

NFA 30M

3D LF Magnetic
Field Analyzer
with Data Logger

NFAsoft

Analysis and Configu-
ration Software

Operating Manual

(Version 6.2.6)

Thank you!

We thank you for the confidence you have shown by buying this product. It allows for a professional analysis of AC electric and AC magnetic fields according to internationally recognized guidelines and the recommendations of the building biology.

In addition to this manual you can watch the tutorial videos on our website concerning the use of this meter.

Contents

1	Quick Start Guide	1
2	Overview: Front Cover	1
3	Display	2
4	Switches / Push-Buttons / Connector	3
5	How to Measure and Data-Log	5
6	Power Supply	6
7	„NFAssoft“	8
8	Firmware-Update	14
9	What if... (FAQ)	15

This manual is based on the firmware version 49 and NFAssoft version 126.

The firmware and software of the NFA will be continuously improved and made available via e-mail or download from our homepage.

1 Quick Start Guide

When you turn on the instrument the LCD will briefly show "batt" and the remaining recording time with the current capacity of the batteries.

"Signal" -> default setting is tRMS

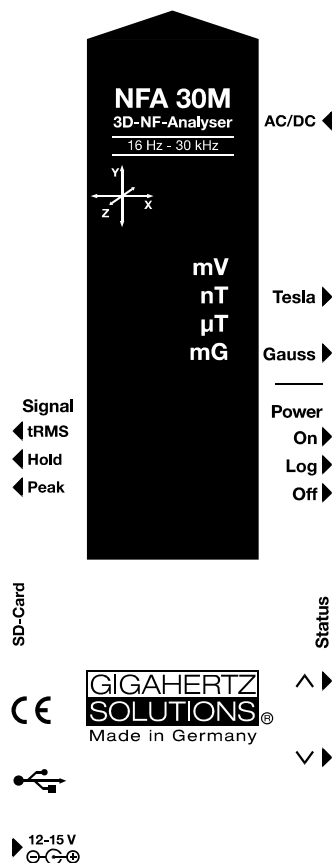
"On" = Measurement in process

"Log" = Long term recording in process

Double-click NFAsoft and follow your intuition for an evaluation of the data recorded on the SD-card.

Should the meter not do what you expect, please turn to the chapter on frequently asked questions at the end of this manual (Chapter 9)!

2 Overview: Front Cover



3 Display



In general, the display will show the three dimensional ("resulting") magnetic field. There is no need for a conversion: Simply read the measurement value on the display and the unit on the LEDs. The signal of an AC/DC input possibly connected to the device will be shown in millivolt. Use the key "[^]" to switch from one display mode to the other.

Special LCD Display Messages

"Low Batt": The rechargeable battery is low – please charge the battery

"Err. ": Short for 'Error'. Indicates an erroneous configuration.

„----“: No reliable values to be shown – either due to the instrument's transient effect, or the value is within the range of the instrument's residual noise.

„CHAr“: Instrument is being charged.

(For technical reasons the display will show "FULL" prior to loading, which is to be ignored)

„FULL“: During the charging process, with the mains adaptor connected, this indication means: charging completed, battery loaded. During normal operation, however, "FULL" means the SD memory card is full.

The time indications are set up as follows:

„XXXd“: XXX days or

„Xd.XX“: X days and XX hours or

„XX.XX“: XX hours and XX minutes

„XX.XX“: (with blinking dot): XX minutes and XX seconds.

They will be shown upon switching on the NFA and when logging (see chapter 5.4).

4 Switches / Push-Buttons / Connector

4.1 On / Off switch ("Power")

"ON" = Measurement in process. When measuring, logging is not automatically activated. Briefly press "Log" until the status LED switches from yellow to green to activate parallel logging.

"Log" = Logging / long term recording.

4.2 Tesla/Gauss Switch

This switch allows to select the display unit for the magnetic field – the selection is indicated by the LEDs.

The isotropic point of the magnetic field measurement is underneath the „Y“ of the coordinate system printed on the meter faceplate. Value recordings will be axis specific.



