Exhibit A - Narrative Statement

Introduction

Swarm Technologies Inc ("Swarm") is a California-based corporation proposing a constellation of two-way communications satellites to serve as a cost-effective, low-data rate Internet of Things (IoT) network connectivity solution for remote and mobile sensors. Swarm seeks Part 5 experimental authority to test and develop hardware for the ground segment of its proposed satellite system.

Each ground station and ground device in the proposed experiment will use VHF band frequencies for communications. The VHF frequencies proposed in this application, more specifically in the 148-150.05 MHz bands, are allocated on a primary basis for ground-to-space Mobile Satellite Service (MSS) communications for non-Federal, non-voice, non-geostationary orbit (NGSO) systems. These bands enable ground-to-space communications [redacted]

Experimental Program Description

Swarm requests experimental authority to test and demonstrate the capabilities of its ground hardware for communications between spacecraft and terrestrial-based remote sensors and data collectors. Specifically, Swarm requests authority to communicate with previously authorized satellites identified below from experimental testing sites in the United States.[1]

Swarm was previously granted Special Temporary Authorization under STA 1140-EX-ST-2018 to communicate with its four ¼U satellites currently on orbit for the sole purpose of downlinking telemetry data. A subsequent STA, 0976-EX-ST-2018, provided Swarm with launch authority and authorized transmissions with Swarm's three 1U satellites to be launched on the upcoming SpaceX SSO-A mission, currently scheduled for November 2018. Communications with the Swarm satellites at the new ground station sites proposed in this application will be conducted within the conditions set forth in the previous STA grants (*e.g.* communications between the satellites authorized under 0976-EX-ST-2018 with additional ground sites will remain exclusively for the purpose of downlinking telemetry data). Experimental authorization to communicate with these satellites (seven in total) is requested starting January 10, 2018 or as soon as practical.

The Swarm system architecture is comprised of the following space and ground segments:

- Satellites: Data relay satellites that send messages to and receive messages from Swarm earth stations.
- Ground stations: Internet-connected devices that relay data downlinked from the Swarm

[1] A complete list of proposed experimental sites is provided in Table 2.

satellites to the internet. [redacted]

- Ground devices: Mobile transceivers that send messages to and receive messages from Swarm satellites. [redacted]

Swarm's nominal plan is to conduct testing of ground stations and ground devices at a series of experimental test sites (see Table 2 for a full list of proposed sites). Swarm will ensure that all transmissions occur within the indicated 15 km radius encompassing each test site.

The experimental program is designed to meet the following objectives and validations:

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

General Description of the Overall System and Operations

As described above, the Swarm satellite network consists of data relay satellites, ground stations, and ground devices. [redacted] All uplink and downlink transmissions will be one-way.

The satellites and ground stations will transmit only upon command and persist only during active data transmissions. Any transmission can be immediately terminated by ground

command if interference is detected or reported. [redacted]

Public Interest Consideration:

The commission's grant of this application will serve the public interest by allowing Swarm to demonstrate the above described [redacted]

Non-Interference Criterion

Pursuant to 47 C.F.R. § 5.84 and 5.85, it is understood that a grant of authority for this experimental program will be on a non-exclusive and non-interference basis to both Federal and non-Federal authorized users of the VHF spectrum proposed in this application. Operations under the experimental program will be conducted only at the listed experimental test sites within a 15 km radius of each location.

Uplink transmissions to the Swarm satellites from the ground stations and ground devices located at Swarm's experimental test sites will occur with a maximum power level of 1.5 W. The out of band emissions are minimized by digital modulation techniques and filtering with at least 20 dB spectral rolloff at 120% of signal bandwidth in any 4 kHz band, 40 dB at 200% bandwidth, 55 dB at 300% bandwidth, and more than 60 dB beyond 4 times the bandwidth. Center frequencies of 148.315, 148.345, 148.375, and 148.405 MHz are chosen to remain within the band allocated to NGSO MSS, minimizing potential for interference into adjacent services, including allowance for Doppler shift and frequency tolerance.

Exhibit B attached to this application describes fully the electromagnetic compatibility of the Swarm system with other users and services in the VHF frequencies proposed in this

application, more specifically in the 148-150.05 MHz band.[2]

Radio System Technical Characteristics

The link parameters for ground-to-space and space-to-ground communications are further characterized in the link budget provided in Table 1.

