

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of

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

Amendments to Parts 1, 2, 27 and 90 of the Commission's Rules to License Services in the 216-220 MHz, 1390-1395 MHz, 1427-1429 MHz, 1429-1432 MHz, 1432-1435 MHz, 1670-1675 MHz, and 2385-2390 MHz Government Transfer Bands

WT Docket No. 02-8

REPLY COMMENTS OF MOTOROLA, INC.

Motorola, Inc. ("Motorola") hereby submits these reply comments on the *Fourth Notice of Proposed Rulemaking* ("*Fourth NPRM*") in the above-captioned proceeding.¹ Motorola supports the Commission's efforts to clear the 1710-1755 MHz band of Federal Government operations and to accommodate Federal Government operations that will be displaced from the 1710-1850 MHz band in appropriate alternative spectrum. Although Motorola generally supports the proposals in the *Fourth NPRM*, it opposes the Commission's proposed modifications to Part 15 of its rules that would eliminate the designation of the 1910-1920 MHz

¹ 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, *Fourth Notice of Proposed Rulemaking*, 18 FCC Rcd 13235, 68 Fed. Reg. 52156 (Sept. 2, 2003).

Personal Communications Services (“PCS”) band for unlicensed PCS (“UPCS”) operations. Instead, Motorola supports retaining the 1915-1920 MHz band for UPCS use and allowing isochronous devices to operate in this spectrum. Notably, the record developed in this proceeding provides support for each of Motorola’s positions.

I. DOD TT&C OPERATIONS CAN BE ACCOMMODATED IN THE 2025-2110 MHZ BAND PROVIDED THAT THE COMMISSION ADOPTS APPROPRIATE INTERFERENCE MITIGATION AND COORDINATION REQUIREMENTS

Motorola supports the Commission’s proposal to permit the Department of Defense (“DoD”) to operate tracking, telemetry, and command (“TT&C”) transmit earth stations at eleven sites in the 2025-2110 MHz band on a co-primary basis with Television Broadcast Auxiliary Services (“BAS”) operations. Relocation of these TT&C stations from the 1710-1755 MHz band is critical to the introduction of advanced wireless services (“AWS”) and will facilitate more efficient use of this spectrum, provided that adequate coordination procedures are adopted.² The Commission’s proposal also would further harmonize U.S. space operations with the rest of the world.³ The comments submitted in response to the *Fourth NPRM* reflect considerable support for the proposed relocation of DoD TT&C operations.⁴

While it is appropriate to relocate DoD satellite operations to the 2025-2110 MHz band, the Commission must adopt interference mitigation and coordination measures to ensure that the DoD operations do not cause interference either to incumbent BAS operations in the 2025-2110

² See Comments of Motorola, Inc., ET Docket No. 00-258, Nov. 3, 2003, at 2-6 (“Motorola Comments”).

³ See *Fourth NPRM* ¶ 26; Motorola Comments at 3.

⁴ See Comments of the Cellular Telecommunications & Internet Association, Nov. 3, 2003, at 2-3 (“CTIA Comments”); Comments of Cingular Wireless LLC, Nov. 3, 2003, at 3 (“Cingular Comments”); Comments of Ericsson Inc, Oct. 31, 2003, at 3-4 (“Ericsson Comments”); Comments of Space Imaging LLC, Nov. 3, 2003, at 1.

MHz band, or to prospective AWS operations in the immediately adjacent 2110-2155 MHz band. Several broadcast commenters have noted the potential for significant interference to receivers that are utilized for electronic news gathering (“ENG”) services in the vicinity of the eleven DoD TT&C earth stations.⁵ The broadcast commenters recognize, however, that use of a combination of interference mitigation measures may be sufficient to enable successful sharing of the 2025-2110 MHz band. Gannett, for example, suggests a number of possible mitigation techniques, including reduced transmitter power, higher elevation angles, the use of “pie-plate shrouds” to reduce side lobe leakage, and, where necessary, relocation of TT&C earth stations to more remote locations.⁶ The Society of Broadcast Engineers (“SBE”) support the use of similar measures,⁷ and the National Association of Broadcasters and the Association for Maximum Service Television, Inc. (“NAB/MSTV”) suggest these and other mitigation techniques, including restrictions on high power TT&C operations during peak hours.⁸

Notably, the February 2001 *DoD Final Report* identifies and addresses many of these same available mitigation techniques.⁹ The report notes that one option, subject to Congressional review and the availability of additional funding, is to relocate uplink antennas

⁵ See Comments of Gannett Co., Nov. 3, 2003, at 7-9 (“Gannett Comments”); Joint Comments of the National Association of Broadcasters and the Association for Maximum Service Television, Inc., Nov. 3, 2003, at 7-10 (“NAB/MSTV Comments”); Comments of the Society of Broadcast Engineers, Nov. 3, 2003, at 2-6 (“SBE Comments”).

