



ITU Forum on  
Conformance and Interoperability  
for the Arab and African Regions,  
Tunis (Tunisia) 5-7 November 2012.

# Test laboratories of the CERT



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## Context

The Association Agreement between Tunisia and the European Union:



- Aims to establish a free trade area between Tunisia and the EU at 2012 deadline.
- Enter into action after the signing of the Agreements on Conformity Assessment and Acceptance of industrial products (ACAA).



## ACAA signing

The signing of mutual recognition requires:



- The use by Tunisia of technical rules of the European Community relating to the quality of industrial products.
- The establishment of a regulatory framework,
- The establishment of a system of conformity assessment:
  - **Measurement laboratories (EMC, LVD, etc.)**
  - Metrology labs,
  - Etc ...
- Creating structures for market surveillance.



## Objectives



This project aims to:

- Improve the competitiveness of Tunisian industry,
- Protect the Tunisian consumer,
- Protect the electromagnetic environment,
- Apply quality systems as national requirement and in export operations of industrial products,

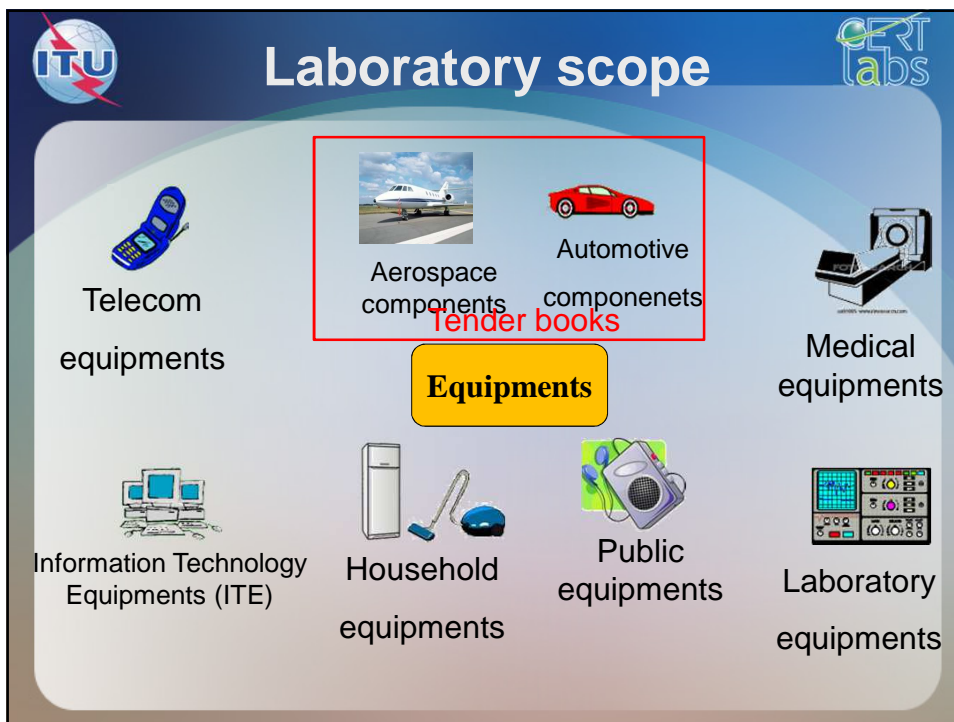
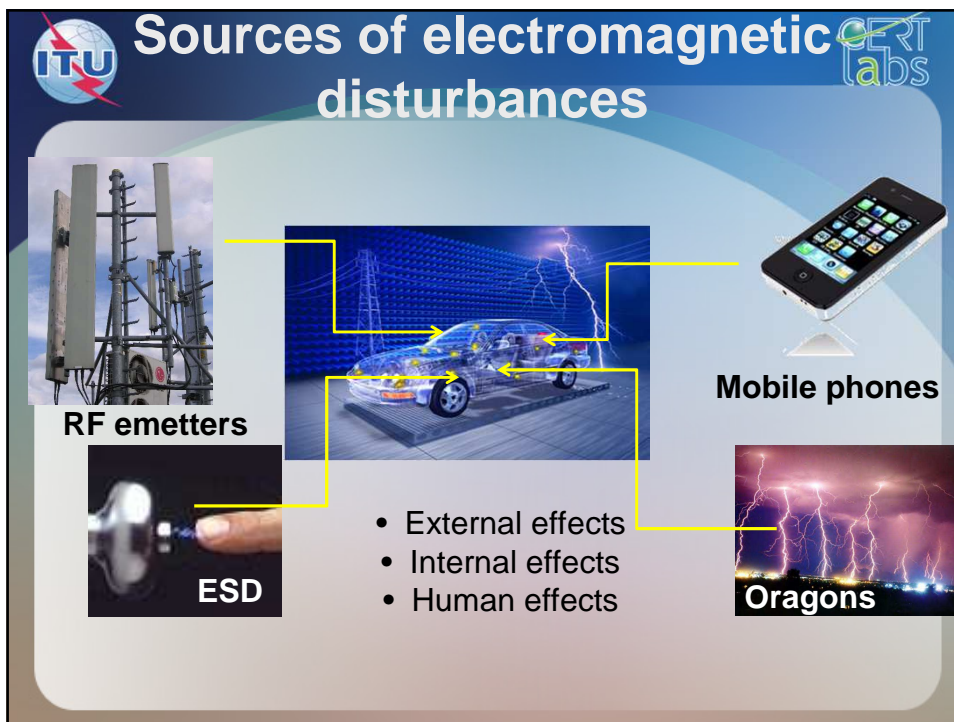


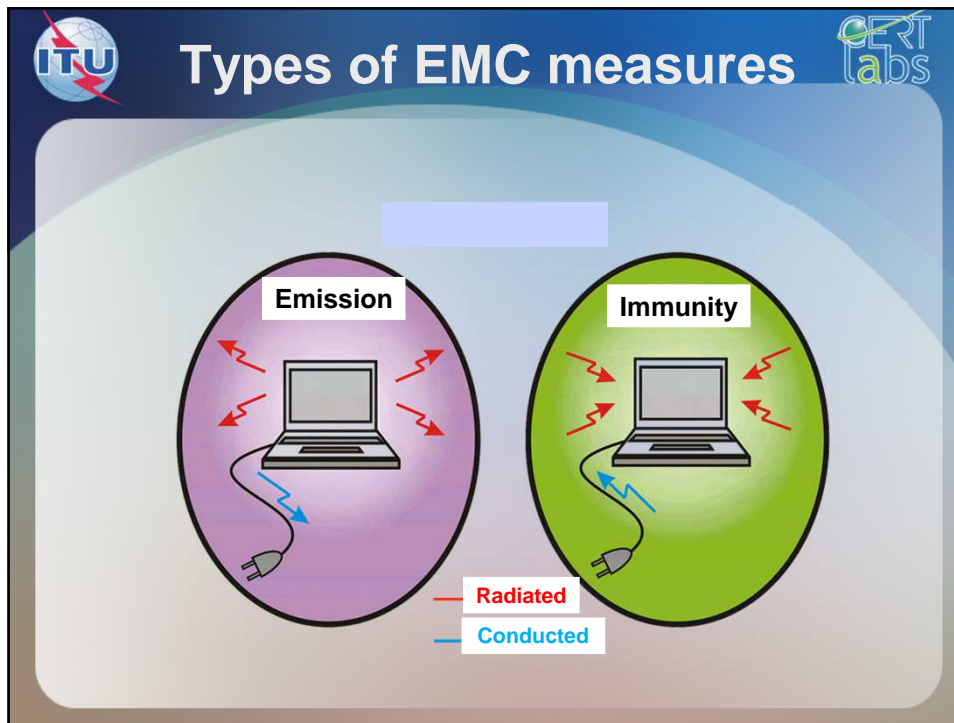
## Activity of the laboratory

- Industry support (pre / full compliance)
  - Compliance verification before marketing
  - Technical advice, training and expertise
  - Engineering
  - Professional training
- Market control:
  - CERT is a government entity
  - Implementation of Legal and administrative structures of market control (in progress)
  - Baseline 10 meters distance of measures
  - accreditation required



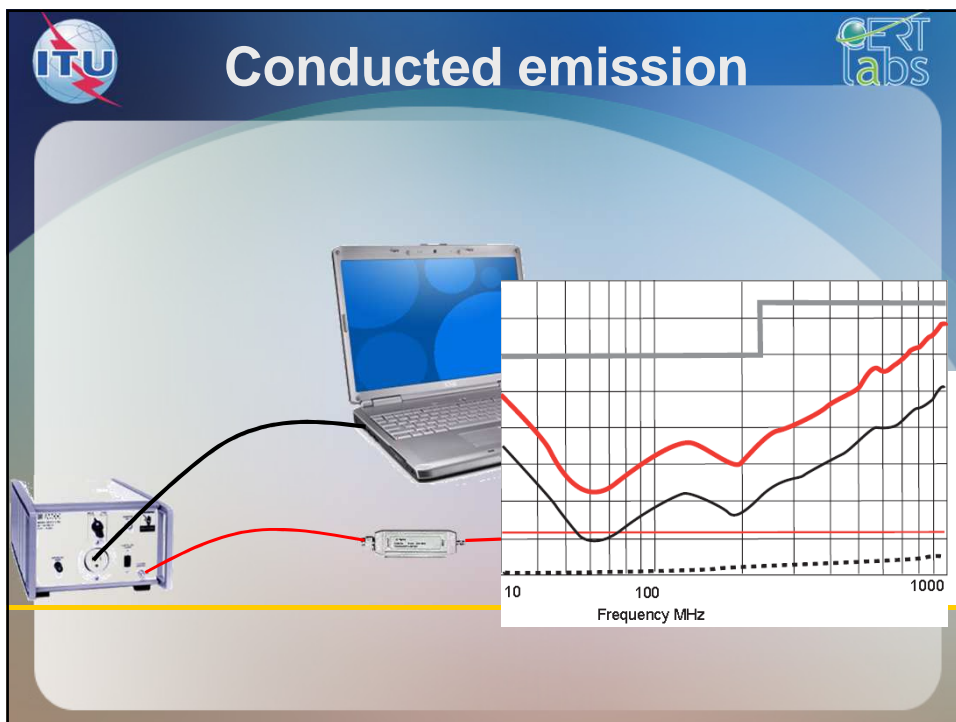
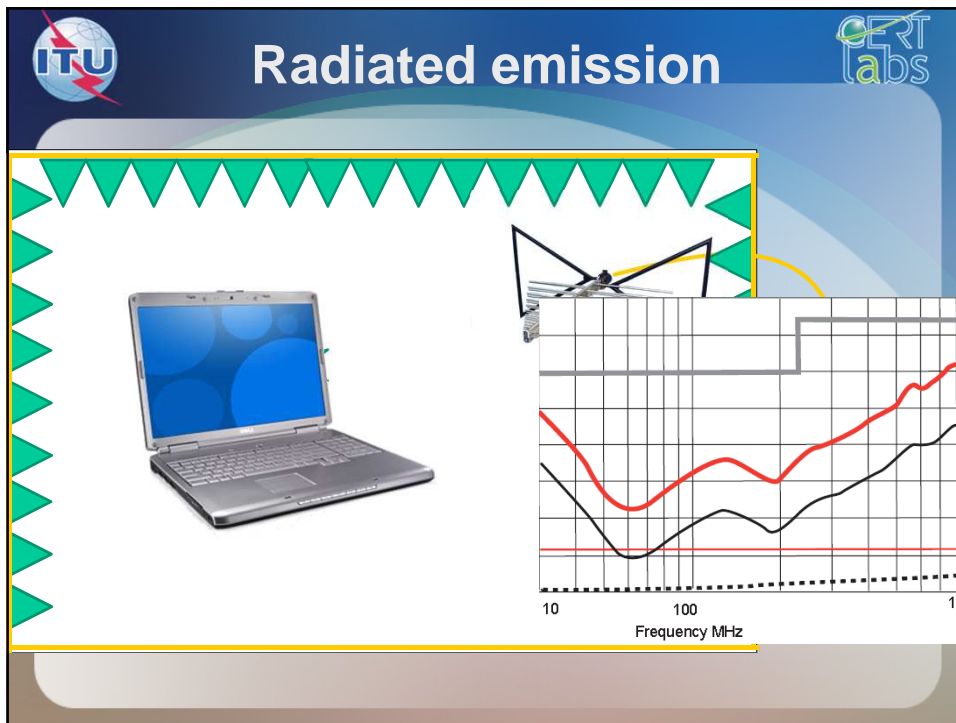
## EMC measures

