

FEDERAL COMMUNICATIONS COMMISSION
SATELLITE SPACE STATION AUTHORIZATIONS
(Technical and Operational Description)

S1. GENERAL INFORMATION Complete for all satellite applications.

a. Space Station or Satellite Network Name: ECHOSTAR EX-5		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): 12 Years	j. Number of transponders offered on a common carrier basis: 0
c. Construction Completion Date:		g. Total Number of Transponders: 32	k. Total Common Carrier Transponder Bandwidth: 0 MHz
d1. Est Launch Date Begin:	d2. Est Launch Date End:	h. Total Transponder Bandwidth (no. transponders x Bandwidth) 768 MHz	l. Orbit Type: Mark all boxes that apply: ☒ 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)		
24.75	G	25.25	G	R	Feeder Link for Broadcasting Satellite Service in FSS
17.3	G	17.8	G	T	Broadcasting Satellite Service - Video

S3. ORBITAL INFORMATION FOR GEOSTATIONARY SATELLITES ONLY:

a. Nominal Orbital Longitude (Degrees E/W): 62.15 W		b. Alternate Orbital Longitude (Degrees E/W):		c. Reason for orbital location selection: See section A.2 of Attachment A ("Technical Information to Supplement Schedule S").
Longitudinal Tolerance or E/W Station-Keeping:		f. Inclination Excursion or N/S Station-Keeping Tolerance: 0.05 Degrees	Range of orbital are in which adequate service can be provided (Optional): g. Westernmost: h. Easternmost:	
d. Toward West:	0.05 Degrees			
e. Toward East:	0.05 Degrees			
i. Reason for service are selection (Optional):				

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Page 2: NGSO Orbits

S4. ORBITAL INFORMATION FOR NON-GEOSTATIONARY SATELLITES ONLY

S4a. Total Number of Satellites in Network or System:

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

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

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)
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NO NGSO DATA FILED

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Page 3: Service Areas

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		Arizona + Wyoming
SA2	S		CONUS + Puerto Rico
SA3	S		ITU Region 2, excluding territories of the United States
SA4	S		Visible Earth

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Page 4: Antenna Beams

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 Noise 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
RXR	R	40.1	38.1	0.12	0.1	25	N		SA1				600	12.3	-98.1	20	0.5
RXL	R	40.1	38.1	0.12	0.1	25	N		SA1				600	12.3	-98.1	20	0.5
TX1R	T	37.8	29.8	0.12	0.1	25	N		SA2	2.3	178	60.3					
TX1L	T	37.8	29.8	0.12	0.1	25	N		SA2	2.3	178	60.3					
TX2R	T	36.4	30.4	0.12	0.1	25	N		SA3	2.3	178	58.9					
TX2L	T	36.4	30.4	0.12	0.1	25	N		SA3	2.3	178	58.9					
GBL	R	19.7	16.7	0.12	0.1	30	N	90	SA4				2400	-14.1			
GBL	T	19.7	16.7	0.12	0.1	30	N	90	SA4	5.7	5.4	27					
OMN	R	4	0	0.12	0.1	30	N	0	SA4				3162	-31			
OMN	T	4	0	0.12	0.1	30	N	90	SA4	3	8	13					

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Page 5: Beam Diagrams

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
RXR	R	C	-62.15		RXR.gxt					
RXL	R	C	-62.15		RXL.gxt					
TX1R	T	C	-62.15		TX1R.gxt	-123.5	-123.1	-122.3	-122.4	-122
TX1L	T	C	-62.15		TX1L.gxt	-123.5	-123.1	-122.3	-122.4	-122
TX2R	T	C	-62.15		TX2R.gxt	-117.6	-117.5	-117.3	-117.2	-117.1
TX2L	T	C	-62.15		TX2L.gxt	-117.6	-117.5	-117.3	-117.2	-117.1
GBL	R	C	-62.15		GBLU.gxt					
GBL	T	C	-62.15		GBLD.gxt					

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Page 6: Channels and Transponders

S9. SPACE STATION CHANNELS For each frequency channel provide: S10. SPACE STATION TRANSPONDERS For each transponder 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)
U0001	24000	R	24772	R	C
U0003	24000	R	24801.16	R	C
U0005	24000	R	24830.32	R	C
U0007	24000	R	24859.48	R	C
U0009	24000	R	24888.64	R	C
U0011	24000	R	24917.8	R	C
U0013	24000	R	24946.96	R	C
U0015	24000	R	24976.12	R	C
U0017	24000	R	25005.28	R	C
U0019	24000	R	25034.44	R	C
U0021	24000	R	25063.6	R	C
U0023	24000	R	25092.76	R	C
U0025	24000	R	25121.92	R	C
U0027	24000	R	25151.08	R	C
U0029	24000	R	25180.24	R	C
U0031	24000	R	25209.4	R	C
U0002	24000	R	24786.58	L	C
U0004	24000	R	24815.74	L	C
U0006	24000	R	24844.9	L	C
U0008	24000	R	24874.06	L	C
U0010	24000	R	24903.22	L	C
U0012	24000	R	24932.38	L	C
U0014	24000	R	24961.54	L	C
U0016	24000	R	24990.7	L	C
U0018	24000	R	25019.86	L	C
U0020	24000	R	25049.02	L	C
U0022	24000	R	25078.18	L	C
U0024	24000	R	25107.34	L	C
U0026	24000	R	25136.5	L	C
U0028	24000	R	25165.66	L	C