⁶ Gannett Comments at 14-15.

⁷ See SBE Comments at 6.

⁸ See NAB/MSTV Comments, Exhibit B, at 8. The February 2001 DoD Final Report notes that high power satellite operations are “typically reserved for emergency operations” or periodic “system checkout and training.” DoD, *Investigation of the Feasibility of Accommodating the International Mobile Telecommunications (IMT) 2000 Within the 1755-1850 MHz Band*, Feb. 9, 2001, Appendix B, § B.4.2.1.4.1 at B-33 to B-34 (“*DoD Final Report*”).

⁹ See *DoD Final Report* § 4.2.1.4. Although the *DoD Final Report* addresses these mitigation techniques in the context of potential spectrum sharing between TT&C and AWS operations in the 1755-1850 MHz band, they are equally valid as measures to mitigate interference to BAS operations in the shared 2025-2110 MHz band.

away from population centers.¹⁰ The report also states that “it may be possible that some of the operations currently performed by terminals in populated areas could be off-loaded to more remote terminals.”¹¹ The *DoD Final Report* discusses four other interference mitigation techniques that may be used to reduce interference: (1) restricting the minimum transmitter elevation angle to limit power at the horizon; (2) reducing out-of-beam energy through the use of antenna shields or by redesigning antennas to reduce side lobe leakage; (3) power management; and (4) cooperative scheduling to take advantage of the fact that DoD satellite operations only use a limited amount of spectrum at any given instant in time.¹²

The record therefore indicates a wide range of interference mitigation techniques that may be employed, either individually or in combination, to limit interference to BAS operations in the 2025-2110 MHz band and AWS operations in adjacent spectrum. Indeed, Motorola recommends the use of similar measures, including power control, operation of TT&C stations at higher elevation angles and baseband filtering, to protect AWS licensees in the 2110-2120 MHz band from harmful out-of-band emissions from relocated TT&C earth stations.¹³

Several other points are worth emphasizing with regard to the potential for interference to BAS operations. First, as some of the broadcasters note, the conversion to digital BAS operations will significantly reduce the potential for interference to ENG receivers.¹⁴ Moreover,

¹⁰ See *id.* at B-33.

¹¹ *Id.*

¹² See *id.* at B-33 to B-35. DoD notes that further analysis is warranted on these interference mitigation techniques to address viability, cost and implementations issues. See *id.* at B-32 to B-33.

¹³ See Motorola Comments at 5.

¹⁴ See SBE Comments at 5 (noting that once broadcasters have converted to digital ENG, the desired-to-undesired signal ratio needed to ensure no interference from a DoD uplink will be reduced substantially from 60 dB to 30 dB). The NAB/MSTV comments also recognize the transition to digital ENG systems will lower the potential for interference and thus use digital equipment characteristics to analyze interference scenarios. See NAB/MSTV Comments at 8-9 and Exhibit B at 2.

it is appropriate to factor in the use of digital ENG equipment when considering shared use of the 2025-2110 MHz band because the migration of DoD TT&C earth stations into the band will be very gradual, extending beyond the anticipated completion of the ENG digital conversion. New satellite transponders incorporating 2025-2110 MHz TT&C frequencies will not be available for a number of years,¹⁵ and any migration of DoD uplinks to the 2025-2110 MHz band will not be feasible until at least 2010 or beyond, even if full funding is available.¹⁶ Furthermore, even after transponders become available, satellites that are currently in orbit will continue to utilize only the 1761-1842 MHz band until the end of their operational lives because it is not feasible to make the hardware modifications necessary to allow them to utilize the 2025-2110 MHz frequencies.¹⁷ According to DoD, the migration will be completed no earlier than 2020,¹⁸ and the eleven earth stations may continue to utilize TT&C frequencies in the 1761-1842 MHz band until 2030.¹⁹

Second, appropriate interference mitigation techniques for particular TT&C earth stations can be determined during the proposed mandatory coordination process, which would require DoD to coordinate TT&C operations at the eleven earth stations prior to relocation to the 2025-2110 MHz band.²⁰ Furthermore, the Commission has made a firm commitment that BAS incumbents will have the right to protection from relocating DoD TT&C earth stations under its

¹⁵ See *DoD Final Report* § 5.7. The report estimates that a transponder with program specific capabilities will be available in 2005, but this estimate is based on the assumption that the “decision to proceed with the transponder program will occur by July 2001.” *Id.* As no decision to proceed with the program is likely to occur prior to final Commission action regarding relocation of DoD earth stations of the 2025-2110 MHz band, it is unlikely that hardware will be available until several years after 2005.

