



Memorandum

Date: 31 Jan 2018

From: Michael C. Maguire
Vector Launch

FRN 0026456863

FCC File Number: 0162-EX-ST-2018

To: Leann Nguyen, FCC – OET
Jeanette Spriggs, FCC – OET

Subject: Vector Launch Inc. Experimental STA Application for
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 GN-0275-VSS-NEW, Vector FCC Memo Block 0.003 (this document)

REF3 GN-0276-VSS-NEW, Vector Supporting Material Experimental STA Application B0.003

REF4 FCC Table of Frequency Allocations (Note US276)

This memorandum provides backup data for the Experimental STA Application for the Vector-R B0.003 series launch vehicle being developed by Vector Launch Inc of Tucson AZ. 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. Vector Launch Inc is developing the Vector-R as a small, low cost, launch vehicle to serve the commercial small satellite market. A spreadsheet providing tabulated values of mission parameters is provided in REF3 also attached to this application.

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 capable Vector-R B1 and B2 series. Separate STA applications will be submitted for the follow-on Vector-R series.

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This application is for a single flight (**estimated 3 hours of frequency usage**) of the Vector launch vehicle. The launch vehicle maximum flight duration will be less than 5 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.

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.

A brief summary of Vector-R B0.003 launch follows; detailed technical data for the B0.00X series is contained in GN-0224-VSS-NEW (REF3) attached.

Launch Date	Vehicle	Launch Site	Comment
March 2018	B0.003	Randsburg (Mojave) CA	Planned
April 2018	TBD	TBD	Additional launch opportunity TBD
May 2018	TBD	TBD	Additional launch opportunity TBD

The Randsburg launch site is located at 35.348°N, -117.810°W, and at an altitude of 1070 m. The test vehicle will not exceed 10000 ft (3048 m) above the launch site.

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

The three downlink frequencies s are planned as a worst case; one or more of the links may not be used for the flight.

	Frequency	Modulation	Data Rate	Emission Designator	Use
Link 1	2364.5 MHz	SOQPSK	128 kbps	241KG1DCT	1 st Stage Telemetry
Link 2	2370.5 MHz	SOQPSK	256 kbps	355KG1DCT	2 nd Stage Telemetry
Link 3	2382.5 MHz	SOQPSK	5000 kbps	4M61G1DCT	HD Digital Video

Antenna registration is provided for 3 antennas; a single transmitter type will be used.

The transmitter is a Quasonix nanoTX™; this is a Commercial-Off-The-Shelf (COTS) telemetry transmitter used extensively throughout the aerospace and space industries. The Quasonix unit employs Shaped Offset Quadrature Phase Shift Key (SOQPSK) modulation to provide highly efficient bandwidth utilization at data rates up to 46 Mbps. In the Vector application 3 data rates are indicated: 128 kbps, 256 kbps, and 5000 kbps. These will be used for low-rate digital telemetry, high-rate digital telemetry, and digital video respectively.

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Note: not all digital telemetry streams will be used for the launch, extra transmitters are provided should Vector require them for additional downlink dat.

The antennas on the launch vehicle are omnidirectional. All downlinks will be split to two hemispherical antennas located on either side of the launch vehicle to create an omnidirectional antenna pattern. All antennas are right hand circularly polarized (RHCP).

The antenna height will vary from 5 m off the ground while on the launch pad to approximately 3000 m (10000 ft) altitude.

Please contact me as soon as possible should additional information be required.

Thank you,

Mike

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