E3NETWORK

Energy Efficient E-band transceiver for backhaul of the future networks

DELIVERABLE **D.6.4.2**

Recommendation for standardization in E-Band

Contract number :	317957
Project acronym :	E3NETWORK
Project title :	Energy Efficient E-Band Transceiver for Backhaul of the Future Networks

Deliverable number :	**D6.4.2**
Nature :	Report
Dissemination level :	PU
Report date :	31-10-2014

Author(s):	Frecassetti, Mario Giovanni Luigi (ALU)
Partners contributed :	ALU, OTE, CEIT
Contact :	ALCATEL-LUCENT, Via Trento 30, Vimercate (MB) Italy mario_giovanni.frecassetti@alcatel-lucent.com

The E3NETWORK project was funded by the European Commission under the 7th Framework Programme (FP7) –ICT

Coordinator: CEIT

VERSION CONTROL

Version	Date	Contributors	Sections Affected
1	20-09-2013	ALU	All
	28-10-2013	ALU;OTE;CEIT	All
	30-10-2013	ALU;OTE;CEIT	All –final version
2	01-10-2014	ALU	Start revision 2
	30-10-2014	ALU	Mainly chapter 3 and 4 -Final draft Version
	31-10-2014	ALU;OTE;CEIT	All –final version

INDEX

1. INTRODUCTION 5

1.1 E3NETWORK potential contributions to standardization activities 5

2. E3NETWORK TARGET STANDARDIZATION BODIES 7

2.1 European regulatory environment for radio equipment and spectrum 7

2.1.1. Radio Regulatory Environment 7
2.1.2. European Union Radio Spectrum Regulatory Framework 7
2.1.3. ECC of CEPT 8
2.1.4. ETSI 8
2.1.5. Cooperation between CEPT/ECC and ETSI 9
2.1.6. Cooperation between the EC and CEPT/ECC 10
2.1.7. Cooperation between the EC and ETSI 10
2.1.8. Obligation of manufacturers 11
2.1.9. ITU 11
2.1.10. Cooperation between the CEPT and ITU 12
2.1.11. National Regulatory bodies 12

3. STANDARDIZATION PLAN 13

3.1 CEPT ECC 13
3.1.1. CEPT ECC methodology for Contribution 14
3.2 ETSI ATTM TM4 15
3.2.1. ATTM TM4 Methodology for contribution 18
3.3 ITU 18
3.4 Others Groups 18
3.5 National Regulatory bodies 19
3.5.1. OFCOM –UK 19
3.5.1. National Telecommunications and Post Commission (EETT) - Greece 20
3.5.2. Ministero dello Sviluppo Economico - MISE – ITALY 20

4. E-BAND REGULATION STATUS IN EUROPE 21

5. CONCLUSIONS 23

6. LIST OF ABBREVIATIONS AND ACRONYMS 24

7. RELEVANT WEBSITES AND REFERENCES 25

EXECUTIVE SUMMARY

This document contains information on the relevant standardization bodies from the E3NETWORK project point of view. The ongoing standardization activities, strictly related to the project, carried out by these standardization bodies are also described.

It may be worth noting the high visibility of the E3NETWORK project that can be achieved through standardization initiatives. In fact, it is important that the results of the project are made known in order to have an impact on the wider research and industrial communities.

The E3NETWORK consortium will be active in the different standardization activities in order to achieve this goal. These standardization bodies are:

- ETSI
- CEPT ECC
- ITU
- National Administrations

In this phase of the project, we can only list the intended contributions to these standardization bodies, but it is expected that during the E3NETWORK project the achieved results will originate contributions to the different target standardization bodies.

The standardization bodies related to the Frequency Spectrum Management (CEPT ECC, ITU-R and national regulatory bodies responsible of spectrum management) will be monitored to ensure that an adequate frequency arrangement for E3NETWORK will be maintained. E3NETWORK will be ready to produce a technical contribution to the relevant working groups. The standardization bodies related to the equipment requirements (ETSI ATTM TM4) will receive contributions produced by the E3network study's results.

This deliverable is organised as follows, in chapter 1, an introduction to the scope of the standardization bodies is presented. Then, in chapter 2, an introduction of the European regulatory environment for radio equipment and spectrum and a description of the main players involved are provided. In chapter 3, the right places inside the standardization bodies in which E3NETWORK can contribute are identified. Moreover, a first draft of E3NETWORK action plan is presented and the activities carried out within the first period of the project are summarized.

A first update of the chapter 3 is provided.

1. INTRODUCTION

The E3NETWORK project aims to not only validate actual wireless state-of-the-art technology, but also to upgrade and integrate it in order to prepare for the deployment of next generation Information and Communications networks across Europe. Basically, the E3NETWORK project proposes a solution for 10Gbps connectivity based on a wireless technology in E-Band, providing a flexible, cost-effective, energy-efficient system.

The results of E3NETWORK are expected to have an important role in the ongoing standardization processes carried out by the different standardization bodies. In this chapter, a brief summary of the potential contributions of E3NETWORK to the relevant standardization committees is presented.

1.1 E3NETWORK potential contributions to standardization activities

E3NETWORK is a new approach that allows a 10Gbps wireless interconnection useful for the next generation networks. One of the main objectives of the E3NETWORK project is to assess the feasibility of a high modulation scheme radio, 64QAM, operating in the highest frequency band today available, the E-Band, and with widest channel, never used so far, 2000MHz, to make it possible to transport with a single radio link, up to 10Gbps and up to 1Km with huge link availability, 99.995% of the time.

The contributions that E3NETWORK can provide to standardization bodies are related to the points listed below:

- **Frequency Arrangement of E-Band**. The consortium should recommend that 2000MHz channel will be available in the future.

  The CEPT/ECC is the European institute in charge of the Frequency arrangement Definition. An important role, in this context, is also played by the National Administrations that are in charge of the management of radio spectrum. In the next chapter, the relation between National Administration and CEPT/ECC will be explained, focusing on those related to E3NETWORK. The relationship between ITU and CEPT/ECC is also described in the following chapter.

- **Characteristics and requirements for point-to-point Fixed Radio Systems operating in E-Band in 2000MHz channel spacing carrying 10Gbps**

  This point is related to the requirements a radio link must fulfil to operate in compliance with the current EU mandatory rules; in particular, “the regulatory framework for placing radio systems on the market, established by the R&TTE Directive” is relevant for this project. The R&TTE Directive requires the availability of a Harmonized document, called ENs covering the essential requirements under article 3.2 of the R&TTE Directive.

  The ETSI ATTM TM4 is in charge of the EN 302 217 series that meet this demand by providing a rational subdivision of requirements into general, system dependent "not essential" and "essential" requirements from the perspective of the R&TTE Directive.

  Since, E3NETWORK aims to introduce a new radio equipment, the consortium will help ETSI to define or complement the essential and not essential requirements requested by the R&TTE Directive that fit with the E3NETWORK solution.

- **Energy efficiency metrics**

  It will be very interesting for the ETSI TM4 to know where E3NETWORK solution will be positioned according to the Equipment Energy Efficiency Ratio (EEER) metrics under definition.

