
Integrirana vezja - Vrednotenje elektromagnetne združljivosti (EMC) oddajnikov-sprejemnikov - 5. del: Ethernet oddajniki-sprejemniki - Dopolnilo A1

Amendment 1 - Integrated circuits - EMC evaluation of transceivers - Part 5: Ethernet transceivers

Integrierte Schaltungen - Bewertung der elektromagnetischen Verträglichkeit von Sende-Empfangsgeräten - Teil 5: Ethernet-Sende-Empfangsgerät

Amendement 1 - Circuits intégrés - Evaluation de la CEM des émetteurs-récepteurs - Partie 5: Émetteurs-récepteurs Ethernet

Ta slovenski standard je istoveten z: EN IEC 62228-5:2021/prA1:2022

ICS:

31.200	Integrirana vezja, mikroelektronika	Integrated circuits. Microelectronics
33.100.01	Elektromagnetna združljivost na splošno	Electromagnetic compatibility in general

SIST EN IEC 62228-5:2021/oprA1:2023 en



47A/1148/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: IEC 62228-5/AMD1 ED1	
DATE OF CIRCULATION: 2022-12-16	CLOSING DATE FOR VOTING: 2023-03-10
SUPERSEDES DOCUMENTS: 47A/1137/CD, 47A/1140A/CC	

IEC SC 47A : INTEGRATED CIRCUITS	
SECRETARIAT: Japan	SECRETARY: Mr Yoshinori FUKUBA
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: <input type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: <input checked="" type="checkbox"/> EMC <input type="checkbox"/> ENVIRONMENT <input type="checkbox"/> QUALITY ASSURANCE <input type="checkbox"/> SAFETY	
<input checked="" type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING Attention IEC-CENELEC parallel voting The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	<input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

Amendment 1 - Integrated circuits - EMC evaluation of transceivers - Part 5: Ethernet transceivers

PROPOSED STABILITY DATE: 2026

NOTE FROM TC/SC OFFICERS:

IEC SC 47A WG 9 reviewed the comments on 47A/1140A/CC of 47A/1137/CD and decided to distribute CDV.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

INTEGRATED CIRCUITS – EMC EVALUATION OF TRANSCEIVERS –

Part 5: Ethernet transceivers

Amendment 1

FOREWORD

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Amendment 1 to IEC 62228-5:2021 has been prepared by subcommittee 47A: Integrated circuits, of IEC technical committee 47: Semiconductor devices.

The text of this standard is based on the following documents:

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Full information on the voting for its approval can be found in the report 49 on voting indicated in

50 the above table.

51 The language used for the development of this Amendment is English.
 52 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in
 53 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available
 54 at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are
 55 described in greater detail at www.iec.ch/standardsdev/publications/.

56 The committee has decided that the contents of this document will remain unchanged until the
 57 stability date indicated on the IEC website under webstore.iec.ch in the data related to the
 58 specific document. At this date, the document will be

- 59 • reconfirmed,
- 60 • withdrawn,
- 61 • replaced by a revised edition, or
- 62 • amended.

63

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68 Annex G (normative) EMC evaluation of optical Ethernet transceivers

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71 *Add the following new figure titles and table titles:*

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82 Table G.4 - Transceiver network tests – component value definitions of coupling ports and networks

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86 2 Normative references

87 *Add the following new references:*

88 ISO/IEC/IEEE 8802-3:2021, *Telecommunications and exchange between information*
89 *technology systems — Requirements for local and metropolitan area networks — Part 3:*
90 *Standard for Ethernet*

91

92 3 Terms, definitions and abbreviations

93 *Add the following new terms and definitions:*

94 **3.1.8**

95 **1000BASE-RH transceiver**

96 transceiver 1000 Mbit/s via FOT (fiber optic transceiver) and multi-mode plastic optical fiber,
97 with a functionality according to ISO/IEC/IEEE 8802-3 (1000BASE-RH)

98

99 *Add the following new abbreviated terms:*

100

FOT	Fiber optic transceiver
OFE	Optical front end
POF	Plastic optical fiber
SFP	Small form-factor pluggable

101

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103 *Add, after Annex F, the following new Annex G :*

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105

Annex G (normative)

EMC evaluation of optical Ethernet transceivers

G.1 General

This annex specifies the application of measurement methods of EMC evaluation of optical Ethernet transceiver ICs under network condition. It defines test configurations, test conditions, test signals, test procedures and test setups. It is applicable for an Ethernet transceiver IC and a fiber optic transceiver (FOT) of the Ethernet systems using duplex plastic optical fibers specified in

- 1000BASE-RH according to ISO/IEC/IEEE 8802.3.

For optical Ethernet transceiver ICs which do not implement global pins, evaluation covers

- the conducted emission of RF disturbances;
- the radiated emission of RF disturbances (optional);
- the radiated immunity against RF disturbances (optional).

For optical Ethernet transceiver ICs which have global pins, conducted RF immunity tests, impulse immunity tests and ESD test shall be additionally performed as described in 5 and 6 of IEC 62228-5 for Ethernet transceivers.

