

# Mobile broadband work program— February 2016 update

FEBRUARY 2016

**Canberra**

Red Building  
Benjamin Offices  
Chan Street  
Belconnen ACT

PO Box 78  
Belconnen ACT 2616

T +61 2 6219 5555  
F +61 2 6219 5353

**Melbourne**

Level 32  
Melbourne Central Tower  
360 Elizabeth Street  
Melbourne VIC

PO Box 13112  
Law Courts  
Melbourne VIC 8010

T +61 3 9963 6800  
F +61 3 9963 6899

**Sydney**

Level 5  
The Bay Centre  
65 Pirrama Road  
Pyrmont NSW

PO Box Q500  
Queen Victoria Building  
NSW 1230

T +61 2 9334 7700 or 1800 226 667  
F +61 2 9334 7799

**Copyright notice**

<http://creativecommons.org/licenses/by/3.0/au/>

With the exception of coats of arms, logos, emblems, images, other third-party material or devices protected by a trademark, this content is licensed under the Creative Commons Australia Attribution 3.0 Licence.

We request attribution as: © Commonwealth of Australia (Australian Communications and Media Authority) 2016.

All other rights are reserved.

The Australian Communications and Media Authority has undertaken reasonable enquiries to identify material owned by third parties and secure permission for its reproduction. Permission may need to be obtained from third parties to re-use their material.

Written enquiries may be sent to:

Manager, Editorial and Design  
PO Box 13112  
Law Courts  
Melbourne VIC 8010  
Tel: 03 9963 6968  
Email: [candinfo@acma.gov.au](mailto:candinfo@acma.gov.au)

# Contents

<b>Introduction</b>	<b>1</b>
<b>Stages and considerations for band re-farming</b>	<b>2</b>
<b>Status of current and ongoing mobile broadband projects</b>	<b>4</b>
<b>Work program</b>	<b>7</b>
Monitoring	7
600 MHz (520–694 MHz)	8
3.3 GHz (3 300–3 400 MHz)	9
4.9 GHz (4800–4990 MHz)	10
Bands being studied under WRC-19 agenda item 1.16	11
Bands being studied under WRC-19 agenda item 1.13	11
Initial investigation	12
1.5 GHz Band (1427–1518 MHz)	12
2 GHz (1980–2010 MHz and 2170–2200 MHz)	13
3.6 GHz (3575–3700 MHz)	14
Preliminary replanning	15
Re-farming	15
Spectrum available for the licensing of mobile broadband services	15
850 MHz expansion band (809–824 MHz and 854–869 MHz)	16
900 MHz (890–915 MHz and 935–960 MHz)	16
1800 MHz regional and remote (1710–1785 MHz and 1805–1880 MHz)	17



# Introduction

Mobile broadband spectrum management is one area where the ACMA, for a number of years, has provided detailed public guidance on its associated strategy and work program. In September 2015, the ACMA consulted on updating its strategy and work program in the discussion paper [Beyond 2020—A spectrum management strategy to address the growth in mobile broadband capacity](#) (*Beyond 2020*). In response to submissions to this consultation process, the ACMA has updated both its strategy and work program surrounding mobile broadband spectrum planning projects.

This document outlines the ACMA's current spectrum planning work program regarding mobile broadband, as at February 2016.

The *Spectrum Review Report*<sup>1</sup> included recommendations to clarify the roles and responsibilities of the Minister for Communications and the ACMA under a new legislative framework by, among other measures, requiring the ACMA to provide to the minister an annual work program (including key priorities over a three to five-year time frame), prepared in consultation with stakeholders. As this and other recommendations of the Spectrum Review are implemented, the mechanism for providing yearly updates to the mobile broadband work program may be altered to best fit into the new legislative framework. It is the ACMA's intention to provide annual updates to the mobile broadband work program via some mechanism, whether this be through the [Five-year spectrum outlook](#) (FYSO) or another publication. As outlined in the document *Mobile broadband strategy—The ACMA's spectrum management strategy to address the growth in mobile broadband capacity* (MBB strategy paper), the ACMA's intention was to use the FYSO as the mechanism for yearly updates to the mobile broadband work program, for as long as this remains appropriate.

However, to conclude the initial consultation process initiated by *Beyond 2020*, the ACMA has released this paper to publish its initial work program. This work program will be included, with any updates, in the appropriate place later in 2016. Until that time, this document contains the existing ACMA mobile broadband work program.

The ACMA's finalised mobile broadband strategy is contained in MBB strategy paper, which is available on the ACMA website.

---

<sup>1</sup> Available on the [Department of Communications and the Arts website](#).

# Stages and considerations for band re-farming

As stated in its mobile broadband strategy (Strategy 2), to assist in providing transparency to its work related to mobile broadband capacity growth and greater certainty to all spectrum holders, the ACMA has articulated and adopted a transparent spectrum management planning process for the consideration of additional bands for mobile broadband. In doing this, the ACMA has broken its process of repurposing a band into three broad stages, outlined in Table 1.<sup>2</sup> These stages are preceded by an initial 'monitoring' stage where it is determined whether consideration of a particular band should progress further. Although the ACMA maintains a general awareness across all bands, those included in this stage are monitored closely.

