

SLS RF hardware report 2005

M. Pedrozzi

Paul Scherrer Institute, 5232 Villigen PSI, Switzerland

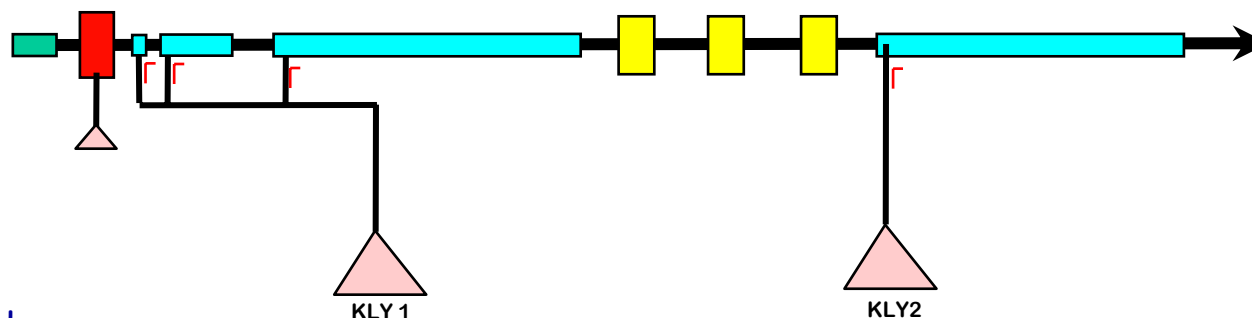
SUMMARY

- LINAC report
- SR Superconducting Third Harmonic system report
- SR 500 MHz system report

SLS Linac Report

- 35 MW Klystron history:
 - TH2100E 031: 30'000 hours - presently in operation for bunching section and acc. Structure 1 at ~16 MW
 - TH2100E 032: 21'000 hours - presently in operation for acc. Structure 2 at ~20 MW)
 - TH2100E 032: 9'000 hours - January 2005 **Filament short cut after reassembly** - back to Thales for repairs

Typical al pulsed voltage ~270 KV, repetition rate 3 Hz

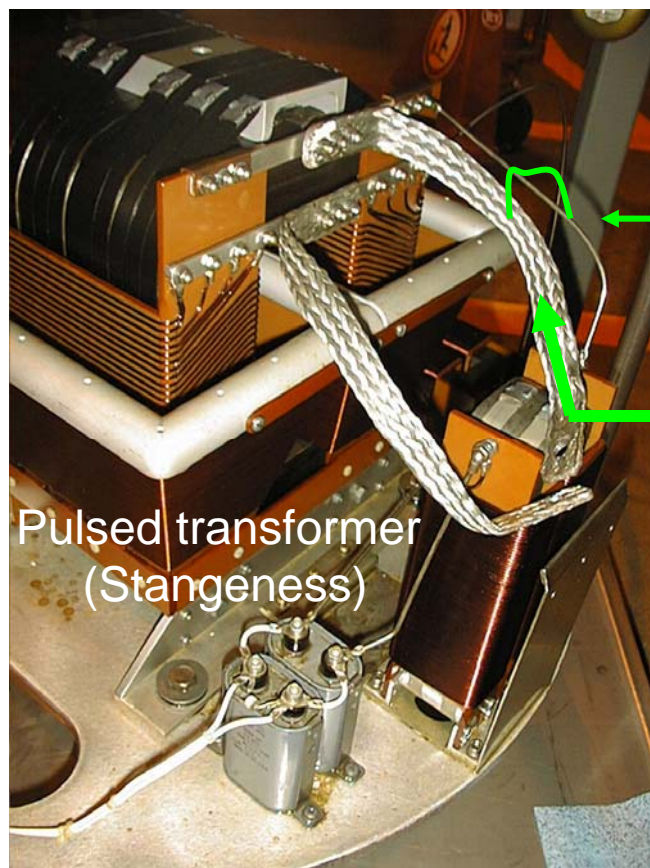


- Operation problems:
 - Arcs at the klystron cathode after a long operation with constant HV. Seems to ameliorate after HV conditioning.
- Thales adapted the prices to the "new market boundary conditions"!
 - New spare klystron TH2100W ordered: 110'000 EU
 - Refurbishing TH2100E 032: 75% of new klystron ~80'000 EU

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• Tank modifications:

Integration of two window per tank for maintenance and direct observation during operation (January 2005).



