

# Overview of Ongoing Analysis and Publications

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GUILLAUME GIROUX

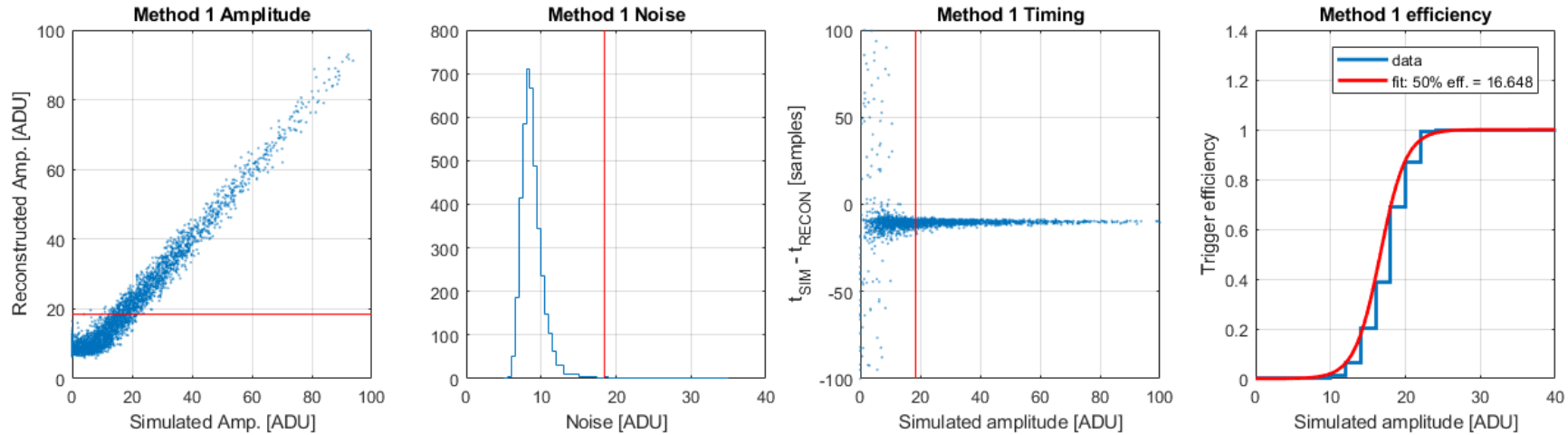
6<sup>TH</sup> NEWS-G COLLABORATION MEETING

LPSC GRENOBLE, JUNE 2019

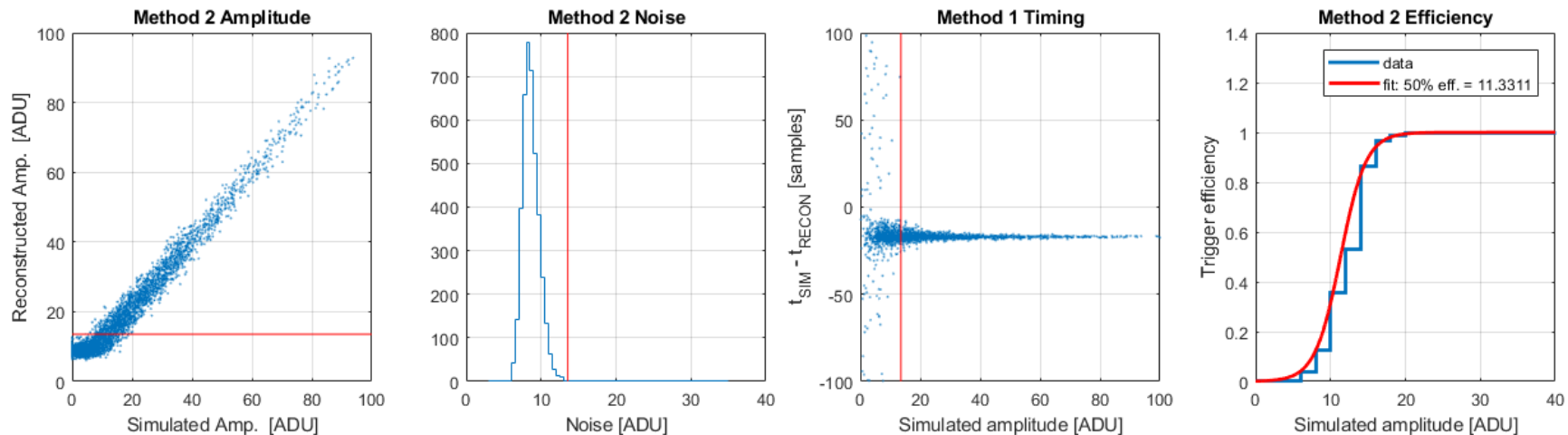
# Pulse Processing – Trigger (P. Lautridou, G. Giroux)

