Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of:

Facilitating Shared Use in the 3.1-3.55 GHz Band	**)** **)** **)**	**WT Docket No. 19-348**

To: The Commission

COMMENTS OF RADIO AMATEUR SATELLITE CORPORATION

The Radio Amateur Satellite Corporation, commonly known as and hereinafter referred to as AMSAT, pursuant to Sections 1.415 and 1.419 of the Commission's Rules [47 C.F.R. §§ 1.415 and 1.419], hereby respectfully submits comments in response to the *Notice of Proposed Rulemaking*, FCC 19-130, 85 FR 3579, published January 22, 2020 (the Notice). These comments are timely filed. For its comments, AMSAT states as follows:

I. Background

AMSAT is a scientific and educational non-profit corporation chartered in the District of Columbia in 1969. We design, construct, test, and operate space stations in the amateur satellite service. We also make available a variety of publications, computer programs, educational services, and internet services promoting space science education among radio amateurs and students worldwide[1]. AMSAT opposes the Notice's proposed deletion of the 3.3 – 3.5 GHz amateur service allocation generally and the 3.40 – 3.41 GHz amateur satellite service allocation specifically.

[1] See www.amsat.org

II. Importance of Microwave Spectrum to the Amateur Satellite Service

Presently and historically, most amateur satellites have operated in the 144-146 MHz and 435-438 MHz amateur satellite service allocations. The availability of commercial equipment for these allocations and the types of narrowband operations supported by most amateur satellites have made these frequencies the most popular for the amateur satellite builders and operators. Although VHF and UHF frequencies remain most common, several amateur satellites have experimented with the utilization of microwave frequencies for the satellite's downlink, uplink, or both. The Amateur Radio on the International Space Station (ARISS) project has also used microwave frequencies for experiments such as MarconISSta as well as the HamTV live video transmission system. Recently, microwave spectrum utilization has entered the mainstream of the amateur satellite world with the operation of Qatar-OSCAR 100 (QO-100), a transponder located on a commercial geostationary satellite over Africa. This transponder supports narrowband analog, narrowband digital, and wideband digital amateur communications (including amateur television) utilizing the 2.4 GHz band for the uplink and the 10.5 GHz band for the downlink. AMSAT is currently working on two projects involving the use of microwave spectrum. First, our GOLF or "Greater Orbit, Larger Footprint" program is working toward the deployment of amateur CubeSats into a high earth orbit to replace the worldwide communications capability of a satellite in such an orbit that has been unavailable to amateur radio operators since AMSAT-OSCAR 40 ceased operation over 16 years ago. The availability of power and antenna space on a 3U CubeSat necessitates the use of microwave frequencies to allow reliable communications with modestly equipped amateur stations from a high orbit. Second, AMSAT is working with several of our worldwide ARISS partners to develop amateur radio capability for the Lunar Gateway. The distances involved likewise require the use of microwave spectrum to meet the mission requirements, including 2-way voice, Slow Scan TV (SSTV) picture uplink and downlink, high definition television, Automatic Position Reporting System (APRS) two-way (Twitter-

like) communications, weak signal communication, and digital data uplinks and downlinks. Other amateur satellite projects are also expected to utilize the microwave allocations for a variety of experimental and communications purposes.

III. Sufficiency of Existing Amateur Spectrum

AMSAT has identified the three amateur satellite service allocations between 2.4 GHz and 5.67 GHz as the most desirable for uplink usage for future projects based on the cost of equipment and the necessary antenna sizes. These allocations total 80 MHz. The most desirable downlink allocation is 10.45-10.50 GHz, totaling 50 MHz. Many of the proposed uses for amateur space stations, including high definition amateur television and high-speed data transmission will use a considerable amount of bandwidth. Although the beamwidth of the high gain antennas used at these frequencies will limit interference between satellites using the same frequencies, there is still the potential for interference between satellites operating on microwave bands in low earth orbit and those in high earth orbit or lunar orbit if they utilize the same frequencies.

