

record of this rulemaking, would be arbitrary and capricious, and would disserve the public interest.

Respectfully submitted,

NATIONAL SPECTRUM MANAGERS  
ASSOCIATION, INC.

FIXED POINT-TO-POINT COMMUNICATIONS  
SECTION, NETWORK EQUIPMENT DIVISION  
OF THE TELECOMMUNICATIONS INDUSTRY  
ASSOCIATION

  
\_\_\_\_\_  
William R. Lye, President

  
\_\_\_\_\_  
George M. Kizer, Chairman  
Denis Couillard, Vice Chairman  
Eric Schimmel, Vice President of TIA

Of Counsel:  
Robert J. Miller  
Jeffrey D. Jacobs  
Gardere & Wynne, L.L.P.  
1601 Elm Street, Suite 3000  
Dallas, Texas 75201  
(214) 999-3000

March 16, 1995

207571.01/GW03



**ATTACHMENT 1**  
**COMMENTS FILED IN WT DOCKET NO. 94-148**

AirTouch Communications, Inc. ("AirTouch")  
Alcatel Network Systems, Inc. ("ANS")  
ALLTEL Mobile Communications, Inc. ("ALLTEL")  
American Petroleum Institute ("API")  
Association of American Railroads ("AAR")  
AT&T Corp. ("AT&T")  
BellSouth  
Cellular Communications of Puerto Rico, Inc. ("CCPR")  
Central and South West Services, Inc. ("Central")  
Comsearch  
Creative Broadcast Techniques, Inc. and The New Vision Group, Inc. ("CBT/New Vision")  
CSI Telecommunications ("CSI")  
Digital Microwave Corporation ("DMC")  
E.F. Johnson Company ("EFJ")  
EDS Corporation ("EDS")  
Entergy Services, Inc. ("Entergy")  
Fixed Point-to-Point Communications Section, Network Equipment Division of the Telecommunications Industry Association and National Spectrum Managers Association, Inc. ("TIA/NSMA")  
GTE Service Corporation ("GTE")  
Harris Corporation-Farinon Division ("Harris")  
Industrial Telecommunications Association, Inc. ("ITA")  
Liberty Cable Company ("Liberty")  
Local Area Telecommunications, Inc. ("LOCATE")  
MCI Telecommunications Corporation ("MCI")  
Metropolitan Water District of Southern California ("Metropolitan")  
Motorola  
NYNEX  
Omaha Public Power District ("Omaha")  
Pacific Bell, Nevada Bell & Pacific Bell Mobile Services ("Pacific Bell")  
People's Choice TV Corp. ("PCTV")  
Pepper & Corazzini, L.L.P. ("P&C")  
Rural Common Carrier Microwave Coalition ("RCCMC")  
SBC Communications, Inc. ("SBC")  
Telecom Services Group, Inc. ("TSGI")  
Telephone and Data Systems, Inc. ("TDS")  
The Southern Company ("Southern")  
UTC, The Telecommunications Association ("UTC")  
Western Multiplex Corporation ("WMC")  
WinComm, Inc.  
Wireless Cable Association International, Inc.



(214)999-4219

February 20, 1995

Regina M. Keeney  
Chief, Wireless Telecommunications Bureau  
Federal Communications Commission  
1919 M Street, N.W.  
Washington, D.C. 20554

Re: September 2, 1994, FCC Public Notice --  
Private Radio Bureau to Implement New Microwave Licensing System

Dear Ms. Keeney:

On September 2, 1994, the Commission released the above-referenced, attached Public Notice, which implements a new microwave licensing system.<sup>1</sup> In the Public Notice, the Commission states that an applicant filing a Form 494 no longer is required to identify what transmitters and antennas it will use.

The Fixed Point-to-Point Communications Section, Network Equipment Division of the Telecommunications Industry Association ("TIA"), and the National Spectrum Managers Association, Inc. ("NSMA"),<sup>2</sup> oppose eliminating the requirement that an applicant filing a Form 494 must specify what transmitter and antennas are to be utilized. As detailed below, this new policy must be rescinded because: (i) it is inconsistent with Section 21.15(g) of the Commission's rules and thus cannot be enforced absent a formal rule change; and (ii) such equipment data are crucial to effective frequency coordination and interference protection. Accordingly, TIA and

---

<sup>1</sup>Public Notice, Private Radio Bureau to Implement New Microwave Licensing System (Mimeo No. 44611, released September 2, 1994).

<sup>2</sup>TIA is the principal industry association representing fixed point-to-point microwave manufacturers. The NSMA is a voluntary association of individuals involved in frequency coordination of terrestrial microwave and satellite earth stations.

