

# EMC & SAFETY COMPLIANCE

**2016 DESIGN COURSES**  
emctech.com.au

Immediate project & financial benefits.  
Practical methods.  
Plain english.

**Christchurch**

April 5 - April 12

**Auckland**

April 14 - April 21

**Melbourne**

April 26 - May 4

**Sydney**

May 5 - May 13

Overview of changes to all EU Directives coming into force April-June 2016, with big implications for the entire supply chain (agents, distributors, etc.).

Practical techniques we need to quickly and easily achieve signal integrity (SI), power integrity (PI), electromagnetic compatibility (EMC) and safety compliance, with low risks and low costs in any electronic application.

These updated and improved versions of courses that have been very popular in Australia since 2000 are both great introductions for those new to these subjects, and valuable refreshers/updaters for the experienced.

Developments in electronic technologies and their applications continue to create new challenges to design/development costs, timescales, manufacturing costs, reliability and safety. They increase exposure to compliance test failures, warranty costs, penalty charges, liability claims, fines or banning from major markets, and other financial risks.

These courses help manufacturers deal with these challenges to improve time to market whilst improving financial performance.

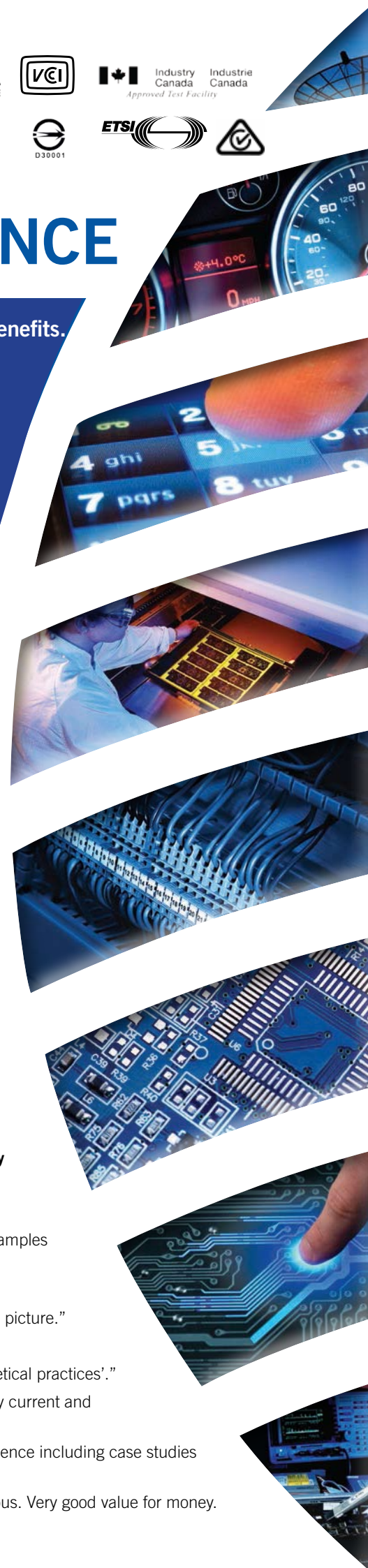
- Design techniques for compliance with global standards  
e.g. C-tick/A-tick/RCM, CE, FCC, VCCI, CCC (China)
- Complying with human exposure limits – SAR, EMF, EMR/EME, MPE etc.
- EMC for Wi-Fi, GSM, GPRS, 3G/UMTS, 4G/LTE, Bluetooth, ZigBee, WLAN, RLAN, etc.
- Preventing interference with co-located GPS receivers

**Presented by Keith Armstrong, a practising EMC & electronic design engineer, 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:**

- “The most valuable part of the presentation was giving real physical examples I could relate to.”
- “The presentation of the information is fantastic!”
- “Well-rounded insightful presentation. Filled in the blanks in my overall picture.”
- “We were designing PCBs that violate many of these rules last week!”
- “Learning proven techniques is always good, instead of learning ‘theoretical practices’.”
- “I enjoyed your presentation, the content was concise & relevant for my current and anticipated requirements”
- “The most valuable part of the presentation was years of real life experience including case studies presented throughout the courses”
- “Very relevant. Clear and logical explanations, well spoken and humorous. Very good value for money. Good quality notes, easy to read.”



