

UBB27

Ultra broad bandwidth antenna

Active antenna with a quasi isotropic Directional Pattern from 27 MHz to beyond 3.3 GHz



Operating Manual

Revision 1.6

This manual will be continuously updated, improved and expanded. Please visit www.gigahertz-solutions.de or your local distributor for the most recent version..

Please review documentation before using the instrument.

This manual contains important information for use, safety and maintenance of the antenna.

In addition it provides the background information necessary to make accurate measurements.

Professional Technology

The excellent technical parameters of the ultra broad bandwidth antenna opens a multitude of analysis, for its price range.

The antenna enables the HFE35C or the HF59B, a high quality measurement of RF radiation from 27 MHz to far beyond 3.3 GHz. This band contains all sources of radiation from CB-radio and other amateur frequencies, broadcasting, TV (analogue and digital), mobiles (GSM and UMTS), cordless phones (CT1+ and DECT) up to radar and WLAN. At least to some extent also frequencies up to 6 MHz can be monitored, but the measurement accuracy for this frequency range is still to be determined.

We appreciate the confidence you have shown in our product by your purchase. We are convinced that it will provide you useful information.

Should you ever encounter a problem, please contact us! We are ready to assist you quickly and efficiently.

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Safety instructions

Again: Please read this manual carefully **before using this instrument for the first time!** It contains important information for use, safety and maintenance of the antenna.

Do not allow the antenna to contact water. Do not use it outdoors while it rains. Clean its outside only, and with a slightly moist cloth. No cleaning agent or spray! Before cleaning remove the antenna from the instrument.

There are no user-serviceable parts inside the instrument.

The antenna is sensitive to heat, shock and touch. Do not leave it exposed to the sun or hot surfaces. Do not let it drop. Do not open it.

Use it only for purposes it has been designed for. Use it only with instruments or accessories recommended or supplied with it.

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Design of the antenna and its elements



- 1) Resonator ("large monopole")
- 2) Indicator lights (LED's)
 - Red = contact to circuitry and power supply ok
 - green = contact of the resonator ok
- 3) Ground plane for shielding radiation from sources below, including the instrument itself.
- 4) Casing for the circuitry (incl. Filter and compensation)
- 5) SMA connector to the instrument.

Assembly

Screw the SMA connector of the antenna to the antenna input socket as shown in the figure. The antenna is to be vertical when measuring the vertical polarized RF-signals in the horizontal plane! Adjust the mounting angle to conveniently read the display.

Clip the tool supplied with the antenna to the nut of the connector and tighten the nut as far as possible. All other nuts have already been sufficiently tightened by Gigahertz and should not be loosened. A wrench should only be used with utmost caution: The threading can easily be damaged by over tightening. The tool supplied may be left on the nut.

The two black ferrites of the antenna enhance its characteristics considerably. But their additional weight makes it the more necessary to tighten the nut of the SMA connector securely.

Note of caution:

For technical reasons the resonator is a very delicate part. Avoid touching it!

Technical instructions for the use of the UBB27

The two LED's indicate functionality of the antenna with the instrument when the instrument is switched on:

- The green LED checks the internal circuitry of the antenna and is on only when it is ok. At the same time it indicates an adequate power supply.
- The red LED verifies the antenna is correctly connected to the instrument. The red LED turns on if the connectors and contacts are ok.
- Both LED's are part of an analogue circuit. When the power becomes "low", they do not go off completely, instead they become dimmer.

The power for the active circuits of the UBB27 is supplied by the RF analyser (HFE35C or HF59B) through the antenna socket.

- The power consumed by the UBB27 alone is higher than that of the instrument itself. The time one battery charge can power the instrument plus antenna therefore is reduced to less than half. For long term recordings use the external power supply.
- As long as the display does not show "low batt", the measurements are reliable, regardless of the reduced brightness of the LED's.

Directional pattern, reception characteristic of the UBB27

The directional pattern of reception of the antenna held upright resembles a lying doughnut (of course with no hole in its centre).

Its best reception is:

- Isotropic (uniform over the whole circumference) in the perpendicular plane around the resonator axis,
- For *vertically* polarized radiation sources.

Its sensitivity decreases with an increased angle of incidence to the ground plane. The radiation from below is shielded by the ground plane. This considerably reduces the distortions of the radiation field to be measured. It also isolates the antenna from the instrument,,casing, connectors and the measuring technician below the antenna.

Power densities of *horizontally* polarized sources in the horizontal plane will be displayed as lower values by up to – 10 dB. To better analyze a horizontally polarized TV transmitter, turn the UBB27 horizontally with the ground plane in the direction of the transmitter (like a wheel rolling towards the source to be measured).

