

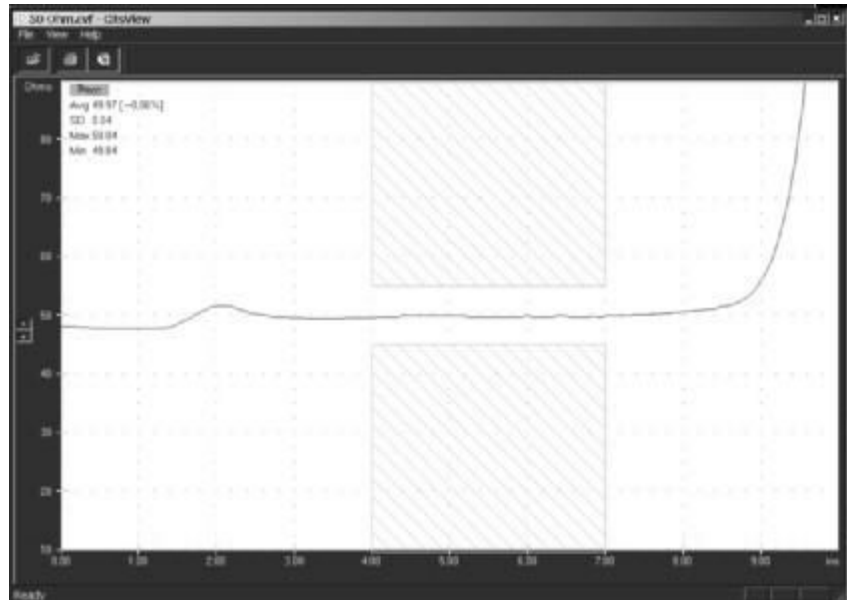
## Lossy traces - Where and how to use loss compensation on the CITS

### Background

Polar CITS impedance test systems are easy to set up and use. However care in setting up and understanding the test regions can yield improved measurement accuracy and better R&R. Some fine line traces now exhibit significant loss (a rising trace). Compensation may be applied to correct this on a CITS.

### First understand what is displayed

The test area shown on the 50 Ohm coupon on the right shows an ideal situation. And, to help understand what you are seeing you need to know each area of the trace under test. On the left hand side between 0 and 1.5" the trace is the end of the test probe.



**Impedance test TDR trace of an ideal (lossless) 50 Ohm sample coupon**

**Important note:** Loss compensation needs careful application. Polar strongly recommends you only use this facility after thorough consultation with the original design authority for the board

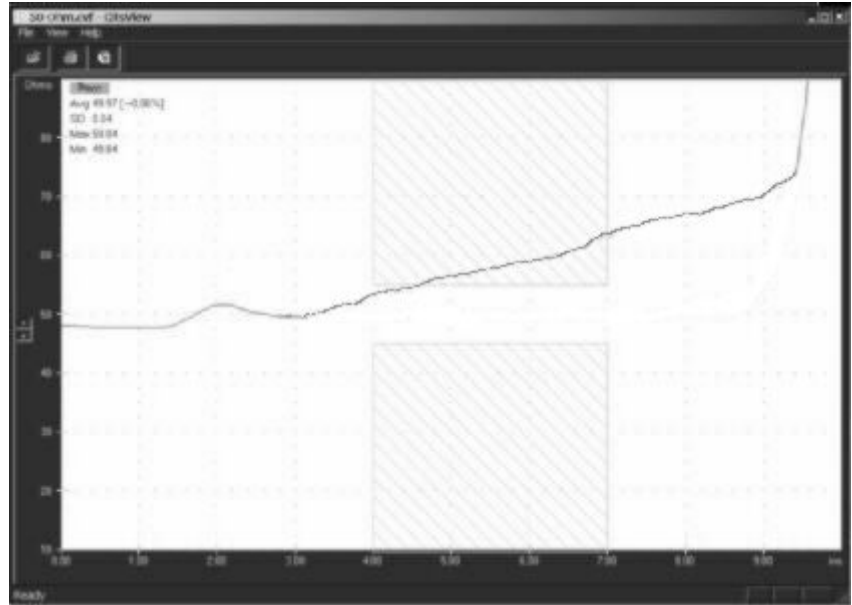
The small bump at 2.0" is caused by the impedance discontinuity between the probe and the test sample. This can vary depending on the condition of your test probe, and the quality of the test connection to the sample trace. The rest of the trace is flat and loss free.

### Look now at a lossy trace

Look carefully after the initial pulse has settled ( after an inch or two into the coupon.) Note the trace continues to rise in a linear way.

