HF W 35C

HF-Analyser for Frequencies
from 2.4 to 6 GHz

Instruction Manual

Revision 4.7
This manual will be continuously updated, improved and expanded. You will find the current version at your local distributors homepage or at www.gigahertz-solutions.de

Please carefully review the manual before using the device. It contains important advice for use, safety and maintenance of the device. In addition it provides the background information necessary to make reliable measurements.

Professional Technology

With the HF analyzers, GIGAHERTZ SOLUTIONS© sets new standards in HF testing. Professional measurement engineering is offered with a unique price/performance ratio - the only one of its kind worldwide. This was made possible through the consistent use of innovative integrated components, as well as highly sophisticated production engineering. Some features have patents pending.

The HF analyzer you purchased allows a competent assessment of HF exposures between 2.4 and 6 GHz, a range containing Bluetooth / WLAN, WIMAX, some beam radio and Radar frequencies. **Lower frequencies (like e.g. cellular phone frequencies, TV, DECT) are suppressed, which means they are not audible in the Audio Frequency Analysis.** This is to avoid falsification of the reading.

We appreciate the confidence you have shown in purchasing this instrument. With the confidence that your expectations will be met, we wish you great success in collecting valuable information with this HF analyzer.

If you should encounter any problems, please contact us immediately. We are here to help. For your local partner please check:

www.gigahertz-solutions.com

Alternatively you can always turn directly:

GIGAHERTZ SOLUTIONS GmbH, Germany
D-90579 Langenzenn, Am Galgenberg 12
www.gigahertz-solutions.com

Contents

Safety Instructions:

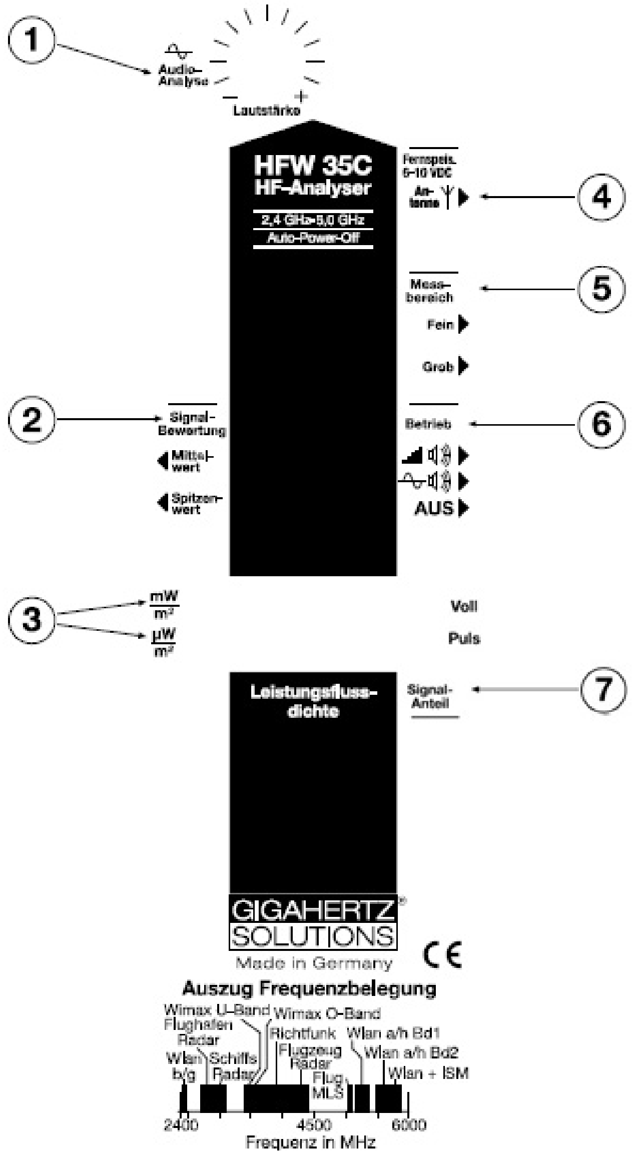
It is imperative to carefully study the instruction manual prior to using the HF analyzer. Important information regarding safety, use and maintenance is provided herein.

The HF analyzer should never come into contact with water or be used outdoors during rain. Clean the case only from the outside, using a slightly moist cloth. Do not use cleaners or sprays.

Prior to cleaning the HF analyzer or opening the case, shut it off and unplug all extension cords. There are no user-serviceable parts inside the instrument.

