IIT RESEARCH INSTITUTE

Spectrum Engineering Group
185 Admiral Cochrane Drive
Annapolis, Maryland 21401-7396

2 September 1999

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Mr. Hugh L. Van Tuyl
Office of Engineering and Technology
Federal Communications Commission
The Portals
445 12th Street, SW (Room 7-A162)
Washington, DC 20554

Subject: FCC ET Docket 99-255 / Amendment of Part 2 and 95 of the Commission's Rules to Create a Wireless Medical Telemetry Service)

Dear Mr. L. Van Tuyl,

The IIT Research Institute (IITRI) has reviewed the subject document and has provided our comments on this document in **Attachment 1**. Also, IITRI is very interested in becoming the frequency coordinator defined in the subject document. I have outlined our qualifications in **Attachment 2** to this letter. I think you will see that IITRI is uniquely qualified to be the frequency coordinator for the Wireless Medical Telemetry Service (WMTS). We have given some thought about the duties of a WMTS Frequency Coordinator. **Attachment 3** is a draft Statement of Work (SOW) defining the basic tasks that we envision a WMTS Frequency Coordinator would need to perform. We provide this draft SOW to assist you in defining the various functions of the WMTS Frequency Coordinator.

We feel that our extensive experience in spectrum management will be very beneficial to the FCC and the medical community in maintaining and coordinating frequency usage in the WMTS. If you have any questions about anything in this letter, please contact me by telephone at 410-573-7560 or by e-mail at skennison@iitri.org.

Sincerely,

S Kennison

Stuart Kennison
Division Manager
Database Operations

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Attached:
1. Comments on FCC 99-182 Proposed Rulemaking
2. IITRI Qualifications for WMTS Frequency Coordinator
3. Draft WMTS Frequency Coordinator Statement of Work

Comments on FCC 99-182 Proposed Rulemaking

PARAGRAPH: 11

Comment on tentative conclusions that:

The need exists for the allocation of additional spectrum for wireless medical telemetry equipment. Spectrum should be allocated on a primary basis to ensure that medical telemetry equipment is able to function without interference from other sources.

COMMENT - We concur with these conclusions. Pressure to reduce medical costs by reducing the amount of time that patients remain in ICUs/CCUs are driving the need for additional spectrum for wireless medical telemetry equipment. At the same time, increased spectrum usage by the primary services in the bands currently used for medical telemetry is decreasing spectrum availability and, thus, increasing the probability of electromagnetic interference to wireless medical telemetry equipment. To receive protection from other spectral users, wireless medical telemetry equipment must be allocated frequencies on a primary (or co-primary) basis.

PARAGRAPH: 12-20

Comment on the spectrum requirements analysis performed by AHA:

Whether assumed spectral efficiency in analysis is reasonable.

Whether more spectrally efficient technologies could be employed to reduce the amount of spectrum required.

COMMENT - We have reviewed the methodology and assumptions used by the Physiologic Parameters Workgroup to estimate current and future spectral bandwidth requirements for wireless medical telemetry equipment and find the recommendations of that workgroup to be sound.

COMMENT - We concur with the position that medical telemetry equipment manufacturers should be encouraged to use the most spectrally efficient technologies in designing future systems/equipment.

PARAGRAPH: 14 -20

Comment on the impact of frequency allocation for medical telemetry would have on other prospective users of the bands:

608-614 MHZ.
1385-1390 MHZ.
1432-1435 MHZ.

COMMENT - The advantages and limitations of each of the proposed and alternate bands are presented below along with comments regarding the impact of wireless medical telemetry equipment operating in these bands on other users of the bands.

COMMENT - Re. 608-614 MHZ

Advantages:
- low background noise floor
- no other transmitting systems in band
- equipment available with "off-the-shelf" technology

Limitations:
- requires frequency coordination with local radio astronomy facilities

- bandwidth may not be sufficient to meet future requirements

COMMENT - We concur with the AHA's position that a Wireless Medical Telemetry Service (WMTS) should be created and that service be designated a "co-primary" service in the 608-614 MHz band. The low power output of wireless medical telemetry transmitters will limit any EMI to radio astronomy services to those located in close proximity to a medical facility. The condition that systems in the WMTS may not interfere with the radio astronomy service and facilities already operating in the band should be retained.

COMMENT - Re. 1385-1390 and 1432-1435 MHZ

Advantages:
- equipment available with "off-the-shelf" technology

Limitations:
- "grandfathered" DoD systems limit immediate availability
- significantly higher propagation path loss (relative to 608-614 MHZ band)
- severe contiguous bandwidth limitations
- Balanced Budget Act requires that these bands be reallocated through competitive bidding.

