



Agence spatiale
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Canadian Space
Agency

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March 29, 2017

Mr. Martin Proulx
Director General,
Engineering, Planning and Standards Branch
Innovation, Science and Economic Development (ISED) Canada
235 Queen Street, Ottawa ON, K1A 0H5

Dear Mr. Proulx

The Canadian Space Agency has reviewed the document "*Consultation on the Technical and Policy Framework for Radio Local Area Network Devices Operating in the 5150-5250 MHz Frequency Band (SMSE-002-17)*", issued in January 2017, with considerable interest. We are happy to be able to give our views on the Consultation to Innovation, Science and Economic Development (ISED) Canada.

As you are fully aware, CSA has been operating the RADARSAT-1 and RADARSAT-2 Earth exploration satellite systems in the 5 GHz band for many years, and is planning to operate RADARSAT-3 (RADARSAT Constellation Mission, aka RCM) as well as the next generation planned RCM in 5 GHz band, as it is further explained in the attached document. For the reasons given in the attachment, we are very interested in the Canadian policies for the use of the 5 GHz band, particularly the sub-bands between 5250 MHz and 5570 MHz,

In general, we fully support the Department's efforts to review the existing Spectrum Management and Telecommunications Policies when all necessary technical information is available. However, CSA would like to add that it is not in favour of any changes in policies related to the use of 5GHz in Canada at this time, since it believes that any ruling by the Department on spectrum issues subject to Agenda Item 1.16 of WRC-19 would pre-judge the results of studies within the Canadian Preparatory Committee for WRC-19, the Canadian proposals and positions for the Conference, as well as the outcome of the Conference.

As a result, we cordially request the Department to wait for the conclusion of WRC-19 Conference before considering any changes as proposed in the above mentioned Consultation paper.

Yours sincerely,

Daniel Gratton

Gestionnaire, Hyperfréquence et communication | Manager, Microwave & Communication

Développement de l'utilisation de l'espace

Space Utilization Development

Agence spatiale canadienne | Canadian Space Agency

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Attach.



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Attachment

The Canadian Space Agency's Response to Industry Canada Related to SMSE-002-17

1. Background

The Canadian Space Agency (CSA) is pleased to be able to provide its comments to Innovation, Science and Economic Development (ISED) Canada in its review of SMSE-002-17.

Canada currently operates active Earth Exploration Satellite Service (EESS) through the Radarsat-2 (RS-2) satellite and is in the process of implementation of the Radarsat Constellation Mission (RCM). These satellites utilize the central portion (5 350 - 5 470 MHz) of the 5 GHz band allocated to EESS. RS-2, RCM, as well as the European Sentinel-1 Constellation have been designed to operate in this portion of the 5 GHz band where there is no mobile service allocation with the expectation of free from potential radio frequency interference.

The design and operation of this type of satellite networks require large investment in the multiple billion-dollar range, and must be protected from interference. In addition, future user needs for high-resolution imaging (one-meter resolution in range) will require the use of the complete 320 MHz (5250 – 5570 MHz) C-band range of frequencies currently allocated to EESS.

Canada's rationale for selection of 5 GHz Synthetic Aperture Radar (SAR) from onset, and investing heavily in it, is due to the fact that C-band range of frequencies represent excellent cost-performance compromise compared to using L-band and X-band SARs, specially noting that C-band SAR has advantage over other frequencies due to its larger degree of penetration, ice detection capability and soil moisture measurements. C-band signals can penetrate vegetation to a depth critical for Canadian applications.

Should wide band spectrum at C-band no longer be available for Space-based Earth Observation because of the possible interference caused by RLAN devices, Canada would have to face economic, operational, scientific and policy development impacts. Canada would have no choice but to switch to another frequency band. Aside from the sunk costs in the current capability, foreign companies currently have the competitive advantage in the other bands and Canada would be faced with the very real possibility of buying satellites or data services from foreign providers rather than Canadian. That is, there will very likely be a loss in autonomy by relying on outside sources of information, which in turn will have an impact on policy development and decision making for accessing reliable data that will be necessary for many aspects of Canadian lives, including security of the country and establishing Canadian sovereignty over the entire Canadian territories. Another important impact would be the possible loss of correlation of image data with other international systems operating at C-band.

Canada needs to use the full 320 MHz allocated bandwidth to EESS (5250 -5570MHz) in its planned Next Generation RCM for increased accuracies in deterministic and statistical measurements of physical and biophysical quantities of scattering targets, including classification, detection and identification.



