

# GKT-008 EMI Near Field Probe

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## USER MANUAL



ISO-9001 CERTIFIED MANUFACTURER

**GW INSTEK**

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# S SAFETY INSTRUCTIONS

Read the following before any operation to ensure your safety and to keep the device in the best condition.

## Safety Symbols

These safety symbols may appear in this manual or on the device.

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Attention: Refer to the Manual



DANGER High Voltage



Protective Conductor Terminal



DANGER Hot Surface



Earth (ground) Terminal

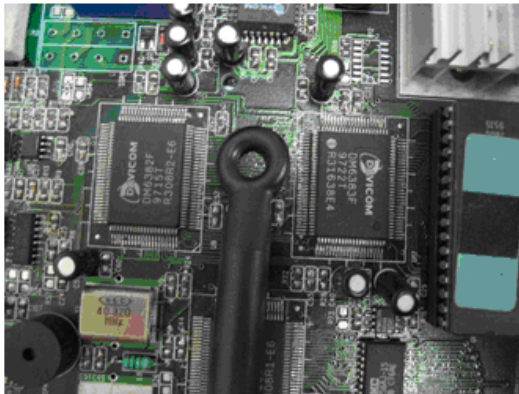
# M MAIN FEATURES

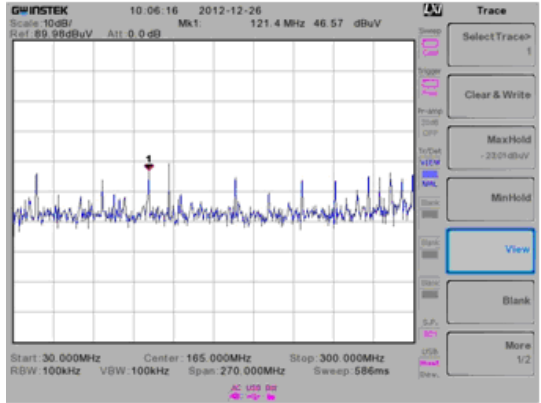
## High Sensitivity

The GKT-008 probe has a high sensitivity to quickly analyze a source of noise. The probe can be used with the dedicated EMI Pretest function on the GW Instek GSP-9300 spectrum analyzer. When used with the default pre-amplifier function, the sensitivity of the EMI probe can be significantly enhanced to distinguish subtle noise.

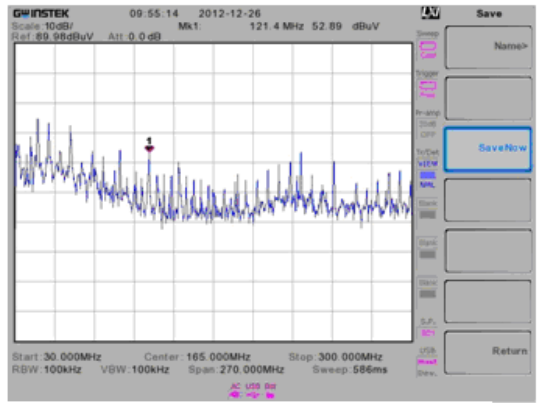
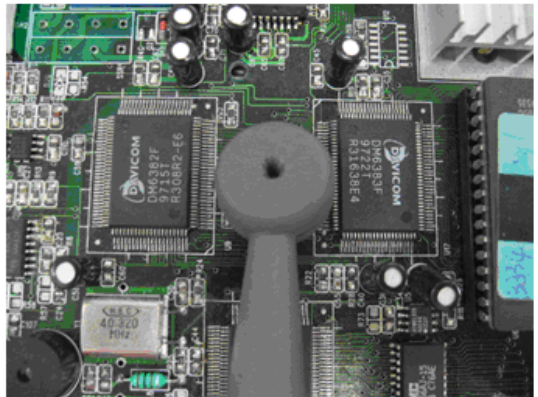
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Test Results from  
a Common EMI  
Probe





