Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
Supplementing the record on proposal rules to re-allocate 1675-1680 MHz band	)	WT Docket No. 19-116

COMMENTS OF THE AMERICAN GEOPHYSICAL UNION, ALERT USERS GROUP, AMERICAN METEOROLOGICAL SOCIETY, AMERICAN WEATHER AND CLIMATE INDUSTRY ASSOCIATION, BARON WEATHER, CAPITOL METEOROLOGICS, MICROCOM ENVIRONMENTAL, NARAYAN STRATEGY, NATIONAL WEATHER ASSOCIATION, THE SEMAPHORE GROUP AND UNIVERSITY CORPORATION FOR ATMOSPHERIC RESEARCH

February 28, 2025

The above noted organizations from the weather and water communities hereby provide comments on the Wireless Telecommunications Bureau's Public Notice[1] that seeks to supplement the record in this rulemaking proceeding on a proposal to re-allocate the 1675-1680 MHz band for shared use between incumbent federal operations and non-federal fixed or mobile operations on a co-primary basis.[2]

The weather, water and Earth science communities and the users that rely on our data have submitted to the record more than 120 times in this proceeding as well as in the underlying rulemaking petition proceeding (RM-11681) on this topic. We submit that these comments remain fully relevant and those views should continue to be considered as part of this proceeding. We appreciate the opportunity to supplement the record.

[1] Information sought to supplement the record on a proposal to re-allocate the 1675-1680 MHz band, Public Notice, FCC WT Docket No. 19-116 (released January 29, 2025). https://www.federalregister.gov/d/2025-01535
[2] Allocation and Service Rules for the 1675-1680 MHz Band, WT Docket No. 19-116, Notice of Proposed Rulemaking and Order, 34 FCC Rcd 3552 (2019) (NPRM)

In September 2022, thirteen private sector, academic and non-profit organizations from across the weather, water, aviation, civil space and Earth science communities expressed their continued concerns with sharing 1675-1680 MHz with one or more fixed or mobile operators in response to the public release of the "Spectrum Pipeline Reallocation 1675–1680 MHz Engineering Study (SPRES) Program Report."[3] All of the above noted non-Federal entities (and many others as noted in the record of this proceeding and the rulemaking petition record) rely on information from the current NOAA satellite fleet in geostationary orbit, known as Geostationary Operational Environmental Satellites Series R (GOES-R).[4]). (This satellite series relies on the 1675–1695 MHz band to collect and disseminate critical, real-time information on weather, hydrologic and other environmental conditions, and solar activity. **Of critical note, many of these and other non-Federal users rely on real-time and near-real-time access to the GOES-R series satellite data, a mission that is slated to operate until at least 2039 and likely longer.**

Real-time data access by non-Federal users of the GOES Rebroadcast (GRB)[5] and Data Collection System (DCS)[6], which includes the Data Collection Platform Relay (DCPR), play numerous discrete roles in supporting an array of environmental forecasting with significant economic impacts.[7] The public-private-academic enterprise that comprise the weather forecasting capabilities in the U.S. has grown and persisted for more than 20 years, bolstered by the recommendations made in a renowned 2003 National Academies report titled "Fair Weather: Effective Partnership in Weather and Climate

[3] U.S. Department of Commerce. NOAA. National Environmental Satellite Data Information Service (NESDIS). *Spectrum Pipeline Reallocation 1675–1680 MHz Engineering Study (SPRES) Program Report.* Silver Spring, MD: NESDIS, October 2020. Released September 2022.

[4] The public views imagery daily from the GOES-R series of satellites when watching television weather broadcasters or national images shown on weather apps.

[5] The GRB system enables real-time transmission of sensor data from NOAA's GOES satellites that is robust in the most severe weather situations and, unlike potential non-wireless alternative transmission solutions, not impacted by power and internet outages that are frequent in emergencies when information matters most to saving lives and property, especially during hurricanes.

[6] DCS is a relay system used to collect information from earth-based platforms that can be placed in remote locations and left to operate with minimal human intervention, and has great, diverse and remote geographic distribution across the Americas and its surrounding oceans.

[7] See *SPRES Program Report* at 46-62.

Services,"[8] which has been cited as an efficient model for public-private partnerships[9] and applied to multiple other industries.

