

ECC Newsletter December 2017

Providing spectrum to support machine-to-machine communications

As home automation, smart energy, industrial applications and intelligent transport become a reality, machine-to-machine (M2M) communications technologies are increasingly prevalent. M2M — also referred to as 'machine type communications (MTC)' and the 'Internet of Things (IoT)'— present opportunities in new market sectors such as remote healthcare, smart cities and agriculture. But in order, for these exciting new applications to work, there must be connectivity to a widespread deployment of a large number of devices. Therefore, these new applications bring new demand for spectrum.



Figure 1: Examples of some M2M deployment scenarios

In a special edition of the [ECC newsletter in April 2016](#), we reported on the outcome of a CEPT workshop to determine spectrum, numbering and harmonisation needs for M2M¹. From a spectrum point of view, one of the key elements is that, due to their diversity, M2M communications are expected to make extensive use of a range of different radio applications/systems. These include: private mobile radio systems (PMR); public access mobile radio systems (PAMR); mobile networks; short range devices (SRD); radio local area networks (RLANs), as well as satellite systems. The workshop identified in particular a need for dedicated spectrum for utilities in the 400 MHz range (410-430 MHz and 450-470 MHz), and improved harmonisation in the 900 MHz range (862-876 MHz and 915-921 MHz). The possibility for commercial mobile networks to address M2M needs was also identified.

Shared spectrum access — especially in the 400 MHz bands, as well as frequency bands used by short range devices — was proposed, to allow new technologies to use existing spectrum in an opportunistic way. This is partly based on the assumption that while some networked M2M applications can reach very high device usage densities (e.g. 50,000 devices/km²), in particular in metropolitan areas, individual devices only use the spectrum for a very small fraction of the time.

So, what are the recent developments in these and other areas?

Harmonisation of dedicated spectrum for M2M

The current European regulatory framework applicable to SRD is specified in [ERC Recommendation 70-03](#) for CEPT and in the [EC Decision 2017/1483/EU](#) for EU member states. It already allows the possibility to roll out M2M systems in various harmonised bands for SRD, provided they fulfil the relevant technical parameters. In particular, bands identified for the category "non-specific short-range devices" are the most favourable for new innovative M2M usages, including wide-area networks in 169.4-169.475 MHz, 865-868 MHz (limited to the four RFID channels), 868.0-868.6 MHz and 869.4-869.65 MHz.

Furthermore, as reported in [our July 2016 edition](#), additional opportunities have been identified in the frequency bands 870-876 MHz and 915-921 MHz, which are suitable in particular for new types of M2M applications in SRD networks. The conditions currently defined in ERC Recommendation 70-03 allow for a soft harmonisation approach, where the spectrum availability and the national usage may vary in different portions of these bands, taking into account the existing and planned use of these bands by other applications/services.

In its work under a permanent mandate from the EC to regularly review spectrum harmonisation for SRD, ECC published in early 2017 an Addendum to CEPT Report 59. It specifically addressed the possibilities for further harmonisation of the 862-876 MHz and 915-921 MHz frequency bands for SRD.

While the EC included recommendations from ECC for the band 863-868 MHz in its recent update of the EC Decision for SRD, discussions on an EU-harmonised approach for the 870-876 and 915-921 MHz bands are ongoing.

