



PUBLIC NOTICE

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**INTERNATIONAL BUREAU ISSUES GUIDANCE ON SITING METHODOLOGIES FOR
EARTH STATIONS SEEKING TO OPERATE IN THE 24.75-25.25 GHz, 27.5-28.35 GHz, 37.5-40
GHz, 47.2-48.2 GHz, AND 50.4-51.4 GHz FREQUENCY BANDS TO DEMONSTRATE
COMPLIANCE WITH SECTION 25.136
IB Docket No. 17-172**

In this Public Notice, the International Bureau (Bureau) provides guidance on methodologies to implement section 25.136 of the Commission's rules, which specifies conditions under which Fixed-Satellite Service (FSS) earth stations can operate in certain bands shared with the Upper Microwave Flexible Use Service (UMFUS).¹ This guidance is informed by comments and *ex parte* presentations filed with the Commission, as well as the Bureau's experience in processing earth station applications.² Here, we clarify the Commission's expectations regarding the demonstrations required under section 25.136 to promote consistency among filings, while still providing reasonable flexibility to FSS earth station applicants.

¹ 47 CFR § 25.136.

² See International Bureau Seeks Comment on Implementing Earth Station Siting Methodologies, *Public Notice*, DA 17-606 (June 21, 2017) (*June 21 Public Notice*); and comments filed by EchoStar Satellite Operating Corp. and Hughes Network Systems, LLC (filed July 21, 2017); AT&T Services, Inc. (filed July 21, 2017); Viasat, Inc. (filed July 21, 2017); WorldVu Satellites Limited (filed July 21, 2017); The Boeing Company (filed July 21, 2017); Joint Comments of SES Americom, Inc., O3b Limited, Inmarsat, Inc., and Telesat Canada (filed July 17, 2017); CTIA (filed Aug. 7, 2017); Joint Reply Comments of SES Americom, Inc., O3b Limited, Inmarsat, Inc., Telesat Canada and WorldVu Satellite Ltd. (filed Aug. 7, 2017); AT&T Services, Inc. (filed Aug. 7, 2017); Viasat, Inc. (filed Aug. 7, 2017); Notice of *Ex Parte* of Hughes Network Systems, LLC and Inmarsat, Inc. (filed Aug. 25, 2017); Notice of *Ex Parte* of Hughes Network Systems, LLC, Inmarsat, Inc., SES Americom, Inc., O3b Limited, WorldVu Satellites Ltd, and Telesat Canada (filed Sept. 14, 2017); Space Exploration Technologies Corp. (filed Feb. 20, 2020), Hughes Network Systems, LLC (April 9, 2020), CTIA (filed May 21, 2020), Verizon (June 5, 2020) and Hughes Network Systems (filed June 9, 2020). We note in particular that Hughes' proposal in its April *ex parte* filing, to require that any objections made by UMFUS licensees be made during the part 101 coordination process and to preclude objections during the earth station licensing process, is not addressed here as it is outside of the scope of the guidance for siting methodologies provided in this public notice and is in contravention of the Commission's rules governing oppositions and other pleadings in response to applications. See *e.g.*, 47 CFR § 25.154.

Background

In the *Spectrum Frontiers First Report and Order*, the Commission adopted section 25.136 to specify conditions under which FSS earth stations can coexist with UMFUS operations in the 27.5-28.35 GHz and 37.5-40.0 GHz frequency bands.³ The Commission also directed the Bureau to issue a public notice seeking comment on earth station interference zone and protection zone calculation methodologies and on best practices for siting earth stations.⁴ The Bureau released the Public Notice on June 21, 2017, regarding the circumstances under which FSS earth stations may operate in bands shared with the UMFUS, including seeking comment on minimizing the impact on UMFUS, colocating earth stations, and accommodating multiple earth station interference zones within an UMFUS license area. We received comments on the Public Notice from a variety of interested parties.⁵

Since the release of the June 21, 2017 Public Notice, the Commission has released additional orders in the *Spectrum Frontiers* proceeding addressing the 24.75-25.25 GHz, 47.2-48.2 GHz, and 50.4-51.4 GHz bands in section 25.136.⁶ While the changes the Commission made to section 25.136 do not impact the general issues raised in the Bureau's June 21, 2017 Public Notice, this guidance is drafted in a manner consistent with the rule as modified by the Commission's subsequent decisions.⁷

Earth Station Application Guidance

The guidance outlined in this Public Notice is intended to provide applicants with a better understanding of the Bureau's expectations regarding earth station applications subject to section 25.136 of the Commission's rules.⁸ In general, in issuing this guidance, we seek to allow applicants flexibility in how they demonstrate compliance with this rule, ease the application preparation process, and facilitate efficient Commission review. All applications will be assessed on a case-by-case basis.⁹

Earth Station Location and Antenna Pointing

- Earth stations communicating with geostationary orbit (GSO) space stations should provide an analysis based on the antenna pointing angles toward the points of communication requested in their earth station applications and demonstrate that the

³ *Use of the Spectrum Bands Above 24 GHz for Mobile Radio Services*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014 (2016) (*Spectrum Frontiers First Report and Order*).

⁴ *Spectrum Frontiers First Report and Order*, 31 FCC Rcd at 8051, paras. 54, 93 n.120 & n.223.

⁵ See *supra* n.2.

⁶ See *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services et. al.*, Second Report and Order, Second Further Notice of Proposed Rulemaking, Order on Reconsideration, and Memorandum Opinion and Order, 32 FCC Rcd 10988 (2017); *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services et. al.*, Third Report and Order, Third Further Notice of Proposed Rulemaking, and Memorandum Opinion and Order, 33 FCC Rcd 5576 (2018) (adopting rules for FSS operations in the 27.5-28.35 GHz and 38.6-40 GHz bands); *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, Fifth Report and Order, 34 FCC Rcd 2556 (2019) (adopting rules for FSS earth station operations in the 50.4-51.4 GHz band).

⁷ 47 CFR § 25.136 - Earth Stations in the 24.75-25.25 GHz, 27.5-28.35 GHz, 37.5-40 GHz, 47.2-48.2 GHz, and 50.4-51.4 GHz bands.

⁸ The methodologies presented in this guidance are intended to be used for all frequency bands covered by 47 CFR § 25.136, unless otherwise instructed.

⁹ For space-to-Earth frequency bands, section 25.136 uses the term "protection zone." For Earth-to-space frequency bands, section 25.136 refers to "PFD contours." As used in this Notice, the term "licensing area" refers to the applicable geographic area specified in the relevant part of section 25.136 for a particular frequency band.

aggregate affected population corresponding to all points of communication does not exceed the applicable limits in section 25.136.¹⁰

- Earth stations communicating with non-geostationary orbit (NGSO) space stations should provide an analysis based on a range of antenna pointing angles necessary to communicate with the satellites in its application. The analysis should represent the PFD contour or protection zone under realistic assumptions consistent with actual operations of the network.

Computing PFD Contours and Protection Zones

- Applicants should provide a list of input parameters and formulas used to calculate the PFD contours or protection zones to allow for independent verification of the results of the propagation models used to generate the PFD contours and protection zones.
- We encourage the use of widely accepted and publicly available propagation models, (*e.g.* ITU Recommendations such as ITU-R Rec. P. 452) that are appropriate for the analysis in question. For example, the model should be appropriate for the distances over which the PFD contours are being measured, the environment in which the earth station is located, and the frequency band. Applicants should explain which models they rely on for their analysis and why the chosen models are appropriate. Any proprietary information should be submitted under a request for confidentiality pursuant to section 0.459 of the Commission's rules.
- Demonstrations should generally rely on measured gain patterns. Calculated gain patterns may be used when measured patterns are unavailable.
 - Demonstrations may also rely on the section 25.209 mask,¹¹ but applicants should update their demonstration with a measured gain pattern when certifying completion of earth station construction pursuant to section 25.133(b).¹²
- Demonstrations should take into account terrain, clutter, and shielding.
 - Applicants should not use statistical models to estimate clutter loss when there are more accurate means of estimating clutter loss (*e.g.*, the clutter model in ITU-R Rec. 452).¹³
 - Where an applicant relies on the installation of shielding for its analysis, it should certify the installation of such shielding when certifying completion of earth station construction pursuant to section 25.133(b).
- Demonstrations should take into account worst case input power density and not just input power density during clear sky conditions.
- Where an application relies on clear-sky conditions, the applicant should explain with detail why that assumption is appropriate for the specific circumstances and location.¹⁴

¹⁰ See 47 CFR § 25.136(a)(4)(ii) (28 GHz band), 47 CFR § 25.136(c)(2) (37.5-40 GHz band), 47 CFR § 25.136(d)(4)(ii) (47.2-48.2 GHz band), 47 CFR § 25.136(e)(4)(ii) (24 GHz band and 50.4-51.4 GHz band).

¹¹ 47 CFR § 25.209.

¹² Noting that section 25.209(a) allows that the envelope may be exceeded by up to 3 dB in 10% of the range of θ angles from ± 7 -180°, and by up to 6 dB in the region of main reflector spillover energy. If the actual antenna pattern exceeds the section 25.209 mask in any regard, the contour resulting from the actual antenna pattern must continue to meet all of the applicable criteria specified in section 25.136.

¹³ See ITU Recommendation R-REC-P.452, available at <https://extranet.itu.int/brdocsearch/R-REC/Forms>.

¹⁴ For example, an applicant could submit a demonstration showing that, for the particular location and system configuration, there will be a high probability that fading between the earth station and the satellite will be highly correlated with fading within the earth station contour. Applicants should describe any additional assumptions that were made in conducting their section 25.136 analysis.

Determining Estimated Aggregate Population Coverage

- Estimates should rely on the most recent decennial census block data.¹⁵
- Estimates should be based on the actual area method.¹⁶ Applicants utilizing other methodologies should fully explain such methodologies and why they are being used.
- We recommend that applicants provide a full-page diagram, clearly labeled and to scale, depicting the proposed earth station location, along with its proposed PFD contour or protection zone, provided as:
 - An overlay on a magnified satellite view of the service area, with county borders depicted; and
 - An overlay on a census block map of the service area, with county borders and census block ID numbers depicted.
- Where two PFD contours or the protection zones of two earth stations overlap within the same licensing area, the population covered by the overlap will be counted only once against the aggregate population limit for that licensing area.
- Where a PFD contour or protection zone covers multiple licensing areas, the covered population in each of these licensing areas will be counted against the limit for that specific licensing area.

Limit on the Number of Earth Stations Within a Market

- Earth stations will be counted against the limit on the total number of earth stations within a market only in the licensing area where the earth station coordinates are located.

Format of Data

- We suggest that the boundaries of the calculated contour be submitted as a shapefile, a format for storing the geometric location, and attribute information of geographic features, compatible with ArcGIS or another commercially available mapping software; or other commonly used file formats for sharing geographic information such as XML, KML, or KMZ.

Colocation of Earth Stations

- Earth station applicants that claim that they will collocate with existing earth stations should provide a section 25.136 analysis that considers the aggregate PFD contour or protection zone produced by the existing earth station and the new earth station. For a grandfathered earth station, the applicant must work with the earth station licensee to obtain the information necessary to conduct such analysis.
- For colocation with a grandfathered or a non-grandfathered earth station, if the aggregate PFD contour or protection zone is entirely contained within the contour or protection zone of the existing earth station, the new earth station will not be counted against the limit on

¹⁵ The measured census data available from the U.S. Census Bureau are collected and reported on a decennial basis in years ending in “0.”

¹⁶ Under the “actual area method,” the population within the contour would be calculated based on the proportion of the census geographic area covered by the PFD contour (*e.g.*, if the contour covered 50% of the census area then 50% of the census area population would be counted as within the contour). *See* June 21 Public Notice, n.11, and Implementation of section 6002(B) of the Omnibus Budget Reconciliation Act of 1993, 31 FCC Rcd 10534, 10559 (2016).

the total number of earth stations for that licensing area or considered in the calculation of the aggregate population limit.

- For colocation with a grandfathered earth station, if the aggregate PFD contour or protection zone contains areas outside the contour or protection zone of the grandfathered earth station, the new earth station will be counted against the limit on the total number of earth stations for that licensing area and considered in the calculation of the aggregate population limit only for the areas outside the contour or protection zone of the existing earth station.

Guidance Regarding Definition of Roadways

- An earth station's exclusion zone should not cross any roads classified as Other Freeways and Expressways or Other Principal Arterials.¹⁷
- The relevant Department of Transportation regulation states that “[t]he State transportation agency shall have the primary responsibility for developing and updating a statewide highway functional classification in rural and urban areas to determine functional usage of the existing roads and streets.”¹⁸ While the rule mentions the Federal Highway Administration Office of Planning, Environment, and Realty's Executive Geographic Information System (HEPGIS) map as a convenience for users, state classifications govern road classifications. Therefore, in addition to the HEPGIS map, applicants should also consult state sources to ensure that roads that intersect the contour are not designated by a state transportation agency as Other Freeways and Expressways, or Other Principal Arterials.

For further information about this notice or questions about filing applications in compliance with section 25.136, please contact Paul Blais at (202) 418-7274 or Paul.Blais@fcc.gov, or Kal Krautkramer at (202) 418-1335 or Kal.Krautkramer@fcc.gov.

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¹⁷ See 47 CFR § 25.136(a)(4)(iii) (28 GHz band), 47 CFR § 25.136(c)(3) (37.5-40 GHz band), 47 CFR § 25.136(d)(4)(iii) (47.2-48.2 GHz band), and 47 CFR § 25.136(e)(4)(iii) (24 GHz band and 50.4-51.4 GHz band). Maps of the National Highway system, developed with the cooperation of state and local officials can be found state by state at https://www.fhwa.dot.gov/planning/national_highway_system.

¹⁸ 23 CFR § 470.105(b)(1).