

WTB-16-290

Federal Communications
Commission

AUG 21 2019

Office of the Secretary

From: John A. Dooley [<mailto:john.dooley@jarvinian.com>]
Sent: Wednesday, April 13, 2016 12:09 PM
To: Brian Regan <Brian.Regan@fcc.gov>
Subject: 1.4 GHz WMTS

Brian,

Thank you for making time to meet with Philips Healthcare and us on Thursday. Attached is an electronic copy of the presentation we will be giving for your reference.

We will be taking a deep dive on the short-term / long-term implications to WMTS and Philips will speak to the deployment mechanics.

I'll look forward to chatting with you.

Best,
John

John A. Dooley

Jarvinian
One International Place, Suite 1400
Boston, MA 02110

631.682.2508
john.dooley@jarvinian.com

No. of Copies rec'd 0
List ABCDE



WMTS and 1.3 / 1.4 GHz Band Reformation

Discussion with the Federal Communications Commission and Philips Healthcare

April 2016



For expansion on this presentation, please contact:

John Dooley
Jarvinian Advisors

One International Place, Suite 1400
Boston, MA 02110

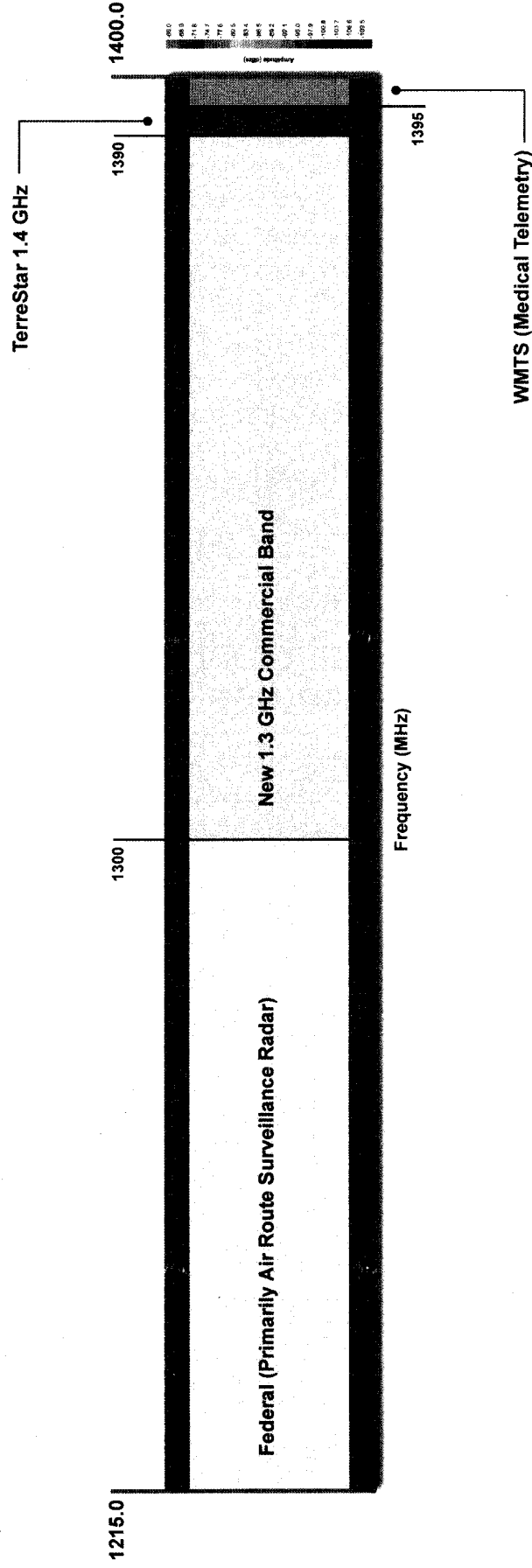
T: 631.682.2508
E: john.dooley@jarvinian.com

Contents

• Context of Band Reformation Proposal.....	4
• 1.4 GHz WMTS Capacity Concerns.....	8
• 1.4 GHz WMTS Interference Concerns.....	15
• Short-Term Proposal for WMTS Protection and Expansion.....	20
• Long-Term Proposal for WMTS Protection and Expansion.....	25
• Short-Term Plans and Regulatory Relief Requirements.....	30

Commercial Reallocation of 1.3 GHz Band

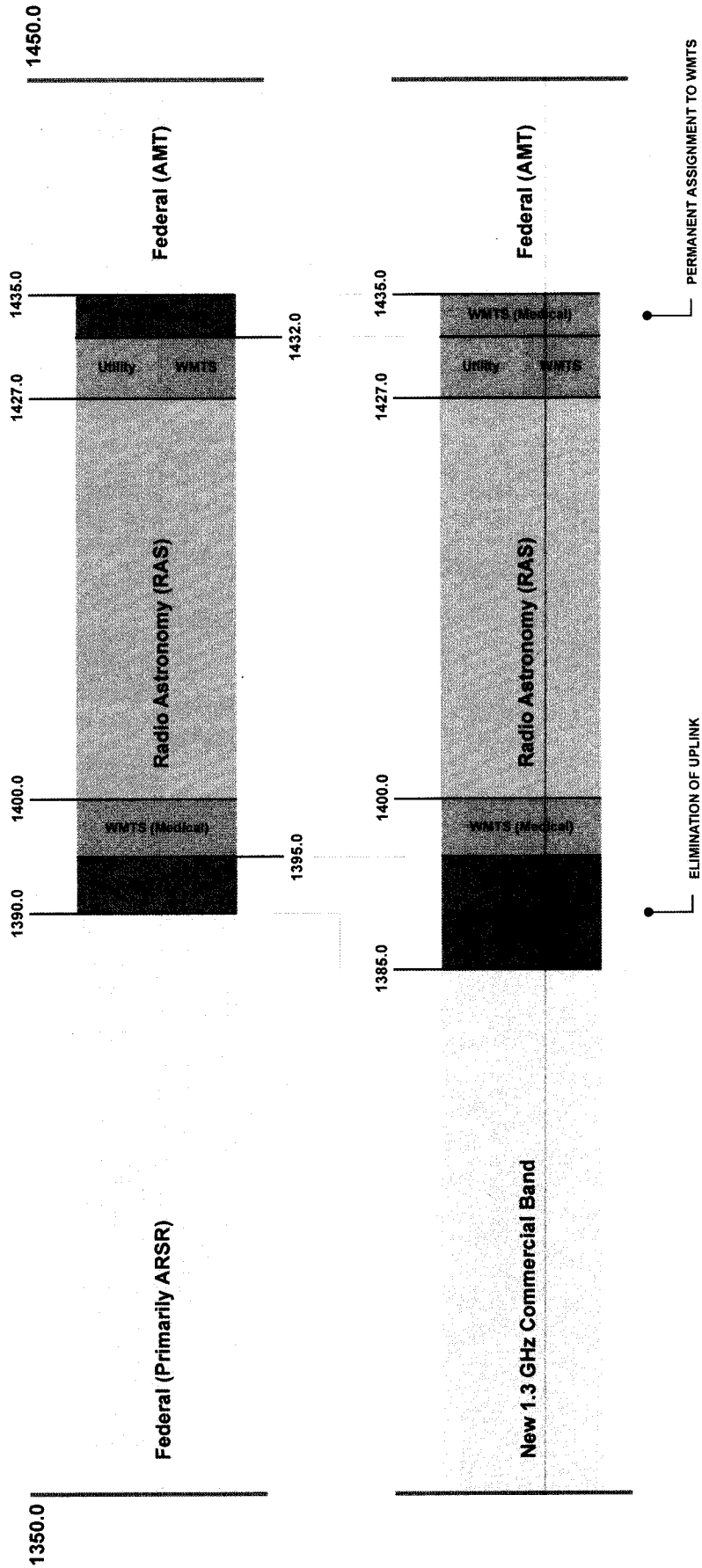
The National Telecommunications and Information Administration (NTIA) has been tasked with identifying Federal spectrum for reallocation to commercial service. A primary recommendation is the 1.3 GHz Federal radar band from 1300-1390 MHz. Significantly, the proposed reallocation represents the only parcel of size below 2700 MHz.¹



¹Fifth Interim Progress Report on the Ten Year Plan: http://www.ntia.doc.gov/files/ntia/publications/ntia_5th_interim_progress_report_on_ten_year_timetable_april_2015.pdf

Proposed 1.4 GHz Band Reformation

To achieve the maximum potential of new commercial 1.3 GHz spectrum, emissions rules associated with TerreStar's 1.4 GHz allocation will require modification. We believe that this represents a unique opportunity to reform both commercial and WMTS spectrum in ways that not only expand available resources, but also ensure long-term interference protection.



Key Elements of Proposed 1.4 GHz Band Reformation

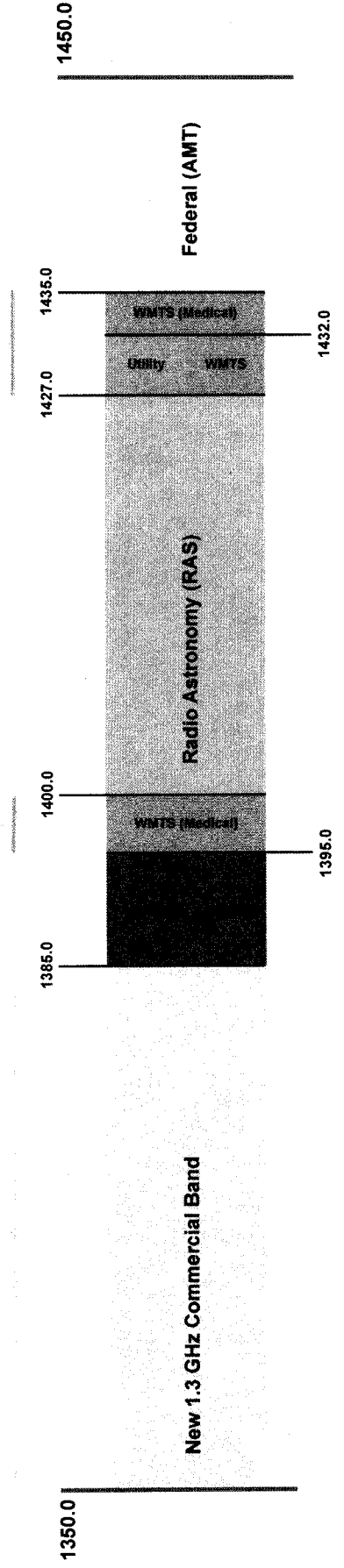
TerreStar views intelligent deployment and reformation of the 1.4 GHz band as key elements in the protection and expansion of adjacent band services. Reformation of the commercial 1.4 GHz band will (i) readily enable a larger 1.3 GHz commercial allocation, (ii) permanently protect and expand 1.4 GHz medical telemetry, and (iii) offer long-term security for uniquely sensitive Federal defense and scientific allocations.

