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ORIGINAL

January 23, 1998

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
1919 M Street, N.W.
Room 222
Washington, D.C. 20554

Re: Application of Pegasus Development Corporation
For Authority to Launch and Operate a Communications
Satellite System in the Ka band

Dear Ms. Salas:

Pegasus Development Corporation ("Pegasus"), by its counsel, hereby requests reinstatement of the above-referenced application, originally submitted on December 22, 1997. (A copy of the application is attached hereto as Exhibit A.) As discussed below, Pegasus complied with the Commission's rules and practices, including submitting an appropriate waiver request. Thus, return of its application was improper.

The Pegasus application requests authority to operate two technically identical satellites at each of five orbit locations. As part of its original filing, Pegasus submitted a check for $425,225 to cover filing fees for the five orbit locations and requested a waiver of the Commission's fee rules, the literal terms of which provide that the fee payment is to be calculated on the basis of the ten satellites, or $850,450. (See Pegasus Application, FCC Form 312, Item 35 and FCC Form 312, Exhibit D). The grant of a waiver to permit application fees to be calculated on a per-orbit-location basis is consistent with the Commission's actions in all other satellite processing rounds since the issue first arose over two years ago, including during the earlier processing round for applications in the frequency bands at issue here. *Public Notice* 56031 (September 28, 1995); *Public Notice* 76181 (August 26, 1997) (attached hereto as Exhibits B and C, respectively). In addition, we understand that the Commission has asked Congress to amend its statutory authority to codify that application filing fees for technically identical geostationary satellites should be submitted on a per-orbit-location basis, which is consistent with the Commission's actual practice.

The Pegasus application was returned by letter from Claudette E. Pride, Chief, Fee Section, Fee Control No. 9712248210223001 (January 13, 1998) (attached hereto as Exhibit D). The provision relied on to dismiss the Pegasus application is contained in the public notices setting the December 22, 1997 cut-off for this round of Ka-band applications. *Public Notices*, Report No. SPB-105 and SPB-106, DA 97-2201 and DA 97-2202 (October 15, 1997) (attached hereto as Exhibit E). The public notices contain identical language stating that

> ... applicants for geostationary satellite systems would file the fee listed for "Space Stations (Geostationary)" on a per satellite basis (*see* 47 C.F.R. § 1.1107(9)(b)(1)). Pursuant to Section 1.1117 of the Commission's rules, 47 C.F.R. § 1.1117, requests for a waiver of the fees will be considered on a case-by-case basis.

This public notice is at best ambiguous as to whether applicants requesting a waiver to file on a per-orbit location basis must submit their fees on a per-satellite basis. Other than the reference to the general provisions of Section 1.1117, there is no specific indication that the larger fee must be paid at the time the application is submitted. The use of the conditional word "would" rather than more mandatory language such as "must" or "shall" also suggests that there are acceptable alternatives to paying the fee on a per-satellite basis. Given the Commission's well-established practice of permitting applicants to submit fees based on the number of orbit locations requested, it is reasonable to interpret the public notice as confirming that practice, rather than notifying potential applicants of what would effectively be a new policy. Certainly, the ambiguous nature of the public notice does not establish the kind of precision necessary for the Commission to abandon its well-established policy in as draconian an action as the return of the Pegasus application. See, e.g., *Salzer v. FCC*, 778 F.2d 869 (D.C. Cir. 1985).

Moreover, as the practice in the other, earlier processing rounds involved the Commission issuing a ruling prior to the cut-off deadline granting a blanket waiver, Pegasus recognized this by including a specific waiver request in its application. That waiver request should be seen as having two components: (i) a request that the filing fee be paid on a per-orbit-location basis and (ii) a request that Pegasus not be required to submit the per-satellite filing fee at the time of its application. The application, however, was returned without addressing the second part of the waiver request. The Commission must give a "hard look" at all waiver requests, which was not done here. *WAIT Radio v. FCC*, 418 F.2d 1153 (D.C. Cir. 1969), *cert. denied*, 409 U.S. 1027 (1972). In the past, the Commission has reviewed and granted waiver requests submitted without the payment of the full fee in question, without requiring the application to be refiled. See, e.g. *Grupo Televisa*, Fee Control No. 9612188160147001 (February 26, 1997) (a copy of which is attached hereto as Exhibit F).

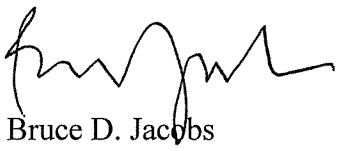
Finally, common sense should prevail here. At most, Pegasus, by filing the orbit-location-based fee, should be seen as having taken a risk that its request to file fees on a per-orbit-location basis would not be granted. But if, as expected, the Commission maintains its policy of treating identical satellites at the same orbit location as one satellite for the purposes of calculating filing fees, then it makes no sense to penalize Pegasus for not having included in its application a payment of $425,225 that would eventually be reimbursed. Requiring Pegasus to

demonstrate an ability to file the larger fee would serve no public interest purpose. If the Commission ultimately accepts and processes applications based on a per-orbit-location fee, the Commission will have treated similarly-situated applicants differently, with no rationale basis for such disparity. *Melody Music v. FCC*, 345 F.2d 730, 732 (D.C. Cir. 1965).

Pegasus requests expedited review of this request in order to avoid any potential prejudice to its application or to the development of its satellite business. In the interest of expedition, however, Pegasus is not resubmitting its application at this time along with a new filing fee (for either $425,255 or $850,450), but it is prepared to accept the requirement for such a refiling as a condition to its reinstatement if the Commission decides that its procedures require such a filing.

Therefore, based on the foregoing, Pegasus urges the Commission to reinstate its application *nunc pro tunc*.

Very truly yours,



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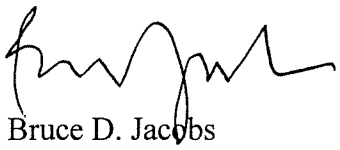

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EXHIBIT A

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of

Pegasus Development Corporation File No.

Application for Authority to Launch and
Operate a Communications Satellite
System

APPLICATION

Pegasus Development Corporation
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December 22, 1997

TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

List of Figures

TABLE OF CONTENTS (cont.)

List of Tables

Before the
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In re Application of	)	
	)	
PEGASUS DEVELOPMENT CORPORATION	)	File No.
	)	
Application for Authority to Launch and Operate a Communications Satellite System in the Ka Band	)	

APPLICATION

Pegasus Development Corporation ("Pegasus") hereby applies for authority, pursuant to Sections 308 and 309 of the Communications Act of 1934, as amended, and Section 25.114 of the Commission's Rules, to launch and operate a communications satellite system in the Ka Band.[1/]

1.0. INTRODUCTION

Pegasus' parent company, Pegasus Communications Corporation ("Pegasus Communications") is a growing communications company that has achieved success in a variety of media industries. Pegasus Communications owns and operates five broadcast television stations and operates three other stations under local marketing agreements. Pegasus Communications is the largest independent provider of DIRECTV®, with the exclusive right to distribute DIRECTV® programming services to approximately 2.3

1/ *See* Public Notice, Report No. SPB-106 (October 15, 1997).

million U.S. television households in rural areas of twenty-seven states. In addition, Pegasus Communications also provides cable service to approximately 42,000 subscribers in New England and Puerto Rico.

For purposes of this application, Pegasus proposes to launch and operate the Pegasus I Satellite System ("Pegasus I") in the Fixed Satellite Service ("FSS") using Ka-band spectrum. The global system consists of: a constellation of ten geostationary orbit ("GSO") satellites (two satellites at each of five orbit locations); satellite and network control facilities; and customer equipment. The system has the capability to provide a broad range of multimedia services, consisting primarily of wide-band, high-speed data transmissions. The overall operational concept for Pegasus I is illustrated in Figure 1-1. Figure 1-1 shows the ability of Pegasus I subscribers to communicate either with other Pegasus I subscribers or, through a gateway interface, with subscribers to other broadband networks.

2.0. SYSTEM DESCRIPTION

2.1 GENERAL OVERVIEW OF SYSTEM

2.1.1 SATELLITE DESCRIPTION

Each of the ten Pegasus I satellites contains an IF switch matrix for routing signals between the 30 uplink and 30 downlink beams illuminating the service area, defined as the field-of-view for a 20 degree minimum elevation angle, including beams north and south of the equator. No on-board demodulation is required. East-west intersatellite links are proposed in the 50 to 70 GHz millimeter wave band. TT&C during launch and pre-operation will be provided in the Ku Band. On-station, operational TT&C will be provided in the Ka Band.

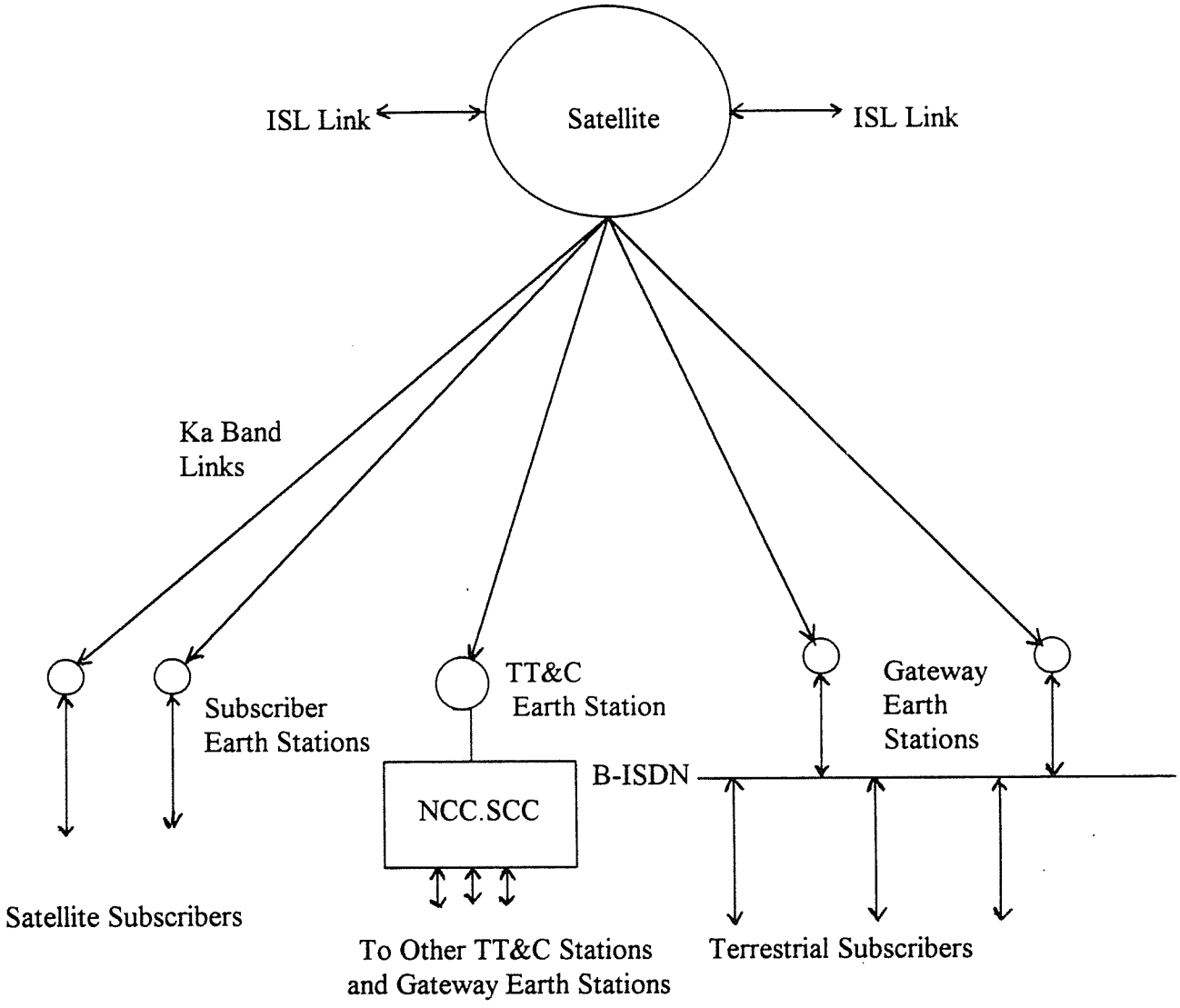


Figure 1-1. Operational Concept

With further development, ATM technology, on-board demodulation and phased array technology may become possible. If this technology is available at the time of licensing, Pegasus may amend its application, if necessary. No significant changes to the satellite capacity or radiation characteristics will result from such modification, however.

Pegasus I will operate in the Ka-Band frequencies that are the subject of the Public Notice with respect to GSO systems. Actual use will depend on what spectrum can be coordinated. Section 2.5.1, below, describes one likely frequency plan.

The satellite concept is depicted in Figure 2-1. Each uplink beam contains a High Band and Low Band segment, each amplified by an LNB, with further amplification, frequency conversion, and filtering provided by a matrix of TDM/FDM channel units. Signals at three different burst rates enter the IF switch matrix where individual transmission bursts are routed to the correct downlink beam. Signals exiting the IF switch matrix destined for individual downlink beams are amplified by downlink TDM/FDM channel units and then by high efficiency, linearized TWTAs.

2.1.2 GROUND SEGMENT

The Pegasus I ground segment consists of a Network Control Center ("NCC") for controlling the communications network and a Satellite Control Center ("SCC") for controlling the launching and operation of satellites and associated TT&C facilities. A NCC/SCC and TT&C terminal will be located within CONUS and a TT&C earth station located in ITU Regions 1 and 3 and interconnected to the NCC/SCC via satellite or terrestrial communications facilities. This ground segment is required for the control of the space segment.

The ground segment also consists of subscriber earth stations installed on or near

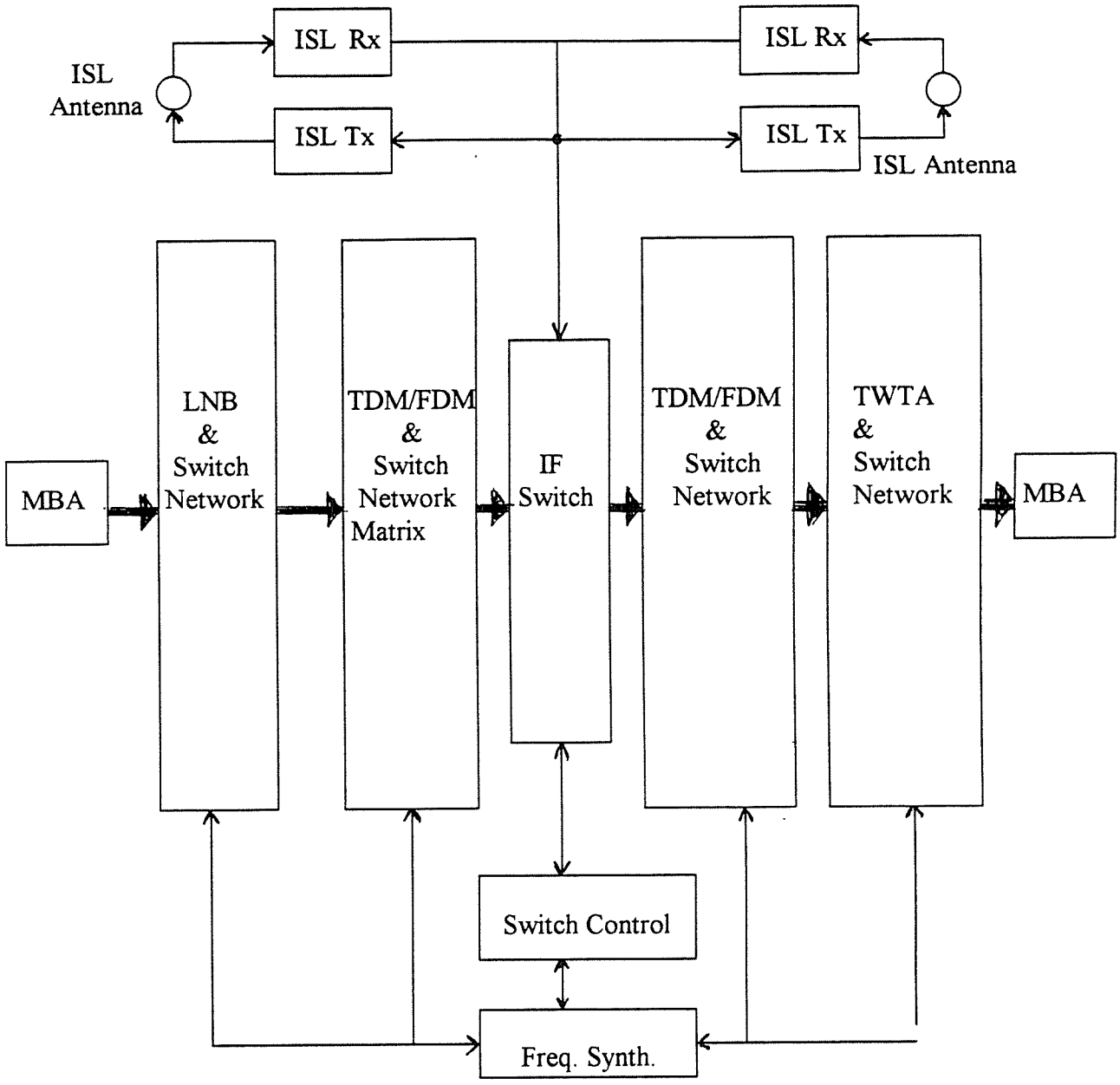


Figure 2-1. Satellite Communications Concept

residences or office and factory buildings, and larger, more sophisticated gateway earth stations providing interconnection, network, trunking and other services. These ground facilities are expected to be owned and operated by service providers.

Subscriber earth station antennas are expected to range from 0.5 to 3.0 meters, with smaller antennas used by private or small-business subscribers and larger antennas used by larger business and government subscribers requiring higher-quality service. Larger antennas also will be used in subtropical and tropical rainy areas. Gateway earth station antennas are expected to be at least 1.0 meter, and as large as 3.0 meters in subtropical or tropical areas. Gateway earth stations provide network services to associated subscribers, such as signaling, routing, authentication, and billing, and may provide interconnection to terrestrial wireless or fiber system subscribers, including protocol conversion. Gateway earth stations are also expected to allow the introduction of network services such as the Internet and provide trunking services between terrestrial systems of various kinds.

2.2. ORBITAL CHARACTERISTICS

2.2.1 OPERATING REGIONS

Pegasus proposes to operate a global network serving four important regional areas:

1) North America, including the 50 states, Puerto Rico, the U.S. Virgin Islands, Canada and Mexico. For interconnectivity, it is desirable to illuminate portions of Central and South America;

2) South and Central America; for interconnectivity it is desirable to illuminate portions of North America;

3) Europe, the Middle East, and Africa; and

4) Asia.

With coverage limited to minimum elevation angles of 20 degrees due to Ka-Band rain attenuation, the range of orbital arcs within which a Pegasus I satellite may operate is limited. The five orbital locations will be occupied by an initial system of ten satellites. The presence of two satellites at each orbital location will permit Pegasus to double system capacity via orthogonal polarization and possibly extend existing coverage areas.

2.2.2. REQUESTED ORBITAL STATIONS

As stated above, the Pegasus I system is comprised of five orbital stations. These orbital stations are 93° and 103° W.L., primarily for North America and the Caribbean region, 69° W.L. for Central and South America, 26.2° E.L. for Europe, Africa, and the Mediterranean area, and 99° E.L. for Asia. Each orbital station enables service both north and south of the equator, using two co-located satellites.

2.2.3 ALTERNATIVE ORBITAL STATIONS

Pegasus is aware that Ka-Band orbital locations may be in short supply and consequently pledges to work diligently with the Commission and its fellow applicants to resolve all orbital issues or conflicts. Ka-Band orbital slots are subject to coordination with other U.S. systems and with the Ka-Band systems of other administrations, and consequently the ITU record, which Pegasus has examined, may not be adequate or up to date regarding announced systems. Consequently, Pegasus is willing to consider alternatives. The range of acceptable longitudes is restricted at Ka Band because of the elevation angle (20 degrees) believed to be necessary for acceptable Ka-Band service. The following is the suggested range of orbital arcs that might prove acceptable to applicants serving the respective regions:

1) North America. The arc plus and minus ten degrees from 93° and 103° W.L. degrees provides acceptable service to CONUS. Orbital stations outside this arc, apparently available at 69° W.L., 121° W.L., and 129° W.L., are less desirable because of rain attenuation effects.

2) Central and South America. The arc from 90° W.L. to approximately 25° W.L. provides acceptable service to this area. This includes possible alternative orbital locations at 63° W.L., 59° W.L., 55° W.L., 51° W.L., 45° W.L., 43° W.L. and 34.5° W.L.

3) Europe and Africa. The arc from 10° W.L. to 40 ° E.L. provides acceptable service to this area. This includes a possible alternative orbital location at 2° E.L.

4) Asia. The arc from 90° E.L. to 140° E.L. provides acceptable service to much of this area. This includes possible alternative orbital locations at 72.7° E.L., 139° E.L., 155° E.L. and 160° E.L.

2.2.4. STATION KEEPING AND LOCATION REQUIREMENTS

Pegasus intends to maintain its satellites on-station with an accuracy of 0.03 degrees north-south and east-west. North-south, i.e., inclination correction, is required over the entire operating life of each satellite because subscriber earth station antennas are fixed and re-pointing requires revisiting each site by a local technician.

2.3. SPACE SEGMENT DESCRIPTION

The Pegasus I satellites are based on state-of-the-art space technology. The use of IF switching results in a space system having high flexibility in data rate and beam-to-beam routing. The multiple beam antenna may be composed of fixed horns with multiple feeds. There may be a need, however, to move satellites from orbit station to orbit station, requiring some flexibility for re-pointing the beams. At a minimum, this flexibility can be accomplished through the use of several antennas. Alternatively, separate transmit and receive multiple beam phased arrays with independent steering may be available. Pegasus I spacecraft require a high power bus and accurate attitude control

and station keeping; these requirements are well within the present capability of the satellite manufacturing industry.

It may become possible to build Pegasus I using ATM-like switching technology, with on-board processing (demodulation, decoding, demultiplexing and the inverse). This satellite will not exceed the radiation characteristics described herein, and will have the same capacity and link performance cited herein. The use of on-board processing will reduce the required earth station HPA power and satellite power densities.

ISLs are planned for the millimeter wave band, 50 to 70 GHz. Commercially-proven optical ISLs also may be used.

2.3.1. COMMUNICATIONS SYSTEM DESIGN

The satellite communications systems are based on the latest miniature microwave integrated circuit ("MMIC") technology, designed to conserve mass and power and to achieve high performance. MMICs are mandatory for LNBs and TDM/FDM channel units because the large number of antenna beams (30) requires the use of repetitive, light- weight, low power subsystems and components. Multiple IF switches also are used in order to provide routing flexibility. Multiple beam reflector antennas provide high efficiency, good crosspol performance, and good co-channel beam isolation. Several antenna assemblies are anticipated in order to achieve beam pointing flexibility. The power amplifiers are expected to be linearized, high efficiency, variable power TWTAs with the high efficiency achieved at the operating point. ATPC, activated via the signaling channel, is provided by the downlink TDM/FDM channel units.

2.3.2. TT&C SUBSYSTEM

The TT&C subsystem will operate in the Ku Band during launch, using omnidirectional satellite antennas, and in the Ka Band during normal operation, with omnidirectional command antennas and a horn telemetry antenna. In certain operational situations where satellite attitude control has been lost, it may be necessary to use the Ku-Band telemetry as part of the restoral operations. TT&C also provides for tracking and ranging.

Command receivers, decoders, and decryptors are fully redundant via cross-strapping. Telemetry encoders, transmitters, and beacons are hot-switched redundant. Functionality will not be lost due to any single failure. A summary of launch and on-orbit TT&C performance is given in Section 2.5.4.3.

2.3.3. ELECTRICAL POWER SUBSYSTEM

Pegasus expects to base its electrical power subsystem on a single high voltage regulated bus with direct energy transfer. Primary power is provided by two deployed gallium arsenide solar arrays steered around a single axis. A silicon solar array is considered an alternative. Power control units and DC/DC converters support local equipment. Excess energy is stored in charge-controlled nickel-hydrogen batteries for use during eclipse and peak load conditions. The required power and energy storage are well within the range of capabilities in the commercial space industry.

