

FM 49 Radio Spectrum for PPDRFM49(11)010

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Introduction

Public Safety Communication Europe Forum (PSCE) is a liaison partner of the ECC and represents institutional organizations as well as individual members from the Public Safety Communication Sector. PSCE is a permanent autonomous organisation aiming at improving provision of public safety communications and information management systems and the safety of the citizens during crisis and emergency situations. PSCE provides a unique common platform for researchers, industry and users enabling regular exchange of ideas, information, experiences and best practices.

TETRA Association has 160 organizations as members who all work in the professional communications field, including Public Protection and Disaster Relief (PPDR) sector as well as in energy, transport, oil & gas, and other sectors servicing a safe and effective society. Members include official PPDR organizations from the majority of European states¹.

Summary

The ERC/DEC(96)01 decision has proven to be an extremely successful decision by the CEPT. We encourage FM 49 to take a similar successful decision again.

The ERC/DEC(96)01 decision has enabled effective PPDR networks to be established in hundreds of countries around the world. A whole industry relies on this decision and the demand side enjoys competition, choice of many specialized devices and the established networks are expected to remain in operation for 10+ years.

The larger PPDR community, including Critical Infrastructure services², rely on spectrum in 410-470 MHz band which is equally essential to a well functioning society.

¹Finland, Sweden, Norway, Denmark, Germany, Netherlands, Belgium, UK, Ireland, Estonia, Hungary, Austria, Italy, Portugal etc.

²Public utilities including Gas, Electricity and Water, Transportation including Ports and Airports, Buses and Trains, Power Generation, etc.

Although 380-400 MHz is being used for voice & data communication, voice communication takes up all allocated spectrum when disasters happen. Wideband dependent data services in the future broadband spectrum are required in addition hereto. A solution must be found.

The user community has, through ETSI³ and through the European Council⁴ made its need clear.

We encourage the European Regulators to identify a fully harmonized spectrum solution for the benefit of tax-payers, PPDR practitioners and the European industry.

TETRA Association and PSC-Europe are confident that FM49 will find a harmonised solution for above needs.

Discussion

Effect of 1996 decision.

In the early 1990s ETSI was developing a digital mobile radio standard for the users of mission critical radio systems. This highly successful technology eventually became known as TETRA and is now deployed in 124 countries of the world.

The reasons for the success of TETRA are varied. The technology satisfied a latent demand for high capacity, high functionality private radio systems that were needed by Public Safety and other critical communications users from Transport, Utilities, Fuel and Power and others sectors. Users in these sectors had previously been limited to only basic analogue radio systems. TETRA provided superior voice quality, high levels of functionality and much more efficient use of spectrum. However, due to the relatively small market when compared with public systems such as GSM and 3G, a co-ordinated approach to a wide geographic market was essential.

"The European Commission and the TETRA MoU Association worked with the Public Safety users to negotiate harmonised spectrum for Europe. In agreement with NATO a 2 x 5 MHz band within 380 to 400 MHz was harmonised for emergency services by ERC/DEC(96)01 and in practice the band was adopted by both TETRA and Tetrapol emergency service networks. Following the emergency services decision the bands 410 to 430 MHz and 450 to 470 MHz were identified for other digital PMR users from critical infrastructures to commercial enterprises by ERC/DEC(96)04, with the former band then becoming the commonly used civil TETRA band. The harmonised bands ensured that industry could develop highly complex equipment and systems with common frequency bands, an essential element if the investment was to be viable.

What is essential to note is that the ERC/DEC(96)01 opened the way for introduction of shared nationwide multi-agency networks, which had two major consequences from collecting all public safety users to common network and common radio frequencies:

- common network enabled a totally new way of cooperation between the services in the field, as flexible or as controlled as wanted
- common frequency band along time vacated the earlier used multiple VHF and UHF band channels available for other usage, thus radically improving the spectral efficiency of emergency services radio operations."

³SRDOC TR102628

⁴LEWP

With the success of ERC/DEC(96)01 in Europe visible to other parts of the world many regulators have made similar spectrum available resulting in use in 124 countries. This global success has been valuable for European industry as well as providing a leadership in PPDR technology worldwide.

Development of user requirements at Council Level

Initiatives from the Law Enforcement Working Party (LEWP)

The LEWP concluded in a workshop in 2009 that cross border cooperation should be improved and that it was limited because of lack of cross border radio communications between the member states.

