

**Inmarsat response to
Ministry of Business, Innovation and Employment**

Draft Five Year Outlook 2017-2021

15 February 2017

1 Introduction and Background

Inmarsat is pleased to provide comments to the Ministry of Business, Innovation and Employment (the Ministry) on its Draft Five Year Spectrum Outlook 2017-2021. Inmarsat appreciates that the Ministry seeks the views of stakeholders in matters of radio spectrum management. For a global satellite operator like Inmarsat, a clear and stable regulatory framework is very important, but also one which adapts to changing requirements.

Since the previous Five Year Outlook in 2012, the demand for mobile satellite connectivity has increased dramatically and Inmarsat continues to invest billions of dollars developing new systems operating in new frequency bands, to meet the demand.

Inmarsat provides mobile satellite services which are used throughout the world, supporting a wide range of applications ranging from low data rate IoT/M2M applications through to broadband Internet connectivity to passengers on ships and aircraft. Inmarsat user terminals are used on aircraft and on ships in all parts of the world, supporting safety and broadband communications. Inmarsat handheld and portable terminals are used by travellers and remote workers at any location, typically in areas where there is poor or non-existent terrestrial infrastructure. Our services are used by New Zealand businesses and citizens, at home and abroad.

The Inmarsat-3 and Inmarsat-4 satellites operate service links in the L-band (specifically the band 1525-1559 MHz and 1626.5-1660.5 MHz) and the feeder links operate in C-band. Our next generation of L-band satellites, which are planned for launch around 2020, will increase the L-band capacity available for MSS services in New Zealand with the addition of the “extended L-band” frequencies: 1518-1525 MHz and 1668-1675 MHz.

The Inmarsat-3 and Inmarsat -4 feeder links operate through a number of land earth stations which are located throughout the world; with one of the land earth stations located in Albany.

Inmarsat’s “Global Xpress” network (Inmarsat-5) consists of three geostationary satellites - shortly to be supplemented with a fourth satellite - which all operate in Ka-band¹. The Global Xpress system provides broadband connectivity (data rates up to around 50 Mbit/s) using small steerable antennas which may be installed on aircraft, ships and land mobile platforms. The user is connected to the

¹ Further information is available at <http://www.inmarsat.com/service/global-xpress/>

terrestrial infrastructure at a number of gateway earth stations - two of which are located in New Zealand; in Albany and Warkworth.

Inmarsat is also developing a network in Europe focussed on providing broadband aircraft connectivity - the “European Aviation Network”. This system operates in the S-band spectrum (1980-2010 MHz and 2170-2200 MHz), combing a multi-spot beam satellite² to provide wide coverage, with a network of ground stations to provide high capacity. The system is focussed on meeting the demand for broadband connectivity for aircraft passengers in flight in Europe and will become operational this year. While this system is limited in its coverage to Europe, similar systems can be envisaged for other parts of the world including New Zealand.

Looking further ahead, Inmarsat is developing plans for new satellites and systems to cater for the expected demand in mobile satellite communications, which may require operating in new frequency bands and could require new national authorisations in New Zealand and elsewhere. New satellites, forming the Inmarsat-6 and Inmarsat-7 generations and carrying multiple payloads including at L-band and Ka-band, are planned to be deployed starting in 2019.

2 Comments on Spectrum Trends raised in the Draft RSM Spectrum Outlook

2.1 Replanning of C-band (3.4-3.6 GHz)

One of the Work Plan Action Points refers to the “replanning of the additional IMT allocations in the C-band (3.4 – 3.6 GHz)” (page 13), which we understand to be related to the Ministry’s desire to make the band 3.4-3.7 GHz available for mobile broadband in New Zealand.

One important aspect is the sharing of this band between new mobile systems and incumbent systems, including FSS earth stations such as Inmarsat’s land earth station in Albany. The mobile community has long campaigned for the opening of the C-band to terrestrial mobile broadband based on claims that sharing is feasible with FSS earth stations. Also in this regard, the Ministry has described in section 4.2 of the Five Year Outlook various authorisation regimes developed in other countries which are based on different services sharing use of a band. Surprisingly, the Ministry goes on to conclude that such mechanisms are not necessary in New Zealand.

It is disappointing that Inmarsat’s land earth station at Albany, which operates in the 3.4-3.7 GHz band, will no longer be protected from October 2022 so as to accommodate mobile broadband without constraints. It is not clear why a sharing regime could not be considered in this case.

2.2 International Regulatory Developments in the L-band

The abovementioned Work Plan Action Item also states that RSM will “engage in the international development in the L-band (1427-1518 MHz)”. Related to the fixed service use of the same band, RSM states (page 24) that it will “review the outcomes of international decisions in the L band (1427 -1518 MHz) for IMT, with a view to develop options for incumbent fixed links services should this allocation change.”

² “Inmarsat-S” satellite planned to be launched June 2017.

These developments presumably lead to the possibility of making this band available for mobile broadband in New Zealand in the future.

Inmarsat is concerned about the adjacent band compatibility between mobile broadband (IMT) services in the band 1427-1518 MHz and MSS services operating in the band 1518-1559 MHz. Mobile broadband IMT systems have the potential to cause harmful interference to MSS terminals, including those which operate in New Zealand in the band 1525-1559 MHz. The CEPT has carried out technical studies, contained in draft ECC Report 263. These studies show the need for a guard band of at least 3 MHz to prevent harmful interference to MSS operations in the same area as IMT and also show the need for additional protection measures near airports and harbours to protect MSS terminals on aircraft and on ships.

