Standardization Activities on EMC for Telecommunication in ITU-T SG5

Yuichiro Okugawa, Yasuhiro Honma, and Kazuhiro Takaya

Abstract

The NTT Group participates in the development of electromagnetic compatibility (EMC)-related standards as part of its effort to provide safe and secure telecommunication services. This article reports on the latest standardization activities on EMC for telecommunication. Specifically, it presents an overview of the first meeting of ITU-T SG5 (International Telecommunication Union, Telecommunication Standardization Sector, Study Group 5) in its new study period (2013–2016), including details of discussions held.

Keywords: EMC, ITU-T, standardization

1. Introduction

The NTT Group aims to enhance the quality and reliability of telecommunication services and has therefore defined an internal standard on electromagnetic compatibility (EMC) called *Requirements for EMC of Telecommunication Systems*, which specifies technical requirements that must be met in formulating specifications for the development or procurement of telecommunication systems (**Fig. 1**). The technical requirements for EMC define permissible values of electromagnetic interfering waves radiated by telecommunication systems, requirements for resistance to overvoltages generated by electromagnetic interfering waves from other systems, lightning, etc., and test methods related to these requirements. These requirements conform to international standards on IT (information technology) systems or telecommunication systems defined by the IEC (International Electrotechnical Commission), CISPR (International Special Committee on Radio Interference), and ITU-T (International Telecommunication Union, Telecommunication Standardization Sector). Therefore, activities in these international standardization organizations greatly affect the quality and reliability of telecommunication services provided by the NTT Group. This article introduces international standardization activities related to EMC, particularly the activities of ITU-T.

2. Overview of ITU-T SG5 WP1/WP2

ITU-T is headquartered in Geneva, Switzerland and issues recommendations in the field of telecommunications. ITU-T has ten Study Groups (SGs). Recommendations on EMC are developed by SG5 (Environment and climate change). SG5 consists of three Working Parties (WPs), of which WP1 (Damage prevention and safety) and WP2 (Electromagnetic fields: emission, immunity, and human exposure) are working on standards related to EMC.

In the current study period (2013–2016), WP1 and WP2 are addressing the questions shown in **Fig. 2**. The first meeting of SG5 was held in Geneva from January 29 to February 7, 2013. Discussions held on these questions in the first meeting are introduced below.

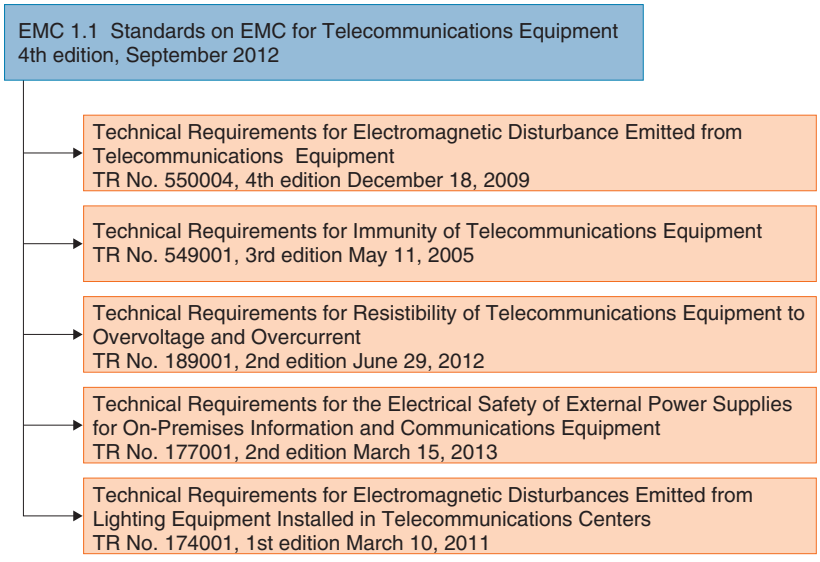


Fig. 1. NTT Group's requirements related to EMC in telecommunication equipment.