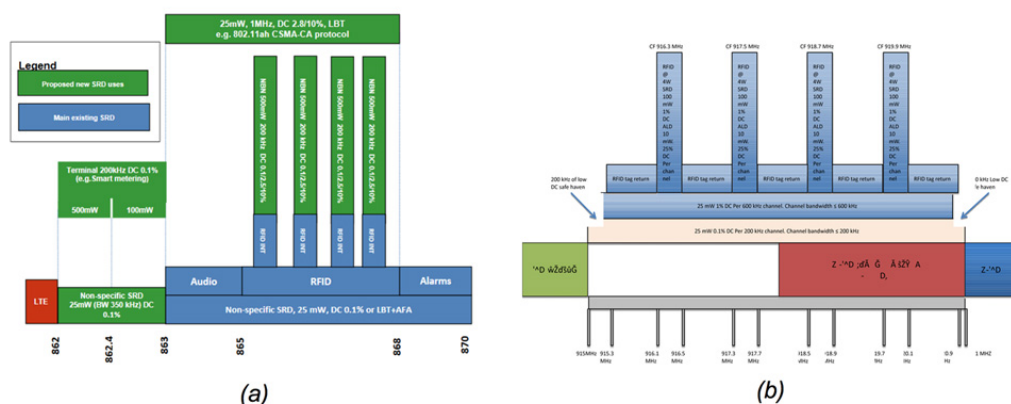


Figure 2: Spectrum use overview in the 'SRD domain': (a) 862-870 MHz and (b) 915-921 MHz

M2M in dedicated land mobile networks

There is no "one solution fits all" approach for M2M connectivity. In the smart energy sector, while a low voltage smart grid could make use of licence-exempt SRD spectrum, high voltage smart grids will require enhanced communications and extremely resilient systems. Customised dedicated systems in licensed spectrum are needed since other solutions cannot fulfil requirements such as low latency and high availability.

Similarly, the transportation and government sectors may also require dedicated M2M network solutions.

In this context, ECC has undertaken studies to expand the opportunities for M2M using professional private mobile radio (PMR) or public access mobile radio (PAMR) networks. As a result, Project Team FM54 is continuing to review the CEPT framework applicable to PMR/PAMR. This includes a revision of the CEPT [Recommendation T/R 25-08](#), which describes planning criteria and coordination of frequencies for land mobile systems in the range 29.7-470 MHz. It also comprises the development of a new technology-neutral ECC Decision, which is intended to make available, in response to market demand, a sufficient amount of spectrum for land mobile systems within a set of frequency ranges between 68 and 470 MHz ².

One of the main focuses of this work is to facilitate narrowband, wideband and broadband solutions (including mobile technology) within the 410-430 MHz and 450-470 MHz bands. It is supported by an extensive package of compatibility studies, which are nearing completion within Project Team SE7. These studies address the coexistence of these various solutions for PMR/PAMR and also the compatibility with a range of applications within and in adjacent bands, including Digital Terrestrial Television (DTT), radars, radio astronomy, fixed service, as well as several others.

Opportunities for mobile cellular networks to support M2M

The possibility of deploying M2M within commercial mobile networks was studied in [ECC Report 266](#). The analysis focussed on a number of bands currently identified for mobile cellular networks within CEPT, i.e. 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2.1 GHz and 2.6 GHz.

The analysis in this report was based on various cellular M2M technologies developed within 3GPP, which allow M2M to be incorporated within an existing cellular network in different ways:

- Extended Coverage GSM IoT (EC-GSM-IoT): This is an evolution of the existing GSM air interface with a channel bandwidth of 200 kHz. The analysis concluded that it can be implemented in the 900 and 1800 MHz bands, as it is similar to existing GSM
- LTE Machine Type Communication (LTE-MTC) and evolved MTC (LTE-eMTC)³: LTE-based technology where M2M is integrated in a normal LTE carrier. The Report concluded that, as an integral part of the system, LTE-MTC/eMTC can be deployed in any of the considered frequency bands.
- Narrowband IoT (NB-IoT)⁴: LTE-based technology where a dedicated 200 kHz independent carrier is used either 'standalone' (i.e. independently in its own spectrum), 'in-band' within an existing LTE carrier, or in the guard band adjacent to an existing carrier. The Report describes the conditions under which NB-IoT can be deployed in the considered bands.

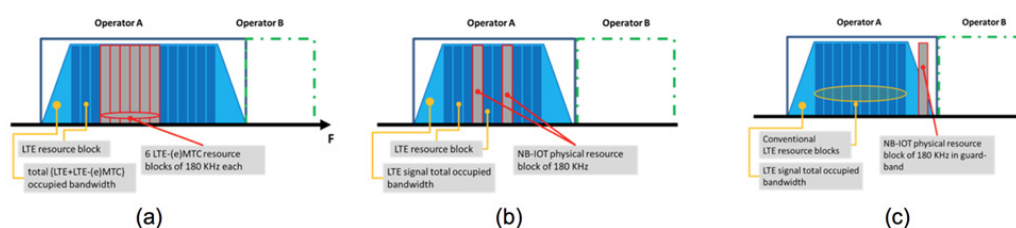


Figure 3: Overview of LTE M2M options within a mobile operator's spectrum block: (a) LTE-eMTC; (b) In-band NB-IoT; (c) Guard band NB-IoT

