

Revised Standards For Installed Cabling and Their Impact On Testing

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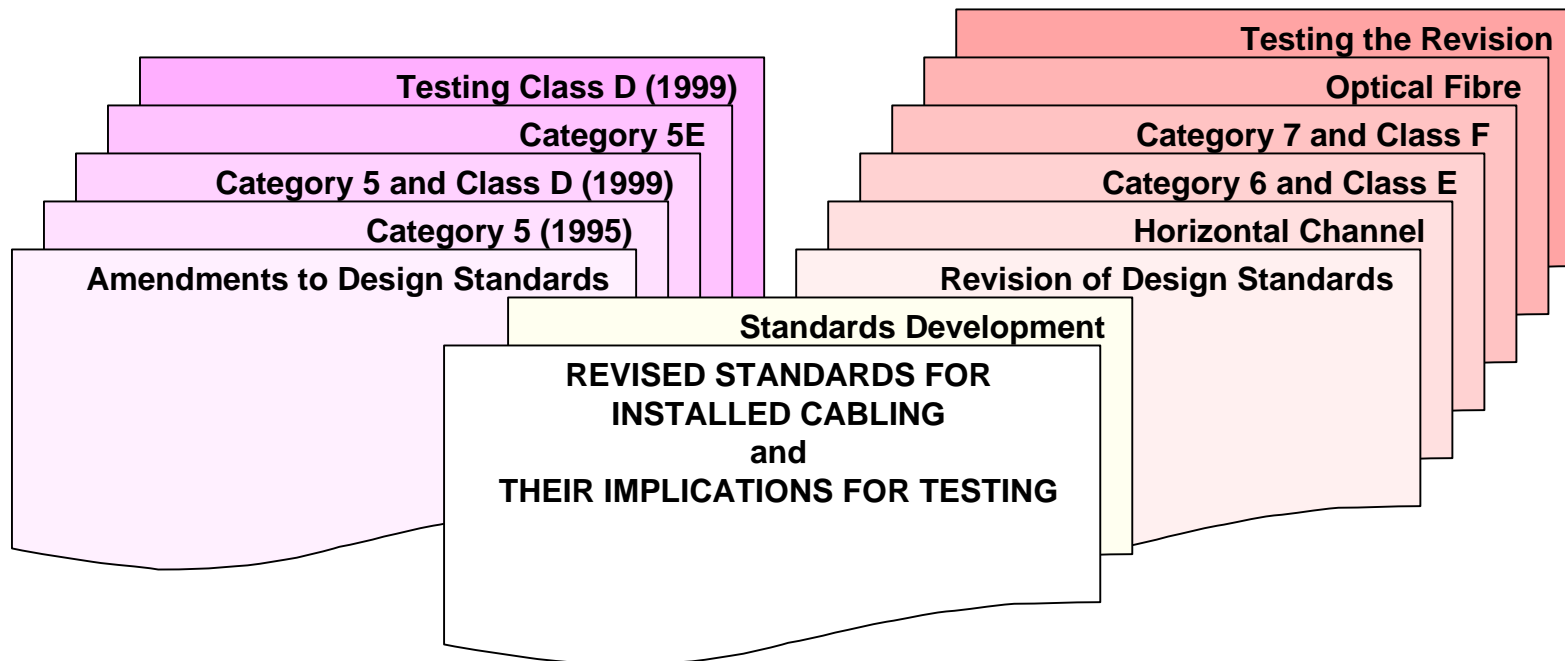


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Agenda



REVISED STANDARDS FOR INSTALLED CABLING AND THEIR IMPACT ON TESTING





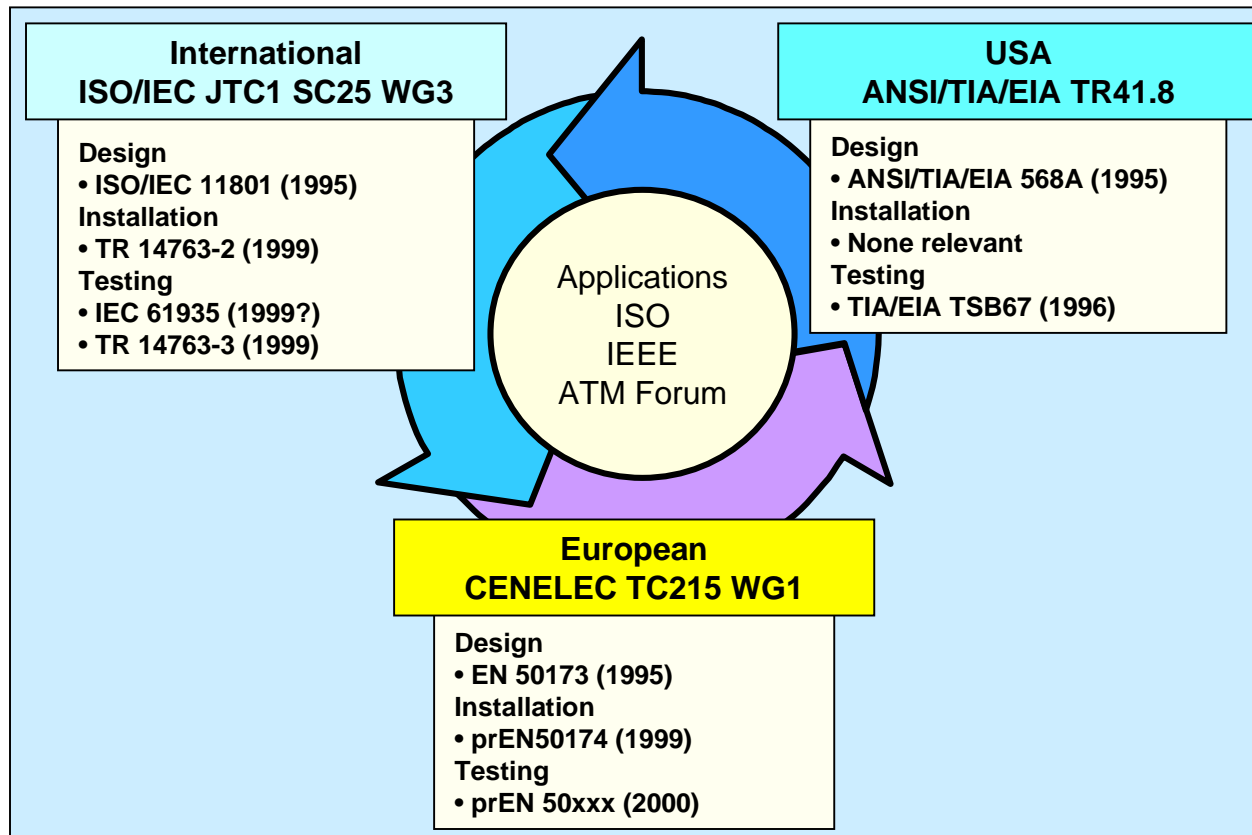
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Standards Development



BICSI Europe
Conference
25th November 1998

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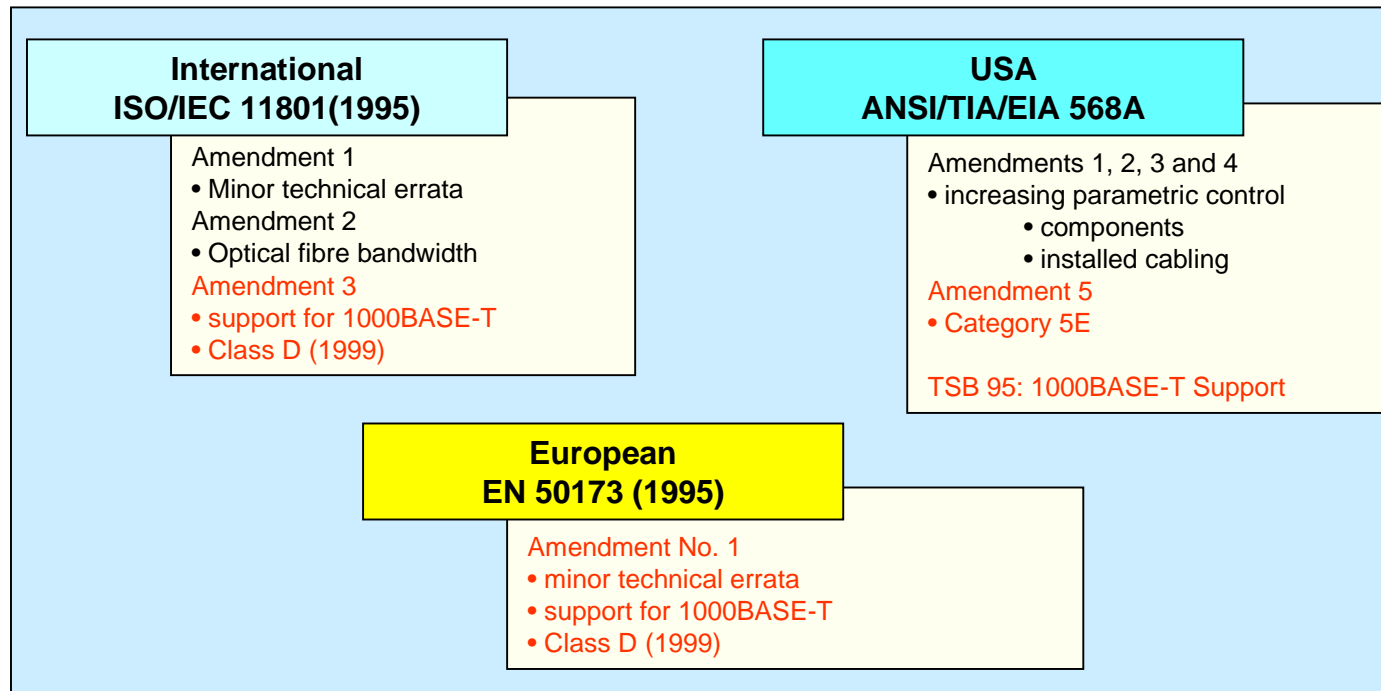


