



AUG 01 2019

MEMORANDUM TO: Executive Branch Departments and Agencies

FROM: Diane Rinaldo 
Assistant Secretary of Commerce for Communications and Information (Acting)

SUBJECT: Review of Current Frequency Assignments and Quantification of Spectrum Usage

With this memorandum and the enclosed guidance, the National Telecommunications and Information Administration (NTIA), on behalf of the Secretary of Commerce (Secretary), provides guidance to the executive branch departments and agencies (collectively “agencies”) for conducting reviews of current frequency assignments and quantification of their spectrum usage.

President Trump’s October 25, 2018, Presidential Memorandum on “Developing a Sustainable Spectrum Strategy for America’s Future” calls for the development of a comprehensive, long-term National Spectrum Strategy.¹ In addition, Section 2(a) of the President’s memorandum requires the agencies to initiate a review of their current frequency assignments and quantification of their spectrum usage in accordance with guidance to be provided by the Secretary of Commerce.² The enclosed guidance addresses this requirement.

As stated in the Presidential Memorandum, spectrum-dependent systems are indispensable to the performance of many United States Government missions.³ In addition, the President mentioned that “flexible, predictable spectrum access by the United States Government will help ensure that Federal users can meet current and future mission requirements for a broad range of both communications and non-communications-based systems.”⁴ The President’s memorandum expected federal agencies to “thoughtfully consider whether and how their spectrum-dependent mission needs might be met more efficiently and effectively, including through new technology and ingenuity.”⁵

One of NTIA’s core statutory responsibilities is to promote the best possible and most efficient use of electromagnetic spectrum resources across the Federal Government, subject to,

¹ Memorandum for the Heads of Executive Departments and Agencies, Developing a Sustainable Spectrum Strategy for America’s Future (rel. Oct. 25, 2018), *published at* 83 Fed. Reg. 54513 (Oct. 30, 2018), *available at* <https://www.gpo.gov/fdsys/pkg/FR-2018-10-30/pdf/2018-23839.pdf> (Presidential Memorandum).

² *Id.* at Sec. 2(a). The Presidential Memorandum also directs agencies to report to the Secretary, working through NTIA, on their anticipated future spectrum requirements. In November 2018, NTIA provided guidance to agencies on that reporting task. *See* Memorandum from David J. Redl, Assistant Secretary of Commerce for Communications and Information, to Executive Departments and Agencies (Nov. 28, 2018), *available at* <https://go.usa.gov/xmZKh>.

³ *See Presidential Memorandum* at Sec. 1.

⁴ *Id.*

⁵ *Id.*

and consistent with, the needs and missions of Federal agencies.⁶ Pursuant to Section 105(c)(2) of the NTIA Authorization Act, as amended, “executive agencies are authorized and directed to cooperate with the NTIA and to furnish it with such information, support, and assistance, not inconsistent with law, as it may require in the performance of its functions.”⁷

The enclosed guidance establishes a process for agencies to review their current data and provide additional information, support, and assistance regarding their assignments and usage of spectrum. Towards this end, and in furtherance of the objectives of the Presidential Memorandum, NTIA is requiring that agencies review frequency assignment data in an initial set of bands and provide additional, specified data fields in order to validate the accuracy of existing data and further quantify spectrum use. Similar to previous quantitative assessment efforts, NTIA will then use this information to develop spectrum use contours for these initial bands and any additional bands, to estimate the extent to which each system uses its assigned spectrum.⁸ Moreover, agencies will continue, concurrently, to review their frequency assignments according to the current schedule in their assignment records for all bands.⁹

The information provided will be subject to existing safeguards protecting classified, sensitive, and proprietary data. At the same time, a key element of the National Spectrum Strategy will be transparency of spectrum use and improved cooperation and collaboration between federal and non-federal spectrum stakeholders. Similarly, the Presidential Memorandum provides that the “Secretary may release publicly a summary of information provided by agencies, to the extent consistent with applicable law.” Accordingly, NTIA will post on its website (www.ntia.gov) this memorandum, the enclosed guidance document, and other reporting and analysis as appropriate and consistent with security guidelines.