---

<sup>2</sup> Under the Act, the minister and the government have a policy-making role that is independent of the ACMA.

**Table 1: Stages of the process for consideration of additional spectrum for mobile broadband services**

Stage		Description
Monitoring		'Business as usual' <b>monitoring</b> of international and domestic mobile broadband spectrum trends.
Initial investigation		Initial investigation and scoping of potential <b>options</b> for domestic re-farming of a band, informed by preliminary technical assessment.  If initial scoping and technical assessment shows potential, <b>preliminary assessment of highest value use or uses</b> of the spectrum is undertaken.
Preliminary replanning		Identification of replanning/re-farming <b>proposals</b> (including mechanisms to address incumbent issues), informed by detailed technical sharing studies and analysis of ongoing incumbent spectrum needs. A <b>comprehensive assessment of the highest value use</b> of the band is undertaken.
Re-farming		<b>Decisions</b> made on preferred re-farming proposal.
Re-farming sub-stage a	Replanning	Detailed band/channel replanning undertaken to support the change in the use of the spectrum to mobile broadband. Where possible, long-term transition arrangements are put in place, allowing incumbents to transition <b>voluntarily</b> over time (incumbents <b>retain their rights</b> during the replanning stage in accordance with the Act). In this scenario, a change of spectrum use commences at this stage, with final implementation concluded in the <i>allocation sub-stage</i> via an allocation of spectrum to specific mobile broadband users.  However, in some cases it may be appropriate for spectrum already available for mobile broadband to be replanned in order to better support new mobile broadband technologies. In this scenario, a change of use of spectrum and subsequent allocation may not be necessary. In such cases, the <i>allocation sub-stage</i> is not required and the process would stop here.
Re-farming sub-stage b	Allocation (to mobile broadband users)	Development of final technical framework and allocation instruments/tools for near-term re-farming. Incumbents are <b>obliged</b> to transition to new arrangements or cease operations in specified time frame (incumbents <b>rights are varied and/or removed</b> in accordance with the Act). Mobile broadband users are given the opportunity to acquire and use re-farmed spectrum.

A more detailed explanation of each of these stages is available in the MBB strategy paper.

# Status of current and ongoing mobile broadband projects

The ACMA's work program for mobile broadband spectrum planning projects, updated following initial consultation via the *Beyond 2020* discussion paper, is contained in Table 2. This table outlines where each of these projects is positioned within the overall process (the stages) and identifies those frequency bands that are currently in the *monitoring* stage.

This work program will be regularly reviewed. Moving forward, the ACMA will include an updated mobile broadband work program in the annual update to the FYSO, or another publication as appropriate in line with the implementation of the recommendations of the Spectrum Review. This will be used as a tool to keep stakeholders informed on the suite of mobile broadband spectrum planning projects. As discussed, frequency bands identified for monitoring, as well as those frequency bands in the later stages of the process for consideration of additional spectrum for mobile broadband services, will be noted in the FYSO.

Once a frequency band moves into the *initial investigation* stage and beyond, the ACMA will also release discussion papers, provide more detailed individual work programs and engage with stakeholders in the usual fashion.

A more detailed overview of the reasoning for the status of each band in Table 2 is provide in the next section.

**Table 2: Status of current mobile broadband spectrum planning projects**

Stage	Current mobile broadband spectrum planning projects	Next steps
Monitoring	600 MHz (520–694 MHz)	Continue to monitor international developments in the 600 MHz band. Follow outcomes of US incentive auctions.
	3.3 GHz (3300–3400 MHz)	Continue to monitor international developments. Consideration of engagement in international studies.
	4.9 GHz (4800–4990 MHz)	Continue to monitor international developments. Consideration of engagement in international studies.
	Bands being studied under WRC-19 agenda item 1.16: 5150–5350 MHz, 5350–5470 MHz, 5725–5850 MHz and 5850–5925 MHz	Continue to monitor international developments. Consideration of engagement in international studies.
Initial investigation	Bands being studied under WRC-19 agenda item 1.13: 24.25–27.5 GHz, 31.8–33.4 GHz, 37–40.5 GHz, 40.5–42.5 GHz, 42.5–43.5 GHz, 45.5–47 GHz, 47–47.2 GHz, 47.2–50.2 GHz, 50.4–52.6 GHz, 66–76 GHz and 81–86 GHz	Continue to monitor international developments. Consideration of engagement in international studies.
	1.5 GHz (1427–1518 MHz)	Commence reconsideration of the band domestically with a discussion paper expected the second half of 2016. Consideration of engagement in international studies.
	2 GHz (1980–2010/2170–2200 MHz)	Development of timeframe for further consideration of band to be included in the next update to the MBB work program. Consideration of engagement in international studies.
	3.6 GHz (3575–3700 MHz)	Commence reconsideration of the band domestically with a discussion paper expected the first half of 2017. Consider options to review the arrangements in the broader 3400–3700 MHz band.