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Amendments to Design Standards



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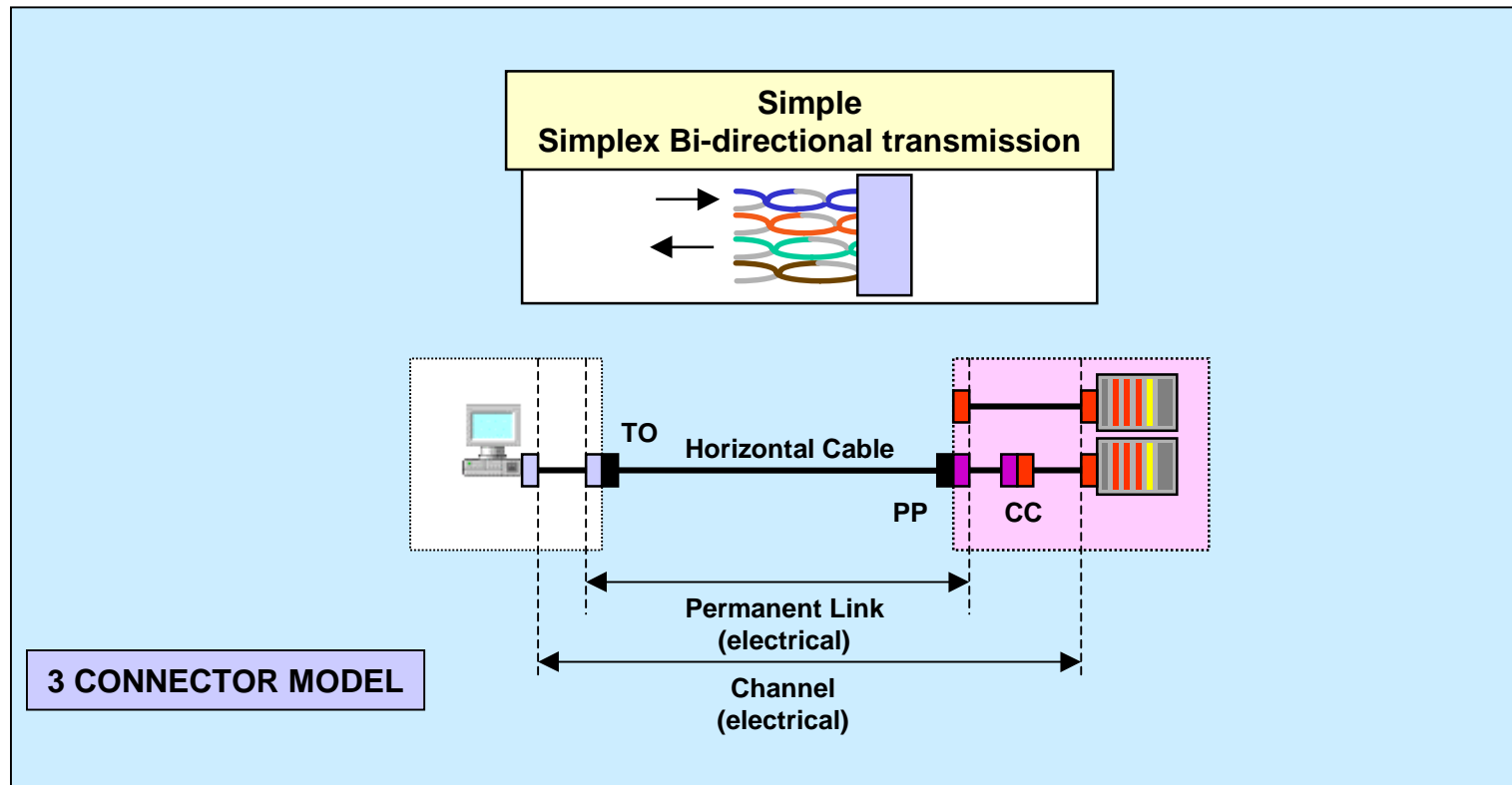


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Simple Transmission Model



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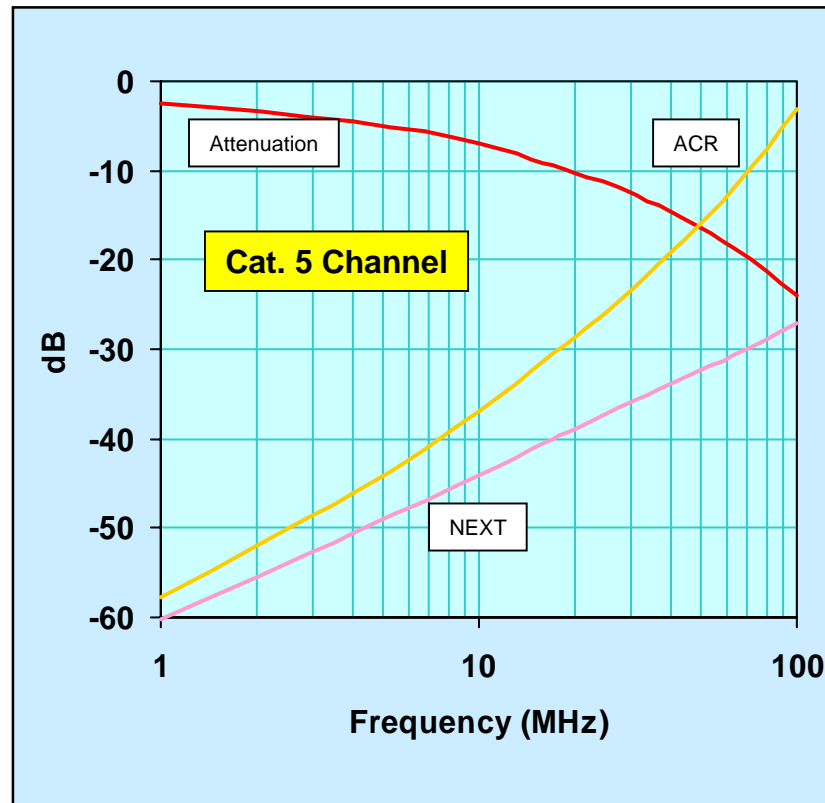


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Cat.5 Channel (1995 -1998)



