

# Silicon PhotoMultipliers as readout system for shashlik and crystal calorimeters

The work presented in this poster has been performed in the framework of the FACTOR/TWICE collaboration, a R&D project funded by the INFN with the purpose to develop and optimize the SiPM technology and test the performance of these devices as a readout system for fiber calorimeters and scintillators in high energy and space physics experiments

The FACTOR project actively collaborates with FBK-irst, which has in the past years designed and produced SiPMs with different size and layout, featuring excellent performance

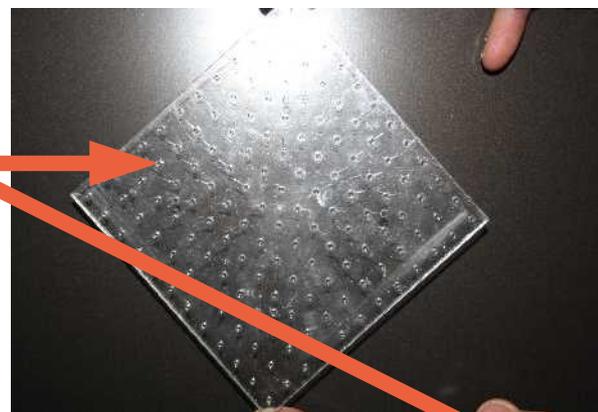
Two cases have been investigated by our group

The use of standard SiPMs for the readout of sampling calorimeters based on the shashlik technique

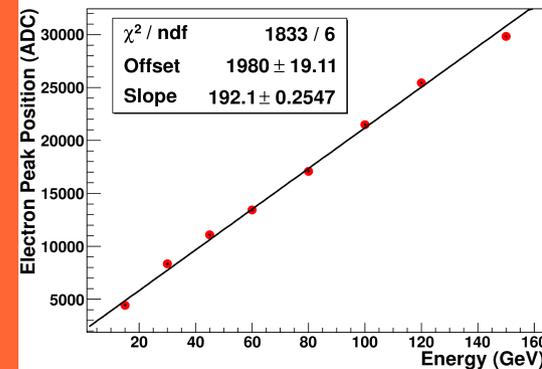
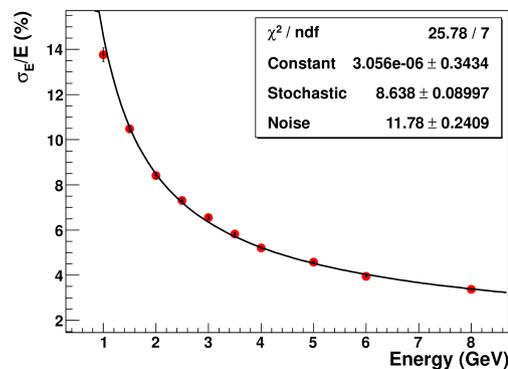
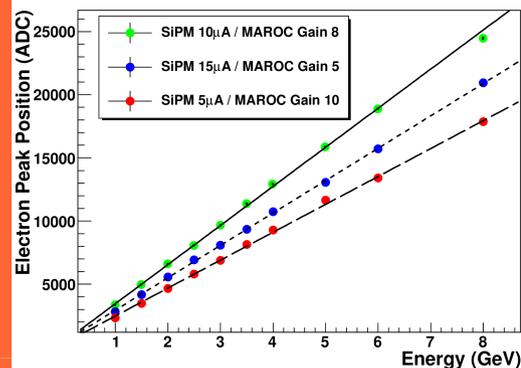
The use of a new type of SiPM (an embedded matrix of 4 SiPMs) for the readout of a lead-tungstate crystal

# Shashlik calorimetry

The shashlik calorimeter prototype tested with the SiPM readout is composed of 65 tiles of scintillator 4 mm thick and 65 tiles of lead 1.5 mm thick, for a total of  $18 X_0$ . The readout is performed with 144 WLS fibers coupled to 36 4x4mm<sup>2</sup> SiPMs.



The SiPM readout has been performed using a frontend board based on the MAROC3 ASIC.