Table 1: Space and ground link budget.[3]

	ground to satellite		**satellite to ground**		
Item	**Nominal**	**Worst-Case**	**Nominal**	**Worst-Case**	**Units**
Satellite Orbital Altitude	**500**	**500**	**500**	**500**	km
Earth Radius	6371	6371	6371	6371	km
Frequency	0.149	0.149	0.138	0.138	GHz
Elevation Angle to Satellite	50	0	50	0	deg
Satellite Angle from Nadir	36.58	68.01	36.58	68.01	deg
Theta Angle	3.42	21.99	3.42	21.99	deg
Transmitter Power	**1.50**	**1.50**	**0.10**	**0.10**	Watts
Transmitter Power	1.76	1.76	-10.00	-10.00	dBW
Transmitter Line Loss	-1.00	-1.00	-1.00	-1.00	dBW
Peak Transmit Antenna Gain	11.00	11.00	2.00	2.00	dBi
Transmit Antenna Pattern Loss	-3.84	0.00	-1.18	-2.97	dB
Transmit Total Gain	6.16	10.00	-0.18	-1.97	dB
Eq. Isotropic Radiated Power	**7.92**	**11.76**	**-10.18**	**-11.97**	**dBW**
Propagation Path Length	637	2573	637	2573	km
Path Loss	-131.99	-144.12	-131.33	-143.46	dB
Polarization Loss	-3.00	-3.00	-3.00	-3.00	dB
Power @ Receiver Antenna	**-127.07**	**-135.36**	**-144.51**	**-158.43**	**dBW**
Peak Receive Antenna Gain	2.00	2.00	11.00	11.00	dBi
Receive Antenna Line Loss	-1.00	-1.00	-1.00	-1.00	dB

[2] On November 29, 2018, Swarm contacted Orbcomm, the only mobile satellite service provider licensed to conduct commercial operations in the United States in the 148-150.05 MHz bands, to initiate coordination to prevent interference with Orbcomm's system. Coordination between Swarm and Orbcomm remains ongoing. Swarm appreciates that operations in the proposed VHF frequencies must occur on a sufferance basis, and Swarm cannot create interference and must accept interference from other authorized users. Should the Commission act prior to the conclusion of discussions with Orbcomm, Swarm will accept a condition on its grant of experimental authority that requires successful coordination prior to the initiation of communications.

[3] Shown for the downlink power levels authorized under STA 1140-EX-ST-2018 for communications with Swarm's four ¼U satellites currently on orbit. Downlink power levels for other satellites will be consistent with the values granted in their respective STAs or experimental licenses.

Receive Antenna Pattern Loss	-1.18	-2.97	-4.49	-0.66	dB
Rx Gain with pointing error	-0.18	-1.97	5.51	9.34	dB
Rx Power	**-127.25**	**-137.33**	**-139.01**	**-149.08**	**dBW**
Necessary Bandwidth	20.8	20.8	20.8	20.8	kHz
Assigned Bandwidth	30.0	30.0	30.0	30.0	kHz
Target Rx Level	-162.80	-162.80	-162.80	-162.80	dBW
Implementation Margin	6	6	6	6	dB
Remaining Margin	**29.54**	**19.47**	**17.79**	**7.72**	**dB**

For the ground stations and ground devices proposed in this application, two different types of antennas will be evaluated: 1) a vertically polarized half-wave monopole antenna with a maximum gain of 2 dBi, and 2) a 5-element Yagi antenna with a maximum gain of 11 dBi.[4] Figures 1 and 2 show the ground station antenna patterns and characteristics, applicable for both transmit and receive.

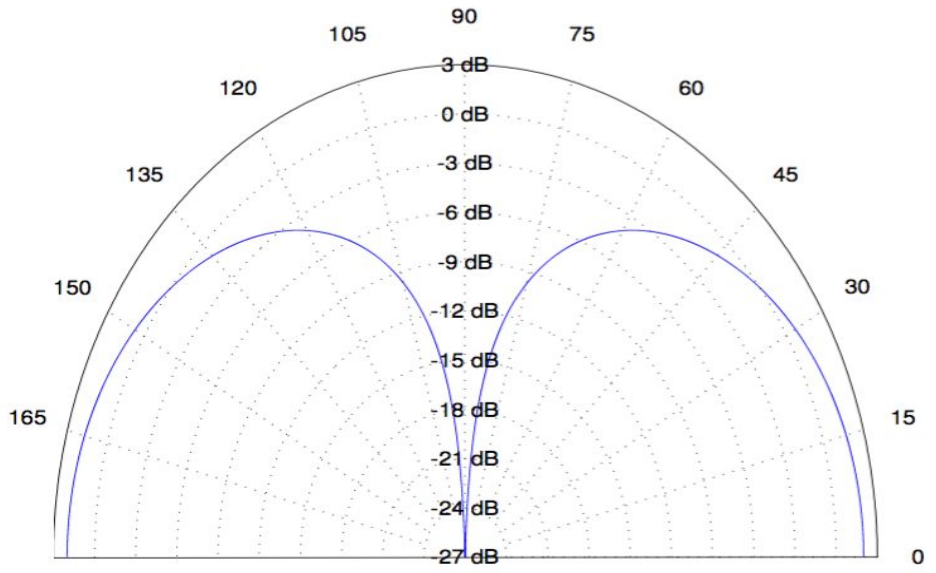

Figure 1: Ground station or ground device TX and RX antenna pattern (end-fed vertical monopole antenna).

