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ATTACHMENT F

Version 1.0

UTAM Disablement Test Suite

Background

The FCC has mandated that coordinatable, unlicensed PCS equipment deployed before the spectrum is totally cleared are subject to disablement requirements that ensure that they will protect the incumbent microwave community from interference as specified by TIA Bulletin 10 F, including its latest revisions. UTAM has developed a framework for testing the mobile and non-mobile RF portions of unlicensed PCS devices for compliance with these requirements. They include:

1. The mobile element of a coordinatable system must cease transmitting when removed from the radio vicinity of the coordinatable part. Examples of mobile elements of an unlicensed PCS system include handsets, PDAs, and notebook computers.

2. The fixed part of an unlicensed PCS system must not begin operation until its geographic location is confirmed to be in a coordinated area. The fixed piece must be attached to a permanent structure such as a building (so that it may not be easily relocated) and also must communicate with the mobile part. An example of a fixed part is a base station or radio controller that provides the central coordination point of a wireless PBX.

3. If the fixed part of the system is moved from the installed location and reinstalled at another location, it must not operate until that location is confirmed to be clear of microwave transmissions.

The FCC will allow manufacturers to define mechanisms to enable their unlicensed PCS product to be FCC disablement compliant (see Part 15.3). To provide a product development and testing framework, UTAM has defined a series of tests that coordinatable unlicensed PCS devices/systems can use to establish the prerequisites for FCC Part 15 certification.

These tests permit a manufacturer to ensure that, prior to deployment, its products will not violate FCC disablement requirements and cause harmful interference. It should be noted, however, there has been no attempt to devise methodologies which will survive deliberate, illegal attempts to defeat the safeguards.

1. Mobile Part Disablement Requirements

The unlicensed PCS system mobile part must either be physically constrained to the unlicensed PCS fixed part location or incorporate a mechanism that will engage when the unlicensed PCS mobile part does not detect the presence of the fixed part. In this case, the mobile part must cease transmitting within 1 minute if it fails to detect a signal from the

fixed part, and transmission may not be resumed until the mobile part again detects the presence of the fixed part.

Disablement Compliance Certification Test

Step 1.

The manufacturer must demonstrate that the unlicensed PCS moveable part is operational and that it communicates with the fixed part by establishing a radio link with the fixed part.

Step 2.

The manufacturer must demonstrate that, when the moveable part is placed in an environment where the power received from any system fixed part is less than KTB+6 dBm (e.g., the removal of power from the fixed part), within 1 minutes the power emitted by the moveable part in the band of operation must be less than -60 dBc or the levels specified in FCC Part 15.209, (whichever is the less stringent level) measured at a distance of three meters under all manufacturer specified operating conditions.

To ensure that a moveable part is responding to emissions from a related fixed part rather than a "noise" level in the environment, the tester must generate a noise pulse of at least KTB+50 dBm, lasting for two minutes within 10 meters of the portable part. The measured output of the portable part must not exceed -60 dBc or the levels specified in FCC Part 15.209 (whichever is the less stringent level) measured at a distance of 3 meters for at least three minutes after the noise pulse ends under all manufacturer specified operating conditions.

Step 3.

The manufacturer must now enable the fixed part to operate and confirm that the moveable part is operational by establishing a communications link with the fixed part.

2. Fixed Part Disablement Requirements

The fixed part of a coordinatable unlicensed system may not become operational until its geographic location has been verified as available for deployment by UTAM. This requirement also applies to the remotable fixed part of those systems where the remotable fixed part can be located more than 8000 meters from other fixed parts. Remotable parts must be designed so that they cannot be cascaded or daisy chained. An example of a remotable part of an unlicensed PCS device/system is a remoted portion of a wireless PBX.

Compliance Certification Test

Step 1.

The manufacturer must completely install an average sized system according to the installation instructions. Average size shall be determined by the manufacturer, but in no case shall be less than 20% of the designed capacity to a maximum of 20 fixed radiating parts. These fixed parts must be deployed with representative spacing. (This is to prevent manufacturers from presenting minimal architectural configurations that may misrepresent the effectiveness of the safeguards).

Systems that support radiating parts located more than 8000 meters from each other and/or a central controlling element must test a minimum number of two such remotable parts.

Step 2.