NTIA looks forward to working with your agency to initiate this important and timely review pursuant to the Presidential Memorandum. Please examine closely the attached guidance and confirm the appropriate points of contact on your agency’s staff who will be responsible for reviewing, assembling, producing, and submitting the necessary information. The enclosure lists NTIA’s points of contact for this effort, but please do not hesitate to contact me at drinaldo@ntia.gov or 202-482-1840 with any questions or concerns.

Enclosure

⁶ See 47 U.S.C § 902(b)(2)(U).

⁷ *Id.* at § 904(c)(2).

⁸ See generally, NTIA, *Quantitative Assessments of Spectrum Usage* (Nov. 17, 2016), available at <https://www.ntia.gov/report/2016/quantitative-assessments-spectrum-usage>.

⁹ See NTIA, *Manual of Regulations and Procedures for Federal Radio Frequency Management* at Sec. 8.2.6 ¶ 1 and Annex F (Sept. 2017 Rev., May 2013 Edition), available at <https://www.ntia.gov/page/2011/manual-regulations-and-procedures-federal-radio-frequency-management-redbook>.

Guidance on Reviewing Current Frequency Assignments and Quantification of Spectrum Usage

INTRODUCTION

In his Presidential Memorandum (PM) on “Developing a Sustainable Spectrum Strategy for America’s Future,” President Trump called for the development of a comprehensive, long-term National Spectrum Strategy.¹ Concurrent with development of the strategy, executive branch departments and agencies (collectively “agencies” hereafter) are to initiate a review of their current spectrum assignments and quantification of spectrum usage, pursuant to guidance provided by the Secretary of Commerce (Secretary).²

On behalf of the Secretary, and in execution of its statutory responsibilities, the National Telecommunications and Information Administration (NTIA) will work on this effort collaboratively and informatively with the agency members of the Policy and Plans Steering Group (PPSG), the Interdepartment Radio Advisory Committee (IRAC), and the Executive Office of the President’s Spectrum Strategy Task Force.³

Initially, NTIA is requiring those affected agencies to review their assignments in only two initial bands over the next 6-9 months.⁴ After the agencies begin to review these bands, NTIA will then solicit input from the agencies and other stakeholders on the next set of bands to be reviewed on a recurring and rolling basis. The PM directs the agencies to review current frequency assignments and quantify their use of spectrum as part of the effort to advance the National Spectrum Strategy and ongoing initiatives. NTIA hereby provides guidance to the agencies to undertake this effort.

¹ Memorandum for the Heads of Executive Departments and Agencies, Developing a Sustainable Spectrum Strategy for America’s Future (rel. Oct. 25, 2018), *published at* 83 Fed. Reg. 54513 (Oct. 30, 2018), *available at* <https://www.gpo.gov/fdsys/pkg/FR-2018-10-30/pdf/2018-23839.pdf>.

² *Id.* at Sec. 2(a).

³ *Id.* at Sec. 5. The Spectrum Strategy Task Force shall work with the Secretary and NTIA in the coordination and implementation of the PM.

⁴ On March 6, 2019, NTIA’s Office of Spectrum Management (OSM) provided to the IRAC and PPSG a draft work plan, outlining OSM’s objectives, proposed approach, and timetable for this effort along with a list of five frequency bands (over 13,000 assignments) to be reviewed during the next 12 months. That draft plan considered the large amount of effort that would be required to accelerate and expand the regular agency reviews of all frequency assignments in all bands (over 250,000 frequency assignments). This guidance is based on the feedback from several agencies and prioritizes a smaller initial set of bands to be reviewed and quantified over the next 6-9 months.

