Model CST-ADAP ESD Current Target Adapterline

Per IEC 61000-4-2, ISO 10605

User's Manual

Revision 11/21/2016

- **Meets IEC61000-4-2-2009**
- **DC – 4 GHz Bandwidth**
- **Stainless Steel Construction**

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OVERVIEW

ESD simulators are calibrated according to the standard IEC/EN 61000-4-2. An ESD Current Calibration set conforms to the new 4 GHz requirement of IEC 61000-4-2 Ed. 2.0. Measurement of individual impulse parameters is performed using an ESD current target, and the ESD current calibration set should be calibrated with ESD target adapterlines. The model A4002 ESD Target Adapter Line is designed to calibrate the frequency response of ESD current target (Model A4001) and ESD Current Target Adapter Lines (Model A4002).

SPECIFICATIONS

Insertion Loss	≤ 0.3 dB up to 4 GHz
Reflection Coefficient	< -30 dB up to 1 GHz, < -20 dB up to 4 GHz
Weight	0.6 kg
Test Standards	EN/IEC 61000-4-2 -2009 or ISO 10605-2008

OPERATION

1. ESD TARGET ADAPTER LINE CALIBRATION METHOD

Calibration Objective

The objective of this report is to calibrate the ESD target adapter line, check its performance, and compare the results to the requirements of the IEC 61000-4-2 standard.

Requirements from IEC 61000-4-2 standard:

The 50ohm conical adapter line connects the 50ohm cable to the input of the ESD target. Geometrically, it smoothly expands from the diameter of the 50ohm coaxial cable to the diameter of ESD target. If the target is made such that the impedance calculated from the diameter ratio d/D not being equal to 50, the target adapter line shall be made such that the outer diameter of its inner conductor equals the diameter of the inner electrode of the current target. The impedance is calculated considering the dielectric constant of the material that fills the conical adapter line (typically air).

The target adapter line shall show an impedance of 50ohm +/-2% from DC to 4GHz. The reflection coefficient of two target adapter lines face-to-face mounted shall be better than 30dB up to 1GHz and better than 20dB up to 4GHz while the insertion loss shall be less than 0.3dB in the same configuration.

1. Measurement Setup and Results:

In the test, two identical ESD target adapter lines are mounted face to face and connected to a calibrated network analyzer.