Arcing if to close due to the pulse propagation delay

PFN pulse

Pulsed transformer
(Stangeness)



Repositioning of the HV cable on the primary side of the pulsed transformer, to avoid arcs.

PLC LINAC-interlock system modification

An external Simatic panel has been added to the original SIEMENS S7 PLC in order to adjust the modulator and klystron interlock thresholds without a computer connection. Needed to simplify the klystron test procedure and debugging.



Next upgrade - New SF6 recuperation system (on going)



SF6 System delivered by ACCEL

-We need a more robust system to facilitate the filling procedure.

-Protect the personnel with respect of SF6 gaseous and solid decomposition products.

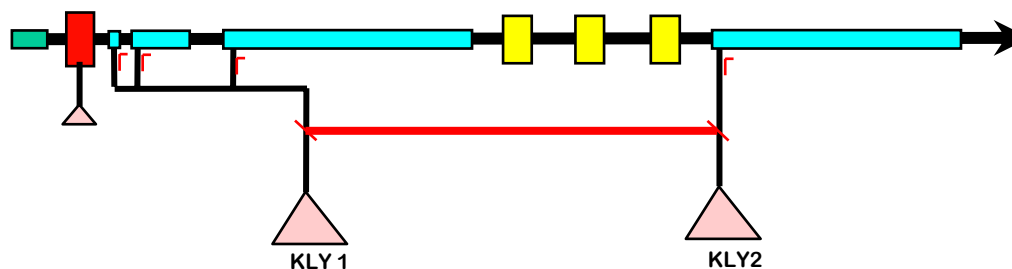
-Fulfill EU regulations about gases responsible of Greenhouse effect (SF6 is up to 24000 more "efficient" than CO2).



SF6 DILO MPC-04 compressor

Next upgrade - Modification of the Wave guide system (evaluation phase).

Integration of a wave guide switch to allow injection in case of major failure of klystron 1 during operation. Implies low energy injection mode for the booster (>60 MeV).



S3HC report 21-03-2005

New problem detected on the HELIAL turbines

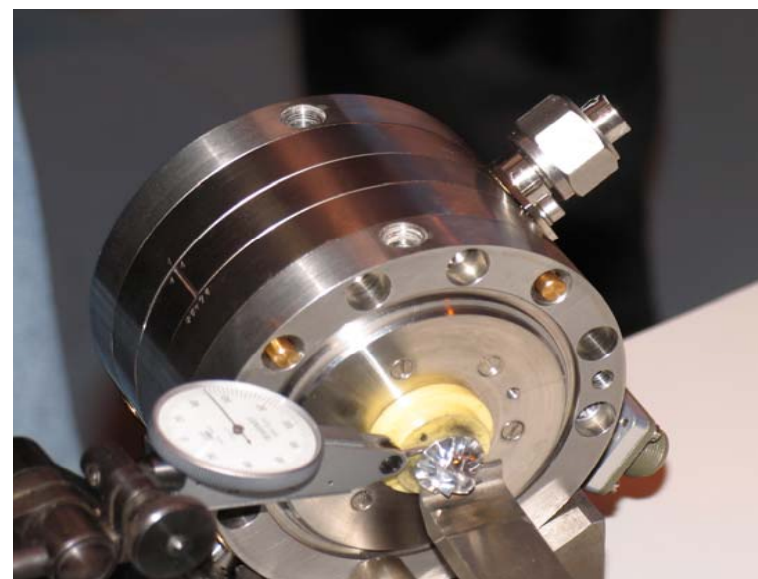
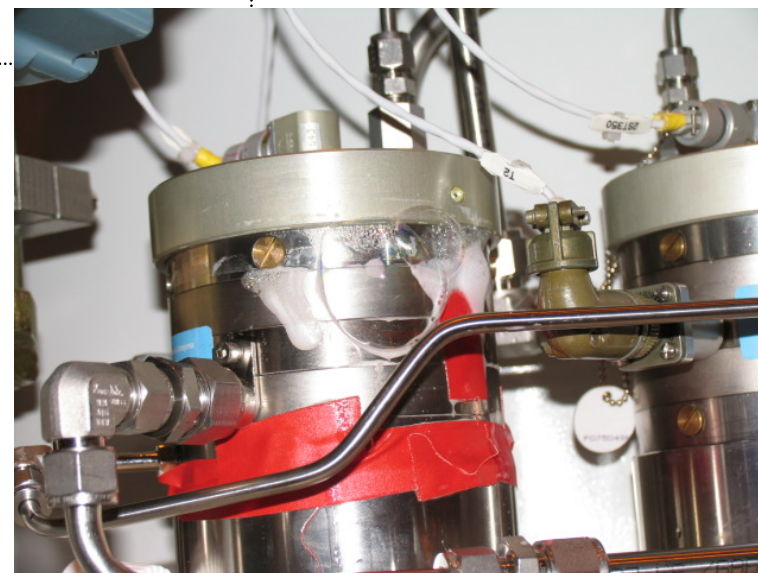
May 2005:

- Substitution of turbine 1 because of an He leak due to a defective O-ring . Not reparable in house with PBS personnel (*První brněnská strojírna, Velká Bíteš, a. s., Aircraft Technique Division, Vlkovská 279, 594 12 Velká Bíteš, CZECH REPUBLIC*).

We suspect that the Turbine was leaking since the last turbine substitution in June 2003.

- Axial clearance of turbine 2 out of PBS specifications. Replaced with spare turbine.

The spare turbine have been mounted and tested by PBS personnel (May 2005). Presently the defective turbine are still at PBS to complete the repairs. Training course on turbine foreseen for PSI personnel.



S3HC report

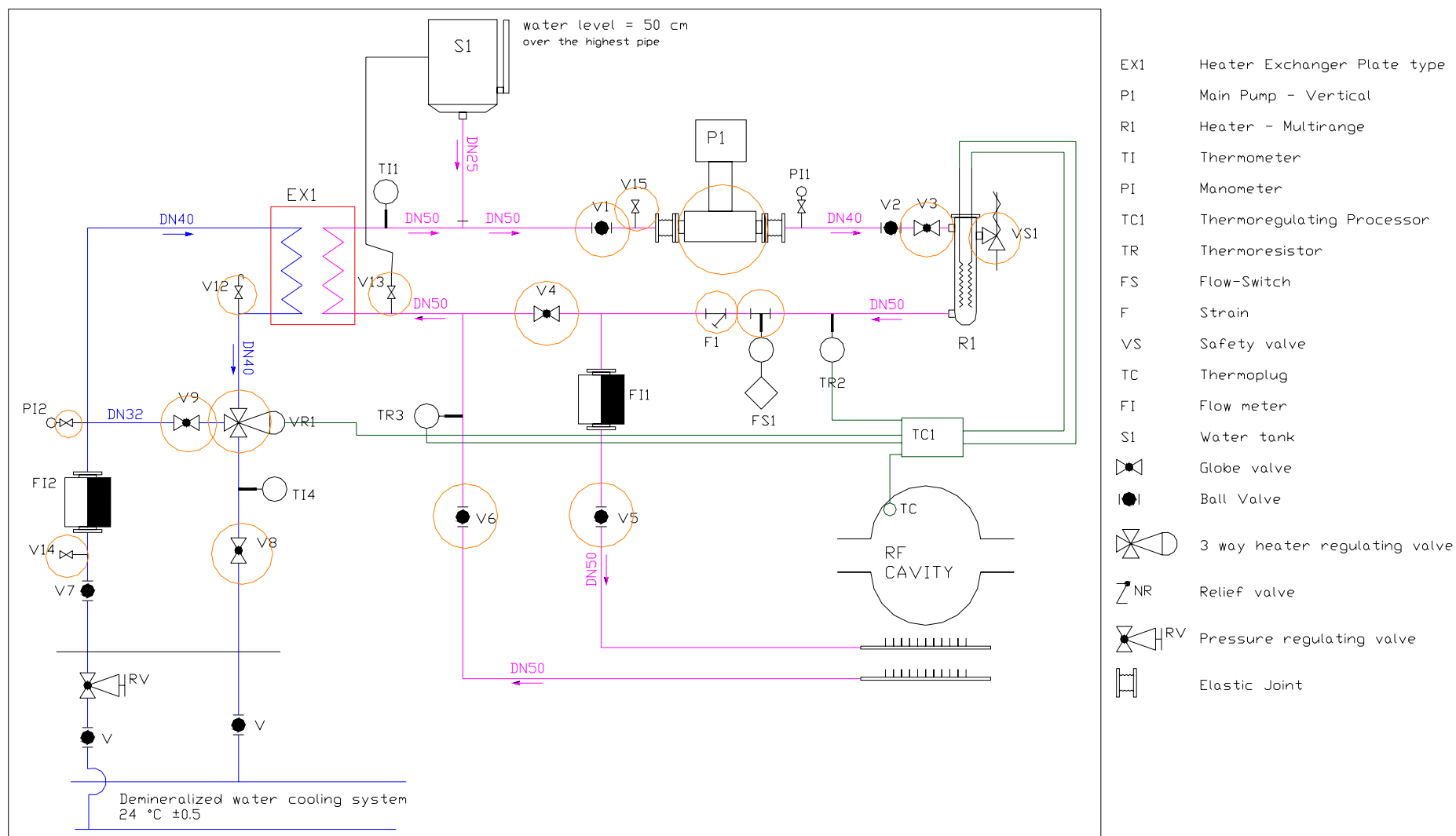
January 2005: Substitution of the tuning system stepping motors (Phytron) with a more robust version (CEA intervention at PSI).

