I. APPLICATION NARRATIVE

Sierra Space is leading an effort to create a low-cost commercial space system to support the transport of cargo to and from low-Earth orbit (LEO), including the International Space Station (ISS). This effort is focused on the development of the Dream Chaser Cargo System (DCCS) and is part of the Dream Chaser® (DC) Program. The uncrewed spaceplane is part of NASA's commercial resupply services. The primary DCCS mission is to provide the National Aeronautics and Space Administration (NASA) with a commercial system to safely transport cargo and payloads to and from ISS.

The present application pertains to the planned electromagnetic compatibility (EMC) and electromagnetic interference (EMI) compliance testing of Sierra Space 's DCCS spacecraft (uncrewed cargo spaceplane). This testing is to be conducted in partnership with NASA and NTS Technical Systems. It will be conducted approximately 60 days prior to launch most likely by NTS Technical Systems (a NIST designated, US Conformity Assessment Body for EMC) in the High-Bay of the Space Station Processing Facility (SSPF) at the Kennedy Space Center (an NTIA authorized testing facility in Florida).

Sierra Space requests a Special Temporary Authority (STA) that will enable its DCCS spacecraft EMC and EMI testing, pursuant to Sections 5.54 (a)(2) and 5.61 of the FCC rules. Sierra Space is requesting a 180-day STA for EMC and EMI testing to occur somewhere between March 24th, 2024, and September 20th, 2024.

II. ANNEX

A. Testing overview

The Equipment under Test (EUT) is the DCCS spacecraft, which will support the transport of cargo to and from the ISS in conjunction with the National Aeronautical and Space Agency (NASA). Its planned operations will be the subject of a separate Special Temporary Authority request under Sections 5.54 (a)(2) and 5.61 of the FCC rules.

The proposed testing of the DCCS spacecraft[1] is being conducted to fulfill requirements, which stipulate among other things that electrical and electronic subsystems, equipment, and systems will meet MIL-STD-461F for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment.[2]

Sierra Space expects that the testing will be conducted by NTS Technical Systems, 1536 East Valencia Dr. Fullerton, CA 92831.

The proposed EMC and EMI testing will be conducted at the SSPF High-Bay.

A Radiated Susceptibility test will verify that the DCCS is compatible with the ISS Radio Frequency (RF) environment.

The proposed operations are being cleared with potentially affected parties, such as NASA, KSC, Space Force, FAA, AFTRCC.

[1] Tests are to be performed for DCCS components, subsystems, and the vehicle.
[2] The full list of requirements includes MIL-STD-461, MIL-STD-464, SSP30243, SSP30237, SSP50808, SSP50833, SSP52000-IDD-ERP, and SSP57000

Sierra space's point-of-contact information to permit the prompt delivery at all times of notices of harmful interference is provided below:

Mr Ronak Shah, Test Engineer (Director of Testing), Ronak.Shah@sierraspace.com, 303-542-7828

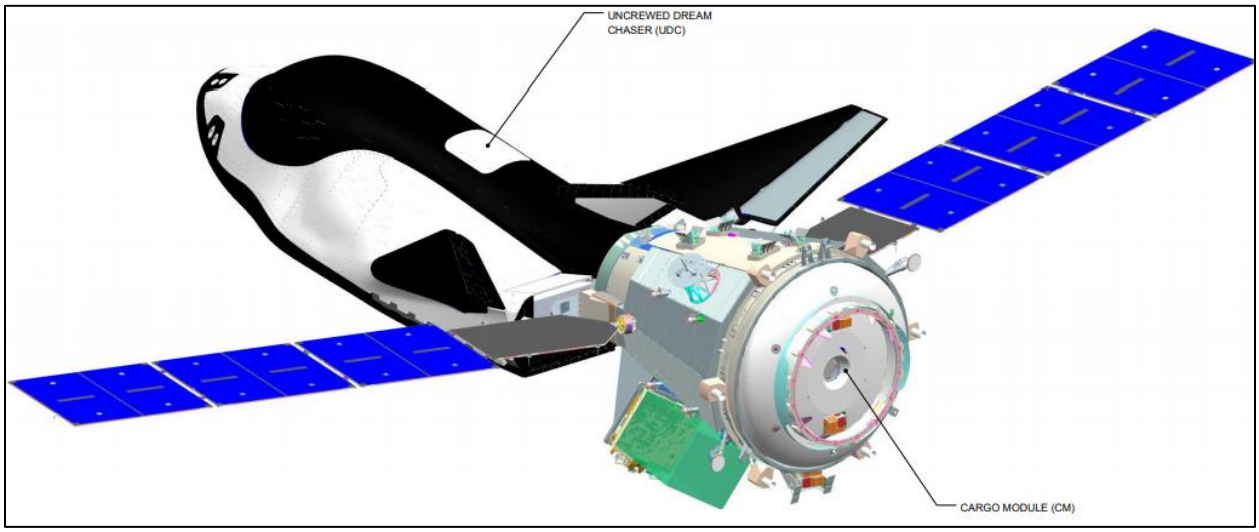
Mr John Carter, Electrical Engineer III, john.carter@sierraspace.com, 720-572-3007

Mr. John Tate, Engineering Manager, john.tate@sierraspace.com, 720-572-3339

These are the initial points of contact for all matters involving interference resolution and they have authority to discontinue any and all experiments being conducted under an STA grant, if necessary.

