



EOLE Series

EMC MODE STIRRED REVERBERATION CHAMBERS (MSRCs)



CUSTOMER'S BENEFITS

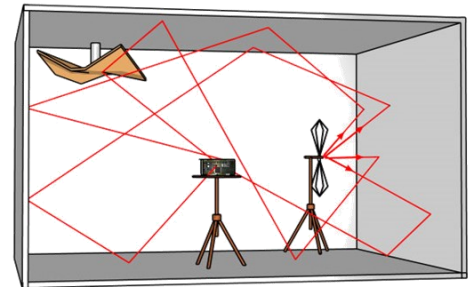
- Generation of a high field at a limited cost using power amplifiers
- Reduced testing time
- Shielded high-performance enclosure with highly conductive panels
- Guaranteed to achieve the required performances
- Exhaustive testing coupled with a high level of repeatability

A Mode Stirred Reverberation Chamber (MSRC) is a metallic cavity fitted with a mode stirrer; the resonances of the cavity are modified in a random fashion by mode stirring in order to obtain a field that is considered statistically uniform. Reverberation chambers allow to produce high fields, up to several hundreds or thousands of V/m, with optimized input power. They illuminate the equipment under test (EUT) with isotropic radiation.

OPERATING PRINCIPLES

The **mode stirrer**, as it rotates, **modifies the distribution of the electromagnetic fields**. The stirring can be performed electronically or mechanically by a metallic paddle with a complex shape and large dimensions relatively to the size of the chamber.

The **electromagnetic environment** created by the mode-stirring is **statistically isotropic and homogeneous** (as defined by the standards) over a full rotation of the stirrer. As a multi-mode resonant cavity, MSRC allows to obtain high field strength.



MAIN FEATURES

Reverberation chambers make it possible to operate immunity and emission tests in compliance with all international EMC standards on a wide range of frequencies (from a few MHz to 18/40 GHz).

STANDARD	BUSINESS FIELD	SIEPEL REVERBERATION CHAMBERS
RTCA DO 160	AERONAUTICS	EOLE 100 / 400 / 1000
MIL-STD-461	MILITARY	EOLE 200 / 400 / 1000
ISO 11452-11	AUTOMOTIVE	EOLE 80 / 200 / 400
IEC EN 61000-4-21	CIVIL	EOLE 80 / 200 / 400



Depending on the expected performances and the frequency range of operation, the internal walls of an MSRC can be made of steel or aluminum.

Based on its know-how, extensive research and modelling as well as feedback, Siepel is in the only supplier capable of modelling, manufacturing the shielded room and the stirrer as well as committing on minimum guaranteed field levels.

MAIN ADVANTAGES

- High fields (CW or pulse modulated) can be achieved with a reduced input power
- Isotropic illumination of EUT (from all directions and polarizations)
- Optimized investment cost as compared with achievable fields: shielded room + stirrer (no electromagnetic absorbers)
- Easy upgrading, dismantling, moving / rebuilding of the MSRC without deterioration thanks to the modular structure
- All components of the MSRC being designed and manufactured in our production site (France), we can react swiftly
- Commitment on field levels, based on the applicable standard and the equipment under test (EUT)
- A unique mode stirrer, designed to maximize the dimensions of the working area
- Engineering capabilities for the design and supply of the test system including antennas, amplifiers, software and training.

DIMENSIONS vs FREQUENCIES

Large reverberation chambers enable to work at **low frequencies** while ensuring **attractive minimum normalized field levels**;
Small reverberation chambers are used in full compliance at **high frequencies** with the **highest normalized field levels**.

The choice of reverberation chamber will therefore be a trade-off between three main criteria :

- The Equipment Under Test (EUT) dimensions
- Frequency range of operation
- Power level available and field strength required

Current standard models of reverberation chambers are characterized by their **Lowest Usable Frequency (LUF)**

