1µH Line Impedance Stabilisation Network

1 Introduction

The TBL0110-2 LISN is a two path 50 Ω // 1 µH LISN characterized from 30Hz – 500 MHz. It is based on the standard ECSS-E-ST-20-07C Rev 1. The standard provides the general schematic of the LISN and allows for some flexibility in component values. The TBL0110-2 implementation aims for use in EMC measurements of small satellites and spacecraft. The LISN does not have an output for conducted emission measurements; instead, it merely functions as a network for line impedance stabilisation. An RF current monitoring probe is used to measure conducted emissions, according to the standard.
The 1µH inductor mimics the typical inductance of the supply wire harness in small spacecraft or satellites.
The LISN is inserted into the power line and power return line of the EUT.

2 Parameters

LISN type: V-AMN, 50 Ω // 1 µH

Characterized frequency range: 30 Hz – 500 MHz

DC Resistance: 120 mΩ

Maximum current: 10 A continuous

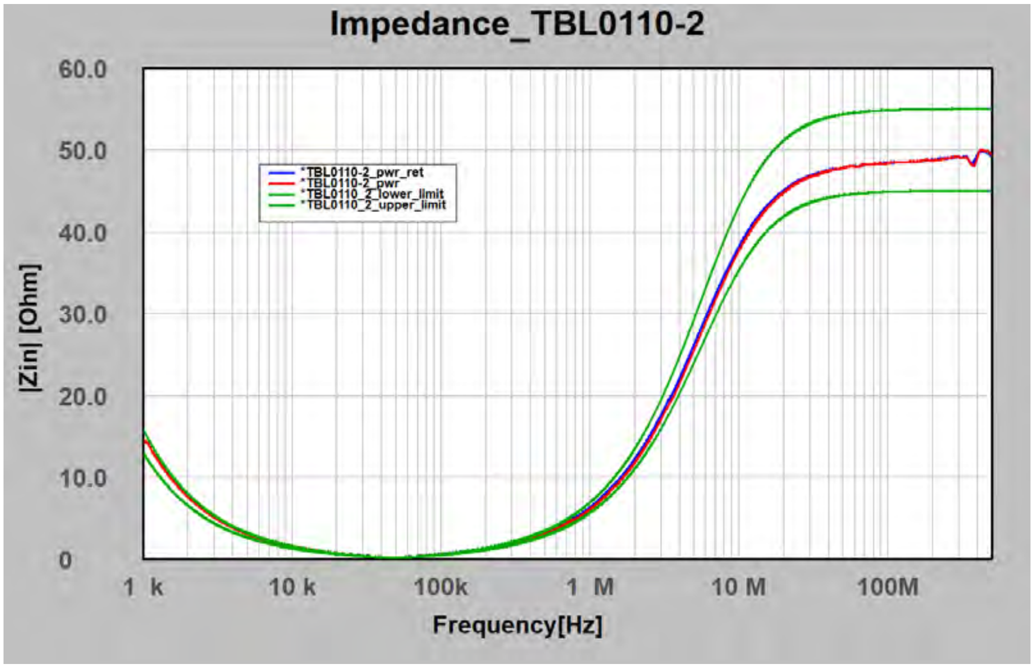
Operating voltage range: 0 – 60V DC

EUT / SOURCE terminals: 4 mm banana sockets

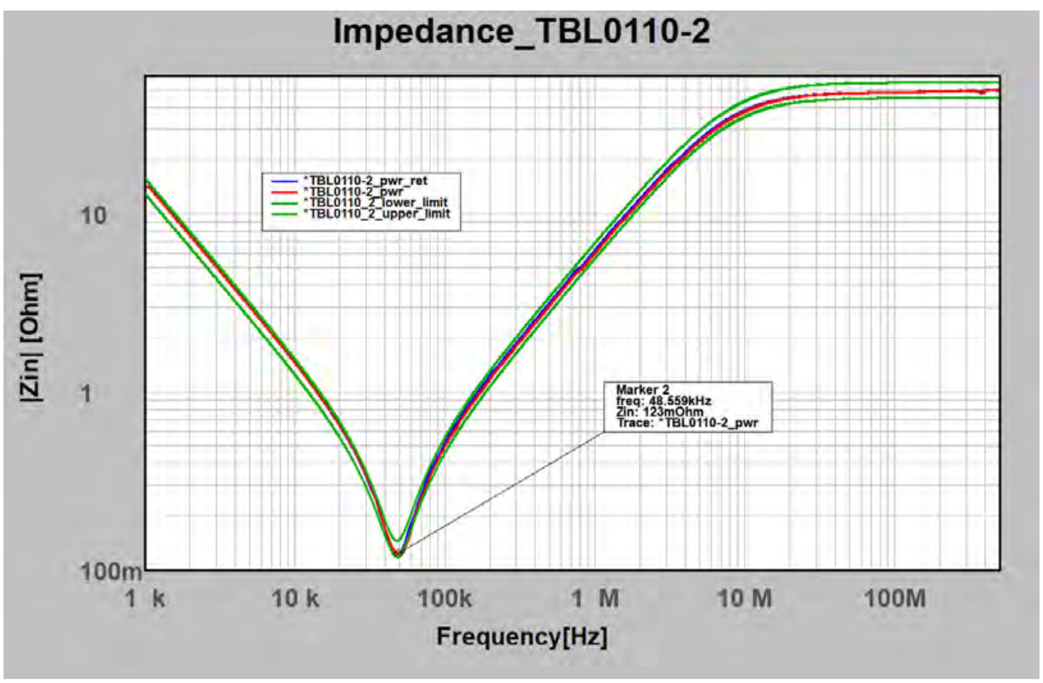
Dimensions: W 120 mm x L 175 mm x H 85 mm;

Weight: 0.9 kg

3 Impedance

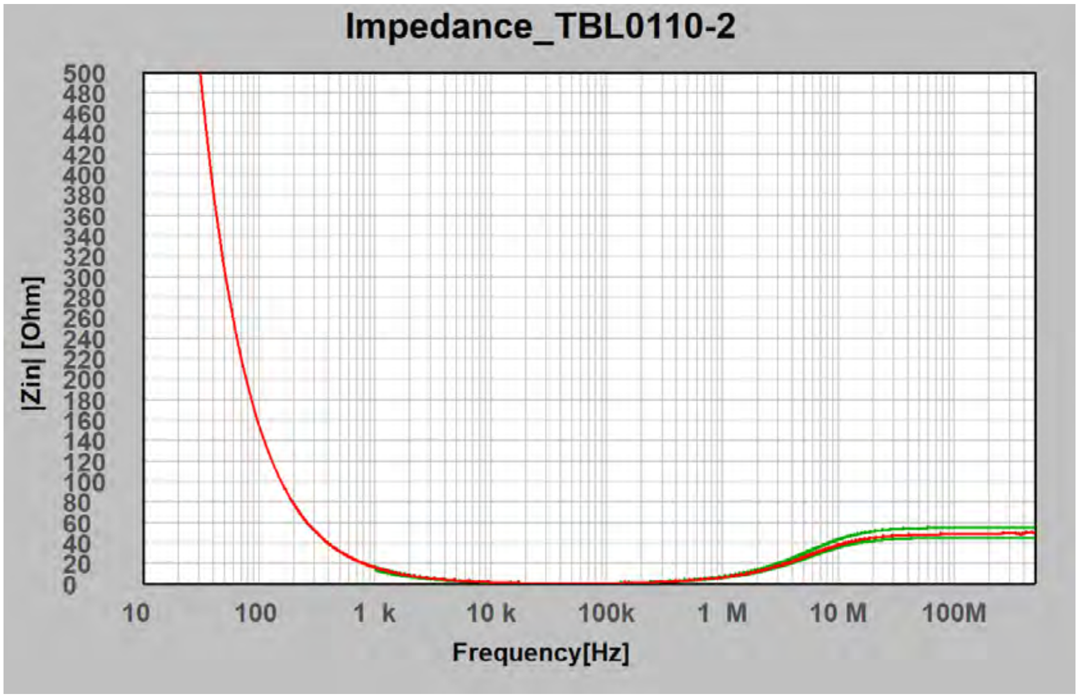


Impedance: 1 kHz – 500 MHz; source terminals open, typical data



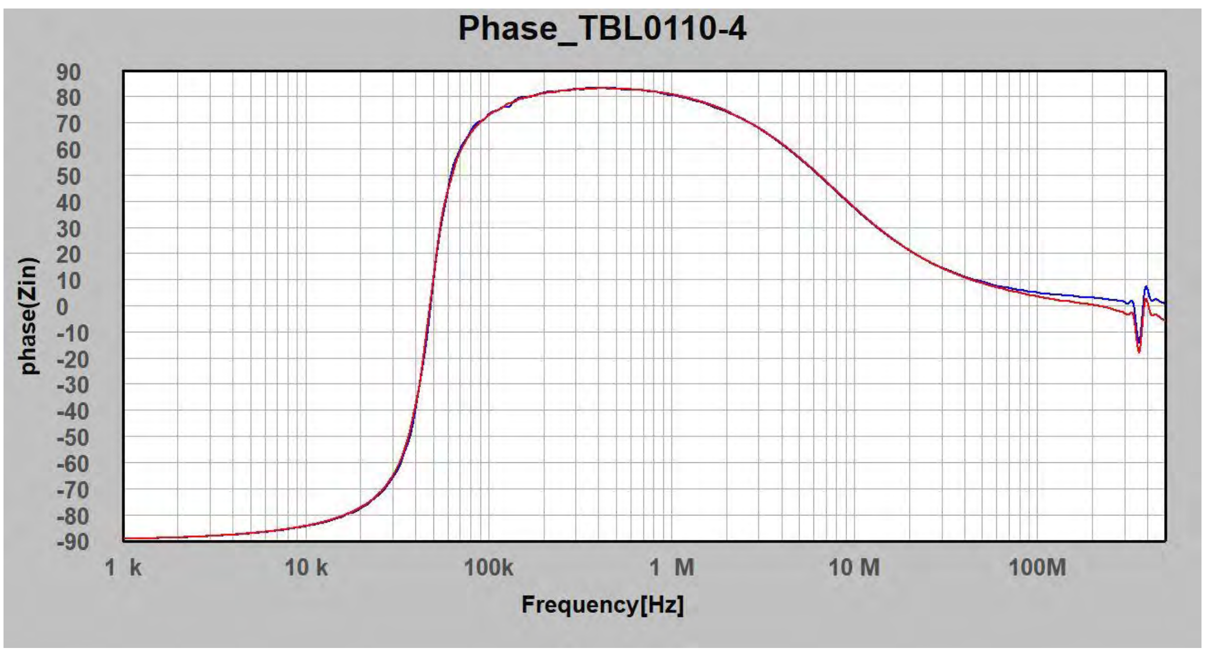
Impedance: 1 kHz – 500 MHz; logarithmic impedance axis, source terminals open, typical data

The standard does not specify impedance limits. The green traces represent a ± 10% tolerance band of the simulated impedance (ideal components/no parasitics);



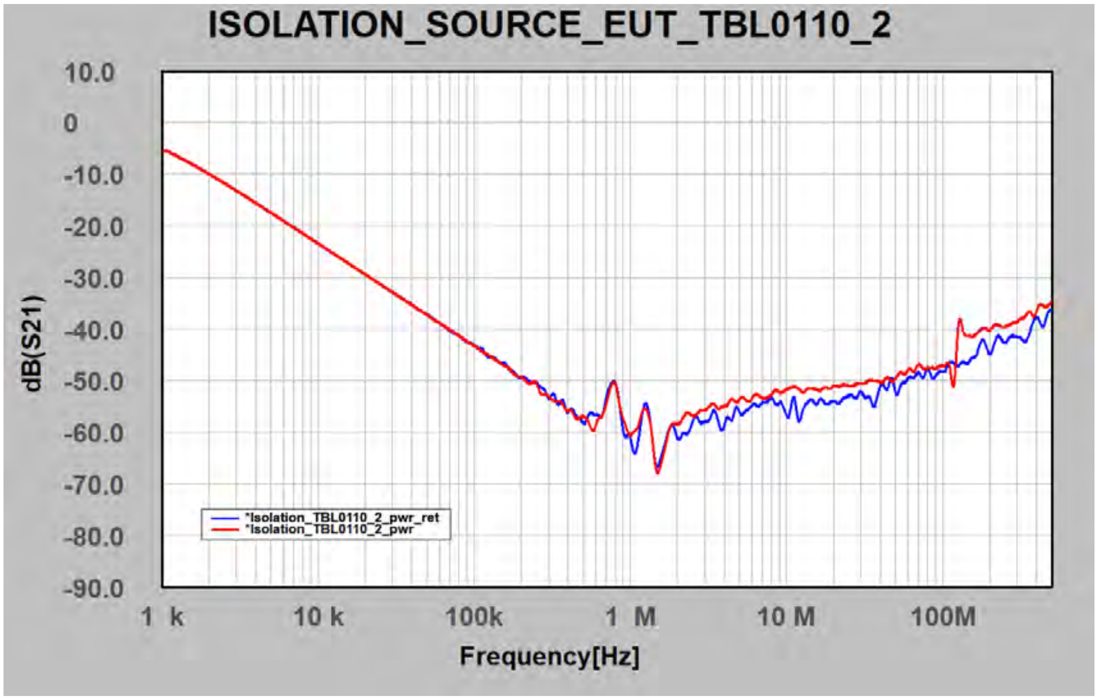
Impedance: 30 Hz – 500 MHz; logarithmic impedance axis, source terminals open, typical data

4 Phase



Input phase: 1 kHz – 500 MHz; source terminals open, typical data

5 Isolation



Isolation from SOURCE terminals to EUT terminals: 1 kHz – 500 MHz, typical data

6 Principle Schematics

In order to reproduce the system power bus impedance and to standardize the measurement conditions used in different test sites, emissions and susceptibility measurements on primary power lines shall be performed on inserting a Line Stabilization Network (LISN) between the EGSE power supply and the unit under test. The LISN schematic and the relevant impedance versus frequency are chosen in accordance with the bus impedance mask. The design of the LISN is usually provided by the spacecraft contractor. In case it is not available in time the LISN schematic and the relevant impedance versus frequency given below shall be used.
Prior to test, the network impedance shall be measured in the relevant frequency range and attached to the test report.