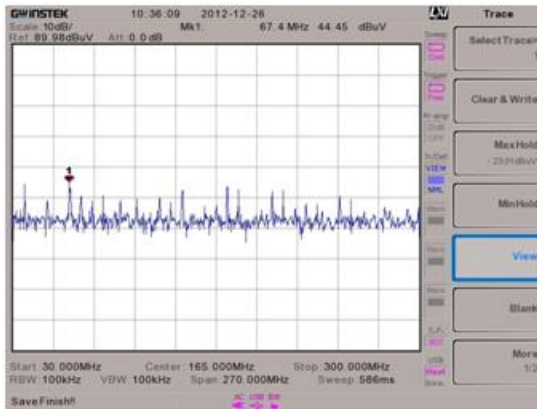
Test Results from  
the GKT-008  
Probe

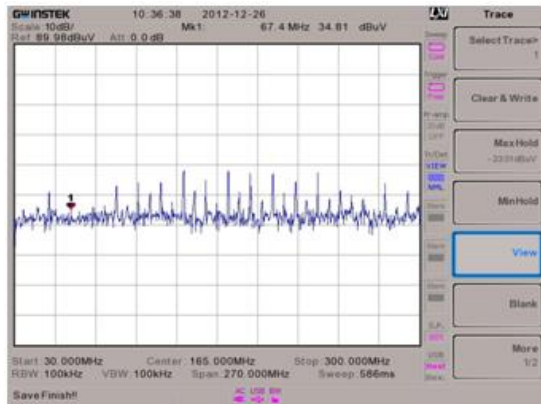


## Ultra-Low Directionality

Typically the design of near field ring probes cause measurement results to vary greatly when using the probes in a horizontal or vertical orientation. This often leads to incorrectly diagnosing a source of noise and therefore nullifying any corrective action. The special structure of the GKT-008 is designed to reduce the differences between the vertical and horizontal measurements, allowing noise to be measured accurately and effectively regardless of whether results are obtained in a horizontal or vertical position.

Measurement Differences in the Horizontal and Vertical Orientation of General Ring Probes(Case 1)

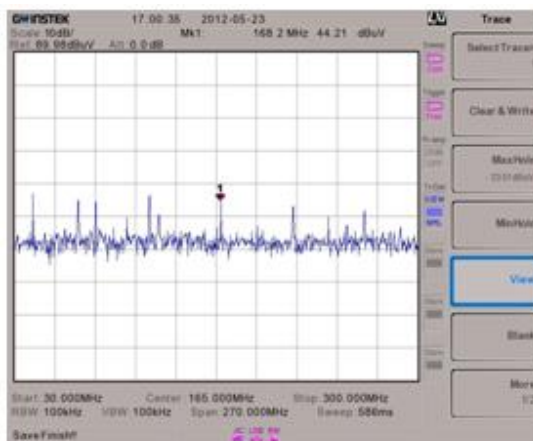
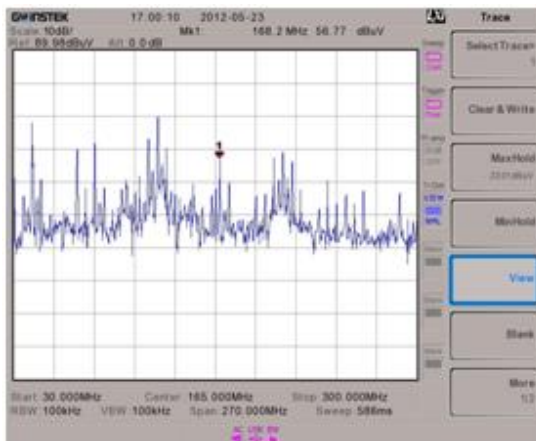




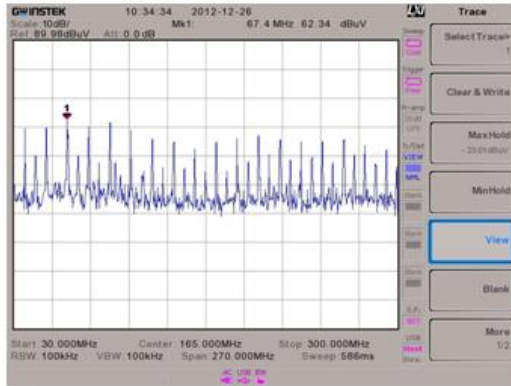
Measurement Differences in the Horizontal and Vertical Orientation of General Ring Probes(Case 2)