AMSAT notes that the amateur satellite service allocations at 2.4 GHz and 5.8 GHz are allocated for Industrial, Scientific, and Medical (ISM) use and are also filled with millions of WiFi, Bluetooth, and other consumer devices, leading to unpredictable interference. For example, the prevalence of WiFi interference to amateur satellite operations led AMSAT to determine nearly 15 years ago that the 2.4 GHz allocation would no longer be useful for satellite downlinks from high earth orbit. While the amateur satellite service is a secondary allocation at 3.40 – 3.41 GHz, this allocation is shared with primary Federal and non-Federal licensees with a history of successful sharing and cooperation with amateur users, and is free from the unpredictable interference of consumer devices.

IV. Amateur Satellite Operations in the 3.40 – 3.41 GHz Segment

The Notice seeks comment on current amateur satellite usage of the 3.40 – 3.41 GHz amateur satellite service segment. Currently, no amateur satellite uses this segment. A Peruvian satellite named UNSA-SAT1 planned to utilize a 230 kbps BPSK downlink in the 3.4 GHz segment, but the project was canceled.[2] AMSAT has also evaluated the use of this segment for past projects, including AMSAT Eagle, which was a planned high earth orbit satellite. However, the 3.40 – 3.41 GHz allocation is only available in ITU Regions 2 and 3, making it unsuitable for satellites intended for worldwide communications. Despite this limitation, this allocation remains useful for several potential applications. As worldwide amateur satellite communications in other desirable microwave allocations increase, the 3.40 – 3.41 GHz allocation could be utilized as a command channel or secondary data downlink for AMSAT ground stations in Region 2, without interfering with the primary communications on the other allocations or other satellites utilizing those segments. Additionally, the segment could serve as the uplink or downlink for a satellite in geostationary orbit above the Americas, without potential interference to worldwide activities involving space stations in high earth orbit or lunar orbit.

V. Other Amateur Operations in the 3.3 – 3.5 GHz Allocation

Many amateur radio activities take place outside the amateur satellite service allocation, including mesh networks such as the Amateur Radio Emergency Data Network (AREDN). The AREDN project provides an inexpensive way for amateur radio operators to implement high-speed data networks in support of Emergency Operations Centers, non-governmental agencies, and first responders.[3] This band is also used for amateur radio contesting and Earth-Moon-Earth (EME) communications. As previously

[2] "UNSA-SAT1 – The First 3.4 GHz CubeSat." AMSAT-UK. https://amsat-uk.org/2014/01/08/unsa-sat1-the-first-3-4-ghz-cubesat/ Retrieved 18 February 2020.
[3] Amateur Radio Emergency Data Network home page. https://www.arednmesh.org/homepage Retrieved 18 February 2020.

mentioned, the 3.3 – 3.5 GHz amateur allocation allows these activities to take place without the unpredictable interference encountered in the 2.4 and 5 GHz amateur bands.

IV. Conclusion

The amateur satellite service continues to provide immense value to the growing field of small satellites. Experiments conducted by amateur satellites have informed and continue to inform the development of the commercial small satellite industry. Additionally, student participation in amateur satellite projects provides both inspiration for young men and women to pursue careers in the commercial satellite industry and practical experience for those careers. A strong and robust amateur satellite service will continue to benefit the public interest and inspire future developments in satellite technology. Continued progress in achieving these goals requires adequate spectrum, especially in suitable microwave bands. We urge the Commission to consider the future need for substantial microwave spectrum for amateur satellite activities in this rulemaking.

RESPECTFULLY SUBMITTED,

Radio Amateur Satellite Corporation (AMSAT)
P. O. Box 27
Washington, DC 20044-0027

By / Paul R. Stoetzer /

Paul Stoetzer, N8HM
Executive Vice President
Email: n8hm@amsat.org

February 21, 2020