What equipment do you need?

Getting the Right Equipment

Several factors should be considered before you decide what type of equipment you need. Start by answering the question “Do I want to make a measurement or do I simply want to detect potentially hazardous levels?” In many cases you may decide to do both.

SURVEY EQUIPMENT

- provides accurate measurements and can be used to determine the level of compliance to a particular standard
- requires a reasonable level of training before it can be used with confidence
- does not provide continuous monitoring against sudden equipment failure

In contrast . . .

MONITORING EQUIPMENT

- is not designed for – nor should it be used to make – measurements
- requires only very limited training of personnel
- provides continuous monitoring in an area or for an individual

Frequency

Determine the operating frequency or frequencies of all the emitters, or sources, that may be present where you are going to make measurements or monitor. Don’t forget to include any sources that belong to another organization – they may be contributing some energy to the environment that you will be in. If any of the frequencies are below 300 MHz, you will probably have to measure both the electric (E) field and the magnetic (H) field. The survey system or monitor should be capable of accurately detecting all the relevant frequencies.

Microwave Ovens versus All Other Sources

(Direction vs. Omni Directional Measurement)

All major standards around the world are human exposure standards. Therefore, you need to monitor or measure the energy from all directions and polarizations. The isotropic probes used in Narda survey systems have sets of three internal sensors so that they pick up from all directions. Most oven monitoring probes contain two sensors so that they are sensitive to the energy polarized in a plane.

These directional, or anisotropic, probes meet the needs of the leakage regulations for microwave ovens but do not satisfy any other standards. Occasionally, microwave oven type instruments are used to locate leaks in industrial equipment that operate at the same 2450 MHz frequency as microwave ovens (915 MHz for very old ovens). These simple, inexpensive units can be used to find leaks but should not be used to quantify the amount of human exposure.

Determine the Type of Detection Required

In summary:

- Radar systems should only be measured with thermocouple sensors or detectors.
- Multi-signal environments require RMS detection – either thermocouple or compensated diode detectors.
- AM modulated signals require RMS detection – either thermocouple or compensated diode detectors.
- Complex, multi-signal environments, where the operating frequencies have different exposure limits, are most easily measured with Narda’s patented, shaped frequency response probes.
- Microwave ovens should be measured with anisotropic, or directional, sensors or probes.

Electric Field versus Magnetic Field Measurement

In the “far field” the electric and magnetic fields are at right angles to each other and to the direction of propagation and their magnitudes have a specific relationship. Therefore, measuring either field under these conditions is all that is required. Since the boundaries of the far field are largely related to the number of wavelengths, which decreases as the frequency increases, microwave frequency measurements are invariably far field measurements. The major standards usually use 300 MHz as the upper limit for measurement of both fields. Although you could measure either the electric or magnetic field component under far field conditions and yield the same result, higher frequency probes are almost always designed to measure the electric field because of design considerations.
Units of Measure

The power density units of mW/cm² and W/m² are really only applicable in the far field. No commercial instrument actually measures power density – they detect the electric field, the magnetic field, or the square of either field. However, plane wave equivalent power density units are often convenient even in the near field because using a common unit makes it easy to see which field contains the most energy. The Unit Conversion Tables and Formulas section contains the information that you need to make conversions. Narda’s latest microprocessor-based instruments allow you to make readings in any appropriate unit of measure with the same probe without needing to make any calculations.

Low Frequency Measurements

Low frequency electric field measurements (particularly below 10 MHz) require special techniques because of the effects of the human body on the field and because the meter and probe can be at different electrical potentials, which can result in incorrect readings. The problem can be solved in one of two ways:

- Put the equipment together on an insulated stand and stand back to make the readings.

  OR

- Use a fiber optic link to electrically isolate the probe from the meter and the user.