

## **Bringing License Free Wireless Products to Market in the EU**

8 January 2012

### **Summary**

This article is the first part of two covering unlicensed wireless products sold and used in the European Union (EU). This article starts with a brief history of wireless regulation as seen from a British perspective. It provides useful background to wireless regulation to those unfamiliar with the topic. The article then proceeds to introduce the recommendations and specifications that govern spectrum use and product approvals for wireless Short Range Devices (SRDs).

In the second article in this series Tim explains in some detail the reference documents introduced here and how to best use them by employing some real world product examples.

### **Part 1**

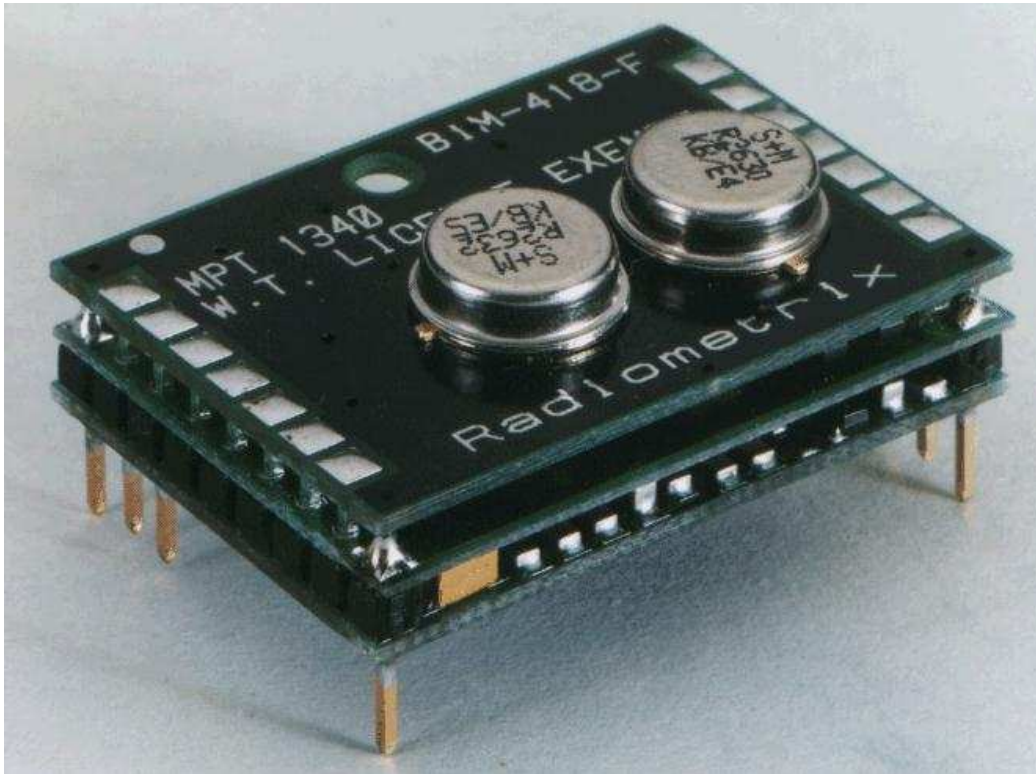
#### ***A brief history of spectrum regulation***

The first Wireless Telegraphy Act was enacted in the UK in 1904, just three years after Guglielmo Marconi's first transatlantic test transmission. Before the act, wireless transmissions were unregulated. After the act the spectrum was regulated and licenses issued by the British government. These were priced to cover the costs of running the department that regulated the spectrum.

Subsequent Wireless Telegraphy Acts passed into law in 1906, 1949, 1967, 1998 and 2006. The spectrum regulator authority was firstly The Wireless Telegraphy Board from 1918, and then the General Post Office (GPO) from 1949.

The Ministry of Posts and Telecommunications (MPT) was formed by the Post Office Act in 1969. The MPT took over from the General Post Office Engineering Department, which was set up in 1949 to bring together all radio regulatory work. In 1974 the MPT becomes the Radio Regulatory Division of the Home Office and then, in 1983, the same division of the Department of Trade and Industry (DTI), being renamed the Radiocommunications Division in 1986. Amongst its other responsibilities the division writes and maintains standards for license free telemetry such as MPT1340<sup>[1]</sup>, the predecessor to those 433.9 MHz license free devices we all know and love; and MPT1329<sup>[2]</sup>, the standard that once regulated license free telemetry around 459 MHz, an allocation we'll meet again in the next issue.

The first license free wireless products were marked with the MPT standard number and the words "W.T. license exempt", which simply meant that they didn't need the user to apply for a license under the Wireless Telegraphy (W.T.) act.



License exempt products are always low power and hence referred to as Short Range Devices (SRDs). The most frequently used power limits being: 10mW, 100mW and 500mW. It's very rare for a product that transmits at more than 500mW to not require a license in the EU.

