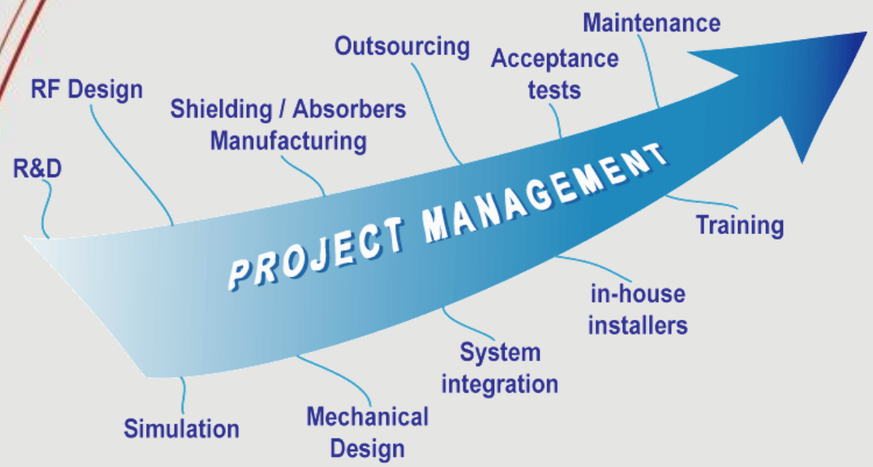
SIEPEL SCOPE OF WORK



TURNKEY SYSTEMS

SIEPEL supplies the whole test system including: anechoic chamber, software, test instruments (amplifiers, antennas, …) commissioning and training.

Based on information supplied by the customer (applicable standard, EUT dimensions, available instruments), SIEPEL is able to **define the test system** and **determine the power required for the amplifiers** by taking into account losses of coaxial cables, harmonic filters, etc..

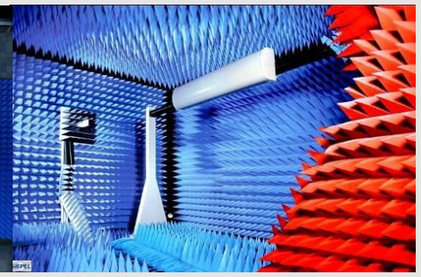
Our service department offers preventive maintenance contracts or remedial actions.

OTHER

Please contact us for other EMC and non EMC applications:

- Mode stirred reverberation chambers,
- Antenna radiation pattern measurements,
- Cybersecurity rooms, shielded pouches,
- Telecom applications,
- RCS, PIM, Near Field measurements
- Other MILSTD standards applications.

We also offer a wide range of microwave & RF electromagnetic absorbers



SIEPEL SAS – PA de Kermarquer, Impasse de la Manille - 56470 La Trinité-sur-Mer France
Ph.+33(0)2 97 55 74 95 – Email: sales@siepel.com - www.siepel.com

HOW TO CHOOSE AN EMC ANECHOIC CHAMBER?

An anechoic chamber dedicated to Electromagnetic Compatibility (EMC) measurements generally meets international or European standards.

Its size depends on both the requirements of these standards and the type of equipment under test.

INTEGRATED SKILLS

The specifications and performances indicated below are from an experiment over 30 years.

SIEPEL has the distinction of having **in-house expertise** to **design, manufacture, install, measure and maintain EMC test means** for both shielded rooms (Faraday cages) and for electromagnetic absorbers.

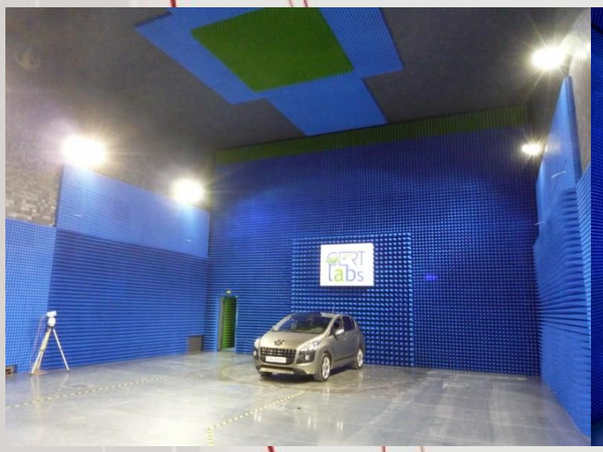
The **Research & Development Department** offers **innovative solutions**, through the use of **numerical simulation tools**: The proposed designs of anechoic chambers enable to position the pyramidal absorbers in critical areas and to optimize the dimensions of the enclosures.

