

Technical Article

IEC 62311: Demonstrating conformance in the high frequency range

Standards, methods, and limit values

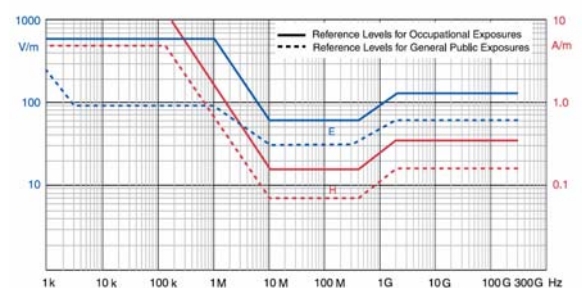
The international standard IEC 62311 entitled “Assessment of electronic and electrical equipment related to human exposure restrictions for electro-magnetic fields (0 Hz – 300 GHz)” [1] came into force in 2007. IEC 62311 applies to all devices not covered by the domestic appliance standard IEC 62233 [4] or other product group specific standards.

The equivalent European standard, EN 62311 [2] followed in 2008. It is harmonized with the international IEC standard and is already incorporated into national standards (the next lower level). The standard in the UK, for example, is BS EN 62311 [3].

IEC 62311 defines measurement procedures, not limit values. These procedures are *normative*, whereas the limit values are *informative*. According to Recommendation 1999/519/EC [5] the limit values to be applied in countries belonging to the European Community are those defined by ICNIRP, the International Commission for Non-ionizing Radiation Protection [6]. The limit values defined for “General Public” should be used in this case. In contrast, the limit values specified by IEEE [7, 8] may be applied in the USA.

The test equipment

The Narda Broadband Field Meter NBM-520 or NBM-550 can make rapid conformance measurements with evaluation in the time domain when used in conjunction ED5091 probe. This probe is a so-called Shaped Probe, i.e. it is frequency weighted so that it automatically takes account of the ICNIRP Occupational limit values. It can also be used to verify ICNIRP General Public limit values in the frequency range from 10 MHz to 50 GHz, because the Occupational limit value curves are exactly five times higher than the General Public limit value curves with reference to the flux density. Merely multiplying the displayed “% of STD” value by five will give the value according to the General Public standard.



ICNIRP limit value curves, shown from 1 kHz upwards

NBM-520 or NBM-550 with Shaped Probe ED5091

- For the frequency range 10 MHz – 50 GHz
- Automatic evaluation to ICNIRP Occupational
- Converts the results to ICNIRP General Public



The range of applications

The 10 MHz to 50 GHz range is not only used for telecommunications. It also includes frequencies that are used for industrial, scientific, and medical applications (ISM). Some of these applications are:

ISM frequency	Band	Application
13.553 – 13.567 MHz	HF	RFID, intelligence services
26.957 – 27.283 MHz	HF	CB radio, RFID, baby monitors / intercoms
40.66 – 40.70 MHz	VHF	Telemetry
433.05 – 434.79 MHz	UHF	Keyless entry, remote controls (Europe, Africa)
902 – 928 MHz	UHF	RDF, amateur radio (North and South America)
2.45 GHz	UHF	Microwave ovens, telemetry, movement sensors, WLAN
5.725 – 5.825 GHz	SHF	WLAN
24 – 24.25 GHz	EHF	Movement sensors, radio links

The advantages

Shaped Probe delivers correct results even in multi-frequency environments

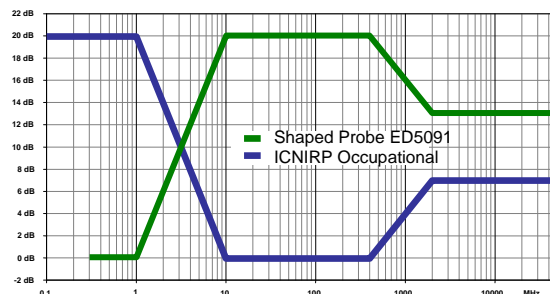
When several field components from different sources with different frequencies overlap, the test equipment must evaluate each frequency separately and produce the overall result. The Narda Broadband Field Meter NBM-520 or NBM-550 combined with the Shaped Probe ED5091 produces this result automatically and immediately. The result only needs to be multiplied by five to derive the General Public value from the Occupational value.

Shaped Probe delivers correct results regardless of spatial orientation

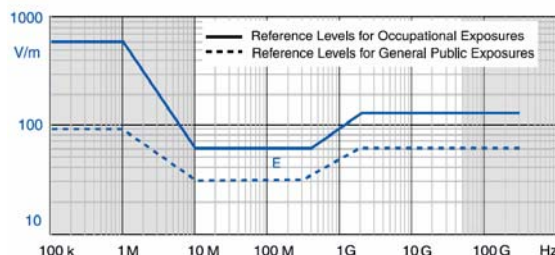
Isotropic probes are equally sensitive in all directions. The orientation of the probe with respect to the source is therefore unimportant when measuring with isotropic probes. This would otherwise be a problem in the case of multiple sources. The Shaped Probe ED5091 from Narda Safety Test Solutions is isotropic.

The limitations

The Occupational and General Public limit value curves are not parallel below 10 MHz. If there significant field components in this range are present, simple multiplication cannot be used. Additionally, the noise level of the Shaped Probe would distort the result. In cases of doubt, a measurement should be made to determine what field components below 10 MHz are present. The Selective Radiation Meter SRM from Narda Safety Test Solutions can be used for this.



Principle of the Shaped Probe: Automatic evaluation in a given frequency range. The probe sensitivity corresponds to the inverse of the limit value curve. The test equipment shows the result as “% of STD” i.e. as a percentage of the limit value of the chosen standard (ICNIRP Occupational in this case).



The ICNIRP limit value curves for Occupational and General Public are parallel to each other above 10 MHz, offset by a factor of five. The result in this range is thus simply derived from the formula

$$(\% \text{ of STD General Public}) = 5 \times (\% \text{ of STD Occupational})$$

Standards and regulations

- [1] IEC 62311 – Ed. 1.0 (2007)
Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz – 300 GHz)
- [2] EN 62311:2008
Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz – 300 GHz) (IEC62311:2007, modified)
- [3] BS EN 62311:2008
Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz) (EN 62311:2008 Identical, IEC 62311:2007 Modified)
- [4] IEC 62233 – Ed. 1.0 (2005)
Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure
- [5] Council Recommendation of 12 July 1999 on the limitation of exposure of the general public to electromagnetic fields (0 Hz to 300 GHz) (1999/519/EC).
Official Journal of the European Communities L 199/59, 30.7.1999
- [6] ICNIRP Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz).
Health Phys., 1998, vol. 41, no. 4, pp. 449-522
- [7] IEEE C95.6:2002
IEEE Standard for Safety Levels With Respect to Human Exposure to Electromagnetic Fields, 0 – 3 kHz
- [8] IEEE Std C95.1:2005
IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

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