The manufacturer must now activate the system or device. The energy output level of the system must then be measured. To demonstrate that it is inoperable, one minute after the system has finished initialization, the tester must determine whether any fixed radiating device(s) attached to the system are transmitting radio energy in the band of operation greater than -60 dBc or the levels specified in FCC Part 15.209, whichever is the higher level, measured at a distance of three meters under all manufacturer specified operating conditions.

Step 3.

After establishing that the system or device cannot operate upon installation, the location verification process (LVP) should be performed to enable the system or device.

The LVP should be performed on the fixed part and on the part(s) that can be remoted more than 8000 meters. The LVP must meet the following criteria:

- The LVP must be specific to each system, where system is defined as any group of fixed parts that exchange messages.

- The LVP must have a uniqueness feature that differs each time the LVP is used.

- The LVP must not be readily replicable by unauthorized personnel either by random or informed operation.

- The LVP must contain the function that reports the system size, unit power output and area of installation.

Example:

After installing the system, the installer calls the monitoring center as part of the LVP. The installer provides identification and is verified. The required information is provided to the data base. If the geographic area ia a UTAM authorized area, the authorization key is provided to the installer who uses the key to enable the system. If the geographic area is not a UTAM authorized area, the authorization key is denied and the system cannot be enabled.

Step 4.

Verify that the system is now operational and the fixed and portable radiating devices are performing as designed.

Step 5.

Retain the system as installed for the next test.

3. Disablement when Moved Requirement

If the fixed part of the system is moved from its original installed location and reinstalled at another location, the system must not be able to begin operation until the location is re-verified with UTAM as open for deployment.

Systems that have the ability to locate radiating parts more than 8000 meters from each other and/or from a central controlling element, must perform the following tests. Systems that do not have this capability must complete only Steps 5-8.

Systems with Remotable Parts:

Steps 1.

Install system for testing as specified in the fixed part disablement requirements section.

Remove the remotable part(s) as outlined in the instructions. In the absence of instructions, good installation practices must be used.

Step 2.

Pack the remotable part(s) in the shipping containers or other equivalent containers.

Store the remotable part(s) for 8 hours.

Step 3.

Unpack the remotable part(s). Install this equipment in a different area from the original testing site. Following the installation instructions.

Step 4.

Perform Steps 2-4 in the fixed part disablement requirements test.

All systems must complete the following test Steps:

Step 5.

Begin with the system as installed for testing in the fixed part disablement requirements section or, if this system participated in the test for remotable parts, begin with that configuration.

Remove the system as outlined in the installation instructions.

Step 6.

Pack the system in the shipping containers or other equivalent containers.

Store the system for 8 hours.

Step 7.

Unpack the system. Install according to the instructions.

Step 8.

Perform Steps 2-4 in the fixed part disablement requirements test.

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ATTACHMENT G

UTAM GLOSSARY

2GHz band unlicensed frequencies	The FCC has designated 1910 to 1930 megahertz for unlicensed PCS. These frequencies are currently used by fixed microwave license holders. (see OFS)
AAA	American Arbitration Association
AAR	American Association of Railroads
A-F Licensed Frequencies	Frequency Bands A 1850-1865 1930-1945 30MHz MTA D 1865-1870 1945-1950 10MHz BTA B 1870-1885 1950-1965 30MHz MTA E 1885-1890 1965-1970 10MHz BTA F 1890-1895 1970-1975 10MHz BTA C 1895-1910 1975-1990 30MHz BTA
ACA	Adaptive Channel Allocation
ADPCM	Adaptive Differential Pulse Code Modulation
AIN	Advanced Intelligent Network
AMA	Automatic Message Accounting
AMPS	Advanced Mobile Phone System. (First USA Cellular system Standard)
ANI	Automatic Number Identification
ANSI	American National Standards Institute
APCO	Association of Public Safety Communications Officials-International Inc.
API	American Petroleum Institute
Asynchronous devices [FCC Part 15 Subpart D 15.303 (a)]	Devices that transmit RF energy at irregular time intervals, as typified by local area network systems
Asynchronous sub band	Sub band for mostly data devices
AT&T	American Telegraph & Telephone
AVM	Automatic Vehicle Monitoring
B-CDMA	Broadband CDMA
BCR	Bell Communications Research
BOC	Bell Operating Company
BTA	Business Trading Area (As defined by Rand McNally). There are 492 identified.
Bulletin 10-F	This is a TIA (TR14.11) document which covers the interference criteria to microwave systems. (F) is the version addressing PCS interference parameters

