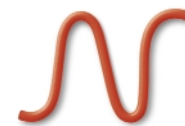


de-embedded impact on Category 6 offering

White paper
Nexans Cabling Solutions
January 2003



Category 6/Class E systems have been on the market since a few years now. Only now the standards have been fully ratified and published. One of the things that have constantly changed throughout the different drafts, and have only been fully ratified with this final standard, are the de-embedded test plug values. What is de-embedded all about, and what impact does it have on the Category 6 offering?

Category 6 in the standards

End-to-end Class E/Category 6 performance has been fixed in standardisation committees since 2 years. Link, channel, cable and connector performance (with connector defined as being the mated device or combination of plug and jack) have been fixed in the cabling and the cable committees since then. The only open issue in the standards has been how the connector could be specified as plug and jack separately. This resulted in Category 6/Class E cabling systems which perfectly fulfil the performance as specified in the standard on link, channel and mated component, but which were not interoperable. As the aim of the standard is to define a system and components making up this system which are vendor independent, connector compliance needed to be worked out further to the level of the plug and jack separately. The test method defining this is called the de-embedded test method.

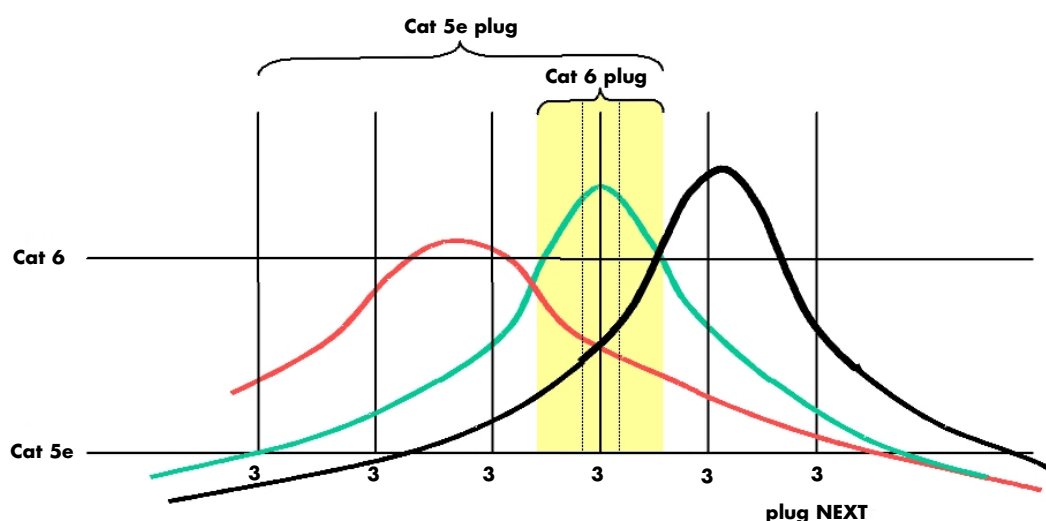
What is de-embedded ?

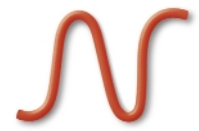
The de-embedding test method is now defined in the American TIA/EIA-568-B.2-1 and the international IEC 60603-7-4 (unscreened) and IEC 60603-7-5 (screened), of which the TIA standard has been ratified. The test method aims at fixing plug NEXT and FEXT performance range. Without this, every connector manufacturer has been free in choosing the plug range, under the condition that the mated performance passed the Cat 6 limits. This has resulted in proprietary and non-interoperable Cat 6 products. Of course, this is a situation which is not acceptable for an international standard. The ratification of this de-embedding method fixes the plug range and finally allows full connector compliance and thus interoperability. Without respecting de-embedded requirements, it is perfectly possible to offer a cabling system complying to Class E/ Cat 6 requirements for the link, channel and mated connector. But it only lasts as long as the patchcords stay in place.



Technical background of the current proprietary character of Cat 6?

NEXT performance of a mated connector shall achieve 54dB @ 100MHz and 46dB @250MHz for all pair combinations. The graph below shows a typical graph for mated connector performance at 100MHz in function of the plug performance for pair combination 1-3, which is a critical combination. It shows that mated connector NEXT reaches a maximum in a certain plug performance window. Only for plugs within this window, the mated connector NEXT exceeds standard's limits. For plugs with lower or higher NEXT, the combination does not fulfil the requirements anymore. In other words, when plugging in a patchcord of another vendor, Cat 6 performance on the combination could not be guaranteed. The same graph also shows that plug and jack need to be matched to give optimal performance.





Why has it taken so long to finish the Cat 6 standard?

