



users of the radio spectrum.<sup>7</sup> Section 15.255 of the rules stipulates operational policies and technical parameters for the 57-71 GHz band.<sup>8</sup> Unlicensed devices in this band generally include indoor communication networking devices such as WiGig,<sup>9</sup> outdoor fixed point-to-point communication links,<sup>10</sup> and field disturbance sensors that are either fixed or used as special short-range devices for interactive motion sensing.<sup>11</sup> The rules prohibit general mobile radar operation. Specifically, section 15.255(a)(2) prohibits vehicle radars from operating in this band.<sup>12</sup> Section 15.255(b)(2) further prohibits operation on-board aircraft, except under specific conditions, e.g., “only in closed exclusive on-board communication networks within the aircraft;” this section also specifically prohibits operation on-board UA.<sup>13</sup> 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.<sup>14</sup>

2. The Ictos is designed to operate as a Part 15 device that will be installed on UA used for close-up flights around building structures.<sup>15</sup> Leica explains that the Ictos will be used to prevent the UA from colliding with the structure the UA is inspecting or with other objects.<sup>16</sup> Leica further states that using the 60-64 GHz frequency range will permit the detection and avoidance of thin objects, such as cables, down to 2.5 mm in width. It also asserts that this choice of frequencies, together with specified power and out-of-band emissions and conditions on sales and use, will avoid interference to other spectrum users in the band, including the passive EESS operations.<sup>17</sup>

3. The Office of Engineering and Technology (OET) issued a Public Notice soliciting comments on Leica’s waiver request on November 21, 2019.<sup>18</sup> The National Academy of Sciences Committee on Radio Frequencies (CORF) and Facebook, Inc. (Facebook) filed comments and Leica filed

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<sup>7</sup> 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.

<sup>8</sup> 47 CFR § 15.255. *See Revision of Part 15 of the Commission’s Rules Regarding Operation in the 57-64 GHz Band*, ET Docket No. 07-113, FCC 13-112, Report and Order, 28 FCC Rcd 12517 (2013). The rules were further amended in 2016 to specifically permit certain types of field disturbance sensors. *See Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, GN Docket 14-117, FCC 16-89, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014 (2016).

<sup>9</sup> *See* Wi-Fi Alliance, *Wi-Fi Certified WiGig*, <http://www.wi-fi.org/discover-wi-fi/wigig-certified>.

<sup>10</sup> *See* e.g., <http://www.airlinx.com>; <https://www.ignitenet.com/technology/metrolinq/>.

<sup>11</sup> *See* <https://atap.google.com/soli/>.

<sup>12</sup> 47 CFR § 15.255(a)(2).

<sup>13</sup> 47 CFR § 15.255(b)(2).

<sup>14</sup> 47 CFR § 15.255(c)(3).

<sup>15</sup> The UA could be used for a variety of specialized activities including, for example, close-up visual surveying of roofs to optimize planning for solar panel installation and visual surveying of archeological sites for computer-aided analysis and documentation.

<sup>16</sup> *Request* at 3.

<sup>17</sup> *Request* at 12.

<sup>18</sup> *See OET Seeks Comment on LEICA Geosystems AG's Request for Waiver of Section 15.255 of the Rules to Operate Radars on a Commercial unmanned Aerial Vehicle (UAV)*, ET Docket No. 19-350, Public Notice, DA 19-1198, 34 FCC Rcd 10521 (2019).

reply comments.<sup>19</sup> CORF states that it can support Leica’s request, as long as the Ictos device complies with the proposed specific parameters designed to limit the potential that EESS observations would be negatively affected: a guard band to separate the intentional emissions from neighboring EESS allocations, the small number Ictos deployments within the United States, and the specified low intensity of out-of-band, spurious, and unwanted emissions into the EESS bands.<sup>20</sup> While Facebook urges the Commission to initiate a rulemaking proceeding to provide clearer guidance on radar uses in the 60 GHz band, “given the magnitude of interest in the...band,”<sup>21</sup> it also states that, if the Commission instead determines to address Leica’s request on an *ad hoc* basis, it requests that the Commission consider the potential harmful interference that could result on existing users in the band and establish Leica’s proposed limitation of the waiver to 800 devices per year as a condition to any waiver granted.<sup>22</sup>

### III. DISCUSSION

4. 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.<sup>23</sup> Good cause, in turn, may be found and a waiver granted “where particular facts would make strict compliance inconsistent with the public interest.”<sup>24</sup> 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.<sup>25</sup> We find that the grant of a limited waiver allowing a small number of Ictos devices to operate at the requested power levels on board UA in the 60-64 GHz band, with appropriate conditions, will not materially change the operating environment and thus will not increase potential harmful interference to other users in the 57-71 GHz band. Grant of the waiver will, however, provide substantial public benefit in improving safety and enhancing opportunities for scientific, commercial, and engineering applications.

