# European frequency management and the role of CRAF for radio astronomy

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*Abstract*
In Europe, radio frequency regulation is managed by the CEPT, the *Conference of European Posts and Telecommunications Administrations* (under an MoU with the European Commission). The CEPT develops guidelines and provides national Administrations with tools for harmonised European frequency management. In frequency management matters, the European radio astronomy community is represented by CRAF, the Committee on Radio Astronomy Frequencies of the ESF, the European Science Foundation. CRAF at present has members from 17 CEPT countries and a number of international organisations and it employs a full-time pan-European spectrum manager. Like several other non-government organis-ations, CRAF participates actively in this process through collaboration and communication with national Administrations and at CEPT level. CRAF has an observer status within the CEPT and is a Sector Member of the ITU-R, allowing it to participate in its own right in European and global fora dealing with radio frequency management.

## 1. Introduction

The task of accommodating all competing radio services and systems within the finite usable range of the radio frequency spectrum comes under the generic title of *spectrum management* or *frequency management*. This process is mainly the responsibility of government Administrations and it is imperative that those Administrations coordinate their efforts internationally. The international Administrative cooperation body that has the responsibility for coordinating spectrum management at the global level is the *International Telecommunication Union*, ITU.

The global framework for radio frequency management is provided by the Radio Regulations of the ITU (ITU 2001), which have international treaty status and thus are binding for all members of the ITU. They provide rules to national Administrations that allow them to regulate equitable access to the radio spectrum for

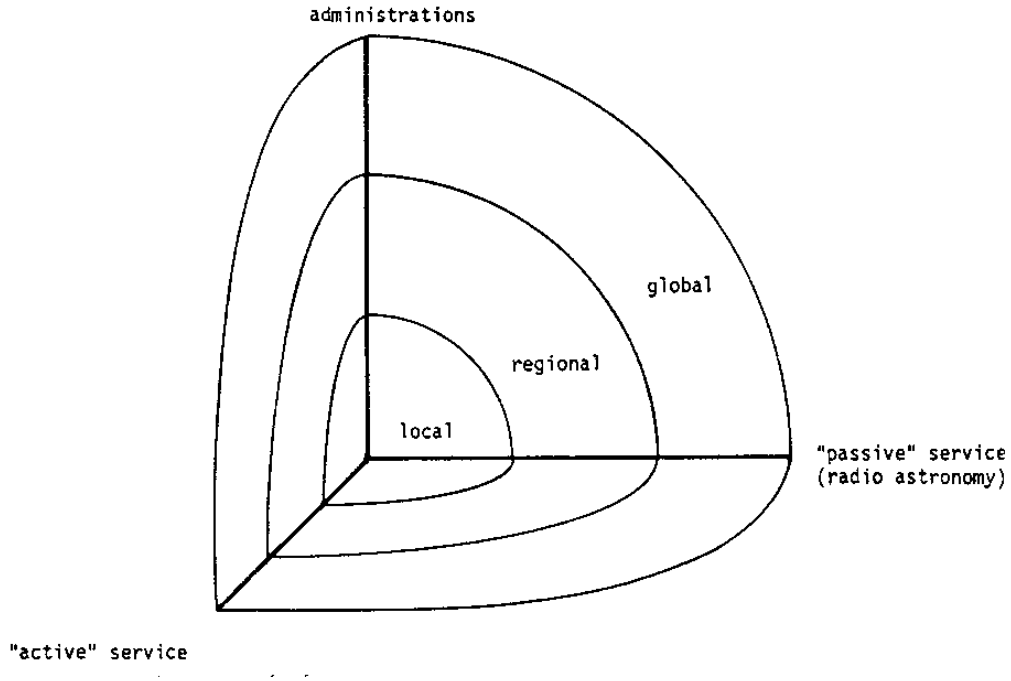


Figure 1: The "problem space" of spectrum management.

all entities requiring frequency allocations: telecommunication industry, safety services, aeronautical services, various scientific and hobby uses, etc. The Radio Regulations contain the international *Frequency Allocation Table*. For the purpose of this table, Europe lies within ITU Region 1, together with the Middle East, Africa and Asia north of the Himalayas. The ITU Radio Regulations contain much more than this table alone, such as rules for the use and operation of frequencies, operating procedures for stations and procedures for the coordination of frequencies.

