WP2: Anlysis Updates

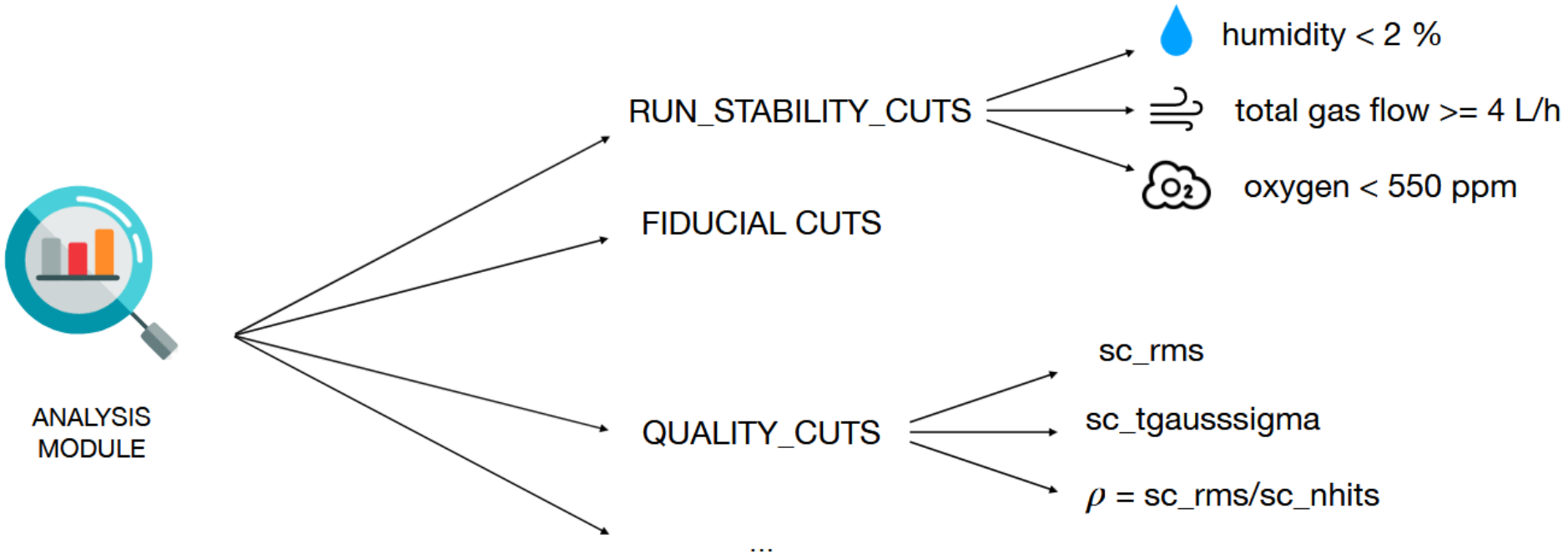
G. Dho

06/04/2024

Early Run5 (M. D'Astolfo)

https://agenda.infn.it/event/46166/contributions/260264/attachments/132697/198270/analysis_meeting_run5.pdf

- Melba is starting to address Run5 data analysis (with MC comparison and neutron flux extraction as goals)
- Preliminary study on stability parameters and **gas quality**, fiducial cuts and data quality cuts
- Gas quality checks were not really available for Flaminia's work, so these are important to reduce systematics

