



AVIAT NETWORKS
4 Bell Drive
Hamilton International
Technology Park
Blantyre
Glasgow
G72 0FB
Phone: +44 7740 671232

WWW.AVIATNETWORKS.COM

Dear Sirs,

Aviat Networks is pleased to submit its response to your “Consultation on Spectrum Utilization Policies and Technical Requirements Related to Backhaul Spectrum in Various Bands, Including Bands Shared With Satellite, Mobile and Other Services”, SMSE-018-12.

4-4 Is there a continuing need for bands below 3.7 GHz for long-haul systems or could this need be met in bands at 3.7 GHz and above?

In the long term Aviat Networks believes that the bands below 3.7GHz will be used primarily for mobile access rather than backhaul. Consequently demand for long haul will need to be and can be met in the higher bands, e.g. L6GHz, U6GHz etc.

4-6 Are the above definitions still practical in determining what areas are congested (i.e. when technical requirements should be relaxed or tightened)? If not, please explain and provide proposals on alternative definitions and/or measures.

There are no maps or definitions of congested areas. Aviat Networks have asked Industry Canada for this and they say the maps do not exist. Having these maps would allow the use of the more relaxed antenna specifications. Industry Canada’s response was that the congested areas would be discovered during coordination (using MICS?) which is a bit late in the quote and sell process.

4-7 Although a relaxation of antenna pattern is most commonly requested through the application of the GDP guideline, other policy and technical requirements may also be eased. Should the Department specify technical requirements and policies to be relaxed when the GDP guideline is applied in uncongested areas? Please explain and provide proposals on the specific minimum technical requirements that should be relaxed.

Aviat Networks would prefer to quote smaller antennas to expand the use of microwave as a backhaul option. Quoting lower grade antennas on fixed price contracts is very risky under these conditions

5-1 Is there any interest in the deployment of new heavy route backhaul systems or the expansion/growth of existing systems within the band? What is the anticipated time frame?

This frequency band (3700-4200MHz) remains attractive for long haul systems owing to the propagation characteristics at these frequencies.

5-2 Are there technical characteristics or regulatory provisions limiting deployment within the band (e.g. capacity designation)?

Coordination with FSS and the US, the later being a requirement in border areas, are considerations for deployment in this band.

5-3 Provide proposals on specific revisions to policy and/or technical standards to improve usage of the band.

Technical standards should be aligned with the US to in order to provide the necessary market scale in order to develop usage of this band in Canada.

5-4 The Department is seeking comments on deploying fixed two-way backhaul systems within the band 6930-7125 MHz. Please specifically address any technical issues, the feasibility of sharing, as well as any coordination considerations with the FSS and transportable TV pickup operations.

In order to fully share with the TV services the 20MHz channel spacing needs to be respected. Therefore, this would enable fixed services using both 20MHz and 40MHz (2x20MHz) channel widths to share this spectrum.

5-5 Given the demand for additional spectrum, the Department is seeking comments on providing other users with access to all channels, including 30 MHz bandwidth channels within the (7125-7725GHz) band.

Aviat Networks believes that the band should be opened up to all users, including the ability to utilize the 30MHz channel bandwidth.

5-6 As the Department continues to encourage other diversity techniques that are more spectrally efficient, comments are being sought on the continued use of frequency diversity by utilities in this (7125 – 7725GHz) band.

Aviat Networks believes that the continued use of frequency diversity should be allowed by the utilities but not opened up for use by others spectrum users.

5-7 The Department is seeking comments on deploying fixed two-way backhaul systems within the band 8275-8500 MHz. Please address any technical issues, the feasibility of sharing and any coordination considerations with the incumbent services, including Earth exploration-satellite service (space-to-Earth), space research service (space-to-Earth) FSS (Earth-to-space), and one-way fixed services

Aviat Networks would welcome the opening of this band for the FS. However, sharing and coordination considerations should not be underestimated. One way video is a waste of paired spectrum. At present we do not have details of the satellite and space research systems in order to comment on specifics.

5-8 The Department is seeking comments on its proposal to introduce fixed two-way backhaul services within the 12.7-13.2 GHz range, including any technical issues (e.g. preferred channel plan, bandwidths and capacity requirements), sharing and coordination considerations, as well as any other relevant factors regarding the use of this band.

We believe that a similar approach to that recently adopted by the FCC part to share this spectrum with TV pick-up services. Specifically this would be; Channel bandwidths of 12.5, 25 and 50MHz, T/R spacing 225MHz, Max freq tolerance of 0.005%, Max TX power of +50dBW.