¹⁶ See *id.* § B.3.1.

¹⁷ See *id.* §§ 6.2.1, B.4.1; see also *Fourth NPRM* ¶ 1 & n.4.

¹⁸ See *DoD Final Report* § B.3.1.

¹⁹ See *id.* § 2.1, B.7; see also *Fourth NPRM* n.76.

²⁰ See *Fourth NPRM* ¶ 30.

long established “first in time, first in right” doctrine.²¹ Given these coordination and protection measures, sharing of the 2025-2110 MHz band appears feasible.²²

The record also supports Motorola’s recommendation that the Commission should adopt measures that minimize the potential for interference to AWS mobile receivers in the 2110-2155 MHz band, particularly the 2110-2120 MHz spectrum directly adjacent to the upper end of the 2025-2110 MHz band. As Motorola noted in its initial comments, DoD’s analysis indicates that interference to AWS receivers in the 2110-2155 MHz band is likely, even if frequency separation measures are employed to limit TT&C operations at the upper edge of the 2025-2110 MHz band.²³ Comments filed in response to the *Fourth NPRM* show that the required protection distance for an AWS mobile receiver could be as high as 200 kilometers based on the existing NTIA out-of-band emission (“OOBE”) limit.²⁴ The record also shows that there is significant potential for TT&C transmissions to overload AWS receivers, particularly where limited frequency separation exists, *e.g.*, for AWS receivers operating in the 2110-2120 MHz band.²⁵ Therefore, the Commission should require DoD earth stations operating in the 2025-

²¹ See *id.*

²² The broadcasters’ interference concerns appear to stem largely from the lack of available information on the technical parameters of the eleven DoD TT&C earth stations. See NAB/MSTV Comments at 4 (stating that NAB/MSTV’s opposes spectrum sharing in the 2025-2110 MHz band in light of “the absence of NTIA information,” “at least until such time as NTIA provides details about the technical parameters of the relocated DoD operations”); SBE Comments at 2 (noting that “the NPRM is outstandingly vague on the technical characteristics of the newcomer uplinks”). The engineering analyses presented by the broadcasters are thus based largely on assumptions regarding these technical parameters, and thus likely overstate the potential for interference. See, *e.g.*, SBE Comments at 2. As the NAB/MSTV’s comments concede, “there is simply not enough information available to make any accurate or worthwhile determinations.” NAB/MSTV Comments at 13.

²³ See Motorola Comments at 3-4. The *DoD Final Report* states that “additional filtering of the [earth station] terminals will be required to mitigate interference to the IMT-2000 systems in the adjacent band.” *DoD Final Report* § B.5.2 at B-50.

²⁴ See Cingular Comments at 5-7.

²⁵ See *id.* at 7-8.

2110 MHz band to utilize interference mitigation techniques to attenuate out-of-band emissions. These techniques should include power control, operation of TT&C stations at higher elevation angles, baseband filtering, and frequency offsets if necessary.²⁶ Motorola recommends that the Commission work with Industry, NTIA and DoD to develop a baseband filtering requirement for DoD earth station transmitters, which should then be adopted as a new OOB limit in the NTIA Manual.²⁷ The Commission should also work with NTIA to amend footnote US346 to require DoD to coordinate with AWS licensees in the 2110-2120 MHz sub-band prior to relocation of TT&C operations to the 2025-2110 MHz band.²⁸

Furthermore, Motorola supports comments urging the Commission to complete remaining actions necessary to enable the introduction of AWS operations. Of particular note, the Commission must complete rulemakings to allocate replacement spectrum for multipoint distribution service (“MDS”) licensees in the 2150-2155 MHz band and to establish procedures governing the relocation of these incumbents.²⁹

²⁶ See Motorola Comments at 5.

²⁷ Manual of Regulations & Policy Procedures for Federal Radio Frequency Management (“NTIA Manual”). This out-of-band emission requirement could be waived for the 2110-2120 MHz band on a site-by-site basis by agreement between DoD and an AWS Block A licensee.

²⁸ See Motorola Comments at 5-6.

²⁹ See Cingular Comments at 2; 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, *Third Notice of Proposed Rulemaking*, 18 FCC Rcd 2223, ¶¶ 72-73 (2003).