Due to the high sensitivity level, the electronics of the HF analyzer are very sensitive to heat, impact as well as touch. Therefore do not leave the instrument in the hot sun, on a heating element or in other damaging environments. Do not let it drop or try to manipulate its electronics inside when the case is open.

This HF analyzer should only be used for the purposes described in this manual and only in combination with supplied or recommended accessories.



The original printwork on the housing is in English, of course.

The HF component of the testing instrument is shielded against interference by an internal metal box at the antenna input (shielding factor ca. 35 – 40 dB)

Functions and Controls

1) Volume control for the audio analysis. Active, when switch “Mode” is set to the position “∿ 🔊 ”

2) Selector switch for signal evaluation. Standard setting: **“Peak”.**

3) The measurement range selected is indicated by a small horizontal bar, the units are µW/m².

4) Connecting socket for the antenna.

5) Measurement range selector switch
1999 µW/m² (“coarse”)
199.9 µW/m² (“fine”)

6) **ON/OFF switch**. In middle switch-position „∿🔊„, the audio analysis mode is activated. In upper position .ıll🔊 setting, you can additionally hear a signal proportional to the field strength[1]. This instrument has an “Auto-Power-Off function“[2].

7) **Signal fraction**[3]: The switch-position “Full” shows the total power flux density of all signals in the respective frequency range, the switch position “Pulse” only shows the amplitude modulated (pulsed) part.
Caution: Pre-amplifiers only to be used in the switch position “Pulse”

Contents of the package

Instrument

Attachable antenna

Alkaline Manganese (AlMn) 9 V battery (inside the meter)

Comprehensive instruction manual

Typical default settings are marked yellow.

Check the HF analyzer and its antenna by following the instructions under “Getting Started.“

[1] For this feature the volume control should be turned down completely because otherwise the sound mixes with the “audio analysis”. Similar to Geiger counter.

[2] The instrument switches off after about 30 minutes to avoid unintentional discharge of the battery. If the charge condition of the battery is too low, which is indicated by “LOW BATT” on the display, the device will switch off after only few minutes to avoid total discharge.

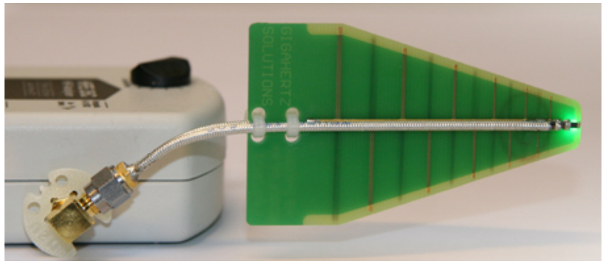
[3] Implemented as new feature from November 2007

Getting Started

Connecting the Antenna

Screw the angle SMA-connector of the antenna connection into the uppermost right socket of the HF analyzer. It is sufficient to tighten the connection with the tightening aid. Do not use a wrench or other tools because over tightening may damage the threads.

The radiation in the frequency rang of this instrument are normally vertically polarized. An orientation of the antenna suitable for this is as shown in the following picture:



Do not twist the antenna cable or bend it sharply!

For horizontal orientation of the antenna you should rotate the instrument rather than twisting the cable. The LED at the front of the antenna indicates a good connection, which is essential for an accurate measurement!

Do not touch the cable while measuring.

Remarks concerning the antenna

The SMA connector of the antenna to the instrument of the highest industrial quality available. Also the “semi rigid” cable has the best technical parameters in the instrument’s frequency range. It is designed for several hundred changes of orientation without effects for the accuracy of the measurement. For the special design of the second connecting cable we have a patent pending. The objective is to reduce an inherent weakness of “simple-log.per” antenna designs made of PCB material. For radiation incoming at an angle to the main direction normal designs pick up signals also below the design frequency range, which can falsify the measurement. This antenna suppresses this by 15 to 20 dB in addition to the approx. 40 dB of the high pass filter.

Checking Battery Status

When the “LOW BATT“ indicator appears in the center of the display, measurement values are not reliable anymore. In this case the battery needs to be changed.

If there is nothing displayed at all upon switching the analyzer on, check the connections of the battery. If that does not help try a new battery.

Remember that rechargeable batteries only have about a quarter of the capacity of the recommended AlMn-batteries.

Note

Each time you make a new selection (e.g. switch to another measurement range) the display will systematically overreact for a moment and show higher values that droop down within a couple of seconds.

The instrument is now ready for use.

In the next chapter you will find the basics for true, accurate HF-measurement.