There are also studies underway in the ITU-R on this issue, which will likely lead to a need for a guard band below 1518 MHz and emission and deployment limits on IMT base stations. These requirements should be taken into account by RSM in any work to make the band 1427-1518 MHz available for IMT.

If it is intended that the band 1427-1518 MHz is made available to IMT in New Zealand in the future, then Inmarsat would recommend including a 3 MHz guard band below 1518 MHz to protect MSS operations. Considering that there is also a need to protect the earth-exploration satellite service in the band below 1427 MHz, and assuming that the mobile use of this band would be used for “supplementary downlink” in common with many other countries, Inmarsat recommends a channel plan within the range 1430-1515 MHz, as illustrated below. This would provide for 85 MHz spectrum for IMT (17 channels of 5 MHz each). With 3 MHz guard band at the lower and upper edge, the filtering required on IMT base stations and in MES user terminals would be relatively easy to achieve. We would be pleased to discuss the detailed arrangements further with the Ministry if the work is taken forward in the next five years.



Furthermore, since Inmarsat plans to seek authorisation for MSS operation in the adjacent band 1518-1525 MHz, any review of the L-band would benefit from a widened scope, to include consideration of this band along with the band 1427-1518 MHz. We request that this extended scope is included in the final version of the Five Year Outlook.

2.3 Increased Efficiency in Wireless Technologies

In section 4.3 of the Draft Five Year Outlook, related to “Increased efficiency in wireless technologies”, the Ministry states that RSM will “review the feasibility of additional spectrum for IMT carriers subject to international harmonisation outcomes, in the L, S and C bands (page 16).

As one would expect increased efficiency to lead to a *reduced* need for spectrum, it is not clear how the need for additional spectrum for IMT carriers is justified.

With regard to the possibility of making more S-band spectrum available for IMT, the document is not specific on which bands would be considered, but if the bands 1980-2010 MHz and 2170-2200 MHz are within the scope, that would be a concern to Inmarsat in relation to the “European Aviation Network” described above. These bands are allocated to both the terrestrial mobile service and to the MSS. These bands have been retained for MSS in most countries and have not been authorised for terrestrial mobile systems. There is a risk of interference between satellite and terrestrial systems in these bands, and WRC-19 agenda item 9.1, issue 9.1.1, aims to address this issue. It should be noted that interference is not geographically limited, as IMT deployment in one country can cause interference to an MSS satellite serving areas very far away, e.g. IMT deployment in New Zealand could cause interference into a satellite serving Europe. Inmarsat recommends that the Ministry retains these bands for MSS operations and does not deploy terrestrial IMT systems in these bands. In any case the Ministry should wait for the outcome of this WRC-19 agenda item to be resolved before taking any action.

We have commented on possible impact of making more C-band spectrum and L-band spectrum available to IMT above.

2.4 Mobile Broadband

The Ministry stresses the importance of mobile broadband and developments towards the introduction of 5G. We note that RSM intends to engage in ITU studies related to IMT-2020 (5G) and we hope that this will extend also to ITU-R Task Group 5/1, where the feasibility studies under WRC-19 agenda item 1.13 will be conducted.

Several of the frequency bands within the scope of WRC-19 agenda item 1.13 are of importance to Inmarsat; in particular the FSS/MSS allocations around 37-50 GHz, which are potential bands for operation by Inmarsat in New Zealand in the medium-term future. We request that the Ministry gives careful consideration to the protection of incumbent services - both current and planned operations - in its work on this WRC-19 agenda item.

2.5 Earth Stations In Motion (ESIM)

Inmarsat notes the Work Plan Action Point (page 23) concerning the modifications to the General User Radio Licences for the satellite, maritime and aeronautical services to accommodate the implementation of ESIM. RSM has already implemented changes to the General User Radio licence

to cover ESIM operation on aircraft, ships and on land in the bands 19.7-20.2 GHz and 29.5-30 GHz³. Inmarsat is grateful for these changes, as this is vital to the operation of Inmarsat's Global Xpress services in New Zealand.

Inmarsat is also pleased to see that RSM plans to monitor the international studies for the expansion of ESIM to the bands 17.7 – 19.7 GHz and 27.5 – 29.5 GHz. These expansion bands are already needed to accommodate demand in some areas, and more widespread use can be anticipated in the future. We therefore hope that RSM will support this work at the ITU-R and WRC-19, and after WRC-19 will consider further changes to the General User Radio Licence to accommodate ESIM. This could be explicitly included in the final Five Year Outlook.

3 Concluding Comments

Inmarsat thanks the Ministry for the opportunity comment and we ask that these comments and proposals are taken into account in finalising the Five Year Plan. We would be pleased to provide further information and to discuss these matters further with the Ministry. Enquiries may be directed to:

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³ For Aero ESIM see <https://gazette.govt.nz/notice/id/2016-go5553>; for Maritime ESIM see <https://www.gazette.govt.nz/notice/id/2016-go6223>; for land ESIM see <https://gazette.govt.nz/notice/id/2016-go5552>.