Use of Micropixel Avalanche Photodiodes for readout of Lead/Scintillator Hadron Calorimeter


Institute for Nuclear Research, Moscow, Russia; pr. 60-letiya Oktyabrya 7a, Moscow, Russia

MAPDs is a natural choice for the readout of highly segmented detectors, in particular, of the hadron calorimeters with fine longitudinal and transverse granulation. Such calorimeters are requested for new generation of heavy ion experiments CBM at FAIR (Germany), NA61 (CERN) and NICA (Dubna).

108 individual modules in calorimeter. Each module includes 60 lead/scintillator sandwiches. Light readout with WLS-fibers from each scintillator. Every 6 neighboring WLS-fiber are collected in one optical connector at rear side (10 longitudinal sections in module). 10 MAPDs readout light in each module.

MAPDs with individual micro-wells are produced by Dubna-Mikron collaboration.

Active area – 3x3 mm²
Pixel density - 10⁴/mm²
PDE – 20% (green light)
Gain – up to 5x10⁴
Properties of Dubna-Micron MAPDs

Linearity up to $10^4$ photoelectrons!

In full-scale calorimeter improved MAPDs from Zecotek Photonics Inc. with pixel density up to $40000$/mm$^2$ will be used.

First beam test of calorimeter prototype (9 modules)

Comparison of experimental and simulated energy depositions

Experimental energy resolution of calorimeter