Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
GLOBALSTAR, L.P.	)	File Nos. 182-SAT-P/LA-97(64)
	)	and 183-186-SAT-P/LA-97
For Authority to Launch and Operate	)	
a Satellite System to Provide Mobile-	)	(IBFS File Nos.
Satellite Services in the 2 GHz Bands	)	SAT-LOA-19970926-00156,
	)	SAT-LOA-19970926-00151-154)

APPLICATION FOR MODIFICATION OF LICENSE

Of Counsel:

William D. Wallace
CROWELL & MORING LLP
1001 Pennsylvania Avenue, NW
Washington, DC 20004
(202) 624-2807

William F. Adler
Vice President, Legal and
Regulatory Affairs
GLOBALSTAR, L.P.
3200 Zanker Road
San Jose, CA 95134
(408) 933-4401

Dated: July 17, 2002

TABLE OF CONTENTS

Page

INDEX OF TABLES

Page

INDEX OF FIGURES

Page

Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
GLOBALSTAR, L.P.	)	File Nos. 182-SAT-P/LA-97(64)
	)	and 183-186-SAT-P/LA-97
For Authority to Launch and Operate	)	
a Satellite System to Provide Mobile-	)	(IBFS File Nos.
Satellite Services in the 2 GHz Bands	)	SAT-LOA-19970926-00156,
	)	SAT-LOA-19970926-00151-154)

APPLICATION FOR MODIFICATION OF LICENSE

Globalstar, L.P. ("GLP"), hereby requests modifications of the Order and Authorization (DA 01-1634, released July 17, 2001) ("Order"), granting the above-referenced applications to launch and operate a satellite system ("GS-2") in the 2 GHz Mobile-Satellite Service ("2 GHz MSS").

I. INTRODUCTION AND PURPOSE OF APPLICATION

The GS-2 system is a satellite-based communications system intended to provide worldwide voice and data communications for mobile, portable and fixed user terminals. In the Order, the Commission authorized GLP to construct, launch and operate GS-2 as a system comprised of a non-geostationary ("NGSO") constellation (Call Sign S2320) and four geostationary ("GSO") satellites (Call Signs S2321-S2324). GLP was authorized to use a "Selected Assignment" of 3.5 MHz in each direction in the 2 GHz MSS band, in accordance with the rules and policies adopted for 2 GHz MSS.[1] Feeder link frequencies were assigned for the NGSO constellation, but not for the GSO satellites.

As of July 17 2002, GLP has entered into a non-contingent contract for construction of both the NGSO and GSO satellites in its 2 GHz MSS system with Space Systems/Loral, Inc. In the process of developing a contract for GS-2, GLP has decided to modify a number of the technical parameters of the authorized system and is seeking authority for other parameters that remained pending.[2]

A complete description of the GS-2 system and service proposal was provided in Globalstar's September 26, 1997, initial application ("GS-2 Application"). The November 3, 2000, amendment brought the system into compliance with the rules and policies adopted in the 2 GHz MSS Rules Order. The general description of the system design, technical capabilities and services to be provided by GS-2 remain essentially the same. This narrative describes the proposed modifications to the authorized GS-2 system, including:

- Reconfigure the non-geostationary ("NGSO") constellation from 64 satellites to 48 in-service in eight orbital planes and eight in-orbit spare satellites at a lower altitude parking orbit. All satellites will be at an inclination angle of 52 degrees;

---

[1] See Establishment of Rules and Policies for the Mobile-Satellite Service in the 2 GHz Band, 15 FCC Rcd 16127 (2000) ("2 GHz MSS Rules Order").

[2] GLP is contemporaneously filing a separate "Request for Wavier and Modification of Implementation Milestones for Satellite Constellation" addressing proposed modifications to the milestone schedule established in the Order. A copy is attached as Appendix A.

- Lower the orbital height of the NGSO constellation from 1420 to 1414 kilometers;
- Reduce the number of antenna beams on the NGSO satellites from 96 to 16;
- Specify the authorized NGSO feeder uplinks as 15.43-15.61 GHz (rather than 15.43-15.63 GHz);
- Expand the authorized NGSO feeder downlinks to 6700-6885 MHz (from 6700-6800 MHz);
- Modify the technical parameters of the NGSO satellites to correspond to the changes in orbital height, beam patterns and feederlinks.
- Specify a new orbital location in the domestic arc at 99° West, replacing the slot at 101° West;
- Select orbital locations for the three other authorized GSO satellites at 10° East, 100° East and 170° West;
- Select feeder uplinks for the GSO satellite at 99° West at 13.795-13.995 GHz;
- Select feeder downlinks for the GSO satellite at 99° West at 11.5-11.7 GHz;
- Select feeder uplinks for the GSO satellites at 10° East, 100° East and 170° West as 200 MHz from within the band 12.75-13.25 GHz;
- Select feeder downlinks for the GSO satellites at 10° East, 100° East and 170° West as 200 MHz from within the bands 10.7-10.95 GHz or 11.2-11.45 GHz;
- Modify the antenna beam patterns on the GSO satellites from 64 to 263 beams;
- Modify the technical parameters of the GSO satellites to reflect changes in beam patterns and feederlink frequencies.
- Eliminate the use of Inter-Satellite Links.

These proposed modifications to GS-2 will streamline the system, make it more efficient, and fill in the remaining gaps in the authorized GS-2 design without increasing the potential for harmful interference.

II. DESCRIPTION OF MODIFIED NGSO CONSTELLATION.

GLP has chosen to modify its NGSO constellation so that it is more of a "clone" of the existing Globalstar Big LEO constellation. Globalstar's first-generation system covers the globe very well and has proven to be easy to operate and maintain in orbit. Using the first-generation satellite design and constellation operating parameters while changing the payload will allow GLP to save literally hundreds of millions of dollars in design, development and production costs.

Accordingly, like the Globalstar Big LEO constellation, the modified NGSO constellation is comprised of 48 low-earth orbit satellites at 1414 km altitude that will provide global coverage between 70 degrees north and south latitudes. As with the original GS-2 NGSO proposal, the modified NGSO constellation will provide continuous coverage of the specified range of latitudes that correspond to a major portion of the populated earth. The system is designed to maximize elevation angles to improve availability to end-users. The NGSO constellation will be designed and constructed to meet the requirements of the Commission and the International Telecommunication Union (ITU). GLP has reduced the number of satellites in the NGSO constellation to improve its cost-effectiveness. The revised constellation design will maximize capacity and quality of service.

A. NGSO Satellite Constellation Parameters.

The modified NGSO constellation contains 48 satellites, in eight orbital planes, each with six satellites and an inclination angle of 52 degrees. There will be eight in-orbit spare satellites to be located at a parking orbit of 920 kilometers until needed. The constellation is a 48/8/1 Walker. The satellite payload remains a "bent-pipe" transponder that includes: service uplink and downlink antenna arrays, which form 16 spot beams on the Earth's surface for links between users and the satellite; horn antennas for feeder uplinks and downlinks, as well as for telemetry and command; and adjustable gain transponders which are connected to the feederlink and service link antennas and frequency selection filters. The specifics of the NGSO constellation are shown in Table 1.

Number of Satellites	48
Orbital Altitude	1414 km
Number of Planes	8
Inclination	52°
Argument of perigee	90°
Eccentricity	0
Plane spacing at equator	45°
Relative phasing between satellites in adjacent planes	7.5°
Orbit period	114 minutes

Table 1. GS-2 Modified NGSO Constellation Parameters

Figure A shows the modified GS-2 satellites in the NGSO constellation as they orbit the earth. The system will provide coverage to all 50 United States, Puerto Rico, the U.S. Virgin Islands, and the majority of the populated regions of the world, and will meet the geographic coverage requirements for 2GHz MSS NGSO constellations set forth in Section 25.143(b)(ii-iii) of the Commission's Rules.

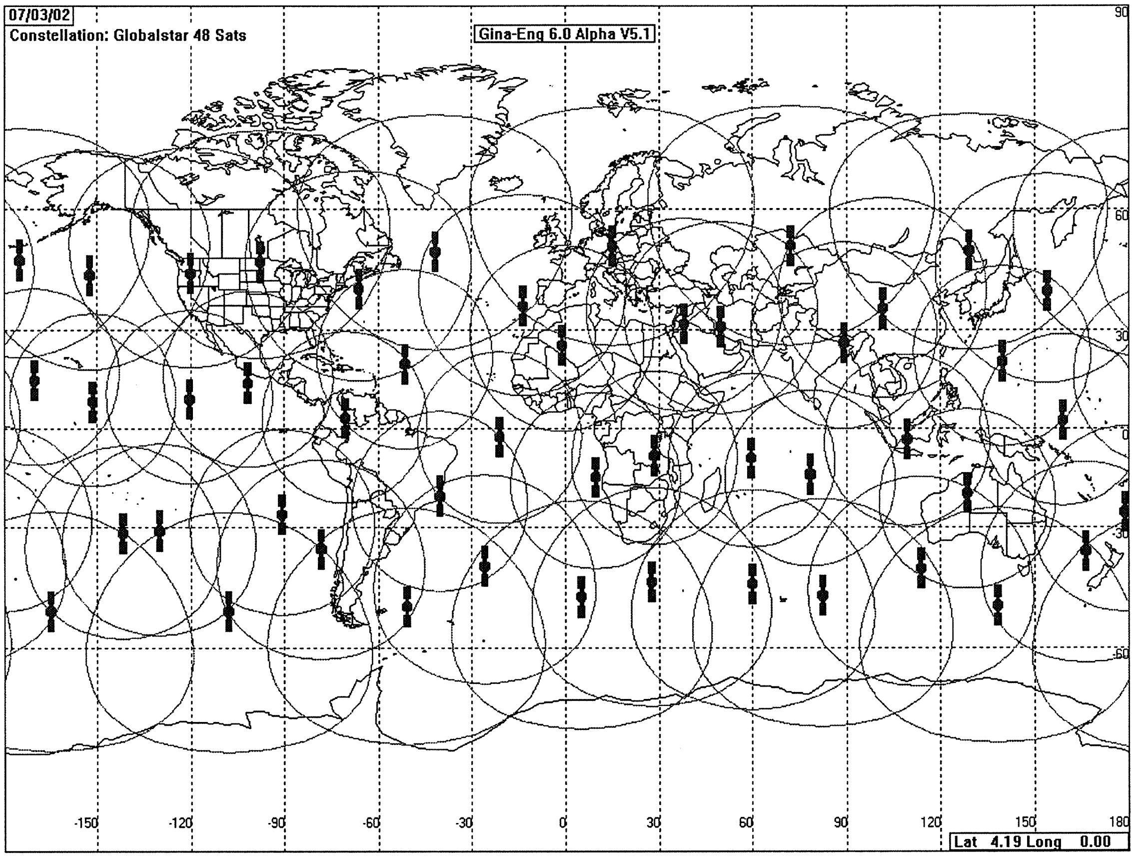


Figure A. GS-2 Modified NGSO Satellite Constellation Orbital Map

The 48 NGSO satellites are placed in eight planes separated by angles of 45 degrees. Each orbit plane has a distinct Right Ascension of the Ascending Node (RAAN), since the RAAN gives the location of the northward equatorial crossing point of each plane with respect to a reference direction. The six satellites in an orbit plane share a common RAAN. A letter, A-H, as shown in Table 2, designates each plane. The six satellites in each orbit plane are numbered consecutively, 1-6.

The RAANs of the orbit planes are at 45-degree intervals. The RAAN of any orbit plane changes by –3.1 degrees per day, or 3.1 degrees to the west each day due to a perturbation known as nodal regression. Accordingly, the RAANs of all the satellites change as functions of time, as shown in Table 2. The RAAN of each orbit plane cycles through 360 degrees in about 116 days or approximately three times per year. The RAAN value at an epoch will be specified when launch documents are prepared.

The argument of perigee (ARGP) for a satellite is the angle measured around the orbit in the direction of motion of the satellite from the ascending node to the perigee. The position of the perigee, and the ARGP, varies with time because of perturbations arising from the fact that the Earth's mass is not uniformly distributed.

For the modified 2 GHz NGSO constellation, specific choices of orbital eccentricity (or shape) and the ARGP operate to minimize the rates of change for mean eccentricity and mean ARGP. These mean values are the values of the two orbital elements averaged over one orbital revolution. The mean eccentricity will be on the order of 0.001 and the mean ARGP will be set to 90 degrees as shown in Table 2.

Plane		RAAN, degrees *	ARGP, degrees
A.	Satellites A1-A6	0-3.1T	90
B.	Satellites B1-B6	45-3.1T	90
C.	Satellites C1-C6	90-3.1T	90
D.	Satellites D1-D6	135-3.1T	90
E.	Satellites E1-E6	180-3.1T	90
F.	Satellites F1-F6	225-3.1T	90
G.	Satellites G1-G6	270-3.1T	90
H.	Satellites H1-H6	315-3.1T	90

* T is time in days.

Table 2. RAAN and ARGP for GS-2 Modified NGSO Constellation

B. Frequency Plan and Transmission Parameters.

The GS-2 system is designed to operate over the available service uplink MSS band of 1990-2025 MHz within the United States and 1980-2025 MHz elsewhere where allocated and over the available service downlink MSS band of 2165-2200 MHz within the United States and 2160-2200 MHz elsewhere where allocated.

The identified feeder link spectrum for this system has been allocated at WRC-95 to feeder links for NGSO MSS systems, and has now been allocated for MSS feederlinks in the United States.[3]

---

[3] See Final Acts of the World Radiocommunication Conference, Pt. I (Geneva 1995); Amendment of Parts 2, 25 and 97 of the Commission's Rules with regard to the Mobile-Satellite Service Above 1 GHz, 17 FCC Rcd 2658 (2002).

The NGSO constellation will use 180 MHz of feeder uplink spectrum from within the band assigned in Order (¶ 14). Specifically, the band 15.43-15.61 GHz will be used. GLP was originally authorized to use 100 MHz of C-band spectrum for the feeder downlink (Order, ¶ 14). As a result of the change in NGSO satellite design described herein, GLP is requesting 185 MHz of feeder downlink spectrum in the C-band allocation at 6700-6885 MHz. GLP requests that the band 6800-6885 MHz be added to its existing feeder downlink assignment to accommodate the direct one-to-one translation between the service uplink and feeder downlink. The requested frequency and polarization plan is shown in Table 3.

Satellite Link	Allocated Frequency Band	Polarization
User to Satellite	US: 1990 – 2025 MHz Where available: 1980 - 2025 MHz	LHCP
Satellite to User	US: 2165 – 2200 MHz Where available: 2160 - 2200 MHz	LHCP
Gateway to Satellite	15.43 – 15.61 GHz (command link at 15.58 GHz)	LHCP and RHCP
Satellite to Gateway	6700 – 6885 MHz (includes 24 telemetry carriers with 0.3 MHz bandwidths and center frequencies going from 6875.15 MHz to 6882.05 MHz in 0.300 MHz steps)	LHCP and RHCP

Table 3. Frequency and Polarization Plans

A summary of the transmission rates and modulation characteristics for the service and feeder link carriers as well as the command and telemetry carriers is shown in Table 4. The carriers with transmission rates of multiples of 1.23 Mbps may occupy common segments of the service and feeder link spectrum. This will provide significant spectrum efficiency and system flexibility with the service links. The corresponding emission designators are shown in Table 5.

Satellite Link	Transmission Rate, Mbps	Modulation Format	Channel Bandwidth, MHz
User to Satellite, Satellite to User, Gateway to Satellite, Satellite to Gateway	0.016*	QPSK	0.033
	0.576*	QPSK	1.2
	1.23	QPSK	1.23
	2.46	QPSK	2.46
	4.92	QPSK	4.92
Telemetry Carrier	16 kbps	PCM//BPSK	0.032
Command Carrier	16 kbps	PCM/NRZ/BPSK	0.032

* Uncoded burst rate; coding is K=9, r=1/2 convolutional

Table 4. Summary of Transmission Rates and Modulation Characteristics

Satellite Link	Emission Designators
User to Satellite, Satellite to User, Gateway to Satellite, Satellite to Gateway	33K0G7W
	1M2G7W
	1M23G7W
	2M46G7W
	4M92G7W
Telemetry Channel	33K0G7D
Command Channel	33K0G7D

Table 5. Emission Designators

Primary telemetry and command channels will be located in the feederlink bands. Secondary telemetry and command channels used for launch and emergency scenarios will also be located in the feederlink band as they are for the current Globalstar constellation. The satellite feederlink antenna beams will be full Earth coverage beams.

C. Communications Payload.

The major communications payload parameters for the modified NGSO satellites are summarized in Table 6. The communications payload block diagrams are shown in Figures B and C. It consists of two transponders, one for the forward link (from gateway-to-user terminal) and one for the return link (user terminal-to-gateway). The payload makes use of frequency re-use to reduce the feeder link bandwidth required, while providing 16 service beams to increase satellite capacity within the allocated service link frequency band.

The spacecraft is equipped with transmit filters to minimize out-of-band emissions and interference into other services plus narrow band receive and transmit filters to reduce adjacent-channel interference and select channels.