2.3.4. THERMAL SUBSYSTEM

Pegasus I included a passive thermal subsystem, using thermal finishes, blankets, and heat pipes augmented with temperature-controlled heaters. These devices minimize temperature excursions and maintain satellite equipment at proper operating

temperatures. Special heaters can maintain minimum operating temperatures for critical equipment. Heat pipes likely will be used to distribute dissipated payload heat and to limit maximum equipment temperatures. In addition, the telemetry subsystem provides fault detection alarms in the event of improper temperature operation and monitors temperature-critical subsystems. The satellite contains three separate thermally-isolated areas (areas having minimal mutual heat transfer) -- the main satellite body, the battery area, and the solar arrays.

2.3.5. PROPULSION SYSTEM

The propulsion subsystem may be based on either a monopropellant or bi-propellant hydrazine system (depending on the selection of a spacecraft manufacturer) operated in a blow-down mode with helium as the pressurant. Propellant and pressurant loading is accomplished through independent fill and drain valves. Thruster isolation is provided by a latch valve. Sufficient propellant will be loaded in order to accomplish all necessary attitude and orbital maneuvers over the expected lifetime of each spacecraft, including the final de-orbiting maneuver. High impulse ion thrusters also may be used, depending on the specific experience of the selected spacecraft manufacturer.

2.3.6. ATTITUDE CONTROL SUBSYSTEM

The attitude control system will contain a special, computer-oriented, autonomous system with command over-rides for automatic operation of the attitude control system. The attitude control system is expected to be a three-axis, stabilized momentum bias system using redundant momentum wheels and associated thrusters. Earth and sun sensors and inertial measurement sensors monitor spacecraft attitude in three axes. A star tracker or RF beacon also may be used for more accurate yaw measurements.

2.3.7. STRUCTURE AND MECHANISMS

The structure provides a rigid stable platform for maintaining alignment of precision pointing sensors and antennas. The structure also conducts heat and provides adequate surface areas for heat radiation. Rigid mounting surfaces are provided for solar arrays and antennas. Deployment mechanisms are required for the solar arrays and antennas.

2.3.8. LAUNCH VEHICLES

Pegasus I satellites may be launched by a variety of launch vehicles. Launch vehicles will be selected on the basis of performance and cost.

2.3.9. MASS AND POWER BUDGETS

Estimated spacecraft mass and power are as follows:

TABLE 2-1. Mass Properties of Pegasus I Satellite.

	Mass, Kg
Communications Subsystem	277
Spacecraft, BOL	833
Launch Mass	1,515

TABLE 2-2. Power Properties of Pegasus I Satellite.

	Power, watts
Communications	1,068
Spacecraft Bus	150
Daytime Power, with margin, EOL	1,346
Daytime Power, with margin, BOL	1,548

2.3.10 OVERALL SPACECRAFT DIMENSIONS

The tip-to-tip spacecraft, with deployed solar arrays, is approximately 15 meters.

2.3.11. SYSTEM LIFE AND RELIABILITY

Pegasus I satellites will have a design lifetime of 12 years. The expected orbital

lifetime of these satellites will exceed 12 years, the probability of a satellite remaining fully operational after 12 years is estimated to be 0.8.

2.4. EARTH STATION DESCRIPTIONS

2.4.1. CPE EARTH STATION DESCRIPTION

The CPE earth station, designed for low-cost, high-volume production and ready installation on residences, industrial buildings, or on the ground, makes use of earth station antennas in the range of 0.5 to 3.0 meters, with 0.7 meters being typical. The antennas are fixed in the direction of the satellite and cannot be re-pointed without the services of a local technician. The HPA of each earth station operates with ATPC such that the signal arriving at the satellite is always near its "clear sky" value, controlled by measuring the downlink attenuation but with the supervision of the local gateway earth station.

Generally, each CPE earth station can operate in either the Low Band or High Band on either polarization set and at either the high or low burst rate (unless coordination precludes the use of the Low Band at that site). Business and government users likely will prefer larger antennas in order to achieve greater availability due to rain, dual band operation, dual polarization operation and generally, will require higher capacity earth stations at the higher data rates. Private subscribers may prefer smaller antennas and simpler earth station configurations because of cost considerations. Thus, the Pegasus I design permits operational flexibility and customized service options, thereby encouraging higher system use.

Authentication of each CPE earth station transmission is provided by its associated gateway earth station, which also monitors services and performance over the

signaling channels. Burst timing corrections are provided by the local gateway earth station based on information transmitted from the NCC/SCC.

For a full range of household multimedia services the PC will need to be connected to other household appliances such as the television set, VCR, or CD player.

2.4.2. GATEWAY EARTH STATION DESCRIPTION

Gateway earth stations will have 1.0 meter fixed antennas or larger, in order to improve availability during periods of rain. Gateway earth stations, with full hot-switched redundancy and operated by independent service providers, operate in the same transmission format as CPE earth stations and provide the following network services:

1) Authentication of subscribers and services, other network services, control of CPE earth station performance, billing, etc. for associated CPE earth stations. Each CPE earth station must be controlled by an authorized gateway earth station.

2) Interconnection with the B-ISDN and other broadband terrestrial transmission facilities, enabling communication between Pegasus I subscribers, terrestrial subscribers, and other satellite system subscribers. Gateway earth stations provide protocol conversion, as required.

3) Introduction of special network services, such as Internet.

4) Provision of point-to-point trunking services for isolated fiber and terrestrial wireless systems and other terrestrial or satellite systems.

2.4.3. NCC/SCC AND TT&C EARTH STATION DESCRIPTION

The NCC/SCC are planned for installation within CONUS, along with a TT&C earth station. The NCC controls the Pegasus worldwide network via terrestrial or satellite communication interconnection with all gateway earth stations. The SCC monitors and controls the satellites, supervises launches and corrects attitude and orbit parameters. The NCC/SCC, again via terrestrial or satellite communications facilities, controls the satellites in other ITU regions via TT&C facilities in those regions. A geographically

separate, redundant NCC/SCC is planned for installation within CONUS.

2.4.4. EARTH STATION CAPACITY

Each earth station may operate at data rates between 16 KBps up to the maximum burst rate, 53 MBps in the Low Band and 61MBps in the High Band. If needed, multiples of these rates can be provided for gateway earth station trunking services or other services by changing the frequency plan in the satellite beams.

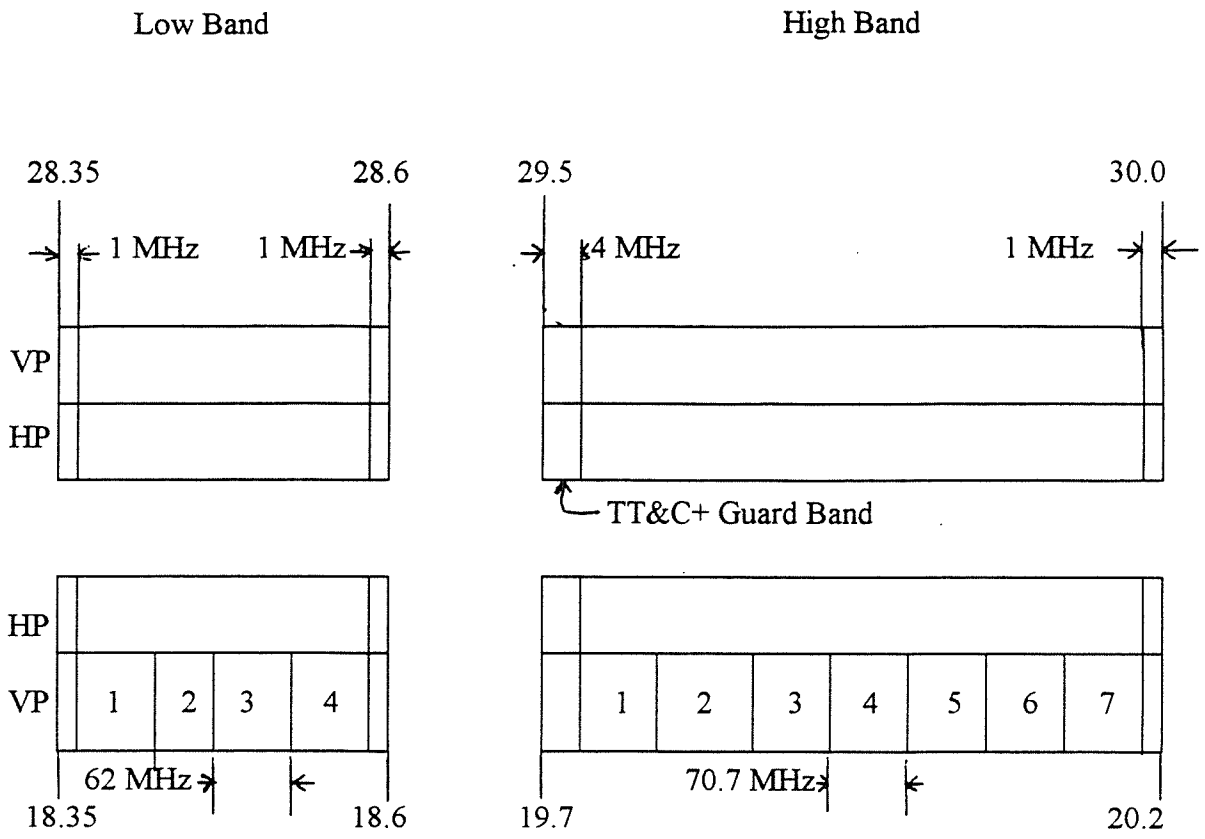
2.4.5. EARTH STATION ANTENNA BEAM PATTERNS

All Ka-Band earth station antennas will meet the requirements specified in 47 C.F.R. § 25.209.

2.5. COMMUNICATIONS SYSTEM DESCRIPTION

2.5.1. SPECTRUM AND POLARIZATION PLAN

The spectrum and polarization plan is depicted in Figure 2-2, illustrating a "High Band" segmented into seven parts, plus guard bands and TT&C, and a "Low Band" segmented into four parts, plus guard bands. The different segmentations, resulting in slightly different antenna self-interference in the two bands, provide approximately the same maximum data rate to subscribers. A segment from each band is assigned to each beam such that an adequate separation exists between two co-channel beams. Orthogonal polarization is used with each band such that transmit and receive signals are orthogonally polarized. While Figure 2-2 indicates equal segmentation, operational requirements may result in more bandwidth for some beams relative to others, in order to adapt to the demand for service over the service area. The bandwidth per beam is controlled by the LNB and TWTA switching.



Frequency in GHz
Not to Scale

Figure 2-2. Spectrum and Polarization Plan

For equal-bandwidth segmentation, the following are the transponder center frequencies.

Transponder	Low Band		High Band	
	Downlink MHz	Uplink MHz	Downlink MHz	Uplink MHz
Guard Band	18,350-18351	28,350-28351	19,700-19,704	29,500-29,504
T1	18,382	28382	19,739.4	29,539.4
T2	18,444	28444	19,810.1	29,610.1
T3	18,506	28506	19,880.8	29,680.8
T4	18,568	28568	19,951.5	29,751.5
T5			20,022.2	29,822.2
T6			20,092.9	29,892.9
T7			20,163.6	29,963.6
Guard Band	18,599-18,600	28,599-28,600	20,199-20,200	29,999-30,000

2.5.2. SATELLITE COVERAGE AND ANTENNA BEAM PATTERNS

Coverage of the U.S., including offshore states and territories by the 30 beam antenna, is depicted in Figure 2-3a from the 93° W.L. orbital position and Figure 2-3b from the 103° W.L. orbital position. Tables 2-3a and b list the beam pointing angles relative to the antenna boresight for 93° and 103° W.L. Table 2-4 depicts the segmentation and polarization plan for the individual beams for the 93° W.L. orbital location. The 93° W.L. orbital position also can provide coverage of Canada, Mexico, Central America, the Caribbean area and portions of South America by operating a second satellite with this coverage pattern from the 93° W.L. orbital position. Figures 2-3a and b also depict the 20 degree earth station elevation contour for these orbital positions, illustrating the narrow range of orbital stations capable of serving CONUS. Alaska can be served at a lower elevation angle because typical rain rates in Alaska are lower. Hawaii also is beyond the 20 degree contour. There are regions in Hawaii where rain rates are very high, consequently service to Hawaii from the 93° W.L. orbital slot is not as good as it could be from orbital stations further west. Hawaii is within the 20

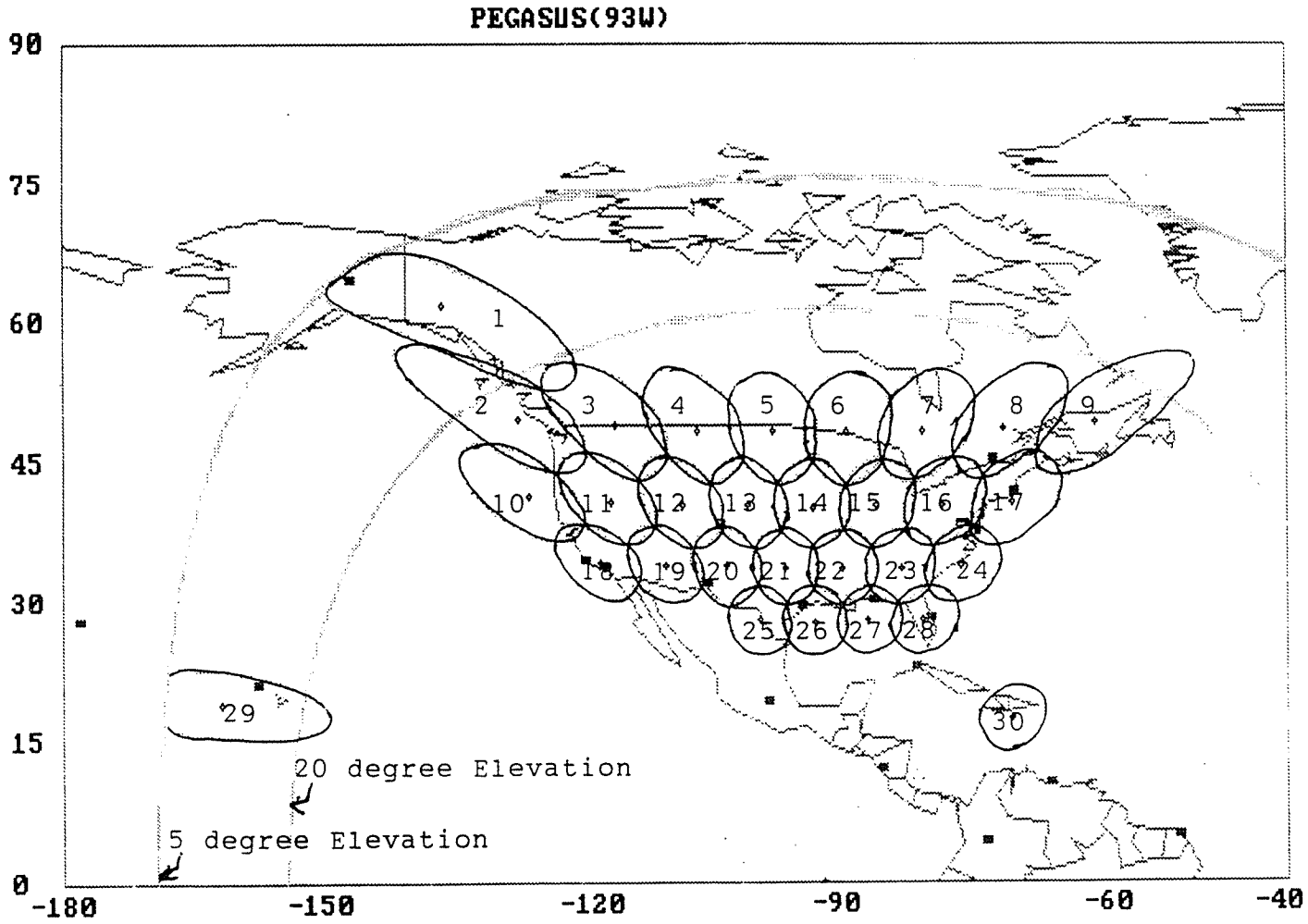


Figure 2-3a. Coverage of U.S. Including Offshore States and Territories for Satellite at 93° W.L.

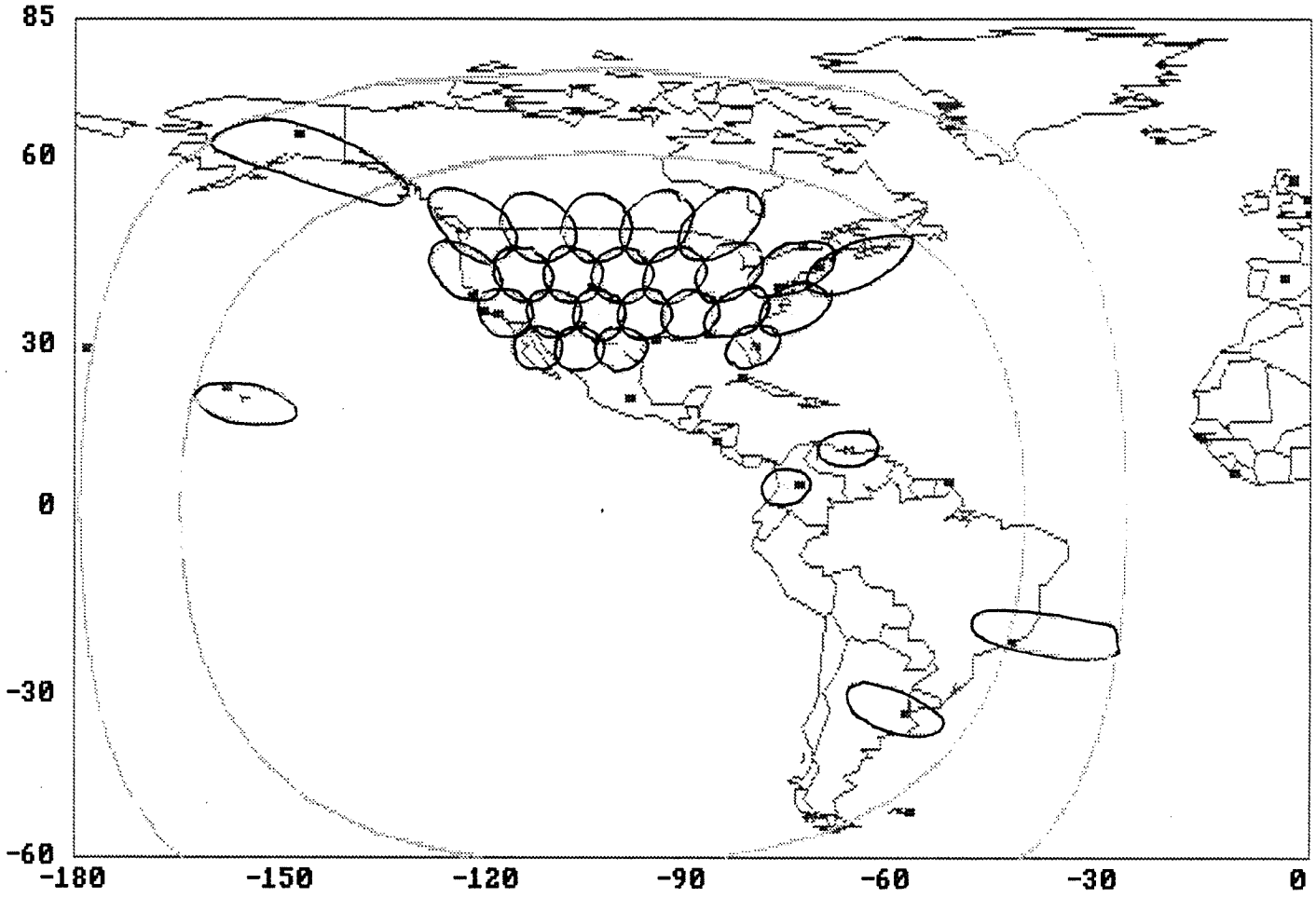


Figure 2-3b. Coverage of U.S. and South America for Satellite at 103° W.L.

degree contour of the satellite at 103° W.L.

Satellite coverage for South America, Europe-Africa, and Asia is proposed to be based on the same basic 30 beam configuration. Because these coverage areas are less regular and larger than CONUS, the beams for the initial system will cover only regions of significant demand. Because of this irregularity, however, higher frequency reuse will be obtainable. These coverage diagrams will be provided as required.

Figures 2-4a through 2-4d depict the -2, -4, -6, -10 and -20 dB antenna beam contours at 0, 3.8, 5.7 and 7.62 degrees roll or pitch scan angles. The antenna beam contours are identical for each of the proposed orbital locations.

TABLE 2-3a. Antenna Beam Pointing Directions For U.S. Coverage at 93° W.L..

Beam	IP deg.	OP deg.	Beam	IP deg.	OP deg.	Beam	IP deg.	OP deg.
1	-3.00	8.00	11	-3.03	6.33	21	-0.64	5.50
2	-3.50	7.16	12	-2.07	6.33	22	0.31	5.50
3	-2.55	7.17	13	-1.12	6.33	23	1.27	5.50
4	-1.59	7.16	14	-0.17	6.33	24	2.22	5.50
5	-0.64	7.16	15	0.79	6.33	25	-1.11	4.68
6	0.31	7.16	16	1.74	6.33	26	-0.16	4.68
7	1.27	7.16	17	2.69	6.33	27	0.80	4.68
8	2.22	7.16	18	-3.5	5.50	28	1.75	4.68
9	3.17	7.16	19	-2.55	5.50	29	-8.00	3.00
10	-3.98	6.33	20	-1.59	5.50	30	3.50	3.00

Note: IP means the angle in the plane of the orbit, and OP means the angle out-of-plane.

TABLE 2-3b. Antenna Beam Pointing Directions For U.S. and South American Coverage at 103° W.L.

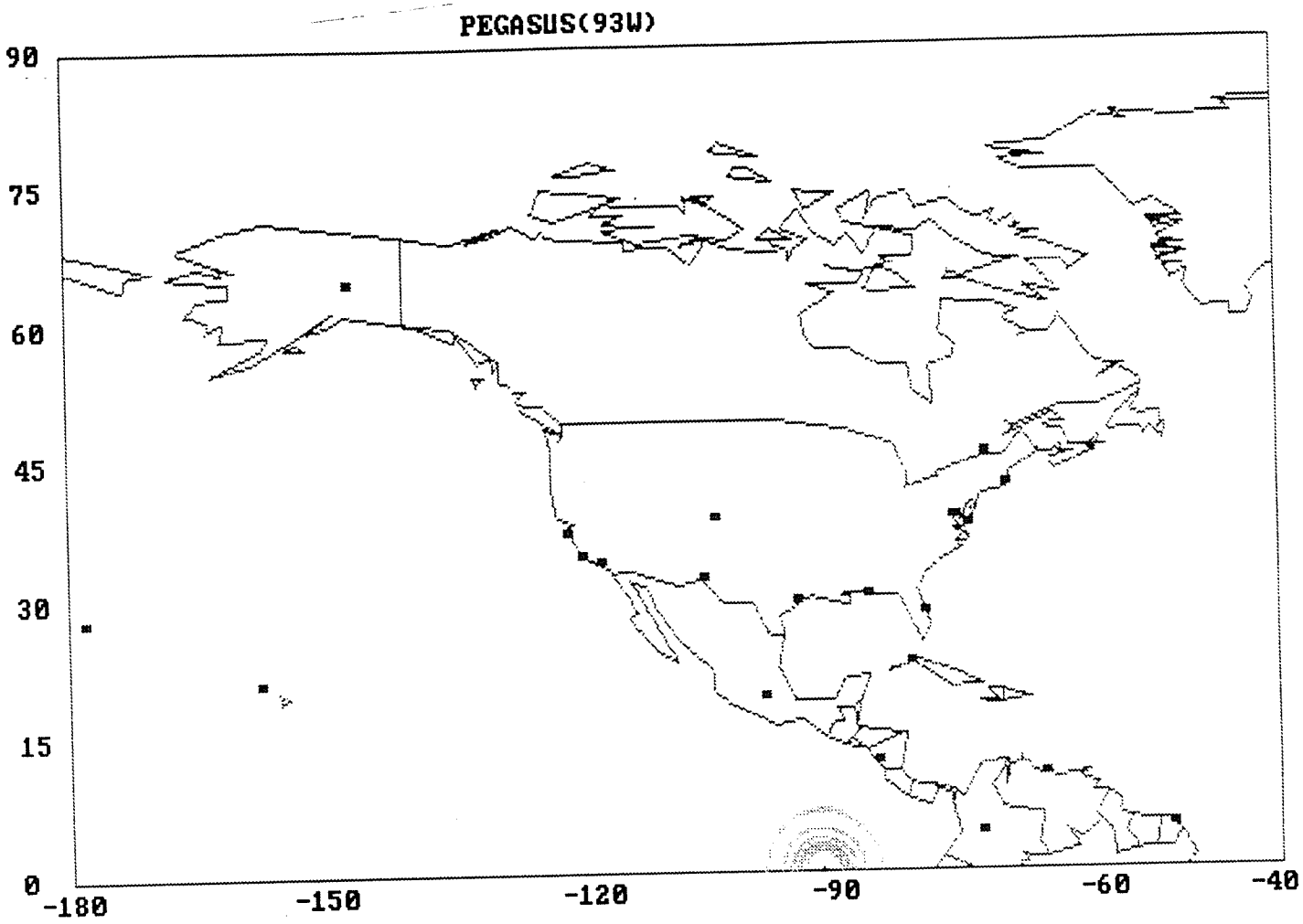
Beam	IP deg.	OP deg.	Beam	IP deg.	OP deg.	Beam	IP deg.	OP deg.
1	-3.00	8.00	11	1.33	6.33	21	3.72	5.50
2	-2.00	7.16	12	2.29	6.33	22	-1.52	4.68
3	-1.05	7.16	13	3.33	6.33	23	-0.57	4.68
4	-0.10	7.16	14	4.19	6.33	24	-0.38	4.68
5	0.86	7.16	15	-2.00	5.50	25	3.24	4.68
6	1.81	7.16	16	-1.05	5.50	26	-8.00	3.00
7	-2.48	6.33	17	-0.10	5.50	27	5.30	-5.3
8	-1.52	6.33	18	0.86	5.50	28	7.70	-3.3
9	-0.57	6.33	19	1.81	5.50	29	-4.50	0.70
10	0.38	6.33	20	2.76	5.50	30	5.70	1.80

Note: IP means the angle in the plane of the orbit, and OP means the angle out-of-plane.

