

Cable Test Requirements

**A presentation at SPI-3 working
group**

Jan.26, 1999



Cable Test Requirements

- Impedance (Differential & SE)
 - TDR vs Frequency domain
 - TDR measurement
 - 1) Sample window
 - 2) Sample length
 - 3) Rise time

 - Attenuation
 - Testing frequency range
 - 6 dB down requirement
-

Cable Test Requirements

- Capacitance (Mutual & SE)
 - Frequency domain sweep vs test on interesting point
- Time Delay
 - TDT vs Signal generator/Scope

The purpose of this presentation is to address some concerns in the cable test requirements proposed at working group on Dec.2, 1998.

TDR vs Frequency domain on Impedance Measurement

- TDR is more appropriate test method for impedance(Z) measurement on SCSI cables
 - at HF, Z is almost independent from frequency for the insulation compound used on SCSI cables
 - at LF, Z varies as frequency varies and $Z @LF$ can not be controlled separately from $Z @HF$
 - in frequency domain, Z measurement is very sensitive to the test cable length. To accurately measure Z , an optimal test length and its measureable frequency range need to be carefully calculated. For a desired wide frequency range, several cable length needed to be tested and this is not practical at production level. See attached test data.



MADISON Cable Corporation

An AMP Company

TDR vs Frequency domain on Impedance Measurement

- for a desired wide frequency range, several cable length needed to be tested and this is not practical at production level.
- There is a limit on test frequency where the test cable length is too short comparing to the test fixture that accurate Z can be measured.

Impedance TDR Measurement

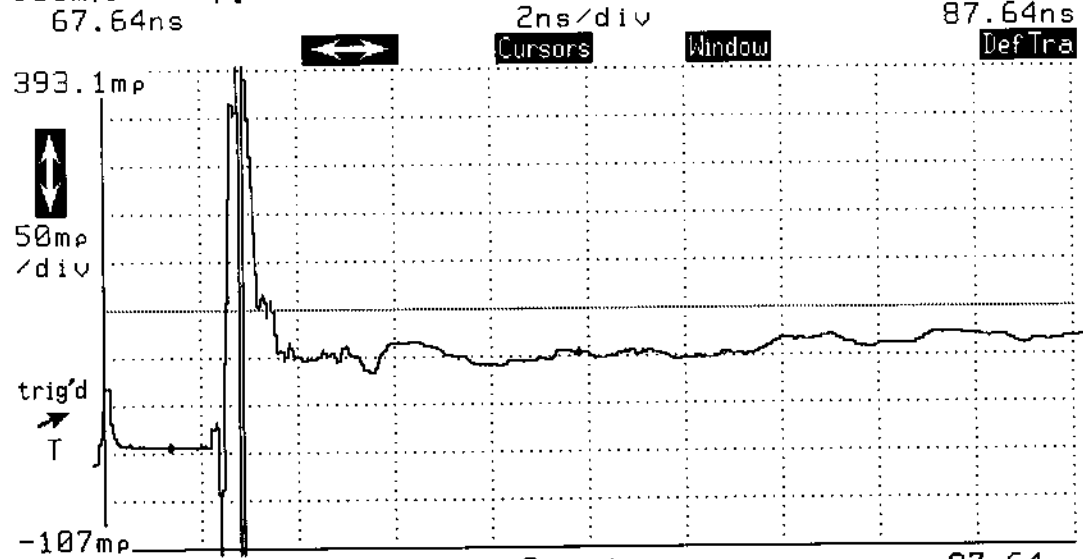
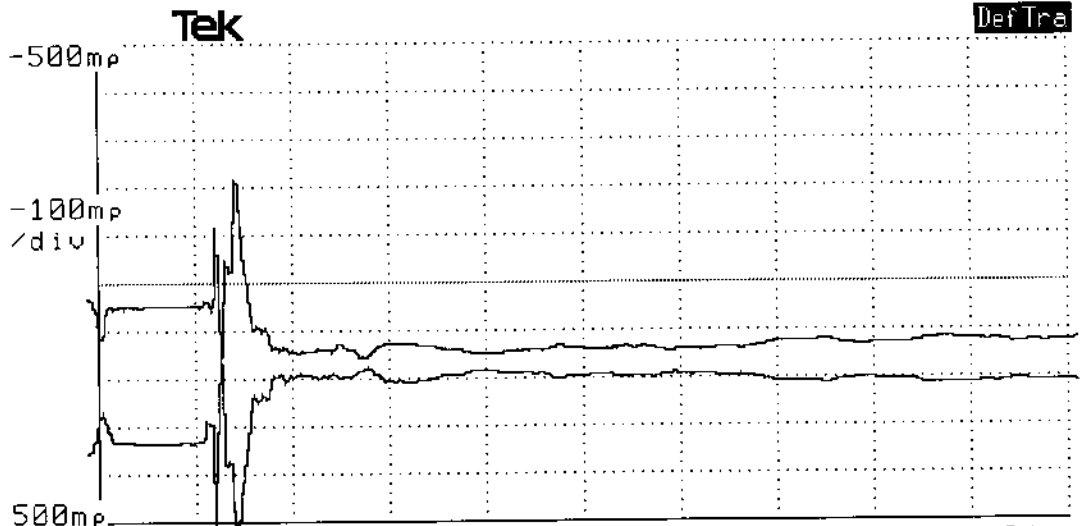
- We concern the following issues on impedance TDR measurements
 - Time Window need to be specified
 - Because @TDR, impedance is indepedant from the cable length so that the minimum testable cable length should be allowed, for example 10 ft. See attached figure for the comparision of impedance measurement on a 6 m and a 10 ft cable.
 - Rise time: we concerned 3 ns rise time is too slow for SCSI cable impedance measurement.

