CERT experience on conformance testing

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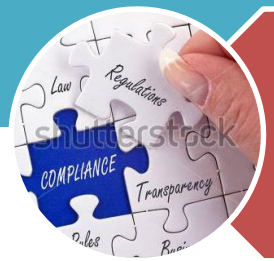
GENERAL OVERVIEW : ITU C&I Program



PILLAR 1. CONFORMITY ASSESSMENT

PILLAR 2. INTEROPERABILITY EVENTS

PILLAR 3. CAPACITY BUILDING

PILLAR 4. ASSISTANCE TO DEVELOPING COUNTRIES

GENERAL OVERVIEW : ITU C&I Program

The ITU Conformity and Interoperability (C&I) Programme was established at the request of ITU membership to:

- ✓ Reinforce the conformity and interoperability of ICT equipment implementing ITU Recommendations, whether fully or partially;
- ✓ Enhance the technical rigor, consistency, and reliability of ITU Recommendations;
- ✓ Mitigate the digital divide and close the Standardization Gap by providing developing countries with targeted support in capacity building, both in terms of human expertise and technical infrastructure.

"Conformance and Interoperability Resolutions and Ongoing Work"

- ✓ **ITU Resolutions:**
  - Resolution 177 (PP-22)
  - Resolution 76 (WTSA 24)
  - Resolution 47 (WTDC 22)
  - Resolution62-3 (RA-23)
- ✓ **ITU-T has launched an informative and voluntary Product Conformity Database** and is progressively populating it with details of ICT equipment having undergone testing for conformity to ITU-T Recommendations
- ✓ **CASC in collaboration with other certification bodies or institutions (e.g., International Electrotechnical Commission IEC or ILAC) are working on the establishment of joint certification scheme** for assessing ICT equipment for conformity with ITU-T Recommendations
- ✓ **CASC** has been set up for the purpose of **developing a procedure for the recognition of ITU experts and elaborating detailed procedures for the implementation of a test laboratory recognition procedure in ITU-T**
- ✓ **ITU support** the implementation of the **testing laboratories recognition procedure of the ITU** and make the list of recognized testing laboratories accessible for ITU members

Conformance ?
Article 3 : Essential requirements
DIRECTIVE 2014/53/EU

1. Radio equipment shall be constructed so as to ensure:

(a) the protection of health and safety of persons and of domestic animals and the protection of property, including the objectives with respect to safety requirements set out in Directive 2014/35/EU, but with no voltage limit applying;

(b) an adequate level of electromagnetic compatibility as set out in Directive 2014/30/EU.

2. Radio equipment shall be so constructed that it both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference.

3. Radio equipment within certain categories or classes shall be so constructed that it complies with the following essential requirements:

Application of 2014/53/EU which replaces the R&TTE directive 1999/05/EC

✓ **In scope (equipment covered by RED):**

- All radio equipment : Any electrical or electronic product that intentionally emits or receives radio waves for radio communication and/or radio determination (Art. 2).
- Radio equipment intended to be installed in vehicles (cars, trucks, etc.), since Directive 72/245/EEC (automotive EMC) and Directive 92/61/EEC (two- or three-wheeled motor vehicles) were repealed and replaced by newer legislation. Such devices fall under RED when they include radio functions.
- Equipment and systems for air traffic management are covered, but only radio equipment parts (not the entire ATM infrastructure).

✗ **Excluded from RED (Art. 1(3))**:

- Radio equipment used by radio amateurs, unless made available on the market (kits, components, custom-built for own use are excluded).
- Marine equipment within the scope of Directive 96/98/EC (repealed and replaced by Directive 2014/90/EU).
- Airborne equipment, parts and appliances covered by Regulation (EC) No 216/2008 (now superseded by Regulation (EU) 2018/1139).
- Custom-built evaluation kits intended for professionals for R&D purposes.

The applicable essential requirements

Efficient use of spectrum	Electromagnetic compatibility	Health and Safety Protection
Application of spectrum protection requirements Use of frequency bands	Compliance with the EMC Directive Directive 2014/30/EU, which replaces 2004/108/EC	Compliance with the LV Directive Directive 2014/35/EU, which replaces Directive 2006/95/EC without low voltage threshold Compliance with Recommendation 1999/519/EC

Recommendations and decisions

They are developed by CEPT

They are used in conjunction with the harmonized standards produced by ETSI.

Objectives of the European recommendations

- Spectrum use and frequency band allocation requirements
- Maximum transmitted power
- Channel spacing
- Duty cycle

The ERC 70-03 recommandation

It defines a common European position on the use of the radio frequency spectrum

- Annex 1 : Non Specific Short Range Devices
- Annex 2 : Tracking, Tracing and Acquisition
- Annex 3 : Wideband Data Transmission systems
- Annex 4 : Railway applications
- Annex 5 : Road Transport and traffic Telematics
- Annex 6 : Radio determination applications
- Annex 7 : Alarms
- Annex 8 : Model Control
- Annex 9 : Inductive applications
- Annex 10 : Radio microphones ans assistive Listening Devices
- Annex 11 : Radio frequency identification applications
- Annex 12 : Active Medical Implants and their associated periphéricals
- Annex 13 : Wireless Audio Applications

Annexe 12 (1) of ERC 70-03 Recommandation

ANNEX 3: WIDEBAND DATA TRANSMISSION SYSTEMS

Scope of Annex

This annex covers frequency bands and regulatory as well as informative parameters recommended for Wideband Data Transmission Systems and Wireless Access Systems including Radio Local Area Networks (WAS/RLANs) within the bands 2400-2483.5 MHz and for Multiple-Gigabit WAS/RLAN Systems within the band 57-66 GHz.

Table 3: Regulatory parameters

	Frequency Band	Power / Magnetic Field	Spectrum access and mitigation requirements	Channel spacing	ECC/ERC Decision	Notes
a	2400.0–2483.5 MHz	100 mW e.i.r.p.	Adequate spectrum sharing mechanism (e.g. Listen-before-Talk, Detect-And-Avoid) shall be implemented by the equipment	No spacing		For wide band modulations other than FHSS, the maximum e.i.r.p. density is limited to 10 mW/MHz
b	57–66 GHz	40 dBm mean e.i.r.p. This refers to the highest power level of the transmitter power control range during the transmission burst if transmitter power control is implemented	Adequate spectrum sharing mechanism (e.g. Listen-before-Talk, Detect-And-Avoid) shall be implemented by the equipment.	No spacing		Fixed outdoor installations are not allowed. The maximum mean e.i.r.p density is limited to 13 dBm/MHz. Point-to-point links of the Fixed Service are regulated by ECC/REC/(05)02 and ECC/REC/(09)01

Additional Information

Harmonised Standards
EN 300 328 sub-band a)
EN 302 567 sub-band b)

Comparison between International standards & ITU recommendations

Category	IEC Basic Standards (Testing Methods)	Product / Generic Standards	ITU Recommendations (Examples)
Electrostatic Discharge (ESD)	IEC 61000-4-2 (ESD immunity test)	CISPR 35 (multimedia immunity), IEC 61000-6-1 / -6-2 (generic)	ITU-T K.20, K.21, K.45 (protection of telecom equipment against ESD)
Electrical Fast Transients / Bursts (EFT/Burst)	IEC 61000-4-4 (EFT immunity test)	IEC 61000-6-1 / -6-2, CISPR 35	ITU-T K.20, K.45 (EFT/burst protection for telecom networks)
Surge (Lightning / Switching)	IEC 61000-4-5 (surge immunity test)	IEC 61000-6-1 / -6-2, CISPR 35	ITU-T K.20, K.21, K.45, K.66 (lightning/surge protection for telecom systems)
Conducted RF Immunity	IEC 61000-4-6 (immunity to conducted disturbances, RF fields)	IEC 61000-6-1 / -6-2, CISPR 35	ITU-T K.43, K.44 (telecommunication equipment immunity)
Radiated RF Immunity	IEC 61000-4-3 (radiated RF immunity test)	CISPR 35, IEC 61000-6-1 / -6-2	ITU-T K.48 (RFI immunity for telecom equipment)
Magnetic Fields	IEC 61000-4-8 (power frequency magnetic field immunity)	IEC 61000-6-1 / -6-2	ITU-T K.66, K.68 (magnetic fields in telecom installations)
Voltage Dips / Interruptions	IEC 61000-4-11 (voltage dips, short interruptions, variations)	IEC 61000-6-1 / -6-2	ITU-T K.85 (power supply immunity for telecom equipment)
Harmonics / Flicker	IEC 61000-3-2 (harmonic current emissions), IEC 61000-3-3 (voltage fluctuations)	CISPR 32 (emissions), IEC 61000-6-3 / -6-4 (emission limits)	ITU-T K.60, ITU-R SM.329 (limits on harmonics/flicker for spectrum protection)
Conducted Emissions	Test method: CISPR 16-2-1	CISPR 32 (multimedia emission), IEC 61000-6-3 (residential), IEC 61000-6-4 (industrial)	ITU-R SM.329 (unwanted emissions), ITU-T K.48
Radiated Emissions	Test method: CISPR 16-2-3	CISPR 32, IEC 61000-6-3 / -6-4	ITU-R SM.1541, SM.329 (spurious and unwanted emissions)

ETSI vs ITU Equivalence (Radio / SRD Standards)

ETSI Standard (EN)	Scope / Frequency Range	Closest ITU Recommendation / Report	Notes / Equivalence
EN 300 328	Wideband data transmission systems (e.g. Wi-Fi, Bluetooth) operating in the **2.4 GHz ISM band**	**ITU-R SM.329** (Spurious emissions), **ITU-R SM.2421** (Unwanted emissions of digital radio systems)	The emission limits in EN 300 328 (e.g. −30 dBm/1 MHz spurious) correspond to ITU-R SM.329 "Category B" limits. Used for RED compliance in Europe.
EN 300 220	Short Range Devices (SRD) in **25 MHz – 1 000 MHz**, up to 500 mW	**ITU-R SM.2179** (Use of SRD regulations worldwide), **ITU-R SM.2153** (Technical characteristics of SRD)	EN 300 220 is referenced in ITU reports as the basis for SRD regulation in Europe. Defines technical limits (power, duty cycle, spurious) aligned with ITU SRD principles.
EN 300 330	Inductive / radio equipment operating in **9 kHz – 25 MHz** (including RFID, NFC, alarms)	**ITU-R SM.2179** (SRD overview), **ITU-T O.153** (bit error performance measurement, cited in EN 300 330 Annex)	Covers inductive SRD and RFID. ITU documents mainly recognize its emission limits. For measurement methods, EN 300 330 refers to ITU-T O.153.
EN 300 440	SRD / radio equipment in the range **1 GHz – 40 GHz**	**ITU-R SM.2303** (Use of SRD above 1 GHz), **ITU-R SM.329** (spurious)	Used for SRD above 1 GHz (radars, motion sensors). ITU reports reference EN 300 440 for harmonized spectrum management.
EN 301 893	Broadband wireless access systems (e.g. Wi-Fi in **5 GHz**)	**ITU-R SM.329** (spurious), **ITU-R SM.1757** (unlicensed broadband wireless access)	Specifies DFS, TPC, coexistence requirements. ITU references these limits for global harmonization in unlicensed 5 GHz.

Terminal equipment requirements

- Terminal access requirements have been removed: fixed network terminal equipment therefore only needs to comply with
  - ✓ Health and Safety requirements:
    - Health : as per EMF recommandation 1999/519/CE
    - Safety : as per Directive 2006/95/CE (LVD) but with the lower limit removed. (Article 3.1)
  - ✓ EMC requirements: as per Directive 2004/108/CE (Article 3.1)
  - ✓ Radio equipment needs to effectively use the spectrum and not cause harmful interference. (Article 3.2)

Radio equipment compliance
An example

Applied standards

- **Radio** : EN 300 328 + ERC 70-03 recommandation
- **EMC** : EN 301 489-17 & EN 301 489-01
- **Safety** : EN 60950 / EN 62368-1
- **Health** : EN 50364

CERTLabs your partner for compliance testing

Testing, certification and qualification of electronic & electrical products

- Proximity
- Advice
- Reactivity
- Availability

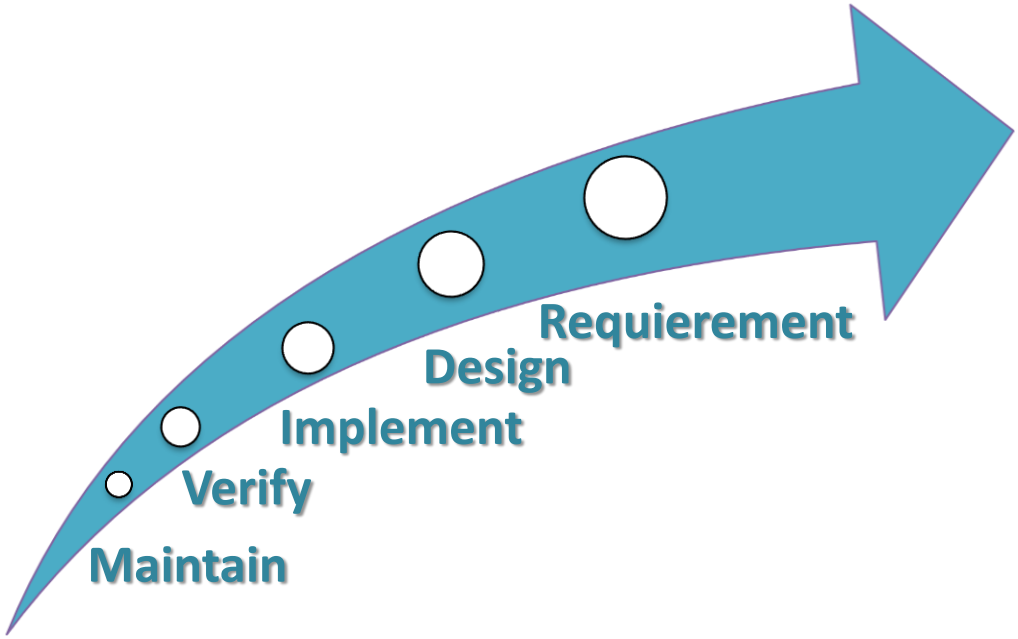
Testing, certification and qualification of electronic & electrical products

- Engineering, Testing
- Electromagnetic compatibility
- electrical safety
- Climate and Mechanics
- Radio