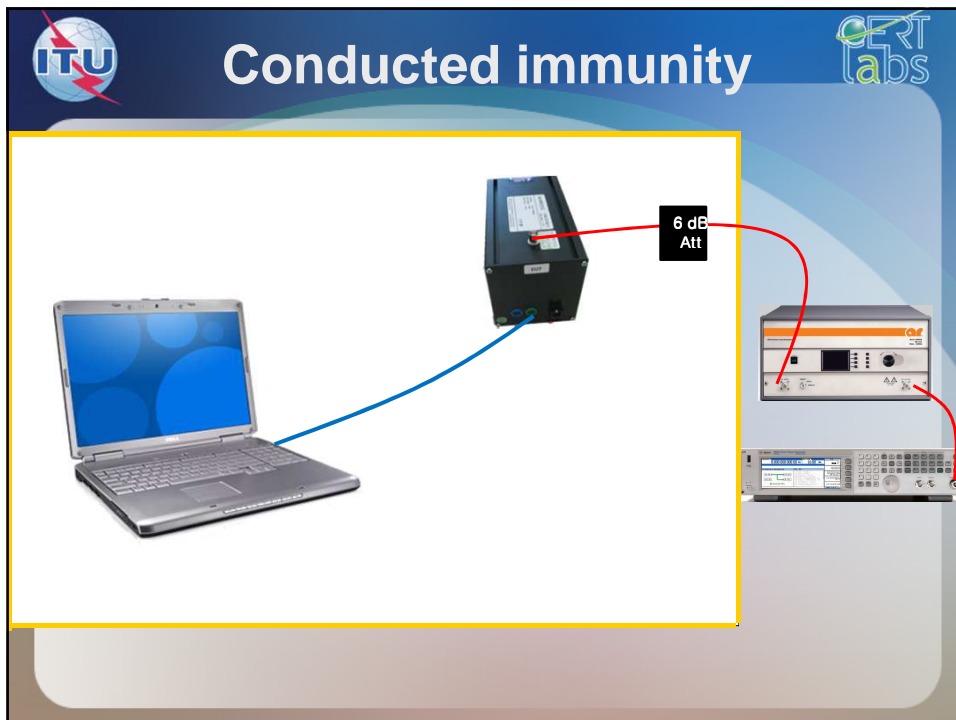
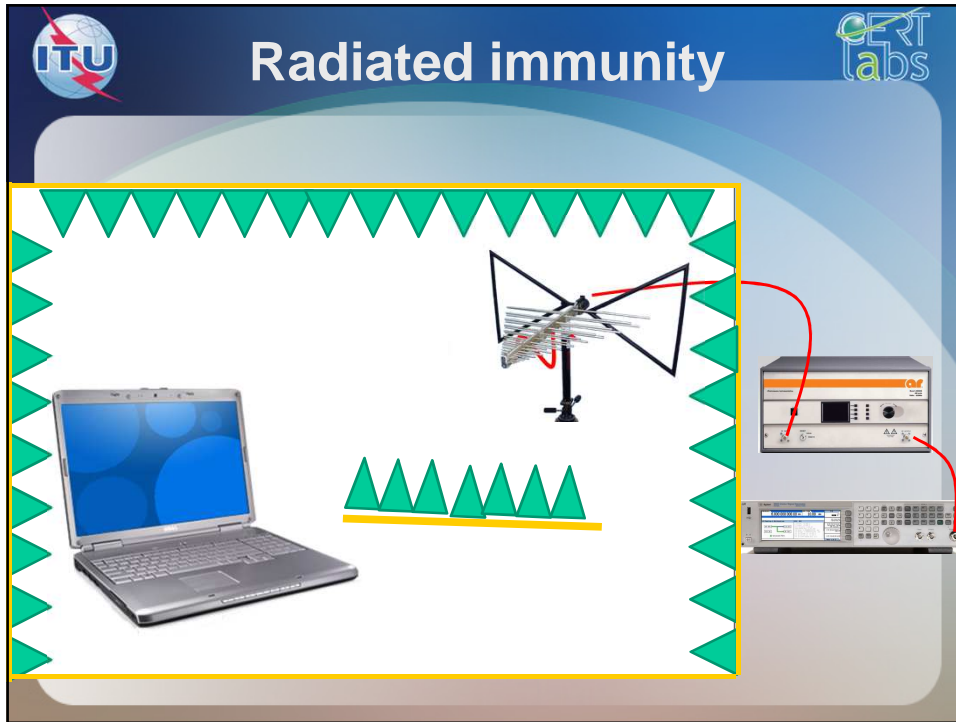





ITU **Standards** CERT labs


- Voluntary compliance with harmonized standards demonstrates compliance with Directive
- Three types of standards:
  - Fundamental standards (e.g. EN 61000-4-x)
  - Product standards (eg EN 55011 (ISM), ETS 300 342-1 (GSM))
  - Generic standards (e.g. EN 61000-6-x)
- Standardization bodies:
  - CISPR, IEC, ISO, ITU as international organizations
  - CENELEC, ETSI in Europe
  - ANSI in United States



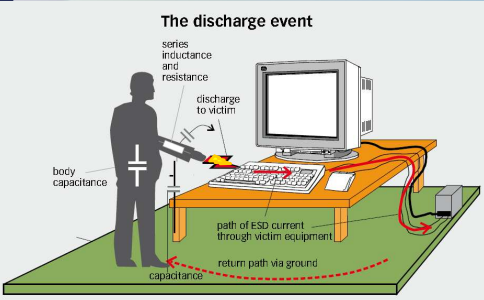


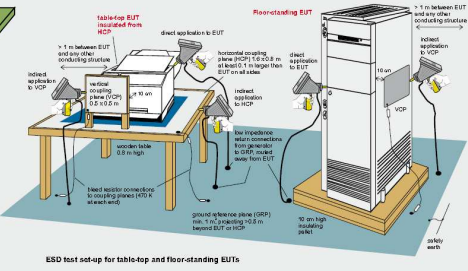


# Electrostatic discharge




### The discharge event




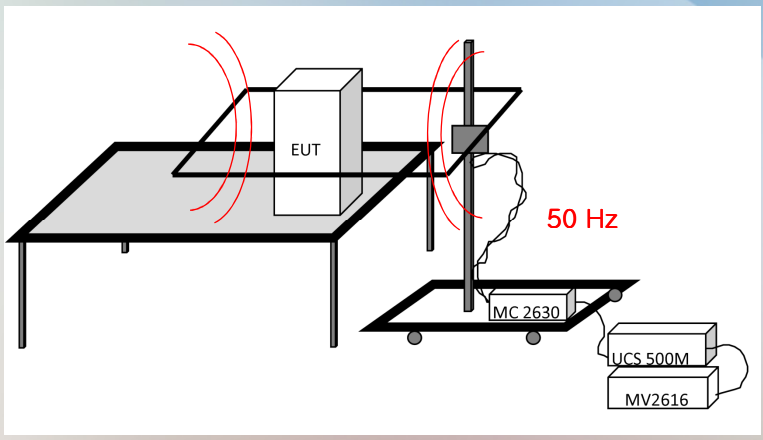


ESD test set-up for table-top and floor-standing EUTs



# Magnetic field immunity







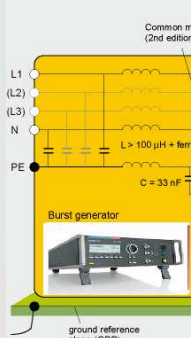
50 Hz



## Electrical Fast Transients immunity

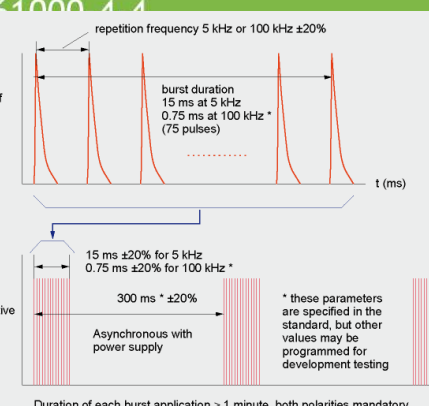
**EFT - IEC/EN 61000-4-4**



Common mode (2nd edition)

Burst generator

ground reference plane (GRP), to safety earth



repetition frequency 5 kHz or 100 kHz  $\pm 20\%$

burst duration  
15 ms at 5 kHz  
0.75 ms at 100 kHz \*

15 ms  $\pm 20\%$  for 5 kHz  
0.75 ms  $\pm 20\%$  for 100 kHz \*

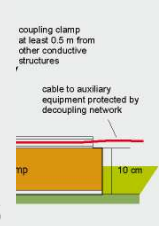
300 ms  $\pm 20\%$

Asynchronous with power supply

\* these parameters are specified in the standard, but other values may be programmed for development testing

Duration of each burst application  $\geq 1$  minute, both polarities mandatory

p and coupling





coupling clamp at least 0.5 m from other conductive structures

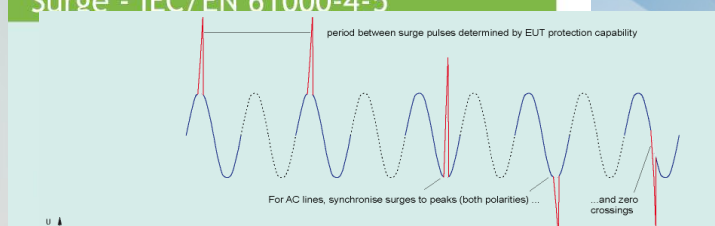
cable to auxiliary equipment protected by decoupling network

10 cm

## Surge immunity

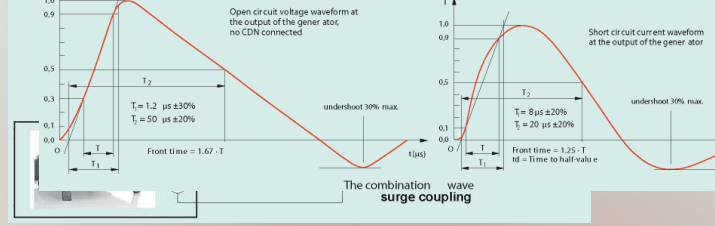



**Surge - IEC/EN 61000-4-5**

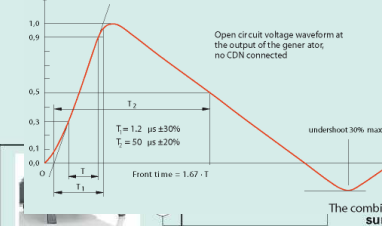


period between surge pulses determined by EUT protection capability

For AC lines, synchronise surges to peaks (both polarities) ... ..and zero crossings



The combination wave surge coupling



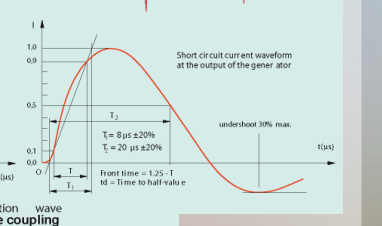
Open circuit voltage waveform at the output of the generator, no CDN connected

$T_1 = 1.2 \mu\text{s} \pm 30\%$

$T_2 = 50 \mu\text{s} \pm 20\%$

Front time =  $1.67 \cdot T_2$

undershoot 30% max.



Short circuit current waveform at the output of the generator

$T_1 = 8 \mu\text{s} \pm 20\%$

$T_2 = 20 \mu\text{s} \pm 20\%$

Front time =  $1.25 \cdot T_2$

$t_d = \text{Time to half-value}$

undershoot 30% max.

**Immunity to voltage fluctuation & short interruptions**

- Aim of the test:
  - Simulate defects supply network
  - Simulate a sudden change in load
- Materials needed:
  - generator
  - Drive voltage (Variac)
  - Ground plane
- Examples of voltage fluctuations:
  - 30% discount for 10 ms
  - 60% off for 100 ms
  - 95% reduction for 5 s

Figure 6M Example of a 'dip'

A 40% dip with a 20ms duration

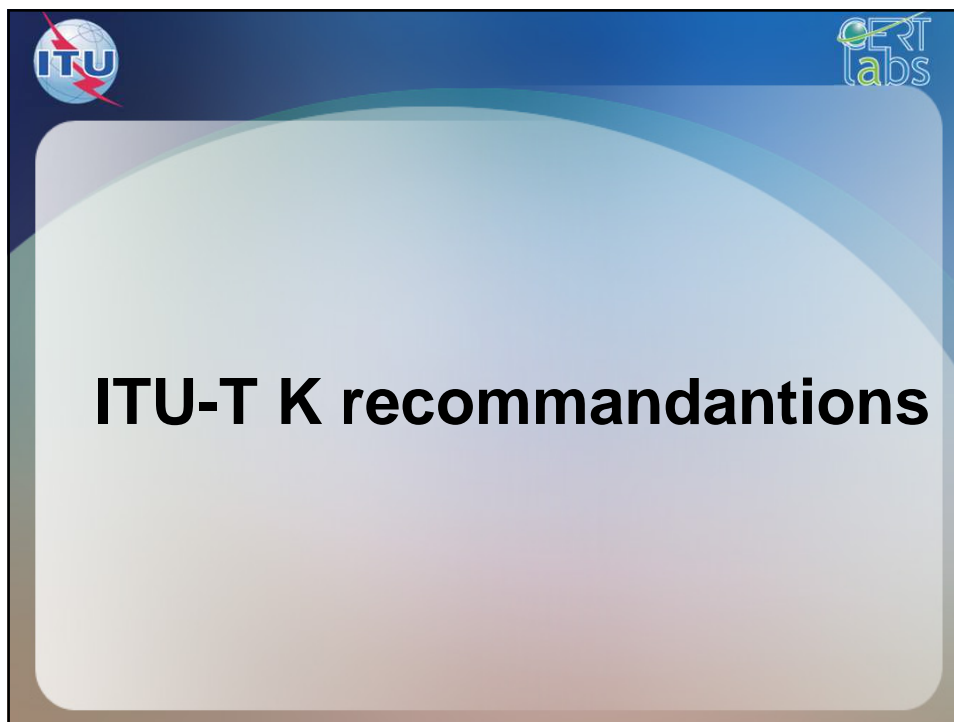
This dip started and finished at zero-crossings (as in most tests using IEC 61000-4-11) but real life dips can happen at any phase angles

Figure 6N Example of a 'short interruption'

A 50ms interruption in the mains supply

This interruption started and finished at zero-crossings (as in most tests using IEC 61000-4-11) but real life interruptions can happen at any phase angles

**EMC engineering**



**K.43 and K.48**

ITU-T K recommendations call the IEC and CISPR EMC Standards already presented. Example:

- Recommendation ITU-T **K.43**
  - Immunity requirements for telecommunication network equipment
- Recommendation ITU-T **K.48**
  - EMC requirements for telecommunication equipment – Product family Recommendation
    - ✓ Emission : CISPR 22
    - ✓ Immunity : IEC 61000-4-X fundamental standards



**Table A.1/K.48 – Equipment for telecommunication centre**

Environmental phenomena	Test levels	Units	Basic standard	Performance criteria	Remarks
<i>Enclosure port</i>					
Radio-frequency electro-magnetic field	3 10 3 10	V/m	IEC 61000-4-3 [36]	A	80-800 MHz 800-960 MHz 960-1000 MHz 1400-2000 MHz (Note 1)
Electrostatic discharge	4	kV	IEC 61000-4-2 [35]	B	Contact and air discharge
<i>Outdoor telecommunication ports</i>					
Radio-frequency conducted continuous	3	V	IEC 61000-4-6 [39]	A	0.15-80 MHz (Notes 2, 3 and 5)
Surges	0.5 (line to line) 1 (line to ground)	kV	IEC 61000-4-5 [38]	B	10/700 $\mu$ s (Notes 4 and 13)
Fast transients	0.5	kV	IEC 61000-4-4 [37]	B	(Note 12)

## Overvoltages or overcurrents

Overvoltages or overcurrents covered by some K Recommendations include surges due to:



- lightning “on” or “near” the line plant,
- short-term induction of alternating voltages from adjacent electric power lines or electrified railway systems,
- earth potential rise due to power faults,
- and direct contacts between telecommunication lines and power lines.



## Immunity/emission


- Preventing equipment performance degradation, the system shall have an adequate immunity level
- Immunity is the ability of the equipment to work as expected in a presence of an e.m. disturbance
- Preventing disturbances to other systems, the system shall control its e.m. emission level

To this end, Equipment shall comply with Electromagnetic Compatibility (EMC) requirements




## Resistibility and Protection

- Preventing equipment damage may require a combination of resistibility and protection
  - ✓ **Resistibility is The ability of the equipment to withstand an over-voltage or over-current** (*during the test the equipment may have degradation of performances but damage is not allowed !*)
  - ✓ **Protection is the addition of protective measures to prevent damage from larger surges**




## Network Interfaces (1)




The ITU define very clearly interfaces between elements of the telecommunication system. These are given in recommendation **K.44** and are listed here.

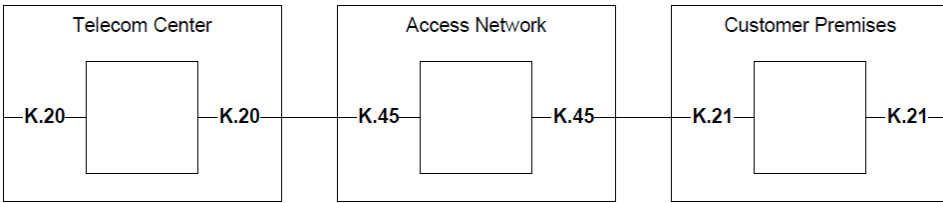
- **K.20** Resistibility of telecommunication equipment installed in a **telecommunications center** to overvoltages and overcurrents.
- **K.21** Resistibility of telecommunication equipment installed in **customer premises** to overvoltages and overcurrents.
- **K.45** Resistibility of telecommunication equipment installed in the **access and trunk networks** to overvoltages and overcurrents.



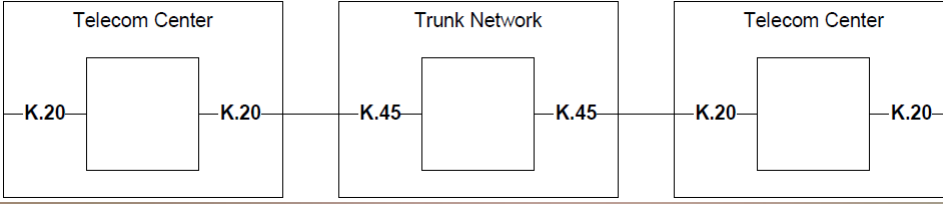
## Network Interfaces (2)





1. Connection between a telecommunications center, via Network Access equipment to a customer Premises:



2. Connection between two telecommunication centers







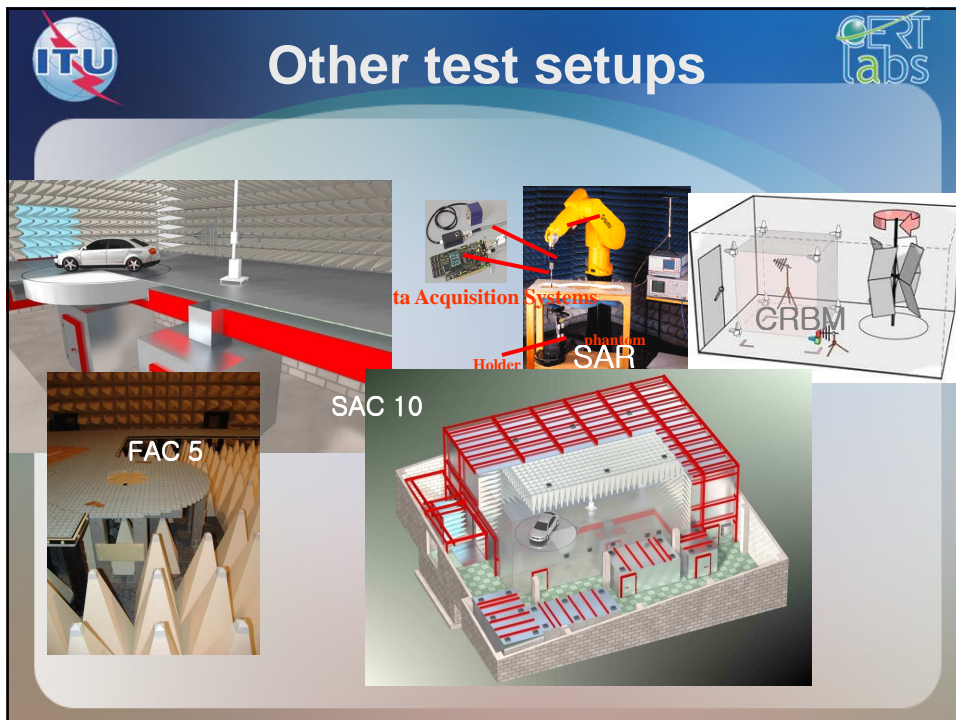
## ITU K.20, K.21 and K.45 recommendations

These recommendations contain the following tests:

- Lightning
- ESD
- power induction
- earth potential rise
- neutral potential rise
- mains power contact



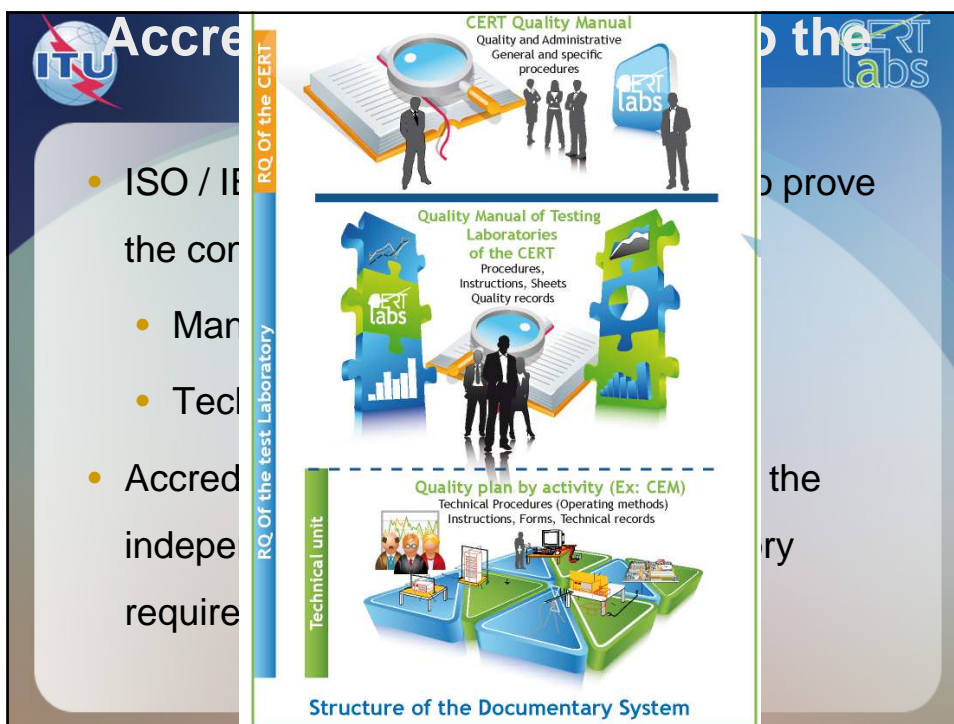
## EMC test setups

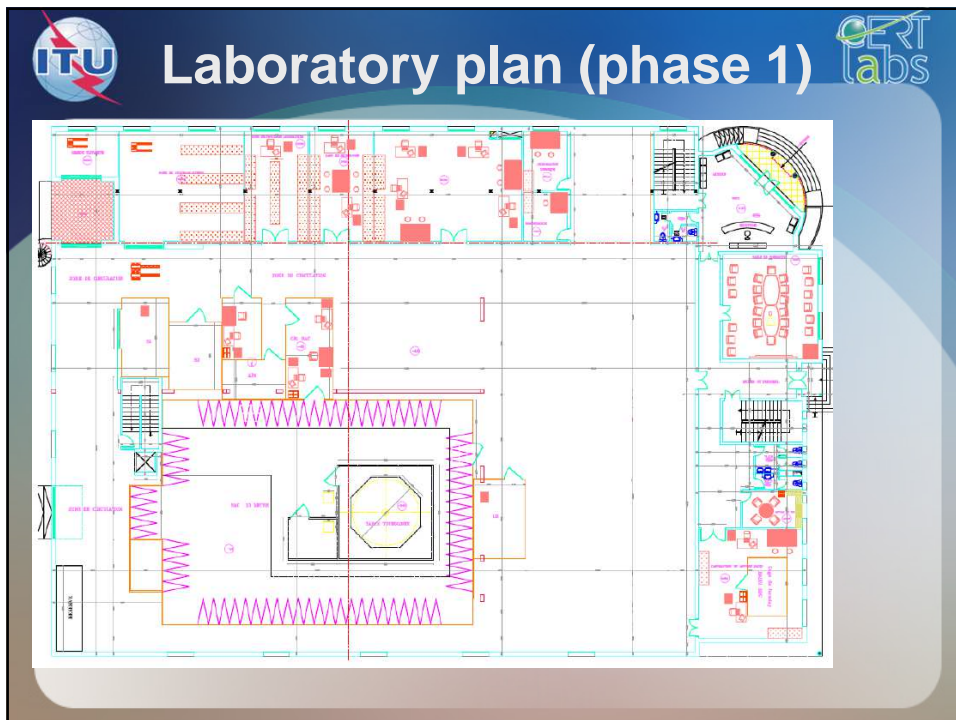
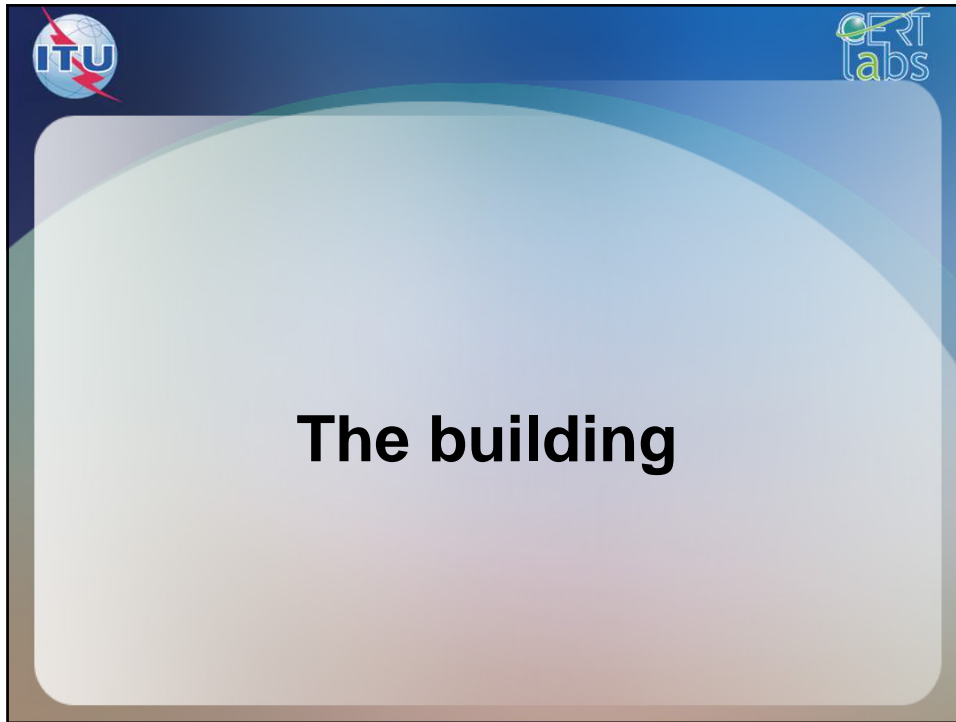


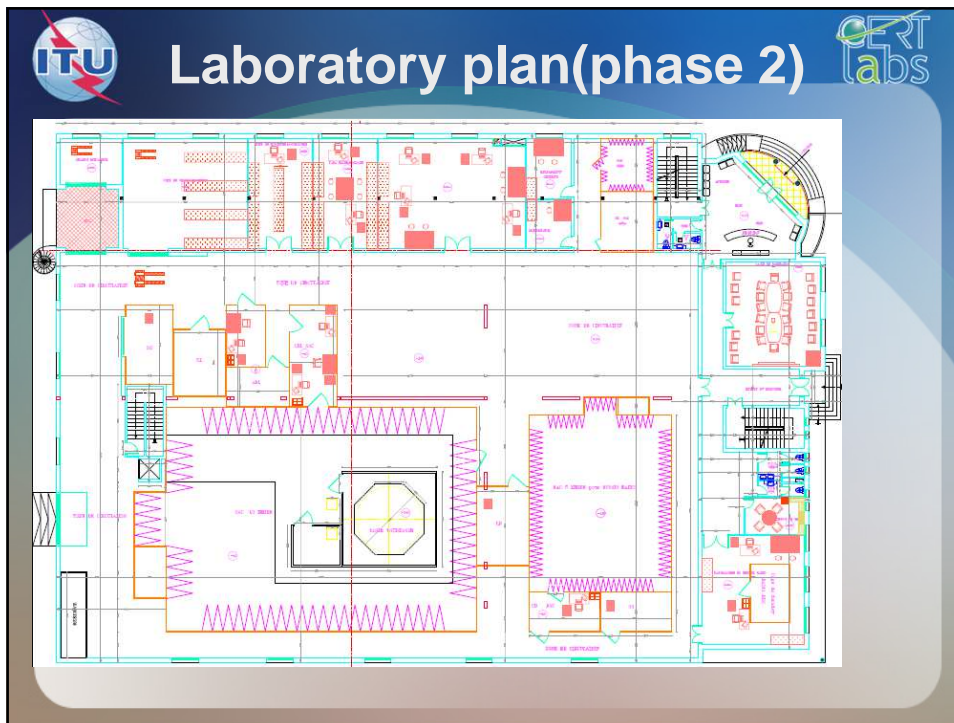


ITU CERT labs

# Accreditation











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# Thank you

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