EMC & Compliance International

The Grandstand, Newbury Racecourse, UK,
18th-19th May 2022, www.emcandci.com

Training Workshops

Wednesday 18th May 2022

08:30 - 09:00 Registration & Refreshments

09:00 – 10:30 **Designing Interconnections for EMC (cables and connectors)**
Keith Armstrong

- *Accidental antenna behaviour of all conductors*
- *Use fibre optics or alternatives, instead of conductors*
- *The "RF Reference"*
- *Cable classification and EM Zoning (segregation)*
- *Good practices for both shielded and unshielded interconnections*
- *Shielding techniques*
- *Interconnecting shielded enclosures, and 'Ground loops'*
- *Transmission-lines*

10:30 - 11:00 Refreshments in the Exhibition Hall and Exhibition Visit

11:00 – 12:30 **Suppressing Electrostatic Discharge (ESD)**
Keith Armstrong

- *Insulation and/or shielding techniques*
- *Suppressing signal, data and power connector pins and conductors*
- *PCB layout for ESD suppressors*
- *Earth lift problems in systems*
- *Protecting control, data and signals from errors*
- *Software techniques for ESD suppression*

12:30 – 14:00 Lunch in the Workshop area, and refreshments in the Exhibition Hall

14:00 - 15:30 **Suppressing surges/transients on AC or DC power, signals or data**
Keith Armstrong

- *Using galvanic isolation or filtering*
- *Surge protection components (SPCs)*
- *Lead inductance and "let-through" voltage*
- *The effects of SPC capacitance on signals*
- *Surge protection devices (SPDs)*
- *Electronic protection for DC power supplies*
- *"Earth/ground lift" problems in systems*
- *Data needs error correction*

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Thursday 19th May 2022

08:30 - 09:00	Registration and Refreshments
09:00 – 09:40	**Basic EMC for the manager** *Chris Nicholas* • *Fundamental concepts of electromagnetic compatibility/electromagnetic interference (EMC/EMI).* • *A basic case study of spark generation.* • *The financial and time implications of EMC.* • *Visualising EMC.* • *Actual case stories and their costs.* • *The most common reasons for failing Certification tests.*
09:40 – 10:30	**EMC design for Switched Mode Power Supply – Techniques that will give you an EMC pass first time** *Min Zhang* *Techniques for designing switched mode power supplies for EMC are presented. We will cover the whole design process from component selection, schematics, layout to final assembly. One essential EMC design course that power electronics engineers cannot miss.*
10:30 - 11:00	Refreshments in the Exhibition Hall, and Exhibition Visit
11:00 – 12:45	**How to calibrate and use a Network Analyser, including revealing the hidden characteristics of components** *Chris Nicholas* *Basic calibration and the choice of the calibration standards. A look at the characteristics of some simple components. Secondary effects of these and the implications on your design.* *Discussions will show the capacitive and inductive effects, and how you could try to minimise their interactions.*
11:45 – 12:30	**Accidental Antennas – the No. 1 Radiated noise source** *Min Zhang* *Accidental antennas such as cables, traces on the PCB, islanded plane or even heat sinks are the number 1 radiated noise source in product design. This session will show you how to identify these antennae structures, how to fix the problem and how to avoid accidental antennas for your future design*
12:30 – 14:00	Lunch in the Workshop area, and refreshments in the Exhibition Hall

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14:00 – 14:45 **Teaching EMC using an EMC demonstration unit**

Andy Degraeve

The goal of new EMC demonstration unt is to teach/study:

- *Shielding effectiveness*
- *Impact of apertures (slots and holes)*
- *Impact of seams of the lid*
- *Conducted & radiated emissions levels*
- *Impact of EMC filters and importance of RF-bonding*
- *Effects of PCB layout*
- *Effects of shielded and unshielded cables*
- *Effects of matched and unmatched loads*

Also, to help visualize some fundamental aspects of EMC, and help "bridge the gap between theory and practice", which is always a challenge

14:45 – 15:30 **So you think you know how to design a good filter?**

Min Zhang

Engineers are quite familiar with the concept of filter design, filter design is taught in every university's programme. So why in real life, most of the filters fail to do the filtering job properly? In this session, you will learn important skills of designing filter, selecting filter components, and most important, how to test the performance of filters.

