

## **Wireless LANs**

**Excerpts form the NPRM and TD 90-314 to establish PCS**

**Federal Communications Commission**

**Prepared by Vic Hayes, NCR**

The FCC has published a Notice of Proposed Rulemaking and Tentative Decision on an "Amendment of the Commission's Rules to Establish New Personal Communications Services" with filing dates of the comments on November 9, 1992 and reply comments on December 9, 1992.

I have copied those sections I thought would be relevant to IEEE P802.11 work.

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

FCC 92-333  
 24397

In the Matter of )  
 ) GEN Docket No. 90-314  
 ) ET Docket No. 92-100  
 )  
 ) RM-7140, RM-7175, RM-7617,  
 ) RM-7618, RM-7760, RM-7782,  
 Amendment of the Commission's ) RM-7860, RM-7977, RM-7978,  
 Rules to Establish New Personal ) RM-7979, RM-7980  
 Communications Services )  
 ) PP-35 through PP-40, PP-79  
 ) through PP-85

**NOTICE OF PROPOSED RULE MAKING AND TENTATIVE DECISION**

Adopted: July 16, 1992;

Released: August 14, 1992

Comment Date: November 9, 1992

Reply Comment Date: December 9, 1992

By the Commission: Commissioner Quello concurring and issuing a statement; Commissioners Marshall and Barrett issuing separate statements.

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Channel Block A - 1850-1865/1930-1945 MHz;  
 Channel Block B - 1865-1880/1945-1960 MHz; and  
 Channel Block C - 1880-1895/1960-1975 MHz.

We further propose to allow the licensees of these frequency block pairs to have the flexibility to channelize the frequency blocks to accommodate the technologies and services that they wish to provide. This channeling plan will permit the use of channel pairings as well as allow for single frequency technologies such as one-way services or for two-way time division duplex.

39. Our proposed frequency block pairing is consistent with the existing fixed microwave channelization plan that provides an 80 MHz separation between transmit and receive frequencies. This will provide PCS operators some advantages and flexibility in designing their systems. First, channels not used by the microwave service in an area should be immediately available on both transmit and receive frequencies for PCS operations. A different separation for the PCS services than the current fixed microwave channelling plan likely would result in cases in which half of the frequency pair (*i.e.*, either transmit or receive) is used by a fixed microwave user, and therefore not immediately available for PCS service. In these cases the PCS operator could not take advantage of unused microwave channels for paired operation without first negotiating for use of the other half of the pair. Second, maintaining the same separation as for fixed microwave services simplifies the negotiation process; successful negotiations with a microwave user will clear a channel pair for the PCS operator.

40. We note this same separation consistency can be maintained within the 1850-1990 MHz band with other combinations of block size and number of licenses, *e.g.*, three licenses with 20, 30 or 40 MHz each; four licenses with 20 or 30 MHz each; or five licenses with 20 MHz each. The remaining combinations on which we seek comment, *i.e.*, four licenses with 40 MHz and five licenses with 30 or 40 MHz, would require different separations for at least some of the licenses as well as the allocation of additional spectrum from one of the other proposed emerging technologies bands. Commenters supporting such alternative configurations should specifically address separation issues that are likely to arise.

✓ 41. Unlicensed Devices. Some commenters, including Apple and AT&T, discuss a need for forms of personal communications services that might best be used on an unlicensed basis. For example, Apple Computer, Inc., proposes a concept for a high-speed, unlicensed data communications service.<sup>28</sup> It suggests that we amend Part 15 of the Commission's rules to accommodate families

<sup>28</sup>See note 6 and para. 10, *supra*.

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of PCS devices that will be particularly useful for the transmission of high and low speed data between computing devices, cordless telephones and wireless PBXs. On the other hand, several incumbent fixed microwave licensees oppose unlicensed PCS operations. Specifically, UTC argues that such an unlicensed approach would not ensure reimbursement of existing users' relocation costs.<sup>29</sup>

42. We find considerable merit in the potential use of unlicensed PCS devices. We tentatively conclude that permitting the use of PCS devices on an unlicensed basis would be in the public interest, and therefore propose to allocate spectrum for the operation of such PCS devices. This approach should foster the rapid introduction of new PCS technologies by permitting manufacturers to experiment with, and directly market to the general public, products using new designs and technologies, without the delays associated with the licensing of a radio service.