2. E3NETWORK TARGET STANDARDIZATION BODIES

2.1 European regulatory environment for radio equipment and spectrum

This section provides a short introduction to the regulatory environment in Europe for radio equipment and spectrum as described in [14].

2.1.1. Radio Regulatory Environment

At national level, radio spectrum is managed by National Administrations, which adopt a national table of radio spectrum allocations, define a framework for use of the radio spectrum and assign radio spectrum to the different users via licences or via licence-free arrangements.

At European level, the European Commission (EC), the European Telecommunications Standards Institute (ETSI) and the Electronic Communications Committee (ECC) of the European Conference of Postal and Telecommunications Administrations (CEPT) cooperate on aspects related to the regulatory environment for radio equipment and spectrum both at the EU level and at the wider intergovernmental level across Europe.

Figure 1. Radio Regulatory environment

2.1.2. European Union Radio Spectrum Regulatory Framework

The European Commission embodies and upholds the general interest of the 27 countries of the European Union. Its four main roles are: to propose legislation to Parliament and Council; to administer and implement Community policies; to enforce Community law; and, to negotiate international agreements, mainly those relating to trade and cooperation.

EU radio spectrum policy aims to coordinate spectrum management approaches across the Union. The overarching objective is to support the internal market for wireless services and to foster innovation in electronic communications and other sectors. It includes a regulatory framework to harmonize access conditions at EU level to ensure efficient use of radio spectrum and to enable interoperability of radio equipment.

The Commission may also, under the EC Radio Spectrum Decision, harmonize the technical conditions for the use of spectrum with the technical assistance of CEPT, on the basis of specific mandates. EU Decisions and regulations take precedence in the EU over ECC

decisions, which are non-binding, in cases where both measures exist in relation to the same issue.

The electronic communications regulatory framework was also modified to introduce more flexibility through the principles of technology and service neutrality. The EC harmonizes the essential requirements for radio equipments, which include constructing radio equipment so as to avoid harmful interference, via the New Approach R&TTE Directive. The New Approach R&TTE Directive regulates the requirements that products must meet in order to be placed on the market and put into service. The Directive is implemented at national level by Member States.

The usual way for manufacturers to comply with these requirements is to apply Harmonized Standards developed by ETSI and by CENELEC.

2.1.3. ECC of CEPT

The CEPT is a cooperative body in Europe of 48 national regulatory administrations in the field of posts and telecommunications. It is a recognized regional organization acting in accordance with pan-European goals set up by CEPT.

The Electronic Communications Committee (ECC) brings together 48 countries to develop common policies and non-binding regulations in electronic communications and related applications for Europe, and to provide the focal point for information on spectrum use. Its primary objective is to harmonize the efficient use of the radio spectrum, satellite orbits and numbering resources across Europe. It takes an active role at the international level, preparing common European proposals to represent European interests in the ITU and other international organizations.

The ECC's approach is strategic, open and forward-looking, and based on consensus between the member countries. It applies its expertise in partnership with all stakeholders, the European Commission and ETSI to facilitate the delivery of technologies and services for the benefit of society.

The ECC, in particular on request of its members, among others, undertakes compatibility studies and establishes conditions and parameters under which the sharing between the different users of the spectrum may take place. This may result in the development of an ECC Decision. Other ECC deliverables are ECC Recommendations, CEPT Reports (responses to mandates from the EC) and ECC Reports. ECC documents can be found at [12].

Attendance at ECC meetings includes representatives of the EC and of the European Free Trade Association (EFTA) Secretariat, representatives of ETSI, possibly representatives of relevant inter-governmental organizations as well as other organizations or non-CEPT Administrations concerned with electronic communications. In addition, industry representatives may also be invited as Observers by the Chairman.

In 1988, ETSI, the European Telecommunications Standards Institute, was created under the auspices of CEPT, which transferred all of its telecommunication standardization activities to ETSI. The ECC has a strong cooperation with ETSI in order to ensure coherence between ECC Decisions and ETSI Harmonized Standards.

2.1.4. ETSI

ETSI produces globally-applicable standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and internet technologies.

ETSI is officially recognized by the European Union as a European Standards Organization under the 98/34/EC Directive. ETSI is an independent, non-profit association with more than

700 members (including national administrations, companies and international organizations), drawn from 62 countries across 5 continents worldwide, participating directly in its work.

ETSI currently has more than 70 collaboration agreements with other organizations throughout the world. ETSI's purpose is to produce and maintain the technical standards and other deliverables which are required by its members. Much of the work is carried out in committees and working groups composed of technical experts from ETSI's member companies and organizations. ETSI, together with CENELEC, is responsible for the development of Harmonized Standards under the R&TTE Directive (1999/5/EC) in response to the EC mandates.

Applying Harmonized Standards referenced in the Official Journal of the European Union (OJEU) enable manufacturers and service providers to benefit from a presumption of conformity with the requirements of the Directive, and thus be able to sell, deploy and put into service (without prejudice to conditions attached to spectrum usage rights) the radio and telecommunications terminal equipment within the European Union.

ETSI also develops Technical Reports, named System Reference Documents (SRDoc), providing technical, legal and economic background on new radio systems under standardization and informs the ECC accordingly.

2.1.5. Cooperation between CEPT/ECC and ETSI

The ECC develops regulations for the effective use and Europe-wide harmonization of the radio frequency spectrum, and the efficient use of satellite orbits. Therefore, the ECC provides decisions regarding the allocation/designation of frequencies for radio communications services and applications within the CEPT countries. It also provides requirements for the use of spectrum by radio equipment.

ETSI develops standards for radiocommunication systems and equipment. These radio standards, and in particular those under article 3.2 of the R&TTE Directive, contain various requirements about the efficient use of the spectrum, including compatibility between different radio services.

A Memorandum of Understanding (MoU) has been agreed between ETSI and the CEPT Electronic Communications Committee (ECC), for co-operation. In the development of Harmonized Standards for radio equipment as well as in relevant ECC deliverables, the provisions of the ETSI-CEPT MoU are applied, as depicted in Figure 2.

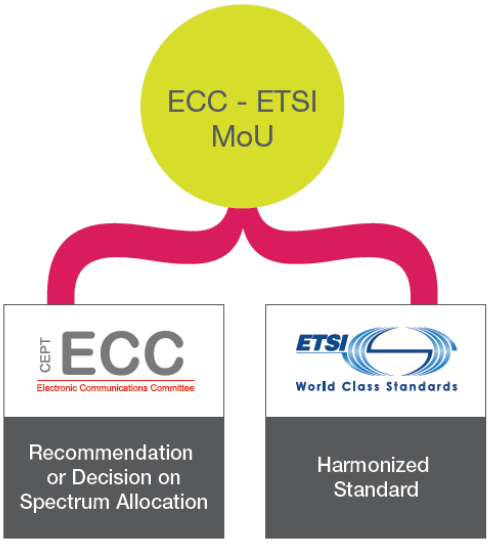

Figure 2. Relationship between ETSI and ECC

2.1.6. Cooperation between the EC and CEPT/ECC

ECC/CEPT develops CEPT Reports in response to mandates issued by the EC, as shown in Figure 3. Those CEPT Reports provide input for the development of Commission Decisions which may also reflect the technical parameters and sharing conditions identified by ECC/CEPT.