COMMENT - Because of the low power of wireless medical telemetry transmitters, they pose virtually no potential to interfere with the Air Traffic Control (ATC)/air defense (AD) radars or military air-ground telecommand and telemetry systems that will continue to operate in these bands for a number of years.

COMMENT - We agree with NTIA's concern that the requirement that these bands be reallocated through competitive bidding and that the new users of the band be required to compensate displaced Federal users may make it economically infeasible to use these bands for the proposed WMTS.

COMMENT - We concur with the concerns that "grandfathered" DoD systems may rule the band out as a solution to the WMTS allocation problem for the near future.

COMMENT - Re. 1390-1400 MHZ

Advantages:
- equipment available with "off-the-shelf" technology
- contiguous bandwidth sufficient for long-term WMTS requirements

Limitations:
- "grandfathered" DoD systems limit immediate availability
- significantly higher propagation path loss
- coordination with local radio astronomy facilities required

COMMENT - Re. 1427-1432 MHZ

Advantages:
- equipment available with "off-the-shelf" technology

Limitations:
- "grandfathered" DoD systems limit immediate availability
- band allocated to space operations (primary) and land mobile (secondary) services
- significantly higher propagation path loss

COMMENT - Because of the low power of wireless medical telemetry devices, they pose virtually no potential to interfere with the Air Traffic Control (ATC)/air defense (AD) radars or military air-ground telecommand and telemetry systems that will continue to operate in these bands for a number of years.

PARAGRAPH: 21-23

Comment of which of two proposed option allocations is more suitable, or any other alternative frequencies would be more suitable.

Option 1: 608-614 MHZ. / 1395-1400 MHZ. / 1429-1432 MHZ.
Option 2: 608-614 MHZ. / 1391-1400 MHZ.

COMMENT - The Land Mobile Communications Council (LMCC) has petitioned the FCC to allocate the 1390-1400 and 1427-1432 MHz bands for use by the private land mobile radio (PLMR) services. Because of the low power output of wireless medical telemetry transmitters, it is highly unlikely that they could cause EMI to the PLMR

services. If this petition is approved, operation of PLMRs in the vicinity of medical facilities may pose significant EMI problems for the WMTS.

COMMENT - The operators of Little Leo satellites are considering the use of the 1390-1393 MHz and 1429-1432 MHz bands for satellite feeder downlinks and uplinks, respectively. Because of the low output power of wireless medical telemetry transmitters, it is highly unlikely that this equipment could cause EMI to Little Leo operations. There is some potential for Little Leo operations causing EMI to the WMTS, with the satellite downlink posing a somewhat greater potential for EMI because of the large "footprint" of the downlink antenna pattern.

COMMENT - Except for the greater contiguous bandwidth afforded by Option 2, there are no inherent technical advantages offered by either option.

PARAGRAPH: 24-42

Comment on all aspects of proposed rules for the new Wireless Medical Telemetry Service (WMTS):

COMMENT - Specific issues addressed in Paragraph 25-42

PARAGRAPH: 25 & 26

Comment on proposed wording of definition of *medical telemetry*:

"Measurement and recording of physiological parameters and other patient-related information via radiated bi- or unidirectional electromagnetic signals"

COMMENT - We concur with the definition of medical telemetry as stated.

COMMENT - Today, wireless medical telemetry equipment is used almost exclusively in unidirectional (i.e., patient to central monitor) applications. Clearly, bi-directional applications are envisioned for the future -- first to devices worn on the person (patient), but ultimately to implanted devices. We feel that the issue of different EMI susceptibility standards for patient-vs-provider end of bi-directional systems has not been adequately addressed by the medical community to date.

PARAGRAPH: 27

Comment on conclusions reached regarding licensing:

No need to require individual operators licenses in the new WMTS.

WMTS exist as one of the Citizens Band Service giving it authority to license by rule and define service by rule.

COMMENT - We concur in principle with the commission's proposal that the WMTS exist as one of the Citizens Band services as contained in Part 95 of the FCC rules; and the AHA's conclusion that the WMTS can be licensed "by rule." However, the rationale that the AHA gives to support its position that "there is no basis for the administrative burden of individual licenses" is based on the assertion that they (the AHA), "do not envision operators in the WMTS will be in competition with each other as are parties in other radio services." This leaves open the issue of how disputes will be resolved if a newly introduced system does interfere with a previously installed system.

PARAGRAPH: 28

Comment on eligibility requirement:

Should it be expanded to cover in-home use?

And how in-home use can be enforced without individual licensing?

