

Additional Space Station Information Required by 25.114(d)

Included in this application is FCC Form 312S, which provides the Commission with the information regarding the JCSAT-2B satellite required by 25.114(c). Provided below is additional information required by 25.114(d) of the Commission's Rules.

1. General System Description-25.114(d)(1)

JCSAT-2B is a Space Systems / Loral SSL1300 class hybrid C/Ku-band, three-axis stabilized spacecraft located at 154 E.L. Both C-band and Ku-band payloads on JCSAT-2B operate under authority of Japan. The satellite will have 26 C-band transponders and 18 Ku-band transponders. Frequency reuse will be provided in each frequency band through the use of orthogonal linear polarization. The C-band transponders will operate with 100-watt TWTAs, and the Ku-band transponders will have 150-watt TWTAs. All of the transponders will contain gain-step attenuators (adjustable in 1 dB steps) that can be adjusted remotely by ground commands.

In addition to Japan and Hawaii, Alaska(U.S.A), the C-band payload will provide coverage to East Asia, SE Asia, Russia, Oceania, Pacific Region. The Ku-band payload will provide coverage to Japan, Hawaii, East Asia, SE Asia, Pacific Region. The satellite will be designed for a service life of 15 years.

The satellite Telemetry, Tracking and Control (TT&C) will be performed from SKY Perfect JSAT Corporation (JSAT) Yokohama Satellite Control Center (YSCC) at Midori-ku, Yokohama-shi, Kanagawa-ken, Japan.

2. Antenna Gain Contours-25.114(d)(3)

Attached to Form 312S at table S6 are GTX files displaying the antenna gain contours for JCSAT-2B's C-band beams and Ku-band beams. The beams and the relevant beam connectivity options included in the associated Schedule S form are restricted to those accessible by U.S. licensed earth stations.

3. Service Description-25.114(d)

Hawaii Pacific Teleport (HPT) will use its Kapolei, Hawaii earth station as a gateway to provide various non-common carrier services between United States and Japan and Australia in the coverage area of the satellite. Digital Services supporting a variety of information rates ranging between a single carrier per transponder to hundreds of carriers per transponder types of operation will be offered. These will employ Phase

Shift Keying (e.g., 8PSK, QPSK) modulation and use Forward Error Correction Coding (FEC) where appropriate. The specific information required by 25.114(d) (4) is included in the attached Form 312S at tables S11, S12 and S13.

4. Power Flux Density Levels-25.114(d)(5)

The specific information required by 25.114(d)(5) is included in the attached Form 312S at Table S8.

5. Public Interest Considerations-25.114(d)(6).

Hawaii Pacific Teleport, L.P. proposes to provide digital services with JCSAT-2B, thus serving the public interest.

6. Legal and Technical Qualifications-25.140(b)

This satellite will be authorized by the Japanese government for commercial services and has been coordinated with all adjacent satellites within the coordination arc. The satellite will be launched by Space Exploration Technologies Corporation (SpaceX) in the latter half of 2015.

7. Interference Analysis-25.140(b)(2)

JCSAT-2B will be located at the 154 degrees E.L. orbital position. Actually there is one U.S.-licensed satellite, Intelsat 5 at 157 degrees. E.L., within the plus or minus 8 degrees coordination arc of JCSAT-2B for C-band and the plus or minus 7 degrees coordination arc of JCSAT-2B for Ku-band. However, this analysis demonstrates that digital satellite networks accessing JCSAT-2B from the Kapolei earth station are fully compatible with the 2 degrees orbital spacing requirements. Specifically, the Earth Station antenna meets the established antenna sidelobe level performance, $29-25\log(\theta)$ dBi. The maximum uplink transmit power levels for all carriers will be operated under the limits specified in the FCC Rule 25.212(c) and (d) for routine licensing of digital transmission, and 25.211(d) for video transmission. Further, note that there are international (non-U.S.) FSS satellites in the neighborhood of JCSAT-2B. Coordination has been completed with these international satellite networks. Attachments 1 and 2 set forth the detailed interference analysis and compliance requirements per the FCC rules.

8. Orbital Debris Mitigation

This section addresses requirements contained in the new 25.114(d)(14)(i)-(iv) of the Commission's rule.

