



# **GQ EMF-360/ EMF-360+/EMF-380 EMF Multi-Field/Multi-Function Meter User Guide**



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## Overview

The GQ EMF-360/ EMF-360+/EMF-380 advanced multi-function digital EMF meter is designed to be a portable and convenient device. It can be used as industrial, commercial maintenance, research, evaluation, simulation and other analytical or scientific applications in areas such as industrial plants, public utilities, universities, laboratories, and electronic repair shops. The device integrated testing features include three axis Electromagnetic Fields, Electric Field, Radio Frequency and Radio Spectrum Power Analyzer (EMF-360+/EMF-380 only). The meter is able to identify the common source from EMF measured, such as Power Line, WiFi etc. It also comes with built-in audible and visual alarm. It can be used for EMF,EF, RF detection and monitoring both indoor and outdoor(protected), as well as in other similar environments. It can continually monitor the radiation. When connect the device to a PC, PC software can download the radiation data to the computer and the user is able to analyze those data later. The device also installed a high contrast black/white LCD module and one front LED indicator.

The device is equipped with an USB port, utilized for communication and external power supply/charging of the internal rechargeable Li-Ion 3.6V/3.7V battery.

The GQ EMF-360/ EMF-360+/EMF-380 internal rechargeable battery can be charged with a standard USB port, USB charger or with a computer USB port. Using the external power, continuous data monitoring is possible. Using either power adapter you will not have to worry about the batteries charge condition or any data loss.

The EMF-380 also has a real time clock on board for time related data measurement.

The meter installed multiple sensors to ensure maximum scale/range measurement and highest accuracy. .

High sensitivity meter let you check EMF/RF radiation easily. Examples: computer mouse, car remote key, cell phone, cordless phone, static, electric field, WiFi, computer laptop, microwave, electric heater, hair dryer, vehicle engine, light, outdoor power line, monitor the WiFi signal, Smart meter signal, spy wireless video camera signal, even track radio signal in air.

## Specification

- EMF (Electromagnetic Field)
  - Triple axis (X, Y, Z) up to 300MHz
  - Range: 0.00~2000mG, 0.00 to 200 $\mu$ T
  - Resolution: 0. 1/1 mG or 0.01/0.1  $\mu$ T
  - Frequency: up to 7G Hz
  - Accuracy:  $\pm(15\%+100\text{dgt})$
- EF (Electric Field)
  - Range: 0V/m to 2000V/m
  - Resolution: 0.1 V/m
  - Accuracy:  $\pm (10\%+50\text{dgt})$
- RF Field (Radio Frequency Field)
  - Range: 0.02 $\mu$ W/m<sup>2</sup> ~ 554mW/m<sup>2</sup>
  - Resolution: 0.01 $\mu$ W / m<sup>2</sup>, 0.1 $\mu$ A / m, 0.1mV/m,0.001 $\mu$ W/cm<sup>2</sup>, 1dB
  - Frequency: up to 7GHz
- RF Spectrum Power Analyzer (EMF-360+ only)
  - Frequency band 6: 2.4GMhz – 2.5GMHz
    - Frequency step: 25KHz – 405KHz
    - Frequency span: 58KHz – 812KHz
- RF Spectrum Power Analyzer (EMF-380 only)
  - Frequency band 1: 153KHz – 534KHz
    - Frequency step: 1KHz – 3KHz
    - Frequency span: 1KHz – 3KHz
  - Frequency band 2: 520KHz – 1710KHz
    - Frequency step: 1KHz – 6KHz
    - Frequency span: 1KHz – 6KHz
  - Frequency band 3: 64MHz – 108MHz
    - Frequency step: 10KHz – 100KHz
    - Frequency span: 40KHz – 100KHz
  - Frequency band 4: 2.3MHz – 25.34MHz
    - Frequency step: 1KHz – 180KHz
    - Frequency span: 1KHz – 6KHz
  - Frequency band 5: 240MHz – 1040MHz
    - Frequency step: 1KHz – 10KHz
    - Frequency span: 50KHz – 4000KHz
  - Frequency band 6: 2.4GMhz – 2.5GMHz
    - Frequency step: 25KHz – 405KHz
    - Frequency span: 58KHz – 812KHz
- Battery life: >48 hours continually
- Audible alarm: buzzer
- Visual alarm: green, red LED
- Operating temperature & humidity: 5°C to 40°C, below 80% RH
- Storage temperature & humidity: -10°C to 60°C, below 70%
- Working Voltage: 3.6-3.7V

- Display: LCD dot matrix, back lighted
- Power: Consumption 25mW – 125mW (backlight dependant)
- Power: Supply 3.7V Li-Ion battery(Size:18650) / USB power
- Dimensions 135 x 78 x 25 mm (5.25"x 3" x 1" )

## Package List

1. GQ EMF meter main unit.
2. USB cable
3. Quick start guide
4. Download link for a complete user guide in PDF version.

## Caution

1. Avoid doing measurements when battery low.
2. Do not get the meter wet. Use sealed plastic bag to void wet.
2. Avoid doing measurements in direct sunlight.
3. Turn off the unit when not in use.
4. When the unit not in use, store it in a dry place or box. This will avoid mechanical part be oxidized, such as button or battery contacting points.

## Hardware setup

1. Power up the unit. Pressing the power key for 3 seconds will turn on the unit. Check the battery level. Charge the battery fully when first time use. It may take a few hours to get the battery fully charged. Check the battery icon on the display, a fully charged battery icon will be filled with solid color, without flashing.
2. Set the backlight timeout in second, in order to minimize the power consumption.
3. Now the unit is ready to use. You should see the background EMF/EF reading.

For technical questions and support, please use the forum at the following link:

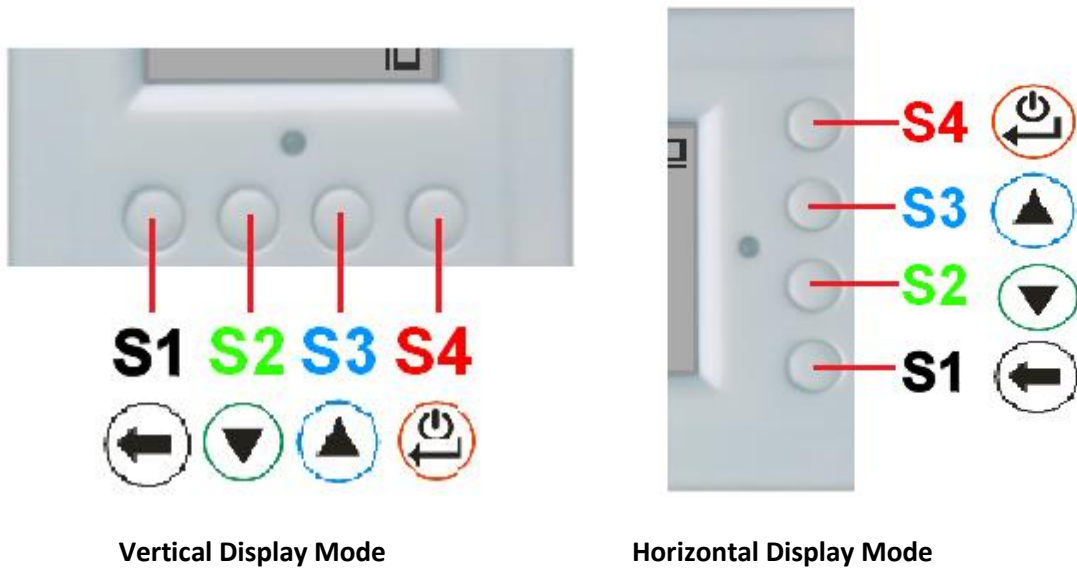
<http://www.GQElectronicsLLC.com/forum>

For the latest version user guide, please visit our software download page:

