

Users Report

High Precision High Voltage Supplies of EHS series for characterization of New developed Avalanche Photo Diodes

PANDA Experiment

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The high precision EHS modules from iseg Spezialelektronik GmbH are used as very stable HV power supplies for new developed Avalanche Photodiodes (APDs) featuring a very large active area. To guarantee a stable diode operation at a designated internal gain, the voltage has to be kept stable down to a level of $\Delta V = \pm 0.1V$ over a very wide voltage range from 0 to over 500 V corresponding to the APD gain values needed for device characterization. The main application of the High Precision EHS Modules is the characterization of those semiconductor devices concerning the development of the dark current I_d increasing with increasing bias voltage. The high precision of those modules is needed to measure the dark current values at very low internal gains which correspond to I_d values in the order of a few nA at room temperature. At this temperature the dark current increase for designated bias voltage values below an internal gain of 50 are in the order of a few 100 pA and has to be monitored in a very precise way to be able to identify the APD gain by measuring the occurring dark current of the device and vice versa.

On the other hand the very precise measurement of the dark current is needed for the determination of the breakdown voltage of the diodes, which is defined as the bias voltage at a designated dark current value given by the APD producer.

In case of lower operation temperatures (for our purpose $T = -25^\circ\text{C}$) the need of precise dark current measurement is much more crucial: The values of the dark current are measured to be below 1 nA and the increase steps for given bias voltage values are in the order of a few pA to determine the dark current-bias voltage characteristic in a realistic way.

The characterizations of the diodes have to be done at several different temperature values to ensure a proper operation during the experiment runtime which will be in the order of 10 years without being able to touch the diodes during this time.

Therefore the precise characterization of the new developed APDs before being mounted inside the experiment is one of the most crucial parts in the ongoing R & D program.

The High Precision EHS modules from iseg Spezialelektronik GmbH fulfill these ambitious requirements needed for our purposes.