SLOVENSKI STANDARD

SIST EN 50289-1-9:2002

01-september-2002

Communication cables - Specifications for test methods - Part 1-9: Electrical test methods - Unbalance attenuation (longitudinal conversion loss, longitudinal conversion transfer loss)

Communication cables - Specifications for test methods -- Part 1-9: Electrical test methods - Unbalance attenuation (longitudinal conversion loss, longitudinal conversion transfer loss)

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Kommunikationskabel - Spezifikationen für Prüfverfahren -- Teil 1-9: Elektrische Prüfverfahren - Unsymmetriedämpfung (Unsymmetriedämpfung am nahen und am fernen Ende)

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Câbles de communication - Spécifications des méthodes d'essai -- Partie 1-9: Méthodes d'essais électriques - Affaiblissement de disymétrie (perte de conversion longitudinale, perte de transfert de conversion longitudinale)

Ta slovenski standard je istoveten z: **EN 50289-1-9:2001**

ICS:

33.120.20	Ģice in simetriļ ni kabli	Wires and symmetrical cables

SIST EN 50289-1-9:2002 **en**

2003-01.Slovenski inštitut za standardizacijo. Razmnoževanje celote ali delov tega standarda ni dovoljeno.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50289-1-9

November 2001

ICS 33.120.20

English version

Communication cables - Specifications for test methods Part 1-9: Electrical test methods - Unbalance attenuation (longitudinal conversion loss, longitudinal conversion transfer loss)

Câbles de communication -
Spécifications des méthodes d'essai
Partie 1-9: Méthodes d'essais électriques -
Affaiblissement de disymétrie
(perte de conversion longitudinale, perte de transfert de conversion longitudinale)

Kommunikationskabel -
Spezifikationen für Prüfverfahren
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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 46X, Communication cables.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50289-1-9 on 2001-05-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2002-05-01
- latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2004-04-01

This European Standard has been prepared under the European Mandate M/212 given to CENELEC by the European Commission and the European Free Trade Association.

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1 Scope

Part 1-9 of EN 50289 details the test methods to determine the attenuation of converted common mode signals into differential mode signals due to balance characteristics of cables used in analogue and digital communication systems by using the transmission measurement method. The terms related to this attenuation are defined in 3.1, 3.2 and 3.3.

It is to be read in conjunction with Part 1-1 of EN 50289, which contains essential provisions for its application.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

EN 50289-1-1	2001	Communication cables – Specifications for test methods - Part 1-1: Electrical test methods - General requirements
EN 50290-1-2 [1]		Communication cables - Part 1-2: Definitions

3 Definitions

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For the purposes of this European Standard, the definitions of EN 50290-1-2 apply in addition to the following ones.

3.1
unbalance attenuation

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the unbalance attenuation is the logarithmic ratio of the differential mode power (transmission signal of a balanced pair) to the common mode power (signal in the pair to ground/earth unbalanced circuit)

The unbalance attenuation is measured at the near and at the far end.

In reference to common screening effectiveness definitions, the unbalance attenuation is described by the logarithmic ratio of the differential mode power to the common mode power in a matched system:

$$a_u = 10 \times \log_{10} \left| \frac{P_{differential\ mode}}{P_{common\ mode}} \right| = 20 \times \log_{10} \left| \frac{U_{differential\ mode}}{U_{common\ mode}} \right| + 10 \times \log_{10} \left(\frac{Z_{unbal}}{Z_{bal}} \right)$$

$P_{differential\ mode}$ = differential mode power in the balanced circuit
$P_{common\ mode}$ = common mode power in the unbalanced circuit
$U_{differential\ mode}$ = differential mode voltage in the balanced circuit
$U_{common\ mode}$ = common mode voltage in the unbalanced circuit
Z_{bal} = characteristic impedance of the balanced circuit
Z_{unbal} = characteristic impedance of the unbalanced circuit

3.2
longitudinal conversion loss (LCL)
the longitudinal conversion loss (LCL) is defined in ITU-G.117 as the logarithmic ratio of the common mode injected signal at the near end to the resultant differential signal at the near end of a balanced pair. LCL is equal to unbalance attenuation at near end when the CUT is terminated with the same impedances as defined for unbalance attenuation measurement

[1] At draft stage.

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3.3
longitudinal conversion transfer loss (LCTL)
the longitudinal conversion transfer loss (LCTL) is defined in ITU-G.117 as the logarithmic ratio of the common mode injected signal at the near end to the resultant differential signal at the far end of a balanced pair. LCTL is equal to unbalance attenuation at far end plus the attenuation of the CUT, when the CUT is determinated with the same impedances as defined for unbalance attenuation measurement

4 Test method

4.1 Equipment

1) Network analyser
2) Two baluns transformer with a centre tap:
   balanced port: nominal impedance of the CUT
   unbalanced port: nominal impedance of the analyser or generator
   balance: 10 dB better than the specified value of the cable

NOTE Where the centre tap impedance is low, care should be taken calculating the result.

3) Time domain reflectometer (optional)
4) Metal drum: big enough to hold 100 m of unscreened cables in one layer for measurement.

As an alternative to a network analyser, a generator and vector voltmeter may be used.

4.2 Test sample

The ends of the CUT shall be prepared such that when connected to the terminals of the test equipment the twisting of the pairs/quads is maintained. The CUT shall have a length of 100 m ± 1 m.

