September 17, 2003

Reference:
File No SES-MOD 20030506-00598
Call Sign: E980235

Ms. Sylvia T. Lam
Engineer, System Analysis Branch
Satellite Division
International Bureau
Federal Communications Commission
Washington, D.C. 20554

SUBJECT: Application of Stratos Offshore Service Company to change assigned frequency and add Eutelsat Atlantic Bird 2 satellite located at 8 degrees W.L.

Dear Ms. Lam:

In response to your conversation yesterday with my staff member Sue Gibbs, please find attached the additional information submitted as an amendment to the original application, requested in your letter of July 25th. Upon receipt of this letter with attachments you should have all information necessary to complete the subject application.

I wish to thank you for your patience in working with us during this process and look forward to working with you again on future projects.

Should you have any questions, please feel free to contact me at 504-323-2602.

Sincerely

Sheryl W. Scobel

Sheryl W. Scobel
Regulatory Manager

Attachments:
1. Radiation Hazard Study
2. 24-Hour Point of Contact
3. Signed Certification
4. Comsearch Analysis and Calculations Report

Attachment 1

Radiation Hazard Assessment

Of A

6.1 m Ku Band Antenna System

In accordance with FCC OET Bulletin #65 as annotated and amended.

Down to Earth Solutions
to Real World Problems
Practical Technology, LLC
1122 Post Rd. Carencro, LA 70520
(337) 896-9798

General

This document is based on information contained in the Federal Communications Commission Office of Engineering Technology Bulletin 65.

I certify that I have read and am familiar with that document.

Background

This report is based on the generic calculation for a circular parabolic antenna.

These calculations contemplate uniform illumination of the reflector with 100 watts of power at the feed point of the antenna.

Summary Of The Results

The analysis shows that there is potential hazard to the general public under certain circumstances as shown below:

> The analysis shows that the power density levels will exceed the FCC MPE limit during periods of maximum output, near the reflector surface, between feed and reflector.

This antenna will be mounted inside a 2 meter tall chain link fence. This location is inaccessible to the general population.

The analysis shows that there is potential hazard to the occupational user under certain circumstances.

> The analysis shows that the power density levels will exceed the FCC MPE limit during periods of maximum output between feed and reflector.

The area between the feed and the reflector has field intensity greater that the limit for any population. The earth station transmitter will be turned off whenever maintenance and repair personnel are required to work within this potentially hazardous area.

Description Of Terms

1. Near Field Region:

The near field (or Fresnel) region is essentially a cylindrical region with its axis co-inclined with the antenna boresight. The diameter of this cylinder is equal to that of the antenna. According to the OET Bulletin No. 65, its length is equal to

2. Far Field Region:
The far field (or Fraunhofer region) extends outward from a distance equal to 0.6 times the square of the reflector diameter divided by the wavelength, according to OET Bulletin No. 65. Power density varies inversely as the square of the distance.

3 Transition Region:
The transition region between the near field and the far field regions will have a power density that essentially decreases inversely as the distance. In any case, the maximum power density is calculated using the equation given in the Bulletin

4 Region Near The Reflector Surface:
The power density in the region near the reflector surface can be estimated as equal to four times the power divided by the area of the reflector surface, assuming illumination is uniform and that it would be possible to intercept equal amounts of energy in both directions.

5. Region Between Reflector And Ground:
The power density in the region between the reflector and ground can be estimated as equal to the power divided by the area of the reflector surface, assuming uniform illumination over the reflector.

6. Region Between The Feed Mouth and the Reflector:
The radiation from the feed is essentially confined to a conical region whose vertex is located at the feed mouth and extends to the reflector. Power density is maximum at the feed mouth, and can be estimated as four times the power divided by the area.

<u>Data</u>

The calculations are given in the next pages.