Attached supporting test data

- See the test cable construction on the next page
 - Impedance measurement @TDR on one pair (10 ft sample)
 - Impedance measurement @frequency domain (25 m sample)
 - Short sample frequency domain impedance measurement
 - same 10 ft sample measured from 1 to 10 MHz
 - 5 ft sample measured from 2 to 20 MHz
 - 2.5 sample measured from 4 to 40 MHz

Cable being tested
30 awg 7 stranded,
foam polyolefin insulated,
34 pairs,
overall shielded,
Differential Impedance=124 +/- 10 ohms

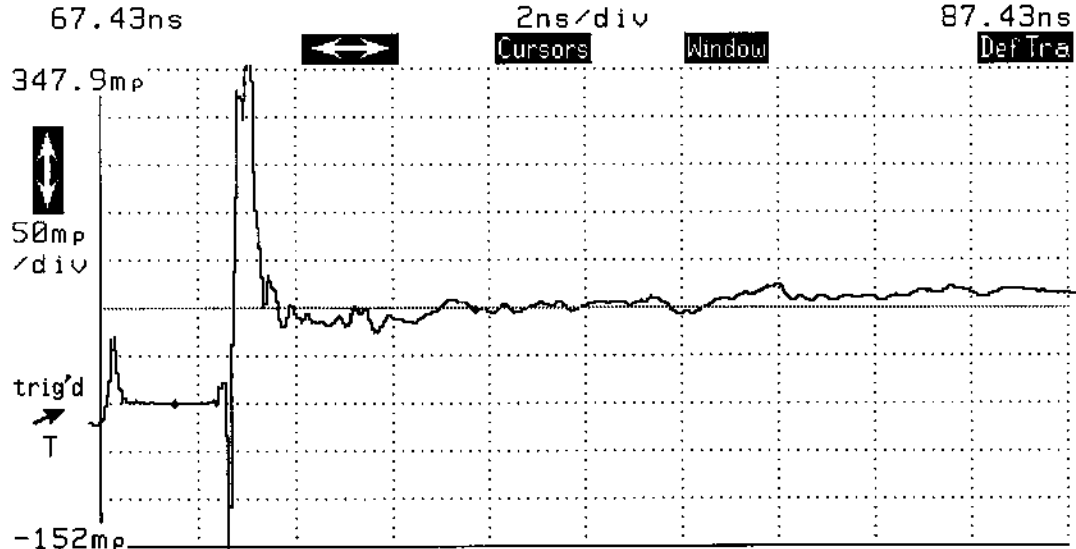
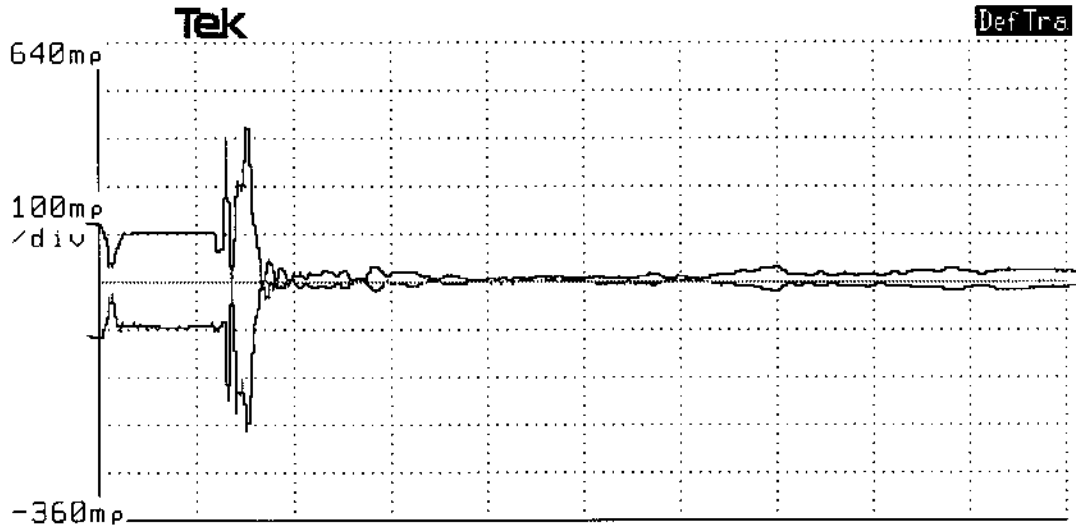
11801 DIGITIZING SAMPLING OSCILLOSCOPE
 date: 20-JAN-99 time: 13:54:06



