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Consultation on a Policy, Technical and Licensing Framework for Use of the Bands 2000-2020 MHz and 2180-2200 MHz

Comments of

Omnispace, LLC

Monday, 23 June 2014

I. EXECUTIVE SUMMARY

i. Omnispace, LLC ("Omnispace") is the owner and operator of a mid-earth orbit ("MEO") satellite system consisting of space and ground assets (the "Omnispace system") that represents a cumulative investment to date of over US$1.5 billion. Designed to operate in the 2000-2020 MHz and 2180-2200 MHz frequency bands in the so-called "S-band" spectrum range, Omnispace's F-2 satellite is currently in orbit and additional satellites to augment the constellation are in advanced stages of construction.

ii. The Omnispace system, including its existing and fully operational F-2 satellite, has the unique ability to serve every point in Canada, including its rural, remote, and farthest northern areas, without the inherent physical and technical limitations of geo-stationary ("GEO") systems. With the addition of between four and six planned additional satellites, which are in advanced stages of construction, Omnispace's existing coverage of the entire Canadian land mass and maritime areas would grow to ubiquitous 24/7 coverage.

iii. Not only would the Omnispace system provide coverage of the entire Canadian land mass, all the way up to the North Pole, its footprint is truly global in scale. The global nature of Omnispace's satellite network allows it to scale its services and device and technology capabilities across markets and vendors. Potential MSS customers, such as users in rural and remote regions, and at the furthest northern and southern latitudes of the globe, as well as customers of terrestrial services, will benefit from the advantages attendant on this scale in terms of greater device choice, lower cost and better services.

iv. Omnispace appreciates the work of the Department in launching the 2 GHz MSS Consultation. Omnispace is supportive of several principal components of the policy and technical proposals, namely (i) maintenance of the requirement to provide MSS in the S-band (B-1); (ii) the removal of the dual ancillary terrestrial component ("ATC")-MSS mode requirement for handsets and proposal to remove the requirement that terrestrial service be at all times ancillary to the provision of MSS service (B-2 and B-3); but that (iii) the deployment of terrestrial service not constrain the deployment of MSS (B-4); and (iv) proposals for appropriate modifications to the technical parameters for the S-band (Annex D).

v. Indeed, Omnispace wholeheartedly supports the Department's proposed policy framework, which appears to recognise that in order to achieve commercial deployment of broadband telecommunications services in Canada's rural, remote, and farthest northern areas, service providers must be able to leverage MSS services with other commercial terrestrial services.

vi. No one understands the challenges, opportunities and social, economic, and strategic potential of the global MSS business better than Omnispace. In turn, Omnispace understands and appreciates, perhaps better than most, the fine balance that the Government is seeking to achieve in tabling the policy proposals set out in the 2GHz MSS Consultation. Given the unique coverage and technical capabilities of the Omnispace system, Omnispace's business model is built around fully exploiting a range of commercial and non-commercial business opportunities in a truly global, rather than a merely national or continental perspective, thereby enhancing its viability.

vii. To that end, work to develop mobile terminal equipment with identified partners is under way. The handsets that are being developed will be LTE-enabled and will be compact with integrated antennae. Omnispace expects to deploy LTE in a 10 MHz channelization and MSS in one of several prospective narrower-band channelizations, depending on the MSS waveform(s) that are selected in a manner that will enable each band/technology, both separately and in combination, in its device range.

viii. Furthermore, as part of a multi-faceted business plan, Omnispace is currently developing critical MSS services that could be deployed in the near-term in Canada and the around the globe. Over and above commercial terrestrial mobile services, the Omnispace system could offer the following MSS and hybrid services:

a. hybrid WiFi / microcell and MSS broadband deployment for both urban and rural markets;

b. MSS backhaul services as an alternative to strained microwave backhaul facilities in challenging rural and remote geographies;

c. machine-to-machine ("M2M") applications, such as transfer of seismic data from unattended sensors, delivery of large maritime databases, and asset tracking;

d. strategic and defence applications, such as fulfilment of the tactical narrowband requirements ("TNS") of the Government of Canada's Polar Weather and Communications ("PCW") initiative; and

e. other scientific and research community applications, such as North American polar exploration.

ix. Licensing of a MSS provider like Omnispace under the proposed policy framework in Canada would enable commercial service launch in the S-band that to date has lain essentially fallow. All of Canada's citizens, particularly those in its currently underserved rural, remote, and farthest northern areas, would stand to benefit from a global MEO system, with the attendant scale, cost and device variety user benefits. And it would inject a nimble and efficient global player into the Canadian telecommunications landscape.

x. However, against this promising policy backdrop, the Department has proposed a problematic licensing approach that appears to undermine the key goal of ensuring that Canadians in every region have access to a variety of broadband services at reasonable prices in two important ways.

xi. Space infrastructure is expensive – as stated above, the Omnispace system represents over US$1.5 billion in invested build and launch capital. In order to leverage this infrastructure into a viable business, operators in the band require the use of the spectrum asset for MSS and terrestrial services, optimized on a geographical basis. While the proposed policy framework appears to recognise this fact, the licensing framework fundamentally undermines it by proposing to bifurcate the MSS and MSS / terrestrial authorizations between two different entities, respectively. If this aspect of the licensing framework is maintained, it lowers the probability that any independent business (whether urban or rural), will be commercially viable. It also greatly diminishes the prospects of

enabling service to the currently unserved / underserved citizens in the rural, remote, and farthest northern areas of Canada, a stated goal of the proposed policy.

xii. Second, Omnispace is perplexed by the Department's proposal to extend the existing 20 MHz MSS and MSS/ATC licences of the two existing S-band licensees to a full 40 MHz each, thereby cutting out the possibility of considering in further detail the comparative benefits of other potential operators in the S-band, such as Omnispace. This approach clearly limits competition, and goes against the grain of the Department's general mandate to promote competition as the primary means to safeguard the interests of users.

xiii. More perplexing still, the proposed licensing approach appears to be based on faulty assumptions in relation to the future direction of the device ecosystem and inadequate consideration of the potential benefits to Canadians in every part of the country that can be derived from the global scale and efficiencies of a non-geostationary MEO MSS system, such as the Omnispace system.

xiv. Thus, the Department's proposed licensing framework should be realigned to permit due and proper consideration of the benefits that the licensing of a global MEO system could offer to all Canadians, in terms of competition, lower prices, greater device choice and better services

xv. Omnispace is keenly interested in the outcome of this public consultation. Omnispace believes that with the right policy, licensing and technical framework in place, the S-band will enable the Government of Canada to simultaneously achieve long-standing and important public policy objectives of enabling sustainable entry into the national mobile wireless telephony market that is in strong need of additional competition, enabling the introduction of much-needed broadband data services in the North, while in parallel serving the strategic and advanced communications needs of Canada's polar defence and research communities.

