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

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

TO: The Commission

REPLY COMMENTS OF CABLEVISION SYSTEMS CORPORATION

CABLEVISION SYSTEMS
CORPORATION

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TABLE OF CONTENTS

	PAGE
INTRODUCTION	1
I. EACH PCS LICENSEE SHOULD HAVE AT LEAST 40 MHZ OF BANDWIDTH	2
II. PCS SPECTRUM SHOULD NOT BE SET ASIDE FOR LOCAL EXCHANGE CARRIERS	5
III. THE COMMISSION SHOULD SERIOUSLY CONSIDER AN INFRASTRUCTURE SET ASIDE FOR LOCAL CABLE TELEVISION OPERATORS	7
CONCLUSION	9

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TO: The Commission

REPLY COMMENTS OF CABLEVISION SYSTEMS CORPORATION

Cablevision Systems Corporation ("Cablevision"), by its attorneys, hereby submits its reply comments in the above-captioned rulemaking proceeding.[1/]

INTRODUCTION

Unlike many of the commenters in this proceeding, Cablevision has been conducting experiments with PCS for nearly two years. It has gained experience and learned valuable lessons in the real-world application of this breakthrough technology.

1/ In the Matter of Amendment of the Commission's Rules to Establish New Personal Communications Services, Notice of Proposed Rule Making and Tentative Decision, FCC 92-333 (rel. Aug. 14, 1992) ("NPRM").

Cablevision argued in its original comments[2/] that the overriding consideration in formulating a regulatory and licensing structure for PCS should be ensuring, to the maximum extent possible, the operational and economic viability of a PCS service. With this consideration in mind, Cablevision suggested that the Commission adopt rules in this proceeding that assure PCS licensees adequate spectrum with which to engineer viable systems, prohibit local exchange carriers from stifling the development of this technology, and provide for a preference or set aside for PCS applicants that are best able to provide service rapidly and economically. The Comments filed in this proceeding provide substantial support for each of these proposals.

I. EACH PCS LICENSEE SHOULD HAVE AT LEAST 40 MHZ OF BANDWIDTH

Cablevision's extensive experimentation with PCS technologies has lead it to conclude that 20 Mhz per PCS licensee is inadequate to operate a robust PCS system, especially where large number of incumbent microwave users exist, as often is the case in large metropolitan markets (e.g. New York, where Cablevision has been conducting PCS experiments). Cablevision has found that it may be impossible to construct a viable PCS system around existing microwave users with only 20 Mhz of

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[2/] Comments of Cablevision Systems Corporation in Gen. Docket No. 90-314 (filed November 9, 1992) ("Cablevision Comments").

spectrum per PCS licensee, particularly in light of the fact that many incumbents are government entities that would be immune from forced relocation under the Commission's proposed rules.[3/] While Cablevision set out in detail the basis for its conclusions on this issue in its initial comments, Exhibit 1 to these comments offers an additional technical discussion showing the difficulties of engineering adequate PCS services with only 20 Mhz of spectrum.

Accordingly, Cablevision reiterates its support for a minimum allocation of 40 MHz to each PCS licensee. Based on Cablevision's analysis, this bandwidth would give each licensee sufficient capacity to engineer viable systems around existing grandfathered users. Not only would such an allocation help to assure that each PCS licensee would have sufficient bandwidth to operate a competitive, full-service PCS system, it would also significantly reduce many of the complex problems, including cost burdens, involved with wholesale relocation of incumbents. By utilizing the 1850-1910 and 1930-1990 MHz bandwidths, three licenses per market could be granted, allowing for robust competition.

There is overwhelming support for a 40 MHz per-licensee approach in the comments filed in this docket. For example, Comsearch, a disinterested party with extensive knowledge and expertise in this area, agrees that three licenses per market

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[3/] See Cablevision Comments at 7.

should be granted, each with 40 MHz.[4/] In addition, several equipment manufacturers support granting each PCS licensee 40 MHz of spectrum.[5/] In contrast, those entities that favor a 20 MHz spectrum allocation generally operate existing services with which PCS will likely compete to some extent (i.e. cellular operators and local exchange carriers).[6/] The mixed interests of these parties require that their position be evaluated with skepticism, and rejected.

Perhaps most importantly, the Commission's Office of Plans and Policy has recognized that consolidation of multiple licenses would be necessary in many cases if licenses are granted in 20 MHz blocks.[7/] In light of the expensive and time consuming

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[4/] See Comsearch Comments at 4.

