Preliminary test of Si Photmultipliers as neutron detectors

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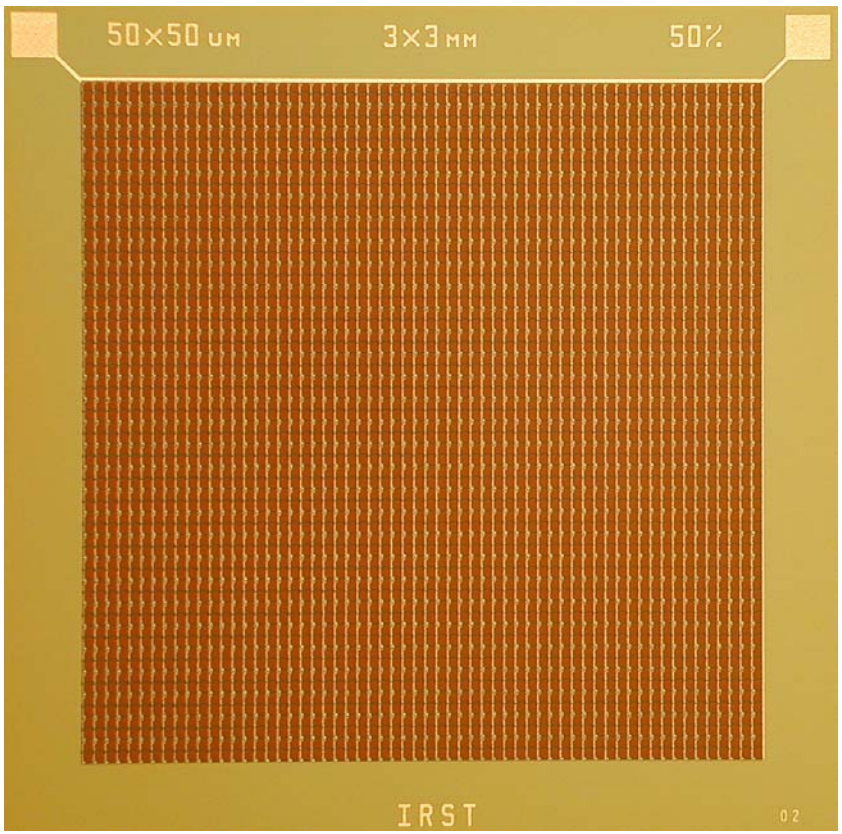
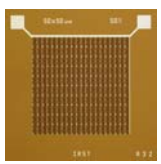
Tests performed on a 3x3 mm^2 chip composed of 3600 cells 50x50 μm^2. This device has been produced by IRST

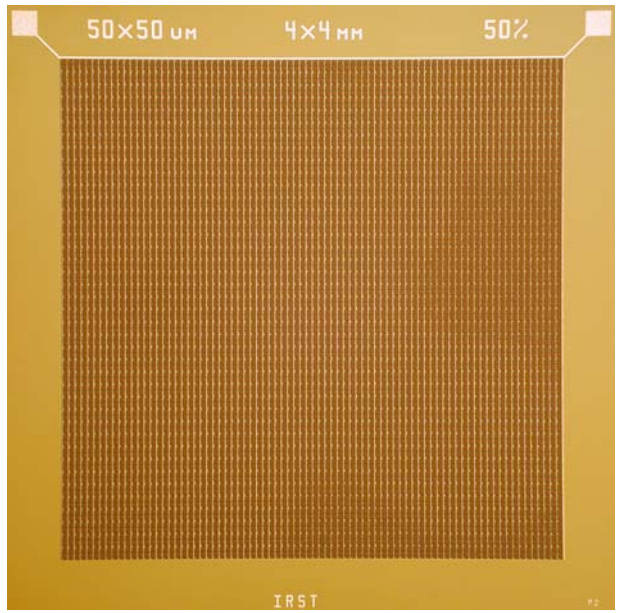


Width of the dead region around each micro cell, 5 μm.

