



ISO/IEC JTC 1/SC 25/WG 3 N 739B

Date: 2005-02-18

Replaces ISO/IEC JTC 1/SC 25/WG 3 N 739A

ISO/IEC JTC 1/SC 25/WG 3
Customer Premises Cabling
Secretariat: Germany (DIN)

DOC TYPE: Liaison reports
TITLE: Liaison letter from ISO/IEC/JTC 1/SC 25/WG 3 to IEEE 802.3, on present status of a Technical Report on qualification of installed cabling for 10GBASE-T, and on an Amendment to ISO/IEC 11801 that includes channels specified up to 500 MHz and 1 GHz
SOURCE: WG 3
PROJECT: 25.03.02.02: Generic cabling systems for customer premises
STATUS: Liaison report as developed by correspondence.
ACTION ID: FYI
DUE DATE: N/A
REQUESTED ACTION: To IEEE 802.3 for consideration TO SC 25/WG 3 for information.
A response to the this liaison report is welcome any time as it will support work done by correspondence that shall develop a detailed answer to the question of IEEE 802.3 not later than at the next meeting of SC 25/WG 3, 2005-09-26/30, in Oxford, UK
MEDIUM: Def
No of Pages: 7 (including cover page)

DISTRIBUTION:

Members of JTC 1/SC 25/WG 3, see N 721	IEC Central Office, Mr Barta
JTC 1 Secretariat, Mrs Rajchel	DKE, Hr Wegmann
JTC 1/SC 6 Sec Ms J. Lee	JTC 1/SC 25 Chair Dr. Zeidler
JTC 1/SC 25 Sec Dr. von Pattay	JTC 1/SC 25/WG 1 Conv/Sec Wacks/Schoechele
JTC 1/SC 25/WG 4 Conv/Sec Mr Robinson	IEC TC 46 Chair, Sec Prof Halme
I IEC SC46A Chair/Sec Prof. Halme, Mr Thompson	IEC SC46A/WG 2 Convener, Mr Perrot
IEC SC 46C Chair/Sec, Brüggendieck/ Mr de Sainte Marie	IEC TC 48 Chair/Sec/Liaison Weking/Freedman/Joynes
IEC TC 48B Chair/Sec Mr Joynes/Mr Toran	IEC TC 65 Chair/Sec Mr A. C. Capel /Mr Dumortier
IEC SC 65C Chair/Sec/liais Mr Capel/ Mr Dumortier/Mr Gilmore	IEC TC 86 Chair/Sec Rossi, Mr Matthews
IEC/SC 86A Chair/Sec/Liaison Mr Zeidler/Mr Perrot/Swanson	IEC TC 86B Chair/Sec/liaison Mr Lefevre/ Mr Sugita/Bolhaar
IEC/CISPR SC I Chair/Sec/Liaison Wright/ Okazaki/Bech	CENELEC TC 205 Chair/Sec Mr König/Mr Tretter
CENELEC TC 215 Chair/Sec/Liais Roche/Wegmann/Gilmore	ETSI Mr Ochel, Mrs Laverack
IEEE 802 Chair/Liaison Mr. Nikolich/Mr. Flatman	IEEE 802.3 Chair/Liaison Mr Grow/Mr Flatman
IEEE 802.11 Chair Mr Kerry,	IEEE 802.15 Mr Heile
IEEE 1394 Mr P. Johansson	ATM Forum, Chair/Liaison Mr Townsend, Mr Ortkrass

Secretary - ISO/IEC JTC 1 / SC 25/WG 3 - Dr.-Ing. Walter P. von Pattay
ZVEI FV 7 & FV 8, Gotthelfstraße 24, D- 81677 München, Germany
Tel.: +49/89/923 967 57, Tfx.: +49/89/923 967 59 (on request only)
EM: Walter@Pattay.com

Ftp address SC 25: "ftp.iec.ch", login: "sc25mem", password: see SC 25 N 791
Home page SC 25: "http://www.iec.ch/sc25"

ISO/IEC JOINT TECHNICAL COMMITTEE 1
SUBCOMMITTEE No. 25: INTERCONNECTION OF INFORMATION TECHNOLOGY
EQUIPMENT

WORKING GROUP 3: CUSTOMER PREMISES CABLING
INDUSTRIAL PREMISES TASK GROUP

**Liaison letter from ISO/IEC/JTC 1/SC 25 to IEEE 802.3, on
present status of
a Technical Report on qualification of installed cabling for 10GBASE-T, and
an Amendment to ISO/IEC 11801 that includes channels specified up to
500 MHz and 1 GHz**

