Recommendation WG 20.95.045, Rev. 3.0

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PCS COORDINATION PROCEDURES
with
FIXED MICROWAVE USERS IN THE 1.9 GHz BAND

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NSMA - Working Group 20

1.0 Preface

The FCC's Memorandum Opinion and Order (MO&O) in Docket 90-314 adopted June 9, 1994 represented the culmination of a four-year regulatory process to establish broadband personal communications services (PCS). By allocating 120 MHz of spectrum in the 1.9 GHz band to broadband PCS on a co-primary basis with point-to-point microwave systems, the Commission introduced many new and complex interference concerns. In Section 24.237 of the Rules for PCS, the Commission outlines interference protection criteria and procedures to characterize and minimize the potential interference objections between PCS and incumbent microwave users.

The purpose of this recommendation is to clarify the Commission's Rules and Regulations and establish industry procedural guidelines for meeting interference and frequency coordination rules regarding shared usage of the 1.9 GHz band by PCS and fixed microwave users. The guiding principle is that it is the PCS licensee's responsibility not to cause harmful interference into an incumbent's microwave receiver operating in the 1.9 GHz band.

2.0 Background

In the MO&O, the Commission amended Part 24 to include Section 24.237 titled "Interference protection." This section was developed in response to incumbent fixed microwave user's concerns regarding potential interference into their systems. In this Rule section, the Commission outlines the procedures which the PCS licensee must follow to avoid potential interference. Several different interference analysis methodologies are referenced. Section 24.11 details initial authorization requirements which grant blanket licenses for each PCS market and frequency block. Individual PCS site applications are not required. In the 1.9 GHz point-to-point band, individual site application information provides the basis for analyzing potential interference objections. Absent this requirement for PCS, the Commission opted to initiate an industry notification and response procedure based upon Rule Section 101.103. The National Spectrum Managers Association (NSMA) Working Group 20 was tasked with interpreting the Commission's Rules and Regulations to develop industry guidelines for coordination of PCS systems with incumbent microwave users.

3.0 Terms and Definitions

"Full coordination" begins with sending out a prior coordination notice (PCN) to potentially affected incumbents. The PCN should contain PCS system information and/or interference analysis results for evaluation by the incumbent. The full coordination process requires a response from the incumbent or designated agent within 30 days after receipt of the PCN pursuant to FCC Rule Section 101.103(d)(2)(iv), which is referenced by Section 24.237(c).

An "Expedited PCN" is a coordination notification that requests a response in less than 30 days. The requested response date must be stated in the notification letter. Expedited action is generally acceptable when the PCN contains small changes from a previous PCN or in special circumstances. (Reference FCC Rule Section 101.103(d)(2)(viii).)

An "Information Only" PCN can be used when no response is required from the incumbent because of the limited scope of modifications presented in the notification. (Reference FCC Rule Section 101.103(d)(2)(ix).)

A PCN that includes the abbreviated data set shown in Appendix A is defined as a "Limited Data" PCN. Appendix B describes the data elements and format to be used in a "Complete Data" PCN. Either a limited data or a complete data PCN can be used for "full coordination", "expedited PCN" and "information only" purposes.

4.0 Recommendation

The PCS licensee should follow the procedures described in this document to complete an interference analysis and the prior frequency coordination process before operating any base station(s) in a PCS system.

4.1 Interference Analysis

Pursuant to FCC Rule Section 24.237(d), the PCS licensee must perform an interference analysis using one of the FCC recommended methods. This analysis should assure that the proposed PCS facilities will not cause harmful interference to any incumbent's licensed microwave facilities in the 1.9 GHz band.. It is recommended that the interference analysis consider all microwave receivers in this band found within the coordination distance.

4.2 Prior Coordination

Utilizing the coordination distance criteria found in FCC Rule Section 24.237(d), the PCS licensee shall send coordination notifications to incumbent microwave licensees (or their designated coordination representative) of potentially affected licensed and applied for systems. At a minimum, the notification should be sent to all incumbent microwave licensees or applicants with receivers which are co-channel or adjacent channel to the frequencies listed in the PCN (reference Section 8.0). Licensees with receivers beyond adjacent channel, where the interference analysis reveals a potential conflict, should also be notified. The PCN must include relevant technical details of the proposal. When a PCN is sent out for a new PCS market area,

the full coordination process described in Section 3.0 above must be used with all incumbents in the coordination area.

Appendix A lists the data items that must be included in a limited data PCN that contains the PCS licensee's interference analysis summary. This information could be sent to incumbents who do not wish to perform their own independent analysis.

Appendix B lists the data set and data element definitions that should be provided to those incumbents who request it for coordination purposes. In addition to the data elements listed in Appendix B, the coordinator has the option to provide additional information in a PCN to clarify clearance of suspected cases. These items could include interference analysis computations, path loss predictions or other supporting documentation. Also, this recommendation does not rule out other methods of PCS prior coordination as long as these methods are acceptable to both the PCS licensee and the affected incumbent microwave licensee.

