FCC 312 Schedule S	FEDERAL COMMUNICATIONS COMMISSION SATELLITE SPACE STATION AUTHORIZATIONS (Technical and Operational Description)	Page 1: General, Frequency Bands, and GSO Orbit

S1. GENERAL INFORMATION Complete for all satellite applications.

a. Space Station or Satellite Network Name: ECHO-45W		e. Estimated Date of Placement into Service:	i Will the space station(s) operate on a Common Carrier Basis: N
b. Construction Commencement Date:		f. Estimated Lifetime of Satellite(s): 15 Years	j. Number of transponders offered on a common carrier basis:
c. Construction Completion Date:		g. Total Number of Transponders: 16	k. Total Common Carrier Transponder Bandwidth: MHz
d1. Est Launch Date Begin:	d2. Est Launch Date End:	h. Total Transponder Bandwidth (no. transponders x Bandwidth) 1840 MHz	l. Orbit Type: Mark all boxes that apply: [X] GSO [ ] NGSO

S2. OPERATING FREQUENCY BANDS Identify the frequency range and transmit/receive mode for all frequency bands in which this station will oper
Also indicate the nature of service(s) for each frequency band.

Frequency Band Limits				e. T/R Mode	f. Nature of Service(s): List all that apply to this band
Lower Frequency (_Hz)		Upper Frequency (_Hz)			
a. Numeric	b. Unit (K/M/G)	c. Numeric	d. Unit (K/M/G)		
12750	M	13250	M	R	Fixed Satellite Service
10700	M	10950	M	T	Fixed Satellite Service
11200	M	11450	M	T	Fixed Satellite Service
10700	M	10950	M	T	Direct to Home in the Fixed Fixed Satellite Service
11200	M	11450	M	T	Direct to Home in the Fixed Fixed Satellite Service

S3. ORBITAL INFORMATION FOR GEOSTATIONARY SATELLITES ONLY:

a. Nominal Orbital Longitude (Degrees E/W): 45.1 W	b. Alternate Orbital Longitude (Degrees E/W):		c. Reason for orbital location selection: The Appendix 30B Ku-band frequencies requested in this application are not in use at the nominal 45 W.L. orbital location.
Longitudinal Tolerance or E/W Station-Keeping: d. Toward West: 0.05 Degrees e. Toward East: 0.05 Degrees	f. Inclination Excursion or N/S Station-Keeping Tolerance: 0.05 Degrees	Range of orbital are in which adequate service can be provided (Optional): Degrees E/W g. Westernmost: h. Easternmost:	
i. Reason for service are selection (Optional):			

FEDERAL COMMUNICATIONS COMMISSION
SATELLITE SPACE STATION AUTHORIZATIONS
FCC Form 312 - Schedule S: (Technical and Operational Description)

S4. ORBITAL INFORMATION FOR NON-GEOSTATIONARY SATELLITES ONLY

S4a. Total Number of Satellites in Network or System:

S4b. Total Number of Orbital Planes in Network or System:

S4c. Celestial Reference Body (Earth, Sun, Moon, etc.):

S4d. Orbit Epoch Date:

For each Orbital Plane Provide:

(e) Orbital Plane No.	(f) No. of Satellites in Plane	(g) Inclination Angle (degrees)	(h) Orbital Period (Seconds)	(i) Apogee (km)	(j) Perigee (km)	(k) Right Ascension of the Ascending Node (Deg.)	(l) Argument of Perigee (Degrees)	Active Service Arc Range (Degrees)		
								(m) Begin Angle	(n) End Angle	(o) Other

S5. INITIAL SATELLITE PHASE ANGLE For each satellite in each orbital plane, provide the intital phase angle.

(a) Orbital Plane No.	(b) Satellite Number	(c) Initial Phase Angle (Degrees)

NO NGSO DATA FILED

FEDERAL COMMUNICATIONS COMMISSION
SATELLITE SPACE STATION AUTHORIZATIONS
FCC Form 312 - Schedule S: (Technical and Operational Description)

S6. SERVICE AREA CHARACTERISTICS for each service area provide:

(a) Service Area ID	(b) Type of Associated Station (Earth or Space)	(c) Service Area Diagram File Name (GXT File)	(d) Service Area Description. Provide list of geographic areas (state postal codes or ITU 3-ltr codes), satellites or Figure No. of Service Area Diagram.
SA1	S		-6 dB contour of beams NAUR and NAUL
SA2	S		-6 dB contour of beams SAUR and SAUL
SA3	S		-6 dB contour of beams NADR and NADL
SA4	S		-6 dB contour of beams SADR and SADL
SA5	S		Visible Earth

