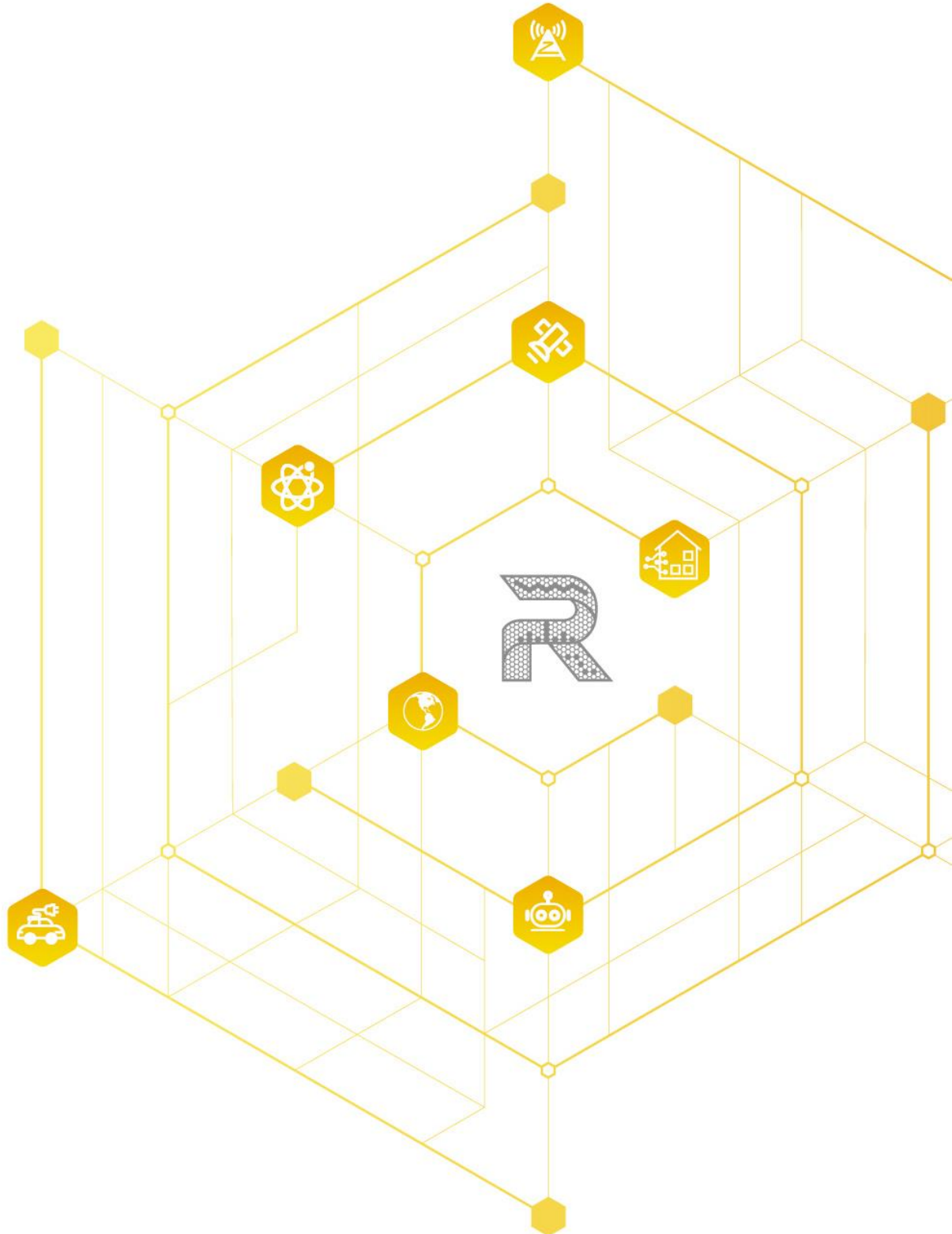




RIGOL

# Application of RSA5065N Spectrum Analyzer in Electromagnetic Shielding Material Testing



## Executive Summary

Electromagnetic shielding technology protects sensitive electronic equipment from external electromagnetic interference (EMI) by leveraging reflection, absorption, and multiple reflection mechanisms to block electromagnetic waves. To evaluate shielding material performance, spectrum analyzers are employed to measure shielding effectiveness (SE). This case study demonstrates how the RIGOL RSA5065N Spectrum Analyzer enables precise testing and analysis of electromagnetic shielding materials to validate compliance with electromagnetic compatibility (EMC) requirements.

## Testing Background & Technical Challenges

Electromagnetic shielding materials are widely used in communication devices, power systems, and precision electronics to mitigate external EMI. These materials operate through three primary mechanisms:

- **Reflection:** Conductive materials generate induced surface currents that produce counteracting electromagnetic waves.
- **Absorption:** Specific materials convert incident electromagnetic energy into thermal energy.
- **Multiple Reflections:** In multilayer structures, repeated interfacial reflections progressively attenuate signal energy.

### Material Categories:

- **Metallic materials** (e.g., copper, aluminum) rely on high conductivity for reflection-based shielding.
- **Non-metallic materials** (e.g., ferrite, carbon-based composites) excel in high-frequency absorption.
- **Hybrid composites** combine multiple shielding mechanisms for broadband applications.
- **Coating materials** (e.g., graphene, silver paste) offer lightweight solutions.

Traditional shielding tests often suffer from unstable environments and inconsistent data accuracy. High-performance spectrum analyzers like the RSA5065N address these limitations by optimizing test processes and ensuring reliable measurements.

