



## COMMERCIAL EMC

IEC | CISPR | ISO | FCC  
PRE-COMPLIANT CHAMBERS



Our EMC Test Sites offer much more than the sum of components, products, services and integration. Our solution philosophy begins with the initial customer inquiry and continues through the entire process to include maintenance service and a lifelong commitment to our customer's EMC facilities.

## Chamber Overview

STANDARDIZATION MAKES CUSTOMIZED SOLUTIONS AFFORDABLE. ....

Today, we directly control the R&D and manufacturing of the two principal components found in any EMC facility solution namely the shielding and the RF absorbers. Additionally, we work closely with our suppliers in the development of the components (i.e. RF filters, turntables, antenna masts, etc.), to insure they meet our stringently defined specifications.

Pre-compliant test sites provide consistent and reproducible measurements of the EMI performance of a EUT, while the EMS test can be performed full compliant for certification. Recognized as a working tool to assist the R&D engineer during development, the family of pre-compliant EMC Test Sites includes semi-anechoic chambers (SAC) as well as fully anechoic rooms (FAR) for 3 m test distance.

The end-user has a choice between the two. In connection with the chamber validation correlation factors from the 3 m FAR performance to a 10 m OATS can be worked out and provided. Compact in size with a total height between 3.2 m (10.5 ft) and 3.5 m (11.5 ft), the pre-compliant test site (CDC) is ideal for office and laboratory areas.

The completely modular configuration of the CDC and the durable pan shielding system enables an upgrade to a compliant 3 m test site at a later stage in a time and cost efficient way. All pre-compliant test sites provide shielding compliant to EN 50147-1. Conducted EMC measurements, according to all of the relevant standards, can be performed in all chambers, provided that the geometry of the test site allows it.

# Chamber Validation

A WIN-WIN SITUATION FOR BOTH CUSTOMER AND SUPPLIER. ....

The chamber validation procedure and the test reports serve many functions but most importantly, are proof positive that we fulfill our contractual obligation to the client by providing a high performance RF chamber.

In order for the customer to receive accreditation for their chamber, it is necessary that the chamber undergo final verification testing by an independent third party who will certify conformity to the required standards.

We, as an EMC Test Site solution provider, consider the validation procedure to be the final and irrevocable quality control of the chamber design, selected materials and installation skills. From the very beginning we have invested considerable resources in the capability of independently performing the chamber validation procedure according to the recognized international standards.

Our record of more than 200 continuous chamber validations over the past ten years furthers our understanding of the behavior of an anechoic chamber. Our close cooperation with globally recognized independent test houses ensures a continuous and accurate calibration of our measuring antennas.

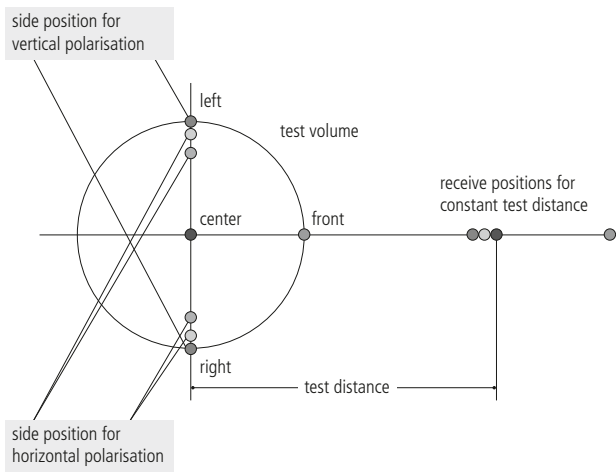
We offer chamber validation service wherever requested and appropriate.

