EMC and RE directive

–

Wireless module integration (EU and FCC requirements)

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Who am I?

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- **Title:** **Head of Laboratory**
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- **Experience:** **16 years experience in EMC and wireless compliance, covering multiple product types. Extensive knowledge of the EMC and RE Directive.**
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TECHNOLOGICAL INFRASTRUCTURE OF THE SLOVENE ECONOMY
SIQ provides important support to the Slovene economy.

BY ASSESSMENTS AND BY TRANSFERRING OUR KNOWLEDGE AND EXPERIENCE we contribute to the development of the society that is knowledge driven and based on products and services of the highest quality.

KNOWLEDGE
PARTNER RELATIONS
COMPLETE SOLUTIONS
INTEGRITY
INDEPENDENCE
IMPARTIALITY

SCOPE OF ACTIVITIES

METROLOGY

SAFETY AND ELECTROMAGNETICS

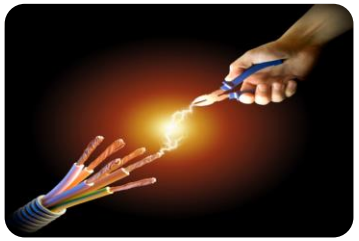
SEMINARS

MANAGEMENT SYSTEMS

EXPLOSION PROTECTION

GAMING TECHNOLOGIES

INFORMATION TECHNOLOGIES



COMPETENCE

- **11 ACCREDITATIONS**
- NOTIFIED BODY UNDER **8 DIRECTIVES** AND **1 REGULATION**
- **NATIONAL** METROLOGY LABORATORY
- COOPERATION IN THE INTERNATIONAL NETWORK FOR MANAGEMENT SYSTEMS ASSESSMENT - **IQNET**
- COOPERATION IN **INTERNATIONAL AGREEMENTS** AND **SCHEMES** FOR PRODUCT TESTING AND CERTIFICATION (IECEE-CB, CB-FCS, IECEX, ETICS (EEPCA), ETC.)

SIQ WORLDWIDE

SLOVENIA - SIQ Ljubljana

CROATIA - SIQ Croatia d.o.o.

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SIQ Macedonia (representative office)

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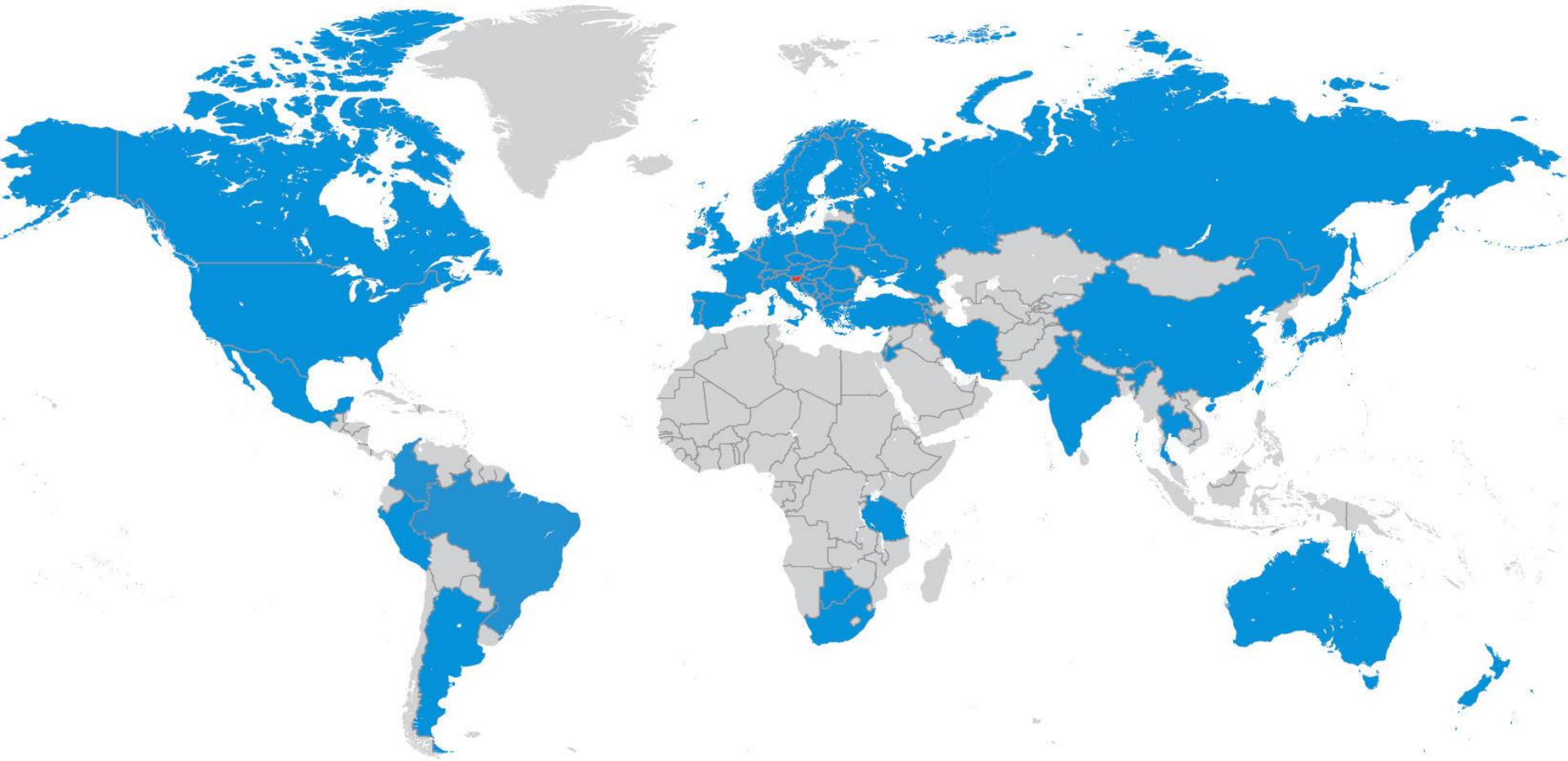
PARTNERS FROM MORE THAN 65 COUNTRIES



