Update on RICH status

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The MAPMT status

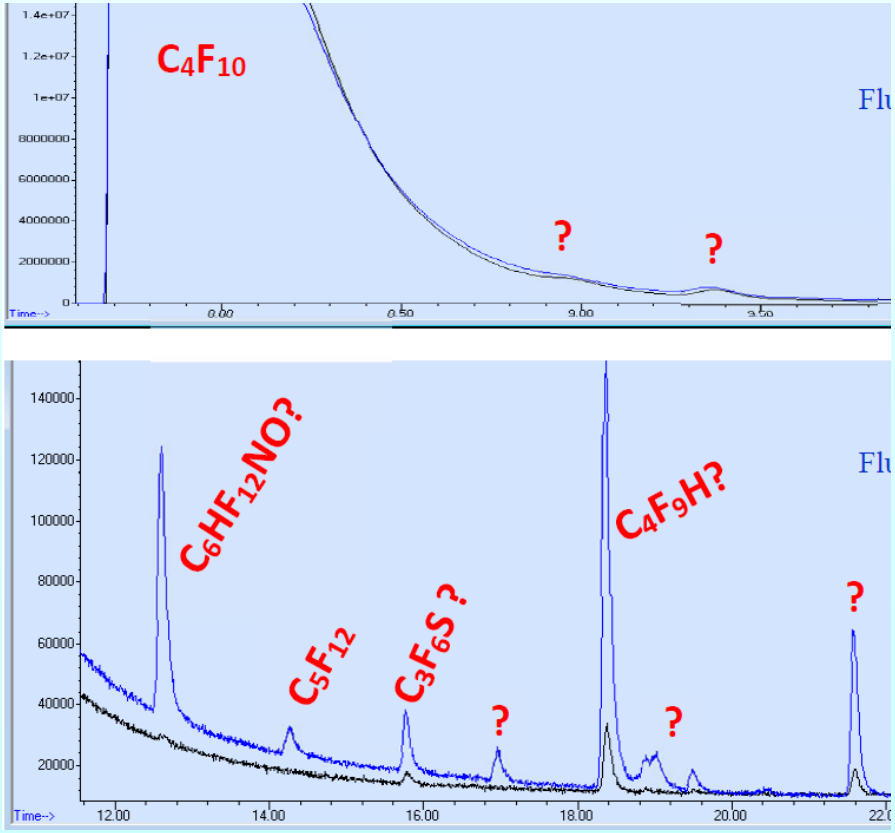
The RICH-1 gas radiator status

The gas-chromatography results

The Hbrid PDs stability during the run

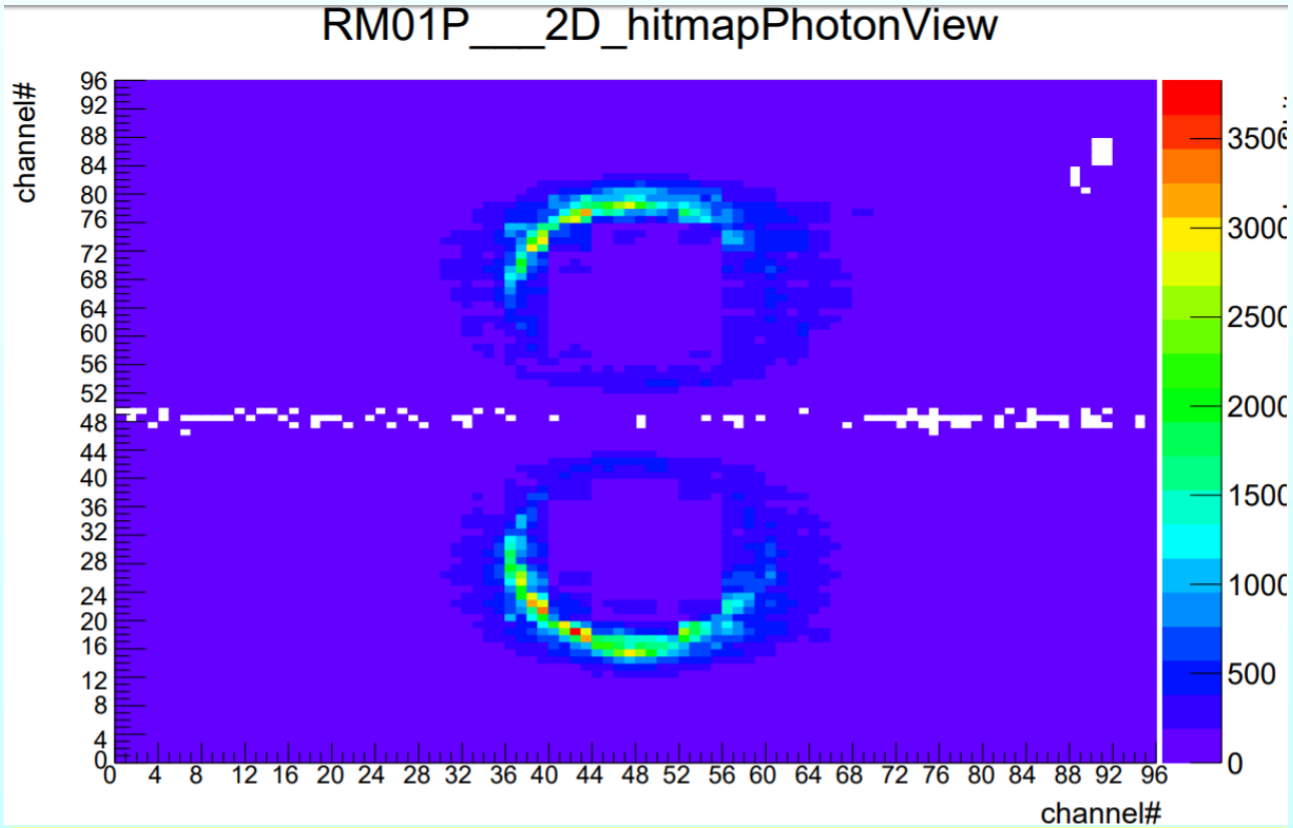
RICH surveying

The (n-1) "double peak" studies



MAPMTs status

In 2018 the RICH will operate with N2 as radiator and MAPMTs only as detectors



The MAPMT system needs minor fixing of HV and CMAD problems. Intervention foreseen in March.

New LV power supply bought: will be prepared as spare

24 new fibers bought: they are in bundles of 6

C_4F_{10} radiator status

In 2021 the RICH should operate with C_4F_{10} as radiator and all detectors

We need ~ 1500 kg of C_4F_{10}

About 700 kg of "clean" C4F10 are presently in the COMPASS tank.

➔ 800 kg of clean C_4F_{10} have to be provided.

We have ~400 kg which cannot be cleaned with standard procedure

LHCb agreed to exchange them with equivalent amount of their (cleaner) gas

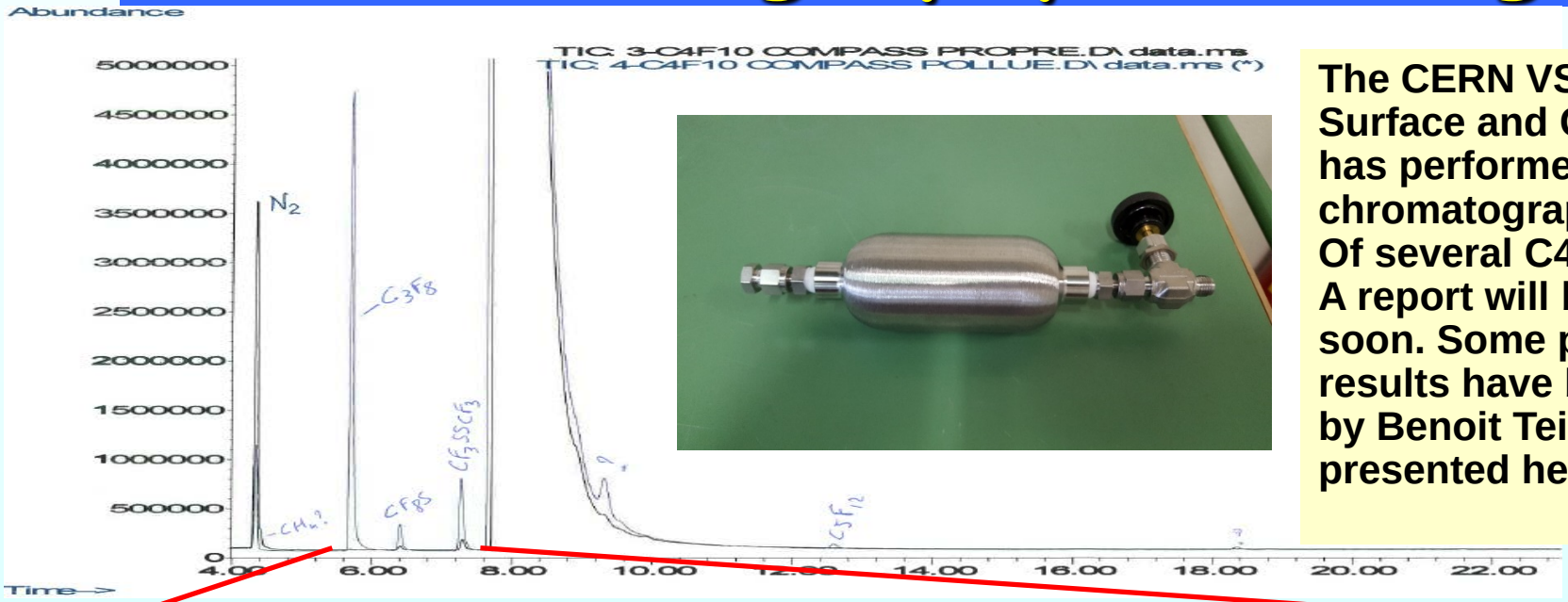
A market investigation allowed to find one producer:

F2 Chemicals confirmed the availability of C_4F_{10} for both small and large quantities.

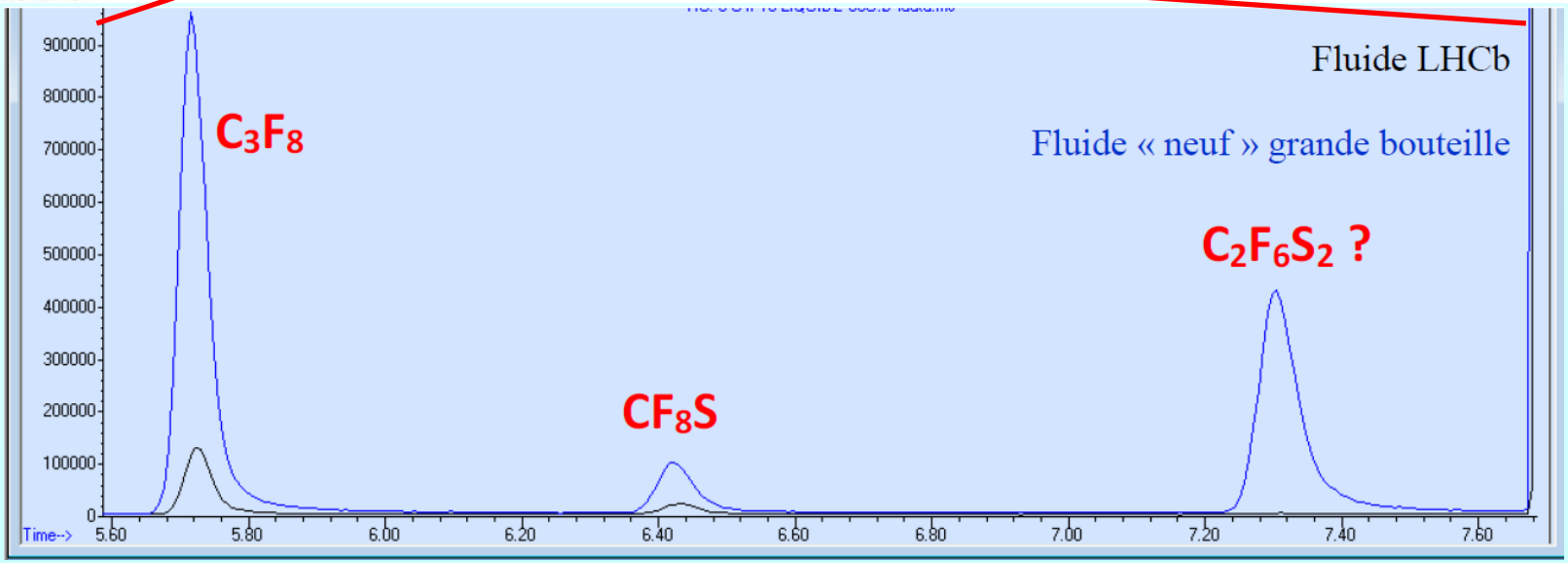
They quoted a price of 110 £/kg for large quantities.

