

**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: RAINBOW 4	e. Estimated Date of Placement into Service: 9/1/2010	i. Will the space station(s) operate on a Common Carrier Basis: N
b. Construction Commencement Date: 9/1/2006	f. Estimated Lifetime of Satellite(s): 15 Years	j. Number of transponders offered on a common carrier basis: 0
c. Construction Completion Date: 9/1/2008	g. Total Number of Transponders: 32	k. Total Common Carrier Transponder Bandwidth: 0 MHz
d. Estimated Launch Date: 6/1/2010	h. Total Transponder Bandwidth (no. transponders x Bandwidth) 768 MHz	i. Orbit Type: Mark all boxes that apply: <input checked="" type="checkbox"/> GSO <input type="checkbox"/> 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)		
12.2	G	12.7	G	T	Broadcasting Satellite Service - Video
17.3	G	17.8	G	R	Feeder Link for Broadcasting Satellite Service in FSS

**S3. ORBITAL INFORMATION FOR GEOSTATIONARY SATELLITES ONLY:**

a. Nominal Orbital Longitude (Degrees E/W): 166 W	b. Alternate Orbital Longitude (Degrees E/W):	c. Reason for orbital location selection: Orbital location awarded through Auction No. 52	
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): <u>Degrees</u> <u>E/W</u> g. Westernmost:            166 W h. Easternmost:            166 W	
i. Reason for service are selection (Optional):			

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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 initial phase angle.

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

**NO NGSO DATA FILED**

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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.
ALASKA	S		Alaska (ALS00002)
HAWAII	S		Hawaii (HWA00002)
WEST USA	S		Western Contiguous United States (USAPSA02)

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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			Input Attenuator (dB)		
		(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)	(q) Max. Value	(r) Step Size	
ALS2	T	38.5	35.3	0.05	0.05	30	N		ALASKA	1	30.2	53.3						
HWA	T	45.7	42.7	0.05	0.05	30	N		HAWAII	1	13.5	56.9						
USP2	T	40.1	37.1	0.05	0.05	30	N		WEST US	1	30.2	54.9						
USP	R	37.8	34.3	0.05	0.05	30	N		WEST US				1184	7.1	-96.2	12	4	

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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
ALS2	T	C	-166		66_ALS00002_DN.gx					
HWA	T	C	-166		66_HWA00002_DN.g					
USP2	T	C	-166		66_USAPSA02_DN.g					
USP	R	C	-166		66_USAPSA02_UP.g					

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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)
1	24000	T	12224	R	C
1	24000	R	17324	R	C
2	24000	R	17338.58	L	C
2	24000	T	12238.58	L	C
3	24000	R	17353.16	R	C
3	24000	T	12253.16	R	C
4	24000	R	17367.74	L	C
4	24000	T	12267.74	L	C
5	24000	R	17382.32	R	C
5	24000	T	12282.32	R	C
6	24000	R	17396.90	L	C
6	24000	T	12296.90	L	C
7	24000	R	17411.48	R	C
7	24000	T	12311.48	R	C
8	24000	R	17426.06	L	C
8	24000	T	12326.06	L	C
9	24000	R	17440.64	R	C
9	24000	T	12340.64	R	C
10	24000	R	17455.22	L	C
10	24000	T	12355.22	L	C
11	24000	R	17439.80	R	C
11	24000	T	12369.80	R	C
12	24000	R	17484.38	L	C
12	24000	T	12384.38	L	C
13	24000	R	17498.96	R	C
13	24000	T	12398.96	R	C
14	24000	R	17513.54	L	C
14	24000	T	12413.54	L	C
15	24000	R	17528.12	R	C
15	24000	T	12428.12	R	C

