Electro Optical Components, Inc.
5464 Skylane Boulevard, Suite D, Santa Rosa, CA 95403
Toll Free: 855-EOC-6300
www.eoc-inc.com | info@eoc-inc.com

Detector Performance Terminology

Background Temperature
The effective temperature of all radiation sources viewed by the detector, excluding the signal source.

Bias Voltage
The voltage applied to the detector circuit, normally DC volts; sometimes called optimum bias for values which give optimum signal-to-noise ratios and maximum bias for values which produce the maximum signal voltage output, it is called reverse bias when applied to the P-N junction of solid crystal detectors in a reverse mode to increase the speed of response or to increase the long wavelength response.

Dark Current
The measured current in a detector circuit when operated with no signal radiation incident on the detector element

Dark Resistance
The ratio of the DC voltage across the detector to the DC current through it when no radiation is incident on the detector.

D-Star (D*)
A relative measure of sensitivity used to compare the detecting capabilities of different detectors. D* is the signal-to-noise ratio at a specific electrical frequency with a 1 Hz bandwidth when radiant power is incident on the detector active area.

Load Resistor
A resistance element that is in series with the detector element and bias voltage; typically matched to the detector's dark resistance

Resistivity
The square areas resistance of a thin film detector, where L and W are equal; L being the separation between the electrodes and W is the length of the detector active area. Resistivity is a function of the detector element temperature and the level of irradiance.

Responsivity
A value indicating signal output from radiation incident on the detector element. The value where the detector has a maximum spectral response is called peak responsivity. It is a function of detector area, wavelength, and circuit parameters.

Rise Time-Fall Time
Rise time and fall time are the times in seconds required for the signal response to rise from 10% to 90% and fall from 90% to 10% of the maximum observed signal value. This happens when detectors are exposed to pulses of signal radiant power.

RMS Noise Voltage or Current
The element of the electrical output (voltage or current) which is incoherent with the signal radiant power, usually measured with no signal radiation incident on the detector element and is related to the detector area. It is the function of frequency response, noise equivalent bandwidth, operating temperature, other circuit parameters such as the load resistor, and in some cases detector solid angle and background temperature.

Noise-Equivalent-Power (NEP)
The amount of required signal radiant power on the detector element area to yield a signal-to-noise ratio of one, and indicates the minimum detectable radiation level; the smaller the NEP value, the better the performance.

Photoconductive Detector
A photon detector which exhibits increased conductivity with incident radiant power.

Photovoltaic detector
A photon detector with a p-n or p-i-n junction which converts radiant power directly into electrical current; also called a photodiode.

RMS Signal Voltage or Current
The element of the electrical output (voltage or current) which is coherent with the monochromatic or blackbody input signal radiant power. It is a function of electrical frequency, signal power, spectral characteristics, operating temperature, and other circuit parameters such as the load resistor and bias voltage.

Spectral Response
Most of the time this is shown as D* vs. Wavelength, usually presented as a graph showing relative signal as a function of wave length of the incident radiant power.

Time Constant
A measurement of a detector's speed of response when the detector is exposed to a square wave pulse of radiation. The rise time constant is the time required for the signal voltage to reach 0.63 times its asymptotic value. The decay time constant is the time required for the signal voltage to decay to 0.37 of the asymptotic value. This can also be measured by determining the chopping frequency at which the signal response is 0.707 of its maximum value.

Document courtesy of New England Photoconductor