We are ordereing 20 kg to F2 Chemicals at a price of 125 £/kg
(half of the cost is covered by LHCb RICH colleagues)

Gaschromatography of bad gas



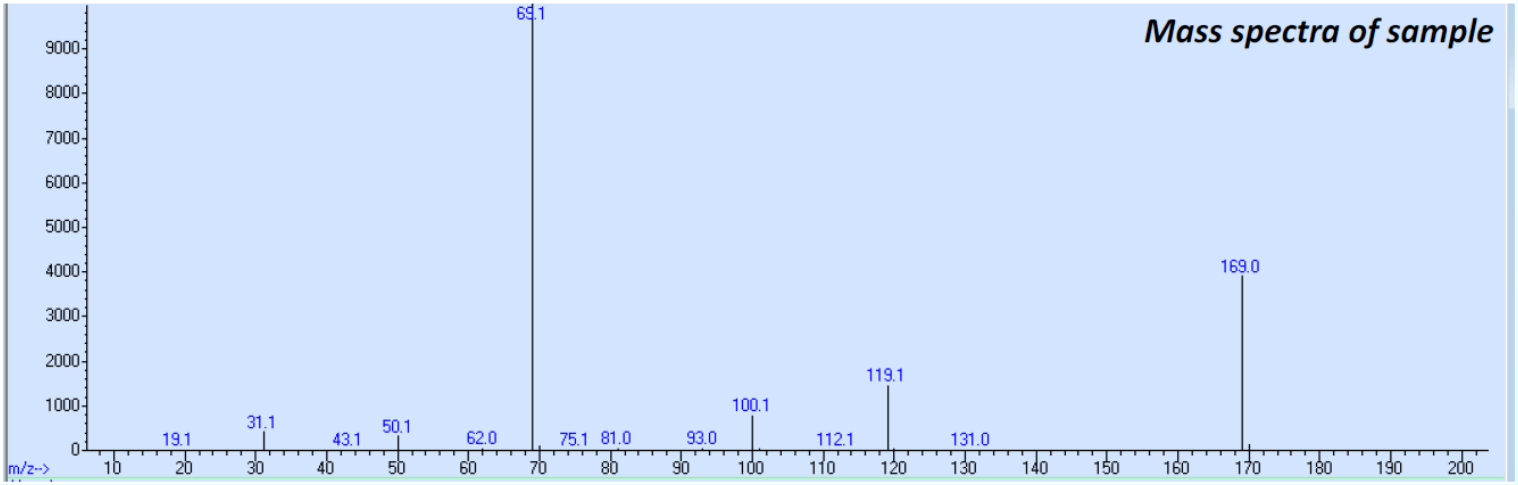
The CERN VSC (Vacuum Surface and Coating) Group has performed a Gas-chromatography analysis Of several C4F10 gas sample. A report will be provided soon. Some preliminary results have been anticipated by Benoit Teissandier and are presented here

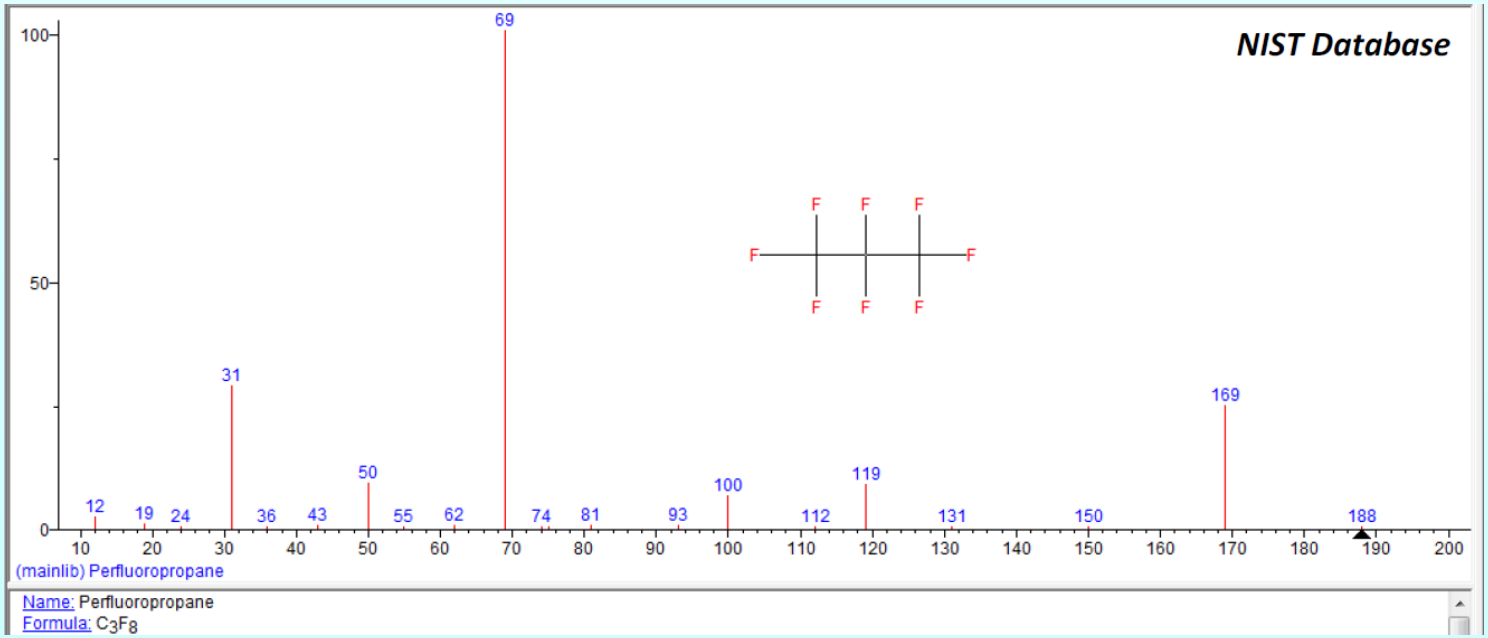


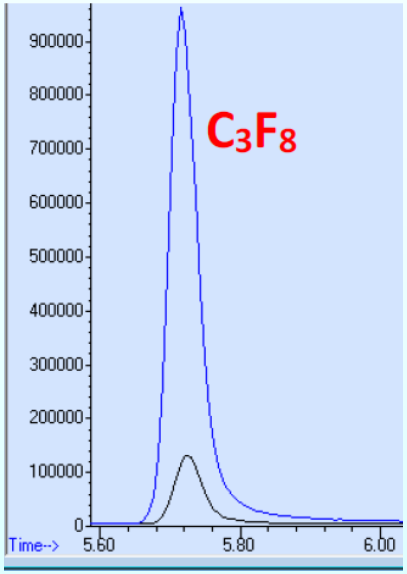
The main three peaks before the major C4F10 peak

Identification: C_3F_8

RT. 5.7 min – Identification du C_3F_8



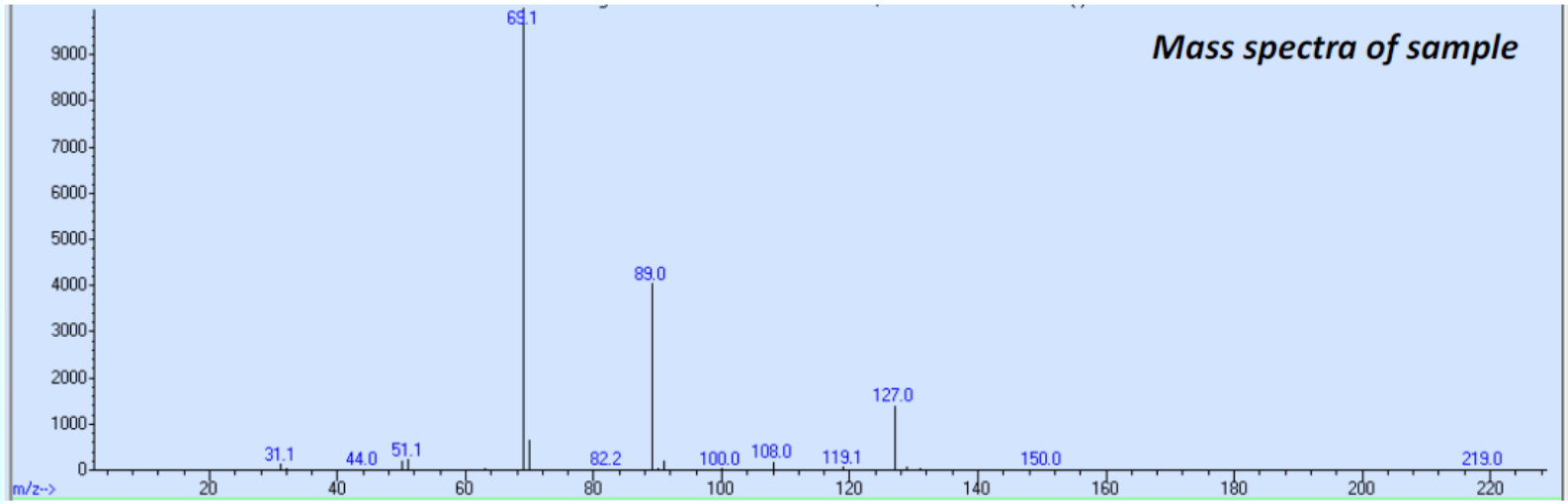


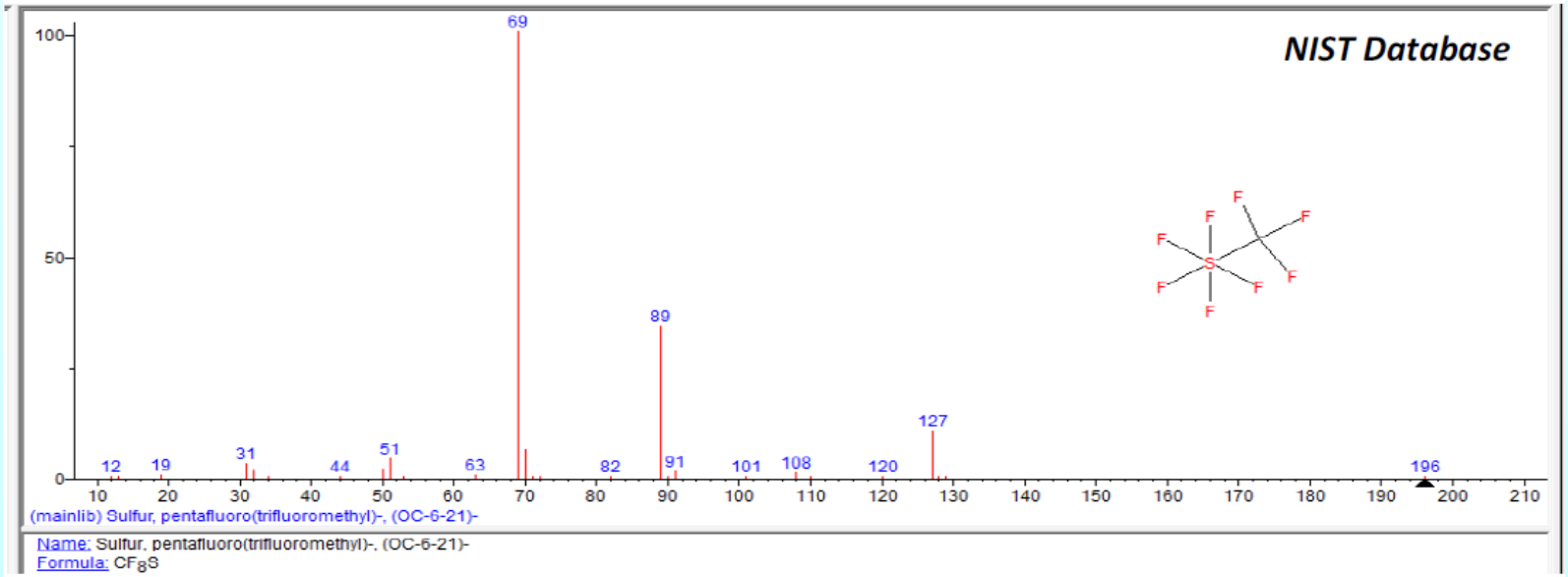


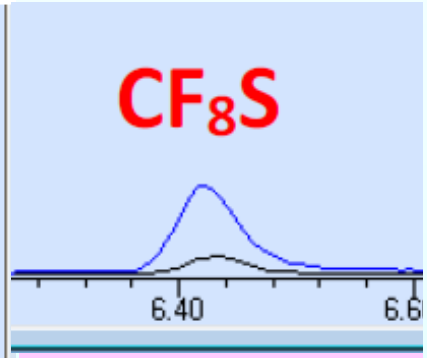
In this case the identification via comparison with the corresponding NIST database mass spectra Is convincing