4.3 AC/DC-input

AC/DC = combined AC/DC-input

As soon as an external sensor is connected to the device, its signal is automatically displayed in mV and recorded, if required.

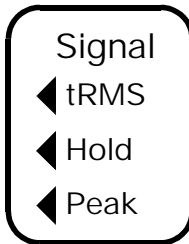
AC: A displayed value of 2000 corresponds to "1V_{peak-peak}" ¹.

DC: +/- 0.1 to 1500 mV, i.e. with an HF59B connected in the coarse measuring range (scaled to 1.5 V DC), the device plots measurement values from 1 to 15,000 $\mu\text{W}/\text{m}^2$; the displayed value in mV is 10 times less than the actual reading in $\mu\text{W}/\text{m}^2$.²

¹ Note: The information produced by the frequency decomposition of a demodulated pulsed HF signal will, of course, not provide any really useful data.

² For other measuring ranges just compare the position of the comma and convert accordingly. Readings below $0.1\mu\text{W}/\text{m}^2$ cannot be displayed or recorded because of noise-issues.

4.4 Evaluation of Signal



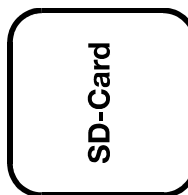
tRMS = "true Root Mean Square". The values displayed and recorded can be compared directly to classifications recommended by building biologists.

Peak = Real peak value measurement: With this setting the meter measures the highest culminating point of the wave³. A new measurement feature for building biologists which allows for a more detailed analysis of the LF world in a way which has long since been

considered essential in the analysis of high frequencies. This option supplies important information for the evaluation of "Dirty Power" (E-field > 2 kHz).

Hold = Hold maximum value ("Max hold"). Retains „tRMS“ or „Peak“ of the signal, depending on the switch position from which „Hold“ was chosen. When the signal switch is set to „Hold“ only the reading on the display is held, the real time value is still recorded on the SD card, if recording.

4.5 SD Memory Card



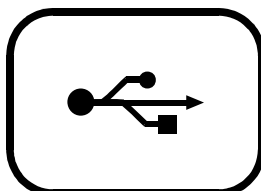
This is the slot for the SD card. Insert until it snaps (use fingernail or pencil, if necessary). To withdraw, press again to undo the snap mechanism.

The high-speed SD memory card (4 GB, SDHC) supplied with the instrument contains the current version of the PC software NFAssoft, as well as enough memory to do long-term full speed logging over a whole week.

Your PC will recognize the SD card as an external device when connected by USB cable or inserted into a card reading device. It can then be processed with the standard Windows or Linux functionality. Inserting the SD memory card directly into the card reader of the PC will result in a 40 times faster data transfer than if using the USB cable⁴.

Please note: Do not remove the SD memory while the NFA is running!

4.6 USB-Socket

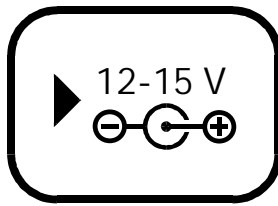


Computer interface connection: Used for meter configuration with NFAssoft. (USB 1.0) Please connect and disconnect the USB-cable only while the NFA is switched off!

³ Not to be mixed up with the „Hold“-function, which, in case of fluctuating fields „freezes“ the highest reading. The resolution of the frequencies during the analysis of the (actually by their nature broadbanded) peak values does not consider phase information that is being a worst-case consideration. Tolerances are much higher than using the tRMS analysis.

⁴ In order to make use of this speed advantage, your SD card reader needs to be specified „SDHC“ which is standard for units built 2008 or later. For older units inexpensive adaptors are available.

4.7 Charging Socket



For connection to external DC sources

External supply: 12 V battery or 12 V DC power supply unit is sufficient to keep the instrument operational for long term data logging, but will not recharge the battery.

Charging: 15 to 18 V DC battery or AC adaptor is required to charge the instrument. The instrument comes with an AC adaptor, which can be switched from 12 to 15 V. Euro mains plug! Measurements or recordings parallel to the charging procedure are technically possible, but not specified, therefore not to be recommended.

