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November 17, 1993

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, Room 222
Washington DC 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

RE: Ex parte communication in ET Docket 92-9

Dear Mr. Caton:

This is to advise that representatives of AT&T, consisting of the undersigned and Terrance Sterkel, met today with representatives of The Office of Engineering & Technology to discuss matters related to the Commission's Third Report and Order in the above captioned docket. OET representatives present were Bruce Franca, Julius Knapp, Phil Inglis, Paul Marrangoni, David Means, John Reed, Dave Siddall and Fred Thomas.

Separately, we also met with the following individuals from the Office of Plans & Policy: Robert Pepper, Evan Kwerel, David Reed and John Williams.

Attached is a copy of the presentation materials used in both meetings. Should any questions arise, they may be directed to me.

Sincerely,

A handwritten signature in cursive script that reads "F. Mathewson".

Enclosure

cc: FCC attendees (w/o enclosure)

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Ex Parte Presentation to FCC

AT&T

November 17, 1993

AT&T Supports FCC Actions on Unlicensed PCS

- **AT&T Supports and Endorses the FCC's Visionary and Innovative Actions for Unlicensed PCS.**
- **AT&T Is Concerned about Recent Misconceptions which may Undermine the Industry Consensus by Dozens of Companies.**
- **AT&T Suggests Clarifications to the UPCS Part 15 Technical Rules.**
- **AT&T Is Convinced that the Integrity of UPCS Service Quality Requires that ANSI-standard Measurement Procedures be Established Prior to Allowing Equipment Certification.**

Agenda

☞ *UPCS Misconceptions*

- Suggested Technical Clarifications to new Part 15 Rules**
- UPCS Measurement Techniques Required for Service Quality.**

What is the User PCS Vision?

- Premises-Bound, Low Power Operation
- Customer Owned/Controlled Equipment and Service
- "Test Bed" for Future Generation Technologies
- No Prior Licensing Required
- No Service Providers (no air time fees)
 - (otherwise: possible 25% - 50% dilution of licensed PCS Auction Value)
- Not Necessarily Same Phone Everywhere

Misconception 1: "X" Industry Was Not Represented.

- **WINForum Dominated by "Data" Companies**
 - 71% "Data", 5% "Mixed", 12% "Telecom", 12% "Other"
- **Data/Computer Equipment Manufacturers**
 - HEWLETT-PARKARD*, IBM*, NCR*, PROTOCOL SYSTEMS*, SUN MICROSYSTEMS*, XIRCOM*
 - Altamont Research, Digital Equipment, EO Computer, Diablo Research, Domestic Automation, Faralon Computing, Grid Systems, Metricom, O'Neill Communications, Rockwell, Telemetry, Tetherless Access, Threshold Technologies, WiSE Communications, WINData, Xerox,
- **Software/Device Manufacturers**
 - CALIFORNIA MICROWAVE*, INTEL*, M/A-COM*, MICROSOFT*, TRAVELING SOFTWARE*
 - AMD, National Semiconductor
- **Computer/Telecom Equipment Manufacturers**
 - AT&T, MOTOROLA
- **Telecom Equipment Manufacturers**
 - ERICSSON*, NORTHERN TELECOM*, OMNIPPOINT*, ROLM*, SPECTRALINK*
- **Independent Organizations**
 - BELLCORE*, LACE COMMUNICATIONS*, SRI INTERNATIONAL*
 - Salient Communications, Worcester Polytech

NOTE PARTICIPANT IN ETIQUETTE DEFINITION*

Key Concept: Industry Consensus

Misconception 2: Missed Critical Issues

<u>Technical Contribution By Topic</u>	<u>Number</u>
Simulations/Propagation/Generic Technical	36
Spectrum Sharing Issues	15
Isochronous Transmission Issues	39
Asynchronous Transmission Issues	9
Working Group Report/Recommendations	37
Outside Input	9

Key Concept: Peer Review

Misconception 3: I Represent "X" Industry.