TABLE 2-4 High and Low Band Segmentation and Beam Number, U.S. Coverage From Orbital Station 93° W.L. and 103° W.L.

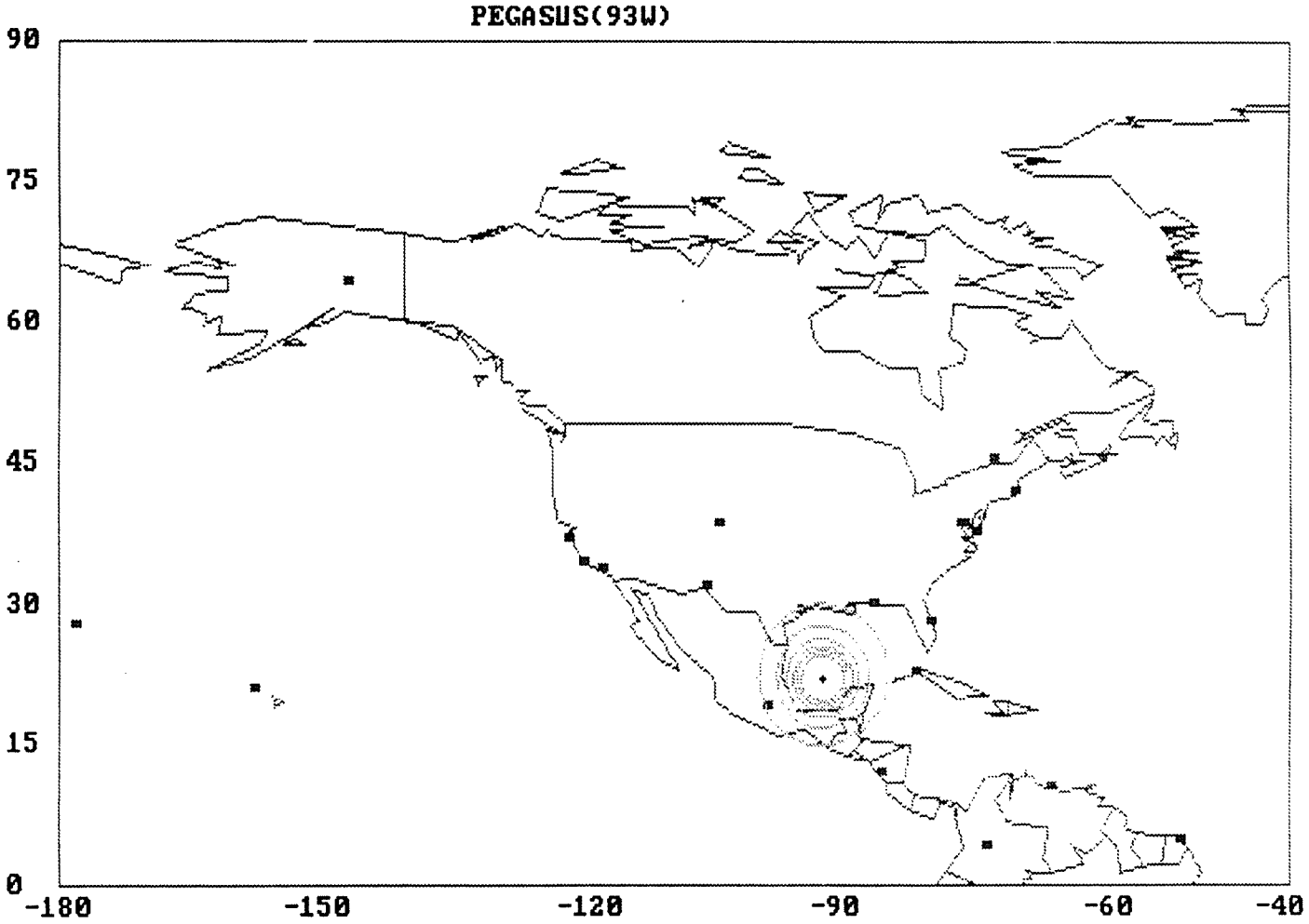
Transmit: VLP or HLP
Receive: HLP or VLP

Segment	Low Band	High Band
1	10, 12, 14, 16, 26, 28	4, 10, 17, 22
2	1, 11, 13, 15, 17, 25, 27, 29	5, 11, 23, 25
3	2, 4, 6, 8, 18, 20, 22, 24	6, 12, 24, 26, 29
4	3, 5, 7, 9, 19, 21, 23, 30	1, 7, 13, 18, 27, 30
5		8, 14, 19, 28
6		2, 9, 15, 20
7		3, 16, 21



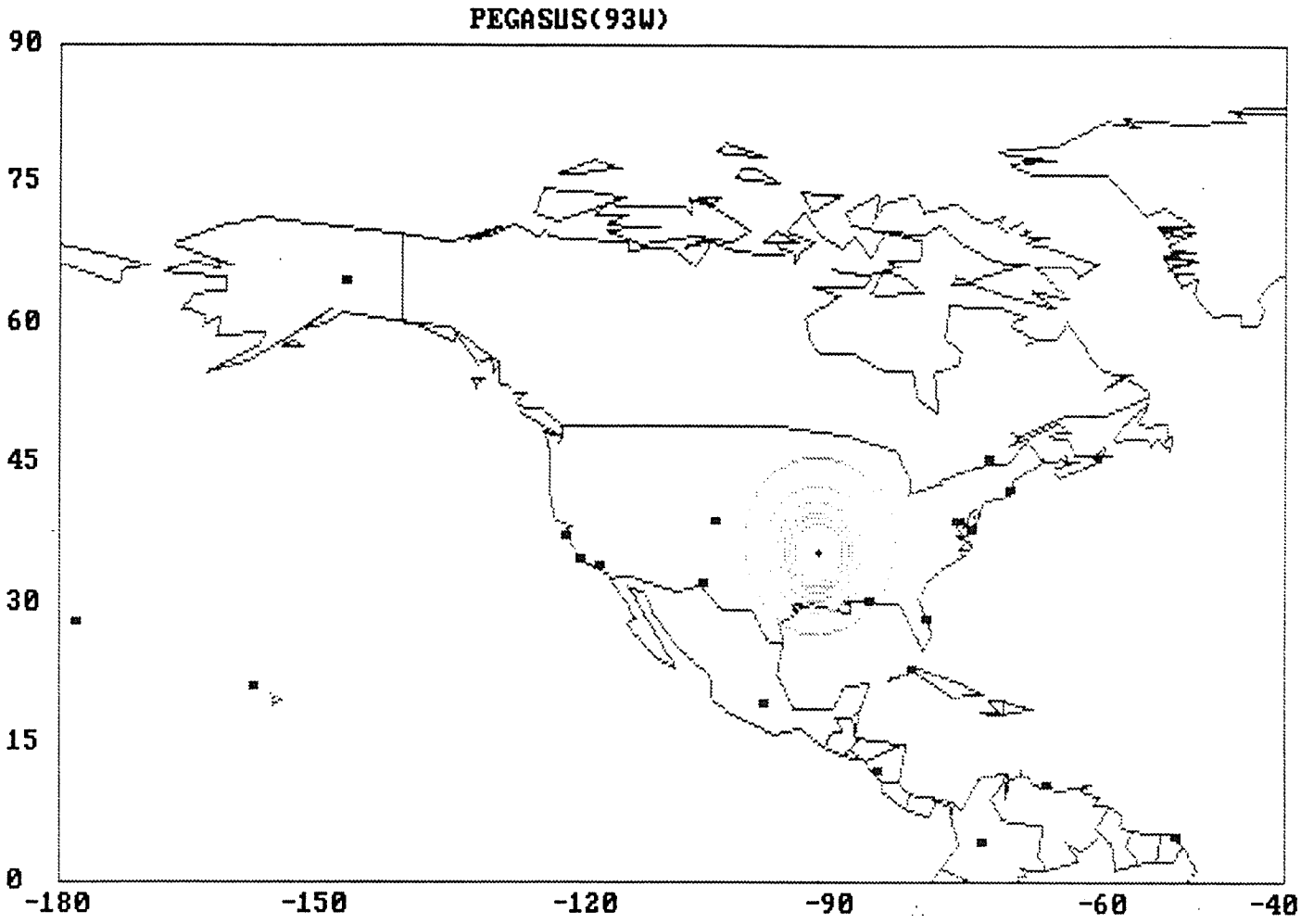
Contour Level dB	Beamwidth degrees
-2	0.78
-3	0.95
-4	1.10
-6	1.34
-10	1.73
-20	2.45

Figure 2-4a. Beam Contours, -2, -3, -4, -6, -10 and -20 dB, For Pitch Scan = 0, For Satellite at 93° W.L.



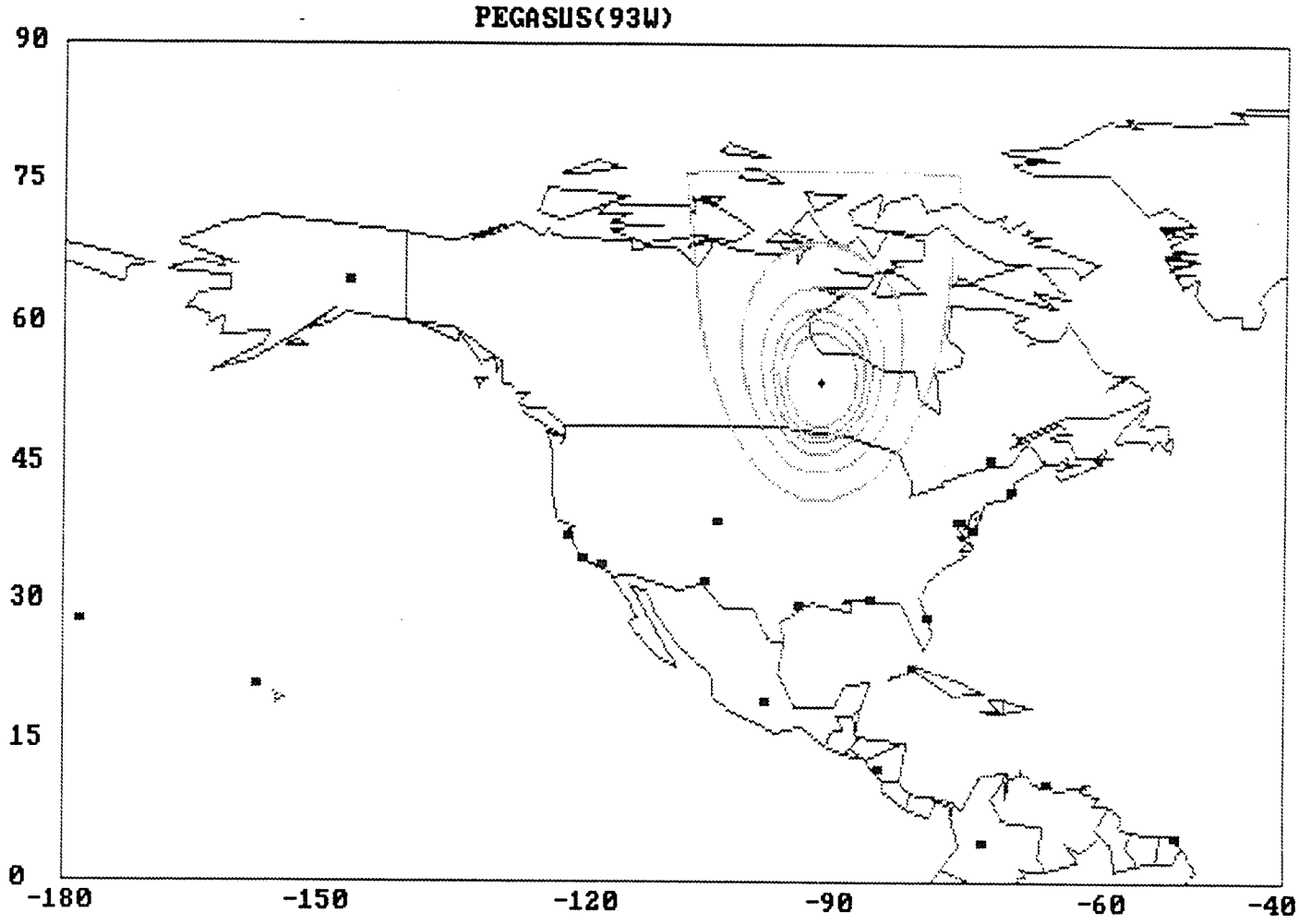
Contour Level dB	Beamwidth degrees
-2	0.78
-3	0.95
-4	1.10
-6	1.34
-10	1.73
-20	2.45

Figure 2-4b. Beam Contours, -2, -3, -4, -6, -10 and -20 dB, For Pitch Scan = 3.8, For Satellite at 93° W.L.



Contour Level dB	Beamwidth degrees
-2	0.78
-3	0.95
-4	1.10
-6	1.34
-10	1.73
-20	2.45

Figure 2-4c. Beam Contours, -2, -3, -4, -6, -10 and -20 dB, For Pitch Scan = 5.7, For Satellite at 93° W.L.



Contour Level dB	Beamwidth degrees
-2	0.78
-3	0.95
-4	1.10
-6	1.34
-10	1.73
-20	2.45

Figure 2-4d. Beam Contours, -2, -3, -4, -6, -10 and -20 dB, For Pitch Scan = 7.62, For Satellite at 93° W.L.

2.5.3. ACCESS METHOD AND ROUTING

The access method is TDM/FDM/TDMA. Uplink and downlink signals in the High Band occur on either 3.088 MBps or 61 MBps TDM/FDM carriers. Uplink and downlink signals in the Low Band occur on either 3.088 MBps or 53 MBps TDM/FDM carriers. To avoid burst collisions, access to Pegasus I is controlled by the gateway earth stations via signaling channels in each of the TDM/FDM carriers. Gateway earth stations are under the supervision of the NCC/SCC, owned and operated by Pegasus Development Corporation. Rate diversity is used wherein the maximum data rate during rain fades is 3.088 MBps. During moderate weather conditions the subscriber may request any data rate from 16 KBps up to the maximum burst rates of either 61 or 53 MBps. In addition there may be high performance earth stations operating at the higher data rates even during heavy rain.

Cessation of emission is controlled by the NCC/SCC via the TT&C system.

2.5.4. EXAMPLE TRANSMISSION PERFORMANCE.

A summary of transmission parameters is given in Table 2-5

TABLE 2-5. Transmission Parameters.

Earth Station Access	TDM/FDM
Overall Access Method	TDM/FDM/TDMA
Carrier Burst Rates, MBps (1)	
High Band	3.088 and 61
Low Band	3.088 and 53
Carrier Bandwidths, MHz	
High Band	2.85 and 56.3
Low Band	2.85 and 49.0
Modulation	QPSK
Coding	Convolutional Rate 3/4 Concatenated with Reed Solomon
Eb/No, dB	4.5 (ber = 10^-9)
Number of Antenna Beams	30, uplink or downlink
Number of Transponders	30
Transponder Gain, dB	120, nominal (4)
SFD, dBW per square meter	N/A (3)
Gain Steps, dB	1 over 20 dB range
Filters, input & output	4 pole Tschebyscheff or equivalent
Filters, channel	6 pole Tschebyscheff or equivalent
Power Control (2)	ATPC
Satellite Local Oscillator Stability, %	0.002
Earth Station Local Oscillator Stability, %	0.001
Crosspol Isolation, clear sky, dB	30
Satellite Antenna Peak Gain, dBi	50.2

(1) A minimum burst rate of 1.544 MBps also is under consideration; this selection does not alter the radiation characteristics described herein.
(2) Uplink power control is provided by each earth station. Downlink power control is provided by satellite downlink TDM/FDM channel units.
(3) A satellite, typically, is not operated at saturation; uplink PFD varies burst by burst because of uplink rain attenuation, changes in antenna gain over the field-of-view, slant range, etc.
(4) Transponder gain varies burst by burst because of downlink rain attenuation, changes in antenna gain over the field-of-view, slant range, etc.

In addition, each satellite transmitter output filter shall attenuate all signals by the following;

1) -25 dB in any 4 KHz band, between 50 and 100 percent of authorized bandwidth,

2) -35 dB in any 4 KHz band between 100 and 250 percent of authorized bandwidth,

3) -43 + 10 Log P, in dB, in any 4 KHz band greater than 250 percent of authorized bandwidth, where P is the transmitter power in watts.

2.5.4.1. Ka BAND TRANSMISSION PERFORMANCE

The Pegasus I global system performance is described under representative conditions, for various Crane Model climate regions and for typical earth station elevation angles corresponding to those regions. Within the U.S, Crane Model D2, "continental moderate" is the worst rain rate for the CONUS midwest and mid-Atlantic regions except for the area to the southeast, which is typified by Crane Model E, "sub-tropical wet." Some portions of Hawaii and Puerto Rico have Crane Model H, "tropical wet" climates. Areas to the west and north of D2 within CONUS have more moderate rain climates.

Pegasus I subscribers have many choices in earth station equipment so that they may optimize their performance and cost. Performance is described at several burst rates. 1.544 Mbps or 3.088 MBps correspond to the maximum transmitted burst rate under "rain" conditions, defined at 99.5 percent availability during rain. Subscribers may select a higher performance earth station in order to achieve, say, 99.9 percent availability due to rain. The 3.088 MBps burst rate, in a TDM/FDM format, enables a subscriber to operate with any data rate from 16 KBps up to the maximum of 3.088 MBps.

A subscriber also may require higher data rates, up to 61 MBps in the High Band and up to 53 MBps in the Low Band, requiring a higher performance earth station. Subscribers may choose these higher data rates with availabilities of 99.5 percent if the earth station performance is adequate, or may choose to obtain these data rates only at the 98 percentile with regard to rain, shifting, via rate diversity, to 3.088 MBps during heavy rain. Thus high data rates are supportable under clear sky or near-clear-sky conditions with moderate earth station performance.

The transmission performance is calculated with approximately equal contributions of uplink and downlink thermal noise and with the use of automatic transmitter power control, ATPC, in both the uplink and downlink, on a burst-by-burst basis. A 1 dB "threshold" is used in the downlink before ATPC is activated. The objective Eb/No = 4.5 dB, corresponds to a BER = 10^-9.

Table 2-6 describes important performance characteristics for the High Band for a subscriber operating at 3.088 MBps or, optionally, at 61 MBps. The HPA power, 11 dBW or 12.6 watts, for 3.088 MBps is modest for a 0.5 meter earth station antenna. However, if the subscriber transmits at 61 MBps, the HPA power increases to 17.8 dBW or 60.3 watts, still within the bounds of a low cost, mass-produced HPA. Alternatively the subscriber may opt for a larger earth station antenna; a one meter antenna reduces the HPA power for 61 MBps to 15 watts.

Table 2-7 describes similar, important performance characteristics for the Low Band. The data rate is less because the bandwidth of the Low Band is less, and the satellite antenna contributes more co-channel inter-beam interference.

More detailed transmission characteristics, such as assumptions regarding C/I and performance for different rain regions, are given in Appendix A.

TABLE 2-6. Example High Band Transmission Performance (for 0.5 meter CPE Earth Station With 0.5 dB Pointing Loss For Crane Model D2 At An Elevation Angle of 40 degrees).

EARTH-TO-SPACE Condition	Rain	Clear-Sky	98 %	Clear-Sky
ES Transmit Power, dBW	11	1.2	17.8	14.2
Output Loss, dB	-1	-1	-1	-1
ES Antenna Gain, dBi	41.8	41.8	41.8	41.8
Eirp, dBW	51.3	41.5	58.1	54.5
Frequency, GHz	29.2	29.2	29.2	29.2
Space Loss, dB	-213.3	-213.3	-213.3	-213.3
Rain & Atmos. Loss, dB	-10.8	-1	-4.6	-1
Total Loss, dB	-224.1	-214.3	-217.9	-214.3
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6
Sat. Noise Temp., dB	28.6	28.6	28.6	28.6
Sat. Peak Antenna Gain, dBi	50.2	50.2	50.2	50.2
Data Rate, MBps	3.088	3.088	61	61
Bandwidth, MHz	2.85	2.85	56.3	56.3
Uplink C/I	17.2	17.2	17.2	17.2
Uplink CNR	8.3	8.3	8.3	8.3
SPACE-TO-EARTH Condition	Rain	Clear-Sky	99.5 %	Clear-Sky
Transmit Power, dBW	1.34	-6.0	14.3	7.0
Output Loss, dB	-1	-1	-1	-1
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	50.04	43.2	59.5	52.2
Frequency, GHz	19.3	19.3	19.3	19.3
Space Loss, dB	-209.7	-209.7	-209.7	-209.7
Rain & Atmos. Loss, dB	-4.6	-0.5	-4.6	-0.5
Fixed Loss, dB	-1	-1	-1	-1
Total Loss, dB	-215.3	-211.2	-215.3	-211.2
G/T, dBi/K	12.9	16.1	12.9	16.1
ES Antenna Gain, dBi	38.2	38.2	38.2	38.2
ES Noise Temp., dB	24.8	21.6	24.8	21.6
Downlink CNR, dB	8.2	8.2	8.2	8.2
C/I, dB	15.4	15.4	15.4	15.4
Total CNR, dB	4.9	4.9	4.9	4.9
Eb/No, dB	4.5	4.5	4.5	4.5

TABLE 2-7. Example Low Band Transmission Performance (for 0.5 meter CPE Earth Station Operating With 0.5 dB Pointing Loss For Crane Model D2 At An Elevation Angle of 40 degrees).