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HISTORY OF STANDARDISATION

Cat. 5 cables/connecting hardware

- ISO/IEC 11801
- EN 50173
- ANSI/TIA/EIA 568A

Cat. 5 links and channels

- ANSI/TIA/EIA 568A
- TIA/EIA TSB67

Cat. 5 links/channels specified for simple applications

- attenuation
- NEXT
- ACR
- delay

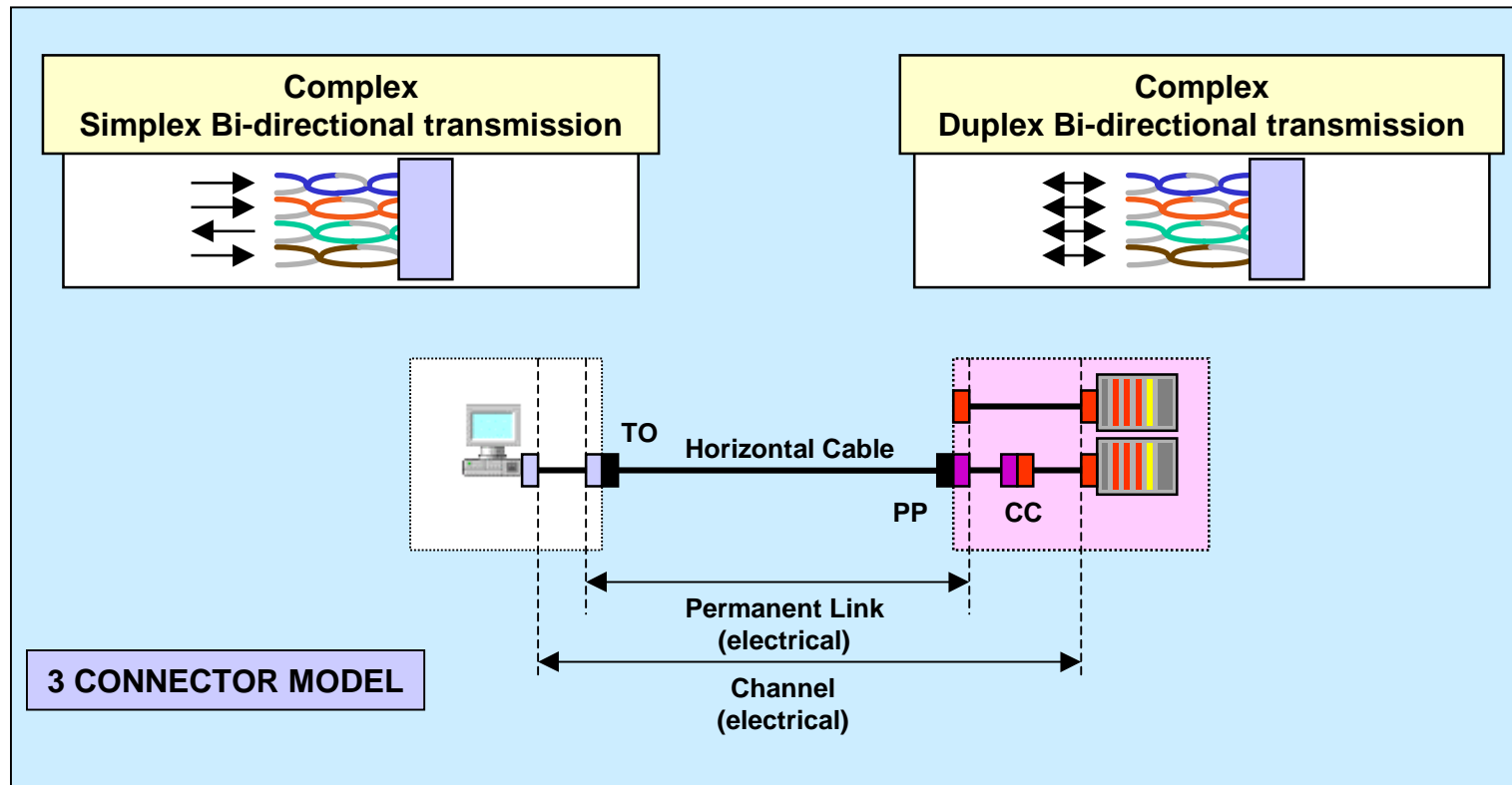


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Complex Transmission Model



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Application Classification



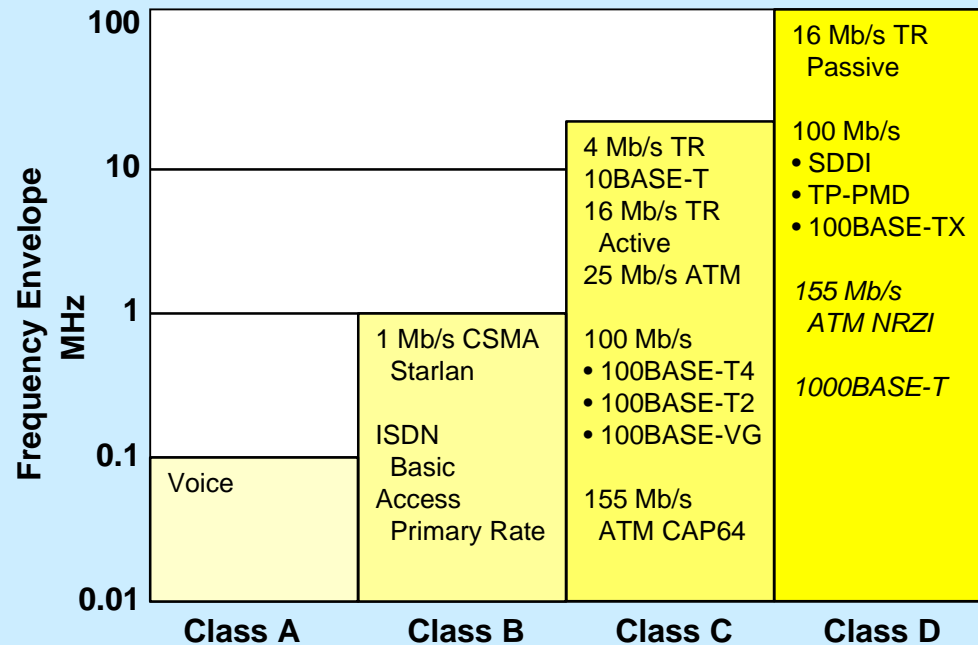
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ISO/IEC 11801 and EN 50173

- defined classes of links and channels
 - to support applications
 - rarely used for installed cabling
 - (568A/TSB67 preferred)

Amendments (1999)

- to support complex applications
- including 1000BASE-T
- re-defines classes of links and channels
 - installed link performance
 - installed channel performance



