

## Cover sheet for response to an Ofcom consultation

### BASIC DETAILS

Consultation title: A review of the management of the spectrum currently used for point to point fixed links and other services that share this spectrum

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# **Response on behalf of UK Radio Astronomy to the Ofcom review on the management of the spectrum currently used for point to point fixed links and other services that share this spectrum.**

## **1 – Introduction**

UK Radio astronomy is a unique stakeholder within the scope of this review process as it uses allocated bands which are adjacent to, nearby or even shared with the FS for several of the frequency bands under consideration. Developments over the last 20 years mean that radio astronomical observations are often made on a coordinated basis worldwide and, since radio astronomy is also dependent on naturally occurring phenomena, the operational frequencies it uses cannot be moved within the spectrum. Additionally, radio astronomy cannot operate effectively with levels of interference that would be tolerable in commercial systems. Consequently, its coexistence with other services in adjacent and shared bands needs careful management. The existing status quo in relation to the coexistence of the RAS with fixed links in the UK has developed over many years and produced a broadly satisfactory operating environment for both services. In fact, with the possibility of co-ordination, the allocation of fixed links to bands which can be shared with or are adjacent to radio astronomy bands is a well-matched system, unlike the situation with mobiles, although it must also be said that in some instances effective coordination to prevent harmful interference to the RAS has been challenging. The introduction (only in the U.K.) of 'unlicensed' low-power CCTV video links into the band 1389 – 1399 MHz has been particularly damaging.

It is acknowledged that new demands and technologies mean that regular reviews of the status quo are required. The consultation document issued by Ofcom focuses heavily on seeking information about changes to the use of and future demand for this spectrum within the FS; it also affords opportunities for other services to lobby for access to some parts of this spectrum, again based on predicted future demands. The specific questions posed within the document are structured to support this proposition. As representatives of UK radio astronomy, we are unable to respond to these directly as radio astronomy has a different operational perspective. None of the questions in the consultation relate to Science Services. It is not possible to predict when some new observational technique or physical phenomenon will be discovered that may have implications for the use of the bands allocated (or a requirement to observe at frequencies not yet allocated), although these do indeed occur. Consequently, the comments contained in this document are of a general nature and try to highlight potential technical, operational and financial issues for UK radio astronomy that may arise as a possible consequence of the various changes that have been suggested. Our comments are however based around the broad concepts within the document such as: changes of use; changes in management of the bands; revised licence/fee regimes, etc.

We would also like to note that, as far as the undersigned are aware, no representatives of the UK radio astronomy community were consulted by Aegis Systems Ltd in the development of the study informing this consultation.

## 2 – General comments

For information, the following table lists commonly used bands allocated to UK radio astronomy in relation to some of the bands under consideration in this review(from the 2010 UK FAT).

**Table 1 - UK Radio Astronomy bands in common use in relation to the FS bands under consideration by Ofcom**

RAS Band	Related ITU RR	UK-RAS Status	Related band under review by Ofcom	Comments on RAS band
<sup>1</sup> 1350 – 1380 MHz	5.149	‘D’ - No Protection	“1.4 GHz”	Shared with FS.
<sup>1</sup> 1380 - 1400 MHz		‘C’ - RR 5.149		Low power video links have caused interference to MERLIN telescopes.
1400 – 1427 MHz	5.340	PRIMARY		Passiveband of importance to the UK-RAS lies in between the “1.4 GHz” paired bands.
<sup>1</sup> 6650 – 6675.2	5.149	‘D’ – No Protection	“Upper 6 GHz”	UK-RAS use continues to increase.This band lies completely within the “Upper 6 GHz” band.
14.47 – 14.50 GHz	5.149	Secondary. ‘D’ – No Protection	“15 GHz”	Adjacent to a “15 GHz” paired band.
15.35 – 15.40 GHz	5.340	PRIMARY		Passiveband of importance to the UK-RASadjacent to a “15 GHz” paired band.
22.01 – 22.21 GHz	5.149	PRIMARY	“23 GHz”	Of importance to the UK-RAS. Shared with FS.Coordination can be difficult and have financial consequences for the RAS.
22.21 – 22.50 GHz		PRIMARY		
<sup>2</sup> 22.55 – 23.00 GHz		PRIMARY		
<sup>2</sup> 23.00 – 23.55 GHz		Secondary		
23.60 – 24.00 GHz	5.340	PRIMARY	& “26 GHz”	Passive band of importance to the UK-RASadjacent to “23 GHz” and near to “26 GHz”
<sup>3</sup> 31.2 – 31.3 GHz	5.149	?	“31 GHz”	Shared with FS.
31.3 – 31.5 GHz	5.340	PRIMARY		Passiveband of importance to the UK-RAS. Lies in between the “31 GHz” paired bands.
31.5 – 31.8 GHz	5.149	PRIMARY		Shared with FS.