[5/] Interdigital Communications Corp. Comments at 3-7; Xircom Corporation Comments at 2. See also American Personal Communications Comments at 7-19; Associated PCN Co. Comments at 2-4; Cox Enterprises, Inc. Comments at 10; MCI Telecommunications Corp. Comments at 4-8; Omnipoint Communications, Inc. Comments at 11-12; PCN America, Inc. Comments at 3-4; PCN Communications, Inc. Comments at 2; Pertel, Inc. Comments at 2-5; and Time Warner Telecommunications Comments at 4-7.

[6/] See, e.g., Alltel Companies Comments at 15-16; AT&T Comments at 10-11; BellSouth Comments at 20-23; Cellular Telecommunications Industry Association Comments at 28-30; Centel Corporation Comments at 10; Century Cellunet, Inc. Comments at 9; Cincinnati Bell Telephone Co. Comments at 14; Comcast PCS Communications, Inc. Comments at 17; GTE Corp. Comments at 28-32; Fleet Call, Inc. at 8-9 (recommending 15 MHz per licensee); and The South Carolina Telephone Association Comments at 3.

[7/] See Reed, David, Putting It All Together: The Cost Structure of Personal Communications Services, at 55 (OPP Working Paper No. 28, rel. Nov. 1992) (hereinafter "OPP Working Paper").

market consolidation process in the cellular industry,[8/] adopting an approach in allocating spectrum for PCS licensees that necessarily involves such costly consolidation would represent a regrettable failure to learn from the cellular experience of the past ten years.

Several other commenters, in addition to the Commission itself, have recognized the desirability of avoiding the unnecessary transaction costs of consolidating PCS frequencies in order to combine enough spectrum to support a viable system.[9/] It would be better policy -- both from a consumer cost perspective and speed of service to the public -- for the Commission to initially grant PCS licensees 40 MHz of spectrum and thereby avoid the costly negotiations with co-market licensees that would otherwise result. Such an approach would assure licensees the ability to provide full-service PCS to the public as quickly as possible at the lowest possible price.

II. PCS SPECTRUM SHOULD NOT BE SET ASIDE FOR LOCAL EXCHANGE CARRIERS

Contrary to the position advocated by numerous local exchange carriers, Cablevision continues to believe that LECs should not be granted a set-aside or any other preferential

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[8/] NPRM at ¶ 57, noting that this process may ultimately cost over one billion dollars.

[9/] See, e.g., American Personal Communications Comments at 15-18; Cox Enterprises, Inc. Comments at 8.

treatment in the granting of PCS licenses.[10/] History has shown that LECs' control over bottleneck facilities offers too great a temptation for anticompetitive behavior, and that the LECs have been more than willing to engage in such behavior.[11/] Guaranteeing LECs a PCS license would create exactly the type of anticompetitive problems that some cellular operators have faced in interconnecting their systems to the public switched telephone network.

Many other commenters with various interests agree with Cablevision's position,[12/] as apparently does the Commission itself.[13/] Cablevision strongly believes that the Commission

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[10/] See, e.g., Centel Corp. Comments at 20; Chesnee Telephone Co. Comments at 1; Home Telephone Co. Comments at 8-10; The National Rural Telecom Association and the Organization for the Protection and Advancement of Small Telephone Companies Comments at 13-15; National Telephone Cooperative Association Comments at 4; Rock Hill Telephone Co., et. al Comments at 11-12; and The South Carolina Telephone Association Comments at 10-11.

[11/] See Cablevision Comments at 15 n.16.

[12/] See, e.g., Adelphia Communications Corp., et. al Comments at 12; Associated PCN Co. Comments at 14; Cellular Service, Inc. Comments at 6; Celsat, Inc. Comments at 18; Cox Enterprises, Inc. Comments at 16-17; Florida Cellular RSA Limited Partnership Comments at 10-12; McCaw Cellular Communications, Inc. at 33-34 New York State Department of Public Service Comments at 9-10; Pagemart, Inc. Comments at 12; PCN Communications, Inc. Comments at 6; PDM/PCS Comments at 4 (equipment developer); Pinon Communications, Inc. Comments at 2 (equipment manufacturer); Tel/Logic, Inc. Comments at 9-10 (experimental PCS licensee); Teleport Denver Ltd. Comments at 4-5 (competitive access provider); U.S. Department of Justice Comments at 30; Viacom International, Inc. Comments at 18; Vanguard Cellular Systems, Inc. Comments at 13-15.