43. We also believe interference with existing fixed microwave users can be minimized by employing appropriate technical standards and making use of specific portions of the 2 GHz spectrum. We propose that unlicensed PCS operation be co-primary with Part 94 operations. We would add the condition that such devices may not cause harmful interference to stations for which license applications are on file as of the adoption date of this proposal.<sup>30</sup> Commenters should address questions of interference and how existing users could be compensated should they wish to move. We are proposing that the 1910 to 1930 MHz band be designated for use by unlicensed PCS devices. This band currently is used for one-way transmissions by private fixed microwave systems operating under Part 94 of the Commission's rules. The band is divided into two unpaired channels and is

<sup>29</sup>See Comments of the Utilities Telecommunications Council to the en banc hearing at footnote 42.

<sup>30</sup>Part 94 operations for which a license application is filed after the adoption of this proposal if final rules are adopted in this proceeding would have to accept any interference received from unlicensed PCS operations. This is somewhat more restrictive than the Commission's policy regarding licensing of new microwave facilities in the 2 GHz bands, see Notice of Proposed Rule Making in ET Docket No. 92-9, supra note 10; and Public Notice released May 14, 1992, Two Gigahertz Fixed Microwave Licensing Policy, Mimeo No. 23115. However, we believe that proposed unlicensed services will require relatively clear spectrum. We believe that this approach is appropriate and will eliminate or minimize, as much as practicable, the need for coordination between private fixed microwave systems and unlicensed operations.

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relatively lightly loaded.<sup>31</sup> It appears that this band can be made available for unlicensed operations with minimal impact on the private fixed microwave community. We seek comment on this conclusion.

44. We tentatively conclude that there is a need to accommodate three broad types of PCS technologies within these bands, each of which has different spectrum requirements: broadband technologies requiring at least 10 MHz, technologies requiring at least 1.25 MHz channels, and narrowband technologies requiring 100 kHz channels. In light of these requirements, we are proposing to divide the 20 MHz of unlicensed spectrum into three blocks: a 10 MHz block for broadband technologies, a 5 MHz block divided into four 1.25 MHz channels, and a 5 MHz block divided into fifty 100 kHz channels. An alternative scheme would be to overlay several blocks of spectrum: two 10 MHz blocks, overlaid by sixteen 1.25 MHz blocks, in turn overlaid with two hundred 100 kHz channels. Overlaying different PCS devices that have different technical characteristics would provide greater flexibility to avoid conflicts with existing Part 94 users and may increase spectrum utilization, but also may increase potential interference between PCS devices.

45. We invite comment on the above channelization proposals and solicit other proposals for channelizing this spectrum. We specifically request commenters to address benefits and impact of any channelization approach based on our desire to provide protection to incumbent fixed microwave licensees and flexibility for unlicensed PCS devices.

#### Negotiations

46. In ET Docket No. 92-9, the Commission proposed that new service providers be empowered to negotiate with the existing users for access to the 2 GHz frequencies and, conversely, to permit incumbents to negotiate with the new service providers for continued use of the spectrum. Assuming the Commission moves forward with ET Docket No. 92-9 and contingent on actions taken in that docket, we propose in this proceeding to adopt specific negotiation procedures for use in the PCS context. It appears that such a mechanism would permit marketplace forces to achieve a balance between the immediate need for spectrum to permit implementation of new services and the requirements of existing

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<sup>31</sup>For example, currently there are only 28 microwave receivers in the 1910 to 1930 MHz band located within a 10 mile radius of the center of the top 50 Metropolitan Statistical Areas (MSAs). This figure was computed by counting all microwave receivers within a ten mile circle centered on the reference coordinates of the first city listed for each MSA, as listed at Section 76.53 of the Commission's Rules.

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fixed microwave operators. Financial arrangements with existing licensees should encourage reaccommodation and help underwrite the cost of transition. In return, the new licensees should receive access to the frequencies used by the fixed microwave operators that are reaccommodated through this process. Also consistent with ET Docket No. 92-9, we propose that incumbent licensees be protected during a transition period should a transition period ultimately be adopted in that proceeding.