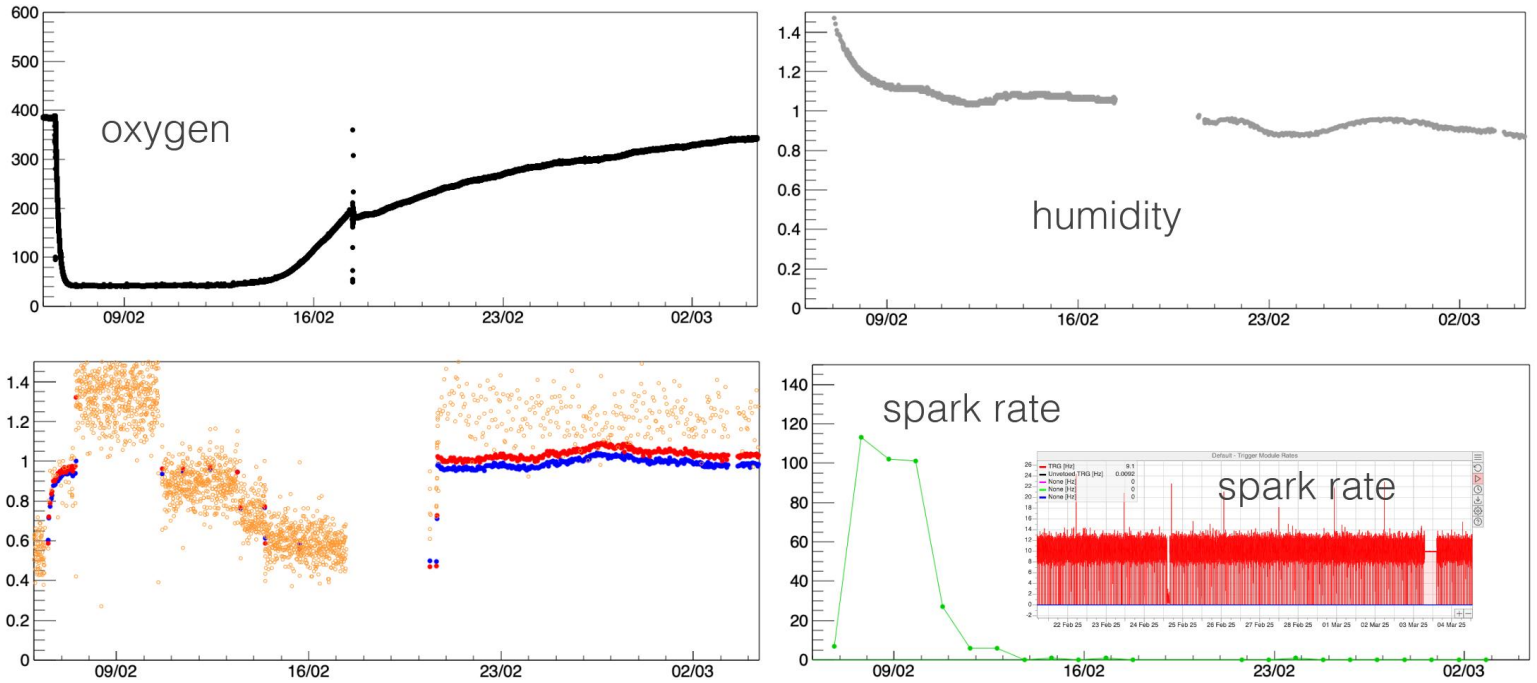


Gas Filters (D. Pinci)

https://agenda.infn.it/event/46166/contributions/260268/attachments/132924/198552/gas-stabilityFeb25.pdf

- First analysis of the gas behaviour with new oxygen filters
- The too low content of oxygen compromised the regular operation and stability of LIME
- The light yield though seems to be affected more by humidity (must be kept under control in CYGNO-04)

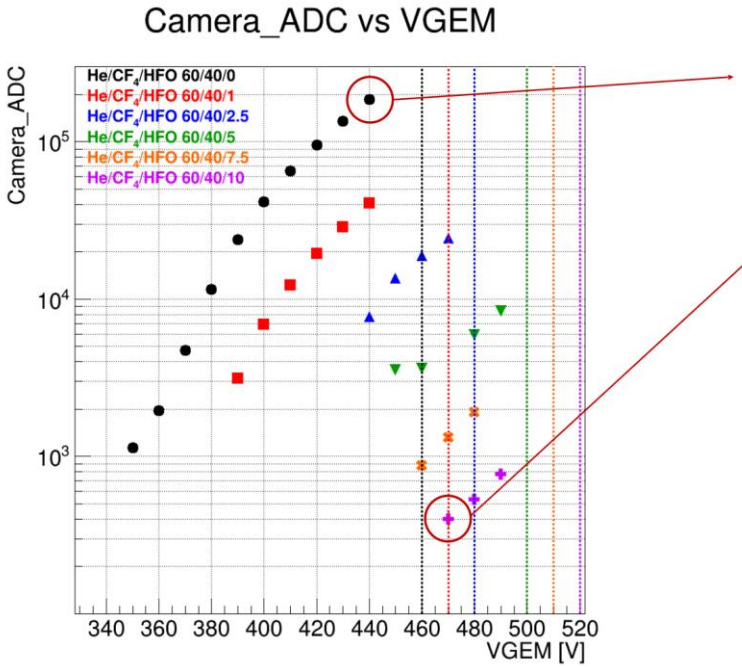
Melba's work will also help understanding this



