

Operation of an IMT satellite direct-to-mobile service

Regulatory guide

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About this guide

The Australian Communications and Media Authority (ACMA) issues regulatory guides to assist both industry and the community by:

- giving practical guidance (for example, guidance about the ACMA's approach to a particular issue or describing the steps of a process)
- describing the principles underlying the ACMA's approach in particular areas
- explaining the ACMA's view on the interpretation of the law or its application to a regulated industry
- explaining when and how the ACMA will exercise specific powers under the legislation it administers.

A regulatory guide does not constitute or replace legal advice on obligations under the relevant legislation.

Satellite direct-to-mobile services

A satellite direct-to-mobile service¹ is a recent advancement in communications technology that provides direct connectivity between a mobile phone² and a satellite network. This enables a mobile phone to communicate with satellites when it is outside the coverage area of both terrestrial cellular and wi-fi networks. Previously, a dedicated device such as a satellite phone was required for mobile communication with satellites.

From a spectrum management perspective, there are 2 types of satellite direct-to-mobile services, which are discussed below.

MSS satellite direct-to-mobile services

These operate in frequency bands already planned for mobile-satellite services (MSS) with allocations in the International Telecommunication Union (ITU) [Radio Regulations](#)³ and the [Australian Radiofrequency Spectrum Plan](#) (the Spectrum Plan). Use of this service requires a mobile phone that incorporates functionality for satellite communications using the relevant MSS frequency bands.

MSS allocations support communications applications that involve a satellite network communicating with numerous or ubiquitous mobile earth stations. For an MSS satellite direct-to-mobile service, the mobile earth station functionality is included in the mobile phone. Since an MSS satellite direct-to-mobile service uses frequency bands already planned for MSS (with allocations for MSS), operating this service can be authorised under our normal licensing process.⁴

If an MSS operator already has an authorisation (that is, a licence) to operate an MSS in Australia and the operation of the satellite direct-to-mobile service is within the conditions of that licence, an additional licence is not required.

IMT satellite direct-to-mobile services

These services are intended to operate in frequency bands allocated to terrestrial mobile broadband services, known internationally as International Mobile Telecommunications (IMT)⁵ services. These frequency bands are predominantly authorised for use in Australia by mobile network operators (MNOs) under spectrum licences and the bands are not planned for MSS – there are no MSS allocations⁶ for supporting the proposed space station transmitters and receivers station. An IMT satellite direct-to-mobile service works on standard mobile phones that have no additional satellite communications capability.

Given that the intent of these systems is to operate in bands used by terrestrial services with no MSS allocation, this raises technical and regulatory considerations that are not applicable to MSS direct-to-mobile services. As the ITU framework does not support satellite services in

¹ Other common names for this type of satellite service include direct to device (D2D), direct to handset, direct to cell, or direct to satellite.

² We use the generic term 'mobile phone' here, also commonly called a smartphone, cellphone or mobile handset.

³ The ITU Radio Regulations is an international treaty governing global use of the radiofrequency spectrum and satellite orbits.

⁴ Provided the smartphone meets all other regulatory requirements.

⁵ For more information on IMT, see <https://www.itu.int/en/ITU-R/Documents/ITU-R-FAQ-IMT.pdf>

⁶ While an allocation in the ITU Regulation or the Spectrum Plan does not mean that all elements of the spectrum framework are in place (for example the required supporting licensing and technical frameworks). Having an allocation is normally considered the prerequisite to start the process of developing the required supporting spectrum framework. For more information see our [Spectrum planning framework Information paper](#).

these bands, internationally these services are operated on a no-interference, no-protection basis with the requirement to cease or vary operation if interference occurs.⁷

Since there are no novel regulatory issues arising from MSS satellite direct-to-mobile services, the guidance in this paper only covers IMT satellite direct-to-mobile services. With both of these models, beyond the requirements of the [Radiocommunications Act 1992](#), there may be other regulatory obligations for operators to consider including telecommunications carrier licensing responsibilities under the [Telecommunications Act 1997](#) and emergency call services obligations under the [Telecommunications \(Emergency Call Service\) Determination 2019](#). Relevant parties should seek further advice on their obligations.

⁷ Refer ITU [Radio Regulations](#) No. 4.4 and ITU [Rules of Procedure](#).

