

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.39

(11/2019)

SERIES K: PROTECTION AGAINST INTERFERENCE

Risk assessment of damages to telecommunication sites due to lightning discharges

Recommendation ITU-T K.39

Recommendation ITU-T K.39

Risk assessment of damages to telecommunication sites due to lightning discharges

Summary

Protective measures against a randomly occurring overvoltage phenomenon like lightning discharges have to a great extent been empirically based. Modern equipment has shown to be more prone to damages compared with older ones. Serious consequences in complexed communication systems may also occur in built-up areas, earlier classified as unexposed. The widespread use of radio stations with high antenna masts for wireless telecommunication has significantly increased the risk for damages due to direct lightning strikes to the site.

The need for protection should be based on a risk assessment considering the cost and importance of the system, the electromagnetic environment at the particular site and the probability of damages. The protection levels and the type of protective methods should also be chosen regarding the costs of installation and maintenance of protective devices.

An assessment of the probability of overvoltage occurrences and the sensitivity of the existing telecommunication installation shall give a possibility to attain a well-balanced protection of the whole system.

Protective measures to eliminate severe injuries to people during thunderstorms are especially important at exposed sites that are permanently or temporarily manned.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T K.39	1996-10-18	5	11.1002/1000/3877
2.0	ITU-T K.39	2019-11-13	5	11.1002/1000/14068

Keywords

Coupling, lightning discharge, risk assessment, telecommunication sites.

* 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 2019

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.....	1
3	Definitions	1
5	General.....	1
6	Coupling mechanisms.....	2
6.1	Resistive coupling	2
6.2	Magnetic coupling	2
6.3	Electric coupling.....	2
6.4	Electromagnetic coupling.....	2
7	Principles for the risk assessment	3
7.1	Frequency of damage, F	3
7.2	Risk of damage, R	4
8	Calculation of risk areas	4
9	Estimation of probability factors p	6
10	Consequential damage factor d.....	8
11	Acceptable risk levels, R_{accept}	9
	Appendix I – Example – Risk assessment of damages to a telecommunication site with an adjacent antenna mast	10
	Bibliography.....	13

Recommendation ITU-T K.39

Risk assessment of damages to telecommunication sites due to lightning discharges

1 Scope

This Recommendation comprises a method for the risk assessment of damages to equipment at telecommunication sites and personnel safety due to overvoltages and overcurrents caused by lightning discharges.

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 (2019), *Resistibility of telecommunication equipment installed in a telecommunication centre to overvoltages and overcurrents*.
- [ITU-T K.21] Recommendation ITU-T K.21 (2019), *Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents*.
- [ITU-T K.27] Recommendation ITU-T K.27 (2015), *Bonding configurations and earthing inside a telecommunication building*.
- [IEC 62305-1] IEC 62305-1:2010, *Protection against lightning – Part 1: General principles*.

3 Definitions

This Recommendation defines the following terms.

3.1 surge protective device (SPD): A device that is intended to limit transient overvoltages and divert surge currents. It contains at least one non-linear component.

3.2 subscriber line circuit (SLIC): A printed circuit board containing subscriber line functions and placed in an exchange at the interface to the external telecommunication lines.

4 Conventions

None.

5 General

Telecommunication centres and other information systems contain large amounts of electronic equipment sensitive to lightning discharges. Unprotected sites may be damaged by cloud to ground flashes at a distance of several kilometres. Interferences may even be caused by intracloud discharges.

The risk of damages depends on a number of factors, among which the following are the more important:

- type of incoming services, especially power supply and telecommunication cables;