



Another EMC resource
from EMC Standards

Designing for Compliance

Helping you solve your EMC problems

EMC: Designing for Compliance

Practical Techniques | Plain English | Immediate Project & Financial Benefits

2018 Design Courses

www.emctech.com.au/2018courses

Adelaide

April 23 – 27

Melbourne

April 30 - May 4

Sydney

May 7 - 11

UPDATE: new EU CE Marking Directives into force in 2016/17, with huge implications for supply chains (agents, distributors, etc.). **SPECIAL FOCUS on RED compliance for 'Combined Equipment':** products that incorporate Bluetooth, Zigbee, WiFi, GSM or similar wireless datacomms and used to comply with LVD and EMC Directives but since June 2017 must comply with the RED instead. Case studies will help describe officially-approved EU methods for declaring RED compliance despite absence of relevant RED-listed harmonised standards.

NEW: "Good EMC Engineering techniques for Systems and Installations (including Rail)", well-proven for 20+ years to control EMI, DC-Daylight, even in the toughest applications.

UPDATE: Medical EMC: AMD1 to IEC 60601-1-2 Ed.4, and the risk-management of EMI.

NEW: Focus on shielding and filtering to meet Military EMC standards (Adelaide only)

FREE: Halfday session – The RCM explained

**These courses have
been popular worldwide
for 20+ years:**

*they provide engineers
with great introductions to
cost-effective EMC design,
and refresh/update the
experienced.*



Presented by Keith Armstrong, a practising EMC & electronic design consultant, well-known author and articulate and lively presenter. His very popular visits to Australia & New Zealand have excellent approval rates, and here are some comments received:

"I would also like to thank you for the interesting and informative course that you presented. I have already begun to implement some design changes in an ongoing project."

"All participants were very experienced yet I'm sure that the others found it as valuable as I did."

"You have the most comprehensive work in my opinion for a practical EMC engineer or tech instead of academic based information with no relationship to practice."

"All participants were very experienced yet I'm sure that the others found it as valuable as I did."

"There's no question my time was well spent, I have learned things that I need to act upon immediately."

Global Markets

- Compete more effectively by using the latest electronic technologies, which require regular up-skilling. These courses describe practical low-cost techniques, well-proven for over 23 years to (almost!) guarantee quick and easy compliance with functional spec's (signal integrity, SI, and power integrity, PI), and achieve electromagnetic compatibility, EMC — for any/all electronic applications — for any test standards (civilian, automotive, military, aerospace, rail, etc.).
- Design techniques for compliance with global EMC standards e.g. RCM, CE, FCC, VCCI, CCC (China), MIL-STDs
- EMC for Wi-Fi, GSM, GPRS, 3G/UMTS, 4G/LTE, Bluetooth, ZigBee, WLAN, RLAN, etc., and for preventing interference with co-located GPS receivers
- Risk management of EMI for medical devices

Participants will receive:

- A PDF copy of the presented course material in full colour, for the courses they attend. Colour-printed and bound course materials are available at extra cost, when registering.
- A certificate of attendance, signed by Keith
- A USB stick containing a great deal of EMC information that Keith has published on testing, designing, PCB layout, systems and installations, EMI and Functional Safety, risk management of medical EMI, complying with the EMC Directive, CE + CE ≠ CE, and lots more



Sponsored by EMC Technologies

EMC Technologies has been operating since 1992 and is the largest and most accredited EMC, EMR & Safety test house in Aus/NZ with four fully accredited laboratories in Melbourne, Sydney, and Auckland.

EMC Technologies' reports are accepted in most countries including Europe (CE marking), USA (FCC), Japan (VCCI), Canada (IC), Taiwan (BSMI), Singapore (IMDA), VCA(UK) to name a few. No other test house in Australia/NZ offers such a wide scope of international recognition.

Course contents

EU Directives into force in 2016/17

(½ day, Adelaide & Melbourne, major updates since 2016)

Relevant for: Everyone who designs, manufactures, or is an agent or otherwise handles products intended for supply to European Union (EU) member states, including 'distance sellers'. Huge implications for entire supply chains (agents, distributors, etc.).