<http://www.gqelectronicsllc.com/comersus/store/download.asp>

## GQ EMF Meter Multi-Function Keys

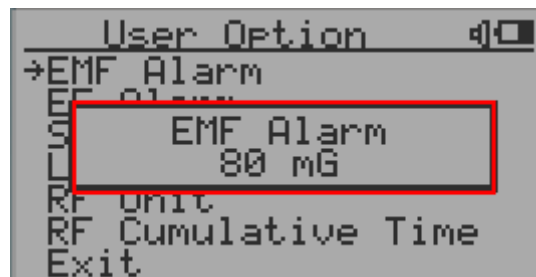
The multi-function keys S1, S2, S3 and S4 explained:



These keys's function will be reassigned dynamically based on the context of the current (sub-) menu being displayed.

## Popup Windows

The Popup Windows will show the current status/value of selected features. The current status/value can be changed only when it is displayed in the Popup Window and the currently displayed status/value will be stored when the Popup Window has timed out after 3 seconds if no key has been pressed.



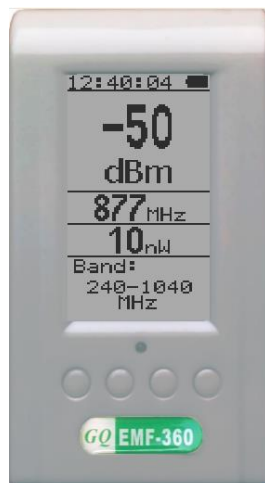
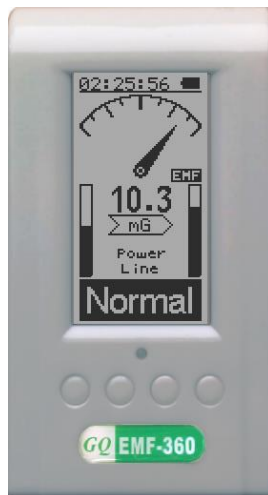


## Dual Display Modes

EMF-360/EMF-380 supports two display formats to fit user's display preferences: Vertical Display and Horizontal Display.

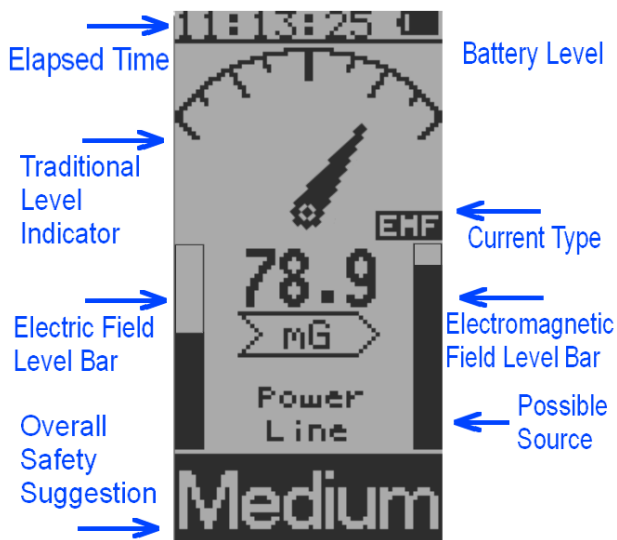
The Horizontal Display Mode displays **large font mode** for EMF mode and RF mode, **table mode**, **RF Graph mode** and **EMF Graph mode**.

The Vertical Display Mode displays **large font mode** for EMF mode and RF mode.

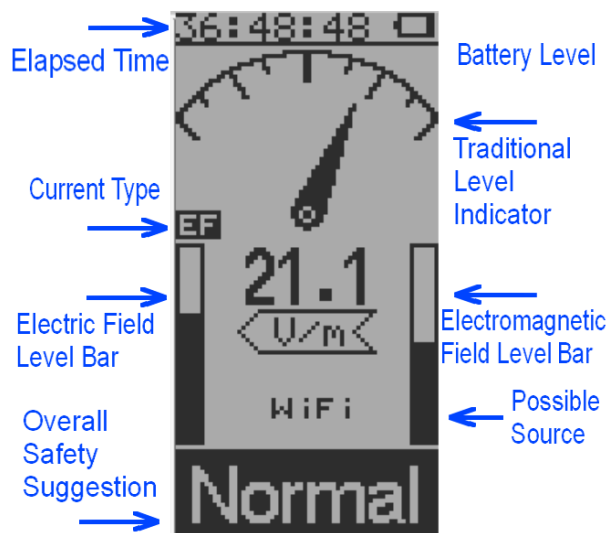


RF Power Display (EMF-360+, EMF-380 only)

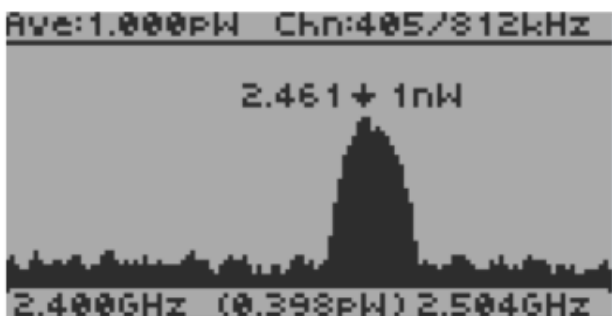
**Display Layout**



Electromagnetic Field Display



Electric Field Display



RF Power Graph (EMF-360+, EMF-380 Only)

Power in this graph:

Average: 1.00 picowatte

Maximum : 1.00 nanowatte @ 2.461Ghz

Minimum: 0.398 picowatte

Frequency checked scope: 2.400GHz – 2.504GHz

Channel step: 405 KHz

Channel bandwidth: 812KHz

	MHz	dBm	Power ↑
1.	2458	-68	158 PW
2.	2463	-69	126 PW
3.	2460	-70	100 PW
4.	2464	-71	79 PW
5.	2457	-73	50 PW

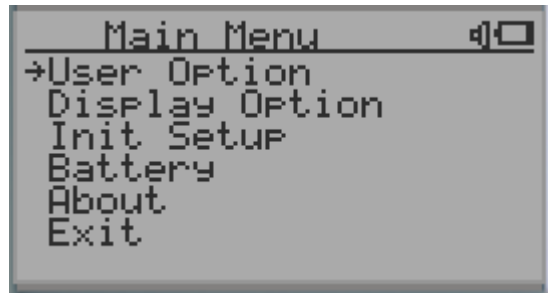
RF Power top 5 list (EMF-360+, EMF-380 Only)

## Main Menu

In any display mode, press S4 to enter the menu mode.

