

From: Amy Ngai

To: Nimesh Sangani

Date: November 03, 2021

Subject: Additional Information Request

Message:

TABLE 1

Launch Vehicle Frequency Pre-coordination, 2025-2110 MHz and 2200-2290 MHz

Required Data/Information	Response
Name of Agency	ABL Space Systems
Name of Payload and transmit authority (e.g., FCC or NTIA)	Payload(s): VARISAT-1 and VARISAT-2
Transmit Authority: FCC	
Name of Launch Vehicle	RS1
Launch Site (with coordinates)	N58° 25' 50.46418" (N 58.430684) W152° 21' 10.902918" (W 152.353028)
Launch Date/Time- Launch Window (Primary and Backup)	Primary: Dec. 15, 2021, 10:00am to 04:00pm Backup: Dec 16, 2021, 10:00am to 04:00pm
Orbital Location (Orbit Insertion)	See Table 1
Required Frequency(ies)	2220 MHz and 2280 MHz
Location of Transmitter on Launch Vehicle or Payload (e.g., first stage, second stage)	Second Stage
EIRP (Watts, or dBW, or milliWatts, or dBm) for Each Required Frequency	6.7 dBW
Transmitted Bandwidth for Each Required Frequency (state if the signal is filtered or not)	7.8 MHz
-3 dB Bandwidth for Each Required Frequency (if the signal is filtered, state whether this is the bandwidth before or after filtering)	3.9 MHz
-20 dB Bandwidth for Each Required Frequency (if the signal is filtered, state whether this is the bandwidth before or after filtering)	9.2 MHz
-60 dB Bandwidth for Each Required Frequency (if the signal is filtered, state whether this is the bandwidth before or after filtering)	14.1 MHz
Nature of Modulating Signal(s) (modulation type i.e. BPSK, QPSK, APK, FSK, Analog, etc.; if it is a digital signal, state the final symbol rate in symbols/second after all overhead encoding or the final bit rate in bits/second after all overhead encoding; if FSK, also include the type of FSK and the peak-to-peak frequency deviation as well as the final symbol rate or final bit rate; if the signal has subcarriers, say so and which ones are used)	SOQPSK-TG 10 Mbps
Duration of Transmission(s), to Include On/Off Time (nominal and maximum durations) and receiving stations corresponding to the on/off times	Duration of flight
Transmit Antenna Type, Gain, Beamwidth	Patch Antenna, RHCP, 130°; 3 dB beam width
Coordinates of Receiving Ground Station(s)	N 57° 27' 18.925" (N 57.455257) W 152° 22' 24.172" (W 152.373381)
Ground Receiver Sensitivity and Selectivity, Antenna Type, Gain, Beamwidth	Sensitivity: 17 dB/K Selectivity: ≥60 dBc
Antenna Type: 5.4M parabolic dish	
Gain: 38 dB at 2.25 GHz	
Beamwidth: 1.6°; 3dB beam width	
Ground Track from Lift-Off until Payload Separation	See Figure 1
See Table 2	
ECF Cartesian Vectors Format (position and velocity vs. time or position, velocity, and acceleration vs. time) in one minute time steps (at least) for Each Phase of Launch Through the End of Transmission (there should be vectors for each time step, from the beginning of the launch out to the maximum duration, not just out to the nominal duration) (Table 3)	See Table 3
A picture of the 2 dimensional ground track of the launch vehicle	See Figure 2

Primary and Alternate POC for Questions (Include Name, Email and Commercial Phone)

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TABLE 1

Orbital Location (Orbit Insertion)

Event	SECO 1	SECO2
Semi-Major Axis (km)	6653.2	6727.9
Eccentricity	0.011733	0.000059
Inclination (°)	86.967	86.981
Long. of Ascending Node (Vernal Equinox) (°)	33.648	33.627
Argument of Perigee (°)	103.4	0
True Anomaly (°)	16.225	-
Argument of Latitude (°)	135.34	334.56

TABLE 2

Sequence of Events

Event	Time (sec)	GeodeticLatitude (°)	GeodeticLongitude (°)	Altitude (m)
Liftoff	0	57.43068449	207.6469716	50.8656336
MECO	155.7639523	56.84411612	207.7200543	64366.29975
Stage Sep	159.2639523	56.78455616	207.7273074	68605.14288
S2 Startup 1	159.2639523	56.78455616	207.7273074	68605.14288
Fairing Sep	199.2639523	56.06237553	207.8093044	112239.3312
SECO1	511.5902173	44.89332812	208.5158663	210605.1873
Payload Dep	661.5902173	34.68408115	208.8065773	211965.1766
S2 Startup 2	3051.990217	-56.12020822	16.39833473	376037.7966
SECO2	3052.890217	-56.06196733	16.40443854	376017.5542

