| FCC 312<br>Schedule S | FEDERAL COMMUNICATIONS COMMISSION<br>SATELLITE SPACE STATION AUTHORIZATIONS<br>(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: | | e. Estimated Date of Placement into Service: | i Will the space station(s) operate on a Common Carrier Basis: |
|---|---|---|---|
| FLOCK 1 | | 12/15/2013 | N |
| b. Construction Commencement Date: | | f. Estimated Lifetime of Satellite(s): | j. Number of transponders offered on a common carrier basis: |
| 3/1/2013 | | 1 Years | 0 |
| c. Construction Completion Date: | | g. Total Number of Transponders: | k. Total Common Carrier Transponder Bandwidth: |
| 9/1/2013 | | 0 | 0 MHz |
| d1. Est Launch Date Begin: | d2. Est Launch Date End: | h. Total Transponder Bandwidth (no. transponders x Bandwidth) | l. Orbit Type: Mark all boxes that apply: |
| 12/1/2013 | 3/1/2013 | 0 MHz | [ ] GSO [X] 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) | | |
| 8025 | M | 8400 | M | T | Earth Exploration Satellite Service |
| 2025 | M | 2110 | M | R | Earth Exploration Satellite Service |
| 401 | M | 402 | M | T | Space Operations Service |
| 449.75 | M | 450.25 | M | R | Space Operations Service |

S3. ORBITAL INFORMATION FOR GEOSTATIONARY SATELLITES ONLY:

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S4. ORBITAL INFORMATION FOR NON-GEOSTATIONARY SATELLITES ONLY

S4a. Total Number of Satellites in Network or System: 28

S4b. Total Number of Orbital Planes in Network or System: 1

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

S4d. Orbit Epoch Date: 12/15/2013

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 |
| 1 | 28 | 51.6 | 5520 | 410 | 410 | 280.5 | 61.8 | 0 | 360 | |

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) |
|---|---|---|
| 1 | 1 | 0 |
| 1 | 2 | 12.86 |
| 1 | 3 | 25.71 |
| 1 | 4 | 38.57 |
| 1 | 5 | 51.43 |
| 1 | 6 | 64.29 |
| 1 | 7 | 77.14 |
| 1 | 8 | 90 |
| 1 | 9 | 102.86 |
| 1 | 10 | 115.71 |
| 1 | 11 | 128.57 |
| 1 | 12 | 141.43 |
| 1 | 13 | 154.29 |
| 1 | 14 | 167.14 |
| 1 | 15 | 180 |
| 1 | 16 | 192.86 |
| 1 | 17 | 205.71 |
| 1 | 18 | 218.57 |
| 1 | 19 | 231.43 |
| 1 | 20 | 244.29 |
| 1 | 21 | 257.14 |

| | | |
|---|---|---|
| 1 | 22 | 270 |
| 1 | 23 | 282.26 |
| 1 | 24 | 295.71 |
| 1 | 25 | 308.57 |
| 1 | 26 | 321.43 |
| 1 | 27 | 334.29 |
| 1 | 28 | 347.14 |

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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. |
|---|---|---|---|
| VISEARTH | E | | XVE |

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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 Isolation (dB) | (h) Polarization Switchable? (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 |
| XDLH | T | 12.3 | 12.3 | 0.5 | 0 | 15 | N | 0 | VISEART | 1 | 2.9 | 15.92 | | | | | |
| XDL | T | 5 | -2 | 0.5 | 0 | 9 | N | | VISEART | 1 | 2.9 | 9.12 | | | | | |
| SUL | R | 5 | -1 | 0.5 | 0 | 9 | N | | VISEART | | | | 100 | -15 | 0 | | |
| UDL | T | 2.19 | -2 | 0.5 | 0 | 20 | N | | VISEART | 1 | 0.7 | 0.19 | | | | | |
| UUL | R | 2.16 | -2.5 | 0.5 | 0 | 20 | N | | VISEART | | | | 100 | -17.84 | 0 | | |

