



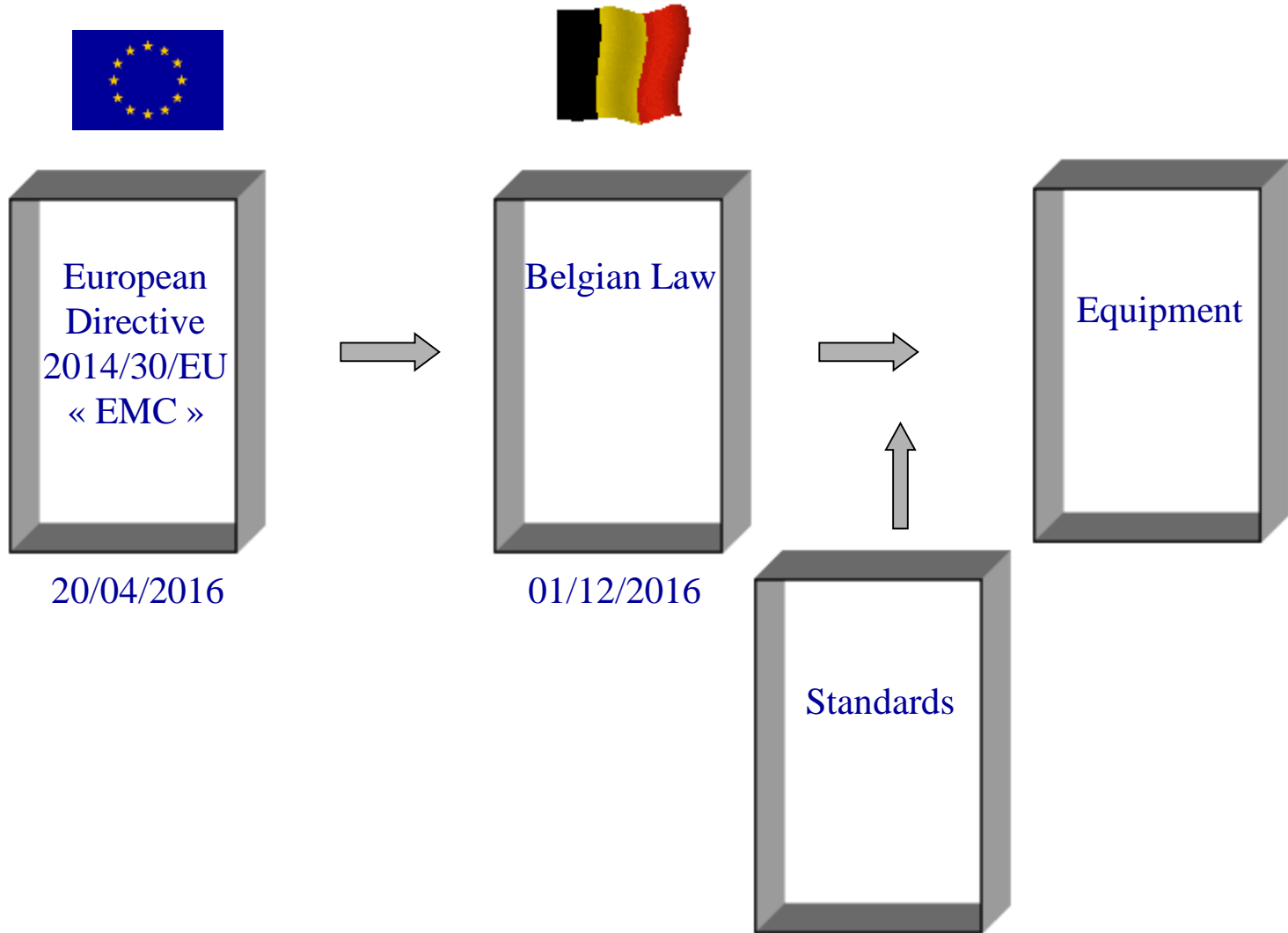
# EMC Regulations

Véronique Beauvois, Ir.  
2020-2021



# EMC Directive 2014/30/EU

Véronique Beauvois, Ir.  
2020-2021





# Directive 2014/30/EU

## Objectives

Good functioning of the internal market

*Free movement* of goods

Electromagnetic environment *with an adequate level*

adequate protection of **radio communication**

adequate protection of **telecommunication networks**

Not related to safety

# Directive 2014/30/EU



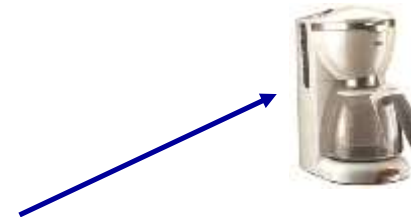
## Scope

**equipment** is

\*apparat

electrical or electronic apparatus

component (for the integration by the end-user)



\*fixed installation: particular combination of several types of apparatus assembled, installed and intended to be used permanently at a fixed location.