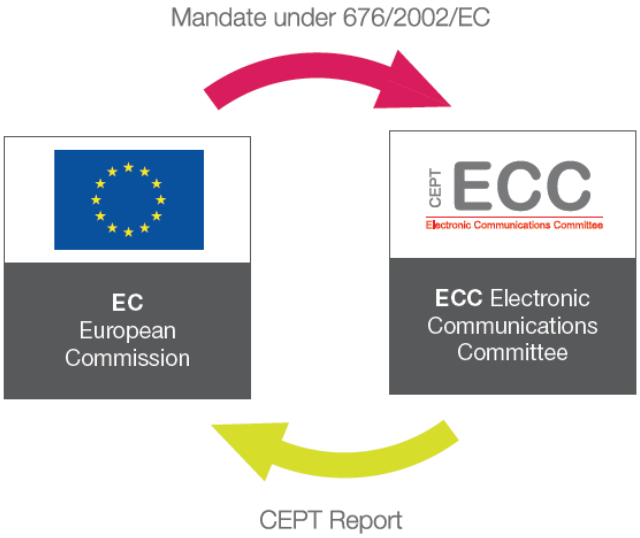

Figure 3. Relationship between ETSI and ECC

Commission Decisions are mandatory harmonization measures within the EU. Thus, the implementation of EC Decisions is mandatory for EU Member States, EEA countries, bilaterally "associated" countries as well as any accession country before it can join the EU.

Finally, the ECC also assists the Commission in the publication of sub classes for equipment in accordance to the R&TTE Directive by contributing to Telecommunications Conformity Assessment and Market Surveillance (TCAM).

2.1.7. Cooperation between the EC and ETSI

The Telecommunications Conformity Assessment and Market Surveillance (TCAM) Committee assists the Commission in the management of R&TTE Directive (1999/5/EC).

The R&TTE Directive (1999/5/EC) regulates the requirements that radio and telecommunication terminal equipment must meet in order to be placed on the market and to be put into service (without prejudice to conditions attached to spectrum usage rights, as described in Articles 6.1, 7.1 and 7.2). It harmonizes the requirements for radio equipment to use the radio spectrum effectively so as to avoid interference with the objective of ensuring the good functioning of the internal market of the European Union.

The EC, after consultation with TCAM prepares mandates for development of Harmonized Standards. Under these mandates ETSI produce the Harmonized Standards (see figure 4). These mandates are subject to approval of the 98/34 Committee under the Directive on the procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services (98/34/EC).

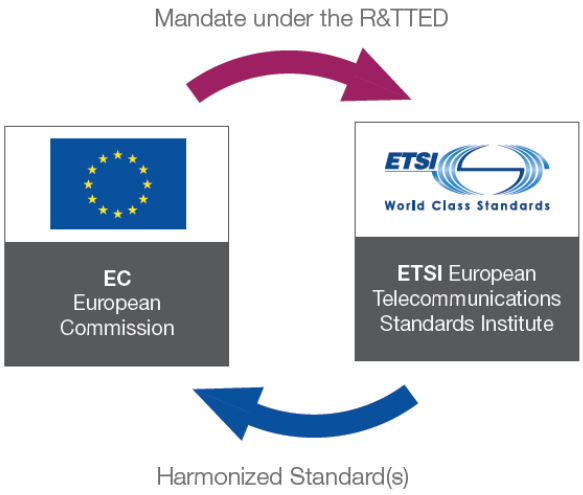

Figure 4. Relationship between EC and ETSI

2.1.8. Obligation of manufacturers

The picture below shows the responsibilities of manufacturers under the R&TTE Directive [6].

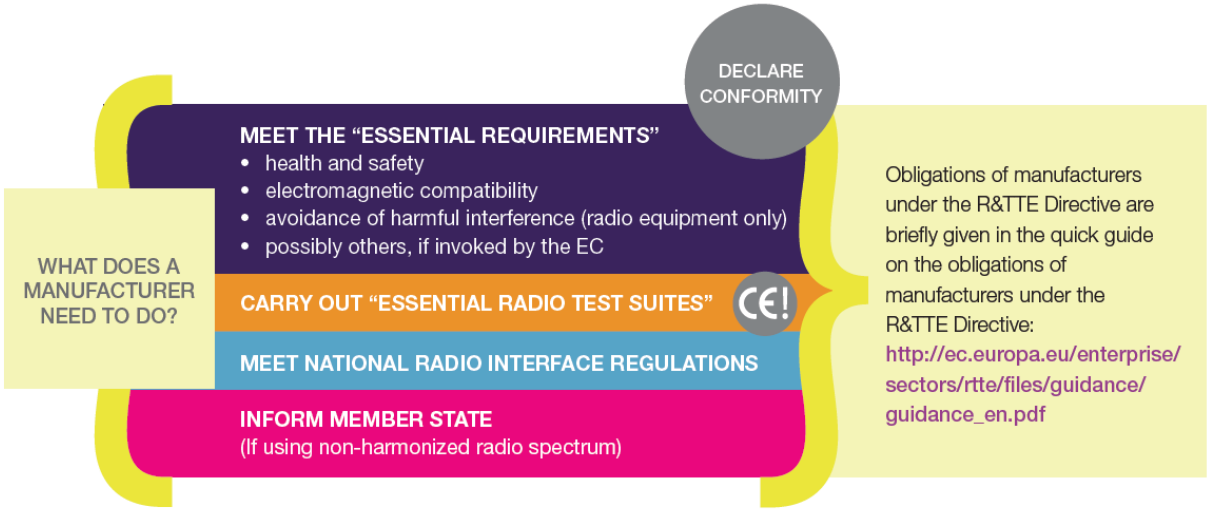

Figure 5. Responsibilities of the manufactures under R&TTE Directive

2.1.9. ITU

ITU is the United Nations specialized agency for information and communication technologies (ICT). ITU allocates global radio spectrum and satellite orbits, develops the technical standards that ensure networks and technologies seamless interconnection, and strives to improve access to ICTs to underserved communities worldwide.

The ITU Radiocommunication sector (ITU-R) is the part of ITU relevant in the E3NETWORK context. The ITU-R plays a vital role in the global management of the radio-frequency spectrum and satellite orbits - limited natural resources which are increasingly in demand from a large and growing number of services such as fixed, mobile, broadcasting, amateur, space research, emergency telecommunications, meteorology, global positioning systems, environmental

monitoring and communication services - that ensure safety of life on land, at sea and in the skies.

The mission of ITU-R is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including those using satellite orbits, and to carry out studies and approve Recommendations on radiocommunication matters. In implementing this mission, ITU-R aims at creating the conditions for harmonized development and efficient operation of existing and new radiocommunication systems, taking due account of all parties concerned.

The primary objective of ITU-R is to ensure interference free operations of radiocommunication systems. This is ensured through implementation of the Radio Regulations and Regional Agreements, and the efficient and timely update of these instruments through the processes of the World and Regional Radiocommunication Conferences.

