



FCC Wireless Regulatory Updates

William H. Graff

Emeritus Chair of the TCB Council

March 2022

A brief history lesson from 1936

THE FUTURE OF RADIO AND PUBLIC INTEREST, CONVENIENCE AND NECESSITY

BY

DAVID SARNOFF

President, Radio Corporation of America

*Statement—Presented before Federal Communications Commission,
Washington, D. C., June 15, 1936.*

THE Radio Corporation of America welcomes the opportunity to testify at this informal hearing. We are deeply aware of the importance and urgency of the tasks before the Federal Communications Commission. We are pleased to place at your disposal the information and experience of RCA, gained from its operations in radio research, communications, broadcasting, manufacture and sales. These interrelated enterprises have enabled us to study and develop radio in ever widening fields of public usefulness.

In such a fast moving art as radio, government regulation must have wide powers of discretion. A strait-jacket of rigid rules would cripple its energies. In the Radio Act of 1927 and in the Communications Act of 1934, Congress recognized this fact and wisely refrained from prescribing hard-and-fast formulas. Instead it set up a high standard for flexible regulation, the standard of “public interest, convenience and necessity.” That standard gives your Commission the power, and therefore the responsibility, of judging issues on the basis of past accomplishments, of present activities, and particularly on the capacity for future progress.

- FCC Rules continue to follow the concept of ‘public interest, convenience and necessity’
- FCC Rules are based upon the idea of minimizing interference through frequency and emissions separation
- FCC Rules are blind to technology.

USA Frequency Allocation

47CFR §2.106 Table of Frequency Allocations <https://transition.fcc.gov/oet/spectrum/table/fcctable.pdf>



**FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF ENGINEERING AND TECHNOLOGY
POLICY AND RULES DIVISION**

FCC ONLINE TABLE OF FREQUENCY ALLOCATIONS

47 C.F.R. § 2.106

Revised on February 1, 2021

Disclaimer: The Table of Frequency Allocations as published by the Federal Register and codified in the Code of Federal Regulations remains the legal source material. This Online Table of Frequency Allocations may display amendments that have been adopted by the FCC but that have not yet taken effect.

Spectrum Developments

Office of Engineering and Technology

- ✓ Frequency Allocations and Equipment Authorization (Part 2)
 - ✓ Experimental (Part 5)
 - ✓ Unlicensed Device (Part 15)
 - ✓ Industrial, Scientific, and Medical Equipment (ISM) (Part 18).
-
- *Implementing new services or providing additional spectrum for existing services typically require modifications to the Table of Frequency Allocations.*
 - *The Policy and Rules Division conducts proceedings to implement new allocations and closely collaborates with other bureaus that are responsible for individual service rules.*

Engineering & Technology

Mission:

- ✓ Manage the spectrum and create new opportunities for competitive technologies
- ✓ Maintain the U.S. Table of Frequency Allocations,
- ✓ Manages the Experimental Licensing and **Equipment Authorization** programs,
- ✓ Regulates the operation of unlicensed devices, and
- ✓ Conducts engineering and technical studies.

Engineering & Technology

Laboratory Division

- ✓ The Laboratory Division is responsible for the evaluation of radio frequency (RF) devices and related technologies to determine their interference risk potential and technical operating parameters
- ✓ Develop technical standards and recommend appropriate action.
- ✓ Support rulemaking proceedings and conducts technical studies of competing technologies to assist the Commission in reviewing options.
- ✓ Designs test procedures for compliance to the Rules
- ✓ Supports national and international standards activities to develop measurement procedures used to determine compliance.
- ✓ Manages the Equipment Authorization program, and participates in international efforts to harmonize conformity assessment procedures for equipment authorization via Mutual Recognition Agreements.

Equipment Authorization

How do I get an equipment authorization?

- Electronic and electrical products that are marketed and used in the United States are required to be tested, documented, and managed for continued compliance.
- If a device is subject to FCC rules, determine the specific type of equipment authorization that applies to the device. Become familiar with all the basic marketing, equipment authorization, and importation rules.
- Determine all applicable technical and administrative Rules that apply to the device requiring an equipment authorization.
 - The technical requirements are generally specified in the applicable FCC rule parts
 - Administrative rules are specified in Part 2, Subpart J.

