

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

In the Matter of)
Service Rules for Advanced Wireless Services in)
the 2000-2020 MHz and 2180-2200 MHz Bands) WT Docket No. 12-70
Fixed and Mobile Services in the Mobile Satellite)
Service Bands at 1525-1559 MHz and 1626.5-) ET Docket No. 10-142
1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500)
MHz, and 2000-2020 MHz and 2180-2200 MHz)
Service Rules for Advanced Wireless Services in)
the 1915-1920 MHz, 1995-2000 MHz, 2020-2025) WT Docket No. 04-356
MHz and 2175-2180 MHz Bands)

Accepted / Filed

AUG 6 - 2014

Federal Communications Commission
Office of the Secretary

REPORT AND ORDER AND ORDER OF PROPOSED MODIFICATION

Adopted: December 11, 2012

Released: December 17, 2012

By the Commission:

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I. INTRODUCTION

1. With this Report and Order, we increase the Nation's supply of spectrum for mobile broadband by adopting flexible use rules for 40 megahertz of spectrum in the 2 GHz band (2000-2020 MHz and 2180-2200 MHz), which we term the AWS-4 band. In so doing, we carry out a recommendation in the *National Broadband Plan* that the Commission enable the provision of stand-alone terrestrial services in the 2 GHz Mobile Satellite Service (MSS) spectrum band, thus dramatically increasing the value of this spectrum to the public.¹ Specifically, we remove regulatory barriers to mobile broadband use of this spectrum, and adopt service, technical, and licensing rules that will encourage innovation and investment in mobile broadband and provide certainty and a stable regulatory regime in which broadband deployment can rapidly occur.

¹ See *infra* ¶ 4.

2. To create a solid and lasting foundation for the provision of terrestrial services in this spectrum and to make this spectrum available efficiently and quickly for flexible, terrestrial use, such as mobile broadband, we will assign the spectrum to the incumbent MSS operators. Thus, together with this Report and Order, we issue an Order of Proposed Modification, proposing to replace the incumbent MSS operators' Ancillary Terrestrial Component (ATC) authority with full flexible use terrestrial authority. Additionally, we decline to adopt the alternative band plan proposals presented in the *AWS-4 NPRM and NOI*, including shifting the AWS-4 uplink spectrum up five or ten megahertz or further exploring the larger and more complex 2 GHz Extension Band Concept.²

II. BACKGROUND

A. The Growing Spectrum Demands of Mobile Broadband Services

3. Demand for wireless broadband services and the network capacity associated with those services is surging, resulting in a growing demand for spectrum to support these services. Adoption of smartphones increased at a 50 percent annual growth rate in 2011, from 27 percent of U.S. mobile subscribers in December 2010 to nearly 42 percent in December 2011.³ Further, consumers have rapidly adopted the use of tablets, which were first introduced in January of 2010.⁴ By the end of 2012, it is estimated that one in five Americans—almost 70 million people—will use a tablet.⁵ Between 2011 and 2017, mobile data traffic generated by tablets is expected to grow at a compound annual growth rate of 100 percent.⁶ New mobile applications and services, such as high resolution video communications, are also using more bandwidth. For example, a single smartphone can generate as much traffic as thirty-five basic-feature mobile phones,⁷ while tablets connected to 3G and 4G networks use three times more data than smartphones over the cellular network.⁸ All of these trends, in combination, are creating an urgent need for more network capacity and, in turn, for suitable spectrum.

² See *Service Rules for Advanced Wireless Services in the 2000-2020 MHz and 2180-2200 MHz Bands*, WT Docket Nos. 12-70, 04-356, ET Docket No. 10-142, *Notice of Proposed Rulemaking and Notice of Inquiry*, 27 FCC Rcd 3561, 3570-3571, 3577, 3607-3611 ¶¶ 21, 42-43, 137-147 (2012) (*AWS-4 NPRM* and *AWS-4 NOI*, respectively); *infra* Sections III.A.1. (*AWS-4 Frequencies and Paired Spectrum (uplink/downlink)*, VI. (*Notice of Inquiry: 2 GHz Extension Band Concept*)).

³ comScore 2012 Mobile Future in Focus (2012) at 16 http://www.comscore.com/Press_Events/Presentations_Whitepapers/2012/2012_Mobile_Future_in_Focus (last visited Nov. 30, 2012).

⁴ Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services, WT Docket No. 10-133, *Fifteenth Report*, 26 FCC Rcd 9664, 9754 ¶ 145 (*Fifteenth Mobile Wireless Competition Report*).

⁵ Press Release, eMarketer, *Tablet Shopping Growing, but Retailers Must Keep Up* (June 15, 2012), available at <http://www.emarketer.com/Article.aspx?R=1009120&ecid=a6506033675d47f881651943c21c5ed4> (last visited Nov. 30, 2012).

⁶ Ericsson, *Traffic and Market Report: On the Pulse of the Networked Society* (June 2012), available at http://www.ericsson.com/res/docs/2012/traffic_and_market_report_june_2012.pdf (last visited Nov. 30, 2012).

⁷ Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2011-2016 (February 2012), available at http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html (last visited Nov. 30, 2012).

⁸ Kevin Fitchard, *3G/4G tablets suck up 3x more data than smartphones*, GIGAOM, May 15, 2012, available at <http://gigaom.com/mobile/study-3g4g-tablets-suck-up-3x-more-data-than-smartphones/> (last visited Nov. 30, 2012).

4. The widely-acknowledged need for more broadband spectrum has spurred several initiatives across the U.S. government. The 2010 *National Broadband Plan* recommended the Commission undertake to make 500 megahertz of spectrum available for broadband use within ten years, including 300 megahertz within five years.⁹ The Commission has taken numerous steps to achieve these goals, including recently adopting a notice of proposed rulemaking on conducting the world's first incentive auction to repurpose broadcast spectrum for wireless broadband use,¹⁰ and updating the Commission's rules for the 2.3 GHz Wireless Communications Service (WCS) band to permit the use of the most advanced wireless technologies in that band.¹¹ Similarly, the Administration has recognized the need to make more spectrum available for broadband. In 2010, the President directed the National Telecommunications and Information Administration (NTIA) to collaborate with the Commission to "make available a total of 500 MHz of Federal and non-Federal spectrum over the next ten years, suitable for both mobile and fixed wireless broadband use."¹² NTIA undertook a "fast-track" review of several bands that could be reallocated to mobile use¹³ and proposed exploring Federal / non-Federal sharing of the 1755-1850 MHz band.¹⁴

B. The Spectrum Act

5. In February 2012, Congress enacted Title VI of the Middle Class Tax Relief and Job Creation Act of 2012 (the "Spectrum Act").¹⁵ The Spectrum Act includes several provisions to make more spectrum available for commercial use, including through auctions, and to improve public safety communications.¹⁶ Among other things, the Spectrum Act requires the Commission, by February 23, 2015, to allocate the 1915-1920 MHz band and the 1995-2000 MHz band (collectively, the "H Block") for commercial use, and to auction and grant new initial licenses for the use of each spectrum band, subject to flexible use service rules.¹⁷ Congress provided, however, that if the Commission determined

⁹ Connecting America: The National Broadband Plan, Recommendation 5.8 at 84-85 (2010) (*National Broadband Plan*), available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296935A1.pdf (last visited Nov. 30, 2012)

¹⁰ See Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, Docket No. 12-268, *Notice of Proposed Rulemaking*, 27 FCC Rcd 12357 (2012) (*Incentive Auction NPRM*); *National Broadband Plan* at 81-82.

¹¹ See Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band, WT Docket No. 07-293, IB Docket No. 95-91, *Order on Reconsideration*, 27 FCC Rcd 13651 (2012) (*2012 WCS Order*); see also, *Amendment of Part 27 of the Commission's Rules to Govern the Operation of Wireless Communications Services in the 2.3 GHz Band*, WT Docket No. 07-293, IB Docket No. 95-91, GEN Docket No. 90-357, RM-8610, *Report and Order and Second Report and Order*, 25 FCC Rcd 11710 (2010) (*2010 WCS Order*).

¹² Memorandum of June 28, 2010—Unleashing the Wireless Broadband Revolution, 75 Fed. Reg. 38387 (July 1, 2010).

¹³ See U.S. Department of Commerce, *An Assessment of the Near-Term Viability of Accommodating Wireless Broadband Systems in the 1675-1710 MHz, 1755-1780 MHz, 3500-3650 MHz, and 4200-4220 MHz, 4380-4400 MHz Bands* (Oct. 2010), available at http://www.ntia.doc.gov/reports/2010/FastTrackEvaluation_11152010.pdf ("*NTIA Fast Track Report*") (last visited Nov. 30, 2012).

¹⁴ See *NTIA Fast Track Report* at pp. 2-3-2-5.

¹⁵ See generally Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, 126 Stat. 156 (2012) (Spectrum Act).

¹⁶ Spectrum Act §§ 6001-6703.

¹⁷ See Spectrum Act § 6401(b), codified at 47 U.S.C. § 1451(b).

that either of the bands could not be used without causing harmful interference to commercial licensees in 1930-1995 MHz (PCS downlink), then the Commission was prohibited from allocating that specific band for commercial use or licensing it.¹⁸ Additionally, Sections 6401(f) and 6413 of the Spectrum Act specify that the proceeds from an auction of licenses in the 1995-2000 MHz band and in the 1915-1920 MHz band shall be deposited in the Public Safety Trust Fund and then used to fund the Nationwide Public Safety Broadband Network (“FirstNet”).¹⁹ The H block spectrum could be the first spectrum specified by the Spectrum Act to be licensed by auction, and thus could represent the first inflow of revenues toward this statutory goal.²⁰

C. MSS and Terrestrial Use in the 2 GHz Band

6. As the Commission explained in the *AWS-4 NPRM*, in 1997 the Commission reallocated 70 megahertz of spectrum in the 2 GHz band from a terrestrial Fixed and Mobile allocation to a Mobile Satellite allocation.²¹ MSS is a radiocommunication service involving transmission between mobile earth stations and one or more space stations.²² The Commission intended for MSS to provide communications in areas where it is difficult or impossible to provide communications coverage via terrestrial base stations and at times when coverage may be unavailable from terrestrial-based networks.²³ The Commission adopted MSS rules for the 2 GHz band in 2000,²⁴ and in 2001 the International Bureau authorized eight satellite operators to provide MSS in this band.²⁵ By February 2003, the International Bureau cancelled three MSS authorizations for failure to meet their system implementation milestones.²⁶

¹⁸ See Spectrum Act § 6401(b)(4), codified at 47 USC § 1451(b)(4).

¹⁹ Spectrum Act §§ 6401(f), 6413, codified at 47 U.S.C. §§ 309(j)(8)(D)(ii), 1457. Amounts remaining in the Public Safety Trust Fund after fiscal year 2022 are required to be deposited into the Treasury’s general fund for the purpose of deficit reduction.

²⁰ Concurrently with the issuance of this Report and Order, the Commission is issuing a Notice of Proposed Rulemaking that proposes service, technical, and licensing rules for the H block. See generally, Service Rules for the Advanced Wireless Services H Block—Implementing Section 6401 of the Middle Class Tax Relief and Job Creation Act of 2012 Related to the 1915-1920 MHz and 1995-2000 MHz bands, WT Docket No. 12-357, *Notice of Proposed Rulemaking*, FCC 12-152 (rel. Dec. 17, 2012) (*H Block NPRM*).

²¹ *AWS-4 NPRM*, 27 FCC Rcd at 3563-64 ¶ 3 (citing Amendment of Section 2.106 of the Commission’s Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service, ET Docket No. 95-18, *First Report and Order and Further Notice of Proposed Rule Making*, 12 FCC Rcd 7388 at 7391, 7395 ¶¶ 5-6, 14 (1997)).