[4] The antenna gain value provided in the accompanying FCC Form 442 reflects the highest-gain antenna that will be used with the proposed ground stations and ground devices.

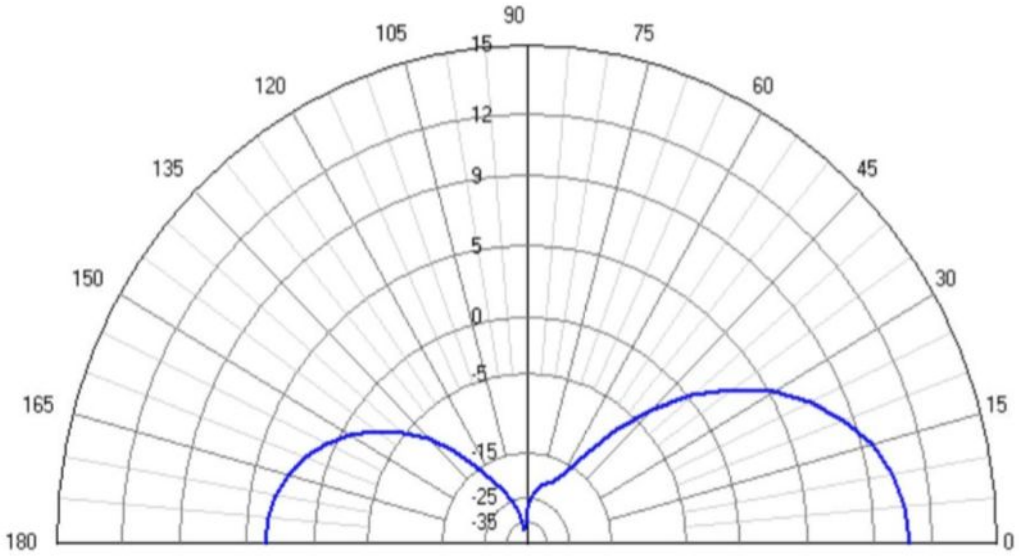

Figure 2: Ground station or ground device TX and RX antenna pattern (Yagi antenna).

All satellite-to-ground communications initiate upon command and self-terminate at the completion of the data transmission. If any deviation from the authorized technical requirements of the transmission is detected, the ground system will mute further transmissions until the deviation is understood and can be corrected.

Swarm requests a waiver of rule 47 C.F.R. § 5.115 related to station identification. More specifically, Swarm requests a waiver of the requirement for periodic station identification in the interest of minimizing transmission durations and activity. Grant of such waiver serves the public interest, as compliance with the station identification requirement unnecessarily adds additional data and modulation changes during transmissions. Grant of such waiver does not adversely affect the spectrum rights of any third party and is consistent with Commission's longstanding commitment to spectral efficiency.

Previously Authorized or Pending Ground Station Locations

Ground Stations 1 and 2 were previously authorized under 1140-EX-ST-2018 (for communications with Swarm's four ¼U satellites currently on orbit for the sole purpose of collecting orbital and tracking data) and under 0976-EX-ST-2018 (for communications with Swarm's three 1U satellites to be launched on the upcoming SpaceX SSO-A mission).

Ground Station 1
845 Madonna Way
Los Altos, CA 94024
NL 37-21-53; WL 122-06-39
Elevation: 132 m
Antenna height: 3 meters above ground level
Antenna type: VHF vertical dipole

Ground Station 2
4015 Biltmore Cove Way
Buford, GA 30519
NL 34-05-05; WL 83-56-51
Elevation: 366 m
Antenna height: 3 meters above ground level
Antenna type: VHF vertical dipole

Experimental Testing Sites for which Authorization is Requested

General Parameters (applicable for all sites)
Antenna height: 3 meters above ground level
Antenna type: VHF vertical monopole or Yagi antenna
Radius of operation: Testing will be conducted within a 15 km radius of the latitude and longitude provided for each location

Number of Transmitting Devices
At Sites 1 and 2 (located in Palo Alto, California and Draper, Utah), a maximum of one ground station and ten ground devices will transmit simultaneously. At all other proposed test sites, only a single ground station or ground device will transmit at any given time.

Table 2: Requested experimental testing sites.