EARTH-TO-SPACE Condition	Rain	Clear-Sky	98 %	Clear-Sky
ES Transmit Power, dBW	11	1.2	17.4	13.8
Output Loss, dB	-1	-1	-1	-1
ES Antenna Gain, dBi	41.8	41.8	41.8	41.8
Eirp, dBW	51.3	41.5	57.7	54.06
Frequency, GHz	29.2	29.2	29.2	29.2
Space Loss, dB	-213.3	-213.3	-213.3	-213.3
Rain & Atmos. Loss, dB	-10.8	-1	-4.6	-1
Total Loss, dB	-224.1	-214.3	-217.9	-214.3
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6
Sat. Noise Temp., dB	28.6	28.6	28.6	28.6
Sat. Peak Antenna Gain, dBi	50.2	50.2	50.2	50.2
Data Rate, MBps	3.088	3.088	53	53
Bandwidth, MHz	2.85	2.85	49.0	49.0
Uplink C/I	17.2	17.2	16.3	16.3
Uplink CNR	8.3	8.3	8.3	8.3
SPACE-TO-EARTH Condition	Rain	Clear-Sky	99.5 %	Clear-Sky
Transmit Power, dBW	1.34	-6.0	13.9	6.5
Output Loss, dB	-1	-1	-1	-1
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	50.04	43.2	59.07	51.7
Frequency, GHz	19.3	19.3	19.3	19.3
Space Loss, dB	-209.7	-209.7	-209.7	-209.7
Rain & Atmos. Loss, dB	-4.6	-0.5	-4.6	-0.5
Fixed Loss, dB	-1	-1	-1	-1
Total Loss, dB	-215.3	-211.2	-215.3	-211.2
G/T, dBi/K	12.9	16.1	12.9	16.1
ES Antenna Gain, dBi	38.2	38.2	38.2	38.2
ES Noise Temp., dB	24.8	21.6	24.8	21.6
Downlink CNR, dB	8.2	8.2	8.4	8.4
C/I, dB	15.4	15.4	14.7	14.7
Total CNR, dB	4.9	4.9	4.9	4.9
Eb/No, dB	4.5	4.5	4.5	4.5

2.5.4.2. ISL PERFORMANCE.

Each east or west ISL, operated in the 50 to 70 GHz millimeter wave band in a 61 and 3.088 MBps TDM/FDM format, connected to the satellite IF switch matrix. Without on-board processing, the ISL CNR must be large in order to avoid unnecessarily degrading the Ka-Band downlink or uplink CNR. A CNR = 20 dB has been assumed. Without specific information concerning final orbital locations, it has been assumed that the ISL is between two GEO satellites spaced as much as120 degrees apart. ISL performance is given in Figure 2-5, requiring a 28 watt TWTA and a 2 meter antenna.

2.5.4.3 TT&C PERFORMANCE

Since the satellite manufacturer has not yet been chosen, general performance and radiation characteristics have been assumed for these links. Launch operations are planned to be supported by Ku Band TT&C, based on a 5 meter TT&C earth station antenna and omnidirectional satellite TT&C antennas. On orbit operations will be transferred to Ka Band and based on a 5 meter TT&C earth station antenna, an omnidirectional satellite command antenna and a satellite telemetry horn antenna. TT&C performance is given in Figure 2-6, requiring a modest 2 watt satellite transmitter at Ku and Ka Band.

2.5.4.4. GENERAL RADIATION PARAMETERS

As described in Appendix A, general radiation parameters are based on the "worst case" performance, which is for a 0.5 meter CPE earth station antenna. Worst-case rain conditions occur in the southeast at an elevation angle of approximately 50 degrees, and worst-case clear-sky conditions occur at approximately 20 degrees. Both conditions pertain to the worst-case data rate, which is either 1.544 or 3.088 MBps.

ISL Link	Plane
Slant Range, Km. (1)	73000
Satellite to Satellite	
Transmitter Power, dBW	14.5
Output Loss, dB	-2
Pwr Density dBW/Hz	-65
Antenna Gain (2.0m) dBi	60.3
Eirp, peak, dBW	72.8
Pointing Loss, dB	-0.5
Eirp, dBW	72.3
Eirp Density, dBW/Hz	-4.7
Frequency, GHz	61.5
Space Loss, dB	-225.491
Misc.Loss, dB	-0.5
Total Loss, dB	-225.991
G/T, dBi/K	23.39
Sat. Temp., dB	24.9
Antenna Gain, peak, dBi	48.29
C/T, dB/K	-130.301
Data Rate, 61 MBps, dB	77.9
Bandwith, 56.3 MHz, dB	77.5
CNR, dB	20.79827
Interference C/I, dB	30
Overall CNR, dB	20.30539
Eb/No, dB	19.95539

(1) Lacking specific information on orbital locations it has been assumed that the ISL traverses the distance between satellites spaced 120 degrees.

Figure 2-5. ISL Link Performance.

Slant Range, 5 deg., Km.	41127	41127	41127	41127
	Launch Ku Band		On-Orbit Ka Band	
	Command	Telemetry	Command	Telemetry
Transmitter Power, dBW	30	3	30	3
Output Loss, dB	-2	-2	-3	-2
Pwr Density dBW/Hz	-35	-62	-36	-62
Antenna Gain, dBi (1)	55.4	22	61.8	18
Eirp, peak, dBW	83.4	23	88.8	19
Pointing Loss, dB	-0.5	-3	-0.5	0
Eirp, dBW	82.9	20	88.3	19
Eirp Density, dBW/Hz	20.4	-40	25.8	-44
Frequency, GHz	14	11.7	29.2	19.3
Space Loss, 5 deg., dB	-207.652	-206.094	-214.037	-210.441
Misc.Loss, dB	-0.5	-0.5	-1	-1
Total Loss, dB	-208.152	-206.594	-215.037	-211.441
G/T, dBi/K	-25.9	34.1	-26.8	37.7
Temp., dB	25.9	19.8	26.8	20.5
Antenna Gain, peak, dBi	0	53.9	0	58.2
C/T, dB/K	-151.152	-152.494	-153.537	-154.741
Bandwidth, dB (2)	63	63	63	63
CNR, dB	14.44713	13.10597	12.06203	10.85854
Required CNR, dB	8	8	8	8

Notes.
1) 5 meter TT&C antenna, omni satellite telemetry antenna at 11.7 GHz and horn telemetry antenna at Ka Band.
2) Command and telemetry bandwidth = 2 MHz

Figure 2-6. TT&C Link Performance, On-Orbit and Launch.

The Pegasus I system is operated with ATPC for both the uplink and downlink. Therefore, all communications signals are just strong enough to meet the objective Eb/No, with a small margin.

The PFDs are well within the levels specified by RR-28.

Pegasus also is considering on-board processing with an ATM-like switch, and may implement this technology instead of the IF switch/transponder satellite described herein if the satellite manufacturer selected to build Pegasus I has the requisite technology. In this case, the radiation levels will be somewhat less than for the IF switch/transponder type satellite described herein.

The maximum radiation levels are listed in Table 2-8. Additional parameters are given in Appendix A.

TABLE 2-8. General Radiation Parameters.

	Ka Band	Ka Band	ISL	TT&C	
Condition (1)	E	Clear-Sky	N/A	Clear -Sky	
Elevation Angle, degrees	50	20	N/A	5	5
Frequency, GHz	29.2	29.2	61.5	14.0	29.2
Transmit Power Into Antenna, dBW	11.7	0.6	12.5	28.2	27.0
Peak Eirp Density, dBW/Hz	-11.0	-22.1	-4.7	20.4	25.8
Frequency, GHz	19.3	19.3		11.7	19.3
Transmit Power Into Antenna, dBW	1.3	-6.6		1.0	1.0
Peak Eirp Density, dBW/Hz	-13.0	-20.9		-40.0	-44.0
PFD, per MHz	-115	-123.8			
RR 28, PFD per MHz	-105	-107.5			

(1) The parameters for beams on Puerto Rico and Hawaii, due to tropical rain may be 3.1 dB higher than given above; see Appendix A.

2.5.5. EMISSION DESIGNATORS.

The emission designators for the Pegasus I system are given in Table 2-9.

TABLE 2-9. Emission Designators.

Bandwidth MHz	Emission Designator
1.43	1M43G1W
2.85	2M85G1W
49.0	49M0G1W
56.3	56M3G1W
0 (beacon)	H000N0N
2 (telemetry)	2M00XXD
2 (command)	2M00XXD

2.5.6. SATELLITE AND CONSTELLATION CAPACITY

2.5.6.1 Ka BAND SATELLITE CAPACITY

The satellite capacity with all beams equally filled at the busy hour is 3.6 GBps.

This capacity will be augmented by a second satellite at the same orbital station operating

on the orthogonal polarization.

2.5.6.2. ISL CAPACITY

Each of the two ISLs per satellite operates at data rates of 61 and 3.088 MBps in a TDM/FDM format.

2.5.6.3. CONSTELLATION CAPACITY

For the five orbital stations, the constellation capacity, with all beams filled at the busy hour, is 36.0 GBps per polarization, one way.

2.5.7. LINK AVAILABILITY

The Pegasus I performance objective is to meet an availability due to rain of 99.5 percent. Earth station antennas larger than 0.5 meters will be required in the southeast U.S. and portions of Hawaii and Puerto Rico in order to meet this objective. An availability due to rain approaching 99.9 percent is available via proper selection of earth station antennas and HPA powers.

The same link availability analysis applies to service outside the United States.

2.5.8. ECLIPSE AND SUN TRANSIT EFFECTS

The Pegasus I satellites are designed to operate fully during solar eclipse. Earth stations experiencing sun transit within their antenna beams will experience a short outage.

2.6. INTERFERENCE AND BAND SHARING

The bands 19.7-20.2/29.5-30.0 GHz and the uplink band 28.35-28.6 GHz are allocated to the GSO FSS on an exclusive primary basis in the United States. However, issues of spectrum access may arise during the coordination process for these bands. Pegasus will support these coordination negotiations in order to help promote a mutually satisfactory outcome.

2.6.1. GSO-GSO Ka-BAND SHARING

The Commission has established the basic principles for GSO-GSO system sharing through its proceedings on the use of C Band and Ku Band, and with its recent order establishing service rules for FSS systems in the Ka Band, including a system of 2 degree spacing for satellite systems in that band. *See* Third Report and Order, CC Docket No. 92-297 (October 15, 1997) ("Ka-Band Order"). Unfortunately, these sharing criteria have not been adopted internationally, resulting in controversy over orbital positions and satellite coordination issues.

Coordination between GSO systems depends primarily on the sidelobe characteristics of the earth station antenna and on the relative radiation characteristics of the two systems being coordinated. Ka-Band systems have two unique characteristics. One is the use of physically small (but electrically large) earth station antennas, approximately 0.5 meters. The other is the use of all-digital signals which are detectable at lower signal-to-noise ratios than comparable analog signals, thus improving their resistance to interference. The single entry adjacent satellite interference, for space systems with overlapping coverage, is simply written as:

$$C/I = A + G-(29-25\ \mathrm{Log}\varphi)$$

where G is the earth station antenna gain, φ is the topocentric angle between the two space systems, and A is a measure of their relative received PFDs.

If the systems are identical, then A = 0. The factor A depends on the earth station G/T, the modulation parameters (QPSK, 8PSK etc.), the coding, the sensitivity of the demodulator, and the BER objectives. Consequently, absolute values of A can differ by several decibels. Since the Ka-Band Order permits either circular or linear polarization for GSO FSS systems, polarization isolation -- circular to linear -- might also provide additional (small) isolation.

At 19.3 GHz, a 0.5 meter antenna has a gain of 38.2 dBi, and a 0.7 meter antenna has a gain of 41.1 dBi. With a geocentric satellite spacing of 2 degrees, for satellites at 93° W.L. and 91° W.L. and earth stations within CONUS, the following holds:

C/I (0.5m) = 17.8 dB (one interference entry), and

C/I (0.7m) = 20.7 dB (one interference entry).

The main lobe of the smaller 0.5 meter antenna also may be a problem, depending on its design. Consequently, a 0.5 meter antenna is the smallest that ought to be considered for 2 degree satellite spacing. Depending on the specifics of the earth station antenna design, the minimum acceptable antenna ought to be in the range of 0.5 to 0.7 meters.

Pegasus proposes a minimum earth station antenna diameter of 0.5 meters, which also defines the maximum radiation properties of its system, and recognizes that coordination with other Ka-Band space systems serving the U.S. may preclude the use of the smaller antenna. Similarly, coordination with other Ka-Band space systems serving foreign territories, including systems with different satellite spacing and different

radiation characteristics, also may preclude the use of the smaller antennas. As stated above, Pegasus will support these coordination negotiations in order to help promote a mutually satisfactory outcome.

2.6.2. GSO-GSO ISL BAND SHARING

Pegasus generally is aware of the need for ISLs for FSS and MSS GSO and NGSO systems, and that the millimeter wave bands also are used by government space systems. Nevertheless, Pegasus prefers ISLs in the millimeter band from 50 to 70 GHz, because they are commercially proven. Optical ISLs are not commercially proven. The Ka-band Order confirms that the Commission has not yet resolved all of the issues relating to millimeter wave band (and other band) sharing. Pegasus will support any coordination negotiations in order to help promote a mutually satisfactory outcome.

2.6.3 SHARING WITH FS

The downlink band 18.35-18.6 GHz is shared on a co-primary basis with the Fixed Services ("FS"). There will be potential earth station locations in the path of an FS link that cannot be coordinated, despite the use of building and other shielding. In these cases, the subscriber earth station will be operated only in the 19.7-20.2/29.5-30.0 GHz band. Pegasus will participate in coordination arrangements to protect existing operational FS and FSS facilities.

2.7. TECHNICAL QUALIFICATIONS

2.7.1. BANDWIDTH UTILIZATION

With 30 beams, the Low Band develops 30 x 62 MHz = 1860 MHz from a 250 MHz allocation or 7.4 times frequency reuse. With 30 beams, the High Band develops 30 x 70.7 MHz = 2121 MHz from a 500 MHz allocation or 4.2 times frequency reuse.

Because of the geographical breadth of the area, bandwidth utilization in South America and Asia will be even more efficient, with the satellite beams even more widely separated. The Pegasus I design develops its spectrum efficiency via multiple spot beams. The use of orthogonal polarization is planned to permit increased capacity at each orbital location.

2.7.2. POLARIZATION

Pegasus I is expected to operate with horizontal/vertical linear polarization, with transmit and receive signals orthogonally polarized. Pegasus plans to increase orbital efficiency by operating an orthogonally polarized satellite at each orbital location.

2.7.3. ORBITAL EFFICIENCY

Pegasus I, through the use of automatic transmitter power control ("ATPC") for both earth stations and satellites, minimizes potential harmful interference to space systems at adjacent orbital slots. Pegasus proposes to operate with 2 degree geocentric spacing from satellites having similar but not identical radiation characteristics. Rare interference events, caused by lack of rain-path shielding, can be compensated by ATPC.

3.0. MARKETS AND SERVICES

Pegasus I can provide data rates from 16 KBps up to approximately 60 MBps to any subscriber terminal and route such communications to any other earth station anywhere in the coverage area of the Pegasus I satellite constellation. Communications signals may be one-way or two-way or broadcast, all with bandwidth on-demand.

With full audio, video, and graphics capabilities, Pegasus I will provide users with a diverse array of multimedia services. Residential, business, and government subscribers will be able to benefit from a variety of applications. Residential service will

provide entertainment, information, news, financial data, and Internet capability. The system will also facilitate distance learning, remote medical services, and telecommuting. Pegasus I will provide benefits to law enforcement, public safety and disaster management, and defense preparedness.

4.0. SYSTEM COST AND FINANCING

4.1. IMPLEMENTATION SCHEDULE

The time of licensing is unclear, due to uncertainties relating to the coordination of orbital stations. Consequently, all schedules are tied to the time of licensing. A three-year construction period is anticipated because the satellite technology is well within the envelope of satellites now under construction.

TABLE 4-1. IMPLEMENTATION SCHEDULE The following implementation schedule is within the requirements specified in the Ka-Band Order.

Event	Months
Development	-12 to 0
Time of Licensing	0
Spacecraft Contract	+12
Launch Vehicle Contract	+18
NCC/SCC Installed	+38
First TT&C Installed	+38
First Launch	+42
Second Launch	+46
Third Launch	+50
Fourth Launch	+54
Fifth Launch	+57
Sixth Launch	+60
Seventh Launch	+63
Eighth Launch	+76
Ninth Launch	+69
Tenth Launch	+72

5.0. LEGAL INFORMATION

5.1 NAME AND ADDRESS OF APPLICANT AND LEGAL COUNSEL

Attached at Appendix B on Form 312 is information describing the legal qualifications of Pegasus. In addition, the following information is provided.

(1) Name, address, and telephone number of the applicant:

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5.2 REGULATORY CLASSIFICATION

In response to Section 25.114(c)(14) of the Commission's rules, Pegasus proposes

to operate the space stations described in this application on a noncommon carrier basis through privately negotiated contractual arrangments reflecting individual customer's requirements.

Respectfully submitted,

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APPENDIX A

TRANSMISSION CHARACTERISTICS.

A-1. TRANSMISSION ASSUMPTIONS. Estimations of basic transmission assumptions are given in Tables A-1 and A-2 for the High Band and Low Band respectively.

TABLE A-1. Transmission Assumptions, High Band.

Elevation, degrees	20	30	40	50	60
Crane Model Region	A	B	D2	E	H
Interference, dB	20	20	20	20	20
Antenna C/I, dB	21	21	21	21	21
ISL CNR, dB	20	20	20	20	20
Xpol, dB	30	30	30	30	28
Total Downlink C/I, dB	15.4	15.4	15.4	15.4	15.4
Total Uplink C/I, dB	17.2	17.2	17.2	17.2	17.1

Table A-2. Transmission Assumptions, Low Band.

Elevation, degrees	20	30	40	50	60
Crane Model Region	A	B	D2	E	H
Interference, dB	20	20	20	20	20
Antenna C/I, dB	19	19	19	19	19
ISL CNR, dB	20	20	20	20	20
Xpol, dB	30	30	30	30	28
Total Downlink C/I, dB	14.7	14.7	14.7	14.7	14.7
Total Uplink C/I, dB	16.3	16.3	16.3	16.3	16.2

Satellite burst rates down to 1.544 MBps during rain, are under consideration which involve tradeoffs relating to the satellite technology such as IF switching versus on-board processing and switching. The radiation characteristics stated herein are not changed by varying the burst rate over the range of 1.544 to 3.088 MBps , for the same rain and other propagation conditions and for the same earth station.

A2. Ka BAND TRANSMISSION. Figures A-1a, b and c depict transmission performance with 0.5 meter earth station antennas at 3.088 MBps for rain, clear sky and 98 percentile conditions for typical Crane Model climate regions and typical earth station antenna elevation angles. Uplink and downlink thermal noise contributions are approximately balanced. An earth station HPA power of 11 dBW or 12.6 watts is required to sustain this link under rain conditions corresponding to Crane Model D2 at an elevation angle of 40 degrees, typical of central CONUS. Subscribers operating in Crane Region H may elect to substitute a larger antenna in order to reduce the required HPA power. Subscribers requiring better availability than 99.5 percent during rain also may

elect to use higher powered HPAs, larger antennas or a combination. The PFDs meet the requirements of RR-28.

Figures A-2a, b and c depict transmission performance with a 0.7 meter earth station antenna.

Both Figures A-1 and A-2 apply to both the High Band and Low Band, with small error, the only difference arising from the lower antenna C/I in the Low Band.

Figures A-3a, b and c depict performance at the data rate of 61 MBps in the High Band with a 0.7 meter earth station antenna. Earth station HPA powers of the order of 100 watts are required to sustain this data rate under the stated rain conditions. Somewhat less power is required to support this link at the 98 percentile. The HPA power also is reduced if a larger antenna is employed.

Figures A-4a, b and c depict performance with a 0.5 meter antenna, increasing the HPA and satellite power correspondingly.

Figures A-5a, b and c depict performance in the Low Band at 53 MBps with a 0.5 meter earth station antenna and Figures A-6a, b and c depict similar performance with a 0.7 meter earth station antenna.

Figures A-7a, b and c depict performance at 1.54 MBps with a 0.5 meter earth station antenna, the performance defined to be the "worst" case with regard to radiation characteristics.

Subscribers have many equipment choices depending on their climate location, elevation angle and availability and data rate requirements.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	9.6	8.49	11	12.74	15.83
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-55.9	-57.01	-54.5	-52.76	-49.67
Antenna Gain (0.5m) dBi	41.8	41.8	41.8	41.8	41.8
Eirp, peak, dBW	50.4	49.29	51.8	53.54	56.63
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	49.9	48.79	51.3	53.04	56.13
Eirp Density, dBW/Hz	-14.1	-15.21	-12.7	-10.96	-7.87
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-9	-8.1	-10.8	-12.7	-15.9
Total Loss, dB	-222.699	-221.589	-224.100	-225.837	-228.906
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-155.199	-155.199	-155.200	-155.197	-155.176
Data Rate (3.088MBps) dB	64.9	64.9	64.9	64.9	64.9
Bandwidth, dB	64.5	64.5	64.5	64.5	64.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	0.49	-0.16	1.34	2.34	3.79
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-65.01	-65.66	-64.16	-63.16	-61.71
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	45.69	45.04	46.54	47.54	48.99
Eirp, max, dBW	49.69	49.04	50.54	51.54	52.99
Eirp Density, dBW/Hz	-14.81	-15.46	-13.96	-12.96	-11.51
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-3.7	-3.4	-4.6	-5.5	-6.8
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.802	-214.293	-215.304	-216.041	-217.209
G/T, dBi/K	13.25031	13.39047	12.90358	12.64081	12.36341
ES Antenna Gain (0.5m) dBi	38.2	38.2	38.2	38.2	38.2
ES Temp. (rain) dB	24.44968	24.30952	24.79641	25.05918	25.33658
C/T, dB/K	-155.862	-155.862	-155.860	-155.860	-155.856
Data Rate (3.088 MBps) db	64.9	64.9	64.9	64.9	64.9
Bandwidth, dB	64.5	64.5	64.5	64.5	64.5
Downlink CNR, dB	8.237372	8.237114	8.239426	8.239572	8.243887
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.857783	4.857500	4.858249	4.859464	4.854431
Downlink Eb/No, dB	4.507783	4.507500	4.508249	4.509464	4.504431
PFD per MHz	-117.746	-118.186	-116.497	-115.334	-113.752

Figure A-1a. Link Performance, 0.5 meter ES, Crane Model Rain, 3.088 MBps, High Or Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	1.6	1.39	1.2	1.04	0.93
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-63.9	-64.11	-64.3	-64.46	-64.57
Antenna Gain (0.5m) dBi	41.8	41.8	41.8	41.8	41.8
Eirp, peak, dBW	42.4	42.19	42	41.84	41.73
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	41.9	41.69	41.5	41.34	41.23
Eirp Density, dBW/Hz	-22.1	-22.31	-22.5	-22.66	-22.77
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.699	-214.489	-214.300	-214.137	-214.006
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-155.199	-155.199	-155.200	-155.197	-155.176
Data Rate (3.088MBps) dB	64.9	64.9	64.9	64.9	64.9
Bandwidth, dB	64.5	64.5	64.5	64.5	64.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	-5.58	-5.79	-5.99	-6.14	-6.27
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-71.08	-71.29	-71.49	-71.64	-71.77
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	39.62	39.41	39.21	39.06	38.93
Eirp, max, dBW	43.62	43.41	43.21	43.06	42.93
Eirp Density, dBW/Hz	-20.88	-21.09	-21.29	-21.44	-21.57
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	16.12128	16.12128	16.12128	16.12128	16.12128
ES Antenna Gain (0.5m) dBi	38.2	38.2	38.2	38.2	38.2
ES Temp., dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-155.861	-155.862	-155.872	-155.859	-155.858
Data Rate (3.088 MBps) db	64.9	64.9	64.9	64.9	64.9
Bandwidth, dB	64.5	64.5	64.5	64.5	64.5
Downlink CNR, dB	8.238344	8.237926	8.227133	8.240046	8.241756
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.858229	4.857873	4.852601	4.859682	4.853454
Downlink Eb/No, dB	4.508229	4.507873	4.502601	4.509682	4.503454
PFD per MHz	-123.816	-123.816	-123.827	-123.814	-123.812

Figure A-1b. Link Performance, 0.5 meter ES, Clear Sky, 3.088 MBps, High Or Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	5.4	4.79	4.8	3.94	4.13
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-60.1	-60.71	-60.7	-61.56	-61.37
Antenna Gain (0.5) dBi	41.8	41.8	41.8	41.8	41.8
Eirp, peak, dBW	46.2	45.59	45.6	44.74	44.93
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	45.7	45.09	45.1	44.24	44.43
Eirp Density, dBW/Hz	-18.3	-18.91	-18.9	-19.76	-19.57
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-4.8	-4.4	-4.6	-3.9	-4.2
Total Loss, dB	-218.499	-217.889	-217.900	-217.037	-217.206
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-155.199	-155.199	-155.200	-155.197	-155.176
Data Rate (3.088MBps) dB	64.9	64.9	64.9	64.9	64.9
Bandwidth, dB	64.5	64.5	64.5	64.5	64.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	-5.58	-5.79	-5.99	-6.14	-6.27
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-71.08	-71.29	-71.49	-71.64	-71.77
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	39.62	39.41	39.21	39.06	38.93
Eirp, max, dBW	43.62	43.41	43.21	43.06	42.93
Eirp Density, dBW/Hz	-20.88	-21.09	-21.29	-21.44	-21.57
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	16.12128	16.12128	16.12128	16.12128	16.12128
ES Antenna Gain (0.5m) dBi	38.2	38.2	38.2	38.2	38.2
ES Temp. (rain) dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-155.861	-155.862	-155.872	-155.859	-155.858
Data Rate (3.088 MBps) db	64.9	64.9	64.9	64.9	64.9
Bandwidth, dB	64.5	64.5	64.5	64.5	64.5
Downlink CNR, dB	8.238344	8.237926	8.227133	8.240046	8.241756
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.858229	4.857873	4.852601	4.859682	4.853454
Downlink Eb/No, dB	4.508229	4.507873	4.502601	4.509682	4.503454
PFD per MHz	-123.816	-123.816	-123.827	-123.814	-123.812