Element I

Enable a Future 1.3 GHz Commercial Band

Element II

Protect and Expand 1.4 GHz Medical Telemetry



TerreStar's full band reformation overview may be found via:
http://fcc.jarvinian.com/TerreStar/TerreStar_FCC_032116.pdf

USER: FCC
PASS: ljarvinian16 (character and case sensitive)

1.4 GHz WMTS Capacity Concerns

Medical Telemetry Band Summary

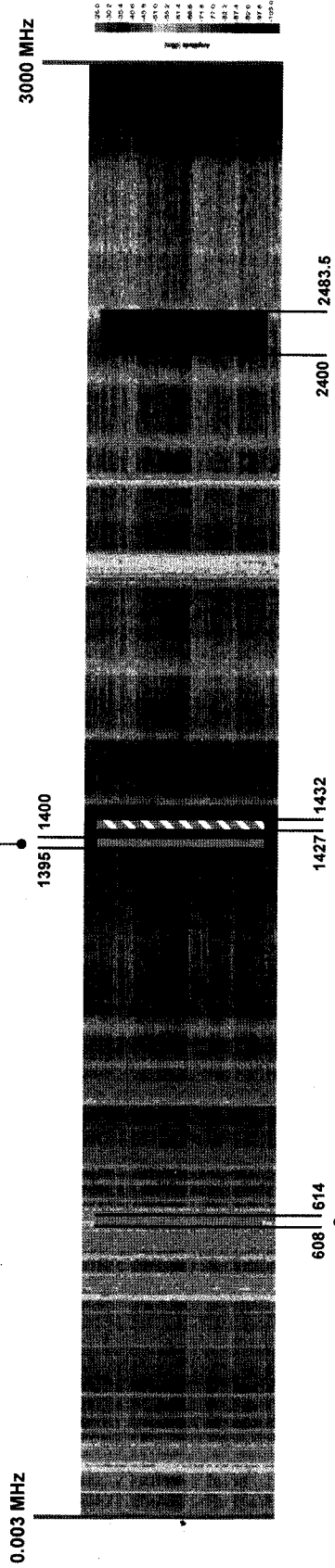
Though medical telemetry applications have access to three spectrum allocations, only the 1.4 GHz WMTS band represents an authorization suitable for high-priority patient monitoring capabilities. The 7.5 MHz of primary nationwide allocation (1395-1400 MHz, 1427-1429.5 or 1429-1431.5 MHz) is increasingly viewed as critical for applications not suited to coexistence with unlicensed services.

1.4 GHz WMTS

CONFIG: Primary Allocation 1395-1400 MHz
"Flip" Primary Status 1427-1432 MHz

CHALLENGE

Primary allocation insufficient for projected growth in utilization.
Limited room for new manufacturers migrating from increasingly compromised 600 MHz and 2.4 GHz bands.



600 MHz WMTS

CONFIG: 4 Channels from 608-614 MHz
Band Shared with Radio Astronomy

CHALLENGE

Small allocation with significant urban noise floor.
New unlicensed and commercial 600 MHz users represent uncertainty.

2.4 GHz ISM

CONFIG: Part 15 Emissions Rules
No Protection from Interference

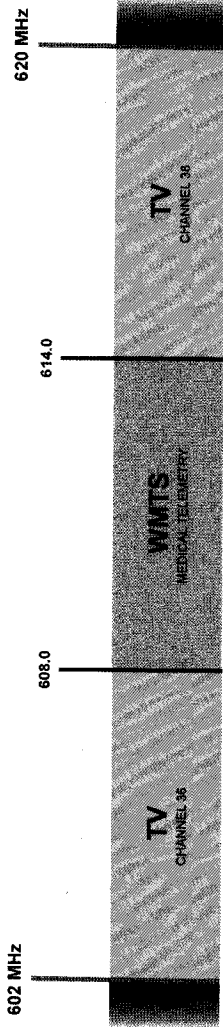
CHALLENGE

Long-term viability in question. Saturation of unlicensed 2.4 GHz band limits safety and efficacy of medical applications.

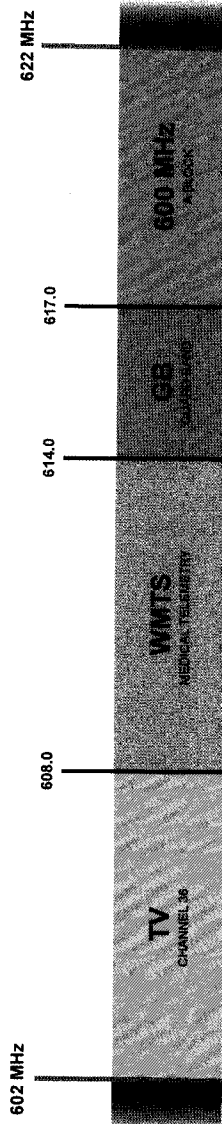
600 MHz Band

Significant WMTS applications have evolved on the 6 MHz of unused TV Channel 37. Shared with Radio Astronomy (RAS) and protected nationwide, 600 MHz has been a safe haven for medical telemetry. Today, introduction of commercial networks in adjacent spectrum and opening of unlicensed services in Channel 37 represent a significant interference threat.

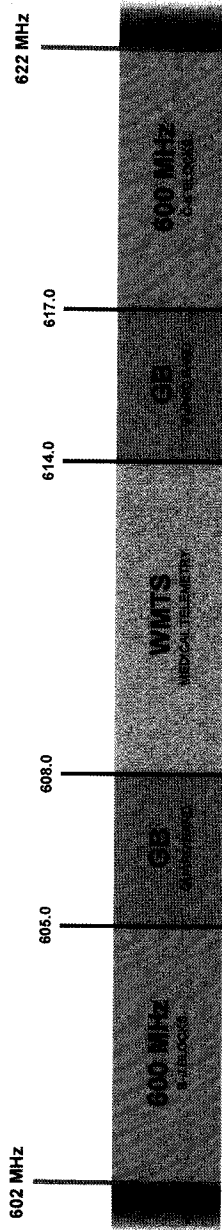
Clearing Scenarios Below 76 MHz



84 MHz Clearing Scenario

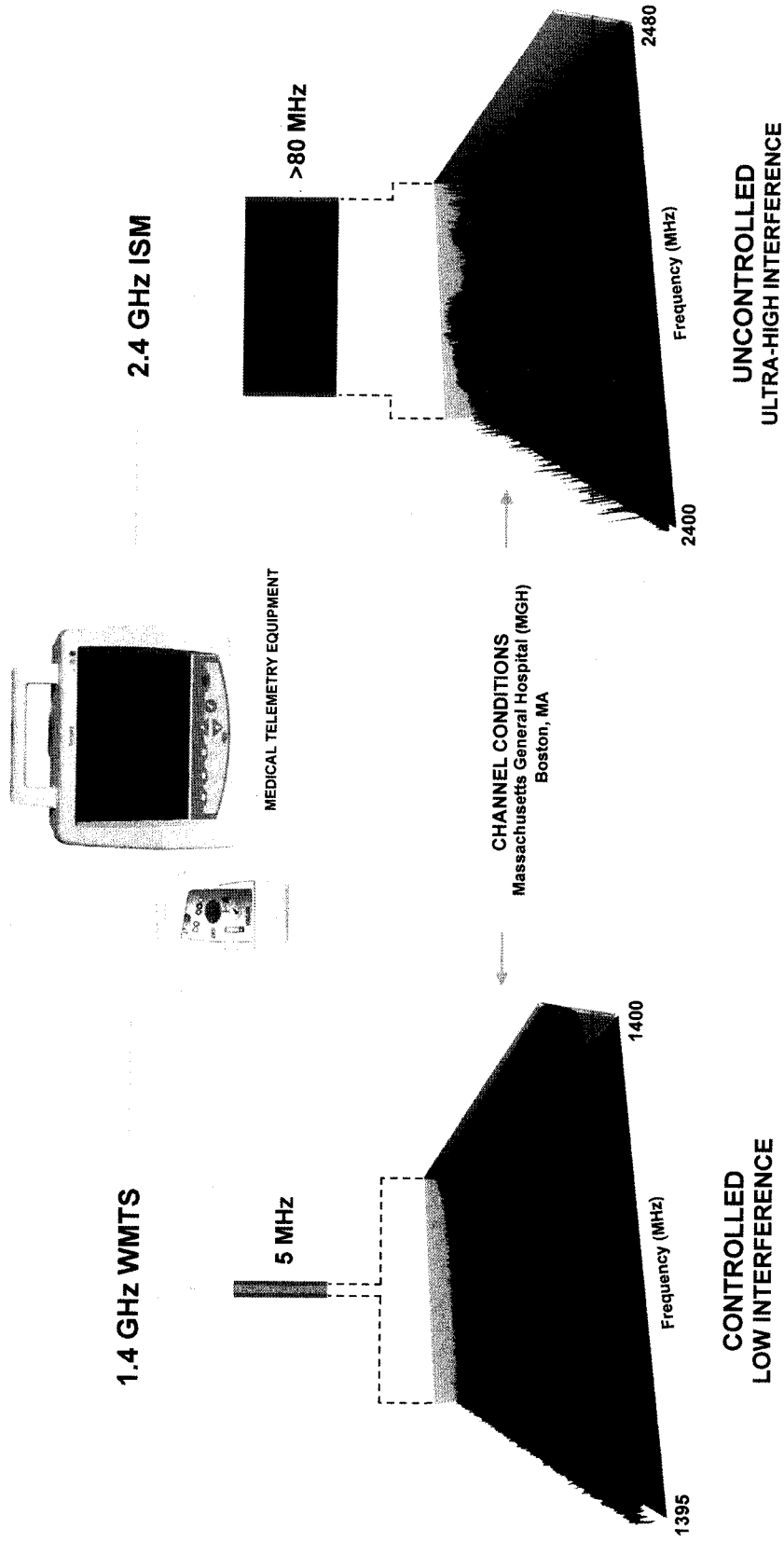


108 MHz - 144 MHz Clearing Scenarios



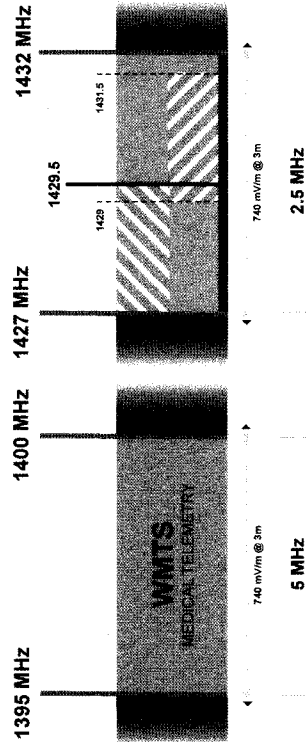
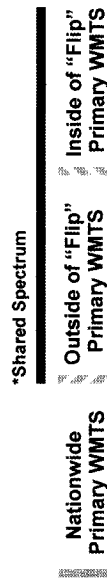
2.4 GHz Band

In the United States, many medical telemetry systems come with the option of either 1.4 GHz WMTS or 2.4 GHz ISM Band transceivers. While 2.4 GHz ISM offers many times the available bandwidth and an extremely low cost component ecosystem, the ultra-high interference levels seen in Part 15 spectrum compel a need for protected primary WMTS allocations.



