



HCS Newsletter

No. 54, Dated Friday, 06 January, 2006

HCS Category 6 UTP Channel Balance, Coupling Attenuation & EMC

One of the problematic issues concerning unshielded LAN cabling is the Electro-Magnetic Compatibility, better known as EMC.

The limits for **radiated emission** specified in FCC Part 15 and in the EU Directive (as specified in CENELEC EN 55022) for Class A (Commercial) and Class B (Residential) are similar.

The **radiated immunity** requirements specified in CENELEC EN 55024 are also divided into 2 sections:

(a) Residential & Light industrial areas where the noise signal strength is set to 3V/m.

(b) Heavy industrial areas where the noise signal strength is set to 10V/m.

High-quality UTP cabling can meet the immunity level of 3V/m signal but not the 10V/m signal.

High-quality shielded cabling can meet both.

The above EMC regulations require LAN cabling systems to be tested when attached to active components. In order to test the EMC of the de-embedded passive cabling components other tests must be utilized.

In January 2005 a paper linking the coupling attenuation of LAN cabling to its EMC performance in 3 major protocols was submitted to ISO/IEC JTC1/SC25/WG 3.

This paper provides solid technical evidence that coupling attenuation can be used to predict the EMC of the passive elements when used with complying (CE) active equipment transmitting Ethernet 10BASE-T, 100BASE-T and 1000BASE-T (Gigabit-Ethernet).

Minimum coupling attenuation required for Cabling Channels in order to meet the Immunity limits of EN55024 according to [ISO/IEC JTC1/SC25/WG3-025a](#)

Application	CA up to 30 MHz		CA up to 50 MHz		CA up to 100 MHz	
	10V/m	3V/m	10V/m	3V/m	10V/m	3V/m
10BASE-T	CA should be >54dB up to 500 KHz. No information available for higher frequencies.					
100BASE-T	60	50	56	46	50	40
1GBASE-T	60	50	56	46	50	40
10GBASE-T	Not yet specified					

10V/m is the specified signal strength for industrial environments.

3V/m is the specified signal strength for residential & office environments.

Based on the above, HCS Category 6 UTP DataLink 250 Channel was tested by DELTA-EC for coupling attenuation and was found to comply with the radiated emission limits of FCC Part 15 & EN 55022 for Class A & Class B and with the radiated immunity limits for light industrial and office areas (3V/m field) when used in Ethernet 10BASE-T, 100BASE-T and 1000BASE-T (Gigabit Ethernet).

The complete report is attached.

Sincerely,

Ergun Riza AKAN, Asst. General Manager

HCS is the No.1 Turkish supplier of high- performance fiber optic and twisted pair LAN Cabling Systems.



Test Report



Special testing of 100 ohm unshielded channel, Class E

Performed for HCS KABLOLAMA SISTEMLERI SAN.VE TIS.A.S.

DANAK-19J1508

Project no.: 312107-2

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20 December 2005

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Title Special testing of 100 ohm unshielded channel, Class E

Product description Category 6 UTP channel

Product identification Cords: T06-00401-XX (XX designates the length)
Horizontal cable: H06-00401
RJ 45 connecting hardware (keystone jack): J6E-00813 (3 pieces)

Report no. DANAK-19J1508

Project no. N312107-2

Test object received 1 December 2005

Test period 1 December 2005

Client HCS Kablolama Sistemleri San.Ve TIC.A.S.
Bankalar Cad. Ekas Han No:75-77 Karakoy
Istanbul
Turkey

Contact Ergun Akan

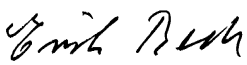
Specification EN 50289-1-6

Results Coupling attenuation = 48 dB

Prepared by Erik Bech

Reviewed by Claude Videt

Date 20 December 2005

Responsible 

Erik Bech, Test Manager
DELTA LAN Components and Systems Testing

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1. Summary

One communication channel has been subjected to a test for measurement of coupling attenuation.

The channel for this coupling attenuation test was assembled and delivered to DELTA by the client.

The channel testing has been performed under laboratory conditions at the European Cabling group of DELTA.

This report firstly gives a detailed description of the channels under test. Then the conclusion is given followed by the test results. At last an overview of the test procedures and applied standard are given.

2. Channel components

The channel was configured with keystone jacks for the wall outlet and consolidation point in the terminal end. One more keystone jack was used for the connector in the floor distributor end. There were one cord in each end and a length of cable (15 m) between the wall outlet and the consolidation point. A length of horizontal cable in the middle completed the channel.

Type designations of the test samples

Cords: T06-00401-XX (XX designates the length)

Horizontal cable: H06-00401

RJ 45 connecting hardware (keystone jack): J6E-00813 (3 pieces)

3. Conclusion

The measured coupling attenuation for the tested channel is 48 dB.

Below 100 MHz the coupling attenuation is better than 50 dB.

According to the report: Establishment of the needed electromagnetic performance of generic cabling for compliance with generic cabling (see clause 5.2 for the reference), this performance is adequate with EMC specifications for applications listed below:

EMC specifications:

Radiated emission EN 55022 class B and FCC part 15 class B

Radiated emission EN 55022 class A and FCC part 15 class A

Radiated immunity EN 55024 Residential and light industrial areas

Applications¹:

10Base-T

100Base-T

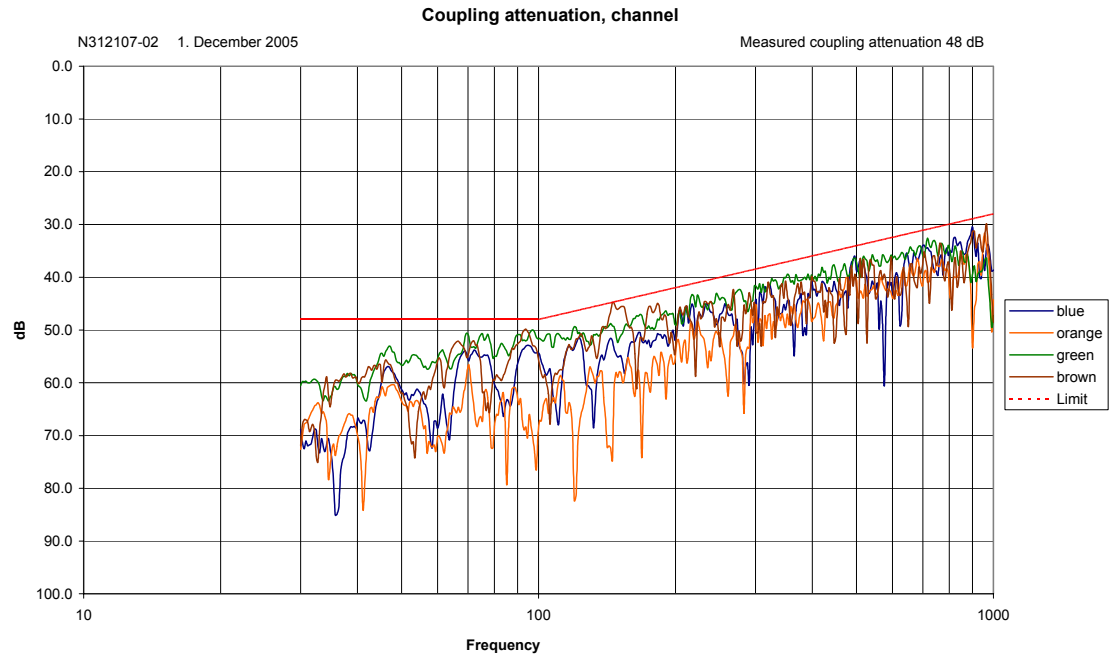
1000Base-T

EMC compliance of the complete system is only possible if compliance of the electronic equipment is verified according to the standards with application of unshielded cabling. (This means CE marked in Europe)

¹ These applications are investigated in the referenced document. Other applications, which use the lower part of the frequency spectrum may also comply.

4. Test results

4.1 Coupling attenuation



Equipment:

Network Analyser Hewlett Packard, type 8753E
Absorbing clamp Rohde & Schwarz, type MDS 21
Hybrid MA-COM, type H-1-4
Hybrid MA-COM, type H-1-4
Hybrid MA-COM, type H-1-4
Hybrid MA-COM, type H-1-4

Instrument no.: 31109
Instrument no.: 31097
Instrument no.: 31079
Instrument no.: 31080
Instrument no.: 31100
Instrument no.: 31148

5. Reference to applicable standards and documents

Test of the channel under test is performed with reference to the following standard:

5.1 Cable test standard

CENELEC EN 50289-1-15

Communication cables – Specifications for test methods-Part 1-15:Electromagnetic performance-Coupling attenuation of links and channels.

5.2 Expert contribution for JTC 1/SC 25/WG 3

WG 3 IXT025a, 13 January 2005. Establishment of the needed electromagnetic performance of generic cabling for compliance with generic cabling.

6. Test procedures and equipment

The tests carried out on the communication channel under test are performed according to test procedures worked out by DELTA and approved by DANAK. These procedures are as far as possible in compliance with the standardised procedures that are referred in the standards for cabling.

6.1 Coupling attenuation

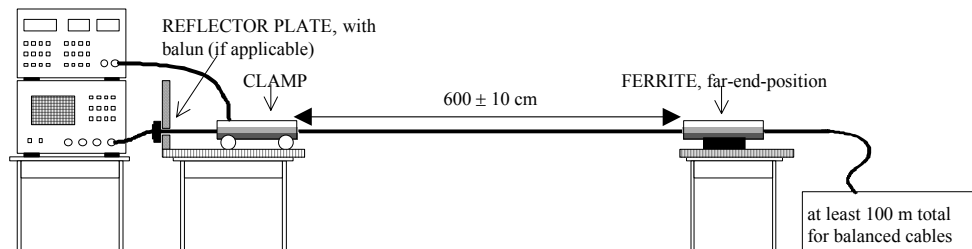


Figure 1 Test set-up for coupling attenuation measurements

The coupling attenuation is measured in different parts of the channel using an absorbing clamp. The length of the measured part of the channel under test is 6 m. The measurement result of the network analyser is corrected for insertion loss of the balun and absorbing clamp. The result is also corrected for the reflected wave at the input of the clamp. The result is evaluated by a limit curve, which is horizontal up to 100 MHz and has a slope of 20 dB/octave up to 1 GHz. The value for which the limit curve intercepts the Y axis is the coupling attenuation.

6.2 Test software

Test software according to information in the table below is used for the conducted tests.

Software name	Function	File name	Version	Date
Cablingtotal	Electrical cable tests	Cabltot	3.94	050621
DELTA Automatic Reporting Program	Automatic word processing	Rapport	1.42	050124
Cable report 2002	Cable report generation	Cable report	2.8	050823