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SERIES K: PROTECTION AGAINST INTERFERENCE

**Techniques to mitigate interference between
radio devices and cable or equipment
connected to wired broadband networks and
cable television networks**

Recommendation ITU-T K.106

ITU-T

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Techniques to mitigate interference between radio devices and cable or equipment connected to wired broadband networks and cable television networks

Summary

Recommendation ITU-T K.106 describes techniques used to mitigate the effects of interference between radio devices used in the home and cable or equipment connected to wired broadband networks and cable television networks. With the advancement of household appliances, many widely used devices are now connected to home networks. This Recommendation introduces the relevant electromagnetic compatibility (EMC) requirements applicable to wired home network devices, and feasible solutions to resolve EMC problems caused by the use of radio devices in proximity to other wired network equipment.

History

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Cables, home network, interference, wireless.

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Introduction

Along with advances in radio communication technologies, possible interference between home-use radio devices and telecommunication devices, such as cable or equipment connected to wired broadband networks and cable television networks are new phenomena. Interference to cabling or devices falls under the responsibility of ITU-T, whereas the interference between two (or more) radio devices falls under the responsibility of ITU-R. Such problems may occur in the field, especially in a home environment. This Recommendation provides guidance on how to solve problems arising from these kinds of phenomena by taking measures to reduce the interference and to ensure normal operating conditions of wired telecommunication equipment. Guidance on mitigation measures against radio devices is not provided in this Recommendation.

Recommendation ITU-T K.106

Techniques to mitigate interference between radio devices and cable or equipment connected to wired broadband networks and cable television networks

1 Scope

This Recommendation provides guidance to solve interference problems in home networking environments between radio devices and the cable or equipment connected to wired broadband networks and/or cable television networks. It also presents appropriate measures to be applied to the cable and the equipment connected to wired broadband networks and/or cable television networks for solving the interference and procedures to address these troubles in the field.

The scope of this Recommendation focuses on procedures to identify the cause of interference problems in the home, and mitigation measures for the equipment or cabling needed to solve these problems. Mitigation techniques for the radio devices and interference problems between multiple radio devices are outside the scope of this Recommendation.

Necessary electromagnetic compatibility (EMC) requirements for the equipment are given by relevant international standards, such as: [ITU-T K.74], [ITU-T K.93], [ITU-T K.37], [ITU-T K.43], [ITU-T K.48] and [IEC CISPR 22]. Moreover, interference related to power line communication (PLC) is outside the scope of this Recommendation, which is already covered by [ITU-T K.60].

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.

- [ITU-T J.142] Recommendation ITU-T J.142 (2000), *Methods for the measurement of parameters in the transmission of digital cable television signals*.
- [ITU-T K.34] Recommendation ITU-T K.34 (2003), *Classification of electromagnetic environmental conditions for telecommunication equipment – Basic EMC Recommendation*.
- [ITU-T K.37] Recommendation ITU-T K.37 (1999), *Low and high frequency EMC mitigation techniques for telecommunication installations and systems – Basic EMC Recommendation*.
- [ITU-T K.43] Recommendation ITU-T K.43 (2009), *Immunity requirements for telecommunication network equipment*.
- [ITU-T K.48] Recommendation ITU-T K.48 (2006), *EMC requirements for telecommunication equipment – Product family Recommendation*.
- [ITU-T K.60] Recommendation ITU-T K.60 (2008), *Emission levels and test methods for wireline telecommunication networks to minimize electromagnetic disturbance of radio services*.
- [ITU-T K.74] Recommendation ITU-T K.74 (2008), *EMC, resistibility and safety requirements for home network devices*.

- [ITU-T K.92] Recommendation ITU-T K.92 (2012), *Conducted and radiated electromagnetic environment in home networking*.
- [ITU-T K.93] Recommendation ITU-T K.93 (2012), *Immunity of home network devices to electromagnetic disturbances*.
- [ITU-T MTIM] ITU-T Handbook (2008), *Mitigation measures for telecommunication installation – Part 1*. ITU-T, Geneva.
- [IEC 61000-2-5] IEC TR 61000-2-5 (2011), *Electromagnetic compatibility (EMC) – Part –2-5: Environment – Description and classification of electromagnetic environments*.
- [IEC 60728-2] IEC 60728-2 (2010), *Cable networks for television signals, sound signals and interactive services – Part 2: Electromagnetic compatibility for equipment*.
- [IEC 60728-12] IEC 60728-12 (2001), *Cabled distribution systems for television and sound signals – Part 12: Electromagnetic compatibility of systems*.
- [IEC CISPR 22] IEC CISPR 22 (2008), *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*.
- [IEC CISPR 24] IEC CISPR 24 (2010), *Information technology equipment – Immunity characteristics – Limits and methods of measurement*.
- [IEC CISPR 32] IEC CISPR 32 (2015), *Electromagnetic compatibility of multimedia equipment –Emission requirements*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 cable television [ITU-T J.142]: Communication systems that distribute broadcast and non-broadcast signals, as well as a multiplicity of satellite signals originating programming and other signals by means of coaxial cable and/or optical fibre.

