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
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
The Establishment of Polices and Service Rules for the Mobile-Satellite Service in the 2 GHz Band	IB Docket No. 99-81
Petition for Rule Making of the Wireless Information Networks Forum Concerning the Unlicensed Personal Communications Service	RM-9498
Petition for Rule Making of UTStarcom, Inc. Concerning the Unlicensed Personal Communications Service	RM-10024

COMMENTS OF MOTOROLA, INC.

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Summary

The extensive record already developed in this proceeding demonstrates that there is an unmistakable need for an allocation of 160-200 MHz of additional spectrum for 3G commercial mobile services through the end of the decade. To this end, Motorola has previously recommended that the U.S. utilize the 1710-1850 MHz band as the main source for additional 3G spectrum. In addition, Motorola has also recommended that the 2110-2150 MHz and the 2160-2165 MHz bands be made available for near term 3G system deployment.

A mandatory component of this plan is the full compensation and accommodation of any spectrum incumbents of these bands, especially Department of Defense ("DoD") and other Federal Government operations in the 1710-1850 MHz band. While Motorola believes that it is feasible to develop a sharing and relocation strategy that could make most of the 1710-1850 MHz spectrum available for the accommodation of 3G services, such a plan would inevitably be complex, and would need to ensure that different spectrum blocks, which are affected differently by incumbent operations, are made available in the same time frame.

Given the timing complexity of implementing a plan in the US that is fully aligned with global spectrum use, and the tragic events of September 11, Motorola now believes that the option proposed in the *FNPRM* to make the 1710-1770 and 2110-2170 MHz available for 3G represents the most viable option for making spectrum available in the required time frame and for providing much needed certainty regarding spectrum availability for the industry and investment community. While this is not Motorola's preferred option, this near-term solution would minimize the short-term impact on DOD operations and greatly simplify the timing of the transition. In addition, this option offers significant harmonization benefits by making available spectrum that is used globally for commercial mobile services. Motorola thus supports this option proposed by the Commission as an initial step toward meeting the demand for 3G

spectrum. However, the allocation of 120 MHz of spectrum is not sufficient to accommodate the long-term growth of the mobile industry over the next decade. The Commission should thus continue to pursue additional long-term spectrum options for 3G wireless services.

Finally, Motorola believes that the FCC's proposal for allowing higher-power operations to use the 1910-1930 MHz band would pose unacceptable interference risks to adjacent band PCS operations. Further, additional allocations on a shared basis would cause significant disruption to existing UPCS devices now being deployed in the band. Motorola does, however, support proposals that will lead to expanded use of the band for compatible systems.

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COMMENTS OF MOTOROLA, INC.

Motorola, Inc. hereby submits these comments on the *Further Notice of Proposed Rulemaking* ("*FNPRM*") in the above-captioned proceeding.[1] The FNPRM identifies additional spectrum bands to those considered in the initial *Notice of Proposed Rulemaking* ("*NPRM*")[2] and

[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, *Memorandum Opinion and Order and Further Notice of Proposed Rulemaking*, FCC 01-224 (rel. Aug. 20, 2001) ("*FNPRM*").

[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,

now seeks comment on how these additional spectrum options may be utilized to complement the options identified in the *NPRM*. Motorola supports the Commission's decision to explore new ideas for fulfilling the demand for third generation ("3G") wireless services, and to adopt a holistic approach to developing a solution. Only by considering all of the various spectrum bands identified in the *NPRM* and *FNPRM* as a whole can the Commission reach a truly comprehensive solution.

I. Introduction

The extensive record already developed in this proceeding demonstrates that there is an unmistakable need for an allocation of 160-200 MHz of additional spectrum for 3G commercial mobile services through the end of the decade.[3] Using the economic benefits derived from the spectrum allocations for first and second generation ("1G" and "2G") commercial mobile service as its model, the Council of Economic Advisers ("CEA") estimates that an allocation of spectrum for 3G services would provide additional service revenues of $38-47 billion per year to the U.S. economy.[4] Moreover, the CEA predicts that 3G services will generate an annual

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including Third Generation Wireless Systems, ET Docket No. 00-258, *Notice of Proposed Rulemaking*, 16 FCC Rcd 596 (2001) (*"NPRM"*).

[3] An allocation of at least 160 MHz for 3G services is consistent with the recommendations of the International Telecommunications Union ("ITU") and many of the commenting parties in this proceeding. *See Provisional Final Acts of the World Radiocommunication Conference* (Istanbul, WRC-2000), Resolution 223, §h; *see also* Comments of Motorola, Inc., Feb. 22, 2001, at 7, ("Motorola Comments"), Comments of Cingular Wireless, LLC, Feb. 22, 2001, at 8 ("Cingular Comments"), Comments of the Telecommunications Industry Association, Feb. 22, 2001, at 2, 3 ("TIA Comments").

[4] The CEA estimates that $238 million of service revenues are generated each year in the U.S. for each MHz of spectrum allocated for 1G and 2G mobile services. A spectrum allocation of 160-200 MHz would thus generate additional annual revenues of $38-47 billion. *See* The Council of Economic Advisers, *Economic Impact of Third-Generation Wireless Technology*, Oct. 2000, at 8 (*"CEA Report"*).

consumer surplus in the range of $50-100 billion.[5] Obviously, such an economic stimulus is urgently needed at this time when the U.S. economy is facing slower growth.

The record is also clear on the benefits of the U.S. establishing 3G spectrum allocations that are aligned or harmonized with international allocations. Otherwise, notes the CEA, the U.S. risks forfeiting a leadership role in the development of profitable "economic clusters" that are based on 3G technologies.[6]

With these points in mind, Motorola has recommended to the FCC and the NTIA a spectrum plan that would maximize the amount of globally harmonized spectrum to be made available in the U.S. for advanced wireless services. More specifically, Motorola has recommended that the U.S. utilize the 1710-1850 MHz band, which is used throughout much of the world for 2G Global Systems for Mobile Communications ("GSM") services, as the main source for additional 3G spectrum.[7] In addition, Motorola has also recommended that the 2110-2150 MHz band and the 2160-2165 MHz be made available for near term 3G system deployment. This spectrum plan is intended to: (1) provide sufficient capacity to support 3G service goals through 2010; (2) support timely regional and global harmonization between PCS and GSM band plans; and (3) facilitate near term evolution of 2G PCS and GSM systems to 3G advanced systems.[8]

A mandatory component of this plan is the full compensation and accommodation of any spectrum incumbents of these bands, especially Department of Defense ("DoD") and other Federal Government operations in the 1710-1850 MHz band. While Motorola believes that it is

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5 *See CEA Report* at 6.

6 *See id*. at 11-12, 14.

7 *See* Motorola Comments at 20-21; Letter from Steve B. Sharkey, Motorola, Inc. to Secretary, FCC, May 1, 2001, ET Docket No. 00-258, Attachment at 3-4, 6 ("Motorola *ex parte*").

8 *See* Motorola Comments at 11, 18, 21; Motorola *ex parte* at 3, 6.

feasible to develop a sharing and relocation strategy that could make most of the 1710-1850 MHz spectrum available for the accommodation of 3G services while, at the same time, meeting the needs of the Government users, such a plan would inevitably be complex, and would need to ensure that different spectrum blocks, which are affected differently by incumbent operations, are made available in the same time frame.