Other devices mounted in the same way are also available from IRST

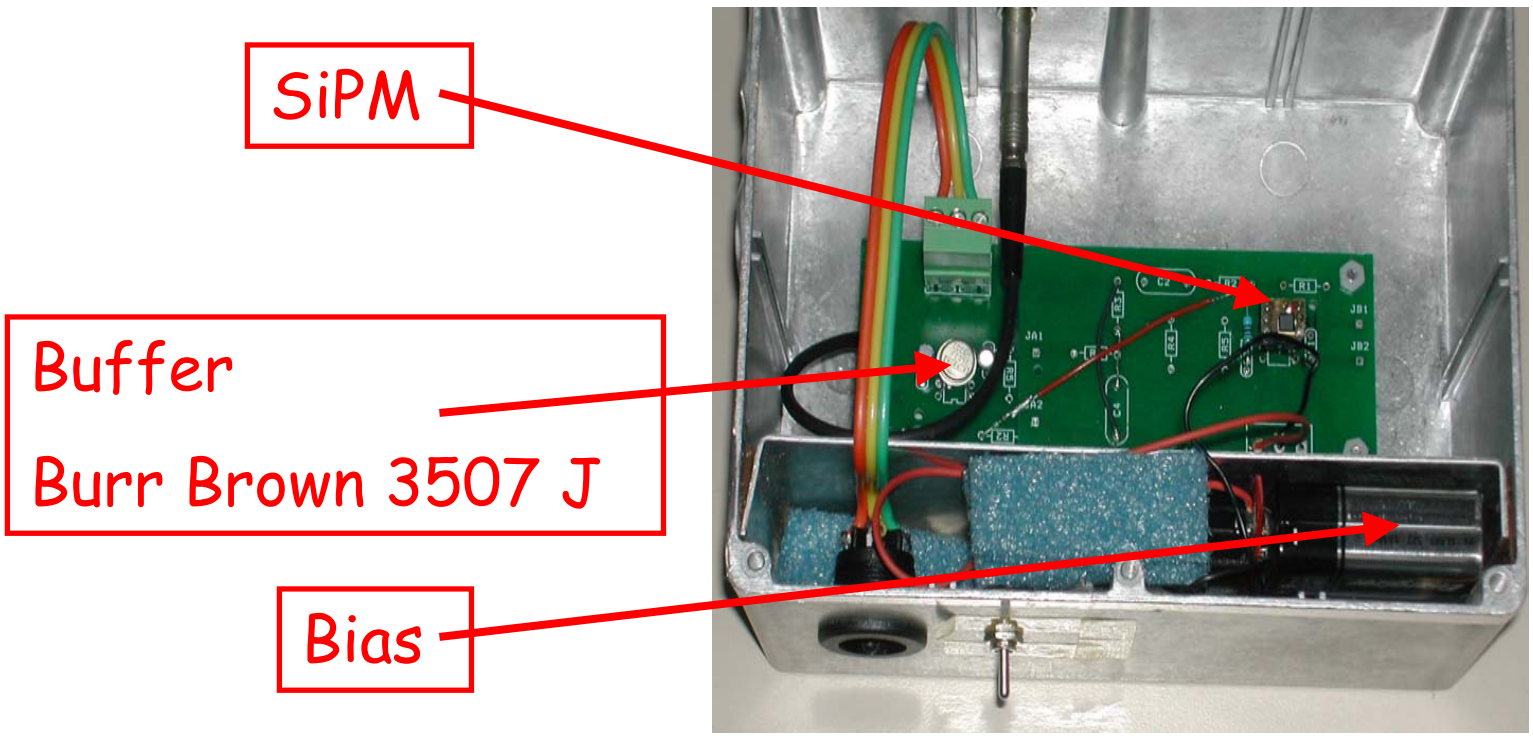


1x1 mm^2

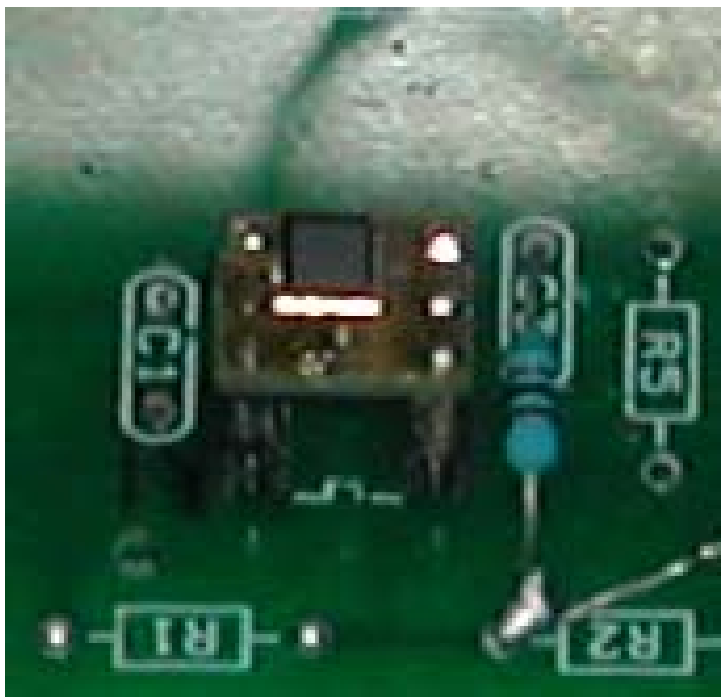


4x4 mm^2

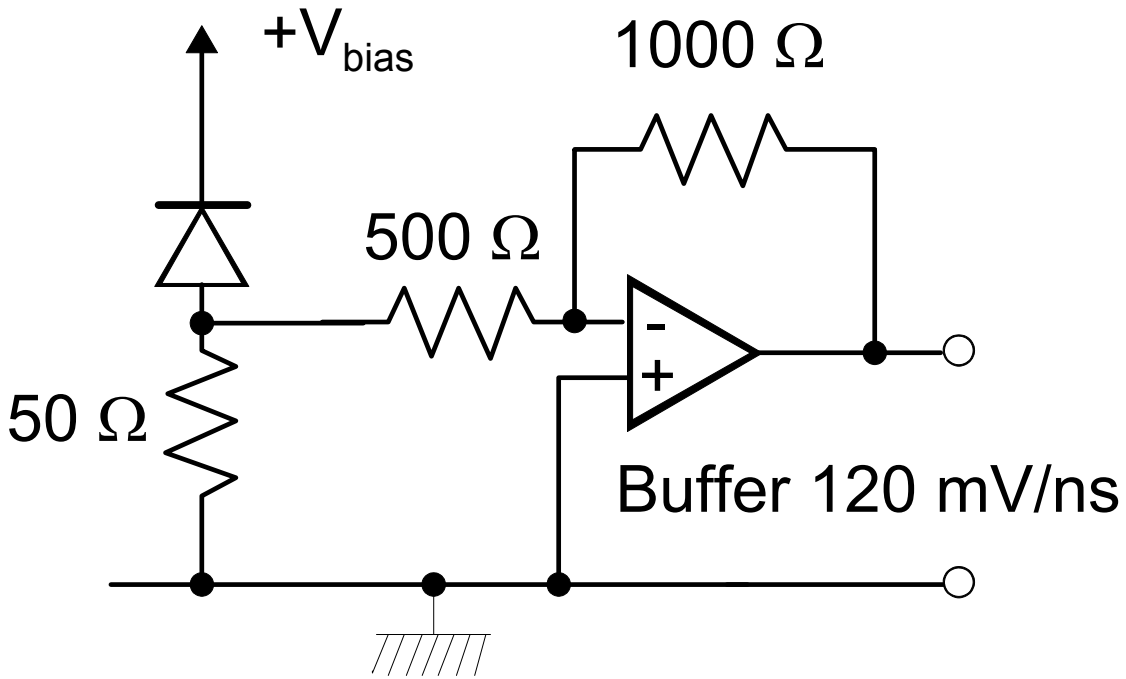
The actual test device is in the picture. The scintillator (litium glass and ZnS with ^{6}Li) is inserted in front of the SiPM at a minimum distance. In real applications it must be coupled directly to collect the maximum light pulse.



