RF Common Mode Choke

1 Introduction

The TBCMC-1 is a general purpose RF common mode choke. It is designed primarily to attenuate ground loop currents in impedance measurement setups based on the shunt method. The TBCMC-1 is a symmetric design.

Picture 1: TBCMC-1 RF common mode choke

2 Specification

Compliance:	RoHS
Differential mode impedance:	50 Ohm, typ.
Characterized frequency range:	1 Hz – 1 GHz
Recommended frequency range:	10 Hz – 500 MHz
Differential mode power rating:	max. 130 W up to 1 GHz
Differential mode voltage rating:	max. 225V_{pp} up to 1 GHz
Insertion loss (S21, S12):	< 0.1 dB up to 10 MHz, typ.
	< 0.2 dB up to 100 MHz, typ.
	< 0.6 dB up to 1 GHz, typ.
Common mode rejection:	> 60 dB up to 1 MHz, typ.
	> 30 dB up to 100 MHz, typ.
	> 10 dB up to 1 GHz, typ.
Input return loss (S11, S22):	> 20 dB up to 1 GHz, typ.
Common mode saturation current:	500 mA, typ.
RF connectors:	50 Ω N - female,
Operating temp. range:	0°C – 60°C
Enclosure dimensions:	70 mm x 60 mm x 140 mm
Weight:	350 g