Figure A-1c. Link Performance, 0.5 meter ES, 98 Percentile Uplink Rain, Clear Sky Downlink, 3.088 MBps, High Or Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	6.7	5.59	8.1	9.84	12.93
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-58.8	-59.91	-57.4	-55.66	-52.57
Antenna Gain (0.7m) dBi	44.7	44.7	44.7	44.7	44.7
Eirp, peak, dBW	50.4	49.29	51.8	53.54	56.63
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	49.9	48.79	51.3	53.04	56.13
Eirp Density, dBW/Hz	-14.1	-15.21	-12.7	-10.96	-7.87
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-9	-8.1	-10.8	-12.7	-15.9
Total Loss, dB	-222.699	-221.589	-224.100	-225.837	-228.906
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-155.199	-155.199	-155.200	-155.197	-155.176
Data Rate (3.088MBps) dB	64.9	64.9	64.9	64.9	64.9
Bandwidth, dB	64.5	64.5	64.5	64.5	64.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	-2.41	-3.06	-1.56	-0.56	0.89
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-67.91	-68.56	-67.06	-66.06	-64.61
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	42.79	42.14	43.64	44.64	46.09
Eirp, max, dBW	46.79	46.14	47.64	48.64	50.09
Eirp Density, dBW/Hz	-17.71	-18.36	-16.86	-15.86	-14.41
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-3.7	-3.4	-4.6	-5.5	-6.8
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.802	-214.293	-215.304	-216.041	-217.209
G/T, dBi/K	16.15031	16.29047	15.80358	15.54081	15.26341
ES Antenna Gain (0.7m) dBi	41.1	41.1	41.1	41.1	41.1
ES Temp. (rain) dB	24.44968	24.30952	24.79641	25.05918	25.33658
C/T, dB/K	-155.862	-155.862	-155.860	-155.860	-155.856
Data Rate (3.088 MBps) db	64.9	64.9	64.9	64.9	64.9
Bandwidth, dB	64.5	64.5	64.5	64.5	64.5
Downlink CNR, dB	8.237372	8.237114	8.239426	8.239572	8.243887
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.857783	4.857500	4.858249	4.859464	4.854431
Downlink Eb/No, dB	4.507783	4.507500	4.508249	4.509464	4.504431
PFD per MHz	-120.646	-121.086	-119.397	-118.234	-116.652

Figure A-2a. Link Performance, 0.7 meter ES, Crane Model Rain, 3.088 MBps, High Or Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	-1.3	-1.51	-1.7	-1.86	-1.97
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-66.8	-67.01	-67.2	-67.36	-67.47
Antenna Gain (0.7m) dBi	44.7	44.7	44.7	44.7	44.7
Eirp, peak, dBW	42.4	42.19	42	41.84	41.73
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	41.9	41.69	41.5	41.34	41.23
Eirp Density, dBW/Hz	-22.1	-22.31	-22.5	-22.66	-22.77
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.699	-214.489	-214.300	-214.137	-214.006
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-155.199	-155.199	-155.200	-155.197	-155.176
Data Rate (3.088MBps) dB	64.9	64.9	64.9	64.9	64.9
Bandwidth, dB	64.5	64.5	64.5	64.5	64.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	-8.48	-8.69	-8.89	-9.04	-9.17
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-73.98	-74.19	-74.39	-74.54	-74.67
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	36.72	36.51	36.31	36.16	36.03
Eirp, max, dBW	40.72	40.51	40.31	40.16	40.03
Eirp Density, dBW/Hz	-23.78	-23.99	-24.19	-24.34	-24.47
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	19.02128	19.02128	19.02128	19.02128	19.02128
ES Antenna Gain (0.7m) dBi	41.1	41.1	41.1	41.1	41.1
ES Temp., dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-155.861	-155.862	-155.872	-155.859	-155.858
Data Rate (3.088 MBps) db	64.9	64.9	64.9	64.9	64.9
Bandwidth, dB	64.5	64.5	64.5	64.5	64.5
Downlink CNR, dB	8.238344	8.237926	8.227133	8.240046	8.241756
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.858229	4.857873	4.852601	4.859682	4.853454
Downlink Eb/No, dB	4.508229	4.507873	4.502601	4.509682	4.503454
PFD per MHz	-126.716	-126.716	-126.727	-126.714	-126.712

Figure A-2b. Link Performance, 0.7 meter ES, Clear Sky, 3.088 MBps, High Or Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	2.5	1.89	1.9	1.04	1.23
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-63	-63.61	-63.6	-64.46	-64.27
Antenna Gain (0.7) dBi	44.7	44.7	44.7	44.7	44.7
Eirp, peak, dBW	46.2	45.59	45.6	44.74	44.93
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	45.7	45.09	45.1	44.24	44.43
Eirp Density, dBW/Hz	-18.3	-18.91	-18.9	-19.76	-19.57
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-4.8	-4.4	-4.6	-3.9	-4.2
Total Loss, dB	-218.499	-217.889	-217.900	-217.037	-217.206
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-155.199	-155.199	-155.200	-155.197	-155.176
Data Rate (3.088MBps) dB	64.9	64.9	64.9	64.9	64.9
Bandwidth, dB	64.5	64.5	64.5	64.5	64.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	-8.48	-8.69	-8.89	-9.04	-9.17
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-73.98	-74.19	-74.39	-74.54	-74.67
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	36.72	36.51	36.31	36.16	36.03
Eirp, max, dBW	40.72	40.51	40.31	40.16	40.03
Eirp Density, dBW/Hz	-23.78	-23.99	-24.19	-24.34	-24.47
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	19.02128	19.02128	19.02128	19.02128	19.02128
ES Antenna Gain (0.7m) dBi	41.1	41.1	41.1	41.1	41.1
ES Temp. (rain) dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-155.861	-155.862	-155.872	-155.859	-155.858
Data Rate (3.088 MBps) db	64.9	64.9	64.9	64.9	64.9
Bandwidth, dB	64.5	64.5	64.5	64.5	64.5
Downlink CNR, dB	8.238344	8.237926	8.227133	8.240046	8.241756
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.858229	4.857873	4.852601	4.859682	4.853454
Downlink Eb/No, dB	4.508229	4.507873	4.502601	4.509682	4.503454
PFD per MHz	-126.716	-126.716	-126.727	-126.714	-126.712

Figure A-2c. Link Performance, 0.7 meter ES, 98 Percentile Uplink Rain, Clear Sky Downlink, 3.088 MBps, High Or Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	19.7	18.59	21.1	22.84	25.93
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-58.8	-59.91	-57.4	-55.66	-52.57
Antenna Gain (0.7m) dBi	44.7	44.7	44.7	44.7	44.7
Eirp, peak, dBW	63.4	62.29	64.8	66.54	69.63
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	62.9	61.79	64.3	66.04	69.13
Eirp Density, dBW/Hz	-14.1	-15.21	-12.7	-10.96	-7.87
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-9	-8.1	-10.8	-12.7	-15.9
Total Loss, dB	-222.699	-221.589	-224.100	-225.837	-228.906
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-142.199	-142.199	-142.200	-142.197	-142.176
Data Rate (61MBps) dB	77.9	77.9	77.9	77.9	77.9
Bandwidth (56.3 MHz) dB	77.5	77.5	77.5	77.5	77.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	10.59	9.94	11.44	12.44	13.89
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-67.91	-68.56	-67.06	-66.06	-64.61
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	55.79	55.14	56.64	57.64	59.09
Eirp, max, dBW	59.79	59.14	60.64	61.64	63.09
Eirp Density, dBW/Hz	-17.71	-18.36	-16.86	-15.86	-14.41
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-3.7	-3.4	-4.6	-5.5	-6.8
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.802	-214.293	-215.304	-216.041	-217.209
G/T, dBi/K	16.15031	16.29047	15.80358	15.54081	15.26341
ES Antenna Gain (0.7m) dBi	41.1	41.1	41.1	41.1	41.1
ES Temp. (rain) dB	24.44968	24.30952	24.79641	25.05918	25.33658
C/T, dB/K	-142.862	-142.862	-142.860	-142.860	-142.856
Data Rate (61 MBps) db	77.9	77.9	77.9	77.9	77.9
Bandwidth (56.3 MHz) dB	77.5	77.5	77.5	77.5	77.5
Downlink CNR, dB	8.237372	8.237114	8.239426	8.239572	8.243887
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.857783	4.857500	4.858249	4.859464	4.854431
Downlink Eb/No, dB	4.507783	4.507500	4.508249	4.509464	4.504431
PFD per MHz	-120.646	-121.086	-119.397	-118.234	-116.652

Figure A-3a. Link Performance, 0.7 meter ES, Crane Model Rain, 61 MBps, High Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	11.7	11.49	11.3	11.14	11.03
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-66.8	-67.01	-67.2	-67.36	-67.47
Antenna Gain (0.7m) dBi	44.7	44.7	44.7	44.7	44.7
Eirp, peak, dBW	55.4	55.19	55	54.84	54.73
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	54.9	54.69	54.5	54.34	54.23
Eirp Density, dBW/Hz	-22.1	-22.31	-22.5	-22.66	-22.77
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.699	-214.489	-214.300	-214.137	-214.006
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-142.199	-142.199	-142.200	-142.197	-142.176
Data Rate (61MBps) dB	77.9	77.9	77.9	77.9	77.9
Bandwidth (56.3 MHz) dB	77.5	77.5	77.5	77.5	77.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	4.52	4.31	4.11	3.96	3.83
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-73.98	-74.19	-74.39	-74.54	-74.67
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	49.72	49.51	49.31	49.16	49.03
Eirp, max, dBW	53.72	53.51	53.31	53.16	53.03
Eirp Density, dBW/Hz	-23.78	-23.99	-24.19	-24.34	-24.47
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	19.02128	19.02128	19.02128	19.02128	19.02128
ES Antenna Gain (0.7m) dBi	41.1	41.1	41.1	41.1	41.1
ES Temp., dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-142.861	-142.862	-142.872	-142.859	-142.858
Data Rate (61 MBps) db	77.9	77.9	77.9	77.9	77.9
Bandwidth (56.3 MHz) dB	77.5	77.5	77.5	77.5	77.5
Downlink CNR, dB	8.238344	8.237926	8.227133	8.240046	8.241756
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.858229	4.857873	4.852601	4.859682	4.853454
Downlink Eb/No, dB	4.508229	4.507873	4.502601	4.509682	4.503454
PFD per MHz	-126.716	-126.716	-126.727	-126.714	-126.712

Figure A-3b. Link Performance, 0.7 meter ES, Clear Sky, 61 MBps, High Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	15.5	14.89	14.9	14.04	14.23
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-63	-63.61	-63.6	-64.46	-64.27
Antenna Gain (0.7) dBi	44.7	44.7	44.7	44.7	44.7
Eirp, peak, dBW	59.2	58.59	58.6	57.74	57.93
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	58.7	58.09	58.1	57.24	57.43
Eirp Density, dBW/Hz	-18.3	-18.91	-18.9	-19.76	-19.57
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-4.8	-4.4	-4.6	-3.9	-4.2
Total Loss, dB	-218.499	-217.889	-217.900	-217.037	-217.206
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-142.199	-142.199	-142.200	-142.197	-142.176
Data Rate (61MBps) dB	77.9	77.9	77.9	77.9	77.9
Bandwidth (56.3 MHz) dB	77.5	77.5	77.5	77.5	77.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	4.52	4.31	4.11	3.96	3.83
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-73.98	-74.19	-74.39	-74.54	-74.67
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	49.72	49.51	49.31	49.16	49.03
Eirp, max, dBW	53.72	53.51	53.31	53.16	53.03
Eirp Density, dBW/Hz	-23.78	-23.99	-24.19	-24.34	-24.47
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	19.02128	19.02128	19.02128	19.02128	19.02128
ES Antenna Gain (0.7m) dBi	41.1	41.1	41.1	41.1	41.1
ES Temp. (rain) dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-142.861	-142.862	-142.872	-142.859	-142.858
Data Rate (61 MBps) db	77.9	77.9	77.9	77.9	77.9
Bandwidth (56.3 MHz) dB	77.5	77.5	77.5	77.5	77.5
Downlink CNR, dB	8.238344	8.237926	8.227133	8.240046	8.241756
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.858229	4.857873	4.852601	4.859682	4.853454
Downlink Eb/No, dB	4.508229	4.507873	4.502601	4.509682	4.503454
PFD per MHz	-126.716	-126.716	-126.727	-126.714	-126.712

Figure A-3c. Link Performance, 0.7 meter ES, 98 Percentile Uplink Rain, Clear Sky Downlink, 61 MBps, High Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	22.6	21.49	24	25.74	28.83
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-55.9	-57.01	-54.5	-52.76	-49.67
Antenna Gain (0.5m) dBi	41.8	41.8	41.8	41.8	41.8
Eirp, peak, dBW	63.4	62.29	64.8	66.54	69.63
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	62.9	61.79	64.3	66.04	69.13
Eirp Density, dBW/Hz	-14.1	-15.21	-12.7	-10.96	-7.87
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-9	-8.1	-10.8	-12.7	-15.9
Total Loss, dB	-222.699	-221.589	-224.100	-225.837	-228.906
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-142.199	-142.199	-142.200	-142.197	-142.176
Data Rate (61MBps) dB	77.9	77.9	77.9	77.9	77.9
Bandwidth (56.3 MHz) dB	77.5	77.5	77.5	77.5	77.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	13.49	12.84	14.34	15.34	16.79
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-65.01	-65.66	-64.16	-63.16	-61.71
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	58.69	58.04	59.54	60.54	61.99
Eirp, max, dBW	62.69	62.04	63.54	64.54	65.99
Eirp Density, dBW/Hz	-14.81	-15.46	-13.96	-12.96	-11.51
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-3.7	-3.4	-4.6	-5.5	-6.8
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.802	-214.293	-215.304	-216.041	-217.209
G/T, dBi/K	13.25031	13.39047	12.90358	12.64081	12.36341
ES Antenna Gain (0.5m) dBi	38.2	38.2	38.2	38.2	38.2
ES Temp. (rain) dB	24.44968	24.30952	24.79641	25.05918	25.33658
C/T, dB/K	-142.862	-142.862	-142.860	-142.860	-142.856
Data Rate (61 MBps) db	77.9	77.9	77.9	77.9	77.9
Bandwidth (56.3 MHz) dB	77.5	77.5	77.5	77.5	77.5
Downlink CNR, dB	8.237372	8.237114	8.239426	8.239572	8.243887
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.857783	4.857500	4.858249	4.859464	4.854431
Downlink Eb/No, dB	4.507783	4.507500	4.508249	4.509464	4.504431
PFD per MHz	-117.746	-118.186	-116.497	-115.334	-113.752

Figure A-4a. Link Performance, 0.5 meter ES, Crane Model Rain, 61 MBps, High Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	14.6	14.39	14.2	14.04	13.93
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-63.9	-64.11	-64.3	-64.46	-64.57
Antenna Gain (0.5m) dBi	41.8	41.8	41.8	41.8	41.8
Eirp, peak, dBW	55.4	55.19	55	54.84	54.73
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	54.9	54.69	54.5	54.34	54.23
Eirp Density, dBW/Hz	-22.1	-22.31	-22.5	-22.66	-22.77
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.699	-214.489	-214.300	-214.137	-214.006
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-142.199	-142.199	-142.200	-142.197	-142.176
Data Rate (61MBps) dB	77.9	77.9	77.9	77.9	77.9
Bandwidth (56.3 MHz) dB	77.5	77.5	77.5	77.5	77.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	7.42	7.21	7.01	6.86	6.73
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-71.08	-71.29	-71.49	-71.64	-71.77
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	52.62	52.41	52.21	52.06	51.93
Eirp, max, dBW	56.62	56.41	56.21	56.06	55.93
Eirp Density, dBW/Hz	-20.88	-21.09	-21.29	-21.44	-21.57
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	16.12128	16.12128	16.12128	16.12128	16.12128
ES Antenna Gain (0.5m) dBi	38.2	38.2	38.2	38.2	38.2
ES Temp., dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-142.861	-142.862	-142.872	-142.859	-142.858
Data Rate (61 MBps) db	77.9	77.9	77.9	77.9	77.9
Bandwidth (56.3 MHz) dB	77.5	77.5	77.5	77.5	77.5
Downlink CNR, dB	8.238344	8.237926	8.227133	8.240046	8.241756
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.858229	4.857873	4.852601	4.859682	4.853454
Downlink Eb/No, dB	4.508229	4.507873	4.502601	4.509682	4.503454
PFD per MHz	-123.816	-123.816	-123.827	-123.814	-123.812

Figure A-4b. Link Performance, 0.5 meter ES, Clear Sky, 61 MBps, High Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	18.4	17.79	17.8	16.94	17.13
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-60.1	-60.71	-60.7	-61.56	-61.37
Antenna Gain (0.5) dBi	41.8	41.8	41.8	41.8	41.8
Eirp, peak, dBW	59.2	58.59	58.6	57.74	57.93
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	58.7	58.09	58.1	57.24	57.43
Eirp Density, dBW/Hz	-18.3	-18.91	-18.9	-19.76	-19.57
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-4.8	-4.4	-4.6	-3.9	-4.2
Total Loss, dB	-218.499	-217.889	-217.900	-217.037	-217.206
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-142.199	-142.199	-142.200	-142.197	-142.176
Data Rate (61MBps) dB	77.9	77.9	77.9	77.9	77.9
Bandwidth (56.3 MHz) dB	77.5	77.5	77.5	77.5	77.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	7.42	7.21	7.01	6.86	6.73
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-71.08	-71.29	-71.49	-71.64	-71.77
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	52.62	52.41	52.21	52.06	51.93
Eirp, max, dBW	56.62	56.41	56.21	56.06	55.93
Eirp Density, dBW/Hz	-20.88	-21.09	-21.29	-21.44	-21.57
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	16.12128	16.12128	16.12128	16.12128	16.12128
ES Antenna Gain (0.5m) dBi	38.2	38.2	38.2	38.2	38.2
ES Temp. (rain) dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-142.861	-142.862	-142.872	-142.859	-142.858
Data Rate (61 MBps) db	77.9	77.9	77.9	77.9	77.9
Bandwidth (56.3 MHz) dB	77.5	77.5	77.5	77.5	77.5
Downlink CNR, dB	8.238344	8.237926	8.227133	8.240046	8.241756
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.858229	4.857873	4.852601	4.859682	4.853454
Downlink Eb/No, dB	4.508229	4.507873	4.502601	4.509682	4.503454
PFD per MHz	-123.816	-123.816	-123.827	-123.814	-123.812

Figure A-4c. Link Performance, 0.5 meter ES, 98 Percentile Uplink Rain, Clear Sky Downlink, 61 MBps, High Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	22.16	21.05	23.56	25.3	28.39
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-55.74	-56.85	-54.34	-52.6	-49.51
Antenna Gain (0.5m) dBi	41.8	41.8	41.8	41.8	41.8
Eirp, peak, dBW	62.96	61.85	64.36	66.1	69.19
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	62.46	61.35	63.86	65.6	68.69
Eirp Density, dBW/Hz	-13.94	-15.05	-12.54	-10.8	-7.71
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-9	-8.1	-10.8	-12.7	-15.9
Total Loss, dB	-222.699	-221.589	-224.100	-225.837	-228.906
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-142.639	-142.639	-142.640	-142.637	-142.616
Data Rate (53MBps) dB	77.2	77.2	77.2	77.2	77.2
Bandwidth (49 MHz) dB	76.9	76.9	76.9	76.9	76.9
Uplink CNR, dB	9.060546	9.060128	9.059335	9.062248	9.083959
Total C/I, dB	16.27285	16.27285	16.27285	16.27285	16.16648
Total Uplink CNR, dB	8.305052	8.304701	8.304034	8.306482	8.307481
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	13.02	12.37	13.87	14.87	16.32
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-64.88	-65.53	-64.03	-63.03	-61.58
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	58.22	57.57	59.07	60.07	61.52
Eirp, max, dBW	62.22	61.57	63.07	64.07	65.52
Eirp Density, dBW/Hz	-14.68	-15.33	-13.83	-12.83	-11.38
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-3.7	-3.4	-4.6	-5.5	-6.8
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.802	-214.293	-215.304	-216.041	-217.209
G/T, dBi/K	13.25031	13.39047	12.90358	12.64081	12.36341
ES Antenna Gain (0.5m) dBi	38.2	38.2	38.2	38.2	38.2
ES Temp. (rain) dB	24.44968	24.30952	24.79641	25.05918	25.33658
C/T, dB/K	-143.332	-143.332	-143.330	-143.330	-143.326
Data Rate (53 MBps) db	77.2	77.2	77.2	77.2	77.2
Bandwidth (49 MHz) dB	76.9	76.9	76.9	76.9	76.9
Downlink CNR, dB	8.367372	8.367114	8.369426	8.369572	8.373887
Total C/I, dB	14.73799	14.73799	14.73799	14.73799	14.66302
Total Downlink CNR, dB	4.855025	4.854752	4.855480	4.856651	4.851255
Downlink Eb/No, dB	4.505025	4.504752	4.505480	4.506651	4.501255
PFD per MHz	-117.616	-118.056	-116.367	-115.204	-113.622

Figure A-5a. Link Performance, 0.5 meter ES, Crane Model Rain, 53 MBps, Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	14.16	13.95	13.76	13.6	13.49
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-63.74	-63.95	-64.14	-64.3	-64.41
Antenna Gain (0.5m) dBi	41.8	41.8	41.8	41.8	41.8
Eirp, peak, dBW	54.96	54.75	54.56	54.4	54.29
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	54.46	54.25	54.06	53.9	53.79
Eirp Density, dBW/Hz	-21.94	-22.15	-22.34	-22.5	-22.61
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.699	-214.489	-214.300	-214.137	-214.006
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-142.639	-142.639	-142.640	-142.637	-142.616
Data Rate (53MBps) dB	77.2	77.2	77.2	77.2	77.2
Bandwidth (49 MHz) dB	76.9	76.9	76.9	76.9	76.9
Uplink CNR, dB	9.060546	9.060128	9.059335	9.062248	9.083959
Total C/I, dB	16.27285	16.27285	16.27285	16.27285	16.16648
Total Uplink CNR, dB	8.305052	8.304701	8.304034	8.306482	8.307481
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	6.95	6.74	6.54	6.39	6.26
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-70.95	-71.16	-71.36	-71.51	-71.64
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	52.15	51.94	51.74	51.59	51.46
Eirp, max, dBW	56.15	55.94	55.74	55.59	55.46
Eirp Density, dBW/Hz	-20.75	-20.96	-21.16	-21.31	-21.44
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	16.12128	16.12128	16.12128	16.12128	16.12128
ES Antenna Gain (0.5m) dBi	38.2	38.2	38.2	38.2	38.2
ES Temp., dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-143.331	-143.332	-143.342	-143.329	-143.328
Data Rate (53 MBps) db	77.2	77.2	77.2	77.2	77.2
Bandwidth (49 MHz) dB	76.9	76.9	76.9	76.9	76.9
Downlink CNR, dB	8.368344	8.367926	8.357133	8.370046	8.371756
Total C/I, dB	14.73799	14.73799	14.73799	14.73799	14.66302
Total Downlink CNR, dB	4.855458	4.855113	4.850002	4.856862	4.850308
Downlink Eb/No, dB	4.505458	4.505113	4.500002	4.506862	4.500308
PFD per MHz	-123.686	-123.686	-123.697	-123.684	-123.682