UTAM GLOSSARY

CAMA	Centralized Automated Message Accounting
CATV	Cable Television
CBEMA	Computer and Business Equipment Manufacturers Association
CCITT	Consultative Committee International Telegraph and Telephony
CDMA	Code Division Multiple Access
CDPD	Cellular Digital Packet Data
Cellcos	Cellular Companies
CMSA	Consolidated Metropolitan Statistical Area. (Used to describe the major cellular license area) see MSA
CMRS	Commercial Mobile Radio Service
Coordinatable or Non Nomadic devices [FCC Part 15 Subpart D 15.303 (b)]	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
COPE	Coalition Of Private users of Emerging multimedia Technologies
CTIA	Cellular Telecommunications Industry Association
dBc	Decibel level relative to the carrier
dBm	Decibel level relative to millivolt
DBS	Direct Broadcast Satelitte
dBuV/m	Decibels referenced to one microvolt per meter
DCS	Digital Cellular System
DCS1800	DCS 1.8 Gigahertz ETSI PCN Standard
DMH	Dual Mode Handset
DSA	Defined Service Area
E911	Enhanced 911 (added capabilities to 911 including calling number and displaying the address)
EIRP	Equivalent Isotropic Antenna Radiated Power
EMAIL	Electronic mail

UTAM GLOSSARY

EMI	Electro Magnetic Interference
ENG	Electronic News Gathering
ERP	Effective Radiated Power
ESN	Electronic Serial Number
ET	Emerging Technologies
ETSI	European Telecommunications Standards Institute
FAXMAIL	Facsimile Mail
FCC	Federal Communications Commission
FDD	Frequency Division Duplex
FDMA	Frequency Division Multiple Access
GEN (Docket No.)	General Docket Number....
GSM	Global System for Mobile Communications
HAAT	Height Above Average Terrain
HLR	Home Location Register
Hz	Hertz (1 cycle equals 1 Hertz)
ICC	International Communications Conference
ID	Identity
IEEE	Institute of Electrical and Electronic Engineers
IN/1	Intelligent Network revision .1
IPR	Intellectual Property Rights
ISC	Industry and Science of Canada (incorporates former DOC Department of Communications)
ISDN	Integrated Services Digital Network
ISM	Industrial Scientific and Medical. (The operating frequencies are listed in the FCC rules Part 18 subpart C 18.301)
Isochronous devices [FCC Part 15 Subpart D 15.303 (d)]	Devices that transmit at a regular interval, typified by time-division voice systems
Isochronous sub band	Band for mainly voice products and systems

UTAM GLOSSARY

ISUP	ISDN User Part
IXC	Inter Exchange Carrier
kbps	kilobits per second
"kickstart" funds	The funding for UTAM Inc.needed for operations prior to any clearing funds being raised from deployment of equipment in the unlicensed frequency band
kTf (KTB)	Thermal noise power in watts. k is Boltzmann's constant. T is the absolute temperature in degrees Kelvin. f is the emission bandwidth of the device in Hertz. (used in disablement test suite)
LATA	Local Area and Transport Access
LBT	Listen Before Talk (Transmitting)
LEC	Local Exchange Carrier
LEOS	Low Earth Orbit Satellite system
Licensed PCS	PCS service providers who are required to participate in the Spectrum Auctions to obtain a license to operate. (includes Pioneer Preference winners)
LMS	Location and Messaging Services
LVP	Location Verification Process. These are the proceedures used by manufacturers to verify the installation location is authorized.
MDS	Multipoint Distribution Service (used for TV distribution)
MFJ	Modified Final Judgment
MHz	Megahertz
MIRS	Motorola Integrated Radio System
MMI	Man/Machine Interface
MoU	Memorandum of Understanding
MS	Mobile Station
MSA	Metropolitan Statistical Area. There are 306 in the USA (Used to describe the major cellular license area) see CMSA
MSC	Mobile Services Switching Center
MSS	Mobile Satellite Service