SUMMARY OF KEY MILESTONES AND TARGET DATES

- Affected agencies briefed on review/quantification effort: April 24, 2019
 - IRAC Frequency Assignment Subcommittee (FAS) Kick-off Meeting held
 - Agencies provided points of contact for this effort to FAS Chairperson
- NTIA's Office of Spectrum Management (OSM) and agency brainstorming workshop on scheduling, monitoring, and additional candidate bands: end of August 2019 (followed by additional workshops and stakeholder outreach, as needed)
- Assignment data for initial bands provided to agencies: August 2019
- FAS status check: November 2019
- Recommendation of additional bands by IRAC and PPSG: December 2019
- OSM identifies additional bands based upon agency and stakeholder feedback: January 2020
- FAS status check: January 2020
- Affected agencies complete assignment review and provide supplementary information for Band 1 in Table 1 below: February 3, 2020
- FAS status check: March 2020
- Affected agencies complete assignment review and provide supplementary information for Band 2 in Table 1 below: April 30, 2020
- Affected agencies complete assignment review and provide supplementary information for additional bands: Schedule to be determine in January 2020 when the additional bands are scheduled to be selected.
- Application of new data fields to five-and-ten-year reviews: January 1, 2021

DATA COLLECTION EFFORTS

The data collection efforts consist of four components. First, applicable agencies will review frequency assignment data for the two initial bands (and any additional bands) and provide supplementary data fields in order to quantify their spectrum use. Second, OSM will use this information to update or develop spectrum use contours for these initial and any additional bands. Third, agencies will continue, concurrently, to review their frequency assignments according to Section 8.2.6 ¶ 1 and Annex F of the NTIA Manual,⁵ subject to further enhancements and changes. Fourth, OSM, the agencies, and other stakeholders will explore additional methods, such as monitoring and scheduling, to better quantify spectrum use. These components are explained in more detail as follows:

1. Reviewing Frequency Assignments in Initial Bands: Considering the large amount of effort and lengthy period of time that would be required to review all federal frequency assignments, this guidance prioritizes an initial set of bands (see Table 1, below). These

⁵ See NTIA, Manual of Regulations and Procedures for Federal Radio Frequency Management at Sec. 8.2.6 ¶ 1 and Annex F (Sept. 2017 Rev., May 2013 Edition), available at <https://www.ntia.gov/page/2011/manual-regulations-and-procedures-federal-radio-frequency-management-redbook> (NTIA Manual).

initial band reviews will update and refine data and analysis from NTIA’s previous quantification assessments and provide further experience to generate the most optimal and current data on current spectrum usage. The two bands identified below were chosen to provide a set of bands that could be reviewed in a relatively short period of time, while offering more fulsome and granular data on usage. For instance, based upon ever-changing frequency assignment data, the 3100-3550 MHz band is being revisited to bring up to date and validate this assignment data and contours, providing more accurate and transparent usage of these federal systems in anticipation of a report due to Congress early next year.⁶

Table 1
List of Bands for Initial Assignment Review and Quantification

Frequency Band	Amount (megahertz)	Assignments*	Agencies**
Band 1: 3100-3550 MHz	450	445	AF, AR, N, MC, C, DHS, DOE
Band 2: 7125-8400 MHz	1,275	8,713	A, AF, AR, C, CG, DHS, DOE, FAA, I, J, MC, N, NASA, NSF, S, SI, TVA, VA
Totals	1,725	9,158	

* Assignment records/count change daily. Current assignment data will be provided to the agencies.

** The table of acronyms and abbreviations in Appendix C includes these agency abbreviations.

The mechanism for agencies to review and report on the assignments and quantification for the bands in Table 1 will be through the FAS. Working through the FAS, agencies will provide updates on the progress of their reviews of the above bands, based on Annex F procedures with supplemental guidance provided in Appendices A and B (see #2 below). OSM will provide each applicable agency a template populated with existing data from the relevant assignment records contained in the Government Master File (GMF). Each applicable agency will then verify and update the existing data, where necessary, and provide any new data as specified below.