Stage	Current mobile broadband spectrum planning projects	Next steps
Preliminary replanning	None	
Re-farming	<p>Spectrum available for the licensing of mobile broadband services</p> <p>850 MHz expansion band (809–824/854–869 MHz)</p> <p>900 MHz (890–915/935–960 MHz)</p> <p>1800 MHz regional/remote (1710–1725/1805–1880 MHz)</p>	<p>Unsold spectrum licence lots: Monitor demand and determine when it is appropriate to allocate the spectrum.</p> <p>Apparatus licences: first-in-time over-the-counter licence application processes usually apply.</p> <p>Implement reforms identified in decision paper (due for completion in 2024). Commence planning and allocation of the 850 MHz expansion band to mobile broadband in the period leading up to 2024. Investigate introduction of 1 MHz guard band at 889–890 MHz.</p> <p>Seek feedback from incumbent licensees on factors to be considered in the reconfiguration and allocation of the 900 MHz band.</p> <p>Implement early access arrangements for 1800 MHz regional areas. Monitor relocation of fixed links in regional areas. Review the effectiveness of the arrangements implemented for the 1800 MHz band in remote areas in 2017.</p>

# Work program

The ACMA intends to continue with current projects and monitor other alternative mobile broadband spectrum options as appropriate. Table 2 identified the numerous bands being considered for potential future use for mobile broadband and where each of the associated projects for these bands is positioned within the overall process outlined in Table 1. A more detailed overview of the reasoning for the status bands in each stage in Table 2 is provided below.

## Monitoring

Table 3 below outlines the bands currently in the *monitoring* stage as well as the status of the bands against some of the key considerations that have led to their inclusion at the *monitoring* stage. These considerations include (but are not always limited to):

- > *Domestic interest*—interest has been expressed from Australian proponents for consideration of the use of the band for mobile broadband services.
- > *International spectrum harmonisation (IMT/RLAN identification)*—the band is identified in Article 5 of the Radio Regulations for International Mobile Telecommunications (IMT) or the band is under consideration at WRC-19 for such an identification. Alternatively, the band is identified for use by RLANs.
- > *Technology standardisation (for example, 3GPP and IEEE)*—standardised arrangements for mobile broadband that have been or are being developed.
- > *Potential or evolving ecosystem*—an equipment ecosystem exists for devices to generate economies of scale for equipment and roaming benefits, alternatively there are indications that such an ecosystem could develop over time.
- > *Regional group interest*—there is interest in this band from regional organisations such as CEPT, CITELE and APT.
- > *Other relevant issues*—where applicable.

Note that the process for consideration of additional spectrum for mobile broadband services relates to the domestic re-planning process. For bands being considered within international fora such as the ITU, the ACMA will, where appropriate, engage with stakeholders via the international preparatory process to develop Australian positions on relevant issues. Where appropriate, this international engagement can include participation in relevant studies for example.

**Table 3: Frequency bands at the *monitoring* stage within the process for consideration of additional spectrum for mobile broadband services**

Band	Domestic interest	International spectrum harmonisation (IMT/RLAN identification)	Technology standardisation (e.g. 3GPP, IEEE etc.)	Potential or evolving ecosystem	Regional group interest	Other relevant issues
600 MHz	Yes	Yes	No	Yes	No	The US and 13 other countries have identified for IMT
3.3 GHz	Yes	Yes	Yes (WiMAX)	Yes	No	46 countries have identified for IMT
4.9 GHz	Yes	Yes	Yes (RLAN)	Yes	No	RLAN standards across part of the band
WRC-19 agenda item 1.16 bands	Yes	Potential (WRC-19 agenda item)	Yes (RLAN)	Yes	Yes	Increased demand for RLAN spectrum. RLAN standards across some of these bands
WRC-19 agenda item 1.13 bands	Yes	Potential (WRC-19 agenda item)	No	-	Yes	Significant interest world-wide

### 600 MHz (520–694 MHz)

At WRC-15, all or part of the 600 MHz band was identified for IMT by the Bahamas, Barbados, Belize, Canada, Colombia, the United States (US), Mexico, Micronesia, the Solomon Islands, Tuvalu, Vanuatu, Bangladesh, Maldives and New Zealand. The band is being allocated or considered for allocation in countries such as the US and Canada.

There is support from domestic mobile broadband interests in pursuing this band for mobile broadband in Australia. Mobile broadband interests have argued that the ACMA could take a more proactive interest in the band. This view is encouraged by the outcomes of WRC-15 and the push by the Federal Communications Commission (FCC) in the US to conduct incentive auctions in the band. In addition, the Radio Spectrum Policy Group (RSPG) of the European Commission (EC) has also provided a [long-term strategy for the future of the UHF band](#), which suggests the band remain available for broadcasting services until at least 2030. It also recommends that the band should be available for downlink-only broadband services on a secondary basis. This outcome is reflected in the [EC's inception assessment](#), but a final decision is still pending.

The 600 MHz band is currently used by digital television services in Australia and is available for some services under the [Radiocommunications \(Low Interference Potential Devices\) Class Licence 2015](#).

