

Tests of the upgraded JET gamma camera detectors

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In 2017 tests of upgraded detectors installed at the JET Gamma Camera (GC) were performed at both NCBJ and JET.

19 detector systems consisting of a silicon photomultiplier MPPC placed on an RC passive base and a $\phi 25.4 \times 16.9$ mm LaBr₃:Ce scintillator were assembled at NCBJ. The MPPC was glued to a scintillator with a Cargille glue (MELTMOUNT 1.539 Code 53). The climate chamber available at Świerk Science & Technology Park was used for this procedure. The operational voltage of the MPPC was set to 54.6 V.

Sample test results are shown in Fig. 1.

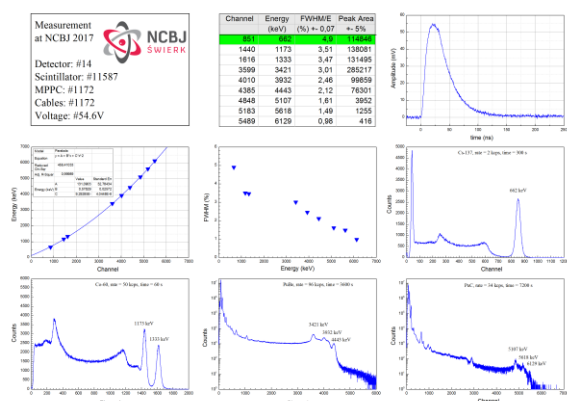


Fig. 1. Datasheet for detector #14 from tests conducted at NCBJ.

The amplitude of each detector (top right) was observed on an oscilloscope. Afterwards measurements with radioactive sources were conducted: ¹³⁷Cs (middle right), ⁶⁰Co (bottom left), ^{Pu}Be (bottom middle), ^{Pu}C (bottom right). An energy calibration of the detectors (middle left) was performed and the energy resolution was evaluated (middle). A CAEN DT5730 digitizer was used in the measurements.

The detectors were then sent to the JET laboratory with their auxiliary equipment, including the MTC@NCBJ and the FilterBox@NCBJ [1].

At JET, measurements were conducted with a ²²Na source (right part in Fig. 2), placed permanently inside the GC construction, and with an external ¹³⁷Cs source (left part) placed in front of each detector. These measurements were carried out with a CAEN DT 5730 digitizer (bottom), and the dedicated acquisition system from the Instituto de Plasmas e Fusão Nuclear (IST) (top).

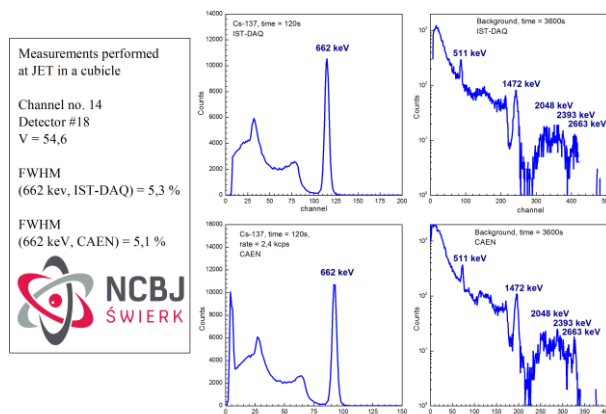


Fig. 2. Datasheet for detector #14 from tests conducted at JET.

In Fig. 3 a comparison of measured energy resolution values obtained at NCBJ and JET is shown.

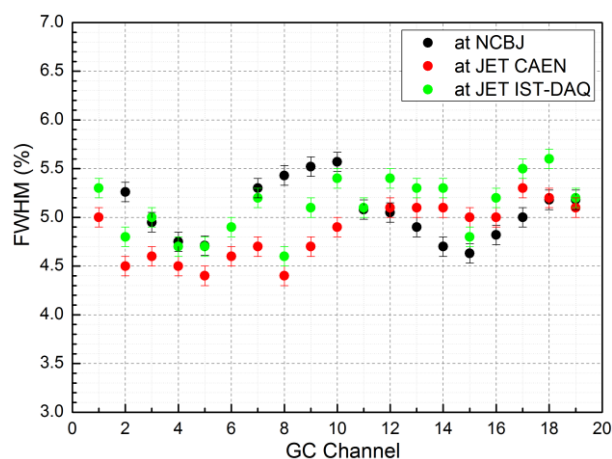


Fig. 3. Energy resolutions of the 0.662 MeV line for each detector in the Gamma Camera.

In 2018 tests will be carried out at JET with the Gamma-ray Camera installed in the tokamak hall.

References

- [1] A. Urban et al., *Detectors for High Count Rate Measurements with a Compensation for MPPC Gain Dependence on Temperature*, EPJ Web Conf., 170 (2018) 02007
- [2] DOI: <https://doi.org/10.1051/epjconf/201817002007>

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