The test method used for the Category 5 connecting hardware was the TOC or Terminated Open Circuit method. Shortcomings did not show up for Category 3 and 5, but the elevated performance needs of Cat 6 and the complex electrical interactions between plug and jack have proven it being inadequate for Category 6 connector qualifications.

Defining a new test method requires round robin tests and extensive evaluations to prove reliability and reproducibility. This has been evaluated by a group of key industry participants including Nexans.

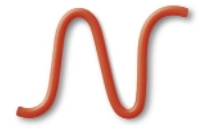
The method specifies the reference jack characterisation, which allows plug NEXT characterisation. Twelve resulting well defined plugs are needed to fully determine mated NEXT performance on all pair combinations.

Advantages for the installer

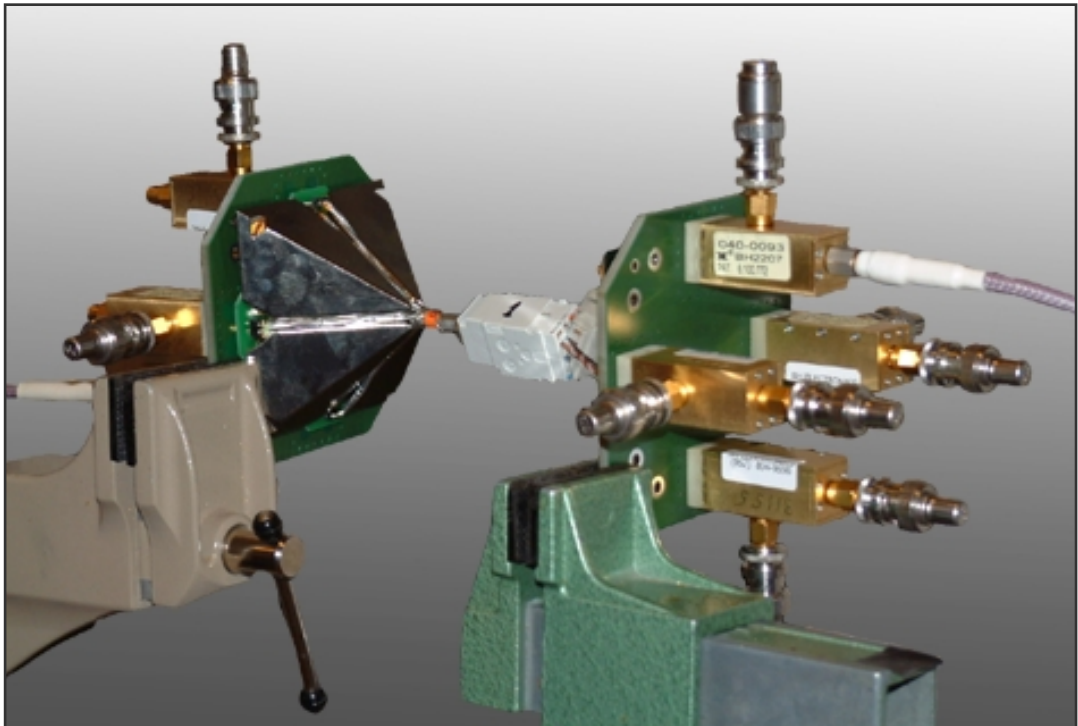
Full ratification of the Category 6 standards removes one headache for the installer in such that he can use one set of field-testheads for all Category 6 cabling systems on the market. As it ensures full interoperability, the testheads are also matched to the de-embedded range of testplugs, meaning they will work with all systems compliant to this standard. It thus removes the need for many different expensive testheads and personality modules.

Advantages for the end-user

With the full ratification of the Category 6 standards, the end-user is sure of a fully compliant system. Not only will the system work optimally with vendor-dependent equipment, but also operation is ensured when connecting active equipment or patchcords that from third party vendors. The end-user can be sure of full compliance to the latest ratified standards without having to worry about interoperability and backwards compatibility.



How do the so-called 'pyramid tests' come in the de-embedded picture?



The pyramid which is sometimes used to claim real Cat 6 performance is only one aspect of the whole de-embedded test method. The pyramid assembly is a test fixture which is given as a possible example for qualifying FEXT for UTP plugs. It is thus one of the tests which are part of a full Cat 6 qualification of a connector. Category 6 tests according to the latest standards describing the de-embedded test method thus incorporate the FEXT tests, but cover more than that. Pyramid tests only say nothing on NEXT compliance. The only indication of full Category 6 qualification is certification from an approved and fully independent test laboratory such as Delta for connector and patchcord separately, as Nexans has obtained for its new LANmark-6 offer.



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