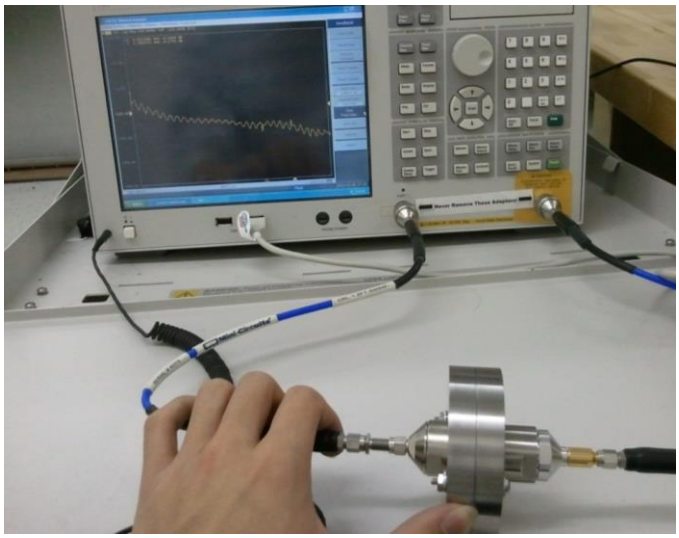
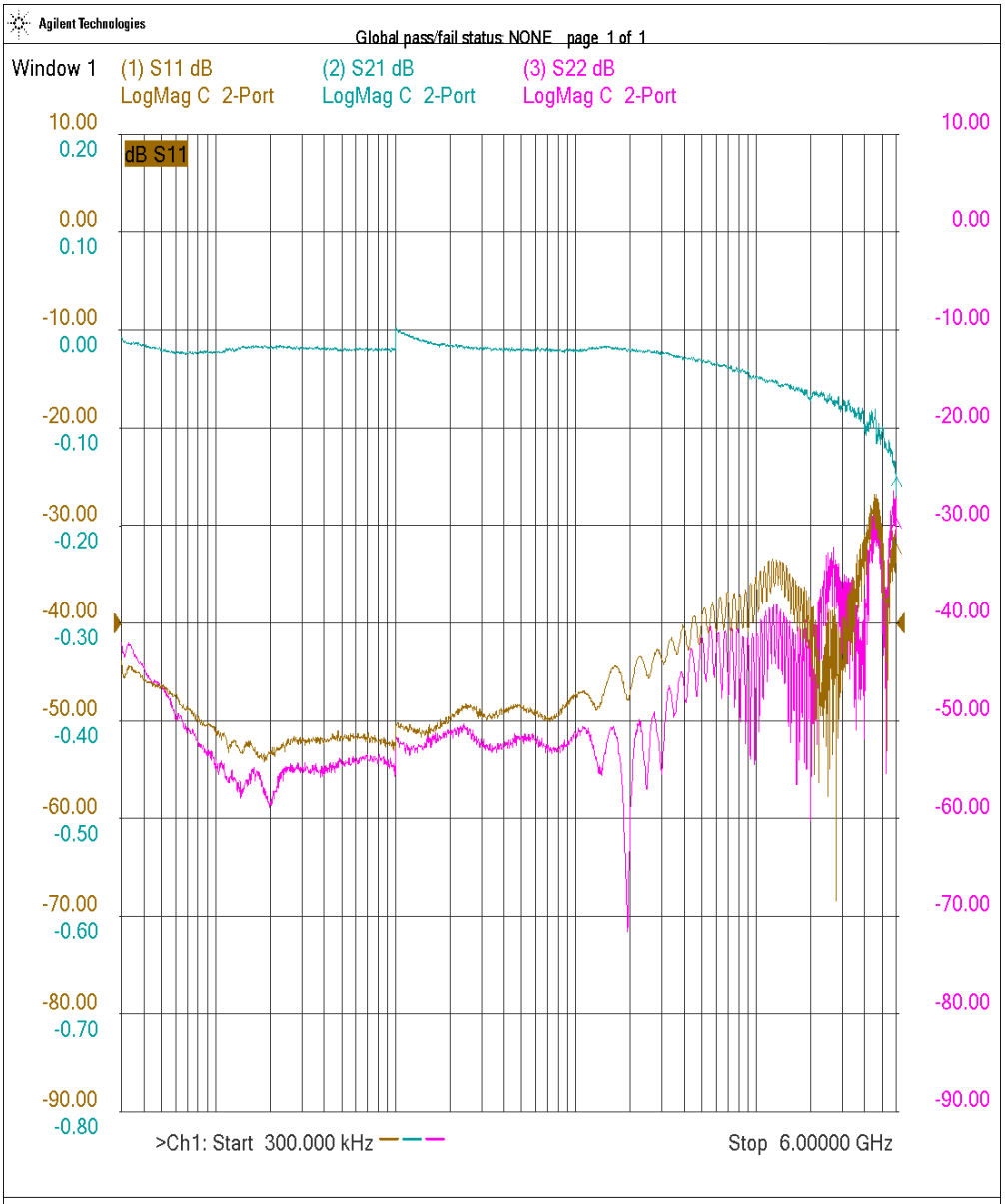


Figure 1 Face-to-face adapter line calibration test setup

The measured results, S11 and S22 values, show the reflection coefficient of the ESD Target adapter line, which according to the standard, the value should be better than 30dB up to 1GHz and better than 20dB up to 4GHz**,** with the S21 or S12 values showing the insertion loss of less than 0.3dB. The results below are examples that exceed the requirements of the IEC 61000-4-2 standard:



Channel Settings								
Channel	Sweep Type	Points	Start (kHz)	Stop (GHz)	IF BW (kHz)	Sweep Time (s)	Pow 1 (dBm)	Pow 2 (dBm)
1	LogFreq	1601	300.000000	6.000000	1.000000	1.479000	0.000000	0.000000

Trace Attributes					
Window	ID	Trace	Channel	Correction	Options
1	1	S11	1	C 2-Port	
	2	S21	1	C 2-Port	
	3	S22	1	C 2-Port	

Figure 2 ***Reflection Coefficient*** *and* ***Insertion Loss*** *of two face–to-face mounted adapter lines*

2. ESD TARGET CALIBRATION METHOD

1. Calibration Objective

The objective of this report is to calibrate the ESD target, check its performance, and compare the results to the requirements of the IEC 61000-4-2 standard.