COMMENT - We concur with the Commission's recommended word changes in defining the eligibility requirements for operating wireless medical telemetry equipment.

COMMENT - It is inevitable that, at some time in the future, a requirement will arise for "in-home" use of wireless medical telemetry equipment. It is envisioned that such use will involve the use of a relatively narrowband (single patient) installation with an in-home monitor linked most likely by telephone (or some other means) to a remote medical facility. In the majority of situations, the low power of the telemetry transmitter will minimize the potential for causing EMI to other equipment in the surrounding environment. The far greater risk involves EMI to the in-home monitor in unknown and uncontrollable environments. No administrative procedure, including individual licensing, will resolve all of the problems associated with such applications. The best that can be accomplished is to limit devices used in such applications to operation in bands containing only similar devices, and imposing ridged susceptibility standards on these devices.

PARAGRAPH: 29

Comment on the appointment of a frequency coordinator for the proposed WMTS.

COMMENT - We concur with the AHA's recommendation that a frequency coordinator be appointed to develop and maintain a database of the frequency assignments of all WMTS equipment in operation.

COMMENT - We concur with the AHA's recommendation and Commission's proposal that frequency registration of individual wireless medical telemetry equipment with a designated Frequency Coordinator be made mandatory, whether or not such equipment is licensed individually or "by rule," as recommended. We further concur with the proposal that such registration include the operating frequencies and other relevant operating parameters as deemed necessary by the frequency coordinator.

COMMENT - We also concur with the proposal that this database be used by eligible healthcare facilities and equipment manufacturers to plan for specific frequency use within a given geographic area; and that equipment registered first in a given geographic area be entitled to protection over those registered later. (See additional comments on accessibility in our comments on PARAGRAPH 32.)

COMMENT - We concur that the duties of the Frequency Coordinator are essentially that of a "record keeper," and with the designation of the Commission as the arbitrator of all disputes among users.

PARAGRAPH: 30

Comment on the duties of the frequency coordinator.

Single-vs- multiple frequency coordinators

Limits on fees charged by the frequency coordinator.

COMMENT - We concur with the proposal that a single frequency coordinator be designated to establish and maintain a nationwide engineering database of all wireless medical telemetry transmitters and to handle all requests for information from that database.

COMMENT - Based on some 40 years experience with distributed spectrum management/frequency assignment databases, it is our observation that there is no advantage to partitioning such a database, while there are many problems associated with maintaining and coordinating its elements. Ultimately, a higher level overseer becomes necessary to assure consistency in the format, content, and currency of distributed databases.

COMMENT - The functions performed by the Frequency Coordinator appear to fall into three categories: (1) those

associated with developing the database itself and populating it with its initial contents; and (2) those associated with maintaining the database (i.e., adding, changing, and deleting records, as time progresses; and (3) those associated with identifying EMI concerns regarding the introduction of new telemetry systems into the environment and making recommendations regarding compatible frequency assignments. It would appear appropriate for these separate tasks to be funded in different ways:

- Development and initial population of the database and the development of the (remote) user interface are one-time cost efforts and should be funded accordingly, e.g., as a cost-plus-fixed fee (CPFF) contract (or some variant thereof).
- Maintenance of the database is a recurring cost that could also be funded as a CPFF contract.
- In contrast, the total effort required to review proposed plans for introducing new systems into the environment and recommending compatible frequencies depends upon the number of requests for this service, and should be funded on a fixed fee for service (to the requestor) basis.

In each case, cost ceilings can be defined.

PARAGRAPH: 30

Comment on the qualifications of the frequency coordinator.

COMMENT - We feel that the qualifications of the frequency coordinator should include:

(1) demonstrated expertise in the fields of electromagnetic compatibility (EMC) and spectrum management.
(2) demonstrated capabilities to develop and maintain spectrum management/frequency assignment and equipment characteristics databases.
(3) experience in identifying and resolving incidents involving electromagnetic interference (EMI), and
(4) familiarity with EMC standards for systems/equipment and testing procedures and methods for demonstrating compliance with such standards, in addition to familiarity with medical telemetry.

COMMENT - We strongly recommend that corporations that manufacture wireless medical telemetry equipment be excluded from consideration for the position of WMTS Frequency Coordinator because of the conflict of interest involved.

IITRI is interested in the position of Frequency Coordinator for the WMTS. Our qualifications summary is contained in Attachment 2 to this submission.