- large machines

- networks (power plant, telecommunication)

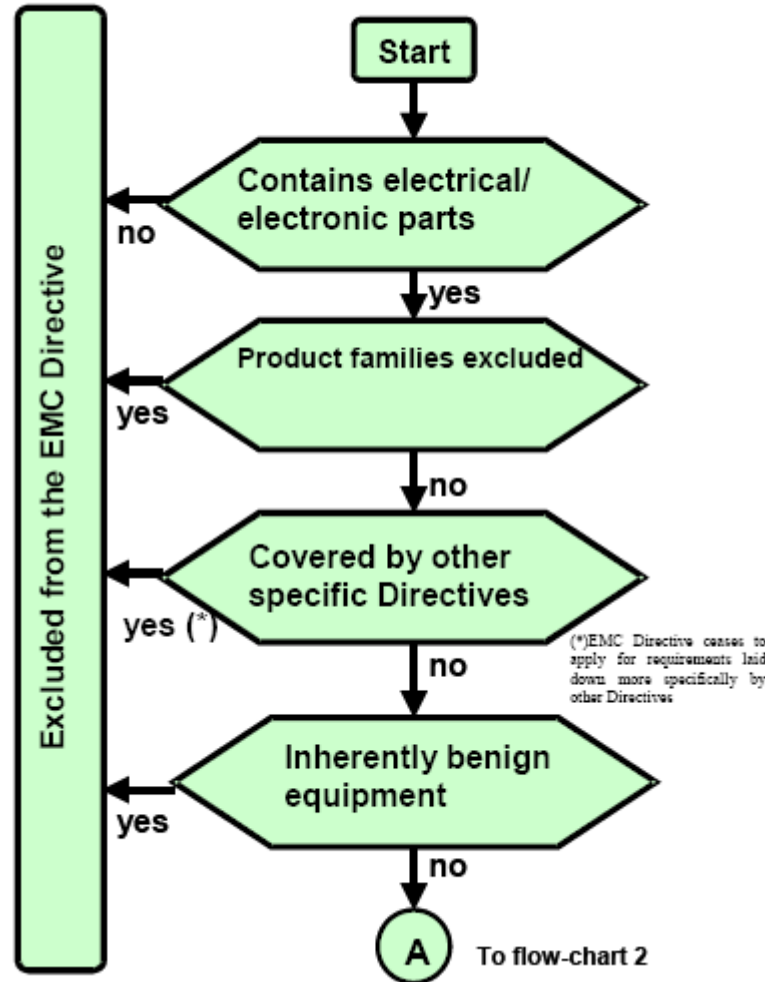




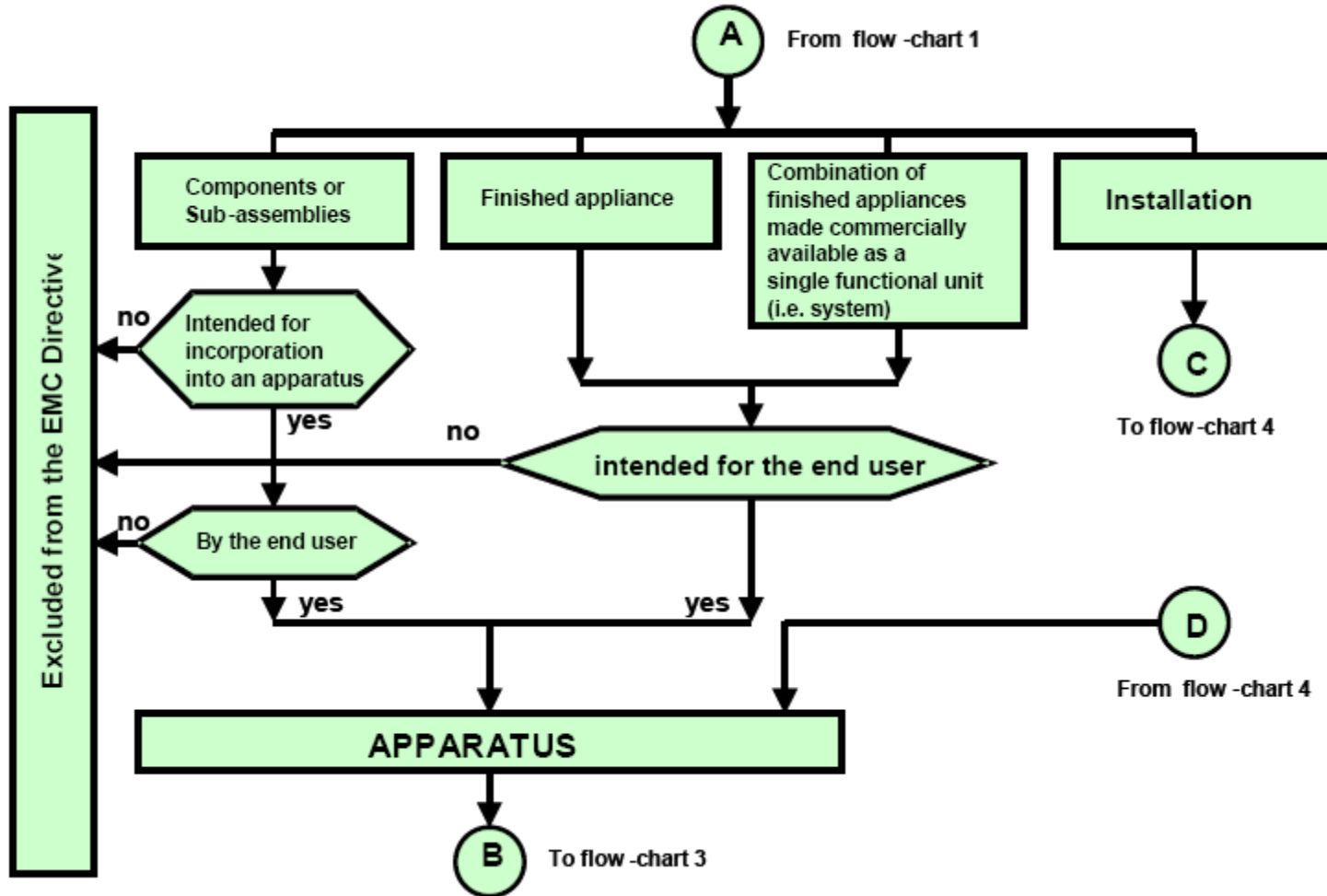
## Scope – exclusions

- equipment covered by **Directive RE** (2014/53/EU)
- aeronautical products (other regulations)
- radio equipment used by radio amateurs, except if available commercially
- equipment inherently not emitting (passive equipment, watch, electronic greeting cards)
- equipment for which essential requirements are laid down in other directives
  - 93/42/EEC: medical devices
  - 90/385/EEC: active implantable medical devices
  - 2004/22/EEC: measuring instruments (water meter, gas meter, taximeters)