No failure of the motors have been observed at the SLS with the old and the new motor version, but the S3HC worked at fixed tune up to now.

A current upgrade from 350 to 400 mA could imply a tuning loop between 300 and 400 mA to keep under control the longitudinal CBI.

Storage Ring and booster 500 MHz RF report

Cavity cooling circuit - Corrosion process observed in the cavity cooling circuit



CAVITY 3- Water leak in the cooling water circuit water circuit (31-03-2004)



Water analysis May 2004

Element	Rückstand HF Anlage 1 52°C %	Rückstand HF Anlage 2 62°C %	Rückstand HF Anlage 3 64°C %	Rückstand HF Anlage 4 54°C %	Rückstand HF Anlage 5 %	Nachweis- Grenze %
Al	0.558	0.836	0.877	0.489	0.0057	0.0008
Ca	4.11	3.52	3.06	4.92	0.008	0.006
Cr	0.662	0.078	0.107	0.185	0.0091	0.001
Cu	2.24	2.95	8.56	3.01	89.3	0.02
Fe	51.2	30.1	42.2	41.1	0.0328	0.0005
Mg	0.143	0.216	0.203	0.250	0.00924	0.0001
Mn	0.297	0.711	0.448	0.382	0.0881	0.00005
Ni	0.606	0.303	0.535	0.282	0.032	0.002
Zn	0.348	1.03	0.544	0.745	0.487	0.004



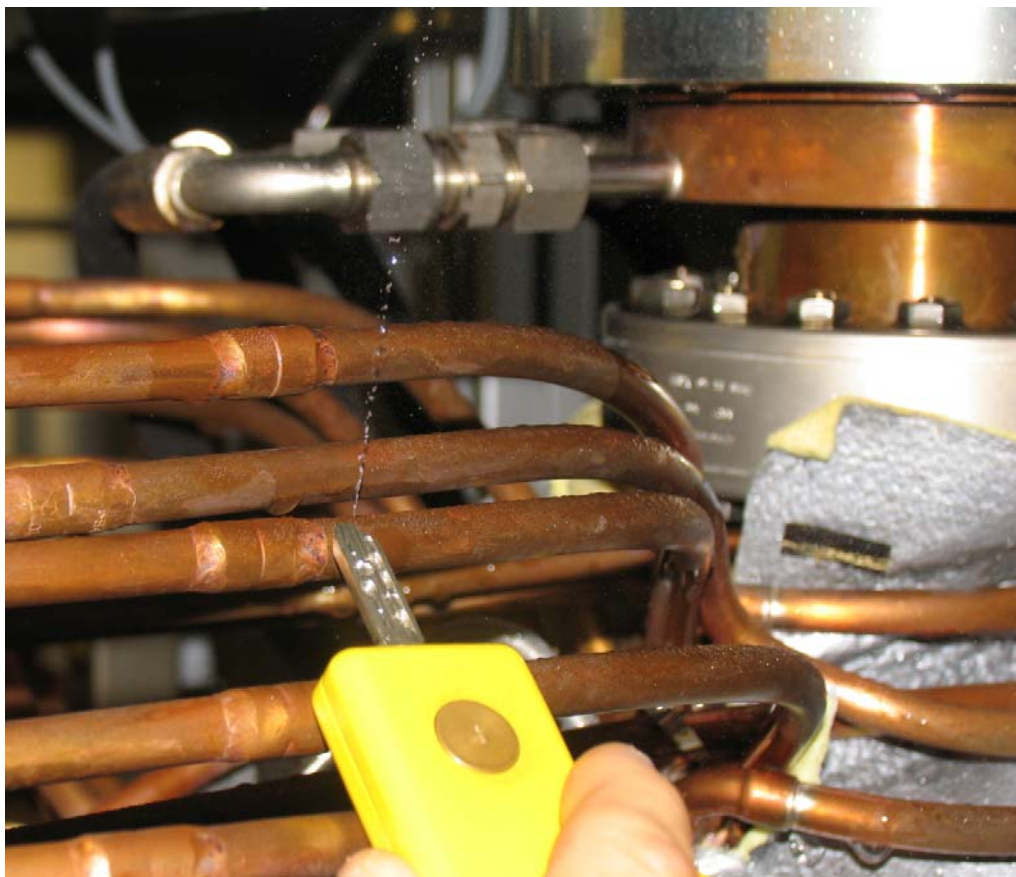
Chemical passivation treatment of the circuit surfaces
November 2004(ACQUAFLEX srl, Milano)