²² See 47 C.F.R. § 2.1(c).

²³ See Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, IB Docket No. 01-185, ET Docket No. 95-18, *Notice of Proposed Rulemaking*, 16 FCC Rcd 15532 ¶ 1 (2001).

²⁴ Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band, IB Docket No. 99-81, *Report and Order*, 15 FCC Rcd 16127 (2000).

²⁵ Third Report and Analysis of Competitive Market Conditions with Respect to Domestic and International Satellite Communications Services, Report and Analysis of Competitive Market Conditions with Respect to Domestic and International Satellite Communications Services, IB Docket Nos. 09-16, IB Docket No. 10-99, *Third Report*, 26 FCC Rcd 17284, 17310 ¶ 56 (2011) (*Third Satellite Competition Report*).

²⁶ Mobile Communications Holdings, Inc. and ICO Global Communications (Holdings) Limited for Transfer of Control, *Memorandum Opinion and Order*, 18 FCC Rcd 1094, 1099-1103 ¶¶ 15-24 (2003); Application of Globalstar, L.P. for Modification of License for a Mobile-Satellite Service System in the 2 GHz Band, *Memorandum Opinion and Order*, 18 FCC Rcd 1249, 1251-55 ¶¶ 6-15 (2003).

7. At the same time, the Commission took two actions in this band to respond to the growth in terrestrial wireless services. First, the Commission reallocated 30 megahertz of MSS spectrum for terrestrial Fixed and Mobile use, reducing the spectrum allocated to MSS to 40 megahertz.²⁷ Second, the Commission established ATC rules, which allowed authorized MSS operators to augment their satellite services with terrestrial facilities.²⁸ ATC consists of terrestrial base stations and mobile terminals that re-use frequencies assigned for MSS operations.²⁹ To ensure that ATC would be ancillary to the provision of MSS, the Commission determined that ATC authority would be limited to MSS operators who met specific “gating” criteria.³⁰

8. Significantly, in establishing ATC, the Commission determined that only existing MSS operators would be permitted to receive ATC authority. The Commission found that:

[S]haring between MSS and terrestrial mobile services is neither advisable, nor practical. Revocation of the authority of operational MSS systems and those MSS licenses that have met their implementation milestones in good faith is unreasonable and unwarranted. And our detailed technical analyses demonstrate that a third party cannot operate in the licensed MSS spectrum without compromising the operations of existing and future MSS licensees.³¹

Further, “based on the record and our detailed technical analysis, . . . granting shared usage of the same MSS frequency band to separate MSS and terrestrial operators would likely compromise the effectiveness of both systems.”³² Therefore, the Commission decided against adopting a licensing framework that would allow the acceptance of mutually exclusive applications that would be resolved by auction and instead concluded that ATC authority would be granted through a license modification.³³

9. Three additional MSS operators surrendered their licenses in 2005.³⁴ This left only two MSS operators in the 2 GHz band, DBSD (then known as ICO) and TerreStar (then known as TMI), each of which had the right to use 20 megahertz of 2 GHz band spectrum to provide MSS.³⁵

²⁷ Amendment of Part 2 of the Commission’s Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, ET Docket No. 00-258, IB Docket No. 99-81 RM-9911, RM-9498, RM-10024, *Third Report and Order, Third Notice of Proposed Rulemaking and Second Memorandum Opinion and Order*, 18 FCC Rcd 2223, 2238-40 ¶¶ 28-32 (2003) (*AWS Third Report and Order*).

²⁸ See Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, IB Docket Nos. 01-185, 02-364, *Report and Order and Notice of Proposed Rulemaking*, 18 FCC Rcd 1962, 1964 ¶ 1 (2003) (*ATC Report and Order*).

²⁹ See Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, ET Docket No. 10-142, *Report and Order*, 26 FCC Rcd 5710, 5711-12 ¶ 5 (2011) (*2 GHz Band Co-Allocation Report and Order*).

³⁰ 47 C.F.R. § 25.149(b); *ATC Report and Order*, 18 FCC Rcd at 1990-95, 2068-71 ¶¶ 47-55, 221-26; see *ATC Report and Order*, 18 FCC Rcd at 1999-2011 ¶¶ 66-93 (gating criteria); Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, IB Docket No. 01-185, *Memorandum Opinion and Order and Second Order on Reconsideration*, 20 FCC Rcd 4616, 4625-26 ¶¶ 24-27 (2005) (*ATC Second Reconsideration Order*).

³¹ *ATC Report and Order*, 18 FCC Rcd at 1999 ¶ 65.

³² *Id.* at 1965 ¶ 2; see also *id.* at 1993 ¶ 52.

³³ See *id.* at 2068-69 ¶ 221.

³⁴ *Third Satellite Competition Report*, 26 FCC Rcd at 17310 ¶ 56.

10. DBSD and TerreStar launched their satellites in April 2008 and July 2009, respectively, and met their operational milestones in May 2008 and August 2009, respectively.³⁶ DBSD and TerreStar received ATC authority in 2009 and 2010, respectively.³⁷ Despite having MSS and ATC authority and an orbiting satellite, DBSD never offered either commercial satellite or terrestrial service and TerreStar offered only minimal satellite service (partnering with AT&T to offer a non-ATC satellite/terrestrial service using AT&T terrestrial spectrum and TerreStar satellite spectrum).³⁸ To date, there remains little commercial use of this spectrum for MSS and none for terrestrial (ATC) service.³⁹

11. The *National Broadband Plan* in 2010 recommended that the FCC “accelerate terrestrial deployment in 90 megahertz” of MSS spectrum.⁴⁰ The *National Broadband Plan* proposed different approaches to expanding terrestrial services in different MSS bands.⁴¹ For the 2 GHz MSS band, the Plan recommended that the “FCC should add a primary ‘mobile’ (terrestrial) allocation to the S-Band, consistent with the international table of allocations, which will provide the option of flexibility to licensees to provide stand-alone terrestrial services using the spectrum.”⁴² Additionally, the Plan recommended that “[e]xercise of this option should be conditioned on construction benchmarks, participation in an incentive auction, or other conditions designed to ensure timely utilization of the spectrum for broadband and appropriate consideration for the step-up in the value of the affected spectrum.”⁴³

12. In July 2010, the Commission issued a Notice of Proposed Rulemaking proposing to add Fixed and Mobile allocations to the 2000-2020 MHz and 2180-2200 MHz bands.⁴⁴ The Commission adopted this proposal in April 2011, thereby establishing the predicate for more flexible use of the band

(Continued from previous page) _____

³⁵ See Use of Returned Spectrum in the 2 GHz Mobile Satellite Service Frequency Bands, IB Docket Nos. 05-220, 05-221, *Order*, 20 FCC Rcd 19696 at 19707 ¶ 26 (2005). Prior to this action, DBSD and TerreStar shared this spectrum allocation equally with the other MSS operators.

³⁶ See Improving Public Safety Communications in the 800 MHz Band, WT Docket No. 02-55, ET Docket No. 00-258, ET Docket No. 95-18, *Fifth Report and Order*, *Eleventh Report and Order*, *Sixth Report and Order*, and *Declaratory Ruling*, 25 FCC Rcd 13874, 13877 ¶ 7 (2010) (*2010 BAS Ruling*).

³⁷ New ICO Satellite Services G.P., Application for Blanket Authority to Operate Ancillary Terrestrial Component Base Stations and Dual-mode MSS/ATC Mobile Terminals in the 2 GHz MSS Bands, *Order and Authorization*, 24 FCC Rcd 171 (2009) (*ICO Waiver Order*); TerreStar Networks Inc., Application for Blanket Authority to Operate Ancillary Terrestrial Component Base Stations and Dual-Mode MSS/ATC Mobile Terminals in the 2 GHz MSS Bands, *Order and Authorization*, 25 FCC Rcd 228 (2010) (*TerreStar Waiver Order*).

³⁸ *Fifteenth Mobile Wireless Competition Report*, 26 FCC Rcd at 9701 ¶ 38 n.98.

³⁹ See Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, ET Docket No. 10-142, *Notice of Proposed Rulemaking and Notice of Inquiry*, 25 FCC Rcd 9481, 9483 ¶ 6 (2010) (*MSS Fixed and Mobile Allocation NPRM*) (“The deployment of MSS and ATC in the 2 GHz band has been a slow process.”).

⁴⁰ *National Broadband Plan*, Recommendation 5.8.4 at 87-88.

⁴¹ *Id.* at 88.

⁴² *Id.* at 87-88.

⁴³ *Id.* at 87-88.

⁴⁴ Fixed and Mobile Services in the Mobile Satellite Service Bands at 1525-1559 MHz and 1626.5-1660.5 MHz, 1610-1626.5 MHz and 2483.5-2500 MHz, and 2000-2020 MHz and 2180-2200 MHz, ET Docket No. 10-142, *Notice of Proposed Rulemaking and Notice of Inquiry*, 25 FCC Rcd 9481 (2010) (*2 GHz Band Co-Allocation NPRM* and *2010 MSS NOI*, respectively).

for terrestrial mobile broadband services.⁴⁵ The Commission also declared its intent to initiate a service rules rulemaking proceeding, stating that “having added co-primary Fixed and Mobile allocations to the 2 GHz band, we anticipate issuing a notice of proposed rulemaking on subjects raised in the 2010 MSS NOI, including possible service rule changes that could increase investment and utilization of the band in a manner that further serves the public interest.”⁴⁶ The Commission expected that this rulemaking would include an examination of the relationship of the 2 GHz band with neighboring bands.⁴⁷

13. In May 2011, the Commission’s Spectrum Task Force issued a public notice requesting technical input on approaches to encourage the growth of terrestrial mobile broadband services in the 2 GHz spectrum range that is allocated for fixed and mobile use. Specifically, the Spectrum Task Force sought information on “developing a cohesive approach that maximizes the terrestrial mobile broadband potential of this spectrum.”⁴⁸ The public notice specifically focused on the 2 GHz MSS band and neighboring Advanced Wireless Services (AWS) blocks, including the AWS-2 Upper “H” block spectrum at 1995-2000 MHz; the AWS-2 paired “J” block spectrum at 2020-2025 MHz and 2175-2180 MHz; and the AWS-3 spectrum at 2155-2175 MHz.⁴⁹ In response, several parties offered comments on potential changes to the existing 2 GHz MSS band plan.⁵⁰

14. In 2011, DISH Network Corporation (DISH) acquired both TerreStar and DBSD out of bankruptcy, paying approximately \$1.4 billion for each company.⁵¹ DISH filed applications with the Commission for approval to transfer control of the MSS licenses, including ATC authority, of each of TerreStar and DBSD to two separate subsidiary companies of DISH.⁵² At the same time, DBSD and TerreStar filed requests to modify their respective ATC authorities, including for a waiver of certain non-technical ATC rules, such as the integrated service and spare satellite rules, and of certain ATC technical rules.⁵³ On March 2, 2012, the International Bureau granted the applications for transfer of control of the MSS licenses, including ATC authority, of DBSD and TerreStar to DISH. As a result, in New DBSD

⁴⁵ *2 GHz Band Co-Allocation Report and Order*, 26 FCC Rcd at 5710 ¶ 2.

⁴⁶ *Id.* at 5716 ¶ 13.

⁴⁷ *Id.* at 5716 ¶ 13.

⁴⁸ Spectrum Task Force Invites Technical Input on Approaches to Maximize Broadband Use of Fixed/Mobile Spectrum Allocations in the 2 GHz Range, ET Docket No. 10-142, WT Docket Nos. 04-356, 07-195, *Public Notice*, 26 FCC Rcd 7587 (2011) (*2 GHz Public Notice*).

