Practical Steps from R&TTE to RED
Gap testing and new standards

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Introduction-History

“R&TTE” Vs “RED”
Introduction-History

  The Radio and Telecommunications Terminal Equipment Directive

  Radio Equipment Directive
  - applicable as of 13 June 2016  (subject to one year transitional period)
All equipment in the scope of RED must meet the requirements of 2014/53/EU by 13 June 2017.

- 22 May 2014: 2 year transposition
- 13 June 2016: 1 year implementation
- 13 June 2017: Products placed on the market before 13 June 2017: R&TTE OR RED
  R&TTE no longer give presumption of Conformity after 13 June 2017
Where does RED apply?

EU + EEA-EFTA States

- Iceland
- Liechtenstein
- Norway
- Switzerland

Also valid in

- Turkey
(1) ‘radio equipment' means an electrical or electronic product, which intentionally emits and/or receives 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.
Radio communication means communication by means of radio waves.

'radio waves' means electromagnetic waves of frequencies lower than 3000 GHz, propagated in space without artificial guide' (so limit of 9 kHz has been removed)
Radio determination means determination of the position, velocity and/or other characteristics of an object.
Change in scope from R&TTE to RED

**R&TTE frequency range:** 9 kHz- 3000 GHz

**RED frequency range:** 0 - 3000 GHz

- Equipment operating below 9 KHz, previously excluded, will now fall within the scope of the RED.

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New products in RED

Broadcast Radio and TV receivers *(previously excluded, will now fall within the scope of the RED, EMCD → RED)*
New products in RED < 9 kHz (moved from EMC to RED)

Railway applications

Robotic lawnmowers
New products in RED < 9 kHz (moved from EMC to RED)

Metal detectors

Stud finder

T-Coil
RED does not cover

Fixed line terminal equipment
(Moved from R&TTE to EMC)

Radio amateur equipment

Military equipment
RED does not cover

Marine equipment (Wheelmark)

Custom build evaluation kits
Airborne equipment

Airborne products, parts and appliances falling within the scope of Article 3 of Regulation (EC) No 216/2008 as amended of the European Parliament and of the Council are excluded from the RED.

BUT!

Specific example: drones

According to Annex II of Regulation (EC) No 216/2008, Article 4(1), (2) and (3) of that Regulation do not apply to 'unmanned aircraft with an operating mass of no more than 150 kg'. Therefore, drones of 150 kg or less should be considered as radio equipment within the scope of the RED.

In future this may change because of a new EASA regulation.
Article 3.1(a): Health and Safety to persons
Article 3.1(a): Health and Safety

Cover also domestic animals
Essential requirements:

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;
Essential requirements:

Therefore, battery-operated equipment, such as a GSM handset, is also subject to this essential requirement and has to ensure that, the limits for human exposure to electromagnetic fields are respected.

In this respect, the manufacturer has also to take into account the reasonably foreseeable conditions of use (Article 17.1 of the RED).
Essential requirements:

This essential requirement covers all health and safety risks arising from the use of equipment, e.g. electrical, mechanical and chemical (e.g. emission of aggressive substances) as well as (but not exclusively) health aspects relating to noise, vibration and ergonomic aspects.
RED essential requirements

Article 3.1(b): EMC (Electromagnetic compatibility)

- Emissions
- Immunity
RED essential requirements

Article 3.2: Radio Spectrum

![Graph showing frequency and dB levels]

6373.83 Hz, -97.79 dB
CONFORMITY ASSESSMENT PROCEDURES
Conformity assessment procedures - RED

Using harmonized standards

Module A
Internal Production Control

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Conformity assessment procedures - RED

Using harmonized standards

Module B
EU-Type Examination
Conformity assessment procedures - RED

Using harmonized standards

Module H
Full Quality Assurance

Notified Body number can be put on the product, only when using Module –H.
Conformity assessment procedures - RED

Not using or partial use of harmonised standards

Module A
Internal Production Control

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Conformity assessment procedures - RED

Not using or partial use of harmonised standards

Module B
EU-Type Examination
Conformity assessment procedures - RED

Not using or partial use of harmonised standards

Module H
Full Quality Assurance

Notified Body number can be put on the product, only when using Module –H.
Conformity assessment