Properties of HF Radiation…

For in-depth information on the subject of "Electro Smog" from high frequency radiation refer to the extensive literature. This instruction manual focuses on those properties that are particularly relevant for measurements in residential settings.

Across the specified frequency range (and beyond), HF radiation causes the following effects in materials exposed to it:

1. Partial Permeation
2. Partial Reflection
3. Partial Absorption.

The proportions of the various effects depend, in particular, on the exposed material, its thickness and the frequency of the HF radiation. Wood, drywall, roofs and windows, for example, are usually rather transparent spots in a house.

A continuously updated most extensive collection of exact shielding property data of construction materials by Dr. Moldan/Prof. Pauli is available under www.drmoldan.de (the file is also available in English).

Minimum Distance

In order to measure the quantity of HF radiation in the common unit "power density" (W/m²), a certain distance has to be kept from the HF source. It is important to keep a minimum distance of one to two meters between the HF35C and the source of radiation.

Background: Close to the source the electrical and the magnetic field have to be measured separately; one cannot calculate the one from the measured values of the other and vice versa. In free field conditions one can. It is measured as power density in mW/m² or µW/m².

Polarization

When HF radiation is emitted, it is sent off with a "polarization". In short, the electric component of an electromagnetic wave propagates either vertically or horizontally. Cellular phone technology, which is of greatest interest to us, is usually vertically polarized. In urban areas, however, it sometimes is already so highly deflected that it runs almost horizontally or at a ±45-degree angle. Due to reflection effects and the many ways in which a cellular handset can be held, we also observe other polarization patterns. Therefore it is always strongly recommended to measure both polarization planes, which is defined by the orientation of the antenna.

Fluctuations with Regards to Space and Time

Amplification or cancellation effects can occur in certain spots, especially within houses. This is due to reflection and is dependent on the frequencies involved. Most transmitters or cellular handsets emit different amounts of energy during a given day or over longer periods of time, because reception conditions and network usage change constantly.

All the above-mentioned factors affect the measurement technology and especially the procedure for testing. This is why in most cases several testing sessions are necessary.

…and Consequences for Measuring HF Radiation

When testing for HF exposure levels in an apartment, home or property, it is always recommended to record individual measurements on a data sheet. Later this will allow you to get a better idea of the complete situation.

It is important to **repeat measurements several times**: First, choose different daytimes and weekdays in order not to miss any of the fluctuations, which sometimes can be quite substantial. Second, once in a while, measurements should also be repeated over longer periods of time, since a situation can literally change "overnight."

Furthermore you should be aware that taking measurements indoors adds another dimension of testing uncertainties to the specified accuracy of the used HF analyzer due to the narrowness of indoor spaces. According to the "theory" quantitatively accurate HF measurements are basically only reproducible under so-called "free field conditions", yet we have to measure HF inside buildings because this is the place where we wish to know exposure levels. In order to keep system-immanent measurement uncertainties as low as possible, it is imperative to carefully follow the measurement instructions.

As mentioned earlier in the introduction, only slight changes in the positioning of the HF analyzer can lead to rather substantial fluctuations in measurement values. (This effect is even more prevalent in the ELF range.) **It is suggested that exposure assessments are based on the maximum value within a locally defined area** even though this particular value might not exactly coincide with a particular point of interest in, for example, the head area of the bed.

The above suggestion is based on the fact that slightest changes within the environment can cause rather major changes in the power density of a locally defined area. The person who performs the HF testing, for example, affects the exact point of the maximum value. It is quite possible to have two different readings within 24 hours at exactly the same spot. The maximum value across a locally defined area, usually changes only if the HF sources change, which is why the latter value is much more representative of the assessment of HF exposure.

The potential shifting of local maxima needs special consideration when setting up WLAN networks.

The following guidelines are meant for measuring immissions in buildings, i.e. power density values for comparison with recommended allowables.

A second application of this instrument is to locate the source and strength of a specific radiation (emission). The log.per antenna coming with this instrument is best suited for this. For defining counter measures and shielding see separate section at the end of this chapter.

Step-by-Step-Instruction to HF-Measurement

Preliminary Notes Concerning the Antenna

Logarithmic-periodical antenna designs can be optimized for two purposes:

- Direction finding (narrow opening angle sensitivity at the expense of measurement accuracy)
- Quantitative measurements (wide angle sensitivity at the expense of direction finding.

Our antenna strikes a good compromise between the two, with very good accuracy with still good direction finding. The direction to the source can be determined with good accuracy, a prerequisite for remedial action.

