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December 11, 2013

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

Re: Expanding Access to Broadband and Encouraging Innovation through Establishment of an Air-Ground Mobile Broadband Secondary Service for Passengers Aboard Aircraft in the 14.0-14.5 GHz Band; GN Docket No. 13-114, RM-11640

Dear Ms. Dortch:

Qualcomm hereby files a redlined and annotated version of Appendix B to the Commission's Notice of Proposed Rulemaking ("NPRM") in the above-referenced docket. The attached version of Appendix B to the NPRM reflects revised rule text based upon issues covered in comments and reply comments.

In most cases, the source of the revision is identified in the comment field in the right hand margin. For example, proposed Rule Section 22.1104 of the revised rules identifies the two spectrum blocks to be auctioned as 14.0 - 14.25 and 14.25 - 14.5 GHz. Also, the power levels in proposed Rule Section 22.1120(a) & (b) were reduced to reflect the 4 dB G/T level that Qualcomm discussed in its Reply Comments. In addition, Qualcomm proposes modifications to proposed Rule Section 22.1120(c) to allow an Air-Ground Mobile Broadband base station to use 6 dB power control due to adverse atmospheric conditions, so long as the total emission level into the GSO arc remains below -48.7 dBW/Hz. Finally, Qualcomm proposes new Rule Section 22.1124 containing requirements for certifying the base station and aircraft antennas that will be used to support the Air-Ground Mobile Broadband Service.

Qualcomm encourages the Commission to promptly issue a Report and Order that establishes the Air-Ground Mobile Broadband Service on a secondary licensed basis in the 14.0 to 14.5 GHz band and adopts the attached regulations. The traveling public is demanding the level of broadband Internet access that the proposed service will support in a highly cost-effective manner.

Respectfully submitted,

John W. Kuzin

John W. Kuzin

Senior Director, Government Affairs – Regulatory

Att.

cc w/ Att.
(via email)

Jim Ball
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APPENDIX B

Proposed Rules

For the reasons discussed in the preamble, the Federal Communications Commission proposes to amend 47 CFR parts 2 and 22 as follows:

PART 2 – Frequency Allocations And Radio Treaty Matters; General Rules And Regulations

1. The authority citation for Part 2 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

2. Section 2.106, the Table of Frequency Allocations, is amended as follows:
 - a. Page 49 is revised.
 - b. In the list of United States (US) Footnotes, footnote US133 is revised.

§ 2.106 Table of Frequency Allocations.

The revisions and additions read as follows:

* * * * *

Region 1 Table		International Table		United States Table		FCC Rule Part(s)
Region 1 Table		Region 2 Table	Region 3 Table	Federal Table	Non-Federal Table	
14.14.25	FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504B 5.504C 5.506A Space research			14.14.2 Space research US133	14.14.2 FIXED-SATELLITE (Earth-to-space) NG54 NG183 NG187 Mobile-satellite (Earth-to-space) Space research Aeronautical mobile US133	Public Mobile (22) Satellite Communications (25)
5.504A 5.505				14.2-14.4	14.2-14.47 FIXED-SATELLITE (Earth-to-space) NG54 NG183 NG187 Mobile-satellite (Earth-to-space) Aeronautical mobile	
14.25-14.3	FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B RADIONAVIGATION 5.504 Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.508A Space research					
14.3-14.4		14.3-14.4 FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A 5.506 5.506B Mobile-satellite (Earth-to-space) 5.506A MOBILE except aeronautical mobile Radionavigation-satellite 3.506A 3.509A Radionavigation-satellite 5.504A	14.3-14.4 FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.484A 5.506 5.506B 5.487A 5.488A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 3.504B 3.506A 3.509A Radionavigation-satellite 5.504A			
14.4-14.47	FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Space research (space-to-Earth) 5.504A			14.4-14.47 Fixed Mobile		
14.47-14.5	FIXED FIXED-SATELLITE (Earth-to-space) 5.457A 5.457B 5.484A 5.506 5.506B MOBILE except aeronautical mobile Mobile-satellite (Earth-to-space) 5.504B 5.506A 5.509A Radio astronomy 5.149 5.504A			14.47-14.5 Fixed Mobile	14.47-14.5 FIXED-SATELLITE (Earth-to-space) NG54 NG183 NG187 Mobile-satellite (Earth-to-space) Aeronautical mobile	
14.5-14.8	FIXED-SATELLITE (Earth-to-space) 5.510 MOBILE Space research			US133 US203 US342 14.5-14.7145 FIXED Mobile Space research 14.7145-14.8 MOBILE Fixed Space research	US133 US203 US342 14.5-14.8	
14.8-15.35	FIXED MOBILE Space research			14.8-15.1365 MOBILE SPACE RESEARCH Fixed US310	14.8-15.1365 US310	