Requirements from IEC 61000-4-2 standard:

1. Input Impedance of ESD target

Figure 3 The Front Side of ESDEMC A4001 ESD Current Target

The ESD current target, used to measure the discharge current from ESD generators, should have an input impedance between the inner electrode and ground **≤ 2.1 Ohm @ DC**.

2. Insertion Loss of the Target-Attenuator-Cable Chain

Figure 4 ESDEMC A4001 ESD Current Target-Attenuator-Cable Chain

Instead of specifying the insertion loss of the ESD current target, the insertion loss of the measurement chain consisting of the target, attenuator and cable is specified. The variation of the insertion loss may not exceed:

+/- 0.5 dB up to 1 GHz

+/- 1.2 dB 1 to 4 GHz.

The nominal value S21 of the insertion loss:

$$\mathbf{S21 = 20*\log\left[2*Z_{sys}/(R_{in} + 50\ \Omega)\right]\ dB}$$

Where R_{in} is the DC input impedance of the chain when loaded with 50 Ω.

2. Measurement Setup and Results:

Device	Manufacture	Model	Serial Number	Calibration Due
Network Analyzer	Agilent	E8357A	US42070561	08/13/2016
VNA Calibration Kit	Agilent	85092C	MY46180831	08/14/2016
Digital Multi-meter	Keithley	2110	1374108	07/15/2016
Digital Power Supply	Agilent	E3648A	MY40004580	07/20/2016
ESD Target Adapter Line	ESDEMC	A4002	A4002-001	09/02/2016

Table 1. Measurement equipment used in this report

1. For the DC input impedance

An LCR meter or a 4-wire source-measurement-meter (SMU) should be used to measure the DC input impedance. The electrodes should be connected in parallel to the input of the target. For this calibration report, the target was connected with a 20-dB attenuator plus a low loss, well-shielded cable with a 50-Ohm termination. A value of around 2.00 Ohm should be measured.

2. For the frequency response

The ESD current target, attenuator and coax cable are attached to the target adapter for determination of the frequency response. The typical setup is shown in figure 5:

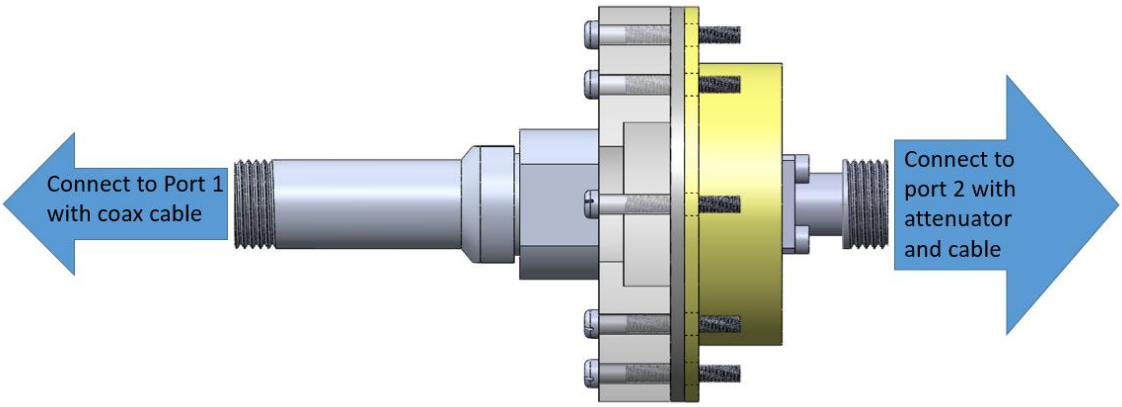


Figure 5 Mount ESD Target on to Target Adapter Line connected to a Network Analyzer

For measuring insertion loss of the target-attenuator-cable chain, a network analyzer was used to measure the S21. The S21 result of the setup is shown on figure 7. The red dash lines are the limits from the ICE 61000-4-2 standard. So, this ESD Target is within the spec per ICE 61000-4-2 standard.