5-9 Given the limited requests for VHCM systems, the Department is seeking comments on the introduction of a moratorium on future licensing of new VHCM systems in the (12.7 – 13.2 GHz) band.

Aviat Networks believes that a moratorium on future licensing of VHCM systems is appropriate.

5-10 The Department is seeking comments regarding the low usage of the 18.14-18.3 GHz and 19.3-19.36 GHz portions of the band. Please address any technical characteristics or regulatory provisions limiting deployment, and provide proposals on specific policy or allocation revisions to improve usage within the band.

Aviat Networks believes that when a band plan is fragmented into multiple sections, the smaller sections, especially if not aligned with other regions will not be attractive to either operators or manufacturers due to the limited market opportunities.

5-11 The Department is seeking comments on making the band 31.8-33.4 GHz available for backhaul and is seeking views on equipment availability, considering that the band is not allocated for FS in United States.

Aviat Networks believes that as there will still be legacy DS1 systems that require support we would propose a T/R spacing of 812MHz but with 10, 20, 30, 40, 50, 100MHz channel sizes.

There is also the need to consider the potential future alignment with US should the US open this band to fixed service.

5-12 In addition to backhaul, comments are being sought on other potential FS applications.

Aviat Networks believe that any regulation should simply state point to point and leave the application up to the market place. However we envisage mobile and enterprise urban backhaul will be the primary applications in the near future, but we do not know what the future holds in terms of innovative applications.

5-13 The Department is seeking comments on channelling plans, policy implications, sharing measures and coordination considerations or constraints, architecture (point-to-point, point-to-multipoint or a combination thereof) and anticipated time frames in which this spectrum would be required.

Aviat Networks would like to see the whole of this band allocated to fixed point to point usage as mixed use has a tendency to discourage use by service providers wanting to build a wide spread reliable network. Channel aggregation should be allowed as it is an effective way of satisfying the demand for more bandwidth. Link by link licensing should be used as block/area licensing has the effect of tying up large amount of spectrum for the exclusive use of one user thus preventing its wider use for the benefit of all. Finally we would like to see this band made available in the shortest possible time frame.

5-14 The Department is seeking comments on the lack of usage to date within the 38.4-38.6 GHz portion of the band. Are there technical characteristics or regulatory provisions limiting deployment within this portion of the band?

The 38.4 - 38.6GHz portion of the band is too small to support the necessary duplex spacing for FDD systems, thus meaning this spectrum segment is too small to be practical use.

5-15 The Department is also seeking comments on its proposal to allow fixed two-way systems within the 38.4-38.6 GHz range. Please include any technical issues, sharing and coordination considerations with other services, preference regarding duplexing methods, and other relevant factors.

Owing to the small size of this section of spectrum, Aviat Networks believes that two-way systems would be limited to TDD operation.

5-17 The Department is seeking comments on whether deploying fixed systems in the band 40.5-43.5 GHz should be permitted. Factors such as potential applications, anticipated time frames, sharing constraints, mitigation measures and/or coordination considerations with other services, including radio astronomy and future HDFSS applications, are of particular interest. As well, comments are being sought on whether this band should be made available for point-to-point, point-to-multipoint systems or a combination thereof.

Assuming the whole band 40.5 - 43.5GHz is made available Aviat Networks recommends a T/R spacing of 1500MHz, with channel widths of 10, 20, 30, 40, 50 and 100MHz.

5-18 The Department is seeking comments on whether additional spectrum is needed for backhaul purposes. Proposals should identify the particular frequency band(s) and address technical requirements, policy

and licensing implications, as well as sharing and coordination considerations. Proposals should also state whether equipment is currently available and provide as much information as possible on the use of such spectrum in other countries.

Aviat Networks believes that the bands 21.8-22.4 GHz and 23.0-23.6 GHz should be opened up to the fixed service and added to the existing 23GHz band spectrum covered by SRSP 321.8. This is justified by the increased demand for shorter range backhaul spectrum caused by increased demand for cellular services especially in business core areas such as Toronto and Vancouver.

Aviat Networks believes that the 57-66GHz has a role for small cell short haul backhaul in conjunction with 71-76/81-86GHz. The oxygen absorption factor at these frequencies is a help with frequency re-use as the application envisaged is short distance, high capacity small cell backhaul. Licensing is required because service providers require a degree of guarantee for quality of service that prior coordination etc provides. However the fee model needs to take into account the effective range of the “average” link rather than be based solely on the amount of bandwidth used.