Number of beams	
Service uplink	16
Service downlink	16
Ku-band feeder uplink	1
C-band feeder downlink	1
Bandwidth per service beams	40-45 MHz
Polarization of 2 GHz service beams	Left hand circular
Satellite Receive G/T	
Service uplinks	-17.5 dB/K
Feeder uplinks	-24 dB/K
Maximum EIRP capability per beam	
Service downlink	28 dBW
Feeder downlink	27 dBW
Nominal satellite capacity	2000 simultaneous voice circuits

Table 6. GS-2 Modified NGSO Communications Payload

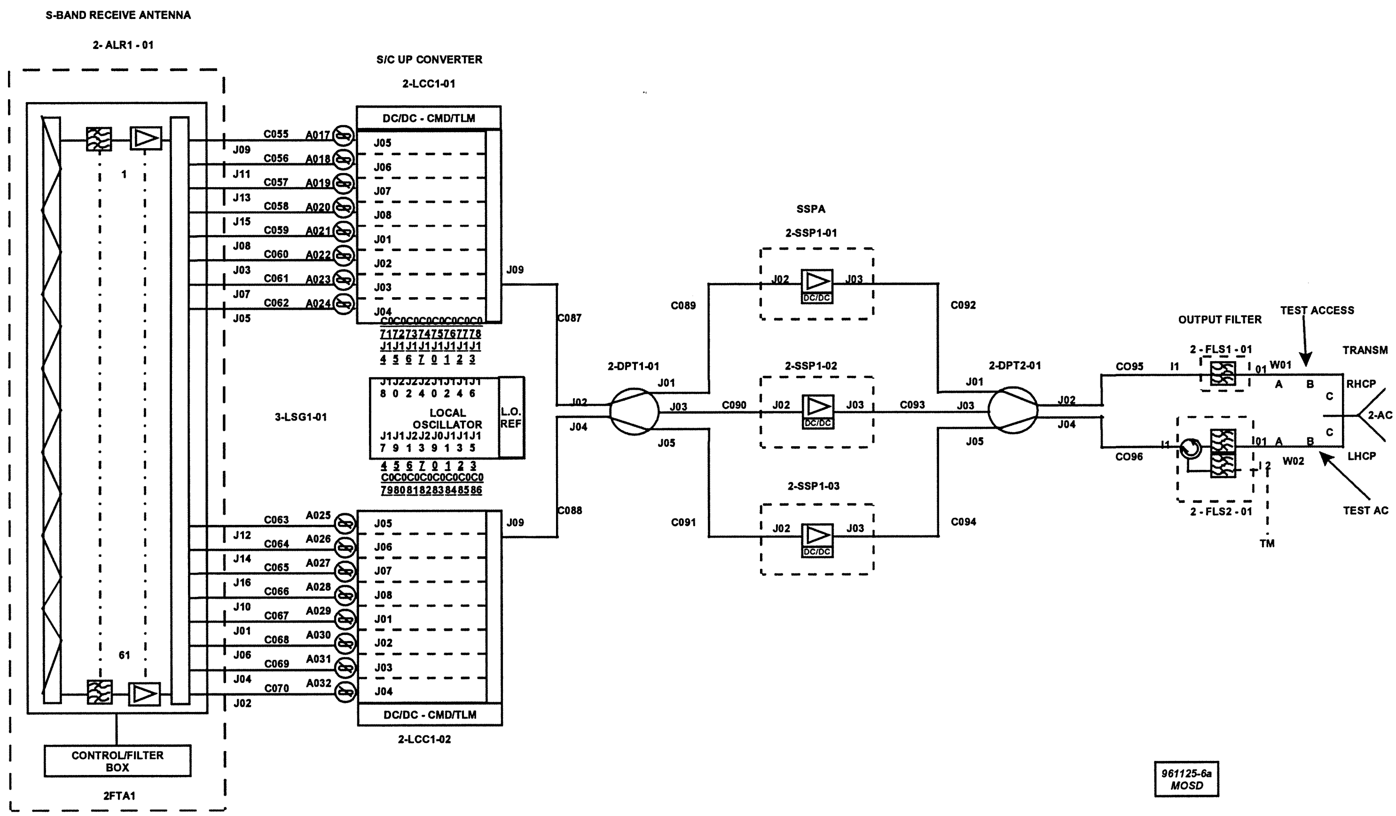


Figure B. NGSO Satellite Communications Return Link Payload

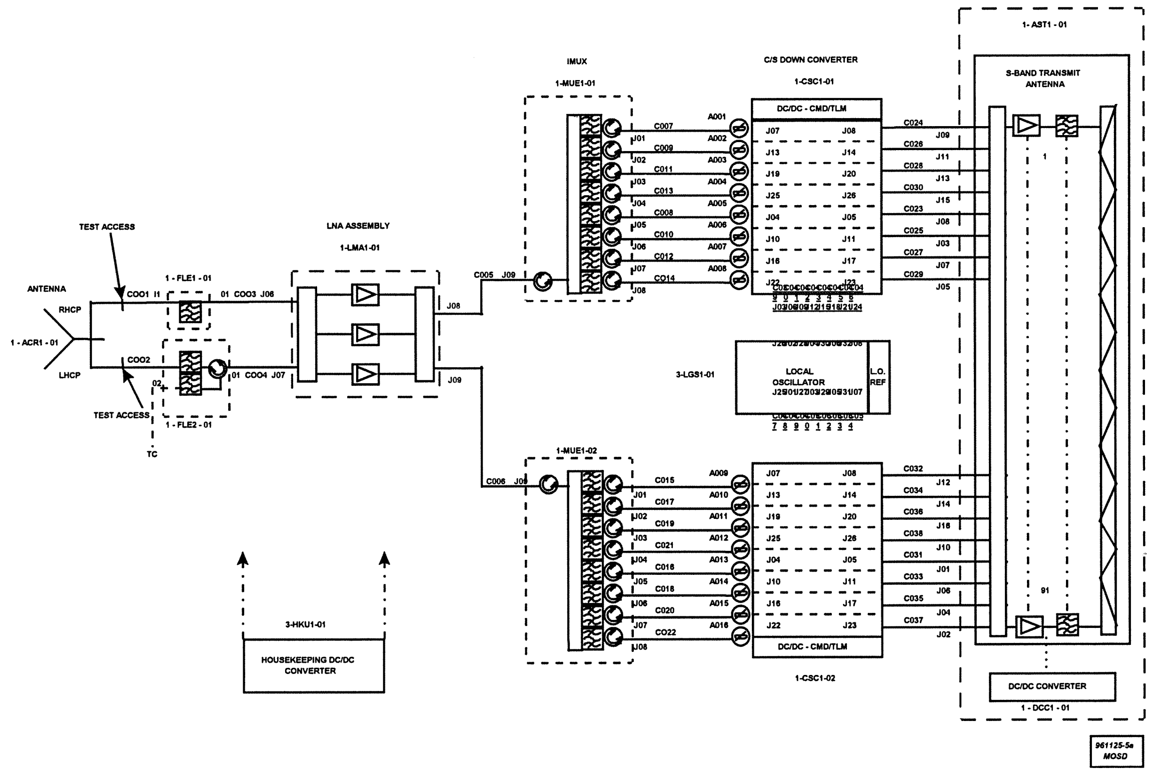


Figure C. NGSO Satellite Communications Forward Link Payload

1. Return transponder.

The return uplink signal is received at S-band through an active S-band antenna, as shown in Figure B. The antenna is a phased array antenna that forms 16 beams on the earth's surface. The outputs from the individual antenna elements, each of which includes a low-noise preamplifier, are fed into 16 uplink beam-forming networks (BFNs). The 16 outputs from the BFNs are sent to a bank of surface acoustic wave (SAW) filters which are controllable, either by ground command or on the satellite, to allow only the range of frequencies authorized in each region as the satellite overflies that region, on a beam by beam basis. These SAW filters may be implemented either directly at S-band or at a lower frequency such as UHF. The filter outputs are fed to S-to-C-band upconverters for transmission to the gateways on feeder link frequencies. C-band solid state power amplifiers (SSPAs) amplify the upconverter signal before being transmitted to the gateway by a C-band broad-beam antenna. Polarization diversity is used for feeder links to reduce the required feeder link bandwidth. The upconverters contain attenuators to adjust the gain over a nominal 10 dB range in 1 dB steps. Nominal transponder gains are shown in the link budget.

2. Forward transponder.

The forward transponder as shown in the block diagram (Figure C) is similar to the return transponder. It uses an S-band active phased array to form 16 beams in the transmit direction, while the receive antenna is broad-beam. Filters, switches, and power dividers are employed to route one uplink feeder link sub-band into an appropriate downlink beam.

3. Antenna Patterns and Antenna Beams.

The 2 GHz uplink and downlink satellite antennas for the modified NGSO satellites are active phased arrays forming 16 spot beams that are optimized to cover the Earth's surface and are left-hand circularly polarized (LHCP). The nominal beam shapes and numbering system are in Figures D and E. Contour plots of the beam gain normalized to the peak gain are provided in Appendix B for the center beam and one representative beam for each of the appropriate beam types. Contour patterns are also supplied for the feeder link broad beam antenna. There is a nominal 1 dB transmit and receive line loss.

The antenna arrays include the SSPAs for transmit and the LNAs for receive. The antenna gains cited include all losses. The gain contours are angular and are not projections onto the Earth. The X and Y coordinates are rectangular projections of the off-nadir angle.

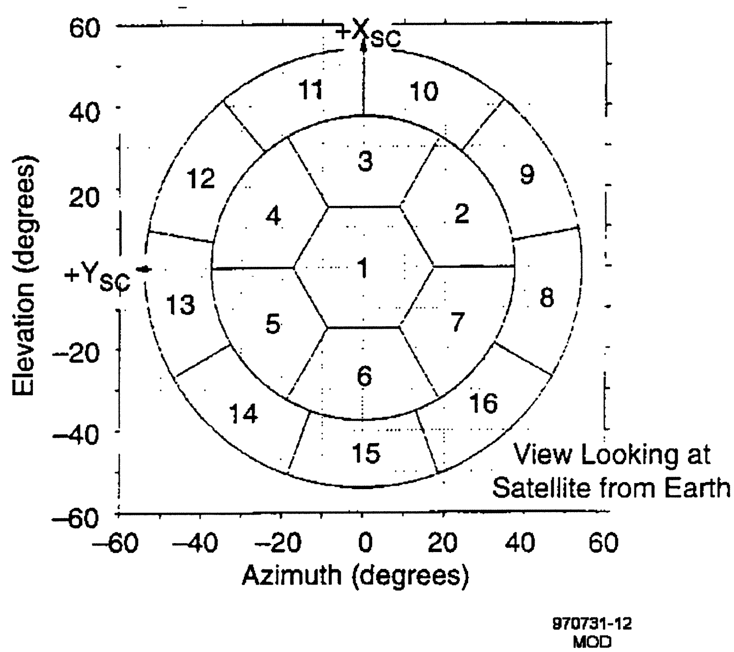


Figure D. Numbering Convention for NGSO Forward Link Beams

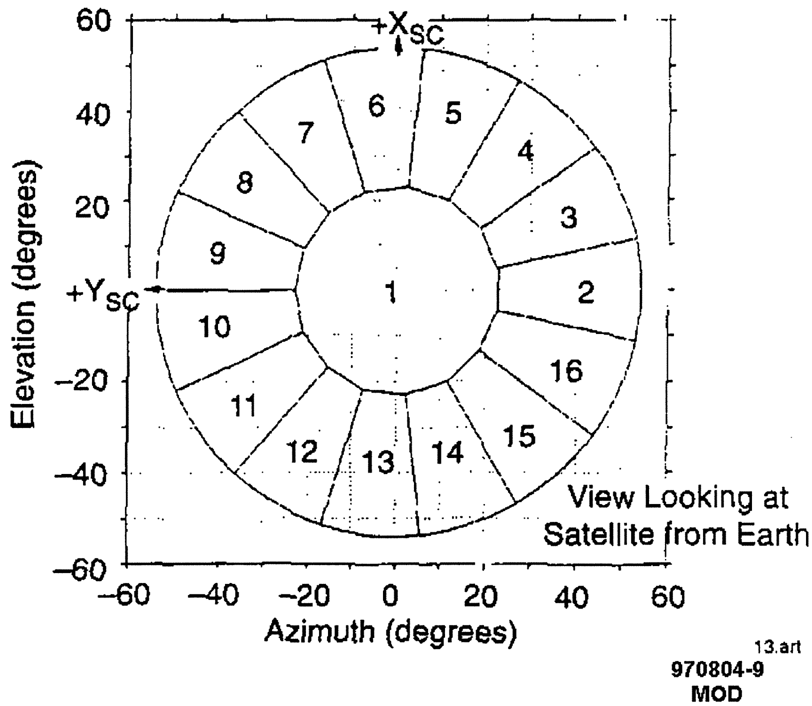


Figure E. Numbering Convention for NGSO Return Link Beams

D. Spacecraft Characteristics.

Figure F depicts the NGSO spacecraft configuration with the solar arrays stowed. The payload is mounted on the earth-facing panel of the spacecraft for efficient communications. The mechanical configuration is designed to maximize the number of units that can be launched successfully on a single vehicle, minimizing launch costs. The satellite design minimizes manufacturing cost, consistent with the communications mission and maximizes reliability of the system, which in turn maximizes useful life of the satellite.

Table 7 shows the physical characteristics of the spacecraft. The antennas are fixed-mounted. The active transmit antennas are provided with heat pipes and radiating panels to reject dissipated heat.

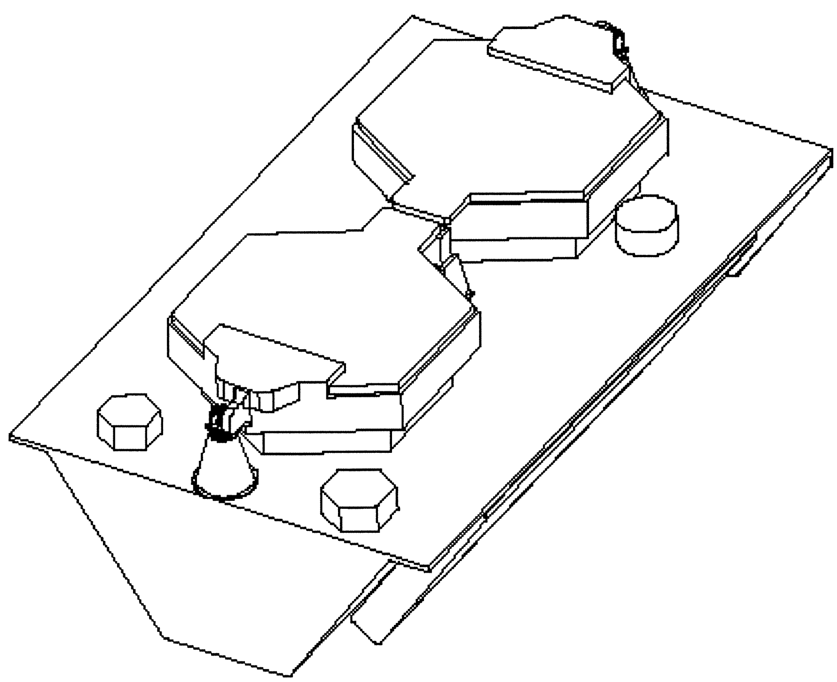


Figure F. NGSO Spacecraft Configuration

Spacecraft Dimensions	
Length Width Height	4.2 m 2.1 m 1.5 m
Spacecraft Dry Weight	1750 kg
Spacecraft Wet Weight	2106 kg
Orbit Average DC Power	
End of Life	10043 W
Propellant	356 kg
Attitude and Orbit Control	
Attitude Control	3 Axis Stabilized, Momentum Bias
Orbit Determination	GPS

Table 7. GS-2 Modified NGSO Spacecraft Characteristics

1. Spacecraft Bus.

The satellite is a three-axis stabilized design with sun-pointing solar arrays. The satellite bus is a derivative of the Globalstar spacecraft, which is on file with the Commission, and other proven spacecraft systems. It employs a structural assembly, an electrical power system, an attitude and orbit control system, a propulsion system, a thermal control system and a telemetry and command system. The spacecraft is designed to facilitate the launch of multiple units on existing expendable launch vehicle systems.

2. Structural Subsystem.

The structural subsystem of the spacecraft is constructed of lightweight metallic and composite materials. It is designed to accommodate the loads during ground handling, launch and orbit phase of the mission, to minimize the cost of fabrication and integration, and to optimize assembly-line production. The structural subsystem is configured to maximize the number of satellites that can be efficiently integrated into the launch vehicle fairing. The structure provides a flat front (earth facing) surface for the mounting of the integral payload assembly. The internal volume of the spacecraft houses various electronic components, the propellant tank, and the attitude and orbit control system. The solar array is a deployable system with multiple panels that are stowed during launch and deploy on orbit. The structure also protects the internal electronic boxes from the effects of radiation on the electronic components.

3. Attitude and Orbit Control System (AOCS).

The AOCS performs several attitude pointing functions during the satellite life, including attitude steering during orbit raising, and antenna pointing and yaw steering during normal on-orbit operation. In addition, it provides several attitude control features required for orbit maintenance, contingency operations, and end-of-life shutdown. The use of on-orbit yaw steering allows the satellite solar arrays to be accurately sun-pointed with only a single-axis array drive system.

Using a conventional momentum-bias control system that has redundancy performs all of the above functions. This system consists of a set of four momentum wheels, magnetic torquers for wheel unloading, and horizon sensors, sun sensors and magnetometers. The use of simple, proven hardware results in a highly reliable subsystem implementation. In addition, the AOCS receives orbit position and timing data from the on-board GPS receivers.

4. Electrical Power System.

Electrical power for the spacecraft is derived from solar cells mounted on solar array panels and a storage battery located within the spacecraft. The orbit average power required for this spacecraft is shown in Table 7. When the spacecraft is in the sun, the output from these arrays is used to power the spacecraft. Under some heavy-load conditions, power from the battery is also used while the spacecraft is in sunlight.

For eclipse operation, the spacecraft power comes only from the battery. An electronic control system ensures efficient power use. The solar array power is used to recharge the battery during sunlight periods of the orbit. The solar arrays are motor driven to continuously track the sun for maximum energy generation.

5. Propulsion System.

The propulsion system is a conventional hydrazine monopropellant design. The thrusters are used for orbit raising, orbit maintenance, repositioning, contingency attitude control, final de-orbit, and as backup (to the magnetic torquers) for momentum wheel unloading.

6. Thermal Control System.

The thermal control system of the spacecraft is maintained by both passive and active systems that have been used in Globalstar, as on file with the Commission, and many previous spacecraft. Radiators and heat pipes are used to transport heat from the electronic assemblies to surfaces where the heat can be rejected to space. Some components require temperature control with heaters to maintain the thermal environment within their design constraints.

7. Reliability.

The estimated mean operational satellite lifetime is 10 years. Because the operating orbit requires very little maintenance, the life of the spacecraft is limited not by fuel, but rather by random component failures and the well-documented degradation of the solar arrays due to space environmental effects.

The satellites are designed for a probability of success at 10 years of 0.85. A major contributor to long satellite life is the use of redundancy in all critical areas, e.g., momentum wheels. Furthermore, the overall constellation operational life is greatly increased by appropriate sparing and replacement strategies for failed individual spacecraft.[4]

8. Launch Segment.

The launch segment consists of expendable launch vehicles (LVs) and ground facilities to place the satellites into their initial orbits. The satellites are designed to be launched on LVs with a minimum fairing diameter of 5 meters. LV candidates include the Delta, Ariane, and Atlas, all of which offer the key cost advantage of multiple spacecraft per launch. Final selection of specific LVs will be made later in the program, based on constellation fill and sparing strategies, launch site suitability, cost, number of satellites per launch, and program risk.

---

[4] GLP plans to update its orbital debris mitigation statement at least six months prior to the Critical Design Review milestone. See Order, ¶ 43.

It should be pointed out that in order to place satellites from the same launch into different operational orbital planes, it is necessary to launch them into an intermediate altitude orbit, and let asymmetric earth forces slowly drift the orbit plane away from the original launch plane and into the final operational plane. This is the same well-established technique that was used for the Globalstar Big LEO constellation.

E. Power Flux Density Compliance.

Estimates of power flux density (pfd) have been determined for the satellites. For the space-to-Earth links in the bands 2165-2200 MHz for the United States and 2160-2200 MHz where available elsewhere globally, the system operating levels will not exceed the pfd values in table 5-2 of Appendix 5 of the Radio Regulations. For the space-to-Earth links in the band 6700-6885 MHz, the system operating levels will not exceed the pfd limits in table 21-4 of Article 21 of the Radio Regulations.

F. Spectrum Sharing.

The proposed system is designed to accommodate sharing of spectrum with other NGSO systems in the feeder links. Sharing in the service links can be accommodated if such sharing is arranged among the licensees in the 2 GHz band. Further, techniques exist which can be used to mitigate interference between multiple NGSO systems. Such interference mitigation techniques include polarization diversity, spread spectrum, power control and satellite diversity, which allows links between users and/or gateways to be established through one or more satellites.

G. Link Budgets.

In Appendix C, representative link budget calculations for the communication links for voice transmissions with CDMA links (Tables C-1 and C-2) have been provided. Both forward and return links with clear line-of-sight (LOS) are presented between a user at average elevation angles for the system. Although shown for voice, the same link budgets can be used for low rate data at 2.4 kbps. Link budgets for higher data rates can be easily derived by using higher power levels transmitted per user (i.e., for a factor of 2 increase in data rate, 3 dB more power per user is needed). Channel bandwidths are as shown in Table 4. The required Eb/No for each link includes margin for power control.

H. Telemetry & Command Link Budgets.

The telemetry and command link budgets are provided in Appendix D.

III. DESCRIPTION OF MODIFIED GSO SATELLITES

GLP has been authorized to construct, launch and operate four geostationary (GSO) satellites. The purpose of the GSO constellation is to provide communications traffic capacity to selected high-user-density regions and to provide service to where the NGSO gateways do not provide service. The 2 GHz GSO segment will provide the same voice telephony services as provided by the 2 GHz NGSO system to mobile user terminals. For fixed user terminals, the GSO segment will provide data service up to a rate of 144 kbps.

The GS-2 ground segment consists of two subsets, one required for satellite operations and the other required for MSS communications service. Designated existing Globalstar gateways may be augmented with Ku-band communications equipment for operation with the 2 GHz GSO satellites. The 2 GHz user terminal design will take into account operation with the longer delays experienced on a communication path with a GSO satellite as well as the shorter delays with the NGSO satellites. Whereas the NGSO system relies on satellite diversity to achieve high availability, operation through the 2 GHz GSO system will rely upon the higher elevation angles to the GSO satellite to ensure high availability, rather than satellite diversity.

