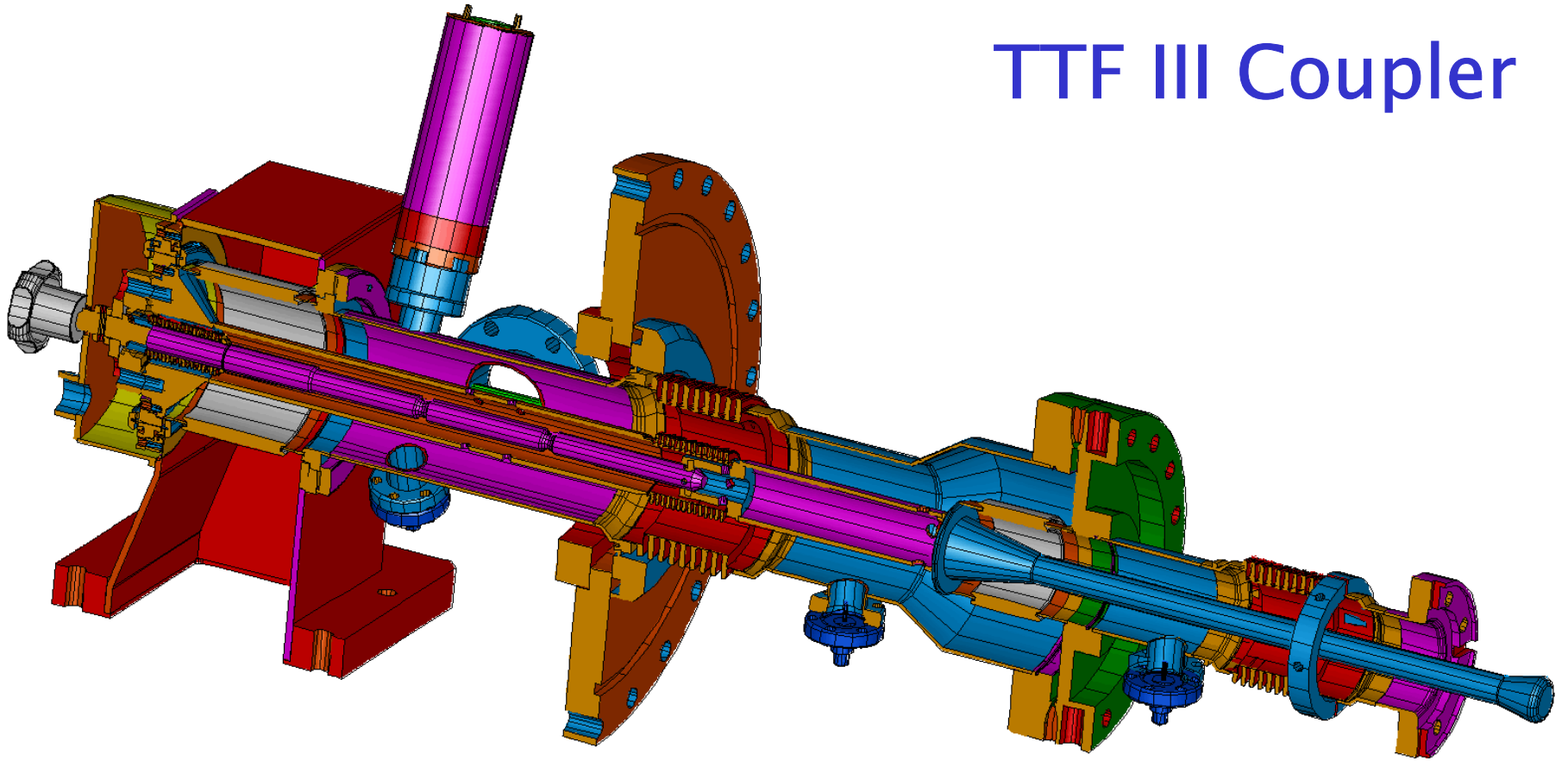


TTF III Couplers Conditioning

Denis Kostin, MHF/sl, DESY

TTF III Coupler



Assembly and treatment

- ★ Coupler cold parts are assembled in the class 10 clean room, then couplers are assembled in a mobile clean room class 100.
- ★ All coupler vacuum parts are stored under dry nitrogen gas.
- ★ Time when coupler vacuum system parts being exposed to the air is minimized.
- ★ Warm and cold ceramic windows are protected during the assembly and transport (protecting caps are used).
- ★ Before RF test on the test stand couplers are baked for about 3 days at the temperature of 150°C.

