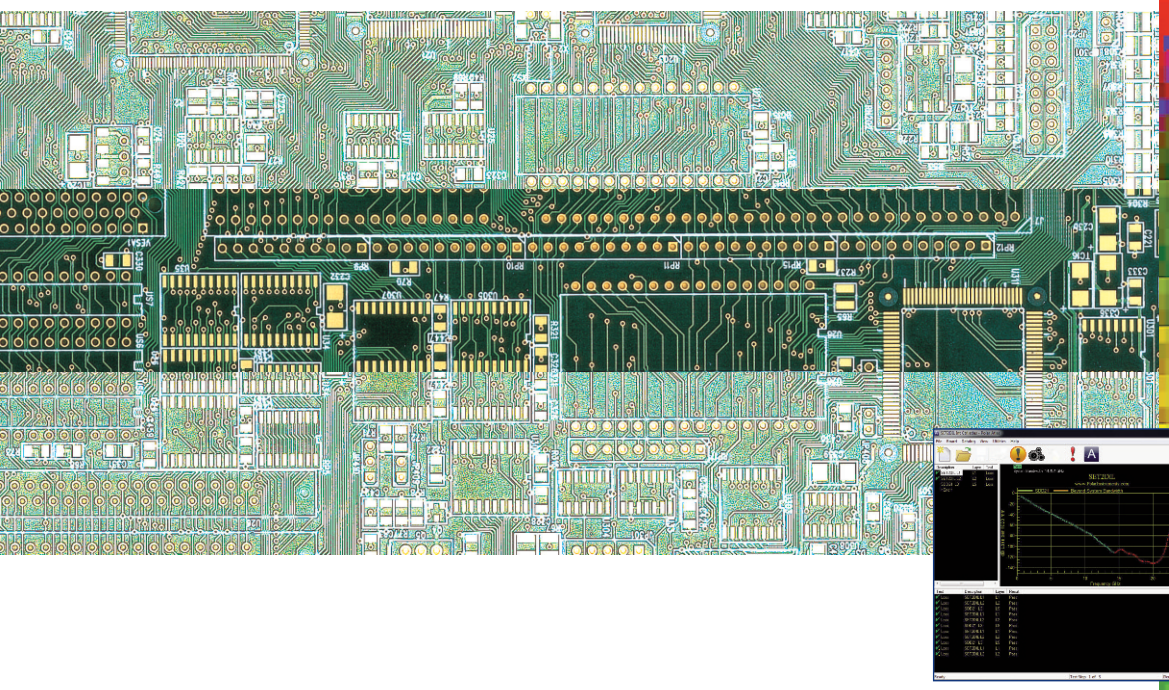
PCB insertion loss test system



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

Atlas 2010

Ensures accurate insertion loss measurement

Incorporates SET2DIL method to extract $S_{DD}21$

The first lossy-line test system designed for PCB fabricators

Easy to use by non-skilled operators

Polar

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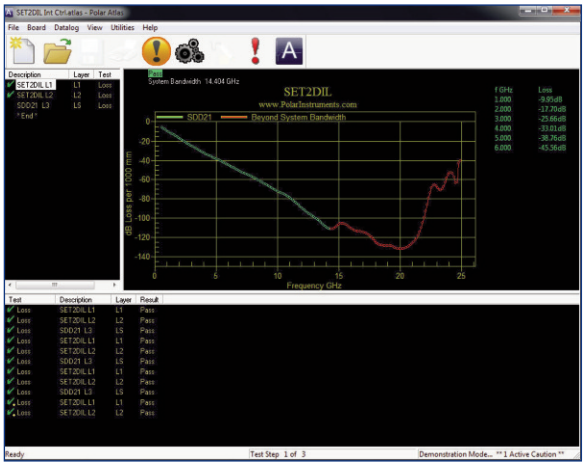
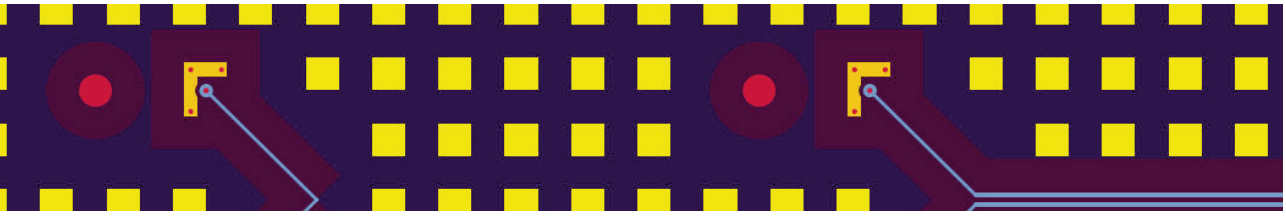


The Atlas GHz PCB test system is the first insertion-loss measurement system designed specifically for PCB fabricators.

