

SECTION 25.114 (d) TECHNICAL INFORMATION

SECTION 25.114 (d) INFORMATION FOR HISPASAT 30W-6 SPACE STATION

(1) General description of overall system facilities, operations and services;

HISPASAT 30W-6 is a multi-mission system with payloads in C-band, Ku-Band and Ka-Band (not intended to be used to provide service over USA). This system will be used to satisfy the needs of communications by satellite in Europe, North of Africa and in the Americas.

HISPASAT will operate HISPASAT 30W-6 satellite system at 30° W.L., substituting HISPASAT 30W-4 and incorporating additional frequency bands to provide a wide range of telecommunications services, including routing and delivery of video and audio programs, satellite news gathering, VSAT applications, internet backbone services, broadband links, multimedia and interactive services, capacity for both public and private networks, etc.

Once HISPASAT 30W-6 will be fully in operation, HISPASAT 30W-4 is planned to be relocated into another orbital slot yet to be decided or utilized as a back-up satellite for HISPASAT 30W-6. The definitive plan will be informed to the Commission as soon as the decision is made concerning this matter.

(2) If applicable, the feeder link and inter-satellite service frequencies requested for the satellite, together with any demonstration otherwise required by this chapter for use of those frequencies (see, e.g., §§25.203(j) and (k));

N/A

(3) Predicted space station antenna gain contour(s) for each transmit and each receive antenna beam and nominal orbital location requested. These contour(s) should be plotted on an area map at 2 dB intervals down to 10 dB below the peak value of the parameter and at 5 dB intervals between 10 dB and 20 dB below the peak values, with the peak value and sense of polarization clearly specified on each plotted contour. For applications for geostationary orbit satellites, this information must be provided in the .gxt format.

C Band

The station antenna gain contour in copolar and crosspolar for the AMERICA beam are contained electronically in .gxt format in the files named *CURH.GXT* (AMERICA receive beam horizontal polarization, copolar), *CURHxpol.GXT* (AMERICA receive beam horizontal polarization, crosspolar), *CURV.GXT* (AMERICA receive beam vertical polarization, copolar), *CURVxpol.GXT* (AMERICA receive beam vertical polarization, crosspolar), *CUTH.GXT* (AMERICA transmit beam horizontal polarization, copolar), *CUTHxpol.GXT* (AMERICA transmit beam horizontal polarization, crosspolar), *CUTV.GXT* (AMERICA transmit beam vertical polarization, copolar) and *CUTVxpol.GXT* (AMERICA transmit beam vertical polarization, crosspolar) attached to this application.

For the AMERICA beam, the gain peak for receiving antenna is 27.7 dBi and for the transmitting antenna 26.4 dBi, for both polarizations.

Ku Band

The station antenna gain contour in copolar and crosspolar for the AMERICA beam are contained electronically in .gxt format in the files named *KURH.GXT* (AMERICA receive beam horizontal polarization, copolar), *KURHxpol.GXT* (AMERICA receive beam horizontal polarization, crosspolar), *KURV.GXT* (AMERICA receive beam vertical polarization, copolar), *KURVxpol.GXT* (AMERICA receive beam vertical polarization, crosspolar), *KUTH.GXT* (AMERICA transmit beam horizontal polarization, copolar), *KUTHxpol.GXT* (AMERICA transmit beam horizontal polarization, crosspolar), *KUTV.GXT* (AMERICA transmit beam vertical polarization, copolar) and *KUTVxpol.GXT* (AMERICA transmit beam vertical polarization, crosspolar) attached to this application.

For the AMERICA beam, the gain peak for receiving antenna is 31.7 dBi and for the transmitting antenna 30.4 dBi, for both polarizations.

- (4) A description of the types of services to be provided, and the areas to be served, including a description of the transmission characteristics and performance objectives for each type of proposed service, details of the link noise budget, typical or baseline earth station parameters, modulation parameters, and overall link performance analysis (including an analysis of the effects of each contributing noise and interference source);**

The HISPASAT 30W-6 satellite will be used for digital communications services, including video and internet applications, with bit rates ranging from 64 Kbit/s, possibly less, to 75 Mbit/s.