SIQ LJUBLJANA

TRŽAŠKA 2, LJUBLJANA

- METROLOGY
- MANAGEMENT SYSTEMS ASSESSMENT
- EXPLOSION PROTECTION

MAŠERA-SPASIĆEVA ULICA 10, LJUBLJANA

- SAFETY AND ELECTROMAGNETICS
- GAMING TECHNOLOGIES

DUNAJSKA CESTA 159 , LJUBLJANA

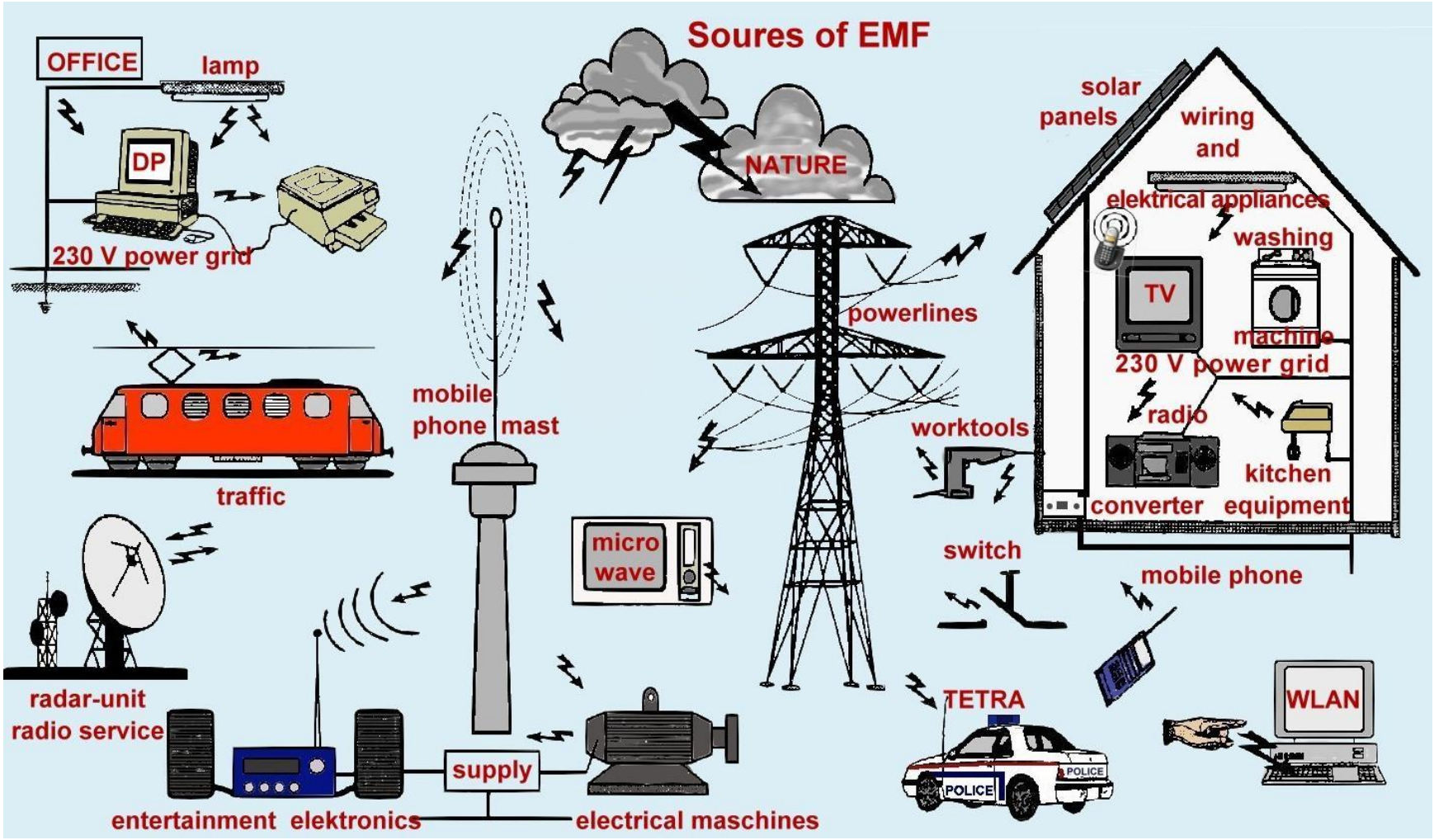
- SEMINARS

Topics

- **EMC directive 2014/30/EU**
- **New EMC Laboratory - capabilities**
- **RE directive 2014/53/EU**

- **Radio module – integration in to the final product**
  - **EU requirements**
  - **FCC requirements**

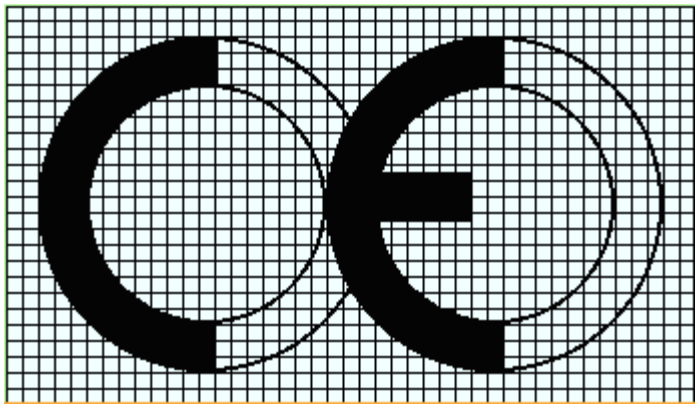
What is EMC?