Cursor		2ns/div			87.64ns	
Type	p1	54.717μp	50.01Ω	100.0Ω	Cursor 1	69.00000ns
Paired	p2	98.602mp	60.94Ω	121.9Ω	Cursor 2	77.44000ns
Dots	Δp	98.523mp	10.93Ω	21.86Ω		
Exit	Set	t1	69.000ns	t1/2	34.500ns	Remove/Cln
	Zero	t2	77.440ns	t2/2	38.720ns	Trace 3
		Δt	8.440ns	Δt/2	4.220ns	Avg(M1-M2)
		1/Δt	118.48MHz			Main

W4T/ORG-ORG/W4T-10

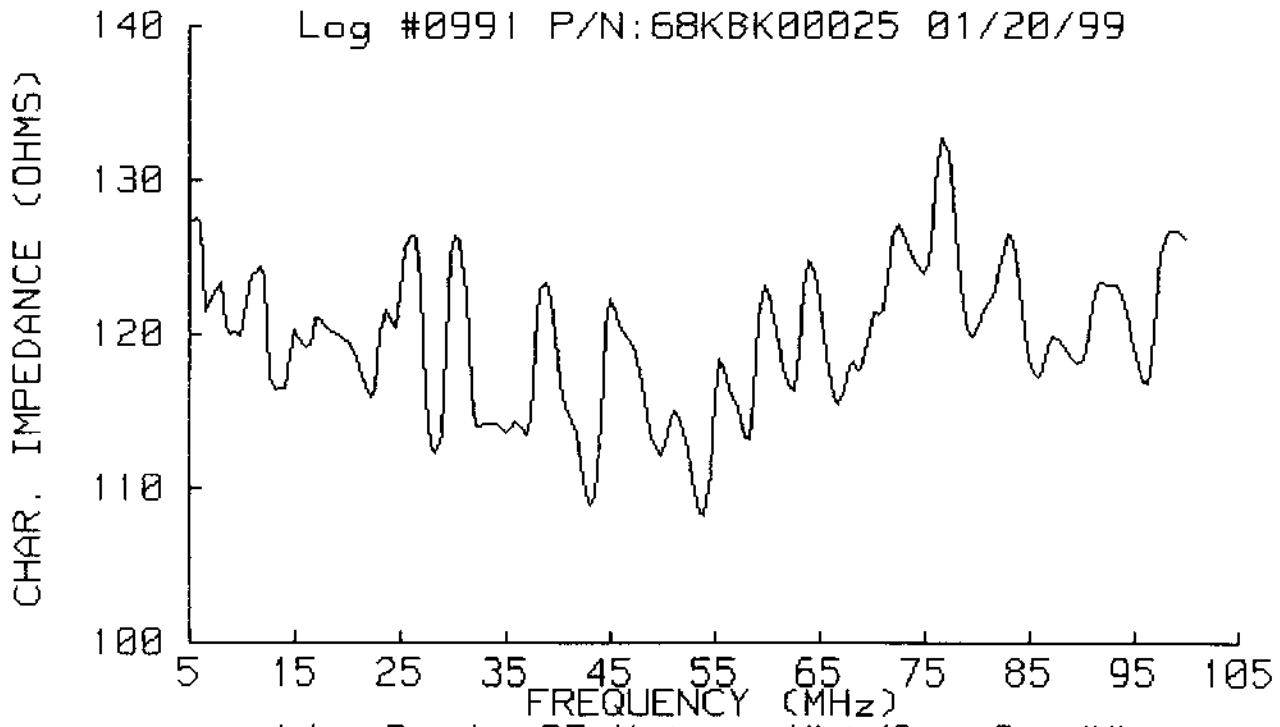
11801 DIGITIZING SAMPLING OSCILLOSCOPE
 date: 22-JAN-99 time: 13:46:26