II. THE RECORD SUPPORTS THE PROPOSED ALLOCATION CHANGES TO THE 2360-2400 MHZ BAND

The record shows there is widespread support for the Commission's proposed changes to the 2360-2400 MHz band, which would make the 2360-2395 MHz spectrum available for Federal Government and non-Federal Government aeronautical mobile operations on a primary basis.³⁰ The proposed relocation of airborne telemetry operations from the 1710-1755 MHz band is critical to the deployment of AWS in this spectrum. Notably, none of the commenters oppose the relocation of airborne telemetry operations to this band.

The two satellite digital audio radio service ("satellite DARS") licensees have requested that the Commission adopt the OOB limits that currently apply to the 2305-2320 MHz and 2345-2360 MHz Wireless Communications Services ("WCS") bands for new airborne telemetry operations in the 2360-2395 MHz band.³¹ The Commission should reject this request. The OOB limits adopted by the Commission specifically for the WCS bands directly adjacent to satellite DARS spectrum are not appropriate for wholly different operations in non-adjacent spectrum. Notably, the Commission adopted a far less stringent OOB limit for the 2385-2390 MHz WCS band.³² Furthermore, the operational characteristics of flight testing and airborne telemetry are different than for WCS, and thus no basis has been established for applying the WCS OOB limits to aeronautical mobile operations in the 2360-2395 MHz band.

³⁰ See Comments of the Aerospace and Flight Test Radio Coordinating Council, Nov. 3, 2003, at 3; Comments of ARRL, the National Association for Amateur Radio, Nov. 3, 2003, at 6; CTIA Comments at 3; Ericsson Comments at 3; Motorola Comments at 6-8.

³¹ See Joint Comments of Sirius Satellite Radio Inc. and XM Radio Inc., Nov. 3, 2003, at 5-6.

³² Compare 47 C.F.R. § 27.53(a) with 47 C.F.R. § 27.53(j).

III. THE RECORD SUPPORTS RETAINING THE 1915-1920 MHZ BAND FOR UNLICENSED USE AND ALLOWING ISOCHRONOUS DEVICES TO OPERATE IN THIS SPECTRUM

As Motorola noted in its opening comments, Appendix A to the *Fourth NPRM* proposes modifications to Part 15 of the Commission's rules that would eliminate the designation of 1910-1920 MHz for UPCS use.³³ To the extent that the proposed rules accurately reflect the Commission's intentions, Motorola opposes this proposal to eliminate 10 MHz of spectrum for unlicensed use and supports retaining the 1915-1920 MHz band for UPCS operations. While no other comments specifically address the proposed rule changes affecting the 1910-1920 MHz band, there is support for the continuing UPCS operations in the 1915-1920 MHz band.³⁴

There is also support in the record for Motorola's recommendation to allow greater flexibility for UPCS operations in the 1915-1920 MHz band by making this spectrum available for isochronous devices.³⁵ The DECT Forum notes that UPCS isochronous etiquette rules have enabled the development of high quality real time services, and that providing an additional 5 MHz of spectrum for isochronous devices will help to meet the growing consumer demand for isochronous UPCS voice services.³⁶ The DECT Forum's comments also support Motorola's position that the 1915-1920 MHz band should not be re-designated for PCS operations because a duplex gap of 15 MHz is required between the PCS mobile transmit and base transmit bands.³⁷ In addition, Motorola supports the DECT Forum's proposed changes to the Commission's Part

³³ See Motorola Comments at 8-9.

³⁴ See Recommendations of the DECT Forum, Nov. 7, 2003, at 5-6 ("DECT Forum Comments"); see also Reply Comments of Motorola, Inc., ET Docket No. 00-258, Apr. 28, 2003, at 6 & n.21 ("Motorola 3rd NPRM Reply") (citing numerous comments).

³⁵ See DECT Forum Comments at 5-6.

³⁶ See *id.* at 6.

³⁷ See *id.*; Motorola 3rd NPRM Reply at 2-4.

15 rules, which have been developed in conjunction with UTAM and would allow existing UPCS devices to co-exist with DECT phones.

IV. CONCLUSION

For the foregoing reasons, Motorola supports the Commission's proposals in the *Fourth NPRM* to facilitate clearance of the 1710-1755 MHz band of Federal Government operations. The Commission should require DoD to coordinate with BAS licensees in the 2025-2110 MHz band and with AWS licensees in the 2110-2120 MHz band prior to relocating each of its TT&C earth stations to the 2025-2110 MHz band, and it should work with Industry, NTIA and DoD to develop an appropriate OOB limit for these stations. In addition, Motorola opposes any proposal to eliminate 10 MHz of UPCS spectrum in the 1910-1920 MHz band and instead supports retaining the 1915-1920 MHz spectrum for UPCS operations and making this spectrum available for isochronous devices.

Respectfully submitted,

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