COAXIAL RF CURRENT MONITORING PROBE

1 Introduction

The TBCCP1-400K600 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 400 kHz to 600 MHz and a very flat response from 1 MHz to 200 MHz. The transimpedance is characterized over the frequency range from 10 Hz to 100 MHz. The TBCCP1-400K600 is primarily designed as transducer for passive 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 ¼" thread permits connectivity to standard tripods.

2 Specification

Characterized frequency range:	10 Hz to 600 MHz
Transfer impedance:	23 dB Ohm
3 dB bandwidth:	400 kHz to 600 MHz, typ.
Dimensions:	76 mm x 102 x 69 mm
Weight:	400 g
Connector type:	N female
Max. primary current (RF):	12 A
Max. core temperature:	125 °C

RoHS

3 Transfer impedance

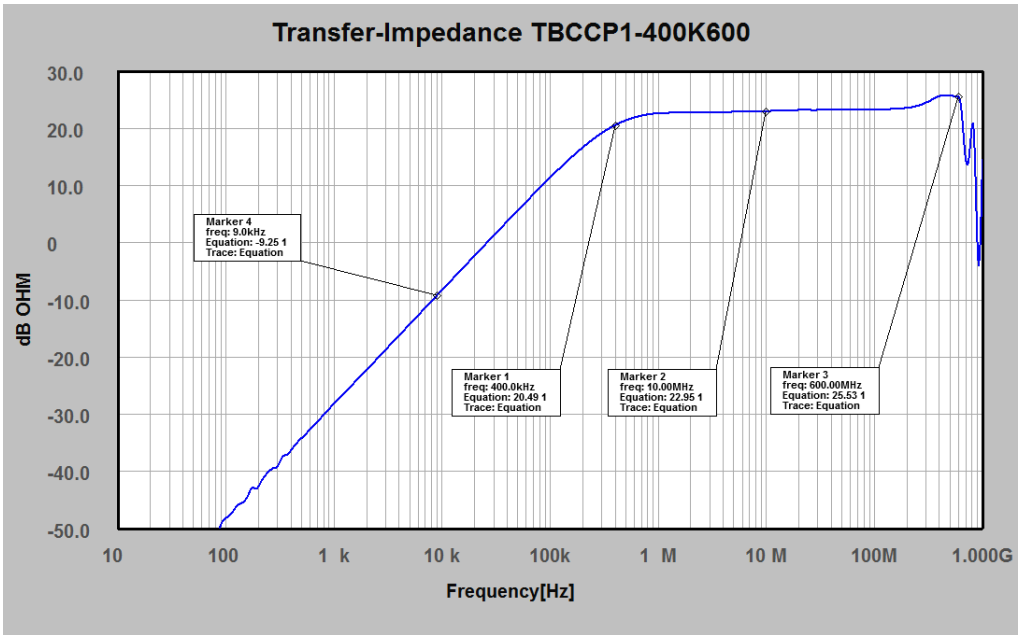

Figure 1: transfer impedance, 10 Hz – 1 GHz, typical data

4 Coaxial Path – Insertion loss (S21)

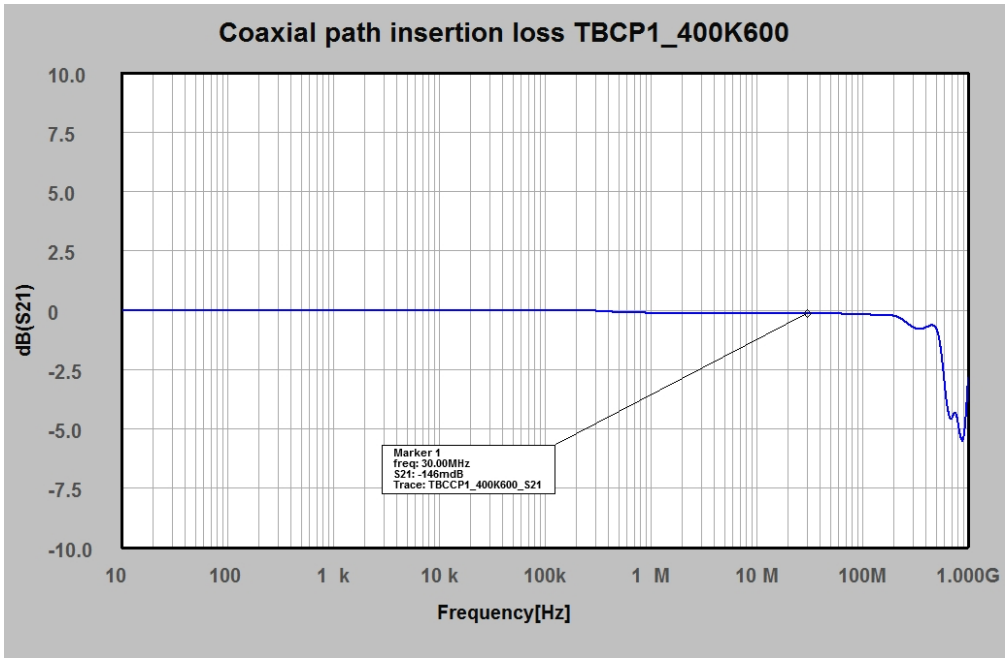

Figure 2: S21, insertion loss of the coaxial path, 10 Hz – 1 GHz, typical data

5 Coaxial Path – Matching (S11)

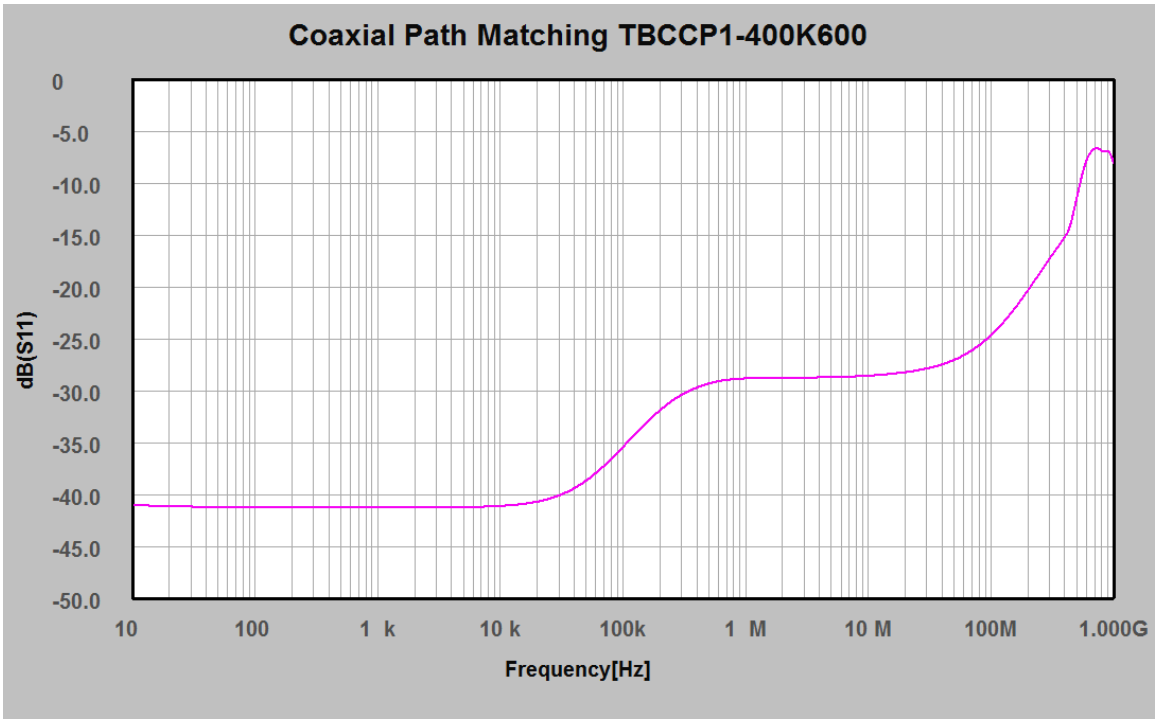

Figure 3: S11, impedance matching of the coaxial path, 10 Hz – 1 GHz, typical data

6 Application

The TBCCP1-400K600 is primarily designed as current transducer for passive loop antennas. It will provide a low antenna factor / good sensitivity over a wide frequency range.

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 -18 dBS/m.

When used as transducer for a passive antenna, a typical sensitivity of -22 dBµA/m can be achieved. This is sufficient for all CISPR xx radiated emission measurments 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.

