Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Sharing in the Lower 37 GHz band in connection with the National Spectrum Strategy Implementation Plan	)	WT Docket No. 24-243

COMMENTS OF THE AMERICAN GEOPHYSICAL UNION, AMERICAN METEOROLOGICAL SOCIETY, NATIONAL WEATHER ASSOCIATION and UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH

November 22, 2024

The American Geophysical Union (AGU), American Meteorological Society (AMS), National Weather Association (NWA) and University Corporation for Atmospheric Research (UCAR) hereby provide comments on this Public Notice[1] that seeks to further develop the record for the 37.0-37.6 GHz band (Lower 37 GHz band) with the goal of informing the forthcoming report mandated by the National Spectrum Strategy (NSS) Implementation Plan.[2]

In our comments, we will highlight the importance of the adjacent 36.0-37.0 GHz Earth Exploration Satellite Service (EESS) band to the atmospheric science community and respond to the Commission's request for input on "whether additional measures are needed to protect spaceborne remote passive sensors" in this band. Our organizations support the detailed comments submitted by the National Academy of Sciences' Committee on Radio Frequencies (CORF)[3] on this matter.

[1] Information Sought on Sharing the Lower 37 GHz Band in Connection With the National Spectrum Strategy Implementation Plan, Public Notice, FCC WT Docket No. 24-243, DA 24-789 (released August 9, 2024). https://www.federalregister.gov/documents/2024/08/27/2024-19081/information-sought-on-sharingthe-lower-37-ghz-band-in-connection-with-the-national-spectrum

[2] The signed organizations hereby seek leave to file these Comments later than the stated due date. The public interest will be served by the acceptance of these Comments, as the subject matter expertise of the signed organizations provide significant information from a unique user perspective on passive use of the spectrum, a core issue in this proceeding. No party will be harmed by the timing of this filing, since there is no official opportunity to respond to Comments in this proceeding. Nevertheless, other parties will have an opportunity to respond to these Comments in *ex parte* filings, if they so choose.

[3] 27 Sept 2024. CORF. https://www.fcc.gov/ecfs/document/109271386707031/1

The membership of AGU, AMS, NWA and UCAR include the world's preeminent atmospheric, oceanic, hydrological and other physical scientists as well as operational practitioners of environmental modeling and forecasting. These scientists and practitioners depend heavily on technology that is reliant on passive bands for their forecasts, models and research to better understand the Earth's atmosphere, oceans and land to predict natural hazards that impact lives, property and economies in the U.S. and across the world. The atmospheric science community first used passively-sensed information near 37 GHz in 1978 when NASA's Nimbus-7 satellite was launched with a microwave radiometry instrument.

1) To safeguard U.S. weather forecasting and climate monitoring abilities, the use of passive bands near 37 GHz must not cause harmful interference.

The natural emissions produced adjacent to the area noted in the Public Notice are measured using microwave radiometer sensors on the Defense Meteorological Satellite Program (DMSP)-17 and -18, launched in 2006 and 2009, and the Weather System Follow-on Microwave 1 and 2 (WSF-M1; WSF-M2) launched in April 2024 and planned for launch in 2028. The primary payload on the WSF-M mission is a Microwave Imager (MWI) sensor that takes calibrated passive radiometric measurements at multiple microwave frequencies to measure Ocean Surface Vector Winds (OSVW) and Tropical Cyclone Intensity (TCI), both of which are important to hurricane forecasting. Passive measurements near 36-37 GHz are unique from other passive bands in that they are best at pinpointing a tropical cyclone's center. Forecasters can use 36-37 GHz imagery in tandem with 85-91 GHz imagery, as measured by NOAA's operational Joint Polar Satellite System (JPSS), to assess the vertical structure of tropical cyclones.

The data from these U.S. Department of Defense (DoD) satellites are used more broadly than for national defense purposes and their data are openly available and extremely valuable to civil and international users of meteorological information across the public, private and academic sectors in support of weather prediction and climate monitoring worldwide. Other satellites operated by Europe and Japan[4] also conduct passive measurements near 37 GHz, and similarly, those missions are also relied upon by U.S. civil agencies such as NOAA and NASA, as well as DoD, the private sector and academic partners. To be useful for forecasting and climate studies, remote sensing observations must be made over the entire Earth and with the highest practicable temporal resolution. For this reason, data from these instruments in different orbits that are operated by various international agencies are not seen as duplicative and are customarily shared with U.S. agencies in near real time to enable such benefits to forecasting.[5]

A National Aeronautics and Space Administration (NASA) mission in partnership with the Japanese Space Agency (JAXA) called the Global Precipitation Measurement Mission (GPM) includes a microwave radiometer that measures near the bands under discussion for study. On orbit for the past ten years and expected to continue to produce data well into the 2030s, the GPM mission has innovated around the measurement of precipitation, and particularly snow and ice in clouds. Per the former Director of Earth Sciences at NASA when speaking about the value of GPM, "knowing

[4] 27 Sept 2024. CORF. At 4.
[5] 27 Sept 2024. CORF. At 3.

when, where and how much it rains or snows has improved our understanding of weather and climate cycles."[6]

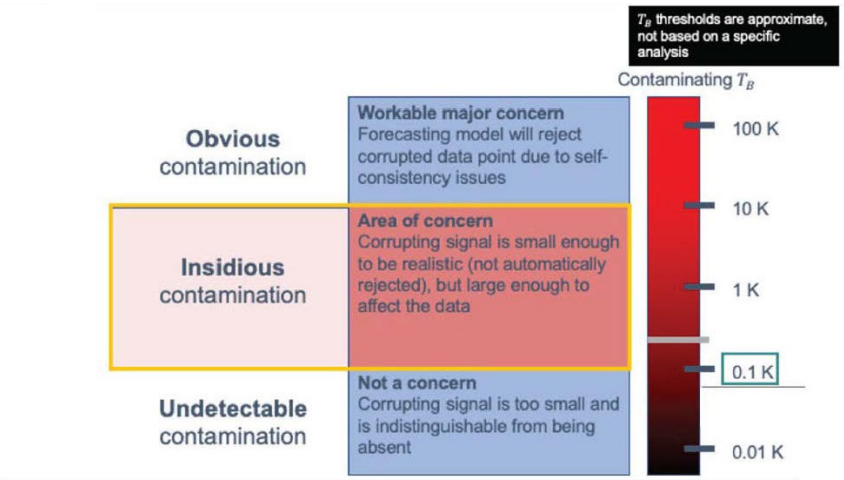
Given the broad use of passive measurements near 37 GHz for weather forecasting, which supports the protection of life, property and economies both here and abroad, it is crucial to protect these measurements from harmful interference.

2) Harmful interference is a growing threat to U.S. weather forecasting and climate monitoring.

As CORF discussed, the natural emissions measured by the instruments noted above are very weak.[7] Remote sensing receivers need to measure changes in noise temperature of 0.1 K or less, with absolute radiometric calibration, while active systems operate at signal-to-noise ratios well in excess of that.

In addition, these instruments are total power radiometers, and they have no way of distinguishing between the natural emissions these systems are designed to detect or interference from artificial transmitters, unless the artificial signals rise to a level that causes a statistically or physically recognizable unnatural emission level.[8] Such recognizable interference can be flagged out, and discarded, resulting in data loss, but lower-level "insidious interference" introduces unknown measurement bias into remote sensing data. These realities were explained in testimony to the U.S. House of Representatives[9] in July 2021 and are highlighted in Figure 1 below.

Figure 1:



[6] Freilich, Michael. NASA Earth Science Director in "A Decade of Global Precipitation - GPM" Video produced by NASA. 20 Aug 2024. https://youtu.be/LtNrT3JQazo
[7] 27 Sept 2024. CORF. At 3.
[8] 27 Sept 2024. CORF. At 5.
[9] https://science.house.gov/2021/7/full-committee-hearing-spectrum-needs-observations-earth-and-space-sciences

Our organizations support the CORF view that Resolution 243 (WRC-19), moves in the direction of establishing interference levels where the consequences will be less toxic for these delicate measurements in comparison to the previous resolution from WRC-07 and the Commission's 2016 Report and Order on 36-37 GHz.[10] However, a greater degree of protection from OOBE than what was defined by WRC-19 would be important to safeguard these important measurements when accounting for the aggregate emission from many devices within the footprint of these passive sensors.[11] It is critical for the analysis of an appropriate interference level to be estimated on the expectation that there will be multiple competing devices, rather than just one,[12] especially since the Public Notice indicates the potential uses of the band have not yet been defined.[13] If the number of devices operating adjacent to these passive bands exceed 10 per 100 km^2, the OOBE criteria will need to be adjusted to allow for greater protection of the passive signals.[14]

3) Conclusion

AGU, AMS, NWA and UCAR are clear that it is important for the Commission to implement additional measures to protect spaceborne remote passive sensors in the 36-37 GHz band. As the implementation of the National Spectrum Strategy continues, we hope that the dialogue can continue as the commercial operations in the band become more defined. We appreciate that the Commission released this Public Notice and that we had the opportunity to provide input.

Signed:

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[10] Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, GN Docket No. 14-177, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014, 8073 (2016) (2016 R&O), https://www.federalregister.gov/documents/2019/05/13/2019-09426/use-of-spectrum-bands-above-24-ghz-for-mobile-radio-services.
[11] 27 Sept 2024. CORF. At 6.
[12] 27 Sept 2024. CORF. At 11.
[13] Public Notice. At 2.
[14] 27 Sept 2024. CORF. At 11.