How to choose an IR Detector & Preamplifier

Choosing a Detector

There are four issues:

- The wavelength or wavelength region of interest
- The required speed of response
- Required sensitivity
- Other characteristics (e.g., required power consumption, size, hardiness, price)

Wavelength or wavelength region of interest.

Our IR quantum detectors are usually sensitive enough to be useful only at wavelengths shorter than 13 microns or longer. Though some models retain useful sensitivity in visible and near infrared, we suggest they be used there only when such use allows the user to avoid adding complexity to the system by not adding a more suitable detector like silicon or germanium photodiode to a system already having ours for the longer wavelength.

Required speed of response.

If the system is to monitor rapidly changing input signals, like laser pulses, you need a fast detector. We offer nanosecond response to 11+ microns. If the system is to provide real-time control of a process, you probably only need microsecond or millisecond response. If the system just needs to turn off the room lights after the last person leaves the room, a quite slow response is probably fine. Our photovoltaic detectors typically provide excellent service for all frequencies from DC to tens or even hundreds of megahertz. Our photoconductive types (like all photoconductors), though fast, have excess noise at low frequencies (called 1/f or 'flicker' noise) and must normally be chopped at a suitable frequency and synchronously demodulated to achieve slow response.

Sensitivity

How much sensitivity do you need? The best objective expression of "sensitivity" is the signal-to-noise-ratio (S/N) that a photodetector and its following electronics produces at the point where the information is to be used. S/N>10 is often plenty and S/N>100 is normally more than enough to eliminate perceived noise when viewed as an oscilloscope trace by the human eye. Higher S/N is needed as the required precision of measurement increases. Sensitivity is often costly in both money, system complexity and logistics (such as LN_2 cooling). **D*** (spoken "D-star") is a figure of merit for IR photodetectors that attempts to allow comparison between types. When it comes to D*, bigger is better.

For detailed info on how to predict the performance of a photodetector from knowledge of wavelength, frequency, D*, etc., and thus determine the S/N you can expect in your system, see our application note, "Predicting the Performance of a Photodetector".

Other detector characteristics

Characteristics that may influence your choice of a detector include power consumption, logistics like LN_2 for cooling if required, size, robustness, and price.

Choosing a Preamplifier

1. Determine the detector you intend to purchase.

2. Determine the highest frequency you expect to see or the system chopping frequency.

3. Multiply the highest frequency or the chopping frequency by 10 if you want to resolve the waveform cleanly.

4. Consult our table of available preamps. Normally select a DC-coupled preamp for use with photovoltaic devices or an AC-coupled preamp for use with photoconductive devices, or consult us.

5. Consult us if you need customized bandwidth or special gain for your preamp. We routinely customize.