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4.3 Procedure

4.3.1 Calibration procedure

In a first step, the composite loss of the connecting coaxial cables, which are used at the measuring procedure, between generator/receiver and baluns shall be measured over the whole specified frequency range.

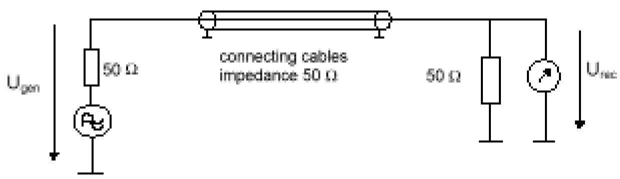

Figure 1 - Principle

$$a_{cable} = 20 \times \log_{10} \left| \frac{U_{gen}}{U_{rec}} \right|$$

In a second step, the composite loss of the balun shall be measured over the whole specified frequency range. Therefore two equal baluns are connected together. The connection of the baluns to the generator and receiver shall be done with the cables from the measurement described above. The connection between the two baluns shall be done with negligible loss.

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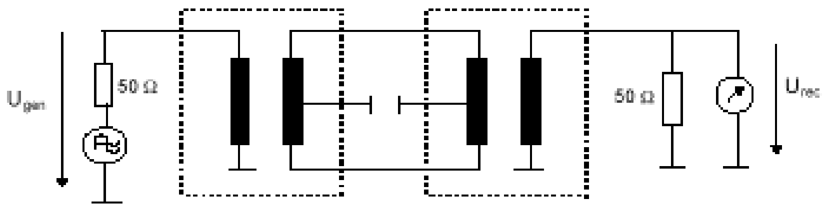

Figure 2 - Composite loss of balun measurement

$$a_{balun} = \frac{1}{2}\left(20 \times \log_{10}\left|\frac{U_{gen}}{U_{rec}}\right|\right) - a_{cable}$$

4.3.2 Measuring procedure

All pairs/quads of the cable shall be measured at both ends of the CUT. The unbalance attenuation shall be measured over the whole-specified frequency range and at the same frequency points as for the calibration procedure. The measurement is done under matched conditions in the differential mode (balanced) circuit and also in the common mode (unbalanced) circuit. Therefore, normally, a suitable resistor must be connected in parallel or series to the input resistance of the receiver. If a series resistor is used the additional attenuation shall be taken into account.

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The pairs that are not measured shall be connected to the screen/ground at both ends of the cable.

The impedance of the common mode circuit Z_{unbal} shall be measured either with a time domain reflectometer (TDR) or a network analyser.

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The two cores of the pair are connected together at both ends and the impedance is measured between these cores and the cable screen or metal drum for unscreened cables.

4.3.3 Screened cables

The baluns are connected to the CUT. The screen of the CUT has to be terminated properly to ground at both ends.

The set-up shall be optimised such that the mismatch between the measuring ports and the sample is minimised.

4.3.4 Unscreened cables

The CUT shall be wound tightly around the metal drum in one layer. The distance between the windings should be at least the diameter of the cable. The metal drum shall be grounded by fixing the baluns to the drum.

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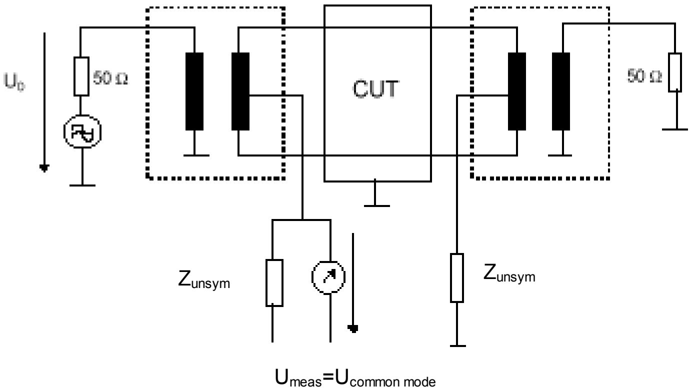

Figure 3 - Near end measurement

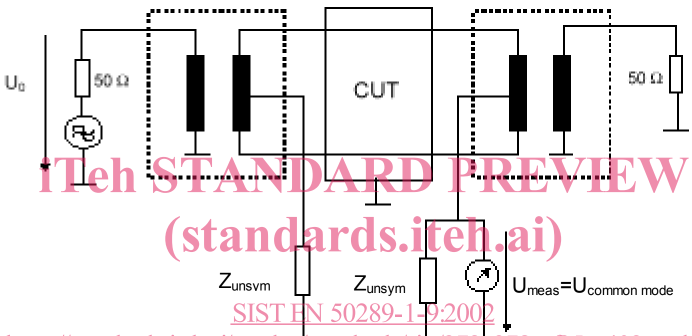

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Figure 4 - Far end measurement

$$a_{meas} = 20 \times \log_{10} \left| \frac{U_0}{U_{meas}} \right|$$

5 Expression of test results

The voltage ratio of a balun is given by:

$$a_{ratio} = 20 \times \log_{10} \left| \frac{U_{\sec}}{U_{prim}} \right| = 10 \times \log_{10} \left(\frac{Z_{\sec}}{Z_{prim}} \right) - a_{balun}$$

U_{sec} = voltage at the secondary side of the balun ($U_{differential\ mode}$)
U_{prim} = voltage at the primary side of the balun
Z_{sec} = impedance at the secondary side of the balun (Z_{sym})
Z_{prim} = impedance at the primary side of the balun (Z_0)
a_{balun}(f) = composite loss of the balun measured at calibration procedure