Regulatory framework

Spectrum licensing framework

Spectrum of interest for IMT satellite direct-to-mobile services is mainly authorised Australia-wide for use by MNOs under spectrum licences. Mobile phones used in an IMT satellite direct-to-mobile service can be operated under the current spectrum licensing framework, subject to the phone complying with all applicable licence conditions, without the need for explicit approval from the ACMA.

This means that the emissions (in the form of radiocommunications) from a mobile phone that can reach a space station on-board a satellite (when out-of-range of a terrestrial base station) are authorised under the existing spectrum licensing framework, provided the emissions remain within the parameters of the licence conditions. Similarly, when a space station transmits to a radiocommunications receiver in a mobile phone, reception by the phone continues to be authorised by the spectrum licence. All of this is a result of the technology-flexible nature of our spectrum-licensing frameworks.

No authorisation of a space station is required to provide a IMT satellite direct-to-mobile service. In addition to space stations being outside the geographic area covered by a spectrum licence (see discussion at ‘Geographic area of a spectrum licence and authorisation of devices’), our understanding is that only foreign satellite systems (satellite systems for which the ACMA has not submitted a satellite filing to the ITU) will be involved in providing such services for the foreseeable future. Further, in the frequency bands of interest for IMT satellite direct-to-mobile services, such satellite systems are not considered foreign space objects under the [Radiocommunications \(Foreign Space Objects\) Determination 2014](#) (as the frequency bands are not included in the [Radiocommunications \(Communication with Space Object\) Class Licence 2015](#)), meaning that those satellite systems are currently outside the scope of the Radiocommunications Act for licensing purposes.

The interference management framework for spectrum licences in these bands does not envisage the possibility of space-based emissions (from ‘base stations’ in space). We expect spectrum licensees and their partner satellite operators to undertake their own due diligence to manage coexistence with other spectrum uses and users. This would include managing interference to services outside of spectrum-licensed areas. With this in mind, we consider that the operation of an IMT satellite direct-to-mobile service would likely only be practical under an Australia-wide spectrum licence. In these bands, a satellite operator providing a IMT satellite direct-to-mobile service for all practice purposes would only need to undertake coordination (interference management) with a single licensee that is responsible for managing coordination of services within the licensed band across Australia.⁸ Meaning that there are no geographic boundary issues to coordinate across or multiple licensees for the satellite operator to consider.

⁸ As the Australia-wide spectrum licence area does not include areas such external territories and their territorial seas, while theoretically there could be additional though minimal coordination requirement for those areas, they are not the initial focus of the proposed services and will be considered later if required. Refer discussion on ‘Operation under Australia-wide spectrum licences’. For information of definition of Australia when used in a geographical sense, see definition at [How to use spectrum boundary data](#).

Spectrum licensing and allocations in the Spectrum Plan

The [Australian Radiofrequency Spectrum Plan](#) provides that a service operating under a spectrum licence is taken to be a primary service unless the spectrum licence specifies that it is a secondary service.⁹ This means that operation of a mobile phone under a spectrum licence used in an IMT satellite direct-to-mobile service is consistent with the Spectrum Plan.

Currently there are no conditions in existing spectrum licences specifying that earth or earth receive services are secondary services. This means that a mobile phone operating under a spectrum licence in relation to an IMT satellite direct-to-mobile service would be doing so as part of a primary service.

Regulatory framework for space objects

Any foreign satellite system proposed for provision of direct-to-mobile services in Australia would be:

- operating in outer space
- outside the geographic area of Australian spectrum licences held by MNOs (see discussion in the following section)
- currently outside the scope of the [Radiocommunications Act 1992](#) for licensing purposes.

This means that it would be operating under the ITU Radio Regulations. As noted above, there is no provision in the Radio Regulations for satellite services to operate in bands utilised by terrestrial mobile broadband services. The rules governing the operation of services in bands for which there is no allocation in the Radio Regulations are contained in Article 4.4.

Article 4.4 provides that if a country assigns a frequency to a service that has no international allocation for that purpose, it may only be operated under the following conditions:

- the service must not cause harmful interference to other services that are operating on their designated frequencies; and
- if the service experiences interference from other services that are operating within their designated frequencies, the operator cannot claim protection or complain about it.¹⁰

This is commonly referred to as operating on a 'no-interference, no-protection' basis under the provisions of Article 4.4.