The international rules for the certification of EMC Test Sites require the validation of the:

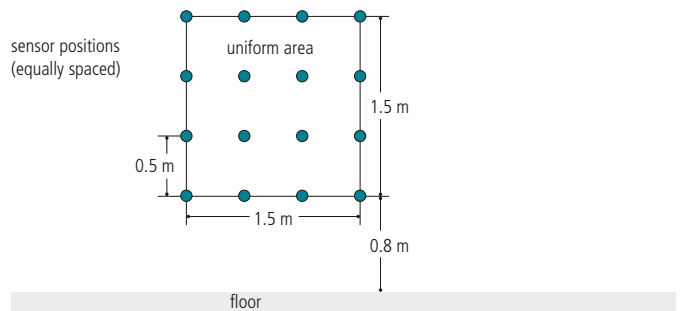
- Shielding effectiveness (SE)
- Emission performance (NSA, sVSWR)
- Susceptibility performance (FU)

Our participation in the international Standard Committees (CISPR/IEC) contributes to the evolution of the validation procedures. Consequently, all our pre-compliant EMC Test Sites are designed to meet or exceed the performance criteria set in those relevant standards. With regard to EMC Test Sites, the CISPR 16-1-4 now includes in chapters 5 and 8, the validation procedures for semi-anechoic chambers (SAC) and fully anechoic rooms (FAR) in the frequency range 30 MHz – 18 GHz. The well known test volume principle is maintained as illustrated below. (see lower left graph)

For the susceptibility performance, the IEC 61000-4-3 continues to be the governing standard using the well known principle of the uniform area. (see lower right graph)



Basic set-up for test volume measurement



Uniform area for field uniformity test

# Purpose & Standards

## WHAT IS THIS SOLUTION FOR? .....

Electro Magnetic Compatibility is the ability of electrical and electronic equipment and systems to share the electromagnetic spectrum and perform their desired functions without unacceptable degradation to or from the specified electromagnetic environment.

This basic statement must be implemented by manufacturer and dealer into all electrical and electronic equipment brought into the market. Our pre-compliant EMC Test Sites are designed for conducted and radiated measurements on industrial, electrical, and electronic equipment.

It should be noted that the high shielding effectiveness is at least 100 dB and the low ambient noise level in our anechoic chambers allow for several additional applications such as an EMC hardening test on equipment and boxes/cabinets as well as measurements of the shielding effectiveness of materials. Obviously size and configuration of the anechoic chamber should suit the requirements of such specific applications.

For industrial equipment, the product family standard for emission measurements should refer to ANSI C63.4, CISPR 16-1-4, EN 55016-1-4, IEEE C63.4, VCCI and other national standards. For conducted and radiated susceptibility tests, the product family standard should refer to IEC 61000-4-3, EN 6100-4-3, EN 6001-4-6 and IEC 61000-4-6.

Additionally, the applicable requirements of the following standards can be met for pre-compliant tests and measurements:

- Bellcore, ETSI, FCC (Telecom)
- CISPR 25, ISO and SAE (Automotive)
- MIL-STD 461, RTCA DO-160 (Military/Aerospace)

# Quality Management

## QUALITY MEANS DOING IT RIGHT FROM THE VERY FIRST THOUGHT. ....

Our quality management ensures a most efficient quality control over products, management and organizational systems.

