

APPENDIX A: Proposed Rules

For the reasons discussed in the preamble, the Federal Communications Commission proposes to amend 47 C.F.R. parts 15 and 25 as follows:

PART 15 – RADIO FREQUENCY DEVICES

1. The authority citation of Part 15 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 302a, 303, 304, 307, 336, and 544A.

2. Section 15.205 is proposed to be amended as follows:

§ 15.205 Restricted bands of operation.

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 3650	(²)
13.36 - 13.41		3700 - 4400	

¹ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

3. A new Section 15.252 is proposed to be added to read as follows:

§ 15.252 Operation within the band 3.65-3.70 GHz.

(a) Fixed and non-fixed unlicensed devices in this band must be operated in a manner so as not to cause harmful interference to licensed fixed satellite service (FSS) earth stations authorized to receive signals in the 3650 – 3700 MHz band.

(b) *Fixed devices.* Fixed devices must be installed by a recognized professional installer. The installer shall ensure that the operation of the fixed device is unlikely to cause harmful interference to licensed FSS earth stations and complies with the following requirements.

(1) The maximum peak effective isotropic radiated power (EIRP) shall not exceed 25 Watts. The fixed device may employ an advanced antenna system capable of dynamically modifying the system radiation pattern. The EIRP of the fixed device must be reduced to levels which will not cause interference to existing licensed FSS earth stations.

(2) No fixed unlicensed device shall operate within the sector of a circle around a licensed FSS earth station defined by an arc $\pm 15^\circ$ on either side of the FSS earth station antenna boresight and a 180 km radius. Outside of this sector, no fixed device shall operate within 25 km of a licensed FSS earth station.

(c) *Non-fixed devices.* The maximum peak EIRP of non-fixed devices shall not exceed 1 Watt.

(1) The non-fixed device shall employ active interference avoidance mechanisms to detect FSS earth station uplink signals in the bands 5.85 – 5.925 GHz and 6.425 – 6.723 GHz.

(2) The non-fixed device shall reduce peak EIRP below 1 Watt in accordance with the receive signal level (R_{SS}) as shown below:

Unlicensed Device Receive Signal Strength (R_{SS})	Maximum Allowed EIRP
$R_{SS} > -76$ dBm	(not allowed)
-76 dBm $\geq R_{SS} > -79$ dBm	250 mW
-79 dBm $\geq R_{SS} > -82$ dBm	500 mW
-82 dBm $\geq R_{SS}$	1 Watt

(3) For systems having multiple devices operating under a central controller, only the central controller is required to detect FSS earth station uplink signals. The central controller must instruct all devices under its control to reduce transmit EIRP in accordance with the R_{SS} and paragraph (c)(2) of this section.

(d) No device in this band shall be operated within 80 kilometers of the three authorized Government radiolocation stations unless the methods described above are applied. See § 2.106, Footnote US348, of this chapter.

(e) *Operation in Border areas.* Fixed devices must be located at least 8 kilometers from the U.S./Canada or U.S./Mexico border if the antenna of that device looks within the 160° sector away for the border. The devices must be located at least 56 kilometers from each border if the antenna looks within the 200° sector towards the border.

(f) Within any one second interval of signal transmission, each unlicensed device must transmit a transmitter identification at least once. The identification must be confined to the 3650 – 3651 MHz portion of the band. Each application for equipment authorization must declare that the equipment contains the required transmitter identification feature and must specify a method whereby interested parties can obtain sufficient information, at no cost, to enable them to fully detect and decode this transmitter identification information. Upon the completion of decoding, the transmitter identification data block must provide the following fields.

- (1) User/owner contact information.
- (2) Current physical location of the unlicensed device.

The grantee must implement a method that makes it possible for users to specify and update this data.