# Directive 2014/30/EU



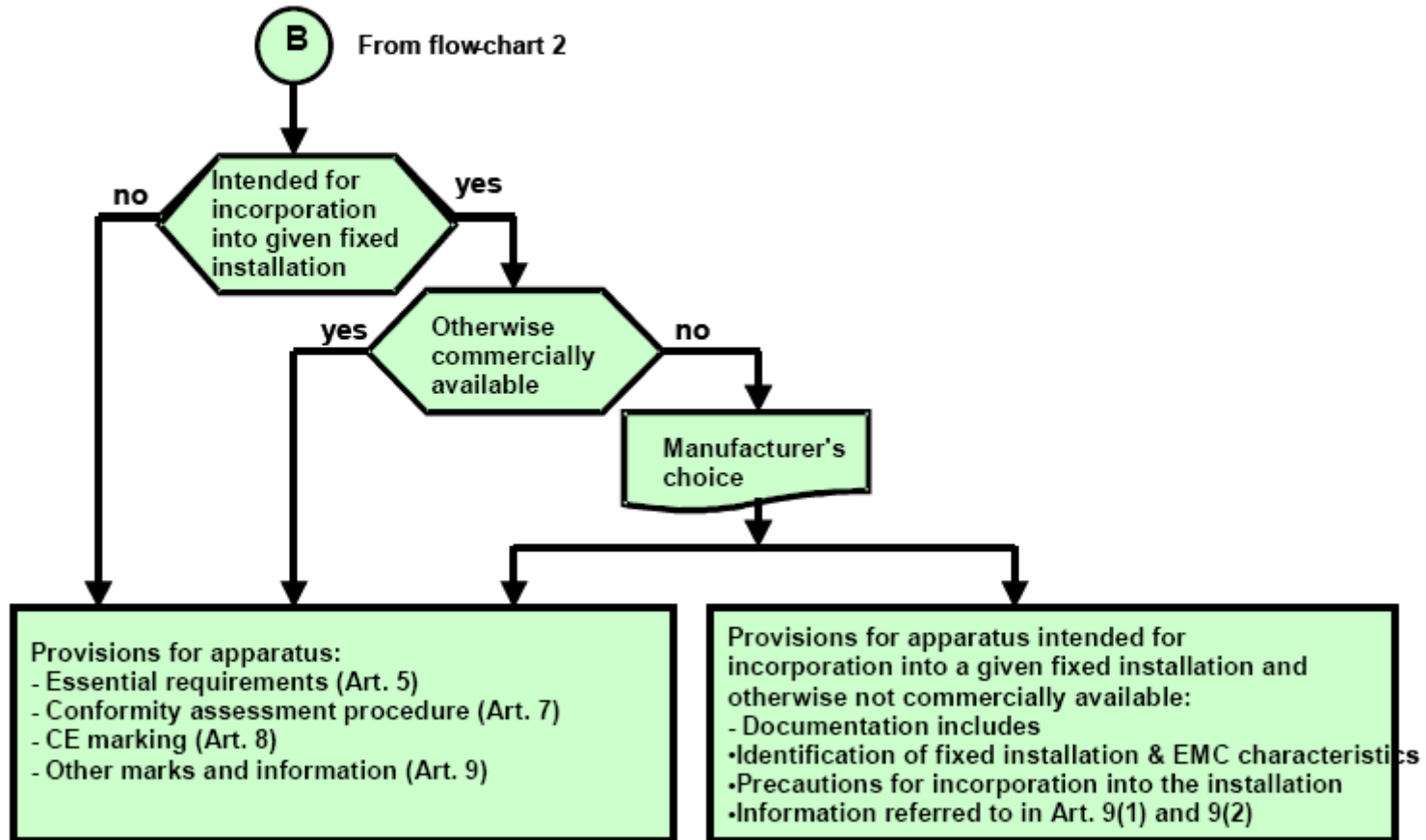
# Directive 2014/30/EU







Flowchart 3 - Provisions applicable to apparatus





# Directive 2014/30/EU

## Essential requirements

Protection requirements for all equipment

Emission

Immunity

Specific requirements for fixed installations

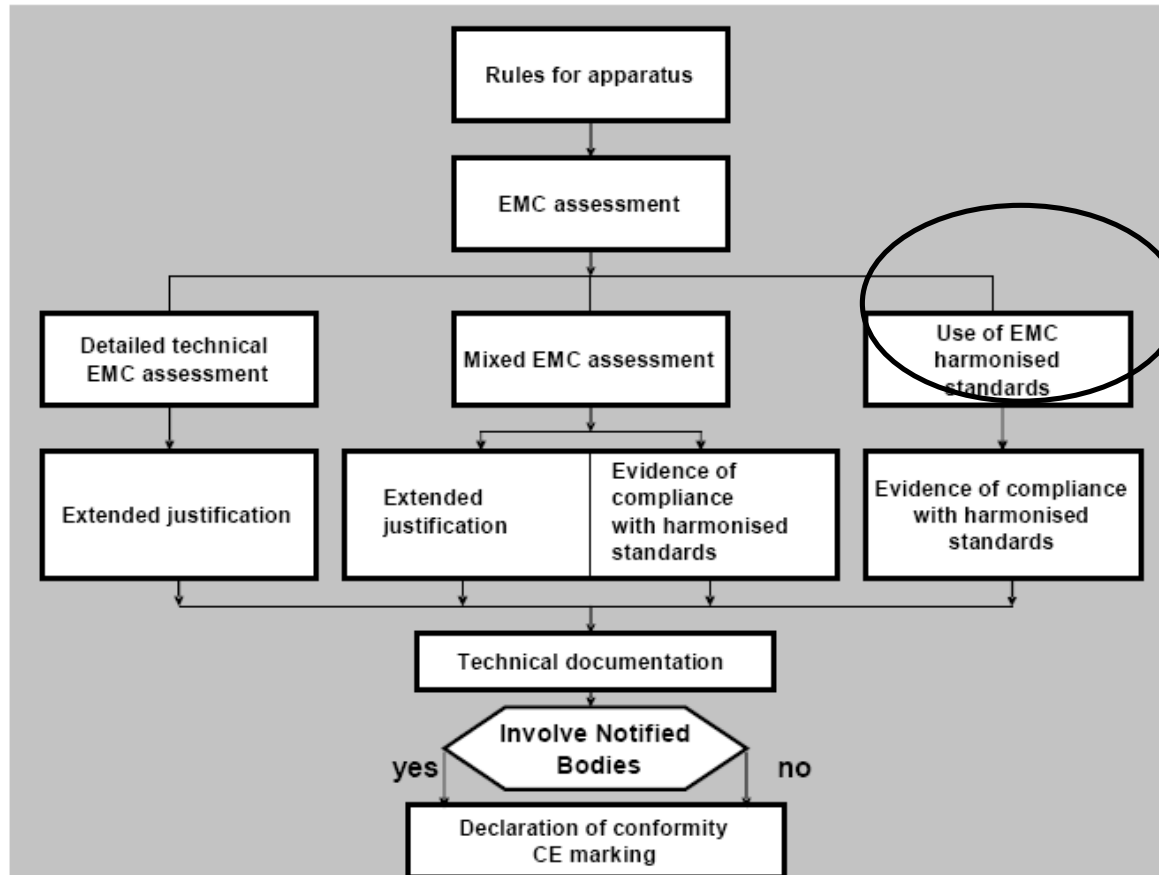
shall be installed applying good engineering practices and respecting the information on the intended use of its components with a view of meeting the protection requirements

The good engineering practices shall be documented and the documentation shall be held by the person responsible at the disposal of the relevant national authorities for inspection purposes.

# Directive 2014/30/EU



Flowchart 5 - Conformity assessment procedure for apparatus

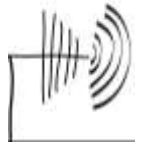




# Directive 2014/30/EU

## Information

- Information requirements for all equipment
  - identification (type, batch, serial number...)
  - name & address of manufacturer
  - name & address of authorised representative in the Community
    - if manufacturer is not established in the Community
  - use instructions
  - specific precautions
    - to ensure the conformity with protection requirements for installation, use and maintenance
  - a clear indication of use restrictions
    - e.g. if conformity is not insured in residential locations

**Suppliers Declaration of Conformity (conform ISO 17050)**

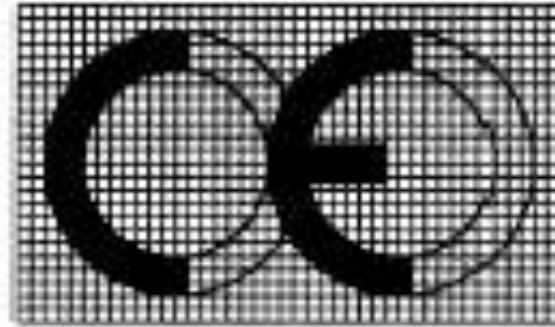
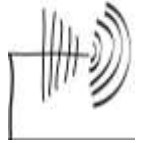
1. **Number of SdoC:** 23456