Soures of EMF
OFFICE
lamp
DP
230 V power grid
NATURE
solar
panels
wiring
and
elektrical appliances
washing
machine
TV
230 V power grid
powerlines
mobile
phone mast
traffic
worktools
radio
kitchen
converter
equipment
micro
wave
switch
mobile phone
radar-unit
radio service
TETRA
WLAN
POLICE
supply
entertainment elektronics
electrical maschines

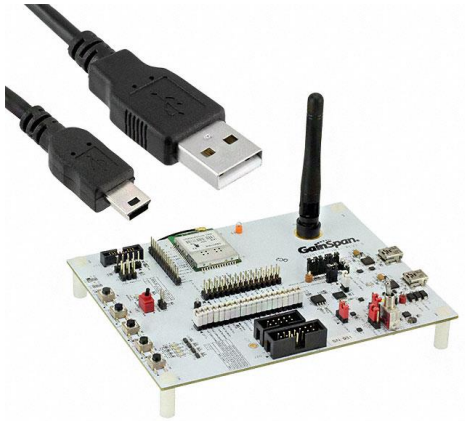
EMC Directive 2014/30/EU

- **Old EMC directive 2004/108/EC**
- **EMC directive 2014/30/EU**

is a consequence of aligning the **old EMCD** with the requirements of the New Legislative Framework (**NLF**).



Scope Changes



- Does not apply to custom built evaluation kits for professionals used solely at research & development facilities

- Broadcast receivers (TV, Radio) moved to RED from EMCD

- Telecom terminal equipment moved to EMC-D from old R&TTE-D

- Transmitters operating <9 kHz moved from EMC-D to RE-D

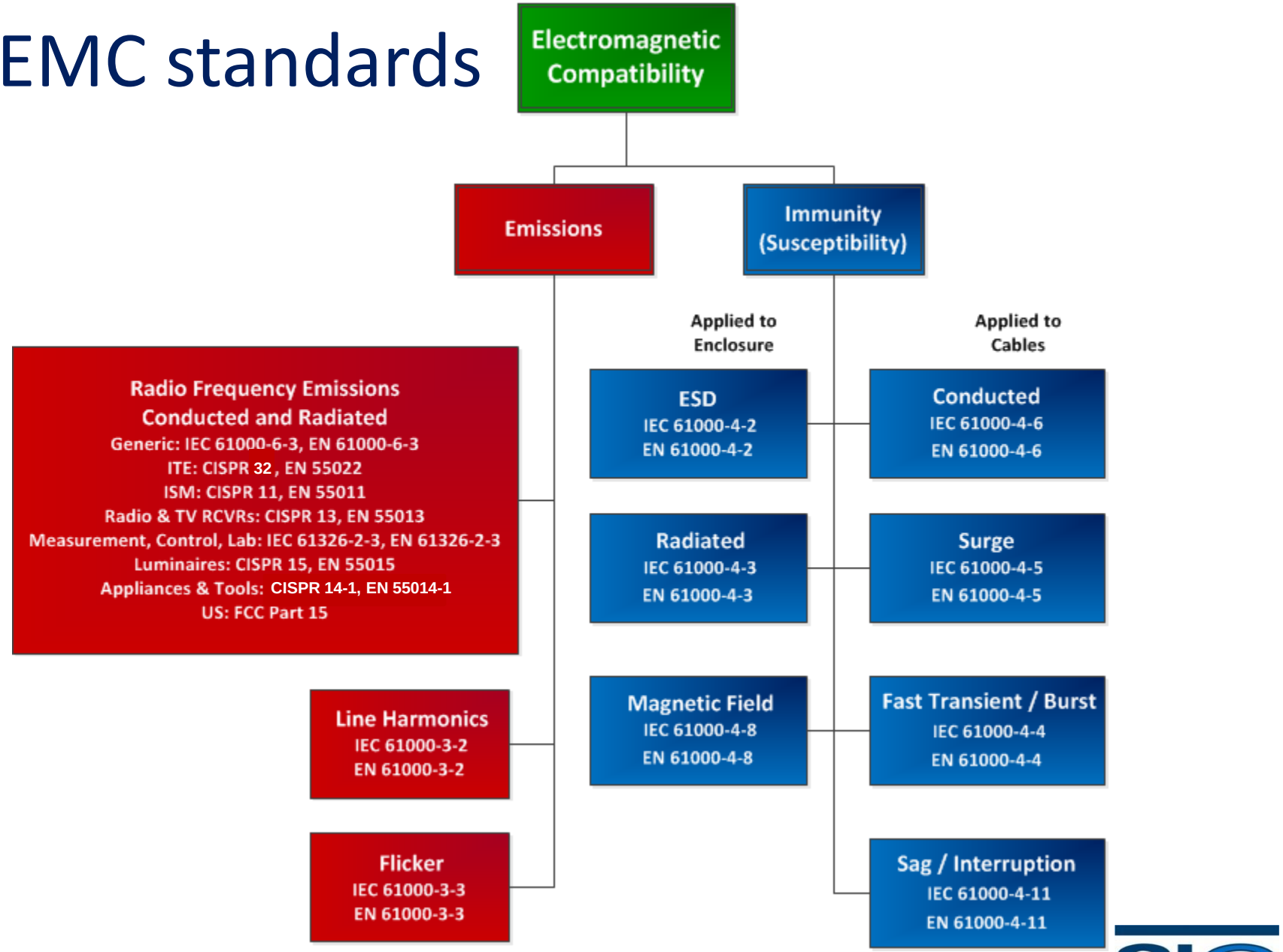
EMCD – Essential requirements

- **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.