- The New Legislative Framework – creating Version 2 of the EU's Single Market
- New EMC Directive 2014/30/EU
- New LVD, 2014/35/EU (Safety)
- New Radio Equipment Directive (RED) 2014/53/EU, **SPECIAL FOCUS on 'Combined Equipment'** – products that used to comply with LVD and EMC Directives must now comply with RED instead if they have any Bluetooth, Zigbee, WiFi, GSM or other wireless datacomms. Officially-approved EU methods for declaring RED compliance despite the absence of relevant RED-listed harmonised standards will be described, using a number of case studies.
- New, *much tougher*, Medical Regulations

Designing for cost-effective EMC with financial benefits *(2 days, updated from 2016)*

Relevant for: All electronic and mechanical designers and their managers, in all industry areas including: medical, consumer, household, IT, data/tele/radiocommunications, instrumentation & control, professional audio, video and broadcasting, automotive, railway, marine, aerospace, military, security, etc.

The Adelaide course will focus on shielding and filtering to meet Military EMC standards.

- Using these slides as a checklist to (almost!) guarantee compliance from first prototypes
- Adapting these design rules to the requirements of specific emissions and immunity standards
- EMC techniques for cables and connectors
- EMC filtering
- EMC shielding (DC to 10s of GHz)
- EMC techniques for heatsinks
- Circuit design for EMC:
 - a) Digital design including spectrum spreading and data scrambling
 - b) Analogue design
 - c) Switching power conversion design
 - d) Communications design
- Choice of components for EMC
- Suppressing electrostatic discharge (ESD)
- Suppressing surges and transients on AC or DC power supplies, signals, and data
- Integrating wireless communication devices (transmitter and receivers, including GPS)

Note: PCB design/layout is not covered by this course, but the above material is relevant for all PCBs too.

Cost-effective SI, PI, EMC PCB design, 2018 *(2 days, Melbourne & Sydney, updated from 2016)*

Relevant for: All electronic and mechanical designers and their managers, in all industry areas including: medical, consumer, household, IT, data/tele/radiocommunications, instrumentation & control, professional audio, video and broadcasting, automotive, railway, marine, aerospace, military, security, etc.

Essential PCB techniques for SI, PI, and EMC in 2018

- Using these slides as a checklist to (almost!) guarantee compliance from first prototypes
- Adapting these rules to specific emissions and immunity standards, and wireless transmitters
- EM Zoning ('Segregation')
- Interface analysis, filtering, and suppression
- OV(GND) and Power (PWR) planes
- PCB-chassis RF-bonding
- Power supply decoupling
- Switching power converters (AC/DC, DC/DC, DC/AC)
- Matched transmission lines
- Layer stacking and trace routing
- Devices with BGA packages and/or multiple DC rails

Advanced PCB techniques for SI, PI, and EMC in 2018

- When should we use advanced PCB techniques?
- Future trends and their implications
- Guidelines, approximations, simulations, and virtual design for SI, PI and EMC
- Advanced EM Zoning techniques
- Advanced interface filtering and suppression, including BLS (board-level shielding) to 10s of GHz
- Advanced PCB-chassis bonding
- Advanced PCB planes
- The totally shielded board assembly
- Damping the resonances in parallel planes: OV(GND) or PWR
- Advanced PCB decoupling
- Buried components, especially buried capacitance decoupling
- Traces crossing plane splits or changing layers
- Advanced transmission lines, including differential signalling up to 32Gb/s
- Microvia (i.e. High Density Interconnect, HDI) and 3D-printing board manufacturing techniques
- Advanced crosstalk
- Some final tips and tricks

Good EMC engineering techniques for systems and installations (1 day, Adelaide, NEW)

Relevant for: System, electronic, mechanical designers & managers in all industries: railway systems, telecoms (exchanges, networks), industrial (plants, instrumentation, control), radiocomms (base stations), military (sites, platforms and vehicles), medical & healthcare (sites, MRI, EEG, ECG, EvP, ultrasound), hotels & restaurants, information technology (ITE), automotive (manufacturing sites, vehicles, infrastructure), infrastructure (water, gas, electricity, internet), mine sites, extraction & refining (oil, gas, metals, minerals, onshore/offshore), entertainment (recording & broadcasting studios, theatres, cinemas, opera houses, transmitting stations), railway (stations, infrastructure, vehicles), marine (harbours, ports, docks, vessels), aerospace (airports, control towers, launch sites/vehicles, air/space craft, satellites), science facilities (accelerators, synchrotrons, etc.), power generation & distribution, etc.