Current Approval Procedure

- **Suppliers Declaration of Conformity**
 - Equipment approved using the SDoC procedure is required to be tested at a qualified 17025 laboratory.
- **Certification**
 - Equipment approved under the Certification procedure is required to be tested by an FCC Testing Laboratory as follows

Equipment Authorization

What is the responsible party?

- **§2.909 Responsibility Party.**

- ✓ (a) In the case of equipment that requires the issuance of a **Grant of Certification**, the party to whom that grant of certification is issued is responsible for the compliance of the equipment with the applicable standards. If the radio frequency equipment is modified by any party other than the Grantee and that party is not working under the authorization of the Grantee pursuant to § 2.929(b), the party performing the modification is responsible for compliance of the product with the applicable administrative and technical provisions in this chapter.
- ✓ (b) For equipment subject to **Supplier's Declaration of Conformity** the party responsible for the compliance of the equipment with the applicable standards, who must be located in the United States (see § 2.1077), is set forth as follows
 - 1) The **Manufacturer** or, if the equipment is assembled from individual component parts and the resulting system is subject to authorization under Supplier's Declaration of Conformity, the **Assembler**.
 - 2) If the equipment by itself, or, a system is assembled from individual parts and the resulting system is subject to Supplier's Declaration of Conformity and that equipment or system is imported, the **Importer**.
 - 3) **Retailers** or original equipment manufacturers may enter into an agreement with the responsible party designated in paragraph (b)(1) or (b)(2) of this section to assume the responsibilities to ensure compliance of equipment and become the new responsible party.
 - 4) If the radio frequency equipment is modified by any party not working under the authority of the responsible party, **the party performing the modifications**, if located within the U.S., **or the importer** becomes the new responsible party.

Equipment Authorization

Certification Procedures (Part 2, Subpart J)

- **Most rigorous approval process for RF Devices with the greatest potential to cause harmful interference.**
 - ✓ It is an equipment authorization issued by a recognized TCB (Telecommunication Certification Body) based on an application and test data submitted by the responsible party
 - ✓ The testing is done by an **accredited testing laboratory recognized by the Commission** as approved for testing
 - ✓ TCB examines the test data and supporting documentation to determine whether the testing followed appropriate protocols and the data demonstrates technical and operational compliance with all pertinent rules.
 - ✓ Technical parameters and other descriptive information for all certified equipment submitted in an application for Certification are published in a Commission-maintained public database.

Equipment Authorization

Certification Labeling

Part 15 Certification	15.19(a)(3) All devices	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.	§2.925(a)(1) FCC ID XZZYYNNNNN <ul style="list-style-type: none">• Grantee Code if (X is Numeric) Grantee code is XZZYY else XZZ• Equipment Product Code NNNNN
--------------------------	----------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

If the labelling area is considered too small and therefore it is impractical (smaller than the palm of the hand) to display the compliance statement, then the statement may be placed in the user manual or product packaging. However, the device must still be labelled with the FCC ID. If the device is unquestionably too small for the FCC ID to be readable (smaller than 4-6 points), the FCC ID may be placed in the user manual.

Electronic display of the FCC ID may be used for Certification for devices that have an integrated display screen in lieu of a physical label or nameplate.

For information on how to obtain a grantee code, manage grantee code information (company name, address and contact information), recover a lost grantee code's registration number, see **KDB Publication 204515**.

Equipment Authorization

Electronic Labeling

- **Information to be displayed**
 - 1) The FCC ID and/or the Declaration of Conformity (DoC) logo (if applicable).
 - 2) Any other information required by specific rule to be provided on the surface of the product unless such information is permitted to be included in the User's manual or other packaging inserts.
- **Access to the required information on the e-label**
 - 1) Users must be able to access the information without requiring special access codes or permissions and, in all cases the information must be accessible in no more than three steps in a device's menu.
 - 2) Devices must not require special accessories or supplemental plug-ins (e.g., the installation of a SIM/USIM card) to access the information.
 - 3) Users must be provided specific instructions on how to access the information. The instructions must be included in the User's manual, operating instructions, insert in the packaging materials, or other similar means. Alternately, the access information may be available on the product related website with instructions on how to access the website provided in the packaging material.
 - 4) The equipment authorization application for the device must clearly include the instructions for accessing information as part of the exhibit showing the label information.

