RECOMMENDATION ITU-R SM.1265-1*

National alternative allocation methods

(Question ITU-R 208/1)

(1997-2001)

Scope

This Recommendation contains the considerations and approaches that each Administration should consider for its alternative frequency allocation.

Keywords

Alternative frequency allocation, radio-frequency spectrum, allocation structure, new technologies

The ITU Radiocommunication Assembly,

considering

a) that the Radio Regulations (RR) define over 40 different radio services;

b) that narrowly defined services can unnecessarily restrict flexibility and limit spectrum utilization;

c) that new technologies are often capable of providing several fully compatible radiocommunication services from a single technology platform;

d) that any changes in the current frequency allocation structure must be fully tested and proven before gaining acceptance on a global basis;

e) that such testing may not always be possible in accordance with Article **5** of the RR,

recognizing

provision RR No. **4.4**:

"**4.4** Administrations of the Member States shall not assign to a station any frequency in derogation of either the Table of Frequency Allocations in this Chapter or the other provisions of these Regulations, except on the express condition that such a station, when using such a frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the provisions of the Constitution, the Convention and these Regulations.",

recommends

1 that administrations should consider theoretical and practical test applications of the alternate allocation methods cited in the conclusion of Annex 1;

2 that administrations should always undertake such practical tests in accordance with the provisions of the RR, including application of RR No. **4.4** where necessary;

3 that administrations should provide timely information on their experience in applying provisions of this Recommendation to Radiocommunication Study Group 1.

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* Radiocommunication Study Group 1 made editorial amendments to this Recommendation in the years 2019 and 2023 in accordance with Resolution ITU-R 1.

ANNEX 1

Allocation structures

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1 Introduction

This Annex examines alternate allocation structures with the aim of using the radio spectrum more efficiently and providing flexible access to the spectrum by new technologies. These alternate allocation structures should also maintain use of the spectrum by existing systems and limit interference.

The approach taken in this Annex is in two steps: first, the alternative frequency allocation structures are presented with a list of advantages and disadvantages for each structure. Then an example of the application of the proposed approach is given.

2 Alternative frequency allocation structures

This Annex considers five approaches to allocating the radio spectrum, one of which is the current approach. The advantages and disadvantages of the *status quo* are presented to provide a basis for judging the improvement or degradation resulting from the new approaches being proposed.

The new approaches considered are:

– allocations based on generic services,

– allocations based on spatial service areas,

– allocations based on technical rules,

– allocations based on market approaches.

It is important to note that with the new approaches to allocations it would be necessary to include further conditions to ensure compatibility within the new "service" groups.

The objective of formulating alternate allocation structures is to permit some additional flexibility to administrations in the allocation process and where possible to simplify the regulatory provisions. An additional objective is to reduce the size and complexity of the RR while guaranteeing the continued access which is provided currently by the existing block allocation methodology together with its footnotes.

The following provides a description, list of advantages and disadvantages and an example application for each of these potential structures.

