

1. Introduction

In practical use, the radio frequency spectrum is a technical resource, similar to natural gas, electricity, or water.

The radio frequency spectrum cannot be enlarged; instead, it can only be allocated to a changed usage through redistribution.

A great many of the activities of modern daily life depend on wireless devices that use the radio frequency spectrum (e.g. radio, police radio or wireless telephones). The use of such devices is increasing constantly. It can be expected that even with clever multiplexing, the available resources in the radio frequency spectrum will diminish continually.

There are portions of the radio frequency spectrum that have especially useful propagation properties. Among these frequencies is the frequency range from 470 to 862 MHz, which has up to now been allocated to broadcasting.

Around the world, a large portion of this UHF spectrum is currently allocated to other applications. In the USA, for example, there has been about a 40% change in use. In Europe, the frequently range from 790 to 862 MHz (about 20%) has been allocated to the cellular phone network.

Such large changes in the usable radio frequency spectrum are not made without further consequences. The wireless production tools of Programme Making and Special Events - PMSE - are especially affected. These applications are coming under considerable pressure, since replacement resources at higher frequencies are available to a limited extent only and have significantly worse propagation properties. Result: the continued existence of many professional applications is threatened through no fault of their own.

2. PMSE

“Programme Making and Special Events” is a collective term which has been introduced to specify a large number of wireless devices.

Among others, these include:

- Microphones and in-ear monitor systems (PWMS, see appendix 2)
- Stage direction radio technology (Wireless Intercom)
- Cameras (equipped with the necessary audio and video receiver and transmitter)
- Effects and remote control technology

- Conference systems
- Transmission systems for translated conference contents
- (Tour-) Guide systems

What all these wireless technologies have in common is that they are at the beginning of a production chain. Every change in use can have significant, difficult-to-predict effects on subsequent production and distribution.

It is technically significant that the radio frequency spectrum that is utilized must be free of interference for the entire length of the production (for example, while a sporting event is broadcast) and that many transmission channels are absolutely required. These utilized transmission frequencies are generally used with a signal duty cycle of 100%.

3. ETSI is looking for alternatives

ETSI is asking international specialists to work on these problems through a "Call for Experts" (see appendix 1). Working together, the experts in this "Specialist Task Force" are to formulate solutions that will form the basis of subsequent research and the standardization of the results.

For this purpose, ETSI is counting on initiatives that could generate open technology projects: on the basis of a specification of tasks (originated by ETSI) and with well-formulated test criteria, it is intended that research groups – outside ETSI's responsibility and financing – will develop solutions and present results on their own.

4. The ETSI-STF as a supportive framework process

The ETSI STF links together a number of possible national or international research projects. For this purpose, the "Specialist Task Force" formulates the problems to be solved, a demonstrator project and test criteria.

The Open Technology Projects incorporated in the ETSI STF are to assume the implementation of the tasks, organize and finance themselves, and send the results back to ETSI for evaluation and subsequent classification in the standard process. Alternatively, these research activities could be assumed by the PMSE industry with support from scientific facilities. The coming months will decide which model is ultimately followed.

The ETSI STF will be convened again when suitable results become available. These will be evaluated for their applicability and be prepared for standardization. There will be an emphasis on the testing of a demonstrator when doing this.

5. Preliminary main focus issues for the ETSI STF

In the first phase, the ETSI STF should concentrate on the following issues:

- Formulation of cognitive properties for PMSE or PMSE assistance systems to serve as quick and adapted information and requirements for taking action on the basis of the observed allocation situation in the radio frequency spectrum (e.g. changes to free or