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3 Measurement plots

3.1 Common mode rejection

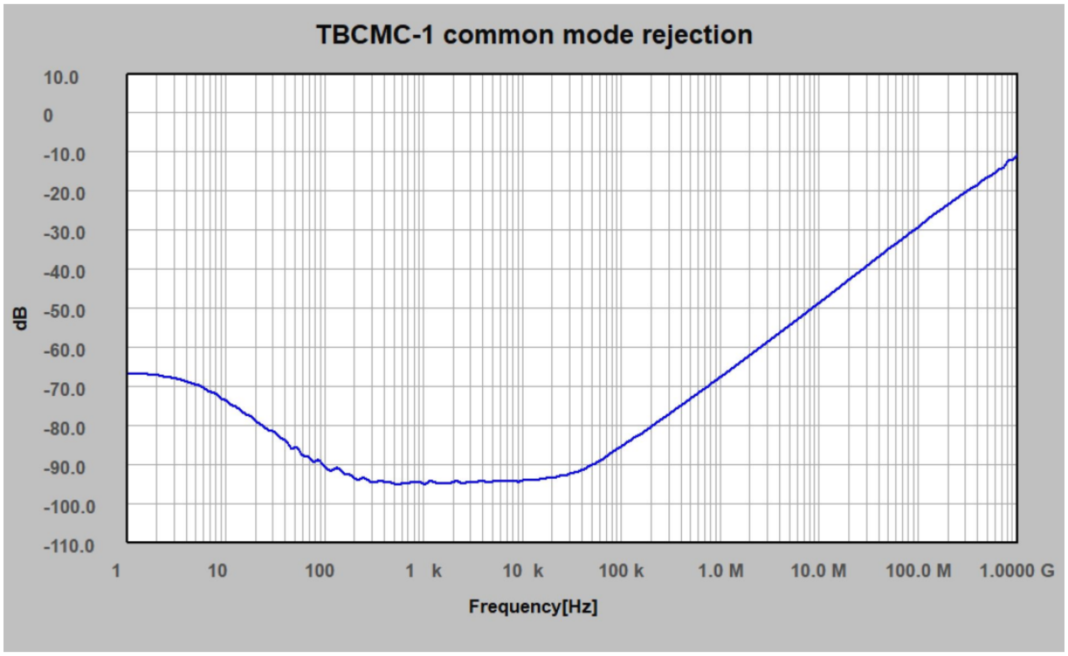

Figure 3-1, Common Mode Rejection

3.2 Insertion loss

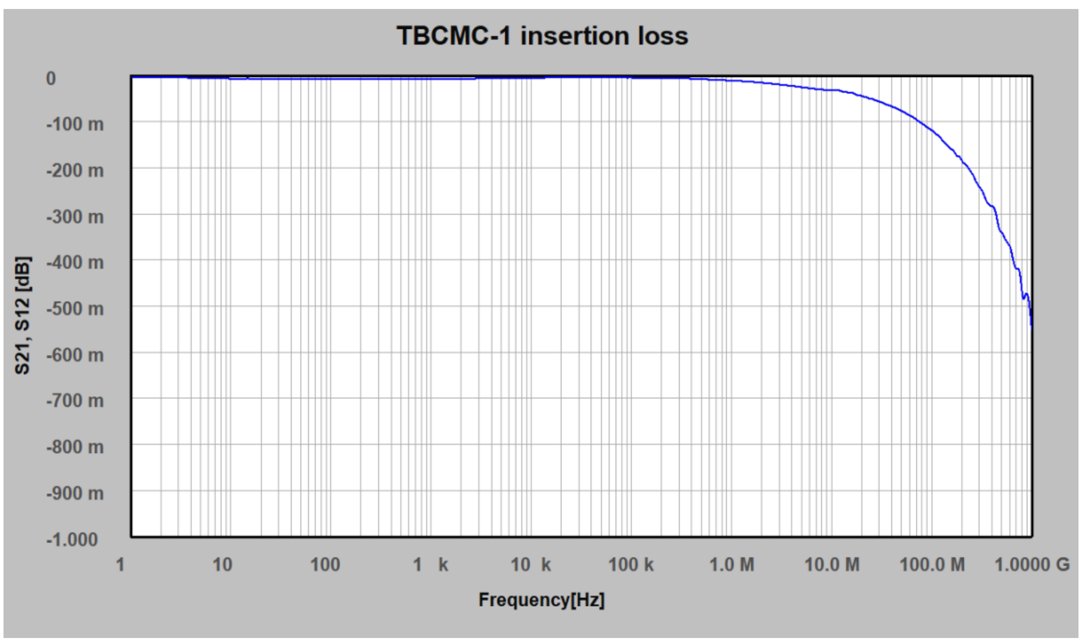

Figure 3-2, typical insertion loss

3.3 Input return loss

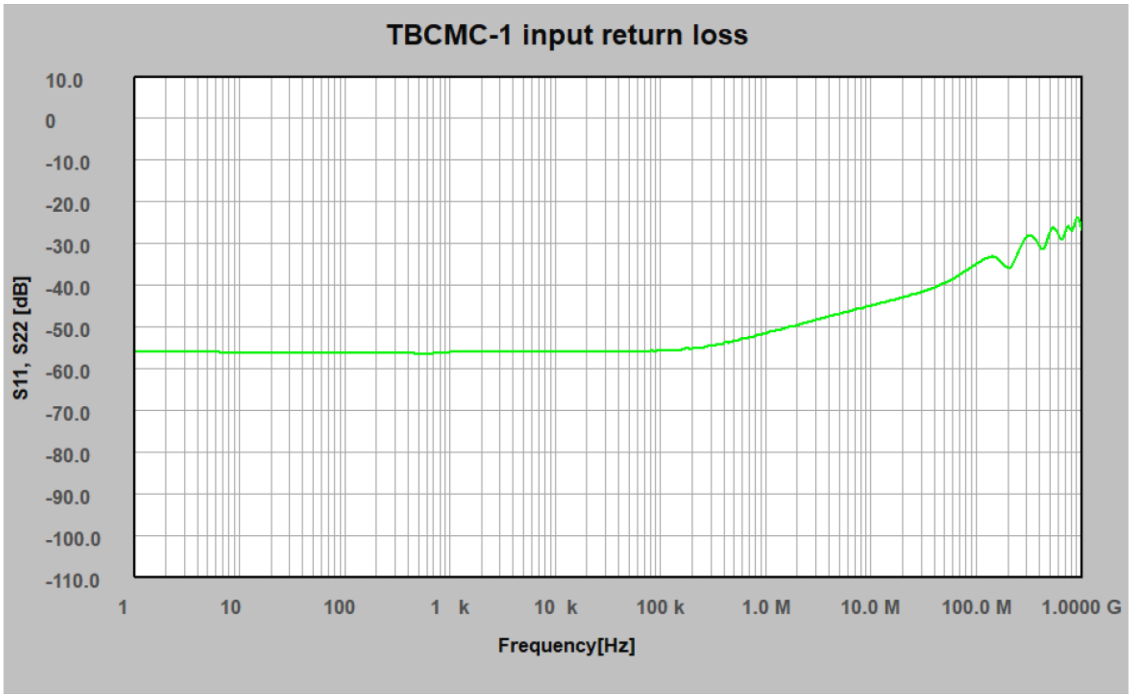

Figure 3-3, typical input return loss

4 Application

Application example: measure a 0.47 Ohm resistor using the shunt method and TBVNA-6000

