28th International Conference on Lightning Protection

Topic X: Lightning Protection and Lightning Testing Standards Moderator's Report

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I. Introduction

There are 12 papers for that session. This session is mostly dedicated to application of standard to real cases. Some contributions are trying to show difficulties to apply international rules to specific regional concerns or complexities coming from various standards dealing with same topics but with conflicting requirements. The other papers are dealing with new field or new approach to be discussed in future in standard organisations.

II. Application of Standard

X-2 "*Discussion on TOV test of voltage switching type SPD specified by IEC 61643-1*"

This papers shows that SPDs tested as per IEC 61643-1 can create safety hazard in Chinese installation due to the fact that some tests (Temporary OverVoltage tests) does not represent local situation encountered in China. TOV duration and current magnitude are far greater in China that they are considered in IEC. Especially switching type SPD are found to be tested in a not appropriate way regarding failure mode by IEC. This paper is good food for the revision of IEC 61643-1. **It is important that IEC can take this into account in order to cover application for a large number of application in the world.**

X-3 "*A review of the current test methodologies for surge protective devices - a comparison of IEC and UL test methods*"

This paper intends to show the difference between UL (mainly a safety standard) and IEC SPD standards (both safety and performance). Even if UL tends to adopt a lot of IEC requirements and terms there are still big difference. For example UL includes loss of neutral in its concerns when this is deliberately outside IEC SPD standard scope. There is also the suppression of Imax (even if this is also considered in IEC at the moment). **This paper is a key for understanding US practice regarding SPDs testing and could be useful inside IEC working groups which are currently revising SPDs standards.**

X-5 "*Lightning Protection Guides of Power Systems in Japan*"

Criepi has published three guides related to protection of power systems. They are used in Japan as standards for transmission, distribution lines and substations.

These new guides includes new data related to Japan situation such as use of lightning location systems instead of keraunic level or recorded lightning current distribution. Damages of surge arresters due to winter lightning conditions are also included in the guides. **This could be an interesting document for both CIGRE and IEC.**

X-6 "*Standards for Lightning Protection in Telecommunication Systems and Issues for its Application in Japan*"

This paper deals with a similar subject:
applicability of international standard (IEC and ITU) to Japan. Telecom equipments were well protected until new generation of equipment including telecom and power ports appears. Japan has implemented a lot of the IEC standards but surge protection, especially on the power port, is not mandatory by law. This means that big voltages are generated coming from the unprotected power port or due to ground potential rise when surge current flow through telecom port protection. This means that resistibility should

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be higher when no adequate protection is provided. A solution called by-pass SPD mixing power SPD, telecom SPD and bonding between the two networks, is a good solution. It can be implemented in a multi-services SPD even if the standard are not describing such devices in details. The problem of sensitivity of the RCDs to surge is also discussed. **This problem could be discussed in IEC 37A WG3 where multi-service SPDS have been introduced and RCD withstand is a real concern.**

X-9 "*Development of a 3D Lightning Protection Diagnosis System*"

This paper presents a software allowing to describe a structure (either in details through the CAD files or more simply through dimensions of the building). Then the software can determined parts of the building which need to be protected or which are protected using angle method, mesh method or rolling sphere. The software can be used by non experts. **Such a software is helpful and shows how the standards can lead to simple applications, even if at the end of the day, an expert needs to validate the complete protection scheme.**

X-12 "*A comparison of surge requirements for telecommunication equipment signal ports of EN300386, GR-1089-CORE and ITU-T K series*"

This paper discusses the problem faced my manufacturers regarding the opening of the worldwide market and is based on experience in China. There are common testing requirements but also in some cases strong differences amongst various EMC rules and standard namely the EU directives, the US ones and the ITU standards. This is particularly the case for the surge testing of equipment ports. The authors concentrate on the telecom port of such equipments. According to the authors the EMC tests related to CE marking are easy to pass and my still lead to failure in practice. The other tests are more severe but are using up to 6 different surge test waveshapes and this is found to be difficult to handle. It is then proposed to use less surge waveshapes and also to try harmonizing the requirements. **There is a need for future work to achieve this.**

III. NEED FOR STANDARD IMPROVEMENTS AND CLARIFICATIONS, NEW FIELDS AND NEW APPROACHES

X-1 "*Analysis of necessary separation distances for lightning protection systems including natural components*"

This paper revisits the concept of separation distance and compares the formula given in IEC standards and the value obtained by simulation using a well proven code. Reasonable agreement appears between the IEC formula and the calculation. The case of metal roof, excluded from IEC formula, is also calculated. **It seems necessary to include this work in the present revision of IEC 62305-3 standard**.

X-4 "*A probabilistic approach to the selection and location of protection measures against lightning overvoltages*"

This paper deals with the protective distance between an SPD (switching type) and equipment to be protected. Simulation is performed in order to show the influence of many parameters. First of all it appears that subsequent strokes are the more severe regarding protective distance. In addition, the induced voltage in the circuit needs to be superimposed to the well know phenomenon of travelling wave leading to double voltage in worse case. **This should be discussed in IEC standards which mainly either ignore this additional induced voltage or consider both phenomena as independent.**

X-7 "*Volt-time characteristics reproduction of MV line insulation under impulses similar to lightning induced overvoltages*"

This paper presents the results of the application of models based on disruptive effect concept, as proposed by Kind and modified by Chowdhuri, in order to reproduce the Volt - time to breakdown characteristics of MV insulators. Induced impulses have a short duration and the 1,2/4 waveshape has been used to simulate them. Fixing the onset value at 50% of critical breakdown voltage, the models give good agreement with experimental results. **This matter is very important for insulation coordination.**

X-8 "*Connection Components of the Lightning Protection System Tested Using an Infrared Camera*"

It is proposed in that paper that the infrared camera technique is used to assess the quality of connector and especially of the contact resistance. Tests have shown that it is possible, by using the technique used in power engineering, to conclude about the quality of the contact. This is important for lightning protection components, which are used outside and are submitted to corrosion and aging. **Such a method should be discussed inside the Cenelec working group dealing with components.**

X-10 "*Broken Mechanism of Straight Cu Conductors due to Lightning High Impulse Current*"

This paper studies the effect of impulse current on straight copper wire of small dimensions (1 mm diameter or below) It shows that breakdown can be obtained not only by joule effect but also by mechanical stress on the conductor. For diameter greater than 0,4 mm the mechanical damage is predominant to the Joule effect. **The test could be extended to larger dimensions and stronger impulses and be submitted to the European working group dealing with such components and tests**.

X-11 "*A Coupling/decoupling Network for Lightning Surge Test in High-speed Communication Lines*"

This papers deals with influence of the coupling/decoupling network (CDN) on surges transmitted to equipment under test (EUT for high speed networks). The CDN itself proved to be satisfactory but it appears that grounding of EUT affects greatly the result (three cases

have been studied no direct grounding, grounding via a 300 Ω resistance and grounding direct to ground). **These results should be shared with ITU experts.**