INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

K.63

(02/2004)

SERIES K: PROTECTION AGAINST INTERFERENCE

Maintaining the suitability of production telecommunications equipment to its intended electromagnetic environment

ITU-T Recommendation K.63

ITU-T Recommendation K.63

Maintaining the suitability of production telecommunications equipment to its intended electromagnetic environment

Summary

This Recommendation suggests some Electromagnetic Compatibility tests that may be used by both Telecommunications Operators and Equipment Manufacturers to determine the suitability of a batch of Telecommunications Equipment to its intended Electromagnetic Environment.

It is recognized that variation will occur between the Electromagnetic Compatibility performance of the Telecommunications Equipment item tested to demonstrate compliance with market entry requirements and the Electromagnetic Compatibility performance of Telecommunications Equipment items manufactured subsequently. Hence variation in the Electromagnetic Compatibility performance will be seen within a batch of Telecommunications Equipment either received by the Telecommunications Operator or manufactured by the Equipment Manufacturer.

Methods to allow both Telecommunications Operators and Equipment Manufacturers to demonstrate the compliance of a batch of Telecommunications Equipment are therefore needed. As it is not economically feasible to test the Electromagnetic Compatibility performance of every item within the batch, this Recommendation suggests that just three tests be performed on a small number of Equipment items selected at random from the batch.

The recommended tests are Radiated Emissions, Electrostatic Discharge and Electrical Fast Transient. It is the past experience of Telecommunications Operators that the largest variation in performance occurs for these three tests.

Telecommunications Operators may therefore use this Recommendation to assure the suitability of a batch of equipment received from a manufacturer. Equipment Manufacturers may use this Recommendation to monitor the variation in Electromagnetic Compatibility performance from their manufacture line.

Source

ITU-T Recommendation K.63 was approved on 29 February 2004 by ITU-T Study Group 5 (2001-2004) under the ITU-T Recommendation A.8 procedure.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. 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, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

Introduction

It is recognized that variation will occur between the Electromagnetic Compatibility performance of the Telecommunications Equipment item tested to demonstrate compliance with market entry requirements and the Electromagnetic Compatibility performance of Telecommunications Equipment items manufactured subsequently. Hence variation in the Electromagnetic Compatibility performance will be seen within a batch of Telecommunications Equipment either received by the Telecommunications Operator or manufactured by the Equipment Manufacturer.

Methods to allow both Telecommunications Operators and Equipment Manufacturers to demonstrate the compliance of a batch of Telecommunications Equipment are therefore needed. As it is not economically feasible to test the Electromagnetic Compatibility performance of every item within the batch, this Recommendation suggests that just three tests be performed on a small number of Equipment items selected at random from the batch.

The recommended tests are Radiated Emissions, Electrostatic Discharge and Electrical Fast Transient. It is the past experience of Telecommunications Operators that the largest variation in performance occurs for these three tests.

ITU-T Recommendation K.63

Maintaining the suitability of production telecommunications equipment to its intended electromagnetic environment

1 Scope

This Recommendation suggests some Electromagnetic Compatibility tests that may be used by both Telecommunications Operators and Equipment Manufacturers to determine the suitability of a batch of Telecommunications Equipment to its intended Electromagnetic Environment.

This Recommendation is not intended to be applied for conformity test.

2 Normative 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.

[1] ITU-T Recommendation K.48 (2003), *EMC requirements for each telecommunication equipment – Product family Recommendation*.

[2] IEC 60050-161 (1990-09), *International Electrotechnical Vocabulary. Chapter 161: Electromagnetic compatibility.*

[3] IEC CISPR 22 (2003-04), *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement.*

[4] IEC 61000-4-2 (2001-04), *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*.

[5] IEC 61000-4-4 (1995-01), *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: – Electrical fast transient/burst immunity test*.

3 Terms and definitions

The following definitions are based on the International Electrotechnical Vocabulary [2]:

3.1 electromagnetic compatibility (161-01-07): The ability of an Equipment or System to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbance to anything in that environment.

3.2 electromagnetic environment (161-01-01): The totality of electromagnetic phenomena existing at a given location (in general this totality is time dependent and its description may need a statistical approach).

3.3 radiated emission (161-01-08): The phenomenon by which energy in the form of electromagnetic waves emanates from a source into space (energy transferred through space in the form of electromagnetic waves).

3.4 electrostatic discharge (161-01 22): A transfer of electric charge between bodies of different electrostatic potential in proximity or through direct contact.

3.5 electrical fast transient (161-02-07): A sequence of a limited number of distinct pulses or an oscillation of limited duration.

3.6 electromagnetic disturbance (161-01-05): Any electromagnetic phenomenon that may degrade the performance of Equipment. Examples include EMF, ESD and EFT.

3.7 electromagnetic interference (161-01-06): Degradation to the performance of a piece of Equipment caused by an electromagnetic disturbance.