1.4 GHz Band

In the 1.4 GHz band, medical telemetry applications are limited to just 5 MHz of nationwide primary allocation from 1395 - 1400 MHz. While an additional 2.5 MHz of "flip" spectrum is available for WMTS in the 1.4 GHz band, it is shared with high-power utility applications and has a complex geographically determined primary status.

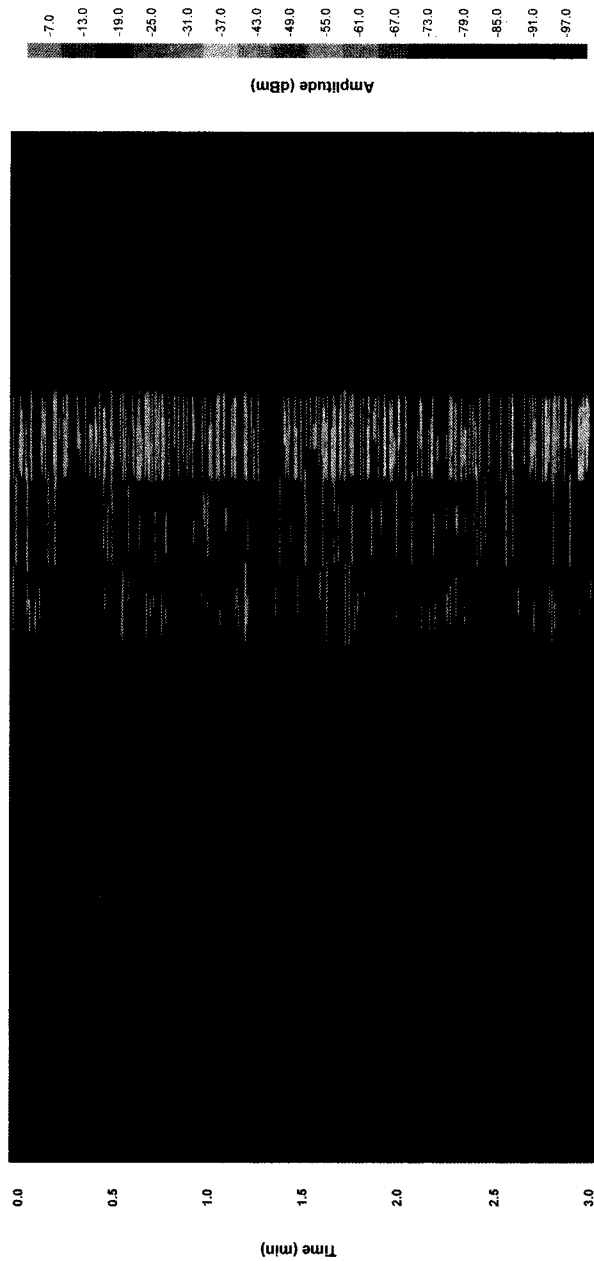
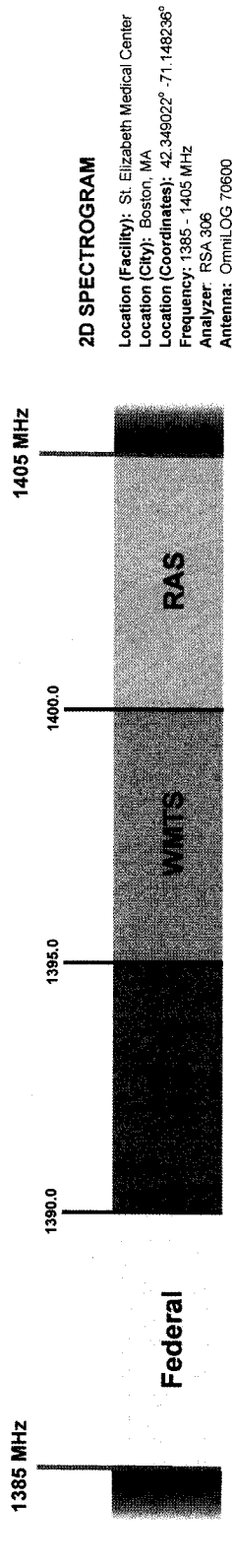


***1427-1432 MHz:** The channels in this spectrum band are shared by WMTS devices and non-WMTS devices such as utility telemetry devices. Generally, WMTS devices have primary status in the 1427-1429.5 MHz segment and non-WMTS devices have primary status in the 1429.5-1432 MHz segment, but there are seven geographical areas where WMTS and non-WMTS status is "flipped" and WMTS devices have primary status in the 1429-1431.5 MHz segment and non-WMTS devices have primary status in the other segments of the band:

1. Pittsburgh, PA
2. Washington, D.C.
3. Richmond/Norfolk, VA
4. Austin/Georgetown, TX
5. Battle Creek, MI
6. Detroit, MI
7. Spokane, WA

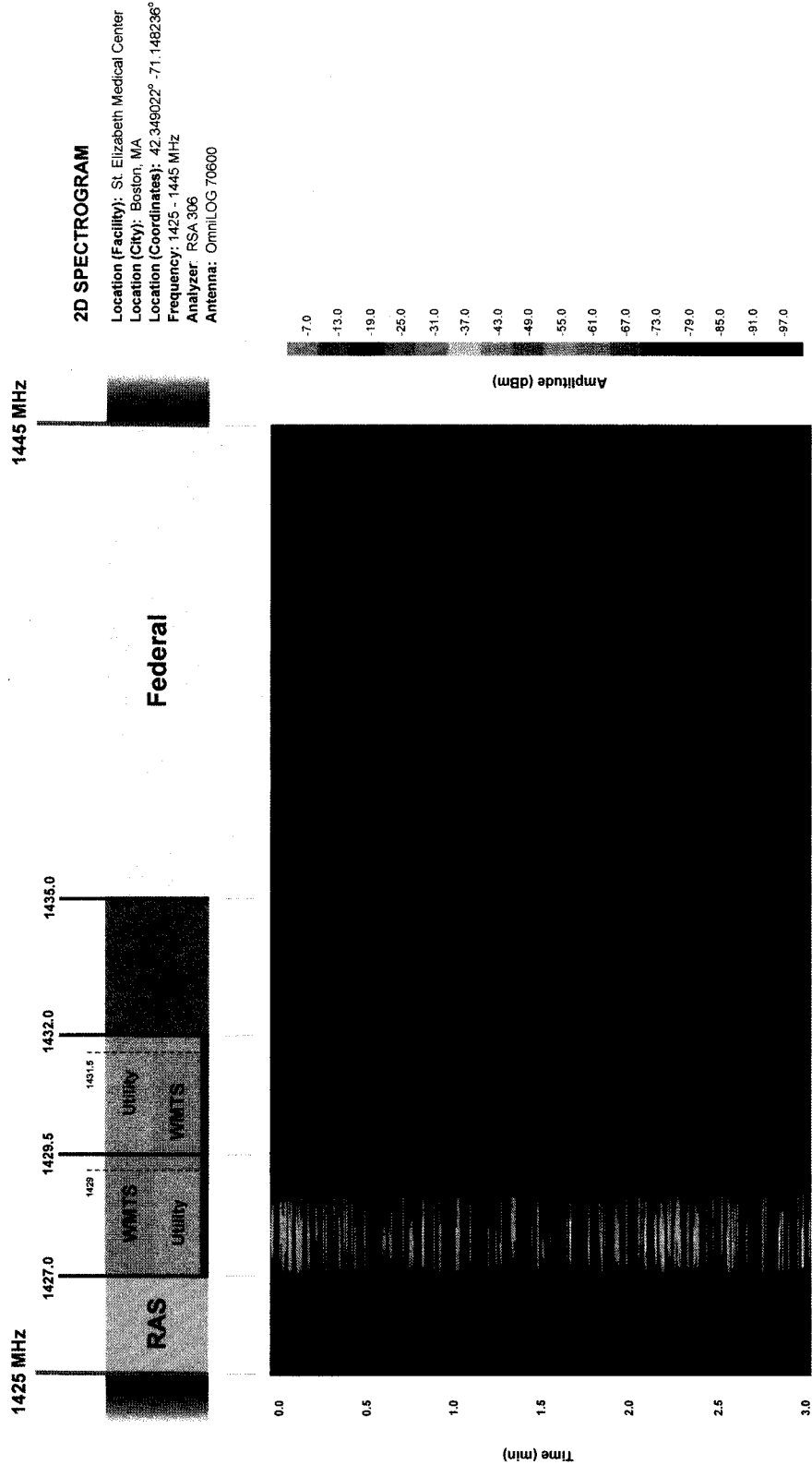
Spectrographic Overview of Lower 1.4 GHz Medical Telemetry

The spectrogram below depicts lower WMTS band activity in a typical Boston area hospital. Even low density medical facilities are near saturation on 1.4 GHz in their cardiac and pulmonary wards. A reformed TerreStar lower 1.4 GHz band will extend emissions rules currently in place to protect WMTS and act as a critical buffer between medical telemetry and a future 1.3 GHz commercial allocation.