Equipment Authorization

(Modular Transmitters)

Modular Transmitter Requirements

- A host product manufacturer is responsible for ensuring compliance with the module(s) installed. The module Grantee shall provide guidance to the host manufacturer for ensuring compliance.
- Modules must be a separate physical assembly that can be installed into a host as a separate subassembly. The method used for input and output electrical connections to the host may be soldered, cabled, wired, or use plug-in connectors.
- A module cannot solely be the implementation of a design specification (including antenna).
 - 1) *The radio elements must have the radio frequency circuitry shielded.*
 - 2) *The module must have buffered modulation/data inputs;*
 - 3) *The module must contain power supply regulation on the module;*
 - 4) *The module must contain a permanently attached antenna; or a unique antenna connector, and operated only with specific antenna(s)*
 - 5) *The module must demonstrate compliance in a stand-alone configuration;*
 - 6) *The module must be labeled with its permanently affixed FCC ID label, or use an electronic display*
 - 7) *The module must comply with all specific rules applicable to the transmitter, including all the conditions provided in the integration instructions by the grantee;*
 - 8) *The module must comply with RF exposure requirements*

[See KDB 996369](#)

<https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?switch=P&id=44637>

Permissive Changes

KDB 178919 D01 Permissive Change Policy v06

- A **Class I** permissive change includes those modifications in the equipment which do not degrade the characteristics reported by the manufacturer and accepted by the Commission when certification is granted. No filing is required.
- A **Class II** permissive change includes those modifications which degrade the performance characteristics as reported to the Commission at the time of the initial certification. The grantee shall provide change descriptions and test results
 - ✓ Changes to the **basic frequency determining and stabilizing circuitry, frequency multiplication stages, basic modulator or maximum power/field strength** will always require a new grant of certification (FCC ID) and a new equipment authorization application.

Permissive Changes

Antennas Changes for Part 15 transmitters

- 1) Any antenna with a **higher gain** than the antenna(s) with which the device was originally approved requires a Class II permissive change filing.
- 2) If an antenna is of the **same type** and has a **lower gain** than the antenna(s) originally approved and tests show that the emission levels or reported RF safety levels are not increased, a Class I permissive change is allowed. If either the emission levels or reported RF safety levels increase, a Class II permissive change is required.
- 3) If an antenna is of the **same type, same specifications**, and **same gain** as an antenna originally approved but is made by a different manufacturer, a Class I permissive change is permitted.
- 4) If an antenna is a **different type**, has a **lower gain** than an originally approved antenna and tests show that the spurious emission levels or reported RF safety levels are not increased, then a Class I permissive is permitted.
- 5) If an antenna is a **different type**, has a **lower gain** than an originally approved antenna and tests show that the spurious emission levels or reported RF safety levels have increased, a Class II permissive change is required.

Cautions:

- *Omni-directional antennas are not an antenna type. Omni-directional is a reference antenna pattern*
- *Not all panel antennas are the same. Panel antennas contain multiple elements t configurations.*
- *U-NII devices – the lowest gain antenna, in addition to the highest gain of each type, is needed because the lowest gain results in worst case TDWR reception.*
- *Any change in antenna pattern, antenna type or installation that results in an increase in the reported level requires a Class II permissive change.*

Pre-Approval Guidance

KDB 388624 D01 Pre-Approval Guidance Procedure

- All Grants or Equipment Authorizations are issued exclusively by TCBs. FCC does not issue Grants directly. However, some Equipment Authorizations require oversight by the Commission. Section 2.964 specifies Pre-Approval Guidance (PAG) procedures for continuing the Commission oversight where compliance review procedures are not fully developed.
 - ✓ *Devices subject to special authorization procedures must be approved by the FCC.*
 - ✓ *Devices for which a sample must be submitted to FCC for pre-approval testing.*
 - ✓ *Devices for which there are new or unique operation or installation issues subject to FCC review*
- **See KDB 388624** <https://apps.fcc.gov/oetcf/kdb/forms/FTSSearchResultPage.cfm?id=28319&switch=P>
- In many circumstances it is not required for manufacturers or test laboratories to submit KDB inquires prior to submitting an application. As long as testing or submission guidance has been published for the devices subject to PAG, it is not necessary to contact the FCC for further guidance. The applicant should be prepared to provide the following to the TCB:
 - ✓ The KDB publication number of the document that includes the guidance that was followed
 - ✓ Documentation of how the guidance applies to the circumstances.

