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March 24, 2014

Via Electronic Filing

Marlene H. Dortch, Secretary
Federal Communications Commission
445 Twelfth Street SW
Washington, DC 20554

Re: *Amendment of the Commission's Rules with Regard to Commercial Operations in the 1695-1710 MHz, 1755-1780 MHz, and 2155-2180 MHz Bands,* GN Docket No. 13-185; *Amendment of Part 90 of the Commission's Rules,* WP Docket No. 07-100 – *Ex Parte* Notice

Dear Ms. Dortch:

On March 20, 2014, on behalf of TerreStar Corporation ("TerreStar"), John Dooley and Tom Eddy of Jarvinian Advisors LLC, Steve Berman of Lawler, Metzger, Keeney & Logan, LLC, and I met with Blaise Scinto, Roger Noel, Peter Daronco, Thomas Derenge, Brian Regan, and Janet Young of the Wireless Telecommunications Bureau, and Julius Knapp, Ira Keltz, Nicholas Oros, Geraldine Matise, and Ronald Repasi of the Office of Engineering and Technology, regarding the above-captioned proceedings. At this meeting, we discussed TerreStar's plans to seek rule changes that would optimize the wireless broadband use of its licensed 1.4 GHz band spectrum and add 10 megahertz to the nation's broadband spectrum inventory, while protecting the rights and operations of adjacent-band licensees. We also addressed the potential pairing of TerreStar's 1.4 GHz spectrum with AWS-3 frequencies in the 1695-1710 MHz band segment, and the potential use of spectrum in that band for Wireless Medical Telemetry Services ("WMTS").

TerreStar is the sole, nationwide licensee in the 1.4 GHz band, which includes an unpaired band segment at 1390-1392 MHz and paired spectrum at 1392-1395 MHz/1432-1435 MHz. TerreStar completed its acquisition of nationwide rights to this 8 megahertz of spectrum in 2008.[1] TerreStar's 1.4 GHz spectrum is subject to the Commission's flexible Part 27 service

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[1] *See* Application to Assign Licenses from CCTV Wireless, Inc., to TerreStar License Inc., ULS File No. 0003665274; Public Notice, *Assignment of License Authorization Applications – Action*, Report No. 4584, at 14 (rel. Dec. 10, 2008) (FCC consent to the assignment application); Public Notice, *Assignment of License Authorization Applications – Action*, Report No. 4617, at 19 (rel. Dec. 24, 2008) (consummation of the assignment).

rules, which permit a full variety of fixed and mobile services and allow both uplink and downlink operations in this band. As described in the attached presentation, TerreStar's 1.4 GHz spectrum has extraordinary potential for 4G development and wireless broadband applications.[2] The 1.4 GHz band is in the lowest noise portion of the usable RF spectrum, and this band enjoys advantageous signal propagation that combines reasonably long-distance "canopy" coverage with short-distance cellular reuse capability that supports high-throughput deployments in dense urban areas.

In order to maximize the 4G potential of the 1.4 GHz band and augment the nation's broadband spectrum inventory, however, TerreStar believes that the Commission must make a number of changes to the licensing and regulatory framework in this band and in adjacent spectrum. We discussed these necessary changes at our meeting with Commission staff, and TerreStar expects to submit a petition for rulemaking on these issues within the near future. First, TerreStar supports the adoption of a uniform power limit for downlink commercial wireless operations across the 1.4 GHz band. TerreStar believes that the standard base station power limit of 1640 watts (or 62 dBm) would be appropriate throughout the 1.4 GHz band. To establish this uniform limit, the Commission must lower the current 2000 watt limit at 1390-1392 MHz and 1432-1435 MHz and raise the existing 100 watt limit at 1392-1395 MHz. To ensure that critical, safety-of-life WMTS operations at 1395-1400 MHz remain fully protected from interference, TerreStar would commit to compliance with an out-of-band emissions limit of 46 + 10 log (P) dB at the 1395 MHz band edge, a requirement twice as stringent as the existing OOBE limit at 1395 MHz.[3] The Commission could also extend the current field strength limit (150 uV/m) at medical facilities to the entire 5 megahertz band segment at 1390-1395 MHz.[4]

To optimize the 1.4 GHz band for wireless broadband, it is also essential that the Commission expand this band to 10 megahertz. Given the bandwidth requirements of LTE and other next-generation wireless technologies, TerreStar may be unable to make meaningful broadband use of its existing 3 megahertz band segment at 1432-1435 MHz. To address this bandwidth constraint, TerreStar believes that the Commission should "re-farm" the 1430-1432 MHz band segment and make this 2 megahertz segment available at auction as an extension of the 1.4 GHz band, with flexible service rules for wireless broadband use. Currently, the 1430-1432 MHz band is allocated and licensed to general telemetry operations, except in seven markets where WMTS is primary at 1429-1431.5 MHz.[5] Under this 1.4 GHz band expansion

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[2] *An Integrated Spectrum Solution for L-band*, Jarvinian Advisors (March 2014).

[3] *See* 47 C.F.R. § 27.53(i).

[4] *See* 47 C.F.R. § 27.804.

[5] Generally, WMTS enjoys primary status in the 1427-1429.5 MHz band segment and non-medical telemetry has primary status at 1429.5-1432 MHz. There are seven geographical areas, however, where WMTS and non-medical telemetry operations are "flipped." In those areas, WMTS has primary status at 1429-1431.5 MHz and non-medical telemetry enjoys primary status in the rest of the 1427-1432 MHz band.

proposal, telemetry operations at 1430-1432 MHz (and WMTS operations in the seven "flipped" markets) would be shifted down below 1430 MHz. Based on its assessment of current WMTS and telemetry usage of the 1427-1432 MHz band, TerreStar believes that all incumbent WMTS and telemetry operations at 1427-1432 MHz could coexist within the 1427-1430 MHz band segment without producing harmful interference.

If the Commission re-farms the 1430-1432 MHz band and makes these frequencies available at auction, TerreStar will seek to acquire this spectrum, combine this band segment with its other 1.4 GHz holdings, and create two 5 megahertz blocks of spectrum usable for 4G wireless broadband applications.[6] While this outcome would be an important development for the nation's broadband efforts, TerreStar believes that it could put its 1.4 GHz licenses to their best and highest use by obtaining additional spectrum in the Commission's upcoming AWS-3 auction[7] and pairing those AWS-3 frequencies with its 1.4 GHz holdings. Specifically, if it were able to acquire nationwide rights at 1700-1710 MHz (the Commission is apparently planning to auction geographic area licenses in that 10 megahertz band segment), TerreStar could pair this AWS-3 uplink band with its 1.4 GHz downlink bands, creating one 10 x 10 MHz paired band or two 5 x 5 MHz paired bands for 4G broadband use. TerreStar believes that the 1.4 GHz and 1.7 GHz bands are a logical match for frequency band pairing, given their similar noise levels and propagation characteristics. To this end, TerreStar recently filed an application for experimental authority to test frequency duplex division ("FDD") equipment and devices that utilize these downlink and uplink bands.[8]

Significantly, it appears that carriers currently have limited interest in the unpaired AWS-3 uplink band at 1695-1710 MHz. Such "orphaned" uplink spectrum by itself is of little practical utility to network operators, and the expected auction values for this uplink band are only a small fraction of the values for symmetrically paired commercial wireless bands. Pairing the 1.4 GHz band with this AWS-3 uplink spectrum, however, could meaningfully increase the consumer utility of the 1695-1710 MHz band.

Finally, if TerreStar were able to pair its licensed 1.4 GHz spectrum with AWS-3 frequencies at 1700-1710 MHz, TerreStar believes that the best use of the adjacent AWS-3 spectrum at 1695-1700 MHz would be for WMTS. The use of WMTS systems for patient monitoring in health care facilities is critical to patient safety, and an additional 5 megahertz block of spectrum dedicated to this service would generate significant public interest benefits.

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[6] TerreStar notes that wireless broadband operations in the 1.4 GHz band would not raise any technical issues relating to the Global Positioning System ("GPS"), given the spectral distance between its licensed 1.4 GHz spectrum and GPS operations.

[7] *See Amendment of the Commission's Rules with Regard to Commercial Operations in the 1695-1710 MHz, 1755-1780 MHz, and 2155-2180 MHz Bands*, Notice of Proposed Rulemaking and Order on Reconsideration, 28 FCC Rcd 11479 (2013) ("*AWS-3 NPRM*").

[8] *See* Application of Jarvinian Advisors, OET ELS File No. 0215-EX-PL-2014 (March 14, 2014).

While medical telemetry applications have access to three major spectrum allocations, only the 1395-1400 MHz band is currently suitable for high-priority monitoring capabilities. Permitting WMTS use of the 1695-1700 MHz band would double the spectrum available for such crucial medical applications. In addition, low-power WMTS operations would be far more compatible with co-channel federal satellite systems than would higher-power commercial wireless systems.[9]

Low-power WMTS systems would be consistent with the Commission's proposed flexible use service rules for the AWS-3 spectrum at 1695-1700 MHz, and TerreStar urges the Commission to acknowledge in its AWS-3 order the feasibility of WMTS operations in this band segment.[10] To the extent that subsequent rule changes would optimize the use of this band for WMTS (such as a dedicated allocation to WMTS and appropriate performance requirements), TerreStar expects that such rulemaking could occur following the Commission's AWS-3 auction.

Pursuant to section 1.1206(b)(2) of the Commission's rules, 47 C.F.R. § 1.1206(b)(2), this *ex parte* notification and attached presentation are being filed electronically for inclusion in the public record of the above-referenced proceeding.

Respectfully submitted,

/s/ *Regina M. Keeney*
Regina M. Keeney

cc: Blaise Scinto
Roger Noel
Peter Daronco
Thomas Derenge
Brian Regan
Janet Young
Julius Knapp
Ira Keltz
Nicholas Oros
Geraldine Matise
Ronald Repasi

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[9] The AWS-3 band at 1695-1710 MHz is also utilized by National Oceanic and Atmospheric Administration ("NOAA") satellite systems. Currently utilized by legacy polar orbiting satellites, this band segment will soon be used for the Joint Polar Satellite Service ("JPSS") and the sensitive GOES-R geostationary spacecraft. In particular, the 1695-1700 MHz band will be used by NOAA for sensitive high-speed data links with the GOES-R spacecraft. Low-power indoor WMTS applications would present virtually no interference risk to NOAA ground stations used in conjunction with the GOES-R system.

[10] *See AWS-3 NPRM*.

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1.4 GHz

WMTS

1695-1710 MHz

An Integrated Spectrum Solution for L-Band

Presentation to the Federal Communications Commission (FCC)

March 2014

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Three Spectrum Challenges

1.4 GHz Band

CONFIG: 5 x 3 MHz (UPLINK or DOWNLINK)

POTENTIAL
Very low noise and advantageous propagation suggest unusually high 4G capacity.

