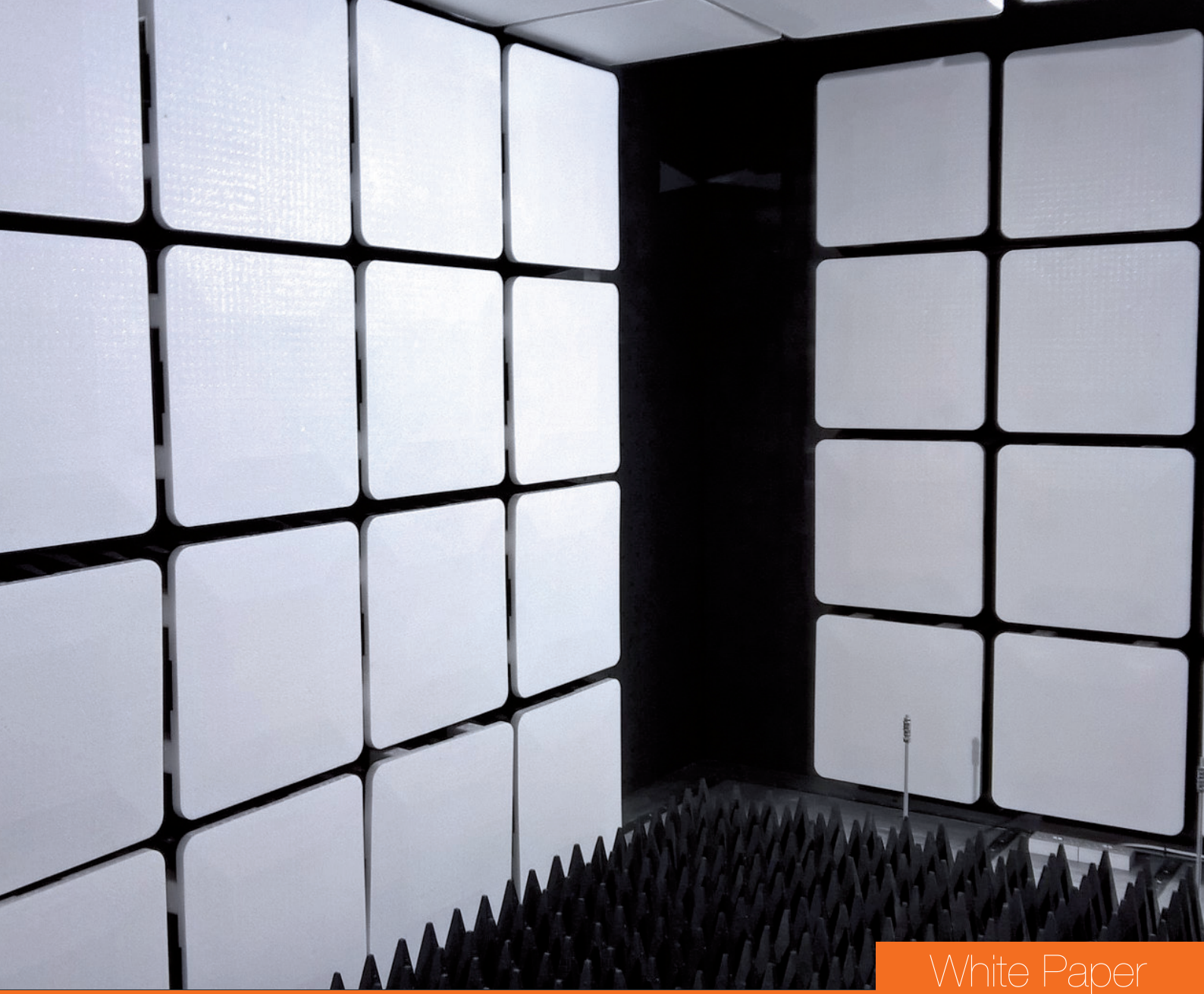


White Paper

EMC Pre-Compliance Test Chambers

Optimizing EMC testing with a pre-compliance chamber

mvg
Microwave Vision Group

Is it advantageous to own a pre-compliance chamber? Well, as the demands for accurate assessment of products increase, so has product complexity. But, manufacturers also have the challenge of meeting increased industry standards for testing compliance. Today's industry is highly competitive and keeping knowledge and development in house is crucial to success. With manufacturers now at the forefront of industry development, how can they protect their development and their patents? The solution: On-site Shielded Rooms and Anechoic EMC test Chambers.