RR 5.149: “In making assignments to stations of other services to which the bands... [ ] ...are allocated, administrations are urged to take all practicable steps to protect the radio astronomy service from harmful interference. Emissions from space borne or airborne stations can be particularly serious sources of interference to the radio astronomy service (see Nos. **4.5** and **4.6** and Article **29**).

RR 5.340: bands in which “All emissions are prohibited”

It should be noted that there are bands in the above table that are covered by RR 5.149 for which the UK administration does not comply with the expectation in the text,evidenced via designations

<sup>1</sup> Radio Astronomy is not given a formal status in the UK FAT and there is no RSA, but the band is mentioned in Annex ‘D’. RAS use is supported via ITU RR 5.149

<sup>2</sup> Only some parts of these bands are covered by ITU RR 5.149

<sup>3</sup> Radio Astronomy is not given a formal status in the UK FAT; there is no RSA and no mention in Annex ‘D’. RAS use is supported via ITU RR 5.149

of 'no protection' in UK-FAT Annex D. In particular this applies to the UK-RAS use of the band at 6.67 GHz, which we feel should be protected owing to its increasing use.

## 2.1 - Change of use

The Ofcom consultation document itself states that licences issued for point to point fixed links require equipment with very tightly defined technical characteristics and that each link is coordinated on an individual basis with existing services. Coordination is frequently achieved via manipulation of known FS characteristics, some of which are:

- the transmitter location is fixed
- the transmit power and antenna characteristics are well defined and directed
- the frequencies of link 'pairs' can be swapped in direction or changed completely
- the unwanted emissions are tightly specified
- often, frequency of operation is fixed

The above characteristics in combination can be effectively managed via a coordination process with an observatory to achieve satisfactory operation for both services. From the perspective of radio astronomy this translates into a scenario where a broadly manageable status quo has evolved. If we now contrast this with, for example, mobile services, it can be appreciated that in addition to the likelihood of a significantly higher density of transmitters, the items in the above list are either in themselves not fixed, are in some other way uncontrollable (from the perspective of coordination with the RAS), or in the case of unwanted emissions are generally at a higher level and less well-defined. This is in the nature of high-volume consumer equipment produced to a minimum acceptable specification. Additionally these services usually have licensing that would not facilitate any form of coordination.

The above paragraph focuses on mobile use (including the MSS), but arguments in a similar vein can be made if the bands were reallocated to other services for use by some nomadic, airborne or satellite applications.

If significantly different categories of services were allocated into the bands under consideration, this would generate a completely new situation for UK observatories in coexisting with these services. As a consequence, we believe that there may be a significant increase in the potential for harmful interference to the UK-RAS, which would constrain its operations. It is possible that there would be parts of some of the bands where an allocation to certain types of services would be completely incompatible with the operation of the existing UK-RAS in shared and/or adjacent bands. For terrestrial services this might well be able to be dealt with from the radio astronomy perspective by suitable coordination or exclusion zones (commercial service providers may well be uncomfortable with the existence of geographic areas where operation is denied), but for satellite or airborne systems incompatibility would effectively be total. The Ofcom document itself points out in section 3.31 that for fixed links the question of spectrum access by a completely different category of service often translates into a choice between continued use by the fixed service only, or closing the band to fixed links and reallocation to the new service. We feel that certain conditions provided by some of

the changes being considered would provide essentially similar questions for RAS operation in some bands.