Conformity with the Radio Regulations is for the responsibility of the satellite operator and the foreign administration that filed the satellite system with the ITU.

⁹ Spectrum Plan, section 7.

¹⁰ Specifically, Article 4.4 states 'Administrations of the Member States shall not assign to a station any frequency in derogation of either the Table of Frequency Allocations in this Chapter or the other provisions of these Regulations, except on the express condition that such a station, when using such a frequency assignment, shall not cause harmful interference to, and shall not claim protection from harmful interference caused by, a station operating in accordance with the provisions of the Constitution, the Convention and these Regulations.'

Geographic area of a spectrum licence and authorisation of devices

The geographic area of an Australian spectrum licence can extend to the limits of the major portion of the Earth's atmosphere over Australia but does not extend to outer space. Under the [Outer Space Treaty](#), to which Australia is a party, outer space cannot be subject to national appropriation.¹¹

A mobile phone used in an IMT satellite direct-to-mobile service can be operated within the geographic area of the spectrum licence, provided it operates in accordance with the conditions of the licence. If a terrestrial base station authorised by the licence is not within reach of the phone, the phone's transmissions could be received by a space receive station – unrelated to and not authorised by the spectrum licence – as part of an IMT satellite direct-to-mobile service.

The spectrum licence and its conditions do not extend to space stations receiving radio emissions from a mobile phone, as those space stations are not within the geographic area of the spectrum licence. A space object, in this case an artificial satellite,¹² is an object beyond the major portion of the Earth's atmosphere.¹³ That is, the satellite and any station (radiocommunications devices) on it is in orbit around the Earth. An orbit is a path, not a geographic area. A satellite's orbital configuration may allow for it to pass over Australia, but that does not mean the satellite is within the geographic area of Australia. It is only over the geographic area of Australia, not within it.¹⁴

Regarding the reception of radio emissions from a space station by a mobile phone, the frequencies used for the reception must be within the frequency band covered by the spectrum licence, and the reception must occur in the geographic area of the spectrum licence. If these conditions are met, when the space station transmits direct to a radiocommunications receiver in a mobile phone, the operation of the mobile phone continues to be authorised by the spectrum licence.

¹¹ Under Article II of the Outer Space Treaty, outer space is not subject to national appropriation by claim of sovereignty, by means of use or occupation, or by any other means.

¹² As in made by humankind as opposed to natural satellites like the Earth and moon.

¹³ See definition of space object in section 5 of the *Radiocommunications Act 1992*. Space object means an object (whether artificial or natural) that is beyond, has been beyond or is intended to go beyond the major portion of the Earth's atmosphere, or any part of such an object, even if the part is intended to go only some of the way towards leaving the major portion of the Earth's atmosphere.

¹⁴ While section 18 of the *Radiocommunications Act 1992* states that references to Australia, a place or any waters include references to the 'outer space' above, this cannot mean the geographic extent of Australia extends to outer space. However, management of the spectrum can extend to outer space.

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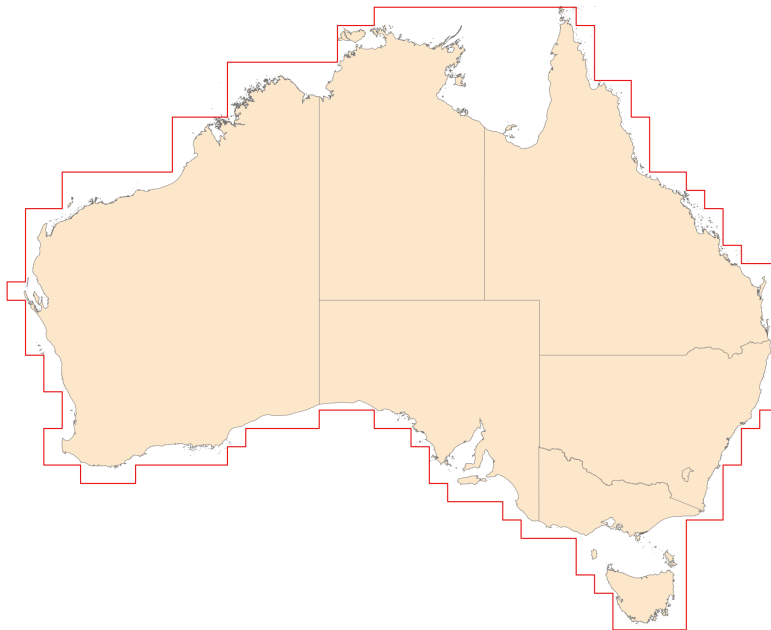
Operation under Australia-wide spectrum licences