⁴⁹ See generally, *2 GHz Public Notice*, 26 FCC Rcd 7587.

⁵⁰ See, e.g., Comments of TerreStar Networks Inc., ET Docket No. 10-142, WT Docket Nos. 04-356, 07-195 (July 8, 2011); Comments of T-Mobile USA, Inc., ET Docket No. 10-142, WT Docket Nos. 04-356, 07-195 (July 8, 2011); Comments of Ericsson, ET Docket No. 10-142, WT Docket Nos. 04-356, 07-195 (July 8, 2011).

⁵¹ See DISH Network Corporation Files to Acquire Control of Licenses and Authorizations Held By New DBSD Satellite Services G.P, Debtor-in-Possession and TerreStar License Inc., Debtor-in-Possession, IB Docket No. 11-150, *Public Notice*, 26 FCC Rcd 13018 (2011) (*DBSD and TerreStar Transfer of Control Public Notice*); http://www.sec.gov/Archives/edgar/data/1001082/000110465911061256/a11-25886_110q.htm#TableOfContents (last visited Dec. 10, 2012).

⁵² See DISH Network Corporation Files to Acquire Control of Licenses and Authorizations Held By New DBSD Satellite Services G.P, Debtor-in-Possession and TerreStar License Inc., Debtor-in-Possession, IB Docket No. 11-150, *Public Notice*, 26 FCC Rcd 13018, 13020-1 (2011) (*DBSD and TerreStar Transfer of Control Public Notice*).

⁵³ New DBSD Satellite Service G.P., Debtor-in-Possession, and TerreStar Licensee Inc., Debtor-In-Possession, Request For Rule Waivers And Modified Ancillary Terrestrial Component Authority, IB Docket No. 11-149, *Public Notice*, 26 FCC Rcd 13011 (2011); see 47 C.F.R. §§ 25.149(b)(2), (4), 25.252.

Satellite Services G.P., a wholly owned subsidiary of DISH, obtained control of the former DBSD MSS license, including ATC authority, and Gamma Acquisition L.L.C., also a wholly owned subsidiary of DISH, obtaining control of the former TerreStar MSS license, including ATC authority.⁵⁴ In granting these applications, the International Bureau denied the non-technical rule waiver requests and deferred to the technical rule waivers to a rulemaking proceeding, stating that “[s]ince the release of the National Broadband Plan . . . the Commission has been clear about its intent to remove regulatory barriers in this band through a rulemaking to unleash more spectrum for mobile broadband.”⁵⁵

15. In March 2012, the Commission adopted the *AWS-4 NPRM*, which consisted of a Notice of Proposed Rulemaking and Notice of Inquiry.⁵⁶ In the *AWS-4 NPRM*, the Commission proposed to increase the Nation’s supply of spectrum for mobile broadband by removing barriers to flexible use of spectrum currently assigned to the MSS.⁵⁷ The Commission proposed terrestrial service rules for the 2 GHz band that would generally follow the Commission’s Part 27 flexible use rules, modified as necessary to account for issues unique to the particular spectrum bands.⁵⁸ The proposed rules were designed to provide for flexible use of this spectrum, to encourage innovation and investment in mobile broadband, and to provide a stable regulatory environment in which broadband deployment could develop.⁵⁹ The proposed rules also included aggressive build-out requirements and concomitant penalties for failure to build out designed to ensure timely deployment of wireless, terrestrial broadband in the band.⁶⁰ Additionally, in the Notice of Inquiry, the Commission sought comment on potential ways to free up additional valuable spectrum to address the Nation’s growing demand for mobile broadband spectrum, including through examination of alternative band plans incorporating the Federal 1695-1710 MHz band.⁶¹

16. Comments on the *AWS-4 NPRM* were due by May 17, 2012 and reply comments were due by June 1, 2012. Thirty-four comments and twenty-one reply comments were filed in response to the *AWS-4 NPRM*. A list of commenters and reply commenters can be found in Appendix C. In addition, as permitted under our rules, there have been ex parte presentations.⁶²

III. REPORT AND ORDER: AWS-4

17. In this *AWS-4 Report and Order*, we build on the Commission’s recent actions to increase the availability of spectrum by enabling terrestrial mobile broadband service in 40 megahertz of spectrum in the 2000-2020 MHz and 2180-2200 MHz spectrum bands.⁶³ As explained below, we adopt

⁵⁴ New DBSD Satellite Service G.P., Debtor-in-Possession, and TerreStar Licensee Inc., Debtor-In-Possession, Request for Rule Waivers and Modified Ancillary Terrestrial Component Authority, IB Docket Nos. 11-149, 11-150, *Order*, 27 FCC Rcd 2250, 2251, 2255, 2262 ¶¶ 1, 13, 31, 33 (2012) (*DISH Transfer Order*).

⁵⁵ *DISH Transfer Order*, 27 FCC Rcd at 2261-62 ¶¶ 29, 34.

⁵⁶ See *AWS-4 NPRM*, 27 FCC Rcd 3561.

⁵⁷ *Id.* at 3563 ¶ 1.

⁵⁸ *Id.* at 3594 ¶ 103.

⁵⁹ *Id.* at 3563 ¶ 1.

⁶⁰ *Id.* at 3589-3592 ¶¶ 90-98.

⁶¹ *Id.* at 3607-3611 ¶¶ 138-147.

⁶² See 47 C.F.R. § 1.1415(d); 47 C.F.R. §§ 1.1200-1.1216.

⁶³ The 2000-2020 MHz and 2180-2200 MHz bands are the fourth spectrum bands that the Commission has sought to make available for Advanced Wireless Service (AWS) use. The Commission assigned licenses for the 1710-1755 (continued....)

AWS-4 terrestrial service, technical, and licensing rules that generally follow the Commission's Part 27 flexible use rules, modified as necessary to account for issues unique to the AWS-4 bands. First, we establish 2000-2020 MHz paired with 2180-2200 MHz as the AWS-4 band plan.

18. Second, we adopt appropriate technical rules for operations in the AWS-4 band. This includes rules governing the relationship of the AWS-4 band to other bands. For example, as explained below, we require the licensees of AWS-4 operating authority to accept some limited interference from operations in the adjacent upper H block at 1995-2000 MHz, and impose more stringent out-of-band emission (OOBE) limits and power limits on these licensees to protect future operations in 1995-2000 MHz. With respect to adjacent operations at 2200 MHz, we permit operator-to-operator agreements to address concerns regarding interference and also establish default rules to protect against harmful interference. Further, we require licensees of AWS-4 authority to comply with the OOBE limits contained in a private agreement entered into with the Global Positioning Systems (GPS) industry.

19. Third, mindful that AWS-4 spectrum is now allocated on a co-primary basis for Mobile Satellite and for terrestrial Fixed and Mobile services and that MSS licensees already have authorizations to provide service in the band,⁶⁴ we determine that the AWS-4 rules must provide for the protection of 2 GHz MSS systems from harmful interference caused by AWS-4 systems.⁶⁵ In addition, consistent with our determination below to grant AWS-4 terrestrial operating authority to the incumbent 2 GHz MSS licensees, we propose to assign terrestrial rights by modifying the MSS operators' licenses pursuant to Section 316 of the Communications Act.

20. Fourth, we adopt performance requirements for the AWS-4 spectrum. Specifically, licensees of AWS-4 operating authority will be subject to build-out requirements that require a licensee to provide terrestrial signal coverage and offer terrestrial service to at least 40 percent of its total terrestrial license areas' population within four years, and to at least 70 percent of the population in each of its license areas within seven years, and will be subject to appropriate penalties if these benchmarks are not met.

21. Fifth, we adopt a variety of regulatory, licensing, operating, and relocation and cost sharing requirements for licensees of AWS-4 operating authority.

(Continued from previous page)

MHz and 2110-2155 MHz bands (AWS-1) in 2003. Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands, WT Docket No. 02-353, *Report and Order*, 18 FCC Rcd 25162 (2003) (*AWS-1 Report and Order*); modified by Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands, WT Docket No. 02-353, *Order on Reconsideration*, 20 FCC Rcd 14058 (2005). The Commission proposed licensing as AWS spectrum the following bands: AWS-2 (H blocks: 1915-1920 MHz and 1995-2000 MHz; and J blocks: 2020-2025 MHz and 2175-2180 MHz) in 2004; AWS-3 (2155-2180 MHz) in 2007 and 2008, Service Rules for Advanced Wireless Services in the 1915-1920 MHz, 1995-2000 MHz, 2020-2025 MHz and 2175-2180 MHz Bands, WT Docket No. 04-356, Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands, WT Docket No. 02-353, *Notice of Proposed Rulemaking*, 19 FCC Rcd 19263 (2004) (*AWS-2 NPRM*); Service Rules for Advanced Wireless Services in the 2155-2175 MHz Band, WT Docket No. 07-195, *Notice of Proposed Rulemaking*, 22 FCC Rcd 17035 (2007) (*AWS-3 NPRM*), and Service Rules for Advanced Wireless Services in the 2155-2175 MHz Band, WT Docket No. 07-195, *Further Notice of Proposed Rulemaking*, 23 FCC Rcd 9859 (2008) (*2008 Further Notice*), respectively. The Commission has yet to adopt service rules or assign licenses for the AWS-2 and AWS-3 bands, but is issuing a rulemaking to adopt service rules for and subsequently assign the AWS-2 H block spectrum concurrently with this Report and Order. See *H Block NPRM*.

⁶⁴ *2 GHz Band Co-Allocation Report and Order*, 26 FCC Rcd at 5714-16 ¶¶ 8-13.

⁶⁵ See *infra* Section III.C. (Protection of MSS Operations). Unless otherwise indicated, the term "AWS-4" refers to terrestrial service and the term "2 GHz MSS" refers to satellite service in the 2 GHz frequencies discussed in this item.

22. Sixth, we eliminate the ATC rules for the 2 GHz MSS band and propose to modify the 2 GHz MSS operators' licenses to eliminate their ATC authority.

23. Seventh, consistent with the scope of the *AWS-4 NPRM*, we take no action on the Commission's ATC rules for other MSS bands.⁶⁶

24. In reaching these conclusions below, we consider other possible outcomes for this spectrum, proposed in the *AWS-4 NPRM* or by commenters in response thereto, but ultimately decline to adopt them. For example, we decline to adopt any of the proposed alternative band plans, including shifting the AWS-4 uplink spectrum or pursuing the 2 GHz Extension Band Concept that was set forth in the *AWS-4 NOI*. Similarly, we reject calls to reduce or take back spectrum allocated to the 2 GHz MSS licensees and decline to assign AWS-4 terrestrial rights through an auction. We also decline to adopt the interim build-out benchmarks and their associated penalties as proposed in the *AWS-4 NPRM*. Further, we decline to impose restrictions on transferring or assigning AWS-4 spectrum beyond the general requirements applicable to Wireless Radio Service spectrum generally. Nor do we impose any roaming or wholesale obligations beyond those contained in the Commission's rules, or "use it or share it" obligations. Rather, the rules we adopt today represent the Commission's efforts to make more spectrum available for terrestrial flexible use, including for mobile broadband, in the public interest, without imposing undue restrictions on the use of the spectrum.

25. We emphasize that we find the rules we adopt and the actions we take and propose to take today to be in the public interest based on the totality of the facts and circumstances before us considered as a whole.

