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Corrected by [In the Matter of Amendment of the Commission's Rules to Establish New Personal Communications Services](#), F.C.C., October 31, 1994

8 FCC Rcd. 7162 (F.C.C.), 9 FCC Rcd. 6388, 73 Rad. Reg. 2d (P  
& F) 435, 8 F.C.C.R. 7162, 9 F.C.C.R. 6388, 1993 WL 757328  
FCC 93-329

FEDERAL COMMUNICATIONS COMMISSION (F.C.C.)

IN THE MATTER OF  
AMENDMENT OF THE COMMISSION'S RULES TO ESTABLISH  
NEW NARROWBAND PERSONAL COMMUNICATIONS SERVICES

GEN Docket No. 90-314

ET Docket No. 92-100

RM-7617

RM-7760

RM-7782

RM-7860

RM-7977

RM-7978

RM-7979

RM-7980

PP-4

PP-5

PP-11

PP-14

PP-35 through PP-40

PP-53

PP-69

PP-79 through PP-85

Adopted: June 24, 1993; Released: July 23, 1993

**\*7162** First Report and Order

**\*\*1** By the Commission: Commissioner Barrett issuing a statement.

## INTRODUCTION

1. By this action, the Commission provides for operation of new, narrowband personal communications services (PCS) on spectrum in the 900 MHz band.<sup>1</sup> Such new services are expected to include advanced voice paging, two-way acknowledgement paging, data messaging, and both one-way and two-way messaging and facsimile. The regulatory plan we are adopting for narrowband PCS includes an allocation of spectrum, a flexible regulatory structure, and technical and operational rules. Issues regarding licensee selection procedures and the regulatory status of the service are the subject of legislation actively being considered by the Congress and will be addressed by the Commission in a further action. The narrowband PCS services authorized under these rules are expected to increase the productivity of businesses, result in significant opportunities for small business participation, make available to the public new services to enhance their communications, and assist American industry to maintain its leadership position in the global telecommunications marketplace.

## BACKGROUND

2. The Commission initiated the PCS proceeding with a Notice of Inquiry in 1990.<sup>2</sup> The Commission subsequently issued a Policy Statement on PCS and has held an en banc hearing to address the issues raised in this proceeding.<sup>3</sup>

3. On July 16, 1992, the Commission adopted a Notice of Proposed Rule Making and Tentative Decision (Notice) in which it addressed both narrowband PCS services at 900 MHz and PCS at 2 GHz.<sup>4</sup> In the Notice, the Commission enumerated the following four goals: 1) universality of service availability; 2) speed of deployment; 3) diversity of services; and 4) competitive delivery. It stated that these four goals should be optimized and balanced in providing spectrum and a regulatory structure for PCS.<sup>5</sup> The Commission noted that the 900 MHz proposals include a variety of narrowband PCS services such as advanced paging, messaging, and advanced cordless telephones. 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 services that would provide subscribers with more diverse messaging than is currently available, including for example, tracking and acknowledgement. In addition, two-way advanced cordless telephone services were proposed.

**\*\*2** 4. In view of the wide diversity of proposed services, the Commission proposed to define PCS broadly. Specifically, the Commission proposed to define PCS as a family of mobile or portable radio services which could provide services to individuals and business, and be integrated with a variety of competing networks. An allocation of spectrum for narrowband PCS was proposed at 901-902, 930-931 and 940-941 MHz. Comment also was requested on various combinations of four licensed service area options: 1) 487 Basic Trading Areas (BTAs); 2) 47 Major Trading Areas (MTAs); 3) 194 Local Access and Transport Areas (LATAs); and, 4) nationwide.

5. The Notice included proposals for technical requirements, such as emission limits and frequency stability. The item proposed 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. Comment was sought on three alternative channeling plans providing both paired and unpaired channels and on the amount of spectrum that should be provided for each configuration.

6. In the tentative decision portion of the Notice, the Commission proposed to award a pioneer's preference to Mtel for development of innovative new technology that will increase spectrum efficiency.<sup>6</sup> This tentative decision was based on Mtel's having developed and tested "Multi-Carrier Modulation" technology that is capable of transmitting a 24 kbps nationwide simulcast signal in a single 50 kHz channel and designing a complete advanced messaging system based upon this efficient technology.