NSMA request that the Commission withdraw this new policy, at least until the Part 101 rules governing fixed microwave services are adopted.<sup>3</sup>

In the Public Notice, the Commission announces several changes in its licensing procedures to support "implementation of a new automated licensing system for radio services currently licensed by the Microwave Branch of the Licensing Division in Gettysburg, Pennsylvania." One of these changes is eliminating the Form 494 requirement for listing data regarding antennas and transmitters:

These filings must include the transmitting and receiving antenna gains (dBi), the effective isotropic radiated power (W), and the "new" emission designator and frequency stability (%) of the transmitter, in lieu of antenna and transmitter codes, for all frequency paths added or modified by the application. The Commission currently determines these values based on the antenna codes entered in items 8 and 11 and the transmitter codes entered in item 10 of the application form. These values will be required on all application filings, for all frequency paths added or modified by the application, in items 8 and 10. Antenna gains will be entered in lieu of antenna codes in items 8f, h, j, and l; items 11(a), (b), and (c) may be left blank. Transmitter information will be required in items 10a, f, g, and h; the remainder of item 10 may be left blank. Alternatively, the antenna gains and transmitter information for all frequency paths added or modified by the application may be provided by path data attachments.

Eliminating the requirement to include antenna and transmitter data in the Form 494 is inconsistent with Section 21.15(g) of the Commission's rules, which states:

Each application in the Point-to-Point Radio, Local Television Transmission, Multipoint Distribution Service and Digital Electronic Message Service (excluding user stations) proposing a new or replacement antenna (excluding omni-directional antennas) shall include an antenna radiation pattern showing the antenna power gain distribution in the horizontal plane expressed in decibels, unless such pattern is known to be on file with the Commission in which case the applicant may reference in its application the FCC-ID number that indicates that the pattern is on file with the Commission.<sup>4</sup>

---

<sup>3</sup>Reorganization and Revision of Parts 1, 2, 21, and 94 of the Rules to Establish a New Part 101 Governing Terrestrial Microwave Fixed Radio Services, Notice of Proposed Rulemaking, WT Docket No. 94-148 (released December 28, 1994) ("NPRM"). Current Section 21.15(g) is maintained in Section 101.21(c), as proposed in the NPRM.

<sup>4</sup>47 C.F.R. Section 21.15(g) (1993).

Under this policy, critical data used to meet other Commission requirements, such as Section 21.100(d) frequency coordination obligations, Section 21.107 transmitter power limits, and Section 21.110 antenna polarization specifications, no longer must be provided. These are crucial items for proper frequency interference studies, especially with the near-term influx of PCS systems and relocation of 2 GHz fixed point-to-point microwave users. Deletion of antenna and transmitter data from the Form 494 adversely affects the ability of fixed point-to-point microwave users to operate without being subjected to harmful interference. If these antenna and transmitter specifications are not required to be provided in the Form 494, spectral efficiency will suffer in this increasingly congested environment.

Absent transmitter and receiver data from the Form 494, the prior coordination notice will have to suffice. Unfortunately, a prior coordination notice is not sufficient certification by a microwave system operator that the prior coordinated technical parameters are, in fact, compliant. In addition, this information must be shown on any station license issued by the Commission to ensure future adherence to the licensed parameters. However, the new policy does not ensure that the such data would be set forth on the license.

The following examples illustrate the chaos that will result from implementing the new Form 494 policy regarding antenna and transmitter data. Any proposal that only requires an applicant to include antenna gain and EIRP on an application would not allow the Commission to post a specific antenna on the station license. If this scenario should occur, an applicant could prior coordinate an antenna system and actually implement a much lower performance antenna while remaining compliant with the provisions of the Public Notice. Similarly, specification of an actual transmitter to be utilized is also important to spectral efficiency. There may be more than one specific transmitter that can share a common emission designator. Different transmitters may have different characteristics, such as receiver filter response. Receiver filter characteristics are critical to proper frequency interference studies and must be specified in an application for service.

For the foregoing reasons, the Public Notice results in a substantive, rather than a procedural, change in application requirements under Section 21.15(g). Thus, the changes made in the Public Notice are invalid because they change the provisions of a rule without a notice and comment rule making.<sup>5</sup>

---

<sup>5</sup>A notice and comment rule making is not applicable "to interpretive rules, general statements of policy, or rules of agency organization, procedure, or practice . . ." 5 USC Section 553(b)(3)(A) (1994). The changes to the Form 494 requirements are not interpretive, are not general policy statements, and are not related to the Commission's procedures.

Currently, in the NPRM, the Commission is considering a generic consolidation of Parts 21 and 94 into a new Part 101. In joint comments that will be filed on the NPRM, TIA and NSMA propose that a single application form be used for all services subject to the new Part 101, that this application form require that the applicant list all the equipment it will use in its system, including transmitter and antenna information, and that such information be included on the license. Requiring this information by rule will facilitate data basing antenna, transmitter, and other equipment specifications so that proper frequency coordination and interference protection can be maintained.

The new policy announced in the Public Notice, which eliminates the requirement that the Form 494 specify what transmitter and antennas are to be utilized, disserves the public interest, is contrary to Section 21.15(g), and threatens frequency coordination and interference protection. Thus, TIA and NSMA respectfully request that the Commission issue another Public Notice, which stays this policy change pending Commission action on the Part 101 NPRM.

It is also possible that certain applicants made changes to their facilities which, pursuant to the Commission's new policy announced in the September 2, 1994, Public Notice, did not have to be submitted in a Form 494 modification application. TIA and NSMA request that the Commission, in a Public Notice staying the September 2, 1994, Public Notice, instruct such applicants to submit back-up documentation, of any unreported changes, in a Form 494 modification application, within 90 days of that Public Notice.