2. **Issuer's name:** Electronic Emission Presentation B.V.  
Immunitystreet 2  
Emission City  
Belgium
3. **Object of declaration:** Seminar Presentation Machine  
Honshu Model de Luxe
4. **The object of declaration described above is in conformity with the requirements of the following documents:**

<b>Document No:</b>	<b>Title</b>
2004/108/EC	EU EMC Directive (December 2004)
<b>EU Harmonised standards</b>	EN 88099:2009 EN 99099:2010 EN 99088:2008 Part X except Chapter Y
<b>EEP test method: 2009</b>	Test method XYZ. To cover the parts of EN 99088 not being applied
5. **Additional information** A technical documentation nr. Global Presentation nr. YZZ is available to document compliance of the excluded part of the harmonized standard
6. **Signed for and on behalf of:** Electronic Emission presentations B.V.
7. **Date:** 30 August 2010
8. **Name and Function:** Mr. E Veen Managing Director



# Directive 2014/30/EU

## CE Marking



The 'CE' marking must have a height of at least 5 mm. If the 'CE' marking is reduced or enlarged the proportions given in the above graduated drawing must be respected.

The 'CE' marking must be affixed to the apparatus or to its data plate. Where this is not possible or not warranted on account of the nature of the apparatus, it must be affixed to the packaging, if any, and to the accompanying documents.

Where the apparatus is the subject of other Directives covering other aspects and which also provide for the 'CE' marking, the latter shall indicate that the apparatus also conforms with those other Directives.