Based on the number and distribution of assignment records in each of the bands above, the FAS Chairperson will develop, in consultation with FAS representatives, specific timelines to review/quantify the assignments in each band and have regular status checks. The FAS Chairperson will also ensure that progress and deliverables remain on track with established deadlines. Further guidance and details for reviewing these bands may be developed within the FAS if necessary, but no extensions of time are contemplated for these two initial bands.

2. Quantifying Spectrum Use: For the bands identified in Table 1, the applicable agencies will update or supplement their GMF frequency assignment data with more granular technical and operational information. Appendix A provides more information on the specific fields that are required. In addition to this supplemental technical information,

⁶ See MOBILE NOW Act, Pub. L. No. 115-141, § 605(a), (c), 129 Stat. 1100 (Mar. 23, 2018).

each applicable agency must submit an MS Word document (see template provided in Appendix B), further elaborating and fully describing, in narrative form, the additional information as further detailed in Appendix B.

The information provided in the narrative document should describe, in detail, the data points provided in Appendix B. The supplemental information required by NTIA includes data elements not currently contained in the GMF. This data will assist in quantifying the agency use of spectrum by improving the accuracy of the analysis. These and additional data elements may be incorporated into the GMF records in the future.

Using the information provided by the agencies, OSM will generate spectrum usage contours to quantify frequency, geography, and time of use for each applicable frequency assignment. If the data is incomplete, OSM will highlight the assignments in question and ask the agencies to provide the correct data or supplemental data in a re-submission. The spectrum usage contours will be generated using the methodology described in NTIA's report, *Quantitative Assessments of Spectrum Usage*.⁷ This methodology calculates received power levels displayed through spectrum use contours.⁸

3. Continuing Regular Reviews as Scheduled: The PM directs agencies to review their current frequency assignment data. NTIA will leverage the process already in place with the five-to-ten year reviews. As stated in the NTIA Manual, each Federal agency must maintain a program of continuing review of frequency assignments to its radio stations and must delete or amend such assignments as appropriate. The objectives of this program are (a) to ensure that frequency assignments are in current use and are correctly reflected in the GMF; (b) to ensure that frequency assignments are required for continued operations for the purpose stated in their justification; and (c) to ensure that frequency assignments are still qualified for authorization under the provisions of the regulations contained in the NTIA Manual. Each assignment shall be reviewed in the manner specified in Annex F of the NTIA Manual, unless by the terms of its authorization it is subject to review more frequently.⁹

Agencies must continue to review their frequency assignments as scheduled according to their assignment record, and make any changes to the record fields to properly reflect the usage in accordance with provisions in Annex F of the NTIA Manual, including any modifications thereto.

⁷ See NTIA, *Quantitative Assessments of Spectrum Usage* (Nov. 17, 2016), available at <https://www.ntia.gov/report/2016/quantitative-assessments-spectrum-usage>. Using the data provided, validated and supplemented by the agencies, NTIA computed spectrum usage contours and the estimated percentage of the population impacted using an analytical tool developed for the purpose of compiling and summarizing usage. See *id.* at 4.

⁸ While this methodology and tool currently has some limitations with regard to analyzing airborne platforms and assignments covering the United States and Possessions (US&P) frequency assignments, OSM is looking to improve its quantitative analysis capabilities and will be seeking agency suggestions on how to better quantify usage in this regard.

⁹ See NTIA Manual at Annex F, available at https://www.ntia.gov/files/ntia/publications/redbook/2017-09/F_17_9.pdf.

In the future, a more comprehensive review process will be developed whereby agencies will provide additional information similar to the information sought in Appendices A and B of the this guidance document. NTIA is adding in additional fields to assignment records to better understand and quantify agency spectrum use. In the meantime, the assignment review process should continue as is, except for those bands listed in Table 1 and the additional bands subsequently identified for review pursuant to the PM and this guidance document. The goal is to eventually incorporate the new data fields into the regular review process as a permanent data collection effort.