Introduction

- EMC Directives and Regulations, Wiring Regulations, lightning protection, etc., etc.
- Overview of the overall EMC control procedure

Good EMC practices for general use

- Buying electronic equipment
- Power distribution systems and power quality
- Galvanic isolation
- Reducing the accidental-RF-antenna efficiency of cables

- EM Zoning (segregation) of sites, equipment, and cables
- Using a bonding ring conductor (BRC)
- Cable routing, and correct shield termination at both ends
- Galvanic isolators and PECs
- Creating an RF Reference
- RF-bonding techniques for metalwork and cable shields

EM Mitigation Techniques

- Advanced EM Zoning
- Safety earthing/grounding for safety and EMC
- Mesh-bonding of Common Bonding Networks (MESH-CBNs and MESH-IBNs)
- Damping the CM loop
- What to do if you can't use mesh-bonding
- Filtering power and signals for cabinets and EM Zones
- Shielding for cabinets and EM Zones
- Surge and Lightning protection

Preventing corrosion

Maintaining good EMC performance over the operational lifecycle

Bonus Material: Close-field probing to save time and cost

Medical EMC: complying with IEC 60601-1-2: 2014 (½ day, Sydney, major updates since 2016)

Relevant for: All electronic designers, EMC testers, and their managers in the medical equipment industry, and also useful for managers of healthcare premises.

- The requirements to risk-manage EMI
- IEC 60601-1-2:2014 (Edition 4) only covers EMI safety, not performance
- Matrix of test requirements depending on the anticipated user environment
- The likely changes in AMD1 to Ed.4 (expected late 2018)
- A practical way to comply with the EMI Risk Management requirements of ISO 14971

RCM: EMC, EMR, Radio, Safety and Cellular approvals for Australia and New Zealand (½ day) FREE!



Presented by Chris Zombolas, Technical Director, EMC Technologies

Relevant for: Manufacturers, importers, suppliers, retailers, traders of electrical equipment.

The Regulatory Compliance Mark (RCM) is now mandatory under ACMA regulations for most electrical equipment that is on the market and operates in conjunction with the Electrical Equipment Safety System (EESS). The use of the RCM requires manufacturers, importers and suppliers to register prescribed products on the EESS national data base. The RCM is a single compliance mark and may only be used after establishing compliance with **all** applicable regulations including EMC, Telecoms, Radiocomms, Electromagnetic Radiation (EMR) and electrical safety. This session will explain the ACMA and EESS regimes including the testing, certification and administrative requirements for all product categories including mobile phones and cellular devices.

For many more details on these courses, background information on why they are so necessary and valuable, and information on Keith Armstrong, visit: www.emctech.com.au/2018courses

2018 Program

Venue	Monday	Tuesday	Wednesday	Thursday	Friday
Adelaide TBA	April 23 Designing for cost – effective EMC Part 1 (not PCB)	April 24 Designing for cost – effective EMC Part 2 (not PCB)	April 25 ANZAC DAY	April 26 Good EMC Engineering Techniques for Systems & Installations (including Rail)	April 27 am EU Directives, especially the RED
	Focusing on Military shielding & filtering				April 27 pm RCM approvals, Australia & NZ
Melbourne Keilor Park Conference Room	April 30 Designing for cost – effective EMC Part 1 (not PCB)	May 1 Designing for cost – effective EMC Part 2 (not PCB)	May 2 Essential PCB Techniques for SI, PI and EMC in 2018	May 3 Advanced PCB Techniques for SI, PI and EMC in 2018	May 4 am EU Directives, especially the RED
					May 4 pm RCM approvals, Australia & NZ
Sydney Seven Hills Training Room	May 7 Designing for cost – effective EMC Part 1 (not PCB)	May 8 Designing for cost – effective EMC Part 2 (not PCB)	May 9 Essential PCB Techniques for SI, PI and EMC in 2018	May 10 Advanced PCB Techniques for SI, PI and EMC in 2018	May 11 am Medical EMC Complying with IEC 60601-1-2: 2014 and AMD.1
					May 11 pm RCM approvals, Australia & NZ

Registration form return to: denise.kercheval@emctech.com.au

Session	Price Excluding GST	City	Cost
Designing for cost-effective EMC (2 days)	\$1500	ADL, MEL, SYD	
Essential and Advanced PCB Techniques for SI, PI and EMC in 2018	\$1500	MEL, SYD	
Advanced PCB Techniques for SI, PI and EMC in 2018 (2 days)			
Good EMC Engineering Techniques for Systems & Installations (1 day)	\$800	Adelaide only	
New EU Directives into force in 2016/17 (Half day)	\$500	ADL, MEL	
Medical EMC: Complying with IEC 60601-1-2:2014 and AMD.1:2018 (Half day)	\$500	Sydney only	
RCM: EMC, EMR, Radio, Safety and Cellular approvals- Australia & NZ (Half day)	FREE	ADL, MEL, SYD	
Sub-total			
Plus 10% GST			
Total cost of sessions selected (including GST)			
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For more information, visit: www.emctech.com.au/2018courses