EMC standards



Product Labelling

Manufacturer's Trade Name/Mark:

Full Postal Address:

Web Address: (recommended but not mandatory)

Importer's Label; Trade Name/Mark:
Full Postal Address:

Product Name/Type:
Batch/Serial Number:

CE

Other Directives may require further data

Topics

- EMC directive 2014/30/EU
- **New EMC Laboratory - capabilities**
- RE directive 2014/53/EU
- Radio module – integration in to the final product
  - EU requirements
  - FCC requirements

New SIQ premises („EMC“)

Industrial SAC, 3 m (2x)

Automotive SAC (1x)

Control room (4x)

Test room, H and V ground plane (6x)

Test room, H and V ground plane (1x)

- **Test room for larger samples**
- **Test equipment is moved to this location**

EMC Laboratory – key facts

- **Over all cca. 800 m2**
- **21 employees**
- **14 test sites**
- **Two amplifiers sets (up to 6 GHz, 250 V/m; 600 V/m)**
- **SA, IECEE and FCC part 15/18 accredited**
- **Notified body for EMC and RE-D**
- **CAB for FCC**
- **Sub-contracting EMC Laboratory in Serbia (SIQ Beograd)**
- **Cooperation with EMC Laboratory in Mahle Letrika**
- **Acquiring FCC ID and IC Canada, E-mark, …**

Topics

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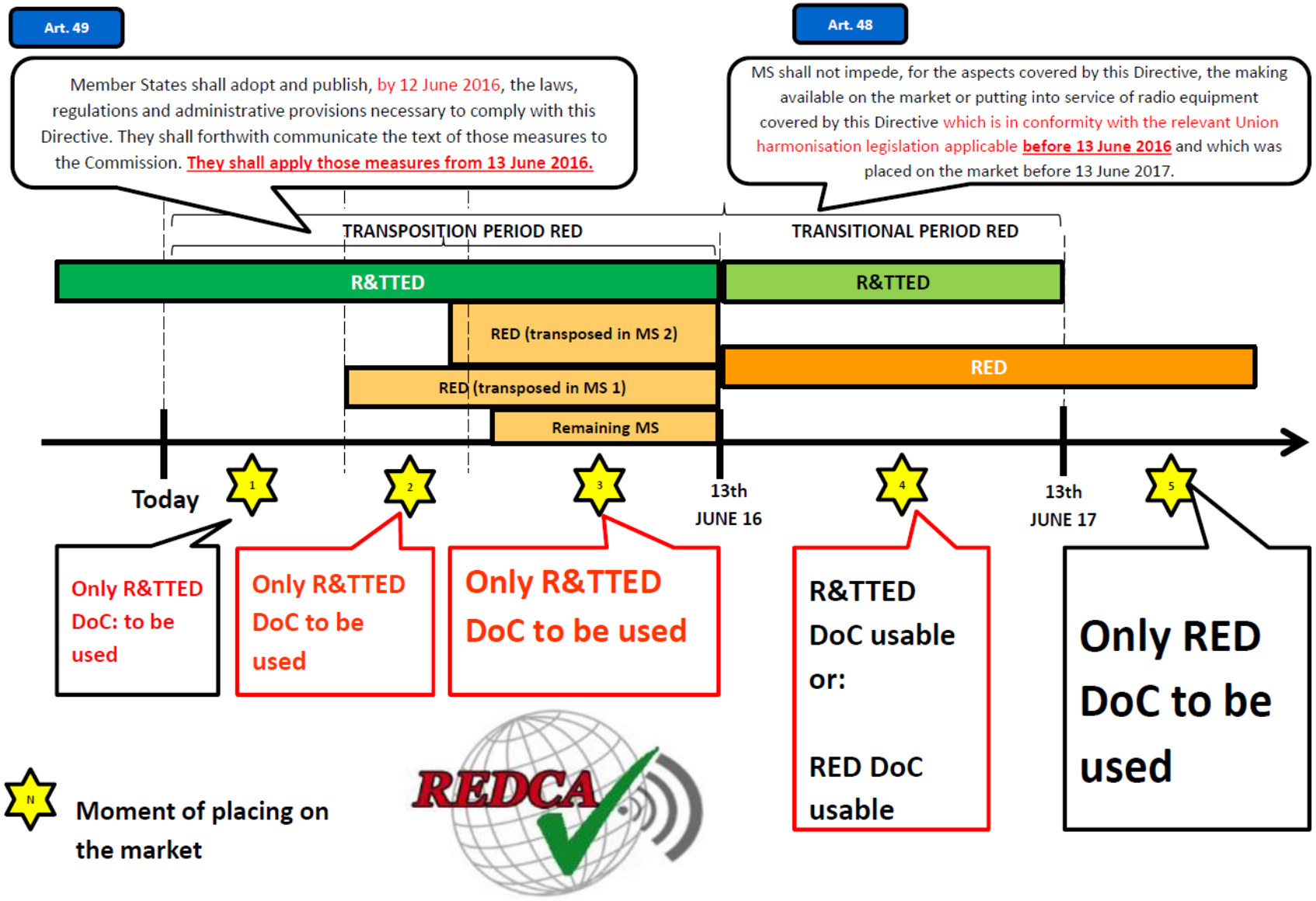
Radio Equipment Directive (RED)

- **R**adio **E**quipment (**RE**) Directive (**2014/53/EU**) replaced the R&TTE Directive.
- This has been a work in progress since 2007.
- **RED** is a consequence of aligning the **R&TTED** with the requirements of the New Legislative Framework (**NLF**).