Figure A-5b. Link Performance, 0.5 meter ES, Clear Sky, 53 MBps, Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	17.96	17.35	17.36	16.5	16.69
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-59.94	-60.55	-60.54	-61.4	-61.21
Antenna Gain (0.5) dBi	41.8	41.8	41.8	41.8	41.8
Eirp, peak, dBW	58.76	58.15	58.16	57.3	57.49
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	58.26	57.65	57.66	56.8	56.99
Eirp Density, dBW/Hz	-18.14	-18.75	-18.74	-19.6	-19.41
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-4.8	-4.4	-4.6	-3.9	-4.2
Total Loss, dB	-218.499	-217.889	-217.900	-217.037	-217.206
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-142.639	-142.639	-142.640	-142.637	-142.616
Data Rate (53MBps) dB	77.2	77.2	77.2	77.2	77.2
Bandwidth (49 MHz) dB	76.9	76.9	76.9	76.9	76.9
Uplink CNR, dB	9.060546	9.060128	9.059335	9.062248	9.083959
Total C/I, dB	16.27285	16.27285	16.27285	16.27285	16.16648
Total Uplink CNR, dB	8.305052	8.304701	8.304034	8.306482	8.307481
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	6.95	6.74	6.54	6.39	6.26
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-70.95	-71.16	-71.36	-71.51	-71.64
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	52.15	51.94	51.74	51.59	51.46
Eirp, max, dBW	56.15	55.94	55.74	55.59	55.46
Eirp Density, dBW/Hz	-20.75	-20.96	-21.16	-21.31	-21.44
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	16.12128	16.12128	16.12128	16.12128	16.12128
ES Antenna Gain (0.5m) dBi	38.2	38.2	38.2	38.2	38.2
ES Temp. (rain) dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-143.331	-143.332	-143.342	-143.329	-143.328
Data Rate (53 MBps) db	77.2	77.2	77.2	77.2	77.2
Bandwidth (49 MHz) dB	76.9	76.9	76.9	76.9	76.9
Downlink CNR, dB	8.368344	8.367926	8.357133	8.370046	8.371756
Total C/I, dB	14.73799	14.73799	14.73799	14.73799	14.66302
Total Downlink CNR, dB	4.855458	4.855113	4.850002	4.856862	4.850308
Downlink Eb/No, dB	4.505458	4.505113	4.500002	4.506862	4.500308
PFD per MHz	-123.686	-123.686	-123.697	-123.684	-123.682

Figure A-5c. Link Performance, 0.5 meter ES, 98 Percentile Uplink Rain, Clear Sky Downlink, 53 MBps, Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	19.26	18.15	20.66	22.4	25.49
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-58.64	-59.75	-57.24	-55.5	-52.41
Antenna Gain (0.7m) dBi	44.7	44.7	44.7	44.7	44.7
Eirp, peak, dBW	62.96	61.85	64.36	66.1	69.19
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	62.46	61.35	63.86	65.6	68.69
Eirp Density, dBW/Hz	-13.94	-15.05	-12.54	-10.8	-7.71
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-9	-8.1	-10.8	-12.7	-15.9
Total Loss, dB	-222.699	-221.589	-224.100	-225.837	-228.906
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-142.639	-142.639	-142.640	-142.637	-142.616
Data Rate (53MBps) dB	77.2	77.2	77.2	77.2	77.2
Bandwidth (49 MHz) dB	76.9	76.9	76.9	76.9	76.9
Uplink CNR, dB	9.060546	9.060128	9.059335	9.062248	9.083959
Total C/I, dB	16.27285	16.27285	16.27285	16.27285	16.16648
Total Uplink CNR, dB	8.305052	8.304701	8.304034	8.306482	8.307481
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	10.12	9.47	10.97	11.97	13.42
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-67.78	-68.43	-66.93	-65.93	-64.48
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	55.32	54.67	56.17	57.17	58.62
Eirp, max, dBW	59.32	58.67	60.17	61.17	62.62
Eirp Density, dBW/Hz	-17.58	-18.23	-16.73	-15.73	-14.28
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-3.7	-3.4	-4.6	-5.5	-6.8
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.802	-214.293	-215.304	-216.041	-217.209
G/T, dBi/K	16.15031	16.29047	15.80358	15.54081	15.26341
ES Antenna Gain (0.7m) dBi	41.1	41.1	41.1	41.1	41.1
ES Temp. (rain) dB	24.44968	24.30952	24.79641	25.05918	25.33658
C/T, dB/K	-143.332	-143.332	-143.330	-143.330	-143.326
Data Rate (53 MBps) db	77.2	77.2	77.2	77.2	77.2
Bandwidth (49 MHz) dB	76.9	76.9	76.9	76.9	76.9
Downlink CNR, dB	8.367372	8.367114	8.369426	8.369572	8.373887
Total C/I, dB	14.73799	14.73799	14.73799	14.73799	14.66302
Total Downlink CNR, dB	4.855025	4.854752	4.855480	4.856651	4.851255
Downlink Eb/No, dB	4.505025	4.504752	4.505480	4.506651	4.501255
PFD per MHz	-120.516	-120.956	-119.267	-118.104	-116.522

Figure A-6a. Link Performance, 0.7 meter ES, Crane Model Rain, 53 MBps, Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	11.26	11.05	10.86	10.7	10.59
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-66.64	-66.85	-67.04	-67.2	-67.31
Antenna Gain (0.7m) dBi	44.7	44.7	44.7	44.7	44.7
Eirp, peak, dBW	54.96	54.75	54.56	54.4	54.29
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	54.46	54.25	54.06	53.9	53.79
Eirp Density, dBW/Hz	-21.94	-22.15	-22.34	-22.5	-22.61
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.699	-214.489	-214.300	-214.137	-214.006
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-142.639	-142.639	-142.640	-142.637	-142.616
Data Rate (53MBps) dB	77.2	77.2	77.2	77.2	77.2
Bandwidth (49 MHz) dB	76.9	76.9	76.9	76.9	76.9
Uplink CNR, dB	9.060546	9.060128	9.059335	9.062248	9.083959
Total C/I, dB	16.27285	16.27285	16.27285	16.27285	16.16648
Total Uplink CNR, dB	8.305052	8.304701	8.304034	8.306482	8.307481
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	4.05	3.84	3.64	3.49	3.36
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-73.85	-74.06	-74.26	-74.41	-74.54
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	49.25	49.04	48.84	48.69	48.56
Eirp, max, dBW	53.25	53.04	52.84	52.69	52.56
Eirp Density, dBW/Hz	-23.65	-23.86	-24.06	-24.21	-24.34
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	19.02128	19.02128	19.02128	19.02128	19.02128
ES Antenna Gain (0.7m) dBi	41.1	41.1	41.1	41.1	41.1
ES Temp., dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-143.331	-143.332	-143.342	-143.329	-143.328
Data Rate (53 MBps) db	77.2	77.2	77.2	77.2	77.2
Bandwidth (49 MHz) dB	76.9	76.9	76.9	76.9	76.9
Downlink CNR, dB	8.368344	8.367926	8.357133	8.370046	8.371756
Total C/I, dB	14.73799	14.73799	14.73799	14.73799	14.66302
Total Downlink CNR, dB	4.855458	4.855113	4.850002	4.856862	4.850308
Downlink Eb/No, dB	4.505458	4.505113	4.500002	4.506862	4.500308
PFD per MHz	-126.586	-126.586	-126.597	-126.584	-126.582

Figure A-6b. Link Performance, 0.7 meter ES, Clear Sky, 53 MBps, Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	15.06	14.45	14.46	13.6	13.79
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-62.84	-63.45	-63.44	-64.3	-64.11
Antenna Gain (0.7) dBi	44.7	44.7	44.7	44.7	44.7
Eirp, peak, dBW	58.76	58.15	58.16	57.3	57.49
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	58.26	57.65	57.66	56.8	56.99
Eirp Density, dBW/Hz	-18.14	-18.75	-18.74	-19.6	-19.41
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-4.8	-4.4	-4.6	-3.9	-4.2
Total Loss, dB	-218.499	-217.889	-217.900	-217.037	-217.206
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-142.639	-142.639	-142.640	-142.637	-142.616
Data Rate (53MBps) dB	77.2	77.2	77.2	77.2	77.2
Bandwidth (49 MHz) dB	76.9	76.9	76.9	76.9	76.9
Uplink CNR, dB	9.060546	9.060128	9.059335	9.062248	9.083959
Total C/I, dB	16.27285	16.27285	16.27285	16.27285	16.16648
Total Uplink CNR, dB	8.305052	8.304701	8.304034	8.306482	8.307481
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	4.05	3.84	3.64	3.49	3.36
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-73.85	-74.06	-74.26	-74.41	-74.54
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	49.25	49.04	48.84	48.69	48.56
Eirp, max, dBW	53.25	53.04	52.84	52.69	52.56
Eirp Density, dBW/Hz	-23.65	-23.86	-24.06	-24.21	-24.34
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	19.02128	19.02128	19.02128	19.02128	19.02128
ES Antenna Gain (0.7m) dBi	41.1	41.1	41.1	41.1	41.1
ES Temp. (rain) dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-143.331	-143.332	-143.342	-143.329	-143.328
Data Rate (53 MBps) db	77.2	77.2	77.2	77.2	77.2
Bandwidth (49 MHz) dB	76.9	76.9	76.9	76.9	76.9
Downlink CNR, dB	8.368344	8.367926	8.357133	8.370046	8.371756
Total C/I, dB	14.73799	14.73799	14.73799	14.73799	14.66302
Total Downlink CNR, dB	4.855458	4.855113	4.850002	4.856862	4.850308
Downlink Eb/No, dB	4.505458	4.505113	4.500002	4.506862	4.500308
PFD per MHz	-126.586	-126.586	-126.597	-126.584	-126.582

Figure A-6c. Link Performance, 0.7 meter ES, 98 Percentile Uplink Rain, Clear Sky Downlink, 53 MBps, Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	6.6	5.49	8	9.74	12.83
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-55.9	-57.01	-54.5	-52.76	-49.67
Antenna Gain (0.5m) dBi	41.8	41.8	41.8	41.8	41.8
Eirp, peak, dBW	47.4	46.29	48.8	50.54	53.63
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	46.9	45.79	48.3	50.04	53.13
Eirp Density, dBW/Hz	-14.1	-15.21	-12.7	-10.96	-7.87
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-9	-8.1	-10.8	-12.7	-15.9
Total Loss, dB	-222.699	-221.589	-224.100	-225.837	-228.906
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-158.199	-158.199	-158.200	-158.197	-158.176
Data Rate (1.544MBps) dB	61.9	61.9	61.9	61.9	61.9
Bandwidth (1.43 MHz) dB	61.5	61.5	61.5	61.5	61.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	-2.51	-3.16	-1.66	-0.66	0.79
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-65.01	-65.66	-64.16	-63.16	-61.71
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	42.69	42.04	43.54	44.54	45.99
Eirp, max, dBW	46.69	46.04	47.54	48.54	49.99
Eirp Density, dBW/Hz	-14.81	-15.46	-13.96	-12.96	-11.51
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-3.7	-3.4	-4.6	-5.5	-6.8
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.802	-214.293	-215.304	-216.041	-217.209
G/T, dBi/K	13.25031	13.39047	12.90358	12.64081	12.36341
ES Antenna Gain (0.5m) dBi	38.2	38.2	38.2	38.2	38.2
ES Temp. (rain) dB	24.44968	24.30952	24.79641	25.05918	25.33658
C/T, dB/K	-158.862	-158.862	-158.860	-158.860	-158.856
Data Rate (1.544 MBps) db	61.9	61.9	61.9	61.9	61.9
Bandwidth (1.43 MHz) dB	61.5	61.5	61.5	61.5	61.5
Downlink CNR, dB	8.237372	8.237114	8.239426	8.239572	8.243887
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.857783	4.857500	4.858249	4.859464	4.854431
Downlink Eb/No, dB	4.507783	4.507500	4.508249	4.509464	4.504431
PFD per MHz	-117.746	-118.186	-116.497	-115.334	-113.752

Figure A-7a. Link Performance, 0.5 meter ES, Crane Model Rain, 1.54 MBps, High Or Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	-1.4	-1.61	-1.8	-1.96	-2.07
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-63.9	-64.11	-64.3	-64.46	-64.57
Antenna Gain (0.5m) dBi	41.8	41.8	41.8	41.8	41.8
Eirp, peak, dBW	39.4	39.19	39	38.84	38.73
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	38.9	38.69	38.5	38.34	38.23
Eirp Density, dBW/Hz	-22.1	-22.31	-22.5	-22.66	-22.77
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.699	-214.489	-214.300	-214.137	-214.006
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-158.199	-158.199	-158.200	-158.197	-158.176
Data Rate (1.544MBps) dB	61.9	61.9	61.9	61.9	61.9
Bandwidth (1.43 MHz) dB	61.5	61.5	61.5	61.5	61.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	-8.58	-8.79	-8.99	-9.14	-9.27
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-71.08	-71.29	-71.49	-71.64	-71.77
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	36.62	36.41	36.21	36.06	35.93
Eirp, max, dBW	40.62	40.41	40.21	40.06	39.93
Eirp Density, dBW/Hz	-20.88	-21.09	-21.29	-21.44	-21.57
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	16.12128	16.12128	16.12128	16.12128	16.12128
ES Antenna Gain (0.5m) dBi	38.2	38.2	38.2	38.2	38.2
ES Temp., dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-158.861	-158.862	-158.872	-158.859	-158.858
Data Rate (1.544 MBps) db	61.9	61.9	61.9	61.9	61.9
Bandwidth (1.43 MHz) dB	61.5	61.5	61.5	61.5	61.5
Downlink CNR, dB	8.238344	8.237926	8.227133	8.240046	8.241756
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.858229	4.857873	4.852601	4.859682	4.853454
Downlink Eb/No, dB	4.508229	4.507873	4.502601	4.509682	4.503454
PFD per MHz	-123.816	-123.816	-123.827	-123.814	-123.812

Figure A-7b. Link Performance, 0.5 meter ES, Clear Sky, 1.544 MBps, High Or Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	2.4	1.79	1.8	0.94	1.13
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-60.1	-60.71	-60.7	-61.56	-61.37
Antenna Gain (0.5) dBi	41.8	41.8	41.8	41.8	41.8
Eirp, peak, dBW	43.2	42.59	42.6	41.74	41.93
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	42.7	42.09	42.1	41.24	41.43
Eirp Density, dBW/Hz	-18.3	-18.91	-18.9	-19.76	-19.57
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-4.8	-4.4	-4.6	-3.9	-4.2
Total Loss, dB	-218.499	-217.889	-217.900	-217.037	-217.206
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-158.199	-158.199	-158.200	-158.197	-158.176
Data Rate (1.544MBps) dB	61.9	61.9	61.9	61.9	61.9
Bandwidth (1.43 MHz) dB	61.5	61.5	61.5	61.5	61.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	-8.58	-8.79	-8.99	-9.14	-9.27
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-71.08	-71.29	-71.49	-71.64	-71.77
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	36.62	36.41	36.21	36.06	35.93
Eirp, max, dBW	40.62	40.41	40.21	40.06	39.93
Eirp Density, dBW/Hz	-20.88	-21.09	-21.29	-21.44	-21.57
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-211.602	-211.393	-211.204	-211.041	-210.909
G/T, dBi/K	16.12128	16.12128	16.12128	16.12128	16.12128
ES Antenna Gain (0.5m) dBi	38.2	38.2	38.2	38.2	38.2
ES Temp. (rain) dB	21.57871	21.57871	21.57871	21.57871	21.57871
C/T, dB/K	-158.861	-158.862	-158.872	-158.859	-158.858
Data Rate (1.544 MBps) db	61.9	61.9	61.9	61.9	61.9
Bandwidth (1.43 MHz) dB	61.5	61.5	61.5	61.5	61.5
Downlink CNR, dB	8.238344	8.237926	8.227133	8.240046	8.241756
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.858229	4.857873	4.852601	4.859682	4.853454
Downlink Eb/No, dB	4.508229	4.507873	4.502601	4.509682	4.503454
PFD per MHz	-123.816	-123.816	-123.827	-123.814	-123.812

Figure A-7c. Link Performance, 0.5 meter ES, 98 Percentile Uplink Rain, Clear Sky Downlink, 1.544 MBps, High Or Low Band.

Elevation, degrees	20	30	40	50	60
Slant Range, Km.	39555	38612	37780	37078	36520
Scan Half Angle, degrees	8.17	7.53	6.65	5.58	4.34
Crane Model Region (0.995)	A	B	D2	E	H
Earth To Space, ES-to-Satellite					
Transmitter Power, dBW	6.6	5.49	8	9.74	12.83
Output Loss, dB	-1	-1	-1	-1	-1
Pwr Density dBW/Hz	-55.9	-57.01	-54.5	-52.76	-49.67
Antenna Gain (0.5m) dBi	41.8	41.8	41.8	41.8	41.8
Eirp, peak, dBW	47.4	46.29	48.8	50.54	53.63
Pointing Loss, dB	-0.5	-0.5	-0.5	-0.5	-0.5
Eirp, dBW	46.9	45.79	48.3	50.04	53.13
Eirp Density, dBW/Hz	-14.1	-15.21	-12.7	-10.96	-7.87
Frequency, GHz	29.2	29.2	29.2	29.2	29.2
Space Loss, dB	-213.699	-213.489	-213.300	-213.137	-213.006
Loss, dB	-9	-8.1	-10.8	-12.7	-15.9
Total Loss, dB	-222.699	-221.589	-224.100	-225.837	-228.906
G/T, EOC, dBi/K	17.6	17.6	17.6	17.6	17.6
Sat. Temp., dB	28.6	28.6	28.6	28.6	28.6
Antenna Gain, peak, dBi	50.2	50.2	50.2	50.2	50.2
C/T, dB/K	-158.199	-158.199	-158.200	-158.197	-158.176
Data Rate (1.544MBps) dB	61.9	61.9	61.9	61.9	61.9
Bandwidth (1.43 MHz) dB	61.5	61.5	61.5	61.5	61.5
Uplink CNR, dB	8.900546	8.900128	8.899335	8.902248	8.923959
Total C/I, dB	17.22544	17.22544	17.22544	17.22544	17.09338
Total Uplink CNR, dB	8.304665	8.304301	8.303609	8.306149	8.307830
Space To Earth, Satellite-to-ES					
Transmitter Power, dBW	-2.51	-3.16	-1.66	-0.66	0.79
Output Loss, dB	-1	-1	-1	-1	-1
Pwr. Density, dBW/Hz	-65.01	-65.66	-64.16	-63.16	-61.71
Antenna Gain, EOC, dBi	46.2	46.2	46.2	46.2	46.2
Eirp, EOC, dBW	42.69	42.04	43.54	44.54	45.99
Eirp, max, dBW	46.69	46.04	47.54	48.54	49.99
Eirp Density, dBW/Hz	-14.81	-15.46	-13.96	-12.96	-11.51
Frequency, GHz	19.3	19.3	19.3	19.3	19.3
Space Loss, dB	-210.102	-209.893	-209.704	-209.541	-209.409
Rain & Atmos. Loss, dB	-3.7	-3.4	-4.6	-5.5	-6.8
Fixed Loss, dB	-1	-1	-1	-1	-1
Total Loss, dB	-214.802	-214.293	-215.304	-216.041	-217.209
G/T, dBi/K	13.25031	13.39047	12.90358	12.64081	12.36341
ES Antenna Gain (0.5m) dBi	38.2	38.2	38.2	38.2	38.2
ES Temp. (rain) dB	24.44968	24.30952	24.79641	25.05918	25.33658
C/T, dB/K	-158.862	-158.862	-158.860	-158.860	-158.856
Data Rate (1.544 MBps) db	61.9	61.9	61.9	61.9	61.9
Bandwidth (1.43 MHz) dB	61.5	61.5	61.5	61.5	61.5
Downlink CNR, dB	8.237372	8.237114	8.239426	8.239572	8.243887
Total C/I, dB	15.38452	15.38452	15.38452	15.38452	15.29763
Total Downlink CNR, dB	4.857783	4.857500	4.858249	4.859464	4.854431
Downlink Eb/No, dB	4.507783	4.507500	4.508249	4.509464	4.504431
PFD per MHz	-117.746	-118.186	-116.497	-115.334	-113.752

Figure A-7a. Link Performance, 0.5 meter ES, Crane Model Rain, 1.544 MBps, High Or Low Band.

APPENDIX B

FCC FORM 312

FCC 312
Main Form

FEDERAL COMMUNICATIONS COMMISSION
APPLICATION FOR SATELLITE SPACE AND EARTH STATION AUTHORIZATIONS

Approved by OMB 3060-0678
Est. Avg Burden Hours Per Response: 10 Hrs

FCC Use Only
File Number:
Call Sign:

PAYOR AND FILING FEE INFORMATION

a. Payor Name				b. Daytime Telephone Number
Fisher Wayland Cooper Leader & Zaragoza L.L.P.				(202) 659-3494
c. Mailing Street Address or P.O. Box				d. FCC Account Number
2001 Pennsylvania Avenue, N.W., Suite 400				0530190523
e. City		f. State	g. Zip Code	h. Country Code (if not U.S.A.)
Washington		DC	20006	
i. Payment Type Code	j. Quantity	k. Fee Due for Payment Type Code in (i)	l. Total Amount Paid	FCC Use Only
BNY	5	$85,045	$425,225	

APPLICANT INFORMATION

1. Legal Name of Applicant			2. Voice Telephone Number
Pegasus Development Corporation			(610) 341-0766
3. Other Name Used for Doing Business (if any)			4. Fax Telephone Number
			(610) 341-1835
5. Mailing Street Address or P.O. Box		6. City	
5 Radnor Corporate Center, Suite 454 100 Matsonford Road ATTENTION:		Radnor	
		7. State / Country (if not U.S.A.)	8. Zip Code
		PA	19087
9. Name of Contact Representative (If other than applicant)			10. Voice Telephone Number
Bruce D. Jacobs			(202) 659-3494
11. Firm or Company Name			12. Fax Telephone Number
Fisher Wayland Cooper Leader & Zaragoza L.L.P.			(202) 296-6518
13. Mailing Street Address or P.O. Box		14. City	
2001 Pennsylvania Avenue, N.W., Suite 400 ATTENTION:		Washington	
		15. State / Country (if not U.S.A)	16. Zip Code
		DC	20006

CLASSIFICATION OF FILING

17. Place an "X" in the box next to the classification that applies to this filing for both questions a. and b. Mark only one box for 17a and only one box for 17b.

- [ ] a1. Earth Station
- [X] a2. Space Station

- [X] b1. Application for License of New Station
- [ ] b2. Application for Registration of New Domestic Receive-Only Station
- [ ] b3. Amendment to a Pending Application
- [ ] b4. Modification of License or Registration
- [ ] b5. Assignment of License or Registration
- [ ] b6. Transfer of Control of License or Registration
- [ ] b7. Notification of Minor Modification
- [ ] b8. Other (Please Specify): _____

18. If this filing is in reference to an existing station, enter:	19. If this filing is an amendment to a pending application enter:	
Call sign of station:	(a) Date pending application was filed:	(b) File number of pending application:
N/A	N/A	

TYPE OF SERVICE

20. NATURE OF SERVICE: This filing is for an authorization to provide or use the following type(s) of service(s): Place an "X" in the box(es) next to all that apply.

[X] a. Fixed Satellite [ ] b. Mobile Satellite [ ] c. Radiodetermination Satellite [ ] d. Earth Exploration Satellite [ ] e. Other (please specify) _____

21. STATUS: Place an "X" in the box next to the applicable status. Mark only one box.

[ ] a. Common Carrier [X] b. Non-Common Carrier

22. If earth station applicant, place an "X" in the box(es) next to all that apply.

[ ] a. Using U.S. licensed satellites [ ] b. Using Non-U.S. licensed satellites

23. If applicant is providing INTERNATIONAL COMMON CARRIER service, see instructions regarding Sec. 214 filings. Mark only one box. Are these facilities:

[ ] a. Connected to the Public Switched Network [ ] b. Not connected to the Public Switched Network N/A

24. FREQUENCY BAND(S): Place an "X" in the box(es) next to all applicable frequency band(s). TT&C: Ku Band (12/14 GHz) ISL Links: 50-70 GHz

[ ] a. C-Band (4/6 GHz) Ka Band: 28.35-28.6 GHz, 29.25-29.5 GHz, 29.5-30 GHz, 17.7-18.8 GHz, 19.7-20.2 GHz

[X] b. Ku-Band (12/14 GHz) [X] c. Other (Please specify) _____

TYPE OF STATION

25. CLASS OF STATION: Place an "X" in the box next to the class of station that applies. Mark only one box.

[ ] a. Fixed Earth Station [ ] b. Temporary-Fixed Earth Station [ ] c. 12/14 GHz VSAT Network [ ] d. Mobile Earth Station [X] e. Space Station [ ] f. Other (Specify) _____

If space station applicant, go to Question 27.