The readings from the instrument's display reflect the integral power density in the "antenna lobe". (ie., the antenna is most sensitive, with a rounded peak, to radiation from a direction parallel to its axis with the sensitivity tapering off rapidly with increasing angle of incidence.)

The logarithmic-periodic antenna supplied is optimized for the range 2.4 to 6 GHz 2400 to 6000 MHz).Its characteristic is compensated by circuitry within the instrument over the full range specified. This covers the following services (some only in Europe /Germany as of Oct. 2006):

2412 - 2484 MHz	WLAN b/g / Bluetooth
2450 MHz	Microwave oven
2700 - 2900 MHz	Airport Radar
2920 - 3100 MHz	Nautical Radar
3410 - 3494 MHz	WiMAX Low band
3510 - 3594 MHz	WiMAX High band
3600 - 4200 MHz	Beam radio
4200 - 4400 MHz	Aviation Radar (height)
5030 - 5091 MHz	MLS
5150 - 5350 MHz	Wlan a/h BAND I
5470 - 5725 MHz	Wlan a/h Band II
5725 - 5875 MHz	WLAN

All of these are digitally pulsed and for this reason considered of special biological relevance by concerned physicians.

For monitoring of these critical sources of radiation as conveniently as possible the frequency band of the LogPer aerial supplied together with the instrument has been limited intentionally by its design to frequencies above 2.4 GHz, i.e. frequencies below 2400 MHz are suppressed by the antenna design. The suppression is additionally enforced by an internal highpass filter at 2.4 GHz. This reduces the disturbing impact of sources like radio broadcasting, television stations, amateur radio, cellular and DECT phones on the measurements to a minimum.

Beyond 6 GHz the sensitivity curve of antenna and instrument droop slowly. To make use of this fading sensitivity no lowpass filter has been built in.

In order to measure frequencies below 2.4 GHz Gigahertz Solutions offers a wide range of instruments.

Measurements for a Quick Overview

This is helpful to gain insight into the overall situation. Since the actual number values are of secondary interest in this phase, it is usually best to simply follow the audio signals which are proportional to the field strength.

Procedure for the Quick Overview Measurement:

The HF analyzer and antenna should be checked following the instructions under "Getting Started."

First set the measurement range ("Range Selection") switch to "1999 μW/m²" (coarse). In this phase measurements beyond the range of the display do not matter, as the loudness of the monitoring tone is still proportional up to beyond 6000 μW/m². Only if the displayed measurement values are persistently below approx. 10 μW/m², change to the measurement range "199.9 μW/m²" (fine).

Note: When switching from the range "1999 μW/m²" to "199.9 μW/m²", the volume of the audio signal increases sharply.

Set the "Signal Evaluation" switch to "Peak"

HF radiation exposure can differ at each point and from all directions. Even though the HF field strength of a given space changes far more rapidly than at lower frequencies, it is neither feasible nor necessary to measure all directions at any given point.

Since there is no need to look at the display during an overview measurement, you only need to listen to the **audio signal**. It is very easy to walk slowly through in-door or out-door spaces in question. In doing so constantly moving the antenna or the HF analyzer with attached antenna, in each direction. This will provide you with a quick overview of the situation. In in-door spaces, antenna movements towards the ceiling or the floor will reveal astonishing results.

As already mentioned above, overview measurements are not meant to provide accurate results, but to identify those zones within which local maximum values are found.

Quantitative Measurement

Settings

After having identified the measurement points subject to closer investigation following the instructions in the previous section, quantitative precise measurements can be started.

Setting:
Measurement Range Selection

Select the appropriate switch settings as described under "Quick Overview Measurements". Basic rule for measurement range selection:

- As coarse as necessary, as fine as possible.

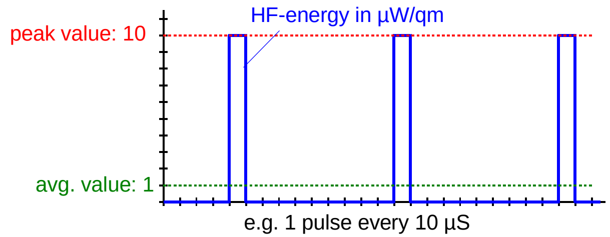
Note:

Power densities beyond the designed range of the instrument (display shows "1" on its left side with the range set on "1999 μW/m²") can still be measured by inserting the attenuator DG20_G6, available as an optional accessory. When using this attenuator, multiply the displayed power flux density by 100 to calculate the actual measurement. If more sensitivity is needed then use the pre-amplifier use the pre-amplifier HV20_2400G10 and divide the reading by 100.