A. GSO Satellite Constellation Description.

Although the Commission authorized GLP to launch and operate four GSO satellites, specific orbital locations have not yet been identified because of difficulties in identifying appropriate feeder links. In conjunction with its request for specific feeder link frequencies in this application, GLP requests the following geostationary orbital locations for its 2 GHz MSS listed in Table 8.[5]

---

[5] GLP's four orbital slots have been advanced published to the ITU by the Commission under the names set forth in Table 8. The only change in position from the initial request is from 101° West to 99° West. In accordance with Commission requirements, GLP has initiated an analysis of the inter-satellite interference environment with respect to operation of the GSO satellite at, in the alternative, 99° W.L., 97° W.L., 103° W.L. or 105° W.L. This analysis is evaluating ITU filings within several degrees of these locations as well as U.S. licenses and applications for satellite systems in the vicinity. These analyses are expected to be completed shortly and will be submitted to the Commission.

GLP is also analyzing the current and planned operations for the three GSO satellites at 10° E.L., 100° E.L. and 170° W.L. with respect to the feederlink bands set forth in Table 9 to determine which frequencies are most appropriate for each of the GSO satellites operating outside of the United States. (As a potential
(continued...)

Satellite	General Description of Coverage Area	Orbital Locations	Coverage Range Longitudes	TT&C Sites*
USASAT -27E	North & South Americas (CONUS to Brazil)	99°W	(125°W to 35°W)	Clifton, TX
USASAT -27F	Europe & Africa	10°E	(35°W to 55°E)	Aussaguel, France
USASAT -27G	Asia (Afghanistan to Japan)	100°E	(55°E to 145°E)	Yeo-ju, Korea
USASAT -27H	Pacific (New Zealand to Alaska)	170°W	(145°E to 125°W)	Dubbo, Australia

*The four TT&C sites associated with the satellites are those in operation for the Globalstar system.

Table 8. GS-2 GSO Satellite Orbital Locations

B. Frequency Bands and Polarizations of Transponders.

The satellites will operate over the available frequencies presented in Table 9.[6] A summary of the transmission rates and modulation characteristics is presented in Table 10. The corresponding emission designators are shown in Table 11.

For CDMA access, the link waveforms for the GSO satellites will be the same as those of the NGSO satellites. For TDMA access, the burst rate of 16 kbps will allow four user slots in a TDMA frame.

(...continued)

alternative, GLP is also reviewing the use of the bands 13.795-13.995 GHz and 11.5-11.7 GHz at the three orbital locations outside the United States.) When these analyses are completed, GLP will submit more specific frequency proposals and interference analyses.

[6] With respect to the use of the 11.5-11.7 GHz band for the feeder downlinks at 99° West, GLP has included, as Appendix E, a request for waiver of NG104 in the U.S. Table of Frequency Allocations (47 C.F.R. § 2.106).

Satellite Link	Frequency Band	Polarization
User to Satellite	US: 1990 – 2025 MHz Where available: 1980 – 2025 MHz	LHCP
Satellite to User	US: 2165 – 2200 MHz Where available: 2160 – 2200 MHz	LHCP
Gateway to Satellite	99° West: 13795-13995 MHz 10° East, 100° East, 170° West: 200 MHz within the band 12750-13250MHz	LHCP and RHCP Both polarizations
Satellite to Gateway	99° West: 11500-11700 MHz 10° East, 100° East, 170° West: 200 MHz within the band 10700-10950 MHz or 11200-11450 MHz	LHCP and RHCP Both polarizations

Table 9. Frequency and Polarization Plans

Satellite Link	Transmission Rate, Mbps	Modulation Format	Channel Bandwidth, MHz
User to Satellite, Satellite to User, Gateway to Satellite, Satellite to Gateway	0.016 *	QPSK	0.033
	0.576 *	QPSK	1.2
	1.23	QPSK	1.23
	2.46	QPSK	2.46
	4.92	QPSK	4.92
Telemetry Carrier	32 and 1 kbps	PCM//BPSK	0.033
Command Carrier Ranging	32 kbps	PCM/NRZ/BPSK/FM	0.033

* Uncoded burst rate; coding is K=9, r=1/2 convolutional

Table 10. Summary of Transmission Rates and Modulation Characteristics

Satellite Link	Emission Designators
User to Satellite, Satellite to User, Gateway to Satellite, Satellite to Gateway	33K0G7W
	1M20G7W
	1M23G7W
	2M46G7W
	4M92G7W
Telemetry Channels	33K0G7D
Command Channels	33K0G7D

Table 11. Emission Designators

C. Communications Payload.

The four GSO spacecraft will be of the Space Systems/Loral FS-1300 product line, which includes Intelsat VII and VIIA.

The communications payload provides for 2 GHz MSS service. The communications payload block diagram is shown in Figures G and H. It consists of two transponders, one for the forward link (from gateway to terminal) and the other for the return link (user terminal to gateway). The payload uses on-board switching to reduce the feederlink bandwidth required, while providing a large number of service beams to increase satellite capacity within the allocated service link frequency band. The spacecraft is equipped with transmit filters to minimize out-of-band emissions and interference into other services plus narrowband receive and transmit filters to reduce adjacent-channel interference. In addition, the transponder includes tunable notch filters to suppress incoming interference. The TT&C subsystem is frequency-division multiplexed with the Ku-band communication subsystem on the feeder links. The major communications payload parameters are summarized in Table 12.

Type of Link	Direction	Number of beams
Service uplink Service downlink Ku-band feeder uplink Ku-band feeder downlink	Receive Transmit Receive Transmit	263 263 4 4
		Satellite receive G/T
Service uplinks Feeder uplinks	Receive Receive	+4.0 dB/K +13.0 dB/K
		Maximum EIRP capability per beam
Service downlinks Feeder downlinks	Transmit Transmit	50.8 dBW 56 dBW
Nominal satellite capacity		11,000 simultaneous voice circuits

Table 12. GS-2 GSO Communications Payload

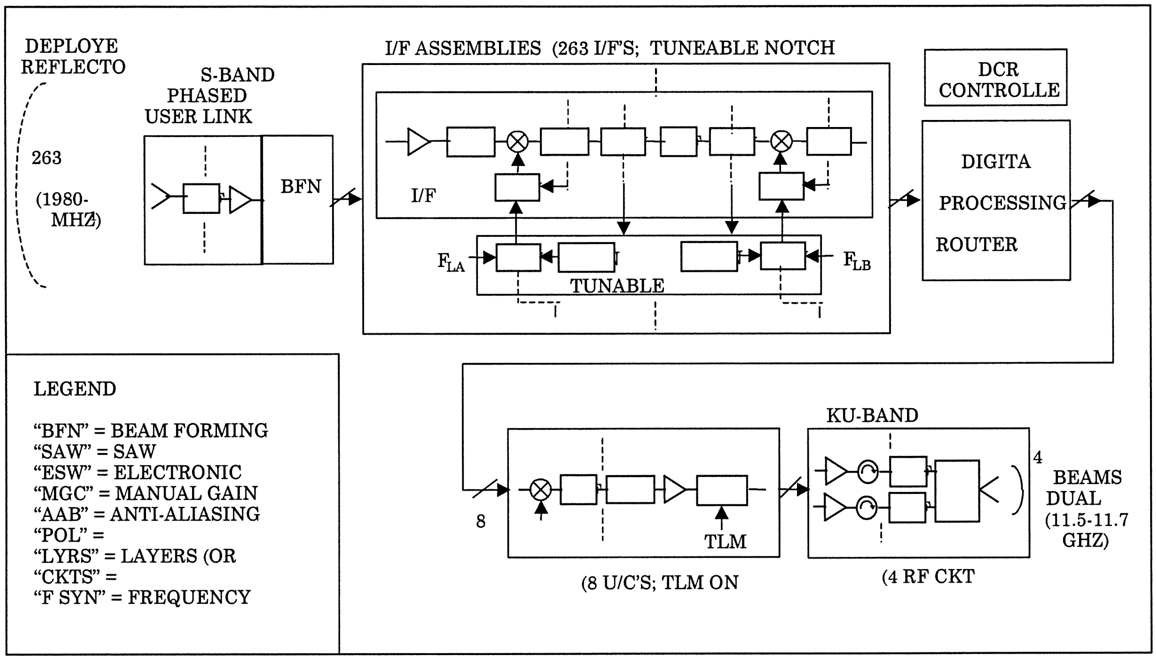


Figure G. GS-2 GSO Satellite Communications Payload (Return Link)

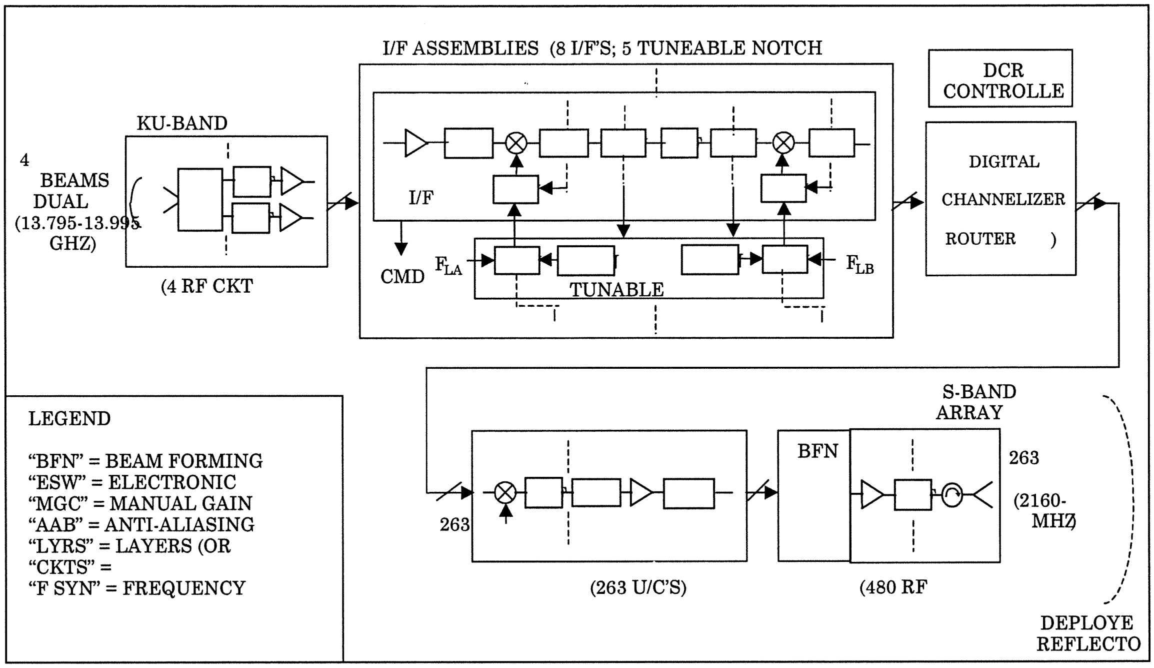


Figure H. GS-2 GSO Satellite Communications Payload (Forward Link)

1. Return transponder.

As shown in Figure G, the return service uplink signal is received at S-band. The S-band antenna consists of a deployable reflector and a 263-element feed array; together these form 263 spot beams on the Earth's surface. The outputs from the individual antenna elements are fed to a switch matrix, which has 263 outputs, each of which is fed to a low-noise preamplifier. The 263 outputs from the low-noise preamplifiers are sent to filters that are controllable, either by ground command or on the satellite, to allow only the range of frequencies authorized in each region, on a beam-by-beam basis. These filters may be implemented either directly at S-band or at a lower frequency such as UHF. The filter outputs are fed to a switch matrix. The outputs of the switch matrices are subject to S-to-Ku-band frequency conversion and frequency-division multiplexing, which concentrates the signals into eight beams for transmission to the gateways on feederlink frequencies. The upconverters contain attenuators to adjust the gain over a nominal 5 dB range in 1 dB steps. Additional gain control of 10 dB is provided in the switch and routing matrix. Each upconverter output signal is amplified by one of eight Ku-band TWTAs. Four additional TWTAs allow for a 12-for-8 redundancy. The signals are transmitted to the gateway by way of four steerable Ku-band antennas. Four spot beams are created by eight antenna feed elements to provide for four regions of the Earth where gateways may be located. Dual polarization and geographical separation of gateways is used to reduce the required feederlink bandwidth.

2. Forward transponder.

The forward transponder as shown in the block diagram (Figure H) is similar to the return transponder. The filters, switches, and power dividers are employed to route uplink feederlink sub-bands into one of 263 downlink beams. The selected signals are fed to a switch matrix, which has 263 possible outputs. The S-band antenna consists of a deployable reflector and a 263-element feed array; together these form 263 spot beams on the Earth's surface.

3. Antenna Patterns and Antenna Beams.

The contour plots of the service link spot beams are provided in Appendix F as Figures F-1 through F-3. These gain contours are angular and not projections onto the surface of the Earth. The X and Y coordinates are rectangular projections of the off-nadir angle. The contour plots for feederlinks at Ku-band are provided in Appendix F as Figures F-4 and F-5.

D. Spacecraft Characteristics.

The spacecraft is shown in Figure I. The physical characteristics of the spacecraft are presented in Table 13.

Spacecraft Main Body Dimensions	
Length Width Height	8.2 m 4.3 m 4.5 m
Spacecraft Dry Weight	3001 kg
Spacecraft Wet Weight	5821 kg
Orbit Average DC Power	
End of Life	12384 W
Propellant	2820 kg
Attitude and Orbit Control	
Attitude Control	3 Axis Stabilized, Momentum Bias
Orbit Determination	Ranging from Gateways

Table 13. GS-2 GSO Spacecraft Characteristics

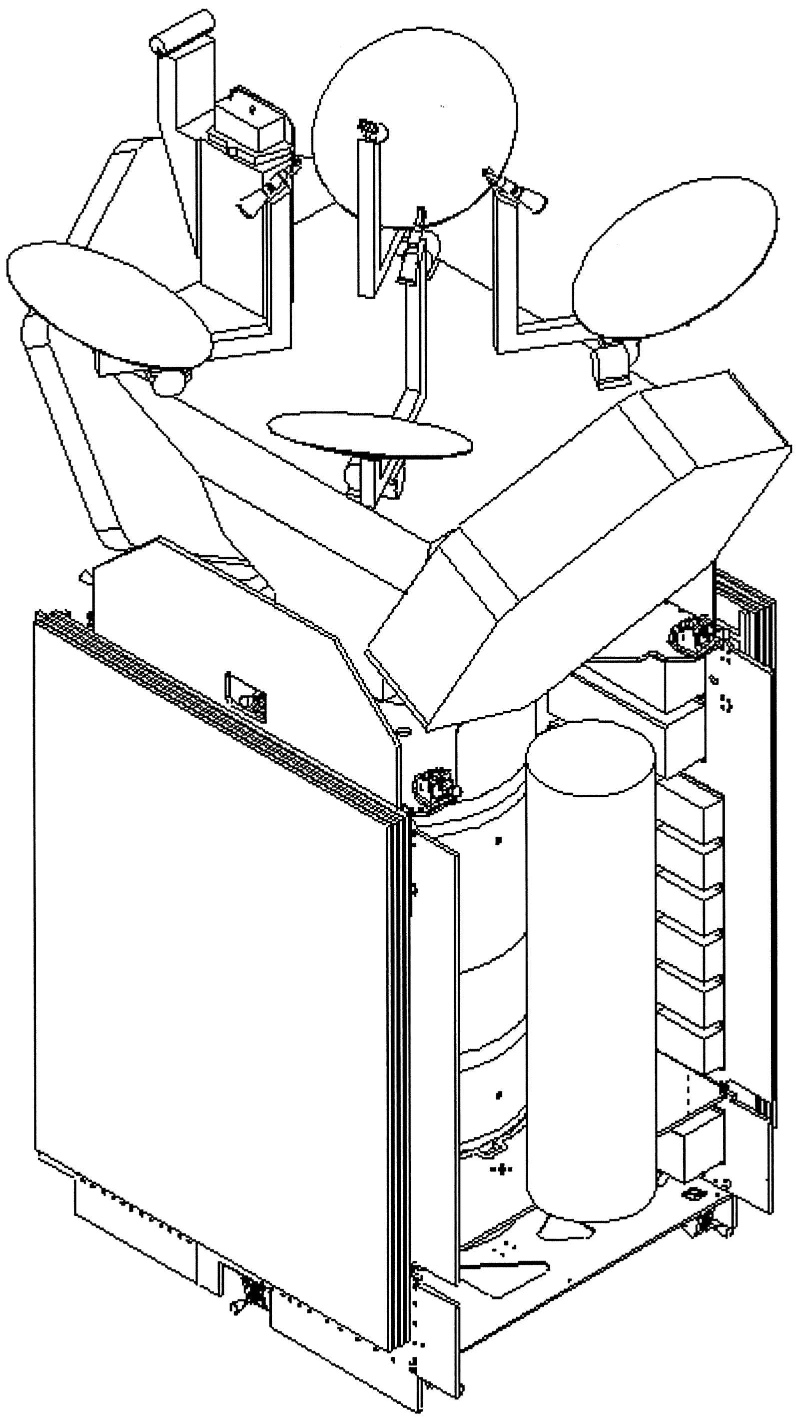


Figure I. GS-2 MSS System GSO Satellite

1. Spacecraft Bus.

The satellite bus provides a stable structural platform for accurate S-band antenna pointing. The satellite main body is structurally located between the large S-band antenna reflectors, maintaining maximum alignment of the antennas.

For the transfer orbit, the two solar array wings are deployed to provide the required electrical power and to expose the reaction control thrusters for orbit-raising maneuvers.

The major heat-dissipating spacecraft components are located on the north and south equipment panels for efficient heat radiation. To provide maximum thermal efficiency the outsides of the north and south panels are covered with optical solar reflectors.

The exterior earth-facing panel is used to mount, via an antenna support, earth sensors and a telemetry, tracking and command (TT&C) antenna. The antenna support module is attached through the earth deck to the central cylinder. This module provides support for the Ku-band antenna, the S-band feed arrays. The coarse analog and digital sun sensors are mounted on the west side. A second transmit and receive TT&C antenna is mounted to the anti-earth deck. The roll and yaw coarse-analog-sun sensors situated on the east and west (E/W) side of the spacecraft are also attached to the anti-earth panel.

Two S-band deployable truss structure (DTS) reflectors are attached to the lower E/W satellite structure. Each reflector stows as a long cylindrical package vertically up against the east or west side of the satellite. When on-orbit, the reflector and boom structure are deployed with motors in a slow controlled process.

2. Structural Subsystem.

The structural subsystem uses a central cylinder as the primary load carrying structure, as the support for two propellant tanks, and as the interface to the launch vehicle. The structure externally supports the two deployable S-band antenna reflectors and the two solar arrays. It also provides a stable platform for preserving the alignment of the critical elements of the spacecraft, such as antenna geometrical relationships and earth sensors. The mechanism subsystem includes all the deployment mechanisms and holddowns for the antenna reflectors, solar array and solar-array-drive assembly.

3. Attitude and Orbit Control System.

The attitude and orbit control system is three-axis-stabilized, momentum-biased. It is a derivative of the existing design developed for the SS/L FS-1300 bus. The same architecture, sensors, reaction components, and electronics previously qualified and flight proven will be the heritage and basis of this design.

4. Electrical Power System.

Electrical power for the spacecraft is derived from solar cells mounted on solar array panels and storage batteries located within the spacecraft. When the spacecraft is in the sun the output from these arrays is used to power the spacecraft. For eclipse operation, the spacecraft power comes only from the batteries. An electronic control system ensures efficient power management.

The solar arrays are motor driven to continuously track the sun for maximum energy generation. The solar arrays are connected to the satellite body by a yoke attached to the solar array drive assembly. The yoke is elongated to minimize sun shadowing from the DTS mesh antenna reflectors. See Figure I.

