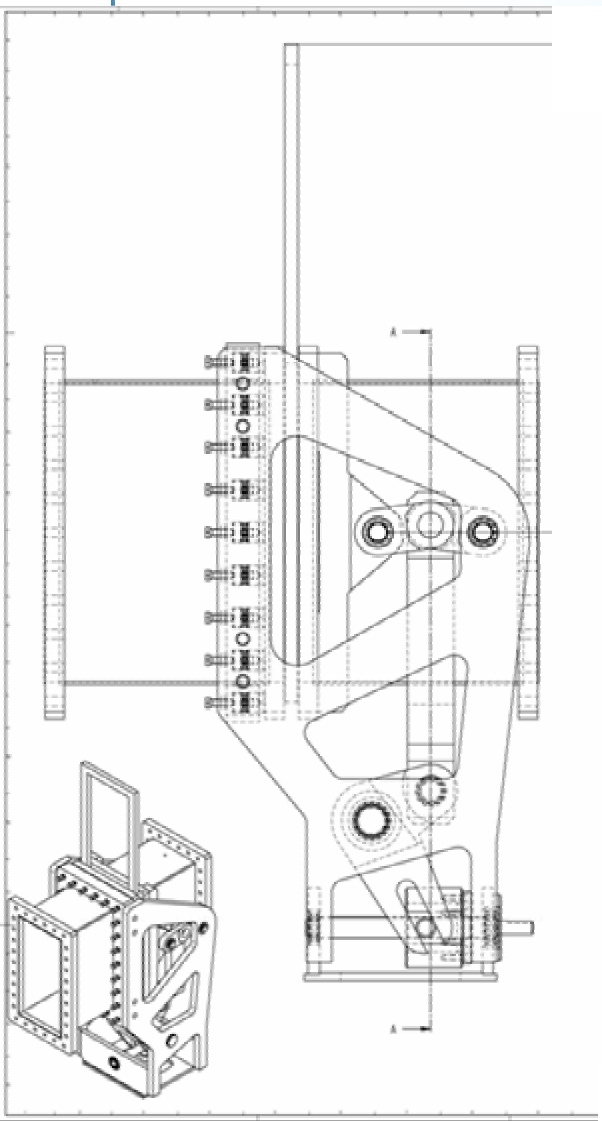
rf-system at PETRA III

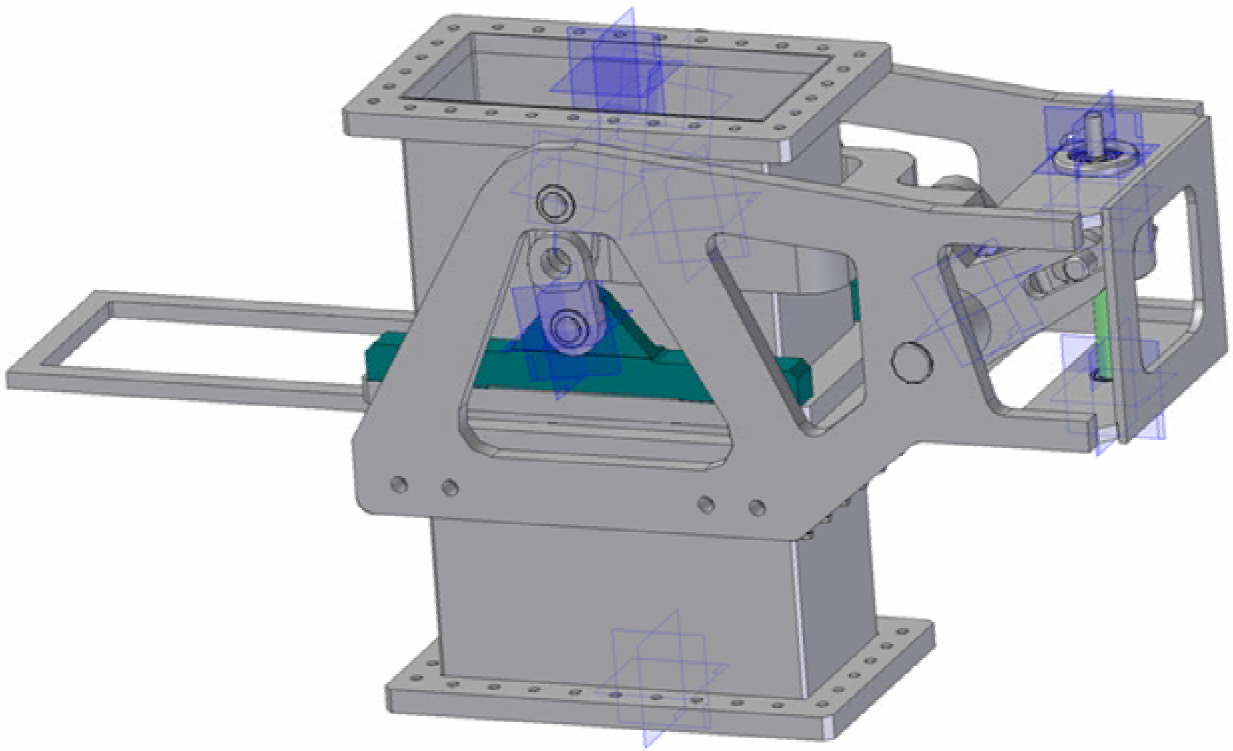


one transmitter hall (SR)