Identification: CF_8S

RT. 6.4 min – CF_8S suspected







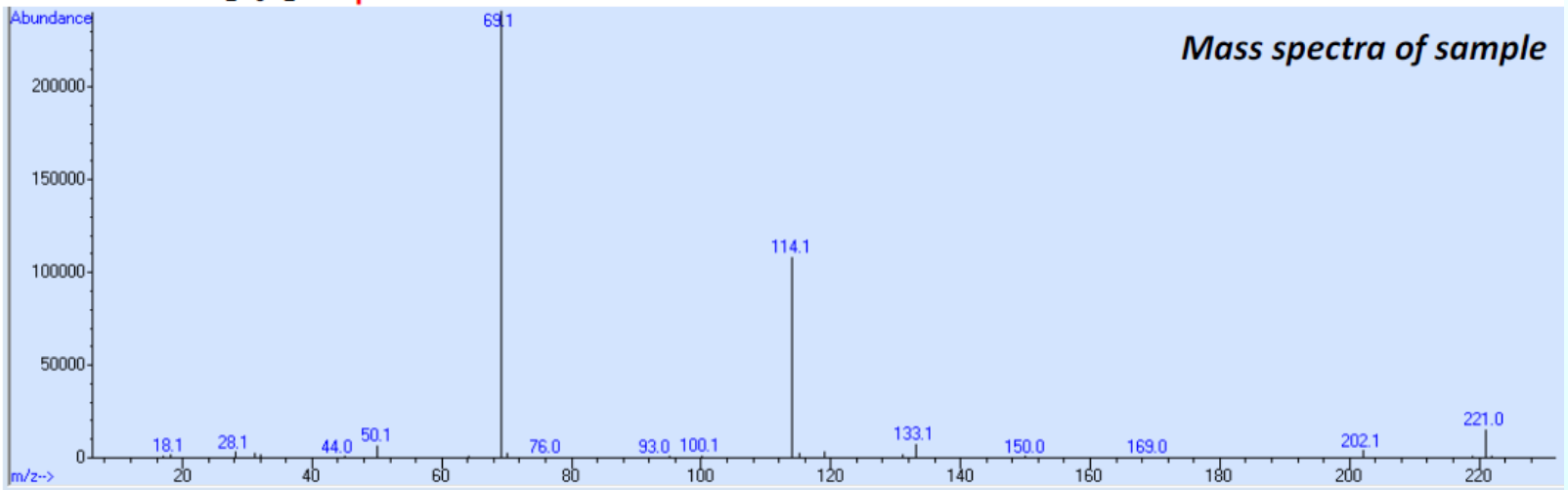
A molecule as CF_8S is likely to absorb in the far UV: it could be responsible for our problems

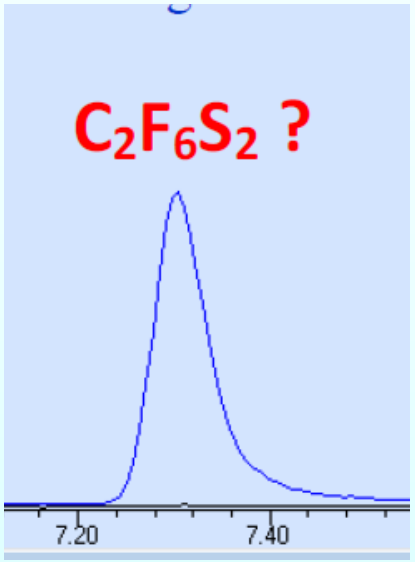
In this case however the identification is less obvious.

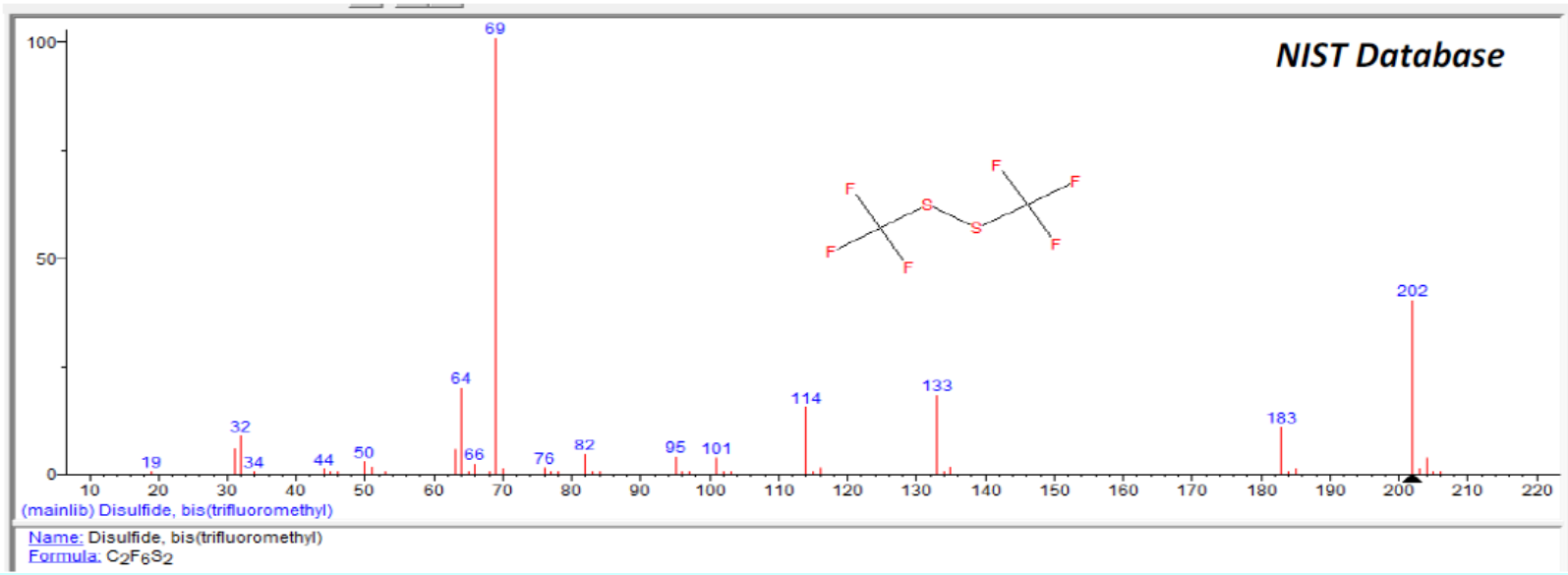
For instance: m(S) = 32 but also $m(O_2) = 32$

Identification: $C_2F_6S_2$

RT. 6.4 min –$C_2F_6S_2$ suspected





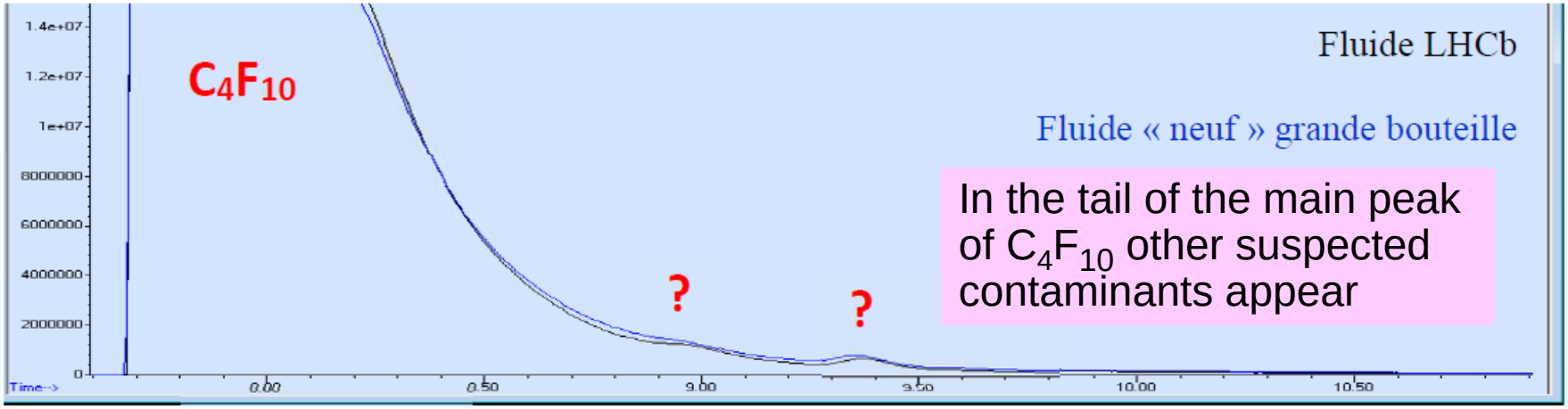


Another molecule containing sulfur is strongly suspected: $C_2F_8S_2$

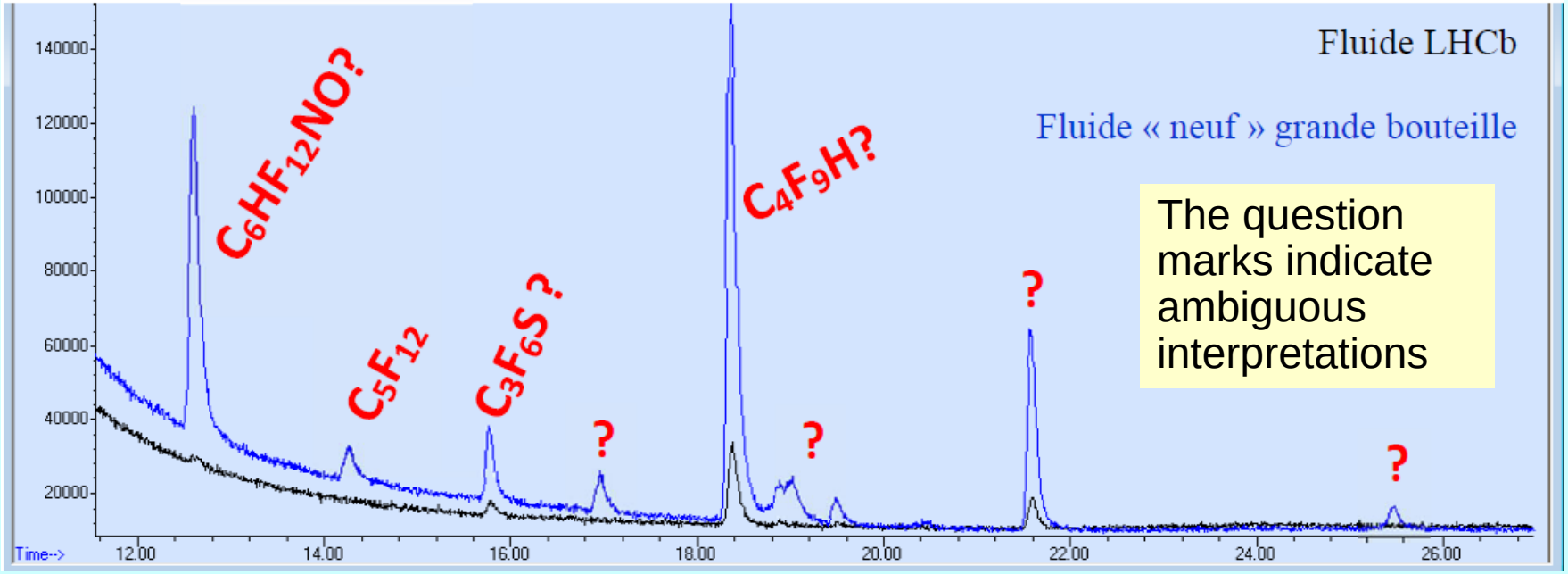
In this case the identification is more ambiguous

In the tail of the C_4F_{10} peak

le pic principal de C4F10



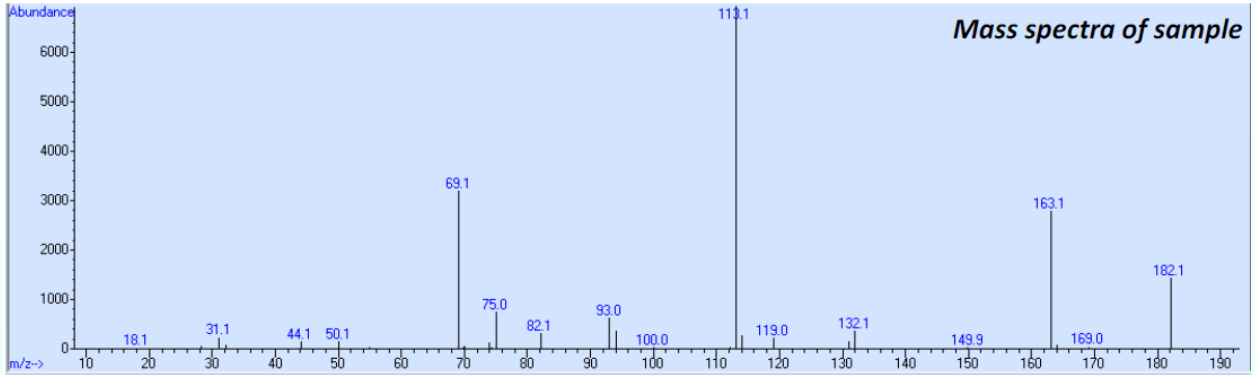
In the tail of the main peak of C_4F_{10} other suspected contaminants appear



The question marks indicate ambiguous interpretations

More Sulfur compounds, C-H, NO,…

RT. 15.8 min –C_3F_6S suspected



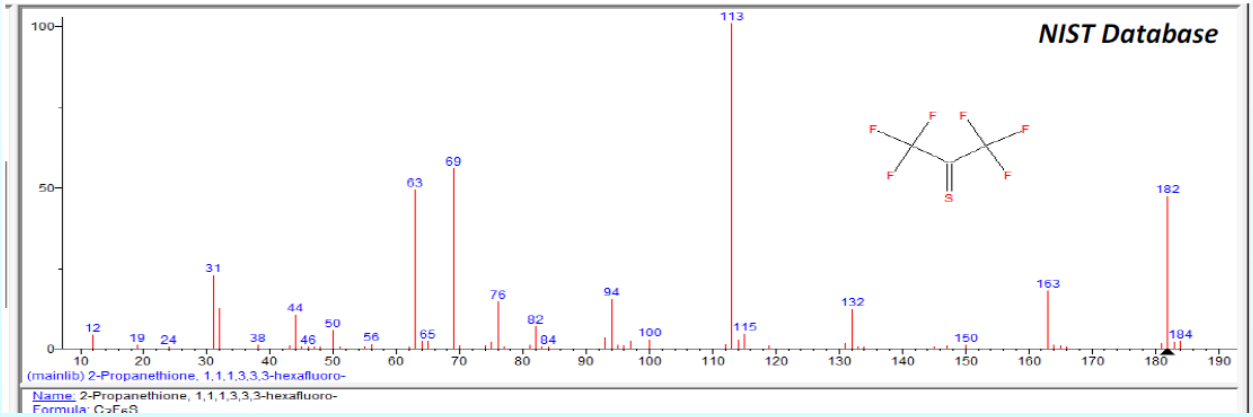
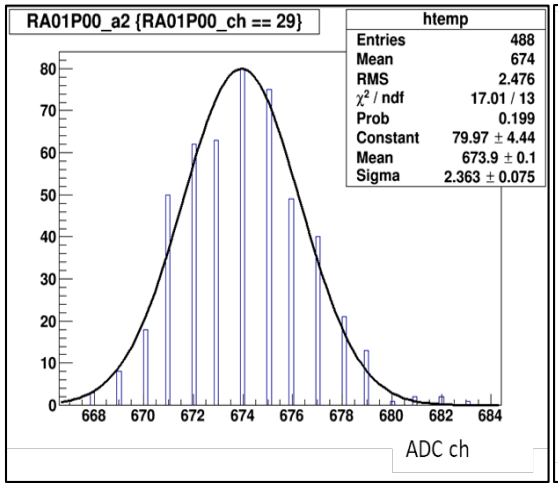


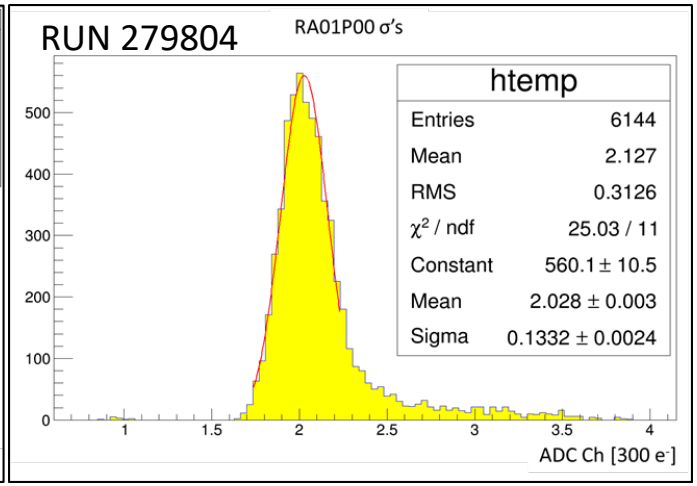
Tableau de synthese

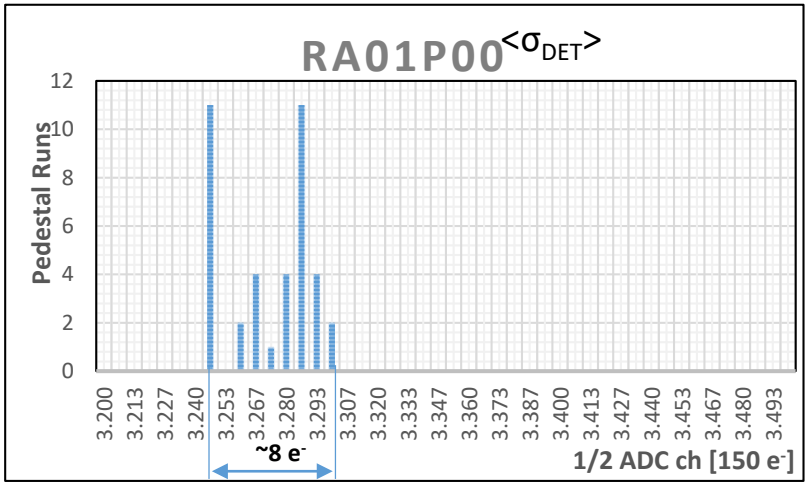
Temps de retention (min)	5.7	6.4	7.29	7.7	8.98	9.36	9.61	9.9	12.6	14.27	15.77	16.97	18.36	18.9	19.04	19.5	20.47	21.58	25.5
Gaz fortement suspectes	C3F8	CF8S	C2F6S2 ?	C4F10	?	?	?	?	C6HF12NO?	C5F12	C3F6S ?	?	C4F9H ?	?	?	?	?	?	?
% aire de pic	0.051	0.011	0.001	99.4 (sat.)	0.175	0.318	0.008	/	0.001	/	0.003	/	0.021	0.001	/	0.0001	/	0.007	/
	0.409	0.053	0.252	98.5 (sat.)	0.063	0.32	0.011	0.009	0.09	0.011	0.018	0.011	0.14	0.007	0.012	0.007	0.002	0.051	0.005

We decided not to proceed with the cleaning of this gas

APV pedestals showed good stability

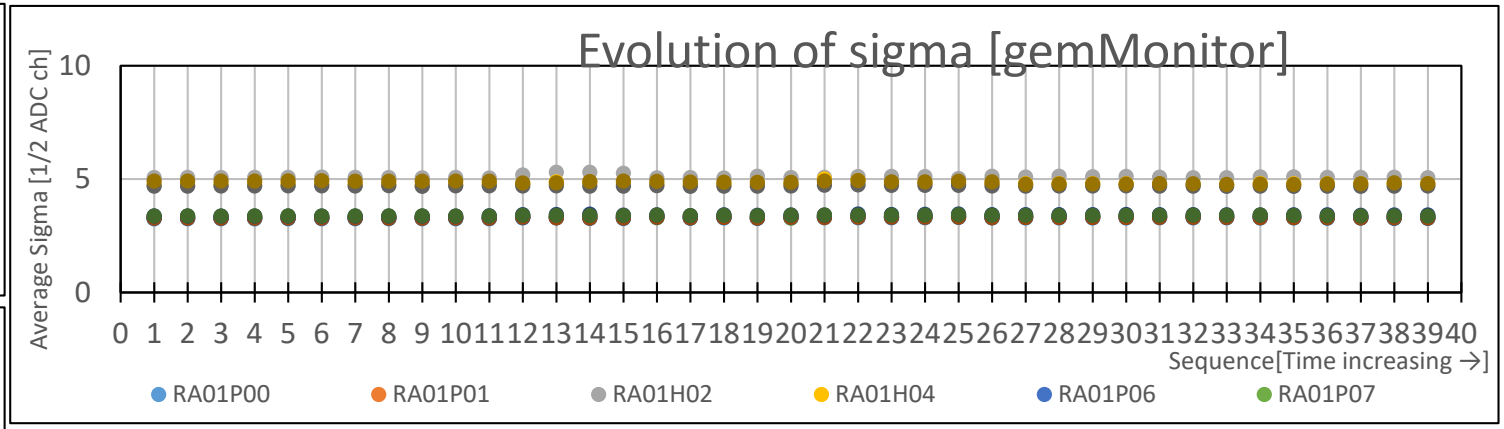






- 39 APV Pedestal Runs during COMPASS 2017 run.
- 12 Detectors 6144 Chs each.
- The average of the 6144 σs is called $<\sigma_{Det}>$.

- MWPC ~ 500 e^-
- Hybrid ~ 700 e^-



3.26876	3.321482	5.095745	4.785086	3.303659	3.33926	3.290695	3.293254	4.69301	4.85541	3.408315	3.388042
490.3139	498.2223	764.3618	717.7629	495.5488	500.8889	493.6042	493.988	703.9516	728.3115	511.2472	508.2064

MWPCs with CsI and Hybrids

In 2017 we collected data in nominal conditions

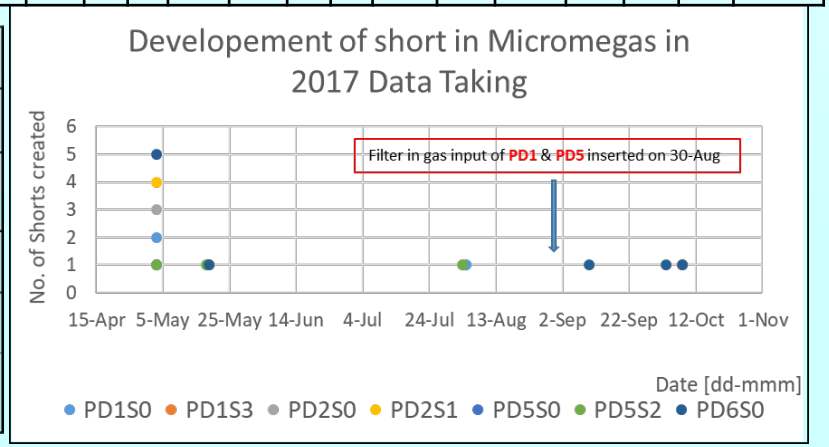
Micromegas performed nicely, despite few shorted pads (25 for a total of ~20k

- 16 pads were shorted at the beginning of the run
- 9 new shorts appeared during the data taking
- Filters installed on Aug 30 on PD1 and PD5 lines
- 1 new short appeared on PD1 on October 8

	PD 1				PD2				PD5				PD 6				Total
Date	S0	S1	S2	S3	S 0	S 1	S2	S3	S 0	S 1	S2	S3	S0	S1	S2	S3	
3-May	2				3	4			1		1		5				16
18-May											1						1
19-May				1									1				2
3-Aug											1						1
4-Aug	1																1
10-Sep													1				1
3-Oct													1				1
8-Oct				1									1				2
Total	3	0	0	2	3	4	0	0	1	0	3	0	9	0	0	0	
	5				7				4				9				25

