



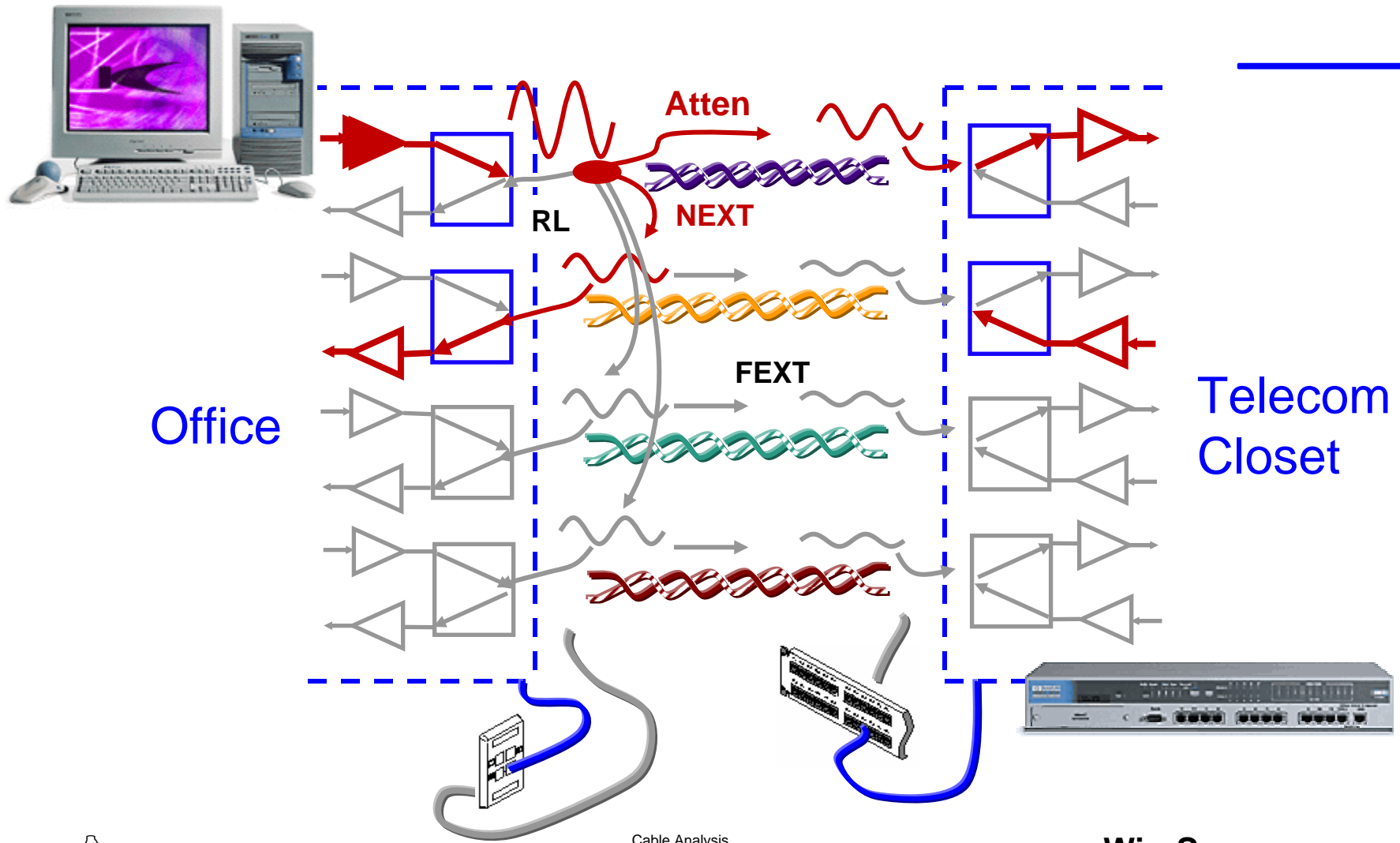
# Cable Analysis

## Extracting Information From Measured Data

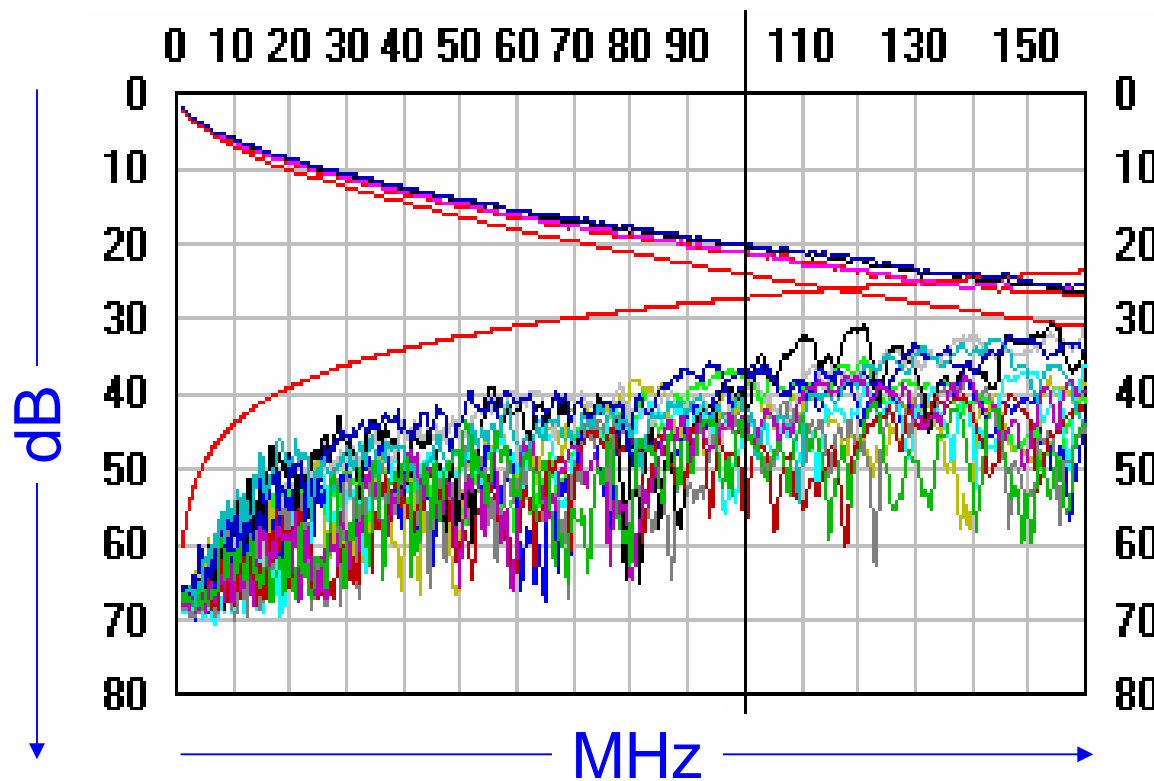
Fanny Mlinarsky

January 1999

# What We Measure and Why



# Why do Cabling Standards Use Frequency Domain?