- **Industry Consensus?**
 - **Telocator**
 - **PCS Action**
 - **WINForum**
 - **UTAM, Inc.**
- **Technical Peer Review?**
 - **When was the Information Released in Sufficient Detail for Technical Review?**
 - **Who Endorsed Technical Merit?**
 - **TR14 (MW Relocation)**
 - **TR46 (L-PCS technical)**
 - **WINForum (U-PCS technical)**
 - **IEEE 802-11 (WLAN Technical)**

Misconception 4: "X" Technology Deserves Special Treatment

- **Why?**
 - **Technical?**
 - **Market?**
- **Endorsed by:**
 - **Technical Peer Review?**
 - **Industry Consensus?**

Misconception 5: "X" is the same as "Y"

- **Ways of Looking at Wireless Communication**
 - **Data and Voice**
 - **Isochronous and Asynchronous**
 - **Nomadic and Non-Nomadic**

- **NOT NECESSARILY Synonyms!!**
 - **Data is not Asynchronous is not Nomadic**
 - **Voice is not Isochronous is not Non-Nomadic**

Misconception 5: continued...

Non-Nomadic

LAN

File Transfer

PBX/KS

Graphics

Asynchronous

Isochronous

Personal Data

Video

P-P Data

P-P Communicators

Nomadic

Issues Associated with New Part 99 Devices

- **L-PCS seems to be exempted from section 15.209 (Should include UPCS Exclusion Zone)**
- **L-PCS "out of band" emissions does not protect UPCS**
 - **2Watt Mobiles are likely to prevent UPCS use of 5 MHz (2.5 MHz at each "end")**
 - **100 Watt Bases are likely to prevent UPCS use of 10 MHz (5 MHz at each "end")**
- **Recommend L-PCS Emissions into UPCS (1890 - 1930 MHz) at same microwatt level as 1.25 MHz UPCS Radiator**

Agenda

- **UPCS Misconceptions**
- ☞ ***Suggested Technical Clarifications to new Part 15 Rules***
- **UPCS Measurement Techniques Required for Service Quality.**

Major Technical Issues in new Part 15 Rules

- **Details Provided in Attachment**
- **Some Highlights**
 - **Power Limits and Definitions**
 - **Beacons**
 - **Frame Definition**

Agenda

- **UPCS Misconceptions**
- **Suggested Technical Clarifications to new Part 15 Rules**
- ☞ ***UPCS Measurement Techniques Required for Service Quality***

Equipment Certification for New Part 15 Devices

- **AT&T Endorses ANSI-Standard Measurement Procedures for all UPCS Devices.**
- **Etiquette is Unprecedented, and is largely outside Current Engineering Practice.**
- **Attached Tables provide details of areas requiring new Measurement Standards.**
- **Equipment Certification should be contingent on promulgation of ANSI-Standard Measurement Procedures.**

		Discussion of Issue(s)	AT&T/NCR recommended wording
	Part 15 – RADIO FREQUENCY DEVICES		
15.300	Subpart D– Unlicensed Personal Communications Service Devices		
	Table of Contents		
	15.301 Scope		
	15.303 Definitions.		
	15.305 Equipment authorization requirement.		
	15.307 Coordination with fixed microwave service.		
	15.309 Cross reference.		
	15.311 Labeling requirements.		
	15.313 Measurement procedures.		
	15.315 Conducted limits.		
	15.317 Antenna requirement.		
	15.319 General technical requirements.		
	15.321 Specific requirements for isochronous devices operating in the 1890-1900 and 1920-1930 MHz sub-bands.		
	15.323 Specific requirements for asynchronous operation in the 1900-1920 MHz sub-band.		
15.301	Scope.		
	This subpart sets out the regulations for unlicensed personal communications service (PCS) devices operating in the 1890-1930 MHz frequency band.		
15.303	Definitions.		
	(a) Asynchronous devices.		
	Devices that transmit RF energy at irregular time intervals, as typified by local area network data systems.		
	(b) Coordinatable PCS device. PCS devices whose geographical area of operation is sufficiently controlled either by necessity of operation with a fixed infrastructure or by disabling mechanisms to allow adequate coordination of their locations relative to incumbent fixed microwave facilities.		
	(c) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier.		

