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A Compact System for Photon Counting based on Silicon Photomultiplier

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ABSTRACT

A compact and portable detection system is necessary to measure the amount of pollutant from environmental sample by detecting and quantifying the light emitted by bioluminescent reporters. This silicon photomultiplier based project is hoping to acquire even more accurate data at a far lower light level than previously developed smartphone based system. After pre-amplification and comparator, the signal is separated from the internal noise present in the overall circuit. Next, the microcontroller counts the number of pulses generated by the comparator in a set amount of time and transfers the data to the Bluetooth module for the smartphone to receive it. Currently, each component of the system has been placed on a printed circuit board and works as designed; including the proper amplification, fast discrimination of signal and optimized pulse counting program with Bluetooth communication. With this compact system, many future experiments can be carried out in order to determine the effectiveness of different bioluminescent reporter strains on the detection of environmental pollutant contents or food-safety related analytes such as pathogenic bacteria. Future work should focus on the complete integration of all the developed components and the silicon photomultiplier to deliver its maximum performance.

KEYWORDS

Photon counting, bioluminescent reporter, pollutant, silicon photomultiplier.