### Navigation keys:

S1: Back S2: Up S3: Down S4: Select/Enter



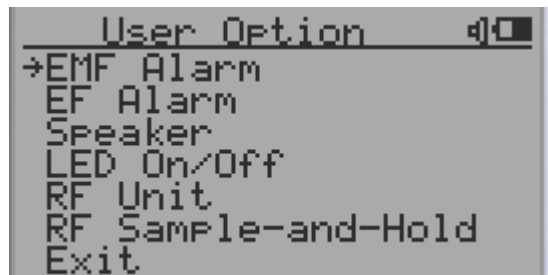
## User Option

### Navigation keys:

S1: Back S2: Up S3: Down S4: Select/Enter

You can set your personal setting for your EMF device:

1. The threshold for the EMF Alarm (in mG).
2. The threshold for the EF Alarm (in V/m).
3. Speaker on and off.
4. LED indicator on and off.
5. Preferred unit for RF graph (dbm/Watts).
6. RF Sample and hold: the time duration (in seconds) for RF graph to hold the maximum sampled value on graph. The maximum graph will be cleared and start a new session after this duration.



## Display Option

### Navigation keys:

S1: Back S2: Up S3: Down S4: Select/Enter

#### Backlight Timer:

Set the timeout duration for the backlight.

#### Backlight Level:

Set the level for the backlight.

#### Contrast:

Set the contrast for the backlight.

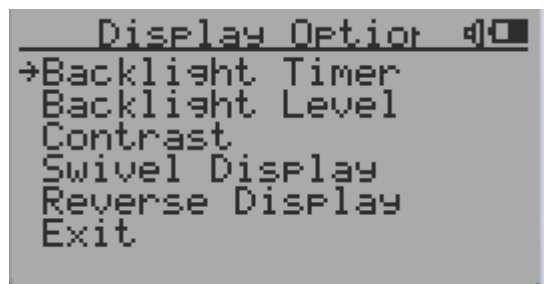
#### Swivel Display:

Pressing the S4 key will cycle between: Normal -> Swivel -> Auto Swivel modes.

In the Auto Swivel mode, the horizontal display will be rotated by 180° if the unit is held upside down.

#### Reverse Display:

Invert the color for the screen.

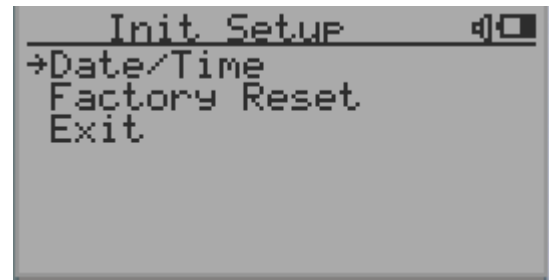


## Initial Setup

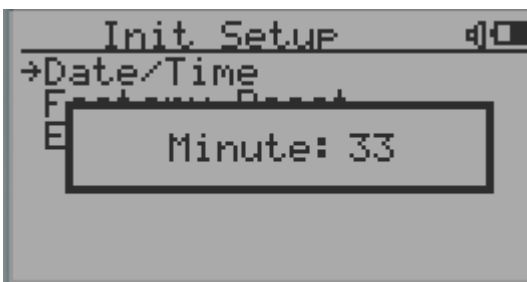
### Date and Time setting (EMF-360+/EMF-380 Only)

Navigation keys:

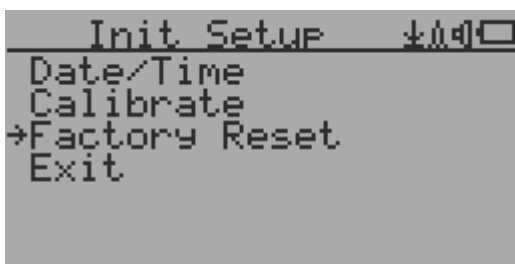
- S1: Back/Exit
  - S2: Increase value by 1 (or hold the key down)
  - S3: Decrease value by 1 (or hold the key down)
  - S4: Select setting mode between Year, Month, Date, Hour, Minute and Second.
- Each key press will change the mode to be set.



**NOTE: Setting of Date and Time is important, all history data use Date and Time as a time stamp reference.**

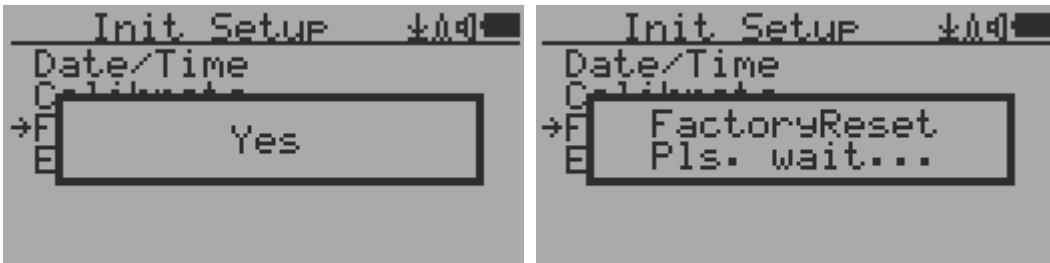


### Factory Reset



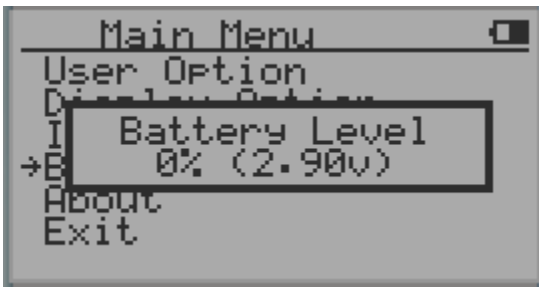
Select Factory Reset to reset the unit to the factory default settings.

**Note: The reset will erase all user settings and recorded history data.**



Select Factory Reset menu item and change the popup Windows message to Yes. Wait for popup message window's timeout to confirm the reset request. Any other key press will cancel the reset request. It may take up to 30 seconds to complete the reset.

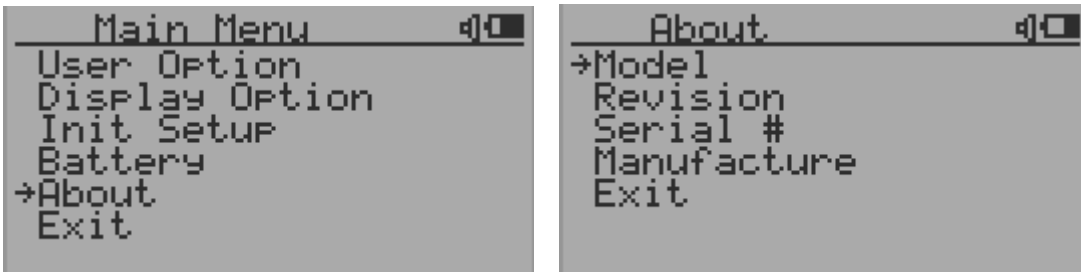
### Battery



The battery submenu shows the information about the battery level: percentage and the voltage.

