



WPJET4 Gamma Camera Upgrade (GCU)

Additional report	Detector tests at JET in May 2017 and analysis
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Replacing the existing gamma-ray detectors of the camera for improving the energy resolution and count rate capability needed for operation in the DT campaign. Target values are an energy resolution of 5% at 1.1 MeV and a count rate capability exceeding 500 kHz.

For the upgraded Gamma Camera in the new detector setup LaBr₃:Ce-based detectors are used coupled to MPPC with a passive RC system.

Necessary scintillators and electronic elements were ordered and delivered to the National Centre for Nuclear Research (NCBJ) in 2016:

- 25.4 x diameter= 16.9 mm LaBr₃:Ce scintillators from St Gobain,
- MPPC type S13361-3050NE-04 from Hamamatsu,
- printed circuit boards for FilterBox@NCBJ production,
- printed circuit boards for MPPC temperature compensation device MTCD@NCBJ production.

After preparing detectors at NCBJ in early Spring 2017, all 19 detectors were delivered to JET where they were tested and assembled in both vertical and horizontal parts of the JET Gamma Camera in May 2017.

Final detector response functions for each of 19 detectors will be determined experimentally after a GC installation in the torus hall and then compared to Monte Carlo simulations.

Below results of measurements at JET are shown. These results can be compared to those obtained at NCBJ and presented in a report for the D20 deliverable "Report on M25: Detector assembly and laboratory tests with radioactive source and C&M".

In addition to measurements with a CAEN D5730 digitizer, we present spectra registered with the IST DAQ system.

The report was prepared by the NCBJ team

Andrzej Broslawski, Marcin Gosk, Stefan Korolczuk, Arkadiusz Urban, Izabella Zychor.

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WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	1 of 20

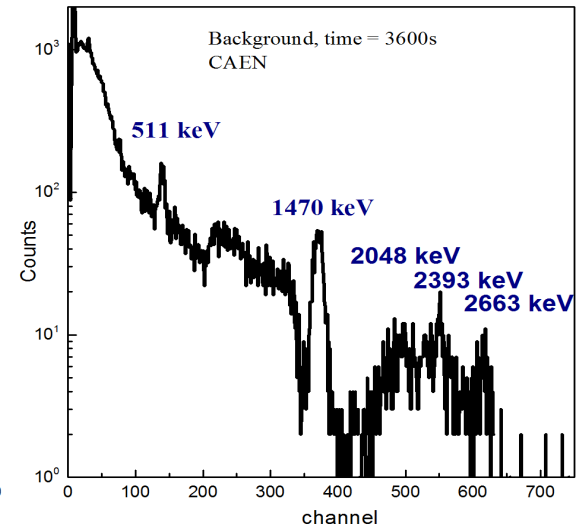
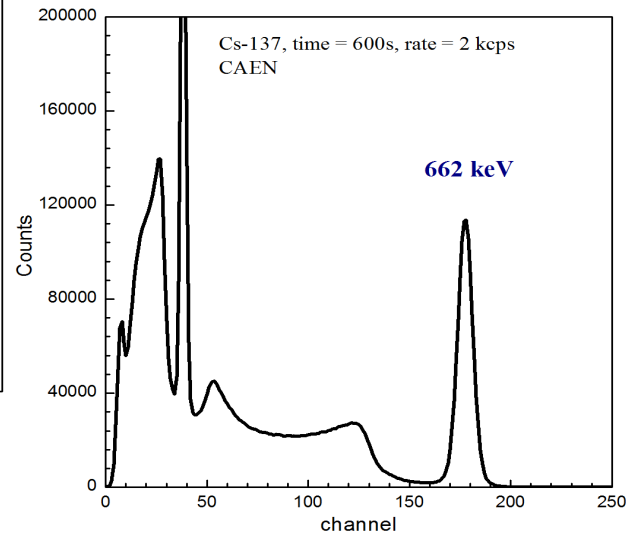
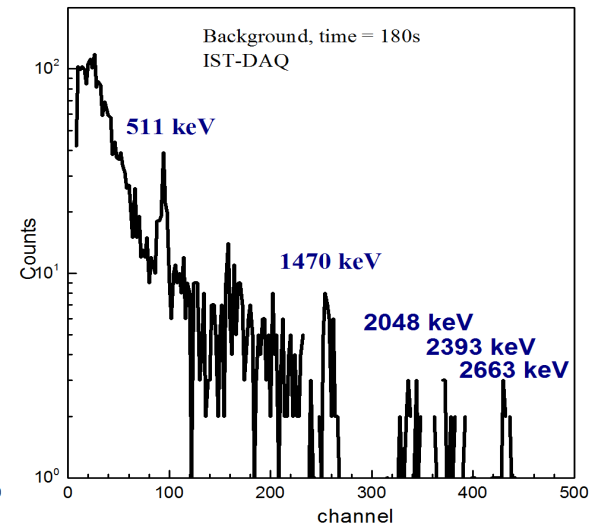
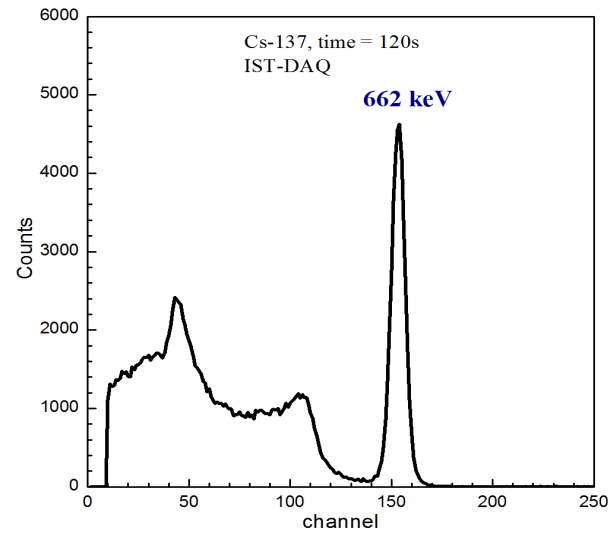


Measurements performed
at JET in a cubicle

Channel no. 1
Detector #2
V = 55,1

FWHM
(662 keV, IST-DAQ) = 5,3 %

FWHM
(662 keV, CAEN) = 5,0 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	2 of 20

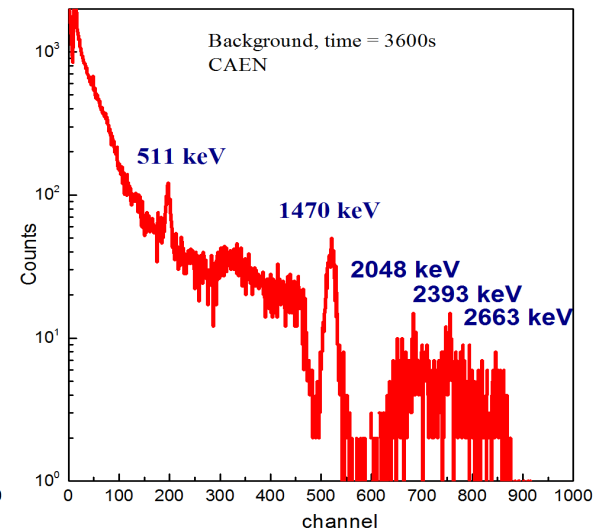
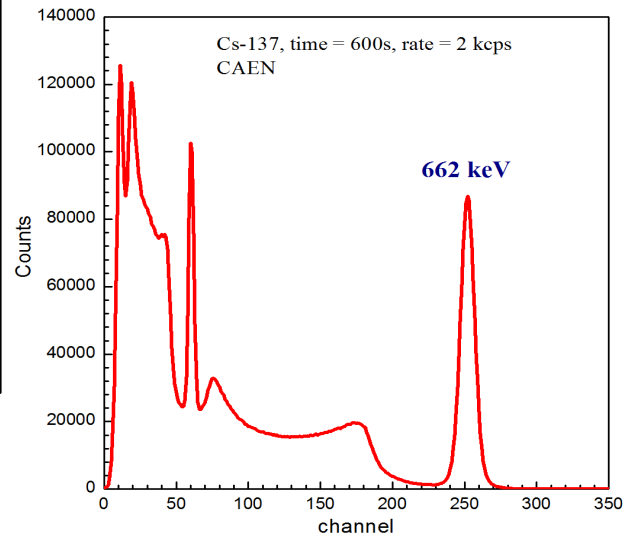
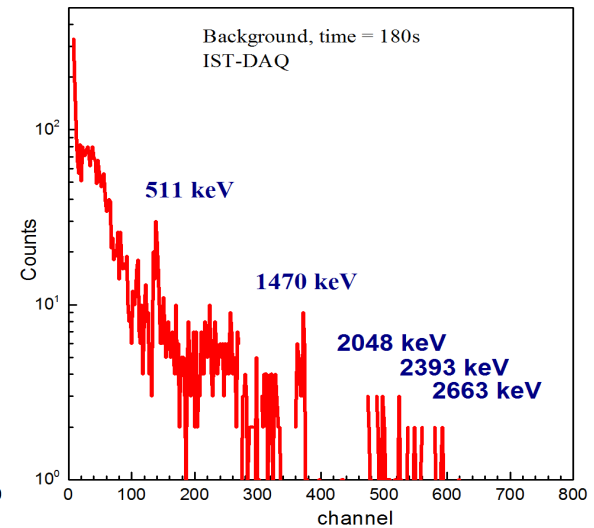
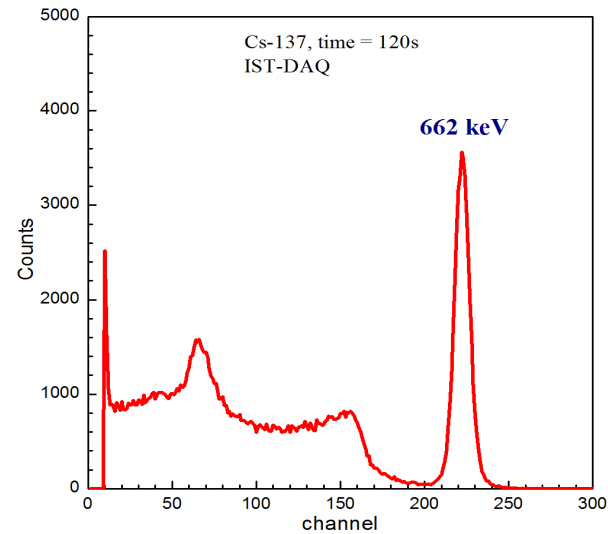


Measurements performed
at JET in a cubicle

Channel no. 2
Detector #4
V = 55,1

FWHM
(662 keV, IST-DAQ) = 4,8 %

FWHM
(662 keV, CAEN) = 4,5 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	3 of 20

