

Cooled SiPM matrixes module

Elena Popova

On behalf of MEPHY-MPI for Physics-PULSAR collaboration

During several years MPI(Munich)-MEPhI/PULSAR(Moscow) collaboration successfully developed SiPM detectors for VHE gamma-astronomy. Main goals of the development are upgrade of MAGIC experiment and creation EUSO on the SiPM basis.

The mentioned above experiments have several common requirements concerning to photosensors:

- High sensitivity to the UV light (300-400nm)
- Size not less then 5x5 mm²
- Single photon counting capability and single photon resolution
- Minimum value of optical crosstalk between the SiPM pixels, ENF=1
- Fast signal, timing resolution <2.5ns
- Ability of high density packing of photosensors with minimum gap between them
- Acceptable intrinsic dark rate

Such requirements demand necessity to find complex solution – to develop not single SiPM but whole detecting assembly for specific experiment, some kind of basic module. This module should consists of SiPM matrixes, monolithic or assembled, analogue electronics, cooling system and optical concentrators for light input to ensure assembling of modules without gap.

First prototype of such module for MAGIC experiment has been developed, produced and successfully operated now. Prototype is small knock-down vacuum chamber which contains 16 single 5x5 mm² SiPMs mounted on double stage Peltier elements together with 16 hybrid electronic channels (fast preamp-shaper) developed specially for this type of SiPM. The temperature difference between warm and cool level depends on applied voltage and can reach maximum value 90C. Knock-down construction allows to change tested SiPMs and electronics. Input window of module produced from quartz glass.

Experimental results obtained for prototype and possible ways for module construction optimization will be presented.