Inmarsat response to the IDA consultation paper

"PROPOSED ALLOCATION OF SPECTRUM FOR INTERNATIONAL MOBLE TELECOMMUNICATIONS ("IMT") AND IMT-ADVANCED SERVICES AND OPTIONS TO ENHANCE MOBILE COMPETITION"

10 June 2014

1 Introduction

Inmarsat is pleased to provide comments to the IDA in response to its consultation document "PROPOSED ALLOCATION OF SPECTRUM FOR INTERNATIONAL MOBLE TELECOMMUNICATIONS ("IMT") AND IMT-ADVANCED SERVICES AND OPTIONS TO ENHANCE MOBILE COMPETITION". We provide comments specifically on the potential use of the "3.5 GHz" frequency band (3400-3600 MHz).

Inmarsat operates a network of 10 geostationary orbit (GSO) satellites providing mobile satellite services to users in Singapore and throughout the world. Inmarsat services are used by ships, aircraft, and land vehicles for voice and data services. Transportable and hand portable terminals are also used. The Inmarsat services range from low data rate SCADA applications, through voice communications, ISDN and include broadband Internet access. In addition, safety-of-life services are also provided to ships (as part of the GMDSS[1]) and to aircraft. Further information is available at www.inmarsat.com.

The feederlinks for Inmarsat's GSO satellites operate in extended C-band, with the downlinks operating in the band 3550-3700 MHz. There are Inmarsat earth stations operating in this band throughout the world, providing a vital element in the link between the satellites and the terrestrial networks. Interference to these feederlink earth stations has the potential to disrupt or prevent service to our users.

2 General comments

The possible use of the 3.5 GHz band for IMT systems has been studied by the ITU-R. Report ITU-R M.2109[2] was developed before World Radiocommunication Conference WRC-07. In the context of WRC-15 agenda item 1.1, new studies have been conducted within the ITU-R Joint Task Group 4-5-6-

[1] GMDSS is short for Global Maritime Distress and Safety System.
[2] Available at http://www.itu.int/pub/R-REP-M.2109.

7. Those new studies are contained in Attachment 3 to Annex 11 of Document 4-5-6-7 document 4-5-6-7/584[3].

All studies have shown that very large separation distances are required to protect FSS earth stations from interference from IMT systems. Required separations distances are at least tens of kilometres, and often hundreds of kilometres. The conclusions of the studies for co-frequency operation are as follows:

> "For the long-term interference criterion, the required separation distances are at least in the tens of km. For the short-term interference criterion, the required separation distances, including when the effects of terrain are taken into account, exceed 100 kilometres for most of the cases. Both the long-term and short-term interference criteria would have to be met.
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> In some cases, the required separation distances are larger, up to 525 kilometres. In other cases, the required separation distances could be reduced by taking into account additional effects of natural and artificial shielding. However these effects are site specific."

The studies have also considered potential use of indoor, small cell IMT applications, with the following conclusions:

> "The required protection distance for an indoor small cell deployment was smaller relative to small cell outdoor due to the fact that some degree of building attenuation was assumed, as well as lower base station e.i.r.p. and antenna height.
>
> For the long-term interference criterion, the required separation distances vary from about 5 kilometres to tens of kilometres. For the short-term interference criterion, the required separation distances vary from about 5 kilometres to tens of kilometres, and in some instances up to 120 kilometres. Both the long-term and short-term interference criteria would have to be met.
>
> The wide range of distances is a consequence of earth stations in a variety of terrain conditions, assumed clutter loss, and different assumptions for the building penetration loss (0 to 20 dB)."

The draft Report also examines the impact of IMT systems on FSS earth stations operating in the adjacent band (i.e., operating above 3600 MHz in this case). Even in this case, the required separation distance may be up to tens of kilometres. The draft Report also contains information of interference caused to numerous TVRO terminals in Dhaka as a consequence of the deployment of WiMAX systems in Bangladesh. In that case, interference was caused even though the WiMAX systems and the TRVO systems were operating on non-overlapping frequencies. There is also information of a similar case of interference caused to TVRO receivers in Brazil.