Keith Armstrong



## GLOBAL MARKETS

### USE NEW ELECTRONIC TECHNOLOGIES TO COMPETE EFFECTIVELY

To benefit from modern electronic technologies requires designers and their managers to keep their knowledge and skills up-to-date to control SI, PI, EMC and safety. These courses describe practical techniques that can be put to work right away to get immediate benefits with the aim of complying on the first test.

#### Participants will receive:

- A bound copy of the presented course material in full colour for the courses they attend
- A certificate of attendance, signed by Keith
- A USB stick containing:
  - 17 guides on EMC testing that Keith wrote for REO (UK) Ltd
  - Keith's published articles on:
    - Design techniques for EMC series
    - PCB design for EMC series
    - D-I-Y EMC testing techniques series
    - EMC for Systems and Installations series
    - EMC for Functional Safety
    - Complying with the EMC Directive 2004/108/EC
    - How the new EMC Directive applies to "fixed installations" and to custom-made equipment supplied to them
    - A number of other EMC design topics
  - 5 guides on good EMC practices in systems and installations, including complying with IEC 61800-3, also written by Keith for REO (UK) Ltd
  - The IET's 2008 Guide on EMC for Functional Safety and it's important 2013 update – the first practical method for demonstrating compliance with Functional Safety or medical Risk Management standards as regards EMI and EMC.



#### 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 fully accredited laboratories in Melbourne, Sydney, and Auckland.

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

## COURSE CONTENTS

### New EU Directives coming into force in 2016 (*½ day - afternoon*)

Big changes for the entire supply chain (agents, distributors, distance sellers, etc.)

**Relevant for:** *Everyone who designs, manufactures, or is an agent or otherwise handles products supplied in the European Union (EU).*

- The New Legislative Framework: the problems it addresses and its changes to the Single EU Market
- The new EMC Directive 2014/30/EU, replacing 2004/108/EC on 20 April 2016
- The new LVD Directive 2014/35/EU, replacing 2006/95/EC on 20 April 2016
- The new RED Directive 2014/53/EU, replacing the R&TTE Directive 1995/5/EC on 13 June 2016
- The new Medical Devices Directives, replacement dates TBA
- The other new directives for 2016 (ATEX, Lifts, Simple Pressure Vessels, Measuring Instruments, Non-automatic Weighing Instruments, Civil Explosives, and Pyrotechnic Articles.)

### Designing for cost-effective EMC compliance, with extra financial benefits (*2 days*)

**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 physical basis of EMC
- Digital design for EMC
- Analogue design for EMC
- Switch-mode power conversion design for EMC
- Communications design for EMC
- Choice of components for EMC
- EMC techniques for cables and connectors
- EMC filtering
- EMC shielding (VLF to many GHz)
- EMC techniques for heatsinks
- Suppressing surges and transients on AC or DC power supplies, signals, and data
- Suppressing electrostatic discharge (ESD)
- Integrating wireless communication devices (transmitter and receivers, including GPS)
- Some useful references

*Note: PCB design techniques are covered in the separate PCB course.*

## Designing for safety of electrical products, and LVD compliance (1½ days)

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

- What do we mean by 'safe enough'?
- Doing hazards analysis and risk assessments
- Non-CE marking safety directives
- Complying with the Low Voltage Directive for CE Marking
- Human health and Electromagnetic Fields: requirements for compliance with LVD & RTTE
- Using the most relevant safety standards
- Single-fault safety
- electrical shock hazards
- Energy hazards
- Fire hazards
- Heat related hazards
- Mechanical hazards
- Other hazards
- Choosing and using components
- Wiring, supply and construction
- Markings and manuals
- Type testing (testing the design)
- Routine tests in serial manufacture
- Special national conditions
- Good safety engineering techniques not yet standardised
- Design and test for functional safety
- EMC for functional safety (Melbourne & Sydney only)
- Some useful safety resources