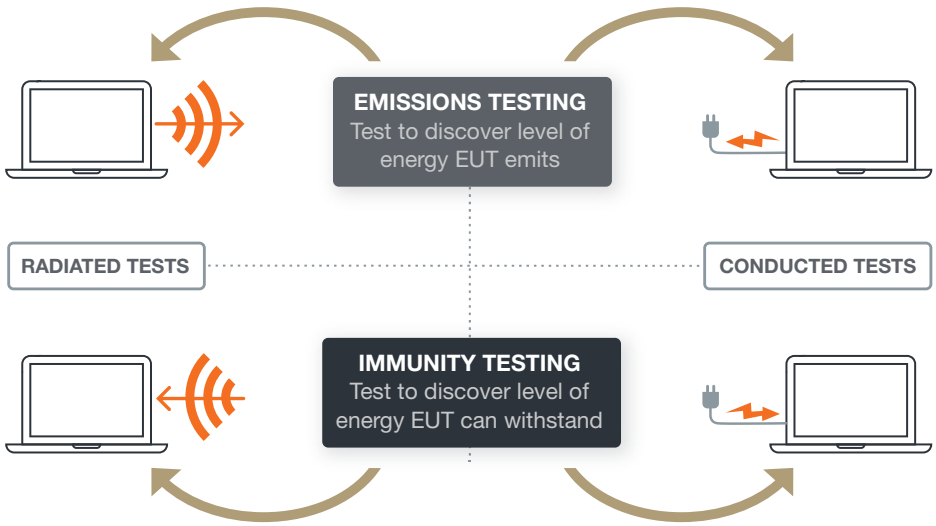
Importance of EMC Testing

Ever since Marconi and the first antenna, engineers have been concerned with electromagnetic noise, and its effects on electronic equipment. These electromagnetic disturbances create the need for ElectroMagnetic Compatibility (EMC) testing. This is the concern for every electronic product that is developed and sold out in the marketplace. Testing for EMC is becoming an even greater concern today, given the rapid proliferation of electronic devices and "interconnectivity." We have IoT, WiGiG, 5G; it seems that everyone and everything is connected to everyone and everything else.

Some common EMC challenges when producing products for the marketplace are:

- Increased clock speeds that create a greater potential for radiated emissions
- Lower logic voltage levels create a greater potential for susceptibility to noise
- A proliferation of wireless communication devices that increase the risk of interference

These challenges must be overcome in developing and changing products that are sold in the various marketplaces. We don't want a hearing aid to receive the low frequency emissions of lighting system in a building. We don't want the anti-lock braking system to fail because we are driving near a high-power radio transmitter. And… we certainly don't want to hear the motor and spark plugs over our car's radio. This creates a greater need for EMC testing. We must thoroughly test the products to find and eliminate problems and to validate that these products are compatible in an EM environment. Depending on the marketplace, we must make sure a device does not emit energy that is above some level (whether it be radiated or conducted) and we must ensure devices can survive some defined amount of energy that we know exists in the environment.



EMC Test Facilities

The testing must be accomplished on an Open-Area Test Site (OATS) or inside of an anechoic chamber that is designed to correlate to the OATS.

Example of an OATS

Liberty Labs, Kimballton, Iowa

Example of a 3m Anechoic Chamber

For "commercial" products, testing is typically done in what in the following common types of anechoic chambers:

- 3 m Chamber (a 3 m test distance) – typical internal dimensions: 8.9 m x 5.6 m 5.7 m (H)
- 5 m Chamber (5 m test distance) – typical internal dimensions: 11.5 m x 7.5 m x 5.8 m (H)
- 10 m Chamber (10 m test distance) – typical internal dimensions: 21 m x 12 m x 8.5 m (H)

These test chambers are relatively large to accommodate the given test distance, which varies depending on the size of the Equipment Under Test (EUT), the size of the turntable, height of the raised floor, etc. These can be expensive, as is the facility in which these chambers are installed. Thus, most testing to certify products is done at an authenticated test lab – a testing lab that is designed to carry out the appropriate EMC testing for a defined standard or set of standards. However, test time at a test lab is booked well in advance, and there is often a two or three-months wait list to get the test time. Moreover, the test time is lengthy and expensive. It can take up to several days for testing at up to $2000/day. For this reason, companies consider testing in what is known in the EMC world as a "pre-compliance chamber."