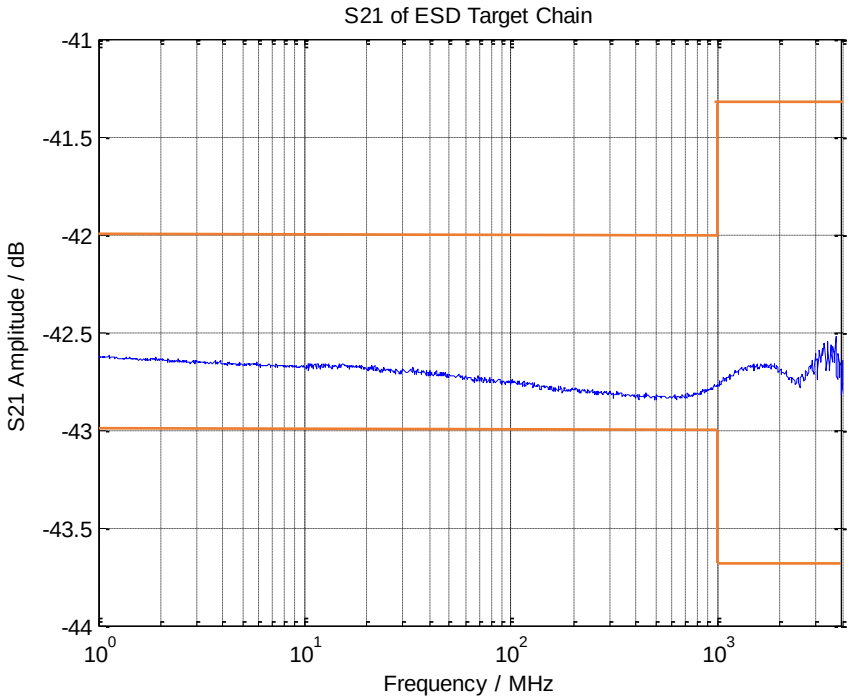


Figure 6 The Insertion Loss - S21 of ESDEMC A4001 ESD Target Chain

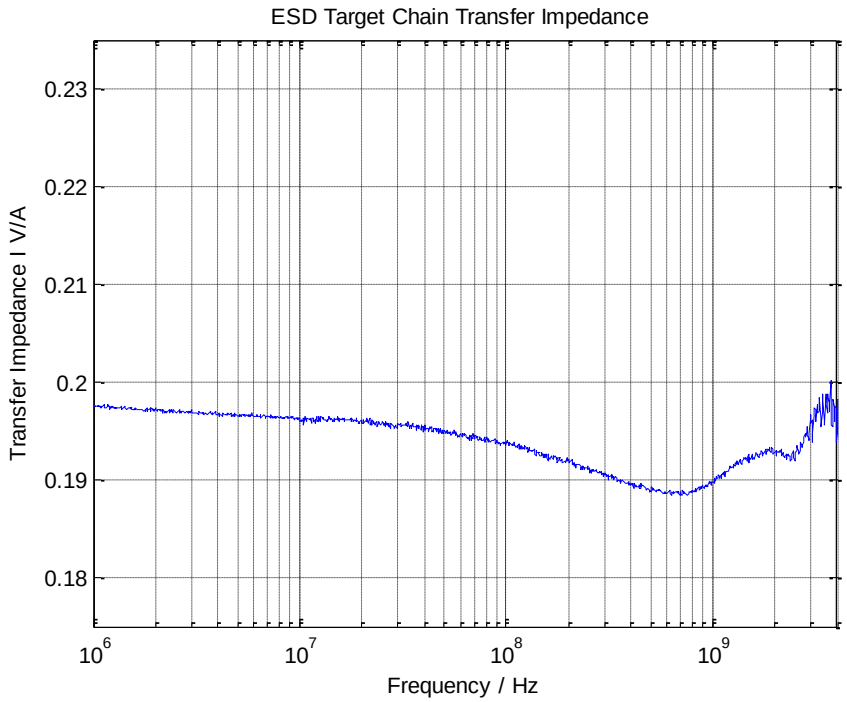


Figure 7 Transfer Impedance of the ESDEMC A4001 ESD Target Chain

Reference: ***IEC 61000-4-2 standard ed2.0***