Timing of the RED



Major changes 1/3

- **RED** only applies to wireless/radio products; wired Telecom Terminal Equipment (**TTE**) is not covered anymore,
- **RED** scope includes radio communication and also radio determination (RFID, radar, movement detectors, etc.) equipment,
- Radio devices operating below 3000 GHz included,
- **RX** only (like GPS) devices remain in scope,

Major changes 2/3

- **Evaluation kits** are now **excluded** (no approval required),
- **No lower limit** of the covered frequency range (for R&TTE lower limit was 9 kHz), upper limit remains at 3000 GHz,
- Safety requirements now explicitly apply also for **animal related equipment** (was in R&TTE but not clear to many readers),
- **Broadcast receivers** now fall into the scope,

Major changes 3/3

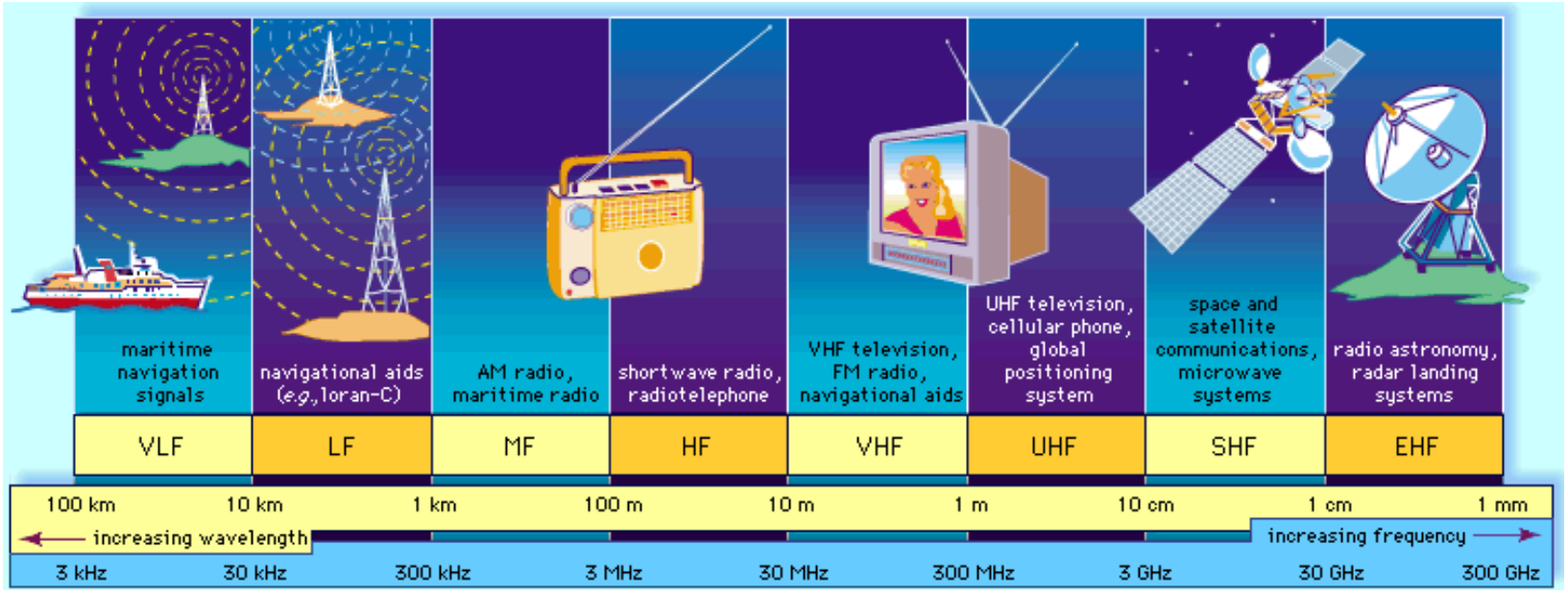
- RED requires **common/universal chargers**,
- No more equipment **class 2** notifications,
- No more class 2 labelling (**Alert Sign**),
- **Notified Body number** only applies if the **Quality System** of the manufacturer was assessed against RED requirements (Full Quality Assurance – **Module H**),
- No more CE mark in the **user manual**,
- NB Opinion is replaced by "**EU-Type Examination Certificate**".

Equipment not covered by RED

- Radio equipment used by **radio amateurs**, unless the equipment is made available on the market,
- **Marine** equipment (Council Directive 96/98/EC),
- **Airborne** products, parts and appliances (Article 3 of Regulation (EC) No 216/2008),
- **Custom-built evaluation kits** destined for professionals to be used solely at research and development facilities for such purposes.

Essential requirements

- **Art. 3.1(a):** Health and Safety requirements as LVD, **but with no lower voltage limit**
- **Art. 3.1(b):** EMC requirements as EMCD
- **Art. 3.2:** effective and efficient use of radio spectrum to avoid harmful interference



Topics

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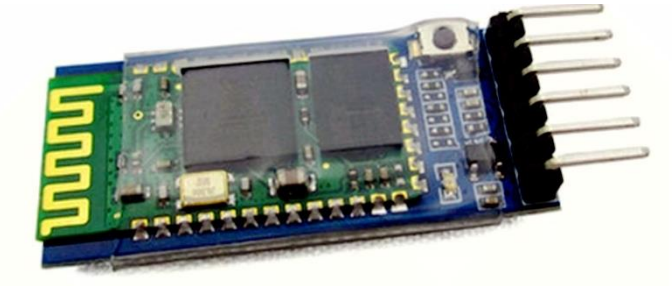
  - FCC requirements
-

Why use Wireless Modules?

- **What are Wireless modules?**

  Wireless modules are “building blocks” that can be assembled in to an application quickly and without any great RF expertise, greatly reducing development time and overall project risk.