Compliance testing versus pre-compliance testing

In the EMC world, the term full compliance generally applies to "commercial testing" as governed by the procedures and specifications of CISRP 16. It typically means that the facility (chamber and system) can be an authenticated test lab, approved for testing and certifying products to be sold in market place (given that the tests pass the applicable benchmarks). This results in the FCC or CE sticker that you see on the back or on the bottom of electronic devices.

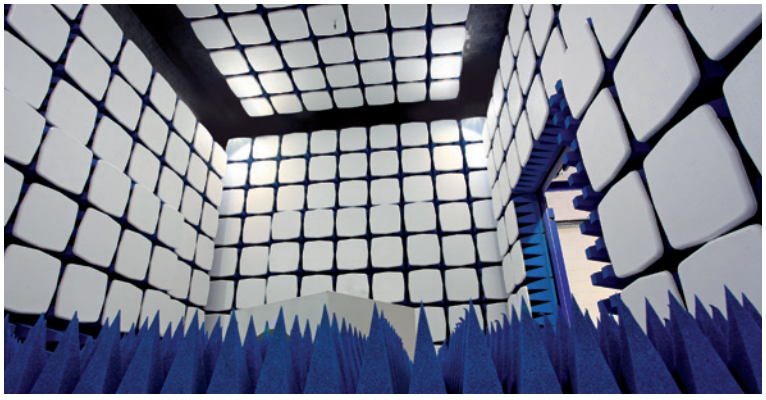
By contrast, a pre-compliance test lab is mainly used for R&D evaluation. It allows the engineers to make changes and then perform realtime diagnostics and analysis to obtain relative comparisons. Also, it gives assurances of the device to pass certification testing before it is sent to the authenticated, full-compliance test lab. That helps eliminate or minimize failures at the test lab, which cost time and money.

Pre-Compliance Chambers

A pre-compliance chamber is a smaller, less expensive anechoic chamber in which testing can be done to conduct testing, usually at a 3 m distance. The chambers are smaller so they fit into existing office buildings with little or no customization to the host facility. Because the chamber is smaller, some compromises need to be made regarding performance at the lower frequencies (e.g., ≤ 300 MHz) but the chamber still gives results that are repeatable and which can easily be correlated to the results of testing done at an "authenticated test lab" inside of a full-compliance chamber.

Two common sizes for pre-compliance chambers are:

- EMC-3C compact 3 m chamber: typical internal dimensions: 7 m x 3 m x 3 m (H)
- EMC-MC mini-compact 3 m chamber: typical internal dimensions: 6 m x 3 m x 2.4 m (H)



EMC-3C compact 3 m chamber: typical internal dimensions: 7 m x 3 m x 3 m (H)

The EMC-3C allows for a smaller antenna tower and one can more accurately replicate full-compliance test results for quiet zone sizes up to about 1.2 or even 1.5 m in diameter. The EMC-MC is typically used with a fixed antenna tower and offers good measurements for quiet zone sizes of 0.5 m to 1.0 m in diameter.

As stated above, the term pre-compliance mainly applies to commercial testing that is governed by CISPR 16, although it can apply to any testing that standards for any market place. Usually, the commonly accepted chamber sizes will allow full-compliance testing for radiated immunity, as per IEC 61000-4-3, for example. However, as stated above some compromises are made for performing radiated emissions testing. Additionally, because the application is pre-compliance, one can use less expensive receivers. For example, it is common to use spectrum analyzers that do not have a pre-selector and might have lower dynamic range. However, they still offer rigorous and accurate results.