## Medical EMC: complying with IEC 60601-1-2:2007 and 2014 (½ day - morning)

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

- IEC 60601-1-2:2007 (Edition 3) is now required for legal compliance in EU and USA
- Testing requirements
- EMC Risk Management Requirements
- IEC 60601-1-2:2014 (Edition 4) only covers EMC safety, not performance
- Matrix of test requirements for emissions and immunity, depending on the anticipated user environment
- EMC Risk Management requirements
- A practical way to comply with the EMC Risk Management requirements of both IEC 60601-1-2:2007 and 2014

## PCB design for cost-effective Signal Integrity (SI), Power Integrity (PI) and EMC in 2016 (2 days)

**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 EMC techniques now generally required for all PCBs:

- The scope of these layout techniques
- Saving time and money
- The physical basis of EMC (summary)
- Segregation
- Interface analysis, filtering, and suppression
- OV(GND) and Power planes
- PCB-chassis RF-bonding
- Power supply decoupling
- Switching power converters (AC/DC, DC/DC, DC/AC)
- Matched transmission line techniques
- Layer stacking and trace routing
- Devices with BGA packages and/or multiple DC rails
- Some useful references and sources
- Advanced EMC PCB design and layout techniques:
- When should we use advanced PCB techniques?
- Future trends and their implications
- Guidelines, approximations, simulations, and virtual design for SI, PI and EMC
- Advanced segregation (zoning) techniques
- Advanced interface filtering and suppression, including BLS (board-level shielding) to tens of GHz
- Advanced PCB-chassis bonding
- Advanced PCB planes
- The totally shielded board assembly
- 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 board manufacturing techniques i.e. High Density Interconnect, HDI
- Advanced crosstalk
- Some final tips and tricks
- Some useful contacts, sources, references

For many more details on these courses, background information on why they are so necessary and valuable, and information on Keith Armstrong, visit [emctech.com.au/2016courses](http://emctech.com.au/2016courses)



# 2016 PROGRAM

## Christchurch Venue TBA

<b>Tuesday April 5</b>	Designing for cost-effective EMC compliance, with extra financial benefits. <i>Day 1 of 2.</i>
<b>Wednesday April 6</b>	Designing for cost-effective EMC compliance, with extra financial benefits. <i>Day 2 of 2.</i>
<b>Thursday April 7</b>	PCB design for cost-effective Signal Integrity (SI), Power Integrity (PI) and EMC in 2016. <i>Day 1 of 2.</i>
<b>Friday April 8</b>	PCB design for cost-effective Signal Integrity (SI), Power Integrity (PI) and EMC in 2016 benefits. <i>Day 2 of 2.</i>
<b>Monday April 11</b>	Designing for safety of electrical products, and LVD compliance. <i>Day 1 of 1½.</i>
<b>Tuesday April 12</b>	Designing for safety of electrical products, and LVD compliance. <i>Final ½ of 1½.</i>  New EU Directives coming into force in 2016. <i>½ day (PM).</i>

## Melbourne EMC Technologies 176 Harrick Road, Keilor Park, 3042

<b>Tuesday April 26</b>	Designing for cost-effective EMC compliance, with extra financial benefits. <i>Day 1 of 2.</i>
<b>Wednesday April 27</b>	Designing for cost-effective EMC compliance, with extra financial benefits. <i>Day 2 of 2.</i>
<b>Thursday April 28</b>	PCB design for cost-effective Signal Integrity (SI), Power Integrity (PI) and EMC in 2016. <i>Day 1 of 2.</i>
<b>Friday April 29</b>	PCB design for cost-effective Signal Integrity (SI), Power Integrity (PI) and EMC in 2016 benefits. <i>Day 2 of 2.</i>
<b>Monday May 2</b>	Designing for safety of electrical products, and LVD compliance. <i>Day 1 of 1½.</i>
<b>Tuesday May 3</b>	Designing for safety of electrical products, and LVD compliance. <i>Final ½ of 1½.</i>  New EU Directives coming into force in 2016. <i>½ day (PM).</i>
<b>Wednesday May 4</b>	Medical EMC: complying with IEC 60601-1-2:2007 and 2014. <i>½ day (AM).</i>