2.1 *Status quo*

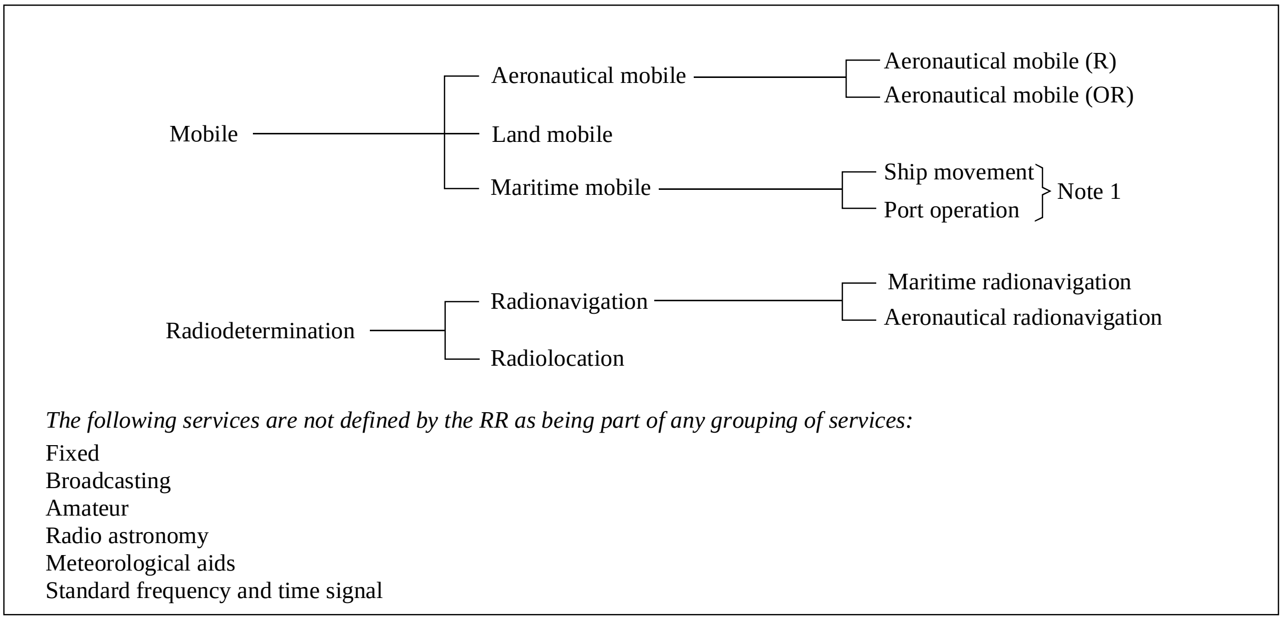
2.1.1 Approach

In the *status quo* structure, the current Table of Frequency Allocations will be retained. Here the frequency band from 9 kHz to 400 GHz is segmented into smaller bands and allocated to over 40 radiocommunication services in the Table of Frequency Allocations. The radio services are identified as primary or secondary in the Table. Footnotes are used to alter, limit or change the relevant allocations. The Table is also organized into three Regions of the world and is supplemented by assignment and allotment plans for some bands and services. The existing radiocommunication services as defined by the ITU and their relationship are shown in Fig. 1.

FIGURE 1

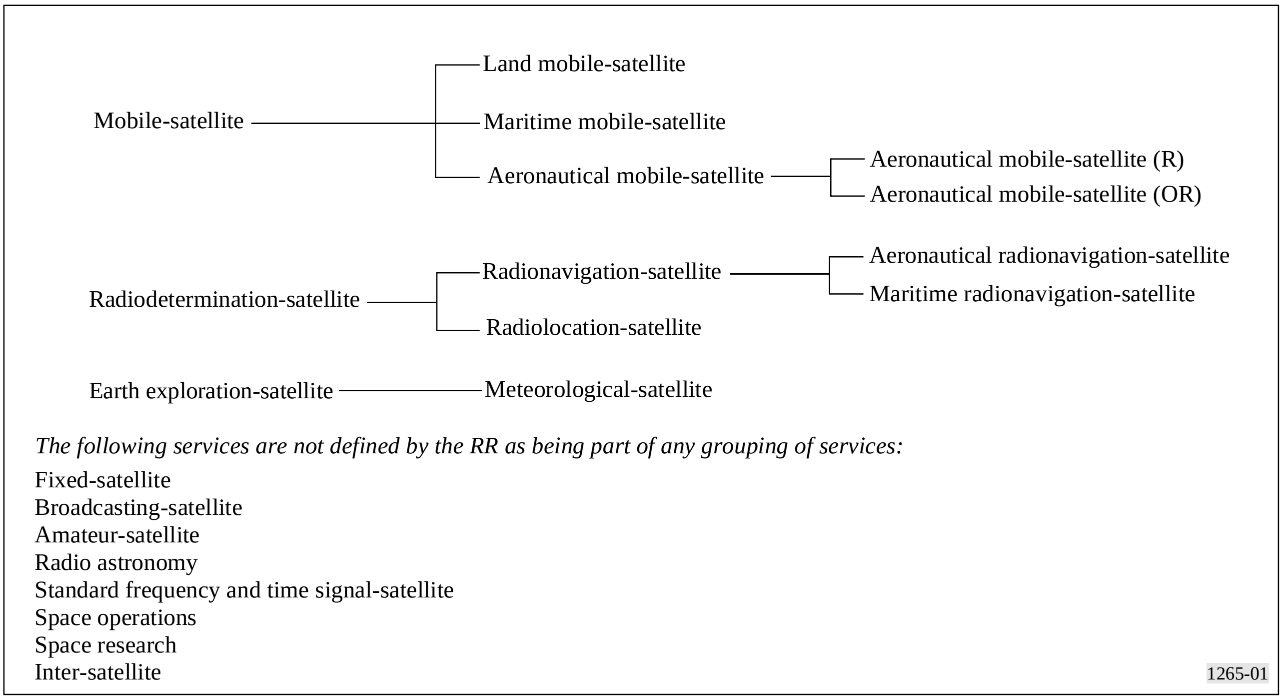
Relationship between radio services in terms of broader and narrower definitions

Terrestrial services



NOTE 1 – The ship movement and port operation services are not subject to any table allocations. They are referred to in RR Appendix 18.

