

I n t e r n a t i o n a l   T e l e c o m m u n i c a t i o n   U n i o n

**ITU-T**

TELECOMMUNICATION  
STANDARDIZATION SECTOR  
OF ITU

**K.87**

(06/2016)

SERIES K: PROTECTION AGAINST INTERFERENCE

---

## **Guide for the application of electromagnetic security requirements – Overview**

Recommendation ITU-T K.87



# Recommendation ITU-T K.87

## Guide for the application of electromagnetic security requirements – Overview

### Summary

General guidelines of information security management for telecommunications organizations are presented in Recommendation ITU-T X.1051, which is based on ISO/IEC 27001 and ISO/IEC 27002. In an information security management system (ISMS) based on Recommendation ITU-T X.1051, physical security is a key issue, as shown for example in the following text presented in Recommendation ITU-T X.1051:

"a site whose environment is least susceptible to damage from strong electromagnetic field shall be selected for communication centres; where a site is chosen that is exposed to strong electromagnetic fields, appropriate measures should be taken to protect telecommunications equipment rooms with electromagnetic shields;"

"controls should be adopted to minimize the risk of potential physical threats, e.g., theft, fire, explosives, smoke, water (or water supply failure), dust, vibration, chemical effects, electrical supply interference, communications interference, electromagnetic radiation, and vandalism[.]"

When security is managed considering the quoted passages, the threat to equipment or site should be evaluated and mitigated. The threat is related to "vulnerability" and "confidentiality" in ISMS.

This Recommendation, Recommendation ITU-T K.87, outlines electromagnetic security risks of telecommunication equipment and illustrates how to assess and prevent those risks, in order to manage ISMS in accordance with Recommendation ITU-T X.1051. Major electromagnetic security risks addressed in this Recommendation are as follows:

- natural electromagnetic (EM) threats (e.g., lightning);
- unintentional interference (i.e., electromagnetic interference, EMI);
- intentional interference (i.e., intentional electromagnetic interference, IEMI);
- deliberate EM attacks via high-altitude electromagnetic pulse (HEMP);
- deliberate high-power electromagnetic (HPEM) attacks;
- information leakage from EM emanation (i.e., electromagnetic security, EMSEC);
- mitigation methods against electromagnetic security threats.

### History

| Edition | Recommendation | Approval   | Study Group | Unique ID*                                                                |
|---------|----------------|------------|-------------|---------------------------------------------------------------------------|
| 1.0     | ITU-T K.87     | 2011-11-13 | 5           | <a href="http://handle.itu.int/11.1002/1000/11426">11.1002/1000/11426</a> |
| 2.0     | ITU-T K.87     | 2016-06-29 | 5           | <a href="http://handle.itu.int/11.1002/1000/12878">11.1002/1000/12878</a> |

### Keywords

Electromagnetic emanation security, EMSEC, high-altitude electromagnetic pulse, HEMP, high-power electromagnetic, HPEM, IEMI, information leakage.

\* To access the Recommendation, type the URL <http://handle.itu.int/> in the address field of your web browser, followed by the Recommendation's unique ID. For example, <http://handle.itu.int/11.1002/1000/11830-en>.

## 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.....                                 | 2    |
| 3 Definitions .....                               | 4    |
| 3.1 Terms defined elsewhere .....                 | 4    |
| 3.2 Terms defined in this Recommendation.....     | 5    |
| 4 Abbreviations and acronyms .....                | 6    |
| 5 Conventions .....                               | 6    |
| 6 Protection from electromagnetic phenomena ..... | 7    |
| 6.1 Lightning .....                               | 7    |
| 6.4 High-power electromagnetic .....              | 10   |
| 6.5 Information leakage .....                     | 12   |
| Bibliography.....                                 | 16   |



# Recommendation ITU-T K.87

## Guide for the application of electromagnetic security requirements - Overview

### 1 Scope

This basic Recommendation presents guidance on the management of physical security concerned with electromagnetic interference and/or emanation, for telecommunications centre managers to implement the information security management system (ISMS) requirements of Recommendation [ITU-T X.1051]. The relationship between [ITU-T X.1051] and this Recommendation is shown as Figure 1.

There are two primary categories on the electromagnetic security.

One is high-power electromagnetic interference, either natural (such as lightning) or deliberate (malicious EM attack) that causes damage and disruption for telecommunication centre equipment such as switching, transmission, radio and power.