Setting:
Signal Evaluation

Signal Evaluation – Average / Peak

A pulsed signal consists of sections of its time period with high output and another sections with zero output. Their maximum output is the wave peak. The following illustration shows the difference in the evaluation of a pulsed signal if displayed as an average value reading or a peak value reading.



Note: The **peak HF radiation value**, not the average value, is regarded as the measurement of critical "biological effects". The peak value is displayed in the switch setting: "Peak". The average value is displayed in the switch setting: "Average". It will show 1μW/m² (=(1*10)+9*0))/10).

The reading obtained with the setting "peak" with the Gigahertz instrument is often termed descriptively by building biologists as “average of the peak”, thus meeting the requirements. “Official” allowables are based on consideration of averages. For assessing of ”official” measurements such comparisons are useful.

Note for users of professional spectrum analyzers:

- For pulsed radiation Gigahertz’ HF-analyzers in switch setting “Peak” show the same value on the display as obtained by the “Max Peak” or “Positive Peak” Detector of a modern spectrum analyzer (calculated into µW/m²).
- The setting “average” corresponds to the setting “RMS-detector” of modern spectrum analyzers.

Quantitative Measurement: **Determination of Total High Frequency Pollution**

As described in Getting Started, attach the LogPer **antenna to the HF analyzer.** Hold the HF analyzer with a **slightly outstretched arm** because objects (mass) directly behind it “like yourself”, have effects on the testing result. Your hand should not get too close to the antenna, but should be near the bottom end of the instrument.

In the area of a **local maximum,** the positioning of the HF analyzer should be changed until the power density (the most important measurement value) can be located. This can be achieved as follows:

- When **scanning** “all directions“ with the LogPer to locate the direction from which the major HF emission(s) originate, move your wrist right and left. For emission sources behind your back, you have to turn around and place your body behind the HF analyzer.
- Through **rotating** the HF analyzer, with attached LogPer antenna, around its longitudinal axis, determine the polarization plane of the HF radiation.
- **Change** the **measurement position** and avoid measuring exclusively in one spot.. because that spot may have local or antenna-specific cancellation effects.

Some manufacturers of field meters propagate the idea that the power density should be obtained by taking measurements of all three axes and calculating the result. Most manufacturers of professional testing equipment, however, do not share this view.

In building biology, it is well accepted that exposure limit comparisons should be based on the maximum value emitted from the direction of the strongest radiation source.

Quantitative Measurement: **Special Case: Radar**

For air and sea navigation a radar antenna slowly rotates around its own axis, thereby emitting a tightly bundled “radar ray“. Even with sufficient signal strength, this ray can only be detected every couple of seconds, for a few milliseconds. This requires special measurement technology.

Please use the following procedure to ensure correct readings:

Setting: “Signal Evaluation” – “Peak”. With the help of the audio analysis (a very short “Beep” every couple of seconds), one can clearly identify a radar signal. With this setting and the LogPer antenna you can identify the direction of the source of the signal.

The long delays between pulses may consume a great deal of time trying to detect signal direction with a LogPer aerial.

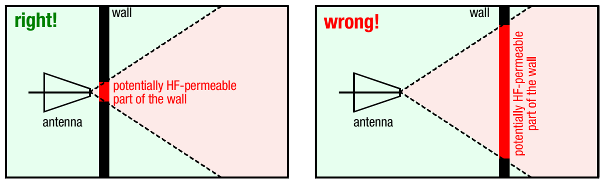
If you have identified the direction of highest radiation peaks, then keep holding the instrument into that direction and take a note of the highest reading you get as a basis for the evaluation of the radiation.

Depending on the type of radar, the average level can be up to 10 dB or 10 times lower than the actual peak power density, sometimes even more. To be on the safe side one should multiply the radar peaks (i.e. peak minus background radiation between pulses) by ten and compare this value with limits or recommendations.

Please note that there are Radar systems that are operated at even higher frequencies that can be measured with this instrument, yet possibly not the full intensity.

Quantitative Measurement:
Identify where the radiation enters a structure

As a first step eliminate sources from within the same room (e.g. cordless phones, wireless routers, etc.) Once this is completed, the remaining radiation will originate from outside. For remedial shielding it is important to identify those areas of all walls (including doors, windows and window frames!), ceiling and floor, which are penetrated by the radiation. To do this one should not stand in the centre of the room, measuring in all directions from there, but monitor the permeable areas with the antenna (log.-per.) directed and positioned close to the wall[2]. That is because the antenna lobe widens with increasing frequency. In addition reflections and cancellations inside rooms make it difficult and often impossible to locate the "leaks" accurately. See the illustrating sketch below!



