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A Demountable Readout for Optical Image Intensifiers

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The performance and operational advantages of using electronic image readouts in image intensifiers, such as their simplicity, flexible format, low noise, and capability for high spatial and temporal resolution, are offset by the practical issues of housing them within the detector vacuum enclosure. They commonly require oversized, non-standard vacuum enclosures, multiple low noise electronic ultra high vacuum (UHV) feed-throughs, need to be manufactured in UHV suitable materials capable of being baked to high temperatures, and are often difficult to re-use should a failure occur during detector assembly, for example due to a vacuum leak.
We describe an image intensifier utilizing the Image Charge technique which eliminates the requirement for the electronic image readout to be located within the vacuum enclosure. The Image Charge technique utilizes a single resistive anode within the vacuum enclosure to localize the event charge, while the charge signal is capacitively coupled to the readout device through a dielectric substrate which doubles as the rear wall of the vacuum enclosure. We present results obtained using a generic intensifier design with a variety of readout devices manufactured using standard multi-layer PCB techniques, from a 50 ohm multi-element design optimized for high speed operation to a four electrode multi-layer device developed from the wedge and strip anode with enhanced image resolution. The benefits of this intensifier design are discussed and a readout scheme with integrated multi-channel ASIC based electronics, which combines high spatial resolution at very high count rates, is proposed

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