

## Seminar 8 Monday June 18, 2001

Updated Version

### **SWITCHMODE MAGNETICS DESIGN CALCULATING AND CONTROLLING SKIN AND PROXIMITY EFFECT CONDUCTOR LOSSES IN HF MAGNETICS**

9:00am - 6:00pm

**Instructor: Bruce Carsten, Bruce Carsten Assoc., USA**

**ABOUT THE INSTRUCTOR: SEE SEMINAR 7**

#### **CONTENTS**

This one day course focusses on understanding the nature of eddy current losses in switchmode magnetics, and how these losses can be calculated and minimized. New material in this seminar explores the "excess loss" vs frequency of various planar winding designs. Other topics include:

- Winding Skin and Proximity Effects at High Frequencies
  - Diffusion of a Magnetic Field into a Conductor
  - A redefinition of "Skin Effect" to reduce Misconceptions
  - Tools for Visualizing Surface Current Distribution
- Single and Multi-Layer Proximity Effects
- Losses with Non-Sinusoidal Currents
- Pros and Cons of Litz Wire vs Foil and Solid Conductors
- Lead Breakouts with Foil Windings
- Minimizing AC and DC Winding Losses with Dual Windings;
  - High Ripple Filter Inductors
  - Half Wave Transformers
- Inductor "Gap Loss" Effects with HF AC Currents;
  - Reducing Losses with Multiple Core Gaps
  - The Emerging Ferrite and Powdered Iron Hybrid Core
- "Entrant Flux" Losses in Non-Ideal Planar Windings
- Losses in Flyback Transformers
- Minimizing Losses in Multiple Secondaries
- Measuring HF Conductor Losses

The complex formulas for calculating HF winding losses with non-sinusoidal currents remain in the notes, but are no longer discussed in detail, as economical software is available for this task.

#### **WHO SHOULD ATTEND**

Designers of high frequency magnetics, who are concerned with eddy current losses, and switchmode supply designers, who specify high frequency magnetics.

**SEMINAR**