If you have any questions, please contact the undersigned.

Respectfully submitted,

NATIONAL SPECTRUM MANAGERS  
ASSOCIATION, INC.



William R. Lye, President

FIXED POINT-TO-POINT COMMUNICATIONS  
SECTION, NETWORK EQUIPMENT DIVISION  
OF THE TELECOMMUNICATIONS INDUSTRY  
ASSOCIATION



George M. Kizer, Chairman

cc: Karen Brinkmann  
Robert James  
Michael Hayden



**Section 4****TLA Bulletin 10-F**

consider the overall system noise objectives in parallel with the system reliability (outage) objectives. Most analog links require significant carrier level increases above threshold sensitivity just to achieve acceptable baseband signal-to-noise (e.g. >35 dB increase for 70 dB S/N in the worst message channel in an FM-FDM link).

### 4.3 Automatic Transmit Power Control in Digital Links

#### 4.3.1 Introduction:

Automatic (or Adaptive) Transmit Power Control (ATPC) is a desirable feature of a digital microwave radio link that automatically adjusts transmitter output power based on path fading detected at the far-end receiver(s). ATPC allows the transmitter to operate at less than maximum power for most of the time. When fading conditions occur, transmit power will be increased as needed. ATPC is useful for extending the life of transmitter components, reducing power consumption, simplifying frequency coordination in congested areas, allowing additional up-fade protection, and (in some radios) increasing the maximum power output (improves system gain).

If the maximum transmit power in a ATPC link is needed for only a short period of time, a transmit power less than maximum may (if certain restrictions are met) be used when interference calculations are made into other systems. Many years of fading statistics have verified that fading on different physical paths is non-correlated, i.e. the likelihood of two paths in a given area being in a deep fade and thus sensitive to interference simultaneously is very small. Further, to allow for inevitable deep fading, microwave paths are designed with unfaded carrier-to-noise (C/N) and carrier-to-interference (C/I) ratios much greater than those required for high quality path performance. Since fading is non-correlated among paths, a short-term power increase by a path experiencing a deep fade will not reduce the C/I on other paths to an objectionable level. On a properly designed path, and one not affected by rain outage, ATPC-equipped transmitters will be at maximum power for a short period of time. However, because the maximum power is available when deep fades occur, CFM, threshold C/N, and C/I calculations into an ATPC link may assume the "Maximum Transmit Power" receive carrier level.

ATPC has been successfully implemented in FCC Part 21 common carrier bands for several years, and, under FCC *ET Docket 92-9*, is now permitted under Part 94. Currently, there are two types of ATPC available. The "ramping" type increases power dB for dB with a fade greater than a certain depth. The "stepped" type increases power in a single step to maximum power when a fade exceeds a certain depth. Besides significantly aiding the frequency coordination process, ATPC also provides receiver up-fade overload protection due to the backed-off transmit power under normal signal level conditions.

#### 4.3.2 ATPC recommendations for frequency coordination

During the coordination process, the ATPC user must clearly state that ATPC will be used. The transmit powers associated with an ATPC system included on the coordination notice are defined as follows:

Maximum Transmit Power	That transmit power that will not be exceeded at any time, used for CFM and path reliability (outage) computations, and for calculating the C/I into an ATPC system.
Coordinated Transmit Power	That transmit power selected by the ATPC system licensee as the power to be used in calculating interference levels into victim receivers.
Nominal Transmit Power	That transmit power at or below the coordinated power at which the system will operate in normal, unfaded conditions.

The Coordinated Transmit Power is restricted to a 0 to 10 dB range below the Maximum Transmit Power. The Nominal Transmit Power must be less than or equal to the Coordinated Transmit Power, with typical values ranging from 6 to 15 dB below the Maximum Transmit Power. The receive level at which the system either steps up or begins to increase (ramp up) the far-end transmit power (depending on the type of ATPC) is referred to as the ATPC Trigger Level. Because shallow fading characteristics are path dependent and unpredictable, at least a 10 dB fade must occur before the Coordinated Transmit Power is exceeded.

In order to claim a Coordinated Transmit Power less than the Maximum Transmit Power (ATPC feature is used), certain restrictions on the time that this power is exceeded must be met. Below about 12 GHz, the expected annual time percentages should not exceed the limits shown in Figure 4-4 and provided in Table 4-2. These time percentages can be calculated by the applicable reliability calculations as shown in Section 4.2.3. First, the fade depth that causes the transmit power to exceed the Coordinated Transmit Power by a certain number of dB must be calculated. This fade depth is then substituted for the CFM in the reliability calculation. For a ramping ATPC system that uses a step increase in transmit power, a single calculation of the time that the fade depth to the ATPC trigger level is exceeded is all that is required. For an ATPC system that increases (ramps up the) power in a linear dB for dB fashion, calculations of the time that the Coordinated Transmit Power is exceeded and the time that the Maximum Transmit Power is reached are sufficient. Future ATPC systems that boost transmit power in some other way may require time percentage calculations for the entire range of transmit power in excess of the Coordinated Transmit Power.

