Testing the performance of the TRACE detector

Identification of A~10 mass ions at low kinetic energy, by PSA analysis

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Outline

- Scientific motivation
- Experimental setup
- Results of the particles identification analysis

Scientific motivation

- Particle spectroscopy of unbound states in light nuclei

O

N

C

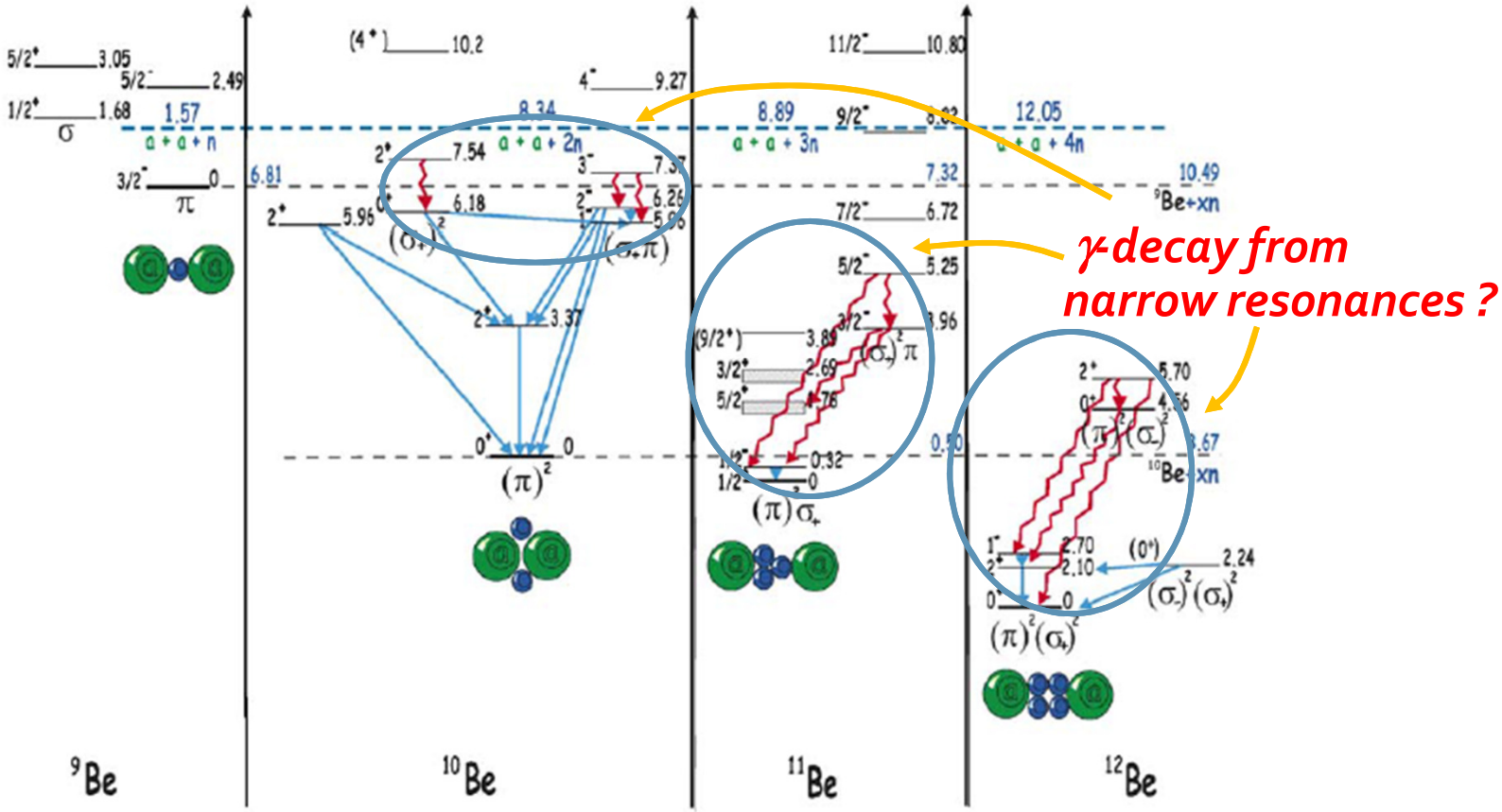
B

Be

Example of the physics case: neutron-rich Be isotopes

W. von Oertzen et al. / Physics Reports 432 (2006) 43–113

W. von Oertzen, M. Freer, Y. Kanada-En'yo, …



Example:

1n-3n transfer in the **^{18}O**(10-20 MeV/A) **+ ^{9}Be reaction**

^{10}Be, ^{11}Be, ^{12}Be products going backward and having very low kinetic energy

Reaction and detection

- To produce low energy Li, Be, B, C …. fragments we used:.

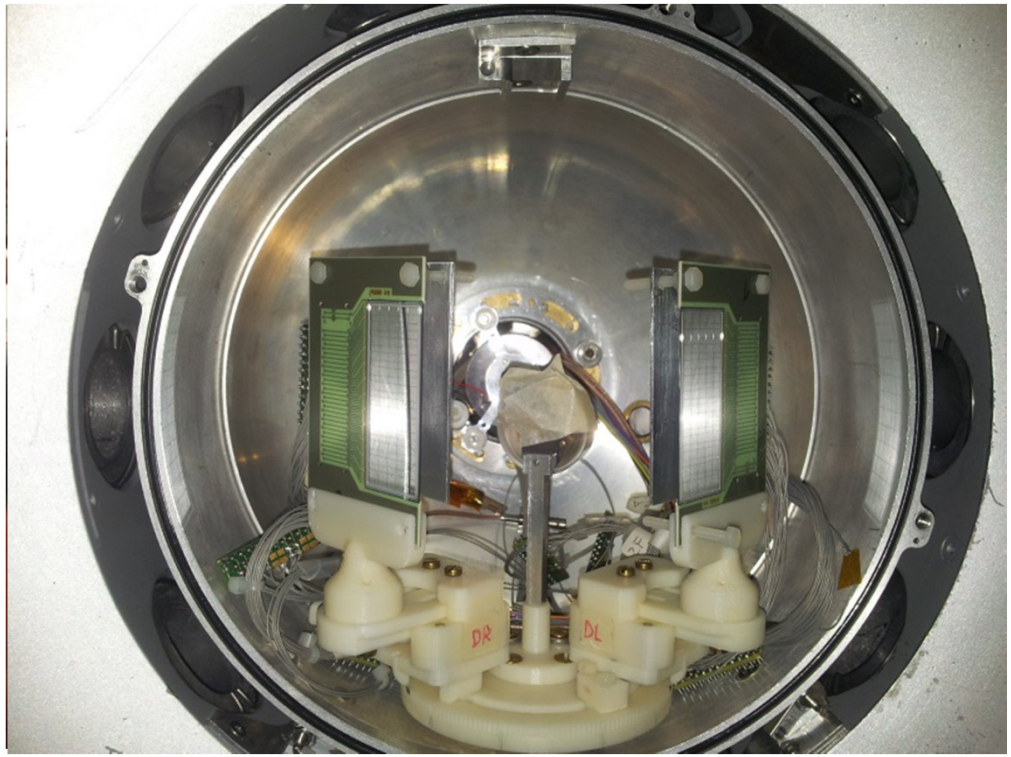
^{37}Cl beam (186 MeV, 1pnA) + ^{12}C target

- The nuclei of interest, target-like products (Li, Be, B, C …) of mass A~10, are scattered at ~40°-60°. The kinetic energy of these products ranges from a few MeV to a few tens of MeV.

- Measurements of the energy, position, mass and charge: Pulse Shape Analysis of the signals from the TRACE detector