- a. Debris Release Assessment-25.114(d)(14)(i). JSAT has assessed and limited the amount of debris released in a planned manner during normal operations and has assessed and limited the probability of the spacecraft becoming a source of debris by collisions with small debris or meteoroids. JSAT will maintain the satellite within +/- 0.1 degrees of its assigned orbital position. From the best information available, JSAT has determined that the nearest spacecrafts in the vicinity of JCSAT-2B are located at 152 E.L. and 156 E.L. and that these satellites pose no threat of collision that would prevent post-mission disposal of the satellite to a supersynchronous orbit.
- b. Accidental Explosion Assessment-25.114(d)(14)(ii). JSAT has assessed the probability of accidental explosions during and after completion of mission operations. The spacecraft employs the SSL 1300 satellite bus. This type of spacecraft has a history of successful on-orbit operations without fragmentation of the satellite into pieces of debris. All batteries and propellant tanks are monitored for pressure or temperature variations. Alarms in the Satellite Control Center inform controllers of any variations. Additionally, long-term trending analysis is performed to monitor for any unexpected trends.

The batteries are operated utilizing the manufacturer's automatic recharging scheme. Doing so ensures that charging terminates normally without building up additional heat and pressure. As this process occurs wholly within the spacecraft, it also affords protection from command link failures (on the ground).

In order to ensure that the spacecraft has no explosive risk after it has been successfully de-orbited, all stored energy sources onboard the spacecraft will be removed by venting excess propellant (Hydrazine, Oxidizer, and Xenon), and all propulsion lines and latch valves will be vented and left open. All battery chargers will be turned off and batteries will be left in a permanent discharge state. These steps will ensure that no buildup of energy can occur resulting in an explosion in the years after the spacecraft is de-orbited.

- c. Assessment Regarding Collision with Larger Debris and Other Space Stations-25.114(d)(14)(iii). JSAT has also assessed and limited the probability of the spacecraft becoming the source of debris by collisions with larger or other operational space stations. As noted above, the closest known spacecraft in geostationary orbit are separated by 2 degrees from JCSAT-2B. Because JSAT will maintain JCSAT-2B within +/- 0.1 degrees of the assigned

orbital position in both the longitude and latitude planes, risk of collision is negligible.

- d. Post-Mission Disposal Plans-25.114(d)(iv). Post-mission disposal of the satellite from operational orbit will be accomplished by maneuvering it to a 300km higher orbit. Propellant budget for this operation is included in the satellite design, and all propellant tanks will be near empty, also all propellants will be vented when accomplished. (See Appendix-A for details.)

Appendix-A Analysis for Post-Mission Disposal Plan

1) Post-mission disposal altitude

The minimum post-mission disposal altitude above the geostationary-Earth orbit is calculated as follows; (using the IADC formula)

$$235 \text{ km} + (1000 \cdot CR \cdot A/m) = 274.2 \text{ km}$$

CR = 1.23 JCSAT-2B Solar radiation pressure coefficient

A = 68m² JCSAT-2B Area based on deployed on-station configuration

M = 2136 kg JCSAT-2B dry mass

Planned post-mission disposal altitude: 300km

Margin to minimum altitude requirement: 25.8km

2) Propellant budget for post-mission disposal

The amount of propellant reserved for the post-mission orbital raising is shown in the table below.

Disposal altitude	GEO + 300Km
Required Delta V	10.9m/s
Effective Isp	281 sec
Spacecraft Mass after orbital raising	2622.2 kg
Required propellant (reserved)	9.7 kg

The propellant budget is based on -3sigma worst case analysis incorporating on-orbit performance deviations for the propulsion and attitude control subsystem.

In order to ensure the reserved propellant at the time of disposal, three propellant gauging methods are employed during on-orbit operations: Book-keeping, Pressure-Volume-Temperature (PVT) and Propellant Tank Thermal Capacity Gauging. Typical uncertainties of three gauging methods are shown in the table below. All three methods can be used and compared to track the remaining propellant in conservative approach throughout the mission life.

Combination of Book-keeping and PVT method	+/- 10kg
Propellant Tank Thermal Capacity Gauging	+/- 2.5kg at ≤ 60 kg bipropellant remaining