

# Systems & Projects

EMC Centre of SEE in Luxembourg

Since July 1997, the EMC Centre of SEE (Service de l'Energie de l'Etat) at Capellen, Luxembourg is fully operational in order to test and certify a diversity of products which have to comply to the European EMC Directive.

The EMC Test Centre has been realised in close co-operation with Rohde & Schwarz, who was in charge of the turnkey project management.

## Standards

SEE is able to test according to the following standards :

### Emission (EN/IEC)

- EN55011, EN55014, EN555015, EN55022
- EN50081-1&2
- EN61000-3-2 & 3

### Immunity (EN/IEC)

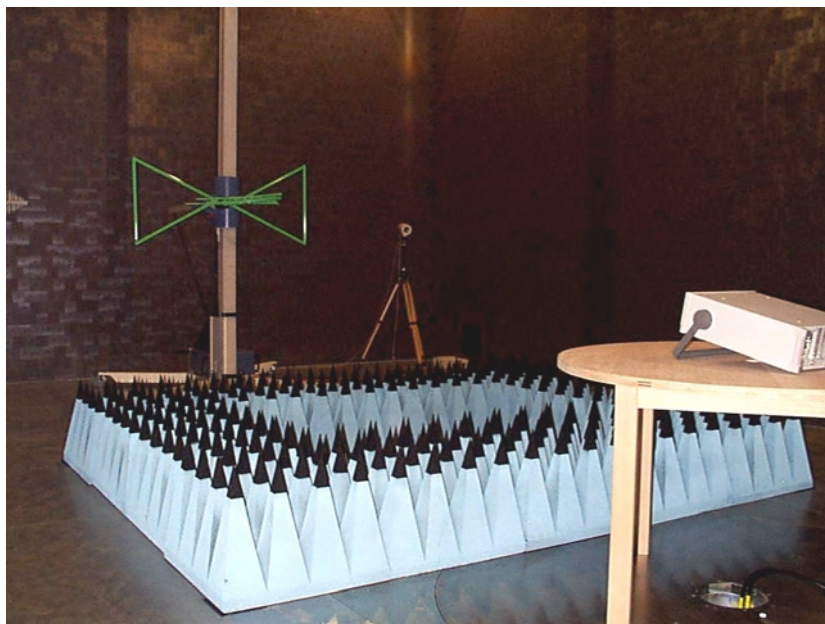
- EN50082-1&2
- IEC1000-4-2/3/4/5/6/8/11
- EN55014-2, EN55104, EN55105, EN61547, EN50130-4

### ETSI

- ETS300-279, ETS300-339, ETS300-445, ETS300-680-1, -2, ETS300-683, ETS300-684

## Anechoic Chamber and Control Room

With respect to the existing building, an anechoic chamber with approximate inner dimensions of 9 x 6 x 5 m (l x w x h) is used for radiated emission and immunity tests. The shielding of the chamber is specified up to 20GHz, by using appropriate shielding materials, filters and honeycombs. Access to the anechoic chamber is provided by a double door of 2m x 2.5m (w x h). The absorbing material consists of ferrite tiles, which work in the frequency range from 26-1000MHz. They can be extended in future by pyramidal foam absorbers covering the frequency range from 1 to 18GHz.



For emission tests, the floor is reflective. For immunity tests, the reflective floor is covered by movable absorber panels (ferrites and pyramidal)

Adjacent to the anechoic chamber, a control room of 6x5x2.5m houses the test systems.

## Test Systems

Based on the analysis of applicable standards, the following test systems have been configured and adapted to the requirements of SEE, allowing maximum flexibility to the future.

### RFI Immunity Tests

The **EMS test system** consists of a **signal generator SMY**, followed by two power amplifiers. A **100W amplifier** from 80 to 1000MHz drives a **log.-periodic antenna** generating fields (pulse or modulated) over 10V/m at 3m distance. A **150W amplifier** from 10kHz to 220MHz is used for conducted immunity tests with **different CDNs** and an **injection clamp**. The conducted tests are done on a **wooden table with metallic surface**.

Both power amplifiers are followed by **directional couplers** for the measurement and control of the output power. The RF power (normal and Peak-Envelope-Power) is measured by the **dual channel power meter URV5**.

The amplifiers, signal paths and power control units are automatically switched by the **System Control Interface Unit SCIU**.