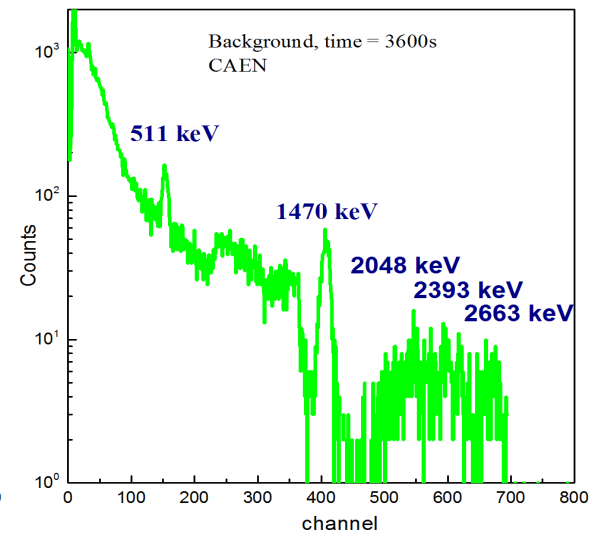
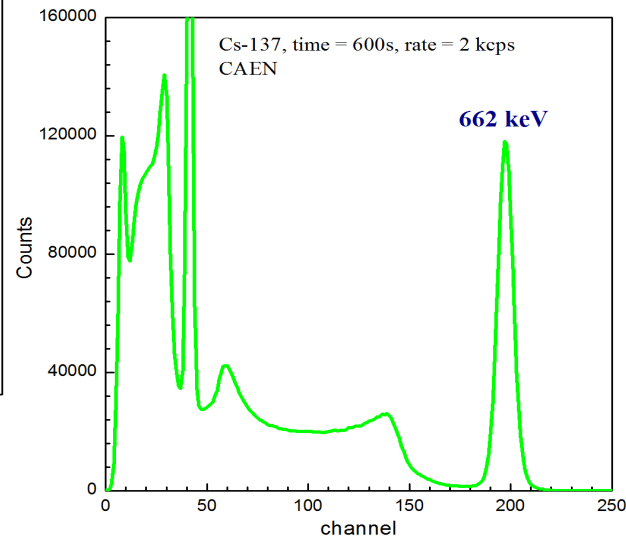
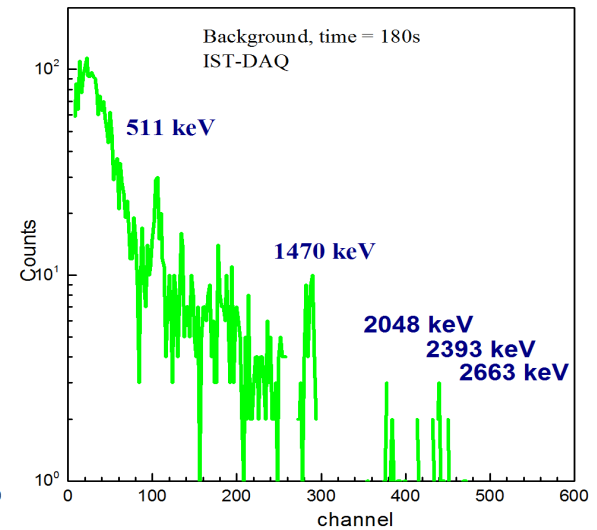
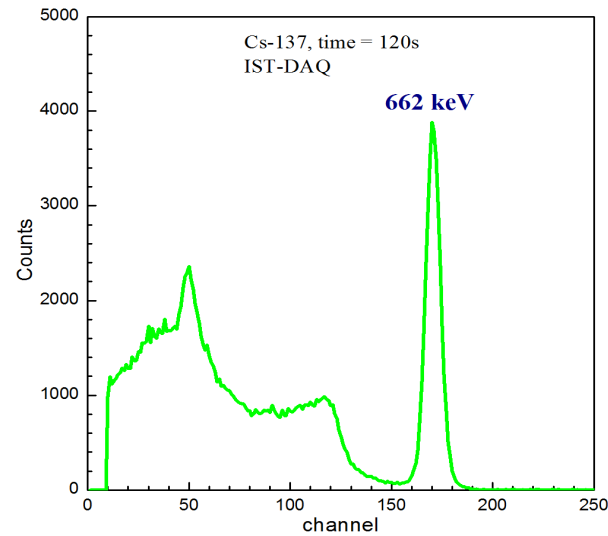


Measurements performed
at JET in a cubicle

Channel no. 3
Detector #5
V = 55,1

FWHM
(662 keV, IST-DAQ) = 5,0 %

FWHM
(662 keV, CAEN) = 4,6 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	4 of 20

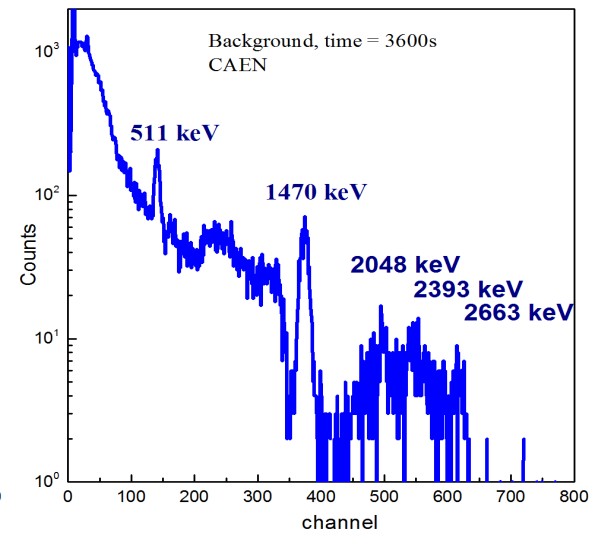
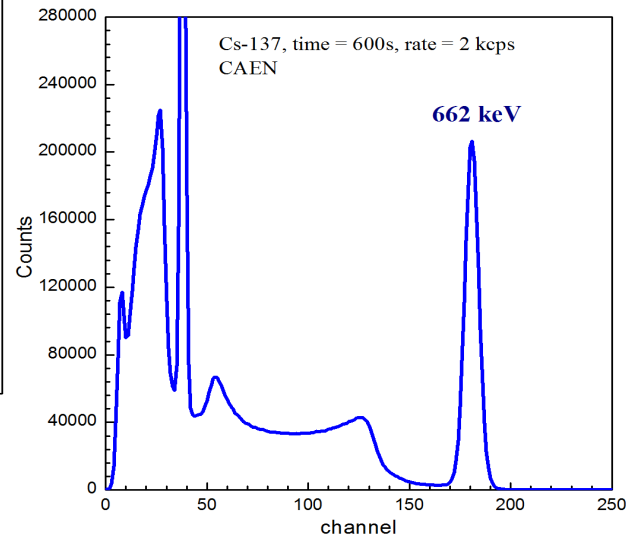
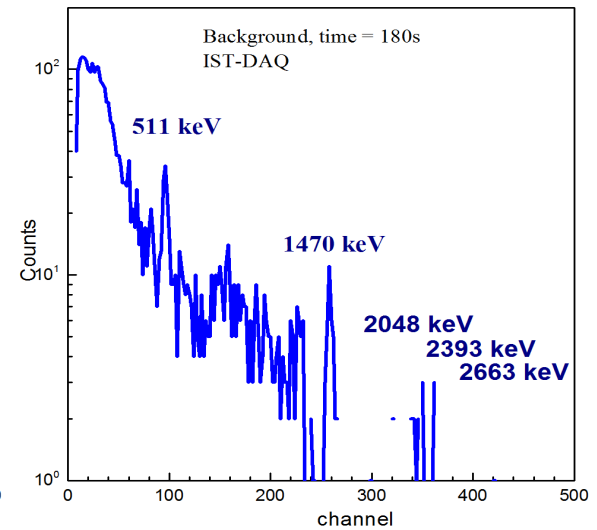
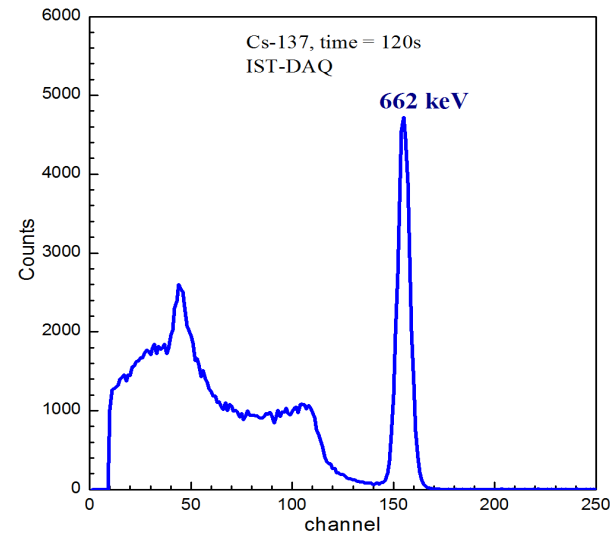


Measurements performed
at JET in a cubicle

Channel no. 4
Detector #3
V = 55,1

FWHM
(662 keV, IST-DAQ) = 4,7 %

FWHM
(662 keV, CAEN) = 4,5 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	5 of 20



Measurements performed
at JET in a cubicle

Channel no. 5

Detector #6

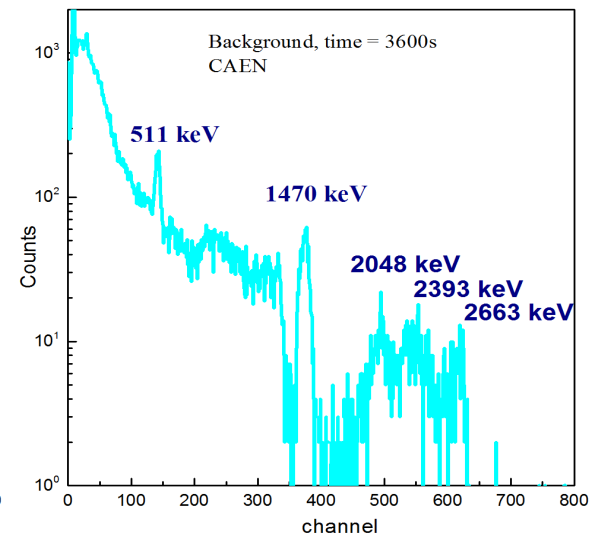
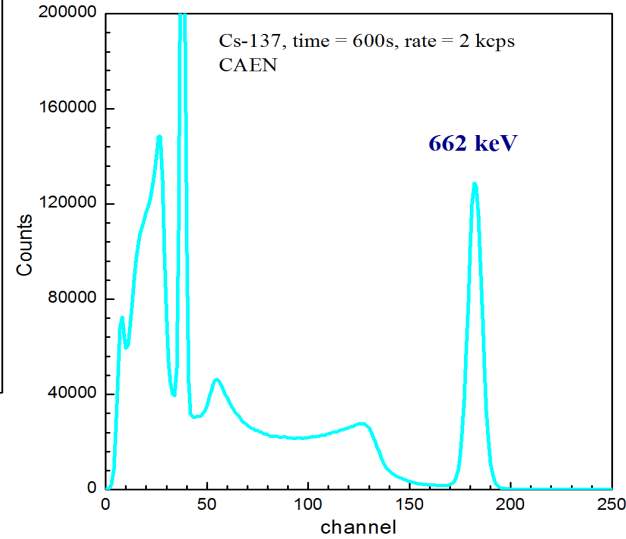
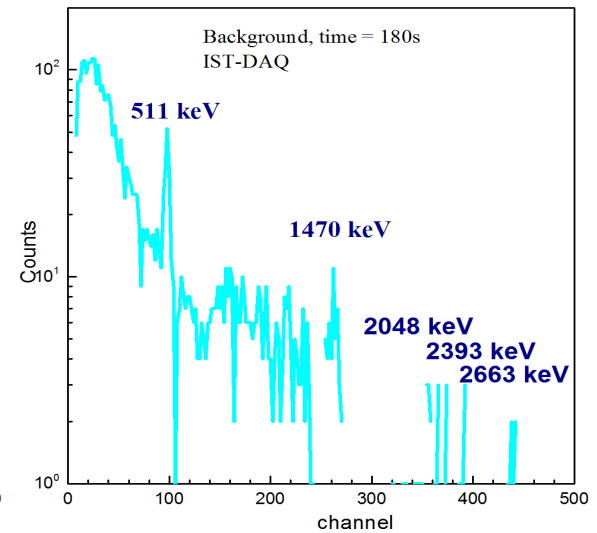
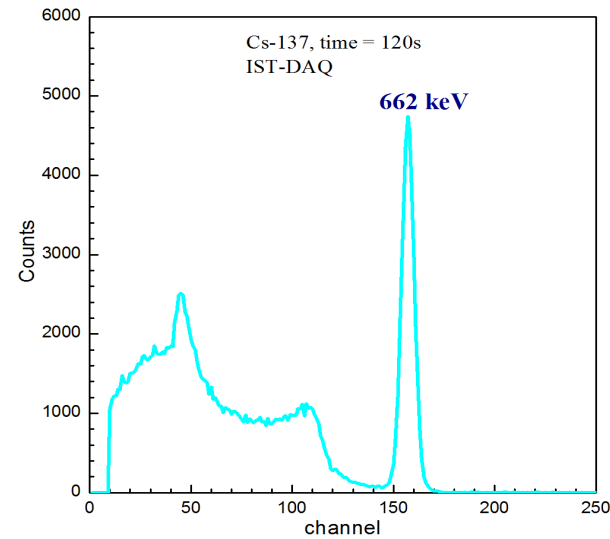
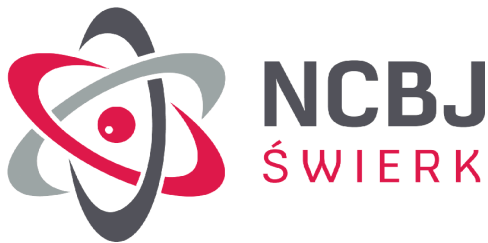
V = 55,1