Test Procedure

Coupler Test Stand (TW) and Horizontal Test Stand (SW, OFF resonance):

Pulse Length [μs]	20	50	100	200	400	800	1300
Peak Pulsed Power [kW]	1000					500	

After: power sweep @ 1.3 ms pulse, 50..500 kW

Horizontal Test Stand (SW, ON resonance):

Pulse type	Rectangular					Flat Top 500 μs + ...			
Pulse Length [μs]	20	50	100	200	400	100	200	400	800
Peak Pulsed Power [kW]	1000				330	250			

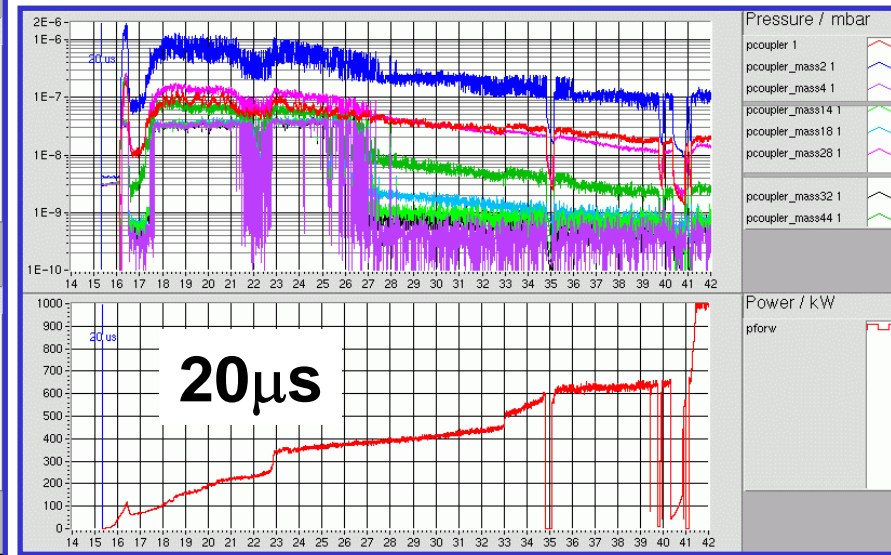
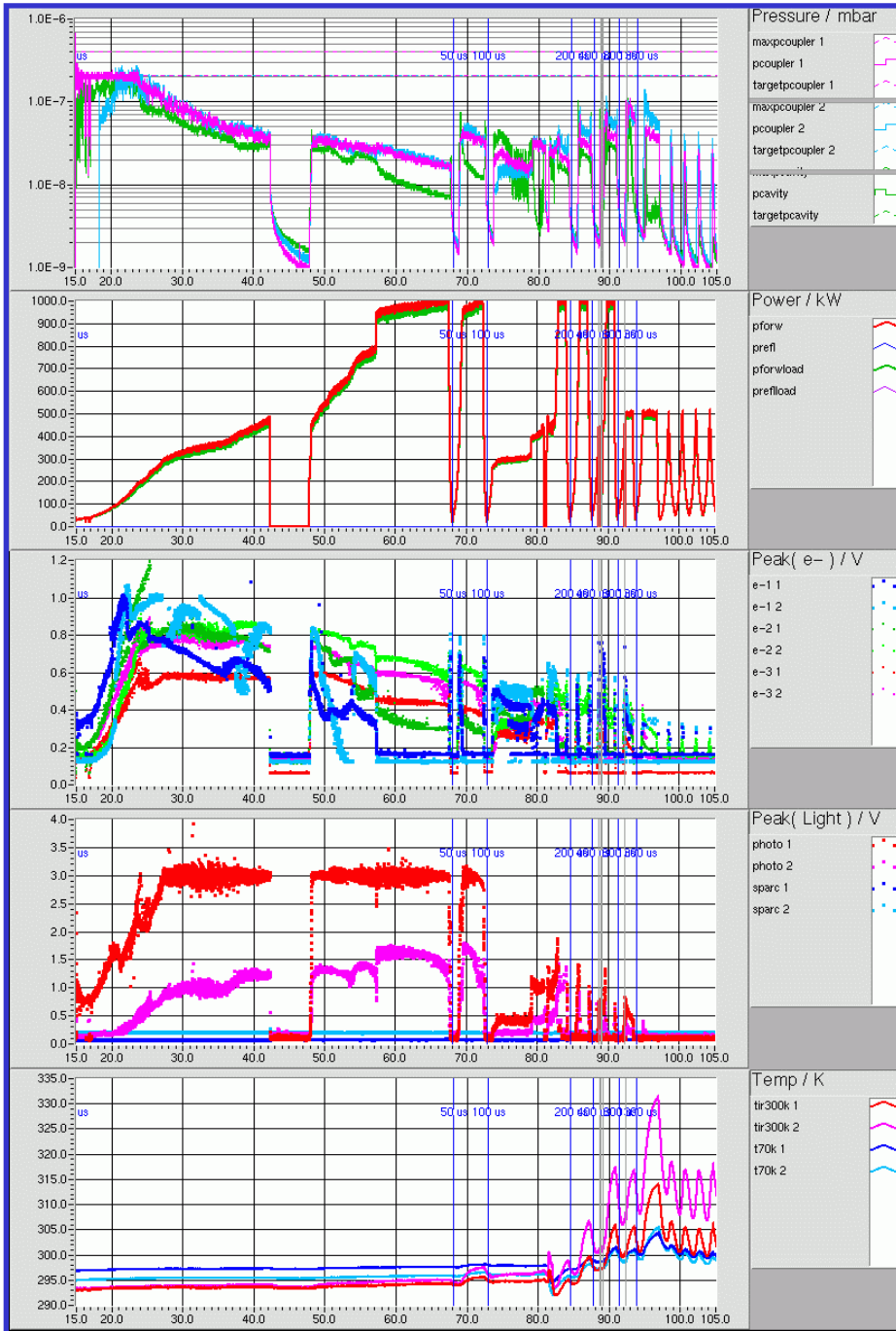
After: power sweep @ 1.3 ms = 500 ms + 800 ms flat top pulse, 50..250kW