As a follow-up activity, a revision of ECC Decision(06)13, which sets the regulatory framework for the 900 MHz and 1800 MHz bands, is currently underway to include M2M cellular technologies. For the other bands, the technology-neutral technical conditions set up in the [relevant ECC Decisions](#) already provide the opportunity for M2M operation — under the condition that compliance to the relevant Block-Edge Mask (BEM) is met.

Satellite connectivity for M2M

In order to achieve widespread coverage for M2M communications, satellite systems may provide appropriate solutions, in particular in remote areas with no or poor terrestrial coverage. In this context, [Project Team FM44](#) is currently studying the feasibility of M2M operation through satellites, from both a technical and regulatory point of view. This study will explore technical opportunities and suitable frequency bands for the introduction of M2M applications via satellite, in order to extend terrestrial networks and create complementary services. Work on the study is expected to be finalised in the second half of 2018.

The future for M2M spectrum in Europe and beyond

In this article we have summarised a set of complementary activities that aim to identify appropriate solutions around spectrum for M2M communications in Europe. These initiatives contribute to the [spectrum roadmap for IoT](#) as defined by the Radio Spectrum Policy Group

(RSPG) in November 2016.

Considerations on spectrum for M2M are not limited to Europe. Spectrum for M2M at a global level, both in dedicated bands and within mobile bands, is also being studied within the ITU-R. It is specifically the topic of the Agenda Item 9.1.8 of the next World Radiocommunication Conference in 2019. ECC PT1 is leading the CEPT preparation for this issue. The preliminary CEPT position is to support the development within the ITU-R framework of Reports and Recommendations, consistent with the activities performed in Europe. This, in turn, will facilitate M2M deployment. On this basis no changes to the Radio Regulations are considered necessary at this stage to accommodate spectrum for M2M.

M2M is also intended to be an important component of future 5G mobile networks, as reported in [previous newsletters](#). 5G aims to provide widespread coverage of low latency and highly reliable networks, which could provide opportunities for high density deployment of future M2M devices. In this context the ongoing ECC activities on spectrum for 5G, as outlined in the [CEPT Roadmap for 5G](#), are also relevant for M2M.

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¹ Prior to this workshop, ECC had already identified national options for M2M in the frequency bands 733-736 MHz and 788-791 MHz as specified in [ECC Decision \(15\)01](#) and [ECC Report 242](#)

² The specified frequency ranges are: 68-87.5 MHz, 146-174 MHz; 406.1-410 MHz, 410-430 MHz, 440-450 MHz, 450-470 MHz.

³ In 3GPP terms, LTE-MTC corresponds to LTE Cat-1 or LTE Cat-0 and LTE-eMTC corresponds to LTE Cat-M1.

⁴ In 3GPP terms, NB-IoT is also referred to as LTE Cat-NB1.

The ECO Frequency Information System (EFIS) and the new Documentation Database: an Update

The purpose of EFIS: a key tool for information on the actual spectrum utilisation in Europe

Over the past 15 years, EFIS has been administered by ECO and managed under the supervision of the ECC through its EFIS Maintenance Group (EFIS/MG).

The purpose of EFIS is to provide information about the actual use of the spectrum in Europe. While all the data in EFIS is in the public domain, its users are typically those from the 'interested public' such as spectrum regulators, market surveillance and enforcement authorities, radio equipment producers, providers and users, certification bodies, and those involved in standardisation activities. This includes also the interested public outside of Europe.

Since the information in EFIS is linked to a common agreed terminology and frequency ranges, EFIS is most helpful in getting information in short time and with a good overview. Professionals using EFIS can therefore save a lot of time which they otherwise would need for the collection of information from many different sources. EFIS also harmonises to some extent the availability and the way information is provided from many different sources.

EFIS is an information system and should not be misunderstood as a tool for frequency management or planning purposes.

