

**TECHNICAL REQUIREMENTS FOR
ELECTROMAGNETIC DISTURBANCE EMITTED FROM
TELECOMMUNICATIONS EQUIPMENT**

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Nippon Telegraph and Telephone Corporation

NOTICE

This document provides a summary of the basic technical requirements for the limits, test methods, etc. for the electromagnetic disturbance emitted from telecommunications equipment used and provided by Nippon Telegraph and Telephone Corporation (NTT) and NTT group companies. This document is intended as reference material to be used by telecommunication equipment designers, manufacturers and providers.

The content of this document may be changed without notice when related standards are revised, new equipment technology is introduced, or equipment requirements are modified.

If you have any questions about the content of this document, please contact the following sections.

NTT Space Environment and Energy Laboratories
Resilient Environmental Adaptation Research Project
Proactive Environmental Adaptation Technology Group

E-mail: emc-spec-p[at*]ml.ntt.com

*When you contact us, please replace “[at]” to “@”.

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Revision History

Edition	Revision date	Application date	Reason of revision
1.0	August 17th, 1998	Same as the revision date.	First edition.
2.0	April 1st, 2001	Same as the revision date.	Changes of the contact address and references.
3.0	May 30th, 2002	Same as the revision date.	Changes of the references.
4.0	December 18th, 2009	Same as the revision date.	Addition of the limits and test methods of radiated disturbance.
4.1	April 1st, 2015	Same as the revision date.	Changes of the contact address.
5.0	August 1st, 2018	Same as the revision date.	Addition of the limits and test methods of conducted disturbance from power conversion equipment.
5.1	September 3rd, 2018	Same as the revision date.	Changes of the contact address.
5.2	June 5th, 2023	Same as the revision date	Revision of contact address

1. Overview

1.1 Purpose

To control the radiated and conducted disturbance emitted from telecommunications equipment, this document prescribes limits and measurement methods for electromagnetic disturbances emitted from the following equipment: 1) telecommunications equipment containing digital circuits, microprocessors, or switching power supplies that are used in a telecommunication center controlled by a telecommunication provider and 2) information technology equipment installed and used in outdoor-locations and customer- premises .

1.2 Outline

Section 2 describes key terms used and laws and regulations referred to in this document and some information that is relevant when this document is used.

Section 3 describes requirements related to limits and measurement methods for electromagnetic disturbances emitted from *customer-premises equipment*, *outdoor-locations equipment*, and *telecom-center equipment*.

1.3 Applicability

This document shall be applied when the specifications are enacted or revised with changes of the circuits in customer-premises, outdoor-locations, and telecom-center equipment from April 1, 2018. For radiated disturbance above 1 GHz, this document shall be applied when the specifications are enacted or revised with changes of the circuits in customer-premises, outdoor-locations, and telecom-center equipment from October 1, 2010.

The TR No. 550004 edition 3 may be applied in the following conditions.

- 1) Procure equipment reporting compliance with the VCCI regulations by March 31, 2010 without change of circuits for customer-premises and outdoor-locations equipment.
- 2) Procure telecom-center equipment from April 1, 2010 to March 31, 2011.

2. References and terminology

2.1 References

- [1] **VCCI RULES FOR VOLUNTARY CONTROL MEASURES, VCCI 32-1:2016**
(original in Japanese)
- [2] **VCCI TECHNICAL REQUIREMENTS, VCCI-CISPR32:2016** (original in Japanese)
- [3] **CISPR 32, edition 2.0: 2015**, Electromagnetic compatibility of multimedia equipment – Emission requirements
- [4] **EN55032: 2012**, Electromagnetic Compatibility of Multimedia Equipment
- [5] **ITU-T K.123: 2016**, Electromagnetic compatibility requirements for electrical equipment in telecommunication facilities
- [6] **ITU-T K.48; 2006**, EMC requirements for each telecommunication network equipment
- [7] **TTC JT-K48: 2004**, EMC requirements for each telecommunication network equipment (in Japanese)
- [8] **CISPR 16-1-1 edition 2.1: 2006**, Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus
- [9] **CISPR 16-1-2 edition 1.2: 2006**, Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Conducted disturbances, Amendment 1
- [10] **CISPR 16-1-4 edition 2: 2007**, Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Radiated disturbances
- [11] **CISPR 16-2-1 edition 3.0 : 2014**, Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-1: Methods of measurement of disturbances and immunity - Conducted disturbance measurements
- [12] **CISPR 16-2-3 edition 2: 2006**, Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements
- [13] **CISPR 16-4-2: 2003**, Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modeling – Uncertainty in EMC measurement