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II. INTRODUCTION

1. Omnispace, LLC ("Omnispace") is pleased to provide its comments in response to Industry Canada's (the "Department") *Consultation on a Policy, Technical and Licensing Framework for Use of the Bands 2000-2020 MHz and 2180-220 MHz*, Notice No. SMSE-011-14 (the "2 GHz MSS Consultation").

2. As the owner and operator of a mid-earth orbit ("MEO") satellite system consisting of space and ground assets (the "Omnispace system") designed to operate in the 2000-2020 MHz and 2180-2200 MHz frequency bands (the so-called "S-band" spectrum range"), Omnispace is keenly interested in the outcome of the public process initiated by the Department in the 2 GHz MSS consultation.

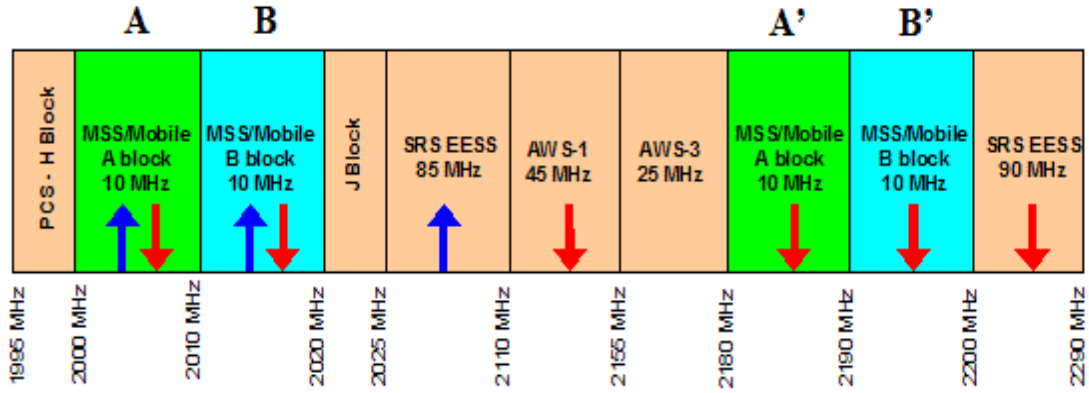
3. Omnispace wholeheartedly supports the Department's proposed policy framework, with its focus on maintaining the provision of MSS in the band. As discussed in further detail below, provided that the Department realigns its proposed licensing approach, Omnispace firmly believes that deployment of S-band frequencies has the potential to enable the Government of Canada to deliver on its long-standing but as yet elusive public policy goal of bringing all of Canada's citizens, particularly those in its currently underserved rural, remote, and farthest northern areas, into the digital broadband age.

III. DISCUSSION

A. Band Plan

A-1 **Industry Canada proposes to adopt the 2 GHz band plan and the block pairing shown in Figure 2**

Figure 2 — Proposed Block Pairing



4. Omnispace has considered the Department's proposed band plan from two perspectives, namely the proposed block pairings and second, the proposed uplink and downlink blocks.

5. Omnispace supports the proposed block pairings as proposed in Figure 2 of the 2 GHz MSS Consultation.

6. With regards to the proposed uplink and downlink blocks, the Department has proposed that upper A' (2180 MHz to 2190 MHz) and upper B' (2190 MHz to 2200 MHz) be used for downlink but that the licensee have the option to determine, by May 20, 2016, whether it will use the lower A (2000 MHz to 2010 MHz) block and lower B (2010 MHz to 2020 MHz) block for uplink or downlink operations during the term of the licence.

7. Omnispace supports the designation of the upper A' and upper B' blocks for downlink usage in both the MSS and terrestrial services.

8. However, insofar as MSS in the lower A and B blocks is concerned, Omnispace's current intention, if licensed by the Minister, is to use these blocks for MSS uplink operations.

Any party that genuinely intends to deploy two-way MSS services in this band would necessarily support retention of the lower A and B blocks for uplink MSS uses.

B. Spectrum Policy Considerations

(i) Importance of Maintaining MSS Uses in the Band

B-1 Industry Canada proposes to maintain the provision of MSS in this band.

9. In exercising the powers conferred by the *Radiocommunication Act* to issue radio authorizations under such terms and conditions as the Minister of Industry may fix, the Minister may "have regard to the objectives of the Canadian telecommunications policy set out in section 7 of the *Telecommunications Act*."[1]

10. Section 7 of the *Telecommunications Act* affirms that "telecommunications performs an essential role in the maintenance of Canada's identity and sovereignty" and that "the Canadian telecommunications policy" includes among its objectives:

> (a) to facilitate the orderly development *throughout Canada* of a telecommunications system that serves to safeguard, enrich and strengthen the *social and economic fabric of Canada and its regions*;
>
> (b) to render *reliable and affordable telecommunications services* of *high quality accessible* to Canadians in both urban and rural areas *in all regions of Canada*;
>
> …
>
> (h) to respond to *the economic and social requirements of users* of telecommunications services;[2] [emphasis added]

11. The Government of Canada continues to espouse the objective of seeking to improve and expand the provision of advanced telecommunications services in Canada's rural and remote regions in order to promote economic development. For example, an important component of both the Economic Action Plan 2014[3] and the Digital Canada 150 policy

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1 *Radiocommunication Act,* R.S.C. 1985, c. R-2, section 1.1.

2 *Telecommunications Act,* S.C. 1993, c. 38, section 7.

3 Government of Canada, Budget Plan: *The Road to Balance: Creating Jobs and Opportunities,* tabled on 11 February 2014 in the House of Commons by the Honourable James M. Flaherty, Minister of

initiative[4] is the extension and enhancement of broadband service to areas that do not currently benefit from such services with a target speed of 5 megabits per second. The Government of Canada has established this policy initiative because it recognises that "[e]nhancing and extending access will create jobs, growth and prosperity for rural and Northern Canadians by increasing their ability to participate in the digital economy."[5]

12. The Government has signalled its intention to promote this particular policy priority through a variety of policy instruments. For example, over and above the funds specifically earmarked for the extension and enhancement of fixed broadband access referred to above, both the Government of Canada and the Minister of Industry have stated that the Government will seek to use the Minister's spectrum licensing powers to benefit consumers living in rural and remote regions through the upcoming 2500 MHz spectrum auction:

> In 2015, we will hold the 2500 MHz spectrum auction, with rules specifically designed to benefit consumers, especially those living in rural regions. [6]
>
> Spectrum in the 2500 MHz band is ideal for delivering fast, reliable service on the latest smart phones and tablets, and it can also be used to provide fixed broadband Internet services in rural areas. [7]
>
> Canadian consumers in urban and rural areas will soon benefit from the deployment of advanced mobile and broadband services across the country, which will lead to better, faster Internet services on the latest technologies.[8]

13. It should come as no surprise, then, that in the 2 GHz MSS Consultation, the Department stresses that

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Finance (hereinafter, "*Budget Plan 2014*"), chapter 3.4 at 179 <online: http://www.budget.gc.ca/2014/docs/plan/pdf/budget2014-eng.pdf >

[4] Government of Canada, *Digital Canada 150*, 4 April 2014 at 8 <online: https://www.ic.gc.ca/eic/site/028.nsf/vwapj/DC150-EN.pdf/$FILE/DC150-EN.pdf >.