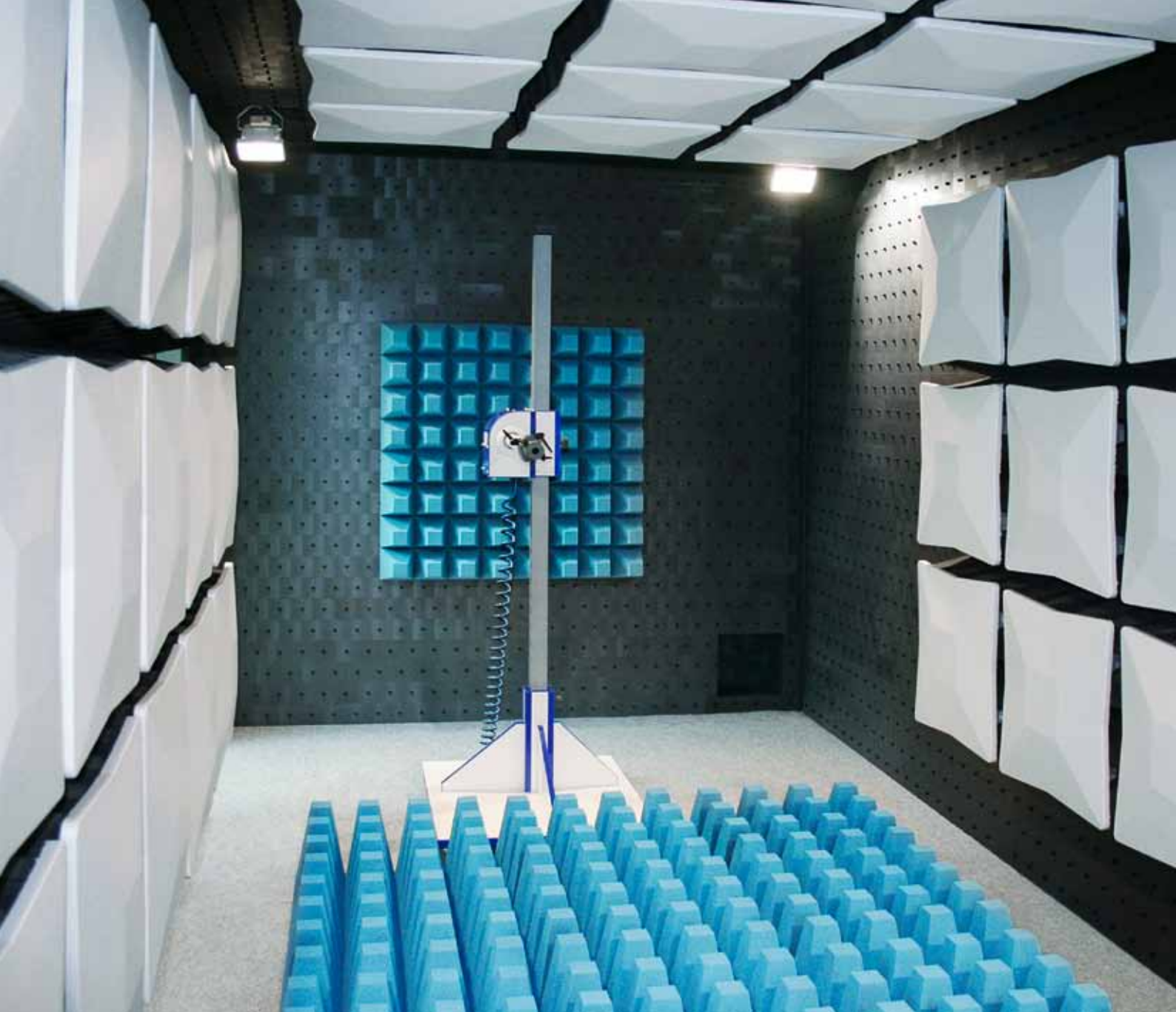
The organization ensures the availability of resources and information necessary to support the operation and monitoring of these processes. All relevant processes are defined in our management system. Through monitoring, analysis, and improvement, the highest quality and customer satisfaction is our target.

In an effort to improve our quality assurance systems, we ask our customers to provide an evaluation of our performance at the conclusion of each project. This feedback, coupled with input from the market and the Standards Committees gives, continuous enhancement to our systems and correction to any non-conformity found.

Product purchasing and sourcing is a priority in our role as system integrator, so much that it encompasses one of sixteen chapters in our quality management system. Key process figures are:

- audit & approval of suppliers
- evaluation of products by our technical team
- technical reporting on delivered products
- project related factory acceptance by the project manager.

Our ISO 9001 certification guarantees that our designs, products, and solutions will always meet the highest quality standards. It's our goal to provide you the very best of expertise, project management, and products. The main system components like shielding, absorbers etc. are manufactured by daughter companies or by our shareholders. This ensures a full control with regard to quality and delivery time.