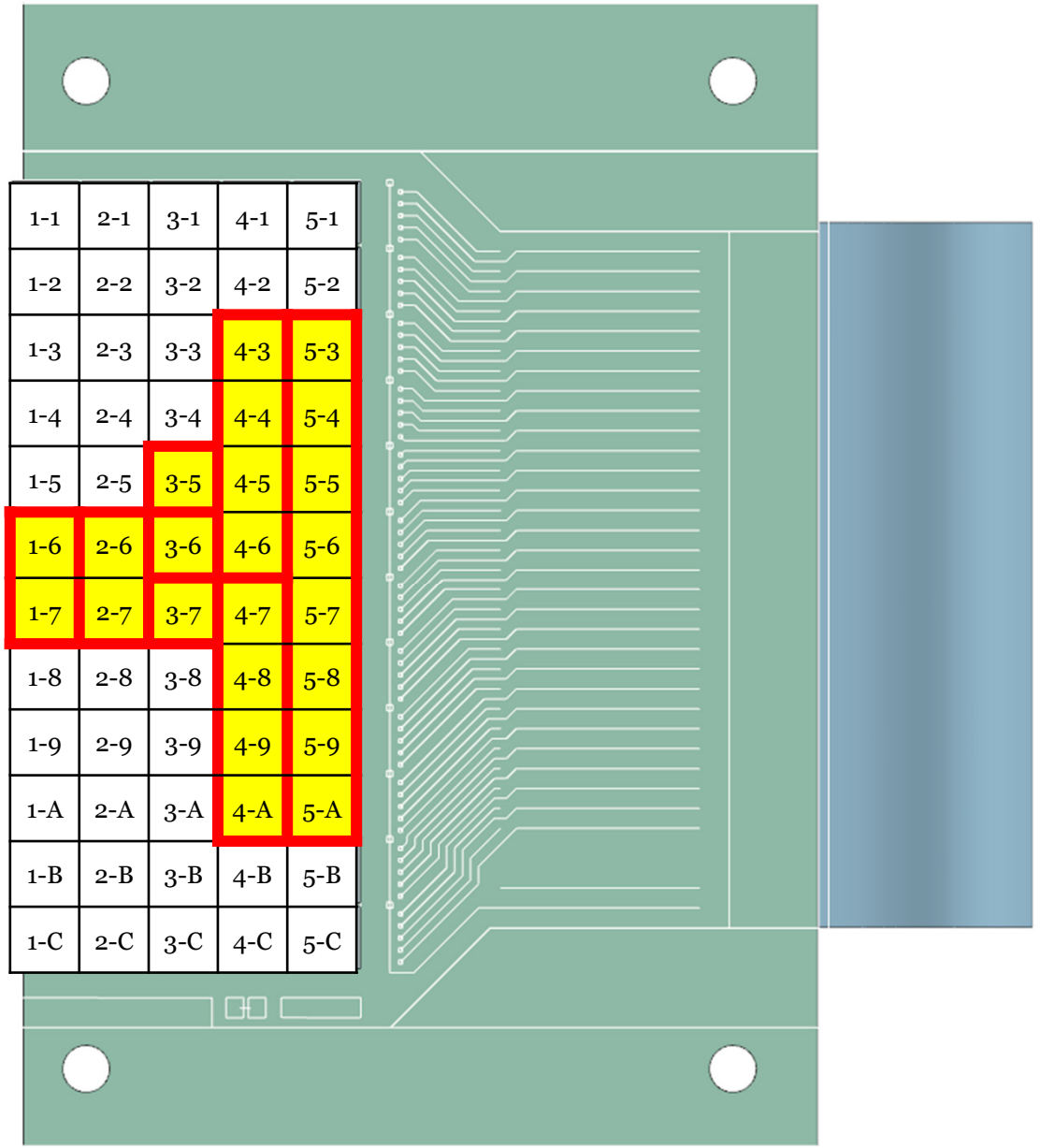
Experimental setup

- TRACE
- GALILEO
- LaBr
- NWall

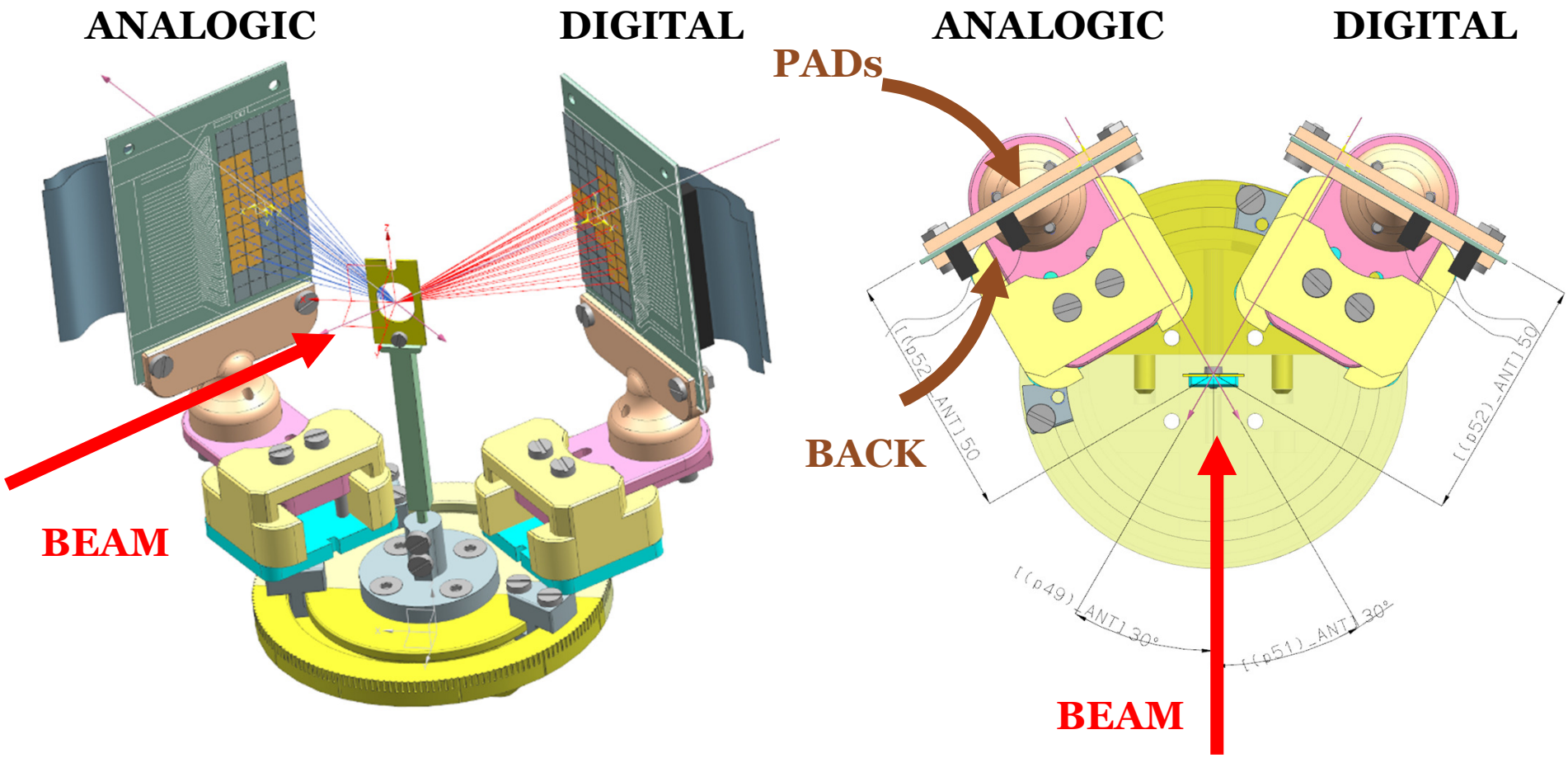


Experimental setup – TRACE

- 8 groups of pads were connected
- The angular range ~30°-50°
- The back was the trigger