To: Bob Grow; Chair, IEEE 802.3 (bgrow@ieee.org)
Cc: Brad Booth; Chair, IEEE P802.3an Task Force (bbooth@ieee.org)
From: ISO/IEC JTC 1/SC 25/WG 3 Customer premises cabling
Date: 2005-01-24
Venue: developed by correspondence after Ixtapa, Mexico, January 2005
**Subject: present status of
a Technical Report on qualification of installed cabling for
10GBASE-T, and
an Amendment to ISO/IEC 11801 that includes channels
specified up to 500 MHz and 1 GHz**

Present status of New Work

ISO/IEC JTC 1/SC 25/WG 3 thanks IEEE 802.3 for the liaison letters (SC 25/WG 3 N 716, 730) that were considered at the meeting at Ixtapa, Mexico, 2005-01-10/14. SC 25/WG 3 acknowledges the request for input relating to closely grouped cables and PS AFEXT (SC 25/WG 3 document WG 3 N 730). With respect to the effects of temperature rise SC 25/WG 3 has given an interim response with document WG 3 N 738. For ANEXT and AFEXT please see below.

ISO/IEC JTC 1/SC 25/WG 3 is pleased to announce that the NWIP (see liaison report WG 3 N 711, 2004-07-03) on a Technical Report and on an Amendment to ISO/IEC 11801 was approved.

The Technical Report (TR) will define qualification of installed cabling for compliance with the 10GBASE-T channel requirements. The TR will specify the minimum performance of a channel that meets the requirements of 10GBASE-T, compare them with the minimum performance of channels specified in ISO/IEC 11801:2002 and provide guidance in cases where the requirements of 10GBASE-T exceed the minimum channel performance of ISO/IEC 11801 Class E. Such additional requirements are explained. A special chapter contains mitigation techniques.

The Amendment will extend the existing channel specifications and add new cabling channels that are specified up to 500 MHz and 1 GHz.

First working drafts (WD) for the TR and for the amendment are expected in May 2005.

Request for input

In support of the development of these WDs SC 25/WG 3 would highly appreciate input from IEEE 802.3 on the following:

In the current Draft D 1.2 of IEEE 802.3an it is mentioned that if the external noise into the channel is higher than the specified noise a reduction of length would still allow the system to work. SC 25/WG 3 works on simplified equations to define this proposed scaling (see Annex 1).

Please let us know if this still would work if powerbackoff is introduced.

In case it is of interest, SC 25/WG 3 could additionally provide IEEE 802.3 with implementation examples for different cablings. Please let us know about your preference.

SC 25/WG 3 could also share with IEEE 802.3 some investigations on Alien crosstalk. This issue is complex, specifically if one also considers alien FEXT. At the moment there are no specified measurement methods for installed systems, thus presently verification can only be done by design. The attached compressed presentation (See Annex 2) shows how SC 25/WG 3 started to address the issue. In case this does not cover the complexity of the issue to the needs of IEEE 802.3 SC 25/WG 3 would welcome further input. SC 25/WG 3 hopes to provide first results on alien crosstalk soon.

Annex 1:

Excerpt of the current draft of the technical report referring the interaction of insertion loss and ANEXT.

Channels

6.1 General

In this clause the requirements of IEEE 802.3an are stated together with the minimum channel performance of ISO/IEC 11801(edition 2)

Insertion loss and alien crosstalk

The insertion loss of each pair of a channel shall not exceed the limits computed, to one decimal place, using the formula of Table 1. The limits shown in Table 2 are derived from the formula at key frequencies only.

When required, the insertion loss of the channel shall be measured according to EN 50346.

Table 1 - Formula for insertion loss limits for a channel

Frequency MHz	Maximum insertion loss dB
$1 \leq f \leq 500$	$1,05 \times \left(1,82 \times \sqrt{f} + 0,0169 \times f + 0,25/\sqrt{f} \right) + 4 \times 0,02 \times \sqrt{f}$, 4,0 min

Table 2 - Insertion loss limits for a channel at key frequencies

Frequency (MHz)	1,0	16,0	100,0	250,0	500,0
Maximum insertion loss (dB)	4,0	8,3	21,7	35,9	53,4

The formula of Table 1 represents an extension to the Class E requirements of ISO/IEC 11801(edition 2)

In order to support 10GBASE-T the formula of Table 1 conforms to the Class F requirements of ISO/IEC 11801(edition 2).

