Analysis of RE data from JET Gamma ray Camera

Arkadiusz Urban[1], Andrzej Brosławski[1], Izabella Zychor[1], Vasili Kiptily[2], Cedric Reux[3]
[1]National Centre for Nuclear Research (NCBJ), Świerk, Poland
[2]Culham Centre for Fusion Energy, Culham, United Kingdom
[3]CEA, IRFM, F-13108 Saint-Paul-lez-Durance, France

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Reminder

Metting 5th April 2017

Conclusion

Shots **#91067, #91069, #92448 - #92461** have been successfully analysed: we obtained very promising results.

The pile-up filter must be **created** and **applied** – the majority of signals is formed by pile-ups.

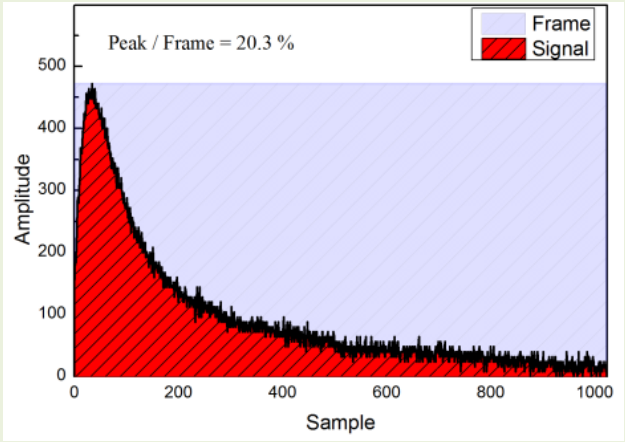
Data analysis performed for all detectors will enable to find **the response function**: it will be possible to obtain the electron energy spectrum.

Analysis of shots with RE production, e.g., from M15-19 sessions, were analyzed.

Obtained results have shown a necessity to include a pile-up decomposition algorithm to increase statistics.

A program ***PileupFilter.cpp*** was prepared with a decomposition of pile-up events by comparing to an undistorted peak.

Pile-up rejection

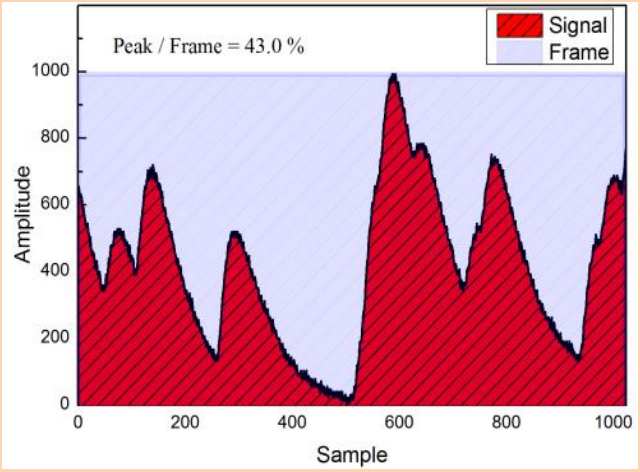


Rate is **low**:

- Single pulse without any others
- Energy released is **proportional to the amplitude**

The process of detecting pulses is called **"pile-up rejection"**.

The minimum resolution time depends on the **detector type**, the **front-end electonics** and the **implementation of pile-up rejector**.



