Grenoble Data (February 2019) - June 2019

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Quick analysis with TANGO , key points… and an IQF preliminary measurements of H in CH_4 !

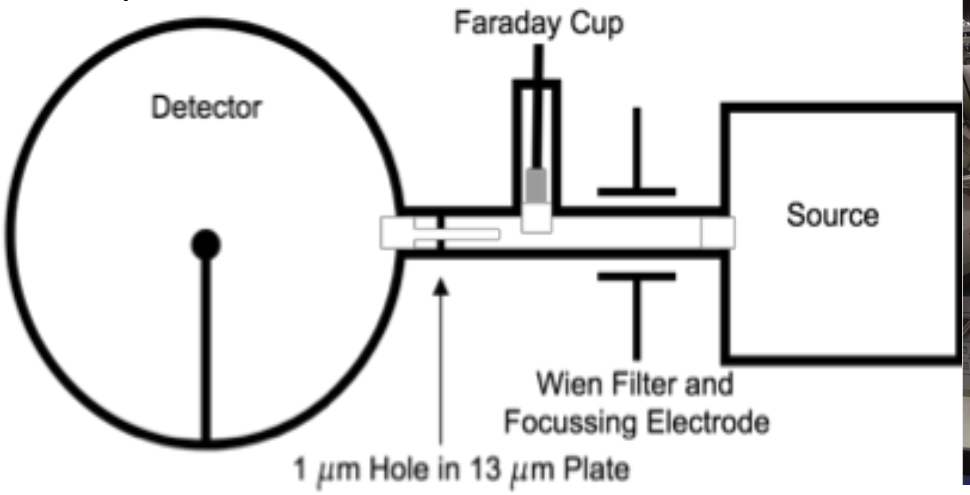
Data Taken

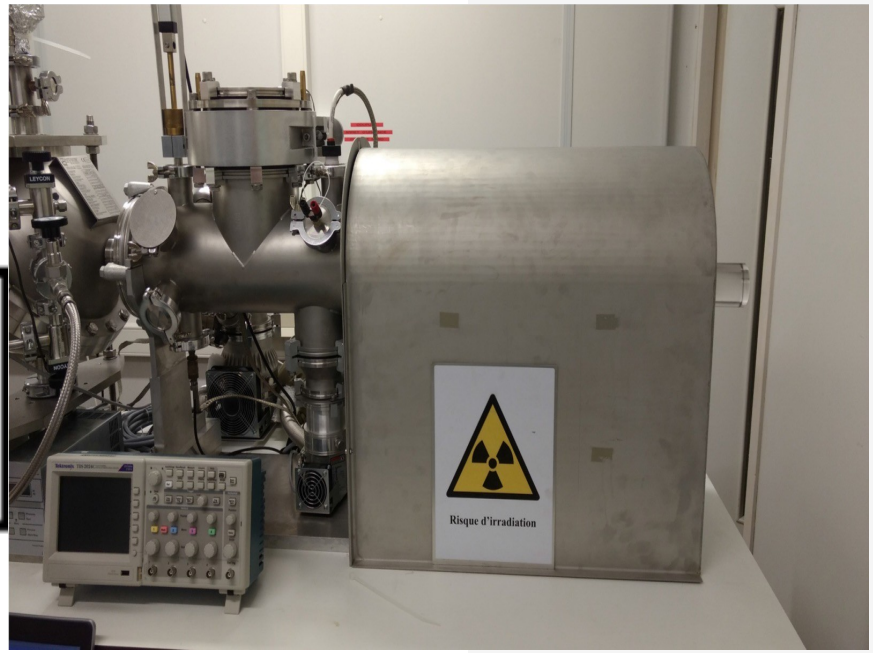
- Runs (tb07c001-30) – CH_4 (100%) at 100 mbar
- Data taken with electrons (0.8 keV- 15 keV),
  and Protons (3 keV – 15 keV)
- Detector was **stable** against rate changes and any gain/rise time changes **recover immediately**
- **No sparks**

The rod mounted diameter= 3 mm

Set-up

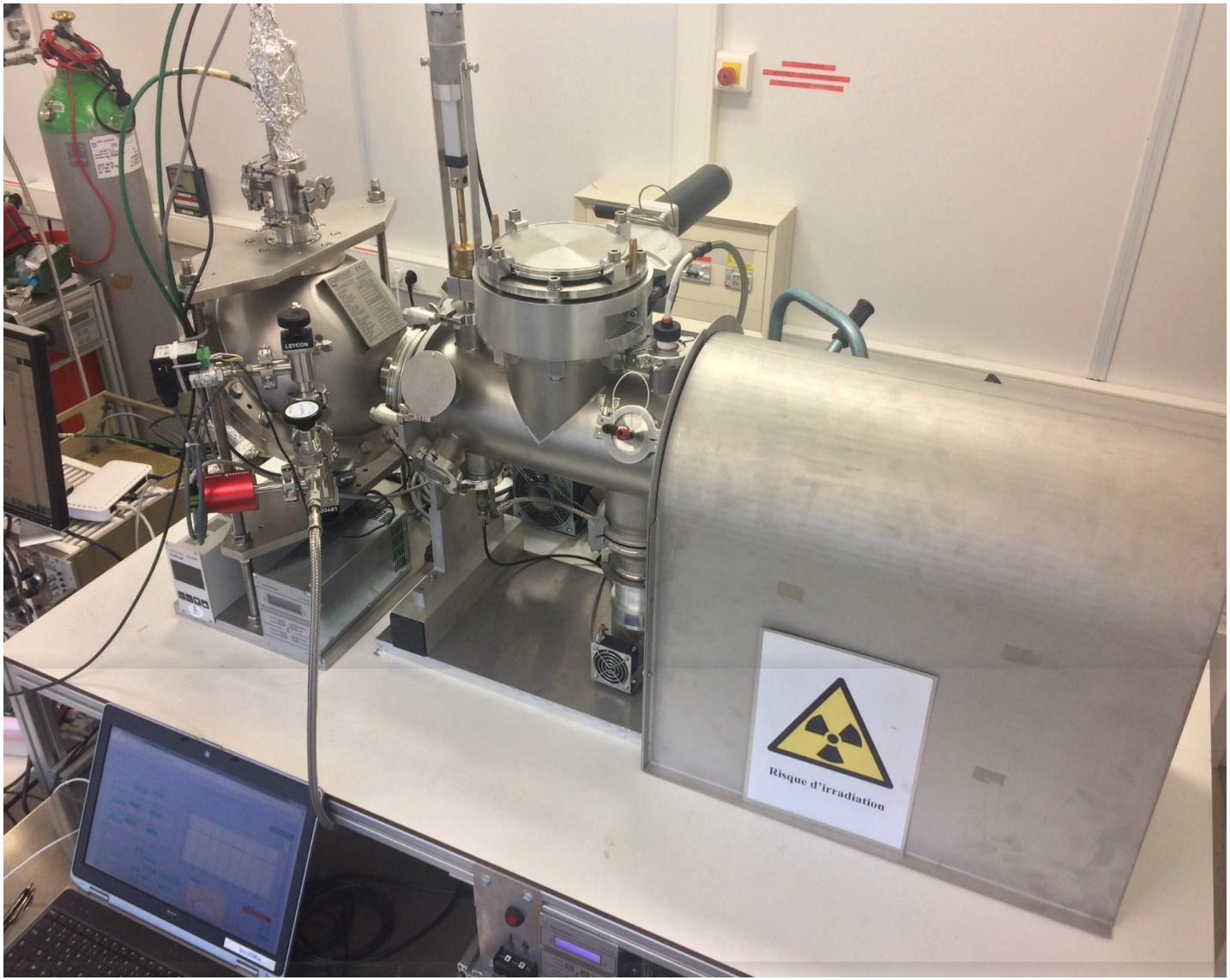
S30 sphere





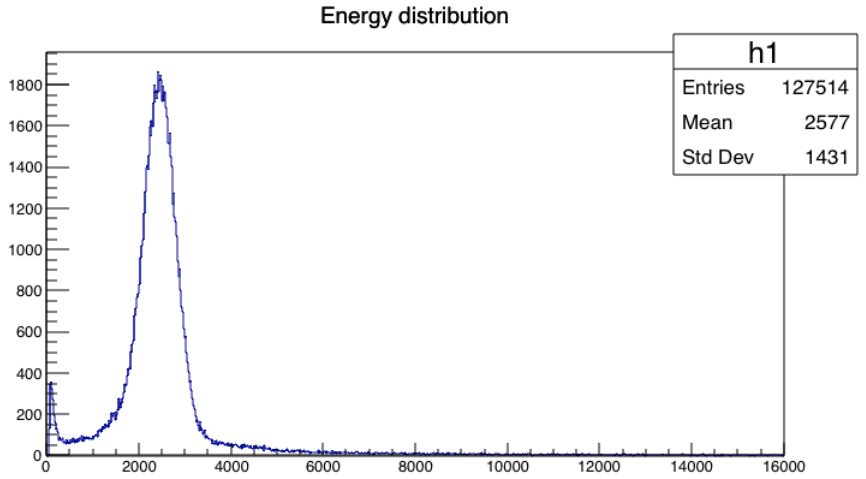
- COMIMAC source is an electron cyclotron resonance source – **producing ions and electrons** which are extracted by a **well known (< 0.5%)** electric field
- Energies from ~**0.5 keV to 40 keV** for both electrons and ions
- Directed through a 1 um hole in a 13 um stainless steel plate to the detector – pressure difference of about 8 orders of magnitude between the detector and source