(a) Transponder ID	(b) Transponder Gain (dB)	Receive Band		Transmit Band	
		(c) Channel No.	(d) Beam ID	(e) Channel No.	(f) Beam ID
AL001	111.4	1	USPU	1	ALS2
AL002	111.4	2	USPU	2	ALS2
AL003	111.4	3	USPU	3	ALS2
AL004	111.4	4	USPU	4	ALS2
AL005	111.4	5	USPU	5	ALS2
AL006	111.4	6	USPU	6	ALS2
AL007	111.4	7	USPU	7	ALS2
AL008	111.4	8	USPU	8	ALS2
AL009	111.4	9	USPU	9	ALS2
AL010	111.4	10	USPU	10	ALS2
AL011	111.4	11	USPU	11	ALS2
AL012	111.4	12	USPU	12	ALS2
AL013	111.4	13	USPU	13	ALS2
AL014	111.4	14	USPU	14	ALS2
AL015	111.4	15	USPU	15	ALS2
AL016	111.4	16	USPU	16	ALS2
AL017	111.4	17	USPU	17	ALS2
AL018	111.4	18	USPU	18	ALS2
AL019	111.4	19	USPU	19	ALS2
AL020	111.4	20	USPU	20	ALS2
AL021	111.4	21	USPU	21	ALS2
AL022	111.4	22	USPU	22	ALS2
AL023	111.4	23	USPU	23	ALS2
AL024	111.4	24	USPU	24	ALS2
AL025	111.4	25	USPU	25	ALS2
AL026	111.4	26	USPU	26	ALS2
AL027	111.4	27	USPU	27	ALS2
AL028	111.4	28	USPU	28	ALS2
AL029	111.4	29	USPU	29	ALS2
AL030	111.4	30	USPU	30	ALS2

16	24000	R	17542.70	L	C
16	24000	T	12442.70	L	C
17	24000	R	17557.28	R	C
17	24000	T	12457.28	R	C
18	24000	R	17571.86	L	C
18	24000	T	12471.86	L	C
19	24000	R	17586.44	R	C
19	24000	T	12486.44	R	C
20	24000	R	17601.02	L	C
20	24000	T	12501.02	L	C
21	24000	R	17615.60	R	C
21	24000	T	12515.60	R	C
22	24000	R	17630.18	L	C
22	24000	T	12530.18	L	C
23	24000	R	17644.76	R	C
23	24000	T	12544.76	R	C
24	24000	R	17659.34	L	C
24	24000	T	12559.34	L	C
25	24000	R	17673.92	R	C
25	24000	T	12573.92	R	C
26	24000	R	17688.50	L	C
26	24000	T	12588.50	L	C
27	24000	R	17703.08	R	C
27	24000	T	12603.08	R	C
28	24000	R	17717.66	L	C
28	24000	T	12617.66	L	C
29	24000	R	17732.24	R	C
29	24000	T	12632.24	R	C
30	24000	R	17746.82	L	C
30	24000	T	12646.82	L	C
31	24000	R	17761.40	R	C
31	24000	T	12661.40	R	C
32	24000	R	17775.98	L	C
32	24000	T	12675.98	L	C

AL031	111.4	31	USPU	31	ALS2
AL032	111.4	32	USPU	32	ALS2
US001	111.4	1	USPU	1	USP2
US002	111.4	2	USPU	2	USP2
US003	111.4	3	USPU	3	USP2
US004	111.4	4	USPU	4	USP2
US005	111.4	5	USPU	5	USP2
US006	111.4	6	USPU	6	USP2
US007	111.4	7	USPU	7	USP2
US008	111.4	8	USPU	8	USP2
US009	111.4	9	USPU	9	USP2
US010	111.4	10	USPU	10	USP2
US011	111.4	11	USPU	11	USP2
US012	111.4	12	USPU	12	USP2
US013	111.4	13	USPU	13	USP2
US014	111.4	14	USPU	14	USP2
US015	111.4	15	USPU	15	USP2
US016	111.4	16	USPU	16	USP2
US017	111.4	17	USPU	17	USP2
US018	111.4	18	USPU	18	USP2
US019	111.4	19	USPU	19	USP2
US020	111.4	20	USPU	20	USP2
US021	111.4	21	USPU	21	USP2
US022	111.4	22	USPU	22	USP2
US023	111.4	23	USPU	23	USP2
US024	111.4	24	USPU	24	USP2
US025	111.4	25	USPU	25	USP2
US026	111.4	26	USPU	26	USP2
US027	111.4	27	USPU	27	USP2
US028	111.4	28	USPU	28	USP2
US029	111.4	29	USPU	29	USP2
US030	111.4	30	USPU	30	USP2
US031	111.4	31	USPU	31	USP2
US032	111.4	32	USPU	32	USP2
HW001	107.9	1	USPU	1	USP2
HW002	107.9	2	USPU	2	USP2
HW003	107.9	3	USPU	3	USP2
HW004	107.9	4	USPU	4	USP2
HW005	107.9	5	USPU	5	USP2

