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VIA ELECTRONIC FILING

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

Re: **Written *Ex Parte* Communication**

Use of Spectrum Bands Above 24 GHz for Mobile Radio Services, GN Docket No.
14-177

Dear Ms. Dortch:

On March 16, 2016, the National Academy of Sciences' Committee on Radio Frequencies ("CORF") late-filed reply comments asserting that "comments submitted . . . in support of unlicensed use of 57-64 GHz devices on aircraft do not address the resulting interference impact" on Earth Exploration Satellite Service ("EESS") instruments.^{1/} In fact, Wi-Fi Alliance^{®2/}'s February 26, 2016 reply comments and the interference analysis attached to those reply comments address this precise issue, demonstrating that there is little likelihood of interference to EESS from WiGig[®] operations on board aircraft.^{3/} Accordingly, the Commission should permit the entire 57-64 GHz band to be used to meet the growing need for on-board communications.

^{1/} Reply Comments of the National Academy of Sciences' Committee on Radio Frequencies, GN Docket No. 14-177, *et al.*, at 3 (filed Mar. 13, 2016) ("CORF Reply Comments").

^{2/} Wi-Fi[®], the Wi-Fi logo, the Wi-Fi CERTIFIED logo, Wi-Fi Protected Access[®] (WPA), WiGig[®], the Wi-Fi ZONE logo, the Wi-Fi Protected Setup logo, Wi-Fi Direct[®], Wi-Fi Alliance[®], WMM[®], and Miracast[®] are registered trademarks of Wi-Fi Alliance. Wi-Fi CERTIFIED[™], Wi-Fi Protected Setup[™], Wi-Fi Multimedia[™], WPA2[™], Wi-Fi CERTIFIED Passpoint[™], Passpoint[™], Wi-Fi CERTIFIED Miracast[™], Wi-Fi ZONE[™], WiGig CERTIFIED[™], Wi-Fi Aware[™], Wi-Fi HaLow[™], the Wi-Fi Alliance logo and the WiGig CERTIFIED logo are trademarks of Wi-Fi Alliance.

^{3/} See Wi-Fi Alliance, *60 GHz Use Aboard Aircraft Industry Interference Analysis*, at 5, 16 (Feb. 2016) ("Wi-Fi Alliance Interference Analysis"), attached to Reply Comments of Wi-Fi Alliance, GN Docket No. 14-177, *et al.* (filed Feb. 26, 2016) ("Wi-Fi Alliance Reply Comments"); Wi-Fi Alliance Reply Comments at 6-8.

Background

As Wi-Fi Alliance noted in its comments, the Commission should lift the current restriction on the use of devices aboard aircraft in the 57-64 GHz band and similarly impose no restrictions on unlicensed operations in aircraft in the 64-71 GHz band.^{4/} Others supported Wi-Fi Alliance's request.^{5/} In its reply comments, Wi-Fi Alliance demonstrated that WiGig technology is highly unlikely to cause any interference to EESS or Radio Astronomy Service ("RAS") operations noting, among other things, that there are no line-of-sight transmissions between WiGig devices and either EESS satellites or RAS ground stations.^{6/} Wi-Fi Alliance's reply comments were supported by detailed engineering analyses. In its late-filed reply comments, CORF neglected the Wi-Fi Alliance reply comments and alleges that parties have not addressed the impact of WiGig operations on the 57-59.3 GHz band.^{7/} Wi-Fi Alliance is hopeful that information that it has already submitted and summarized briefly here can provide sufficient bases to alleviate concerns over WiGig use of the entire 57-64 GHz band on board aircraft so that this spectrum can be deployed to meet the needs for in-flight communications capacity.

WiGig Does Not Rely on Reflected Signals

CORF misunderstands how WiGig access points will communicate with client devices on board aircraft.^{8/} WiGig does not rely on reflected signals to establish network and maximize throughput. As Wi-Fi Alliance explained in its reply comments, maximizing WiGig's performance requires forming narrow beams using highly directional antennas — not omnidirectional antennas, as with Wi-Fi.^{9/} Passengers' bodies and the aircraft cabin interior absorb a significant amount of these signals, so a number of WiGig access points mounted on the ceiling of an aircraft must establish line-of-sight connectivity with client

^{4/} See Comments of Wi-Fi Alliance, GN Docket No. 14-177, *et al.*, at 7-8 (filed Jan. 27, 2016)

^{5/} See Comments of the National Cable & Telecommunications Association, GN Docket No. 14-177, *et al.*, at 7-8 (filed Jan. 28, 2016); Comments of Intel Corporation, GN Docket No. 14-177, *et al.*, at 19-20 (filed Jan. 27, 2016); Comments of The Boeing Company, GN Docket No. 14-177, *et al.*, at 13-14 (filed Jan. 28, 2016); Comments of Microsoft Corporation, GN Docket No. 14-177, *et al.*, at 11-14 (filed Jan. 27, 2016); Comments of Dynamic Spectrum Alliance, GN Docket No. 14-177, *et al.*, at 3 (filed Jan. 27, 2016).

^{6/} Wi-Fi Alliance Reply Comments at 6-8.

