Towards Ultrasensitive LIF Microdetectors Using Low-Cost Planar-Technology Single-Photon Avalanche Diodes

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There is widespread interest to development of microfabricated chips with integrated ultrasensitive photodetector head. Small solid-state photodetectors are more attractive than bulky Photomultiplier tubes PMT. The commercially available Single-Photon Avalanche Diodes SPAD have sensitivity much higher than PMTs, particularly in the red and near-infrared spectral range. However, they are unsuitable for integration in a chip because of features inherent in their dedicated technology: they are delicate devices with high operating voltage, power dissipation and cost. We developed different SPAD devices, specifically designed for standard planar technology, currently employed for integrated-circuit fabrication. The SPAD devices thus obtained have suitable features for integration in a chip: they are rugged and have low operating voltage, power dissipation and cost. We have developed a LIF system for chip-based DNA separation employing these SPADs. Performance better than PMT-based systems is verified, both in sensitivity tests with fluorescein samples and in DNA separation.