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UNITED STATES (US) FOOTNOTES

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US133 In the bands 14-14.2 GHz and 14.47-14.5 GHz, the following provisions shall apply to the operations of Earth Stations Aboard Aircraft (ESAA) and to the Aeronautical Mobile Service (AMS):

(a) In the band 14-14.2 GHz, ESAA and AMS licensees planning to operate within radio line-of-sight of the coordinates specified in 47 CFR 25.227(c) are subject to prior coordination with NTIA in order to minimize harmful interference to the earth stations of NASA's Tracking and Data Relay Satellite System (TDRSS).

(b) In the band 14.47-14.5 GHz, operations within radio line-of-sight of the radio astronomy stations specified in 47 CFR 25.226(d)(2) are subject to coordination with the National Science Foundation in accordance with 47 CFR 25.227(d).

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PART 22 –Public Mobile Services

3. The authority citation for Part 22 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 222, 303, 309, and 332.

4. Part 22 is amended by adding the following to the end of Subpart B

* * * * *

§ 22.232 14.0-14.5 GHz band subject to competitive bidding.

Mutually exclusive initial applications for 14.0 –14.5 GHz band licenses are subject to competitive bidding. The general competitive bidding procedures set forth in 47 CFR Part 1, Subpart Q will apply unless otherwise provided in this subpart.

§ 22.233 Designated entities in the 14.0-14.5 GHz bands.

- a) Eligibility for small business provisions:

(1) A small business is an entity that, together with its affiliates, its controlling interests, the affiliates of its controlling interests, and the entities with which it has an attributable material relationship, has average gross revenues not exceeding \$40 million for the preceding three years.

(2) A very small business is an entity that, together with its affiliates, its controlling interests, the affiliates of its controlling interests, and the entities with which it has an attributable material relationship, has average gross revenues not exceeding \$15 million for the preceding three years.

- b) Bidding credits.

A winning bidder that qualifies as a small business as defined in this section or a consortium of small businesses may use the bidding credit specified in § 1.2110(f)(2)(iii) of this chapter. A winning bidder that qualifies as a very small business as defined in this section or a consortium of very small businesses may use the bidding credit specified in § 1.2110(f)(2)(ii) of this chapter.

5. Part 22 is amended by adding the following to the end of the Part:

* * * * *

Subpart K – Air-Ground Mobile Broadband Service

§ 22.1100 Scope.

The rules in this subpart govern the licensing and operation of the air-ground mobile broadband service in the 14.0-14.5 GHz band. The licensing and operation of these stations and systems is also subject to rules elsewhere in this part that apply generally to the public mobile services. However, in case of conflict, the rules in this subpart govern.

§ 22.1101 Definitions Associated With Air-Ground Mobile Service.

Air-Ground Mobile Broadband Service. An air-ground mobile broadband service that operates on a secondary basis in the 14.0 to 14.5 GHz band and provides high-data-rate connectivity between terrestrial ground stations and aircraft stations flying above the contiguous United States (“CONUS”).

Comment [QU1]: See NAB Comments at Appendix B.

Air-Ground Mobile Broadband Equipped Aircraft. Aircraft equipped with air-ground mobile broadband communications technology.

Base Stations. Fixed terrestrial-based air-ground mobile broadband communications stations that provide air-ground mobile broadband to air-ground mobile broadband equipped aircraft.

§ 22.1102 Permissible communications.

The 14.0-14.5 GHz band may be used to provide air-ground mobile broadband. Such service shall be provided in a manner consistent with §2.106 of this chapter.

§ 22.1104 Frequencies.

Two channel block(s) are available for assignment in the 14.0-14.5 GHz air-ground mobile broadband service:

A Block: 14.0-~~XX.XX~~14.25 GHz
B Block: ~~XX.XX~~14.25-14.5 GHz

§ 22.1106 Service Areas.

Service areas for 14.0-14.5 GHz air-ground mobile broadband are available on a nationwide basis. For the purposes of this paragraph, “nationwide” refers to a geographic market area covering the contiguous United States, *i.e.* the United States excluding Alaska, Hawaii, and island territories.

