Annex 149A

(normative)

Coupling and screening attenuation test methodology

149A.1 Introduction

This annex describes the test methodologies used to measure 2.5GBASE-T1, 5GBASE-T1, and 10GBASE-T1 link segment coupling and screening attenuation specified in 149.7.1.4 and 149.7.1.5.

149A.2 General Test Conditions

Coupling and screening attenuation are the main parameters for a shielded differential link segment to define its EMC properties. Coupling and screening attenuation are tested as specified in IEC 62153-4-7 using triaxial tube in tube method.

The usable frequency range of the setup may be limited by the dimensions of the triaxial measurement equipment, as higher order modes may occur. IEC 62153-4-7 provides additional information on how to suppress higher order modes in order not to falsify the measurement result.

These test methods are applicable for temperature and humidity as specified by IEC 62153-4-7.

149A.3 Reference cable assembly

The reference cable assembly is intended to be a simplified representation of the components used within a wiring harness. These include cable, PCB connectors, and inline connectors. This also ensures that connectors and cable are matched in terms of balance and shielding, in order to reach sufficient accuracy to measure coupling and screening attenuation.

This topology serves as common reference to compare link segments made of different components. It also enables the comparison of results from different test houses.

The reference cable assembly has a nominal length of 1.75 m, including one inline connector and one PCB connector with termination as shown in Figure 149A–1.

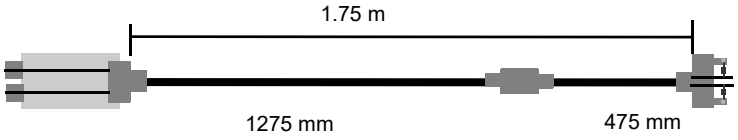

Figure 149A–1—Coupling attenuation reference cable assembly

149A.4 Measurement setup

Figure 149A–2 shows the reference cable assembly within the triaxial tube in tube method measurement setup.

Additional to the nominal lengths, some length tolerances are allowed. The overall assembly length shall be between 1650 mm and 1800 mm. The exposed cable length within the triaxial tube shall be between 900 mm and 1000 mm. Therefore, the cable length from the measurement fixture to the triaxial tube shall be between 650 mm and 900 mm. This allows easy handling while keeping the influence of the feeding cable section on insertion loss and balance low.

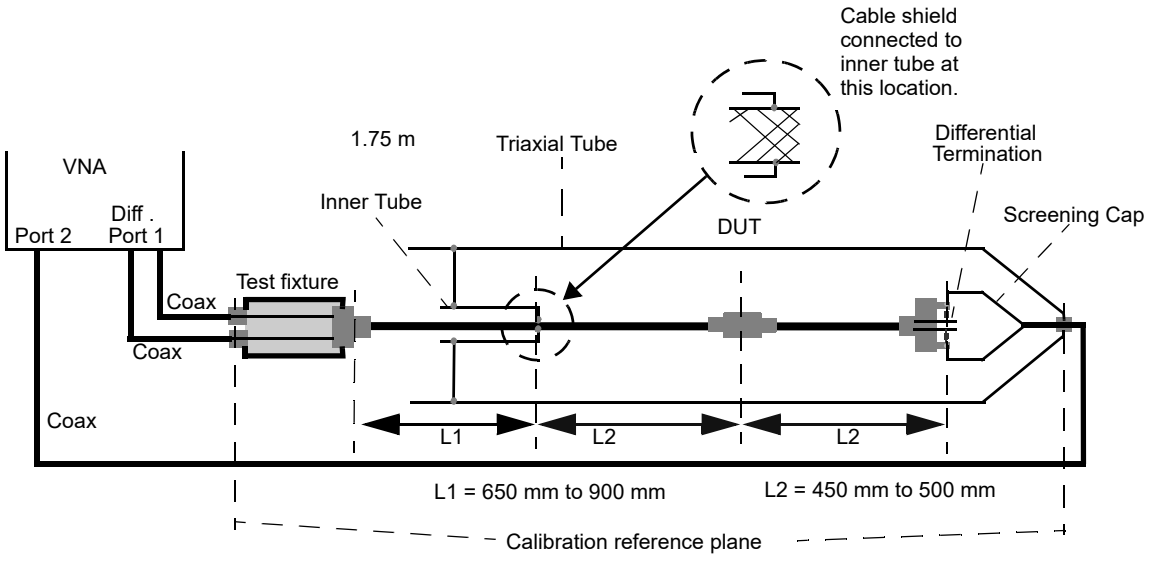

Figure 149A–2—Coupling attenuation reference cable assembly measurement setup

A 3-port vector network analyzer (VNA) measurement setup shall be used without baluns. Two ports of the VNA act as generator and the third port is used as single-ended receiver. For coupling attenuation measurements, the generator port-pair is operated in differential mode. For screening attenuation measurements, the generator port-pair is operated in common mode.

The measurement setup shall be optimized with respect to balance. This includes VNA, accurate and well-balanced test fixture and termination designs, as well as the use of phase stable coaxial cables.

The termination shall be nominal 100 Ω in differential mode and 25 Ω in common mode. The requirements on the single ended termination of every conductor of the differential pair shall be 50 Ω ± 1% to ground. The two resistors of the differential pair shall be matched to within ±0.1 Ω at DC. The resistors need to be suitable for RF applications in the frequency range under test.

The measurement shall include the transition from the MDI connector to the PCB. Therefore, the termination resistors shall be placed between the signal conductors and ground of a termination housing or equivalent termination fixture as shown in Figure 149A–3. Termination resistors shall not be placed inside the connector in order to omit the transition to the PCB. The termination housing shall be shielded and cover the termination resistors and any signal conductors placed on the bottom of the PCB.