MSISDN	Mobile Station ISDN
MT1	Mobile Termination 1
MT2	Mobile Termination 2
MTA	Major Trading Area (As defined by Rand McNally) There are 51 identified.
MTBR	Mean Time Between Repairs
MTTR	Mean Time To Repair
NABER	National Association of Business and Educational Radio users
NASNA	National Association of State Nine One One Administrators
NEBS	New Equipment Building Specifications
NENA	National Emergency Number Association
Nomadic Device	This is a device which can be either Asynchronous or Isochronous that can operate and transmit without the need for an infrastructure. It could therefore cause untraceable interference to microwave systems.
Non Nomadic Device or Coordinatable Device	This is a device which requires an infrastructure and can be deployed in areas where interference to Microwave systems will not be generated
NPA	Numbering Plan Area
NPA-Nxx	NPA N=2-9 X=0-9 X=0-9
NPRM	Notice for Proposed Rule Making
NSA	National Security Agency
NSMA	National Spectrum Managers Association
NTIA	National Telecommunications and Information Administration (U.S. Department of Commerce)
NVNG	Non Voice Non Geostationary
OAM&E	Operations and Maintenance and Engineering
OC1	Sonet OC1
OFS	Operational Fixed System (Microwave System)
ONA	Open Network Architecture

OSHA	Occupational Safety & Health Act
PABX	Private Automatic Branch Exchange (see PBX)
PAC	Preferred Access Carrier
PBX	Private Branch Exchange (seePABX)
PCIA	Personal Communications Industry Association (formerly Telocator)
PCMCIA	Personal Computer Memory Card International Association
PCN	Prior Coordination Notice (Used in the microwave coordination process)
PCN	Personal Communications Network (Used as alternate definition to PCS. eg., in the United Kingdom)
PCP	Private Carrier Paging
PCS	Personal Communications Service
PIC	Preferred Intra Exchange Carrier
PLEA	PCS Licensing Equity Alliance
PSAP	Public Safety Answering Point (answering point for 911 calls)
POI	Point Of Input
PSTN	Public Switched Telephone Network
PUB	Publication
PUC	Public Utility Commission
Q-CDMA	Qualcomm Code Division Multiple Access
RF	Radio Frequency
RM	Rule Making
SDMA	Spatial Division Multiple Access
SMR	Specialized Mobile Radio
SONET	Synchronous Optical Network
SPL	Sound Pressure Level
SS7	Signaling System #7

UTAM GLOSSARY

T1	24 Channel Digital Transmission Interface
TA	Technical Advisory
TBD	To Be Determined
TCP/IP	Transmission Control Protocol/Internet Protocol
TDD	Telephone Devices for the Deaf
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
TMOS	Telecommunications Management and Operations Support System
TR	Technical Reference
TSB	Telecommunications Systems Bulletin. Issued by EIA/TIA
TRX:s	Transmitter Receivers
UDI	Unrestricted Digital Information
Unlicensed Frequencies	1910-1930 20MHz
Unlicensed PCS (UPCS)	PCS services such as Wireless PBX which will operate in a private environment without air time charges
UTAM Inc.	Unlicensed Transition and Management for Microwave Relocation in the 2 GHz band. Pending a satisfactory Financial and Deployment plan the FCC has designated UTAM Inc.as the coordinating body for Unlicensed PCS (September 23 1993)
UTC	Utilities Telecommunications Council
VLR	Visitor Location Register
VMAIL	Voice Mail
WACS	Wireless Access Communications Systems
WACS-U	Wireless Access Communications Systems Unlicensed
WCA	Wireless Cable Association
WCPE	Wireless Customer Premises Equipment
W EIRP	Wattage EIRP

UTAM GLOSSARY

WEO	Wireless End Office
WINForum	Wireless Information Network Forum A non profit organization made up of manufacturers from Data, Computer and voice radio.
WINForum Spectrum Etiquette	A protocol and set of rules offered to the FCC as a guide to Rule making for the sharing of PCS unlicensed frequencies by dissimilar technologies without causing interference to each other.
WUPE	Wireless User Premises Equipment
WPBX	Wireless PBX

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ATTACHMENT H

Market Demand for In-Building Wireless Voice and Data Systems

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Executive Summary

Introduction

BIS Strategic Decisions was retained by UTAM Inc. to provide an independent assessment of the scale and timing of demand for Unlicensed Wireless Personal Communications Services (PCS).

With over 25 years of experience, BIS Strategic Decisions is a leading global consulting and research company, with a specific focus on mobile and wireless communications markets.

Objectives

The objectives for the market opportunity assessment were:

- To identify the key driving forces affecting adoption of in-building wireless solutions
- To develop defensible assumptions on key factors in market adoption for in-building wireless solutions
- To create forecasts for in-building wireless solutions

The focus of this assignment has been those applications or services envisaged within the unlicensed spectrum that are most tangible, or readily understood by, the target user population. It should be noted that there are potentially many different applications which have not been considered within the scope of the current assignment.