The Recommendation on improving radio communication between operational units in border areas was approved by the Council in its meeting on 4 and 5 June 2009 (doc. 10141/09 ENFOPOL 143 TELECOM 116 COMIX 421), recommending, inter alia, to establish a group of experts to examine the issues involved in the development of intersystem interfaces for the existing national digital radio networks and for future mobile data solutions.

In its meeting in Stockholm on 24-25 November 2009, the Radio Communication Expert Group (RCEG) agreed to set up two sub-groups: the Forerunner group and the Inter System Interface (ISI) group.

Progress of the Forerunner group

The Forerunner group has the task to provide a mid/long term solution for mobile highspeed data communication.

The Forerunner group has split this into 2 subtasks:

- to work on harmonised mobile broadband data technical solution and
- to work on harmonised frequency band(s).

As regards the recent developments in relation to both of these tasks, the following could be noted:

1. Technology:

- The Forerunner Group has worked on the "European set of Public Safety high-speed mobile data requirements", and at the last RCEG meeting held on 23-24 May 2011 in Budapest a respective matrix, based on existing studies from Germany, France, Finland, UK, ETSI, Belgium and the Netherlands, was adopted.
- This matrix was unanimously approved in the LEWP-RCEG June 2011.
- This matrix will now be used in the discussions with European Telecommunication Standardisation Institute⁵ (ETSI) and industries regarding the technology possibilities, and for explaining the need for frequencies.

2. Frequencies:

- In November 2010, the BE Presidency sent a letter (doc. DS 1795/10) to the ECC-CEPT with the public safety frequency statement from the LEWP - RCEG.

⁵ETSI has accepted to support RCEG following the letter sent by the SE Presidency in 2009.

- Until now this issue was dealt with in CEPT FM-PT38. However, there will be a new FM PPDR Group (PT49) dealing with the frequencies for public safety.
- At its meeting on 23-24 May 2011 in Budapest RCEG agreed that as many countries as possible should participate in the new CEPT-PPDR Group (PT49), including the chairman of the Forerunner Group.
- The Commission organised a "high level PPDR workshop" on 30 March 2011, which proposed, inter alia, to start a "PPDR task group". If the Commission indeed launches this group, the Forerunner group would also join such an initiative in an active role.

Observations of the RCEG regarding the frequency process

RCEG met May 2011 in Budapest and June in Brussels to review the progress of activities relating to the critical need for adequate radio spectrum to support public safety activities. The following points were taken note of:

- Despite the request from the LEWP for additional frequencies for public safety as set out in doc. DS 1795/10, the meeting noted that the work done by ECC/CEPT WGFM-PT38 on an allocation for such frequencies for mobile wide-band and broadband data has not yet resulted in concrete proposals.
- The meeting noted the widespread recognition of the continuing requirement for additional dedicated and harmonised frequencies for public safety, with reference to reports from the recent workshop on the future of PPDR services in Europe, organised by the Commission on 30 March 2011, and the ongoing discussions on the Proposal for a Decision of the European Parliament and of the Council establishing the first radio spectrum policy programme (doc. 13872/10 TELECOM 91 AUDIO 26 MI 314 CODEC 872, doc. 10211/11 CODEC 831 TELECOM 68 AUDIO 13 MI 260 PE 231, doc. 10295/11 TELECOM 69 AUDIO 14 MI 262 CODEC 839).
- The meeting further noted that the WGFM resolved to concentrate the work for PPDR frequencies in a new project team (FMPT49). RCEG has committed to participate actively in this group. RCEG seeks to emphasise to the ECC/CEPT-WGFM that the Public Safety community will work closely together with FMPT49 to achieve progress on the need for additional frequencies for high-speed mission critical data communication to support the operations of European Public Safety organisations. RCEG have in parallel asked each delegation to contact their national spectrum administration to inform them on the recommendation set out below, and to also ask their support for PPDR requirements in the ECC WGFM.

Development of user requirements in ETSI - SRdoc TR 102 628

ETSI produced the SRdoc TR 102 628 regarding "Additional spectrum requirements for future Public Safety and Security (PSS) wireless communication systems in the UHF frequency range".

According to the Working Procedures for ETSI, a 'System Reference Document' (SRdoc) should be produced for any new system, service or application requiring a change of the present frequency designation / utilisation within CEPT or a change in the present regulatory framework for the proposed band(s) regarding either intended or unwanted emissions.