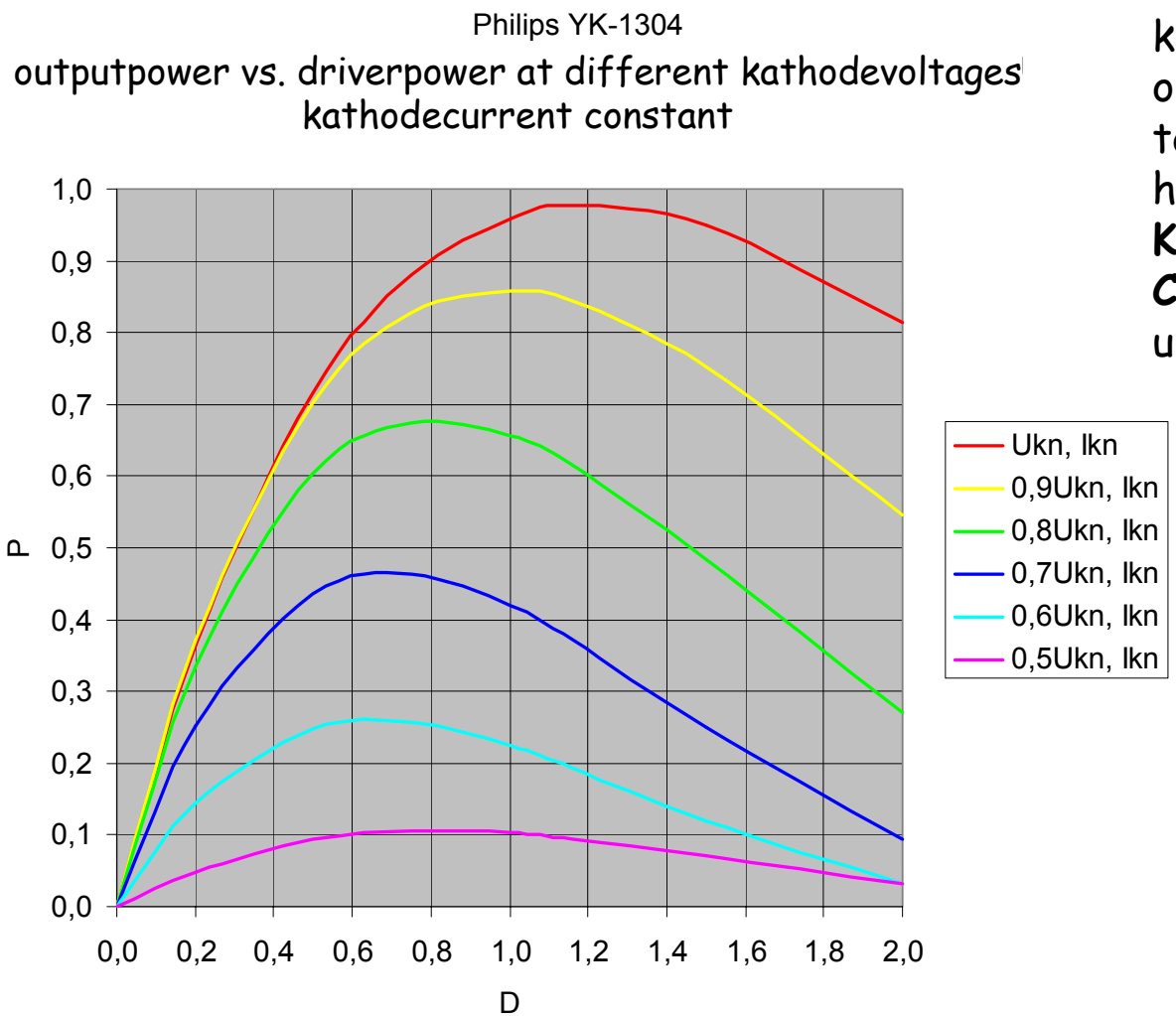


waveguide shutter





Klystron Working Point Control
and fast RF-Loop



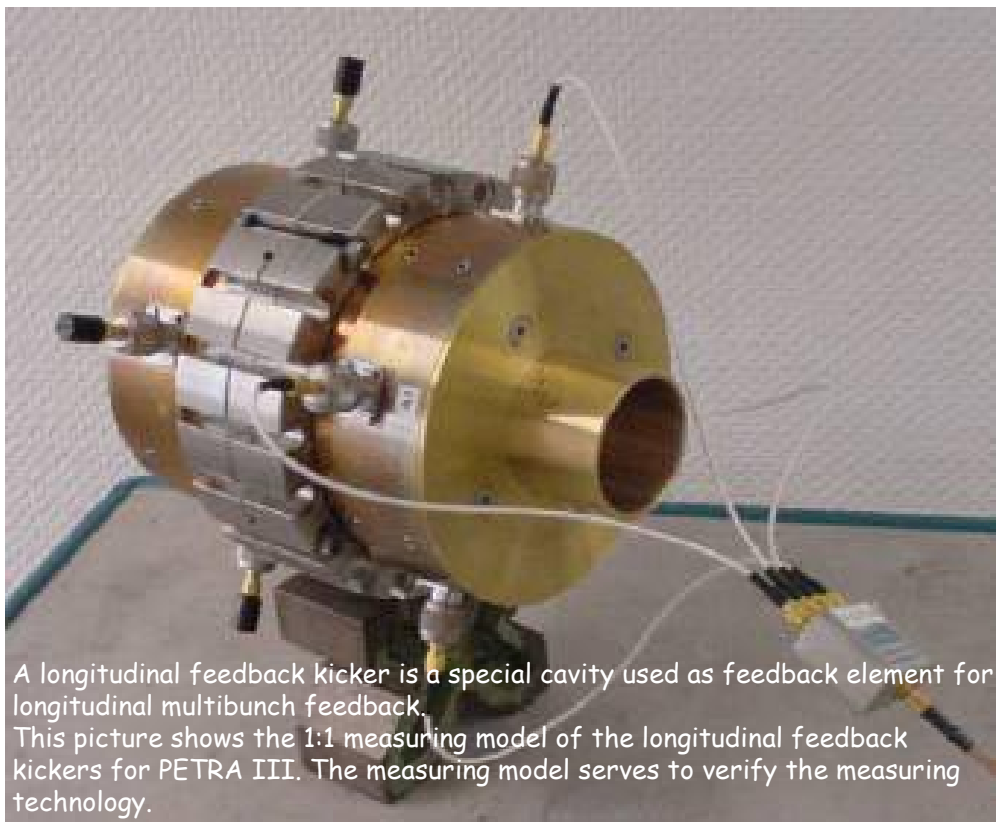
In order to run the klystron over the full output power range close to saturation and at highest efficiency a **Klystron Working Point Controller (KWPC)** is under development.

PETRA III longitudinal feedback

To achieve the design current (100 mA) in PETRA III powerful feedback systems are necessary since the threshold currents for coupled bunch instabilities are around **7 mA**!
Required bandwidth ≥ 62.5 MHz (8 ns bunch distance) !!