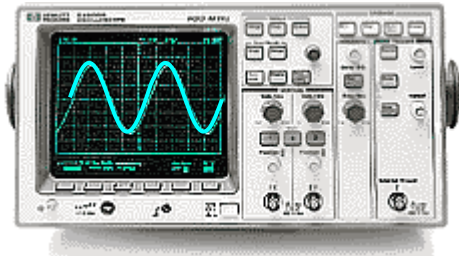


Frequency domain shows available channel bandwidth

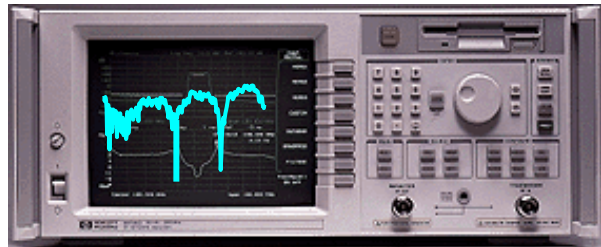
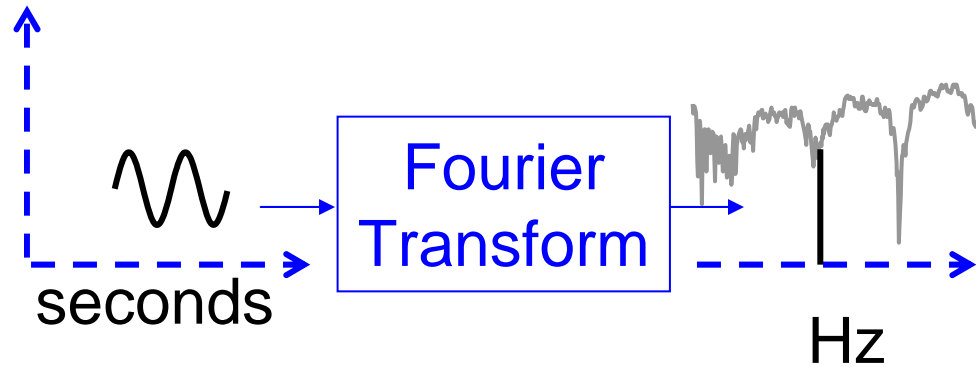
Channel bandwidth determines symbol rate