The HISPASAT 30W-6 satellite serves from the North of USA to the South of Argentina.

The files called *LINK_BUDGET_1.pfd* to *LINK_BUDGET_11.pfd* (for C and Ku bands) attached to this application, contain several examples of link noise budgets. Also these link budgets are a two-degree spacing interference analysis for HISPASAT 30W-6.

- (5) Calculation of power flux density levels within each coverage area and of the energy dispersal, if any, needed for compliance with §25.208; Calculation of power flux density levels within each coverage area and of the energy dispersal, if any, needed for compliance with §25.208, for angles of arrival other than 5°, 10°, 15°, 20°, and 25° above the horizontal.**

C Band

In all the C downlink frequency range, the power flux density at the Earth's surface produced by emissions from a space station for all conditions and for all methods will not exceed -162 dBW/m² 4 KHz over the US territory and all the Americas:

-62.3 dBW/Hz max psd + 26.4 (max gain dBi) – 162.1 spreading losses (dB) (worst case).

Ku Band

In all the Ku downlink frequency range, the power flux density at the Earth's surface produced by emissions from a space station for all conditions and for all methods will not exceed -128 dBW/m² 1 MHz over the US territory and all the Americas:

-56.7 dBW/Hz max psd + 30.4 (max gain dBi) – 162.1 spreading losses (dB) (worst case).

(6) Public interest considerations in support of grant;

The HISPASAT 30W-6 satellite will ensure digital transmission services between the United States, the Americas, North Africa and Europe at the 30° W longitude orbital location.

The entry of the HISPASAT 30W-6 satellite into the market to meet US customers' demand for such services will enhance competition in that market. Accordingly, the grant of this application is in the public interest.

(7) Applications for authorizations for fixed-satellite space stations shall also include the information specified in §25.140 (b)(1) and (2) of this part. Applicants for authorizations for space stations in the 17/24 GHz broadcasting-satellite service must also include the information specified in Sec. Sec. 25.140(b)(1) and (3) of this part.

C band

There is currently no satellite operating in the Appendix 30B C-band frequencies located within two degrees from 30° W.

The results of the two-degree interference analysis shown below assumes that a future C-band satellite, operated at 32° W or 28° W, will have transmission parameters similar to those of HISPASAT 30W-6 (see Table 1). Table 2 provides a summary of the overall link C/I margins using the transmissions of HISPASAT 30W-6 as both the wanted and interfering carriers.

The interference calculations assumed a 1dB advantage for topocentric to geocentric conversion, all wanted and interfering transmission are co-polarized and all earth station antennas conform to a sidelobe pattern of 29-25 log (theta).

	Design. Emission	Mod. Type	Diam TX (m)	TX Ant. Gain (dBi)	Diam RX (m)	RX Ant. Gain (dBi)	U/L Power (dBW)	U/L Power Dens. (dBW/Hz)	D/L EIRP (dBW)	D/L EIRP Dens. (dBW/Hz)	C/N Req. (dB)	C/I Criterion (dB)
Wanted Carrier	70K0G7W	8-PSK	4.5	47	4.5	43.3	2	-46.5	9.5	-39	8	20.2
	1M70G7W	8-PSK	4.5	47	4.5	43.3	16.2	-46.1	23.9	-38.4	8	20.2
	7M50G7W	QPSK	4.5	47	4.5	43.3	24	-44.8	31.6	-37.2	9	21.2
	36M0G7W	QPSK	4.5	47	8.6	48.8	27	-48.6	34.7	-40.9	7.4	19.6

Table 1.- Assumed C-band transmission parameters of an adjacent satellite.