FWHM

(662 keV, IST-DAQ) = 4,7 %

FWHM

(662 keV, CAEN) = 4,4 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	6 of 20

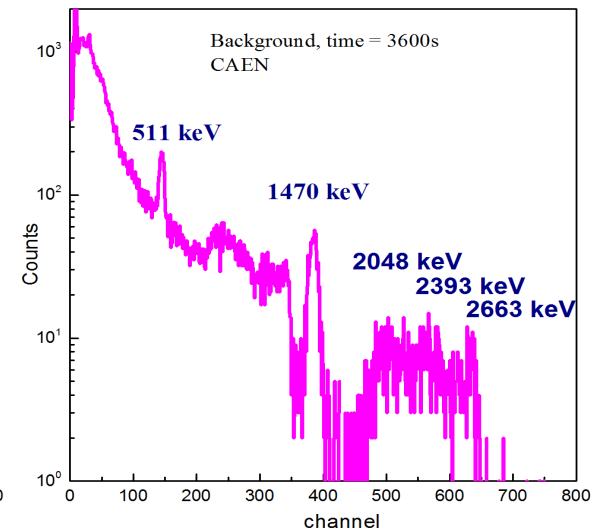
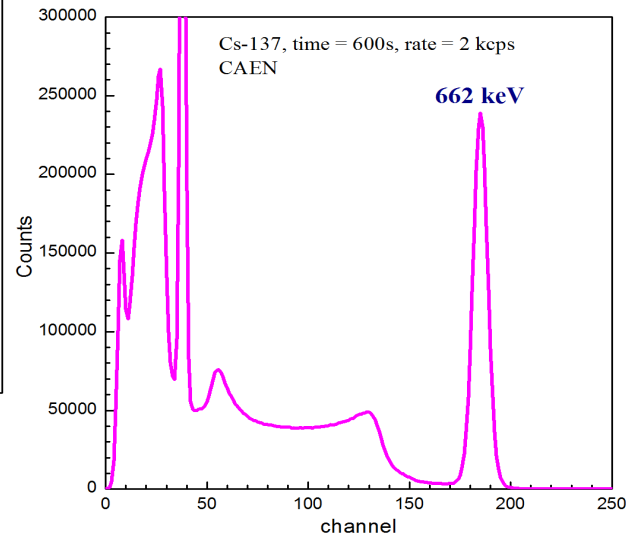
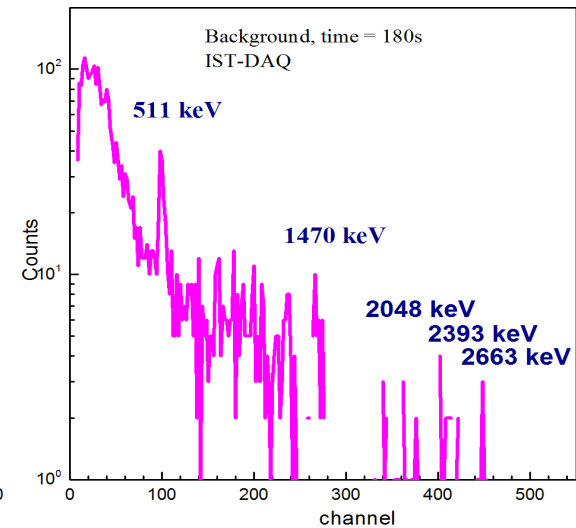
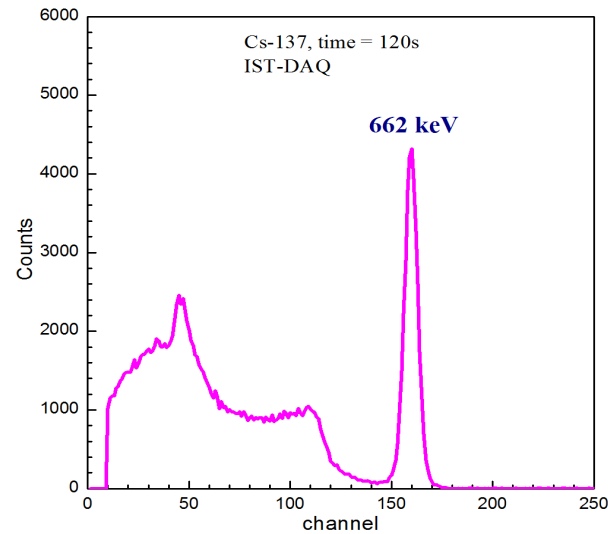


Measurements performed
at JET in a cubicle

Channel no. 6
Detector #1
V = 55,1

FWHM
(662 keV, IST-DAQ) = 4,9 %

FWHM
(662 keV, CAEN) = 4,6 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	7 of 20

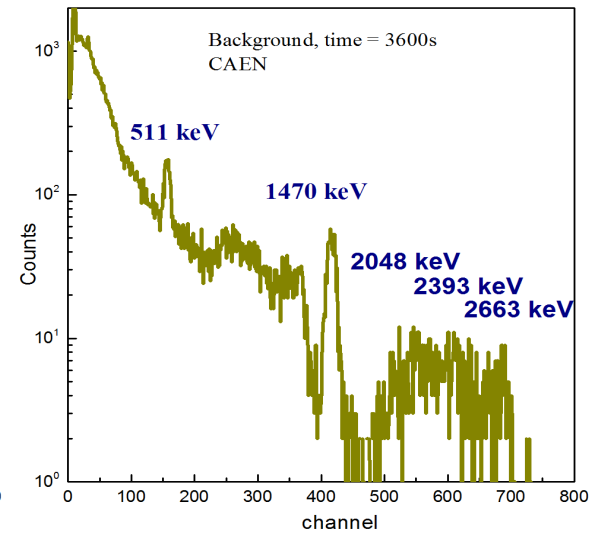
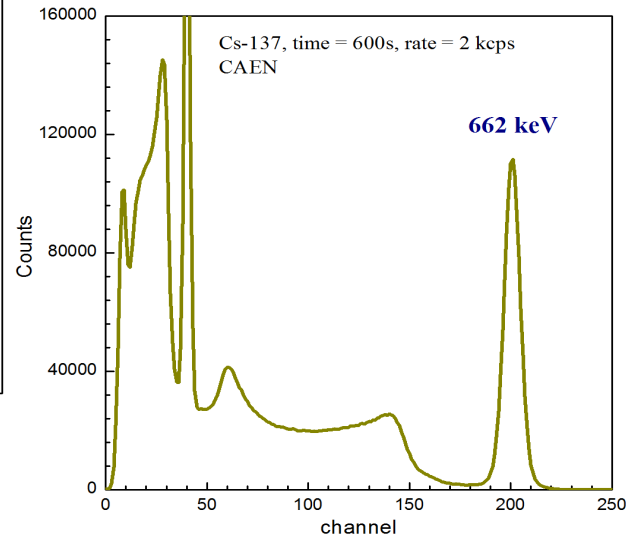
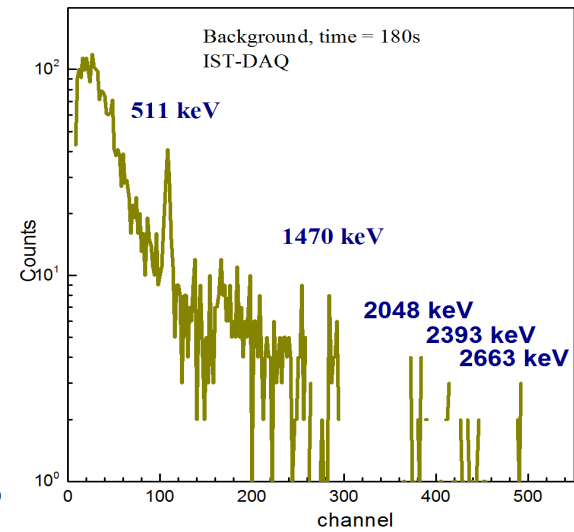
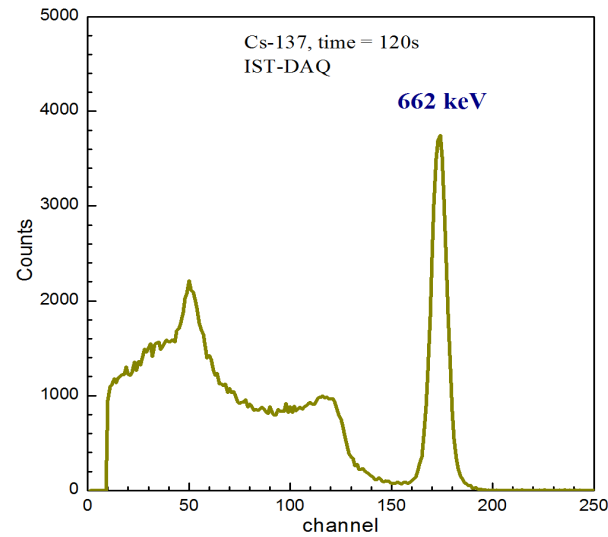