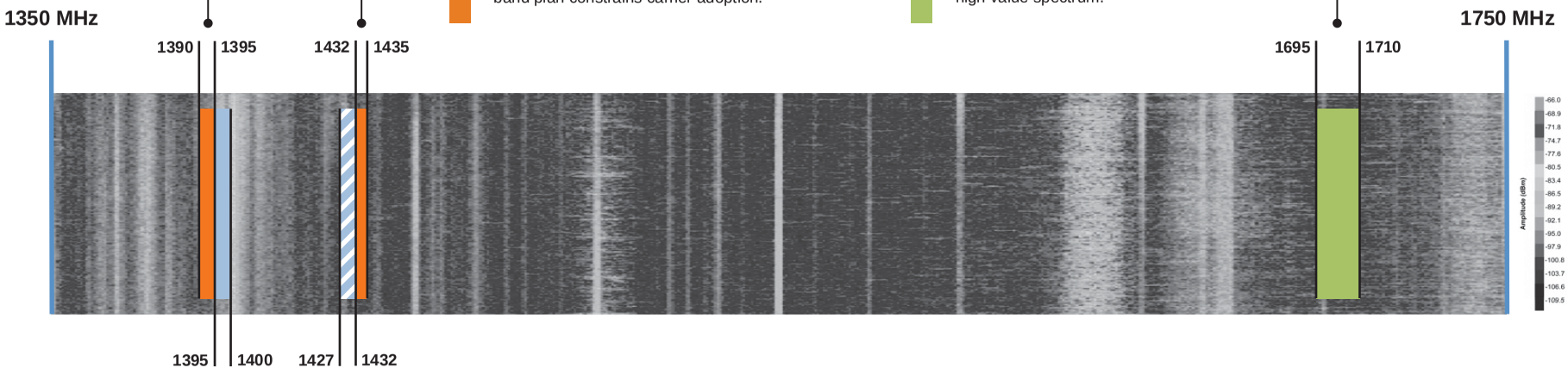
CHALLENGE
Low fixed station power levels and asymmetric band plan constrains carrier adoption.

1695-1710 MHz Band

CONFIG: TBD

POTENTIAL
Low noise and advantageous propagation suggest unusually high 4G capacity.

CHALLENGE
Lack of downlink pair effectively orphans high value spectrum.



WMTS Band

CONFIG: 5 MHz Primary Allocation

POTENTIAL
Licensed and coordinated spectrum will ensure safety of medical telemetry.

CHALLENGE
Current and emerging applications will require additional channel capacity.

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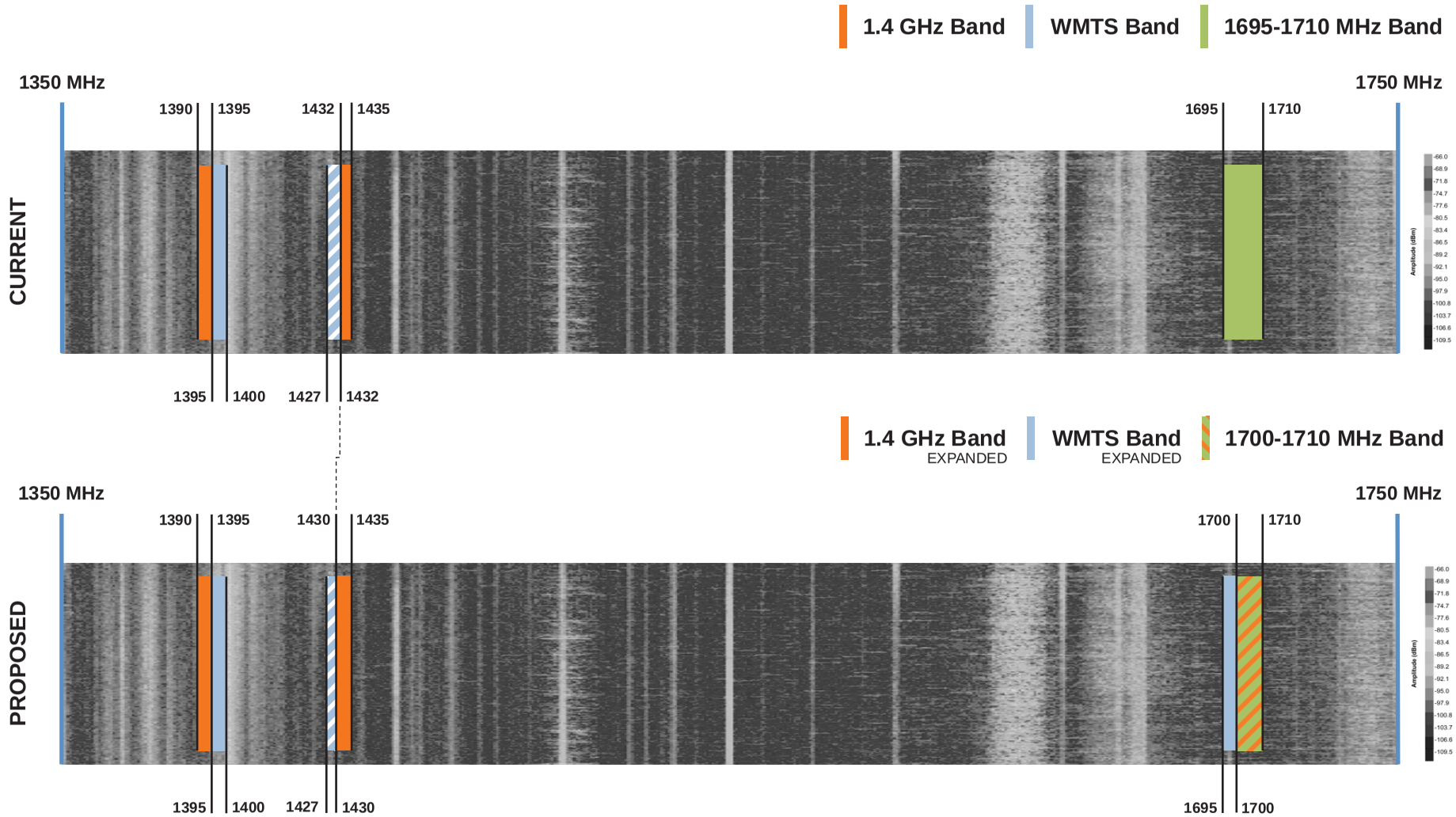
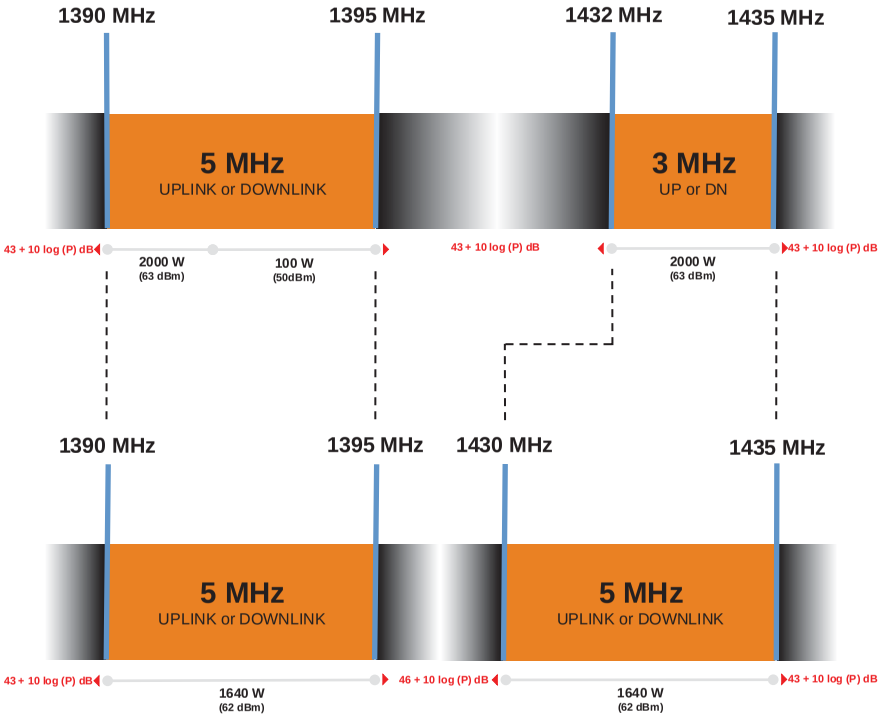
An Integrated Spectrum Solution

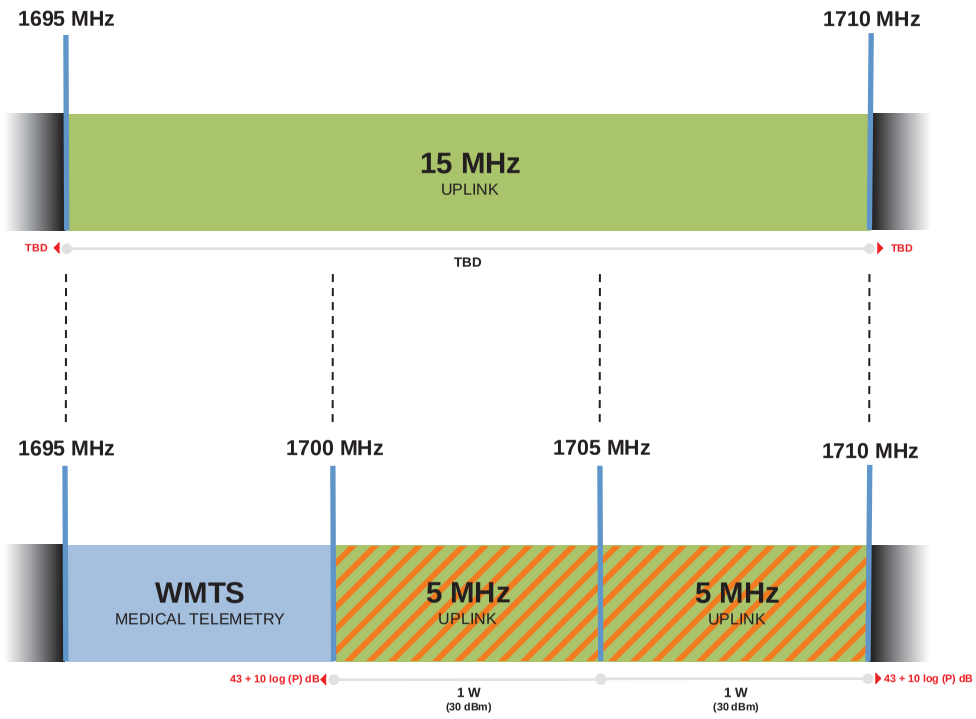


1.4 GHz Band Solution Summary

Reform 1.4 GHz Band Into Flexible 5x5 MHz Resource

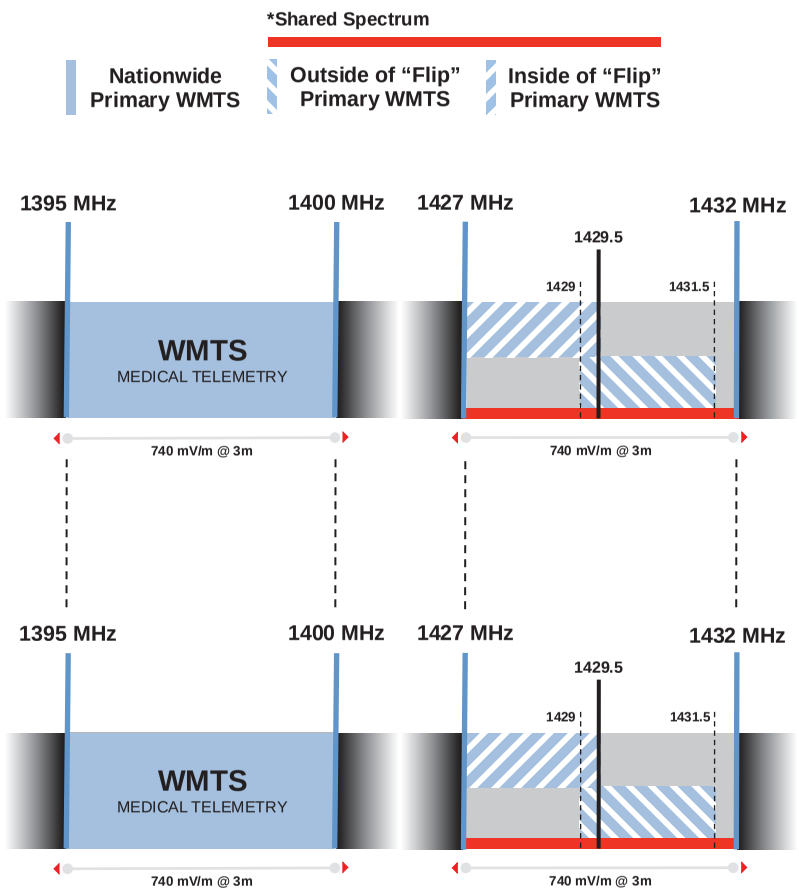


Reform Orphaned 1695-1710 MHz Band Into 5x5 MHz CMRS Uplink Resource and WMTS Expansion