G.2 General requirements for EMC evaluation of optical Ethernet

A PHY of an optical Ethernet consists of PCS, PMA, and PMD as described in ISO/IEC/IEEE 8802-3. The PMD is a fiber optic transceiver (FOT) which can be integrated in a transceiver IC or can be an external component connected with a transceiver IC via optical front end (OFE) interface. For an optical Ethernet transceiver IC which does not implement global pins, only RF emission through local DC supply connections of the transceiver IC shall be measured. In addition, since FOT is also an active component with power supply, RF emission through DC supply pins of the FOT shall be measured as a part of DUT. The Ethernet transceiver shall be tested in functional operation modes according to Table G.1.

NOTE No test in low power mode is required for RF emission measurement.

Table G.1 –Overview of measurements and tests

Configuration	Test	Test method	Evaluation	Functional operation mode
Transceiver network	RF conducted emission (EMI)	150 Ω direct coupling (IEC 61967-4)	Spectrum	Normal

G.3 Test and operating conditions

G.3.1 Supply and ambient conditions

For all tests and measurements under operating conditions, the same settings for electrical Ethernet transceivers, specified in 5.1, are used.

G.3.2 Test operation modes

G.3.2.1 General

Depending on the transceiver type, the configuration for functional operation mode is controlled by hardware and/or software settings.

G.3.2.2 Transceiver configuration for normal operation mode

For test in normal functional operation mode, a transceiver configuration according to Table G.2 shall be used.

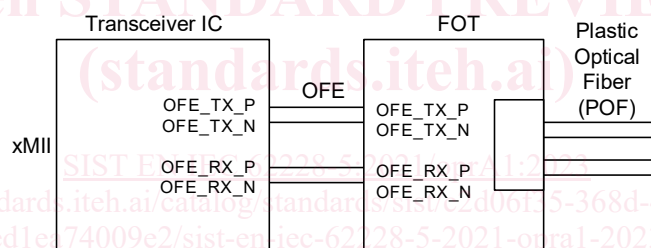
Table G.2 – Definition for transceiver configuration for normal operation mode

Topic	Content
Transceiver configuration	<ul style="list-style-type: none"> – full duplex mode with maximum data rate for DUT – transceiver configuration as specified by semiconductor manufacturer for reference application in datasheet, application note or comparable documentation (to be documented in the test report)

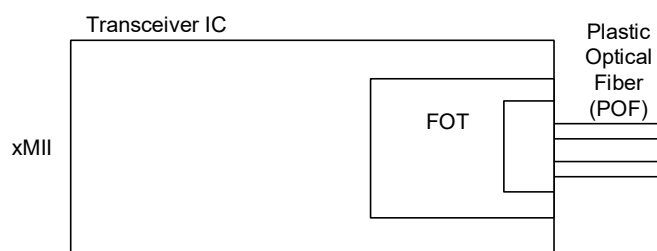
G.3.3 Definition of BIN

For test of 1000BASE-RH transceivers, the following MDI test network is defined:

- Fiber optical MDI interface network (Optical-BIN): as illustrated in Figure G.1.



(a) Transceiver IC and a separate FOT



(b) Transceiver IC with an integrated FOT

Figure G.1 – Fiber optical MDI interface test network with FOT (Optical-BIN)

G.3.4 Test configuration

G.3.4.1 General test configuration for optical transceiver network

For evaluation of conducted RF emission characteristics of an optical Ethernet transceiver in normal functional operation mode, a minimal Ethernet test network consisting of two Ethernet

transceiver nodes connected by duplex plastic optical fibers shall be used. The two nodes are electrically isolated as shown in Figure G.2 and Figure G.3. To form a simple evaluation network in operating condition, the operation mode shall be set to normal operation for both nodes, and one of the nodes shall be set to external loopback on the test PCB as shown in Figure G.2.

The test configuration in general consists of Ethernet transceivers with mandatory external components (Ethernet node) in a minimal test network, where filtered power supplies, signals, monitoring probes and coupling networks are connected as shown in Figure G.3.

Node 1 is connected to an Ethernet tester or a monitoring and stimulation circuit for generating a test communication signal and monitoring the Ethernet communication.

Node 2 is the test node configured according to the data sheet definitions of the semiconductor manufacturer to establish a full duplex optical Ethernet link. Node 2 shall be set in GMII loopback connection. If the Ethernet transceiver supports multiple implementation types of GMII interfaces, minimum two of them (e.g. RGMII and SGMII) should be used for Node 2 to test the operation with each implementation type of the GMII. The selection recommendation is given in Table G.3.

NOTE In specific cases or for analyses a deviation from this setup can be agreed between the users of this document and will be noted in the test report.