26. TYPE OF EARTH STATION FACILITY Mark only one box.

[ ] a. Transmit/Receive [ ] b. Transmit-Only [ ] c. Receive-Only N/A

PURPOSE OF MODIFICATION OR AMENDMENT

27. The purpose of this proposed modification or amendment is to: Place an "X" in the box(es) next to all that apply.

N/A

[ ] a -- authorization to add new emission designator and related service
[ ] b -- authorization to change emission designator and related service
[ ] c -- authorization to increase EIRP and EIRP density
[ ] d -- authorization to replace antenna
[ ] e -- authorization to add antenna
[ ] f -- authorization to relocate fixed station
[ ] g -- authorization to change assigned frequency(ies)
[ ] h -- authorization to add Points of Communication (satellites & countries)
[ ] i -- authorization to change Points of Communication (satellites & countries)
[ ] j -- authorization for facilities for which environmental assessment and radiation hazard reporting is required
[ ] k -- Other (Please Specify) _____

ENVIRONMENTAL POLICY

28. Would a Commission grant of any proposal in this application or amendment have a significant environmental impact as defined by 47 CFR 1.1307? [ ] YES [X] NO
If YES, submit the statement as required by Sections 1.1308 and 1.1311 of the Commission's rules, 47 C.F.R. §§ 1.1308 and 1.1311, as Exhibit A to this application.

A Radiation Hazard Study must accompany all applications as Exhibit B for new transmitting facilities, major modifications, or major amendments. Refer to OET Bulletin 65.

ALIEN OWNERSHIP

29. Is the applicant a foreign government or the representative of any foreign government?	☐ YES	☒ NO
30. Is the applicant an alien or the representative of an alien?	☐ YES	☒ NO
31. Is the applicant a corporation organized under the laws of any foreign government?	☐ YES	☒ NO
32. Is the applicant a corporation of which more than one-fifth of the capital stock is owned of record or voted by aliens or their representatives or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	☐ YES	☒ NO
33. Is the applicant a corporation directly or indirectly controlled by any other corporation of which more than one-fourth of the capital stock is owned of record or voted by aliens, their representatives, or by a foreign government or representative thereof or by any corporation organized under the laws of a foreign country?	☐ YES	☒ NO
34. If any answer to questions 29, 30, 31, 32 and/or 33 is Yes, attach as Exhibit C an identification of the aliens or foreign entities, their nationality, their relationship to the applicant, and the percentage of stock they own or vote.		

BASIC QUALIFICATIONS

35. Does the applicant request any waivers or exemptions from any of the Commission's Rules? If Yes, attach as Exhibit D, copies of the requests for waivers or exceptions with supporting documents.	☒ YES	☐ NO
36. Has the applicant or any party to this application had any FCC station authorization or license revoked or had any application for an initial, modification or renewal of FCC station authorization, license, or construction permit denied by the Commission? If Yes, attach as Exhibit E, an explanation of the circumstances.	☐ YES	☒ NO
37. Has the applicant, or any party to this application, or any party directly or indirectly controlling the applicant ever been convicted of a felony by any state or federal court?	☐ YES	☒ NO
38. Has any court finally adjudged the applicant, or any person directly or indirectly controlling the applicant, guilty of unlawfully monopolizing or attempting unlawfully to monopolize radio communication, directly or indirectly, through control of manufacture or sale of radio apparatus, exclusive traffic arrangement or any other means or unfair methods of competition?	☐ YES	☒ NO
39. Is the applicant, or any person directly or indirectly controlling the applicant, currently a party in any pending matter referred to in the preceeding two items?	☐ YES	☒ NO
40. By checking Yes, the undersigned certifies, that neither the applicant nor any other party to the application is subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Act of 1988, 21 U.S.C. Section 862, because of a conviction for possession or distribution of a controlled substance. See 47 CFR 1.2002(b) for the meaning of "party to the application" for these purposes.	☒ YES	☐ NO

41. Description. (Summarize the nature of the application and the services to be provided).

Pegasus Development Corporation proposes to launch and operate the Pegasus I Satellite System in the Ka Band to provide high data rate wideband communications services.

CERTIFICATION

The Applicant waives any claim to the use of any particular frequency or of the electromagnetic spectrum as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application. The applicant certifies that grant of this application would not cause the applicant to be in violation of the spectrum aggregation limit in 47 CFR Part 20. All statements made in exhibits are a material part hereof and are incorporated herein as if set out in full in this application. The undersigned, individually and for the applicant, hereby certifies that all statements made in this application and in all attached exhibits are true, complete and correct to the best of his or her knowledge and belief, and are made in good faith.

42. Applicant is a (an): (Place an "X" in the box next to applicable response.)

☐ a. Individual ☐ b. Unincorporated Association ☐ c. Partnership ☒ d. Corporation ☐ e. Governmental Entity ☐ f. Other (Please specify) _____

43. Typed Name of Person Signing	44. Title of Person Signing
Nicholas A. Pagon	President

45. Signature	46. Date
Nicholas A. Pagon	December 22, 1997

WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND/OR IMPRISONMENT (U.S. Code, Title 18, Section 1001), AND/OR REVOCATION OF ANY STATION AUTHORIZATION (U.S. Code, Title 47, Section 312(a)(1)), AND/OR FORFEITURE (U.S. Code, Title 47, Section 503).

WAIVER

Waiver for Filing Fee

The identical technical design of the satellites at each orbital location permits Pegasus Development Corporation to file a geostationary satellite application fee for each orbital location, pursuant to waiver of Section 1.1107(9) of the Commission's rules. See Public Notice, 76181 (August 26, 1997).

APPENDIX C

BALANCE SHEET FOR
PEGASUS COMMUNICATIONS CORPORATION

Pegasus Communications Corporation

Consolidated Balance Sheets

	December 31, 1996	September 30, 1997 (unaudited)
ASSETS		
Current assets:		
Cash and cash equivalents	$8,582,369	$34,210,959
Restricted cash	-	1,181,306
Accounts receivable, less allowance for doubtful accounts of $243,000 and $346,000, respectively	9,155,545	10,577,322
Program rights	1,289,437	1,588,392
Inventory	697,957	759,638
Deferred taxes	1,290,397	1,290,397
Prepaid expenses and other	851,592	1,250,836
Total current assets	21,867,297	50,858,850
Property and equipment, net	24,115,138	27,423,266
Intangible assets, net	126,236,128	237,511,764
Program rights	1,294,985	1,747,621
Deposits and other	166,498	199,404
Total assets	$173,680,046	$317,740,905
LIABILITIES AND TOTAL EQUITY		
Current liabilities:		
Notes payable	$48,610	
Current portion of long-term debt	315,223	$4,894,945
Accounts payable	5,075,981	5,705,241
Accrued interest	5,592,083	3,456,814
Accrued expenses	3,803,993	3,738,944
Current portion of program rights payable	601,205	897,687
Total current liabilities	15,437,095	18,693,631
Long-term debt, net	115,211,610	152,423,965
Program rights payable	1,365,284	1,242,102
Deferred taxes	1,339,859	1,389,859
Total liabilities	133,353,848	173,749,557
Commitments and contingent liabilities	-	-
Minority interest	-	3,000,000
Series A preferred stock	-	108,677,500
Common stockholders' equity:		
Class A common stock	46,632	53,425
Class B common stock	45,819	45,819
Additional paid-in capital	57,736,011	57,017,011
Accumulated deficit	(17,502,264)	(24,802,407)
Total common stockholders' equity	40,326,198	32,313,848
Total liabilities and stockholders' equity	$173,680,046	$317,740,905

This balance sheet is from the Securities and Exchange Commission 10-Q filed by Pegasus Communications Corporation for the period ending September 30, 1997. Explanatory notes contained in the 10-Q are excluded here.

APPENDIX D

ENGINEER'S CERTIFICATION

Technical Certification

I, John D. Kiesling, Consultant, certify under perjury that:

I am the technically qualified person with overall responsibility for preparation of the technical information contained in the instant application of Pegasus Development Corporation, for a license to operate a communications satellite system in the Ka Band.

I am familiar with the requirements of Part 25 of the Commission's rules, and the information contained in the application is true and correct to the best of my belief.

John D. Kiesling

December 22, 1997

EXHIBIT B

PUBLIC NOTICE

FEDERAL COMMUNICATIONS COMMISSION
1919 M STREET N.W.
WASHINGTON, D.C. 20554

56031

News media information 202/418-0500 Recorded listing of releases and texts 202/418-2222

SEP 28 1995

INTERIM FILING FEE PAYMENT ESTABLISHED FOR Ka-BAND SATELLITE APPLICATIONS

The Managing Director has established an interim filing fee payment for fixed Ka-band (17.7-20.2/27.5-30) satellite applications, based upon the total number of orbital locations that an applicant proposes to occupy. This action will afford the Commission an opportunity to determine whether to seek congressional amendment of the statutory filing fee schedule, as it now applies to geostationary space stations, because of the evolution in geostationary satellite technology and the multiple geostationary space stations that Ka-band applicants are anticipated to deploy in their systems.

The interim payment should be filed, along with underlying applications, no later than September 29, 1995. Ka-band satellite applicants should submit a filing fee payment of $2,330 per orbital location (Payment Code BBY) to cover their applications for authority to construct and an additional fee payment of $80,360 per orbital location (Payment Code BNY) for authority to launch and operate Ka-band satellites at each orbital location, regardless of how many space stations are proposed for operation. Thus, for example, if an applicant requests authorization for nine satellites to operate at three orbital locations, it should submit three fee payments to construct and three additional fee payments to launch and operate its space stations, totalling $248,070.

Any Ka-band applicant submitting an interim fee payment, as described above, should also file with its check and Form 159 a cover letter stating that it is making an interim payment and that it will submit any further payment, if required by the Commission, within thirty (30) days of notification from the Commission that an additional payment remains due.

For further information, see letter to John P. Janka, Esquire from Andrew S. Fishel, Managing Director, dated September 28, 1995. Questions regarding the foregoing should be directed to Thomas M. Holleran, Deputy Associate Managing Director for Operations (202) 418-1925.

FEDERAL COMMUNICATIONS COMMISSION
Washington, D. C. 20554

SEP 28 1995

OFFICE OF
MANAGING DIRECTOR

John P. Janka, Esquire
Latham & Watkins
1001 Pennsylvania Avenue, N.W.
Washington D.C. 20004-2505

Dear Mr. Janka:

This is an initial response to your letter, dated September 19, 1995, requesting, on behalf of Hughes Communications Galaxy, Inc. (Hughes), a determination of the appropriate filing fee payment due for its Ka-band (17.7-20.2/27.5-30GHz) satellite applications.

A further and more comprehensive response to the issues raised in your request will be forthcoming shortly. However, because applications for Ka-band satellites are to be filed by September 29, 1995, we believe an initial response is required.

In view of the evolution in geostationary satellite technology and the multiple geostationary space stations that Hughes and other Ka-band applicants may propose to deploy in their systems, the International Bureau's Satellite staff has tentatively concluded that the "per space station" fee formulation, currently mandated by Congress' filing fee schedule for all geostationary space stations, may not be suitable for this fixed service in the Ka-band. See 47 U.S.C. § 158(g). We agree and, therefore, we expect that the Commission will request an amendment to the Congressionally imposed fee schedule in order to modify the fee payment amount required for Ka-band space station applications. Because it is premature to determine the nature of any proposed filing fee modification, we believe that interim relief from the requirement to file a "per space station" fee payment is appropriate in order to avoid unnecessary hardship on the applicants. This action will afford the Commission time to determine its future course of action, including an opportunity to seek Congressional amendment of the fee schedule as it now applies to geostationary space stations.

In this connection, an interim fee payment for Ka-band satellite applications, based upon the total number of orbital locations that an applicant proposes to occupy, should be filed along with underlying applications no later than September 29, 1995. Under this interim formulation, Hughes and other Ka-band satellite applicants should submit a filing fee payment of $2,330 per orbital location (Payment Code BBY) to cover their applications for authority to construct and an additional fee payment of

$80,360 per orbital location (Payment Code BNY) for authority to launch and operate Ka-band satellites at each orbital location, regardless of how many space stations are proposed for operation. Thus, if an applicant requests authorization for nine satellites to operate at three orbital locations, it should submit three fee payments to construct and three additional fee payments to launch and operate its space stations, totalling $248,070.

Any applicant submitting an interim fee payment, as described above, should also file with its check and Form 159 a cover letter stating that it is making an interim payment and that it will submit any further payment, if required by the Commission, within thirty (30) days of notification from the Commission that an additional payment remains due.

If you have any questions regarding the foregoing, please contact Thomas M. Holleran of my staff at (202) 418-1925.

Sincerely,

Andrew S. Fishel
Managing Director

EXHIBIT C

PUBLIC NOTICE

Federal Communications Commission
1919 M St., N.W.
Washington, D.C. 20554

News media information 202 / 418-0500
Fax-On-Demand 202 / 418-2830
Internet: http://www.fcc.gov
ftp.fcc.gov

76181

Released: August 26, 1997

FILING FEE WAIVER ESTABLISHED FOR APPLICATIONS PROPOSING GEOSYNCHRONOUS SPACE STATIONS IN RESPONSE TO REPORT NOS. SPB-88 AND SPB-89 – CUT-OFFS ESTABLISHED IN THE 2 GHz AND 36-51.4 GHz FREQUENCY BANDS

The Managing Director has granted in part a request by Hughes Communications, Inc. for waiver of the fee required by Section 1.1107(9)(b) of the Commission's rules for geosynchronous space station applications. See letter to John P. Janka, Esquire, from Andrew S. Fishel, Managing Director, dated August 22 , 1997. In light of this waiver, the Managing Director has determined that similar waivers should be granted to all applicants who meet the criteria for waiver specified in his August 22, 1997 letter and who are filing geosynchronous space station applications in response to the Cut-Off Notices in the 2 GHz and 36-51.4 GHz Frequency Bands (*see* Public Notices, Report Nos. SPB-88 and SPB 89 (July 22, 1997), *as clarified*, Report No. SPB-95 (August 13, 1997)). The waiver permits applicants proposing more than one technically identical space station to be located at a single orbital location to file their fees based upon the number of orbital locations they propose to occupy rather than the number of space stations they propose to launch and operate. All satellites at each orbital location must be technically identical, including using exactly the same frequency band, in order for the waiver standard to be met.

The fee payment should be filed, along with underlying applications, no later than September 5, 1997. Applicants qualifying for the waiver should submit a fee payment of $85,045 per orbital location (Payment Code BNY) for authority to launch and operate one or more technically identical space stations at each orbital location, regardless of how many space stations are proposed for operation. Thus, for example, if an applicant requests authorization for nine technically identical satellites to operate at three orbital locations, it should submit three fee payments to launch and operate its space stations, totalling $255,135. These applicants should also submit with their applications a statement setting forth the reasons why their applications satisfy the criteria described above for a fee waiver.

Questions regarding the foregoing should be directed to Regina Dorsey, Chief, Billings and Collections Branch, (202) 418-1995 or Kathleen Campbell, International Bureau, at (202) 418-0753.

EXHIBIT D

Federal Communications Commission
1919 M Street, N.W.
Washington, DC 20554
January 13, 1998

Pegasus Development Corp.
C/O Fisher Wayland Cooper Leader & Zaragoza, LLP
2001 Pennsylvania Ave., N.W., Suite 400
Washington, D.C. 20006

Dear Sir: RE: 9712248210223001

We are refunding your fee for the following reason(s).

[ ] Fee paid - No fee required (See block checked "other" for further explanation.)

[ ] Overpayment

[ ] Duplicate Payment

[X] Incorrect fee - Fee Should be: $ 850,450.00

Your application is being returned. Please resubmit a complete application package according to the appropriate Fee Filing Guide.

[ ] Multiple Fee Application - Additional fee required.

Your application is being returned. Please resubmit a complete application package according to the appropriate Fee Filing Guide.

[X] Other: See attached copy of Form A-462 for reason.

Payment is being made through the U.S. Treasury Department. Please allow 8 - 10 weeks for processing. If you have any questions concerning this letter, please contact Octavia Purnell at (202) 418-1995.

Sincerely,

Octavia Purnell /for

Claudette E. Pride
Chief, Fee Section

FEDERAL COMMUNICATIONS COMMISSION

BUREAU/FEE SECTION TWO-WAY CORRESPONDENCE FORM

DATE: 1/13/98

TO:
- [x] Fee Section, FMD - Room 452
- [ ] CCB - Room
- [ ] Other (Specify Bureau and Room Number):
- [ ] MMB - Room
- [ ] OET - Room

APPLICANT'S NAME: Pegasus Development LLC

FEE CONTROL NUMBER: 97-12-24 8210 223001

FROM:
- [ ] Fee Section, FMD - Room 452
- [ ] CCB - Room
- [x] Other (Specify Bureau and Room Number): 1B, 500, 2000M
- [ ] MMB - Room
- [ ] OET - Room

BUREAU/OFFICE ID NUMBER:

This is to Notify You that Subject Application Requires Further Action:

- [ ] NO FEE RECEIVED - FEE REQUIRED
- [ ] APPLICATION ATTACHED
- [ ] PROCESS APPLICATION
- [ ] FEE NOT ELIGIBLE FOR REFUND
- [ ] OTHER - PLEASE EXPLAIN IN REMARKS SECTION

REMARKS:
Cut-off Notices SPB-105 & SPB-106 requested applications in Ka-band be filed by 12/22/97. Fees aquired by GSO applicants on a "per satellite" basis. This applicant paid on a "per location" basis. $425,225.00 instead of $850,450.00. Refund $425,225.00 Cef

Return or Refund for the following reason(s):

- [ ] NO FEE REQUIRED (S1.1111a(1))
- [x] INSUFFICIENT FEE - APPLICATION DISMISSED WITHIN 30 DAYS (S1.1111a(2))
- [ ] DOES NOT MEET AGE REQUIREMENT (S1.1111a(3))
- [ ] NEW RULE, LAW OR TREATY (S1.1111a(4))
- [ ] WAIVER (S1.1111a(5))
- [ ] OVERPAYMENT
- [ ] UNTIMELY FILED WINDOW FILING (S1.1111a(6))
- [ ] FIRST COME, FIRST SERVED CONSTRUCTION PERMIT (S1.1111(c))
- [ ] MODIFICATION OF EXISTING/PENDING AUTHORIZATION (S1.1112(a))
- [ ] GOVERNMENT ENTITY (S1.1112(a))
- [ ] NONCOMMERCIAL EDUCATIONAL OR INSTRUCTIONAL SERVICE (S1.1112(cXdXeX1,2,3))
- [ ] INSTRUCTIONAL TV FIXED STATION EXEMPTION (S1.1112(cX4))
- [ ] RESTRICTED RADIOTELEPHONE (S1.1112(eX4,5))

Regulatory Fee:
- [ ] No fee required or excessive fee
- [ ] Overpayment
- [ ] Advance payment subject to S1.1152
- [ ] New rule - license not valid
- [ ] License surrendered (PR services)
- [ ] Section 8 Application declined, return regulatory fee

BUREAU/OFFICE CONTACT: Kathleen Campbell

BUREAU/OFFICE APPROVAL: Cassandra C Thomas

FOR FEE SECTION USE ONLY:

- [ ] Copy returned to Bureau

Date Received: _____

Action Taken: BY: DATE:

* For Refund Overpayment, provide justification in remarks section.

COPY DISTRIBUTION: Original and Part 2 to forwarding office; Part 3 retained by originating office

Form A-462
September 1994

EXHIBIT E

Federal Communications Commission DA 97-2201

PUBLIC NOTICE

FEDERAL COMMUNICATIONS COMMISSION
1919 M STREET N.W.
WASHINGTON, DC 20554

News media Information 202/418-0500 Recorded listing of releases and texts 202/418-2222.

Report No. SPB-105 October 15, 1997

SATELLITE POLICY BRANCH INFORMATION:

Satellite Application Accepted For Filing in the 18.8-19.3/28.6-29.1 and 19.7-20.2/29.5-30 GHz Bands

Cut-off Established for Additional Applications in the 18.8-19.3 and 28.6-29.1 GHz Bands

The Commission has found, upon initial review, that the following application is acceptable for filing in the 18.8-19.3/28.6-29.1 GHz and 19.7-20.2/29.5-30 GHz frequency bands. The Commission reserves the right to return this application if, upon further examination, it is determined that it is defective or not in conformance with the Commission's rules, regulations, and policies.

The Commission emphasizes that neither initial acceptance of this application for filing, nor this Public Notice, should in any way be construed as evidence of any predisposition on the part of the Commission with respect to the international or domestic regulatory changes that must be effected before this application can be granted. We further note that coordination with the National Telecommunications and Information Administration (NTIA), which has primary jurisdiction over U.S. Government use of spectrum, must occur with respect to the proposed bands shared between Government and non-Government uses, prior to any grant of this application.

Motorola Global Communications, Inc. **File No. 79-SAT-P/LA-97(63)**

Motorola Global Communications, Inc. (Motorola) has filed an application for authority to construct, launch, and operate the Celestri Multimedia LEO System, a non-geostationary orbit (NGSO) global satellite system providing FSS in the Ka-band. The Celestri LEO System accounts for one of three Motorola satellite systems geared towards integrating broadband FSS services to various market segments. The other two systems consist of the licensed geostationary orbit (GSO) FSS Millennium system and the proposed NGSO FSS M-Star System.

The proposed Celestri LEO System consists of 63 low-Earth orbit (LEO) satellites rotating in circular orbits at an altitude of 1400 kilometers in seven inclined orbital planes. The proposed service and gateway links include the 18.8-19.3 and 19.7-20.2 GHz bands (space-to-Earth), and the 28.6-29.1 and 29.5-30.0 GHz bands (Earth-to-space). In addition, the tracking, telemetry, and command ("TT&C") high gain links will operate in these frequency bands. The system will employ optical inter-satellite links to interconnect the satellite network in space.

Motorola represents that it can share spectrum with other NGSO and GSO systems through the use of space diversity, whereby sufficient angular separation is maintained between the satellites of separate systems so that their respective earth stations can discriminate between the systems and provide interference-free service. Motorola states that in the 19.7-20.2 GHz and 29.5-30.0 GHz bands, it is not requesting protection from interference caused by, and will not cause unacceptable interference to, any existing or future licensed GSO system operating in these bands in accordance with generally accepted industry standards and Commission rules. Motorola also states that it is not requesting protection from fixed service transmissions of its ubiquitous terminals in the 18.8-19.3 GHz band. Motorola's proposed system will operate multi-beam phased array antennas with fixed beams to provide ubiquitous coverage throughout the satellite footprint. By utilizing single or multiple low power and low cost earth terminals, the Celestri LEO System will provide access to the satellite constellation with equivalent antenna aperture sizes from 0.3 to 1 meter, and will support bit rates from 2.048 to 155.52 Mbps. Motorola plans to operate the Celestri LEO System on a non-common carrier basis.

Comments or petitions regarding this application may be filed on or before **December 1, 1997**. Replies and oppositions may be filed on or before **December 22, 1997**. Responses may be filed on or before **January 6, 1998.**

CUT-OFF ESTABLISHED FOR ADDITIONAL APPLICATIONS

On October 9, 1997, the Commission adopted a Report and Order setting forth service rules for entities proposing to operate Ka-band satellite systems in the Fixed Satellite Service. *See Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Service, Third Report and Order*, FCC 97-378 (adopted October 9, 1997).

This Public Notice establishes a cut-off date for applications to be considered in the 18.8-19.3 GHz and 28.6-29.1 GHz bands.

The Bureau invites new applications to construct, launch and operate U.S.-licensed space stations to provide satellite services in the 18.8-19.3 GHz and 28.6-29.1 GHz bands.

The Bureau invites those entities seeking to operate in the U.S., using non-U.S. licensed space stations in the 18.8-19.3 and 28.6-29.1 GHz bands, to file an earth station application proposing to operate with a non-U.S. licensed space station. Alternatively, these entities may file a letter of intent to provide satellite service in the 18.8-19.3 and 28.6-29.1 GHz bands in accordance with the procedures outlined in the Public Notice released by the Commission on April 16, 1997.[1] We do not intend to require space stations that are licensed by, or are the subjects of license applications to other administrations to obtain a separate (and duplicative) space station license from the United States before serving the U.S. market.