[5] Budget Plan 2014, chapter 3.4 at 179.

[6] Minister of Industry James Moore, *Announcement of 700 MHz Spectrum Auction Results,* 19 February 2014 < online:http://news.gc.ca/web/article-en.do?nid=816909 >.

[7] Government of Canada, *Harper Government Announces New Measures to Benefit Canadian Wireless Consumers*, 10 January 2014 <online:http://news.gc.ca/web/article-en.do?nid=808739>

[8] Government of Canada, *Harper Government Announces New Measures to Benefit Canadian Wireless Consumers*, 10 January 2014 <online:http://news.gc.ca/web/article-en.do?nid=808739>

> MSS offerings can be beneficial in areas of the country that are not easily covered by other technologies. The Canadian geography includes large areas with low population density, and the majority of its territory is not covered by terrestrial networks. These areas could effectively be served by MSS. Industry Canada is of the view that, in this particular instance, departmental policy should differ from the recent decisions in the United States. Specifically, the Department's policy should continue to require MSS offerings in conjunction with the terrestrial services in order to encourage increased coverage.[9]

14. Omnispace wholeheartedly supports the Department's proposal to maintain the provision of MSS in the S-band. Furthermore, as demonstrated below in a comparative review of the relevant technical characteristics of MEO satellite systems relative to a GEO satellite system and a review of some of the use cases that MEO systems are particularly suited to provide, it is clear that MEO systems such as that of Omnispace are uniquely positioned to actually develop and deliver MSS services throughout all of Canada, including at its farthest northern latitudes.

15. Many familiar satellite communications systems rely upon GEO (geostationary) satellites. This choice is often made because such systems allow simple, albeit highly directional antennae (dishes) to point to a fixed point in the sky and because the satellite remains over its targeted market. The laws of astrophysics require that GEO satellites be located at the Equator at a very high altitude above the Earth. Unfortunately, because of these features, GEO satellites come with inherent physical and technical drawbacks.

16. First, GEO systems come with a severe penalty for high latitude locations which cannot "see" the satellite. In the case of Canada, the land mass above about 60 degrees of latitude North will have elevation or "look" angles (namely the angle between the tangent to the surface of the earth at the user's location and the position of the satellite in the sky) of often *below 10 degrees.* Best practices dictate that all MSS systems employ look angles from the user to the satellite that are ideally above 20 degrees and definitely above 10 degrees. This is particularly essential in the case of GEO systems because mobile user terminals are often operated under non-ideal geometric conditions, as discussed in the next paragraph.

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9 2 GHz MSS Consultation, paragraph 27.

17. Second, because GEO systems have, by definition, a fixed position in the sky, if the user is in an area that is obstructed by any obstacle, whether it is natural terrain, a structure or an object, there is little that can be done from a technical perspective, absent displacement of the user to an unobstructed area, to augment the quality of the signal between the user and the satellite.

18. Third, because GEO satellites are situated at a very high altitude above the surface of the Earth, GEO systems are prone to latency. A GEO system has combined latencies of about ½ second, which result in noticeable degradation of voice communications and can be problematic for higher speed data communications.

19. The physical and technical features of GEO systems discussed above can be contrasted to those of MEO (mid-earth orbit) systems. A MEO system has the following advantages over a GEO system:

    (a) elevation angles in the north are much higher for a MEO than a GEO. The orbit of the satellite in a MEO system provides much higher view angles in the north (typically between 35 and 90 degrees peak) and can be used all the way to the North (and South) Pole. A higher angle avoids a loss of service caused by even small obstacles;

    (b) a MEO system will have varying angles to a user, as compared to the fixed angles provided for in a GEO system. In practical terms, what this means is that if the coverage is bad for the user in a GEO system, it will always be bad. However, a MEO system offers a user an opportunity for excellent partial coverage. Take for example a use case in mountainous terrain in the northern hemisphere, where the only usable elevation angles would be from a satellite to the north. In a MEO system, the satellites operating in tandem will provide access to the north of every fixed point on the surface of the Earth. However, relative to Canada, a GEO system or satellite will always be in the southern sky. The user in this particular use case will never have good line of sight communication with the GEO satellite; in contrast, the user would have good line of sight communication with one or more MEO satellites in the MEO system. The probability of a better line-of-site for Omnispace

is further increased as we progressively launch our additional four to six MEO satellites; and

(c) MEO systems exhibit low latency since they are closer to the earth. Signal delays are more closely comparable to those in terrestrial systems.

20. Figure 1 below provides a graphical comparison of the average peak elevation or "look" angles for the Omnispace MEO system to that of a GEO system at 111°W for Canadian latitudes:

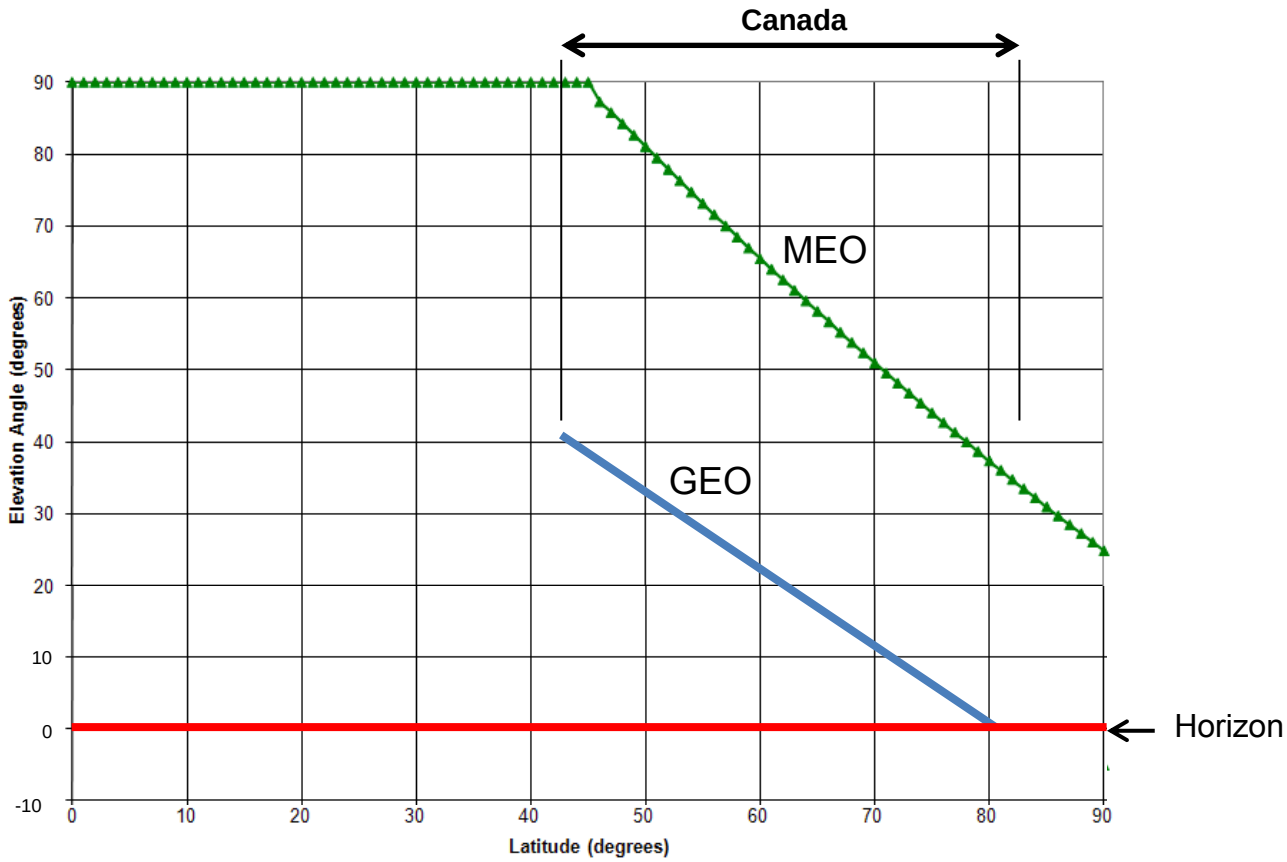

Figure 1 – Comparison of Northern Hemisphere Elevation Angles for Omnispace MEO System v. GEO System at 111°W

21. Figure 2 below shows the northern hemisphere elevation angles for the same GEO system at 111°W superimposed over North America. As can be seen in Figure 2, a GEO satellite at 111°W would have user look angles of below 10 degrees over a sizeable portion of Canada and look angles of below 20 degrees over approximately one half of the Canadian land mass.

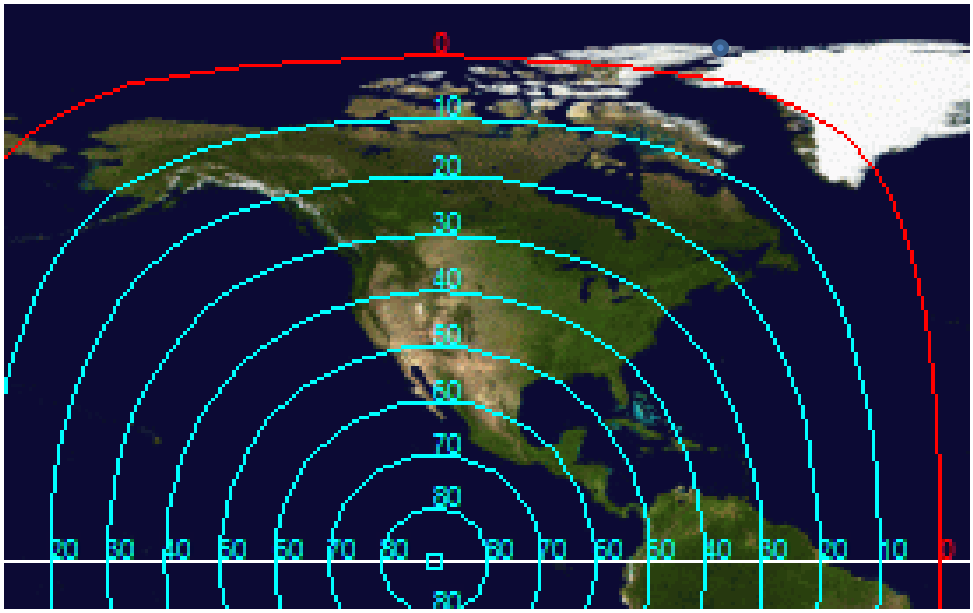

Figure 2 – Map View of Northern Hemisphere Elevation Angles for a GEO Satellite at 111°W

22. The Yukon, Northwest Territories, and Nunavut are all above 60 degrees North. These territories represent about 40 per cent of the land mass of Canada, not including waterways and ice flows. With a GEO system, it is also likely that a significant portion of Quebec and Newfoundland and Labrador will have elevation angles of below 20 degrees, thus increasing the potential for marginal coverage to over 50 per cent of Canada. This is less than optimal, given that relative to Canada, a GEO satellite will always appear in the southern sky and will in some instances be permanently obscured.

23. At the extreme, Alert, Nunavut (82.5 N, 62.34 W) would at all times have a negative elevation angle (-3 to -4 degrees) to a GEO satellite located at 111 °W. This means that for users in this part of Canada, the path of the GEO satellite would always be below the horizon. As a result, both voice and data communications would not be possible. In

contrast, with the MEO Omnispace system, the peak elevation angle at Alert would be about 35 degrees above the horizon.

24. Indeed, the team leading the joint Canadian Space Agency/Environment Canada/Department of National Defence PCW (Polar Communications and Weather) initiative has independently concluded that GEO satellite systems are not appropriate for serving the northern regions of Canada including the Northwest Passage:

> Telecommunication services are the backbone of a modern society. Satellite communications, in particular, provide a critical means of providing such services across Canada, given its tremendous area and the concentration of most of its population.
>
> The majority of communications satellites have a geostationary Earth orbit (GEO) due to the inherent advantages (i.e. large coverage area and fixed position relative to a position on the ground) that this orbit provides for communications purposes. However, GEO satellites have limited northern latitude coverage due to line of sight limitations of the Earth. Furthermore, even at a lower latitude of 65° N, there are limitations as to what GEO satellites can provide for mobile users, such as ships, planes, ground troops, and Unmanned Aerial Vehicles (UAVs).
>
> In summary, there is a large part of the Canadian territory in the Arctic region, and the global Arctic Region, without access to secure, highly reliable and high capacity telecommunications solutions. This specifically inhibits the welfare of northerners, northern communities, northern economic development, and military safety and security operations. [10]

25. Therefore, from the perspective of coverage, the MEO orbit of the Omnispace system has the advantage (over the stationary position of a GEO satellite) of providing much higher view angles in the North (typically between 35 and 90 degrees peak) and can be used all the way to the North Pole. A significant portion of Canada is above 60 degrees North latitude, and as noted above, the Government of Canada's own experts have concluded that GEO satellites are not appropriate for serving the northern regions of Canada including the Northwest Passage.