User communities have determined that mobile data is equally as "mission critical" as voice and therefore cannot be safely transported over commercial networks. This is because officers will become more and more reliant and dependent on mobile data communications in support of their day to day operations and thus losing and or interrupting these services in

an emergency would seriously impact their ability to meet their public safety commitments. Consequently, additional spectrum is required to meet the future needs of PPDR.

SRdoc TR 102 628 aims at establishing a dedicated, harmonized European spectrum designation for PPDR mission-critical Public Safety and Emergency Communications. This proposed resource would be a harmonized spectrum across Europe allowing interoperable and permanent PPDR networks to be established in the 300 MHz to 790 MHz band (including "Digital Dividend" band), preferably in the lower parts of the band. It is proposed that such a network would cater for all narrowband, wideband and broadband PPDR applications requiring wide area coverage. The applications will be used for voice, voice and data or data only.

The SRdoc is based on the fact that Europe is embracing the concept of Homeland Security resulting in an increasing co-operation between Police, Fire, Rescue, Health and Military organizations. This concept calls for interoperable, secure and wide-area coverage communications between these agencies often across national boundaries.

In addition to the PSS services, other organisations such as transportation, utilities, etc. are expected to share to some extent the same communications network infrastructure to enable reliable and interoperable communications in disaster situations.

In the SRdoc the emphasis is on a spectrum within the tuning range of the technology, to be used for wide-band and broadband applications. According the SRdoc it is of critical importance that:

- 1) The high-speed data emergency communication services assume a very high priority in European spectrum designation.
- 2) The requested band is considered as a European-wide asset for PPDR communication and is not subject to criteria used in spectrum designation for commercial consumer networks and services such as auctions.
- 3) This band is to be designated on a dedicated (and protected) basis.
- 4) This band is for harmonised use (interoperable) across Europe.

Based on the market and technical information the ETSI SRdoc concludes that the future spectrum requirements can be summarised as:

Preferably, 2 separate contiguous blocks of 10 MHz plus 2 separate non-contiguous blocks of 2 x 3 MHz for new NB and 2 x 3 MHz for new WB, minimum, dedicated to PSS and harmonised across Europe; the total of additional 16 MHz for each direction (uplink and downlink). The tuning range concept of $\pm 12,5$ % of the centre frequency applies to NB and WB, however not to BB. The BB spectrum designation may be located in separate spectrum range.

Summary and status of PPDR Work of ECC WG FM and FM38

Wideband/TEDS questionnaire 2006

WG FM decided in January 2006 while considering the band options for emergency services wideband PMR (TEDS) service to conduct a questionnaire among the member state administrations to clarify if there exists any specific 2 x 2 MHz spectrum slot in the 410 to 430 MHz frequency band that could provide opportunity for harmonisation to emergency services use. ERO received 26 responses in February 2006 and among those very few administrations were able to point out a sub-band for harmonisation. Furthermore, the indicated sub-bands were largely different in each country.

Based on the analysed responses PT FM38 and WG FM had a long debate during year 2006 on whether to adopt a tuning range as from 380 to 430 MHz or 380 to 470 MHz for emergency services wideband PMR. Later in 2006 WG FM decided to extend the TEDS tuning range to cover 380 to 470 MHz, however noting that the band 380 to 430 MHz would be "most suitable" inside that range.

ECC/DEC/(08)05

PT FM 38 prepared and ECC adopted a new decision ECC/DEC/(08)05 to replace the old emergency services TETRA Decision and to include TETRA TEDS among other wideband systems in the same 400 MHz PPDR radio frequency decision. Wideband tuning range was defined as 380 to 470 MHz.

ECC/REC(08)04

PT FM38 likewise developed a new ECC Recommendation ECC/REC/(08)04 on temporary use of broadband radio systems for disaster relief and pre-planned events in the 5150 to 5250 MHz band that is in daily operation allocated for indoor radio LAN's, and optionally also in 4940 – 4990 MHz that is in military use.

PPDR questionnaire to users, administrations, industry 2009

To meet the need for continuously available wide area broadband mobile communication as described in the ETSI SRDoc (TR 102 628) WG FM decided to conduct a questionnaire to radio users, administrations and industry in April 2009 asking for information on PPDR data needs, user requirements, used systems and further spectrum possibilities. ERO received in total 52 replies, of which 23 came from administrations.