- **Why use a module?**

  Manufacturers/integrators are no longer required to possess a strong understanding of RF engineering principles or complex manufacturing experience to obtain Wireless communication.

Wireless Modules - Benefits

- **Benefits of Wireless modules**
  - Reduced Time to Market
  - Reduced Development & Testing Expense (cost savings can be huge!)
  - Inherited Certification Testing
  - Simplified Manufacturing
  - Stable Hardware Platform
  - Technology Maintenance
  - Easy to Use . . .

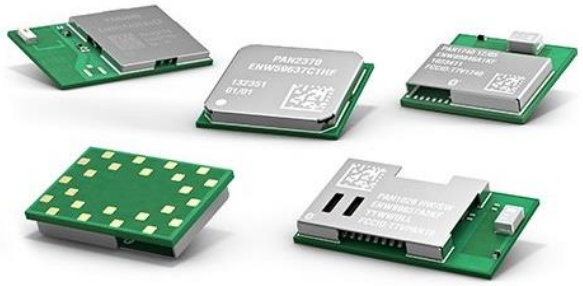
Most common Modules integrated

2.4 GHz ISM Band (Worldwide band – very commonly used)

- Bluetooth, Zigbee, WLAN 802.11 b/g/n (WiFi)

5 GHz ISM Band

- WLAN 802.11 a/n/ac (WiFi)



Below 1 GHz

- Short Range Devices (SRD) 13,56/433/868/915MHz (Frequency bands defined by region)

Licensed Cellular

- GSM/CDMA2000 (2G), W-CDMA (3G), LTE (4G), Satellite (Iridium etc.)

Module integrating

There are two typical scenarios:

a) A Radio Module **not placed on the market** but integrated in a product by a (number of) different manufacturer(s) who places the final product on the market.

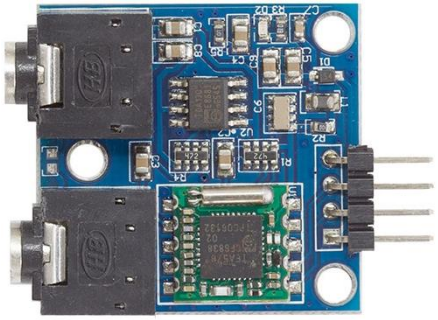
b) An assessed Radio Module **placed on the market and integrated** in a product by a (number of) different manufacturer(s) who places the final product on the market.

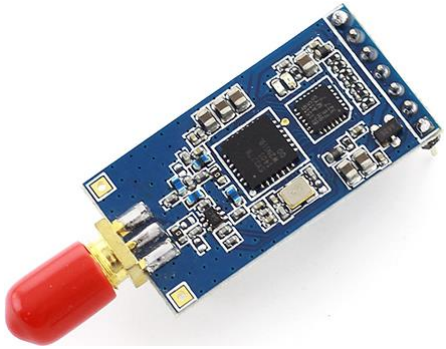
Scenario ″a″

- Module is not placed on the market and, therefore the **RE Directive does not apply**,

- The module **does not require the CE Mark** for the RE Directive,

- The **integrator** (host product manufacturer) **is responsible** for the assessment and marking of the end product which will include the module.





Scenario ″b″

- A Radio Module which is placed on the market and an OEM installs it **must be assessed** to the requirements of the RE Directive for CE Marking

- A **partial assessment** of the RE Directive requirements is **not possible** when applying the CE Mark.

RED - definition

Radio inside = RED!!

EMCD + LVD

+

RED

= **RED**

2014/53/EU

Conformity Assessment

Conformity Assessment Procedures for RED

Conformity Assessment

- Assessment of the final product must be made against the **Essential requirements** of the RE Directive;
  - may include technical analysis, design evaluation and testing.
- The person integrating the module becomes the **manufacturer** of the final product.