3.8 immunity (161-01-20): The ability of an electrical or electronic product to operate as intended without performance degradation in the presence of an electromagnetic disturbance.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations:

AC Alternating Current

DC Direct Current

EFT Electrical Fast Transient

EM ElectroMagnetic

EMF ElectroMagnetic Fields

EMC ElectroMagnetic Compatibility

ESD ElectroStatic Discharge

EUT Equipment Under Test

I/O Input/Output

5 Classification of equipment suitability

This Recommendation defines three classes of equipment suitability to its intended EM environment.

Class I Equipment: Equipment suitable for location within its intended environment. (The probability that the EM environment could create disturbances to the equipment, or that the equipment could create interference to other telecommunication equipment installed in the same environment is **very low**.)

Class II Equipment: Equipment with acceptable performance for location within its intended environment. (The probability that the EM environment could create disturbances to the equipment, or that the equipment could create interference to other telecommunication equipment installed in the same environment is **low**.)

Class III Equipment: Equipment not suitable for location within its intended environment. (The probability that the EM environment could create disturbances to the equipment, or that the equipment could create interference to other telecommunication equipment installed in the same environment is **high**.)

6 EMC tests

The following EMC tests are suggested to evaluate the suitability of Telecommunications Equipment to its intended Electromagnetic Environment:

– radiated emission;

– ESD immunity;

– EFT immunity.

Tests should be made on a small number of Equipment items selected at random as follows:

- for the Telecommunications Operator: Equipment selected from the shipment received from the manufacturer;
- for the Equipment Manufacturer: Equipment selected from the manufacturing process.

6.1 Normal operational conditions

The Equipment specific operating conditions will be derived from the product descriptions and documentation; this information will be stated within the Equipment's EMC report.

The general operational conditions shall allow for appropriate emissions measurement and for immunity testing.

The tests described shall be performed with the EUT operating in a manner that is representative of intended and normal operation. Grounding, interconnecting cabling and physical placement of the Equipment shall simulate the typical application.

6.2 Emissions tests

6.2.1 Radiated emissions tests

The requirements for radiated emissions are presented in Table 1 and the evaluation criteria are presented in Table 2; the test procedure is given in ITU-T Rec. K.48 [1] and in IEC CISPR 22 [3].

Table 1/K.63 – Requirements for radiated emission

Port	Test specification	Intended environment	Reference standard
Enclosure	Class A	Telecom centres	IEC CISPR 22 [3]
Enclosure	Class B	Outdoor locations, customer premises	IEC CISPR 22 [3]
NOTE – If equipment can be installed in either intended environment, Class B shall be applicable.			

Radiated emission measurement shall be performed on the whole system; all interconnection cables shall be connected to the EUT in a manner typical of intended use. The configuration of the EUT and interconnecting cables shall be adjusted during the test to allow measurement of the maximum possible disturbance.

6.2.2 Evaluation criteria for the results of radiated emission tests

Equipment performance to radiated emissions testing is classified according to clause 5 using the criteria presented in Table 2:

Table 2/K.63 – Equipment performance criteria for radiated emission

Equipment class	Evaluation criteria
I	The maximum Equipment emissions level is more than 4 dB below Electromagnetic Environment limit
II	The maximum Equipment emissions are between 4 dB below the limit and 4 dB above the limit itself
III	The maximum Equipment emissions is more than 4 dB above the limit

6.3 Immunity tests

6.3.1 Immunity to ESD

The requirements for immunity to ESD are presented in Table 3.

Table 3/K.63 – Immunity requirements for ESD

Test	Test specification	Reference standard
ESD	8 kV indirect discharge 8 kV air discharge 4 kV contact discharge	IEC 61000-4-2 [4]

6.3.2 Immunity to EFT

The requirements for immunity to EFT are presented in Table 4. IEC 61000-4-4 [5] gives the test procedure.

Common and differential mode coupling methods on a.c. mains are described in IEC 61000-4-4 [5]. The test level presented in Table 4 is to be applied for both differential and common mode tests.

Test on I/O signal ports shall be applied in common mode only.

Table 4/K.63 – Immunity requirements for EFT

On power supply port		On I/O signal, data and control ports	
Voltage peak [kV]	Repetition rate [kHz]	Voltage peak [kV]	Repetition rate [kHz]
1 (a.c.) 0.5 (d.c.)	5	0.5	5

6.3.3 Evaluation criteria for the result of immunity test to ESD and EFT

Equipment performance to immunity testing is classified according to Clause 5 using the criteria presented in Table 5.

Table 5/K.63 – Equipment performance criteria for immunity test to ESD or EFT

Equipment class	Evaluation criteria
I	During and after the test, there is no degradation of performance
II	During application of the test, some degradation of Equipment function occurs, but at the end of test the equipment functions normally
III	During application of the test, severe degradation of Equipment function occurs and no recovery in Equipment function occurs when the test ends. Recovery of Equipment function requires either: • manual intervention by specialized personnel; • the replacement of the Equipment.

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series B	Means of expression: definitions, symbols, classification
Series C	General telecommunication statistics
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	**Protection against interference**
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks and open system communications
Series Y	Global information infrastructure, Internet protocol aspects and Next Generation Networks
Series Z	Languages and general software aspects for telecommunication systems

Printed in Switzerland
Geneva, 2004