		Interfering carrier			
		DESIGN EMISSION	70K0G7W	1M70G7W	7M50G7W
Wanted carrier	70K0G7W	1.1	0.6	-0.7	3.1
	1M70G7W	15.4	1.1	-0.2	3.5
	7M50G7W	22.2	7.8	0.1	3.8
	36M0G7W	29.8	15.5	7.8	4.7

Table 2.- Summary of the overall link C/I margins (dB)

It can be seen in Table 2 that mostly all C/I margins are positive. The worst case is represented for Wanted Carrier 1 with respect to Interfering Carrier 3. The deficit with respect to the 6% C/I criterion is 0.7 dB, which is equivalent to an increase of 7.1% of victim noise temperature (instead of the normal criteria of 6%). It is expected that such a C/I level can be coordinated between satellite operators.

Ku band

There are no operational satellites that operate two-degrees away from 30° W.L. and which use the same frequency bands as the HISPASAT 30W-6 satellite. In fact, the two immediately adjacent operational satellites operating in the unplanned Ku band are the INTELSAT 701 at 29.5° W.L. and the INTELSAT 25 at 31.5° W.L. HISPASAT will operate all the traffic on HISPASAT 30W-6 following the coordination agreements reached to ensure unacceptable interference will not occur between them. Moreover, there is currently no satellite operating in the Appendix 30B Ku-band frequencies located within two degrees from 30° W

Nonetheless, a demonstration that the HISPASAT 30W-6 satellite network is two-degrees compatible is shown below. The results of the two-degree interference analysis shown below assumes a satellite, operated at 32° W or 28° W, having transmission parameters similar to those of HISPASAT 30W-6 (see Table 3). Table 4 provides a summary of the overall link C/I margins using the transmissions of HISPASAT 30W-6 as both the wanted and interfering carriers.

The interference calculations assumed a 1dB advantage for topocentric to geocentric conversion, all wanted and interfering transmission are co-polarized and all earth station antennas conform to a sidelobe pattern of 29-25 log (theta).

	Design. Emission	Mod. Type	Diam TX (m)	TX Ant. Gain (dBi)	Diam RX (m)	RX Ant. Gain (dBi)	U/L Power (dBW)	U/L Power Dens. (dBW/Hz)	D/L EIRP (dBW)	D/L EIRP Dens. (dBW/Hz)	C/N Req. (dB)	C/I Criterion (dB)
Wanted Carrier	14K0G7W	QPSK	1.2	43	2.9	49.7	-8	-49.5	5.6	-35.9	6.8	19
	14K0G7W	QPSK	2.4	49.2	1.7	44.9	-9.4	-50.9	10.4	-31.1	6.8	19
	1M80G7W	QPSK	3.7	53	2.6	48.7	9.5	-53.1	32.1	-30.5	9	17.7
	9M00G7W	8-PSK	3.7	53	2.6	48.7	15.1	-54.4	37.7	-31.8	8	20.2
	36M0G7W	QPSK	3.7	53	1.7	44.9	23	-52.6	45.1	-30.5	6.1	18.3

Table 3.- Assumed Ku-band transmission parameters of an adjacent satellite.

DESIGN EMISSION		Interfering carrier				
		14K0G7W	14K0G7W	1M80G7W	9M00G7W	36M0G7W
Wanted carrier	14K0G7W	2.7	4.4	4.6	6.0	4.5
	14K0G7W	1.5	4.1	4.5	5.9	4.4
	1M80G7W	22.2	27.9	9.2	10.5	9.0
	9M00G7W	25.3	31.0	12.3	6.7	5.1
	36M0G7W	34.8	38.7	18.6	13.0	5.5

Table 4.- Summary of the overall link C/I margins (dB)

It can be seen in Table 4 that all C/I margins are positive.

