

NARRATIVE IN SUPPORT OF REQUEST FOR NEW EXPERIMENTAL STA

This document provides context, confirmations, and technical details in support of the Application for New Special Temporary Authority by Rocket Lab USA, Inc. to receive authorization of launch vehicle communications for its planned Electron Launch Vehicle (Electron) launch from the Wallops Island Flight Facility in Accomack, Virginia, January 10, 2023. First, the document briefly summarizes the purpose of the application and the communications that will take place during the launch. Second, it acknowledges and commits to observing likely coordination and reporting obligations associated with the proposed experimental uses. Third, it provides tables of technical details for frequency transmission in support of the launch, including altitude information and frequency usage information.

Background and Launch Overview:

Rocket Lab is an American aerospace company with operations in the United States and New Zealand. Rocket Lab is the manufacturer of the Electron rocket, a three-stage launch vehicle designed to launch small satellites into low earth orbit.¹ Rocket Lab has planned mission using Electron as the launch vehicle in January 2023, and seeks authority to transmit between Electron and ground stations using 2 GHz S-band frequencies during the launch and for conducting testing in support of the launch. To account for unexpected delays, Rocket Lab requests authority to operate on an unprotected, non-interference basis to authorized federal stations using the requested frequencies from December 10, 2022 to June 9, 2023. However, should the testing and launch activities conclude prior to June 10, 2023, Rocket Lab will cease transmissions upon the completion of its testing and launch activities.²

A previous launch STA (1084-EX-ST-2022) has been submitted for a planned launch on 1 December 2022 using the Electron rocket at Wallops Island Flight Facility in Accomack, Virginia.

An ITU Filing # 120545187 satellite name ELECTRONUSA-1 was filed by the FCC during an earlier launch STA submission in 2020.

The launch will occur at Rocket Lab's Launch Complex 2, which is located at the Mid-Atlantic Regional Spaceport on Wallops Island. As of the date of this application, the launch has one payload customer; additional customers may be integrated into the manifest prior to the launch date.

¹ The Electron launch vehicle is sometimes referred to as having two stages plus a kick-stage. *See, e.g.*, Rocket Lab, Overview (Jun. 24, 2022), available at <https://www.rocketlabusa.com/launch/electron/>.

² To the extent required, Rocket Lab requests authorization to operate without periodically transmitting the call sign associated with this authorization, as this would significantly disrupt ongoing transmissions to and from the launch vehicle.

The three stages of Electron as well as the radio transmissions necessary to support each stage are as follows:

- **Stage 1** of the launch vehicle transports the rocket out of the earth's atmosphere and separates from Stage 2 approximately T+150 seconds after lift-off, and falls back to Earth, landing in the Atlantic Ocean. No radio transmissions will occur from Stage 1 of the launch vehicle.
- **Stage 2** of the launch vehicle occurs after separation from Stage 1 when Electron ignites its engines to boost the vehicle into an elliptical orbit. Stage 2 will transmit downlink telemetry data to NASA ground stations at Wallops Flight Facility and in Bermuda using channels centered on 2272.5 MHz and 2287.50 MHz. It is proposed that these telemetry transmissions will occur from a few hours before launch (T-5 hours) until approximately T+690 seconds when it goes out of view of the Bermuda tracking ground station.
- **Stage 3**, the kick stage, separates from Stage 2 at approximately T+590 seconds. It then coasts to orbit apogee and then circularizes the orbit with its onboard Curie engine before deploying the payload over the southern Indian Ocean. Stage 3 would transmit downlink telemetry to one or more ground stations listed in this application using transmissions centered at 2239 MHz. Stage 3 uplink telemetry will use transmissions centered at 2085 MHz to communicate with the Electron rocket from ground station transmitters located exclusively outside the U.S. for which separate authorizations are being secured.

Note: Stage 3 carrier frequency on 2239 MHz. This frequency has been moved from the US96 footnote channels due to WFF Spectrum Manager advice (during our previous STA application, 1084-EX-ST-2022) that the 2208.5-2213.5 MHz, 2212.5-2217.5 MHz bands cannot be coordinated at Wallops Island due to NASA/NOAA activities. Correspondence with Anthony Serafini, FCC.

Acknowledgment of Conditions and Limitations

Rocket Lab will coordinate its launch operations with federal incumbents, including the National Telecommunications and Information Administration (NTIA); the U.S. Air Force; the U.S. Navy; the National Aeronautics and Space Administration; and the National Oceanic and Atmospheric Administration. Furthermore, Rocket Lab will only operate in a manner consistent with any coordination agreements reached with federal incumbents. Rocket Lab also will provide stop-buzzer contact information to NTIA, and Rocket Lab will log transmissions and make that information available to NTIA. Finally, Rocket Lab acknowledges that any grant of authority is limited to a single launch of its Electron rocket, including pre-launch testing, on an unprotected, non-interference experimental basis.