CLEAN 332: Pickling for Fe Oxides for cleaning of circuit (first intervention).

POLYFLEX 181: Remove and prevent the deposition of metallic oxides, phosphates, silicati and mud (one purge per per year).

POLYFLEX 177: Anodic inhibitor of inorganic type (Molybdate), to be added to the water for the normal operation (maintain the Ph ~8.5).

BOOSTER CAVITY - Water leak in the cavity water circuit - only demi water (30-08-2004)

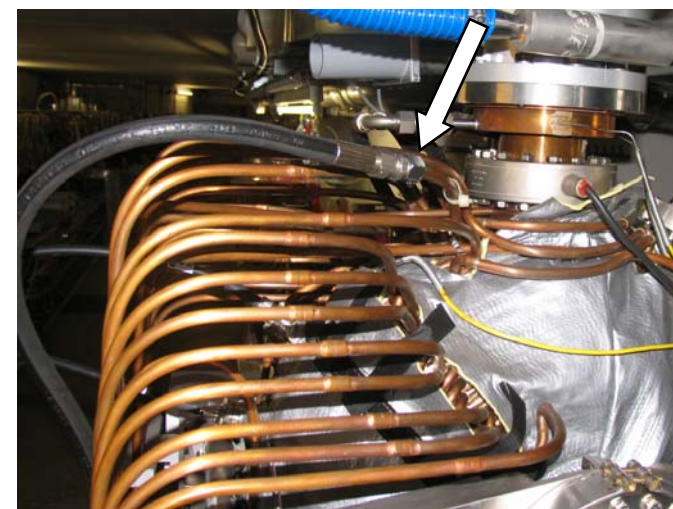


Leak due to the presence of a "stainless steel" chip inside the copper tube.

Cavity 3 and Booster partially inspected with an endoscope, no more chips found in the inspected portions.