[13/] See NPRM at ¶ 79 (spectrum the LECs would be eligible for "would not be a LEC set-aside. Any applicant, otherwise eligible, would be able to apply for spectrum under this option.")

should adhere to this view, and urges the Commission to reject the LECs' suggestions to adopt some sort of LEC set-aside or other preference for PCS spectrum. Moreover, whether or not the LECs are permitted to obtain PCS licenses, the Commission should explicitly affirm the right of PCS licensees to interconnect with the public switched telephone network, and implement a streamlined procedure for the prompt resolution of disputes.[14/]

III. THE COMMISSION SHOULD SERIOUSLY CONSIDER AN INFRASTRUCTURE SET ASIDE FOR LOCAL CABLE TELEVISION OPERATORS

As noted in its initial comments, Cablevision urges the Commission to help speed the provision of PCS to the public by taking advantage of the ubiquitous cable television infrastructure already in place and granting a set-aside of one PCS license per market for local cable operators.[15/] In addition to taking advantage of existing backbone facilities for PCS systems, such an approach would further the goal of preserving valuable spectrum for PCS expansion or future services by connecting microcells using wire-based facilities rather than radio spectrum.

[14/] See Cablevision Comments at 8-9; see also Adelphia Communications Corp., et al Comments at 17-18; American Personal Communications Comments at 52-54; Associated PCN Co. Comments at 20-21; Cellular Communications, Inc. Comments at 28-29; Concord Telephone Co. Comments at 5. As it has done, for example, in the context of Open Network Architecture, the Commission should also ensure that interconnection offerings are unbundled and provided at non-discriminately charges.

[15/] Cablevision Comments at 13-14.

In fact, the Commission's staff has agreed that "economies of scope exist between PCS and cable television service" and that a "strategic advantage of the cable television infrastructure is that it offers a ubiquitous, alternative medium of transport for PCS in residential areas."[16/]

In addition to a cable set-aside, the Commission should consider instituting a weighted lottery procedure for granting PCS licenses, in which applicants that have contributed to the development of PCS through significant activities under experimental licenses would have a greater chance of receiving a PCS license.[17/] Several other commenters also support the idea

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[16/] OPP Working Paper at pp. 34-35. PDS/PCS suggests that if a cable television system utilizes its facilities for PCS, it should be required to provide equivalent access to all other PCS carriers in the market. PDS/PCS Comments at 7-8. Cablevision believes that such an requirement is neither necessary nor appropriate. Based on the technologies that it has developed, Cablevision has long been of the view that cable facilities may be able to support multiple PCS providers using a single cable backbone. Thus, normal economic incentives to maximize revenues should ensure the provision of such backbone services where they are economically efficient. It is important to note, that in contrast to LECs, cable operators will not have an incentive to stifle PCS development in order to avoid competition with core local exchange telephone service. Given these different incentives, and the fact that cable operators will not control monopoly bottleneck facilities on which other PCS providers must depend, imposition of equal access requirements would be burdensome and unjustified.

[17/] See Cablevision Comments at 9-12. Merely having a PCS experimental license should not be sufficient, however, as not all experimental licensees have made significant contributions to the development of PCS.

of a license preference to entities that have demonstrated the ability to rapidly deploy and operate a PCS system.[18/]

IV. CONCLUSION

In crafting its rules for PCS, the Commission is faced with a fast changing, complex telecommunications environment. The Commission's task is made easier, however, by the benefit of having learned from its cellular licensing experience, which should provide some guidance in minimizing problems.

Maintaining and expanding the competitiveness of the telecommunications environment should be paramount among the Commission's goals. Assuring that each PCS licensee has adequate spectrum to engineer a multi-faceted system will promote competition in the PCS marketplace, and telecommunications markets generally, and minimize the transaction costs of spectrum allocation that might otherwise occur. Prohibiting LECs from engaging in anti-competitive behavior, such as impeding PCS interconnection in order to thwart potential competition to their own wireline networks, will help to assure that PCS licensees are able to fully develop their potential. Finally, ensuring that cable television system operators -- who do not control

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[18/] See, e.g., GTE Corp. Comments at 59-60; PCN Communications, Inc. Comments at 3; Tel/Logic Inc. Comments at 13-15 (suggests reserving one frequency block for qualified experimental licensees and pioneer's preference applicants); Gateway Technology, Inc. Comments at 7 (preference should be given to PCS experimental licensees that have submitted meaningful reports); and Calcell Wireless, Inc. Comments at 16 (an "infrastructure preference" should be available in each market).

bottleneck facilities as do the LECs -- participate in the provision of PCS will help to speed the provision of service to the public at reduced cost without jeopardizing the development of competitive PCS systems.