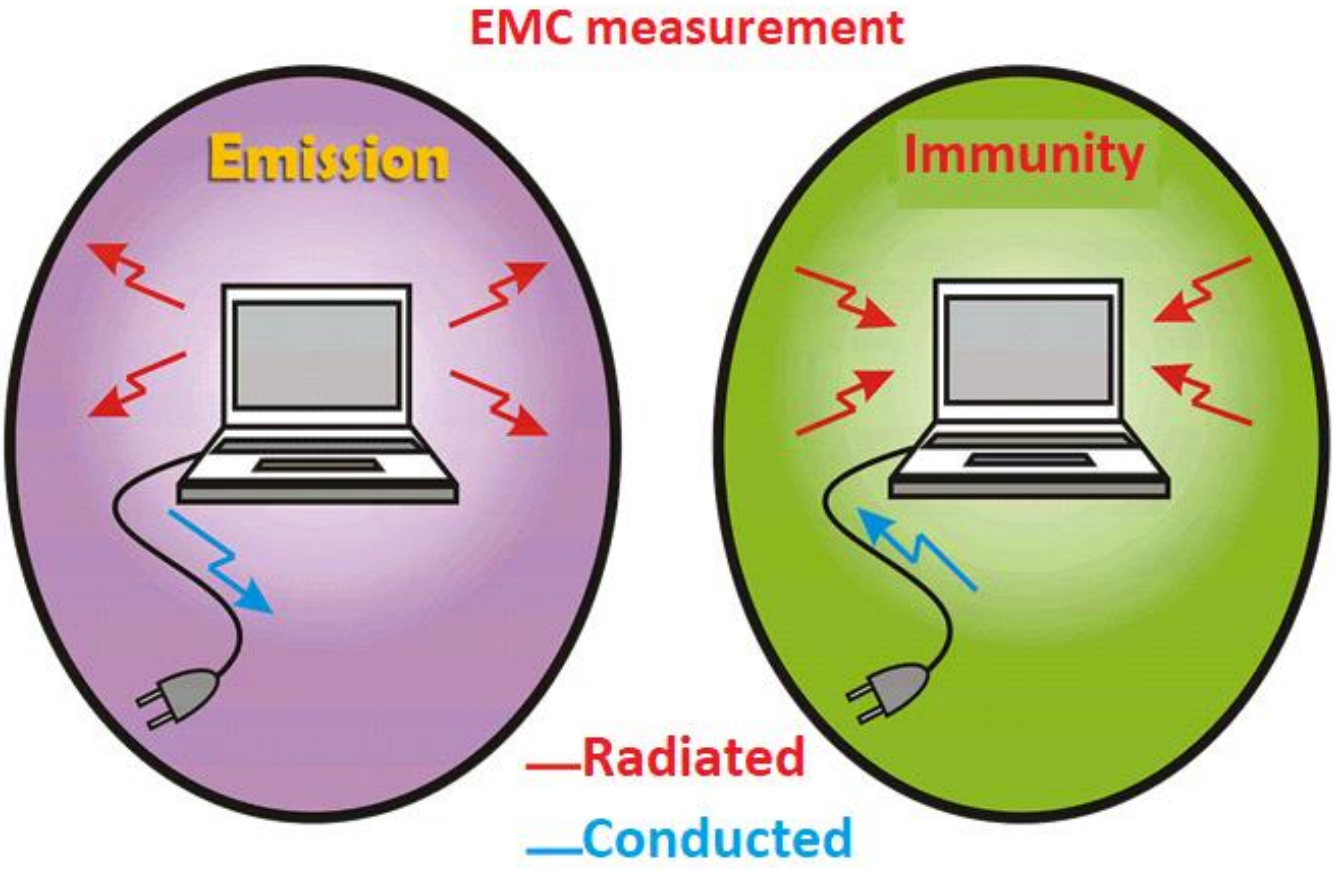
CERT has established state-of-the-art laboratories for EMC and Electrical Safety and Radio testing, fully compliant with international standards. This project, carried out in partnership with the European Union, has resulted in the creation of unique facilities in Africa. These laboratories are strategically positioned to deliver high value-added compliance services, supporting companies across the region and the continent in both civil and industrial sectors.

CERTLabs can contribute at any stage of your project by providing:

- ✓ **Expertise:** In-depth assessment of product performance, durability, and reliability against international standards.
- ✓ **Engineering Support:** "Design and delivery of optimized technical solutions, supported by hands-on expertise, to ensure successful project outcomes and sustained customer satisfaction."



Classification of EMC Measures

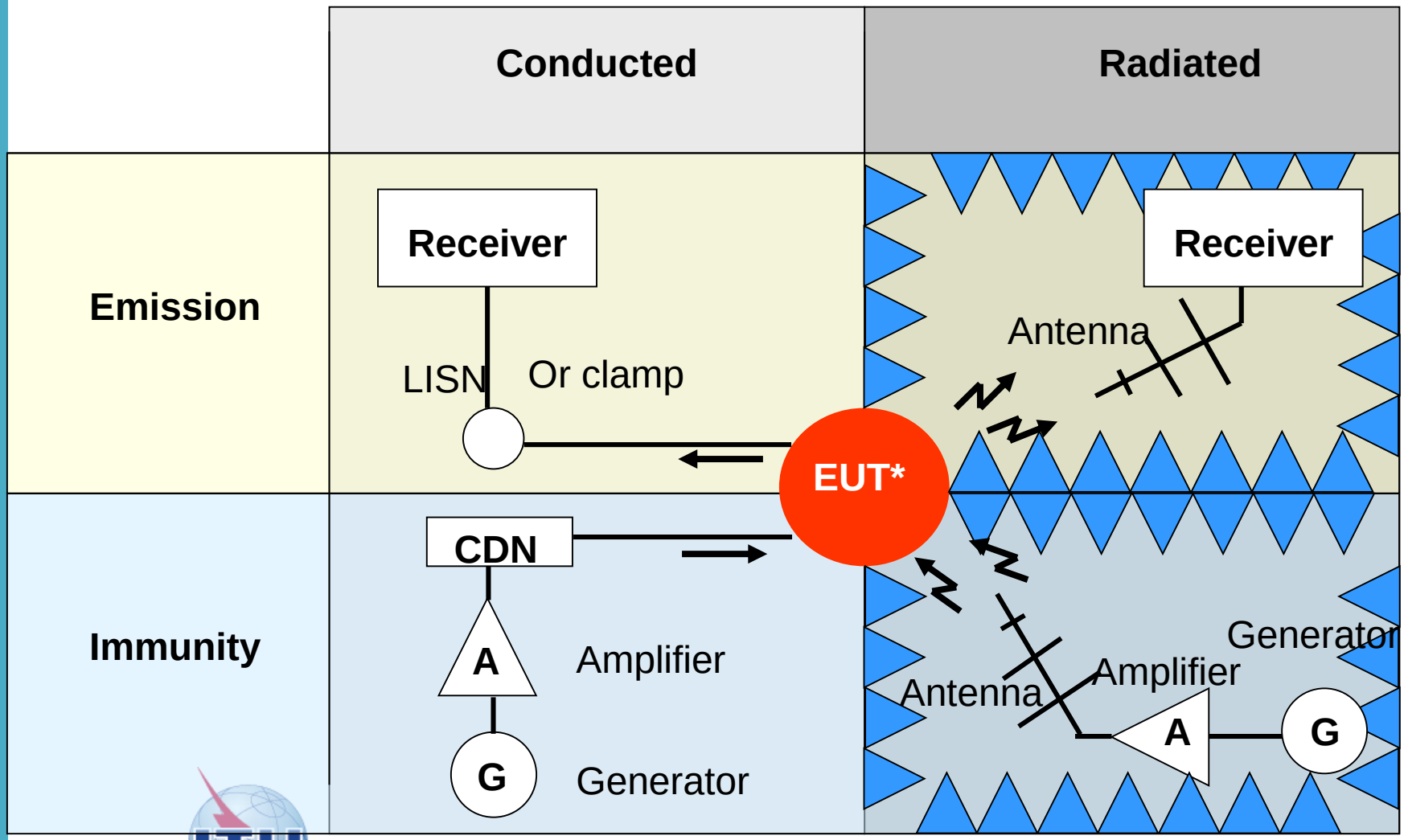


EMC

Under European Directive 2014/30/EU, Electromagnetic Compatibility (EMC) refers to :

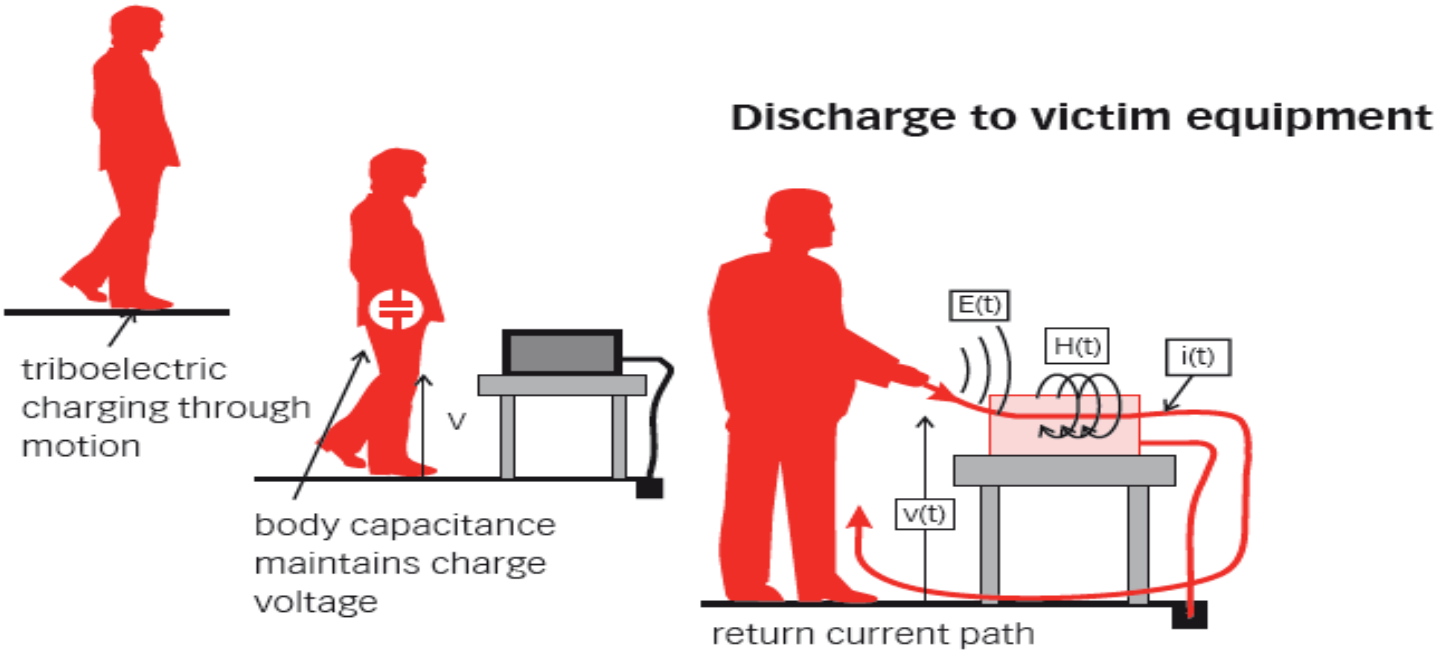
- ✓ the ability of equipment or systems to work properly in their usual electromagnetic environment,
- ✓ while ensuring that they do not create disturbances that could negatively affect other nearby equipment.

