January 31, 2020

Ex Parte

Marlene Dortch, Secretary
Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Re:  Unlicensed Use of the 6 GHz Band, ET Docket No. 18-295; Expanding Flexible Use in Mid-Band Spectrum between 3.7 and 24 GHz, GN Docket No. 17-183

Dear Ms. Dortch,


We discussed the power levels that would be required by virtual and augmented-reality body-worn devices in the 6 GHz band. We explained how, given the significant body loss that affects connectivity between body-worn devices, 14 dBm radiated power is the minimum level of power that will reliably enable AR/VR applications. Critically, the fact that a radiated power level of 14 dBm in a 160 MHz channel is necessary to enable a satisfactory AR/VR user experience for VLP devices does not mean that VLP devices will typically or constantly transmit at these power levels. In configurations where body loss is lower, industry-standard dynamic power control features in VLP devices will reduce transmit power to the minimum necessary to maintain the user experience. This will be necessary to ensure that VLP devices have sufficient battery life and will further minimize the risk of harmful interference from VLP devices.

In response to staff questions, we also discussed how existing RLAN technology capabilities, such as carrier-sense functionality, might be repurposed to address certain specific cases put forward by incumbents, but did not present a proposal for consideration.

Pursuant to the FCC’s rules, I have filed a copy of this notice electronically in the above referenced dockets. If you require any additional information, please contact the undersigned.
Sincerely,

[Signature]

Paul Margie
MEETING ATTENDEES

Monisha Ghosh, FCC Chief Technology Officer
Ronald Repasi, OET
Bahman Badipour, OET
Michael Ha, OET
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Hassan Yaghoobi*, Intel Corporation
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Dave Wright*, Ruckus Networks, a business segment of CommScope

Paul Margie, Harris, Wiltshire & Grannis LLP
Paul Caritj, Harris, Wiltshire & Grannis LLP

*Participated telephonically
VLP Use Cases
VLP Background

Very-low-power (VLP) devices are a critical indoor/outdoor device class for enabling next generation services and 5G experiences for mobile peripherals.

Key VLP use cases include personal area network applications such as immersive AR/VR, mobile peripherals, and in-car connectivity.

These devices will be short range and battery powered, with rigorous latency requirements.

VLP devices will require EIRP of 14 dBm, which is -8 dBm/MHz radiated PSD in a 160 MHz channel, to address the very challenging body loss found in typical scenarios.

Three 6GHz European studies performed in CEPT (Broadcom, Facebook and Qualcomm; German Government; and French Government) recently concluded that 14 dBm (with maximum 1 dBm/MHz PSD) will not create harmful interference when used outdoors.¹

VLP Link Budget Analysis

Typical High-Body-Loss Case: Phone in bag or back pocket.

This is typical of many common use cases where body loss is a very significant factor.

VLP must tolerate body loss of 30 dB or more, which is common in real-world use patterns\(^1\).

<table>
<thead>
<tr>
<th>Min sustainable sensitivity for AR/VR applications (160 MHz)(^2)</th>
<th>-74 dBm</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSPL (1 m)</td>
<td>48 dB</td>
</tr>
<tr>
<td>Body Loss for these examples (smartphone in bag or back pocket to AR/VR glasses)</td>
<td>30 dB or more</td>
</tr>
<tr>
<td>Tx.Rx Antenna losses</td>
<td>10 dB</td>
</tr>
<tr>
<td>VLP Radiated PSD</td>
<td>-8 dBm/MHz</td>
</tr>
<tr>
<td>VLP Radiated Power (160 MHz)</td>
<td>14 dBm</td>
</tr>
</tbody>
</table>

2. Full immersive experience will require higher received power levels and will be enabled in situations with lower body loss.
Personal Area Network Body Loss

IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION, VOL. 60, NO. 7, JULY 2012 - On-Body Channel Measurement Using Wireless Sensors

IEEE measurements at 2.4 GHz waist to chest shows median body loss of 30 dB.

Facebook is conducting body loss measurements at 6 GHz.

Body loss at 6 GHz will be greater than for 2.4 GHz due to higher frequency.

Fig. 1. Location of transmitter and receiver antennas used for each on-body measurement in an anechoic environment.