Measurements performed
at JET in a cubicle

Channel no. 7
Detector #9
V = 55,1

FWHM
(662 keV, IST-DAQ) = 5,2 %

FWHM
(662 keV, CAEN) = 4,7 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	8 of 20

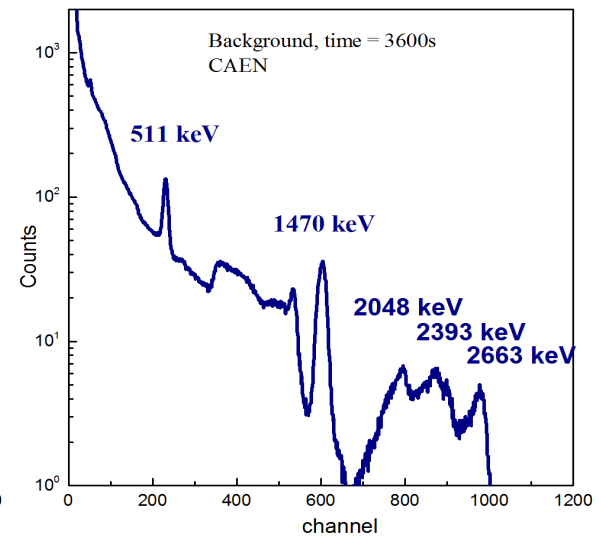
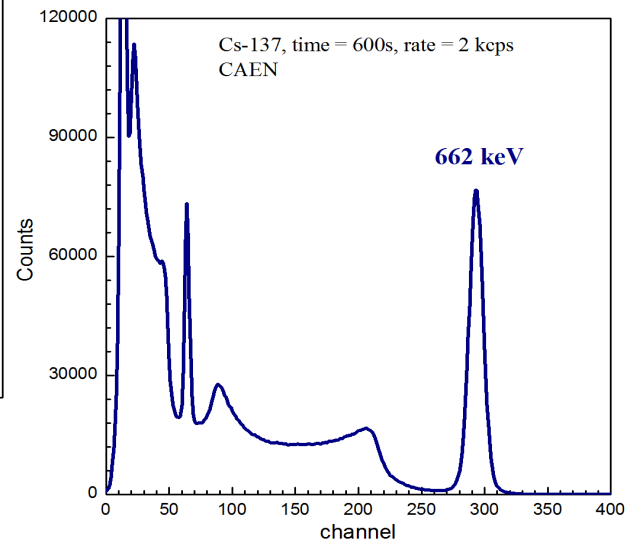
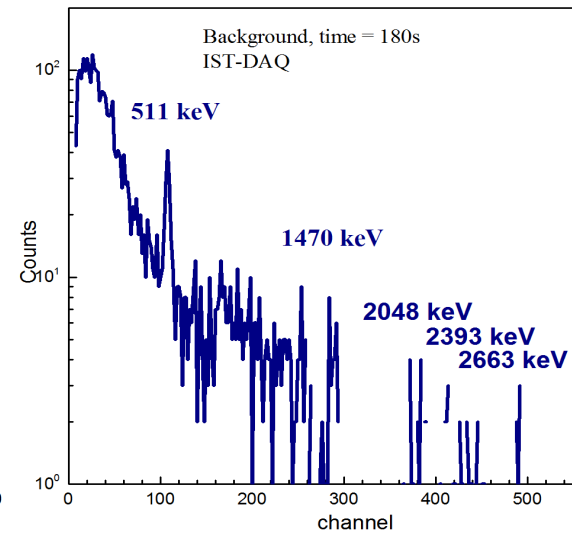
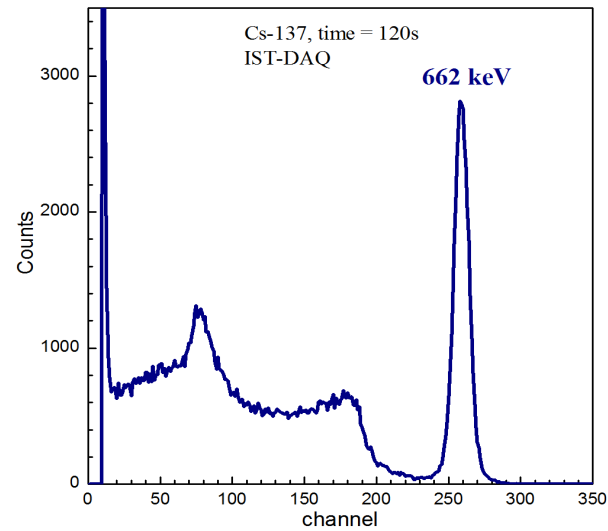
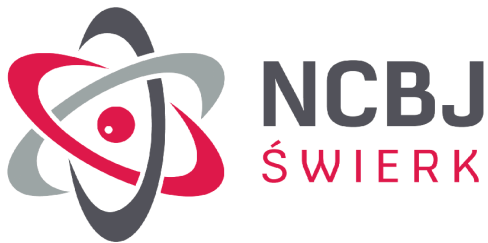


Measurements performed
at JET in a cubicle

Channel no. 8
Detector #8
V = 55,1

FWHM
(662 keV, IST-DAQ) = 4,6 %

FWHM
(662 keV, CAEN) = 4,4 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	9 of 20

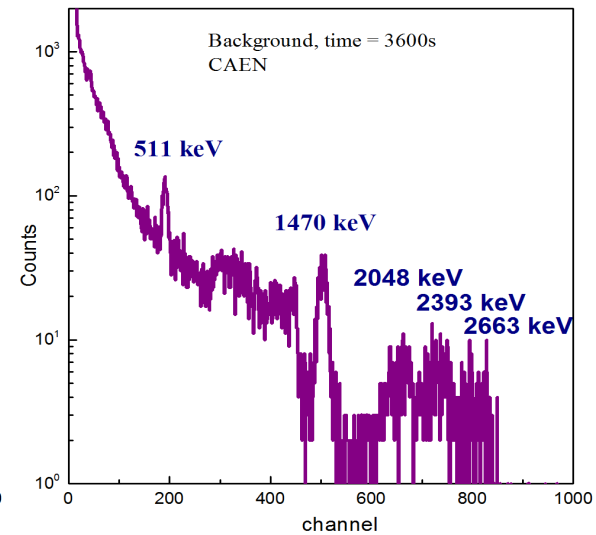
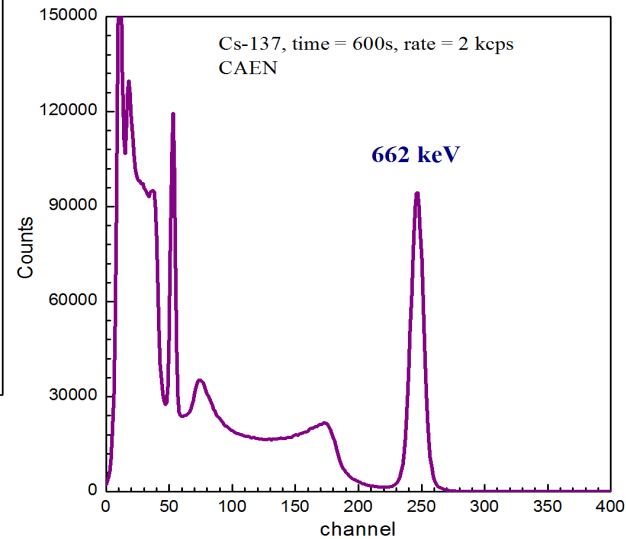
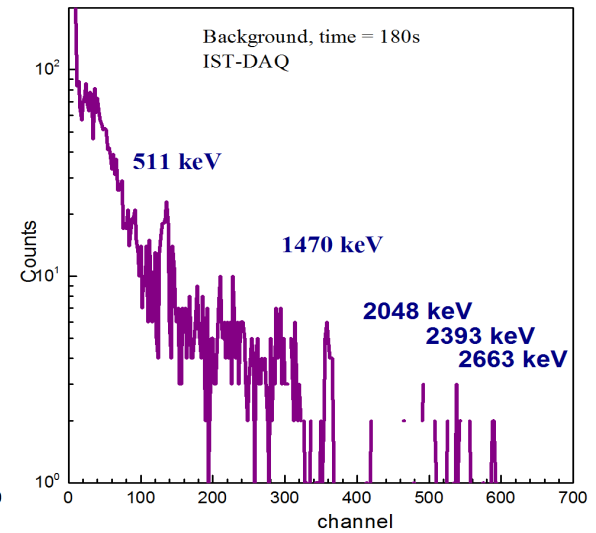
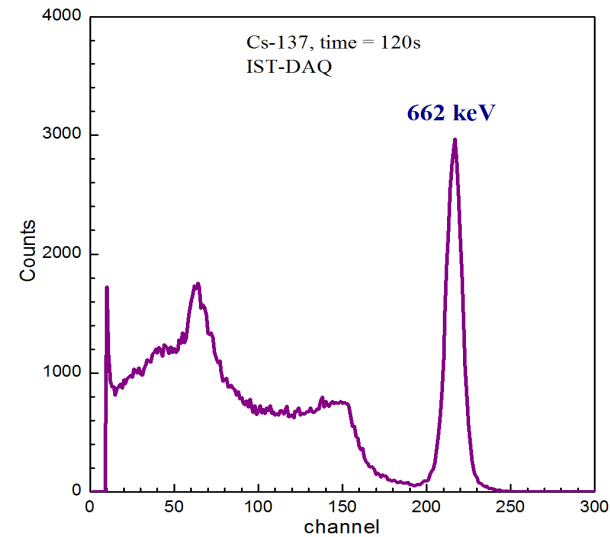
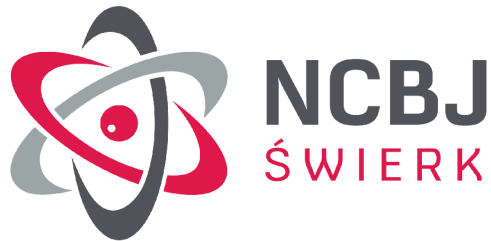


Measurements performed
at JET in a cubicle

Channel no. 9
Detector #7
V = 55,1

FWHM
(662 keV, IST-DAQ) = 5,1 %

FWHM
(662 keV, CAEN) = 4,7 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	10 of 20