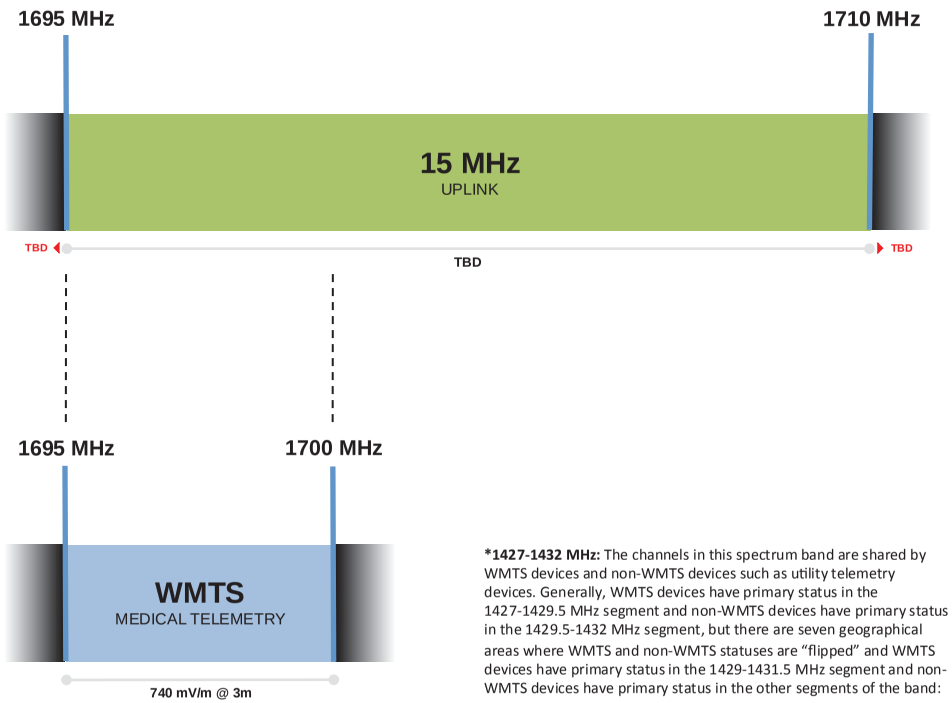


Rapid Addition of 6.35 Billion MHz-POPs

WMTS Band Solution Summary



Reform Portion of Orphaned 1695-1710 MHz AWS-3 Band Into 5 MHz WMTS Band Expansion



Clear 10 MHz of High Performance Spectrum

***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 statuses are "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

1695-1710 MHz Band Solution Summary

NOAA Federal Service Spectrum

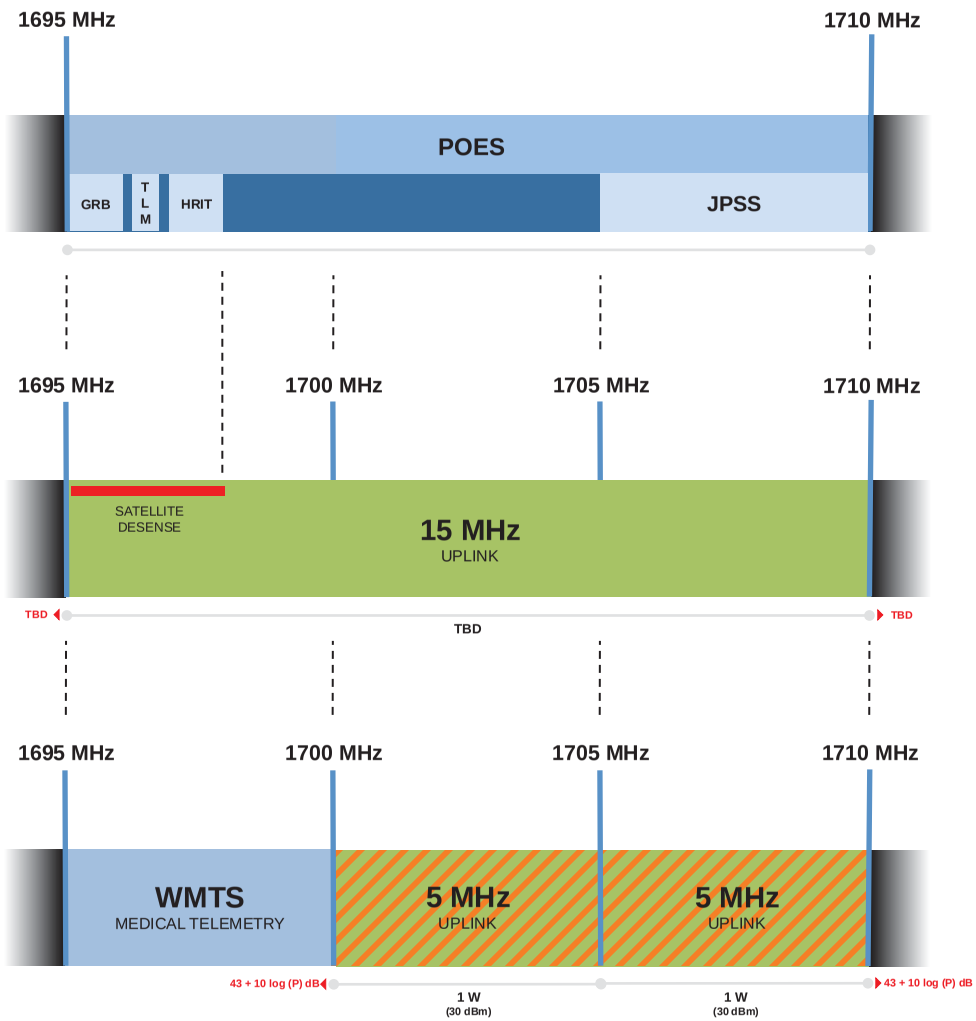
Current: POES Future: TLM / HRIT + JPSS

Commercial AWS-3 Spectrum

Uplink Spectrum Threatens GRB / TLM / HRIT

Spectrum Sharing Plan that Protects NOAA

WMTS Expansion Secures Long-Term NOAA Utility



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1.4 GHz

Transforming the 1.4 GHz Band into a Viable 4G Resource

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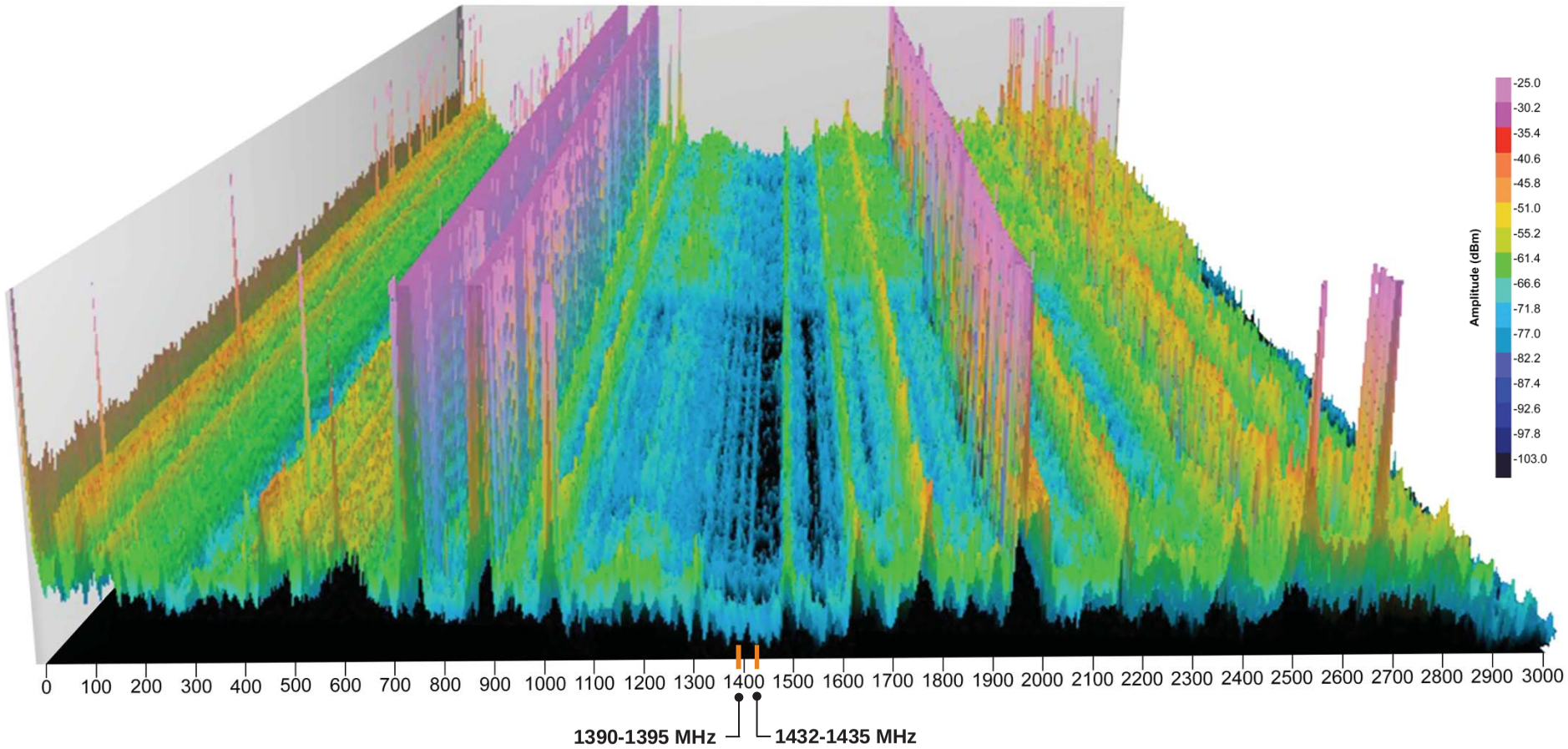
The 1.4 GHz Band is a Unique Low Noise Refuge

The usable wireless spectrum for wide area networks spans less than 3 GHz. Of the few remaining spectrum allocations, none exhibit the extreme low noise and interference characteristics of central L-Band. Free from the GPS considerations of other L-Band license holders, the 1.4 GHz band represents a unique spectrum resource for high density urban 4G data applications.

