Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of Google LLC Request for Waiver of Section 15.255(c)(3) of the Commission's Rules Applicable to Radars used for Short-Range Interactive Motion Sensing in the 57-64 GHz Frequency Band	)))))	ET Docket No. 18-70

ORDER

Adopted: December 31, 2018 **Released: December 31, 2018**

By the Chief, Office of Engineering and Technology:

I. INTRODUCTION

1. By this Order, we grant a request by Google, LLC (Google)[1] for waiver of section 15.255(c)(3)[2] of the rules governing short-range interactive motion sensing devices, consistent with the parameters set forth in the *Google-Facebook Joint ex parte Filing*, to permit the certification and marketing of its Project Soli field disturbance sensor (Soli sensor) to operate at higher power levels than currently allowed. In addition, we waive compliance with the provision of section 15.255(b)(2) of the rules to allow users to operate Google Soli devices while aboard aircraft.[3] We find that the Soli sensors, when operating under the waiver conditions specified herein, pose minimal potential of causing harmful interference to other spectrum users and uses of the 57-64 GHz frequency band, including for the earth exploration satellite service (EESS) and the radio astronomy service (RAS). We further find that grant of the waiver will serve the public interest by providing for innovative device control features using touchless hand gesture technology.

II. BACKGROUND

2. Part 15 of the Commission's regulations permits unlicensed operation of radio frequency devices. The rules are designed to ensure that unlicensed devices have a low probability of causing harmful interference to other users of the radio spectrum.[4] Section 15.255 of the rules stipulates operational policies and technical parameters for the 57-71 GHz band. These rules allow for field disturbance sensors that are either fixed or used as short-range devices for interactive motion sensing.[5]

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[1] Google, LLC's Request for Waiver of section 15.255(c)(3) the Commission's Rules (filed Mar. 7, 2018) (*Google Waiver Request*); Letter from Megan Anne Stull, Google LLC, and Pankaj Venugopal, Facebook, Inc., to Marlene Dortch, FCC, ET Docket No. 18-70 (filed Sept. 7, 2018) (*Google-Facebook Joint ex parte Filing*).

[2] 47 CFR § 15.255(c)(3).

[3] 47 CFR § 15.255(b)(2).

[4] 47 CFR §§ 15.1 *et seq*. The fundamental operating conditions under Part 15 are that the operator of a Part 15 device must accept whatever interference is received and must correct whatever harmful interference it caused. Should harmful interference occur, the operator is required to immediately correct the interference problem, even if correction of the problem requires ceasing operation of the Part 15 equipment causing interference. *See* 47 CFR § 15.5.

[5] 47 CFR § 15.255. *See Revision of Part 15 of the Commission's Rules Regarding Operation in the 57-64 GHz Band*, Report and Order, 28 FCC Rcd 12517 (2013). The rules were further amended in 2016 to specifically permit

Specifically, section 15.255(c)(3) specifies that the peak transmitter conducted output power shall not exceed -10 dBm and the peak EIRP level shall not exceed 10 dBm;[6] Section 15.255(b)(2) requires that while airborne, devices may operate "only in closed exclusive on-board communication networks within the aircraft."[7]

3. Google developed the Soli sensor to capture motion in a three-dimensional space using a radar beam to enable touchless control of device functions or features, which can benefit users with mobility, speech and tactile impairments.[8] In its original waiver request, Google sought a waiver of our rules to allow its short-range interactive motion sensing Soli radar to operate in the 57-64 GHz frequency band at power levels consistent with European Telecommunications Standards Institute (ETSI) standard EN 305 550 which are higher than currently permitted under the Commission's rules.[9] Google argued that the power levels in existing Commission's rules are too restrictive to adequately enable Soli's intended functions – resulting in user dissatisfaction due to missed motions and fewer effective interactions.[10]

4. The Office of Engineering and Technology (OET) issued a Public Notice soliciting comments on the *Google Waiver Request* on March 12, 2018.[11] Five parties filed comments and six parties filed replies.[12] While several parties supported Google's request, other commenters sought additional data from Google, based on concerns regarding co-existence of Soli sensors with authorized services such as passive sensors in the Earth Exploration Satellite Service (EESS) and the radio astronomy service (RAS) (focused on airborne operation of Soli devices) as well as with other unlicensed devices including 60 GHz Wi-Fi (WiGig) operations and other 60 GHz point-to-point short-range devices.[13] In response, Google submitted simulations and measurement studies for the Soli sensor with various assumed power levels and duty cycles.[14]

5. Google, following discussions with interested parties, indicated that it could operate Soli sensors under a waiver incorporating a lesser peak power limit than sought in its waiver request and while

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these types of field disturbance sensors. *See Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014 (2016).