### About

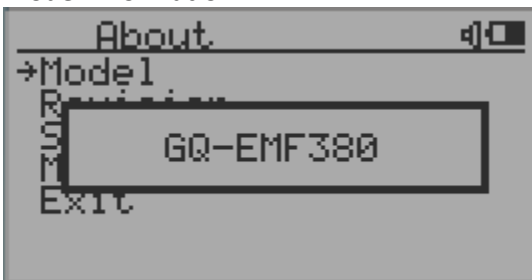
This menu item is used to gather information about the instruments model number, firmware revision and serial number.



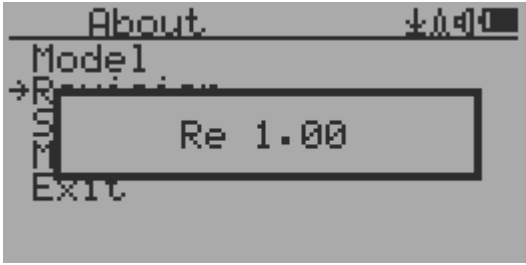
### Navigation keys:

S1: Back S2: Up S3: Down S4: Select/Enter

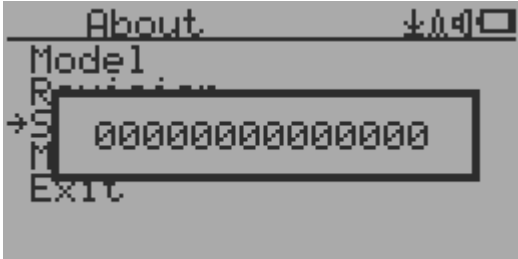
### Model information



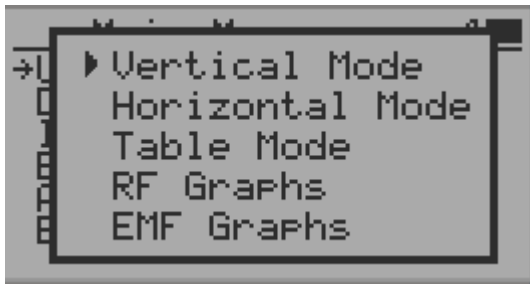
**Firmware version**



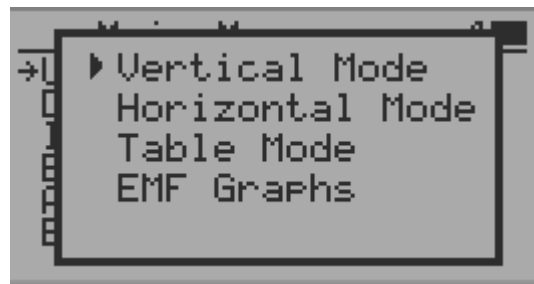
**Unit serial number**



**Display Modes**



(EMF-360+/EMF-380 only)



EMF-360

You can access the 5 display modes menu by pressing S1 in any of the display mode.

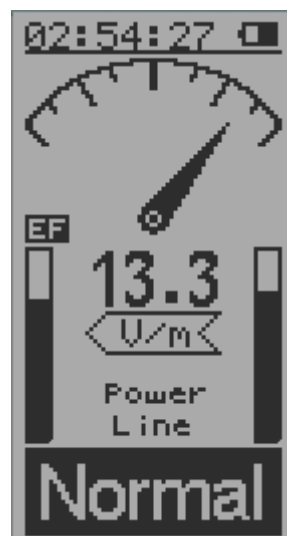
**Vertical Mode (EMF/EF)**

Navigation keys:

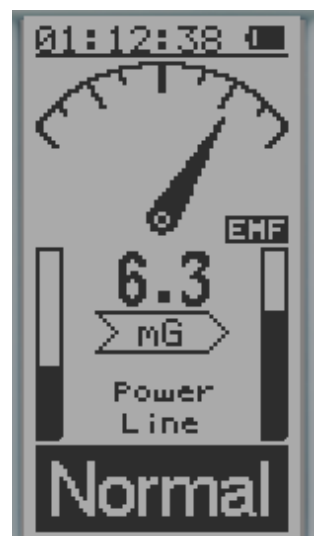
- S1: Display mode selector
- S2: Display the value for EF/EMF only
- S3: Toggle between and RF mode
- S4: Main Menu

The left bar is used to indicate the EF value and the right bar is used to indicate EMF value. Actual EMF/EF value will be displayed when you press S2.

The dose of EF/EMF will be displayed as Normal/Medium/High.



EF Mode



EMF mode

**Possible radiation source**

The possible source will be displayed once the valid data has been identified.

Following are the possible sources:

WiFi, Microwave, WiFi/Microwave, Power Line, AC EF (AC voltage Electric Field), Static, Phone Call.

If more than one kind of source coexist at same time, then the device will show possible source as “Mixed”.

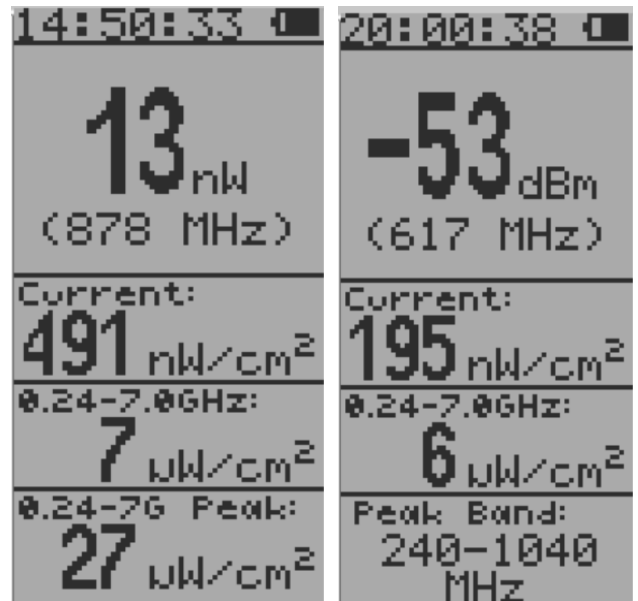
When there are **4 dashes** (“----”) in the possible source field, it means the data is not enough to determine the source. To get accurate source information, user may rotate or change the location of device let sensors to collect valid data.

**Vertical Large Font Mode (RF) (EMF-360+/EMF-380 only)**

Navigation keys:

- S1: Display mode selector
- S2: Display the unit between dbm and Watts
- S3: Toggle between EMF/EF and RF mode
- S4: Main Menu

This mode displays the RF value in Watt, Hz and dbm separately.  
 This mode also shows the frequency band range in Hz.