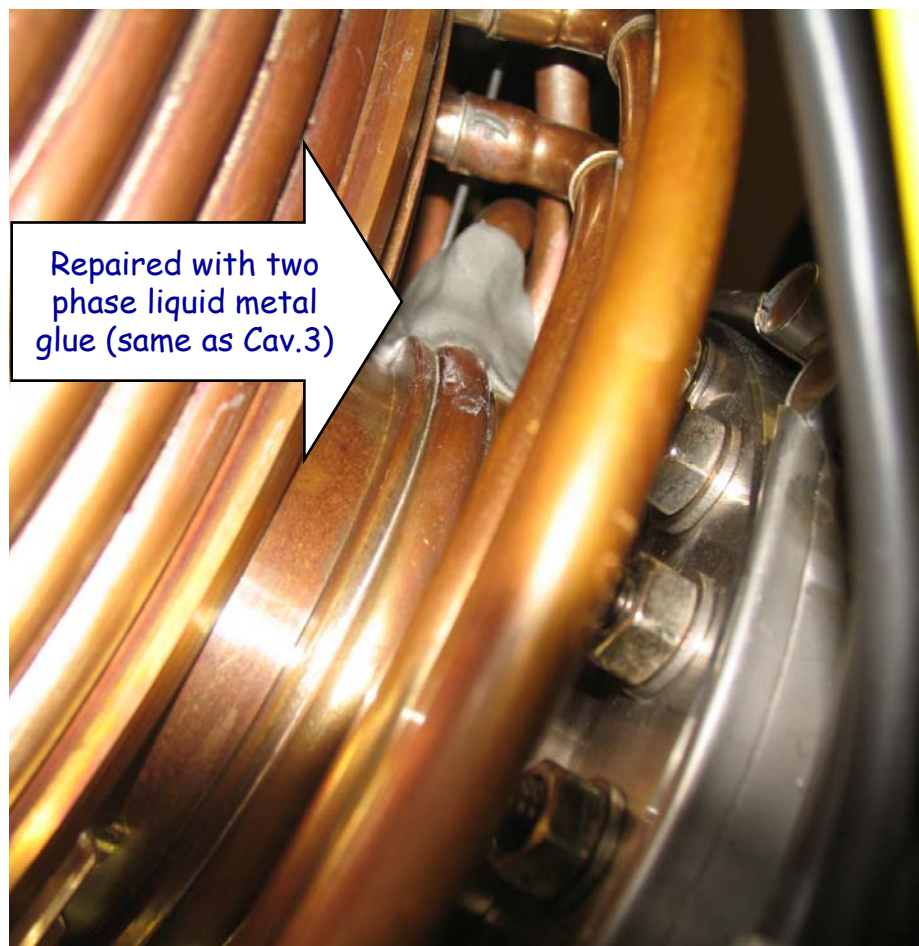


"stainless steel" chip



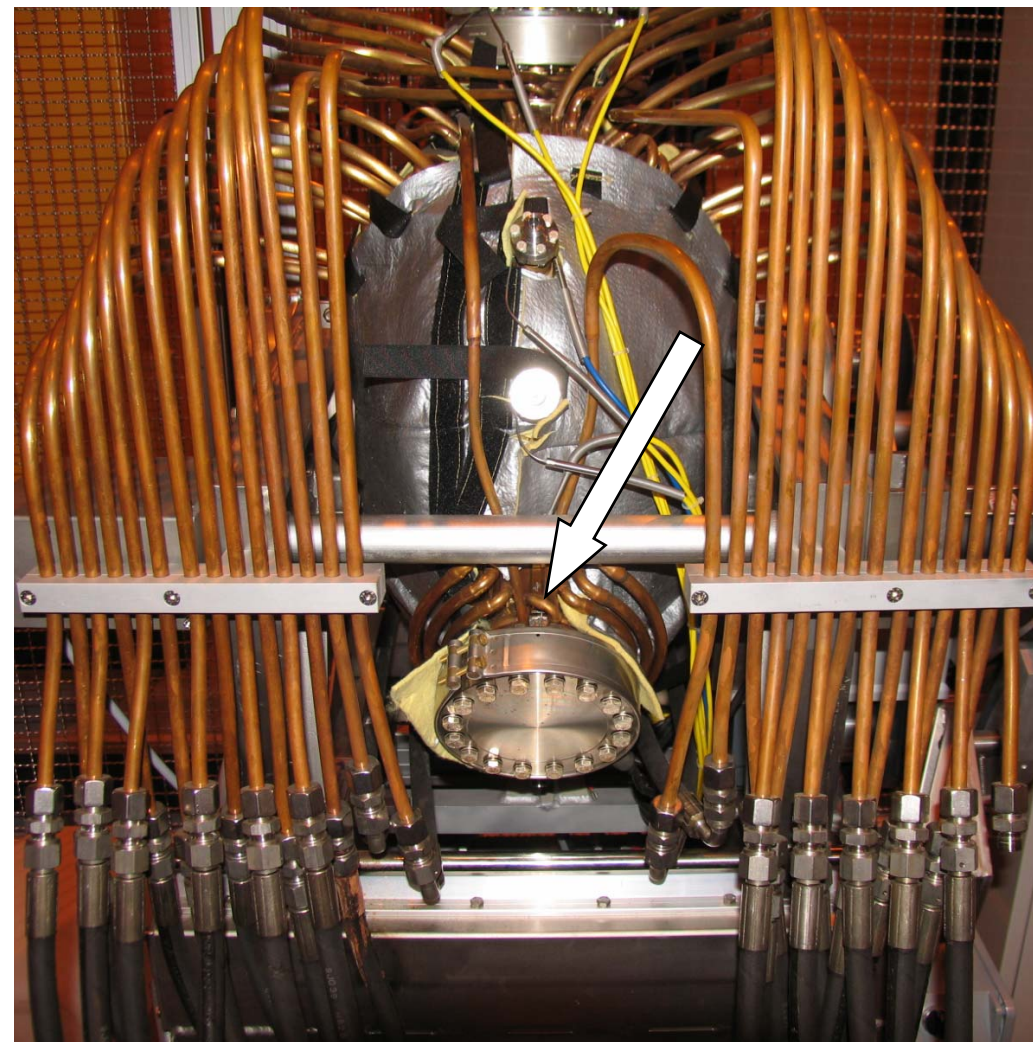
Temporary repair

CAVITY 4 pumping port - Water leak in the demineralised water circuit (15-09-2004)



The leak could be a weakness in one pipe brazing

We have to find a strategy to inspect deeply all cavities!



General problem on all SR cavities

decomposition of the flexible tubes connecting the cavity to the cooling rack due to the long term high temperature operation (54-64 °C)

The booster tubes are not affected (24 °C)