APPENDIX B: INITIAL REGULATORY FLEXIBILITY ANALYSIS

As required by the Regulatory Flexibility Act of 1980, as amended (RFA),¹¹⁷ the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on a substantial number of small entities by the policies and rules proposed in this Notice of Proposed Rule Making (NPRM).¹¹⁸ Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments on the NPRM provided in Part V of the item. The Commission will send a copy of the NPRM, including this IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).¹¹⁹ In addition, the NPRM and IRFA (or summaries thereof) will be published in the Federal Register.¹²⁰

A. Need for, and Objectives of, the Proposed Rules

In broad terms, the central proposal of this Notice would allow unlicensed devices to operate in either all, or portions of, this radiofrequency (RF) band under flexible technical limitations with smart/cognitive features that should prevent interference to licensed satellite services. We also seek comment on whether to restore a uniform primary allocation for all Fixed Satellite Service (FSS) earth stations in the band regardless of the date the earth stations were authorized, and whether to delete the existing co-primary allocations for the Fixed Service (FS) and Mobile Service (MS) in this band. We also seek comment on other options that could also allow for the provision of licensed terrestrial service in this band.

The 3650 – 3700 MHz band is a “transfer” band that the National Telecommunications and Information Administration (NTIA) reallocated from Government/non-Government shared use status to mixed use status effective 1993.¹²¹ Prior to the transfer, the non-government use of the band was limited to international, intercontinental FSS receive stations.¹²² A condition of the transfer allows Government radiolocation stations to continue to operate indefinitely in the 3650 – 3700 MHz band at three locations with a “radius of operation” of 80 kilometers (49.7 miles).¹²³

¹¹⁷ See 5 U.S.C. § 603. The RFA, see 5 U.S.C. § 601 - § 612, has been amended by the Contract With America Advancement Act of 1996, Pub. L. No. 104-112, 110 Stat. 847 (1996)(CWAAA). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA).

¹¹⁸ We also note that we could certify this action under 5 U.S.C. § 605. See Section E., *infra*.

¹¹⁹ See 5 U.S.C. § 603(a).

¹²⁰ See *id*.

¹²¹ See Spectrum Reallocation Final Report, Response to Title VI – Omnibus Budget Reconciliation Act of 1993, NTIA Special Publication 95-312, released February 1995. Shared use means that a band of frequencies is generally available for both government and non-government use. See 47 C.F.R. § 2.105(b). Mixed use means that government use is limited by geographic area, by time or by other means so as to guarantee that the potential use by government stations is substantially less than the potential use to be made by non-government stations. See Section 113(b)(2)(B) of OBRA-93; 47 U.S.C. § 923(b)(2)(B).

¹²² See *Second Report and Order* in Gen. Docket No. 80-739 (Amendment of Part 2 of the Commission’s Rules Regarding Implementation of the Final Acts of the World Administrative Radio Conference, Geneva, 1979), 49 Fed. Reg. 2357 (January 19, 1984).

¹²³ The three locations are Pascagoula, Mississippi; Pensacola, Florida; and Saint Inigoes, Maryland. Any unlicensed operations in the 3650 -3700 MHz band would be required to protect Federal Government operations at these locations.

In reallocating this spectrum, we sought to maximize the use of the band, and particularly to facilitate the provision of a broad range of traditional voice and broadband high-speed services, and to foster the introduction of such service to rural areas of the country.¹²⁴ We expected this allocation to encourage new and more effective competition to existing wireline local exchange carriers by providing for an economical means to offer competitive “local loop” or “last mile” facilities.

On December 20, 2002, the Commission released a *Notice of Inquiry (NOI)* in ET Docket No. 02-380 seeking comment from the public on the possibility of permitting unlicensed devices to operate in additional frequency bands.¹²⁵ Specifically, the *NOI* sought comment with regard to the feasibility of allowing unlicensed devices to operate in TV broadcast spectrum and the technical requirements that would permit unlicensed devices to operate in that spectrum such that the devices do not cause interference to authorized services. Additionally, the *NOI* sought comment on the feasibility of permitting unlicensed devices to operate in the 3650 – 3700 MHz band at power levels higher than those permitted for unlicensed devices in other bands. Seventy-five parties filed comments and twenty-six parties filed reply comments in response to the *NOI*.