Respectfully submitted,

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CABLEVISION SYSTEMS CORPORATION

EXHIBIT 1

CABLEVISION SYSTEMS CORP
PCN RESEARCH
NPRM REPLY COMMENTS
GENERAL TECHNICAL COMMENTS **JANUARY 8, 1993**

PCNs are envisioned to be RF based mobile voice and data communications networks, which offer service through small diameter cells with ubiquitous coverage areas, and deliver commercially acceptable and competitive transmission quality delivered at a price such that PCS is able to compete with the cellular and home telephone markets. To achieve this vision, the FCC will need to give PCN the resources to compete with both cellular and the LECs to avoid hampering competition. Among the critical technical issues which affect competitive parity are such issues as bandwidth, height and power restrictions, interconnection, the ability to provide comparable services, user density per Mhz, and local government oversight. Cablevision has concerns about the FCC's proposals and the long-term economic impact on PCS resulting from the structuring of technical standards based upon the present evolutionary stage of PCN equipment.

Of particular concern to Cablevision is spectrum sharing with the grandfathered state and local OFS users and the potential detrimental impact these rules could have on economical and ubiquitous PCS. If the Commission continues to allow local government OFS users to be permanently grandfathered into the spectrum proposed for use by PCN operations, based upon the proposed license allocations, the Commission may inadvertently limit PCS as a viable competitor to both cellular and the LECs before the consumer market has even had a chance to vote on the acceptability of PCS.

The success of cellular is largely attributable to a conformity in standards and in the uniformity of transmit and receive paths throughout the cellular service areas on a local and national basis. Cellular can operate on one set of uniform transmit and receive paths because cellular has dedicated spectrum. For PCN to be competitive, each entity will require a comparable amount of available bandwidth which is technologically able to support similar user density per MHz for RF transmission throughout the service area. Because PCN has the potential for perpetual sharing of the spectrum with the grandfathered OFS users, in order to compete effectively, PCN must have enough bandwidth to provide at least one set of Tx/Rx paths of a uniform bandwidth comparable to cellular in areas where spectrum sharing is imposed.

To accommodate the potential for permanent sharing with OFS users, the uniform equipment specifications regarding Tx/Rx paths and the modulation pattern must be engineered to meet the lowest common denominator from an engineering perspective at the

individual system level while maintaining cost effectiveness. These decisions regarding Tx/Rx bandwidth will, in all likelihood, be made by equipment manufacturers. The larger the number of grandfathered OFS paths within a given territory, the smaller will be the amount of usable bandwidth for the PCN licensee in the buffer zones between the PCN and the OFS users.

The size of these buffer zones becomes critical to spectrum sharing and requires further research. While there has been research regarding the size of the zone to prevent interference to the microwave users, the reciprocal research, interference from the OFS to the PCN, has not been sufficiently documented. It has been Cablevision's experience during the PCN process that the buffer zone required to prevent interference to narrowband PCN networks is considerably larger than the buffer zone to prevent interference from the PCN to the Microwave path.

The FCC, in the Emerging Technologies docket, the Pioneer's Preference proceeding, and the PCN/PCS NPRM, has proposed that PCN should initiate service by sharing the spectrum with the fixed microwave users currently licensed at 1850-1990 MHz. In the Pioneer Preference proceeding, the FCC suggests that long-term spectrum sharing with the grandfathered OFS users is the key to early deployment of PCS. One of the leading ideas surrounding spectrum sharing focuses upon the use of spread spectrum technology to reduce the size of buffer zones around the grandfathered OFS users and use of the cable infrastructure to connect the small diameter microcells. Cablevision's concerns with spectrum adequacy and permanent grandfathering arise from its experience with and analysis of spread spectrum technologies.

As of today, there are three forms of spread spectrum technology to be evaluated; broadband/FDD (SCS Mobilecom, Inc.), wideband/TDD (Omnipoint), and narrowband/FDD (Qualcomm). Each technology has its own merits and disadvantages.