Furthermore, ITU-R establishes ´Recommendations´ intended to assure the necessary performance and quality in operating radiocommunication systems. It also seeks ways and means to conserve spectrum and ensure flexibility for future expansion and new technological developments.

2.1.10. Cooperation between the CEPT and ITU

Com-ITU (Working Group ITU) is responsible for organising the co-ordination of CEPT actions. They also organize meetings for the Council, Plenipotentiary Conferences, World Telecommunication Development Conferences, World Telecommunication Standardisation Assemblies for and during the course of the ITU activities and other meetings as appropriate.

2.1.11. National Regulatory bodies

National regulatory bodies are responsible for the regulation and control of the communications sector in each country. It is their responsibility to define and propose strategies to develop the communication sector.

Moreover, they should also supervise the telecommunications market, in order to ensure the application of the defined laws, regulations and technical requirements, as well as guarantee that the communications operators are respecting the granted licences. Sometimes, the National Regulatory bodies ask for opinion about the possible review of the Spectrum Management Approach trough public consultation.

3. STANDARDIZATION PLAN

This chapter presents the standardization activities that have been planned within E3Network. The relevant working groups and tasks in each standardization committee are identified. Moreover, the activities performed in each relevant working group within the first period of the project are described in this chapter.

3.1 CEPT ECC

The following figure shows the structure of ECC.

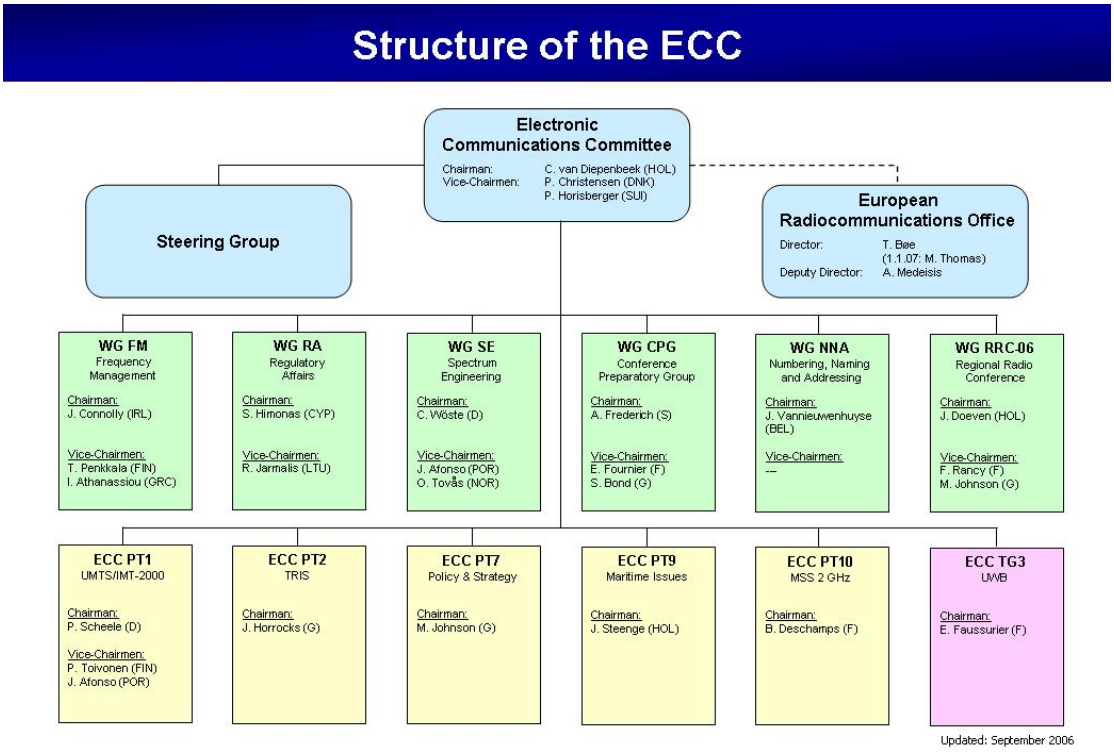

Figure 6. Structure of the ECC

The most relevant group of interest of E3NETWORK for contribution within ECC is the Working Group 'Spectrum Engineering' (WG SE). This working group (WG SE) shall:

- Develop technical guidelines for the use of the frequency spectrum by various radiocommunication services;
- Develop sharing criteria between radiocommunication services, systems or applications using the same frequency bands;
- Develop compatibility criteria between radiocommunication services using different frequency bands;
- Co-ordinate CEPT activities and contributions for the related work in ITU-R;
- Co-operate with relevant technical bodies in ETSI in accordance with the procedures given in the Memorandum of Understanding between ECC and ETSI;

- Study technical impacts of ISM and other non-radio equipment on radio services taking into account related activities in the relevant International and European Organisations;
- On request from the CPG (Conference Preparatory Group) contribute to the preparation of CEPT positions for WRCs (World Radiocommunication Conferences) and other relevant fora;
- Seek, where relevant, contributions and assistance from the Office and the relevant ECC subordinate bodies;
- Consult with various bodies and organisations within CEPT countries or Administrations outside the CEPT, with the principal aim to collect information and to broaden the support for the deliverables of the working group;
- Prepare draft Decisions as directed by the Plenary and prepare and approve Recommendations and Reports as necessary;
- Develop and maintain its work programme, approve the work programme of its subordinate bodies, and guide and co-ordinate the work of these bodies;
- Report to the Plenary.

Inside the WG SE, the most relevant group for E3NETWORK is "SE19 Fixed Service". The SE19 takes care of:

- Preparing harmonised frequency plans and guidelines for introducing novel broadband applications in the FS;
- Studying developments in new FS technology;
- Studying compatibility/sharing issues involving traditional FS (such as radio relay links) as well as broadband FS applications;
- Co-ordinating the relevant activities in ITU-R;
- Liaising/contributing to ETSI ATTM/TM4 in accordance with the CEPT/ETSI MoU.

Some of the works currently under SE19 responsibility, and interesting for the E3NETWORK project, are listed below:

- SE19_20: Technical conditions for FS deployment inside 71-76/81-86 GHz
- SE19_19: Add in the ECC/REC(05)07 [14] the option of subdividing a number of contiguous 250 MHz channels into 50 MHz or/and 62.5 MHz slots in order to provide smaller

  Both contributions are related to a revision of the ECC/REC(05)07 (Radio frequency channel arrangements for Fixed Service Systems operating in the bands 71-76 GHz and 81-86 GHz).

- SE19_24: Coordinated inputs to ITU-R: WP5C

  This is the way used for coordination of contributions related to FS channel arrangements to ITU-R F series recommendations. In particular, the new version of ECC/REC(05)07 will be enclosed in the ITU-R F2006 "Radio-frequency channel and block arrangements for fixed wireless systems operating in the 71-76 and 81-86 GHz bands".

3.1.1. CEPT ECC methodology for Contribution

The CEPT ECC SE 19 FIXED SERVICE organizes regular meetings, where it is possible to participate and provide feedback. The contribution to SE 19 may consist of preparation for

supporting document to specific topics, or can be done orally during the face-to-face meetings. Sometimes a web-meeting is arranged for particular topics.