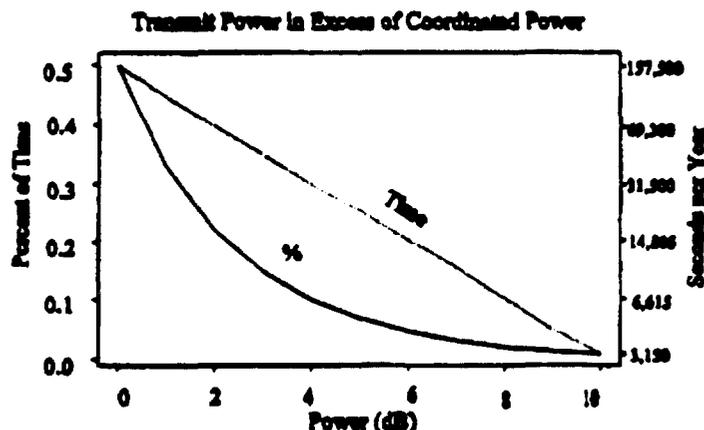


Figure 4-4 — Permitted Time Above Coordinated Transmit Power

In dB steps above the selected Coordinated Transmit Power for ramping-type ATPC systems, the permitted time percentages (and annual transmit power boost times) are shown in the following table. Only one single value (+6, +10 dB, etc.) need be considered in step-type ATPC systems (see examples in Section 4.3.3).

Power above Coordinated Transmit Power (dB)	Permitted time (annual)	
	Percentage of time	Seconds per year
0.0	0.50	157,500
1.0	0.33	103,950
2.0	0.22	69,300
3.0	0.15	47,250
4.0	0.10	31,500
5.0	0.07	22,050
6.0	0.047	14,805
7.0	0.032	10,080
8.0	0.021	6,615
9.0	0.014	4,410
10.0	0.010	3,150

Table 4-2 — Time Permitted Above the Coordinated Transmit Power in an ATPC Link

$$Time = 100 \left( \frac{Time, sec}{31.5 \times 10^6} \right) \% \quad (4.3-1)$$

ATPC-equipped transmitters that claim a Coordinated Transmit Power less than the Maximum Transmit Power must base transmit power increases on path fading. In those cases, interference or error correcting information alone is not sufficient for increasing transmit power, but either or both may be used as an additional criterion. For systems with space diversity, ATPC must be controlled by the stronger signal from the two antenna system. In calculating the time percentages above Coordinated Transmit Power, the space diversity improvement factor may be found to be less than one if the fade depth is small. In these instances, a space diversity improvement factor of one may be assumed (no improvement or penalty from using space diversity).

ATPC-equipped transmitters must not be allowed to stay in the Maximum Transmit Power mode for more than any five minute duration. This event should result in an alarm condition which returns the transmit power to the Normal Transmit Power. ATPC should then not be re-enabled until a determination has been made that this long-term anomaly has been corrected and normal operation can be resumed. This criterion will prevent a long-term degradation, such as a down-stream receiver or control channel failure falsely implying a deep fade, from causing a transmitter to be in the Maximum Transmit Power mode for an extended period of time.

If the above restrictions are met, interference calculations from an ATPC system may assume the lower Coordinated Transmit Power level. Interference and CFM calculations into the receiver of an ATPC-equipped system can then assume that the Maximum Transmit Power is in use. Thus, in calculating performance (outage, etc.) and a C/I for comparison to the objectives, the "C" is then based on the Maximum Transmit Power.

When a Coordinated Transmit Power less than Maximum Transmit Power is claimed for an ATPC

system, documentation that the system will meet these recommendations should be supplied during the coordination process. Because rain fading, obstruction fading, or surface duct fading could cause an ATPC system to increase power for a much longer time, additional justification for claiming a Coordinated Transmit Power less than the Maximum Transmit Power may have to be provided for paths with inadequate clearance or long paths above about 10 GHz. Paths that do not meet the restrictions may still use ATPC, but a Coordinated Transmit Power equal to the Maximum Transmit Power must be used in the coordination process.

The cumulative yearly time at maximum transmit power and the maximum transmit power single duration event time of five minutes may not be appropriate for radios operating above about 12 GHz due to the impact of rain rates and duration on interference cases. Further study in this area is needed.

In order to best reflect ATPC operation in the licensing process, the transmit power shown in the FCC filing should be the Maximum Transmit Power of the station. The station EIRP corresponding to the Maximum Transmit Power must meet FCC EIRP requirements.

Note: ATPC is not recommended for use with analog radios because of the signal-to-noise degradation with the increase in thermal noise proportional to the normal transmitter back-off.