BROADBAND

Broadband spread spectrum provides overall spectral efficiency by allowing spectrum sharing of the OFS users and PCN resulting in a net increase in the use of the spectrum. While this co-existence offered poor spectral efficiency individually to the PCN operator in the realm of user density per MHz, it was still appealing because it allowed a net gain in spectral efficiency overall through the perceived ability to have PCN

overlay all of the existing OFS users. To achieve this, broadband spread spectrum required a tremendous amount of spectrum.

NARROWBAND

Devised by Qualcomm, narrowband spread spectrum utilizes FDD modulation in a bandwidth of approximately 1.25 MHz in each direction for the Tx/Rx path. This is the only leading modulation contender which currently utilizes FDD. It assumes that each cell utilizes the same frequencies as every other cell but is "separated" by the use of codes. Having all frequencies in each and every cell creates a frequency reuse pattern of N=1. The ability to execute an N=1 reuse pattern has been an area of debate among the various manufacturers, with each taking a proprietary view. As of today, it has yet to be proven or disproven whether narrowband spread spectrum can support N=1 under commercial conditions. Until this issue can be resolved, Cablevision believes that it is desirable to follow this technology development closely but not to set rules at this juncture which either incorporate or preclude an N=1.

WIDEBAND

Omnipoint has devised a direct sequence spread spectrum which operates over a 10 MHz bandwidth using time division duplex (TDD). The amount of bandwidth used in the spreading coincides with that of 80% of the fixed microwave paths in the United States which are licensed for 10 MHz in each direction.

FDD VERSUS TDD AND SPECTRAL EFFICIENCY

The downside of paired FDD channels lies in the "splits" where the OFS path is not an 80 MHz paired offset. A split results in one half of the microwave path being licensed to different PCN operators. Operators using paired FDD channels can take advantage of the clear spectrum created by a split. A split occurs when, for example, a microwave path is licensed for 1850-1860/1950-1960 and the PCN operator is licensed for 1850-1860/1930-1940, using FDD, the operator could not use the 10 MHz from 1930-1940. If both PCN operators use FDD, this results in 20 MHz of non-utilized spectrum until such time as that path

is relocated. In the case of state and local OFS, this may never occur.

In contrast, TDD would be able to utilize the spectrum not used by an OFS user due to the split. TDD offers higher flexibility in spectrum planning on the part of the PCN operator. With the exception of wideband spread spectrum, the majority of the modulations in use today which utilize TDD are all narrowband. Narrowband will cause an increase in the size of the buffer zone but, as discussed later, this may not be a relevant factor.

I. REQUIREMENT FOR NARROW BAND CHANNELS

As the Commission has already pointed out, broadband spread spectrum requires a bandwidth allocation beyond those proposed for PCN/PCS. Of the two remaining spread spectrum technologies to choose from, both have differing requirements in the area of licensed bandwidth for viable operations.

The three primary variables surrounding these bandwidth requirements are the geographic density of subscribers versus the spectral efficiency of the technology or users per MHz. The size of the coverage area of a cell is inversely proportional to the geographic subscriber densities while being directly proportional to the spectral efficiency of a technology. For example, setting constant the amount of spectrum, the larger the number of subscribers per square mile (Grand Central Station at rush hour versus a rural area) the smaller the area of a cell must be to accommodate the traffic flow. Conversely, the higher the spectral efficiency of a modulation technique, given the same limitations on bandwidth and subscriber densities, the larger the size of a cell could be and still accommodate similar traffic flows.

A third primary factor which will influence both the extent of subscriber densities and the spectral efficiency a technology can support is the frequency reuse pattern as it relates to the coverage area of the cell. Spectral efficiency, users per MHz, becomes directly proportional to the frequency reuse coefficient and heavily impacts the cell coverage area. The more often a set of frequencies can be reused, the higher the presumed spectral efficiency for supporting a higher level of subscribers. Setting

constant the amount of bandwidth, the smaller the geographic coverage area of a cell, the more often the frequencies can be reused if the power levels are reduced or the modulation technology allows for reuse without impacting power levels.

As the cell size decreases, handset receiver sensitivity can be reduced without incurring a loss in the voice or data quality, which may lower the consumer cost of the handset (ie. As the cell size is reduced, power levels can be reduced and battery life increased). Setting power levels constant, as the cell size is increased, the receivers must become more sensitive to allow the subscriber to communicate over the larger area of the cell. The direct proportionality of receiver sensitivity and cell size is influenced by the signal to noise ratio (C/N) of the receivers. As the receiver sensitivity is increased to create a higher quality of reception, the receiver also becomes more susceptible to the ambient noise level. Noise, in this example, is electronic noise created by other subscribers, the grandfathered OFS users transmitting on the same frequency as the cell, or the noise originating from the adjacent cells.