FEDERAL COMMUNICATIONS COMMISSION
SATELLITE SPACE STATION AUTHORIZATIONS
FCC Form 312 - Schedule S: (Technical and Operational Description)

S7. SPACE STATION ANTENNA BEAM CHARACTERISTICS For each antenna beam provide:

(a) Beam ID	(b) T/R Mode	Isotropic Antenna Gain		(e) Pointing Error (Degrees)	(f) Rotational Error (Degrees)	(g) Min. Cross-Polar Iso-lation (dB)	(h) Polar-ization Switch-able? (Y/N)	(i) Polarization Alignment Rel. Equatorial Plane (Degrees)	(j) Service Area ID	Transmit			Receive				
		(c) Peak (dBi)	(d) Edge (dBi)							(k) Input Losses (dB)	(l) Effective Output Power (W)	(m) Max. EIRP (dBW)	(n) System Noice Temp (k)	(o) G/T Max. Gain Pt. (db/K)	(p) Min. Saturation Flux Density (dBW/m2)	Input Attenuator (dB)	
																(q) Max. Value	(r) Step Size
NAU	R	35.9	29.9	0.12		30	N		SA1				575	8.3	-95	20	0.5
NAUL	R	35.9	29.9	0.12		30	N		SA1				575	8.3	-95	20	0.5
SAU	R	33	27	0.12		30	N		SA2				625	5	-95	20	0.5
SAUL	R	33	27	0.12		30	N		SA2				625	5	-95	20	0.5
NAD	T	35.9	29.9	0.12		30	N		SA3	1.4	109.7	56.3					
NADL	T	35.9	29.9	0.12		30	N		SA3	1.4	109.7	56.3					
SAD	T	33	27	0.12		30	N		SA4	1.7	257	56.1					
SADL	T	33	27	0.12		30	N		SA4	1.7	257	56.1					
GBL	R	19.7	16.7	0.12		30	N		SA5				5650	-17.8			
GBL	T	19.7	16.7	0.12		30	N		SA5	7.8	1.35	21					
OMN	R	3	-8	0.12		30	N	0	SA5				5500	-34.4			
OMN	T	3	-8	0.12		30	N	0	SA5	4	25.1	17					

FEDERAL COMMUNICATIONS COMMISSION
SATELLITE SPACE STATION AUTHORIZATIONS
FCC Form 312 - Schedule S: (Technical and Operational Description)

S8. ANTENNA BEAM DIAGRAMS For each beam pattern provide the reference to the graphic image and numerical data:
Also provide the power flux density levels in each beam that result from the emission with the highest power flux density.

(a) Beam ID	(b) T/R Mode	(c) Co-or Cross Polar Mode ("C" or" X")	(d) GSO Ref. Orbital Longitude (Deg. E/W)	(e) NGSO Antenna Gain Contour Description (Figure/Table/ Exhibit)	(f) GSO Antenna Gain Contour Data (GXT File)	Max. Power Flux Density (dBW/M2/Hz) At Angle of Arrival above horizontal (for emission with highest PFD)				
						(g) 5 Deg	(h) 10 Deg	(i) 15 Deg	(j) 20 Deg	(k) 25 Deg
NAU	R	C	-45.1		NAUR.gxt					
NAUL	R	C	-45.1		NAUL.gxt					
SAU	R	C	-45.1		SAUR.gxt					
SAUL	R	C	-45.1		SAUL.gxt					
NAD	T	C	-45.1		NADR.gxt	-150.4	-149.2	-148.1	-147.7	-147.6
NADL	T	C	-45.1		NADL.gxt	-150.4	-149.2	-148.1	-147.7	-147.6
SAD	T	C	-45.1		SADR.gxt	-166.8	-166.6	-166.5	-162.4	-156.3
SADL	T	C	-45.1		SADL.gxt	-166.8	-166.6	-166.5	-162.4	-156.3
GBL	R	C	-45.1		GBLUR.gxt					
GBL	T	C	-45.1		GBLDR.gxt	-159	-158.9	-156.8	-156.7	-156.6
OMN	T	C	-45.1			-159.8	-159.8	-159.8	-159.8	-159.8