A. AWS-4 Band Plan

26. Band plans establish parameters and provide licensees with certainty as to the spectrum they are authorized to use. Here, the band plan relates to the use of the spectrum by any licensee of AWS-4 terrestrial authority, including the existing 2 GHz MSS licensees, or by any other future licensee.⁶⁷ In establishing the band plan, the Commission defines the frequency range(s), as well as specific block(s), block sizes, and geographic areas to enable licensees to optimize their individual service needs and business plans. As discussed below, the Commission in the *AWS-4 NPRM* proposed that the AWS-4 band plan follow the existing 2 GHz MSS band plan, and that AWS-4 spectrum be licensed in paired, 10 + 10 megahertz blocks on an Economic Area (EA) geographic-area basis.⁶⁸ The Commission sought comment on these proposals, as well as on possible alternatives, notably including proposals that would shift the lower AWS-4 band up five megahertz to 2005-2025 MHz or shift the band up ten megahertz while compressing the band to 2010-2025 MHz. The Commission also sought comment on the potential costs and benefits associated with the band plan. Finally, in the *AWS-4 NOI*, the Commission sought comment on an alternative band plan that would include the 1695-1710 MHz Federal band, which NTIA has indicated could be reallocated to non-Federal use.⁶⁹

27. As explained below, based on the record before us, we adopt as the AWS-4 band plan 2000-2020 MHz paired with 2180-2200 MHz, configured in two consistently-spaced 10 megahertz blocks. (See Figure 1, below.) Further, we will license the blocks on an EA basis.

⁶⁶ *AWS-4 NPRM*, 27 FCC Rcd at 3563, 3607 ¶¶ 2, 136.

⁶⁷ *AWS-4 NPRM*, 27 FCC Rcd at 3570 ¶ 19.

⁶⁸ *Id.* at 3570-73 ¶¶ 19-27.

⁶⁹ *Id.* at 3607-3611 ¶¶ 137-147.

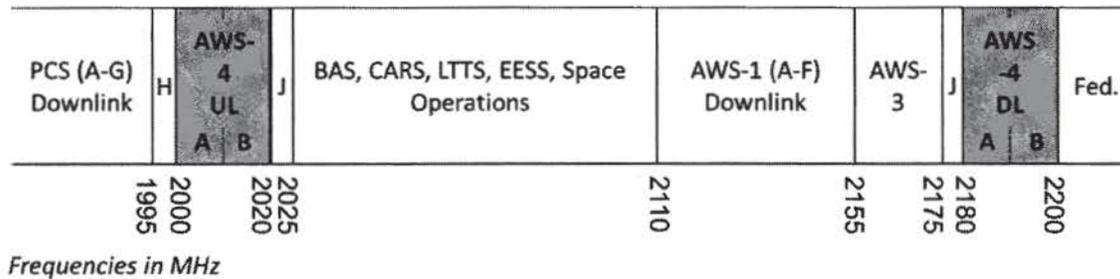


Figure 1 – AWS-4 Band Plan

1. AWS-4 Frequencies and Paired Spectrum (uplink/downlink)

a. Background

28. In the *AWS-4 NPRM*, the Commission proposed and sought comment on establishing the AWS-4 bands at 2000-2020 MHz and 2180-2200 MHz, consistent with the existing frequencies for the 2 GHz MSS band.⁷⁰ The Commission also proposed pairing the AWS-4 spectrum in a manner that is consistent with the existing 2 GHz MSS band plan.⁷¹ The spectrum is currently licensed as paired spectrum for mobile satellite use, with the 2000-2020 MHz band serving as the MSS uplink band and the 2180-2200 MHz band serving as the MSS downlink band.⁷² In the *AWS-4 NPRM*, the Commission proposed adopting the same uplink and downlink pairing designations for providing terrestrial service as the 2 GHz MSS bands.⁷³

29. The Spectrum Act directs the Commission to make available for commercial use through a system of competitive bidding several spectrum blocks, including 1995-2000 MHz (the AWS-2 upper H block), unless doing so would cause interference with operations at 1930-1995 MHz (the broadband PCS downlink band).⁷⁴ Concerned about whether use of the 1995-2000 MHz band would conflict with use of the 2000-2020 MHz for AWS-4 uplink, the Commission sought comment on alternative band plan proposals wherein the uplink band would be shifted up 5 megahertz to 2005-2025 MHz or up 10 megahertz and compressed to 2010-2025 MHz.⁷⁵ For both of these alternative proposals, the Commission proposed that the spectrum shift would apply to both terrestrial and satellite service, which would result in a modified 2 GHz MSS uplink band at 2005-2020 MHz or 2010-2020 MHz, respectively. Because the

⁷⁰ *Id.* at 3577 ¶ 43.

⁷¹ *Id.* at 3570-73 ¶¶ 19-27.

⁷² The Commission allocated the uplink and downlink bands for the 2 GHz MSS spectrum in a companion item to the Commission's decision to permit MSS providers with the flexibility to integrate ATC into their MSS networks. See *ATC Report and Order*, 18 FCC Rcd at 1964 ¶ 1 n.1 (2003); see also *2 GHz Public Notice* (seeking comment on whether to pair this spectrum and, if so, the appropriate designation of uplink and downlink bands for possible wireless terrestrial use in this spectrum, including on whether to adopt uplink and downlink designations opposite of those currently specified for 2 GHz MSS).

⁷³ *AWS-4 NPRM*, 27 FCC Rcd at 3570-71 ¶ 21.

⁷⁴ Spectrum Act § 6401(b)(4), codified at 47 U.S.C. § 1451(b)(4).

⁷⁵ *AWS-4 NPRM*, 27 FCC Rcd at 3570-71 ¶ 21.

2020-2025 MHz block is allocated for terrestrial service, but not for satellite service, the Commission did not propose to add this five megahertz to the 2 GHz MSS band in either of these proposals.⁷⁶

30. Some commenters supported the proposal to establish the AWS-4 bands at 2000-2020 MHz and 2180-2200 MHz.⁷⁷ For example, DISH states that the Commission's proposed band plan would enable the quickest road to the deployment of service in the band, would promote competition, is consistent with international harmonization, and accords with its existing authorization to provide MSS.⁷⁸ DISH opposes the alternative band plan proposals on the grounds that they are generally less likely to yield such benefits, would complicate and delay deployment of the band, and would reduce DISH's MSS spectrum rights.⁷⁹ Alcatel argues that shifting the lower band of the AWS-4 spectrum is unnecessary and unwarranted. Alcatel anticipates that the H Block would remain lightly used and effectively serve as a guard band.⁸⁰ Further, Alcatel states that setting the AWS-4 band plan to mirror the existing MSS band plan would allow for the most efficient use of the spectrum, whereas dividing the spectrum for use by separate MSS and terrestrial licenses would restrict data rates and capacity of each, and would render part of the MSS spectrum unusable.⁸¹ The Computer and Communications Industry Association (CCIA), in support of the Commission's proposed band plan, states that the Commission should "reach an equitable solution" between protecting future 1995-2000 MHz operations and AWS-4 deployment.⁸²

31. A number of other commenters argued in favor of shifting the uplink spectrum 5 megahertz. These commenters generally claim that five or ten megahertz of frequency separation between AWS-4 and PCS or the 1995-2000 MHz band is necessary to avoid harmful interference.⁸³ For example, AT&T, Greenwood and Motorola recommended a shift of 5 megahertz.⁸⁴ Sprint noted that the 5 MHz shift warranted serious consideration as it could protect PCS with a minimal disruption to nearby licensees.⁸⁵ Sprint also commended the shift as a good way to put the lower J Block to productive use.⁸⁶ US Cellular supported the 10 megahertz shift, suggesting that 10 megahertz of separation may be needed between AWS-4 spectrum and the 1995-2000 MHz band.⁸⁷ Additionally, various parties argue that, while frequency separation is one way to protect future use of 1995-2000 MHz, there may be other technical solutions, as well. For instance, Sprint argues that the Commission should take steps to ensure that AWS-

⁷⁶ *Id.* at 3577 ¶ 43.

⁷⁷ *See, e.g.*, Alcatel Comments at 5, DISH Comments at 33; Globalstar Comments at 5-6, NRTC at 1, 3 (generally supporting the expeditious adoption of proposals).

⁷⁸ DISH Reply Comments at 3; Letter from Jeffrey H. Blum, DISH, to Marlene H. Dortch, Sec'y, FCC, WT Docket Nos. 12-70, 04-356, ET Docket No. 10-142, at 3 (filed Aug. 28, 2012).

⁷⁹ DISH Comments at 34.

⁸⁰ Alcatel Comments at 9, 12

⁸¹ *Id.* at 5, 7, 9, 12-13.

⁸² Letter from Catherine R. Sloan, Vice President, Government Relations, Computer & Communications Industry Association, to Marlene H. Dortch, Sec'y, Federal Communications Commission, WT Docket Nos. 12-70, 04-356, ET Docket No. 10-142, at 1 (filed Sep. 10, 2012).

⁸³ AT&T Comments at 7; Motorola Comments at 4.

⁸⁴ AT&T Comments at 7; Motorola Comments at 3.

⁸⁵ Sprint Comments at 11.

⁸⁶ *Id.* at 11.

⁸⁷ USCC Comments at 5.

4 spectrum will not cause interference with future use of the 1995-2000 MHz band, either through frequency separation or through the adoption of other technical rules that will protect the 1995-2000 MHz band.⁸⁸

32. Other parties argued for more fundamental changes to the band plans identified in the *AWS-4 NPRM*. For example, T-Mobile argues that DISH should be given the opportunity to relinquish 20 MHz of MSS spectrum in return for full terrestrial rights on the remaining 20 megahertz.⁸⁹ This would provide 20 megahertz of valuable terrestrial spectrum to be awarded through competitive bidding, and would offer benefits such as preventing windfalls and promoting competition and a diversity of ownership.⁹⁰ MetroPCS advocates a “fresh start” for the 2 GHz band, offering two proposals which, it argues, could allow benefits to the public by obtaining due compensation for the increased value that a grant to DISH of terrestrial rights would provide.⁹¹ The first proposal would have DISH relinquish 20 megahertz of MSS spectrum and the Commission grant DISH terrestrial rights to the remaining 20 megahertz of spectrum, with the released spectrum being made available through a competitive bidding process.⁹² MetroPCS’s other proposal would allow DISH to retain all 40 megahertz of spectrum for coexisting MSS and terrestrial service outside the top 100 metropolitan statistical areas (MSAs).⁹³ Within the top 100 markets, DISH would be allowed to retain only 10 megahertz for either MSS or terrestrial use.⁹⁴ The remaining 30 megahertz could be made available for terrestrial-only service through a competitive bidding process.⁹⁵ In addition, AT&T, while supporting the proposal to provide two 10 + 10 megahertz terrestrial licenses to the incumbent MSS licensees, argues that the MSS allocation should be reduced to a single 10 + 10 megahertz frequency pair.⁹⁶ This would allow for one of the new AWS-4 blocks to operate free from the coordination and interference challenges stemming from sharing by MSS and terrestrial systems.⁹⁷ AT&T further claims that MSS has not succeeded in the 2 GHz band and that any unmet MSS demand could be served by a single 10 + 10 megahertz allocation.⁹⁸ TIA similarly offers support to encourage licensees to relinquish a certain amount of spectrum in exchange for a portion of the proceeds of an auction for new terrestrial-only licenses.⁹⁹ One party, CCIA, counters the proposals to cut back on the amount of spectrum as impractical and would make it difficult to be an effective national competitor with only 20 megahertz of spectrum.¹⁰⁰

⁸⁸ Sprint Reply Comments at 8-10; Letter from Lawrence R. Krevor – Vice President, Legal and Government Affairs –Spectrum, Sprint, and Rafi Martina –Counsel, Legal and Government Affairs, Sprint, to Marlene H. Dortch, Sec’y, FCC, WT Docket Nos. 12-70, 04-356, ET Docket No. 10-142, at 5-6 (filed Oct. 22, 2012).