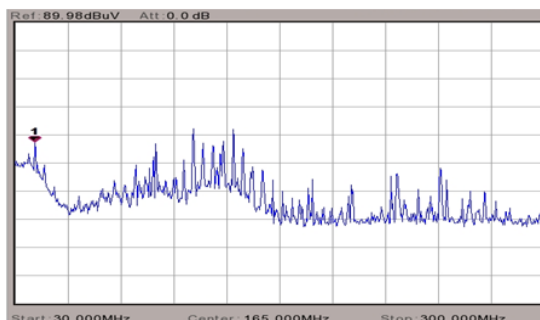
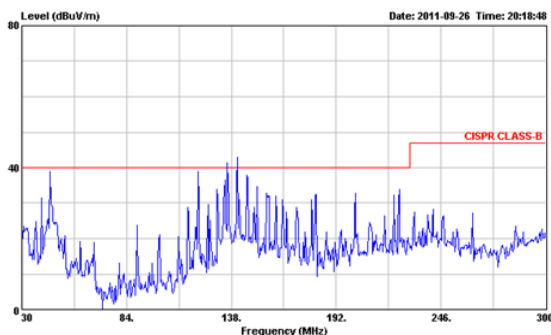




## Good Far Field Frequency Response

In general, test specifications are limited to 3M far field tests, but with tests performed using EMI probes to measure the near field electromagnetic field. However, the frequency response between far field & near field electromagnetic fields differ greatly, and thus when EMI near field probes are used to diagnose far field noise problems, test results can cause false positives and other misdiagnoses. Due to the structural design and electrical features of the GKT-008 probe, the measured electromagnetic wave in the near field has a strong correlation to the frequency response of the emitted far field electromagnetic wave.

Comparison of Measurement Results of Using the GKT-008 Probe in the Near Field and in 3M Far Field



# E MI NEAR FIELD PROBE

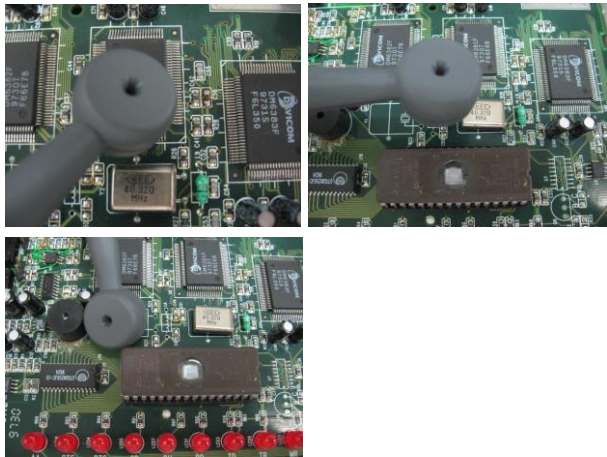
## USES

### Magnetic Field Probe

The magnetic field probe can analyze and diagnose the problems listed below:

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- Spatial noise of the device and equipment
- Spatial noise of PCB boards
- PCB trace and component radiated noise
- Cable and wire radiated noise
- Confirmation of shielding effectiveness



## Electric Field Probe

The electric field probe can analyze and diagnose the problems listed below:

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- Ground and power noise
- PCB trace conducted noise
- IC pin output noise
- I/O pin output noise
- Confirmation of filter effectiveness

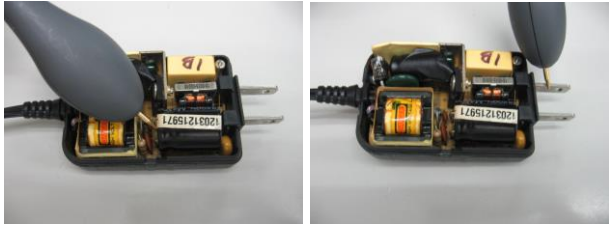


## AC Voltage Probe

The AC voltage probe can analyze and diagnose the problems listed below:

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- AC conducted Noise
- Switching power supply noise and component noise