PT FM38 summarised their findings from the answers as follows in April 2009:

1. The use of existing and new data applications (high speed data) by PPDR users will increase rapidly;
2. Increased data usage, especially for mission critical communications, will have a significant effect on the frequency need and justifies requirements for additional spectrum;
3. There are many requirements and conditions for the use of PPDR (ref. questions 3 and 7), which lead to the need to use dedicated PPDR networks. However, in addition to the dedicated networks, commercial / public networks are and will also be used for non-mission critical data applications.
4. In ETSI SRDoc it is proposed that contiguous blocks of 2x16MHz are required for PPDR. FM PT38 requested ETSI to clarify this requirement, since the candidate bands 385-390/395-399.9 MHz, 410-430 MHz and 450-470 MHz would not provide possibilities to fully satisfy the requirement, particularly the broadband needs.
5. Spectrum sharing between PPDR and military seems to offer the best possibilities for further studies. Therefore FM PT38 proposes that the ECC initiates negotiations with the military to study the possible use of the military bands in the 300-400 MHz range.

As there were diverging views expressed concerning the conclusions from the questionnaire answers – especially related to band sharing with the military - WG FM decided to arrange a workshop to further clarify and discuss the issues. That workshop took place after some logistic delays in March 2010 in Mainz.

CEPT PPDR Workshop Mainz March 2010

The PPDR workshop was attended by over 100 participants from various stakeholders. The main observations of ERO office from the as reported to PT FM38 were as follows:

- European harmonisation is essential for the frequencies to be used for PPDR
- Public mobile networks can not be used for mission critical PPDR applications
- Broadband is emerging for PPDR
- Sharing with the military provides some possibilities for further studies
- Choice of frequency band should be made as soon as possible
- Further work is foreseen for FM38, WG FM and ECC

Having noted that discussion on concrete band proposals still turned out to be difficult, PT FM38 proposed to phase their PPDR work as follows:

WG FM is requested to consider and adopt the approach proposed by FM38 for PPDR, i.e.

- 1) As a first step identify additional spectrum for narrow band and wide band PPDR in 380-470 MHz tuning range
- 2) In parallel FM38 continues studies on broad band issues
- 3) In a second step FM38 continues the work with identification of spectrum for broad band PPDR

This approach was agreed by the WG FM meeting in May 2010.

FM38 PPDR questionnaire Nov 2010

To move forward with the first step of the agreed work plan PT FM38 started the studies on additional narrow band and wide band by launching a questionnaire among its participating administrations with specific question related to the 2 x 1.5 MHz above 385/395 MHz, 410 – 430 and 450 – 470 MHz. Responses were received from 23 administrations and 4 other organisations.

The summary made by ECO concluded that of the 23 administrations 7 named the 385 – 386.5//+ 10 MHz as the preferred choice and in total 13 saw some possibility for using that in future (while 10 others did not). The ECO summary did not identify a firm harmonisation possibility within the 410 – 430 and 450 – 470 MHz bands. (About half a dozen administrations had indicated availability of at least 2 x 3 MHz in some place inside those bands now or later.)

The questionnaire results were discussed in the PT FM38 meeting in December 2010 and in the WG FM meeting in January/February 2011 without reaching consensus on immediate further actions.

FM38 December 2010 meeting also received and discussed the result of the German government funded study on the future PPDR spectrum needs and options. During the discussion the meeting prepared a summary table of the identified BB PPDR frequency options, covering frequencies from 380 to 862 MHz, the L-band and some bands at 2, 3 and 5 GHz.

Situation in 2011

As a result of the discussions during 2010 and early 2011:

- ECC/DEC/(08)05 has been kept unchanged
- ECC decided to set up a new PT FM49 for the broadband and high speed PPDR studies

- Consequently PT FM38 has been closed down

Activities at EU level

EU PPDR Workshop Mar 30th "The future of PPDR services in Europe"

On 30 March 2011 the Commission held a workshop on "The future of PPDR services in Europe". It was attended by 90 participants representing national administrations and governmental organisations responsible for public safety tasks, spectrum regulators, equipment manufacturers and telecom operators, as well as a representative of the European Parliament.

The goal of the workshop for the Commission was to understand better the nature of national commitments regarding public safety and security tasks which require high-speed mobile communications (broadband), and the real spectrum needs that this entails.