Without a reduction in power, sensitivity to noise requires a greater spatial separation between cells of the frequency reuse pattern or the buffer zones of noninterference of the OFS user to the PCN operator. This greater spatial separation defeats spectral efficiency through frequency reuse. Frequency reuse and diminished receiver sensitivity can be achieved by shrinking the cell size and the power output if the technology's propagation characteristics can support low power. However, cell size is also inversely proportional to capital cost per subscriber such that, at some given level, the cell size becomes too small to be justified economically.

REUSE PATTERNS AND BANDWIDTH ALLOCATIONS

All of the above factors figure prominently into the amount a spectrum which should be assigned to a PCN operating license. Even utilizing a frequency reuse pattern of N=1, to coexist with the grandfathered OFS users, the PCN operator must be granted sufficient spectrum to create a Tx/Rx path in spectrum that is not used by a grandfathered OFS user. Assuming that there is only a single grandfathered OFS user operating on the same frequency as a licensee granted a total of 20 MHz comprised of 10 MHz of spectrum in each direction which matches the 80 Mhz offset of the OFS user, PCS could not be offered in the buffer zones and

under the path of that OFS licensee. To offer service in the buffer zone, the licensee must be granted a second set of frequencies with which to create a second Tx/Rx path to initiate operations in the buffer zone or a two path scenario (P=2). If there are multiple grandfathered paths, and their buffer zones do not overlap, the licensee might still be able to operate in a P=2 setting. Should their buffer zones overlap, then enough spectrum is required to accommodate the two paths as well as an additional path for operation. This would equate to requiring three paths totaling 30 MHz in each direction or P=3.

Today's narrowband technologies operate with N=4 reuse patterns as does wideband spread spectrum. Using 10 MHz per channel, wideband spread spectrum requires 40 MHz of clear spectrum to operate with N=4. If a single grandfathered OFS path is located within the PCN license area, the Commission must now allocate a total of 60 MHz, 40 MHz for N=4 and 20 MHz for the microwave path. Allocating 60 MHz per licensee would restrict the competitive aspect of PCN by limiting the number of licensees. Thus, it becomes apparent that fostering competition between a large number of PCS licensees and co-sharing with grandfathered OFS users are not compatible concepts.

In light of these factors, Cablevision believes that proposals which advocate an allocation of license bandwidth of less than 40 MHz are not in the best interest of the public. Less than 40 MHz will not allow for coexistence with the grandfathered OFS and would limit competition. Cablevision further believes that coexistence can be accommodated without having to grant overly generous blocks of spectrum. To accomplish this, adequate spectrum must be licensed for the PCN operator to coexist with at least one grandfathered OFS user at anytime while still remaining competitive. Cablevision has advocated the licensing of three PCN operators with 40 MHz of spectrum. The 40 MHz would be issued as follows:

Block A	1850-1870	and	1930-1950
Block B	1870-1890	and	1950-1970
Block C	1890-1910	and	1970-1990

At roll-out, allocating 40 MHz per licensee gives the PCN operator sufficient spectrum to coexist long term with one grandfathered OFS user, while maintaining 20 MHz of clear spectrum to either create eight Tx/Rx channels with narrowband

spread spectrum or four channels, if the wideband can be reduced to 5 MHz per channel. While the lower amount of bandwidth utilized in the 5 MHz Tx/Rx paths would allow N=4, it would also reduce the number of subscribers percell while increasing the size of the buffer zones. Should the increase in size of the buffer zones create an area where the buffer zones of two grandfathered OFS paths cross, there would be an area where PCS could not be offered.

In addition, by setting the licensed bandwidth to two 20 MHz channels offset by the same 80 MHz utilized in licensing the majority of the microwave sites, the allocation would evenly match the spectrum licensing scheme of 80 % of the OFS users which have 10 MHz in each direction. This would reduce the number of splits and straddles as explained in our NPRM Comments filed in November, 1991. As suggested by the Commission, by stipulating 1865 and 1895 MHz as the breakpoint between licensees, it creates a situation whereby microwave paths are in the licensed spectrum of two different PCN operators or a "straddle". By aligning the break points as Cablevision suggests, in the areas we have studied, the straddle incidents are reduced by almost 50%.

