RGA Specifications for XFEL Cryomodules

Source : DESY vacuum005

Leak test:

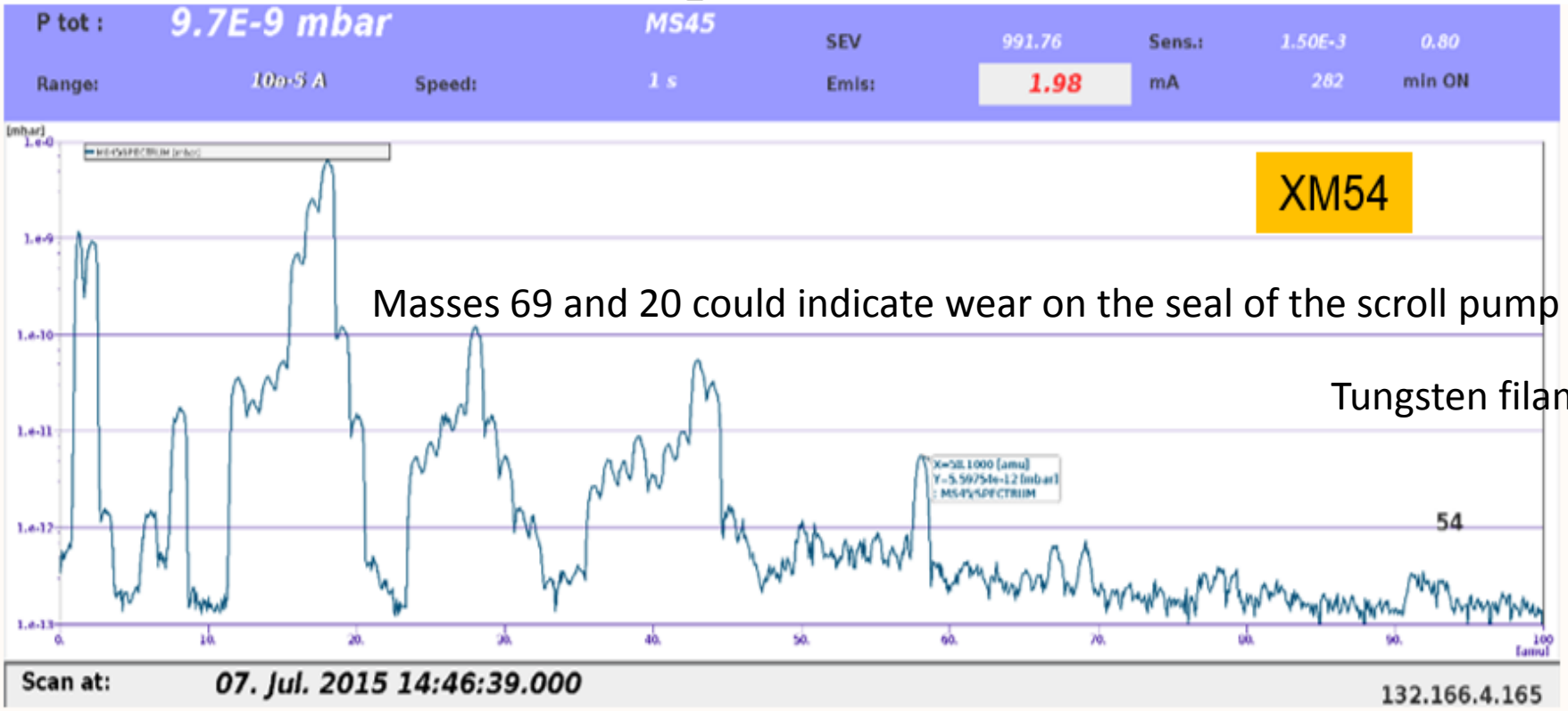
Integral leak rate has to be ≤ 10^{-10} mbarl/s

Content of hydrocarbons:

the leak-free system reaches a total pressure below 10^{-7} mbar
the sum of the partial pressures of masses from mass 45 on to at least mass 100 is less than 10-3 of the total pressure.

- Change in specifications (to avoid Pb when long pumping time)
  - If the pressure of the device-under-test is below 10-8 mbar, it is required that all peaks including and above 45 are less than a per mille of the total pressure.
  - If the pressure is between 10-7 and 10-8 mbar the DESY spec is applied as is, meaning the summation is required.