# A APPLICATIONS

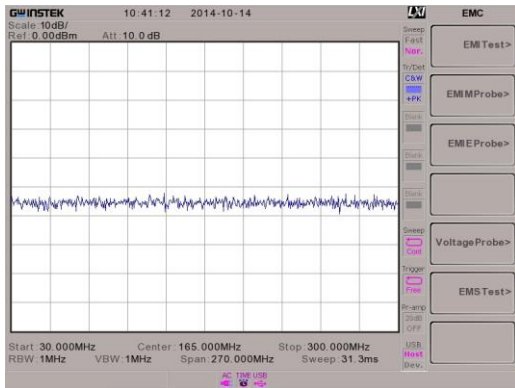
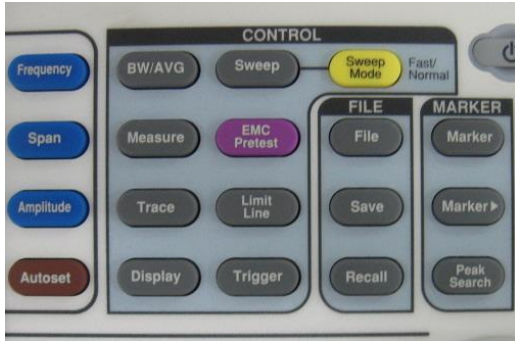
This probe set should be used with GW Instek spectrum analyzers. When used in conjunction with the analyzer's built-in application functions (EMI pretest and EMS Debug), the probes are able to diagnose EMI near field problems, estimate far fields as well as diagnose and analyze EMS.

When the EMC pretest button on the GSP-9300 is selected, the EMC mode will appear on the screen, and five common EMC functions will become available to select from.

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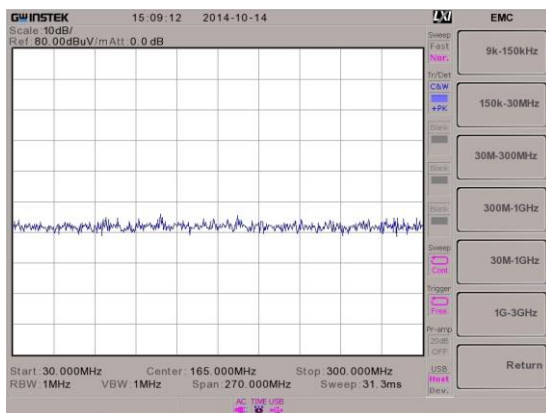






## EMI Test

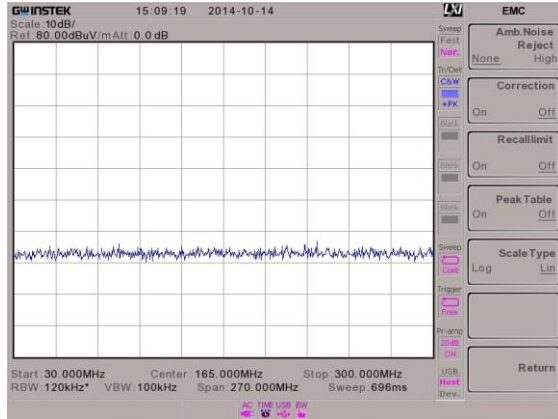
When the EMI test soft-key is selected, different test frequency bands will appear on the right of the screen. Select the desired test frequency band according to the EMI test requirements. If the desired test frequency band doesn't appear on the screen, you can manually set the Start and Stop frequencies yourself.



Connect the probe to the “RF Input” terminal when performing EMI tests



The GSP-9300 has various EMI test functions available, including the ability to test in high noise areas by pressing the Amb Noise soft-key, the ability to enter the antenna factor settings according to the type of antenna by pressing the Correction soft-key as well as applying limit line specifications by pressing the Recall Limit soft-key.



## Field Sensor

When you need to diagnose the energy distribution and source of spatial noise in products, the Field Sensor as shown in the photo below can be used.



