White Paper

Class E Channel Frequency Myths and Misconceptions

excel without compromise.

As the Structured Cabling market gets ever more competitive we see an increasing amount of FUD (Fear, Uncertainty & Doubt) being spread by vendors in an attempt to prove themselves better than their rivals.

Unfortunately some of this is being done by vendors quoting greater numbers that in reality do not demonstrate any better performance, than a system that states it meets or exceeds the required standard.

One of the most notable of these instances is when a manufacturer has a 350MHz cable and therefore claims it has better performance. This document will endeavour to expose this myth and correct the misconception.

As a point of note, Excel Networking has successfully run internal tests across all of its Category 6 cable to 350MHz, but we do not claim performance to this frequency for the reasons laid out in this document.

Standards Requirement

In Cenelec (EN) or ISO terms each Class of Channel or Permanent link is made up by Categories of Components. The performance requirements of those components, whether cable, connecting hardware or patch cords are laid out in the general requirements of the respective Standards, namely EN50173-1: 2011 and ISO 11801: Ed 2.2: 2010.

The following extract from EN50172-1:2011 lays out the frequency requirements for each class of channel.

'5.2.2 Balanced cabling channel performance

5.2.2.1 General

This standard specifies the following classes for balanced cabling:

a) Class A: *specified up to 0,1 MHz;*
b) Class B: *specified up to 1 MHz;*
c) Class C: *specified up to 16 MHz;*
d) Class D: *specified up to 100 MHz;*
e) Class E: *specified up to 250 MHz;*
f) Class EA: *specified up to 500 MHz;*
g) Class F: *specified up to 600 MHz;*
h) Class FA: *specified up to 1 000 MHz'*

The standard then goes on to define the performance for each required measurement at these set frequencies. In the case of Return Loss the table is as follows:

Table 5 - Return loss limits for a channel at key frequencies

Frequency MHz	Maximum return loss dB							
	0,1	1,0	16,0	100,0	250,0	500,0	600,0	1 000,0
Class C	N/A	15,0	15,0	N/A	N/A	N/A	N/A	N/A
Class D	N/A	17,0	17,0	10,0	N/A	N/A	N/A	N/A
Class E	N/A	19,0	18,0	12,0	8,0	N/A	N/A	N/A
Class E_A	N/A	19,0	18,0	12,0	8,0	6,0	N/A	N/A
Class F	N/A	19,0	18,0	12,0	8,0	8,0	8,0	N/A
Class F_A	N/A	19,0	18,0	12,0	8,0	8,0	8,0	6,0
Class BCT-B	N/A	19,0	18,0	14,0	11,0	10,2	10,0	8,0

continued overleaf

For a true Channel compliance all elements MUST be of the stated Class or Higher. However, it is the lowest category of component that decides the Class, therefore if a 350Mhz cable is used with Category 6 connecting hardware and Category 6 patch cords, you will still only have a Class E Channel.

Additional Frequency measurement is all well and good in theory but in practice, it starts to throw up a number of interesting problems, not least of which is the fact that no Field Test equipment has the in-built ability to test beyond the Standards base limit of 250mHz for a Class E Channel or Permanent Link. You can set up to test beyond the standard, but it is down to the user to then export the data and write a new set of limit lines using the existing formula for Category 6 in EN50173.

An example of that formula is as follows for Insertion Loss:

E	$1 \le f \le 250$	$1{,}05 \times (1{,}82 \times \sqrt{f} + 0{,}016\,9 \times f + 0{,}25/\sqrt{f}) + 4 \times 0{,}02 \times \sqrt{f}$, 4,0 min.

The subject gets even more complex when looking at using a Network Analyser, EN50346, (the testing parameters called for in EN50173-1 sets out 401 swept measurement points across the 250MHz. How is that then going to be applied to the 350MHz? Do you use the same points and calculate an additional number or do you space out those measured points and therefore start losing some of the granularity and accuracy of the results. Either way the outcome is less than ideal.

Conclusions

Whilst on paper having a cable that is said to operate to a higher frequency may appear to be an attractive option. To gain a sense of reality and cut through the 'Marketing Spin' the following facts must be remembered and questions asked.

- Do all the component elements perform to the 350MHz, if not, then any supposed benefit is immediately lost.
- There is NO effective way of testing a 350MHz, once installed, or 'In the Field'
- There are NO applications that operate at this extended frequency. If talking in pure Ethernet terms, Category 6 already gives additional Headroom over Category 5e. When it comes to 1Gb Ethernet that operates at 100MHz the next level is 10Gb which requires 500MHz Class EA
- If this additional frequency comes at additional cost, and provides no known benefit, the cost has to be seriously questioned.

This is a classic case of 'Spin' over substance being used to try and confuse the end-user and get them to believe that having a bigger number means they are getting more for their money, when it is simply not the case.

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