Case of small contamination

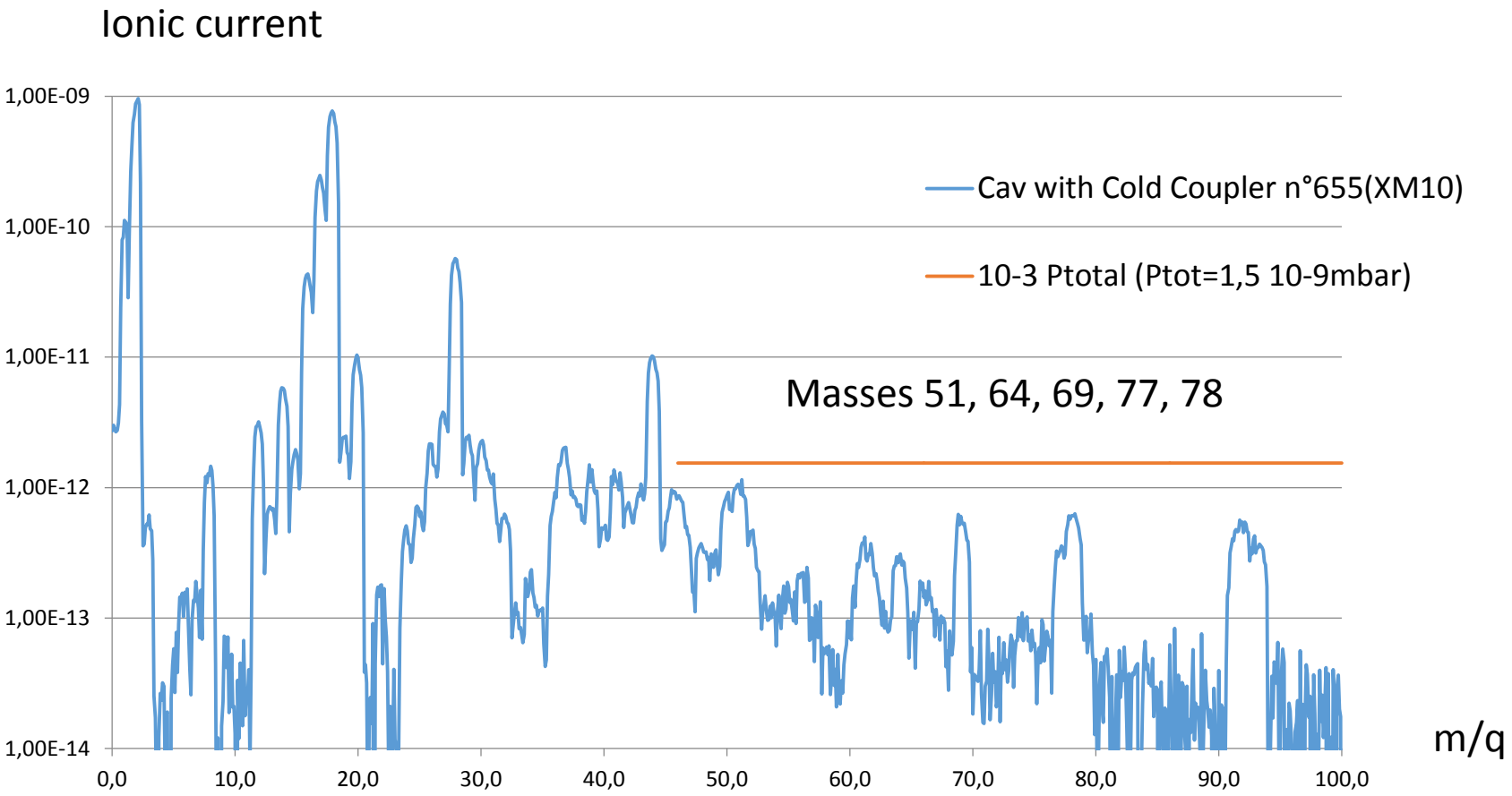


Masses 69 and 20 could indicate wear on the seal of the scroll pump

Tungsten filament

Observations of small contaminations

Small contamination means about 10-4 less than the partial pressure of water at m/q=18. When several peaks of mass/q> 45 show up, it becomes hard the DUT to be conform to the specification.

