

EMC/Signal Integrity

Since 1992, Tektronix has partnered with Kimmel Gerke Associates to develop and present the popular **EMC Seminar Series**. We're pleased to invite you to attend one of our regularly updated classes in 2016.

Days 1 & 2 – **Designing for EMC/SI**

The objective of this two day class is to help you *identify, prevent, and fix common EMI/SI problems at the box and at the circuit board level*. Includes over 35 practical EMI/SI fixes.

Day 3 – **EMC Troubleshooting Workshop**

The objective of this class is to help you better understand the *methodology for troubleshooting the EMC problems*.

Prerequisites — Familiarity with electronics at the technician or basic engineering level, plus a desire to better understand EMC issues. Important — **NO PRIOR EMC EXPERIENCE** is necessary or expected.

Who Should Attend — Design engineers and technicians, PCB designers, systems engineers, test engineers, managers, and regulatory personnel responsible for EMC issues should all benefit from attending these courses.

Why Attend This Seminar???

Focused on Design & Systems

Not testing — Not regulations — Not a sales pitch

Practical "Nuts and Bolts" Information

Take the class today — apply the fixes tomorrow

Taught An Experienced EMC Design Expert

A Full time EMC Consulting Engineer since 1987

Free Book!

Attend either class and receive
EDN Designer's Guide to EMC
by Bill Kimmel and Daryl Gerke.

Be sure to visit emiguru.com

Summary Description *Identify, Prevent, and Fix EMC/SI Noise Problems*

Designing for EMC/SI + EMI Troubleshooting (3 Days)

Introduction

- Interference Sources, Paths, and Receptors
- Key Threats in EMC and SI
- EMI Regulations & Impact on Design
- Signal Integrity and EMC
- Looking for "Hidden Transmitters" and "Hidden Antennas"

Physics of EMI

- Frequency, Time, and Dimensions
- Dealing with "Hidden Schematics"
- Transmission Lines and "Hidden Antennas"
- Common Mode & Differential Mode

Components

- Passive Components and Their Limitations
- EMC Effects in Active Components
- Simple EMC Filters and How to Design Them
- Clock and Reset Circuits
- On-Board Power Regulators
- Clock Dithering

General PCB Issues

- Identifying Critical Circuits
- Component Placement
- PCB Stack-up Recommendations
- Isolated or "Split" Planes
- I/O Treatments
- Circuit Board Grounding
- Power Decoupling
- Buried Capacitance
- Trace Routing and Terminations
- Crosstalk
- Component Shielding

Grounding

- Function of a Ground
- Safety and EMI
- Single Point, Multi Point, and Hybrid Grounds
- Ground Loops
- Signal Grounds
- Analog Grounds
- Grounding Guidelines

Power Electronics

- Power Quality and EMI
- Filters & Transient Protection
- Switch Mode Power Supply Design for EMC
- Power, Relay and Motor Circuits

Shielding

- Materials & Limitations
- Dealing with Openings and Penetrations
- Magnetic Field Shielding Issues
- Shielding Design Guidelines

Cable and Connectors

- Cable Grounding
- Cable Shielding & Connectors
- Cable Crosstalk

Troubleshooting Methods and Techniques

- Common Symptoms, Problems, & Solutions
- Differential Diagnosis — A Powerful Tool
- The Rule of 90 and 9
- How to Quickly Identify Likely Causes

Case Studies ("You Be The Consultant...")

- Design Examples
- Systems Examples

Grounding, Shielding, Circuit Boards, Power, Emissions, ESD, RFI & More



All materials presented by
Kimmel Gerke Associates, Ltd.

Tektronix

Enrollment Information

Location and Dates:

—**Roseville, MN** - October 4-5-6, 2016
Courtyard by Marriott
2905 Centre Pointe Drive
Roseville, MN 55113
651-764-8000

Time: 8:30 AM – 4:30 PM (Registration 8:00 – 8:30 AM)

Fee: \$1495. Includes materials, continental breakfast, lunch, and refreshments. Hotel accommodations are NOT included. Discount for three or more students.

Registration: Course registration is limited, so early registration is recommended. Register on-line at www.emiguru.com, or call the MN office at 612-253-7689.

Payment: Check, Eventbrite, or Credit Card accepted (Visa, Master Card, American Express)

You may bring check to class, or mail directly to:

Kimmel Gerke Associates, Ltd.
2538 W. Monterey Avenue
Mesa, AZ 85202

**PLEASE MAKE CHECKS PAYABLE TO:
KIMMEL GERKE ASSOCIATES LTD.**

Cancellation Policy: Cancellations must be received by Kimmel Gerke Associates seven days prior to the class for full refund. Less than seven days will incur a \$200 cancellation fee.

Questions: E-mail dgerke@emiguru.com, or call 612-253-7689.

ON-SITE SEMINARS - If you have twelve or more persons, an on-site seminar may be advantageous. This seminar can be done with or without the EMC Troubleshooting workshop.

Other EMC seminars are also available, and can be lightly tailored. For details, call or visit www.emiguru.com. As seminars are limited to one per month, please call early if you are interested.