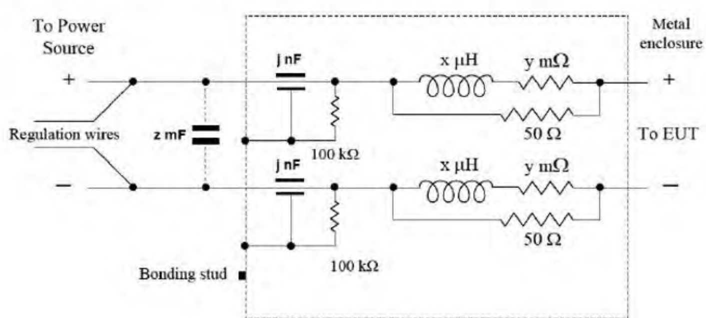


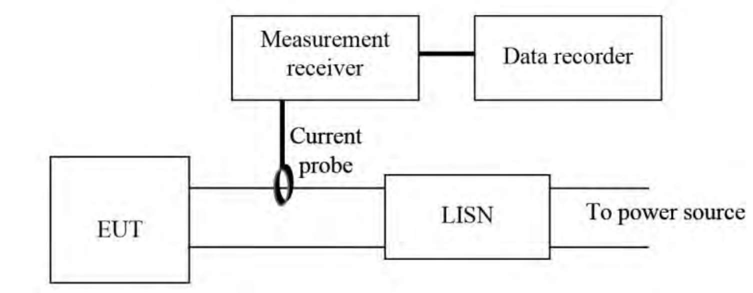
Figure 5-2: LISN schematic

X = 1 µH Y = 100 mΩ j = 11µF

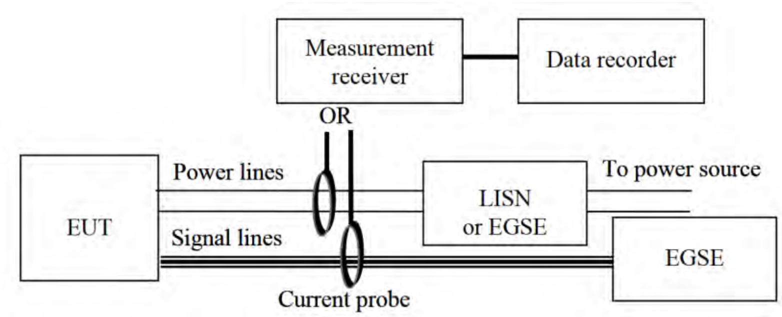
7 Measurement of conducted emissions

ECSSEST2007C specifies differential mode conducted emission measurements on power leads in the frequency range of 30 Hz to 100 kHz.

Furthermore, ECSSEST2007C specifies common mode and differential mode conducted emission measurements on power and signal leads in the frequency range of 100 kHz to 100 MHz.



Conducted emission, differential mode, measurement setup



Conducted emission, common mode, measurement setup

**) EGSE: electrical ground support equipment*

Tekbox also provides suitable RF current monitoring probes, such as the TBCP2-30K400.

LISN are also required in other ECSSEST2007C measuring setups:

Radiated emission – electric field; inrush current; conducted susceptibility – signal injection; conducted susceptibility – bulk cable injection; conducted susceptibility – transients; conducted susceptibility – spike series / parallel injection; radiated susceptibility – magnetic field; radiated susceptibility – electric field;

8 References

ECSS-E-ST-20-07C Rev. 1

9 Ordering Information

Part Number	**Description**
TBL0110-2	1µH LISN, two path
TBCP2-30K400	Optional accessory: RF current monitoring probe for CE measurements

10 History

Version	Date	Author	Changes
V1.0	31.10.2023	Mayerhofer	Creation of the document
V1.1	31.10.2023	Mayerhofer	Chapter 7 added
V1.2	22.01.2024	Mayerhofer	Chapter 1, type error correction

2µH Line Impedance Stabilisation Network

1 Introduction

The TBL0225-2 LISN is a two-paths 50 Ω // 2 µH LISN characterized from 10Hz – 200 MHz. It is based on the standard ECSS-E-ST-20-07C Rev 1. The standard provides the general schematic of the LISN and allows for some flexibility in component values. The TBL0225-2 implementation aims for use in EMC measurements of satellites and spacecraft. The LISN does not have an output for conducted emission measurements; instead, it merely functions as a network for line impedance stabilisation. An RF current monitoring probe is used to measure conducted emissions, according to the standard.
The 2 µH inductor mimics the typical inductance of the supply wire harness in spacecraft or satellites.
The LISN is inserted into the power line and power return line of the EUT.

2 Parameters

LISN type: V-AMN, 50 Ω // 2 µH

Characterized frequency range: 10 Hz – 200 MHz

DC Resistance: 100 mΩ per path

Maximum current: 25 A continuous

Operating voltage range: 0 – 60V DC

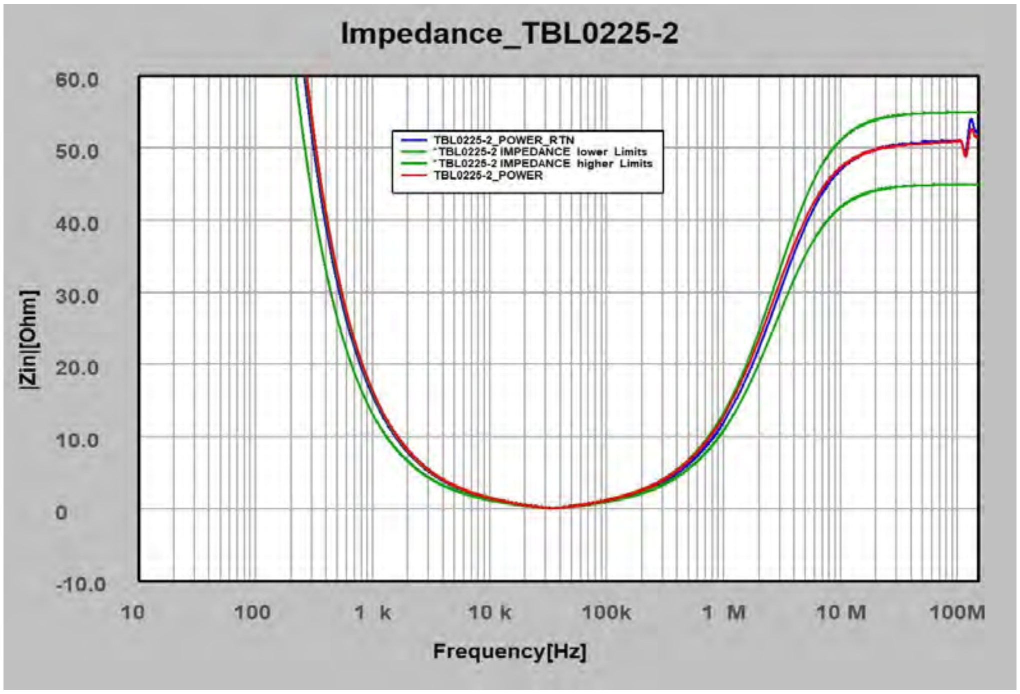
EUT / SOURCE terminals: 4 mm banana sockets

Dimensions: W 260 mm x L 140 mm x H 150 mm

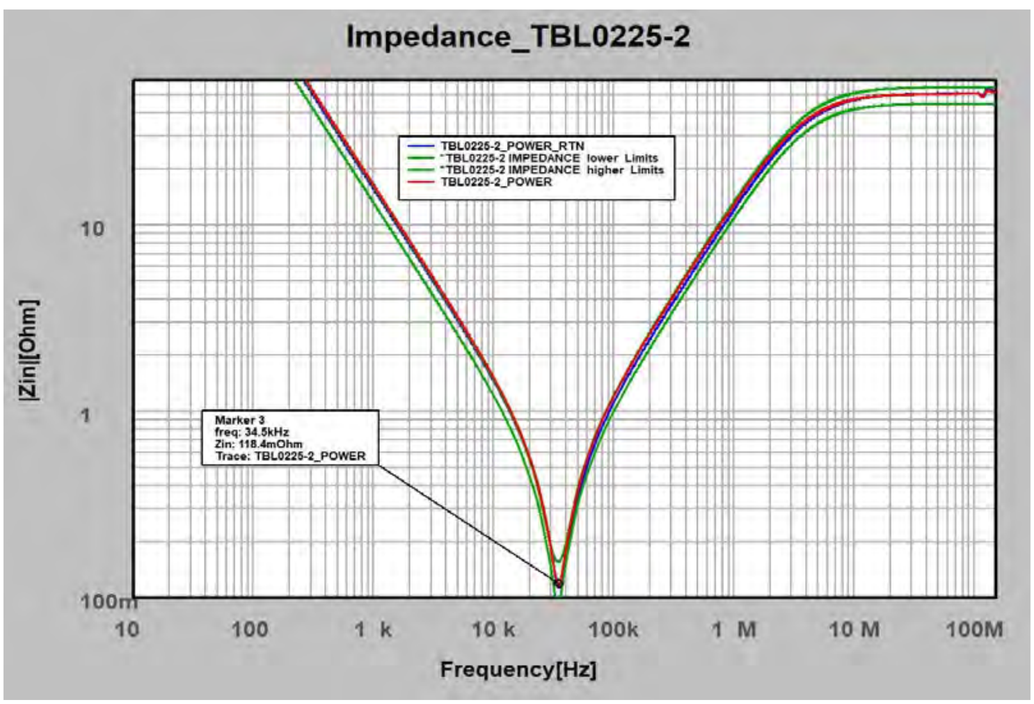
Weight: 4.1 kg

ES France - Département Tests & Mesures
127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 45
Fax. 01 47 01 16 22
e-mail : tem@es-france.com
Site Web : www.es-france.com

3 Impedance



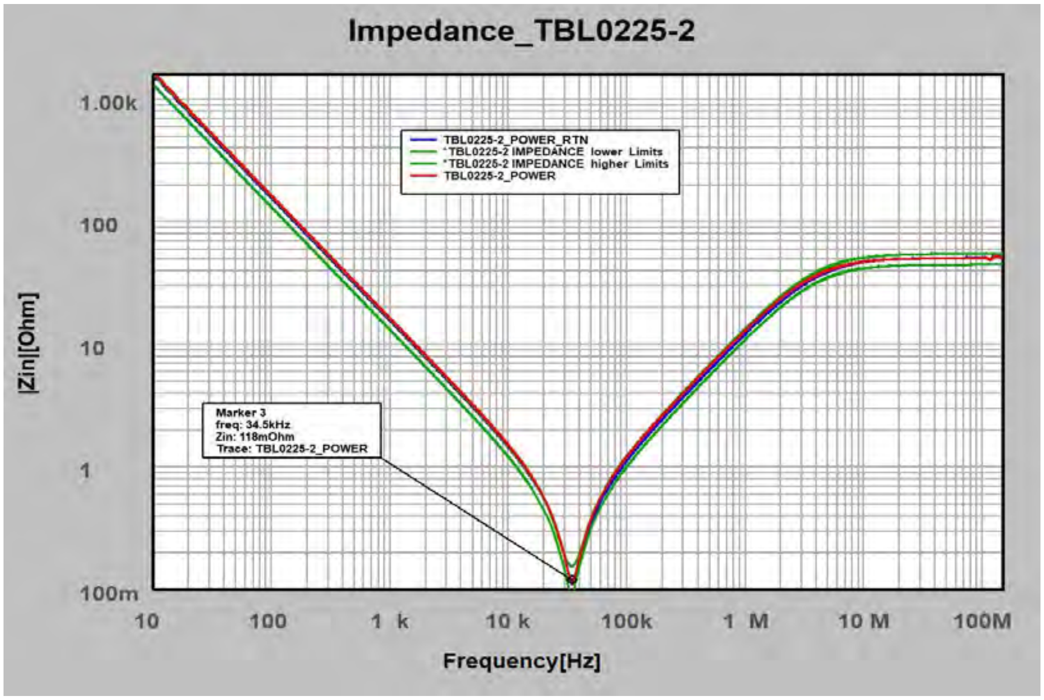
Impedance: 10Hz – 200 MHz; source terminals open, typical data



Impedance: 10 Hz – 200 MHz; logarithmic impedance axis, source terminals open, typical data

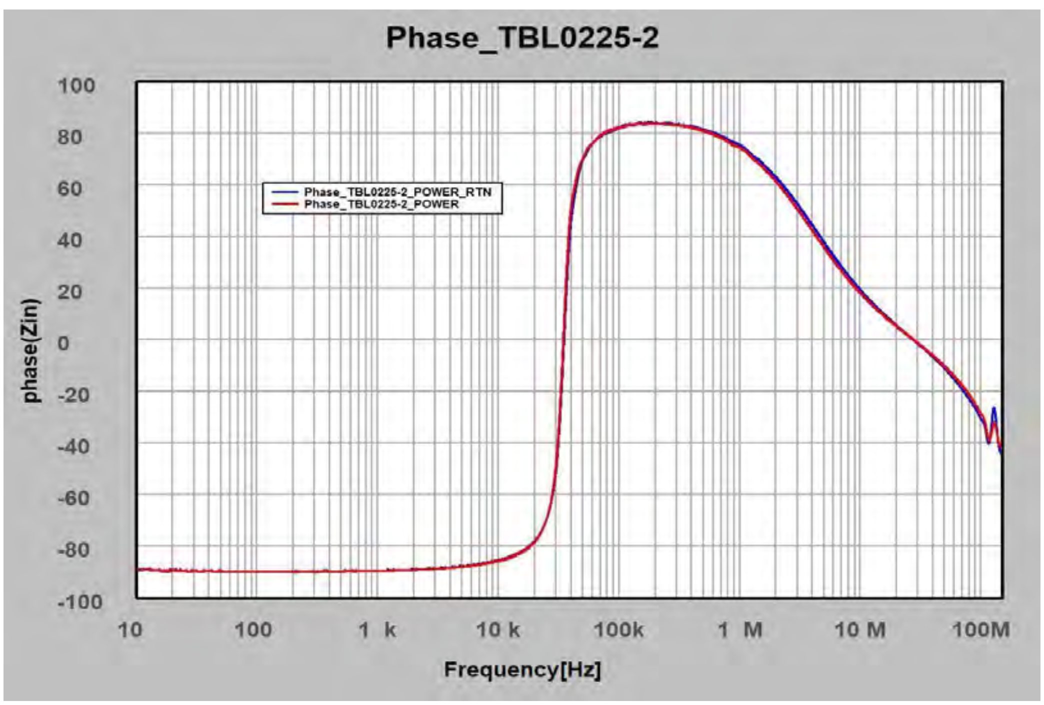
The standard does not specify impedance limits. The green traces represent a ± 10% tolerance band of the simulated impedance (ideal components/no parasitics);