EMC testing - Combined Equipment

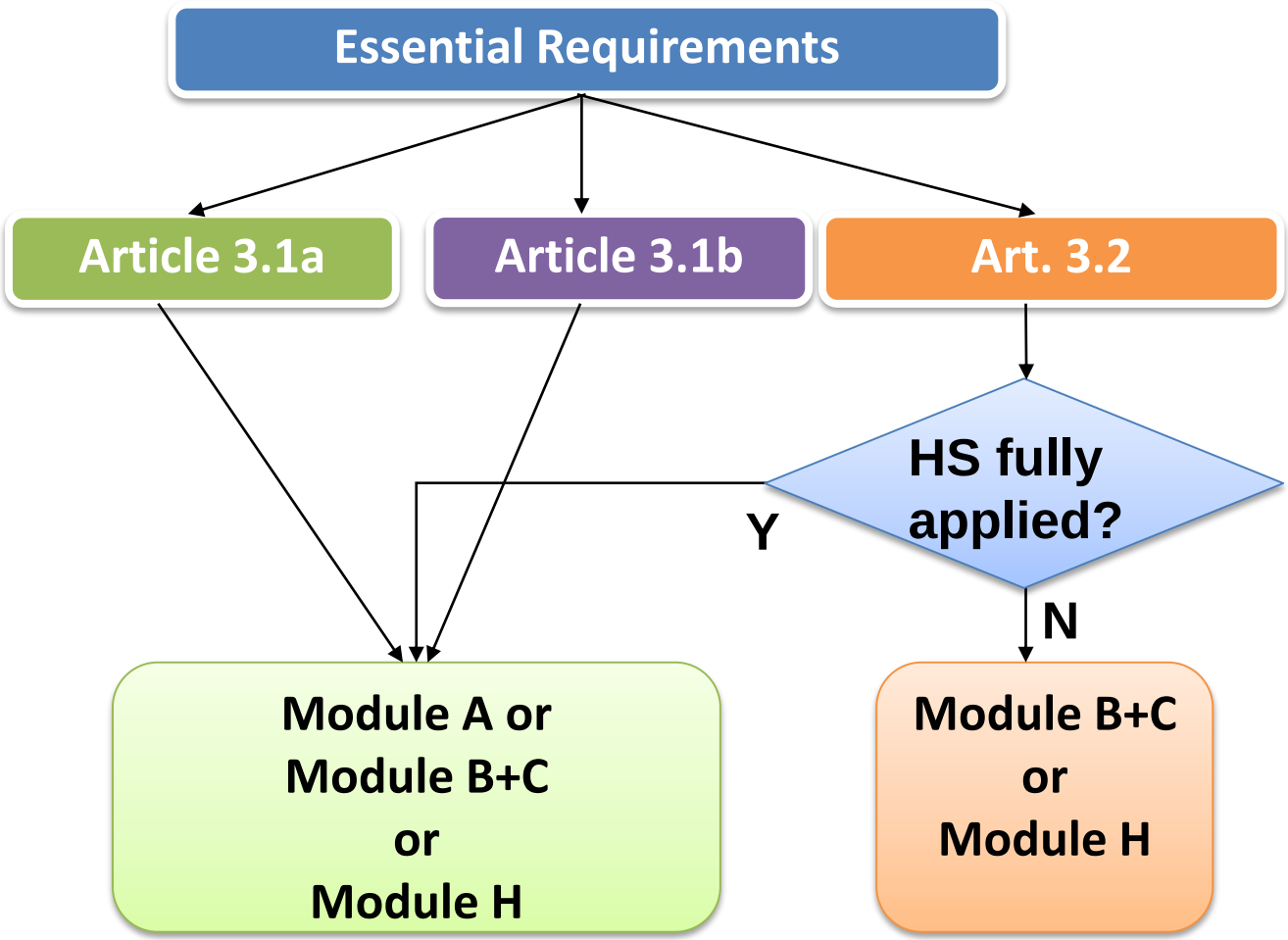
- EN 55014-1
- EN 55014-2
- EN 61000-3-2
- EN 61000-3-3

- EN 301 489-1
- EN 301 489-3
- EN 301 489-17
- EN 301 489-52

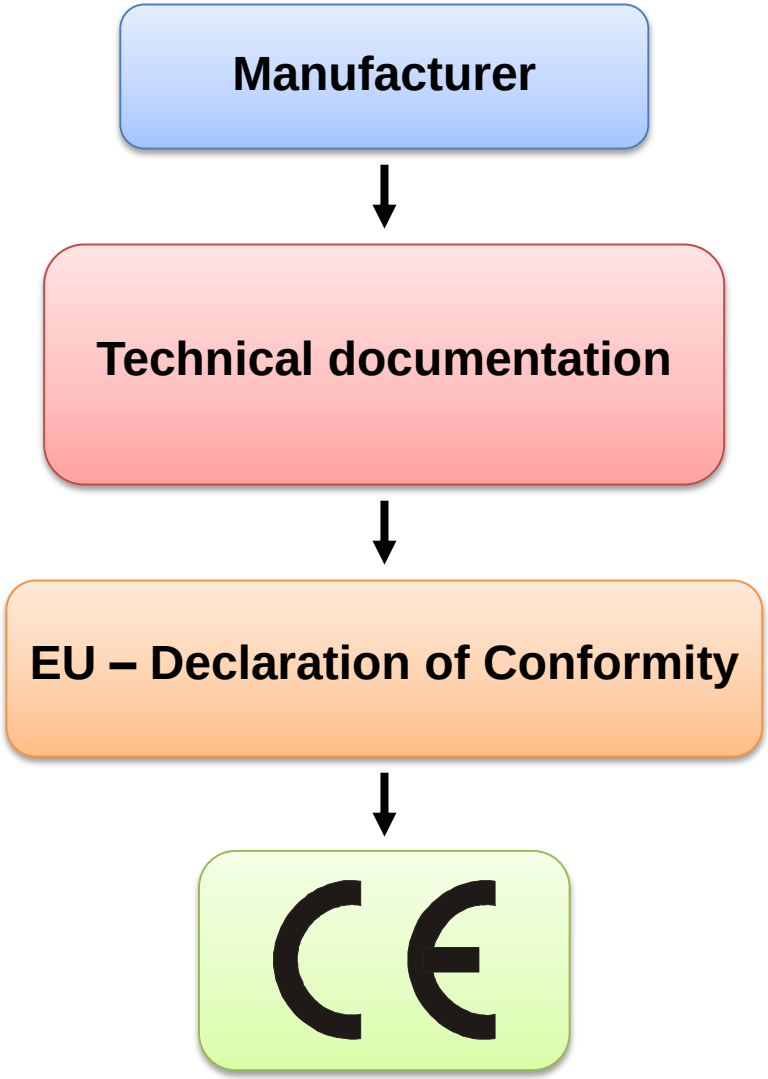
Draft ETSI EN 303 446-1

EMC standard for combined and/or integrated radio and non-radio equipment; Part 1: Requirements for equipment intended to be used in residential, commercial and light industry locations