Aviat Networks believes that link by link licensing as opposed to block/area licensing is the most efficient method of allocating spectrum for backhaul. Link by link licensing allows operators to adjust their network capacity subject to demand more accurately than bidding for an estimated amount of spectrum which may prove to be much more than they require. Additionally block licensing has the unwelcome side-effort of freezing out new market entrants of potentially “ideal” spectrum.

6-1 The Department is seeking comments and proposals on mechanisms to encourage greater spectral efficiencies. Recommendations pertaining to a specific frequency band should identify the band and the proposed minimum spectral efficiency. Recommendations should also address any technical issues or implications and the treatment of existing deployments.

Whilst encouraging increased spectrum efficiency is a good idea, care must also be taken not to construct the rules so tightly that only high bandwidth, data hungry applications are served. If this happens, then microwave technology will not be available for other innovative applications, e.g. low latency links, that may be developed in the future.

The Department is seeking comments regarding the current capacity definitions (see Table 5) and restrictions on system traffic loads:

6-2 Do the current capacity definitions accurately reflect today’s requirements?

Aviat Networks believe that table 5 should be updated as follows to more clearly represent current trends:

| Table 5: Definitions of System Capacities RF Channel Capacity a,b | Traffic Load (Mbit/s)c | |
|--|-------------------------------|---------|
| Low-capacity (LC) | ≥ 50.0 | ≤ 100.0 |
| Medium-capacity (MC) | >100.0 | ≤ 150.0 |
| High-capacity (HC) | > 150.0 | |

6-3 Is there still a specific requirement for LC- and/or MC-only bands, or should the current restrictions on the use of higher capacity systems in such bands be reconsidered? Please address specific bands, implications on usage and deployment.

Retain the status quo with respect to which bands are designated LC and MC.

6-4 Assuming that capacity restrictions are retained, the Department is seeking comments on the RABC’s request to allow MC systems specifically within the 10 GHz band, including any implications that this may have on future usage and deployment.

Yes, current technology allows medium capacity systems to utilize the quoted bandwidths.

The Department is seeking comments on defining minimum antenna characteristics:

- 6-5 Please provide proposals on specific frequency bands for which the Department may wish to review the minimum antenna characteristics. The proposals must include specifics for new standards, including maximum beam width, minimum gain and maximum off-axis emissions or radiation pattern envelope. Address any implications to existing licensees and the radio environment, future deployments, spectrum sharing and congestion.**

In the 42GHz band and below Aviat Networks believe that the minimum antenna standard should align with ETSI class 3.

In the 55GHz and above bands the propagation characteristics together with the desire to use systems for short haul means that even before antenna characteristic are considered these systems are being deployed with frequency re-use in mind. Consequently antenna requirements can be relaxed when compared with those recommended for 42GHz and below.

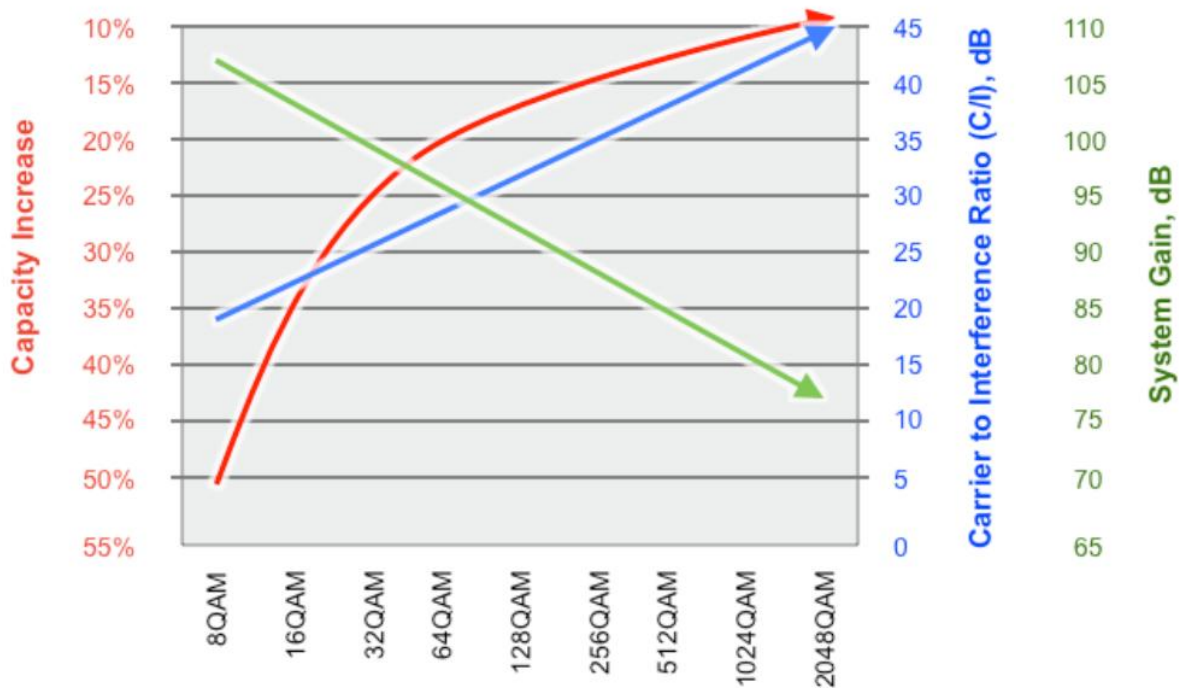
Note: ETSI antenna classes are defined in EN 301 217-4-2