SIEPEL STANDARD MODELS*

	EOLE 80	EOLE 100	EOLE 200	EOLE 400***	EOLE 1000***
Lowest Usable Frequency (LUF) According to MIL STD 461, IEC / EN 61000-4-21, Standard deviation = 4dB @ 100 MHz	≥ 80 MHz	≥ 100 MHz	≥ 200 MHz	≥ 400 MHz	≥ 1 000 MHz
Lowest Usable Frequency (LUF) According to DO 160, ISO 11452-11 Standard deviation = 6dB @ 100 MHz	≥ 80 MHz	≥ 80 MHz**	≥ 100 MHz**	≥ 400 MHz ≥ 100 MHz with LUF extender option**	≥ 1 000 MHz
Working volume Length x width x height	4.10 x 3.30 x 2.96 m 13.45 x 10.82 x 9.71 ft	3 x 2.44 x 2.11 m 9.84 x 8 x 6.92 ft	2.6 x 1.6 x 1.8 m 8.53 x 5.25 x 5.9 ft	2.36 x 1.25 x 1.16 m 7.74 x 4.1 x 3.8 ft	0.72 x 0.56 x 0.4 m 2.36 x 1.84 x 1.31 ft
External dimensions Including stiffeners	9.57 x 6.72 x 5.35 m 31.4 x 22.05 x 17.55 ft	7.65 x 5.17 x 4.52 m 25.1 x 16.96 x 14.83 ft	4.88 x 3.76 x 3.12 m 16 x 12.34 x 10.24 ft	3.15 x 2.52 x 3.25 m 10.33 x 8.23 x 10.66 ft	1.02 x 1 x 1.77 m 3.35 x 3.28 x 5.81 ft
Internal dimensions	9.3 x 6.1 x 4.96 m 30.51 x 20 x 16.27 ft	7.44 x 4.96 x 4.11 m 24.4 x 16.27 x 13.48 ft	4.84 x 3.72 x 2.86 m 15.88 x 12.2 x 9.38 ft	3.11 x 2.48 x 2.86 m 10.2 x 8.14 x 9.38 ft	0.98 x 0.82 x 1.24 m 3.21 x 2.69 x 4.07 ft
Internal walls	Steel	Steel	Steel or aluminum	Aluminum	Aluminum

* Customized models available upon request (for larger EUT size, other LUF ...)

** With reduced working volume

*** Mobile frame on request

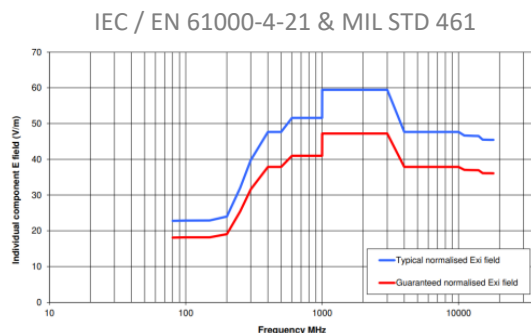
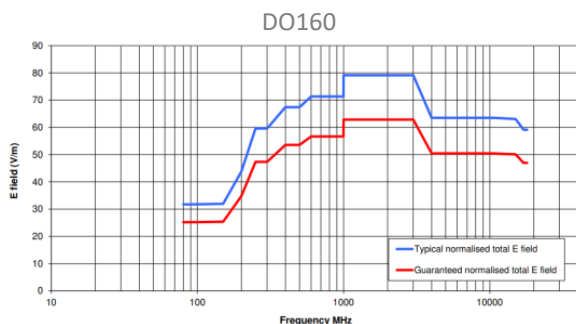
NORMALIZED FIELDS

Following normalized E fields are achievable with 1 watt input power ;

These values have to be considered for an empty chamber: coaxial or waveguide loss not included.

Galvanized steel EOLE 80

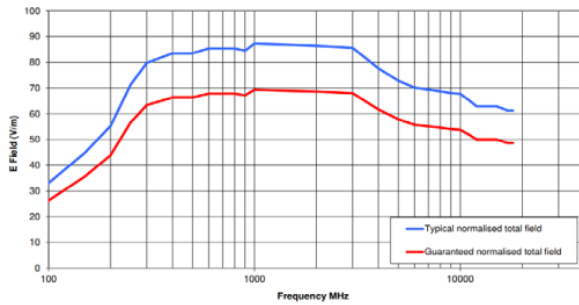
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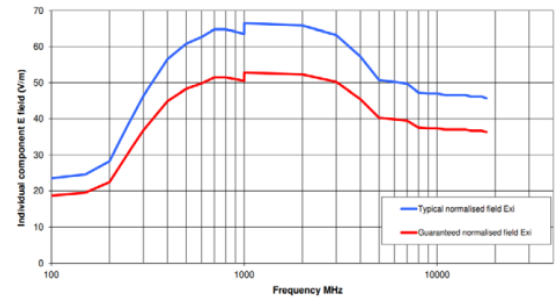
Galvanized steel EOLE 100