FEDERAL COMMUNICATIONS COMMISSION
SATELLITE SPACE STATION AUTHORIZATIONS
FCC Form 312 - Schedule S: (Technical and Operational Description)

S9. SPACE STATION CHANNELS For each frequency channel provide:

(a) Channel No.	(B) Assigned Bandwidth (kHz)	(c) T/R Mode	(d) Center Frequency (MHz)	(e) Polarization (H, V, L, R)	(f) TTC or Comm Channel (T or C)
CU001	115000	R	12812.5	R	C
CU002	115000	R	12937.5	R	C
CU003	115000	R	13062.5	R	C
CU004	115000	R	13187.5	R	C
CU005	115000	R	12812.5	L	C
CU006	115000	R	12937.5	L	C
CU007	115000	R	13062.5	L	C
CU008	115000	R	13187.5	L	C
CD001	115000	T	10762.5	L	C
CD002	115000	T	10887.5	L	C
CD003	115000	T	11262.5	L	C
CD004	115000	T	11387.5	L	C
CD005	115000	T	10762.5	R	C
CD006	115000	T	10887.5	R	C
CD007	115000	T	11262.5	R	C
CD008	115000	T	11387.5	R	C
CMD1	1000	R	13248	R	T
CMD2	1000	R	13249	R	T
CMD3	1000	R	13248	H	T
CMD4	1000	R	13249	H	T
TLM1	300	T	11448	R	T
TLM2	300	T	11449	R	T
TLM3	300	T	11448	H	T
TLM4	300	T	11449	H	T

S10. SPACE STATION TRANSPONDERS For each transponder provide:

(a) Transponder ID	(b) Transponder Gain (dB)	Receive Band		Transmit Band	
		(c) Channel No.	(d) Beam ID	(e) Channel No.	(f) Beam ID
T0001	123	CU001	NAUR	CD001	NADL
T0002	123	CU002	NAUR	CD002	NADL
T0003	123	CU003	NAUR	CD003	NADL
T0004	123	CU004	NAUR	CD004	NADL
T0005	123	CU005	NAUL	CD005	NADR
T0006	123	CU006	NAUL	CD006	NADR
T0007	123	CU007	NAUL	CD007	NADR
T0008	123	CU008	NAUL	CD008	NADR
T0009	126	CU001	SAUR	CD001	NADL
T0010	126	CU002	SAUR	CD002	NADL
T0011	126	CU003	SAUR	CD003	NADL
T0012	126	CU004	SAUR	CD004	NADL
T0013	126	CU005	SAUL	CD005	NADR
T0014	126	CU006	SAUL	CD006	NADR
T0015	126	CU007	SAUL	CD007	NADR
T0016	126	CU008	SAUL	CD008	NADR
T0017	129	CU001	SAUR	CD001	SADL
T0018	129	CU002	SAUR	CD002	SADL
T0019	129	CU003	SAUR	CD003	SADL
T0020	129	CU004	SAUR	CD004	SADL
T0021	129	CU005	SAUL	CD005	SADR
T0022	129	CU006	SAUL	CD006	SADR
T0023	129	CU007	SAUL	CD007	SADR
T0024	129	CU008	SAUL	CD008	SADR
T0025	126	CU001	NAUR	CD001	SADL
T0026	126	CU002	NAUR	CD002	SADL
T0027	126	CU003	NAUR	CD003	SADL
T0028	126	CU004	NAUR	CD004	SADL
T0029	126	CU005	NAUL	CD005	SADR
T0030	126	CU006	NAUL	CD006	SADR

T0031	126	CU007	NAUL	CD007	SADR
T0032	126	CU008	NAUL	CD008	SADR
CMD1		CMD1	GBLUR		
CMD2		CMD2	GBLUR		
CMD3		CMD3	OMNUH		
CMD4		CMD4	OMNUH		
TLM1				TLM1	GBLDR
TLM2				TLM2	GBLDR
TLM3				TLM3	OMNDH
TLM4				TLM4	OMNDH

FEDERAL COMMUNICATIONS COMMISSION
SATELLITE SPACE STATION AUTHORIZATIONS
FCC Form 312 - Schedule S: (Technical and Operational Description)

S11. DIGITAL MODULATION PARAMETERS For each digital emission provide:

(a) Digital Mod. ID	(b) Emission Designator	(c) Assigned Bandwidth (kHz)	(d) No. of Phases	(e)Uncoded Data Rate (kbps)	(f) FEC Error Correction Coding Rate	(g) CDMA Processing Gain (dB)	(h) Total C/N Performance Objective (dB)	(i) Single Entry C/I Objective (dB)
D1	48K6G7W	48.6	4	56	0.691		5.7	15.9
D2	1M34G7W	1340	4	1544	0.691		5.7	15.9
D3	6M33G7W	6330	4	8448	0.801		5.8	16
D4	36M0G7W	36000	4	41505	0.691		5.7	15.9
D5	36M0G7W	36000	8	76502	0.841		6.5	16.7
D6	72M0G7W	72000	8	153004	0.841		6.5	16.7

FEDERAL COMMUNICATIONS COMMISSION
SATELLITE SPACE STATION AUTHORIZATIONS
FCC Form 312 - Schedule S: (Technical and Operational Description)

S12. ANALOG MODULATION PARAMETERS For each analog emission provide:

(a) Analog Mod. ID	(b) Emission Designator	(c) Assigned Bandwidth (kHz)	(d) Signal Type	(e) Channels per Carrier	Multi-channel Telephony				(j) Video Standard NTSC, PAL, etc.	(k) Video Noise-Weighting (dB)	(l) Video and SCPC/FM Modulation Index	(m) SCPC/FM Compander, Preemphasis, and Noise Weighting (dB)	(n) Total C/N Performance Objective (dB)	(o) Single Entry C/I Objective (dB)
					(f) Ave. Companded Talker Level (dBm0)	(g) Bottom Baseband Freq. (MHz)	(h) Top Baseband Freq. (MHz)	(i) RMS Modulation Index						
A1	1M00F2D	1000		1									10	22.2
A2	300KG2D	300		1									9	21.2

FEDERAL COMMUNICATIONS COMMISSION **Page 9: Typical Emissions**

SATELLITE SPACE STATION AUTHORIZATIONS

FCC Form 312 - Schedule S: (Technical and Operational Description)

S13. TYPICAL EMISSIONS For each planned type of emission provide:

Associated Transponder ID Range		Modulation ID		(e) Carriers per Transponder	(f) Carrier Spacing (kHz)	(g)Noise Budget Reference (Table No.)	(h) Energy Dispersal Bandwidth (kHz)	Receive Band (Assoc. Transmit Stn)			Transmit Band (This Space Station)			
								(i)Assoc. Stn. Max. Antenna Gain (dBi)	Assoc. Station Transmit Power (dBW)		EIRP (dBW)		(n) Max. Power Flux Density (dBW/m2/Hz)	(o)Assoc. Stn Rec. G/T (dB/K)
(a) Start	(b) End	(c) Digital (Table S11)	(d) Analog (Table S12)						(j) Min.	(k) Max.	(l) Min.	(m) Max.		
T0017	T0024	D5		3	38333	SA-SA5.docx		53.8	23	29	42.3	48.3	-153.5	26.1
T0017	T0024	D6		1		SA-SA6.docx		53.8	26	32	50.1	56.1	-148.8	23.6
T0025	T0032	D1		1971	58.3	NA-SA1.docx		42.3	-5.7	0.3	14.1	20.1	-153	26.1
T0025	T0032	D2		71	1608	NA-SA2.docx		48.4	8.6	14.6	28.5	34.5	-153	26.1
T0025	T0032	D3		15	7666	NA-SA3.docx		52.1	9	15	35.3	41.3	-153	26.1
T0025	T0032	D4		1		NA-SA4.docx		53.8	23	29	50.1	56.1	-145.8	17.5
T0025	T0032	D5		3	38333	NA-SA5.docx		53.8	23	29	42.3	48.3	-153.5	26.1
T0025	T0032	D6		1		NA-SA6.docx		53.8	26	32	50.1	56.1	-148.8	23.6
CMD1	CMD2		A1	1		CMD_OS.docx		61.8	1	4				
CMD3	CMD4		A1	1		CMD_TE.docx		61.8	14	25				
TLM1	TLM2		A2	1		TLM_OS.docx					18	21	-155.8	37.8
TLM3	TLM4		A2	1		TLM_TE.docx					6	17	-159.8	37.8
T0001	T0008	D1		1971	58.3	NA-NA1.docx		42.3	-5.7	0.3	14.3	20.3	-153.1	26.1
T0001	T0008	D2		71	1608	NA-NA2.docx		48.4	8.6	14.6	28.7	34.7	-153.1	23.6
T0001	T0008	D3		15	7666	NA-NA3.docx		52.1	9	15	35.5	41.5	-153.1	26.1
T0001	T0008	D4		1		NA-NA4.docx		53.8	23	29	50.3	56.3	-145.9	17.5
T0001	T0008	D5		3	38333	NA-NA5.docx		53.8	23	29	42.5	48.5	-153.6	26.1
T0001	T0008	D6		1		NA-NA6.docx		53.8	26	32	50.3	56.3	-148.9	23.6
T0009	T0016	D1		492	58.3	SA-NA1.docx		48.4	-5.8	0.2	20.3	26.3	-147.1	20
T0009	T0016	D2		71	1608	SA-NA2.docx		48.4	8.6	14.6	28.7	34.7	-153.1	23.6
T0009	T0016	D3		15	7666	SA-NA3.docx		52.1	9	15	35.5	41.5	-153.1	26.1
T0009	T0016	D4		1		SA-NA4.docx		53.8	23	29	50.3	56.3	-145.9	17.5
T0009	T0016	D5		3	38333	SA-NA5.docx		53.8	23	29	42.5	48.5	-153.6	26.1
T0009	T0016	D6		1		SA-NA6.docx		53.8	26	32	50.3	50.6	-148.9	23.6
T0017	T0024	D1		492	58.3	SA-SA1.docx		48.4	-5.8	0.2	20.1	26.1	-147	20
T0017	T0024	D2		71	1608	SA-SA2.docx		48.4	8.6	14.6	28.5	34.5	-153	26.1
T0017	T0024	D3		15	7666	SA-SA3.docx		52.1	9	15	35.3	41.3	-153	26.1
T0017	T0024	D4		1		SA-SA4.docx		53.8	23	29	50.1	56.1	-145.8	17.5