#### 4.3.3 ATPC time above Coordinated Transmit Power sample calculations

In order to best reflect ATPC operation in the licensing process, the transmit power shown in the FCC filing should be the Maximum Transmit Power of the station. The following examples illustrate typical ATPC computations:

*Example 1: Ramping-type ATPC is to be used on a 40 km (25 mile) 6.7 GHz path without space diversity. The ATPC trigger level is -55 dbm. Once this trigger level is reached, the system will increase transmit power one dB for every additional dB of fade. The Nominal Transmit Power of the equipment is +14 dBm with a Maximum Transmit Power of +29 dBm. Average climate, terrain, and temperature conditions exist on the path. The path is designed for a receive level, with Nominal Transmit Power, of -43 dBm. The designer wishes to check if a Coordinated Transmit Power of +19 dBm, 10 dB below the Maximum Transmit Power, can be specified under the recommendations:*

*A fade depth of 12 dB from -43 to -55 dBm causes the trigger level to be reached. An additional 5 dB of fade boosts the power from +14 dBm to the +19 dBm Coordinated Transmit Power. The time that the fade depth exceeds 12+5=17 dB is computed to be:*

$$T = 20 (6.7) (25)^3 10^{-\left(\frac{17}{18}\right)} = 41,776 \text{ seconds} \quad (4.3-2)$$

*or 0.1326 percent of the time, which meets the 0.5 percent requirement.*

*An additional 10 dB of fade will cause the transmitter to reach its +29 dBm Maximum Transmit Power. The time that the fade depth exceeds 17+10 = 27 dB is computed to be:*

$$T = 20 (6.7) (25)^3 10^{-\left(\frac{27}{10}\right)} = 4,178 \text{ seconds} \quad (4.3-3)$$

or 0.0133 percent of the time. This does not meet the requirement of 0.01 percent of the time for 10 dB above the Coordinated Transmit Power.

Since the power is allowed to exceed the Coordinated Transmit Power by as much as 9 dB for 0.014 percent of the time, a Coordinated Transmit Power of +20 dBm (9 dB below the Maximum Transmit Power) may thus be specified.

**Example 2:** ATPC equipment that increases power in a single step to Maximum Transmit Power is to be considered on the non-diversity path in the previous example. The Nominal Transmit Power is +24 dBm for a receive level of -33 dBm. The Maximum Transmit Power is +30 dBm and the ATPC trigger level is 10 dB above the  $10^{-3}$  BER outage threshold of -74 dBm. The designer wants to check if a Coordinated Transmit Power equal to the Nominal Transmit Power can be specified under these rules:

The ATPC trigger level is -64 dBm (10 dB above the  $10^{-3}$  BER threshold) and a fade depth of 31 dB from the nominal power receive level will cause this trigger level to be reached. The time that the fade depth exceeds 31 dB is computed to be:

$$T_{ED} = 20 (6.7) (25)^3 10^{-\left(\frac{31}{10}\right)} = 1,663 \text{ seconds} \quad (4.3-4)$$

or 0.0053 percent of the time. Since a path is permitted to be 6 dB above the Coordinated Transmit Power (+24 boosted to +30 dBm) for 0.047 percent of the time, this path meets the requirement.

**Example 3:** A single-step ATPC'd transmitter is considered for a 48 km (30 mi) 6.7 GHz space diversity path with 9 m (30 ft) dish spacing. Average climate terrain and temperature conditions are present on the path. The Nominal (and Coordinated) Transmit Power is +20 dBm (+30 dBm maximum) for a -42 dBm nominal receive level. The ATPC trigger level is 10 dB above the -77 dBm  $10^{-3}$  BER outage threshold, or -67 dBm.

The ATPC is thus triggered with both space diversity receivers faded from -42 dBm to -67 dBm, or 25 dB. The time that the fade depths both exceed 25 dB is computed to be:

$$T_{ED} = \frac{3 \times 10^5 (30)^4 10^{-\left(\frac{25}{5}\right)}}{30^2} = 2,700 \text{ sec} \quad (4.3-5)$$

or 0.0086 percent of the time. Since a path is permitted to be 10 dB above the Coordinated Transmit Power 0.01% of the time, this space diversity link meets the requirement.



## APPENDIX A-1<sup>1</sup>

### TEXT OF PROPOSED REVISIONS

In their Joint Comments, Appendix A, TIA/NSMA submitted suggested revisions to selected proposed Part 101 rules. To ensure that these suggested revisions are clear, TIA/NSMA, therein, listed all Part 101 rules from the NPRM. If no change to the NPRM text was proposed, it was so noted. If deletion and/or relocation of the entire rule was proposed, it was so noted. If a change was proposed, the entire text of the rule was included as set forth in the NPRM, and it was marked to show the changes that TIA/NSMA propose.

In this Appendix A-1, further suggested revisions are made. The format in the Joint Comments, Appendix A, is used herein. Any changes to Appendix A herein are highlighted in bold. Thus, this Appendix A-1 constitutes the complete set of rules that TIA/NSMA propose for adoption.

#### I. GENERAL REVISIONS TO SUBPARTS C, H AND I.

The following general revisions to Subparts C, H and I are proposed:

- All technical rules in Subparts H and I are deleted.
- Subpart C is amended to add new Section 101.147 for frequency assignments (which merges Sections 101.605 and 101.703) and to add Section 101.723 (special requirements for operation in the 38,600-40,000 MHz band) and re-number it to Section 101.149.
- Subpart H is amended to delete Sections 101.605 (frequency assignments), 101.607 (bandwidth) and 101.609 (standards for pre-1977 equipment).
- Subpart I is amended to delete Sections 101.703 (frequencies), 101.705 (transmitter power), 101.707 (bandwidth and emission), 101.709 (modulation), 101.713 (supplementary application showing), 101.715

---

<sup>1</sup>Appendix A-1 has been provided on computer disk to the Commission.

