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Development of the microstrip silicon detector for imaging of explosions at a synchrotron radiation beam.

In situ imaging of explosions allows to study material properties under very high pressures and temperatures. Synchrotron radiation (SR) is a powerful tool for such studies because of its unique time structure. New beam line at the VEPP-4M storage ring will allow to get X-Ray flux from each bunch close to 10^6 photons/channel where channel area is 0.05x0.5 mm^2 and average beam energy is about 30 keV. Bunches in the machine can be grouped into trains with 20 ns time gap. In order to meet these requirements a new detector development was started based on Si microstrip technology. The detector with a new dedicated front-end chip will be able to record images with maximum signal equivalent to 10^6 photons/channel, with signal to noise ratio of ~10^3, spatial resolution of 50 μm and maximum frame rate of 50 MHz. The detector has to draw very high peak and average currents without affecting the front-end chip, therefore a specific design of Si sensor should be developed. The front-end chip has to provide signal measurements with the dynamic range of about 10^4 or more and recording of the signal to an analogue memory with the rate of 50 MHz. The concept of such detector will be discussed in the presentation. The results of the simulations of the main detector parameters and the results of the first measurements with the prototype sensors will be presented.

Author: Mr SHEKHTMAN, Lev (Budker Institute of Nuclear Physics (RU))

Presenter: Mr SHEKHTMAN, Lev (Budker Institute of Nuclear Physics (RU))

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