Discussion of Issue(s)		AT&T/NCR recommended wording	
	Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.		
	(d) Isochronous devices.		
	Devices that transmit at a regular interval, typified by time-division voice systems.		
	(e) Noncoordinatable PCS device.		
	A PCS device that is capable of randomly roaming and operating in geographic areas containing incumbent microwave facilities such that operation of the PCS device will potentially cause harmful interference to the incumbent microwave facilities.		
	(f) Peak transmit power.		
	The peak power output as measured over an interval of time equal to the frame rate or transmission burst of the device under all conditions of modulation.	Problem in that it does not allow for varying modulation envelope techniques such as QAM	"The mean power of the transmitter over any interval of continuous transmission and under all conditions of modulation." Ideally, any further details could be taken up by the measurement test committee. clarifications as needed.
	Usually this parameter is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test.		
	If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used.		
	(g) Personal Communications Service (PCS) Devices [Unlicensed].		
	Intentional radiators operating in the frequency band 1890-1930 MHz that provide a wide array of mobile and ancillary fixed communication services to individuals and businesses.		
	(h) Spectrum window.		
	An amount of spectrum equal to the intended emission bandwidth in which operation is desired.		
	(i) Sub-band.		
	For purposes of this subpart the term sub-band refers to the spectrum allocated for isochronous or asynchronous transmission.		
	(j) Thermal noise power.		

Discussion of Issue(s)

AT&T/NCR recommended wording

	The noise power in watts defined by the formula $N = kTf$ where N is the noise power in watts, k is Boltzmann's constant, T is the absolute temperature in degrees Kelvin (e.g., 296 deg. K) and f is the emission bandwidth of the device in hertz.		
	(k) Time window. An interval of time in which transmission is desired.		"A sequence of time intervals, which begins at the same instant in each frame, in which transmission is desired. Transmission during the time window in a given frame must be continuous."
303(x)	NEW PARAGRAPH	need to define mean power	The average power supplied to the antenna transmission line by a transmitter during an interval of time sufficiently long compared to the lowest frequency encountered in the modulation taken under normal conditions... paragraph 303(f) be added for cases in which direct connection is not possible.
303(y)	NEW PARAGRAPH	need to define peak envelope power per ITU definition.	Peak envelope power (of a radio transmitter): The average power during one radio frequency cycle at the crest of the modulation envelope under normal operating conditions.
303(z)	NEW PARAGRAPH	Define "frame"	AT&T/NCR suggests moving the "definition" that is embedded in 321(e) to become a general definition, with some modification: "Frame: a set of consecutive time windows in which the position of each time window can be identified by reference to a synchronizing source."
15.305	Equipment authorization requirement. PCS devices operating under this subpart shall be certified by the Commission under the procedures in Subpart J of Part 2 of this Chapter before marketing.		
	The application for certification must contain sufficient information to demonstrate compliance with the requirements of this subpart.	Best Engineering Practice does not exist for this class of devices. Recommend convening appropriate standards body to identify the needed measurement procedures.	"The application for certification must contain sufficient information to demonstrate compliance with the ANSI-standard measurement requirements of this subpart."
15.307	Coordination with fixed microwave service.		

	Discussion of Issue(s)		AT&T/NCR recommended wording
	<p>(a) UTAM, Inc., is designated to coordinate and manage the transition of the 1890-1930 MHz band from Private Operational- Fixed Microwave Service (OFS) operating under Part 94 of this Chapter to unlicensed PCS operations, conditioned upon the submittal and acceptance by the Commission of: 1) a funding plan that is equitable to all prospective manufacturers of unlicensed PCS devices, and 2) a plan for "band clearing" that will permit the implementation of noncoordinatable (nomadic) devices and, in particular, noncoordinatable data PCS devices, as promptly as possible.</p>		
	<p>The responsibilities of UTAM, Inc., include, but are not limited to, relocation of existing OFS microwave stations pursuant to requirements established in ET Docket No. 92-9, negotiating costs of relocation, ensuring that comparable facilities are provided, and resolving any disputes of interference to OFS microwave operations from unlicensed PCS operations. These responsibilities shall terminate upon a determination by the Commission that interference to OFS microwave operations from unlicensed PCS operations is no longer a concern.</p>		
	<p>(b) Each application for certification of equipment operating under the provisions of this Subpart must be accompanied by an affidavit from UTAM, Inc. certifying that the applicant is a participating member of UTAM, Inc.</p>		
	<p>In the event a grantee fails to fulfill the obligations attendant to participation in UTAM, Inc., the Commission may invoke administrative sanctions as necessary to preclude continued marketing and installation of devices covered by the grant of certification, including but not limited to revoking certification.</p>		
	<p>(c) An application for certification of a PCS device that is deemed by UTAM, Inc. to be noncoordinatable will not be accepted until the Commission announces that a need for coordination no longer exists.</p>		
	<p>(d) A coordinatable PCS device is required to incorporate measures to assure that it cannot be activated until installation at its authorized location is verified by UTAM, Inc.</p>		