The shunt method is preferred for accurate measurement of low impedance values. To achieve the highest level of precision, the shunt method requires a common mode choke in the signal path.

Set start frequency to 10 Hz, set stop-frequency to 100 MHz, set the port power to -5 dBm and logarithmic sweep. Set the measurement bandwidth to 100 Hz. Connect a suitable common mode choke to Port 2 and perform a full 2-port calibration. Use a PCB with a short 50 Ohm microstrip line as Through-standard. This PCB will later carry the DUT resistor.

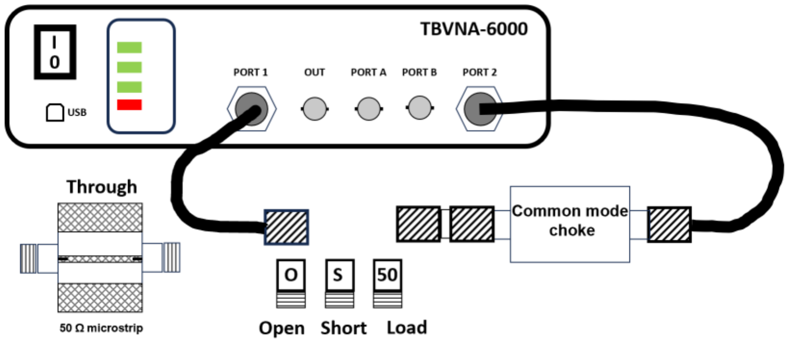

Figure 4-1, calibration setup

Solder the 0.47 Ohm resistor from the microstrip line to the GND of the PCB and set up the measurement.

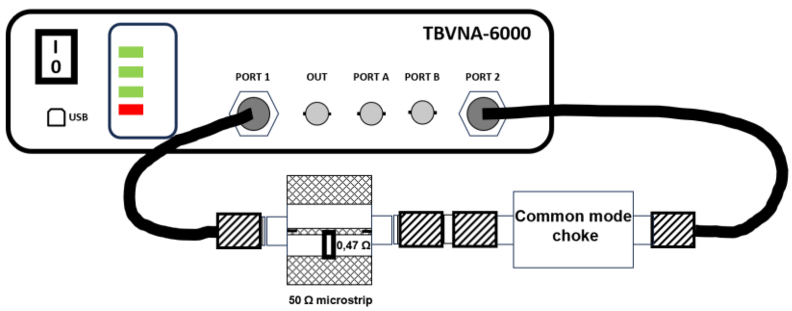

Figure 4-2, Measurement setup

Create a rectangular diagram and add a trace. In the Trace Dialog, Scroll down the Trace Function list and select <IMP Shunt>