Given the timing complexity of implementing a plan in the US that is fully aligned with global spectrum use, and the tragic events of September 11, Motorola believes that the option proposed in the *FNPRM* to make the 1710-1770 and 2110-2170 MHz available for 3G represents the most viable option for making spectrum available in the required time frame and for providing much needed certainty regarding spectrum availability for the industry and investment community. While this is not Motorola's preferred option, this near-term solution would minimize the short-term impact on DOD operations and greatly simplify the timing of the transition. In addition, this option still offers significant harmonization benefits by making available spectrum that is used globally for commercial mobile services, albeit with a different band pairing arrangement. Motorola thus supports this option proposed by the Commission as an initial step toward meeting the demand for 3G spectrum.

However, the allocation of 120 MHz of spectrum that would be made under this option is not sufficient to accommodate the long-term growth of the mobile industry over the next decade. The Commission should thus continue to pursue additional long-term spectrum options for 3G wireless services.

II. Motorola Supports the Commission's Proposal to Reallocate the 1710-1770 MHz and 2110-2170 MHz Bands for 3G Wireless Services

The FCC's *FNPRM* has identified additional frequency bands that could be considered for either allocation for advanced wireless services, such as 3G, or for accommodating displaced

incumbents from other reallocated frequency bands. In particular, the *FNPRM* offers several new band-pairing options for advanced wireless services, including the option of pairing the 1710-1770 MHz and 2110-2170 MHz bands.[9] The statement recently issued by the National Telecommunications and Information Administration ("NTIA")[10] lends further support to this band pairing option. As further described below, Motorola supports the proposal to allocate the 1710-1770 MHz and 2110-2170 MHz bands for advanced wireless services, including 3G.

A. Allocation of the 1710-1770 MHz and 2110-2170 MHz Bands for 3G Wireless Services Would Harmonize with Existing Global Mobile Allocations and Yield Considerable Economic Benefits

The 1710-1770 MHz and 2110-2170 MHz bands correspond with existing spectrum allocations for mobile service elsewhere in the world and would thus yield the many benefits that flow from harmonized global use of spectrum. The 1710-1770 MHz band lies within the 1710-1885 MHz spectrum band identified for terrestrial International Mobile Telecommunications-2000 ("IMT-2000") use at the 2000 World Radiocommunication Conference ("WRC-2000").[11] Also, the 1710-1770 MHz band overlaps in its entirety with the European DCS-1800 mobile station transit spectrum, which occupies 1710-1785 MHz. Designating the 1710-1770 MHz band as the 3G mobile station transit band would thus achieve considerable harmonization with spectrum that is being used for mobile applications throughout much of the world and is identified by the ITU as global spectrum for terrestrial IMT-2000 applications.[12]

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9 *FNPRM* at ¶¶ 42-44.

10 NTIA, *NTIA Statement Regarding New Plan To Identify Spectrum for Advanced Wireless Mobile Services (3G), available at* http://www.ntia.doc.gov/ntiahome/threeg/ 3gplan_100501.htm.

11 *See Final Acts of the World Radiocommunication Conference* (Istanbul, WRC-2000), Resolution 223, *Additional frequency bands identified for IMT-2000.*

12 *See id*.; *see also NPRM*, ¶ 4.

The 2110-2170 MHz band provides additional harmonization potential. It coincides exactly with the terrestrial component of one of the IMT-2000 spectrum bands identified at the World Administrative Radio Conference ("WARC-92").[13] The band also has been widely allocated as the terrestrial component of the "core band" of the Universal Mobile Telecommunications System ("UMTS") spectrum designated for 3G services,[14] and specifically the base station transmit portion of this UMTS spectrum.[15] It also corresponds to the terrestrial 3G spectrum allocations in Brazil, Japan, and Korea, among other nations.[16] Designating the 2110-2170 MHz band as the 3G base station transmit band would thus harmonize U.S. allocations with global terrestrial IMT-2000 spectrum.

While additional spectrum will be required to meet the long-term industry needs, these two bands represent a sufficient "critical mass" to fuel initial 3G development and deployment. Further, although other allocation options offer even more in terms of global harmonization, Motorola recognizes that these bands represent a good compromise especially considering their expected near term availability. Therefore, if these bands were made available for 3G services, the U.S. should expect to accrue significant economic benefits of a magnitude consistent with the projections of the CEA.

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13 *See Final Acts of the World Administrative Radio Conference* (Istanbul, WARC-92); *see also NPRM*, ¶ 4. WARC-92 identified the 2110-2200 MHz band for possible 3G use. The 2110-2170 MHz portion of this band is identified for terrestrial use; the remainder is the satellite component. *See NPRM*, appendix G.

14 *See UMTS/IMT-2000 Spectrum*, UMTS Forum Report No. 6, June 1999, §§ 1.5, 3.4.1, at 18, 44, *available at* http://www.umts-forum.org/reports_r.html.

15 *See id*. § 3.5.4, at 52.

16 *See id*. § 1.5, at 18; *Decision on 3G Spectrum Aligns Brazil with Global IMT-2000 Vision*, June 23, 2000, *at* http://www.umts-forum.org/press/article039.html.

B. Allocation of the 1710-1770 MHz Band for Commercial 3G Wireless Services Is Feasible and Would Not Disrupt Federal Government Operations

1. The FCC and NTIA Must Ensure that Federal Government Systems Operating in the 1710-1755 MHz Band Are Relocated Promptly to Make This Band Available for 3G Applications

The 1710-1755 MHz band is currently allocated for Federal Government use but will be transferred to the Commission for reallocation for commercial use in 2004, as directed by Congress in 1993 and 1997.[17] The band is currently host to point-to-point microwave operations and several military uses, most notably tactical radio relay ("TRR"). Although the vast majority of Federal Government incumbents are required to vacate the band by January 2004, a number of federal power agency ("FPA") fixed microwave and DoD sites are exempted by statute from mandatory relocation.[18] These grandfathered DoD and FPA sites preclude ubiquitous 3G operations in the U.S. In particular, the sixteen protected areas around the exempted DoD sites make significant portions of the Continental United States ("CONUS") unavailable for commercial use. These protected areas range in size from 100 km to 320 km in diameter and include areas located near major cities such as Los Angeles, Seattle, and Washington, D.C.[19]

The March 2001 *NTIA Final Report*[20] demonstrates that solutions are available that will allow the successful relocation of all Federal Government incumbents in the 1710-1755 MHz band. Because they are frequency agile, NTIA states that TRR systems could operate in bands up to 2690 MHz, if available.[21] Motorola supports such solutions and further believes that

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17 *See NPRM*, ¶ 40.

18 *See id*.

19 *See id*., appendix F.

20 NTIA, *The Potential for Accommodating Third Generation Mobile Systems in the 1710-1850 MHz Band: Federal Operations, Relocation Costs, and Operational Impacts*, Final Report (rel. Mar. 30, 2001) ("*NTIA Final Report*").

21 *See id*. at 4-20 to –21. The Department of Defense has also indicated that future systems will be able to operate up on frequencies up to 2690 MHz. *See* Dep't of Defense, *Investigation*

shared spectrum use could be an appropriate solution given the intermittent nature of their operations in mostly rural areas. Motorola again emphasizes that any Government office or agency being relocated from this spectrum would receive full cost compensation for their displacement. Motorola urges the Government to finalize the estimate of relocation costs prior to the auction of this spectrum and for the Commission and NTIA to work together on a streamlined way of providing compensation to the incumbents in this band.

Furthermore, to enable ubiquitous 3G operations throughout the U.S., the Commission and NTIA should foster negotiations to relocate the grandfathered DoD and FPA microwave facilities to other frequency bands. The FCC's relocation process of 2 GHz non-government microwave facilities has well documented that such operations can be located to much higher frequency bands without disruption. To facilitate this relocation, Motorola supports full reimbursement of all relocation costs, even to the extent that reimbursement is not required by statute.[22] NTIA has recognized that protected Government sites may voluntarily accept reimbursement for relocation,[23] and Motorola believes such voluntary reimbursement is both appropriate and necessary to expedite the availability of the 1710-1755 MHz band for nationwide 3G services.