26. In addition, Omnispace firmly believes that it is uniquely poised to deploy a broad range of innovative broadband services that are in short supply and high demand in Canada's

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[10] *Business-Level Requirements (BR) for the Polar Communications and Weather (PCW) Project* (DRAFT), Version 3.0, at 2-3 (section 2.1.2), as attached at Annex B to Request for Information re Polar communications and Weather (PCW) Project, Solicitation No. W6369-04DC01/A issued 1 November 2013,

North. In particular, Omnispace could simultaneously deliver the following services to meet the civilian, defence and aerospace, and scientific user communities' communication needs in the North:

(a) wireless hot spots that will provide improved Internet access to far northern communities;

(b) improved data services to mountainous areas that have limited line of sight to GEO satellites;

(c) improved pipeline monitoring to the oil and gas industry, including video, voice, and wider bandwidth data services;

(d) enhanced data transfer for key medical and diagnostic services (e.g. diabetic retinal scans) to far northern residents in cases where significant travel is impractical;

(e) communications to maritime operations in the Northwest Passage and northern ports, including database navigational aids, use of Automatic Identification System data and crew communications;

(f) the TNS (Tactical Narrowband System) required by the Department of National Defence to provide tactical voice and data communications to Canadian and allied (*e.g.*, U.S. forces) operating above 60 degrees North; and

(g) numerous scientific projects to measure and analyze seismic activity, beginning in the Canadian Northwest. Outbound data would exceed 30 megabytes per sensor per day from hundreds of sensors.

27. The development work that Omnispace has already undertaken can be contrasted to the actions of the existing S-band licensee. Based on the regulatory and commercial activity of the U.S. operator referenced in the 2 GHz MSS Consultation, it is not clear that this operator will deploy MSS services in the band in the U.S. market. Indeed, the US operator sought and has received authority from the U.S. Federal Communications Commission ("FCC") to deploy the S-band entirely for terrestrial downlink uses.[11] For

[11] See https://apps.fcc.gov/edocs_public/attachmatch/DA-13-2409A1.pdf.

terrestrial provision, the U.S. operator would likely pair the S-band downlink (potentially the entire S-band) with another uplink band that is not contemplated in Canada. This may impair or altogether obviate MSS service in the S-band by the U.S. operator.

28. Non-GEO MSS systems, such as Omnispace's, offer heretofore unseen benefits to Canada's currently unserved / underserved citizens in rural, remote, and farthest northern areas, due to the coverage characteristics of their non-geostationary constellation of multiple satellites. Not only are the physical characteristics and technical capabilities of Omnispace's MEO system far superior to those of GEO systems, particularly across the vast northern reaches of Canada, Omnispace is actively developing multi-faceted opportunities across a broad range of sectors to enable a northern MSS business case.

29. However, by the very same token, the non-geostationary nature of its satellites means that the Omnispace system, once fully built out, will cover every geography of the globe. This unique and distinct aspect of Omnispace's MEO system and the ramifications of this in terms of scale, efficiencies and device variety, will be discussed in further detail in section III.C below. In order to fully understand the potential benefits of authorising Omnispace's MEO system in the S-band in Canada, one must take into account the global scale and global nature of the business case that sets Omnispace's system apart.

(ii) Promotion of Mobile Broadband

B-2 Industry Canada proposes to remove the dual-mode requirement in the 2 GHz band, and to modify RP-023 and RSS-170 accordingly.

B-3 Industry Canada proposes to modify the spectrum and licensing policy principles1 on the implementation of ATC mobile services in RP-023 with regard to the 2 GHz band.

30. In RP-023, the Department approved of the provision of Ancillary Terrestrial Component ("ATC") services as an integral component of a substantial MSS offering in the S-band. In approving this policy and licensing change at the time, the Department established the following spectrum and licensing policy principles:

> (a) The ATC mobile service will be an integral part of MSS service offerings. A substantial level of mobile-satellite services will be provided with the ATC service.
>
> (b) The frequencies used for the ATC system will be within the assigned spectrum for a particular MSS network and the ATC service will be limited to the satellite serving areas. The use of the MSS spectrum for ATC operation will be subordinate to the spectrum being available for mobile-satellite service.
>
> (c) The ATC mobile service will be required to cease operation, within a reasonable period, should the mobile-satellite service or network be discontinued.
>
> (d) The ATC operation will be authorized such that it will neither cause harmful interference to, nor claim protection from, MSS services and other primary radio services operating in adjacent bands. ATC operations will be subject to technical and operational requirements considered appropriate to mitigate potential interference.
>
> (e) Complete applications as radiocommunication carriers will need to be submitted to seek authorization to operate an ATC mobile system as an integral and indefeasible part of the MSS service offerings. Specific information will be required as part of the applications to demonstrate adherence to policy, operational and regulatory principles.
>
> (f) Spectrum area licences will be issued for ATC systems and will be subject to spectrum fees based on a future consultation.

31. In the 2GHz MSS Consultation, the Department proposes to remove the obligation for terrestrial licensees to provide dual-mode terminals because this will increase the cost of the terminals compared to terrestrial-only phones and hinder the ability of MSS offerings to compete with cellular mobile systems. However, the Department has rightly maintained the requirement that the licensee deploy MSS in Canada.[12]

32. Omnispace concurs with the Department's proposal that the provision of terrestrial services in the S-band should no longer be required to be ancillary to the provision of MSS services or be required to be provided only in geographic areas where MSS is provided, but that the provision of MSS services must be maintained. As a result, Omnispace submits that the spectrum and licensing policy principles governing the provision of terrestrial services in the S-band should provide as follows:

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[12] 2 GHz MSS Consultation, paragraph 28.