EMC



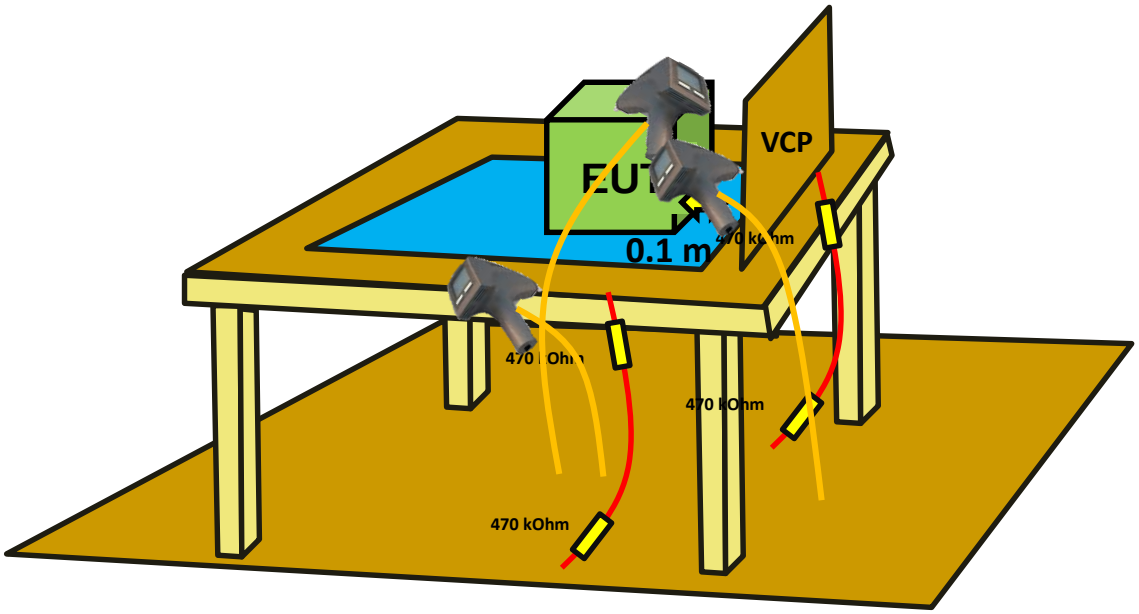
*EUT = Equipement Under Test

EMC : Electrostatic discharge
ESD - IEC 61000-4-2



ESD generator

EMC



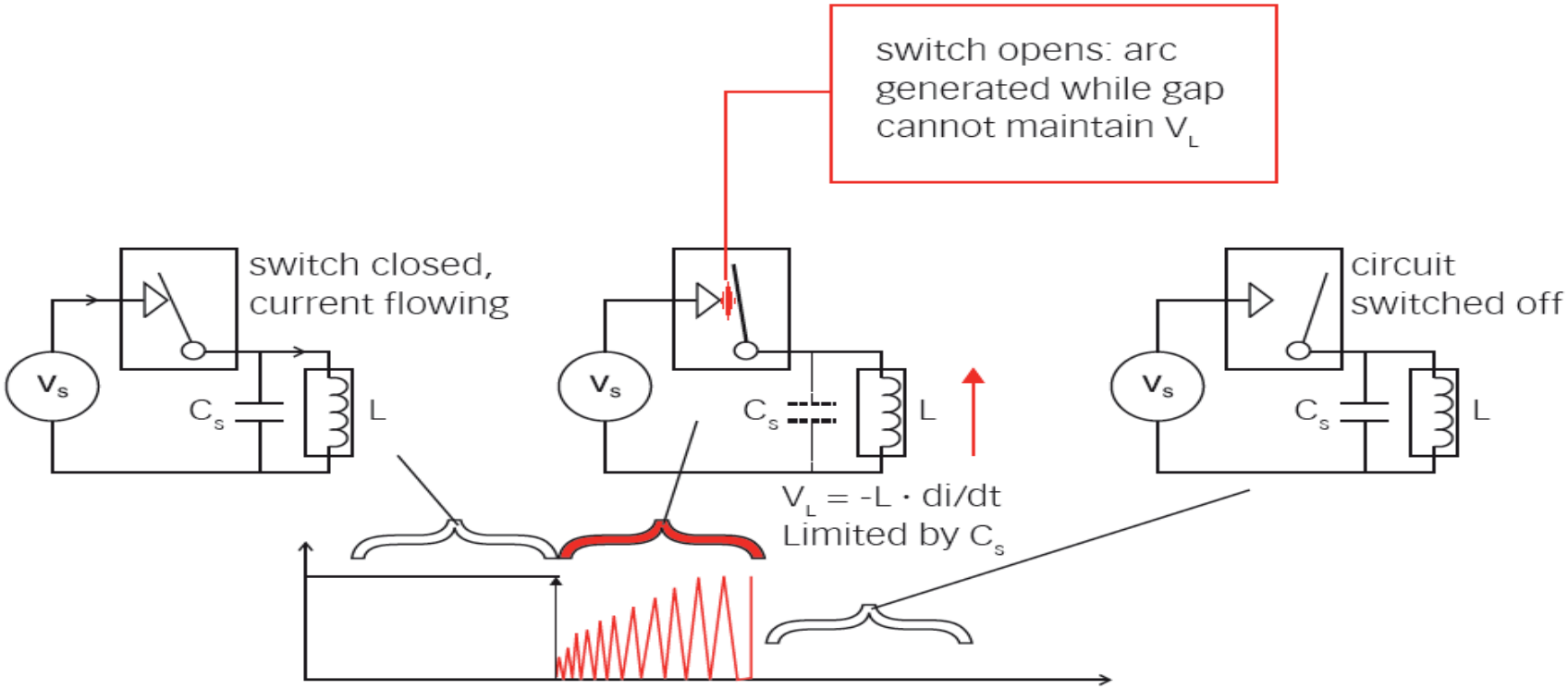
Conducting surface

Dielectrical material

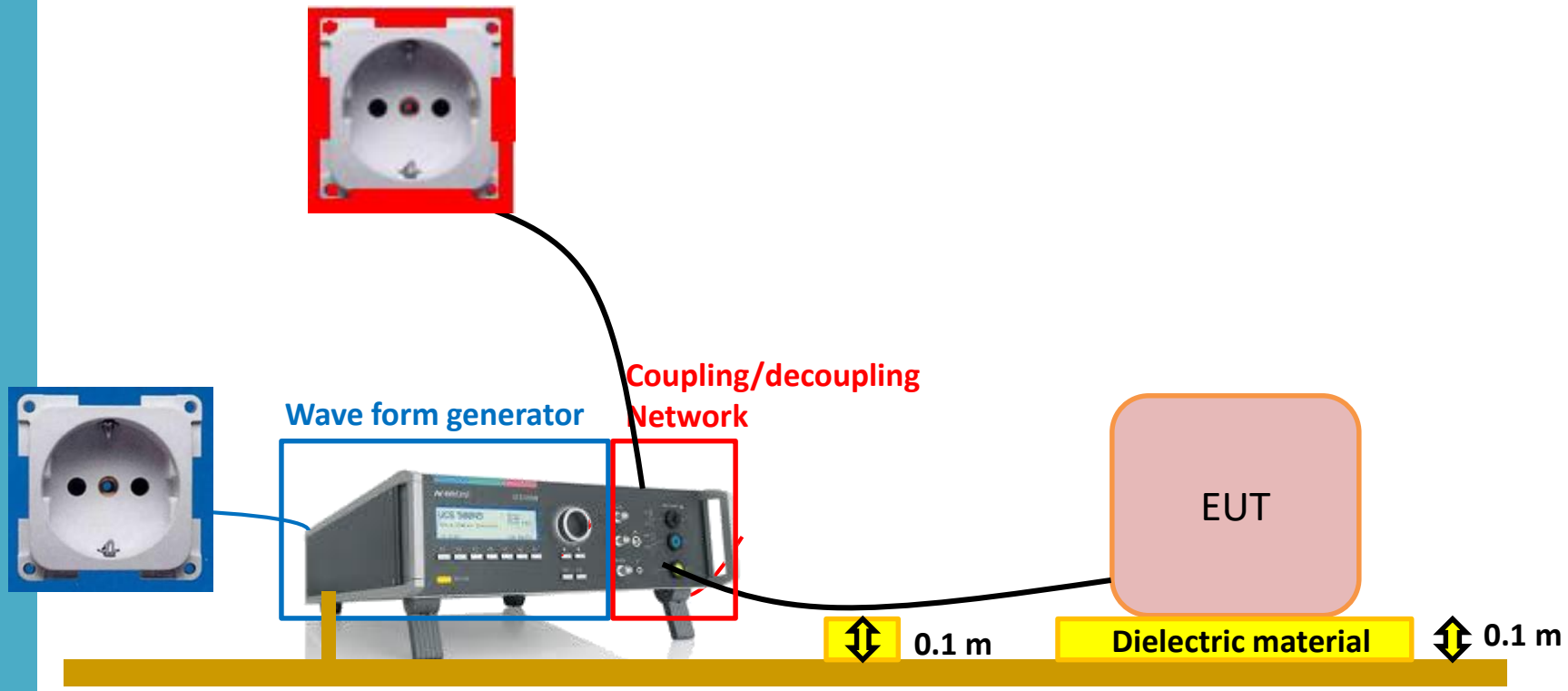
Isolating surface

EMC : Electrical fast transients EFT - Burst - EN 61000-4-4

the phenomenon



EMC: EFT - Burst - EN 61000-4-4



Burst generator
With integrated CDN

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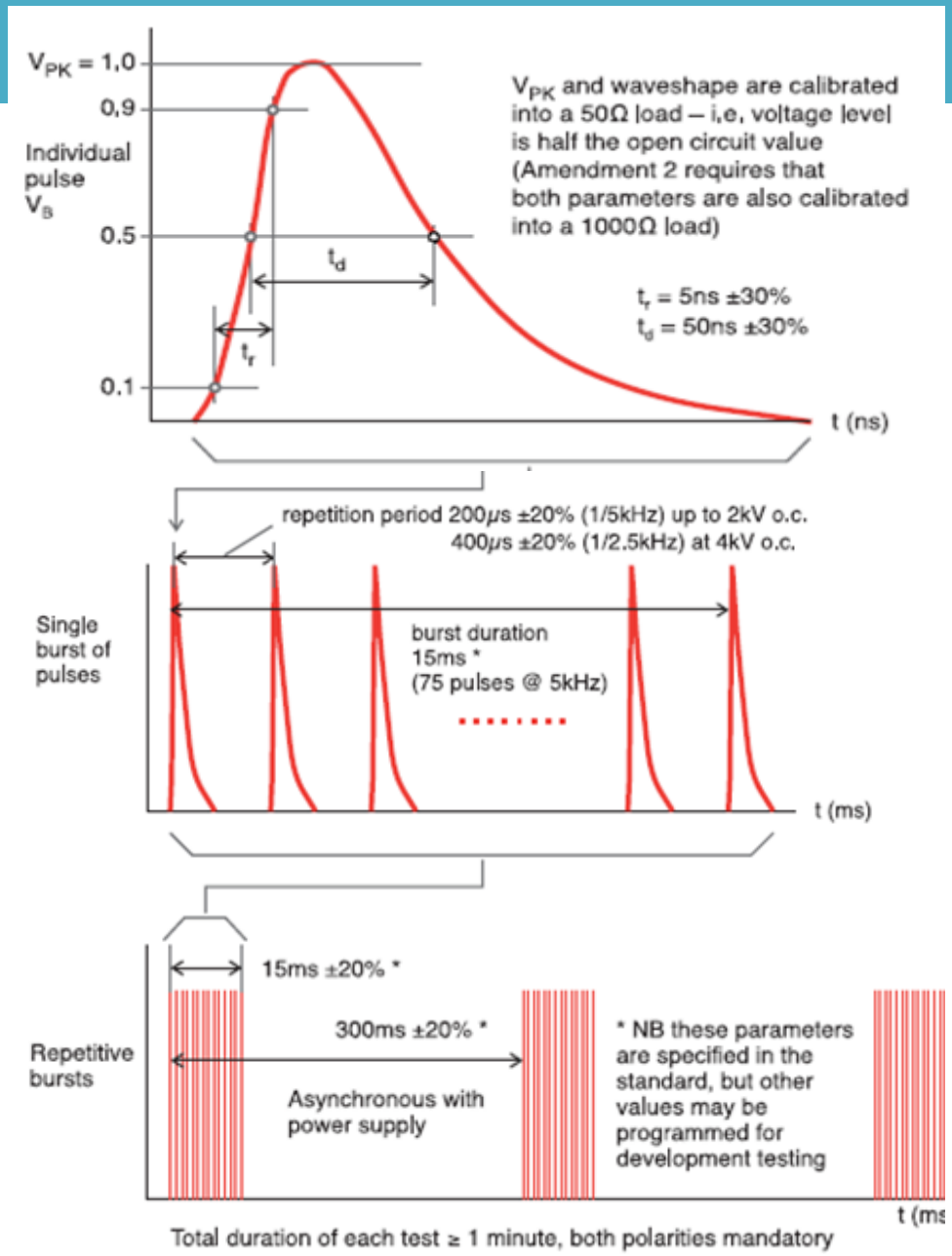
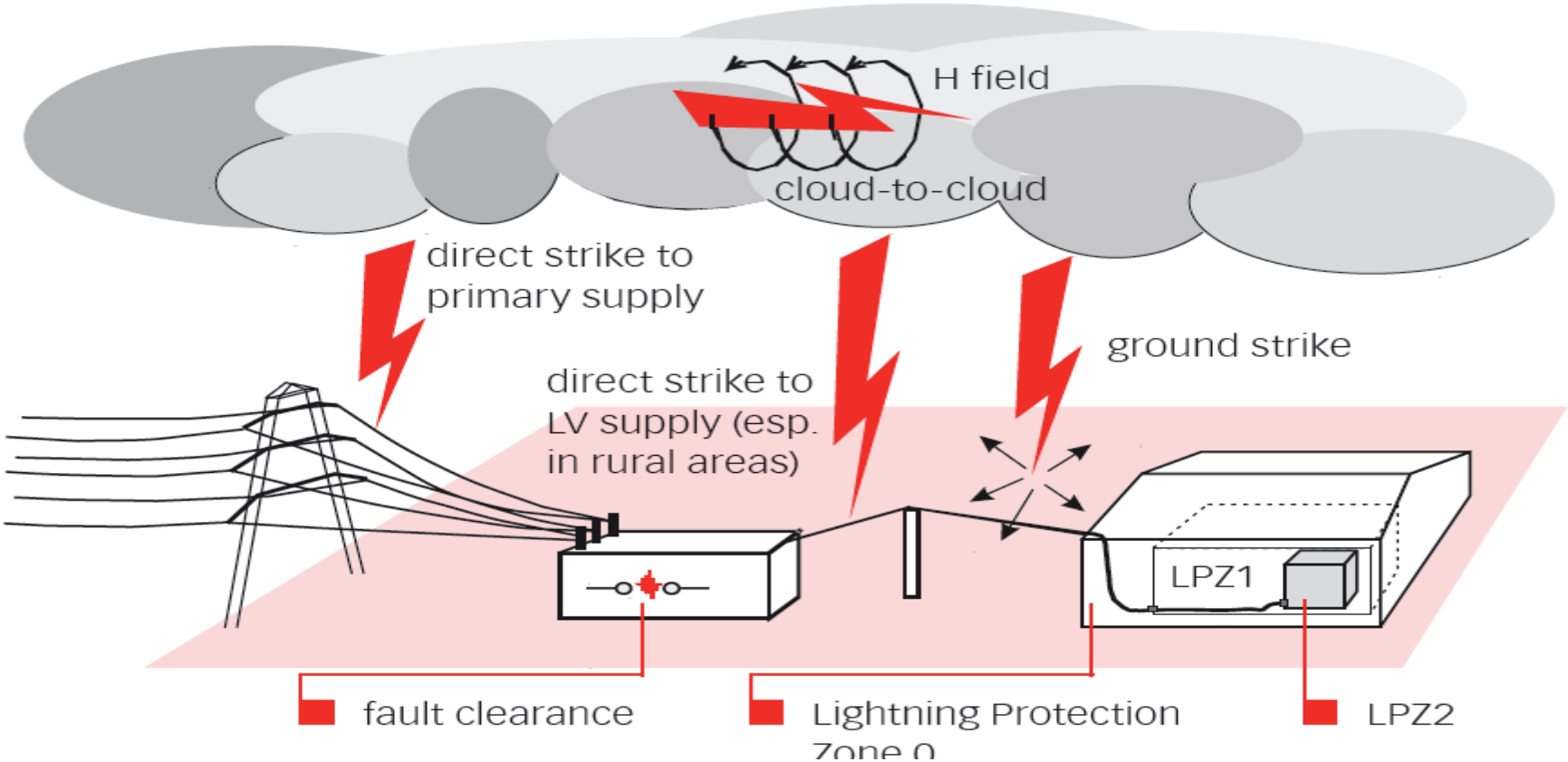
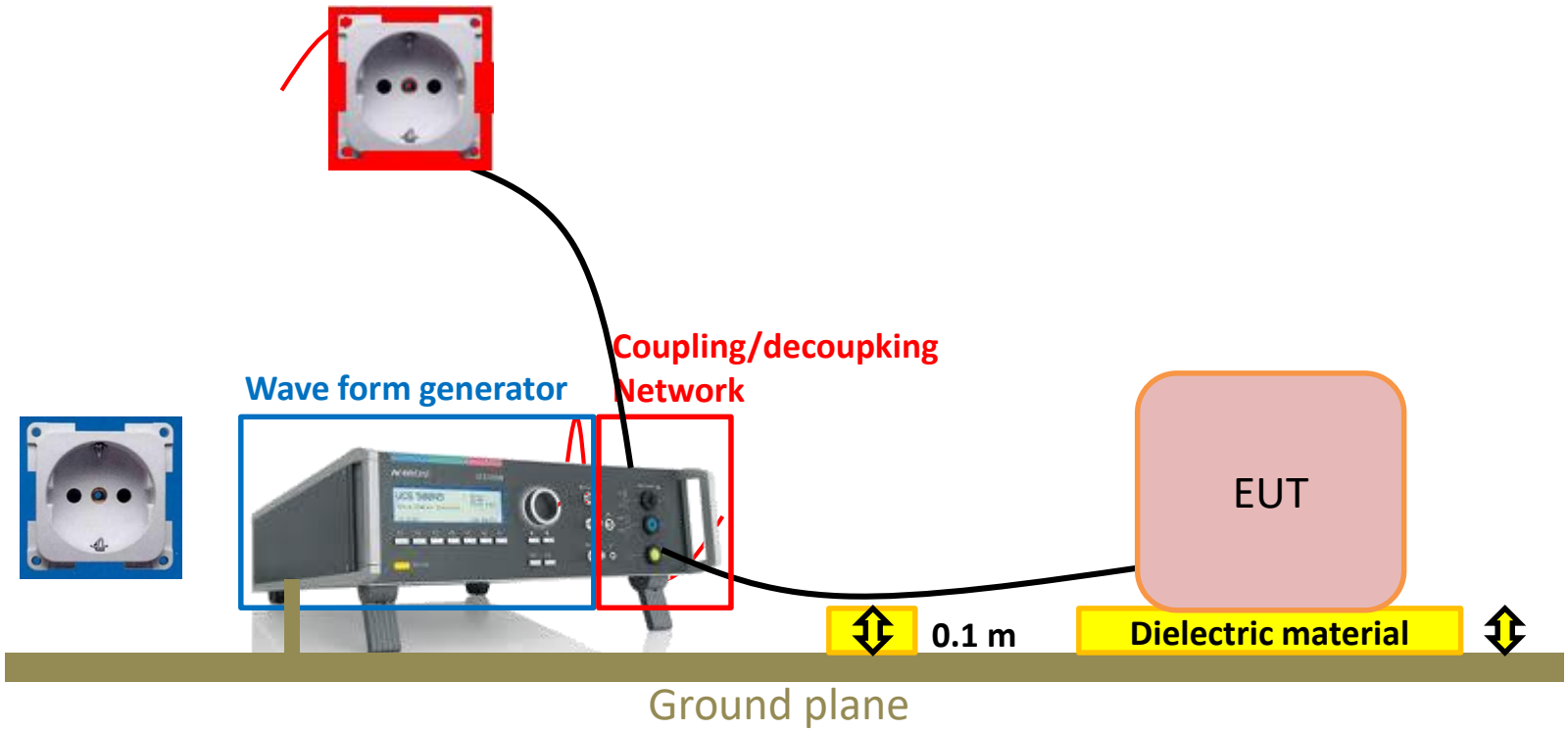

V_{PK} = 1,0
0,9
Individual pulse V_B
0.5
0.1
t_d
t_r
V_{PK} and waveshape are calibrated into a 50Ω load – i.e. voltage level is half the open circuit value (Amendment 2 requires that both parameters are also calibrated into a 1000Ω load)
t_r = 5ns ±30%
t_d = 50ns ±30%
t (ns)
repetition period 200μs ±20% (1/5kHz) up to 2kV o.c.
400μs ±20% (1/2.5kHz) at 4kV o.c.
Single burst of pulses
burst duration 15ms * (75 pulses @ 5kHz)
t (ms)
15ms ±20% *
300ms ±20% *
Repetitive bursts
Asynchronous with power supply
* NB these parameters are specified in the standard, but other values may be programmed for development testing
t (ms
Total duration of each test ≥ 1 minute, both polarities mandatory

EMC : IEC 61000-4-5 (surge immunity test)

the phenomenon

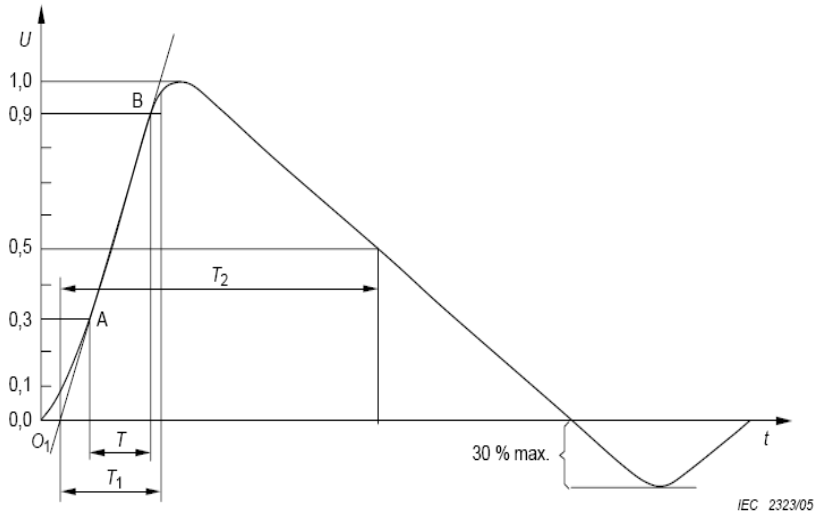


EMC : surge immunity test



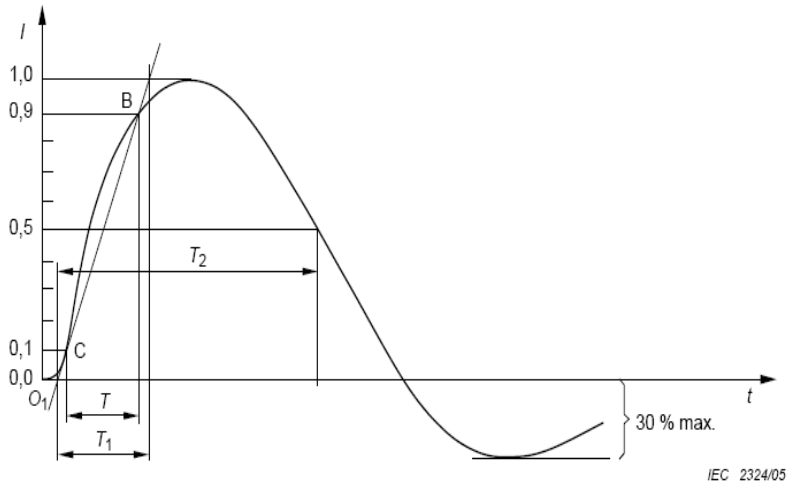
EMC : surge immunity test

Waveform, 1.2/50 µs



Front time: $T_1 = 1{,}67 \times T = 1{,}2\ \mu s \pm 30\ \%$
Time to half-value: $T_2 = 50\ \mu s \pm 20\ \%$.

Waveform of **open-circuit voltage (1,2/50 µs)** at the output of the generator with no CDN connected (waveform definition according to IEC 60060-1)

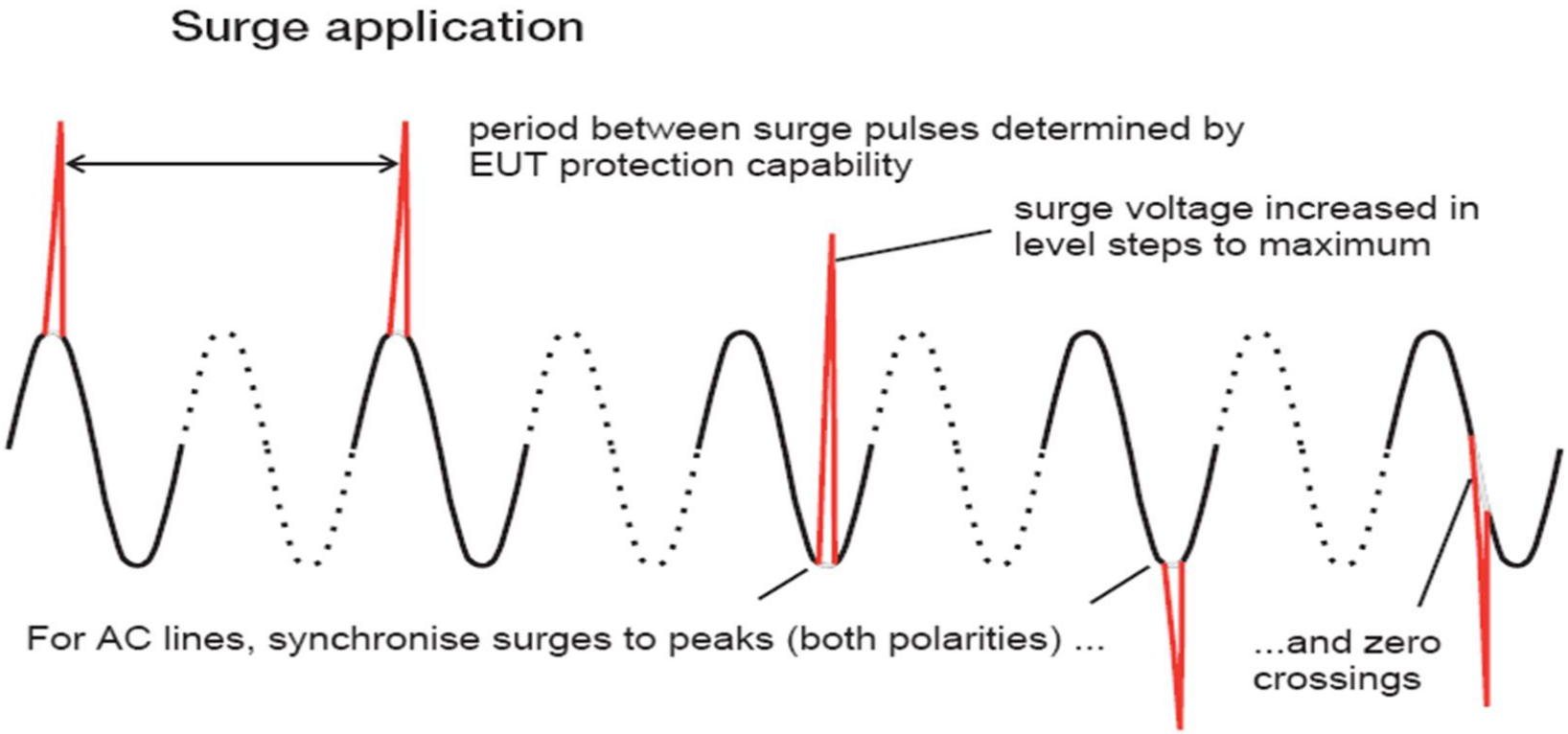


Front time: $T_1 = 1{,}25 \times T = 8\ \mu s \pm 20\ \%$
Time to half-value: $T_2 = 20\ \mu s \pm 20\ \%$

Waveform of **short-circuit current (8/20 µs)** at the output of the generator with no CDN connected (waveform definition according to IEC 60060-1)

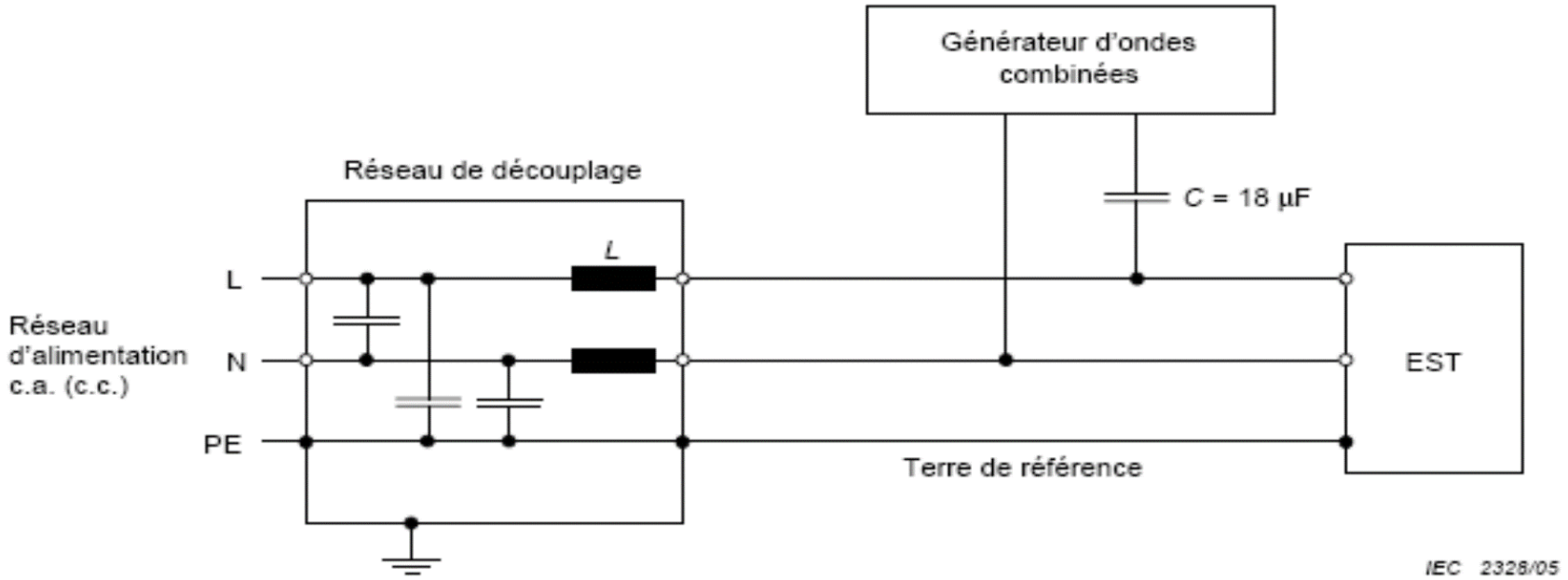
EMC : surge immunity test

Shock wave superposition



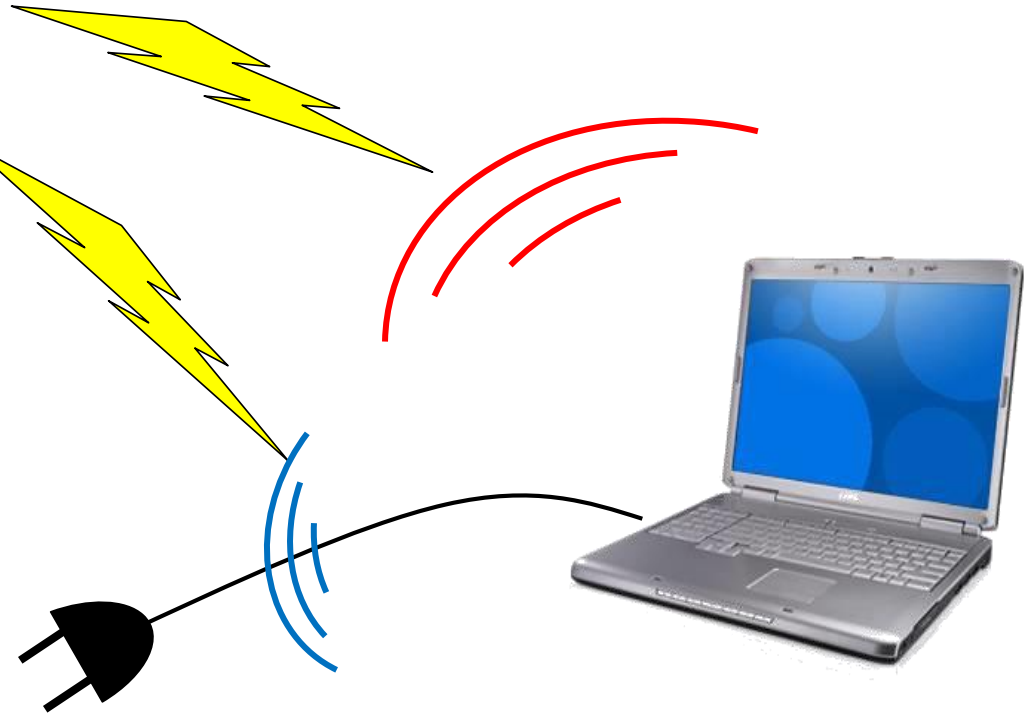
EMC : surge immunity test

Role of the CDN

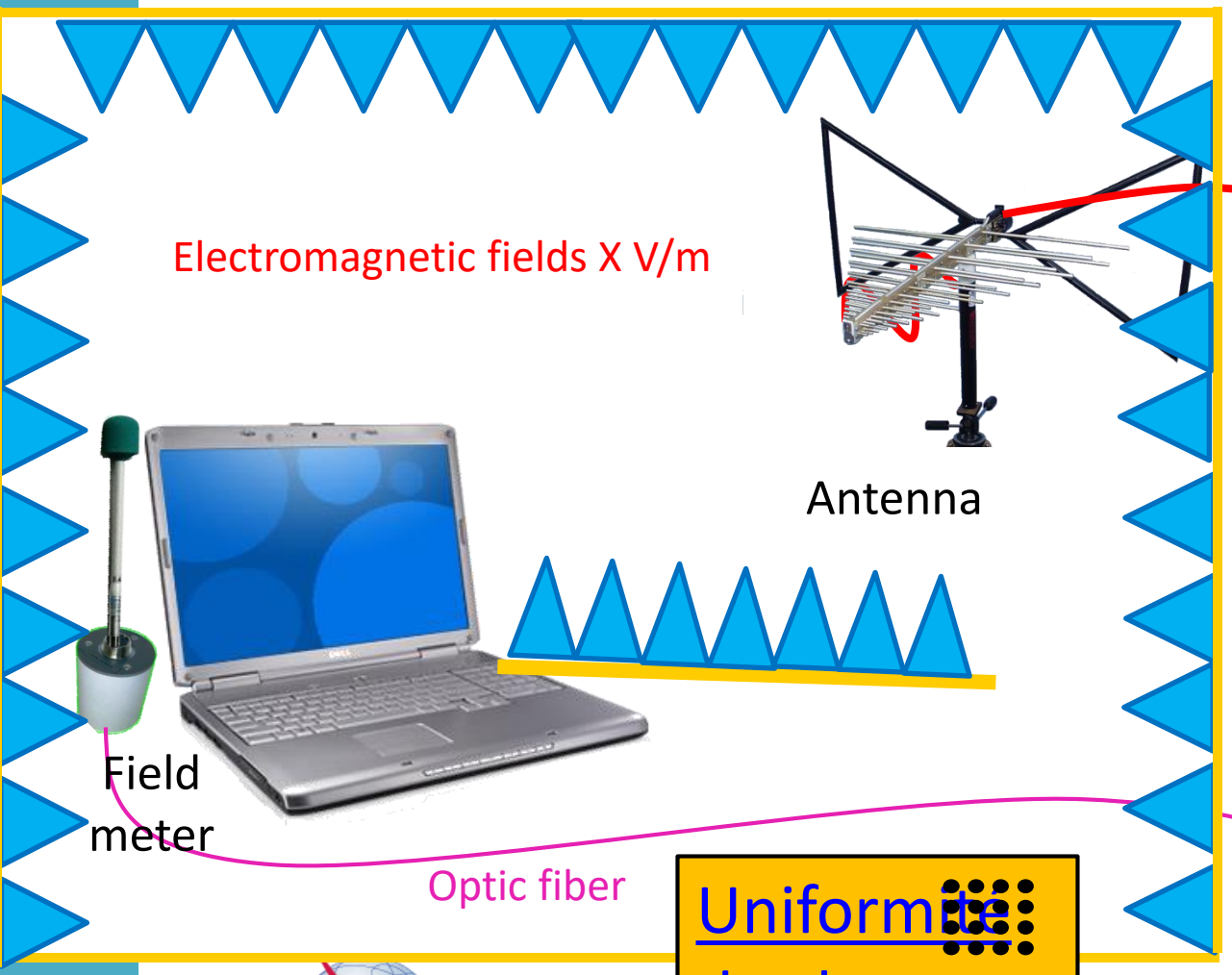


RF coupling

RF emetters



EMC : Radiated immunity - IEC 61000-4-3



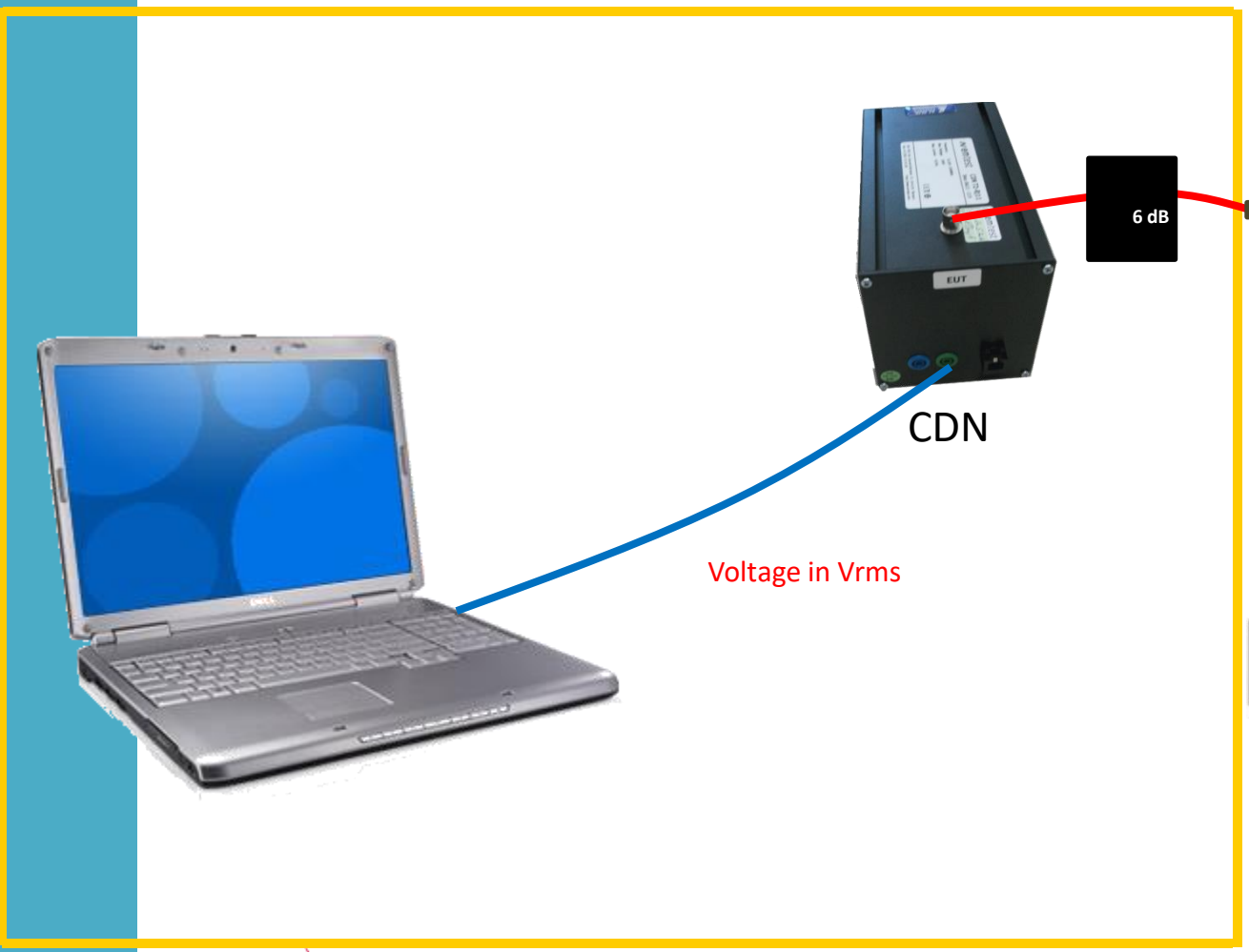
Power amplifier

Generator

GPIB

35

EMC : Conducted immunity- IEC 61000-4-6



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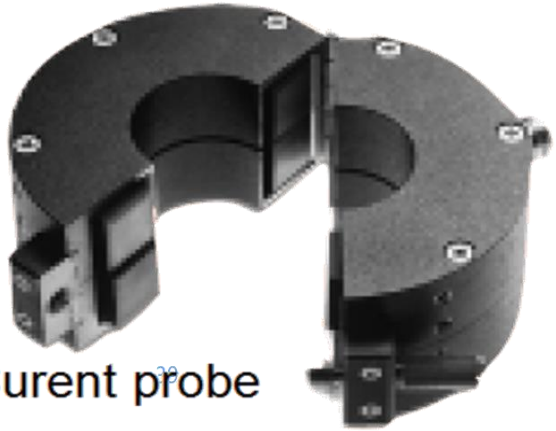
EMC