2. Commercial 3G Services Would Not Produce Unacceptable Interference with DoD Satellites or Satellite Control Operations in the 1755-1770 MHz Band

The DoD's telemetry, tracking and commanding ("TT&C") systems operate in the 1761-1842 MHz band, so there would be a relatively small (9 MHz) overlap between these systems

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of the Feasibility of Accommodating the International Mobile Telecommunications (IMT) 2000 Within the 1755-1850 MHz Band, Feb. 9, 2001, at C-4 ("*DoD Report*").

22 *See NTIA Final Report* at 4-12.

23 *See id*. at 4-13.

and the 1710-1770 MHz mobile transmit band proposed for commercial 3G services. Fortunately, industry and Government analysis shows that these critical systems are not at risk. For example, the *NTIA Final Report* states that "potential interference is within the range of prudent risk management" and concludes that the "potential for sharing the satellite control uplinks with IMT-2000 mobile units seems to be technically feasible."[24] Motorola agrees. Because the 1710-1770 MHz band would serve as the mobile station transmit band, the interference with DoD satellites is manageable. According to DoD's analysis, 3G mobile units operating co-channel would degrade the link, but would leave positive margin, even when 3G systems are fully deployed.[25] Industry analysis indicates even less degradation of the link margin and demonstrates that such levels of interference are manageable.[26]

Moreover, the number of satellites that would be affected by interference from mobile units is extremely limited because of the limited overlap between the DoD TT&C and the probable commercial 3G bands. The 9 MHz overlap affects just the first three of the twenty TT&C channels in the 1761-1842 MHz band. According to ITU data, only four satellite systems utilize these three channels: L-92, USAPEX, IUS and P80-1.[27] Two of these four systems (L-92

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24 *NTIA Final Report* at xvi.

25 *See id*. at 4-2.

26 *See* Joint Comments of the Cellular Telecommunications & Internet Association, Telecommunications Industry Association and Personal Communications Industry Association ("Association Group"), Feb. 22, 2001, Report of the Industry Association Group on Identification of Spectrum for 3G Services, Attachment II, Report of the Working Group on Satellite Control Systems, *Evaluation of Sharing Between International Mobile Telecommunications (IMT) 2000 Technology and Satellite Control Systems Operating in the Band 1755-1850 MHz*, Feb. 19, 2001, § 1, at 1-4 ("*Association Group Report, Attachment II*"); *see also id*. at 3 (stating that "[i]ndications are that the margin for the most sensitive satellite link will be positive" and "significant positive margin remains for the higher power transmissions").

27 ITU Space Network Systems Online, *at* http://www.itu.int/sns/index.htm. See Appendix II for information regarding IUS, L-92, USAPEX and P80-1.

and IUS) also operate on channels that would be unaffected by 3G operations.[28] Presumably, these systems could be operated on their alternate channels without any loss of operational capability. Moreover, the remaining two systems, USAPEX and P80-1 are relatively old and nearing the end of their operational lives (P80-1 commenced operation in 1985, USAPEX in 1994).[29] Furthermore, both the P80-1 and USAPEX satellites can be operated by satellite control stations in Guam and at Kaena Point, Hawaii.[30] These sites outside the CONUS are likely to be subject to less interference from mobile units than is represented in DoD's interference analysis.[31]

Some interference by DoD satellite control stations to 3G mobile units may occur, but steps can be taken to lessen the impact and frequency of such occurrences. According to the Comments of the Association Group, this interference can be mitigated by: (1) avoiding low-elevation operations in areas containing 3G terminals; (2) limit the times of day when low-elevation operations are performed to off-peak hours; (3) relocate the satellite control ground stations to areas where 3G utilization is low; (4) operating the ground stations at the minimum required transmit power; (5) shielding the ground stations; (6) reducing the cell radius of the 3G operations; and (7) filtering the baseband of the satellite ground stations.[32] Motorola urges the Government to provide sufficient information on the frequency of use of DoD TT&C operations

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28 L-92 operates on channels 1 and 5; IUS operates on channels 3, 4, 7, and 15. *See id.* Only channels 1-3 would be affected by 3G mobile units.

29 *See id.*

30 *See id.*

31 For satellites that can communicate with those two sites the number of urban and non-urban locations where 3G systems may operate is very limited due to the fact that these regions of the world are primarily covered by oceans and have very little land mass in which to deploy a 3G system. *See Association Group Report, Attachment II, Figure 8,* at B-13.

32 *See Association Group Report, Attachment II,* Appendix C, § 3, at C-8 to C-9.

in channels 1-5 so that industry can fully understand the potential impact to 3G and further refine these mitigation techniques.[33]

3. Other Military Operations in the 1755-1770 MHz Band Can Be Successfully Accommodated

All other military systems that operate in the 1755-1770 MHz band can be successfully accommodated by relocating these systems to other frequency bands, or limiting their operation to above 1770 MHz. TRR systems in the 1755-1770 MHz band can be relocated in the same manner as TRR systems that operate in the 1710-1755 MHz band.[34]

With regard to the DoD Air Combat Training System ("ACTS"), none of the ground-to-air or air-to ground frequencies lie within the 1710-1755 MHz band.[35] It appears that only one ACTS frequency would be affected: the ACTS master ground station uplink at 1768 MHz.[36] The *NTIA Final Report* notes that the ACTS "ground-based links could be re-accommodated in the 1790-1850 MHz portion, or relocated to an alternative band."[37] In addition, ACTS is expected to be replaced by the Joint Tactical Combat Training System ("JTCTS") which could be tuned to operate above 1770 MHz.[38] Finally, while the *DoD Report* provides little detail on the analysis of interference with precision guided munitions, DoD indicates that such systems should be able to operate within the remaining portion of the 1710-1850 MHz band (*i.e.*, 1770-

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[33] Due to potential out-of-band emissions, data should be provided not only for channels 1 through 3, but also for channels 4 and 5.

[34] *See NTIA Final Report* at 4-18 (noting that"[t]he assessment for TRR in the 1755-1790 MHz segment is the same as for the 1710-1755 MHz segment"); *see also supra* section I.B.1.

[35] ACTS ground stations transmit data to aircraft at 1830 MHz or 1840 MHz, and receive data from the aircraft on 1778 MHz or 1788 MHz. *See NTIA Final Report* at 4-7.

[36] *See id.* at 4-18. The ACTS airborne downlink at 1778 MHz would not be affected by 3G operations in the 1710-1770 MHz band.

[37] *Id.* at 4-18 to –19.

[38] JTCTS is frequency agile and can tune across the 1710-1850 MHz band. *See DoD Report* at D-1.

1850 MHz) in the near term without receiving interference, if inexpensive modifications are made to the data link.[39]

C. Allocation of the 2110-2170 MHz Band for Commercial 3G Wireless Services Is Feasible

1. The FCC Should Reallocate a Portion of the Mobile Satellite Service Allocation at 2165-2200 MHz for 3G.

Motorola supports the Commission's proposal to reallocate a segment of the spectrum that is presently allocated for mobile satellite service ("MSS") in the 1990-2025 MHz and 2165-2200 MHz bands for 3G services or displaced incumbents within the next year.[40] At a minimum, the 2165-2170 MHz segment portion of the upper MSS band should be reallocated for 3G services.