5. As an initial matter, we are treating the Ictos as a field disturbance sensor and acting on the portion of Leica’s request that pertains to waiver of sections 15.255(a)(2), (b)(2) and (c)(3) of the rules.<sup>26</sup> While Leica asserts that its Ictos is not a field disturbance sensor as defined in the rules and should be treated as a radar (which it asserts would then only require a waiver of section 15.255(b)(2)),<sup>27</sup>

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<sup>19</sup> In addition, a joint comment from 7 parties (Facebook, Google, Samsung, Qualcomm, Intel, Infineon, Socionext America) was filed *ex parte* on Feb. 3, 2020 to urge the FCC to open a rulemaking proceeding to ensure reasonable co-existence of all technologies in the 60 GHz band, instead of granting *ad hoc* germane waiver requests.

<sup>20</sup> CORF Comments at 1.

<sup>21</sup> Facebook Comments at 1. The Commission has received at least one more waiver request for expanded usage by radars in the 57-64 GHz band, and Commission staff have been consulted on additional radar uses in this frequency band by other interested parties. See, e.g., *OET Seeks Comments on Vayyar Imaging LTD. Request for Waiver of Sections 15.255(b)(2) and 15.255(c)(3) of the Commission's Rules for Radars Used for Interactive Motion Sensing in the 57-64 GHz Band*, ET Docket No. 20-15, Public Notice, DA 20-68, 35 FCC Rcd 500 (2020).

<sup>22</sup> Facebook Comments at 1.

<sup>23</sup> 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).

<sup>24</sup> *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.

<sup>25</sup> 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).

<sup>26</sup> *Request* at 8 and 11-12.

<sup>27</sup> 47 CFR § 15.3(l); *Request* at 5-8.

we recognize that the Commission has a long history of considering radar devices in part 15 of the rules to constitute a subset of field disturbance sensors.<sup>28</sup> Evaluating the Ictos as a field disturbance sensor allows us to grant the requested relief under our delegated authority in a manner that is consistent with established precedent.

6. Section 15.255(a)(2) explicitly prohibits the operation of field disturbance sensors, with limited exceptions that do not apply to Leica's proposed operations. The rule is designed to mitigate against the risk of harmful interference by limiting unlicensed use to a limited set of applications.<sup>29</sup> We find that the specialized use model of the Ictos and the limitation on the number of units Leica has agreed to will not undermine this intent. Because the Ictos is not an off-the-shelf consumer product but is instead limited to scientific, commercial and engineering applications,<sup>30</sup> we find that allowing a small number of these units to operate will not cause harmful interference to other services in this band for several reasons. First, the Ictos device operates in the 60-64 GHz subset band of the larger 57-71 GHz band covered under section 15.255; the Ictos thus avoids the EESS passive service at 57-59.3 GHz band, resulting in a natural guard band from 59.3 GHz to 60 GHz that will protect EESS operations. Second, the Ictos only operates while the UA is in motion (and is turned off when the UA is hovering);<sup>31</sup> and because 60 GHz communication systems tend to use narrow antenna beams, especially in fixed point-to-point outdoor communication links,<sup>32</sup> any harmful interference potential would be very short-lived. Finally, as we will limit the number of Ictos devices per year, the use of the Ictos device will be restricted and contained. Accordingly, we find that the Ictos device will not increase the potential for harmful interference to other services in the 60-64 GHz band, thus a waiver of section 15.255(a)(2) would not undermine the purpose of our rules.

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<sup>28</sup> The definition for FDS sensors was adopted in 1971, in *Amendment of Part 15 of the Commission's Rules to Add Regulations Governing the Use of Field Disturbance Sensors (Formerly Designated as Radio Frequency Operated Intruder Alarms)*, Docket No. 13863, FCC 71-873, Report and Order, 31 FCC 2<sup>nd</sup> 210 (1971). The Commission did express that it "will interpose no objection to the operation of speed measuring equipment (or other radiolocation devices) under the regulations for field disturbance sensors..." while discussing radars in this context. *Id.*, at para. 21. In 1995, the Commission adopted the rules prohibiting FDS, specifically mobile FDS in 47 CFR § 15.255 in *Amendment of parts 2, 15, and 97 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*, ET Docket No. 94-124, FCC 95-499, First Report and Order, 11 FCC Rcd. 4481, 4496 (1995); in 2002, the Commission adopted rules for UWB radars in 47 CFR §§ 15.503 & 15.515, specifically defining radars as FDS in *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems*, ET Docket No. 98-153, FCC 02-48, First Report and Order, 17 FCC Rcd 7435 (2002); in 2003, the Commission adopted rules for vehicular radars in 47 CFR § 15.252, specifically labeling vehicular radars as FDS in *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems*, ET Docket No. 98-153, FCC 04-285, Second Report and Order, 19 FCC Rcd 24558 (2003).