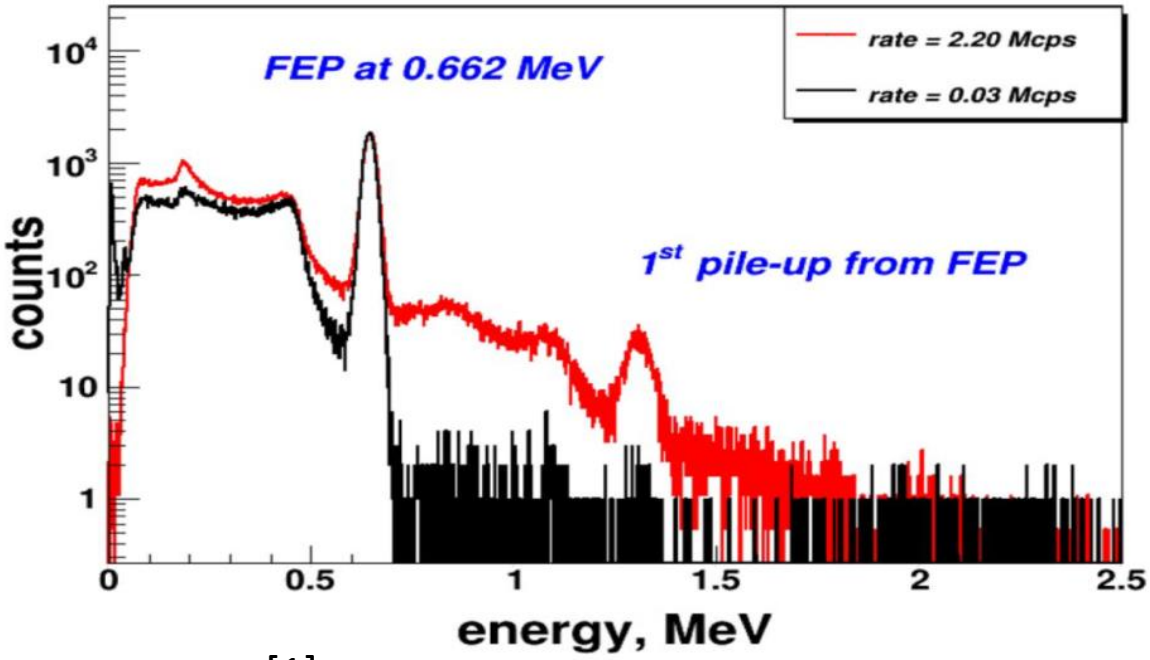
Rate is **high**:

- Pulses arrive **closer** in time than the pulse resolution time for the system
- If the pulses are very close in time the system will simply record the two pulses as a single event with **combined pulse amplitude**

Pile-up rejection

Example

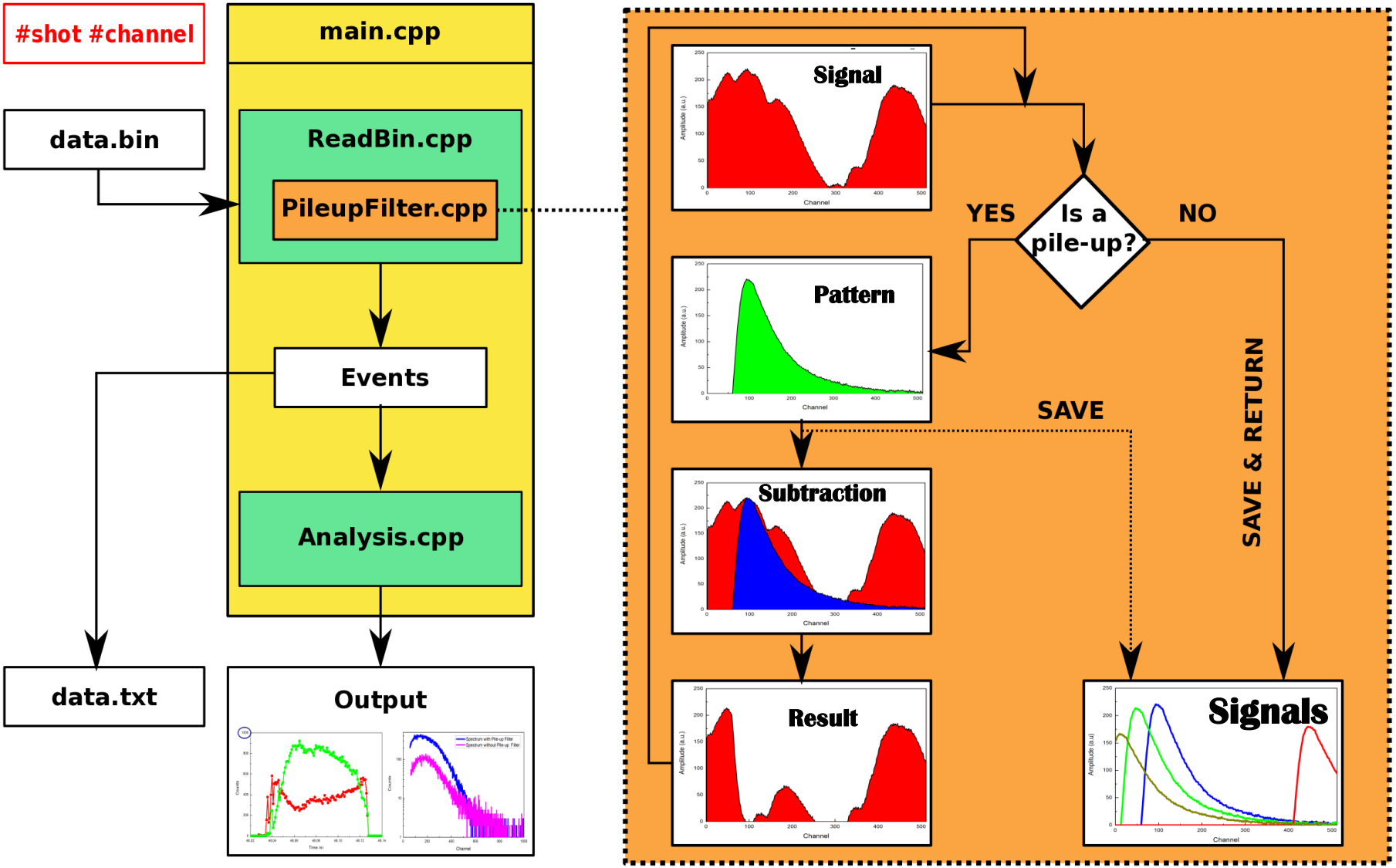
Figure shows the result of measurement performed with the strong Cs-137 source.
The clean spectrum has no recordered events above the photo peak at 662 keV
whereas the pile-up spectrum has recorded events up to 2 x 662 keV.



