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A large surface Photomultiplier based on SiPMs

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Photosensitive devices represent a key solution for several current and future categories of experiments in which light detection can be considered the main observation channel for physical phenomena.

Astro-particle experiments for instance, one of the most promising observation channels for passive High Energy Physics, typically study energetic phenomena in which charged particles originating from the interactions or decays of primary particles radiate Cherenkov or fluorescence light, which is then detected by photosensitive devices.

In these fields of applications, the relatively new Silicon Photomultipliers (SiPM) based on the limited Geiger-mode avalanche (generally G-APD, Geiger Avalanche Photons Detectors), are starting to be extensively studied in view of their future utilization.

Actually, however, their use is highly limited by their small sensitive surfaces. In order to overcome to the limits of the small dimensions of the sensitive part of SiPM devices, different solutions to increase their field of view are reported. In particular it is discussed the use of Optical Concentrators with the correct refraction index, characteristic and geometry for the improvement of the aperture angle of view of a SiPM device and the development of a FPGA based digital circuit that allows the combination of many Optical Concentrator +MPPC systems in order to reduce dark counts and to obtain a larger total sensitive surface.

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