Between the broad framework established at the global level by the ITU and the detailed frequency planning necessary for national Administrations, there has always been a need for regional coordination. The forum for achieving such regional harmonisation in Europe is the *Electronic Communications Committee*, ECC, of the CEPT, the *Conference of European Posts and Telecommunications Administrations*. In the Americas it is the *Inter-American Telecommunication Commission*, CITEL, and in the Asia Pacific region the *Asia Pacific Telecommunity*, APT. Similar organisations are emerging in other regions of the world.

## 2. Regional Regulatory Coordination in Europe

Although, especially from the outside, "Europe" is commonly regarded as equivalent to those countries assembled in the European Union, for frequency management matters, Europe covers a considerably larger territory: the 44 countries of the CEPT (see Section 2.2).

In Europe the key 'players' on frequency management issues are the following:

- Administrations
- CEPT - Conference of European Posts and Telecommunications Administrations
- EC - European Commission
- Standardisation InstitutesOther interested parties (including CRAF for radio astronomy)

## 2.1 Administrations

The ITU Radio Regulations define an Administration as "*any governmental department or service responsible for discharging the obligations undertaken in the Constitution of the International Telecommunication Union, in the Convention of the International Telecommunication Union and in the Administrative Regulations*" (ITU Constitution – Annex 1002).

Each sovereign state has, in some way or other, its own Administration with the mandate to use all means possible to facilitate and regulate radiocommunication in that country. The mandate and terms of reference of a Regulatory Authority are usually defined by national telecommunication law, which in EC member states and affiliated countries is defined within the framework of EC telecommunication Directives. Such laws also include a national frequency allocation table, which is the national articulation of the ITU Radio Regulations. These national regulations concern the application of national frequency policy, the enforcement of regulations and the protection of the interests of private and public users of radio frequencies. In Europe, the CEPT and the European Commission provide the framework for national regulations.

## 2.2 CEPT

The CEPT was formed in 1959 to bring together the postal and telecommunications Administrations of Western Europe. At present, it comprises 44 countries of Western, Central and Eastern Europe, and its membership continues to grow. Only European Administrations that are members of the ITU or of the *Universal Postal Union*, UPU, can become a member of CEPT. In 2001 the *Electronic Communications Committee*, ECC, was established as a body of radio Regulatory Authorities. Although in principle the CEPT committees come under the CEPT *Plenary Assembly*, in practice they have a great deal of autonomy.

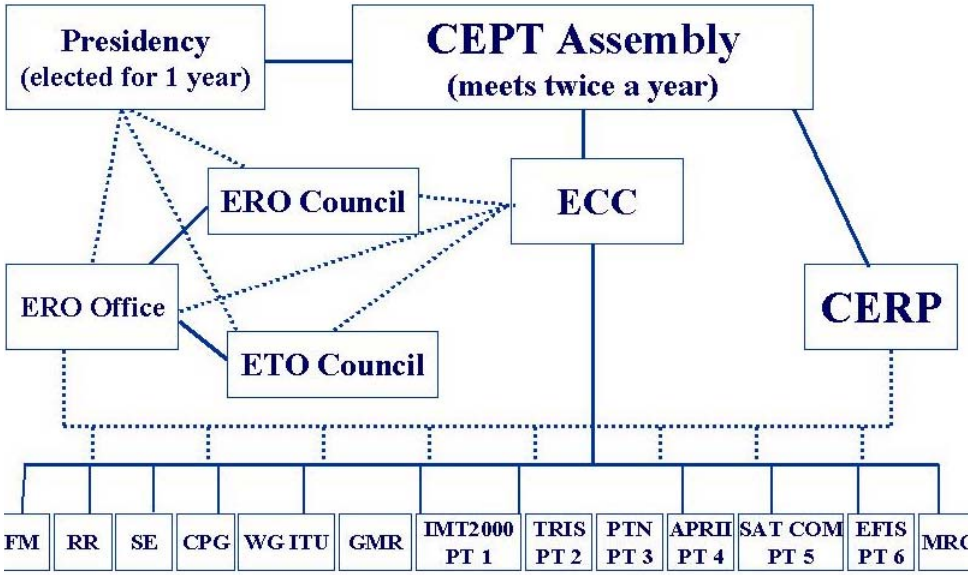


Fig. 2: The organisational structure of the *Conference of European Posts and Telecommunications Administrations,* CEPT.