2μH Line Impedance Stabilisation Network



Impedance: 10 Hz – 200 MHz; logarithmic impedance axis, source terminals open, typical data

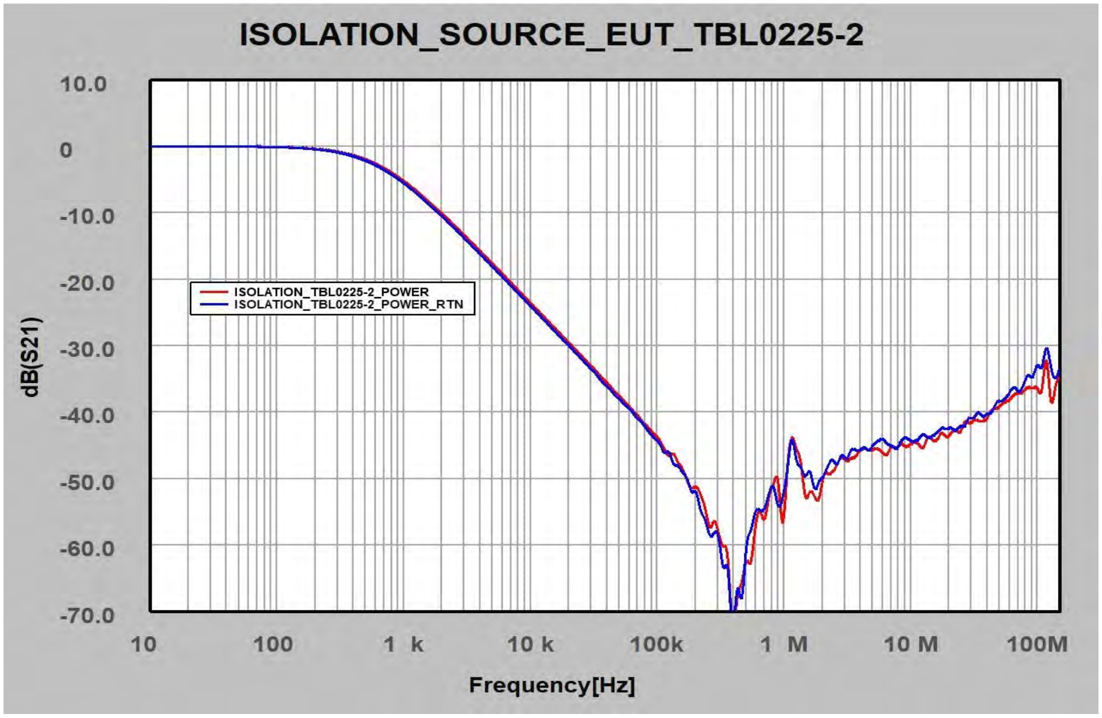
4 Phase



Input phase: 10 Hz – 200 MHz; source terminals open, typical data

ES France - Département Tests & Mesures
127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 45
Fax. 01 47 01 16 22
e-mail : tem@es-france.com
Site Web : www.es-france.com

5 Isolation



Isolation from SOURCE terminals to EUT terminals: 10 Hz – 200 MHz, typical data

6 Principle Schematics

In order to reproduce the system power bus impedance and to standardize the measurement conditions used in different test sites, emissions and susceptibility measurements on primary power lines shall be performed on inserting a Line Stabilization Network (LISN) between the EGSE power supply and the unit under test. The LISN schematic and the relevant impedance versus frequency are chosen in accordance with the bus impedance mask. The design of the LISN is usually provided by the spacecraft contractor. In case it is not available in time the LISN schematic and the relevant impedance versus frequency given below shall be used.
Prior to test, the network impedance shall be measured in the relevant frequency range and attached to the test report.

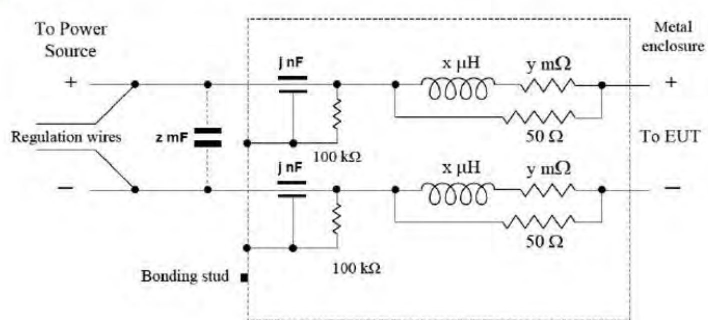


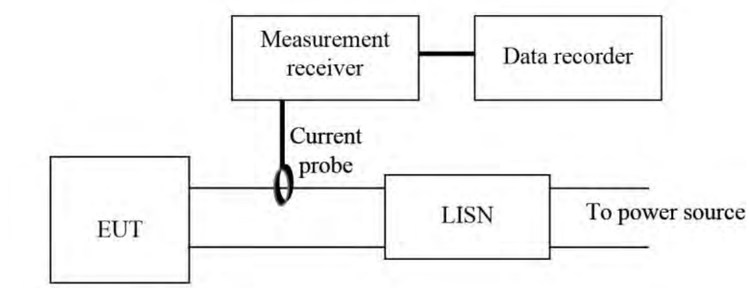
Figure 5-2: LISN schematic

X = 2 µH Y = 100 mΩ j = 11µF

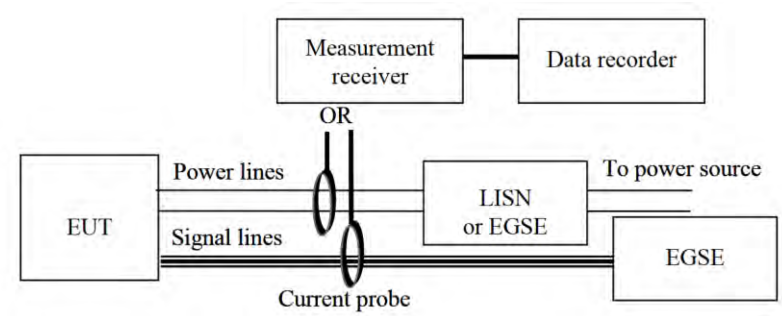
7 Measurement of conducted emissions

ECSSEST2007C specifies differential mode conducted emission measurements on power leads in the frequency range of 10 Hz to 150 MHz.

Furthermore, ECSSEST2007C specifies common mode and differential mode conducted emission measurements on power and signal leads in the frequency range of 10 Hz to 150 MHz.



Conducted emission, differential mode, measurement setup



Conducted emission, common mode, measurement setup

**) EGSE: electrical ground support equipment*

Tekbox also provides suitable RF current monitoring probes, such as the TBCP2-30K400.

LISN are also required in other ECSSEST2007C measuring setups:

Radiated emission – electric field; inrush current; conducted susceptibility – signal injection; conducted susceptibility – bulk cable injection; conducted susceptibility – transients; conducted susceptibility – spike series / parallel injection; radiated susceptibility – magnetic field; radiated susceptibility – electric field;

8 References

ECSS-E-ST-20-07C Rev. 1

9 Ordering Information

Part Number	Description
TBL0225-2	2µH LISN, two path
TBCP2-30K400	Optional accessory: RF current monitoring probe for CE measurements

10 History

Version	Date	Author	Changes
V1.0	31.01.2024	Mayerhofer	Creation of the document

5µH Line Impedance Stabilisation Network

1 Introduction

The TBL0550-1 5µH LISN is a device required to setup conducted noise measurements of DC-powered electronic equipment. It is designed to be used for measurements in the frequency range of 150kHz to 110 MHz according to CISPR 16-1-2, CISPR-25, EN55025, MIL-STD-461F, ISO11452-4 and with limitations DO-160/ED-14G and ISO 7637-2.
The LISN is inserted into the supply line of the DUT (Device Under Test). Conducted noise which is present at the supply terminals of the DUT can be measured at the BNC connector using a spectrum analyzer or a measurement receiver. The source (supply) terminal and the DUT terminal are decoupled by a 5µH inductor.
Two TBL0550-1 in combination with the Tekbox LISN Mate enable separate measurement of common mode and differential mode noise.
The unit comes equipped with a BNC-male to N-male RG232 cable, mating connectors and ground brackets to attach it to a ground plane.

2 Parameters

Frequency range: 100 kHz – 150 MHz

DC Resistance: < 7 mΩ Source+ to DUT+; < 2 mΩ Source- to DUT-

Maximum current: 50A continuous, 70 A for 3 minutes

Nominal operating voltage range: 0 – 60V DC;

Component rating: 250V

High current plug/screw terminals - male: Phoenix Contact 1998933, female: Phoenix Contact 1967375

1µF capacitor can be disconnected internally by removing a jumper

Nist traceable calibration data / certificate

Dimensions: 120 mm x 100 mm x 225 mm (270 mm including ground brackets); weight: 1.6 kg

3 Warning

Spectrum Analyzer / Measurement Receiver protection:

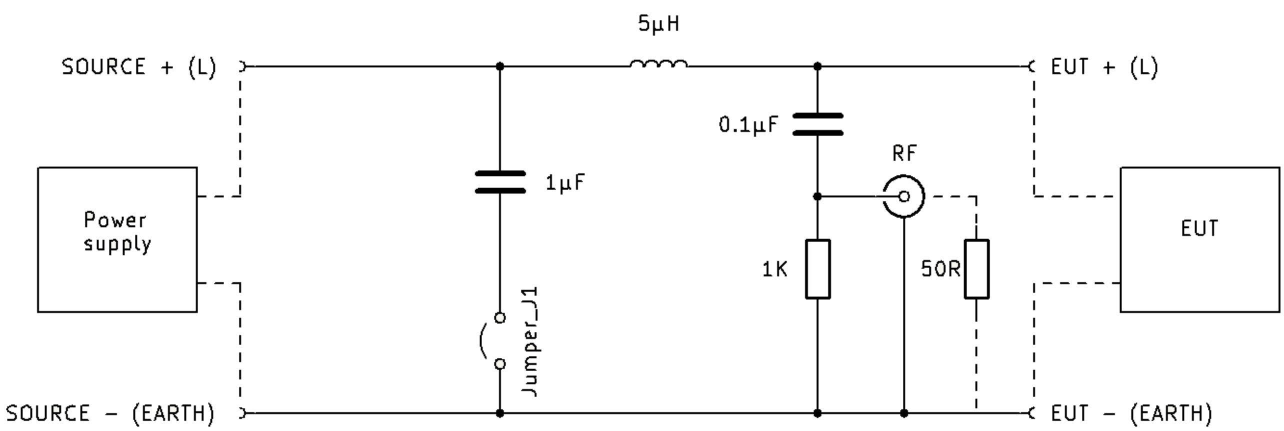
The TBL05100-1 LISN does not contain any protective elements in the RF path. Use an external attenuator and/or limiter to protect the spectrum analyzer / measurement receiver input from harmful transients or high RF noise levels.

Safety:

Because of the CISPR 16-1-2, CISPR 25 (EN 55025), MIL-STD-461G and DO-160 design requirements, LISNs do not do not comply with the maximum permissible leakage current as specified in EN61010-1. Furthermore, LISNs do not fulfil the isolation requirements of CAT II.

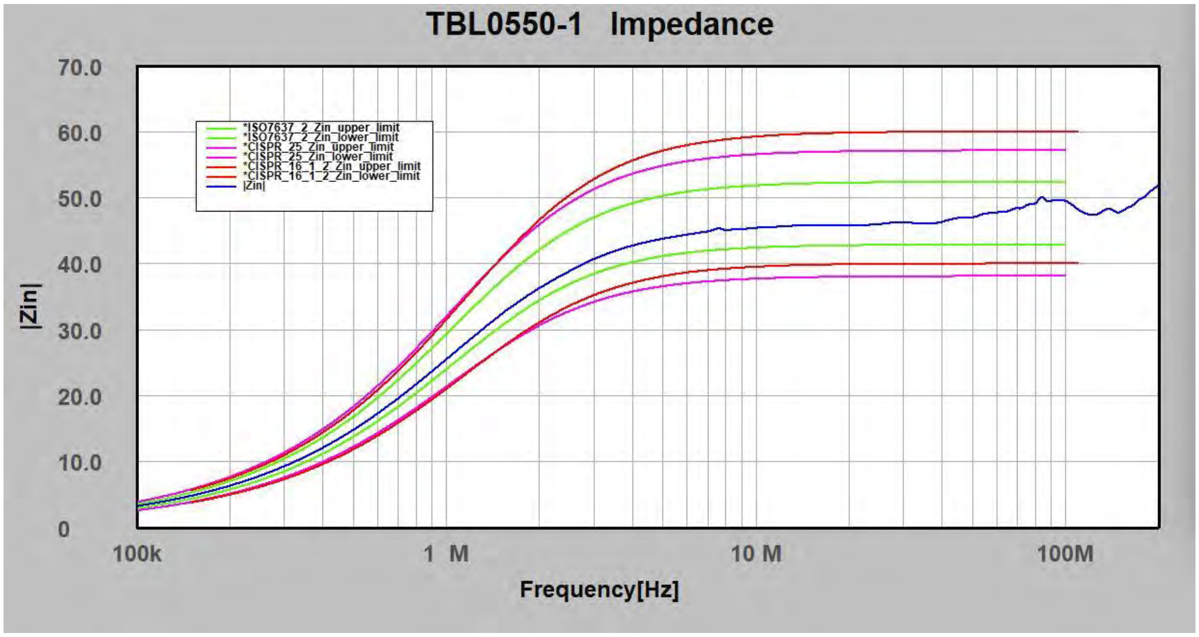
The LISN housing is connected to the negative / ground SOURCE and EUT pin of the terminal block and the ground of the RF connector. Inadvertently connecting the positive voltage or line voltage to the ground pin puts you at risk of a lethal electric shock. The TBL0550-1 is exclusively for use in laboratories and must be operated by qualified personnel.