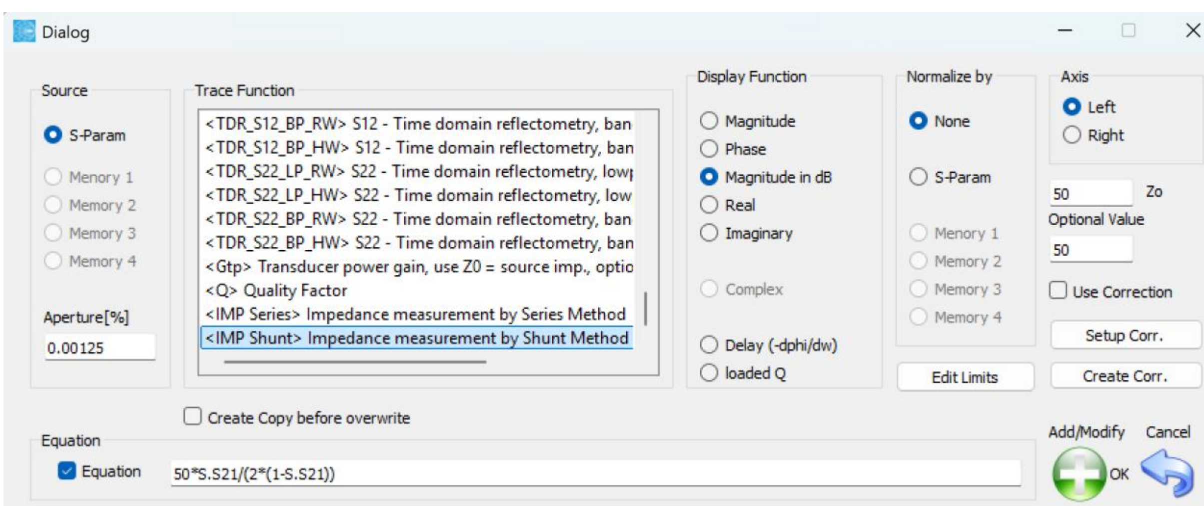

Figure 4-3, Trace dialog

Close the Trace dialog, configure the Y-axis to 10 divisions, top level 1 Ohm, bottom level 0 Ohm and set a marker. Hit the Single Measurement button.

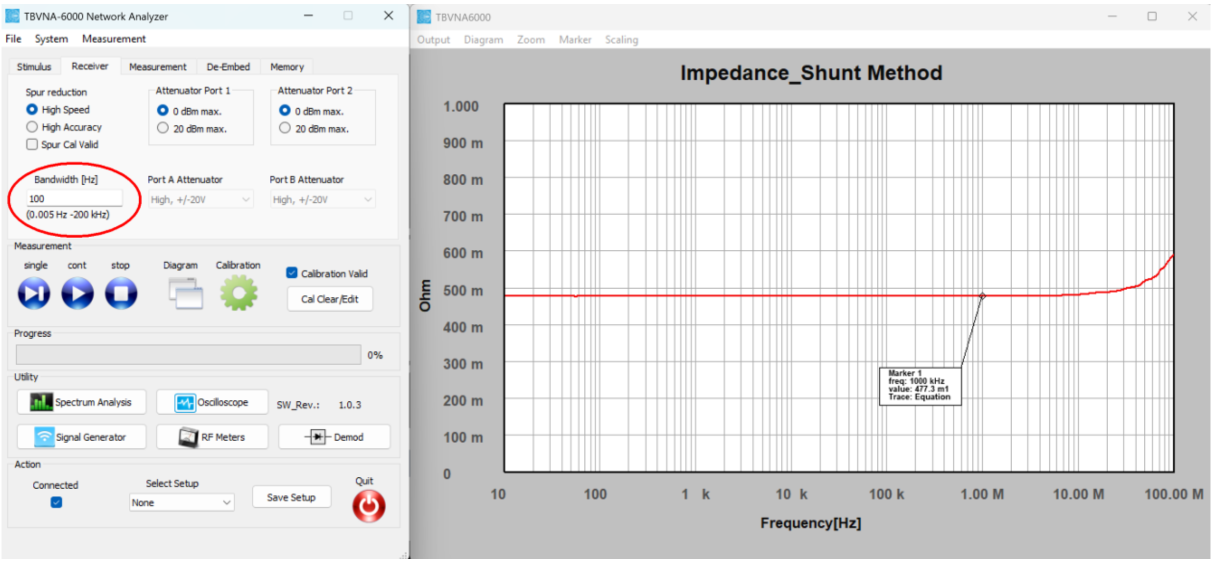

Figure 4-4, measurement result

We measure 0,476 Ohm between 1 kHz and 10 MHz. At higher frequencies, the parasitic inductance of the resistor starts to contribute to the impedance.

5 Ordering Information

Part Number	Description
TBCMC-1	RF common mode choke
TBTB-1	Test PCB for shunt impedance method; through, N-F/N-F; 40 x 60 mm
TBTB-2	Test PCB for series impedance method; N-F/N-F; 40 x 60 mm

6 History

Version	Date	Author	Changes
V 1.0	6.2.2025	Mayerhofer	Creation