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VIA ELECTRONIC FILING

December 4, 2018

Leann Nguyen
Experimental Licensing Branch
Office of Engineering and Technology
Federal Communication Commission
445 12th St., SW
Washington, D.C. 20554

**Re: Thomas Jefferson High School Partnership Fund, Inc., File No. 0950-EX-CN-2018;
TJ REVERB Experimental License Application**

Dear Ms. Nguyen:

On behalf of the Thomas Jefferson High School Partnership Fund, Inc. ("TJHSPF"), we hereby respond to the Commission's November 30, 2018 correspondence requesting additional information regarding the above-captioned experimental application.¹

First, per your request, the Spacecap data file, Spacecap letter, ITU cost recovery letter, and associated ITU materials were sent via email to the following addresses: Joseph.Hill@fcc.gov; Jeanette.spriggs@fcc.gov and Leann.Nguyen@fcc.gov.

Second, attached as Exhibit 1 is an International Amateur Radio Union (IARU) coordination letter confirming coordination for the TJHSPF cubesat, TJ REVERB.

Third, we submit the following technical information regarding the proposed radio transmitters and TJ REVERB satellite operations as requested in your correspondence:

Transmit Antenna – Satellite-to-Iridium (L-band)
Location: Satellite (*see* Orbital Characteristics, below)
Polarization-Orientation: RHCP
Dimension:
Gain (dbi): 4.4 dBi
Beamwidth (deg.): 150°

¹ See Thomas Jefferson High School Partnership Fund, Inc., File No. 0950-EX-CN-2018, (filed Nov. 28, 2018) ("*Experimental Application*"); *see also* Correspondence from Leann Nguyen, FCC, to Carlos Nalda, LMI Advisors, File No. 0950-EX-CN-2018, Correspondence Ref. No. 45268 (Nov. 30, 2018).

Transmit Antenna – Satellite-to-Earth Station (VHF)

Location: Satellite (see Orbital Characteristics, below)

Polarization and Orientation: LHCP

Dimension:

Gain (dBi): 0 dBi

Beamwidth (deg.): 180°

Receive Antenna (Earth Station):

Location (lat/long): 38°49'8" N, 77°10'9" W

City, State: Alexandria, VA

Polarization-Orientation: Vertical

Dimension:

Gain: 0dBi

Beamwidth (deg.): 180°

Azimuth (deg. clockwise from True North): 0°

Elevation (in meters above MSL): 81m

Height (in meters above MSL): 91m (10m AGL)

Satellite Orbital Characteristics

Inclination angle (deg.): 51.6°

Apogee (in km): ~400 km

Perigee (in km): ~400 km

Period (in hours): 1.55 hr

Satellite System Information

Number of satellites in the system: 1 (TJ REVERB)

Number of transmitting satellites: 1 (TJ REVERB)

Number of receiving satellites: 1 (TJ REVERB)²

Stop Buzzer Contact (in the event of interference):

Michael Piccione

M: 703-408-2005

E: mspiccione@fcps.edu

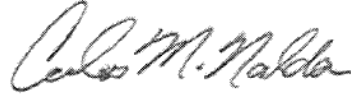
Finally, TJHSPF's technical consultants noted an inadvertent error in the link budgets originally submitted with the Experimental Application. Specifically, the maximum VHF ground station antenna gain should have been 0 dBi (rolling off to -5 dBi) rather than 5 dBi (rolling off to 0 dBi). Accordingly, in Exhibit 2, TJHSPF submits replacement VHF TT&C Downlink and Uplink link budgets. Although similar experimental filings typically do not include such detailed

² Note the TJ REVERB satellite will transmit to the closest Iridium satellite in L-band as described in the Technical Description and accompanying Form 442. Iridium will file a separate experimental application requesting authority for the Iridium-to-TJ REVERB link.

information, TJHSPF respectfully refers the Commission to the new link budgets to confirm that its TT&C links will close.³

Please do not hesitate to contact me with any questions regarding this matter.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Carlos M. Nalda". The signature is fluid and cursive, with the first name "Carlos" and last name "Nalda" clearly distinguishable.

Carlos M. Nalda
Managing Principal
LMI Advisors

³ Note that because TJHSPF is using a terrestrial VHF antenna to communicate with TJ REVERB, there is a small region directly above the earth station (a “donut hole”) in which the downlink link will not close. (The uplink link closes at all elevation angles, so TJHSPF will always maintain control of the TJ REVERB satellite.) Given the velocity of the satellite, the outage period is very short and TJHSPF will tolerate such outages through operational means.

Exhibit 1

IARU Coordination Letter



The International Amateur Radio Union

Since 1925, the Federation of National Amateur Radio Societies
Representing the Interests of Two-Way Amateur Radio Communication

Hans P. Blondeel Timmerman, PB2T
Satellite Advisor
Nieuwe weg 21, 4031 MN Ingen, Netherlands
Email: satcoord@iaru.org

Date: 7 March 2018

To Madeleine Beauvais, KN4DTQ

Dear Madeleine,

In response to your coordination request dated 15 February 2018, IARU has coordinated the following frequency for your satellite **TJREVERB**.