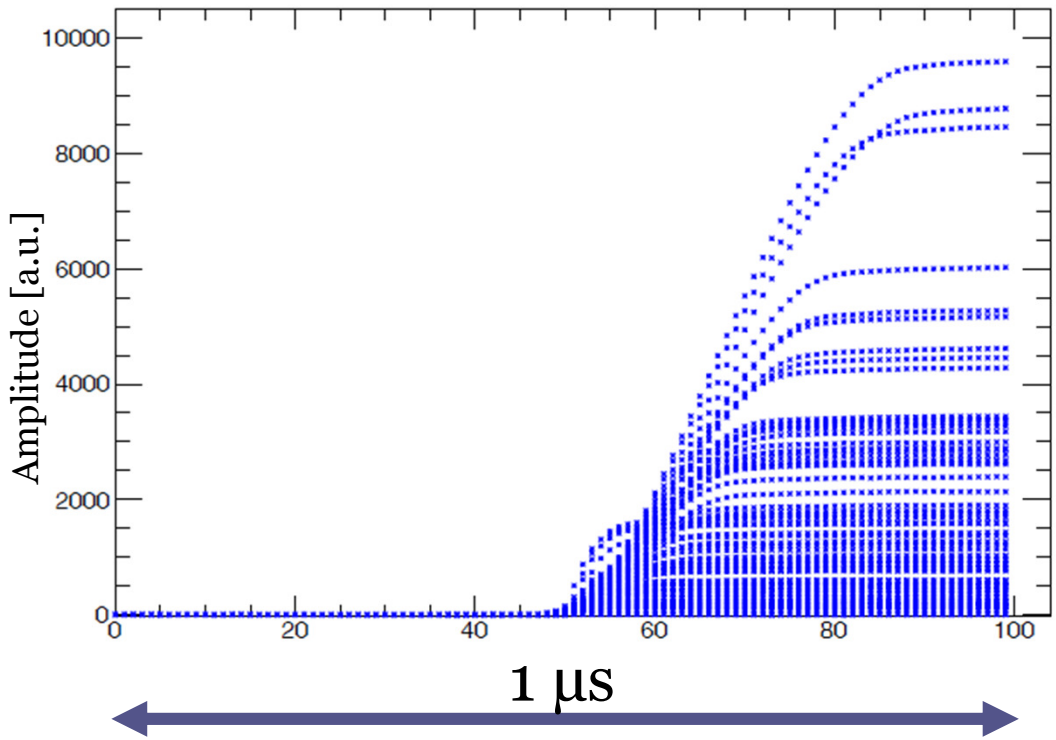


Experimental setup – TRACE

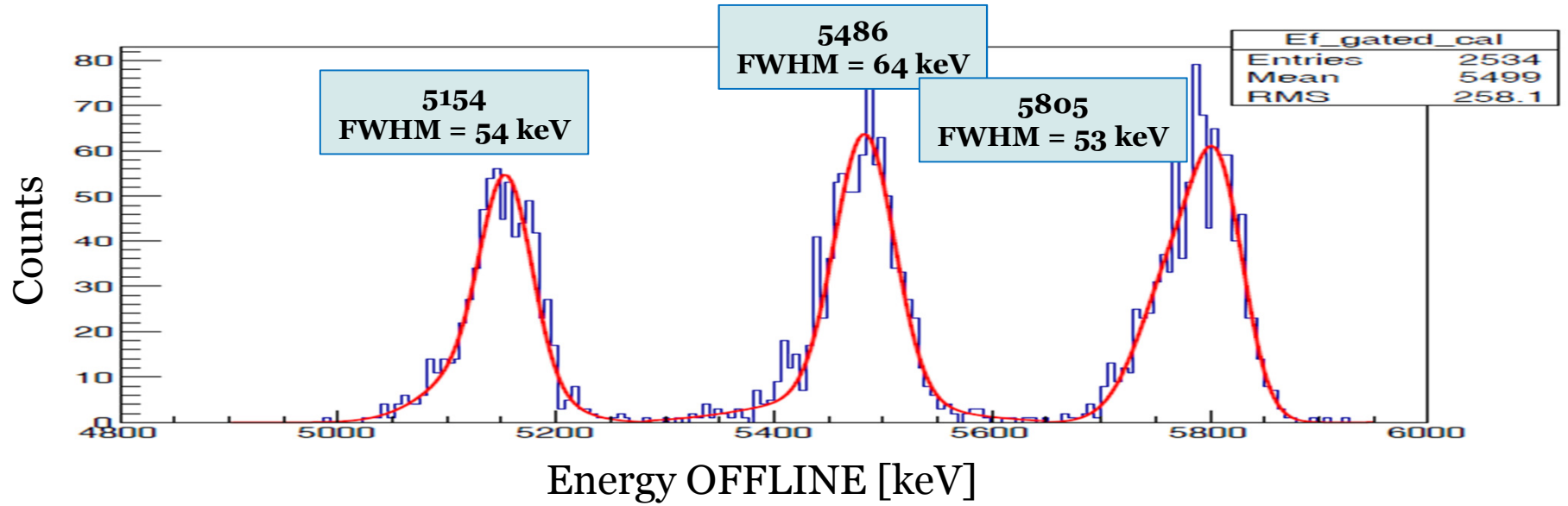


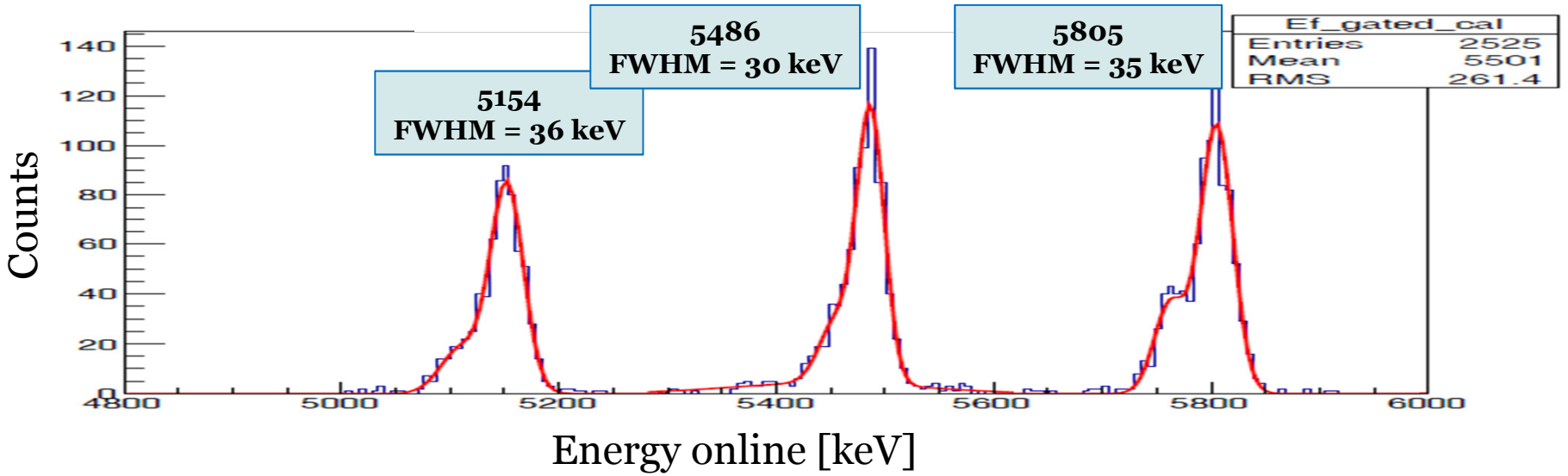
TRACE signals

- Signal measurement at every 10 ns
- Energy „BACK” and „PAD”
- Imax from the derivative
- Rise time

