2017 Consultations - ISED Canada

Consultation on Releasing Millimetre Wave Spectrum to Support 5G

Siklu Communication

Sep 13, 2017

Rev. 1.0

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1. Introduction

Siklu Communication, is pleased to submit this document to ISED Canada in the matter of recommended updates for the Radio Standards Specification, RSS-210, as response to the 2017 Consultation on 'Releasing Millimetre Wave Spectrum to Support 5G'

We are specifically addressing "Annex J — Devices Operating in the Band 57-64 GHz", with reference to question ***'8-1: ISED is seeking comments on its proposal to designate the band 64–71 GHz for licence-exempt operations on a no-protection, no-interference basis.'*** Siklu would like to bring a difference to your attention compering to the US FCC "47 CFR 15.255 - Operation within the band 57-71 GHz". That difference currently prevents utilization of emerging P2MP 60 GHz solutions, in Canada.

60 GHz communication links are foreseen to be used access and backhaul applications. Access applications include street level connectivity, urban/suburban fixed broadband residential access ("FTTH") and business connectivity. Backhaul applications include connecting devices such as Wi-Fi access-point, cellular small-cell and smart-city sensor. These applications are compatible with 60GHz equipment short range and small foot print characteristics, which are make street level installations using either P2P or P2MP topology possible. 60GHz equipment may also be used in rooftop to street connectivity, for access applications and as a feeding point for street-level chains.

The links range using beam-steering antennas is limited due to their relatively low gain, to about 200m, and is additionally restricted by the availability of clear line-of-sight. Link operation is strongly protected from interference by line-of-sight blockage (typically by structures and foliage) and by Oxygen absorption which is about 16dB/Km throughout most of the band. There are also secondary protection mechanisms such as the antenna spatial filtering, the low transmit power spread across wide bandwidth, leading to low spectral power density and robust modulation schemes typically being used. To circumvent residual interference and enhance operation reliability, sharing algorithms such as dynamic frequency selection (DFS) and listen before talk (LBT) medium access protocols may be deployed.

Aligning the RSS-210 with the FCC 47 CFR 15.255, will allow P2MP cost effective implementation, with no technical issues described at our technical annex, based on widely available standard chipsets from various vendors.

2. Difference between 60 GHz Canadian ISED regulations and the US FCC

2.1 Canada 60 GHz ISED regulations RSS-210 [Issue 9, August 2016]

At ISED's RSS-210, Annex J, the relevant phrasing is the following:

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"…For devices located outdoors, the average e.i.r.p. of any emission shall not exceed 82 dBm minus 2 dB for every dB for which the antenna gain is less than 51 dBi. The peak e.i.r.p. of any emission shall not exceed 85 dBm minus 2 dB for every dB that the antenna gain is less than 51 dBi. Compliance testing shall be performed using the highest gain and the lowest gain antennas with which the equipment is certified.

For other devices, the average and peak e.i.r.p., of any emission shall not exceed 40 dBm and 43 dBm, respectively."

2.2 US FCC

At US FCC, 47 CFR 15.255, the phrasing is the following:

"….(b) Within the 57-71 GHz band, emission levels shall not exceed the following equivalent isotropically radiated power (EIRP):

*(1) Products other than fixed field disturbance sensors and short-range devices for interactive motion sensing shall comply with **one** of the following emission limits, as measured during the transmit interval:*

(i) The average power of any emission shall not exceed 40 dBm and the peak power of any emission shall not exceed 43 dBm; or

(ii) For fixed point-to-point transmitters located outdoors, the average power of any emission shall not exceed 82 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi. The peak power of any emission shall not exceed 85 dBm, and shall be reduced by 2 dB for every dB that the antenna gain is less than 51 dBi."

New 60GHz P2MP products do comply with above US FCC b(1)(i).

3. Siklu's analysis "Deployment scenarios and interference analysis using V-band (60 GHz)"

3.1 Highlights:

- Practically achievable beam steering 60 GHz antenna gain is about 20dBi.
- 20dBi is 31dB less than the threshold of 51dBi, and thus max output power should be reduced by 62dB from 82dBm EIRP, to 20dBm EIRP
- 20dBm EIRP allowed for outdoor, is 20dB less than the 40dBm EIRP allowed for other devices
- This forces the antenna gain for outdoor operation to be significantly higher than what is practically achievable using beam steering technology

Above conclusions from our technical analysis demonstrate that even using the practical beam steering antenna gain of 20dBi, probability of having interference is very low.

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3.2 Siklu conducted a technical analysis referring to the following:

- 60 GHz band deployment use cases and characteristics
- Motivation to use P2MP outdoors
- Some insight for V-band exceptional interference immunity
- Interference simulation in rooftop scenario
- Interference simulation in street level scenario

Details are in the attached document:
2017_07_Siklu_Deployment_scenarios_and_interference_analysis_using_V-band.pdf

4. Conclusions

4.1 Rooftop deployment dense P2MP scenario Conclusions:

- Very robust performance in view of the high densities and lack of any planning and use of low gain (21dBi) beam steering antenna.
- The percent of nodes that remain blocked by interference even the their most robust modulation (assumed 4dB C/I) is typically ~1%
- Use of more frequency channels improves the chances for lack of interference
- Real life scenarios are expected to provide even better results due to obstacles to pure LOS propagation
- Rooftop height is not constant across deployment area
- Foliage height often exceeds rooftop height
- Use of LBT protocol
  - LBT protocol is based on verifying there is no ongoing transmission before starting a new transmission
    - Used in many shared media networks (most notably in Wi-Fi)
    - Detection is based on signal strength measurement
  - Adherence to the LBT protocol implies
    - Coexistence between uncoordinated systems (i.e. no unavailability)
    - Some overheads due to media sensing
    - Potential latency for individual links having to backoff
    - Throughput reduction compared to non-interfered case for individual links
  - The less overloaded the channel the smaller are the LBT adverse effects
- LBT enables those remaining links with low C/I to retain high availability at the cost of reduced throughput and higher latency

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4.2 Street level deployment Conclusion

- The analysis is performed on a simplified grid, but results should be valid to a general urban grid and use of low gain (21dBi) beam steering antenna.
- The street structure (i.e. buildings) isolation is the main isolator
- Antenna pattern contribution is secondary as antennas are forced to be aligned to the street direction
- Oxygen absorption plays an insignificant role at such short distances
- Beam-steering antenna results are the same as a regular antenna
- Use of more frequency channels is expected to improve the chances for lack of interference
- Additional means such as LBT protocol and DFS can support uncoordinated use

4.3 64-71GHz ISED Consultation on Releasing Millimetre Wave Spectrum to Support 5G

All above simulations are related to 57-64GHz. Any spectrum addition will enhance the results and thus will further reduce the risk of interference.

Kind Regards,

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About Siklu

Siklu delivers multi Gigabit capacity millimeter wave wireless backhaul solutions operating in the 60, 70 and 80 GHz bands. Ideal for dense, capacity-hungry urban security networks, the ultra-high capacity wireless links can be easily and discreetly installed on the very same street fixtures as the security cameras. The most deployed mmW radios in the world, tens of thousands of units are delivering carrier grade performance in varying weather conditions around the world.

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