



**CSIRO Comments on**  
**“Commonwealth-held spectrum – Discussion Paper, May 2017”**  
**and**  
**“Spectrum pricing – Discussion Paper, May 2017”**  
**July 2017**

## Introduction

CSIRO welcomes this opportunity to comment on the discussion papers in relation to management of Commonwealth-held spectrum and spectrum pricing.

CSIRO Astronomy and Space Science builds and operates national facilities for radio astronomy and for the space research service, which are recognised, for the purposes of spectrum management, as radiocommunication services by the ITU and the Radiocommunications Act 1992. A number of other business units of CSIRO use radio equipment, under apparatus or class licences, for research measurements such as meteorological radar, and for day-to-day operation of facilities including safety of staff. (See Attachment 1.)

There are therefore two general categories of spectrum use in CSIRO: one in which the spectrum is an essential component of the research activity itself (e.g. receiving radio emissions from the natural universe, receiving scientific data from space probes, measuring the atmosphere) and another in which spectrum facilitates efficient research (e.g. safety alarms on worksites, communicating with field staff in remote areas, or navigating a research ship).

It is with these two categories in mind that the following responses are made in relation to the proposals of the discussion papers.

## Part 1: Commonwealth-held Spectrum

### **General comments**

#### **Footnotes, harmonisation and public sector use**

Footnote 5 on page 6 of the discussion paper says “*Footnotes in the international Table of Frequency Allocations (Article 5, the ITU Radio Regulations), to which Australia is a signatory, specify how frequencies are to be assigned or used. Article 5 informs the Australian Radiofrequency Spectrum Plan, which applies these footnotes along with so-called ‘AUS’ footnotes that are unique to the Australian radiocommunications environment.*”

CSIRO believes there is a misunderstanding in this comment. Article 5 of the Radio Regulations consists largely of tables, in which every<sup>1</sup> frequency band is allocated to one or more services. Footnotes to the Table provide, in some cases, additional allocations (for example, in a few countries, this band is also allocated to the fixed service) or conditions (use of the satellite service in this band must comply with certain technical requirements). Allocations described in the main table of Article 5 are those which are used by all or most of the countries in a Region, while those in footnotes are the exceptions for a few

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<sup>1</sup> Frequencies below 6 kHz, for which there is little practical application, are not included. Neither are frequencies above 275 GHz which provide very short-range coverage and until recently have been largely experimental, and which therefore do not provide significant international interference concerns. There are proposals, however, to extend the Radio Regulations to include higher frequencies.

countries. So it is not only, or even mainly, the footnotes of Article 5 that “specify how frequencies are to be assigned or used.”

Further, there is no distinction in status between allocations described in the main table of Article 5 and allocations designated by footnotes.

While it is true that Article 5 informs the ARSP, it is not only (or even primarily) the footnotes which are applied, but the (primarily) the main tables of Article 5.

In the section “The Government’s role in spectrum: As a User” (page 8) there is a statement in the second paragraph “*Factors such as bands allocated via footnotes or through international harmonisation can produce misleading results.*” and in the fourth paragraph: “*Historically, international harmonisation through footnoted bands has prioritised public sector use of spectrum over private sector use, with allocations to public users in those bands potentially being considered generous.*” We believe that there is confusion here in two dimensions.

The first is national vs international footnotes. While some national (Australian Radiofrequency Spectrum Plan) footnotes allocate bands to public sector users (eg Aus 1 and Aus 11 give priority to Defence), international footnotes only allocate bands to generic uses (eg mobile, radionavigation, etc) without indicating a public sector priority. It is therefore incorrect to say that “international harmonisation through footnoted bands has prioritised public sector use...”

Secondly, as noted above, there seems to be a confusion about allocation via footnotes vs allocation in the tables of the Radio Regulations (RR). In any event, there is no relationship to public sector vs private sector use in the international Radio Regulations.

The consultation paper goes immediately from the statement above concerning “international harmonisation through footnoted bands” to this conclusion:

*“Arguably this is justified as there is an expectation that the Government will provide a range of services and capabilities that either cannot or should not wholly be provided by the private sector. These are often of vital national importance and include capabilities such as defence, aviation and maritime safety, meteorology and scientific research.”*

First, at the international level, there are no allocations (either in the RR tables or by footnote) to “defence” as a service in its own right. There are allocations for mobile, fixed, radar and satellite services which, in any country, could be used by defence forces or by other users including the private sector. (Clearly there are logistical reasons for countries to coordinate some defence applications, but that is beyond the scope of this paper.) In relation to the other services, as stated above international allocations to aviation and maritime services, meteorology and scientific research are not specified in the RR as “public sector;” private sector operation of these functions is not excluded by the Radio Regulations or by the ARSP. In the area of scientific research, for example, the bands allocated to radioastronomy are used not only by CSIRO but by universities and private individuals. Bands allocated to aeronautical and maritime services are used both the public and private sectors (commercial airlines and shipping companies as well as private pilots or boat owners.)