TABLE 3

Trajectory File Format

Time_sec	x (km)	y (km)	z (km)	x dot (km/s)	y dot (km/s)	z dot (km/s)
0	-3048.733722	-1597.023316	5351.913857	0	0	0
60	-3051.286549	-1598.383492	5355.447728	-0.134521598	-0.073784767	0.144278106
120	-3077.419835	-1613.553609	5366.909891	-0.895825468	-0.530207792	0.177387734
180	-3173.799659	-1671.222617	5367.389584	-1.977676966	-1.186324027	-0.223457653
240	-3296.84931	-1745.072509	5337.452919	-2.136089201	-1.282582761	-0.786603813
300	-3431.552621	-1825.963773	5271.589203	-2.367450973	-1.421654574	-1.423118005
360	-3582.884477	-1916.814317	5164.497536	-2.69680503	-1.618469234	-2.169841717
420	-3758.278789	-2022.037917	5007.463119	-3.184338796	-1.909851507	-3.1071564
480	-3971.202789	-2149.761269	4783.954827	-3.993340639	-2.396703241	-4.443088185
540	-4240.102675	-2311.139851	4467.911664	-4.572844753	-2.73327349	-5.710935715
600	-4504.324564	-2468.0422	4114.279756	-4.230548222	-2.495132125	-6.071818748
660	-4747.305601	-2610.369601	3739.908673	-3.865113339	-2.247686747	-6.401944609
720	-4967.712304	-2737.608233	3346.695526	-3.478389709	-1.99242343	-6.699620483
780	-5164.326069	-2849.334304	2936.633514	-3.072355067	-1.730855219	-6.963337896
840	-5336.050485	-2945.215348	2511.800576	-2.649102475	-1.464511609	-7.191782189
900	-5481.917841	-3025.010899	2074.347512	-2.210826539	-1.194927935	-7.383840407
960	-5601.094786	-3088.57252	1626.485691	-1.759808797	-0.923634774	-7.538607523

1020	-5692.887087	-3135.843206	1170.474427	-1.29840243	-0.652147497	-7.655390927
1080	-5756.743459	-3166.85616	708.6081479	-0.829016483	-0.381956053	-7.733713129
1140	-5792.258434	-3181.732973	243.2034491	-0.354099755	-0.114515124	-7.773312644
1200	-5799.174256	-3180.681222	-223.4138454	0.12387543	0.14876526	-7.774143056
1260	-5777.381813	-3163.991525	-688.921515	0.602429367	0.406528529	-7.736370284
1320	-5726.920597	-3132.034086	-1151.013557	1.079090823	0.657479699	-7.660368117
1380	-5647.977738	-3085.254774	-1607.412483	1.551412381	0.900392724	-7.546712123
1440	-5540.886123	-3024.170788	-2055.881207	2.016985094	1.134117002	-7.396172092
1500	-5406.12168	-2949.365957	-2494.234439	2.473452279	1.357582976	-7.209703189
1560	-5244.299844	-2861.485734	-2920.349515	2.918522335	1.569806797	-6.988436031
1620	-5056.171297	-2761.231934	-3332.176601	3.349980494	1.769894062	-6.733665911
1680	-4842.617033	-2649.357284	-3727.748241	3.765699471	1.957042622	-6.446841359
1740	-4604.64282	-2526.659817	-4105.188187	4.163648986	2.130544516	-6.129552255
1800	-4343.373117	-2393.977192	-4462.719524	4.541904177	2.289787065	-5.783517659
1860	-4060.044527	-2252.180961	-4798.672045	4.898652919	2.434253194	-5.41057352
1920	-3755.998841	-2102.170838	-5111.488904	5.232202103	2.563521032	-5.01266039
1980	-3432.675728	-1944.869019	-5399.732519	5.540982913	2.677262852	-4.59181128
2040	-3091.60515	-1781.214581	-5662.089764	5.823555159	2.775243435	-4.150139762
2100	-2734.399532	-1612.157988	-5897.376455	6.078610747	2.857317899	-3.68982841
2160	-2362.745752	-1438.655755	-6104.541153	6.304976357	2.923429087	-3.213117658
2220	-1978.396992	-1261.665266	-6282.668314	6.501615426	2.973604568	-2.722295137
2280	-1583.164493	-1082.139793	-6430.98081	6.66762953	3.007953331	-2.219685534
2340	-1178.909229	-901.023713	-6548.841866	6.802259263	3.026662236	-1.707640968
2400	-767.5335603	-719.2479489	-6635.756429	6.904884705	3.029992279	-1.188531894
2460	-350.9728497	-537.7256357	-6691.372006	6.975025566	3.018274733	-0.6647385
2520	68.81290779	-357.3480222	-6715.479002	7.012341085	2.991907207	-0.138642551
2580	489.8474504	-178.9806103	-6708.010582	7.016629731	2.951349656	0.387380382
2640	910.146591	-3.459534271	-6669.04207	6.987828766	2.897120378	0.910968352
2700	1327.726528	168.4118197	-6598.78992	6.92601369	2.829792015	1.429780212
2760	1740.612122	335.8659549	-6497.610257	6.831397599	2.749987571	1.941502604
2820	2146.845128	498.1741664	-6365.996999	6.704330433	2.658376453	2.443856814
2880	2544.492381	654.6492076	-6204.57958	6.545298129	2.55567054	2.934605576
2940	2931.65393	804.6477208	-6014.120256	6.354921639	2.442620263	3.411559877
3000	3306.471102	947.5724331	-5795.511004	6.133955771	2.320010712	3.872585804
3060	3667.436282	1082.989333	-5549.552	5.923221844	2.203878182	4.344454212
3120	4014.591317	1211.070373	-5276.091321	5.64389798	2.064234564	4.767374558

FIGURE 1
Ground Track from Lift-Off until Payload Separation

FIGURE 2
A picture of the 2 dimensional ground track of the launch vehicle

* Figures emailed separately