^{7/} CORF Reply Comments at 2-3. CORF also asserts that the RAS band at 42.5-43.5 GHz must also be protected. Because the Commission has not proposed a particular use of that band, Wi-Fi Alliance does not address those arguments here.

^{8/} See *id.* at 5-6 ("Of greater concern is that there are few direct lines of sight between centrally located access points and user terminals, which are typically located on or near the laps of users. The result is that access points will attempt to use scattered and reflected signals to maximize throughput.").

^{9/} Wi-Fi Alliance Reply Comments at 7-8.

devices to efficiently transmit signals between each other, using beam forming.^{10/} Neither WiGig access points nor client devices will direct energy towards the aircraft's windows. There will be no line-of-sight transmissions between WiGig devices and EESS satellite receivers, and any energy "reflected" towards the windows will have negligible power levels.^{11/} Any small amount of energy that may reach an aircraft's windows will also face significant interior-exterior attenuation of at least 25 dB.^{12/}

CORF's Suggested Interference Amelioration Measures Are Unnecessary and Cumbersome

CORF proposes "making any service at 57-59.3 GHz licensed" or, "in the absence of better data, prohibiting airborne use of WiGig Channel 1 (57.24-59.4 GHz)."^{13/} CORF's suggestions to reduce hypothetical interference from unlicensed devices operating in the band are unnecessary. Wi-Fi Alliance's interference analysis already demonstrates that WiGig operations at channel 1 would not cause interference to EESS,^{14/} so there is no reason to require a license to operate at 57-59.3 GHz or to prohibit use of the spectrum. Moreover, restricting use of the channel, by disabling access point transmissions on the channel or otherwise,^{15/} would add an unnecessary complication to implementing WiGig technologies. As Wi-Fi Alliance noted in its reply comments, such a requirement would cause consumer confusion. CORF's suggested "airplane mode" disabling certain WiGig channels but not complete WiGig functionality would be counterintuitive, because "airplane mode" typically implies that a device ceases transmitting certain kinds of signals (*e.g.*, cellular signals) altogether.^{16/} CORF's proposal would also relegate WiGig use on board aircraft to two of three channels (not four, as CORF erroneously states^{17/}) that would be available under the Commission's current proposal. Limiting the number of Wi-Gig channels would have at least two undesirable effects. First, it would restrict unlicensed capacity on board aircraft. Second, it would potentially require the installation of additional access points throughout the aircraft, increasing costs and introducing unnecessary design considerations.

^{10/} See *id.* Wi-Fi Alliance's interference analysis assumes that there will be 20 access points to enable line-of-sight connectivity. See Wi-Fi Alliance Interference Analysis at 5.

^{11/} See Wi-Fi Alliance Reply Comments at 7-8.

^{12/} *Id.* (citing ITU-R, *Report ITU-R M.2283-0 (12/2013) (2014)*, available at https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-M.2283-2013-PDF-E.pdf).

^{13/} CORF Reply Comments at 3.

^{14/} See Wi-Fi Alliance Interference Analysis at 5, 16. Wi-Fi Alliance's interference analysis is robust, accounting for the aggregation effect of a large number of simultaneous WiGig users, including 320 passengers and 20 access points. See Wi-Fi Alliance Interference Analysis at 5.

^{15/} See CORF Reply Comments at 8 ("CORF therefore recommends controls on the access points, specifically disabling access point transmissions in the 57-59.3 GHz band.").

^{16/} See *id.*

^{17/} See *id.*

Requiring “RF-reflective window films as a prerequisite to permitting airborne emissions in the 57-59.3 GHz band” is also unnecessary and impractical.^{18/} Although future aircraft designs may be able to incorporate RF-reflective window films, retrofitting existing aircraft would be a costly impediment to the adoption of unlicensed technologies in the millimeter wave bands. Moreover, as noted above, reflective window films are intended to address operations using reflected signals that will not exist in the first place.

WiGig Operations Will Not Affect RAS Use

Finally, CORF’s concern that WiGig use of the 64-71 GHz band will create harmonics at 128-142 GHz and 192-213 GHz and could interfere with RAS is misplaced.^{19/} As with EESS receivers, there will be no line-of-sight between WiGig devices in aircraft and RAS ground receivers. Wi-Fi Alliance’s interference analysis definitively shows, in even the worst case scenario, that there will be no interference to RAS, which does not have an allocation in the 64-71 GHz band.^{20/} For example, the analysis assumes that oxygen absorption loss will be 0 dB at altitudes of 7,205 to 30,000 feet,^{21/} whereas realistically oxygen absorption loss may reach up to 10 dB at those altitudes.

* * *

Technical analyses make clear that any restrictions on WiGig use on board aircraft are unnecessary, and would only serve to inhibit the development and adoption of unlicensed technologies in the millimeter wave bands. Wi-Fi Alliance therefore continues to urge the Commission to lift the current restriction on use of devices using the 57-64 GHz band and similarly impose no restrictions on the use of devices in the 64-71 GHz band. If there are any questions, the Commission is urged to contact the undersigned.

Respectfully submitted,



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^{18/} See *id.* at 4-5.

^{19/} See *id.* at 2.

^{20/} See Wi-Fi Alliance Interference Analysis at 7-16.

^{21/} See, *e.g.*, *id.* at 8.