### COURSE FEES

Session	Price	City	
Designing for cost-effective EMC compliance with extra financial benefits <i>(2 days)</i>	\$1380		
PCB design for cost-effective Signal Integrity (SI), Power Integrity (PI) and EMC in 2016 <i>(2 days)</i>	\$1380		
Designing for safety of electrical products, and LVD compliance <i>(1½ days)</i>	\$980		
New EU Directives coming into force in 2016 <i>(½ day PM)</i>	\$640		
Medical EMC Requirements, IEC 60601-1-2:2007 and 2014 <i>(½ day AM - Melbourne and Sydney only)</i>	\$640		
Total cost of sessions selected			
(N/A in New Zealand) +10% GST			
<b>TOTAL AMOUNT PAYABLE</b>			

## Auckland Venue TBA

<b>Thursday April 14</b>	Designing for cost-effective EMC compliance, with extra financial benefits. <i>Day 1 of 2.</i>
<b>Friday April 15</b>	Designing for cost-effective EMC compliance, with extra financial benefits. <i>Day 2 of 2.</i>
<b>Monday April 18</b>	PCB design for cost-effective Signal Integrity (SI), Power Integrity (PI) and EMC in 2016. <i>Day 1 of 2.</i>
<b>Tuesday April 19</b>	PCB design for cost-effective Signal Integrity (SI), Power Integrity (PI) and EMC in 2016 benefits. <i>Day 2 of 2.</i>
<b>Wednesday April 20</b>	Designing for safety of electrical products, and LVD compliance. <i>Day 1 of 1½.</i>
<b>Thursday April 21</b>	Designing for safety of electrical products, and LVD compliance. <i>Final ½ of 1½.</i>  New EU Directives coming into force in 2016. <i>½ day (PM).</i>

## Sydney EMC Technologies 3/87 Station Road Seven Hills, NSW 2147

<b>Thursday May 5</b>	Designing for cost-effective EMC compliance, with extra financial benefits. <i>Day 1 of 2.</i>
<b>Friday May 6</b>	Designing for cost-effective EMC compliance, with extra financial benefits. <i>Day 2 of 2.</i>
<b>Monday May 9</b>	PCB design for cost-effective Signal Integrity (SI), Power Integrity (PI) and EMC in 2016. <i>Day 1 of 2.</i>
<b>Tuesday May 10</b>	PCB design for cost-effective Signal Integrity (SI), Power Integrity (PI) and EMC in 2016 benefits. <i>Day 2 of 2.</i>
<b>Wednesday May 11</b>	Designing for safety of electrical products, and LVD compliance. <i>Day 1 of 1½.</i>
<b>Thursday May 12</b>	Designing for safety of electrical products, and LVD compliance. <i>Final ½ of 1½.</i>  New EU Directives coming into force in 2016. <i>½ day (PM).</i>
<b>Friday May 13</b>	Medical EMC: complying with IEC 60601-1-2:2007 and 2014. <i>½ day (AM).</i>

### REGISTRATION FORM

Surname	
First name	
Organisation	
Postal address	
	Postcode
Email	
Tel	Mobile
Please advise any special requirements:	

### METHOD OF PAYMENT

Payment by: VISA   MASTERCARD   AMEX   PURCHASE ORDER   CHEQUE	
Cardholder:	
Card number:	Card expiry: /
Signature	