



Single Channel Digital Detector Controller

The following describes details of the performance of the Photon Systems single channel Digital Detector Controller (DDC). Although originally designed for use with a photomultiplier tube (PMT) to control the PMT and sense and digitize the PMT output in synchronism with stimulation by one of our deep UV laser products, our DDC can be used for a wider range of applications of sensing very small electrical currents associated with optical beam induced current (OBIC), surface photovoltage spectroscopy (SPV), and other techniques. These applications and others are a logical extension of the use of our DDC.

We produce and sell 224nm or 248nm lasers that operate in a "soft" pulse mode with relatively low peak power and relatively long pulse width compared to diode pumped solid state lasers. The normal pulse duration of our 224nm HeAg lasers is 100us, but the pulse width can be adjusted out to perhaps 300us or so. The normal pulse duration of our 248nm NeCu laser is about 30us and can be extended out to perhaps 50us, but not effectively much longer. These lasers can be pulsed in single pulses or streams or bursts of pulses. In any case the DDC is gated in synchronism with our laser and does not require any other electronics. We normally use our DDC detection electronics with photomultiplier tubes to look at Raman or fluorescence emissions generated by our UV lasers. But the input to our DDC could also be used for OBIC, SPV and other, non-radiometric, applications.

The input impedance is in the gigohm range, with minimum current measurement about 20pA (20E-12A). The PMT, which we normally use, is a current source so it is similar to the input source from other devices or detectors. The current source is inputted into an Analog Devices AD8618 op amp that is similar to JFET devices. The bias current is about 0.2pA, which can be offset. The smallest feedback (integration) capacitor for the op amp is 47pf. The capacitor is digitally zeroed before each integration period, synchronized with the output of our lasers. After integration during the approximately 100us laser pulse, the capacitor charge voltage is digitized using a 16 bit a/d. Voltage resolution is 1.78uV/count which corresponds to 1.78E-15 coulombs. During a typical 100us pulse this corresponds to 1.78pA of average current.

More information about our DDC is in our data sheet. Both hardware and software are considerably improved since the issue of this data sheet. But it will give you an idea of the range of capability. The DDC is a fully digital detector with boxcar integrator with a wide range of digital choices for integration capacitors, resistor feedback, and waveform digitization. Our laser and detection electronics comes with software which enables you to digitally change the laser pulse width and amplitude, the beginning and ending integration times, and the integration capacitor size from 47pf, 4700pf and 47000pf.

If you need further information, please let us know.