Searching for fast signal processing algorithms to maximize trigger efficiency

SMA + COMB  
a.k.a.  
Smoothing +  
trapezoidal  
N = 17

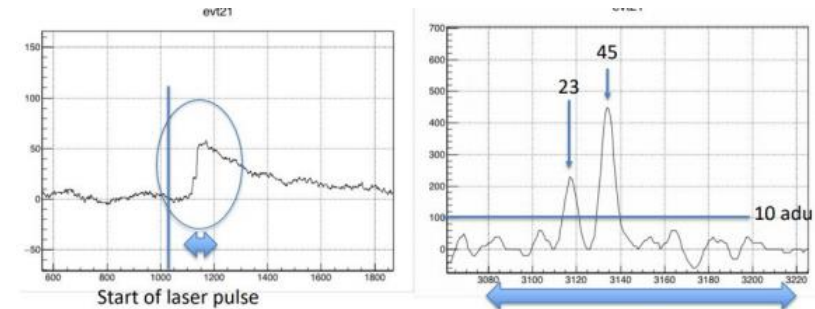
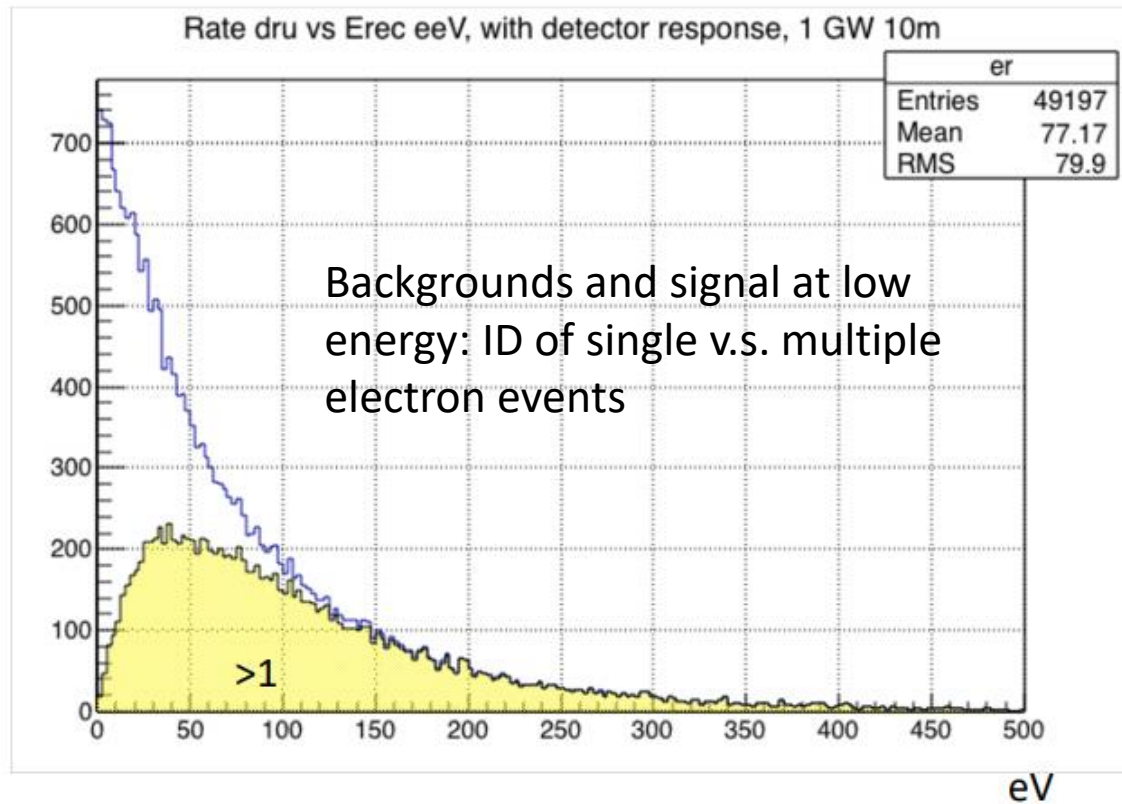