Curious about consulting? Want to see Daryl's wacky side? Visit www.jumptoconsulting.com

Back by popular demand...
3 Days on EMC Issues

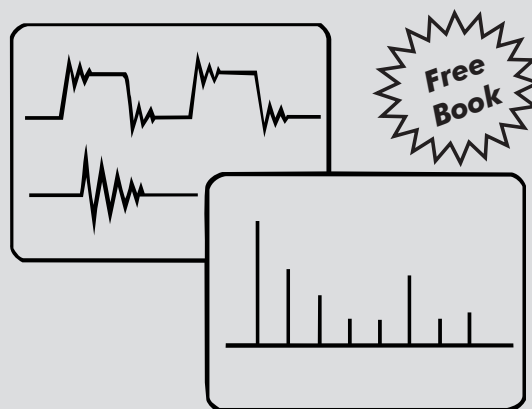
Another Introductory Course on EMC/SI?

Don't bet your Career on it!

Designing for EMC/SI

+

EMC Troubleshooting Workshop



Practical Tools, Tips and Techniques for Bulletproof Designs

Applicable to Military, Avionics, Automotive, Medical, Computer Industrial and Others

October 4-5-6, 2016 – Minneapolis, MN



Please route this material to anyone who might be interested in these seminars

• October 4-5-6, 2016
Minneapolis, MN

Tektronix
P.O. Box 1184
Lakeville, MN 55044-1184
presents...
EMC Seminars

FIRST CLASS MAIL

A NOTE FROM DARYL...

The passing of my late business partner (Bill Kimmel) last year was a reminder that life is not infinite. Since then, I have been reassessing what to do next with Kimmel Gerke Associates. As a result, this public class has not been held since early 2015.

While I no longer consult on EMI/EMC issues, I remain involved with training - both public and private. I really enjoy teaching, and it gives a lot of bang for the buck. More effective to help ten or twenty at a time than just one or two.

So I am pleased to once again offer the public "Design for EMC" class in Minnesota in October 2016. This now includes the "EMC Troubleshooting Workshop".

Although this is the first public design class since 2015. I have been active with in-house classes and with the "EMC in Military Systems" class offered through the Applied Technology Institute. **If you are interested in either class in-house, please contact me at 1-888-EMI-GURU or www.emiguru.com.**

EXPERIENCE COUNTS... Any technical class is a big investment. Not only do you have the cost of the course, but an even bigger expense is the cost of personnel. You can't afford to waste time on non-relevant or out-of-date information. You need experience in both the technology and the teaching.

EXPERIENCE IN EMC... Daryl has been professionally involved with EMC since 1970. Since 1987, he and his late business partner Bill Kimmel were full time EMC consulting engineers. *Daryl has practiced what he preaches, and preaches what he has practiced for over 45 years.*

Two things you won't hear from Daryl. He won't give you the "legal" view heavy with rules and regulations. He won't give you the "academic" view heavy with theory and equations. Rather, he will share the "practical view" with proven tips and techniques to solve EMC problems.

EXPERIENCE IN TRAINING... Daryl has taught this class hundreds of times, and logged thousand of hours of technical training. Not only does he understand EMC, but he knows how to teach it as well.

Here is what some past attendees had to say about this seminar...

"Best EMC class I have attended... ever!"

"Great class - very practical and useful information."

"As an entry level seminar on EMI control, the course covered a broad range of topics, all which are applicable to product design. Excellent course!"

About the Instructor



Daryl Gerke, PE

Daryl Gerke, PE, received his BSEE from the University of Nebraska, and has worked in the electronics industry for over 45 years. His formal EMC experience dates back to 1970. Since 1987, he has been involved exclusively with EMC engineering as a founding partner of Kimmel Gerke Associates, Ltd.

Daryl is a Registered Professional Engineer (PE), a NARTE Certified EMC Engineer, and holds FCC Commercial & Amateur Radio licenses.

About Kimmel Gerke Associates, Ltd.

Kimmel Gerke Associates specializes in Electromagnetic Interference & Compatibility (EMC/EMC). The firm was founded in 1978 by Bill Kimmel, PE, and Daryl Gerke, PE. It has been in full time practice since 1987 as both a professional consulting and training firm.

Kimmel Gerke Associates has prevented or solved hundreds of EMI/EMC problems across a wide range of industries. -- computers, military, medical, industrial, telecommunications, vehicular, facilities, and more. The firm has also trained over 10,000 students through their public and in-house EMC design and systems classes.

With the passing of Bill Kimmel in 2015, the firm now focuses on EMI/EMC training and publications. These include:

- **Seminars** — offered both in-house and at select cities:
 - **Design for EMC** - A two day class offered in-house and partnered with Tektronix.
 - **EMC Troubleshooting Workshop** - A one day class offered with the design class.
 - **EMC in Military Systems** - A three day class offered through the Applied Technology Institute.
- **Publications** — available on-line
 - **EDN Designer's Guide to EMC** - A practical guide to EMC design.
 - **EMI Suppression Handbook** - A compilation of EMC design articles in ENR magazine.
 - **EMC in Medical Systems** - A guide for the medical electronics industry (IEEE Press.)

Additional resources can be found at www.emiguru.com.

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