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# First Results of GaInP Based Light Sensors for High Energy Physics and Future Directions

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Measurements in particle physics often rely on measuring the light produced in particle interactions with detector materials. Highly sensitive and fast detectors are frequently required. This is frequently accomplished with the use of Silicon photomultipliers (SiPMs), a type of avalanche photodiode operated in Geiger-mode (GAPD) with high detection efficiency and single photon resolution capability. However, in the brutal radiation environments of particle physics experiments, SiPMs degrade, pushing for the development of new, radiation hard, GAPDs. This work presents a first look at Gallium-Indium-Phosphide based light detectors, evidencing their promise as a viable alternative to the SiPM. As a large band-gap, compound semiconductor, GaInP possess the prerequisites for radiation hardness. In addition to measurements of the performance properties of these single-photon sensors, we will present radiation studies on the two most recent generations of prototype devices. Also new to this analysis is a long-exposure photography technique to understand the spatial extent of the radiation damage. These devices demonstrate that functional GaInP based APDs can be made, and these early studies suggest methods for improvement in future prototype generations. We will also discuss future physics analyses of cascade decays and new hardware directions.

**Primary author:** CUMMINGS, Grace (University of Virginia)

**Co-author:** Prof. HIROSKY, Bob (Virginia)

**Presenter:** CUMMINGS, Grace (University of Virginia)

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