⁸⁹ T-Mobile Comments at 17.

⁹⁰ *Id.* at 17-23.

⁹¹ MetroPCS Comments at 5, 29-35.

⁹² *Id.* at 30-31.

⁹³ *Id.* at 31-33.

⁹⁴ *Id.* at 5, 31-33.

⁹⁵ *Id.* at 5, 31-33.

⁹⁶ AT&T Comments at 2-4.

⁹⁷ *Id.* at 2.

⁹⁸ *See id.* at 2-3.

⁹⁹ TIA Comments at 12.

¹⁰⁰ CCIA Reply comments at 8.

b. Discussion

33. We adopt the Commission's proposed band plan and spectrum pairing, and establish the AWS-4 spectrum band as 2000-2020 MHz uplink band paired with 2180-2200 MHz downlink band.¹⁰¹

(i) AWS-4 Frequencies

34. We establish the AWS-4 band as 2000-2020 MHz and 2180-2200 MHz. After considerable analysis of the facts and the record before us, we conclude that this band plan will result in the most efficient use of spectrum for mobile broadband and, when paired with appropriate technical rules,¹⁰² will not impair the future use of the 1995-2000 MHz band, thereby enabling us to best fulfill our obligations under the Spectrum Act and our general obligation to maximize the benefits of the spectrum for the public interest.¹⁰³

35. Establishing these frequencies for AWS-4 terrestrial spectrum is the culmination of several years of Commission effort exploring this path. As discussed above, in July 2010, the Commission adopted the *MSS NPRM and NOI* in which it proposed to add co-primary Fixed and Mobile allocations for this spectrum. In April 2011, the Commission added these terrestrial allocations, thereby "lay[ing] the foundation for more flexible use of the band . . . [and] promoting investment in the development of new services and additional innovative technologies."¹⁰⁴ In that order, the Commission also stated its intent to initiate a rulemaking—this proceeding—to explore "service rule changes that could increase investment and utilization of the band in a manner that serves the public interest . . . [including examining] potential synergies with neighboring bands."¹⁰⁵ The record before us demonstrates nearly unanimous support to add terrestrial rights to the 2 GHz MSS band generally.¹⁰⁶

36. We adopt this band plan because, of the options available to us, it should enable the use of the spectrum for mobile broadband in the most expeditious and efficient manner. Setting the AWS-4 band as 2000-2020 MHz and 2180-2200 MHz mirrors the existing 2 GHz MSS band.¹⁰⁷ Because the existing 2 GHz MSS licensees will have AWS-4 operating authority, under this band plan they will be able to offer both terrestrial and satellite service using the same spectrum.¹⁰⁸ In contrast, because the

¹⁰¹ See *supra* Figure 1.

¹⁰² See *infra* Section III.B. (Technical Issues).

¹⁰³ See Spectrum Act § 6401(b); 47 USC § 309.

¹⁰⁴ *2 GHz Band Co-Allocation Report and Order*, 26 FCC Rcd at 5716 ¶ 13.

¹⁰⁵ *Id.*

¹⁰⁶ Alcatel Comments at 2; CCIA Comments at 4; CEA Comments at 3; COMPTTEL Comments at 1; CTIA Comments at 8; DISH Comments at 4; Globalstar Comments at 3; ITI Comments at 1; Motorola Comments at 7; Nokia Comments at 1; NRTC Comments at 2; USGIC Comments at 2; US Cellular Comments at 2; Verizon Wireless Comments at 4; *but see* AT&T Comments at 2 (arguing to reduce the MSS authorization to 20 megahertz); MetroPCS Comments at 5, 20 (arguing to reduce MSS authorization and that sharing of terrestrial and satellite spectrum is technically feasible); T-Mobile Comments at 6 (supporting terrestrial flexibility in the band, but opposing some of the specific proposals contained in the *AWS-4 NPRM* such as stricter build-out requirements, reassigning at least 20 megahertz through competitive bidding, and FCC approval of wholesale agreements).

¹⁰⁷ *AWS-4 NPRM*, 27 FCC Rcd at 3570 ¶ 20, citing Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands and Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands, IB Docket Nos. 01-185, 02-364, *Report and Order and Notice of Proposed Rulemaking*, 18 FCC Rcd 11030 (2003).

¹⁰⁸ See *infra* Section III.D. (Assignment of AWS-4 Operating Authority).

2020-2025 MHz band is not allocated for MSS, shifting the AWS-4 band up to include this spectrum would necessarily create a mismatch between the spectrum available to provide terrestrial service and the spectrum available to provide satellite service.¹⁰⁹

37. We decline to adopt our alternative proposals to shift the spectrum in the lower portion of the AWS-4 band plan. We acknowledge that setting the lower AWS-4 band at 2000-2020 MHz gives rise to potential interference issues between the AWS-4 band and the 1995-2000 MHz band (AWS-2 upper H block). This raises particular concerns because, as discussed below, Congress has directed the Commission to assign licenses in the 1995-2000 MHz band through a system of competitive bidding—a system that, among other things, promotes efficient and intensive use of that spectrum and recovers a portion of the value of the spectrum resource.¹¹⁰ Regulatory actions that might compromise the utility of the 1995-2000 MHz band cannot easily be reconciled with the purposes of the Spectrum Act's mandate that this band be licensed through a system of competitive bidding. We find, however, that the tension between this mandate and the public interest benefits of the band plan we are adopting can be resolved by promulgating appropriate technical rules for the AWS-4 band, as described below.¹¹¹

38. Because we resolve these interference issues through technical rules, we decline to adopt any of the three alternative band plans proposed in the *AWS-4 NPRM*: (1) 2005-2025 MHz paired with 2180-2200 MHz; (2) 2010-2025 MHz paired with 2180-2200 MHz;¹¹² and (3) the alternative NOI proposal, as well as any of the alternative band plan proposals presented by commenters.¹¹³ We decline to shift the band because we find that the technical rules we adopt below offer a better solution than shifting the band. Further, nothing in the record has convinced us that the 2020-2025 MHz band cannot be put to productive use in the future. We decline to pursue the alternative NOI proposal for the reasons discussed in section VI. below.¹¹⁴ Finally, we decline at this time to adopt more aggressive proposals that would reduce the amount of MSS spectrum or return licenses to the Commission, because we believe the approach adopted herein will lead to faster and more efficient terrestrial deployment in the AWS-4 band.

(ii) Paired Spectrum

39. For the AWS-4 band plan, we adopt the same uplink and downlink pairing designations as those currently used in the 2 GHz MSS band. Specifically, for AWS-4 spectrum, the lower band (2000-2020 MHz) will be the uplink band and the upper band (2180-2200 MHz) will be the downlink band. As we noted in the *AWS-4 NPRM*, “[a]dopting the same uplink/downlink pairing approach for AWS-4 as for 2 GHz MSS may facilitate the continued use of existing satellites for MSS.”¹¹⁵ Thus, it is consistent with our determination, *infra*, to require AWS-4 operators to protect 2 GHz MSS operations from harmful interference.¹¹⁶ Stated otherwise, having the AWS-4 band parallel the spectrum pairing of the 2 GHz MSS band, in terms of their uplink and downlink designations, will minimize the possibility that AWS-4 operations could interfere with 2 GHz MSS operations and will offer the greatest opportunity for synergies between the two mobile services. Our finding is supported by the record. For example,

¹⁰⁹ DISH Comments at 34.

¹¹⁰ See 47 U.S.C. §§ 309(j)(3)(C)-(D).

¹¹¹ See *infra* Section III.B. (Technical Issues).

¹¹² *AWS-4 NPRM*, 27 FCC Rcd at 3570-71 ¶¶ 20-21.

¹¹³ *Id.* at 3607-11 ¶¶ 137-147.

¹¹⁴ See *infra* Section VI. (Notice of Inquiry: 2 GHz Extension Band Concept).

¹¹⁵ *AWS-4 NPRM*, 27 FCC Rcd at 3570-71 ¶ 21.

¹¹⁶ See *infra* Section III.C. (Protection of MSS Operations).

Alcatel states that adoption of this proposal will contribute to making the AWS-4 spectrum quickly available for terrestrial broadband use.¹¹⁷ No commenter objected to this pairing of uplink and downlink spectrum.

2. Spectrum Block Size and Duplex Spacing

a. Background

40. The 2 GHz MSS spectrum is currently assigned as two paired 10 + 10 megahertz blocks, in an A-B/B-A duplex configuration: Block A pairs 2000-2010 MHz with 2190-2200 MHz and Block B pairs 2010-2020 MHz with 2180-2190 MHz. To define AWS-4 licenses, the Commission proposed licensing the AWS-4 spectrum in paired 10 + 10 megahertz blocks because the MSS band is currently licensed as paired 10 + 10 megahertz blocks.¹¹⁸ In proposing these spectrum block sizes, however, the Commission noted that the 3GPP standards organization was in the process of examining whether to change the duplex spacing for this spectrum to remove the variable duplex spacing (i.e., to change from an A-B/B-A configuration to an A-B/A-B configuration).¹¹⁹ The Commission also noted that issuing AWS-4 licenses with equivalent bandwidth would facilitate coordination between MSS and AWS services.¹²⁰ Finally, the Commission proposed a flexible paired single block option that, in the event a single licensee holds both the A and B blocks, that licensee would be allowed to combine the blocks into one paired 20 + 20 megahertz block.¹²¹

b. Discussion

41. We adopt our proposal to license the AWS-4 spectrum in two paired 10 + 10 megahertz blocks, but, in doing so, we adopt a consistent (*i.e.*, non-variable) duplex spacing. The AWS-4 band will therefore consist of two paired 10 + 10 megahertz blocks as follows: Block A pairs 2000-2010 MHz with 2180-2190 MHz and Block B pairs 2010-2020 MHz with 2190-2200 MHz.

42. *Block Size.* We adopt 10 megahertz blocks as the block size for the AWS-4 band. This block size has several advantages. First, it mirrors the current MSS/ATC block size. Second, spectrum bands of this size will encourage technologies that utilize wider bandwidth, and will encourage the adoption of and use of next generation technologies. This is particularly the case in a band, such as this one, where large contiguous blocks are readily configurable.¹²² We expect that use of wide, contiguous blocks of spectrum will support continued innovation and deployment of mobile broadband technologies, such as Long Term Evolution ("LTE"), to meet higher data rates and wider bandwidths.¹²³ Additionally, 10 + 10 megahertz blocks allow for the possibility that multiple providers may make use of the spectrum (including through the operation of secondary markets), but can also be used as a single 20 + 20 megahertz block if a single operator controls both blocks in a market.¹²⁴ The record supports both the 10 + 10 MHz blocks and the ability for a single operator to combine both blocks into a 20 + 20 MHz

¹¹⁷ Alcatel Comments at 5-6.

¹¹⁸ *AWS-4 NPRM*, 27 FCC Rcd at 3571-72 ¶ 22.

¹¹⁹ *Id.* at 3571-72 ¶ 22.

¹²⁰ *Id.* at 3572 ¶ 23.

¹²¹ *Id.* at 3572 ¶ 24.

¹²² TIA Comments at 8; Nokia Comments at 4.

¹²³ AT&T Comments at 10 ("10 megahertz pairs will be more useful in support of LTE and other mobile broadband technologies than smaller blocks.").