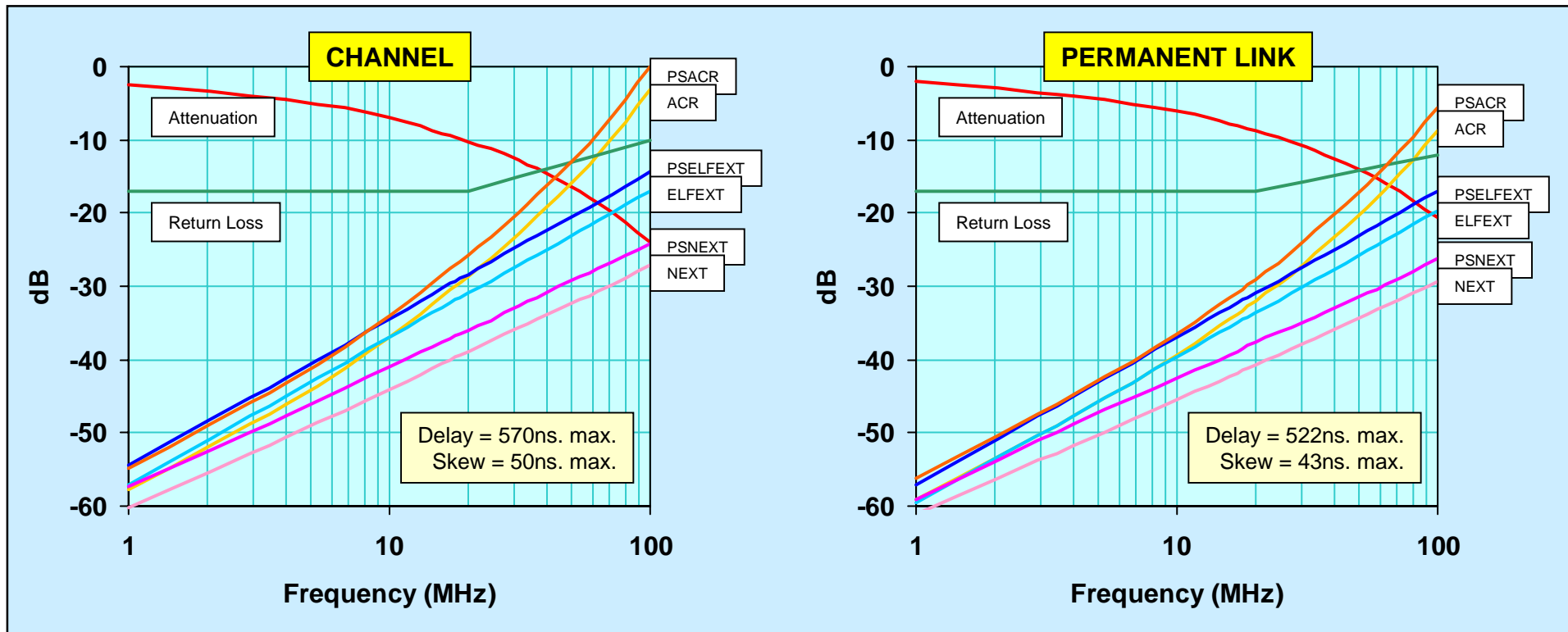


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Class D (1999) Requirements



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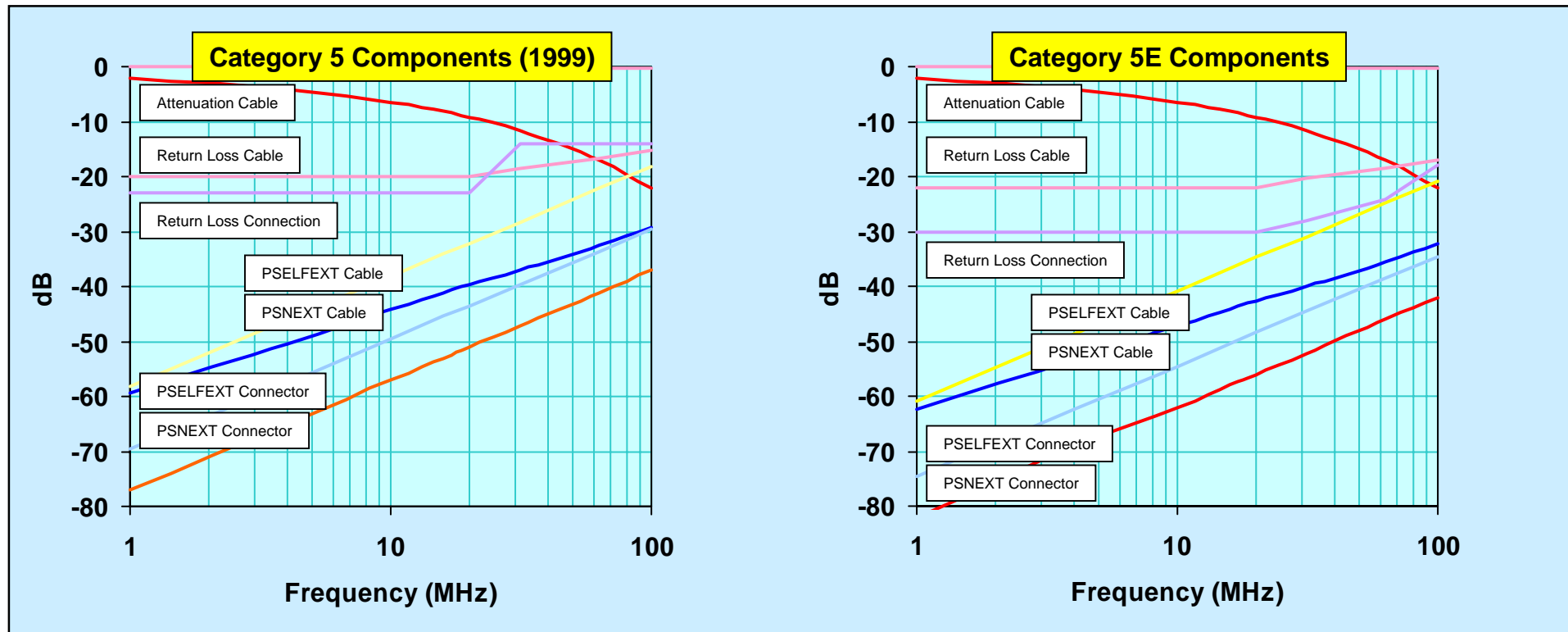


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Category 5 and Category 5E



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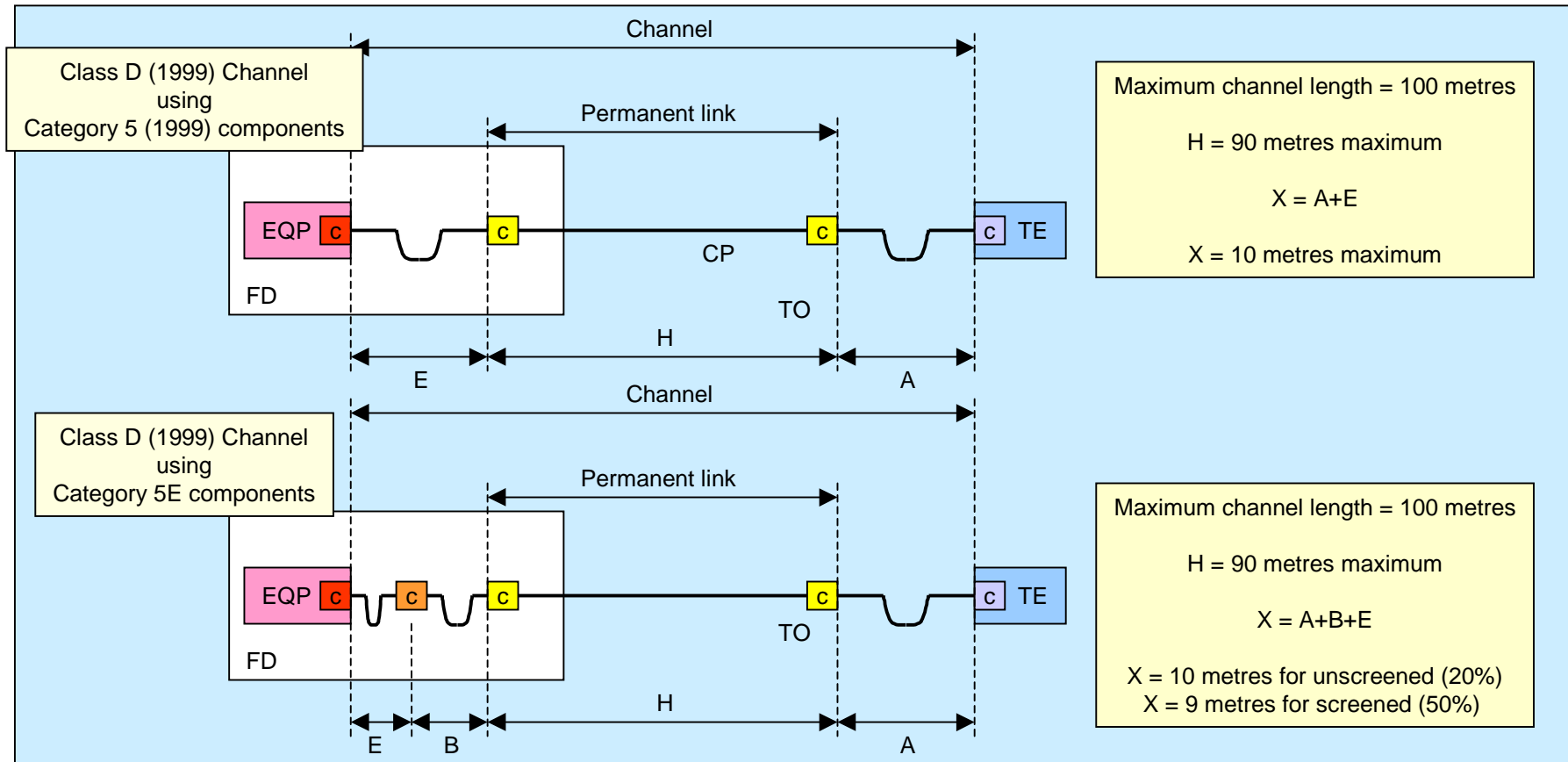


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Channel Mapping



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Testing Class D (1999)



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current approach

- TIA/EIA TSB67
 - include test leads in measured values
 - specify equipment accuracy
- test schedule
 - wire map
 - attenuation
 - NEXT (local and remote)

proposed approach

- ISO/CENELEC revisions
 - exclude test leads from measured values
 - specify measurement accuracy
- increase test schedule to include:
 - PSNEXT (local and remote)
 - ELFEXT (local and remote)
 - PSELFEXT (local and remote)
 - Return Loss (local and remote)
 - skew
- no change in frequency specification
- software upgrade for most test equipment