<sup>29</sup> Originally, when it was adopted in 1995, section 15.255(a)(2) prohibited operation of all field disturbance sensors in the 57-64 GHz band. See *Amendment of parts 2, 15, and 97 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*, ET Docket No. 94-124, FCC 95-499, First Report and Order, 11 FCC Rcd 4481 (1995). However, later, in 1997, the Commission made an exception for sensors in certain fixed industrial applications (speed control, fluid level, and motion detection functions, etc.). *Amendment of parts 2, 15, and 97 of the Commission's Rules to Permit Use of Radio Frequencies Above 40 GHz for New Radio Applications*, ET Docket No. 94-124, FCC 97-267, Memorandum Opinion and Order and Fourth Further Notice of Proposed Rulemaking, 12 FCC Rcd 12212 (1997).

<sup>30</sup> Leica states that "commercial UAVs that would benefit from the Ictos radar have US-dollar prices in six digits; the device does not target the mass consumer market." *Request* at 12.

<sup>31</sup> *Request* at 12.

<sup>32</sup> Fixed point-to-point 60 GHz transmitters are allowed to operate at very high power levels but must use very narrow antenna beamwidths. 47 CFR § 15.255(c)(1)(ii). See also *Revision of Part 15 of the Commission's Rules Regarding Operation in the 57-64 GHz Band*, ET Docket 07-113, FCC 13-112, Report and Order, 28 FCC Rcd 12517 (2013).

7. We next address the waiver of the on-board aircraft requirements of section 15.255(b)(2). This section allows 60 GHz transmitters to operate on-board aircraft that are equipped with a high radio frequency (RF) attenuation body (e.g., commercial airliners) while forming a “closed exclusive on-board communication networks within the aircraft.”<sup>33</sup> The rule specifically prohibits operation of 60 GHz transmitters on-board UA; these type of aircraft do not provide substantial RF shielding. The rule serves to protect EESS observations as well as Radio Astronomy Service (RAS) operations.<sup>34</sup> Although the Ictos device will be installed on a UA, we find that, given its on-the-air limited operation (operation while the UA is in motion only and not when the UA is hovering); the choice of operating frequency band that avoids the passive EESS band; and the limited number of installations and specialized use, the Ictos would not cause harmful interference to EESS users. The natural guard band between the EESS passive service at 57-59.3 GHz and the Ictos operating band at 60-64 GHz protects EESS users. Regarding RAS, for which there is no allocation in the 57-71 GHz band, our strict out-of-band limits in the rules already prevent any increase in potential harmful interference caused by the Ictos’ operation. Furthermore, the Ictos would operate with out-of-band emissions that are 10 dB lower than our limit for frequencies below 40 GHz, and 41.3 dB lower than our limit in the 40-200 GHz band.<sup>35</sup> We therefore find that with the restrictions as discussed above, the Ictos device will not increase the potential for harmful interference to other services in the 57-71 GHz band. Accordingly, a waiver of section 15.255(b)(2) would not undermine the purpose of our rules.

8. Finally, we address the waiver of the FDS transmit power limits in section 15.255(c)(3). This section limits the peak EIRP level to less than +10 dBm to protect communication devices that operate in the band.<sup>36</sup> The Ictos device transmits at 0 dBm average EIRP<sup>37</sup> and +19 dBm peak EIRP. We find that, based on how the Ictos will operate, a 9 dB increase in peak EIRP will not cause harmful interference to other users in the 60-64 GHz band. The high oxygen attenuation at frequencies around 60 GHz, added to the fact that the UA is mostly in motion, will serve to mitigate any potential for harmful interference to other users. In addition, as discussed above, fixed outdoor point-to-point 60 GHz transmitters use narrow antenna beams, thus the likelihood that a UA equipped with the Ictos device would be located within the antenna beamwidth of these transmitters is very small. Accordingly, we find that with the restrictions as discussed above, Leica’s Ictos device will not increase the potential for harmful interference to other services in the 57-71 GHz band, thus a waiver of section 15.255(c)(3) would not undermine the purpose of our rules.

