

# Near-field probes Overview



## Measurement method

- The probes can be used
- to examine the nature, direction and size of near-fields on electronic modules
  - to identify structural parts or components as sources of interference
  - to verify the measures taken to improve the EMC of an electronic module

Field measurement with near-field probes

Near-field probes are guided over the module by hand. The developer can turn and rotate them to get an idea of the spatial distribution of the near-fields. Special field densification at components, traces or structural parts indicates emission sources. Selected EMC countermeasures can be derived from these important findings to improve the module's EMC in terms of its emissions.

The probes are ideal for two basic tasks

<p>To measure fields that may excite emissions</p> <p>Magnetic fields with RF-R 400-1</p>	<p>To locate the source of emissions on the module</p> <p>Magnetic fields with RF-U 2.5</p>
<p>Electric fields with RF-E 02</p>	<p>Electric fields with RF-E 05</p>

## Preamplifier

Preamplifier up to 22 GHz

The preamplifier is used to amplify measurement signals such as weak signals of high-resolution near-field probes. The input and output of the preamplifiers are designed either as a 50 Ω BNC or SMA connector. The PA 303 is also available with N connector.

**PA 203 (BNC/SMA)**

best for LF, RF probes  
Amplification: 20 dB  
Frequency range: 100 kHz - 3 GHz



**PA 303 (N/ BNC/SMA)**

best for LF, RF probes  
Amplification: 30 dB  
Frequency range: 100 kHz - 3 GHz



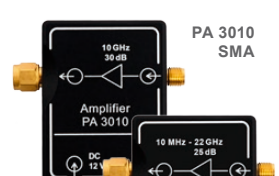
**PA 306 (SMA)**

best for XF probes  
Amplification: 30 dB  
Frequency range: 100 kHz - 6 GHz



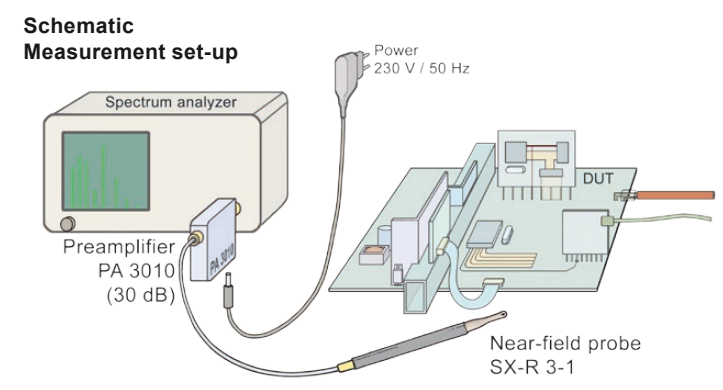
**PA 3010 (SMA)**

best for SX probes  
Amplification: 30 dB  
Frequency range: 10 MHz - 10 GHz



**PA 2522 (SMA)**

best for SX and HR probes  
Amplification: 25 dB  
Frequency range: 10 MHz - 22 GHz



## MFA 1 MHz - 6 GHz (active)

**Magnetic field measurement: MFA-R 0.2-75**

On components, e.g. close to IC pins, very fine conducting paths or small SMD components

- Use only with BT 706 bias tee

**Magnetic field measurement: MFA-R 0.2-6**

On components, e.g. close to IC pins, very fine conducting paths vor small SMD components

- Use only with BT 706 bias tee

**Current measurement: MFA-K 0.1-30**

Lateral shielding allows measurements at very fine conducting paths and IC pins

- Use only with BT 706 bias tee

**Current measurement: MFA-K 0.1-12**

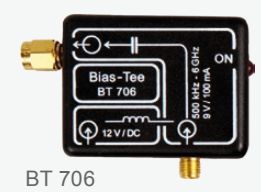
Lateral shielding allows measurements at very fine conducting paths and IC pins

- Use only with BT 706 bias tee

## Bias Tee

**BT 706 bias tee - only for MFA probes**

The bias tee supplies the preamplifier with a direct voltage via the signal transfer lines without interfering with the measurement signal which is transferred by an alternating voltage. The bias tee is connected to the 50 Ω input of a spectrum analyser or oscilloscope. The bias tee is supplied by a separate power-supply unit.