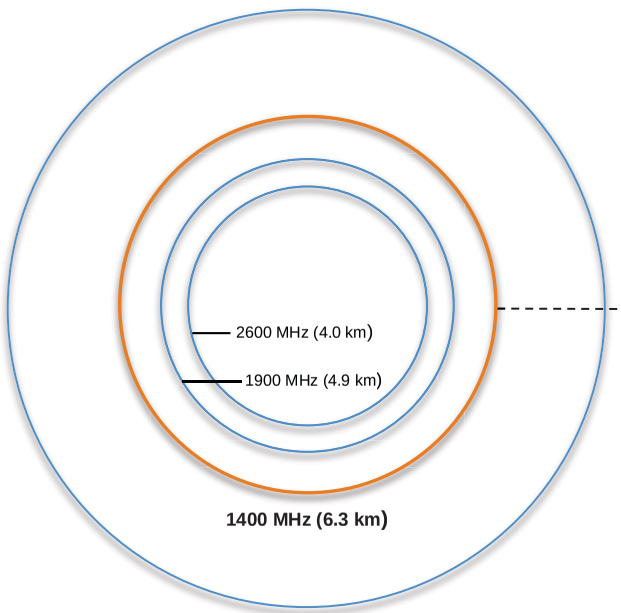


Advantageous Relative Propagation Characteristics of 1.4 GHz

Radio-frequency propagation characteristics vary greatly across the usable wireless spectrum. Below, an Okumura-Hata statistical analysis compares the propagation loss factors of various CMRS bands in suburban, urban, and dense urban coverage environments. As can be easily seen, the 1.4 GHz band is a compelling amalgam of low and high frequency signal characteristics.

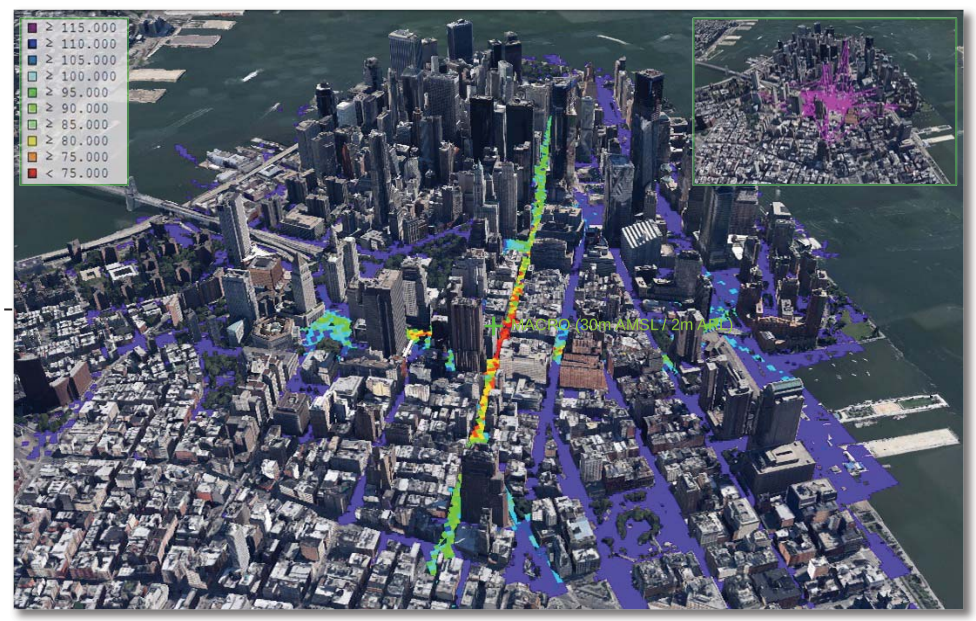
Equivalent Power vs. Propagation Distance (1.4 GHz —)

Okumura-Hata
LARGE CITY



700 MHz RP -98.5 dBm (10 km)

Complex Ray Tracing (1.4 GHz)
NEW YORK CITY



Source: EDX Wireless / University of Colorado

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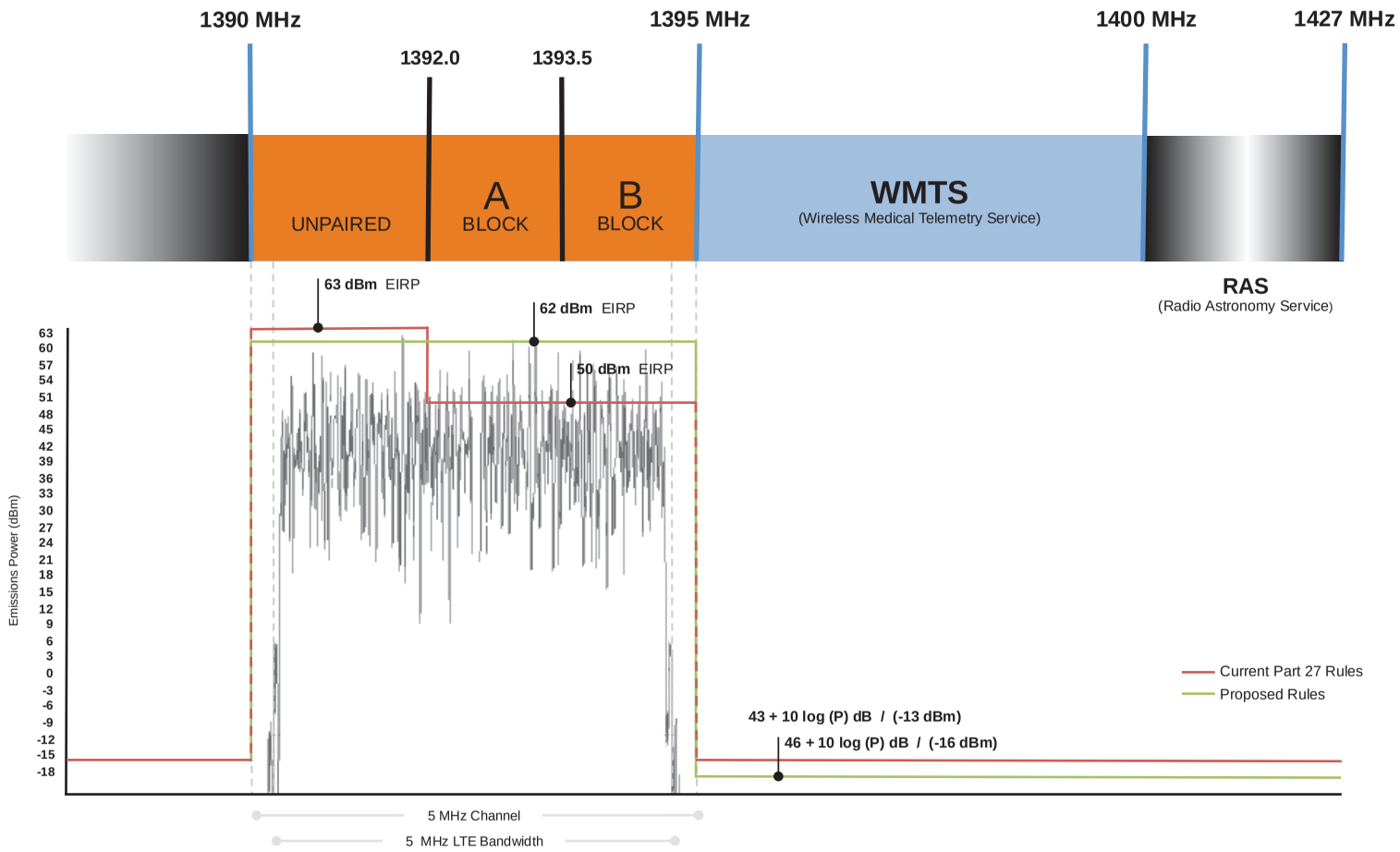
Element I: Normalization of Power Levels

The regulatory rationale for limiting power in the lower band segment A+B Blocks centered on protection of WMTS (Wireless Medical Telemetry Service) and RAS (Radio Astronomy Service). We believe that even more robust protection can be guaranteed through new and stricter Out of Band Emissions (OOBE) limits above 1395 MHz.



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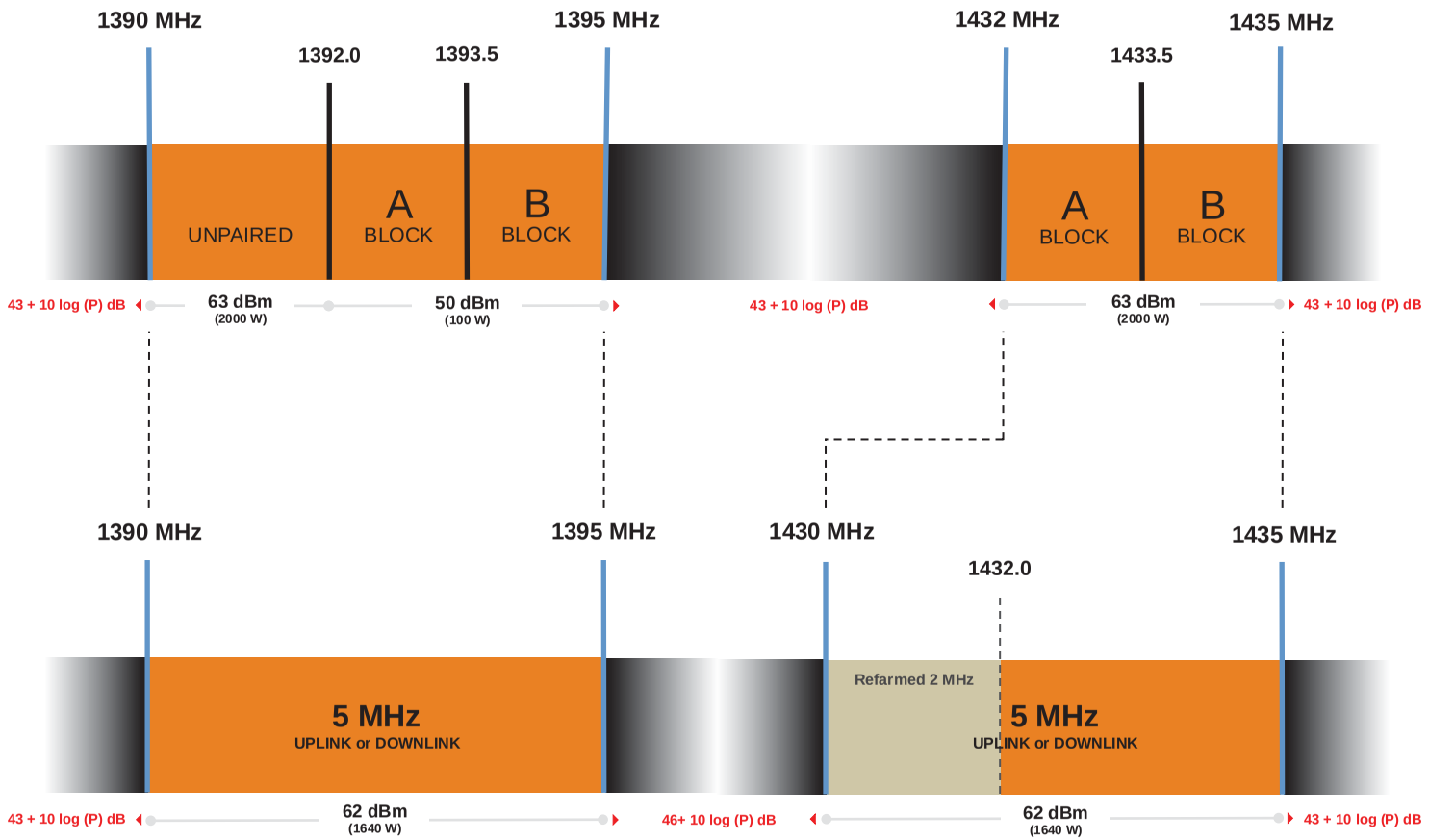
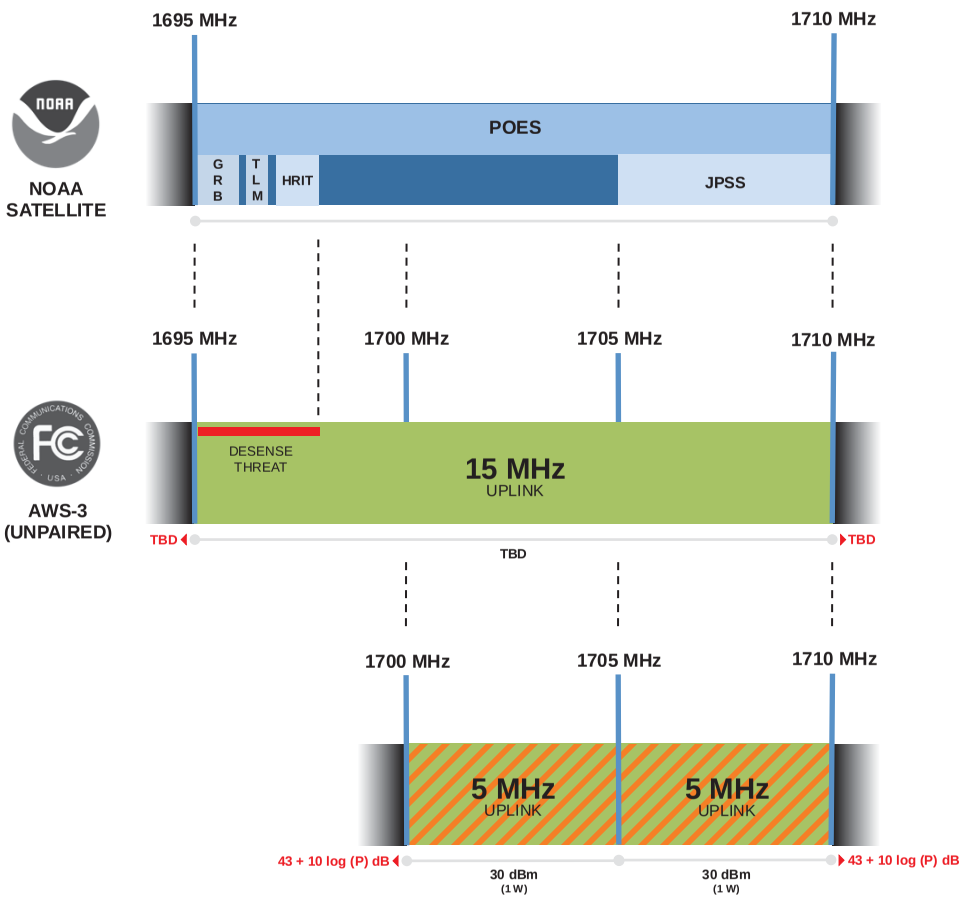
Element II: Creation of 10 MHz Band