¹²⁴ TIA Comments at 8.

block.¹²⁵ For example, Nokia argued that the allocation must allow channel sizes of at least 20 MHz of spectrum (10 MHz in each direction) for the effective content delivery today and will need to be even wider in the near future. No one submitted comments in opposition to the 10 + 10 block size for AWS-4 terrestrial licenses.¹²⁶ Thus, to support the continued innovation of mobile broadband technologies by providing wide, contiguous channels, we adopt our proposal to license the AWS-4 spectrum in paired 10 + 10 megahertz blocks.

43. In the *AWS-4 NPRM*, the Commission proposed that, in the event that a single licensee holds both the A and the B Blocks, that licensee should be permitted to combine the blocks into one paired 20 + 20 megahertz block.¹²⁷ We adopt this proposal. We find it consistent with the record,¹²⁸ with our decision to permit flexible use of AWS-4 spectrum, and with our technical findings below. The rules adopted herein will allow a licensee holding all paired 20 + 20 megahertz of AWS-4 spectrum to make use of that spectrum as it sees fit, so long as such use otherwise complies with the Commission's rules, including the technical and interference rules established herein.¹²⁹ Thus, we will provide a licensee holding AWS-4 terrestrial authority with the opportunity to design its network in a manner that enables it to best respond to its business and technical needs.¹³⁰ For example, combining these blocks may enable a licensee to benefit from establishing larger channel bandwidths, such as paired 15 + 15 megahertz or 20 + 20 megahertz blocks, which can result in greater spectral efficiency and network capacity and, consequently, improved customer experiences.¹³¹

44. *Duplex Spacing.* We find that the paired 10 megahertz blocks should operate with a consistent duplex spacing. Thus, block A will pair 2000-2010 MHz with 2180-2190 MHz and Block B will pair 2010-2020 MHz with 2190-2200 MHz. We license the AWS-4 spectrum such that duplex spacing of the spectrum blocks will be uniform. Although some commenters support using the existing 2 GHz MSS duplex spacing for AWS-4,¹³² we concur with other parties, such as AT&T, that to "facilitate the deployment of terrestrial AWS-4 service, the Commission should adopt an A-B/A-B configuration, similar to the consistent duplex spacing used in other AWS and 3GPP standards."¹³³ Further, this is

¹²⁵ Alcatel Comments at 5; AT&T Comments at 10; DISH Comments at 32; Nokia Comments at 4; TIA Comments at 8; NRTC Comments at 7-8

¹²⁶ However, AT&T argued that the MSS allocation be reduced to one single 10 + 10 MHz block. AT&T Comments at 2-4. DISH opposed AT&T's alternative plan. DISH Reply at 18-22. We decline to pursue AT&T's request that we reallocate part of the 2 GHz band. As the Commission stated in 2011 when adding the co-primary fixed and mobile allocations to the band, "MSS remains co-primary in the 2 GHz MSS band...Both of the MSS licensees in the band will continue to operate under the terms of their existing licenses." *2 GHz Band Co-Allocation Report and Order*, 26 FCC Rcd at 5714-15 ¶ 110.

¹²⁷ *AWS-4 NPRM*, 27 FCC Rcd at 3572 ¶ 24.

¹²⁸ See, e.g., DISH Comments at 32; Alcatel Comments at 6; NRTC Comments at 7-8.

¹²⁹ See *infra* Section III.B.1. (Interference Between Adjacent Block AWS-4 Licensees), Section III.B.2. (Co-Channel Interference Among AWS-4 Systems)

¹³⁰ *AWS-4 NPRM*, 27 FCC Rcd at 3572 ¶ 24.

¹³¹ NRTC Comments at 7-8.

¹³² See, e.g., Motorola Comments at 2-3; Alcatel Comments at 7 (Alcatel comments that the AWS-4 licensee should have the choice of keeping the 2 GHz MSS allocation of A-B/B-A or changing the allocation to A-B/A-B.) The 2 GHz MSS band is currently assigned in two blocks: Block A pairs 2000-2010 MHz with 2190-2200 MHz; Block B pairs 2010-2020 MHz with 2180-2190 MHz.

¹³³ AT&T Comments at 5.

consistent with the recent change by 3GPP in band class 23 to shift from an A-B/B-A pairing to an A-B/A-B pairing.¹³⁴ Thus, to promote uniformity among mobile wireless bands and to maintain consistency with standards setting bodies, we find it appropriate to license AWS-4 spectrum bands in A-B/A-B paired blocks.

45. *Changes to MSS Duplex Spacing.* Currently, the two MSS licenses in the band are arranged with one license authorized to use of 2000-2010 MHz as uplink paired with 2190-2200 MHz as downlink, and the other authorized to use 2010-2020 MHz uplink paired with 2180-2190 MHz downlink. That is, there are effectively two blocks, each 10 + 10 megahertz, paired A-B/B-A. In the *AWS-4 NPRM*, we suggested mirroring this approach for the AWS-4 license, in part to facilitate coordination between MSS and AWS-4 services.¹³⁵ However, as discussed above, we are establishing the AWS-4 blocks in an A-B/A-B pairing, rather than an A-B/B-A pairing. There remains, however, a need to coordinate between MSS and AWS-4 operations. In fact, as discussed below, we have found that the assignment of AWS-4 terrestrial use rights must be made to the existing MSS authorization holders to allow coordination and prevention of harmful interference.¹³⁶ Therefore, we determine to also align the MSS blocks with the AWS-4 blocks.¹³⁷ Because, as AT&T states, the MSS satellites should be “capable of providing service under a modified A-B/A-B configuration,” this rearrangement should be feasible and not present a significant burden on the MSS licensees.¹³⁸ Consequently, we adopt a rearrangement of the 2 GHz MSS blocks as follows: the first block shall be 2000-2010 MHz uplink paired with 2180-2190 MHz downlink, and the second block shall be 2010-2020 MHz paired with 2190-2200 MHz. This rearrangement results in the first MSS block aligning with the AWS-4 A block, and the second MSS block aligning with the AWS-4 B block.¹³⁹

46. *Interoperability.* The *AWS-4 NPRM* also sought comment on whether the Commission should take action to ensure that equipment for the AWS-4 band is interoperable across both paired blocks.¹⁴⁰ No commenters discussed this issue. As the AWS-4 spectrum will be licensed to the existing 2 GHz MSS licensees,¹⁴¹ and the commenter controlling both licensees has stated its desire to operate across the entire band,¹⁴² we anticipate that its operations would result in devices that operate across the entire AWS-4 band. We therefore take no action at this time on this issue. We observe, however, that the

¹³⁴ Compare Older LTE RF standard for user equipment, 3GPP TS 36.101 R10.5.0, at 26, available at http://www.3gpp.org/ftp/Specs/archive/36_series/36.101/36101-a50.zip (last visited Nov. 30, 2012) (*Older LTE RF standard for UE*) with 3GPP Specification TS 36.101 v10.8.0 available at http://www.3gpp.org/ftp/Specs/archive/36_series/36.101/36101-a80.zip at 28. (*LTE RF Standard for UEs*) (last visited Dec. 4, 2012). While the 3GPP standard shows evidence of the utility of consistent duplex spacing, we emphasize that we are not making our decision based on the determination of a third party standards body. See also AT&T Comments at 5.

¹³⁵ *AWS-4 NPRM*, 27 FCC Rcd at 3570 ¶ 20.

¹³⁶ See *infra* Section III.D. (Assignment of AWS-4 Operating Authority)

¹³⁷ See *supra* Section III.A.1.b.ii. (Paired Spectrum).

¹³⁸ See AT&T Comments at 5-6.

¹³⁹ We address the assignment of the A and B blocks below. See *infra* Section III.D. (Assignment of AWS-4 Operating Authority).

¹⁴⁰ *AWS-4 NPRM*, 27 FCC Rcd at 3570 ¶ 20.

¹⁴¹ See *infra* Section III.D. (Assignment of AWS-4 Operating Authority)

¹⁴² DISH Comments at 31-32.

Commission is investigating interoperability issues in other contexts.¹⁴³ We continue to believe that interoperability is an important aspect of future deployment of mobile broadband services. We will closely examine any actions taken that have the potential to undermine the development of interoperability in the AWS-4 band and may take action on this issue if it is warranted in the future.

3. Geographic Area Licensing

a. Background

47. In the *AWS-4 NPRM*, the Commission proposed to license the AWS-4 spectrum using a geographic area approach.¹⁴⁴ The Commission made this proposal, in part, to be consistent with other AWS bands.¹⁴⁵ The Commission also proposed licensing AWS-4 spectrum on a geographic area basis because such an approach is well suited for the types of fixed and mobile services likely to be deployed in the band.¹⁴⁶ The Commission then proposed that the geographic areas should be Economic Areas (EAs).¹⁴⁷ No commenters opposed the proposal to adopt geographic-area licensing, as compared to other approaches, such as site-based licensing. Comments were varied regarding the proposal to use EAs as basis for geographic licensing.

b. Discussion

48. We will assign terrestrial spectrum use rights in the AWS-4 band on a geographic-area basis. A geographic-area licensing approach is well suited for the types of fixed and mobile services we expect to be deployed in this band. Further, geographic-area licensing will maintain consistency between the AWS-4 band and the AWS-1 band.

49. We will award terrestrial rights for the AWS-4 spectrum on an EA basis. In doing so, we observe that the record is mixed on this issue. Some commenters argue that an EA based licensing approach establishes geographic areas that are too small for nationwide service. For example, DISH comments that AWS-4 should be licensed on a nationwide basis because EAs are more difficult to administer than nationwide licenses and do not serve the demand for broad geographic service coverage.¹⁴⁸ SIA argues that it is not practical to constrain MSS and AWS licensees in the same frequency bands by limited geographic areas.¹⁴⁹ Additionally, AT&T asserts that EAs are too small and that AWS-4 license areas should be based on the 52 Major Economic Areas (MEAs), rather than the 176 EAs.¹⁵⁰ Conversely, several parties assert that EAs are the proper size and that they enable the proper

¹⁴³ See, *Promoting Interoperability in the 700 MHz Commercial Spectrum*, WT Docket No. 12-69, *Notice of Proposed Rulemaking*, 27 FCC Rcd 3521 (2012).

¹⁴⁴ *AWS-4 NPRM*, 27 FCC Rcd at 3572-73 ¶¶ 25-27.

¹⁴⁵ *Id.* at 3572-73 ¶¶ 25-27. (AWS-1 is licensed on a geographic basis, and geographic licensing schemes have been proposed for both AWS-2 and AWS-3. See *AWS-1 Report and Order*, 18 FCC Rcd 25162; *AWS-2 NPRM*, 19 FCC Rcd 25162; *AWS-3 NPRM*, 22 FCC Rcd 17035.

¹⁴⁶ *AWS-4 NPRM*, 27 FCC Rcd at 3572 ¶ 25.

¹⁴⁷ *Id.* at 3572-73 ¶ 26.

¹⁴⁸ DISH Comments at 32.

¹⁴⁹ SIA Comments at 4.