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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 |
| XDLH | T | C | | x-band-helical.pdf | | -159.07 | -157.13 | -155.39 | -153.86 | -152.53 |
| XDLH | T | X | | x-band-helical.pdf | | | | | | |
| XDL | T | C | | x-band-patch.pdf | | -158.88 | -156.94 | -155.2 | -153.67 | -152.34 |
| XDL | T | X | | x-band-patch.pdf | | | | | | |
| SUL | R | C | | s-band-patch.pdf | | | | | | |
| SUL | R | X | | s-band-patch.pdf | | | | | | |
| UDL | T | C | | uhf-antenna.pdf | | -152.09 | -150.16 | -148.41 | -146.88 | -145.55 |
| UUL | R | C | | uhf-antenna.pdf | | | | | | |

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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) |
|---|---|---|---|---|---|
| XCH1 | 66830 | T | 8133 | R | C |
| XCH2 | 66830 | T | 8200 | R | C |
| SCH1 | 1310 | R | 2056 | R | T |
| UDCH1 | 60 | T | 401 | H | T |
| UUCH1 | 60 | R | 450 | 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 |
| NONE | 1 | SCH1 | SUL | XCH1 | XDLH |

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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) |
|---|---|---|---|---|---|---|---|---|
| XCH1 | 66M8G1D | 66830 | 8 | 120000 | 0.89 | 0 | 11.54 | 22.84 |
| XCH2 | 66M8G1D | 66830 | 8 | 120000 | 0.89 | 0 | 11.54 | 22.84 |
| SCH1 | 1M31F1D | 1310 | 2 | 250 | 0.5 | 0 | 6.81 | 16.01 |
| UDCH1 | 60K0F1D | 60 | 2 | 2.4 | 0.5 | 0 | 0.02 | 11.32 |
| UUCH1 | 60K0F1D | 60 | 2 | 2.4 | 0.5 | 0 | 0.02 | 11.32 |

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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 | | | | | | |

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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) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (a) Start | (b) End | (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/m2/Hz) | (o)Assoc. Stn Rec. G/T (dB/K) |
| | | | | | | | | | (j) Min. | (k) Max. | (l) Min. | (m) Max. | | |

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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: | | | |
|---|---|---|---|
| 490 2nd St. | | | |
| S14b. City: | S14c. County: | S14d. State/Country | S14e. Zip Code: |
| San Francisco | San Francisco | CA | 94107 |
| S14f. Telephone Number: | S14g. Call Sign of Control Station (if appropriate): | | |
| 415-317-6404 | NONE | | |

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S15. SPACECRAFT PHYSICAL CHARACTERISTICS:

| S15a: Mass of spacecraft without fuel (kg): 4.3 | Spacecraft Dimensions (meters) | Probability of Survival to End of Life (0.0 - 1.0) |
|---|---|---|
| S15b. Mass of fuel and disposables at launch (kg): 0 | | |
| S15c. Mass of spacecraft and fuel at launch (kg): 4.3 | S15f. Length (m): 0.34 | S15i. Payload: 0.8 |
| S15d. Mass of fuel, in orbit, at beginning of life (kg): 0 | S15g. Width (m): 0.62 | S15j. Bus: 0.9 |
| S15e. Deployed Area of Solar Array (square meters): 0.156 | S15h. Height (m): 0.1 | S15k. Total: 0.712 |

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): 13.16 | (f): 13.16 | (k): 13.16 | (p): 13.16 |
| Bus (Watts): | (b): 2.12 | (g): 2.12 | (l): 2.12 | (q): 2.12 |
| Total (Watts): | (c): 15.28 | (h): 15.28 | (m) 15.28 | (r): 15.28 |
| Solar Array (Watts): | (d): 19.1 | (i): 19.1 | (n): 18.9 | (s): 18.9 |
| Depth of Battery Discharge (%): | (e) 30 % | (j) 30 % | (o) 30 % | (t) 30 % |

S17. CERTIFICATIONS:

| | | | |
|---|---|---|---|
| a. Are the power flux density limits of § 25.208 met?: | [ ] YES | [ ] NO | [X] 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.**