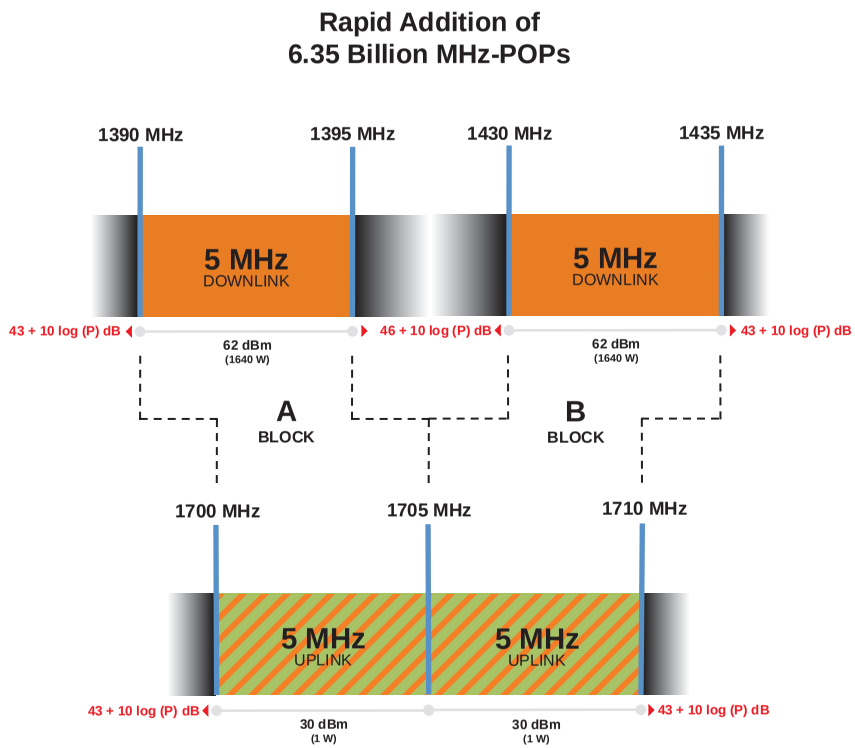
Despite the highly advantageous physical characteristics of the 1.4 GHz band, its current regulatory configuration discourages investment in commercial broadband applications. The diagram below outlines a series of modifications to Part 27 that we believe will transform the long-term potential of this resource.



Element III: Creation of 10 MHz Band Pair

Flexible use of the 1.4 GHz band permits both uplink and downlink applications in either band segment. However, pairing a downlink configured 1.4 GHz band with the orphaned "uplink only" 1695-1710 MHz band may meaningfully increase the value and utility of both allocations.





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WMTS

Protecting and Expanding L-Band WMTS Allocations

Medical Telemetry Across the Spectrum

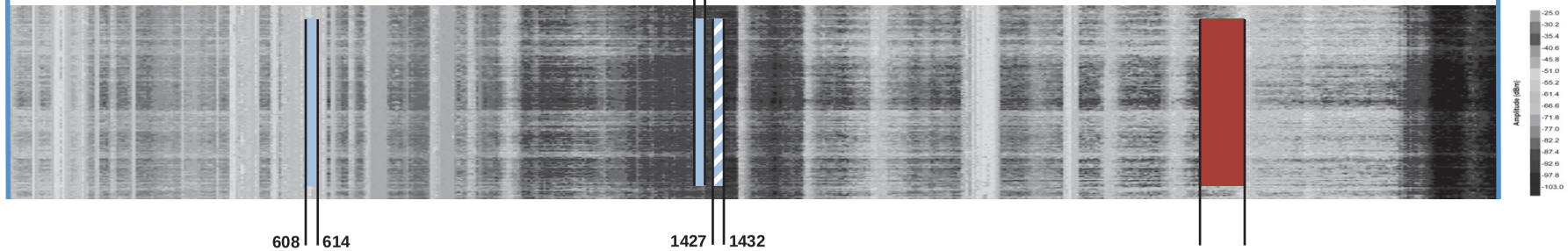
While medical telemetry applications have access to three major spectrum allocations, only the 1.4 GHz WMTS band represents an authorization suitable for high-priority monitoring capabilities. The 5 MHz of primary nationwide allocation (1395-1400 MHz) is increasingly viewed as insufficient to meet rapidly growing medical application demands.

1.4 GHz WMTS

CONFIG: Primary Allocation 1395-1400
Complex Primary / Secondary Status 1427-1432

UTILITY
Ideal spectrum (propagation / noise) for facility based medical telemetry applications.

CHALLENGE
Primary allocation insufficient for projected growth in utilization.



600 MHz WMTS

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

UTILITY
Established band with considerable installed base in medical facilities.

CHALLENGE
Significant urban noise floor. White space users and incentive auctions represent uncertainty.

2.4 GHz ISM

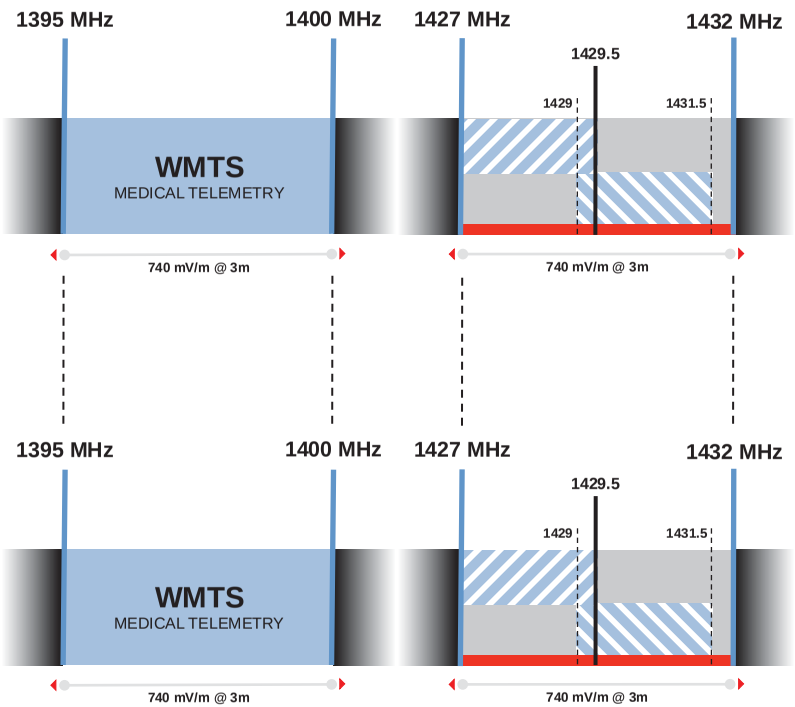
CONFIG: Band Sharing with Part 15

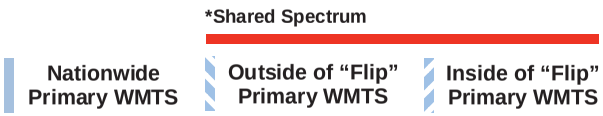
UTILITY
Ample spectrum allocation with extremely low cost transceiver ecosystem.

CHALLENGE
Saturation of 2.4 GHz band limits safety and efficacy of medical applications.

Limits on Primary L-Band WMTS Allocations

Medical telemetry applications are limited to just 5 MHz of nationwide primary WMTS allocation. While an additional 2.5 MHz of 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.





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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