(a) the frequencies used for the terrestrial system will be within the assigned spectrum for a particular MSS network;

(b) the licensee will not be entitled to deploy terrestrial services until such time as it demonstrates that (i) MSS handheld devices are being actively marketed and purchased by Canadians. These handheld devices must support voice and data transmissions; (ii) Canadians can subscribe to the MSS; and (iii) MSS service is operational over the entire licensed service area;

(c) terrestrial mobile service will be required to cease operation, within a reasonable period, should the mobile-satellite service or network be discontinued;

(d) terrestrial operation will be authorized such that its deployment must not constrain the deployment of MSS;

(e) terrestrial operations will be subject to technical and operational requirements considered appropriate to mitigate potential interference;

(f) complete applications as radiocommunication carriers will need to be submitted to seek authorization to operate a terrestrial mobile system. Specific information will be required as part of the applications to demonstrate adherence to policy, operational and regulatory principles; and

(g) spectrum area licences will be issued for terrestrial systems and will be subject to spectrum fees based on a future consultation.

(iii) Protection of MSS from Harmful Interference

B-4 Industry Canada proposes that the deployment of ATC service not constrain the deployment of MSS.

33. Omnispace supports the principle that MSS services must be protected from harmful interference from the deployment of terrestrial services and that the provision of terrestrial services in the S-band must at all times be coordinated with MSS services.

34. However, Omnispace anticipates that the possibility of such interference is not great, given that the geographic areas in which MSS will be provided will be fairly distant from the areas in which terrestrial S-band services will be deployed.

C. Case for Reconsideration of the Proposed Licensing Approach

35. As demonstrated above, MEO systems and the Omnispace system in particular, are uniquely poised to meet unmet demand for broadband services across a diverse range of commercial, public sector, defence and scientific community users. This not only diversifies but strengthens its business case.

36. However, the truly ubiquitous global footprint of a MEO system means that the MEO business case and the drivers behind it do not stop at the borders of any one country or continent. The movement of the satellites over other regions of the Earth enables the non-GEO Omnispace system to serve other markets, thereby creating global benefits.

37. In turn, the global nature of the MEO enterprise requires a nuanced consideration of the impact that this will likely have on the development of the LTE device ecosystem. ***The device ecosystem for LTE will continue to develop to accommodate 10 MHz by 10 MHz deployments.***

38. At paragraph 38, the Department states that “because of the uncertainty regarding the characteristics of the [handset] ecosystem” and its belief that “aligning the MSS and terrestrial spectrum with the United States increases the likelihood of a handset ecosystem capable of operating in Canada”, it reasons that the only licensing approach that is available is one that “aligns” with those issued in the United States. The licensing approach espoused by the Department would result in the extension of the current licences for 20 MHz of spectrum (one for MSS and the other for MSS/terrestrial) to a full 40 MHz of spectrum each.

39. Omnispace submits that the Department appears to have taken an unduly restrictive view of the drivers of the future operationalization of the S-band, both in terms of the globally leveraged business case of MEO systems, and the likely drivers of the development of a global LTE device ecosystem. Furthermore, and ironically, if, as all indicators currently suggest, the U.S. operator does not in fact deploy MSS in the S-band, the proposed licensing approach would undermine the overriding policy objective of bringing the approximately 1 million unserved and underserved Canadians into the digital age.

40. Due consideration of these factors, as discussed in further detail below, should tilt the balance in favour of adopting competition as the principal means to protect the interests of users throughout Canada, including in its unserved and underserved regions.

(i) Global Business, Global Device Ecosystem

C-1 Industry Canada proposes to extend the spectrum assigned in existing 2 GHz MSS licences and ATC authorization to 2000-2020 MHz and 2180-2200 MHz.

C-2 Industry Canada proposes to issue new spectrum licences to incumbent 2 GHz licensees, with terms commencing on April 1, 2015, that reflect the proposed revisions to the band plan and new conditions of licence if a letter indicating interest is received from both incumbents.

41. At paragraph 25 of the 2 GHz MSS Consultation, the Department argues that the "available technology ecosystem in Canada is mainly guided by the U.S. market, as the Canadian and U.S. allocations differ from other countries. Ensuring that devices designed to operate in the United States are also usable in Canada" appears to have been a primary consideration for the Department in its proposed licensing approach in the S-band.

42. The prospective breadth and depth of the handset ecosystem are, as the Department argues, important to both the speed of deployment and the likely attractiveness of the operator's commercial offer. However, the depth of the handset ecosystem for a given

band are determined at a global scale, as handset vendors seek to optimize device band capabilities to serve multiple operators across markets at maximum volumes.

43. A MEO system, serving a range of countries, including emerging markets with large addressable customer bases, has a greater immediate prospect for creating an attractive user device ecosystem than a GEO operator serving a single market, both for MSS terminals and MSS/terrestrial terminals. A MEO system like Omnispace's can serve multiple geographies around the world with targeted MSS services and robust terrestrial services.

44. To this point, Omnispace is leveraging its space assets to form relationships with several operators in a number of countries. This multi-operator global approach is what vendors find most compelling: the opportunity to utilize a device developed for an operator in one geography for other operators around the world. Furthermore, Omnispace's plan to support a broad range of distinct user groups will expand the device ecosystem to include many more types of devices.

45. By licensing this band to a GEO operator, the Department would be significantly reducing the opportunity for vendors to support the Canadian device profile, thereby sub-optimizing device variety, capability and cost for Canadian MSS and terrestrial users.

46. If the U.S. operator replicates the path it has taken in the U.S. for the Canadian market, it is highly unlikely that a usable MSS or MSS-terrestrial device ecosystem of any kind will develop. As stated above, it is not clear that the U.S. operator will deploy MSS in the S-band. If no MSS services are deployed in the United States, the U.S. operator would either have to modify the current 3GPP Band 23 standard or replace it with another specifying the full 40 MHz of S-band for downlink use and incorporating a new, as yet unknown, uplink band. This new uplink band would be determined based on auction and/or commercial transactions that have not yet taken place. In effect, this approach would dramatically *decelerate* any deployments by the U.S. S-band operator in Canada and eventually lead to no MSS being possible, given the lack of a standardized MSS uplink band. Furthermore, the chipsets and RF device components that would be developed to support the U.S. operator's terrestrial U.S. operations would not be usable to

support MSS services in the 20 MHz + 20MHz configuration that is contemplated in the 2 GHz MSS Consultation.

47. In other words, the likely direction of the U.S. operator would diverge from the Department's goal of creating a robust ecosystem for the provision of MSS and terrestrial services in the S-band in Canada.

(ii) Sufficiency of 10 MHz + 10 MHz

48. Another constraint that the Department appears to have accepted as a given to justify its proposed licensing approach is that in the United States, all devices operating in the S-band will use 20 MHz + 20 MHz.

49. Omnispace expects to support MSS operations, wholly or in part, on the same spectrum that will be used to deploy terrestrial LTE in the band, making use of a range of technologies and techniques to eliminate or mitigate self-interference. Given our intentions for the band, Omnispace has investigated device ecosystem considerations, including potential device partners and channelization configurations.

