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Functioning of the CARTOGAM Portable Gamma Camera in a Photon Counting Mode

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Abstract

The CARTOGAM portable gamma camera, which is particularly compact (15 Kg in mass, including the shield, 8 cm in diameter), has been developed for gamma imaging applications in nuclear facilities. The detector is composed of a CsI(Tl) scintillator, an image intensifier and a CCD matrix. The ordinary mode for image acquisition with such a detector is an integrating mode: signal accumulated in the CCD pixels is read at the end of the exposure time, or even periodically with a summation in a PC memory. The main sources of noise in that mode are the photo-cathode thermo-electronic emission and the CCD leaking pixels.

We have developed an alternative acquisition mode based on a morphological processing of the elementary images at the video frequency (25 im/s). In that mode, gamma events are individually identified and the noise due to isolated thermo-electrons or white pixels is (almost) completely removed, thus leading to an important gain in camera sensitivity.

We present here experimental results obtained in this photon counting mode concerning SNR, spatial resolution, saturation limit in dose rate, sensitivity and comparison with the intergrating mode. We present also a short analysis of the problem of measuring the SNR in practice in such images.