The ECC is the highest body within the CEPT mandated to develop policy on spectrum management issues and to decide on European radiocommunication issues. The ECC has several working groups, addressing different aspects of spectrum

management. The secretariat of the CEPT is the European Radiocommunications Office, ERO, in Copenhagen.

At a regional, European level the CEPT plays a key role in spectrum management. Regional regulations in Europe include the development of the European Common Allocation Table (which will come into force in 2008). Among its other tasks are the following :

- development of a common policy on electronic communications activities in a European context, taking account of European and international legislation and regulations;
- preparation of European common positions and proposals for use in the framework of international and regional bodies;
- planning and harmonization of the efficient use of the radio spectrum, satellite orbit, and numbering resources in Europe, so as to satisfy the requirements of European users and industry;
- development and approval of Decisions and other deliverables;
- implementing the strategic decisions of the CEPT Assembly;
- proposing issues for consideration by the Assembly.

In summary, the CEPT provides European Administrations with a wealth of management elements in a framework reflecting the ITU Radio Regulations, which these Administrations can adapt to meet their national requirements.

The CEPT is based on voluntary cooperation between Administrations. It makes political agreements, Decisions and Recommendations. In a legal sense, its Recommendations and Decisions have about the same status. Since the CEPT community is not bound by a treaty that regulates these Decisions and Directives, they are only binding for those Administrations that chose to adopt them.

### 2.3 European Union and European Commission

The European Union consists of 15 Member States, which delegate sovereignty to independent institutions. The European Commission in Brussels upholds the interests of the Union as a whole, while each national government is represented within the Council, and the European Parliament is directly elected by its citizens.

The EC is a political body and the driving force in the institutional system of the EU in the following respects:

1. drafting of legislation and presenting legislative proposals to the Parliament and the Council;
2. implementing European legislation, budget and programmes adopted by the Parliament and the Council;
3. representing the Union on the international stage and in negotiating international agreements;
4. enforcing Community law (jointly with the Court of Justice).

The role of the European Commission is different from that of the CEPT, because of the EU treaty that binds them. Frequency-regulatory issues have been delegated by the EC to the CEPT through an MoU. Their structural difference implies a difference in legal status of the regulatory 'products' of the CEPT and of the EC.

EU Directives prevail over CEPT Decisions and are legally binding for European telecommunication regulation within the *European Economic Area*, EEA, and the EC member states, even for states that do not approve of them (the handling of deviating views has also been regulated). If any national legislation is not in harmony with EU

law, this has to be corrected in due course. Also CEPT Decisions and Recommendations must not be incompatible with EU law.

EU Directives and CEPT Decisions must be seen as instruments serving the interests of the Community, which allow national regulatory authorities to impose licensing conditions that are linked to efficient frequency use. Any such condition must be justifiable and is subject to the principle of proportionality. Regulators must use the least restrictive regulatory means to achieve the required conditions. Given the different mandates of the CEPT and the EC, their views on spectrum management and policy are rather different.

The EC is gradually working to increase its influence on radio frequency issues. It favours a spectrum policy governed by the interests and requirements of the active radiocommunication services, and it lacks a strategic view on the specific interests and requirements of passive (i.e. receive-only) services and applications with respect to those of the active services. This lopsidedness reduces the balance of its spectrum policy. An explanation for this is readily found in the priority the EC gives to commercial and industrial interests.

### 2.4 Standardisation institutes

In Europe, the following bodies address standardisation issues:

- CEN the European Committee for Standardisation
- CENELEC the European Committee for Electrotechnical Standardisation
- ETSI the European Telecommunications Standards Institute.

Besides these, many national standards bodies exist within Europe. Regarding global telecommunications standards, the ITU-T sector is the responsible body. Within Europe, the *European Telecommunications Standards Institute*, ETSI, plays this role and increasingly so with the focus being put on European standards development.