7 Typical transfer impedance table

The table below shows typical transfer impedance data of a TBCCP1-400K600 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 dBΩ subtracted from the analyzer reading in dBµV gives the corrected reading in dBµA.
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 [dBΩ]	Frequency [MHz]	transfer impedance [dBΩ]
0.00001	-62.56	1	22.57
0.000025	-58.21	2.5	22.74
0.00005	-56.10	5	22.82
0.000075	-50.92	7.5	22.89
0.0001	-48.21	10	22.95
0.00025	-40.06	20	23.15
0.0005	-34.26	30	23.19
0.00075	-30.77	40	23.25
0.001	-28.20	50	23.26
0.00125	-26.37	55	23.26
0.0015	-24.76	60	23.25
0.00175	-23.49	65	23.26
0.002	-22.30	70	23.25
0.00225	-21.29	75	23.24
0.0025	-20.39	80	23.24
0.005	-14.34	85	23.25
0.0075	-10.83	90	23.24
0.01	-8.33	95	23.24
0.025	-0.39	100	23.24
0.05	5.55	200	23.51
0.075	8.98	300	24.41
0.1	11.34	400	25.57
0.25	18.04	500	25.70
0.5	21.32	550	25.53
0.75	22.28	600	25.53

Table1: Transfer impedance: 10 Hz to 600 MHz, typical data

8 Calibration

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

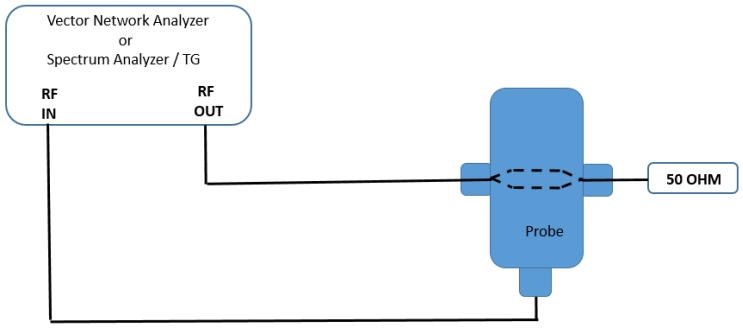

Figure 4: S21, transimpedance measurement set up

Calculate the transfer impedance Z_T using the formula below:

Z_T [dBΩ] = Pin [dBm] – Pprobe [dBm] +34 dB

or simply

Z_T [dBΩ] = S21 [dB] +34 dB

9 Ordering Information

Part Number	Description
TBCCP1-400K600	RF surface current monitoring probe, beech-wood box, calibration protocol 1kHz – 400 MHz

10 History

Version	Date	Author	Changes
V 1.0	1.7.2022	Mayerhofer	Creation of the preliminary document

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