	Discussion of Issue(s)	AT&T/NCR recommended wording
	(e) A coordinatable PCS device shall incorporate an automatic mechanism for disabling operation in the event it is moved outside the geographic area where its operation has been coordinated by UTAM, Inc.	
	The application for certification shall contain a full explanation of the operation of the disabling mechanism and must satisfy the Commission that this mechanism cannot be easily defeated.	
	(f) At such time as the Commission deems that the need for coordination between unlicensed PCS operations and existing Part 94 Private Operational-Fixed Microwave Services ceases to exist, the disabling mechanism required by paragraph (e) will no longer be required.	
	(g) Operations under the provisions of this subpart are required to protect systems in the Private Operational-Fixed Microwave Service operating within the 1850-1990 MHz band until the dates and conditions specified in Section 94.59 of this Chapter for termination of primary status.	
	Interference protection is not required for Part 94 stations in this band licensed on a secondary basis.	
	(h) The operator of a PCS device that is relocated from the coordinated area specified by UTAM, Inc., must cease operating the device until coordination for the new location is verified by UTAM, Inc.	
15.309	Cross reference.	
	(a) The provisions of Subpart A of this Part apply to unlicensed PCS devices, except where specific provisions are contained in Subpart D.	
	(b) The requirements of Subpart D apply only to the radio transmitter contained in the PCS device.	
	Other aspects of the operation of a PCS device may be subject to requirements contained elsewhere in this Chapter.	
	In particular, a PCS device that includes digital circuitry not directly associated with the radio transmitter also is subject to the requirements for unintentional radiators in Subpart B.	
15.311	Labeling requirements.	

	Discussion of Issue(s)	AT&T/NCR recommended wording
	In addition to the labeling requirements of Section 15.19(a)(3), all devices authorized under this subpart must bear a prominently located label with the following statement: Installation of this equipment is subject to notification and coordination with UTAM, Inc.	
15.313	Measurement procedures.	
	Measurements must be made in accordance with Subpart A, except where specific procedures are specified in Subpart D.	Reference to ANSI C63 measurement procedures to be promulgated.
	If no guidance is provided, the measurement procedure must be in accordance with good engineering practice.	There are no "good engineering practice" defined for this class of intentional radiators. Recommend that ANSI-standard measurement procedures be promulgated as mandatory for all equipment in this band. delete sentence
15.315	Conducted limits.	
	An unlicensed PCS device that is designed to be connected to the public utility (AC) power line must meet the limits specified in Section 15.207.	
15.317	Antenna requirement.	
	An unlicensed PCS device must meet the antenna requirement of Section 15.203.	
15.319	General technical requirements.	
	(a) The 1890-1900 and 1920-1930 MHz sub-bands are limited to use by isochronous devices under the requirements of Section 15.321.	
	The 1900-1920 MHz sub-band is limited to use by asynchronous devices under the requirements of 15.323.	
	(b) All transmissions must use only digital modulation techniques.	
	(c) Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in hertz. Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.	need to allow peak power "Transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in Hertz. The peak envelope power shall not exceed the transmit power by more than 10 dB. The measurement results shall be properly adjusted for any instrumentation limitations, such as detector response times, bandwidth, sensitivity, etc. so as to obtain a true power measurement for the emission in question over the emission bandwidth of the channel.

	Discussion of Issue(s)		AT&T/NCR recommended wording
	<p>The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.</p>		
	<p>(d) Power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.</p>		
	<p>(e) The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.</p>		
	<p>(f) The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure.</p>		
	<p>These provisions are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.</p>		
	<p>(g) Notwithstanding other technical requirements specified in this subpart, attenuation of emissions below the general emission limits in Section 15.209 is not required.</p>		
	<p>(h) Where there is a transition between limits, the tighter limit shall apply at the transition point.</p>		
	<p>(i) The device must comply with IEEE C95.1-1991, "Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz." Measurement methods are specified in IEEE C95.3-1991, "Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave." All equipment shall be considered to operate in an "uncontrolled" environment.</p>		
	<p>The application for certification must contain a statement confirming compliance with IEEE C95.1-1991.</p>		
	<p>Technical information showing the basis for this statement must be submitted to the Commission upon request.</p>		
<p>15.321</p>	<p>Specific requirements for Isochronous devices operating in the 1890-1900 and 1920-1930 MHz sub-bands.</p>		