§ 22.1110 Regulatory status.

(a) *Single authorization.* Authorization will be granted to provide any or a combination of the following secondary services in a single license: common carrier, non-common carrier, private internal communications, and broadcast services. A licensee may render any kind of communications service consistent with the regulatory status in its license and with the Commission’s rules applicable to that service. An applicant or licensee may submit a petition at any time requesting clarification of the

Comment [QU2]: See NAB Comments at Appendix B.

regulatory status for which authorization is required to provide a specific communications service.

(b) *Designation of regulatory status in initial application.* An applicant shall specify in its initial application if it is requesting authorization to provide common carrier, non-common carrier, private internal communications, or broadcast services, or a combination thereof.

(c) *Amendment of pending applications.* The following rules apply to amendments of a pending application.

- (1) Any pending application may be amended to:
 - (i) Change the carrier regulatory status requested, or
 - (ii) Add to the pending request in order to obtain common carrier, non-common carrier, private internal communications, or broadcast services status, or a combination thereof, in a single license.
- (2) Amendments to change, or add to, the carrier regulatory status in a pending application are minor amendments filed under §1.927 of this chapter.

(d) *Modification of license.* The following rules apply to amendments of a license.

- (1) A licensee may modify a license to:
 - (i) Change the regulatory status authorized, or
 - (ii) Add to the status authorized in order to obtain a combination of services of different regulatory status in a single license.
- (2) Applications to change, or add to, the carrier status in a license are modifications not requiring prior Commission authorization. The licensee must notify the Commission within 30 days of the change. If the change results in the discontinuance, reduction, or impairment of an existing service, the licensee is subject to the provisions of § [discontinuance rule].

§ 22.1111 Eligibility.

Any entity other than those precluded by section 310 of the Communications Act of 1934, as amended, 47 U.S.C. 310, is eligible to hold a license under this part.

§22.1112 License period.

Initial authorizations will have a term not to exceed ten years from the date of initial issuance or renewal.

§ 22.1113 Construction requirements.

Licensees of 14.0-14.5 GHz air-ground mobile broadband, must, as a performance requirement, make a showing of “substantial service” in their license area within the prescribed license term set forth in §[license term rule].

(a) “Substantial service” is defined as service which is sound, favorable and substantially above a level of mediocre service which just might minimally warrant renewal. Failure by any licensee to meet this requirement will result in forfeiture of the license and the licensee will be ineligible to regain it.

(b) Each 14.0-14.5 GHz air-ground mobile broadband system subject to the requirements of this section must demonstrate substantial service within ~~10~~5 years after grant of the authorization. Substantial service

Comment [QU3]: See Qualcomm Comments at 10; Qualcomm Reply Comments at 12.

may be demonstrated by, but is not limited to, the following “safe harbor” provision:

(1) The construction and operation of ground stations that provides robust, uninterrupted service on routes serving at least 50 airports classified as large or medium hubs (as measured by the most recent Federal Aviation Administration data for annual passenger enplanements) within ten years of license grant.

(c) Aeronautical Mobile Service licensees may apply to transfer control of their licenses only after the licensee complies with the requirements in this rule section.

Comment [QU4]: See Qualcomm Comments at 10, 21; Qualcomm Reply Comments at 12-13.

§ 22.1114 Renewal Criteria.

Air-ground mobile broadband licensees in the 14.0-14.5 GHz band must file a renewal application in accordance with the provisions set forth in §1.949, and must make a showing of substantial service, independent of its performance requirements, as a condition for renewal at the end of each license term.

§ 22.1115 Geographic partitioning and spectrum disaggregation.

(a) *Eligibility.*

(1) Parties seeking approval for partitioning and disaggregation shall request from the Commission an authorization for partial assignment of a license pursuant to §1.948.

(2) Licensees in 14.0-14.5 GHz air-ground mobile broadband may apply to partition their licensed geographic service area or disaggregate their licensed spectrum at any time following the grant of their licenses only after the licensee complies with the construction requirements in Section 22.1113.

Comment [QU5]: See Qualcomm Comments at 10, 21; Qualcomm Reply Comments at 12-13.