5. Propulsion System.

The propulsion subsystem is a bi-propellant system. The propellant tanks (located inside the central cylinder) provide capacity that satisfies the complete mission requirements.

6. Thermal Control System.

The sizing of the thermal radiators, heat pipes, and heaters is dominated by the specific requirements of the payload design. The thermal subsystem design will insure that all equipment is maintained within their thermal design limits.

7. Reliability.

The 2-GHz GSO spacecraft is designed for a probability of success of 0.7 for 15 years of on-orbit operation with all payload channels fully operational.[7] The spacecraft design incorporates effective redundancy and cross-strapping of all electronic assemblies and major mechanical assemblies.

8. Launch Segment.

The launch segment consists of expendable launch vehicles and ground facilities to place the satellites into geostationary orbit. The launch vehicle

---

[7] GLP plans to update its orbital debris mitigation statement at least six months prior to the Critical Design Review milestone. See Order, ¶ 43.

candidates are the Ariane, Atlas and Delta. Final selection of the specific launch vehicle will be made later in the program based on launch site suitability, cost, and program risk.

E. Power Flux Density Compliance.

Estimates of power flux density (pfd) have been determined for the satellites. For the space-to-Earth links in the bands 2165-2200 MHz for the U.S., and 2160-2200 MHz where available elsewhere globally, the system operating levels will not exceed the pfd values specified in table 5-2 of Appendix 5 of the Radio Regulations. Once the feederlink frequencies have been assigned, the system will be designed to meet the required pfd limits and calculations will be provided if needed.

F. Spectrum Sharing.

The proposed system design can be modified to accommodate sharing in the service links or the feederlinks if such sharing is required. Further, techniques exist which can be used to mitigate interference between multiple NGSO and GSO systems. Available interference mitigation techniques are polarization diversity, spread spectrum and power control.

G. Link Budgets.

Representative link budget calculations for the communications links for voice and data transmissions separately with the TDMA and CDMA links have been provided at Appendix G. In each case, forward and return links with clear line-of-sight (LOS) are presented between a user at average elevation angles for the system. A typical data rate for both systems is 144 kbps. Channel bandwidths are shown in Table 10.

In Tables G-1 through G-4, the CDMA link budgets are presented. Intra-system interference from other GS-2 users is taken into account for each link. Tables G-1 and G-2 show the forward and return links for voice transmission, respectively. Tables G-3 and G-4 show the forward and return links for data transmission at typical data rates, respectively.

In Tables G-5 through G-8, the TDMA link budgets are presented. Tables G-5 and G-6 show the forward and return links for voice transmission, respectively. The burst EIRP shown in the TDMA link budgets is the peak EIRP. The average EIRP per user is 6 dB (-10 log (4)) less than its peak value because each user terminal is assigned one slot out of four. Tables G-7 and G-8 show the forward and return links for data transmission at typical data rates, respectively.

H. Telemetry & Command Link Budgets.

The Satellite Operations and Control Center (SOCC) will be an augmentation to the existing Globalstar SOCC in San Jose, California, with a backup in El Dorado, California. The purpose of the SOCC is to monitor and control the satellite orbital location and to monitor the spacecraft status.

At four designated gateway sites, Telemetry and Command Units (TCUs) communicate with the satellites on a sub-band of the Ku-band feeder links. For the 2 GHz GSO system, there is a gateway with a TCU dedicated to each geostationary satellite. The four designated gateways could be the existing four Globalstar TT&C gateways, as shown in Table 8.

A portion of the existing worldwide Globalstar Data Network (GDN) will connect the gateway sites with TCUs to the SOCC. The GDN also connects all gateways with the GOCC and the GBO.

The Telemetry & Command Frequency Plan is presented in Table 14. The Telemetry & Command link budgets are presented in Appendix G (Tables G-9 and G-10). The satellite also provides tone ranging capability using the on-board command and telemetry equipment in loopback mode. This is used to determine accurately the slant range to the satellite in orbit.

TT&C Links	Space-to-Earth	Earth-to-space
Function	Telemetry	Command
Channel 1	11502 MHz LHCP	13796 MHz LHCP
Channel 2	11504 MHz RHCP	13798 MHz RHCP

Table 14. TT&C Frequency Plan For GSO at 99°W

I. Advance Publication Data.

Advance publication data for the GSO satellite at 99° West are provided in Appendix H.

IV. <u>INTER-SATELLITE LINKS.</u>

GLP is currently authorized to launch and operate GS-2 with inter-satellite links (ISLs) at 65.0-65.1 GHz (<u>Order</u>, ¶ 32). GLP has decided to build the GS-2 system without ISLs, and hereby returns its authorization for use of ISL frequencies.

V. REASONS FOR MODIFICATION.

The modifications described herein significantly streamline the 2 GHz MSS system. The initial proposal for GS-2 was designed almost five years ago prior to the launch of the first-generation Globalstar system. Since then, the Globalstar Big LEO system has been launched and placed into commercial service. While the technical features of the operational Globalstar system have exceeded expectations, development of a subscriber base for MSS generally has been taking much longer than anticipated. Moreover, the costs of the original design features have significantly increased over the past five years. Given the currently-depressed MSS business and the cost of the original GS-2 design, GLP believes that it is prudent to plan for a 2 GHz system that is narrower in scope and less expensive than the original GS-2 proposal.

The proposed modifications to the GS-2 system simplify the satellite component of the system by, for example, reducing the number of NGSO satellites and antenna beams on the NGSO satellites. The design also allows GLP to use features of the first-generation design and relies, in part, on off-the-shelf equipment, rather than design innovations, thereby reducing overall costs, indeed by hundreds of millions of dollars. By using this approach for the 2 GHz MSS system, GLP can achieve the services that it desires to offer for the next generation Globalstar system at a cost commensurate with the current markets for MSS.

When the Commission adopted rules and policies specifically for 2 GHz MSS licensees, it noted:

> These satellite systems will provide new and expanded regional and global data, voice and messaging services using the 2 GHz frequency band (2 GHz MSS). The 2 GHz MSS systems also will enhance competition in mobile satellite and terrestrial communications services, and complement wireless service offerings through expanded geographic coverage. 2 GHz MSS systems will thereby promote development of regional and global communications to unserved communities in the United States, its territories and possessions, including rural and Native American areas, as well as worldwide.[8]

Following two years of commercial MSS service with the Globalstar Big LEO system, GLP has been progressively modifying and updating its business plan to target those markets where MSS will be successful in the United States and the rest of the world. As a result of this effort, GLP is confident that the MSS business will eventually be a great success, and still plans that the 2 GHz MSS system will be used to expand capacity and to offer enhanced MSS. The modifications to GS-2 described herein will facilitate GLP's efforts to fulfill the Commission's expectations for 2 GHz MSS, and, therefore, grant of this application will serve the public interest.

---

[8] See 2 GHz MSS Rules Order, 15 FCC Rcd at 16127, ¶ 1.

VI. CONCLUSION.

For the reasons set forth above, GLP requests that this application be granted, and that its 2 GHz MSS system be authorized to operate as described in the original application and amendment, as further modified herein.

The information provided in this Application is accurate and complete to the best of my knowledge.

Signed this 17th day of July 2002, in San Jose, California.

Respectfully submitted,

GLOBALSTAR, L.P.

[signature]

William F. Adler
Vice President, Legal and
Regulatory Affairs
GLOBALSTAR, L.P.
3200 Zanker Road
San Jose, CA 95134
(408) 933-4401

Of Counsel:

William D. Wallace
CROWELL & MORING LLP
1001 Pennsylvania Avenue, NW
Washington, DC 20004
(202) 624-2807

ENGINEERING CERTIFICATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in the foregoing satellite system application, along with attachments and exhibits; that I am familiar with Parts 2 and 25 of the Commission's Rules and Regulations, including the rules and policies adopted for 2 GHz MSS systems; and that I have either prepared or reviewed the engineering information contained in the application, attachments and exhibits; and that it is complete and accurate to the best of my knowledge.

Signed this 17th day of July 2002.

By: ______________________________

Paul Monte
Director, Systems & Regulatory Engineering
Globalstar, L.P.

APPENDIX A: REQUEST FOR WAIVER AND MODIFICATION OF IMPLEMENTATION MILESTONES FOR 2 GHZ MSS SYSTEM

Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
GLOBALSTAR, L.P.	)	File No.
	)	
Authorization to Launch and Operate a Mobile-Satellite Service System in the 2 GHz Band	)))	
	)	

To: Chief, International Bureau

REQUEST FOR WAIVER AND MODIFICATION OF IMPLEMENTATION MILESTONES FOR 2 GHz MSS SYSTEM

Of Counsel:

William D. Wallace
CROWELL & MORING LLP
1001 Pennsylvania Avenue, NW
Washington, DC 20004
(202) 624-2807

William F. Adler
Vice President, Legal and Regulatory Affairs
GLOBALSTAR, L.P.
3200 Zanker Road
San Jose, CA 95134
(408) 933-4401

Dated: July 17, 2002

TABLE OF CONTENTS

Before The
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	
GLOBALSTAR, L.P.	)	File No.
	)	
Authorization to Launch and Operate a Mobile-Satellite Service System in the 2 GHz Band	)	

To: Chief, International Bureau

REQUEST FOR WAIVER AND MODIFICATION OF IMPLEMENTATION MILESTONES FOR 2 GHz MSS SYSTEM

In the Order and Authorization, DA 01-1634 (released July 17, 2001) ("Order"), the Commission granted Globalstar, L.P.'s ("GLP") application to launch and operate a Mobile-Satellite Service ("MSS") system in the frequencies allocated for MSS at 2 GHz. GLP's authorized system consists of four geostationary ("GSO") satellites, each approximately 90 degrees apart, and a non-geostationary ("NGSO") satellite constellation, providing global coverage. As of July 17, 2002, GLP has entered into a non-contingent contract for construction of both the GSO and NGSO satellites in its 2 GHz MSS system with Space Systems/Loral, Inc.[1]

[1] GLP is contemporaneously filing an application for modification of license, describing proposed modifications to the technical parameters of the NGSO and GSO components of its authorized 2 GHz MSS system.

Summary. For the reasons set forth below, GLP is requesting that Section 25.117(e)(1) be waived, and that the existing 2 GHz milestone schedule for GLP's 2 GHz MSS system be modified and extended in part, for the NGSO constellation and three of the four GSO satellites. GLP plans to meet the first four milestones established by the Order and put into service in accordance with the existing milestones the GSO satellite using the 2 GHz MSS frequencies to serve the United States, that is, by the specified implementation date of July 17, 2006. Because GLP intends to use its 2 GHz MSS frequency assignment as scheduled with the GSO satellite, grant of the requested extension will not result in warehousing of the spectrum and, therefore, will not undermine the Commission's milestone policies for satellite systems. Rather, GLP believes that there are "unique and overriding public interest concerns" that justify the limited extension of the milestones as explained herein[2] and that the extension will serve the public interest by ensuring development of a competitive and efficient MSS system that will best serve GLP's existing and future subscribers. If the Commission decides not to grant this limited waiver, then GLP requests that the Commission grant GLP 90 days to renegotiate the terms of its contract. This cure period will not affect GLP's achievement of the first milestone.

---

[2] Section 25.117(e)(2) of the Commission's rules sets forth this standard for extension of milestone dates. The standards for a waiver of Section 25.117(e)(1) outlined in the Commission's case law and for an extension of the milestones set forth Section 25.117(e)(2) require essentially the same showing. Accordingly, GLP is consolidating its request to waive the current milestones and establish the new milestone schedule set forth in the text.

I. BACKGROUND

GLP is the operator of the Globalstar™ MSS Above 1 GHz system licensed to L/Q Licensee, Inc., and is the owner of the international MSS business for which the Globalstar constellation provides space segment. GLP is currently restructuring under Chapter 11 of the U.S. Bankruptcy Code and is operating the system as a debtor-in-possession.[3] The Globalstar system is authorized to operate in the 1610-1621.35 MHz and 2483.5-2500 MHz bands.[4] Commercial service commenced in the United States in January 2000.

Soon after authority for the 1.6/2.4 GHz MSS system was granted in January 1995, GLP began studying the available MSS spectrum to design the second-generation and expanded Globalstar system. Of the candidate bands, GLP preferred the spectrum allocated internationally for MSS at 2500-2520/2670-2690 MHz. However, the Commission has declined to allocate that spectrum in the United States for MSS.[5] In 1997, the Commission opened a filing window for the 2 GHz MSS spectrum that was allocated for MSS internationally at the ITU's 1995

---

[3] GLP filed applications and notices to this effect with the Commission on February 25, 2002.

[4] See Loral/Qualcomm Partnership, L.P., 10 FCC Rcd 2333 (1995) (authorizing constellation and use of service links); L/Q Licensee, Inc., 11 FCC Rcd 16410 (1996) (authorizing the use of feeder links).

[5] See Amendment of Part 2 of the Commission's Rule to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems, 16 FCC Rcd 596, 624-25 (2001).

World Radiocommunication Conference and in the United States in 1997 shortly before the filing window opened.[6] The 2 GHz MSS spectrum is the only MSS spectrum that was unassigned and available for service to the United States in 1997, and to date.

In its initial 2 GHz application, GLP requested authority to use the entire 70 MHz allocated for MSS. It also described a second-generation MSS system, comprised of hybrid spacecraft that carried both the 1.6/2.4 GHz and 2 GHz antennas. In the Order, the Commission granted GLP's application, for a "Selected Assignment" of 3.5 MHz in each direction at 2 GHz, but declined to authorize GLP to launch and operate the hybrid MSS spacecraft. According to the Order, the milestones for the 2 GHz MSS system were not consistent with the timing for construction of replacement satellites of the 1.6/2.4 GHz system, and, therefore, GLP's proposal "to consolidate 2 GHz MSS and Big LEO communications capabilities on a single satellite would not appear to be capable of effectuation consistent with the milestone requirements for this processing round."[7]

Five years have passed since Globalstar prepared the 2 GHz MSS application. In the interim, construction of Globalstar's first generation MSS system was completed, the constellation was launched and commercial MSS service

---

[6] See Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service, 12 FCC Rcd 7388 (1997), on recon., 13 FCC Rcd 23949 (1998).

[7] Order, ¶ 10.

to subscribers commenced. Also, as has been widely reported, the development of a subscriber base has been much slower than anticipated, and, as a result, the Globalstar system has suffered financially. On February 15, 2002, GLP filed for bankruptcy protection in the U.S. Bankruptcy Court in Delaware with the concurrence of several of its major creditors. Undaunted by its financial setbacks and determined to succeed in the global MSS business, GLP has begun to implement its Plan of Reorganization.[8]

The Commission's construction milestones for new MSS systems are intended to ensure that spectrum is used and services are provided to the public in a timely manner. They do not purport to conform with industry experience in developing, testing, constructing and launching satellites, and, indeed, they do not. Similarly, the current Commission-imposed schedule for launch and operation of GLP's entire 2 GHz MSS system is impractical from a technical, business and financial perspective. Nevertheless, even though it is in bankruptcy, GLP is committed to

---

[8] In connection with its financial restructuring, GLP has developed a new business model that depends upon a more vertically-integrated operation, that is, significant consolidation of the assets and management of the space station and earth station segments. To that end, Globalstar Corporation, a wholly-owned subsidiary of GLP, has already acquired a majority interest in the Canadian Globalstar service provider, has acquired the assets of the French Globalstar service provider, and has recently received the Commission's approval to acquire control of Globalstar USA, LLC ("GUSA") and Globalstar Caribbean Ltd., which operate earth stations associated with the Globalstar business for the United States. GUSA also is the Globalstar service provider in the United States. See Order and Authorization, DA 02-1557 (released July 1, 2002). The acquisition of GUSA will allow consolidation of the space segment and earth station functions in the United States under GLP, with the goal of improving and facilitating delivery of MSS to consumers.

doing its level best to conform with the milestones because GLP intends to remain in business for the long haul and intends to use the 2 GHz MSS spectrum. GLP is planning to meet the first four milestones, and to place the first GSO satellite into operation on schedule. GLP is seeking a waiver of the existing schedule only in part to ensure that the Globalstar system can evolve consistent with the commercial realities that have become manifest over the past five years and in light of the Commission's policy that satellite spectrum should be placed into service in a timely manner. To ensure that the 2 GHz MSS spectrum assigned to GLP is used in the time frame set forth in the Order, GLP plans to construct and launch the domestic GSO satellite in the time frame established by the Order. Expanding the existing Globalstar system with this GSO satellite will ensure that the spectrum does not lie fallow and, at the same time, will provide additional flexibility for the Globalstar system as the initial system matures. The limited extension of the milestones for the rest of the 2 GHz MSS system will facilitate GLP's deployment of a technically innovative and financially sound MSS network.

II. A REALISTIC PLAN FOR LAUNCH AND OPERATION OF GLP'S 2 GHz MSS SYSTEM REQUIRES AN EXTENSION OF THE EXISTING MILESTONE SCHEDULE.

GLP's proposed milestone schedule for the 2 GHz MSS constellation is presented in Table 1.

Milestone	July 2001 Order	Proposed Date
Enter Non-Contingent Construction Contract	7/17/02	SAME
Complete Critical Design Review for NGSO System	7/17/03	SAME
Begin Physical Construction of NGSOs	1/17/04	SAME
Begin Physical Construction of GSOs	7/17/04	SAME
Launch First Two NGSO Spacecraft	1/17/05	4/17/07 (27 months later)
Launch First GSO Satellite (U.S. coverage)	7/17/06	SAME
Entire System Operational	7/17/07	GSO 1/17/09 (tentative—subject to acceleration) NGSO 7/17/09 (18 and 24 months later)

TABLE 1: Existing and Proposed Milestone Schedule

As indicated above, GLP is requesting no change to the first four milestones. Moreover, GLP's proposed milestone schedule will result in the GSO satellite in the domestic arc being placed into operation on the existing schedule, the other three GSO satellites placed into operation during the next 30 months, and the NGSO constellation placed into operation 24 months after the original schedule.

There are several reasons why GLP is seeking to extend the later dates for the launch and deployment milestones in this manner. First, given the currently-depressed MSS business and the longer-than-anticipated life of the first-generation Globalstar satellite system, GLP does not anticipate a need for substantial additional MSS capacity, as would be provided by the NGSO constellation, for example, by the system operational date established in the Order. GLP has always planned that the 2 GHz MSS system would be used to expand capacity and to offer enhanced services through the existing system, rather than to operate as a stand-alone system.[9] However, the MSS business simply has not achieved subscriber levels that the entire MSS industry and its investors anticipated in the early 1990s. That fact did not become apparent until after the first 1.6/2.4 GHz MSS systems became operational and several years after the Commission required 2 GHz MSS applications to be filed. In the past two years, GLP has been progressively modifying and updating its business plan to target those markets where MSS will be successful in the United States and the rest of the world. As a result of this effort, GLP is confident that the MSS business will eventually be a great success; however, substantial premature expansion of the capacity, as implied by the Commission's current "Entire System Operational" milestone, would be uneconomic and wasteful of resources.

Second, GLP can fulfill its immediate coverage needs with the GSO satellites alone. Fill-in capacity for hard-to-reach areas of the globe and markets can be provided by GLP's four authorized GSO satellites. Accordingly, GLP intends to launch the first GSO satellite in the 2 GHz MSS system on schedule and the

---

[9] For example, GLP would provide 3G services using cdma2000 or W-CDMA technology, high-speed and broadband data services and, if authorized, new Ancillary Terrestrial Component ("ATC") services via its 2 GHz MSS system.

remaining three GSO satellites over the following 30 months.[10] The GSO satellite in the domestic orbital slot will allow GLP to improve service in the neighboring maritime regions and in Alaska and Hawaii (depending upon the slot assigned). GLP has found that demand for Globalstar services is particularly significant in the maritime markets. The gateways for the 1.6/2.4 GHz band system, however, only serve a radius of about 1500 kilometers at full quality level. That radius makes it difficult for the current system to serve maritime regions beyond about 200 miles offshore without substantially diminished quality of service. With the 2 GHz MSS GSO satellites, these gaps can be filled.