¹⁵⁰ AT&T Comments at 10.

balancing between encouraging wide-spread geographic build-out and providing licensees with sufficient flexibility in developing individual business plans.¹⁵¹

50. Having examined the record, we adopt an EA licensing area scheme. We do so for four reasons. First, addressing the concerns of those seeking larger license areas, EA license areas are a useful and appropriate geographic unit that Commission has used for similar bands. Notably, AWS-1 Blocks B and C spectrum is licensed on an EA basis. EA licenses can be aggregated up to larger license areas, including into MEAs or larger units, including nationwide.¹⁵² Second, EA-based licensing is consistent with the other requirements adopted herein, most notably the performance requirements discussed below, which establish EA-based build-out requirements.¹⁵³ Third, licensing AWS-4 on an EA basis best balances the Commission's goals of encouraging the offering of broadband service both to broad geographic areas and to sizeable populations.¹⁵⁴ For example, as one commenter notes, licensing in smaller geographic blocks averts the phenomenon of huge tracts of licensed territory being left unserved.¹⁵⁵ Finally, contrary to DISH's unsubstantiated claim that "[s]mall EA licenses are more difficult to administer and do not serve the demand for broad geographic coverage"¹⁵⁶ we do not believe that licensing on an EA basis impairs nationwide operations. Indeed, other than the PCS G block, all other major terrestrial spectrum bands are licensed in discrete geographic areas, including AWS-1, several blocks of which are licensed on an EA-basis.¹⁵⁷ These bands have not proven unduly difficult for licensees to administer. Consequently, because EAs allow licensees to build their geographic coverage as needed, are consistent with the other requirements established for this band, and promote the Commission's goal of widespread broadband service, we adopt the proposal in the *AWS-4 NPRM* to assign AWS-4 spectrum rights on an EA basis.

51. *Gulf of Mexico*. In the *AWS-4 NPRM*, the Commission sought comment on how to include the Gulf of Mexico in its licensing scheme.¹⁵⁸ The Commission questioned if the Gulf should be licensed in a similar fashion as the Upper 700 MHz band, where the Gulf was included as part of larger service areas, or whether the Gulf should be licensed separately.¹⁵⁹ The Commission has addressed the issue of licensing the Gulf of Mexico in other proceedings and we will follow the established policy on this issue.¹⁶⁰ Therefore, because we are adopting an EA-based licensing scheme,¹⁶¹ and the Commission received no comments directly addressing this issue, we will license the Gulf of Mexico as EA licensing

¹⁵¹ NTCH Comments at 10-11; NRTC Comments at 6; *see also* U.S. Cellular Comments at 6-7 (suggesting EAs should be used "at a minimum," but "smaller CMAs would better serve the public interest.").

¹⁵² Any such aggregation, however, would not relieve a licensee from obligations that are based on the original EA license area, such as, importantly, build-out requirements. *See infra* Section III.E. (Performance Requirements) (discussing build-out requirements).

¹⁵³ *See* Section III.E. (Performance Requirements).

¹⁵⁴ NRTC Comments at 6.

¹⁵⁵ NTCH Comments at 10; USCC Reply Comments at 7.

¹⁵⁶ DISH Comments at 32.

¹⁵⁷ *See* 47 C.F.R. § 27.6(h)(2).

¹⁵⁸ *AWS-4 NPRM*, 27 FCC Rcd at 3573 ¶ 27.

¹⁵⁹ *Id.* at 3573 ¶ 27.

¹⁶⁰ *See, e.g., AWS-1 Report and Order*, 18 FCC Rcd at 25177 ¶ 40.

¹⁶¹ *See supra* ¶¶ 49-50.

area 176.¹⁶² As we did in licensing other Part 27 services, the Gulf of Mexico service area is comprised of the water area of the Gulf of Mexico starting 12 nautical miles from the U.S. Gulf coast and extending outward.¹⁶³

B. Technical Issues

52. Pursuant to its statutory direction in the Communications Act, the Commission adopts rules for commercial spectrum in a manner that furthers and maximizes the public interest. For example, allowing spectrum to be repurposed for its highest and best use serves this end as more efficient spectrum use, among other things, spurs investment and benefits consumers through better performance and lower prices.¹⁶⁴ Deciding how best to further and maximize the public interest, moreover, is not an assessment that is made in a vacuum. Notably, when developing policies for a particular band, the Commission looks at other bands that might be affected, particularly the adjacent bands. In revising its rules, therefore, the Commission often must strike a balance among competing interests of adjacent bands, and between sometimes competing public interest considerations.

53. The rules for one band, particularly the interference protection rules, affect the use and value of other bands and thus the public interest benefits that can be realized through the use of those adjacent bands. Moreover, the public interest analysis, and the balancing of interests across bands, does not necessarily reduce to an inquiry about the amount of spectrum that is or could be made available in the relevant bands. Not all spectrum use has equal value or leads to the same public interest benefits. For example, as explained below, wireless providers tend to use more downlink than uplink spectrum.¹⁶⁵ Therefore, it is not clear that the loss of some uplink spectrum would diminish the value of, or the public's interest in, a large paired band when compared to the value that would be created in enabling a smaller full power downlink band. Indeed, the public interest benefits of a fully usable new downlink spectrum band likely are substantially greater than a fully usable equal sized addition of uplink spectrum that is a part of a larger band.¹⁶⁶ The balancing between adjacent bands may be weighted further if one band will enable the combination of spectrum bands, including the aggregation of smaller bands, while the other band does not.

54. When the Commission adopted the MSS/ATC regime in 2003, it addressed intra-service and adjacent-band interference concerns, and enacted unique MSS/ATC technical rules in Part 25 of the Commission's rules. These rules did not fully align with the technical rules for similar terrestrial operations in other bands.¹⁶⁷ Subsequently, in 2009 and 2010, in addressing requests for ATC authority by the two 2 GHz MSS authorization holders, ICO and TerreStar, the Commission granted waivers of several of the Part 25 ATC interference rules.¹⁶⁸ These waivers resulted in better aligning the terrestrial

¹⁶² See 47 C.F.R. § 27.6(a)(1).

¹⁶³ 47 C.F.R. §§ 27.6(a)(2), (c)(2)(ii).

¹⁶⁴ See, e.g., *Incentive Auction NPRM*, 27 FCC Rcd at 12357 ¶ 4 (discussing that additional spectrum will "promote economic growth and enhance America's global competitiveness, increase the speed, capacity and ubiquity of mobile broadband service, such as 4G LTE and Wi-Fi like networks, and accelerate the smartphone- and tablet-led mobile revolution, benefitting consumers and businesses throughout the country").

¹⁶⁵ See *infra* ¶ 80.

¹⁶⁶ See *infra* ¶¶ 66, 68, 80.

¹⁶⁷ The ATC interference rules for the 2 GHz MSS band are contained in rule 25.252. See 47 C.F.R. § 25.252; *ATC Report and Order*, 18 FCC Rcd at 2020-2030 ¶¶ 109-127.

¹⁶⁸ See *ICO Waiver Order*, 24 FCC Rcd 171, 183-197 ¶¶ 35-64, 68-69; *TerreStar Waiver Order*, 25 FCC Rcd 228, 235-237, 239-240 ¶¶ 20-27, 33-34.

requirements for the 2 GHz MSS band operators with the Part 27 technical rules that apply to AWS-1 license holders. Earlier this year, the International Bureau denied requests to waive additional technical rules, deferring those issues to this proceeding, as contemplated in the *2 GHz Band Co-Allocation Report and Order*.¹⁶⁹

55. In this section, we adopt the technical operating rules (*e.g.*, interference rules) that will govern AWS-4 operations and licensees. In general, our aim in establishing technical rules is to maximize the flexible use of spectrum while appropriately protecting operations in neighboring bands.¹⁷⁰ We also specifically consider here our statutory obligations set forth in the Spectrum Act with respect to the 1995-2000 MHz band. We base the technical rules we adopt below on the rules for AWS-1 spectrum, with specific additions or modifications designed to protect operations in adjacent bands from harmful interference. These bands include (1) the existing 1930-1995 MHz broadband PCS service; (2) future services operating in the 1995-2000 MHz band; and (3) Federal operations in the 2200-2290 MHz band.

1. OOB Limits

56. In this section we adopt interference rules for operations between AWS-4 blocks within the AWS-4 band and between AWS-4 blocks and adjacent and nearby bands. In the event that, once individual systems are deployed and operational, it is determined that these limitations do not prevent an AWS-4 fixed or mobile transmitter from causing harmful interference, we shall, at our discretion, require the licensee of that transmitter to provide greater emission attenuation consistent with the typical treatment of Part 27 services.¹⁷¹

a. Interference Between Services in Adjacent AWS-4 Blocks

(i) Background

57. To minimize harmful interference between adjacent spectrum blocks, the Commission's rules generally limit the amount of radio frequency (RF) power that may be emitted outside of the assigned block of an RF transmission. The Commission has previously concluded that attenuating OOB by $43 + 10 \log_{10}(P)$ dB at the edge of an assigned block, where P is the transmit power in watts, is appropriate to minimize harmful electromagnetic interference between terrestrial base station operations in the 2180-2190 MHz and 2190-2200 MHz blocks¹⁷² and between terrestrial mobile emissions in the 2000-2010 MHz and 2010-2020 MHz blocks.¹⁷³ Further, when establishing AWS-1 service rules, the Commission concluded that such a level of attenuation was appropriate for protecting terrestrial wireless systems that will operate in the AWS bands.¹⁷⁴ This level of attenuation is now codified in the Commission's rules for the AWS-1 band, for both mobile station and base station emissions.¹⁷⁵

58. To fully define an emissions limit, the Commission's rules generally specify details of the measurement procedure to determine the power of the emissions, such as the measurement bandwidth.

¹⁶⁹ See *New DBSD Satellite Services G.P., Debtor-in-Possession; TerreStar Licensee Inc., Debtor-in-Possession; Requests for Rule Waivers and Modified Ancillary Terrestrial Component Authority, Order*, 27 FCC Rcd 2250 (2012); *2 GHz Band Co-Allocation Report and Order*, 26 FCC Rcd at 5716 ¶ 13.

¹⁷⁰ See *AWS-4 NPRM*, 27 FCC Rcd at 3573 ¶ 29.

¹⁷¹ See 47 C.F.R. § 27.53(n).

¹⁷² *AWS-4 NPRM*, 27 FCC Rcd at 3574 ¶ 32; see also *ICO Waiver Order*, 24 FCC Rcd at 187 ¶ 44.

¹⁷³ *AWS-4 NPRM*, 27 FCC Rcd at 3574 ¶ 32; see also *ICO Waiver Order*, 24 FCC Rcd at 194 ¶ 62.

¹⁷⁴ *AWS-4 NPRM*, 27 FCC Rcd at 3574 ¶ 32; see also *AWS-1 Report and Order*, 18 FCC Rcd at 25198 ¶ 92.

¹⁷⁵ See 47 C.F.R. § 27.53(h). This OOB limit also applies in the broadband PCS band. See 47 C.F.R. § 24.238.

The Part 25 ATC rules determine mobile station compliance with the OOB limit based on a measurement bandwidth of 1 MHz or greater.¹⁷⁶ For AWS-1, the measurement bandwidth used to determine compliance with this limit for both mobile stations and base stations is generally 1 MHz, with some modification within the first 1 MHz.¹⁷⁷ Previously, the Commission concluded the AWS-1 measurement procedure was also appropriate for mobile stations operating in 2000-2020 MHz.¹⁷⁸ At that time the Commission did not address the measurement procedure for base stations operating in 2180-2200 MHz.¹⁷⁹ For these reasons, the Commission believed it was similarly reasonable to apply the AWS-1 procedure to both mobile and base transmissions in the AWS-4 band.¹⁸⁰ Therefore, in the *AWS-4 NPRM*, the Commission proposed that Section 27.53(h) of the Commission's rules, which includes OOB attenuation of $43 + 10 \log_{10}(P)$ dB and the associated measurement procedure, be expanded to apply to AWS-4 operations in the 2000-2020 MHz and 2180-2200 MHz bands.¹⁸¹

(ii) Discussion

59. We adopt the above proposals regarding interference between adjacent AWS-4 blocks and the corresponding measurement procedures. Specifically, we require fixed and mobile transmitters operating in 2000-2020 MHz and 2180-2200 MHz bands to attenuate emissions outside the licensed channels in these bands by $43 + 10 \log_{10}(P)$ dB, unless all affected parties agree otherwise. This limit of $43 + 10 \log_{10}(P)$ dB is consistent with other CMRS bands, including the AWS-1 band that forms the basis for many of the technical rules we adopt herein. This specific emission limit, as well as the principle of adopting the same limits across multiple CMRS bands, is supported by the record. For example, AT&T, NRTC, and SIA comment that OOB limits in AWS-4 should be consistent with rules for other CMRS services.¹⁸² Further, we disagree with DISH's assertion that its intent to operate unified operations in the band makes it unnecessary for us to establish emissions levels between adjacent block AWS-4 operations.¹⁸³ We observe, however, that to the extent a service provider establishes unified operations across the AWS-4 blocks, that operator may choose not to observe this emission level strictly between its adjacent block AWS-4 licenses in a geographic area, so long as it complies with other Commission rules and is not adversely affecting the operations of other parties by virtue of exceeding the emission limit.