(b) *Filing Requirements.* Parties seeking approval for geographic partitioning, spectrum disaggregation, or a combination of both must apply for a partial assignment of authorization by filing FCC Form 603 pursuant to § 1.948 of this chapter. Each request for geographic partitioning must include an attachment defining the perimeter of the partitioned area by geographic coordinates to the nearest second of latitude and longitude, based upon the 1983 North American Datum (NAD83). Alternatively, applicants may specify an FCC-recognized service area (*e.g.*, Basic Trading Area, Economic Area, Major Trading Area, Metropolitan Service Area, or Rural Service Area), county, or county equivalent, in which case, applicants need only list the specific FCC-recognized service area, county, or county equivalent names comprising the partitioned area.

(c) *License Term.* The license term for a partitioned license area or disaggregated spectrum license is the remainder of the original licensee's license term.

(d) *Performance Requirements.* Each party to a geographic partitioning, spectrum disaggregation, or a combination of both must individually meet any applicable performance requirements (*i.e.*, construction and operation requirements). If a licensee fails to meet any performance requirements on or before the required date, its authorization will terminate automatically on that date without further Commission action pursuant to §1.946 of this chapter.

(e) *Unjust Enrichment.* Licensees making installment payments or that received a bidding credit, that partition their licenses or disaggregate their spectrum to entities that do not meet the eligibility standards for installment payments or bidding credits, are subject to the unjust enrichment requirements of §1.2111 of this chapter.

§ 22.1116 Initial authorization.

(a) An applicant must file a single application for an initial authorization for all markets won and frequency blocks desired. Initial authorizations shall be granted in accordance with §§ ~~22.1104 and 22.1106~~ ~~frequencies and service areas rules~~. Applications for individual sites are not required and will not be accepted, except where required for environmental assessments, in accordance with §§ 1.1301 through 1.1319 of this chapter.

(b) Initial authorizations for 14.0-14.5 GHz air-ground mobile broadband shall be for ~~250~~ megahertz of spectrum in accordance with § ~~22.1104~~ ~~frequencies rule~~. Authorizations will be on a nationwide service area basis as defined in § ~~22.11~~~~XX~~06.

§ 22.1118 Discontinuance of Service.

(a) A 14.0-14.5 GHz air-ground mobile broadband licensee’s authorization will automatically terminate, without specific Commission action, if it permanently discontinues service. Permanent discontinuance of service is defined as 180 consecutive days during which a licensee is not providing service to aircraft or subscribers

(b) Filing Requirements. A licensee that permanently discontinues service as defined in this section must notify the Commission of the discontinuance within 10 days by filing FCC Form 601 or 605 requesting license cancellation. An authorization will automatically terminate, without specific Commission action, if service is permanently discontinued as defined in this section, even if a licensee fails to file the required form requesting license cancellation.

(c) Extension Request. A licensee may file a request for a longer discontinuance period for good cause. An extension request must be filed at least 30 days before the end of the 180-day discontinuance period. The filing of an extension request will automatically extend the discontinuance period a minimum of the latter of an additional 30 days or the date upon which the Wireless Telecommunications Bureau acts on the request.

§ 22.1120 Protecting GSO Satellite Systems from Harmful Interference from Air-Ground Mobile Broadband.

The aggregate increase in interference ($\Delta T/T$) from all simultaneous transmitting components (i.e., air-ground mobile broadband aircraft, ~~and~~ base stations, or both including duty cycle effects) into the uplink of GSO satellites shall not exceed one percent. This one percent $\Delta T/T$ limit may be met by complying with subsections (a), (b) and (c) below:

- a) For a baseline air-ground mobile broadband system consisting of 600 beams (e.g., 150 base station sites and 4 beams per site) operating on a given band of spectrum, the transmitted power spectral density from a single base station beam into the GSO arc must not exceed ~~-74.576.5~~ dBW/Hz. If the number of base station beams is increased beyond 600, then the total transmitted power toward the GSO arc must be adjusted accordingly, such that the total transmitted power toward the GSO arc from all beams is not greater than ~~-46.748.7~~ dBW/Hz. If the number of air-ground mobile broadband base stations increases from 150 to ~~250~~400, the single beam EIRP density must ~~be less than the value~~not exceed

Comment [QU6]: See Qualcomm Comments at 24-26; Qualcomm Reply Comments at 13-14.

$$-7\del{6.5} - 10 \text{Log}\left(\frac{n}{150}\right) \text{ dBW/Hz for } 150 \leq n \leq \del{250}\u{400} \tag{1}$$

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~~and the aggregate EIRP density from all beams must be less than~~

$$\del{46.7 - 10 \log\left(\frac{n}{150}\right) \text{ dBW/Hz for } 150 \leq n \leq 250} \quad (2)$$