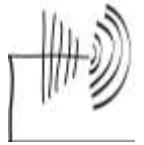
However, where one or more of those Directives allow the manufacturer, during a transitional period, to choose which arrangements to apply, the 'CE' marking shall indicate conformity only with the Directives applied by the manufacturer. In that case, particulars of the Directives applied, as published in the *Official Journal of the European Union*, must be given in the documents, notices or instructions required by the Directives and accompanying such apparatus.



## Directive > Harmonised Standards

2014/30/EU	Cenelec	EN 55015:2006, EN 55015:2006/A1:2007, EN 55015:2006/A2:2009	Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment	20/04/2016	OJ C 173 - 13/05/2016
2014/30/EU	Cenelec	EN 55015:2013	Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment	20/04/2016	OJ C 173 - 13/05/2016
2014/30/EU	Cenelec	EN 55022:2010, EN 55022:2010/AC:2011	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	20/04/2016	OJ C 173 - 13/05/2016
2014/30/EU	Cenelec	EN 55024:2010	Information technology equipment - Immunity characteristics - Limits and methods of measurement	20/04/2016	OJ C 173 - 13/05/2016
2014/30/EU	Cenelec	EN 55032:2012, EN 55032:2012/AC:2013	Electromagnetic compatibility of multimedia equipment - Emission requirements	20/04/2016	OJ C 293 - 12/08/2016
2014/30/EU	Cenelec	EN 55035:2017	Electromagnetic compatibility of multimedia equipment - Immunity requirements	06/08/2019	OJ L 206 - 06/08/2019

# Directive 2014/30/EU Transposition (Art. 16)



Belgian law December 1st, 2016

Competent authorities:

SPF Economie – DG Energie

SPF Emploi – DG Contrôle du Bien-être au Travail

IBPT/BIPT

Notified Bodies:

[http://ec.europa.eu/growth/tools-databases/nando/index.cfm?fuseaction=directive.notifiedbody&ir\\_id=153681](http://ec.europa.eu/growth/tools-databases/nando/index.cfm?fuseaction=directive.notifiedbody&ir_id=153681)





# Standardisation in EMC

Véronique Beauvois, Ir.  
2020-2021



# Content

Directive > Standards  
Standardisation committees  
International Level  
European Level  
National Level  
Standards types : basic, generic, product  
Conclusions



# Directive > Standards

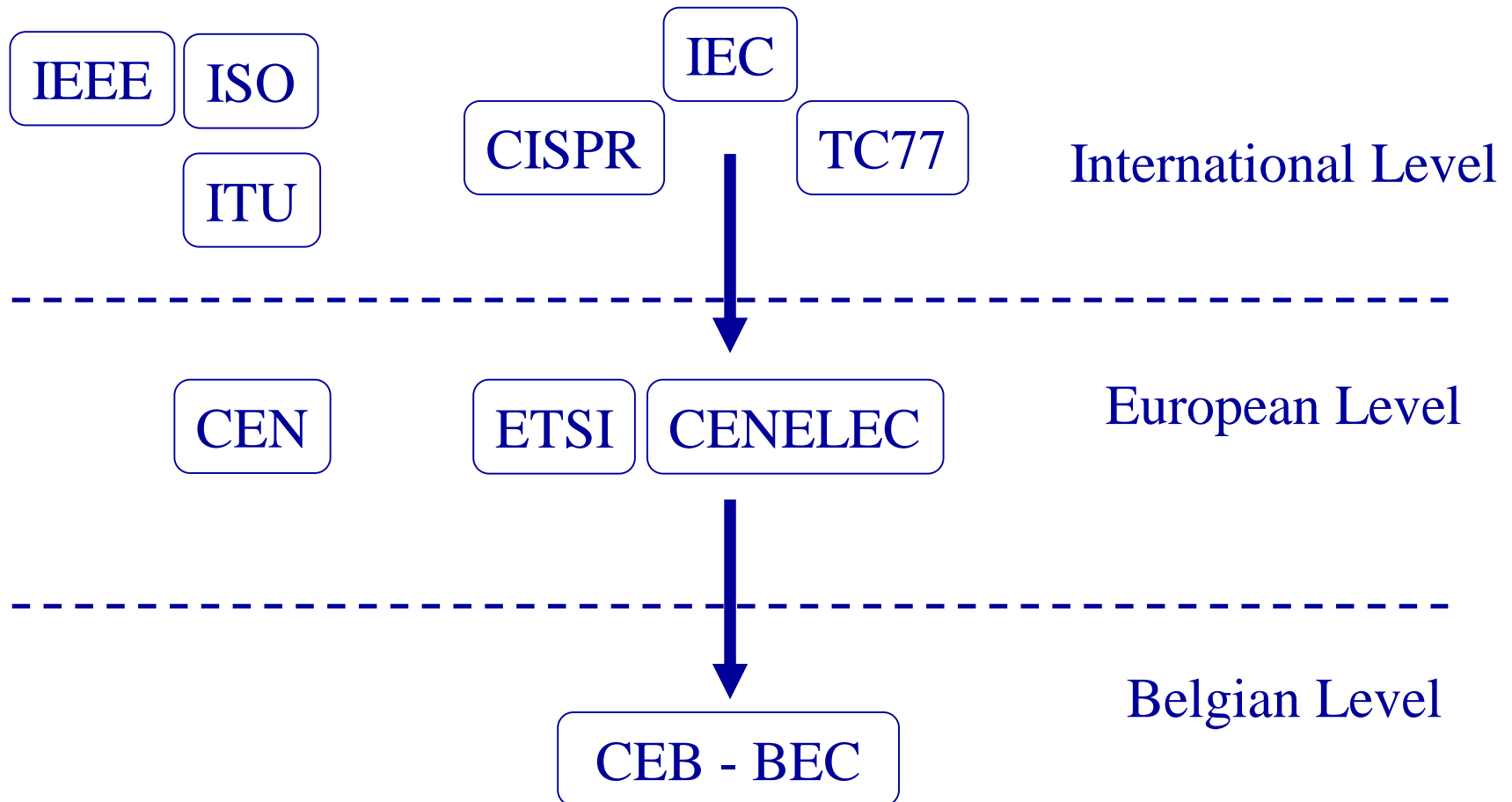
« **New Approach** »: technical harmonisation which defines a clear difference between the responsibilities of the European legislator and the European standardisation committees (CEN, CENELEC, ETSI) in a legal framework to facilitate the movement of goods.



