



Next Generation Bioluminescence Detection System

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Current ultrasensitive photodetector systems use photomultiplier detector (PMT) setups that are expensive, bulky, and difficult to perform maintenance on but are common due to legacy. The primary use of these systems is for very low light wattage detection systems in the order of picowatts. Our system replaces the PMT with a new silicon detector device known as a silicon photomultiplier (SiPM) that functions like an array of avalanche photodiodes in geiger mode. Using an SiPM for a detector gives us high gain, moderate noise, resilience to magnetic effects and can easily be serviced without having to worry about damage from ambient light. The SiPM also has high photon detection efficiency (>40%) and a very small, 1mm x 1mm, footprint.

Our full detection system, branded as Fotek, consists of an SiPM with a peltier cooling system that lowers the dark count noise, and a lens system that increases the photon flux hitting the detector. In addition the system uses a signal conditioning circuit seen in figure 1 that helps separate the noise from the signal. The Fotek detection system is used inside a housing seen in Figure 2. The housing holds the detection system and GeneWeave's specialized test tubes for bioluminescent reaction sensing.



Figure 1: Signal Conditioning PCB



Figure 2: Detection System Housing