PARAGRAPH: 31

Comment on Data Requirements for operating parameters to be maintained in the WMTS database:

Frequency Ranges used (total frequency tuning range of equipment)
Modulation scheme used
Effective radiated power
Number of transmitters in use at facility at time of registration
Legal name of authorized health care provider
Location of transmitter (coordinates, street address, building)
Point of Contact for the authorized healthcare provider

COMMENT - While we concur that the parameters identified above must be included in the database maintained by the Frequency Coordinator, we feel that a number of additional data items should also be included; specifically:

+ Assigned frequencies (specific frequency assignments)
+ Occupied bandwidth of transmitted waveform(s)
+ Equipment function and identity (manufacturer and model number)
+ Equipment susceptibility (as a minimum, statements of compliance with established standards)

COMMENT - We feel that the entry (above) for "frequency ranges used" is insufficient. In the normal context of the frequency management community , "frequency ranges used" is interpreted as the tuning range (i.e., lower and upper frequency limits) of a device or family of devices. The specific frequencies to which the device can tune, including the frequency assigned for each specific device in a specific facility should be recorded. In addition, it should be noted whether the device is "continuously tunable" or "channelized" (i.e., capable of operating only on a set of fixed frequencies).

PARAGRAPH: 32

Comment on equipment registration term length of 5 years, renewable for an additional 5 years:

AHA proposes equipment registration should be effective for 5 years, FCC does not concur
Providers must notify coordinator when a device is taken out of service
Providers must notify coordinator of any change in location or operating parameters

COMMENT - There is merit to both sides of this issue.

COMMENT - It has been our experience, however, based on some 40 years experience in the field of frequency management, that spectrum users become extremely protective of their frequency assignments and do not, as a rule, voluntarily notify cognizant authorities when equipment is taken out of service. Periodic licensing of equipment, while not 100% effective in identifying unused equipment, does provide a periodic affirmation of frequency requirements. Perhaps a longer period, e.g., 10 years, would be a reasonable compromise on this issue.

COMMENT - As to the requirement that users must notify the Frequency Coordinator of any changes in location or operating parameters; we concur with the recommendation that failure to notify would void the right of protection from EMI granted to users who fail to comply with this provision.

PARAGRAPH: 32

Comment on database accessibility:

Who should have access to database?

COMMENT - Since none of the information requirements for the database go beyond the information contained in manufacturer's brochures, all members of the health care community, including equipment manufacturers, should have access to the WMTS frequency assignment database. It is proposed that remote access to the database be provided through the Internet, using passwords to limit accessibility.

COMMENT - If, for some reason, it becomes necessary to store proprietary information in the database for the use of the Frequency Coordinator, access to those portions of the database will not be accessible to the user community.

PARAGRAPH: 33

Comment on Permissible Communications:

AHA recommends all types of information flows; voice, data, video, and telecommand.
FCC recommends all type of information flow except voice or video out of concern for significant spectrum usage.

COMMENT - We concur with the FCC's position that all types of information flow except voice and video be permitted.

PARAGRAPH: 34

Comment on adoption of technical standards:

AHA recommends minimal technical standards for WMTS equipment to spur innovation.
FCC notes some standards should apply -- e.g. spectral efficiency.

COMMENT - We agree with both parties on this issue; the technical requirements should be kept to a minimum, but that the minimum includes some standards -- e.g., EMI susceptibility standards and spectral efficiency.

COMMENT - We support the establishment of technical standards for wireless medical telemetry equipment, and strongly recommend that a single standard be adopted for a given type of device.

PARAGRAPH: 35

Comment on the need for a channelization scheme for the WMTS bands and limitations on the use of broadband technologies.

AHA does not recommend a specific channelization for these bands. The Commission expresses concern that unless a channelization scheme is specified, a single user, using as broadband technology such as spread spectrum, could monopolize the band and inhibit other health care facilities within a given area to utilize narrowband technologies. To facilitate sharing of the spectrum, the Commission recommends broadband equipment operating in 608-614 MHZ be capable of operating within one or more channels of 1.5 MHZ (Each, up to a max of 6 MHZ)

COMMENT - We concur with the Commission's recommendation for partitioning the 608-614 MHZ band into four 1.5 MHZ segments.

PARAGRAPH: 36

Comment on transmission field strength limits

The AHA recommends radiated field strength limits, measured at a distance of 3 meters, of 370 mV/m (608-614) MHZ and 740 mV/m (1385-1390 and 1432-1435 MHZ).