While a better resolution is necessary for land masses and cities in case of a disaster and emergency, there is also a requirement to detect smaller ship in proximity of the Canadian harbors in the future. Detection of ships requires the averaging of multiple pixels to provide good detection and acceptable false alarm rates. Current RCM design uses only 100 MHz to achieve detection of 25 meter ships. However, there is a significant need nowadays to have images with higher resolution using wide swaths. Achieving a 1-meter range resolution (cross-track) would require the use of the whole 320 MHz available bandwidth. That is, security and intelligence applications would be significantly improved with a 320 MHz system because of sharper images.

In conclusion, augmenting the current resolution at C-band would be the best solution for Canada, and it is more economical than developing the infrastructure for two different systems to fulfill both wide area monitoring and high resolution imaging for security and intelligence applications.

**Canadian Space Agency views and input on
Consultation on the Technical and Policy Framework for Radio Local Area Network
Devices Operating in the 5150-5250 MHz Frequency Band
SMSE-002-17**

In the above Consultation, the Department sought comments on the following points:

- A. the demand for and benefit, if any, of allowing HPODs in the 5150-5250 MHz frequency band before WRC-19.
- B. the potential impacts on domestic and foreign satellite systems in the 5150-5250 MHz frequency band of authorizing HPODs use prior to WRC-19 on the basis of a maximum e.i.r.p. of 4 W. Requirements for an elevation mask towards satellites and an exclusion zone of 25 km around receiving earth stations to protect all satellite systems would likely also apply.
- C. should the Department proceed to authorize HPODs use prior to WRC-19, what regulatory approach would best ensure a balance of timely deployment and the protection of other existing and future services in the 5150-5250 MHz frequency band? Also, indicate any and all considerations that should be given to equipment standards, technical requirements, eligibility criteria and/or conditions of licence depending on the relevant approach.

The Canadian Space Agency (CSA) cordially submits the following comments on the above points:

2. General comments

The Canadian Space Agency (CSA) fully supports the 3rd approach proposed by the Department in paragraph 28 of the Consultation; that is “*defer the review of Canadian HPOD rules until 2020*”.

CSA notes that RLAN devices are unlicensed consumer products. As a result, CSA is concerned that Canada would practically reach to the point of no return if the Department makes a decision re HPOD and expansion of devices in 5250-5350 MHz (per paragraph 21 of the Consultation) when the nature of interference into the incumbent services are not well understood and if it is proved later that the interference caused by RLAN devices is excessive and harmful.



CSA recognizes the benefits of economies of scale of consumer products, which are achievable with international harmonization. We also understand that the Canada's general policy is to harmonize its spectrum usage and technical requirements with the international community, in accordance with the decisions reached in a World Radiocommunication Conference.

CSA views that the technical and operational parameters used in the sharing studies to date have been based on the characteristics of RLAN devices as defined in IEEE 802.11. When the technical parameters and characteristics for other types of RLAN technologies (e.g. LTE/LAA etc.) are understood, there will be a need to review the overall sharing studies in order to gauge the impact on incumbent services. This view is in line with the understanding within ITU Working Party 5A that is responsible for Agenda Item 1.16.

As a result, we are of the view that the best approach that the Department could take at this time to ensure that the integrity of the incumbent services is properly protected would be to wait for the results of the compatibility studies within the framework of Agenda Item 1.16 activities and the outcome of WRC-19. This is further discussed in the following when addressing the three points given in paragraph 29 of the Consultation.

A. The demand for and benefit, if any, of allowing HPODs in the 5150-5250 MHz frequency band

1. In CSA's view, the stated demand for RLANs is inflated. CSA does not believe in the correctness of extrapolating the results of the studies and spectrum requirements to the Canadian requirements noting that the Canadian population and the area of the country do not justify such an approach in order to arrive at a need for large demand for public and home WiFi hotspots in Canada.
2. CSA believes that there is the risk of harm from interference caused to the incumbent services by HPOD devices including out of band emissions into the band 5250-5350 MHz. This risk outweighs any benefit of allowing HPOD devices at least until after proper compatibility studies are done and the decision of WRC-19 Conference is known on this subject.
3. As a result, there is no need for changes to the Canadian regulations prior to the conclusion of WRC-19 Conference.

B. The potential impacts on domestic and foreign satellite systems in the 5150-5250 MHz frequency band of authorizing HPODs use prior to WRC-19 on the basis of a maximum e.i.r.p of 4W. Requirements for an elevation mask towards satellites and an exclusion zone of 25 km around receiving earth stations to protect all satellite systems would likely also apply.

