

IUCAF

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1. Introduction

IUCAF is the international organization representing the unfettered views of passive scientific users of the radio-frequency spectrum at the ITU (International Telecommunication Union). It operates under the auspices of ICSU, the International Council for Science, which is part of UNESCO. IUCAF is sponsored by the International Astronomical Union (IAU), the International Union of Radio Science (URSI), and by the Committee on Space Research (COSPAR). ICSU set up IUCAF in 1960 to work towards keeping parts of the radio spectrum clear of interference for passive scientific use. This action was partly stimulated by the potential threat posed at that time by Project WESTFORD (Robinson 1999), which would have placed metallic needles into Earth orbit, as well as by the then recent successes in observing 21 cm emission from neutral hydrogen, which had just led to a major reappraisal of knowledge of our own Galaxy, and our position in it. Indeed CORF, the United States counterpart to IUCAF, was only established by the US National Academy of Science in 1961.

The “IUCAF” acronym used to stand for the “Inter-Union Commission on the Allocation of Frequencies for Space Research and Radio Astronomy”. This title was later changed to the “Scientific Committee on Frequency Allocations for Radio Astronomy and Space Science”, but “IUCAF” had by then become so well known that it was decided to keep the acronym.

2. Terms of Reference

The directive setting up IUCAF, and its terms of reference, follows.

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CONSTITUTION AND TERMS OF REFERENCE OF THE
INTER-UNION COMMISSION ON FREQUENCY ALLOCATIONS
FOR RADIO ASTRONOMY AND SPACE SCIENCE (IUCAF)

Considering that for research in radio astronomy and space science it is urgently necessary to have the use of an adequate number of frequency channels that are sufficiently protected from interference with scientific observations, ICSU established, under URSI as Parent Union, an Inter-Union Commission between URSI and IAU in conjunction with COSPAR, with no more than four representatives of each of the adhering bodies; with the Secretary of the Commission as full member ex officio. The Commission will have the power to co-opt not more than three members not representing the constituent bodies.

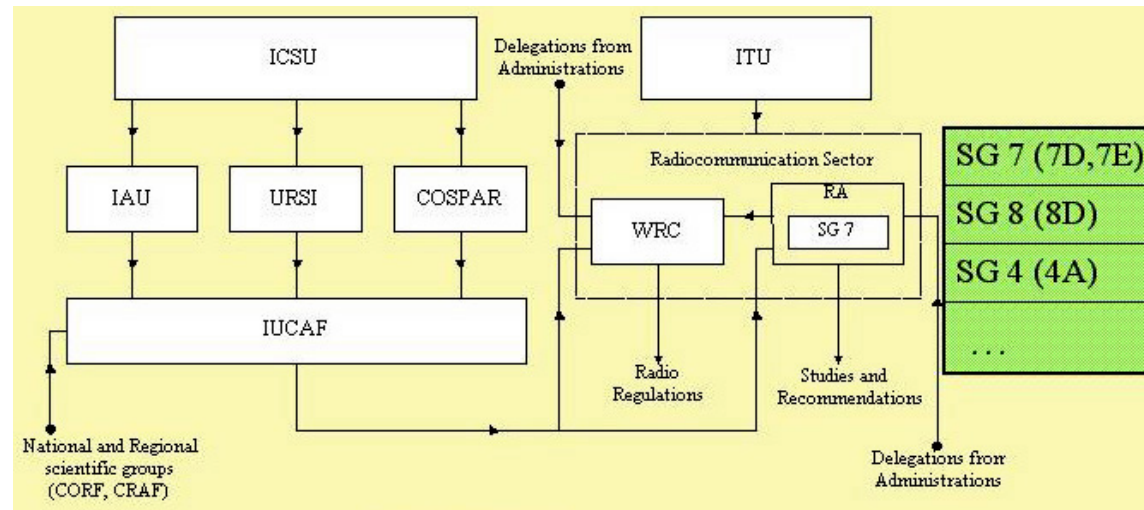
The terms of reference are as follows:

- a) To study the requirements for frequency channels and radio frequency protection for passive radio science research in fields such as radio astronomy, space research and remote sensing
- b) To co-ordinate these requirements for the three constituent bodies which may set up special committees for the purpose;
- c) To formulate proposals for frequency allocations which are adequate to meet these requirements;
- d) To bring these proposals to the attention of the appropriate national frequency allocation authorities with the assistance of the national member bodies which may establish joint national committees for the purpose;
- e) To initiate necessary action to get these proposals placed on the agenda of the International Telecommunication Union (ITU);
- f) To initiate such other action as is deemed appropriate under the charter of ICSU to ensure favourable action on these proposals by the International Radio Consultative Committee (CCIR) and ITU;
- g) To note that any formal communication from the Commission to CCIR or ITU will be sent on behalf of the three bodies by the Secretary of the Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science."