3.1.2 home network device [ITU-T K.74]: A home network device is an electronic/electric equipment whose primary function is the distribution of data within the home, between the network termination point and one or more terminal devices.

3.1.3 shielding effectiveness [ITU-T K.43]: For a given external source, the ratio of electric or magnetic field strength at a point before and after the placement of the shield in question.

3.2 Terms defined in this Recommendation

This Recommendation defines the following term:

3.2.1 radio device: A device, whose primary function is the transmission or reception of data by using radio waves in order to communicate with other devices; it does not require any physical wires for transmitting data to, or receiving data from, other devices.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AC	Alternating Current
ADSL	Asymmetric Digital Subscriber Line
BS	Broadcasting satellite
CMC	Common-Mode Choke

CS	Communication satellite
DC	Direct Current
DSL	Digital Subscriber Line
DVB	Digital Video Broadcasting
EM	Electromagnetic
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
HD	High Definition
IF	Intermediate Frequency
IMT	International Mobile Telecommunication
NGN	Next Generation Network
PC	Personal Computer
PE	Protective Earth
PLC	Power Line Communication
PSTN	Public Switched Telephone Network
RF	Radio Frequency
RFI	Radio Frequency Interface
STB	Set Top Box
VoIP	Voice over Internet Protocol

5 Conventions

None.

6 Issues to be considered in this Recommendation

6.1 Background and problems

With the widespread use of home networks, radio devices, including both new and conventional systems, could be used in close proximity to network cable or devices in the home. Thus, there is a possibility that new EMC problems may occur in the field. One concern is possible interference between radio devices, such as international mobile telecommunication (IMT) user equipment and cable or equipment connected to wired broadband networks and cable television networks. This may occur due to the lack of appropriate installation, such as faulty connections, damaged cables, overly close proximity of devices, etc. Therefore, part of this issue falls under EMC problems and requires necessary mitigation techniques. Key issues are to provide methodologies for preventing possible interference between devices and for providing appropriate measures to be applied to the equipment or cable connected to wired broadband and cable television networks.

For example, if the connection between a coaxial cable and its connector does not have sufficient electrical contact, then it may cause interference to wired broadcasting systems, radio devices or vice versa. Examples of these phenomena in the field are given in Appendices I and III. Therefore, an urgent issue is to take into consideration problems caused by wired broadband networks and cable television network installations.

The area covered in this Recommendation is given in Figure 6-1. Interference into radio devices falls under the responsibility in ITU-R.

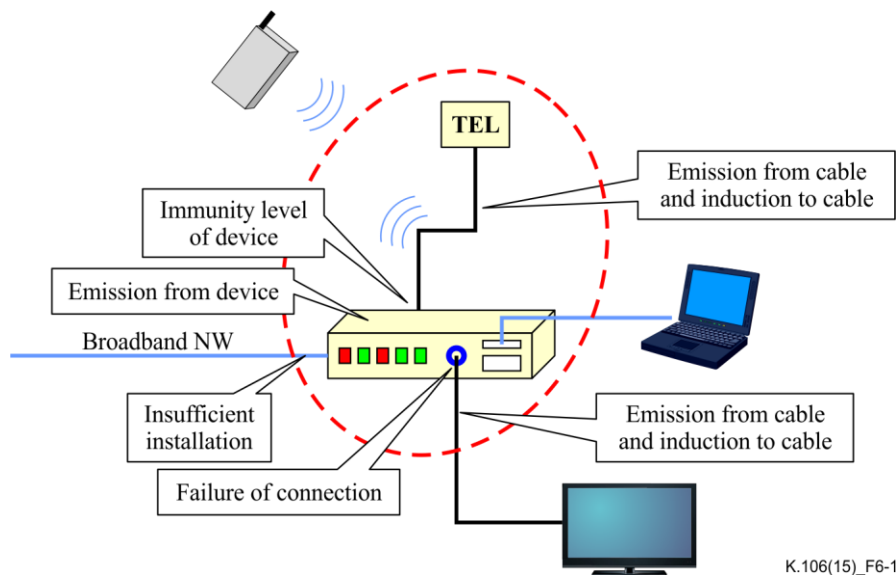


Figure 6-1 – Area covered in this Recommendation

7 Relevant requirements

7.1 Relevant EMC standards for devices

Devices considered in this Recommendation should comply with relevant international standards, such as: [ITU-T K.74], [IEC CISPR 22], [IEC CISPR 24], [IEC CISPR 32], [IEC 60728-2] and [IEC 60728-12]. If devices do not comply with these standards, the devices shall be tested and checked for their EMC performances.

7.2 Regional regulations

In some regions or countries, there are regulations related to interference due to the coexistence of wired telecommunication and radio communication systems. These regional or national regulations should be checked before surveying an interference case between wired telecommunications and radio communications. Examples of these regulations, especially for cable television networks, are given in Appendix II.

8 Guidance to identify and address interference

8.1 Procedure to identify interference sources

8.1.1 Flowchart

The procedure to reduce interference is shown in the flowchart in Figure 8-1. An interference case is dependent on the surrounding conditions, e.g., the number of devices, the electromagnetic (EM) environment and the distance from the antenna of the radio devices. Therefore, users of this Recommendation should take these conditions into account.