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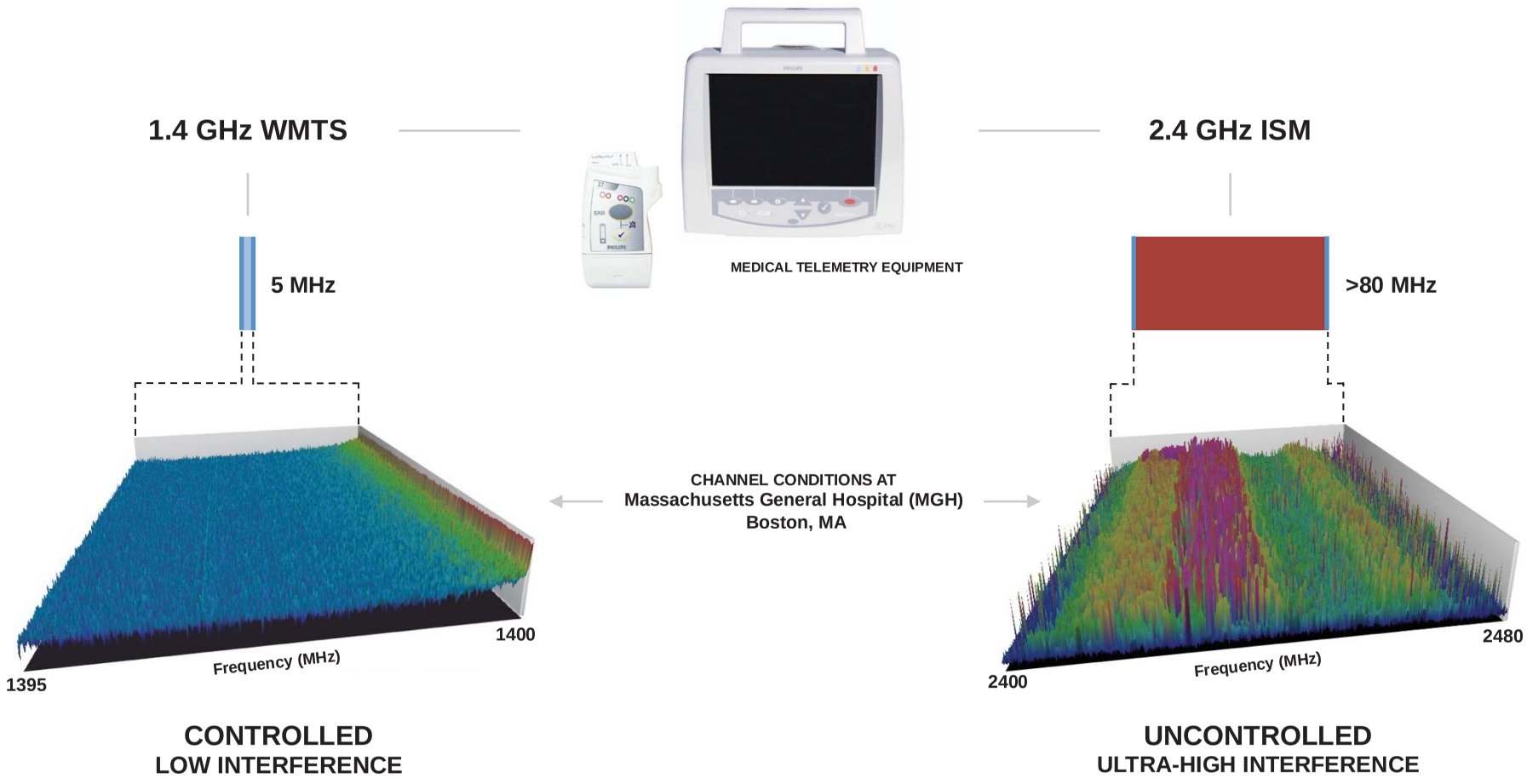
Need for Expanded Primary WMTS Allocations

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 expanded primary WMTS allocations.



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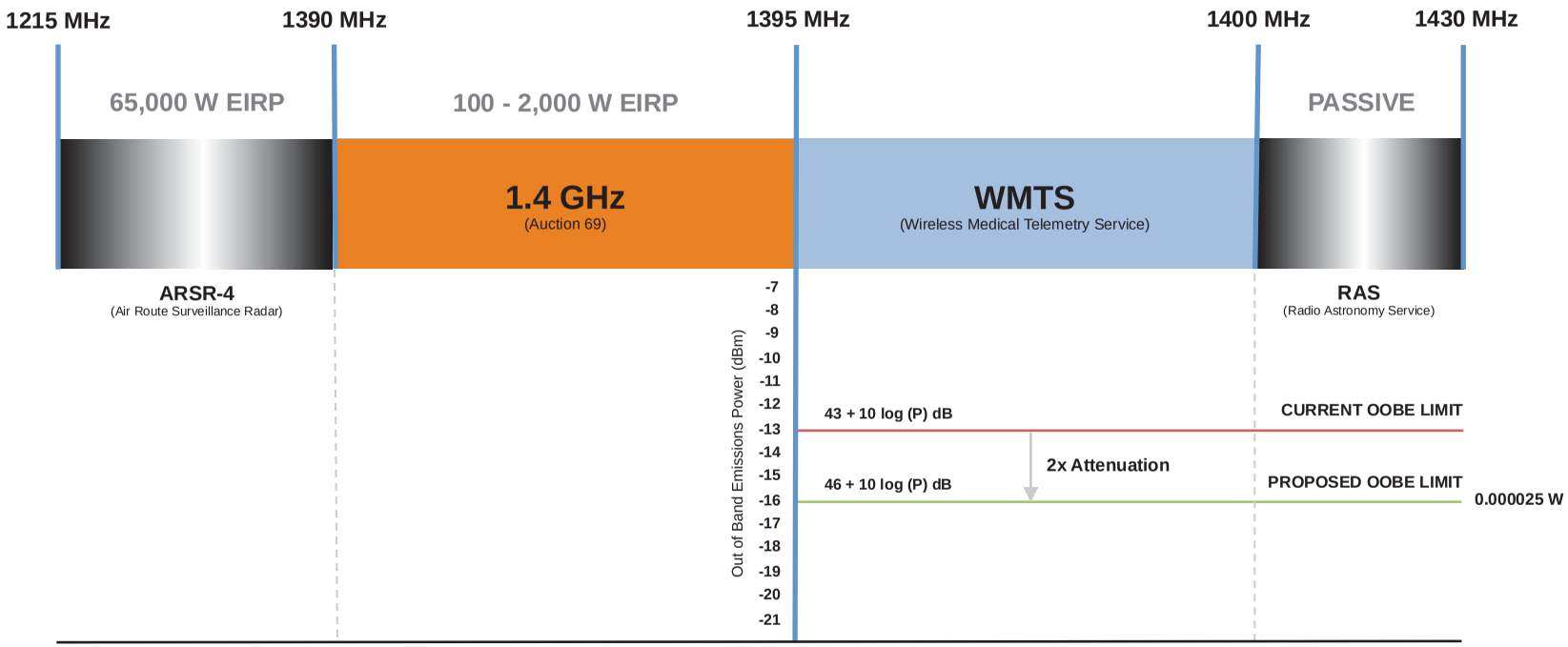
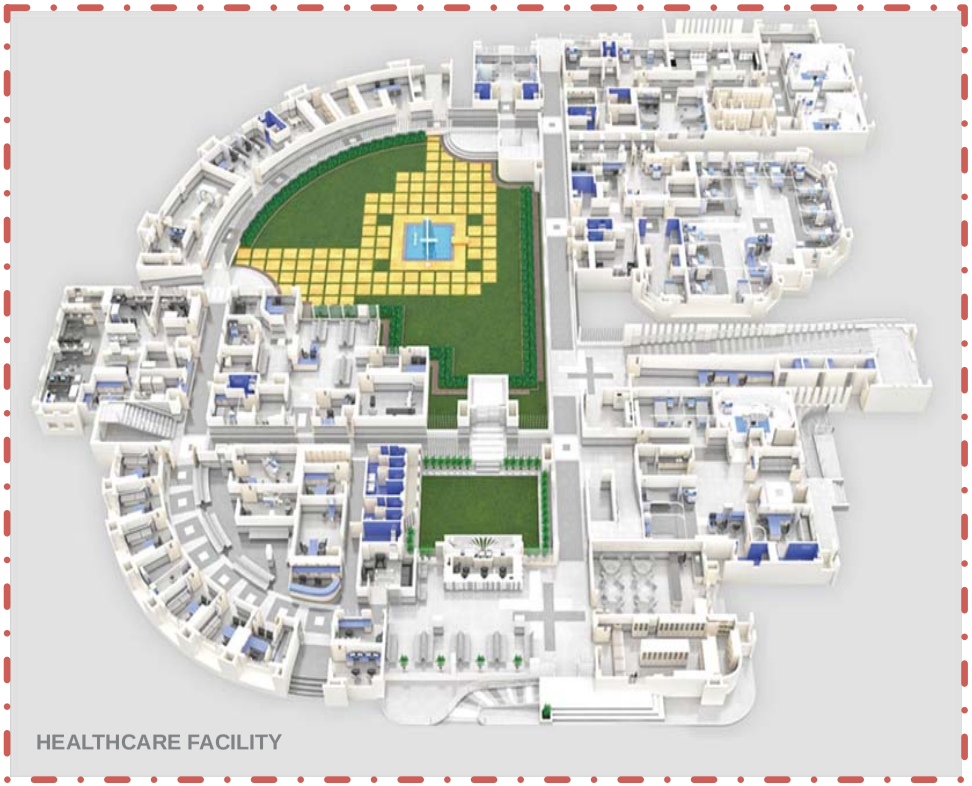
Element I: OOBE Protection of L-Band WMTS

Long-term protection of WMTS requires Out of Band Emissions (OOBE) limits that guarantee increasingly high density adjacent band operations do not impact current or anticipated healthcare use cases. We believe that a stricter 46 + 10 log (P) edge of band attenuation (equivalent to -16 dBm above 1395 MHz) will provide such protection.



Element II: Field Strength Protection of L-Band WMTS

In addition to doubling the effective OOBE limits for commercial services below 1395 MHz, we propose extending the out of band field strength limitations of 150 uV/m at a medical facility currently applicable to operations between 1392-1395 MHz (*see* §27.804) to the entire 5 MHz band segment (1390-1395 MHz).



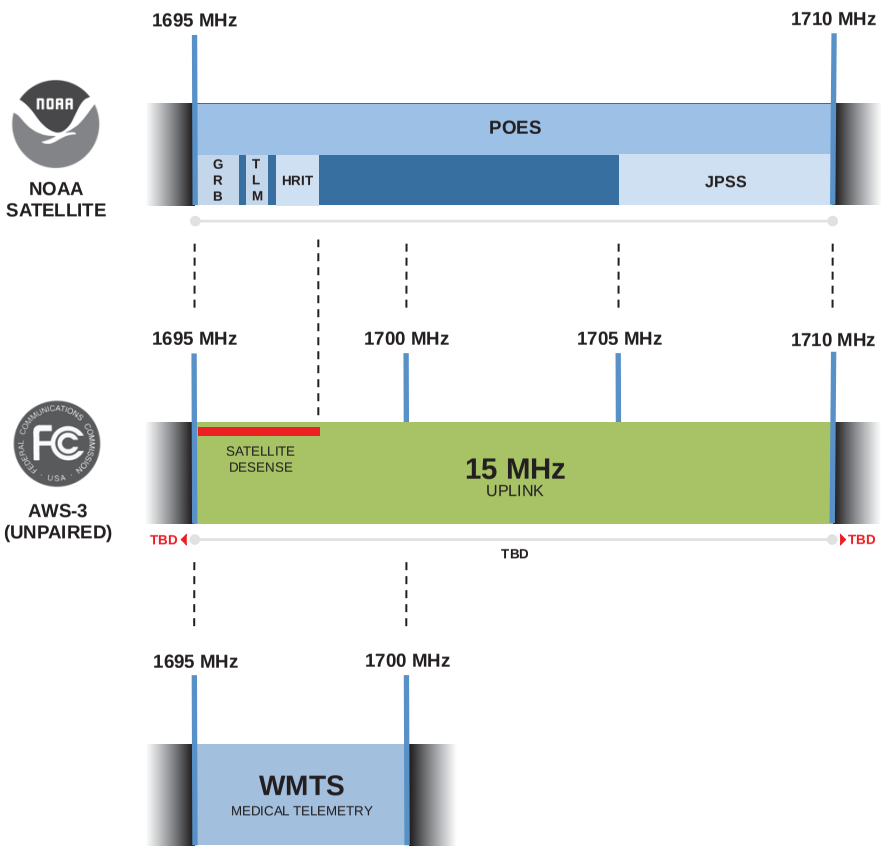
OOBE < 150 uV/m

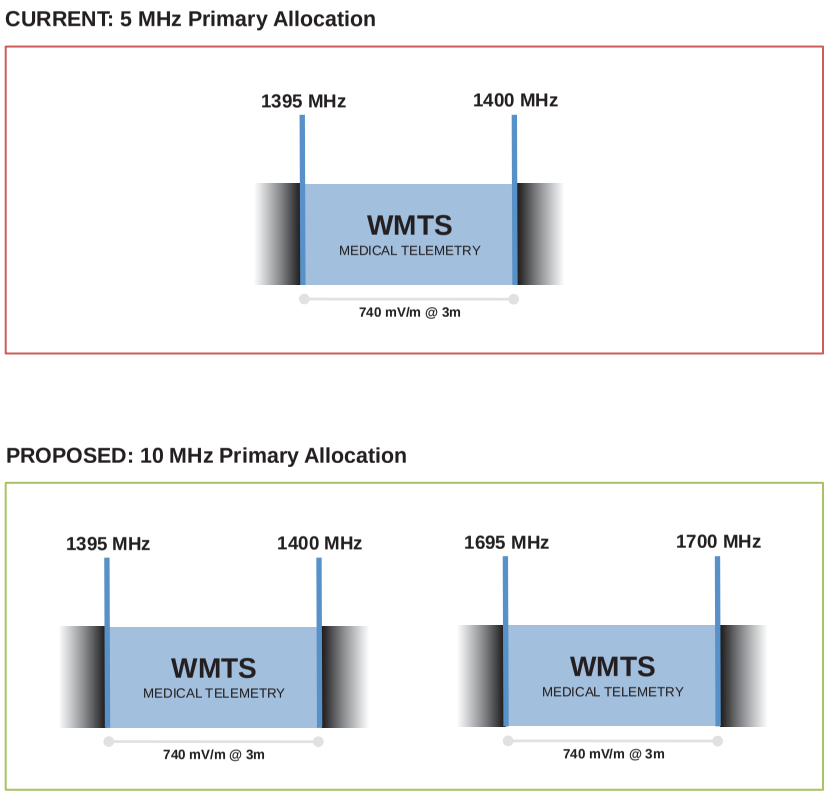
§27.804 Field strength limits at WMTS facility.