Globalstar has not been able to serve Hawaii at all, and is able to provide limited service to Alaska through its Western Canada gateway. While it would be possible to place two additional gateways in Hawaii and Alaska, those gateways would still not provide adequate coverage of the Gulf of Alaska or the deep sea areas of the North and Central Pacific. These areas remain largely an Inmarsat monopoly today. Globalstar intends to compete vigorously with Inmarsat for maritime traffic using its 2 GHz GSO system.

Third, Globalstar's original business plan relied on the first generation satellite system to generate the bulk of the revenues to fund the second-generation system. GLP still expects to fund its follow-on system largely through service

---

[10] MSS demand is considerably greater in North America and its territorial waters than elsewhere in the world. GLP's Big LEO system will remain adequate to serve other areas through the end of this decade.

revenues. Realistically, however, those revenues will not be available in the near future. Constructing and launching the entire 2 GHz MSS constellation on an extended schedule makes financing more viable than building on the milestone schedule set forth in the Order.

Fourth, through an extended milestone schedule for the 2 GHz MSS system, GLP will ultimately be able to achieve lower rates for current subscribers. Amortizing the high cost of construction and launch of satellites contributes to the relatively higher cost of MSS user equipment and service, than, for example, cellular/PCS telephones and service. GLP has chosen for its 2 GHz system to use as much existing and off-the-shelf technology as possible rather than to attempt the expensive innovations characteristic of its Big LEO system. By the same token, GLP needs to cut prices for equipment and services to subscribers now to build up a subscriber base to help pay for the 2 GHz system. By "back-ending" the cost of construction and launch of the second-generation satellites, GLP can afford to build a second-generation system even as it lowers subscriber prices today.

Finally, GLP could not, and did not, enter into its contract for a 2 GHz system without the concurrence of its creditors and approval of the Bankruptcy Court. In exercising its fiduciary duty, GLP must adopt a spending profile for its 2 GHz system that properly balances the financial demands of the new system with the claims that the creditors have against GLP's assets. The spending profile associated with the relatively modest extension proposed herein accomplishes that goal. Accordingly, from both service and financial perspectives, an extension of the 2 GHz MSS milestone schedule is warranted.

III. A WAIVER AND EXTENSION OF THE MILESTONE SCHEDULE IS JUSTIFIED IN THIS CASE.

The Commission's policy on implementation milestones is designed to ensure that satellite systems are constructed in a timely manner so that spectrum resources are not warehoused, but rather are made available to customers.

> The milestone schedule is used to ensure that licensees construct and launch their systems in a timely manner. Requiring licensees to make and fulfill realistic construction and launch commitments prevents increasingly scarce orbital resources from being warehoused by licensees. Such warehousing could hinder the availability of services to the public at the earliest possible date by blocking entry by other entities willing and able to proceed immediately with the construction and launch of their satellite systems.[11]

Accordingly, pursuant to Section 25.117(e)(1) of the Commission's Rules, the Commission generally authorizes extensions of the milestone schedule only when the delay is caused by circumstances beyond the control of the licensee.[12] The

---

[11] Amendment of the Commission's Space Station Licensing Rules and Policies, FCC 02-45, ¶ 101 (released Feb. 28, 2002).

[12] NetSat 28 Co., 16 FCC Rcd 11025, ¶ 9 (Int'l Bur. 2001); 25 C.F.R. § 25.117(e)(1).

Commission has generally denied requests for milestone extensions from licensees who have *not* initiated or continued construction of the authorized spacecraft.[13]

On the other hand, when the licensee has initiated construction, intends to proceed with construction and demonstrates that the public interest will be served by grant of an extension, the Commission has granted a waiver of Section 25.117(e)(1) and an extension and/or modification of the existing milestone schedule.[14] A waiver of the Commission's Rules is warranted if special circumstances justify deviation from the general rule and such deviation would serve the public interest without undermining the policies supported by the general rule.[15] Similarly, Section 25.117(e)(2) contemplates grant of milestone extensions where "there are unique and overriding public interest concerns that justify an extension . . . [for] a precise extension period." The circumstances surrounding GLP's 2 GHz MSS system present special circumstances more compelling than

---

[13] See NetSat 28 Co., 16 FCC Rcd at 11031, ¶ 21 ("in every instance where the Commission has denied a milestone extension request, construction of the satellite either had not begun or was not continuing, thus raising questions regarding the licensee's intention to proceed").

[14] E.g., GE American Communications, Inc., 16 FCC Rcd 11038 (Int'l Bur. 2001).

[15] See, e.g., Northeast Cellular Tel. Co. v. FCC, 897 F.2d 1166, 1166 (D.C. Cir. 1990); WAIT Radio v. FCC, 418 F.2d 1153 (D.C. Cir. 1969).

other cases in which the Commission has granted a waiver and extension of milestones.[16] Therefore, this request should be granted.[17]

A. GLP Intends to Use the 2 GHz MSS Spectrum in a Timely Manner.

Implementation milestones are placed in satellite authorizations "to ensure that licensees construct and launch their systems in a timely manner. . . . [to prevent] increasingly scarce orbital resources from being warehoused by licensees." As discussed above, GLP intends to put its 2 GHz Selected Assignment into use on the schedule specified by the Commission by launching the GSO satellite serving the United States on the timetable in the Order. As a result, the spectrum will not lie fallow.

Moreover, no prospective applicant will be denied access to spectrum through warehousing as a result of grant of the requested extension. GLP is authorized to launch and operate four GSO satellites and one NGSO satellite constellation for operation at 2 GHz. However, GLP is only authorized to operate initially with one 7 MHz "Selected Assignment." The 7 MHz spectrum assignment is currently universal for all 2 GHz MSS licensees, whether they intend to launch GSO satellites

---

[16] See GE American Communications, Inc., 16 FCC Rcd 11038 (Int'l Bur. 2001); Dominion Video Satellite, Inc., 14 FCC Rcd 8182 (Int'l Bur. 1999); GE American Communications, Inc., 7 FCC Rcd 5169 (CCB 1992).

[17] In the event that the Commission does not grant this request as proposed, GLP requests that it be given a reasonable period of time, at least 90 days, to negotiate a reformation of its executed satellite manufacturing contract and to file a revised report with the Commission.

(Celsat, TMI) or NGSO constellations (Boeing, Constellation, ICO, Iridium, MCHI). Although the size of the selected assignments may change if fewer than eight systems are built, GLP will use no more 2 GHz MSS spectrum in the United States than this initial GSO satellite has access to in the United States. Accordingly, by constructing and launching the GSO satellite serving the United States in accordance with the existing milestone schedule, GLP will remain in compliance with all relevant Commission policies and precedents regarding the use of assigned spectrum.

B. The Public Interest Will Be Served by Grant of the Requested Waiver and Extension.

A waiver of the existing milestone schedule and extensions of the schedule as set forth above will serve the public interest in multiple ways.

Currently, the MSS industry -- indeed, the entire telecommunications industry -- is experiencing low demand and consequent financial reversals. Although there are populations that need MSS for basic communications (in the United States as elsewhere), tapping into these markets has proved difficult. The challenge is exemplified by the financial reorganizations of Iridium, Motient, Globalstar and ICO. On the other hand, the Globalstar system technically exceeds the expectations of its developers, and Globalstar service providers and value-added resellers are constantly finding new niche markets where its services are needed and used. Minutes of use have grown month by month since commercial operation commenced even though there has been virtually no advertising or other promotion for the past 15 months. It is anticipated that additional capacity will be needed for a larger subscriber base and advanced services, but not by July 2007, the current in-service milestone for the entire 2 GHz MSS system.

Moreover, the extension will ensure that the existing 1.6/2.4 GHz system is fully utilized. The useful life of the original 1.6/2.4 GHz satellites was expected to be about 7.5 years, which would have required replacement in the 2005-2007 time frame. The satellites are operating so well that their useful life is expected to extend to the 2009-2010 time frame. As an operational system in financial difficulty, Globalstar needs to stretch its resources and replace them efficiently.

The extension will also help preserve the ability of MSS to serve underserved and unserved populations. Globalstar is one of only two operational global MSS systems. Putting into service the parts of a satellite constellation whose capacities are not yet needed would be a substantial financial drain on the company, not only for the 2 GHz system but also for the first-generation system.

In requesting this milestone extension for the 2 GHz MSS system, GLP has attempted to balance the Commission's policy on use of spectrum with the realities of the MSS industry and GLP's current business environment. In prior cases, the Commission has accommodated such requests. For example, the Commission granted GE American Communications an extension of milestones for a new satellite to allow it to utilize operational satellites up to the end of their useful lives while assuring customers of "timely and sufficient replacement capacity."[18] The

---

[18] GE American Communications, 7 FCC Rcd at 5170, ¶ 9.

Commission has granted an extension of milestones where the operator demonstrated an "intent to proceed" with its authorized system but desired an extension to accommodate a change in design of the satellites.[19] The business and technical reasons outlined above are just as compelling and demonstrate that grant of GLP's request will also serve the public interest.

---

[19] See GE American Communications, 16 FCC Rcd at 11041, ¶ 10. See also Astrolink International LLC, DA 02-1431 (released June 18, 2002) (granting an extension of milestone where licensee had substantially completed construction of satellite but had no contract to complete construction).

IV. CONCLUSION

For the reasons set forth above, GLP requests that the milestones for its 2 GHz MSS system be modified and extended as set forth herein.

Respectfully submitted,

GLOBALSTAR, L.P.

William F. Adler
Vice President, Legal and
Regulatory Affairs
GLOBALSTAR, L.P.
3200 Zanker Road
San Jose, CA 95134
(408) 933-4401

Of Counsel:

William D. Wallace
CROWELL & MORING LLP
1001 Pennsylvania Avenue, NW
Washington, DC 20004
(202) 624-2807