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, whilst 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.



- Supports SuperSpeed USB 3.0, PCI Express® Gen2.0, XAUI and RocketIO™ chipsets
- Allows PCBs over 2GHz to be manufactured with the most cost-effective laminates
- Ensures PCBs achieve stringent targets for transmission line losses
- Addresses the emerging need to test lossy-lines

The challenge of multi-GHz PCB fabrication

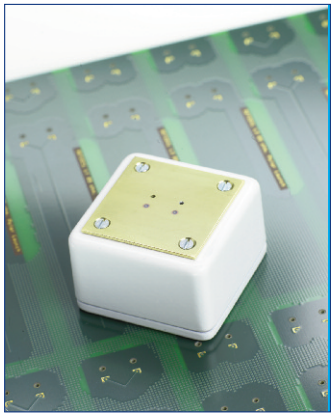
Whilst frequency-based losses are negligible on PCBs operating below 2GHz, above this level signal losses become a major problem for PCBs manufactured in conventional FR4 and other low-cost laminate materials. As more OEMs integrate high-speed chipsets onto their boards, the need for PCB fabricators to measure and control frequency-based losses will also increase.

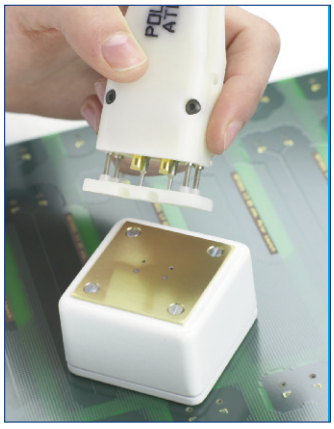
Measuring transmission line losses presents fabricators with a very different set of challenges to controlling impedance: whereas trace width and dielectric separation are among the most important criteria for impedance control, dielectric loss and smoothness of the copper foils are the crucial parameters 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
- Growing need for PCB fabricators to test lossy-lines
- Increases manufacturing yield
- Reduces the high cost of multi-GHz PCB fabrication
- Lossy-line testing is not a substitute for impedance control

The Atlas test system





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 couple of seconds, compared to minutes or hours using traditional techniques.

Atlas uses SET2DIL (Single-Ended TDR to Differential Insertion Loss) test methodology to extract $S_{DD}21$. Atlas monitors system rise-time as well as system bandwidth to calculate insertion losses on differential and single-ended PCB traces.

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.

The Atlas SET2DIL probe, designed exclusively for the Atlas test system, features separate, robust mechanical registration pins designed to extend the life of the signal interconnect pins. The ability to factory-recondition Atlas SET2DIL probes helps fabricators to minimise the cost of testing high-frequency PCBs.

As high bandwidth systems are inherently sensitive to electro-static discharge (ESD) they must be implemented with the highest level of ESD control that is practical in the test environment. Degradation to the TDR sampling heads by ESD is minimised by the Atlas probe's construction which uses materials with high ESD dissipation characteristics.

*Customer supplied

- Atlas test system for SET2DIL testing of frequency-based insertion losses – $S_{DD}21$, S21
- Compatible with Tektronix DSA8200 Time Domain Reflectrometer (TDR) with 80E04 TDR sampler heads (Customer supplied)
- Atlas probe & cable set (recommended)
- 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 system of GHz PCB fabrication tools with other Polar Instruments products. Systems include the Atlas GHZ test software and Polar's Si9000e Transmission Line Field Solver; or the Speedstack Si layer stack-up design system and integrated lossy-line field solver; each system integrates with the CGen-Plus coupon generator to provide a complete multi-GHz PCB fabrication toolkit. 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 advanced 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

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Specifications

Insertion Loss measurement	$S_{DD}21$ magnitude vs frequency over the widest range practicable for a coupon of defined characteristics. $S_{DD}21$ 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. Measurement accuracy relies on the use of Polar SET2DIL probe sets
Impedance measurement	Single ended and differential impedance — results presented graphically. Range of measurement available determined by TDR used — see manufacturer's specification for details Average impedance: specified in Ohms/Rho (reflection coefficient) Test limits: inches/mm or units of time 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
Probes	ACC387: Polar SET2DIL probe with cables (bandwidth to 20GHz) required for SET2DIL insertion loss measurement with Atlas
Bandwidth monitoring	Real time monitoring of system bandwidth
Hardware	Compatible measurement system (customer supplied) (Currently supported TDR: Tektronix DSA8200 with 80E04 plug-in)
Accessories	ACC386: Polar precision "Thru" reference (bandwidth to 20GHz) ACC383: USB footswitch CGen Plus 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	None