4 Principle schematic



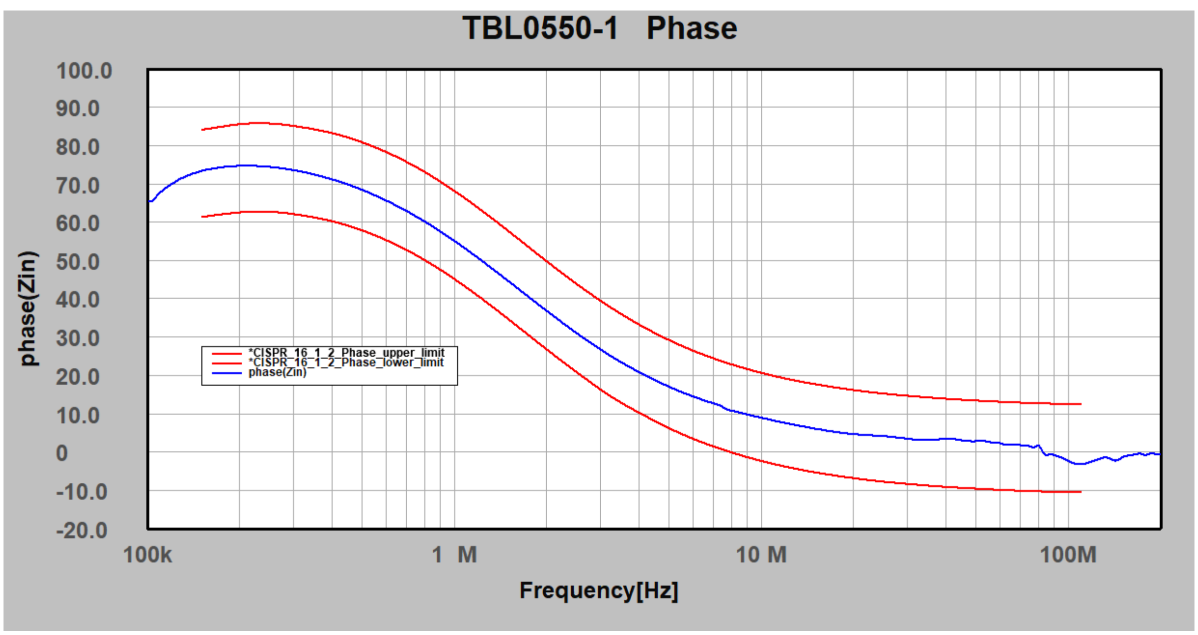
Picture 1: principle schematic

5 Impedance



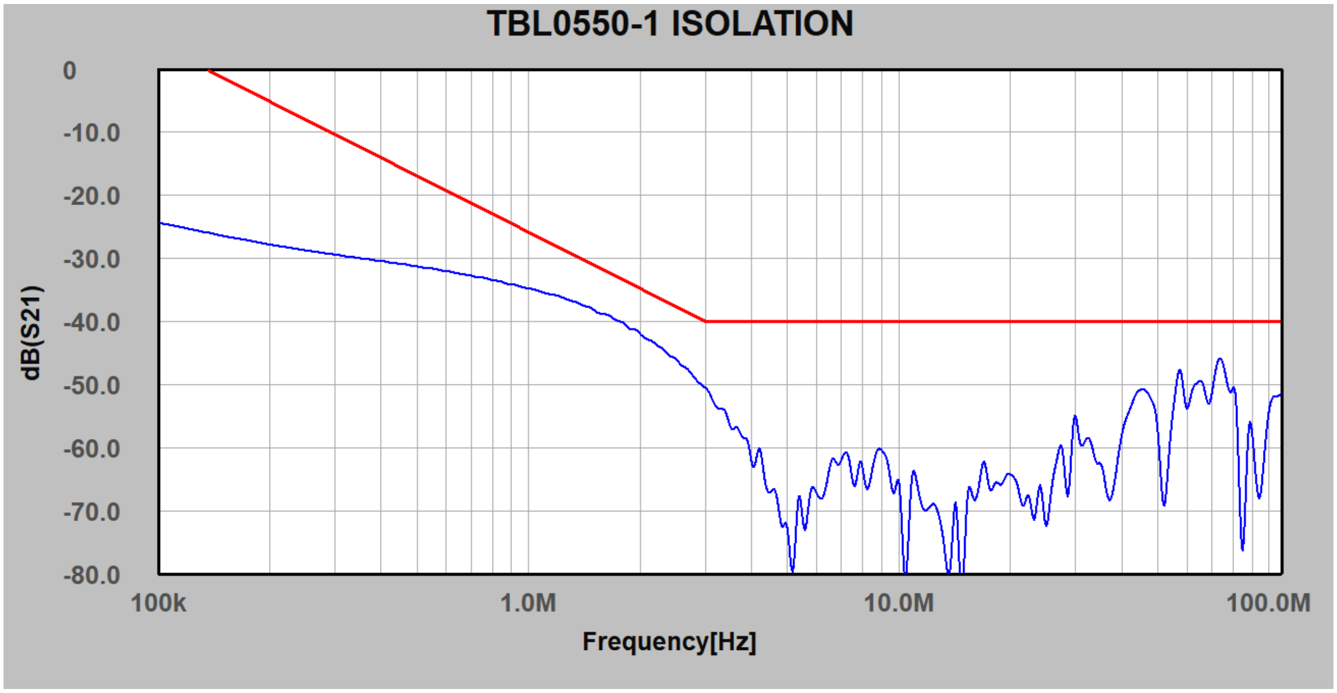
Picture 2: LISN impedance, 100 kHz – 200MHz

6 Phase



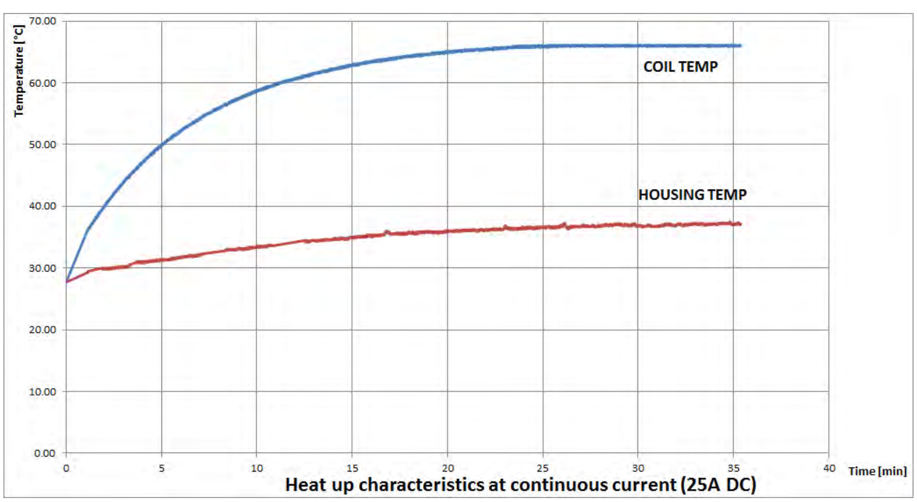
Picture 3: LISN phase, 100 kHz – 200MHz

7 Isolation



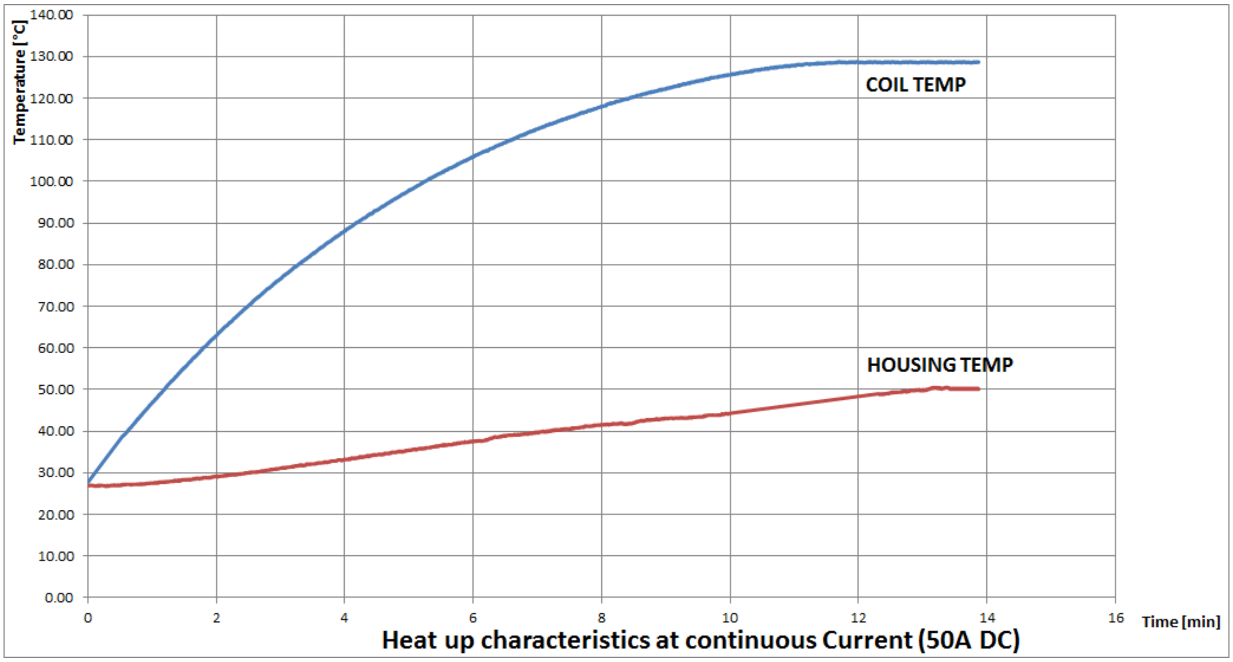
Picture 4: LISN Isolation, 100 kHz – 110MHz