Consistent with the Australian Government's interest in considering the potential for long-term availability of the television 'sixth channel' for non-broadcasting uses and whether there is the possibility of a second digital dividend<sup>3</sup>, this band will continue to be monitored by the ACMA, while noting Australia's current use of the band for terrestrial broadcasting of digital television.

### **Next steps**

Given the outcome of WRC-15 and ongoing work in Europe, the ACMA will continue to monitor international developments in the 600 MHz band. In particular, the outcomes of the incentive auction process underway in the US will be of key interest.

The ACMA will also engage with industry and the government regarding technological evolution of terrestrial digital television, including DVB-T2 and HEVC. Adoption of these technologies is likely to be a pre-requisite for any future reallocation of broadcasting spectrum for non-broadcasting uses, though it is also key to the more efficient use of spectrum by the television industry itself. Both the government and the ACMA have emphasised the availability of 'sixth channel' spectrum for trialling the new standards.

### **3.3 GHz (3 300–3 400 MHz)**

At WRC-15, the 3300–3400 MHz band was identified for IMT by a number of countries including 33 African countries, Argentina, Colombia, Costa Rica, Ecuador, Mexico, Uruguay, Cambodia, India, Lao PDR, Pakistan, Philippines and Vietnam (noting a primary mobile allocation was also made in Papua New Guinea). Notably there was also strong interest from China in identifying the band for IMT. This suggests that a viable ecosystem could develop for mobile broadband systems in this band, noting that this band is already a WiMAX profile band, which has been deployed in some countries.<sup>4</sup>

The following text was also included in the *invites ITU-R* of Resolution **223 (Rev. WRC-15)**:

- 3 to further study operational measures to enable the coexistence of IMT and radiolocation service in the frequency band 3300–3400 MHz;
- 4 to develop an ITU-R Recommendation providing technical and operational measures regarding adjacent band compatibility between IMT systems operating below 3400 MHz and FSS earth stations operating above 3400 MHz;
- 5 to further study adjacent band compatibility between IMT in the frequency band 3300–3400 MHz and radiolocation service below 3300 MHz, in particular unwanted emissions of IMT systems in this frequency band;
- 6 to develop harmonized frequency arrangements for the frequency bands 3300-3400 MHz and 4800-4990 MHz for operation of the terrestrial component of IMT, taking into account the results of the sharing studies;

There is some support from domestic mobile broadband interests in pursuing this band for mobile broadband in Australia. The 3300–3400 MHz band is currently allocated on a primary basis to the radiolocation service worldwide. In Australia, the radiolocation service in this band is designated to be used principally for the purposes of defence and national security via footnote AUS101A of the Australian Radiofrequency Plan

---

<sup>3</sup> Minister of Communications Malcolm Turnbull's speech to RadComms 2014, available at:

[www.malcolmturnbull.com.au/media/radcomms-2014-spectrum-in-the-age-of-digital-innovation](http://www.malcolmturnbull.com.au/media/radcomms-2014-spectrum-in-the-age-of-digital-innovation).

<sup>4</sup> WiMAX networks in India, Medicine Industry News and Marketplace, June 19 2006, [www.wimax-industry.com/ar/7c.htm](http://www.wimax-industry.com/ar/7c.htm).

2013 (ARSP). The Department of Defence is normally consulted in considering non-defence use of this service.

### **Next steps**

Given the outcomes of WRC-15 and the potential for economies of scale to develop for equipment, the ACMA will continue to monitor international developments in the 3.3 GHz band.

Possible engagement (including through contributions) in international studies as outlined in Resolution **223 (Rev. WRC-15)** will be considered as part of the ACMA's international engagement processes.

### **4.9 GHz (4800–4990 MHz)**

At WRC-15, the 4800–4990 MHz band was identified for IMT by a number of countries including Uruguay, Cambodia, Lao PDR and Vietnam. Notably there was also strong interest from China and Japan in identifying the band for IMT. This suggests that a viable ecosystem could develop for mobile broadband systems in this band.

The following text was also included in the *invites ITU-R* of Resolution **223 (Rev. WRC-15)**:

- 6 to develop harmonized frequency arrangements for the frequency bands 3300–3400 MHz and 4800–4990 MHz for operation of the terrestrial component of IMT, taking into account the results of the sharing studies;
- 7 to study the technical and regulatory conditions for the use of IMT in the frequency band 4800–4990 MHz in order to protect the aeronautical mobile service;

There is some support from domestic mobile broadband interests in pursuing this band for mobile broadband in Australia.

However, the ACMA is not aware of any significant interest in this band by regional bodies such as CEPT, CITELE or APT.

The 4800–4990 MHz band is currently allocated on a primary basis for the fixed and mobile services in Australia. The fixed and mobile services in this band are designated to be used principally for the purposes of defence and national security as defined in footnote AUS101A of the ARSP. The Department of Defence is normally consulted in considering non-defence use of these services.

The 4950–4990 MHz band is also allocated to the radio astronomy service on a primary basis under footnote 443 of the ARSP.