A bipartisan letter in 2022 from the leadership of the U.S. House Committee on Science, Space and Technology called on the FCC to stop consideration of the proposal for sharing the 1675-1680 MHz band for commercial wireless carriers operating in downlink mode, based on the results of the SPRES report.[10] The risks of interference associated with operations in downlink mode are considerable and should be given great weight by the FCC in this proceeding, which include:

- The "**low, but non-zero**" risks of harmful interference to the **High-Rate Information Transmission (HRIT)**, which transmits near-real-time weather forecasts and warnings via satellite in a form well-suited for (Federal and non-Federal) emergency managers.[11]
- The "**significant risk**" of harmful interference from sharing the **GOES Rebroadcast (GRB)**, the primary way that NOAA provides weather and environmental data products from its GOES-R satellites to a variety of Federal and non-Federal users, including state and local governments, emergency response personnel, and a host of private companies. Many of these uses are time-sensitive, and GRB is the only method that can be used for data dissemination of full resolution data across the satellite system's coverage area.[12]
- The "**extreme risk**" of harmful interference to the **GOES Data Collection System (DCS),** a relay system managed by NOAA which is used to collect information from 32,000

[8] National Research Council. 2003. Fair Weather: Effective Partnership in Weather and Climate Services. Washington, DC: The National Academies Press. https://doi.org/10.17226/10610.

[9] As an example of the public-private-academic partnership using GRB data, the NOAA Cooperative Institute located at the University of Wisconsin-Madison noticed in real-time the Hunga Tonga volcanic eruption on a small uninhabited island in the Pacific during January 2022. Full resolution GOES-R data from GOES-17 was received at Madison, WI via GRB and was inserted into the National Weather Service's (NWS) Advanced Weather Interactive Processing System (AWIPS) data feed which is used by all NWS Weather Forecast Offices and specialized NWS prediction centers. AWIPS normally receives reduced resolution imagery over the oceans, to save bandwidth in satellite distribution. However, a specialized event such as this could only be analyzed with the full resolution data. The high-resolution data received at the University of Wisconsin-Madison was inserted into the AWIPS data stream in place of the reduced resolution images that would normally be available to forecasters. This powerful and violent volcanic eruption injected volcanic material into the atmosphere, to a height over nine miles. "This eruption produced the largest underwater explosion ever recorded by modern scientific instruments, blasting an enormous amount of water and volcanic gases higher than any other eruption in the satellite era," states NOAA Research. Evidence of this event was noted around the world, and particularly impacted weather forecasts throughout the U.S. Without the availability of the full-resolution imagery from GOES-17 via GRB, forecasters would not have received information on this event. Receiving such data in L-band at a non-Federal site was critical to making these images available to Federal forecasters. See https://cimss.ssec.wisc.edu/satellite-blog/archives/44214.

[10] Letter from Rep. Eddie Bernice Johnson (D-TX) and Rep. Frank Lucas (R-OK). 22 Nov 2022. WT Docket No. 19-116, Allocation Rules for the 1675-1680 MHz Band. https://www.fcc.gov/ecfs/document/11291080521180/1

[11] See *SPRES Program Report* at 20.

[12] See *SPRES Program Report* at 402.

Earth-based platforms, primarily located in remote areas. These platforms record information on weather conditions, water levels, wildfires, etc. and relay it via GOES-R series satellites in real-time to fixed ground stations operated by Federal and non-Federal users alike, with the network sending an average of 800,000 reports a day. **As DCS is a transmission of the original source data, *any* interference results in *permanent* loss of data**.

While we recognize the SPRES report noted that sharing may be "potentially feasible" with commercial wireless carriers operating in uplink mode, we remind the FCC that **for public forecasting operations to not be harmed, non-Federal users need protections as well to be able to accommodate such operations.** While the mitigations necessary to address risks from satellite downlinks are very large, the protections required for uplink operations are, while still problematic, considerably smaller, leading to smaller exclusion zones of less than 60 km in size.[13] Why is protection necessary for non-Federal users? As detailed below, the weather community continues to be skeptical that there are terrestrial distribution solutions that meet the requirements, functionality and performance of existing systems. Given this reality, geographic separation would be required to ensure uninterrupted time-sensitive data reception for hazard prediction and public safety.