	General Population		
Nomenclature	**Formula**	**Value**	**Unit**
Input Paramters			
D=antenna Diameter		6.1	Meters
d=diameter of feed mouth		0.152	Meters
P=max Power input to antenna		100	Watts
n=aperature efficiency		70.00%	Percent
f = Frequency		14	GHz
FCC MPE Limit		10.00 1.00	W/m^2 mW/cm^2
Calculated Values			
k = wavelength @ 14 GHz	.3 / f	0.0214	Meters
A = Area of reflector	$(pi * (D/2)^2$	29.225	$Meters^2$
I = Length of near field	$(D/2)^2 /k$	434	Meters
L = beginning of far field	$.6 * D^{\wedge 2} /k$	1042	Meters
G=Antenna gain	$n\ pi(D/k)^2$	559,816	times
Decibel Gain	$10 \log_{(10)} {}^{P1}/_{P2}$	57.48	dBi
a=area of feed mouth	pi*(d/2)^2	0.02	$Meters^2$
Power Density Calculations			
Region	**Maximum Power Density in Region** Formula	Value (W/m^2)	**Hazard Assessment** (based on FCC limit)
1 Near Field	4nP/A	9.58	< FCC MPE Limit
2 Far Field	$GP/(4(pi)L^2)$	4.10	< FCC MPE Limit
3 Transition	greater of near or far	9.58	< FCC MPE Limit
4 Near Reflector Surface	4 P/A	13.69	Potential Hazard
5 Between Reflector and Ground	P/A	3.42	< FCC MPE Limit
6 Between Feed and Reflectors	4 P/a	22,044.27	Potential Hazard

Occupational exposure			
Nomenclature	**Formula**	**Value**	**Unit**
Input Paramters			
D=antenna Diameter		6.1	Meters
d=diameter of feed mouth		0.152	Meters
P=max Power input to antenna		100	Watts
n=aperature efficiency		70.00%	Percent
f = Frequency		14	GHz
FCC MPE Limit		50.00 5.00	W/m^2 mW/cm^2
Calculated Values			
k = wavelength @ 14 GHz	.3 / f	0.0214	Meters
A = Area of reflector	$(pi * (D/2)^2$	29.225	$Meters^2$
I = Length of near field	$(D/2)^2 /k$	434	Meters
L = beginning of far field	$.6 * D\text{^}^2 /k$	1042	Meters
G=Antenna gain	$n\ pi(D/k)^2$	559,816	times
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1 Near Field	4nP/A	9.58	< FCC MPE Limit
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3 Transition	greater of near or far	9.58	< FCC MPE Limit
4 Near Reflector Surface	4 P/A	13.69	< FCC MPE Limit
5 Between Reflector and Ground	P/A	3.42	< FCC MPE Limit
6 Between Feed and Reflectors	4 P/a	22,044.27	Potential Hazard

Attachment 2

July 25, 2003

Sylvia Lam
International Bureau Satellite and Radio Communication Division
445 12th St. S.W.
Washington, D.C. 20554

Dear Ms. Lam:

As requested, please use the following name and contact information for our 24-hour support:

Mr. David Heximer
337-258-2559

Emergency Alternate:
Mr. Jim Soileau
337-258-2521

Sincerely,

Sheryl W. Scobel

Sheryl W. Scobel
Manager – Interconnect & Regulatory Affairs

Attachment 3

This is to certify operations between Stratos Offshore Service Company's proposed 6.1 meter earth station in Scott, LA and the PANAMSAT1R @ 45 WL, PAS 8B@43 WL, and GE-3@ 87 WL in the 13.75 – 14 GHz band are in accordance with Section 25.204(f) and footnote US357 to Section 2.106 of the Commission's Rules. In particular, the E.I.R.P. density of emission from the proposed 6.1 meter earth station operating with the PANAMSAT1R, PAS 8B, and GE-3 satellites does not exceed 71 dBW in any 6 MHz from 13.77 to 13.78 GHz.

Sheryl W. Scobel 9-17-03

Sheryl W. Scobel Manager Regulatory September 17, 2003

Exhibit For
Scott, LA Earth Stations
Compliance with FCC Report & Order (FCC96-377) for the 13.75 - 14.0 GHz Band
Analysis and Calculations
9/15/03

1. Background

This Exhibit is presented to demonstrate the extent to which the Stratos Offshore Services Company satellite earth station planned for Scott, Louisiana is in compliance with FCC REPORT & ORDER 96-377. The potential interference from the earth station to US Navy shipboard radiolocation operations (RADAR) and the NASA space research activities in the 13.75 - 14.0 GHz Band is addressed in this exhibit. The parameters for the earth station are:

