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Subject: Response to additional information requested by NTIA regarding FCC STA application file number 0139-EX-ST-2012

Two separate communications from NTIA were received through FCC contact Tony Serafini, requesting additional information in response to the application for STA licensing submitted by Orbital Sciences Corporation. All requested information is addressed by responding to the items listed in the second request. Responses are embedded in the paragraphs in [blue](#).

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"Please inform Orbital Sciences for SPACE that they did answer the questions in the attached;

1. Provide a list of ground stations.
2. The identity of receiving stations (including coordinates) for each link.
3. The "center frequency" for each link vice specifying a band for each link."

"However, they did not answer the following:

1. Provide the trajectory information/data file in Earth Centered Fixed (ECF) Vector Format for each link. The trajectory information/data file should cover the period from launch (start) to the point that S-band communications usage will cease (separation or end)."

The requested trajectory data is contained in an exhibit attached to the FCC website associated with this STA application. The trajectory data for each link is determined by applying the information tabulated below to that trajectory data.

Link	Required Link Usage
Telemetry - 2225.5 MHz	Launch through payload separation ( T = 0 - 608.3 seconds)*
Telemetry - 2241.5 MHz	Launch through payload separation ( T = 0 - 608.3 seconds)*
Telemetry - 2259.5 MHz	Launch through payload separation ( T = 0 - 608.3 seconds)
Telemetry - 2269.5 MHz	Launch through S1/S2 interstage sep ( T = 0 - 329.4 seconds)*
Telemetry - 2288.5 MHz	Launch through S1 separation ( T = 0 - 238.7 seconds)*
Range Tracking - 5765 MHz	Launch through required FTS coverage ( T = 0 - 440 seconds)*

\* Information from these links may or may not be collected beyond required coverage, as available, depending on transmitter battery life and coverage provided by ground stations.

2. "A tabular listing of the start and end times for each S-band downlink." **Addressed in response to item 1 above.**
  
3. "NTIA notes that there is no enough information in the application, i.e., spectral power density, to determine the 2.2 GHz power flux-density (PFD). NTIA requests additional information to allow the calculation of the PFD and times of use to determine, if the PFD will be exceeded, what the duration will be." **Power Spectral Density (dBc/Hz for 4 kHz band) was computed for each telemetry link, and is included in the table below.**

Telemetry Link	Modulation	Data Rate (Mbps)	PSD* (dBc/Hz, 4 kHz band)
RCM - 2225.5 MHz	Random NRZ PCM/FM	5	-31.8
AV TLM - 2241.5 MHz	Random NRZ PCM/FM	3	-29.6
PL SIM TLM - 2259.5 MHz	Random NRZ PCM/FM	1.36	-26.1
MC TLM - 2269.5 MHz	Random NRZ PCM/FM	3	-29.6
S1 TLM - 2288.5 MHz	Random NRZ PCM/FM	3	-29.6

\* uses spectral equation for random NRZ PCM/FM found in IRIG 106-07 Appendix A, para. 5.2.4

EIRP information required for PFD calculation and times of use are included for each telemetry link on last page of this response. Though the vehicle antenna system is considered to be nominally omni-directional, specific antenna pattern gain in the direction of the ground is dependent on the vehicle attitude at each point along the mission trajectory. EIRPs are calculated using 95 and 50 percent spherical antenna gains, and using worst case maximum antenna gains.

4. "Is there any receiver requirement on the launch vehicle, e.g., command destruct?" **Yes, there is a command/ destruct receiver as part of the flight termination system. There is also a transponder providing transmitter and receiver function as part of the launch vehicle range tracking system.**
  
5. "Under what FCC authorization will OSC conduct their ground testing at Wallops Island?" **For ground testing at Wallops Island, Orbital is operating under the authority of FCC experimental license 0524-EX-PL-2011 that was granted on 12/16/11.**

"Once the above questions are answered, NTIA can respond to this STA."

Antares TM EIRP results for each telemetry link:

Required Mission Time Performance	RCM Telemetry - 2225.5 MHz								
	xmtr pwr	xmtr pwr	Tx network losses	95% ant gain	EIRP using 95% ant gain	50% ant gain	EIRP using 50% ant gain	max ant gain	EIRP using max ant gain
	(W)	(dBW)	(dB)	(dBic)	(dBW)	(dBic)	(dBW)	(dBic)	(dBW)
T = 0-238.7	10.0	10.0	8.7	-17.7	-16.4	-5.9	-4.6	-1.9	-0.6
T = 238.7-329.4	10.0	10.0	8.7	-16.7	-15.4	-5.4	-4.1	-1.6	-0.3
T= 329.4-608.3*	10.0	10.0	3.5	-13.8	-7.3	-6.2	0.3	1.0	7.5

Required Mission Time Performance	AV Telemetry - 2241.5 MHz								
	xmtr pwr	xmtr pwr	Tx network losses	95% ant gain	EIRP using 95% ant gain	50% ant gain	EIRP using 50% ant gain	max ant gain	EIRP using max ant gain
	(W)	(dBW)	(dB)	(dBic)	(dBW)	(dBic)	(dBW)	(dBic)	(dBW)
T = 0-238.7	5.0	7.0	3.1	-17.7	-13.8	-5.9	-2.0	-1.9	2.0
T = 238.7-329.4	5.0	7.0	3.1	-16.7	-12.8	-5.4	-1.5	-1.6	2.3
T= 329.4-608.3*	5.0	7.0	1.4	-13.8	-8.2	-6.2	-0.6	1.0	6.6

Required Mission Time Performance	PL Sim Telemetry - 2259.5 MHz								
	xmtr pwr	xmtr pwr	Tx network losses	95% ant gain	EIRP using 95% ant gain	50% ant gain	EIRP using 50% ant gain	max ant gain	EIRP using max ant gain
	(W)	(dBW)	(dB)	(dBic)	(dBW)	(dBic)	(dBW)	(dBic)	(dBW)
T = 0-238.7	5.0	7.0	9.0	-17.7	-19.7	-5.9	-7.9	-1.9	-3.9
T = 238.7-329.4	5.0	7.0	9.0	-16.7	-18.7	-5.4	-7.4	-1.6	-3.6
T= 329.4-608.3	5.0	7.0	3.9	-13.8	-10.7	-6.2	-3.1	1.0	4.1

Required Mission Time Performance	Motor Cone - 2269.5 MHz								
	xmtr pwr	xmtr pwr	Tx network losses	95% ant gain	EIRP using 95% ant gain	50% ant gain	EIRP using 50% ant gain	max ant gain	EIRP using max ant gain
	(W)	(dBW)	(dB)	(dBic)	(dBW)	(dBic)	(dBW)	(dBic)	(dBW)
T = 0-238.7	5.0	7.0	3.8	-17.7	-14.5	-5.9	-2.7	-1.9	1.3
T = 238.7-329.4*	5.0	7.0	3.8	-16.7	-13.5	-5.4	-2.2	-1.6	1.6

Required Mission Time Performance	Stage 1 Telemetry - 2288.5 MHz								
	xmtr pwr	xmtr pwr	Tx network losses	95% ant gain	EIRP using 95% ant gain	50% ant gain	EIRP using 50% ant gain	max ant gain	EIRP using max ant gain
	(W)	(dBW)	(dB)	(dBic)	(dBW)	(dBic)	(dBW)	(dBic)	(dBW)
T = 0-238.7*	5.0	7.0	0.13	-17.3	-10.4	-5.5	1.4	-1.5	5.4

\* these transmitters continue to transmit beyond times shown until batteries are drained