FAR CDC

# FAR CDC

The pre-compliant fully anechoic room (FAR CDC) is well suited as a test site for tabletop EUT. Cost reduction is achieved through the efficient design of the FAR CDC. Fixed antenna height and floor absorber layout covering the entire frequency are all contributing factors in the reduced measurement and set-up time.

## Basic Outline FAR CDC

### KEY FEATURES .....

- Self-supporting modular pan shielding for floor, walls and ceiling inclusive of an earthing stud
- Wooden floor with distributed load of 1 t (2,205 lb)
- Floor connection points and wall access panels as to chamber size
- Honeycomb vents in walls and ceiling 0.33 m x 0.33 m (12 in x 12 in) as to the chamber size
- One manually operated RF shielded EUT door 1.2 m x 2.05 m (4 ft x 7 ft)
- One door maintenance kit
- Hybrid absorber lining for floor, walls and ceiling, as to the chamber performance
- Fully functional positioning system including controller, turntable as to test volume size and antenna stand
- EMC power line filters: one filter 3 phase 32 A for EUT supply and one 2 phase 16 A for internal use
- Connectors including one six-fold fiber optic connector, two N-precision connectors and two SMA connectors
- Standard electrical package: electrical distribution, lighting, emergency and signal lamps
- Installation of the FAR CDC including leakage test after shielding installation

## Options FAR CDC

### CUSTOMIZABLE UPGRADES .....

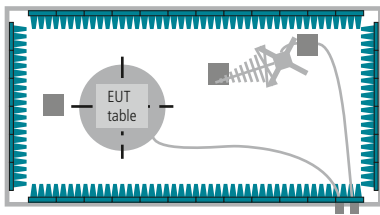
- Fully functional shielded control room
- Fully functional shielded amplifier room
- One additional manually operated RF shielded personnel door 0.9 m x 2.05 m (3 ft x 7 ft)
- Access ramp for entrance door
- Honeycomb fan for forced ventilation
- Digital CCTV monitoring system
- FO converter for Ethernet, GPIB, RS232, VGA, USB, MM and Digi 88
- EMC filters for control- and communication lines
- Fire detection and extinguishing system
- Painted hybrid absorbers
- Exterior paint on the visible shielding surfaces
- SE measurement according to EN 50147-1, IEEE 299
- Chamber validation according to CISPR 16-1-4, ANSI C63.4, EN 55016-1-4
- Chamber validation according to IEC 61000-4-3, EN 61000-4-3
- Correlation factors between 3 m FAR and 10 m OATS

# FAR M-CDC

## ROOM DIMENSIONS

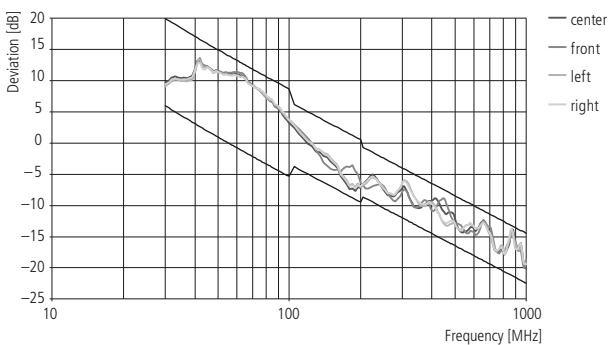
| Room type         | Total required space <sup>1)</sup>                   | Shielding external <sup>2)</sup>                    | Clear internal <sup>3)</sup>                       |
|-------------------|--|---|--|
| FAR M-CDC– 1.0m Ø | 7.3 m x 4.5 m x 3.2 m<br>24.0 ft x 14.8 ft x 10.5 ft | 7.3 m x 3.1 m x 3.0 m<br>24.0 ft x 10.2 ft x 9.8 ft | 6.3 m x 1.9 m x 1.8 m<br>20.6 ft x 6.3 ft x 6.0 ft |

L x W x H <sup>1)</sup>Dimensions including steel structure, gate drive track and HVAC ducts. <sup>2)</sup>Dimensions excluding steel structure. <sup>3)</sup>Absorber to absorber, i.e. ground plane to absorber.