5.0 Confidentiality

The highly competitive nature of PCS results in a need by the PCS licensee to safeguard system design specifications to the greatest extent possible. In this regard, the information included in a PCN must be treated as highly sensitive information and must be used by the incumbent microwave licensee strictly for the purpose of analyzing the PCS provider's proposal as it relates to their system. Other specific privacy and data confidentiality requirements and methods to invoke them are left to the discretion of the parties involved in the coordination.

6.0 PCN Response

Section 24.237 of the FCC Rules requires that coordination occur prior to initiating operations from any base station. According to FCC Rule Section 101.103(d)(iv), incumbent microwave licensees receiving a PCN under the full coordination process are given 30 days in which to analyze the PCN data and respond. After the 30-day period expires and technical objections, if any, are resolved, the PCS licensee may begin operation of the system. Section 24.237(c) references Section 101.103(d) (formerly 21.100(d)) which states "If no response to notification is received within 30 days, the applicant will be deemed to have made reasonable efforts to coordinate…." (Refer to FCC Rule Section 101.103(d)(2)(iv).) The PCS licensee is responsible for getting confirmation as to the receipt of the notification in order to have record of the start of the 30-day response period. Unless otherwise indicated by the incumbent, the PCS coordinator will assume that the incumbent wishes to receive all subsequent notices.

Response to a notification should indicate either concurrence or technical objection. Where objections are identified, the incumbent microwave licensee should provide adequate details of the interference cases to allow the PCS provider to conduct additional analysis. Upon receipt of the documented differences, the coordinator/PCS licensee is responsible for providing additional

justification to resolve the objection. The incumbent microwave licensee is not obligated to suggest changes or engineering proposals in cases involving objections.

7.0 PCN Procedures for System Modifications

PCS systems are very dynamic in nature and will be in a continuous state of engineering, optimization, change and growth. In an effort to limit the number of required PCNs to a manageable level, this section will define when modifications and additions require a full coordination process and when information only notification is appropriate. (See Section 3.0 above for definitions of these two coordination terms.) Under this procedure, some incumbents may require full coordination and others may require information only notification for the same modifications.

7.1 System Modifications Requiring Full Coordination

Full coordination procedures should be used when a system modification:

1. Results in a change in PCS coverage area, frequency block, technology, bandwidth, or specific frequencies.

2. Increases the total number of coordinated base stations listed in the previous "full coordination" PCN by more than 20 percent (see also Section 7.3 below).

3. Results in a new interference case, i.e., identifies a new victim receiver with a negative interference margin that previously had a positive margin (negative margin is defined as a calculated interference level that is higher than the interference objective).

4. Increases the interference level by more than 2 dB for a receiver that had less than a 10 dB positive margin on the basis of the previous full coordination.

5. Expands or increases the coordination area. A full coordination process must be initiated for any new incumbents or links that were not part of the last full coordination.

7.2 System Modifications Requiring Information Only Notification

A notification for information only should be sent to all incumbents in the coordination area when the modification increases the calculated interference level from the previous PCN by more than 1.0 dB and none of the conditions requiring full coordination are applicable (reference Section 7.1 above). Notification should include a brief statement or summary of the PCS system changes. Additional information, such as the items listed in Appendix A, could be included with this notice. The PCS licensee should provide other appropriate details as requested by the incumbent or designated agent.

7.3 Base Station Additions

Under current FCC Rules, new base stations require coordination. When the quantity of base station additions is no more than 20 percent of the number listed in the previous full coordination PCN, a notification for information only should be sent to all incumbents unless one of the conditions requiring full coordination (as described in Section 7.1 above) is triggered. In that case, the full coordination process should be conducted with the respective incumbent(s).

8.0 Co-Channel and Adjacent Channel Coordination

The FCC rules specify that PCS operators must send a prior coordination notice to all co-channel and adjacent channel incumbent microwave systems within the appropriate coordination distance. In order to clearly identify which incumbent microwave users must receive such a notice, the following definitions of co-channel and adjacent channel will be used. These definitions are intended to provide the minimum requirements and do not restrict the distribution to other interested parties.

The designation of co-channel or adjacent channel will be based on whether the PCS frequencies contained within the prior coordination notice are co-channel to the private microwave system's licensed emission bandwidth or fall within the adjacent channel. The PCS service provider is only required to coordinate frequencies that are proposed for actual use.

8.1 Co-Channel

If any portion of a proposed PCS channel falls within the licensed emission bandwidth of a microwave channel, the PCS system is defined as co-channel with this microwave channel.

8.2 Adjacent Channel

The microwave path's adjacent channel will be defined as those frequency bands both above and below its authorized channel(s) that are removed from the microwave channel's center frequency by more than or equal to 50% and less than 150% of the microwave's licensed emission bandwidth. If any portion of a proposed PCS operational channel falls within either of these bands, and is not co-channel, the PCS channel is defined as adjacent to the microwave channel.

8.3 Co-Channel & Adjacent Algorithms

If PCS_fc + (0.5 * PCS_bw) > MW_fc - (0.5 * MW_bw)
and PCS_fc - (0.5 * PCS_bw) < MW_fc + (0.5 * MW_bw),
then co-channel,

Else if PCS_fc + (0.5 * PCS_bw) > MW_fc - (1.5 * MW_bw)
and PCS_fc - (0.5 * PCS_bw) < MW_fc + (1.5 * MW_bw),
then adjacent channel.