Conclusions

Market Projections

Three demand and revenue scenarios were constructed, based on alternative sets of value/price points. The dollar figures should be considered as the incremental amount the user is willing to pay for the functionality described over and above the per user price of a wired system, including the wired subscriber unit (e.g., a handset or data network interface device).

Two of the alternative demand and revenue scenarios, illustrating the highest and lowest price points tested, (Scenarios 1 and 3 respectively) for the in-building wireless market were constructed using the following:

Scenario One: assumes incremental value/price points per user of:

Cordless Voice:	$300
WLAN:	$300
Wireless Messaging :	$225
Cordless & Messaging	$525
Cordless & WLAN	$600

Scenario Three: assumes incremental value/price points per user of:

Cordless Voice:	$500
WLAN:	$500
Wireless Messaging :	$375
Cordless & Messaging	$875
Cordless & WLAN	$1,000

The sets of in-building wireless functionality were described as:

Wireless LAN: "New wireless data capabilities which provide the ability to connect portable data systems such as notebook computers, terminals, and personal digital assistants connections, allowing wireless LANs to provide performance comparable to Ethernet or Token Ring LANs."

Wireless Messaging: "New wireless messaging capabilities offering the ability to provide in-building paging and messaging using special alphanumeric pagers or via portable computers such as personal digital assistants, notebook computers, or even electronic organizers. With this capability, users could potentially both receive and transmit messages from their devices."

Wireless Voice: "New voice systems tied into a firm's PBX, Key Systems, or Centrex Service, which would allow employees to have 'cordless telephone' capabilities anywhere in their building or campus area, allowing them to answer incoming calls and keep them in touch anywhere in the building."

In Scenario 1, the installed base of in-building wireless users reaches 30.2 million by year ten, with annual RF placements reaching 5.5 million in year 5, and achieving a peak of 13.5 million in year eight.

Sites with 100-499 employees take the largest share of the user population with 14.5 million users equipped by year ten.

Cordless voice with messaging is the largest single demand component, and cordless voice functionality, either on a stand alone basis or for users equipped with voice and data, holds a 58% share of the installed base by year ten.

In this scenario, the wireless in-building equipment market is projected to generate cumulative incremental revenues of between $17bn and $22.5bn over a ten-year period.

In Scenario 3, the user base reaches 2.1 million by year ten with annual placements peaking at 958,000 in year eight. Here, the equipment market generates cumulative incremental revenues of between $2.0bn and $2.4bn over the period.

Methodology

BIS Strategic Decisions implemented a quantitative, statistically valid telephone interview program as the primary research tool for assessing the scale and timing of demand for in-building wireless solutions. BIS designed the program to ensure that the results were projectable to the population with an interval of +/- 3.4% at the 90% confidence level. A total of 618 telephone interviews were completed with Telecommunications and MIS managers from a sample consisting of four Site Size categories and eight Industry Sectors. The Site Size categories were defined as follows:

- 1-19 Employees
- 20-99 Employees
- 100-499 Employees
- 500+ Employees

Eight Industry Sectors were defined as follows:

- Manufacturing: Discrete Manufacturing and Process Manufacturing
- Wholesale
- Retail
- FIREL (Finance, Insurance, Real Estate and Legal)
- Health
- Government
- Services (Business and Personal)
- Other (Mining, Construction, Communications and Utilities)

The study was designed to allow meaningful comparisons between the site categories and industry sectors. Appropriate weighting factors were applied in order to ensure that the study results were projectable to the total U.S. site population. The categories represent a total

population of approximately 7.1 million sites based on Dun's Market Identifiers (DMI) Database.

The research program focused on four major components:

- Defining the range of alternative communications tools in place today
- Evaluating the perceived importance of wireless functionality in the in-building market
- Assessing willingness to pay and elasticity measures for in-building voice and data solutions
- Determining the likely scale and timing of site adoption and employee adoption of wireless solutions at a range of price points

A six step approach was adopted to develop demand and revenue forecasts for the in-building wireless market.

- Quantify the site and employee populations across the four site size categories and eight industry clusters covered by the research program.
- Determine site propensity to adopt in-building wireless solutions by size and industries within each size classification
- Determine in-building wireless diffusion as a percentage of employees within adopting sites over a ten year window
- Determine the mix of wireless functionality adopted within each site size classification and industries within each size category
- Calculate revenue streams for in-building wireless solutions based on three alternative assumed price points reflecting total investment per equipped user
- Conduct Validation Research