RF PCB Design and Layout Course

29th November **Tony Richards, Plextek** **Location: Tyndall, Cork**

This 1-day course will be given by Tony Richards of Plextek. Plextek RFI has developed a number of PCB design and layout courses for high speed digital and RF applications.

Course Outline:

1) Introduction: Challenges of designing high performance, high-speed PCBs:

Impact of: Product complexity, Processor speed, Technology, PSU efficiency, Product size, Frequency of operation. What is required for a circuit to perform its function

2) Addressing the needs of sensitive analog systems and covering components in analog systems and sensitivity of analog systems, including:

1. Radio spectrum usage, 2. Dynamic range of signals and 3. Ease of being able to corrupt weak signals

3) Generation and impact of Digital signal noise and covering:

Components in digital systems, Continuous noise and burst noise, Characteristics of clock waveform and Examples of the impact of digital noise on analog systems

4) Mechanisms for interference transfer:

a. Conductive cross talk, b. Radiative crosstalk, c. Techniques to minimize interference transfer including: Via placement, Current in traces and loops, loop area, separation, shielding, cavity resonance, d. Guidelines for reducing potential EMI and EMC issues

5) Digital noise generation in ICs:

a. CMOS current noise, b. Package effects and decoupling, c. Bond-out to PCB – PCB trace inductance, d. Supply current noise spectrum, e. Decoupling capacitor selection: Broadband decoupling and RF decoupling, f. PCB power and ground planes, g. LVDS for high speed data transfer

6) RF Components and Interconnections

RF signal routing - Distributed structures:

a. Microstrip – x-section and trace impedance, b. Stripline – x-section and trace impedance, c. Grounded co-planar – x-section and trace impedance, d. Selecting substrate height, max operating frequency, e. Skin effect and surface roughness

RF performance and limitations of passive SMT Components: a. RF Parasitic modelling of R, L, C, Via and b. RF Footprint modelling.

RF through board Via transitions. Passive RF distributed components: Series L, Shunt L, Shunt C. RF sub-circuit design example: Impact of components on a practical RF filter

7) PCB Technology

a. PCB substrates: FR4, Rogers, Arlon, Taconic, Isola, Park etc., b. Production tolerances: track widths, gaps, min hole diam, c. Component Assembly: peel strength, copper balance, test panels, controlled impedance lines, d. PCB finishes, e. PCB multilayer board processing, f. Resist & legends, g. PCB manufacturers

8) PCB Layout

a. Ground plane: Analog / Digital Ground plane, Impedance of ground plane, Ground stitching vias, Routing of digital ground planes – unintended slot antennas, Directing ground return currents, b. Power planes, c. RF bends, d. Labelling of circuit schematics, e. Floor planning and partitioning, f. Layout check list