If neither condition described above is met, the PCS channel is considered out-of-range.

(Note: _bw = channel bandwidth and _fc = frequency at center of channel.)

8.4 Examples

For example, if a microwave incumbent has a 1945 MHz radio channel with a bandwidth of 10 MHz, any standard PCS channel emission within 1940 MHz to 1950 MHz is co-channel and any standard emission that fails this test, but is within 1930 MHz to 1940 MHz or within 1950 MHz to 1960 MHz is adjacent channel. (In this example, the PCS channel emission refers to the standard occupied bandwidth of the desired PCS signal.) If a PCS operator is building a CDMA system with 1.25 MHz bandwidth channels, then

MW_fc = 1945.0 MHz
MW_bw = 10 MHz
PCS_bw = 1.25 MHz
and using PCS_fc = 1940 MHz, then

PCS_1940 + 0.625 > MW_1945 - 5
(1940.625) > (1940)

and

PCS_1940 - 0.625 < MW_1945 + 5
(1939.375) < (1950)

making this a co-channel case.

Using PCS_fc = 1960 MHz instead of 1940 MHz gives the following results:

1960.625 > 1940 but the second test results in 1959.375 > 1950,

therefore this is not co-channel case.

Proceeding to the next step:

PCS_1960 + 0.625 > MW_1945 - 15 and
PCS_1960 - 0.625 < MW_1945 + 15,

making this an adjacent case.

9.0 Transborder Coordination

9.1 Canada

The U.S. and Canada concluded an interim sharing arrangement for 1.9 GHz broadband PCS on November 14, 1994. The arrangement specifies that any new PCS system in the 1850 - 1990 MHz band is not to cause harmful interference to existing fixed point-to-point microwave operations in the other country. In addition, coordination of PCS systems within 75 miles of the border is required based upon an industry recognized procedure or a mutually acceptable arrangement between PCS and fixed microwave operators. This procedure has been designed by members of industry in the U.S. and Canada to fulfill that requirement. It is recommended that coordination with microwave licensees occur even beyond the 75-mile distance if licensees are identified in this area during the interference analysis.

9.2 Mexico

The U.S. and Mexico concluded an interim sharing arrangement for 1.9 GHz broadband PCS on June 16, 1995. The arrangement specifies that any new PCS system in the 1850 - 1990 MHz band is not to cause harmful interference to existing fixed point-to-point microwave operations in the other country. In addition, coordination of all PCS systems located within 45 miles of the common border relative to any fixed point-to-point service within 75 miles of the border is required based upon an industry recognized procedure or a mutually acceptable arrangement between PCS and fixed microwave operators. This procedure has been designed to fulfill that requirement. It is recommended that coordination with microwave licensees occur even beyond the 75-mile coordination distance if the licensees are identified in this area during the interference analysis.

9.3 Other

No similar agreements have been concluded with other administrations whose operations may be affected by PCS operation within the United States.

10.0 Coordination with Federal Government

Procedures are under review and development.

APPENDIX A

(Limited Data PCN Items)

Information that could be provided to incumbents who do not wish to perform their own analysis.

1.0 PCS System Data Items

1. PCS Licensee Name
2. Market (MTA/BTA)
3. FCC Call Sign
4. PCN Reference Number (for tracking purposes)
5. PCS Frequency Block
6. PCS Technology & Standard Bandwidth
7. Specific Frequencies, MHz (base/mobile)
8. Number of Coordinated Base Stations
9. Maximum EIRP, dBm (base/mobile)

2.0 PCS to Microwave Interference Analysis Parameters and Results

1. Pertinent details on the incumbent's microwave paths considered and/or analyzed (call signs, frequencies, etc.)
2. Propagation Model used in analysis
3. Required Interference Objective (dBm)
4. Interference Margin (dB)

This list represents the minimum information that would be useful to the incumbent for reviewing analysis results provided by a PCS licensee. Other data items could be added at the request of the incumbent.

APPENDIX B

(Complete Data PCN Items)

Data set for incumbents or their agents who perform their own independent analysis.

1.0 Data Transfer

The recommended method for delivery of PCS coordination data will be electronic E-mail transfer of PCN by E-mail via Internet. However, the information can be sent by any means agreeable to the parties involved. If the data is transmitted by electronic means, the format should follow NSMA recommended guidelines. Section 101.103(d)(2) allows for notification and response to be either oral or written form. Oral coordination is typically followed up in written form, to include electronic, mail, or by fax. Data elements and their **maximum field length** are provided below. The use of comma separated variable format for the data file allows field lengths to vary up to the maximum value.

This section describes the recommended format for the electronic transfer of PCS Prior Coordination Notices (PCNs).