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Keith Armstrong Biography

Keith graduated from Imperial College, London, UK, in 1972 with an Honours Degree in Electrical Engineering. He has been a member of the IEE/IET since 1977 and a member of the IEEE since 1997. Appointed both IET Fellow and IEEE Senior Member in 2010.

After working as an electronic designer, project manager then design department manager, Keith started Cherry Clough Consultants in 1990 to help companies reduce project costs and timescales, warranty costs and other financial risks, through the use of well-proven signal integrity, power integrity and EMC engineering design and manufacturing techniques. By 2020 he had well-over 800 satisfied customers worldwide.

Keith has published several books and a great many articles, and taught many training courses worldwide. In 2018 he was first person to receive the new IEEE award: 'Excellence in Continuing EMC Engineering Education, for continuing education in EMC, signal integrity, and power integrity from a practically based point of view'.

Chris Nicholas Biography

Chris is a graduate of Salford Univ, Lancs., UK, and has over 35 years in the RF design of military, aerospace, automotive, commercial and retail electronics working for companies involved in equipment design and EMC compliance.

He started his career in Racal in the early 80's, learning the basics of RF engineering and EMC/EMI.

When automotive electronics first got started, Chris joined the Ford Motor Co. (Dunton, Essex, UK) and was instrumental in setting up their RF and EMC laboratory facilities. He became experienced in high volume design and manufacture, and was awarded a Patent for antenna diversity.
In 2000, working for EADS ASTRIUM he developed a 100W low-band microwave power amplifier for a Galileo satellite launched by ESA.

Most recently, at Lockheed Martin UK, he set up and managed the Military EMC pre-compliance facility used by their design teams.
Chris likes to consider different approaches to difficult problems, and pass on knowledge to younger engineers. He has a passion for good pragmatic engineering design practice and implementing low noise signatures.
Chris passed the radio amateur's examination in 1976 but is hardly active on the air as he prefers to tinker with low noise oscillators on the bench.

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Min Zhang Biography

Dr. Min Zhang received his PhD within Newcastle University's Electrical & Electronics Engineering department in 2013.
His research was in novel power switching schemes to reduce EMI emissions, and his research papers have received many citations.
Since then, he has worked as an EMC specialist on milestone projects with Dyson Technology, UK.

With a proven track record designing state-of-the art electronics and electric machines with minimal EMC issues, Min then established the EMC capability for the Dyson Electric Vehicle project.
Following the closure of that project, he started Mach One Design, and became associated with Cherry Clough Consultants Ltd, to provide independent expertise in good, cost-effective EMC design, worldwide.

Min's in-depth knowledge in power electronics, digital electronics, electronic machines and product design is sure to benefit your product's design, helping you win the race against time and cost.

Andy Degraeve Biography

Andy Degraeve (IEEE Member) was born in Ghent, Belgium, on June 6, 1980.

He received the M.S. degree in electronics and computer engineering from the KU Leuven, Technology Campus Ostend, Belgium, in 2014.

In June 2014 he received a nomination for the best master thesis by the ie-net engineering association. From 2014 till 2018, he was a Research Assistant at the KU Leuven Campus Bruges, Research group ReMI, Reliability in Mechatronics & ICT (now called "M-Group" standing for "Mechatronics Group"). His main research interests included electromagnetic compatibility, immunity and functional safety in life or mission critical situations.

In May 2018 he was a Technical Session chair at the joint IEEE EMC and APEMC symposium in Singapore, Singapore. From 2019 till 2020 he was the Technical and Product Manager at Schlegel Electronic Materials, a member of eMei group, in Belgium, with a focus on shielding, absorbing and thermal management materials.

From 2020, he is focussing on EMC education and diagnostics using low-cost test equipment, and joined Cherry Clough Consultants Ltd as an Associate to provide independent expertise in good, cost-effective EMC design, worldwide.