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Novel micro-pixel avalanche photodiodes and their possible application in cosmic ray/astrophysical researches

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Abstract content

In 80th a new type of APDs with negative local feedback which significantly reduces the excess noise factor introduced by the avalanche process - the metal-resistive layer-semiconductor (MRS) APDs - were developed in INR (Moscow) by Sadygov et al. in the frameworks of the Soviet DUMAND program led by M.A. Markov. In 90th and during a few last years some new kinds of the Micro-pixel Avalanche PhotoDiodes (MAPDs), which have high signal gain (up to 10^6), were developed in INR and JINR (Dubna, Moscow region). The novel MAPDs with high photon detection efficiency and very good single electron resolution which were produced and tested by "Dubna APD" collaboration (JINR - INR - IP AZ - "Zecotek" Company - "Mikron" factory) are described. Sensitive area of a MAPD — 1 mm², 4 mm² and 9 mm²; Spectral range of sensitivity — 250-650 nm; Photon detection efficiency (max.) — 20-30 %; Operating voltage — ~100 V. The excellent parameters of MAPDs are achieved due to forming an electric field with a specific geometry in the multilayer silicon structure, which ensures the localization of the avalanche processes and limits them to the micro regions (micro-pixels) with a diameter of 3 - 30 micron depending of the design. The multi channel modules of a mosaic type on the basis of MAPDs with the above mentioned (and improved!) parameters have a high potential for using as key elements for light detection in fields of Astronomy, Cosmic Ray Physics and Astroparticle Physics. Application of MAPDs in space imaging detectors observing the UV flashes in the atmosphere caused by ultra high energy cosmic ray particles (and other phenomena) is of special interest.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olive, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 5 (HE part 2), pages 1589-1592

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