INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

K.20

Amendment 1
(11/2004)

SERIES K: PROTECTION AGAINST INTERFERENCE

Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents

Amendment 1: New Appendix I – Floating transverse power induction and earth potential rise test for ports connected to external symmetric pair cables

ITU-T Recommendation K.20 (2003) – Amendment 1

ITU-T Recommendation K.20

Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents

Amendment 1

New Appendix I – Floating transverse power induction and earth potential rise test for ports connected to external symmetric pair cables

Source

Amendment 1 to ITU-T Recommendation K.20 (2003) was agreed on 12 November 2004 by ITU-T Study Group 5 (2005-2008).

FOREWORD

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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.

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ITU-T Recommendation K.20

Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents

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New Appendix I – Floating transverse power induction and earth potential rise test for ports connected to external symmetric pair cables

I.1 Introduction

A network operator replaced earlier concentrators with a new type of access nodes in 1999-2000. Although the line cards of the new nodes passed all the tests of K.20, also the enhanced level tests, a large number of line cards were damaged in the field in 2000-2002. The damaged component was generally the subscriber line integrated circuit (SLIC). After three years of intensive study and testing, similar damage could be reproduced in laboratory conditions. The protection on the line card was amended to allow the card to pass also this new test. After applying the new protection to line cards in the field, the number of damaged SLICs was reduced by more than 95% in 2003 and 2004.

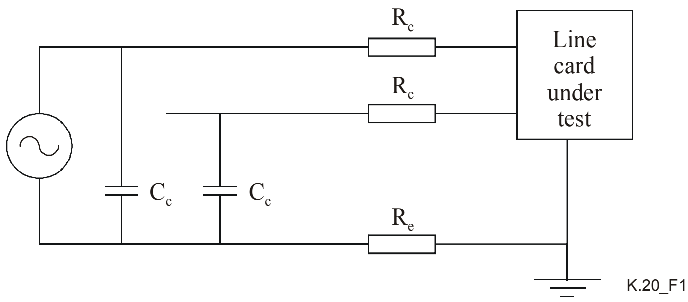
This appendix gives some background information and specifies a simple test method additional to those specified in Table 2b. In the case described above, this test repeatedly caused the damage in ports with the original protection.

Because the reason for this type of coupling is not completely understood, the test method is not included in the main text of ITU-T Rec. K.20. Manufacturers and operators can apply this test using their discretion.

I.2 Discussion on the reason for the damages

As described in clause I.3, a power frequency test voltage is applied transversally between a and b when both of them are floating. This differs from the transverse test of Table 2b where either a or b is connected to the earth(ed frame of the EUT). The transverse test of Table 2b simulates the situation where one of the primary protectors in front of the EUT operates and the other does not.

Theoretically, a power frequency voltage of 100…200 V would hardly appear in a subscriber loop as a result of induction. There certainly should be some kind of connection to earth somewhere in the loop to have such a relatively high voltage between a and b. We suspect that this connection could be an operation of a gas discharge tube at the subscriber end of the line as a result of power frequency earth potential rise. An attempt to simulate such a case was done by testing the line card in a set-up shown in Figure I.1.



Coupling resistors R_c represent the line resistances, C_c represent the line capacitances to earth and R_c represents the earthing resistance of the overvoltage protectors at the subscriber end of the line.

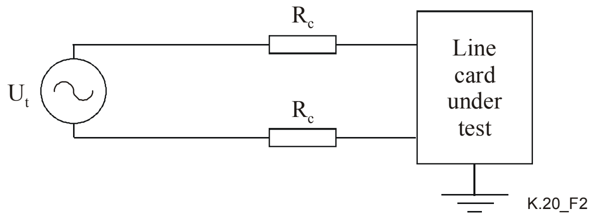
Figure I.1/K.20 – Test set-up for a line card in a telecom centre to simulate earth potential rise at the subscriber end

The damage could be reproduced with certain values of the coupling components of Figure I.1 but not with $R_e = 0$. This strengthens the understanding that the damages have something to do with phenomena along the line.

The most simple way to reveal a port's sensitivity to being damaged for this reason is the floating test described below.

I.3 Test set-up and test voltages

The floating transverse test set-up is shown in Figure I.2. This is easily realized, for example, with an isolation transformer if the test generator is originally earthed. The duration of the test voltage may be, for example, 300 ms, and the coupling resistors, e.g., 100…200 Ω. The test voltage is gradually increased over the operation threshold of the secondary protection. In the case described in clause I.1 the port was repeatedly damaged, e.g., at 145 V test voltage with $R_c = 140\ \Omega$.



Special test protectors may be used in front of the line card under test if the test is extended to higher voltages.

Figure I.2/K.20 – Test set-up for floating power induction and earth potential rise

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