

International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

K.116

(11/2015)

SERIES K: PROTECTION AGAINST INTERFERENCE

Electromagnetic compatibility requirements and test methods for radio telecommunication terminal equipment

Recommendation ITU-T K.116



International
Telecommunication
Union
Documents

Document Sharing Hub

Copyright International Telecommunication Union/ITU Telecommunication Sector

Recommendation ITU-T K.116

Electromagnetic compatibility requirements and test methods for radio telecommunication terminal equipment

Summary

Recommendation ITU-T K.116 establishes the essential electromagnetic compatibility (EMC) requirements for radio telecommunication terminal equipment and ancillary accessories. This Recommendation specifies the emission and immunity requirements for radio telecommunication terminal equipment and ancillary equipment. It also describes test conditions for emission and immunity testing. Performance assessment and criteria for immunity tests are also specified.

History

Edition	Recommendation	Approval	Study Group
1.0	ITU-T K.116	2015-11-29	5 11.1002/1000/12663

Keywords

EMC, radio telecommunication terminal equipment.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2016

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Table of Contents

	Page
1 Scope.....	1
2 References.....	1
3 Definitions	2
3.1 Terms defined elsewhere	2
3.2 Terms defined in this Recommendation.....	2
4 Abbreviations and acronyms	2
5 Conventions	3
6 Test conditions.....	3
6.1 General	3
6.2 Arrangements for test signals	3
6.3 RF exclusion band of radio communications equipment	5
6.4 Narrow band responses of receivers or receivers which are part of transceivers	5
6.5 Normal test modulation	6
7 Performance assessment	6
7.1 General	6
7.2 Equipment which can provide a continuous communication link.....	7
7.3 Equipment which does not provide a continuous communication link.....	7
7.4 Ancillary equipment	7
7.5 Equipment classification	7
8 Performance criteria.....	8
8.1 Performance criteria for continuous phenomena.....	9
8.2 Performance criteria for transient phenomena	9
8.3 Performance criteria for ancillary equipment tested on a standalone basis....	9
9 Applicability overview tables	10
9.1 Emission	10
9.2 Immunity	11
10 Methods of measurement and limits for EMC emissions.....	11
10.1 Test configurations	11
10.2 Radiated emission.....	12
10.3 Conducted emission DC power input/output port.....	12
10.4 Conducted emissions AC mains power input/output port.....	13
10.5 Harmonic current emissions (AC mains input port).....	14
10.6 Voltage fluctuations and flicker (AC mains input port).....	14
10.7 Telecommunication ports	14
11 Test methods and levels for immunity tests	15
11.1 Test configurations	15

	Page
11.2 RF electromagnetic field (80 MHz to 1 000 MHz and 1 400 MHz to 2 700 MHz).....	15
11.3 Electrostatic discharge.....	16
11.4 Fast transients common mode	16
11.5 Radio frequency, common mode.....	17
11.6 Transients and surges, vehicular environment	18
11.7 Voltage dips and interruptions.....	19
11.8 Surges	20
Annex A – Arrangements for the performance assessment of host dependant equipment and plug-in cards.....	22
A.1 Alternative A: composite equipment.....	22
A.2 Alternative B: use of a test jig or host	22
Bibliography.....	23

Copyright © 2015 ITU-T. All rights reserved.

Introduction

Radio telecommunication terminal equipment is developed rapidly and it is necessary to establish the essential electromagnetic compatibility (EMC) requirements for radio terminal equipment to reduce the potential emission issues and interference cases.

The equipment should conform to the requirements laid out in this Recommendation and should be used in its intended electromagnetic (EM) environment in accordance with the manufacturer's instructions:

- it should not generate electromagnetic disturbances at a level which may interfere with the intended operation of other equipment;
- it should have an adequate level of intrinsic immunity to electromagnetic disturbances to operate as intended.

Document Sharing Hub



Documents

Document Sharing Hub

Rec. ITU-T K.116 (11/2015)

v

Recommendation ITU-T K.116

Electromagnetic compatibility requirements and test methods for radio telecommunication terminal equipment

1 Scope

This Recommendation defines the essential electromagnetic compatibility (EMC) requirements for radio telecommunication terminal equipment and ancillary accessories; such as mobile terminals, the devices developed under the standards of Bluetooth, and wireless fidelity (Wi-Fi). This Recommendation also describes the test conditions for emission and immunity testing. Methods of measurement and limits for emissions, test methods and levels, performance assessment, and performance criteria for immunity tests are also specified. If there is an ITU-R provision, it takes precedence to this Recommendation.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