Rep.Rate = 2 Hz. Power Inc. = 0.2 dB/min

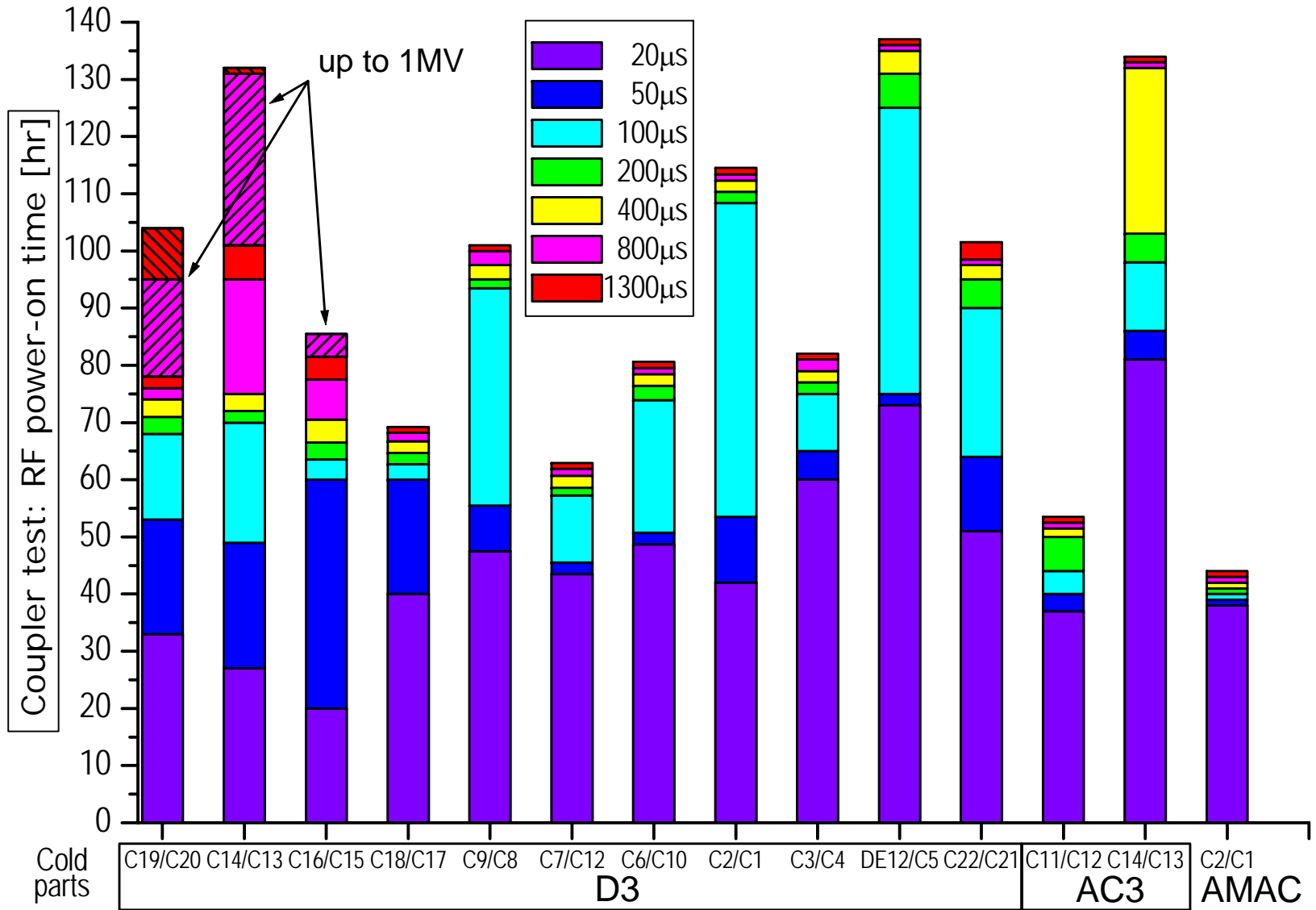
Coupler processing limits:

- e- pick-up IL signal: 5 mA
- Light (PM) IL signal: 1 Lux
- Vacuum pressure: 10^{-6} mbar
- Ceramics temperature: 85°C
- WG sparks: stop if any