### Hint:

**Sloping traces may also occur because an etch problem has formed a track which tapers along its length. Before resorting to loss compensation check the trace from both ends. If it slopes up from one end and down from the other you have a tapered trace. If the trace slopes up when measured from either end, this is the result of a combination of loss.**

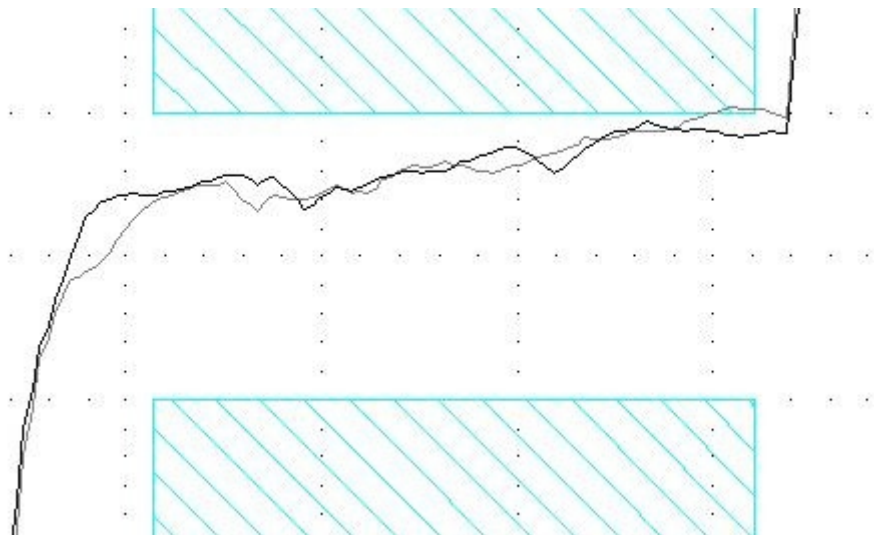


Impedance test TDR trace showing series loss.

### Real Example:

Lossy trace before compensation applied:

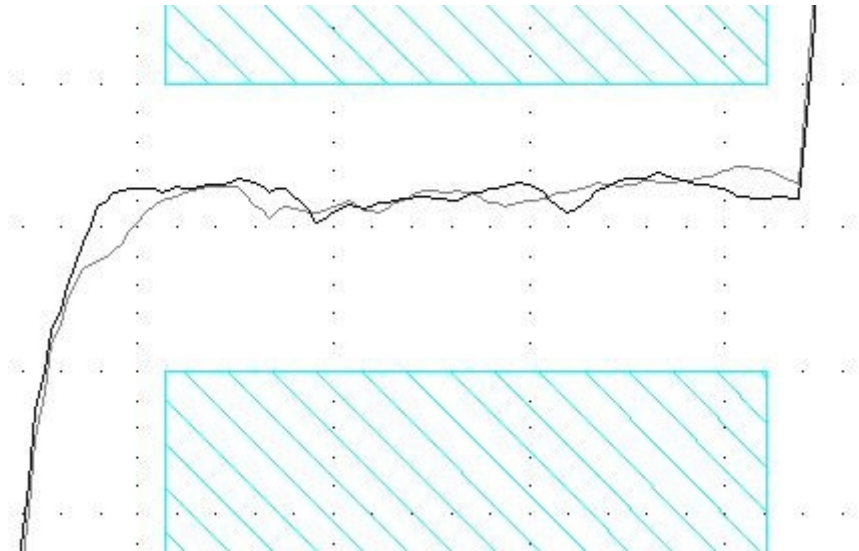
Note the two traces displayed are in fact the same trace measured from either end to confirm this really is a lossy trace and not a tapered trace.



Before compensation

**And after:**

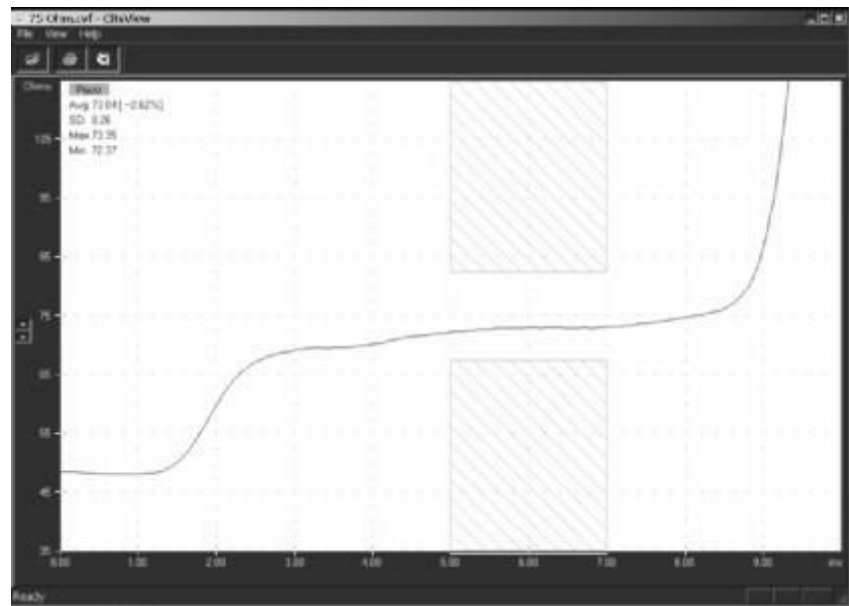
Now you can see the compensation has eliminated the sloping trace.