Hence it is apparent that in a country with a relatively small territory such as Singapore, it is not possible for IMT systems to operate without causing interference to FSS earth stations. The IDA suggests that the operation of in-building deployments might be feasible, but even in such a case,

[3] Available at http://www.itu.int/md/R12-JTG4567-C-0584/en.

the ITU studies suggest that a separation distance of up to 120 km may be required, making the operation of such IMT systems impractical.

As the IDA identifies, international coordination for new mobile systems would be required. There are a number of requirements identified in footnote No. 5.432B of the Radio Regulations (RR) which would need to be met before IMT systems could be deployed in this band. These include:

1. Seeking the agreement of neighbouring countries under No. 9.21 of the RR.
2. Coordination with earth stations in nearby countries, as required by No. 9.18 of the RR
3. Meeting the defined pfd at the border, which may be exceeded only if agreed by relevant administrations.

Inmarsat is particularly concerned about potential interference to our feederlink earth station in Batam, which operates to the Garuda satellite on behalf of ACeS (Asia Cellular Satellite), an Indonesian satellite operator. This earth station is located about 30 kilometres from Singapore and receives in the 3.5 GHz band. The coordination contour for the Batam earth station is shown in the attachment, which can be seen to include all of the territory of Singapore. Given the short separation distance, and the fact that the interference path is over sea, which normally leads to larger separation distances, it is doubtful that the use of IMT systems could be deployed in Singapore while meeting the protection requirements of the Inmarsat earth station and other earth station in Indonesia. This situation would apply even if use of IMT systems would be limited to indoor use.

3 Answers to specific questions

We provide specific answers to the relevant questions posed in the consultation document.

Question 8: IDA seeks:

(a) indications of industry interest in the allocation of long term rights in the 3.5 GHz band, as well as planned services and target market segments for the use of these bands;

Inmarsat comment: The 3.5 GHz will continue to be required for deployment of FSS earth stations, in Singapore and in other countries. Inmarsat is aware that the 3.5 GHz band has been made available for IMT or similar mobile systems in a number of countries, however there has been very limited commercial success. In some countries in Europe, licences have been returned to the regulator after the failure to deploy terrestrial systems.

(b) views on whether the use of the 3.5 GHz bands solely for the deployment of in-building mobile systems is feasible, and the underlying considerations thereof;

Inmarsat comment: As noted above, the recent ITU-R studies have found that even for IMT systems limited to indoor use, separation distances are typically tens of km, and sometimes more than 100 km. Hence the need to protect FSS earth stations in and around Singapore may not allow for the operation of IMT systems, even if limited to indoor only operation.

(c) views on possible impact to end users of FSS and TVRO, if (i) the end users do not have to be migrated; or (ii) the end users have to be migrated; and

Inmarsat comment: The draft new ITU-R Report referenced above contains information on the impact of terrestrial wireless access systems on TVRO systems in Bangladesh and Brazil. The deployment of the terrestrial systems in this band caused interference to many TV viewers in those countries and similar cases have been reported in other countries. As these cases are the result of interference on non-overlapping frequencies, it is apparent that simple segmentation of the band between terrestrial and satellite systems would not be effective in preventing interference. In principle, receiver filters might improve the situation, but it may not be possible or practical to fit filters to all satellite receivers.

It would not be practical to migrate users to other frequency bands, since the C-band TV channels may not be available in other frequency bands and there would be insufficient capacity in Ku-band to accommodate all C-band channels. Furthermore, C-band is often preferred over Ku-band due to the superior resistance to rain fade, meaning higher availability for viewers.

(d) views on possible co-existence issues between TDD systems, and FSS and/or TVRO systems.

Inmarsat comment: The comments and conclusions above are independent of the duplex system employed by the terrestrial system (TDD or FDD).

4 Concluding comments

For the reasons described above, Inmarsat does not believe that it would be possible to deploy IMT systems in the 3.5 GHz band in Singapore. If however such systems are authorised, whether limited to indoor use or otherwise, it is important that Singapore ensures that earth stations operating in Singapore and in other countries are not impacted. In the case of protection of earth stations in other countries, it is important that the requirements prescribed in the Radio Regulations are followed.

Inmarsat thanks the IDA for the opportunity to comment, and asks that the IDA takes careful account of our comments. We would be pleased to provide further information if necessary, for which the suggested contact point is:

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Attachment

RR Appendix 7 coordination contour for C-band earth station in Batam