That said, the information on the system is quite diverse and useful. Among other things, it contains information on the ITU-R Region 1 frequency allocations, the European and National frequency allocation tables and the related spectrum utilisation information. You can also turn to EFIS if you need information on National radio interfaces. Regulatory and spectrum informative documentation – from EC Decisions to ECC deliverables and Reports to ETSI harmonised standards – are also there, as are right-of-use information and related statistics.

It is no surprise that the system is such a hive of information: Some 46 CEPT administrations are publishing data in EFIS; the scope of the content is wider, and there are many new features and facilities. In addition, ECO uploads data to the EFIS for the ITU Region 1, and publishes general European Information such as the European Common Allocation Table.

EU Member States shall use EFIS to make comparable information regarding the use of radio spectrum in each Member State available to the public. Therefore, manufacturers, providers and other bodies can access this information via the internet and refer to it.

EFIS is available to the public under www.efis.dk.

Developments in recent years

The EFIS database has become more and more useful in recent years.

In the past four to five years, EFIS has been significantly expanded regarding the nature and amount of available data and documentation on spectrum usage in Europe. You can see the main evolutions of the database in the figure below.

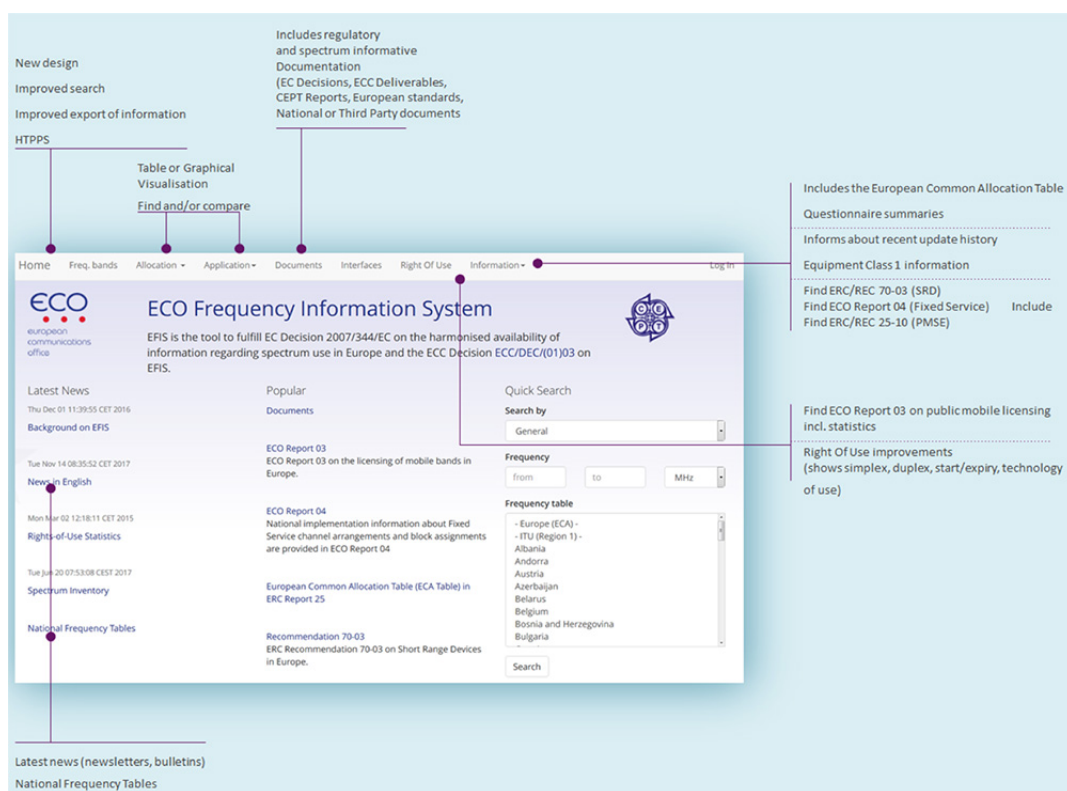


Figure 1: Evolutions brought to the EFIS database

EFIS use has more than quadrupled from 2012 to 2016: a clear indication of the benefits of these continuous improvements.