Note

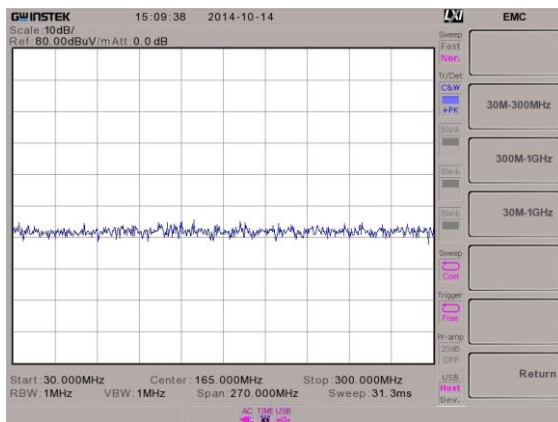
The measurement category and corresponding maximum measurement voltage for the ANT-04 or ANT-05 probe is CAT I 50Vdc.

They can't be used for other measurement categories other than CAT I.

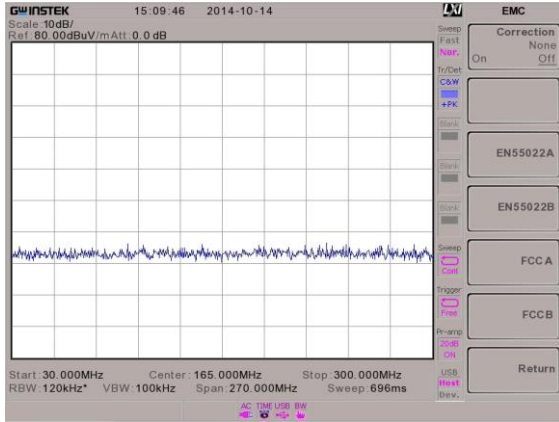
There are two Field Sensors sizes in this probe set. According to the size of the area to be measured, the large probe can be used to measure over a large area and the small probe can be used to

measure small areas of radiated emissions from IC components. Both probes have the same features for near field measurement.

When the Field Sensor soft-key is selected, three commonly used frequency bands appear on the right of the screen. Select the desired frequency band according to the needs of the test. At this time you can sweep each area or each component one at a time to test for the highest sources of noise in the test product.



The GSP-9300 spectrum analyzer has a near field to far field conversion function that can be used when used in conjunction with these Field Sensors. When the Correction soft-key is selected, noise in the near field can be converted to radiated field strength in the far field accordingly. This can this be used to determine whether the test product will be able to comply with the 3M far field test.



## Source Contact Probe

When you need to know the energy distribution and the source of noise in the PCB traces, power, ground or component pin conductors, you can use an electric field probe as shown below:

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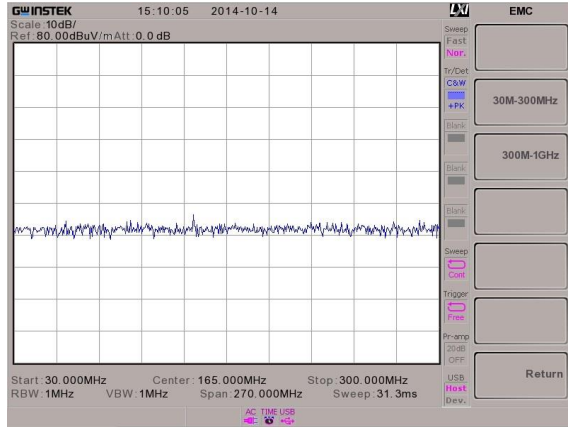


Note

The measurement category and corresponding maximum measurement voltage for the PR-02 probe is CAT I 50Vdc.

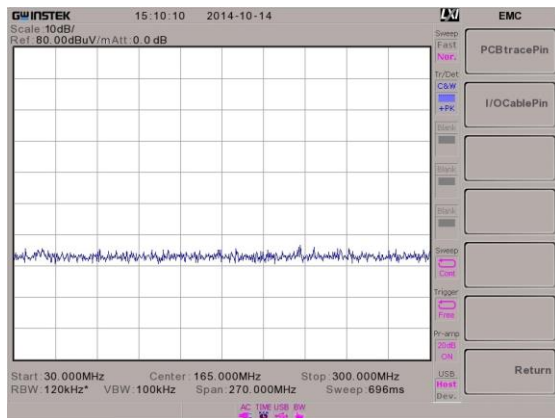
It can't be used in other measurement categories other than CAT I.