1.1 Introduction

The PCS Electronic Prior Coordination Notice (PCN) Format for electronic transfer was developed to recognize and accommodate the following needs:

- Since the electronic PCNs will be sent by e-mail and will in some cases be processed by computer, header and footer coding needed to be added to enable extraction of the PCN data from the e-mail message
- Because some e-mail systems cannot handle long lines without introducing errors, the line length needed to be limited to 80 characters

The general layout of an e-mail message containing PCN data would be as follows:

ASCII Text Only

E-mail message header
Beginning of e-mail message body
PCN header

Binary Data or ASCII Text

PCN
or
Conversion error report
or
Conversion success report

ASCII Text Only

PCN footer
End of e-mail message body

An alternative to e-mail is files placed on a DOS format disk, with the necessary header information included on the disk in a "readme.txt" type file, or in a written cover letter. It is intended that the reports which may take the place of the PCN in the foregoing layout will be read by a human being rather than a computer and may have a variety of formats and any length. The computer processing the e-mail message containing the PCN free-form reports must be programmed to recognize the field in the Header Record which signals this free-form content and store it in a file rather than in indefinite fields in a table or spreadsheet. The file would then be routed to an e-mail address keyed by the coordinator fields in the initial PCN.

A comma (,) delimiter between fields has been chosen to enable importation of the flat file into spreadsheets used commonly in Personal Computers (PC). This choice was based on the belief that most users will be pre-processing the data in PCs before entering it into a larger computer for interference analysis against a large database. For this reason, **DATA FIELDS MAY NOT CONTAIN COMMAS.**

To overcome the problems created by long lines (over 80 characters) in some mail systems, all ASCII PCNs must be converted to the UUencoded format which has a line length limited to 80 characters.

It may be desirable to compress and/or encrypt a PCN. "ZIP" indicates compression using PKZIP software. "PGP" indicates encryption using the Pretty Good Privacy software. Most message systems require that the compressed and/or encrypted portion be UUencoded (or the PGP equivalent) before transmission to translate binary to ASCII characters. This part will then be unreadable without decoding and decompression and/or decryption. To alert the reader (human or computer) to the process that was used and to allow extraction of the file, the header and footer are transmitted in the original ASCII

The agreed-upon combinations of encoding, compression and encryption are shown below:

1.2 Encoding, Compression And Encryption Types

Accepted Encoding Format:	UUENCODE/UUDECODE
Accepted Compression Format:	PKZIP v2.04g (or earlier)
Accepted Encryption Format:	Pretty Good Privacy

Examples for Transmitting Data Files

UUencoding: Store file in the delimited format listed below. (1) Enter the email system and address the message to the appropriate recipients. If the email system allows "Attached Files" select this option and the select the prepared file(s). Most email systems will automatically encode the attached files. Send the message. (2) If your email system does not support attached files, prior to entering the email

system, use an UUencode utility to encode the file. These utilities should be available at a variety of Internet sites or bulletin board systems. When using an external encoder, it is always wise to send test data to insure that the recipient can decode the file.

Compression: Store file in the delimited format listed below. Use the PKZIP utility to compress the file and send the compressed file as described in UUencoding. It is always wise to send test data to insure that the recipient can decode the file.

Encryption: Using the PGP encryption system requires the exchange of an "encryption key" with recipients. Use email or other means to exchange this information and configure the PGP system as detailed in the instructions. It is possible to encrypt a standard text file or a compressed file. Therefore, it should be determined whether compression should be used for large files. Send test data to insure that the recipient can decode the compressed file before encrypting. Once the file is selected (compressed or uncompressed), encrypt the file using the instructions provided with PGP. Send the encrypted file as discussed in UUencoding (referenced above).

1.3 Header and Footer

The PCN header displays ASCII information necessary to extract the data part of the e-mail message. The footer tags the end of the PCN data. Thus, a computer reading the message can extract the PCN data from the overall message. The header contains the format version number, the number of administrative records and the number of sites contained in the PCN.

All the header and footer fields are required, with the idea that, at some time, all Electronic PCNs may be read by a computer. To ease the detection of the end of a record in a DOS environment, a carriage return and line feed are inserted between each pair of records and after the last record

1.3.1 Header Record

The content and format of the header record are listed below:

Field #	Name of Data Field	Mandatory	Format	Record
1	Text format	M	Character	H
	- ASCII: ASCII, UUencoded" - ZIP: Compressed using PKZIP & UUencoded - PGP: Encrypted, compressed and encoded using PGP.			
2	Type of the PCN and the format version	M	Character	H
	- EPCNP1.3 Personal Communication System			
3	PCN data being sent	M	Character	H
	- EPCN: Electronic PCN - EPCN Errors: Errors found in conversion to receiving system			
	- EPCN OK: EPCN converted to receiving system OK - EPCN Op List: List of potentially affected operators			

4	**PCN Internal ID (serial #)**	**M**	**Character**	**H**
	- Unique to the originating coordinator			
5	**Revision number of this PCN serial #**	**M**	**Character**	**H**
	- 00 to 99			
6	**Date of this revision**	**M**	**Character**	**H**
	- YYYYMMDD			
7	**# of PCNs (Admin Records)**	**M**	**Character**	**H**
8	**# of Sectors**	**M**	**Character**	**H**

1.3.2 Footer Record

The footer record consists merely of $EPCN End$

1.4 PCN Body - General

A. In the field type tables, all fields marked **'M'** are required for intra-United States of America coordination and must be included. Fields marked **'O'** are optional.