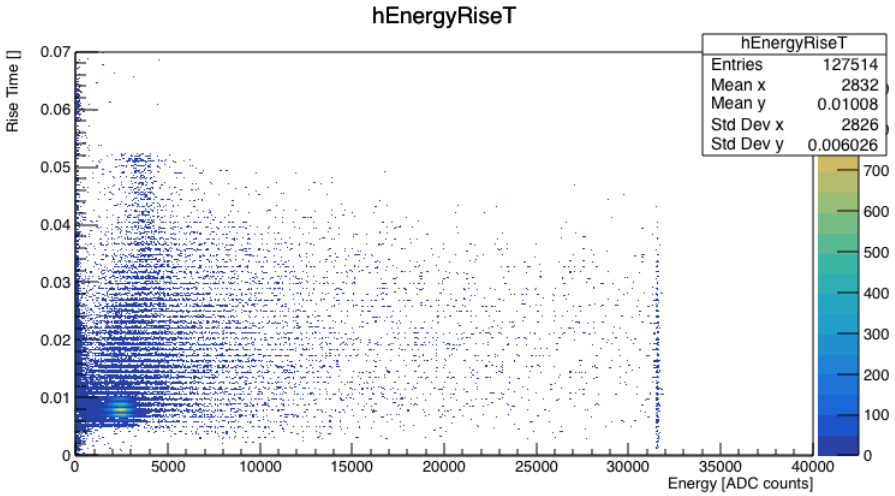
S30 coupled to COMIMAC

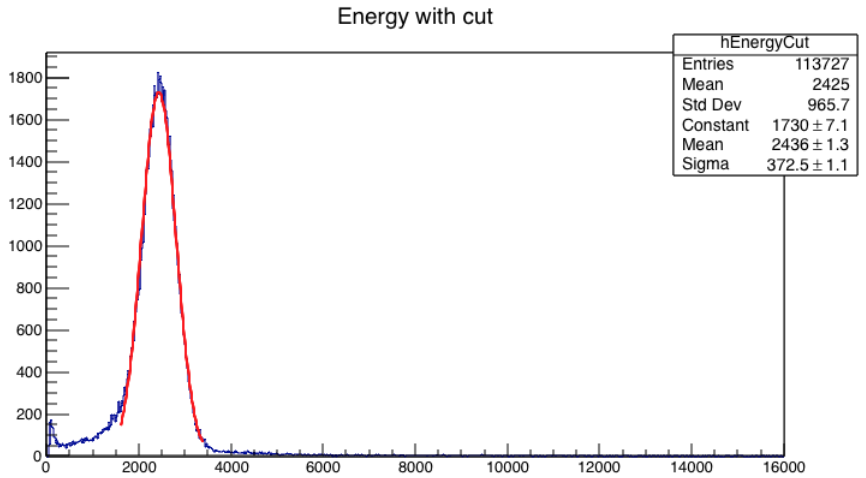


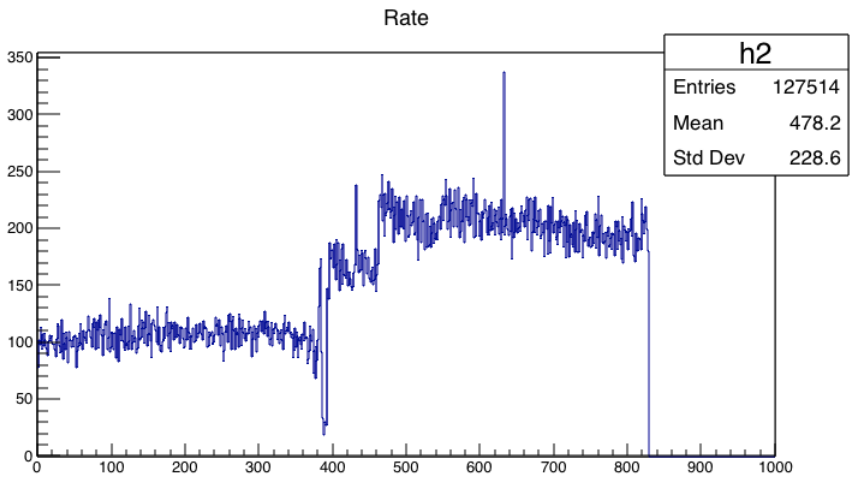
Electrons (2 keV) - Raw data

for fitting purposes (only on the risetime < 0.015)

