SPI-5 Cable/backplane Issues

Periodic structures

ACR

Distance versus specifications
Periodic Structure Issues

- Device spacing or connector spacing cannot be quarter wavelength.
  - Common spacing for twist and flat cable is 160 MHz quarter wavelength spacing which creates a comb filter with the first notch at 160 MHz.
  - Spacing and modeling for cables and backplanes is critical.
Attenuation – Crosstalk Ratio ACR

- Some of the current cables have little or no margin at 160 and 320 MHz.
- Specifications need to be generated to insure adequate margin.
- Applies to both backplanes and cables.
Distance versus Electrical specification

• SPI-4 specifies distance without the detailed cable specification.
• If SPI-5 has distance specifications, it needs electrical specifications for the cables. It can not just be the wire gauge.
• Electrical specification is the cleanest engineering specification, but this does not meet some of the marketing requirements.
Distance versus Specifications

• PIP defines the testing of each of the parameters.
• Specifications for each test need to exist either in PIP or each generation of SPI.
• SPI-5 compliant cables should be for more than one generation.
### Table 21 - Attenuation requirements for SCSI bulk cable

<table>
<thead>
<tr>
<th>Distance between SCSI bus segment terminators (m)</th>
<th>Attenuation per m maximum (dB) at 200 MHz</th>
<th>Attenuation of length equivalent to terminator to terminator distance maximum (dB) at 200 MHz</th>
<th>Distances are consistent with these minimum size conductors when used with high quality dielectrics</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 9</td>
<td>0.63</td>
<td>6</td>
<td>0.0324 mm² (32 AWG) solid/ 0.05092 mm² (30 AWG) stranded</td>
<td>multiple loads allowed</td>
</tr>
<tr>
<td>0 to 12</td>
<td>0.48</td>
<td>6</td>
<td>0.05092 mm² (30 AWG) solid/ 0.08042 mm² (28 AWG) stranded</td>
<td>multiple loads allowed</td>
</tr>
<tr>
<td>&gt;12 to 25</td>
<td>0.48</td>
<td>12</td>
<td>0.05092 mm² (30 AWG) solid/ 0.08042 mm² (28 AWG) stranded</td>
<td>point to point only</td>
</tr>
</tbody>
</table>

Both the per meter and the length equivalent to the terminator to terminator spacing requirements shall be simultaneously met.
Cables must match \( K \times \sqrt{f} \) for table

-0.165 dB~
-1.9 dB~

1 MHz

-12 dB

200 MHz

Notes:
1) the multidrop specification is based on a 3 meter maximum length with 30 AWG wire
2) the point to point is based on a 25 meters maximum length with 30 AWG wire
3) curve shape is \( K \times \sqrt{f} \)

Maximum allowable (end to end) S21 vs log frequency
Twist and flat attenuation
Twist and Flat Crosstalk