- European directives define essential requirements (health, safety and environmental issues);
- European standardisation committees publish technical specifications in standards to answer to the essential requirements (presumption of conformity) and then they are considered as “harmonised standards”.



# Standardisation Committees (EMC)





# International Level (IEC / CISPR)



Documents types: standards, reports, technical reports, guides

IEC: divided in commissions and sub-commissions

EMC:

**TC 77** (1973) – horizontal commission – divided in sub- commissions

SC 77A (L.F.  $\leq 9$  kHz)

SC 77B (H.F.  $> 9$  kHz)

SC 77C (High power transient phenomena)

# International Level (IEC / CISPR)



IEC: divided in commissions and sub-commissions

EMC:

**CISPR** (1933) (The International Special Committee on Radio Interference).

-Main task: from 9 kHz, prepare standards to protect radio reception from interference sources (IT, lighting, ISM, ...)

- divided in sub-commissions.



# European Level (CENELEC)



Frequently IEC > CENELEC

Divided in commissions and sub-commissions.

EMC: TC 210 – horizontal commission – divided in W.G.



# Belgian Level (CEB-BEC)



Bureau de Normalisation (**NBN**)

Comité Electrotechnique Belge (**CEB-BEC**)

Membre of IEC and CENELEC. Same TCs.

Publication of standards from IEC and CENELEC

**NBN** = Norme Belge – Belgische Norm

Modifications, exceptions and/or possible additions

[www.nbn.be](http://www.nbn.be)



# Types of standards in EMC

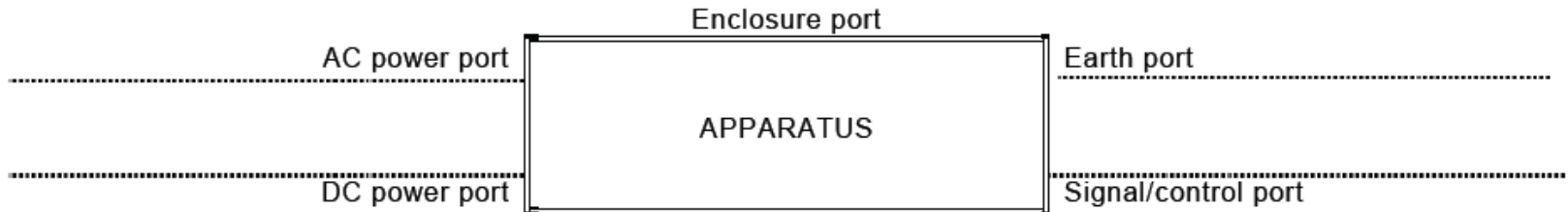


Type	Contents	Aims
<b>BASIC (*)</b>	<ul style="list-style-type: none"> <li>- Measurement and test methods</li> <li>- Instrumentation</li> <li>- Test set-up</li> <li>- Ranges of test levels (immunity)</li> <li>- No limits/No performance criteria</li> </ul>	<ul style="list-style-type: none"> <li>- Reference documents</li> <li>- No conformance testing of products (Not published in the OJEU list)</li> </ul>
<b>GENERIC</b>	<ul style="list-style-type: none"> <li>- Precise and essential requirements (limits) for all products intended for use in each environment i.e. residential, commercial, light industry and industry</li> <li>- Refer to basic standards for measurement/test methods (no repetition)</li> <li>- General performance criteria</li> </ul>	<ul style="list-style-type: none"> <li>- Conformance testing of products (Published in the OJEU list)</li> <li>- Co-ordination tool for product (family) standards</li> </ul>
<b>PRODUCT-FAMILY</b>	<ul style="list-style-type: none"> <li>- EMC requirements for product-families</li> <li>- More detailed performance criteria</li> <li>- Specific test set-up etc.</li> <li>- Refer to basic standards for measurements/tests (no repetition)</li> </ul>	<ul style="list-style-type: none"> <li>- Conformance testing of products (Published in the OJEU list).</li> <li>- Precedence over generic standards but to be co-ordinated with them.</li> </ul>
<b>DEDICATED PRODUCT</b>	<ul style="list-style-type: none"> <li>- Same as for product-family but more specific.</li> </ul>	<ul style="list-style-type: none"> <li>- Same as for product-family but more specific.</li> <li>- Generally not needed for emission</li> </ul>

[Cenelec Guide 24]



# Apparatus - Ports



Tests are related to different ports:

- Enclosure: E & H (LF & HF), DES
- Power supply ports ( AC/DC)
- Signal/Control ports (Ethernet, RS-232, ...)