Pre-Approval Guidance

Example from the Pre-Approval Guidance List *Revised List 12/03/2021*

- RF exposure limits are not fully established
- RF exposure evaluations using numerical simulations or computational modeling
- Portable transmitters operating at frequencies above 6 GHz for which routine RF exposure evaluation is required
- Non-standard phantom configurations or test procedures are used for SAR testing.
- Dynamic antenna tuning is applied to optimize transmission efficiency
- low duty factor analysis report is required to qualify for SAR test exclusion
- Implanted transmitters with maximum total available output power > 1.0 mW
- Devices certified under Part 30 Upper Microwave Flexible Use Service
- Where directional gain of antenna systems is measured in lieu of calculations
- Devices restricted to use by only State, Local, or Federal law enforcement agencies.
- Unlicensed National Information Infrastructure (U-NII) devices with Dynamic Frequency Selection (DFS) capability
- Grants issued under an FCC Waiver

WiFi 5.925-7.125 GHz

KDB 987594

There are seven equipment classes that are applicable for 6 GHz UNII device

- **6ID:** 15E 6 GHz Low-power indoor access point.
- **6PP:** 15E 6 GHz Subordinate indoor device under control of a Low-power indoor access point
- **6XD:** 15E 6 GHz Low-power Indoor client under control of a low-power indoor access point
- **6CD:** 15E 6 GHz Dual client under control of either a low-power indoor or standard power access point
- **6SD*:** 15E 6 GHz Standard power access point managed by the AFC system.
- **6FX*:** 15E 6 GHz Standard client under control of a Standard power access point
- **6FC*:** 15E 6 GHz Fixed client associated with a standard power access point

* Certification for equipment classes (6SD, 6FX, 6FC) will be in Phase 2 when the AFC specifications are finalized

WiFi 5.925-7.125 GHz

KDB 987594

Table 1 Overviews of U-NII Rules

Band	Band GHz	Rules	Notes	KDB Pub
U-NII 1	5.15-5.25	15.407(a)(1)	Indoor Use/Outdoor Restrictions	789033 (U-NII)
U-NII 2A	5.25-5.35	15.407(a)(2)	Indoor/Outdoor/DFS	789033 (U-NII) 905462 (DFS)
U-NII 2B	5.35-5.47	Not Available		
U-NII 2C	5.47-5.725	15.407(a)(2)	Indoor/Outdoor/DFS	789033 (U-NII) 905462 (DFS)
U-NII 3	5.725-5.85	14.407(a)(3)	Indoor/Outdoor	789033 (U-NII) 926956 (&)
U-NII-4	5.85-5.925	95 Subpart L and 90 Subpart M	On-Board Units (OBU) must transmit signals to other OBUs and Roadside Units (RSU).	FCC 20-164 ⁵
U-NII 5	5.925-6.425	15.407(a)(4) – (8)	Low-power Indoor AP, Subordinates, Indoor Clients Standard Power AP, Fixed & Standard Clients	789033 (U-NII) 987594 (6 GHz Band)
U-NII 6	6.425-6.525	15.407(a)(5), (6), (8)	Low-power Indoor AP, Subordinates, Indoor Clients	
U-NII 7	6.525-6.875	15.407(a)(4) – (8)	Low-power Indoor AP, Subordinates, Indoor Clients Standard Power AP, Fixed & Standard Clients	
U-NII 8	6.875 -7.125	15.407(a)(5), (6), (8)	Low-power Indoor AP, Subordinates, Indoor Clients	
& Transition period ended March 2, 2020 for marketing DTS in the 5 GHz Band, as stated in 15.407(b)(4)(ii)				