Spectrographic Overview of Upper 1.4 GHz Medical Telemetry

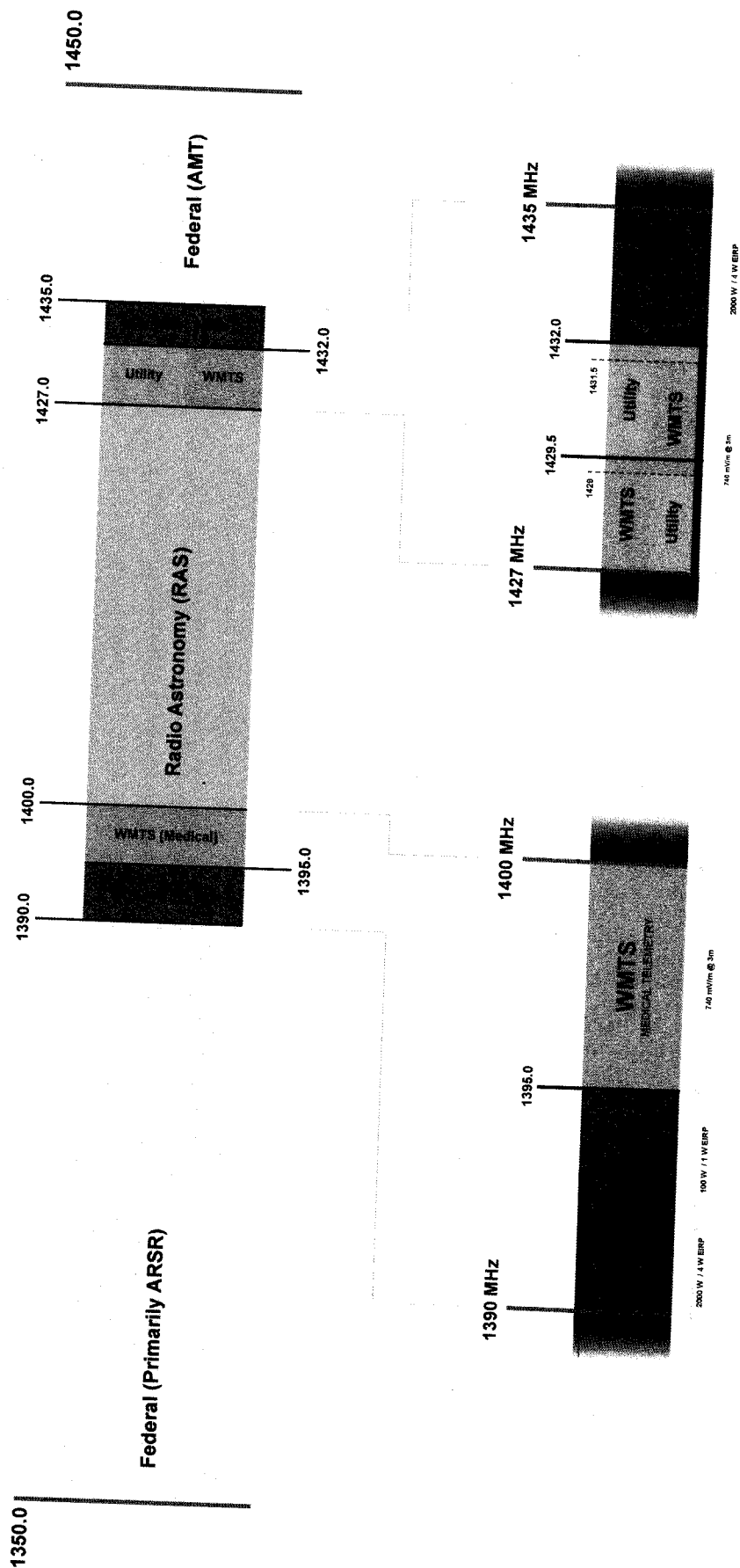
The spectrogram below depicts upper "flip band" WMTS activity in a typical Boston area hospital. As may be seen in the lower band study, traffic levels are nearing saturation even in facilities where both bands are occupied by systems from a single manufacturer. The addition of upper TerreStar 1.4 GHz spectrum will secure both overall capacity and the ability of new OEMs to utilize the band.



1.4 GHz WMTS Interference Concerns

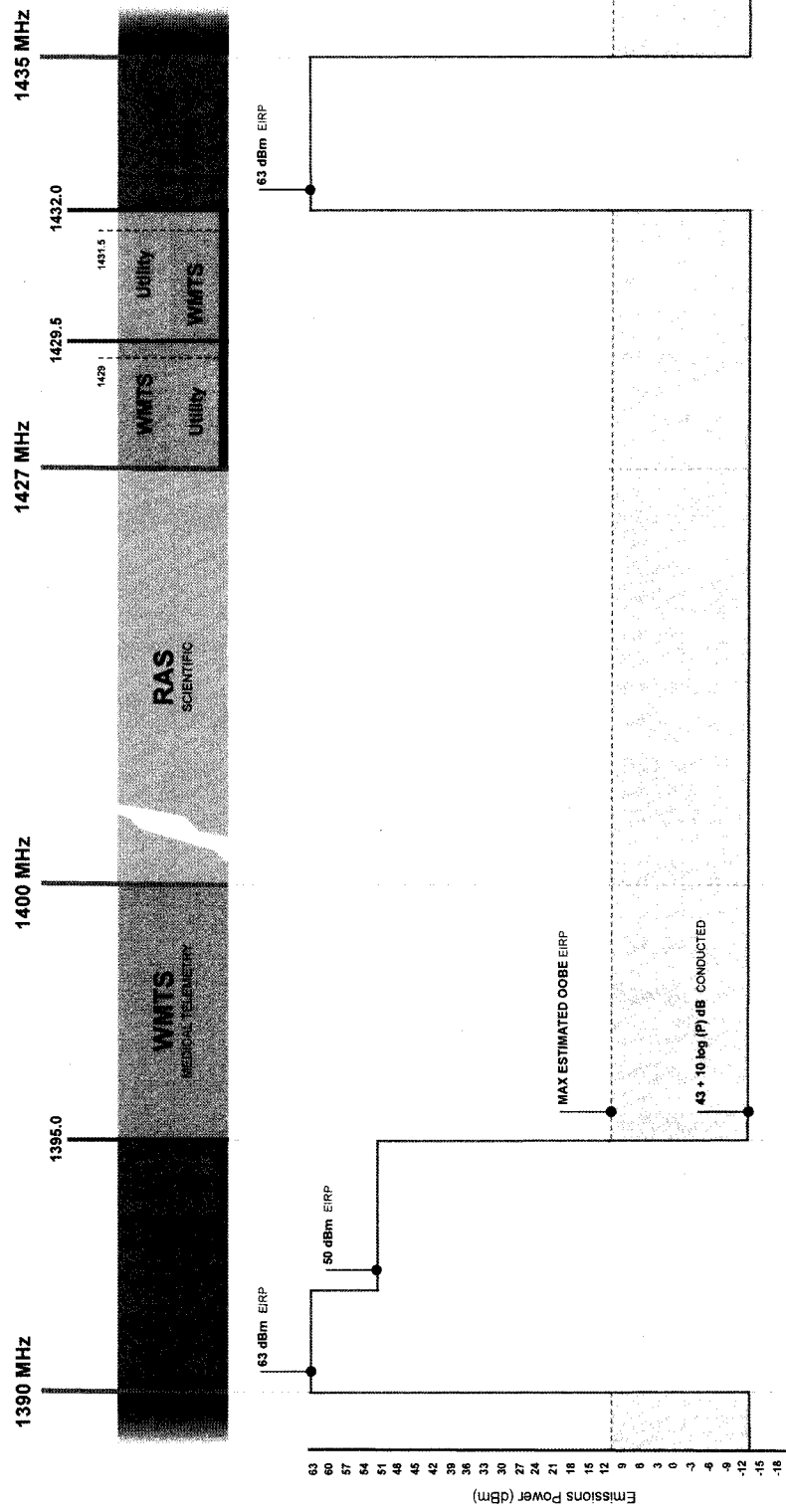
Current 1.4 GHz Commercial and WMTS Bands

The two commercial 1.4 GHz bands held by TerreStar and two primary WMTS 1.4 GHz bands available to the medical device community sit directly adjacent to one another. The unusual configuration of commercial band segments and available ecosystems at 1.4 GHz have resulted in applications that the WMTS community views as potential risks to patient safety, due to the possibility of future interference.



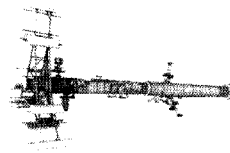
Detailed 1.4 GHz Emissions Limits

The TerreStar 1.4 GHz band is split into upper and lower segments. The lower segment is authorized for 100 – 2000 W EIRP base and 1 – 4 W EIRP mobile power, while the upper band is authorized for 2000 W EIRP base and 4 W mobile power. Both bands may be used for either uplink or downlink, with a minimal $43 + 10 \log (P)$ dB OBE limit applied to all configurations.

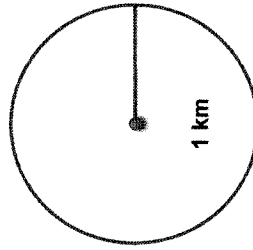
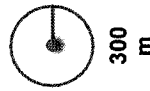


Interference Threats Associated with Uplink

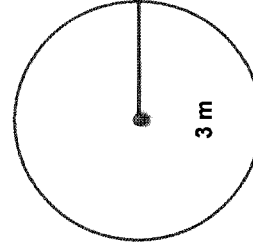
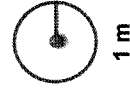
While base stations typically emit much higher fundamental emissions power than mobile devices, spatial separation and the ability to strongly attenuate Out of Band Emissions (OOBE) often makes base station operation a far less impactful adjacent band neighbor. For this reason, WMTS stakeholders have advocated strongly for “downlink only” authority in adjacent commercial allocations.