- (8) **Applications for authorizations in the Mobile-Satellite Service in the 1545–1559/1646.5–1660.5 MHz frequency bands shall also provide all information necessary to comply with the policies and procedures set forth in Rules and Policies Pertaining to the Use of Radio Frequencies in a Land Mobile Satellite Service, 2 FCC Rcd 485 (1987) (Available at address in §0.445 of this chapter.);**

N/A

- (9) **Applications to license multiple space station systems in the non-voice, non-geostationary mobile-satellite service under blanket operating authority shall also provide all information specified in §25.142; and**

N/A

- (10) **Applications for authorizations in the 1.6/2.4 GHz Mobile-Satellite Service shall also provide all information specified in §25.143.**

N/A

- (11) **In addition to a statement of whether the space station is to be operated on a common carrier basis, or whether non-common carrier transactions are proposed, as specified in paragraph (c)(11) of this section, satellite applications in the Direct Broadcast Satellite service must provide a clear and detailed statement of whether the space station is to be operated on a broadcast or non-broadcast basis.**

N/A

- (12) **Applications for authorizations in the non-geostationary satellite orbit fixed-satellite service (NGSO FSS) in the bands 10.7 GHz to 14.5 GHz shall also provide all information specified in §25.146.**

N/A

- (13) **For satellite applications in the Direct Broadcast Satellite service, if the proposed system's technical characteristics differ from those specified in the Appendix 30 BSS Plans, the Appendix 30A feeder link Plans, Annex 5 to Appendix 30 or Annex 3 to Appendix 30A, each applicant shall provide:**

- (i) **The information requested in Appendix 4 of the ITU's Radio Regulations. Further, applicants shall provide sufficient technical**

- showing that the proposed system could operate satisfactorily if all assignments in the BSS and feeder link Plans were implemented.
- (ii) Analyses of the proposed system with respect to the limits in Annex 1 to Appendices 30 and 30A.

N/A

- (14) A description of the design and operational strategies that will be used to mitigate orbital debris including the following information:

- (i) A statement that the space station operator 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 space station becoming a source of debris by collisions with small debris or meteoroids that could cause loss of control and prevent post-mission disposal;

The spacecraft is designed such that no debris will be released during normal operations. As part of the daily routine operations, an analysis using a public catalogue of orbital objects is conducted to avoid any collision, preventing the spacecraft to become a source of debris.

- (ii) A statement that the space station operator has assessed and limited the probability of accidental explosions during and after completion of mission operations. This statement must include a demonstration that debris generation will not result from the conversion of energy sources on board the spacecraft into energy that fragments the spacecraft. Energy sources include chemical, pressure, and kinetic energy. This demonstration should address whether stored energy will be removed at the spacecraft's end of life, by depleting residual fuel and leaving all fuel line valves open, venting any pressurized system, leaving all batteries in a permanent discharge state, and removing any remaining source of stored energy, or through other equivalent procedures specifically disclosed in the application;

Please, see Attachment A (This information is subject to EAR and does not must be public available. Please keep it confidential).

- (iii) A statement that the space station operator has assessed and limited the probability of the space station becoming a source of debris by collisions with large debris or other operational space stations. Where a space station will be launched into a low-Earth orbit that is identical, or very similar, to an orbit used by other space stations, the statement must include an analysis of the potential risk of collision and a description of what measures the space station operator plans to take to avoid in-orbit collisions. If the space station operator is relying on coordination with another system, the statement must indicate what steps have been taken to contact, and ascertain the likelihood of successful coordination of physical operations with, the other system. The statement must disclose the accuracy--if any--with which orbital parameters of non-geostationary satellite orbit space stations will be maintained, including apogee, perigee, inclination, and the right ascension of the ascending node(s). In the event that a system is not able to maintain orbital tolerances, i.e., it lacks a propulsion system for

orbital maintenance, that fact should be included in the debris mitigation disclosure. Such systems must also indicate the anticipated evolution over time of the orbit of the proposed satellite or satellites. Where a space station requests the assignment of a geostationary-Earth orbit location, it must assess whether there are any known satellites located at, or reasonably expected to be located at, the requested orbital location, or assigned in the vicinity of that location, such that the station keeping volumes of the respective satellites might overlap. If so, the statement must include a statement as to the identities of those parties and the measures that will be taken to prevent collisions;

HISPASAT has assessed and limited the probability of the space station becoming a source of debris as a result of collisions with large debris or other operational space stations. As part of the daily routine operations, an analysis using a public catalogue of orbital objects is conducted to avoid any collision, preventing the spacecraft to become a source of debris.