50. Having done so, Omnispace finds the assumptions and premises underlying the Department's understanding of the drivers of LTE device development in the S-band (and in other bands) questionable on a number of different fronts.

51. First, *20 MHz channel bandwidth will not be a driver for operationalising the S-band.* The E-UTRA (LTE) standards permit use of a range of specified channel bandwidths ranging between 1.4 and 20 MHz. Globally, a significant portion of the spectrum authorized and band-standardized for LTE and the majority of current Frequency Division Duplex ("FDD") LTE deployments are in blocks of 10 MHz. In North America, which currently represents the largest share of LTE subscribers worldwide, all current LTE deployments are in spectrum blocks of either 10 MHz or 5 MHz. Tellingly, the upcoming AWS-3 U.S. spectrum auctions will offer blocks mainly of that size and no blocks of 20 MHz. Thus, while a 20 MHz channel bandwidth is in theory interesting, this configuration will not be a global standard or drive device specifications for LTE in the S-band or other bands.

52. Even if device profiles for the S-band are developed to support 20 MHz channelization, *any band specified in 3GPP to support 20 MHz channelization would also support 10 MHz and other channel bandwidths.* There are a handful of bands that, in certain regions, are currently specified for 20 MHz channelization.[13] However, in the regions in question, these bands are also specified to support 10 MHz channelization and other channel bandwidths. Thus, were the U.S. operator to configure its U.S. S-band spectrum for 20 MHz by 20 MHz operation, the same band standard would also include 10 MHz and other bandwidths, thereby enabling standard-compliant devices operating in 10 MHz by 10MHz channels. It is also important to note that the current standard for Band 23 (the LTE profile of this band) supports 5 MHz and 10 MHz channels, but not 20 MHz channels.

53. Third, *a device that supports 20 MHz LTE operation in the band could support 10 MHz operation with minimal modification.* Modems within LTE device chipsets typically support all LTE channel bandwidths. Thus, a chipset that supports 20 MHz operation in a band in one market can support the same band's operation on 10 MHz (or other bandwidths) in other markets. User devices built for one channelization can be used for another channel configuration in all respects through the use of comparatively straightforward and inexpensive RF front end components such as filters and duplexers.

(iii) Interference Considerations

54. At paragraph 38 of the 2 GHz MSS Consultation document, the Department also states that in order "to prevent interference, the ATC licence must be awarded to an MSS licensee, or an entity with business agreements with an MSS licensee."

55. Omnispace is perplexed by two aspects of this statement. First, Omnispace does not understand how the policy objective of ensuring viable MSS services in Canada's rural

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[13] Frequency Division Duplex ("FDD") networks deployed in 20 MHz FDD are in high-frequency (≥2.5 GHz) spectrum, mostly in Hong Kong, Taiwan, and Russia. LTE deployments in North America and most other markets are all on either 10x10 and/or 5x5 MHz carriers. As the LTE standard evolves, some operators plan to aggregate carriers in non-contiguous spectrum to form synthetic 15 or 20 MHz carriers, either symmetric or asymmetric, and Omnispace and/or other licensees might later elect to deploy in this manner < online: http://en.wikipedia.org/wiki/List_of_LTE_networks >

and remote and farthest northern areas would be achieved by bifurcating the licences for MSS and MSS/terrestrial services. Second, Omnispace questions the premise that interference mitigation concerns dictate that only one satellite system can operate in the band.

56. In regards to the first point, space infrastructure is expensive – the Omnispace system represents over US$1.5 billion in invested build and launch capital. In order to leverage this infrastructure into a viable business, operators in the band require the use of the spectrum asset for MSS and terrestrial services, optimized on a geographical basis. While the proposed policy framework appears to recognise this fact, the licensing framework fundamentally undermines it by proposing to bifurcate the MSS and MSS / terrestrial authorizations to two different entities, respectively. If this aspect of the licensing framework is maintained, it lowers the probability that any independent business (whether urban or rural), will be commercially viable. It also greatly diminishes the prospects of enabling service to the currently unserved / underserved citizens in the rural, remote, and farthest northern areas of Canada, a stated goal of the proposed policy.

57. With respect to the Department's interference argument, there is no justifiable concern that precludes the operation of two MSS satellite systems in the S-band.

58. To be clear, Omnispace assumes that the interference scenario that most troubles the Department is the scenario where the U.S. operator in the S-band is providing terrestrial services south of the border, and a third-party Canadian licensee in the band (such as Omnispace) is providing MSS services.[14]

59. Omnispace understands the potential for co-channel interference between licensees in adjacent jurisdictions. It further understands better than most the need for beam-by-beam coordination for co-channel MSS and terrestrial uses in geographically proximate locations.

[14] Omnispace would concur with the view that (i) terrestrial adjacent channel operation by two different licensees in the same area and (ii) terrestrial co-channel operation by two licensees in adjoining geographic areas are by now commonplaces that are addressed through well-known coordination and interference mitigation techniques.

60. In this regard, Omnispace notes that from a technical perspective, there is absolutely no impediment to achieving full beam-by beam coordination.

61. Moreover, such beam-by-beam coordination between co-channel MSS and terrestrial uses has been achieved in L-band systems around the globe.

62. In addition, practically speaking, Omnispace anticipates that there will be limited instances in which such coordination will be required. This is so because (i) it is not anticipated that the U.S. operator will provide MSS services in this band; and (ii) the MSS services that Omnispace intends to provide in Canada would largely be provided in northern Canada, rather than at the border, where the U.S. operator will be providing terrestrial services. In these circumstances, the risk of MSS to terrestrial co-channel uses appears slim at best.

(iv) Proposed Flexibility re Up or Downlink Use of 2000-2020 MHz Band

C-3 Industry Canada proposes that the ATC licensee be allowed to decide if the use of the band 2000-2020 MHz will be for uplink or downlink operations and notify Industry Canada by May 20, 2016; and further proposes that the decision apply to all of Canada and for the rest of the licence term.

63. Please see the comments provided above in Section III.A.1, in relation to the band plan.

(v) Licence Service Areas

C-4 Industry Canada proposes a Tier 1 Service Area for the MSS and ATC spectrum licences.

64. Subject to Omnispace's concerns above in respect of the Department's proposal to issue spectrum licences for 40 MHz each, Omnispace supports the Department's proposal to issue licences that are *national* in scope.

(vi) Conditions of Licence

A. 20-year licence term

C-5 Industry Canada proposes that spectrum licences in the 2 GHz band have a licence term of 20 years.

65. Subject to Omnispace's concerns above in respect of the Department's proposal to issue spectrum licences for 40 MHz each, Omnispace supports the Department's proposal to issue licences with terms of duration of 20 years.