#### 2.4.1 ETSI

ETSI was created by the CEPT in 1988, and is aimed at the common European goals: to facilitate the integration of the telecommunications infrastructure, to assure the proper inter-working of future telecommunications services and the compatibility of terminal equipment, and to create new pan-European telecommunications networks.Since the ITU-T Recommendations very often contain options and/or are not detailed enough in order to allow, for instance, end-to-end compatibility of terminal equipment, the European standardisation in ETSI plays a key role in the development of voluntarily harmonised standards within the EU, and serves worldwide standards development. This is done through the construction of a coordinated European solution, which can be offered as a European contribution to the ITU, and adopted as a European standard. As such, it constitutes a useful instrument for speeding up the work at a European level, rather than a hurdle on the way to international standardisation.

The guidelines of the European standardisation process in ETSI can be summarized as follows:

* to prepare a common European position for the work in worldwide standardisation bodies (ITU, IEC, ISO, etc.) and to support the adopted European standards in these bodies;
* to complete the standards according to the European requirements, defining one option only;

* to anticipate the activity of the worldwide standards bodies through the adoption of European standards.

Since the CEPT is the founding organisation of ETSI, an ETSI Member must be from a CEPT member country. The ETSI membership consists *inter alia* of Administrations, Administrative Bodies and National Standards Organisations and Manufacturers, Private Service Providers, Research Bodies, Consultancy Companies / Partnerships, and others (the large majority).

It is the goal of ETSI to meet the standardisation needs of the whole of Europe. ETSI is open to Central and Eastern European states and has already established closer contacts in that region with Administrations, network operators and manufacturers in the telecommunications field in order to fulfill this objective.

Since a standard is a voluntary agreement or 'tool' to facilitate industry, it is not legally binding.CENELEC and ETSI can only work on standard development after CEPT has approved the frequency selection, when relevant. Also draft system reference documents and draft standards need approval of CEPT before official publication.

### 2.5 Other interested parties

Apart from Administrations and standardisation institutes, there are many more organisations that are interested in proper frequency management. In Europe, these include:

CRAF Committee on Radio Astronomy Frequencies
EBU European Broadcasting Union
ESA European Space Agency
IARU International Radio Amateur Union
NATO North Atlantic Treaty Organisation

These organisations have a formal observer status in CEPT, which enables them to participate in the work of the CEPT in all its commissions, working groups and project teams from the ECC to the lowest level.

Such a relation is also desired with the European Commission, where the interests of industrial and commercial are well served, while in practice this is not the case for the science services and the space service. A similar situation applies to the standardisation institutes, where the active participation of science services is difficult since the cost of joining these institutes is prohibitive.

## 3. The Role of CRAF

In frequency management matters, the European radio astronomy community is represented by CRAF, the Committee on Radio Astronomy Frequencies of ESF, the European Science Foundation. CRAF, which was founded in 1987, was established as an ESF committee in 1988. Its members represent the radio astronomical observatories of 17 CEPT countries, the European VLBI Network (EVN), the Joint Institute for VLBI in Europe (JIVE), and three other multi-national organisations (EISCAT, ESA and IRAM). Together, these observatories cover the entire ITU frequency allocation range, from 13 MHz to 275 GHz.

The European Science Foundation (ESF) acts as a catalyst for the development of science by bringing together leading scientists and funding agencies to debate, plan, and implement pan-European scientific and science policy initiatives. It is an

association of the 70 major national funding agencies devoted to scientific research in 27 countries, and it represents all scientific disciplines.

The role of CRAF is "to keep the frequency bands used by radio astronomers free of interference". To this end it operates both at an administrative and at a technical level: CRAF co-ordinates the relevant representations concerning radio astronomy made to the various national and supranational radio regulatory bodies within Europe, it acts as the European voice in concert with other groups of radio astronomers in discussions within the international bodies that allocate frequencies, and it initiates and encourages scientific studies aimed both at reducing interference at source and the effects of interference.

Since January 1, 1997, CRAF has employed a full-time pan-European radio astronomy Spectrum Manager. Funding for this position is provided by the member Institutes or their funding Agencies, and financial support within the sixth Framework Programme, FP6, of the EU will be sought as part of the Radio Astronomy Integrated Activity proposal.