Table 1 reports the ECC SE 19 FIXED SERVICE meetings since October 2014 and the E3NETWORK attendees. During the first period of the E3NETWORK project, a full monitoring of the ECC WG group and ECC SE group, with particular focus on ECC SE19, has been performed both by meeting attendance and by reading the meeting documents off-line. The information relevant for the project has been reported to the E3NETWORK partners.

Table 1. SE19 meetings since October 2014

MEETING NUMBER	DATE	PLACE	Office	E3NETWORK ATTENDEES
61	JANUARY 2013	Copenhagen	ERO	MARIO FRECASSETTI
62	FEBRUARY 2013	Copenhagen	ERO	MARIO FRECASSETTI
63	APRIL 2013	Copenhagen	ERO	-
64	JUNE 2013	Copenhagen	ERO	-
65	OCTOBER 2013	Copenhagen	ERO	-
66	JANUARY 2014	Copenhagen	ERO	-
67	*APRIL*	Maison Alfort - France	*ANFR*	MARIO FRECASSETTI
68	*AUGUST*	*BUCHAREST*	*ANCOM*	MARIO FRECASSETTI
69	*NOVEMBER*	*BIENN/BIEL*	*OFCOM*	

3.2 ETSI ATTM TM4

Figure 7 shows the structure of ETSI. Within ETSI, the most relevant group of interest of E3NETWORK for contribution is inside the Technical Committee (TC) ATTM "Access Terminals Transmission and Multiplexing" Technical Body.

The TC ATTM addresses Access, Terminals, Transmission and Multiplexing including all aspects within the ETSI scope - cabling, installations, signal transmission, multiplexing and other forms of signal processing up to digitalization in private and public domain; excluding those aspects that relate to Hybrid Fibre-Coaxial cable networks which are covered by TC Cable. TC ATTM closely collaborates with the Technical Bodies responsible for communications, networking and services and the exact boundary between the activities is adapted to the members' needs.

ATTM is organized around a set of ETSI work items addressing specific technologies, equipment, installations and regulatory aspects of the physical layer e.g.:

- Transmission issues of interfaces.
- Frequency management on the non-radio communication infrastructures.
- Analogue and digital presented communication interfaces of balanced wired (twisted pair), coaxial cable and optical fibre infrastructures.
- Interfaces based on new technologies, as far as they are relevant for communication infrastructures. These interfaces could be public or private, switched or non-switched, seen from either the network or the terminal side.
- Point-to-point and point-to-multipoint radio systems and infrastructures used for the fixed service (core and access networks), covering all equipment aspects including antenna parameters.
- Transmission related aspects of network architectures (including protection issues)-

- Specification of the transmission functions and performance of the network elements such as transmission paths, path elements, sections, systems, functional entities, antenna, cable and optical fibre.

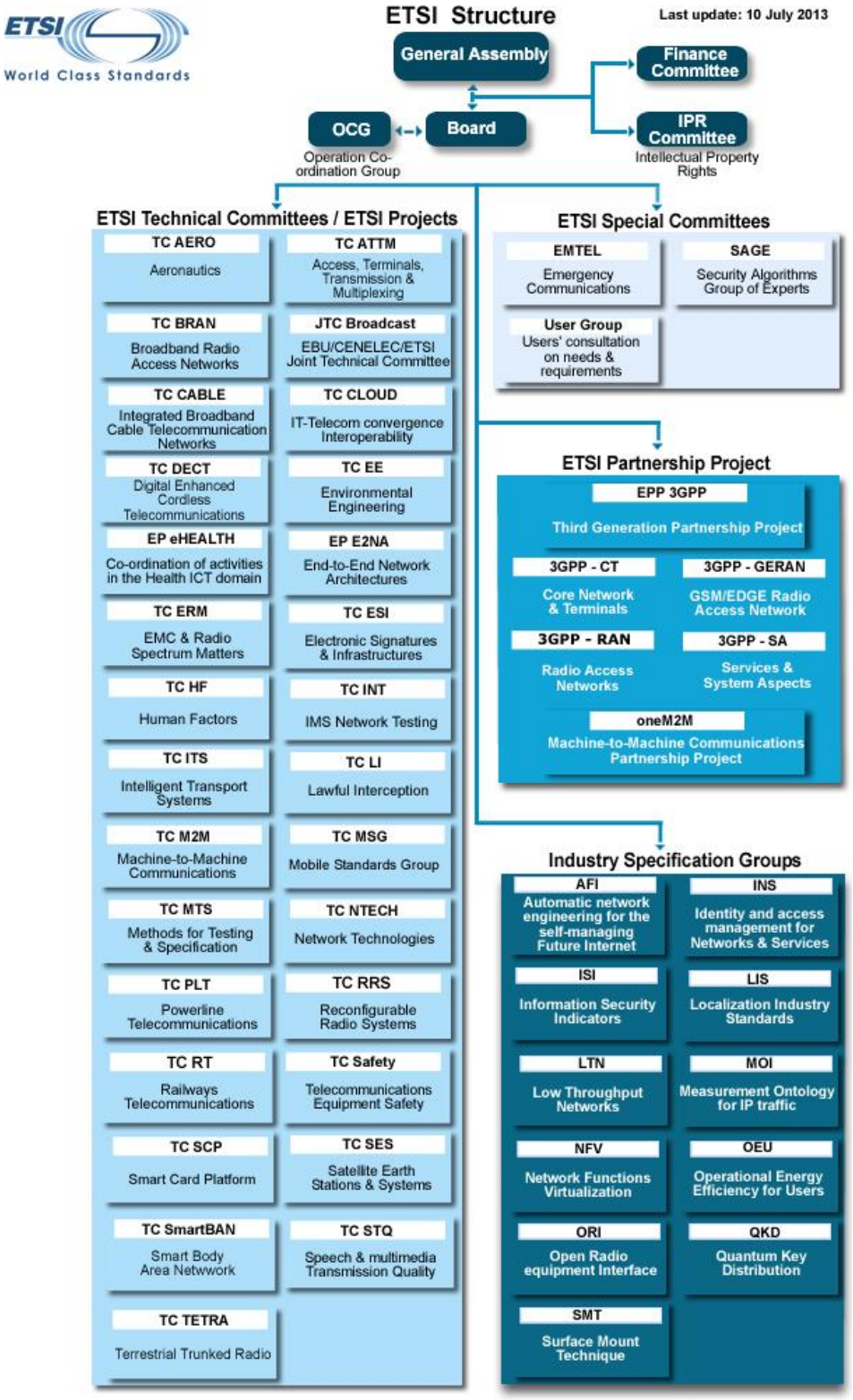

Figure 7. The structure of ETSI

TC ATTM consists of three Working Groups:

- WG AT2: Infrastructure, Physical Networks & Communication Systems
- WG TM4: Fixed Radio Systems
- WG TM6: Wireline Access Network Systems

Within TC ATTM of ETSI, the relevant group for E3NETWORK is WG TM4: Fixed Radio Systems. WG TM4 has the following responsibilities:

- Specifications for point-to-point and multipoint radio systems, in the fixed service used in core and access networks, covering all equipment aspects including antenna parameters. Radio-frequency matters that may affect CEPT/ECC radio-frequency allocation and policy are excluded;
- Functional requirements for radio-frequency equipment interface, including allocation of overhead;
- Co-operation and technical support towards ECC/PT SE19 for channel arrangements and improved spectrum usage in the frequency bands allocated to fixed service (in co-ordination with ETSI WG ERM/RM).