The SiPM is mounted on a small test board which can be removed to compare different devices.



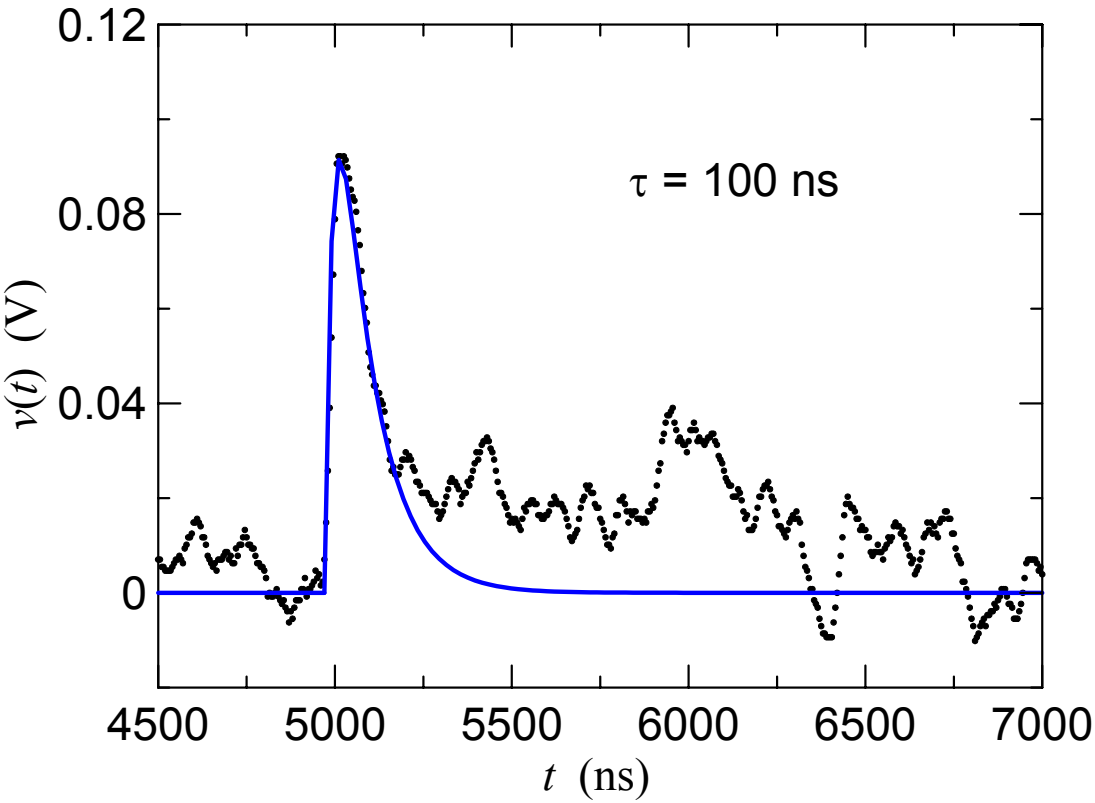
A simple scheme has been employed. The output signal has been acquired using a fast scope.



The test has been performed at FRMII using a rather long wavelength beam. The first analysis has been performed using a ^{6}Li glass and no integration of the signal apart from that intrinsically present in the circuit (~2 ns).

Several fast acquisitions have been analysed. A trigger level of 40 mV and a time step of 0.25 ns were used. The length of each acquisition was 20 μs. The actual neutron efficiency was not measured.

A typical neutron pulse is reported in the plot, where the neutron pulse is fitted to a simple form which includes a rise time of 30 ns (collection time) and a decay time of 100 ns. A statistical analysis of the data will be performed in order to define the resolution of the neutron pulses.



Similar results, but with longer decay time were obtained using a ZnS scintillator in a similar configuration. The time step was 5 ns, while the rest of the sistem is identical.