A Look at Category 6 Cable

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Periodicals and conferences focusing on structured cabling systems have become forums to discuss the advent and integration of Category 6 cabling for high-bandwidth applications such as massive file downloads, video to the desk or for "future proofing," to the extent possible, an organization's local area network (LAN). Some suppliers to the industry are even beginning to tout what they call Category 6e (presumably for "enhanced") product. This paper will examine the topic from the one perspective that counts: how do cabling and cabling products measure up against existing and proposed industry standards.

Most easily dispensed with are manufacturers' claims to provide standards-compliant Category 6e cable and connecting hardware. This is simply because there is no standard for Category 6e. Nor is there one for Category 6 cabling. What these manufacturers are suggesting is that their product performance exceeds standards that have been *proposed* for Category 6 cabling. Organizations planning network upgrades to handle Gigabit Ethernet should discount vendor claims based on a so-called Category 6e standard. Instead, they should seek written assurances from their vendors that the network performance will *exceed* the proposed Category 6 standard.

Category 6 is a copper-cabling standard proposed by a Telecommunication Industry Association (TIA) task group under TIA/EIA-568-B.2-1 (addendum No. 1 to TIA/EIA-568-B.2). The proposed standard contains transmission performance specifications for 4-pair 100Ω Category 6 Cabling, and is expected to be completed by December 2001.

The objective of this work was to develop a new category of cabling that will support positive Power Sum Attenuation to Crosstalk (PSACR) margins up to 200MHz. At the request of the IEEE (Institute of Electrical and Electronic Engineers) 802.3 committee, TIA agreed to specify Category 6 cabling system and components to 250MHz in order to accommodate transmission equipment designs that utilize Digital Signal Processing (DSP) techniques.

Category 6 provides higher performance than Category 5e (for which there is a standard) and is designed to recognize new technology. Category 6 is backward compatible with categories defined earlier by 568-A and 568-B.1 and 2.

The proposed Category 6 standard specifies Insertion Loss, Near-End Crosstalk (NEXT) loss, Equal Level Far-End Crosstalk (ELFEXT), Return Loss, Propagation Delay, and Delay Skew. Worst pair-to-pair and multi-disturber power sum requirements are specified for cabling and cable NEXT loss and ELFEXT. These parameters (see accompanying table) are similar to, but more stringent than, Category 5e requirements.

Frequency (MHz)	Insertion Loss (dB)	NEXT (dB)	PSNEXT (dB)	ELFEXT (dB)	PSELFEXT (dB)	Return Loss (dB)
0.772	1.8	76.0	74.0	70.0	67.0	-
1.0	2.0	74.3	72.3	67.8	64.8	20.0
4.0	3.8	65.3	63.3	55.8	52.8	23.0
8.0	5.3	60.8	58.3	49.7	46.7	24.5
10.0	6.0	59.3	57.3	47.8	44.8	25.0
16.0	7.6	56.2	54.2	43.7	40.7	25.0
20.0	8.5	54.8	52.8	41.8	38.8	25.0
25.0	9.5	53.3	51.3	39.8	36.8	24.3
31.25	10.7	51.9	49.9	37.9	34.9	23.6
62.5	15.4	47.4	45.4	31.9	28.9	21.5
100.0	19.8	44.3	42.3	27.8	24.8	20.1
200.0	29.0	39.8	37.8	21.8	18.8	18.0
250.0	32.8	38.3	36.3	19.8	16.8	17.3