COMMENT - The FCC takes issue with the AHA recommendation of 370 mV/m in the 608-614 MHZ band, and proposes to maintain the current Part 15 limit of 200 mV/m, measured at a distance of 3 meters, in that band. The Commission objects to the AHA's recommendation in this band for two reasons: (1) the AHA's recommendation is unjustified; and (2) a concern that this modest increase "could result in interference to radio astronomy." The AHA's request for higher power will undoubtedly increase the reliability of the telemetry system resulting from multipath fading as the patient moves about the health care facility. Since the WMTS user is required to coordinate the use of all such systems located in proximity of radio astronomy facilities,

COMMENT - The FCC concurs with the AHA recommendations in the 1385-1390 and 1432-1435 MHZ bands. We also concur.

PARAGRAPH: 37

Comment on out-of-band transmitter emission limits

COMMENT - We concur with the proposed limits for out-of-band emissions.

PARAGRAPH: 38

Comment on need to protect other existing services

COMMENT - We concur with the proposed rule requiring coordination with the use of wireless medical telemetry equipment in the 608-614 MHZ band with radio astronomy operations.

COMMENT - We concur that operation of wireless medical telemetry equipment in the proposed 1385-1390 and 1432-1435 MHZ bands (or any of the alternate bands, e.g., 1391-1400 and 1427-1432 MHZ) be permitted on a non-interference basis to afford protection to "grandfathered" government operations.

PARAGRAPH: 39

Comment on equipment authorization requirement through the Declaration of Conformity (DoC) procedure

COMMENT - We concur with the AHA's recommendation and the Commission's proposal that wireless medical telemetry equipment be licensed under the Declaration of Conformity (DoC) procedures specified in Part 2 of the rules.

COMMENT - We concur with the Commission's proposal that laboratories accredited to perform DoC testing under Part 15 of the rules, be permitted to perform wireless medical telemetry equipment DoC testing.

COMMENT - We support the position that certification should be applied to both existing and proposed new types of equipment.

PARAGRAPH: 40 & 41

Comment on decreasing mandatory transition time frame to new bands from 4 years to 2.

Should cutoff date be imposed on manufacturing and importation of equipment authorized under Parts 15 and 90?

COMMENT - We support the Commission's proposal that a two-year transition period is reasonable for requiring all new wireless medical telemetry equipment to operate in the bands authorized in these rules.

COMMENT - We see no need to set a cut-off date on the manufacturing and importation of equipment authorized under Parts 15 and 90. These equipment are unlicensed and operate at the risk of the user.

PARAGRAPH: 42

Comment on five-year transition period on high power operation on the 12.5 kHz. offset channels in the 450-470 MHZ. Band.

What steps may be taken to allow an earlier lifting on freeze in 450-470 MHZ. Band without causing interference problems?

COMMENT - We support the AHA's 5-year transition plan for lifting the freeze on high-power operations on the 12.5 kHz off-set channels in the 450-470 MHZ band. Every effort should be made to permit earlier lifting of the freeze in portions of the band or specific geographic regions.

IIT Research Institute

Qualifications for Wireless Medical Telemetry Service (WMTS) Frequency Coordinator

INTRODUCTION

The IIT Research Institute (IITRI) is uniquely qualified to perform the duties of Frequency Coordinator for the Wireless Medical Telemetry Service (WMTS). Our qualifications are described here; first in terms of our extensive experience in spectrum engineering and frequency assignment databases; and second, in terms of our experience to perform the individual tasks required of the WMTS Frequency Coordinator.

IITRI EXPERENCE

IIT Research Institute (IITRI), founded in 1936, is a private, non-government, not-for-profit research center, affiliated with the Illinois Institute of Technology (IIT) in Chicago, Illinois. With annual revenues of $130M, IITRI employs scientists and engineers who are engaged in research, prototype and software development in areas of both national and international significance. IITRI's Spectrum Engineering Group in Annapolis, Maryland has over 500 employees dedicated exclusively to the provision of high quality services and product development in radio frequency (RF) and Spectrum Engineering. Since 1965, IITRI has provided engineering support services to the Department of Defense (DoD) Electromagnetic Compatibility Center (ECAC) and the Joint Spectrum Center (JSC). In support of ECAC and the JSC, IITRI has developed and maintained nearly all of DoD's spectrum management databases and information systems. Our spectrum management products and services have been provided to a wide range of US Government Agencies, including the NTIA, Coast Guard, FAA and the Military Departments. Most recently, IITRI is now supporting the newly created Office of Spectrum Analysis and Management (OSAM). Table 1 provides a small sample of IITRI's past support that highlights our competencies in the area of frequency coordination and spectrum engineering.

