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Guidance on safety relating to the use of surge protective devices and surge protective components in telecommunication terminal equipment

Recommendation ITU-T K.143

ITU-T

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Guidance on safety relating to the use of surge protective devices and surge protective components in telecommunication terminal equipment

Summary

Requirements on bridging between primary circuit and protective earth by a surge protective device (SPD) in equipment are described in clause 5.5.7 of [IEC 62368-1]. However, [IEC 62368-1] does not take into consideration the lightning voltage, which is larger than that appearing in the conditions considered in overvoltage category II, and it does not provide the requirements necessary for lightning protection of class II equipment without earthing in which bridging by SPD/surge protective components (SPCs) is usually applied.

It is necessary to clarify the electrical requirements for SPDs/SPCs in order to realize both resistibility and safety of telecommunication systems. Recommendation ITU-T K.143 analyses the influence on human safety of lightning measures bridging across insulation by SPDs. Recommendation ITU-T K.143 provides guidance for design of lightning protection and requirements of SPDs from the human safety standpoint. Requirements for SPDs/SPCs in multiservice surge protective devices (MSPDs) external to the equipment and SPDs installed on lines in a building lie outside the scope of this Recommendation.

History

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Introduction

Requirement on bridging between primary circuit and protective earth by SPD in equipment is described in clause 5.5.7 of [IEC 62368-1]. However, the standard does not take into consideration lightning voltage which is larger than that considered in overvoltage category II, and it does not provide the requirements necessary for lightning protection of class II equipment without earthing in which bridging by SPD/SPCs is usually applied.

It is necessary to clarify the electrical requirements for SPDs/SPCs to achieve both resistibility and safety of telecommunication systems. This Recommendation analyses influence of lightning measures including bridging by SPDs on human safety. This Recommendation gives guidance for design of lightning protection and requirements of SPDs from the human safety standpoint.

Recommendation ITU-T K.143

Guidance on safety relating to the use of surge protective devices and surge protective components in telecommunication terminal equipment

1 Scope

This Recommendation provides guidance on how to ensure the safety of construction and maintenance personnel as well as customers of telecommunication systems in customer buildings and access networks when surge protectors are installed in telecommunication equipment.

The safety of persons on access metallic lines, in-home lines and terminal equipment lies within the scope. The requirements for surge protective devices/surge protective components (SPDs/SPCs) in multiservice surge protective devices (MSPDs) external to the equipment and SPDs installed on lines in building lie outside the scope of this Recommendation, as does equipment in telecommunication centres and outdoor network equipment operating by remote or local power feeding.

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.21] Recommendation ITU-T K.21 (2019), *Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents*.
- [ITU-T K.64] Recommendation ITU-T K.64 (2016), *Safe working practices for outside equipment installed in particular environments*.
- [ITU-T K.68] Recommendation ITU-T K.68 (2008), *Operator responsibilities in the management of electromagnetic interference by power systems on telecommunication systems*.
- [ITU-T K.98] Recommendation ITU-T K.98 (2014), *Overvoltage protection guide for telecommunication equipment installed in customer premises*.
- [IEC 60364-4-44] IEC 60364-4-44:2007:+AMD1:2015+AMD2:2018, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*.
- [IEC 60479-1] IEC 60479-1:2018, *Effects of current on human beings and livestock – Part 1: General aspects*.
- [IEC 61643-11] IEC 61643-11:2011, *Low-voltage surge protective devices – Part 11: Surge protective devices connected to low-voltage power systems – Requirements and test methods*.
- [IEC 62368-1] IEC 62368-1:2018, *Audio/video, information and communication technology equipment – Part 1: Safety requirements*.

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 class I equipment [IEC 62368-1]: Equipment with basic insulation used as a basic safeguard, and with protective bonding and protective earthing used as a supplementary safeguard.

3.1.2 class II equipment [IEC 62368-1]: Equipment in which protection against electric shock does not rely on basic insulation only, but in which a supplementary safeguard is provided, there being no provision for protective earthing or reliance upon installation conditions.

3.1.3 class III equipment [IEC 62368-1]: Equipment in which protection against electric shock relies upon supply from ES1 and in which ES3 is not generated.

3.1.4 TT power distribution system [b-ITU-T K.44]: A TT power distribution system has one point directly earthed, the parts of the equipment required to be earthed being connected at the user premises to earth electrodes that are electrically independent of the earth electrodes of the power distribution system.

3.1.5 IT power distribution system [b-ITU-T K.44]: An IT power system is isolated from earth, except that one point may be connected to earth through an impedance or a voltage limiter. The parts of the equipment to be earthed are connected to earth electrodes at the user premises.

3.2 Terms defined in this Recommendation

This Recommendation defines the following terms:

3.2.1 electrical energy source class 1, ES1: Class 1 electrical energy source with levels not exceeding ES1 limits under normal operating conditions and abnormal operating conditions that do not lead to a single fault conditions and not exceeding ES2 limits under single fault conditions of a basic safeguard.

NOTE 1 – ES1 may be accessible to an ordinary person. ES1 effects are; not painful on the body, but may be detectable and ignition of combustible materials not likely.

NOTE 2 – Paraphrased form the main body of [IEC 62368-1].

3.2.2 electrical energy source class 2, ES2: Class 2 electrical energy source with levels not exceeding ES2 limits under normal operating conditions, abnormal operating conditions, and single fault conditions, but is not ES1.

NOTE 1 – ES2 may be accessible to an instructed person. ES2 effects are; painful on the body, but not an injury Ignition of combustible materials possible, but limited growth and spread of fire.

NOTE 2 – Paraphrased form the main body of [IEC 62368-1].

3.2.3 electrical energy source class 3, ES3: Class 3 electrical energy source with one or more parameters exceeding ES2 limits

NOTE 1 – ES3 may be accessible to a skilled person. ES3 effects are; injury to the body and ignition of combustible materials likely with rapid growth and spread of fire.

NOTE 2 – Paraphrased form the main body of [IEC 62368-1].

3.2.4 TN-S power distribution system: Neutral earthed electrical supply system where, in part of the installation, the neutral conductor is also the protective earthing conductor, and in other parts there are separate neutral and protective earthing conductors.

NOTE – Based on the definition of "TN-S" in [b-ITU-T K Sup.7].

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms: