AFSEC WORKSHOP

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Hervé ROCHEREAU
EDF R&D, Clamart – France

IEC TC 77

Content

- Introduction
- EMC
- TC 77
- Focus on
  - Low Frequency Emission and
  - Power Quality
- CENELEC TC 210

Introduction

Hervé ROCHEREAU
EDF R&D, Clamart – France

Delegate for standardization

UTE 8 Chairman

UTE 109 Chairman

TC8X Chairman

Smart Grid CG Steering Committee Member

SMB Member

SC77A Secretary

ACEC Member

TC8/WG1 Convenor

ELECTROMAGNETIC COMPATIBILITY APPROACH : Definitions (1/2)

- EMC - Electro Magnetic Compatibility

  The ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable disturbances to that environment.

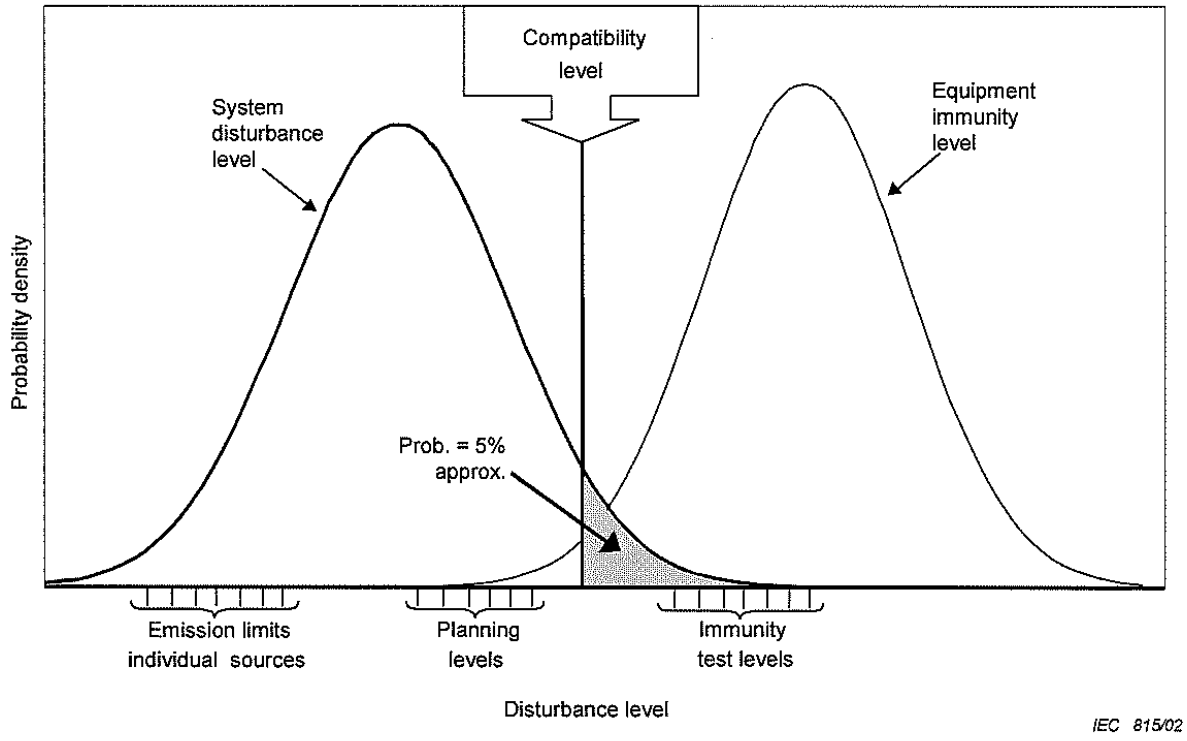

Figure A.1 – Relation between compatibility, immunity, planning and emission levels

ELECTROMAGNETIC COMPATIBILITY APPROACH : Definitions (2/2)

- Basic EMC publication
  - General and fundamental conditions or rules for the achievement of EMC. Reference documents for the product committees.
  - *Category of the large majority of TC 77 standards.*
- Generic EMC standard
  - Specify set of essential requirements, test procedures and generalized performance criteria applicable to products or systems operating in a particular environment.
- Product (family) EMC standard
  - Specify specific electromagnetic requirements and test procedures dedicated to a particular product (family).

NOTE : Definitions from IEC Guide 107 "*EMC Guide to the drafting of EMC publications*"

ELECTROMAGNETIC COMPATIBILITY
ROLE OF TC 77

- background: IEC Guide 107 and coordination with CISPR (Protection of Radio services)

- Emission (Low Frequency only)
  - Test methods, as basic EMC publications
  - Limits: for Product (Family) and Generic EMC Standards

- Immunity (whole frequency range)
  - Test methods, as basic EMC publications
  - Limits: for Generic EMC Standards
  - Product (family) immunity standards, only if required by product committees (coordinated by ACEC)

- Basic EMC publications on fundamental concepts in EMC, as, e.g.
  - EM environment
  - Mitigation, protection, installation guides, informative documents

- Assistance to Product committees in the development of their EMC standards if requested.

ELECTROMAGNETIC COMPATIBILITY
TC 77 : Structure (1/2)

EM phenomena as defined by TC 77

- Low-frequency phenomena **SC 77A**
- High-frequency phenomena **SC 77B**
  - Conducted, radiated, ESD
- High Power transient phenomena **SC 77C**

LF : Low frequency (≤ 9 kHz)
HF : High frequency (> 9 kHz)
High power conditions are achieved when the peak incident electromagnetic field exceeds 100 V/m.

ELECTROMAGNETIC COMPATIBILITY
TC 77 Structure (2/2)

- **Working Groups**

WG 13 Generic EMC Standards (Immunity)

- **Maintenance Teams**

MT 15 Maintenance on TS IEC 61000-1-7 - EMC and Functional Safety

- **Joint Task Forces**

JTF MU Joint Task Force TC 77/CISPR on Measurement Uncertainty

ELECTROMAGNETIC COMPATIBILITY

SC 77B : High-frequency phenomena

- **Working Groups**

WG 10 Immunity to radiated electromagnetic fields and to conducted disturbances induced by these fields

- **Maintenance Teams**

MT 12 Transient phenomena immunity tests

- **Joint Task Forces**

JTF REV Joint Task Force CISPR/A/SC77B on Reverberation chambers linked to CIS/A

JTF TEM Joint Task Force CISPR/A/SC77B on TEM Waveguides linked to CIS/A

JTF FAR Joint Task Force between CISPR/A and SC77B on Fully anechoic rooms (FARs) Managed by CIS/A

ELECTROMAGNETIC COMPATIBILITY

SC 77C High Power transient phenomena

- **Project Teams**

PT 61000-4-35: Intentional Electromagnetic Interference (IEMI) Simulator Compendium

PT 61000-4-36: Electromagnetic compatibility (EMC) - Testing and measurement techniques - IEMI Immunity Test Methods for Equipment and Systems

PT 61000-5-8: HEMP protection methods for the distributed civil infrastructure

PT 61000-5-9: System-level susceptibility assessments for HEMP and HPEM

PT 61000-5-1 & 61000-5-2: EMC Installation and mitigation guidelines

ELECTROMAGNETIC COMPATIBILITY
SC 77A - LOW FREQUENCY PHENOMENA

- Working Groups
  - WG1 : Harmonics and other low frequency disturbances
  - WG2 : Voltage fluctuations and other low frequency disturbances
  - WG6 : Low frequency immunity tests
  - WG8 : Electromagnetic interference related to network frequency
  - WG9 : Power quality measurement methods
- Project Teams
  - PT 61000-3-15 : Assessment of electromagnetic immunity and emission requirements for dispersed generation in LV networks

ELECTROMAGNETIC COMPATIBILITY
SC 77A - LOW FREQUENCY PHENOMENA - EMISSION

- As LF Emissions from the different equipment add together on the network, it is essential that the determination of limits is made in one place with all players represented

- Emission Limit standards for equipment, as well as the Test Method standards, are prepared by :
  - SC 77A WG 1 (harmonics) and
  - SC 77A WG 2 (flicker)
  - where are present : Utilities, Manufacturers (from different sectors) , R&D and University Experts.
- Emission Limits for installations connected to the grid are prepared by :
  - SC 77A WG 8 in cooperation with IEEE, CIGRÉ, CIRED, EURELECTRIC and UIE.