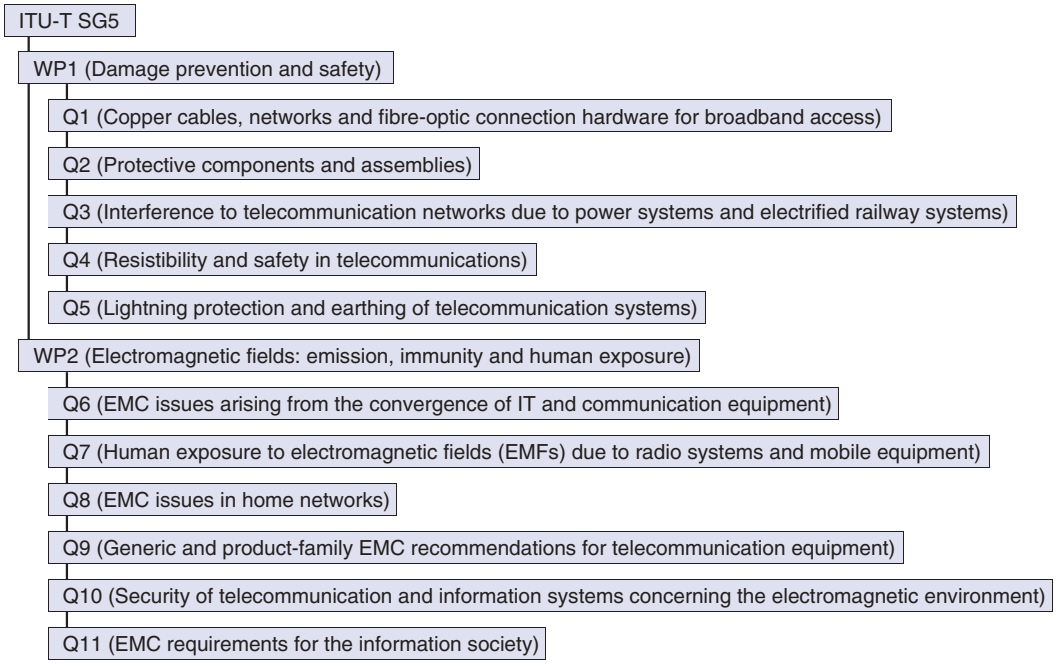


Fig. 2. Questions (Qs) discussed by WPs 1 and 2.

2.1 Discussions in WP1

WP1 is studying how to protect telecommunication systems from overvoltages generated by lightning and other sources, and from electromagnetic interference due to electromagnetic induction from power systems, electrified railway systems, and other sources. In particular, in view of the fact that reports of lightning damage have begun to come from areas that

have conventionally seldom been hit by lightning and that the extent of damage from localized lightning has been increasing in recent years owing to global climate change, WP1 is studying new and additional recommendations to protect telecommunication systems from overvoltages generated by lightning.

Discussions on each question are summarized below.

Question 2 concerns test methods, requirements, and methods of use related to components and assemblies that protect against overvoltage such as fuses, varistors, surge arresters, and transformers. In the current study period, WP1 is focusing on developing recommendations on the basis of K.appl4, a new draft recommendation on the application of isolation transformers in telecommunication systems, and K.LIT, a new draft recommendation on requirements for isolation transformers.

In the first meeting, in order to advance discussions on K.appl4, NTT proposed a method of increasing the dielectric strength of telecommunication systems by using isolation transformers in both the telecommunication system and the associated power supply system. Whether the proposed method should be included in the new proposed recommendation will be discussed at the next meeting. China proposed a surge protective device (SPD) to be applied to 400-V direct current (DC) systems. Discussions on this proposal will continue in subsequent meetings.

Question 3 relates to the issue of how to protect telecommunication systems from electromagnetic induction from power systems and electrified railway systems, and the safety of workers in the event of ground faults. In the first meeting, NTT submitted the results of an experiment on measuring the voltage that rises in the metallic tension member of an optical fiber cable when a ground fault occurs in the power line. It was decided to study the need for protection from such voltages. At the next meeting, a questionnaire will be distributed to collect information about such cases in other countries. Greece submitted a contribution concerning protective measures taken when installing telecommunication devices at the tops of poles. It was decided to study this issue under a new draft recommendation, K.tup.

Under Question 4, WP1 studies requirements for overvoltage resistibility at interfaces of telecommunication systems that are installed in telecommunication centers, outdoors, or in customers' premises, methods of protection against overvoltage, and electrical safety. WP1 also keeps existing relevant ITU-T recommendations up to date. In the first meeting, NTT submitted a contribution that reports on the results of an overvoltage test in which high-voltage pulse transformers were used to raise the overvoltage resistibility at the Ethernet port of devices connected to a home network. The contribution showed that an overvoltage resistibility of 7 kV can be provided at the Ethernet port. This has given Japan a strong position to drive the discussion on Ethernet ports with the aim of developing an overvoltage protection guide and a new draft recommendation K.lit (Question 2) at the next meeting.

Question 5 addresses methods of risk management related to lightning protection and the earthing of telecommunication systems. At the first meeting it was agreed to study during this study period the earthing of 400-V DC systems, a new draft recommendation, K.dbs, concerning lightning protection of power transformers near wireless base stations, and lightning protection of concrete poles installed near wireless repeater stations to protect these stations from lightning. At the next meeting, we will submit a proposal on the earthing of 400-V DC systems based on studies done by ETSI (European Telecommunications Standards Institute).