Conclusion

On-site testing is an efficient way to complete EMC product testing to EMC industry standards (CISPR, IEC and FCC). Listing the major benefits, on-site testing:

1. Is Cost-effective
2. Is Time saving
3. Ensures confidentiality
4. Protects company development and patents
5. Increases reliability

MVG's range of Shielded Rooms & Anechoic EMC Test Chambers enables companies to produce, test and certify their electrical and electronic products. You can read more about it at www.mvg-world.com/emc

MVG provides anechoic chambers, absorbing materials, and various products to conduct **EMC measurement and testing.** With our SmartShield™ construction technique, HyPyr-Loss™ product line, and the expertise of our team, we can help you avoid the most common EMC failures.

ABBREVIATIONS

- CE → Conformité Européenne
- CISPR → Comité International des perturbations radioélectriques
- EM → Electromagnetic
- EMC → Electromagnetic Compatibility
- EUT → Equipment Under Test
- FCC → FEDERAL Communication Commission
- IEC → International Electrotechnical Commission
- IoT → Internet of Things
- OATS → Open-Area Test Site
- R&D → Research & Development
- WIGIG → Wireless Gigabit

MVG - About Us

The Microwave Vision Group (MVG) has developed unique expertise in the visualization of electromagnetic waves. These waves are at the heart of our daily lives: smartphones, computers, tablets, cars, trains, planes - these devices and vehicles would not work without them. MVG expertise brings measurement solutions to R&D teams for the characterization of antennas and their performance within these devices, and chamber solutions for EMC testing. MVG innovation remains focused on supplying R&D teams with the most advanced EMF measurement technology on the market.

MVG Industries
17 avenue de Norvège
91140 Villebon-sur-Yvette
FRANCE
Tel: +33 (0)1 69 29 02 47

MVG - Corporate HQ
47, boulevard Saint Michel
75005 Paris
FRANCE
Tel: +33 (0)1 75 77 58 50

MVG Industries Bretagne
Technopole Brest Iroise
Z.I de la Pointe du Diable
295 avenue Alexis de Rochon
29280 Plouzané
FRANCE
Tel: +33 (0)2 98 05 13 34

Orbit/FR Germany
ORBIT/FR Germany
J. S. Bach-Str. 11
85591 Vaterstetten
GERMANY
Tel: +49 (0)810 699 6060

Orbit/FR Israel
1 Gesher Ha-Ets St.,
P.O. Box 12096,
Emek Hefer Industrial Park,
38777-01 Emek Hefer
ISRAEL
Tel: +972 74 713 0130

MVG Italy
Via Castelli Romani, 59
00040 Pomezia (Rome)
ITALY
Tel: +39 06 89 99 53 11

Research and Production center in France

MVG Sweden
P.O. Box 35
44121 Alingsas
Gothenburg
SWEDEN
Tel: +46 31 402 430

Rainford EMC Systems Limited
Unit 400,
Haydock Lane,
Haydock WA11 9TH
UNITED KINGDOM
Tel: +44 (0)1 942 296 190

MVG Hong-Kong
Suite 702, 7th floor
Cyberport 1
100 Cyberport Road
Pok Fu Lam
Hong Kong SAR
CHINA
Tel: +85 229 896 128

MVG India
N° 414 Cunnigham Road
Level 4 Prestige Centre Point,
560052 Bangalore
INDIA
Tel: +91 70 22 98 12 16

Production site in Israel

MVG Japan
#101 Confort Musashi-Nakahara,
2-10-32, Shimokodanaka,
Nakahara-ku, Kawasaki-city
211-0041 Kanagawa
JAPAN
Tel: +81 44 948 9301

Orbit/FR's Corporate HQ
506 Prudential Road
Horsham, PA
19044
UNITED STATES
Tel: +1(215) 674 5100

MVG, Inc
2105 Barrett Park Dr.,
Suite 104
Kennesaw, GA 30144
UNITED STATES
Tel: +1 678 797 9172

AEMI
1320 Air Wing Road,
suite 101
Otay Mesa, CA 92154
UNITED STATES
Tel: +1 (619) 449 9492

mvg
Microwave Vision Group

Contact your local sales representative for more information
http://mvg-world.com/emc
salesteam@mvg-world.com