4. Exploring Other Means to Quantify Spectrum Use: NTIA requests that federal agencies work with NTIA and other stakeholders to collaboratively explore other metrics to quantify spectrum use, including assessing the benefits of other agencies' monitoring and scheduling efforts, such as those employed by the Federal Aviation Administration (FAA), National Science Foundation (NSF), and the Federal Communications Commission.

Quantification through Monitoring and Measurements: Spectrum monitoring is long-term, continuous measurement of the radio-frequency environment from multiple sensors, providing information about the use of radio frequencies across broad areas and enabling observation of historical trends and events. Spectrum managers can use data generated through spectrum monitoring to ensure compliance with spectrum-use rules and frequency assignments, as well as validating spectrum usage contours. With more extensive, detailed, and accurate data from monitoring and measurements, NTIA will be able to validate updated assignment data, confirm analyses related to repurposing activities, provide transparency and inform decision-makers when considering spectrum-sharing opportunities. Enhanced measurement techniques, analytics, and technical parameters will provide more accurate information on spectrum usage.

Quantification through Temporal Understanding: Some agencies, such as the Department of Defense (DOD), organize a limited number of frequency assignments for certain capabilities tied to testing and training via a scheduling regime, particularly at military and test ranges. DOD's Integrated Frequency De-confliction System, for example, is used for scheduling at military test facilities and ranges. Knowing how spectrum is used, and at what times, could provide insight into the quantification of frequency use.

As the review/quantification process gets underway, NTIA will explore and schedule one or more workshops in collaboration with the agencies to explore additional data points and/or fields for potential inclusion in the reviews going forward (for example, involving scheduling or monitoring of usage in geographical or temporal elements of usage, passive systems, etc.).

SUBMISSIONS

The mechanism for applicable agencies to submit the required information for the bands in Table 1 will be through the FAS. The FAS Chairperson will provide an initial Comma-Separated Values (CSV) file with the data and serial numbers for existing records in the GMF for each

band to each agency that has a record in that band (those parameters from Appendix A without an asterisk). The applicable agencies must review each record for accuracy and to ensure that it is up-to-date. Where the agencies provide new or corrected data in existing fields, they should note the change(s) in their submissions back to OSM in the CSV file. In addition, agencies should provide data in the additional fields (*i.e.*, those parameters with an asterisk in Appendix A). Further, agencies must provide, in an MS Word document, additional information on usage for each assignment in each band for the information described in Appendix B. The CSV file and MS Word file should be linked by the common assignment serial number.

All submissions back to OSM, classified or unclassified, should be sent through the FAS and be consistent with normal FAS procedures for frequency assignment review and submissions. Those agencies with classified systems or assignments should submit a classified version subject to existing safeguards. Files containing Controlled Unclassified Information (CUI) should be marked in accordance with appropriate regulations and guidelines.¹⁰ All completed files should be sent to John McFall, FAS Chairperson at email: jmcfall@ntia.gov; SIPR: jmcfall@doc.sgov.gov; or JWICS: jmcfall@doc.ic.gov.

The PM provides that the “Secretary may release publicly a summary of information provided by agencies, to the extent consistent with applicable law.” Accordingly, NTIA will protect classified information and CUI in accordance with appropriate authorities, regulations, and guidance.¹¹ NTIA will also coordinate with the applicable agencies prior to making public any agency-specific information or analysis based upon agency supplied information.¹²

NEXT STEPS

The FAS held a kick-off meeting for this effort on April 24, 2019, to discuss the review process, including additional metrics for quantification, milestones, deliverables and further guidance that may be needed for clarification. A workshop with the agencies will be held at the end of August 2019 on monitoring and scheduling to better understand the relationship with quantification of usage of the initial and additional candidate review bands. After consultation with the agencies, additional band assignments will be provided and then reviewed. Additional status updates will then follow within the FAS over the ensuing months in order to ensure that reviews remain on track according to the schedule for each band.

¹⁰ See, e.g., 47 C.F.R. Part 2002; National Archives and Records Administration, *CUI Policy and Guidance*, available at <https://www.archives.gov/cui/registry/policy-guidance>.