B. For increased readability, use both upper and lower case letters for descriptions and narratives.

C. The PCS EPCN consists of one administrative record followed by a sector record and a number of related transmitter, receiver and frequency records. There can be more than one of each type of the related records, all corresponding to the sector record.

D. The fields are separated with a comma (,) and do not require justification or padding. There must be one delimiter (,) per field and a pair of double quotes per field in each record whether the field is blank or not. Only printable ASCII characters can be used for data. All records are followed by a carriage return and line feed at the end of each line

1.5 Administrative Record Description

The Administrative record contains data describing the entire PCN, including who is doing the coordinating and for which Owner/Licensee it is being done.

The fields listed below fall in the Administrative Record:

#	Field Name	Description	Mandatory?
9	PCS Licensee Name	Name of licensee of the PCS system	M
10	PCS Licensee Email Address	Internet electronic address of licensee	O
11	PCS Licensee Agent Name	Name of frequency coordination agent for the PCS operator	O

12	Agent Email Address	Agent's Internet electronic address	O
13	PCN Contact Name	Name of person to contact for more information	M
14	PCN Contact Phone Number	The contact person's voice phone number	M
15	PCN Reference Number	Internal reference number assigned by PCS operator	O
16	PCS Market Code	A code which indicates the geographical market for which the PCS operator is licensed (e.g. M01 for the New York MTA). Use UTAM for Unlicensed PCS, CAN for Canadian PCS systems and MEX for Mexican PCS systems	O
17	PCS Frequency Block (A,B,C,D,E,F,U,V)	The letter designation of the frequency block for which the PCS operator is licensed. May include multiple blocks U = Unlicensed Isoc V = Unlicensed Asynch (up to 3).	O
18	Technology (PCS1900, IS95, IS136, OMNI, DECT, WCDMA, WACS, NL)	The technology standard/protocol which this PCS network is deploying. From this information you then know many of the system's technical parameters such as rf bandwidth channelization modulation type that are needed for the analysis.	M
19	Total # of Sectors	Total number of sectors included in this PCN. This is to be used to confirm that the PCN was transmitted completely.	M
20	PCN Date (yyyymmdd)	The date that the PCN was sent (e.g. January 16, 1992 = 19920116)	M
21	Propagation Model (T,L,F,N,O)	The propagation model used in the analysis (T)IA TSB10, (L)ongely-Rice, (F)ree Space, (N)SMA OH95, (O)ther	O
22	Lat/long flag (1 or 0)	1 = NAD 27 datum, 0 = NAD 83 datum	M
23	Comments	Free form text field to describe the	

		special interference case or any specific assumptions used	O

1.6 Sector Record Description

The Sector records provides details of the PCS base station location as well as assumptions regarding the PCS configuration and environment. Fields are listed below:

#	Field Name	Description	Mandatory?
24	Site ID	A unique identifier assigned by the PCS operator to identify a site	M
25	Site Name	A more descriptive name given to a site that may be assigned by the PCS operator	O
26	# of Receive Sets	The number of base station receive antennas at this sector - indicates the number of receive antenna sets to follow.	O
27	# of Frequency Sets	The number of frequency sets that follow	M
28	# of Transmitter Sets	The number of transmitter records that follow	M
29	Latitude (ddmmss.ss)	latitude North for the antenna site (e.g. 38-54-21.05N = 385421.05N)	M
30	Longitude (dddmmss.ss)	longitude West for the antenna site (e.g. 77-02-41.05W = 0770241.05W)	M
31	Ground Elevation (meters)	Elevation of terrain AMSL at the base of the antenna structure	M
32	Sector ID	A unique identifier for a given antenna/radiation source	M
33	Sector Status Code (E, P)	(E)xisting (P)roposed	M
34	Tx Antenna Center Height AGL (meters)	The height above ground of the center of the radiating structure	M
35	Tx MFG	The name of the manufacturer of the transmitter	M
36	Tx Model Number	The manufacturer's model number of the transmitter including all descriptive	

		suffixes	M
37	Tx Fixed Losses (dB)	Fixed losses associated with the transmitter. This number includes losses from feed lines combiners filters duplexers. etc..	O
38	Rx MFG	The name of the manufacturer of the receiver	O
39	Rx Model Number	The manufacturer's model number of the receiver including all descriptive suffixes	O
40	Rx Fixed Losses (dB)	Fixed losses associated with the transmitter. This number includes losses from feed lines, combiners, filters duplexers, etc..	O
41	Base Station Environment (U,D,S,R)	The man-made environment classification as per TIA TSB10 (core (U)rban, (D)ense suburban, residential (S)uburban and (R)esidential)	M
42	Tx Antenna MFG	The name of the manufacturer of the transmit antenna	M
43	Tx Antenna Model	The manufacturer's model number of the transmit antenna including all descriptive suffixes	M
44	Tx Antenna Gain (dBi)	The maximum isotropic gain of the antenna in any direction	M
45	Tx Antenna Beamwidth (deg.)	The 3 dB beamwidth of the transmit antenna	M
46	Tx Antenna Azimuth (deg. North)	The direction in the horizontal plane with respect to true north that the boresite of the antenna is pointed.	M
47	Tx Antenna Tilt (degrees)	The angle (+ or -) from the horizontal plane that the boresite of the antenna is pointed (e.g., -4.0 = 4 degrees below the horizontal plane)	M
48	Tx Antenna Tilt Type (M or E)	Type of beam tilt employed (mechanical or electrical)	M
49	Tx Antenna Polarization (H,V,O)	The polarization of the radiating antenna (H)orizontal, (V)ertical, (O)ther	M