2.2 Discussions in WP2

WP2 is studying emissions from telecommunication systems and devices, immunity to such emissions, and protection against human exposure to electromagnetic fields. Owing to the widespread use in recent years of electrical appliances and power converters that use inverter control to save energy, there is an increasing number of reports of telecommunication failures caused by electromagnetic disturbance waves at low frequencies (up to 150 kHz), which are problems not covered by existing ITU-T recommendations. WP2 will study EMC problems that arise from such electromagnetic disturbance waves, discuss new draft recommendations, and revise existing recommendations as necessary. The main questions that WP2 is discussing are introduced below.

Question 6 concerns EMC problems that arise from the mutual use of telecommunication networks by different providers, which has resulted from the liberalization of telecommunication policies, and the maintenance of existing relevant recommendations. At the first meeting it was agreed to study the new draft recommendation, K.eun, which addresses methods of estimating the leakage of broadband signals from cables and which had been discussed in the previous study period (2009–2012), and to treat it as a

draft revision to the existing recommendation, K.60 (Emission levels and test methods for wireline telecommunication networks to minimize electromagnetic disturbance of radio services). Similarly, WP2 decided to discuss the new draft recommendation, K.mit, which is intended to define methods of reducing the effects on next-generation access systems, as draft revisions to K.58 (EMC, resistibility and safety requirements and guidance for determining responsibility under co-located telecommunication installations) and K.59 (EMC, resistibility and safety requirements and procedures for connection to unbundled cables).

Question 7 deals with human exposure to electromagnetic fields near antennas of radio systems and mobile equipment. WP2 is studying methods and procedures for estimating, calculating, and measuring electric field strength. In the first meeting, a rapporteur proposed a revised version of the software program for calculating equivalent isotropically radiated power (attached to the existing recommendation, K.52: Guidance on complying with limits for human exposure to electromagnetic fields (EMFs)), and a revised version of the software program for calculating the EMF (attached to the existing recommendation, K.70: Mitigation techniques to limit human exposure to EMFs in the vicinity of radiocommunication stations). WP2 approved the addition of these revised programs to the Appendix of each of these recommendations.

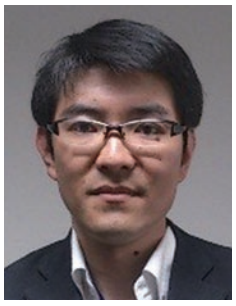
Question 8 covers immunity specifications, overvoltage and electrical safety specifications, and electromagnetic environments for communication devices that make up a home network. The first meeting included a discussion of the policy for revising the existing recommendation, K.74 (EMC, resistibility, and safety requirements for home network devices). Additionally, a new draft recommendation, K.mhn (Version 3) was studied, which concerns how to mitigate disturbances caused by radio signals in cables or devices connected to broadband cables. WP2 agreed to develop a recommendation on the basis of K.mhn by collecting further information about cases of interference between CATV (community access television) and wireless devices, which are referred to in the Appendix to K.mhn, and by exchanging information with ITU-R.

Question 9 relates to the study of EMC specifications for new telecommunication equipment and services, and the maintenance of existing relevant recommendations. In the first meeting, NTT submitted cases of telecommunication service failures caused by a sub-150-kHz conducted disturbance wave emitted by inverters. The meeting participants recognized the need to specify emission immunity in sub-150-kHz frequency bands, and they agreed to develop a new recommendation on this subject. In addition, NTT reported on the results of its tests of a radiation immunity testing method. This method assumes the use of wireless devices near telecommunication systems, and it was studied in order to meet the growing demand for using wireless devices in NTT's telecommunication equipment rooms. The meeting agreed to incorporate this issue in revising the existing recommendation, K.80 (EMC requirements for telecommunication network equipment (1 GHz–6 GHz)).

Question 10 focuses on issues pertaining to the electromagnetic security of telecommunication systems. WP2 is studying methods of protecting electronic systems from the electromagnetic effects of HEMP (high altitude electromagnetic pulse) and HPEM (high power electromagnetic) attacks, and measures to prevent information leaks in attacks that take advantage of electromagnetic properties. At the first meeting, a new draft recommendation, K.secmiti (Version 3) was discussed, which has been developed since the previous study period. It defines a method of mitigating threats to electromagnetic security. WP2 agreed to incorporate NTT-developed technology for preventing information leaks via electromagnetic waves as one of the countermeasures.

3. Conclusion

This article introduced standardization activities in ITU-T SG5 WP1/WP2. The main issues to be addressed in this study period are the development of new recommendations to prevent lightning-derived failures of telecommunication systems and finding solutions to new EMC problems arising from a conducted disturbance wave emitted by inverters, along with the revision of existing recommendations. These are important issues for telecommunication services in Japan, so NTT will be active in submitting proposals, thereby contributing to solving EMC problems. NTT will also enhance the quality and reliability of telecommunications by incorporating useful test methods and countermeasure technologies adopted in ITU recommendations into its technical requirements.



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