(temporary authorization), 101.717 (temporary authorization), and 101.721 (channel loading). Subpart I also is amended to re-number Section 101.711 (permissible communications) to Section 101.703, and Section 101.719 (license renewal) to Section 101.705.

- Former Section 101.713 is integrated into Section 101.21; and former Sections 101.715 and 101.717 are integrated into Section 101.31.
- The titles for Subparts H and I are amended and renamed to describe accurately the services involved.

<b>SUBPART C TECHNICAL STANDARDS</b>	<b>SUBPART H PRIVATE OPERATIONAL FIXED POINT-TO-POINT MICROWAVE SERVICE</b>	<b>SUBPART I COMMON CARRIER FIXED POINT-TO-POINT MICROWAVE SERVICE</b>
101.101 - Frequency availability	101.601 - Eligibility	101.701 - Eligibility
101.103 - Frequency coordination procedures	101.603 - Permissible communications	101.703 - Permissible communications
101.105 - Interference protection criteria		101.705 - Renewal of station licenses
101.107 - Frequency tolerance		
101.109 - Bandwidth		
101.111 - Emission limitations		
101.113 - Transmitter power		
101.115 - Directional antennas		
101.117 - Antenna polarization		
101.119 - Simultaneous use of common antenna structures		
101.121 - Marking of antenna structures		
101.123 - Quiet zones		
101.125 - Temporary fixed antenna height restrictions		
101.127 - Topographical data		
101.129 - Transmitter location		
101.131 - Transmitter construction and installation		

<b>SUBPART C TECHNICAL STANDARDS</b>	<b>SUBPART H PRIVATE OPERATIONAL FIXED POINT-TO-POINT MICROWAVE SERVICE</b>	<b>SUBPART I COMMON CARRIER FIXED POINT-TO-POINT MICROWAVE SERVICE</b>
101.133 - Limitations on use of transmitters		
101.135 - Shared use of radio stations and the offering of private carrier service		
101.137 - Interconnection of private operational fixed point-to-point microwave stations		
101.139 - Authorization of transmitters		
101.141 - Microwave modulation		
101.143 - Minimum path length requirements		
101.145 - Interference to geostationary-satellites		
101.147 - Frequency assignments		
101.149 - Special requirements for operation in the band 38,600-40,000 MHz		

## PART 101

### FIXED MICROWAVE SERVICES

#### Subpart A - General

Sec.

- 101.1 Scope and authority.
- 101.3 Definitions.

#### Subpart B - Applications and Licenses

##### General Filing Requirements

- ~~101.4~~ ~~Transition plan~~
- 101.5 Station authorization required.
- 101.7 Eligibility for station license.
- 101.9 Formal and informal applications.
- 101.11 Filing of applications, fees, and number of copies.
- 101.13 Application forms and requirements ~~for private operational fixed stations.~~
- ~~101.15~~ ~~Application forms for common carrier fixed stations licenses.~~
- 101.17 [Reserved]
- 101.19 General application requirements.
- 101.21 Technical content of applications.
- 101.23 Waiver of rules.
- 101.25 Inconsistent or conflicting applications.
- 101.27 Repetitious applications.
- 101.29 Amendment of pending applications.
- 101.31 Special temporary ~~authority.~~ ~~authorization and temporary authorization.~~
- 101.33 Who may sign applications.

##### Processing of Applications

- 101.35 Preliminary processing of applications.
- 101.37 Public notice period.
- 101.39 Dismissal and return of applications.
- 101.41 Ownership changes and agreements to amend or dismiss applications or pleadings.
- 101.43 Opposition to applications.
- 101.45 Mutually exclusive applications.

- 101.47 Consideration of applications.
- 101.49 Grants by random selection.
- 101.51 Comparative evaluation of mutually exclusive applications.

**License Transfers, Modifications, Conditions and Forfeitures**

- 101.53 Assignment or transfer of station authorization.
- 101.55 Considerations involving transfer or assignment applications.
- 101.57 Modification of station license.
- 101.59 Processing of applications for facility minor modifications.
- 101.61 Certain modifications not requiring prior authorization.
- 101.63 Period of construction; certification of completion of construction.
- 101.65 Forfeiture and termination of station authorizations.
- 101.67 License period.
- 101.69 Transition of the 2.11-2.13 and 2.16-2.18 GHz bands from the Common Carrier Fixed ~~Point-to-Point Microwave Radio Services~~ and the 1.85-1.99, 2.13-2.15, and 2.18-2.20 GHz bands from the Private Operational Fixed ~~Point-to-Point Microwave Radio Service~~ to emerging technologies.