FCC Plans for 5G

- **High-band:** Concluded 5G spectrum auction for the 28 GHz & 24 GHz bands. Auction for the upper 37/39/47 GHz bands is complete and we are in the process of issuing the licenses.
- **Mid-band:** Repurposing activities to make a large contiguous block of mid-band spectrum available for commercial use, 3.45-3.55 GHz band and neighboring 3.5 GHz and 3.7 GHz bands could offer 530 megahertz of mid- band spectrum for flexible use.
- **Low-band:** The FCC is acting to improve use of low-band spectrum with targeted changes to the 600 MHz, 800 MHz, and 900 MHz bands.
- **Unlicensed:** Recognizing that unlicensed spectrum will be important for 5G, the agency is creating new opportunities for the next generation of Wi-Fi in the 5.9 GHz and 6 GHz and above 95 GHz band.

3.45-3.55 GHz Band

3.45-3.55 GHz band currently allocated for Federal Radiolocation Service repurposed

- Reallocate 100 megahertz of spectrum in the 3.45 GHz band for non-federal flexible use wireless services
- Establish a framework for the 3.45 GHz band that will enable robust commercial use by an array of service providers, while also ensuring that federal incumbents are still protected from harmful interference where and when they require continued access to the band
- Protection provided within designated cooperative planning areas and periodic use areas
- Technical rules
- Power level consistent with other flexible use band
- Two-step emission mask; similar to CBRS
- Collectively, the 3.45 GHz band, the neighboring 3.5 GHz and 3.7 GHz bands represent 530 megahertz of contiguous mid-band spectrum for 5G

3.7-4.2 GHz Band

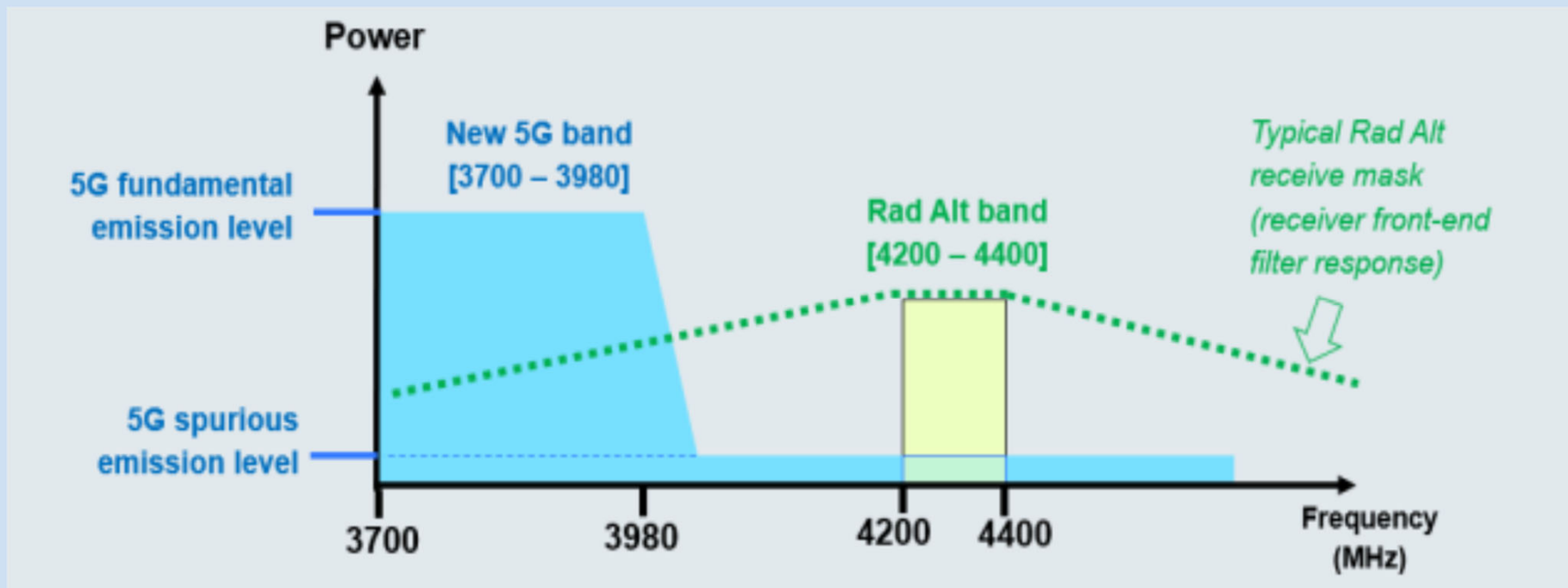
Repurpose 300MHz from fixed satellite service/fixed service to flexible use mobile broadband