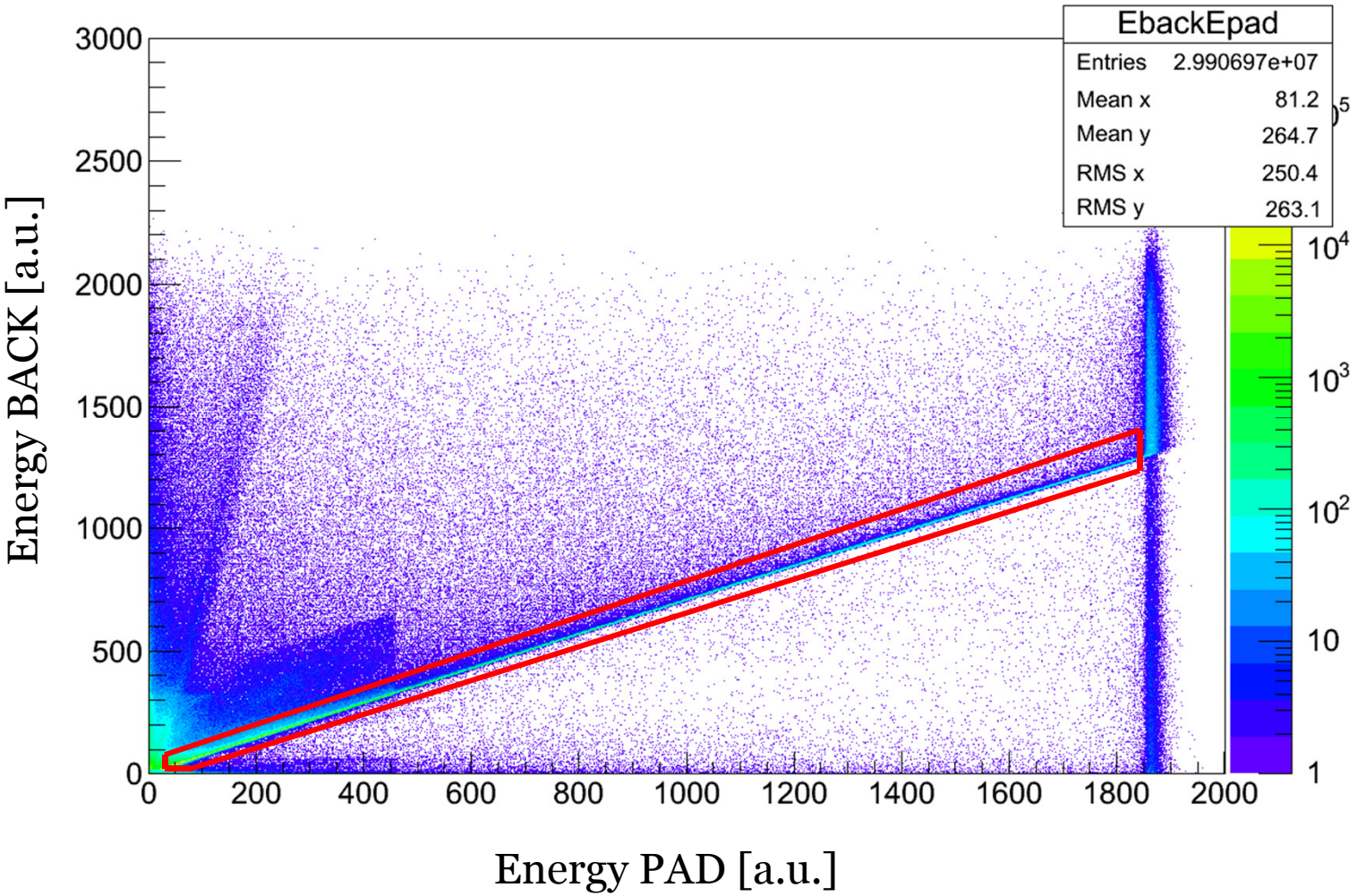


TRACE signals – „online” and „offline” energy resolution

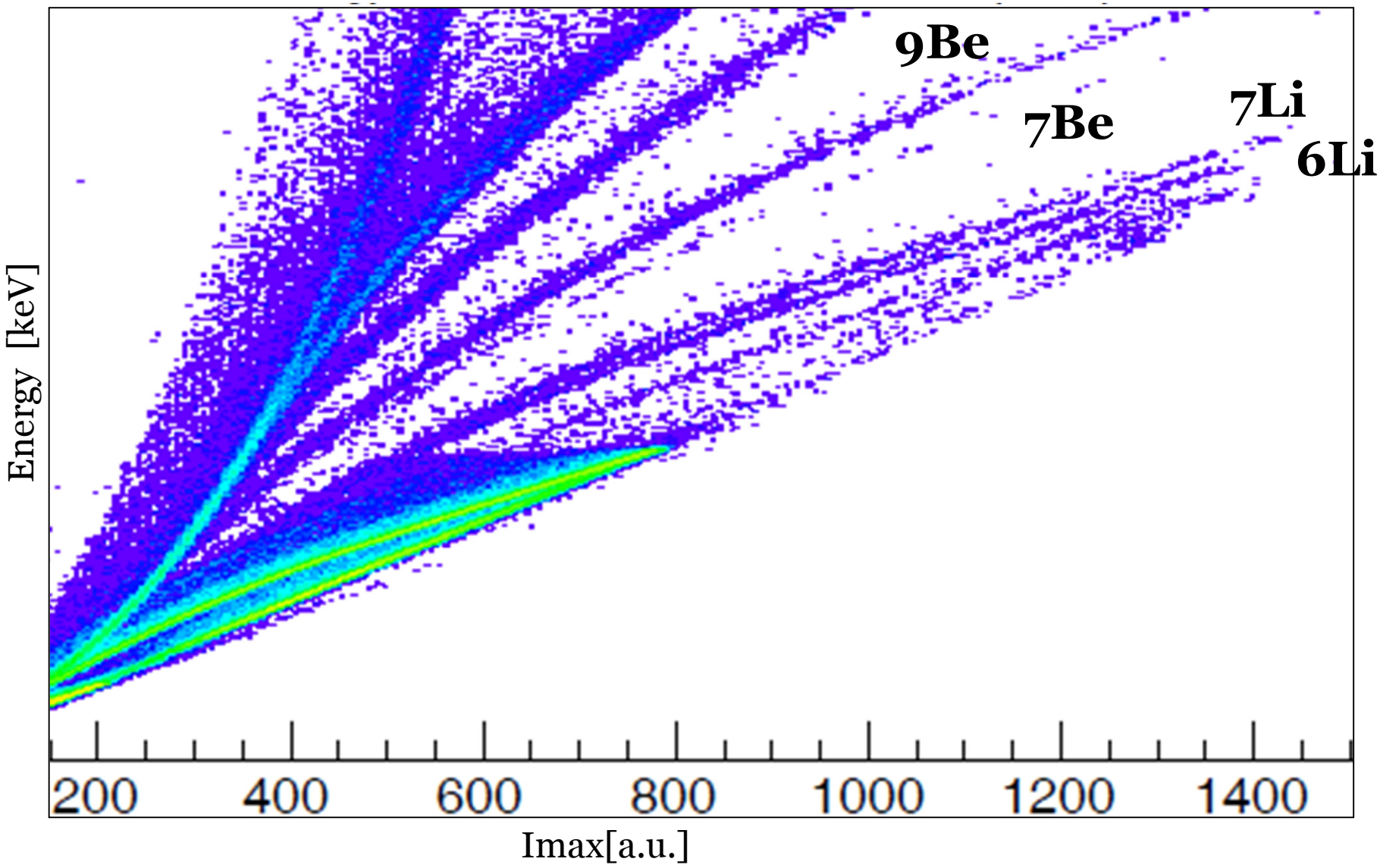




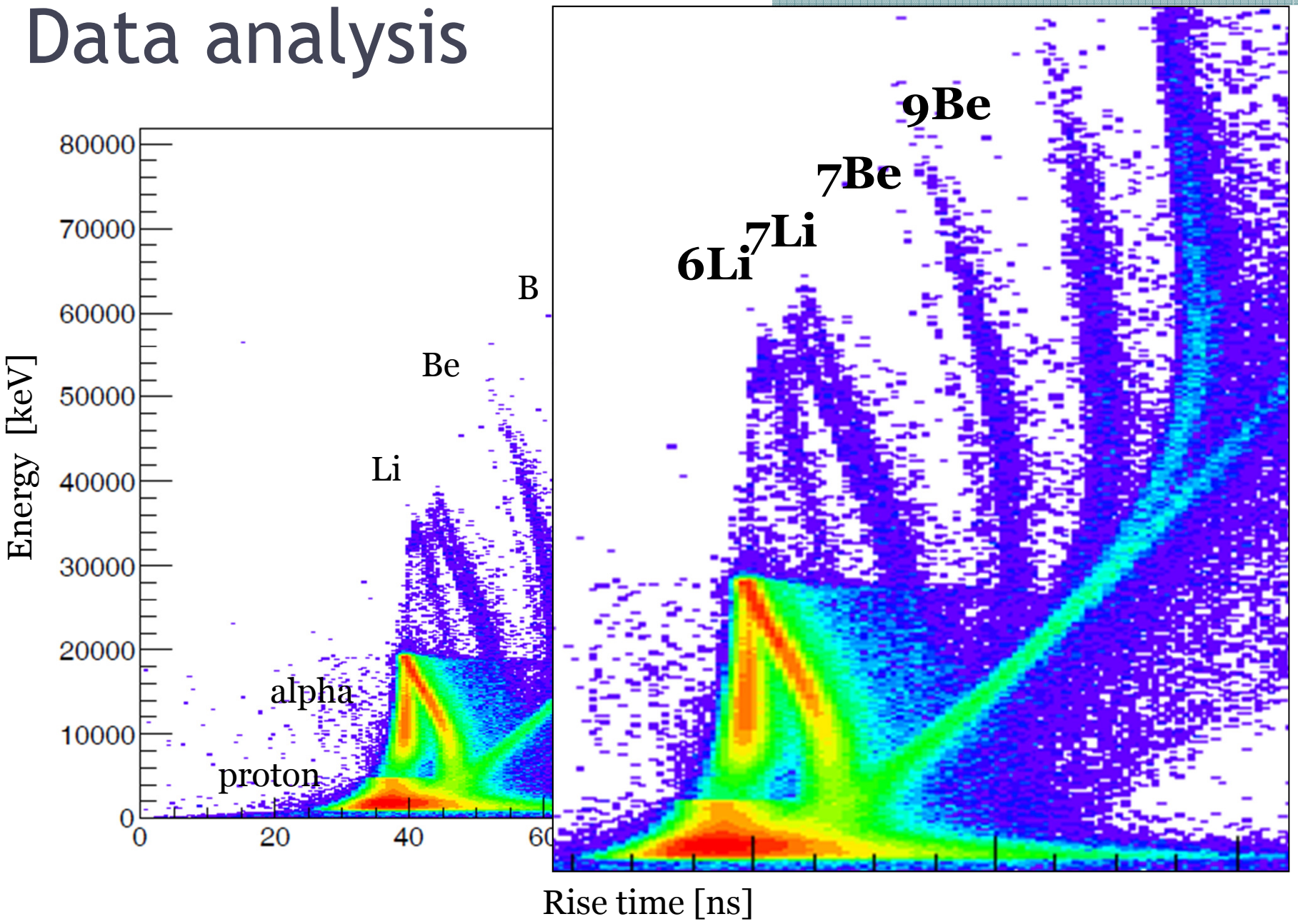
Data analysis



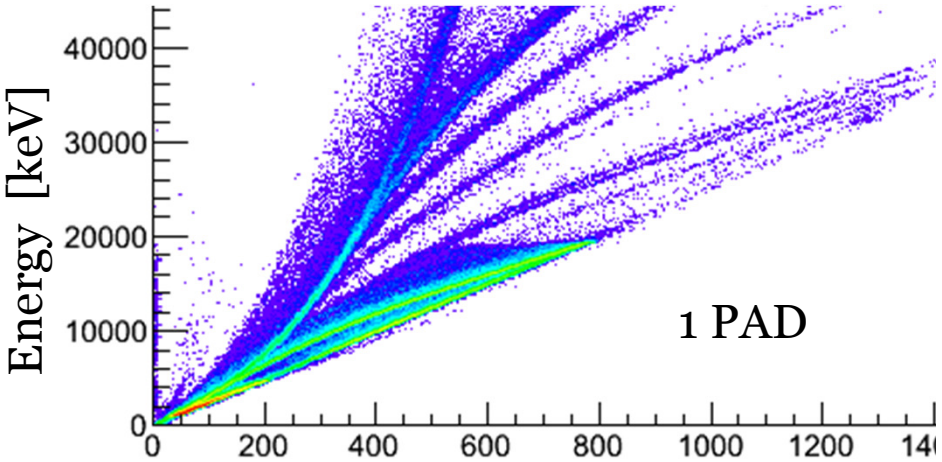
Data analysis

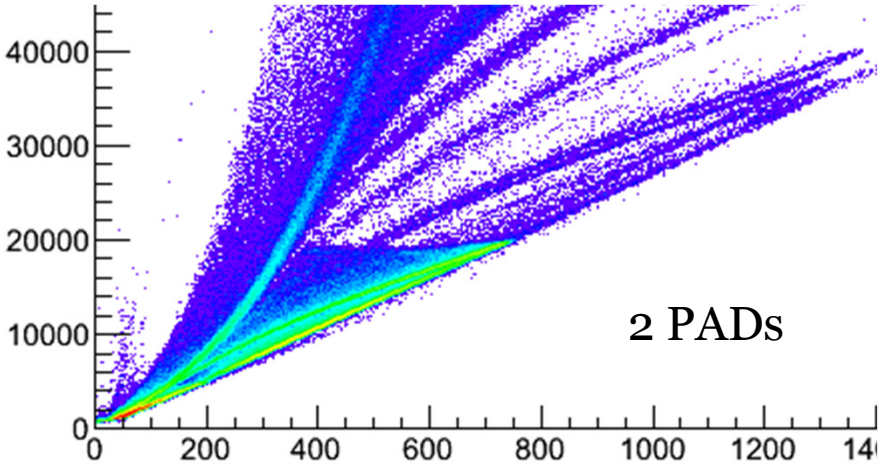


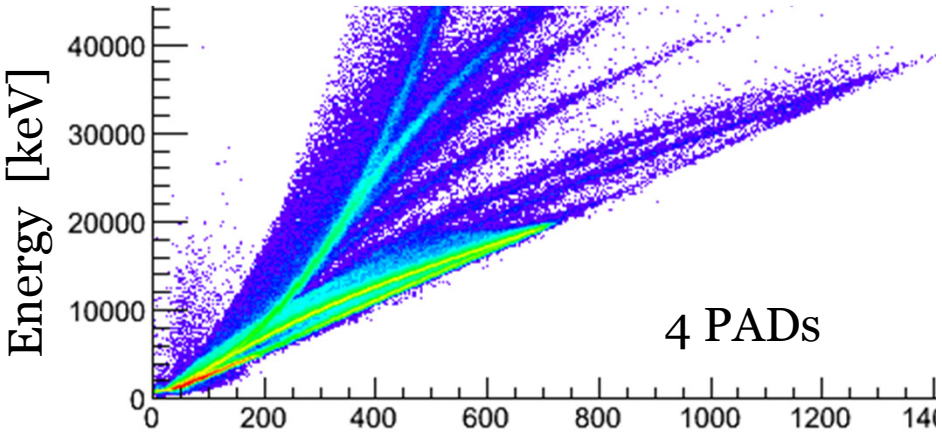
Data analysis

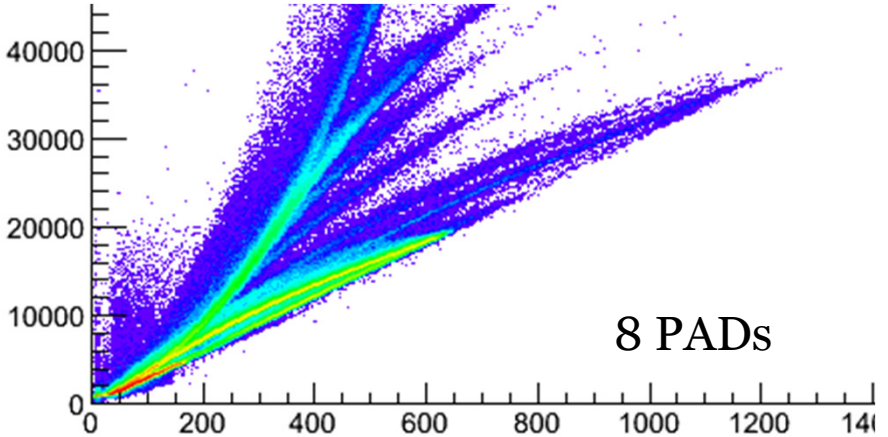