- | | |
|------------------|--|
| [IEC CISPR 25] | IEC CISPR 25 (2008), <i>Vehicles, boats and internal combustion engines – Radio disturbance characteristics – Limits and methods of measurement for the protection of on-board receivers.</i> |
| [IEC CISPR 32] | IEC CISPR 32 (2015), <i>Electromagnetic compatibility of multimedia equipment – Emission requirements.</i> |
| [IEC 61000-3-2] | IEC 61000-3-2 (2014), <i>Electromagnetic compatibility (EMC) Part 3-2: Limits for harmonic current emissions (equipment input current ≤ 16 A per phase).</i> |
| [IEC 61000-3-3] | IEC 61000-3-3 (2013), <i>Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection.</i> |
| [IEC 61000-3-11] | IEC 61000-3-11 (2000), <i>Electromagnetic compatibility (EMC) – Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems – Equipment with rated current ≤ 75 A and subject to conditional connection.</i> |
| [IEC 61000-3-12] | IEC 61000-3-12 (2012), <i>Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase.</i> |
| [IEC 61000-4-2] | IEC 61000-4-2 (2008), <i>Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test.</i> |

[IEC 61000-4-3]	IEC 61000-4-3 (2010), <i>Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test.</i>
[IEC 61000-4-4]	IEC 61000-4-4 (2012), <i>Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test.</i>
[IEC 61000-4-5]	IEC 61000-4-5 (2014), <i>Electromagnetic compatibility (EMC) – Part 4-5: Testing and Measurement Techniques – Surge Immunity Test.</i>
[IEC 61000-4-6]	IEC 61000-4-6 (2013), <i>Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields.</i>
[IEC 61000-4-11]	IEC 61000-4-11 (2004), <i>Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity test.</i>
[ISO 7637-2]	ISO 7637-2 (2004), <i>Road vehicles – Electrical disturbances from conduction and coupling – Part 2: Electrical transient conduction along supply lines only.</i>

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 ancillary equipment [b-ETSI EN 301 489-1]: Equipment (apparatus), used in connection with a receiver or transmitter.

NOTE – It is considered as an ancillary equipment (apparatus) if:

- the equipment is intended for use in conjunction with a receiver or transmitter to provide additional operational and/or control features to the radio equipment, (e.g., to extend control to another position or location); and
- the equipment cannot be used on a stand-alone basis to provide user functions independently of a receiver or transmitter; and
- the receiver or transmitter, to which it is connected, is capable of providing some intended operation such as transmitting and/or receiving without the ancillary equipment (i.e., it is not a sub-unit of the main equipment essential to the main equipment basic functions).

3.1.2 portable equipment [b-ETSI EN 301 489-1]: Radio and/or ancillary equipment intended for portable (e.g., handheld) operation, powered by its own integral battery.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 radio telecommunication terminal equipment: The communications equipment (apparatus) at either end of a wireless communications link, used to accomplish the mission of communication.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AC	Alternating Current
ACK	Acknowledgement

AMN	Artificial Mains Networks
AN	Artificial Network
ARQ	Automatic Retransmission request
CDN	Coupling and Decoupling Network
DC	Direct Current
EM	Electromagnetic
EMC	Electromagnetic Compatibility
EUT	Equipment Under Test
NACK	Not Acknowledgement
RF	Radio Frequency
Wi-Fi	Wireless Fidelity

5 Conventions

None.

6 Test conditions

6.1 General

The equipment shall be tested under normal test conditions according to the relevant product and basic standards or the information accompanying the equipment, which are within the manufacturer's declared range of humidity, temperature and supply voltage. The test conditions shall be recorded in the test report.

The test configuration and mode of operation shall represent the intended use and shall be recorded in the test report.

6.2 Arrangements for test signals

Adequate measures shall be taken to avoid the effect of immunity test signals on both the measuring equipment and the signal sources for the wanted signals located outside the test environment.

6.2.1 Arrangements for test signals at the input of transmitters

The signal source providing the transmitter under test with the modulation signal for the normal test modulation shall be located outside the test environment, unless the transmitter is modulated by its own internal source.

The transmitter shall be modulated with normal test modulation, by an internal or external signal source capable of delivering the normal test modulation.

6.2.2 Arrangements for test signals at the output of transmitters

The measuring equipment for the wanted radio frequency (RF) output signal from the transmitter under test shall be located outside the test environment. For transmitters with an integral antenna, the wanted RF output signal to establish a communication link shall be delivered from the equipment under test (EUT) to an antenna located within the test environment. This antenna shall be connected to the external measuring equipment by a coaxial cable.

For transmitters with a removable antenna, the wanted RF output signal to establish a communication link shall be delivered from the antenna connector to the external measuring equipment by a shielded transmission line, such as a coaxial cable. Adequate measures shall be