Table 1. Earth Station Characteristics

- Coordinates : 30° 14' 36.7'' N, 92° 03' 06.4'' W (NAD83)
- Satellite Location for Earth Station: PAS 3R @ 43° W.L., PAS 1R @ 45° W.L., AMC-3 @ 87° W.L.
- Frequency Band: 13.75-14.5 GHz for uplink; 11.7-12.2 GHz for downlink
- Polarizations: Circular Feed, L
- Modulation: Digital Data, 100 kHz, 200 kHz, 1.4 MHz, 2.4 MHz, 2.8 MHz, 4.9 MHz
- Maximum Required Uplink EIRP: 68 dBW/Carrier or 68 dBW /10 MHz
- Transmit Antenna Characteristics
  - Antenna Size: 6.1 meter
  - Antenna Type/Model: TriPoint Global
  - Transmit Gain: 56.9 dBi
- RF power into Antenna Flange: 11.1 dBW or 11.1 dBW/10 MHz (Maximum)
- Elevation Angle:
  - Earth Station Scott, LA: 26.7° toward the PAS-3R (43° W.L.); 54.3° toward the AMC-3 (87° W.L.)
- Azimuth Angle (Ref North):
  - Earth Station Scott, LA: 113.6° for PAS-3R; 170.0° for AMC-3
- Side Lobe Antenna Gain: $32- 25*\log(\theta)$

Because the above spectrum is shared with the Federal Government, coordination in this band require resolution data pertaining to potential interference between the earth stations and both Navy Department and NASA systems. Potential interference from the earth station could impact with the Navy and/or NASA systems in five areas. These areas are noted in FCC Report and Order 96-377 dated September 1996, and consist of (1) Radiolocation and radio navigation, (2) Data Relay Satellites, (3) Precipitation Radar, (4) Altimeters, and (5) Scatterometers.

Summary of Coordination Issues:

1) Potential Impact to Government Radiolocation (Shipboard Radar)
2) Potential Impact to NASA Data Relay Satellite Systems (TDRSS)
3) Potential Impact to NASA/NASDA Operations (Precipitation Radar)
4) Potential Impact to NASA Operations (Altimeters)
5) Potential Impact to NASA Operations (Scatterometers)

2. Potential Impact to Government Radiolocation (Shipboard Radar)

Radiolocation operations (RADAR) may occur anywhere in the 13.4 - 14 GHz frequency band aboard ocean going United States Navy ships. The Federal Communication Commission (FCC) order 96-377 allocates the top 250 MHz of this 600 MHz band to the Fixed Satellite Service (FSS) on a co-primary basis with the radiolocation operations and provides for an interference protection level of -115 $dBW/m^2/10$ MHz based upon WRC-2003.

The closest distance to the shoreline from the Scott, Louisiana earth station is approximately 30 miles North of the Gulf of Mexico near Vermilion Bay. The calculation of the power spectral density at this distance is given in the next two subsections.

The RADAR characteristics used for the calculations are presented in Table 2.

Table 2. RADAR Characteristics

Transmitter Parameters

Transmit Power*	250 kWatts
Frequency Range	13.4-14.0 GHz

Spectral Density Transmitted at the Tuned Frequency

Pulse Width**	0.5 µs	25.8 dBW/4kHz
Pulse Width**	1.0 µs	28.8 dBW/4kHz
Pulse Width**	2.0 µs	31.8 dBW/4kHz
Pulse Rate**		1200 pulses per second
Emission Characteristics		$\sin(\theta)/\theta$ Roll-Off
Mode of Operation		Pulse Doppler Detection

Antenna Parameters

Shape*	Circular and Parabolic
Physical Size*	1.5 m^2
Antenna Gain at 14 GHz*	44.3 dB
Antenna Motion*	360° Rotation in Detection Mode Track Mode after Target lock-on and Weapon-on
Effective Area of Antenna	
Main Beam*	1.0 m^2
Side Lobe Gain	-10.0 dB
Antenna height	51 feet

Receiver Parameters

Noise Figure*	8 dB
Doppler Filter for Mach 1	31 kHz
Interference Criteria	-115 dB (W/m^2/10 MHz)

The earth station's power flux density was calculated at the azimuth of the Pas 3R Satellite at 113.6 degrees azimuth. The signal density at this point on the shoreline, considering over-the-horizon loss is:

PFD = Antenna Feed Power density (dBW/10 MHz) + Antenna Off-Axis Gain (dBi) – Spread Loss (dBW-m^2).