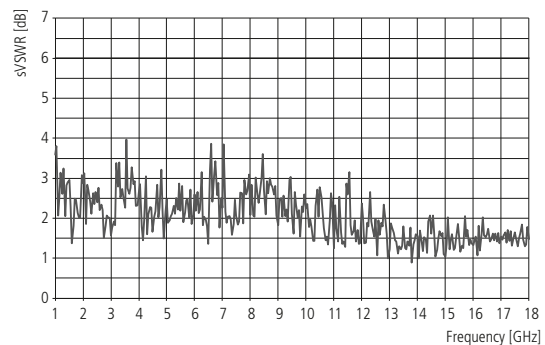


## PERFORMANCE

|                      | NSA FS                                   |          |          | Site sVSWR                                       | Field Uniformity              |
|----------------------|--|----------|----------|--|-------------------------------|
| Standard             | ANSI C63.4<br>CISPR 16-1-4, EN 55016-1-4 |          |          | In accordance with<br>CISPR 16-1-4, EN 55016-1-4 | IEC 61000-4-3<br>EN 61000-4-3 |
| Frequency range      | 30 MHz – 1 GHz                           |          |          | 1 GHz – 18 GHz                                   | 80 MHz – 18 GHz               |
| Test distance        | 3 m                                      |          |          | 3 m  | 3 m                           |
| Test volume          | 1.0 m                                    | 1.0 m    | 1.0 m    | 1.0 m  | 1.5 m x 1.5 m vertical plane  |
| Test frequency (MHz) | 30–100                                   | 101–200  | 201–1000 |  | 80 MHz –18 GHz                |
| Test axis            | Off axis                                 | Off axis | Off axis | Off axis   | In axis                       |
| Deviation            | ±7 dB                                    | ±5 dB    | ±4 dB    | ≤ 6 dB   | 0 to +6 dB / 75% rule         |



Typical performance FAR M-CDC 3 m (FS NSA)



Typical performance FAR M-CDC 3 m (sVSWR)

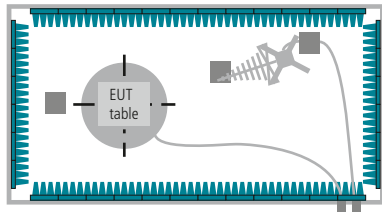


# FAR C-CDC

## ROOM DIMENSIONS

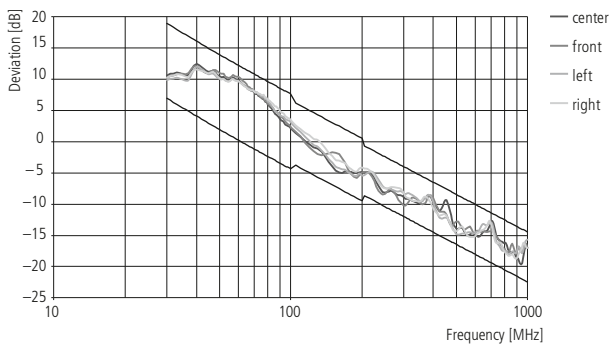
| Room type           | Total required space <sup>1)</sup>                   | Shielding external <sup>2)</sup>                     | Clear internal <sup>3)</sup>                       |
|---------------------|--|--|--|
| FAR C-CDC – 1.2 m Ø | 7.3 m x 4.9 m x 3.5 m<br>24.0 ft x 16.1 ft x 11.5 ft | 7.3 m x 3.4 m x 3.3 m<br>24.0 ft x 11.2 ft x 10.8 ft | 6.3 m x 2.2 m x 2.1 m<br>20.6 ft x 7.3 ft x 7.0 ft |

L x W x H <sup>1)</sup>Dimensions including steel structure, gate drive track and HVAC ducts. <sup>2)</sup>Dimensions excluding steel structure. <sup>3)</sup>Absorber to absorber, i.e. ground plane to absorber.