## Magnetic field measurement: SX-B 3-1

Directly on modules, detection of critical current loops in the layout

**E-field measurement: SX-E 03**

Bus structures, larger components and supply areas

## HR up to 40 GHz

**Magnetic field measurement: HR-R 8-1**

On IC pins or individual conductor tracks

- Use only with a HR SF550S microwave cable

**E-field measurement: HR-E 40-1**

Directly on individual conductor tracks

- Use only with a HR SF550S microwave cable

**LF, RF, XF, SX and HR probe sets** are supplied with:

- Probes
- Measurement cable
- Quick guide
- Case



**MFA probe sets** are supplied with:

- Probes
- Bias Tee
- Power supply
- Measurement cable
- Quick guide
- Case



**Note:**  
All probes and amplifiers are designed and manufactured in Germany.

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# LF 100 kHz - 50 MHz

**Magnetic field measurement: LF-R 400**  
Up to a distance of 10 cm around assemblies and devices

Frequency: 100 kHz to 50 MHz  
Probe head dimensions: Ø approx. 25 mm

**Magnetic field measurement: LF-R 50**  
At assemblies, devices or cables up to a distance of 3 cm, larger components as potential weak points

Frequency: 100 kHz to 50 MHz  
Probe head dimensions: Ø approx. 10 mm

**Magnetic field measurement: LF-R 3**  
On assemblies, e.g. near IC pins and IC housings, conducting paths, decoupling capacitors and EMC components

Frequency: 100 kHz to 50 MHz  
Probe head dimensions: Ø approx. 3 mm

**Magnetic field measurement: LF-B 3**  
Directly on modules, detection of critical current loops in the layout

Frequency: 100 kHz to 50 MHz  
Probe head dimensions: Ø approx. 4 mm

**RF current measurement: LF-U 5**  
At wide conducting paths, cables, plug-and-socket connectors, electronic components, cables and their connectors - Works like a coupling clamp

Frequency: 100 kHz to 50 MHz  
Probe head dimensions: (6 x 6) mm

**RF current measurement: LF-U 2.5**  
In conducting paths, SMD-components and IC pins

Frequency: 100 kHz to 50 MHz  
Probe head dimensions: Ø approx. 4 mm

**Magnetic field measurement: LF-K 7**  
At lines, rod-shaped structural parts, at cable connectors and along the edges of planar structural parts - Works like a coupling clamp

Frequency: 100 kHz to 50 MHz  
Probe head dimensions: (6 x 10) mm

# RF 30 MHz - 3 GHz

**Magnetic field measurement: RF-R 400-1**  
At the edge and in the vicinity of modules and housings, up to a distance of 10 cm

Frequency: 30 MHz to 3 GHz  
Probe head dimensions: Ø approx. 25 mm

**Magnetic field measurement: RF-R 50-1**  
In the vicinity of modules and on larger components, up to a distance of 3 cm

Frequency: 30 MHz to 3 GHz  
Probe head dimensions: Ø approx. 10 mm

**Magnetic field measurement: RF-R 3-2**  
On modules, determination of the direction of the magnetic surface field

Frequency: 30 MHz to 3 GHz  
Probe head dimensions: Ø approx. 3 mm

**Magnetic field measurement: RF-R 0.3-3**  
On modules, particularly small probe head for IC pins

Frequency: 30 MHz to 3 GHz  
Probe head dimensions: Ø approx. 2 mm

**Magnetic field measurement: RF-B 3-2**  
Directly on modules, detection of critical current loops in the layout

Frequency: 30 MHz to 3 GHz  
Probe head dimensions: Ø approx. 4 mm

**Magnetic field measurement: RF-B 0.3-3**  
Directly on modules, particularly small probe head for IC pins

Frequency: 30 MHz to 3 GHz  
Probe head dimensions: Ø approx. 2 mm

**RF current measurement: RF-U 5-2**  
At wide conducting paths, cables, connectors, electronic components and their connections - Works like a coupling clamp