Space services



2.1.2 Advantages

- Requires no transitional change;
- safeguards existing allocated services;
- familiar to administrations;

– provides stability for equipment manufacturers and users;

– coordination methods well established;

– provides stable planning environment for administrations;

– generally provides compatible services with similar technical characteristics;

– provides for safety services;

– provides, in some cases, for broadly defined services and narrowly defined services.

2.1.3 Disadvantages

– Some allocations are service specific and hence inflexible;

– current block allocation is slow to respond to new services;

– limited use of technical characteristics in the allocation process;

– current user has no incentive to accommodate new users except through world radiocommunication conferences;

– narrowly defined blocks can lead to inefficient use of the spectrum due to the spectrum not being used or through the use of inefficient technology;

– present spectrum is becoming fragmented due to the number of system driven allocations and footnotes.

2.2 Allocations based on generic services

2.2.1 Approach

Existing radio services could be combined to form a number of "generic" radio services. The combination can be based on grouping by similar usage (based on operational zones, systems and propagation characteristics).

There can be different degrees of combination of existing services. At the minimum level, services which are application specific could be combined (e.g. aeronautical-mobile satellite, maritime-mobile satellite, land-mobile satellite combined to form mobile satellite). Further combination could be achieved by, grouping services which could operate under either mutually acceptable technical conditions or, by consideration of their area of operation (i.e. worldwide, regional, etc.). Clearly it will be necessary to establish the technical conditions and include these as part of the allocation in Article 5 or in a reference document of the ITU-R.

2.2.2 Example of a smaller number of generic services

The Table of Frequency Allocations could contain only:

– fixed,

– mobile,

– broadcasting,

– aeronautical mobile,
– maritime mobile,
– amateur,
– space operation,
– space research,
– radiolocation,
– radionavigation,
– passive services (radio astronomy),
– mobile satellite,
– fixed satellite,
– broadcasting satellite,
– amateur satellite.

A further reduction might be possible in the future as technologies advance and services evolve (e.g. trend towards universal personal communications and more widespread use of digital techniques).

2.2.3 Advantages over *status quo*

– Flexible to accommodate new services;
– fewer allocations and possibly fewer coordination methods;
– efficient use of the spectrum;
– encourages technology development and entrepreneurial initiatives;
– has a strong technical basis.

2.2.4 Disadvantages

– Reduction of stability;
– requires services to observe technical conditions;
– the conditions of operation of existing services could be complicated;
– may penalize slow growth services;
– may increase the amount of coordination.

2.3 Allocations based on spatial types

2.3.1 Approach

The spatial service area approach categorizes the spectrum by using the service area of the radio system application. Service areas can be defined as:

Terrestrial:

– point-to-point,

– point-to-area[(1)],

– area[(1)]-to-point,

– area[(1)]-to-area.

(1) Area also covers multipoint.

Space:

– space-to-Earth;

– Earth-to-space;

– space-to-space.

A further condition that needs to be included for gaining access is the usage within the service area as well as technical conditions. Examples of this might be:

– communications;

– radiodetermination;

– passive.

This approach is a major change, and will require careful consideration in mapping the existing services into the new framework, as a current service may qualify for more than one spatial allocation. The following example is based on mapping of a complete communication system to each spatial type in the terrestrial section, and mapping of the basis of links in a case of space systems:

2.3.1.1 Terrestrial

Point-to-point	FIXED METEOROLOGICAL AIDS
Point-to-area[(1)]	FIXED MOBILE – LAND – MARITIME – AERONAUTICAL, (R), (OR) BROADCASTING METEOROLOGICAL AIDS STANDARD FREQUENCY AND TIME SIGNAL AMATEUR RADIONAVIGATION RADIOLOCATION
Area[(1)]-to-point	METEOROLOGICAL AIDS
Area[(1)]-to-area	MOBILE – LAND – MARITIME – AERONAUTICAL, (R), (OR)

(1) Area also covers multipoint.

