**EMAT Inspection Course Syllabus**

**Description**

In this two day course the participant will receive a thorough introduction to various aspects of inspecting with EMATs (Electromagnetic Acoustic Transducers). This instructor-led course covers the basics of the function and the use of EMATs for traditional and automated NDT. The material includes theoretical approaches to the subject and several hands-on exercises in which participants will use EMATs for inspection applications. Upon completion of this course participants will better understand the use of EMATs for practical NDT applications and be able to better evaluate your needs for EMAT inspection.

**Agenda**

**Lesson 1: EMAT Principle**

- **Acoustic Wave Generation**
  - Acoustic wave definition in materials
  - Various ways to generate an ultrasonic wave
- **Review of Eddy Currents**
  - Eddy current definition
  - Eddy current generation
- **Review Magnetization**
  - Magnetic fields in specimens
- **Electromagnetic Acoustic Wave Generation**
  - Lorentz Force
  - Magnetostrictive Force

**Lesson 2: EMAT Sensors and Wave Modes**

- **Coil and Magnet Configuration**
  - Concept
  - Shear Waves
  - Longitudinal Waves
  - Surface waves
  - Angle waves
  - Shear Horizontal waves
- **EMAT Probes**
  - Configuration
  - Coil Types
  - Magnet Type
  - Connectors
  - Impedance Matching
  - Filters

**Hands-On 1: EMAT Signal Demonstration**

**Lesson 3: EMAT Systems and Signals**

- **EMAT Inspection System**
  - General Concept
  - Requirements
- **EMAT Set Up Components**
  - High Power Amplifier, Broad Band Receiver
  - Diplexer, Preamplifier
  - Ground, Cables

**Lesson 3: EMAT Systems and Signals (continued)**

- **Type of EMAT Inspection Set Up**
  - Laboratory Setup
  - Industrial Setup
  - Field Setup
- **EMAT Signal**
  - Description & Interpretation
  - Configuration/Probe Dependancy
  - Defect Indications

**Lesson 4: EMAT Advantages & Limitations**

- **EMAT Advantages**
- **EMAT Limitations**

**Lesson 5: Advanced Topics on EMAT**

- **Complex Configuration**
- **Scanning with EMATs**
- **Phased Arrays EMATs**
- **Texture Measurements**
- **Stress Measurements**
- **Signal Conditioning for Noise Reduction**
- **Wave Generation in Poor Conductors**

**Hands-On 2: EMAT Lab Set Up and Measurements**

**Hands-On 3: Inspection System Using EMAT Demonstration**

**Hands-On 4: EMAT Scanning and Measurements**

**Quiz**

**Discussion and Conclusion**
### Instructor

The course will be given at Tektrend by Julie Gauthier and Ahmad Chahbaz, both of whom have extensive experience in using EMATs for NDT inspection. Ms Gauthier holds a Master's degree in Physics, NDT Electromagnetic Methods, and a Level III UT Certificate. Mr. Chahbaz, Vice-President R&D at Tektrend, holds a Master's degree in Electronic Automatization. Both instructors have participated in the development EMATs for several applications.

### Miscellaneous

**Training Location:** Tektrend's Montreal facility  
**Training Date:** 28-29 August – to be confirmed  
**Training Info:** julie.gauthier@tektrend.com  
**Tektrend Web Page:** http://www.tektrend.com  
**Prerequisites:** UT level II knowledge  
**Registration:** sophia.puskas@tektrend.com or Tektrend Web page