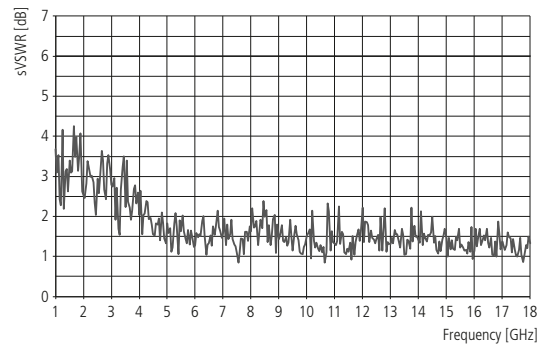


## PERFORMANCE

|                      | NSA FS                                   |          |          | Site sVSWR                                       | Field Uniformity              |
|----------------------|--|----------|----------|--|-------------------------------|
| Standard             | ANSI C63.4<br>CISPR 16-1-4, EN 55016-1-4 |          |          | In accordance with<br>CISPR 16-1-4, EN 55016-1-4 | IEC 61000-4-3<br>EN 61000-4-3 |
| Frequency range      | 30 MHz – 1 GHz                           |          |          | 1 GHz – 18 GHz                                   | 80 MHz – 18 GHz               |
| Test distance        | 3 m                                      |          |          | 3 m  | 3 m                           |
| Test volume          | 1.2 m                                    | 1.2 m    | 1.2 m    | 1.2 m  | 1.5 m x 1.5 m vertical plane  |
| Test frequency (MHz) | 30–100                                   | 101–200  | 201–1000 |  | 80 MHz – 18 GHz               |
| Test axis            | Off axis                                 | Off axis | Off axis | Off axis   | In axis                       |
| Deviation            | ±6 dB                                    | ±5 dB    | ±4 dB    | ≤ 6 dB   | 0 to +6 dB / 75% rule         |



Typical performance FAR C-CDC 3 m (FS NSA)



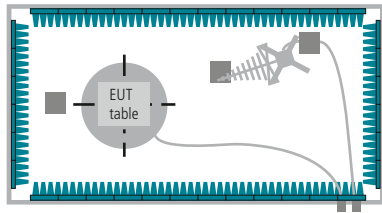
Typical performance FAR C-CDC 3 m (sVSWR)

# FAR XL-CDC

## ROOM DIMENSIONS

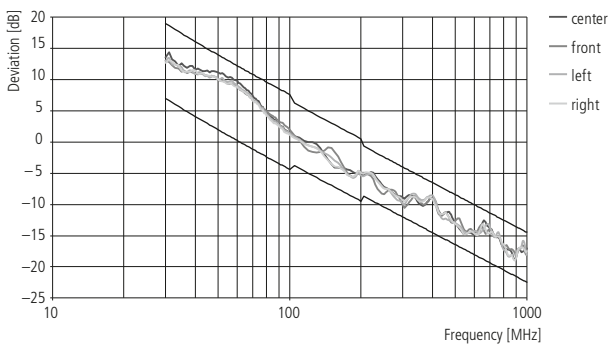
| Room type          | Total required space <sup>1)</sup>                   | Shielding external <sup>2)</sup>                     | Clear internal <sup>3)</sup>                        |
|--------------------|--|--|---|
| FAR XL-CDC 1.5 m Ø | 8.1 m x 6.2 m x 3.5 m<br>26.6 ft x 20.3 ft x 11.5 ft | 7.9 m x 4.6 m x 3.3 m<br>25.9 ft x 15.1 ft x 10.8 ft | 6.9 m x 3.4 m x 2.1 m<br>22.5 ft x 11.2 ft x 7.0 ft |

L x W x H <sup>1)</sup>Dimensions including steel structure, gate drive track and HVAC ducts. <sup>2)</sup>Dimensions excluding steel structure. <sup>3)</sup>Absorber to absorber, i.e. ground plane to absorber.