HIGH POWER BASE STATION



LOW POWER HANDSET



MODEL:	"ACROSS THE STREET"
OOBE POWER:	-16 dBm
ANT. GAIN (ABSOLUTE):	6 dB
WMTS ANT. GAIN:	3 dB
RECEIVED OOBE POWER (FREE SPACE):	-94.4 dBm (reference)
RECEIVED OOBE POWER (MED. CITY OKUMURA):	-123.5 dBm (conservative)

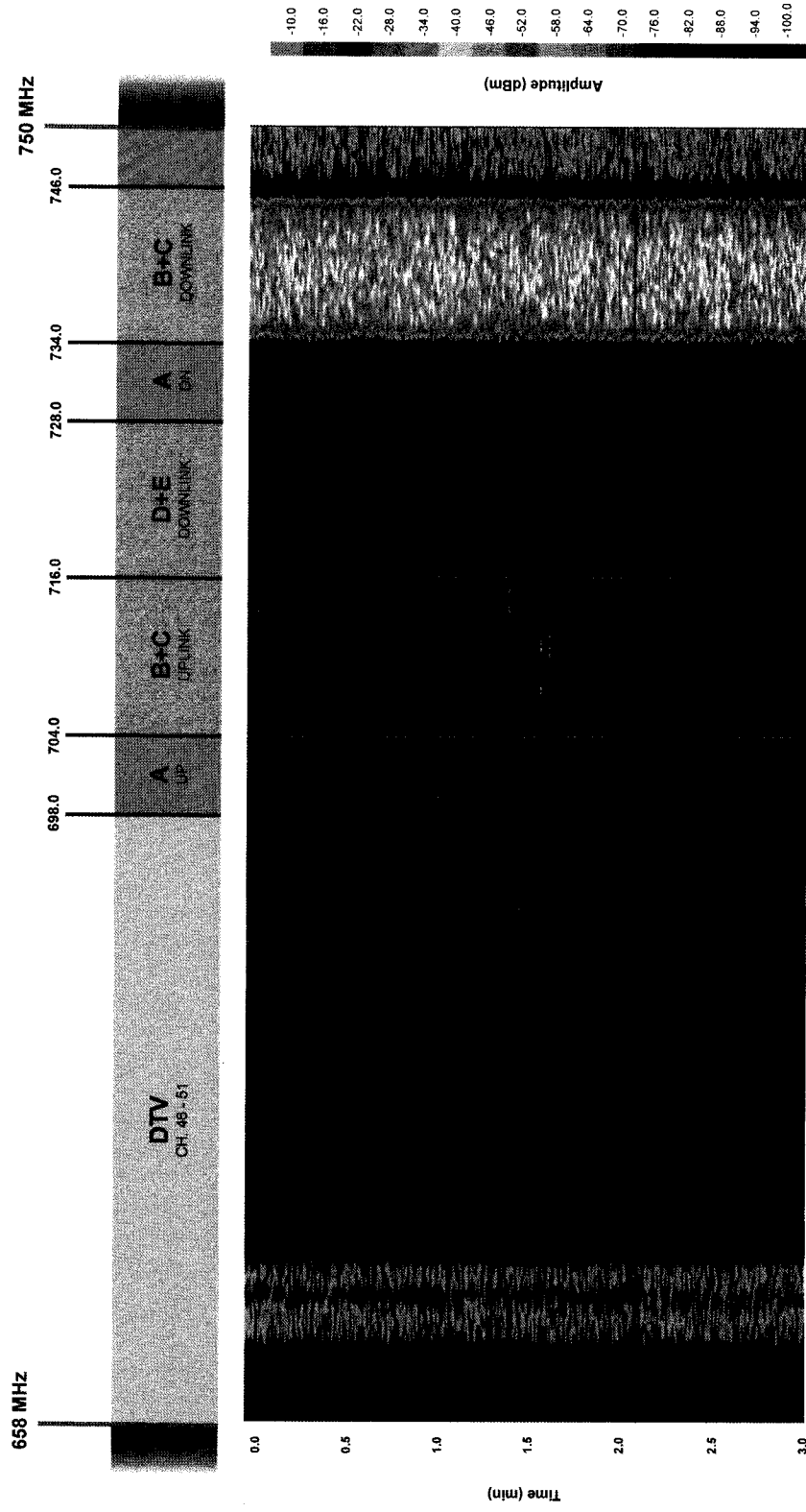
MODEL:	"NEIGHBORHOOD"
OOBE POWER:	-16 dBm
ANT. GAIN (ABSOLUTE):	6 dB
WMTS ANT. GAIN:	3 dB
RECEIVED OOBE POWER (FREE SPACE):	-102.4 dBm (reference)
RECEIVED OOBE POWER (MED. CITY OKUMURA):	-139.5 dBm (conservative)

MODEL:	"BEDSIDE"
OOBE POWER:	-13 dBm
ANT. GAIN (ABSOLUTE):	1 dB
WMTS ANT. GAIN:	3 dB
RECEIVED OOBE POWER (FREE SPACE):	-44.4 dBm (conservative)

MODEL:	"HOSPITAL"
OOBE POWER:	-13 dBm
ANT. GAIN (ABSOLUTE):	1 dB
WMTS ANT. GAIN:	3 dB
RECEIVED OOBE POWER (FREE SPACE):	-53.9 dBm (conservative)

Typical Spectra of Uplink Analog (700 MHz Lower B+C)

Using 700 MHz LTE systems as an analog, the emissions of typical mobile devices are observed generating significant adjacent band interference products. This is especially true over short ranges and in applications requiring high channel occupancy. Below, an iPhone 6 is measured from a 1 meter distance (bedside model) while conducting a Facetime call.

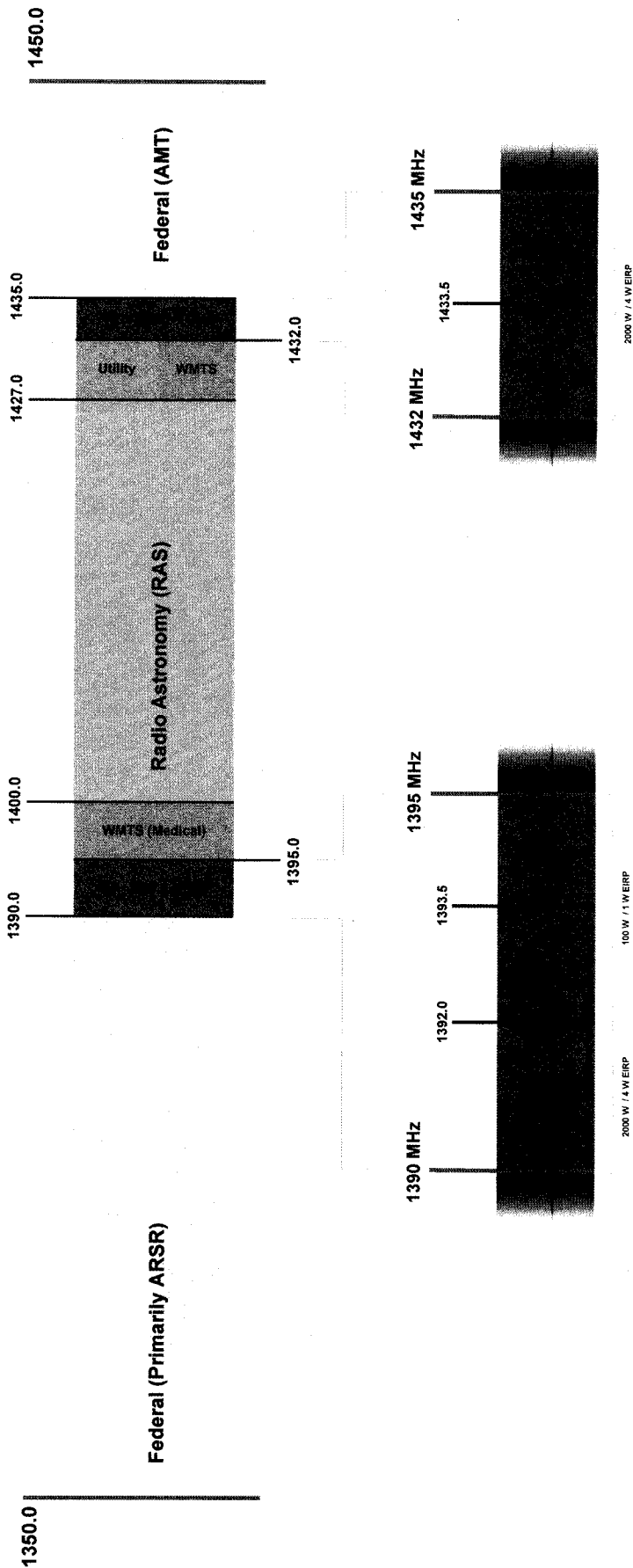




Short-Term Proposal for WMTS Protection and Expansion

Proposed Interim Band Utilization

Use of TerreStar 1.4 GHz spectrum in its existing configuration will meaningfully complicate both the development of a future 1.3 GHz commercial band and the prospects for permanent expansion of 1.4 GHz WMTS. Therefore, TerreStar proposes a utilization plan that (a) makes the upper 1.4 GHz band immediately available for medical telemetry and (b) leaves the lower 1.4 GHz band in temporary reserve.



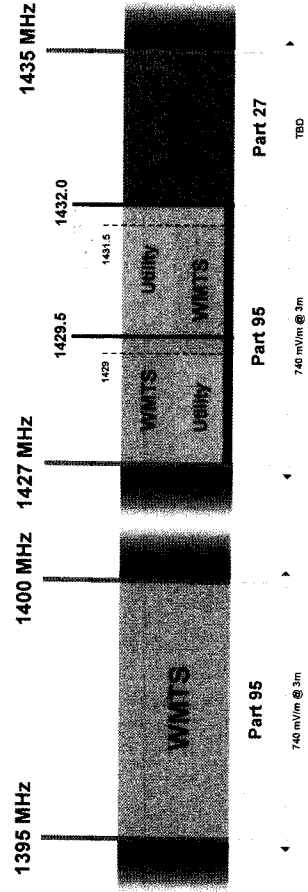
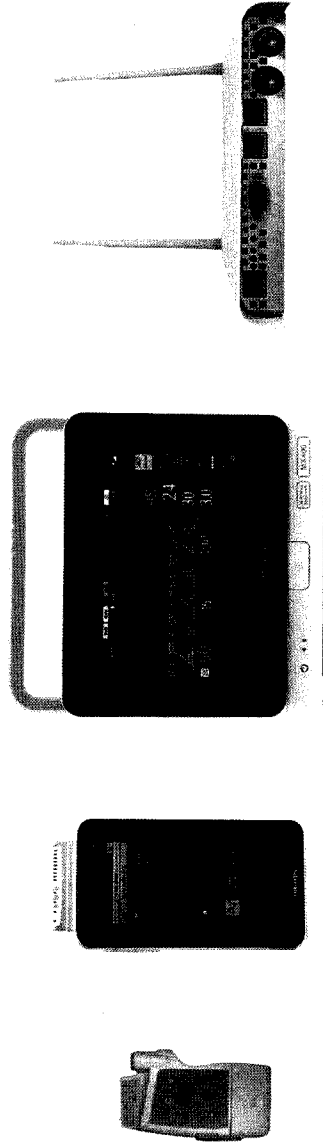
RESERVE FOR COMPATIBILITY WITH
1.3 GHz COMMERCIAL ALLOCATION