## RIGOL Solution & Product Advantages

The RIGOL RSA5065N Spectrum Analyzer delivers an efficient, high-precision solution for shielding material evaluation. It supports broadband signal measurement, real-time electromagnetic wave monitoring, and quantitative SE analysis.

### Core Advantages:

- **Broad Frequency Coverage:** 6.5 GHz analysis range accommodates diverse shielding material requirements.
- **High-Sensitivity Measurement:** Low-noise front-end design ensures accurate detection of weak signals.
- **Real-Time Spectrum Analysis:** Tracks frequency-dependent attenuation and generates detailed SE curves.
- **Streamlined Data Processing:** Built-in SE calculation and graphical visualization tools simplify analysis.

## Operational Procedures & Application

### Test Environment Setup

Tests are conducted in shielded chambers to eliminate external interference. Configure transmitting and receiving antennas to emit calibrated electromagnetic waves and measure post-shielding signal strength.

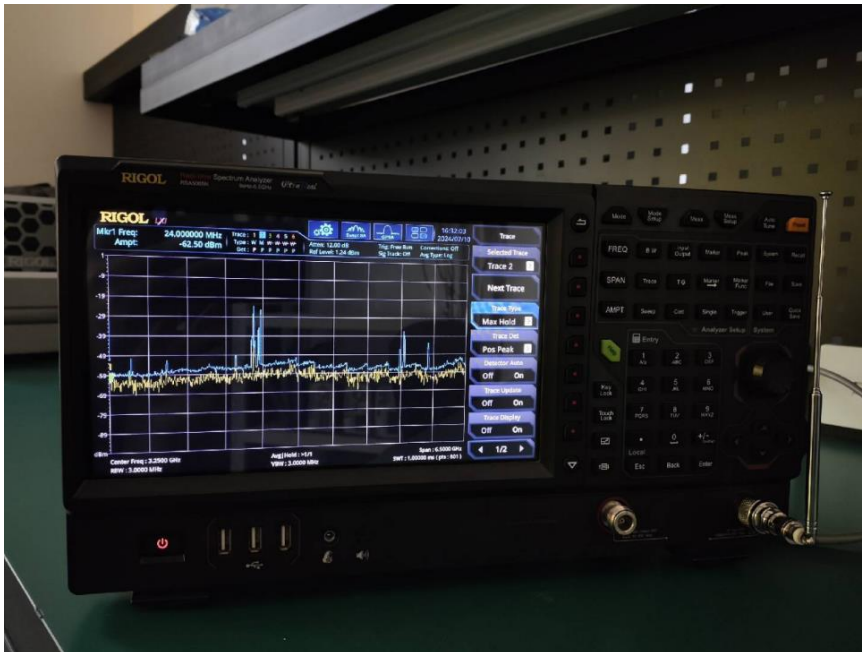


Figure 1: RSA5065N with antennas in test configuration

## System Calibration

Perform baseline measurements without shielding materials to establish reference signal transmission levels.

## Material Testing

1. Place the shielding material between transmitting and receiving antennas, ensuring full coverage of the electromagnetic path.
2. Transmit signals across multiple frequency points while using the RSA5065N to record attenuated signal strengths.
3. Calculate SE by comparing unshielded and shielded signal intensities. Higher SE indicates superior isolation capability.

## Data Analysis

- **Frequency Response Curves:** RSA5065N generates SE-vs-frequency plots to evaluate shielding efficiency across bands.
- **Performance Validation:** Confirm compliance with application-specific requirements (e.g., GHz-level shielding for communication devices, kHz-MHz shielding for power systems).

## Repeatability Testing

Conduct multi-location, repeated measurements to ensure data reliability and accuracy.

## Conclusions & Future Perspectives

### Value of RSA5065N in Shielding Testing

- **High-Precision Measurements:** Broadband analysis enables accurate SE assessment.
- **Real-Time Insights:** Automated SE calculations and visualizations streamline engineering analysis.
- **Operational Efficiency:** Simplified workflows enhance testing productivity for R&D, industrial, and quality control applications.

## Advancing EMC Technology

As electronic device integration intensifies, EMI challenges grow increasingly complex. The RSA5065N's advanced capabilities empower engineers to optimize shielding materials and accelerate EMC innovation.

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## Summary

Electromagnetic shielding materials are critical for ensuring device EMC. The RIGOL RSA5065N Spectrum Analyzer provides precise SE measurements to guide material selection and optimization. This solution enhances test accuracy while improving experimental efficiency. Moving forward, the RSA5065N will play an expanded role in EMC testing, delivering professional, high-efficiency solutions for engineering challenges.

# Boost Smart World and Technology Innovation

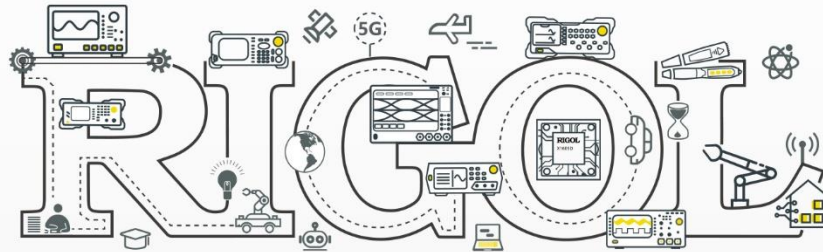
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