


### 8.2 RMS or not RMS? That is the question!

Does the **Narda NBM** show the RMS (Root Mean Square) value? The limit values specified by ICNIRP or measurement standards such as IEC require that the display shows the RMS value of the electromagnetic field that is measured.

The answer to the question is yes, absolutely. You can read all about this in our **Technical Note TN012**. This publication also tells you how the required averaging algorithms are implemented in the NBM, for example. Enjoy the read!





Narda Broadband Field Meter NBM 520/500

Technical Note TN012

### Measuring RMS Field Strength

Demonstrating adherence to limit values using the NBM wideband measuring sets

Numerous national and international safety standards and directives have been published for protection from non-ionizing radiation. These define permissible limit values. Measuring the frequency-dependent reference values specified in the standards provides proof that the limits are not exceeded. These reference values are given as RMS (root mean square) values, as they represent the equivalent average value of the signal power level. The RMS value for a sine wave signal is equal to the peak value divided by  $\sqrt{2}$  (Figure 1). The RMS value is used because it represents the relevant influence quantity for the thermal effects of electromagnetic radiation. IEC 60509-1:01 also uses the terms "effective value" or "quadratic value" instead of RMS, all three terms have the same meaning.

**RMS result display**

Measured field strengths should always be taken as being RMS values unless otherwise stated. This is comparable to any multi-meter that displays the RMS value of an AC voltage, without specifically displaying "RMS" (Figure 2). The NBM field meter, too, always registers the RMS value with its wideband probes, regardless of the result type setting (Actual, Maximum, Minimum, Average or Maximum Average). The probe and base unit are therefore calibrated for RMS values.

**How this works in the NBM**

The RMS detector in the NBM is formed by the probe, which in conjunction with the base unit produces an overall integration time of about 320 ms. The probe itself delivers a DC voltage proportional to the square of the field strength, but which also still contains some residual ripple. This residual ripple is smoothed by integration in the base unit. The signal is then digitized and displayed as the RMS value. This method applies both to distributed probes and to thermocouple probes. The nonlinearity that inherently occurs in diode probes at increasing amplitudes are compensated by the base unit for each probe individually. To do this, the base unit reads the binary data out from the memory module integrated into the probe (Figure 3). This method ensures that the highest possible accuracy is achieved for large and small signal levels alike.

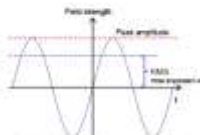


Figure 1. RMS value of a sine wave field strength signal versus sine




Figure 2. Results are always displayed as the RMS or RMS value, just like a multi-meter, regardless of the result type setting




Figure 3. A small memory chip in the NBM probe stores all the probe data

TN012\_04\_1800\_03\_Measuring RMS Field Strength
1.1.0
Subject to change