= 11.1 dBw/10 MHz - 4 dBi – 10*log[4Π*(48,460m)^2]

= -97.6 dBW/m^2/10 MHz + Additional Path Losses (29 dB)

= -126.6 dBW/m^2/10 MHz

Our calculations show additional path loss of 29 dB at 1% controlling to the coastline for this earth station. See profile data attached in Annex 1.

These levels are in compliance with the new interference criteria requirements of -115 dBW/m^2/10 MHz.

3. Potential Impact to NASA's Data Relay Satellite System (TDRSS)

The geographic location of the Stratos Offshore Services Company earth station in Scot, Louisiana is outside the 390-km radius coordination contour surrounding NASA's White Sands, New Mexico ground station complex. Therefore, the TDRSS space-to-earth link will not be impacted by the Stratos Offshore Services Company earth station in Scott, LA. The TDRSS space-to-space link in the 13.772 to 13.778 GHz band is assumed to be protected if an earth station produces an EIRP less than 71 dBW/6 MHz in this band. The 6.1-meter earth station dish will have an EIRP smaller than 71 dBW in this band. The earth station will uplink no more than 68 dBW EIRP total, therefore, there will be no interference to the TDRSS space-to-space link.

The Scott, Louisiana earth station can be tuned to operate at the frequencies in the 13.772 to 13.778 GHz Band.

4. Potential Impact to NASA/NASDA Operations (Precipitation Radar)

The Tropical Rain Measuring Mission (TRMM) Precipitation Radar (PR) operates at two frequencies 13793 and 13805 MHz with a bandwidth of 600 kHz at each frequency. The FCC Report and Order 96-377 grants NASA protection to the spacecraft borne sensors like those used for the TRMM in the 13.75 to 14.0 GHz band until January 1, 2001. The 6.1-meter antenna system will have an EIRP of 68 dBW/100 kHz or 68 dBW/600 kHz.

The ITU-R SA. 1071 states that the recommended threshold of interference at the two TRMM frequencies is -150 dBW. The geographic location of the Stratos Offshore Services Company earth station antenna is outside the TRMM PR ground truth exclusion zones described in ITU-R SA. 1071. For the earth station antenna location, the antenna coupling to the space borne antennas can be earth station sidelobe to TRMM PR sidelobe, and earth station side lobe to TRMM PR main beam. The coupling to the TRMM PR main beam is the worst case, therefore, it will be the one calculated. The calculation will be made for an overhead pass of the TRMM PR satellite having a ±17° cross-track scan. The calculation will be made for scan angles of 0°, 8.5°, and 17°.

Table 2. Calculation Parameters for TRMM PR

The parameters for the calculation are:

TRMM Range @0° Scan Angle:	350 km
TRMM Range @8.5° Scan Angle:	354 km
TRMM Range @ 17° Scan Angle:	366 km
TRMM Antenna Gain:	47.7dBi
Earth Station Elevation Angle:	26.7° (worst case)
6.1-meter Antenna Gain:	56.9 dBi
Earth Station Side Lobe Antenna Gain:	32 - 25*log(θ)or, ≥ -10 dB Where θ is the angle between the Earth Station antenna and the TRMM antenna.
EIRP spectral density for Antenna :	68 dBW
Transmit Power	11.1 dBW/ 100 kHz or 11.1 dBW/600 kHz
FSL @ 350 km	166.2 dB
FSL @ 354 km	166.3 dB
FSL @ 366 km	166.6 dB

Table 3. TRMM PR Calculated Results

6.1-meter Antenna Transmit Power = 11.1 dBW/600 kHz
Calculations at Antenna Elevations 26.7°

Scan Angle	ES Antenna Gain	TRMM Gain	FSL	Power Received	Margin
0°	-10 dBi	47.7 dBi	166.2 dB	-117.4 dBW	- 32.6 dB
8.5°	-10 dBi	47.7 dBi	166.3 dB	-117.5 dBW	- 32.5 dB
17.0°	-9.6 dBi	47.7 dBi	166.6 dB	- 117.4 dBW	- 32.6 dB

From the calculated results the earth station will not meet the interference criteria for an EIRP of 68 dBW/100 kHz. Since, the NASA TRMM PR was protected only until January 1, 2001, this earth station can operate in this band. However, the government should be aware that the earth station at Scott, Louisiana could cause interference into the frequencies of the TRMM PR.