ECO will continue to improve the EFIS database in line with approved action plans which are discussed with CEPT administrations.

EFIS Workshop on 19 September 2017

A one-day ECO Workshop on EFIS took place on 19 September in Mainz, Germany. More than 50 participants attended the workshop, which gave advice to CEPT administrations on providing information to EFIS, as well as guidance to the interested public on how to use EFIS in an efficient way. Suggestions were made for improvement and what could be added to EFIS. Presentations were provided by ECO, National administrations, market surveillance authorities and notified bodies/test houses demonstrating how they update, use, or what they expect from EFIS. The workshop's [agenda](#), a [wrap-up](#) of the discussions and the [presentations](#) are available.



Figure 2: EFIS workshop

The results of the workshop were further discussed at the WGFM meeting in October 2017 and some actions agreed for amendments in EFIS. ECO will continue to ask for feedback from the 'interested public' and it is planned to send a questionnaire to all users of EFIS. The aim of the questionnaire will be to get additional feedback from users with the purpose to trigger improvements in EFIS. Another major outcome of the workshop is the development of a new application programming interface (API), which is planned to be used for EFIS and the new documentation database.

Purpose and renewal of the new ECO Documentation Database (DocDB)

A new ECO Documentation Database has been live for testing since May 2017 on <http://test.ecodocdb.dk/docdb/>. This new DocDB will replace the old documentation database <http://www.ecodocdb.dk/> in early 2018.

A renewal has become necessary for several reasons. For example, in the old DocDB, there was neither an archive nor possibility to include active web-links in the graphical user interface. Editing of information in the database was carried out using a cumbersome system defined more than 20 years ago. The content management could not follow modern developments in terms of functionality, nor could it deal with new interfaces or features. The purpose of the DocDB is to act as the library of ECC Deliverables (everything from ECC Decisions, to Recommendations and Reports), CEPT Reports, ECO Reports, and the EC Decisions and ETSI-harmonised standards related to ECC Deliverables. The documentation is provided in the new DocDB together with information about applicable frequency ranges and application terminology, related documentation and attachments. As with EFIS, the whole library is in the public domain and the users are typically those from the 'interested public'.

The new database features a new layout, an archive showing older versions of a document, improved search functionality and linkage with EFIS — information about harmonised standards and the application terminology is imported from EFIS. National implementation information can also be provided by CEPT administrations directly via their own account, which is used for editing such information.

The new documentation database will run in parallel with the current documentation database until the switch-over. After that, the old documentation database will be available for some time internally in the ECO. It will be finally switched-off when all data is very much complete in the new DocDB and we are certain that nothing is left-over in the old database any longer.

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ECC Decisions

Filter:

Published ↑ ↓	Title ↑ ↓	Description	Status	Download
2017-11-17	ECC/DEC/(05)02	ECC Decision of 18 March 2005 amended 8 November 2013 on the use of the frequency band 169.4-169.8125 MHz.	Active	<ul style="list-style-type: none"> ECCDec0502.docx ECCDEC0502.PDF
2017-11-17	ECC/DEC/(11)02	ECC Decision of 11 March 2011 on industrial Level Probing Radars (LPR) operating in frequency bands 6 - 8.5 GHz, 24.05 - 26.5 GHz, 57 - 64 GHz and 75 - 85 GHz.	Active	<ul style="list-style-type: none"> ECCDEC1102.docx ECCDEC1102.pdf
2017-11-17	ERC/DEC/(01)11	ERC Decision of 12 March 2001 on harmonised frequencies, technical characteristics and exemption from individual licensing of Short Range Devices used for Flying Model control operating in the frequency band 34.995 - 35.225 MHz	Active	<ul style="list-style-type: none"> Dec0111.docx ERCDec0111.pdf
2017-11-17	ERC/DEC/(01)12	ERC Decision of 12 March 2001 on harmonised frequencies, technical characteristics and exemption from individual licensing of Short Range Devices used for Model control operating in the frequencies 40.665, 40.675, 40.685 and 40.695 MHz	Active	<ul style="list-style-type: none"> ERCDec0112.pdf ERCDec0112.docx
2017-11-17	ERC/DEC/(01)17	ERC Decision of 12 March 2001 amended 9 December 2011 on harmonised frequencies, technical characteristics and exemption from individual licensing of Ultra Low Power Active Medical Implant (ULP-AMI) communication systems operating in the frequency band 401 - 406 MHz on a secondary basis	Active	<ul style="list-style-type: none"> ERCDec0117.pdf ERCDec0117.docx
2017-11-17	ECC/DEC/(01)03	ECC Decision of 15 November 2001 on ECO Frequency Information System (EFIS)	Active	<ul style="list-style-type: none"> ECCDEC0103.docx ECCDEC0103.pdf
2017-11-17	ECC/DEC/(17)06	The harmonised use of the frequency bands 1427-1452 MHz and 1492-1518 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL)	Active	<ul style="list-style-type: none"> ECCDEC1706.docx ECCDEC1706.pdf