Given the broad coverage provided by satellite services, our view is that operation of an IMT satellite direct-to-mobile service in Australia is only practical where there is an Australia-wide spectrum licence. In these bands, a satellite operator providing a IMT satellite direct-to-mobile service for all practice purposes¹⁵ will only need to coordinate with a single licensee responsible for managing coordination of services within the licensed band across Australia. Meaning that there are no geographic boundary issues to manage or multiple licensees for the satellite operator to consider. By nature, non-geostationary satellite systems used in an IMT satellite direct-to-mobile service transmit over a broad coverage area, with limited ability to restrict emissions within specific geographic boundaries such as those defined by metropolitan or regional spectrum licence areas.

The geographic area authorised for use under Australia-wide spectrum licences is defined with reference to cells in the [Australian spectrum map grid \(ASMG\)](#). The boundary of the ASMG is a polygon surrounding the Australian mainland and Tasmania, as illustrated in Figure 1 below. This boundary defines the maximum extent of a spectrum-licensed area, which is commonly known as an Australia-wide licence.

Refer to the 'Frequency bands' section below for information on relevant frequency bands that may be used to provide an IMT satellite direct-to-mobile service in Australia-wide spectrum-licensed areas.

Figure 1: Australian spectrum map grid boundary



¹⁵ See caveats in earlier discussion on spectrum licensing framework

Operation in other areas of Australia

Since an IMT satellite direct-to-mobile service may be operated in relation to existing spectrum-licensing arrangements, a spectrum licensee can operate such a service in a non-Australia-wide spectrum-licensed area without explicit approval from the ACMA.

If a spectrum licensee wishes to operate an IMT satellite direct-to-mobile service in a non-Australia-wide licence area, then the potential for interference to services operating outside of the spectrum licence area will need to be considered. This may necessitate interference mitigations not required for Australia-wide licences, such as not being able to service significant parts of a spectrum-licensed area to manage interference outside that area.

In addition, Australian territory extends beyond the boundary of the ASMG to Australian territorial waters and various offshore areas. In these outside areas, while [Public Telecommunications Service](#) (PTS) apparatus licences can be used to authorise operation of terrestrial wireless broadband services,¹⁶ PTS licences do not authorise operating an IMT satellite direct-to-mobile service in either the ground segment or the space segment. We expect Spectrum licensees are responsible for investigating the extent of geographic authorisation and associated implications.

Frequency bands

Table 1 provides an overview of spectrum-licensed bands and the type of licensing arrangements that apply to different geographic areas. An IMT satellite direct-to-mobile service may only be operated in relation to a spectrum-licensed area. The current regulatory framework does not support operation of such a service in other areas where apparatus licensing arrangements apply.

The 700 MHz, 800 MHz, 850/900 MHz and 2.5 GHz spectrum-licensed bands are suitable for IMT satellite direct-to-mobile services (since they support frequency division duplexing arrangements) and are licensed to MNOs under Australia-wide spectrum licences.

Theoretically, the 1800 MHz and 2 GHz spectrum-licensed bands could also support IMT satellite direct-to-mobile services. However, as these bands are not licensed for Australia-wide use, we consider there would be technical challenges in deploying services (as noted in the previous section). Further, the current regulatory framework does not support their use for operation of an IMT satellite direct-to-mobile service outside of spectrum-licensed areas. These bands are shaded in Table 1 to draw out this distinction.

¹⁶ In some spectrum-licensed frequency bands, PTS apparatus licences have been issued in areas outside of the ASMG boundary.

