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65k pixel X-Ray camera module of 75μm pixel size

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We present X-Ray camera consisting of hybrid pixel detector working in SPC mode. The camera consists of hybrid pixel detector built from silicon sensor and two readout integrated circuits, each of which is a matrix of 128 x 256 pixels with 75μm pitch, designed in CMOS 130 nm. The camera communicates with the higher level system using Ethernet, USB 2.0 and a Camera Link (up to 640 MB/s). An Artix-7 FPGA is used for both Camera Link interface and integrated circuit specific communication at the frequency of up to 200MHz –programmed in single software platform.

Summary

We present a X-Ray camera module consisting of a hybrid pixel detector working in single photon counting mode. The camera consists of square-shaped, 2 cm x 2 cm hybrid pixel detector built from a single 320 or 450 μm thick silicon sensor designed and fabricated by Hamamatsu and two readout integrated circuits, each of which is a matrix of 128 x 256 pixels with 75μm pitch, designed in CMOS 130nm at AGH-UST. The camera communicates with the higher level system using one of the interfaces including Ethernet (UDP), USB 2.0 and a Camera Link for high-speed data streaming up to 640 MB/s while having single 5V power supply connector. A commercially available sbRIO 9651 module containing an Artix-7 FPGA is used for both Camera Link interface and integrated circuit specific communication at the frequency of up to 200MHz. In the design of the camera functionality a single software platform was used for FPGA, Real-time OS and a host application allowing high acceleration of the development process.

During presentation a silicon pixel detector readout circuit architecture will be presented including single channel architecture, threshold dispersion trimming capabilities and high-count rate performance. The camera design will be shown with the details of FPGA and Real-time application written in single software platform without any significant limitations.

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