Date: July 17, 2002

APPENDIX B: NGSO ANTENNA GAIN CONTOURS

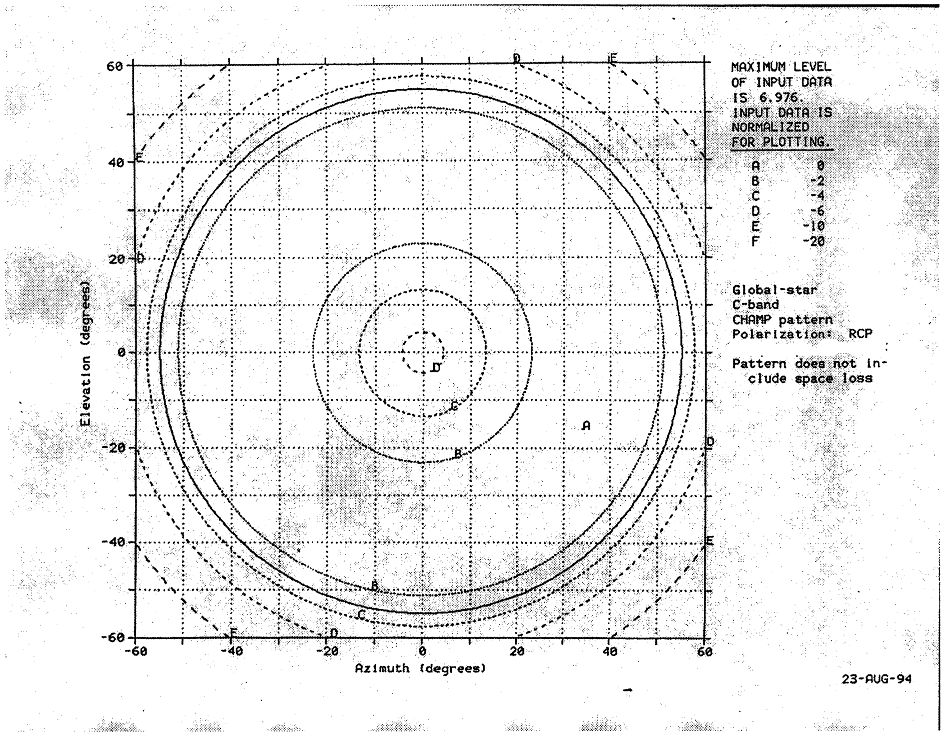


FIGURE B-1 – Ku-Band Receive Antenna Pattern

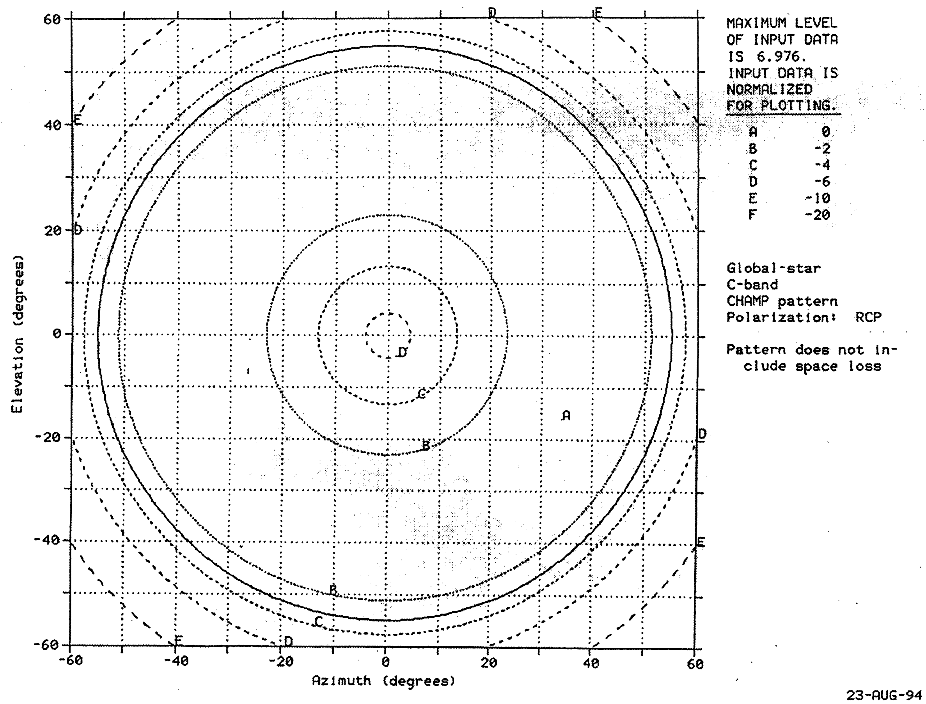


FIGURE B-2 – C-Band Transmit Antenna Pattern

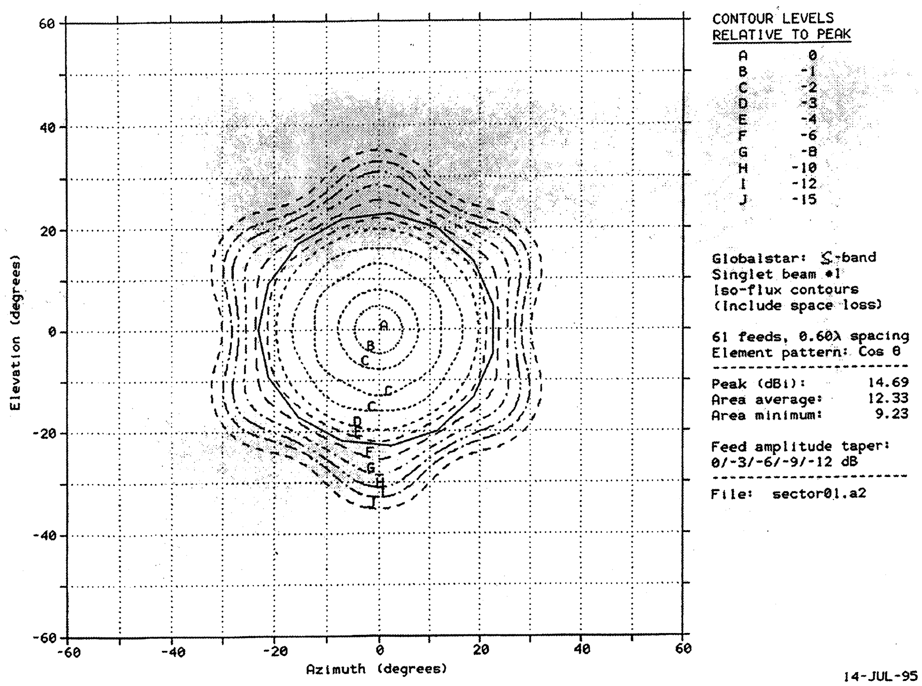


FIGURE B-3 – S-Band Receive Antenna Pattern

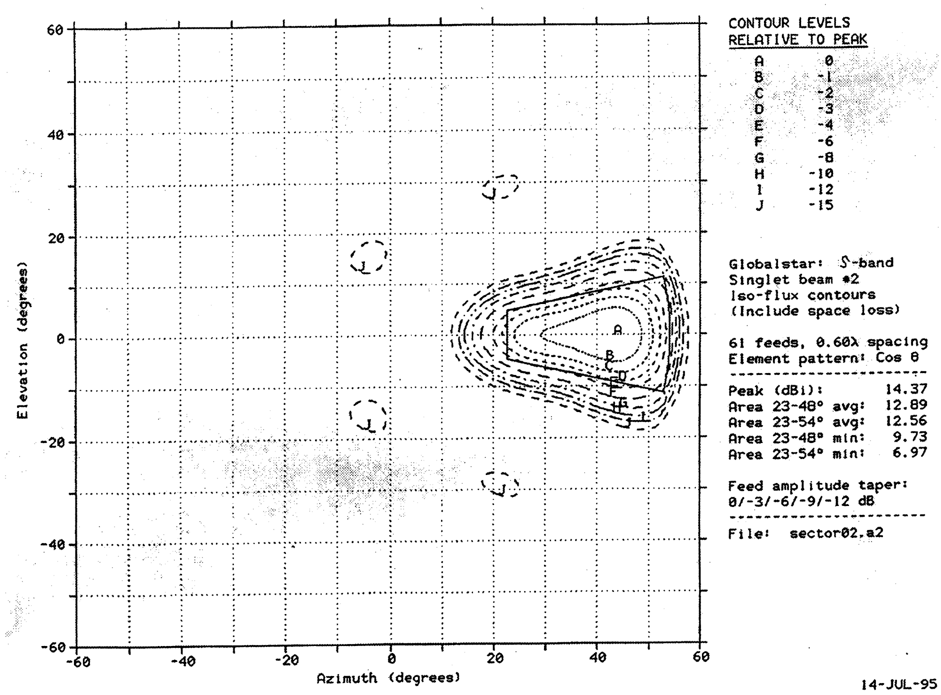


FIGURE B-4 – S-Band Receive Antenna Pattern

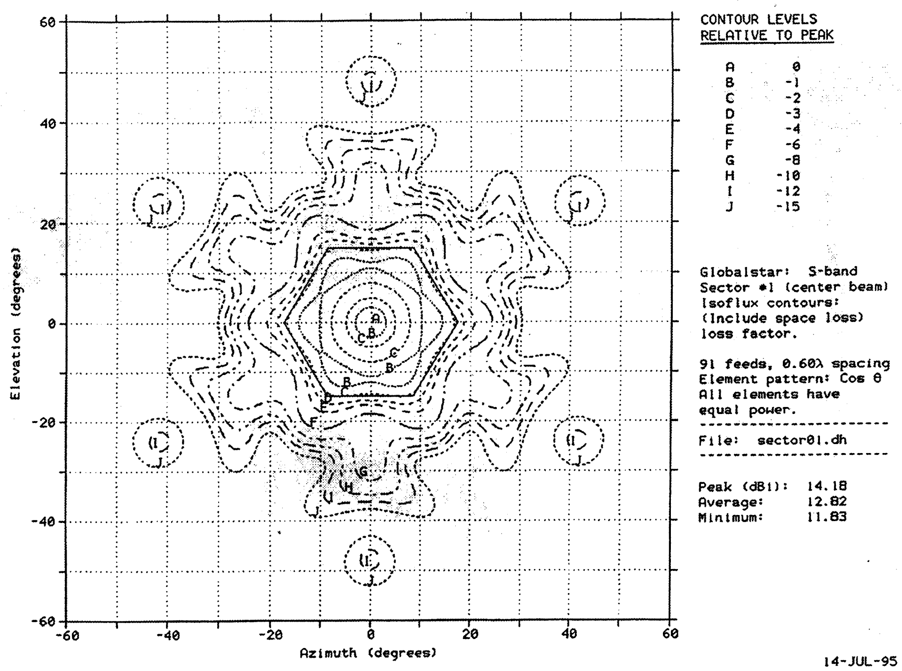


FIGURE B-5 – S-Band Transmit Antenna Pattern

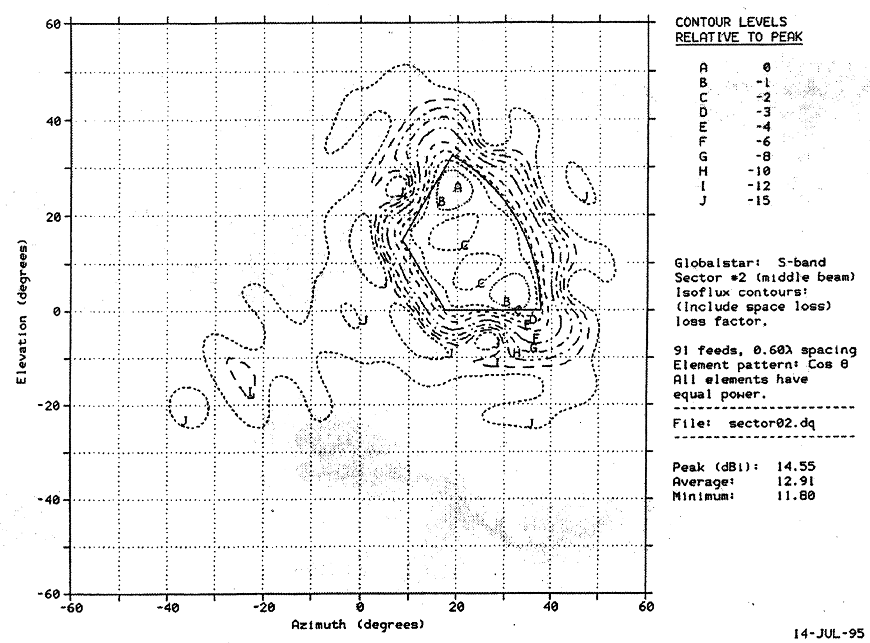


FIGURE B-6 – S-Band Transmit Antenna Pattern

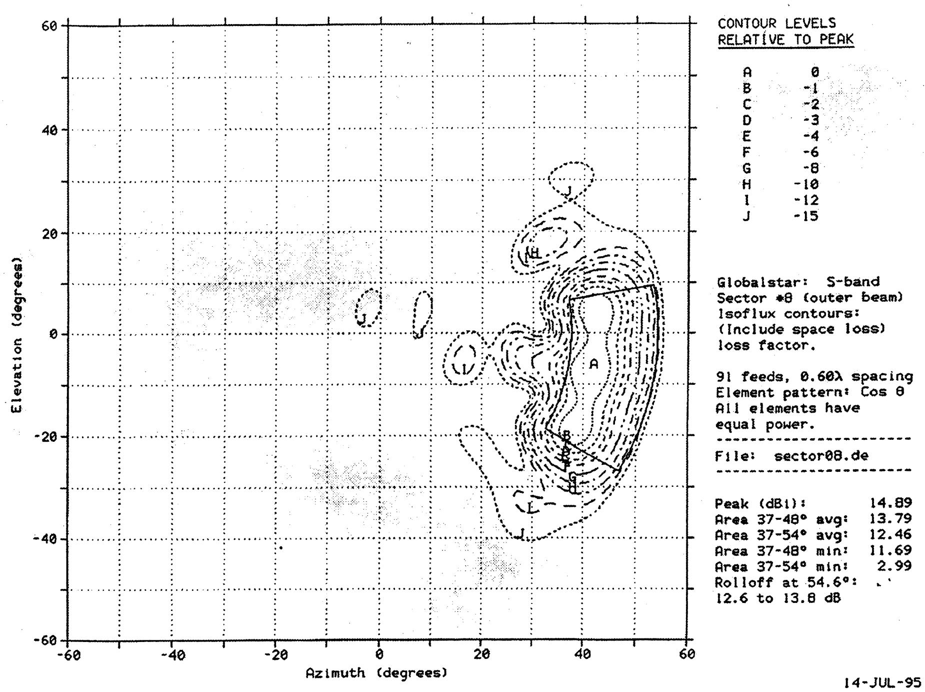


FIGURE B-7 – S-Band Transmit Antenna Pattern

APPENDIX C: NGSO COMMUNICATIONS LINK BUDGETS

Table C-1

Forward Link NGSO: Ku up/S down, CDMA voice, 2 satellite diversity

Gateway to satellite	**Ku-band up**	**Satellite to user**	**S-band down**
Average data rate,kbps	2.40	Average data rate,kbps	2.40
Carrier freq. GHz	15.50	Carrier freq. GHz	2.00
EIRP per user, dBW	28.00	EIRP per user, dBW	-0.30
Pointing & polarization loss, dB	1.00	Pointing & polarization loss, dB	1.00
Elevation, deg.	40.00	Elevation, deg.	40.00
Range, km	1978.00	Range, km	1978.00
Path loss, dB	182.17	Path loss, dB	164.39
Boltzmann's constant, dBW/K-Hz	-228.60	Boltzmann's constant, dBW/K-Hz	-228.60
Receive antenna gain (incl line loss), dB	6.00	Receive antenna gain (incl. line loss), dB	0.00
Receive Noise Temperature, deg-K	512.00	Receive Noise Temperature, deg-K	400.00
Receive power at LNA per user, dBW	-149.17	Receive power, dBW	-165.69
Interfering beam power density,dBW/Hz	-216.60	Interfering beam power density,dBW/Hz	-212.00
Noise power density, dBW/Hz	-201.51	Noise power density, dBW/Hz	-202.58
Io+No, dBW/Hz	-201.37	Io+No, dBW/Hz	-202.11
Uplink Eb/(No+Io), dB	18.40	Downlink Eb/(No+Io), dB	2.62
		Combining gain, dB	2.50
		Overall Eb/(No+Io), dB	5.01
		Required Eb/No w. pwr ctl mgn, dB	5.00

Table C-2

Return Link NGSO: S up/C down, CDMA voice, 2 satellite diversity

User to satellite	**S-band up**	**Satellite to gateway**	**C -band down**
Average data rate,kbps	2.40	Average data rate,kbps	2.40
Carrier freq. GHz	2.00	Carrier freq. GHz	6.80
EIRP per user, dBW	-14.10	EIRP per user, dBW	-27.00
Pointing & polarization loss, dB	1.00	Pointing & polarization loss, dB	1.00
Elevation angle, deg.	40.00	Elevation, angle, deg.	40.00
Range, km	1978.00	Range, km	1978.00
Path loss, dB	164.39	Path loss, dB	175.02
Boltzmann's constant, dBW/K-Hz	-228.60	Boltzmann's constant, dBW/K-Hz	-228.60
Receive antenna gain (incl line loss), dB	15.00	Receive antenna gain (incl. line loss), dB	49.50
Receive Noise Temperature, deg-K	483.00	Receive Noise Temperature, deg-K	121.00
Receive power at LNA per user, dBW	-164.49	Receive power, dBW	-153.52
Interfering beam power density,dBW/Hz	-216.60	Interfering beam power density,dBW/Hz	-213.00
Noise power density, dBW/Hz	-201.76	Noise power density, dBW/Hz	-207.77
Io+No, dBW/Hz	-201.62	Io+No, dBW/Hz	-206.63
Uplink Eb/(No+Io), dB	3.33	Downlink Eb/(No+Io), dB	19.31
		Combining gain,dB	1.80
		Overall Eb/(No+Io), dB	5.02
		Required Eb/No w. pwr ctl mgn, dB	5.00

APPENDIX D: NGSO TELEMETRY AND COMMAND LINK BUDGETS

Table D-1

Command NGSO Gateway to satellite	Earth antenna, 10 deg. Elev	Earth antenna, 90 deg. Elev	Anti-earth antenna, 10 deg. Elev
Data rate, kbps	16.00	16.00	16.00
Carrier freq. GHz	15.60	15.60	15.60
EIRP, dBW	50.00	50.00	50.00
Pointing & polarization loss, dB	1.00	1.00	1.00
Range, km	3500.00	1400.00	3500.00
Path loss, dB	187.19	179.23	187.19
Boltzmann's constant, dBW/K-Hz	-228.60	-228.60	-228.60
Receive antenna gain (incl line loss), dB	3.00	1.00	-1.00
Receive Noise Temperature, deg-K	512.00	512.00	512.00
Receive power, dBW	-135.19	-129.23	-139.19
Noise power density, dBW/Hz	-201.51	-201.51	-201.51
Uplink Eb/(No), dB	24.28	30.24	20.28
Reqd. Eb/No for 10^-6 BER, dB	14.00	14.00	14.00
Margin, dB	10.28	16.24	6.28

Table D-2

NGSO Telemetry Satellite to gateway	Earth antenna (10 deg. Elev.)	Earth antenna (90 deg. Elev.)	Anti-earth antenna (10 deg. Elev)
Data rate, kbps	16.00	16.00	16.00
Carrier freq. GHz	6.80	6.80	6.80
EIRP , dBW	-17.60	-19.50	-15.00
Pointing & polarization loss, dB	1.00	1.00	1.00
Elevation, degrees	10.00	90.00	10.00
Range, km	3500.00	1400.00	3500.00
Path loss, dB	179.97	172.01	179.97
Boltzmann's constant, dBW/K-Hz	-228.60	-228.60	-228.60
Receive antenna gain (incl. line loss), dB	49.00	49.00	49.00
Receive Noise Temperature, deg-K	121.00	121.00	121.00
Receive power, dBW	-149.57	-143.51	-146.97
Noise power density, dBW/Hz	-207.77	-207.77	-207.77
Downlink Eb/(No), dB	16.16	22.22	18.76
Required Eb/No for 10^-6 BER, dB	14.00	14.00	14.00
Margin, dB	2.16	8.22	4.76

APPENDIX E: REQUEST FOR WAIVER OF NG104

Request for Waiver of NG104

In this application to modify its authorized 2 GHz MSS system, GLP is requesting to use feederlinks for the geostationary satellite at the 99° West orbital slot at 13.795-13.995 GHz (space-to-earth) and 11.5-11.7 GHz (earth-to-space).

In the U.S. Table of Frequency Allocations, NG104 restricts the use of the 10.7-11.7 GHz bands to international, non-domestic, service.[1] Accordingly, Globalstar is requesting a waiver of NG104 to use the 11.5-11.7 GHz band for GS-2 feederlinks.

The Commission's concern regarding the 10.7-11.7 GHz band expressed in Footnote NG104 is the potential for restrictions on the terrestrial Fixed Service.[2] In the United States, the Fixed-Satellite Service ("FSS") is co-primary with the Fixed Service in the 10.7-11.7 GHz band. GLP believes that the 11.5-11.7 GHz bands can be used by GS-2 without causing undue restrictions on terrestrial stations.[3] A waiver of NG104 is therefore appropriate because use of these frequencies by GS-2 for GSO feederlinks will not undermine the purpose of NG104 in protecting terrestrial services and will serve the public interest by allowing Globalstar to fulfill the design for GS-2 to offer advanced MSS to the public.[4]

The Commission has already granted a waiver of NG104 to AMSC Subsidiary Corporation for use of the 11/13 GHz bands for feederlinks for AMSC's previously

---

[1] See 47 C.F.R. § 2.106, Footnote NG104.

[2] See An Inquiry Relative to Preparation for a General World Administrative Radio Conference, 70 FCC 2d 1193, 1252 (1978) (in these bands, "it is envisioned that the number of fixed-satellite earth stations would be limited to about half a dozen stations, located in places far from population centers, so as not to restrict unduly the further development of terrestrial services"); The Establishment of Policies and Service Rules for the Mobile Satellite Service in the 2 GHz Band, 14 FCC Rcd 4843, 4867 (1999) (purpose of NG104 is to avoid "ubiquitous deployment of FSS earth stations in these bands").

[3] GLP has commissioned a study of the U.S. FS stations in this band to facilitate coordination. GLP will provide additional information on coordination with the FS when it submits its inter-satellite interference analyses for the 99° West orbital slot.

[4] See, e.g., WAIT Radio v. FCC, 418 F.2d 1153 (D.C. Cir. 1969).

planned satellite at 101° West.[5] As the Commission noted at that time, the 11/13 GHz bands are not currently used for FSS in the United States, and, therefore, are appropriate choices for feederlink frequencies. Moreover, since FSS systems are generally not using these bands domestically, use of these bands by one satellite system would require placement of at most a few earth stations in the United States. Indeed, GLP anticipates deployment of only one U.S. gateway earth station in associated with the satellite at 99° West where these frequencies would be in service. Moreover, the gateway station can be located and/or shielded, as necessary, to minimize restrictions on new FS stations.

As the Commission stated in granting a waiver to AMSC:

> For the following reasons, we find that granting AMSC a waiver of footnote NG104 for use of these bands is in the public interest. FSS use of these bands has been restricted to international systems because the Commission believed that such systems would employ few earth stations, thereby avoiding potential interference cases between earth stations and terrestrial networks that could unduly restrict further development of terrestrial services in these bands. Of primary importance here is the fact that AMSC seeks this waiver so that it may implement a new service, MSS, and the proposed use of these 11/13 GHz frequencies for feeder link operations is generally consistent with recognized FSS use of these bands. In addition, this action allows for continued FSS use of these frequencies, consistent with the international allotment plan, while protecting the interests of current terrestrial users of these bands by limiting the waiver granted to one satellite in the first-generation MSS system. Coordination between domestic satellite and fixed services is successfully accomplished in other frequency bands, such as the 4/6 GHz bands, and

---

[5] See Amendment of Parts 2, 22 and 25 of the Commission's Rules to Allocate Spectrum for and to Establish Other Rules and Policies Pertaining to the Use of Radio Frequencies in a Land Mobile Satellite Service for the Provision of Various Common Carrier Services, 4 FCC Rcd 6041, 6051 (1989).

also can be accomplished in the 11/13 GHz bands (see discussion below).[6]

As required by the Commission's Rules,[7] GLP agrees to coordinate its earth stations with terrestrial users in the 11.5-11.7 GHz band. There are established methods for coordinating gateway earth stations with terrestrial users, and GLP will take those steps as necessary.[8]

Grant of this waiver will serve the public interest. GLP has proposed an innovative design for the GS-2 system, with an NGSO constellation and GSO satellites for service to high user-density areas. Finding appropriate feederlinks is necessary to ensure all technical aspects of the design can be put into service. However, finding appropriate feederlinks for the GSO satellites, particularly in the domestic orbital arc, has proven difficult, as evidenced in the Order and Authorization, DA 01-1634 (released July 17, 2001).

Use of the 11 GHz feeder downlink will provide feederlinks for GS-2, without unduly restricting FS stations. By allowing GLP to share this spectrum with FS stations in the U.S., the Commission can facilitate introduction of advanced MSS services over the GS-2 system. GLP's domestic GSO service will be particularly helpful in extending valuable MSS services to maritime areas beyond the 200 mile territorial limit where currently MSS service is limited to Inmarsat as a monopoly provider.

GLP is planning commencement of 2 GHz MSS service in 2006 with the GSO satellite at 99° West. Grant of this waiver request will ensure that these innovative services will be delivered to U.S. consumers in a timely manner without restricting the growth of services in the FS in these bands or the FSS in other FSS bands.

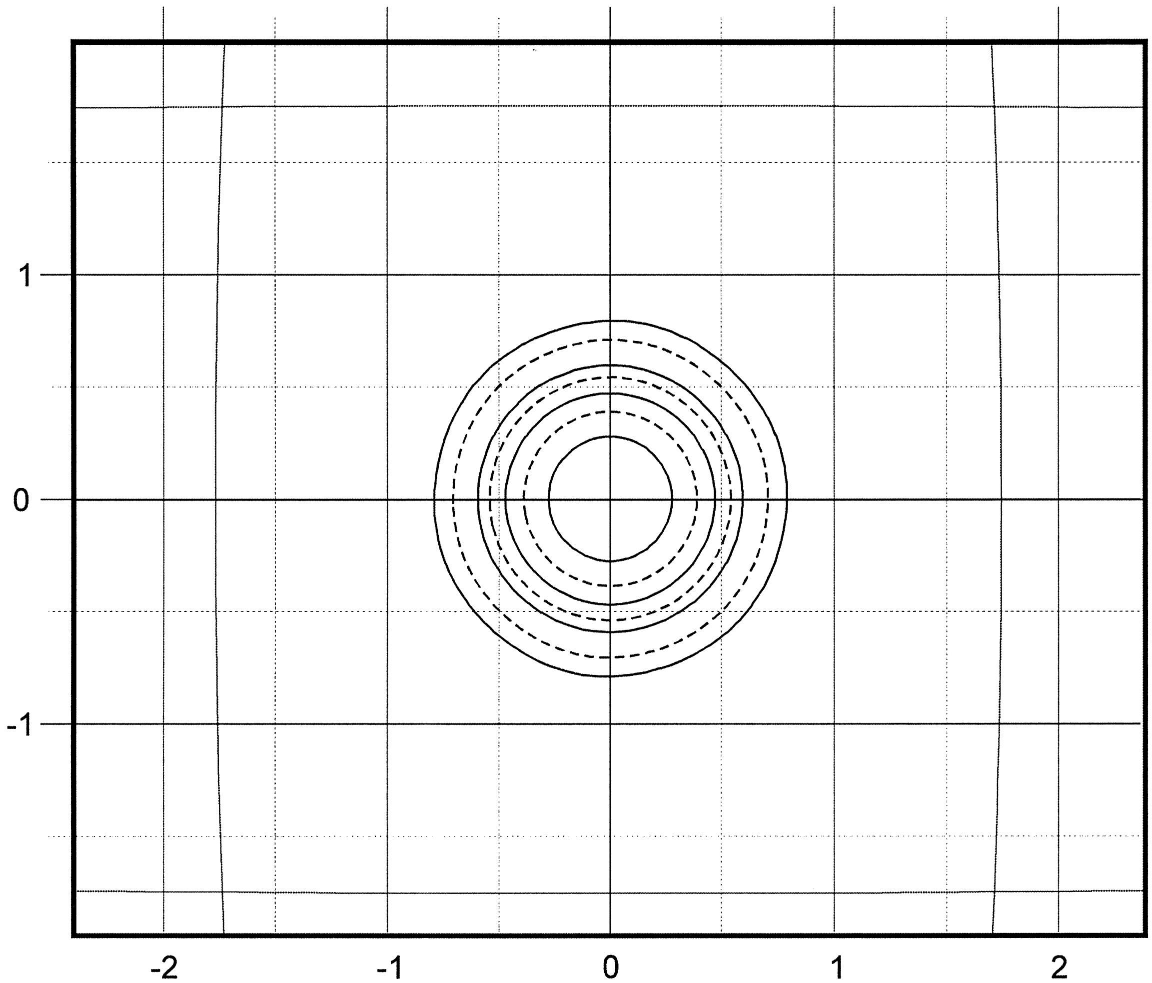
---

[6] Id. (footnotes omitted).

[7] 47 C.F.R. § 25.203.