Figure 3: Example of ECC Decisions within the new Documentation Database

A new application programming interface (API)

Taking into account the feedback received at the recent EFIS workshop and the new developments brought to the ECO Documentation Database, it is planned to develop in 2018 a new application programming interface (API), which would rationalise the interaction with the existing databases (in particular EFIS and Doc DB) managed within ECC, and thus would facilitate their future use and development.

The API is a new import/export facility to be used by users to import/export information into and from EFIS and the new DocDB database. One common API in EFIS and the new DocDB will mean that the same information is handled only one time, leading to increased work efficiency and avoidance of deviations between the databases.

With the API, users of the EFIS and the DocDB can also build their own query applications and use online data from the EFIS and new DocDB databases in their external machines. For the first time, it will be possible in a fully automated way and without manual queries. Users of the API can also define by themselves how to set out information and with which data details, based on their defined query application.

The API is also going to be used to import information from CEPT administrations (for example, National implementation information) and ETSI (such as harmonised standards and ETSI system reference documents). This will result in a much improved showing of detailed information of the applicable ETSI deliverables, for example, in connection to the European Common Allocation Table in EFIS.

The aim is to have full compatibility for the API information elements between the new DocDB and EFIS, as well as ETSI, and to focus on automating processes wherever possible. With these planned additions in 2018, a decisive contribution will be made for improving ECO's information services; binding information together in the new Documentation and EFIS databases.

EFIS in short: Facts and Figures

The ECO Frequency Information System (EFIS) was launched in 2002. Forty-six CEPT administrations publish data in EFIS. The scope of the content is now wider and there are many more features and facilities.

EFIS is available to the public on the Internet either via the ECO website or directly under www.efis.dk.

The EFIS database was visited approximately 235,000 times in 2016 with a 14-minute average visit duration by the interested public, who include frequency managers in industry, operators, administrations, test houses, vendors, as well as interested users. A considerable amount of users came from outside of Europe, from places such as China and the USA.

EFIS is administered by the ECO and managed under the supervision of the ECC through its ECO Frequency Information System Maintenance Group (EFIS/MG).

EFIS users should familiarise themselves with the new content sections, which were added in the recent years:

- The most common frequencies utilisations in Europe are found in the European Common Allocation Table ([ERC Report 25](#)), including the related ECC harmonisation deliverables and European standards;
- National information: [Links to National Tables/ Websites](#) in EFIS;
- Topic related sections for the fixed service use in Europe ([ECO Report 04](#)), short range devices ([ERC Recommendation 70-03](#)) or by audio and video applications ([ERC Recommendation 25-10](#)), including detailed information about National implementation conditions and related restrictions;
- the EFIS module on the licensing of mobile bands in Europe ([ECO Report 03](#)) and a related [statistics tool](#);
- an extensive library of documents including EC and ECC harmonisation deliverables and many reports containing information about the actual spectrum use including documentation from ETSI, third parties, coexistence studies performed in the ECC, summaries from questionnaires, etc.

The legal background for the obligation to publish information in EFIS, as the 'European Spectrum Information Portal', can be found in EC Decision [2007/344/E](#), The Commission Implementing Decision [2013/195/EU](#), and Recital 24 of the Radio Equipment Directive ([2014/53/EU](#)). [ECC Decision \(01\)03](#) defines the needs for EFIS for the whole CEPT membership.

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