~~where n is the number of base stations.~~

- b) ~~Transmissions from any air-ground mobile broadband aircraft stations located over CONUS, when averaged in azimuth and elevation towards all points in the GSO arc must not exceed an EIRP density of -76.5 dBW/Hz 3 dBW/2 megahertz. Furthermore, the aggregate EIRP from all air-ground mobile broadband aircraft stations over CONUS towards any point in the GSO arc, accounting for aircraft cruise level roll angles of ±5° in elevation, must not exceed -47 48.7 dBW/Hz. When deriving the aggregate EIRP density toward the GSO arc, the aircraft cruise level roll angle of ±5° in elevation must be taken into account.~~
- c) ~~Every An air-ground mobile broadband base station may increase its transmit power by up to 6 dB to compensate for rain fade adverse atmospheric conditions. In compensation for the increase in power, the air-ground mobile broadband base station must reduce the number of beams it transmits system shall turn off or reduce the power transmitted from other base station beams, as necessary, to ensure that the total transmitted power toward the GSO arc does not exceed -48.7 dBW/Hz to maintain the same maximum transmitted power.~~

Comment [QU7]: See Qualcomm Comments at 28 n.93; Qualcomm Reply Comments at 28 n.67.

Comment [QU8]: See Petition for Rulemaking, Appendices A & B; Qualcomm Comments at 29 n.97.

Comment [QU9]: See Petition for Rulemaking, Appendix A; Qualcomm Comments at 30-31; Qualcomm Reply Comments at 25, 30-31.

§ 22.1122 Out of Band Emissions (OOBE) Requirement for Two Separate Air-Ground Mobile Broadband Systems.

If two separate licensees deploy air-ground mobile broadband systems within distinct portions of the 14.0 to 14.5 GHz band, the power level of any emission outside an air-ground mobile broadband licensee's frequency band of operation shall be attenuated below the transmitter power of P watts (with averaging performed only during periods of transmission) within the licensee's band of operation by at least $43 + 10 \log(P)$ dB. Compliance with this rule shall be measured via use of instrumentation employing a resolution bandwidth of 1 megahertz or greater, except that in the 1 megahertz bands immediately adjacent to the licensee's frequency band of operation, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (that is, 1 megahertz or 1 percent of the emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated by at least 26 dB below the transmit power level.

§ 22.1124 Air-Ground Mobile Broadband System Antenna Performance.

(a) ~~The Air-Ground Mobile Broadband system operator shall maintain documentation with measurements that demonstrate that its base station and aircraft antennas and their associated modem designs will not exceed the emission limits into the GSO arc that are specified in this rule part.~~

~~(1) The documentation shall contain measurements of the three dimensional antenna pattern of the base station antenna(s) by pointing the beam peak at five azimuthal angles of zero degrees (i.e., true north), and ±60°, ±30° from true north at low, mid and high frequencies across the band of operation. The proposed maximum pre-amplifier power into the antenna port for beams at azimuthal angles of ±60°, ±30°, and true north shall be imposed onto the measured three~~

Comment [QU10]: See Qualcomm Reply Comments at 25-26 (responding to Echostar comments at 10-11).

dimensional antenna patterns to demonstrate that the emission limit into the GSO arc is not exceeded.

(2) The documentation shall contain measurements of the aircraft antenna(s) in elevation at relevant azimuth cuts using an appropriate aircraft fuselage model. The proposed transmit power into the aircraft antenna port should then be imposed onto the measured antenna pattern to ensure that the emission limit into the GSO arc is not exceeded.

(b) The Air-Ground Mobile Broadband system operator shall demonstrate that its aircraft terminals are capable of automatically ceasing transmissions upon loss of synchronization or within 5 seconds upon loss of reception of the base station downlink signal, whichever is less. The aircraft terminal must be capable of adjusting its transmit power within 100 milliseconds if necessary to ensure the emission limit into GSO arc is met under aircraft roll conditions.

(c) The Air-Ground Mobile Broadband system operator shall file with the Commission a report no later than six months after the air-ground mobile broadband system has achieved substantial service, describing the aggregate EIRP-density levels resulting from the operation of the Air-Ground Mobile Broadband system. The report shall contain sufficient statistical technical information on the individual aircraft transceivers and base stations and the overall system operation in order to assess compliance with the technical requirements in this rule part.