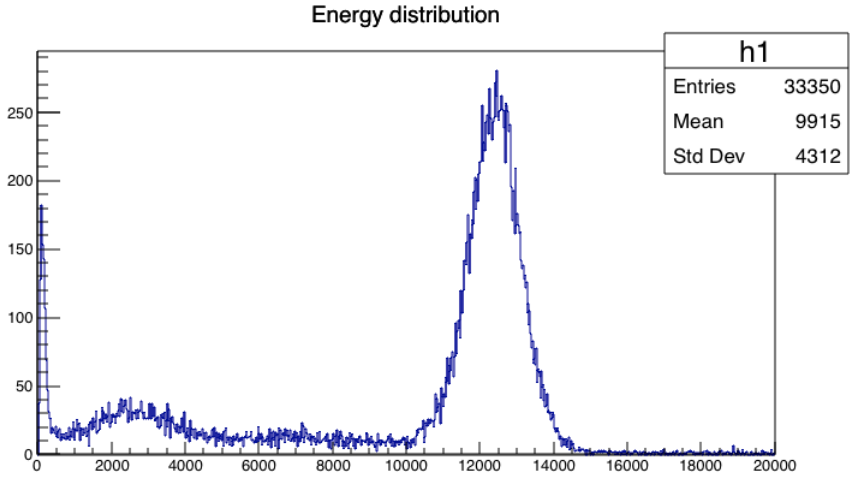


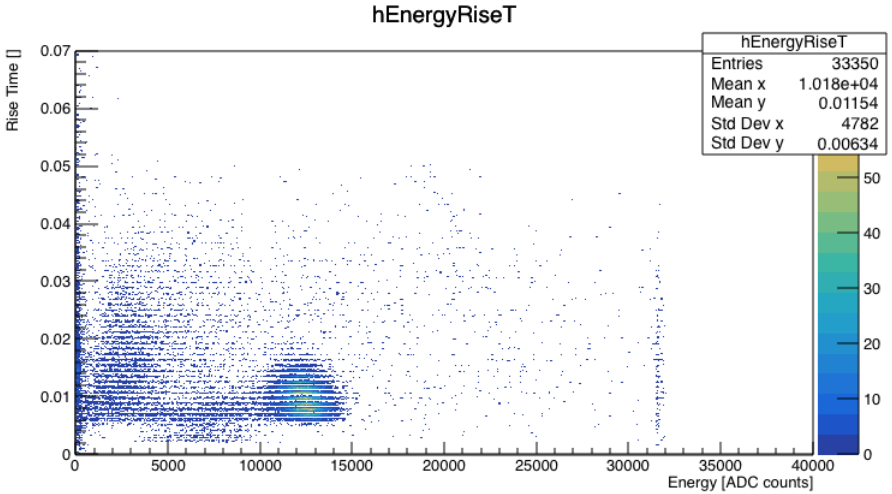


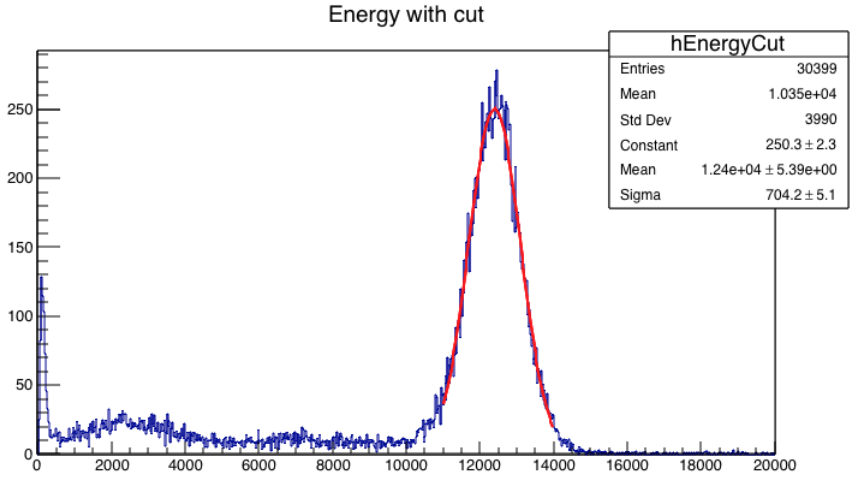


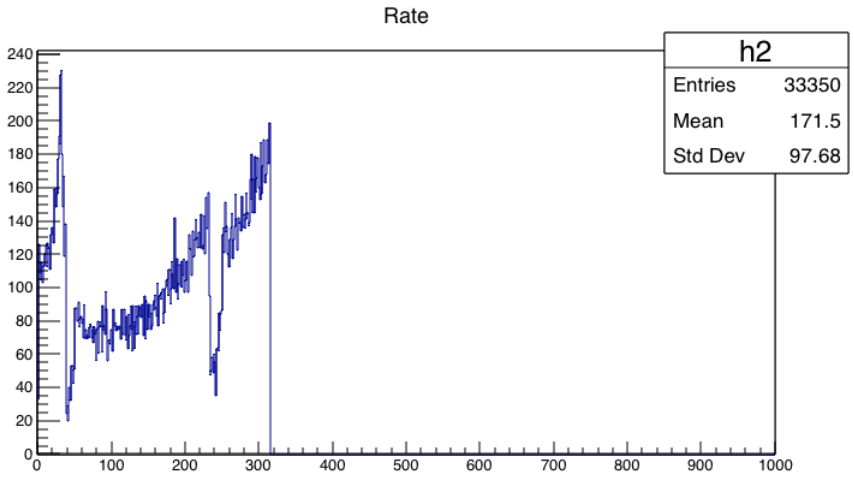


Electrons (10 keV) - Raw data

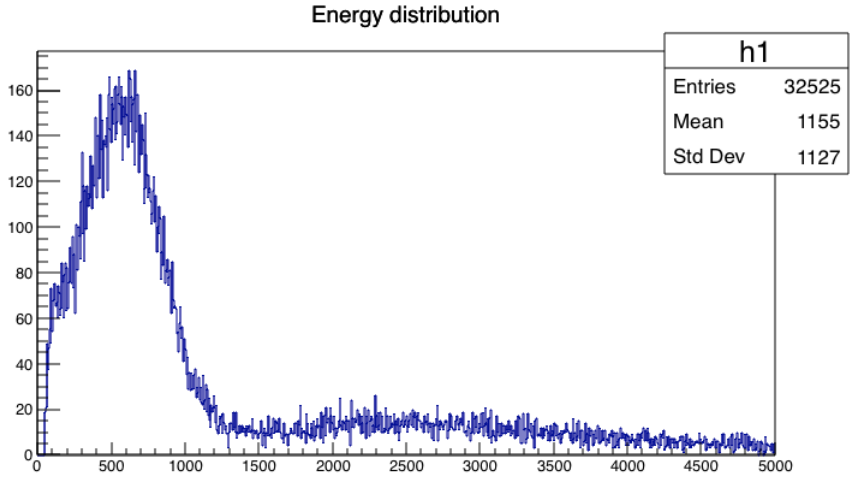


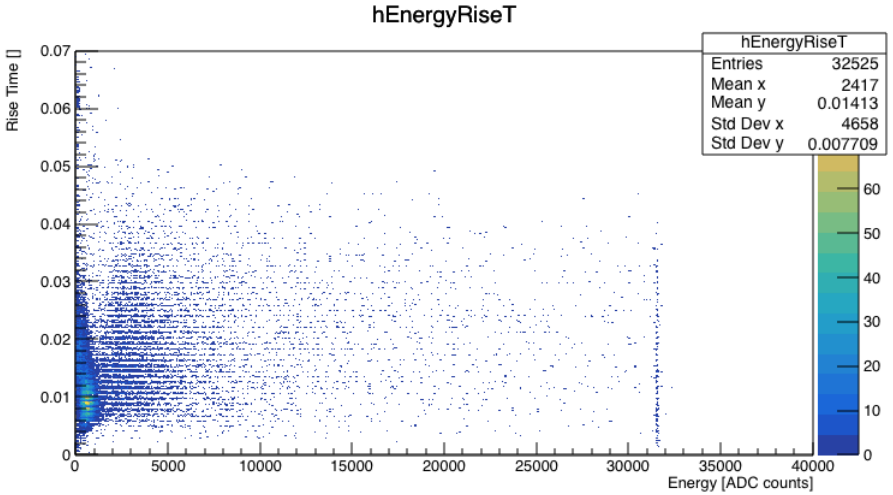


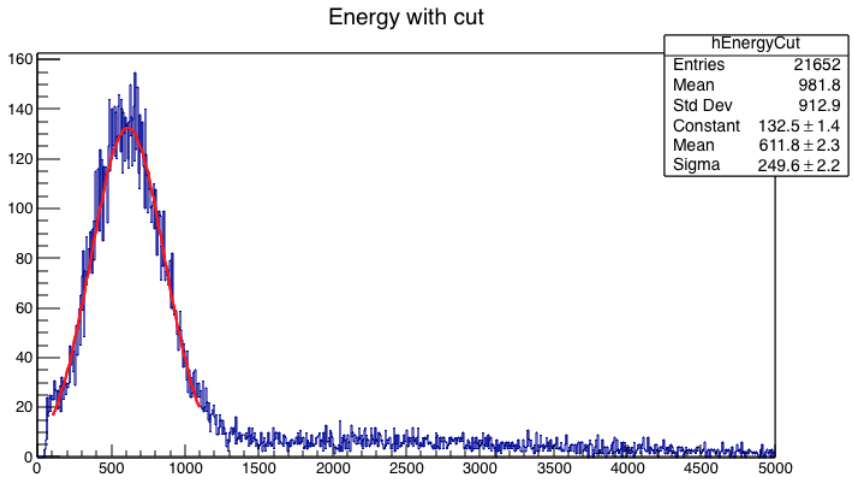