Cursor		2ns/div			87.43ns	
Type	p1	-1.2969mp	49.87Ω	99.74Ω	Cursor 1	68.94800ns
Paired	p2	97.727mp	60.83Ω	121.7Ω	Cursor 2	75.14799ns
Dots	Δp	99.023mp	10.96Ω	21.92Ω		
Exit	Set	t1	68.948ns	t1/2	34.474ns	Remove/Clr
	Zero	t2	75.148ns	t2/2	37.574ns	Trace 3
		Δt	6.2000ns	Δt/2	3.1000ns	Avg(M1-M2)
		1/Δt	161.29MHz			Main

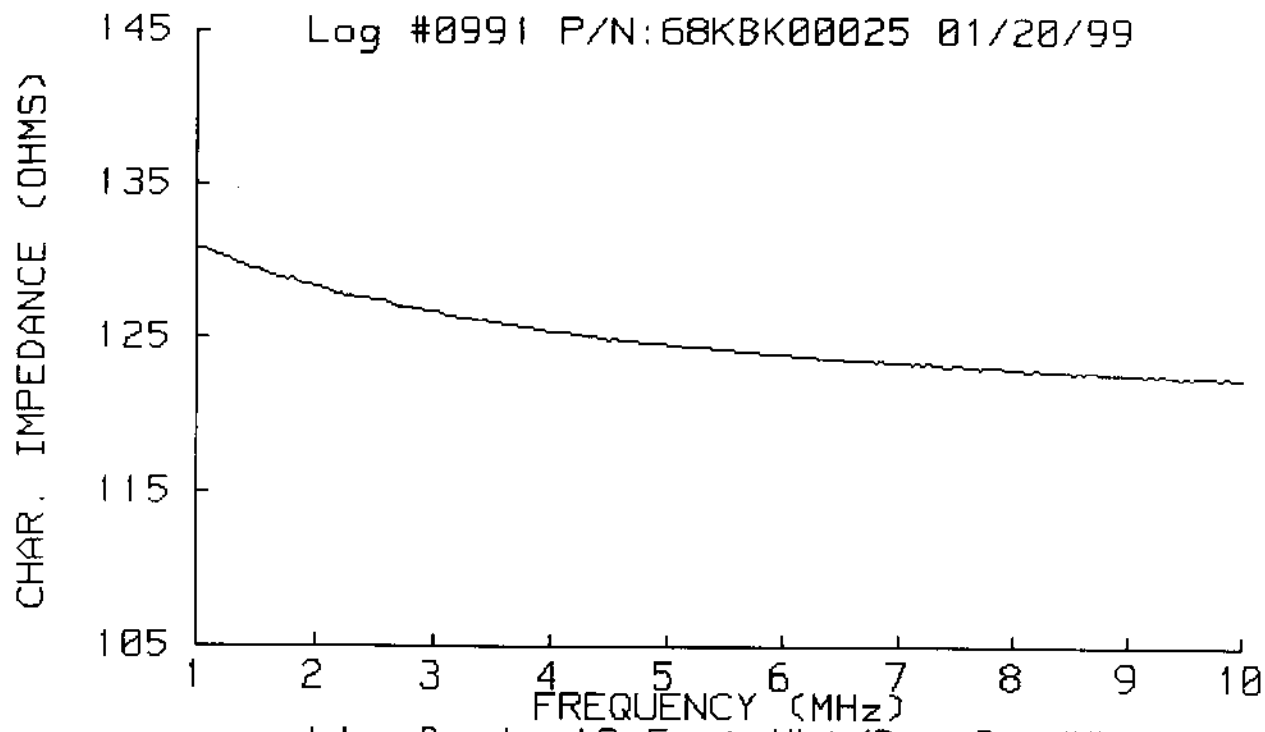
WHITE/ORANGE
 6 METERS

Log #0991 P/N:68KBK00025 01/20/99