IMMEDIATE AVAILABILITY TO
WMTS COMMUNITY

Compatibility of Existing WMTS Hardware

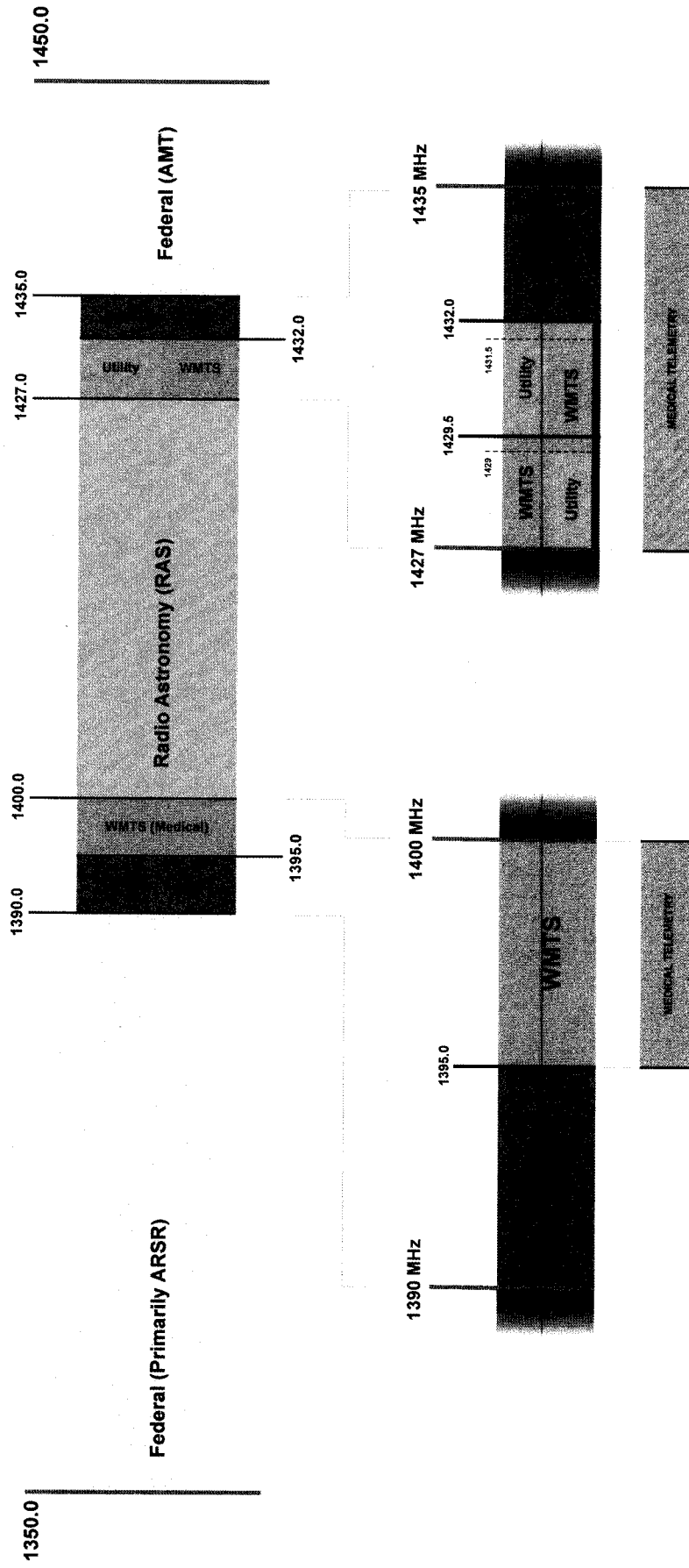
The immediate adjacency of commercial 1.4 GHz to WMTS permits many existing medical telemetry products to utilize the band with little or no hardware modification. While this reality underscores adjacent band interference concerns, it also opens the compelling possibility for effectively immediate use of the band by existing WMTS operators.

Existing Philips 1.4 GHz Intellivue Product Line



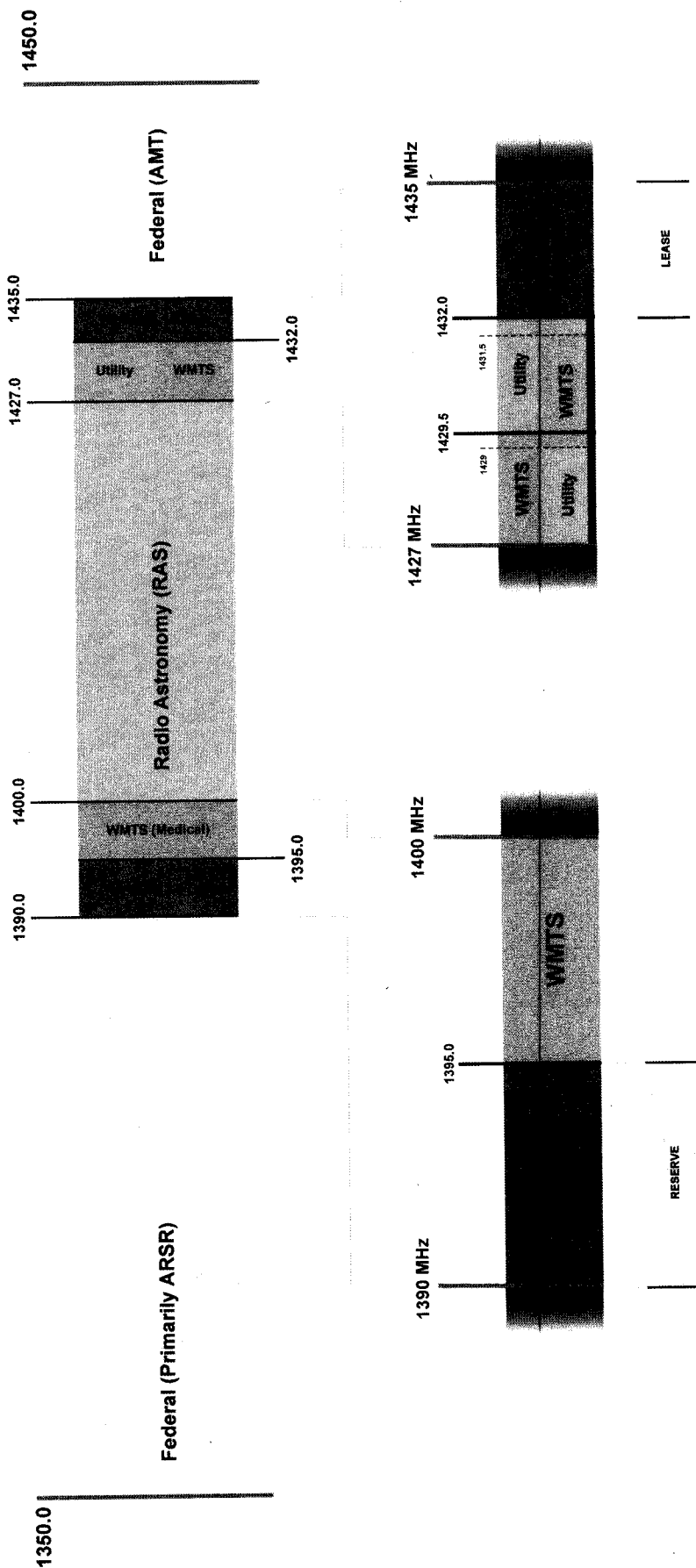
Interim Expansion of 1.4 GHz Medical Telemetry

Prior to reformation of the upper 1.4 GHz commercial band, TerreStar will make this spectrum available for medical telemetry applications. An additional 3 MHz will expand the existing 1.4 GHz WMTS footprint by 40% nationwide. This represents a significant increase in capacity at a time when migration from compromised 600 MHz and 2.4 GHz bands is set to accelerate.



Interim Protection of 1.4 GHz Medical Telemetry

Long-term WMTS protection can only come through reformation of emissions rules that restrict commercial spectrum to downlink, while applying more aggressive band edge attenuation limits. In the interim, lease of upper 1.4 GHz for medical telemetry and commercial reserve of lower 1.4 GHz may provide necessary assurance that expanding WMTS applications will remain safe.