The outside references quoted in this document are the latest editions.

2.2 Terminology

- (1) **information technology equipment (ITE):** Equipment with a rated power supply voltage not exceeding DC/AC 600 V, whose primary function is any of the following or a combination of any of the following: entry, storage, display, retrieval, transmission, processing, switching, or control of data and of telecommunication messages. ITE might have one or more terminal ports typically operated for information transfer.
- (2) **telecom-center equipment:** Telecommunications equipment or facilities used only within buildings that are supervised by telecommunications operators.
 - (a) Switching, transmission, communication processing, server, IP, and radio equipment.
 - (b) Power conversion equipment.
e.g., rectifier, uninterruptible power supply (UPS), inverter
 - (c) Peripheral equipment directly connected to or used with the equipment listed in (a),
e.g., workstations controlling the equipment listed in (a).
 - (d) Equipment mounted on vehicles (excluding vehicle components and components designed as part of telecommunications equipment),
e.g., radio transmitting and receiving equipment on radio-relay vehicles.
- (3) **outdoor-locations equipment:** ITE used for telecommunications in outdoor-locations (e.g., telegraph pole, roadside, basement, outside wall, and so on).
- (4) **customer-premises equipment:** ITE used for telecommunications other than "telecom-center equipment" and "outdoor-locations equipment".
- (5) **electric-field strength of radiated disturbance:** The electric field strength of the disturbance radiated from the equipment directly into the air.
- (6) **disturbance voltage at mains ports:** The voltage of the radio frequency disturbance induced at AC/DC power ports.
- (7) **disturbance at telecommunication ports:** The voltage or current of the radio frequency disturbance induced at telecommunication ports.
e.g., wired-network port, signal/control port, optical fiber port which has metal shield or tension member, RF modulated output port, antenna port, broadcasting receiver port
- (8) **VCCI:** Abbreviation for "Voluntary Control Council for Interference by Information Technology Equipment". It was established to voluntarily control the disturbance radiated from ITE in Japan.
- (9) **CISPR:** French acronym meaning "International Special Committee on Radio Interference". This special committee was established by the International Electrotechnical Commission to study standards for limits, test methods, and test facilities with regard to radiated emission.
- (10) **ARIB:** Abbreviation for "Association of Radio Industries and Businesses" in Japan.

3. Technical requirements

3.1 Requirements and test methods for customer-premises equipment and outdoor-locations equipment

Limits and test methods for the disturbances emitted from customer-premises equipment and outdoor-locations equipment shall meet the limits and test methods in latest VCCI RULES FOR VOLUNTARY CONTROL MEASURES[1] and VCCI TECHNICAL REQUIREMENTS [2]. Though, test results with fully anechoic rooms (FAR) are unacceptable.

3.2 Requirements for telecom-center equipment

3.2.1 Limits

Limits for the disturbances emitted from telecom-center equipment are as follows.

Electric-field strength of radiated disturbance

A) Limits below 1 GHz

Quasi-peak values for the electric-field strength of the radiated disturbance should be no greater than the values at the specified distance given in Table 1.