This workshop was jointly organised by DG Information Society and Media (INFSO) in close cooperation with several other Commission services, namely DGs Humanitarian Aid and Civil protection (ECHO), Home Affairs (HOME), and Enterprise and Industry (ENTR).

During the Workshop the PPDR community was delivering a strong testimonial in favor of dedicated and harmonized PPDR spectrum.

The main conclusions from the workshop have been reported in the Commission document Summary report from the EU workshop on "The future of PPDR services in Europe" – 8th April 2011 (RSCOM11-19).

Conclusion from Session 1 – National activities:

Clear user requirement for high-speed mobile data services and dedicated PPDR network. Call for European harmonisation of spectrum and European standards to ensure interoperability of PPDR systems.

Conclusion from Session 2– Cooperation in Europe and abroad:

Common view that co-operation at all levels among different public safety services as well as with the defense community brings clear benefits.

Conclusion from Session 3 - Creating a common way forward

This was an interactive session allowing all participants to take part in the discussion. The session also included an intervention from MEP Dr. Paul Rübig who underlined the importance of PPDR services alongside other priorities included in the Radio Spectrum Policy Programme (RSPP).

The Commission drew the following main conclusions from the lively debate, ensuring its support to PPDR community actions:

- There was clear support for a harmonisation at the European level coming from both national regulators and industry. Both equipment standards and spectrum are seen as important elements in this matter. While fully recognising the national competence of the Member States, the co-ordinating role of the Commission is important and is fully acknowledged.

- While some PPDR high speed data requirements may be covered by commercial networks, there were clear indications that mission critical services call for a dedicated, non-commercial network. This requirement will generate costs that can only be borne by government funding (and not by the market), thus creating a very challenging situation in the period of budgetary cuts. Consequently, it will be crucial to share resources among public safety services and defense in order to ensure cost effectiveness as well as timely solutions.
- Public safety standardisation activities in ETSI have started and all public safety and defense users were invited to participate in order to conceive a standard reflecting the functionality required for various mission critical services.

The same day of the workshop, many of the attendees also went to an evening event organised by the Kangaroo Group in the Parliament, giving to PPDR users the opportunity to address the RSPP rapporteur of the EP Mr. Gunnar HÖKMARK.

PPDR issue in EU Radio Spectrum Policy Programme

The EU Commission starting from the 2002 first regulatory framework legislation, revised on 2009 (and particularly by the Radio Spectrum Decision 676/2002/EC), recognized that access to radio spectrum is essential for a huge range of activities from commercial ones (es. telephony and broadcasting) through to public interest /social activities (es. public safety and security, transport, space applications), and it is crucial to ensure that EU citizens in both urban and rural areas can enjoy the benefits of digital communications technologies and fast broadband connections.

Framework Directive 2002/21/EC as amended by Directive 2009/140/EC invites the Commission to present a legislative proposal to the European Parliament and Council to establish a multiannual Radio Spectrum Policy Programme (RSPP) setting out policy orientations and objectives for the strategic planning and harmonisation of the use of spectrum, taking utmost account of the opinion of the Radio Spectrum Policy Group (RSPG).

The Commission adopted on 20 September 2010 its proposal to the European Parliament and Council for a first Radio Spectrum Policy Programme which outlines at a strategic level how the use of spectrum can contribute to the most important political objectives of the European Union from 2011 to 2015. It supports the Europe 2020 Strategy and the Digital Agenda for Europe and promotes EU policies using spectrum beyond electronic communications.

The procedure file for the first Radio Spectrum Policy Programme is available at the following link:

<http://www.europarl.europa.eu/oeil/FindByProcnum.do?lang=2&procnum=COD/2010/0252>

The intended impact of the RSPP presupposes that it should cover all types of radio spectrum use. The programme sets general regulatory principles and policy objectives to be applied for spectrum in all sectors of the internal market, defines actions and common principles to enhance efficiency and flexibility, preserve and promote competition, support wireless broadband communications as well as other EU policies such as public safety and security, transport, environment protection, earth surface monitoring or space exploration.

Indeed the RSPP calls for an inventory and monitoring of existing and emerging needs for spectrum, sets principles to defend EU's interests at international level and calls for improvement in the standardisation process.