The uncertainty of localization with HF-antennas

[2] Please note: In this position the readings on the LCD only indicate relative highs and lows that cannot be interpreted in absolute terms.

The shielding itself should be defined and surveyed by a specialist and in any case the area covered by it should be much larger than the area of incidence.

Limiting values, recommendations and precautions

Precautionary recommendation

for sleeping areas with pulsed radiation
Below 0.1 $\mu W/m^2$
("no anomaly" according to recommendations to the standard of building biology measuring technology SBM 2003)

for indoor areas
below 1 $\mu W/m^2$
(according to: Landessanitätsdirektion Salzburg, Austria)

The official regulations in many countries specify limits far beyond the recommendations of environmentally oriented, critical doctors, "building biologists" and many scientific institutions and also those of other countries. They are vehemently criticised, but they are nonetheless "official". The limits depend on frequencies and in the HF range of interest here they are at 10 W/m^2 for the frequencies considered here, far beyond 10 million times the recommendations. Official limits are determined by the potential heat generation in the human body and consequently measurements of averages rather than peaks. This ignores the state of environmental medicine. The "official" limits are far beyond the range of this instrument, which is optimized for accurate measurement of power densities targeted by the building biologists.

The standard SBM 2003 cited above classifies power densities of below 1 $\mu W/m^2$ as "no anomaly" for non pulsed radiation in sleeping areas, and for pulsed radiation one tenth of that.

The cerebric pulsing found in the Alpha frequency range (about 10 Hertz), as for instance used by WLAN, are considered especially active. **Effects on human health have already been observed at values far below 0.1 $\mu W/m^2$!**

The "Bund für Umwelt und Naturschutz Deutschland e. V." (BUND) proposes 100 $\mu W/m^2$ outside buildings. In view of the shielding properties of normal building materials, far lower values exist inside buildings.

In February 2002 the Medical Authority of the Federal State Salzburg, Austria, recommends to reduce its "Salzburger Precautionary Recommendation" from 1 000 $\mu W/m^2$ to 1 $\mu W/m^2$ inside buildings and 10 $\mu W/m^2$ outside. These limits are based on empirical evidence over the past few years.

The ECOLOG-Institute in Hannover, Germany made a recommendation only for outside areas, namely 10000 $\mu W/m^2$. This is well above the recommendation by building biologists and aims at getting consent also from the industry. This would possibly enable a compromise for a more realistic limit than the government regulations cited above. The authors qualify their recommendation in

- The limit should be applicable to the maximum possible emission of the transmitting stations. As the emission measured depends on the constantly varying actual load, this restricts the normal exposure much further.
- A single station should not contribute more than one third to this total.
- The extensive experience and findings of medical and building biology specialists could not be considered for the proposed limits, as their results are not sufficiently documented. The authors state, that “scientific scrutiny of their recommendations is needed urgently”.
- Not all effects on and in cells found in their research could be considered for the proposed limits, as their damaging potential could not be established with sufficient certainty.

In summary it confirms the justification of precautionary limits well below the present legal limits.

Audio Frequency Analysis

Many different frequencies within the frequency band between 2.4 and 6 GHz, are being used by many different services. The audio analysis of the modulated portion of the HF signal, help to **identify the source of a given HF radiation signal**.

How to proceed:

Set the On/OFF switch at ∿ 🔊.

For audio analysis, simply turn the volume knob of the speaker at the top of the case all the way to the left (“-“). If you are switching to audio analysis while high field strength levels prevail, high volumes can be generated quite suddenly. The knob is not fastened with glue to prevent over winding. However, if by accident you should turn the knob too far, simply turn it back again. No damage will be caused.

Sounds and signals are very difficult to describe in writing. The best way to learn the signals is to approach known HF sources very closely and listen to their specific signal patterns. Without detailed knowledge, the **characteristic signal patterns** of the following HF sources can be easily identified: 2.4-GHz telephones (base station and handset) as well as cellular phones, the signal patterns of which can be divided into “a live connected phone call“, “stand-by mode“ and especially the “establishing of a connection“. The typical signal patterns of a cellular phone base station can also be identified this way. For comparison reasons you are well advised to take measurements during high-traffic times, as well as some times during the night, in order to familiarize yourself with the different noises.

The volume can be controlled with the “volume” (speaker) knob. Note: The power consumption of the speaker is directly proportional to the volume.