Even though the earth station at Scott, Louisiana is within ± 55° latitude, and the elevation angle is 26.7° which is below the maximum of 71° recommended in the ITU-R SA.1071, the levels calculated indicate there will be an interference conflict at the operational frequencies of the TRMM PR.

5. Potential Impact to Altimeter Operations

There are two families of airborne radar altimeters operating in the 13.75 - 14.0 GHz band that are of concern with respect to interference from earth stations. They are the TOPEX-POSEIDON and the ERS-1/2. These radar altimeters are downward looking pulsed-radar installed on orbiting spacecraft. These systems are used to very precisely measure range from the satellite to the surface of the earth. In addition to the operational radar in this band, a number of other systems are planned in the future. The parameters for the operational radar in this band are listed below.

Table 4. Altimeter Interference Criteria

Radar System	Frequency of Operation	Interference Criteria
TOPEX-POSEIDON (1)	13.60 GHZ ± 160 MHz	- 117 dBW/320 MHz
TOPEX-POSEIDON (2)	13.65 GHz ± 160 MHz	- 130 dBW/320 MHz
ERS -1/2	13.77 GHz ± 165 MHz	- 120 dBW/330 MHz

The orbiting spacecraft, with the radar altimeter, is assumed to be at an altitude of 800 km. The slant range from earth station to the spacecraft is 1780.5 km at the elevation 26.7° when the earth station main beam illuminates the spacecraft. This is the worst case alignment of the earth station antenna and the spacecraft radar antenna. It will occur when the spacecraft travels through the main beam circle formed by the earth station antenna. The time it takes the spacecraft to travel through this circle in space is a function of the 20-dB beam width of the earth station antenna (the 20-dB beam-width is used according to ITU Appendix S7 calculation methods) and the speed of the spacecraft. The spacecraft is traveling at 6.5 km/sec and the 20-dB beam width of the 6.1-meter antenna is estimated to be 0.52°. The diameter of the circle in space formed by the 6.1-meter antenna is 16.1 km at a range of 1780.5 km. The spacecraft will pass through the beam-width of the earth station's antenna at the elevation 26.7° in approximately 2.5 seconds. During this time, there may be a small blip of noise introduced into the radar display but it would be so transitory it may go unnoticed.

The availability requirement for the NASA altimeter data is 95%, which assumes that the associated individual outages are brief and randomly dispersed over all observation times and areas. If the outage were due to only one earth station the 95% availability would not be a problem. However, the outage caused by the earth station and other causes such as intense rainfall must be accounted for in determining the net availability of the system. Because the earth station interference will occur in a predictable manner for a given area it cannot be considered random. However, because of its predictability and relatively short time duration, it should have very little impact on the operation of present radar systems, and processing circuits and/or procedures can be designed in future systems to minimize the effect of the interference from single or multiple earth stations.

In order to calculate the interference level to the altimeter radar, we will assume that the side lobe gain toward the earth station antenna is -10 dB. Since the earth stations signal is narrow band compared to the RADAR bandwidth, the signals will be totally captured by the radar receiver. The following parameters are used in the calculation:

FSL for Antenna @ elevation 26.7°:	180.4 dB
Atmospheric Absorption:	1.2 dB
EIRP 6.1-meter Antenna:	68 dBW

Table 5. Altimeter Calculated Results

Earth Station for 68 dBW @ Elevation 26.7°

Radar Receiver	**Interference Level**	**Margin**
TOPEX-POSEIDON (1)	- 123.6 dBW	+ 6.6 dB
TOPEX-POSEIDON (2)	- 123.6 dBW	- 6.4 dB
ERS-1/2	- 123.6 dBW	+ 3.6 dB

The comparison of these levels to the interference criteria indicates that there will be interference coupled to the TOPEX (2) altimeter. However, if the Scott, Louisiana earth station generates some interference to the altimeters, the net result will not prevent the 95 % availability of the RADAR data. For example, if the earth station interfere with a satellite altimeter at the elevation angle 26.7°, a very unlikely condition, the total outage time would be 2.5 seconds. This would occur in a period of two hours which would mean the earth station would reduce the availability of the altimeter data by 0.035% which would still allow for a data availability of over 99.96% versus the required 95%. This would be the extreme worst case since the probability of the satellite passing through the main beam of the earth station antenna in the same orbit is very unlikely.