HFO Measurements (D'Astolfo, Dho, Fiorina)

https://agenda.infn.it/event/46166/contributions/259838/attachments/132696/198280/Analysis_meeting.pdf

- Test at CERN with MetalMANGO and spectrometer of gas mixtures with HFO content
- Light yield reduction is dramatic with increasing percentage of HFO
- But we found a combination of camera/lens, solid angle coverage where the threshold can be close to the gas limit



196k for 5.9 keV

Cluster above noise found with 900 counts

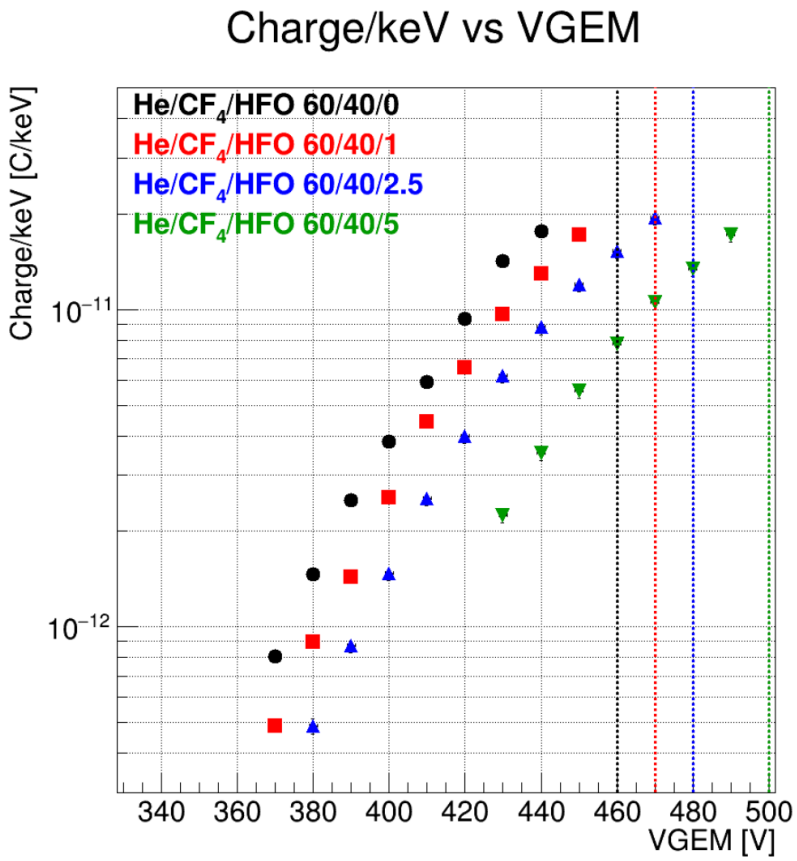
Threshold of 30-40 eV (Gas limit!)

Camera: Quest1
Lens: EHD 0.85 aperture
Pressure :980-1000 mbar
Solid angle: 1.16 10^{-3}
Pixel size: 35 μm per pixel
Imaged area: (143.4 x 80.6) mm^2

HFO Measurements (D'Astolfo, Dho, Fiorina)

https://agenda.infn.it/event/46166/contributions/259838/attachments/132696/198280/Analysis_meeting.pdf

- Charge/keV measurement suggest that the process of light production is suppressed in the mixture, not the gain
- Good for charge readout not for us



HFO Measurements (D'Astolfo, Dho, Fiorina)