EMA + COMB  
N = 17



# Pulse Processing – Electron counting (P. Lautridou)

Similar algorithms well suited to search for 1, 2, 3 electron counting



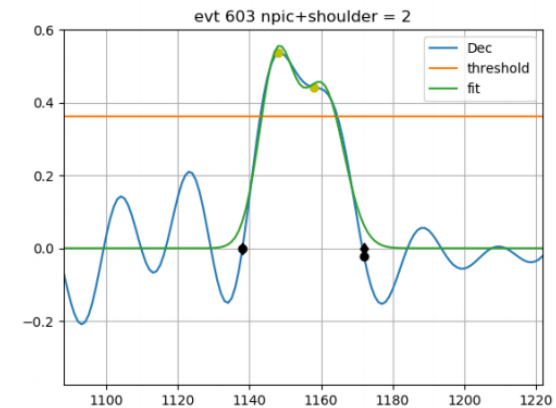
Evt 214

	213	214	2	2	2	64	0	40	17	0
apicf	1135	1152								
apobf	1132	1148								
ampof	23	45								
awidf	8	10								
awidm	8	8								
antmf	146	297								
antf	139	311								
adisc	0	0								
stat	17									

Time

Amplitude max

FWHM



# Physics Papers (short-to-medium term)

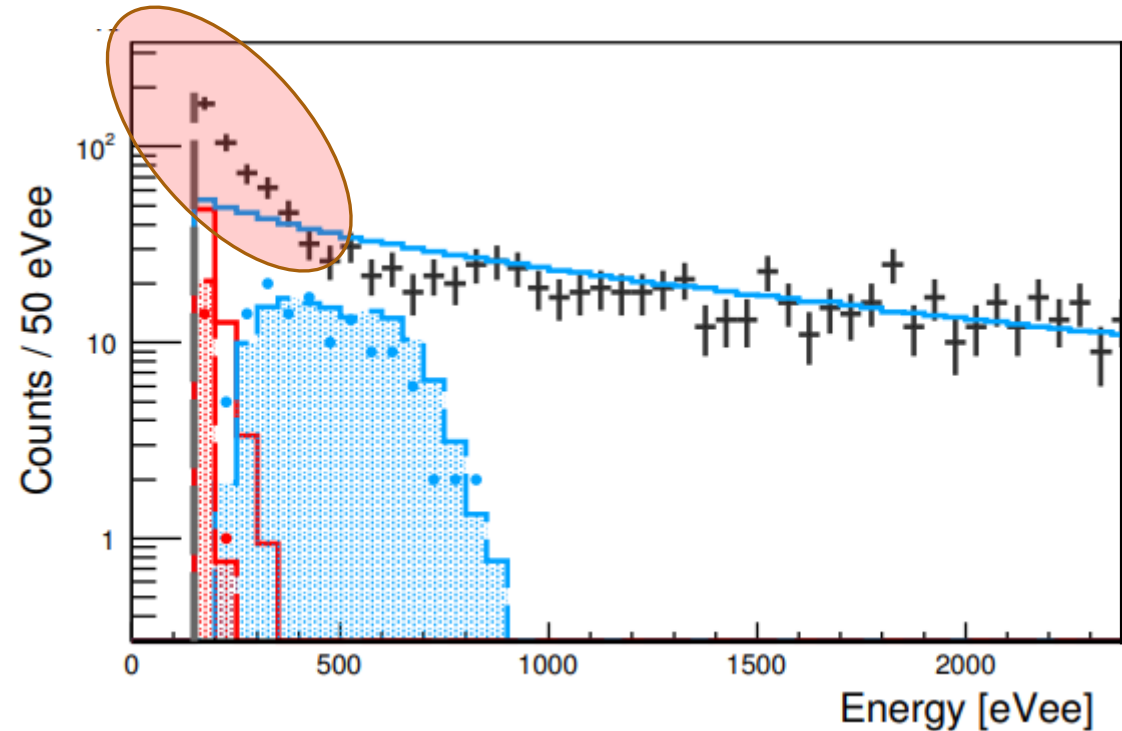
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1. Quenching Factor Measurements
  - a. At Grenoble [D. Santos]
  - b. At TUNL [M. Vidal]
2. WIMP search at LSM and SNOLAB
  - a. Spin independent
  - b. Spin dependent
  - c. Pure CH<sub>4</sub>
3. Other Physics
  - a. KK axions [P. Vazquez De Sola]
  - b. SEDINE low energy background re-analysis [D. Durnford, A. Rolland]
4. Instrumentation
  - a. Sensors
  - b. NEWS-G SNOLAB detector (?)
  - c. Trigger, signal processing, etc. [P. Lautridou, G. Giroux]

# SEDINE re-analysis [D. Durnford, A. Rolland]

## SEDINE Low-Energy Background(s)

- Conventional Analysis [D. Durnford]
  - Background subtraction
  - Event by event - Pulse shape
- Machine Learning [A. Rolland]
  - Classification
  - ?