47. In ET Docket No. 92-9, proponents of PCS argue that the Commission should adopt a fixed transition period, at the end of which existing users would revert to secondary status. They argue this is necessary for new licensees to successfully negotiate relocation agreements.<sup>32</sup> Another approach was suggested by the Utilities Telecommunications Council (UTC) in comments it filed addressing voluntary and involuntary negotiations. With regard to involuntary negotiations, UTC states:

"To the extent there is concern over the feasibility of voluntary negotiations, [the Commission should] provide for an involuntary relocation program, to commence 10 years from now, based on the MMDS/ITFS relocation plan adopted in GEN Doc. 90-54:

- (1) A new user may request involuntary modification of an existing user's license to specify operation on different frequencies;
- (2) The new user is responsible for all relocation costs, and must set up an escrow account or buy a performance bond to guarantee relocation costs;
- (3) The proposed system must provide equal or better reliability than the existing system;
- (4) Existing user has an opportunity to oppose the relocation proposal; and
- (5) If the new facilities prove to be unsatisfactory in practice, the user must be relocated back to its original facilities at the new user's expense."<sup>33</sup>

We solicit comment in this proceeding on the merits of implementing such a negotiated relocation program, and on how the negotiation process should be implemented specifically with regard to PCS services. Further, we solicit specific comment on

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<sup>32</sup>See, e.g., Comments of Personal Communications Network Services of New York, Inc. at ii.

<sup>33</sup>See Comments of Utilities Telecommunications Council in ET Docket No. 92-9, "Recommended FCC Action Plan for Accommodating New Technologies" (filed March 3, 1992).

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what restrictions, if any, the Commission should place on such negotiated arrangements.

#### 900 MHz Allocation

48. The proposals that relate to 900 MHz include a variety of narrowband PCS services such as advanced paging, messaging, data, and CT-2. These services include one-way systems with relatively low power transmissions from a subscriber to a base station, one-way systems with relatively high power transmissions from a base station to a subscriber, and one-way services that include facsimile, graphics, and other imaging services. Also proposed are two-way systems that would provide subscribers both longer and more diverse message services than are available with current paging services, including for example, tracking and acknowledgment. In addition, two-way advanced cordless telephone service is proposed. In some respects these 900 MHz proposals are similar to some of the proposals for use of the 2 GHz band. They differ, however, in that all require only relatively narrow bandwidths for transmission, generally from 5 to 50 kHz per individual channel. Consequently, the information would be transmitted at slower rates.

49. We recognize the increasing demand for the services that reasonably and efficiently can be provided at 900 MHz. Accordingly, we propose to allocate three megahertz in the 900 MHz spectrum for narrowband PCS services: 901-902, 930-931, and 940-941 MHz. These frequencies currently are reserved for advanced paging<sup>34</sup> and general purpose mobile services.<sup>35</sup>

50. The petitioners propose many types of services that have different spectrum requirements. In determining how best to divide and assign these bands, it is important to provide spectrum that will allow flexibility in the design and implementation of different and innovative systems and still allow for competition among systems. As an initial matter, we tentatively conclude that dividing the 900 MHz spectrum into both paired and unpaired blocks would provide for competitive services as well as for future flexibility. We propose, therefore, to pair blocks of spectrum from the 901-902 and 940-941 MHz bands; and to provide for unpaired use in the 930-931 MHz band. We request comment on providing both paired and unpaired spectrum at 900 MHz, and on the amount provided for each configuration.

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<sup>34</sup>See First Report and Order, GEN Docket No. 80-183, 47 Fed. Reg. 24577 at para. 14 (1982).

<sup>35</sup>See Report and Order, GEN Docket Nos. 84-1231, 84-1233, and 84-1234 at para. 118 (1986), allocating 901-902 MHz and 940-941 MHz to a General Purpose Mobile Service.



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162. PacTel Paging, PP-38, proposes a broadly-defined "advanced architecture paging" to provide a wide array of one-way paging services, including digitized voice messaging, alphanumeric messages, E-mail, video, facsimile, and graphics. PacTel's experimental report indicates that it is testing bit rates for simulcast systems, but testing and results have not concluded. There is no evidence that PacTel has developed a methodology that equals or exceeds the information transmission capacity developed by Mtel. Accordingly, we tentatively conclude that this request should be denied.

163. Finally, Global Enhanced Messaging Venture, PP-80, also proposes to provide a wide variety of data and paging services using a claimed new technology capable of transmitting at a rate in excess of 6,000 bps. We note that even if Global had demonstrated the feasibility of its proposal through an experiment, Mtel's technology is capable of transmitting at greater than 20,000 bits-per-second. Accordingly, we tentatively conclude that this request should be denied.