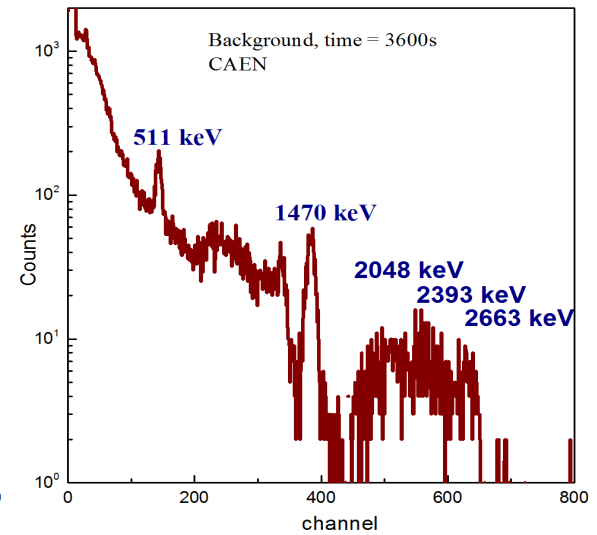
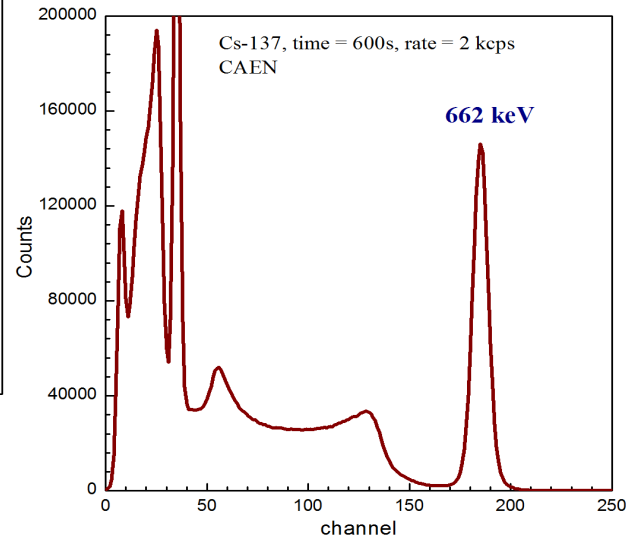
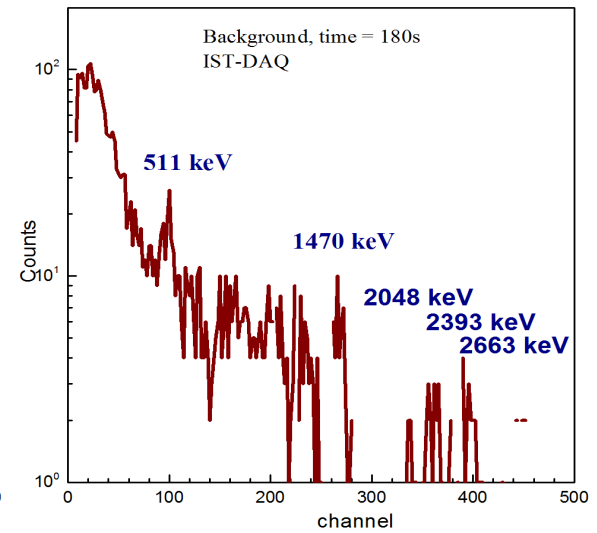
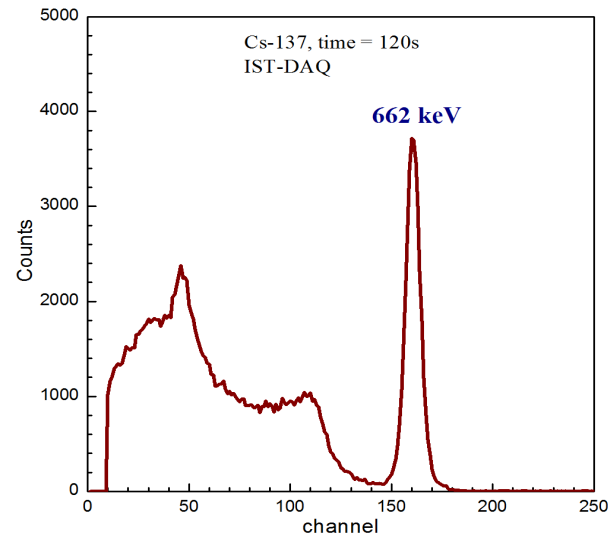


Measurements performed
at JET in a cubicle

Channel no. 10
Detector #10
V = 55,1

FWHM
(662 keV, IST-DAQ) = 5,4 %

FWHM
(662 keV, CAEN) = 4,9 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	11 of 20

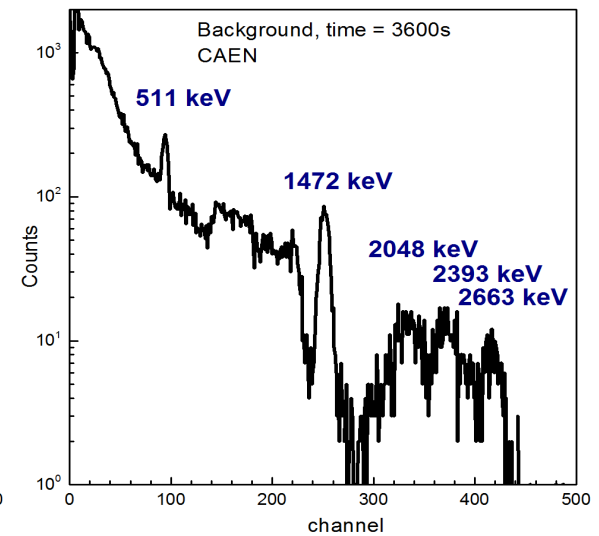
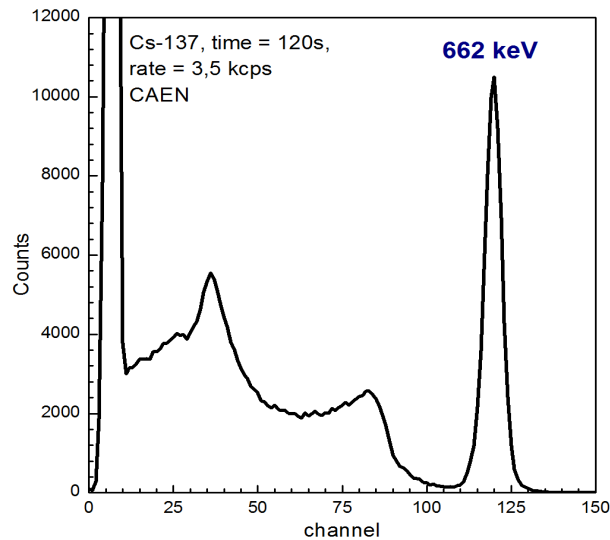
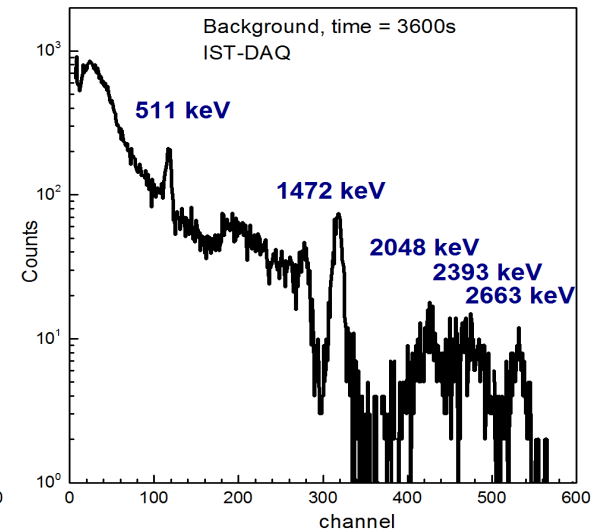
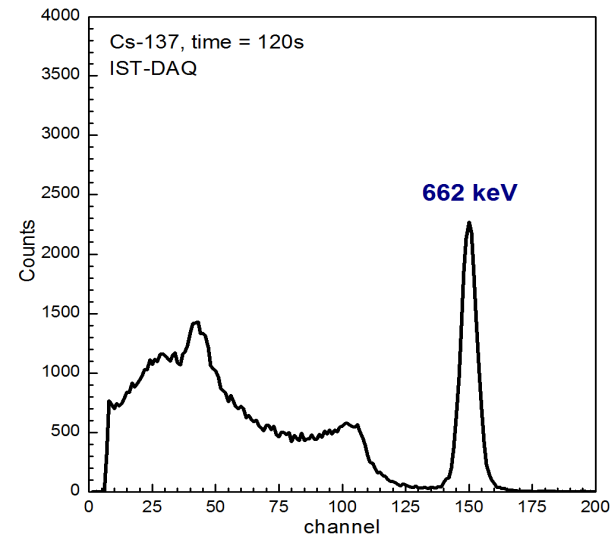


Measurements performed
at JET in a cubicle

Channel no. 11
Detector #17
V = 54,6

FWHM
(662 keV, IST-DAQ) = 5,1 %

FWHM
(662 keV, CAEN) = 5,1 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	12 of 20

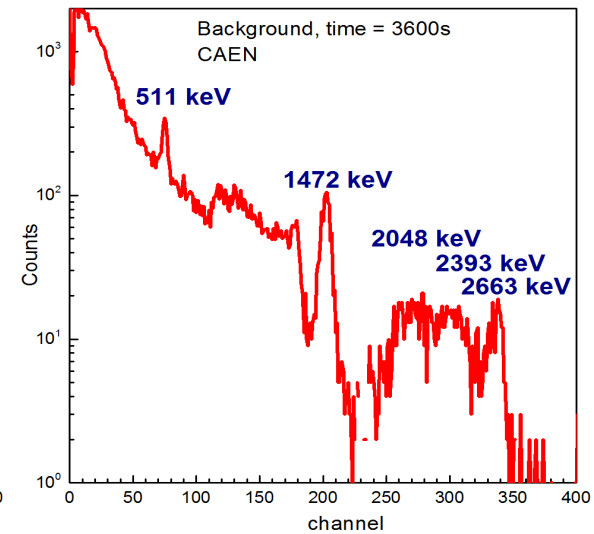
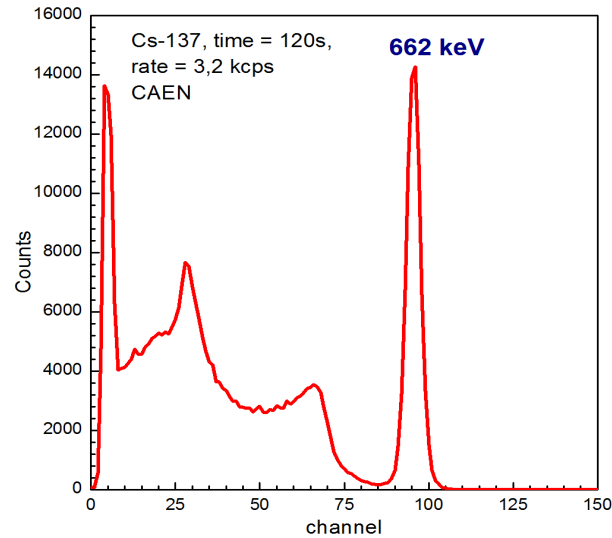
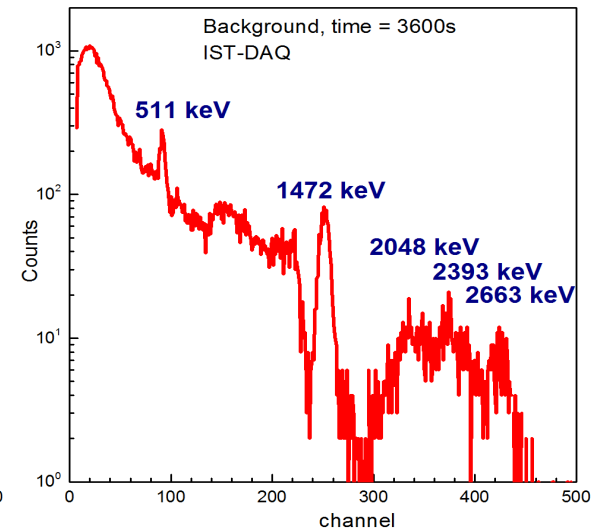
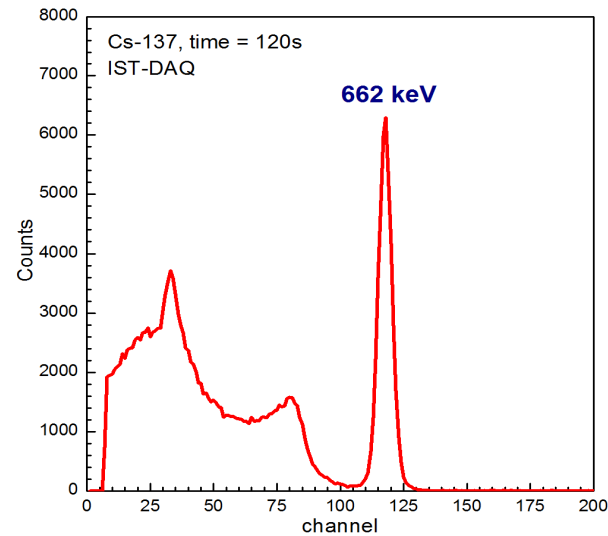