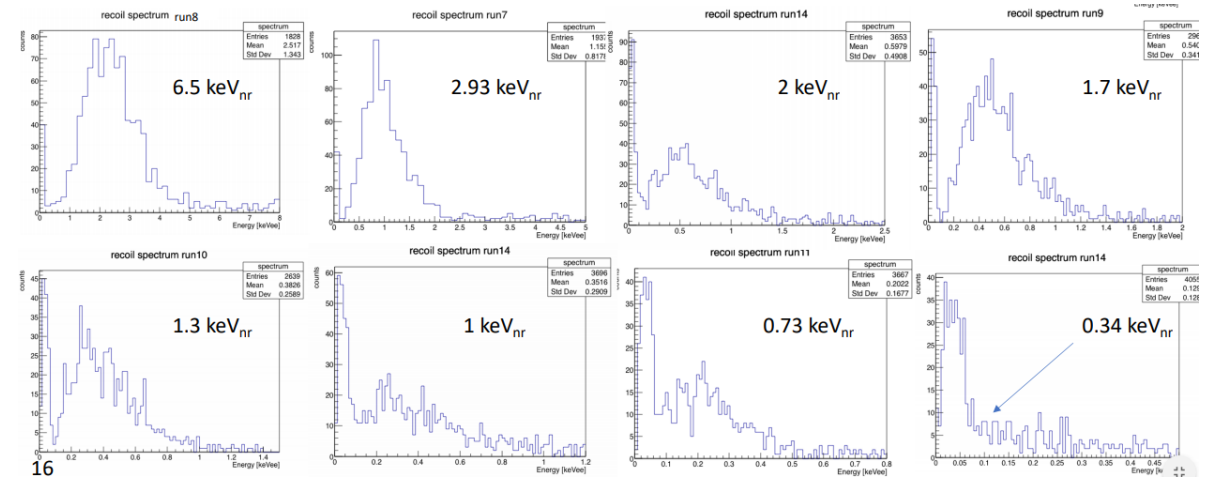
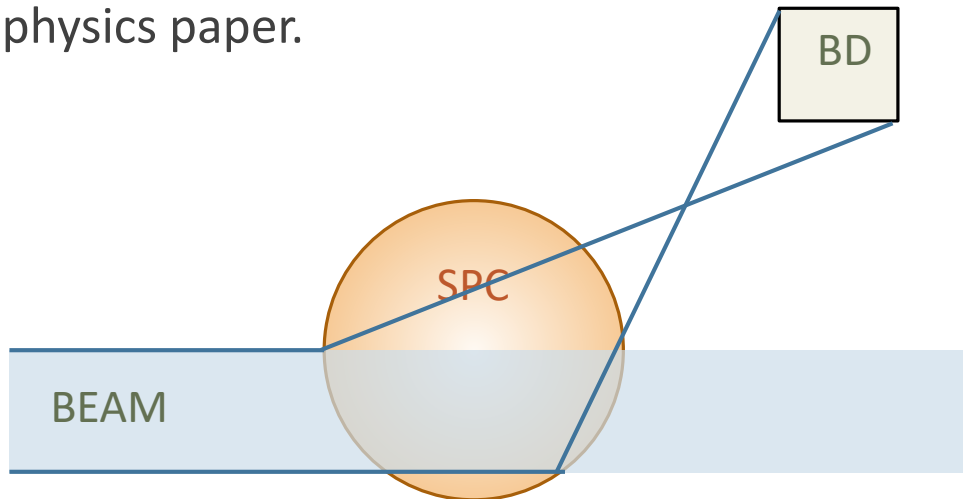


# Quenching Factor at TUNL [M. Vidal]

High quality data taken at TUNL down to 0.3 keV<sub>nr</sub>.

Current analysis challenge is the simulation of the expected response.

Ideally published in companion with first physics paper.