8 Thermal characteristics

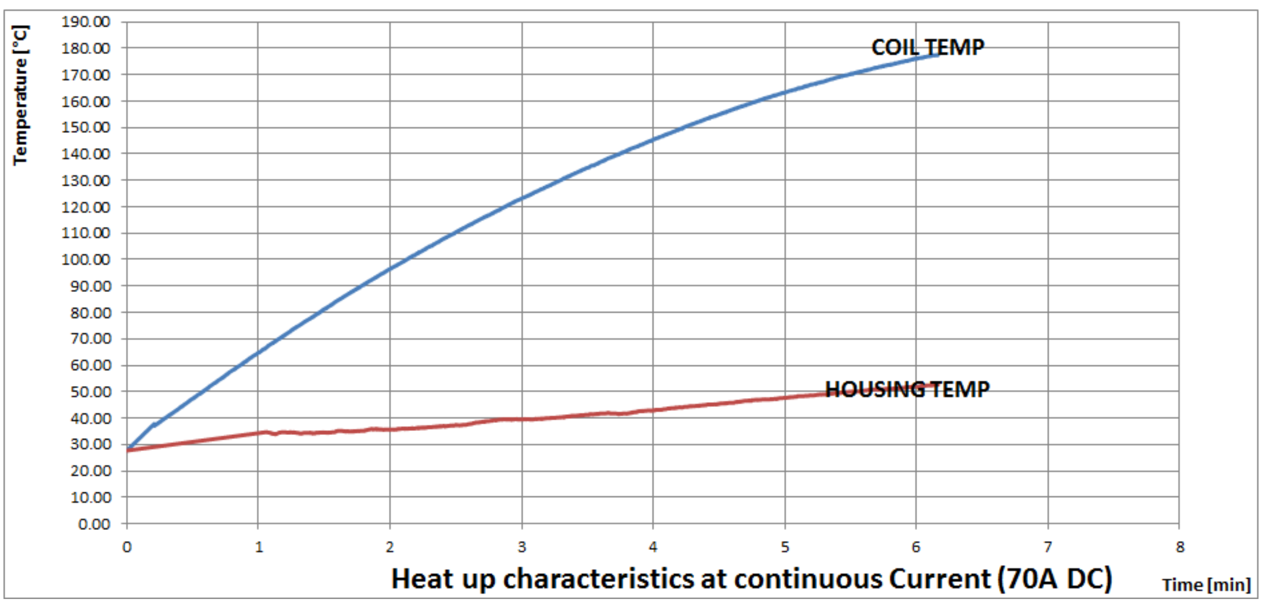


Picture 5: Coil and housing temperature at 25 A DC current

5µH Line Impedance Stabilisation Network

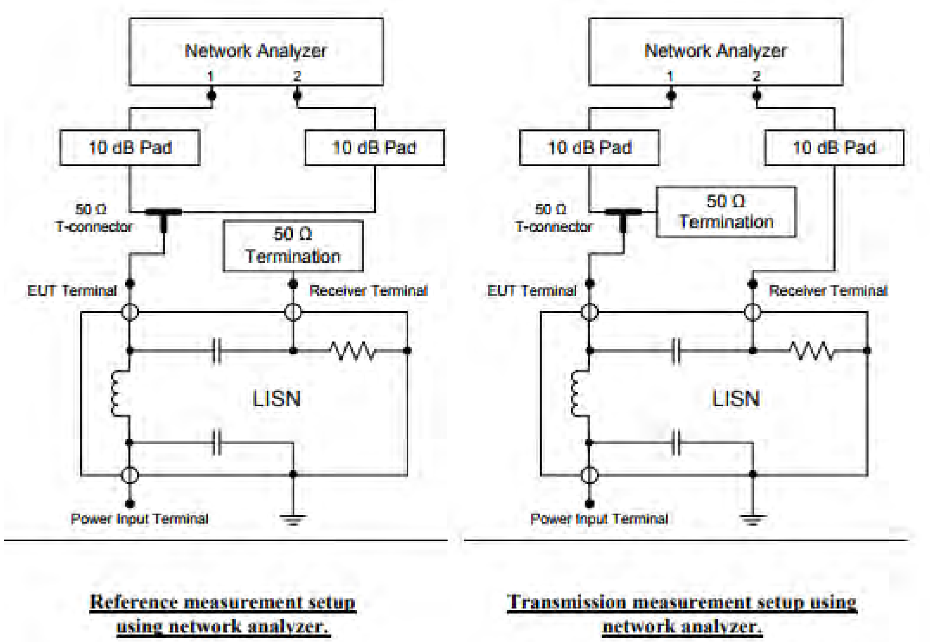


Picture 6: Coil and housing temperature at 50 A DC current

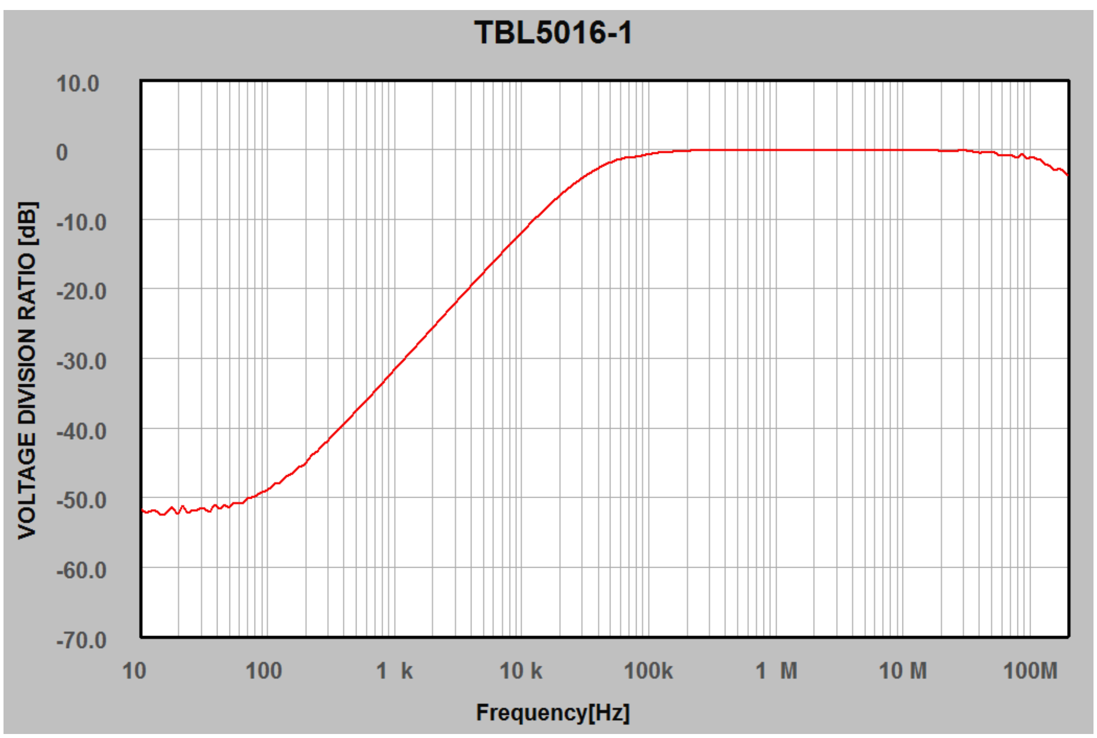


Picture 7: Coil and housing temperature at 70 A DC current

9 Calibration data according to CISPR 16 -1-2 Annex A8



Picture 8: Calibration set up according to CISPR 16-1-2 Annex A.8.



Picture 9: Voltage division ratio DUT terminals to RF connector

5µH Line Impedance Stabilisation Network

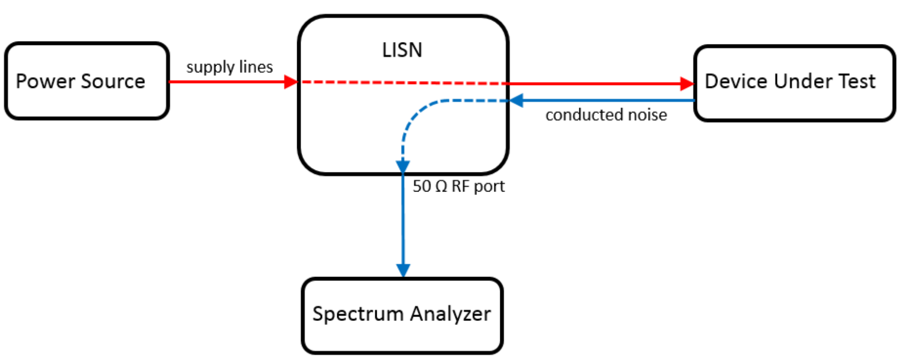
Frequency [MHz]	Voltage Division Ratio DUT port to RF port (1µF across source terminals) [dB]	Frequency [MHz]	Voltage Division Ratio DUT port to RF port (1µF across source terminals) [dB]
0.01	-11.81	70	-0.82
0.025	-5.13	80	-0.97
0.05	-1.86	90	-0.98
0.075	-1.33	100	-1.21
0.1	-0.72	110	-1.36
0.15	-0.39	120	-1.52
0.25	-0.16	130	-2.07
0.5	-0.01	140	-2.36
1	-0.01	150	-2.77
10	-0.13	160	-2.93
20	-0.24	170	-2.85
30	-0.18	180	-3.1
40	-0.47	190	-3.49
50	-0.38	200	-3.86
60	-0.66		

Table 1 - LISN calibration data

10 Application

The abbreviation LISN stands for Line Impedance Stabilisation Network.

- It is a low pass filter typically placed between a power source and the supply terminals of a device under test (EUT).
- It has a feed-through path to supply the EUT with power
- It provides a well-defined RF-impedance to the EUT
- It couples electrical noise generated by the EUT to a 50 Ω RF port, which can be connected to a spectrum analyser or measurement receiver
- It suppresses electrical noise from the supply side towards the EUT
- It suppresses electrical noise from EUT side towards the supply



Picture 10: Basic diagram of a conducted emission measurement setup with a LISN

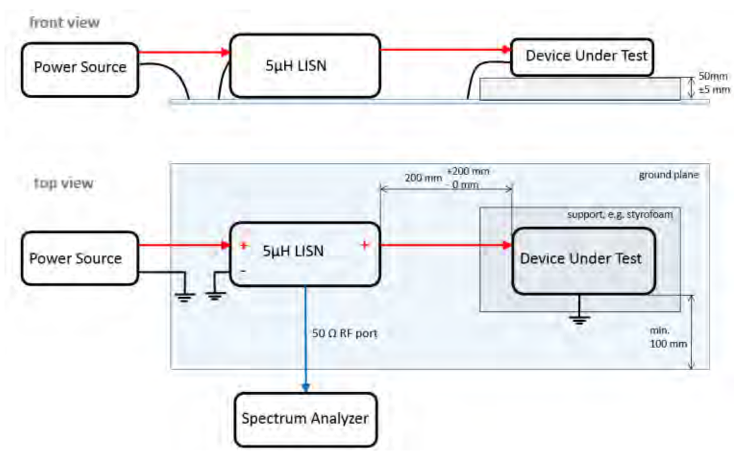
Further applications such as conducted noise measurements using RF current monitoring probes, radiated emission tests, BCI tests and voltage transient tests require LISNs to establish a defined supply line impedance.

10.1 Conducted Emission Measurement Setup, Voltage Method

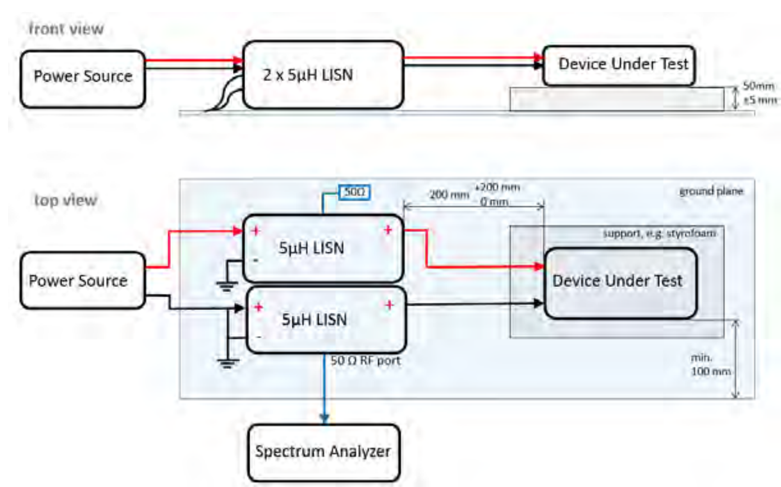
CISPR 25 specifies two measurement configurations:

If the EUT is grounded to the vehicle chassis with a power return line shorter than 20 cm in length, a single LISN is adequate, and the conducted noise is monitored only on the positive supply line.
If the power return line of the EUT is longer than 20 cm, two LISNs are required. One LISN connects the positive supply line to the EUT, and another LISN connects the power return line to the EUT. Conducted noise is measured on both lines. It is actually measured on one LISN at a time, with the other LISN's RF port terminated with a 50 resistor.

Professional noise measurements are performed in shielded chambers since any ambient noise picked up by the wires connecting LISN to EUT or by the EUT itself will be present at the RF terminal. In pre-compliance setups, a test should be performed with the EUT turned off to distinguish between conducted noise generated by the EUT and emissions from other sources (ambient noise). Tekbox provides low cost, desktop shielded tents or shielded bags to suppress ambient noise for pre-compliance conducted noise measurements.



Picture 11: conducted emission measurement, voltage method, DUT with power return line locally grounded



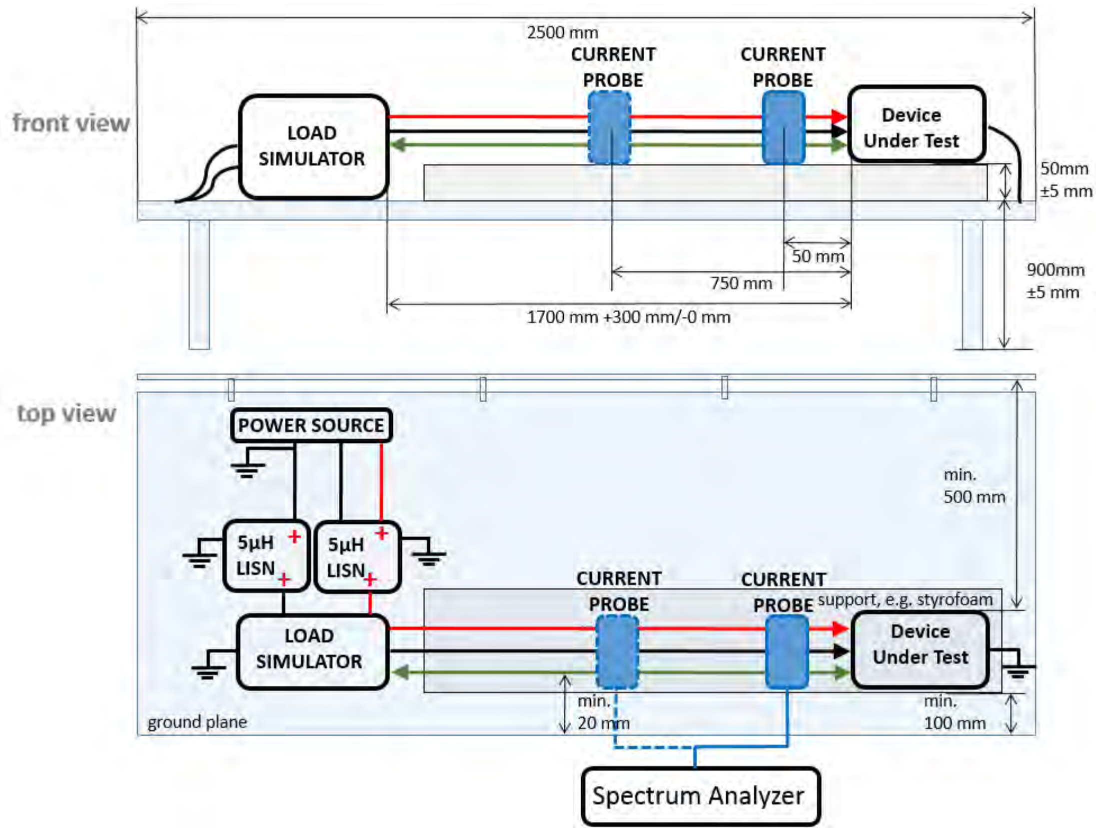
Picture 12: conducted emission measurement, voltage method, DUT with power return line remotely grounded

Pictures 11 and 12 depict conducted noise measurement setups using the voltage method, as specified in CISPR 25. If the EUT is connected to additional peripheral devices, they should also be connected or emulated using a load box. If a remotely powered EUT's housing is designed for chassis grounding, it should also be grounded to the ground plane. The grounding lead should be no more than 150mm length.

Because most devices are remotely grounded, the configuration shown in Picture 12 is more frequent. The measurement must then be performed alternately on both the positive and negative power lines. The unused RF port is always terminated with 50 Ohm.

It should be noted that conducted noise testing per DO160 necessitates the insertion of a 10µF capacitor across the LISN's source terminals.

10.2 Conducted emission measurement set up, current probe method



Picture 13: conducted emission measurement according to CISPR 25, current probe method

The CISPR 25 current probe measurement is used to monitor conducted emissions on a wire harness, including control/signal lines of an EUT. Some vehicle manufacturers utilise the wide bandwidth of current probes to measure conducted emissions on power supply lines over a wider frequency range than LISNs can. Measurements are typically taken on various lines – plus, minus, control signals, plus + minus, plus + minus + control lines. In order to account for cable harness resonance effects, the current probe is measured at 50 mm and 750 mm distances from the EUT. Each LISN's RF output must be terminated with 50 Ohm.

The current probe picks up the conducted emissions. To establish a defined impedance on the power lines, two LISNs are necessary. The load simulator is a specially designed device that simulates the load existing at the EUT's signal/control interface.

10.3 Bulk Current Injection

Immunity tests performed in accordance with ISO11452-4 employ a configuration similar to that used for current probe-based conducted emission measurements. However, instead of using a current probe to measure conducted emissions, a signal generator / power amplifier feeds an interferer signal into the BCI probe. Again, two LISNs are required to establish a defined supply impedance. The LISNs' RF output must be terminated with an external 50 Ohm termination with enough power handling capacity.

10.4 Voltage transient testing

When utilising the LISN for voltage transient testing according to ISO 7637-2, the 1µF capacitor at the LISN's source input must be unplugged. To do so, open the top cover of the LISN housing and remove the Harwin jumper next to the source terminal block.
It should be noted that the TBL0550-1 impedance is slightly outside the tight ISO 7637-2 limits.