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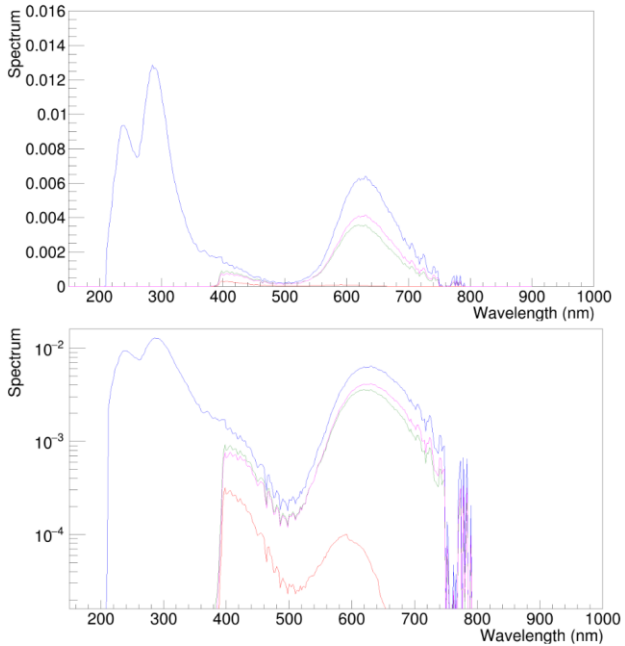
- Spectral measurement can be combined with QE and transparency to determine the actula photon per secondary electron we are sensitive to
- Further spectra analysis will come also for NID mixture

- LIME-CYGNO-04: Quest2 or Fusion, PMMA window, Bialkali PMT, 900 mbar

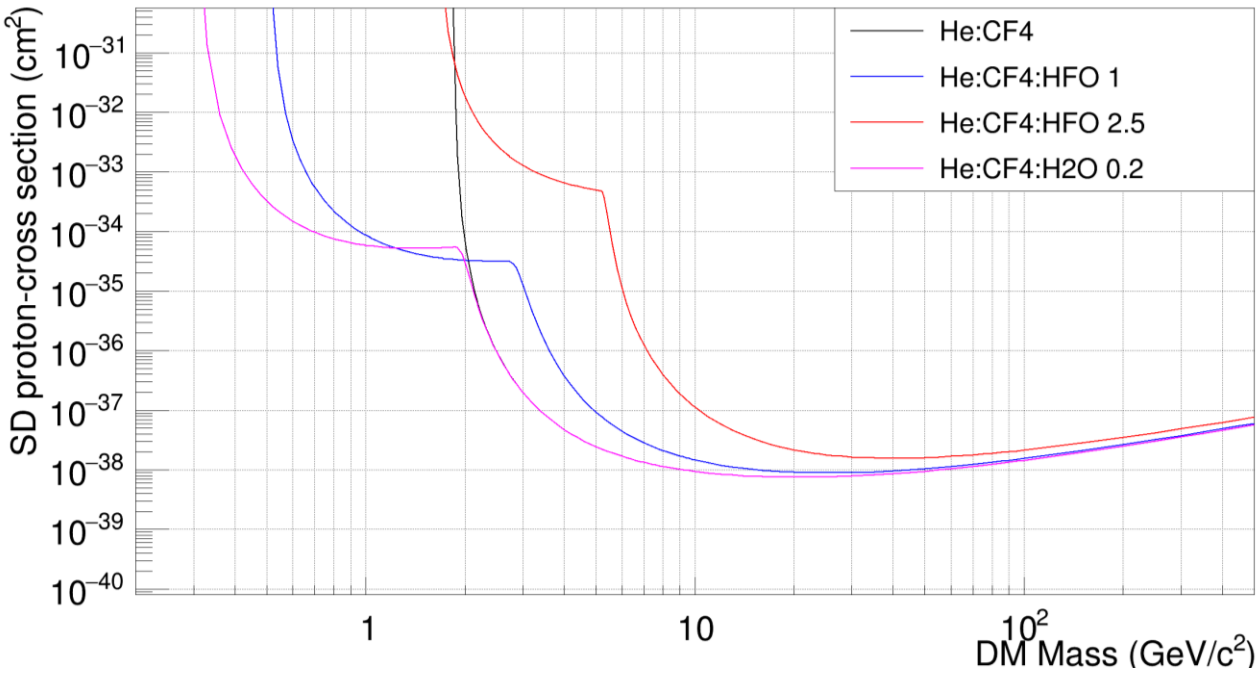


	Effective QE	Ph/e-
PMT	1.2%	0.0011
QUEST2	22.9%	0.022
Fusion	26.0%	0.025

HFO Measurements (D'Astolfo, Dho, Fiorina)

https://agenda.infn.it/event/46486/contributions/261464/attachments/133450/199498/27_03_25_LimitsHFO.pdf

- Limit estimation (CYGNO-04 1 year, 1200 events/year) with HFO content to estimate improvements lead to
  - Useless for SI
  - Useless for SD… but H_2O is not here.. Should be optimized for CYGNO-04



16% increase in limit for H_2O