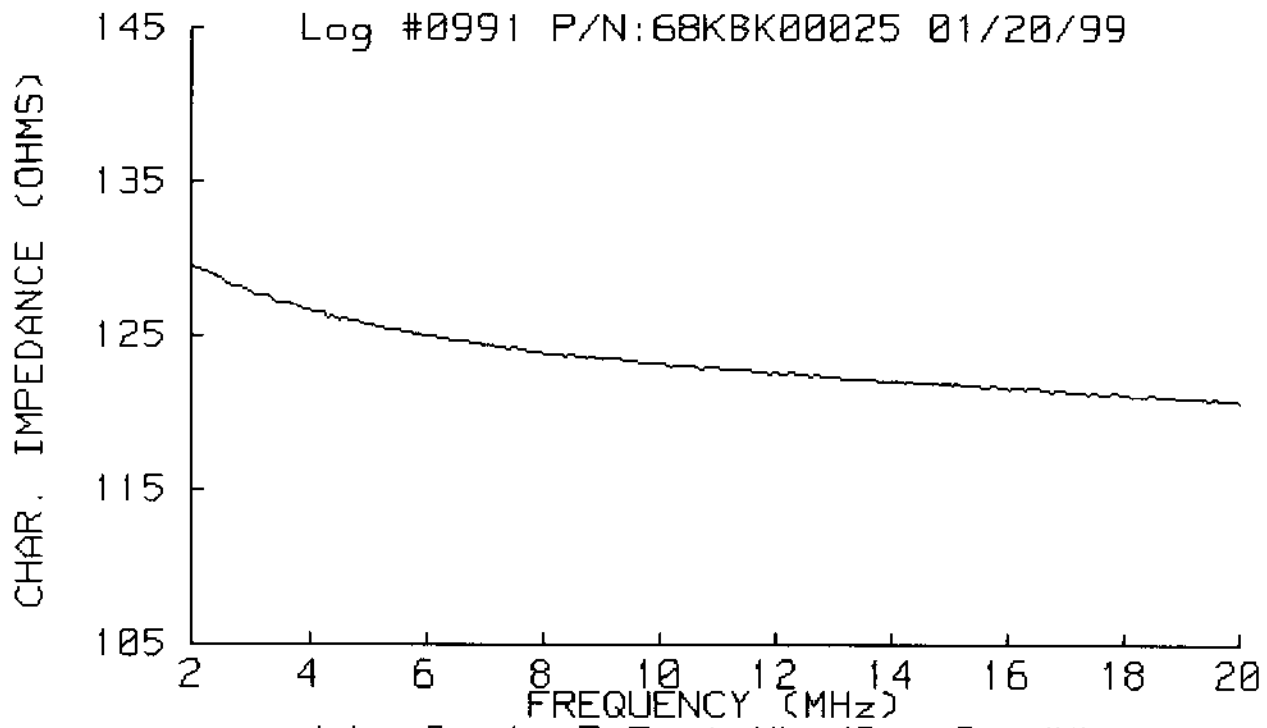
John Deely 25 Meters Wht/Org-Org/Wht

Log #0991 P/N:68KBK00025 01/20/99



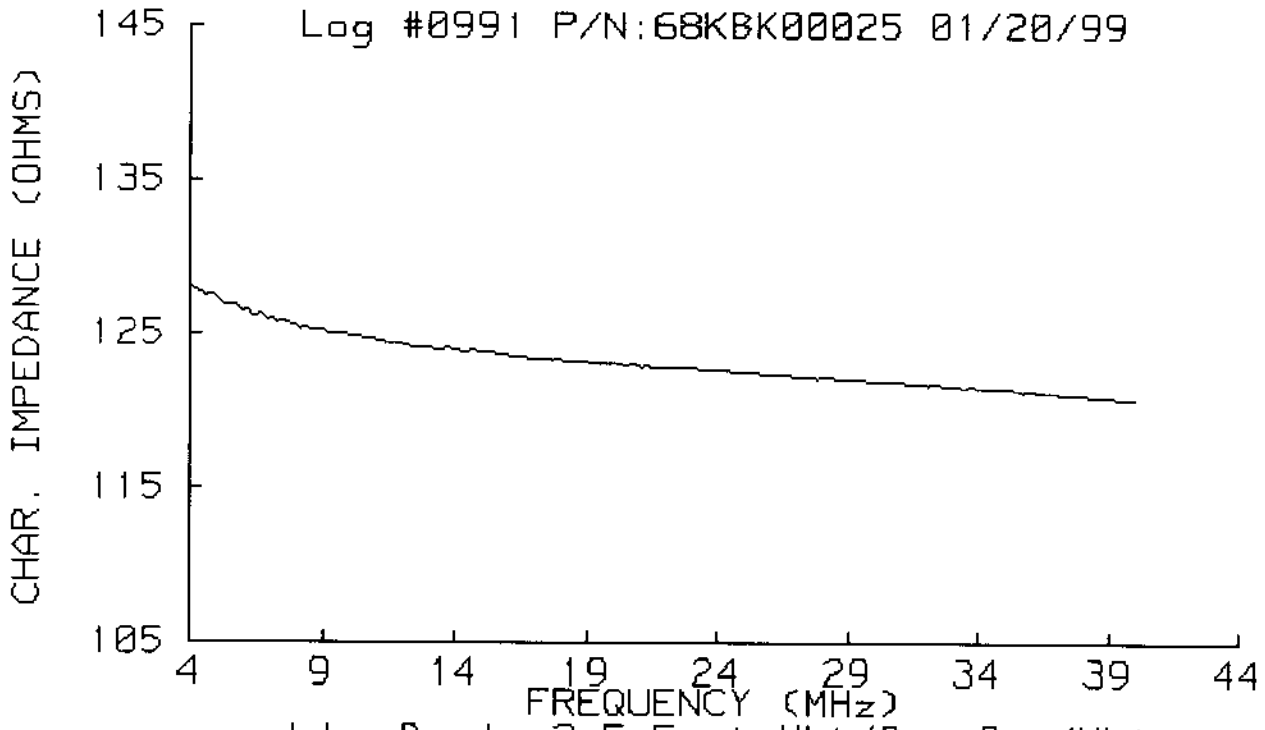
John Deely 10 Feet Wht/Org-Org/Wht

Log #0991 P/N:68KBK00025 01/20/99



John Deely 5 Feet Wht/Org-Org/Wht

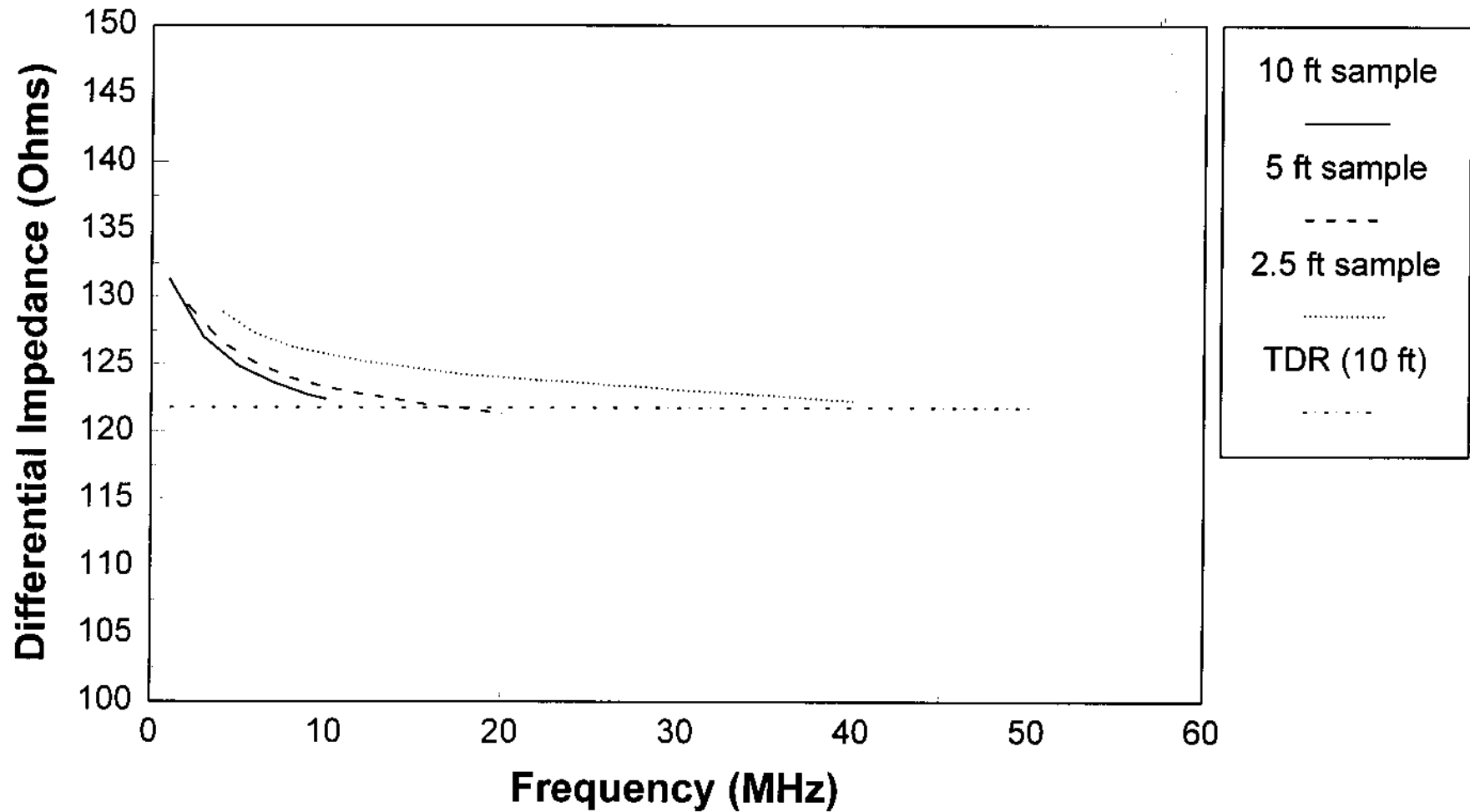
Log #0991 P/N:68KBK00025 01/20/99



John Deely 2.5 Feet Wht/Org-Org/Wht

Pg 3