Measurements performed
at JET in a cubicle

Channel no. 12
Detector #11
V = 54,6

FWHM
(662 keV, IST-DAQ) = 5,4 %

FWHM
(662 keV, CAEN) = 5,1 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	13 of 20



Measurements performed
at JET in a cubicle

Channel no. 13

Detector #14

V = 54,6

FWHM

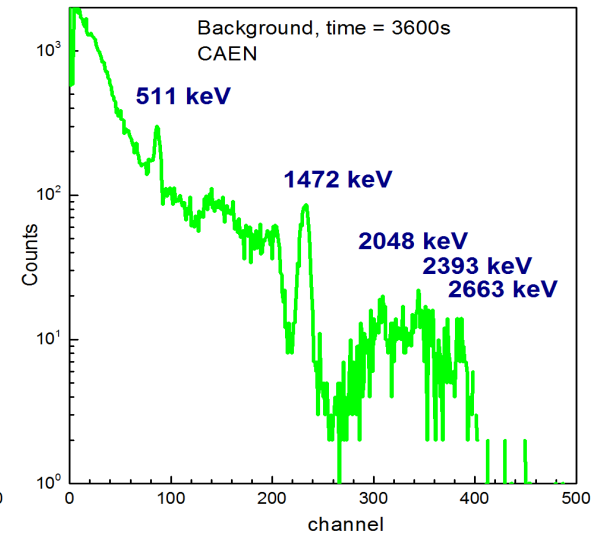
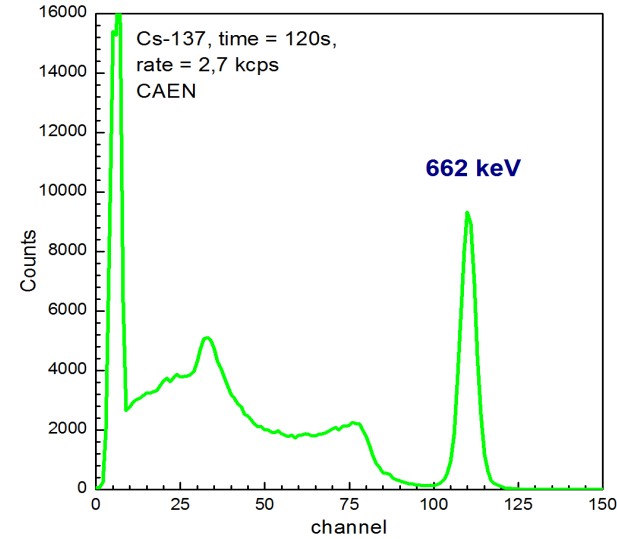
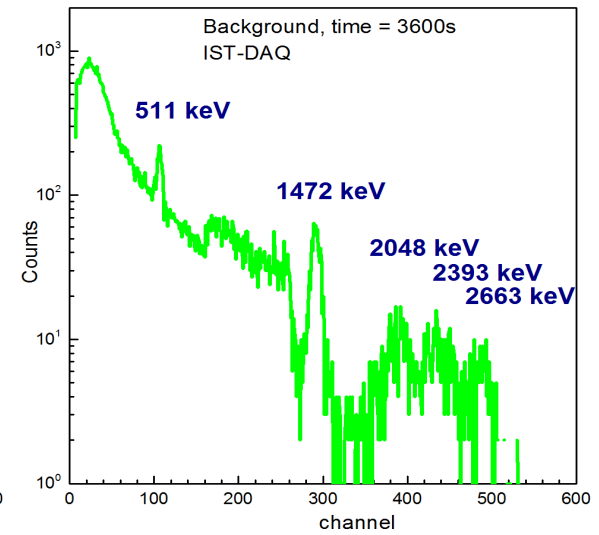
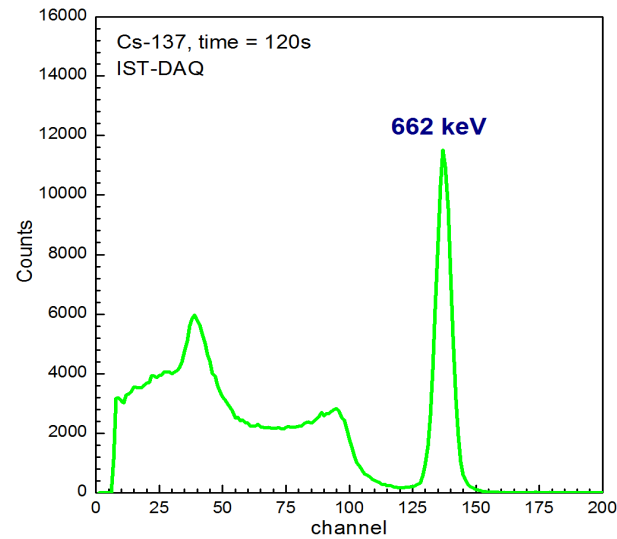
(662 keV, IST-DAQ) = 5,3 %

FWHM

(662 keV, CAEN) = 5,1 %



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WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	14 of 20



Measurements performed
at JET in a cubicle

Channel no. 14

Detector #18

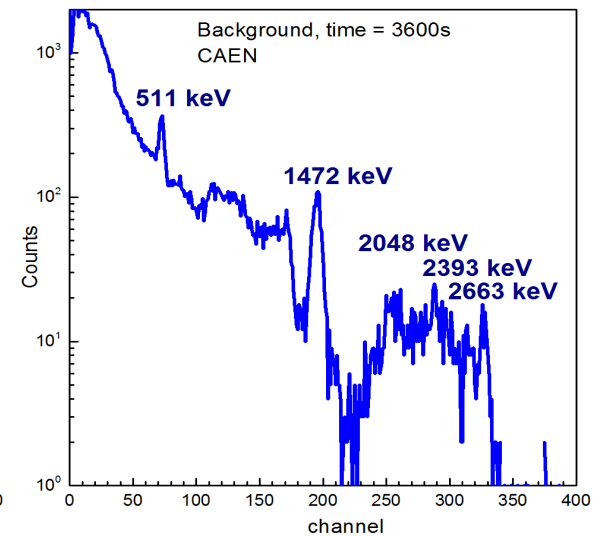
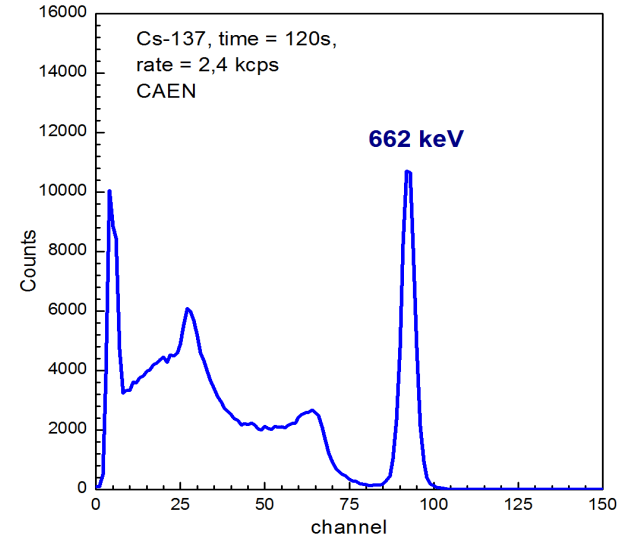
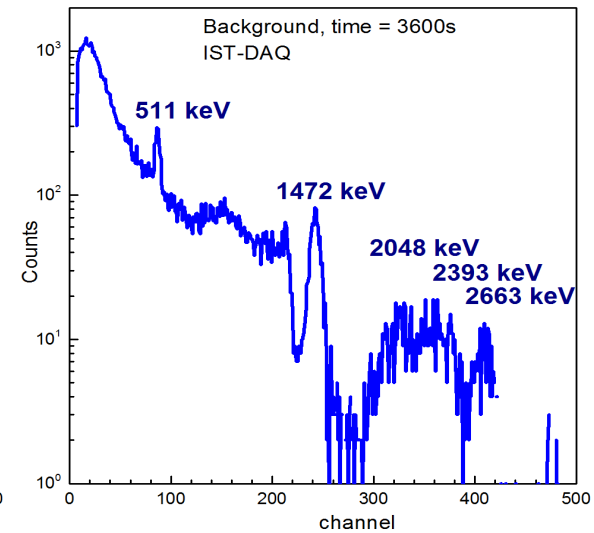
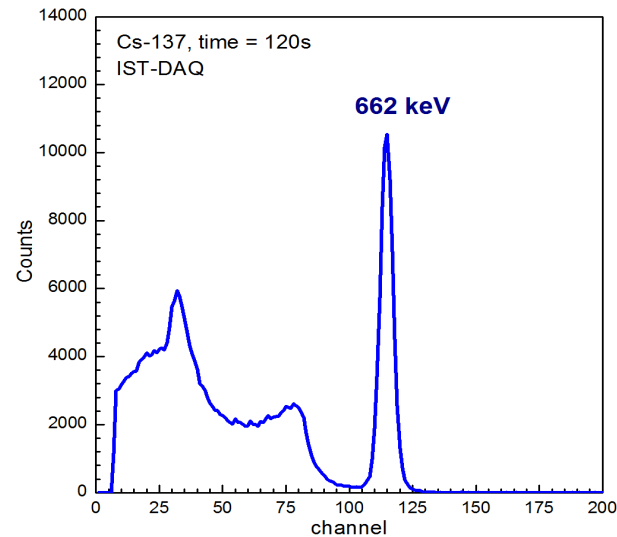
V = 54,6

FWHM

(662 keV, IST-DAQ) = 5,3 %

FWHM

(662 keV, CAEN) = 5,1 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	15 of 20