Lower insertion losses are obtained on shorter channels or by using lower loss cables.

The allowable PSANEXT is inter-related to the insertion loss of the channel and is based upon the measured insertion loss at 250 MHz as detailed below.

The PSANEXT for each pair of a channel shall meet the limits computed, to one decimal place, using the formulae of Table 3. The limits shown in table 4 are derived from the formulae at key frequencies only.

The PSANEXT requirements shall be met at both ends of the cabling.

PSANEXT of pair k, $\alpha_{PSANEXT}(k)$, is computed from pair-to-pair ANEXT $\alpha_{ANEXT}(i,k)$ of the adjacent pairs i, $i = 1...n$, as follows:

$$\alpha_{PSANEXT}(k) = -10 \times \lg \sum_{i=1, i \neq k}^n 10^{-0,1 \times \alpha_{ANEXT}(i,k)} \quad (1)$$

where $\alpha_{ANEXT}(i,k)$ is the pair-to-pair ANEXT of pair k to adjacent pair i in dB

NOTE adjacent pairs are all the relevant pairs of other channels surrounding the channel pair

Table 3 - Formulae for PSANEXT limits for a channel

Frequency MHz	Minimum PSANEXT dB
$1 \leq f \leq 100$	$((28,6 + IL(250))/1,04) - 10 \lg(f/100)$
$100 < f \leq 500$	$((28,6 + IL(250))/1,04) - 15 \lg(f/100)$
Where IL(250) is channel insertion loss at 250 MHz	
Where IL(250) is less than 20,3 a value of 20,3 shall be used	

Table 4 - PSANEXT limits for a channel at key frequencies

Frequency (MHz)	Minimum PSANEXT dB				
	1,0	16,0	100,0	250,0	500,0
IL(250) ≤ 20,3 dB	67,0	55,0	47,0	41,1	36,5
IL(250) = 33,8 dB	80,0	68,0	60,0	54,0	49,5
IL(250) = 35,9 dB	82,0	70,0	62,0	56,1	51,5

Values of PSANEXT at frequencies for which the measured channel insertion loss is below 4,0 dB are for information only.

Annex 2: Compressed presentation

See following three pages.

IEEE PSANEXT Statements in D1.0, D1.1 and D1.2

- It is very difficult to compensate the unknown Alien Noise because it is external to the channel
 - 55.7.5 note f
- The indicated limit of PSANEXT will assure an adequate BER
 - 55.7.3.2.1

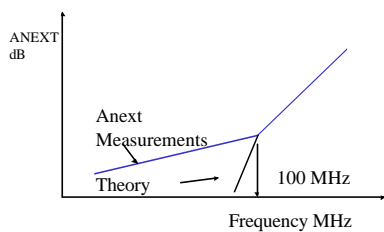
Schicketanz/Trösch SC 25 ISO/IEC WG3 1/2005

(A)NEXT

- For simplicity only cable
- statistical process
- $=Kn * f^{3/2} * (1-att^2)$
 - f frequency
 - att channel attenuation
- The att^2 part vanishes rapidly

Schicketanz/Trösch SC 25 ISO/IEC WG3 1/2005

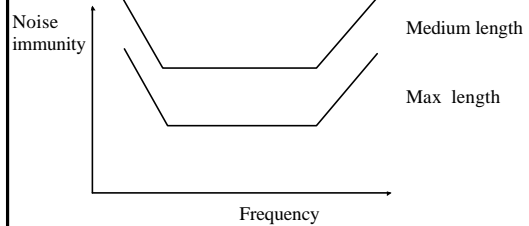
(A)NEXT



10 dB/dec < 100 MHz in phase coupling and other effects
 >100 MHz and > 10m of channel coupling no change anymore:
 nearly independent of coupling length

Schicketanz/Trösch SC 25 ISO/IEC WG3 1/2005

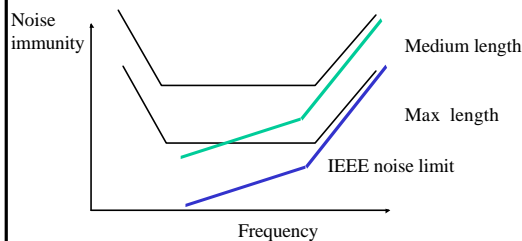
General Receiver Noise Immunity For Given BER