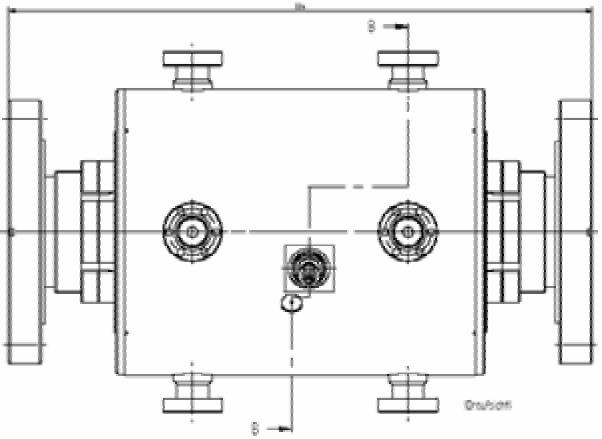
Commercially available amplifiers
(8 * 500 W solid state)

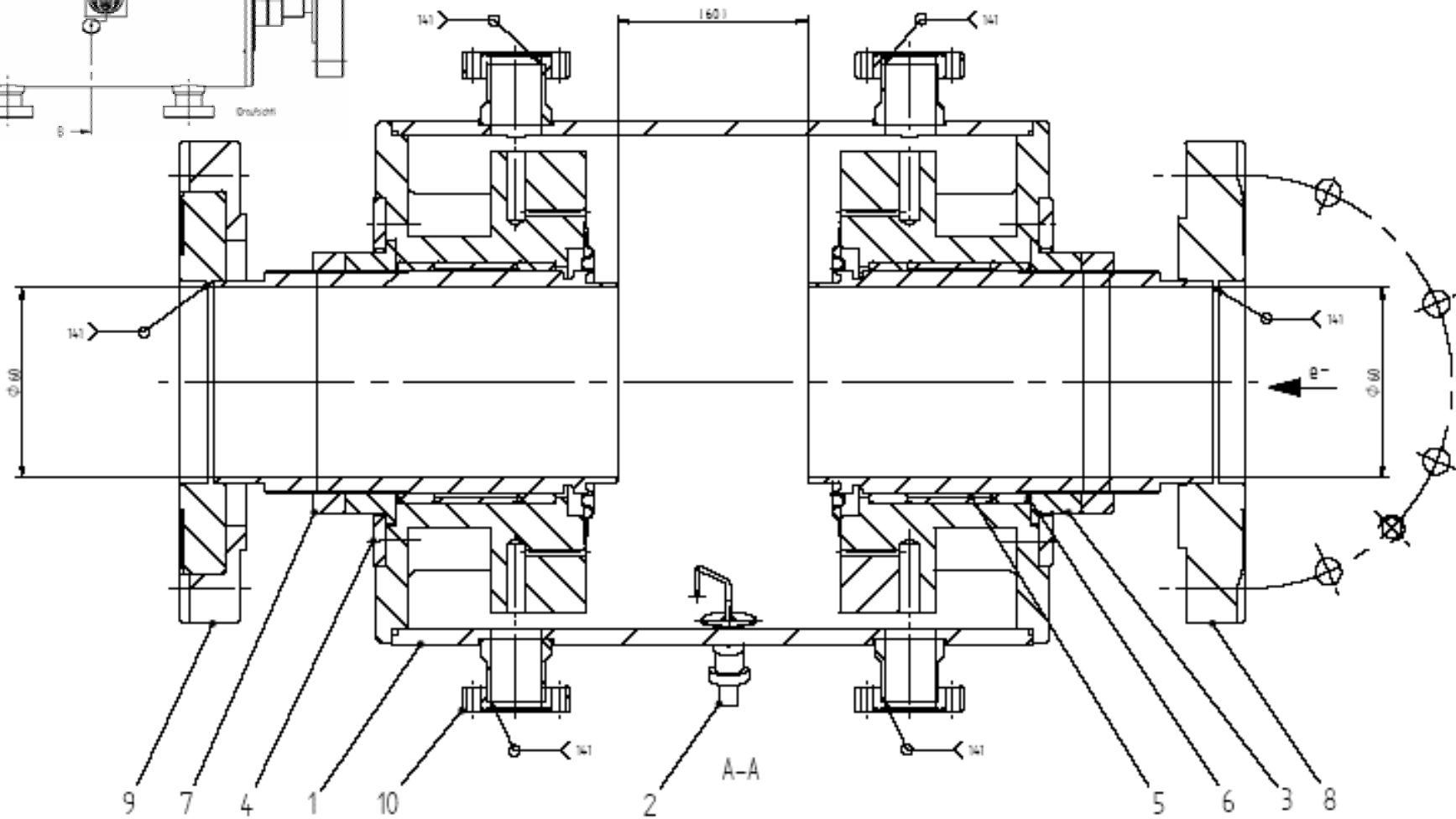
&



A longitudinal feedback kicker is a special cavity used as feedback element for longitudinal multibunch feedback.
This picture shows the 1:1 measuring model of the longitudinal feedback kickers for PETRA III. The measuring model serves to verify the measuring technology.

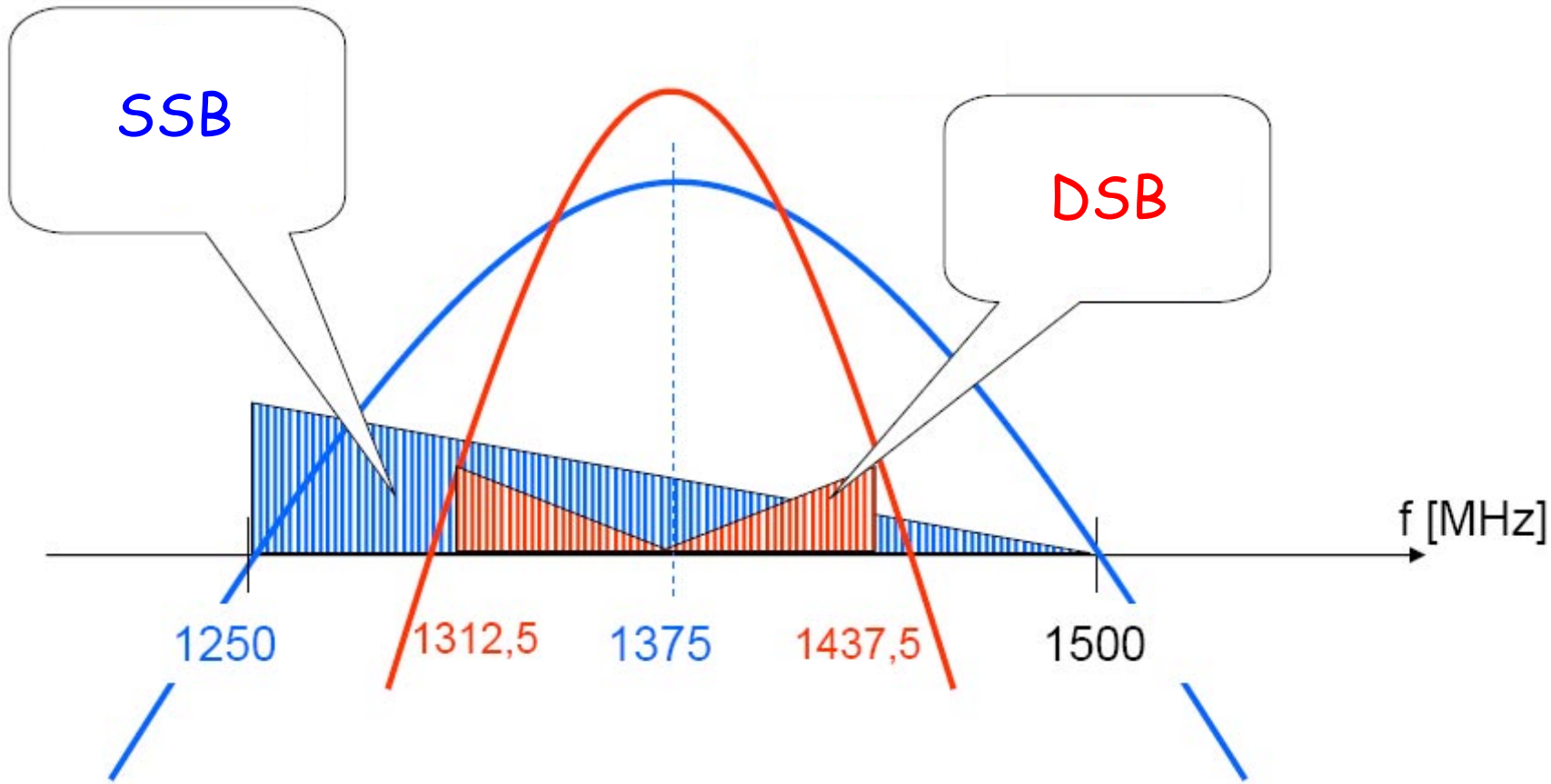
cavity drawings



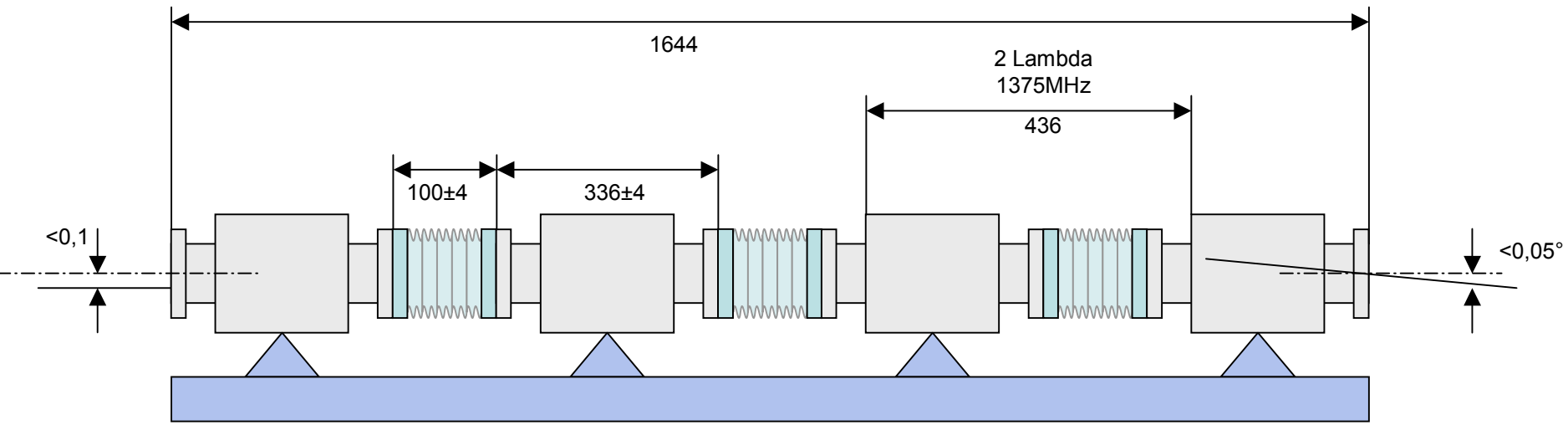


bandwidth

kicker-design for PETRA-3.1 (2 ns bunch distance, B = 250 MHz)
reduction of bandwidth for PETRA-3.0 (8 ns bunch distance, B = 125 MHz).