The present proposals, if adopted, will prove beneficial to manufacturers and users of unlicensed technology, including those who provide services to rural communities. Specifically, we note that a growing number of service providers are using unlicensed devices within wireless networks to serve the varied needs of industry, government, and general consumers alike. One of the more interesting developments is the emergence of wireless Internet service providers or “WISPs.” Using unlicensed devices, WISPs around the country are providing an alternative high-speed connection in areas where cable or DSL services have been slow to arrive. We believe that the increased flexibility proposed herein will help to foster a viable last mile solution for delivering Internet services, other data applications, and even video and voice services to underserved, rural, or isolated communities.

B. Legal Basis

The proposed action is authorized under Sections 4(i), 301, 302, 303(e), 303(f), 303(r), 304 and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154(i), 301, 302, 303(e), 303(f), 303(r), 304 and 307.

C. Description and Estimate of the Number of Small Entities To Which the Proposed Rules Will Apply

The RFA directs agencies to provide a description of, and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.¹²⁶ The RFA defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small business concern”.¹²⁷ In addition, the term “small business” has the same

¹²⁴ We also noted and here reiterate our statutory mandate to provide for the deployment of advanced telecommunications services and technologies to all Americans. See Pub. L. 104-104, Title VII, § 706, Feb. 8, 1996, 110 Stat. 153 (Section 706); 47 U.S.C. § 157.

¹²⁵ See *Notice of Inquiry* in ET Docket No. 03-280, 17 FCC Rcd 25632 (2003).

¹²⁶ See U.S.C. § 603(b)(3).

¹²⁷ *Id.* § 601(3).

meaning as the term “small business concern” under the Small Business Act.¹²⁸ Under the Small Business Act, a “small business concern” is one that: (1) is independently owned and operated; (2) is not dominant in its field of operations; and (3) meets may additional criteria established by the Small Business Administration (SBA).¹²⁹ Nationwide, there are a total of 22.4 million small businesses, according to SBA data.¹³⁰

A “small organization” is generally “any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.”¹³¹ Nationwide, there are approximately 1.6 million small organizations.¹³² The term “small governmental jurisdiction” is defined as “governments of cities, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand.”¹³³ As of 1997, there were approximately 87,453 governmental jurisdictions in the United States.¹³⁴ This number includes 39,044 county governments, municipalities, and townships, of which 37,546 (approximately 96.2%) have populations of fewer than 50,000, and of which 1,498 have populations of 50,000 or more. Thus, we estimate the number of small governmental jurisdictions overall to be 84,098 or fewer.

The Commission has not developed a definition of small entities applicable to unlicensed communications devices manufacturers. Therefore, we will utilize the SBA definition applicable to Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing. Examples of products in this category include “transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment”¹³⁵ and may include other devices that transmit and receive IP-enabled services, such as personal digital assistants (PDAs). Under the SBA size standard, firms are considered small if they have 750 or fewer employees.¹³⁶ According to Census Bureau data for 1997, there were 1,215 establishments¹³⁷ in this category

¹²⁸ 5 U.S.C. § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

¹²⁹ *Id.* § 632.

¹³⁰ See SBA, Programs and Services, SBA Pamphlet No. CO-0028, at page 40 (July 2002).

¹³¹ See 5 U.S.C. § 601(4).

¹³² Independent Sector, *The New Nonprofit Almanac & Desk Reference* (2002).

¹³³ 5 U.S.C. § 601(5).

¹³⁴ U.S. Census Bureau, *Statistical Abstract of the United States: 2000*, Section 9, pages 299-300, Tables 490 and 492.

¹³⁵ Office of Management and Budget, *North American Industry Classification System*, pages 308-09 (1997) (NAICS code 334220).

¹³⁶ 13 C.F.R. § 121.201, NAICS code 334220.