In the following, we identify the works currently under WG TM4 responsibility that may have an impact in the context of E3NETWORK:

- RTR/ATTM-04021: New TR 103 820, Energy efficiency metrics and test procedures for Point-to-point fixed radio systems
- REN/ATTM-04025: Proposed revision of EN 302 217-2-2 (smaller CS in the E-band)
- REN/ATTM-04026: Proposed revision of EN 302 217-3 (smaller CS in the E-band)
- ATTM TM4(13)000028: From ITU-R WP5A on “Multiple Gigabit Wireless Systems in frequencies around 60 GHz”.
- DTR/ATTM-04015: New TR 103 053 for the study factors affecting Receiver Signal Level (RSL) thresholds and to define their practical values in view of possible standardization.

DTR/ATTM-04027: New TR 103 230 on Small Cells Backhauling It is worth noting that the EN 302 217-2-2 is part of the Harmonized Standards relevant for the R&TTE Directive.

3.2.1. ATTM TM4 Methodology for contribution

The ATTM TM4 organizes regular meetings, usually two per year, where it is possible to participate and provide contribution and feedback. The contribution to ATTM TM4 may consist of preparation for supporting document to specific topics, or can be done orally during the meeting.

Table 2 reports the ATTM TM4 "Fixed Radio Services" meetings since May 2011 and the E3NETWORK attendees. We can observe that E3NETWORK has been represented in these meetings since the beginning of the project (December 2012).

Table 2: ETSI ATTM TM4 meetings

MEETING NUMBER	DATE	PLACE	OFFICE	E3NETWORK ATTENDEES
45	MAY 2011	SOPHIA ANTIPOLIS	ETSI	MARIO FRECASSETTI
46	OCTOBER 2011	SOPHIA ANTIPOLIS	ETSI	MARIO FRECASSETTI
47	APRIL 2012	SOPHIA ANTIPOLIS	ETSI	MARIO FRECASSETTI -
48	OCTOBER 2012	SOPHIA ANTIPOLIS	ETSI	MARIO FRECASSETTI -
49	APRIL 2013	SOPHIA ANTIPOLIS	ETSI	MARIO FRECASSETTI -
50	OCTOBER 2013	LONDON	UK	MARIO FRECASSETTI -
51	APRIL 2014	SOPHIA ANTIPOLIS	ETSI	MARIO FRECASSETTI
52	OCTOBER 2014	SOPHIA ANTIPOLIS	ETSI	MARIO FRECASSETTI
53	MAY 2015	T.B.D		
54	OCTOBER 2015	T.B.D		

3.3 ITU

As there is a close relationship between ECC and ITU, the activities that will be performed within ECC should be considered enough to spread inside ITU-R the benefits of E3NETWORK results. Thus, in the context of E3NETWORK, it is not foreseen to provide a direct contribution to ITU, and in particular to ITU-R.

Anyway, it may be possible to have a chance to point out the efforts and the results of E3NETWORK inside a specific ITU technical report.

3.4 Others Groups

At the time being, in order to promote the usage of millimetres wave frequency bands, some third party groups are emerging. In particular, it may be worth to point out the millimeter-Wave Transmission Forum Millimeter Trasmission Forum, mmWTF, announced in September 2014.

The mmWTF members consist of representatives of standards bodies, country spectrum regulators, telecom operators, enterprises, equipment vendors, and associated chip and component vendors. The main aim is to promote the use of V-band (57-66 GHz), E-band (71-76 & 81-86 GHz) and in the future higher frequency bands (from 50 GHz up to 300 GHz) by favouring the conditions to make them a suitable and convenient choice for large volume applications in the back- and front-hauling.

ALU is part of this group. Deutsche Telekom group of companies, where OTE belongs, is also a part of the forum.

3.5 National Regulatory bodies

As mentioned above, sometimes the National Regulatory bodies are asking for the public opinion through a public consultation. It is important, in the context of E3NETWORK to monitor and eventually reach to this kind of consultations.

3.5.1. OFCOM –UK

The most relevant consultation, currently ongoing is issued by OFCOM –UK. OFCOM is the communications regulator of UK. OFCOM regulates the TV and radio sectors, fixed line telecoms, mobiles, postal services, plus the airwaves over which wireless devices operate. The consultation: "Review of the Spectrum Management Approach in the 71-76 GHz and 81-86 GHz bands. Consultation on the future management approach for the 70 / 80 GHz bands" was published in August 2013 and proposes changes to the management and authorization approach within the 71-76 GHz and 81-86GHz Band (E-Band). The consultation can be found in http://stakeholders.ofcom.org.uk/consultations/70-80ghz-review/

In the following picture, the frequency plan proposed in this consultation is shown.

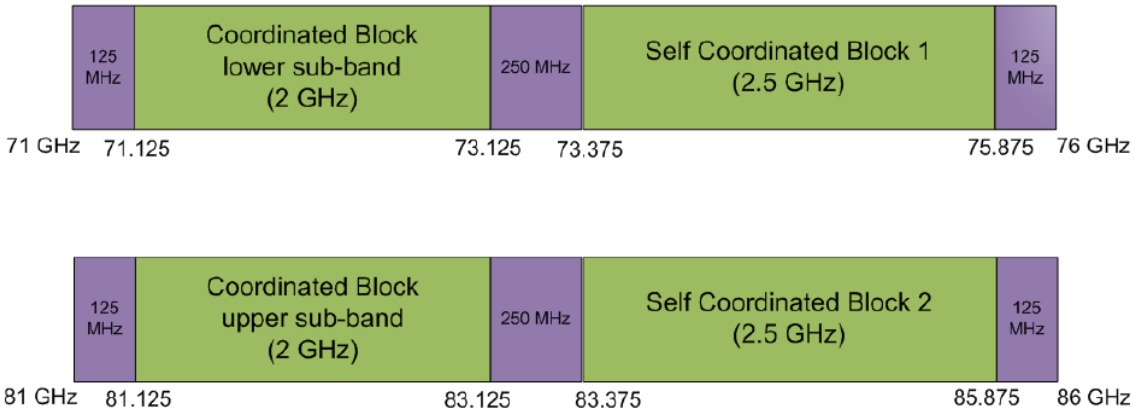

Figure 8. Frequency plan proposed in the consultation of OFCOM-UK.

Currents limits, in terms of Maximum channel bandwidth are reported in the following table.