(a) Transponder ID	(b) Transponder Gain (dB)	Receive Band		Transmit Band	
		(c) Channel No.	(d) Beam ID	(e) Channel No.	(f) Beam ID
T0001	130	U0001	RXR	D0001	TX1R
T0003	130	U0003	RXR	D0003	TX1R
T0005	130	U0005	RXR	D0005	TX1R
T0007	130	U0007	RXR	D0007	TX1R
T0009	130	U0009	RXR	D0009	TX1R
T0011	130	U0011	RXR	D0011	TX1R
T0013	130	U0013	RXR	D0013	TX1R
T0015	130	U0015	RXR	D0015	TX1R
T0017	130	U0017	RXR	D0017	TX1R
T0019	130	U0019	RXR	D0019	TX1R
T0021	130	U0021	RXR	D0021	TX1R
T0023	130	U0023	RXR	D0023	TX1R
T0025	130	U0025	RXR	D0025	TX1R
T0002	130	U0002	RXL	D0002	TX1L
T0004	130	U0004	RXL	D0004	TX1L
T0006	130	U0006	RXL	D0006	TX1L
T0008	130	U0008	RXL	D0008	TX1L
T0010	130	U0010	RXL	D0010	TX1L
T0012	130	U0012	RXL	D0012	TX1L
T0014	130	U0014	RXL	D0014	TX1L
T0016	130	U0016	RXL	D0016	TX1L
T0018	130	U0018	RXL	D0018	TX1L
T0020	130	U0020	RXL	D0020	TX1L
T0022	130	U0022	RXL	D0022	TX1L
T0024	130	U0024	RXL	D0024	TX1L
T0026	130	U0026	RXL	D0026	TX1L
T0027	130	U0001	RXR	D0001	TX2R
T0029	130	U0003	RXR	D0003	TX2R
T0031	130	U0005	RXR	D0005	TX2R
T0033	130	U0007	RXR	D0007	TX2R

U0030	24000	R	25194.82	L	C
U0032	24000	R	25223.98	L	C
D0001	24000	T	17322	R	C
D0003	24000	T	17351.16	R	C
D0005	24000	T	17380.32	R	C
D0007	24000	T	17409.48	R	C
D0009	24000	T	17438.64	R	C
D0011	24000	T	17467.8	R	C
D0013	24000	T	17496.96	R	C
D0015	24000	T	17526.12	R	C
D0017	24000	T	17555.28	R	C
D0019	24000	T	17584.44	R	C
D0021	24000	T	17613.6	R	C
D0023	24000	T	17642.76	R	C
D0025	24000	T	17671.92	R	C
D0027	24000	T	17701.08	R	C
D0029	24000	T	17730.24	R	C
D0031	24000	T	17759.4	R	C
D0002	24000	T	17336.58	L	C
D0004	24000	T	17365.74	L	C
D0006	24000	T	17394.9	L	C
D0008	24000	T	17424.06	L	C
D0010	24000	T	17453.22	L	C
D0012	24000	T	17482.38	L	C
D0014	24000	T	17511.54	L	C
D0016	24000	T	17540.7	L	C
D0018	24000	T	17569.86	L	C
D0020	24000	T	17599.02	L	C
D0022	24000	T	17628.18	L	C
D0024	24000	T	17657.34	L	C
D0026	24000	T	17686.5	L	C
D0028	24000	T	17715.66	L	C
D0030	24000	T	17744.82	L	C
D0032	24000	T	17773.98	L	C
CMD1	1000	R	24753	V	T
CMD2	1000	R	25247	V	T
CMD3	1000	R	17309	H	T
CMD4	1000	R	17791	H	T
TLM1	1000	T	12203.5	V	T