- Add mobile allocation to 3.7-4.0 GHz band.
- Transition 280 megahertz, plus a 20-megahertz guard band, from incumbent use to flexible-use through public auction.
- 3.7-3.8 GHz transition in 46 of top 50 markets – December 2021
- All spectrum across entire U.S. – December 2023
- Require FSS operations to relocate to 4.0-4.2 GHz band.
- Provide incumbent FSS and FS licensees with reimbursement of reasonable relocation costs, paid by flexible-use licensees.
- Adopt service and technical rules for flexible-use licensees in the 280 megahertz of spectrum designated for transition to flexible-use.
- On February 17, 2021, Auction 107 concluded raising a total of \$81,114,481,921 in net bids with 21

3.7-4.2 GHz Band

Typical Radar Altimeter receiver passband illustration

(AIC Advisory Bulletin 01/25/2022)



12.2-12.7 GHz Band

Repurpose 500 MHz in non-geostationary satellite and multichannel video and data distribution services

- New 'Notice of Proposed Rulemaking' 01/15/2021.
- Comment period ended July 7, 2021.
- Proposal would allow thousands of small satellite constellations in low earth orbit to transmit internet connections directly to homes and businesses
- It has yet to be determined if incumbent operators can be protected.

Additional Changes:

- **KDB 447498** - RF Exposure Interpretations in response to specific changes in the FCC Rule limits. It will include new WiFi 6 test methodologies
- **KDB 502150** – Equipment authorization under Waiver. Instructions as to how to request a waiver of FCC rules, and provides specific instructions for how to proceed once a Waiver is received.
- **KDB 484596** – Referencing Test Data. New instructions are being developed for allowing for test data from a separately Certified device to be 'recycled' to a new product. Currently only devices under the same Grantee Code are permitted.

Standards and Revisions

- **ANSI C63.4a (2017)** – Revision is ongoing to main EMC C63.4 (2014)
- **ANSI C63.10 (2020)** - Published 1/29/2021. Corrigendum pending to fix errors
- **ANSI C63.19 (2019)** – HAC Accepted
- **ANSI C63.26 (2015)** – Licensed Transmitters - Revision ongoing
- **ANSI C63.29 (DRAFT)** Under development for LED lighting devices.
- **ANSI C63.30 (DRAFT)** – WPT Balloting complete – document passed and with final editing
- **ANSI C63.31 (DRAFT)** – New standard to replace MP4

CFR 47 Part 1.1307, What Changed?

OLD

- Only specific rule parts were subject to routine evaluation.
 - Most Part 15 devices were out of scope
 - Part 18 was out of scope
- Exemptions for mobile devices based on ERP (<1.5W below 1.5 GHz, < 3W above 1.5 GHz)
 - Portable device exemptions through KDB 447498