Segment	Block Size	Frequency range	Maximum channel bandwidth	Band Plan
Self coordinated block (currently available)	2.5 GHz	73.375–75.875 GHz and 83.375-85.875 GHz	2.5 GHz	no channel plan
Ofcom coordinated Block (available from 17 December 2013)	2 GHz (limited to 1 GHz in the first instance)	71.125-73.125 GHz and 81.125-83.125 GHz	1000 MHz	CEPT band plan (ECC REC (05)07)
Spectrum separating the Self coordinated and Ofcom coordinated blocks	250 MHz	73.125-73.375 GHz and 83.125-83.375 GHz	-	-

Figure 9. Maximum channel bandwidth in UK.

3.5.1. National Telecommunications and Post Commission (EETT) - Greece

According to last decision of EETT [16] current situation is depicted into the following table.

Table 3: E-band frequency planning in Greece

Frequency Band (MHz)	Network Topology	Usage	Channel spacing (MHz)	Frequency Plan	Authorization regime	Interfaces	Equipment standards (ETSI)	Additional requirements
710000-760000 paired with 810000-860000	Point-to-point radio links	Digital radio links	Integer multiple of 250 MHz Possibility of 250 MHz channel subdivision to 4 x 62,5 MHz or 2 x 125 MHz	According to ECC/REC/(05)07	Mandatory		EN 302 217	ECC/REC/(05)07 Use of FDD or TDD

According to this, an integer multiple of 250 MHz channels are allowed, enabling the deployment of an E3NETWORK solution.

3.5.2. Ministero dello Sviluppo Economico - MISE – ITALY

A recent public consultation has taken place in Italy, covering the whole fixed services frequency bands (PNRF).

In this public consultation, among other points, we suggested to adopt, in case of E-Band, a frequency plane according to the latest version of ECC/REC(05)07 (Radio frequency channel arrangements for Fixed Service Systems operating in the bands 71-76 GHz and 81-86 GHz).

In particular we suggested:

- To adopt only annex 3, so only systems working on 71-76 and 81-86 with 10 GHz of distance between RX and TX should be accepted. No restriction in number of channel aggregation will be applied
- Do not adopt the option, foreseen in annex 3, of subdividing the 250MHz channel into narrower 62,5 and 125MHz channels
- Do not adopt the TDD solution, currently foreseen in annex 3
- Do not adopt annex 1 (only 71-76 GHz bands)
- Do not adopt annex 2 (only 81-86 GHz bands)

According to the first feedback received during a face to face meeting in Rome in September 2014, our suggestions have been, for the time being, all accepted.

4. E-BAND REGULATION STATUS IN EUROPE

The scope of this chapter is to provide an overview of the regulation status of E-Band in Europe. We observed a good and fast trend in the regulation of E-Band, proving, in a certain way, the huge interest this band has gained in this last year.

The figure presents the official situation, as depicted in the ECO official website [12], regarding the ECC/REC/(05)07 Fixed Service in the bands 71 - 76 GHz and 81 - 86 GHz implementation status.

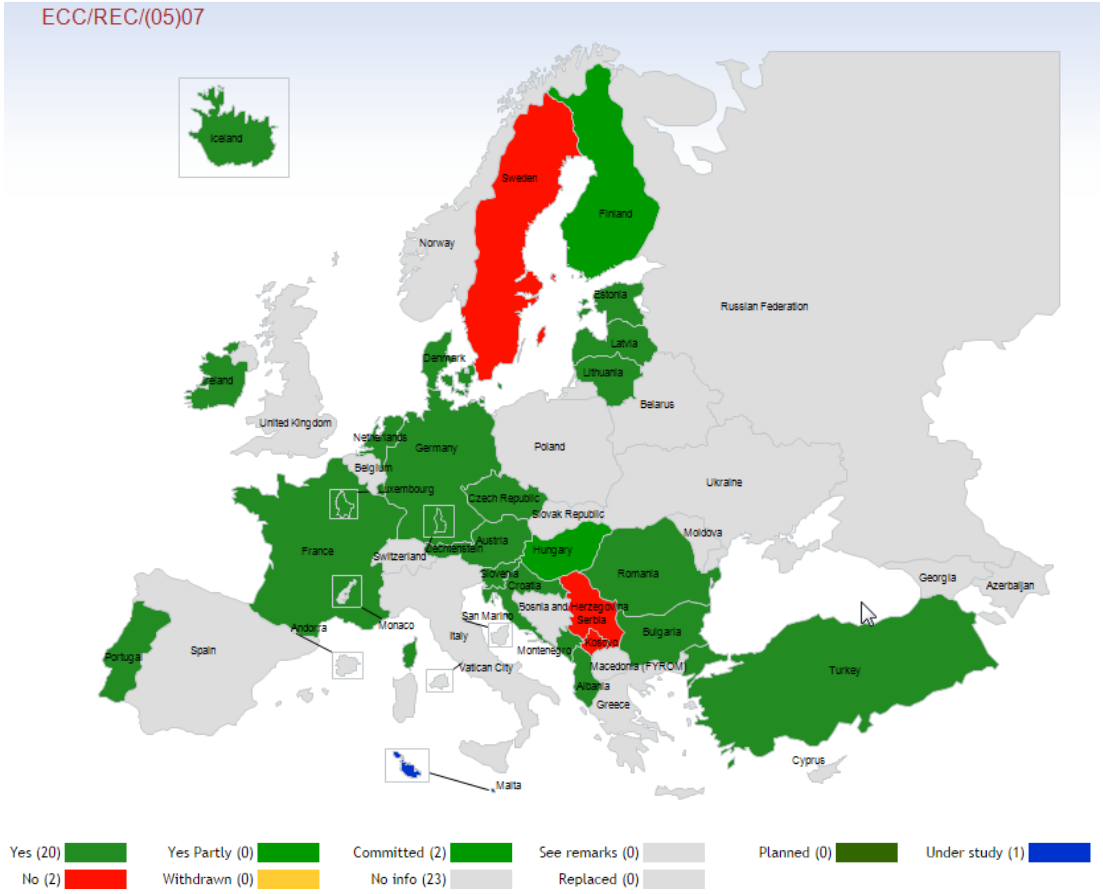

Figure 10. Implementation status of the ECC/REC/(05)07 in Europe

On this regards, we can complement the figure with additional information directly received or not yet reported in ECO website.

- UK implemented a different frequency arrangement with respect to what is currently foreseen in the ECC/REC/(05)07, even if the UK channel planning has a common base with this recommendation.
- Italy is working on the adoption of this recommendation, in particular the annex 3 only and in the context of annex 3, FDD only.

In the following table, it is depicted the whole situation in Europe. This situation is not updated, since we know that Greece has adopted E-Band under a license regime. For sure the positive cases are positive in the perspective of E3NETWORK, and the question mark positions can potentially become positive.

The cases that don't' fit with E3NETWORK requirements are highlighted in red. Analysing these few cases, it is observed that the main reason for this that the E-Band is not totally

allocated to Civil use, but part of it is reserved to military use. case where, even if a band restriction is applied, the E3NETWORK solution can anyway fit are highlighted in yellow.