Data analysis

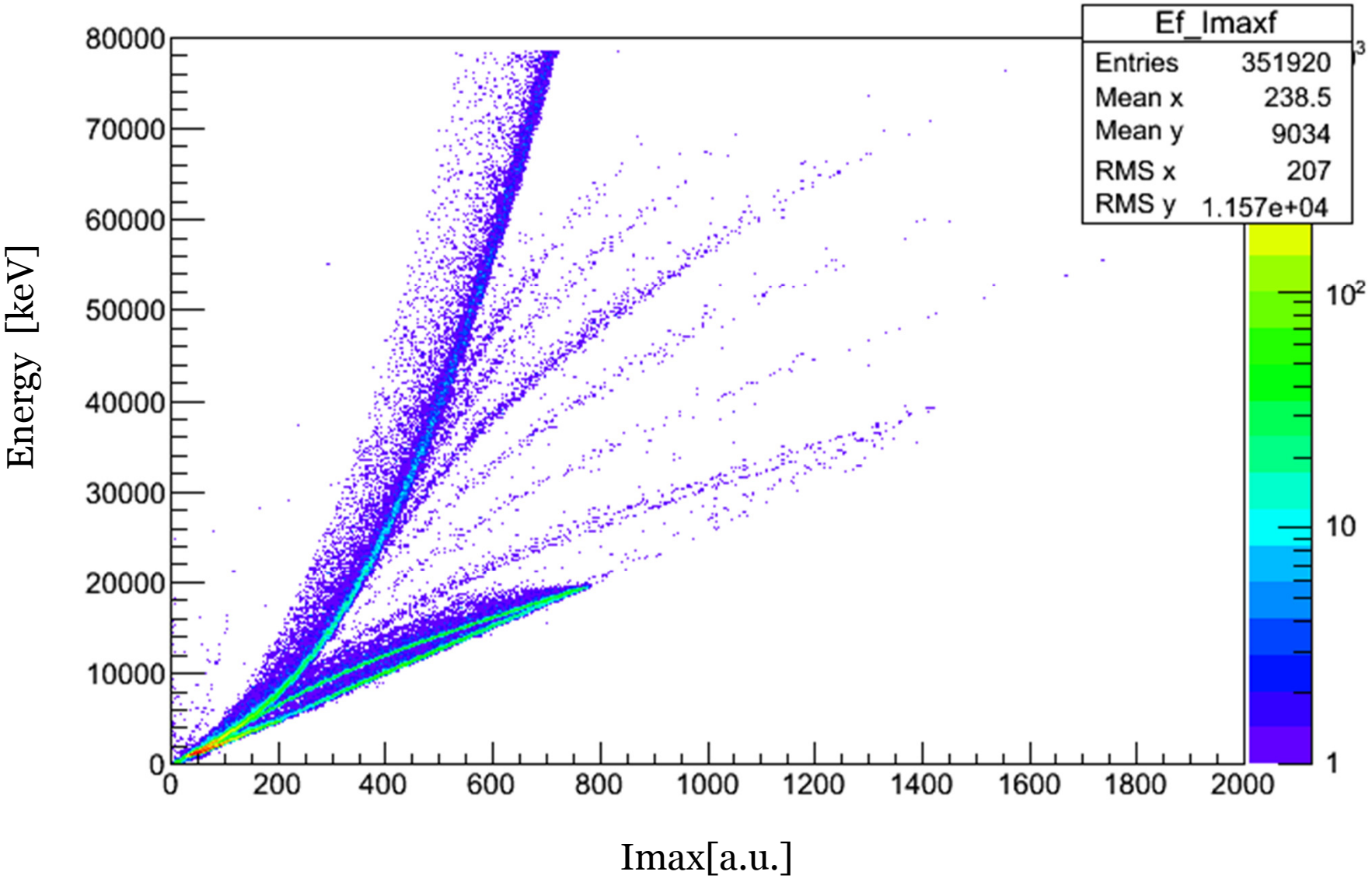








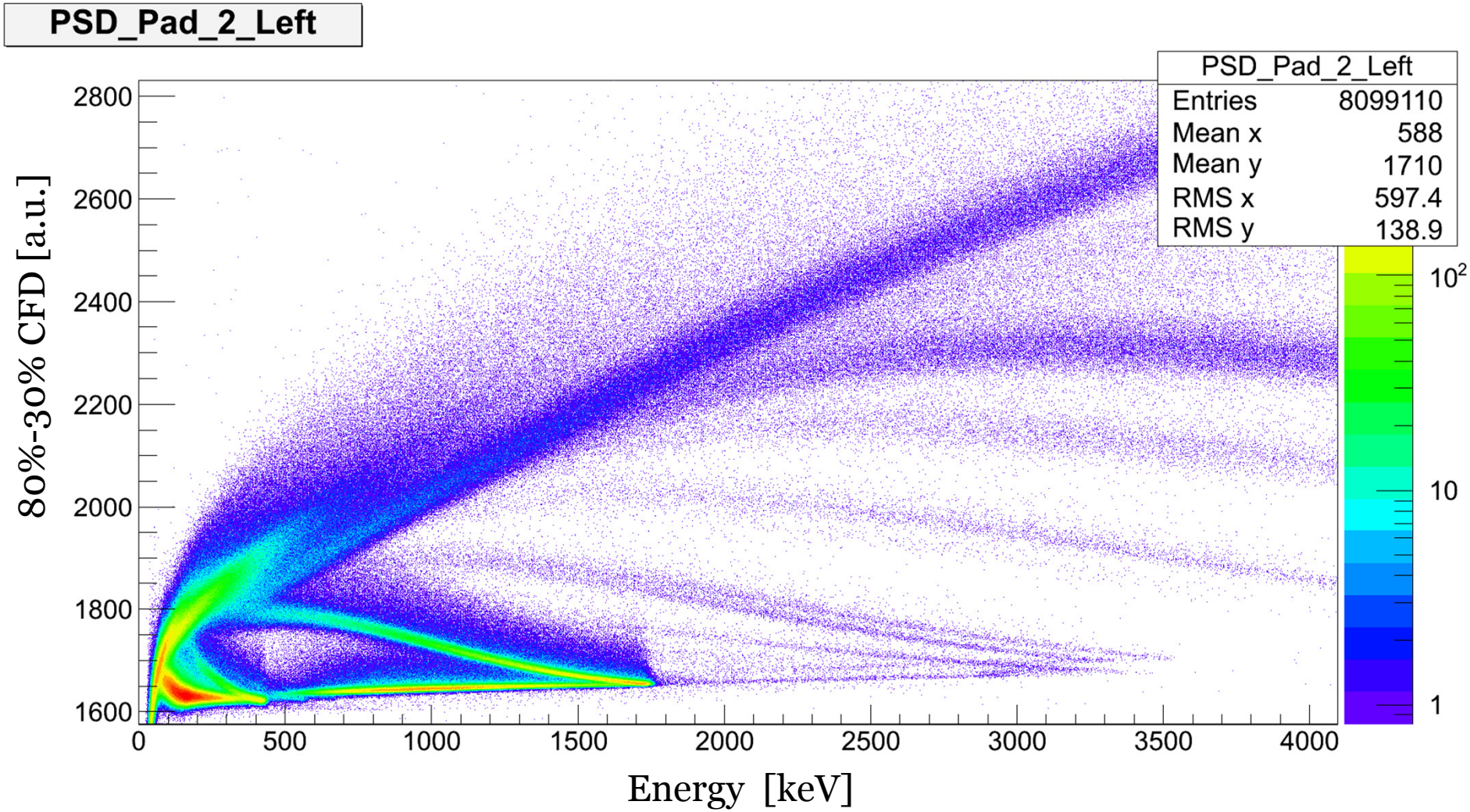
37Cl on 7Li target



Data analysis – analog acquisition

- Preamplifier signal from a single pad or group of pads were carried to a MegAmp module
- Information about energy
- Information about time: 30% and 80% CFD
- Trigger was the OR of the 80% CFD outputs

