

Interference threats to Radioastronomy now and near future

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Introduction

The Radio Astronomy Service is a passive service since the transmitter is a physical process which cannot be controlled. Rest of the active radiocommunication services have both a transmitter and receiver in human control. This difference is a major cause of the vulnerability of radio astronomy to interference from active services, many of which are of the order of 10^9 times stronger than celestial radio signals.

Radio interference can be a result of sharing between two services operating within the same frequency band, of out-of-band emission, or of spurious emission. In geographical terms, this interference can have a global, regional or local origin. The future of radio astronomy and other sciences making passive use of the radio spectrum requires strong pressure on adequate technological developments to cope with the “multi-dimensional problem space” of multi-service frequency use. The intrinsic vulnerability of passive spectrum use should be considered in all scientific use of radio technology.

Outstanding Acute Problems

Bi-annual ITU World Radio Conferences (WRCs) set the guidelines for national administrations work. Their agendas are usually known 2-4 years in advance.

Other important items the Committee had discussed are:

- The increased interference in the 18 cm band (OH emission) by Mobile Satellite System transmissions.
- The increased threat for the 18 cm band by the Radio Determination Satellite Service, RDSS, on which CRAF explained its views on a proposal of the French LOCSTAR project for blanking radiotelescopes when a detectable LOCSTAR transmission occurs (CRAF-90-2A).
- The Belgian MLMS satellite for space-to-Earth transmissions between 400.15 MHz and 401 MHz using spread spectrum techniques. CRAF fears that harmful interference will be experienced in the radio astronomy bands 322-328.6 MHz and 406-410 MHz. Via the Dutch administration CRAF expressed its worries to the Belgian administration and the ITU Radiocommunications Bureau, Space Service Department.
- Iridium LLC satellites into the band 1610.6-1613.8 MHz.

Long term problems

Long term problems are in particular those problems which today and very probably in the near future have not been fully studied by the ITU Radiocommunications Bureau and which will cause severely harmful interference when they come into effect. The indication “long term” indicates that certainly in the next few years an adequate solution is very unlikely and methods and techniques have to be found in the radio astronomical community to cope with them.

Urgent problems are:

- Introduction and application of new modulation techniques: in particular systems using band- spreading are a potential source of harmful interference. In this band-spreading technique bandwidths of several hundreds MHz are used, while the transmitted power is widely spread over this band and may be just under the current ITU-R recommendations. For radio astronomy this means that when the wide band spectrum covers a radio astronomy band – no matter that it be at a very low level – the “sky background” increases and it is no longer be possible to study weak features (even after long integration times).
- Time-sharing: proposal are made that the radio astronomy service should accept frequency allocations with the condition that only a fraction of each second of Universal Time be used for passive frequency use (i.e. radio astronomical observations) which is left over after an active application has already taken its part.
- Pricing and auctioning the spectrum is becoming an important question and the developments have to be monitored very carefully. The implementation of this policy may have serious impact on the budgets and operations of observatories. The lack of coordination between the different national administrations within Europe makes this topic rather confused at present.
- The new Fixed System techniques and systems are going to higher frequencies. There are systems working around 22 and 37 GHz and systems operating up to 70 GHz are under development.

Conclusion (Discussion)

To ensure the purity of spectrum, a continuous work/activity nationally and internationally is needed. Commercial ventures always seek new ways to exploit any available (even radio astronomy) frequencies to their future products.

References

ESF CRAF www site: <http://www.nfra.nl/craf/>