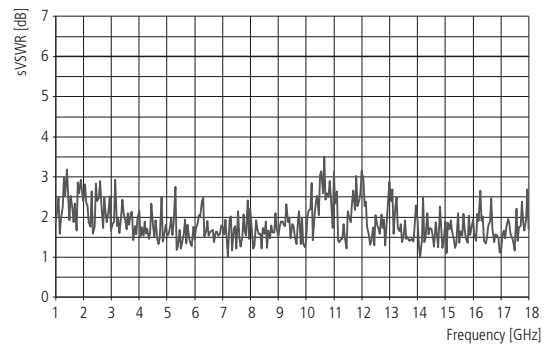


## PERFORMANCE

|                      | NSA FS                                   |          |          | Site sVSWR                                       | Field Uniformity              |
|----------------------|--|----------|----------|--|-------------------------------|
| Standard             | ANSI C63.4<br>CISPR 16-1-4, EN 55016-1-4 |          |          | In accordance with<br>CISPR 16-1-4, EN 55016-1-4 | IEC 61000-4-3<br>EN 61000-4-3 |
| Frequency range      | 30 MHz – 1 GHz                           |          |          | 1 GHz – 18 GHz                                   | 80 MHz – 18 GHz               |
| Test distance        | 3 m                                      |          |          | 3 m  | 3 m                           |
| Test volume          | 1.5 m                                    | 1.5 m    | 1.5 m    | 1.5 m  | 1.5 m x 1.5 m vertical plane  |
| Test frequency (MHz) | 30–100                                   | 101–200  | 201–1000 |  | 80 MHz – 18 GHz               |
| Test axis            | Off axis                                 | Off axis | Off axis | Off axis   | In axis                       |
| Deviation            | ±5 dB                                    | ±4 dB    | ±4 dB    | ≤ 6 dB   | 0 to +6 dB / 75% rule         |



Typical performance FAR XL-CDC 3 m (FS NSA)



Typical performance FAR XL-CDC 3 m (sVSWR)



# FAR XL-CDC



SAC CDC

# SAC CDC

The pre-compliant semi-anechoic chamber (SAC CDC) is well suited as a test site for floor standing and heavy EUT. The ground plane turntable design can easily carry loads up to 1 t (2,205 lb). Due to the height limitation the scanning range is limited to 2.1 m (6 ft). The excellent NSA performance of this chamber is one of many great reasons to choose this version of a pre-compliant chamber.

## Basic Outline SAC CDC

### KEY FEATURES .....

- Self-supporting modular pan shielding for floor, walls and ceiling inclusive of an earthing stud
- High quality ground plane on a wooden floor with distributed load of 1 t (2,205 lb)
- Floor connection points and wall access panels as to chamber size
- Honeycomb vents in walls and ceiling 0.33 m x 0.33 m (12 in x 12 in) as to the chamber size
- One manually operated RF shielded EUT door 1.2 m x 2.05 m (4 ft x 7 ft)
- One door maintenance kit
- Hybrid and pyramidal absorber lining for floor, walls and ceiling, as to the chamber performance
- Fully functional positioning system including controller, turntable as to test volume size and antenna mast
- EMC power line filters: one filter 3 phase 32 A for EUT supply and one 2 phase 16 A for internal use
- Connectors including one six-fold fiber optic connector, two N-precision connectors and two SMA connectors
- Standard electrical package: electrical distribution, lighting, emergency and signal lamps
- Installation of the SAC CDC including leakage test after shielding installation

## Options SAC CDC

### CUSTOMIZABLE UPGRADES .....

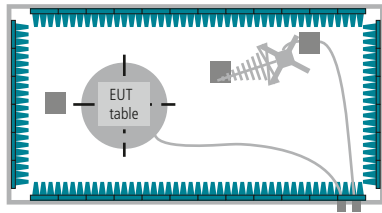
- Fully functional shielded control room
- Fully functional shielded amplifier room
- One additional manually operated RF shielded personnel door 0.9 m x 2.05 m (3 ft x 7 ft)
- Access ramp for entrance door
- Honeycomb fan for forced ventilation
- Digital CCTV monitoring system
- FO converter for Ethernet, GPIB, RS232, VGA, USB, MM and Digi 88
- EMC filters for control- and communication lines
- Fire detection and extinguishing system
- Painted hybrid absorbers
- Exterior paint on visible shielding surfaces
- SE measurement according to EN 50147-1, IEEE 299
- Chamber validation according to CISPR 16-1-4, ANSI C63.4, EN 55016-1-4
- Chamber validation according to IEC 61000-4-3, EN 61000-4-3