When the Source Contact Probe soft-key is selected, two frequency bands will appear on the right of the screen for selection. Select a frequency band according to the frequency of the noise to be analyzed. Touch the points to be measured and accessed, such as different ground points on the PCB board, with the tip of the electric field probe. The existing noise on each pin of the components as well as the size of noise on each I/O pin can all be easily diagnosed with the sensitivity of this electric field probe.

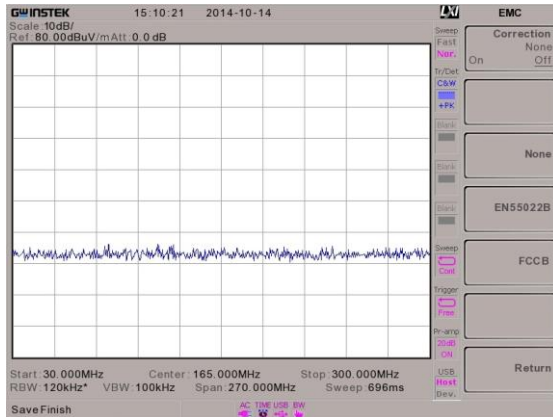


When the Source Contact Probe soft-key is selected, two frequency bands will appear on the right of the screen for selection. Select a frequency band according the frequency of the noise to be analyzed. Touch the points to be measured and accessed, such as different ground points on the PCB board, with the tip of the electric field probe. The existing noise on each pin of the components as well as the magnitude of noise on each I/O pin can all be easily diagnosed with the sensitivity of this electric field probe.

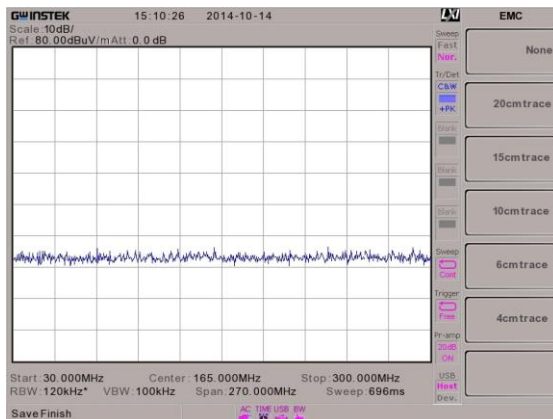
Select PCB trace Pin or I / O Cable Pin



Turn Correction  
On



If PCB trace Pin is selected, select the parameter which best matches the trace length.





## AC Voltage Probe

There is also an AC Voltage Probe in the GKT-008 probe set, shown in the photo below, which can be used as an effective and rapid tool for diagnosing and analyzing AC power conduction noise.

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Note

The measurement category and corresponding maximum measurement voltage for the PR-01 probe is CAT I/CAT II 300Vac.



Note

When holding the probe during measurement, be sure to hold the probe above where the safety symbol is marked on the probe (in other words, hold the probe by the handle, not by the tip.)

In addition, you can perform pretesting of AC conduction noise when the probe is used with the built-in software on the GSP-9300.

When the Pretest soft-key is selected, the spectrum analyzer will automatically convert the AC noise measurements into an analog conduction value of a LISN. When the Debug soft-key is selected, each point or pin of the components on the PCB that are touched by the tip of the AC Voltage Probe can be output to find out the source of noise quickly. When diagnosing with the probe, please pay attention to its withstanding voltage. It can't be used to touch points of AC voltage exceeding 300V, otherwise the probe and the spectrum analyzer can be damaged easily.