## Basic Standards - Immunity

Electrostatic discharge (ESD)	IEC 61000-4-2	EN 61000-4-2
Radio-frequency electromagnetic field	IEC 61000-4-3	EN 61000-4-3
Electrical fast transients/burst - Surges	IEC 61000-4-4	EN 61000-4-4
Conducted high frequency disturbances	IEC 61000-4-5	EN 61000-4-5
Power-frequency magnetic fields	IEC 61000-4-6	EN 61000-4-6
Pulse magnetic fields	IEC 61000-4-8	EN 61000-4-8
Damped oscillatory magnetic fields	IEC 61000-4-9	EN 61000-4-9
Voltage variations, dips and interruptions	IEC 61000-4-10	EN 61000-4-10
Oscillatory waves	IEC 61000-4-11	EN 61000-4-11
Harmonics and interharmonics including mains signally at ac power port, low frequency immunity tests	IEC 61000-4-12	EN 61000-4-12
Voltage fluctuations	IEC 61000-4-13	EN 61000-4-13
Conducted low-frequency disturbances	IEC 61000-4-14	EN 61000-4-14
Ripple on dc input power port	IEC 61000-4-16	EN 61000-4-16
Unbalance	IEC 61000-4-17	EN 61000-4-17
Variation of power frequency	IEC 61000-4-27	EN 61000-4-27
Voltage variations and dips on dc power ports	IEC 61000-4-28	EN 61000-4-28
	IEC 61000-4-29	EN 61000-4-29

[Cenelec Guide 24]



# Generic Standards

## 1 - Residential, commercial and light industrial

EN 61000-6-3 Generic emission standard.

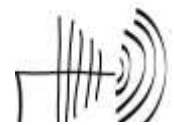
EN 61000-6-1 Generic immunity standard.

## 2 - Industrial

EN 61000-6-4 Generic emission standard.

EN 61000-6-2 Generic immunity standard.

[Cenelec Guide 24]



**Table 4 – Immunity requirements – Input and output AC power ports**

	Environmental phenomena	Test specifications		Units	Basic standards	Remarks	Performance criterion
4.1	Radio-frequency common mode	0,15 to 80 10 80		MHz V % AM (1 kHz)	IEC 61000-4-6	The test level specified is the r.m.s. value of the unmodulated carrier. <sup>a</sup>	A
4.2	Voltage dips	0 1		% residual voltage cycle	IEC 61000-4-11 IEC 61000-4-34	Voltage shift at zero crossings. <sup>b, e</sup>	B <sup>c</sup>
		40 10/12 at 50/60 Hz	70 25/30 at 50/60 Hz	% residual voltage cycle			C <sup>c</sup>
4.3	Voltage interruptions	0 250/300 at 50/60 Hz		% residual voltage cycle	IEC 61000-4-11 IEC 61000-4-34	Voltage shift at zero crossings. <sup>b, e</sup>	C <sup>c</sup>
4.4	Surges	1,2/50 (8/20)		$T_r/T_d$ $\mu$ s	IEC 61000-4-5	See Clause 5, paragraph 3 of this standard. <sup>d</sup>	B
	line-to-earth	$\pm 2$		kV (open circuit test voltage)			
	line-to-line	$\pm 1$		kV (open circuit test voltage)			
4.5	Fast transients	$\pm 2$		kV (open circuit test voltage)	IEC 61000-4-4	<sup>f</sup>	B
		5/50		$t_r/t_w$ ns			
		5 or 100		Repetition frequency kHz			

<sup>a</sup> The test level can also be defined as the equivalent current into a 150  $\Omega$  load.

<sup>b</sup> Applicable only to input ports.

<sup>c</sup> For electronic power converters, the operation of protective devices (e.g. undervoltage protection) and the performance criterion C are allowed.

<sup>d</sup> For supply voltages where no test equipment is commercially available (e.g. CDNs), this test is not required.

<sup>e</sup> The test shall be carried out at the frequencies appropriate to the power supply frequency. Equipment intended to be used in regions where only one of these frequencies is applied needs to be tested at this specific frequency only.

<sup>f</sup> The test may be performed at one or at both repetition frequencies. The use of 5 kHz repetition frequency is traditional; however, 100 kHz is closer to reality.



# European Directives

Véronique Beauvois, Ir.  
2020-2021



Electric or electronic equipment > EMC 2014/30/EU

Radio equipment: an electrical or electronic product, which intentionally emits and/or receives (RED art.2) radio waves for the purpose of radio communication and/or radio determination, or an electrical or electronic product which must be completed with an accessory, such as antenna, so as to intentionally emit and/or receive radio waves for the purpose of radio communication and/or radio determination > RED 2014/53/EU

i.e. : transmitter, receiver or transceiver

Combined equipment: (definition acc. to ETSI EG 203 367) equipment consisting of two or more products where at least one of which is radio communication or radio determination equipment

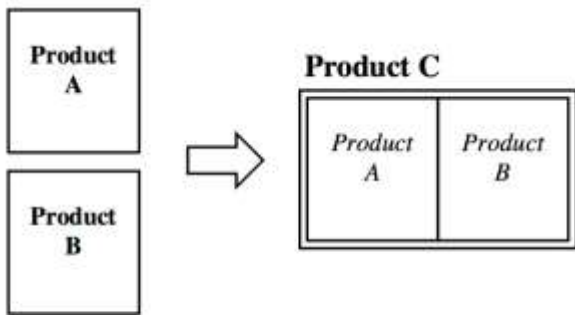


Figure 1: Concept of combined equipment (Product C)

