ETS·LINDGREN™
An ESCO Technologies Company

Magnetic Active Compensation System

for Electron Microscopy and E-Beam Applications

Features:

- Uniform protection from environmental AC/DC magnetic interference (1 mHz to 1 kHz)
- Patented wideband negative-feedback design provides electronic magnetic compensation without the need for continuous re-calibration
- Offers protection against fluctuations in magnetic fields caused by:
  - Subways
  - Electrical Distribution Equipment
  - Elevators
  - Moving Vehicles
- Can be applied to existing or new installations

The ETS-Lindgren™ Magnetic Active Compensation System (MACS™) provides cost-effective, maintenance-free environmental magnetic field shielding solutions for high-resolution EM (Electron Microscope) instrumentation and high precision Electron Beam instrumentation. They are the highest-performance commercial active magnetic fieldcompensation equipment available for protecting sensitive EM instruments from AC/DC environmental magnetic field fluctuation. These reliable systems provide real time compensation of environmental magnetic field fluctuations caused by movingvehicles, trains, elevators, electrical distribution equipment, and other sources.

ETS-Lindgren's MAC systems provide a uniform solution, at DC and through low frequency, using a highly sophisticated electronic magnetic compensation technology. Utilizing a patented wideband negative-feedback electronic design, the equipment deeply attenuates interfering magnetic fields at a fraction of the cost of alternative methods, such as passive shielding or equipment relocation. Field attenuation at the protected EM exceeds a factor of 30. This permits the successful operation of EMs-especially units with highly susceptible FEG emitters- at virtually any site.

Applications

MAC systems broaden siting possibilities by allowing EMs and E-Beams to be placed in locations where varying high magnetic field are present. As a result, they can be installed at sites that have been previously rejected due to magnetic field interference. In addition, if post installation site conditions change, the MACS can provide continuous protection.

Performance

ETS-Lindgren's unique MACS-series active-feedback magnetic shielding technology* provides instantaneous, high-level protection at any frequency or combination of frequencies within a wide passband. No other commercially available compensation system attains this high level of magnetic field cancellation at all frequencies that can interfere with EM operation. Extended-range MACS-QDC systems engage calibrated fluxgate probe to suppress lower-frequency magnetic field fluctuations caused by trucks, subway trains, and elevators or nearby analytical equipment such as mass spectrometers or MRI scanners.

HIgh level signals from the magnetic field sensor preamplifiers are conditioned and amplified by a phase-correcting signal processor and power driver in the controller chassis. Signal levels throughout the processing chain are supervised by an internal controller with front-panel programmable set-points for axial tripoff. The controller also implements a setup algorithm for easy initial adjustment and provides continuous fail-safe fault monitoring for the internal power supplies and power amplifiers. Typically, the distortion known as astigmatism can be corrected by using variable electromagnetic compensation coils.

To reduce interfering magnetic fields throughout the room, compensation flux is generated by driven coils that are mounted along or near the room vertices. Coil sets for each axis are placed on opposing walls and consist of single 0.5" (1.3cm) 0.d. cables installed in the plastic raceway.Cable

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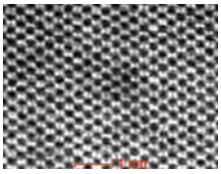
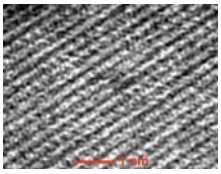
installation is fast and noncritical.

Maintenance-Free Operation

MAC systems are designed to require no maintenance or adjustments following initial installation under normal operating conditions. Additionally, the system is designed for 24-hour operation and protection from environmental interference.



MACS ON



MACS OFF

The image at left shows the silicon (110) lattice with resolution near the 1.4 Å requirement for observing "dumbells" while the image at right shows distortion "banding" resulting from stray AC fields. Data courtesy of International SEMATECH.

System Installation

MAC systems may be installed and calibrated in as little as three days with the support of the EM or E-Beam vendor. The system can be installed on new EM sites as an insurance against EM interference, or on existing sites that are experiencing unanticipated low frequency magnetic field interference. Coils are installed in a neat and inconspicuous manner, ensuring that room aesthetics are not compromised.

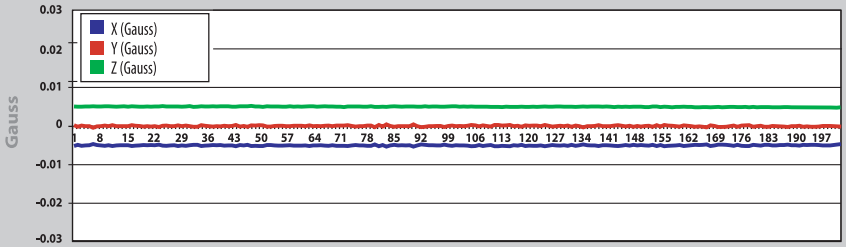
Warranty

ETS-Lindgren's standard limited warranty covers parts and service for one year.

*U.S. Patent 5,465,012

Specifications
Model EMFC-QDC-3:
3 axis
$5m^3$ minimum protected volume
30 dB (factor of 32) -attenuation of magnetic field variation
$3\mu T_{avg}$ ($30mG_{avg}$) max. compensation
1 mHz -1 kHz bandwidth
$1nT_{avg}$ ($10uG_{avg}$) noise floor

MACS "ON"



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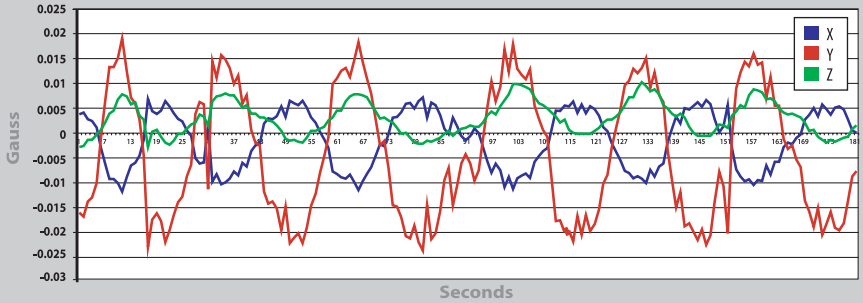

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