Coupling Devices

CDN

EM clamp

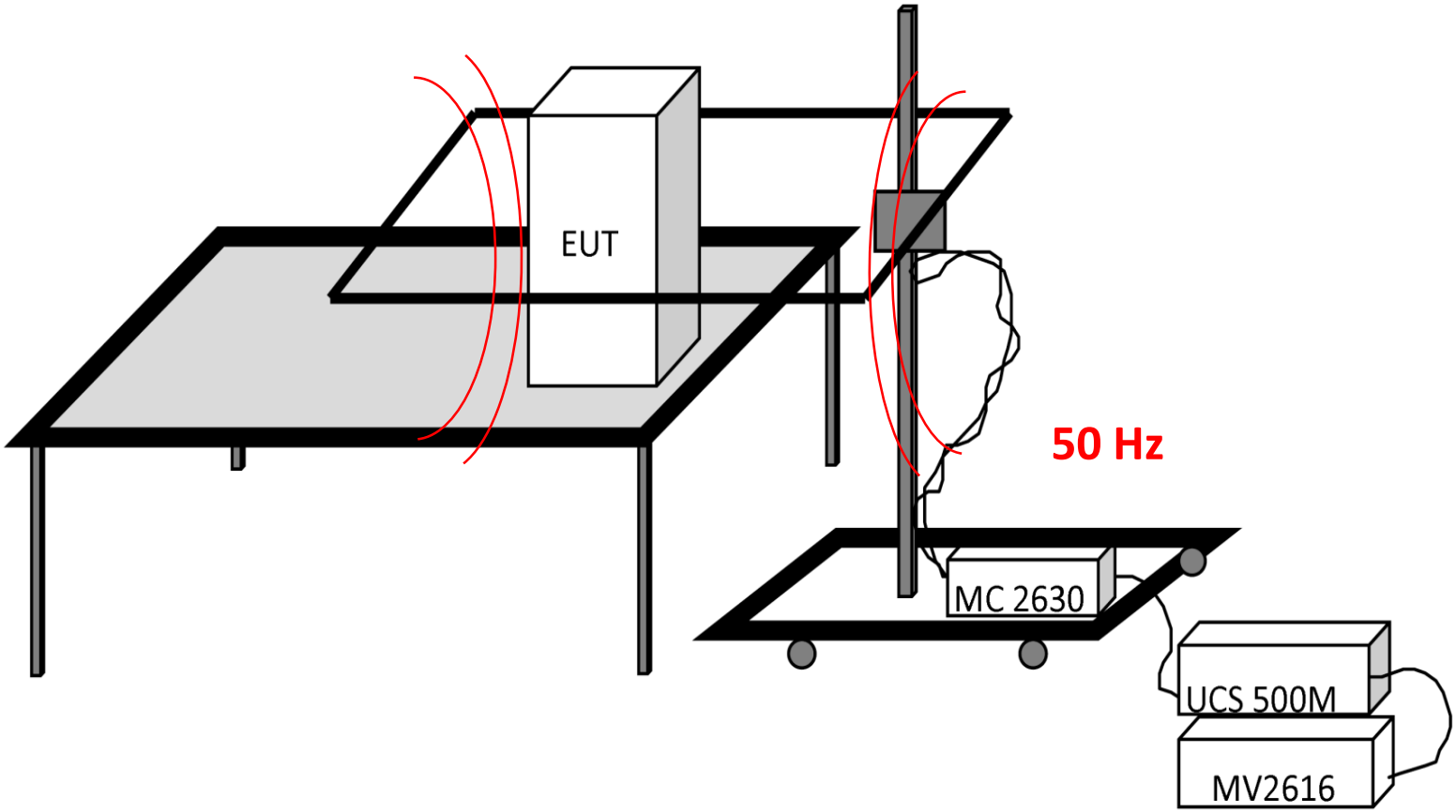
Détail



Curent probe

EMC

Magnetic field immunity - IEC 61000-4-8



Voltage dips and short interruptions- IEC 61000-4-11

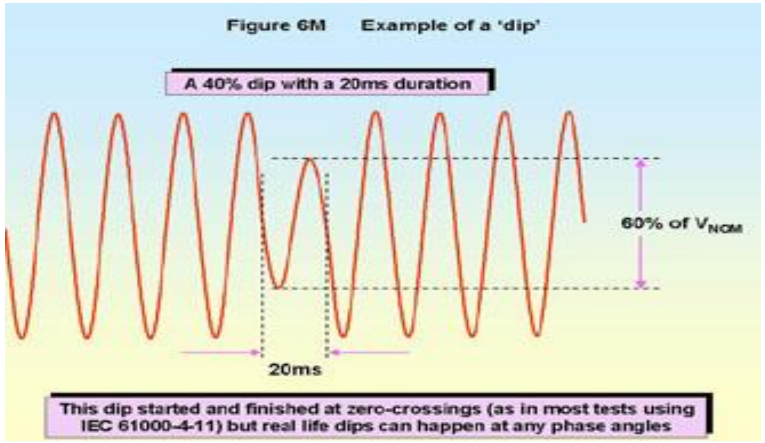
EUT

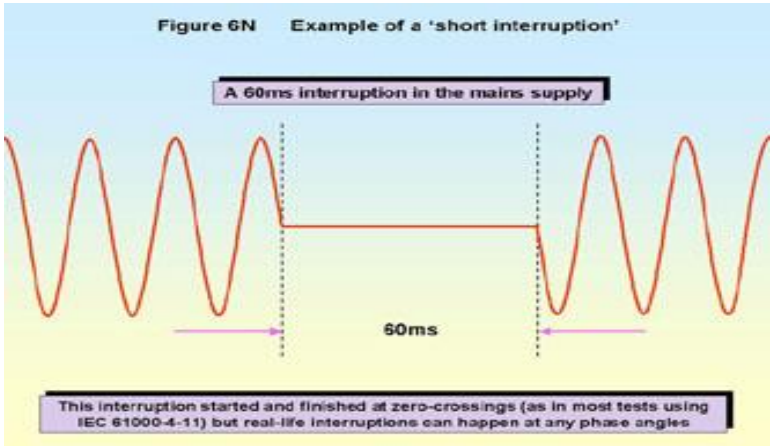
Power fail generator

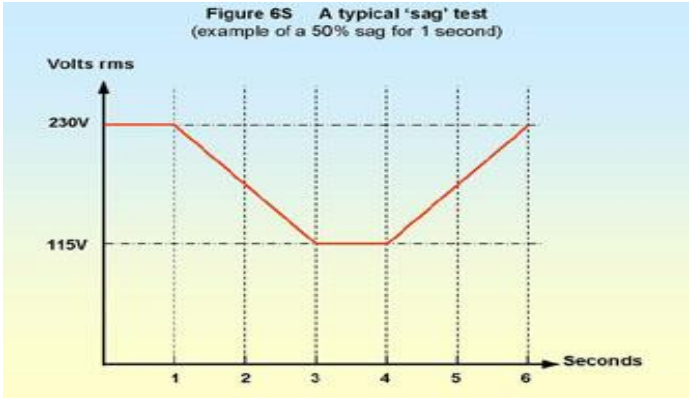
Variac

EMC

Voltage dips and brief interruptions EN 61000-4-11



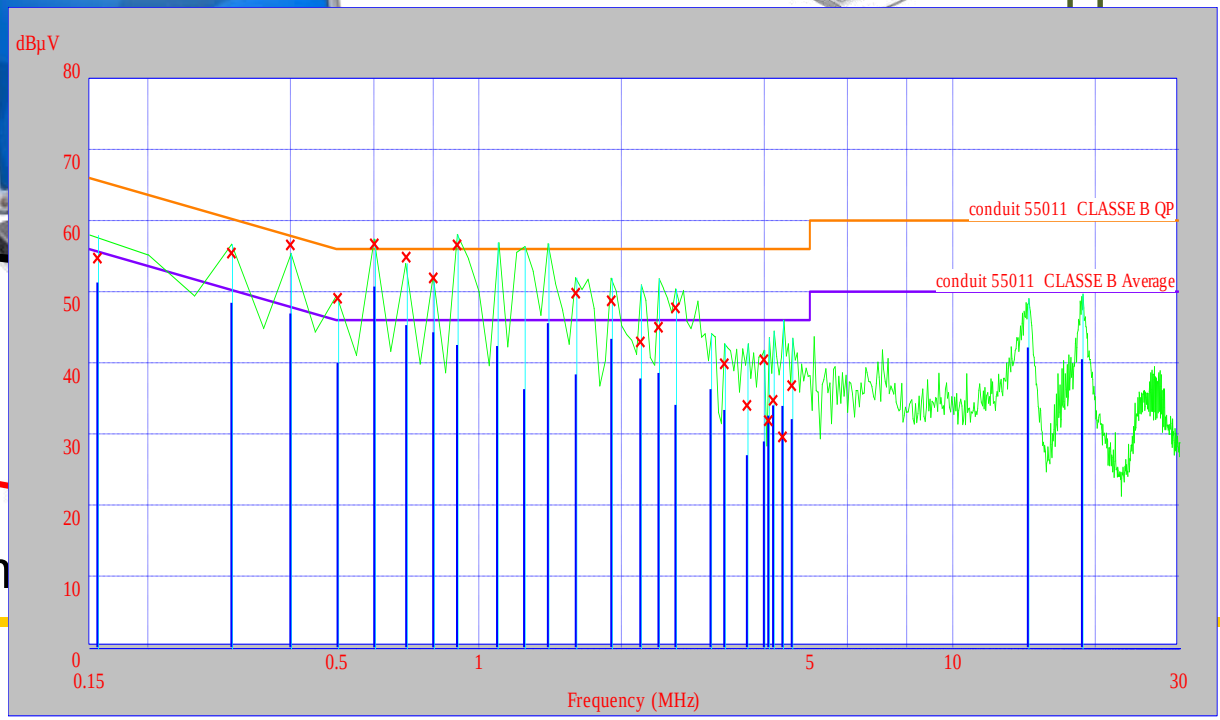




EMC : Conducted emission
CISPR 22/EN 55022 --- CISPR 32/EN 55032

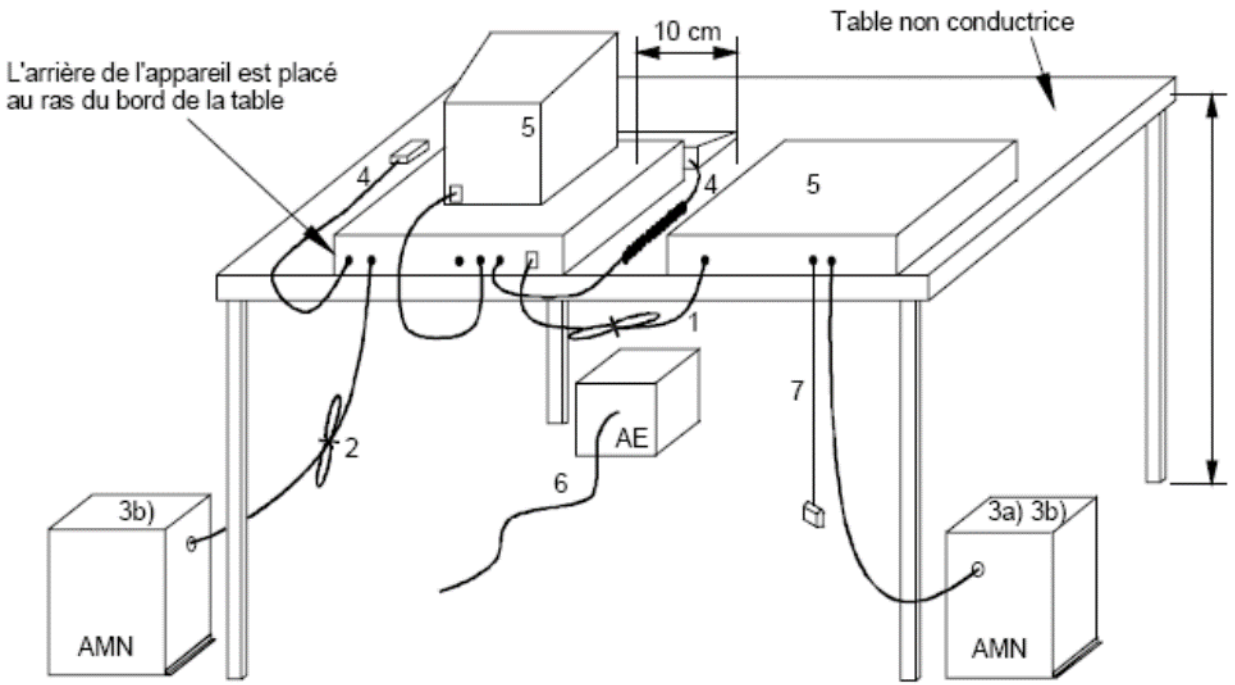
LISN

Tran



EMC : Conducted emission

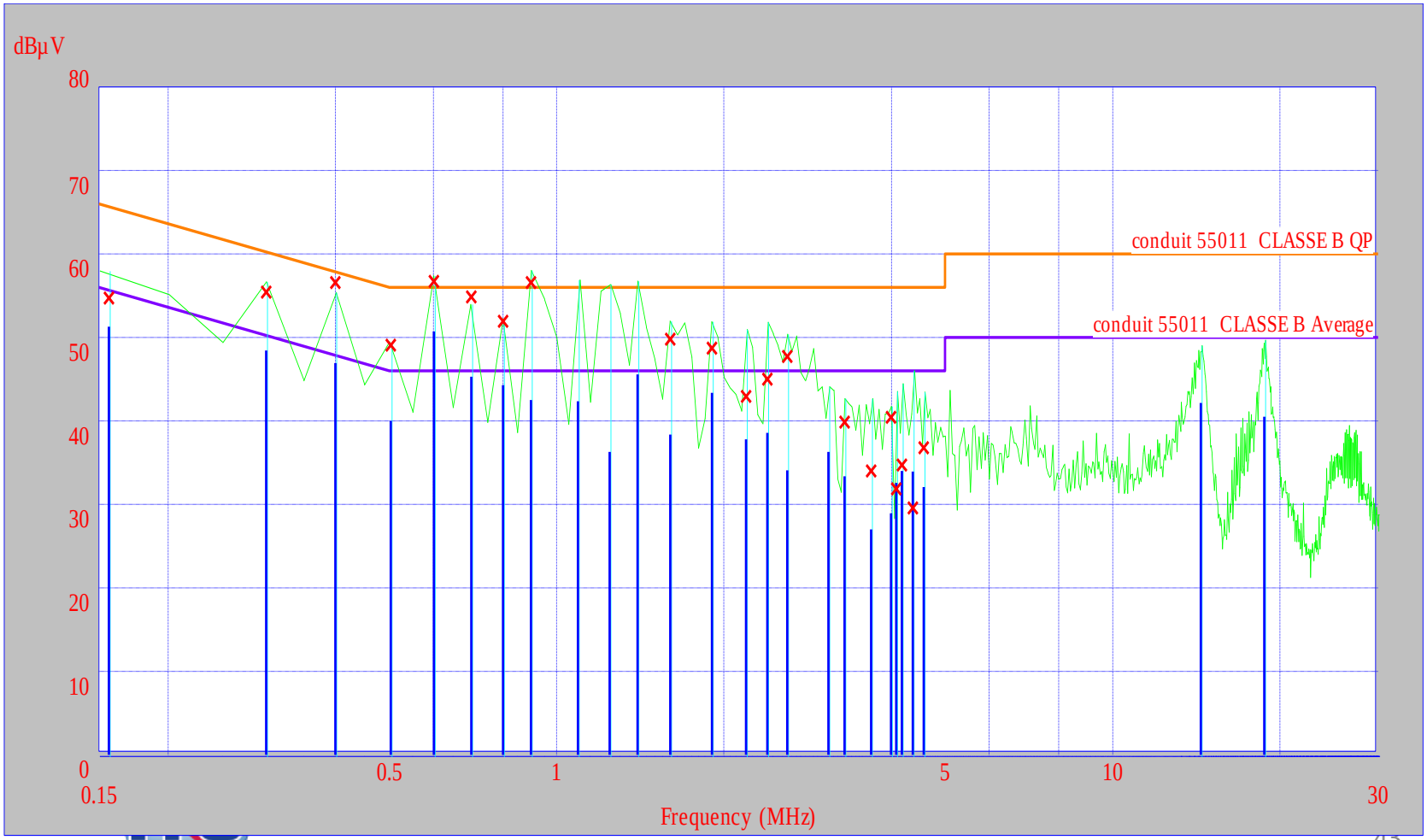
The test configuration for the conducted emission



AMN = Réseau fictif
AE = Appareil auxiliaire
EUT = Appareil à l'essai
RSI = Réseau de stabilisation d'impédance

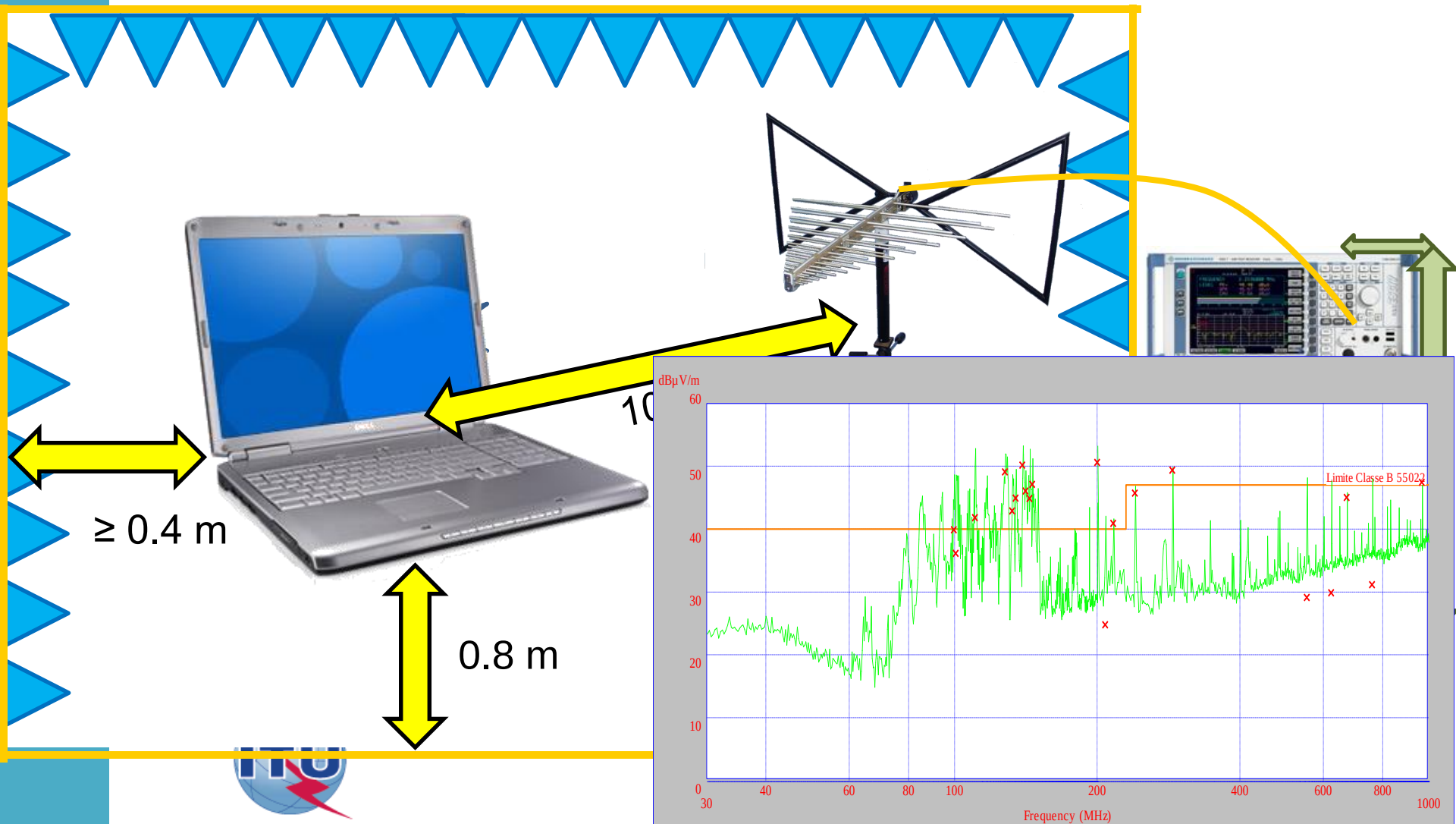
EMC : Conducted emission

Measure



EMC : Radiated Emission - CISPR 22/EN 55022 ---CISPR 32/EN 55032

Radiated Emission - CISPR 22/EN 55022 ---CISPR 32/EN 55032



Radio Testing Practices

Example of “Test Plan Summary” according to ETSI EN 300 220-2

ETSI EN 300 220-2 Test Description	Clause	PASS	FAIL	NA	Comments
Transmitter requirements					
Operating frequency	4.2.1				
Unwanted emissions in the spurious domain	4.2.2				
Effective Radiated Power	4.3.1				
Maximum E.R.P spectral density	4.3.2				See Table A.1 in [1] Annex A
Duty Cycle	4.3.3				
Occupied Bandwidth	4.3.4				
Tx Out Of Band Emissions	4.3.5				
Transient Power	4.3.6				
Adjacent Channel Power	4.3.7				When OCW ≤25kHz
TX behavior under Low Voltage Conditions	4.3.8				For battery powered EUT
Adaptive Power Control	4.3.9				For EUT with adaptive power control
FHSS equipment	4.3.10				For FHSS equipment
Short term behavior	4.3.11				See Table A.1 in [1] Annex A
Receiver requirements					
RX sensitivity	4.4.1				For EUT with polite spectrum access
Blocking	4.2.2				
Polite spectrum access conformance requirements					
Clear Channel Assessment threshold	4.5.2				For EUT with polite spectrum access
Polite spectrum access timing parameters	4.5.3				For EUT with polite spectrum access
Adaptive Frequency Agility	4.5.4				For equipment AFA

TX - effective radiated power

1. TX - effective radiated power

1. Description

Effective radiated power (e.r.p) is the power radiated in the direction of the maximum radiated power under specified conditions of measurements for any condition of modulation. For equipment with a permanent or temporary antenna connection it may be taken as the power delivered from that connector taking into account the antenna gain.