The 1990s heralded the biggest changes to wireless in Europe. The decade kicks off with Margaret Thatcher's deregulation of the whole UK industry in the Broadcasting Act 1990. The same year sees the birth of the Radiocommunications Agency. The agency takes over spectrum regulation and the production and maintenance of MPT standards from the Radiocommunications Division of the DTI.

In Europe there is a drive to harmonise both spectrum allocation and radio standards. CEPT (see below) forms the European Telecommunications Standards Institute (ETSI) in 1988. The Radio and Telecommunications Terminal Equipment (RTTE) directive<sup>[3]</sup> becomes European law in 1999 and the European commission empowers ETSI-ERM (ETSI's Electromagnetic compatibility and Radio spectrum Matters technical committee) to create and manage harmonised standards for wireless products under the RTTE directive. These new European Norms (ENs) rapidly take over from national standards such as the MPT series.

The RA is dissolved and OfCom takes over its responsibilities (somewhat inadequately) in December 2003.

## **CEPT**

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CEPT (Conférence Européenne des Postes et des Télécommunications) is the unified Posts and Telecommunications regulatory body for its 48 signatory countries: Albania, Andorra, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Bosnia and Herzegovina, Croatia, Cyprus, The Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, The Former Yugoslav Republic of Macedonia, Malta, Moldova, Monaco, Montenegro, The Netherlands, Norway, Poland, Portugal, Romania, The Russian Federation, San Marino, Serbia, The Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom and the Vatican City.

In addition to forming ETSI, CEPT forms the European Radiocommunications Office (ERO) and the European Telecommunications Office (ETO). In 2010 both are merged into ECO the European Communications Office<sup>[4]</sup>. ECO produces various recommendations for harmonised spectrum allocations across the CEPT member countries (a geography larger than Europe). For license free SRDs their recommendation is ERC REC 70-03<sup>[5]</sup> (published annually).



### ***Routes to market in Europe***

With the introduction of the RTTE Directive (1999/5/EC) the process of introducing new wireless products to the market is much simplified. Prior to its introduction formal type approval was the only route to market. For each target country a manufacturer had to determine the applicable market access standard (in the UK it would be an MPT standard), then find an approved test house to test and report, then the report was then sent to the government regulatory body for approval and after some weeks the manufacturer would receive a type approval certificate. This process had to be repeated again and again for each target country.

This formal route to market now only remains for products that have no applicable European Norm but do have an applicable national standard. In 2012 there are effectively no such product types and the UK's MPT standards have long been obsolete. There are now just two principal routes to market in Europe:

- (i) Manufacturer self-declare
- (ii) RTTE Notified Body opinion



One can see if a manufacturer has used a notified body because the body's four-digit number will appear following the CE mark. A list of RTTE Notified Bodies can be

found in the Europa Nando (New Approach Notified and Designated Organisations) Information System<sup>[6]</sup>. If there is no number following the CE mark the manufacturer has used the self-declaration route. The exclamation mark in a circle is a warning about the use of the product. It's perfectly acceptable to use a harmonised EN to approve a product that uses a frequency that isn't harmonised. The exclamation mark says beware, you may be able to buy this product in any EU member state but you might not be able to use it.

In practice the exclamation mark gets affixed even to wireless products that do use harmonised frequency allocations because even harmonised allocations tend to get different national conditions and restrictions applied as we will see.

So to be sold into the EU a product has to meet the appropriate product standard and be suitably marked. Before a purchaser can use the product however he/she has to obtain a license to use it. For license exempt wireless products the situation is problematic. A user buying a license-free wireless product in the EU might reasonably expect that he can use that product anywhere in the EU, but often this is not the case.

It's been relatively easy to harmonise product standards across the EU because these standards apply to products as yet unsold. However it is much harder to harmonise spectrum allocations with their incumbent and sometime intransigent users, so there remain many uniquely national allocations.

### ***What wireless technology should I use in my product?***

When it comes to short-range wireless there are many technologies and frequencies available. If you want to sell a new product freely across Europe and all the CEPT signatory countries then you need to consult ERC REC 70-03 first. The recommendation has thirteen annexes covering many product types. If your production doesn't fit into one of the specific types then the first annex catches it. It is simply titled "NON-SPECIFIC SHORT RANGE DEVICES". Each annex lists all the frequencies that have been harmonised for use by product type(s). It specifies power limits, channel bandwidths, etc. At the close of the annex there is a list of ETSI ENs that should be used to certify the product's radio performance under the RTTE directive. Appendix 1 following the annexes contains big national implementation tables. The tables have columns for all the CEPT signatory countries (except the UK which publishes its license free SRD allocations separately in OfCom publication IR2030<sup>[7]</sup>). The table indicates whether or not a country has adopted each harmonised frequency allocation. Y means it has and N means no, whereas L means there are limitations. These limitations on the use of each allocation per country are detailed in appendix 3.

In the next issue I will employ some product examples to help demystify ERC REC 70-03 and explain how use it.