As noted in the *FNPRM*, the Commission allocated 7 MHz of spectrum for each of nine anticipated MSS system operators within the 1990-2205 MHz and 2165-2200 MHz bands, while reserving one 7 MHz allocation for possible future system expansion.[41] However, after release of the allocation order, one of the nine proposed MSS operators withdrew its request for spectrum.[42] As a result, the Commission has recognized that 10-14 MHz of spectrum is now available for reallocation for 3G services, or for incumbents displaced by reallocation of other spectrum for 3G services.[43] Motorola proposes that the Commission reallocate at least 5 MHz of the spectrum in the upper MSS band – 2165-2170 MHz – for 3G services. This reallocation would ensure that 60 MHz of spectrum is available for the 3G base station transmit band at

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39 The *DoD Report* notes that the analysis was performed and presented in the classified Appendix F to the report. *See DoD Report* at 5-4. Given the current emphasis on the 1710-1770 MHz band only, the results of DoD's analysis should be reviewed for sharing only with 3G mobile units, not base stations.

40 *See FNPRM*, ¶ 24.

41 *See id.* ¶ 15.

42 *See id.*

43 *See id.*

2110-2170 MHz, thereby aligning 3G spectrum in the U.S. with the global IMT-2000 band. In the lower MSS band, spectrum could be allocated for unpaired advanced wireless services or even considered as reallocation spectrum for displaced MDS incumbents in the 2150-2162 MHz band, as discussed in the following section.

2. Multipoint Distribution Service Incumbents in the 2150-2162 MHz Band Must Be Relocated to Comparable Spectrum

Allocation of the 2110-2170 MHz band as the base station transmit band for 3G services will require relocation of existing multipoint distribution service ("MDS") licensees operating in the 2150-2162 MHz band. Motorola supports the allocation of comparable spectrum for these licensees, as well as full compensation for relocation costs to this new spectrum.

Motorola proposes two options for relocation of MDS licensees. One option is to relocate MDS operations in the 2150-2162 MHz band to the 2385-2400 MHz band. This option would provide MDS licensees with a comparable amount of spectrum and would allow spectrum for any necessary guardbands for adjacent channel protection. The 2385-2390 MHz spectrum is currently allocated to the Government radiolocation service on a primary basis, and to Government and non-Government mobile service for aeronautical telemetry on a secondary basis.[44] The spectrum will become available for non-Government use on a primary basis on January 1, 2005.[45] As noted in Motorola's July 18, 2001 *ex parte* submission in this proceeding, no parties have expressed an interest in this band for commercial services.[46]

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[44] *See Reallocation of 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*, ET Docket No. 00-221, Notice of Proposed Rulemaking, 15 FCC Rcd 22657, ¶ 44 (2000).

[45] *See id*. However, protected areas around 17 sites would remain allocated on a primary basis for Government Radiolocation Service until January 1, 2007. *See id*. ¶ 44 and Appendix A.

[46] *See* Letter from Steve B. Sharkey, Motorola, Inc. to Secretary, FCC, July 18, 2001, ET Docket No. 00-22, at 1-2. Only one party, the Aerospace and Flight Test Radio Coordinating Council, filed supporting retaining non-Government telemetry uses in the band. *See id*.

The 2390-2400 MHz band is currently allocated on a primary basis to the Amateur Service, and on a secondary basis for asynchronous UPCS.[47] As the *FNPRM* recognizes, there has been little development of asynchronous UPCS devices and the 2390-2400 MHz spectrum is underutilized.[48] While Motorola recognizes the importance of the Amateur Service, given the enormous benefits of 3G that have been documented in this proceeding, the public interest is best served by making this spectrum available for relocation of MDS licensees in order to provide contiguous spectrum for 3G services in the 2110-2170 MHz band.

The second relocation option for MDS licensees is a segment of the 1990-2025 MHz band that is presently allocated for MSS services. As noted in the previous section, the *FNPRM* proposes to reallocate a portion of the MSS band for 3G services or incumbents displaced by reallocation of spectrum for 3G services. If the Commission reallocates a sufficient amount of spectrum, the 2010-2025 MHz band would be a suitable band for relocation of the MDS operations from 2150-2162 MHz and would provide sufficient guardband for adjacent channel operations. To ensure that incumbents MDS licensees are fairly treated, under either relocation option discussed above, Motorola supports full compensation for all reasonable costs associated with relocation.

III. Motorola Supports Continued Use of the 1910-1930 MHz by UPCS Services With Rules that Further Facilitate Growth of These Services

The *FNPRM* seeks comment on the possible reallocation of spectrum in the 1910-1930 MHz UPCS band for 3G wireless services, or for relocation of incumbent licensees that would be displaced by allocation of 3G services in other bands. At present, the lower portion of this band,

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47 *See FNPRM*, ¶ 9.

48 *See id.*

1910-1920 MHz, is allocated for asynchronous UPCS devices; the upper portion, 1920-1930 MHz, is allocated for isochronous devices.

As further detailed below, Motorola believes that the expanded use of 1910-1930 MHz for higher-power operations would pose unacceptable interference risks to adjacent band PCS operations. Further, additional allocations on a shared basis would cause significant disruption to existing UPCS devices now being deployed in the band. Motorola, however, does support proposals that will lead to expanded use of the band for compatible systems.

A. Allocating 1910-1930 MHz for New Services Would Create Significant Interference Risks

1. Reallocation of the 1910-1930 MHz Band for 3G Services or MDS Would Result in Unacceptable Interference with PCS Users in Adjoining Bands

The *FNPRM* seeks comment on whether allocation of the 1910-1930 MHz band for 3G services or for services relocated from other bands is appropriate. Motorola believes that allocation of this band for either 3G services or MDS (the most likely candidate for a relocated service), would result in considerable interference to PCS mobile devices and base stations in adjoining bands, and would require guard bands that effectively render use of the 1910-1930 MHz band impracticable for such applications.

If allocated for PCS, two possible scenarios are likely: (1) the band is utilized for time division duplex ("TDD") operations; or (2) a portion of the band is paired with spectrum above 1990 MHz that has been reallocated from MSS (essentially creating another PCS license). With regard to the first scenario, interference problems would arise. In the case of the second scenario it is questionable if cost effective mobile subscriber units could be manufactured that can operate with the proposed extension of the PCS bands.

A significant amount of work has taken place in ITU-R Working Party 8F on the co-existence between TDD and FDD systems (such as 2 GHz PCS networks as deployed in the U.S.).[49] For example, contributions to 8F have evaluated the case of interference between TDD and FDD base stations indicate that, at a minimum, a 5 MHz guard band would be required at both the upper and lower frequencies that a TDD base station may operate and, even then, additional filtering and/or close coordination of system deployment would be required.[50] The absence of either additional filtering or coordination of system deployment may increase the requirement for a guard band to at least 15 MHz, which would completely rule out any possibility of TDD systems operating in the 1910-1930 MHz band.

These conclusions are verified by recent contributions from the U.S. to ITU-R Working Party 8F which indicate that even guard bands of 5 MHz to10 MHz will be unable to eliminate base station to base station interference.[51] Without sufficient guard bands, interference conditions will also cause receiver overdrive of both systems. For the case of interference between a TDD mobile subscriber and an PCS mobile subscriber, initial studies of co-existence indicate that mobile terminals would have to be separated by relatively large distances in order to reduce interference levels below acceptable levels.[52] A further study that more closely simulates

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[49] *Report of the fifth meeting of working party 8F – Stockholm, 27 June-3 July 2001*, ITU-R 8F/375. Attachment 8.6 contains consolidation of technical work on co-existence between TDD and FDD systems operating in the same geographical area.