For any operation in the 1392-1395 MHz band, the predicted or measured field strength into the WMTS band at 1395-1400 MHz shall not exceed 150 uV/m at the location of any registered WMTS healthcare facility. When performing measurements to determine compliance with this provision, measurement instrumentation employing an average detector and a resolution bandwidth of 1 MHz may be used, provided it accurately represents the true interference potential of the equipment.

Element III: Expansion of L-Band WMTS

We believe that the orphaned AWS-3 uplink band (1695-1710 MHz) presents a compelling opportunity to double the nationwide primary allocation to WMTS in L-Band. The lower 5 MHz (1695-1700 MHz) will continue to be used by NOAA for sensitive high-speed data links with the GOES-R spacecraft. Indoor WMTS applications will present virtually no risk to this application.





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1695-1710 MHz

Protecting NOAA and Increasing Utility of 1695-1710 MHz

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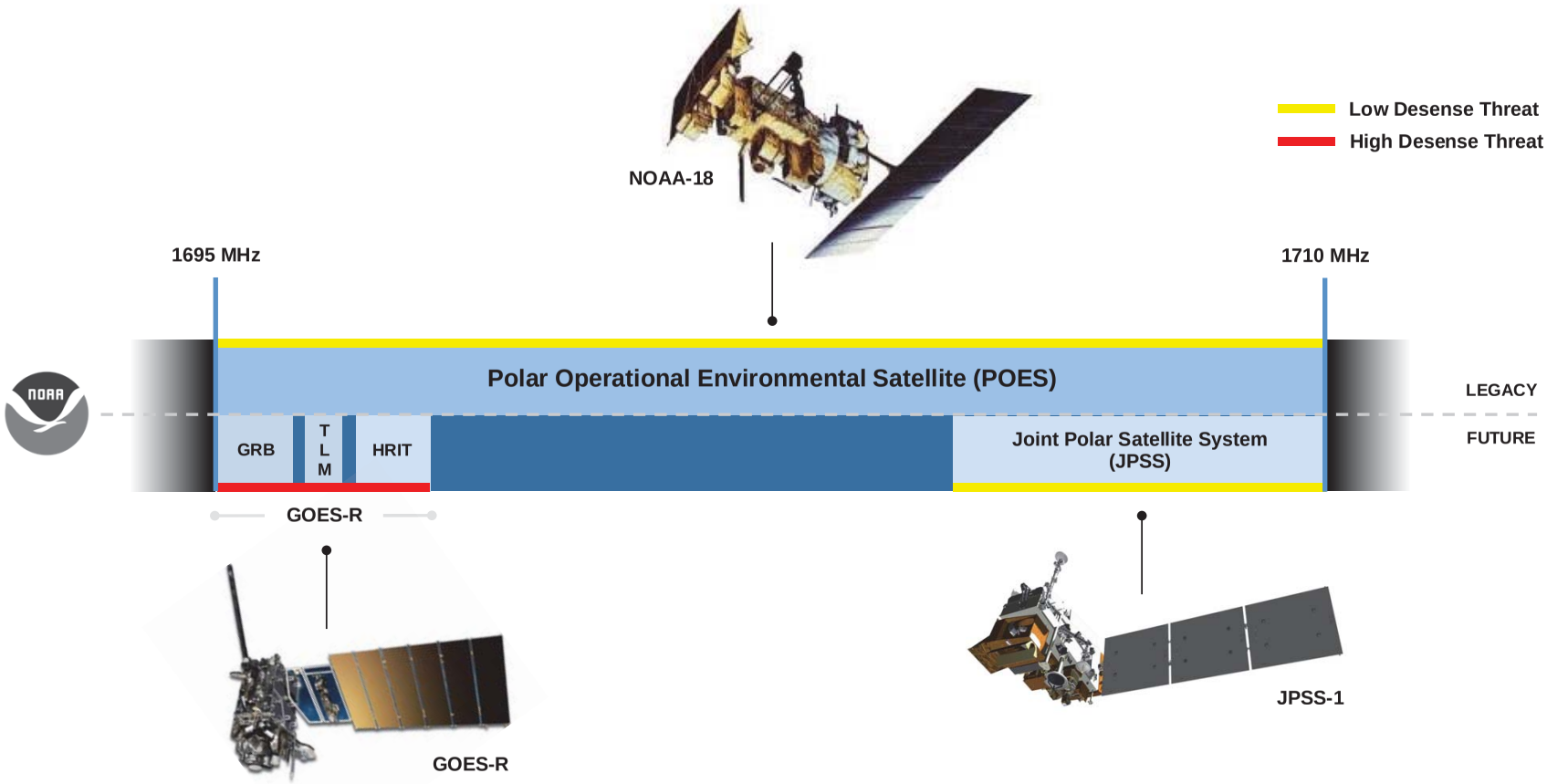
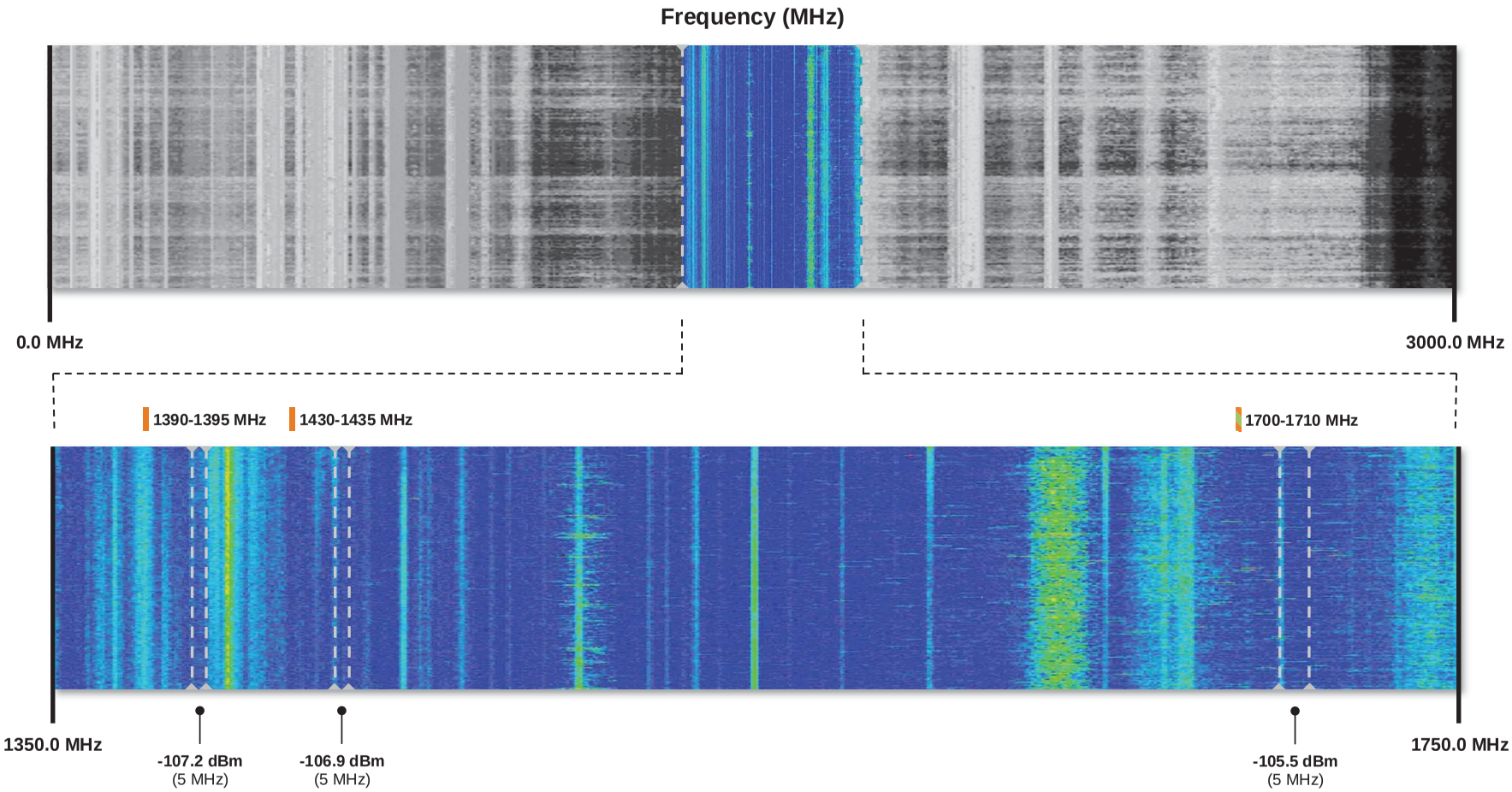
Current and Future Federal Use of 1695-1710 MHz

Far from vacant, the 1695-1710 MHz band is an important allocation for satellites operated by NOAA. Currently used by the legacy Polar Operational Environmental Satellite (POES) service, the band will soon be occupied by next-generation Joint Polar Satellite System (JPSS) spacecraft and the sensitive high-speed downlinks of the GOES-R geostationary satellite.