[8] The 10.7-11.7 GHz band is also allocated for FSS use by non-geostationary systems. See Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO Terrestrial Systems in the Ku-band Frequency Range, 16 FCC Rcd 4096 (2000). GLP recognizes the need to conform its use of the 11 GHz band to applicable rules for GSO/NGSO FSS sharing.

APPENDIX F: GSO ANTENNA GAIN CONTOURS



2 GHz service link contours for nadir beam. -2, -4, -6, -8, -10, -15 and -20 dB contours shown. Peak gain: 46.0 dBi

FIGURE F-1

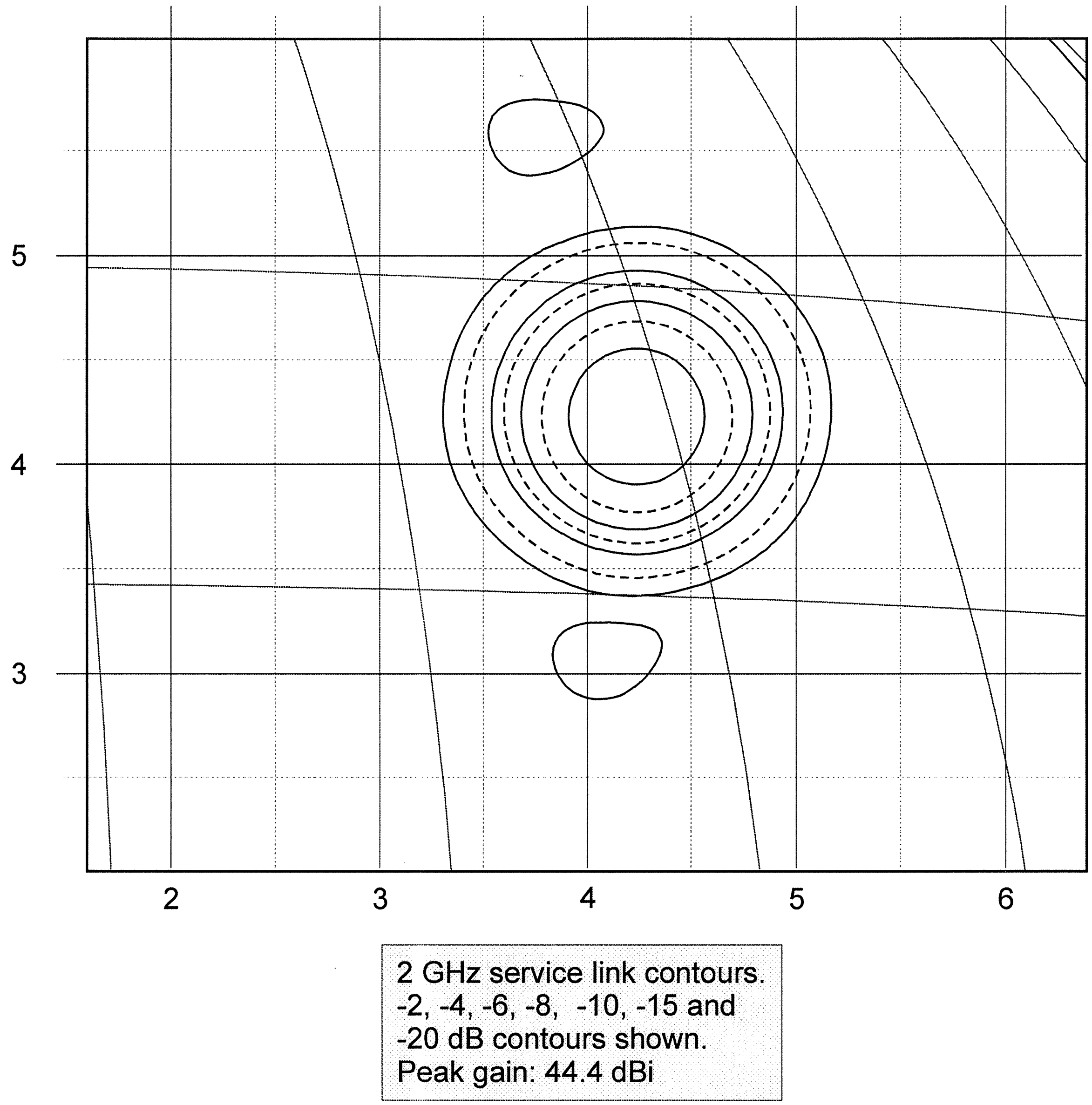
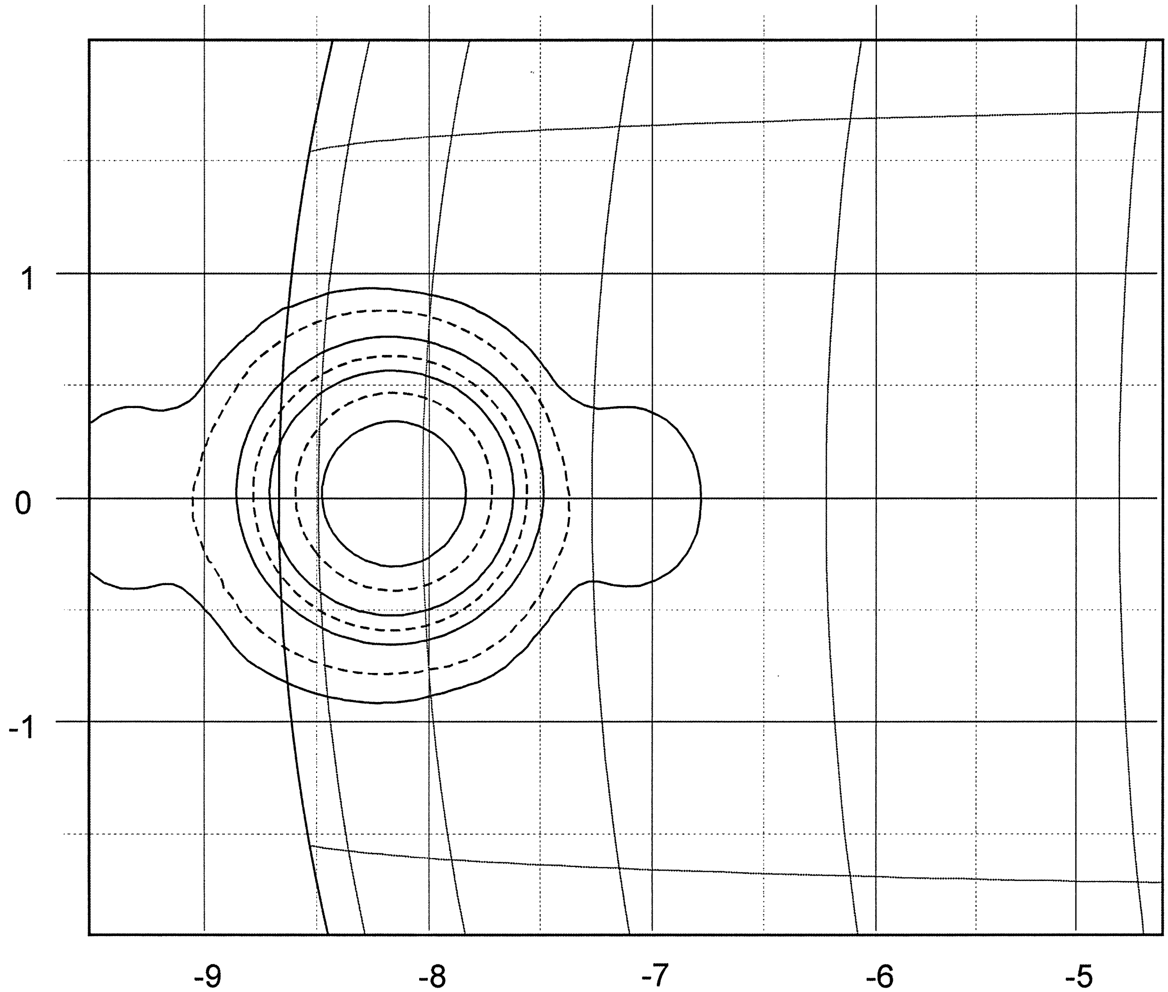

5
4
3
2
3
4
5
6
2 GHz service link contours.
-2, -4, -6, -8, -10, -15 and
-20 dB contours shown.
Peak gain: 44.4 dBi

FIGURE F-2



2 GHz service link contours for edge-of-earth coverage beam. -2, -4, -6, -8, -10, -15 and -20 dB contours shown. Peak gain: 43.5 dBi

FIGURE F-3

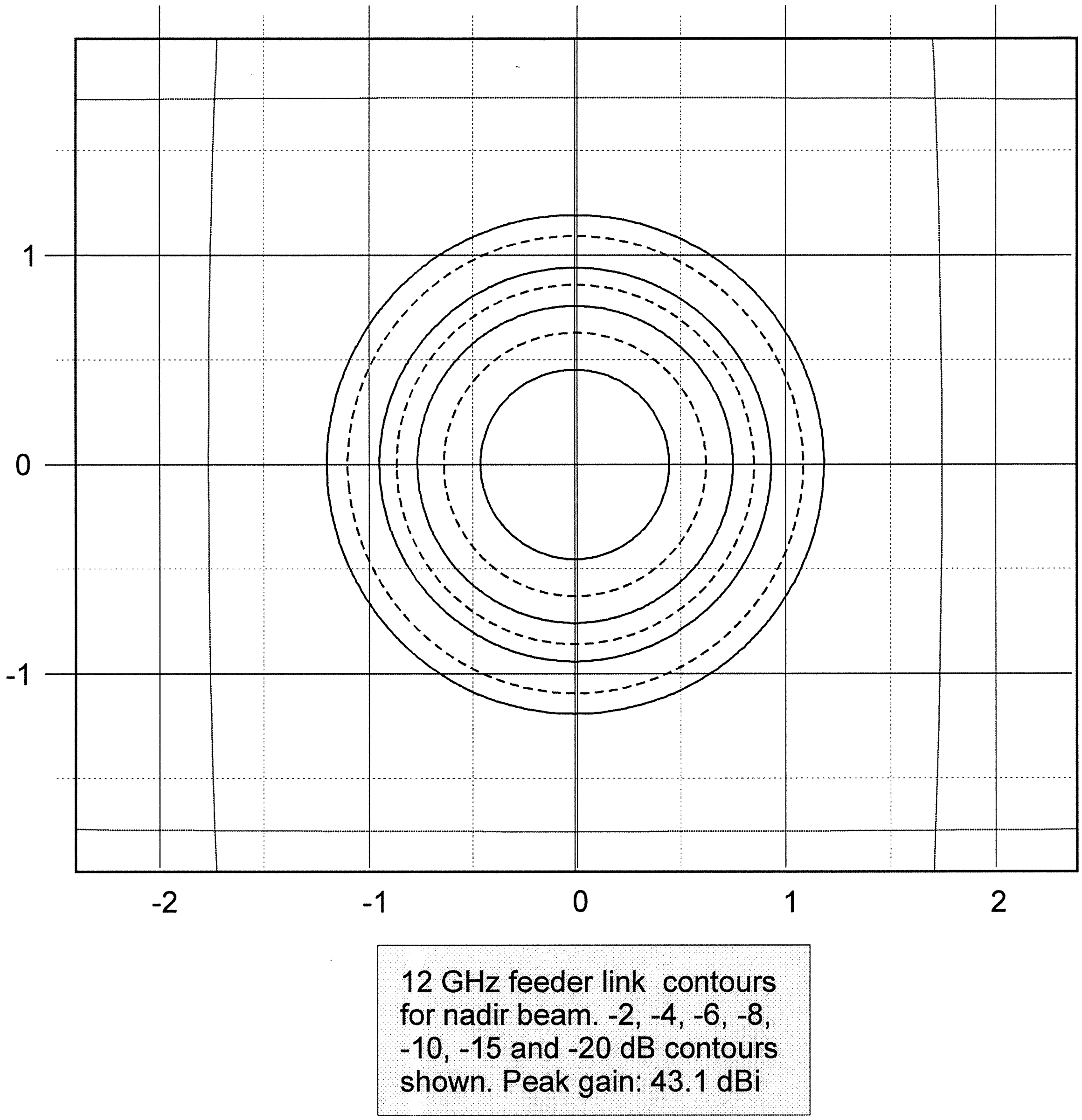
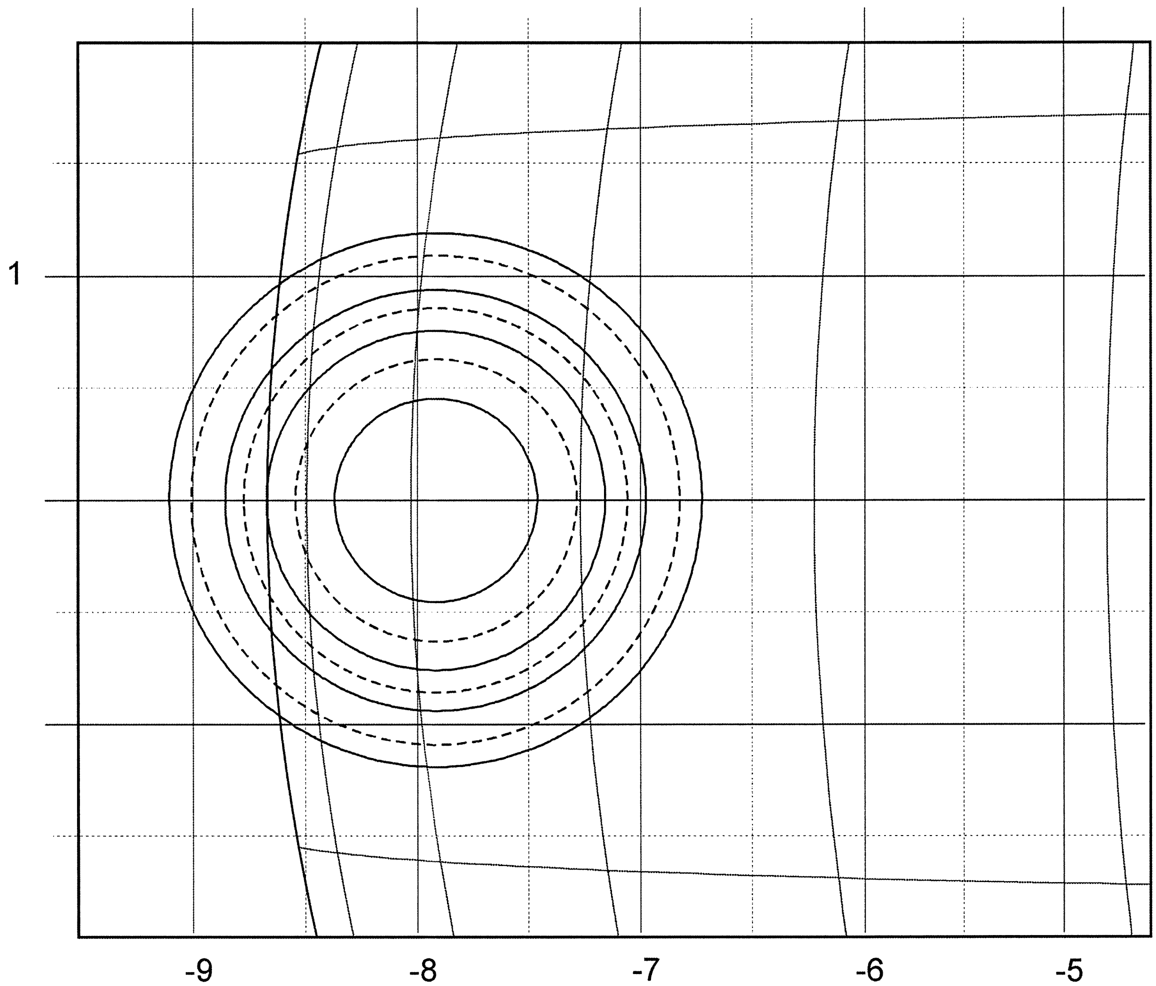

1
0
-1
-2
-1
0
1
2
12 GHz feeder link contours for nadir beam. -2, -4, -6, -8, -10, -15 and -20 dB contours shown. Peak gain: 43.1 dBi

FIGURE F-4



12 GHz feeder link contours
for edge-of-coverage beam.
-2, -4, -6, -8, -10, -15 and
-20 dB contours shown.
Peak gain: 43.1 dBi

FIGURE F-5

APPENDIX G: GSO LINK BUDGETS

Table G-1

Forward Link GSO: Ku up/S down, CDMA voice

Gateway to satellite	**Ku up**	**Satellite to user**	**S-band down**
Average data rate,kbps	2.40	Average data rate,kbps	2.40
Carrier freq. GHz	14.00	Carrier freq. GHz	2.00
EIRP per user, dBW	28.00	EIRP per user, dBW	28.10
Pointing & polarization loss, dB	1.00	Pointing & polarization loss, dB	1.00
Rain margin, dB	10.00	Rain margin, dB	0.00
Range, km	40000.00	Range, km	40000.00
Path loss, dB	207.41	Path loss, dB	190.50
Boltzmann's constant, dBW/K-Hz	-228.60	Boltzmann's constant, dBW/K-Hz	-228.60
Receive antenna gain (incl line loss), dB	39.00	Receive antenna gain (incl. line loss), dB	0.00
Receive Noise Temperature, deg-K	512.00	Receive Noise Temperature, deg-K	400.00
Receive power at LNA per user, dBW	-151.41	Receive power, dBW	-163.40
Interfering beam power density,dBW/Hz	-216.60	Interfering beam power density,dBW/Hz	-232.50
Noise power density, dBW/Hz	-201.51	Noise power density, dBW/Hz	-202.58
Io+No, dBW/Hz	-201.37	Io+No, dBW/Hz	-202.57
Uplink Eb/(No+Io), dB	16.17	Downlink Eb/(No+Io), dB	5.37
		Overall Eb/(No+Io), dB	5.02
		Required Eb/No w. pwr ctl mgn, dB	5.00

Table G-2

Return Link GSO: S up/Ku down, CDMA voice

User to satellite	**S-band up**	**Satellite to gateway**	**Ku -band down**
Average data rate,kbps	2.40	Average data rate,kbps	2.40
Carrier freq. GHz	2.00	Carrier freq. GHz	12.00
EIRP per user, dBW	-2.00	EIRP per user, dBW	9.00
Pointing & polarization loss, dB	1.00	Pointing & polarization loss, dB	1.00
Rain margin, dB	0.00	Rain margin, dB	10.00
Range, km	40000.00	Range, km	40000.00
Path loss, dB	190.50	Path loss, dB	206.07
Boltzmann's constant, dBW/K-Hz	-228.60	Boltzmann's constant, dBW/K-Hz	-228.60
Receive antenna gain (incl line loss), dB	31.00	Receive antenna gain (incl. line loss), dB	52.00
Receive Noise Temperature, deg-K	483.00	Receive Noise Temperature, deg-K	121.00
Receive power at LNA per user, dBW	-162.50	Receive power, dBW	-156.07
Interfering beam power density,dBW/Hz	-216.60	Interfering beam power density,dBW/Hz	-232.50
Noise power density, dBW/Hz	-201.76	Noise power density, dBW/Hz	-207.77
Io+No, dBW/Hz	-201.62	Io+No, dBW/Hz	-207.76
Uplink Eb/(No+Io), dB	5.31	Downlink Eb/(No+Io), dB	17.89
		Overall Eb/(No+Io), dB	5.08
		Required Eb/No w. pwr ctl mgn, dB	5.00