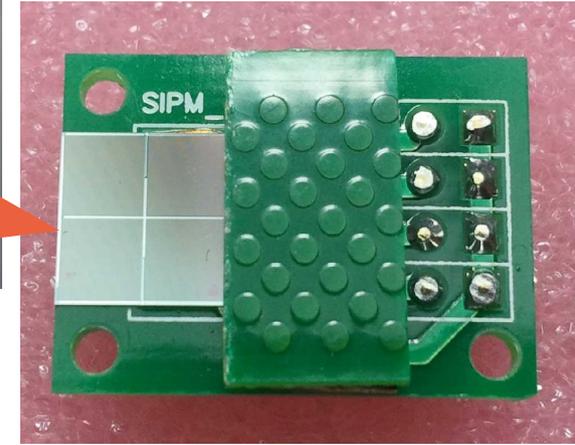
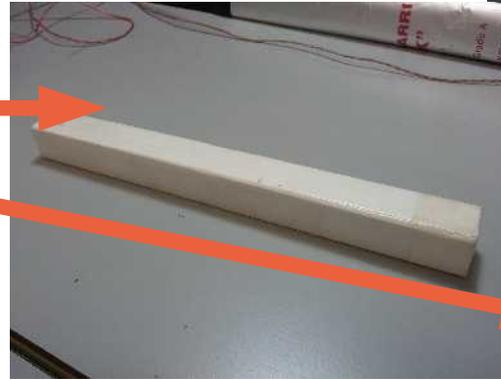


The calorimeter has been tested both with low energy (up to 8 GeV) and high energy (up to 150 GeV) electrons on the T9 and H2 beamlines @ CERN

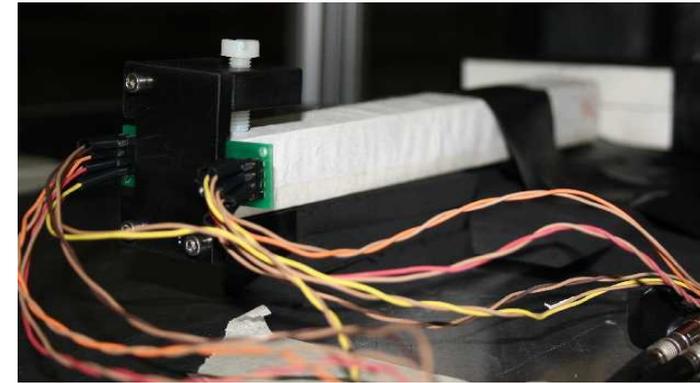
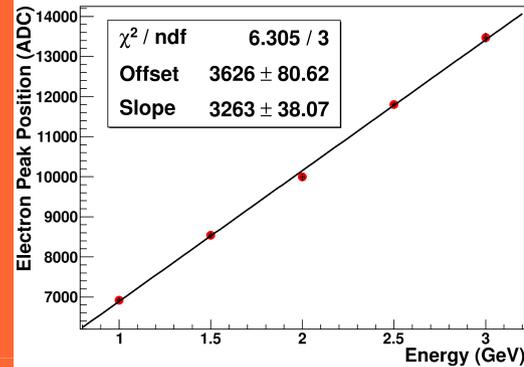
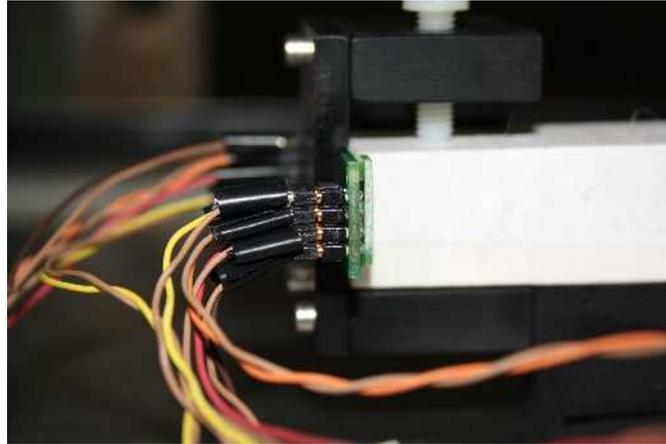


# Crystal calorimetry

A single PbWO<sub>4</sub> crystal has been tested at CERN coupled to a new type of SiPM, consisting of an array of four SiPMs embedded on the same silicon substrate called QUAD. The test have been performed on the CERN T9 beamline.



The SiPM readout has been performed using a standard charge integrating ADC



The crystal has been tested with both a single and dual QUAD readout system in terms of efficiency and energy resolution. A partial energy scan (1-3 GeV) has been also performed