**Lossy trace after application of compensation.**

**Watch out for:**

Do not confuse pulse settling time with loss, make sure that the pulse aberrations due to interconnect have settled before you consider that you need loss compensation. On high impedance traces you may need to allow a couple of inches for the pulse to stabilise at its full amplitude before calculating the ohms per inch loss.



**This is not a lossy trace - the trace is flat in its central region.**

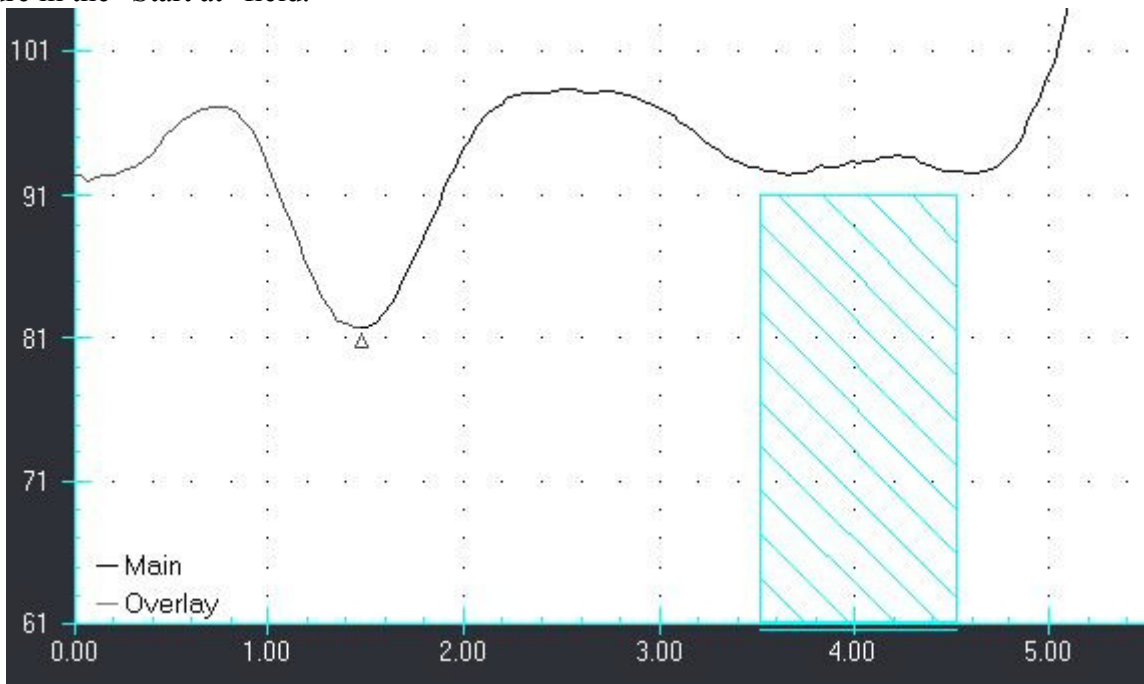
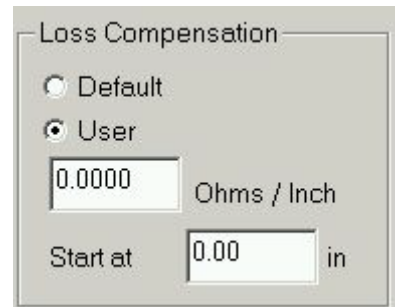
**Note:**

Lossy traces are typically only seen where line width is less than 75 microns (3 mils). You should **never need** to apply loss compensation on traces that are wider than 75 microns (unless you are working with extremely thin foils).

### How should loss compensation be applied?

Once a figure for the number of ohms per inch of compensation has been agreed with the designer, the next question is "where should the compensation start?"

The answer is "At the start of the test coupon trace." The CITS allows you to offset the compensation start position in from the left hand side of the screen. Simply make a test with no coupon and note the position of the end of the test probe. (Typically 1 to 1.5 inches in from the left hand side of the screen). Enter this figure in the "Start at" field.



**Cits waveform display highlights compensated portion, the start position of compensation is denoted by a triangular marker under the trace as shown**

### More information?

Further information on measuring PCB controlled impedances is available by email from [richard.smith@polarinstruments.com](mailto:richard.smith@polarinstruments.com)

For information on field solving impedance design software please contact: [ken.taylor@polarinstruments.com](mailto:ken.taylor@polarinstruments.com)



Polar Instruments Ltd

[www.polarinstruments.com](http://www.polarinstruments.com)

Tel: +44 (0) 1481 253081 Fax: +44 (0) 1481 252476 © 2002 Polar Instruments

© Polar Instruments 2002. Polar Instruments pursues a policy of continuous improvement. The specifications in this document may therefore be changed without notice. All trademarks recognised.