Module A
Internal Production Control

- Manufacturer prepares TCF
- Manufacturer prepares DoC
- Manufacturer applies CE marking
- Manufacturer monitors and controls production
Conformity assessment

- Manufacturer prepares TCF
- Manufacturer engages NB
- Notified Body issues EU-type Examination certificate
- Manufacturer prepares DoC, applies CE marking, and control production

Modules B
EU-Type Examination and Internal Product Control

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Conformity assessment

- Manufacturer operates an approved QMS
- Notified Body assesses QMS and initiates continuing surveillance
- Manufacturer prepares DoC and applies CE marking
Technical Construction File (TCF)

- A general description of the product
- Drawings, diagrams, BOM
- Test reports
  - Radio spectrum
  - EMC
  - Health and safety
- Copy of the Risk Assessment document
- Copy of the manufacturer’s declaration
Marking

Manufacturer’s Trade Name/Mark
Full postal address and contact of manufacturer

Product name/Model:
Batch/Serial No.:

Importer name
Full postal address and contact details of importer

Only use NB no. if Full Quality Assurance is used

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Marking when there are restrictions of use

The alert symbol ⚠️ is no longer required!

On packaging

In user documentation

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ES</td>
<td>LU</td>
<td>RO</td>
</tr>
<tr>
<td>CZ</td>
<td>FR</td>
<td>HU</td>
</tr>
<tr>
<td>SI</td>
<td>DK</td>
<td>HR</td>
</tr>
</tbody>
</table>
Language shall be easily understood by authorities

Language shall be easily understood by consumers and end users
Notified Body document under R&TTE

Notified Body Opinion
Notified Body document under RED

EU-Type Examination Certificate

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EU-Type Examination Certificate

- Notified Body & Number
- Manufacturer’s name & address
- Identification of the product
- Conclusion of the examination
- Requirements covered by the examination
- Conditions for validity
A *notified body* is an organization designated by an EU country to assess the conformity of certain products before being placed on the market.
Challenges

• Standards not ready yet (~70%)

• Limited amount of harmonized standards in OJ
  ~160 standards (04.02.2018)

• Not possible to use Module A due to missing harmonized standards

• R&TTE standards do not give presumption of conformity to RED automatically

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When there are no RED standards available, manufacturers can use alternative conformity assessment procedures through a Notified Body for their assessment.

- R&TTE standards
- Draft RED standards
- Other alternative conformity procedures

When referring to R&TTE standards or draft RED standards in the EU-Type Examination Certificate, the commission has recommended to put an expiry date on the certificate.
RED GAP TESTING
## Gap Testing Article 3.2.

### Article 3.2.- WLAN Radio Standards-Bands:

<table>
<thead>
<tr>
<th>Band</th>
<th>R&amp;TTE-Directive</th>
<th>RE-Directive</th>
</tr>
</thead>
<tbody>
<tr>
<td>2400 MHz to 2483.5 MHz</td>
<td>EN 300 328 V1.9.1 (2015-02)</td>
<td>EN 300 328 V2.1.1 (2016-11)</td>
</tr>
<tr>
<td>2400 MHz to 2483.5 MHz</td>
<td>EN 300 440-1 V1.6.1 (2010-08)</td>
<td>EN 300 440 V2.1.1 (2017-03)</td>
</tr>
<tr>
<td></td>
<td>EN 300 440-2 V1.4.1 (2010-08)</td>
<td></td>
</tr>
<tr>
<td>5150 MHz to 5350 MHz</td>
<td>EN 301 893 V1.8.1 (2015-03)</td>
<td>EN 301 893 V2.1.1 (2017-05)</td>
</tr>
<tr>
<td>5470 MHz to 5725 MHz</td>
<td>EN 301 893 V1.8.1 (2015-03)</td>
<td></td>
</tr>
<tr>
<td>5725 MHz to 5875 MHz</td>
<td>EN 302 502 V1.2.1 (2008-07)</td>
<td>EN 302 502 V2.1.1 (2017-03)</td>
</tr>
<tr>
<td>5725 MHz to 5875 MHz</td>
<td>EN 300 440-1 V1.6.1 (2010-08)</td>
<td>EN 300 440 V2.1.1 (2017-03)</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Note: power limits unchanged.
ETOI EN 300 328 – Differences:

Power Spectral Density

Two measurement options depending on the signal

Option 1 identical to V1.9.1 with alternative Sweeptime for non-continuous signals
  10 s (for continuous signals)
  2 x COT x Number of Sweeppoints (for non-continuous signals)
  PSD calculated from test data (RBW/VBW 10 kHz/30 kHz)

Option 2 usable for continuous signals and signals with constant duty cycle
  Step 1: Sweep with Peak-detector and Span = 2 x nominal Bandwidth (RBW/VBW 1 MHz/3 MHz)
  Step 2: reduced Span of 3 MHz at Max-frequency with RMS-detector and SWT = 1 minute
  No further calculation required
Gap Testing Article 3.2.

ETSI EN 300 328 – Differences:

Adaptivity

Separate chapters for Adaptivity and Receiver Blocking in V1.9.1 defined “Old” Receiver Blocking test completely implemented in the Adaptivity test in V2.1.1
**ETSI EN 300 328 – Differences:**

**Receiver Blocking (new)**

<table>
<thead>
<tr>
<th>Receiver category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adaptive equipment with a maximum RF output power greater than 10 dBm EIRP</td>
</tr>
<tr>
<td>2</td>
<td>Non-adaptive equipment with a Medium Utilization (MU) factor greater than 1% and less than or equal to 10% or adaptive equipment with a maximum RF power of 10 dBm</td>
</tr>
<tr>
<td>3</td>
<td>Non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1% or adaptive equipment with a maximum RF power of 0 dBm EIRP</td>
</tr>
</tbody>
</table>
Gap Testing Article 3.2.

ETSI EN 300 328 – Differences:

**Receiver Blocking (Test Condition)**

- If multiple bandwidths and data rates are supported – tests shall be performed using the smallest bandwidth with the lowest data rate for the lowest and highest channel.

- For multiport equipment only one receive port has to be measured – all other receive ports shall be terminated.

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**Diagram:**

- Signalling Unit or Companion Device
- Blocking Signal Source
- Variable attenuator step size ≤ 1 dB
- Implemented in Signalling Unit
- Direct Coupler
- Spectrum Analyzer
- Optional
- Shielded Box helpful

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IEEE PSES Nemko
ETSI EN 300 328 – Differences:
Receiver Blocking (Steps)
• In the first step the power of the companion device is reduced until the minimum performance criteria is reached
ETSII EN 300 328 – Differences: Receiver Blocking (Steps)

- After increasing the Tx power by 6 dB the blocking signal is set to the level and frequencies defined for the selected receiver class. For all blocking frequencies the EUT is checked for the resulting error rate and compared with the minimum performance criteria.
## ETSI EN 300 328 – Differences: Receiver Category 1

**Table 14: Receiver Blocking parameters for Receiver Category 1 equipment**

<table>
<thead>
<tr>
<th>Wanted signal mean power from companion device (dBm)</th>
<th>Blocking signal frequency (MHz)</th>
<th>Blocking signal power (dBm) (see note 2)</th>
<th>Type of blocking signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_{\text{min}} + 6 \text{ dB}$</td>
<td>2.380</td>
<td>-53</td>
<td>CW</td>
</tr>
<tr>
<td></td>
<td>2.503.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$P_{\text{min}} + 6 \text{ dB}$</td>
<td>2.300</td>
<td>-47</td>
<td>CW</td>
</tr>
<tr>
<td></td>
<td>2.330</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.360</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$P_{\text{min}} + 6 \text{ dB}$</td>
<td>2.523.5</td>
<td>-47</td>
<td>CW</td>
</tr>
<tr>
<td></td>
<td>2.553.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.583.5</td>
<td></td>
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<tr>
<td></td>
<td>2.613.5</td>
<td></td>
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<td></td>
<td>2.643.5</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>2.673.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE 1:** $P_{\text{min}}$ is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal.

**NOTE 2:** The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.
ETSI EN 300 328 – Differences:
Receiver Category 2

Table 15: Receiver Blocking parameters receiver category 2 equipment

<table>
<thead>
<tr>
<th>Wanted signal mean power from companion device (dBm)</th>
<th>Blocking signal frequency (MHz)</th>
<th>Blocking signal power (dBm) (see note 2)</th>
<th>Type of blocking signal</th>
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<td>CW</td>
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<td>2 583.5</td>
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NOTE 1: \( P_{\text{min}} \) is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal.

