

Assessing exposure levels in a complex environment according to EN50492*

Example: Mobile phone base stations on a flat roof,
predominantly GSM-900

Task

Analysis of the location in accordance with EN50492 Section 6 reveals that a comprehensive exposure assessment as per section 6.3.3 case B must be performed:

- Overview measurement
- Determination of measured values
- GSM-900 exposure assessment

Measuring equipment

The following are needed according to Section 8:

- Spectrum analyzer SRM-3006 (calibrated as per section 8.2.3) with isotropic antenna 27 MHz – 3 GHz
- 5 m high frequency cable with ferrite cores for connecting the analyzer to the measuring antenna
- Tripod with antenna holder made from non-reflecting material

Conditions

The following points must be observed during the measurement:

- Distance from source as per Section 7
- Effects of the human body on the measurement result as per Annex G
- Spatial averaging as per Annex H

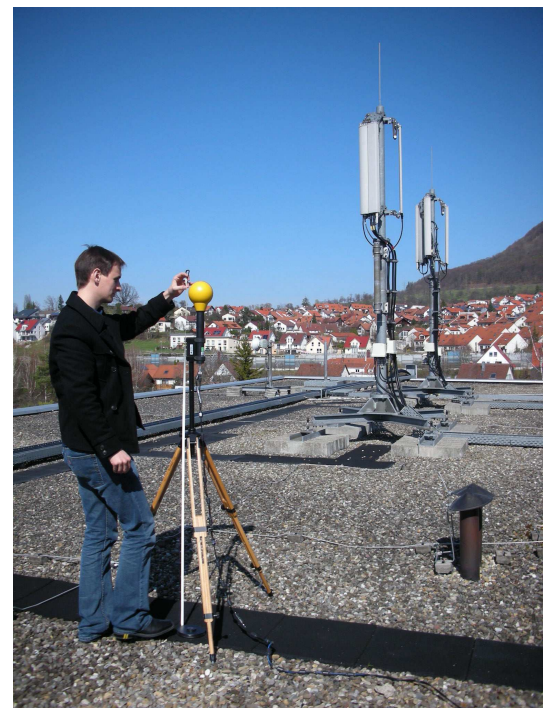


Figure 1: Isotropic measuring antenna set up on a flat roof for assessing the exposure level due to GSM-900 in accordance with EN50492

* Available e.g. from <http://shop.bsigroup.com/en/>

Procedure

A hot spot is located using the **Beep on new Maximum** function of the Spectrum Analyzer SRM-3006 and selected as the measurement location, shown in figure 2. (The Narda Broadband Meter NBM could also be used for this hot spot search.)

According to Section 7 of EN50492, a location 30 cm from the source is already in the far field at frequencies around 900 MHz. It is therefore only necessary to measure the electric field using the isotropic E-field antenna. The angle of incidence of the radiation does not need to be taken into account, as the antenna is isotropic.

A distance of two meters is maintained between the person making the measurement and the measuring antenna to eliminate the effects of the human body as per Annex D. The person's location is chosen as shown in figure 2 to ensure that it is not in the line of sight between the transmitting antennas and the measuring antenna.

The overview measurement made in accordance with EN50492 over the frequency range from 27 MHz to 3 GHz shows that the field exposure is mainly due to GSM-900, with lesser amounts due to GSM-1800 and UMTS. Only the measurement of GSM-900 is therefore considered here.

The overview measurement is also suitable for determining the frequencies that are actually occupied, to ensure that the measuring instrument is not overloaded by frequency components outside the range of interest. For this reason, Result Type Max is chosen on the SRM-3006 and the Measurement Range is set according to the peak value of the entire frequency range.

Spectrum analyzer SRM-3006 settings for the actual measurement:

- Operating mode: **Spectrum Analysis**
- Span: **925 MHz – 965 MHz**
- Resolution bandwidth (RBW): **300 kHz** as per EN50492 Annex D 4.2
- VBW: **automatic**
- Result Type: **Spatial Averaging**

According to Section 9, three measurements at heights of 1.1 m, 1.5 m and 1.7 m above the floor level should be made at the location and the results averaged. This can be done directly by selecting the Result Type Spatial Averaging / Discrete on the SRM-3006. The result averaged from the three measurements is shown directly on the display (figure 3).

Interpretation and assessment

The values at specific frequencies can be read off numerically using the marker. The total exposure level is determined using the Integration over Frequency Band function to integrate over the GSM-900 frequency range (figure 4). This value can also be directly read off numerically.

You can find further Application Notes and references under: http://www.narda-sts.de/no_cache/literature/article-library-appl-notes.html

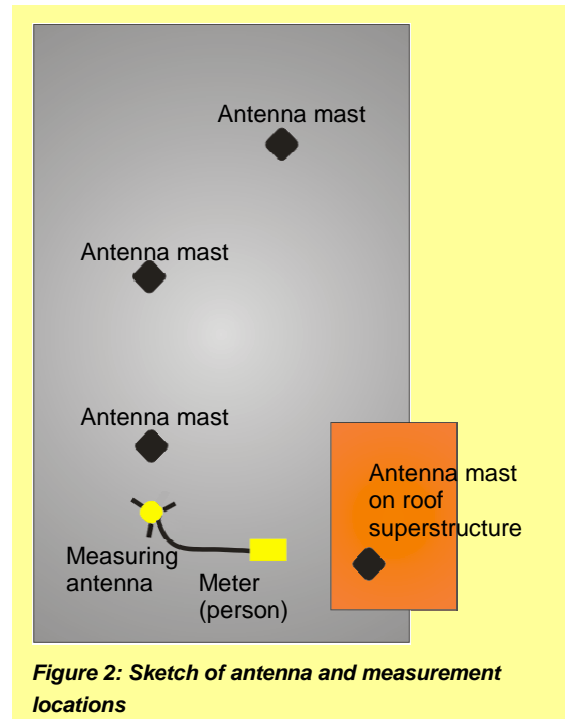


Figure 2: Sketch of antenna and measurement locations

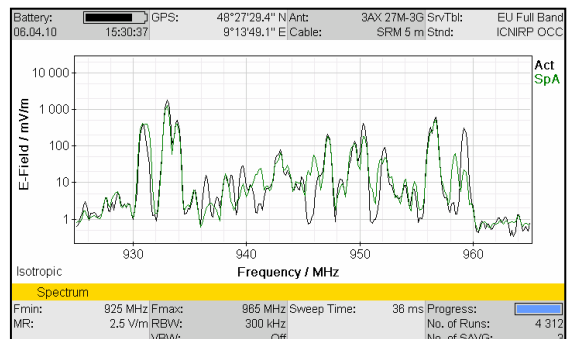


Figure 3: Spatial average result shown directly on the SRM-3006 display

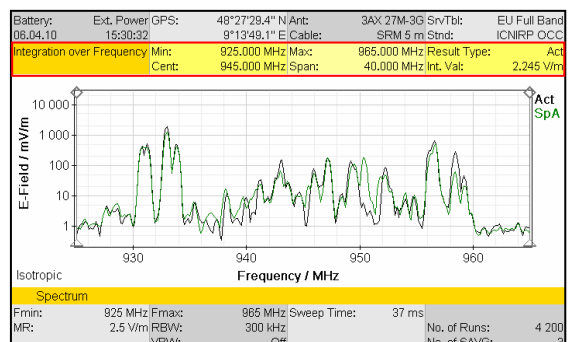


Figure 4: Integration over the GSM-900 band gives the total exposure value due to GSM-900