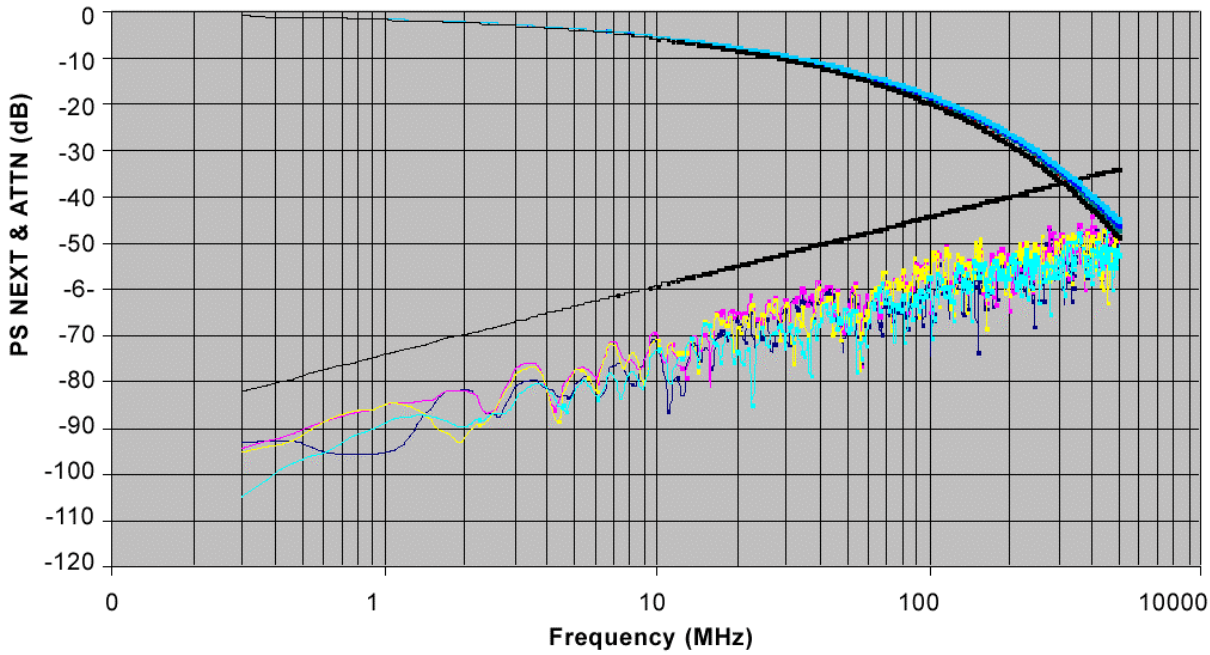
Best in Class Cable

Cable manufacturers including General Cable offer a best in class Category 6 product that meets and exceeds the current proposed standard. This product is offered for three reasons:

1) Accommodating possible enhancements of the proposed Category 6 standard.
2) Providing headroom for additional bandwidth required by new applications.
3) Meeting or exceeding channel and link requirements using any Category 6 connectivity component.

Network designers and end users have welcomed the availability of best in class cable for these and other reasons. For example, while there are no firm assurances as to the final outcome of the proposed Category standard, there are many instances where users' bandwidth requirements are greater than can be accommodated by Category 5e. Organizations with these requirements can substantially reduce their risk by specifying a best in class product, and requesting that their vendors offer written guarantees that the installation's performance will exceed the proposed Category 6 standard. These guarantees should be substantiated by results of independent third party testing.

Figure 1 below is a PSACR plot using Command LINX 6 cable. Command LINX 6 cable exceeds Category 6 limits set today by TIA/EIA 568-B.2-1.



Performance across the Channel

While best in class cabling is important and is designed to support transmission parameters (i.e. NEXT, Insertion Loss, ELFEXT … etc.) to a standard's specifications, there is more to a network than just the cable. Connectors and patch cables can degrade network performance, tuning and impedance matching. For example, impedance between cable and connectivity products can differ, meaning that a cable that designed to 110Ω might be working with a connector that is designed to be 90Ω. While these system components may pass TIA and ISO standards, there could be a problem with impedance matching that will affect channel return loss. The smaller the impedance gap between components the less signal reflection, therefore providing better return loss.

When selecting a system, users must verify the channel performance of the cable and other components to assure themselves that components do work seamlessly together. As with the cable product itself, this performance should be documented by independent third party testing, and supported by vendors' written guarantees.

General Cable has partnered with manufacturers of connectivity products and has secured third-party verification of channel performance meeting TIA and IEEE specifications.