NEW

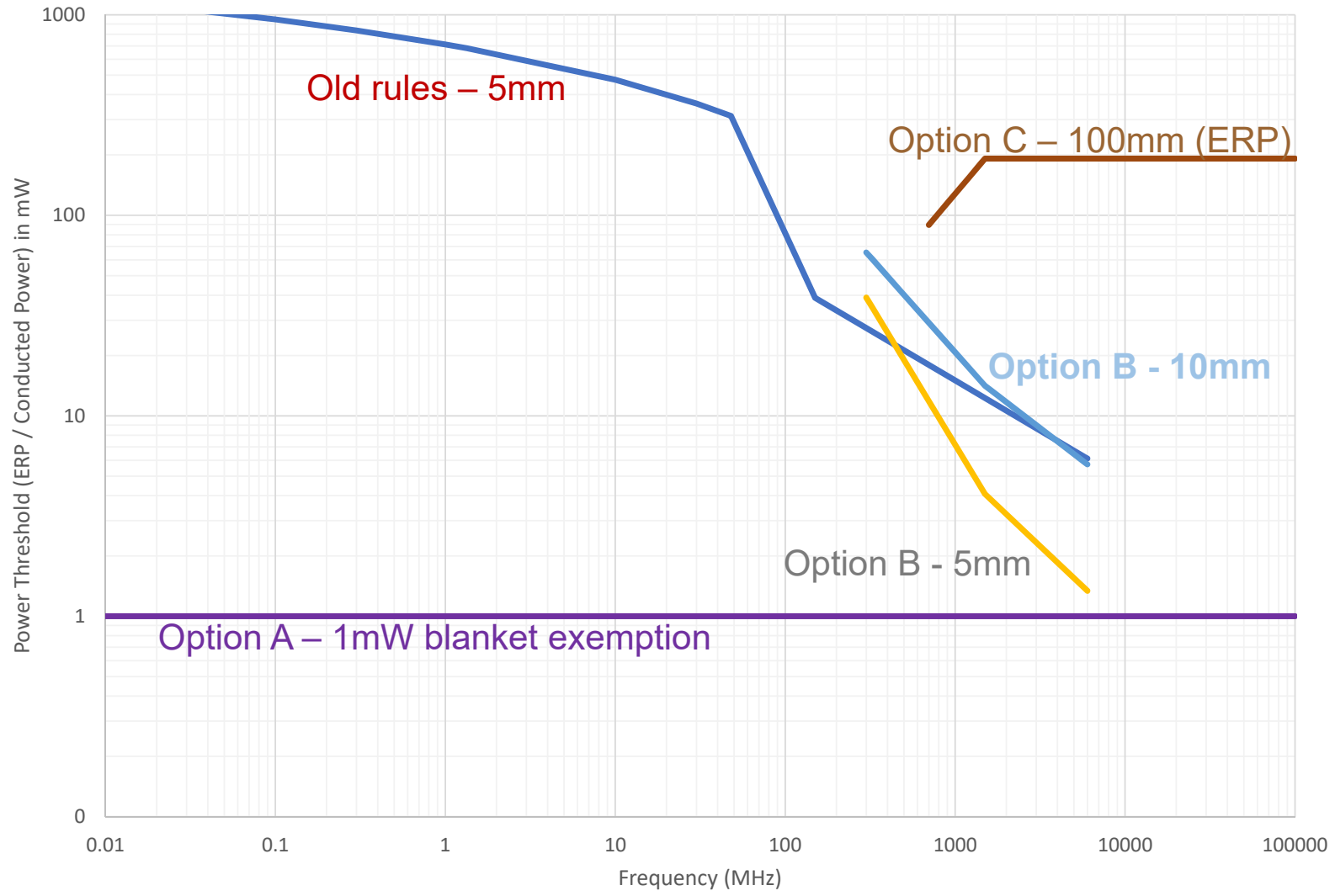
- All devices are now in scope of rf exposure assessment being required
- Exemptions for all devices now codified within the rules

CFR 47 Part 1.1307, What Changed?