**Subpart C - Technical Standards**

- 101.101 Frequency availability.
- 101.103 Frequency coordination procedures.
- 101.105 Interference protection criteria.
- 101.107 Frequency tolerance.
- 101.109 Bandwidth.
- 101.111 Emission limitations.
- 101.113 Transmitter power.
- 101.115 Directional antennas.
- 101.117 Antenna polarization.
- 101.119 Simultaneous use of common antenna structures.
- 101.121 Marking of antenna structures.
- 101.123 Quiet zones.
- 101.125 Temporary fixed antenna height restrictions.
- 101.127 Topographical data.
- 101.129 Transmitter location.
- 101.131 Transmitter construction and installation.
- 101.133 Limitations on use of transmitters.
- 101.135 Shared use of radio stations and the offering of private carrier service.
- 101.137 Interconnection of private operational fixed ~~point-to-point~~ microwave stations.
- 101.139 Authorization of transmitters.
- 101.141 Microwave ~~digital~~ modulation.
- 101.143 Minimum path length requirements.
- 101.145 Interference to geostationary-satellites.

101.147  
101.149

~~Frequency assignments.~~  
~~Special requirements for operation in the band 38,600 - 40,000 MHz.~~

#### **Subpart D - Technical Operation**

101.201 Station inspection.  
101.203 Communications concerning safety of life and property.  
101.205 Operation during emergency.  
101.207 Suspension of transmission.  
101.209 Operation of stations at temporary fixed locations for communication between the United States and Canada or Mexico.  
101.211 Operator ~~requirements for private operational fixed stations.~~ ~~requirements.~~  
101.213 Station identification.

#### **Subpart E - Miscellaneous**

101.301 National defense; free service.  
101.303 Answers to notices of violation.  
101.305 Discontinuance, reduction or impairment of service.  
101.307 Tariffs, reports, and other material required to be submitted to the Commission.  
101.309 Requirement that licensees respond to official communications.  
101.311 Equal employment opportunities.

#### **Subpart F - Developmental Authorizations**

101.401 Eligibility.  
101.403 Scope of service.  
101.405 Adherence to program of research and development.  
101.407 Special procedure for the development of a new service or for the use of frequencies not in accordance with the provisions of the rules in this part.  
101.409 Terms of grant; general limitations.  
101.411 Supplementary showing required.  
101.413 Developmental report required.

#### **Subpart G - Digital Electronic Message Service**

101.501 Eligibility.  
101.503 Digital termination nodal stations.  
101.505 Frequencies.  
101.507 Frequency stability.  
101.509 Interference protection criteria.  
101.511 Purpose and permissible service.  
101.513 Transmitter power.

- 101.515 Emissions and bandwidth.
- 101.517 Antennas.
- 101.519 Interconnection.
- 101.521 Spectrum utilization.

**Subpart H - Private Operational Fixed ~~Point-to-Point~~ Microwave Service**

- 101.601 Eligibility.
- 101.603 Permissible communications.
- ~~101.605~~ ~~Frequencies.~~ [COMBINED INTO §101.147]
- ~~101.607~~ ~~Maximum authorized bandwidth.~~
- ~~101.609~~ ~~Technical standards for stations authorized prior to July 1, 1976.~~

**Subpart I - ~~Common Carrier Fixed~~ Point-to-Point Microwave Radio Service**

- 101.701 Eligibility.
- 101.703 ~~Frequencies.~~ [COMBINED INTO §101.147]
- ~~101.705~~ ~~Transmitter power.~~
- ~~101.707~~ ~~Bandwidth and emission limitations.~~
- ~~101.709~~ ~~Modulation requirements.~~
- ~~101.711~~~~101.703~~ Permissible communications.
- ~~101.713~~ ~~Supplementary showing required with applications.~~ [INTEGRATED INTO §101.21]
- ~~101.715~~ ~~Stations at temporary fixed locations.~~ [INTEGRATED INTO §101.31]
- ~~101.717~~ ~~Notification of station operation at temporary fixed locations.~~
- ~~101.719~~ ~~101.705~~ Renewal of station licenses.
  
- ~~101.721~~ ~~Channel loading.~~
- ~~101.723~~ ~~Special requirements for operation in the band 38.600-40.000 MHz.~~ [NEW §101.149]

**Subpart J - Local Television Transmission Service**

- 101.801 Eligibility.
- 101.803 Frequencies.
- 101.805 Assignment of frequencies to mobile stations.
- 101.807 Transmitter power.
- 101.809 Bandwidth and emission limitations.
- 101.811 Modulation requirements.
- 101.813 Remote control operation of mobile television pickup stations.
- 101.815 Stations at temporary fixed locations.
- 101.817 Notification of station operation at temporary locations.
- 101.819 Stations affected by coordination contour procedures.

## PART 101

### Subpart A - General

§101.1 Scope and authority.

NO CHANGE.

§101.3 Definitions

~~Antenna power gain. The square of the ratio of the root-mean-square free space field intensity produced at one mile in the horizontal plane, in millivolts per meter for one kilowatt antenna input power to 137.6mV/m. This ratio should be expressed in decibels (dB). (If specified for a particular direction, antenna power gain is based on the field strength in that direction only.)~~ maximum radiation intensity to that of an isotropic (omnidirectional) radiator in the far field of its main (forward direction) lobe.