Data analysis – analog acquisition



S. Brambilla, INFN Milano

Summary

- Separation in A and in Z
- Separation in Z down to ~20 MeV for Li and Be isotopes
- Reading from 1 or 2 pads at most

Collaboration

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B. Fornal, M. Ciemała
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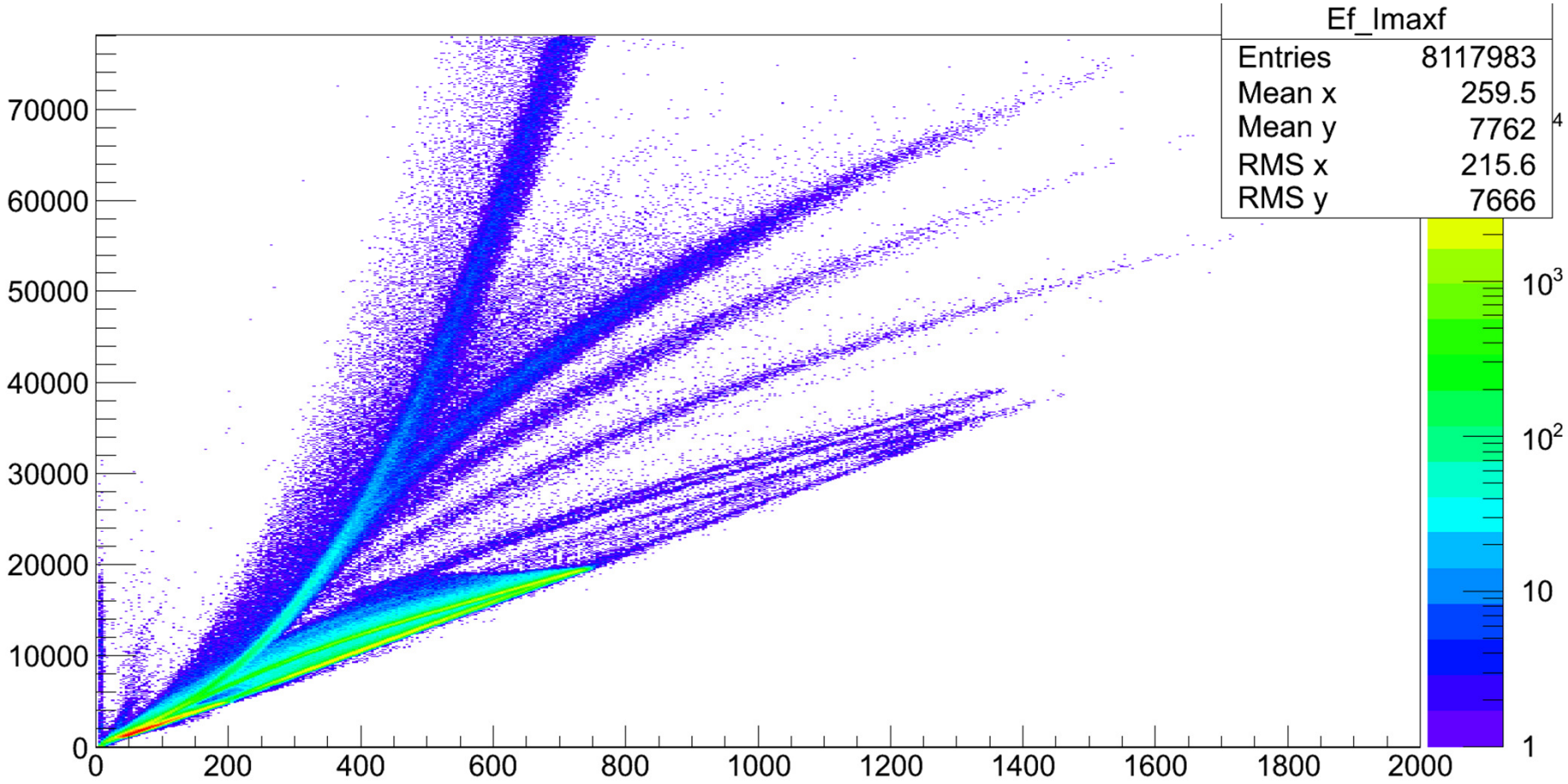
D. Mengoni, D. Bazzacco
(Dipartamento di Fisica e Asstronomia dell'Universita and INFN Sezione di Padova, Padova, Italy)

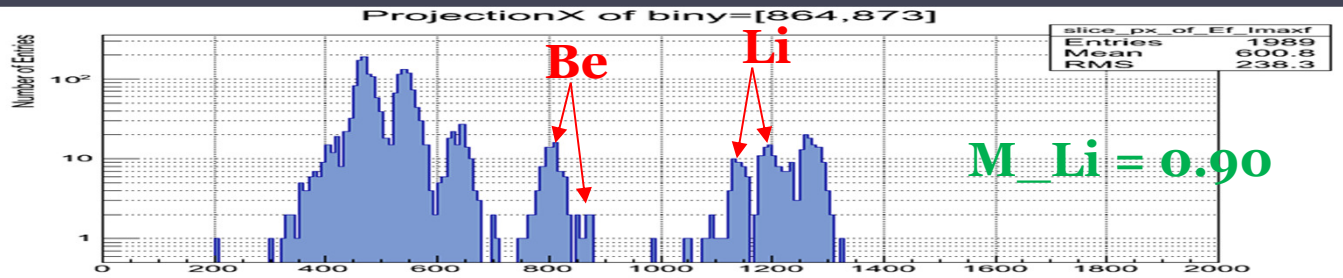
Jose Duenas Diaz
(Universidad de Huelva, Dpto. Ingeniería Eléctrica y Térmica, Huelva, Spain)

Thank you for your attention!