## V. CONCLUSION

164. In view of the increasing activity in development of innovative personal communication systems using advanced technologies and the potential benefits of these enhanced services offer for the public, we find that it is now appropriate to consider providing an allocation in both the 900 MHz and 2 GHz portions of spectrum for these services. To facilitate the development and implementation of these services as quickly as possible we are proposing a flexible regulatory approach with as few restrictions as possible. The proposed changes to the Rules are listed in the Appendix A. We seek comment on our proposals and any additional information that will facilitate the development of PCS services.

## VI. INITIAL REGULATORY FLEXIBILITY ANALYSIS

165. Pursuant to the Regulatory Flexibility Act of 1980, the Commission finds as follows:

### A. Reason for Action

This rule making proceeding is initiated to obtain comment regarding the implementation of PCS in the 901-902, 930-931, 940-941, 1850-1895, and 1910-1975 MHz bands.

### B. Objective

The objective of this proposal is to provide adequate spectrum and service rules in a reasonable time frame for the

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## APPENDIX A: PROPOSED RULES

1. Part 2 of Chapter I of Title 47 of the Code of Federal Regulations is proposed to be amended as follows:

**PART 2 -- FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS;  
GENERAL RULES AND REGULATIONS**

1. The authority citation in Part 2 continues to read:

**AUTHORITY:** Sec. 4, 302, 303, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154, 154(i), 302, 303, 303(r) and 307, unless otherwise noted.

2. Section 2.106, the Table of Frequency Allocations is proposed to be amended as follows:

**Section 2.106 Table of Frequency Allocations.**

United States table		FCC use designators	
Non-Government		Rule part(s)	Special-use frequencies
Allocation MHz			
(5)		(6)	(7)

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901-902 FIXED. MOBILE. US116 US268	PERSONAL COMMUNICATIONS SERVICES (99).	
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929-930 LAND MOBILE.  US116 US215 US268	DOMESTIC PUBLIC LAND MOBILE (22). PRIVATE LAND MOBILE (90).	
930-931 FIXED. MOBILE.  US116 US215 US268	PERSONAL COMMUNICATIONS SERVICES (99).	
931-932 LAND MOBILE.  US116 US215 US268	DOMESTIC PUBLIC LAND MOBILE (22). PRIVATE LAND MOBILE (90).	

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940-941 FIXED. MOBILE.  US116 US268	PERSONAL COMMUNICATIONS SERVICES (99).	
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1850-1990 FIXED. MOBILE.	PERSONAL COMMUNICATIONS SERVICES (99). PRIVATE OPERATIONAL- FIXED MICROWAVE (94). RADIO FREQUENCY DEVICES (15).	
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II. Title 47 of the Code of Federal Regulations, Part 15, is proposed to be amended to read as follows:

1. The authority citation continues to read as follows:

Authority: Sec. 4, 302, 303, 304, and 307 of the Communications Act of 1934, as amended, 47 U.S.C. Sections 154, 302, 303, 304 and 307.

2. Section 15.5 is amended by adding new paragraph (e) to read as follows:

Section 15.5 General Conditions of Operation

\* \* \* \* \*

(e) Operations in the band 1910 - 1930 MHz under Section 15.253 of this Part are not required to protect Part 94 operations for which a license application is filed after July 16, 1992.

3. Section 15.35 is amended by revising the first sentence in paragraph (b) to read as follows:

Section 15.35 Measurement detector functions and bandwidth.

\* \* \* \* \*

(b) Unless otherwise specified, the radiated limits for frequencies above 1000 MHz are based on the use of measurement instrumentation employing an average detector function. \* \* \*

\* \* \* \* \*

4. Section 15.215 is amended by revising paragraph (a) to read as follows:

Section 15.215 Additional provisions to the general radiated emission limitations.

(a) The regulations in Sections 15.217-15.253 provide alternatives to the general radiated emission limits for intentional radiators operating in specified frequency bands. Unless otherwise stated, there are no restrictions as to the types of operation permitted under these sections.

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\* \* \* \* \*

5. A new Section 15.253 is added to read as follows:

Section 15.253 Operation within the band 1910-1930 MHz.

(a) Operation under the provisions of this section is limited to systems used for the following purposes:

(1) Cordless telephones, including wireless PBX systems. Intercom and paging operations are permitted between portable, base and mobile stations without using the public switched telephone network provided these are not intended to be the primary modes of operation.

(2) Data communications between computer systems.

(b) Channelization and emission limits:

(1) Operation in the band 1910-1920 MHz:

(i) The total peak output power of the intentional radiator over the band 1910-1920 MHz shall not exceed 1 watt.