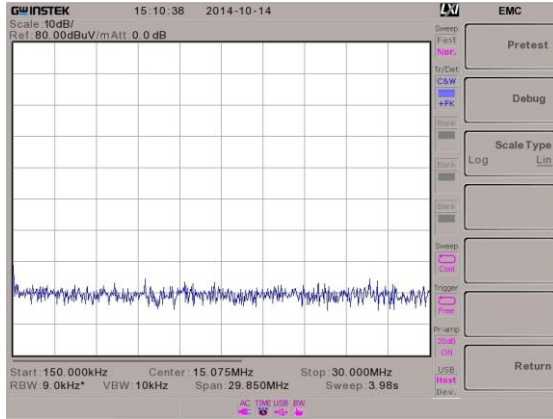
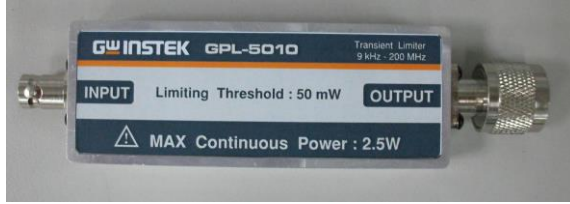


Note

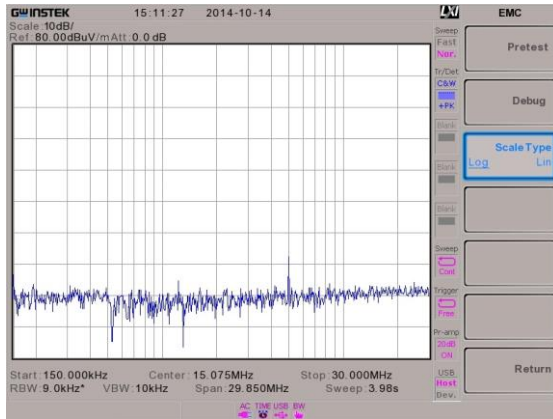
To further protect the spectrum analyzer from transient voltage surges, be sure that a transient limiter is used at the GSP-9300 RF input

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Transient limiter  
GPL-5010

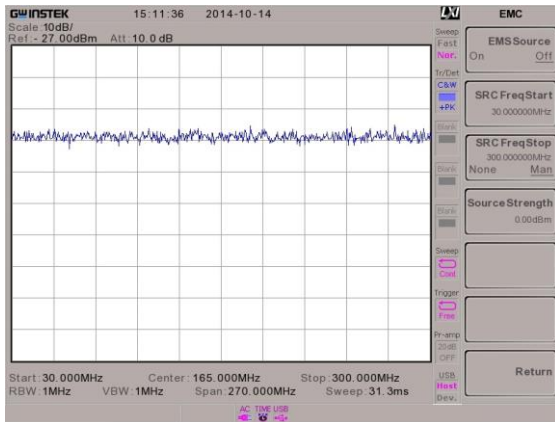


Two kinds of axes  
are available



## EMS Test

If the probe is used with the GSP-9300's tracking generator, it allows you to perform debugging and diagnosis of EMS. The magnetic or electric field probe is connected to the TG (tracking generator) Output terminal of the spectrum analyzer. Select EMS Test and then select the desired EMS diagnostic frequency range. For more sensitive and vulnerable components on a PCB board, signal traces, ground lines or power lines, directly blanket the components with the signal to recognize and analyze where these products are subject to noise interference.



Connect the probe to the "Tracking Generator Output" terminal when performing EMS tests



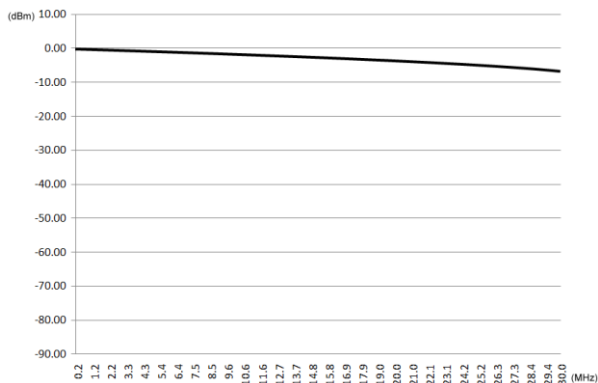
# SPECIFICATIONS

The ANT-04/ANT-05 field sensor was characterized in a transverse electromagnetic mode (TEM) cell. The PR-01 AC voltage probe and PR-02 source contact probe was characterized by vector network analyzer.

