

March 9, 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

On March 5, 2020, Dan Mansergh of Apple Inc., Alan Norman and Thomas Navin of Facebook, Inc., and Megan Stull of Google LLC met with Nicholas Degani, Senior Counsel to Chairman Pai, and Aaron Goldberger, Legal Advisor to Chairman Pai. They discussed the attached presentation regarding very-low-power (“VLP”) devices and reiterated existing points in the record regarding VLP operations.<sup>1</sup> Specifically, they explained that access to unlicensed spectrum within the 6 GHz band for VLP use cases will be critically important to future innovations in augmented and virtual reality (“AR/VR”) as well as advanced peripherals and in-car connectivity. The Commission should permit VLP devices to operate at 14 dBm EIRP. This power level is essential to ensuring that VLP devices are functional in typical high body loss cases—for example, to complete a link between a handset in a purse or backpack and body-worn peripheral devices. As detailed in the attached presentation, this very low power level combined with the characteristics of VLP device operation addresses the risk of harmful interference to fixed service links.

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.

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<sup>1</sup> See Letter from Paul Margie, Counsel to Apple Inc., Broadcom Inc., Cisco Systems, Inc., Facebook, Inc., Google LLC, Hewlett Packard Enterprise, and Microsoft Corporation, to Marlene H. Dortch, Secretary, FCC, ET Docket No. 18-295, GN Docket No. 17-183 (filed Jan. 31, 2020); See Letter from Apple Inc., Broadcom Inc., Facebook, Inc., Google LLC, Hewlett Packard Enterprise, Intel Corporation, Marvell Semiconductor, Inc., Microsoft Corporation, and Qualcomm Incorporated to Marlene H. Dortch, Secretary, FCC, ET Docket No. 18-295, GN Docket No. 17-183 (filed July 2, 2019); Letter from Paul Margie, Counsel to Apple Inc., Cisco Systems, Inc., Facebook, Inc., Google LLC, and Broadcom Inc., to Marlene H. Dortch, Secretary, FCC, ET Docket No. 18-295, GN Docket No. 17-183 (filed Nov. 12, 2019).

Ms. Marlene H. Dortch  
March 9, 2020  
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Sincerely,

A handwritten signature in black ink, appearing to read "Paul Margie". The signature is written in a cursive style with a vertical line to its right.

Paul Margie  
*Counsel to Apple Inc., Facebook,  
Inc., and Google LLC*

Cc: Meeting Participants

Encl.

# VLP Summary

- Apple
- Facebook
- Google

March 5, 2020

# Example Use Case: Mobile Peripherals

- Critical 6 GHz use cases such as immersive AR/VR connectivity and other advanced peripherals will be core VLP applications.
- The connection between AR glasses and a smartphone, for example, would be VLP.
  - LPI rules are inappropriate because they would prohibit outdoor operations for watches, earphones, glasses, and other mobile devices.
  - AFC rules are unnecessary for extreme low powers and would increase costs beyond what the market would bear for peripheral devices.
- These advances will not be practical without VLP rules that support investment.



# Example Use Case: In-Car Connectivity

- Other important VLP uses will occur in vehicles where vehicle penetration loss further reduces the risk of harmful interference.
- These applications include streaming from smartphones to infotainment systems (or vice versa), transmission of navigation data, and other applications.



# 14 dBm EIRP is Essential for VLP

- Typical High-Body-Loss Case: Phone in purse 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.<sup>1</sup>

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

1. *On-Body Channel Measurement – IEEE Transactions on Antennas and Propagation*, Vol. 60, No. 7, July 2012.
2. Full immersive experience will require higher received power levels and will be enabled in situations with lower body loss.



# VLP Can Coexist with FS Operations

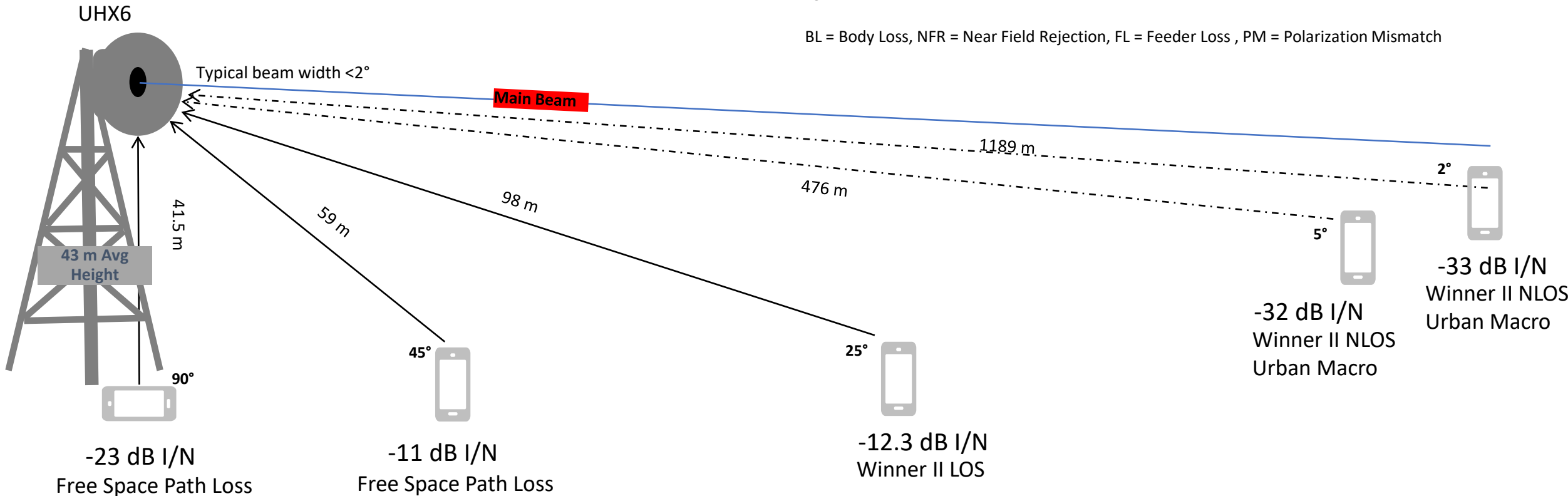
$$\text{Interference} = \text{EIRP} - \text{BL} - \text{Pathloss} + \text{GRX} - \text{OffAxis} - \text{NFR}^* - \text{FL} - \text{PM}$$