At WRC-03, the 4940–4990 MHz band was identified to support public safety services in Regions 2 and 3 for use by government agencies responsible for the provision of defence, national security, law enforcement and emergency services.<sup>5</sup> A number of countries, including Australia, have implemented arrangements in the 4940–4990 MHz band for this purpose. This is principally to support high-speed localised coverage around an incident or event. The [Radiocommunications \(Public Safety and Emergency Response\) Class Licence 2013](#) outlines arrangements for the use of this band, which allows public safety agencies to enhance their ability to perform public safety activities and provide significant flexibility in deployment during emergency response and

---

<sup>5</sup> In accordance with ITU-R Resolution 646.

disaster recovery activities. The 4940–4990 MHz is also included in IEEE standard 802.11y Public Safety WLAN.

#### **Next steps**

Given the outcomes of WRC-15 and the potential for economies of scale to develop for equipment, the ACMA will continue to monitor international developments in the 4.9 GHz band.

Possible engagement (including through contributions) in international studies as outlined in Resolution **223 (Rev. WRC-15)** will be considered as part of the ACMA's international engagement processes.

#### **Bands being studied under WRC-19 agenda item 1.16**

WRC-19 agenda item 1.16 is to consider issues related to wireless access systems, including radio local area networks (WAS/RLAN), in the frequency bands 5150–5350 MHz (to enable outdoor usage), 5350–5470 MHz, 5725–5850 MHz and 5850–5925 MHz, while ensuring the protection of incumbent services including their current and planned use.

There is strong interest from the US and the United Kingdom (UK) to investigate use of the 5350–5470 MHz band for RLANs. Europe has indicated interest in investigating use of the 5725–5850 MHz band for RLANs. Arrangements already exist in Australia for RLANs in the 5150–5350 MHz band (low power indoor use only) and the 5725–5850 MHz band. The 5150–5350 MHz and 5725–5850 MHz bands are also included in the IEEE 802.11 series of standards for WLAN. There are no arrangements in place for RLANs in the 5350–5470 MHz and 5850–5925 MHz bands in Australia.

Numerous countries around the world, including Australia, have or are considering identifying the 5850–5925 MHz band for Intelligent Transport Systems (ITS). The ACMA is currently facilitating trials in Australia while considering the implementation of future arrangements for ITS.

#### **Next steps**

The ACMA intends to monitor and, where appropriate, engage with stakeholders via the usual international preparatory process to develop Australian positions on WRC-19 agenda item 1.16. When appropriate, it will develop individual positions on each of the bands being studied and potentially contribute to international sharing and compatibility studies.

#### **Bands being studied under WRC-19 agenda item 1.13**

WRC-19 agenda item 1.13 is to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis. This agenda item is widely acknowledged to be focussing on spectrum harmonisation requirements for 5G mobile broadband technologies.

The frequency bands to be considered under this agenda item are 24.25–27.5 GHz, 37–40.5 GHz, 42.5–43.5 GHz, 45.5–47 GHz, 47.2–50.2 GHz, 50.4–52.6 GHz, 66–76 GHz and 81–86 GHz, which have allocations to the mobile service on a primary basis; and 31.8–33.4 GHz, 40.5–42.5 GHz and 47–47.2 GHz, which may require additional allocations to the mobile service on a primary basis.

There is strong interest on this issue domestically and internationally, particularly in Region 3 countries such as South Korea, Japan and China.

There are wide and varied ranges of incumbency and co-existence issues associated with each of these bands, which will need to be considered if the bands were to be investigated domestically for mobile broadband in the future.

### **Next steps**

The ACMA intends to monitor and where appropriate engage with stakeholders via the usual international preparatory process to develop Australian positions on WRC-19 agenda item 1.13. When appropriate it will develop individual positions on each of the bands being studied and potentially contribute to international sharing and compatibility studies.

## **Initial investigation**

Bands that are currently in the *initial investigation* stage of the process for consideration of additional spectrum for mobile broadband services are the 1.5 GHz, 2 GHz and the 3.6 GHz bands.

### **1.5 GHz Band (1427–1518 MHz)**

The ACMA released *Planning for mobile broadband in the 1.5 GHz mobile band* in May 2012 to gather further information on issues related to the potential use of the 1427.9–1510.9 MHz band for mobile broadband services.<sup>6</sup> This paper noted that up to 2 x 35 MHz (1427.9–1462.9 MHz and 1475.9–1510.9 MHz) of FDD spectrum, or up to 90 MHz (1427–1518 MHz) of TDD or unpaired mobile downlink (UMD) spectrum, could potentially be released from the 1.5 GHz band for mobile broadband services.

