

## Understanding High-Speed PCB Design—High Speed, RF and EMI (Part 2)

### Title

Part 2: High-Speed PCB Design for Gigabit Data Rates and EMI Control

### Presenter

Robert Easson  
Analytical Edge

### Date and Venue

29-30 October 2009  
iSLI, Livingston

### Cost

£625 per person + VAT  
(Discounts available please enquire)

Mentor Graphics Passbook = 2 Tokens

### Contact

If you have any course queries, please contact the CPD team on 01506 469300 or by emailing [cpd@sl-i-institute.ac.uk](mailto:cpd@sl-i-institute.ac.uk)

### Course Aims

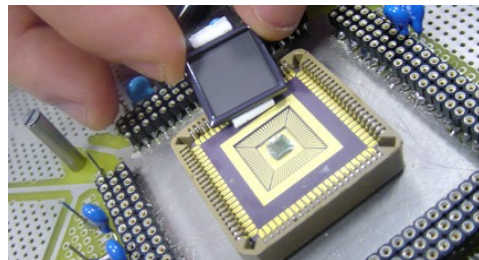
Part 2 of this two-part course builds seamlessly on the principles and practice established in the previous course, extending them to develop techniques for design and test at frequencies above 1GHz for Gb/s serial transmissions and for controlling the generation and propagation of EMI at PCB level. Key topics cover signal quality, material effects and EMC from components to backplanes.

**NOTE:** *This is an integrated course where concepts and methods developed in part 1 are applied directly to topics in part 2. Although not essential, delegates are strongly advised to attend part #1 first.*

### Who Should Attend

Design engineers seeking in-depth knowledge of high-speed PCB design, signal integrity issues, high frequency effects and EMC. As the course is built up from basic electrical principles it is suitable for engineers from many areas of application, and also for new graduates.

PCB designers working on digital or mixed signal boards with design rules governing track impedance control, line terminations, routing to minimise noise coupling etc will also benefit from this course.



## Course Content

- **High frequency measurement and test**— components and signal paths. Time domain (scope, TDR/TDT) and frequency domain. (spectrum analyser, VNA). Probes. S—parameters.
- **Gb/s transmission on PCBs**— application of transmission engineering methods. PCB track effects on signal quality (BER, ISI, jitter). Technologies (e.g. LVDS, PCI Express). PCB requirements to meet system performance.
- **Frequency—dependant PCB transmission lines.** Waveform degradation due to conductor and dielectric loss. PCB material selection— frequency behaviour, manufacturing and cost tradeoffs, and criteria for acceptable signal performance.
- **EMC control.** EMI mechanisms—what factors can we control? Wave propagation, near and far field impedance. RF field generation on a PCB. Differential to common mode conversion and radiation.
- **Controlling EMI generation on PCBs.** Image planes, stackup, return currents. Grounding schemes, common impedance coupling, partitioning, and split planes.
- **EMI from components to systems.** IC package parasitics, ground bounce, component level effects. Filtering, isolation and bridging on PCBs. Interconnections cables, backplanes and signal routing.

Robert Easson, the author of this course, brings many years experience of design engineering, technology and engineering management both with companies involved in microwave, RF and telecommunications engineering and also as an independent consultant. For the last ten years Robert has specialised in developing and delivering courses on High—Speed PCB design and EMC—to date over 1000 delegates in Europe and North America have attended courses. Robert has a BSc in physics and a PhD in engineering, both from the University of Glasgow, and is qualified as a Chartered Engineer and MIET.

### Fees

Fees cover tuition, course notes, lunches and light refreshments.

### Accommodation

Information on local hotels is available by emailing [cpd@sli-institute.ac.uk](mailto:cpd@sli-institute.ac.uk)

### Cancellations

A 10% administration fee is levied for cancellations made up to two weeks prior to the start of the course. Cancellations thereafter will be liable to the loss of the full fee. Substitutions may be made at any time up until the start of the course.

### **Mentor Graphics Customers Only:**

*Cancellations made up to two weeks prior to the start of the course will result in a 1 token per booked place charge. Cancellations thereafter will be liable for full token fees. Substitutions may be made at any time up until the start of the course.*

The Institute reserves the right to cancel an advertised course at short notice or to postpone or make such alterations to the content of a course as may be necessary.

If a course is cancelled, fees will be refunded in full.

## Presenter