Silicon PhotoMultipliers, introducing the Digital Age in Low Light Detection

The Department of Science and High Technology at Università dell'Insubria in Como hosts the activities of the team lead by Massimo Caccia, professor. The team develops instruments and methods based on the use of Silicon detectors of ionizing particles and light.

Since a decade, the core activities have been based on the use of Silicon Photomultipliers (SiPM), single photon sensitive devices with single photon sensitivity, photon number resolving capability, low bias supply, robustness, low cost, magnetic field immunity, extreme time resolution and, last but not least, design flexibility.

The team ci collaborating with the major sensor producers and it has been involved in a number of projects, in collaboration with research teams and industry. Among them, it is worth mentioning:

- RAPSODI, a project supported by the European Commissione within the VI Framework program. RAPSODI addressed the use of SiPM in homeland security, medical dosimetry and radon detection.
- MODES-SNM, a project supported by the European Commissione within the VII Framework program. MODES targeted the development of a detector suite for homeland security, based on scintillation light by high pressure noble gases
- The collaborative projects with AWE (the Atomic Weapons Establishment) and KROMEK, a British public company) on the characterization of novel scintillators for neutron detection and neurton/gamma discrimination
- A series of developments with British and German companies in the medical domain.
- A joint development Laboratory established with CAEN s.p.a., a leading Italian company in the nuclear electronics market
- The design and construction of Dual Readout Calorimeter module, supported by Texas Tech, Iowa State University and INFN.
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Recently, the team addressed as well the use of Silicon Photomultipliers for the analysis of biological samples. Last but not least, it is collaborating with a team from University of Aveiro (Portugal) and CAEN s.p.a. on the development of a table top, low cost Positron Emission tomography scanner.

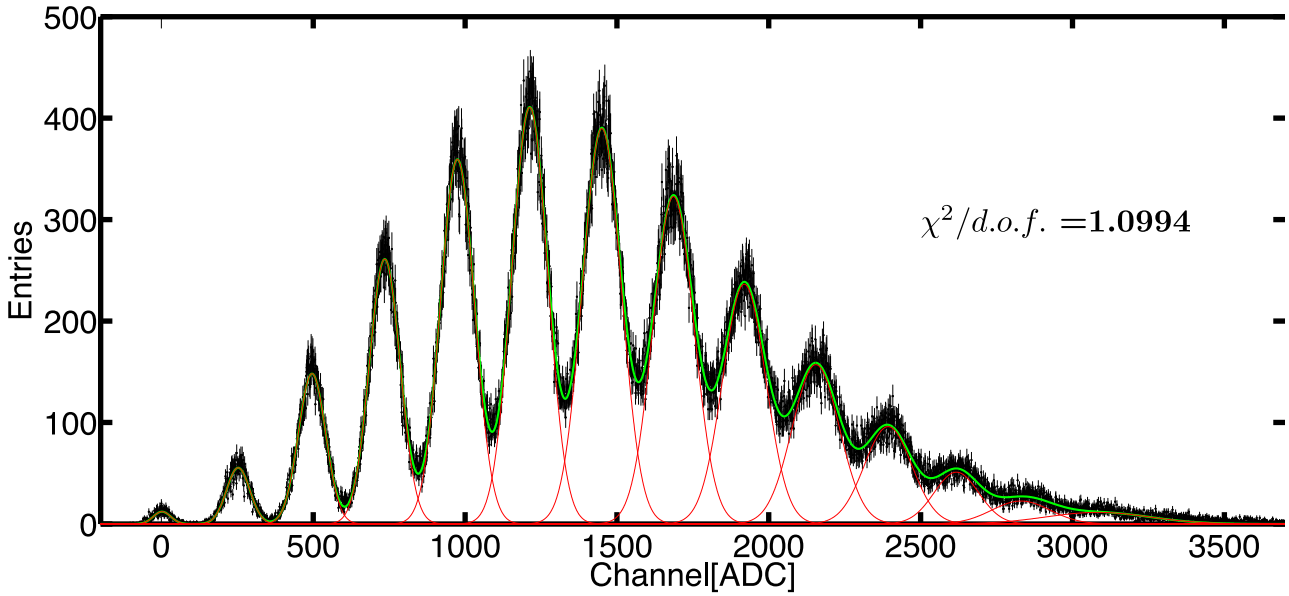

Figure 1.The picture is showing the response of a SiPM sensor to a high statistics of nanosecond long light bullets, illuminating the sensor at kHz rate. The peaks correspond to the number of illuminated pixels, proportional to the number of incoming photons. The different areas of the peaks are due to the statistical properties of the light source, notably following the Poisson distribution..

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