S14. Is the space station(s) controlled and monitored remotely? If Yes, provide the location and telephone number of the TT and C control point(s): Yes

FEDERAL COMMUNICATIONS COMMISSION
SATELLITE SPACE STATION AUTHORIZATIONS
FCC Form 312 - Schedule S: (Technical and Operational Description)

Page 11: Characteristics and Certifications

S15. SPACECRAFT PHYSICAL CHARACTERISTICS:

S15a: Mass of spacecraft without fuel (kg): 1210	Spacecraft Dimensions (meters)	Probability of Survival to End of Life (0.0 - 1.0)
S15b. Mass of fuel and disposables at launch (kg): 1311		
S15c. Mass of spacecraft and fuel at launch (kg): 2521	S15f. Length (m): 25	S15i. Payload: 0.83
S15d. Mass of fuel, in orbit, at beginning of life (kg): 525	S15g. Width (m): 4.2	S15j. Bus: 0.86
S15e. Deployed Area of Solar Array (square meters): 33.3	S15h. Height (m): 3.3	S15k. Total: 0.71

S16. SPACECRAFT ELECTRICAL CHARACTERISTICS:

Spacecraft Subsystem	Electrical Power (Watts) At Beginning of Life		Electrical Power (Watts) At End of Life	
	At Equinox	At Solstice	At Equinox	At Solstice
Payload (Watts):	(a): 5760	(f): 5760	(k): 5760	(p): 5760
Bus (Watts):	(b): 1310	(g): 720	(l): 1310	(q): 720
Total (Watts):	(c): 7070	(h): 6480	(m) 7070	(r): 6480
Solar Array (Watts):	(d): 8134	(i): 7312	(n): 7711	(s): 6931
Depth of Battery Discharge (%):	(e) 76.5 %	(j) %	(o) 76.5 %	(t) %

S17. CERTIFICATIONS:

a. Are the power flux density limits of § 25.208 met?:	X	**YES**		**NO**		**N/A**
b. Are the appropriate service area coverage requirements of § 25.143(b)(ii) and (iii), or § 25.145(c)(1) and (2) met?		**YES**		**NO**	X	**N/A**
c. Are the frequency tolerances of § 25.202(e) and the out-of-band emission limits of § 25.202(f)(1), (2) and (3) met?	X	**YES**		**NO**		**N/A**

In addition to the information required in this Form, the space station applicant is required to provide all the information specified in Section 25.114 of the Commission's rules, 47 C.F.R § 25.114.