11 Ordering Information

Part Number	Description
TBL0550-1	5µH LISN, 2 pcs. ground brackets, 2pcs. female terminal blocks Phoenix Contact 1967375, 1 pc. 75 cm BNC-male to N-male RG223 cable Nist traceable calibration data / certificate

12 History

Version	Date	Author	Changes
V1.0	1.10.2019	Mayerhofer	Creation of the document
V1.1	8.11.2019	Mayerhofer	Chapter 2 updated
V1.2	22.04.2020	Mayerhofer	drawings updated
V1.3	26.11.2021	Mayerhofer	Updated table 1, picture 9
V1.4	15.6.2023	Mayerhofer	All chapters updated

Table 2 – History

5µH Line Impedance Stabilisation Network

Introduction

The TBL05100-1 is a universal 5µH LISN that meets the requirements of several standards. The TBL05100 is factory jumpered to 50Ω // 5µH + 1Ω, fulfilling the CISPR 16-1-2 and CISPR 25 impedance, phase an isolation specification. By setting internal jumper, it can be converted into 50Ω // 5µH variants that support standards such as CISPR 25, MIL-STD-461G, ISO11452-4 and ISO 7637-2. By adding an external 10F capacitor, the impedance will fulfil DO-160 specifications.
The LISN is inserted into the EUT's (Equipment Under Test) supply line. Conducted noise at the EUT's supply terminals can be monitored at the BNC connector with a spectrum analyzer or a measurement receiver. A 5µH inductor decouples the source (supply) terminal from the EUT terminal.
The use of two TBL05100-1 in conjunction with the Tekbox LISN Mate allows for the measurement of common mode and differential mode noise separately. The unit comes equipped with a BNC-male to N-male RG232 cable, mating connectors and ground brackets to attach it to a ground plane.

Picture 1: TBL05100-1

1 Parameters

Topology: single path, configurable, 50Ω // 5µH + 1Ω, 50Ω // 5µH; the internal capacitor can be disconnected for ISO 7637-2 and DO-160 set ups; an external 10µF capacitor is available for DO-160; the LISN is factory setup to 50Ω // 5µH + 1Ω, other configurations require setting of an internal high current jumper

Supported standards: CISPR 16-1-2, CISPR 25, MIL-STD-461G, DO-160, ISO11452-4 and ISO 7637-2

Characterized frequency range: 10 kHz – 400 MHz

DC Resistance: < 5 mΩ Source+ to EUT+; < 5 mΩ Source- to EUT-

Maximum current: 100A; see plot with heat up characteristics, chapter 8

Nominal operating voltage range: 0 – 250V AC/DC;

Component ratings: 350V AC, 50/60 Hz; 1000V DC

High current plug / screw terminals; male: Phoenix Contact 1762741, female: Phoenix Contact 1762592; 2 pcs female terminal blocks are supplied as default accessories

Jumper: Harwin D3087-98

Dimensions: 300 mm x 150 mm x 150 mm   Weight: 2.7 kg

2 Warning

Spectrum Analyzer / Measurement Receiver protection:

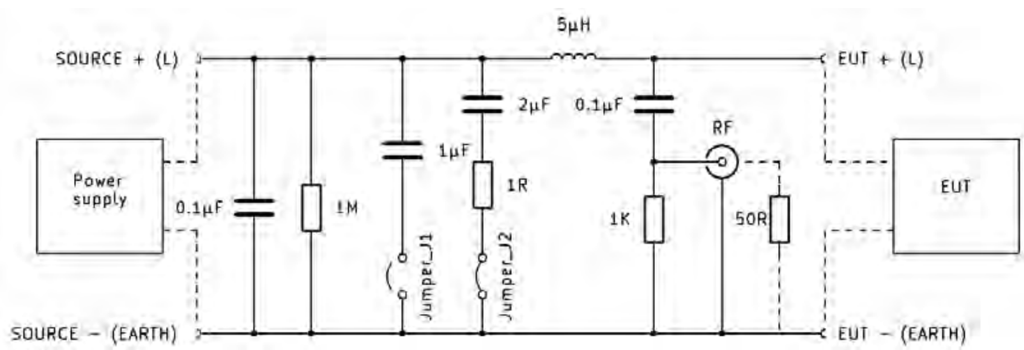
The TBL05100-1 LISN does not contain any protective elements in the RF path. Use an external attenuator and/or limiter to protect the spectrum analyzer / measurement receiver input from harmful transients or high RF noise levels.

Safety:

Because of the CISPR 16-1-2, CISPR 25 (EN 55025), MIL-STD-461G and DO-160 design requirements, LISNs do not do not comply with the maximum permissible leakage current as specified in EN61010-1. Furthermore, LISNs do not fulfil the isolation requirements of CAT II.

The LISN housing is connected to the negative / ground SOURCE and EUT pin of the terminal block and the ground of the RF connector. Inadvertently connecting the positive voltage or line voltage to the ground pin puts you at risk of a lethal electric shock. The TBL05100-1 is exclusively for use in laboratories and must be operated by qualified personnel.

3 Principle schematic

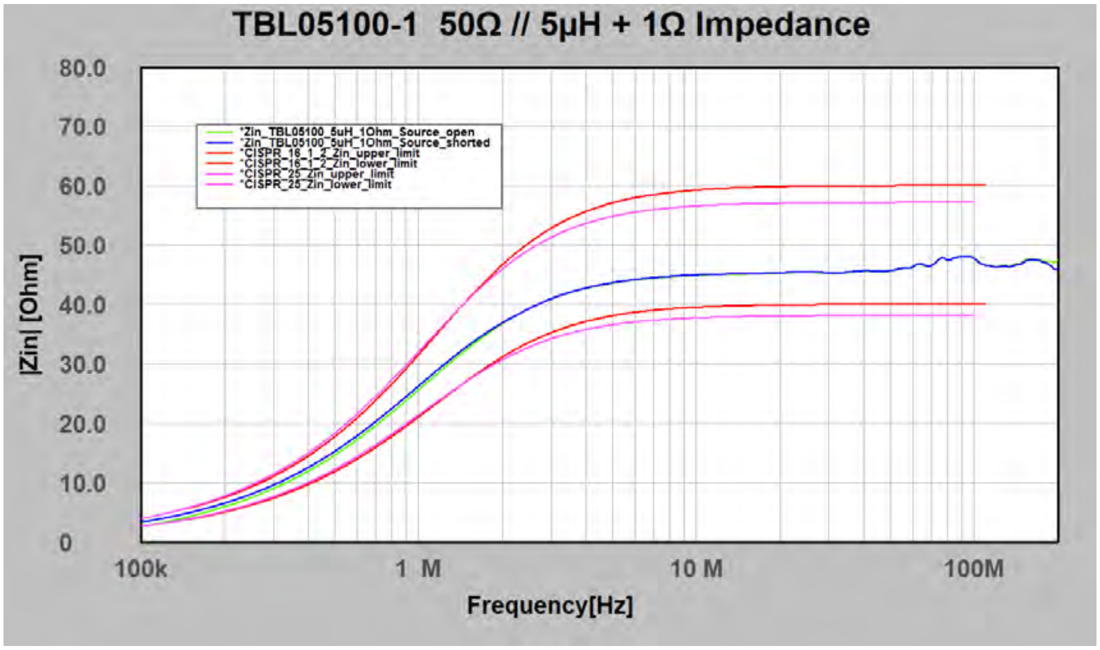


Picture 2: principle schematic

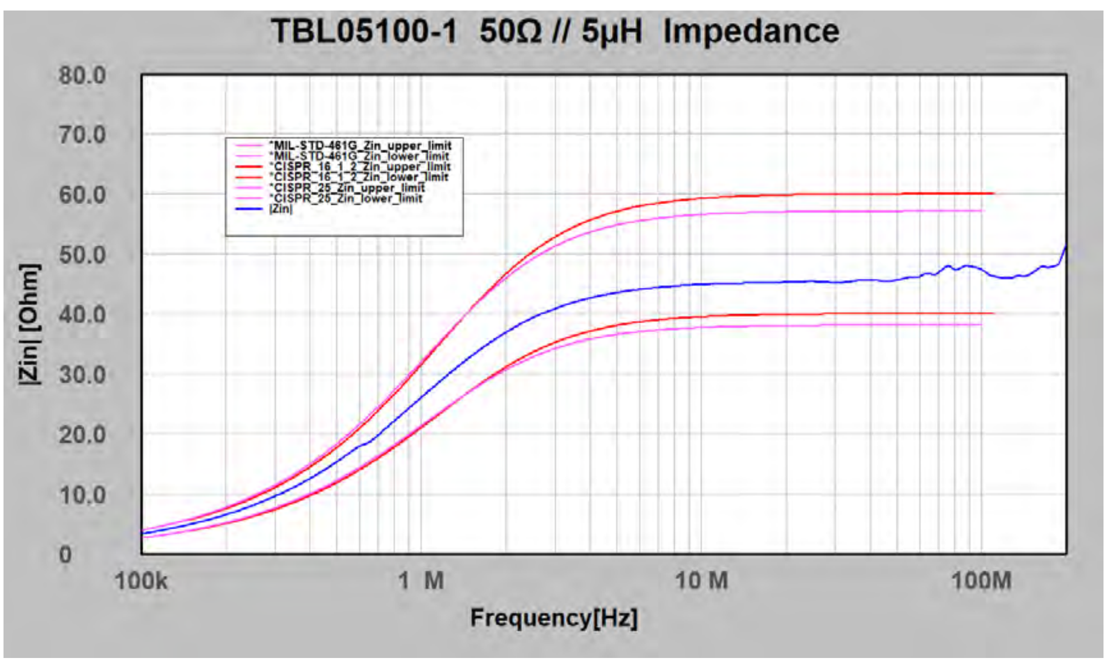
Standards	Jumper J1	Jumper J2
CISPR 16-1-2; CISPR 25: 50Ω // 5µH + 1Ω	open	shorted
CISPR 25, MIL-STD-461G, ISO 11452-4: 50Ω // 5µH	shorted	open
DO-160; 10µF capacitor attached to source terminals	open	open
ISO 7637-2	open	open

To access the jumpers, the housing cover must be removed. Re-attach it after setting the jumpers. Refer to the table above, or to the table on the silkscreen print of the PCB.

4 Impedance

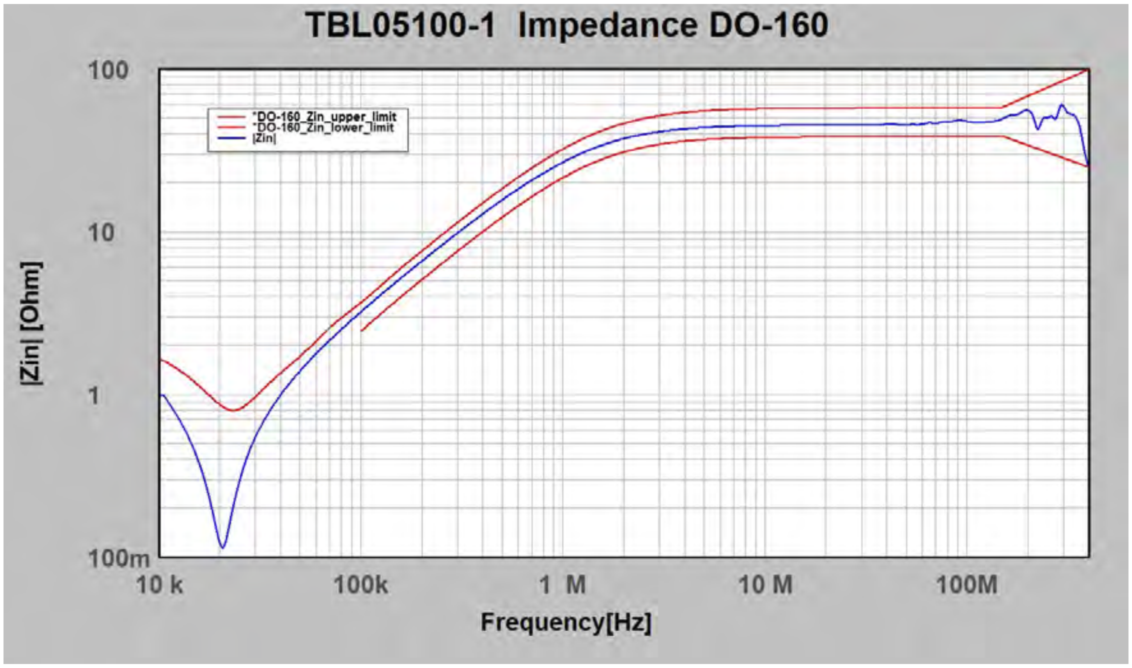


Picture 3: LISN impedance, 100 kHz – 110MHz; 50Ω // 5µH+1Ω; Jumper J1 open, Jumper J2 shorted

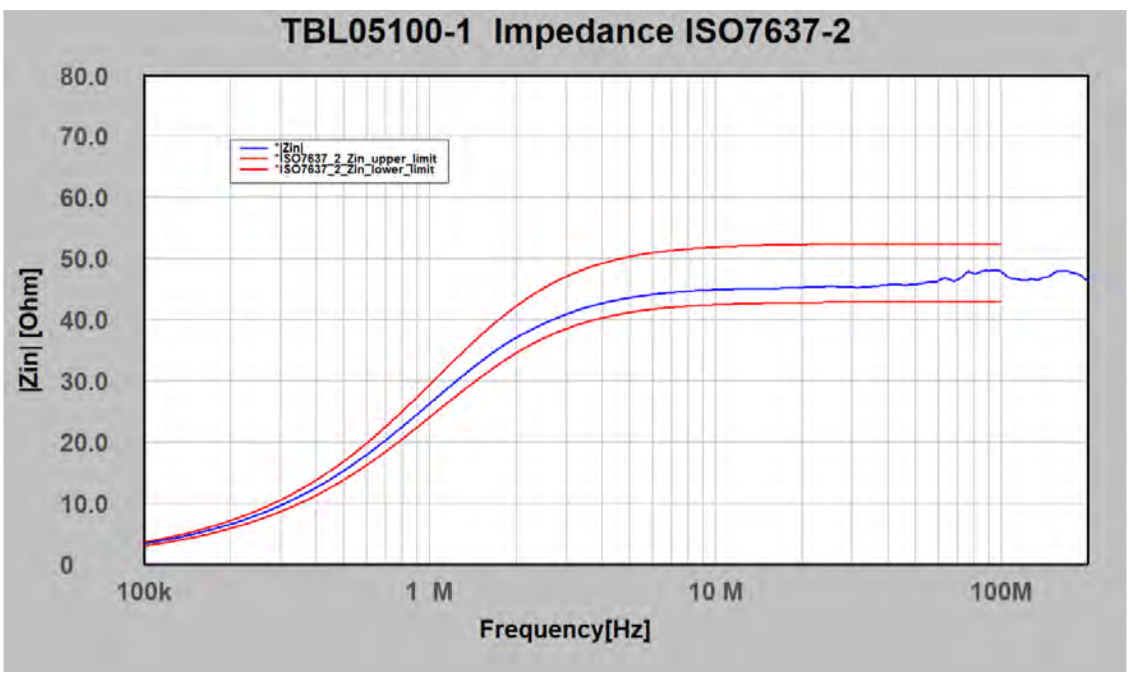


Picture 4: LISN impedance, 100 kHz – 110MHz; 50Ω // 5µH; Jumper J1 shorted, Jumper J2 open