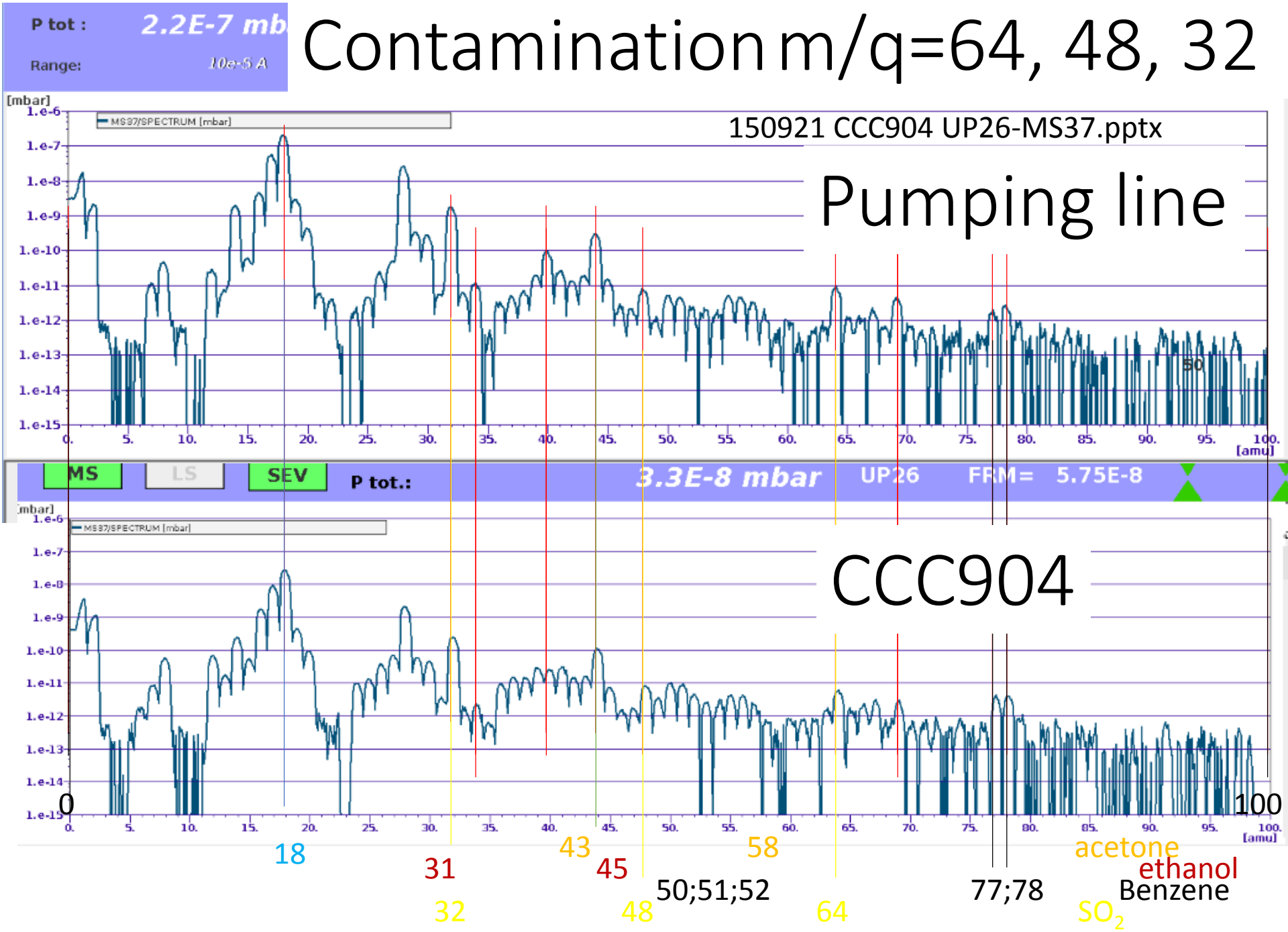


NON conform if DESY original spec

CONFORM with new specs

CONTAMINANT	CHARACTERISTIC m/q
Acetone	43;58;
Ethanol	31;45
Isopropanol	45;
Benzene	50;51;52;77;78
Sulphur Dioxide	64;48;32
Fluorine-based polymer	69;31;others