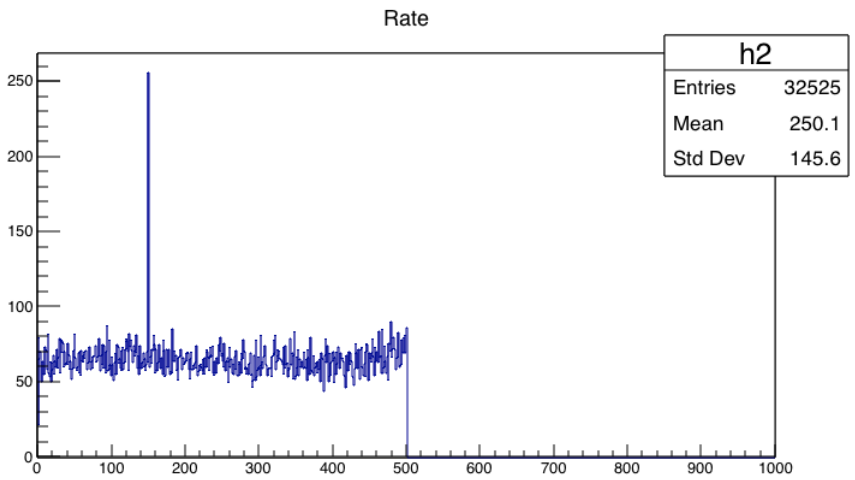


Electrons (0.8 keV) - Raw data



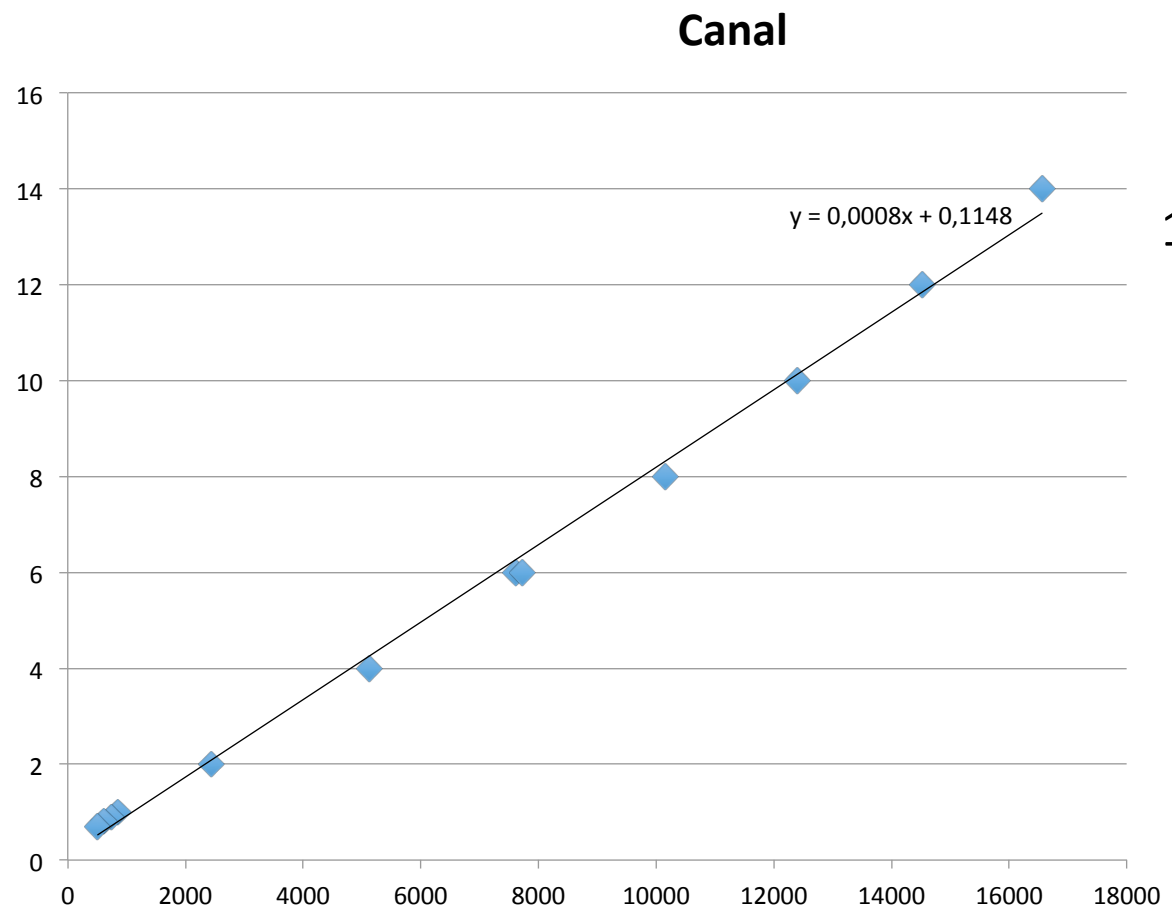






Electron Linearity

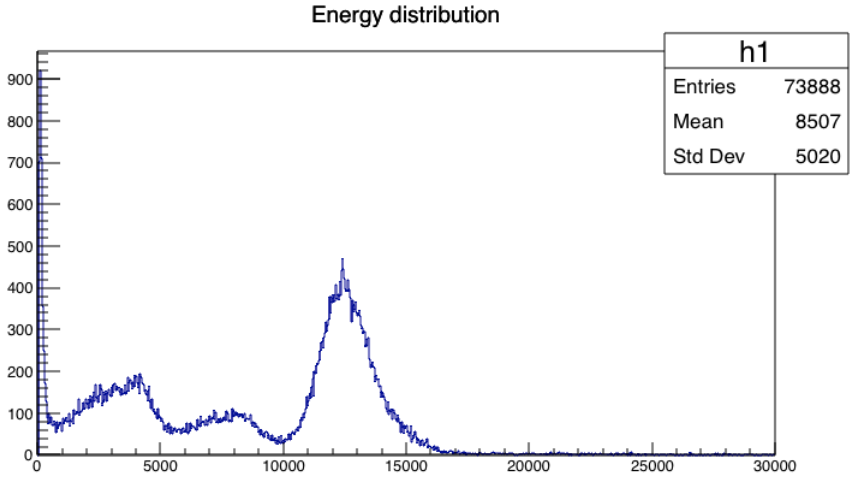
-tb07c001-13

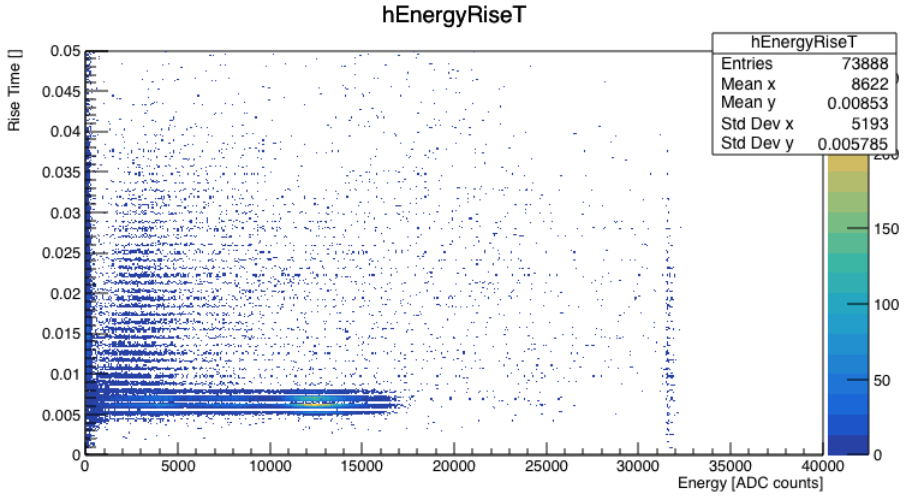


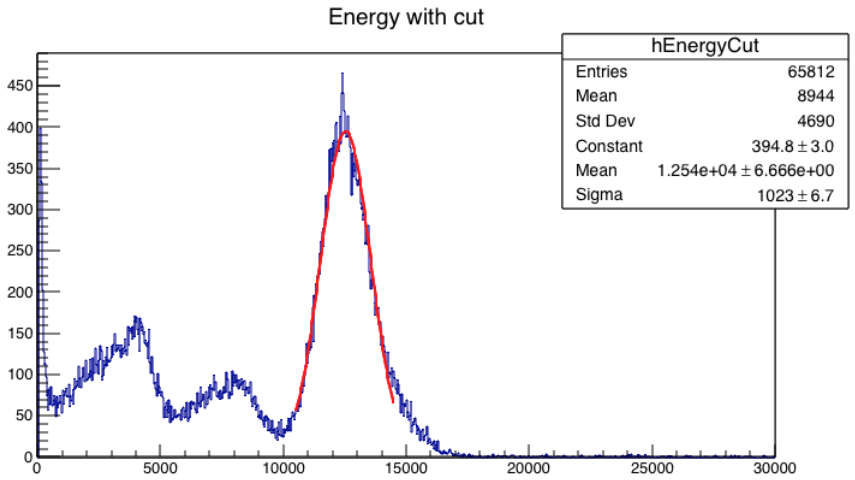
HV1 1800 V

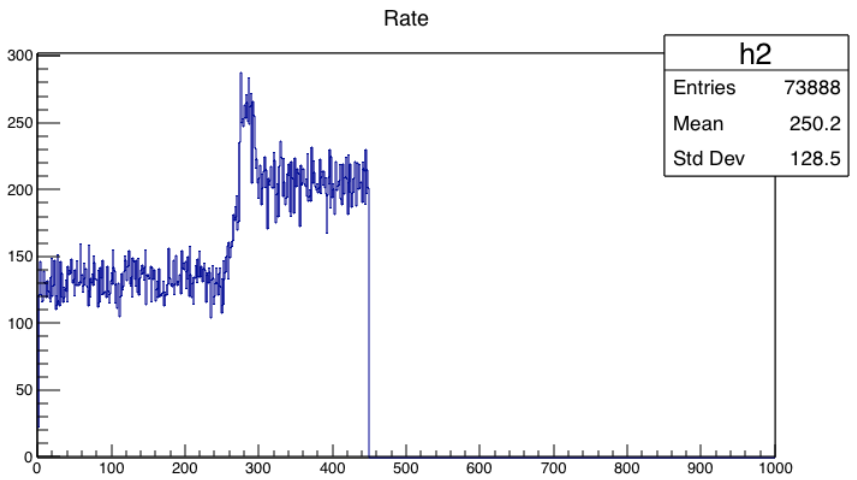
100 mbar CH4

Protons (15 keV)