ELECTROMAGNETIC COMPATIBILITY
SC 77A - LOW FREQUENCY PHENOMENA - EMISSION

- Limits given in Product Family Standards (according to IEC Guide 107))
  - IEC 61000-3-2 Limits for harmonic currents, Equipment ≤ 16 A/phase.
  - IEC 61000-3-3 Limits for voltage fluctuation (Flicker) Equipment ≤ 16 A/phase.
  - IEC 61000-3-11 Limits for voltage fluctuation (Flicker) Equipment ≤ 75 A/phase.
  - IEC 61000-3-12 Limits for harmonic currents, Equipment ≤ 75 A/phase.

Emission standards are the only means to control effect of mass market products on the grid

These four standards are mandatory in several countries. In particular, in EC countries they are “harmonized under the EMC Directive” : a “quasi” mandatory status.

ELECTROMAGNETIC COMPATIBILITY

SC 77A - EMC and POWER QUALITY

- **Power quality – IEV 60050(617)**

  Characteristics of the electric current, voltage and frequencies at a given point in an electric power system, evaluated against a set of reference technical parameters.

  NOTE - These parameters might, in some cases, relate to the compatibility between electricity supplied in an electric power system and the loads connected to that electric power system.

- **Electromagnetic compatibility – IEV 60050(161)**

  Ability of an equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

ELECTROMAGNETIC COMPATIBILITY

SC 77A - EMC and POWER QUALITY

- The purpose of Power Quality (PQ) is to describe Electricity with parameters appropriate for contractual relationship between Network Operators and Network Users, for reporting towards Regulators, for international benchmarking, etc.
- It is a TC 8 issue

- The PQ description does not necessarily fit with the needs of Product Committees when developing EMC immunity requirements. It is the reason why, according to the EMC principles, Immunity requirements for equipment have to be based on EMC basic publications of the 61000-2 series (and not on PQ requirements).

- TC 8 and SC 77A are used to cooperating about PQ standards and measurement methods (IEC 61000-4-30) , and TC 8 formalized the exchanges between the Experts of both Committees in a Technical report published in 2008 : IEC/TR 62510 (2008) *Standardizing the characteristics of electricity*.

- The development of a International PQ standard is underway (8/1295/NP)
- ACEC (and SMB) recommends a liaison with TC 77A and 64

Voltage dips example
(IEC 61000-4 series vs EN 50160)

Classes[a]	Test level and durations for voltage dips (t_s) (50 Hz/60 Hz)				
Class 1	Case-by-case according to the equipment requirements				
Class 2	0 % during ½ cycle	0 % during 1 cycle	70 % during 25/30[c] cycles		
Class 3	0 % during ½ cycle	0 % during 1 cycle	40 % during 10/12[c] cycles	70 % during 25/30[c] cycles	80 % during 250/300[c] cycles
Class X[b]	X	X	X	X	X

a Classes as per IEC 61000-2-4; see Annex B.
b To be defined by product committee. For equipment connected directly or indirectly to public network, the levels must not be less severe than class 2.
c "25/30 cycles" means "25 cycles for 50 Hz test" and "30 cycles for 60 Hz test", "10/12 cycles" means "10 cycles for 50 Hz test" and "12 cycles for 60 Hz test" and "250/300 cycles" means "250 cycles for 50 Hz test" and "300 cycles for 60 Hz test".

Residual voltage u [%]	**Duration t [ms]**				
	$10 \le t \le 200$	**$200 < t \le 500$**	**$500 < t \le 1\,000$**	**$1\,000 < t \le 5\,000$**	**$5\,000 < t \le 60\,000$**
$90 > u \ge 80$					
$80 > u \ge 70$					
$70 > u \ge 40$					
$40 > u \ge 5$					
$5 > u$					

EMC at CENELEC Level : CLC TC 210

- CENELEC TC 210 mirrors IEC TC 77 and CISPR
- Most of their standards are Harmonised Standards, under the EC EMC Directive
- They give Presumption of Conformity to its Essential Requirements
- « Equipment shall be so designed and manufactured, having regard to the state of the art, as to ensure that:

(a) the electromagnetic disturbance generated does not exceed the level above which radio and telecommunications equipment or other equipment cannot operate as intended;

(b) it has a level of immunity to the electromagnetic disturbance to be expected in its intended use which allows it to operate without unacceptable degradation of its intended use. »

Thank you for your attention.
Any questions?