50	Aggregation ID	A unique identifier for this aggregated point	O
51	Latitude of aggregation point (ddmmss.ss)	Latitude North for the aggregation point (e.g. 42-08-13.1N = 420813.10N)	O
52	Longitude of aggregation point (dddmmss.ss)	Longitude West for the aggregation point (e.g. 88-00-03.3W = 0880003.30W)	O
53	Sector coverage radius (km)	The distance from the base station to the furthest point of the mobile coverage area.	M
54	Sector coverage minimum azimuth (deg. North)	The azimuth furthest from the sector azimuth in a counterclockwise direction beyond which the distance from the base station to all points of the mobile coverage area is less than 25% of coverage radius specified above.	M
55	Sector coverage maximum azimuth (deg. North)	The azimuth furthest from the sector azimuth (direction of the main beam) in a clockwise direction beyond which the distance from the base station to all points of the mobile coverage area is less than 25% of coverage radius specified above.	M
56	Mobile Terrain Elevation AMSL (meters)	The terrain elevation AMSL used in the analysis for the mobiles at this point	O
57	Mobile Environment (U,D,S,R)	The man-made environment classification as per TIA TSB10 (core (U)rban, (D)ense suburban, residential (S)uburban and (R)ural)	M
58	Max # of Mobiles	The maximum number of mobiles that operate simultaneously in this sector	M
59	Max Vehicular Mobile EIRP (dBm)	The maximum EIRP used by vehicular-only mobiles within this sector	M
60	Max Portable Mobile EIRP (dBm)	The maximum EIRP used by handheld portable mobiles within this sector	M

61	Max Building Height (meters)	The maximum building height over the aggregated area or used in the analysis	O
62	Average Vehicular Mobile EIRP (dBm)	The average EIRP radiated by vehicular-only mobiles used in the analysis. (e.g. may include averaging due to power control or duty cycle considerations.)	O
63	Average Portable EIRP (dBm)	The average EIRP radiated by handheld portables used in the analysis. (e.g. may include averaging due to power control or duty cycle considerations.)	O
64	Average Building Height (meters)	The average building height over the aggregated area or used in the analysis	O
65	% Vehicular (%)	Percentage of vehicular mobiles over the aggregated area	O
66	% Sidewalk (%)	Percentage of portables at street elevation over the aggregated area	O
67	% In-Building (%)	Percentage of portables used in-building over the aggregated area	O
68	% Rooftop (%)	Percentage of portables aggregated at the rooftop	O
69	# of Stations at this site	For UTAM, use the number of base stations coordinated at this site	O
70	Additional Losses/Gains (dB)	Additional propagation losses such as terrain or man-made obstructions tree loss or building penetration losses. Must be accompanied by detailed description in the comments field	O

1.7 Frequency Records Description

The Frequency Records allows PCS licensees to associate groups of frequencies with transmitter equipment. The number of frequency records for each PCN is included in the Administrative record.

The record contains the frequency set number which is associated with information in the transmitter record. The type of frequency details whether frequencies are listed discretely, over a range or in steps. These records are repeated as necessary.

#	Field Name	Description	Mandatory?
71	Frequency set number	A unique identifier to define this frequency set. May be simply a sequential numbering scheme.	M
72	Type of Frequency Set (D,R,S)	Single (D)iscrete Frequency, Frequency (R)ange, (S)tepped Frequency Range	M
73	Lower frequency (MHz)	The lower frequency of the range of the base station for this set OR a single discrete channel frequency	M
74	Upper frequency (MHz)	The upper frequency of the range of the base station for this set. If a discrete frequency is specified in the previous field, this field will be omitted.	M
75	Frequency Step (MHz)	If a stepped frequency range is specified, this field will define the separation between adjacent frequencies, otherwise, it will be omitted.	M

1.8 Receive Antenna Records

This record provides information regarding the receive antennas used at the PCS base station. Because receive antennas may differ from transmit antennas, in both make and model and also height above ground. The number of receiver records for each PCN is included in the Administrative record. However, this field is optional.