## **2.2 - Changes having financial consequences to the UK-RAS**

We are very concerned that changes made to the use, licensing and management of these bands might lead to an increased financial burden to UK radio astronomy or even to the loss of use of a band owing to a lack of funding, because the cost to radio astronomers is currently based upon a denial of use.

It would appear that certain changes suggested in the consultation document may have far reaching financial consequences for the UK-RAS. For example, a situation may occur where a particular part of a band is planned to be cleared of links and allocated to a different category of service. This new service may be completely incompatible with radio astronomy's use of this shared (or an adjacent) band. It could be argued, and indeed has been in the past, that the UK-RAS should cover the cost to the UK treasury of the loss of use of that particular band or give up its rights to protection from the interference occurring from the newly allocated service. Bearing in mind the potential lost revenue in license fees for a given band and current funding levels for the UK-RAS, this is likely to produce a situation where the UK-RAS can do nothing other than accept the prohibitively high levels of interference, effectively making the band unusable for radio astronomy. We feel that this would be completely unacceptable to the UK-RAS community and beyond.

## **2.3 - Changes to the licensing regime**

As the Ofcom consultation document states, there currently exists a number of different licensing regimes. The comments made above on change of use have knock-on consequences here too. If other categories of services are allowed to use these bands then it is almost inevitable that these new services will carry with them licences that are more appropriate to the nature of the service that is being allocated. If this is the case, the licensing conditions applied to the new service should also adequately reflect the protection requirements of the RAS.

In general we believe that, for bands where the usage stays broadly the same, the licensing regime should stay the same. In particular we are concerned that a light or license exempt regime being substituted for link by link technical coordination and licensing in the bands to which it currently applies would create an additional potential for harmful interference to operations of the UK-RAS.

## **2.4 - Changes of management**

Significant changes of use, reallocation and licensing of this spectrum would necessarily dictate significant changes in the nature of the management of the bands. We can only reiterate that a management system that takes into consideration the needs of all of the stakeholders that might be affected in both shared and adjacent bands should be put in place in this situation.

Presently, the commonly used bands of the RAS that are adjacent to or shared with fixed link bands for which some form of coordination is required are either fully managed by or under the control of Ofcom via outsourced management. These are notionally dealt with on a link by link basis and this has proved to be reasonably effective in dealing with issues of potential interference in the past, although we do believe that some improvements to the handling of the coordination process of fixed links with radio astronomy observatories could be made.

### **3 - Conclusion**

As evidenced by the Ofcom consultation document, the possibilities for various forms of change to the FS bands under consideration are almost limitless. Depending on the exact nature of the changes UK radio astronomy may be affected in various ways to a greater or lesser extent.

Whatever the changes may turn out to be, UK radio astronomy representatives wish to actively engage with Ofcom at all stages as things develop. The assessment of the predicted future demands for potential new services must be extremely carefully considered before any action is taken. In the past the eventual demand for various services has not always been in line with initial predictions. Badly informed decisions have the potential to result in reductions to the operational effectiveness of the U.K.'s radio observatories, perhaps irrevocably or for many years to come. It should also be said that, with a re-think on the allocation of fixed-link spectrum, it should not be out of the question that changes could be made that are of benefit to the U.K. RAS.

We believe that radio astronomy has a significant societal value which is not easy to measure in hard cash terms<sup>4</sup>. We urge Ofcom to put in place all the necessary technical and regulatory requirements to adequately protect UK radio astronomy operations from any changes to the use, management and licensing of the bands under consideration and ensure that any such changes eventually implemented impose no financial constraints.

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30<sup>th</sup> April 2012

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<sup>4</sup> See ITU Report RS.2178