¹³⁷ The number of “establishments” is a less helpful indicator of small business prevalence in this context than would be the number of “firms” or “companies,” because the latter take into account the concept of common ownership or control. Any single physical location for an entity is an establishment, even though that location may be owned by a different establishment. Thus, the numbers given may reflect inflated numbers of businesses in this category, including the numbers of small businesses. In this category, the Census breaks-out data for firms or companies only to give the total number of such entities for 1997, which was 1,089.

that operated for the entire year.¹³⁸ Of those, there were 1,150 that had employment of under 500, and an additional 37 that had employment of 500 to 999. The percentage of wireless equipment manufacturers in this category was approximately 61.35%,¹³⁹ so we estimate that the number of wireless equipment manufacturers with employment of under 500 was actually closer to 706, with an additional 23 establishments having employment of between 500 and 999. Consequently, we estimate that the majority of wireless communications equipment manufacturers are small entities that may be affected by our action.

D. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements

Part 15 transmitters are already required to be authorized under the Commission's certification procedure as a prerequisite to marketing and importation. See 47 C.F.R. §§ 15.101, 15.201, 15.305, and 15.405. The changes proposed in this proceeding would not change any of the current reporting or recordkeeping requirements. Further, the proposed regulations add permissible operating frequencies. The proposals would not require the modification of any existing products.

E. Steps Taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities. 5 U.S.C § 603.

At this time, the Commission does not believe the proposals contained in this Notice will have a significant economic impact on small entities. The Notice does not propose new device design standards. Instead, it relaxes the rules with respect to the types of devices which are allowed to operate pursuant to the Commission's regulations. There is no burden of compliance with the proposed changes. Manufacturers may continue to produce devices which comply with the former rules and, if desired, design devices to comply with the new regulations. The proposed rules will apply equally to large and small entities. Therefore, there is no inequitable impact on small entities. Finally, this Notice does not recommend a deadline for implementation. We believe that the proposals are relatively simple and do not require a transition period to implement. An entity desiring to take advantage of the relaxed regulations may do so at any time.

Unless our views are altered by comments, we find that the proposed rule changes contained in this Notice will not present a significant economic burden to small entities. We also encourage small entity comment generally on this IRFA, as noted *supra*. Notwithstanding our finding, we request comment on alternatives that might minimize the amount of adverse economic impact, if any, on small entities.

¹³⁸ U.S. Census Bureau, 1997 Economic Census, Industry Series: Manufacturing, "Industry Statistics by Employment Size," Table 4, NAICS code 334220 (issued Aug. 1999).

¹³⁹ *Id.* Table 5.

F. Federal Rules that May Duplicate, Overlap, or Conflict With the Proposed Rule

None.

APPENDIX C
Determination of Detection Threshold for Non-Fixed Device

The parameters assumed for this earth station are summarized below:

Table 1: Earth station parameters

Earth Station	Parameters
Maximum antenna gain (dBi)	55.3
Antenna gain at backlobe (dBi) ¹⁴⁰	-10
Transmit main beam EIRP (dBW/MHz) ¹⁴¹	44
Transmit frequency (MHz) ¹⁴²	5850
Thermal noise temperature. (°K)	100
Assumed receiver bandwidth (MHz)	50
Earth station thermal noise floor ¹⁴³ (dBW/50 MHz)	-131.6
Earth station interference threshold @ $\Delta T/T = 10\%$ ¹⁴⁴ (dBW/50 MHz)	-141.6
Receive frequency (MHz)	3650

The parameters assumed for the non-fixed unlicensed device are summarized in Table 2:

Table 2: Unlicensed device parameters

Unlicensed Device	Parameters
Maximum transmit EIRP when receiving signal at detection threshold (mW)	250
Detection receiver bandwidth (MHz)	1
Antenna Gain (dBi)	0

¹⁴⁰ The antenna sidelobe pattern based on $32-25 \cdot \log_{10}(\theta)$. For $\theta \geq 48^\circ$, antenna gain = -10 dBi.

¹⁴¹ This represents the main beam EIRP density above which 99% of the earth stations in the 5.85-5.925 GHz and 6.425-6.723 GHz bands transmit.

¹⁴² This is used because it is the lowest frequency and thus has the smallest path loss.

¹⁴³ The thermal noise floor is determined using the parameters of noise temperature (t) and receiver bandwidth (b) along with Boltzman's constant (k). Thus, the thermal noise floor is equivalent to ktb , where $k = 1.38 \times 10^{-23} \text{ J/K}$

¹⁴⁴ The interference threshold $\Delta T/T$ is a measure of the amount of interference that can be tolerated by the satellite system or earth station. $\Delta T/T$ is related to the increase in system noise temperature and corresponds to the interference-to-noise ratio, I/N. We note that in their comments, SIA assumed a I/N of -10 dB (i.e., $10 \log(\Delta T/T = 0.1 (10\%)) = -10 \text{ dB}$) (See SIA comments at XX). Therefore, we used the same value in our analysis. Accordingly, the aggregate interference noise temperature power from all unlicensed devices in the 3650-3700 MHz band must be 10 dB below the corresponding equivalent earth station system noise temperature. Therefore, the interference threshold is calculated at the thermal noise floor (-131.6 dBW) - I/N (10 dB) and is equivalent to -141.6 dBW.

Step 1: Determine the separation distance needed between a 250 mW unlicensed device operating at the backlobe of the FSS station.

Link Budget	Values
Unlicensed device transmit EIRP (250 mW)	24 dBm
Earth station protection threshold (-141.6 dBW/50MHz)	-111.6 dBm/50 MHz
Loss needed between unlicensed device and earth station (24 dBm - -111.6 dBm)	135.6 dB
Miscellaneous losses ¹⁴⁵	10 dB
Loss needed to be attributed to path loss at 3650 MHz (135.6 dB - 10 dB)	125.6 dB
Separation distance at which path loss = 125.6 dB at transmit frequency of 3650 MHz ¹⁴⁶	12.5 Km

Step 2: Determine the detection threshold to protect an FSS earth station from a 250 mW unlicensed device

Link Budget	Values
Earth station main beam transmit EIRP (44 dBW/MHz)	74 dBm/MHz
Earth station antenna gain (backlobe)	-10 dBi
Earth station EIRP (backlobe)	64 dBm/MHz
Free space path loss of satellite signal at 12.5 Km and 5850 MHz	129.7 dB
Miscellaneous losses	10 dB
Total losses	139.7 dB
Received signal at unlicensed device (64 dBm - 139.7 dB)	-75.7 dBm/MHz
Detection threshold to protect earth station	-76 dBm/MHz

¹⁴⁵ These include polarization mismatch, fade, and other miscellaneous losses.

¹⁴⁶ Free space loss assumed where $\text{Loss (dB)} = 32.44 + 20 \cdot \log_{10}(\text{frequency in megahertz}) + 20 \cdot \log_{10}(\text{distance in kilometers})$

**STATEMENT OF
CHAIRMAN MICHAEL K. POWELL**

Re: Unlicensed Operation in the Band 3650-3700 MHz; Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band; Amendment of the Commission's Rules with Regard to the 3650-3700 MHz Government Transfer Band, ET Docket Nos. 04-151, 02-380 and 98-237

There has been tremendous progress in the past few years in the development of smart/cognitive radio technologies. This Notice of Proposed Rulemaking takes a hard look at 50 MHz of spectrum in the 3650-3700 MHz band which has the potential to make use of these technologies to promote more efficient use of spectrum and to provide new and advanced telecommunications services and technologies to all Americans. With protected earth stations primarily on the coasts, this band appears particularly promising for extending broadband service in rural areas, such as by wireless internet service providers. Some of these uses could potentially complement unlicensed operations in other bands, such as 2.4 and 5.8 GHz that could allow greater flexibility and continuity in the creation of devices for consumers. This may be another giant step in our effort to bring affordable broadband services to all Americans.

We tentatively conclude that we should allow unlicensed operations with smart radio techniques with fixed satellite services in these bands. To ensure that we have the ability to move forward on whatever approaches will best achieve our goals regarding enhanced services, we welcome consideration of alternative proposals and approaches that could potentially allow the use of both unlicensed and licensed terrestrial services.