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Technical Note

Goniometric Radiometer Alignment

Device Alignment

Misleading results can be obtained when performing single axis or perpendicular axes scans if the device under test is either not centered in the entrance aperture or if it is not pointed reasonably well into the instrument. Some users assume the measurement is made through the device optical centroid axis and it may not be so. Only when the instrument optical axis and the device optical centroid axes are coincident will this be the case.

Consider a pinhole scan of an elliptical far-field pattern. If the scan does not go through the major or minor axes, the results will be for shorter cords and smaller angular width values will be obtained. In this case, a 3D scan and Centroid Analysis will give the proper major and minor angular widths, but this takes more time; (10-15 seconds for 10 azimuthal scans, ~1 minute, 45 seconds for 200 scans under Windows 95/98, or 45 seconds for 200 scans under Windows NT 4.0).

What is "reasonably well pointed" depends on the device under test. A smooth LD with divergences of 12-20 X 30-45 degrees seems to give comparable angular widths when mis-pointed by a degree or two. We have tried to devise methods to detect mis-pointing without doing a full 3D centroid axis analysis. Software could notify the user of a possible problem if we can devise a fail-proof method; no method is obvious. Device differences prevent a single solution.

Rectangular View

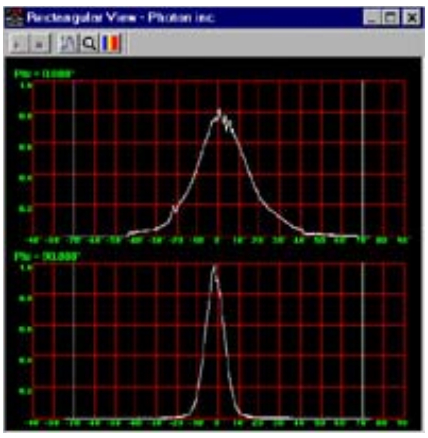

Figure 1 - 2D graphic showing source not pointing along optical axis

Topographic View

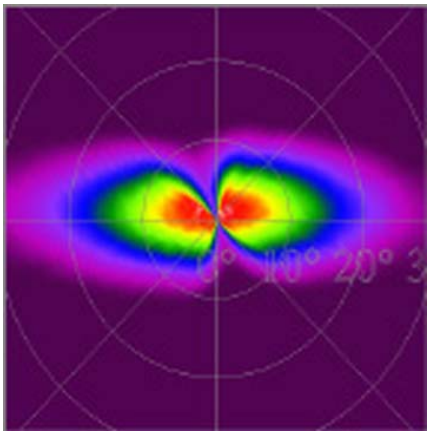

Figure 2
3D graphic showing source not fully within aperture

Topographic View

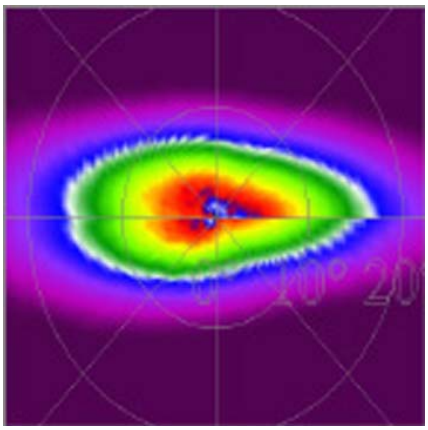

Figure 3 - 3D graphic showing a system misalignment

Alignment Check

Obtain data in perpendicular axes scan mode. If the peak values are not at 0°, as shown in Figure 1, the device is not pointing along the instrument's optical axis. If the values at 0° are not approximately the same magnitude, then the device is not centered in the aperture or is too large for the aperture (>2 mm). If this case, a 3D plot will look like Figure 2. For verification, run the full 3D data analysis and compare the results computed about the centroid axis to the fast results obtained in perpendicular axes scan mode. If they agree, use of the perpendicular axes scan mode provides correct results. Finally, if the device is centered in the aperture, but the 3D plot looks like Figure 3, then there is a system misalignment and the unit will need to be returned to the factory for realignment.