## OVERVIEW

The following is a general guide to the parameters used in selecting a radiometer to fit the application.

## DYNAMIC RANGE

Dynamic Range plays a major part in radiometry. A dynamic range in excess of $10^{10}$ is a natural outdoor occurrence from hazy moonlight to direct sunlight. A radiometer's dynamic range should be appropriate for the intended use of the instrument. For instance, if measurement outdoors are only going to be taken during the day, a dynamic range of $10^5$ is adequate. One method of increasing dynamic range is to use ranges which are switched in as the applied signal strength increases. This method is sometimes called auto ranging when the switching is done automatically. The concept of switching gain in the radiometer does increase the dynamic range, however, it does introduce errors at the switching points. Each switching level must be calibrated separately, and any errors will be evident at the moment the switch occurs. Gain switching or auto ranging should be avoided if possible.

Dynamic range is important to radiometry because it defines the instruments full scale and resolution. Dynamic range can be calculated by dividing the full scale by the resolution. For instance, the PMA2201 UVB Detector has a full scale of 200 [MED/hr] and a resolution of 0.001 [MED/hr]. Therefore, the dynamic range is $200/0.001=2*10^5$.

## WAVELENGTHS

The wavelengths being measured are the true indication of which radiometry system to select. Two types of radiometers exist today. The first is a single purpose meter with dedicated wavelengths, and the second is a radiometer with detachable detectors and various wavelength availability. The dedicated meter tends to be less expensive for an application which requires only one type of measurement. However, if more than one measurement is made, the removable detector is more economical and less time consuming. If multiple measurements are required, simply pick the number of detectors needed and use the same meter. This saves time in obtaining the additional meters and also in learning how to

## COSINE RESPONSE

As a source revolves around a detector, the intensity will be at maximum when the source is directly overhead, and will decrease as the source is moved away from this position. The intensity should follow a cosine response. The angle is defined as the angle between the axis of the source and the normal to the detector surface.
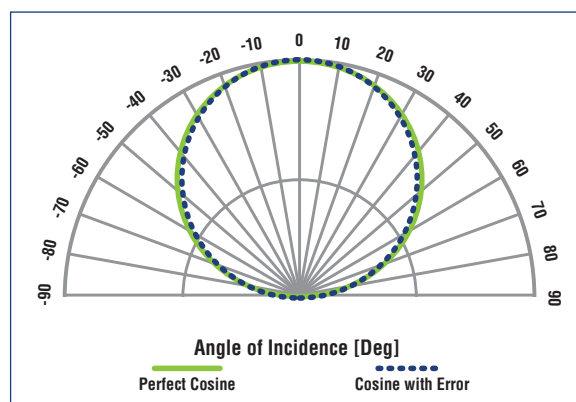


*Figure 1 Polar Plot*

At first, it would seem logical to plot a cosine response on a polar plot *(Figure 1)*. However, the polar plot only shows the general shape of the response which is good for a quick visualization. It does not show details of the error to the perfect cosine response. Errors of a few percent are nearly impossible to see on a polar plot. Therefore a Cartesian system with the error curve shown is a better choice *(Figure 2)*.
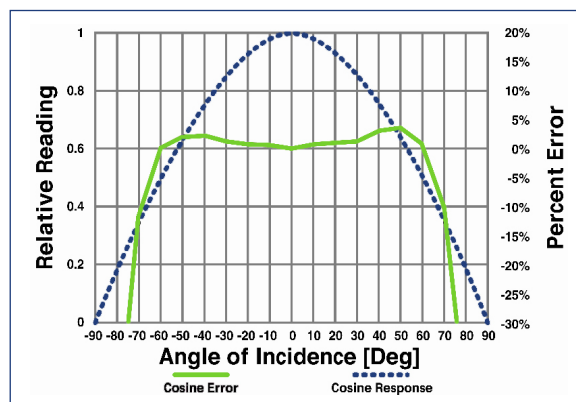


*Figure 2 Cartesian Plot*