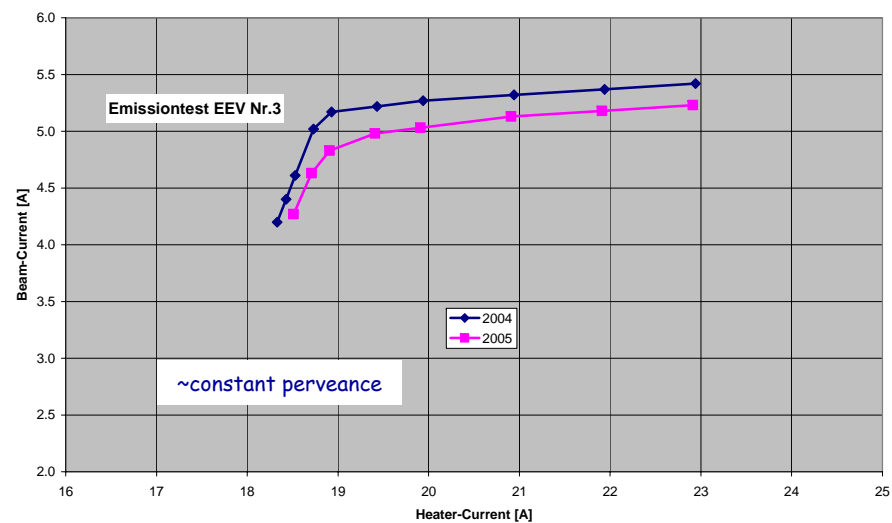
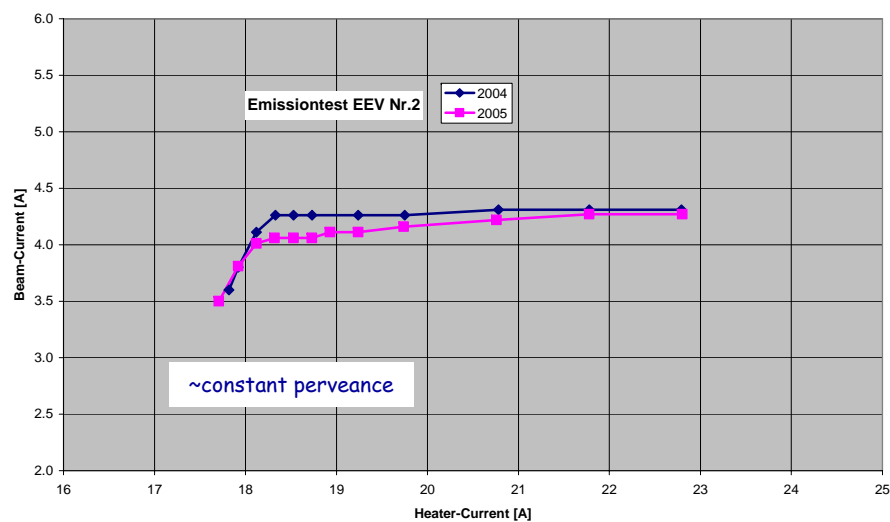
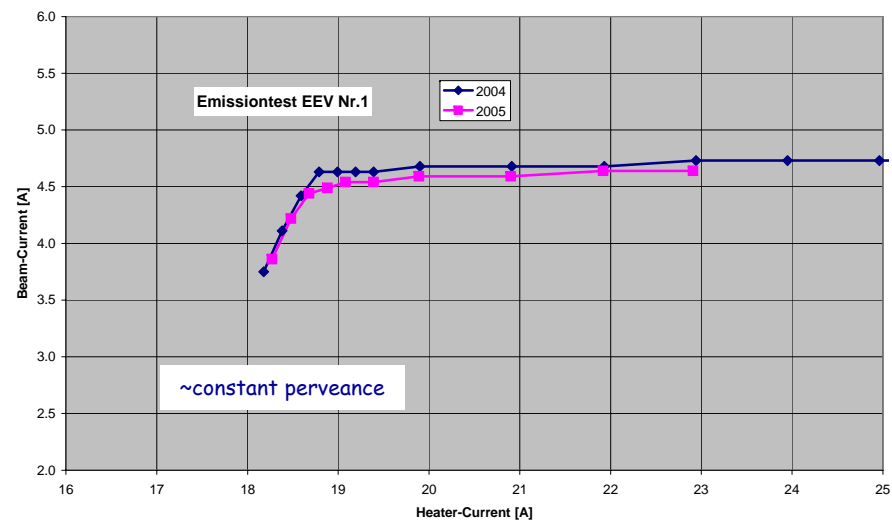
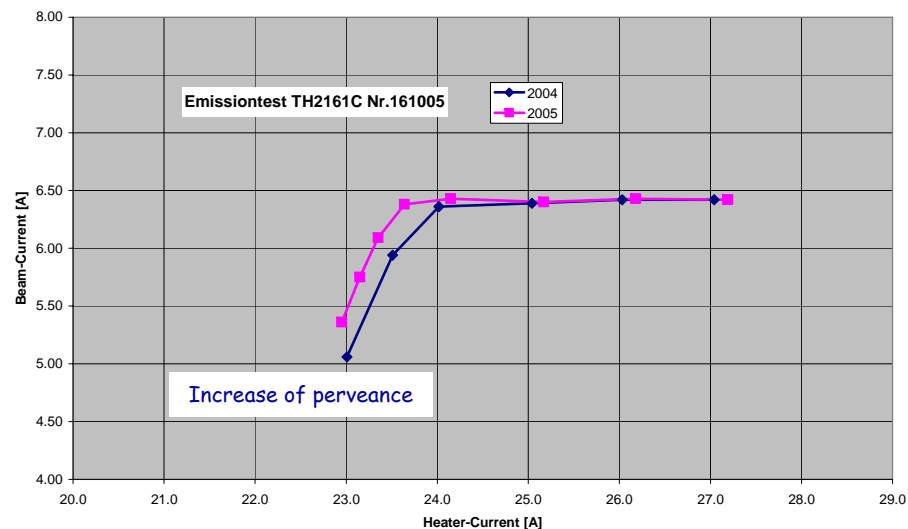
The cooling rack water becomes black due to rubber suspension coming from the flexible pipes (last purge one week ago).



SAIAG HTP - 3/8" - 350 Bar - 160 °C

All flexible tubes should be exchanged with metallic tubes

Storage Ring 500 MHz klystron status: smooth aging

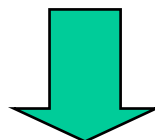




Storage Ring and booster 500 MHz sources

Order for ONE new TH2161 spare klystron submitted to Thales.

New price adapted to the "new market boundary conditions": **255 kEU**
(230kEU for the offer one Year ago, 155kEU March 2002)



Development at PSI of a new 500 MHz 60KW amplifier based on solid state technology following the SOLEIL concept. Already existing a PSI-280 W module prototype.
Hope for a 30 KW tower in one Year (see Marcos Gaspar this workshop).



Substitution of the present Booster power plant with a 60 kW solid state amplifier, and recycling of the Booster power plant as test stand for the Storage Ring RF (cost evaluation for the new power plant ~230kEU).

For the price of one klystron we should get:

- One additional Spare klystron available for the SR (booster klystron).
- The Hardware for a complete test stand for the SR-RF.