TABLE 1. SAMPLE OF RELEVANT PROJECTS PERFORMED BY IITRI

Client	Spectrum Management / Frequency Coordination Support Provided
US National Telecommunications and Information Administration (NTIA)	• Provided over 30 years of support • Developed nationally-approved software systems • Developed national single repository of over six million frequency assignment records • Developed nationally approved licensing, frequency assignment, type approval and engineering software • Provided advice and guidance on spectrum reallocation and migration and development of national-level positions for bi-lateral and multi-national spectrum negotiations

	• Participated in national and international standards committees developing wireless standards • Developed and implemented a strategy for the licensing and type approval of new classes of telecommunications devices
Nortel and Lucent	• Provided consultation on the licensing and channelization schemes for wireless local loop (WLL) system in Mexico • Performed studies and measurements at the request of COFETEL of impact to/from WLL system and US systems
Joint Spectrum Center	• Provided over 40 years of support • Developed and maintained database systems of all DoD frequency assignments worldwide • Developed automated equipment characteristics and space systems databases • Developed automated spectrum management systems for tactical frequency coordination and frequency deconfliction • Developed web-based frequency assignment database system • Designed, procured, and installed spectrum monitoring systems nationally and internationally • Interfaced with US national government on matters of interference resolution, band re-planning, and development of high technology systems such as software programmable radios • Conducted electromagnetic interference resolution of US government systems • Participated as members of multiple International Telecommunications Union working groups
Office of Spectrum Analysis and Management	• Conduct architectural studies of next-generation US licensing and frequency coordination procedures and software • Conduct studies of the impact of software programmable radios on current spectrum management policies and procedures • Conduct studies of high technology developments such as ultra-wide band radar, G3 cellular systems and HDTV on US regulatory policies • Developed US strategic spectrum plan
South Africa - SATRA	• Conducted band re-planning and migration analysis • Provided consultation on licensing of microwave, PCS, cellular, and TDMA systems • Provided consultation on national-level data bases • Provided consultation on frequency assignment, frequency coordination • Provided consultation on WRC and CEPT recommendations • Provided consultation on spectrum enforcement via spectrum monitoring and direction-finding • Assisted in the preparation and reconciliation of standards models based on commercial, national, military, association, and international standards.
Mexico - Comission Federale de Telecommunicaciones (COFETEL)	• Advisors to COFETEL on all areas of spectrum regulation • Adoption of IITRI's FACET software as the nationally approved tool for frequency coordination, assignment and system engineering • Advice and guidance on national-level frequency assignment data bases

As a part of IITRI's extensive experience, we have developed and maintained a wide range of frequency assignment and related databases. IITRI developed the Frequency Assignment Resources Record System (FRRS) which is the DoD distributed database system that maintains all of the permanent DoD frequency assignments worldwide. To supplement the FRRS, IITRI also developed the Background Environment Information (BEI) Database, which is a compilation of all known (non-DoD) frequency assignment databases worldwide. The BEI Database includes the US Government Master File (GMF), FCC database, International Frequency List (IFL), Canadian frequency assignments, NATO's Master Radio Frequency List (MRFL), and the National Research Council's radio astronomy frequency usage. A sample of some of the IITRI developed database systems is shown in Table 2.

TABLE 2. SAMPLE OF RELEVANT DATABASES DEVELOPED BY IITRI

Database Name	Application	Environment
LARGE DATABASE SYSTEMS		
FRRS / BEI	Frequency Assignment	Adabas/VMS
EC/S	Equipment Characteristics	Adabas/VMS, FoxPro/ Windows
TACDB	Platform Configurations/Equipment Inventories	Adabas/VMS
SPECTRUM XXI	Frequency Assignment, EMC Analysis, Spectrum Management	Oracle/Windows FoxPro/Windows
SMALL DATABASE SYSTEMS		
JSMS	Frequency Assignment, Spectrum Certification, EMC Analysis	FoxPro/ Windows
FACET	Frequency Assignment, EMC Analysis	FoxPro/ Windows
SEER	Interference Prediction and Resolution	Oracle/Unix Oracle/ Windows
JSIR	Spectrum Interference Reporting / Resolution	FoxPro/DOS
JOERAD	Ordnance Susceptibility / Interference Resolution	Access/Windows
NATO TACAN	Frequency Assignment	FoxPro/DOS
FAS-HF	Frequency Assignment	FoxPro/DOS
AFES	Frequency Assignment, EMC Analysis	Oracle/Unix
JDAWS	Web-based Frequency Assignment, Equipment Characteristics, Satellite Orbital Characteristics, Interference Reports	Oracle/Windows
MSE/NPT	Spectrum Management	Ingres/Unix
AGAFES	Frequency Assignment, EMC Analysis	Ingres/Unix

Because of IITRI's expertise in spectrum management, we have supported the American Hospital Association (AHA) Medical Telemetry Task Force with recommendations on spectrum usage and electromagnetic compatibility (EMC) issues. IITRI is also a member of Association for the Advancement of Medical Instrumentation (AAMI) and has presented technical papers on medical EMC issues of wireless medical telemetry systems at AAMI symposiums.