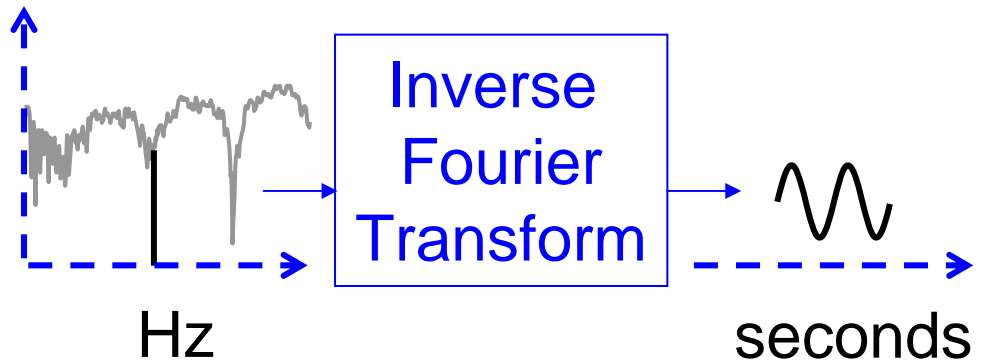
# Time and Frequency Domains



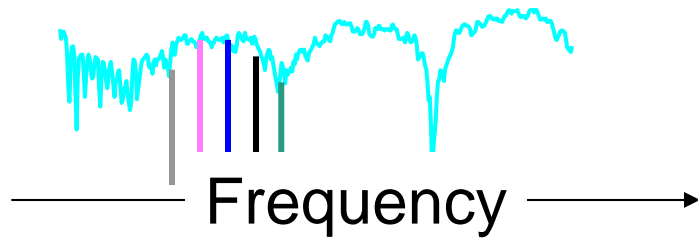
Oscilloscope



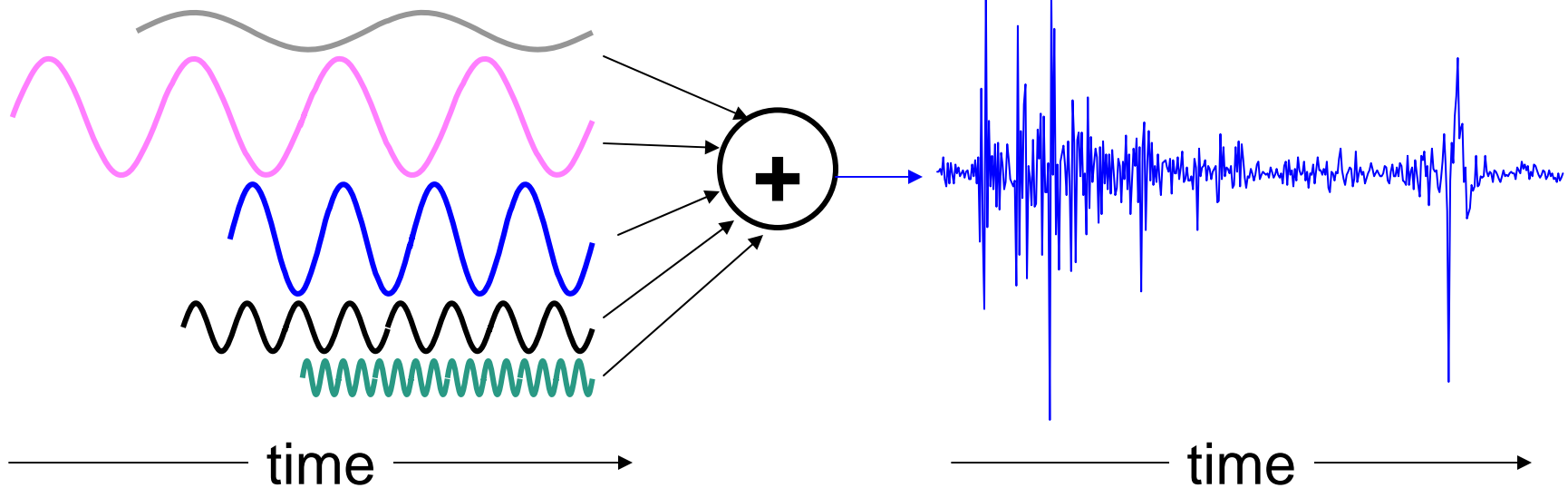
