28 May 2019

**Ex Parte**

Marlene H. Dortch
Secretary, Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

*Re: IBFS File No. SAT-LOA-20181221-00094 and ELS File No. 0340-EX-CN-2019*

Dear Ms. Dortch:

As the record already reflects, Swarm Technologies, Inc. (Swarm) is a U.S. based corporation that intends to deploy an innovative constellation of 150 small low-Earth orbiting satellites. We are filing this ex parte to highlight that despite their small size, the Swarm satellites (called SpaceBEEs) are as trackable—or even more trackable—than satellites four times their size.

Each Swarm satellite has a total mass ranging from 0.31 to 0.45 kilograms, and dimensions of 11 x 11 x 2.8 cm (1⁄4U cubesat form factor), excluding the deployable antennas. Upon deployment of the antennas, which are 114 cm from tip to tip, the size of the spacecraft is significantly larger than 1/4U for purposes of trackability by ground-based radar (see Figure A, attached).

To demonstrate how easy it is to track the SpaceBEEs, Swarm had LeoLabs conduct radar measurements and analyze the trackability and detectability of those currently on orbit. As shown in Exhibit C to Swarm's Part 25 application,[1] LeoLabs had no trouble tracking these 1/4U satellites. LeoLabs noted that "[t]he radar cross-section (RCS) of the SpaceBEEs is comparable to or greater than the other cubesats. Of particular note, the RCS of the SpaceBEEs was approximately twice the RCS of one of the 1U satellites."[2]

It is therefore clear that the 114cm antennas on the SpaceBEEs are providing a significant RCS value to the LeoLabs tracking. And, importantly, the antenna deployment on the SpaceBEEs in a simple, proven, and low-risk operation.

As noted in our Part 25 application:

> With the exception of the antenna deployment process, there are no moving parts on the satellite, and no flotsam is generated during the antenna deployment. More than 500 tests of antenna deployments were performed in a thermal vacuum chamber to simulate the conditions in [Low Earth Orbit]. The antenna deployment

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[1] Application of Swarm Technologies, Inc. for Authority to Launch and Operate a Non-Voice, Non-Geostationary Lower Earth Orbit Satellite System in the Mobile-Satellite Services, IBFS File No. SAT-LOA-20181221-00094 (filed Dec. 21, 2018).

[2] *Id.* at Exhibit C, p.1.

mechanism had a 100 percent success rate, and no debris was generated during any of the antenna deployment tests.[3]

In addition to the more than 500 antenna deployment tests in a thermal vacuum chamber, all seven of Swarm's satellites launched to date in Low Earth Orbit have successfully deployed their antennas and communicated with Swarm's ground stations.

Moreover, the SpaceBEEs have Ku-band retro-reflectors on each side to enhance further their RCS and increase trackability. Since the Leolabs radar units only use UHF frequencies for tracking satellites, the impact of these reflectors were not captured by the Leolabs tests, and Leolabs' results demonstrate that tracking Swarm's satellites in no way depends on the availability of Ku-band radar. Nevertheless, the Ku-band retro-reflectors do add to the trackability of the Swarm satellites.

The bottom line is that the Leolabs data demonstrates that the RCS of Swarm's satellites is even larger than it is for 1U spacecraft, and that data does not take into account the additional RCS generated by the Ku-band retro-reflectors. Simply put, the trackability of the Swarm constellation presents no issues that need concern the Commission.

Respectfully submitted,

/s/

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[3] *Id.* at Narrative Exhibit, p.12.

**Figure A**
**A SpaceBEE with Its Antennas Fully Deployed**