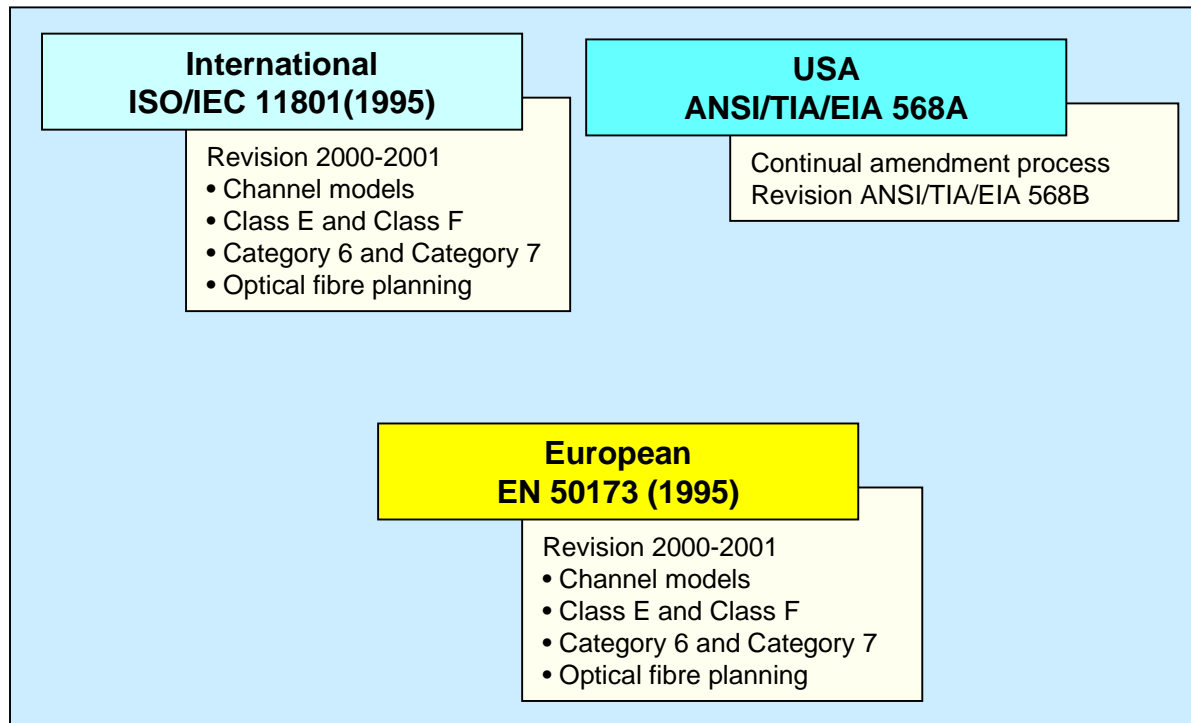


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Revisions to Design Standards



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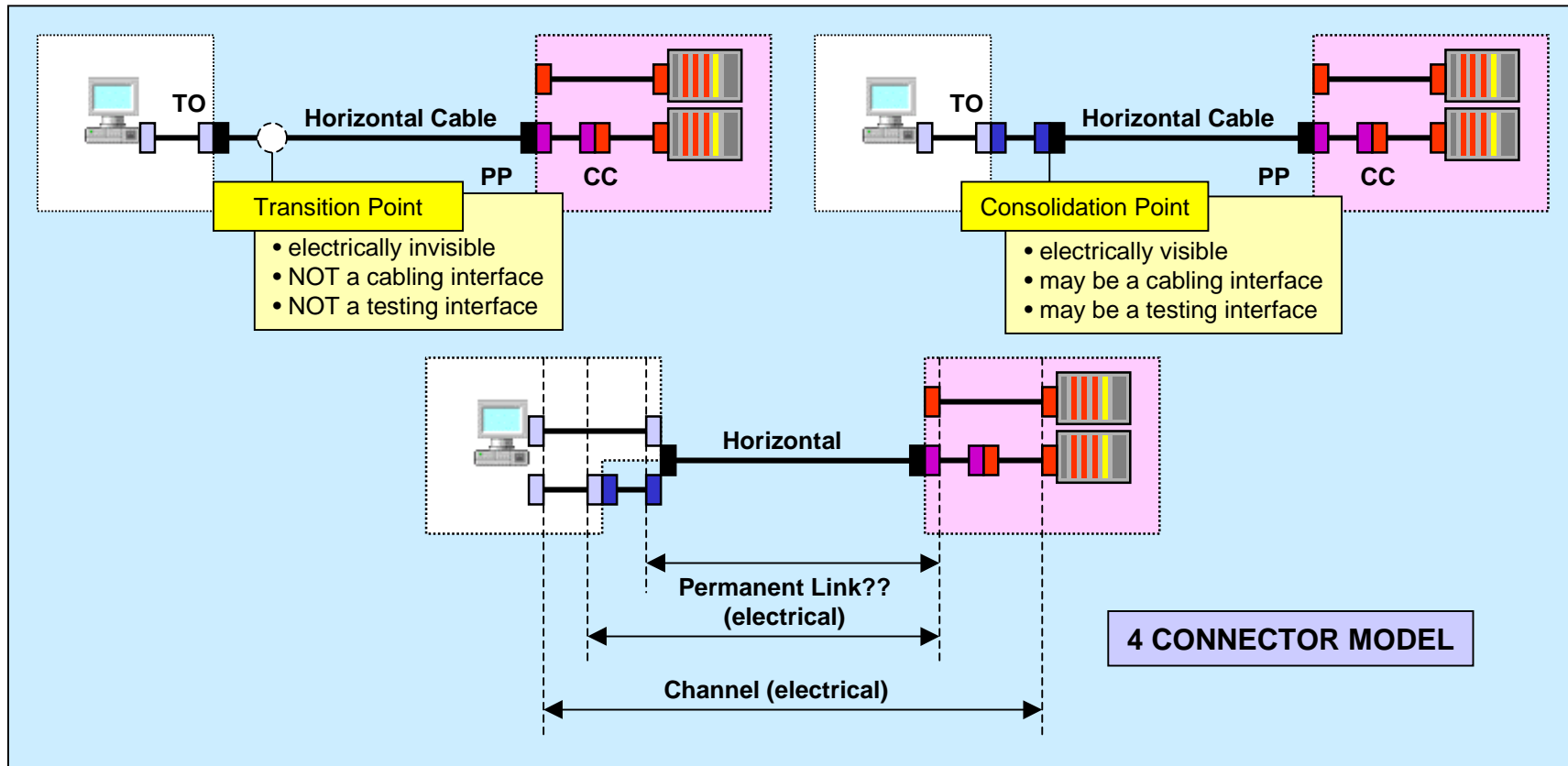


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Horizontal Channel



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Class E and F Channels



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- **Class E - Category 6**
 - 4 pair solution
 - 4 connection model (CP and CC)
 - positive PSACR at 200MHz
 - supported over
 - unscreened balanced pairs
 - foil screened balanced pairs
 - IEC 60603-7 connectivity

- **Class F - Category 7**
 - 4 pair solution
 - 4 connection model (CP and CC)
 - positive PSACR at 600MHz
 - supported over
 - individually screened balanced pairs
 - new connector

Existing standards text from BS EN 50173 (1995)

„Links of a given class will support all applications of a lower link class.

Link class A is regarded as the lowest class.“

Existing standards text from BS EN 50173 (1995)

„Cables and connecting hardware of different categories may be mixed within a subsystem and/or the cabling link, but the transmission characteristics of the link will be determined by the category of the least performing component.“

