



Statement of Brown University

FCC Experimental License File 0235-EX-CN-2020

Reference Number 55098

On May 6, 2020 we received an inquiry from the Commission related to this experimental license application with the above Reference Number. It stated

“Please provide an EMC analysis. It is requested by NASA.”

We are not certain if NASA had reviewed the Supplemental Statement submitted with the original application due to procedural issues in FCC/NTIA coordination. That statement is publicly available at this URL: <https://apps.fcc.gov/els/GetAtt.html?id=249409&x=>.

We wish to remind the Commission that in both this application and the earlier related STA application File 1756-EX-ST-2019 we stated:

“We believe that the technology being tested here is "new technology in the context of 47 U.S.C. 157 and that the results from this experiment will help to further other use by others of spectrum above 95 GHz that now lacks any FCC rules for regular licensing. Therefore, the applicant asks that this application be treated under the provisions of Section 7, particularly with respect to the burden test of § 157(a):

Any person or party (other than the Commission) who opposes a new technology or service proposed to be permitted under this chapter shall have the burden to demonstrate that such proposal is inconsistent with the public interest. (Emphasis added)”

We believe that the proposed continuation of the Brown University experiments will not cause harmful interference based on the that that there are no present operations in the 97.5-103 GHz band and that the only operation we are aware of in the 195-205 GHz band, after numerous searches and inquiries, are:

- 1) NASA AURA satellite
- 2) satellites in similar “A Train” orbits nearby AURA
- 3) NASA TROPICS CubeSats that are expected to be in orbit in 2021.

Brown will not transmit at times when any of these satellites are visible from the experiment location.

The license previously issued in File 1756-EX-ST-2019 contains this condition:

Brown University shall not transmit in the 200-205 GHz frequency band when the NASA Aura spacecraft (NORAD designation 28376 or international spacecraft ID 2004-026A) is within horizon-to horizon view of the testing location.

Brown accepted that condition and has stated in the instant application that a continuation of that condition is acceptable for a new license. As discussed below, Brown is willing to accept a modification of this condition to include the TROPICS CubeSat constellation when it is launched

Brown has reviewed two public international databases for satellites, including passive satellites: The ITU Space Network System Online and the WMO Observing Systems Capability Analysis and Review Tool/OSCAR as well as filing a FOIA request with NASA and successfully appealing a NASA attempt to deny access to 2 documents describing actual passive use near 200 GHz.

A search for the 97.5-103 GHz band in both databases and a FOIA request to NASA reveals no satellites planned or in operation. However, a search in the ITU database for 195-205 GHz reveals the following entries:

SATELLITE NAME	CATEGORY	ADM	NTWK	ORG
AURA	N			USA
MEGHA-TROPIQUES	N			IND
TROPICS	N			USA
AURA	N			USA
EOS PM	A			USA
AURA	A			USA
NPP	A			USA
MEGHA-TROPIQUES	A			IND
MICRONSAT	A			PNG
TROPICS	A			USA
TIANQI-3B	A			CHN
GW-S	A			CHN
MICRONSAT	A			PNG
TOTAL:				13

We believe that all these satellites, except for TROPICS, are part of what NASA describes as the “Afternoon Constellation” or “A Train”, a group of satellites that fly in formation and “all have equator crossings in a northerly direction in the early afternoon at about 1:30 PM local solar time (as well as a southerly nighttime equatorial crossing at about 1:30 AM)”.¹ We assume that this was the justification for the specific condition in the previous license that we accepted without question. If one or more of these satellites have a substantially different orbit we would agree to stop all transmissions when such satellites are visible from our experimental area on the Brown campus.

¹ <https://atrain.nasa.gov/intro.php>

After successfully appealing a FOIA denial from NASA we have obtained a redacted copy of an NTIA-44 Certification of Spectrum Support that indicates that the TROPICS CubeSat has NTIA approval for a receiver at 200-209 GHz.² A publicly available NASA conference presentation in 2018 implies that the actual satellite receiver coverage will be 203.8-205.8 GHz.³ Various sources give the total number of TROPICS CubeSats between 3 and 6 in 3 different orbit planes. Another NASA conference presentation gives the launch date for this system at “early 2021”.⁴ While it is puzzling why the FOIA request to NASA did not yield this information, we are satisfied with the information obtained from public sources about the TROPICS constellation if it is supplemented with the information request below at the time of imminent launch of the constellation. **The proposed Brown experiments will protect these satellites from interference by ceasing all transmissions of 200 GHz spectrum that these satellites receive and that overlap this application whenever any of the satellites operating in the 200 GHz band are visible from the experiment area.** Brown is open to agreeing to a reasonable guardband. We request that NASA notify us of the launch date when it is imminent and then share with us the orbit parameters of all units with 200 GHz receivers as well as their actual frequency coverage once the satellites are launched.

In another FOIA response to Brown, NASA has stated “It is not necessary or required to file receivers, such as the passive sensors operating in the 100-102 GHz and 200-209 GHz bands since protection is provided by the Radio Regulations (RR), an international treaty⁵ in which the U.S. is a signatory.”⁶ This is literally true, but a review of other passive bands such as the 23.6-24 GHz band that was prominent in recent WRC-19 deliberations shows numerous passive satellite passive receiver listings from a wide variety of countries, some friendly to the US and some “less friendly”, in **both** the ITU and WMO databases. Thus, it appears in practice that nations report passive satellite receivers to international data bases even though there is not treaty requirement to do so.

If there are satellites that Brown is not aware of, we would be glad to protect them by avoiding all transmissions when they are visible from the experimental area if NASA or NTIA or FCC could provide us with orbit information.

² NTIA, NTIA-44, Doc. 43857/1, SPS-23433/1 Redacted and included in FOIA release from NASA Headquarters FOIA: 20-HQ-F-00493, May 12,2020

³ W.J. Blackwell, *et al.*, “Overview of the NASA TROPICS CubeSat Constellation Mission”, SPIE Optics + Photonics Conference, 21 August 2018, at slide 13 (<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20180006122.pdf>)

⁴ Erika L. Duran *et al.*, “Observations of the Axisymmetric Tropical Cyclone Diurnal Pulse using Synthetic Observations from the TROPICS NASA Earth Venture Mission”, National Weather Association Annual Meeting, September 10, 2019 (<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20190030781.pdf>)

⁵ While the ITU Radio Regulations are an “international treaty”, the US Senate has never ratified the Final Acts of WRC-97 where RR 5.340 was first adopted nor actions of any subsequent ITU conferences. Thus, US adherence to these provisions is a decision of the Executive Branch, not a constitutional issue.

⁶ Letter from NASA Headquarters Office of Communications to Prof. Mittleman, FOIA: 20-HQ-F-00154, December 19, 2019

Alternatively, we proposed in the original application a different procedure to prevent interference that does not require disclosing technical parameters of the satellites while allowing our experimentation on an interference-free basis:

“Brown University is willing to submit requests for experiment time to FCC or an agency designated by FCC for coordination at least 30 days before any outdoor experimental operation, along with a stated amount of experimental time need in the requested period. Under this option, Brown will only conduct experiments in the passive bands during time that are explicitly approved by FCC or the agency designated for coordination. The applicant is open to alternative scheduling arrangements that will allow this experiment with reasonable advanced notification to the approving agency of experimental time needed and reasonable notification to Brown of approved time periods.”

Brown agrees to accept such a condition in its next license if it is necessary to protect satellites whose technical parameters cannot be disclosed.

Brown is willing to engage in a direct dialogue with any agency that FCC designates to resolve technical details of protecting primary users of the spectrum requested for these experiments.