Since that time, at WRC-15, the entire 1427–1518 MHz band was harmonised for IMT within regions 2 and 3, while Region 1 identified 1427–1452 MHz and 1492–1518 MHz via regional footnotes. In Region 1, only African and Arab states identified the 1452–1492 MHz range (CEPT did not identify this band due to an ongoing dispute with RCC countries over the protection of Aeronautical Mobile Telemetry services). The following text was also included in the *invites ITU-R* of Resolution **223 (Rev. WRC-15)**:

- 1 to conduct compatibility studies in order to provide technical measures to ensure coexistence between MSS in the frequency band 1 518–1 525 MHz and IMT in the frequency band 1 492–1 518 MHz;
- 2 to develop harmonized frequency arrangements to facilitate IMT deployment in the frequency band 1 427–1 518 MHz, taking into account the results of sharing and compatibility studies;

The ACMA notes that an additional outcome of WRC-15 was Resolution **761 [COM4/7] (WRC-15)**. This resolution invites the ITU-R to conduct, in time for WRC-19, the appropriate regulatory and technical studies, with a view to ensuring the compatibility of IMT and the broadcasting-satellite service (BSS) (sound) in the frequency band 1 452–1 492 MHz in regions 1 and 3, taking into account IMT and BSS (sound) operational requirements.

Domestically, the ACMA has also identified that the impact on aeronautical telemetry services and fixed services, including the Digital Radio Concentrator System (DRCS), which will need to be considered in any re-farming considerations.

---

<sup>6</sup> Available on the [ACMA website](#).

As referred to in Resolution **223 (Rev. WRC-15)**, some satellite industry representatives have also pointed out that compatibility with Mobile Satellite Services (MSS) operating above 1518 MHz needs to be considered.

There is strong support domestically from mobile broadband representatives for progressing the re-farming of this band.

### **Next steps**

The ACMA will continue to monitor and engage with stakeholders via the usual international preparatory process to develop Australian positions on studies under Resolution **223 (Rev. WRC-15)** and Resolution **761 [COM4/7] (WRC-15)** and other international issues related to the 1.5 GHz band such as possible new band plans. This could involve the submission of contributions to the ITU and AWG as appropriate.

Considering recent developments (WRC spectrum harmonisation outcomes and momentum in Europe), the ACMA currently expects to recommence consideration of this band for domestic use for mobile broadband in the second half of 2016. This will include the release of a discussion paper, which will progress consideration of this band under the *initial investigation* stage.

### **2 GHz (1980–2010 MHz and 2170–2200 MHz)**

As an outcome of the review of the 2.5 GHz band<sup>7</sup>, the ACMA developed arrangements to support the introduction of television outside broadcast (TOB) in the frequency ranges 1980–2010 MHz and 2170–2200 MHz on an interim basis. In March 2012, the [Television Outside Broadcast \(1980–2110 MHz and 2170–2300 MHz\) Frequency Band Plan 2012](#) (TVOB Band Plan) was made. The frequency ranges remain subject to Embargo 23<sup>8</sup> to support TOB and future replanning activities.

Regulatory measures supporting the mobile-satellite service (MSS) in the 1980–2010 MHz and 2170–2200 MHz bands in Australia are included in the TVOB Band Plan. In Australia, there are currently no space or space receive apparatus licences issued<sup>9</sup> in this frequency range.

Representatives of satellite interests have indicated their concern regarding the potential for interference from mobile broadband services if they are deployed in the frequency bands 1980–2010 MHz and 2170–2200 MHz. Inmarsat and Omnispace have indicated that they have (or plan to deploy) new 2 GHz band MSS services in the near future. Specifically, Omnispace has expressed an interest in providing services in Australia. Satellite industry representatives have also suggested that services similar to those to be provided by Inmarsat's proposed satellite (Europasat) can be expected to be deployed in Australia as part of an international footprint in the future.

The frequency bands 1980–2010 MHz and 2170–2200 MHz are already allocated to the mobile service and subject to a global IMT identification via footnote 388 of the ARSP. In Resolution **212 (Rev. WRC-15)**, it is noted that these frequency bands are available for use for both the terrestrial component of IMT and the satellite component of IMT.

The ITU recently defined IMT channel arrangements for the frequency bands 1980–2010 MHz and 2170–2200 MHz. These can be found in ITU-R Recommendation

---

<sup>7</sup> Refer to [www.acma.gov.au/theACMA/25-ghz-band-review](http://www.acma.gov.au/theACMA/25-ghz-band-review).

<sup>8</sup> Available from the [ACMA website](#) and last revised September 2013.

<sup>9</sup> RADCOM extraction 27 January 2016.

M.1036.<sup>10</sup> In order to include the new arrangements in ITU-R Recommendation M.1036, it was agreed in Resolution **212 (Rev. WRC-15)** to invite study on the possible technical and operational measures to ensure coexistence and compatibility between the terrestrial component of IMT (in the mobile service) and the satellite component of IMT (in the mobile-satellite service) in the frequency bands 1980–2010 MHz and 2170–2200 MHz. These bands are directly adjacent to the existing 2.1 GHz band used for terrestrial mobile voice and broadband services. This work will be conducted as part of WRC-19 agenda item 9.1.1.

The ACMA notes that the work of the ITU on this issue will focus on co-existence of terrestrial and satellite use of the band across international borders, but acknowledges that this work may provide some useful information on how these bands could be shared between uses and users on a geographic basis domestically.

The ACMA has made the 1980–2010 MHz and 2170–2200 MHz bands available for use by TOB services on a temporary basis. RALI FX21 and Embargo 23 indicate that future use of these bands is under consideration as part of the work considering future spectrum requirements for mobile broadband. For these reasons, these bands are only available for use by TOB services while further investigation is undertaken on the long term use of these bands.