The Scott, Louisiana site of the earth station places them outside the TOPEX-POSEIDON critical exclusion zone as defined in the ITU-R Recommendation SA. 1071. The operational elevation look angles for the proposed earth station is 26.7° (PAS-3R), 28.4° (PAR-1R), and 54.3° (GE-3). These elevation angles are below the 71°-elevation angle limitation required until January 1, 2001 in ITU-R Recommendation SA-1071.

6. Potential Impact to NASA Scatterometer Operations

Scatterometers are spacecraft borne RADAR type devices that measure the near surface vector winds over the ocean. Wind data over the oceans is considered a critical parameter in the determination of weather patterns and global climate. The overall availability requirement of the scatterometer system is similar to the altimeter radar. That is, some data loss is tolerable when interference signals exceed interference thresholds. The scatterometers can lose 1% of the ocean data from interference occurring systematically or 5% when the interference is occurring randomly. The scatterometers operate at a center frequency of 13995 MHz ± 1.44 MHz. There are two types of antenna modes of operation, fan beam and spot beam. For fan beam the aggregate interference threshold is - 174 dBW/2 kHz, for spot beam - 155 dBW/10 kHz. ITU-R SA. 1071 Recommendation states that to protect scatterometers using fan beams from unacceptable interference until 1 January 2001, FSS earth stations should not exceed an EIRP density toward the scatterometer orbit over the oceans of 25 dBW in any 2 kHz band between 13.99356 GHz and 13.99644 GHz. The Stratos Offshore Services Company earth station at Scott, Louisiana could produce an EIRP greater than 25 dBW in the scatterometer frequency band. The government should be aware that there might be interference to the scatterometer system. However, since the protection date of January 1, 2001 has passed, the Scott, Louisiana earth station can be tuned to operate at the frequencies in the scatterometer band.

7. Coordination Issue Result Summary and Conclusions

The results of the analysis and calculations performed in this exhibit indicate that compatible operation between the earth station at the Scott, Louisiana earth station and the US Navy and NASA systems is possible if certain operational precautions are taken. These precautions involve avoidance of certain frequency ranges by the earth station so that interference will not occur to NASA operations. Table 6 provides the frequency ranges to be avoided.

Table 6

Frequency Range where Potential Interference Could Occur

System	Frequency Range (MHz)
TRMM PR	13,792.7 - 13,793.3
TRMM PR	13,804.7 - 13,805.7
Scatterometer	13,993.56 - 13,996.44

Since the protection date has passed for these frequency ranges these frequencies will not be excluded from the earth station's operation.

No interference to NASA's Data Relay Satellite Systems (TDRSS) operations from the Scott, Louisiana site. The 6.1-meter antenna at Scott, LA can be tuned to the frequencies in the 13.772 to 13.778 GHz Band.

The NASA altimeter data availability requirement of 95 % will not be degraded by the Scott, Louisiana earth station operations.

No interference to US Navy RADAR operations from the Scott, Louisiana site earth station will occur.