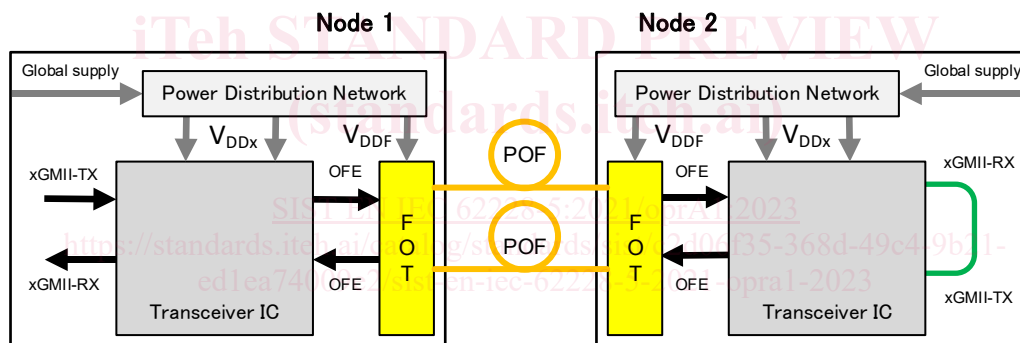
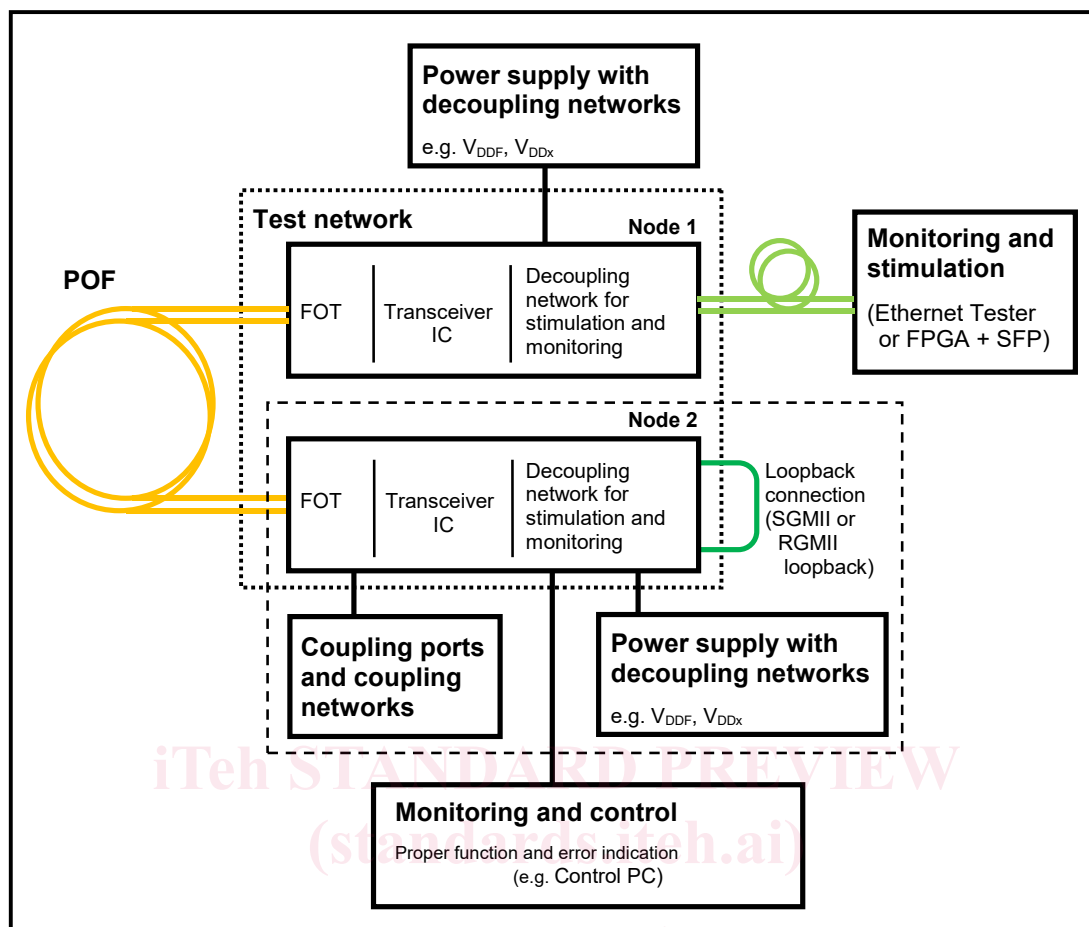


Figure G.2 – 1000 BASE-RHx transceiver network

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<https://standards.iteh.ai/catalog/standards/sist/c2d06f35-368d-49c4-9b21->

Figure G.3 – General test configuration for tests in fiber optical transceiver network

Table G.3 – Selection recommendation of GMII interfaces for transceiver network configuration

184

Ethernet system	GMII interface type 1	GMII interface type 2
1000BASE-RH	SGMII	SGMII / RGMII

185

186 G.3.4.2 Transceiver network tests - coupling ports and networks

187 The coupling ports and coupling networks are used to transfer disturbances from the test
 188 network with a defined transfer characteristic. The schematic of the coupling ports, networks
 189 and pins are shown in Figure G.4.

190 For optical Ethernet PHY consisting of a transceiver IC and a FOT, separate coupling ports for
 191 a transceiver IC and for a FOT, CP4 and CP5, shall be used, and conducted RF emission from
 192 each port as shown in Figure G.4 and G.5 shall be evaluated separately.