4.8 “^” and “v” buttons

These buttons are at present only needed for a firmware update.

5 How to Measure and Data-Log

5.1 “Live”-Measurement

You have the choice of two basic measurement modes: You can either apply the conventional method which involves switching the unit on and reading the display. The status-LED will be yellow. Or you prefer to have the measurement values of all four channels (those of the three field axis plus one further measured variable) logged onto the SD-card. To activate this function, please switch the Power-button to “Log” for a short time until the status-LED is yellow. Then switch it back to “On”.

5.2 Long Term Data Logging

The recording interval of the NFA is set to 10 data sets/sec.

Initiating Long Term Logging of the Meter

For a long term recording of several hours or days, set the “Power” switch to “Log”. In this mode the LEDs are turned off. The long term recording will start automatically after some seconds. In an infinite loop, the display will show the logfile number (“L...”), the elapsed time of recording as well as the remaining time of use until the

battery is empty or the SD-card full. For information on the display format please see chapter 3.

The instrument records all data corresponding to its field selection switch. If an HF analyzer is connected to the AC/DC socket, its output will also automatically be recorded.

“Locking” of the Instrument

„Locking“ ensures that the instrument exclusively executes the predefined tasks when left at the customer’s place for long-term recordings. To lock, remove the SD memory card from the instrument after predefining the measurement settings, set its micro switch on the top left of the SD-card to „lock“ or „write protect“ and reinsert it. Note: The data will still be recorded!

IMPORTANT: Don’t forget to unlock the SD memory card afterwards!

6 Power Supply

6.1 Internal Rechargeable Battery

The instrument features high performance Lithium Ion rechargeable batteries (2 x 3.7 V). When fully charged, they will allow for more than 48 hours of continuous data logging⁵.

6.2 Charging

To charge the battery set the AC adapter switch to 15 Volts. If the device is switched off while charging, the display will show “CHAr” and the potential runtime of the instrument with the current capacity status in an infinite loop. Measurements or recordings during the charging process are technically possible, but not specified, and therefore not recommendable.

With a completely discharged battery only about one hour of charging time is sufficient to operate the instrument for a couple of hours. To achieve the maximum operation time, charging will take 12 to 15 hours. Once the full capacity is reached the instrument will automatically stop charging and will show “FULL” on the LCD.

⁵ Please note that Li-Ion batteries, even when treated with care, will lose some of their original capacity within one or two years and their typical life expectancy is 250-500 complete charge cycles. In this case please always replace both batteries. If possible store in a cool place..

6.3 External Power Supply

Switch the AC adaptor to 12 Volts. With a 32 GB SD card and an external power supply (AC adaptor) you can continuously log at full speed for over two months.

Longterm recordings of the 3D magnetic field and the AC entry can also be done using external power from an AC adapter. In this case, the adapter should be placed as far as possible from the instrument and turned in such a way that the resulting magnetic field is as low as possible, as it can influence the readings.⁶

THE DEVICE IS NOT DESIGNED TO CHARGE ANY OTHER BATTERIES THAN THOSE INCLUDED IN THE SCOPE OF SUPPLY.

⁶ To determine the emission created by the AC adapter at the location of the NFA, proceed as follows:

- Place the instrument and adaptor into their measurement location
- Plug the AC adapter into the wall and to the NFA. Wait until the readings on the display stabilize.
- Disconnect the adapter from the NFA without changing its position and orientation; wait for the display to stabilize.




This procedure will also be logged, and should be marked with an audio note. This will be accessible when evaluating the logged data on the PC. Now potential disturbances can be noted on each axis and corrections be made, if necessary.

7 „NFAsoft“

The provided software allows ...

- for the analysis of the data logged by the NFA
- for the configuration of the NFA according to your preferences and habits.



A double-click on the program-icon  opens the window shown on the left. Here you can chose between the tool for the analysis of the data  and the tool for the user-specific configuration of your NFA .

The software is subject to continuous upgrade. The most current revision can always be found for download on our homepage.