Contamination m/q=64, 48, 32



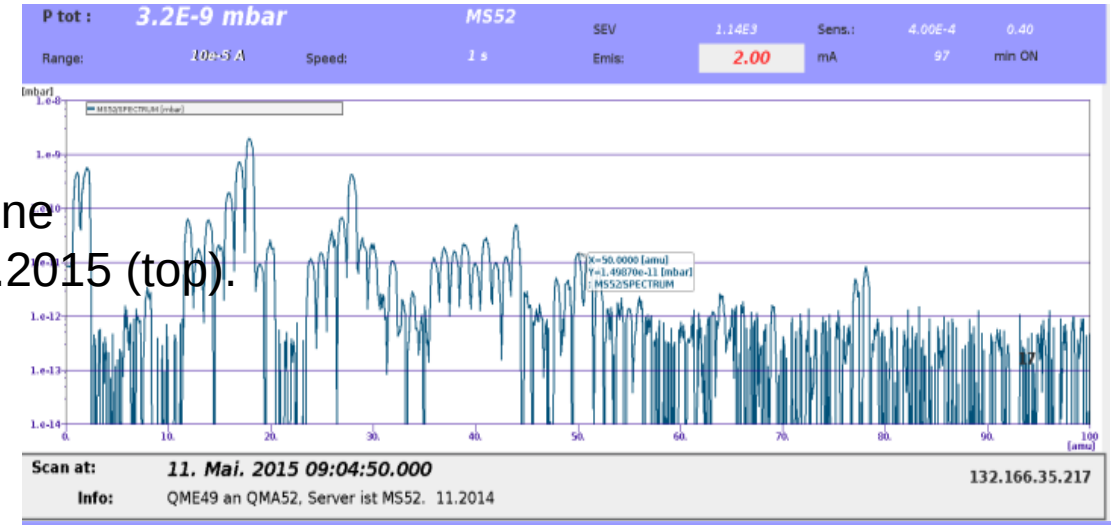
Follow up of the contamination

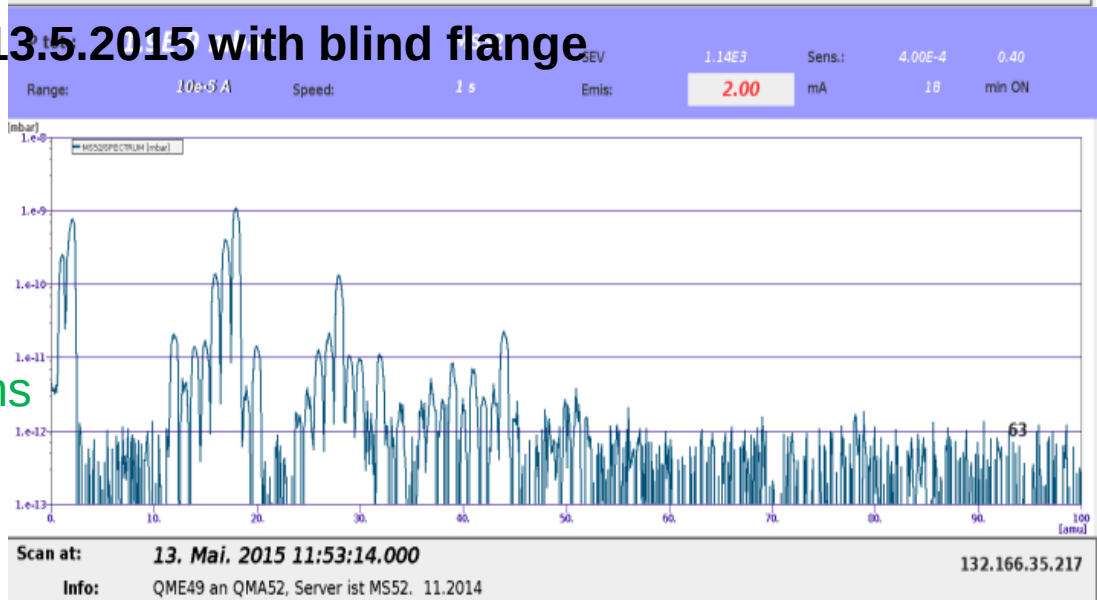
RGA of CCC231 on 11.5.2015
A clear contamination during the measurement of CCC231 with benzene (50, 51, 52) can be identified on 11.5.2015 (top).

Subsequently, m/q=50 is still being observed in RGAs.

RGA of the same pumping line on 13.5.2015 with blind flange
But the signal reduces while pumping is going on 13.5.2015 (cf bottom).
So far the source of **benzene** is not understood.

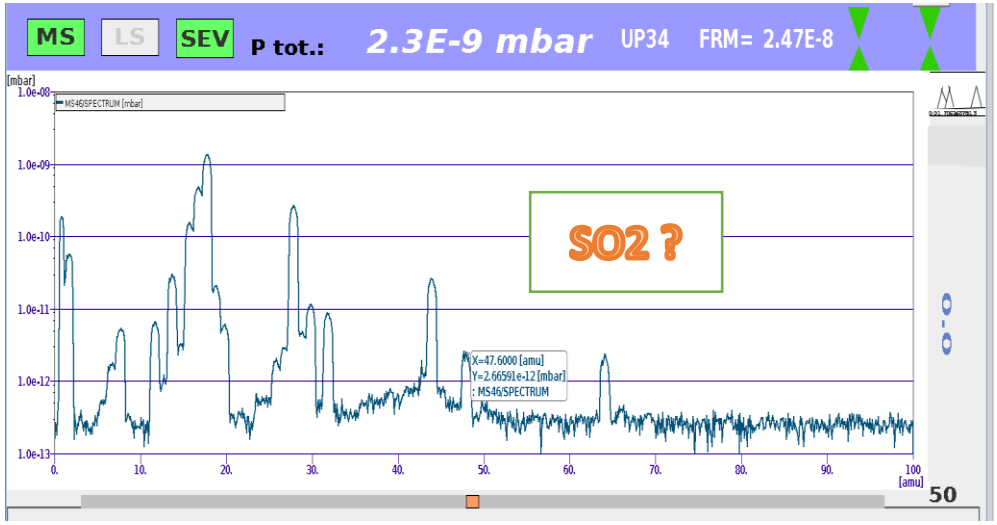
Deviation requests to the specifications has been accepted.