[50] *Change Request - Blocking requirement for co-location of TDD with FDD*, R4-011277, TSG-RAN Working Group 4 (Radio) Meeting #19, Edinburgh, Scotland, Sept. 3-7, 2001. (Source: Ericsson, Lucent, Mannesmann, Nokia, Nortel, Siemens, T-mobil, Vodafone). This coordination would require both PCS operators and TDD operators to deploy systems in separate geographic locations and jointly plan any future expansion within hundreds of meters of any deployed or potentially deployed base station in order to avoid interference.

[51] *Interaction of TDD and FDD Systems: Interference Related to Cell Collocation of Adjacent-Band TDD and FDD Systems*, ITU-R WP 8F/410, Oct. 10, 2001.

[52] *Potential guardband requirements between 1800 MHz and 1850 MHz*, Canada, ITU-R WP 8F/242, 15 February 2001. This study indicated that mobiles would have to be separated by several hundred meters.

actual operating conditions indicates that interference levels are below acceptable levels even if a 5 MHz guard band is implemented.[53]

The second scenario of extending the PCS bands would lead to manufacturing and performance issues since it would require the PCS duplex gap to be significantly reduced.[54] Reduction of the duplex gap increases the size of the radio and decreases the performance. For example, when reducing the duplex spacing from 80 MHz to 20 MHz, studies indicate an increase in the filter size by a factor of 5.6 and an increase in filter attenuation (of the desired signal) from 3.8 to 8.8 dB when considering state of the art technology.[55] Decreasing the duplex gap below 20 MHz will increase the volume of the radio, decrease the battery life and increase the cost of current radio.

Interference characteristics between MDS and PCS units are not much better than the TDD to PCS case. If, for example, the FCC decided to relocate the 2150-2162 MHz MDS uplink band to the 1910-1930 MHz band, Motorola's preliminary analysis indicates that interference between MDS customer premise equipment would cause substantial interference with both PCS base stations and subscriber units. Motorola previously considered the case of interference into mobile handsets from MDS transmitters operating in the 2150-2162 MHz band.[56] Applying the same analysis to 1910-1930 MHz indicates that even if a 3 MHz guard

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53 *Compatibility analysis of IMT-2000 (UMTS 1800) downlink and GSM 1900 uplink in adjacent frequency bands*, Motorola SA, ITU-R WP 8F/335, June 19, 2001. While studies did not simulate interference to and from UMTS TDD terminals, system characteristics are of a similar nature and similar results are expected.

54 The duplex gap is the amount of frequency between the highest frequency that a PCS mobile may transmit and the lowest frequency that it may receive. For PCS this duplex gap is currently 20 MHz.

55 *Impact of Filter Technologies on the Duplex Gap in Frequency Arrangements for IMT-2000 extension bands*, ITU-R WP 8F/237, 15 February 2001.

56 *See* Motorola Reply at 11.

band were implemented, MDS transmitters would still result in a 3 dB increase in the noise floor for PCS mobile units at a distance of 201 meters around the MDS customer premise units. [57] Additional filtering of at least 15 dB of the MDS transmissions would be required, in addition to limiting the maximum frequency of operation to below 1927 MHz, in order reduce interference into PCS mobiles.[58]

Interference into PCS base stations receivers tuned to frequencies below 1910 MHz from MDS customer premise equipment is also of concern due to the possible aggregation of multiple units about PCS base stations. When evaluating interference from a single MDS CPE into a CDMA2000 1x base station receiver, for example, each MDS transmitting device less than 4.5 km away from the CDMA2000 1x base station would degrade the noise floor by at least 3 dB, significantly reducing the coverage/capacity of the mobile network. Additional filtering of at least 25 dB would be required, in addition to limiting the maximum frequency of operation to above 1913 MHz, in order reduce interference into PCS base stations.[59] Thus, interference problems effectively preclude relocation of the MDS up link band to the 1910-1930 MHz UPCS band.

2. Shared Use of the 1910-1930 MHz Band by UPCS and 3G or MDS Systems Would Result in Unacceptable Interference with UPCS Devices

If the Commission were to allocate the 1910-1930 MHz band for shared use by UPCS and either 3G or MDS systems, the resulting interference would make UPCS devices unusable.

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[57] CDMA receiver characteristics as suggested by US contribution to ITU-R WP 8F, ITU-R WP 8F/412, October 1, 2001. Propagation model is free space with 10 dB additional loss.

[58] An out-of-band limit of –75 dBc at 3 MHz from the channel edge would result in a 3 dB increase in the mobile units noise floor for distances of 36 m around the MDS customer unit. Factors such as antenna discrimination and power control of MDS transmissions may reduce this distance.

[59] Reduction of out-of-band emissions to –85 dBc 3 MHz from channel edge would reduce distance to 255 m.

The attached Appendix I provides an interference analysis between TDD 3G technologies and Motorola's Telario system currently being deployed in the 1920-1930 MHz band. As shown in the attached appendix, any IMT-2000 mobile unit operating co-channel within approximately 1 mile of a Telario receiver would cause harmful interference to that receiver. IMT-2000 base stations operating within 12.7 miles of a Telario receiver would cause harmful interference to that receiver. Similar results are predicted for MDS base station transmissions. In Motorola's view, these results demonstrate that IMT-2000 and MDS services cannot share spectrum with UPCS devices.

The Commission seeks comment on UT Starcom's proposal for deployment of advanced service devices in the 1910-1920 MHz band that do not comply with the asynchronous UPCS etiquette.[60] By its petition for rulemaking, UT Starcom is essentially seeking authority to operate a rural wireless telephone service in the band now reserved for asynchronous UPCS operations. In general, Motorola supports the deployment of non-asynchronous technologies in this band provided that they operate at power levels consistent with that authorized for UPCS and, also, are compatible with current industry standards and Part 15 spectrum etiquette. Under these conditions, UT Starcom's technology, and any other compliant technology, can offer more efficient use of the 1910-1920 MHz band without raising interference concerns to adjacent band operations.

B. The Deployment of UPCS is Growing

Contrary to the implication of the *FNPRM*, which states that "only limited wireless PBX use has begun in the 1920-1930 MHz segment,"[61] this band is serving a large, diverse, and fast

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60 *FNPRM* at ¶10.

61 *Id.* The *FNPRM* notes that 45 PBX devices have been approved for this band. *See id*. n.22.

growing community of end users. Today, more than 400,000 users depend on isochronous devices. Large users of these devices include educational, medical, local government and commercial interests. Numerous manufacturers, including Motorola, have successfully deployed products and new manufacturers continue to enter the market.

The market for isochronous devices is only just beginning to emerge, as the relocation of incumbent microwave licensees in the 1920-1930 MHz band nears the end. Today, 95% of the fixed microwave incumbents have been relocated, and the remaining incumbent licensees are located primarily in rural areas. This relocation effort is thus virtually complete. Shortly, users of UPCS devices will have access to the 1920-1930 MHz spectrum throughout the U.S. This will enable the development and deployment of the first nomadic UPCS devices. This new functionality will open a whole new world of potential uses and vastly expand the market for UPCS devices.