[6] 47 CFR § 15.255(c)(3).

[7] 47 CFR § 15.255(b)(2).

[8] *Google Waiver Request* at 2.

[9] *Id.* at 1. Google originally requested power levels based on European standard ETSI EN 305 550 V1.2.1 (2014-10). The ETSI standard specifies requirements for short-range devices (e.g., radars for applications such as telemetry, telecommand, alarms, data transmissions in general) that operate in the 40 GHz to 246 GHz frequency range. For the 57-64 GHz band, the ETSI standard permits a 20 dBm peak EIRP, which is more than what the Commission's rules permit for field disturbance sensors in this frequency band. *See* Short Range Devices (SRD); Radio equipment to be used in the 40 GHz to 246 GHz frequency range; Harmonized Standard for access to radio spectrum, ETSI EN 305 550 V1.2.1 (2014-10), at 32-33 (2014). ETSI is republishing this standard under V2.1.0 (2017-10) with the same power limits. The standard is available at: http://www.etsi.org/deliver/etsi_en/305500_305599/305550/02.01.00_20/en_305550v020100a.pdf.

[10] *Google Waiver Request* at 3. Google also indicated that it has asked to operate Soli technology at the requested power levels only in devices for which Google is the responsible party under the Commission's device authorization rules. *See* Google Reply at 6.

[11] *See OET Seeks Comment on Google's Request for Waiver of Section 15.255(c)*, ET Docket No. 18-70, Public Notice, DA 18-236, 33 FCC Rcd 2206 (2018).

[12] Facebook, Inc. (Facebook), IEEE 802 LAN/MAN Standards Committee (IEEE 802), Continental Automotive Systems, Inc. (Continental), the National Radio Astronomy Observatory (NRAO), and OmniPresense Corporation (OmniPresense) filed comments. Facebook, the National Academy of Sciences' Committee on Radio Frequencies

adhering to a maximum duty cycle requirement.[15] The current request indicates that an acceptable performance level can be achieved if Soli is permitted to operate at a peak transmitter conducted output power of +10 dBm (instead of -10 dBm as permitted in our rules), and at a peak EIRP level of +13 dBm (instead of +10 dBm as permitted in our rules); as well as a peak power spectral density (PSD) level of +13 dBm/MHz.[16] Google also states that it will limit the transmit duty cycle to 10 percent in any 33 millisecond interval.[17]

III. DISCUSSION

6. We are authorized to grant a waiver under section 1.3 of the Commission's rules if the petitioner demonstrates good cause for such action.[18] Good cause, in turn, may be found and a waiver granted "where particular facts would make strict compliance inconsistent with the public interest."[19] To satisfy this public interest requirement, the waiver cannot undermine the purposes of the rule, and there must be a stronger public interest benefit in granting the waiver than in applying the rule.[20] We find that allowing Google Soli sensors to operate at the requested power levels will not materially change the operating environment in the 57-64 GHz band such that there would be an increase in potential harmful interference to other users in the band, and that the higher power Google Soli device will be able to cooperatively share this spectrum with all users. Thus, we find that the waiver standard has been met.

7. Commenters' concern regarding Soli's originally proposed operations fall along two broad categories: the sensor's potential to affect passive service operations when operating on-board aircraft[21] and its ability to coexist with other unlicensed devices operating in the band.[22] Specifically, the National Academy of Sciences' Committee on Radio Frequencies (CORF) urges the Commission to prohibit waiver-based transmissions at 57-59.3 GHz band, because the band is used by EESS to gather atmospheric temperature data for weather forecasting.[23] CORF argues that the sharing studies conducted when the Commission previously allowed usage of the 57-64 GHz band on aircraft contemplated the majority of transmissions emanating from ceiling mounted access points which would limit transmissions

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(CORF), the Computer and Communications Industry Association (CCIA), the Frequency Allocations in Remote Sensing Technical Committee of the IEEE Geoscience and Remote Sensing Society (FARS), NCTA-The Internet and Television Association (NCTA), and Google filed reply comments. In addition, Facebook, Google, Infineon Technologies AG, the Consumer Technology Association, and Qualcomm Incorporated have made *ex parte* presentations.