## PR-01

Frequency Range	150 kHz to 30 MHz
Primary Sensor	E-field
Insertion Loss S21 / Frequency Response	-2.4 dB (Avg.)
Deviation of Insertion Loss S21	± 3 dB
Connector	50 Ω (SMA)
Rated Voltage	300 VAC

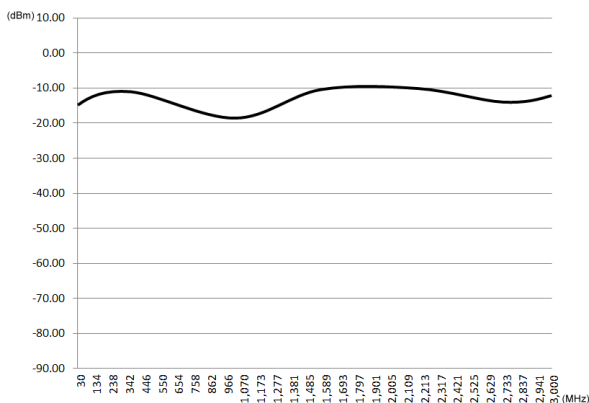
### Suggested Correction Factor



## PR-02

Frequency Range	30 MHz to 3 GHz
Primary Sensor	E-field
Insertion Loss S21 / Frequency Response	-12.8 dB (Avg.)
Deviation of Insertion Loss S21	30MHz ~ 500MHz ± 10 dB 500MHz ~ 3GHz ± 6dB
Connector	50 Ω (SMA)
Maximum Permissible Voltage at Probe Tip	50 VDC

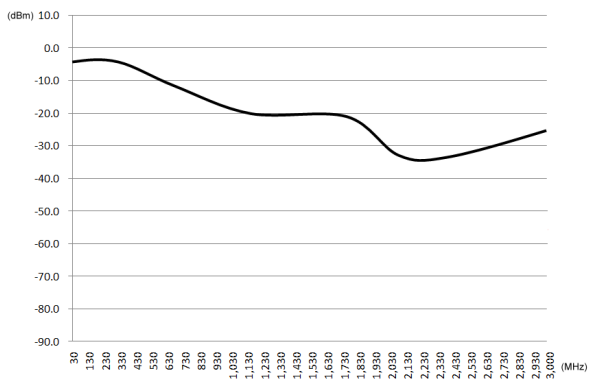
### Suggested Correction Factor



# ANT-04

Frequency Range	30 MHz to 3 GHz
Primary Sensor	H-field
Deviation of Correction Factor	$\pm 6$ dB
Connector	50 $\Omega$ (SMA)
Maximum Input Power	0.5 W

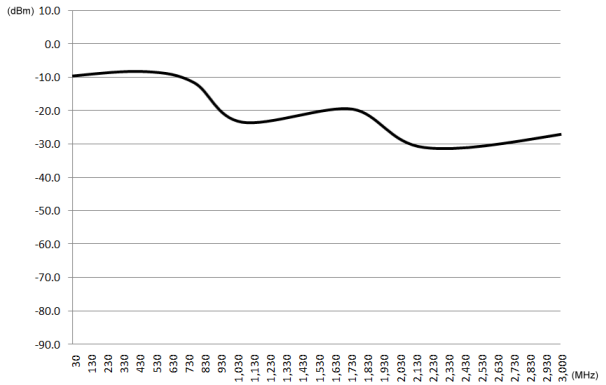
## Suggested Correction Factor



# ANT-05

Frequency Range	30 MHz to 3 GHz
Primary Sensor	H-field
Deviation of Correction Factor	$\pm 6$ dB
Connector	50 $\Omega$ (SMA)
Maximum Input Power	0.5 W

## Suggested Correction Factor



## Declaration of Conformity

We

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No. 7-1, Jhongsing Rd, Tucheng Dist., New Taipei City 236, Taiwan

**GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.**

No. 69 Lushan Road, Suzhou New District Jiangsu, China.

declare that the below mentioned product

**GKT-008 (PR-01; PR-02; ANT-04; ANT-05)**

is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Law of Member States relating to Low Voltage Equipment Directive (2006/95/EC & 2014/35/EU). For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Equipment Directive, the following standards were applied:

©Safety

Low Voltage Equipment Directive 2006/95/EC & 2014/35/EU	
Safety Requirements	EN 61010-1: 2002+A1: 2008