B. Description of the DCCS spacecraft / Equipment Under Test (EUT)

The DCCS spacecraft is composed of two modules: the Unmanned Dream Chaser (UDC) and the Cargo Module (CM). See Figure below.



C. Antenna structures and patterns

The DCCS spacecraft operations subject to testing involve six S-Band MDA antennas, two on the CM pointing aft and the other four above, below, and to the sides of the UDC vehicle. Each antenna has a left- hand circular polarization RF port for TDRS communications and a right-hand circular polarization port for C2V2 communications. See Figure C-1 below.

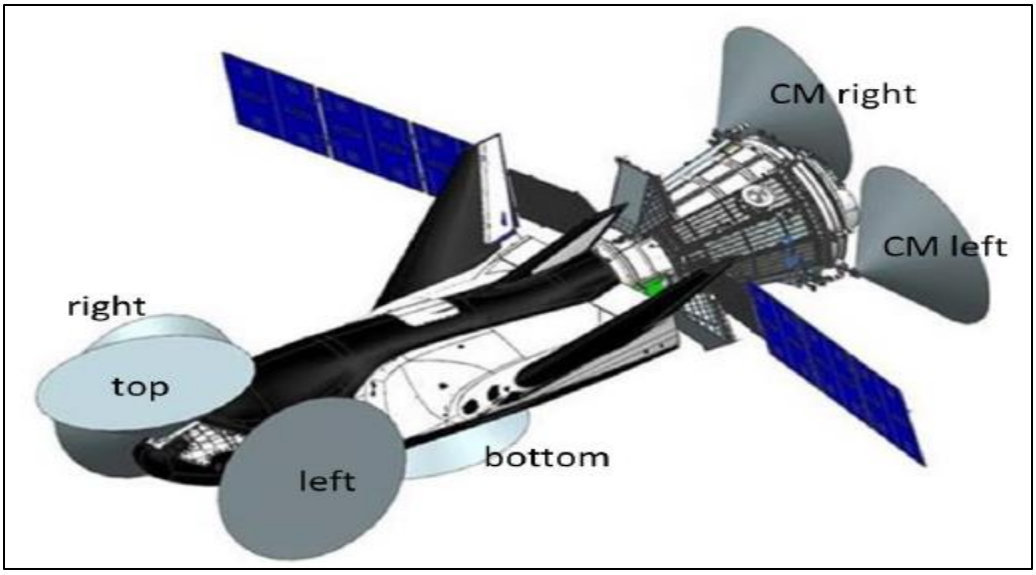


Figure C-1. S-Band Antennas

D. Manufacturer Information (sample equipment list)

Component	Manufacturer	Model Number	No. Of Units	Experimental (Yes/No)
Solid State CW Amplifier (200W) (200-1000 MHz)	ADVANCED AMPLIFIERS	AA-100M1G-200	1	No
TWT CW Research Amplifier (500W) (1 GHz to 2.5GHz)	Rf/microwave instrumentation (Maxim Instruments Corporation)	500T1G2	1	No
Solid State CW Advanced Amplifier (400-500W) (2GHz to 8 GHz)	ADVANCED AMPLIFIERS	AA-28G-400	1	No
High Power CW IFI Amplifier (500W) 7.5GHz to 18 GHz	AXIOM/ IFI	T188-500	2	No
Antenna (200MHz to 1000 MHz)	COM-POWER Corporation	AH-220	1	No
Solid State CW (18-26.5 GHz)	ADVANCED AMPLIFIERS	AA-1826G-40	1	No
Solid State CW (26-40 GHz)	ADVANCED AMPLIFIERS	AA-2640G-40	1	No
Antenna	A.H. Systems, Inc.	SAS-587	1	No
Antenna	A.H. Systems, Inc.	SAS-588	1	No
Antenna	A.H. Systems, Inc.	AHSY-SAS-573	1	No
Antenna	A.H. Systems, Inc.	AHSY-SAS-550-1B	1	No
Antenna	A.H. Systems, Inc.	AHSY-SAS-542-1B	1	No
Antenna	COM-POWER Corporation	AHA-118	2	No
Antenna	COM-POWER Corporation	AH-118	1	No
Antenna	Advanced Antennas	AA-LPD-100M1G	1	No
Antenna	A.H. Systems, Inc.	SAS-571	2	No
Antenna	A.H. Systems, Inc.	SAS-572	1	No
Antenna	A.H. Systems, Inc.	SAS-573	1	No

E. Station Location

All testing will be conducted within a chamber in the SSPF High-Bay. Details of the location of this facility are provided below.