[13] *See generally* Facebook, Inc. (Facebook) Comments; IEEE 802 LAN/MAN Standards Committee (IEEE 802) Comments; National Radio Astronomy Observatory (NRAO) Comments, the National Academy of Sciences' Committee on Radio Frequencies (CORF) Comments; Facebook Reply, the Frequency Allocations in Remote Sensing Technical Committee of the IEEE Geoscience and Remote Sensing Society (FARS) Reply, and NCTA-The Internet and Television Association (NCTA) Reply.

[14] *See Google Waiver Request,* Attachment, *Assessing the Interference of Miniature Radar on Millimeter Wave 60 GHz Wi□Fi Simulation Study* (Initial Google Study) (filed Mar. 7, 2018); *see also* Letter from Megan Stull, Counsel, Google LLC to Marlene Dortch, Secretary FCC, ET Docket No. 18-70, Attach. A, *Assessing the Interference of Miniature Radar on Millimeter Wave 60 GHz Wi□Fi – Supplemental Analysis*, Attach. B, *Measurement Study on Soli/802.11ad Coexistence,* Attach. C, *Compatibility between Earth Exploration-Satellite Service Sensors and Airborne Use of Project Soli Devices at 57.5 to 63.5 GHz* (Supplemental Google Study) (filed Jun. 8, 2018); *See also, Letter from Megan Stull, Counsel, Google, LLC to Marlene H. Dortch, Secretary, FCC,* ET Docket No. 18-70*,* Attach. A, *Gesture classification performance estimate under regulatory limits,* and Attachment B, *Supplement to Measurement Study on Soli/802.11ad Coexistence* (Additional Google Study) (filed Oct. 12, 2018).

[15] *See Google-Facebook Joint ex parte Filing*.

[16] *Id.*

through unshielded aircraft windows.[24] Further, CORF argues that this situation is even more critical given Google's originally requested power increase of 10 dB.[25] Similarly, NRAO expresses concern over the potential harmful interference to passive RAS operations at 114.25-116 GHz and 226–231.5 GHz bands caused by the second and fourth harmonics[26] of Soli transmissions in the 57-64 GHz band, when used on-board aircraft.[27] NRAO claims that the Commission should restrict airborne use of the Soli devices since it has already restricted 60 GHz devices from airborne use.[28]

8. These concerns are misplaced. As an initial matter, Google has indicated that it would seek only a 3 dB increase in radiated power, rather than 10 dB.[29] In addition, Google provides a detailed analysis—based on operating at a 3 dB radiated power increase as well as its original request of a 10 dB increase—that considered bandwidth overlap, transmit duty cycle, aircraft design, transmitter/receiver geometry, and atmospheric attenuation.[30] Google also considers worst-case aggregate interference potential from Soli sensors on simultaneous multiple aircraft "during the busiest month and the busiest day" in a one-year period (2017).[31] Google's analysis shows that "the total integrated interference from every aircraft in flight over the U.S., across the entire EESS (passive) allocation, to a single EESS sensor would be -163.5 dBm, which is 24.5 dB below the EESS interference criterion in ITU Recommendation ITU-R RS.2017-0 of -139 dBm."[32] The analysis also considers CORF's concerns regarding aircraft architecture, and concluded there is no harmful interference to EESS sensors even if a Soli sensor is operating near an aircraft window.[33] In addition to the conclusion from these studies, it is likely that there will be significant signal blockage from the high number of human bodies closely located near a Soli sensor on the airplane.[34] For these reasons, we do not believe that Soli sensors operating under the updated requested parameters pose a threat of harmful interference to EESS operations and thus, we decline to place restrictions on emissions within the 57-59.3 GHz band. In addition, based on the above findings of no harmful interference, we will allow Soli sensors to operate on-board aircraft at the requested power levels. On our own motion, we waive compliance of the Soli sensor with the provision of Section 15.255(b)(2) which specifies that 60 GHz devices must be part of "closed exclusive on-board

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[17] *Id.*

[18] 47 CFR § 1.3; *see also ICO Global Communications (Holdings) Limited v. FCC*, 428 F.3d 264 (D.C. Cir. 2005); *Northeast Cellular Telephone Co. v. FCC*, 897 F.2d 1164 (D.C. Cir. 1990); *WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969).

[19] *Northeast Cellular,* 897 F.2d at 1166; *see also ICO Global Communications,* 428 F.3d at 269 (quoting *Northeast Cellular*); *WAIT Radio,* 418 F.2d at 1157-59.