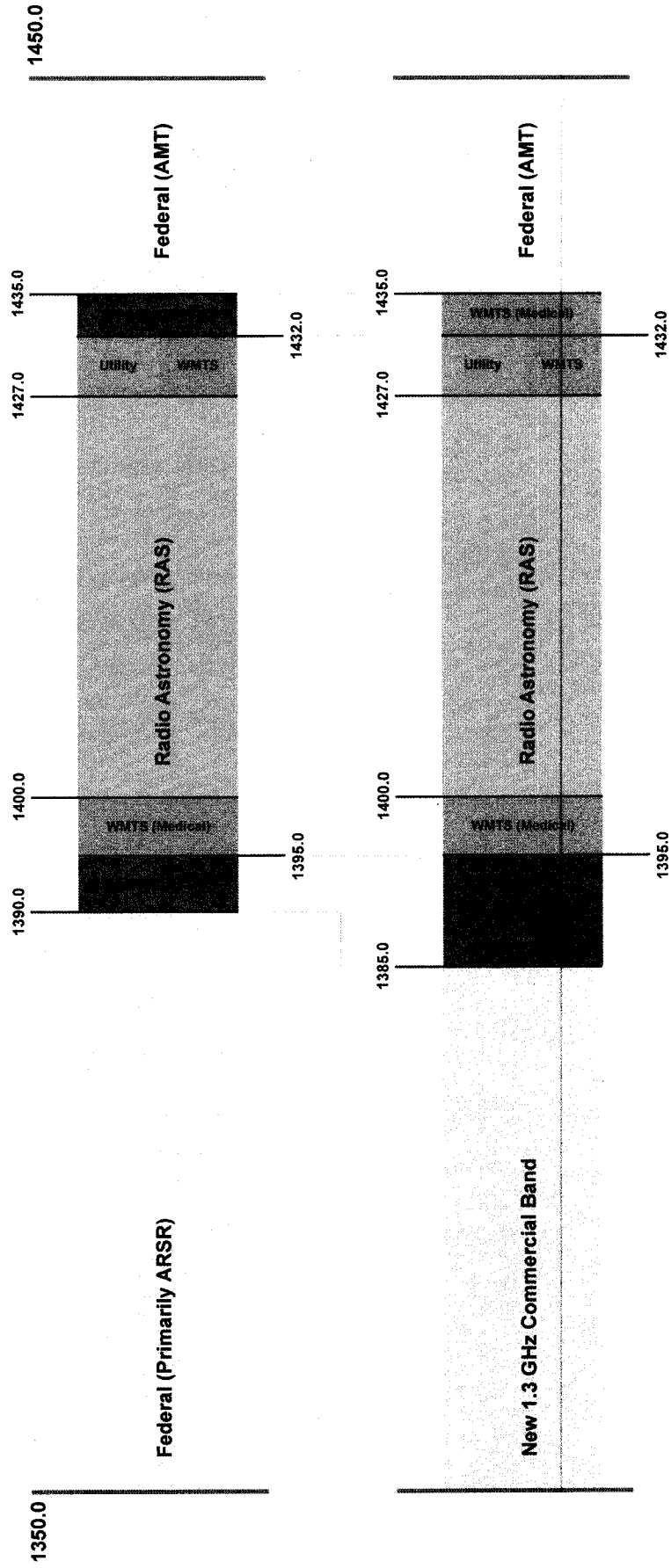




Long-Term Proposal for WMTS Protection and Expansion

Proposed Reformation of 1.4 GHz Commercial and WMTS Bands

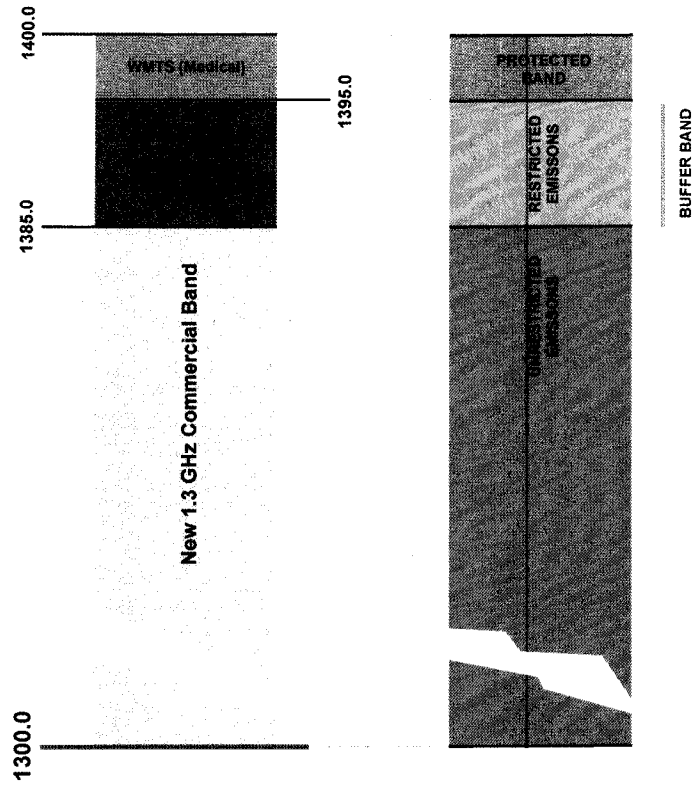
To achieve the maximum potential of new commercial 1.3 GHz spectrum, emissions rules associated with TerreStar's 1.4 GHz allocation will require modification. We believe that this represents a unique opportunity to reform both commercial and WMTS spectrum in ways that not only expand available resources, but also ensure long-term interference protection.



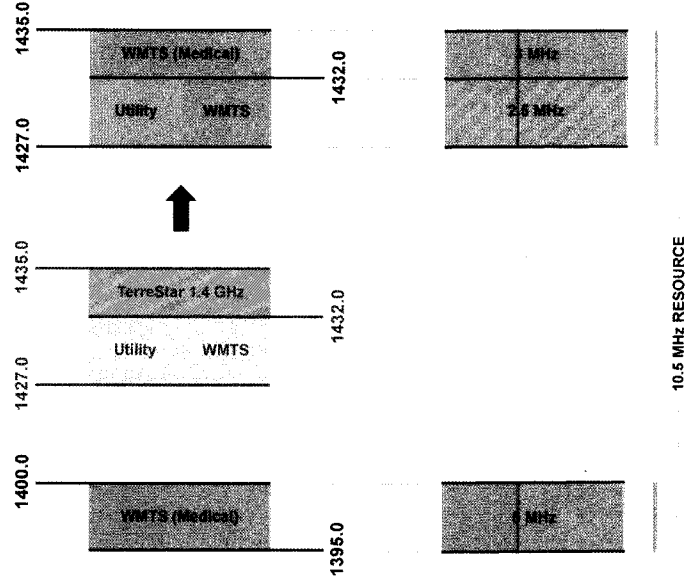
Permanent Protection and Expansion of 1.4 GHz WMTS Allocation

TerreStar supports an expanded 1.4 GHz band from 1385-1395 MHz, which will have special emissions rules designed to permanently protect WMTS services. In this way, the band may be regarded as an effective 10 MHz "buffer." Additionally, reallocation of 1432-1435 MHz will permanently expand spectrum available for WMTS applications on a nationwide basis.

