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A Silicon-photomultiplier based random bit streamer I

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Silicon PhotoMultipliers (SiPM) are rapidly approaching a significant maturity stage, making them a well recognised platform for the development of evolutionary and novel solutions in a wide range of applications for research and industry. However, they are still affected by stochastic terms, notably a significant Dark Count Rate (DCR) at the level of 50 kHz/mm^2 at room temperature, limiting their use when single photo-electron pulses convey the required information, for instance in chemiluminescence or fluorescence analysis of biological samples or dosimetry by counting. In such applications, randomness of the spontaneous generation of carriers triggering the avalanche and the rate of occurrences is significantly decreasing the sensitivity of the system against solutions based, for instance, on traditional photo-multiplier tubes.
However, unpredictability of the "dark"pulses has a potential value in domains connected to encryption and, in general terms, cybersecurity. "Random Power"is a project approved within the ATTRACT call for proposals (https://attract-eu.com), having as a main goal the generation of random bit streams by properly analysing the time sequence of the Dark Pulses. The patent protected principle has been proven using laboratory equipment and its value assessed applying the National Institute of Standard and Technology (NIST) protocols, complemented by other test suites. By the time of writing and thanks to the support by ATTRACT in its "Phase I", a credit-card size board has been designed, produced and qualified as a real "minimum viable product". Now, the project is entering a new stage, thanks to the approval of the "Phase II" ATTRACT project, aiming to the scale-up of the platform to a multi-generator board for data centres and the miniaturisation into a dedicated ASIC, embedding both a Single Photon Avalanche Diode (SPAD) array and the functionalities required to extract the bit stream. The consortium project comprises six industries at European level, both corporates and small enterprise, and three research institutions.

The state of the project and the workplan will be described, together with the results obtained so far and the view to the market.

In-person participation

Yes

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