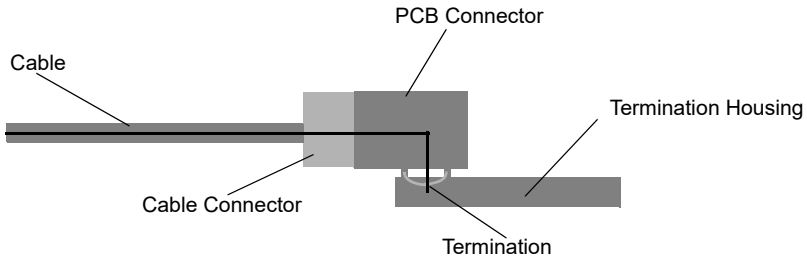

Figure 149A–3—PCB connector and termination

For connectors that provide an additional shield contact from the connector housing to a shielded enclosure, the reference plane at the MDI connector side may be set at the point where the EMC seal is attached. In this case, the connector housing and the transition to the PCB should not be part of the measurement but within the shield cap referenced in Figure 149A–4

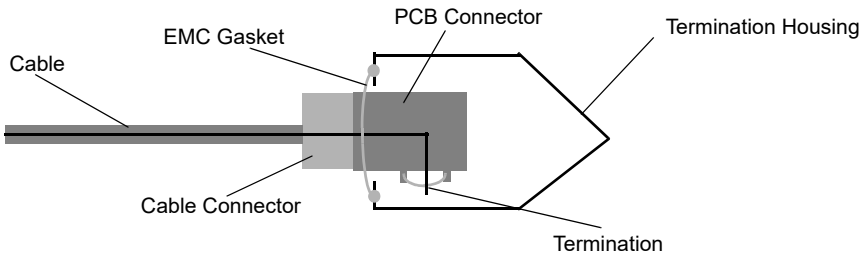

Figure 149A–4—PCB connector with EMC gasket and termination

149A.5 Protocol implementation conformance statement (PICS) proforma for Annex 149A, Coupling and screening attenuation test methodology[2]

149A.5.1 Introduction

The supplier of a protocol implementation that is claimed to conform to Annex 149A, Coupling and screening attenuation test methodology, shall complete the following protocol implementation conformance statement (PICS) proforma.

A detailed description of the symbols used in the PICS proforma, along with instructions for completing the PICS proforma, can be found in Clause 21.

149A.5.2 Identification

149A.5.2.1 Implementation identification

Supplier[1]	
Contact point for inquiries about the PICS[1]	
Implementation Name(s) and Version(s)[1,3]	
Other information necessary for full identification—e.g., name(s) and version(s) for machines and/or operating systems; System Name(s)[2]	
NOTE 1—Required for all implementations. NOTE 2—May be completed as appropriate in meeting the requirements for the identification. NOTE 3—The terms Name and Version should be interpreted appropriately to correspond with a supplier's terminology (e.g., Type, Series, Model).	

149A.5.2.2 Protocol summary

Identification of protocol standard	IEEE Std 802.3ch-201x, Annex 149A, Coupling and screening attenuation test methodology
Identification of amendments and corrigenda to this PICS proforma that have been completed as part of this PICS	
Have any Exception items been required? No [ ] Yes [ ] (See Clause 21; the answer Yes means that the implementation does not conform to IEEE Std 802.3ch-201x.)	

Date of Statement	

[2]*Copyright release for PICS proformas:* Users of this standard may freely reproduce the PICS proforma in this subclause so that it can be used for its intended purpose and may further publish the completed PICS.

149A.5.3 Major capabilities/options

Item	Feature	Subclause	Value/Comment	Status	Support
SDLS	Shielded differential link segment	149A.2		M	Yes [ ]

149A.5.4 PICS proforma tables for Coupling and screening attenuation test methodology

Item	Feature	Subclause	Value/Comment	Status	Support
TM1	The overall assembly length shall be between 1650 mm and 1800 mm.	149A.4		M	Yes [ ]
TM2	The exposed cable length within the triaxial tube shall be between 900 mm and 1000 mm.	149A.4		M	Yes [ ]
TM3	The cable length from the measurement fixture to the triaxial tube shall be between 650 mm and 900 mm.	149A.4		M	Yes [ ]
TM4	A 3-port vector network analyzer (VNA) measurement setup shall be used without baluns.	149A.4		M	Yes [ ]
TM5	The measurement setup shall be optimized with respect to balance.	149A.4		M	Yes [ ]
TM6	The termination shall be nominal 100 Ω in differential mode and 25 Ω in common mode.	149A.4		M	Yes [ ]
TM7	The requirements on the single ended termination of every conductor of the differential pair shall be 50 Ω ± 1% to ground.	149A.4		M	Yes [ ]
TM8	The two resistors of the differential pair shall be matched to within ±0.1 Ω at DC.	149A.4		M	Yes [ ]
TM9	The measurement shall include the transition from the MDI connector to the PCB.	149A.4		M	Yes [ ]
TM10	The termination resistors shall be placed between the signal conductors and ground of a termination housing or equivalent termination fixture as shown in Figure 149A–3.	149A.4		M	Yes [ ]
TM11	Termination resistors shall not be placed inside the connector in order to omit the transition to the PCB.	149A.4		M	Yes [ ]
TM12	The termination housing shall be shielded and cover the termination resistors and any signal conductors placed on the bottom of the PCB.	149A.4		M	Yes [ ]