Network Analyzer



# Frequency to Time

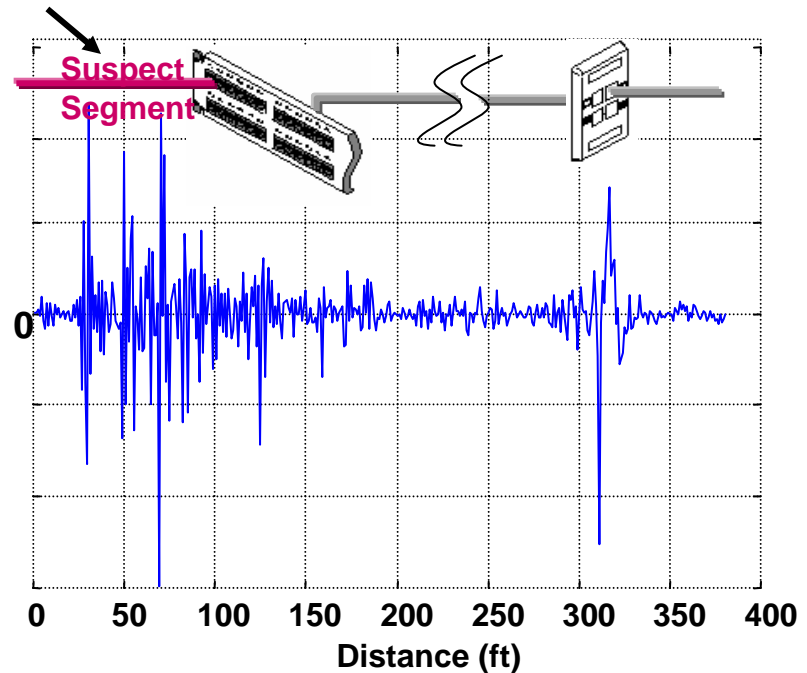
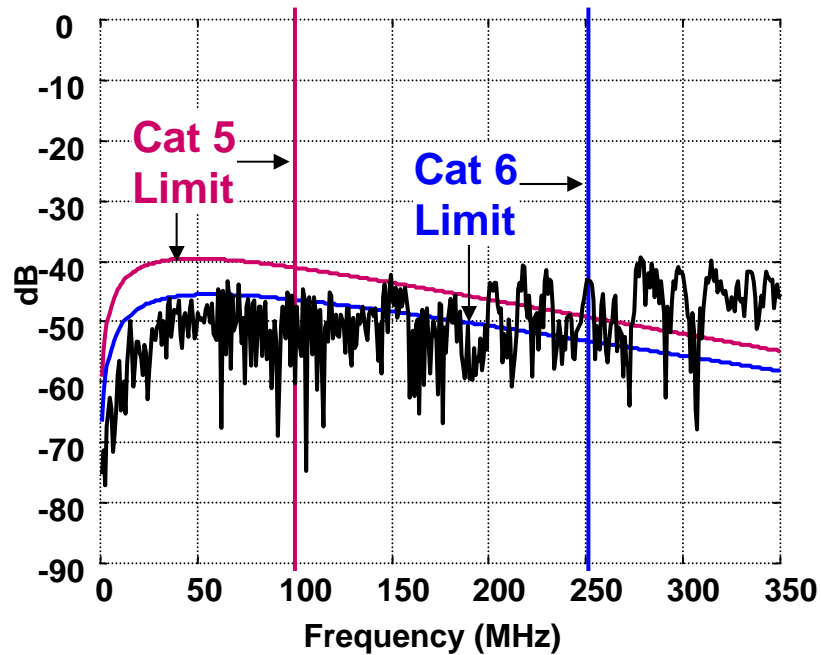


(Note: conceptual example - not mathematically correct)