Utilization of the 1910-1920 MHz band for asynchronous devices has lagged that of the isochronous band. This is in part due to the slower relocation of incumbents from this band and the fact that alternative spectrum is available for such devices in the 2.4 GHz and 5.8 GHz bands. Today, however, 90% of the fixed microwave incumbents have now been relocated from the 1910-1920 MHz band. Moreover, the increasing popularity of isochronous devices in the neighboring 1920-1930 MHz band offers a large potential source of future demand for the 1910-1920 MHz band. To this end, the Wireless Information Networks Forum, Inc. ("WINForum") has petitioned the Commission to allow isochronous devices to cross-over into the 1910-1920 MHz spectrum.[62] In high-density areas, this additional spectrum is needed to meet the demand for isochronous UPCS service. Moreover, many potential isochronous UPCS applications are

[62] *See* WINForum Petition for Rulemaking, Rulemaking-9498, Jan. 8, 1999 ("WINForum Petition").

constrained by the availability of only 10 MHz of spectrum. For example, making available an additional 10 MHz of spectrum would allow isochronous devices to utilize base stations and switching circuits more effectively. If this petition is granted, Motorola believes that the demand for isochronous devices will lead to significant use of the lower band by UPCS devices and generally fuel an increased demand for UPCS devices altogether. For these reasons, Motorola supports WINForum's petition to allow cross-over use of the 1910-1920 MHz band by isochronous devices.

IV. Conclusion

Motorola supports the allocation of the 1710-1770 MHz and 2110-2170 MHz bands for 3G wireless services. Options have been identified for accommodation of Federal Government systems by limiting operations to above 1770 MHz and accommodating them in other bands. In addition, the FCC and NTIA should continue to work together to identify additional opportunities for accommodating Government operations in shared spectrum. In making the 2110-2170 MHz band available, it appears feasible to relocate existing MDS operations and to reallocate MSS spectrum that has not yet been licensed. Making the 1710-1770 MHz and 2110-2170 MHz band available will provide sufficient spectrum to meet the immediate demands for 3G services. However, additional spectrum will be needed to meet demand before the end of this decade and the Commission should continue looking for ways to meet industry requirements. Because of interference to adjacent channel PCS operations, the 1910-1930 MHz UPCS band is unsuitable for the deployment of higher power 3G services or the relocation of the MDS uplink band. Reallocation of the UPCS band should be limited to granting WINForum's petition to allow isochronous devices to cross-over into the asynchronous UPCS band.

Respectfully submitted,

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October 22, 2001
Appendices

Appendix I: Analysis of Interference of PCS Devices in the UPCS 1910-1930MHz Band

The FCC is considering whether to reallocate the 1910-1930 MHz band to either advanced services using IMT-2000 technology or for relocation of displace services such as MDS. The following analysis considers the interference potential that such operations would have on UPCS devices that currently operate within that band. This analysis considers both co-channel operation as well as operations involving some frequency displacement (*i.e.,* the use of a guard band between the new services and the UPCS devices).

The various systems under consideration have varying power levels and bandwidths. To normalize the power and bandwidth, Spectral Power Density will be used. Spectral Power Density, or SPD, is the power radiated, P_r in watts, divided by the system's bandwidth, which gives SPD in dB (W/Hz). At this time, only the channel spacing data is available so it will be used for the normalizing.

If the band is made available for IMT-2000 services and is unpaired with any other frequency band, Time Division Duplex system is the primary candidate technology of choice. For this interference analysis, we consider the use of TD-CDMA technology in the example below. For this technology, the channel spacing is 5 MHz, power output for mobile units is +24 dBm (0.25 W), antenna gain 0 dBi for mobile, and out-of-band emissions of –50 dBc in a 30 kHz bandwidth at 3.5 MHz from channel center. With these values, we can calculate the SPD of this technology:

+24 dBm is equivalent to –6 dBW (-6 dBW = 10log(0.25 W/1 W))
5 MHz is equivalent to –67 dB (Hz) (–67 dB = 10log(1 Hz/5 MHz))
This yields an SPD of –73 dB (W/Hz).

If the mobile is 3.5MHz away from the operating frequency of the UPCS devices, the SPD becomes:

SPD on channel is -6.0 dBW
Out-of-band emission -50.0 dBc (spec. at 1.98 MHz from f_c in 30 kHz bandwidth)
30 kHz is equivalent to -44.8 dB (-44.8 dB = 10log(1 Hz/30 kHz)
SPD at a frequency displacement of 3.5 MHz is –100.8 dB (W/Hz)

The UPCS technology considered in this analysis is the Telario system manufactured by Motorola. A Telario receiver has a sensitivity of –100 dBm and IF bandwidth of 260 kHz, which in SPD becomes:

-100 dBm is equivalent to –130 dBW (-130 dBW = -100 dB + 10log(1 mw/1 W))
260 kHz is equivalent to –54.1 dB (Hz) (-54.1 dB = 10log(1 Hz/260 kHz))
Thus, Telario's receiver sensitivity in SPD is –184.1dB(W/Hz).

Path loss is part of the range equation and in this analysis. For small distances free space is assumed and for large distances plane earth loss is assumed.[1]. For Free Space loss:

$$\text{P.L. Free Space} = (4\pi R/\lambda)^2$$

Where

$\lambda = c/f = 3x10^8/(f_{(MHz)}x10^6)$
R = Distance between transmitter and receiver.

By rearranging this equation to separate R and $f_{(MHz)}$:

$$\text{P.L. Free Space (dB)} = 20\log(R) + 20\log f_{(MHz)} + 20\log(4\pi x10^6)/(3x10^8)$$

Then at the center of Telario's band at 1925 MHz:

$$\text{P.L. Free Space (dB)} = 20\log(R) + 65.7\text{dB} - 27.6\text{dB} = 20\log R + 38.1$$

For Plane Earth loss

$$\text{P.L. Plane Earth} = (4\pi R/\lambda)^2 /(2\ \text{Sin}((2\pi\ \text{Ht Hr})/(\lambda\ R)))^2 \approx (R^2 / \text{Ht Hr})^2$$

Where

Ht = Height of transmitter (2 m for mobiles and 40 m for base)
Hr = Height of receiver (2 m for mobiles and 40 m for base)

Which gives the plane earth loss as

$$\text{P.L. Plane Earth (dB)} = 40\log R - 20\log(\text{Ht Hr}).$$

In order for the interference to be at sensitivity level of the Telario receiver the path loss would have to be –73 dB (W/Hz) – [-184.1 dB (W/Hz)] = 111.2 dB. Using the PL equation to find the required separation distance in meters:

PL =111.2 dB then R = 1.4 km or 0.9 miles.

If the mobile is 3.5 MHz away the required path loss becomes 83.4 dB and requires a separation of 58 meters or 190 feet.

The base station has a power output of +40 dBm and antenna gain of 17 dBi, this would yield a SPD of –40 dB (W/Hz) and the required path loss is:

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[1] A 10 dB additional loss is assumed to account for other propagation losses such as trees or buildings.

PL = -40 dB (W/Hz) – [-184.1 dB (W/Hz)] = 144.2 dB then
R = 20.2 km or 12.7 miles.

At 4 MHz away the required path loss is 132.4 dB and requires a separation of 10.2 km or 6.4 miles[2].

The other potential systems are CDMA-2000 (1X and 3X), UWC-136 (TDMA) EDGE, W-CDMA but are unlikely candidates since they all require paired spectrum from another part of the band. If paired spectrum were to be found similar separation distances would be required. The other IMT-2000 TDD technology, DECT, would require similar separation distances.

MDS (Multipoint Distribution Services) has been mention as another potential system for the 1910-1930 MHz band. This system is so high power, 2000W for omidirectional antennas and up to 7943W for directional antennas, it would interfere with UPCS systems in a similar manner as IMT-2000 base stations.

If the FCC allows IMT-2000 technology in the UPCS band of 1920-1930MHz, UPCS systems will experience significant interference and will be unusable. If the FCC were to allocate IMT-2000 in channels adjacent to UPCS systems and implement a guard band of at least 3.5 MHz, interference levels would be reduced but still significant.