All system components are controlled via the **EMS System Software EMS-K1**, allowing full automatic test runs.

During the illumination of the EUT, a **colour camera system** monitors the EUT.

For the measurements of EUTs according to **ETSI standards**, the EMS Test System has been extended with an EUT monitoring system. It allows to measure any parameter of an analog transmitter/receiver, thanks to the use of the **Radiocommunication Service Monitor CMS52**. Audio signals are applied to the EUT by means of acoustic tubes, artificial mouth/ear and test heads. The EMS Test System allows full automatic EUT monitoring during the immunity test, thanks to the powerful EMS Immunity Software.

The system can be extended in future to cover also digital radiocom equipment (like GSM/DECT/...)

## RFI Emission Tests

The emission measurements are performed via two **EMI Test Receivers ESHS and ESVS**. They cover the frequency range from 9 kHz to 1GHz, and provide excellent EMI RF characteristics for full compliant measurements acc. to CISPR16.

A single **BILOG antenna** covers the whole frequency range from 30 MHz to 2 GHz.

Two LISNs are used : one **LISN ESH3-Z5** for single phase AC powered equipment, and one **LISN ESH3-Z6** for DC powered EUTs. These conducted emission measurements are done on a **wooden table** in the control room, or in the anechoic chamber in case of floor standing equipment.

The **automatic mast HCM** offers the user great flexibility in controlling antennas. It does not influence the accuracy of the measurement results, due to an adequate choice of materials and remote control system (**Controller HCC** via fibre optics).

The **automatic turntable** of 2m diameter is integrated in the floor and assures groundplane continuity. It can handle EUT's up to 1000kg, and is remote controlled via a controller located in the control area.



For measurements of RFI Power or shielding effectiveness, an **absorbing clamp MDS21** is placed on the **automatic clamp rail HCA**, controlled by a **HCC**.

All emission measurements are atomised by the **EMI Software ES-K1**, which runs under MS Windows. It simplifies the reporting facilities, and enables further data processing via commercial software (like EXCEL, WINWORD, ...)

## Transient Immunity Tests

An **ESD simulator ESD30** allows electrostatic air discharges up to 18kV, and contact (relay) discharges up to 8kV.

Electric Fast Transients and Surges are generated by a **Combined Transient Immunity Generator UCS500**. The bursts are coupled into the EUT via the integrated coupling network or via a **capacitive coupling clamp**. The **Telecom Surge Simulator TSS500** is generating the so-called CCITT pulses (10/700µs).

The voltage dips, variations and interruptions are also generated by the UCS500, which controls a motorised variac as AC source.







## LF Harmonics & Flicker Tests

For measurements on the 50Hz power supply line, the standards EN610003-2&3 are applicable. Harmonics are measured by using a **real-time Harmonic Analyser**, which measures the harmonics across a shunt resistance. The AC source consists of a **Programmable Oscillator** followed by a **5000VA Power Amplifier**.

Flicker is measured by means of a **Flickermeter** which analyses the AC voltage supply to the EUT via a **LISN** (complex impedance).

Since the test system is built up around a variable source with power amplifier, these components can also be used for tests according to IEC 1000-4-11 (power fail) as well as IEC1000-4-8 (magnetic immunity), by addition of a **Helmholtz coil** in which the EUT is placed. Fieldstrengths of up to 100A/m can be generated.

All different tests are done fully automatically using special Windows-compatible system software.

## System configurations

The fixed measurement equipment is placed in **19" racks**, with ventilation, power supply control, slides, etc...

The RF and control cabling goes directly from the racks into the false floor, in which the cable ducts are integrated.

Three connection points in the anechoic chamber provide easy access to the cables and connectors. Feedthroughs and filters are also located in the false floor. For future extensions, two access panels are foreseen, equipped with universal feedthrough connections.

Only the best quality of **RF cables** and connections is a guarantee for accurate and repeatable EMC measurements. Therefore the cable sets are very low loss (to obtain maximum sensitivity) and have a high shielding (to avoid interference between the measurement signals and test set-up). They are calibrated by the test systems and their correction values are taken into account by the software.

For the control of the measurement systems, the **process controller** is equipped with the required I/O-Interfaces (like IEEE-488, RS232, TTL I/O, Relays, etc...). It is placed on a convenient integrated **workbench**.