ECONOMICS AND SPECTRAL EFFICIENCY

Smaller cell sizes create a situation whereby the operator must invest in a greater number of switches, backhaul infrastructure nodes, or a higher, more expensive intelligent network (IN) to operate the PCN. All of these factors increase the capital cost per subscriber of the PCN. Even utilizing the RAD technology in the neighborhood hardware corridors developed by Cablevision, the expense per subscriber could cripple the new industry.

The inverse proportionality of cell size and Tx/Rx bandwidth becomes more crippling the smaller the Tx/Rx path utilized. The spectral efficiency of a modulation technique becomes critical if the operator is only allowed two paired channels of 10 MHz each and needs to operate in an N=4 reuse pattern. The larger the amount of bandwidth required for a given modulation technique, the fewer subscribers which can be supported within the cell. For instance, if the modulation technique can only support one subscriber (voice or data) for every 1.5 MHz, then each cell could only support three simultaneous phone conversations. Even using a 10% contention rate, that cell could only support 30

subscribers. In an area of 100 homes per mile the cell sizes become too small to be economically feasible.

By granting PCN operators 30 MHz of spectrum while requiring them to coexist, the Commission may exacerbate the situation. By granting only 15 MHz in each direction, the Commission may have either precluded OFS compatibility or precluded uniformity of the RF Link. Given that 80% of all microwave paths in the United States are licensed for 10 MHz in each direction, should a licensee have but a single grandfathered OFS user in the licensed area, it would force the licensee to select between not offering the service in the area of that path and the resultant exclusion zones to and from the PCN operator, or attempting to carve out four Tx/Rx paths from the remaining 10 MHz (5 MHz in each direction) of available spectrum. If the FCC were to instead grant 40 MHz of spectrum to each licensee (20 MHz in each direction), the operator would at least have four paths of 5 MHz each with which to operate around that OFS path.

It should be kept in mind that the individual operator will probably not get the choice of selecting the Tx/Rx bandwidth. Instead, the bandwidth will be preset by the individual manufacturers possibly to a national standard, possibly not.

Cablevision's research suggests that the worst possible scenario exists in downtown Manhattan. All of the frequencies proposed by the FCC are already licensed to the New York Port Authority and are in operation.

II. CO-SHARING MAY NOT BE FEASIBLE UTILIZING SPREAD SPECTRUM

Given the requirement of narrowband channels stated above and the low user density per MHz of wideband and narrowband spread spectrum, is it practical to utilize spread spectrum? Other technologies, such as TDMA or FDMA can support higher user densities today and offer higher user densities tomorrow than will wideband spread spectrum.

Broadband spread spectrum was an intriguing idea when the PCN community was trying to share spectrum with all of the OFS users. Wideband spread spectrum, given sufficient spectrum allocation, was perceived as benefiting PCS by creating less

interference to the OFS licensee from a smaller buffer zone around the OFS path.

In the Emerging Technologies docket, the FCC has provided for the relocation of the majority of the OFS users, which diminishes but does not eliminate the requirement for spectrum sharing. The grandfathering of state and local OFS users perpetuates the requirement for spectrum sharing and spread spectrum. While the requirement for spectrum sharing remains, the amount of spectrum allocated per licensee appears to be predicated upon using cleared spectrum. This may create a situation requiring the channel width of the Tx/Rx paths to be extremely narrow resulting in cell sizes too small to be economical to construct and maintain.

Since no existing technology will allow for the complete sharing of spectrum directly in the path of, or in the buffer zone around, the OFS microwave link, and if all microwave users will eventually be relocated through negotiated settlement, state and local links included, the use of spectrally inefficient spread spectrum during the initial roll-out of PCS could be much more costly in the long run. For example, without the assumed breakthroughs in voice encoder technology, it may require the complete change out of the RF Link infrastructure at a later date to accommodate the consumer penetration envisioned by PCS proponents.

As the cable industry has learned from costly converter change-outs, and the cellular industry has learned from attempting to change technologies after roll-out, it is very expensive in both time, capital, and opportunity costs to change technologies post roll-out. Cable, which owns the converters in the subscribers home, still finds a converter change-out a costly and time consuming process which is disruptive to the consumer. Cellular and paging have found the task of relocating subscriber owned technology more difficult than cable's converters due to the resistance of the consumer to purchase new hardware and allocate the required time for customer service to cut over to the new subscriber unit.

If, as it appears, that spectrum sharing is inevitable and the Commission wishes to encourage competition, it would be far better to acknowledge the requirements of spectral efficiency and the need for narrowband transmission at the beginning, thus incurring the additional expenses required to relocate all OFS users at the outset. This strategy would allow an initial

deployment of spectrally efficient technology, as opposed to incurring the same relocation expenses over time plus, the additional capital expenses of changing out the RF LINK modulation technique to accommodate spectral efficiency at a later date, if the technology breakthroughs such as voice encoder technology do not occur.

III. THE COMMISSION MAY WISH TO REVISIT THE GRANDFATHERING OF OFS USERS

Within a 50 mile radius of western Long Island, there are 18 microwave paths owned by state and local government which would be grandfathered under the Emerging Technologies decision. In addition, 26 paths are owned by non-state/local governments which will require relocation. In three of the cities Cablevision has studied, there exist a substantial number of grandfathered microwave paths which could inhibit PCN usage in heavily populated areas.

CITY	GOVT OFS	OTHER	RADIUS (Mi)
New York	18	26	50
Cleveland	11	23	50
Chicago	13	18	25

Cablevision's testing of coexistence indicates that the interference zone of OFS to PCS will be far greater than the interference zone of PCS to OFS. This will result in the need for the PCN licensees to relocate these users either prior to commencement of operations or soon thereafter. Either way, unless the FCC should choose to limit the number of licenses to two and award up to 60 or 70 MHz, then the PCN operator must relocate the vast majority of OFS users. The grandfathering of the state and local governments could preclude the PCN licensee's ability to do this. If the grandfathered OFS users should demand unreasonable amounts of compensation for relocating them, it could impede the roll-out of PCS in major urban areas for years to come, if not eliminate the feasibility entirely. Cablevision does not intend to cast a shadow over all state and local OFS users. We believe that the majority of these users will

negotiate in good faith to achieve an equitable settlement to both parties. While we use the Port Authority as a worst case scenario, we fully believe that some resolution can take place.

Where a grandfathered OFS user is not reasonable in the course of discussions, the possibility exists that PCS can not be made available to a large section of an urban market. Given the large percentage of state and local OFS links which have been grandfathered, it would not take many instances to create such a blockage. While many firms tout the statistic that 75% of all microwave paths lie 25 miles from the center of the major cities, it is also necessary to recall that the urban and suburban areas around these cities also extend well beyond 25 miles of the center of the major cities. In addition, the 25% of the microwave paths which are not beyond the 25 mile radius include a sufficient number owned by the grandfathered OFS users to create situations which can block forever the roll-out of PCS over large urban and suburban segments. This not only affects the constituents of that geographic area, but all other transient constituents of that area.

It becomes too easy to look at the overall statistics that have been generated over the course of these PCS proceedings and lose sight of the real meaning behind them. As stated earlier, for PCS to accomplish the success of cellular or the wired telephone industry, common standards must be achieved. Common standards require engineering all networks to a support level equivalent to the weakest possibility of all the networks covered by the standard. It is not the 75% versus the 25% of all OFS links and their proximity to the city center which create the majority of the critical areas. Rather, it is the ownership of the link, the grandfathering of the links, the proximity of the grandfathered links to each other, the proximity of the grandfathered links to the subscriber base, and the size of the buffer zones around these links which create the problem.

What is the probability that at least one critical grandfathered OFS user will be unreasonable in their demands for relocation? We believe it to be sufficient to draw the Commission's attention to the fact that, given the permanent grandfathering, the state and local OFS users can now ask any price to accommodate relocation. How high could this price go? We remind the Commission of a round table discussion which took place at the National Cable Show in New Orleans in 1991. An attendee representing St Petersburg informed the FCC staff that it proposed to access a 10 percent franchise fee on PCN/PCS, a

rate 300% above the local franchise fee of the LEC, simply because St. Petersburg needed the money. Because it is the state and local governments which are currently holding the grandfathered paths, it is this mentality which could stifle the expansion of PCS.

Cablevision is not categorically stating that coexistence is impossible, nor are we deriding any one technology for another. Cablevision wishes to make it clear that we believe that it may be premature to make spectrum allocation decisions based upon assumptions about the state of technology in the future. Under any scenario, the Commission must allocate at least 40 MHz to permit PCS operators to compete. Beyond this, for technical aspects such as bandwidth per license, spectrum sharing, and channeling plans, Cablevision believes that the Commission should allow time for the technology to catch up with the claims. If the technology can not catch up to the claims, there may be a need to revisit the grandfathering of OFS users.

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