Buffer Between WMTS and 1.3 GHz Commercial Band

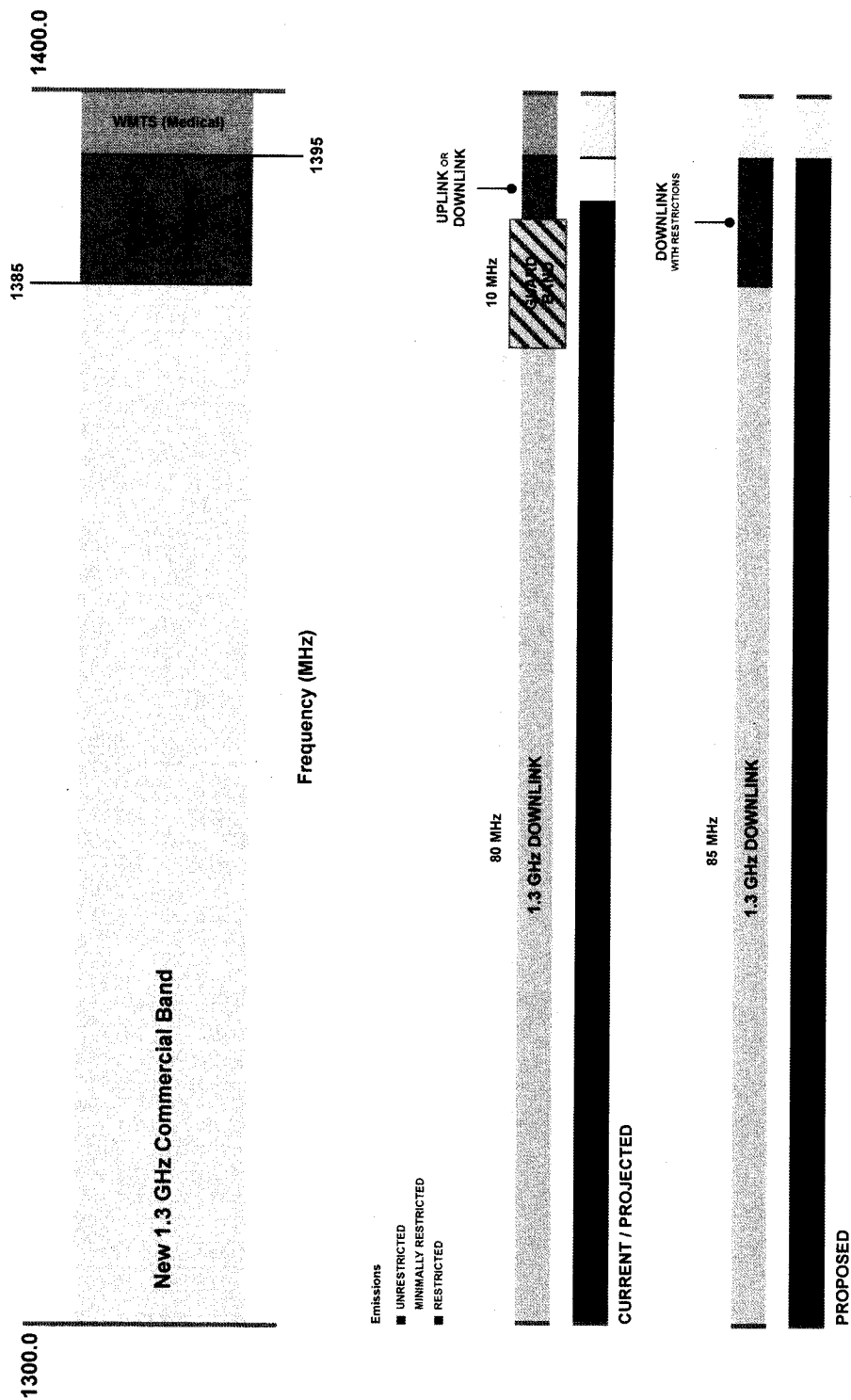


Permanent Expansion of WMTS Resource



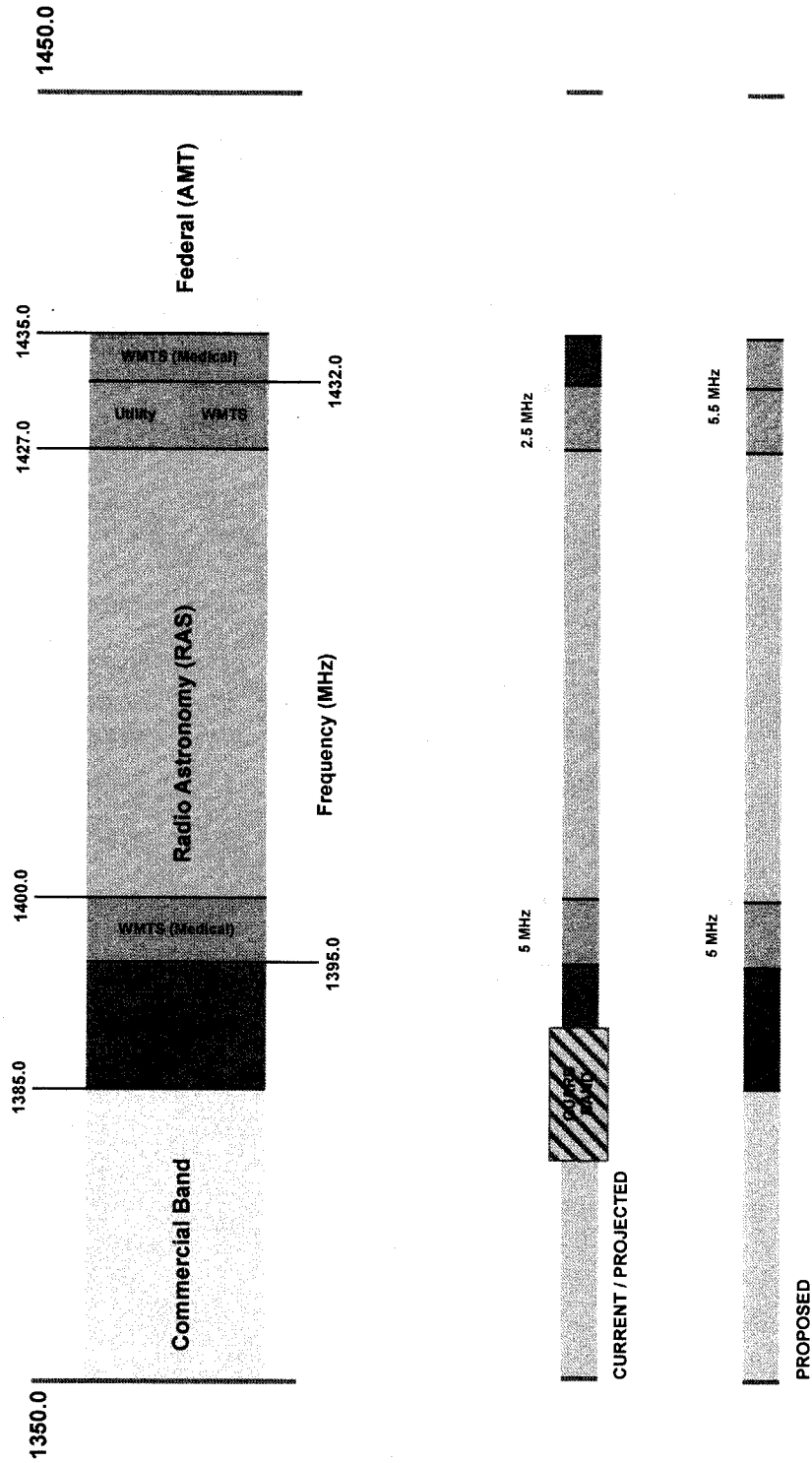
Protection of Lower 1.4 GHz WMTS Band

Conversion of TerreStar 1.4 GHz to “downlink only” will remove the threat of OOB from mobile devices to sensitive WMTS applications within healthcare facilities. Additionally, TerreStar supports expansion of OOB protection for WMTS from 1385-1395 MHz. In this way, the proposed band plan will create an effective “buffer” between new 1.3 GHz allocations and existing medical telemetry systems.



Expansion of Upper 1.4 GHz WMTS Band

Currently, WMTS applications may access only 7.5 MHz of primary allocation in the 1.4 GHz band. With increased utilization and continued migration from 600 MHz WMTS and 2.4 GHz ISM, the present resource is approaching exhaustion. The proposed band reformation will permanently expand the nationwide 1.4 GHz WMTS allocation by 3 MHz (40%).

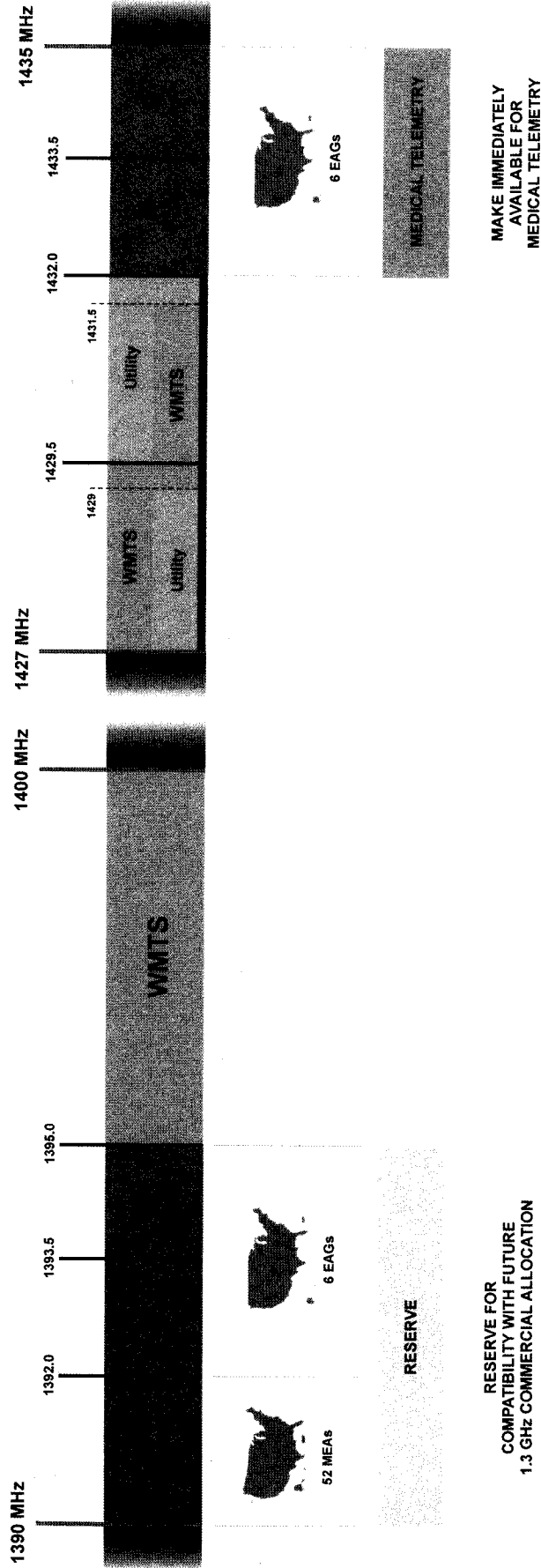




Short-Term Plans and Regulatory Relief Requirements

Required Regulatory Relief for Plan

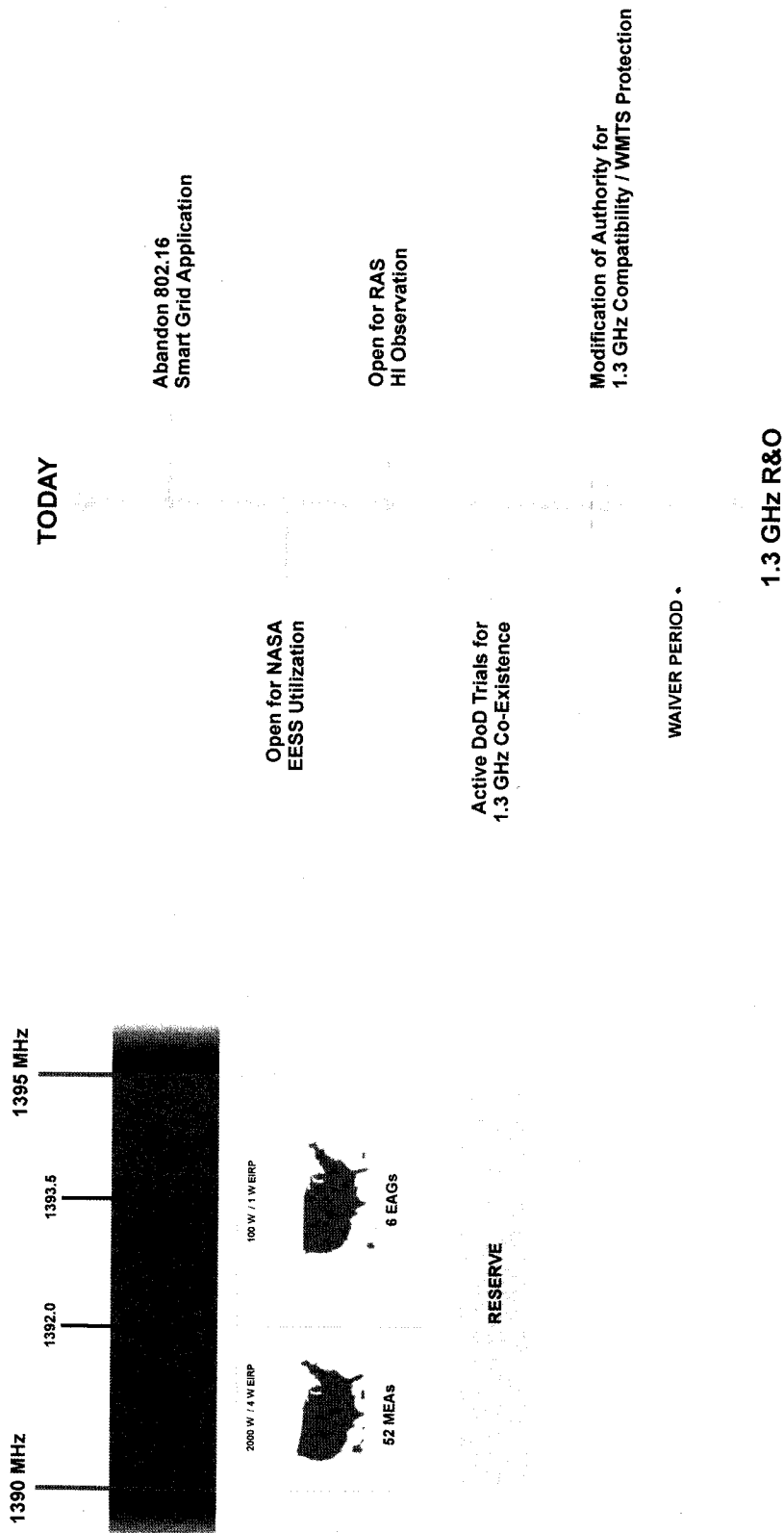
Compatibility between the upper TerreStar 1.4 GHz band and existing WMTS systems permits the commercial allocation from 1432-1435 MHz to immediately impact medical telemetry capacity. At the same time, incompatibility between the lower TerreStar 1.4 GHz band and projected band plans associated with commercial 1.3 GHz compel leaving that spectrum in temporary reserve.



SUBSTANTIAL SERVICE
WAIVER / CLARIFICATION
§ 27.13 (c)(d)

Proposed Timeline for Lower Band Segment

The WMTS community views existing WiMax applications for the lower band segment as an unacceptable risk to patient safety. In response, we propose abandonment of these applications and a substantial service waiver or extension until the band is configured for downlink operation with modified emissions rules. Significant interim utility may still be realized through nationwide Federal science and defense access to this band.



Proposed Timeline for Upper Band Segment

The compatibility of the upper band segment with existing 1.4 GHz WMTS systems provides a compelling means for rapid medical telemetry capacity expansion. Major OEMs have concluded that current Part 95 equipment will be able to access the 1432-1435 MHz band with minimal modification. We propose a brief waiver or extension period to permit (a) safe equipment development and (b) equipment certification (compliance with Part 27 rules) in support of a nationwide deployment.