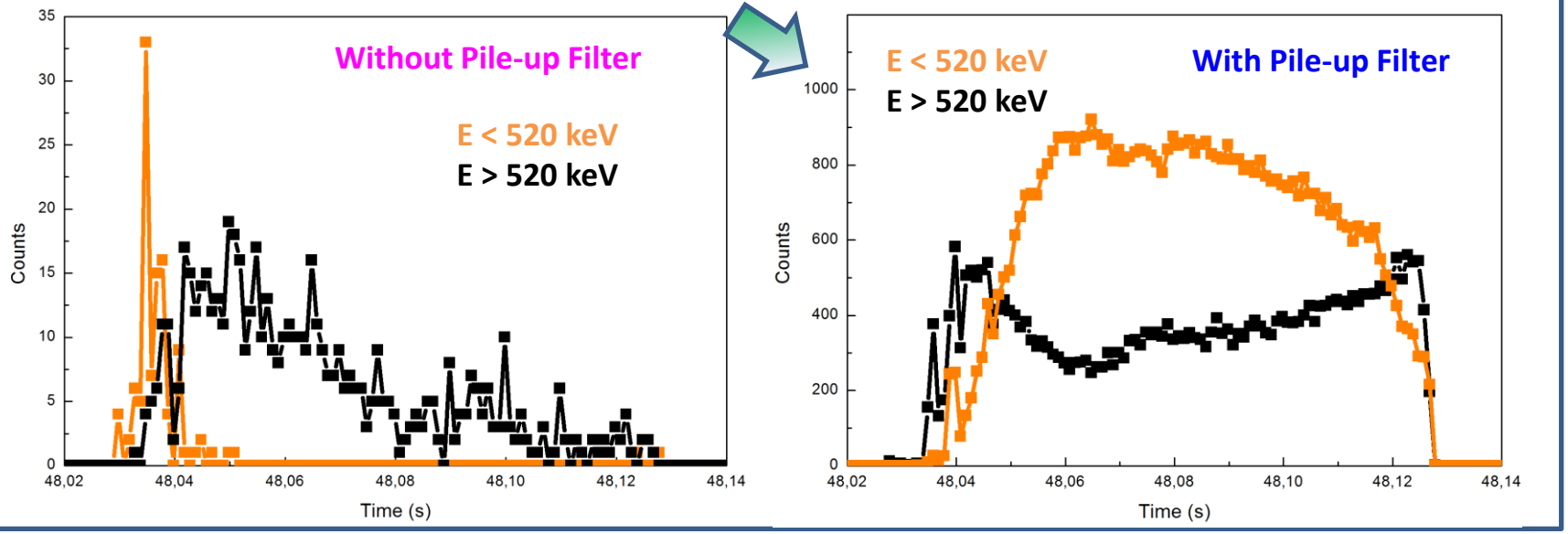
[1]