WMTS REQUIRED FREQUENCY COORDINATOR EXPERIENCE

Four specific tasks that IITRI envisions a WMTS Frequency Coordinator would perform are outlined in Attachment 3 to this submission. IITRI's unique qualifications to perform these four tasks are described below.

WMTS Frequency Assignment Database Development – In addition to IITRI's extensive experience developing and maintaining both large-and small-scale frequency assignment databases outlined above, IITRI has developed several automated database systems that support spectrum engineering. These include the Joint Spectrum Management System (JSMS) and the Frequency Assignment and Certification (FACET) database systems. These PC-based database systems include software tools to support operational planning as well as real-time management of the radio frequency spectrum

with emphasis on assigning compatible frequencies and performing spectrum-engineering tasks. In order to reduce WMTS Frequency Coordinator contract costs, IITRI would tailor its FACET database system for use as the master WMTS Frequency Assignment Database. The spectrum engineering tools already embedded in FACET would provide the capability to predict the EMC of new WMTS frequency assignments.

WMTS Frequency Assignment Web Page Development – In order to provide easy access to WMTS frequency assignment data, IITRI proposes that the WMTS Frequency Assignment Database be accessed via the Internet. IITRI has the needed experience in developing web interfaces to frequency assignment databases. We have successfully developed and now maintain the JSC Data Access Web Server (JDAWS), which provides web access to five separate DoD databases, including the DoD Frequency Resources Record System (FRRS). IITRI will use this same technology to develop an access capability to the WMTS Frequency Assignment Database.

WMTS Frequency Coordination – The primary duties of the WMTS Frequency Coordinator will be to: 1) maintain the WMTS Frequency Assignment Database, 2) maintaining a background environment frequency assignment database, 3) performing technical review of all new frequency assignments to ensure interference-free operation of medical telemetry systems, and 4) provide technical assistance in coordinating with other spectrum users. IITRI has extensive experience in all these functions. We have successfully provided these same areas of technical support to the DoD as engineering support services contractor for the ECAC and the JSC during the past 39 years. Because of our proven expertise in this area, IITRI is now under contract to provide similar frequency coordination support the South African and Mexican governments. IITRI's extensive experience as a frequency coordinator, along with our experience in providing a technical and administrative interface with other spectrum users, will be used to support the FCC and the medical community.

IITRI has no hardware-related production or sales capability for wireless medical telemetry, or any other spectrum-dependent systems. Therefore we have absolute objectivity in the frequency coordination of wireless medical telemetry systems that will be used in the WMTS.

Software Assurance – Part of the duties of the WMTS Frequency Coordinator will be to ensure that all software capabilities developed for the WMTS Frequency Assignment Database and Medical Telemetry Frequency Assignment Web Page are maintained for optimal operation. These software systems are comprised of database structures, data conversion and maintenance applications, and data retrieval and output applications. As outline above, IITRI has extensive experience both in the development and maintenance of these types of software systems. Our organization is dedicated to meeting the highest standards for software configuration management. IITRI's software engineering processes have been developed to meet the requirements of the Software Engineering Institute (SEI) Capability Maturity Model (CMM).

DRAFT

Wireless Medical Telemetry Service Frequency Coordinator

Statement of Work

BACKGROUND

The medical community is becoming increasingly dependent on wireless telemetry for monitoring patient vital signs. It is critical that these biomedical telemetry systems operate effectively in their intended hospital environments. External conditions such as radio frequency interference and electrical power abnormalities can cause this equipment to malfunction. This malfunctioning can be subtle but the effects can sometimes be life-threatening.

The Federal Communications Commission (FCC) and the Food and Drug Administration (FDA) have issued health advisories about interference problems; but, it is the medical community's responsibility to solve these problems. One solution being implemented is to move these systems to a frequency band under the Wireless Medical Telemetry Service (WMTS). This migration would not totally eliminate interference problems, but it would allow them to be more effectively managed. An integral part of this solution includes establishing a centralized frequency coordinator. A WMTS Frequency Coordinator will oversee and manage medical telemetry spectrum usage to ensure interference-free operation and electromagnetic compatibility (EMC). Other spectrum user groups; such as the Department of Defense (DoD), the Federal Aviation Administration (FAA), and the cellular telephone community; have provided these spectrum management services for some time. To date, the medical community has relied on equipment manufacturers and individual hospital biomedical engineers to manage their spectrum usage at the local level. This approach has not proven to be as efficient or effective as having a single frequency coordinator oversee spectrum management for the medical community at large.