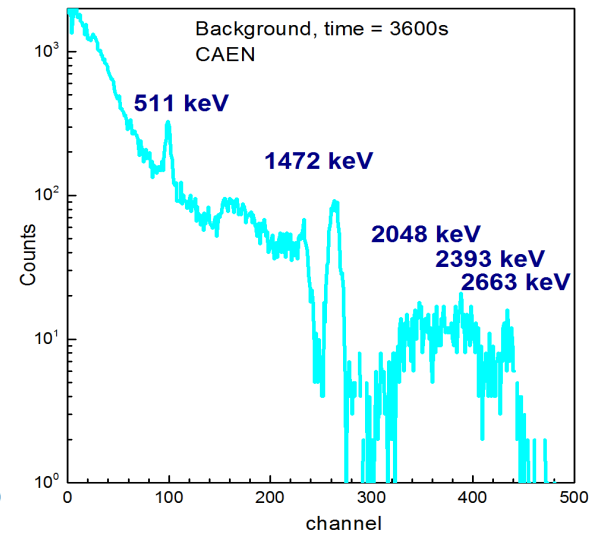
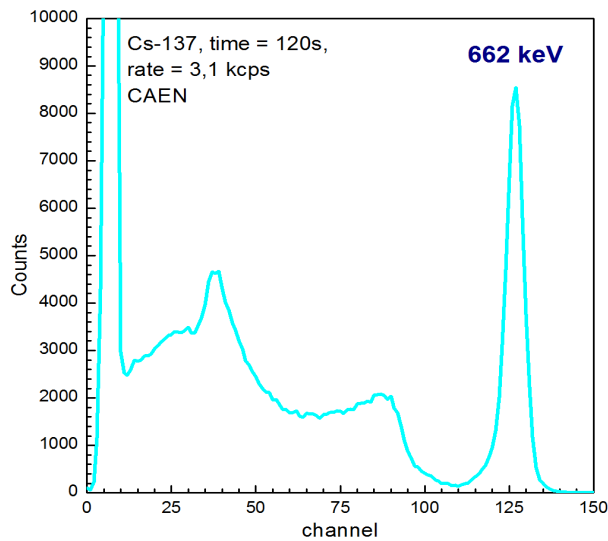
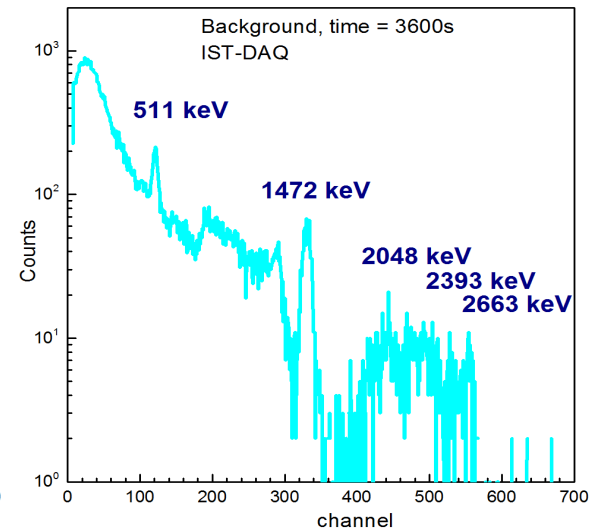
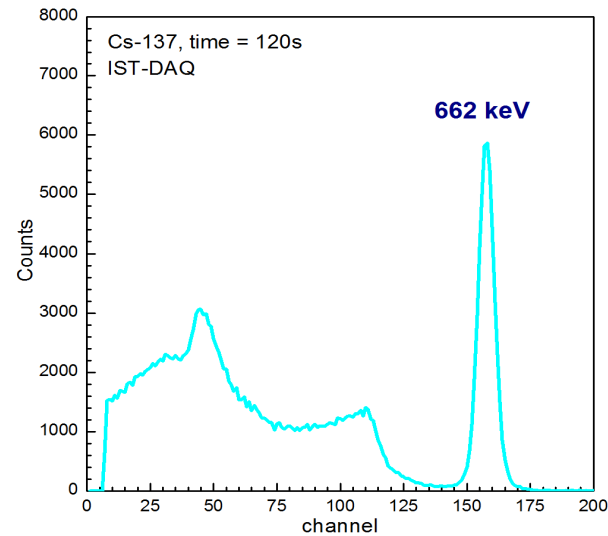


Measurements performed
at JET in a cubicle

Channel no. 15
Detector #20
V = 54,6

FWHM
(662 keV, IST-DAQ) = 4,8 %

FWHM
(662 keV, CAEN) = 5,0 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	16 of 20

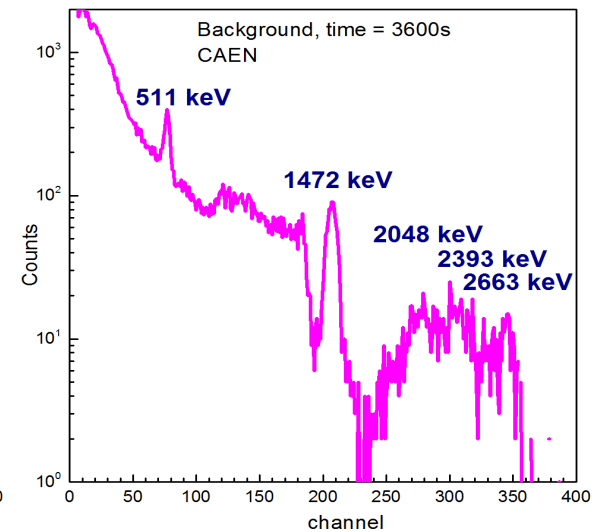
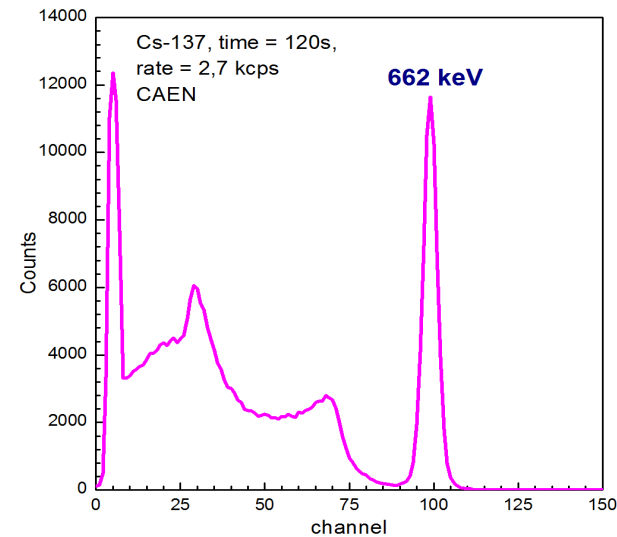
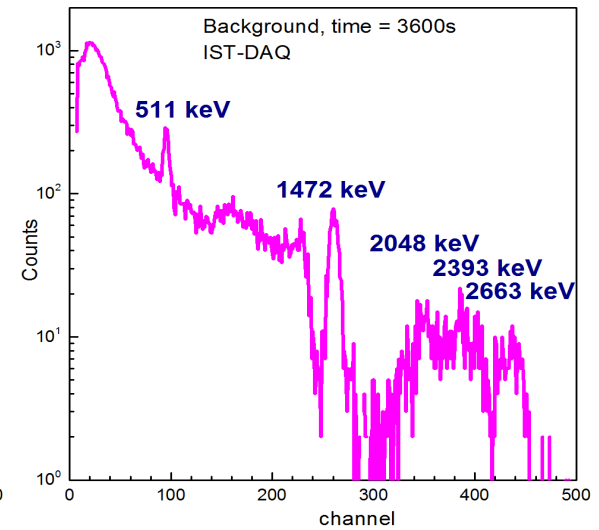
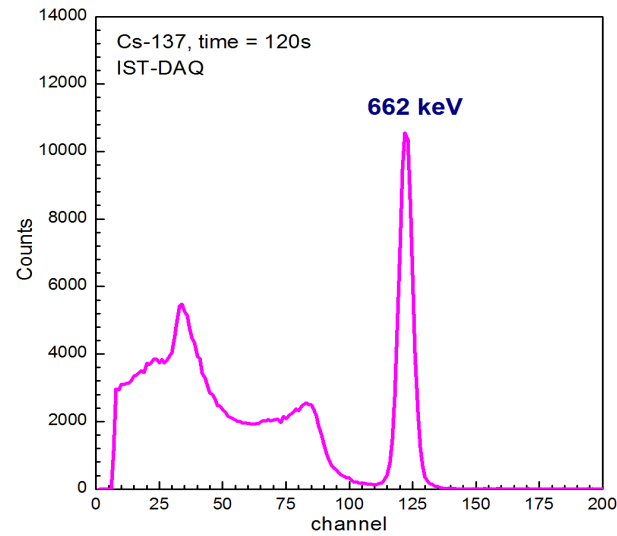


Measurements performed
at JET in a cubicle

Channel no. 16
Detector #16
V = 54,6

FWHM
(662 keV, IST-DAQ) = 5,2 %

FWHM
(662 keV, CAEN) = 5,0 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	17 of 20



Measurements performed
at JET in a cubicle

Channel no. 17

Detector #15

V = 54,6

FWHM

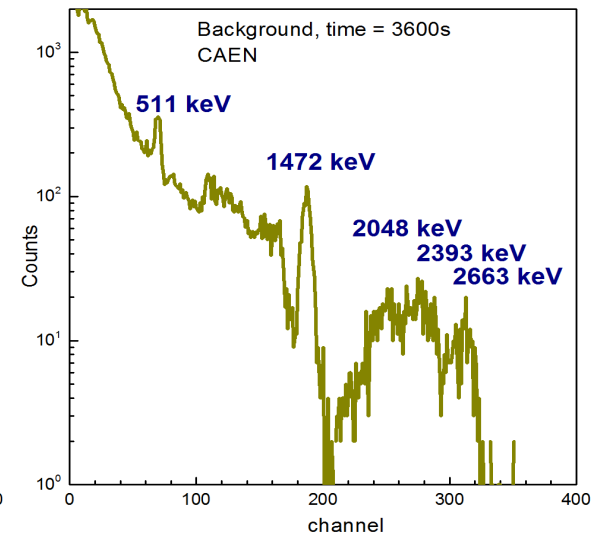
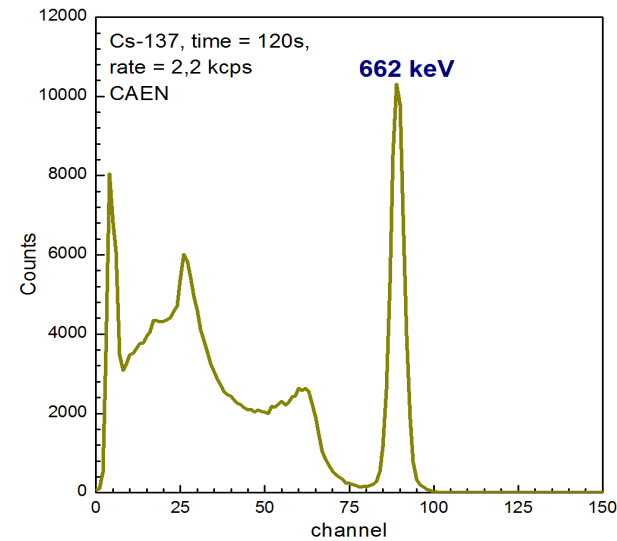
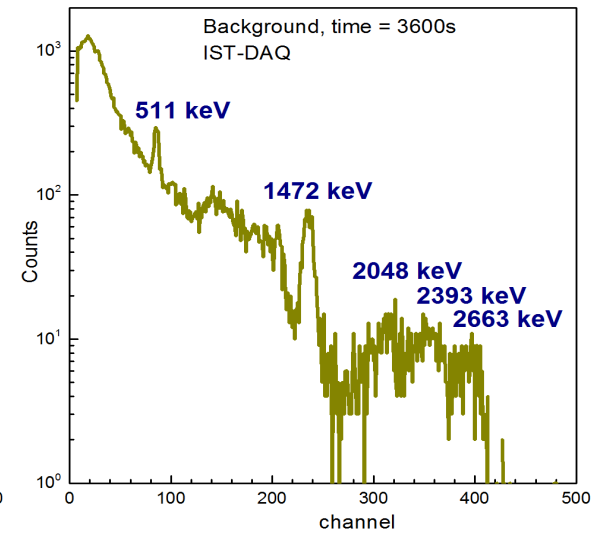
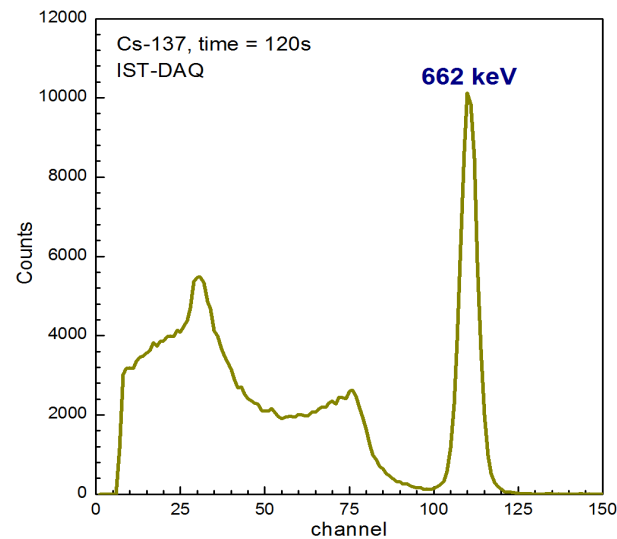
(662 keV, IST-DAQ) = 5,5 %