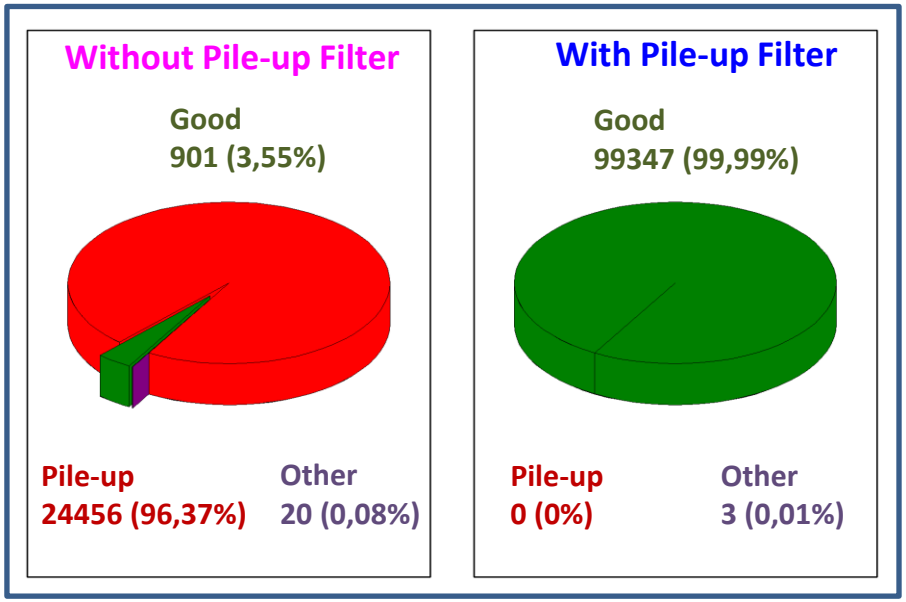
[1] S. Korolczuk et. al „Digital approach to high rate gamma-ray spectrometry", DOI 10.1109/ANIMMA.2015.7465519

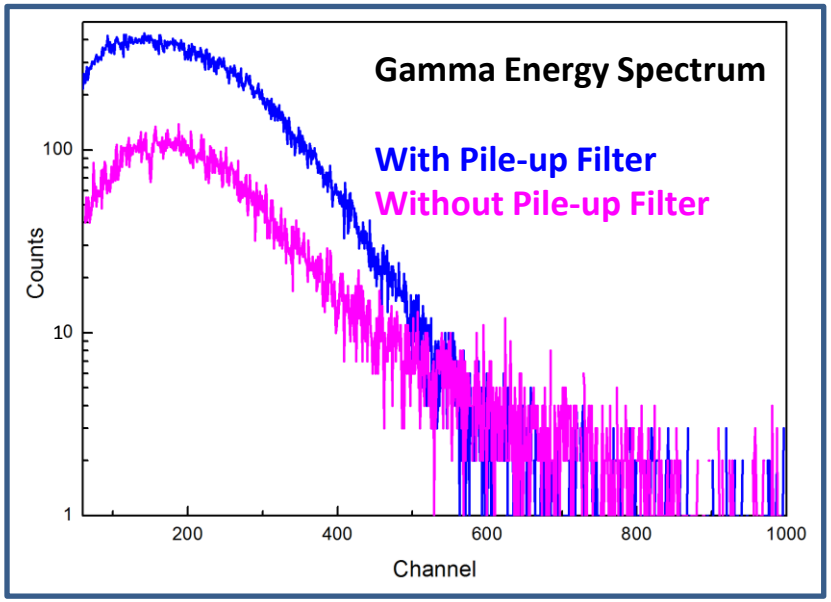
Flowchart


#shot #channel
main.cpp
data.bin
ReadBin.cpp
PileupFilter.cpp
Events
Analysis.cpp
data.txt
Output
Signal
Is a pile-up?
YES
NO
Pattern
SAVE
SAVE & RETURN
Subtraction
Result
Signals
Amplitude (a.u.)
Channel