## DISCUSSION

### Service Definition and Spectrum Matters

7. Narrowband PCS Demand. In the Notice, the Commission recognized the increasing demand for PCS services, including those narrowband PCS services that can be reasonably and efficiently provided using spectrum available at 900 MHz. In response to the Notice, the commenting parties confirm this demand for narrowband PCS. Several commenters also submitted a number of market projections indicating substantial demand for narrowband PCS services. Specifically, Arthur D. Little, Inc. (Arthur D. Little) estimates future demand for enhanced paging/messaging services would be 15 million units in 1995, 17.5 million units in 1998, and 21.3 million units in 2002.<sup>7</sup> Telocator states that the 1991 market for paging services is 11.2 million subscribers (4.5% penetration of total market) and forecasts that the market for paging and advanced paging services

will grow to 16.7 million subscribers in 1997 (6.3% penetration) and 22.99 million subscribers (8.13% penetration) in 2002, if licensing is complete in 1994. Similarly, PageNet states that advanced voice paging, its proposed narrowband PCS service, has an immediate consumer demand of at least 18 million people nationwide. Another paging concern, Dial Page states that four million current paging users and an additional four million new paging users would subscribe to a type of narrowband PCS it refers to as Acknowledgement Paging (AP). Mtel submits another Arthur D. Little study concluding that demand for its nationwide wireless network (NWN) approaches one million subscribers that would increase to nearly ten million after ten years of service, assuming service in 300 markets.<sup>8</sup>

**\*\*3** 8. Based on the record in this proceeding, we continue to believe that there is a significant and growing demand for narrowband PCS services. We find that the establishment of narrowband PCS is warranted and that the public interest would be served through the provision of new and innovative narrowband PCS services to meet consumers' demands and needs for mobile and portable communications services.

9. Narrowband PCS Service Definition. In the Notice, we proposed to define PCS broadly as a family of mobile and portable radio communications services which could provide services to individuals and business, and be integrated with a variety of competing networks. We proposed that broadcasting<sup>9</sup> be excluded from PCS spectrum and that fixed services generally be permitted only if reasonably ancillary to mobile PCS services.

10. Commenting parties interested in providing services in the 900 MHz range provided a number of examples of services that fit within this definition. The most commonly **\*7164** cited services are advanced paging and messaging services. Both of these services go beyond simply alerting the subscriber that a call or message is waiting, and allow the subscriber to respond and interact with the page or message. Motorola Inc. (Motorola) states that advanced messaging services are a major subgroup of narrowband services and will permit the provision of services such as electronic mail (E-mail) and the transmission of voice messages and graphic images.<sup>10</sup> PacTel states that full two-way services (such as two-way data) and limited two-way data (such as acknowledgement paging) should be provided for within the narrowband PCS concept and that a variety of advanced messaging services can be offered in 25 kHz channels. American Paging, Inc. (American Paging) discusses one and two-way messaging communications to deliver enhanced character sets, high/low resolution graphics, video, E-mail, facsimile, digitized voice, and a range of data products.<sup>11</sup> PageNet agrees that narrowband PCS should be defined as mobile or portable paging services including, but not limited to, data, advanced paging and messaging services.

11. Many parties argue that narrowband PCS should be restricted to some type of advanced paging or messaging, or that some type of limitation of use be imposed. A number of parties argue that due to the limited amount of spectrum available, narrowband 900 MHz PCS services should be more limited than broadly-defined PCS at higher frequencies. American Paging proposes that two-way voice communications such as advanced cordless telephone operations be prohibited. Motorola proposes that the entire allocation be dedicated exclusively for new advanced messaging and data services. Utilities Telecommunications Council (UTC) requests that some 900 MHz spectrum be allocated exclusively for non-commercial, internal use by traditional private radio eligibles. Grand Broadcasting Corporation (Grand Broadcasting) proposes that one megahertz be allocated solely for a mobile interactive broadcast radio service (IBRS). In-Flight Phone Corporation (In-Flight) requests that at least one nationwide 500 kHz block be allocated solely for audio broadcast retransmissions to airline passengers. Corporate Technology Partners (CTP) requests that 100 kHz control channels be allocated in the 930-931 and 940-941 MHz bands so that its Personal Communications Interface (PCI) can share frequencies between 930-960 MHz on a secondary basis, which would allow PCI/CT2 Plus roaming between the United States and Canada. Finally, American Petroleum Institute (API) proposes that 375 kHz industrial/land transportation eligibles.