RF measurements carried out regularly (at the factory + on site) allow us to offer **reliable and validated guarantees**.

Numerous technical innovations and prestigious references in many countries confirm the expertise of the company and its commitment to users.

ADVANTAGES OF SIEPEL SOLUTIONS

- **Minimized Cost:** Numerical simulation enables to optimize the dimensions of the anechoic chamber and absorbers' coverage**.**
- **Commitment to performances**: the performances indicated are **measured values.**
- **No sub-contracting** and **high reactivity / flexibility**: workshops specialized in manufacturing shielded doors, panels, Faraday cages, shielded racks, microwave absorbers are together on one site.
- **Project Approach**: a project manager, responsible for the technical aspects and the planning, is the privileged interlocutor of the customer until the final acceptance.
- SIEPEL has its service department including **maintenance throughout the life of the facility**.
- SIEPEL is accredited **NF EN ISO/IEC 17025 : 2005** by the French Committee for Accreditation (COFRAC). Accreditation scope is available at www.cofrac.fr with the n° 1-6220.
- **The management system requirements** in ISO/IEC 17025 operate generally in accordance with the principles of **ISO 9001**.



SIEPEL SAS – PA de Kermarquer, Impasse de la Manille - 56470 La Trinité-sur-Mer France
Ph.+33(0)2 97 55 74 95 – Email: sales@siepel.com - www.siepel.com

How to choose an EMC anechoic chamber V13 – 06.02.2018

EMC ANECHOIC CHAMBERS

SIEPEL proposes standard EMC chambers compliant with the following international standards or their equivalent(s) like:

CISPR16 *:*	*Radio disturbance characteristics (CISPR13, CISPR14, CISPR15, CISPR22, CISPR32)*
IEC/EN 61000-4-3 :	*Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test.*
CISPR 25:	*Vehicles, boats and internal combustion engines - Radio disturbance characteristics for the protection of on-board receivers.*
ISO11452-x :	*Road vehicles - Component test methods for electrical disturbances.*
DO160-xx :	*Environmental conditions and test procedures for Airborne equipment's.*
MIL STD 461-xx:	*Military Standard - Requirements for the control of electromagnetic interference characteristics of subsystems and equipment.*

Our in-house departments (R&D, Design and Technical Management) are at your disposal to offer custom test means.

INDUSTRY RESIDENTIAL AND COMMERCIAL USE PRODUCTS

Hybrid pyramidal absorbers = combination of ferrite tiles and hybrid pyramidal absorbers HY

