

**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: XM-2 | | e. Estimated Date of Placement into Service: 7/15/2001 | | 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: 2 | | 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) 3.68 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) | | |
| 2332.5 | M | 2345.0 | M | T | Satellite Digital Audio Radio Service |
| 7025 | M | 7075 | M | R | Satellite Digital Audio Radio Service |

S3. ORBITAL INFORMATION FOR GEOSTATIONARY SATELLITES ONLY:

| | | | | | |
|---|---------------|--|--|--|--|
| a. Nominal Orbital Longitude (Degrees E/W): 85.217 W | | b. Alternate Orbital Longitude (Degrees E/W): | | c. Reason for orbital location selection: Optimal Look Angle for CONUS/CANADA. Colocation with Primary Satellite XM-3 to act as spare capacity for XM-3 or XM-4. XM Repeaters fed from 85.083 location of XM-3. | |
| Longitudinal Tolerance or E/W Station-Keeping: | | f. Inclination Excursion or N/S Station-Keeping Tolerance: | | Range of orbital are in which adequate service can be provided (Optional): <u> Degrees </u> <u> E/W </u> | |
| d. Toward West: | 0.033 Degrees | e. Toward East: | | g. Westernmost: | |
| | 0.033 Degrees | 0.05 Degrees | | h. Easternmost: | |
| 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. |
|---------------------|---|---|---|
| USA | S | | USA |
| CAN | S | | CAN |

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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 | |
| | | | | | | | | | | | | | | | | | | |
| XM2T | T | 35.51 | 27 | 0.1 | 0.1 | 17 | N | | USA | 1 | | 71 | | | | | | |
| XM2 | R | 18.61 | 18 | 0.1 | 0.1 | 20 | Y | | USA | | | | 509 | -5.3 | -92 | 22 | 1 | |

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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 |
| XM2T | T | C | 85.217 | | 5217WL_Gain Conto | -127 | -127 | -124 | -120.5 | -120 |
| XM2 | R | C | 85.217 | | 7WL_Receive Gain C | | | | | |

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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 | 1840 | T | 2333.465 | L | C |
| 2 | 1840 | T | 2335.305 | L | C |
| 3 | 1840 | T | 2342.205 | L | C |
| 4 | 1840 | T | 2344.045 | L | C |
| 1R | 1840 | R | 7063.993 | R | C |
| 2R | 1840 | R | 7061.561 | R | C |
| 3R | 1840 | R | 7065.965 | R | C |
| 4R | 1840 | R | 7068.397 | R | C |
| CMD1 | 800 | R | 7049.0 | L | T |
| CMD2 | 800 | R | 7074.0 | L | T |
| TLM1 | 100 | T | 2339.2 | R | T |
| TLM2 | 100 | T | 2339.7 | R | T |
| TLM3 | 100 | T | 2344.0 | R | T |
| TLM4 | 100 | T | 2344.5 | R | T |
| 5 | 1840 | T | 2338.75 | L | C |
| 5R | 1840 | T | 7058.521 | 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 |
| 1 | 150 | 1R | XM2R | 1 | XM2T |
| 2 | 150 | 2R | XM2R | 2 | XM2T |
| 3 | 150 | 3R | XM2R | 3 | XM2T |
| 4 | 150 | 4R | XM2R | 4 | XM2T |
| CMD1 | | CMD1 | XM2R | | |
| CMD2 | | CMD2 | XM2R | | |
| TLM1 | | | | TLM1 | XM2T |
| 5 | 150 | 5R | XM2R | 5 | XM2T |
| TLM2 | | | | TLM2 | XM2T |
| TLM3 | | | | TLM3 | XM2T |
| TLM4 | | | | TLM4 | XM2T |

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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) |
|---------------------|-------------------------|------------------------------|-------------------|------------------------------|--------------------------------------|-------------------------------|--|-------------------------------------|
| TDM | 1M84G1ED | 1840 | 4 | 2048 | 0.75 | | 69.1 | 85 |
| CMD | 800KF2DC | 800 | 1 | 1 | | | | |
| TLM | 100KG2DC | 100 | 2 | 4 | | | 48 | |