Technical Information

Below is detailed technical information regarding the transmissions contemplated in the Electron launch as well as the supporting ground stations involved, some of which are located in the United States.

- Rocket Lab will not transmit from earth stations located in the United States using center frequency 2085 MHz. Instead, Rocket Lab will use center frequency 2085 MHz from ground station transmitters located exclusively outside of the United States for which separate authorizations are being secured. Because the 2085 MHz transmissions will occur exclusively outside of the United States, Rocket Lab has not included center frequency 2085 as a requested frequency of operation in this application.
- The antenna located in Long Beach, California, United States (Antenna 4) listed below will operate as a receive-only ground station, not a transmitter. Therefore, this antenna is not listed in the Technical Data section of the Experimental STA application form, which asks for information relating to “Transmitters” and does not request (or provide a space for entering) information relating to receivers.

DOWNLINK TRANSMIT BEAMS

Beam 1

Center Frequency	2272.5 MHz (ATM) (Emhiser)³
Minimum 99% BW	5- MHz
Maximum 99% BW	5- MHz
Proposed minimum emission designation	N/A
Proposed maximum emission designation	5M00G1D--
Minimum transmit power	0 dBW
Maximum transmit power	7 dBW
Minimum Elevation Angle Transmit	0
Maximum Elevation Angle Transmit	90
Transmit Antenna Polarization	Linear
Requested licensing use case	(1) Launch Vehicle Downlink Telemetry to Wallops Island and downrange to Bermuda ground station.
Notes	(1) The PFD towards the Earth will vary depending on the bandwidth and power utilized. At all times, we will comply with the PFD limits in Table 21-4 of the ITU RR. (2) Transmission stops after line-of-sight to Bermuda is lost over the horizon.

³ The equipment number of the Emhiser transmitter is ETSI-Z3EBD502-41A62000. Character limits associated with the Form 442 do not allow entry of the full equipment number into the form.

	(3) Emission designation and maximum 99% BW includes +/- 62.5 kHz of Doppler shift.
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Beam 2

Center Frequency	2287.50 MHz (BTM) (Emhiser)
Minimum 99% BW	5MHz
Maximum 99% BW	5 MHz
Proposed minimum emission designation	N/A
Proposed maximum emission designation	5M00G1D--
Minimum transmit power	0 dBW
Maximum transmit power	7 dBW
Minimum Elevation Angle Transmit	0
Maximum Elevation Angle Transmit	90
Transmit Antenna Polarization	Linear
Requested licensing use case	(1) Stage 2 Launch Vehicle Downlink Telemetry to Wallops and downrange to Bermuda GS.
Notes	(1) The PFD towards the Earth will vary depending on the bandwidth and power utilized. At all times, we will comply with the PFD limits in Table 21-4 of the ITU RR. (2) Emission designation and maximum 99% BW includes +/- 62.5 kHz of Doppler shift.

Beam 3

Center Frequency	2239MHz (OTM1SDL) (SatLab SRS-3)
Minimum 99% BW	0.075 MHz
Maximum 99% BW	0.6 MHz
Proposed minimum emission designation	75K0G1D--
Proposed maximum emission designation	600KG1D--
Minimum transmit power	-3 dBW
Maximum transmit power	7 dBW
Minimum Elevation Angle Transmit	0
Maximum Elevation Angle Transmit	90
Transmit Antenna Polarization	RHCP
Requested licensing use case	(1) Initial on-orbit downlink once outside the United States, over Portugal, South Africa, Mauritius and Australia. (2) Request downlink to Long Beach, California, United States. (3) Downlinks only occur while in view of a ground station listed below.

Notes	<p>(1) The PFD towards the Earth will vary depending on the bandwidth and power utilized. At all times, we will comply with the PFD limits in Table 21-4 of the ITU RR.</p> <p>(2) Emission designation and maximum 99% BW includes +/- 62.5 kHz of Doppler shift.</p>
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UPLINK FREQUENCIES TO LAUNCH VEHICLE

Center Frequency	2085 MHz (OTM1SUL) (Satlab SRS-3)
Requested licensing use case	On-orbit usage once outside the United States.
Minimum 99% BW	0.075 MHz
Maximum 99% BW	0.075 MHz
Proposed minimum emission designation	75K0G1D--
Proposed maximum emission designation	75K0G1D--
Rx System noise temperature	460
Minimum elevation angle tx	5
Maximum Rx antenna gain	5 dBi
Rx antenna polarization	RHCP
Notes	Emission designation and maximum 99% BW includes +/- 62.5 kHz of pre-Doppler shift.