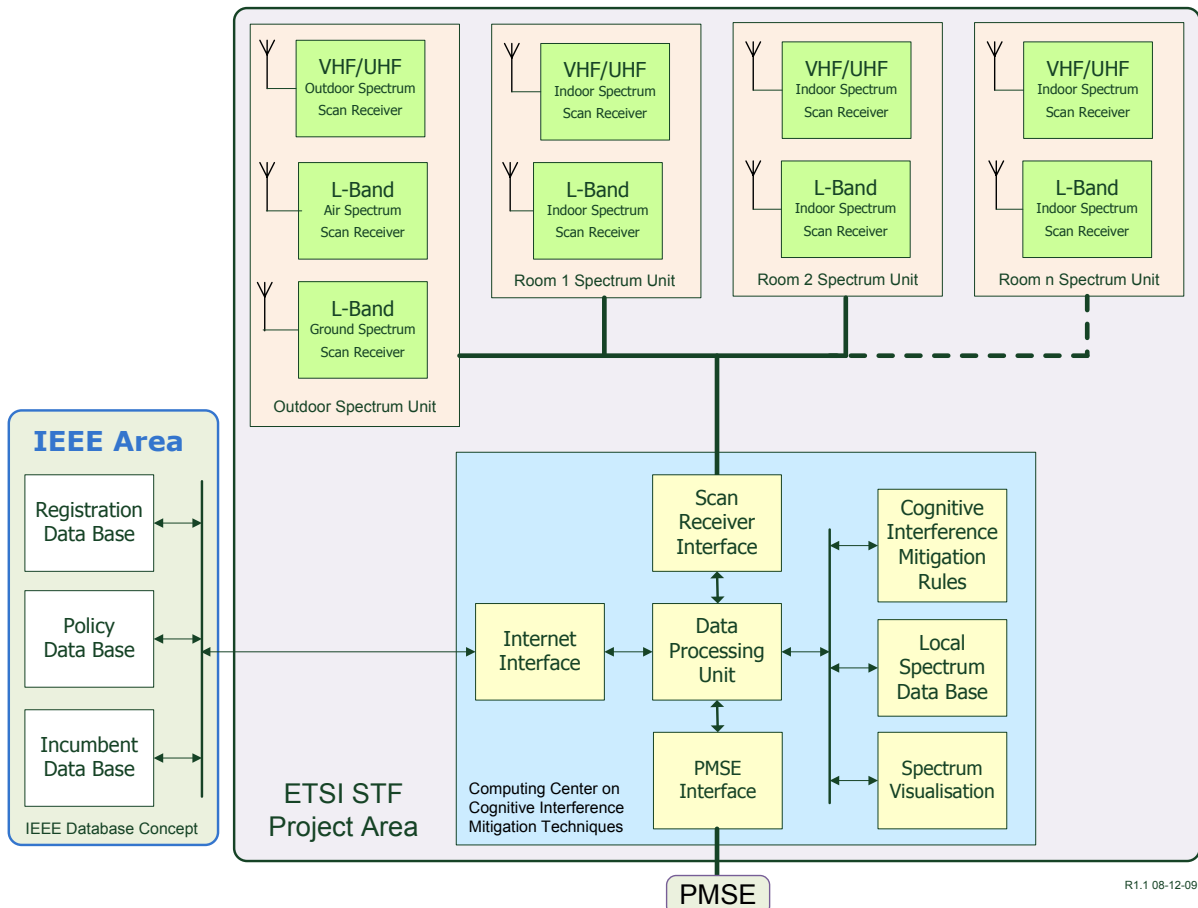
blocked frequency usage).

- Formulation of PMSE instructions for action those are appropriate for the noted changes to the allocation of the radio frequency spectrum. This could be either short-term responses (dealing with interference or frequencies which have been freed for use) or long-term responses (learned frequently utilization of other radio frequency users).
- Formulation of methods for measuring the quality of the portion of the radio frequency spectrum that is used. From this, parameters should be derived for the prediction of possible (audio, video) quality. Information concerning foreseeable losses of quality should be reported in a timely fashion. Example: a decoupled outdoor sensor can detect the approach of a radio microphone that is being operated on the same channel and issue an early warning to the program production being operated indoors.
- Draft of a project definition and test criteria for implementing a demonstrator.