System requirements

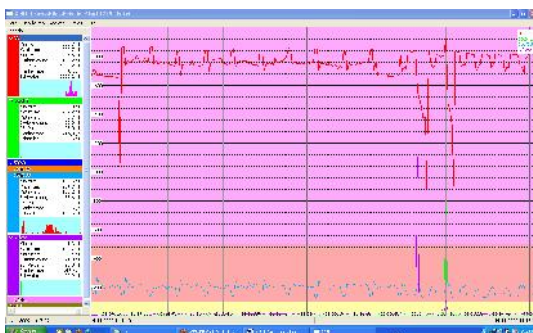
NFAsoft is compatible with Windows XP and above, or LINUX. NFAsoft requires no installation – just double-click and start!

In some cases, it might be necessary to temporarily disable your anti-virus software. Anti-virus software may interpret NFAsoft as a threat and hence might disable or even erase it. It may me necessary to repeat this when a upgraded version of NFAsoft is loaded. NFAsoft can be loaded and executed directly form the SD memory card through a card reader or through the USB interface cable. The NFA is supplied with a „Class 6 SDHC“-SD memory card (appropriate readers have been available since 2008, adapters are available for older computers).



7.1 Data Analysis

Double click the appropriate log file for analysis and the following window will open:



- The far left column labelled “Channels” shows statistic evaluations of the different frequencies or frequency ranges.
- The large area on the right shows the plot of the collected data over the time.
- The values on the left are always the real-time values of the timeline selected in the plot.

Plotted Data Window

Units of measurement appear on the corresponding channel window on the left and are not indicated on the y-axis. The different plots are colour coded. This allows for different channels to be shown simultaneously.

The x-axis indicates the time span. The figures at the left and the right end of the grey status line show the times of start and end of the logging period.

If the status line is mouse clicked, the window on the right will appear. Here one can enter a preferred time span to view. The time span can also be selected in the "View" menu.



The colouring scheme of the plot corresponds to the standards for building biology measurements (SBM2008): Green for "no concern". Yellow for "slight concern". Red for "severe concern". Purple for "extreme concern".

If you select two channels with different units, the SBM colour scheme of the plot's background will be the one corresponding to the unit of the selected (= bold) channel. It will be bold for the one and regular for the other, equalling the markings in the "Statistics/Channels" window.

Navigation within the Plotted Data

Navigation within the plotted data can easily be done with a mouse and its scroll wheel. Move the mouse pointer into the data plot. The scale of the x-axis will be

- zoomed in when scrolling up or by using the „Up Arrow“, zoomed out when scrolling down or by using the „Down Arrow“
- centered around the clock time indicated by the position of the mouse

The data area can be repositioned on the x-axis by a left mouse click hold and drag left or right. One can also use the "right" and "left" arrows of the keyboard. Zooming of the time on the x-axis can also be achieved via the View Menu.

Scaling of the y-axis is done automatically by default but can be adjusted manually if desired through the View menu under "Y-Scale". You can also adapt the scaling of the y-axis manually via the menu (under "View / Scale").

Insert Comments directly into the Diagram

Areas of special interest can be commented directly in the plotted data. Simply position your mouse, right click and enter your comments in the comment window. When you click Ok, the comment will be embedded into the data, marking an event or section of interest.

Program Window "Statistics Channels"

To display the data of a particular channel, click the triangle to the left of the channel.

If multiple channels are open, an additional click on the channel information will bold the channels plotted data and its statistical data.

The top five values are standard statistical values⁷. The numerical value "Edges per hour" is used to analyse the number of steeply rising edges, spikes, peaks, pulses, sharp bursts or high frequency transients of the field. The edge thresholds can be defined in the Channel menu under Set edge criteria. This is an experimental function. PLEASE NOTE: If the 50 Hz high pass filter has been set with the help of the configuration part of NFAssoft (maybe even as pre-setting), this only applies to the channels "All3D", "AllX", "AllY", and "AllZ". Nevertheless, possible frequency components at 16.7 Hz will also be recorded in the correspondent channel. In this case the sum of the frequency specific channels may well be higher than that of "All3D".