Table G-3

Forward Link GSO: Ku up/S down, CDMA data 144 kbps

Gateway to satellite	Ku up	Satellite to user	S-band down
Data rate,kbps	144.00	Data rate,kbps	144.00
Carrier freq. GHz	14.00	Carrier freq. GHz	2.00
EIRP per user, dBW	40.00	EIRP per user, dBW	35.60
Pointing & polarization loss, dB	1.00	Pointing & polarization loss, dB	1.00
Rain margin, dB	10.00	Rain margin, dB	0.00
Range, km	40000.00	Range, km	40000.00
Path loss, dB	207.41	Path loss, dB	190.50
Boltzmann's constant, dBW/K-Hz	-228.60	Boltzmann's constant, dBW/K-Hz	-228.60
Receive antenna gain (incl line loss), dB	39.00	Receive antenna gain (incl. line loss), dB	11.43
Receive Noise Temperature, deg-K	512.00	Receive Noise Temperature, deg-K	400.00
Receive power at LNA per user, dBW	-139.41	Receive power, dBW	-144.47
Interfering beam power density,dBW/Hz	-216.60	Interfering beam power density,dBW/Hz	-232.50
Noise power density, dBW/Hz	-201.51	Noise power density, dBW/Hz	-202.58
Io+No, dBW/Hz	-201.37	Io+No, dBW/Hz	-202.57
Uplink Eb/(No+Io), dB	10.39	Downlink Eb/(No+Io), dB	6.52
		Overall Eb/(No+Io), dB	5.02
		Required Eb/No w. pwr ctl mgn, dB	5.00

Table G-4

Return link GSO: S band up/Ku band down CDMA 144 kbps data

User to satellite	**S-band up**	**Satellite to gateway**	**Ku band down**
Data rate,kbps	144.00	Data rate,kbps	144.00
Carrier freq. GHz	2.00	Carrier freq. GHz	12.00
EIRP per user, dBW	16.40	EIRP per user, dBW	21.10
Pointing & polarization loss, dB	1.00	Pointing & polarization loss, dB	1.00
Rain margin, dB	0.00	Rain margin, dB	10.00
Range, km	40000.00	Range, km	40000.00
Path loss, dB	190.50	Path loss, dB	206.07
Boltzmann's constant, dBW/K-Hz	-228.60	Boltzmann's constant, dBW/K-Hz	-228.60
Receive antenna gain (incl line loss), dB	31.00	Receive antenna gain (incl. line loss), dB	52.00
Receive Noise Temperature, deg-K	483.00	Receive Noise Temperature, deg-K	121.00
Receive power at LNA per user, dBW	-144.10	Receive power, dBW	-143.97
Interfering beam power density,dBW/Hz	-216.60	Interfering beam power density,dBW/Hz	-232.50
Noise power density, dBW/Hz	-201.76	Noise power density, dBW/Hz	-207.77
Io+No, dBW/Hz	-201.62	Io+No, dBW/Hz	-207.76
Uplink Eb/(No+Io), dB	5.93	Downlink Eb/(No+Io), dB	12.21
		Overall Eb/(No+Io), dB	5.01
		Required Eb/No w. pwr ctl mgn, dB	5.00

Table G-5

Forward Link GSO: Ku up/S down, TDMA voice

Gateway to satellite	**Ku up**	**Satellite to user**	**S-band down**
Burst data rate,kbps (4 slots per frame)	9.60	Burst data rate,kbps (4 slots per frame)	9.60
Carrier freq. GHz	14.00	Carrier freq. GHz	2.00
EIRP per user, dBW	34.00	EIRP per user, dBW	34.10
Pointing & polarization loss, dB	1.00	Pointing & polarization loss, dB	1.00
Rain margin, dB	10.00	Rain margin, dB	0.00
Range, km	40000.00	Range, km	40000.00
Path loss, dB	207.41	Path loss, dB	190.50
Boltzmann's constant, dBW/K-Hz	-228.60	Boltzmann's constant, dBW/K-Hz	-228.60
Receive antenna gain (incl line loss), dB	39.00	Receive antenna gain (incl. line loss), dB	0.00
Receive Noise Temperature, deg-K	512.00	Receive Noise Temperature, deg-K	400.00
Receive power at LNA per user, dBW	-145.41	Receive power, dBW	-157.40
Interfering beam power density,dBW/Hz	-216.60	Interfering beam power density,dBW/Hz	-232.50
Noise power density, dBW/Hz	-201.51	Noise power density, dBW/Hz	-202.58
Io+No, dBW/Hz	-201.37	Io+No, dBW/Hz	-202.57
Uplink Eb/(No+Io), dB	16.15	Downlink Eb/(No+Io), dB	5.35
		Overall Eb/(No+Io), dB	5.00
		Required Eb/No w. pwr ctl mgn, dB	5.00

Table G-6

Return Link GSO: S up/Ku down, TDMA voice

User to satellite	**S-band up**	**Satellite to gateway**	**Ku -band down**
Burst data rate,kbps (4 slots per frame)	9.60	Burst data rate,kbps	9.60
Carrier freq. GHz	2.00	Carrier freq. GHz	12.00
EIRP per user, dBW	4.00	EIRP per user, dBW	15.00
Pointing & polarization loss, dB	1.00	Pointing & polarization loss, dB	1.00
Rain margin, dB	0.00	Rain margin, dB	10.00
Range, km	40000.00	Range, km	40000.00
Path loss, dB	190.50	Path loss, dB	206.07
Boltzmann's constant, dBW/K-Hz	-228.60	Boltzmann's constant, dBW/K-Hz	-228.60
Receive antenna gain (incl line loss), dB	31.00	Receive antenna gain (incl. line loss), dB	52.00
Receive Noise Temperature, deg-K	483.00	Receive Noise Temperature, deg-K	121.00
Receive power at LNA per user, dBW	-156.50	Receive power, dBW	-150.07
Interfering beam power density,dBW/Hz	-216.60	Interfering beam power density,dBW/Hz	-232.50
Noise power density, dBW/Hz	-201.76	Noise power density, dBW/Hz	-207.77
Io+No, dBW/Hz	-201.62	Io+No, dBW/Hz	-207.76
Uplink Eb/(No+Io), dB	5.29	Downlink Eb/(No+Io), dB	17.87
		Overall Eb/(No+Io), dB	5.06
		Required Eb/No w. pwr ctl mgn, dB	5.00

Table G-7

Forward Link GSO: Ku up/S down, TDMA data 144 kbps

Gateway to satellite	Ku up	Satellite to user	S-band down
Burst data rate,kbps (4 slots per frame)	576.00	Burst data rate,kbps (4 slots per frame)	576.00
Carrier freq. GHz	14.00	Carrier freq. GHz	2.00
Burst EIRP per user, dBW	46.00	EIRP per user, dBW	41.60
Pointing & polarization loss, dB	1.00	Pointing & polarization loss, dB	1.00
Rain margin, dB	10.00	Rain margin, dB	0.00
Range, km	40000.00	Range, km	40000.00
Path loss, dB	207.41	Path loss, dB	190.50
Boltzmann's constant, dBW/K-Hz	-228.60	Boltzmann's constant, dBW/K-Hz	-228.60
Receive antenna gain (incl line loss), dB	39.00	Receive antenna gain (incl. line loss), dB	11.43
Receive Noise Temperature, deg-K	512.00	Receive Noise Temperature, deg-K	400.00
Receive power at LNA per user, dBW	-133.41	Receive power, dBW	-138.47
Interfering beam power density,dBW/Hz	-216.60	Interfering beam power density,dBW/Hz	-232.50
Noise power density, dBW/Hz	-201.51	Noise power density, dBW/Hz	-202.58
Io+No, dBW/Hz	-201.37	Io+No, dBW/Hz	-202.57
Uplink Eb/(No+Io), dB	10.37	Downlink Eb/(No+Io), dB	6.50
		Overall Eb/(No+Io), dB	5.00
		Required Eb/No w. pwr ctl mgn, dB	5.00

Table G-8

Return Link GSO: S up/Ku down, TDMA data rate 144 kbps

User to satellite	S-band up	Satellite to gateway	Ku -band down
Burst data rate,kbps	576.00	Burst data rate,kbps	576.00
Carrier freq. GHz	2.00	Carrier freq. GHz	12.00
Burst EIRP per user, dBW	22.40	EIRP per user, dBW	27.20
Pointing & polarization loss, dB	1.00	Pointing & polarization loss, dB	1.00
Rain margin, dB	0.00	Rain margin, dB	10.00
Range, km	40000.00	Range, km	40000.00
Path loss, dB	190.50	Path loss, dB	206.07
Boltzmann's constant, dBW/K-Hz	-228.60	Boltzmann's constant, dBW/K-Hz	-228.60
Receive antenna gain (incl line loss), dB	31.00	Receive antenna gain (incl. line loss), dB	52.00
Receive Noise Temperature, deg-K	483.00	Receive Noise Temperature, deg-K	121.00
Receive power at LNA per user, dBW	-138.10	Receive power, dBW	-137.87
Interfering beam power density,dBW/Hz	-216.60	Interfering beam power density,dBW/Hz	-232.50
Noise power density, dBW/Hz	-201.76	Noise power density, dBW/Hz	-207.77
Io+No, dBW/Hz	-201.62	Io+No, dBW/Hz	-207.76
Uplink Eb/(No+Io), dB	5.91	Downlink Eb/(No+Io), dB	12.29
		Overall Eb/(No+Io), dB	5.01
		Required Eb/No w. pwr ctl mgn, dB	5.00

Table G-9

GSO Telemetry: Ku down

Satellite to gateway	**Launch and insertion**	**On-orbit thru comm antenna**
Data rate,kbps	1.00	32.00
Carrier freq. GHz	12.00	12.00
EIRP , dBW	-1.00	10.00
Pointing & polarization loss, dB	1.00	1.00
Range, km	40000.00	40000.00
Path loss, dB	206.07	206.07
Boltzmann's constant, dBW/K-Hz	-228.60	-228.60
Receive antenna gain (incl. line loss), dB	52.00	52.00
Receive Noise Temperature, deg-K	121.00	121.00
Receive power, dBW	-156.07	-145.07
Noise power density, dBW/Hz	-207.77	-207.77
Downlink Eb/(No), dB	21.71	17.65
Required Eb/No for 10^-6 BER, dB	14.00	14.00
Margin, dB (incl. rain margin)	7.71	3.65

Table G-10

Command GSO: Ku up Gateway to satellite	Launch and insertion	On-orbit thru comm antenna
Data rate,kbps	1.00	16.00
Carrier freq. GHz	14.00	14.00
EIRP, dBW	66.00	45.00
Pointing & polarization loss, dB	1.00	1.00
Range, km	40000.00	40000.00
Path loss, dB	207.41	207.41
Boltzmann's constant, dBW/K-Hz	-228.60	-228.60
Receive antenna gain (incl line loss), dB	0.00	39.00
Receive Noise Temperature, deg-K	512.00	512.00
Receive power, dBW	-142.41	-124.41
Noise power density, dBW/Hz	-201.51	-201.51
Uplink Eb/(No), dB	29.10	35.06
Reqd. Eb/No for 10^-6 BER, dB	14.00	14.00
Margin, dB (incl. rain margin)	15.10	21.06

APPENDIX H: ADVANCED PUBLICATION DATA

UNION INTERNATIONALE DES TELECOMMUNICATIONS
BUREAU DES RADIOCOMMUNICATIONS

INTERNATIONAL TELECOMMUNICATION UNION
RADIOCOMMUNICATION BUREAU

UNIÓN INTERNACIONAL DE TELECOMUNICACIONES
OFICINA DE RADIOCOMUNICACIONES

IFIC / DATE **IFIC / DATE** **IFIC / FECHA**		**SECTION SPECIALE Nº** **SPECIAL SECTION No.** **SECCIÓN ESPECIAL N.º**	
RESEAU(X) A SATELLITE **SATELLITE NETWORK(S)** **RED(ES) DE SATÉLITE**	**GS-2GSO-001**	**ADMINISTRATION RESPONSABLE** **RESPONSIBLE ADMINISTRATION** **ADMINISTRACIÓN RESPONSABLE**	**USA**
RENSEIGNEMENTS REÇUS PAR LE BUREAU LE **INFORMATION RECEIVED BY THE BUREAU ON** **INFORMACIÓN RECIBIDA POR LA OFICINA EL**	**17.07.2002**		

Ces renseignements concernant les réseaux à satellite régis par l'article 9, sous-section 1B, sont publiés par le Bureau des radiocommunications en application du No. 9.2B. Ils font l'objet de la(les) procédure(s) suivante(s), indiquée(s) ci-dessous par un X dans la case pertinente.
(voir les commentaires du Bureau des radiocommunications)

This information on satellite networks covered under Article 9, Sub-Section 1B, is published by the Radiocommunication Bureau in accordance with No. 9.2B. It is subject to the procedure(s) indicated below by an X in the relevant box.
(see comments of the Radiocommunication Bureau)

Esta información relativa a las redes de satélite regidas por el Artículo 9, sub-sección 1B, se publica por la Oficina de Radiocomunicaciones en virtud del No. 9.2B. Está sujeta al (los) procedimiento(s) siguiente(s), señalado(s) con una X en la casilla apropriada.
(véanse las observaciones de la Oficina de Radiocomunicaciones)

X	Les renseignements ont été reçus conformément au No. 9.1	The information has been received pursuant to No. 9.1	La información ha sido recibida de conformidad con No. 9.1
	Les renseignements ont été reçus conformément au No. 9.2	The information has been received pursuant to No. 9.2	La información ha sido recibida de conformidad con No. 9.2
	Toute administration estimant que ses réseaux à satellite, ses systèmes à satellites ou ses stations de terre, selon le cas, existants ou en projet, sont affectés, peut envoyer ses observations à l'administration qui a demandé la publication des renseignements, avec copie au Bureau des radiocommunications.	Any administration which considers that its existing or planned satellite systems or networks or terrestrial stations, as appropriate, are affected, may send its comments to the administration which has requested publication of the information, with a copy of such comments to the Radiocommunication Bureau.	Cualquier administración que considere que sus sistemas o redes des satélites o estaciones terrenales, según el caso, existentes o planificados se verán afectados, podrá comunicar sus comentarios a la administración que haya solicitado la publicación de la información, enviando una copia de dichos comentarios a la Oficina de Radiocommunicaciones.

Information aussi disponible sur le / Information also available on the / Información también disponible en: Space Network Systems Online Service : http://www-br/sns/advpub.html

Items	Description	Description	Descripción
A1a	Identité du réseau à satellite	Identity of the satellite network	Identidad de la red de satélite
A1f1	Administration notificatrice (voir le Tableau 1 de la Préface)	Notifying administration (Refer to Table 1 of the Preface)	Administración notificante (véase el cuadro 1 del Prefacio)
A1f2	Organisation Intergouvernementale de Satellite	Intergovernmental Satellite Organization	Organización Intergubernamental de Satélite
A2a	Date de mise en service	Date of bringing into use	Fecha de puesta en servicio
A2b	Période de validité (année)	Period of validity (year)	Periodo de validez (año)
A4a1	Longitude nominale d'une station spatiale géostationnaire (degré)	Nominal longitude of a geostationary space station (degree)	Longitud nominal de una estación espacial geoestacionaria (grado)
A4b1	Inclinaison de l'orbite (degré)	Angle of inclination of the orbit (degree)	Ángulo de inclinación de la órbita (grado)
A4b2	Période (jjj/hh/mm)	Period (ddd/hh/mm)	Periodo (ddd/hh/mm)
A4b3a	Altitude de l'apogée (km)	Altitude of the apogee (km)	Altitud del apogeo (km)
A4b3b	Altitude du périgée (km)	Altitude of the perigee (km)	Altitud del perigeo (km)
A4b4a	Nombre de satellites	Number of satellites	Número de satélites
A4b4b	Corps de référence	Reference body	Cuerpo de referencia
A4b5a	Nombre de plans orbitaux	Number of orbital planes	Número de planos orbitales
A13	Référence aux Sections Spéciales	Reference to Special Sections	Referencia a las Secciones Especiales
C1	Gamme de fréquences	Frequency Range	Gama de frecuencias
C4a	Classe de station (voir le Tableau 3 de la Préface)	Class of station (Refer to Table 3 of the Preface)	Clase de estación (véase el cuadro 3 del Prefacio)
C4b	Nature du service (voir le Tableau 4 de la Préface)	Nature of service (Refer to Table 4 of the Preface)	Naturaleza del servicio (véase el cuadro 4 del Prefacio)
C11a4	Description détaillée de la zone de service	Narrative description of the service area	Descripción detallada de la zona de servicio
BR1	Date de réception	Date of receipt	Fecha de recepción
BR3a	Code de référence de la disposition	Provision reference code	Código de referencia de la disposición
BR6a	Numéro d'identification du réseau à satellite	Identification number of the network	Número de identificación de la red
BR6b	Ancien numéro d'identification du réseau à satellite	Old identification number of the network	Número anterior de la identificación de la red
BR7a	Numéro d'identification du groupe	Identification number of the group	Número de la identificación del grupo
BR7b	Ancien numéro d'identification du groupe	Old identification number of the group	Número anterior de la identificación del grupo
BR14	Symbole et numéro de la Section Spéciale	Symbol and number of the Special Section	Símbolo y número de la Sección Especial
BR15	Code de référence de la disposition pour le groupe de fréquences	Provision reference code for the frequency group	Código de referencia de la disposición para el grupo de frecuencias
BR20	Numéro de la IFIC	IFIC number	Número de la IFIC
BR22	Remarques de l'Administration	Administration remarks	Observaciones de la Administración
BR23	Observations du Bureau des radiocommunications	Radiocommunication Bureau comments	Comentarios de la Oficina de Radiocomunicaciones

SECTION SPECIALE / SPECIAL SECTION / SECCION ESPECIAL

A | *A1a* Sat. Network: GS-2GSO-001 | *A1f1* Notifying adm.: USA | *A1f2* Inter. sat. org.: | *BR1* Date of receipt: 17.07.2002 | *BR20* IFIC no.:

BR6a/BR6b Id. no.: 3 | *BR3a* Provision reference: 9.1/IB

A4a1 Orbital long.: 99 W

BR7a/BR7b Group id.: 1 | *BR14* Special Section:

BR15 Provision reference: 9.1/IB

A2a Date of bringing into use: 12.07.2007 | *A2b* Period of valid.: 15

C1 Frequency Range: From 1980 MHz To 2025 MHz

C4a Class of station: EI

C4b Nature of service: OT

C11a4 Service area: REGIONS 1, 2 & 3

BR7a/BR7b Group id.: 2 | *BR14* Special Section:

BR15 Provision reference: 9.1/IB

A2a Date of bringing into use: 12.07.2007 | *A2b* Period of valid.: 15

C1 Frequency Range: From 2160 MHz To 2200 MHz

C4a Class of station: EI | EI

C4b Nature of service: OT | OT

C11a4 Service area: REGIONS 1, 2 & 3

BR7a/BR7b Group id.: 3 | *BR14* Special Section:

BR15 Provision reference: 9.1/IB

A2a Date of bringing into use: 12.07.2007 | *A2b* Period of valid.: 15

C1 Frequency Range: From 11.45 GHz To 11.7 GHz

C4a Class of station: EI | EI | EC

C4b Nature of service: OT | OT | OT

C11a4 Service area: REGIONS 1, 2 & 3

BR7a/BR7b Group id.: 4 | *BR14* Special Section:

BR15 Provision reference: 9.1/IB

A2a Date of bringing into use: 12.07.2007 | *A2b* Period of valid.: 15

C1 Frequency Range: From 13.77 GHz To 14 GHz

C4a Class of station: EI | EI | EC | EC

C4b Nature of service: OT | OT | OT | OT

C11a4 Service area: REGIONS 1, 2 & 3

SECTION SPECIALE / SPECIAL SECTION / SECCION ESPECIAL

A	*A1a* Sat. Network	GS-2GSO-001	*A1f1* Notifying adm.	USA	*A1f2* Inter. sat. org.		*BR1* Date of receipt	17.07.2002	*BR20* IFIC no.
BR6a/BR6b Id. no.	3		*BR3a* Provision reference	9.1/IB					

BR22 Administration remarks

BR23 Radiocommunication Bureau comments