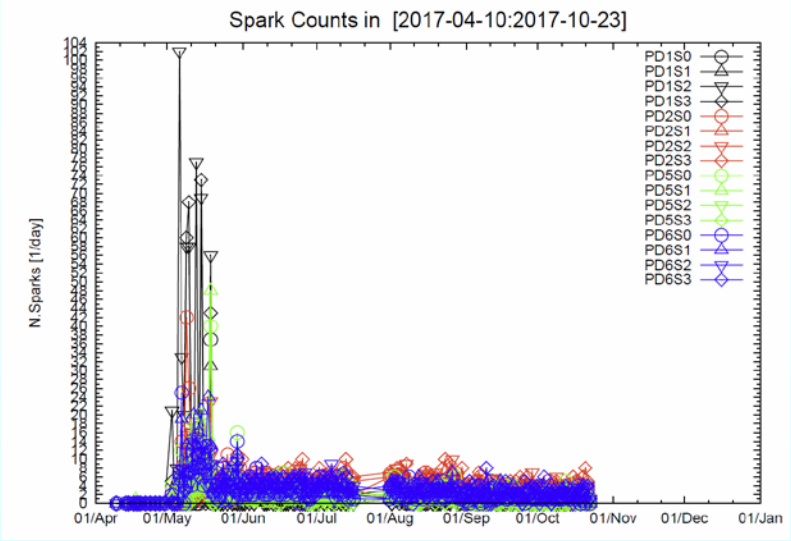
Swagelok 316 stainless steel particulate filter 7 µm pore size

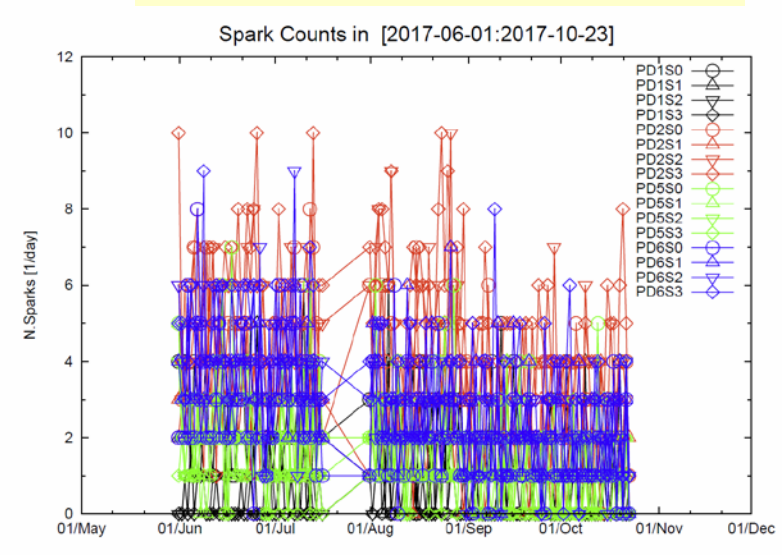
PD6				PD5				Total
S3	S2	S1	S0	S3	S2	S1	S0	All Sectors
0	0	0	9	0	3	Crazy	1	13
PD2				**PD1**				**Total**
S3	S2	S1	S0	S3	S2	S1	S0	All Sectors
0	0	4	3	2	0	0	3	12

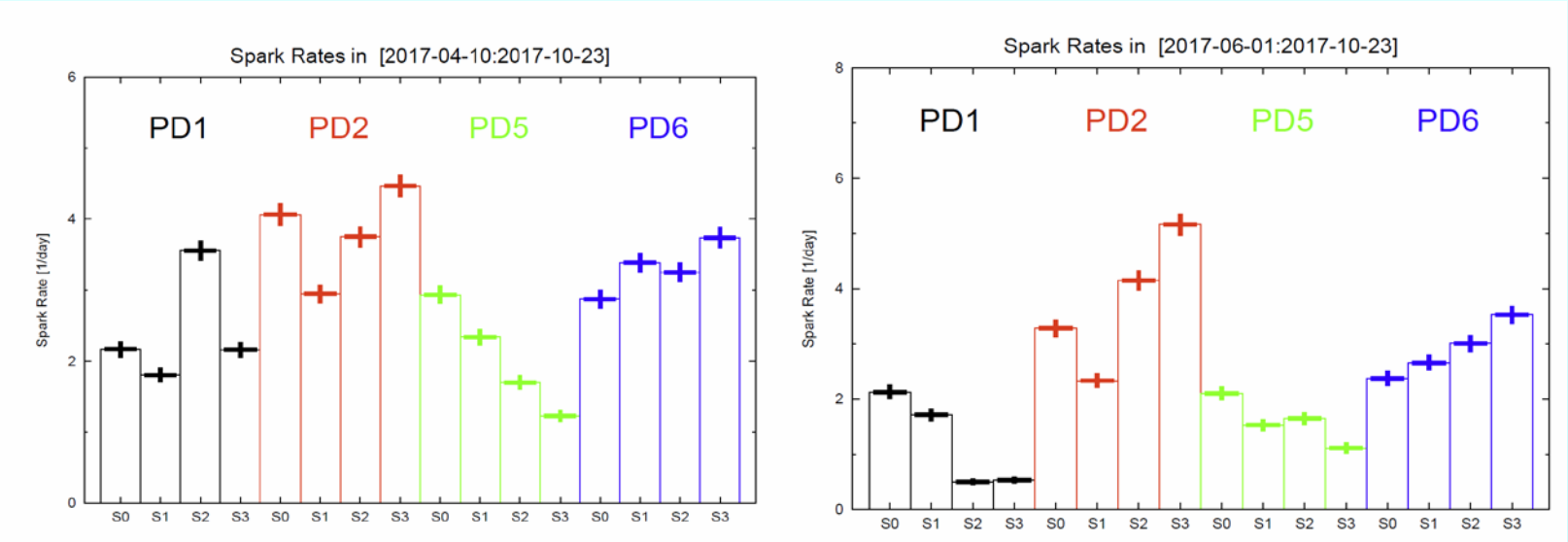


Rate of sparks in THGEMs

Spark rate during the data taking **Spark = I > 23 nA**

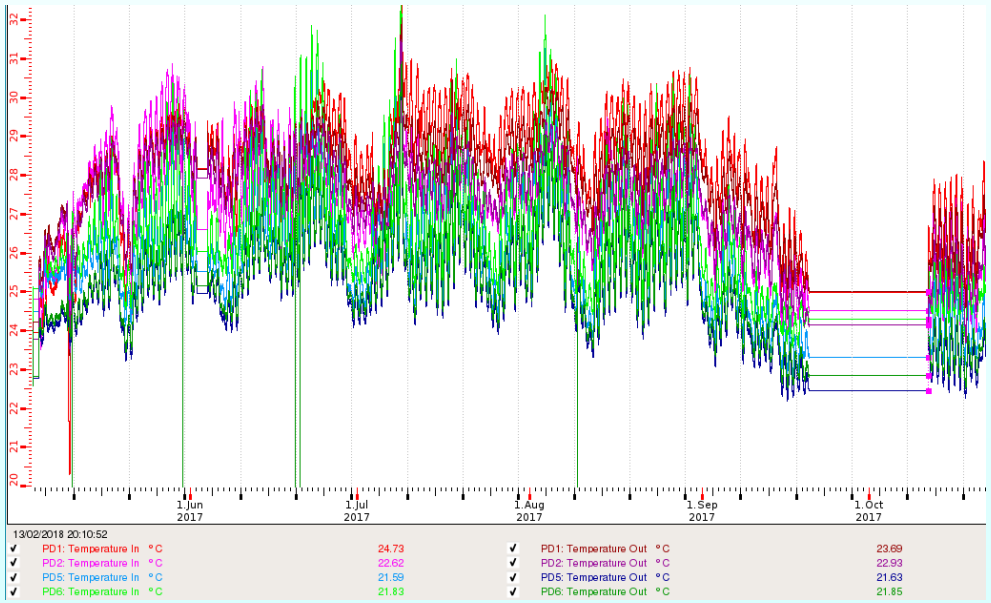


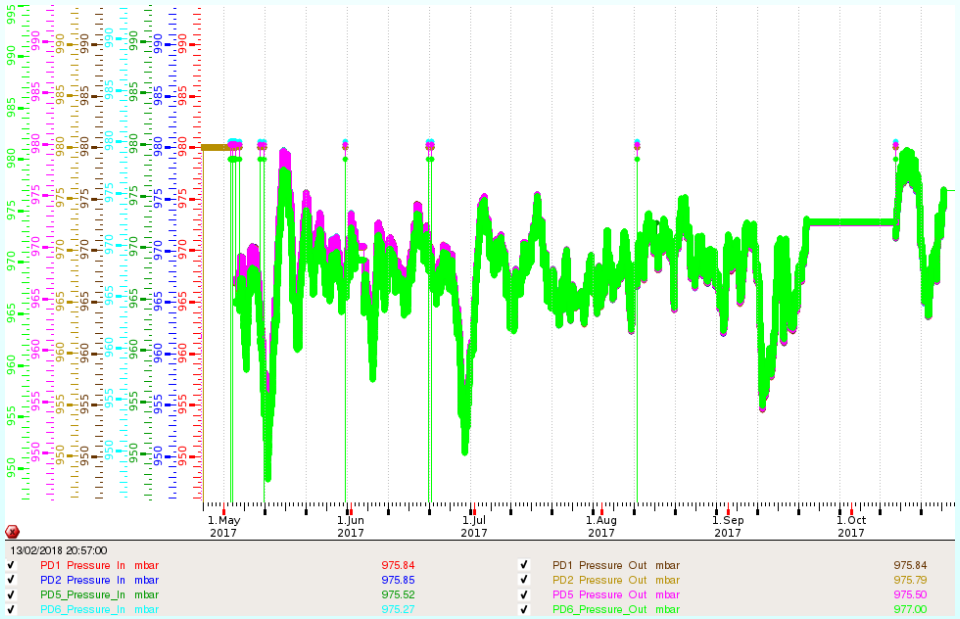




Gain stability

P T corrections were essential to guarantee a constant gain



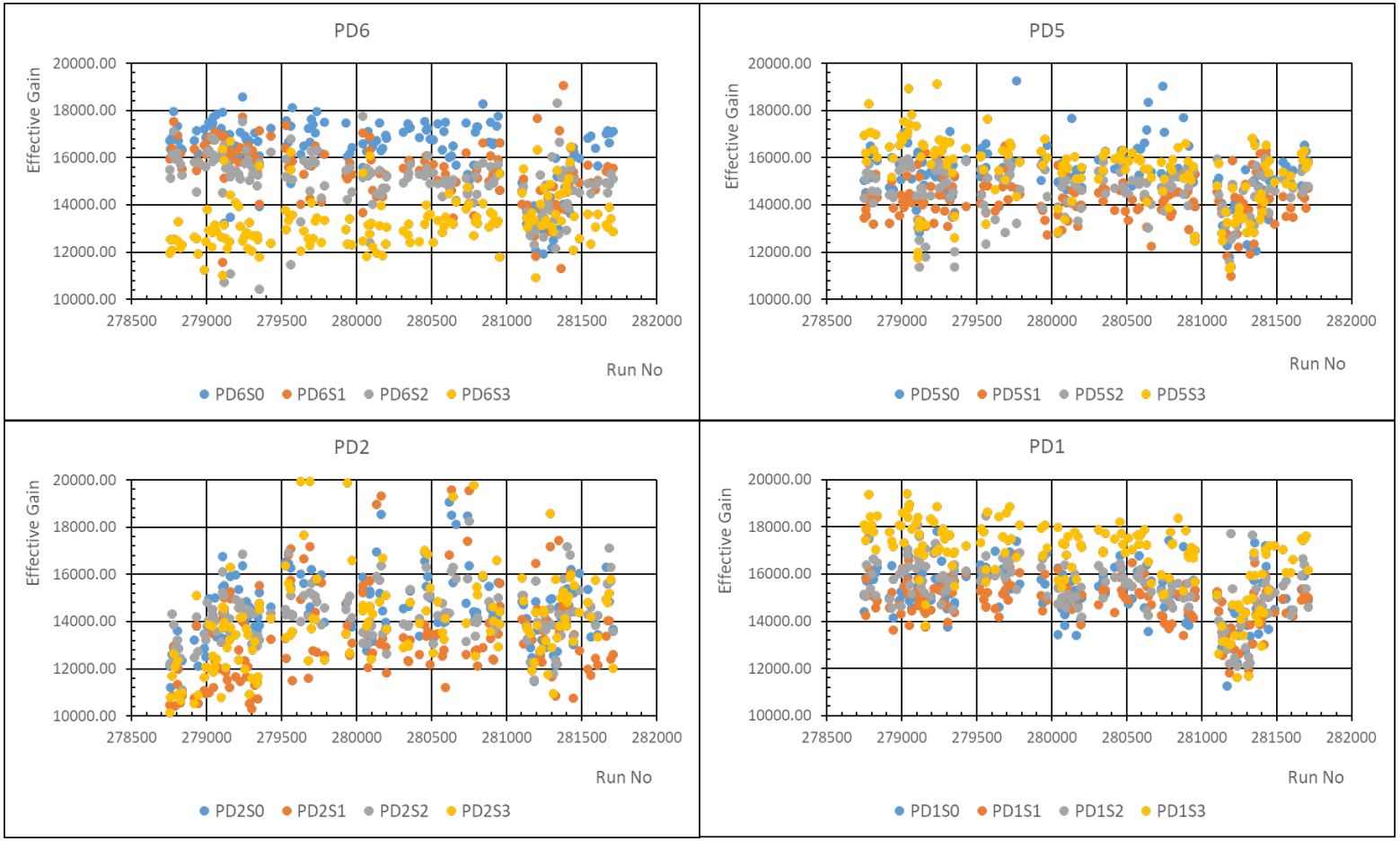


- **216 runs chosen between 01-07-2017 until 23-10-2017.**
- **Typically two runs/day, in the morning and in the evening during coolest and hottest periods.**
- **155 processed runs with no problems chosen for this analysis.**
- **Average gain for each high voltage sector was calculated.**
- Voltage correction:

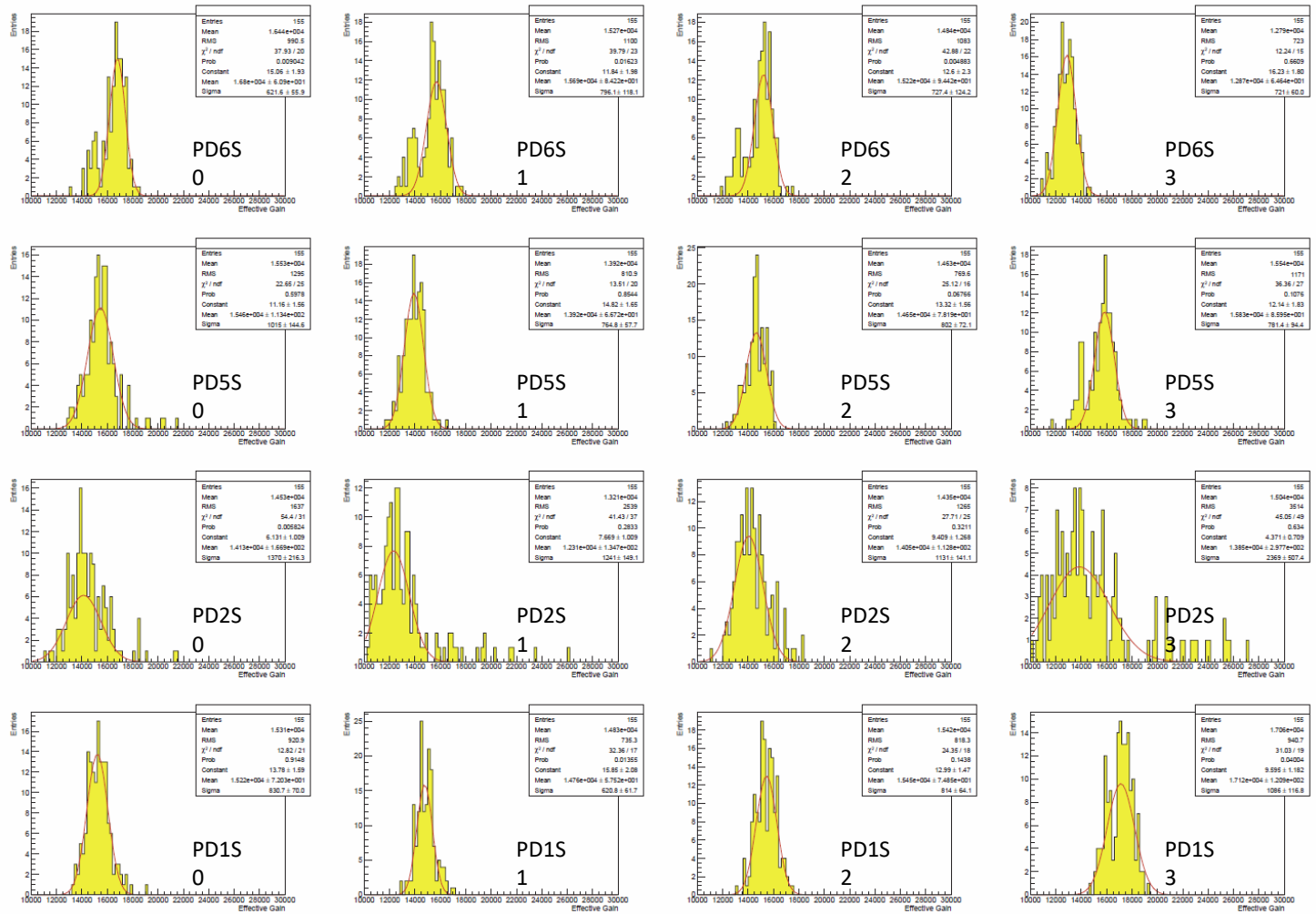
$$V = V_0(1 + C)$$

$$where\ C = 0.5 \times \left(\frac{P}{P_0} \times \frac{T_0}{T} - 1\right)$$

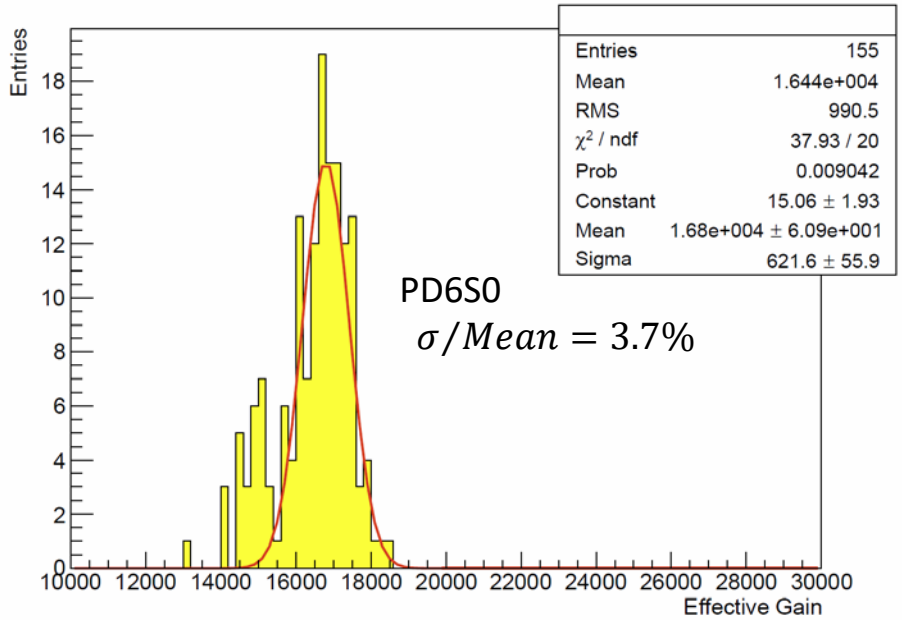
Detector Gain variation over time

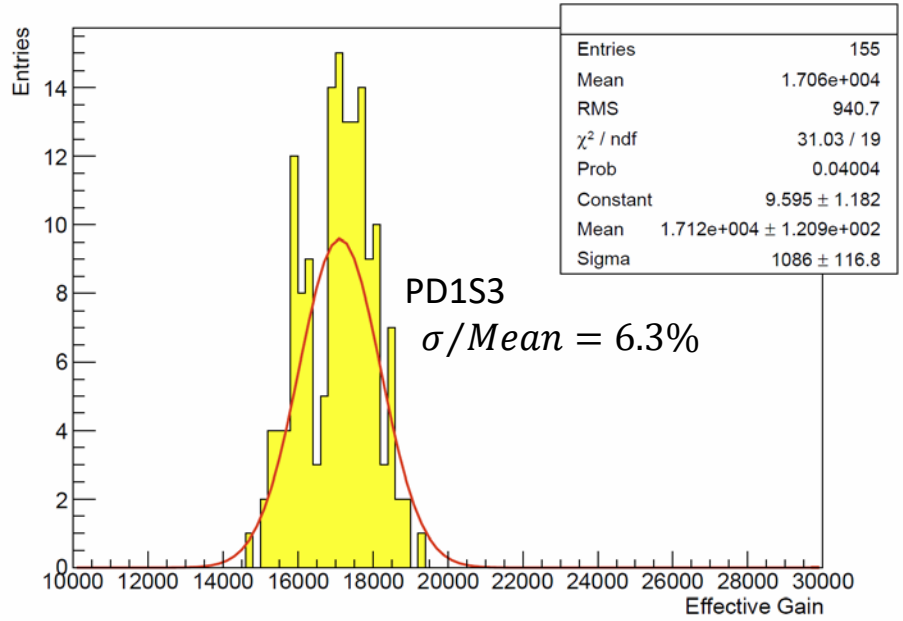


Gain Stability with PT correction



Gain Stability with PT correction



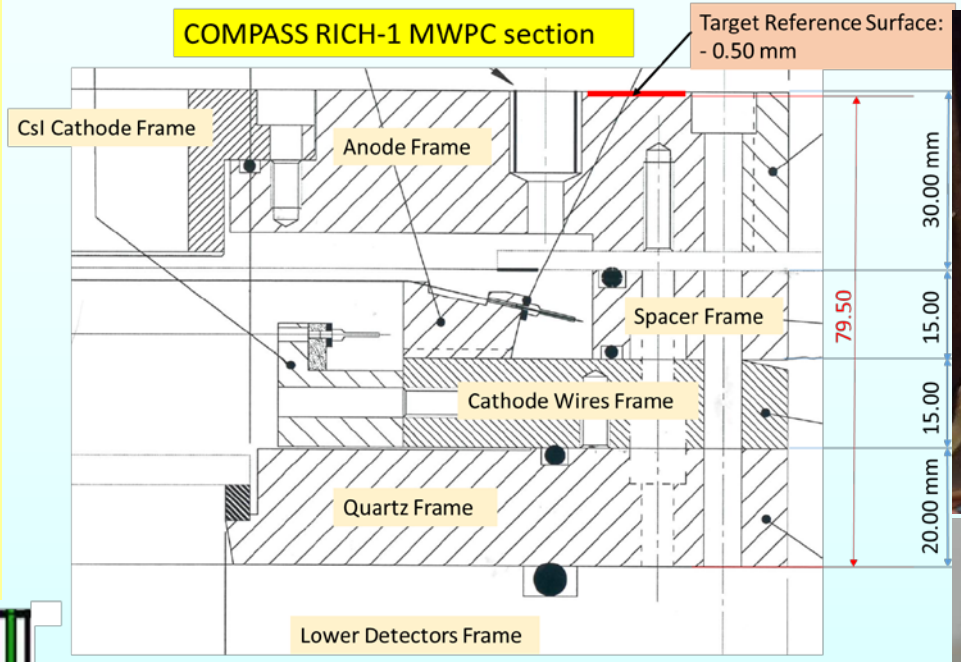


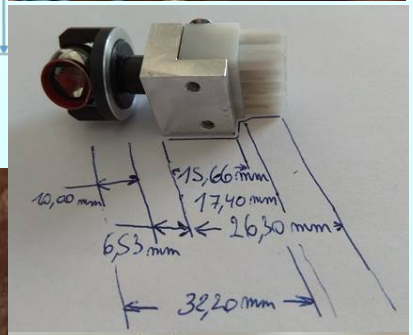
JURA	Average Effective Gain						SALEVE
PD6				PD5			
S3	S2	S1	S0	S3	S2	S1	S0
12870	15220	15690	16800	15830	14650	13920	15460
13850	14050	12310	14130	17120	15450	14760	15220
S3	S2	S1	S0	S3	S2	S1	S0
PD2				PD1			