1. Acceptance criteria

The measured Effective radiated power shall not be greater than the maximum allowed power according to [2] annex B.

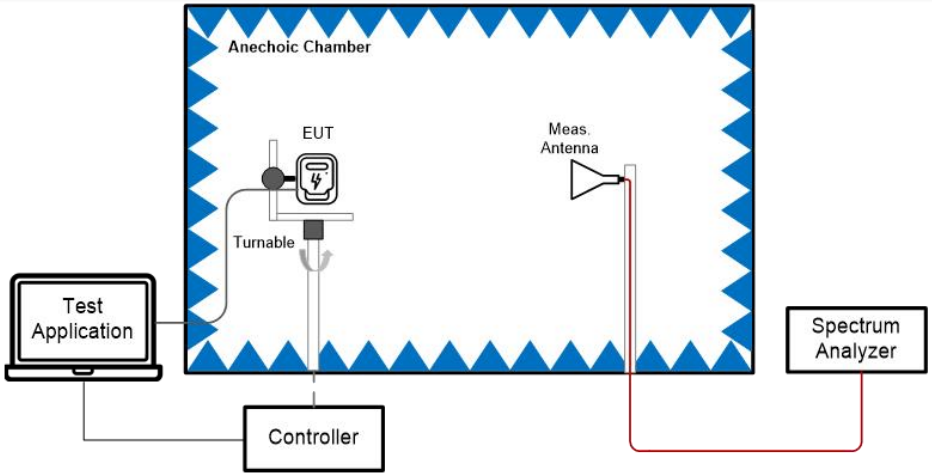
Example : Band M: 868 MHz to 868.6 MHz **→ 25 mW E.R.P (14dBm)**

1. Conditions & procedure

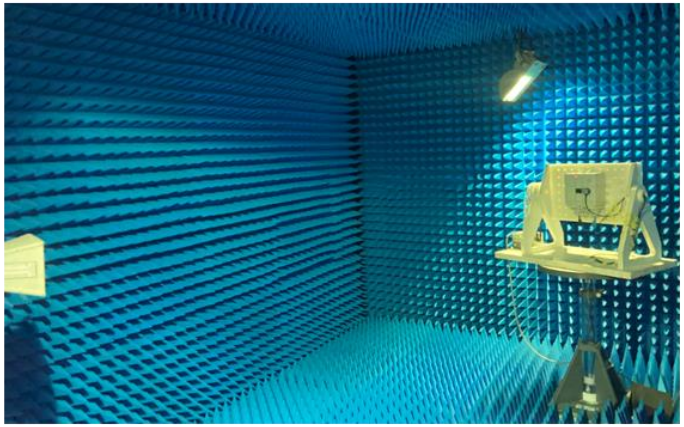
- Measurement are be performed on the lowest and the highest Operating Frequencies declared by the manufacturer.
- Measurements performed at the highest power level at which the transmitter is intended to operate.
- The transmitter sends D-M1 signals (CW), and the measuring receiver tuned to the frequency of the transmitter under test.
- Test at normal condition was carried out in radiated mode:
  - Test site: FAC3
  - Test distance: 3m
  - Receive Antenna: Horn
- Measurement under extreme temperature conditions carried out in conducted mode.

  - ERP_power = Cond_meas (dBm) + ANT_Gain (dBi) – 2.14dB

Test setup



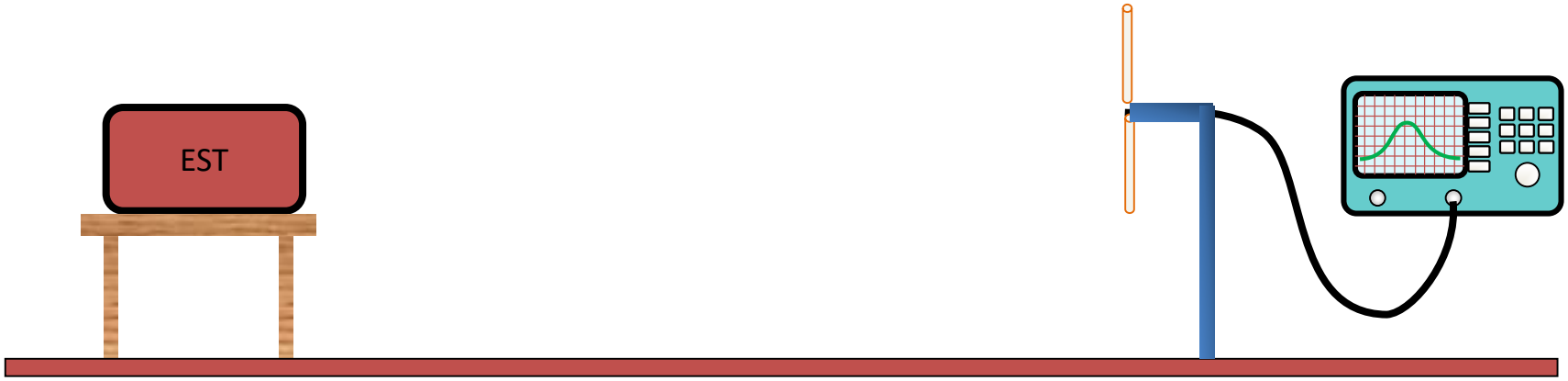
TX Effective radiated power setup bloc diagram – Normal conditions



TX Effective radiated power setup actual setup – Normal conditions

Substitution method used for power measurement

1 . Initial measurement :

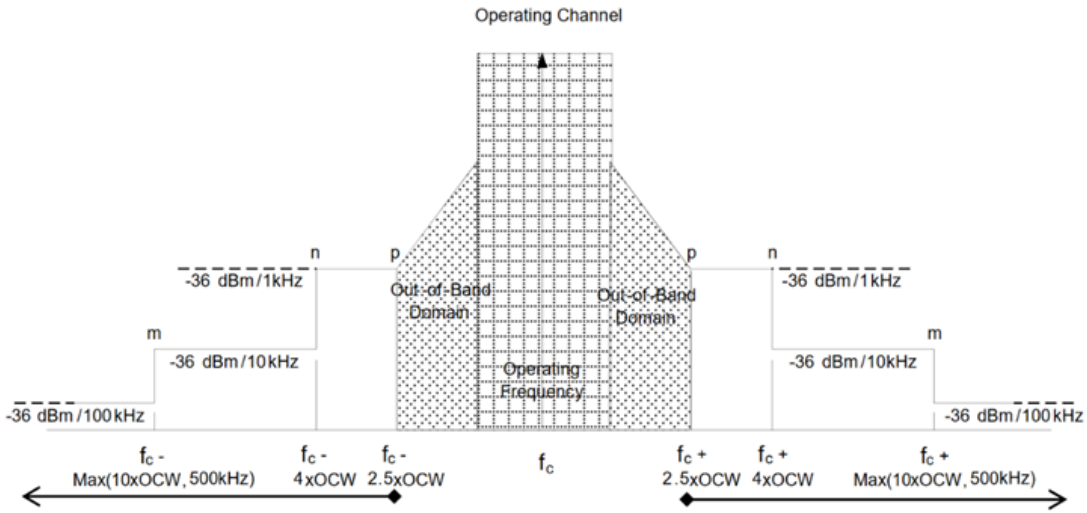


2 . Measurement with a reference antenna:

Unwanted emissions in the spurious domain

1. Description

- Spurious emissions are unwanted emissions in the spurious domain at frequencies other than those of the Operating Channel and its Out Of Band Domain. Unwanted emissions shall be carried out for TX mode and all other modes. Figure 2 shows the relevant spurious domain for the TX mode

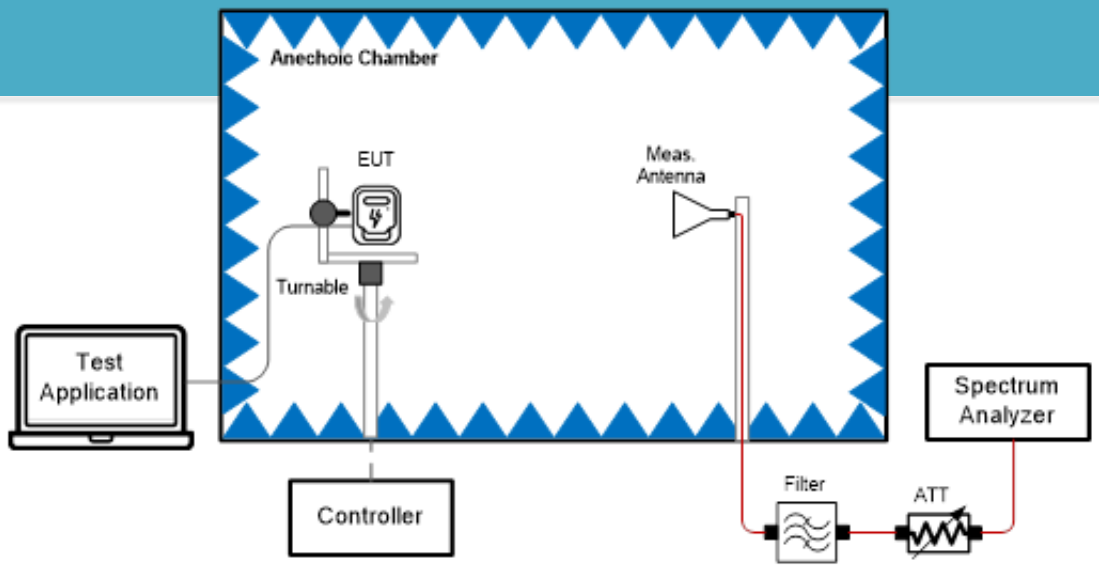


Spectrum Mask for Unwanted Emissions in the Spurious Domain with reference BW

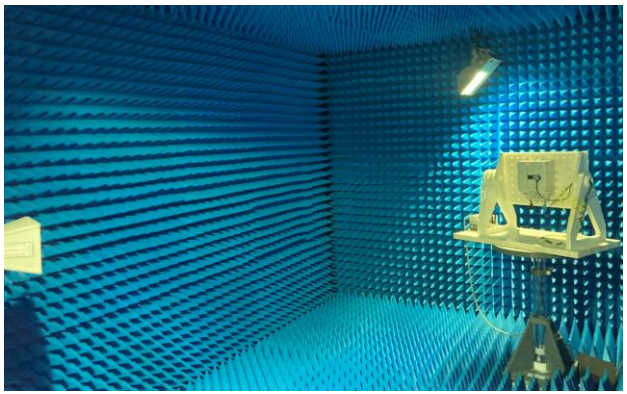
2. Acceptance criteria : Unwanted emission in the spurious domain shall not exceed the values in Table 3.

Table 3: Spurious domain emission limits

Frequency / State	47 MHz to 74 MHz 87,5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 790 MHz	Other frequencies below 1 000 MHz	Frequencies above 1 000 MHz
TX mode	-54 dBm	-36 dBm	-30 dBm
RX and all other modes	-57 dBm	-57 dBm	-47 dBm

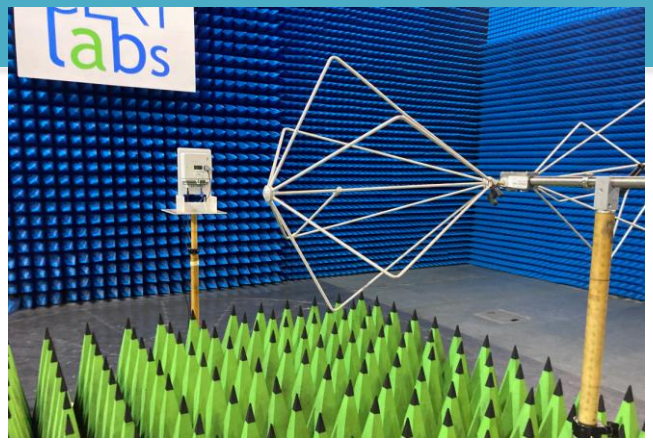


Bock diagram test setup for spurious emissions

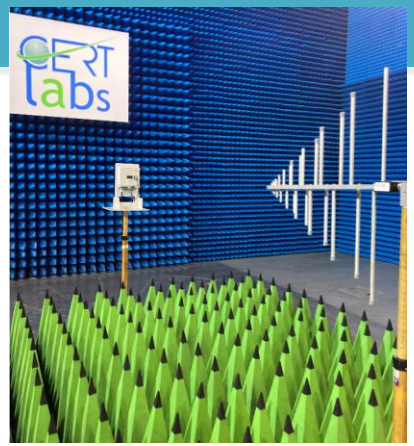


1000 MHz to 6000 MHz

Outside the FAC



25Mhz to 200MHz

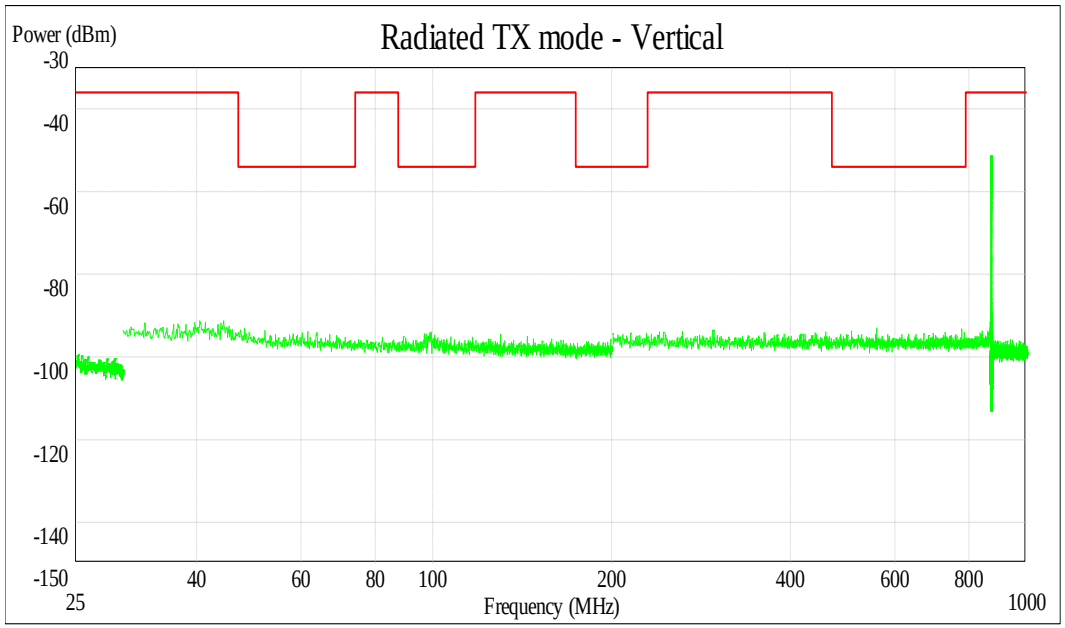


200Mhz to 1000MHz

Example of Results

Radiated TX Mode												
Spur ID	Freq (MHz)	Polar (H/V)	Direct (ϕ , θ)	Read (dBm)	Cables (dB)	ATT (dB)	Filter (dB)	NSA (dB)	ERP (ERP)	Limit (dBm)	Margin (dB)	PASS/FAIL
	No spurs detected											PASS

Radiated RX Mode												
Spur ID	Freq (MHz)	Polar (H/V)	Direct (ϕ , θ)	Read (dBm)	Cables (dB)	ATT (dB)	Filter (dB)	NSA (dB)	ERP (dBm)	Limit (dBm)	Margin (dB)	PASS/FAIL
	No spurs detected											PASS



Radiated spurious emissions from 25MHz to 1000MHZ – TX mode - Vertical.