B. Restriction on transferability

C-6 Industry Canada proposes that the licensees not be permitted to transfer any of the ATC spectrum to a large wireless service provider for the term of the licence. For any other transaction, the transferability and divisibility provisions outlined in Section 5.6.4 ofCPC-2-1-23 will apply to any ATC spectrum transfers.

66. Omnispace has no comment on Proposal C-6 at this time.

C. MSS deployment obligations

C-7 Industry Canada is proposing deployment obligations for MSS licensees, within 5 years, to ensure that MSS is available and being offered throughout Canada.

67. At paragraph 62 of the 2 GHz MSS Consultation, the Department proposes that within five years of the issuance of MSS licences to the incumbent licensees in the S-band, the MSS licensees will be required to demonstrate that they have met the following deployment objectives:

    1. MSS handheld devices are being actively marketed and purchased by Canadians. These handheld devices must support voice and data transmissions;

2. Canadians can subscribe to the MSS; and

3. The service is operational over the entire licensed service area.

68. As stated above, Omnispace considers the MSS deployment obligations to be weak, particularly when one considers that the licensees are being granted a monopoly over a full 40 MHz of spectrum.

69. Omnispace proposes that in addition to the foregoing five-year MSS deployment obligations, the licensees of S-band spectrum be precluded from deploying terrestrial services until such time as they have demonstrated that they have met the three MSS deployment obligations set out above.

70. Omnispace submits that weak deployment targets, combined with the conferral of a monopoly over S-band frequencies will lead to higher prices and less choice for users, particularly those in Canada's currently unserved / underserved remote, rural, and farthest northern areas.

71. Omnispace already has a fully operational satellite capable of providing service and is therefore poised to provide MSS services immediately for about 20-25 per cent of the day during which time the satellite is over Canada. Services will begin with scheduled communications to users and Machine to Machine (M2M), non-time critical applications.

72. In addition, as stated above, Omnispace has additional satellites in advanced stages of construction. Omnispace plans to complete these additional MEO satellites to enable their rapid launch, thereby augmenting the constellation. Services would have enhanced resiliency and a growing percentage of availability during this period. The MEO architecture provides services immediately which then grow as additional satellites are deployed.

73. As a result, Omnispace sees no reason why the deployment objectives for MSS should not be strengthened.

D. Emergency provision

C-8 In case of an emergency leading to the lack of availability of the satellite for the provision of the MSS, Industry Canada proposes to give the satellite operator 48 months to replace the satellite in order to continue MSS operations.

74. At paragraph 63 of the 2 GHz MSS Consultation document, the Department states that

> [i]n the case of an emergency leading to lack of availability of a satellite for MSS in Canada, such as a catastrophic failure of the satellite, the Department proposes to give the operator 48 months to replace the satellite in order to continue MSS operations. Back-up arrangements with foreign satellite operators could be made, with appropriate authorization. Failure to replace the satellite service within the given period could lead to a revocation of the MSS licence.

75. This discussion points to another of the inherent technical and service quality advantages of MEO systems. A well designed MEO system has the advantage of resiliency over a comparably provisioned GEO system. While a GEO satellite creates a network in its coverage area, it is inherently vulnerable to a satellite failure, whereas a MEO system only suffers some graceful degradation.

76. With a MEO network, coverage is achieved through the contributions of multiple satellites as each moves, in an overlapping pattern, over the coverage area and across the surface of the globe. In a MEO system, if one of those satellites fails, the coverage is slightly reduced. Short temporal gaps may be created depending on user conditions, but the overall capability is maintained until a replenishment satellite is launched. Moreover, because of the lower, mid-earth orbit of satellites in a MEO system, the cost and time to launch replacement satellites is comparatively more advantageous than the metrics for re-launch of a GEO satellite. Thus, in cases where a lower look angle can be tolerated, even in the case of the failure of a satellite in a MEO constellation, coverage will likely be maintained at its pre-failure percentage.

77. Given the inherent advantages of the MEO architecture of the Omnispace system and the timelines to full refurbishment and launch of the additional Omnispace satellites, should the Department reconsider its licensing approach and provide Omnispace with the opportunity to obtain 20 MHz of 10MHz by 10 MHz spectrum in the S-band, neither the

Department nor the people of Canada will need to contemplate the possibility of a lack of MSS service due to the age or failure of the satellite infrastructure in question.

E. Terrestrial deployment obligations

C-9 Industry Canada proposes that the ATC licensee be required to demonstrate that, within 5 years, MSS is available and being offered in the Tier 1 area; this condition would apply for the term of the licence provided that the EchoStar T1 satellite or its replacement is operational.

C-10 Industry Canada is proposing deployment obligations for ATC licensees, within 5 years and 10 years, as specified in Annex C.

78. Omnispace as has no comment on the terrestrial deployment obligations proposed by the Department.

C-11 Industry Canada proposes that an interim site licensing procedure be used for radio stations operated by the ATC licensees until a spectrum licence fee is finalized.

79. Omnispace has no comment on Proposal C-11 at this time.

D. Technical Rules

D-1 Industry Canada proposes to develop technical rules for the 2 GHz band, harmonizing with the U.S. rules to the extent feasible and to issue the applicable SRSP and RSS.

80. Omnispace supports the proposed Technical Rules. The proposed Technical Rules reflect the Department's acknowledgement that in order to realize the potential of MSS S-

band deployment in Canada, the MSS licensee must be allowed to leverage the deployment of MSS services in geographies that currently enjoy little to no terrestrial broadband deployment with terrestrial services in more densely populated areas.

81. In particular, when the lower A and B blocks are used for MSS uplink operations (see Omnispace's discussion above under the heading "Band Plan" at section III.A), Omnispace understands and is supportive of the required coordination and acceptance of certain potential out-of-band interference from the neighbouring H-block into the lower A and B blocks. Omnispace's multi-faceted MSS/hybrid and terrestrial offerings could dynamically operate within such constraints, assuming that Industry Canada were to adopt the same or similar limitations.

82. The Technical Rules appear to be consistent with the policy proposals in the 2 GHz MSS Consultation and as such, Omnispace is supportive of these Technical Rules. However, as detailed above, in the view of Omnispace, the Department can better achieve the policy proposals contained in the 2GHz MSS Consultation through a licensing approach that will result in two allocations of 20 MHz of spectrum each, rather than the proposed allocations of a single joint allocation of 40 MHz of spectrum to the existing MSS and MSS/ATC licensees in the band. This would enhance competition in both MSS and terrestrial mobile services, while enabling better quality and assured MSS services across the entire Canadian coverage area.

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