FWHM

(662 keV, CAEN) = 5,3 %



NCBJ
ŚWIERK



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	18 of 20

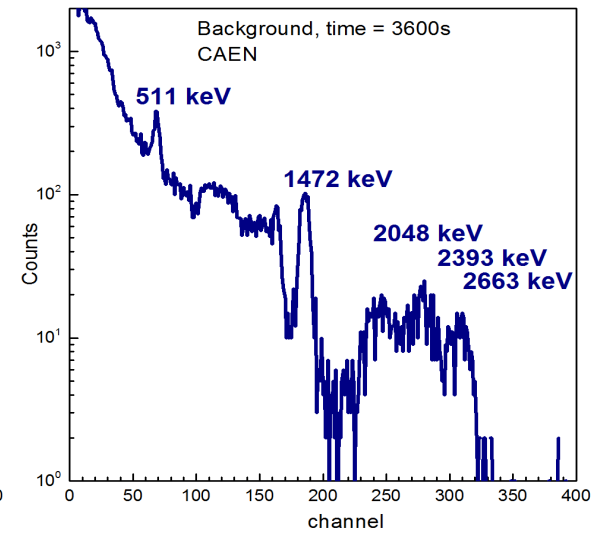
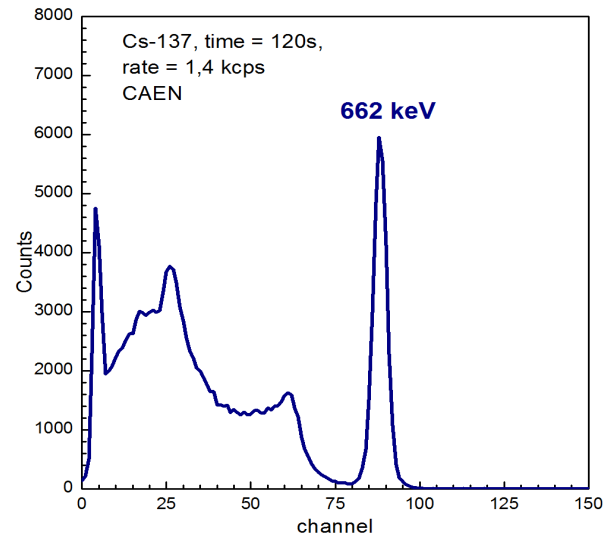
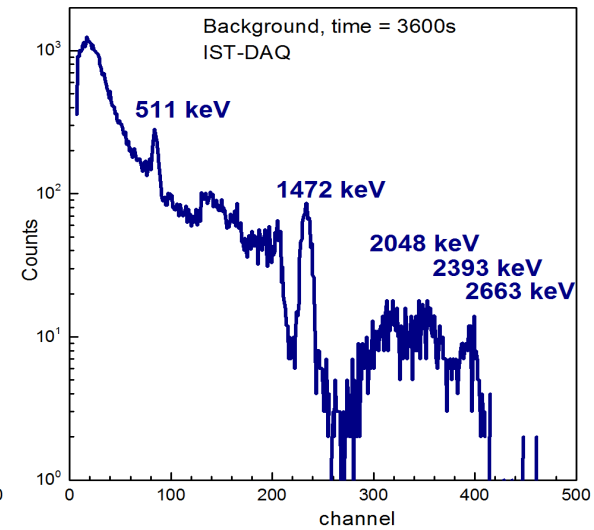
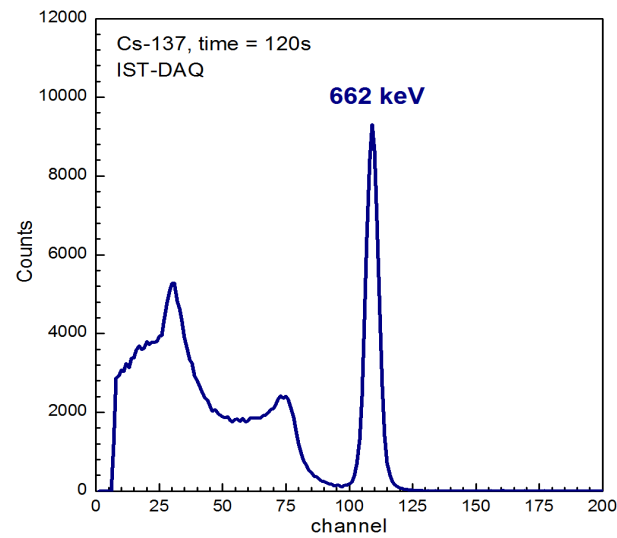


Measurements performed
at JET in a cubicle

Channel no. 18
Detector #13
V = 54,6

FWHM
(662 keV, IST-DAQ) = 5,6 %

FWHM
(662 keV, CAEN) = 5,2 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	19 of 20



Measurements performed
at JET in a cubicle

Channel no. 19

Detector #19

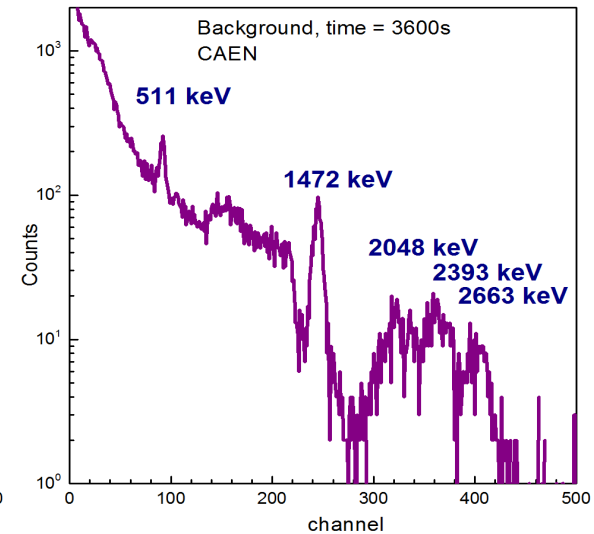
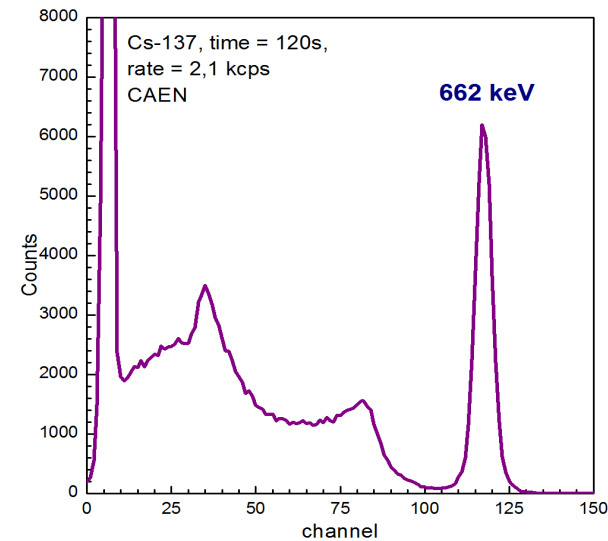
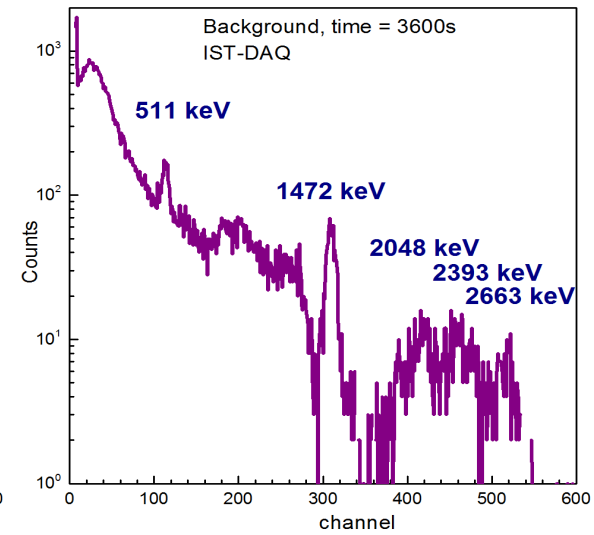
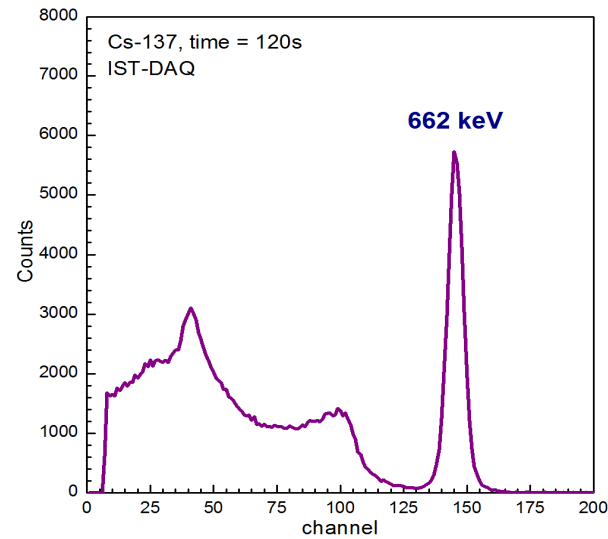
V = 54,6

FWHM

(662 keV, IST-DAQ) = 5,2 %

FWHM

(662 keV, CAEN) = 5,1 %



WPJET4	GCU AT NCBJ	Date	Page
GCU	ADDITIONAL REPORT	July 2017	20 of 20