In the final phase, the ETSI STF should concentrate on the following points:

- Testing the implementation of the demonstrator; analysis and evaluation of results
- Preparation of the results as the basis of further standardization

6. The Demonstrator Project (suggested demonstrator principle)



A detailed project definition for the demonstrator project will be created within the framework of the ETSI STF. A series of key attributes can already be foreseen:

- Development of suitable hardware
- Development of suitable methods for optimization of spectrum utilization:
 - Monitoring of the radio frequency spectrum that is suitable for PMSE use
Goal: identify available frequencies, protect the primary wireless services, learn the behavioural patterns of other frequency allocations.
 - Monitoring the radio frequency spectrum currently used by PMSE
Goal: early recognition of multiple allocations, quality assurance
 - Preparation, provision for an exchange of spectrum information from or to other sources; for example, for the contractual coexistence with other secondary users (self-protection through flexible information)
 - Self-coordination within events (e.g. industrial trade fairs)
 - Support of frequency allocation processes when needed

7. Time frame

- September 2009 to January 2010: first phase of the ETSI STF
- February 2010: pre-industrial research projects (~12 months)
- Afterwards: second phase of the ETSI STF

8. Accompanying projects

The overall project is not a new idea. Instead, it builds on a series of individual projects that have been implemented or are planned:

- EMFIS patent application (2006)
- Work of the DKE-AK 731.0.8 "Professional Wireless Microphones" (since 2006)
- Draft ETSI TR 102 546 - Technical characteristics for PWMS (2006)
- Studies of the frequency resources necessary for PMSE (2008)
- Expert discussion: "New frequency coordination" (2009)
- Study: "Modelling for wireless audio transmission systems" (2009)
- Work of the ECC SE24, for example, Report 121 (since 2008)
- A preparatory study is being planned on the use of MSS frequencies

9. Opportunities and risks. What tasks might not be solved by this ETSI STF?

ETSI STF is an initial process for an alternative and forward-looking way of dealing with the quickly-changing situation of radio frequency resource provision. First of all, the solutions which are badly needed by the PMSE industry will be developed, demonstrated and standardized. From this, the first solution will be information about an optimized way to handle the spectrum for existing PMSE devices. The basis for an upstream "information layer" and suitable handling guidelines will be created first. If this project goes well, PMSE will receive the characteristics it has been missing up to now.

By introducing the results into the international standard process (e.g. IEEE 802.22), significant synergies can be initiated for future secure operation of PMSE devices.

The demonstration of new characteristics in dealing with the radio frequency spectrum responsibly can enable secondary use of the spectrum by primary services which have not been able to cooperate.

Due to the wide variety of PMSE applications, ETSI STF will not be able to achieve a universal implementation of standards. However, substantial momentum for an appropriate implementation of standards will be created. Currently, it appears that implementation will be through expanding EN 300 422 or implementing within the framework of a new microphone standard.

There is strong interest in an implementation for new types of conference systems on alternative frequencies.

Up to now, responses to the concept phase show there is considerable interest in ETSI STF. Based on discussions that have been conducted with experts from various specialties, it can be expected that "Open Technology Projects" will be established and supported successfully.

Risks associated with the research can be summarized simply as follows:

- ETSI STF is not able to describe an appropriate solution
- The research projects that are incorporated cannot be financed
- The research projects fail to find solutions which work in practice

10. Outlook

With the development of a new understanding regarding the use of spectrum paired with the needs of using radio frequency spectrum more efficient and more flexible it will be possible to design totally new PMSE products.

Those products would be from the user's point of view more robust regarding unwanted interference and therefore have for the market an existing usability.

11. Appendices

1. ETSI, 17 June 2009, "Call for Experts for Specialist Task Force UB (ETSI / ERMTG17) on methods parameters and test procedures for cognitive interference mitigation techniques for use by PMSE devices (Programme Making and Special Events)"
2. ETSI, January 2007, "Draft ETSI TR 102 546 - Technical characteristics for Professional Wireless Microphone Systems (PWMS)"

The **Association of Professional Wireless Production Technologies** ("APWPT") represents the interests of the manufacturers and users of wireless radio systems. It is engaged at both the national and the international level for the preservation of the frequencies needed for this technology.

The APWPT currently has 24 associations with about 25,000 members and 20 other organizations from a total of seven countries.

By consistently networking international experts from the fields of applications, standardization, regulation, product development, science and lobbying, the APWPT strives for the highest degree of expertise.

Further information is available at www.apwpt.org.

Association of Professional Wireless Production Technologies e. V.

c/o Matthias Fehr

Erlanger Str. 9

D-91083 Baiersdorf

Germany

Phone: +49 (0) 9133 60 76 864

Fax: +49 (0) 9133 60 76 865

E-mail: info@apwpt.org