9. 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 safely operate a UA close to a structure opens a number of engineering and scientific applications that are not otherwise practicable.<sup>38</sup> Such benefits can be achieved, as Leica asserts, by operating in the 60-64 GHz band to maximize the Ictos devices’ detection

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<sup>33</sup> This refers to entertainment systems that deliver movies and music to passengers on-board commercial aircraft. 47 CFR § 15.255(b).

<sup>34</sup> See *Amendment of Parts 2, 15, and 97 of the Commission's Rules to Permit Use of Frequencies Above 40 GHz for New Radio Applications*, ET Docket No. 94-124, FCC 95-499, First Report and Order and Second FNPRM, 11 FCC Rcd 4481, 4496-97, para. 35 (1995).

<sup>35</sup> Leica states that the Ictos’ out-of-band emissions do not exceed -51.3 dBm EIRP/MHz. *Request* at 12. Section 15.255(d)(2) limits out-of-band emissions to the general limit in section 15.209 (equivalent to an EIRP level of -41.3 dBm) below 40 GHz; and to 90 pW/cm<sup>2</sup> (equivalent to an EIRP level of -10 dBm) between 40 GHz and 200 GHz.

<sup>36</sup> 47 CFR § 15.255(c)(3). The Ictos system transmits at 0 dBm average EIRP and +18.7 dBm peak EIRP.

<sup>37</sup> The rules do not limit the average EIRP level, only the peak EIRP.

<sup>38</sup> *Request* at 1. Leica states that, currently, safety considerations require planning the UA flight path in aerial free space above all possible collision hazards; this typically limits inspections to top-down views, which in turn confines applications to simple environments such as open-pit mines, earth work, and open landscapes. *Id.* At 2.

of thin objects, such as cables, down to 2.5 mm in width, thus avoiding collision with building structures and falling debris from the collision.<sup>39</sup> This ability would improve safety considerations for property and people, and could facilitate applications such as assessing structural integrity of buildings in danger of collapse after natural disasters.<sup>40</sup> We thus find good cause exists for granting Leica a waiver of sections 15.255(a)(2), (b)(2) and (c)(3) of the Commission's rules. While a waiver is an appropriate means to address this narrow and specialized application, we also acknowledge Facebook's comments. While this waiver is based on Leica's unique and compelling circumstances, nothing precludes the issuance of a rulemaking proceeding in which the Commission can undertake a more comprehensive examination of section 15.255 of the rules. Finally, we note that the operation of UA is subject to the Federal Aviation Administration (FAA) regulations, and this waiver grant does not affect obligations under applicable FAA regulations. Users should check with the Federal Aviation Administration (FAA) for guidance and authorization as necessary prior to use.

10. 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 Leica Ictos device under this waiver, as follows:

- 1) The Leica Ictos device 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(a)(2), which is waived to allow the device to operate under the provisions of 47 CFR § 15.255 as a mobile field disturbance sensor;
- 2) 47 CFR § 15.255(b)(2), which is waived to allow the device to operate on-board a UA while not being part of a closed, exclusive on-board communication networks within the aircraft; and 3) 47 CFR § 15.255(c)(3), which is waived to allow the device to operate in the 60-64 GHz band at a maximum +19 dBm peak EIRP.
- 3) The Leica Ictos device shall be installed to transmit on a horizontal plane with respect to the UA on which it is mounted to limit emissions above the horizon. Operation shall be limited to line-of-sight only.
- 4) The Leica Ictos device shall comply with the following technical characteristics: a) intentional emissions shall be contained to the 60-64 GHz band; b) out-of-band emissions shall not exceed -51.3 dBm EIRP/MHz; c) transmit duty cycle shall not exceed 50% over any 40 milliseconds interval; and d) transmission shall occur only when the device is in motion.
- 5) Leica Ictos devices shall operate below a maximum altitude of 400 feet above ground level, unless the small unmanned aircraft: (1) is flown within a 400-foot radius of a structure; and (2) does not fly higher than 400 feet above the structure's immediate uppermost limit.
- 6) U.S. sales shall not exceed 400 Leica Ictos devices in the first year and up to 800 per year for subsequent years. The Leica Ictos device shall not be marketed for retail consumer markets.
- 7) This waiver and its conditions shall apply only to the Leica Ictos device installed on a UA as described herein and are not to be considered to apply generally to other field disturbance sensors or radars. A copy of this Order shall be provided with the application for certification of the Leica Ictos device.

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<sup>39</sup> Request at 3.

<sup>40</sup> Request at 2.

11. 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 Leica Geosystems AG IS GRANTED, consistent with the terms of this Order. This action is effective upon release of this Order.

12. 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

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