¹¹ See Exec. Order No. 13,526, *Classified National Security Information*, 75 Fed. Reg. 707 (Jan. 5, 2010); Exec. Order 13,556, *Controlled Unclassified Information*, 75 Fed. Reg. 68675 (Nov. 9, 2010); National Archives and Records Administration, *Classified National Security Information, Final Rule*, 81 Fed. Reg. 63336 (Sept. 14, 2016); 32 C.F.R. Part 2002 (2016).

¹² Aggregate spectrum usage contours for the bands in Table 1 may also be incorporated into the spectrum use band reports posted on www.spectrum.gov.

NTIA POCs

For additional information or questions, please contact:

- Mr. Richard Orsulak at rorsulak@ntia.gov or 202-482-9139 for general questions;
- Mr. Edward Drocella at edrocella@ntia.gov or 202-482-2608 for questions on quantification and technical matters; or
- Mr. John McFall at jmcfall@ntia.gov or 202-482-1486 for FAS and frequency assignment review matters.

APPENDIX A

Technical Characteristics for Quantification

OVERVIEW

This Appendix specifies the technical information needed for the review and the quantification of spectrum usage and file format for information to be submitted back to OSM for those assignment records in the bands listed in Table 1 above.

The FAS Chairperson will provide the agencies an initial file of characteristics for agency use as delineated below. After review of the data elements, agencies should make any needed corrections to the data fields below, and additional information should be provided for those fields marked with an asterisk (*). The files to be supplied to the agencies are to be formatted as Comma-Separated Values (CSV).

The CSV file format is described for agency use for any corrections and additions. There should only be one frequency assignment per row, and there should not be any duplicate frequency assignments. Each data field should be separated by a comma. There should only be one value per field except for the schedule of operation. Multiple values within the schedule of operation field should be separated by a + symbol. All numeric values should not contain commas, nor should any text fields contain commas or quotes, unless otherwise noted. All frequency values are assumed to be in Hertz, unless otherwise noted. All angles should be provided in degrees. All latitudes and longitudes should be provided in decimal degrees, and any distance in kilometers. The order of data fields within the CSV file should follow the numbering in the data field label specified in this document. The CSV file should not contain a header row.

DESCRIPTION OF DATA FIELDS

In the description section below, asterisks (*) indicate new data fields not currently included in the GMF.

1. Serial Number

The frequency assignment serial number of this system. This field should be text, but formatted as XXXXYYYYYY where XXXX is the agency code of the system padded on the right with spaces, and YYYYYY is numeric. For instance, if the agency code is AF, a valid serial number would be AF 123456. Note that there are *two* spaces after AF in the example.

2. Antenna Gain

The mainbeam antenna gain at which this system operates, in dBi.

3. Transmit Power

The maximum operating transmit power of this system, in Watts. This should be a positive decimal number.

4. Center Frequency

The center frequency at which this system operates, in Hz. This should be a positive decimal number.

5. Necessary Transmit Bandwidth

The necessary transmit bandwidth of this system, in Hz. This should be a positive decimal number.

6. Antenna Height

The height of the antenna above the terrain , in meters. This should be a positive decimal number.

7. Latitude

The latitude at which this system operates, in decimal degrees. If the device is stationary, this is the latitude of the system. If the system is mobile/transportable, this is the center latitude defining the operational area for this system.

8. Longitude

The longitude at which this system operates, in decimal degrees. If the system is stationary, this is the longitude of the system. If the system is mobile/transportable, this is the center longitude defining the operational area of this system.

9. Radius of Operation

The radius around the center latitude and longitude in which this system could operate, in kilometers. If the system is stationary, this value should be 0.

10. Pulse Width (for radars)

The length of a single pulse transmitted from this system, in microseconds.

11. Pulse Repetition Frequency (for radars)

The number of pulses transmitted by this system, in pulses per second.

12. Station Class

The station class(es) for this system. If multiple station classes apply, then separate each station class by a "+" symbol.