**Unit selection in Vertical Large Font Mode (RF)**

S2: Toggle between dbm and Watts unit selection



## Horizontal Large Font Mode (EMF/EF)

### Navigation keys:

- S1: Display mode selector
- S2: Display the value for EF/EMF only
- S3: Toggle between EMF/EF and RF mode
- S4: Main Menu

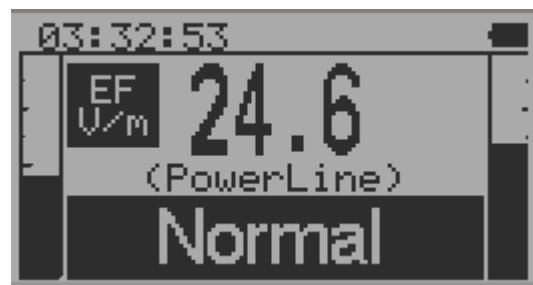
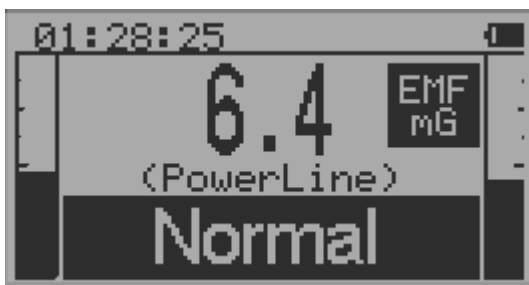
The left bar is used to indicate the EF value.

The right bar is used to indicate EMF value.

Actual value will be displayed when you press S3.

The source of EF/EMF can be identified and displayed. Such as Wifi, microwave, power line, AC EF, static, mixed, phone call etc.

The dose of EF/EMF will be displayed as Normal/Medium/High.



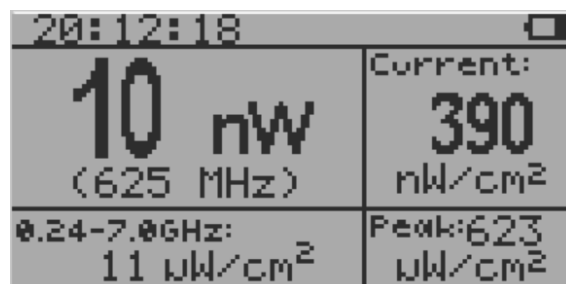
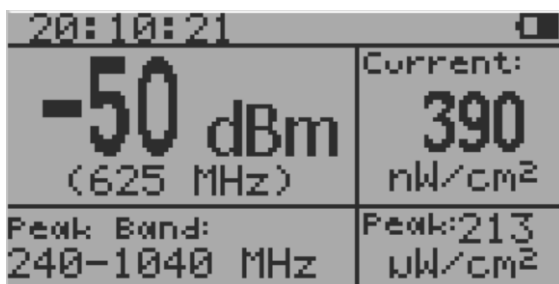
## Horizontal Large Font Mode (RF) (EMF-360+/EMF-380 only)

### Navigation keys:

- S1: Display mode selector
- S2: Display the unit between dBm and Watts
- S3: Toggle between EMF/EF and RF mode
- S4: Main Menu

This mode displays the RF power in Watt, Hz and dBm separately.

This mode also shows the frequency band range in Hz.



S2: Toggle between dbm and Watts unit selection



## Table Mode (EMF/EF)

### Navigation keys:

S1: Display mode selector

S2: Toggle between EMF/EF and RF mode (EMF-360+/EMF-380 only)

S3: Toggle between EMF/EF and RF mode (EMF-360+/EMF-380 only)

S4: Main Menu

X, Y, Z: the EMF value (in mG) in three mutually orthogonal directions, in a X, Y, Z configuration.

Hz: The approximate frequency based on the Y value.

High Frequency: the reading in mG for the EMF high frequency

EF: the EF value in V/m.

MHz: The approximate frequency for the high frequency.

EMF (mG)			
X	Y	Z	HiFreq
14.1	0.9	0.1	17.7
60 Hz			60
EF:	0.9	V/m	MHz

## Table Mode (RF) ) (EMF-360+/EMF-380 only)

### Navigation keys:

S1: Display mode selector

S2: Toggle between EMF/EF and RF mode

S3: Toggle between EMF/EF and RF mode

S4: Main Menu

	MHz	dBm	Power ↑
1.	876	-50	10 nW
2.	878	-62	631 PW
3.	656	-71	79 PW
4.	622	-72	63 PW
5.	632	-72	63 PW

Displays top 5 values with the highest power at the top in descending order.

## RF Graph ) (EMF-360+/EMF-380 only)

The graph shows the detailed power at specific frequency window.

Example:

**Ave:-90dbm**

Average signal strength in current range.

**Chn:405/812kHz**

**Chn: (Channel Step) 405 kHz.**

**Channel Bandwidth: 812 kHz.**

**2.451GHz▼-91dBm**

**User cursor** (2.451GHz, -91dBm): The user cursor (the solid triangle with vertical line) pointed frequency and the power strength at the specific position/channel.

You can use S2 and S3 to move forward and backward to check the power level at specific channel.

**2.463+ -70**

**Peak cursor** (2.463GHz, -70dBm): The peak value in the current band.

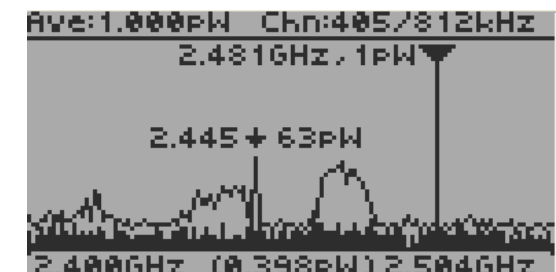
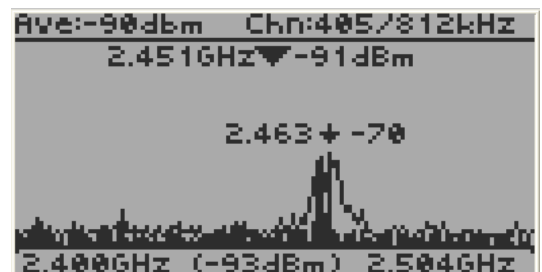
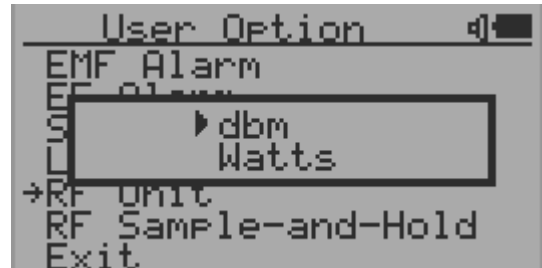
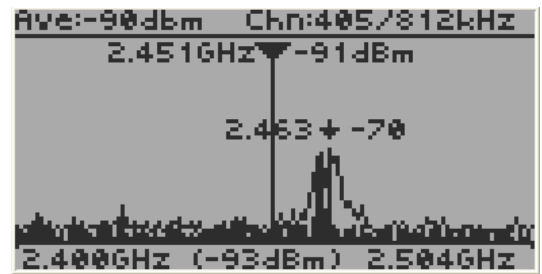
**Start Frequency** (2.400GHz): The starting frequency of the current band.

**End Frequency** (2.504GHz): The ending frequency of the current band.

**Minimum value in current band** (-93dBm): The minimum value in the current band.

You can always **change the displayed unit** for the power (dbm and Watts). You can change the setting by selecting Main Menu->User Option->RF Unit->dbm/Watts.

