

COAXIAL RF CURRENT MONITORING PROBE

1 Introduction

The TBCCP1-3K100 is a coaxial RF current monitoring probe, expanding the Tekbox product range of affordable EMC pre-compliance test equipment.

The probe has a 3 dB bandwidth from 3 kHz to 100 MHz and a very flat response from 9 kHz to 30 MHz. The transimpedance is characterized over the frequency range from 10 Hz to 100 MHz. The TBCCP1-3K100 is primarily designed as transducer for active loop antennas or for measurement of RF currents in coaxial cables.



Picture 1: TBCCP1-3K100 RF current monitoring probe

The probe is equipped with N-connectors. An attachment with a 1/4" thread permits connectivity to standard tripods.

2 Specification

Characterized frequency range:	10 Hz to 100 MHz
Transfer impedance:	5 dB Ohm
3 dB bandwidth:	3 kHz to 100 MHz, typ.
Dimensions:	76 mm x 102 x 69 mm
Weight:	400 g
Connector type:	N female
Max. primary current (RF):	3 A
Max. core temperature:	125 °C



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3 Transfer impedance

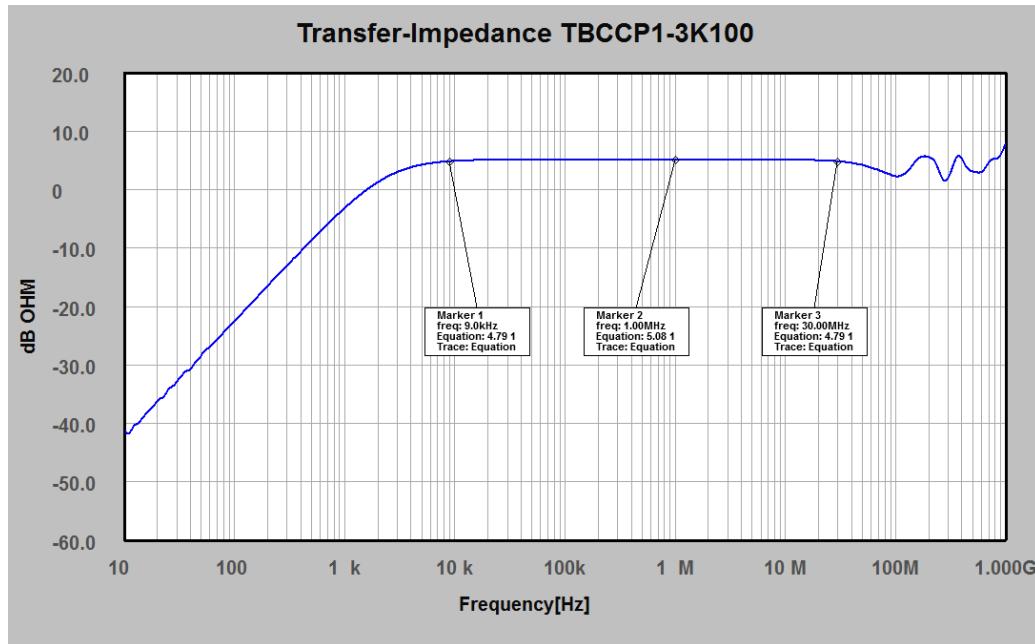


Figure 1: transfer impedance, 10 Hz – 1 GHz, typical data

4 Coaxial Path – Insertion loss (S21)

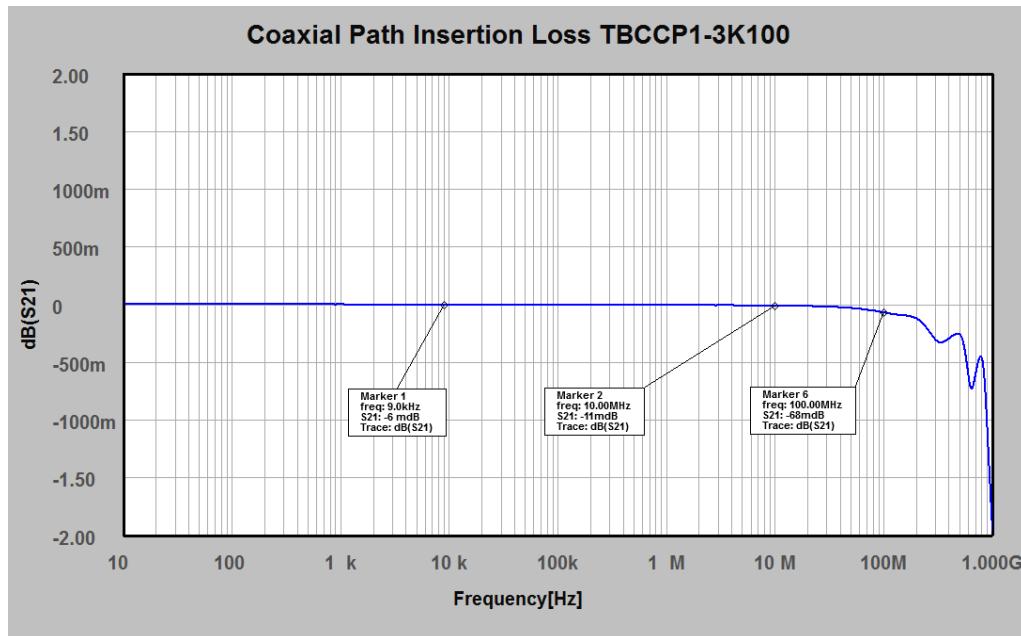


Figure 2: S21, insertion loss of the coaxial path, 10 Hz – 1 GHz, typical data

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5 Coaxial Path – Matching (S11)

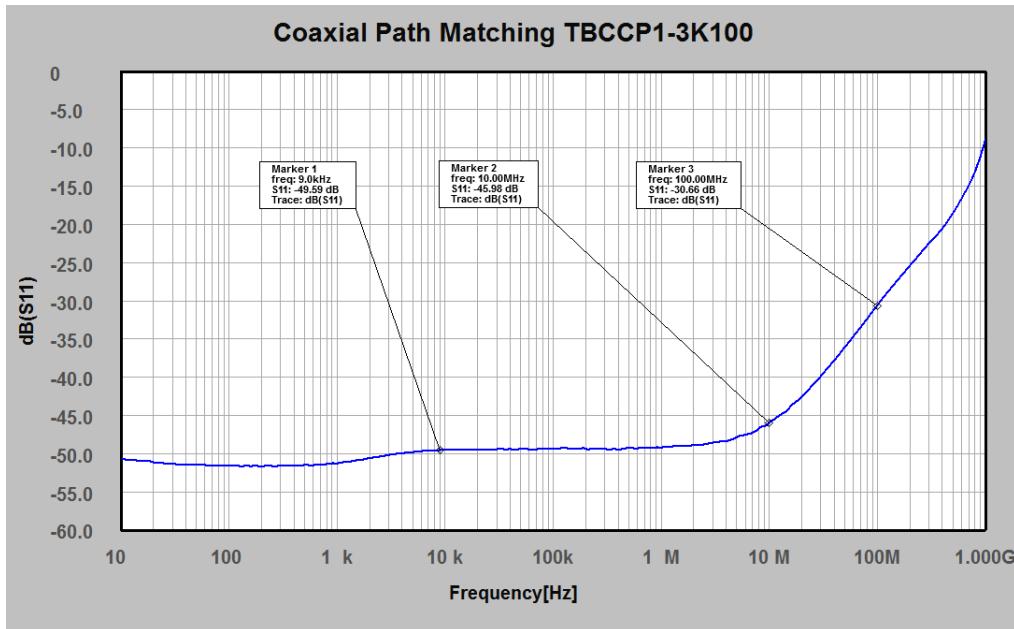


Figure 3: S11, impedance matching of the coaxial path, 10 Hz – 1 GHz, typical data

6 Application

The TBCCP1-3K100 is primarily designed as current transducer for active loop antennas. It will provide a very flat response in the frequency range from 9 kHz to 30 MHz.

Combined with a 185 cm length slotted coaxial cable, it will form a passive loop antenna with a diameter of 60 cm. The magnetic antenna factor will have a value of approximately 0dBs/m.