13. Major Function Identifier

Describes the primary/major function or purpose for which the frequency assignment will be used.

14. Intermediate Function Identifier

Describes the most significant sub-function or purpose for which the frequency assignment will be used.

15. Transmitter Antenna Polarization

Insert one of the following letters or combination of letters to indicate the antenna polarization: A--Elliptic, Left B--Elliptic, Right D--Rotating E--Elliptical F--45 degrees H--Horizontal J--Linear L--Left Hand Circular M--Oblique Angled, Left N--Oblique Angled, Right O--Oblique

Angled, Crossed R--Right Hand Circular S--Horizontal and Vertical T--Right and Left Hand Circular V--Vertical X--Other

16. Time of Operation

The percentage of time this system operates each day: 1--for constant or nearly constant (50-100% use); or 2--for regular or frequent (10-50% use); or 3--for intermittent (1-10% use); or 4--for sporadic/occasional (less than 1% use).

17. Leftmost Azimuth*

The leftmost azimuth at which this system operates, in degrees. 0° indicates that this device at its leftmost scan point points towards true north. This number should always be non-negative, but never greater than 360°.

18. Rightmost Azimuth*

The rightmost azimuth at which this system operates, in degrees. 180° indicates that this device at its rightmost scan point points towards due south. This number should always be greater than or equal to the leftmost azimuth.

19. Equipment Nomenclature*

Provide the equipment nomenclature or manufacturer and model for this system. Since this field can contain commas, this field should be enclosed in the double quote character "(ASCII value 34).

20. Antenna Manufacturer and Model*

Provide the manufacturer and model number for the antenna. Since this field can contain commas, this field should be enclosed in the double quote character "(ASCII value 34).

21. Pulsed Duty Cycle (for radars)*

Pulsed duty cycle is a measure of the fraction of the time a radar is transmitting. The duty cycle cannot exceed 100 percent. This should be a positive decimal number that will not exceed 1.

22. Antenna Tilt Angle*

The antenna tilt angle of this system, in degrees. This should be a decimal number.

23. Antenna Gain Pattern*

The antenna gain in dBi as a function of the off-axis angle in degrees. This field should only have the antenna gains ordered by its corresponding off-axis angle in increments of 1 degree and ranging from 0 to 180 degrees. This field should contain only antenna gains and not its corresponding off-axis angle. A "+" will separate each antenna gain.

24. Coordinates Describing Area of Operation*

Coordinates can describe points, lines, or polygons (areas). This field should have the longitude followed by the latitude and a "+" separates every longitude and latitude. All coordinates should be decimal degrees.

25. Schedule of Operation*

The schedule of operation defines when the system operates throughout a single year. The format is specified as a series of “schedule records”, separated by a “+” symbol. A single schedule record has three parts and takes the form of MMDD-MMDD|WWWWWWW|HHMM-HHMM.

The first part of this data field, MMDD-MMDD specifies a date range of operation. For instance, 1101-1130 specifies a date range including only the month of November. Note that this range *includes the first and last date*.

The second part of this data field specifies the list of days of the week in which the system is active. The days of the week are numbered in this case, 1 being Monday, 2 being Tuesday, and so on, with 7 being Sunday. To provide multiple days of the week include both day numbers in the string. For instance, 1456 would include Monday, Thursday, Friday, and Saturday, but not Tuesday, Wednesday, or Sunday.

The third part of this data field specifies the time range during which the system is active. The first four digits represent a time in 24 hour format (0000 is midnight) for when the device comes online. The second set of 4 digits represents when the system goes offline. For instance, 0000-0059 would represent a time interval of an hour (from 12:00:00 AM to 12:59:59 AM). Multiple schedules can be combined with the + symbol. For example 0101-0131|1|0000-2359+0601-0630|2|0000-2359 would indicate a system that is online every Monday in January and every Tuesday in June. Note that there are no spaces between individual date descriptions and their sections, which applies to both single and multiple schedules.