**\*\*4** 12. In reply comments, Motorola opposes the limitations proposed by CTP, In-Flight, and API. Motorola argues that the spectrum requirements of CTP's CT-2 services are significantly greater than other narrowband services and, consequently, that those services would be more appropriate in higher bands; that In-Flight's service is more similar to broadcast than personal messaging and would consume too much spectrum for each provider; and that API's proposal constitutes a conventional land

mobile radio service already authorized in other spectrum. PageNet also opposes CTP, In-Flight and API's proposals, arguing that the allocation should be limited to advanced paging. Telocator agrees, stating that the spectrum should be used only for advanced messaging type services, and not for the uses suggested by API, CTP, and In-Flight. Telocator also opposes UTC's proposal to reserve a third of the allocation for non-commercial internal use by traditional private radio eligibles.

13. We continue to believe that a broad definition of PCS is warranted. We find that our concept of PCS as family of services is appropriate and will permit PCS to encompass a wide array of mobile, portable and ancillary communication services to individuals and businesses, and be integrated with a variety of competing networks. We find that narrowband PCS is an important first member of the PCS service family, and are adopting the rules proposed in the Notice for the definition of PCS and for permissible communications with minor editorial changes. We decline to adopt the suggestions of some commenters to limit narrowband PCS to advanced paging and messaging services. While we anticipate, given the stated interest in such services, that advanced messaging and paging services will be one of the predominant narrowband PCS services to be provided, at the same time, we do not wish to foreclose other potential narrowband services.

14. Further, we decline to allocate spectrum specifically for an advanced cordless telephone service, inasmuch as already we have permitted cordless telephones to operate in a number of frequency bands, including 902-928 MHz,<sup>12</sup> and have under consideration a petition for additional frequencies in a different band.<sup>13</sup> Additionally, no set-aside for non-commercial use by traditional private radio eligibles, as proposed by UTC, will be made because we are not convinced that spectrum currently allocated for such private land mobile services is inadequate and because, in general, the services suggested by UTC appear to be within the definition of narrowband PCS and permissible in this spectrum. As there is no petition for rule making before us requesting that spectrum sharing in the 930-960 MHz band be permitted, we will not reserve spectrum for control channels in the narrowband PCS spectrum. Finally, we are adopting the restriction that the spectrum allocated for narrowband PCS not be used for broadcasting.

15. Spectrum Allocation/Channelization Plan. In the Notice we proposed to allocate 3 megahertz of spectrum at 901-902, 930-931, and 940-941 MHz to narrowband PCS. Specifically, we proposed 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. Three alternative channelization plans were presented: twenty 50 kHz symmetrically paired blocks and twenty 50 kHz unpaired blocks; four 250 kHz symmetrically paired blocks and four 250 kHz unpaired blocks; and two 500 kHz symmetrically \*7165 paired blocks and a 1 MHz unpaired block. Comment was requested on our proposals to provide both paired and unpaired spectrum and on the amount of spectrum that should be provided for each configuration.

\*\*5 16. There was no clear consensus on channelization. Although most commenters believe that the majority of channels should have bandwidths of 50 kHz or less, a number of commenters suggest that the channeling plan for narrowband PCS should accommodate both paired and unpaired operation and a number of varying channel bandwidths. There was general agreement among the commenters, however, that the 901-902 MHz band should be used for low power "talk-in" (mobile-to-base) operations.<sup>14</sup> Motorola, for example, states that commenters have recognized the potential engineering and cost benefits of reserving the 901-902 MHz band exclusively for low power talk-in channels. Additionally, many of the parties support providing for some asymmetrically paired blocks (a mobile-to-base block of smaller bandwidth than the base-to-mobile block). These parties state that asymmetrical channeling is spectrally efficient since the response requirement uses less bandwidth than that needed for the message being communicated.

17. American Paging, Arch Communications Group, Inc. (Arch), The Ericsson Corporation (Ericsson), and Mtel support channel bandwidths of 50 kHz or less. Mtel states that no proven efficiencies would result from specifying blocks larger than 50 kHz, and that creating larger channel blocks would restrict entry opportunities and limit competition and diversity. PacTel states that large channel blocks such as 200 kHz are unnecessary and would result in "warehousing" of spectrum by applicants that can provide their service with less.