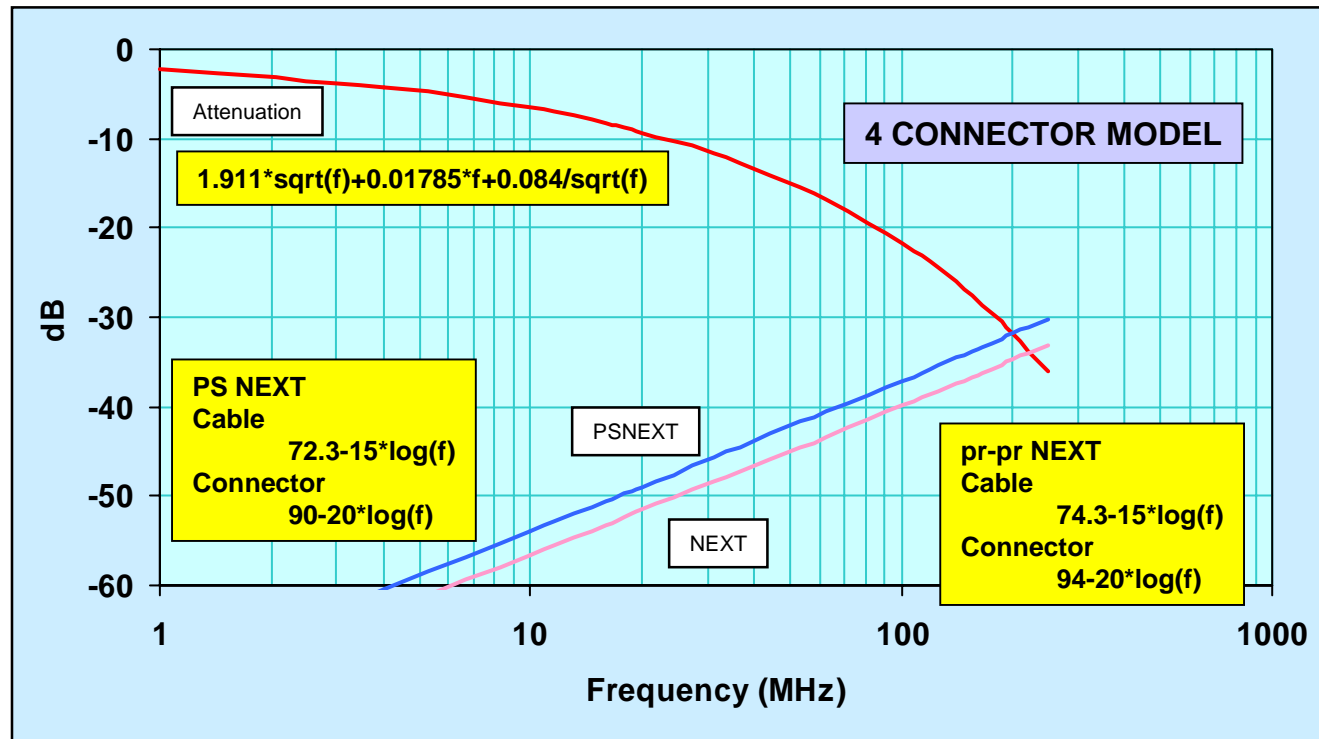


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Class E Channel (05/98)



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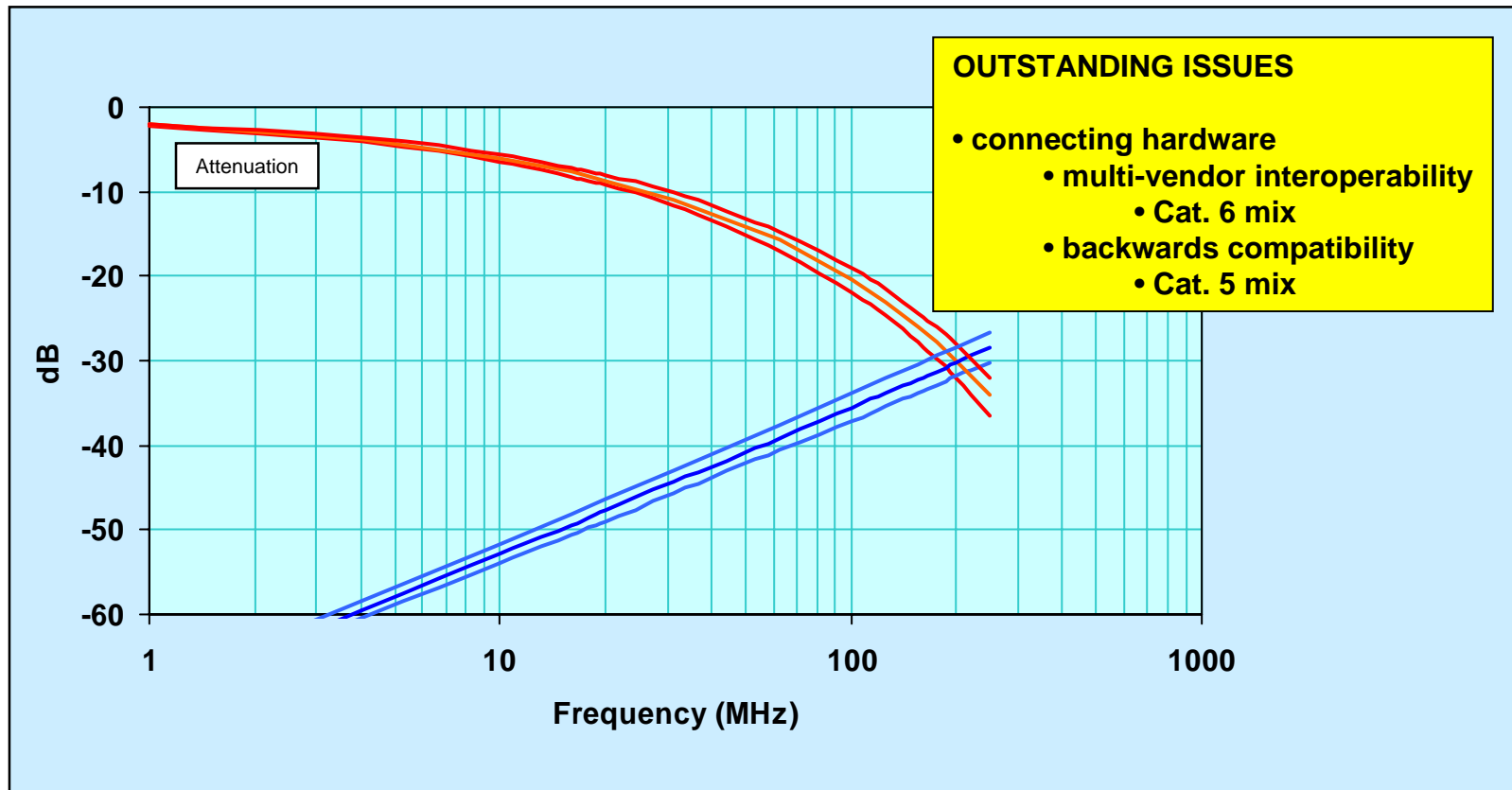


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Class E Channel Options



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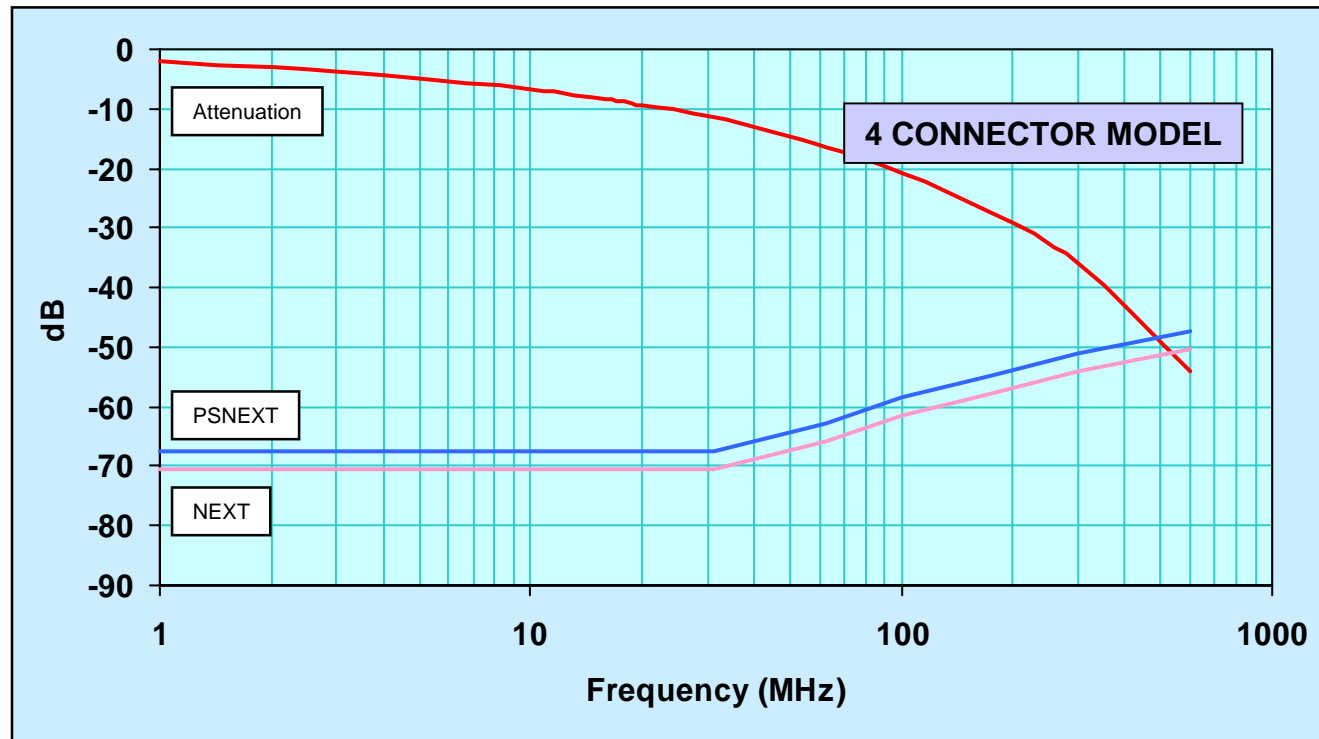
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Class F Channel (05/98)