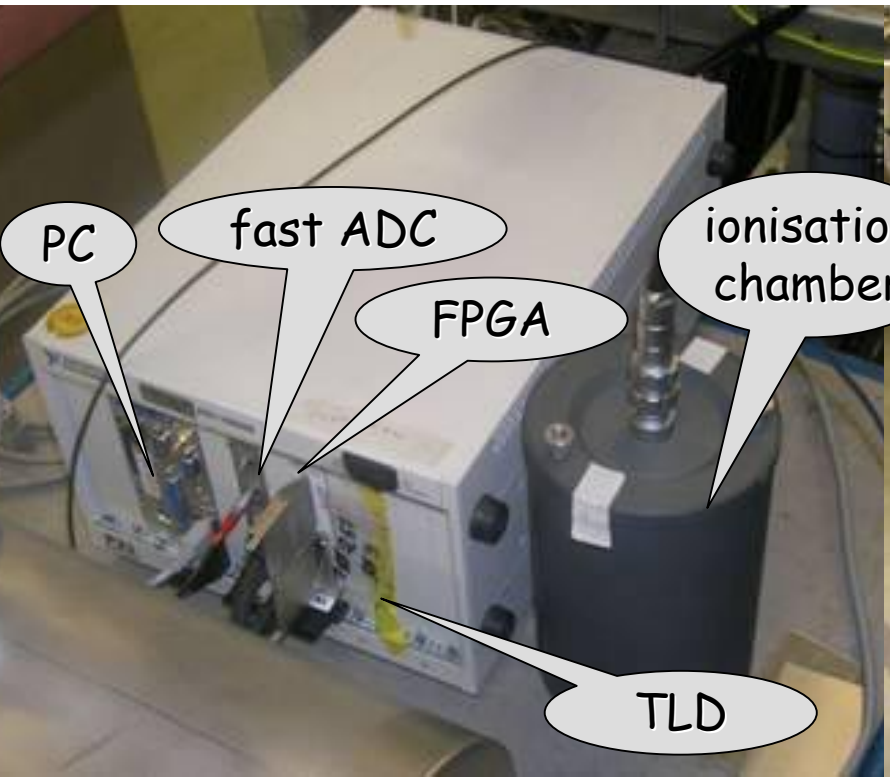
4 feedback-kicker on girder



draft

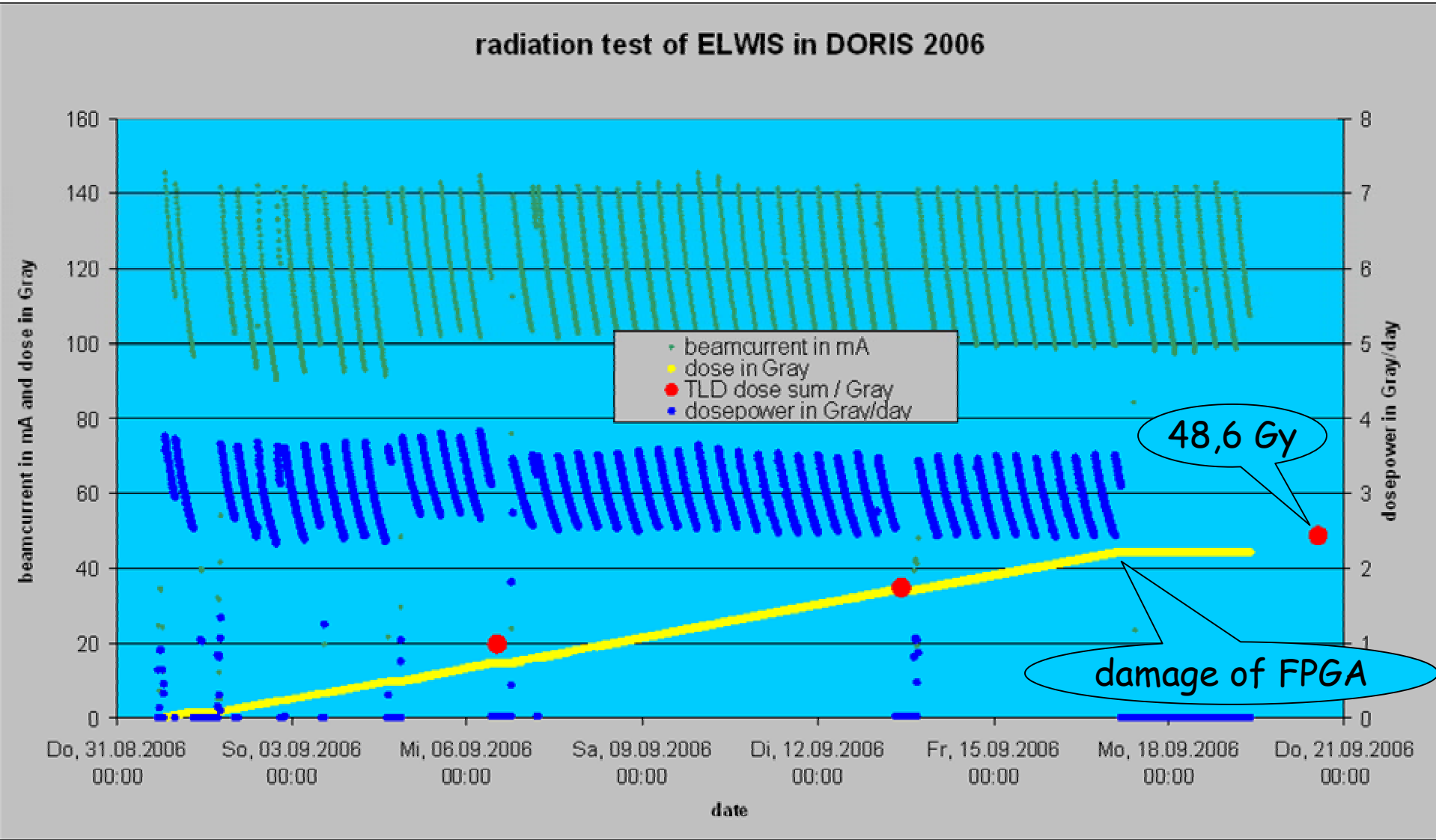
stressing ELWIS

kit: PXI crate, controller (PC), signal conditioning, FPGA, fast ADC incl. TRC, triggerdistribution

