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# Memorandum

**Date:** **29 May 2018**

**From:** **Robert R. Cleave - Vector Launch Inc.**

**Steve Kaltenmark – Telecomm Strategies, LLP**

**FRN 0026456863**

**FCC File Number: 0945-EX-ST-2018**

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

**Subject:** **Vector Launch Inc. Experimental STA Application for Vector-R Launch Vehicle Pathfinder Activities**

Reference Documents:

REF1 FCC, DA-13-446, Guidance on Obtaining Experimental Authorizations for Commercial Space Launch Activities, 15 March 2013.

REF2 GN-VSS-NEW, Vector FCC Memo Pathfinder (this document)

REF3 AFTRCC Coordination E-mail 1294-18/7322 (Vector Launch STA/Ground Checkouts-Kodiak, AK), 21 May 2018

REF4 FCC Table of Frequency Allocations (Note US276)

REF5 Vector Radio License Application_Kodiak_June2018

This memorandum provides backup data for the Experimental STA Application for the Vector-R launch vehicle Pathfinder activities to occur in early July 2018 for 4 to 6 hours over a period of no more than three days during the Time Slot requested in the STA. 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 (REF4).

The Vector-R launch vehicle uses three (3) different communication links for downlinking telemetry information during a launch. This specific request is to conduct a Pathfinder activity related to one (1) of these links, which employs use of the nominal link data rate of 256 kbps. During the Pathfinder activities, the Vector-R launch vehicle will remain on the pad in an inert phase (i.e., not a flight vehicle) at the Polar Spaceport Complex Alaska (PSCA) launch facility in Kodiak, AK located at 57.435209°N, 152.33948°W and at an elevation of 0.05 km. The launch vehicle will be in the vertical or "launch" position and will radiate energy in the S-band and in accordance with the link budget attached to the FCC STA application (REF5). Various test scripts will be run to validate the link quality, avionics performance on the launch vehicle, other electronics equipment owned by Vector and third parties (such as Alaska Aerospace Corporation), and ancillary operational equipment. The Pathfinder will conclude with an internally generated report to better refine Vector's Concept of Operations (CONOPS), operational limitations, third party requirements, and other factors associated with its design and/or launch operations.

Vector will finalize the planned date for the Pathfinder activities with local area frequency managers per AFTRCC Coordination e-mail (REF3); the e-mail is attached to Vector's FCC STA application on the FCC OET ELS website. Communications will be email and telephone. Vector will also provide an update 2-days prior to the Pathfinder activities. 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.

This 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 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 downlink frequency requested and relevant modulation, data rate and emission designator for this telemetry signal are:

| Frequency | Modulation | Data Rate | Emission Designator | Use |
|---|---|---|---|---|
| 2370.5 MHz | SOQPSK | 256 kbps | 240KG1D | 256 kbps digital telemetry |

Antenna registration is provided for 1 antenna; 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.

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. Both antennas are right hand circularly polarized (RHCP).

The antenna height is 10 m off the ground while on the launch pad.

Vector greatly appreciates the FCC's assistance with this STA for the Vector-R launch vehicle Pathfinder activities, and we are fully prepared to support your needs or questions. Please contact me as soon as possible should additional information be required.

Thank you,

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