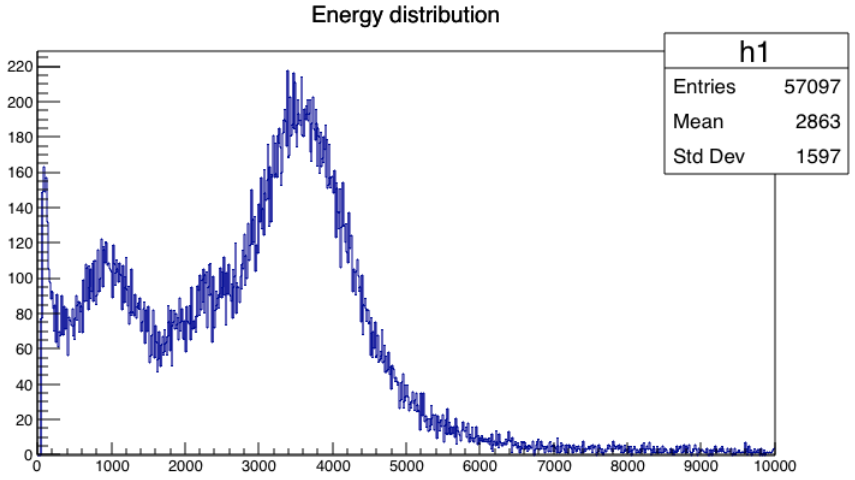


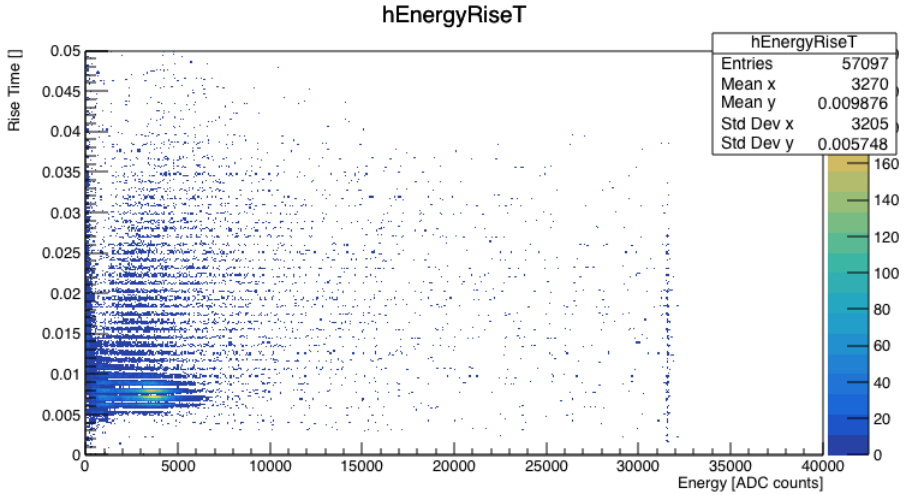


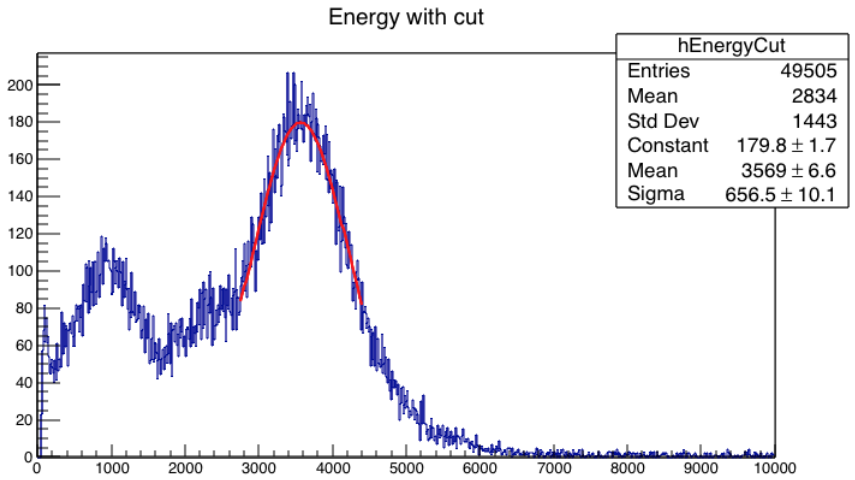


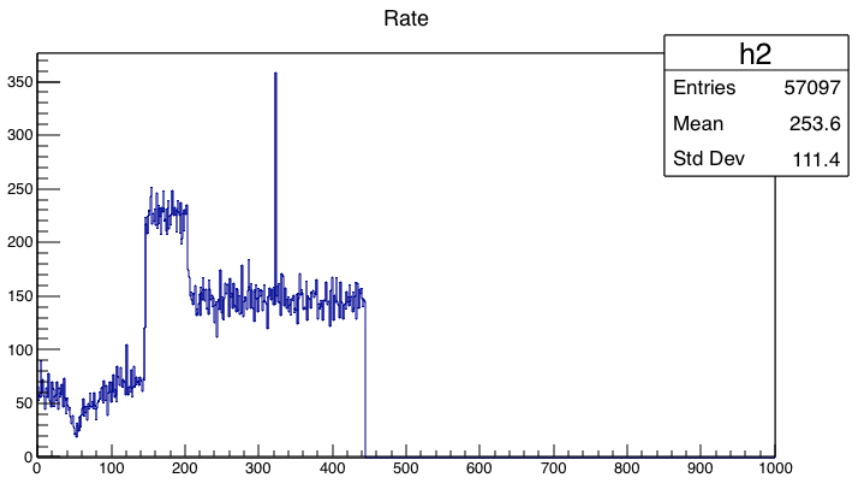


Protons (6 keV) – Raw data

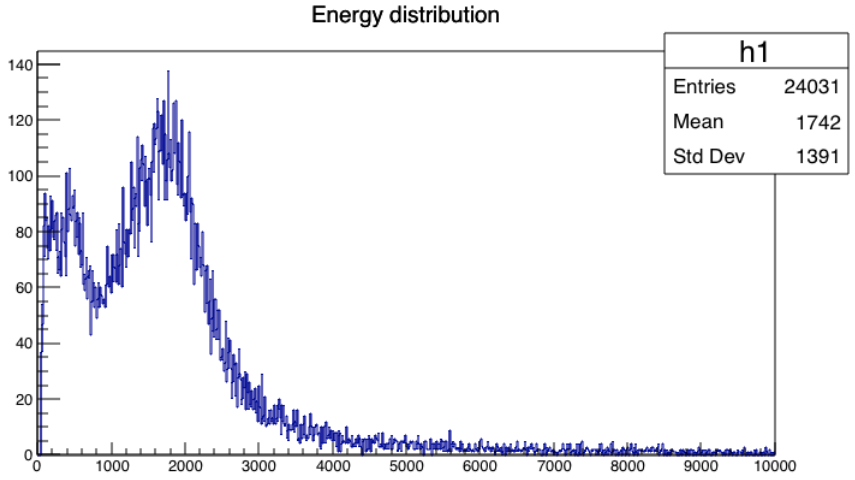


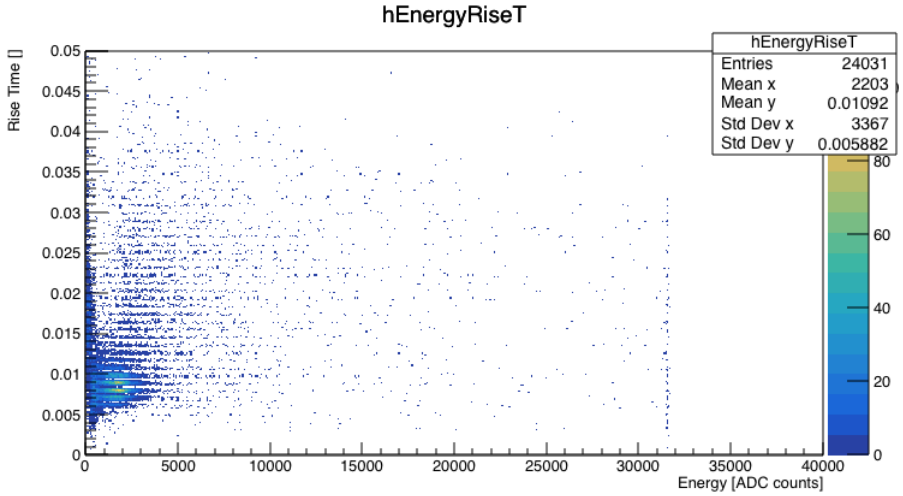


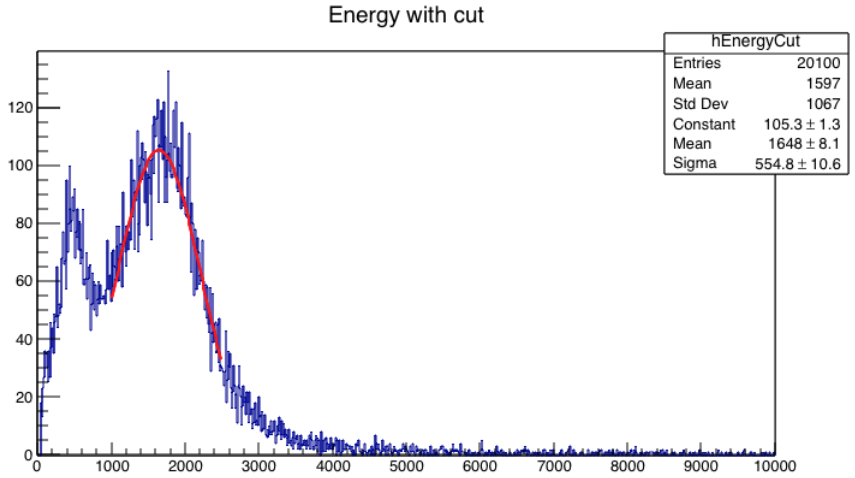


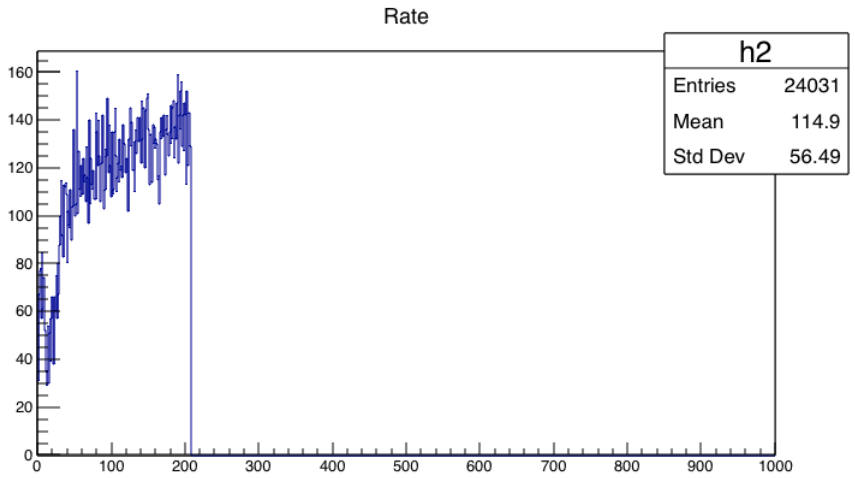


Protons (4 keV) – Raw data

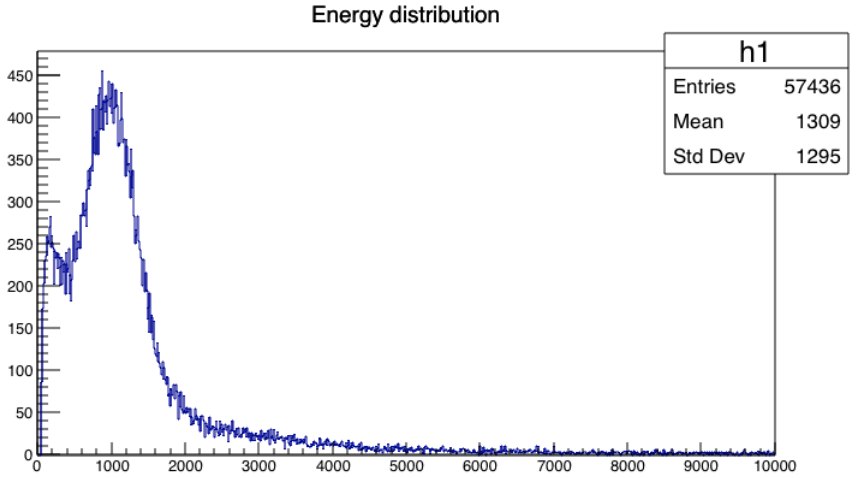


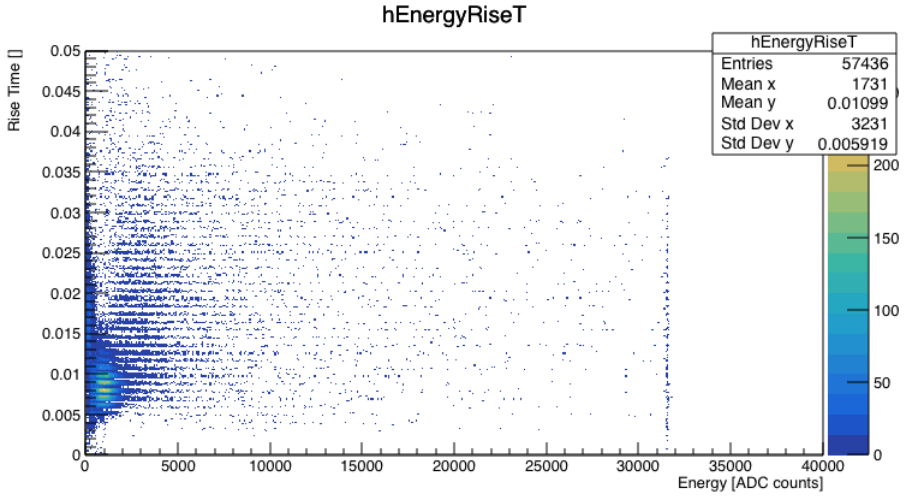


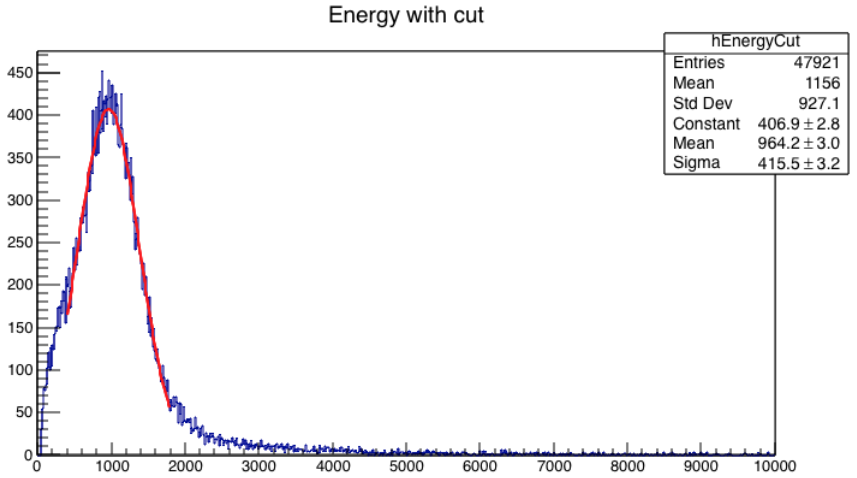


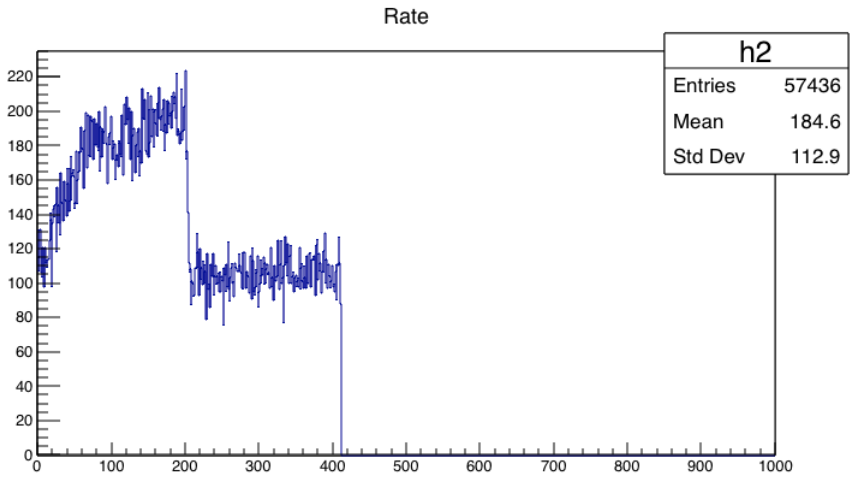


Protons (3 keV) – Raw data



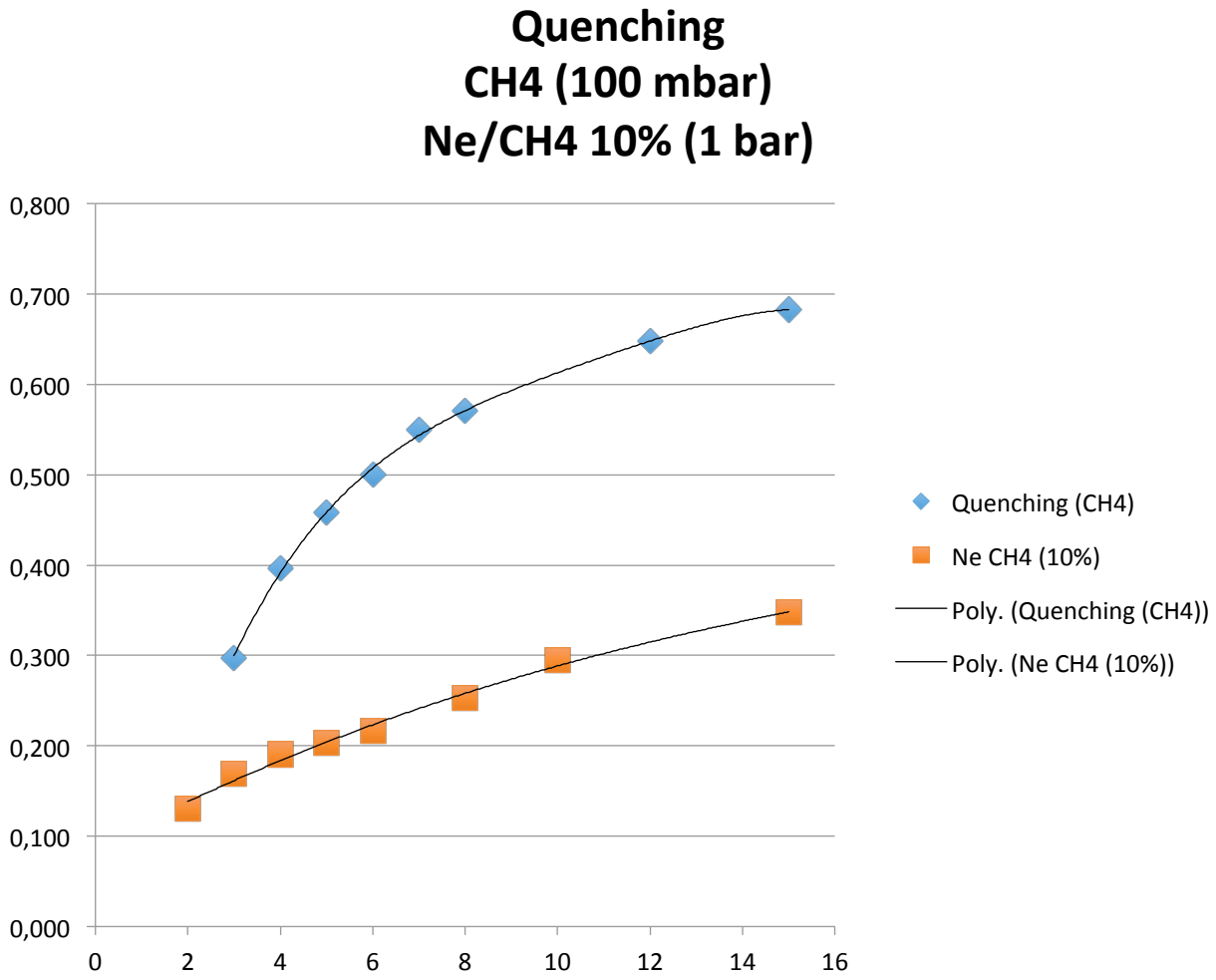






Ionization Quenching Factors of H in pure CH_4

100 mbar (preliminary)