Within the CEPT (see Section 2.2) CRAF has observer status, which enables it to participate in its own right in CEPT work at various levels, such as the ERC Working groups FM (Frequency Management) and SE (Spectrum Efficiency), on various FM and SE project teams, and in the preparation of European Common Positions on WRC issues. Through its CEPT status it can communicate directly with other organisations, such as NATO and IARU. CRAF's relationship with the European Commission is at present only incidental, as the CEPT handles frequency management issues within Europe (of which the EU countries are a subset). These ties will need to be reinvigorated, given the EC's views about the proliferation of active spectrum applications that are potentially detrimental for the passive services, such as Ultra Wide-Band applications. CRAF deals with ETSI only in consultative processes for the development of industrial standards.

At the global level, CRAF is an ITU-R sector member. In general, however, CRAF does not contribute input papers directly to the various ITU-R fora, nor does it send its representatives to their meetings, since it prefers to make its positions know there through collaboration and consultation with IUCAF, the sole worldwide organisation of radio astronomers. At present, three members of CRAF are also IUCAF members. CRAF has an official liaison with CORF, which represents US radio astronomy, an association which we also hope to arrange with the recently-created RAFCAP, which represents radio astronomers in the Asia-Pacific region.

CRAF also has an educational role in making others, particularly active radio spectrum users, aware of the sensitivity and consequent need for protection of the RAS. This function is being fulfilled for example by the publication of the CRAF Handbook for Radio Astronomy (2nd ed., 1997) and the CRAF Handbook for Frequency Management (2001), which are made widely available. Furthermore, CRAF regularly publishes a Newsletter, which is distributed in print and is available on the Web at http://www.astron.nl/craf.

## 4. Important Current European frequency Issues

Currently (2002) the most important radiocommunication issues for the passive services in Europe are:

- preparation for WRC-03 (which has a very full agenda);
- RAS (in-)compatibility with Ultra-Wide Band (UWB) and Short Range Radars;
- RAS (in-)compatibility with Power Line Communication systems;
- Broadcasting re-planning (T-DAB/S-DAB);

- UMTS/IMT2000 developments;
- establishment of a European Common Allocation Table (ECA).

## 5. Literature


CRAF, 1997, Handbook for Radio Astronomy – 2nd edition (European Science Foundation, Strasbourg)

CRAF, 2002, Handbook for Frequency Management (European Science Foundation, Strasbourg)

ITU-R Radio Regulations, edition 2001 (International Telecommunication Union, Geneva)


## 6. Abbreviations

| | |
|---|---|
| APT | Asia Pacific Telecommunity |
| CENELEC | European Committee for Electrotechnical Standardisation |
| CEPT | Conference of European Posts and Telecommunications Administrations |
| CERP | European Committee on Postal Regulation |
| CITEL | Inter-American Telecommunication Commission |
| CORF | Committee on Radio Frequencies (USA) |
| CRAF | Committee on Radio Astronomy Frequencies of the European Science Foundation |
| DAB | Digital Audio Broadcasting |
| ECA | European Common Allocation Table (CEPT) |
| EEA | European Economic Area |
| EBU | European Broadcasting Union |
| EC | European Commission |
| ECC | Electronic Communications Committee (CEPT) |
| ESA | European Space Agency (member of CRAF) |
| EISCAT | European Incoherent Scatter Scientific Association (member of CRAF) |
| ETSI | European Telecommunications Standards Institute |
| EU | European Union |
| EVN | European VLBI Network |
| IARU | International Radio Amateur Union |
| IMT-2000 | International Mobile Telecommunication System |
| IRAM | Institut de radio astronomie millimétrique (member of CRAF) |
| ITU | International Telecommunication Union |
| JIVE | Joint Institute for VLBI in Europe |
| MoU | Memorandum of Understanding |
| NATO | North Atlantic Treaty Organisation |
| RAFCAP | Radio Astronomy Frequency Committee in the Asia-Pacific Region |
| S-DAB | Satellite - Digital Audio Broadcasting |
| T-DAB | Terrestrial Digital Audio Broadcasting |
| UMTS | Universal Mobile Telecommunication System |
| UPU | Universal Postal Union |
| UWB | Ultra-Wide Band |
| WRC | World Radiocommunication Conference (ITU) |