

# EMC & Compliance International, Newbury, UK, 16 & 17 May 2023

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## Draft Agenda for the Training Workshops on Tuesday May 16th

### 09:00 – 09:40 Navigating the Path to Electromagnetic Compatibility Compliance

Chris Nicholas, Threysus (an Associate of Cherry Clough Consultants Ltd)

What is EMC? How is it embodied in various standards? Most important of all, how do we achieve the certification for our products? This session discusses:

- The Basic fundamental concepts
- Why is EMC engineering necessary?
- Financial and time implications
- Looking at some of the standards and limits Some test methods and test equipment EMC Compliance requirements for legal sales Case stories

### 09:40 – 10:30 2D or 3D, that's the simulation question for EMC!

— includes a pre-recorded demonstration

Andy Degraeve, The Limit Line (an Associate of Cherry Clough Consultants Ltd)

Today, 2D and 3D simulations for EMC are a hot topic – but how do they relate to 'real life'?

This session will discuss when 3D full wave solvers are useful, and when they are not. When is a 2D simulation (as in 'SPICE') good enough? What about 2.5D simulations?

### 11:00 – 11:45 Getting the most from a spectrum analyser — includes a live demo!

Chris Nicholas, Threysus (an Associate of Cherry Clough Consultants Ltd) Spectrum analysers are the one piece of gear that is essential for EMC troubleshooting and pre-compliance work. In this session, we will take you through:

- Introduction as an RF receiver
- Basic controls and operations
- Test terminology

Live demo:

- Off air antenna
- Measuring RF currents
- Close field probing
- Identifying antenna structure

### 11:45 – 12:30 Transients, TVS, and Techniques — Protection Demystified

Rod Macpherson, Radiosmith Ltd (an Associate of Cherry Clough Consultants Ltd)

System level electrical disturbances on both power and signal lines represent threats to equipment function and reliability. This session will discuss the sources of electrical surges and transients and the standards typically used to quantify the levels of their threats.

The characteristics of transient protection devices will be presented, along with the common techniques for using them successfully to mitigate these threats.

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## **14:00 – 14:45 Troubleshooting EMI like a Pro — Conducted and Radiated emissions**

Min Zhang, Mach One Design (an Associate of Cherry Clough Consultants Ltd)

Conducted and radiated emissions are the most common EMI issues a product designer faces.

How do we test a product's EMC performance early in a design cycle?

Do we need expensive kits?

This session aims to help you better understand how to use low-cost tools to perform simple tests so you can identify the source of emission problems. Step by step Case studies demonstrate how to solve problems quickly and effectively.

## **14:45 – 15:30 Troubleshooting EMI like a Pro — Conducted and Radiated Immunities**

Min Zhang, Mach One Design (an Associate of Cherry Clough Consultants Ltd)

Radiated immunity, conducted immunity, ESD, and electrical fast transients/bursts have become more pervasive issues for most product designers. The increased complexity of products such as autonomous-driving cars also demands a higher level of immunity performance.

This session aims to help you better understand how to use low-cost tools to perform simple tests so you can identify the immunity vulnerabilities at an early stage in your design cycle. Step by step Case studies demonstrate how to solve the problems.

## **15:45 - 16:30 Pitfalls of EMC Testing – How to apply good practice to EMC tests**

Min Zhang, Mach One Design (an Associate of Cherry Clough Consultants Ltd)

Sources of measurement error in EMC tests are often difficult to spot and can greatly impact manufacturers' product-to-market time. How a product is laid out in the test set-up is critical to its EMC performance. At high frequencies, stray capacitance and inductance mean strong coupling between the device under test and its test equipment. This session discusses these contributions to sources of measurement errors and provides a good practice guide for design engineers.

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## Draft Agenda for the Training Workshops on Wednesday May 17th

### 09:00 – 10:30 **Quickly designing cost-effective EMC Filtering**

Keith Armstrong, Cherry Clough Consultants Ltd

It's relatively easy to design radio-frequency filters using SPICE (or similar), or the maths we were taught at Uni, but in real life they often don't work as well as we needed. They can even have gain, when we were expecting attenuation! This course is about how to design filtering that does what you want – quickly and cost-effectively – with very little, very easy maths.

### 11:00 – 12:30 **Quickly designing cost-effective EMC Shielding – Part 1 of 2**

Keith Armstrong, Cherry Clough Consultants Ltd

Shielding seems easy enough, just enclose things in a 'Faraday Cage'. Right? Wrong! In real life, shielding usually doesn't work as well as we wanted – and it can even cause EMC tests to be failed by a worse margin than without any shielding at all! This course is about how to design shielding that does what you want – quickly and cost-effectively – with very little, very easy maths.

### 14:00 - 15:30 **Quickly designing cost-effective EMC Shielding – Part 2 of 2**

Keith Armstrong, Cherry Clough Consultants Ltd

Sorry – I couldn't fit it all into one session! This is Part 2 of how to design shielding that does what you want – quickly and cost-effectively – with very little, very easy maths.

### 15:45 - 16:30 **Secrets of Grounding – how to optimise the ground design**

Min Zhang, Mach One Design (an Associate of Cherry Clough Consultants Ltd)

Earth, ground, 0V, HV-, etc. Are they all "grounds" or the same thing? Why do we see different symbols of grounds in one design? Shall we split the ground to contain the "noisy" neighbours on our PCB? This session answers your questions with regard to grounding.

## Bio for Keith Armstrong

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 2022 he had well-over 900 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'.



## Bio for Rod Macpherson

Rod is a Chartered Engineer having 32 years of industry experience, with special interests in RF/Microwave development. Since 2015 he has been active in defence electronic systems development and Functional Safety (EN 61508, TÜV certified). After graduating from the University of Strathclyde in 1990 with a 1st Class Honours Degree in Electronics and Electrical Engineering, he has worked as an electronic engineer in the semiconductor and consumer electronics industries with diverse activities from Digital Audio, RF and Microwave development (including 3D/EM modelling) to university research collaboration.

In 2009, he set up Radiosmith to provide independent design consultancy services and has been involved in radiometric imaging, automotive exterior lighting, medical electronics and capacitive sensing where he has applied his expertise in RF design & test, embedded software (Microchip PIC/AVR), 3D mechanical modelling and PCB layout (experienced Altium user). Rod became an associate of Cherry Clough Consultants Ltd in 2021 to also provide EMC consultancy services and has enjoyed drawing from his wide electronics and RF design experience when troubleshooting EMI-related problems in products, equipment and systems.





## Bio for Chris Nicholas

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.



## Bio for Min Zhang

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.







## Bio for Andy Degraeve

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.