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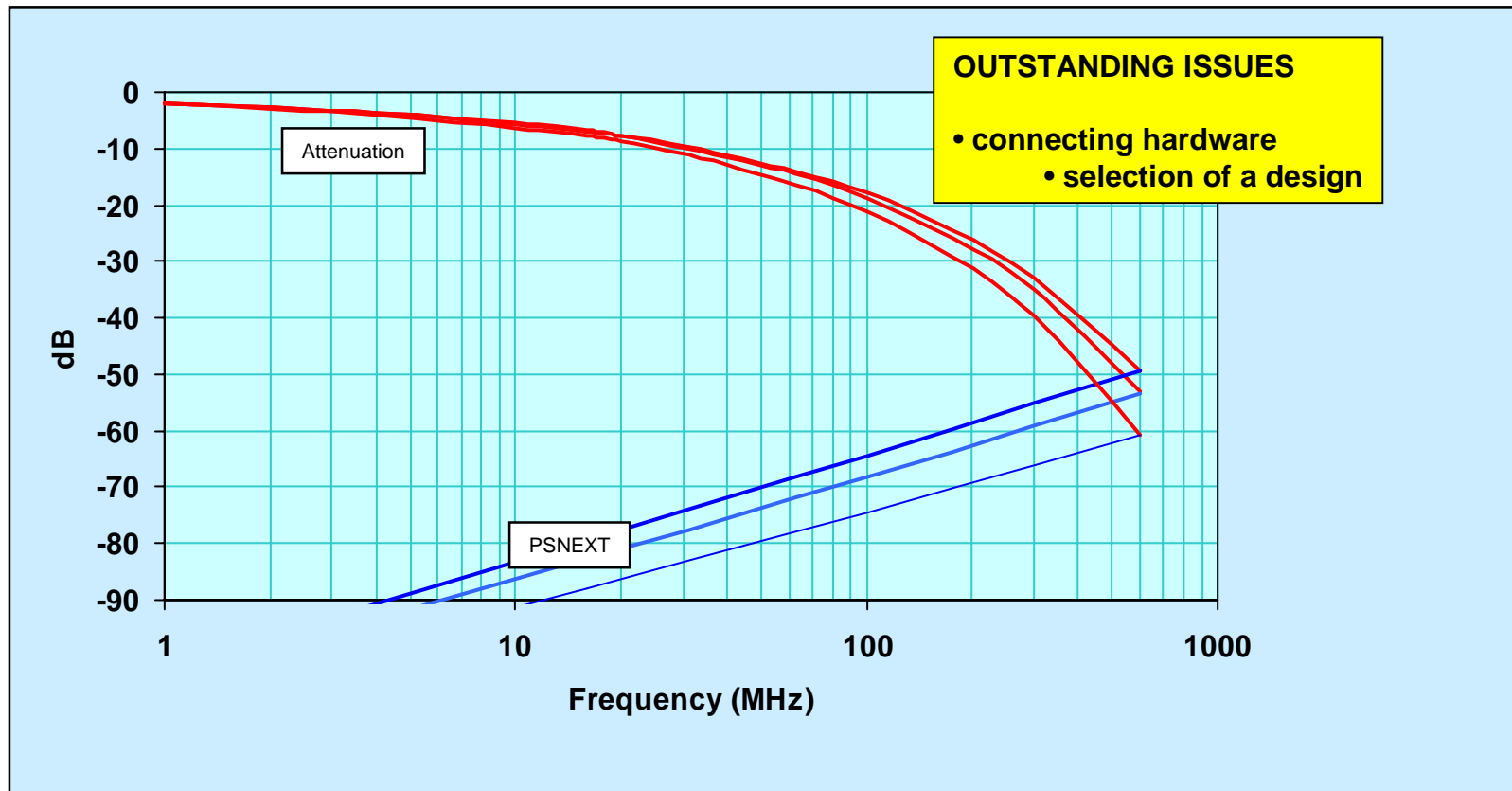


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Class F Channel Options



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Category 6 and 7 Components



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- **NO** products claiming conformance
 - can guarantee to meet final figures
 - may fail tests when available
 - can guarantee interoperability with other products
 - Category 6: technical issue
 - Category 7: physical issue
 - can guarantee backwards compatibility
- all such products represent proprietary solutions
 - procurement of network configuration components may be restrictive



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MMF Bandwidth Restrictions



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Geometry (µm)	B (MHzkm) 850nm	B (MHzkm) 1300nm	1000BASE-SX • 1st window (850nm) • CD LASER/VCSEL	1000BASE-LX • 2nd window (1300nm) • SM LASER		
62.5/125	160	200	220 metres for 160MHzkm	550 metres for 500MHzkm		
62.5/125 (ANSI/TIA/EIA 568A)	160	500				
62.5/125	200	200				
50/125 and 62.5/125	200	400				
IS 11801/EN 50173	200	500	275 metres for 200MHzkm	550 metres for 500MHzkm		
50/125 and 62.5/125	200	600				
62.5/125	250	1000	<p>A recent survey by IEC found a total of 73 (50/125) and 43 (62.5/125) dual window combinations</p> <p>These figures are taken from IEC 60793-2 and are for dual window optical fibres</p>			
62.5/125	300	800				
50/125	400	400				
50/125	400	600				
50/125	400	800				
50/125	400	1000				
50/125	400	1200				
50/125	400	1500				
50/125 (proposed IS 11801/EN 50173)	500	500			550 metres for 500MHzkm	>550 metres for 500MHzkm
50/125	600	1000				



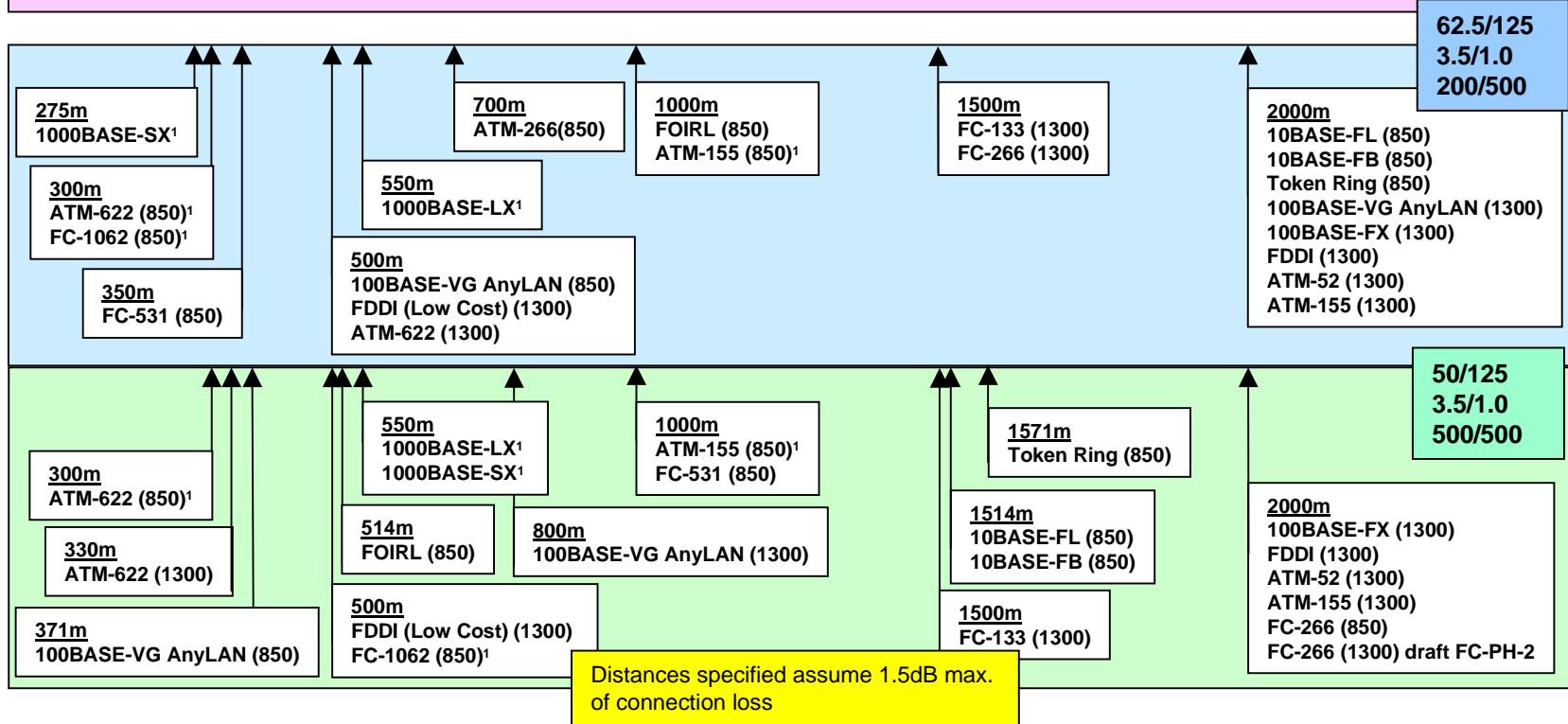
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MMF Channel Lengths



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¹ These applications are bandwidth limited at the channel lengths shown. The use of lower attenuation components to produce channels exceeding the values shown cannot be recommended.