This Statement of Work (SOW) outlines the specific tasks that a WMTS Frequency Coordinator would perform for the medical community.

PURPOSE

The purpose of this SOW is to define the technical support necessary to ensure effective use of the electromagnetic spectrum by the WMTS.

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FREQUENCY COORINATOR TECHNICAL SERVICES TASKS

Technical services will be provided by a single contractor with proven expertise in spectrum management and database design and maintenance. The contractor shall have experience both as a frequency coordinator and in developing and using EMC analytical tools to assess and resolve radio frequency interference.

The contractor shall develop and maintain the necessary information systems to effectively manage all WMTS frequency assignments. To accomplish this, the contractor shall undertake the following tasks.

Task 1 **WMTS Frequency Assignment Database Development** – A database system will be developed to maintain all frequency assignments used in the WMTS. This database will include all pertinent data elements necessary to provide effective frequency management. The data that will be stored in the database will include:

1) Equipment Identifier (Manufacturer and model number)
2) Legal name of authorized healthcare provider
3) Location of transmitter (coordinates, street address, building)
4) Point of Contact for the authorized health care provider
5) Number of transmitters in use at facility at time of registration
6) Total Frequency Range of equipment
7) Assigned frequencies
8) Modulation scheme
9) Emission bandwidth (occupied bandwidth of transmitted waveform)
10) Effective radiated power
11) Equipment susceptibility (as a minimum, statement of compliance with established standards)

In addition to data on medical telemetry systems, a separate database will store and maintain current data on spectrum usage external to medical facilities where wireless medical telemetry is used. This background environment database will include all relevant frequency assignments maintained by the Federal Communications Commission (FCC). These background environment frequency assignments will be used in determining the EMC of the medical telemetry systems with the civil environment external to the hospitals.

The master database of WMTS frequency assignments will be developed to run on a standard PC. A copy of the master database will be maintained on a PC Web server to provide online Internet access to the data for viewing. The master database will also include analytical tools that will use the data to perform EMC analyses. These analytical tools will be able to predict when a new frequency assignment will cause or receive interference to/from other, already assigned, spectrum users.

Task 2 **WMTS Frequency Assignment Web Page Development** – A Web site will be developed for hospitals and other interested parties to access the WMTS frequency assignment data. Its purpose will be to provide an easy-to-use interface between the medical community and the WMTS Frequency Assignment Database (Task 1). This Web site will be developed for operation on a PC Web Server and will provide database query screens so that users can view existing medical telemetry frequency assignments and request new interference-free frequency assignments. Additional information on medical telemetry EMC issues will be available on the Web site. This additional information can be helpful to users in selecting interference-free frequency assignments. E-mail access to the WMTS Frequency Coordinator will also be provided if users need assistance.

Task 3 **WMTS Frequency Coordination** – A Frequency Coordinator will oversee all aspects of the WMTS Frequency Coordination Program. The duties of the Frequency Coordinator will include:

1. Maintaining the WMTS Frequency Assignment Database,
2. Maintaining a background environment frequency assignment database on other spectrum users external to the hospitals,
3. Assist in selecting interference-free frequency assignments for medical telemetry systems, and
4. Providing technical assistance to hospitals and equipment manufactures on EMC matters.

To ensure effective spectrum management, the Frequency Coordinator will review all new frequencies made for the WMTS. These new frequencies will be reviewed for possible interference problems. This review will include an analysis of possible interference to/from both existing internal hospital equipment and systems external to the hospital. EMC analytical models integrated with the WMTS Frequency Assignment Database will be used to quickly assess the interference potential of new frequency assignments. When a potential for interference is found, the submitting user will be notified and an alternate interference-free frequency will be recommended. When new frequency assignments require coordination with spectrum users external to the medical facility, the Frequency Coordinator will initiate that coordination. The Frequency Coordinator will notify the WMTS frequency user of potential conflicts with external spectrum uses.

Task 4 **Software Assurance** – All software capabilities developed for the WMTS Frequency Assignment Database and Medical Telemetry Frequency Assignment Web Page will be maintained for optimal and operation. These

software systems are comprised of database structures, data conversion and maintenance applications, and data retrieval and output applications. Software assurance activities include corrective and adaptive maintenance, changing software based on external requirements, correcting shortcomings in the software, and upgrading documentation to reflect changes to the software. Established configuration management procedures will be closely followed to monitor the necessary changes to the systems during all phases of software assurance.