[2] Out-of-band requirement is –34 dBm in 30 kHz bandwidth at frequencies of 4 MHz from channel center, "3rd Generation Partnership Project; Technical Specification Group Radio Access Networks; UTRA (BS) TDD; Radio Transmission And Reception (Release 1999)", Technical Specification 3GPP Ts 25.105 V3.4.0 (2000-10).

Appendix II: ITU SNS Information for IUS

SUMMARY INFORMATION					
Satellite name	**Category**	**Adm**	**Ntwk Org**	**Provn**	**Date last modified**
IUS	N	USA	-	RR1488	29.11.1993

DETAILED INFORMATION										
INCLIN.	PERIOD (DAYS)	PERIOD (HOURS)	PERIOD (MINUTES)	APOGEE	APOGEE (EXP)	PERIGEE	PERIGEE (EXP)	REFERENCE BODY	NUMBER OF SATELLITES	ACTIVE SATELLITE
90	0	6	0	36156	0	274	0	T	1	A

group id	**adm resp.**	**band**	**date bringing into use**	**noise temp.**	**op agcy**	**polar. type**	**polar. angle**	**area diag**	**validity**	**class stn**	**nat srv**	**date prot**	**spec ref**	**sect no**
88602537	B	2000	01.04.1986	440	8					ED	CO	05.01.1988	AR11/A	192
88712769	B	2000	28.02.1985	440	8					ED	CO	05.01.1988	AR11/A	192

SATELLITE NAME	**CATEGORY**	**ADM**	**NTWK ORG**		**EMI/REC**		**BEAM NAME**		**GROUP ID**
IUS	**N**	**USA**	**-**	**R**		**R1**		**88712769**	

SERVICE AREA
country/geographical area
GUM
HWA
USA

Appendix II: ITU SNS Information for IUS

FREQUENCIES

sequence nbr	frequency symbol	assigned frequency	frequency (MHz)
1	M	1771.72900	1771.72900
2	M	1775.73200	1775.73200
3	M	1787.74400	1787.74400
4	M	1819.77500	1819.77500

EMISSIONS

sequence nbr	designation	total peak power	max. power density	min. peak power	min. power density	c/n ratio
1	2M00G7D--	5	-26			

COORDINATION

provision	status	administration	network organization
RR1610	O	J	
RR1610	O	URS	

EARTH STATIONS

station name	country	station type	longitude	latitude	noise	max. iso. gain	beamwidth	ant. type	rad. diagr.	old name	cls.stn	nat. srv
ANDERSEN	GUM	S	144.855	13.632		47	0.77	AP29			TD	CO
KAENA POINT	HWA	S	-158.295	21.568		47	0.77	AP29			TD	CO
MANCHESTER NH	USA	S	-71.647	42.962		47	0.77	AP29			TD	CO
VANDENBERG CA	USA	S	-120.545	34.827		47	0.77	AP29			TD	CO

SPACE STATIONS

satellite name	type	beam name	satellite (old)	beam (old)

No space stations for group, grp_id = 88712769

Appendix II: ITU SNS Information for IUS

SATELLITE NAME	CATEGORY	ADM	NTWK ORG		EMI/REC		BEAM NAME		GROUP ID
IUS	N	USA	-	R		R1		88602537	

SERVICE AREA

country/geographical area

No service area data for group, grp_id= 88602537

FREQUENCIES

sequence nbr	frequency symbol	assigned frequency	frequency (MHz)
1	M	1787.74000	1787.74000
2	M	1819.77500	1819.77500

EMISSIONS

sequence nbr	designation	total peak power	max. power density	min. peak power	min. power density	c/n ratio
1	2M00G7D--					

COORDINATION

provision	status	administration	network organization
RR1610	O	J	
RR1610	O	URS	

EARTH STATIONS

station name	country	station type	longitude	latitude	noise	max. iso. gain	beamwidth	ant. type	rad. diagr.	old name	cls.stn	nat. srv

No earth stations for group, grp_id = 88602537

Appendix II: ITU SNS Information for IUS

SPACE STATIONS				
satellite name	**type**	**beam name**	**satellite (old)**	**beam (old)**
SPACE SHUTTLE	N	T2		

Appendix II: ITU SNS Information for L-92

SUMMARY INFORMATION					
Satellite name	**Category**	**Adm**	**Ntwk Org**	**Provn**	**Date last modified**
L-92	N	USA	-	RR1488	19.04.2000

DETAILED INFORMATION										
INCLIN.	PERIOD (DAYS)	PERIOD (HOURS)	PERIOD (MINUTES)	APOGEE	APOGEE (EXP)	PERIGEE	PERIGEE (EXP)	REFERENCE BODY	NUMBER OF SATELLITES	ACTIVE SATELLITE
55	0	1	30	1300	0	650	0	T	12	

group id	**adm resp.**	**band**	**date bringing into use**	**noise temp.**	**op agcy**	**polar. type**	**polar. angle**	**area diag**	**validity**	**class stn**	**nat srv**	**date prot**	**spec ref**	**sect no**
300600787	B	4000	01.01.1992	5000	8	CR				EH	CO		AR11/A	1444
													AR14/C	884
										ED	CO		AR14/C	884
													AR11/A	1444

SATELLITE NAME	**CATEGORY**	**ADM**	**NTWK ORG**		**EMI/REC**		**BEAM NAME**		**GROUP ID**
L-92	**N**	**USA**	**-**	**R**		**SOM**		**300600787**	

SERVICE AREA
country/geographical area
HWA
USA

Appendix II: ITU SNS Information for L-92

FREQUENCIES

sequence nbr	frequency symbol	assigned frequency	frequency (MHz)
1	M	1763.72100	1763.72100
2	M	1779.73600	1779.73600
3	M	1815.77200	1815.77200
4	M	1823.77900	1823.77900

EMISSIONS

sequence nbr	designation	total peak power	max. power density	min. peak power	min. power density	c/n ratio
1	4M00G7W--	40	-26	40	-26	15

COORDINATION

provision	status	administration	network organization
S9.21	O	B	
S9.21	O	CUB	

Appendix II: ITU SNS Information for L-92

EARTH STATIONS

station name	country	station type	longitude	latitude	noise	max. iso. gain	beamwidth	ant. type	rad. diagr.	old name	cls.stn	nat. srv
KAENA POINT-1	HWA	S	-158.242	21.563		47	0.7	AP28			TD	CO
											TH	CO
KAENA POINT-2	HWA	S	-158.242	21.563		45	0.9	AP28			TD	CO
											TH	CO
T1		T				47	0.7	AP28			TD	CO
											TH	CO
T2		T				45	0.9	AP28			TD	CO
											TH	CO

SPACE STATIONS

satellite name	type	beam name	satellite (old)	beam (old)

No space stations for group, grp_id = 300600787

Appendix II: ITU SNS Information for P80-1

SUMMARY INFORMATION					
Satellite name	**Category**	**Adm**	**Ntwk Org**	**Provn**	**Date last modified**
USAPEX	N	USA	-	RR1488	10.10.1995

DETAILED INFORMATION										
INCLIN.	PERIOD (DAYS)	PERIOD (HOURS)	PERIOD (MINUTES)	APOGEE	APOGEE (EXP)	PERIGEE	PERIGEE (EXP)	REFERENCE BODY	NUMBER OF SATELLITES	ACTIVE SATELLITE
70	0	1	30	1852	0	352	0	T	1	A

group id	**adm resp.**	**band**	**date bringing into use**	**noise temp.**	**op agcy**	**polar. type**	**polar. angle**	**area diag**	**validity**	**class stn**	**nat srv**	**date prot**	**spec ref**	**sect no**
95609263	B	4000	03.08.1994	627	8	CR				EH	CO	26.05.1995	AR11/A	937
										ED	CO		AR14/C	739
													AR11/A	937
										EH	CO		AR14/C	739
										EK	CO		AR11/A	937
													AR14/C	739
95609265	B	4000	03.08.1994	627	1	CR				EH	CO	26.05.1995	AR11/A	937
										EK	CO		AR11/A	937
													AR14/C	739
										EH	CO		AR14/C	739
										ED	CO		AR14/C	739
													AR11/A	937