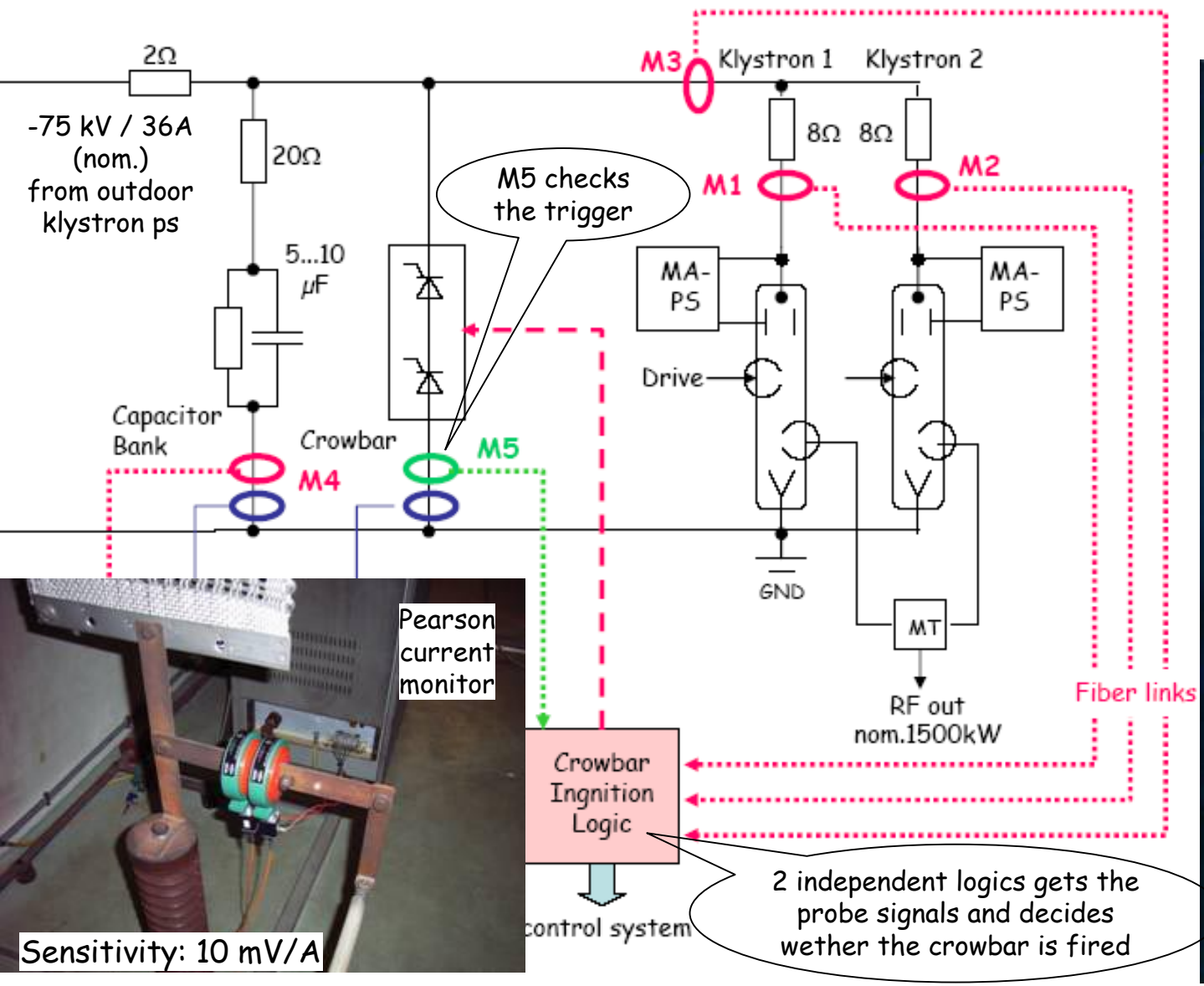


ELWIS : **E**ier **L**egende **W**ollm**I**lch **S**au = Eggs laying wool milk sow (pig)