-8 dBm/MHz    4 dB
39 dB
2 dB
3 dB

$\text{Pathloss}$ 
 $\text{OffAxis}$ 
 $\text{NFR}^*$

Dominates at longer distances
Dominates at shorter distances

BL = Body Loss, NFR = Near Field Rejection, FL = Feeder Loss, PM = Polarization Mismatch



\* We note that Near Field Rejection was NOT included in this analysis. For a 6' antenna at 6.5 GHz, nearfield losses can occur up to 144 meters distance

# VLP device operation reduces the risk of harmful interference to FS

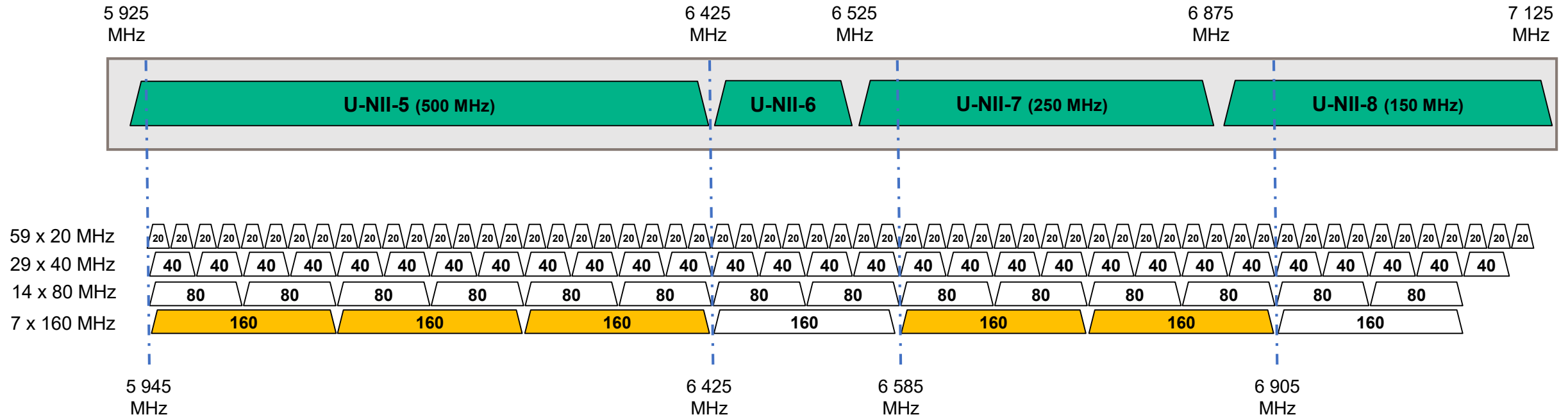
- VLP devices will use *transmit power control* to reduce EIRP to the minimum needed to communicate between devices.
- Majority of VLP portable devices will use *multiple antennas*, both antennas will not exhibit peak gain in the same direction, and peak EIRP in the direction of an FS receiver will therefore be less than the regulatory limit.
- 802.11ax *channel selection* will automatically seek to avoid channels with FS signals present. The lower the antenna height of the FS, the more energy from the FS signal on the RLAN, which will lead to the RLAN selecting a different channel.
- 802.11ax *multi-band operation* will select 5 GHz over 6 GHz when there is significant body loss that needs to be overcome.
- The *dynamic nature of VLP operation* - body worn and in-vehicle devices are moving - will also serve to reduce the risk of harmful interference.



# CEPT and UK Ofcom support 14 dBm

- In EU 6 GHz proceedings, three European studies (Broadcom, Facebook, and Qualcomm, Germany, and France) recently concluded that 14 dBm (with maximum 1 dBm/MHz PSD) will not create harmful interference when used outdoors.
  - See ECC Report 302  
<https://www.ecodocdb.dk/download/cc03c766-35f8/ECC%20Report%20302.pdf>
  - See CEPT SE45 *draft* Short Term Interference Study  
[https://cept.org/Documents/se-45/57210/se45-20-008a1\\_working-document-se45\\_02-eco-clean-version](https://cept.org/Documents/se-45/57210/se45-20-008a1_working-document-se45_02-eco-clean-version)
- UK Ofcom is proposing 14 dBm for Very Low Power devices
  - See UK Ofcom Consultation: Improving spectrum access for wifi – spectrum use in the 5 and 6 GHz bands  
<https://www.ofcom.org.uk/consultations-and-statements/category-2/improving-spectrum-access-for-wi-fi>

# 6 GHz Channel Plan



**Ask: Allow VLP in U-NII-5, U-NII-7 and lower portion of U-NII-8**