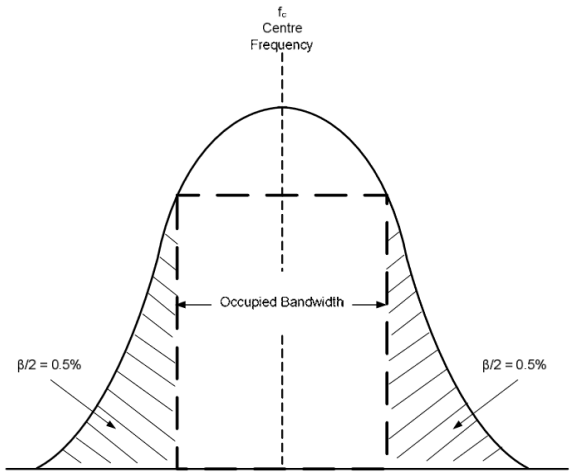
TX – Occupied Bandwidth

Description

- The occupied bandwidth (OBW) is the Frequency Range in which 99 % of the total mean power of a given emission falls.

The residual part of the total power being denoted as β, which, in cases of symmetrical spectra, splits up into β/2 on each side of the spectrum. Unless otherwise specified, β/2 is taken as 0,5 % as described in Figure below.

- The maximum occupied bandwidth includes all associated side bands above the appropriate emissions level and the frequency error or drift under extreme test conditions



Occupied bandwidth

Testing, certification and qualification of electronic & electrical products

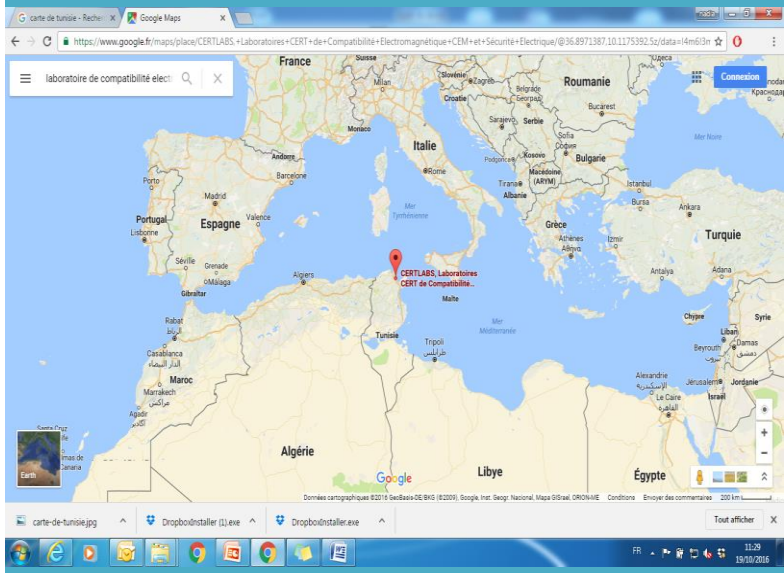
- CERT Labs delivers end-to-end services in both certification and qualification.
- Our advanced instrumentation enables us to expertly manage and fulfill all your specification requirements.

- **End-to-end certification & qualification. Advanced labs.**
- **Precise results..**

Why Laboratories CERTLabs?

Proximity

- **Unique in Africa:**
- **All your tests, one lab. Streamline your compliance,**
- **cut costs, and accelerate your time-to-market by combining EMC, safety, Radio and environmental testing with a single partner.**



Why Laboratories CERTLabs?

Availability

The reception capacity of our laboratories involved in planning tests in line with client expectation.

Reactivity

Our organization areas activity allows us to meet our customer requests in the shortest time.

Quality

A quality policy is established according to the ISO 17025 requirements .

Our strengths

Administrative management simplified

- A single contact centralizes the applications
- The treatment procedure of Customer requests are simplified (Real time)

Easy planning

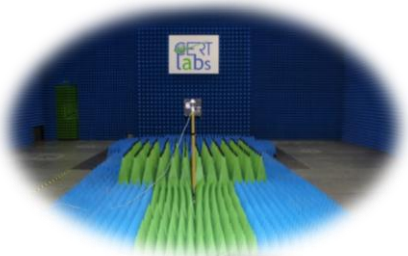
- response time optimized with respect to customer requirements

optimized services

- take into account your technical requirements
- Technical assistance during the product development cycle
- Conform to the initial quote unless justified derogation

Our business areas

- Electromagnetic Compatibility (EMC)
- ELECTRICAL SAFETY
- RADIO TESTS
- CLIMATE TESTS
- IP CODE



Our business areas

ELECTROMAGNETIC COMPATIBILITY (EMC)

EMC tests verify compliance of a device with respect to standards. Witch include testing a product in a reference environment, in which product will be used.

These tests include:

–radiated and conducted emission

–radiated and conducted immunity

– transient immunity testing (EFT, surge, ESD)

Our business areas

ELECTRICAL SAFETY

Electrical and electronic products potentially pose risks to their users and their environment with mainly hazards and fire & electrical risks

These tests include:

- **Isolation Measurements**
- **dielectric strength**
- **Electrical shock**
- **dangers linked to energy**
- **Fire**
- **thermal hazards**
- **mechanical hazards**

Our business areas

CLIMATE TEST ACCORDING

Climate tests consist of reproducing the atmospheric environmental conditions encountered on land and at sea level. This is to simulate the same conditions, often extreme, to measure the reaction materials.

- **Variation temperature,**
- **Robustness testing,**
- **dry heat**
- **Cold test**
- **moist heat**

Our business areas

RADIO TESTS

The radio test designed primarily to check the essential tests according to ETSI standards and ITU recommendations

- **ERP/EIRP**
- **SPURIOUS Emissions (TX / RX)**
- **Occupied channel Bandwidth**
- **Out of band Emissions**
- **…**

Our business areas associated

TRAINING

Our training programs are delivered either as inter-company or intra-company sessions, offered on demand or scheduled by institutions, with fully customized content tailored to the specific needs of our clients

ADVICE & ENGINEERING

- **Definition of regulatory requirements**
- **Drafting of qualification plan (QTP)**
- **Design review and anticipating technological choices**
- **Management projects**
- **Analyse of failure proposal of solutions and corrective**

Our test facilities

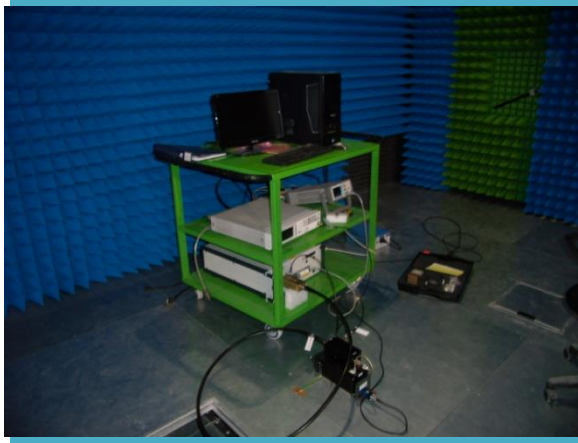
- 10 meter semi-anechoic chamber
- 5 meter Turntable supporting 10 tons (possibility of testing vehicle)
- Mast antenna (1 - 4 m)
- Automatic Door 4x4 m

Our test facilities

- Reverberating chamber
- Faraday cages
  - 02 control cages
  - 02 amplifier cages
  - 01 Engineering cage
  - 01 cages for test bench and DES
  - 02 cage for conducted tests

Our test facilities

- Three measurement receivers full compliant CISPR-16 (Rohde& Schwarz + PMM + Keysight)
- emission and immunity antennas
- RSILs
- RF generators
- Amplifiers (up to 1 kW) until 6 GHz
- couplers
- Power Meters
- Fieldmeters
- burst/surge/ Magnetic Fields / power fail generators
- CDNs
- Flicker and harmonics meter
- automotive test bench ISO 7637 compliant

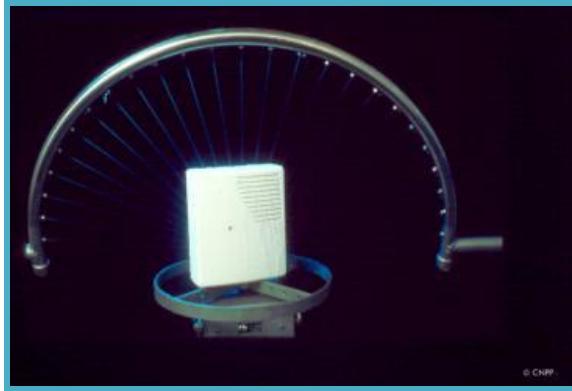


Our test facilities

- environmental chamber from -40 ° C to 180 ° C and a humidity range up to 98%,
- Stabilized power supplies,
- Oscilloscopes,
- generating residual Lightning pulse
- testing materials for glow-wire,
- Materials for flammability testing
- Materials for IP testing
- Dust chamber

Our test facilities

- templates test
- drops test
- oscillating tubes (IP water)
- Jet water
- fingers test,
- Digital Dynamometer,
- Power stations measurement
- temperature control station
- Dielectric strength tests, insulation resistance and continuity Earth
- Apparatus leakage current tests,



normative scope - 1

- **civil EMC standards**
  - CISPR 32 / EN 55032; CISPR 11 / EN 55011; CISPR 14 / EN 55014;
  - CISPR 35 / EN 55035
  - EN / IEC 61000-3-2 / 3-phase ≤ 16 A
  - EN / IEC 61000-4-2; up to 30 kV
  - EN / IEC 61000-4-3;
  - EN / IEC 61000-4-4; up to 5.5 kV power lines (single and three phase) and data
  - EN / IEC 61000-4-5; up to 5 kV power lines (single and three phase) and data with the possibility of waveform 10/700
  - EN / IEC 61000-4-6;
  - EN / IEC 61000-4-8; up to 30 A / m
  - EN / IEC 61000-4-11; monophase

normative scope - 2

- **automotive EMC standards**
  - CISPR 25 - Class 5
  - ISO 11452-2 specifications and manufacturer up to 150 V / m
  - ISO 11452-4 specifications and manufacturer up to 200 mA
  - ISO 7637-2 and manufacturer specifications for non-standard forms of waves
  - ISO 7637-3 and manufacturer specifications
  - ISO 10605 and manufacturer specifications; with 150pF / 330ohm network. Other types of RC networks are in the acquisition phase

normative scope - 3

- **Radio Radio and EMC standards**

EMC	Radio
EN 301 489-1	EN 300 328
EN 301 489-3	EN 300 220
EN 301 489-17	EN 300 330,
EN 301 489-52	EN 300 440
…	EN 301511
	EN 301893

normative scope - 4

- **Electrical safety standards**
  - IEC / EN 60950 / IEC 62368-1
  - IEC / EN 60335
  - IEC / EN 60065
  - IEC 60695-2-10; IEC 60695-2-11
  - IEC 60068-2-1
  - IEC 60068-2-2
  - IEC 60068-2-30
  - IEC 60529

Relations with ITU

- ✓ “CERT LABs has been officially designated by the International Telecommunication Union (ITU) as a Regional Conformance and Interoperability Laboratory serving the African and Arab regions.”
- ✓ Several capacity-building sessions have been delivered for delegates representing Arab and African countries

Training actions by CERT Labs

http://www.itu.int/en/ITU-D/Technology/Pages/Events.aspx

- Conformity and Interoperability Training for Africa Region, 30 May-3 June 2016, Tunis, Tunisia
- Conformity and Interoperability Training for Arab Region ,Tunis (Tunisia), 11-15 April 2016
- ITU Forum on Conformance and Interoperability for the Arab and African Regions, 5-7 November 2012 and Training Course on Conformance and Interoperability Testing, 8-10 November 2012, Tunis (Tunisia)
- Training Course on Conformance and Interoperability Testing for the Arab Region, 2-6 April 2013, Tunis (Tunisia)
- Training Course on Conformance and Interoperability Testing for the Africa Region, 28 October-1st November 2013, Tunis (Tunisia)
- Training Course on Conformity and Interoperability Testing for the Arab Region, 17-22 March 2014, Tunis (Tunisia)
- Training Course on Conformance and Interoperability Testing for the Africa Region, 23-27 June 2014, Tunis (Tunisia)
- Workshop for Maghreb Countries to promote the Development and Implementation of Conformity Assessment Programmes, 9-11 December 2014, Tunis (Tunisia)
- Conformity and Interoperability Training for Arab Region on Type Approval testing for Mobile Terminals, Homologation Procedures and Market Surveillance, 20-24 April 2015, Tunis (Tunisia) - Organized in collaboration with the Centre d'Etudes et de Recherche des Télécommunications (CERT)
- ITU-UMA Experts Meeting on C&I in the Maghreb Countries, Rabat-Morocco, 23-25 Nov. 2015
- Conformity and Interoperability Training for Africa Region on Type Approval Testing for Mobile Terminals, Homologation Procedures and Market Surveillance, 14-18 December 2015, Tunis, Tunisia

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