The slopes and corner frequencies are just general assumptions

Schicketanz/Trösch SC 25 ISO/IEC WG3 1/2005

General Receiver Noise Immunity For Given BER



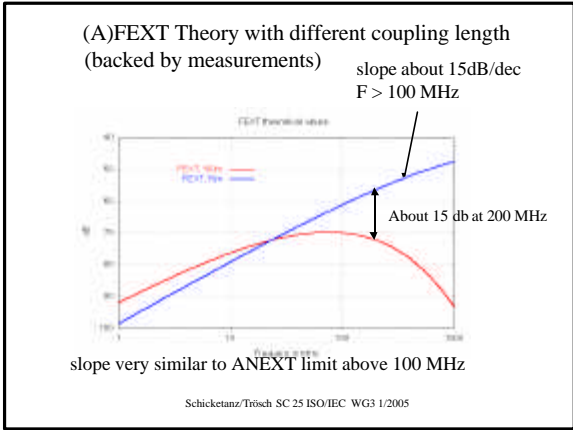
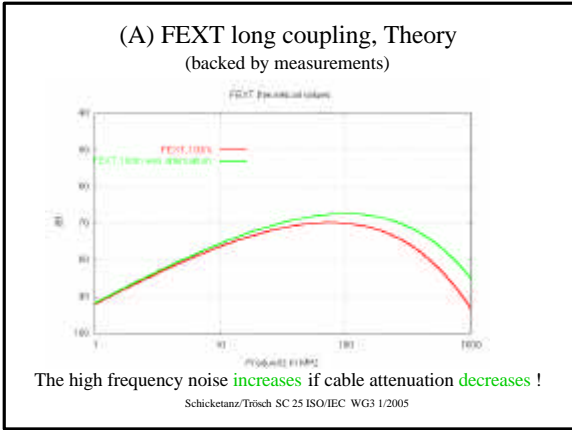
The PSANEXT limits for the 100m and 55m channels make sense

Schicketanz/Trösch SC 25 ISO/IEC WG3 1/2005

(A)FEXT

- Only cable
- Not statistical, couples trough 3rd elements
 - e.g.: pair > common mode > pair
 - if so could be improved by symmetry
- $=Kf * l * f^2 * att$
 - l length
 - f frequency
 - att channel attenuation

Schicketanz/Trösch SC 25 ISO/IEC WG3 1/2005



- (A)FEXT as function of cable coupling length
- As expected the low frequency noise **decreases** when length is shorter (proportional in dB of length)
 - but the harmful high frequency noise **increases**
- Schicketanz/Trösch SC 25 ISO/IEC WG3 1/2005

- Power Reduction Considerations
- Only the worst case of a short channel coupling completely to a long channel is considered
 - The cases of equal (or different) long channels with short length coupling are not considered as not so harmful
- Schicketanz/Trösch SC 25 ISO/IEC WG3 1/2005

Limit Margins for:
No Power Reduction, FEXT Limit **Short** coupling

Direction	short to long		long to short	
ANEXT	0	+	0	+
AFEXT	0	+	+	0
Position	A	C	A	B

0 at the limit, + margin, - fail

Schicketanz/Trösch SC 25 ISO/IEC WG3 1/2005

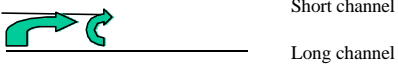
Limit Margins for:
With Power Reduction, FEXT Limit **Long** Length

	short to long		long to short	
ANEXT	+	+		
AFEXT	0	+		
Position	A	C	A	B

As expected: better

Schicketanz/Trösch SC 25 ISO/IEC WG3 1/2005

Limit Margins For:
With Power Reduction, FEXT Limit **Long** Length



End A B C

	short to long		long to short	
ANEXT			0	+
AFEXT			0 to -	-
Position	A	C	A	B

The long channel disturbs the short one at high frequencies because of short length coupling

Schicketanz/Trösch SC 25 ISO/IEC WG3 1/2005

Power Backoff

- Was proposed to decrease (A)FEXT noise created by short channels
- While this is true of short channels disturbing long channels, the opposite may fail the limit
- 1000 BASE T will disturb anyway
- As CENELEC and ISO channels are not length dependent, TDR for backoff calculation is not possible, only attenuation or S/N should be used

Schicketanz/Trösch SC 25 ISO/IEC WG3 1/2005