#### **Next steps**

The frequency bands 1980–2010 MHz and 2170–2200 MHz will be retained at the *initial investigation* stage. The ACMA will review the likely time frame for further consideration of this band at the next update to the MBB work program.

The ACMA will also continue to monitor and, where appropriate, engage with stakeholders via the usual international preparatory process to develop Australian positions on international issues related to the frequency bands 1980–2010 MHz and 2170–2200 MHz, particularly in relation to work conducted as part of WRC-19 agenda item 9.1.1.

#### **3.6 GHz (3575–3700 MHz)**

In November 2009, the ACMA released arrangements for fixed and mobile broadband services in the 3575–3700 MHz band in regional and remote Australia. At the time, the band was not released in capital cities (except Hobart) to preserve future planning options within these areas.

Since that time, the band was considered under WRC-15 agenda item 1.1, resulting in an IMT identification in the 3600–3700 MHz band in Canada, Colombia, Costa Rica and the US. In addition, ECC Decision 11(06)<sup>11</sup> identifies the band for fixed/mobile broadband applications within Europe. Such interest in the Americas and Europe suggests that a viable mobile broadband ecosystem could soon develop in the band.

At WRC-15, Australia also added its name to existing footnotes in the ITU Radio Regulations identifying the 3400–3600 MHz band for IMT. This band is now identified for IMT in regions 1 and 2 and numerous Region 3 countries.

There are some fixed-satellite service (FSS) earth stations operating in the 3.6 GHz band, including installations in Perth and Sydney. Consequently, representatives of satellite interests have queried the justification for identifying the 3600–3700 MHz

---

<sup>10</sup> Available on the ITU-R website at: [www.itu.int/rec/R-REC-M.1036/en](http://www.itu.int/rec/R-REC-M.1036/en).

<sup>11</sup> Available on the European Communications office (ECO) website at: [www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1106.PDF](http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1106.PDF).

band for mobile broadband. Their main concern is the potential for interference from mobile broadband services and belief that this cannot be practically managed when both services operate on the same (or close frequency) in the same area. Satellite representatives have also indicated that given the outcomes of WRC-15, there appears to be little demand for mobile systems above 3600 MHz globally.

Representatives of fixed and mobile broadband interests have indicated their support for progressing the 3.6 GHz band to the *re-planning* stage. They also indicated that since the 3400–3575 MHz band is already available for fixed/mobile broadband, utility of the band for mobile broadband would be further increased if the 3575–3700 MHz band was made available and licences across the entire range were subsequently defragmented. This would require a broader review of the entire 3400–3700 MHz band, taking into account the rights of existing spectrum licence holders.

### **Next steps**

Considering recent developments (WRC spectrum harmonisation outcomes and momentum in the US and Europe), the ACMA currently expects to recommence consideration of this band for domestic use for mobile broadband in the first half of 2017, and release a discussion paper that will progress consideration of this band under the *initial investigation* stage.

Contingent on progress in the 3.6 GHz band, the ACMA sees benefit in pursuing a review of the arrangements in the broader 3400–3700 MHz band to improve its utility.

## **Preliminary replanning**

There are currently no bands in the *preliminary replanning* stage of the process for consideration of additional spectrum for mobile broadband services.

## **Re-farming**

Bands that are currently in the *re-farming* stage of the process for consideration of additional spectrum for mobile broadband services are detailed below. In these cases, the band has been re-farmed or the decision has been made to re-farm the band to mobile broadband services, and final technical frameworks and re-allocation instruments have been or are being prepared.

### **Spectrum available for the licensing of mobile broadband services**

There are numerous bands where the *re-farming* stage has occurred and spectrum is available for mobile broadband services. The following bands have spectrum available under either spectrum licence or apparatus licence arrangements:

- > *700 MHz*: 2 x 15 MHz (733–748/788–802 MHz) available Australia-wide via spectrum licensing.
- > *1800 MHz regional*: Six 2 x 5 MHz lots available in various regional areas via spectrum licensing.
- > *1800 MHz remote*: Available via site-based apparatus licensing.
- > *2.1 GHz metropolitan*: Numerous 2 x 5 MHz lots available in the capital cities of Adelaide, Brisbane, Darwin, Hobart and Perth via spectrum licensing.
- > *2.1 GHz regional/remote*: Available via site-based apparatus licensing.
- > *2.3 GHz*: Numerous lots available in regional and remote areas via spectrum licensing.
- > *3.4 GHz*: Numerous lots available in metropolitan and major regional centres via spectrum licensing.

- > 3.5 GHz: Available via site-based apparatus licencing
- > 3.6 GHz Regional/Remote: Available via site-based apparatus licensing.

### **Next steps**

For bands subject to spectrum licensing, the ACMA will monitor demand and determine when it is appropriate to allocate the spectrum.

For bands subject to apparatus licensing, except those frequencies and areas subject to an embargo, first-in-time over-the-counter licence application processes usually apply.