5µH Line Impedance Stabilisation Network

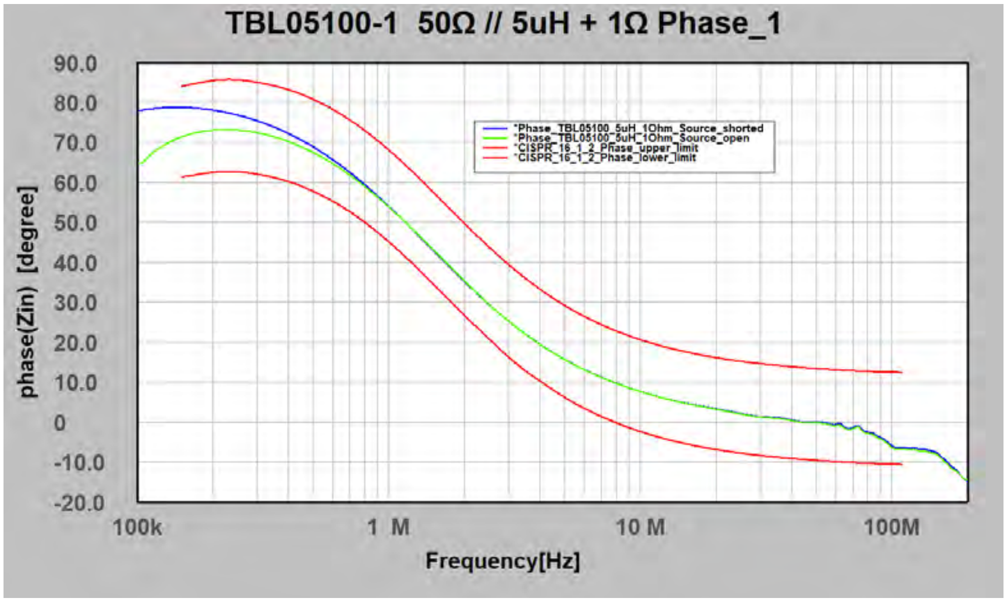


Picture 5: LISN impedance, 10 kHz – 400MHz; 50Ω // 5µH; Jumper J1 open, Jumper J2 open, external 10µF capacitor connected at the source port



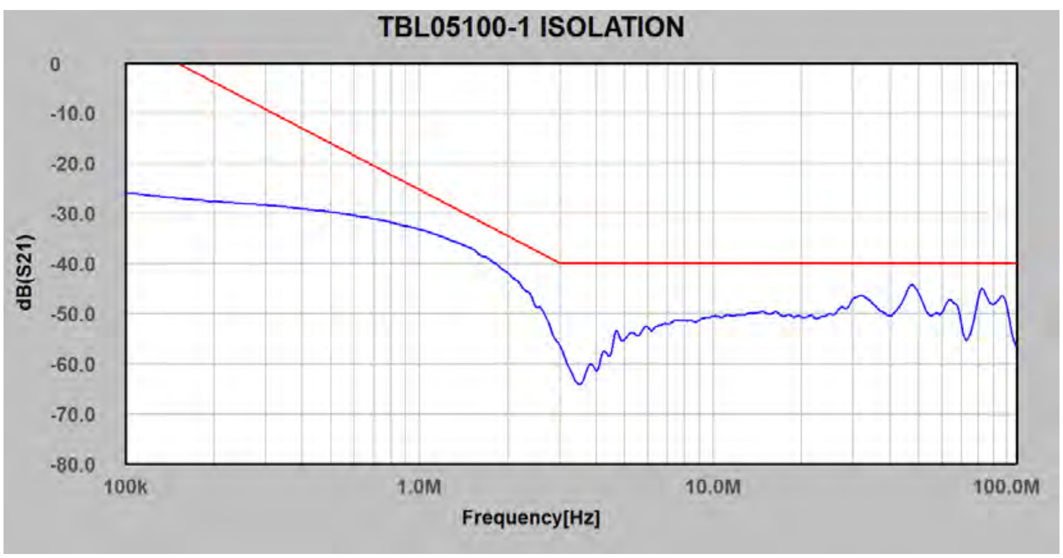
Picture 6: LISN impedance, 100 kHz – 100MHz; 50Ω // 5µH; Jumper J1 open, Jumper J2 open

5 Phase



Picture 7: LISN phase, 100 kHz – 110MHz; 50Ω // 5µH+1Ω

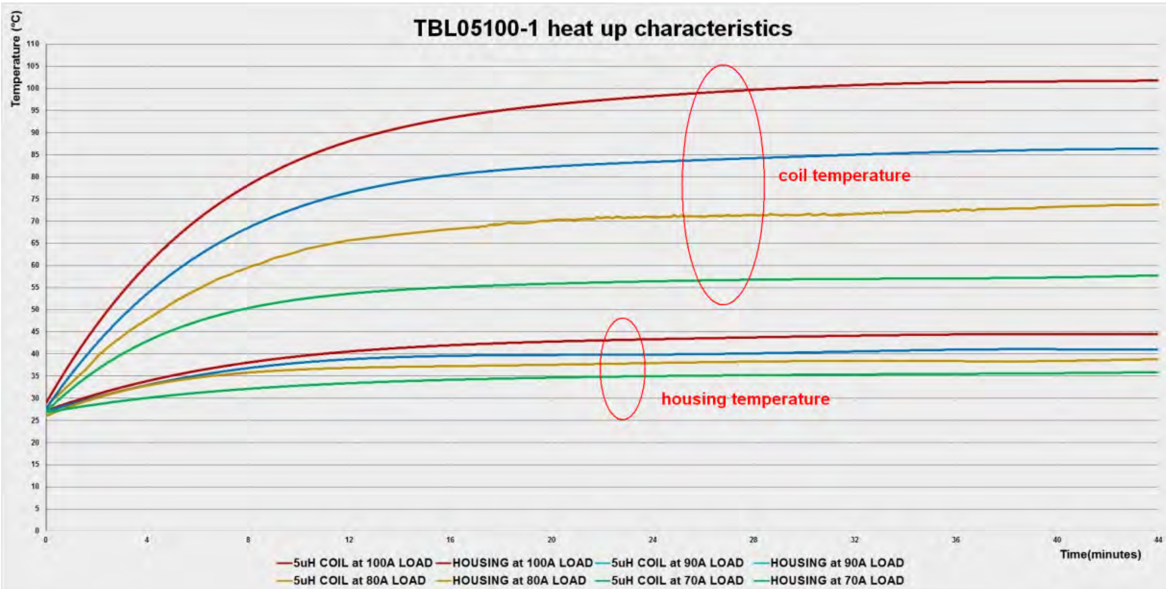
6 Isolation



Picture 8: LISN Isolation, 100 kHz – 110MHz, 50Ω // 5µH+1Ω

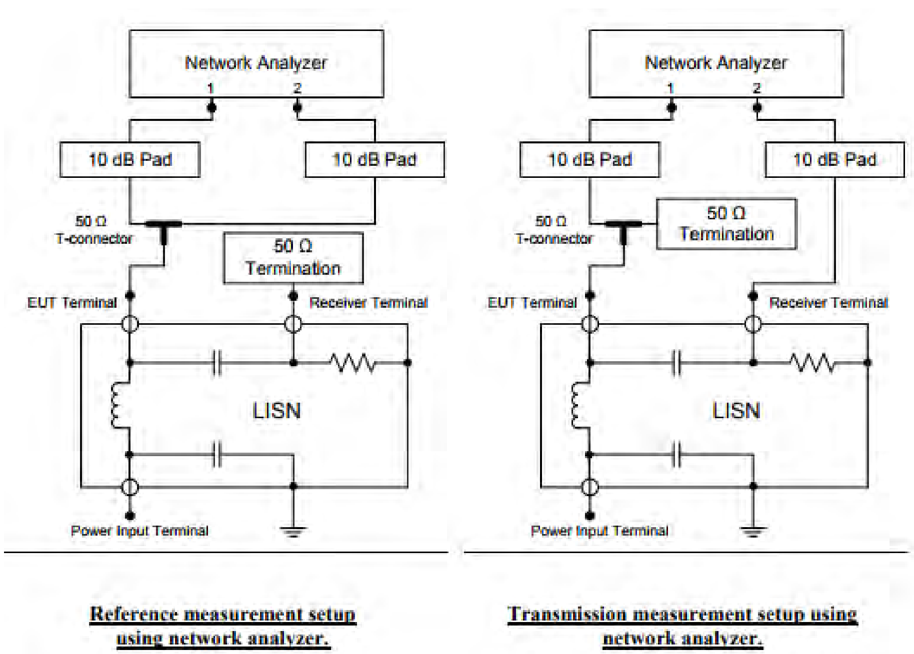
The isolation is measured between SOURCE port and RF port, with the EUT port terminated with 50 Ohm.

7 Thermal characteristics



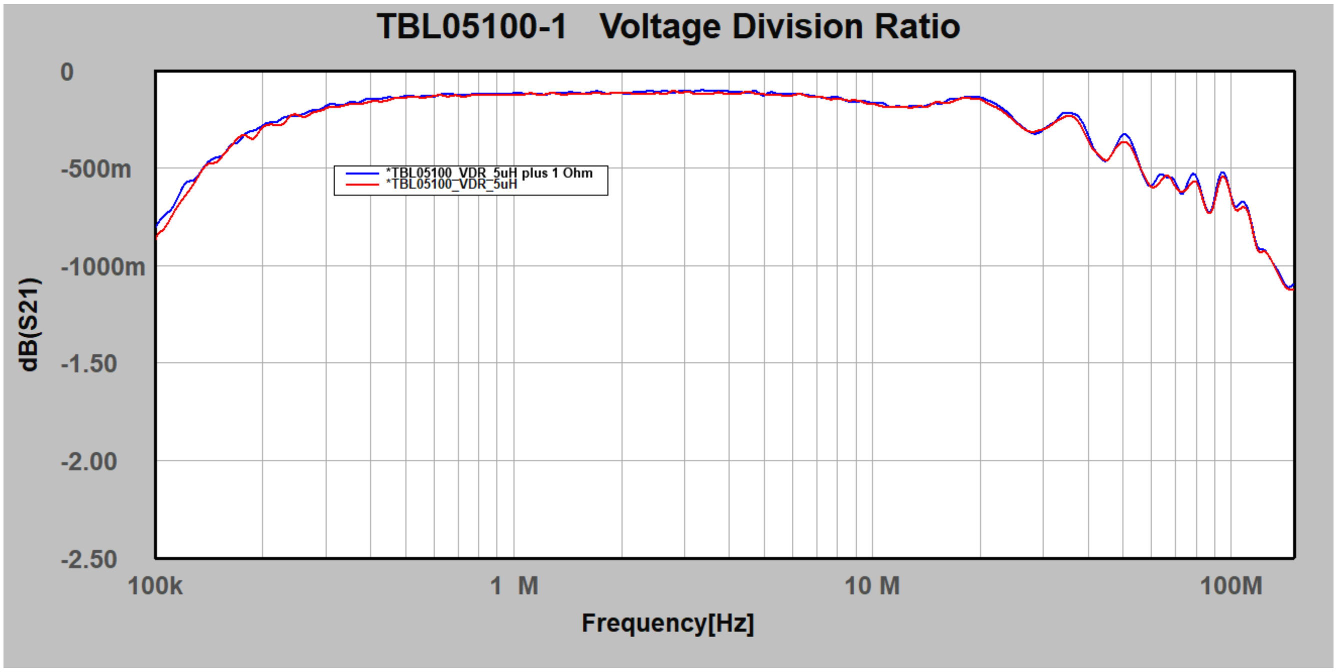
Picture 9: Coil and housing temperature, measured at 27°C ambient temperature

8 Voltage division ratio according to CISPR 16 -1-2 Annex A8



Picture 10: Calibration set up according to CISPR 16-1-2 Annex A.8.