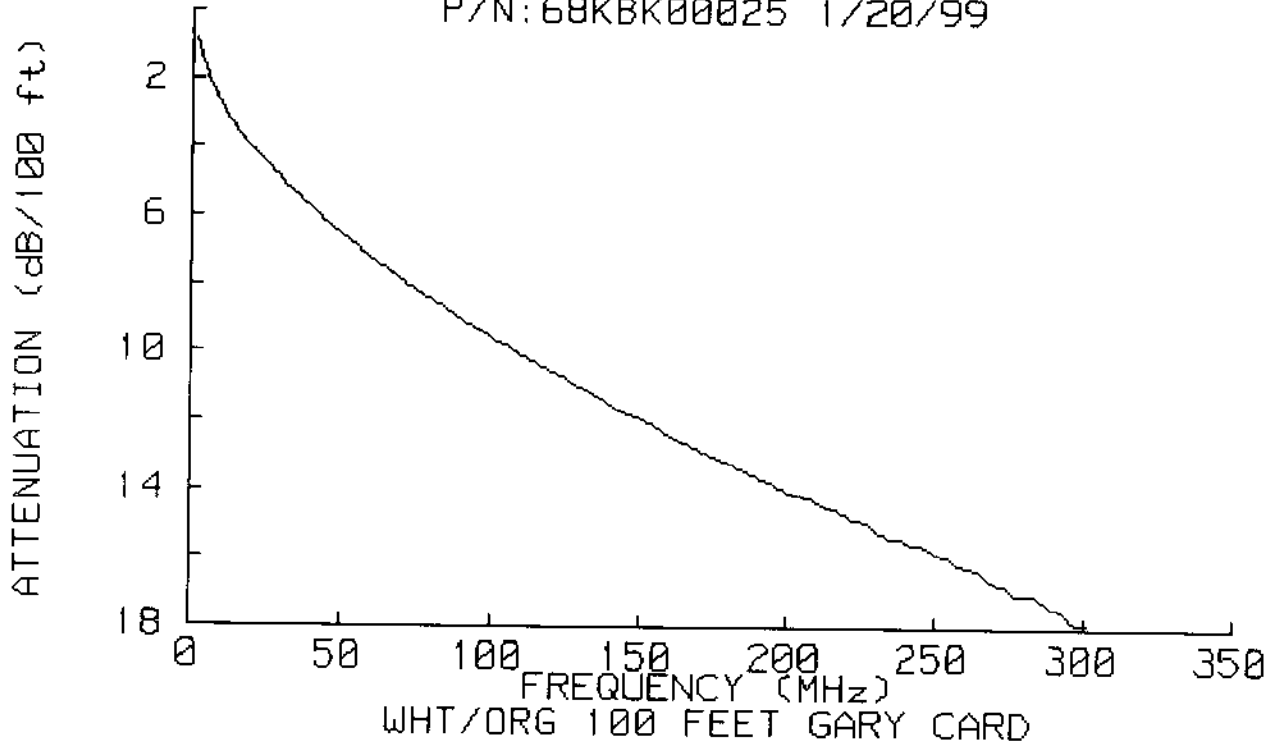
Imp. at Time domain vs Frequency domain



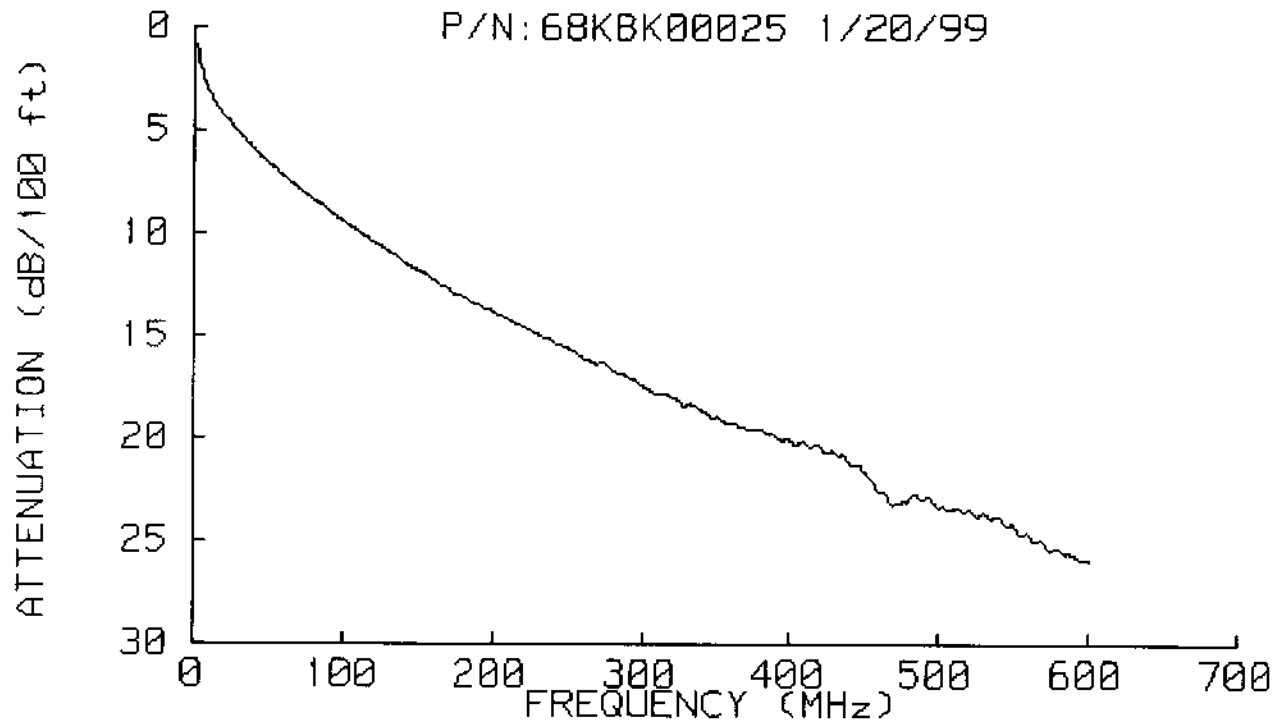
Attenuation test requirements

- We have two concerns:
 - 6 dB insertion loss: Based on our test data, on one given cable length, it is not practical to set this requirement. We propose to remove this requirement.
 - Required test frequency range: It will be very difficult to measure the attenuation at very high frequency due to fixture limit. We propose 1 MHz to 600 MHz and would like to see some actual test data from other manufacturers and to discuss the more practical test range.

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WHT/ORG 100 FEET GARY CARD

Capacitance Measurement

- We have two concerns:
 - Measuring frequency range: Due to the similar concerns as impedance measurement, it is not practical to measure the capacitance in a wide range of the frequency. We propose to set the measurement @ 1 MHz or 1 kHz
 - Capacitance can not be measured at very high frequency due to the proper cable length. See attached test data for support.

Time Delay Measurement

- We would like to test and compare the result of time delay on TDT (Madison's standard method) vs generator/scope method (proposed method).