Annex 1 – OH Loss to Shoreline Calculations

Pathloss Calculation

```
    Path data for case # 1      SCOTT LA               COAST 1
    Latitude                     30  14 36.7             29  49  1.0
    Longitude                    92   3  6.4             91  56 31.4
    Antenna Center Agl .....   12.01 ft.     3.66 m.     50.86 ft.    15.50 m.
    Site Elevation Amsl ....   37.01 ft.    11.28 m.      0.00 ft.     0.00 m.
    Antenna Center Amsl ....   49.02 ft.    14.94 m.     50.86 ft.    15.50 m.
    Effective Antenna Ht ...   20.20 ft.     6.16 m.     50.86 ft.    15.50 m.
    Horizon Distance .......    6.84 mi.    11.00 km.    12.49 mi.    20.10 km.
    Horizon Elevation Amsl .   35.04 ft.    10.68 m.     13.29 ft.     4.05 m.
    Ray Crossover Angle ....    2.93 mr.
    Terrain Delta Ht .......    4.42 ft.     1.35 m.
    Effective Distance .....   86.71 mi.   139.51 km.
    Pathlength ............    30.12 mi.    48.46 km.
    Azimuth ...............   167.36 deg.               347.41 deg.
    Frequency .............    13750 MHz
    K Factor ..............     1.33 (K)
    Radio Climate Phrase ... Maritime Temperate Climate Over Land
    Type of Path ........... Spherical Diffraction
    Free Space Path Loss ...   148.9 dB   Atmospheric Loss ...     1.149 dB
    Diff. Loss ....   51.7 dB (200.6 dB)  Tropo. Loss ... 52.7 dB (201.6 dB)
    Terrain data type ......   1.0 ARC Second
    Losses         L-Fspl         Sigma       Controlling Propagation Mode
    ------         ------         -----       ----------- ----------------
     190.5 dB        41.6 dB        3.9 dB    20.   %     Troposcattering
     177.8 dB        29.0 dB        6.0 dB    1.    %     Troposcattering
     170.6 dB        21.7 dB        7.4 dB    0.1   %     Troposcattering
     164.8 dB        15.9 dB        8.6 dB    0.01  %     Troposcattering
     163.4 dB        14.6 dB        8.9 dB    0.0025%     Troposcattering
    The OH loss calculations considered a terrain profile of 200 points.
    The list below shows the highest point in each fiftieth of the path length.
```

Dist. (km.)	Elev. (m.)	Obstr. (m.)	K=Inf. Clrnce. (m.)	K= 1.33 Clrnce. (m.)	Dist. (km.)	Elev. (m.)	Obstr. (m.)	K=Inf. Clrnce. (m.)	K= 1.33 Clrnce. (m.)
0.00	11.3	3.7	0.0	0.0	24.69	4.6	0.0	10.6	-24.0
0.73	12.2	0.0	2.7	0.7	25.42	4.9	0.0	10.3	-24.2
0.98	12.2	0.0	2.8	0.0	26.40	4.7	0.0	10.5	-23.8
2.20	11.0	0.0	4.0	-2.0	27.38	4.0	0.0	11.3	-22.8
2.93	10.7	0.0	4.3	-3.6	28.36	4.1	0.0	11.2	-22.4
3.91	10.7	0.0	4.3	-6.0	29.09	0.6	0.0	14.7	-18.5
4.89	9.4	0.0	5.6	-7.0	30.07	0.6	0.0	14.7	-17.9
6.11	9.3	0.0	5.7	-9.6	31.29	1.5	0.0	13.8	-17.9
7.58	7.1	0.0	7.9	-10.4	32.02	1.5	0.0	13.8	-17.2
8.31	9.5	0.0	5.5	-14.2	33.00	1.5	0.0	13.8	-16.3
9.29	9.1	0.0	5.9	-15.5	33.98	1.5	0.0	13.8	-15.2
10.51	9.8	0.0	5.3	-18.3	34.96	1.2	0.0	14.1	-13.7
11.00	10.7	0.0	4.4	-19.9	35.94	0.9	0.0	14.5	-12.1
11.98	9.2	0.0	5.9	-19.9	36.91	0.6	0.0	14.8	-10.4
13.45	9.8	0.0	5.3	-22.5	37.89	0.3	0.0	15.1	-8.5
13.93	9.3	0.0	5.8	-22.6	38.87	0.3	0.0	15.1	-6.9
15.16	7.0	0.0	8.2	-21.6	39.85	0.3	0.0	15.1	-5.1
15.89	8.1	0.0	7.1	-23.5	40.83	0.3	0.0	15.1	-3.3
16.62	7.6	0.0	7.5	-23.7	41.80	0.3	0.0	15.1	-1.3
18.09	8.0	0.0	7.1	-25.2	42.78	0.3	0.0	15.1	0.8

18.82	6.0	0.0	9.2	-23.7	43.76	0.3	0.0	15.1	3.0
19.80	6.0	0.0	9.1	-24.3	44.74	0.3	0.0	15.2	5.3
20.78	5.8	0.0	9.4	-24.5	45.96	0.3	0.0	15.2	8.4
22.25	5.6	0.0	9.6	-24.8	47.43	0.3	0.0	15.2	12.3
22.73	6.0	0.0	9.2	-25.3	47.67	0.3	0.0	15.2	13.0
24.20	4.3	0.0	10.9	-23.7	48.46	0.0	15.5	0.0	0.0