The right picture shows the graph with **RF unit set to Watts**.



### Navigation keys:

S1: Display mode selector.

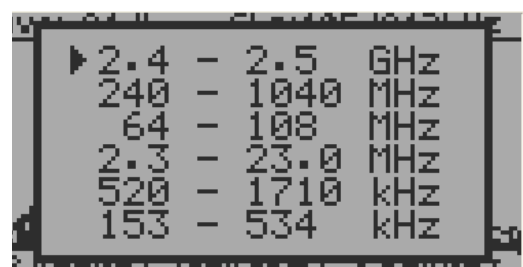
S3 (Short press): Move the current user cursor ahead for 10 channels.

S2 (Short press): Move the current RF cursor backward for 1 channel.

S3 (Hold for 1 sec): Zoom in based on current frequency, 2 zoom levels in total.

S2 (Hold for 1 sec): Zoom out to original selected frequency. If already zoomed out, you can select the range for the start width and the end width for the window.

S4: Main Menu



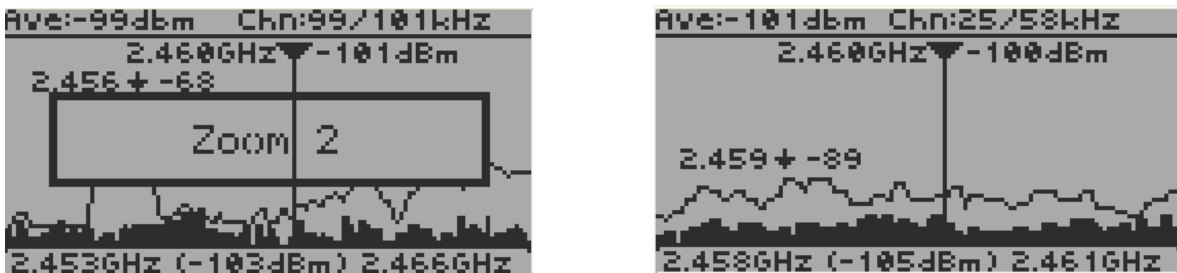
By pressing S2 and S3, you can cross the border of the current band window and the EMF unit will automatically adjust the current start frequency and the end frequency scope.

Below shows the unit automatically adjusting the bandwidth (from 2.447GHz-2.460GHz to 2.453GHz-2.466GHz) when the user cursor reaches the boundary.



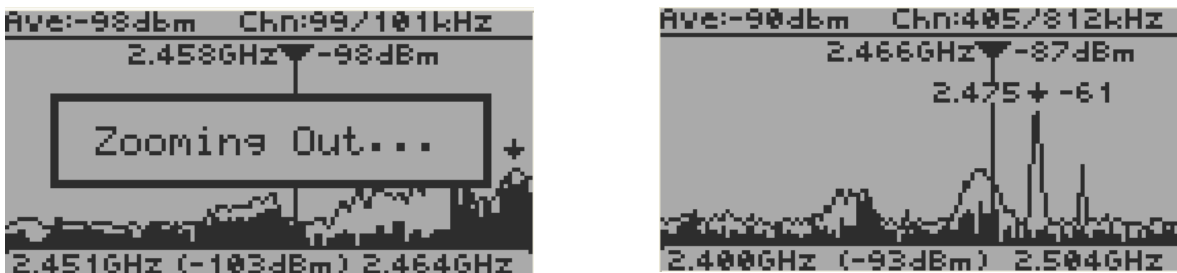
By pressing S3 and hold for 1 second, you can zoom in the current cursor channel for detailed information. Note that there are two zoom levels. To reach zoom 2 level, you have to do zoom 1 first, and press S3 and hold for 1 second again.

Here is an example of ZOOM2. Under ZOOM1 level, press and hold S3 for one second, the display goes to level 2 zooming. the start and end frequency scope changed from 2.453GHz-2.466GHz to 2.458GHz-2.461GHz, which allows you to see more details of the specific scope.



By pressing S2 and hold it for 1 second, you can zoom out the zooming mode and see the overall band data.

Here is an example for zooming out. Pressing and hold S2 for one second. The display will back to original bandwidth. The start and end frequency is changed from 2.451GHz-2.464GHz to 2.400GHz-2.504GHz, which allows you to see overall band data.



## EMF Graphs (EMF/EF)

EMF and EF graph displays past 45 seconds changes graph.

The right side of graph displays the current level.

### Navigation keys:

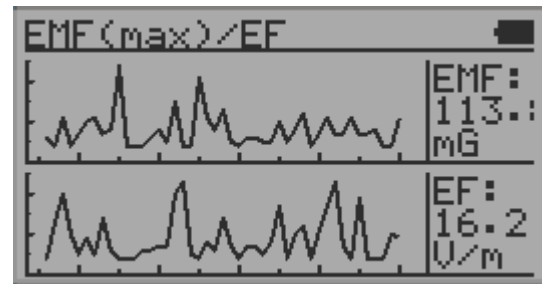
S1: Display mode selector

S2: Toggle between EMF/EF and EMF-XYZ mode

S3: Toggle between EMF/EF and EMF-XYZ mode

S4: Main Menu

Displays EMF (unit: mG) and EF (unit: V/m) graph of past 45 seconds.



## EMF X-Y-Z Graphs

The graph displays EMF past 45 seconds level changes in three axis.

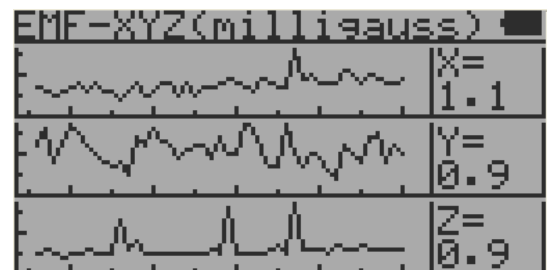
### Navigation keys:

S1: Display mode selector

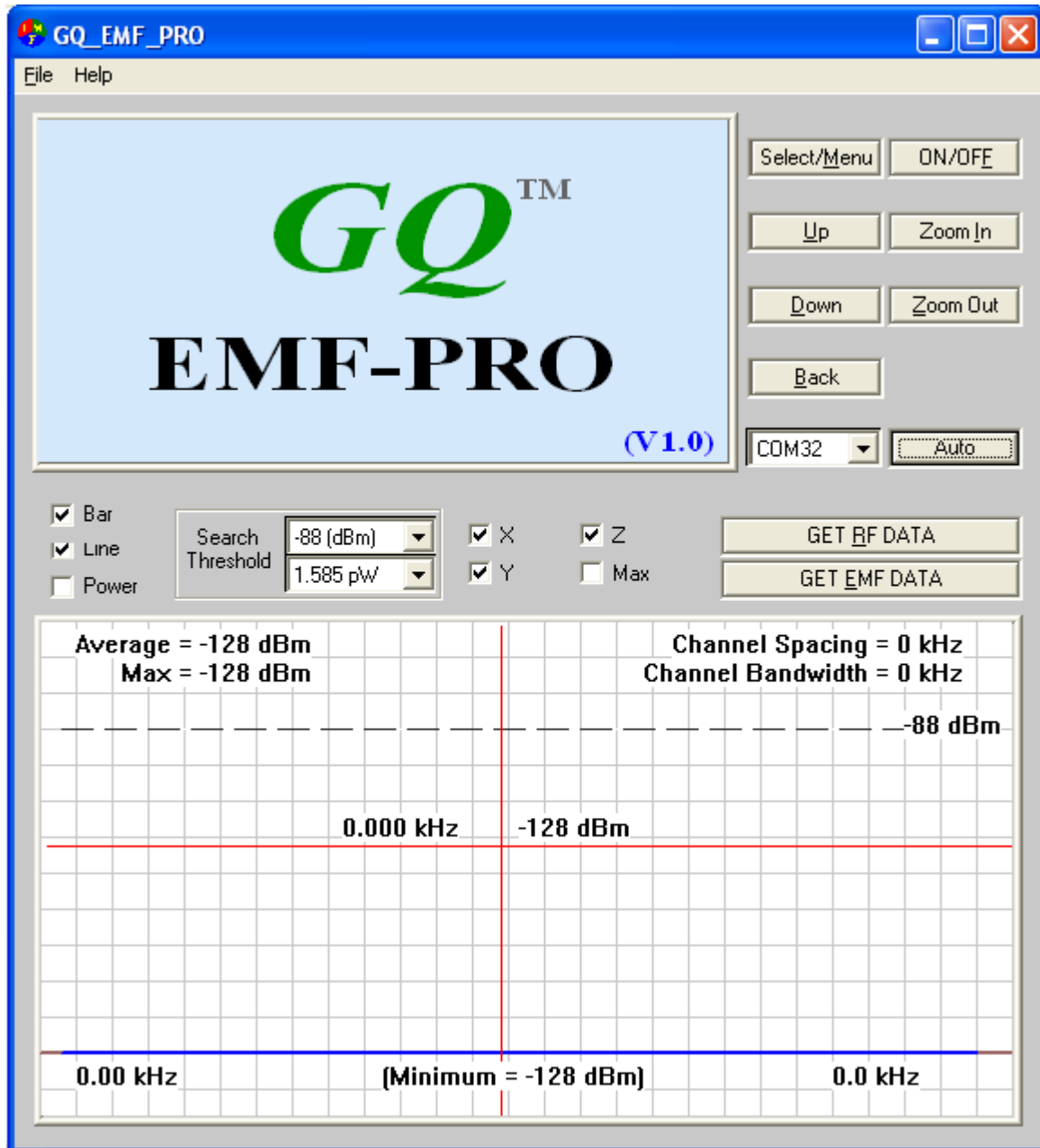
S2: Toggle between EMF/EF and EMF-XYZ mode

S3: Toggle between EMF/EF and EMF-XYZ mode

S4: Main Menu



## GQ EMF Pro Software



The GQ EMF-Pro Data Viewer software is utility software comes with the EMF device package.

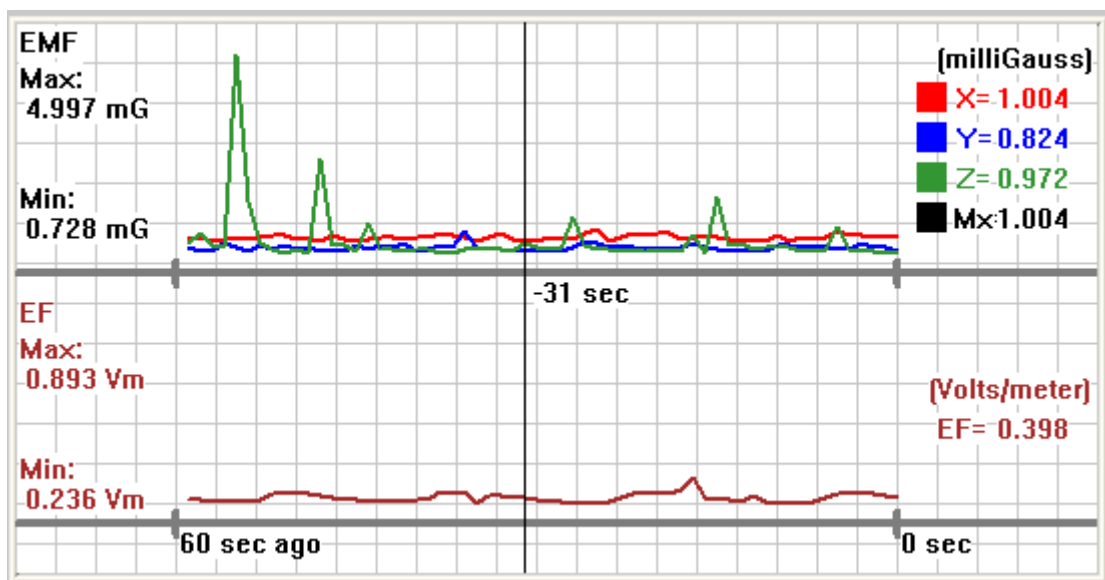
You are able to use software request the real-time data from device and then log it into a data file in .csv format.

You can plug in the EMF unit and press the “Auto” button to scan the COM port and connect automatically.

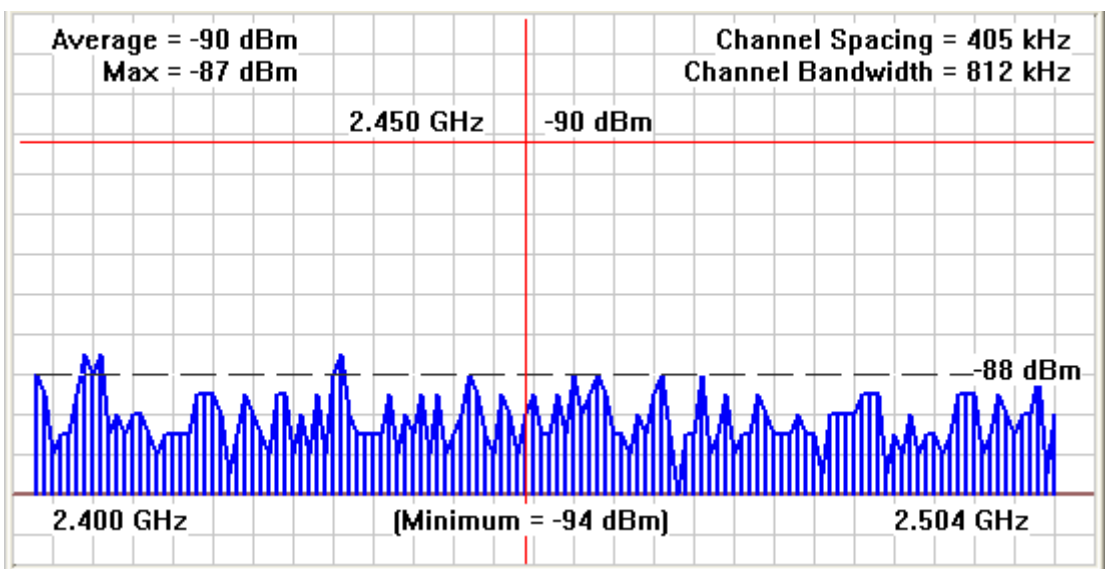
Main features:

- Download the history data from EMF-360/EMF-360+/EMF-380; Save the history data in.csv MS Excel format.
- Real time monitoring (60 seconds) with different graphic mode (bar and line) and different unit (dBm and pWatt) when it connected with EMF-360/EMF-360+/EMF-380.
- Search the threshold data.
- Simulated keys (same as the key settings on the unit).