### **850 MHz expansion band (809–824 MHz and 854–869 MHz)**

The ACMA commenced a review of arrangements in the 803–960 MHz band in May 2011 with the release of the discussion paper, *The 900 MHz band—Exploring new opportunities*.<sup>12</sup> The second discussion paper in the review, *The 803–960 MHz band—Exploring options for future change*, was released in October 2012.<sup>13</sup>

The review has revealed an opportunity to expand the existing mobile segments at 825–845/870–890 MHz (the spectrum-licenced ‘850 MHz band’) by up to 15 MHz (paired) for mobile broadband use. The spectrum licensed segments at 825–845/870–890 MHz are currently used by Telstra 3G services and Vodafone Hutchison Australia (VHA) to provide both 3G and 4G services. The spectrum from 803–820 MHz is part of Australia’s digital dividend and can be easily repurposed. The range 855–870 MHz is used by fixed services, land mobile services and some outmoded technologies, which will be relocated to allow for mobile broadband use.

In November 2015, the ACMA completed its review of arrangements in the radiofrequency band 803–960 MHz and will now move into an implementation phase. The decision paper, [The ACMA’s long-term strategy for the 803–960 MHz band](#) contains a range of decisions on reforms to the 803–960 MHz band, as well as a detailed plan for the implementation of these reforms.

### **Next steps**

The reforms in the decision paper support changes that allow for the re-farming of the 850 MHz expansion band. The relocation of incumbent services, necessary for re-farming to occur, is due to be completed by 2024, providing a lengthy transition window for these incumbent services to migrate to the new arrangements set out in the paper. The ACMA will also investigate technical planning and allocation of the 850 MHz expansion band to mobile broadband in the period leading up to 2024.

In parallel to this work, the ACMA will also consult with incumbent 850 MHz spectrum licensees to investigate the introduction of a 1 MHz guard band between the 850 MHz and 900 MHz bands at 889–890 MHz, which will help alleviate coexistence issues and foster the migration from 2G to 3G and 4G networks in the 900 MHz band (see below).

### **900 MHz (890–915 MHz and 935–960 MHz)**

The 890–915 MHz/935–960 MHz band is an example of an opportunity to re-plan pre-existing mobile broadband spectrum to allow for its more efficient use (rather than re-farming of spectrum used for other services). Spectrum arrangements in this band are currently not optimal for 3G and 4G technologies. Optus and Telstra hold 2 x 8.4 MHz

---

<sup>12</sup> Available on the [ACMA website](#).

<sup>13</sup> Available on the [ACMA website](#).

and VHA holds 2 x 8.2 MHz, when 3G and 4G technologies operate most efficiently on channels 5 MHz (or multiples thereof) wide.

In November 2015, the ACMA completed its review of arrangements in the radiofrequency band 803–960 MHz and will now move into an implementation phase. The decision paper, [The ACMA's long-term strategy for the 803–960 MHz band](#) contains a range of decisions on reforms to the 803–960 MHz band, as well as a detailed plan for the implementation of these reforms. The decision paper however did not conclude on changes to the 900 MHz band, which the ACMA is continuing to progress independently of the broader review outcomes.

### **Next steps**

The ACMA will continue to investigate the most appropriate methods to reconfigure the 900 MHz band to optimise its use. This will involve the ACMA talking directly to incumbent licensees in the first half of 2016 to assist in determining the best way forward.

### **1800 MHz regional and remote (1710–1785 MHz and 1805–1880 MHz)**

Within regional and remote Australia, the 1800 MHz band has historically been used by fixed services. However, there has been increasing demand for access to spectrum in the 1710–1785 MHz and 1805–1880 MHz frequency ranges (the 1800 MHz band) from various industry sectors to deploy mobile broadband services in regional and remote Australia. In 2012, the ACMA commenced a review of the current arrangements for the 1800 MHz band. This review considered both the short- and longer-term planning for the band.

In response to the review, the ACMA decided to develop coexistence arrangements for fixed and mobile services in remote areas utilising Public Telecommunication Service (PTS) apparatus licences. Arrangements for PTS licensing in remote areas are now in place.

In regional Australia, the ACMA determined, given the level of demand, that a price-based allocation of spectrum licences was the most appropriate method to make the band available for mobile broadband applications.

The ACMA has recently implemented the proposed arrangements in both regional and remote areas. The ACMA completed a simultaneous multi-round auction of the regional 1800 MHz band in February 2016, and commenced accepting applications for PTS apparatus licences in remote areas in December 2015.

Further information on the 1800 MHz band is available on the [ACMA website](#).

### **Next steps**

Whilst the main planning work of the 1800 MHz band has been finalised, some elements still require consideration.

In regional Australia, the ACMA will facilitate early access to those bidders that acquired spectrum at auction, where possible. That is, access to the 1800 MHz band before spectrum licences commence.

In remote areas, the ACMA has indicated it will review the effectiveness of the arrangements implemented for the 1800 MHz band in 2017. A review at this time allows existing arrangements to be re-evaluated after the deployment of mobile services, including LTE, and other services in remote Australia. The outcome of the reallocation of regional areas would also be taken into consideration. The findings of this review may see the assignment priority order amended, removed or remain unchanged.