The light-blue field underneath the statistical channel data represents the frequency distribution of the measured intensities of the specific channel („Histogram"). It is self-scaling and can be interpreted as follows:

- On the left side of the x-axis a formula calculates and plots how often the minimum value has occurred in a given time interval, and similarly on the right side for the maximum value.
- The higher point marks the measured intensity - found most often. The lower points indicate a specific value measured very seldomly.

Menu

Edit

"Copy all": Copies the plotted data area as well as the drop-down of the "Statistics/Channels" section into the buffer – from here it can be inserted directly into your measurement protocol at any point of your choice. This is similar to a screen shot.

All other edit options are self explanatory.

View

"Edge Display"

Choose the menu option View/Edge Display to activate the edge display. The edge display option will help find important field strength fluctuations. Steep edges are marked in the diagram in the colour corresponding to each channel – the marked channel will be bolded, the others won't. This way you will always have an overview of what's going on in the other channels, even if your focal point is, for instance, the

⁷ The 95th percentile is calculated heuristically. If the possible deviation exceeds 10%, it will be noted in parenthesis after the figure in absolute terms.

3D-value. The threshold value for an edge display can be defined in the menu option "Channel/Set edge criteria".

"Set Times"

Choose the "Set Times" option to scale the graphic to a defined time segment.

"Y-Scale"

- Automatic – The y-axis will be scaled automatically to give the best display of the area selected for analysis.
- Manual – The y-axis scaling can be manually controlled in this mode. Allows for and will assist in analyzing small values (e.g. those over 2 kHz) overshadowed by other very strong field intensities.

„All“ – zooms out the x-axis and displays the complete data set on the data plot. The keyboard "A" keys can alternatively be used.

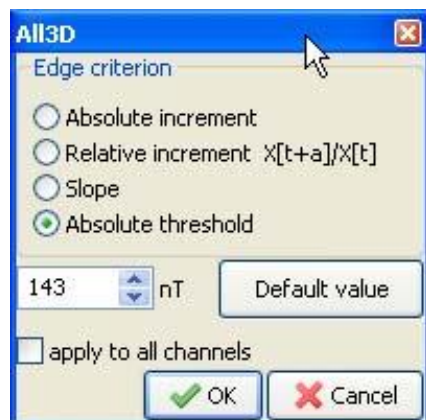
Use the arrow-keys to take over the functions of the mouse.

Channel

Set Edge Criteria (experimental!)

This feature is new and its intention is to facilitate professionals the discussion and analysis of "dirty electricity" beyond today's definition. Activate "Edge Display" in the menu option "View" to use this function.

This function allows you to define a threshold value with which a spike can be marked directly in the "Edge Display" of the plot. This threshold can be selected individually for every channel. Standard values have been pre-selected as defaults.



When clicking „Set edge criteria“ the following window opens. Description:

Absolute increment = Marks a rise of measured field intensity between adjacent points of time by a user defined absolute increment level in V/m, mG or nT

Relative steepness = Marks a rise of measured field intensity between adjacent points in time by a user defined factor or multiple.

Slope = Marks a rise of measured field intensity between adjacent points in time by a user defined slope

rate in V/m, mG or nT per second. This is independent of the measuring intervals. A hypothetical interval of 1 second would give that increment. This permits to compare results recorded with different recording intervals.

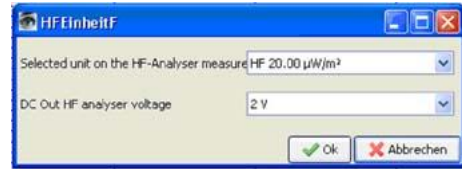
Absolute threshold = Marks a rise of measured field intensity between adjacent points in time by a user defined threshold level in V/m, mG or nT. Any rise beyond this absolute threshold value will be marked.

The selected edge criteria will be graphically displayed on the top of the plotted data section and will appear numerically in the field channel statistical data section under edges per hour for that particular time span. All edge markings displayed appear in real time and allow for a quick visual analysis.

When clicking the „ok“ button, the selected criteria and the set value will be transferred into the statistical values of the channel. When re-accessing the menu option “Set edge criteria”, the pre-set values will again be displayed (under construction).