For uplink and downlink APRS, telemetry and telecommand 145.825 MHz with emission designator 16K0F1D, EIRP 3 dBW.

Planned launch date 8 November 2018.

Licensing administration: USA.

Height and Orbit: Apogee 400 km, Perigee circular, inclination 51.6 degrees, period 90 minutes.

Earth Command stations: W3ADO, WB4APR, W7KKE and DK3WN.

IARU has coordinated frequencies in a bands allocated to the amateur satellite service. All frequencies in the amateur satellite service are shared frequencies.

Please inform me about the final launch date and the API/A number as soon as that information becomes available.

Best wishes for a successful project.

Hans Blondeel Timmerman
IARU Satellite Advisor



Exhibit 2

Replacement VHF TT&C Downlink and Uplink Link Budgets

Thomas Jefferson High School Partnership Fund
FCC Experimental License Application

VHF Link - Downlink

Link parameters	Unit	Ground Station Elevation Angle						
		5	15	30	45	60	75	90
Carrier Frequency	MHz	145.85	145.85	145.85	145.85	145.85	145.85	145.85
Carrier wavelength	m	2.06	2.06	2.06	2.06	2.06	2.06	2.06
Boltzmann constant	dBW/K/Hz	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6
BASIC PARAMETERS								
Orbit height	km	400	400	400	400	400	400	400
Earth radius	km	6371	6371	6371	6371	6371	6371	6371
Elevation Angle	°	5	15	30	45	60	75	90
Tx-Rx distance	km	1804	1176	740	550	458	413	400
Satellite Segment								
Tx antenna gain	dBi	-5.0	-4.0	-3.0	-2.5	-2.0	-1.0	0.0
Tx RF power	W	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Tx losses	dB	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tx EIRP	dBW	-2.0	-1.0	0.0	0.5	1.0	2.0	3.0
PROPAGATION								
Satellite Antenna Pointing Loss	dB	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Polarization Loss	dB	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Free space losses	dB	140.8	137.1	133.1	130.5	128.9	128.0	127.8
Atmospheric Loss	dB	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ionospheric Loss	dB	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Total Propagation Losses	dB	144.2	140.5	136.5	133.9	132.3	131.4	131.2
Receive Antenna Gain	dBm	0.0	-1.0	-3.0	-5.0	-8.0	-15.0	-25.0
Received Power	dBm	-116.2	-112.5	-109.5	-108.4	-109.3	-114.4	-123.2
Receiver Sensitivity	dBm	-117.0	-117.0	-117.0	-117.0	-117.0	-117.0	-117.0
Link Margin	dBm	0.8	4.5	7.5	8.6	7.7	2.6	-6.2

Figure 5 VHF-Band TT&C Downlink Link Budgets

VHF Link - Uplink

Link parameters	Unit	Ground Station Elevation Angle						
		5	15	30	45	60	75	90
Carrier Frequency	MHz	145.85	145.85	145.85	145.85	145.85	145.85	145.85
Carrier wavelength	m	2.06	2.06	2.06	2.06	2.06	2.06	2.06
Boltzmann constant	dBW/K/Hz	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6	-228.6
BASIC PARAMETERS								
Orbit height	km	400	400	400	400	400	400	400
Earth radius	km	6371	6371	6371	6371	6371	6371	6371
Elevation Angle	°	5	15	30	45	60	75	90
Tx-Rx distance	km	1804	1176	740	550	458	413	400
Earth Segment								
Tx antenna gain	dBi	0.0	-1.0	-3.0	-5.0	-8.0	-15.0	-25.0
Tx RF power	W	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Tx losses	dB	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Tx EIRP	dBW	14.0	13.0	11.0	9.0	6.0	-1.0	-11.0
PROPAGATION								
Satellite Antenna Pointing Loss	dB	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Polarization Loss	dB	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Free space losses	dB	140.8	137.1	133.1	130.5	128.9	128.0	127.8
Atmospheric Loss	dB	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ionospheric Loss	dB	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Total Propagation Losses	dB	144.2	140.5	136.5	133.9	132.3	131.4	131.2
Receive Antenna Gain	dBm	-5.0	-4.0	-3.0	-2.5	-2.0	-1.0	0.0
Received Power	dBm	-105.2	-101.5	-98.5	-97.4	-98.3	-103.4	-112.1
Receiver Sensitivity	dBm	-114.0	-114.0	-114.0	-114.0	-114.0	-114.0	-114.0
Link Margin	dBm	8.8	12.5	15.5	16.6	15.7	10.6	1.9

Figure 6 VHF-Band TT&C Uplink Link Budgets