# 3 m SAC CDC

## ROOM DIMENSIONS

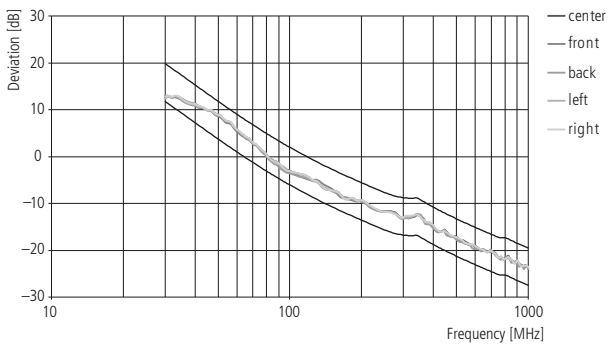
| Room type         | Total required space <sup>1)</sup>                   | Shielding external <sup>2)</sup>                     | Clear internal <sup>3)</sup>                        |
|-------------------|--|--|---|
| SAC CDC – 1.5 m Ø | 7.5 m x 6.2 m x 3.8 m<br>24.6 ft x 20.3 ft x 12.5 ft | 7.3 m x 4.6 m x 3.6 m<br>24.0 ft x 15.1 ft x 11.8 ft | 6.3 m x 3.4 m x 2.9 m<br>20.6 ft x 11.2 ft x 9.5 ft |

L x W x H <sup>1)</sup>Dimensions including steel structure, gate drive track and HVAC ducts. <sup>2)</sup>Dimensions excluding steel structure. <sup>3)</sup>Absorber to absorber, i.e. ground plane to absorber.

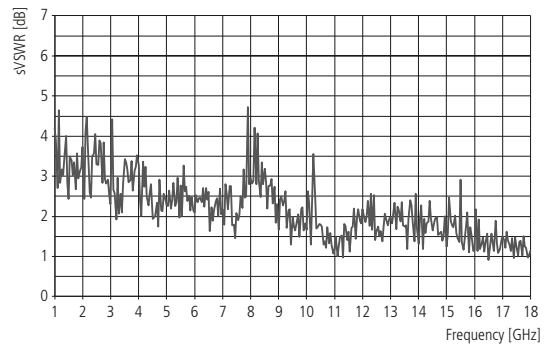


## PERFORMANCE

|                      | NSA                                      |          |          | Site sVSWR                                       | Field Uniformity              |
|----------------------|--|----------|----------|--|-------------------------------|
| Standard             | ANSI C63.4<br>CISPR 16-1-4, EN 55016-1-4 |          |          | In accordance with<br>CISPR 16-1-4, EN 55016-1-4 | IEC 61000-4-3<br>EN 61000-4-3 |
| Frequency range      | 30 MHz – 1 GHz                           |          |          | 1 GHz – 18 GHz                                   | 80 MHz – 18 GHz               |
| Test distance        | 3 m                                      |          |          | 3 m  | 3 m                           |
| Test volume          | 1.5 m                                    | 1.5 m    | 1.5 m    | 1.5 m  | 1.5 m x 1.5 m vertical plane  |
| Test frequency (MHz) | 30–100                                   | 101–200  | 201–1000 |  | 80 MHz – 18 GHz               |
| Test axis            | Off axis                                 | Off axis | Off axis | Off axis   | In axis                       |
| Deviation            | ±4.5 dB                                  | ±4 dB    | ±4 dB    | ≤ 6 dB   | 0 to +6 dB / 75% rule         |



Typical performance SAC 3 m (NSA)



Typical performance SAC 3 m (sVSWR)



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