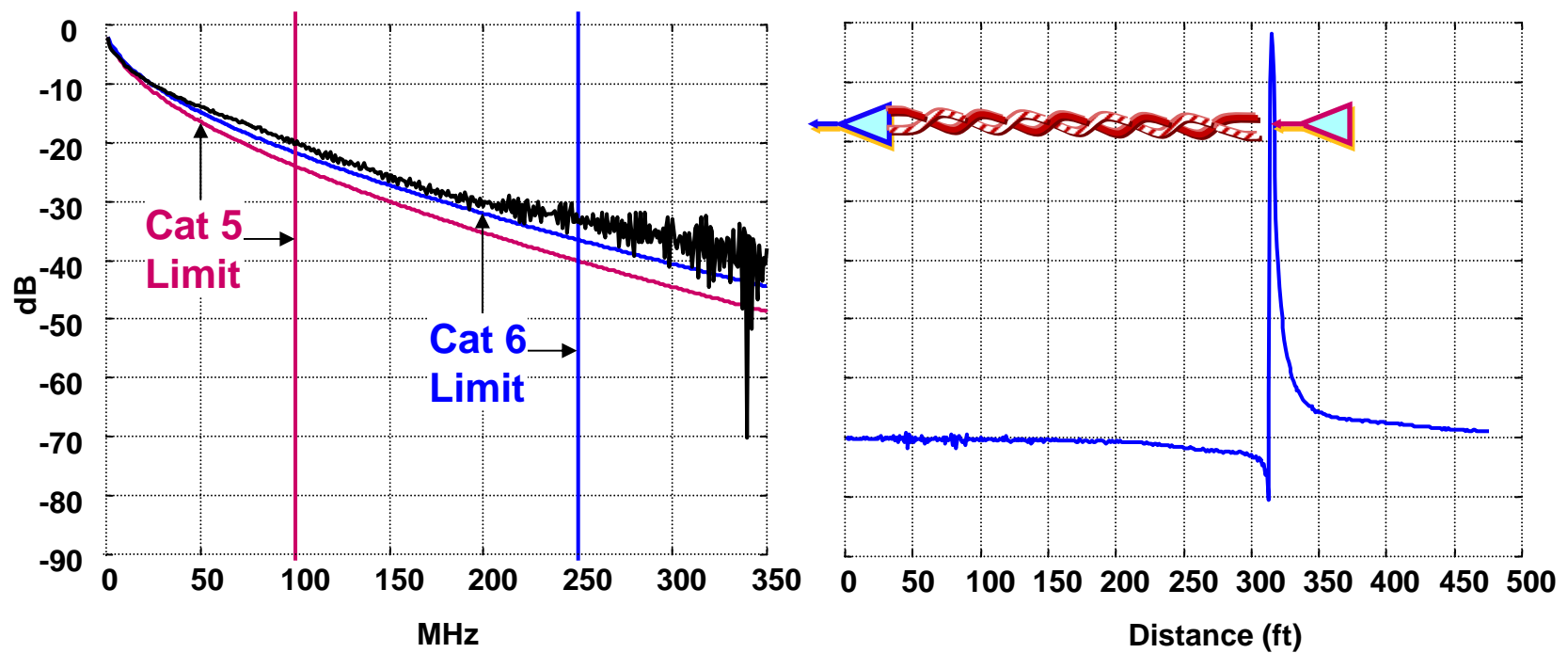


# Why is Time Domain Useful?