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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) | | EIRP (dBW) | | (n) Max. Power Flux Density (dBW/m ² /Hz) | (o) Assoc. Stn Rec. G/T (dB/K) |
| | | | | | | (j) Min. | (k) Max. | | (l) Min. | (m) Max. | | | | |
| 1 | 5 | TDM | | 1 | | | 0 | 52.3 | 41 | 64 | 60 | 71 | -118 | -20 |
| CMD1 | CMD2 | CMD | | 1 | | | | 52.4 | 51.4 | 78 | | | | |
| TLM1 | TLM4 | TLM | | 1 | | | | | | | 24 | 32 | -157 | 21.8 |

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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): No

Remote Control (TT C) Location(s):

| | | | |
|--|--------------------------|---|--------------------------|
| S14a: Street Address: 2875 Fork Creek Church Road | | | |
| S14b. City: Ellenwood | S14c. County: Clayton | S14d. State/Country GA | S14e. Zip Code: 20294 |
| S14f. Telephone Number: 4043812000 | | S14g. Call Sign of Control Station (if appropriate): E040204 | |

Remote Control (TT C) Location(s):

| | | | |
|---|---------------|---|--------------------------|
| S14a: Street Address: 1500 Eckington Place | | | |
| S14b. City: Washington | S14c. County: | S14d. State/Country DC | S14e. Zip Code: 20002 |
| S14f. Telephone Number: 2023804000 | | S14g. Call Sign of Control Station (if appropriate): E000158 | |

Remote Control (TT C) Location(s):

| | | | |
|---|--------------------------|--|----------------------------|
| S14a: Street Address: 1780 Centre Ave NE | | | |
| S14b. City: Calgary | S14c. County: Alberta | S14d. State/Country | S14e. Zip Code: T2E 0A6 |
| S14f. Telephone Number: 4032355751 | | S14g. Call Sign of Control Station (if appropriate): | |

Remote Control (TT C) Location(s):

| | | | |
|---|--------------------------|--|----------------------------|
| S14a: Street Address: 133438 Allan Park Rd | | | |
| S14b. City: Allan Park | S14c. County: Ontario | S14d. State/Country | S14e. Zip Code: N4N 3B8 |
| S14f. Telephone Number: 5193717490 | | S14g. Call Sign of Control Station (if appropriate): | |

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S15. SPACECRAFT PHYSICAL CHARACTERISTICS:

| | | |
|---|-----------------------------------|---|
| S15a. Mass of spacecraft without fuel (kg): 2746 | Spacecraft Dimensions (meters) | Probability of Survival to End of Life (0.0 - 1.0) |
| S15b. Mass of fuel and disposables at launch (kg): 1981 | | |
| S15c. Mass of spacecraft and fuel at launch (kg): 4727 | S15f. Length (m): 6.75 | S15i. Payload: 0.8795 |
| S15d. Mass of fuel, in orbit, at beginning of life (kg): 231 | S15g. Width (m): 14.24 | S15j. Bus: 0.8665 |
| S15e. Deployed Area of Solar Array (square meters): 156 | S15h. Height (m): 36.9 | S15k. Total: 0.762 |

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): 12844 | (f): 12844 | (k): 12844 | (p): 12844 |
| Bus (Watts): | (b): 971 | (g): 908 | (l): 971 | (q): 908 |
| Total (Watts): | (c): 13815 | (h): 13752 | (m): 13815 | (r): 13752 |
| Solar Array (Watts): | (d): 20000 | (i): 19500 | (n): 17842 | (s): 15672 |
| Depth of Battery Discharge (%): | (e) 78.5 % | (j) 13.6 % | (o) 78.5 % | (t) 13.6 % |

S17. CERTIFICATIONS:

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