The proposed orbital location for HISPASAT 30W-6 is 30° W.L. same as HISPASAT 30W-4 and HISPASAT 30W-5. HISPASAT 30W-6 will be a replacement of HISPASAT 30W-4 and will be maintained on the geostationary orbit within a window of less than $\pm 0.07^\circ$ in North-South and less than $\pm 0.05^\circ$ East-West. It will be co-located with the other two satellites. The co-location strategy is coordinated for all the satellites in the cluster and will be based on separation in eccentricity and inclination method assuring no collisions between the satellites.

- (iv) **A statement detailing the post-mission disposal plans for the space station at end of life, including the quantity of fuel--if any--that will be reserved for post-mission disposal maneuvers. For geostationary-Earth orbit space stations, the statement must disclose the altitude selected for a post-mission disposal orbit and the calculations that are used in deriving the disposal altitude. The statement must also include a casualty risk assessment if planned post-mission disposal involves atmospheric re-entry of the space station. In general, an assessment should include an estimate as to whether portions of the spacecraft will survive re-entry and reach the surface of the Earth, as well as an estimate of the resulting probability of human casualty.**

Please, see Attachment A (This information is subject to EAR and does not must be public available. Please keep it confidential).

- (15) **Each applicant for a space station license in the 17/24 GHz BSS shall include the following information as an attachment to its application:**
 - (i) **Except as set forth in paragraph (d)(15)(ii) of this section, an applicant proposing to operate in the 17.3-17.7 GHz frequency band, must provide a demonstration that the proposed space station will comply with the power flux density limits set forth in Sec. 25.208(w) of this part.**
 - (ii) **In cases where the proposed space station will not comply with the power flux density limits set forth in Sec. 25.208(w) of this part, the applicant will be required to provide a certification that all potentially affected parties acknowledge and do not object to the**

use of the applicant's higher power flux densities. The affected parties with whom the applicant must coordinate are those GSO 17/24 GHz BSS satellite networks located up to 6 away for excesses of up to 3 dB above the power flux-density levels specified in Sec. 25.208(w) of this part, and up to 10 away greater for excesses greater than 3 dB above those levels.

- (iii) In cases where the proposed 17/24 GHz BSS space station will be operated in the 17.3-17.7 GHz band, or operated to provide international service in the 17.7-17.8 GHz band, and cannot be located precisely at one of the nominal 17/24 GHz BSS orbital locations specified in Appendix F of the Report and Order, adopted May 2, 2007, IB Docket No. 06-123, FCC 07-76, the applicant must provide a demonstration that the proposed space station will not cause more interference to other 17/24 GHz BSS satellite networks operating in compliance with the rules for this service than if it were located at the precise 17/24 GHz BSS orbital location from which its proposed location is offset.
- (iv) An applicant proposing to provide international service in the 17.7-17.8 GHz band must demonstrate that it will meet the power flux density limits set forth in Sec. 25.208(c) of this part.

N/A

- (16) In addition to the requirements of paragraph (d)(15) of this section, each applicant for a license to operate a 17/24 GHz BSS space station that will be used to provide video programming directly to consumers in the United States, that will not meet the requirements of Sec. 25.225 of this part, must include as an attachment to its application a technical analysis demonstrating that providing video programming service to consumers in Alaska and Hawaii that is comparable to the video programming service provided to consumers in the 48 contiguous United States (CONUS) is not feasible as a technical matter or that, while technically feasible, such service would require so many compromises in satellite design and operation as to make it economically unreasonable.

N/A