CSIRO is therefore concerned about a perception that a significant number of bands are explicitly allocated, at the international level, to “the public sector” which leads to a perception of inefficiency in “public sector use”. Many of the bands described above are already in use by both the private and public sectors.

CSIRO considers that this perception may have arisen because, at the international level, there is a significant amount of spectrum allocated to essential services which are not necessarily commercially attractive (maritime safety, meteorology, radionavigation, space communications) and which have therefore traditionally been undertaken by the public sector for the benefit of the nation. Most of the bands allocated to such services are not available for the one service which has been extremely commercially attractive – mobile – and for which there is therefore considerable private sector interest. Notwithstanding, there is nothing in the ITU Radio Regulations or in the ARSP (except for the footnotes

relating to Defence bands) which prohibits private sector use of the other services, or public sector use of mobile allocations.

### Current Commonwealth holdings

CSIRO notes that the values for CSIRO in Figure 1 (“Commonwealth Government spectrum – 10 largest users by bandwidth and spectrum accesses 21 February 2017”) do not reflect the information provided to the Department of Communications on 23 January 2017, in response to the request of December 2016. (Attachment 1)

CSIRO further notes that simply describing the number of licences or the total bandwidth of those licences is not representative of spectrum exclusivity or value. Some licences are for narrowband use, for low power in a limited geographic space, and/or shared use with other users including the private sector. For example, CSIRO holds licences for CB repeaters for some of its field stations, but hundreds of other users, including private individuals, hold similar licences in the same bands. Other licences may be for wideband use, for national coverage, and/or for exclusive use. So comparing an exclusive Australia-wide wideband licence with a shared, local, narrowband licence is quite misleading. Secondly, the “value” of a given bandwidth is dependent on the centre frequency: 100 MHz of spectrum at a centre frequency of 400 MHz is a significant amount, while 100 MHz at 40 GHz is not.

### **Proposal 1: A strong governance framework**

*“Establish an advisory committee comprising relevant Commonwealth government agencies to provide advice to the Minister for Communications on issues of spectrum policy and identify and implement whole-of-government efficiency improvements that will enhance the management of Commonwealth spectrum holdings.”*

While CSIRO is not opposed to this advisory committee, it considers that it may be difficult to get appropriate representation from some Commonwealth government agencies, and that there may be little scope for the foreseen “whole-of-government efficiency improvements”.

In terms of representation, the consultation paper proposes: “...the committee would be open to all significant Commonwealth government users of spectrum that consider spectrum management issues to be essential to operation” and that “committee members would be senior level staff”. As noted in the Introduction to this submission, within CSIRO there are groups for whom spectrum is an essential component of the research activity, and other groups for whom radio equipment facilitates day-to-day functions. While the first group may have some appreciation for spectrum management issues, particularly in regard to building new research infrastructure or resolving problems of interference, the second group simply needs to use radios to contact staff in the field or on a ship.

In terms of efficiency, the spectrum used by CSIRO for direct research activities is allocated to radioastronomy, to the space research service or to meteorological sensing. CSIRO already shares these bands with other public and private sector users. In the case of radioastronomy, which is receive only, the bands can be used by an infinite number of other radioastronomy users. But there is little scope for a whole-of-government efficiency by sharing, for example, radioastronomy or SRS bands with Defence communication systems or with Australian Federal Police networks, as the bands are not allocated (internationally or nationally) for mobile communications. CSIRO considers that a similar situation exists for most public service use; each agency is using bands for a particular purpose which could be shared with similar users in the private sector but not with significantly different users in the public sector.

### **Proposal 2: Improving transparency**

*“The Government should publish a consolidated report outlining the value and use of the Commonwealths spectrum holdings every two years. To facilitate this portfolio agencies should provide information on the their spectrum holdings by value (price paid) and number of licences; the utilisation-over-time and purposes for which spectrum holdings are used; and future spectrum requirements including the timing of new spectrum allocations.”*

CSIRO considers, as stated above, that the number of licences held is not necessarily a valid metric, as the amount of spectrum, the geographic coverage and the intrinsic value of the use may vary considerably between one licence and another.