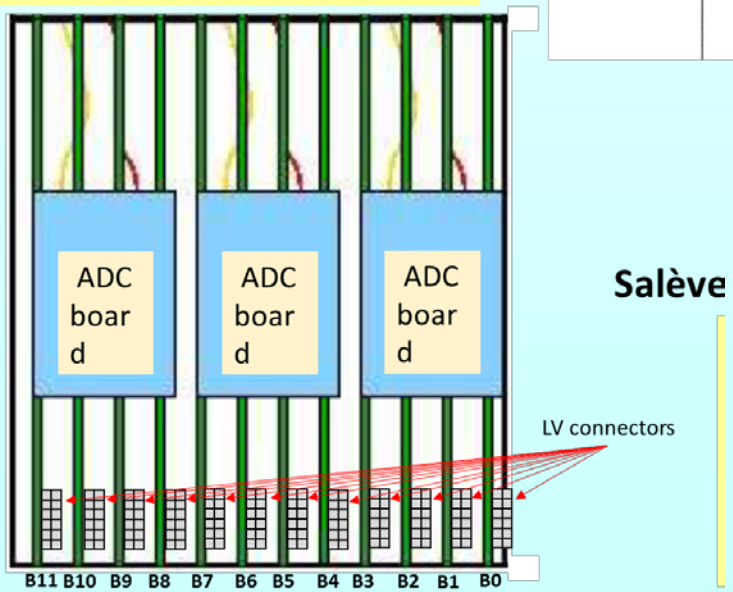
JURA	Sigma of the Effective Gain distribution						SALEVE
PD6				PD5			
S3	S2	S1	S0	S3	S2	S1	S0
5.6	4.8	5.1	3.7	4.9	5.5	5.5	6.6
17.3	8.1	10.1	9.7	6.3	5.3	4.2	5.5
S3	S2	S1	S0	S3	S2	S1	S0
PD2				PD1			

RICH surveying

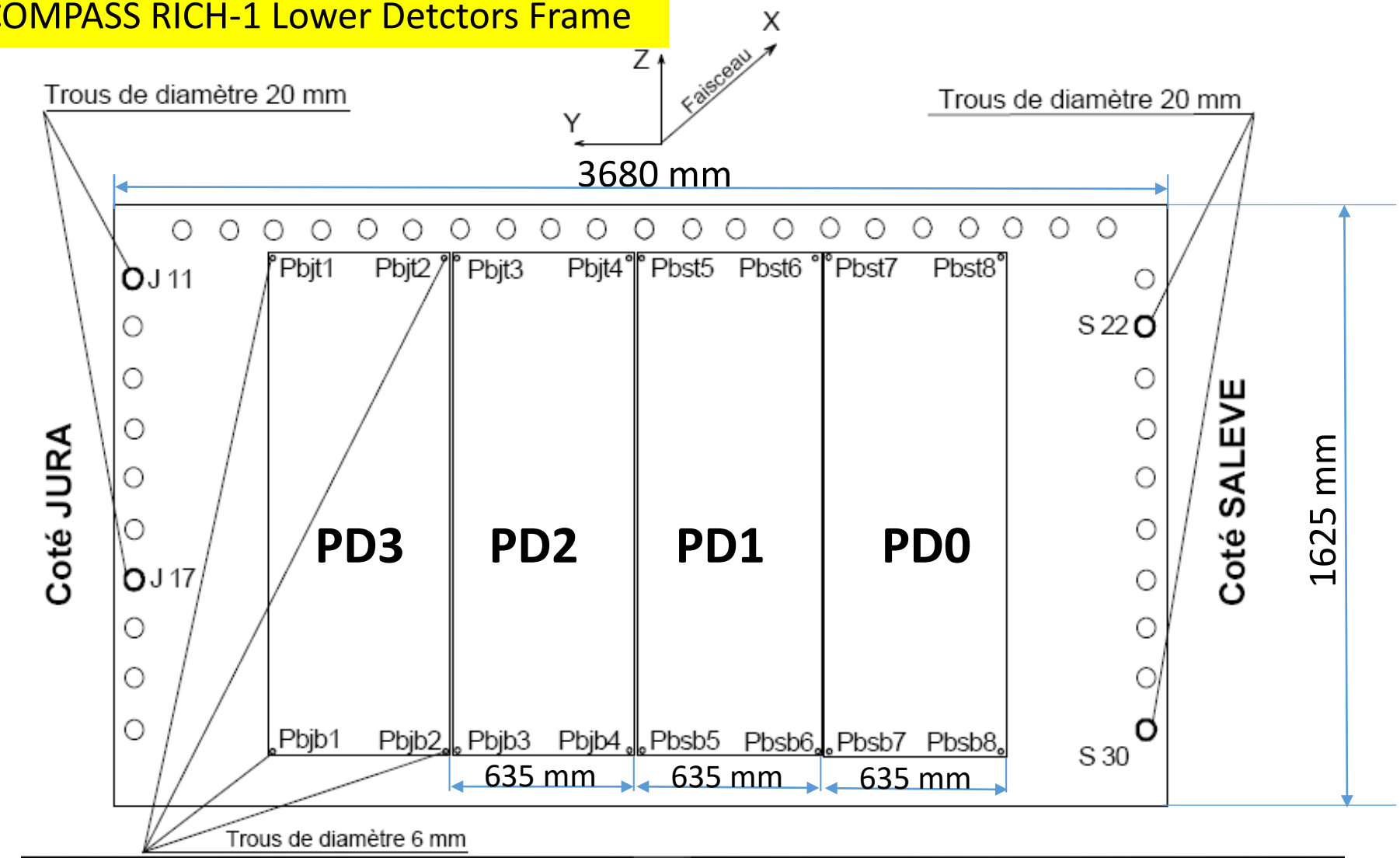
Measurements performed by Pascal Sainvitu on January 23 -26. PDs targets, vessel and large frame targets + APV boards have been measured.
Measurements to be completed this week and, for the part which needs Straws and DCs in beam position, as soon as they will be moved.







COMPASS RICH-1 Lower Detctors Frame

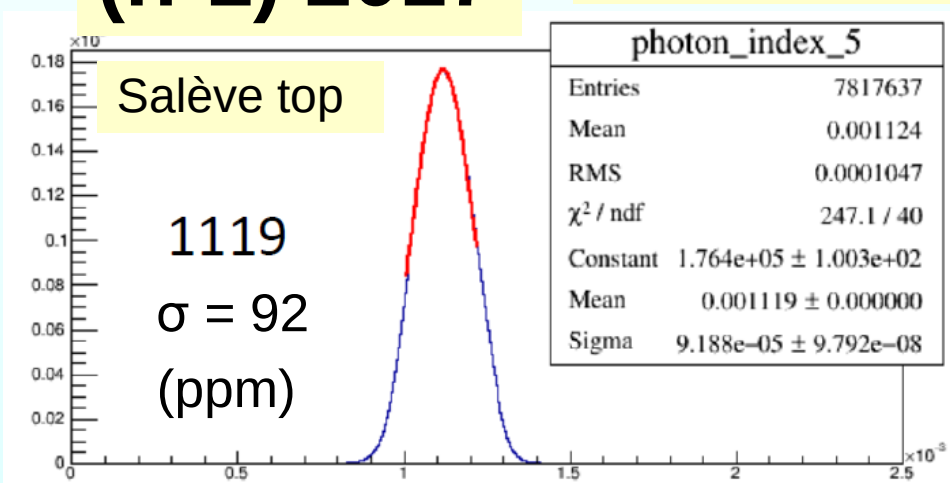


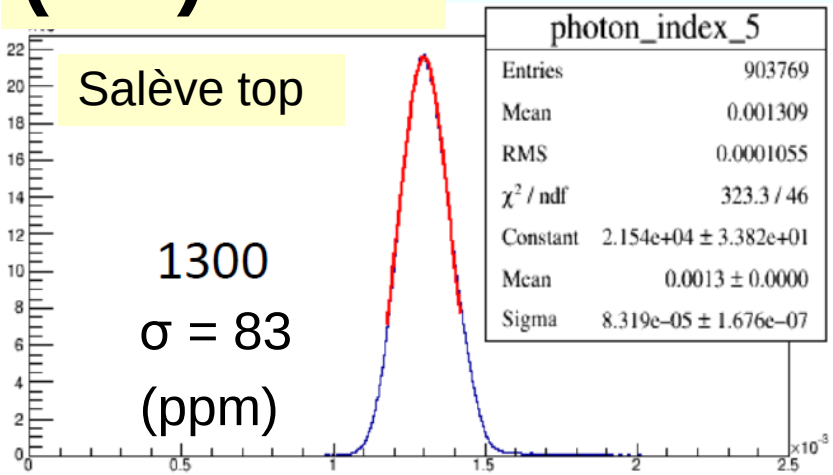
2017 -2010 MAPMT comparison

(n-1) 2017

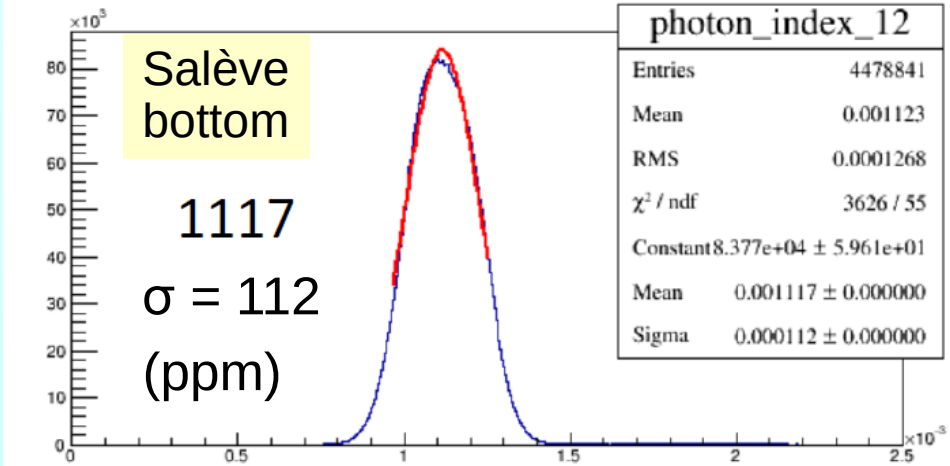
$\mathcal{L}_{\pi} / \mathcal{L}_{second} > 2$