[20] *See*, e.g.*, WAIT Radio*, 418 F.2d at 1157 (stating that even though the overall objectives of a general rule have been adjudged to be in the public interest, it is possible that application of the rule to a specific case may not serve the public interest if an applicant's proposal does not undermine the public interest policy served by the rule); *Northeast Cellular*, 897 F.2d at 1166 (stating that in granting a waiver, an agency must explain why deviation from the general rule better serves the public interest than would strict adherence to the rule).

[21] Unlicensed devices operating in the 57-71 GHz frequency band may not operate on-board satellites nor as vehicular radars. *See* 47 CFR § 15.255(a).

[22] Devices operating under our unlicensed rules are not entitled to protection from harmful interference. Nevertheless, we seek to foster an environment that encourages co-existence among a wide range of different unlicensed device types.

[23] CORF Comments at 3, 7.

[24] *Id*. at 6-7. The Commission addressed the effects of operations of 60 GHz transmitters on-board aircraft in GN Docket No. 14-177. *See Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, Second Report and Order, 32 FCC Rcd 10988, 11012-11017, at paras. 75-87 (2018) (*24 GHz Second R&O*).

[25] CORF Comments at 7.

communication networks within the aircraft" while airborne.[35] Soli sensors still must comply with all the provisions of subsections 15.255(b)(2)(i) and (ii), including the prohibitions of use in wireless avionics intra-communication (WAIC) applications where external structural sensors or external cameras are mounted on the outside of the aircraft structure; and on aircraft where there is little attenuation of RF signals by the body/fuselage of the aircraft.

9. Regarding NRAO's concerns, it is mistaken that 60 GHz devices are not permitted on-board aircraft. While, the Commission, out of an abundance of caution, initially did restrict such operation, it amended the rules after further studies and experience with these devices.[36] The Commission determined that unlicensed operations on-board aircraft would not cause harmful interference to authorized services, even when considering aggregate effects of multiple devices on a single aircraft, and in multiple aircraft in the aggregate during worst-case peak air traffic.[37] In addition, the Commission has already placed stringent out-of-band emissions limits on 60 GHz operations.[38] Thus, similar to 60 GHz WiGig devices that are currently permitted on-board aircraft with certain restrictions,[39] we do not expect harmful interference to EESS and RAS from Google Soli devices which will operate at comparatively lower power levels.[40] Further, and as Google points out, there are additional mitigation factors to consider, including "the significant attenuation from inside an airplane to the outside at 116 GHz or 230 GHz, the loss from the passenger compartment, through the interior floor, through materials in the cargo hold, through the floor of the cargo hold, and out of the airplane's bottom skin, when the aircraft is nearly overhead of the radio astronomy station on the ground."[41] We agree, and, therefore, we will place no additional restrictions on the second and fourth harmonics of the Soli emissions.

10. IEEE 802 argues that Soli sensors would interfere with existing uses of the band, such as WiGig operations.[42] IEEE 802 is also concerned that the Soli sensor may interfere with other systems installed within a device, and urges additional study.[43] In response, Google submitted several studies and measurement results addressing these coexistence issues.[44] Subsequently, the *Google-Facebook Joint ex parte Filing* included parameters for the Soli sensors to operate without concerns of potential harmful

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[26] Harmonic frequencies are radio frequency signals that are integer multiples of the original frequency (also known as the fundamental frequency). For example, a 57 GHz Soli device also produces a signal at 114 GHz (second harmonic), and 228 GHz (fourth harmonic). Harmonic frequencies have increasingly lower power than the original signal. The second harmonic has less power than the original signal and the fourth harmonic exhibits less power than the second harmonic.

[27] NRAO Comments at 2; *see also* FARS Reply at 1 (agreeing that such effects merit additional study).

[28] NRAO Comments at 2. *See also, Amendment of Parts 2, 15, and 97 of the Commission's Rules to Permit Use of Frequencies Above 40 GHz for New Radio Applications,* First Report & Order and Second Notice of Proposed Rulemaking, 11 FCC Rcd 4481 (1995).

[29] *See Google-Facebook Joint ex parte Filing* at 2.

[30] Supplemental Google Study, Attachment C, *Compatibility between Earth Exploration-Satellite Service Sensors and Airborne Use of Project Soli Devices at 57.5 to 63.5 GHz*, at 16.

[31] *Id.* at 15.