5µH Line Impedance Stabilisation Network



Picture 11: Voltage division ratio EUT terminals to RF connector; 100kHz – 200 MHz; 50Ω // 5µH+1Ω; 50Ω // 5µH

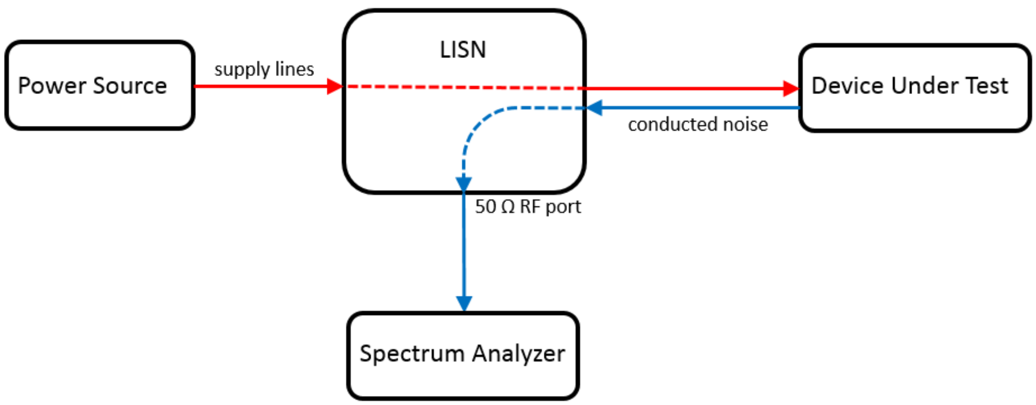
Frequency [MHz]	VDR [dB] 50Ω // 5µH+1Ω	VDR [dB] 50Ω // 5µH	Frequency [MHz]	VDR [dB] 50Ω // 5µH+1Ω	VDR [dB] 50Ω // 5µH
0.1	-0,81	-0,88	10	-0,17	-0,17
0.125	-0,57	-0,61	20	-0,14	-0,15
0.15	-0,45	-0,47	30	-0,30	-0,30
0.175	-0,35	-0,34	40	-0,33	-0,36
0.2	-0,28	-0,29	50	-0,33	-0,37
0.25	-0,23	-0,23	60	-0,59	-0,60
0.5	-0,13	-0,14	70	-0,57	-0,60
0.75	-0,13	-0,13	80	-0,55	-0,57
1	-0,12	-0,12	90	-0,66	-0,68
1.2	-0,12	-0,13	100	-0,64	-0,65
1.5	-0,12	-0,12	110	-0,69	-0,71
2	-0,12	-0,12	120	-0,92	-0,93
2.5	-0,11	-0,12	130	-0,98	-0,98
5	-0,13	-0,12	140	-1,08	-1,10
7.5	-0,14	-0,14	150	-1,09	-1,12

Table 1 - Voltage division ratio

9 Application

The abbreviation LISN stands for Line Impedance Stabilisation Network.

- It is a low pass filter typically placed between a power source and the supply terminals of a device under test (EUT).
- It has a feed-through path to supply the EUT with power
- It provides a well-defined RF-impedance to the EUT
- It couples electrical noise generated by the EUT to a 50 Ω RF port, which can be connected to a spectrum analyser or measurement receiver
- It suppresses electrical noise from the supply side towards the EUT
- It suppresses electrical noise from EUT side towards the supply



Picture 12: Basic diagram of a conducted emission measurement setup with a LISN

Further applications such as conducted noise measurements using RF current monitoring probes, radiated emission tests, BCI tests and voltage transient tests require LISNs to establish a defined supply line impedance.

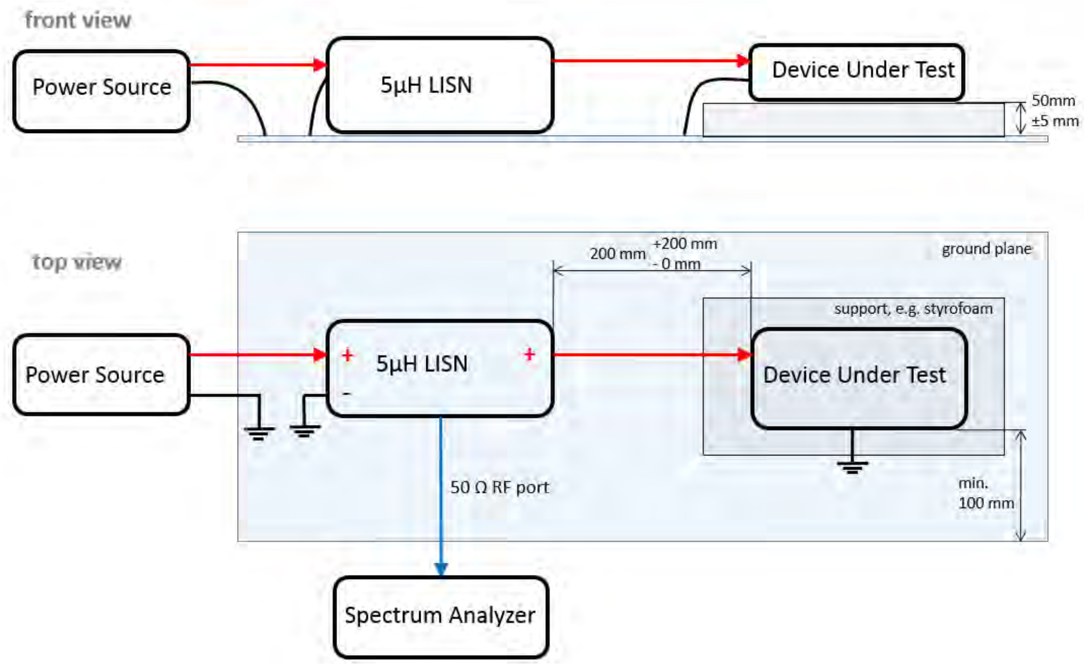
9.1 Conducted Emission Measurement Setup, Voltage Method

CISPR 25 specifies two measurement configurations:

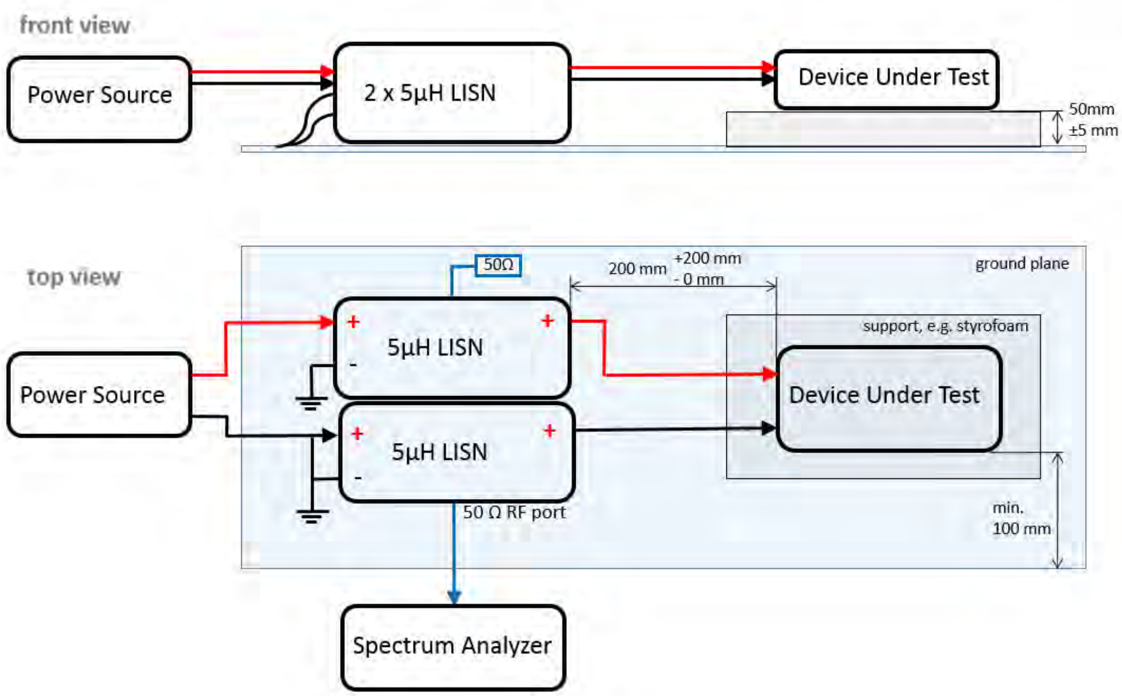
If the EUT is grounded to the vehicle chassis with a power return line shorter than 20 cm in length, a single LISN is adequate, and the conducted noise is monitored only on the positive supply line.
If the power return line of the EUT is longer than 20 cm, two LISNs are required. One LISN connects the positive supply line to the EUT, and another LISN connects the power return line to the EUT. Conducted noise is measured on both lines. It is actually measured on one LISN at a time, with the other LISN's RF port terminated with a 50 resistor.

Professional noise measurements are performed in shielded chambers since any ambient noise picked up by the wires connecting LISN to EUT or by the EUT itself will be present at the RF terminal. In pre-compliance setups, a test should be performed with the EUT turned off to distinguish between conducted noise generated by the EUT and emissions from other sources (ambient noise). Tekbox provides low cost, desktop shielded tents or shielded bags to suppress ambient noise for pre-compliance conducted noise measurements.

5µH Line Impedance Stabilisation Network



Picture 13: conducted emission measurement, voltage method, EUT with power return line locally grounded



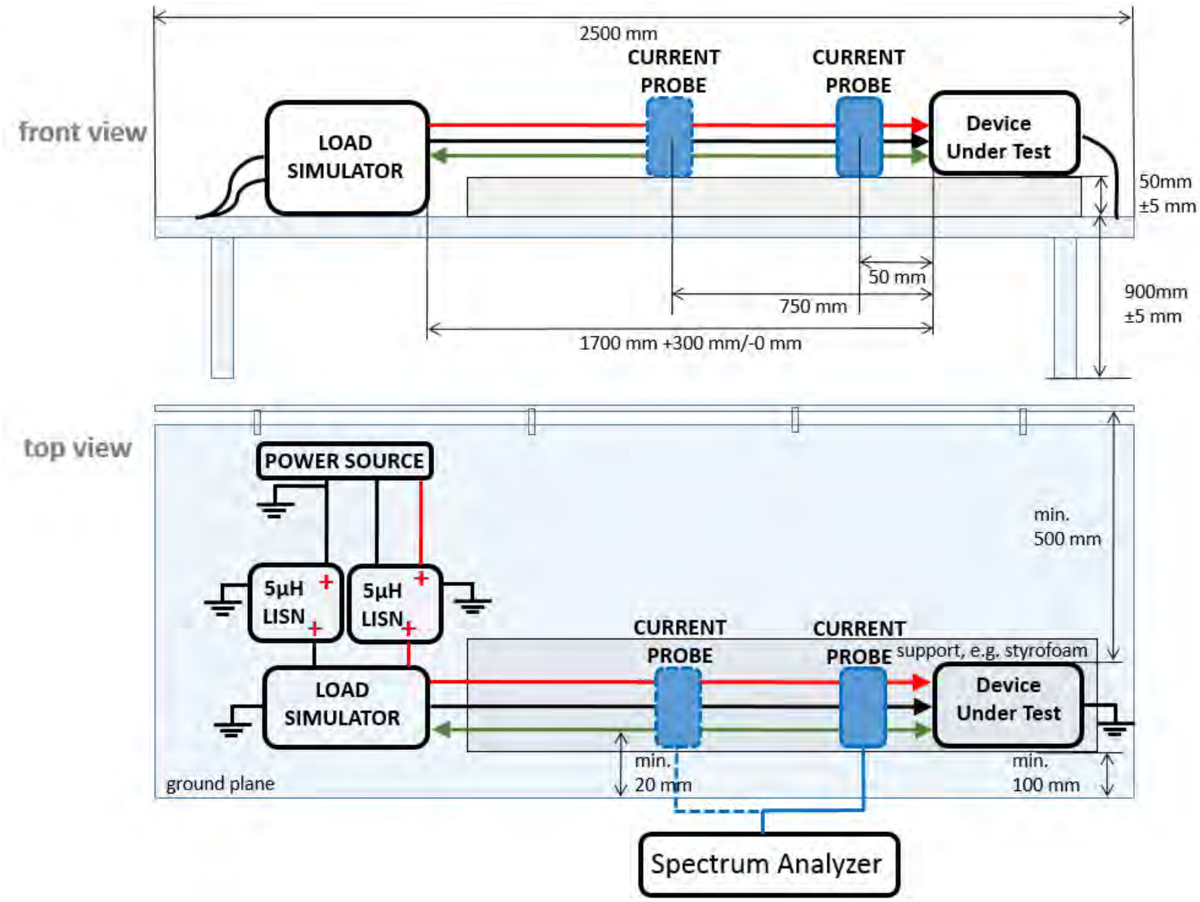
Picture 14: conducted emission measurement, voltage method, EUT with power return line remotely grounded

Figures 3 and 4 depict conducted noise measurement setups using the voltage method, as specified in CISPR 25. If the EUT is connected to additional peripheral devices, they should also be connected or emulated using a load box. If a remotely powered EUT's housing is designed for chassis grounding, it should also be grounded to the ground plane. The grounding lead should be no more than 150mm length.

Because most devices are remotely grounded, the configuration shown in Figure 4 is more frequent. The measurement must then be performed alternately on both the positive and negative power lines. The unused RF port is always terminated with 50 Ohm.

It should be noted that conducted noise testing per DO160 necessitates the insertion of a 10µF capacitor across the LISN's source terminals.

9.2 Conducted emission measurement set up, current probe method



Picture 15: conducted emission measurement according to CISPR 25, current probe method

The CISPR 25 current probe measurement is used to monitor conducted emissions on a wire harness, including control/signal lines of an EUT. Some vehicle manufacturers utilise the wide bandwidth of current probes to measure conducted emissions on power supply lines over a wider frequency range than LISNs can. Measurements are typically taken on various lines – plus, minus, control signals, plus + minus, plus + minus +

control lines. In order to account for cable harness resonance effects, the current probe is measured at 50 mm and 750 mm distances from the EUT. Each LISN's RF output must be terminated with 50 Ohm.
The current probe picks up the conducted emissions. To establish a defined impedance on the power lines, two LISNs are necessary. The load simulator is a specially designed device that simulates the load existing at the EUT's signal/control interface.

9.3 Bulk Current Injection

Immunity tests performed in accordance with ISO11452-4 employ a configuration similar to that used for current probe-based conducted emission measurements. However, instead of using a current probe to measure conducted emissions, a signal generator / power amplifier feeds an interferer signal into the BCI probe. Again, two LISNs are required to establish a defined supply impedance. The LISNs' RF output must be terminated with an external 50 Ohm termination with enough power handling capacity.

9.4 Voltage transient testing

The TBL05100 can be configured to meet the impedance specifications of ISO 7637-2. Chapter 4 contains the appropriate jumper configuration.

10 Ordering Information

Part Number	Description
TBL05100-1	5µH LISN, 2pcs. female terminal blocks Phoenix Contact 1762592, 1 pc. 75 cm BNC-male to N-male RG223 cable Calibration certificate and NIST traceable calibration data

Table 2 – Ordering Information

11 History

Version	Date	Author	Changes
V1.0	7.6.2023	Mayerhofer	Creation of the document

Table 3 – History