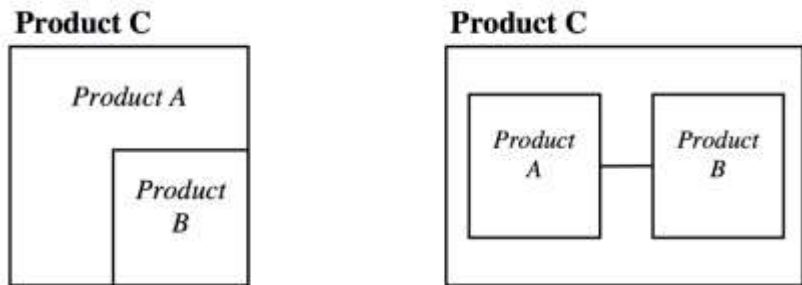
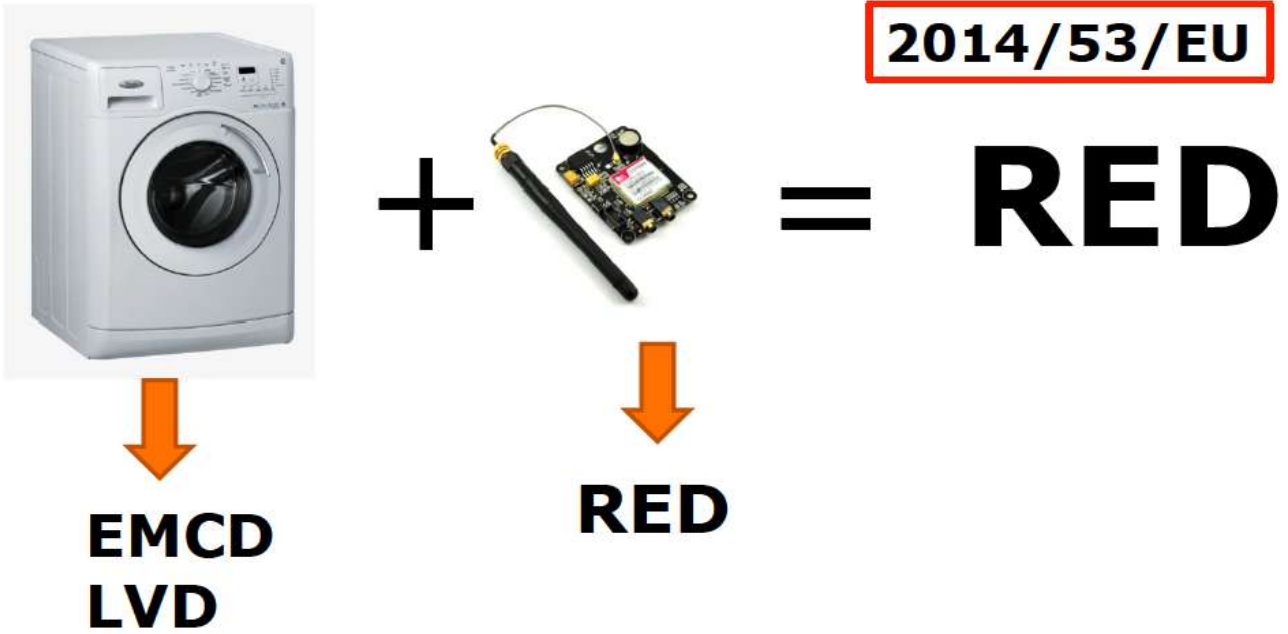


Figure 2: Example configurations of combined equipment (Product C)



# Radio inside = RED!!



Applies to many other product groups, such as:  
ITE, machinery, toys, measuring instruments, etc





- 🔗 CAP according LVD & EMC harmonized standards on **Barco projector HDX-W12**

- EN 60950-1 (product safety)
- EN 55032 (EMC emissions)
- EN 55024 (EMC immunity)



- 🔗 Certificate on WiFi module 802.11a/b/g/n according

- EN 300 328 (2,4 GHz wide band mod.)
- EN 301 893 (5 GHz)



- 🔗 Combined product: WiFi module integrated in projector:

➔ **check ETSI EG 203 367  
for assessment on combination**





## Combined equipment > ETSI EG 203 367

- The manufacturer of the combined equipment is responsible to ensure the conformity of the equipment against the RED 2014/53/EU.
  - Re-use of existing assessment: The manufacturer of the combined equipment should install the radio product in a host non-radio product in equivalent assessment conditions and according to the installation instructions for the radio product.
  - Need for full re-assessment (assessment and tests are different):
    - If radio product in the host non-radio product not installed in equivalent assessment conditions or not according to the installation instructions for the radio product.

It is essential to think about assessment when choosing a radio product!

Some advices: making a cost trade of between test & certification vs certified module, select radio product which has been tested in the modes you are going to use it, use connectors which are stated in the installation manual, use same antenna or antenna with exact same gain, implement radio product away from high frequency component and power cables, take the same design approach in **all your products** > enables reuse of (parts) of your assessment,...



## References

- 2014/53/EU <http://eur-lex.europa.eu/legal-content/EN/TXT?qid=1436887281223&uri=CELEX:32014L0053>
- The Blue Guide <http://ec.europa.eu/DocsRoom/documents/18027>
- Guide to the Radio Equipment Directive 2014/53/EU – Version of June 2018
- ETSI EG 203 367 [http://www.etsi.org/deliver/etsi\\_eg/203300\\_203399/203367/01.01.01\\_60/eg\\_203367v010101p.pdf](http://www.etsi.org/deliver/etsi_eg/203300_203399/203367/01.01.01_60/eg_203367v010101p.pdf)
- Normes harmonisées [https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards\\_en](https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards_en)
- ETSI standards (for free) <http://www.etsi.org/standards>