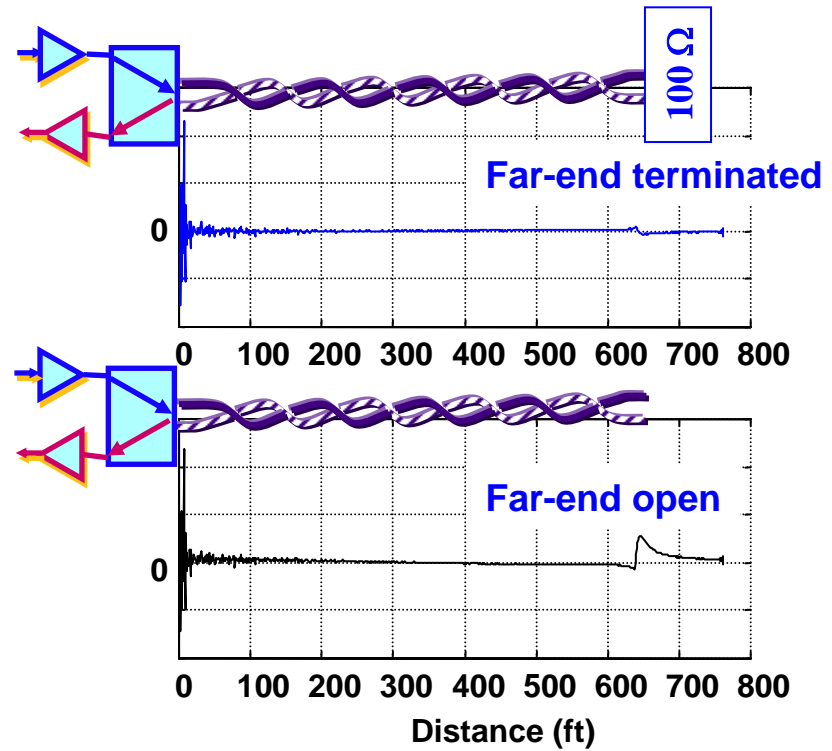
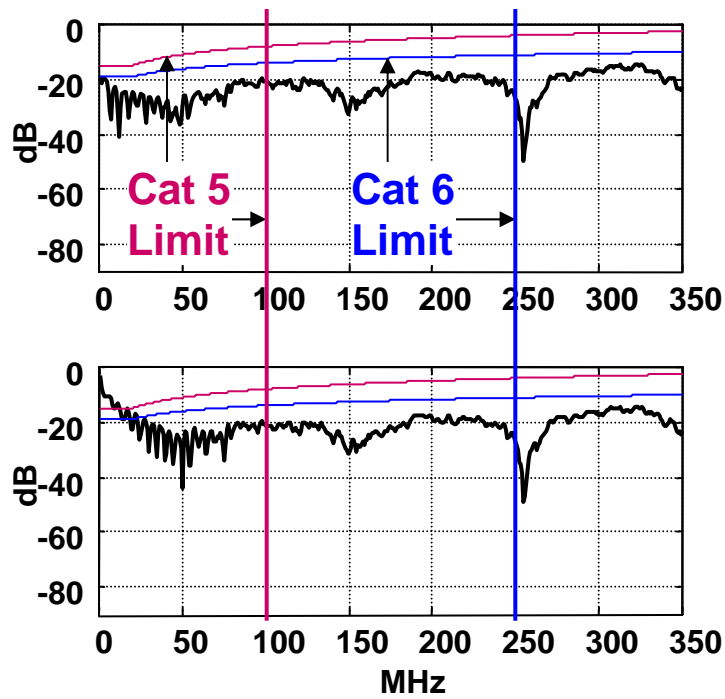
## Far End Crosstalk (FEXT)