NOTE 2: The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.
Gap Testing Article 3.2.

ETSI EN 300 328 – Differences:
Receiver Category 3

<table>
<thead>
<tr>
<th>Wanted signal mean power from companion device (dBm)</th>
<th>Blocking signal frequency (MHz)</th>
<th>Blocking signal power (dBm) (see note 2)</th>
<th>Type of blocking signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_{\text{min}} + 12 \text{ dB}$</td>
<td>2.380</td>
<td>-57</td>
<td>CW</td>
</tr>
<tr>
<td></td>
<td>2.503,5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$P_{\text{min}} + 12 \text{ dB}$</td>
<td>2.300</td>
<td>-47</td>
<td>CW</td>
</tr>
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<td></td>
<td>2.583,5</td>
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**NOTE 1:** $P_{\text{min}}$ is the minimum level of the wanted signal (in dBm) required to meet the minimum performance criteria as defined in clause 4.3.2.11.3 in the absence of any blocking signal.

**NOTE 2:** The levels specified are levels in front of the UUT antenna. In case of conducted measurements, the levels have to be corrected by the actual antenna assembly gain.
Gap Testing Article 3.2.

ETSI EN 301 893 – Differences:

Adaptivity
As regards adaptivity, until 12.06.2018, either clause 4.2.7 of this harmonised standard or clause 4.8 of harmonised standard EN 301 893 v1.8.1 may be used; after that date, only clause 4.2.7 of this harmonised standard may be used

Receiver Blocking
Similar to 2.4 GHz-band
ETSI EN 300 440 – Differences:

No relevant differences
## Gap Testing Article 3.1 (b)

### Article 3.1(b).- WLAN Radio Standards-Bands:

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<tr>
<td>5150 MHz to 5350 MHz</td>
<td>ETSI EN 301 489-17 V2.2.1 (2012-09)</td>
<td>ETSI EN 301 489-17 V3.1.1 (2017-02)</td>
</tr>
<tr>
<td>5470 MHz to 5725 MHz</td>
<td></td>
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<td></td>
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</table>
Gap Testing Article 3.1 (b)

ETSI EN 301 489 – Differences:

RF electromagnetic field (EN 61000-4-3)

Extended range
From: 80 MHz to 1 000 MHz and 1 400 MHz to 2 700 MHz
To: 80 MHz to 6000 MHz
New Standards

RED
NEW STANDARDS
New Standards:

GNSS (GPS/Galileo/GLONASS/SBAS/BDS)

ETS1 EN303 413 V1.1.1 (2017-06)
Satellite Earth Stations and Systems (SES); Global Navigation Satellite System (GNSS) receivers; Radio equipment operating in the 1 164 MHz to 1 300 MHz and 1 559 MHz to 1 610 MHz frequency bands; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

<table>
<thead>
<tr>
<th>Adjacent Signal Selectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spurious Emissions</td>
</tr>
</tbody>
</table>

ETS1 EN 301 489-19 V2.1.0 (2017-03)
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 19: Specific conditions for Receive Only Mobile Earth Stations (ROMES) operating in the 1,5 GHz band providing data communications and GNSS receivers operating in the RNSS band (ROGNSS) providing positioning, navigation, and timing data; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
New Standards:

Wireless chargers

**ETSI EN 303 417**

Wireless power transmission systems, using technologies other than radio frequency beam, in the 19 - 21 kHz, 59 - 61 kHz, 79 - 90 kHz, 100 - 300 kHz, 6 765 - 6 795 kHz ranges; Harmonised Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

**ETSI EN 301 489-3**

ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
New Standards:

Metal and object detection sensors

**EN 303 454**
Short Range Devices (SRD); Metal and object detection sensors in the frequency range 1 kHz to 148.5 kHz; Harmonised standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

**EN 301 489-3**
ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU
Harmonised Standards:

ETSI Standards:
http://www.etsi.org/standards

ETSI Guide (EG) 203 367 (multi-radio and combined radio and non-radio equipment):
http://www.etsi.org/deliver/etsi_eg/203300_203399/203367/01.01.01_60/eg_203367v010101p.pdf

http://ec.europa.eu/docsroom/documents/23321
Thank you!

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