60. Additionally, we adopt the proposed measurement procedures. The record supports applying the proposed measurement procedures found in Section 27.53(h) to AWS-4 mobile and base stations.¹⁸⁴ Specifically, we require a measurement bandwidth of 1 MHz or greater, with an exception allowing a smaller measurement bandwidth within the first megahertz outside the channel. In sum, after

¹⁷⁶ See 47 C.F.R. § 25.252(c)(4).

¹⁷⁷ See 47 C.F.R. § 27.53(h)(1).

¹⁷⁸ See *ICO Waiver Order*, 24 FCC Rcd at 194-195 ¶¶ 63-64.

¹⁷⁹ This has been noted by DBSD and TerreStar, both of whom suggested that the mobile measurement procedure be used for base stations as well. See *New DBSD Satellite Services G.P., Debtor-in-Possession, Application for Modification of Ancillary Terrestrial Component Authority*, IB Docket No. 11-149, at 8-9 (Aug. 22, 2011); *TerreStar License Inc., Debtor-in-Possession, Application for Modification of Ancillary Terrestrial Component Authority*, IB Docket No. 11-149, at 12 n.23 (Aug. 22, 2011) (*TerreStar Waiver Request*).

¹⁸⁰ *AWS-4 NPRM*, 27 FCC Rcd at 3574 ¶ 32.

¹⁸¹ *Id.* at 3574-75 ¶ 33

¹⁸² AT&T Comments at 4, 9; NRTC Comments at 9; SIA Comments at 2.

¹⁸³ DISH Comments at 29.

¹⁸⁴ See DISH Comments at 29-30. No party opposed the proposal.

reviewing the record and finding it supports the Commission's proposals, we conclude that the potential benefits of our proposals would outweigh any potential costs and adopt the proposed OOB limit and measurement procedures.

b. Interference with Services in Adjacent and Other Bands

61. Having established interference rules for operations between adjacent AWS-4 blocks, we next set rules for AWS-4 operations relative to operations in adjacent and nearby spectrum bands. In so doing, wherever possible, we establish rules that permit flexible use of the AWS-4 band, while effectively protecting adjacent and nearby bands from harmful interference resulting from AWS-4 emissions. As a preliminary matter, we observe that the Commission frequently applies a minimum attenuation level of $43 + 10 \log_{10}(P)$ dB to protect operations in adjacent frequency bands.¹⁸⁵

(i) Interference with operations below 1995 MHz

62. *Background:* The AWS-4 uplink band is proximate to the broadband Personal Communications Service (PCS) downlink band at 1930-1995 MHz. To protect PCS mobile receivers from harmful electromagnetic interference from mobile stations transmitting in 2000-2020 MHz, the ATC rules specify an attenuation of $70 + 10 \log_{10}(P)$ dB below 1995 MHz.¹⁸⁶ In the *AWS-4 NPRM*, the Commission proposed that this emission limit should continue to apply to terrestrial operations in the 2000-2020 MHz band, and that a rule should be added to Part 27 that fixed and mobile transmitters operating in 2000-2020 MHz must attenuate emissions below 1995 MHz by $70 + 10 \log_{10}(P)$ dB.¹⁸⁷ We also proposed that this attenuation should be measured using the existing measurement procedure per Section 27.53(h).¹⁸⁸

63. *Discussion:* We conclude that fixed and mobile transmitters operating in the 2000-2020 MHz AWS-4 uplink band must attenuate emissions below 1995 MHz by $70 + 10 \log_{10}(P)$ dB. We also apply the existing measurement procedure contained in Section 27.53(h) of our rules, whereby a measurement bandwidth of 1 MHz or greater is required, with an exception allowing a smaller measurement bandwidth in the first megahertz outside the channel. This emission level is supported by the record. AT&T, CTIA, Sprint, and T-Mobile all support the need to protect PCS operations below 1995 MHz.¹⁸⁹ DISH, Greenwood, Motorola, Nokia, and Sprint all support our proposed OOB limit of $70 + 10 \log_{10}(P)$ dB below 1995 MHz for AWS-4 emissions.¹⁹⁰ No commenters opposed this OOB limit.¹⁹¹ Given the record before us, we therefore conclude that the potential benefits of our proposals

¹⁸⁵ See e.g., *AWS-1 Report and Order*, 18 FCC Rcd at 25198 ¶ 92; 47 C.F.R. § 24.238.

¹⁸⁶ See 47 C.F.R. § 25.252(c)(2). This value was not waived or requested to be waived during any of the ATC designation or other MSS/ATC related procedures.

¹⁸⁷ *AWS-4 NPRM*, 27 FCC Rcd at 3575 ¶ 35.

¹⁸⁸ *Id.* See 47 C.F.R. § 27.53(h).

¹⁸⁹ AT&T Comments at 6-7; CTIA Comments at 2-3, 10-11 and CTIA Reply at 6-8; Sprint Comments at 8-9 and Sprint Reply at 5; T-Mobile Comments at 7-8, 24-25.

¹⁹⁰ DISH Comments at 26; Greenwood Comments at 15; Motorola Comments at 6; Nokia Reply Comments at 4; Sprint Comments at 10-11.

¹⁹¹ We observe that DISH and Sprint have disagreed as to the technical standards that the 3rd Generation Partnership Project (3GPP) had established to protect operations in 1990-1995 MHz from interference from 2 GHz MSS/ATC operators. This disagreement was resolved on Nov. 13, 2012 in 3GPP as -40 dBm/MHz, equivalent to $70 + 10 \log_{10}(P)$ dB, although DISH has expressed concern that Sprint might reopen this issue. We decline to insert ourselves into this dispute before an external standards organization. See e.g., Letter from Lawrence R. Krevor, Vice President, Legal and Government Affairs - Spectrum, Sprint, to Marlene H. Dortch, Sec'y, FCC, WT Docket (continued....)

would outweigh any potential costs and adopt this out-of-band emission limit below 1995 MHz for all fixed and mobile transmitters operating in the AWS-4 uplink band.

(ii) **Interference with operations in 1995-2000 MHz**

64. *General Considerations.* As explained above, in considering the rules that should govern potential interference between the spectrum being repurposed—here, AWS-4 spectrum—and the adjacent bands, to maximize the public interest, the Commission must consider the value of potential uses in both bands. We are thus generally disinclined to treat an adjacent band as a permanent guard band, which, by definition, would preclude most use of that spectrum for the provision of full flexible use service to the public, or as a limited use band, which would have considerably less economic value than would a full flexible use band.

65. Here, one of the adjacent bands—the 1995-2000 MHz portion of the H block—is not in use today, but Congress has directed that it be licensed via a system of competitive bidding by February 2015.¹⁹² As explained below, this adjacent band raises particularly difficult technical issues because it may result in an uplink band (2000-2020 MHz) adjacent to a downlink band (1995-2000 MHz).¹⁹³ The technical rules we adopt today, therefore, are designed to protect future operations in the 1995-2000 MHz band from harmful interference by future operations in the repurposed AWS-4 band.¹⁹⁴ Moreover, enabling full flexible use of the 1995-2000 MHz band may lead to the pairing of this band with the 1915-1920 MHz band, which would thereby maximize the public interest benefit of both of these five megahertz bands.¹⁹⁵ Furthermore, we recognize that in establishing rules that allow the 1995-2000 MHz

(Continued from previous page)

Nos. 12-70, 04-356, ET Docket No. 10-142, at 3 (filed Sep. 17, 2012) (*Sprint Sep. 17 Letter*); Letter from Jeffrey H. Blum, Senior Vice President and Deputy General Counsel, DISH to Marlene H. Dortch, Sec'y, FCC, WT Docket Nos. 12-70, 04-356, ET Docket No. 10-142 at Appendix 2-4 (filed Sep. 24, 2012) (*DISH Sep. 24 Letter*); Letter from Jeffrey H. Blum, Senior Vice President and Deputy General Counsel, DISH to Marlene H. Dortch, Sec'y, FCC, WT Docket Nos. 12-70, 04-356, ET Docket No. 10-142 at 2 (filed Nov. 14, 2012) (*DISH Nov. 14 Letter*); Letter from Marc S. Martin, Counsel for Sprint Nextel Corporation, K&L Gates LLP, to Marlene H. Dortch, Sec'y, FCC, WT Docket Nos. 12-70, 04-356, ET Docket No. 10-142, at 3 (filed Nov. 14, 2012) (*Sprint Nov. 14 Letter*); Letter from Jeffrey H. Blum, Senior Vice President and Deputy General Counsel, DISH to Marlene H. Dortch, Sec'y, FCC, WT Docket Nos. 12-70, 04-356, ET Docket No. 10-142 at Appendix 2-4 (filed Nov. 26, 2012).

¹⁹² See *infra* ¶ 81 (discussing the H block provisions of the Spectrum Act). This requirement is subject to one exception, that the operations in the 1995-2000 MHz band not interfere with operations in the 1930-1995 MHz band. There is no technical information in the record to indicate that such interference would occur.

¹⁹³ In 2004, the Commission determined to pair the 1915-1920 MHz band with the 1995-2000 MHz band, and contemplated that the lower band would be used for mobile transmissions. Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, ET Docket No. 00-258, RM-9498, RM-10024, 19 FCC Rcd 20720, 20739-20740 ¶ 38-41 (2004) (*AWS Sixth Report and Order*). In particular, the Commission determined that these bands were comparable to the 1910-1915 MHz and 1990-1995 MHz PCS bands, which are used as uplink and downlink bands, respectively. *Id.*, 19 FCC Rcd at 20740 ¶ 39 ("We also find that due to similar characteristics and proximity to Broadband PCS, the 1915-1920 MHz and 1995-2000 MHz band pairing is comparable to the 1910-1915 MHz and 1990-1995 MHz band pairing"); see also 2008 Further Notice, 23 FCC Rcd at 9860-61 ¶ 4 (2008) (proposing that the 1995-2000 MHz band be used for downlink and that mobile transmissions be prohibited in the band).

¹⁹⁴ See *infra* Section III.B.1.b.ii (Interference with operations in 1995-2000 MHz), Section III.B.4.b. (Mobile Stations); see *supra* Section III.A.1. (AWS-4 Frequencies and Paired Spectrum (uplink/downlink)) (defining the frequencies being repurposed here).

¹⁹⁵ The Spectrum Act also requires the Commission to make available the 1915-1920 MHz band unless its use would cause interference with operations in the 1930-1995 MHz band. See Spectrum Act § 6401(b); see *supra* Section II.B (The Spectrum Act).