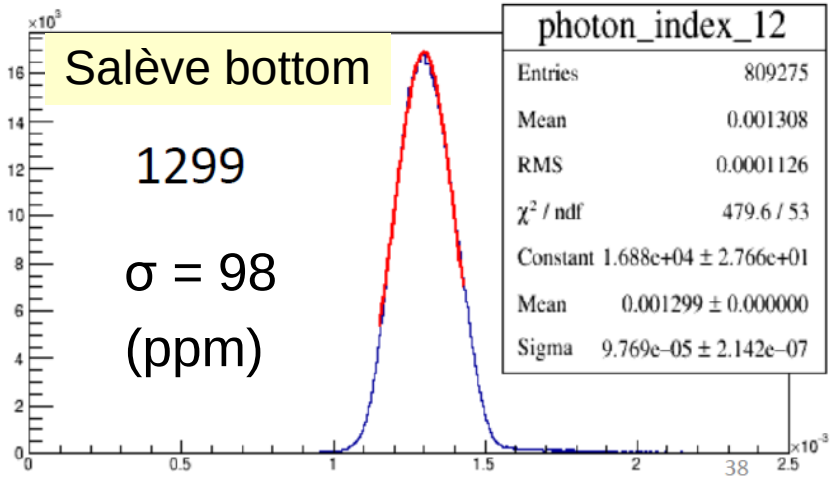
(n-1) 2010





ıst helix) < RICH Z



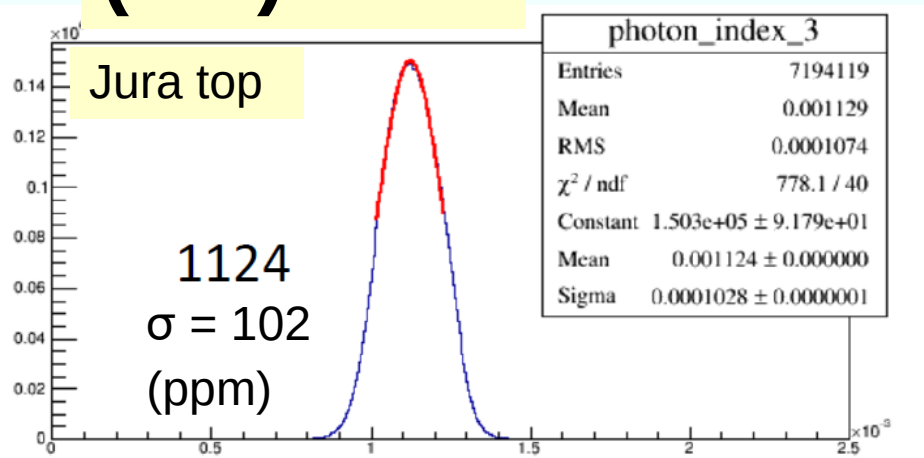


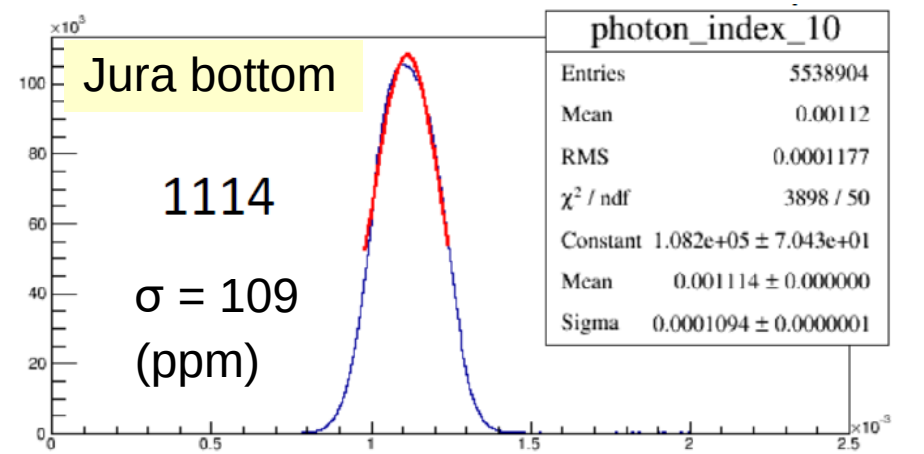
Run 281012

2017 shows 10% larger σ values than 2010

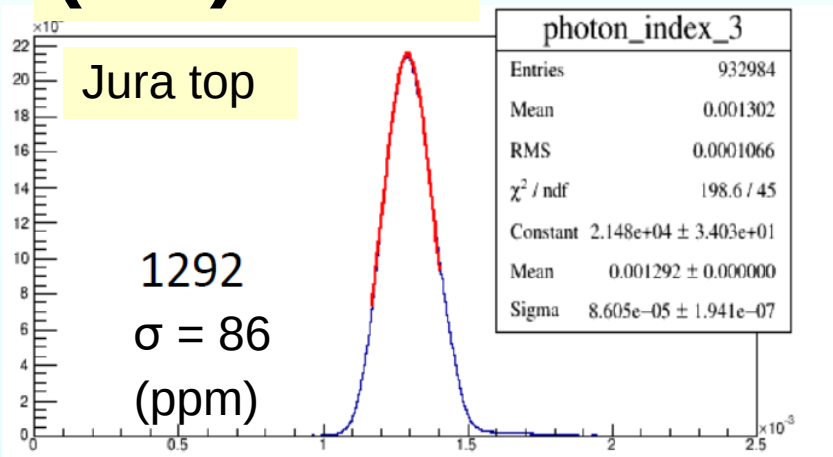
2017-2010 MAPMT comparison

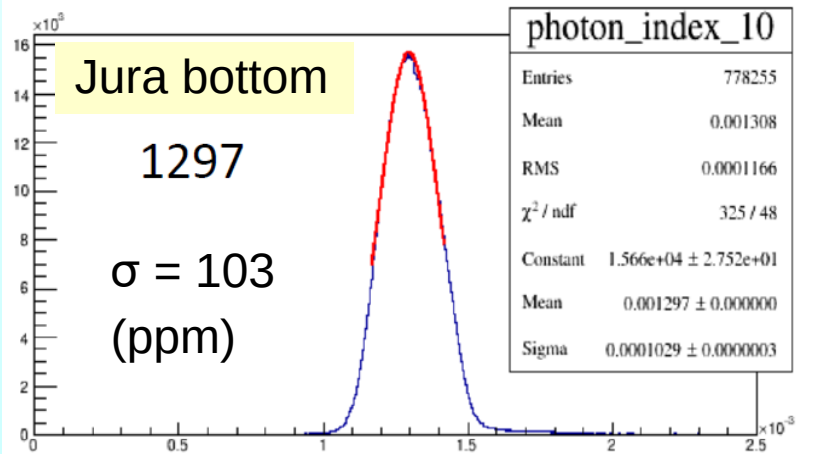
(n-1) 2017





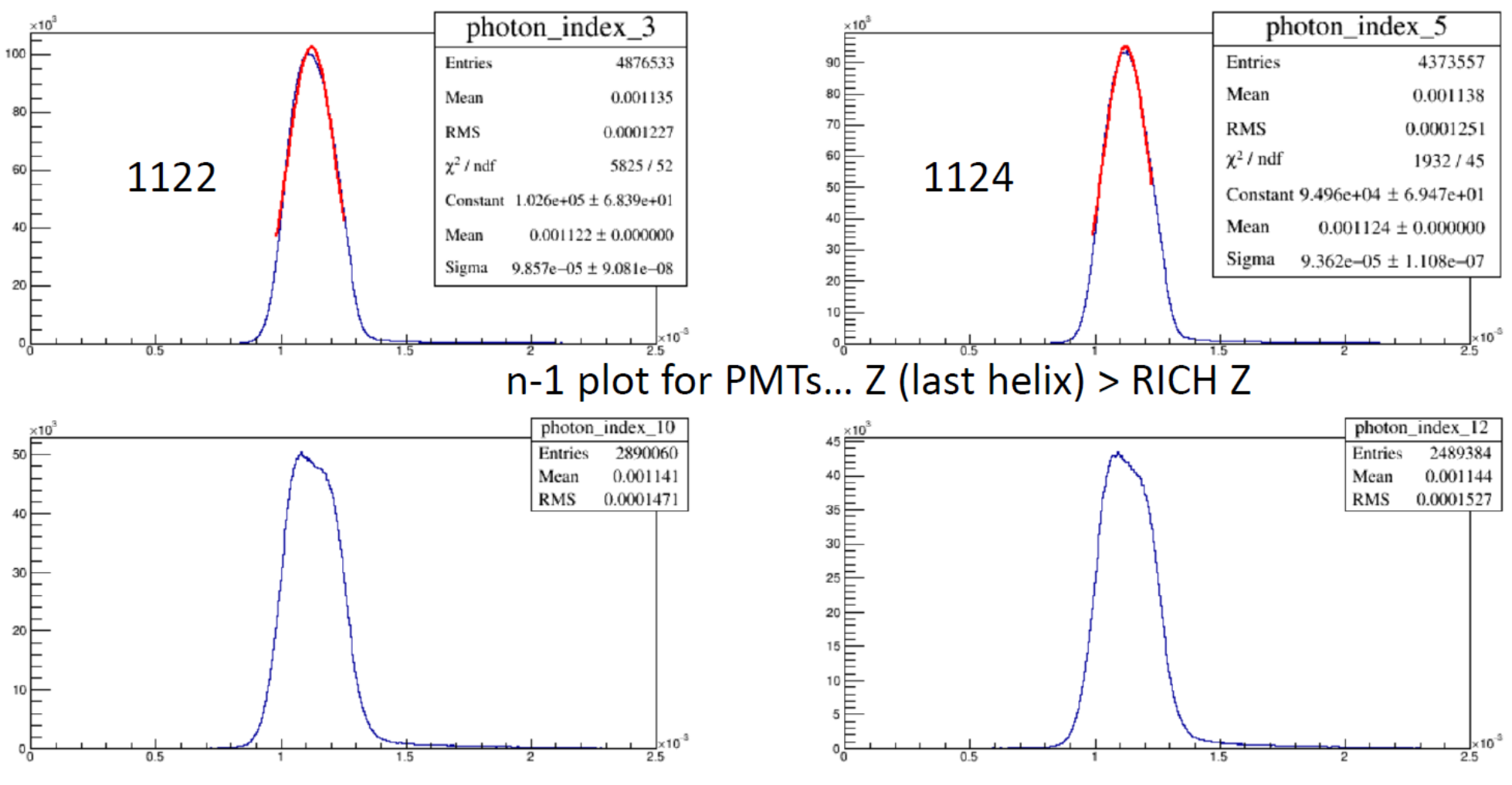
(n-1) 2010





hints for remaining 2017 alignment problems

2017 tracks with $z_{hit} > z_{RICH}$



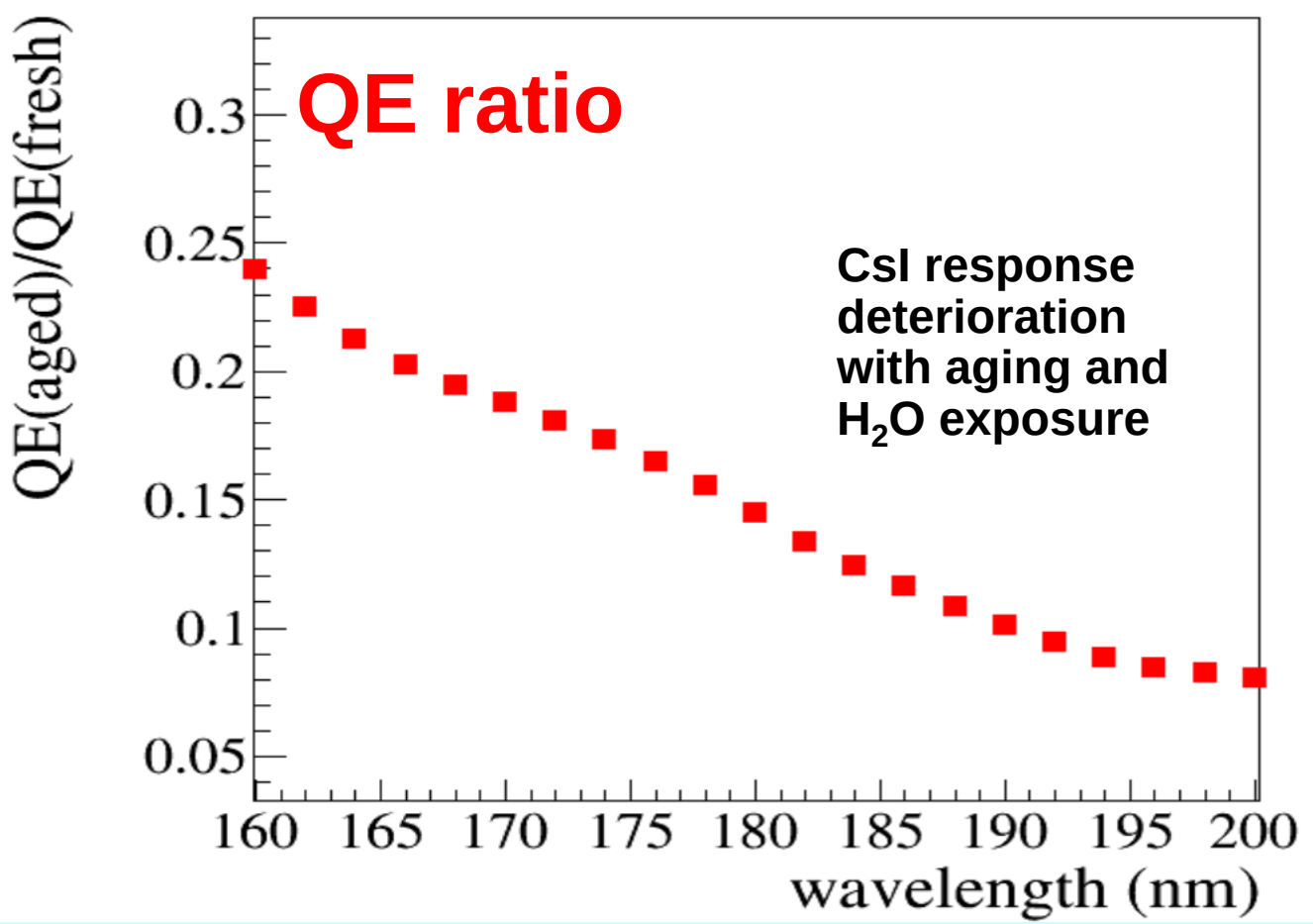
this provides further hints for remaining alignment problems

Wavelenth range change for aged CsI

Ten days ago we evaporated a new CsI sample and compared its QE with that of an old sample, exposed to air for long time.

The QE deterioration is more important for large wavelengths: aged CsI moves the spectrum of detected photons toward smaller wavelengths with respect to fresh CsI.

The refractive index would thus result to be higher.



This effect cannot be responsible for the discrepancy between (n-1) of hybrid and MWPC