### ***I want to self-declare but which harmonised standards apply to me?***

OK so now we've picked our technology and our frequency and we've started to develop our product. What standards must we apply to demonstrate compliance with the RTTE directive?

The EU commission publishes harmonised ENs applicable to the RTTE directive on the Europa website<sup>[8]</sup>. This is termed the RTTE 'relist', short for list of reference standards. The standards for wireless products fall into three basic categories<sup>1</sup>:

- (i) Those dealing with safety, e.g. human exposure to radio waves
- (ii) Those dealing with EMC
- (iii) Those dealing with the proper use of the spectrum

### ***SRDs and Safety Standards***

In addition to electrical product safety as covered by the Low Voltage (LVD)<sup>[9]</sup> and other directives, radio transmitters operating on or near human beings may be subject to Specific Absorption Rate (SAR) testing. There are two EU directives covering human exposure to ElectroMagnetic Fields (EMF):

- (i) Recommendation 1999/519/EC<sup>[10]</sup> covers exposure of the general public (non-binding )
- (ii) Directive 2004/40/EC<sup>[11]</sup> covers exposure of workers.

The RTTE relist standards addressing human exposure to EMF are EN 50371<sup>[12]</sup>, and EN 62311:2008<sup>[13]</sup>. If your SRD transmits at 10 mW ERP human EMF exposure should not concern you, but manufacturers of body worn transmitters with RF output >20 mW will need to look at these standards.

### ***SRDs and EMC***

The RTTE directive takes precedence over the EMC directive<sup>[14]</sup>. For all products containing wireless devices this means that the EMC directive does not apply. In its place the EMC provisions of the R&TTE directive apply. For SRDs this means standard EN 301 489-3<sup>[15]</sup> should be used, although other RTTE relist EMC standards including other parts of EN 301 489 may also apply.

The EN 301 489 series of EMC standards have a lot in common with CISPR's IT equipment EMC standards (as adopted by Cenelec), EN 55022<sup>[16]</sup> and EN 55024<sup>[17]</sup>. The 301 489 series adds exclusion bands for transmitters (emissions) and receivers (immunity).

### ***SRD Radio Performance***

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<sup>1</sup> There are also standards in the relist applicable to wired telecommunications equipment but we are not concerned with these here.

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Radio performance is governed by article 3.2 of the RTTE directive that simply states “radio equipment shall be so constructed that it effectively uses the spectrum allocated to terrestrial/ space radio communication and orbital resources so as to avoid harmful interference”. On these few words hang the vast majority of the ETSI specs in the RTTE refflist. For example the generic specifications dealing with SRD use of the radio spectrum are:

- (i) EN 300 330<sup>[18]</sup> (SRDs operating from 9 KHz to 25 MHz)
- (ii) EN 300 220<sup>[19]</sup> (SRDs operating from 25 MHz to 1 GHz)
- (iii) EN 300 440<sup>[20]</sup> (SRDs operating from 1 GHz to 40 GHz)

It’s part two of most radio performance specifications that appear in the RTTE refflist. Part one contains all the measurement methods and limits referenced by the second, mandatory part.

OEMs using bought in wireless modules usually expect that ETSI radio performance standards to have been applied by the module manufacturer. As a rule the OEM applies the safety and EMC standards and the wireless module manufacturer applies the radio performance standard(s). However this is a somewhat simplistic assumption.

For example consider an OEM developing a desktop paging system. For the transmitter he develops the POCSAG paging software and integrates a bought in 300 220 approved transmitter module. The OEM applies EN 60950-1<sup>[21]</sup> for safety and EN 301 489-2<sup>[22]</sup> for EMC and uses the module’s EN 300 220-2 declaration in his declaration of conformity. Job done?

There are two problems with this simplistic approach: (1) EN 300 224<sup>[23]</sup> is the applicable standard for radio paging and not EN 300 220. (2) Furthermore both EN 300 220 and 300 224 specify limits for Effective Radiated Power (ERP) and radiated spurious emissions. Both depend on the antenna system, product design and product enclosure design. However the OEM, and not the module manufacturer, executed the antenna and enclosure design.

In the next issue we’ll look at these complexities in more detail using some representative product examples.

## BIO

Tim Jarvis graduated from The University of Hull in 1983. He started his career designing RF circuitry for naval sonar systems. In 1988 he moved into the telecommunications sector. In 2001 he set up RadioCAD Limited as an independent RF and EMC consultancy [www.radiocad.com](http://www.radiocad.com). Tim approaches EMC engineering and approvals as an RF engineer with a practical knowledge of electromagnetic phenomenon and good design practice. Tim is a chartered engineer (CEng) and has been a member of the IET and IEEE for many years, and he sits on ETSI ERM committee TG26. Tim presents at conferences and has published a number of technical EMC papers ([www.radiocad.com/downloads/articles.html](http://www.radiocad.com/downloads/articles.html)).

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- [16] EN 55022:2006 Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement + Amendment A1:2007 - Cenelec
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- [19] ETSI EN 300 220-2 V2.3.1 Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive
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