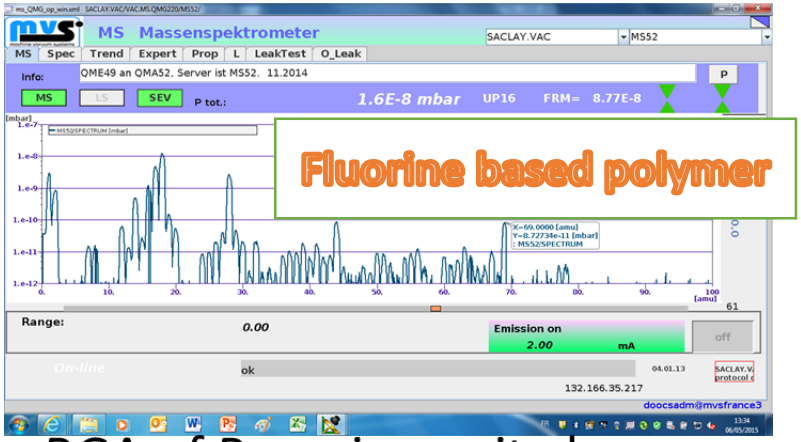
2 cases of non conform RGA=>return

The Residual Gas Analysis test results of Cavity + Cold Coupler Assembly CCC710 (Cavity CAV_FE00710 + Coupler Cold Part THRI-CP-574) revealed a contamination (mass 48 and 64). Previous RGA of the coupler was free of contamination.

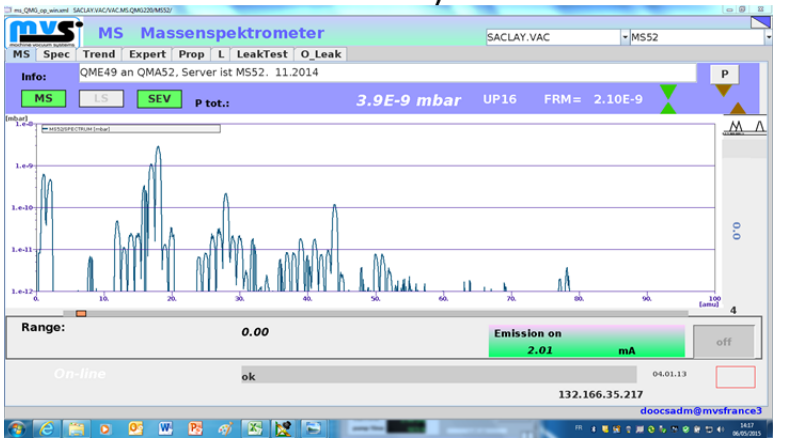


The contamination of CAV710 was discovered and treated before coming at CEA. The RGA has been rejected as non-conform by DESY on 13/11/2014.

RGA of CCC826



RGA of Pumping unit alone (EV closed)



Conclusions

- About 1450 RGA performed and inspected
- ~10% deviation request and discussion.....time
- 2 cavities rejected

- If all components go through RGA as outgoing checks, Is RGA need for the assembly ?

Naturally occurring isotopes

This table shows information about naturally occuring isotopes, their atomic masses, their natural abundances, their nuclear spins, and their magnetic moments. Further data for radioisotopes (radioactive isotopes) of tungsten are listed (including any which occur naturally) below.

Isotope	Mass / Da	Natural abundance (atom %)	Nuclear spin (I)	Magnetic moment (μ/μ_N)
^{180}W	179.946701 (5)	0.12 (1)	0	
^{182}W	181.948202 (3)	26.50 (16)	0	
^{183}W	182.950220 (3)	14.31 (4)	$^1/_2$	0.1177847
^{184}W	183.950928 (3)	30.64 (2)	0	
^{186}W	185.954357 (4)	28.43 (19)	0	