HW006	107.9	6	USPU	6	USP2
HW007	107.9	7	USPU	7	USP2
HW008	107.9	8	USPU	8	USP2
HW009	107.9	9	USPU	9	USP2
HW010	107.9	10	USPU	10	USP2
HW011	107.9	11	USPU	11	USP2
HW012	107.9	12	USPU	12	USP2
HW013	107.9	13	USPU	13	USP2
HW014	107.9	14	USPU	14	USP2
HW015	107.9	15	USPU	15	USP2
HW016	107.9	16	USPU	16	USP2
HW017	107.9	17	USPU	17	USP2
HW018	107.9	18	USPU	18	USP2
HW019	107.9	19	USPU	19	USP2
HW020	107.9	20	USPU	20	USP2
HW021	107.9	21	USPU	21	USP2
HW022	107.9	22	USPU	22	USP2
HW023	107.9	23	USPU	23	USP2
HW024	107.9	24	USPU	24	USP2
HW025	107.9	25	USPU	25	USP2
HW026	107.9	26	USPU	26	USP2
HW027	107.9	27	USPU	27	USP2
HW028	107.9	28	USPU	28	USP2
HW029	107.9	29	USPU	29	USP2
HW030	107.9	30	USPU	30	USP2
HW031	107.9	31	USPU	31	USP2
HW032	107.9	32	USPU	32	USP2



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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)
001	24M0G7W	24000	4	40000	0.58		10	25



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

Associated Transponder ID Range (a) Start    (b) End		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) (j) Min.    (k) Max.		EIRP (dBW) (l) Min.    (m) Max.		(n) Max. Power Flux Density (dBW/m <sup>2</sup> /Hz)
AL001	AL032	1		1		166 link.xls				50.3	53.3		14.7
HW001	HW032	1		1		166 link.xls				53.9	56.9		11.1
US001	US032	1		1		166 link.xls				51.9	54.9		13.1
UPL		1		1			66.2	13.1	16.5				

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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): #Error

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Characteristics and  
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**S15. SPACECRAFT PHYSICAL CHARACTERISTICS:**

S15a. Mass of spacecraft without fuel (kg): 2400	Spacecraft Dimensions (meters)	Probability of Survival to End of Life (0.0 - 1.0)
S15b. Mass of fuel and disposables at launch (kg): 2400		
S15c. Mass of spacecraft and fuel at launch (kg): 4800	S15f. Length (m):	S15i. Payload:
S15d. Mass of fuel, in orbit, at beginning of life (kg):	S15g. Width (m):	S15j. Bus:
S15e. Deployed Area of Solar Array (square meters):	S15h. Height (m):	S15k. Total:

**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): 7100	(f): 7100	(k): 7100	(p): 7100
Bus (Watts):	(b): 800	(g):	(l):	(q):
Total (Watts):	(c): 8400	(h):	(m):	(r):
Solar Array (Watts):	(d): 9000	(i):	(n):	(s):
Depth of Battery Discharge (%):	(e) %	(j) %	(o) %	(t) %

**S17. CERTIFICATIONS:**

a. Are the power flux density limits of § 25.208 met?	<input type="checkbox"/> YES	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> 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?	<input type="checkbox"/> YES	<input type="checkbox"/> NO	<input checked="" type="checkbox"/> 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?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> 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.**