#	Field Name	Description	Mandatory?
76	Receive Antenna Number	A unique identifier to define this receive antenna. May be simply a sequential numbering scheme.	O
77	Rx Antenna Center Height AGL (meters)	The height above ground of the center of the base station receive antenna	O
78	Rx Antenna MFG	The name of the manufacturer of the base station receive antenna	O
79	Rx Antenna Model	The manufacturer's model number of	

		the base station receive antenna including all descriptive suffixes	O
80	Rx Antenna Gain (dBi)	The maximum isotropic gain of the antenna in any direction	O
81	Rx Antenna Beamwidth (deg.)	The 3 dB beamwidth of the receive antenna	O
82	Rx Antenna Azimuth (deg. North)	The direction in the horizontal plane with respect to true north that the boresite of the antenna is pointed.	O
83	Rx Antenna Tilt deg.	The angle (+ or -) from the horizontal plane that the boresite of the antenna is pointed (e.g., -4.0 degrees = 4 degrees below the horizontal plane)	O
84	Rx Antenna Tilt Type (E, M)	Type of beam tilt employed (mechanical or electrical)	O
85	Rx Antenna Polarization (H,V,O)	The polarization of the base station receive antenna (H)orizontal, (V)ertical, (O)ther	O

1.9 Transmitter Records

The transmitter records provides make, model and technical information for the radio equipment used. It is tied to the frequency record in that the transmitter record provides the technical characteristics of the equipment used for each frequency set.

#	Field Name	Description	Mandatory?
86	Transmitter set number	A unique identifier to define this transmitter set. May be simply a sequential numbering scheme.	M
87	Max # of transmitters	The maximum number of transmitters in this set that can operate simultaneously	M
88	EIRP (dBm)	Maximum EIRP of any transmitter in this set	M
89	Power control (0, 1,2,3)	Type of power control used in the analysis 0=none, 1=base, 2=mobile, 3=both	M
90	Time Duty cycle (%)	The maximum percent of time that any	

		transmitter in this set operates at its maximum EIRP. If all time slots are available for traffic or control, duty cycle = 100%	M
91	Frequency Duty cycle (%)	The maximum percent of time that any transmitter in this set dwells on any given frequency within the specified frequency sets. If frequency hopping is not used, duty cycle = 100%	M
92	# of frequency sets at this transmitter	The number of frequency sets for which this type of transmitter is used	M
93	Frequency Set Number	The number of the frequency set(s) used by this transmitter set.	M

1.10 Data Field Summary

Listed below is a summary off data fields in the body of the PCS PCN

Field #	Field Name/Description of Field	O or M	Type	Format	Record
9	PCS Licensee Name	M	Character	XXXXX ..	A
10	PCS Licensee Email Address	O	Character		A
11	PCS Licensee Agent Name	O	Character		A
12	Agent Email Address	O	Character		A
13	PCN Contact Name	M	Character		A
14	PCN Contact Phone #	M	Character		A
15	PCN Reference #	O	Character		A
16	PCS Market Code	O	Character		A
17	PCS Frequency Block	O	Character	XXX	A
18	Technology	M	Character		A
19	Total # of Sectors	M	Number	XXXXX	A
20	PCN Date	M	Character	YYYYMMDD	A
21	Propagation Model Code	O	Character		A
22	Lat/Long Datum Flag	O	Character	0 or 1	A
23	Comment	O	Character		A
24	Site ID	M	Character		S
25	Site Name	O	Character		S
26	Number of Receive Antennas	O	Number	XX	S
27	# 0f Frequency Sets	M	Number	XXXX	S
28	# of Transmitter Sets	M	Number	XXXX	S
29	Latitude	M	Character	DDDMMSS.SS	S
30	Longitude	M	Character	DDDMMSS.SS	S
31	Ground Elevation (meters)	M	Number	XXXX.X	S
32	Sector ID	M	Character		S
33	Sector Status	M	Character	E or P	S
34	TX Antenna Center Hgt	M	Number	XXXX	S
35	TX MFG	M	Character		S
36	TX Model Number	M	Character		S
37	TX Fixed Losses	O	Number	XXXXX.X	S
38	RX MFG	O	Character		S
39	RX Model	O	Character		S
40	RX Fixed Losses	O	Number	XXXXX.X	S
41	Base Station Environment	M	Character		S