DIGITAL

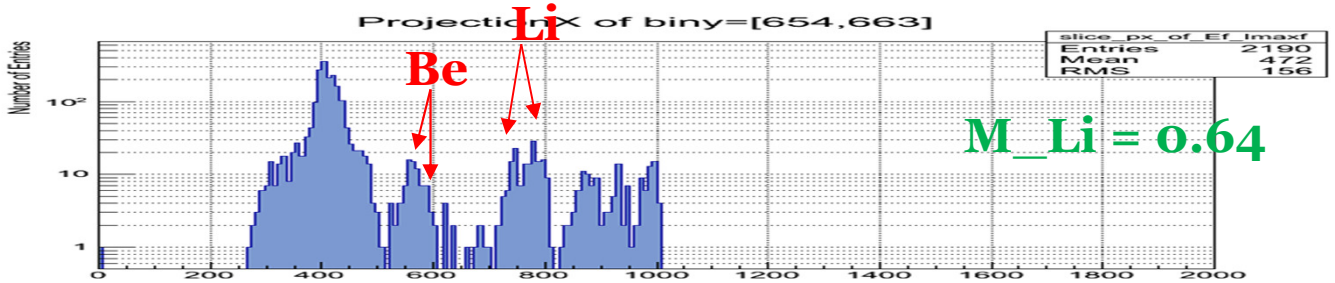
12C 45V 13h **(2PADs)**





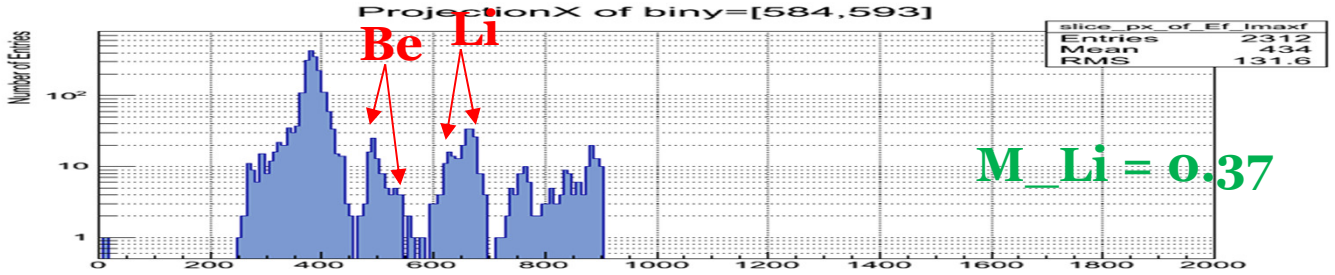
M_Li = 0.90

34.52-34.92 MeV



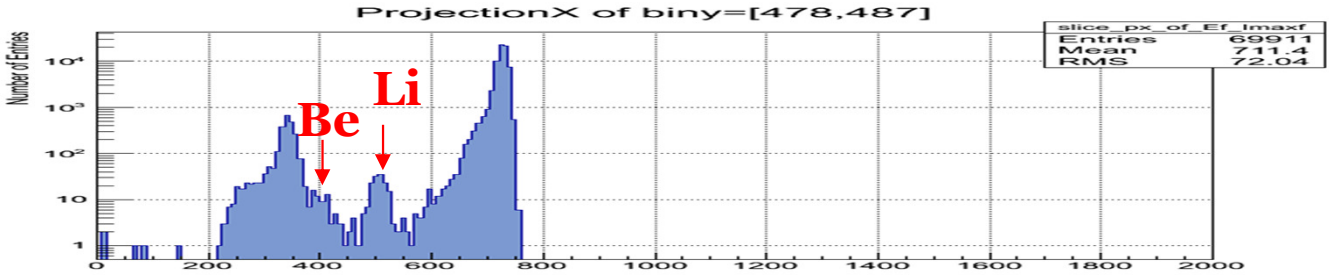
M_Li = 0.64

26.12-26.52 MeV



M_Li = 0.37

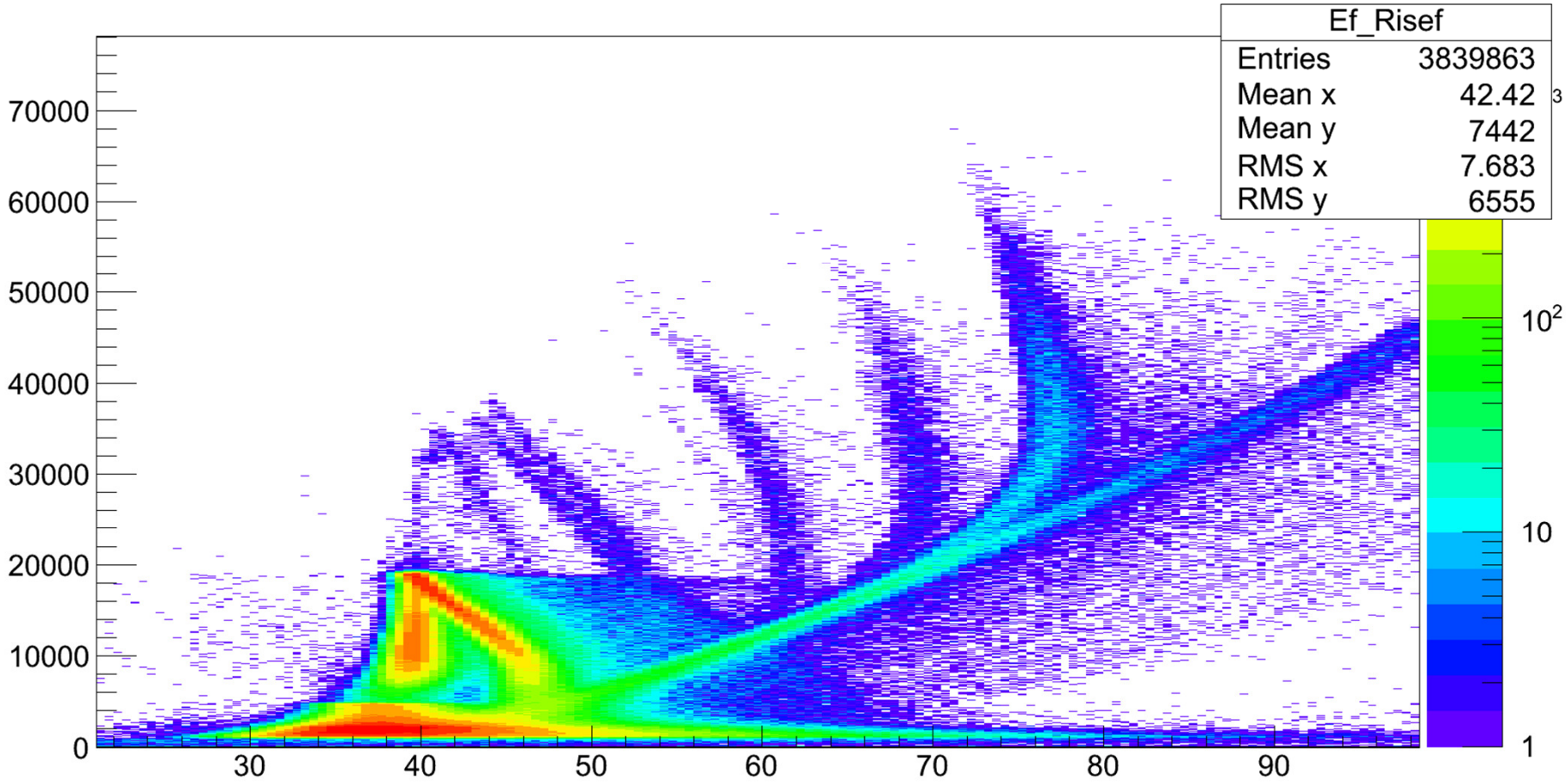
23.32-23.72 MeV

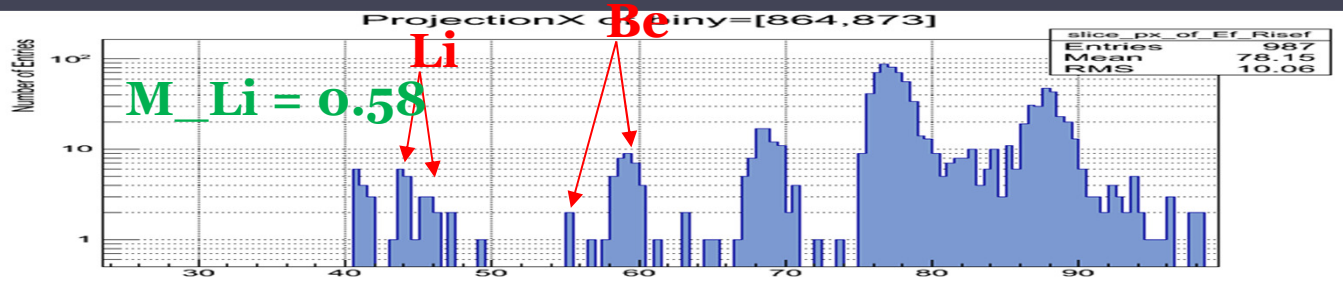


19.08-19.48 MeV

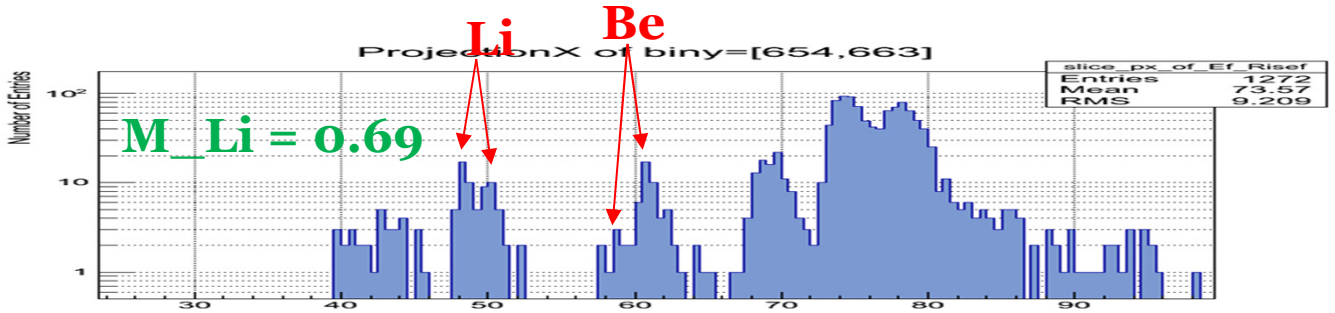
DIGITAL

12C 45V 13h **(2PADs)**

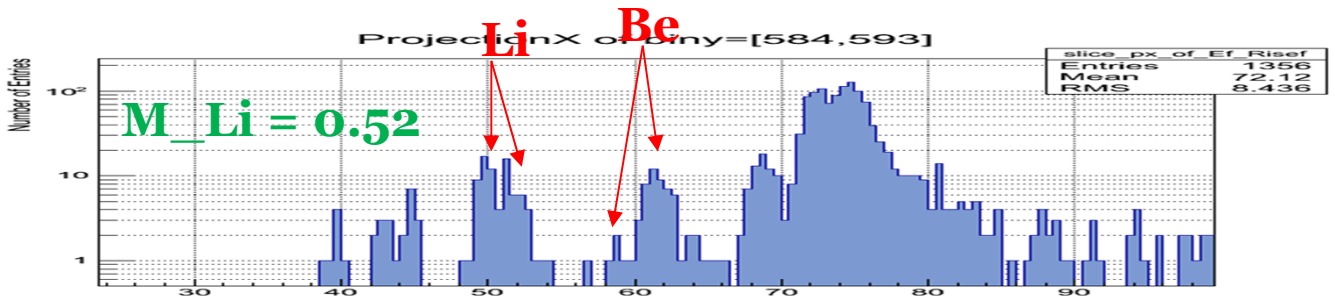