(ii) Emissions outside the band 1910-1920 MHz shall be attenuated at least 50 dB below the maximum level of the fundamental emission, based on testing with the fundamental emission located as close as possible to the edge of the 1910-1920 MHz band, as limited by the design of the intentional radiator frequency control.

(iii) The minimum 6 dB bandwidth under any condition of input or modulation shall be at least 2 MHz.

(iv) Under any condition of operation, the power density shall not be greater than 1.5 mW, peak power, in any 3 kHz bandwidth during any one second interval.

(2) Operation in the band 1920-1925 MHz:

(i) Operation shall be centered, as adjusted by the frequency tolerance, in one of 50 channels, 100 kHz in width, starting with 1920.0-1920.1 MHz and ending with 1924.9-1925.0 MHz.

(ii) The peak output power of the intentional radiator shall not exceed 20 mW.

(iii) Emissions outside the 100 kHz channel shall be attenuated at least 33 dB below the maximum level of the fundamental emission.

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## (3) Operation in the band 1925-1930 MHz:

(i) Operation shall be centered, as adjusted by the frequency tolerance, in one of 4 channels, 1.25 MHz in width, starting with 1925.0-1926.25 MHz and ending with 1928.75-1930.0 MHz.

(ii) The peak output power of the intentional radiator shall not exceed 100 mW.

(iii) The minimum 6 dB bandwidth under any condition of modulation shall be at least 250 kHz.

(iv) Emissions outside the 1.25 MHz channel shall be attenuated at least 40 dB below the maximum level of the fundamental emission.

(4) All power levels specified above are expressed in terms of the maximum peak power when measured with instrumentation calibrated in terms of an rms-equivalent voltage and are based on the use of an antenna with a gain no greater than 3 dBi.

(i) The output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 3 dBi.

(ii) The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the fundamental emission over the full bandwidth of the authorized channel.

(5) On any frequency or frequencies above 1000 MHz, except as noted below, compliance with the emission limits are based on the use of measurement instrumentation employing a peak detector function and a 1 MHz minimum resolution bandwidth, except as noted below. Wider bandwidths may be used.

(i) For intentional radiators operating in the band 1920-1925 MHz, the emission limits within the band of operation are based on the use of measurement instrumentation employing a peak detector function and a 10 kHz resolution bandwidth.

(ii) For intentional radiators operating in the band 1925-1930 MHz, the emission limits within the band of operation are based on the use of measurement instrumentation employing a peak detector function and a 100 kHz resolution bandwidth.

(iii) Where it can be shown that, because of the particular technology employed in the intentional radiator, the above criteria in this paragraph should be modified, it is

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permissible to do so provided prior Commission approval is obtained.

(iv) Compliance with the provisions of Section 15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(6) Radiated emissions below 1000 MHz that result from digital circuitry associated with the intentional radiator, including digital circuitry that enables or controls the operation of the intentional radiator, shall not exceed the limits in this part for a digital device.

(7) If the emissions from the intentional radiator causes harmful interference to authorized radio services operating under another rule part, the Commission may require appropriate technical changes in the equipment to alleviate the interference, including additional reductions in emissions below the limits specified in this part.

(c) The frequency stability of the intentional radiator shall be maintained within  $\pm 0.0001$  percent of the center frequency over a temperature variation of -30 degrees to +50 degrees C at normal supply voltage, and over a variation in the primary supply voltage of 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

(1) For battery operated equipment, the equipment tests shall be performed using a new battery without any further requirement to vary supply voltage.

(2) It is acceptable for an intentional radiator to cease functioning outside of a narrower temperature range as long as it complies with the frequency stability requirements within the temperature range over which it operates.

(d) Spectral efficiency requirements:

(1) Except for systems operating within the band 1910-1920 MHz, before transmission can occur the associated receiver must automatically monitor the spectrum to be used and prevent operation of the intentional radiator if another transmission is detected within the desired band of operation.

(2) Analog modulation shall not be employed. All transmissions are limited to the use of digital modulation techniques.

(3) The spectral efficiency is equal to (data rate in bits/second) divided by (power in watts x the channel bandwidth in Hz). This calculated value shall not be less than 10.

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(4) Intentional radiators shall be equipped with adaptive power control systems that sense when less transmission power could be employed and automatically lower the output level of the intentional radiator by at least one step of 10 dB or more.