SRIM simulations

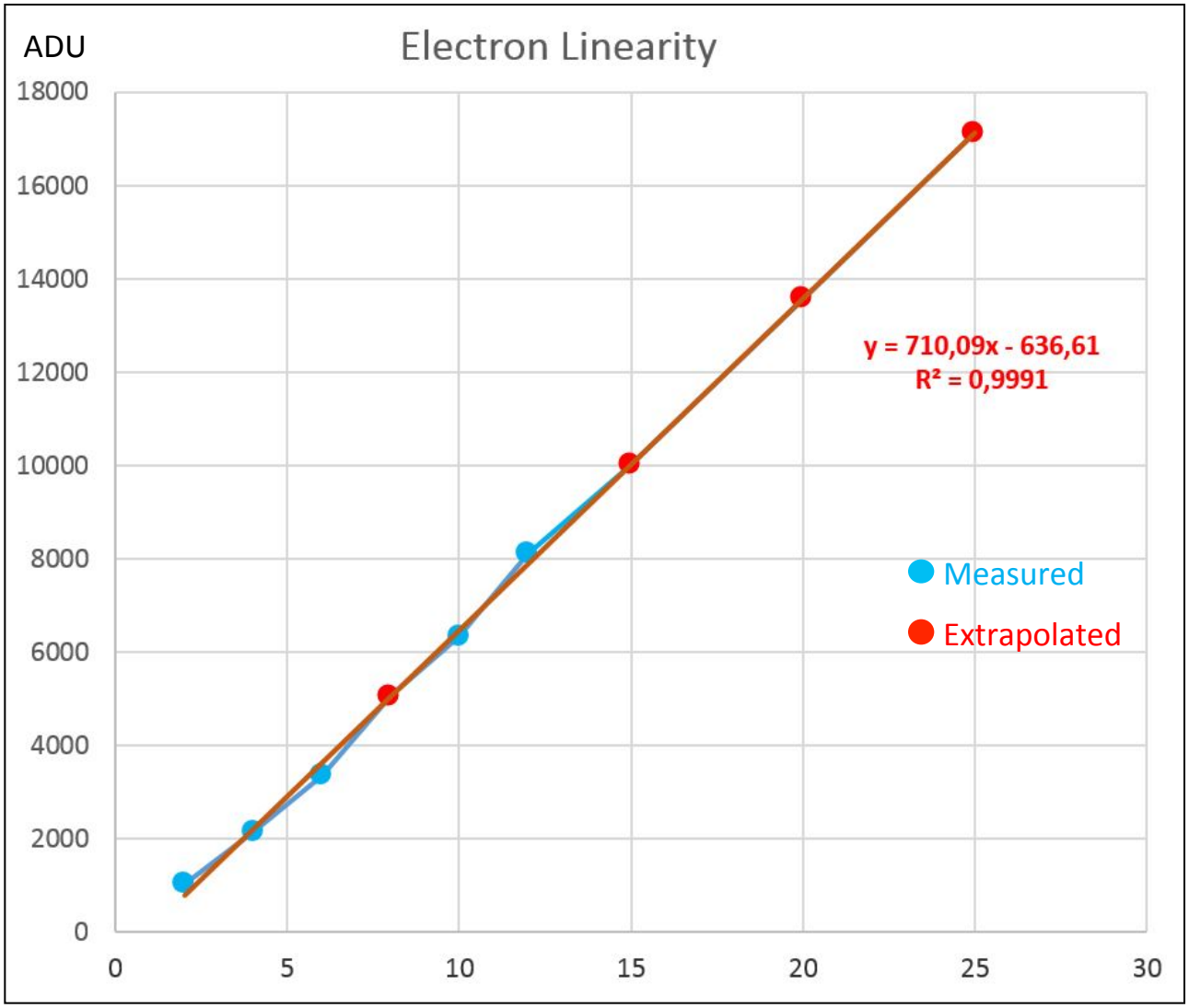
H(1 keV) 74.5%
H(5 keV) 91.2% (88.8 +2.4)
H (10 keV) 94.9%
In pure CH_4

Ne (5 keV) 28% (8.8 + 19.2)
In pure Ne

Conclusions

- We got a high quality of data in pure CH_4 at 100 mbar
- We have to improve the fits of this preliminary data analysis
- We have to study the impact of the pressure in pure CH_4
  (higher the pressure lower the amount of ionization)
- We have confirmed the important differences with respect to
  SRIM simulations in CH_4 ! (to be confirmed in Ne + 10% CH_4)
- We need to confirm the **very interesting** effect
  (first time experimentally observed) concerning the impact of
  the **"recoil ionization"** at low energies !!