Discussion of Issue(s)		AT&T/NCR recommended wording
	(a) Operation shall be contained within one of two channels starting with 1890-1895 MHz and ending with 1895-1900 MHz, or within one of eight channels that are 1.25 MHz in width starting with 1920-1921.25 MHz and ending with 1928.75-1930 MHz.	
	Further sub-division of a 1.25 or 5 MHz channel is permitted with a reduced power level, as specified in Section 15.319(c), but in no event shall the emission bandwidth be less than 50 kHz.	
	(b) Intentional radiators with an intended emission bandwidth less than 625 kHz shall start searching for an available time and spectrum window at 1890 or 1920 MHz and search upward from that point.	<p>There are several problems with this search (packing) algorithm.</p> <ul style="list-style-type: none"> • it is not consistent with 321(c)5, in that a device can not simultaneously choose the lowest energy channel and select a channel closest to one of the band edges. • by forcing devices to use the band edges it will cause the most interference to devices operating in nearby bands
	Devices with an intended emission bandwidth greater than 625 KHz shall start searching for an available time and spectrum window at 1930 or 1900 MHz and search downward from that point.	
	(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy.	
	The following criteria must be met:	
	(1) Before initiating transmission, devices must monitor the time and spectrum windows they intend to use for a period of at least 10 milliseconds to determine if the access criteria is met.	
	(2) The monitoring threshold must not be more than 30 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth used by the device.	
	(3) If no signal above the threshold level is detected, transmission may commence and continue with the same emission bandwidth in the monitored time and spectrum windows without further monitoring.	Rules should also require transmission in every frame once transmission starts.
	However, occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.	<p>"If transmission ceases to occur in the selected time and spectrum window combination at any time, the access procedure must be repeated."</p> <p>remove the "group of cooperating devices". Then, each device will be forced to re-select the time/spectrum window at least once every eight hours, which satisfies the intent of this paragraph.</p>
		<p>"group of cooperating devices" is vague in this case. As an example, a large PBX, spanning many floors of an building, might be considered as a "group of cooperating devices", yet there is no reason to apply this rule to the entirety of such a large system. It is more appropriate to apply it locally, i.e. at each antenna.</p>

	Discussion of Issue(s)	AT&T/NCR recommended wording
	(4) Once access to specific combined time and spectrum windows is obtained an acknowledgment from a system participant must be received by the initiating transmitter within one second or transmission must cease.	The one-second timer should not be applied to control and signaling transmissions as identified in paragraph 303(f). It is very difficult, and inefficient, to require acknowledgments in the case of these signals.
	(5) If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level below a monitoring threshold of 50 dB above the thermal noise power determined for the emission bandwidth may be accessed.	"system access channel" is not defined
	A device utilizing the provisions of this paragraph must have monitored all access channels defined for its system within the last 10 seconds and must verify within the 20 milliseconds immediately preceding actual channel access that the detected power of the selected time and spectrum windows is no higher than the previously detected value.	would like to be able to remove some selections which are known to be bad from the search--this improves performance, and prevents further interference by not attempting access on time/frequency window combinations that are known to be bad.
	The power measurement resolution for this comparison must be accurate to within 6 dB.	
	No device or group of cooperating devices located within 1 meter of each other shall occupy more than three 1.25 MHz channels, two 1.25 MHz channels and one 5 MHz channel, or two 5 MHz channels during any 10 millisecond period of time.	This paragraph was intended to prevent band monopolization. Allowing occupancy by two 5 MHz channels guarantees the monopolization that WINTech was attempting to prevent.
	(6) If the selected combined time and spectrum windows are unavailable, the device may either monitor and select a different window or seek to use the same windows after waiting an amount of time randomly chosen from a uniform random distribution between 10 and 150 milliseconds.	
	(7) The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission and have a maximum reaction time less than $50 \times \text{SQRT}(1.25/\text{emission bandwidth in MHz})$ microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds.	It is not clear that this is understood in a common way.
	If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be $35 \times \text{SQRT}(1.25/\text{emission bandwidth in MHz})$ microseconds but shall not be required to be less than 35 microseconds.	We suggest that this be one of the areas that test committee takes up. Would Commission be willing to consider recommendations made by Test Committee regarding this paragraph?