Table 1: Potential frequency bands for IMT satellite direct-to-mobile services

Band	Spectrum licence area	Apparatus licence area
700 MHz	Australia-wide (ASMG area)	PTS licensed in outside areas*
800 MHz	Australia-wide (ASMG area)	PTS licensed in outside areas
850/900 MHz	Australia-wide (ASMG area)	PTS licensed in outside areas
1800 MHz	Metro and regional areas	Remote areas
2 GHz	Metro (entire band) Regional areas (upper 2x20 MHz)	Regional (lower 2x40 MHz) Remote areas (entire band)
2.5 GHz	Australia-wide (ASMG area)	No licences issued

* Outside areas: Australian territorial waters and offshore areas outside the ASMG boundary.

Agreement between a spectrum licensee and satellite operator

We recommend an agreement be in place between an IMT satellite direct-to-mobile operator and a partner MNO before a satellite operator transmits in spectrum-licensed space as best practice. Otherwise, there may be reasonable grounds for us to treat such transmissions as interference and take appropriate action.

For example, under section 195 of the Radiocommunications Act, it is an offence to use a transmitter on a foreign space object in a manner that the person knows is likely to interfere substantially with radiocommunications within Australia or between a place in Australia and a place outside Australia. If there is no agreement in place and interference is reported by a spectrum licensee, the ACMA may take appropriate action in accordance with our [compliance and enforcement policy](#).

Since the transmitter on-board a satellite is in outer space – which is outside the geographic area of a spectrum licence – it cannot be subject to a third-party agreement under section 68 of the Radiocommunications Act, which provides for third-party authorisations under spectrum licences.

The type of agreement and its provisions would be a matter for the parties involved.

Interference management

The interference management framework for spectrum licences (and the ITU Radio Regulations) in the bands listed in Table 1 does not envisage the possibility of space-based emissions (from ‘base stations’ in space). We expect spectrum licensees offering IMT satellite direct-to-mobile services to undertake their own due diligence to manage coexistence with other spectrum uses and users.¹⁷

In this context, we are aware that there are specific concerns about coexistence with radio astronomy observations, especially at the Murchison Radioastronomy Observatory in the [Australian Radio Quiet Zone Western Australia](#). These considerations are valid and we

¹⁷ For example, services using nearby spectrum in the spectrum bands outside of the spectrum-licensed band that might be affected by out-of-band emissions from space stations.

encourage prospective providers of IMT satellite direct-to-mobile services to engage directly and early with the radio astronomy community (and any other relevant spectrum users).

Given the importance of supporting both radio astronomy and IMT satellite direct-to-mobile services, we intend to closely monitor developments. If required, we may consider introducing regulatory arrangements to provide certainty on spectrum access and interference management requirements. We encourage parties involved to keep us informed about developments, to aid predictability and certainty for all spectrum users.

Telecommunications carrier licensing and emergency calling

Beyond the requirements of the Radiocommunication Act, there may be other regulatory obligations for operators of satellite direct-to-mobile services to consider, including for telecommunications carrier licensing under the [Telecommunications Act 1997](#) and for emergency call services under the [Telecommunications \(Emergency Call Service\) Determination 2019](#).

International developments

The 2027 World Radiocommunication Conference (WRC-27) will also consider new allocations to MSS in bands identified for IMT in the Radio Regulations under WRC-27 agenda item 1.13, as a means of providing regulatory legitimacy for IMT satellite direct-to-mobile communications. This agenda item will be of key interest to Australian government and industry stakeholders involved in the preparatory process for WRC-27.

Until such an allocation is made (*if it is made*), a satellite system operating in bands for which there is no allocation in the ITU Radio Regulations may do so under the 'no-interference, no-protection' provisions of Article 4.4. As discussed in previous sections, conformity with Article 4.4 and other provisions of the ITU Radio Regulations is the responsibility of the foreign satellite operator and the administration that filed the satellite system with the ITU.

Next steps

MNOs and satellite operators seeking to provide an IMT satellite direct-to-mobile service in Australia are advised to [contact us](#) early to discuss deployment plans.

The Department of Infrastructure, Transport, Regional Development, Communications and the Arts leads the development of Australian positions relating to WRC-27 agenda items, including agenda item 1.13 on satellite direct-to-mobile services. Stakeholders can engage further on this issue by [contacting the Department](#) to join the international preparatory process to develop Australian positions on WRC-27 agenda items. We will review domestic arrangements following outcomes of that conference.

We intend to review domestic planning arrangements after a decision is made on this matter at WRC-27 (as is the case for all WRC decisions).