Select HF-Unit

This function will only be displayed when selecting „CH 4“ in the „Channels“ window and the data recorded in this channel are those of an external input device such as an HF-Analyser (and are therefore recorded in mV). Upon selection of this point of the menu the following window will open up for a selection of the HF-Analyser settings during the recording period.



nT <> mG

This function allows to subsequently convert a chosen channel's data from milli-Gauss to nanoTesla and vice versa.

Convert Units

This function can be used to display whichever values recorded via the AC/DC input port directly in its original unit. This way, an HF-recording can be shown either in $\mu\text{W}/\text{m}^2$ or V/m . A new channel will automatically be generated, thus avoiding any potential loss of data.

Rename or Delete Channel

Allows for a renaming or deleting of the marked channel.

Summarise Channels

The plotted channels (selected on the left) will be added up (“square sum”) and added as a new channel. The sum of 100/120 Hz, 150/180 Hz, $R < 2\text{kHz}$ and $> 2\text{kHz}$ are considered to be the relevant parameter for the evaluation of “dirty electricity”.

Extras

The first two items in the dropdown menu have been explained already.

Create KML-File

Required as a plugin for the connection of GPS-data, NFA logs and Google Earth (currently in beta level). Please ask for the current manual by e-mail.



7.2 User-specific Configuration of the NFA

This part of NFAsoft allows for a customized user definable configuration of the NFA. The configurations will be made available in the "CONFIG.NFA" file of your NFA. The new settings are automatically loaded by the NFA upon its next start when saved on the SD memory card.

Several customized pre-settings for NFAsoft can be defined allowing a quick access. Simply select the settings as required and activate the button "save as pre-setting for NFAsoft". All pre-settings are stored in the file "NFAsoft.ini" and are available for NFAsoft provided that this file is in the same folder.

For a synchronisation of the time, the SD-card in the meter should be connected to your computer via USB-cable. The synchronisation will either take place automatically once "CONFIG.NFA" is recorded onto the SD-card, or else the manually entered time is applied at that very moment.

If the high pass is set at 50 Hz, this only refers to the broad band reading or recording as it reduces the influence of movement induced field components. For full information, the frequency components of sinusoidal waves at exactly 16.7 Hz are still recorded separately and can be shown with the help of the NFAsoft.

If the filter is set, it is therefore not unusual for the summary indication "All3D"

to be smaller than the indication for 16.7 Hz, as the signal components at 16.7 Hz are not integrated in the total sum of "All3D". Furthermore, the signals of the different frequencies are added up quadratically, which in turn means that the result of simply adding the individual signals will also differ from the sum of "All3D".

(For more information on this matter see chapter 9)

8 Firmware-Update

The file: "firmware.nfa" is the meter's operating system stored in its internal memory⁸. As known from computer programmes, this software is subject to continuous improvements and upgrade, and can be updated as follows:

Procedure for the Update:

Copy the new "firmware.nfa" file onto your SD memory card. If need be, overwrite any old versions as only one "firmware.nfa" file should be on the card. It should not be renamed.

Lock your SD memory card byswitching the small switch on left side of the card to "lock".

Insert SD card into your powered-off NFA.

Turn your NFA to "On". The display will show "CodE". Then all LEDs will turn off except for the status LED. As soon as this is green, the update process is completed.

Do not switch the meter off during the update process!
Before applying the new firmware, don't forget to unlock the SD-card!

Which is the active firmware on your NFA?

Press the "Mode"-button while switching on the meter, and you will be shown the currently active firmware version for a short period of time.

The NFA always has two firmware versions in its memory. In order to switch from one version to the other, press the "Mode" and the "Rec."-button simultaneously.

⁸

Please differentiate: With „NFAsoft“ one can configure the firmware, with these user settings being stored in the file „CONFIG.NFA“. This has nothing to do with the firmware-update described above.

9 What if... (FAQ)

Answers to frequently asked questions regarding the NFA 30M

Make sure you're always using the most current firmware version!