You can use the EMF-Pro software to get EMF data and RF data.



EF/EMF real-time graph for 60 seconds



RF real-time graph for 60 seconds

### Troubleshooting

1. Remember to press the Auto button   to make sure the COM port is opened and connected.

2. If you want to get the EF/EMF or RF graph  or , remember to turn on the unit and change the mode to EF/EMF or RF mode, otherwise you cannot get the real time graph and the graph will not change until you switch to the correct mode.

# GQ EMF Communication Protocol

## Serial Port configuration

Baud: 115200  
Data bit: 8  
Parity: None  
Stop bit: 1  
Control: None

## Command format

A valid command start with ASCII '<' and ended with ASCII '>>'. Both command and parameters are in between '<' and '>>'.  
Command is a ASCII string. All parameters of command are true value in hexadecimal.

Direction: All commands are initiated from computer(HOST).

Firmware supported: GQ-EMF380, GQ-EMF360+, GQ-EMF360 (except some other commands that EMF360 can't support)

## Commands

### 1. Get hardware model and version

Command: <GETVER>>

Return: total 18 bytes ASCII chars from GQ EMF unit. It includes 9 bytes hardware model and 7 bytes firmware version.

e.g.: GQ-EMF380Re 1.00\r\n

### 2. Key Commands that simulates a key press from the unit

Commands:	<KEY0>> (back key)	Represents Key S0 from the unit
	<KEY1>> (down key)	Represents Key S0 from the unit
	<KEY2>> (up key)	Represents Key S0 from the unit
	<KEY3>> (select/power key)	Represents Key S0 from the unit

Return: none

### 3. To simulate a KeyHold (for zooming and power) just like pressing and holding a key from the unit

Commands:	<KEYHOLD0>> (back key)	nothing special same as <KEY0>>
	<KEYHOLD1>> (down key)	change RF band or Zoom out on RF Graphs
	<KEYHOLD2>> (up key)	zoom in on RF Graphs
	<KEYHOLD3>> (select/power key)	Turn unit on or off

### 4. Get an emf reading

Command: <GETEMF>>

Return: Gets the current max EMF reading from x,y,z,and high frequency emf sensors in ascii 9 bytes  
e.g. : EMF = 3.5

#### 5. Get an ef reading

Command: <GETEF>>

Return: Gets the current ef reading in ascii 9 bytes  
e.g.: EF = 33.9

#### 6. Get the current RF band data (Used in RF Graphs mode)

Command: <GETBANDDATA>>

Return: Returns all the 128 channels dBm in text/string/ascii separated by commas

-88,-88,-89,-88,-89,-87,-87,-89,-88,-87,-87,-86,-87,-87,-86,  
-87,-88,-88,-86,-87,-87,-87,-92,-88,-86,-87,-87,-87,-85,-87,  
-85,-86,-86,-87,-87,-86,-87,-93,-86,-88,-87,-87,-86,-87,-89,-87,  
-87,-87,-88,-89,-89,-87,-89,-92,-89,-90,-89,-88,-88,-86,-91,-86,  
-89,-90,-86,-86,-87,-89,-86,-87,-87,-89,-90,-88,-86,-90,-88,-88,  
-87,-87,-86,-86,-86,-87,-89,-92,-90,-89,-88,-86,-86,-85,-87,-86,  
-87,-88,-89,-89,-87,-87,-86,-78,-88,-87,-88,-87,-88,-88,-86,-85,  
-87,-87,-90,-88,-86,-86,-89,-90,-88,-88,-88,-90,-90,-88,-88,-88,

#### 7. Get the current mode

Command: <GETMODE>>

Return: Current Mode in text  
e.g.: 64 - 108 MHz  
e.g2: EMF/EF

#### 8. Gets the display screen in bitmap

Command: <GETSCREEN>>

Return: Returns 1024 bytes of screen data(bitmap of the lcd screen 128x64) PLUS 0xAA  
total of 1025 bytes  
8E 51 59 95 53 51 8E FF 00 ...

#### 9. Get configuration data

Command: <GETCFG>>

Return: The configuration data. Total 256 bytes will be returned.

#### 10. Erase all configuration data

Command: <ECFG>>



Return: 0xAA

11. Write configuration data

Command: <WCFG[A0][D0]>>

A0 is the address and the D0 is the data byte(hex).

Return: 0xAA

12. send a key

Command: <key[D0]>>

D0 is the key value from 0 to 3. It represents software key S1~S4.

Return: none

13. get serial number

Command: <GETSERIAL>>

Return: serial number in 7 bytes.

14. Power OFF

Command: <POWEROFF>>

Return: none

15. Reload/Update/Refresh Configuration

Command: <CFGUPDATE>>

Return: 0xAA

16. Set realtime clock year

command: <SETDATEYY[D0]>>

D0 is the year value in hexadecimal

Return: 0xAA

17. Set realtime clock month

command: <SETDATEMM[D0]>>

D0 is the month value in hexadecimal

Return: 0xAA

18. Set realtime clock day

command: <SETDATEDD[D0]>>

D0 is the day of the month value in hexadecimal

Return: 0xAA

19. Set realtime clock hour

command: <SETTIMEHH[D0]>>

D0 is the hourvalue in hexadecimal

Return: 0xAA

20. Set realtime clock minute

command: <SETTIMEMM[D0]>>

D0 is the minute value in hexadecimal

Return: 0xAA

21. Set realtime clock second

command: <SETTIMESS[D0]>>

D0 is the second value in hexadecimal

Return: 0xAA

22. Reset unit to factory default

command: <FACTORYRESET>>

Return: 0xAA

23. Reboot unit

command: <REBOOT>>

Return: None

#### 24. Set year date and time

command: <SETDATETIME[YYMMDDHHMMSS]>>

Return: 0xAA

#### 25. Get year date and time

command: <GETDATETIME>>

Return: Seven bytes data: YY MM DD HH MM SS 0xAA

#### 26. Get gyroscope data

command: <GETGYRO>>

Return: Seven bytes gyroscope data in hexadecimal: BYTE1,BYTE2,BYTE3,BYTE4,BYTE5,BYTE6,BYTE7

Here: BYTE1,BYTE2 are the X position data in 16 bits value. The first byte is MSB byte data and second byte is LSB byte data.

BYTE3,BYTE4 are the Y position data in 16 bits value. The first byte is MSB byte data and second byte is LSB byte data.

BYTE5,BYTE6 are the Z position data in 16 bits value. The first byte is MSB byte data and second byte is LSB byte data.

BYTE7 always 0xAA

#### 27. Power ON

Command: <POWERON>>

Return: none