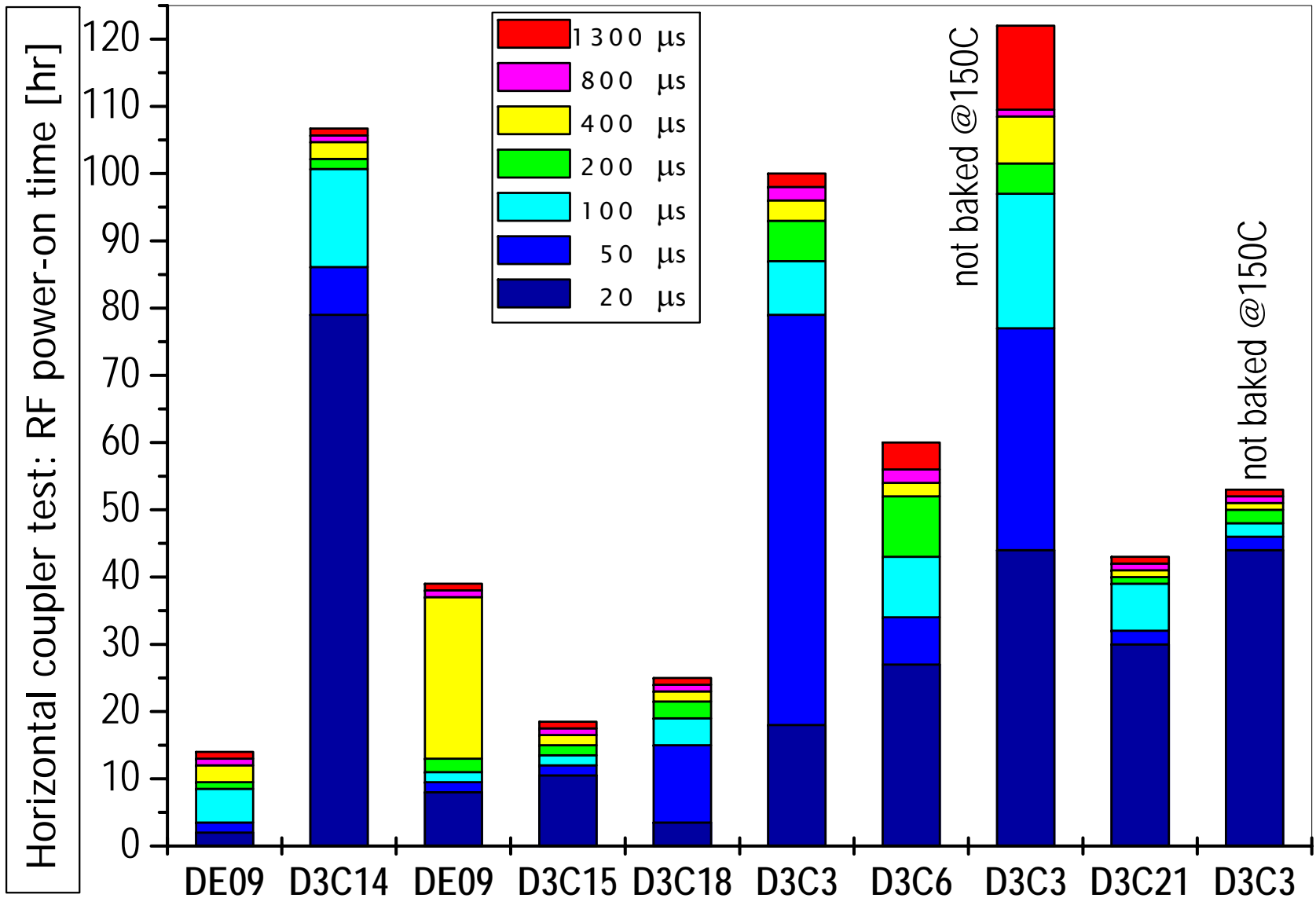
Test Run



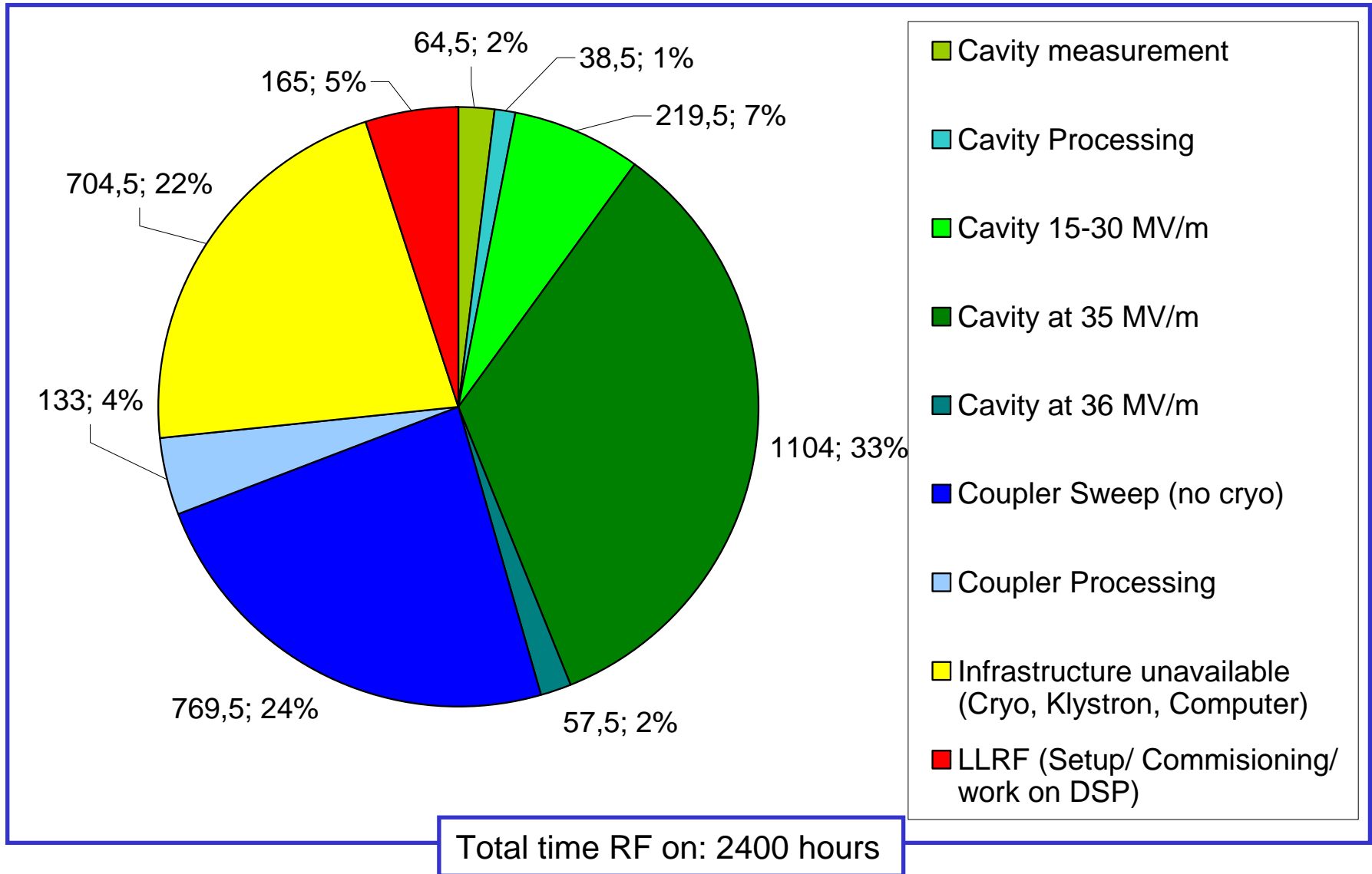
Conditioning: Coupler Test Stand



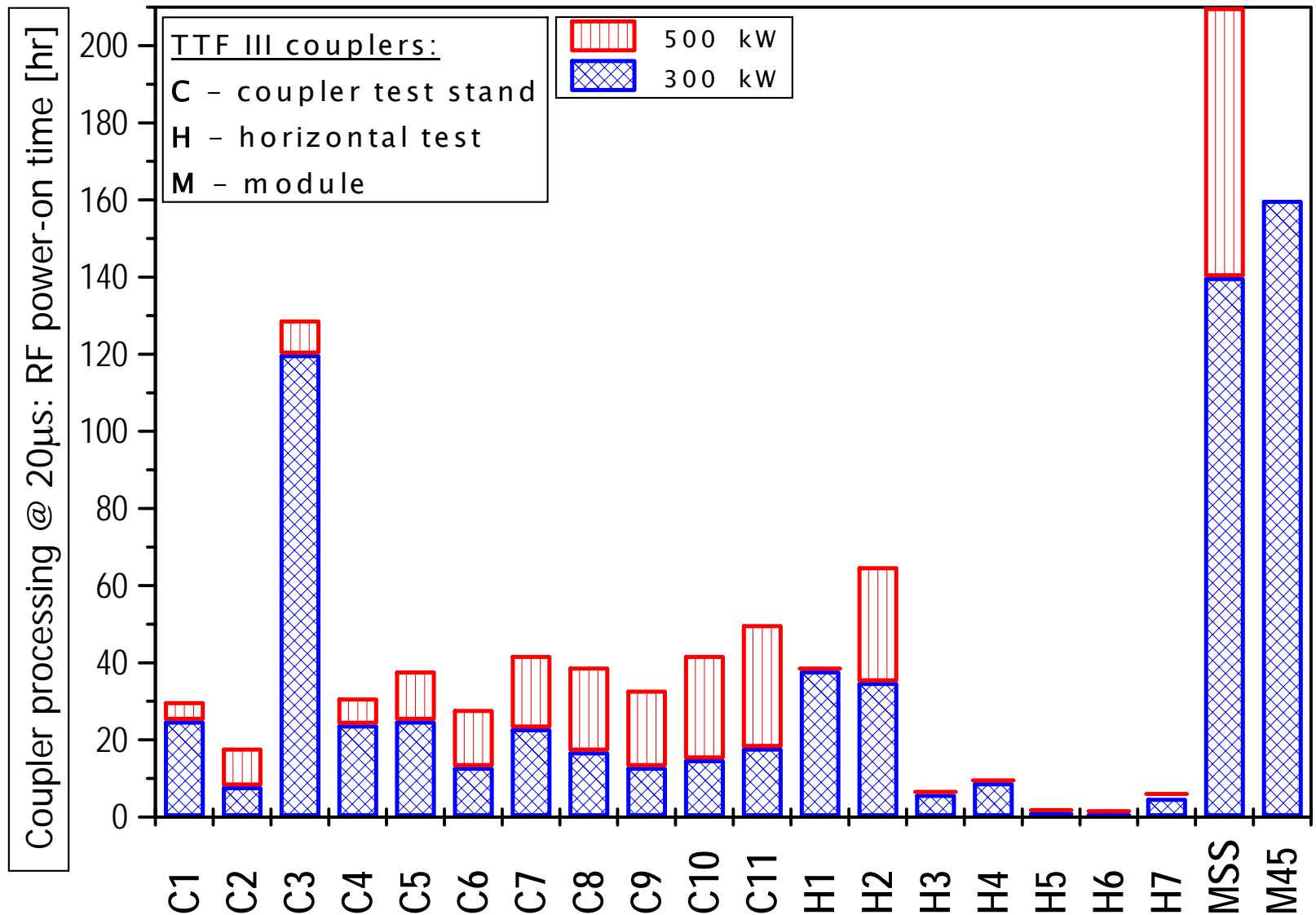
Conditioning: Horizontal Cryostat



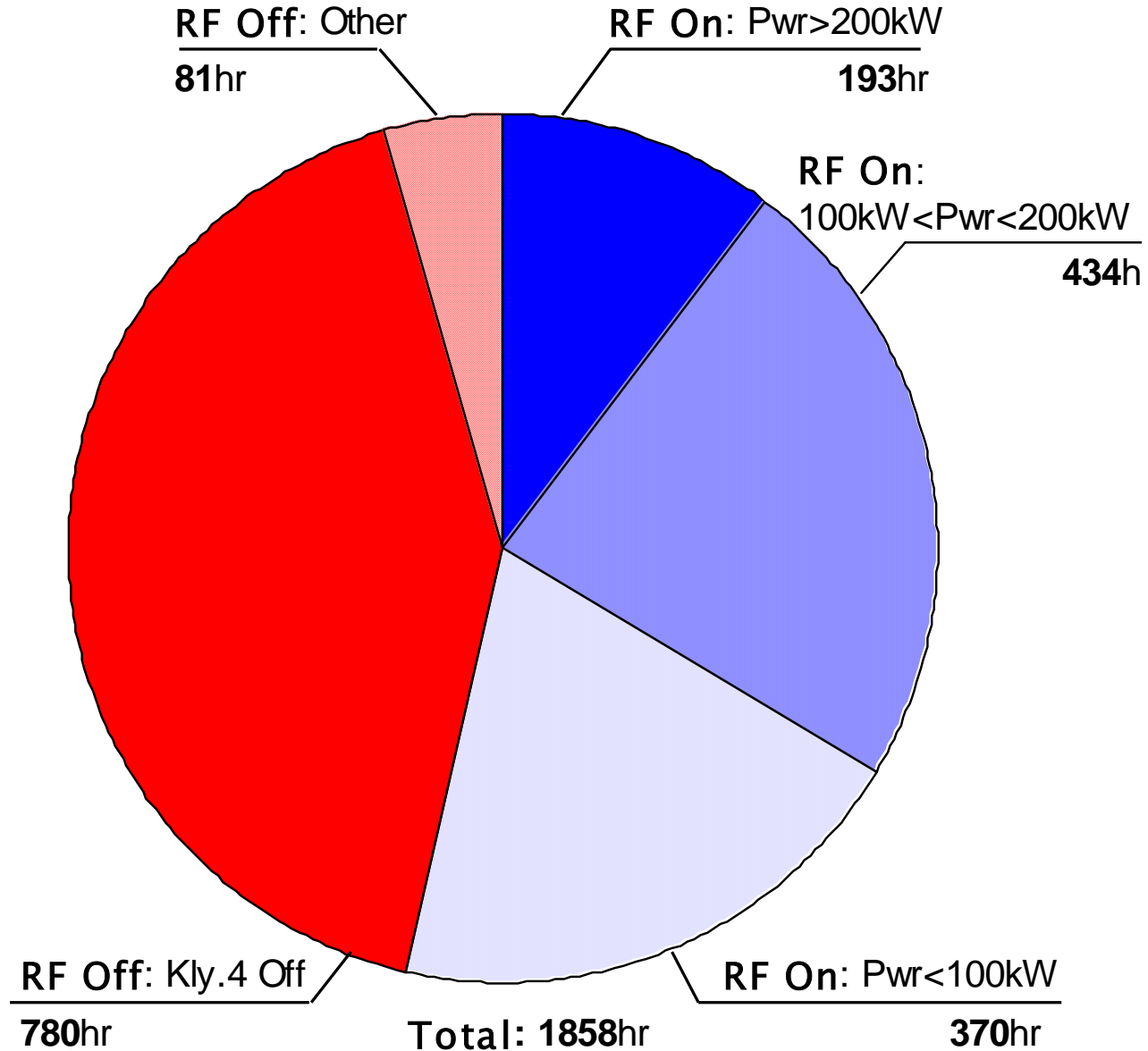
Cavity AC73 Long Run Test



Conditioning: 20 μ s Time Comparison



Modules 4 and 5 couplers processing time



Modules 4 and 5

Module vs Test Stand

- ★ No coupler baking in situ possible @ Module.
- ★ Maximum power of 350 kW @ Module: higher power for short pulses 20..100 ms not available.
- ★ 8 or more couplers are processed together @ Module: processing in serial rather than in parallel.
- ★ 8 couplers pumped out together, different effective pumping speeds (15 l/s Module, 4 l/s Hor.Test).
- ★ Light and Spark detectors @ Module affected by radiation.

Conclusions

- ◆ 26 TTF III couplers successfully tested at the coupler test stand showed very good performance for maximum pulsed power up to 1 MW and 1.3 ms pulse length at 2 Hz repetition rate.
- ◆ 10 TTF III couplers successfully tested at the Superstructure module (2) and Module 5 (8) in the VUV FEL Linac. All TTF III couplers in the VUV FEL Linac could be operated up to the cavity performance limits.
- ◆ 7 TTF III couplers successfully tested at the horizontal cavity test stand. TTF III couplers are tested together with cavities at gradients of 35 MV/m (600 kW) 5 Hz without degradation of cavity or coupler.
- ◆ The parallel processing of 8 respectively 16 couplers at the modules is slower than that at the test stands or in the horizontal cryostat.