The device does not react when trying to switch or press a key

Unlock SD-card! (Push micro switch on the left
of the card upwards)

Restart: All switches up – switch off – switch on.

There is no recording (status LED does not turn green)

Insert or unlock SD-card! (Push micro switch on the left of the
card upwards)

No long-term recording over several hours or days possible

Solution 1: Update your firmware.

Solution 2: There is a file system error on your SD-card. In this
case, save the "good" files and re-format your SD-card ("quick
format" or simple deletion is not enough).

Note: Windows XP does NOT format the SD memory cards according to the stand-
ard (Vista or Windows 7 are ok). XP-users may use the following link to download a
standard-conformed formatter:

http://www.sdcard.org/consumers/formatter_3/SDFormatterEN2905.zip

The meter turns off after quarter of an hour

NFAsoft allows you to change the interval for the auto-power-
off feature. (Auto-power-off is deactivated while recording!)

The sum of the frequency specific channels is higher than the
value of "All3D"

The signals of the different frequencies are added up quadrati-
cally (square root out of the sum of squares), which means that
a simple addition of the individual signals will result in a higher
value than the sum of "All3D".

For example, if you take 500 nT at 16.7 Hz plus 1000 nT at
50 Hz, a simple addition will amount to 1500 nT, whereas the
quadratical addition (= "All3D") will amount to only 1118 nT.

The 16.7 Hz LED is off although measurements with "Band" or "Freq." show values in this frequency

If the 50 Hz high pass filter has been set with the help of the configuration part of NFAsoft (maybe even as pre-setting), the 16.7 Hz LED will remain unlit. However, the filter only applies to the DISPLAY in the "Auto" mode and to recordings made in the "All3D" channel. The aim is to tranquilize the display. Nevertheless, the device may well identify possible frequency components at 16.7 Hz when using "Band" and "Freq.".

NFAsoft is showing measurement values at 16.7 Hz inspite of the 50 Hz high pass filter being set and

The sum of the 16.7 Hz channel and the other channels is higher than the value of "All3D"

If the 50 Hz high pass filter has been set with the help of the configuration part of NFAsoft (maybe even as pre-setting), this only applies to the channels "All3D", "AllX", "AllY", and "AllZ".

Nevertheless, possible frequency components at 16.7 Hz will also be recorded in the correspondent channel. In this case the sum of the frequency specific channels may well be higher than that of "All3D".

The NFA was configured according to customer requirements with NFAsoft, but when restarting, NFAsoft shows the original settings

The "CONFIG.NFA" file on the SD-card transfers user-specific configurations to the NFA. NFAsoft can write this file, but not read it. Therefore you cannot use NFAsoft to check the configuration of the NFA, but only to instal new configurations.

You can save frequently used configurations as presets to a dropdown menu in NFAsoft.

What is the purpose of the individual files and where are they saved?

"CONFIG.NFA" -> user configurations of the NFA -> SD-card

"NFAsoft.ini" -> Presettings for NFAsoft -> same folder as NFAsoft

"FIRMWARE.NFA" -> operating system of the NFA -> SD-card

Streaks and "scratches" on the display foil?

In order to assure a high resolution potential free measurement of the E-field, a highly sensitive foil of a vapour deposited metal layer has had to be mounted onto the display. Unfortunately, scratches and streaks cannot be completely avoided.

There are very many small TXT-files on the SD-card?

Solution 1: You have activated the function "permanent logging", which causes the meter to log not only when switched to "Log". This option will cause a new file to be started each time the meter is switched on, and each time you switch from one mode to the other.

Solution 2: There is a file system error on your SD-card. In this case, save the "good" files and re-format your SD-card ("quick format" or simple deletion is not enough).

Note: Windows XP does NOT format the SD memory cards according to the standard (Vista or Windows 7 are ok). XP-users may use the following link to download a standard-conformed formatter:
http://www.sdcard.org/consumers/formatter_3/SDFormatterEN2905.zip

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www.gigahertz-solutions.de

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Ihr Partner vor Ort / Your local partner
Votre partenaire local / Su socio local: