N°7 WhitePaper

MultimediaConnect

TOPIC OF THE MONTH

Since March 2010, all standards documents defining the performance of 500 Mhz cabling systems are ratified by ISO/EN and TIA and are published. And this is the first time that such significant differences have been noted between the two standards. Whereas for Cat5e and Cat6, TIA/ISO/EN were interchangeable, this is no longer true for CAT6a/Class Ea.

		DOCUMENTS	500 MHz
ISO 11801	Channel	AMD 1.0	Class Ea
	Permanent Link	AMD 2.0	Class Ea
	Cable	AMD 2.0 (IEC 61156-5 : 2009)	CAT6a
	Connector	AMD 2.0 (IEC 61156-5 : 2009)	CAT6a
	Cord	AMD 2.0 (IEC 61603-7-41 & 51)	CAT6a
EN 50173	Channel	AMD 1.0	Class Ea
	Permanent Link	AMD 2.0	Class Ea
	Cable	AMD 2.0 (EN 50288:2009)	CAT6a
	Connector	AMD 2.0 (EN 61073:2009)	CAT6a
	Cord	AMD 2.0	CAT6a
TIA 568	Channel	568-C.2	CAT6A
	Permanent Link	568-C.2	CAT6A
	Cable	568-C.2	CAT6A
	Connector	568-C.2	CAT6A
	Cord	568-C.2	CAT6A

The ISO CAT6a was intended by the standards committees to provide a Shannon capacity of 40Gigabit/s, and the IEEE is already working on connection possibilities higher than 10 Gigabits/s on twisted pair systems in RJ45 through IEEE 802.3 ba.

Recap of SHANNON's theorem:
In an Ethernet type LAN, the allowable theoretical throughput (C) in the bandwidth is defined by the following formula:

$C = BW * LOG2 (1 + SNR)$

BW = Channel Bandwidth
SNR =Signal to Noise Ratio

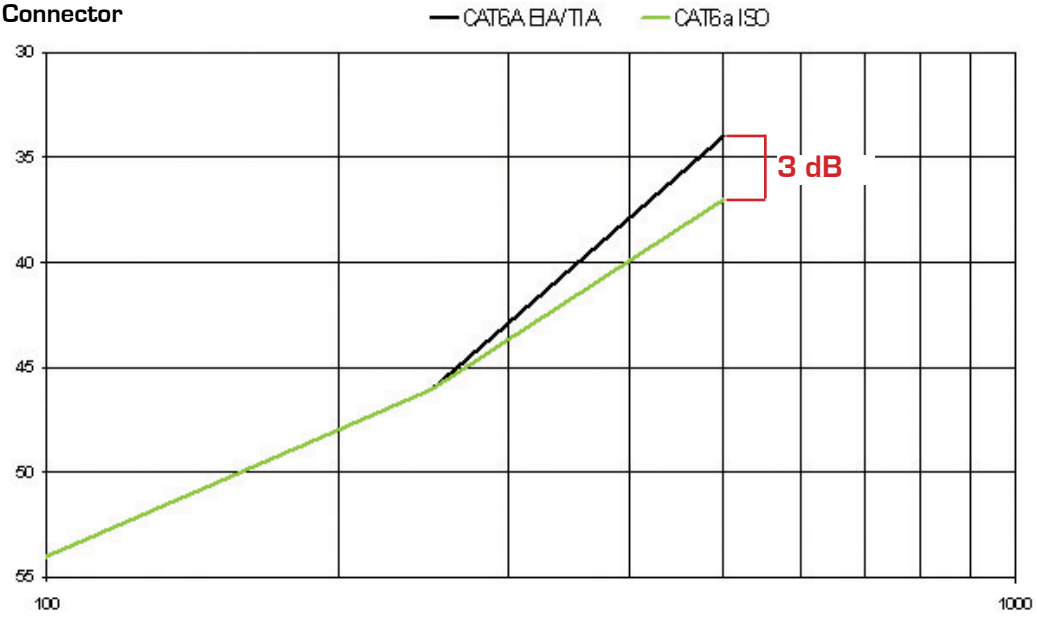
I. MAJOR DIFFERENCES BETWEEN ISO AND TIA CAT6A

a. NEXT : main parameter for network performance

The main difference concerns the NEXT values on the connectors. The difference between the two standards is 3dB at 500 Mhz. TIA tolerates twice as much interference at 500 Mhz as ISO.

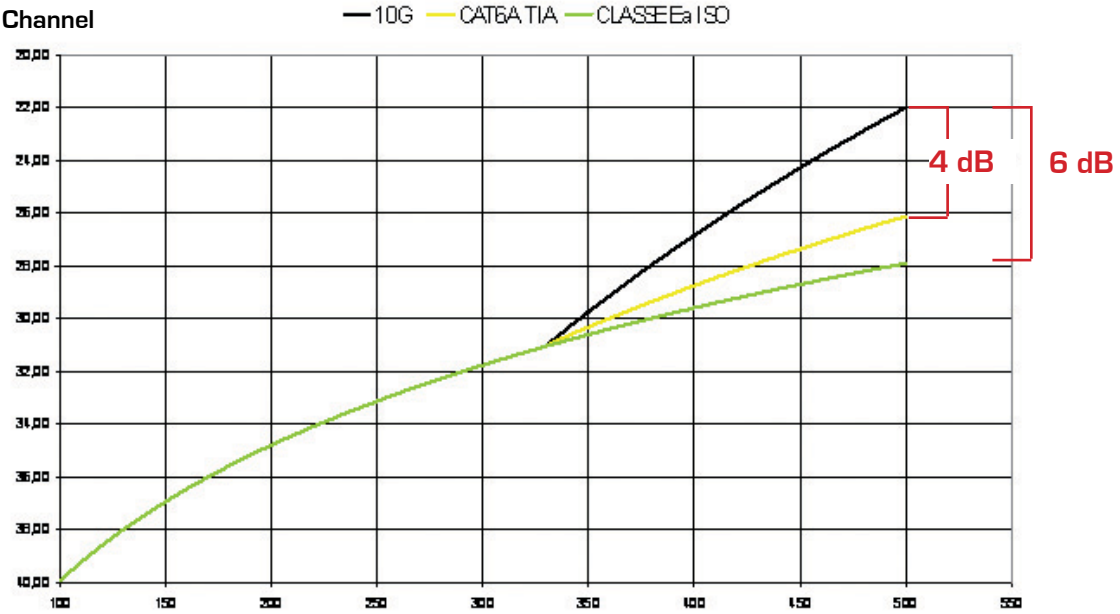
As the graph below shows, this difference is very marked on the connector values:

Limite NEXT - Connector



A representation of these values on the complete link with a comparison between 10G, TIA CAT6A and ISO CAT6a.

Limite NEXT - Channel



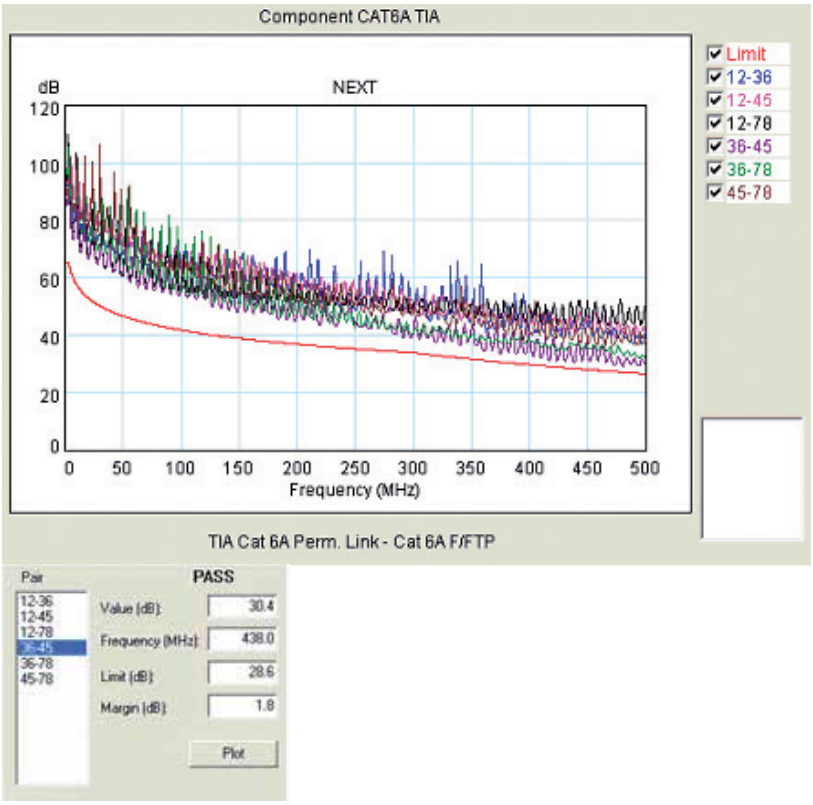
b. Return Loss : no difference here between the standards

The Return Loss values are identical for the ISO, EN and TIA documents, so this is not the differentiating parameter.

c. Effect on a complete link

As a consequence of these differences, the acceptance procedure can be surprising, with a negative result displayed for measurements performed in Class Ea, with CAT6A components.

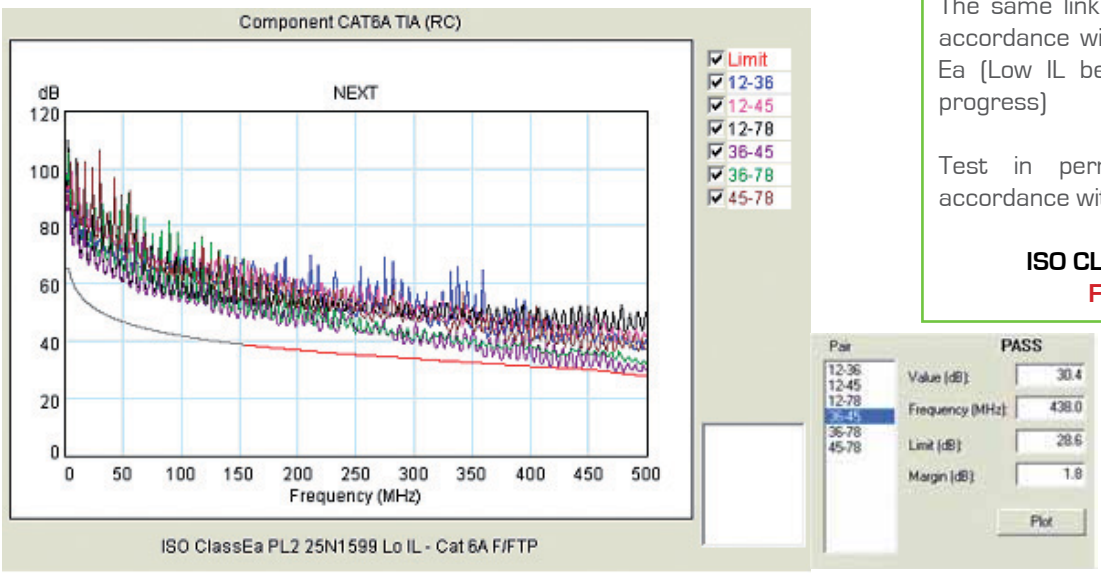
Comparison of measurement with commercially available CAT6A components in accordance with TIA:



Measurement performed on an 18 meter link with commercially available TIA CAT6é components.

Test in permanent link in accordance with

TIA 568-C.2 CAT6A
CORRECT



The same link is re-certified in accordance with the ISO Class Ea (Low IL because link is in progress)

Test in permanent link in accordance with:

ISO CLASSE Ea
FAIL

Components defined by the TIA standard TIA can FAIL the ISO System test:

		ISO CLASS Ea CHANNEL	ISO CLASS Ea PERMANENT LINK
ISO 11801	CAT6a cable CAT6a connector Cord CAT6a	+	+
EN 50173	CAT6a cable CAT6a connector Cord CAT6a	+	+
TIA 568	CAT6a cable CAT6a connector Cord CAT6a	-	-

d. L'Alien Crosstalk

Alien Crosstalk: interference of cables within a bundle. This measurement parameter is mandatory for CAT6a and is treated differently in accordance with the documents.

For TIA, Alien Crosstalk must be measured in the field in all possible situations. The measurement must be performed with a level IV tester.

For ISO, Alien Crosstalk and its parameters (ANEXT, PSANEXT, PSAACR-F, etc.) meet two different requirements:

- **Laboratory reference test** : Must be performed by manufacturer to prove that its system is compliant
- **Field test** : Must be performed on-site to confirm compliance after installation.

Transmission parameters	Laboratory reference tests	Field tests
Return loss	Mandatory	Mandatory
Insertion losses	Mandatory	Mandatory
Pair-to-pair NEXT	Mandatory	Mandatory
PSNEXT	Calculated	Calculated
Pair-to-pair ACR-N	Calculated	Calculated
PSACR-N	Calculated	Calculated
Pair-to-pair ACR-F	Mandatory	Mandatory
PSACR-F	Calculated	Calculated
Continuous loop resistance	Mandatory	Mandatory
Variation of continuous loop resistance	Mandatory	For information
Propagation delay	Mandatory	Mandatory
Delay skew	Mandatory	Mandatory
Coupling attenuation	Mandatory	For information
PS ANEXT*	Mandatory	Mandatory by sampling
PS ANEXTavg*	Calculated	Calculated
PS AACR-F*	Mandatory	Mandatory by sampling
PS AACR-Favg *	Calculated	Calculated
Continuity	Mandatory	Mandatory
Length	For information	For information

* Except when the system has sufficient coupling attenuation.

Important: ISO mentions the possibility of not measuring these Alien Crosstalk parameters as soon as the cabling system coupling attenuation exceeds a certain value.

e. What standard for CAT6a networks in Europe?

From a 'legal' point of view, only ISO has official legitimacy.
In addition, this standard has a higher requirement which guarantees a better performance and the possibility that the installation can support 40 Gbits/s communication protocols (probably over short lengths).
Lastly, ISO offers a solution for field tests of Alien Crosstalk, taking account of the performance of the shielded cabling systems.
With EIA/TIA, on the other hand, measurement of Alien Crosstalk is mandatory. It is noted that these long and expensive measurements are rarely performed in the field. As a result, these installations are formally 'non-standard'.

ISO therefore constitutes the only current applicable standard for CAT6a in Europe.
It is necessary to be vigilant in writing specifications and in checking acceptance procedures.

II. THE MULTIMEDIA CONNECT SOLUTION: ISO CAT6A CERTIFIED COMPONENT

Except for the North American territory, the standard reference document is ISO 11801. Multimedia Connect now proposes an international system with a certified component and guarantee - surely one of the best in the world.

a. MK6AFS: the ISO CAT6a certified Multimedia Connect connector
Currently, the MK6AFS connector is the only connector certified (by Delta Electronics in Denmark) on the adopted version of standard ISO 11801 amendment 2.0

Compliance Statement

No. 2010-056

Connecting Hardware, Category 6A

Company

Product description

Product identification

Generic cabling standards, cabling components standard

- ISO/IEC 11801 2nd edition:2002
- ISO/IEC 11801 amendment 2:2010, Category 6A
- EN 50173:2007, Category 6A
- ANSI/TIA-568-C.2, Category 6A
- IEC 60603-7-41 and draft IEC 60512-27-100

Technical report | Manufacturer code | Certificate valid until

Hørsholm, 10 May 2010

Erik Bech
Test Manager

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Project Manager

Generic cabling standards, cabling components standard

- ISO/IEC 11801 2nd edition:2002
- ISO/IEC 11801 amendment 2:2010, Category 6A[1]
- EN 50173:2007, Category 6A[1]
- ANSI/TIA-568-C.2, Category 6A[1]
- IEC 60603-7-41 and draft IEC 60512-27-100

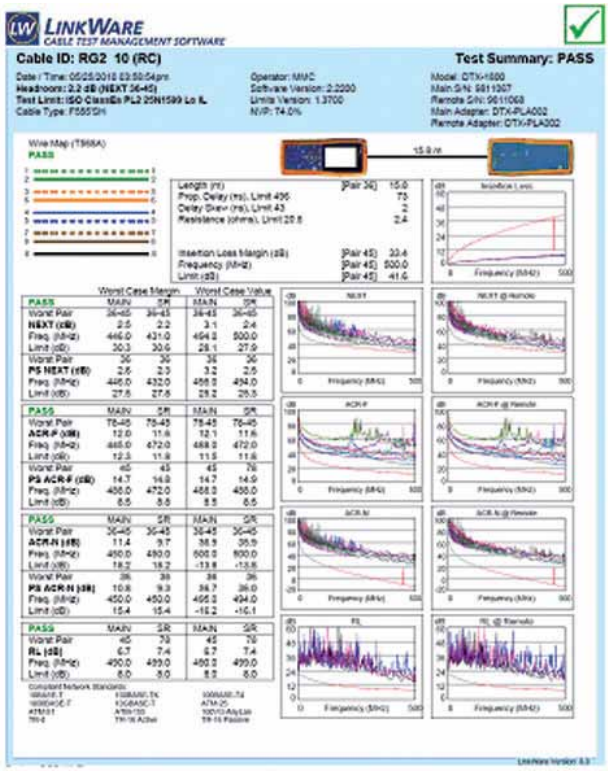
[1] inclusive all connecting hardware alien crosstalk (PS ANEXT and PS AFEXT) parameters

b. Short link: Which standard to choose?

In traditional cabling infrastructures, short lengths of less than 15 m are not authorised because the short distance between the two ends of the link generates reflection phenomena, which often entail negative results in field tests.
Some installers implement excess lengths of cable to extend the distance beyond 15 metres but fortunately the majority of the links in office installations exceed this limit.

For Data Centers, however, there are very many links shorter than 15 metres. They represent between 60 % and 80% of links, depending on the site configuration. It is therefore essential to be able to use cabling systems with performance that allows a positive field test on these short lengths. Category 6A/Class Ea is therefore the most appropriate standard level for Data Center applications.

The Multimedia Connect cable is also component certified by Delta Electronics. It is used to implement high-quality installations, particularly over short lengths with the highest requirements.
The Multimedia Connect links also comply with the same standard for lengths shorter than or equal to 15 metres.



c. 'Component' certified RJ45 cords

The Multimedia Connect LED (end marking) technology cords are component certified by the German Laboratory GHMT. They have light-up identification marking by LED moulded into the sleeve.

d. System made immune to Alien Crosstalk

The Multimedia Connect shielded cabling system has excellent coupling attenuation. It is not necessary to test Alien Crosstalk on-site, therefore. Average value of 60dB shielded systems (1Mhz < F < 1000 Mhz)

Each installation implemented using Multimedia Connect products guarantees compliance with the standard in relation to Alien Crosstalk. As the ISO indicates, measurements were performed in the laboratory:

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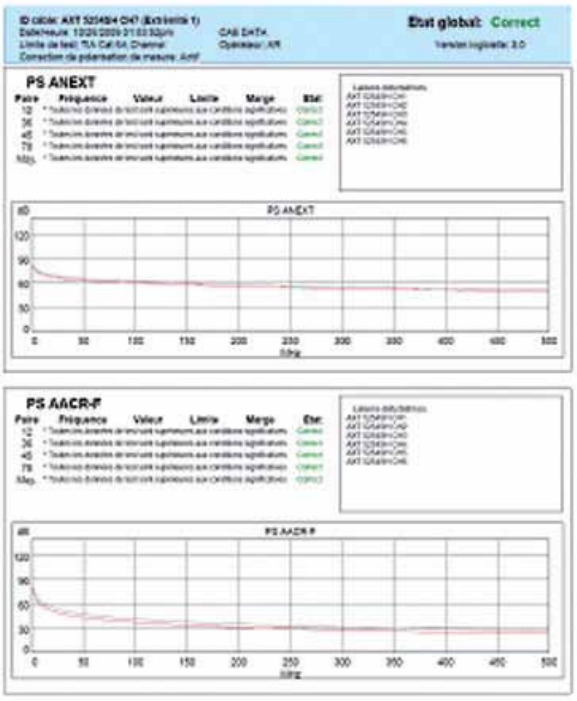

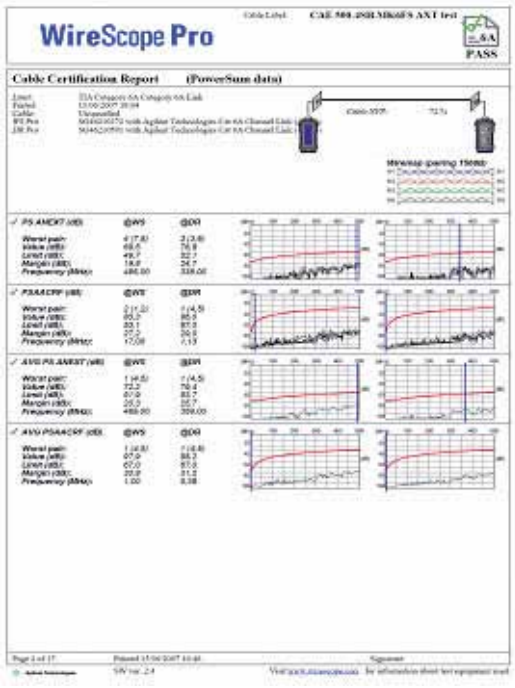

FLUKE networks

e. Complete system measured up to 700 Mhz (extrapolated limits)

The Multimedia Connect system implemented in this way with individually certified components allows the CAT6a limits to be exceeded and throughputs beyond the current 10Gigabits/s to be envisaged.

Connector	Cable	Cord	Length	NEXT margin	Results
MK6AFS	F555-4SH	CORD6A02LED	40 m	5.0 dB	PASS
MK6AFS	F555-4SH	CORD6A02LED	80 m	4.9 dB	PASS
MK6AFS	525-4SH	CORD6A02LED	40 m	4.4 dB	PASS
MK6AFS	525-4SH	CORD6A02LED	80 m	4.3 dB	PASS

The links even support frequencies higher than 700 Mhz, potentially allowing throughputs close to 40 Gigabits/s.