## Conclusion

- 2<sup>nd</sup> estimate of QF for 2018 campaign
- 2019 campaign down to single electron sensitivity: 0.34 keV<sub>nr</sub>
- 12 energy points: 0.34 to 27 keV<sub>nr</sub> in neon gas
- Develop a model for the recoils peak shape
- Worked with Dan to implement the COM-Poisson stat to my model
- Implement model peak shape to extract QF using unbinned likelihood
- Tune different processing parameters: impact on energy spectra
- Tune selection cuts: impact on energy spectra
- Study of systematic uncertainties

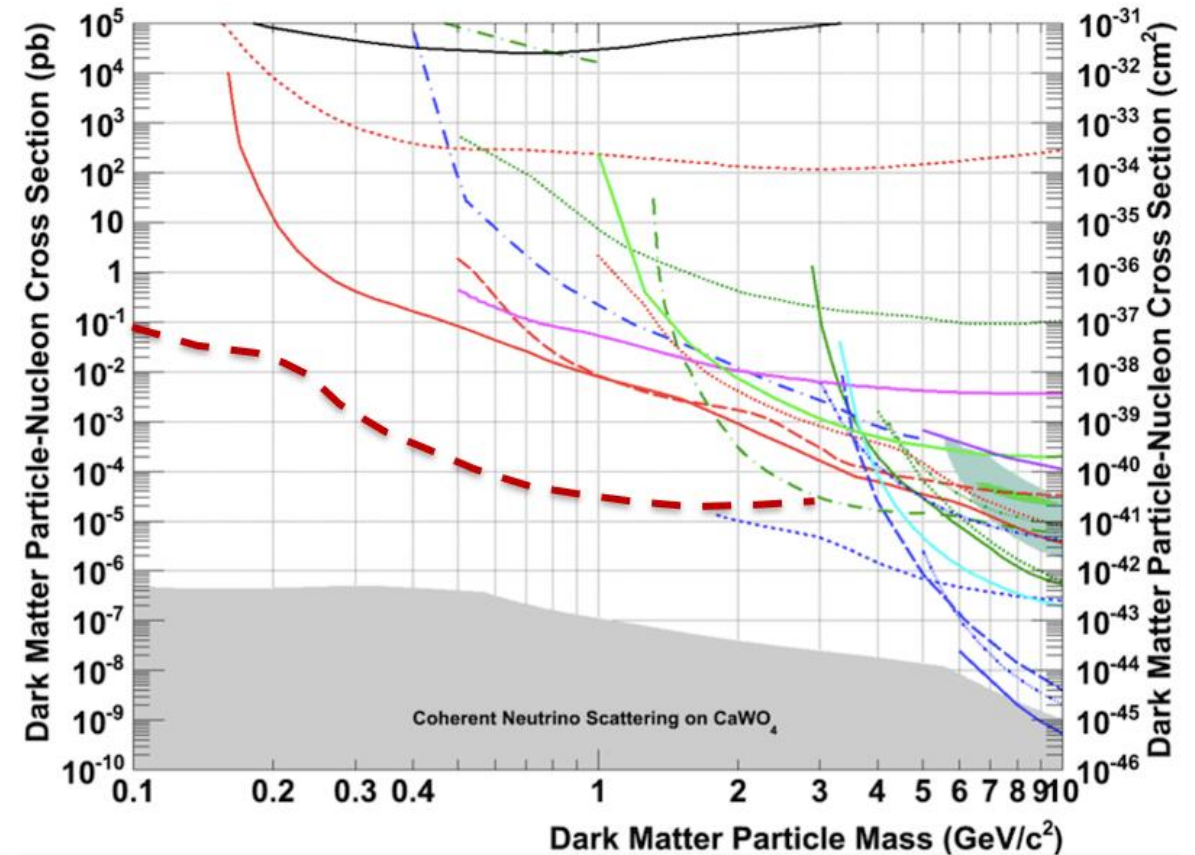
M. Vidal,  
June 2019

# Sensitivity Projection and Limits Calculations [Dan Durnford]

Dan has a “Sensitivity Projections” paper in advanced stage of preparation.

We may be close to have physics results to justify this publication.

A lot of this paper can be reused in our first physics paper(s)



# Other analysis

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## Space charge effects (Kostas, R. Ward)

- Simulations and LSM data

## Simulations (A. Brossard, S. Langrock, et al)

- Electric field (comsol), electron transport (magboltz), signal generation
- Backgrounds (Geant4: shielding,  $^{210}\text{Pb}$ , Cosmogenics, etc)

## Radon removal efficiency (A. Rolland, A. Brossard)

## New sensors

- Sensors with grid
- ACHINOS multi-channel: understanding the response is important to guide operation parameters

## Monitoring tools

- Online data quality tools, plots