Preliminary results (Tango fits) shown November 2018



IQF of ^{20}Ne in
Ne + 10% CH4 (1 bar)

S30
With Wien filter

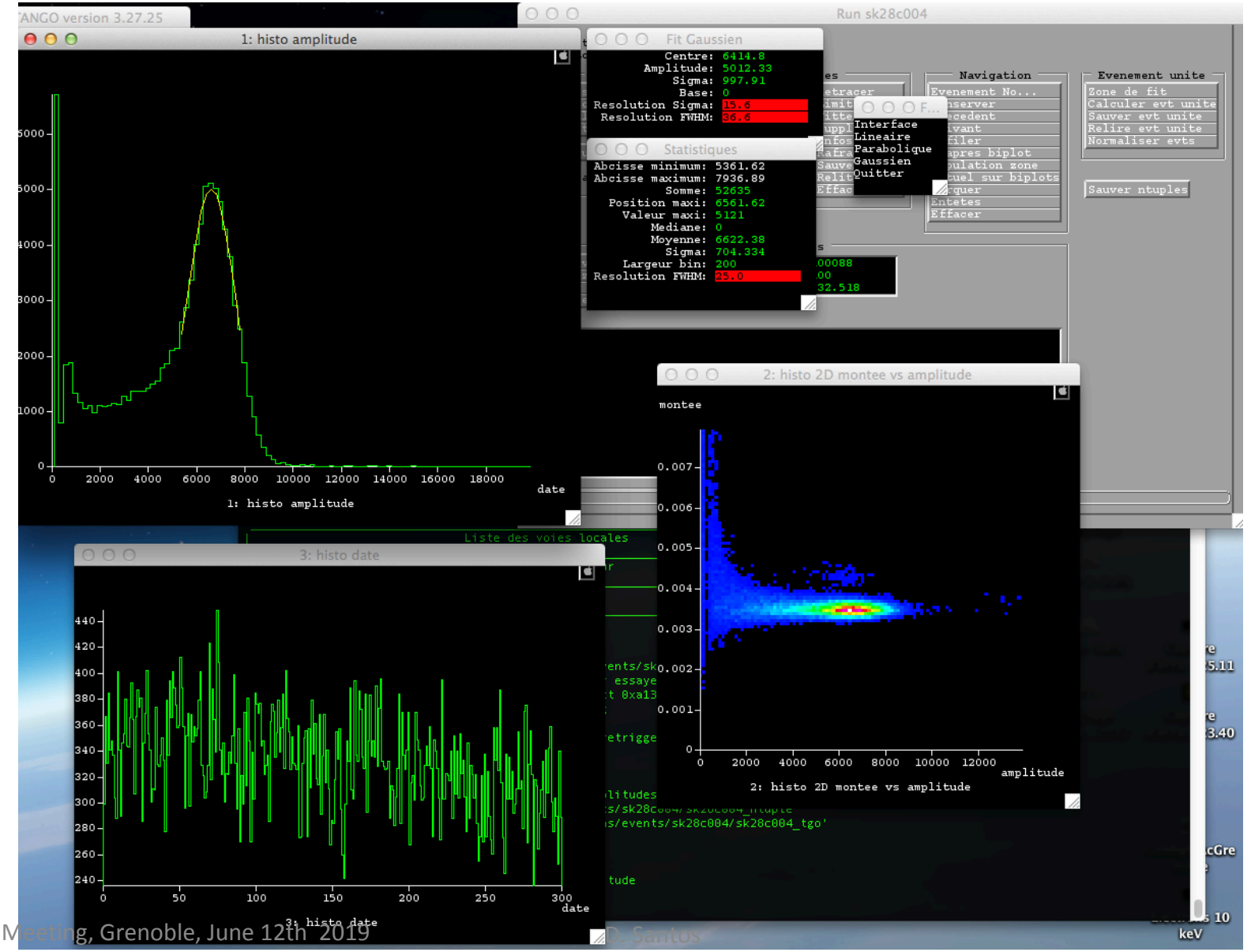
µmégas (diameter=60 mm
gap=256 µm)
At 6 cm from the spherical surface

The IQF does not depend on the detector used to measured it.

The IQF depends on : the nucleus, the energy and the medium (gas and pressure)

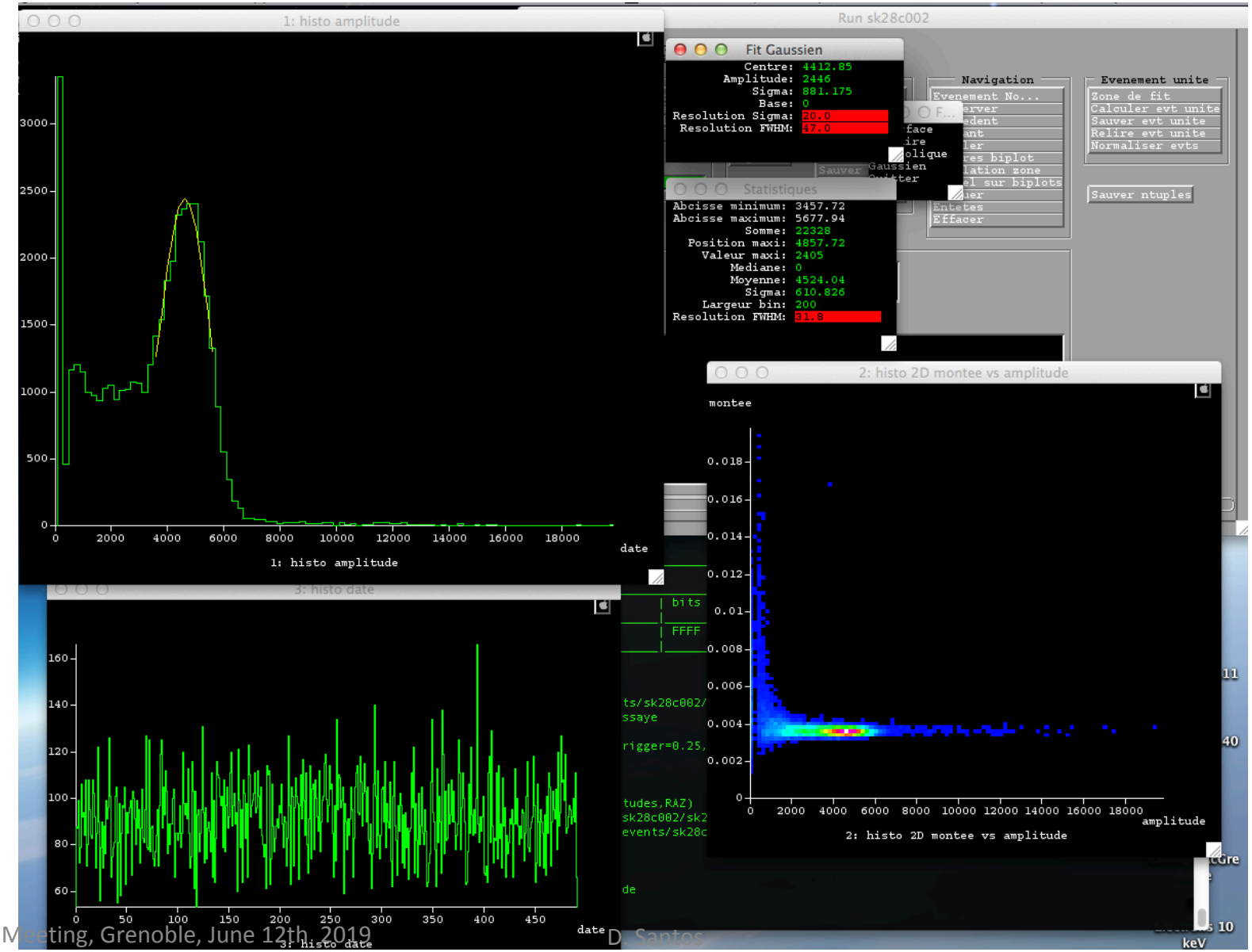
25 keV Neon Drift: 133 V/cm Gain: 500 V Preamp: LPSC n°8

Pic : 6628 ADU Sigma: 15.6 % with Wien Filter



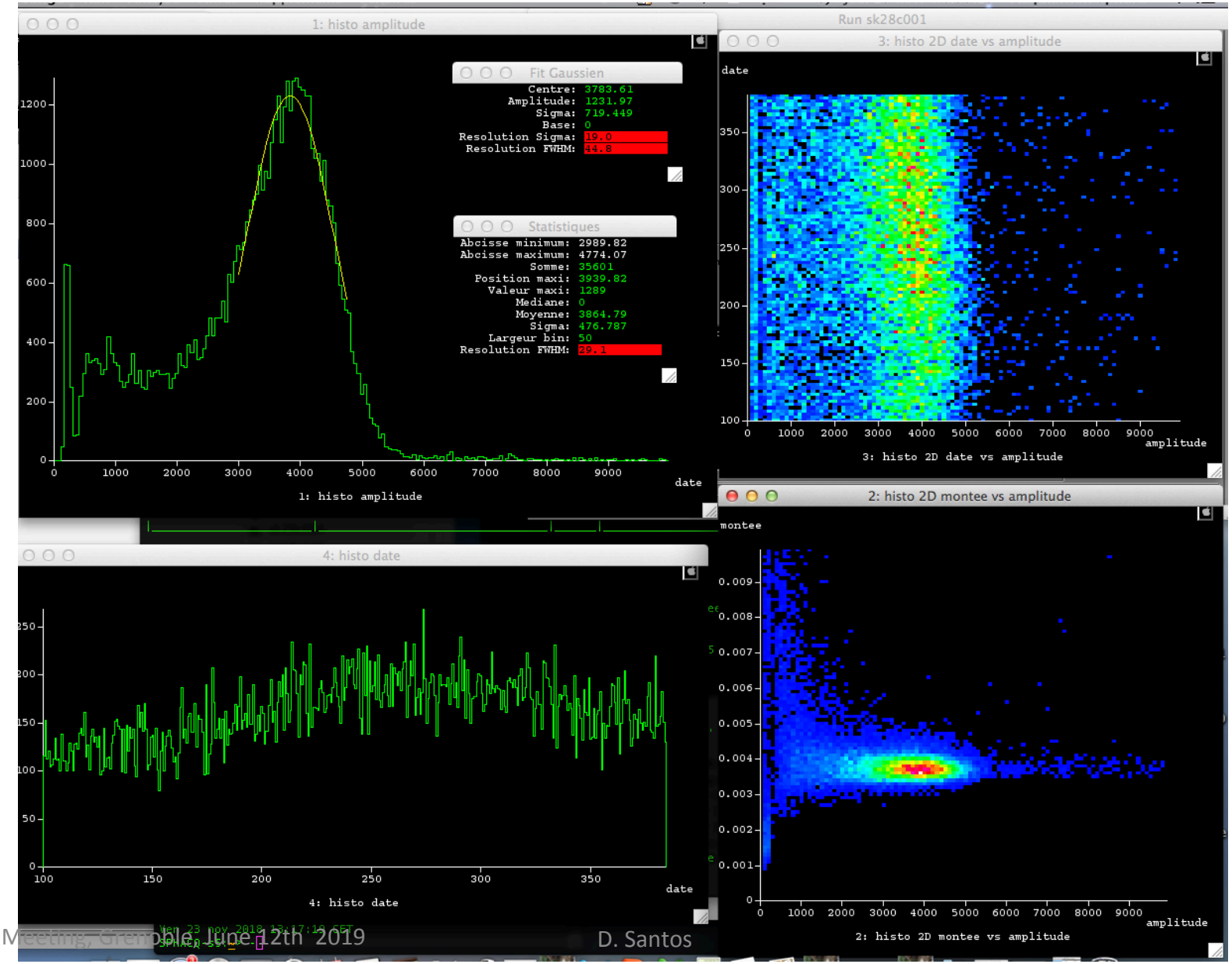
20 keV Neon Drift: 133 V/cm Gain: 500 V Preamp: LPSC n°8