To address the PPDR spectrum needs the Radio Spectrum Policy Programme Commission's proposal includes:

- recognition that the need for BB PPDR spectrum below 1 GHz has been "shown by studies" (in Recital 18)

“(18) Essential public interest objectives such as safety of life call for coordinated technical solutions for the interworking of safety and emergency services between Member States. Sufficient spectrum should be made available on a coherent basis for the development and free circulation of safety services and devices and innovative pan-European or interoperable safety and emergency solutions. Studies have already shown the need for additional harmonised spectrum below 1 GHz to deliver mobile broadband services for public protection and disaster relief, across the Union in the next 5 to 10 years.”

- proposal to take EC action to secure PPDR band below 1 GHz "if necessary" (Article 7 para 3)

“3. If necessary, the Commission shall ensure that sufficient spectrum is made available under harmonised conditions to support the development of safety services and the free circulation of related devices as well as the development of innovative interoperable solutions for public safety and protection, civil protection and disaster relief.”

The proposal was discussed the Parliament (including its ITRE, IMCO and CULT Committees) and the Council of Telecom ministers. Some member states/MEPs are very cautious with giving decision power to the Commission and wish to ensure a higher level of priority to the PPDR requirement.

The CULT and IMCO Committees have submitted their Opinions to the ITRE Committee for their Report. More than ten amendments were submitted by MEP's, including:

- amendments to strengthen the wording of Art 7.3 towards explicit instruction to secure the band, those filed from all four main political party groups
- one amendment proposing to change the requested action to studies only
- a couple of amendments from the CULT committee MEP's to state that PPDR shall not affect current broadcasting frequencies

A stronger compromise text that was adopted in the Parliament first reading vote on May 11th:

“The Commission shall ensure that sufficient spectrum is made available under harmonised conditions and in harmonised bands for PPDR (Public Protection & Disaster Relief) and to take actions to support the development of safety services and the free circulation of related devices as well as the development of innovative interoperable solutions for PPDR. To ensure the efficient use of spectrum the Commission shall in this regard examine the possibilities for PPDR to use military frequencies.”

The Commission's communication from June 11th stated that the EC agrees with the Parliament wording.

However, the Council of Telecom Ministers currently disagrees with the EP and EC, and compromise negotiations will take place during 2H2011, with the competence change from the Hungarian Presidency to the Polish Presidency. The Council Working Group's draft text from May starts with the diluted wording:

"If necessary the Commission shall in cooperation with the Member States foster that sufficient... (then continues as the Commission's original proposal) "

The Council WG was planned to work on the Council's formal proposal during July and in early September COREPER is expected to give the Polish Presidency a mandate to develop a compromise proposal. In those compromise negotiations other spectrum policy topics than PPDR will dominate.

The LEWP agreed their own wording proposal for the RSPP Article 7.3 to the Telecom Council in their June 16th meeting:

"The Member States shall ensure, in cooperation with the Commission and the ECC/CEPT, that sufficient spectrum is made available under harmonised conditions and in harmonised bands for PPDR (Public Protection and Disaster Relief) and take actions to support the development of safety services and the free circulation of related devices as well as the development of innovative interoperable solutions for public safety and protection, civil protection and disaster relief."

Now the final outcome very much depends on the ability and attitude of the Polish EU Presidency to develop and negotiate proper wording during 4Q2011 and they have to be advised accordingly by the PPDR community.

Industry considerations

The PPDR community is a niche sector and relies fully on harmonisation of spectrum to provide a large enough homogeneous market. Even within this small sector, the industry provides a multitude of specialized devices⁶ and infrastructure solutions with the most advanced and spectrally efficient functionality. The European PPDR operators have benefited significantly from the larger market that resulted as a consequence of the ERC/DEC (96)01 decision. That market covers today Asia, Middle East, Africa, Latin America and soon North America.

A general observation is that introduction of a new telecoms technology generation multiplies the development effort and cost.

- In the days of analogue FM radios the development cost was relatively low and the radios were produced by the national champions of each country for use in often nationally defined frequency band.
- The entry of analogue trunked radio systems required creation of the first international radio protocol standards and brought the need for internationally agreed frequency bands and first signs of industry consolidation.

⁶Mobile and handheld units; helicopter units; fire truck units; handhelds for ATEX environment; handheld for covert agents and VIP protection; motorcycle units; M2M units etc.

- The introduction of digital trunked radio required international standards, harmonised frequency bands - and even major industry consolidation - to enable the much higher development investment.

Now that the introduction of broadband technologies is being planned it is again of even higher importance that the development is backed up with both international standards and harmonised markets. The size of the accessible market is even more important factor now.