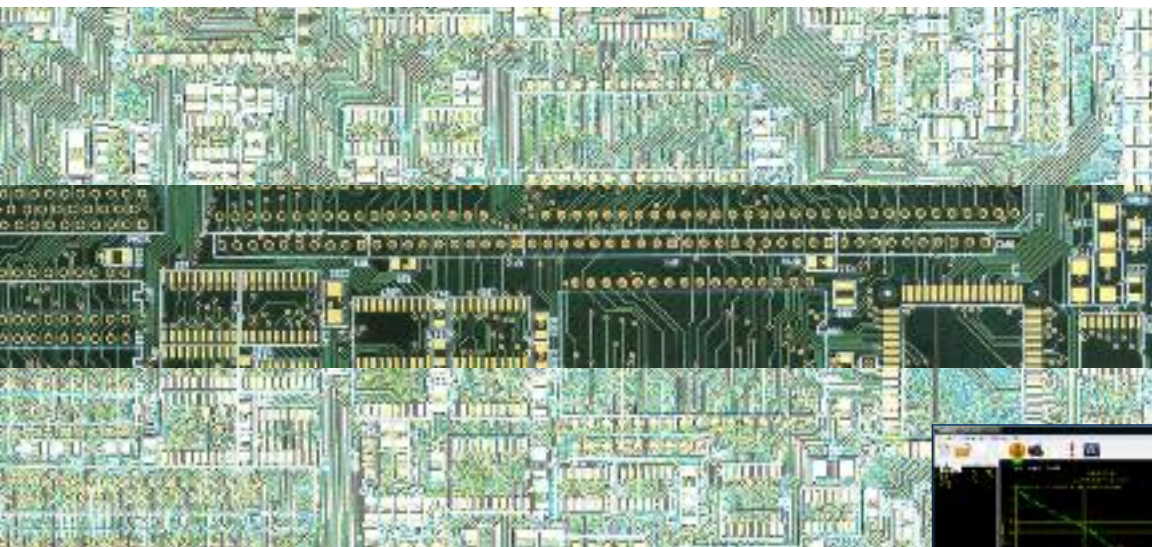


# PCB insertion loss test



*Accurate measurement of  
transmission line insertion loss  
for multi-GHz PCB fabrication*

*Atlas Si 2011*

*Ensures accurate insertion  
loss measurement*

*Incorporates SET2DIL  
method to extract  $S_{DD21}$*

*The first lossy-line test  
system designed for PCB  
fabricators*

*Easy to use by non-skilled  
operators*

*Supports SuperSpeed  
USB 3.0, PCI Express®  
Gen2.0, XAUI and  
RocketIO™ chipsets*



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



Atlas Si is the first insertion loss measurement package designed specifically for PCB fabricators. It provides accurate and repeatable measurements of frequency-based transmission line losses, allowing fabricators to meet stringent targets that maintain signal integrity within the limits of the latest high-speed chipsets.

The emergence of a new generation of high-speed busses, such as SuperSpeed USB 3.0, PCI Express® Gen2.0, XAUI and RocketIO™ means that PCB fabricators must be ready to provide tight control over losses from multi-GHz PCB transmission lines.

The differential signalling techniques used by these new busses allow PCBs operating at multi-GHz to be manufactured using conventional and cost-effective PCB base materials. However, while this gives OEM designers the combination of high performance and low PCB costs, it means that PCB fabricators must be able to accurately measure and control transmission line losses.

### Multi-GHz PCB fabrication

While frequency-based losses are negligible on PCBs operating below 2GHz, above this level signal losses become a major problem for PCBs manufactured in conventional FR4 and other low-cost laminate materials. As more OEMs integrate high-speed chipsets onto their boards, the need for PCB fabricators to measure and control frequency-based losses will also increase. Measuring transmission line losses presents fabricators with a set of challenges very different from those for controlling impedance: whereas trace width and dielectric separation are among the most important criteria for impedance control, dielectric loss and smoothness of the copper foils are the crucial parameters for controlling frequency-based losses.



Fast and accurate measurement of transmission line losses in the production environment allows fabricators to increase manufacturing yield and reduces the comparatively high cost of multi-GHz PCB fabrication.

- Lossy-line testing uses criteria different from impedance control
- Allows PCBs over 2GHz to be manufactured with the most cost-effective laminates
- PCB fabricators face a growing need to test lossy-lines
- Reduces the high cost of multi-GHz PCB fabrication
- Lossy-line testing is not a substitute for impedance control



## Atlas software

**Atlas uses powerful mathematical processing techniques to allow non-skilled operatives to measure differential frequency-dependent losses from a test coupon quickly and easily. The system is easy to set up, easy to use and delivers fast results without the need for extensive operator training. A single insertion loss test can be performed in a fraction of the time compared to traditional techniques.**

Atlas uses SET2DIL (Single-Ended TDR to Differential Insertion Loss) test methodology to extract  $S_{DD21}$ .