APPLICABLE STANDARDS → SIEPEL SOLUTIONS

	EMI Compliant CISPR16						EMS Compliant IEC/EN 61000-4-3									
	Test Volume		NSA (30 MHz – 1 GHz)		Svswr (1 – 18 GHz)											
	MEASUREMENT DISTANCE	DIAMETER	HEIGHT	FREQUENCY RANGE	NSA MAXIMUM DEVIATION	MEASUREMENT DISTANCE	Svswr LEVEL	MEASUREMENT DISTANCE	FREQUENCY RANGE	FIELD UNIFORMITY		CHAMBERS REFERENCES	ABSORBERS LINING	INTERNAL DIMENSIONS BETWEEN ABSORBERS L x W x H	EXTERNAL DIMENSIONS INCLUDING SUPPORT FRAME L x W x H
PRE COMPLIANCE	3.30 ft 1m	3.95 ft 1.2m	4.90 ft 1.5m	30 MHz - 1 GHz	+/-4 dB	3.30 ft 1m	<6 dB	3.30 ft 1m	80 MHz - 18 GHz	1.65 x 1.65 ft (100%) 0.5 x 0.5 m (100 %)		HERA 1F	Hybrid Pyramidal*	14.45 x 7.55 x 6.90 ft 4.40 x 2.30 x 2.10 m	16.4 x 10.3 x 8.55 ft 5.00 x 3.15 x 2.60 m
PRE COMPLIANCE	9.85 ft 3m	3.95 ft 1.2m	6.55 ft 2m	200 MHz - 1GHz	+/-4 dB	9.85 ft 3m	<6 dB	9.85 ft 3m	80 MHz - 18 GHz	4.90 x 4.90 ft (75%) 1.5 x 1.5 m (75 %)		HERA 3P	Foam Pyramidal	22.80 x 9.85 x 8.00 ft 6.95 x 3.00 x 2.45 m	27.25 x 14.75 x 10.65 ft 8.30 x 4.50 x 3.25 m
PRE COMPLIANCE	9.85 ft 3m	3.95 ft 1.2m	6.55 ft 2m	30 MHz - 200 MHz 200 MHz - 1 GHz	+/-8 dB +/-4 dB	3.30 ft 1m	<6 dB	9.85 ft 3m	80 MHz - 18 GHz	4.90 x 4.90 ft (75%) 1.5 x 1.5 m (75 %)		HERA 3F	Hybrid Pyramidal*	23.80 x 8.20 x 8.85 ft 7.25 x 2.50 x 2.70 m	26.10 x 11.15 x 10.65 ft 7.95 x 3.40 x 3.25 m
PRE COMPLIANCE	9.85 ft 3m	3.95 ft 1.2m	6.55 ft 2m	30 MHz - 1 GHz	+/-4 dB	9.85 ft 3m	<6 dB	9.85 ft 3m	80 MHz - 18 GHz	4.90 x 4.90 ft (75%) 1.5 x 1.5 m (75 %)		HESTIA 3F	Hybrid Pyramidal*	25.10 x 12.45 x 13.45 ft 7.65 x 3.80 x 4.10 m	28.05 x 17.05 x 16.55 ft 8.55 x 5.20 x 5.05 m
FULL COMPLIANCE	9.85 ft 3m	6.55 ft 2m	6.55 ft 2m	30 MHz - 1 GHz	+/-4 dB	9.85 ft 3m	<6 dB	9.85 ft 3m	26 MHz - 18 GHz	4.90 x 4.90 ft (75%) 1.5 x 1.5 m (75 %)		HERMES 3	Hybrid Pyramidal*	27.4 x 17.20 x 15.75 ft 8.35 x 5.25 x 4.80 m	30.00 x 23.30 x 19.70 ft 9.15 x 7.10 x 6.00 m
FULL COMPLIANCE	9.85 ft 3m	4.90 ft 1.5m	6.55 ft 2m	30 MHz - 1 GHz	+/-4 dB	9.85 ft 3m	<6 dB	9.85 ft 3m	26 MHz - 18 GHz	4.90 x 4.90 ft (75%) 1.5 x 1.5 m (75 %)		HERMES 3	Hybrid Pyramidal*	25.80 x 17.20 x 15.75 ft 7.85 x 5.25 x 4.80 m	28.35 x 23.30 x 19.20 ft 8.65 x 7.10 x 5.85 m
FULL COMPLIANCE	16.4 ft 5m	9.85 ft 3m	6.55ft 2.5m	30 MHz - 1 GHz	+/-4 dB	9.85 ft 3m	<6 dB	9.85 ft 3m	26 MHz - 18 GHz	4.90 x 4.90 ft (75%) 1.5 x 1.5 m (75 %)		HERMES 5	Hybrid Pyramidal*	37.70 x 22.30 x 18.70 ft 11.5 x 6.80 x 5.70 m	40.35 x 28.85 x 22.80 ft 12.30 x 8.80 x 6.95 m
FULL COMPLIANCE	32.80 ft 10m	13.10 ft 4m	9.85 ft 3m	30 MHz - 1 GHz	+/-4 dB	9.85 ft 3m	<6 dB	9.85 ft 3m	26 MHz - 18 GHz	4.90 x 4.90 ft (75%) 1.5 x 1.5 m (75 %)		HERMES 10	Hybrid Pyramidal*	60.55 x 38.40x 25.75 ft 18.45 x 11.70 x 7.85 m	63.00 x 44.45 x 29.50 ft 19.20 x 13.55 x 9.00 m
FULL COMPLIANCE	9.85 ft 3m	6.55 ft 1.2m	3.30 ft 1m	30 MHz - 1 GHz	+/-4 dB	3.30 ft 1m	<6 dB	9.85 ft 3m	80 MHz - 18 GHz	4.90 x 4.90 ft (75%) 1.5 x 1.5 m (75 %)		ATHENA 3 *Fully anechoic*	Hybrid Pyramidal*	24.45 x 12.30 x 12.15 ft 7.45 x 3.75 x 3.70 m	27.55 x 15.75 x 14.75 ft 8.40 x 4.80 x 4.50 m

*A few blocks of pyramidal foam absorbers are added on the floor.