Directional pattern and reception characteristics are similar to those of the so-called bi-conical antennas, with the UBB held vertically corresponding to the bi-conicals, and their “cages” upwards and downwards. An advantage of the UBB over the bi-conical antenna is the measurements are more reproducible. This is because of the downward shielding of the ground plane

Note of caution concerning far field conditions

Please remember, that this antenna (and the LogPer as well) has been designed for far field conditions and provides reliable data only when those prevail.

Where does the far field begins? From 1.5 to 10 times the wave length. A simple rule of thumb for this complex subject. (2.5 wave lengths) gives

- 27 meters at 27 MHz
- 2.7 meters at 270 MHz
- 27 centimeters at 2.7 GHz.

Note: Inside the Near field the electrical and the magnetic field should be measured separately (one cannot calculate e.g. the magnetic field strength from the electric field strength and vice versa). Under far field conditions a single measurement gives the power density (in W/m², mW/m² or μ W/m²).

How to perform measurements

Under most measuring conditions the antenna is to be held vertically. Therefore secure it to the instrument in a position permitting to read its display with the antenna in the vertical position.

The instrument should be held high with an outstretched arm to reduce the field distortions from the measuring technicians body. If one holds it directly in front of oneself, then the body partly shields the radiation from the backside.

The measurement itself is executed the same way as with a logarithmic-periodic antenna,

except that there is no need to point it in all directions, as the UBB is omni-directional in the plane perpendicular to the resonator. For further detail refer to the instruction manual for the specific instrument in use.

Please note:

The UBB27 often gives higher readings than a LogPer antenna, for two reasons:

- With its smaller dimensions it can show so-called “hot spots”, highly localized areas of intense radiation due to multiple reflections etc, more clearly.
- Sources in the expanded frequency band below that specified for the LogPer antennas may contribute to the total immission.

Measurements obtained with the UBB27 are equally as accurate as those obtained from the LogPer antenna. Please Note: The latter has a narrower tolerance band, because of a lower volatility of their frequency band curve, which on the other hand is much narrower. In addition they are much bigger and provide average power densities over a wider area. Both can be and should be used when evaluating the immission in a given situation. It is significant to note which technique was used for each measurement.

“Rattling tone” for marking of un-pulsed transmitters

- When using the HF59B in audio analysis mode with the UBB27 attached (The switch “Signalanteil” or “Signal” set to “Voll” or “Full”), one will almost always hear a rattling tone. This is because sources of un-

pulsed radiation are almost always present in the very broad frequency range of the UBB27. The loudness of it is proportionate to the percentage of un-pulsed radiation in the total signal received. The marking is done with a frequency of 16 Hz (very low). An audio sample can be down-loaded as a MP3 file from our home page.

Limits for using the variable frequency filters VF2 and VF4

- When set to “bypass” the variable frequency filters VF2 and Vf4 have a high pass frequency band curve which begins to attenuate frequencies below a couple of 100 MHz. The analysis in the band of 27 to several 100 MHz therefore are to be done without VF2 or VF4 mounted to the instrument.

Limits for using the RF amplifiers HV10 or HV30

- The power supplied via the antenna socket of the HFE35C to the UBB27 is sufficient to support the UBB27, but not the extra load required for the amplifiers.
- The HF59B can supply the Power to the UBB27 plus the HV10.
- The HV30 cannot be used without an external power supply with the HF59B plus the UBB27. However the HV30 can be used with the HF59B plus a LogPer antenna without an external power supply.
- The (passive) external attenuator DG20, may be used with the UBB27 plus either HFE35B or HF59B without an external power supply.

Accuracy

By itself, the UBB27 inaccuracy range of +/- 3 dB extends from approx. 85 MHz up to 3.3 GHz. The antenna continues to work beyond that, but with increasing attenuation.

We state the total accuracy of our HF analyzers for the complete assembly of analyzer plus antenna in a far field under well defined conditions. (An “average measurement” with the complete assembly placed on a non-conductive support). The measurement inaccuracies for the complete assembly are the following:

- HFE35C plus UBB27 is the same +/- 3 dB, and
- HF59B plus UBB27 increases moderately to +/- 4.5 DB.

Below 85 MHz the tolerance level of the setup for the calibration becomes predominant and limits the accuracy achievable for the demonstration of the instrument. A simulation, which demonstrated an excellent correlation of actual measurement and simulated signals in the frequency band above the lower limit, proves a very good linearity down to 27 MHz. Without verification we cannot guarantee the accuracy. Frequencies below 27 MHz are damped out by an internal, extremely steep, high pass filter

Warranty

We provide a two-year warranty for factory defects on this antenna.

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