Appendix II: ITU SNS Information for P80-1

group id	adm resp.	band	date bringing into use	noise temp.	op agcy	polar. type	polar. angle	area diag	validity	class stn	nat srv	date prot	spec ref	sect no
95609267	B	4000	03.08.1994	627	2	CR				EK	CO	26.05.1995	AR11/A	937
										ED	CO		AR14/C	739
													AR11/A	937
										EK	CO		AR14/C	739
										EH	CO		AR14/C	739
													AR11/A	937

SATELLITE NAME	CATEGORY	ADM	NTWK ORG		EMI/REC		BEAM NAME		GROUP ID
USAPEX	N	USA	-	R		R1		95609263	

SERVICE AREA

country/geographical area

USA

FREQUENCIES

sequence nbr	frequency symbol	assigned frequency	frequency (MHz)
1	M	1763.72100	1763.72100

EMISSIONS

sequence nbr	designation	total peak power	max. power density	min. peak power	min. power density	c/n ratio
1	4M00G7W--	40	-26			

Appendix II: ITU SNS Information for P80-1

COORDINATION

provision	status	administration	network organization
RR1610	O	B	
RR1610	O	CUB	

EARTH STATIONS

station name	country	station type	longitude	latitude	noise	max. iso. gain	beamwidth	ant. type	rad. diagr.	old name	cls.stn	nat. srv
NEW BOSTON 1 NH	USA	S	-71.627	42.948		47	0.7	AP28			TD	CO
											TH	CO
											TK	CO
NEW BOSTON 2 NH	USA	S	-71.627	42.948		45	0.9	AP28			TD	CO
											TH	CO
											TK	CO
T1		T				47	0.7	AP28			TD	CO
											TH	CO
											TK	CO
T2		T				45	0.9	AP28			TD	CO
											TH	CO
											TK	CO
VANDENBERG 1 CAL	USA	S	-120.502	39.823		47	0.7	AP28			TD	CO
											TH	CO
											TK	CO
VANDENBERG 2 CAL	USA	S	-120.502	39.823		45	0.9	AP28			TD	CO
											TH	CO
											TK	CO

Appendix II: ITU SNS Information for P80-1

SPACE STATIONS

satellite name	type	beam name	satellite (old)	beam (old)

No space stations for group, grp_id = 95609263

SATELLITE NAME	CATEGORY	ADM	NTWK ORG		EMI/REC		BEAM NAME		GROUP ID
USAPEX	N	USA	-	R		R2		95609265	

SERVICE AREA

country/geographical area
HWA

FREQUENCIES

sequence nbr	frequency symbol	assigned frequency	frequency (MHz)
1	M	1763.72100	1763.72100

EMISSIONS

sequence nbr	designation	total peak power	max. power density	min. peak power	min. power density	c/n ratio
1	4M00G7W--	40	-26			

COORDINATION

provision	status	administration	network organization
RR1610	O	B	
RR1610	O	CUB	

Appendix II: ITU SNS Information for P80-1

EARTH STATIONS

station name	country	station type	longitude	latitude	noise	max. iso. gain	beamwidth	ant. type	rad. diagr.	old name	cls.stn	nat. srv
KAENA POINT 1	HWA	S	-158.242	21.563		47	0.7	AP28			TD	CO
											TH	CO
											TK	CO
KAENA POINT 2	HWA	S	-158.242	21.563		45	0.9	AP28			TD	CO
											TH	CO
											TK	CO

SPACE STATIONS

satellite name	type	beam name	satellite (old)	beam (old)

No space stations for group, grp_id = 95609265

SATELLITE NAME	CATEGORY	ADM	NTWK ORG		EMI/REC		BEAM NAME		GROUP ID
USAPEX	N	USA	-	R		R3		95609267	

SERVICE AREA

country/geographical area
GUM

FREQUENCIES

sequence nbr	frequency symbol	assigned frequency	frequency (MHz)
1	M	1763.72100	1763.72100

Appendix II: ITU SNS Information for P80-1

EMISSIONS

sequence nbr	designation	total peak power	max. power density	min. peak power	min. power density	c/n ratio
1	4M00G7W--	40	-26			

COORDINATION

provision	status	administration	network organization
RR1610	O	B	
RR1610	O	CUB	

EARTH STATIONS

station name	country	station type	longitude	latitude	noise	max. iso. gain	beamwidth	ant. type	rad. diagr.	old name	cls.stn	nat. srv
ANDERSEN 1	GUM	S	144.867	13.615		47	0.7	AP28			TD	CO
											TH	CO
											TK	CO
ANDERSEN 2	GUM	S	144.867	13.615		45	0.9	AP28			TD	CO
											TH	CO
											TK	CO

SPACE STATIONS

satellite name	type	beam name	satellite (old)	beam (old)

No space stations for group, grp_id = 95609267

Appendix II: ITU SNS Information for P80-1

SUMMARY INFORMATION					
Satellite name	**Category**	**Adm**	**Ntwk Org**	**Provn**	**Date last modified**
P80-1	N	USA	-	RR1488	16.05.1985

DETAILED INFORMATION										
INCLIN.	PERIOD (DAYS)	PERIOD (HOURS)	PERIOD (MINUTES)	APOGEE	APOGEE (EXP)	PERIGEE	PERIGEE (EXP)	REFERENCE BODY	NUMBER OF SATELLITES	ACTIVE SATELLITE
72.5	0	1	40	740	0	740	0	T	1	A

group id	adm resp.	band	date bringing into use	noise temp.	op agcy	polar. type	polar. angle	area diag	validity	class stn	nat srv	date prot	spec ref	sect no
85703530	B	4000	01.05.1985	1540	8					EH	CO	16.05.1985	SPA-AA	304
										ED	CO		SPA-AA	304

SATELLITE NAME	CATEGORY	ADM	NTWK ORG		EMI/REC		BEAM NAME		GROUP ID
P80-1	**N**	**USA**	**-**	**R**		**R1**		**85703530**	

SERVICE AREA
country/geographical area
GUM
HWA
USA

Appendix II: ITU SNS Information for P80-1

FREQUENCIES

sequence nbr	frequency symbol	assigned frequency	frequency (MHz)
1	M	1771.72900	1771.72900

EMISSIONS

sequence nbr	designation	total peak power	max. power density	min. peak power	min. power density	c/n ratio
1	4M00G2D--	30	-36			

COORDINATION

provision	status	administration	network organization
RR1610	O		

EARTH STATIONS

station name	country	station type	longitude	latitude	noise	max. iso. gain	beamwidth	ant. type	rad. diagr.	old name	cls.stn	nat. srv
ANDERSEN	GUM	S	144.855	13.632	45	0.9	AP28				TD	CO
											TH	CO
KAENA POINT	HWA	S	-158.295	21.568	45	0.9	AP28				TD	CO
											TH	CO
NEW BOSTON NH	USA	S	-71.647	42.962	45	0.9	AP28				TD	CO
											TH	CO
VANDENBERG CAL	USA	S	-120.545	34.827	45	0.9	AP28				TD	CO
											TH	CO

SPACE STATIONS

satellite name	type	beam name	satellite (old)	beam (old)

No space stations for group, grp_id = 85703530

Appendix II: ITU SNS Information for P80-1