Site Number	City or Location	State	Country	Latitude	Longitude
1	Palo Alto	California	USA	37 27 18 N	122 6 39 W
2	Draper	Utah	USA	40 28 53 N	111 49 23 W
3	Flowery Branch	Georgia	USA	34 11 32 N	83 56 28 W
4	Austin	Texas	USA	30 12 32 N	97 40 38 W
5	Cumming	Georgia	USA	34 5 31 N	84 11 13 W
6	Waimea	Hawaii	USA	20 1 54 N	155 41 44 W
7	Dededo	Guam	USA	13 31 3 N	144 50 49 E
8	Agat	Guam	USA	13 21 0 N	144 41 52 E
9	St Croix	St Croix	USA	17 44 1 N	64 45 34 W
10	Oakland	California	USA	37 48 11 N	122 16 22 W
11	Napa	California	USA	38 20 20 N	122 21 41 W
12	Richmond	California	USA	37 55 45 N	122 25 52 W
13	Fairbanks	Alaska	USA	64 53 57 N	147 43 18 W
14	Tampa	Florida	USA	27 52 38 N	82 29 45 W
15	Boulder	Colorado	USA	40 0 54 N	105 16 14 W

16	Vallejo	California	USA	38 6 19 N	122 12 59 W
17	Suffolk	Virginia	USA	36 43 34 N	76 35 57 W
18	Philadelphia	Pennsylvania	USA	39 57 40 N	75 11 9 W
19	Fort Bliss	Texas	USA	31 49 51 N	106 23 42 W
20	Jacumba Hot Springs	California	USA	32 37 31 N	116 8 39 W
21	St. Thomas	St. Thomas	USA (US Virgin Islands)	18 20 52 N	64 55 55 W
22	Woburn	Massachusetts	USA	42 29 44 N	71 7 39 W
23	Franconia	Virginia	USA	38 46 18 N	77 8 17 W
24	Cape Canaveral	Florida	USA	28 32 33 N	80 38 9 W
25	Albuquerque	New Mexico	USA	35 3 17 N	106 35 37 W
26	Mojave	California	USA	34 58 27 N	117 58 4 W
27	Judy Gap	West Virginia	USA	38 42 28 N	79 27 39 W
28	Fredericksburg	Virginia	USA	38 18 12 N	77 26 12 W
29	Matinicus Island	Maine	USA	43 51 13 N	68 54 2 W
30	Tall Trees Grove Trailhead	California	USA	41 12 29 N	123 59 35 W
31	Arlington	Virginia	USA	38 53 34 N	77 5 7 W
32	Chula Vista	California	USA	32 34 41 N	116 51 13 W
33	Monhegan Island	Maine	USA	43 45 34 N	69 18 59 W
34	IVO Wells	Nevada	USA	41 4 2 N	115 1 30 W
35	Dog Island	Florida	USA	29 48 34 N	84 35 51 W
36	St. Vincent Island	Florida	USA	29 40 26 N	85 9 43 W
37	Sand Key, Dry Tortugas	Florida	USA	24 37 41 N	82 52 19 W
38	Twin Lakes	Alaska	USA	60 37 59 N	153 54 34 W
39	Terlingua	Texas	USA	29 19 20 N	103 37 2 W
40	New York City	New York	USA	40 42 10 N	74 0 36 W
41	Rio Grande	Puerto Rico	USA	18 17 37 N	65 47 4 W
42	Sandia Crest	New Mexico	USA	35 12 38 N	106 26 58 W
43	Idaho Falls	Idaho	USA	43 30 41 N	112 2 32 W
44	Burbank	California	USA	34 11 51 N	118 21 25 W
45	Fayetteville	North Carolina	USA	35 5 50 N	78 58 19 W
46	Colorado Springs	Colorado	USA	38 47 16 N	104 51 0 W
47	Harrisburg	Pennsylvania	USA	40 16 23 N	76 53 10 W

48	Pittsburgh	Pennsylvania	USA	40 26 26 N	79 59 44 W
49	Everett	Colorado	USA	39 4 15 N	106 28 56 W
50	Asheboro	North Carolina	USA	35 42 29 N	79 48 59 W
51	Palm Springs	California	USA	33 47 43 N	116 29 59 W
52	Vacaville	California	USA	38 25 34 N	121 55 29 W
53	Saxon	California	USA	38 26 47 N	121 37 55 W
54	Fairfield	California	USA	38 12 32 N	122 2 41 W
55	Olcott	California	USA	38 14 30 N	121 48 19 W
56	Hood	California	USA	38 20 53 N	121 32 1 W
57	Isleton	California	USA	38 8 57 N	121 32 46 W
58	Herald	California	USA	38 16 38 N	121 15 37 W
59	Stockton	California	USA	38 3 29 N	121 22 30 W
60	Antioch	California	USA	38 3 33 N	121 47 0 W
61	San Jose	California	USA	37 18 38 N	121 53 13 W
62	Groveland	California	USA	37 50 36 N	120 11 20 W
63	Lake Tahoe	California	USA	38 59 42 N	120 5 44 W