Antenna power input. The radio frequency peak or RMS power, as the case may be, supplied to the antenna from the antenna transmission line and its associated impedance matching network.

Antenna structure. The antenna, its supporting structure and anything attached to it.

Assigned frequency. The center of the frequency band assigned to a station.

Assigned frequency bandwidth. The frequency band within which the emission of a station is authorized; the width of the band equals the necessary bandwidth plus twice the absolute value of the frequency tolerance.

Authorized bandwidth. The maximum bandwidth authorized to be used by a station as specified in the station license. (See §2.202)

Authorized frequency. The frequency, or frequency range, assigned to a station by the Commission and specified in the instrument of authorization.

Authorized power. The maximum power a station is permitted to use. This power is specified by the Commission in the station's authorization.

~~Automatic Transmitter Power Control (ATPC). ATPC is a feature of a digital microwave radio system that adjusts the transmitter output power. ATPC allows the transmitter to operate at less than maximum power for most of the time. In a radio employing ATPC, the transmit power is reduced during normal operation conditions. When the receiver detects a reduction in signal level, a control signal is sent to the far end transmitter, instructing it to increase the power output to compensate for the signal reduction. The power output is~~

limited to the licensed (maximum) transmit power. Guidelines for use of AIFC are set forth in the TIA Telecommunications Systems Bulletin TSB 10, "Interference Criteria for Microwave Systems (TSB 10)". The TSB 10 is contained in Appendix \_\_\_\_\_ of the [Part 101 Report and Order] and is printed in the Federal Register at \_\_\_\_\_. Copies of the current edition of TSB 10 are available for inspection at \_\_\_\_\_ or may be ordered from the Commission's copying contractor.

**Bandwidth occupied by an emission.** The band of frequencies comprising 99 percent of the total radiated power extended to include any discrete frequency on which the power is at least 0.25 percent of the total radiated power.

**Bit rate.** The rate of transmission of information in binary (two state) form in bits per unit time.

**Carrier.** In a frequency stabilized system, the sinusoidal component of a modulated wave whose frequency is independent of the modulating wave; or the output of a transmitter when the modulating wave is made zero; or a wave generated at a point in the transmitting system and subsequently modulated by the signal; or a wave generated locally at the receiving terminal which when combined with the side bands in a suitable detector, produces the modulating wave.

**Carrier frequency.** The output of a transmitter when the modulating wave is made zero.

**Central office.** A landline termination center used for switching and interconnection of public message communication circuits.

**Point-to-point ~~Common carrier fixed point-to-point~~ microwave radio service.** A common carrier public radio service rendered on microwave frequencies by fixed and temporary fixed stations between points that lie within the United States or between points to its possessions or to points in Canada or Mexico.

**Communication common carrier.** Any person engaged in rendering communication service for hire to the public.

**Control point.** An operating position at which an operator responsible for the operation of the transmitter is stationed and which is under the control and supervision of the licensee.

**Control station.** A fixed station, the transmissions of which are used to control automatically the emissions or operations of a radio station, or a remote base station transmitter.

**Coordination area.** The area associated with a station outside of which another station sharing the same or adjacent frequency band neither causes nor is subject to interfering emissions greater than a permissible level.

**Coordination contour.** The line enclosing the coordination area.

**Coordination distance.** The distance on a given azimuth from a station beyond which another station neither causes nor is subject to interfering emissions greater than a permissible level.

**Digital Electronic Message Nodal Station.** A fixed point-to-multipoint radio station in a Digital Electronic Message Service providing two-way communication with Digital Electronic Message User Stations.

**Digital Electronic Message Service.** A two-way end-to-end fixed radio service utilizing digital termination systems for the exchange of digital information. This service may also make use of point-to-point microwave facilities, satellite facilities or other communications media to interconnect digital termination systems to comprise a network.

**Digital Electronic Message User Station.** Any one of the fixed microwave radio stations located at users' premises, lying within the coverage area of a Digital Electronic Message Nodal Station, and providing two-way digital communications with the Digital Electronic Message Nodal Station.

**Digital modulation.** The process by which some characteristic (frequency, phase, amplitude or combinations thereof) of a carrier frequency is varied in accordance with a digital signal, e.g. one consisting of coded pulses or states.

**Drop point.** A term used in the point-to-point microwave radio service to designate a terminal point where service is rendered to a subscriber.

**Earth station.** A station located either on the Earth's surface or within the major portion of Earth's atmosphere and intended for communication with one or more space stations or with one or more stations of the same kind by means of one or more reflecting satellites or other objects in space.

**Effective radiated power (ERP).** The product of the power supplied to the antennas and its gain relative to a half-wave dipole in a given direction.

**Equivalent Isotropically Radiated Power (EIRP).** The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna.

**Exchange.** A unit of a communication company or companies for the administration of communication service in a specified area, which usually embraces a city, town, or village and its environs, and consisting of one or more central offices, together with the associated plant, used in furnishing communication service in that area.

**Exchange area.** The geographic area included within the boundaries of an exchange.