On our home page (www.gigahertz-solutions.de) there is a link to some typical samples of audio analyses as MP3-files.

Marking of unpulsed signals

Un-pulsed signals (more precisely: not amplitude-modulated signals) by their very nature are not audible in the audio analysis and therefore easily missed. For that reason they are marked by a uniform “rattling” tone, with its volume proportional to its contents of the total signal. This “marking” has a frequency of 16 Hz, and an audio sample can also be downloaded as a MP3 file from our website.

If pre-amplifiers are applied with this device, the setting of the signal switch must be “Pulse”, as the “marking” feature will “interpret” the white noise as an unpulsed signal and thus be heard all the time. All relevant field sources in this range are pulsed anyway so there is no problem related to switch to “Pulse”.

Permanently low display values?

Fortunately, exposures in the frequency range of the HFW35C are not yet widespread. Therefore, we have often been asked whether the device does in fact work, as it rarely ever shows any values. In the following please find answers to frequently asked questions:

"The HFW35C only indicates very low measuring values"

Answer:

Naturally, the radar and directional radio frequencies within the frequency range of the HFW35C will only be found regionally. At present, the components for the upper WLAN band (from 5 to 6 GHz) are still difficult to obtain, so you will only encounter selective exposures in this frequency range. The WiMAX network (from 3 to 5 GHz) is only active in some testing locations, its extension all over the country is, however, expected to be accomplished within the coming two years. Therefore, for the time being, the HFW35C can be considered as a device enabling to exclude potential stronger exposures caused by these sources at the respective site. This already is an important information.

The presently most frequently measured appliances are Bluetooth appliances found at the lowest end of the involved frequency range… Questions related to this field:

"Even when transmitting data with my notebook, only low values are shown on the display"

Answer:

Thanks to the integrated transmitting power control, the notebook won't draw more power than needed for its communication with the remote station. However, if you measure within splitting distance to a notebook just transmitting data wireless, you will obtain values, at least in the finer measuring range.

"No measurement values obtained, even directly next to my WLAN/Bluetooth-compatible notebook…"

"…although the display indicates: 'searching wireless connections'"

Answer:

While searching a network, the notebook is basically not transmitting itself, so obviously no measurements can be obtained.

"…although my notebook shows various networks with good reception"

Answer:

A notebook has no problems with the reception, even if the signal strength is a factor 1000 or more below the lowest display value of the measuring device or below the building biology recommendations.

"In the finer measuring range, the HFW never shows values beyond 0.3 to 0.5 μW/m² (with or without antenna)"

Answer:

This is the residual noise of the device. It would be easy to wire the display in such a way that it would approach zero as soon as only little values are shown, thus suggesting higher precision (paradoxically, the producer himself even recommends to do so!). However, we do not consider this useful, and prefer to indicate the residual noise the way it is. Yet, if measurements without antenna reach values beyond 0.9 μW/m² within the fine measurement range (or 9 within the coarse measurement range), you should return the device for investigation, as this does no longer correspond to the specifications.

Simple testing method:

Take measurements only few meters away from an active point of access (e.g. "DSL-WLAN-router). Its "heartbeat", the well known "tac-tac-tac…", will be clearly audible, and the corresponding pulsed radiation measurable. If this works out, errors can be (almost) excluded, even for the highest frequency range. At least we have not yet had a frequency selected defect of this kind in all the years of producing HF devices.

THE solution: a pre-amplifier!

Based on the statements in the chapter "Limiting values, recommendations and precautions" about the extreme effects of WLAN signals on the human biology, an increased range appears to make sense. There is a pre-amplifier available for the amplification by a factor of 100 (HV20_2400G10). Please note: **Always measure in the "Pulse"-mode** when applying the pre-amplilfier.

Further Analysis / Optional Accessories:

An auxiliary attenuator to increase or decrease the range of power densities which can be processed with this instrument is under development, and two pre-amplifiers for the amplification by a factor of 100 and 1000 are already available (please see above).

Instrument for lower frequencies

For measurement of signal frequencies above 27 MHz (including: CB radioing, analogue and digital TV and radio TETRA etc.) we offer the instruments eHFE35C and eHFE59B.

Instrument for yet higher frequencies

An instrument up to 10/12 GHz is under development for 2007.

Available for low frequencies:

Electro smog is not limited to the Radio Frequency range!

Also for the low frequency range such as power (distribution and domestic installations) including their higher harmonics we offer a broad range of affordably priced instruments with high professional standards.

If you are interested please do not hesitate to contact us. Contact details can be found at the end of this brochure.