City	State	Latitude (N)	Longitude (W)	Mobile	County	Radius of Operation
Merritt Island	Florida	28°31'24.4"	80°38'33.0"	N/A	Brevard	High-Bay (SSPF) at KSC

F. Frequency and Antenna Information

Frequency information is as provided in the application and reflected in Tables F-1 and F-2 below. Also provided are sample power levels which will be radiated into the chamber to achieve the target radiated field levels, per the requirements of MIL-STD-461F, taking into consideration the antenna gain and the distance between the transmitting unit and the DCCS Equipment Under Test (EUT). Table F-2 also includes additional information concerning some of the directional antennae Sierra Space expects will be rented and used for the testing.

Table F-1. Frequencies of Operation (See also Section G for notched out frequencies)

Frequency (MHz)	RS103 E-field (V/m)	Transmission Distance (m)	TX Gain (dB)	RS103 TX Power (W)
100-200	30	2	6	47.7
200-1784	60	2	6	60.3
	60	2	8	38.0
1785-2379	200	2	5	843.3
	200	2	6	843.3
2380-3999	60	2	6	60.3
	60	2	8	38
4000-10000	100	2	8	105.7
	100	2	12	33.4
10000-13700	20	2	12	1.3
13700-15200	250	2	12	208.8
	250	2	12	208.8
25250-27500	200	2	17.1	52.0
	200	2	17.1	52.0

Table F-2. Additional Frequencies of Operation (See also Section G for notched out frequencies)

Frequency (GHz)	Amplifier M/N	Com Power Antennas M/N	Beamwidth (deg)	Beamwidth (cm)	Gain (dBi)	Distance (m)
0.1	Advanced Amplifiers AA-100M1G-200 Solid State CW 100 MHz - 1000 MHz	ALC-100	75	153.47	5.00	2.00
0.2		ALC-100	75	153.47	5.00	2.00
1.75	Amplifier Research 500T1G2 TWT CW 1 GHz - 2.5 GHz	AH-118	63	122.56	8.00	2.00
1.785		AH-118	63	122.56	8.00	2.00
1.785		AH-118	63	122.56	8.00	2.00

Table F-2 (continued). Additional Frequencies of Operations (See also Section G for notched out frequencies)

Frequency (GHz)	Amplifier M/N	Com Power Antennas M/N	Beamwidth (deg)	Beamwidth (cm)	Gain (dBi)	Distance (m)
2.38	Advanced Amplifiers AA-28G-400 Solid State CW 2 GHz - 8 GHz	AH-118	51	95.40	10.00	2.00
2.38		AH-118	51	95.40	10.00	2.00
4		AH-118	53	99.72	12.00	2.00
4		AH-118	53	99.72	12.00	2.00
8		AH-118	40	72.79	12.00	2.00

Table F-2 (continued). Additional Frequencies of Operations (See also Section G for notched out frequencies)

Frequency (GHz)	Amplifier M/N	Com Power Antennas M/N	Beamwidth (deg)	Beamwidth (cm)	Gain (dBi)	Distance (m)
8	IFI T188-500 High Power CW 7.5 GHz - 18 GHz	AH-118	40	72.79	12.00	2.00
8.5		AH-118	48	89.05	12.00	2.00
8.5		AH-118	48	89.05	12.00	2.00
10		AH-118	45	82.84	12.00	2.00
10		AH-118	45	82.84	12.00	2.00
13.7		AH-118	26	46.17	12.00	2.00
13.7		AH-118	26	46.17	12.00	2.00
15.2		AH-118	17	29.89	15.00	2.00

Table F-2 (continued). Additional Frequencies of Operations

Frequency (GHz)	Amplifier M/N	Com Power Antennas M/N	Beamwidth (deg)	Beamwidth (cm)	Gain at 1m (dBi)	Distance (m)	Estimated forward power (at antenna) to Hit Test Level (W)
25.2	Advanced Amplifiers AA-1826G-40 Solid State CW 18 - 26.5 GHz	SAS-587-10	30	53.59	23.00	2.00	26.73
27.2	Advanced Amplifiers AA-2640G-40 Solid State CW 26 GHz - 40 GHz	AHSY-SAS-573	17	29.89	23.00	2.00	26.73