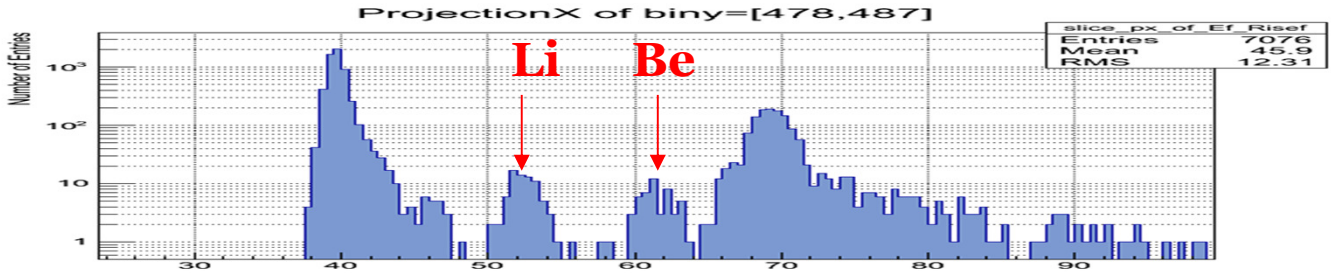
34.52-34.92 MeV



26.12-26.52 MeV



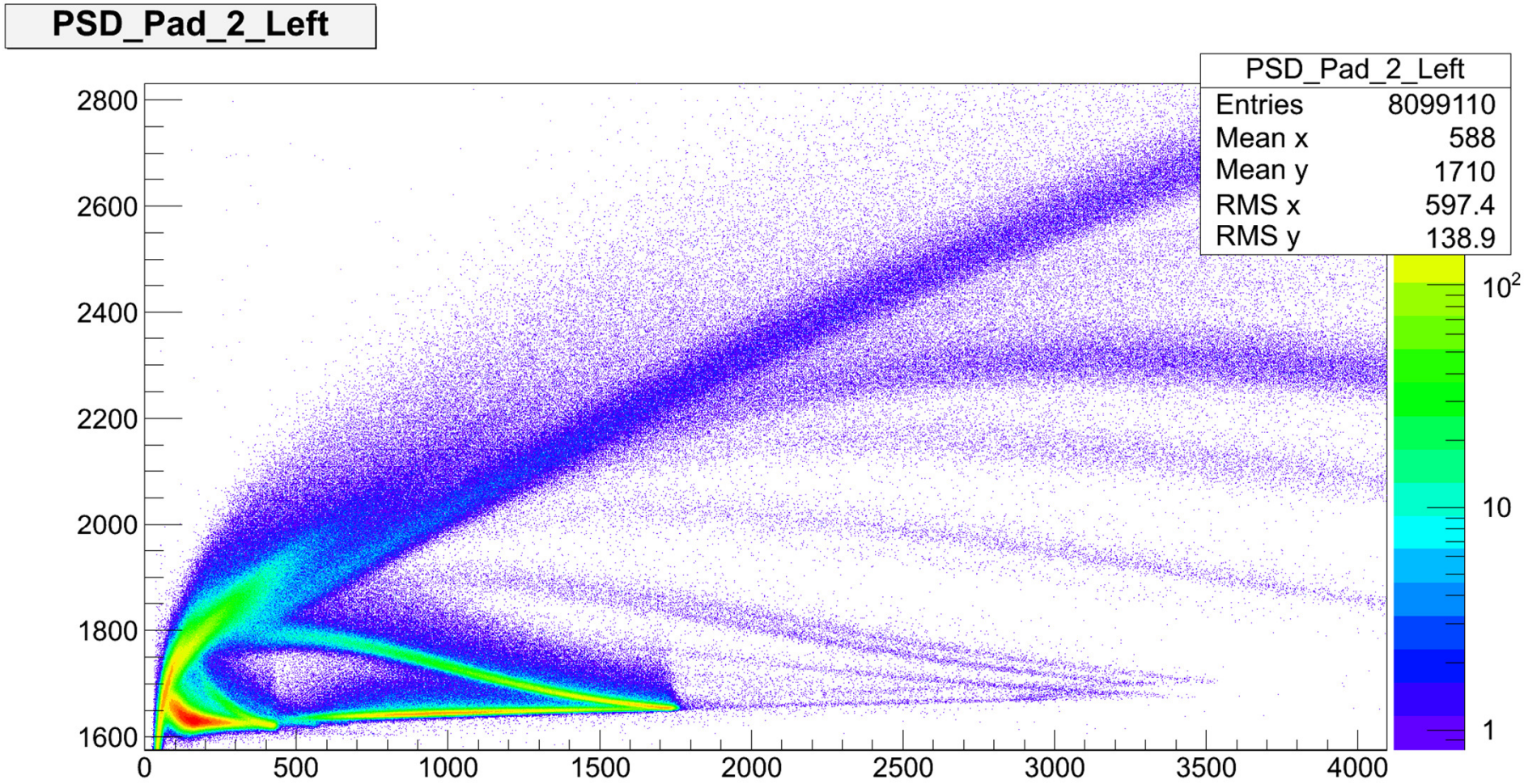
23.32-23.72 MeV



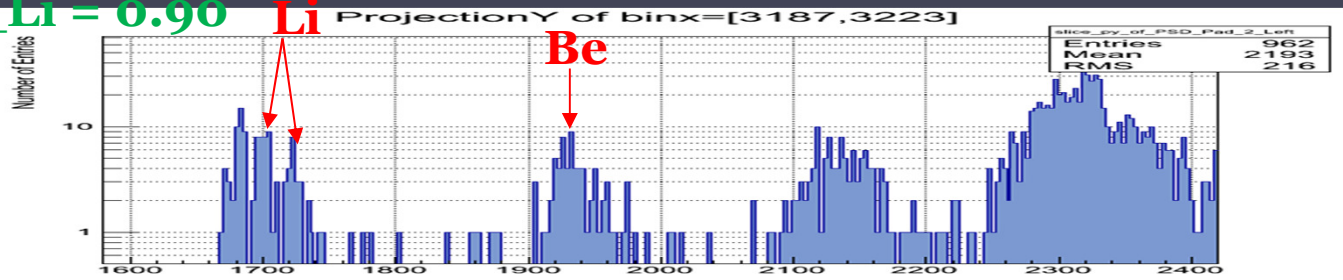
19.08-19.48 MeV

ANALOG

12C 38V 13h **(2PADs)**

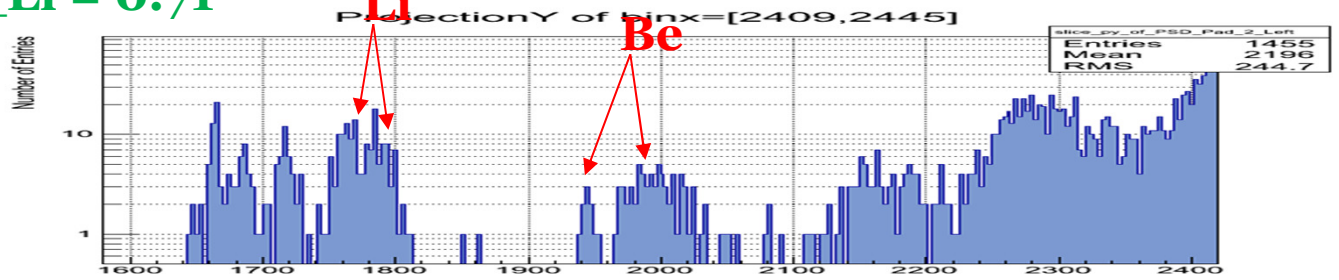


M_Li = 0.90



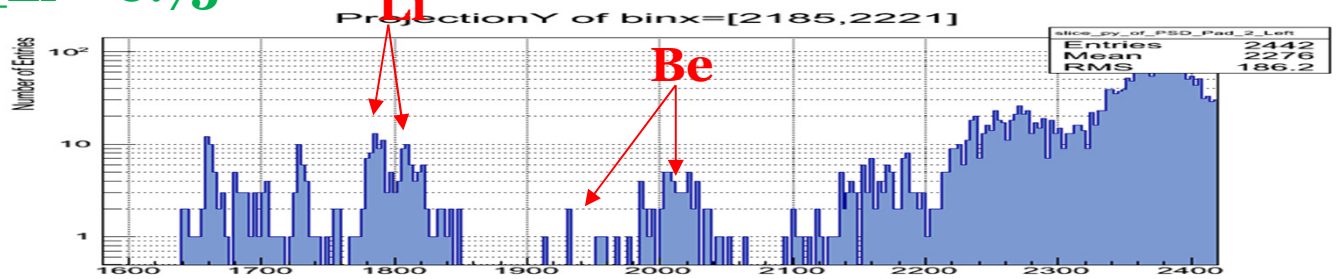
34.52-34.92 MeV

M_Li = 0.71

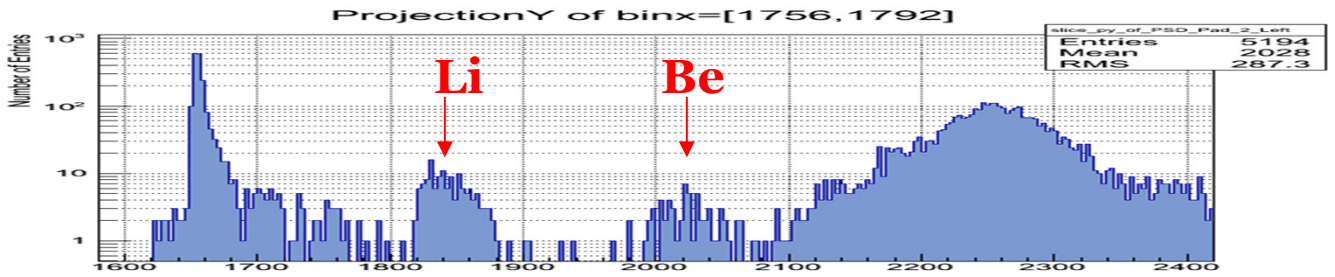


26.12-26.52 MeV

M_Li = 0.75



23.32-23.72 MeV



19.08-19.48 MeV