Power Supply

Changing the Battery

The battery compartment is at the back of the analyzer. To remove the lid, press on the grooved arrow and pull the cap off. The inserted foam will press the battery to the lid, thus avoiding it to rattle. Therefore, when pushing back the lid you will note a little resistance.

Auto-Power-Off

This function conserves energy and extends the total operating time of the battery.

1. In case you have forgotten to turn OFF the HF analyzer or it has been turned ON accidentally during transport, it will shut off automatically after 40 minutes of continuous use.
2. If “low batt” appears vertically between the digits in the center of the display, the HF analyzer will turn OFF after 3 min in order to avoid unreliable measurements. In that case change the battery.

Remediation and Shielding

Please call us or send us an e-mail.

We will assist you in any shielding project you might have.

The shielding effect of the various materials is stated normally in “dB”, e.g. “20 dB”.

Conversion of shielding effect into reduction of power density

„10dB“ is measured value divided by 10
“15dB” is measured value divided by ~30
”20dB” is measured value divided by 100
”25dV” is measured value divided by ~300
”30dB” is measured value divided by 1000
etc.

Please be aware of the manufacturer’s notes about the normally achievable shielding effects, as 100 % shielding is almost always impossible. Partial shielding reduces the attenuation considerably. That is why shielding of seemingly radiation tight adjacent areas is highly recommended.

Warranty

We provide a two year warranty on factory defects of the HF analyzer, the antenna and accessories.

The analyzer is not impact proof, due to the comparatively heavy battery and the large number of wired components.

Any damage as a result of misuse is excluded from this warranty

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Conversion Table W/m² and V/m

nW/m²	µW/m²	mW/m²	W/m²	mV/m	V/m
0,01	0,00001	0,00000001	0,00000000001	0,0614	0,0000614
0,1	0,0001	0,0000001	0,0000000001	0,194	0,000194
1	0,001	0,000001	0,000000001	0,614	0,000614
10	0,01	0,00001	0,00000001	1,94	0,00194
100	0,1	0,0001	0,0000001	6,14	0,00614
1.000	1	0,001	0,000001	19,4	0,0194
10.000	10	0,01	0,00001	61,4	0,0614
100.000	100	0,1	0,0001	194	0,194
1.000.000	1.000	1	0,001	614	0,614
10.000.000	10.000	10	0,01	1.940	1,94
100.000.000	100.000	100	0,1	6.140	6,14
1000.000.000	1.000.000	1.000	1	19.400	19,4
10.000.000.000	10.000.000	10.000	10	61.400	61,4

mV/m and V/m – figures are rounded!

Why no column „dBm“?

Most recommended building biology values for HF radiation are given in W/m², which is why this instrument is displaying in power density, µW/m² resp. mW/m². A display in dBm as e.g. on a spectrum analyzer requires transformation by a complicated formula, which depends on frequency and specifics of the antenna used. A “reconversion” therefore does not make sense.

Conversion Table

(µW/m² to V/m)

µW/m²	mV/m	µW/m²	mV/m	µW/m²	mV/m
0,01	1,94	1,0	19,4	100	194
-	-	1,2	21,3	120	213
-	-	1,4	23,0	140	230
-	-	1,6	24,6	160	246
-	-	1,8	26,0	180	261
0,02	2,75	2,0	27,5	200	275
-	-	2,5	30,7	250	307
0,03	3,36	3,0	33,6	300	336
-	-	3,5	36,3	350	363
0,04	3,88	4,0	38,8	400	388
0,05	4,34	5,0	43,4	500	434
0,06	4,76	6,0	47,6	600	476
0,07	5,14	7,0	51,4	700	514
0,08	5,49	8,0	54,9	800	549
0,09	5,82	9,0	58,2	900	582
0,10	6,14	10,0	61,4	1000	614
0,12	6,73	12,0	67,3	1200	673
0,14	7,26	14,0	72,6	1400	726
0,16	7,77	16,0	77,7	1600	777
0,18	8,24	18,0	82,4	1800	824
0,20	8,68	20,0	86,8	2000	868
0,25	9,71	25,0	97,1	2500	971
0,30	10,6	30,0	106	3000	1063
0,35	11,5	35,0	115	3500	1149
0,40	12,3	40,0	123	4000	1228
0,50	13,7	50,0	137	5000	1373
0,60	15,0	60,0	150	6000	1504
0,70	16,2	70,0	162	7000	1624
0,80	17,4	80,0	174	8000	1737
0,90	18,4	90,0	184	9000	1842