G. Interference Considerations and Frequency Coordination

The following frequencies will be notched out to reflect pre-coordination discussions with potentially affected entities (NASA, Space Force): 73-74.6 MHz, 121.5 MHz, 243 MHz, 400.15-420 MHz, 449.75-450.25 MHz, 608-614 MHz, 1222.1-1233.1 MHz, 1400-1427 MHz, 1567.748-1583.093 MHz, 1660.5-1668.4 MHz, 2025-2110 MHz, 2200-2300 MHz, 2360-2380 MHz, 2400-2500 MHz, 2690-2700 MHz, 4990-5000 MHz, 5700-5900 MHz, 8025-8500 MHz, 9410 MHz, 10.60-10.7 GHz, 13.75-13.8, 15.35-15.4 GHz, 18.6-18.8 GHz, 23.6-24 GHz .

Further coordination is underway which may lead to additional frequencies being removed to avoid interference to terrestrial systems. Additional coordination is also being set up with FAA and AFTRCC.

H. Testing Objectives and Approach

Detailed information regarding the DCCS EMI EMC Test Plan exists in document SSGD142731. The test will verify that the DCCS is compatible with the ISS RF environment.

Figure H-1 below shows the test configuration.

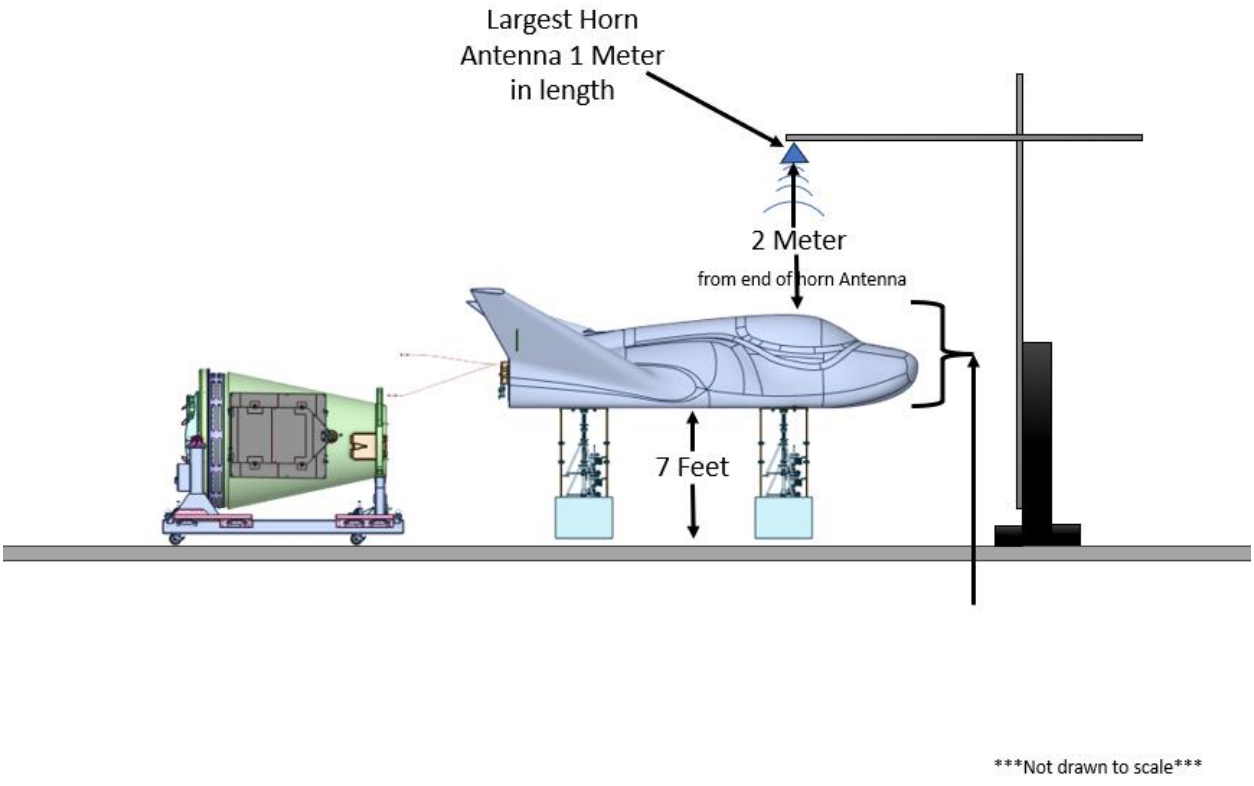


Figure H-1 - UDC and CM in a configuration inside the Reverberant chamber