42	TX Antenna MFG	M	Character		S
43	TX Antenna Model	M	Character		S
44	TX Antenna Gain	M	Number	XXX.X	S
45	TX Antenna Beamwidth	M	Number	XXX.X	S
46	TX Antenna Azimuth	M	Number	XXX.X	S
47	TX Antenna Tilt	M	Number	XXX.X	S
48	TX Antenna Tilt Code	M	Character		S
49	TX Antenna Polarization	M	Character		S
50	Aggregation ID	O	Character		S
51	Aggregation Point Latitude	O	Character	DDDMMSS.SS	S
52	Aggregation Point Longitude	O	Character	DDDMMSS.SS	S
53	Sector Coverage Radius	M	Number	XX.X	S
54	Sector Coverage Min Azimuth	M	Number	XXX.X	S
55	Sector Coverage Max Azimuth	M	Number	XXX.X	S
56	Mobile Terrain Elevation	O	Number	XXXXX.X	S
57	Mobile Environment Flag	M	Character		S
58	MAX Number of Mobiles	M	Number	XXXXXX	S
59	Max Vehicular EIRP	M	Number	XXXX.XX	S
60	Max Portable EIRP	M	Number	XXXX.XX	S
61	Max Building Hgt	O	Number	XXXX	S
62	AVG Vehicular EIRP	O	Number	XXX.X	S
63	AVG Portable EIRP	O	Number	XXX.X	S
64	AVG Building Hgt	O	Number	XXXX	S
65	% Vehicular	O	Number	XXX	S
66	% Sidewalk	O	Number	XXX	S
67	% In Building	O	Number	XXX	S
68	% Rooftop	O	Number	XXX	S
69	# of Stations (UTAM)	O	Number	XXXXX	S
70	Additional Losses/Gains	O	Number	+/-	S
71	Frequency Set #	M	Number	XXXX	F
72	Type of Frequency Set	M	Character	D R	F
73	Lower Frequency	M	Number	XXXXXXXX.XXXXXXXXX	F
74	Upper Frequency	M	Number	XXXXXXXX.XXXXXXXXX	F
75	Frequency Step	M	Number	XXXXXXXX.XXXXXXXXX	F
76	RX Antenna Number	O	Number	XX	R
77	RX Antenna Center Hgt	O	Number	XXXX	R
78	RX Antenna MFG	O	Character		R
79	RX Antenna Model	O	Character		R
80	RX Antenna Gain	O	Number	XXX.X	R
81	RX Antenna Beamwidth	O	Number	XXX.X	R
82	RX Antenna Azimuth	O	Number	XXX.X	R
83	RX Antenna Tilt	O	Number	XXX.X	R
84	RX Antenna Tilt Code	O	Character		R
85	RX Antenna Polarization	O	Character		R
86	Transmitter Set	M	Number	XXXX	T
87	Max # of Transmitters	M	Number	XXXX	T
88	EIRP	M	Number	XXX.X	T
89	Power Control Flag	M	Character	0, 1	T
90	Time Duty Cycle %	M	Number	XXX	T
91	Frequency Duty Cycle %	M	Number	XXX	T
92	# of Freq Sets at this Xmitter	M	Number	XXXX	T
93	Frequency Set #s	M	Character	#, #, #-#	T

2.0 Record Order

The order of the data records could greatly aid in the processing and visual inspection the PCN data. The required format is

Header Record
Administrative Record

S001 (Sector 1)
R001 (Receiver Antenna for Sector 1)
R002 (Receiver Antenna for Sector 1)
….
R00N (Receiver Antenna for Sector 1)
F001 (Frequency Set #1 for Sector 1)
F002 (Frequency Set #2 for Sector 1)
…
F00N (Frequency Set #N for Sector 1)
T001 (Transmitter Set for Sector 1)
T002 (Transmitter Set for Sector 1)
…
T00N (Transmitter Set for Sector 1)
S002 (Sector 2)
R001 (Receiver Antenna for Sector 2)
R002 (Receiver Antenna for Sector 2)
….
R00N (Receiver Antenna for Sector 2)
F001 (Frequency Set #1 for Sector 2)
F002 (Frequency Set #2 for Sector 2)
…
F00N (Frequency Set #N for Sector 2)
T001 (Transmitter Set for Sector 2)
T002 (Transmitter Set for Sector 2)
…
T00N (Transmitter Set for Sector 2)
Footer Record

3.0 Glossary

AGL	Above Ground Level
ASCII	American Standard for Computer Information Interchange
ASK	Amplitude Shift Keying
CCW	Counter Clockwise
Con	Conditional. These fields are conditional and may be required. Conditions are listed if not obvious.
CR	Carriage return. ASCII 13 decimal. Usually shown as <CR>.
CW	Clockwise
DAV	Data Above Voice
dB	Decibel
dBi	Decibel relative to Isotropic Antenna
dBm	Decibel relative to 1 milliwatt
DMSK	Dual Minimal Shift Keying
DUV	Data Under Voice
FCC	Federal Communications Commission
FDMFM	Frequency Modulation with Frequency Division Multiplexing
FDMSSB	Single-Side-Band Frequency Modulation with Frequency Division Multiplexing
FSK	Frequency Shift Keying
Info	Informational. These fields are not required under any circumstance. Because of variations in spelling context or abbreviation, these fields cannot easily be used for computer analysis.
LF	Line Feed. ASCII 10 decimal. Usually shown as <LF>.

Mbps	Megabits per second
MHz	Megahertz
YYYYMMDD	Year, Month and Day, e.g., 19900301 is 1990, March 1
MSK	Minimal Shift Keying
Opt	These fields are optional but may be supplied if the originating coordinator believes they would be useful. (See 'Req' below)
PCN	Prior Coordination Notice. Can be a Terrestrial Microwave or an Earth Station PCN.
PSK	Phase Shift Keying
nPSK	n-Level Phase Shift Keying. 'n' is a power of 2. It can be 4, 8, 16, 32, etc.
nQAM	n-Level Quadrature Amplitude Modulation. 'n' is a power of 2. It can be 4, 8, 16, 32, 64, etc.
QPRSn	Quadrature Partial Response System, Level n. 'n' can be 3, 7, 9, 25, or 49.
QPSK	Quadrature Phase Shift Keying. Same as 4-level Phase Shift Keying (4PSK).
Req	These fields are required under all circumstances. For Opt fields, the circumstances which make them Req fields are obvious or listed
VIDFM	Video with normal Frequency Modulation
VIDSSB	Video with Single-Side-Band Frequency Modulation