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A charge integrating silicon microstrip detector for XFEL and Synchrotron source applications.

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The pulsed beam of the new generation of FEL (Free Electron Laser) based X-ray sources places several challenges to the detector development: in particular the photon counting readout, a successful scheme in case of Synchrotron sources, cannot be used any longer. At the same time the data quality of photon counting systems, i.e. the low noise and the high dynamic range, is essential from an experimental point of view. In this context PSI has developed GOTTHARD, a charge integrating silicon strip detector which, thanks to a novel automatic gain switching feature, can provide single photon resolution, a dynamic range of 10000 12keV photons and a noise well below the photon statistics limit over the full dynamic range.

The detector module is composed from 10 readout ASIC (Application Specific Integrated Circuit) wire bonded to a single silicon sensor with a $64 \times 8 \text{ mm}^2$ sensitive area for a total of 1280 channels at 50 μm pitch. A complete readout chain, from the high speed ADCs to the Gbit link for the data download, is also integrated on the board. Burst frame rates up to 1MHz (60kHz in continuous streaming) are achievable with the system. The detector and ASIC design will be presented together with the results from the characterization measurements.

The performances of the system in XFEL and Synchrotron source applications will be discussed.

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