Another is information leakage from unintentional emanations of telecommunication equipment such as servers, computers and transmission equipment, which process or carry information. There is the possibility that a malicious and sophisticated eavesdropper could reconstruct significant information from intercepted emanations.

Table 1 shows some EM security problems, categorized by EM phenomena, discussed in this Recommendation. Also shown are the relevant Recommendations for each security problem and their mitigation techniques.

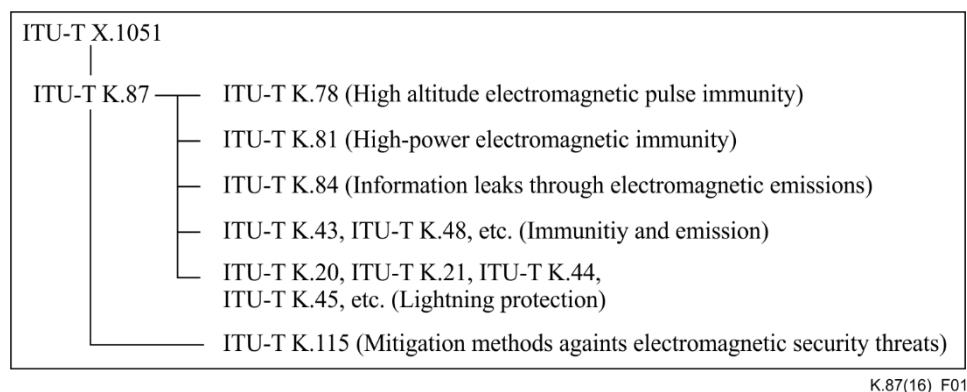


**Figure 1 – The relationship between security Recommendations**

**Table 1 – EM security problems considered in this Recommendation**

| Phenomena                                                                                                                                                       |                        | Category of security problem | Relevant ITU-T Recommendation                                |               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------------------------------|--------------------------------------------------------------|---------------|
|                                                                                                                                                                 |                        |                              | Requirements                                                 | Mitigation    |
| EMI                                                                                                                                                             | Intentional EMI (IEMI) | HEMP                         | [ITU-T K.78]                                                 | [ITU-T K.115] |
|                                                                                                                                                                 |                        | HPEM                         | [ITU-T K.81]                                                 |               |
|                                                                                                                                                                 | Natural EMI            | Immunity and emission        | [ITU-T K.43], [ITU-T K.48], etc.                             |               |
|                                                                                                                                                                 |                        | Lightning protection         | [ITU-T K.20], [ITU-T K.21], [ITU-T K.44], [ITU-T K.45], etc. |               |
| Information leakage                                                                                                                                             |                        | EMSEC                        | [ITU-T K.84]                                                 |               |
| EMI: Electromagnetic interference<br>HEMP: High-altitude electromagnetic pulse<br>HPEM: High-power electromagnetic<br>EMSEC: Electromagnetic emanation security |                        |                              |                                                              |               |

This Recommendation is a guide for the application of [ITU-T K.78] (HEMP), [ITU-T K.81] (HPEM), [ITU-T K.84] (information leakage) [ITU-T K.115] (mitigation method) and K series Recommendations on lightning protection.

This Recommendation represents an overview of electromagnetic security; it classifies the environments where devices and equipment in need of protection are installed, and classifies predicted threats and vulnerabilities as well as countermeasures.