The current (April 2002) members of IUCAF are:-

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|--------|-----------------------|-----------------|
| URSI | W. A. Baan | The Netherlands |
| | M. M. Davis | USA |
| | W. van Driel | France |
| | A. van Eyken | Norway |
| | P. Poiares Baptista | The Netherlands |
| | K. Ruf | Germany |
| | A. Tzioumis | Australia |
| IAU | S. Ananthkrishnan | India |
| | R. J. Cohen | United Kingdom |
| | D. T. Emerson (Chair) | USA |
| | M. Ohishi | Japan |
| COSPAR | K. F. Tapping | Canada |
| | S. Gulkis | USA |
| | J. Romney | USA |

Figure 1 shows the organizational block diagram relating IUCAF to the ITU. IUCAF members are elected by the different scientific unions to represent radio astronomy and other passive science services at World Radio Conferences (WRCs) and at meetings of relevant ITU-R study groups, working parties and task groups. Initially IUCAF's main forum at the ITU was the Working Party 7D, the specialist



where (in alphabetical order):

| | |
|---------------|---|
| CORF | Committee on Radio Frequencies |
| COSPAR | Committee on Space Research |
| CRAF | Committee on Radio Astronomical Frequencies |
| IAU | International Astronomical Union |
| ICSU | International Council of Scientific Unions |
| ITU | International Telecommunication Union |
| IUCAF | Inter-Union Commission for the Allocation of Frequencies for Radio Astronomy and Space Science |
| RA | Radiocommunication Assembly |
| SG 7 | Radiocommunication Study Group7 |
| URSI | International Union of Radio Science |
| WRC | World Radiocommunication Conference |

Fig. 1 : The organizational block diagram relating IUCAF to its parent bodies within ICSU, and its interaction with the subcommittees of the ITU, is based on that in the ITU-R Handbook on Radio Astronomy (1995).

group concerned just with Radio Astronomy. These Working Party meetings at the ITU are open to other delegates, and at some recent WP7D meetings in Geneva the true radio astronomers have found themselves outnumbered by other delegates representing, for example, the satellite industries. In response to this, IUCAF now aims to have its own representative within other ITU Working Parties such as WP8D and WP4A, that may be concerned primarily with satellite emission, but which of course may have a serious impact on radio astronomy. We have had some success in modifying the wording in documents coming from these groups, but clearly this has put a strain on IUCAF's limited resources.

While much of the focused activity of IUCAF occurs at the ITU, particularly during meetings of Working Party 7D (Radio Astronomy), its members keep in close touch these days via the internet. But the world-wide distribution of members, and the diversity of their scientific interests, also results in small meetings being held whenever several members find themselves together for any reason, as occurs from time to time at the IAU, URSI, or one of the national astronomical societies. Moreover, while in Geneva, many members meet after ITU sessions at the *Lord Jim*.

3. Past Successes

IUCAF has been lucky to have had a sequence of effective chairmen since its inception. These were J-F. Denisse (1960 - 1964), F. G. Smith (1964 - 1975), J. P. Hagen (1975 - 1981), J. W. Findlay (1981 - 1987), B. J. Robinson (1987 - 1995), W. A. Baan (1995 - 1999), and K. Ruf (1999 - 2001). These chairmen have led it to some notable successes. Thus India was induced to propose at WARC 1979 that the 322-326.8 MHz band be allocated to radio astronomy, to enable the detection of deuterium, an allocation supported by NATO countries. But this was still very much the "cold-war" period, when the Soviet Union had an extensive radar network around the Middle East at 327 MHz, which it had used in 1960 to track the Gary Powers U2 spy plane over its territory. Thus the acquisition of the radio astronomy allocation at 327 MHz effectively shut down a Soviet radar network.

The Russian counterpart to the US GPS satellite system is GLONASS, which has an ITU allocation to operate in the 1602-1615.6 MHz band. Jim Cohen discusses this system in detail elsewhere in this volume. IUCAF's concern began in 1983, when GLONASS started to produce strong interference in the 1610.6-1613.8 MHz radio astronomy band containing the important emission line of the OH radical at 1612.23 MHz, which provides the type-defining signature of the OH/IR class of stars. In 1983 radio astronomy had exactly equal status with the navigational services in its band, so astronomers had no official grounds to complain. However IUCAF did contact the Russian administration to see what could be done to ameliorate the situation. As a consequence, eventually during WARC-92, an Australian proposal to enhance the status of radio astronomy at 1612 MHz was approved. With that vote, radio astronomy gained full primary status in the band. IUCAF subsequently reached a memorandum of understanding with the Russians that was signed in 1993, and continues to discuss the issue with them, as the Russians are expected to launch a more heavily-filtered version of their satellite when stocks of the initial model are depleted.

Brian Robinson (1999) summarizes the IUCAF scenario:

“IUCAF members had to evolve from being starry-eyed astronomers as they encountered a world of politics, lobbying, entertainment, threats, espionage and bribery. On one occasion, an offer (in Geneva) of two million dollars in cash ‘*to shut up*’ proved no match for dedication to the joys and excitement of twentieth-century astrophysics.”

4. Current Issues

Satellite systems continue to be a current issue for IUCAF, as they have the potential to produce very high levels of unwanted emissions into adjacent radio astronomy bands, and their operating companies are politically powerful adversaries. IUCAF is also involved with coordination issues, as the protection of a radio astronomy band everywhere across the globe is no longer assured. In some cases, such as the 1668.0 to 1670.0 MHz band, only the immediate location of listed radio astronomy observatories is now protected, even in the supposedly “exclusive” radio astronomy bands.

The current drive to speed-up and modernize spectrum management, so as to squeeze ever more systems into the spectrum, poses fresh challenges for IUCAF. In the USA, this has produced initiatives by the FCC to consider new ways of assessing “harmful interference”, such, for instance, as by introducing the concept of an interference temperature. Another current issue is the push in the USA and the EU to allow the operation of unregistered low-power ultra-wide bandwidth devices across spectrum that is already allocated to a variety of other services and which preliminary studies show to be potentially very harmful for radio astronomy. Times are a changing and IUCAF must needs adapt. One possible mode to tackle some of these ills is IUCAF’s advocacy of an increase in the number of Radio Quiet Zones, specifically those for the next generation of giant instruments, ALMA and SKA.

Robinson, B. J., *Ann.Rev.Astron.Astrophys*, 1999, 37, 65-96