The undersigned organizations underscore the further analysis included in the SPRES Follow-On Report (SPRES-FO)[14] released in November 2022. While SPRES-FO does provide further analysis suggesting prospects for sharing, there are still a number of issues that need to be considered further and resolved before issuing an order in this rulemaking making the allocation championed by Ligado Networks, LLC (Ligado).

- **It is critical the FCC recognize that sharing is only "potentially feasible" (with additional considerations and mitigations) with commercial wireless carriers operating in uplink mode.**

[13] See *SPRES Program Report* at 403.

[14] U.S. Department of Commerce. NOAA NESDIS and NTIA. *Spectrum Pipeline Reallocation Engineering Study Follow-On (SPRES-FO) Final Report*. Silver Spring, MD: NESDIS, Aug 2024. Public Release Nov 2024. https://www.fcc.gov/ecfs/document/1122068936842/3

- We are concerned that the user survey and assessment accompanying SPRES-FO was not conducted in a comprehensive manner (e.g., budget and time limitations) and had considerable gaps in assessing the full range of non-Federal uses of both DCS and GRB. Key stakeholders missing in this assessment include the private sector weather industry, county-based water managers in western states and ports management professionals. Further, if these contacts are not established now, we are concerned that further coordination across the public, private and academic sectors will not be able to be conducted and trusted in the future when implementing possible sharing arrangements.
- Given the diversity of user organizations across the public (state, local and federal), private, academic and non-profit sectors for this data, it would be an error to presume that use of DCS and GRB technology will halt once GeoXO is launched and made operational. Given the costs associated with updating equipment and training stakeholders, and the need for on-orbit backup capability for operational weather satellites, **it should be expected that the current reliance on GOES-R series data transmission technologies will persist for multiple years as the GOES-R series satellites continue to be operating and serving as backup to GeoXO.**

With a focus on balancing DCS interference risk and spectrum re-use, NTIA floated a potential "dynamic sharing solution" in SPRES-FO that would create a "nominal condition" where DCS users would not directly use the GOES DCS broadcast channel, allowing commercial users to access the 1675-1680 MHz band without the need to protect DCS user operations. There would then be a defined "enhanced condition," which, when triggered, would promptly give DCS users priority access to the 1675-1680 MHz band and commercial wireless users would be obligated to protect DCS users from interference to the GOES DCS broadcast channel. But we are concerned this may not be an appropriate balance between the considerable risks of DCS interference and the value of spectrum use. Here are some concerns we have with such a scenario:

- As detailed in the SPRES-FO, the U.S. Army Corps of Engineers (USACE) has made considerable investments in DCS technologies to monitor key sites for their water infrastructure assets – particularly in Cincinnati, OH and Sacramento, CA. The report notes that USACE does not believe that receiving data through terrestrial means (such as LRGS or DADDS) satisfies their mission requirements. Even for their backup data in case of DCS

error or failure, they use an HRIT receiver rather than a terrestrial alternative.[15] Further, in discussions with NTIA and NOAA, **USACE indicated they are not in favor of the potential dynamic sharing solution proposed by NTIA**.[16]

- The Bureau of Land Management (Fire), the largest fire program within the Department of Interior, is located at the National Interagency Fire Center (NIFC) in Boise, Idaho, which is directly responsible for wildfire management across hundreds of millions of acres of land across Federal, state, and local jurisdictions. Numerous fire agencies rely on information from a few thousand Remote Automatic Weather Stations (RAWS) that are strategically deployed throughout the U.S., often in very rural landscapes, where they can monitor multiple time-sensitive measurements such as precipitation, relative humidity, wind and solar radiation in near-real time. These data are transmitted back to NIFC servers via GOES. Obtaining local measurements from these RAWS sensors provides essential information to wildfire managers who are making decisions on how to contain such fires and for the protection of the life and safety of firefighters. In BLM Fire's discussions informing the SPRES-FO, they indicated that **the reception of DCS data directly via the GOES downlink at 1675-1680 MHz ensures that their critical missions are executed.**
- As one of the major manufacturers of the DCS Direct Readout Ground System (DRGS), Microcom also conducted its own study on sharing 1675-1680 MHz, which concluded that sharing is possible only under two conditions:[17]
    1. Limit commercial wireless operations in frequency where they do not overlap with 1679.7 – 1680.1 MHz, and
    2. Limit the frequency usage between 1675 – 1680 MHz to **uplink use cases only**.
- In the SPRES-FO's assessment of end user data access options, the SPRES-FO team noted that their study identified that end users like USACE, which are dependent on the latency only delivered by the GOES DCS broadcast channel, would not have their requirements met with alternate channels like HRIT nor the terrestrial options. **The SPRES-FO team recommended that a comprehensive engineering study be conducted to fully ascertain these data latency issues**.[18]