# Attenuation

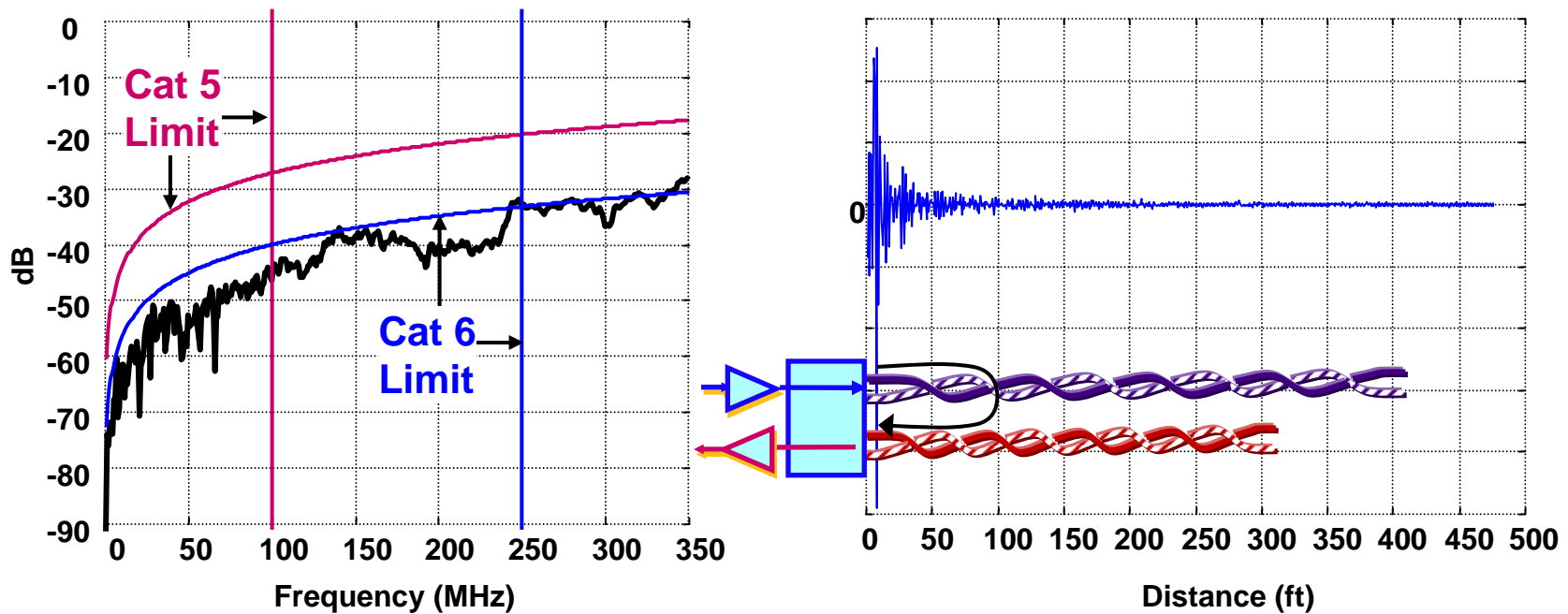


# Return Loss

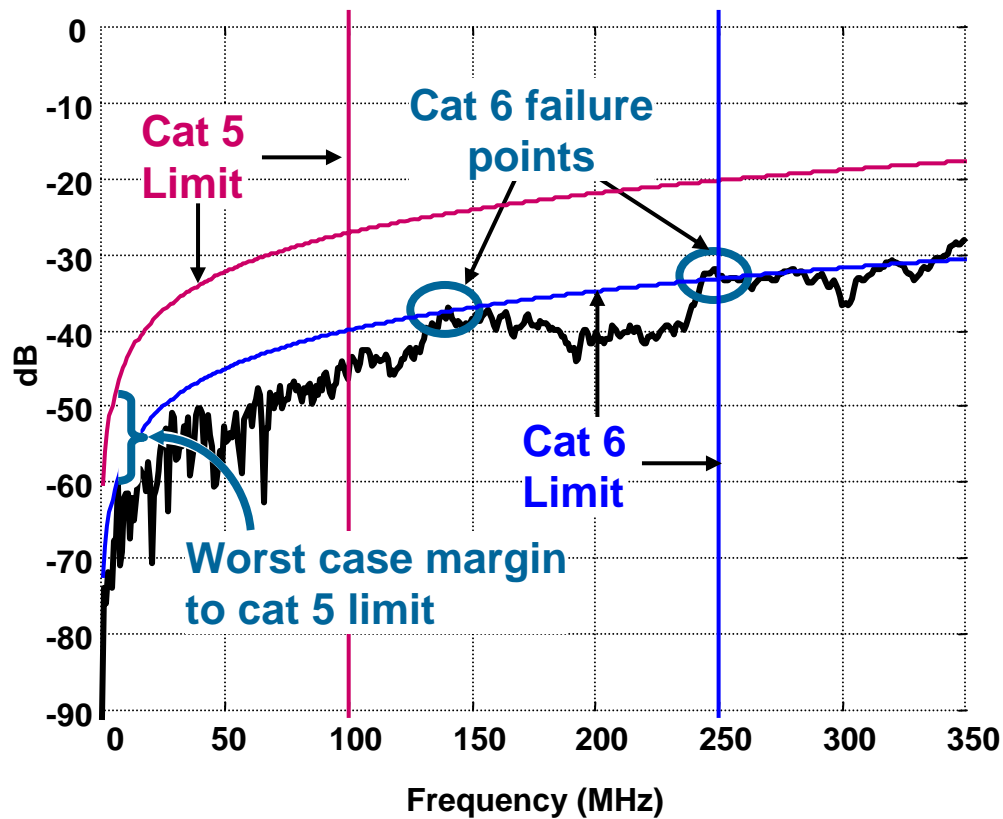




# Near End Crosstalk (NEXT)



# Re-Certifying Plot Data



Worst Case  
**Value:** 59.0 dB  
**Limit:** 46.5 dB  
**Margin:** 12.5 dB  
**Frequency:** 7.1 MHz