Adding a 20...30 dB amplifier will result in an antenna factor of -20 dBs/m-30 dBs/m. This provides sufficient sensitivity, even for standards such as CISPR11 Class A / Group 1 measured in situ, with a magnetic field strength limit of -21.5 dB μ A/m in the frequency range from 20 - 30 MHz and at a distance of 30 meters.

When used as transducer for a passive antenna, a typical sensitivity of -4 dB μ A/m can be achieved. This would be sufficient for CISPR 14 radiated emission measurements in the frequency range from 9 kHz to 30 MHz.

For more details, download the application note *Loop Antenna Basics.pdf* from the Tekbox website.

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7 Typical transfer impedance table

The table below shows typical transfer impedance data of a TBCCP1-3K100 current probe. Each current probe is delivered with its corresponding measurement protocol. This data can be used for the creation of a correction file for EMCview or similar EMC measurement software. The transfer impedance in $\text{dB}\Omega$ subtracted from the analyzer reading in $\text{dB}\mu\text{V}$ gives the corrected reading in $\text{dB}\mu\text{A}$.

Refer to the application notes of EMCview on how to create a current probe correction file, download a file with typical data from the Tekbox website or simply select the file from the installed correction file directory.

Frequency [MHz]	transfer impedance [$\text{dB}\Omega$]	Frequency [MHz]	transfer impedance [$\text{dB}\Omega$]
0.00001	-40.60	0.25	5.16
0.000025	-34.42	0.5	5.15
0.00005	-28.46	0.75	5.15
0.000075	-24.97	1	5.15
0.0001	-22.47	2.5	5.15
0.00025	-14.57	5	5.14
0.0005	-8.70	7.5	5.14
0.00075	-5.38	10	5.12
0.001	-3.17	20	5.03
0.00125	-1.58	30	4.84
0.0015	-0.39	40	4.54
0.00175	0.53	50	4.21
0.002	1.25	55	3.99
0.00225	1.83	60	3.76
0.0025	2.29	65	3.54
0.005	4.25	70	3.32
0.0075	4.73	75	3.08
0.01	4.91	80	2.87
0.025	5.12	85	2.69
0.05	5.15	90	2.52
0.075	5.16	95	2.36
0.1	5.16	100	2.26

Table 1: Transfer impedance: 10 Hz to 100 MHz, typical data

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8 Calibration

Tekbox coaxial RF current probes do not need a calibration fixture for the measurement of the transfer impedance.

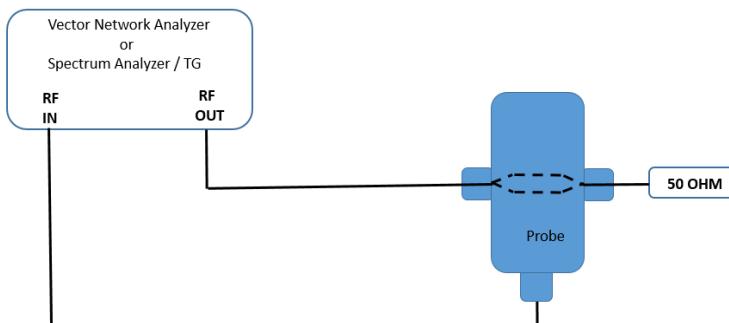


Figure 4: S21, transimpedance measurement set up

Calculate the transfer impedance Z_T using the formula below:

$$Z_T [\text{dB}\Omega] = \text{Pin} [\text{dBm}] - \text{Pprobe} [\text{dBm}] + 34 \text{ dB}$$

or simply

$$Z_T [\text{dB}\Omega] = \text{S21} [\text{dB}] + 34 \text{ dB}$$

9 Ordering Information

Part Number	Description
TBCCP1-3K100	RF surface current monitoring probe, beech-wood box, calibration protocol 1kHz – 400 MHz

10 History

Version	Date	Author	Changes
V 1.0	6.5.2022	Mayerhofer	Creation of the preliminary document
V 1.1	5.6.2025	Mayerhofer	Correction, chapter 2

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