Conformity assessment



Conformity assessment – Module A



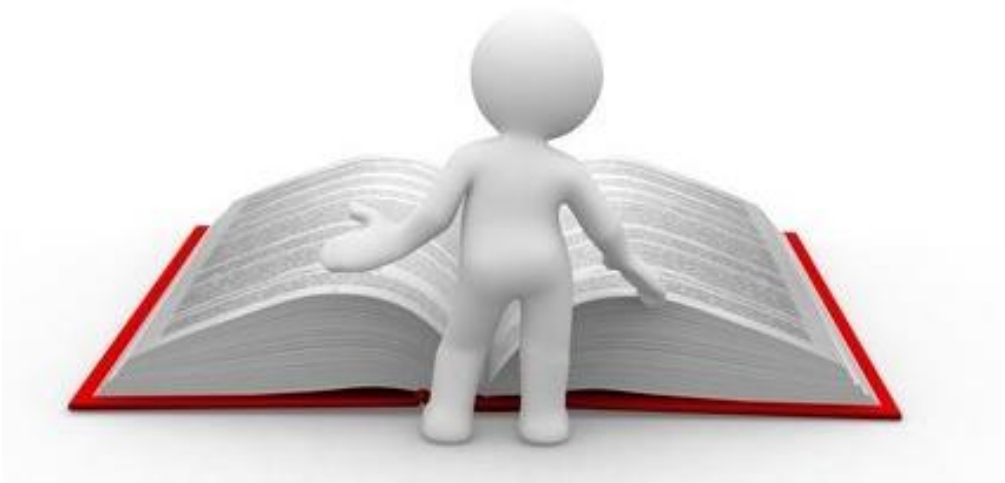
Technical Documentation

- Description of the apparatus,
- General Arrangement drawing,
- List of standards applied,
- Wiring and circuit diagrams,
- Records of risk assessments and assessments to standards,
- Datasheets for critical sub-assemblies,
- Part list (BoM),
- Copies of any markings and labels,
- Copy of instructions (user, maintenance, installation),
- Test reports and certificates,
- Quality control & commissioning procedures,
- EU - Declaration of Conformity.

Technical Documentation

- The **manufacturer** must establish the technical documentation.

- The **manufacturer** or **his authorised representative** must keep it for a period ending at least **10 years** after the last product has been manufactured at the disposal of the relevant national authorities of any Member State for inspection purposes.



EU - DoC

The manufacture must provide the user with a copy of the EU declaration of conformity.

RED - Declaration of Conformity (DoC)

Unique identification of this DoC: ……

We, ……
name and address of the manufacturer and/or if applicable of his authorised representative issuing the declaration (contact information)

……

……

……

declare under our sole responsibility that the product:

product name: ……

trade name: ……

type or model: ……

relevant supplementary information: ……
(e.g. lot, batch or serial number, sources and numbers of items)

to which this declaration relates is in conformity with the essential requirements and other relevant requirements of the RE Directive (2014/53/EU).
The product is in conformity with the following standards and/or other normative documents:

HEALTH & SAFETY (Art. 3(1)(a)): ……
(title and/or number and date of issue of the standard(s) or other normative document(s))

EMC (Art. 3(1)(b)): ……
(title and/or number and date of issue of the standard(s) or other normative document(s))

SPECTRUM (Art. 3(2)): ……
(title and/or number and date of issue of the standard(s) or other normative document(s))

OTHER (incl. Art. 3(3) and voluntary specs): ……
(title and/or number and date of issue of the standard(s) or other normative document(s))

Limitation of validity (if any): ……

Supplementary information:
Notified body involved: ……
……
……
Technical documentation held by: ……
……
……
……

Place and date of issue (of this DoC): ……

Signed by or for the manufacturer: ……
(Signature of authorised person)

Name (in print): ……
Title: ……

Topics

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-

FCC Approval

- **Certification is a mandatory process for radio products.**
- Can be done by:
  - Direct application to FCC
  - Telecommunication Certification Body (TCB)

Modular Radio Cert. Requirements

- **Radio elements must have their own shielding**
- **Buffered I/O (to prevent overflow and modulation distortion)**
- **Self Contained Regulated Power Supply**
- **Permanent antenna or unique coupler**
- **Compliant in a stand alone configuration**
- **Permanently labeled or e-label displayed**
- **User instructions for compliant integration**
- **Compliance with RF exposure requirements**

Modular Certification Types

- **Single Modular**

  Fully self contained module that meets all criteria

- **Limited Modular**

  Radio module that does not meet all modular criteria

- **Split Modular**

  Module having RF section separate from device controls

- **Limited Split Modular**

  A split design that does not meet all modular criteria

Host Device Requirements

- **Review the module certification and comply with applicable grant notes**
- **Configure the radio with the appropriate antenna and support items**
- **Perform SAR or MPE evaluation if necessary**
- **Perform host device testing as required**
- **Apply labelling and update host device user instructions and documents**

Host Device Labeling (sDoC)

- **FCC logo for host devices subject to suppliers Declaration of Conformity equipment authorization.**

Trade name: **Millennium**

Model Number: **TX9000**

Contains FCC ID: **XYZ12-ABC88888888**

Imposed Surveillance

- **TCBs** must annually retest a number of previously approved products equal to 5% of the total number of approvals granted by that TCB in one year.

Summary

- **EMC-D, DoC, …**
- ***New EMC Laboratory…***
- **RE-D, DoC, …**
- ***Radio module – integration***
  - **CE … Two typical scenarios**
  - ***FCC …* Certification is a mandatory**

Common used links

- **Harmonized RED standards**
- https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/red_en
- **IEC**
- https://webstore.iec.ch/
- **CENELEC**
- http://www.cenelec.eu/
- **ETSI**
- http://www.etsi.org
- **SIST**
- http://www.sist.si/

Questions


danke
謝謝
ngiyabonga
teşekkür ederim
спасибо
dank je
thank you
gracias
tapadh leat
bedankt
hvala
mauruuru
mochchakkeram
dziękuję
go raibh maith agat
sagolun
sukriya
kop khun krap
arigatô
takk
dakujem
obrigado
grazie
terima kasih
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ευχαριστώ
merci