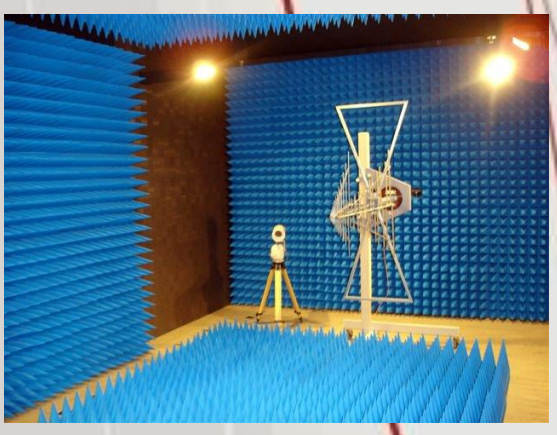
AUTOMOTIVE COMPONENTS

Hybrid pyramidal absorbers = combination of ferrite tiles and hybrid pyramidal absorbers HY

APPLICABLE STANDARDS → SIEPEL SOLUTIONS

MEASUREMENT DISTANCE	EMI Compliant CISPR 25	EMS Compliant ISO11452-2	CHAMBERS REFERENCES	ABSORBERS LINING	INTERNAL DIMENSIONS BETWEEN ABSORBERS L x W x H	EXTERNAL DIMENSIONS INCLUDING SUPPORT FRAME L x W x H
3.30 ft / 1	150 kHz – 18 GHz		CHRONOS 1F	Hybrid pyramidal	16.9 x 12.1 x 9.5 ft 5.15 x 3.70 x 2.9 m	18.5 x 13.6 x 10.7 ft 5.65 x 4.15 x 3.25m
3.30 ft / 1 m	150 kHz – 18 GHz	80 MHz – 18 GHz	CHRONOS 1F ISO	Hybrid pyramidal	18.20 x 14 x 10 ft 5.55 x 4.25 x 3.05 m	19.70 x 15.40 x 11.30 ft 6 x 4.70 x 3.45 m

Please contact us for measurements on civilian or military vehicles, or other ISO and CISPR standards applications.



AERONAUTIC AND MILITARY DEVICES

Hybrid pyramidal absorbers = combination of ferrite tiles and hybrid pyramidal absorbers HY

APPLICABLE STANDARDS → SIEPEL SOLUTIONS

MEASUREMENT DISTANCE	Compliant DO160 & MIL STD 461	CHAMBERS REFERENCES	ABSORBERS LINING	INTERNAL DIMENSIONS BETWEEN ABSORBERS L x W x H	EXTERNAL DIMENSIONS INCLUDING SUPPORT FRAME L x W x H
3.30 ft / 1m	80 MHz - 40 GHz - Reflectivity better than: - 6 dB from 80 to 250 MHz -10 dB above 250 MHz	ARES 1 P	Foam Pyramidal	12 x 9.2 x 7.2 ft 3.65 x 2.80 x 2.20m	16.4 x 13.6 x 9.85 ft 5.00 x 4.15 x 3.00m
3.30 ft / 1m	(30) 80 MHz - 40 GHz - Reflectivity better than: - 6 dB from 80 to 250 MHz -10 dB above 250 MHz	ARES 1 F	Hybrid Pyramidal	12.45 x 9.2 x 6.7 ft 3.80 x 2.80 x 2.05m	15.4 x 12.15 x 8.55 ft 4.70 x 3.70 x 2.60m

Please contact us for measurements on military devices or other military applications.

SIEPEL SAS – PA de Kermarquer, Impasse de la Manille - 56470 La Trinité-sur-Mer FRANCE
Ph.+33(0)2 97 55 74 95 – Email: sales@siepel.com - www.siepel.com