

TRANSIMPEDANCE AMPLIFIERS FOR SILICON PHOTOMULTIPLIER MAPD-1

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Silicon photomultiplier MAPD-1 has high gain, fast response and was developed for tracking detectors. A number of transimpedance broadband amplifiers was developed for use with these silicon photomultipliers. The amplifiers AD-1.14, AD-1.15, AD-1.16 and AD-1.17 (see Fig. 1) have gains from 1 to 20 mV/ μ A and bandwidth from 100 to 250 MHz.

A test setup was developed to investigate the performance of the amplifier-silicon photomultiplier system. The setup allowed detecting single photo-electron events and record corresponding spectra (Fig. 2). Amplification of the system, as well as the dependence of amplification on high voltage and ambient temperature were investigated. The results are in good agreement with expected behavior of the system.

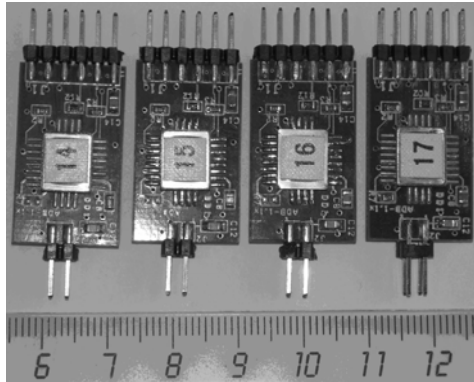


Fig. 1.

The dependence of amplification on silicon photomultiplier bias voltage shows that good stabilization of the bias voltage is required for stable operation. The dependence of amplification on ambient temperature demon-

strates that thermal stabilization of silicon photomultiplier is a critical requirement for a stable gain of the detector readout electronics. It is also demonstrated that cooling of the silicon photomultiplier improves energy resolution.

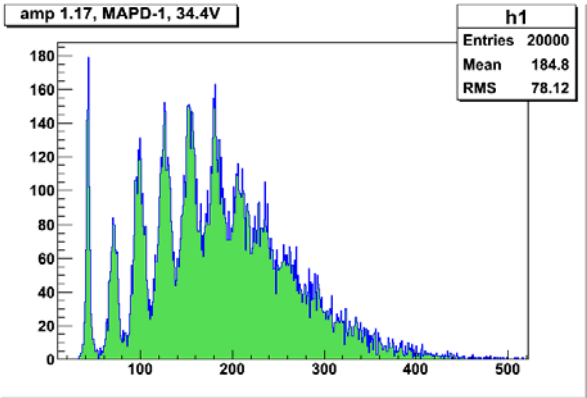


Fig. 2.

Comparison of results from different amplifiers demonstrates that matching of bandwidth of the amplifier to the bandwidth of the silicon photomultiplier is important. Amplifiers with lower bandwidth showed less than expected amplification when used with fast silicon photomultiplier.