[32] Supplemental Google Study, Attachment C, *Compatibility between Earth Exploration-Satellite Service Sensors and Airborne Use of Project Soli Devices at 57.5 to 63.5 GHz*, at 17-18. *See* ITU Recommendation ITU-R RS.2017-0, Performance and Interference Criteria for Satellite Passive Remote Sensing, Recommendation (Aug. 2012) at 5, https://www.itu.int/dms pubrec/itu-r/rec/rs/R-REC-RS.2017-0-201208-I!!PDF-E.pdf (ITU-R RS.2017-0. The interference criterion for passive EESS sensors operating in the 57 GHz band is -139 dBm in 100 MHz, not to be exceeded for more than 0.01% of the time.

[33] Supplemental Google Study, Attachment C, *Compatibility between Earth Exploration-Satellite Service Sensors and Airborne Use of Project Soli Devices at 57.5 to 63.5 GHz*, at 8-12.

interference to other band users.[45]

11. We believe that any coexistence and interference concerns have been adequately addressed with the updated operational parameters and the supporting studies and provide us confidence that all users of the 57-64 GHz band will be able to operate without experiencing harmful interference. Most significantly, the updated operational parameters provide a 7 dB reduction in radiated power from the original request and a limit on the Soli sensor's duty cycle to no more than 10 percent. Google's studies show that these parameters minimize potential effects on WiGig networks and other unlicensed devices located near the Soli device.[46] Finally, with respect IEEE 802's concern regarding in-device coexistence, we note that the device designer or component integrator should ensure that all systems installed within a device are compatible and will not interfere with each other. Thus, we take no specific action addressing in-device coexistence.

12. For these reasons, we find that waiving sections 15.255(c)(3) to permit operation of the Soli sensor at the higher requested power levels, and 15.255(b)(2) to permit the Soli device to operate on-board aircraft, will not increase the potential for harmful interference to authorized radio services or other users of the band;[47] thus, it will not undermine the purpose of the rule. In addition, we find that there is a stronger public interest benefit in granting this waiver than in strictly applying the rule. The ability to recognize users' touchless hand gestures to control a device, such as a smartphone, could help people with mobility, speech, or tactile impairments,[48] which in turn could lead to higher productivity and quality of life for many members of the American public. Such benefits can be achieved by maximizing the ability for Soli devices to meet its operational objectives, which we find necessitates higher power levels than the current rules allow. We thus find good cause exists for granting Google a waiver of section 15.255(c)(3). Finally, we note that the use of portable electronic devices on board aircraft, including the Google Soli sensors, are subject to FAA regulations on portable electronic devices. This waiver grant does not affect obligations under applicable FAA regulations.

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[34] Researchers have found that "at millimeter waves, shorter wavelengths result in a very short penetration depth" through human bodies. *See* Aliye Özge Kaya et al., *Coverage and Capacity Impact of Mobility and Human Body Blocking at Millimeter Waves*, GLOBECOM 2017 - 2017 IEEE Global Communications Conference, Singapore, at 1-7 (2017).

[35] 47 CFR § 15.255(b). As the Soli sensor operates independent of any exclusive on-board communication networks within the aircraft (such as airplane Wi-Fi systems), a waiver of this rule is needed.

[36] *See Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al*., Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd at 8131-8132, paras. 331-33 (2016) (requesting further sharing studies and data before allowing unlicensed 60 GHz operations on-board aircraft); and *24 GHz Second R&O,* 32 FCC Rcd at 11012-11017, paras. 75-87 (2017) (finding that "allowing unlicensed use of this spectrum on-board aircraft while airborne, with certain limitations, will facilitate air travelers' expanded access to broadband/internet services during flight").

[37] *See 24 GHz Second R&O,* 32 FCC Rcd at 11012-11017, paras. 75-87. Google's Supplemental Study provides further confirmation of the Aerospace Vehicle Spectrum Institute (AVSI) Study (demonstrating that the use of WiGig equipment on-board aircraft in the 57-71 GHz band does not cause harmful interference to passive services).

[38] 47 CFR § 15.255(d).

[39] 47 CFR § 15.255(b)(2)(i) prohibits operation of 60 GHz devices such as cameras or sensors mounted on the outside of an aircraft structure. 47 CFR § 15.255(b)(2)(ii) prohibits operation of 60 GHz devices on aircraft where there is little attenuation of RF signals by the body/fuselage of the aircraft.

[40] Consistent with the Google-Facebook Joint *ex parte* Filing, the Google Soli will operate at an EIRP level that is 27 dB lower than the existing average EIRP limit for 60 GHz WiGig devices. *See* 47 CFR §§ 15.255(b) and (e)(1).

[41] Google Reply at 2-5.