1. CSA believes that permitting the use of outdoor devices at an e.i.r.p. of 4W, with no regulatory control over deployment levels, will increase the out of band emissions into the band 5250-5350 MHz used on next generation Synthetic Aperture Radar (SAR) missions. As a result, the aggregate interference could cause a significant increase in the noise seen by an EESS receiver and, thus, making the images practically unusable for many government programs for operational purposes that use the data produced by the Canadian EESS satellite networks. These government programs, including those of Environment and Climate Change Canada, will critically rely on the higher resolution data that future CSA SAR missions will provide in the 5 GHz (5250-5570 MHz).



2. Paragraph 21 of the Consultation states the use of 160 MHz channel bandwidth and implies the use of at least part of 5250-5350 MHz. CSA notes that Radarsat satellite networks use SAR technologies at 5 GHz, allowing 24-hour data collection, regardless of atmospheric or sunlight conditions, which makes this data ideal for use in mapping projects where persistent cloud cover or darkness impede acquisition by optical imaging systems. Radarsat has been the most efficient and effective satellite sensor for detecting flood damages and oil spill due to its sensor's capability of providing interpretable information for first responders in disaster situations. The C-band wavelength is well-suited to provide, by the reflected and scattered signal properties, details of surfaces being imaged, such as forest fire detection, flood delineation and vegetation monitoring. Canada's next generation Radarsat is planned to utilize 5250-5350 MHz in order to improve the image resolution and surveillance mechanism used to exert Canadian sovereignty and provide necessary security for all Canadians. As a result, CSA is very concerned about the intention of Paragraph 21 of the Consultation. Additionally, CSA is concerned about the aggregate RLAN out of band emissions from HPOD devices operating in the band 5150 - 5250 MHz and the potential interference into Radarsat satellite network above 5250 MHz which can result in significant image degradation. As a result, it is unclear as to the appropriateness and effectiveness of the FCC rules cited in the Consultation.
3. CSA, with reference to international EESS 5 GHz satellite networks, notes that Article 6 of the ITU Constitution states:
 - a) The Member States are bound to abide by the provisions of this Constitution, the Convention and the Administrative Regulations in all telecommunication offices and stations established or operated by them which engage in international services or which are capable of causing harmful interference to radio services of other countries, except in regard to services exempted from these obligations in accordance with the provisions of Article 48 of this Constitution,
 - b) The Member States are also bound to take the necessary steps to impose the observance of the provisions of this Constitution, the Convention and the Administrative Regulations upon operating agencies authorized by them to establish and operate telecommunications and which engage in international services or which operate stations capable of causing harmful interference to the radio services of other countries.

C. Should the Department proceed to authorize HPODs use prior to WRC-19, what regulatory approach would best ensure a balance of timely deployment and the protection of other existing and futures services in the 5150-5250 MHz frequency band? Also, indicate any and all considerations that should be given to equipment standards, technical requirements, eligibility criteria and/or conditions of licence depending on the relevant approach.

1. CSA notes that if there is a proliferation of unlicensed outdoor and indoor devices in Canada, then there will be no practical means of removing devices from the market should interference become an issue. CSA believes that any ruling by the Department on the spectrum subject to Agenda item 1.16 of WRC-19 at this time would pre-judge the results of studies within the CPC in preparation for WRC-19, the Canadian position before the start of the Conference, and the outcome of the Conference.



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2. We are not certain if it is useful to change the domestic regulations now noting that they are most likely going to be revisited after WRC-19 Conference.
3. The Canadian Space Agency emphasizes that due to the importance of the Canadian Radarsat satellite networks to Canadians, it is very concerned about the out of band emissions from outdoor devices operating in the band 5150 - 5250 MHz and the potential interference into Radarsat satellite network. To ensure protection of Radarsat, it proposed to refrain deviating from ITU-R Resolution 229.

In conclusion, CSA is particularly concerned about increased interference into its existing and planned Radarsat satellite networks. CSA cordially encourages further independent and technically comprehensive studies before any rule changes are made. It believes that any ruling by the Department at this time on spectrum issues related to WRC-19 Agenda Item 1.16 may 'pre-judge' results of studies within the WRC-19 Canadian Preparatory Committee (CPC), Canadian proposals and positions for the Conference, and the outcome of the Conference. As a result, CSA is opposed to policy or rule changes at this juncture and the precedent that such a policy or rule change may set.