# Typical Text-based Certification Reports

<i>Pair to pair NEXT (dB)</i>	<i>Local</i>	<i>@MHz</i>	<i>Limit</i>	<i>Margin</i>	<i>Remote</i>	<i>@MHz</i>	<i>Limit</i>	<i>Margin</i>
<b>Combo 1 (4,5) - 2 (3,6)</b>	44.5	99.0	27.2	17.3	45.8	91.0	27.8	18.0
2 (3,6) - 3 (1,2)	53.8	99.0	27.2	26.6	53.3	100.0	27.1	26.2
4 (7,8) - 3 (1,2)	53.0	93.0	27.7	25.3	55.6	85.0	28.3	27.3
4 (7,8) - 1 (4,5)	49.8	79.0	28.9	20.9	49.2	84.0	28.4	20.8
1 (4,5) - 3 (1,2)	47.6	100.0	27.1	20.5	48.3	98.0	27.3	21.0
4 (7,8) - 2 (3,6)	47.0	79.0	28.9	18.1	49.2	74.0	29.4	19.8
<i>Pair to pair ACR (dB)</i>	<i>Local</i>	<i>@MHz</i>	<i>Limit</i>	<i>Margin</i>	<i>Remote</i>	<i>@MHz</i>	<i>Limit</i>	<i>Margin</i>
<b>Combo 1 (4,5) - 2 (3,6)</b>	44.5	99.0	0.0	44.5	45.8	91.0	0.0	45.8
2 (3,6) - 3 (1,2)	53.8	99.0	0.0	53.8	53.3	100.0	0.0	53.3
4 (7,8) - 3 (1,2)	53.0	93.0	0.0	53.0	55.6	85.0	0.0	55.6
4 (7,8) - 1 (4,5)	49.8	79.0	0.0	49.8	49.2	84.0	0.0	49.2
1 (4,5) - 3 (1,2)	47.6	100.0	0.0	47.6	48.3	98.0	0.0	48.3
4 (7,8) - 2 (3,6)	47.0	79.0	0.0	47.0	49.2	74.0	0.0	49.2



# Test Reports With Plots

Your Logo Here

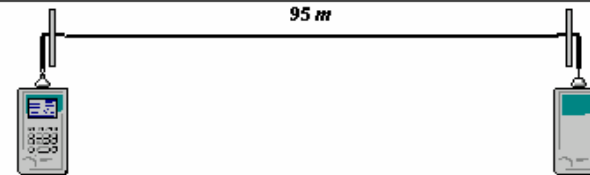
Site: Sears  
 Building: Headquarters  
 Floor: 1  
 Closet: 1  
 Cable ID: F2-O2-P



PASS

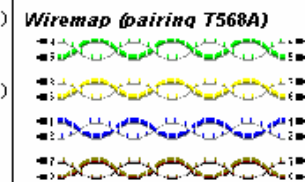
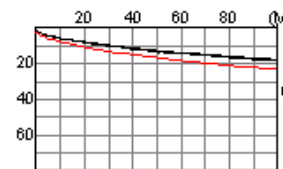
## Cable Certification Report (Pair-to-pair data)

Target: ISO11801 Class D  
 Tested: 12/23/98 11:30 AM  
 Cable: UTP CAT 5  
 Cable Length: 95 m  
 WS 155 020695-001-06 with Channel probe  
 DR 155 031397-005-07 with Basic link probe



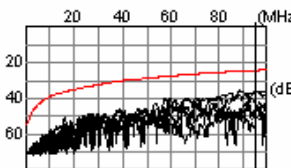
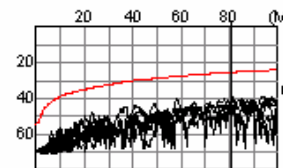
**Attenuation @WS**

Worst pair: 1 (4,5)  
 Value (dB): 18.4  
 Limit (dB): 23.2  
 Margin (dB): 4.8  
 Frequency (MHz): 100.0



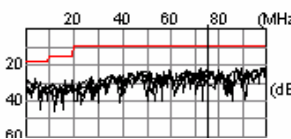
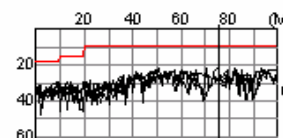
**Pair to pair NEXT @WS @DR**

Worst combo: 1(4,5) - 3(1,2) 1(4,5) - 3(1,2)  
 Value (dB): 38.7 35.6  
 Limit (dB): 25.3 24.3  
 Margin (dB): 13.4 11.3  
 Frequency (MHz): 81.0 95.3



**Return-Loss @WS @DR**

Worst pair: 3 (1,2) 1 (4,5)  
 Value (dB): 21.1 21.7  
 Limit (dB): 10.0 10.0  
 Margin (dB): 11.1 11.7



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# Summary

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- Certification data presents a complete picture of signal and noise environment for data transmission
- Certification reports with plots are far superior to worst case summary reports
- Plot data can be viewed in time domain for diagnostics
- Plot data can be re-certified to new standards