CSIRO is also concerned that the value of spectrum will be equated to the price paid. An appropriate metric for the “value” of spectrum has been debated for some decades, and given the use of spectrum in applications as diverse as scientific research, safety-of-life, national defence, and commerce, it is unlikely that an agreed single metric is possible. CSIRO would be concerned if the price paid for licences were taken in a wider context to represent the value of the radio service, or if the pricing model were changed to represent the full value of the services, which in the case of scientific research (and other applications) would be extremely difficult to quantify.

The consultation paper states (page 15): *“There may be elements of public sector spectrum holdings that could be of significant value to the private sector (or even could be put to better use by other Commonwealth organisations). If alternative bands could be identified for existing holders to move to, thus vacating the valuable bands for alternative use, improvements to spectrum allocation could be achieved.”*

CSIRO notes that radioastronomy and passive sensing services cannot move to “alternative bands” as the frequency bands used are based on the natural emissions of chemicals in space or the atmosphere. Spectrum used to communicate with space probes which have already been launched and whose missions may continue for decades, also cannot move to “alternative bands” because the space craft cannot be retuned to other frequencies.

CSIRO further notes that all of the spectrum between about 400 MHz and 6 GHz (and several higher bands) is seen by the mobile broadband industry as valuable, so any change to an “alternative band” would require other services to move to much higher (or, less likely, much lower) frequencies where geographic coverage or data rates would be adversely affected. Such relocation would also require significant investment in new equipment by the incumbent users. By analogy, the argument in the consultation paper could also be made for Commonwealth real estate in capital cities; the land could be of significant value to the private sector and could in theory be vacated for alternative use. As equivalent space in the same city would be equally valuable, any significant “improvement” would involve moving Commonwealth agencies well out of the capital cities to less expensive locations, but this would require new construction and may lead to significant disruption and logistical inefficiencies.

If, however, the proposal to report regularly on spectrum “value”, utilisation over time and purpose is adopted, CSIRO considers that this reporting should include all entities including government business enterprises, state and local governments, and the private sector. Such reporting, if done across the board, would fully allow for the stated goals of “identification of excess holdings and [cross department] economies of scale.”

### **Proposal 3: Retaining benefits through sharing and trading of spectrum**

*“The Government should explore the implementation of a whole-of-government approach to the identification of sharing and trading mechanisms, including the examination of foreign government approaches and emerging technologies and processes to determine if there are opportunities for the Government to engage in sharing and trading of Commonwealth held spectrum.”*

CSIRO supports efficient use of spectrum, and as noted above, already shares many of the frequency bands for which it holds licences, as appropriate under international and national regulation, with other users. The bands used for mobile communication systems as listed in Attachment 1, for example, are also used by the private sector, so they are not exclusive to CSIRO or even to the Commonwealth. The radioastronomy bands are used (for radioastronomy) by universities and private individuals. CSIRO believes that a clear assessment of the current situation of sharing and trading should be undertaken to determine whether a new whole-of-government approach to sharing and trading is necessary.

## **Part 2: Spectrum Pricing**

**Proposals 1 and 3: “The ACMA should publish guidelines on how it approaches its spectrum pricing decisions” and “Where spectrum fees are determined other than by auction or by the administered pricing formula, the ACMA, or the Government where it directs the ACMA on pricing, should publish the reasons for this decision.”**

CSIRO supports these proposals for transparency.

**Proposal 2: “To ensure efficient use of spectrum, the Government and the ACMA should endeavour to charge users of similar spectrum at the same rate.”**

CSIRO supports this if the meaning of “similar spectrum” is the same application, within the same allocated band, in a similar geographic setting. A licence for a UHF CB repeater in regional NSW should be charged the same as a licence for a UHF CB repeater in regional Victoria. However, there may be good reasons for charging a different fee for a fixed link in the same band, or for a UHF CB repeater in central Sydney.

The band 1400 – 1427 MHz might be considered superficially “similar” to the band 1427 – 1454 MHz, but the first is allocated (internationally and nationally) only for passive services including radioastronomy, while the second is allocated (internationally and nationally) to mobile communication services. CSIRO would not expect that a licence for the radioastronomy band would be priced the same as a licence for a mobile service in the adjacent band.

**Proposals 4, 5 and 6: Market-based allocations**

CSIRO notes that the advantages of market-based allocations occur when (a) the parties contending for the spectrum are in the same sector and (b) spectrum is needed for new or expanding services on a wide geographic scale.