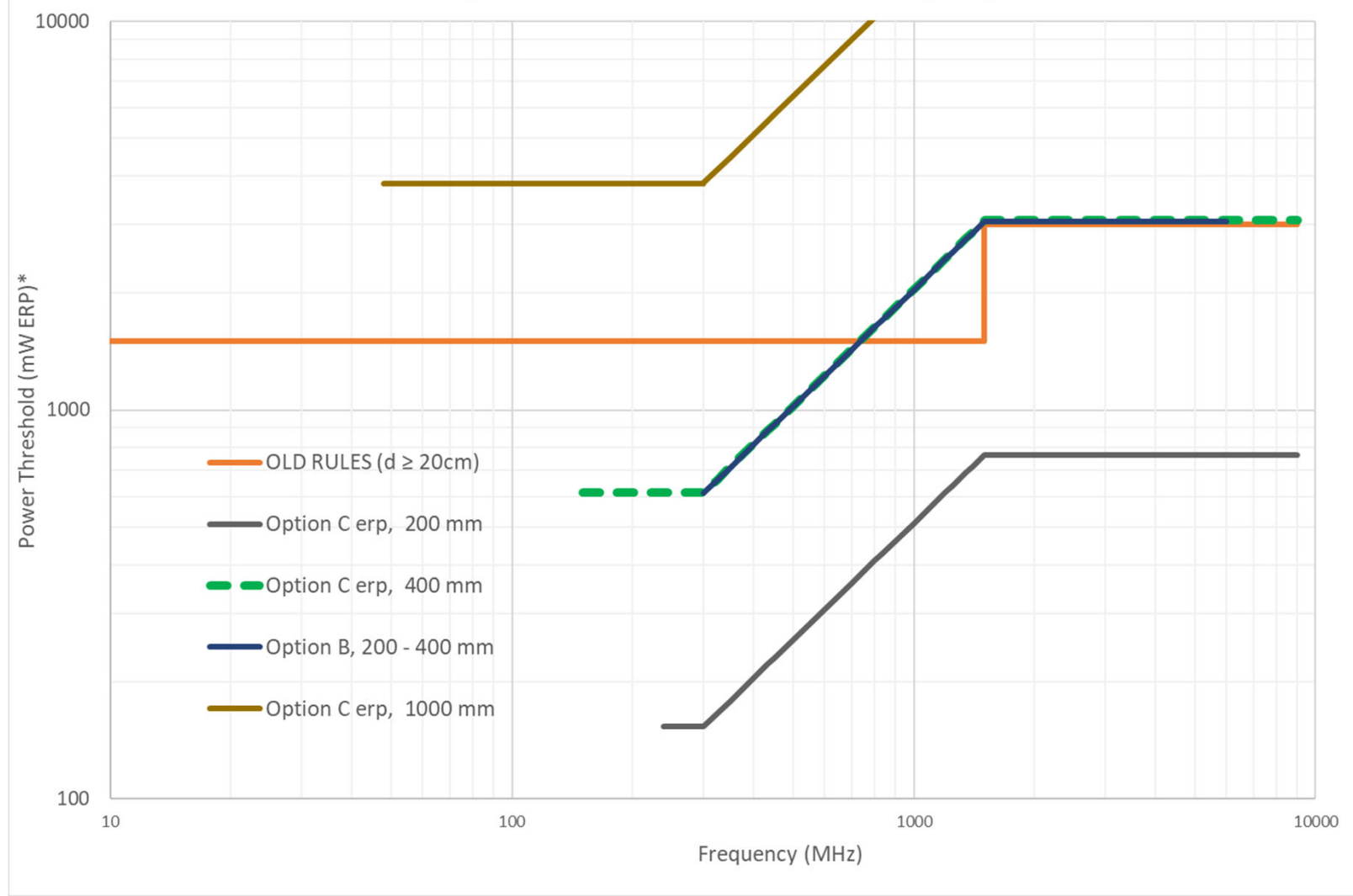
- 1.1307(b)(3) details three options to determine exemption from routine evaluation which are **significantly** different to the ones in the previous version
 - **1.1307(b)(3)(i)(A)**: Available maximum time-averaged power is no more than 1 mW
 - **1.1307(b)(3)(i)(B)**: Device operates between 300 MHz and 6 GHz and the maximum time-averaged power or effective radiated power (ERP), whichever is greater, $\leq P_{th}$.
 - **1.1307(b)(3)(i)(C)**: ERP is below a threshold calculated based on the distance R between the person and the antenna / radiating structure, where $R > \lambda / 2\pi$



Exemption Thresholds - Portable Devices



Exemption Thresholds - Mobile and Fixed Devices
 (Does not include the blanket 1mW exemption)



Questions?

William H. Graff
TUV Rheinland of North America
1279 Quarry Lane Suite A
Pleasanton, CA 94566
Mobile: (925) 819-2956

Special Thanks to Mark Briggs, UL for RFX Threshold Graphics