2.3.1.2 Space

Space-to-Earth	BROADCASTING-SATELLITE RADIODETERMINATION-SATELLITE MARITIME RADIONAVIGATION-SATELLITE AERONAUTICAL RADIONAVIGATION-SATELLITE STANDARD FREQUENCY AND TIME SIGNAL AMATEUR-SATELLITE RADIO ASTRONOMY FIXED-SATELLITE SPACE OPERATIONS SPACE RESEARCH
Earth-to-space	FIXED-SATELLITE SPACE OPERATIONS SPACE RESEARCH EARTH EXPLORATION-SATELLITE MOBILE-SATELLITE – LAND – MARITIME – AERONAUTICAL, (R), (OR) AMATEUR-SATELLITE MARITIME RADIONAVIGATION-SATELLITE AERONAUTICAL RADIONAVIGATION-SATELLITE
Space-to-space	INTERSATELLITE SPACE OPERATIONS SPACE RESEARCH

After the existing radio services are mapped to the spatial classes, they are replaced by the latter in the Table of Frequency Allocations. As a result, the Table will contain the spatial types in place of the radio services.

2.3.2 Advantages

– Allows greater flexibility in accommodating new services and technology;

– provides easy access to the radio spectrum;

– provides greater flexibility for administrations to use the spectrum to meet their specific needs;

– sharing between the terrestrial classes of services could be a matter of domestic or bilateral nature;

– sharing is intrinsically encouraged;

– no need to displace existing users.

2.3.3 Disadvantages

– Radical change and may present a difficult transition plan;

– sharing criteria between space and terrestrial services would continue to be an international matter;

– not able to make the most optimum Frequency Allocations to the spatial classes;

– slow growing systems penalized;

– scientific services may suffer vis-à-vis commercial.

2.4 Allocations based on technical considerations

2.4.1 Approach

Radio system performance can be defined in terms of the performance level and the tolerance level. For any two (similar or dissimilar) radio systems operating in the same geographical area and at the same time, the technical constraints for these two systems to operate based on this model can be established. A matrix providing these parameters can be developed and employed for frequency assignment purposes. The model is based upon the system characteristics of modulation, bandwidth, transmitted power, and antenna parameters as well as propagation characteristics of the radio wave which make up the essential elements of an electromagnetic compatibility (EMC) model.

The EMC techniques characterize a signal in terms of its basic technical parameters, rather than in terms of its specific function (service) or equipment. Since it is by means of such physical quantities (e.g. transmitted power, antenna gain, bandwidth, distance, etc.) that one signal interferes with another signal, signals within a band can be described with a suitable set of these parameters.

This approach defines the sharing between a number of systems in terms of a sharing criteria and the necessary equations or EMC models that determine the levels of the desired and undesired signals at the location of the proposed and existing receivers, or at the boundary of a country. As such it cannot be used as a stand-alone allocation method, but can be used with any other allocation method to increase flexibility and access to the spectrum.

Within any allocation the impact of a new application/service can be assessed based on the technical parameters of the existing and proposed systems. By providing a regulatory means by which the characteristics of systems that could use the band are to be established, greater flexibility could be achieved. The establishment of these characteristics might be a function that could be performed by the Radiocommunication Sector.

Extensive propagation modelling techniques, combined with extensive and up-to-date databases, can be processed in high-performance computer systems to accurately predict the impact of new applications. Better database techniques will make it more practical to keep track of uses of the band, as well as keeping track of much more complex types of systems. These capabilities within a suitable regulatory environment could provide the desired flexibility in the use of the RR.

2.5 Market approach

The existing examples of market approach applications to national frequency management, though offering a flexible means for the accommodation of new applications on the national level, are not practical to use on the international level. It should also be noted that a simplified and more flexible table may facilitate the application of market approaches within an administration.

3 Conclusions

Herein are five approaches to allocation of the radio-frequency spectrum. Out of these only three appear to be technically feasible methods, namely:

– *status quo*,

– generic services,

– spatial types.

These approaches require testing before further conclusions can be drawn. All three cases can be improved by the addition of technical criteria which could increase the sharing and efficiency of spectrum use within a frequency block. The technical criteria includes EMC models, permissible interference and propagation conditions.