Frequency: 30 MHz to 3 GHz  
Probe head dimensions: (6 x 6) mm

**RF current measurement: RF-U 2.5-2**  
On modules, directly on IC pins, SMD components and individual conducting paths

Frequency: 30 MHz to 3 GHz  
Probe head dimensions: Ø approx. 4 mm

**Magnetic field measurement: RF-K 7-4**  
Circular fields at metal edges, large components, wide conducting paths  
Special feature: a homogenous magnetic field is compensated

Frequency: 30 MHz to 1 GHz  
Probe head dimensions: (6 x 10) mm

**E-field measurement: RF-E 02**  
Bus structures, larger components or supply surfaces at a distance of 1 cm - 2 cm from the component

Frequency: 30 MHz to 1.5 GHz  
Probe head dimensions: (23 x 53) mm

**E-field measurement: RF-E 05**  
Directly on modules or wide conducting paths

Frequency: 30 MHz to 3 GHz  
Probe head dimensions: approx. (1 x 8) mm

**Note:**  
Determine the direction of the magnetic field by rotating the probe and deduce the path of the current causing the magnetic field.

**E-field measurement: RF-E 09**  
At a distance of 0.5 mm to 10 mm on the surface of multi-pin ICs and electronic modules

Frequency: 30 MHz to 3 GHz  
Probe head dimensions: (10 x 10) mm

**E-field measurement: RF-E 04**  
Surface measurement on clocked lines and smaller ICs with a distance from 0.5 to 10 mm above the assembly

Frequency: 30 MHz to 3 GHz  
Probe head dimensions: (5 x 5) mm

**E-field measurement: RF-E 10**  
Lateral shielding allows individual evaluation of conducting paths with a width of 0.1 mm or single IC pins at multi-pin ICs

Frequency: 30 MHz to 3 GHz  
Probe head dimensions: approx. (0.5 x 2) mm

# XF 30 MHz - 6 GHz

**Magnetic field measurement: XF-R 400-1**  
At the edge and in the vicinity of modules and housings up to a distance of 10 cm

Frequency: 30 MHz to 6 GHz  
Probe head dimensions: Ø approx. 25 mm

**Magnetic field measurement: XF-R 100-1**  
Around assemblies, devices or cables at a distance of up to approx. 3 cm

Frequency: 30 MHz to 6 GHz  
Probe head dimensions: (10 x 10) mm

**Magnetic field measurement: XF-R 3-1**  
On assemblies, e.g. around pins and IC housings, conducting paths, decoupling capacitors and EMC components

Frequency: 30 MHz to 6 GHz  
Probe head dimensions: Ø approx. 3 mm

**Magnetic field measurement: XF-B 3-1**  
Directly on modules, detection of critical current loops, e.g. between large components of switching controllers

Frequency: 30 MHz to 6 GHz  
Probe head dimensions: Ø approx. 4 mm

**RF current measurement: XF-U 2.5-1**  
In conductor runs, component connections, capacitors and IC pins

Frequency: 30 MHz to 6 GHz  
Probe head dimensions: Ø approx. 4 mm

**E-field measurement: XF-E 09s / XF-E 04s**  
At a distance of 0.5 mm to 10 mm on the surface of multi-pin ICs and electronic modules

Frequency: 30 MHz to 6 GHz  
Probe head dimensions: (5 x 5) mm

**E-field measurement: XF-E 10**  
Conducting paths with a width of 0.1 mm, single IC pins on multi-pin ICs

Frequency: 30 MHz to 6 GHz  
Probe head dimensions: (0.5 x 2) mm

# SX 1 GHz - 20 GHz

**Magnetic field measurement: SX-R 20-1**  
On assemblies, e.g. on individual IC pins, conductors, components and their connections to locate sources of interference

Frequency: 1 GHz to 20 GHz  
Probe head dimensions: (6 x 6) mm

**Magnetic field measurement: SX-R 3-1**  
On assemblies, e.g. around the pins and IC housings, conducting paths, decoupling capacitors and EMC components

Frequency: 1 GHz to 10 GHz  
Resolution: approx. 1 mm