18. PageMart, PacTel, and Motorola each propose alternate channeling plans. Each of these plans would limit the 901-902 MHz band to low power transmissions and would provide for both symmetrical and asymmetrical channel pairings. All of the proposed channeling plans include some unpaired channels in 901-902 MHz to provide low-power response capability for existing paging licensees. In particular, PageMart proposes: five 200 kHz blocks, each associated with two 25 kHz blocks; five 25 kHz symmetrically paired blocks; ten 25 kHz blocks paired with 12.5 kHz blocks; ten 50 kHz unpaired blocks; and fifty 12.5 kHz unpaired blocks. PacTel proposes five 100 kHz symmetrically paired blocks; twenty-two 20 kHz blocks paired with ten 100 kHz blocks, eight 50 kHz blocks, and four 25 kHz blocks; and three 20 kHz unpaired blocks. Motorola proposes three 150 kHz symmetrically paired blocks; thirty-one 50 kHz blocks paired with 12.5 kHz blocks; and thirteen 12.5 kHz unpaired blocks for use by existing paging providers. Additionally, Motorola suggests that we allow licensees the flexibility to combine or split channels as long as they stay within their authorized spectrum.

19. We believe that the channelization plan for narrowband PCS should provide a flexible framework that will foster our goals of universality, speed of deployment, diversity of services and competitive delivery. Potential PCS providers propose a diverse range of services with varying channel bandwidth requirements. We find that a mix of paired, unpaired and varying bandwidths will provide the most flexible solution for meeting the stated needs of narrowband PCS providers. At the same time, we have reconsidered our original proposal to channelize and license the entire 3 MHz of available 900 MHz spectrum at this time. We now believe that less spectrum is sufficient to support the narrowband PCS proposals before us. Further, given the diversity in channel bandwidths and other operational considerations associated with these proposals, this approach will allow us to respond to growth and development of specific narrowband PCS services as well as potential new future services. In view of the above considerations, we are allocating the 901-902, 930-931 and 940-941 MHz bands to narrowband PCS. However, at this time we will only channelize and license two of the three megahertz of spectrum we are making available for 900 MHz PCS use. We believe this will provide an adequate amount of spectrum for the initiation of narrowband PCS and allow us flexibility in the future to channelize and license the remaining one megahertz of spectrum as this service develops.

**\*\*6** 20. Based on the record, it appears that most proposed narrowband services can be accommodated within a 50 kHz channelization plan. It also appears that the vast majority of narrowband PCS services propose low-power return path response capability. In this regard, we agree with the commenting parties that the 901-902 MHz band is particularly suited to use for low-power operations and that asymmetrical channel bandwidth pairings should be used to promote spectrum efficiency. As noted by Motorola and others, the communications requirements of response operations are substantially less than those of base-to-mobile operations. Therefore, our channelization plan will provide twelve 50 kHz channels in the 930-931 MHz band asymmetrically paired with twelve 12.5 kHz channels in the 901-902 MHz band. We also concur with those commenters that suggest that some response channels be provided for use by existing licensees. This will permit existing paging operations to be upgraded and provide some acknowledgement and messaging capability. We will therefore provide eight 12.5 kHz channels for use by existing common carrier and private paging licensees. To accommodate unpaired 50 kHz operations, we are providing five unpaired channels. To accommodate uses that require symmetrical pairings, we are providing nine 50 kHz channel pairs (i.e., 50 kHz paired with 50 kHz).

21. Finally, we will permit the aggregation of channels in any of the paired or unpaired channel groups (e.g., up to 150 kHz paired with 150 kHz) to accommodate the wider bandwidth services. We believe that such an aggregation approach will permit the wider bandwidth proposals suggested by PacTel and Motorola, yet ensure that the spectrum resource is used in an efficient manner.<sup>15</sup> Further, **\*7166** our technical rules will permit sufficient flexibility for licensees to use different modulations and other technical characteristics as suggested by Motorola.

22. Licensed Service Areas. In the Notice, the Commission stated that large regional or nationwide licensed service areas would provide for flexibility in the design and implementation of 900 MHz narrowband PCS systems.<sup>16</sup> The Commission also noted that 900 MHz petitioners generally proposed either regional or nationwide services. The Commission tentatively concluded that PCS licensed service areas should be larger than those initially licensed in cellular; and requested comment on four options: 1) 487 BTAs plus Puerto Rico;<sup>17</sup> 2) 47 MTAs with Alaska separated from the Seattle MTA, plus Puerto Rico;<sup>18</sup> 3) 194 LATAs; and 4) nationwide.

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