13. Lastly, we will not pursue the requests in the comments filed by Continental and OmniPresense seeking even higher power for field disturbance sensor operation in the 57-64 GHz band for possible uses in vehicular crash avoidance applications and other related vehicle safety functions.[49] These matters are outside the scope of the instant waiver request and the Commission has already provided new opportunities for vehicular radar applications in the 76-81 GHz band range.[50]

14. To ensure that harmful interference to authorized operations and other spectrum users will not occur, we impose explicit conditions on the installation, operation and certification of the Google Soli sensor under this waiver, as follows:

- The Google Soli sensor shall be certified for compliance with all the technical specifications applicable to operation under 47 CFR. Part 15, with the exception of the following provisions in: 1) 47 CFR § 15.255(c)(3), which is waived to allow the device to operate in the 57-64 GHz band at a maximum +13 dBm EIRP, +10 dBm transmitter conducted output power, and +13 dBm/MHz power spectral density; and 2) 47 CFR § 15.255(b)(2), which is waived to allow the device to operate on-board aircraft while not being part of a closed, exclusive on-board communication networks within the aircraft. However, the Google Soli sensor shall comply with the prohibitions of use specified in 47 CFR § 15.255(b)(2)(i) and (ii).
- The Google Soli sensor shall operate with a maximum transmit duty cycle of 10 percent in any 33 milliseconds (ms) interval (i.e., the Soli sensor will not transmit longer than a total of 3.3 ms in any 33 ms time period).
- A copy of this Order shall be provided with the application for certification of the device.

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[42] WiGig devices operate pursuant to the 802.11ad standard. *See* IEEE 802.11ad-2012 - IEEE Standard for Information technology--Telecommunications and information exchange between systems--Local and metropolitan area networks--Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 3: Enhancements for Very High Throughput in the 60 GHz Band. IEEE 802 argues that although the Project Soli OFDM modulation is supported by the 802.11ad standard most 57-64 GHz devices do not use that modulation scheme and given the requested power increase and assuming a 100% duty cycle, it is not clear that such devices will share the spectrum fairly. IEEE 802 Comments at 1-2. Facebook initially raised similar concerns, prior to the *Google-Facebook Joint ex parte Filing*. *See* Facebook Comments at 1; Facebook Reply at 2.

[43] IEEE 802 Comments at 2.

[44] *See generally* Supplemental Google Study; Additional Google Study.

[45] *Google-Facebook Joint ex parte Filing* at 1-2. Qualcomm also supports these updated operational parameters. Letter from John W. Kuzin, Vice President and Regulatory Counsel, Qualcomm Incorporated to Marlene Dortch, Secretary, FCC, ET Docket 18-70 (filed Nov. 16, 2018) (stating that Qualcomm and Google have agreed to work together to resolve any technical concerns with coexistence of Soli radar and 802.11 devices operating in the 57 to 64 GHz portion of the 60 GHz unlicensed band).

[46] *See Google-Facebook Joint ex parte Filing* at 1-2.

[47] We note that ETSI has permitted short-range devices in the 57-64 GHz band to operate in Europe since 2014 at Google's originally requested power levels without adverse interference effects. *See supra* note 9.

[48] *Google Waiver Request* at 2.

[49] *See* Continental Comments at 1-3; OmniPresense Comments at 1.

[50] The Commission recently decided to consolidate radars used in vehicular applications into a single frequency band at 76-81 GHz under Part 95 of the rules. *See Amendment of Parts 1, 2, 15, 90 and 95 of the Commission's Rules to Permit Radar Services in the 76-81 GHz Band*, ET Docket No. 15-26, Report and Order, 32 FCC Rcd 8822. (2017). The Commission stopped accepting new applications for certification of vehicle radars under 47 CFR §§ 15.252 and 15.515 after Sep 20, 2018.

- This waiver and its conditions shall apply only to the Google Soli sensor as described herein and are not to be considered to apply generally to other field disturbance sensors.

15. Accordingly, pursuant to authority in Sections 0.31, 0.241, and 1.3 of the Commission's rules, 47 CFR §§ 0.21, 0.241, and 1.3, and Sections 4(i), 302, 303(e), and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 302, 303(e), and 303(r), IT IS ORDERED that the Request for Waiver filed by Google, LLC IS GRANTED, consistent with the terms of this Order. This action is effective upon release of this Order**.**

16. IT IS FURTHER ORDERED that, if no petitions for reconsideration or applications for review are timely filed, this proceeding SHALL BE TERMINATED, and the docket CLOSED.

FEDERAL COMMUNICATIONS COMMISSION

Julius P. Knapp
Chief, Office of Engineering and Technology