[15] See *SPRES-FO Final Report* at 86.
[16] See *SPRES-FO Final Report* at 89.
[17] See *SPRES-FO Final Report* at 90.
[18] See *SPRES-FO Final Report* at 45.

The undersigned are concerned about several inaccuracies in the Ex Partes filed by Ligado during the past year. We would like to emphasize that, regardless of Ligado's statements,[19] **the SPRES-FO report does <u>not</u> clearly affirm that sharing between Federal and commercial users is feasible in the 1675-1680 MHz band for both uplink and downlink usage**, especially when looking within the actual report, as noted in the above discussion related to USACE, BLM Fire and Microcom.

Also in January 2025, Ligado announced that they were working toward a long-term deal granting AST Mobile up to 40 MHz of L-band mobile spectrum in the U.S. and Canada and 5 MHz of adjacent spectrum in the U.S. That last reference was to 1670-1675 MHz, the five-megahertz band segment directly adjacent to 1675-1680 MHz. The announcement indicated that AST would like to use this spectrum for direct-to-device satellite applications. If 1675-1680 MHz were offered for a similar allocation, though this band is not currently allocated for mobile usage, neither the SPRES nor the SPRES-FO reports studied the case where the potential shared signal was a direct-to-device satellite signal. **If plans are to be made for 1675-1680 MHz to be integrated into future mobile devices, then direct-to-device transmission must be evaluated for compatibility with Federal and non-Federal operations related to DCS and GRB.**

Weather enterprise organizations have expressed significant concerns in the past about Ligado's proposed cloud-based terrestrial network,[20] noting that it is not a suitable replacement for operational users given the extreme conditions that these GOES-R series transmissions need to be accessible through, at times without electricity and internet service. For example, George Mason University does not have a direct operational forecasting imperative with DCS and GRB data in partnership with NOAA, so Ligado's example invoking the University is not relevant to this situation. Entities with a direct operational partnership with NOAA require significant measures for protection including an availability of 99.988% over a 30-day period, which ensures no more than five minutes of downtime each month. Cloud service and internet service providers typically only

[19] See Ligado Networks LLC *Ex Parte* in WTC 19-116 at 1. (10 Jan 2025)
https://www.fcc.gov/ecfs/document/10110856406566/1
[20] *See* AMS et al. written *Ex Parte* in RM-11681 at 3-6. (10 Apr 2017)
https://www.fcc.gov/ecfs/document/104132285323927/1

operate at 99.95% availability, which allows for upwards of 20 to 40 minutes of downtime per month, which would be significant exacerbation of the degradation.

In summary, the weather, water and Earth science communities, (and aviation and other industry sector entities that rely on the meteorological data transmitted over the GOES-R series satellites, whether directly or indirectly) represented by the undersigned continue to be fundamentally concerned with the proposal to re-allocate the 1675-1680 MHz band for shared use between incumbent Federal operations and non-Federal fixed or mobile operations on a co-primary basis. The undersigned are concerned that there is a significant likelihood of harmful interference to the reception of weather satellite imagery and relayed environmental data to the public, private and academic partners that are crucial to the nation's inherently collaborative weather and hydrological forecasting efforts. The results of SPRES and SPRES-FO are not as helpful to Ligado's position as Ligado suggests in its *Ex Partes*. We have highlighted multiple topics of concern and areas where further research is required to inform how to ensure harmful interference would not disrupt critical weather and water forecasting operations that save both lives and property across the U.S.

While there may be a future possibility of sharing 1675-1680 MHz in an LTE uplink-only scenario with additional considerations, **a sharing regime that includes both LTE downlink and uplink operations is not feasible**. At best, only uplink operations have some prospect of being able to share the band.

Thank you for the opportunity to continue to contribute to this important proceeding.

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