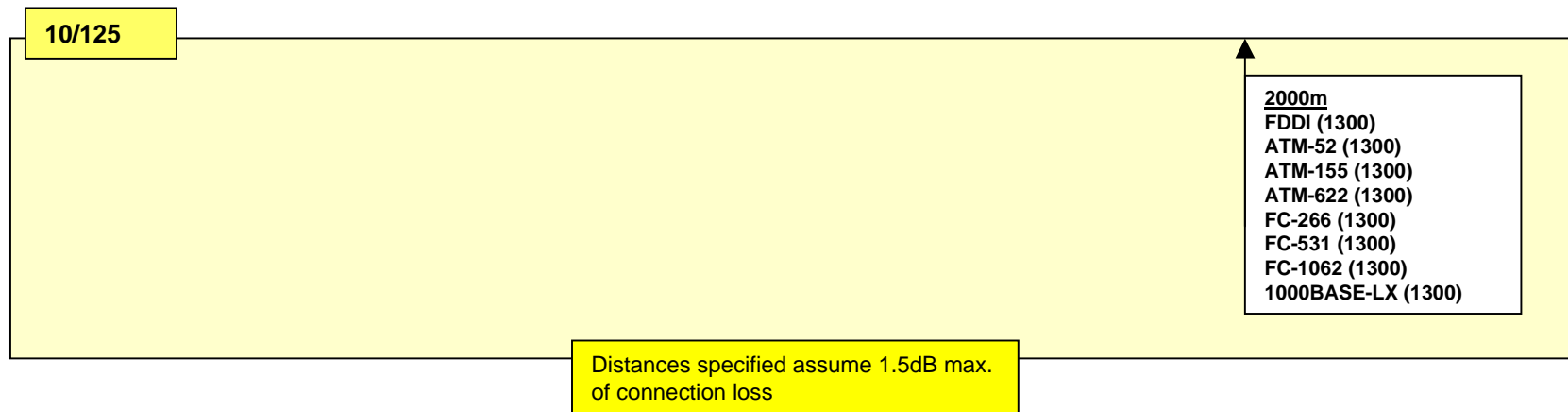


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SMF Channel Lengths



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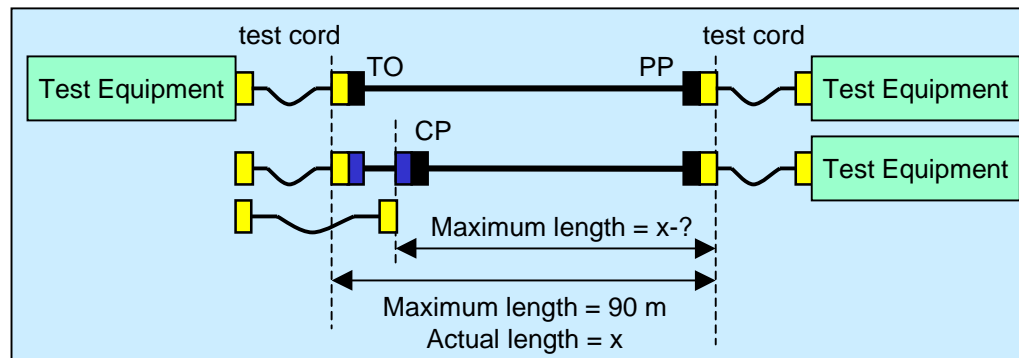


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Testing the Copper Channel



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Length/connector-independent parameters

- Wire map

Length-dependent parameters

- Delay
- Skew
- Attenuation

NVP used for length calculation

Length/connector-dependent parameters

- NEXT
- PSNEXT
- ELFEXT
- PSELFEXT
- Return Loss

Length allowance is complex to compute

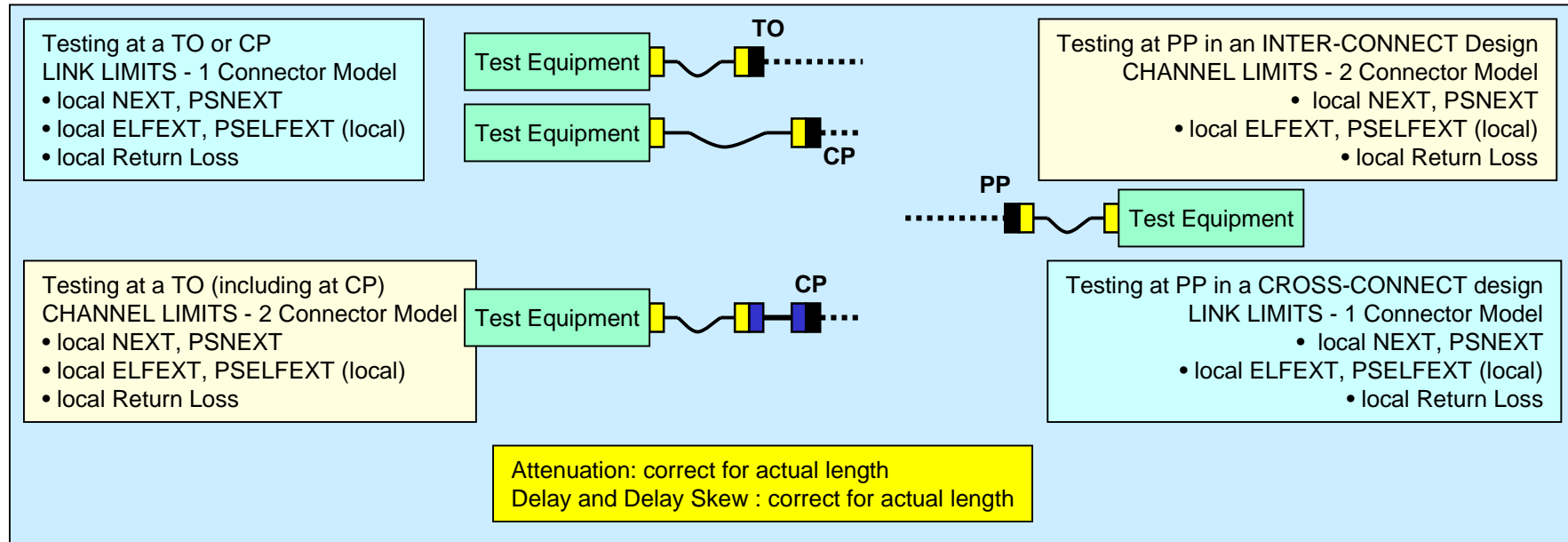


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Configuration-based Testing



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Testing the New Classes



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Class D (1999)

- ISO/CENELEC test standard
 - exclude test leads from measured values
 - specify measurement accuracy
- test schedule:
 - wire map
 - attenuation
 - NEXT (local and remote)
 - PSNEXT (local and remote)
 - ELFEXT (local and remote)
 - PSELFEXT (local and remote)
 - Return Loss (local and remote)
 - skew
- measurement range 1MHz - 100MHz

Class E

- extended frequency
 - 1 - 250MHz

Class F

- extended frequency
 - 1 - 600MHz
- remote parameters represent major challenge
 - attenuation at high frequencies
 - may not be measurable



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Testing Optical Fibre



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current approach

- test schedule:
 - optical power loss
 - power meter
 - optical time domain reflectometer

Issues

- high bit rate applications
 - low loss limit
 - measurement accuracy is important
- modal bandwidth
 - installed base unknown
 - no low-skill test method



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Summary



REVISED STANDARDS FOR INSTALLED CABLING AND THEIR IMPACT ON TESTING

AMENDMENTS TO ISO/IEC AND CENELEC STANDARDS

COMPLETE 1999

- Permanent links - channels
 - testable elements
- Class D (1999) - 1000BASE-T support
 - additional parameters
 - component mapping
 - certain configurations require >Cat. 5
- New tests
 - existing parameters
 - current limits
 - new parameters
 - software upgrade for most test equipment

REVISIONS TO ISO/IEC AND CENELEC STANDARDS

COMPLETE 2001

- New channel model including "consolidation point"
- New Classes
 - E specified to 250MHz
 - F specified to 600MHz
- New components
 - Category 6
 - Category 7
- New test equipment
 - higher frequencies
- Optical fibre
 - bandwidth under pressure
 - new planning guides