According to:

DO160



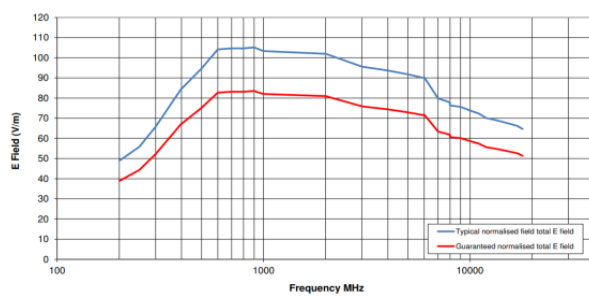
IEC / EN 61000-4-21 & MIL STD 461



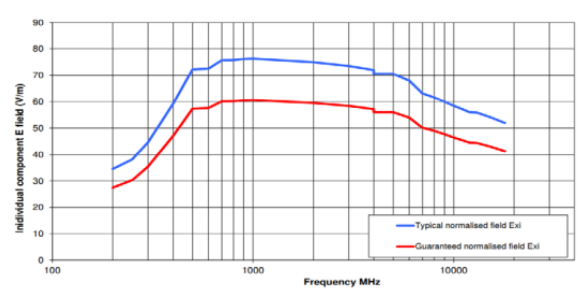
Galvanized steel EOLE 200

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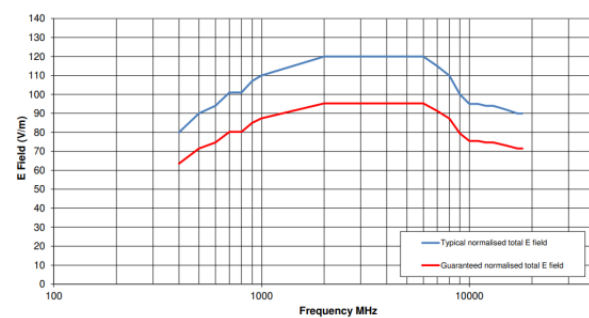
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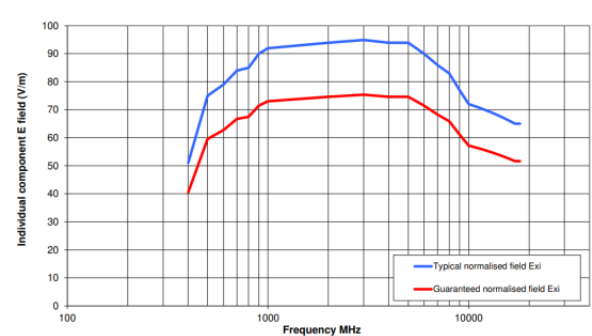
Aluminum EOLE 400

According to:

DO160



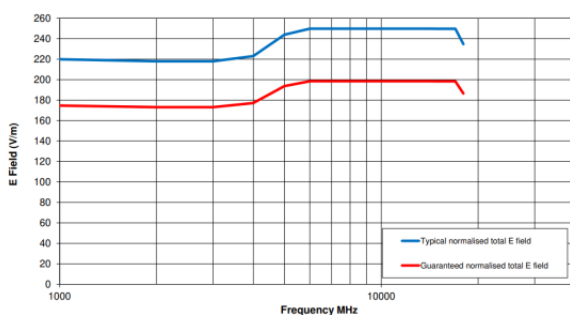
IEC / EN 61000-4-21 & MIL STD 461



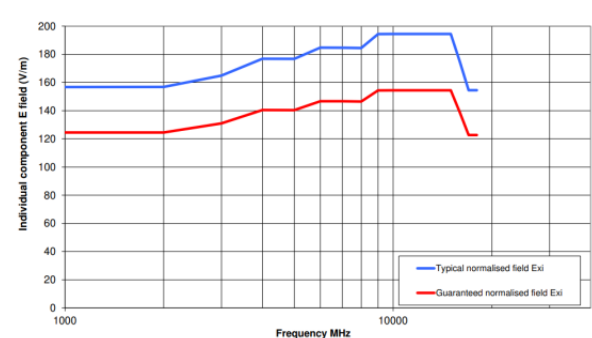
Aluminum EOLE 1000

According to:

DO160



IEC / EN 61000-4-21 & MIL STD 461





EOLE SERIES



EMC MODE STIRRED REVERBERATION CHAMBERS



■ TURNKEY SYSTEM

Siepel provides a complete test system inclusive of Reverberation Chamber, software, RF instrumentation (amplifiers, antennas ...), on-site set-up and user training.

Based on the customer inputs (applicable standard, LUF, EUT dimensions, available instrumentation), Siepel can define the **test facility as a whole and determine the required output power of the amplifiers**, taking into account the losses from coaxial cables, harmonic filters, etc.

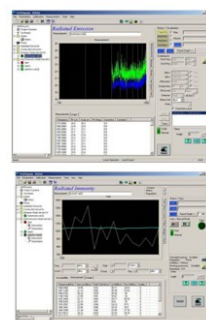
■ MEASUREMENT SOFTWARE

Using a proper software package is the key element when performing EMC tests in an MSRC.

Siepel offers a user-friendly, comprehensive solution, which has been approved and used by many international labs. It integrates various modules that enable, among other, to perform following tests:

- **Radiated immunity measurements** in a Reverb Chamber
- **Emission measurements** in a Reverb Chamber

This software allows to carry out full-compliance measurements in MSRCs according to EN61000-4-21, RTCA DO 160, MIL-STD-461 and ISO 11452-11 standards as well as for custom applications.

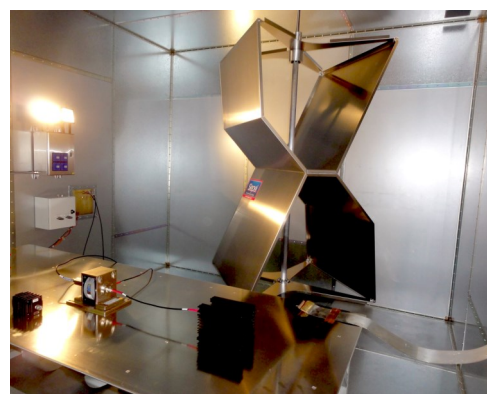
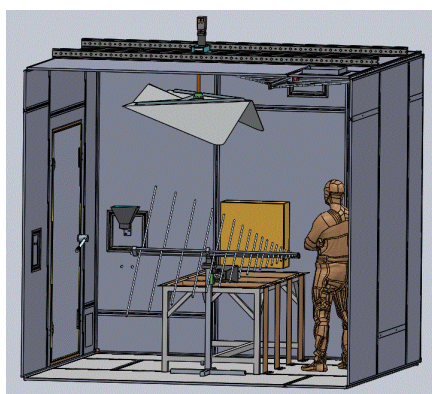
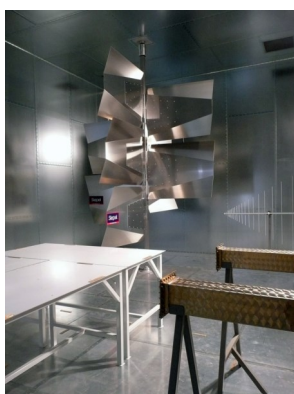


■ AVAILABLE OPTIONS

- Performance verification: statistical Uniformity
- Other types and dimensions of doors
- Test table
- Additional filters and feedthroughs



For more information, ask our
Mode-Stirred Reverberation Chambers guide:
"Everything you ever wanted to know about
reverberation chambers but never dared to ask!"
Send an email to sales@siepel.com



Do not hesitate to contact us for the following products & applications:

- Faraday cages and components of shielded rooms: doors, filters, feedthroughs ...
- Anechoic chambers or cabinets for EMC or antenna measurement
- Cybersecurity of infrastructures: secure rooms and secure boxes, shielded pouches
- Services: accredited measurements, maintenance, transfers, upgrades, refurbishments

We also offer a wide range of microwave and RF electromagnetic absorbers.