Table 4: Regulation status of E-band in Europe

Country	Regulation status	License type	Allocated Frequencies
Albania	Regulated	License	71-76 GHz, 81-86GHz
Austria	Regulated	License	73-76GHz, 83-86 GHz
Belgium	Regulated	License	71-76 GHz, 81-86GHz
Bosnia and Herzegovina	Regulated	License	74-76 GHz, 84-86GHz
Bulgaria	Allocated	?	71-76 GHz, 81-86GHz
Croatia	Allocated	Light licensing ?	71-76 GHz, 81-86GHz
Cyprus	Regulated	License	71-76 GHz, 81-86GHz
Czech Republic	Regulated	Free	71-76 GHz, 81-86GHz
Denmark	Regulated	License	71-76 GHz, 81-86GHz
Estonia	Regulated	License	71-76 GHz, 81-86GHz
Finland	Regulated	License	71-76 GHz, 81-86GHz
France	Regulated	License	71-76 GHz, 81-86GHz
Germany	Regulated	License	71-76 GHz, 81-86GHz
Greece	Allocated	License	71-76 GHz, 81-86GHz
Hungary	Regulated	Light licensing	71-76 GHz, 81-86GHz
Iceland	Regulated	License	74-76 GHz, 84-86GHz
Ireland	Regulated	License	71-76 GHz, 81-86GHz
Italy	Regulated	License	71-76 GHz, 81-86GHz
Latvia	Regulated		74-76 GHz, 84-86GHz
Liechtenstein	Regulated	License	71-76 GHz, 81-86GHz
Lithuania	Regulated	Light licensing	74,6–75,9 GHz 84,6–85,9GHz
Macedonia	Regulated	License	71-76 GHz, 81-86GHz
Malta	Regulated	License	71-76 GHz, 81-86GHz
Montenegro	Regulated	?	?
Netherlands	Regulated	License	71-76 GHz, 81-86GHz
Norway	Regulated	License	71-76 GHz, 81-86GHz
Poland	Regulated	License	74-76 GHz, 84-86GHz
Portugal	Regulated	License	71-76 GHz, 81-86GHz
Romania	Regulated	License	71-76 GHz, 81-86GHz
Russian Federation	Regulated	Free	71-76 GHz, 81-86GHz
Serbia	Regulated	Free	72-76 GHz, 82-86GHz
Slovakia	Regulated	Free	71-76 GHz, 81-86GHz
Slovenia	Regulated	License	74-76 GHz, 84-86GHz
Spain	Regulated	License	71-76 GHz, 81-86GHz
Sweden	Allocated	License	71-76 GHz, 81-86GHz
Switzerland	Regulated	License	71-76 GHz, 81-86GHz
Turkey	Regulated	License	71-76 GHz, 81-86GHz
Ukraine	Regulated	?	?
United Kingdom	Regulated	Double regime - free and Light licensing	71-76 GHz, 81-86GHz

5. CONCLUSIONS

The standardization bodies related with the E3NETWORK project are CEPT ECC, ITU, ETSI, and the National Administrations.

Within CEPT ECC, the working group SE19 Fixed Service has been identified as the most relevant for the project. They are currently revising the frequency channel arrangements for Fixed Service Systems operating in the bands 71-76 GHz and 81-86 GHz. E3NETWORK has been represented in the relevant meetings of this working group and the most interesting information has been reported to the E3NETWORK partners. The consortium will keep monitoring the work done within this working group in the following periods. Due to the close link between CEP ECC and ITU-R, the consortium considers that any contribution to CEPT ECC can be spread to ITU-R, when relevant.

Within ETSI, the working group ATTM TM4 “Fixed Radio Systems” is considered as the most relevant for E3NETWORK. They are in charge of the specifications of point-to-point radio systems, such as the one to be built in the project. Moreover, they are devising energy efficiency metrics and test procedures for point-to-point fixed radio systems that are interesting for the project. E3NETWORK has been represented in the meetings of this working group since the beginning of the project.

Finally, the consortium of E3NETWORK will monitor the public consultations of the National Regulatory bodies, such as the one issued by OFCOM in UK about “Review of the Spectrum Management Approach in the 71-76 GHz and 81-86 GHz bands. Consultation on the future management approach for the 70 / 80 GHz bands”. A whole picture related to the current European situation is added.

In addition third party groups, promoting the millimeter waves for back-hauling and front-hauling application mainly, have been observed during these last months. E3NETWORK will try to monitor also these groups.

6. LIST OF ABBREVIATIONS AND ACRONYMS

ATTM	Access Terminals transmission and multiplexing
CENELEC	Comité Européen de Normalisation Electrotechnique
CEPT	European Conference of Postal and Telecommunications Administrations
CPG	ECC's Conference Preparatory Group
CS	Channel Spacing
EEA	European Economic Area
EEER	Equipment Energy Efficiency Ratio
EC	European Commission
ECC	Electronic Communications Committee
ECO	European Communications Office
EFTA	European Free Trade Association
EN	European Standard, telecommunications series
ESO	European Standardisation Organisations
ETSI	European Telecommunications Standards Institute
EU	European Union
FS	Fixed Service
HS	Harmonized Standard
ICT	Information and Communications Technologies
ISM	Industrial Scientific and Medical
ITU	International Telecommunication Union
ITU-R	International Telecommunication Union- Radiocommunication sector
MoU	Memorandum of Understanding
NSO	National Standards Organisation
OJEU	Official Journal of the European Union
QAM	Quadrature Amplitude Modulation
RSC	Radio Spectrum Committee
RSL	Received Signal Level
R&TTE	Radio and Telecommunications Terminal Equipment
SRDoc	System Reference Documents
TC	Technical Committee
TCAM	Telecommunication Conformity Assessment and Market Committee
WG SE	Working Group “Spectrum Engineering”
WRC	World Radiocommunication Conference

7. RELEVANT WEBSITES AND REFERENCES

[1] ETSI: www.etsi.org

[2] ECC:www.cept.org/ecc

[3] EC Radio Spectrum Policy Group: http://rspg.ec.europa.eu/

[4] EC Radio Spectrum Committee: http://ec.europa.eu/information_society/policy/radio_spectrum/activities/rscwork/index_en.htm

[5] Radio Spectrum Decision 676/2002/EC: http://europa.eu/legislation_summaries/information_society/l24218a_en.htm

[6] R&TTE Directive: http://ec.europa.eu/enterprise/rtte/index_en.htm and

[7] http://europa.eu/legislation_summaries/information_society/l21003a_en.htm

[8] 98/34/EC Directive: http://europa.eu/legislation_summaries/internal_market/single_market_for_goods/technical_harmonisation/l21003_en.htm

[9] OFCOM UK http://www.ofcom.org.uk/

[10] EU legislation: http://eur-lex.europa.eu/en/index.htm

[11] R&TTE Compliance Association: http://www.rtteca.com/

[12] ECO documents repository: http://www.ecodocdb.dk/

[13] Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity (R&TTE Directive).

[14] ECC/ETSI brochure: “The European regulatory environment for radio equipment and spectrum”, 2001.

[15] ECC/REC(05)07 (Radio frequency channel arrangements for Fixed Service Systems operating in the bands 71-76 GHz and 81-86 GHz).

[16] Newspaper of the Government of Hellenic Democracy – 26 June 2014 (FEK 1713/B/26-6-2014) Regulation regarding the terms of use of individual radiofrequencies or radiofrequency bands.