Each new application, or letter of intent must include a concrete, comprehensive proposal for its proposed system, describing in detail all pertinent technical, operational and ownership aspects of the system and its ability to proceed expeditiously with construction and launch. Entities filing earth station applications or letters of intent to use non-U.S. satellites must include in their filings an exhibit containing this information for the space station they seek to access. This should include the information specified in Section 25.114 of the Commission's Rules, 47 C.F.R. § 25.114, as amended by the Commission's Part 25 Streamlining Order,[2] including appropriate information related to any feeder link and telemetry, tracking, and control requirements. However, applicants seeking to use a non-U.S. licensed satellite to serve the United States need not file financial information in cases where the non-U.S. satellite is in-orbit and operating, even if the information is required for that service under our rules. Further, applicants need not file the technical information specified in Sections 25.114(c)(5) through 25.114(c)(12), where international coordination for the non-U.S. licensed satellite has been completed through the International Telecommunication Union ("ITU") and the network has been notified to the ITU, unless the technical characteristics of the proposed system or service differ from the characteristics established in the ITU coordination process.

In order to be considered as part of the processing round, applicants are required to apply for and file corresponding fees for launch and operating authority as set forth in Section 1.1107 of the Commission's rules, 47 C.F.R. § 1.1107. (Construction authority and corresponding fees are no longer required.) Thus, applicants for non-geostationary satellite systems would file the fee listed for "Space Stations (Low Earth Orbit Satellite Systems)" on a per system basis (*see* 47 C.F.R. § 1.1107(10)(b)) and applicants for geostationary satellite systems would file the fee listed for "Space Stations (Geostationary)" on a per satellite basis (*see* 47 C.F.R. § 1.1107(9)(b)(1)). Pursuant to Section 1.1117 of the Commission's rules, 47 C.F.R. § 1.1117, requests for a waiver of the fees will be considered on a case-by-case basis.

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[1] *See* Report No. SPB-80 (released April 16, 1997). These procedures were approved by the Office of Management and Budget, OMB No. 3060-0772 (July 15, 1997)

[2] In the Matter of Streamlining of the Commission's Rules and Regulations for Satellite Application and Licensing Procedures, *Report and Order*, 62 FR 5924 (Feb. 10, 1997) ("Part 25 Streamlining Order").

Entities filing earth station applications to access non-U.S. satellites must file an earth station filing fee. Entities filing letters of intent need not file application fees with their proposals.

Pursuant to Section 25.155 of the Commission's rules, 47 C.F.R. § 25.155, interested parties wishing to file, in the 18.8-19.3 GHz and 28.6-29.1 GHz frequency bands, any of the following items: (1) new U.S. space station applications, (2) earth station applications, or (3) letters of intent to use non-U.S. licensed space stations to be considered in this processing round must do so on or before **December 22, 1997**. Section 25.110(d) requires space station applicants to file an original and nine copies of their submissions. Proposals that fail to provide all required information in their filings or fail to include the appropriate filing fee as of the cut-off date will be dismissed as unacceptable for filing.

Applicants filing by the cut-off date will be afforded an opportunity to amend their applications, if necessary, to conform to any requirements and policies that may be adopted subsequently for space stations concerning the provision of service in these bands.

A copy of this application will be available for public inspection in the International Reference Center, Room 102, 2000 M St. N.W., Washington, D.C. and from ITS Duplicating Services at 202-857-3800. For further information, contact Julie Garcia at 202-418-0763 or Kathleen Campbell at 202-418-0753.

- FCC -

PUBLIC NOTICE

FEDERAL COMMUNICATIONS COMMISSION
1919 M STREET N.W.
WASHINGTON, DC 20554

News media Information 202/418-0500 Recorded listing of releases and texts 202/418-2222.

Report No. SPB-106 **October 15, 1997**

SATELLITE POLICY BRANCH INFORMATION:

Satellite Applications Accepted For Filing in the Ka-band

Cut-off Established for Additional Applications in the 28.35-28.6 GHz, 29.1-30 GHz, 17.7 - 18.8 GHz, and 19.3 - 20.2 GHz Frequency Bands

The Commission has found, upon initial review, that the following applications are acceptable for filing in the 18.35-18.60 GHz, 19.3-20.2 GHz downlink bands and the 28.35-28.6 GHz, 29.1-30.0 GHz uplink bands. The Commission reserves the right to return these applications if, upon further examination, it is determined that they are defective or not in conformance with the Commission's rules, regulations, and policies.

The Commission emphasizes that neither initial acceptance of any of the following individual applications for filing, nor this Public Notice, should in any way be construed as evidence of any predisposition on the part of the Commission with respect to the international or domestic regulatory changes that must be effected before these applications can be granted. We further note that coordination with the National Telecommunications and Information Administration (NTIA), which has primary jurisdiction over U.S. Government use of spectrum, must occur with respect to the proposed bands shared between Government and non-Government use prior to any grant of these applications.

10

Geostationary Satellite-Orbit Systems:

5/6

Motorola Global Communications, Inc. **File Nos. 94 through 98-SAT-P/LA-97**

Q

Motorola Global Communications, Inc. has filed an application for authority to construct, launch, and operate the Celestri GEO system, a network of five satellites in geostationary orbit (GSO) providing FSS service in the Ka-band. Motorola proposes real-time global broadband communication services from the following orbital positions: 139° W.L., 7.5° W.L., 42° E.L., 97° E.L., and 151.5° E.L. The Celestri GEO System, together with the

previously licensed Millenium GSO FSS system, account for one of three Motorola satellite systems geared towards integrating broadband FSS services to various market segments. The other two systems consist of the proposed non-geostationary orbit (NGSO) Celestri LEO system and the proposed NGSO FSS M-Star System.

Motorola requests 750 MHz of spectrum for uplink and downlink transmission in the Ka-band. Specifically, it proposes to operate in the 18.35-18.60 GHz and 19.7-20.2 GHz band (space-to-Earth) and the 28.35-28.6 GHz and 29.5-30.0 GHz bands (Earth-to-space). Motorola also requests 2,000 MHz in the 50-70 GHz range for its inter-satellite links. The spectrum for the service links, which consists of 500 MHz and 250 MHz in each direction, is divided into six frequency sub-bands, with each antenna beam using dual orthogonal polarization. Thus, the system's capacity is multiplied by 9.5 over the particular satellite's coverage area. When employing five satellites, the Celestri GEO System reutilizes the bandwidth five times, which results in a re-use factor of 47.5 and an effective system bandwidth of 35,625 MHz.

The Celestri GEO System will be operating with other Celestri Architecture satellite systems, *i.e.*, Celestri LEO System, Millennium, and M-Star. Motorola asserts the Celestri GEO System will offer broadcast, multicast and other data distribution services at data rates suitable for High Definition Television ("HDTV") and high speed file transfers. Motorola proposes to offer services on a non-common carrier basis.

Feeder Links for Mobile Satellite Service Systems:

The following applicants have requested feeder link spectrum in the Ka-band to operate in conjunction with proposed mobile-satellite service systems in the 2 GHz band.

GlobalStar, L.P. **File Nos. 182 through 186-SAT-P/LA-97**

GlobalStar, L.P. has filed an application to launch and operate a mobile-satellite service system in the 2 GHz frequency band to provide worldwide voice and data communications for mobile, portable and fixed user terminals. GlobalStar requests, among other things, 200 MHz of feeder uplink spectrum in the Ku-band allocation of 15.45-15.65 GHz or in the Ka-band allocation of 19.3-19.6 GHz.

Iridium LLC **File No. 187-SAT-P/LA-97**

Iridium LLC has filed an application to launch and operate the Macrocell system, a low earth orbit mobile satellite system proposed to operate in the 2 GHz frequency bands. Iridium requests, among other things, feeder downlink frequencies in the 19.3-19.7 GHz and feeder uplink frequencies in the 29.1-29.5 GHz bands.

We recognize that, in accordance with the domestic band segmentation plan, the 29.1-29.25 GHz band is shared between NGSO MSS feeder link and local multipoint distribution service operations. Any applications proposing NGSO MSS feeder link operations in the 29.1-29.25 GHz band will need to comply with the special requirements for operations in this band contained in Section 25.257 of the Commission's Rules.

Comments or petitions regarding these applications may be filed on or before **December 1, 1997.** Replies and oppositions may be filed on or before **December 22, 1997.** Responses may be filed on or before **January 6, 1998.**

CUT-OFF ESTABLISHED FOR ADDITIONAL APPLICATIONS

On October 9, 1997, the Commission adopted a Report and Order setting forth service rules for entities proposing to operate Ka-band satellite systems in the Fixed Satellite Service. *See Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Service. Third Report and Order*, FCC 97-378 (adopted October 9, 1997).

This Public Notice establishes a cut-off date for applications to be considered in the 28.35-28.6 GHz, 29.1-30 GHz uplink and 17.7-18.8 GHz, 19.3-20.2 GHz downlink frequency bands.

The Bureau invites new applications to construct, launch and operate U.S.-licensed space stations to provide satellite services in the 28.35-28.6 GHz, 29.1-30 GHz uplink and 17.7-18.8 GHz, 19.3-20.2 GHz downlink frequency bands.

The Bureau invites those entities seeking to operate in the United States using non-U.S. licensed space stations in the 28.35-28.6 GHz, 29.1-30.0 GHz uplink and 17.7-18.8 GHz, 19.3-20.2 GHz downlink frequency bands, to file an earth station application proposing to operate with a non-U.S. licensed space station. Alternatively, these entities may file a letter of intent to provide satellite service in the 28.35-28.6 GHz, 29.1-30.0 GHz uplink and 17.7-18.8 GHz, 19.3-20.2 GHz downlink frequency bands in accordance with the procedures outlined in the Public Notice released by the Commission on April 16, 1997.[1] We do not intend to require space stations that are licensed by or are the subjects of license applications to other administrations to obtain a separate (and duplicative) space station license from the United States before serving the U.S. market.

[1] *See* Report No. SPB-80 (released April 16, 1997). These procedures were approved by the Office of Management and Budget, OMB No. 3060-0772 (July 15, 1997)

Each new application or letter of intent must include a concrete, comprehensive proposal for its proposed system, describing in detail all pertinent technical, operational and ownership aspects of the system and its ability to proceed expeditiously with construction and launch. Entities filing earth station applications or letters of intent to use non-U.S. satellites must include in their filings an exhibit containing this information for the space station they seek to access. This should include the information specified in Section 25.114 of the Commission's Rules, 47 C.F.R. § 25.114, as amended by the Commission's Part 25 Streamlining Order,[2] including appropriate information related to any feeder link and telemetry, tracking, and control requirements. However, applicants seeking to use a non-U.S. licensed satellite to serve the United States need not file financial information in cases where the non-U.S. satellite is in-orbit and operating, even if the information is required for that service under our rules. Further, applicants need not file the technical information specified in Sections 25.114(c)(5) through 25.114(c)(12), where international coordination for the non-U.S. licensed satellite has been completed through the International Telecommunication Union ("ITU") and the network has been notified to the ITU, unless the technical characteristics of the proposed system or service differ from the characteristics established in the ITU coordination process.

In order to be considered as part of the processing round, applicants are required to apply for and file corresponding fees for launch and operating authority as set forth in Section 1.1107 of the Commission's rules, 47 C.F.R. § 1.1107. (Construction authority and corresponding fees are no longer required.) Thus, applicants for non-geostationary satellite systems would file the fee listed for "Space Stations (Low Earth Orbit Satellite Systems)" on a per system basis (*see* 47 C.F.R. § 1.1107(10)(b)) and applicants for geostationary satellite systems would file the fee listed for "Space Stations (Geostationary)" on a per satellite basis (*see* 47 C.F.R. § 1.1107(9)(b)(1)). Pursuant to Section 1.1117 of the Commission's rules, 47 C.F.R. § 1.1117, requests for a waiver of the fees will be considered on a case-by-case basis. Entities filing earth station applications to access non-U.S. satellites must file an earth station filing fee. Entities filing letters of intent need not file application fees with their proposals.

Pursuant to Section 25.155 of the Commission's rules, 47 C.F.R. § 25.155, interested parties wishing to file, in the 18.8-19.3 GHz and 28.6-29.1 GHz frequency bands, any of the following items: (1) amendments to existing U.S. space station applications, (2) new U.S. space station applications, (3) earth station applications, or (4) letters of intent to use non-U.S. licensed space stations to be considered in this processing round must do so on or before **December 22, 1997**. Section 25.110(d) requires space station applicants to file an original and nine copies of their submissions. Proposals that fail to provide all required information in their filings or fail to include the appropriate filing fee as of the cut-off date will be dismissed as unacceptable for filing.

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[2] In the Matter of Streamlining of the Commission's Rules and Regulations for Satellite Application and Licensing Procedures, *Report and Order*, 62 FR 5924 (Feb. 10, 1997) ("Part 25 Streamlining Order").

Applicants filing by the cut-off date will be afforded an opportunity to amend their applications, if necessary, to conform to any requirements and policies that may be adopted subsequently for space stations concerning the provision of service in these bands.

Additionally, the following parties filed applications to operate in Ka-band frequencies that are not in conformance with the domestic band segmentation plan[3] and the 28 GHz Service Rules released today (*See* In the Matter of Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Service, *Third Report and Order*, FCC No. 97-378, released October 15, 1997): CAI Data Systems, Inc., Orion Asia Pacific Corporation, Orion Atlantic, L.P., PanAmSat Licensee Corporation, and CelSat America, Inc. These applicants have until **December 22, 1997**, the cut-off date for additional applications in this processing round, to submit conforming amendments to their applications.

A copy of these applications will be available for public inspection in the International Reference Center, Room 102, 2000 M St. N.W., Washington, D.C. and from ITS duplicating Services at 202-857-3800. For further information, contact Julie Garcia at 202-418-0763 or Kathleen Campbell at 202-418-0753.

- FCC -

[3] In the Matter of Rulemaking to Amend Parts 1, 2, 21, and 25 of the Commission's Rules to Redesignate the 27.5-29.5 GHz Frequency Band, to Reallocate the 29.5-30.0 GHz Frequency Band, to Establish Rules and Policies for Local Multipoint Distribution Service and for Fixed Satellite Services, *First Report and Order and Fourth Notice of Proposed Rulemaking*, adopted July 17, 1996.

EXHIBIT F

File

FEDERAL COMMUNICATIONS COMMISSION
Washington, D. C. 20554

February 26, 1997

OFFICE OF
MANAGING DIRECTOR

Norman P. Leventhal, Esquire
David S. Keir, Esquire
Leventhal, Senter & Lerman
Suite 600 - 2000 K Street, N. W.
Washington, D.C. 20006-1809

Re: Fee Control # 9612188160147001

Dear Messrs. Leventhal and Keir:

This will respond to your request filed on behalf of Grupo Televisa, S.A. ("Televisa") for a determination of the appropriate fee to be charged by the Commission in connection with its application to deploy "up to one million technically identical receive-only earth stations as part of a planned direct-to-home ("DTH") satellite service."

Televisa represents that the Commission's licensing rules do not expressly authorize the filing of a blanket license application for such multiple technically identical receive-only earth stations, nor does the Commission's fee schedule specify a corresponding fee category. Rather, the Commission's licensing rules and fee schedule are based on a single earth station application, the applicable fee being $280 per application. see 47 C.F.R. §§ 25.110, 25.115, 25.131, 1.1107(5)(a)(ii). Televisa maintains that the filing of a million technically identical applications would be "absurdly burdensome, require reams of documents containing duplicative information" and necessitate "an astronomical aggregate filing fee of $280,000,000.00." Televisa thus requests a waiver of the Commission's fee requirements and a determination of the appropriate filing fee for its proposal to deploy approximately one million technically identical receive-only DTH stations.

The purpose of the Commission's fee program is to enable the Commission "to assess and collect charges for certain of the regulatory services it provides to the public. The charges are based primarily on the Commission's costs of providing these regulatory services." See Establishment of a Fee Collection Program to Implement the Provisions of the Consolidated Omnibus Budget Reconciliation Act of 1985, 2 FCC Rcd 947, 948 (1987). We agree with Televisa that a literal interpretation and application of the Commission's rules, here, would result in the imposition of a $280,000,000.00 fee requirement, which would bear scant, if any, relation to the Commission's cost of processing Televisa's application. Moreover, as Televisa points out, the Commission has expressly contemplated the issuance of blanket authorizations for the operation of such multiple technically identical receive-only earth stations, in conjunction with an application fee "associated with a blanket earth station." See Amendment of the Commission's Regulatory Policies to Allow Non-U.S.-Licensed Space Stations to Provide Domestic and International Satellite Service in the United States, IB Docket 96-111 (Released May 14, 1996)(¶80).

The Commission may waive filing fees upon a showing of good cause and a finding that the public interest will be served thereby. See Establishment of a Fee Collection Program to Implement the Provisions of the Consolidated Omnibus Budget Reconciliation Act of 1985, 2 FCC Rcd at 961; see also 47 C.F.R. §1.1117. We find that the circumstances presented here warrant the waiver of the $280,000,000.00 fee requirement for individual stations and the imposition of a fee for a blanket authorization. Specifically, we find that the requested waiver will minimize the regulatory burdens on Televisa, expedite processing Televisa's application, and, more importantly, enable the prompt initiation of service by Televisa, during the pendency of the Commission's IB Docket 96-111 proceeding, as well as the Commission's preparation of a congressional proposal to specifically amend the fee schedule in this regard if the Commission decides to adopt a blanket authorization policy for receive-only earth stations in the DTH satellite service.

With respect to the appropriate fee to be charged, we find that the regulatory costs involved in processing Televisa's application will be similar to, if not the same as, blanket authorizations for Fixed Satellite Very Small Aperture Terminal (VSAT) Systems and Mobile Earth Satellite Stations, for which the Commission's fee schedule specifies a $6,840.00 charge. See 47 C.F.R. §1.1107(6)(a), 7(a). As with blanket authorizations for VSATs and Mobile Earth Stations, the Commission staff will expend less resources and will be able to more efficiently process Televisa's application because the multiple earth stations will be technically identical. We thus find that the imposition of a $6,840.00 fee is appropriate for processing Televisa's proposed deployment of multiple technically identical DTH earth stations. If, in the future, Congress specifies a fee for blanket receive-only DTH stations, and that fee is greater than the $6,840.00 charge, we will require Televisa to pay the balance. Of course, if Congress should specifiy a fee that is less than the $6,840.00 charge, Televisa will be entitled to a partial refund.

Accordingly, under the authority delegated to the Managing Director by section 0.231(a) of the Commission's rules, the filing fee requirement for Televisa's proposed deployment of multiple technically identical receive-only earth stations is waived, and the appropriate filing fee is determined to be $6,840.00. Televisa will be required to remit the $6,560.00 balance within thirty (30) days of the date of this letter. If you have any questions concerning this matter, please contact the Chief, Fee Section, at (202) 418-1995.

Sincerely,

Marilyn McDermett

Marilyn McDermett
Associate Managing Director
for Operations

Holly

961218816014700/

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December 16, 1996

BY HAND DELIVERY

Ms. Marilyn J. McDermett
Associate Managing Director - Operations
Federal Communications Commission
1919 M Street, N.W., Room 848
Washington, D.C. 20554

RE: Request for Fee Determination/Deferral Concerning Application for Blanket License to Deploy 1,000,000 Receive-Only Earth Stations

Dear Ms. McDermett:

This letter is submitted on behalf of Grupo Televisa, S.A. ("Televisa") in conjunction with its application for a blanket authorization to deploy up to one million technically identical receive-only Earth stations as part of a planned direct-to-home ("DTH") satellite service. Televisa's application has been filed on FCC Form 493, and is accompanied by a check payable to the FCC in the amount of $280, the fee specified for a receive-only Earth station application.

At present, the FCC's rules do not expressly authorize the filing of a blanket license application for multiple identical receive-only Earth stations, and there is no specific fee category applicable to such applications other than the existing receive-only category for individual facilities. Nonetheless, the Commission expressed in May 1996, in its "DISCO II" Notice of Proposed Rule Making, its intention to allow applicants "to request blanket authority to operate multiple technically identical receive-only Earth stations in a particular service" and to "pay application fees associated with a blanket Earth station license." Amendment of the Commission's Regulatory Policies to Allow Non-U.S.-Licensed Space Stations to Provide

Domestic and International Satellite Service in the United States, FCC 96-210, slip op. at 27 (¶ 80) (released May 14, 1996). In doing so, the Commission specifically cited the need to reduce unnecessary regulatory burdens on service providers, such as DTH services, that might require millions of receivers. Id. More recently, the United States and Mexico entered into a protocol concerning DTH satellite services which makes specific reference to blanket licensing for receive-only Earth stations. See "Protocol Concerning the Transmission and Reception of Signals from Satellites for the Provision of Direct-to-Home Satellite Services in the United States of America and the United Mexican States" at Art. V, ¶ 1 ("U.S.-Mexico DTH Protocol"). Accordingly, while both the DISCO II NPRM and the U.S.-Mexico DTH Protocol specifically anticipate the filing of blanket receive-only Earth station applications for DTH service, the FCC's fee processing rules have not yet been modified to reflect this policy.

In the absence of a new rule, Televisa has necessarily been compelled to choose the most reasonable and appropriate application vehicle for submission of its request for authorization. As the Commission alluded in the DISCO II NPRM, filing a separate application for each receive-only DTH Earth station would be absurdly burdensome, requiring reams of documents containing duplicative information and an astronomical aggregate filing fee of $280,000,000. In contrast, it is expected that blanket receive-only Earth station applications will simply be submitted on a single Form 493 with additional information included to reflect the blanket nature of the authorization request. For this reason, Televisa has filed its application in this manner along with the currently applicable fee for a single receive-only application.

Televisa expects, of course, that the Commission will ultimately adopt a separate, higher fee for blanket receive-only Earth station applications. For example, the current fee for filing an application for blanket authorization of mobile-satellite Earth stations ("MES") is $6,840, the same fee applicable to very small aperture terminal satellite ("VSAT") networks. Given these existing fees, Televisa believes there is a high probability that the Commission will ultimately adopt the same $6,840 fee for blanket receive-only Earth station applications. At this time, however, there is no such fee category established, and the only way to file an acceptable application is to submit it with the $280 fee currently applicable for a single receive-only application, as Televisa has done.

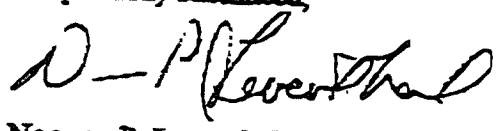
Because Televisa expects that the type of application it is filing today will ultimately be subject to a higher fee, it is hereby requesting a determination by the Managing Director's Office that its application is acceptable as filed under the current fee rules, and that the application may be processed by the International Bureau prior to the determination of the appropriate fee to be paid by applicants for blanket receive-only Earth station authorizations.

Televisa further requests that it be permitted to submit any remaining fees ultimately required for blanket receive-only Earth station authorizations upon notification by the Commission that a fee for such applications has been formally established. (For example, should the Commission determine that the fee of $6,840 applicable to blanket MES and VSAT applicants is also appropriate for blanket receive-only applicants, then Televisa would be billed for the balance of $6,560 at that time.)

Accordingly, Televisa respectfully requests that the Managing Director's Office determine that Televisa's blanket receive-only Earth station application is acceptable for filing based upon its initial payment of $280 and, further, that any obligation of Televisa to pay additional fees that may ultimately be required be deferred until such fees have been formally adopted by the Commission.

Should there be any questions concerning this request, please contact the undersigned counsel.

Respectfully submitted,



Norman P. Leventhal
David S. Keir
Attorneys for Grupo Televisa, S.A.

cc: Tom Tycz
Josiyn Read
Fern Jarmulnek
Steve Sharkey
Suzanne Hutchings
H. Frank Peace

4.2. SCHEDULE OF COSTS

A schedule of costs is given in Table 4-2 for the space segment and its associated ground segment. The cost of Pegasus I through the first year of operation is $1,953 M.

TABLE 4-2 Schedule of System Costs.

(Per satellite)	
Satellite Cost, $M	80
Launcher Cost, $M	70
Insurance, $M	27
Launching Cost, $M	3
Launched Cost, $M	180
Launched Cost for Constellation	1,800
NCC/SCC, U.S., $M	50
TT&C, U.S., $M	1
Earth Station Development	
Gateway ES, $M	10
Subscriber ES, $M	12
Pre-operational Expenses, $M	30
Operational Expenses, 1 Yr., $M	50
Total Cost, Through First Year of Operations, $M	1,953

4.3. SYSTEM FINANCING

Pegasus believes that it is financially qualified to construct and operate the proposed domestic fixed satellite system. Should the Commission conclude, however, that Pegasus does not satisfy the financial requirements of 25.140(b)-(e), Pegasus asks the Commission to grant Pegasus a waiver of this requirement pursuant to Section 1.3 of the Commission's rules. A waiver would be consistent with both Commission precedent and the public interest goal of encouraging new entrants into the satellite communications industry.