Comparison: #92449 channel 10

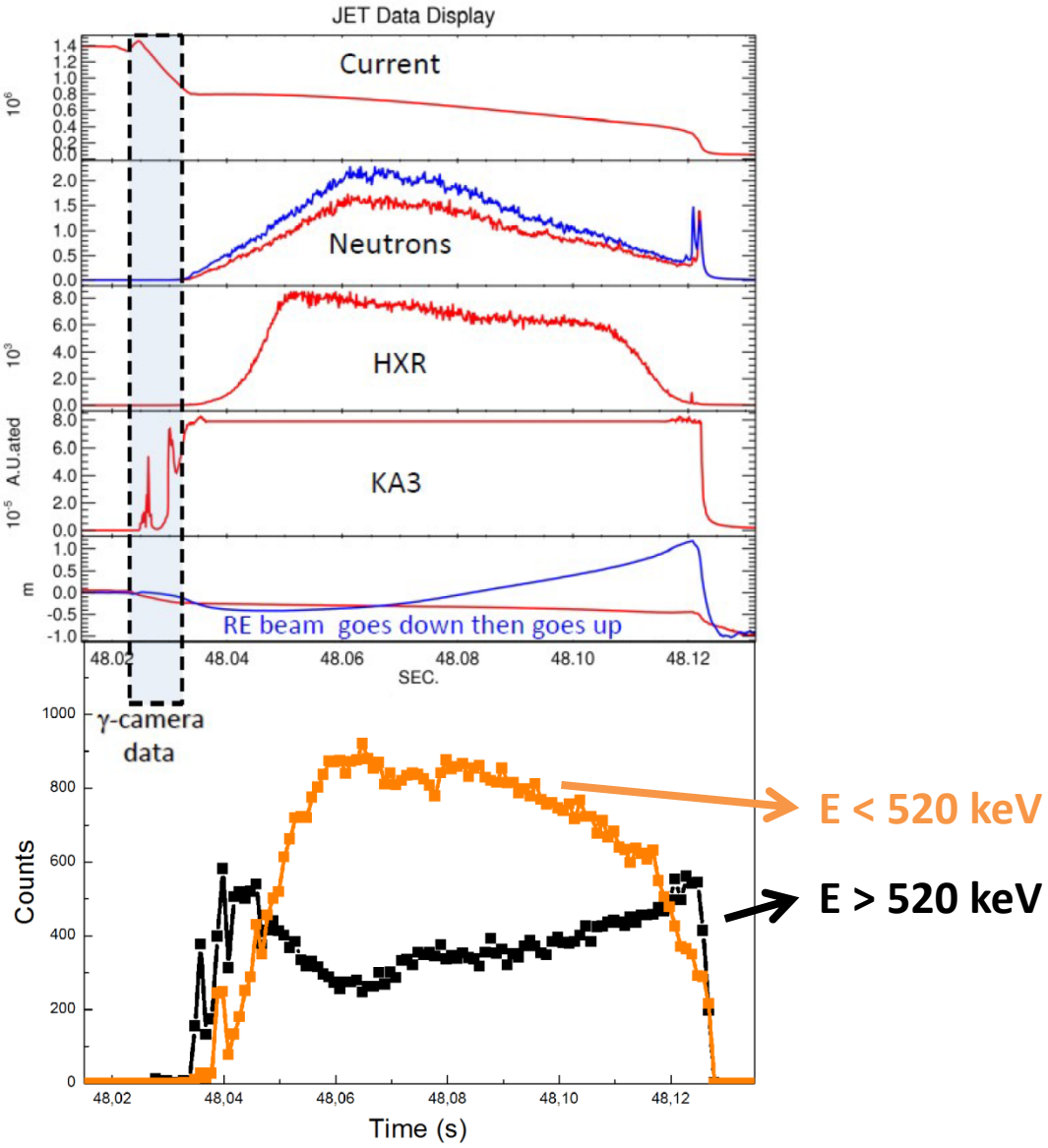






Preliminary results NCBJ 2017

Comparison: #92449 channel 10



Conclusions and outlook

Preliminary results are promising and in the next step a fitting including all available peak parameters will be implemented.

Data from all suitable shots will be analysed.

Monte Carlo simulations with Geant4 code will be used to put an interpretaion on measured spectra.