

Operation of a silicon microstrip detector prototype for ultra-fast imaging at a synchrotron radiation beam.

A method of imaging of ultra-fast processes, like explosion or fast combustion, at a synchrotron radiation beam is being developed at the Siberian Synchrotron and Terahertz Radiation Center (SSTRC). Two stations are operating at beam line 0 at the VEPP-3 storage ring and at beam line 8 at the VEPP-4M storage ring. Both stations are equipped with the detector for imaging of explosions DIMEX, based on high pressure ionization chamber, and allowing to record up to 100 one dimensional images with the frame rate of 8 MHz. However the maximum flux that DIMEX can detect is limited as well as spatial resolution and frame rate because of gas technology used. In view of significant increase of SR flux at the VEPP-4M beam line due to the new 9-pole 2 T wiggler, a new detector is being developed for this beam line, based on Si microstrip sensor. The first Si microstrip detector prototype has been mounted with new specially developed front-end ASIC that allows to record data with the rate of 50 MFrames/s. The first measurements with this prototype demonstrated significant improvement of all critical parameters of the detector compared to the gaseous version. The maximum detected photon rate before saturation is increased to 20000 photons/(chan x bunch) compared to 1500 photons/(chan x bunch) (Si detector has 50 um channel pitch while gaseous detector has 100 um channel pitch). Spatial resolution is improved from 240 um to 130 um and frame rate is increased by a factor more than 6.

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