Table 1 Limits for electric-field strength of radiated disturbance (quasi-peak values)

Measurement distance	10 m
Frequency range	
30 MHz to 230 MHz	40 dB μ V/m
230 MHz to 1 GHz	47 dB μ V/m
Note 1: 1 μ V/m is taken to be 0 dB.	
Note 2: The lower limit shall apply at the transition frequency.	
Note 3: Add 10 dB to the limit when the measurement distance is 3 m.	
Subtract 10 dB from the limit when the measurement distance is 30 m.	

B) Limits above 1 GHz

The electric-field strength of the radiated disturbance should be no greater than the values at the specified distance given in Table 2 when measured in accordance with the method and conditional testing procedure described below.

Table 2 Limits for electric-field strength of radiated disturbance from ITE

Measurement distance	3 m	
Frequency range	Average	Peak
1 GHz to 3 GHz	56 dB μ V/m	76 dB μ V/m
3 GHz to 6 GHz	60 dB μ V/m	80 dB μ V/m
Note: The lower limit shall apply at the transition frequency.		

<Conditional testing procedure>

The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes.

If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.

If the highest frequency of the internal source of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz.

If the highest frequency of the internal source of the EUT is between 500 MHz and 1 GHz, the measurement shall only be made up to 5 GHz.

If the highest frequency of the internal source of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or 6 GHz, whichever is less.

Disturbance voltage at mains ports

The quasi-peak and average disturbance voltages at AC mains ports should be no greater than the values specified in table 3.

Table 3 Limits for disturbance voltage at AC mains ports

Frequency range \ Detection type	Quasi-peak value	Average value
9kHz to 50kHz	138-127.5 dB μ V	125-114.5 dB μ V
50kHz to 150kHz	127.5-100 dB μ V	114.5-87 dB μ V
150kHz to 500kHz	79 dB μ V	66 dB μ V
500kHz to 30MHz	73 dB μ V	60 dB μ V

Note 1: 1 μ V is taken to be 0 dB.
Note 2: If the quasi-peak value of the measurement is less than the limit specified for average-value detection, the equipment shall be deemed to meet both limits and there is no need to take an average-value measurement.
Note 3: The lower limit shall apply at the transition frequency.
Note 4: The limits of 9 kHz to 150 kHz are applied only to power conversion equipment.

Disturbance voltage (current) at telecommunication ports

The quasi-peak and average disturbance voltages or currents at telecommunication ports should be no greater than the values specified in Table 4.

Table 4 Limits for disturbance voltage (current) at telecommunication ports

Frequency range	Voltage		Current	
	Quasi-peak	Average	Quasi-peak	Average
150 kHz to 500 kHz	97-87 dB μ V	84-74 dB μ V	53-43 dB μ A	40-30 dB μ A
500 kHz to 30 MHz	87 dB μ V	74 dB μ V	43 dB μ A	30 dB μ A

Note 1: The limits shall decrease linearly with the logarithm of the frequency range 150 kHz to 500 kHz.
Note 2: Conversion factor between voltage and current limits is $20\log_{10} 150=44$ dB

3.2.2 Test methods and test facilities

Electric-field strength of radiated disturbance

The radiated disturbances emitted from the telecom-center equipment should be measured using the test site and test method specified in the applicable standards listed below. Though, test results with fully anechoic rooms (FAR) are unacceptable.

- (1) CISPR 32, edition 2.0.

Disturbance voltage at mains ports

The disturbances emitted from the mains port of the telecom-center equipment should be measured using the test site and test method specified in the applicable standards listed below. Here, Artificial mains network (AMN), which meets CISPR16-1-2 clause 4.2 for AC and meets CISPR16-1-2 clause 4.4 for DC, shall be applied.

- (1) CISPR 32, edition 2.0.
- (2) CISPR 16-1-2, edition 2.0

Disturbance voltage (current) at telecommunication ports

The disturbances emitted from the telecommunication ports of the telecom-center equipment should be measured using the test site and test method specified in the applicable standards listed below.

- (1) CISPR 32, edition 2.0.