2nd ELWIS radiation test in DORIS

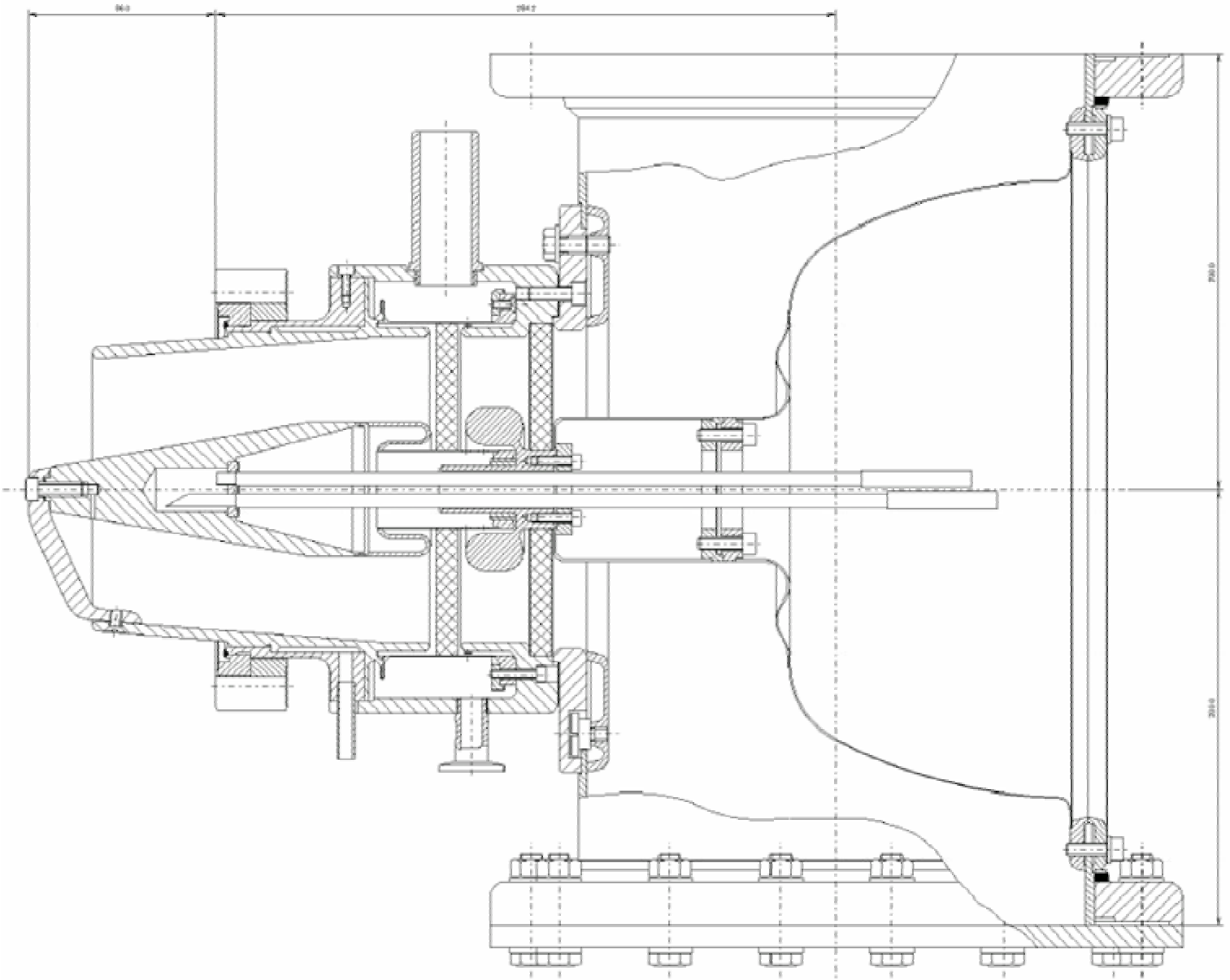


klystron protection

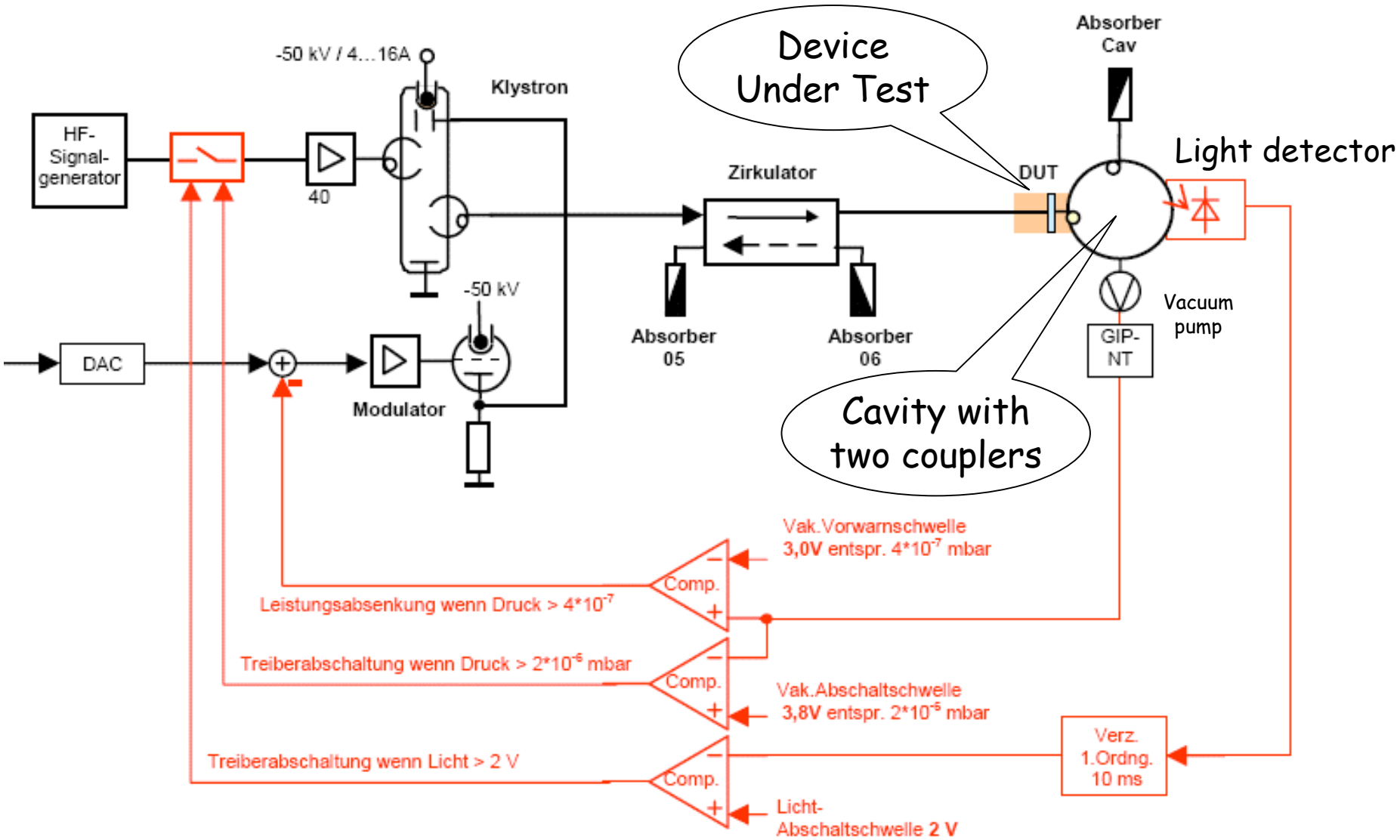


Light (laser) Triggered
Thyristor Crowbar

conditioning of input power couplers

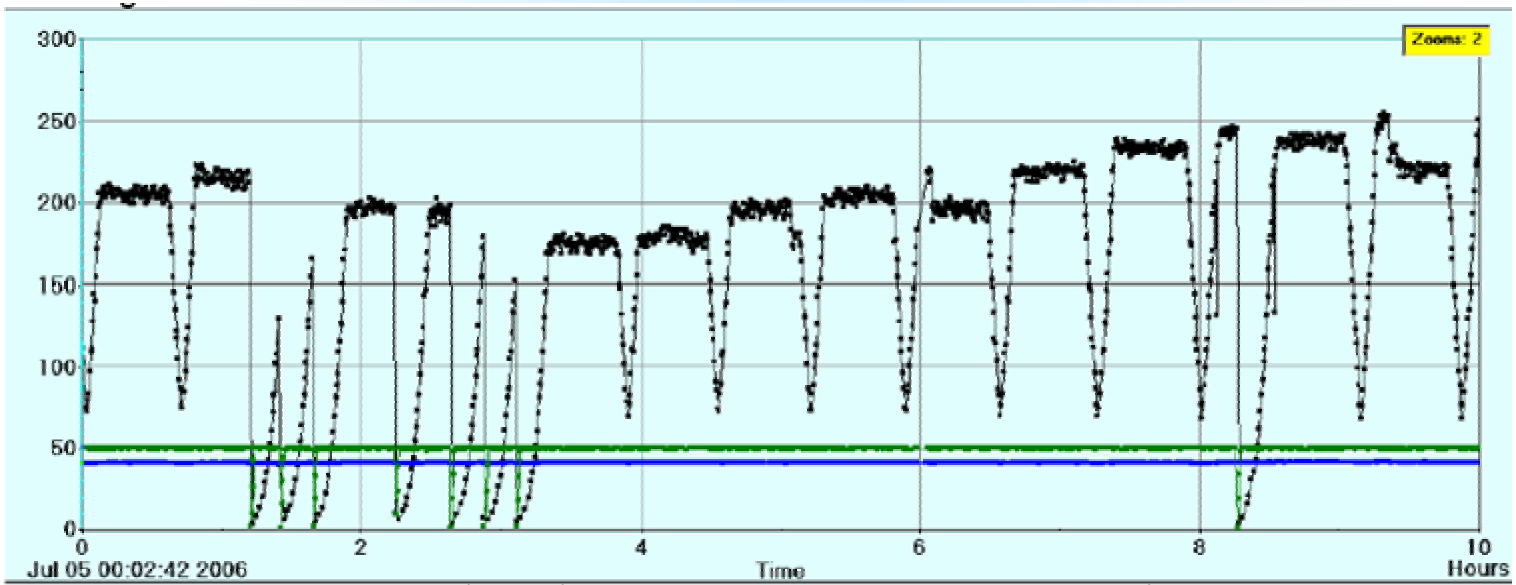


test transmitter

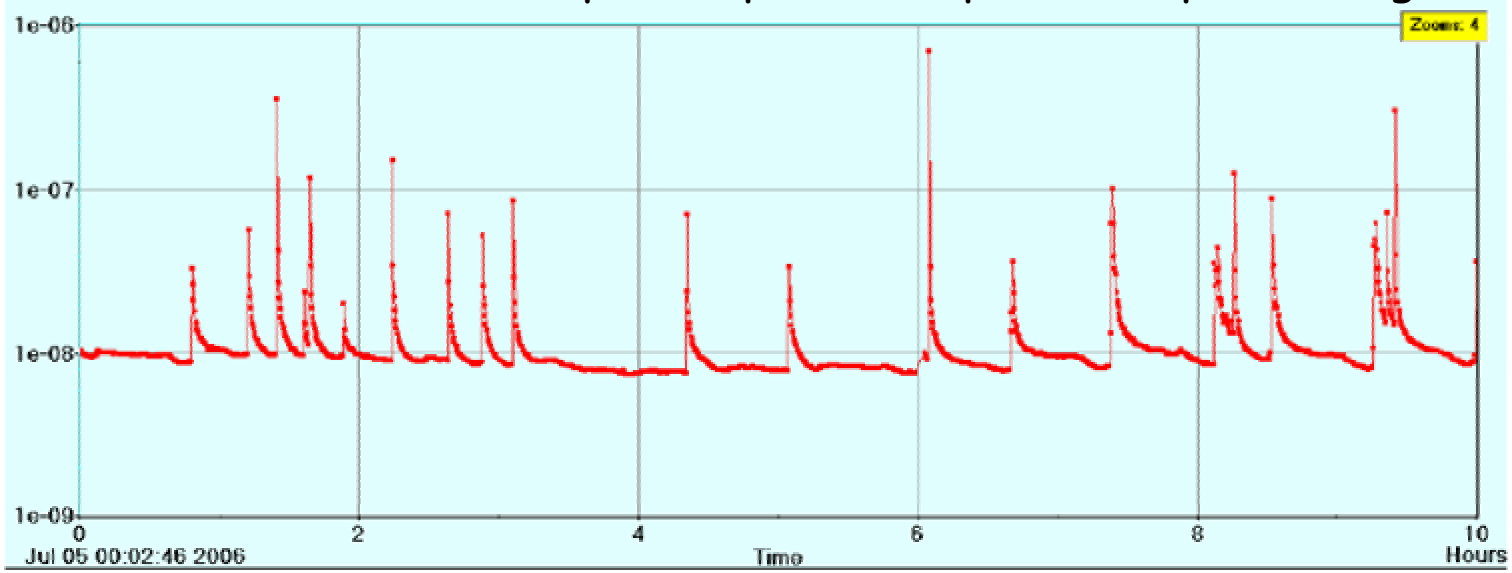


test cavity with light detector

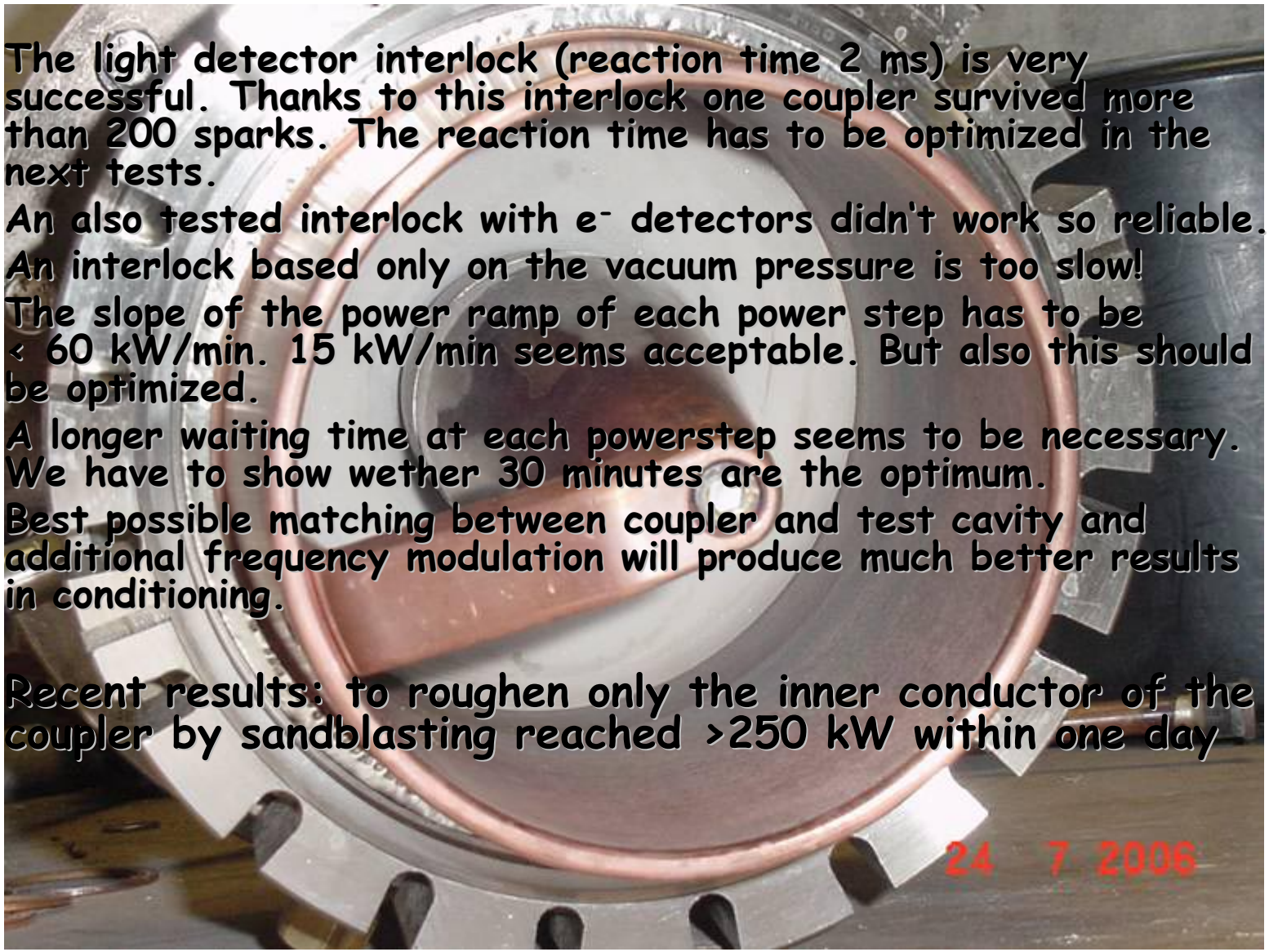
reaching 250 kW



Parameter: start and end power, power step size, slope, waitingtime



interlock and experiments



- The light detector interlock (reaction time 2 ms) is very successful. Thanks to this interlock one coupler survived more than 200 sparks. The reaction time has to be optimized in the next tests.
- An also tested interlock with e^- detectors didn't work so reliable.
- An interlock based only on the vacuum pressure is too slow!
- The slope of the power ramp of each power step has to be < 60 kW/min. 15 kW/min seems acceptable. But also this should be optimized.
- A longer waiting time at each powerstep seems to be necessary. We have to show wether 30 minutes are the optimum.
- Best possible matching between coupler and test cavity and additional frequency modulation will produce much better results in conditioning.
- Recent results: to roughen only the inner conductor of the coupler by sandblasting reached >250 kW within one day

the end and thank you!

MHF-e at DESY: 25 colleagues