Pic : 4720 ADU Sigma: 20 % with Wien Filter



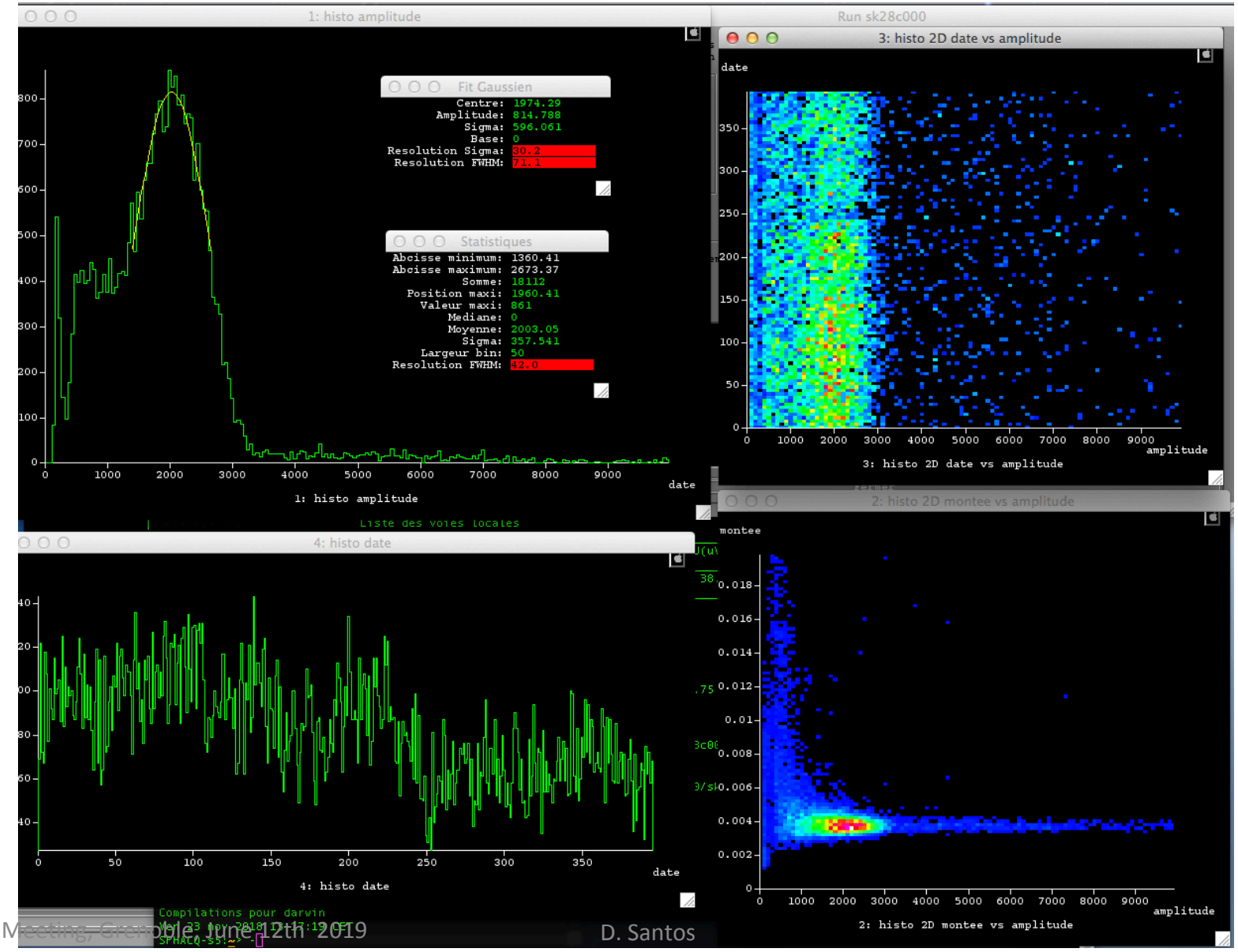
15 keV Neon Drift: 133 V/cm Gain: 500 V Preamp: LPSC n°8

Pic : 3922 ADU Sigma: 19 % with Wien Filter



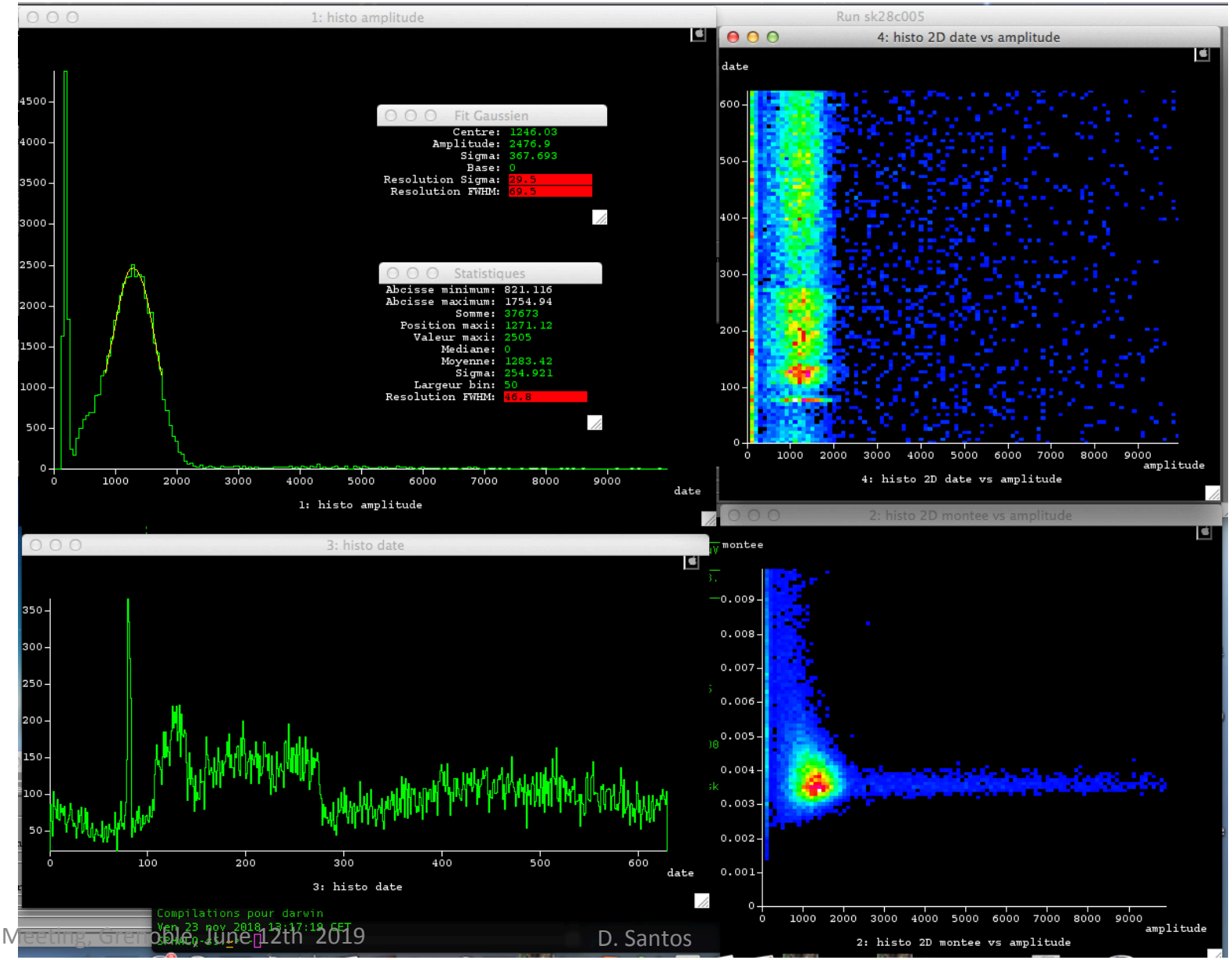
10 keV Neon Drift: 133 V/cm Gain: 500 V Preamp: LPSC n°8

Pic : 2024 ADU Sigma: 30.2 % with Wien Filter



8 keV Neon Drift: 133 V/cm Gain: 500 V Preamp: LPSC n°8

Pic : 1288 ADU Sigma: 29.5 % with Wien Filter



Conclusions (Nov. 30th 2018)

- The E field at the surface of S30 is too low (E = 4,4 V/cm every 1 kV) to collect without primary electron losses the low energy electrons or nuclear recoils

- With the configuration proposed (uMegas inside S30) **we have measured the IQF of ^{20}Ne** in Ne + 10% CH_4 at 1 bar

- A new data analysis is needed to improve the fits (e- and Ne) and to add some cuts.

- A new run at lower energies (E< 8 keV) is possible shortly and at different pressures.