



Memorandum

Date: 5 Dec 2018

From: Christopher Timperio
Vector Launch, Inc.

FRN: 0026456863
FCC File Number: 0162-EX-ST-2018
Call Sign: WM9XGK

Subject: Vector Launch, Inc. Experimental STA Application License
Resubmission Vector-R Series B0.003 Launch Vehicle

Reference Documents:

- REF1 FCC, DA-13-446, Guidance on Obtaining Experimental Authorizations for Commercial Space Launch Activities, 15 March 2013.
- REF2 FCC Table of Frequency Allocations (Note US276)
- REF3 Vector 0162-EX-ST-2018 License Resubmission, Vector FCC Memo 0003 (this document)
- REF4 GN-0276-VSS-0003_RE, Vector Supporting Material Experimental STA Application 0003
- REF5 87_Tform_Vector_0003_RE, AFTRCC Experimental License Form
- REF6 STA Grant WM9XGK Original, FCC Experimental STA Grant Vector 0003

The purpose of this memorandum is to resubmit the Experimental STA application; Call Sign: WM9XGK, under Vector Launch, Inc. which inadvertently expired on 1 September 2018. The original application was for the Vector-R B0.003 series launch vehicle developed by Vector Launch, Inc. of Tucson, AZ. The previous FCC STA grant is attached to this resubmission application (REF6). The new application reference files can be seen in REF3 – REF5. This STA request follows the application guidelines DA-13-446 Guidance on Obtaining Experimental Authorizations for Commercial Space Launch Activities (REF1) and guidance from the FCC Table of Frequency Allocations Note US276 (REF2).

This application will cover a **single flight** of the Vector-R B0.003 launch vehicle. The Vector-R B0.003 vehicle is a low altitude test launch required to develop the orbital launch capability of the Vector-R B1 and B2 launch series. Separate STA applications will be submitted for the follow-on Vector-R series.

This application is for a single flight (**estimated 3 hours of frequency usage**) of the Vector-R launch vehicle. The launch vehicle maximum flight duration will be less than 10 minutes. Pre-flight transmitter operation is expected to be less than 90 minutes. The maximum operating time is expected to be less than 3 hours from the commencement of launch activities. This is an absolute worst-case estimate as operating longer than 30 to 60 minutes may require shut down of the transmitters due to thermal concerns.

The proposed launch site will be **Randsburg, CA** at the Friends of Amateur Rocketry (FAR) launch complex, which is located at 35.348°N, -117.810°W, and is situated at an altitude of 1050 m. The B0.003 launch vehicle will not exceed 10000 ft (3048 m) above the launch site and will not travel further than 5km away from the launch site.

For this application we would like to submit approval for the following range of dates; December 17th, 2018 to June 1st, 2019. However, the planned launch date for Vector-R B0.003 is targeted for mid-January 2019 from Randsburg, CA.

Vector will finalize the planned launch date with local area frequency managers 7-days prior to the test flight. Communications will be email and telephone. Vector will also provide an update 2-days prior to launch and the day of launch prior to the flight. Vector has included a stop buzzer phone number in the data table attached to our FCC STA application. Vector will confirm the stop buzzer contact information prior to the flight.

The experimental STA application requests one telemetry downlink in the 2360 to 2390 MHz S-Band. This band is allocated for government use however the allocation is also authorized for use by commercial launch vehicles telemetering in accordance with the FCC Table of Frequency Allocations Note US276 (REF2). Vector requests use of this band on a non-interference basis.

The downlink frequency listed below is planned for the Vector-R B0.003 flight.

	Frequency	Modulation	Data Rate	Emission Designator	Use
Link 1	2370.5 MHz	SOQPSK-TG	2 Mbps	1M92G1D	Vehicle Telemetry

A Quasonix nanoTX™ S-Band transmitter will be used as Commercial-Off-The-Shelf (COTS) telemetry transmitter radio components for the Vector-R B0.003 rocket. The Quasonix brand is used extensively throughout the aerospace and space industries. The Quasonix unit employs Shaped Offset Quadrature Phase Shift Key (SOQPSK-TG) modulation to provide highly efficient bandwidth utilization at higher data rates. For the Vector-R B0.003 application, a single data rate is indicated: 2 Mbps. This link is to be used for high-rate digital vehicle telemetry.

The Quasonix nanoTX™ transmitter radio will output a 10W (40dBm) 2370.5MHz RF signal of 2MHz bandwidth. Two antennas with “hemi-spherical” radiation patterns are used on opposite sides of the vehicle to provide full RF visibility during flight. The output power from the Quasonix transmitters will be split equally and fed to these antennas. Given the full pattern coverage of the vehicle, we note the antennas to have an effective gain of 0dBi. Therefore, the effective isotropic radiated power (EIRP) can be estimated as the equivalent power output from the Quasonix nanoTX™ transmitter as 10W (40dBm).

The TX S-Band antennas on the launch vehicle are of a single omnidirectional type; Haigh-Farr conformal panel antennas; P/N: 13315. The S-Band antennas are of the linear polarization type. The antenna height on the vehicle is 12 m off the ground.

Thank you for your consideration, and if additional information is required, please do not hesitate to contact me as soon as possible.

Thank you,

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