Spectrum auctions have been successful, for example, when a number of commercial entities sought to offer mobile services (same sector) across Australia (wide geographic scale). However, requiring public sector agencies to compete against the private sector for spectrum essential to national priorities would not be appropriate. At best, Commonwealth agencies would require additional Commonwealth funding to offset higher spectrum prices and this money would then be returned to the Commonwealth through the spectrum auction. At worst, Commonwealth agencies would need to cut the services they offer due to lack of spectrum, or reduce other services to cover the additional expenditure.

As noted elsewhere in the discussion paper, CSIRO does not consider market-based allocations to be appropriate when a user (whether public or private sector) needs a single, geographically-limited licence. Note that most of CSIRO’s current licence are of this nature.

**Proposal 7: “The ACMA should undertake a detailed review of the administrative pricing formula’s parameters, including density areas, the number of pricing bands, and the number of power categories. The ACMA should implement regular updates to the location and band weightings to reflect changes in density, demography and demand.”**

CSIRO supports the review of the pricing formula, including a wider number of pricing bands and power categories (or geographic coverage). We support a major review, with potentially major changes, under the new spectrum management process. CSIRO also recognises that over time, this will need to be updated, but considers that the rate of such updates be balanced against stakeholders need for certainty and planning. For example, an annual change in location and band weighting could make long-term budget planning difficult for all users.

**Proposal 8: “The ACMA should apply opportunity cost pricing to a greater number of spectrum bands, especially where it is impractical to competitively allocate spectrum.”**

CSIRO has similar concerns to those described above for market-based allocations.

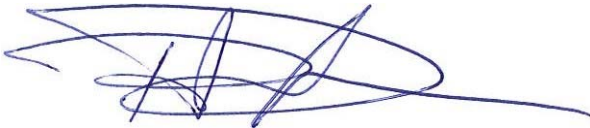
**Proposals 9, 10 and 11: Legislative and cost recovery framework**

CSIRO has no further comments on these proposals.

**Conclusion**

CSIRO values the opportunity to provide input to the consultation process. We are available for further discussion of these important issues.

*Contact for further information:*  
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A handwritten signature in blue ink, consisting of several overlapping loops and a long horizontal stroke extending to the right.

Mr Brendan Dalton  
Acting Executive Director, CSIRO Digital, National Facilities & Collections  
CSIRO

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Attachment 1

**Extract from Submission by CSIRO on “Commonwealth Spectrum Holdings – Usage and Reporting Data”**

**23 January 2017**

1. The amount of spectrum your Department has access to and if applicable, spectrum that your department may manage on behalf of subsidiary users.

In total, CSIRO has access to 2340.5465 MHz of spectrum within the range 77.465 MHz to 34.316 GHz, which represents 6.8% of the spectrum in that range. Of this, 437 MHz (or 1.3 % of the spectrum in the full frequency range) is internationally allocated only for passive use. Details are given under question 2.

In addition to the frequencies listed at question 2, CSIRO holds non-assigned licences for remote area emergency communications (licence 1107020/1), maritime communications (licence 1190542/1) and maritime satellite communications (licence 1960200/1). These licences do not specify a specific frequency band or bandwidth.

CSIRO also conducts radio astronomy (receive only) observations in other frequency bands when possible. Radio astronomy observations at the Murchison Radioastronomy Observatory in WA are protected by RALI MS 32 and the Radiocommunications (Mid-West Radio Quiet Zone) Frequency Band Plan 2011.

2. What the spectrum is used for and the intensity with which it is used. For example, is the spectrum held in reserve in case it is needed or is it regularly under use?

CSIRO holds licences for the following bands, with purpose and intensity as shown:

Band (MHz)	Bandwidth (MHz)	Purpose	Intensity of use	Licence number(s)	
77.4525 - 77.4775	0.025	Field work communications	Regular during field work	435356/1	
87.9 - 88.1	0.2	Narrowcasting – Narrabri local information	Continuous 24/7/365	484408/1	
160.06875 - 160.08125	0.0125	Staff mobile communications (receive)	Continuous use	1943053/1	
160.44375 - 160.45625	0.0125		Continuous use	1943055/1	
161.45625 - 161.46875	0.0125	Staff mobile communications (transmit and receive)	Continuous use	1943056/1	
164.66875 - 164.68125	0.0125	Staff mobile communications (transmit)	Continuous use	1943053/1	
165.04375 - 165.05625	0.0125		Continuous use	1943055/1	
402.67 - 402.75	0.08	Weather balloon radiosondes	Regular use	10117867/1	
450.3625 - 450.3875	0.025	Safety alarm paging system (Marsfield)	On call for emergency use	1230712/1	
457.045 - 457.055	0.01	Surveying equipment communications	Regular use	9965926/1	
476.60625 - 476.61875	0.0125	Field staff communication in rainforest	Regular during field work	1977096/1	
477.35625 - 477.36875	0.0125				
509.6325 - 509.6425	0.01	Mobile communications	Regular use	1954582/1	
915.008 - 915.018	0.01	Wind profiler radar	Regular use	1970236/1	
1400 - 1427 *	27	Radio astronomy (receive only) – Parkes and Narrabri	Regular use depending on science requirements	1137072/1, 1137073/1	
1610.6 - 1613.8	3.2				
1660 - 1670	10				
2025 - 2118.22	93.22	Spacecraft tracking (transmit) Tidbinbilla	Regular use depending on spacecraft mission	446317/1	
2028.9375 - 2031.9375	3	Spacecraft tracking (transmit) Yarragadee		1187478/1	
2034.4625 - 2037.4625	3	Spacecraft tracking (transmit) Yarragadee		1187479/1	
2103.406 - 2109.406	6	Spacecraft tracking (receive) Alice Springs		10080214/1	
2203.5 - 2206.5	3	Spacecraft tracking (receive) Yarragadee		1187480/1	
2204.85 - 2220	15.15	Spacecraft tracking (receive) Tidbinbilla		1138036/1	
2209.5 - 2212.5	3	Spacecraft tracking (receive) Yarragadee		1187481/1	
2228.385 - 2231.615	3.23	Spacecraft tracking (receive) Tidbinbilla		1138036/1	
2236.93 - 2239.07	2.14			1138036/1	
2239 - 2259	20			1138036/1	
2259.51 - 2260.31	0.8			1138036/1	
2262.102 - 2300	37.898			1138036/1	
2284.5 - 2290.5	6			Spacecraft tracking (transmit) Alice Springs	10080221/1

2690 - 2700 *	10	Radio astronomy (receive only) – Parkes and Narrabri	Regular use depending on science requirements	1137072/1,	
4825 - 4835	10			1137073/1	
5619 - 5631	12	Ship-based weather radar	Regular use	1963610/1	
7139.485 - 7193.085	53.6	Spacecraft tracking (transmit) Tidbinbilla	Regular use depending on spacecraft mission	446317/1	
7203.3693 - 7206.3693	3			1958953/1	
7209.123 - 7209.127	0.004			1232882/1	
7215.13 - 7215.38	0.25			446317/1	
7222.4915 - 7222.5085	0.017			446317/1	
8400 - 8500	100	Spacecraft tracking (receive) Tidbinbilla		1138036/1	
10755 - 10795	40	Connect Toowoomba site to CSIRO network	Continuous 24/7/365	9854258/1	
11245 - 11285	40				
22210 - 22500	290	Radio astronomy (receive only) – Parkes and Narrabri	Regular use depending on science requirements	1137072/1,	
23600 - 24000 *	400			1137073/1	
25535.5 - 25764.5	229	Spacecraft tracking (receive) Tidbinbilla	Regular use depending on spacecraft mission	1902147/1	
26500 - 26850	350			1900718/1	
31800 - 32300	500	Radio astronomy (receive only) – Narrabri	Regular use depending on science requirements	1137073/1	
31977.64 - 32017.64	40	Spacecraft tracking (receive) Tidbinbilla	Regular use depending on spacecraft mission	1229213/1	
31986.329 - 31988.329	2			1138036/1	
32006.962 - 32008.962	2			1138036/1	
32023.344 - 32023.544	0.2			1138036/1	
32028.504 - 32028.704	0.2			1138036/1	
32030.195 - 32030.205	0.01			1138036/1	
32033.665 - 32033.865	0.2			1138036/1	
32079.26 - 32139.26	60			1229214/1	
32155.176 - 32156.676	1.5			1138036/1	
32160.29 - 32172.29	12			1229212/1	
32217.333 - 32229.333	12			1139852/1	
34316.262 - 34316.462	0.2			Spacecraft tracking (transmit) Tidbinbilla	446317/1

\* These bands are internationally allocated for passive use only and cannot be used by active (transmitting) services.

Note that some bands listed in the table are subsets of, or overlap, other bands, so the total bandwidth is not the sum of the bandwidths in the table.