- 6-6 Are there specific technical considerations or requirements that the Department should consider in order to mitigate any potential of increased interference or congestion if minimum antenna characteristics are relaxed or conversely, implications should these characteristics be made stricter?**

Interested parties are invited to provide any other comments that may be relevant to antenna characteristics and standards.

- 6-7 The Department is seeking general information on new equipment advances or technologies that can ease the growing capacity issues on backhaul systems.**

The move to ever higher modulation rates e.g. 1024QAM will drive system capacity increases. 2048QAM and even 4096QAM are beginning to be seen. However there is a diminishing rate of return with the very high modulation rates as you move up the modulation index as soon in the diagram below.



The higher frequency bands with the ability to support larger channel bandwidths will also enable greater capacity links to be constructed.

However, care must also be taken to construct the rules to accommodate various bandwidths, various frequency bands so that microwave technology will be able serve many form of innovative applications that may be developed in the future ranging from applications with very large amount of data to applications with bursty type of data.

6-8 The Department is seeking comments on whether the use of the following techniques should be considered as standard. Please address any resulting technical, policy or spectrum management issues, any sharing or coordination considerations, as well as any implications on congestion, frequency reuse or the radio environment as a whole.

a. Radio systems that employ adaptive modulation, noting that during adverse propagation conditions, the systems' spectral efficiencies may fall below the specified minimums.

Adaptive modulation is a valuable technique that should be allowed in all fixed link bands. However there are situations where its use is not appropriate and for this reason it should not be mandated.

b. Radio links that use CCDP to effectively increase the capacity over the same channel.

CCDP increases link capacity but make future coordination more difficult because polarity can no longer be used for coordination issues and as such its use should not be mandated.

c. Systems that make use of channel bonding to effectively increase the available bandwidth.

Channel bonding should be allowed where feasible

d. Other planned or available types of radio equipment technology to ease capacity issues.

In general, new transmission techniques should be allowed and encouraged wherever feasible.

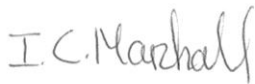
6-12 The Department is seeking comments on the need for additional flexibility or other updates to policies and/or standards to promote flexible and efficient use of wireless backhaul services. Please provide specific situations and criteria under which greater flexibility of spectrum use may be afforded, addressing any technical implications, sharing and coordination considerations, as well as any impact on the interference environment and congestion levels.

Fees should take into consideration both throughput and path length.

6-13 The Department is seeking general comments on the need to introduce one-way transmissions in certain bands where the use of a two-frequency plan is currently a regulatory obligation. Please specify the frequency band and address any technical, sharing and coordination issues.

One way systems can be used to fill in the gaps left by other one way system in certain bands, e.g. 6930-7125 MHz (Q5.4) & 12.7-13.2 GHz (Q.5.8), in order to fully utilize the available spectrum. Their introduction into bands that are fully assigned and used in a FDD duplex plan is less desirable as it would lead to unused and potentially usable spectrum.

Yours faithfully

A handwritten signature in black ink that reads "I.C. Marshall". The signature is written in a cursive, slightly slanted style.

Ian Marshall
Regulatory Manager