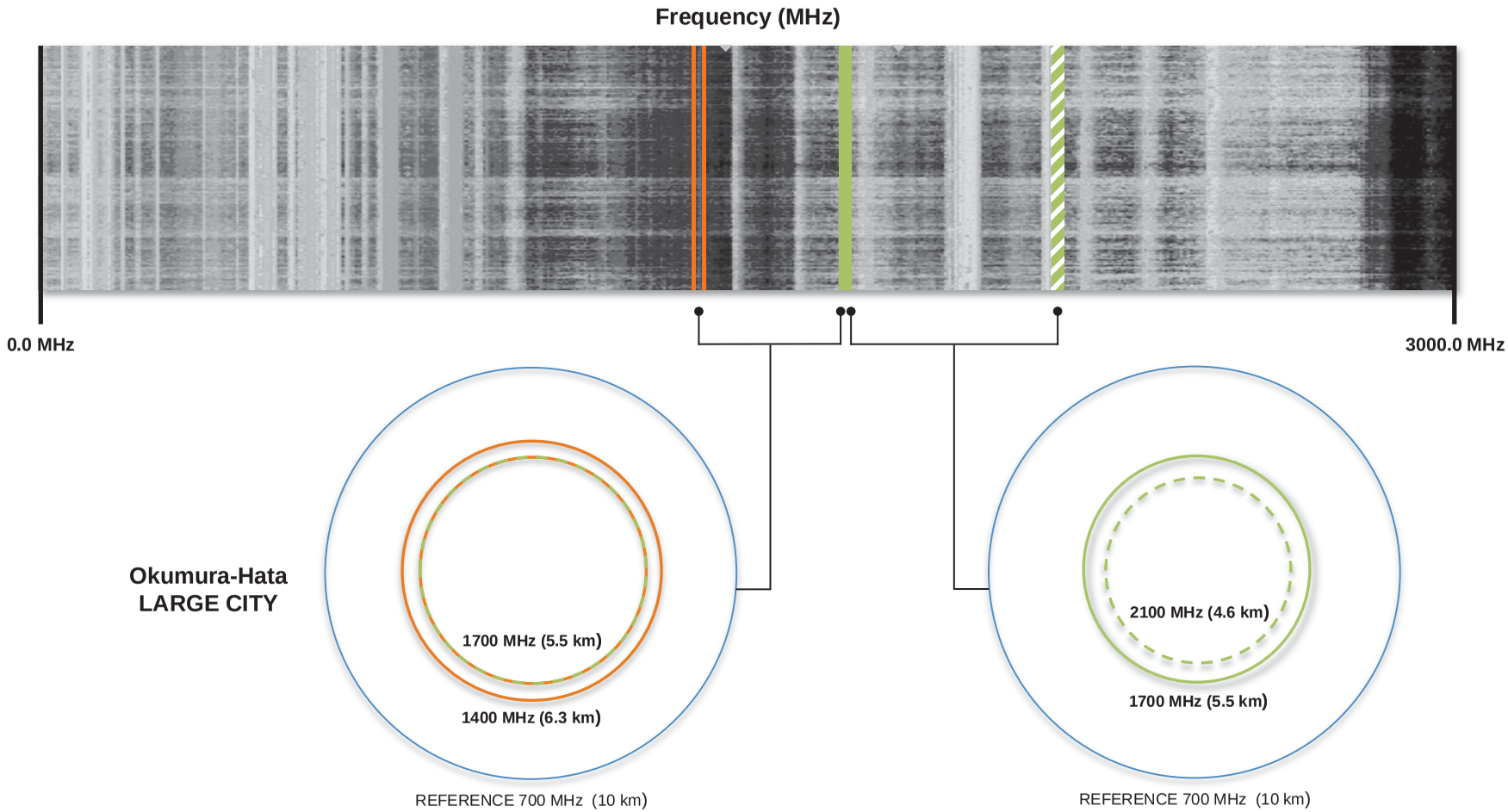
Comparable Low Noise Floor: 1.4 GHz vs. 1.7 GHz

Central L-Band is and will likely remain the lowest noise portion of the usable RF spectrum. This has meaningful implications for urban LTE systems, which can use this noise floor to achieve superior spectral efficiencies relative to more compromised spectrum (e.g. 700 MHz). Measurements in Midtown Manhattan show comparably low noise floors across the 1.4 and 1.7 GHz bands.



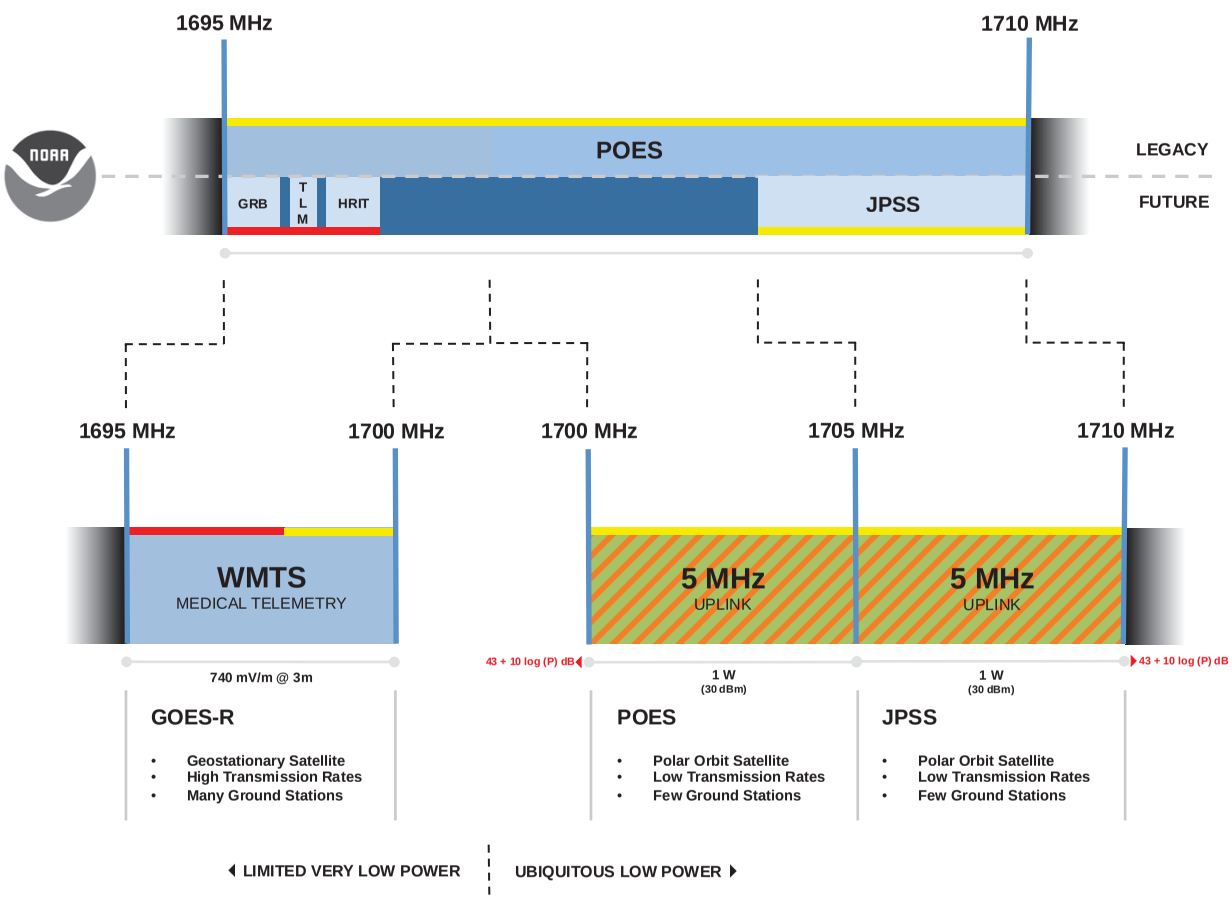
Comparable Urban Propagation: 1.4 GHz vs. 1.7 GHz

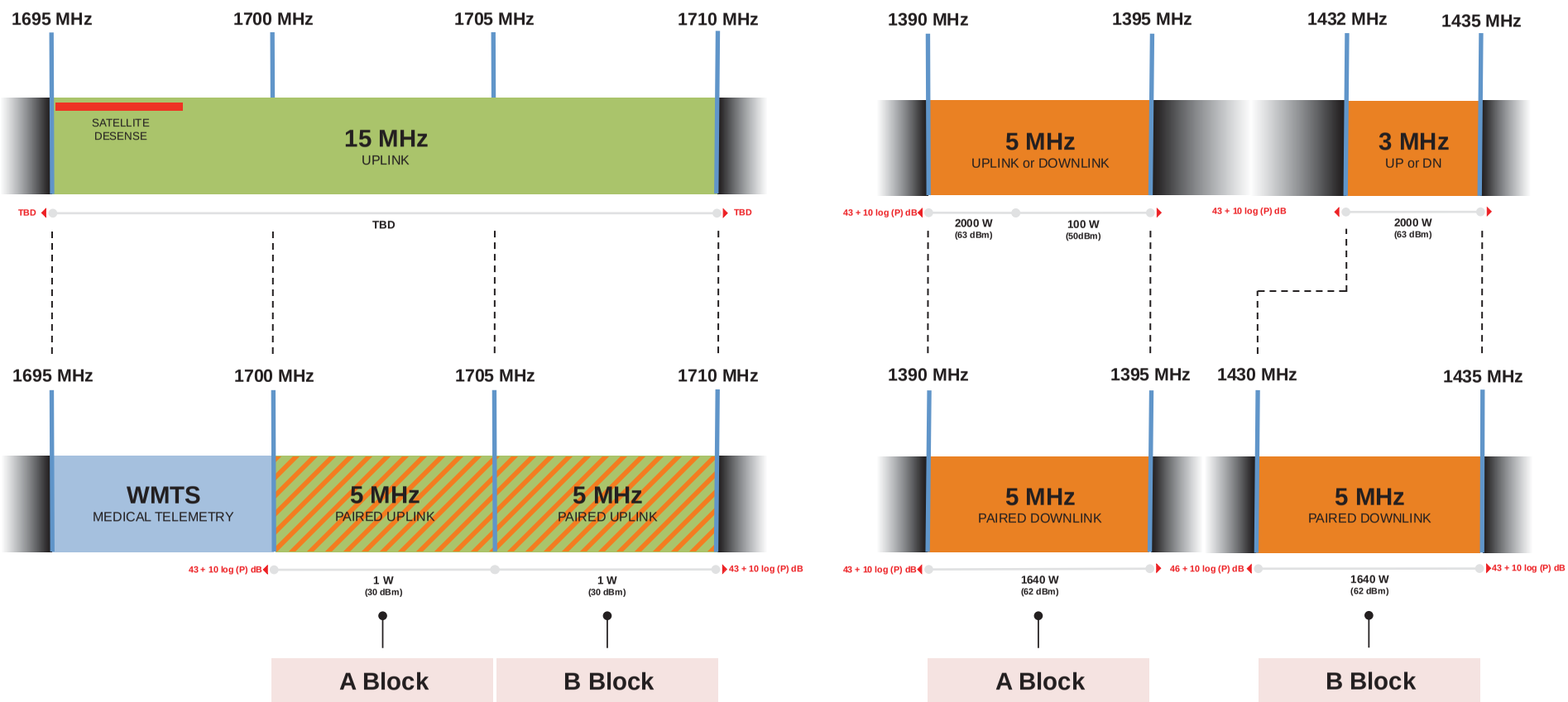
Network planners must balance the long-distance / canopy coverage qualities of low frequency spectrum with the short-distance / high cellular reuse potential of high frequencies. Central L-Band spectrum displays propagation characteristics that blend the utility of low and high frequency bands. As a paired resource, 1.4 and 1.7 GHz display comparable propagation physics in urban environments.



Element I: Protect Sensitive NOAA Satellite Applications

The currently unpaired AWS-3 segment (1695-1710 MHz) shares satellite spectrum with the National Oceanic and Atmospheric Administration (NOAA). Currently used for legacy polar orbiting satellites, the allocation will soon be used for the Joint Polar Satellite Service (JPSS) and the sensitive GOES-R geostationary spacecraft. Segmentation of the band to a paired 10 MHz commercial service and 5 MHz WMTS expansion provides long-term protection for NOAA ground stations.



Element II: Increase Value of 1695-1710 MHz Uplink

Unpaired FDD spectrum is of little practical utility to network operators. Despite the advantageous noise and propagation qualities of 1.7 GHz, anticipated auction values for orphaned L-Band uplink spectrum is a small fraction of that for symmetrically paired allocations. Creating even an implicit pairing with 1.4 GHz may meaningfully increase market value.