## 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 K.20] Recommendation ITU-T K.20 (2015), *Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents*.
- [ITU-T K.21] Recommendation ITU-T K.21 (2015), *Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents*.
- [ITU-T K.40] Recommendation ITU-T K.40 (1996), *Protection against LEMP in telecommunications centres*.
- [ITU-T K.43] Recommendation ITU-T K.43 (2009), *Immunity requirements for telecommunication network equipment*.
- [ITU-T K.44] Recommendation ITU-T K.44 (2012), *Resistibility tests for telecommunication equipment exposed to overvoltages and overcurrents – Basic Recommendation*.
- [ITU-T K.45] Recommendation ITU-T K.45 (2015), *Resistibility of telecommunication equipment installed in the access and trunk networks to overvoltages and overcurrents*.
- [ITU-T K.48] Recommendation ITU-T K.48 (2006), *EMC requirements for telecommunication equipment – Product family Recommendation*.
- [ITU-T K.78] Recommendation ITU-T K.78 (2009), *High altitude electromagnetic pulse immunity guide for telecommunication centres*.
- [ITU-T K.81] Recommendation ITU-T K.81 (2014), *High-power electromagnetic immunity guide for telecommunication systems*.
- [ITU-T K.84] Recommendation ITU-T K.84 (2011), *Test methods and guide against information leaks through unintentional electromagnetic emissions*.
- [ITU-T K.115] Recommendation ITU-T K.115 (2015), *Mitigation methods against electromagnetic security threats*.
- [ITU-T X.1051] Recommendation ITU-T X.1051 (2008) | ISO/IEC 27011:2008, *Information technology – Security techniques – Information security management guidelines for telecommunications organizations based on ISO/IEC 27002*.
- [CISPR 22] CISPR 22 (2008), *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*.

- [IEC 61000-1-5] IEC 61000-1-5 (2004), *Electromagnetic compatibility (EMC) – Part 1-5: General – High power electromagnetic (HPEM) effects on civil systems.*
- IEC 61000-2-9] IEC 61000-2-9 (1996), *Electromagnetic compatibility (EMC) – Part 2: Environment – Section 9: Description of HEMP environment – Radiated disturbance. Basic EMC publication.*
- [IEC 61000-2-10] IEC 61000-2-10 (1998), *Electromagnetic Compatibility (EMC) – Part 2-10: Description of HEMP environment – Conducted disturbance.*
- [IEC 61000-2-11] IEC 61000-2-11 (1999), *Electromagnetic Compatibility (EMC) – Part 2-11: Classification of HEMP environments.*
- [IEC 61000-4-20] IEC 61000-4-20 (2010), *Electromagnetic compatibility (EMC) – Part 4-20: Testing and measurement techniques – Emission and immunity testing in transverse electromagnetic (TEM) waveguides.*
- [IEC 61000-4-23] IEC 61000-4-23 (2000), *Electromagnetic Compatibility (EMC) – Part 4-23: Test methods for protective devices for HEMP and other radiated disturbances.*
- [IEC 61000-4-24] IEC 61000-4-24 (1997), *Electromagnetic Compatibility (EMC) – Part 4: Testing and Measurement Techniques – Section 24: Test methods for protective devices for HEMP conducted disturbance – Basic EMC publication.*
- [IEC 61000-4-25] IEC 61000-4-25 (2015), *Electromagnetic compatibility (EMC) – Part 4-25: Testing and measurement techniques – HEMP immunity test methods for equipment and systems.*
- [IEC 61000-4-32] IEC 61000-4-32 (2002), *Electromagnetic Compatibility (EMC) – Part 4-32: Testing and measurement techniques – High-altitude electromagnetic pulse (HEMP) simulator compendium-First Edition.*
- [IEC 61000-4-33] IEC 61000-4-33 (2005), *Electromagnetic compatibility (EMC) – Part 4-33: Testing and measurement techniques – Measurement methods for high power transient parameters.*
- [IEC 61000-5-3] IEC TR 61000-5-3 (1999), *Electromagnetic compatibility (EMC) – Part 5-3: Installation and mitigation guidelines – HEMP protection concepts.*
- [IEC 61000-5-4] IEC TS 61000-5-4 (1996), *Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation guidelines – Section 4: Immunity to HEMP – Specifications for protective devices against HEMP radiated disturbance – Basic EMC publication.*
- [IEC 61000-5-5] IEC 61000-5-5 (1996), *Electromagnetic compatibility (EMC) – Part 5: Installation and mitigation guidelines – Section 5: Specification of protective devices for HEMP conducted disturbance – Basic EMC publication.*
- [IEC 61000-5-7] IEC 61000-5-7 (2001), *Electromagnetic compatibility (EMC) – Part 5-7: Installation and mitigation guidelines – Degrees of protection provided by enclosures against electromagnetic disturbances (EM code).*
- [IEC 61000-6-6] IEC 61000-6-6 (2003), *Electromagnetic compatibility (EMC) – Part 6-6: Generic standards – HEMP immunity for indoor equipment.*
- [ISO/IEC 27001] ISO/IEC 27001 (2013), *Information technology – Security techniques – Information security management systems – Requirements.*