T0035	130	U0009	RXR	D0009	TX2R
T0037	130	U0011	RXR	D0011	TX2R
T0039	130	U0013	RXR	D0013	TX2R
T0041	130	U0015	RXR	D0015	TX2R
T0043	130	U0017	RXR	D0017	TX2R
T0045	130	U0019	RXR	D0019	TX2R
T0047	130	U0021	RXR	D0021	TX2R
T0049	130	U0023	RXR	D0023	TX2R
T0051	130	U0025	RXR	D0025	TX2R
T0053	130	U0027	RXR	D0027	TX2R
T0055	130	U0029	RXR	D0029	TX2R
T0057	130	U0031	RXR	D0031	TX2R
T0028	130	U0002	RXL	D0002	TX2L
T0030	130	U0004	RXL	D0004	TX2L
T0032	130	U0006	RXL	D0006	TX2L
T0034	130	U0008	RXL	D0008	TX2L
T0036	130	U0010	RXL	D0010	TX2L
T0038	130	U0012	RXL	D0012	TX2L
T0040	130	U0014	RXL	D0014	TX2L
T0042	130	U0016	RXL	D0016	TX2L
T0044	130	U0018	RXL	D0018	TX2L
T0046	130	U0020	RXL	D0020	TX2L
T0048	130	U0022	RXL	D0022	TX2L
T0050	130	U0024	RXL	D0024	TX2L
T0052	130	U0026	RXL	D0026	TX2L
T0054	130	U0028	RXL	D0028	TX2L
T0056	130	U0030	RXL	D0030	TX2L
T0058	130	U0032	RXL	D0032	TX2L
TC1		CMD1	GBLU		
TC2		CMD2	GBLU		
TC3		CMD3	OMNUH		
TC4		CMD4	OMNUH		
TM1				TLM1	GBLD
TM2				TLM2	GBLD
TM3				TLM1	OMNDV
TM4				TLM2	OMNDV

TLM2	1000	T	12698	V	T
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Page 7: Digital Modulation

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	24M0G7W	24000	4	27647	0.721		4.8	17
D2	25M8G7W	25800	8	41200	0.641		7.5	19.7

Page 8: Analog Modulation

[illegible]

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Page 9: Typical Emissions

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)			
		(c) Digital (Table S11)	(d) Analog (Table S12)					(i) Assoc. Stn. Max. Antenna Gain (dBi)	Assoc. Station Transmit Power (dBW)		EIRP (dBW)		(n) Max. Power Flux Density (dBW/m ² /Hz)	(o) Assoc. Stn Rec. G/T (dB/K)
(a) Start	(b) End								(j) Min.	(k) Max.	(l) Min.	(m) Max.		
T0001	T0026	D1		1		LB1.doc		68.2	-3.3	16.7	52.3	60.3	-115.27	13.1
T0001	T0026	D2		1		LB2.doc		68.2	-3.3	16.7	52.3	60.3	-115.27	13.1
T0027	T0058	D1		1		LB3.doc		68.2	-3.3	16.7	52.9	58.9	-116.36	13.1
T0027	T0058	D2		1		LB4.doc		68.2	-3.3	16.7	52.9	58.9	-116.36	13.1
TC1	TC2		A1	1		CMD GBL.doc		65.7	1.8	16.8				
TC3	TC4		A1	1		CMD OMNI.doc		66	12.1	31				
TM1	TM2		A2	1		TLM GBL.doc					24	27		36.7
TM3	TM4		A2	1		TLM OMNI.doc					9	13		41.2

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Page 10: TT and C

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

Remote Control (TT C) Location(s):

S14a. Street Address: 530 Echostar Drive			
S14b. City: Cheyenne	S14c. County: Laramie	S14d. State/Country WY	S14e. Zip Code: 82007
S14f. Telephone Number: 307-633-5460		S14g. Call Sign of Control Station (if appropriate):	

Remote Control (TT C) Location(s):

S14a. Street Address: 801 North Dish Drive			
S14b. City: Gilbert	S14c. County: Maricopa	S14d. State/Country AZ	S14e. Zip Code: 85223
S14f. Telephone Number: 480-558-2778		S14g. Call Sign of Control Station (if appropriate):	

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**Page 11:
Characteristics and
Certifications**

S15. SPACECRAFT PHYSICAL CHARACTERISTICS:

S15a. Mass of spacecraft without fuel (kg): 2450	Spacecraft Dimensions (meters)	Probability of Survival to End of Life (0.0 - 1.0)
S15b. Mass of fuel and disposables at launch (kg): 3150		
S15c. Mass of spacecraft and fuel at launch (kg): 5610	S15f. Length (m): 7	S15i. Payload: 0.87
S15d. Mass of fuel, in orbit, at beginning of life (kg): 1050	S15g. Width (m): 8	S15j. Bus: 0.85
S15e. Deployed Area of Solar Array (square meters): 92	S15h. Height (m): 32	S15k. Total: 0.74

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): 14100	(f): 14100	(k): 14100	(p): 14100
Bus (Watts):	(b): 3500	(g): 1700	(l): 3500	(q): 1700
Total (Watts):	(c): 17600	(h): 15800	(m): 17600	(r): 15800
Solar Array (Watts):	(d): 19500	(i): 17500	(n): 18500	(s): 16500
Depth of Battery Discharge (%):	(e) 75 %	(j) 75 %	(o) 75 %	(t) 75 %

S17. CERTIFICATIONS:

a. Are the power flux density limits of § 25.208 met?:	☒ 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	☒ 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?	☒ 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.