RECEIVING GROUND STATIONS / ANTENNAS (U.S.)

Antenna 1

Location	LC2 Wallops Island, Goddard Space Facility
Rx Band	S-Band Ext.
Owner/operator	NASA/WFF
Latitude (dec)	37.92361
Longitude (dec)	-75.47722
Latitude (DMS)	37N 55m 25s
Longitude (DMS)	75W 28m 38s
Antenna description	8m NASA Operated Upper S-Band (Rx)

Antenna 2

Location	LC2 Wallops Island, Goddard Space Facility
Rx Band	S-Band Ext.
Owner/operator	NASA/WFF
Latitude (dec)	37.928029
Longitude (dec)	-75.474451
Latitude (DMS)	37N 55m 41s
Longitude (DMS)	75W 28m 28s
Antenna description	6m NASA Operated Upper S-Band (Rx)

Antenna 3

Location	LC2 Wallops Island, Goddard Space Facility
Rx Band	S-Band Ext.
Owner/operator	NASA/WFF
Latitude (dec)	37.841558
Longitude (dec)	-75.484489
Latitude (DMS)	37N 50m 30s
Longitude (DMS)	75W 29m 4s
Antenna description	NASA Off Axis Antenna

Antenna 4

Location	Long Beach, California, United States
Rx Band	S-Band
Owner/operator	KSAT
Latitude (dec)	33.824305
Longitude (dec)	-118.146587
Latitude (DMS)	33N 49m 27s
Longitude (DMS)	118W 8m 48s
Location	Long Beach, California, United States
Antenna description	KSAT Lite S-Band RX (3.7m)

LOCATIONS OF ALL TRANSMITTING GROUND STATIONS

Location	Purpose	Latitude/ Longitude
Wallops Island, Goddard Space Facility, Virginia, United States	Hangar testing downlink	N: 37° 52' 21'' W: 75° 26' 31''
Santa Maria Island, Azores, Portugal	Stage 3 S-Band Orbital downlink transmissions	N: 36.996983° W: 25.136102° Alt 274m (WGS84)
Mingenew, Australia	Stage 3 Orbital Uplink S- Band transmissions	S: 29° 0' 38'' E: 115° 20' 36''
Savanne, Mauritius	Stage 3 Orbital Uplink S- Band transmissions	S: 20° 30' 3'' E: 57° 27' 0''
Hartebeesthoek, South Africa	Stage 3 Orbital Uplink S- Band transmissions	S: 25° 53' 9'' E: 27° 42' 18''

LOCATIONS OF ALL RECEIVING GROUND STATIONS

Location	Purpose	Latitude/ Longitude
Wallops Island, Goddard Space Facility, Virginia, United States	Stage 2 Launch downlink telemetry from launch vehicle	N: 37° 50' 0'' W: 75° 29' 18'' N: 37° 55' 41s''; W: 75° 28' 27'' N: 37° 49' 59''; W: 75° 29' 17''
Bermuda	Stage 2 Launch downlink telemetry from launch vehicle	N: 32° 21' 4'' W: 64° 39' 31''
Long Beach, California, United States	Stage 3 Orbital downlink S-Band transmissions	N: 33° 49' 27'' W: 118° 8' 48''
Wagin, Western Australia	Stage 3 (Kick Stage) Orbital downlink transmissions	S: 33° 16' 58'' E: 117° 25' 43''
Santa Maria Island, Azores, Portugal	Stage 3 S-Band Orbital downlink transmissions	N: 36° 59', 49.1'' W: 25° 8' 10'' Alt 274m (WGS84)
Mingenew, Australia (Capricorn)	Stage 3 S-Band Orbital downlink transmissions	S29° 0' 37'' E 115° 20' 30'', Alt 240m
Mingenew, Australia (KSAT)	Stage 3 S-Band Orbital downlink transmissions	S: 29° 0' 38'' E: 115° 20' 36''
Savanne, Mauritius	Stage 3 -Band Orbital downlink transmissions	S: 20° 30' 3'' E: 57° 27' 0''
Hartebeesthoek, South Africa	Stage 3 S-Band Orbital downlink transmissions	S: 25° 53' 9'' E: 27° 42' 18''