More examples are provided below:

0101-1231|1234567|0000-2359 specifies a system/station that is always online;
0201-0228|14|1200-1259 specifies a system/station that is online only in February on Mondays and Thursdays from 12pm to 1pm;
0101-0531|12345|0000-2359+0601-1231|67|0000-2359 specify weekdays from January through the end of May, and then weekends from June to the end of December.

It is recognized that not all systems operate on a pre-defined schedule of operation as described above. Some systems may have more intermittent and variable schedules. In this case, please provide your best estimate of scheduled use.

NOTES

For azimuths, to specify that the system scans the entire horizon, indicate a leftmost azimuth of 0° and a rightmost azimuth of 360°. However, indicating a leftmost azimuth of 0° and a rightmost azimuth of 0° would mean the system does not scan, but rather always points due north. The azimuth definition can also describe a specific field of view or sector blanking.

APPENDIX B

Supplementary Assignment Information

This document provides a template for additional, supplementary narrative text describing and elaborating on certain data points that the agencies will provide, pursuant to the guidance (quantifying spectrum use). The information will provide a better understanding on how the system is used relative to its radio frequency environment, which will enhance future spectrum management and planning and provide more accurate and finite analysis.

For each assignment in each of the bands listed in Table 1, agencies must provide (in addition to the technical information from Appendix A) detailed information in the following areas:

- Mission: Describe the mission and purpose of the systems for the associated frequency assignment(s).
- Actual Frequency of Operation: Provide an accurate representation of operating frequency(ies). For example, instead of reflecting the entire band assignment, provide actual frequencies of operation.
- Actual Time of Operation: A field for percentage of time a system is used already exists in the GMF for each frequency assignment ¹ Provide more specific information on temporal use describing the dynamic operation of their systems. For example, is the frequency assignment associated with a system that operates on a known schedule? That is, are there specific times and dates the system is typically used, such as at test ranges? If so, state specific temporal details.
- Actual Area of Operation: For assignments that are authorized for US&P or other large geographical areas of operation, provide more specific information describing the area of operation. For example, identify operational areas within test and training ranges in terms of exact locations/geographical boundaries. For statewide or other large geographical assignments, provide specific geographic areas within the United States.
- Operating Conditions: Provide information for those assignments with operating limits or restrictions based on agency coordination process (e.g., sector blanking, time of operation, etc.)
- Modes of Operation: Identify the different modes of operation for a system. Provide data for each mode of operation in a frequency assignment (for example, for radars systems provide specific Pulse Repetition Frequency (PRF)/pulse width combinations)

¹ See NTIA Manual, Chapter 9, page 9-23, available at <https://www.ntia.gov/files/ntia/publications/redbook/2017-09/9>.

This information should be provide in a table in an MS Word document format as indicated below.

**Template for Agency Use in Providing
Supplemental Assignment Information**

Band	Assignment Serial Number	Purpose/ Mission	Frequency of Operation	Time of Operation	Area of Operation	Operating Conditions	Modes of Operation

APPENDIX C
Acronyms and Abbreviations

A	Department of Agriculture
AF	Department of the Air Force
AR	Department of the Army
C	Department of Commerce
CG	United States Coast Guard
CSV	Comma-Separated Value
CUI	Controlled Unclassified Information
DHS	Department of Homeland Security
DOD	Department of Defense
DOE	Department of Energy
FAA	Federal Aviation Administration
FAS	Frequency Assignment Subcommittee (of the IRAC)
GMF	Government Master File
I	Department of the Interior
IRAC	Interdepartment Radio Advisory Committee
J	Department of Justice
MC	United States Marine Corps
N	Department of the Navy
NASA	National Aeronautics and Space Administration
NSF	National Science Foundation
NTIA	National Telecommunications and Information Administration
OSM	Office of Spectrum Management (of NTIA)
PM	Presidential Memorandum
PPSG	Policy and Plans Steering Group
S	Department of State
SI	Smithsonian Institute
TVA	Tennessee Valley Authority
VA	Department of Veterans Affairs