Atlas is compatible with the Tektronix DSA8200\* oscilloscope and 80E04\* Time Domain Reflectometer (TDR) head which provides the raw data from which Atlas can calculate insertion loss results.

\*Customer supplied

As high bandwidth systems are inherently sensitive to electrostatic discharge (ESD) they must be implemented with the highest level of ESD control that is practical in the test environment.

- Atlas test system for SET2DIL testing of frequency-based insertion losses –  $S_{DD21}$  and  $S_{21}$
- Compatible with Tektronix DSA8200 Time Domain Reflectometer (TDR) with 80E04 TDR sampler heads
- Compatible with GGB Picoprobe type 40A-GSSG-450-TLD (for Intel SET2DIL testing)
- Compatible with other Polar GHz PCB design and fabrication tools – Si9000e / Speedstack Si and CGen Plus – lossy-line coupon generator.

### Standalone or part of a complete GHz PCB fabricator package

Atlas can be used for standalone testing of lossy lines at the point of fabrication or as part of a suite of GHz PCB fabrication tools with other Polar products, including the Si9000e Transmission Line Field Solver, Speedstack Si layer stack-up design system and the CGen Si coupon generator. The combination of these powerful tools can help to improve manufacturing yields as well as reducing the cost of multi-GHz PCB fabrication. Using the Si9000e to analyse and predict losses during the design stage, the fabricator can quickly model a range of scenarios, dramatically reducing both material costs and engineering time, to improve manufacturing yields. The data on the modeled stack geometries can then be imported into the CGen coupon generator to create accurate coupons for Atlas SET2DIL test coupons. Finally, the Atlas software ensures that transmission line losses are measured and controlled during the fabrication process.

### For PCBs 2GHz and below Polar recommends:

- CITS900s controlled impedance test
- CGen coupon generator
- Si8000 controlled impedance design system
- Speedstack PCB



#### USA / CANADA

##### **Polar Instruments Inc**

T: (503) 356 5270

F: (650) 344 7964

E: ken.taylor@polarinstruments.com

#### \* ASIA / PACIFIC

##### **Polar Instruments (Asia Pacific) Pte Ltd**

T: +65 6873 7470

F: +65 6873 7471

E: terence.chew@polarinstruments.asia

#### UNITED KINGDOM / EUROPE

##### **Polar Instruments (Europe) Ltd**

T: +44 23 9226 9113

F: +44 23 9226 9114

E: neil.chamberlain@polarinstruments.com

#### \* JAPAN

##### **Polar Instruments - Japan Branch**

Tel: +81 44-276-9112

F: +81 44-276-9136

E: terumitsu.tsuji@polarinstruments.asia

#### \* CHINA

##### **Polar Instruments (China) Ltd**

Tel: +86 21 3530-7470

F: +86 21 3530-7471

E: terence.chew@polarinstruments.asia

#### \* KOREA

##### **Polar Instruments Korea Corp**

T: +82 2 2644 2493/4

F: +82 2 2644 2495

E: jsbae@polarinstruments.asia

#### \* GERMANY, AUSTRIA, SWITZERLAND

##### **Polar Instruments GmbH**

T: +43 7666 20041-0

F: +43 7666 20041-20

E: hermann.reischer@polarinstruments.eu

#### REST OF WORLD

##### **Polar Instruments Ltd**

(Head office)

Garenne Park, Guernsey

UK. GY2 4AF

United Kingdom

T: +44 1481 253081

F: +44 1481 252476

E: gwen.merchant@polarinstruments.com

\* Authorised distributor for Polar Instruments Ltd's products.  
These independent operations are neither agents nor  
subsidiaries of Polar Instruments Ltd.

© Polar Instruments 2011.

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

All trademarks recognised.

## Specifications

Insertion Loss measurement	$S_{DD21}$ magnitude vs frequency over the widest range practicable for a coupon of defined characteristics. $S_{DD21}$ measured using the SET2DIL method and industry standard SET2DIL coupon
	Test limits per test: Unlimited number of min / max values for insertion loss v frequency.
Impedance measurement	Single ended and differential impedance
	Accuracy specifications: as defined by the TDR manufacturer
Data logging and output	All tests data logged and output as pipe delimited text files for customer processing
	Printable test lists and waveforms
3rd Party Probes	Intel SET2DIL — GGB Picoprobe type 40A-GSSG-450-TLD
Bandwidth monitoring	Real time monitoring of system bandwidth
Hardware	Compatible acquisition system (customer supplied)
	(Currently supported TDR: Tektronix DSA8200 with 80E04 plug-in)
Accessories	ACC383: USB footswitch
	CGen Si Lossy Line Coupon Generator
PC requirements	PC running Windows XP or later
	TCP/IP Ethernet connection for communication with compatible measurement system (static IP address required for compatible measurement system)
Applicable standards	IPC TM-650 2.5.5.12

polarinstruments.com