TECHNICAL NARRATIVE

B.1 Scope

This Exhibit B to ASTCA's application for authority construct and operate a Gateway Earth Station on American Samoa draws in part from the satellite system technical information provided in O3b Networks' license application for its Hawaii earth station, File No. SES-LIC-20100723-00952 (granted September 25, 2012) ("O3b Hawaii License"). This Exhibit B provides link budgets, antenna contours, a coordination study and a radiation hazard study in support of ASTCA's application.

B.2 Frequency Ranges for ASTCA's Service

The ASTCA service will operate only in the following frequency ranges, which are a sub-set of those included in O3b's Hawaii gateway earth station application:

- Uplink: 28.6-29.1 GHz
- Downlink: 18.8-19.3 GHz

B.3 ASTCA Service Area

Figure A.3-1 depicts the service area for which ASTCA seeks authority in this application. As can be seen, the service area is just American Samoa. All of this service area is at latitudes of roughly 14°S, and with elevation angles from the active O3b satellite no less than 10°.[1]

[1] In practice the minimum elevation angle of 10° would likely apply only for the more northerly latitudes of the service area where the elevation to the O3b orbit is inherently lower.

Figure B.3-1: ASTCA Service Area

B.4 Predicted Space Station Antenna Gain Contours

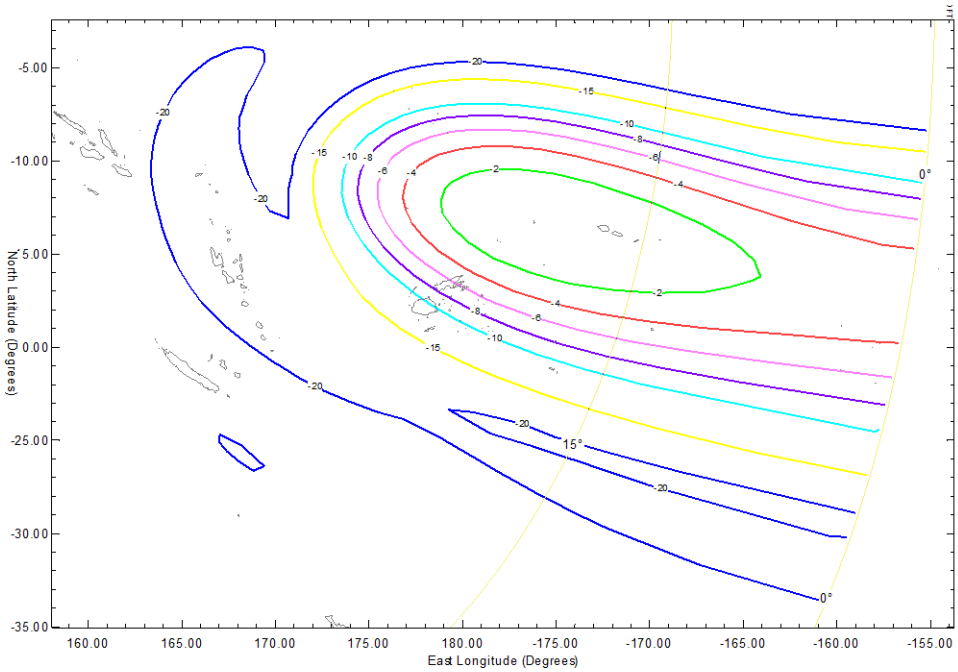
The mid-band antenna gain contours for the O3b satellite receive and transmit beams, when directed towards the ASTCA Gateway Earth Station, are shown below. Only one set of beam patterns is provided for transmit and one set for receive because all O3b satellite transmit beams are identical and all receive beams are identical.

These beam patterns demonstrate the effects on the satellite antenna gain contours as the O3b satellite moves in its orbit. Various satellite positions are shown starting with the O3b satellite appearing at 15° elevation angle in the west as viewed from the ASTCA Gateway Earth Station (see Figure A.2-1). The next O3b satellite position (Figure A.2-2) is at the point when it is at the same longitude as the ASTCA Gateway Earth Station. The third O3b satellite position is when the O3b satellite is disappearing below the 15° elevation angle in the east as viewed from the

ASTCA Gateway Earth Station (Figure A.2-3). For each of these Figures both the transmit and receive antenna gain contours are shown.

Figure B.4-1: Satellite antenna gain contours when O3b satellite is at 141.5°E

(a) Transmit



(b) Receive

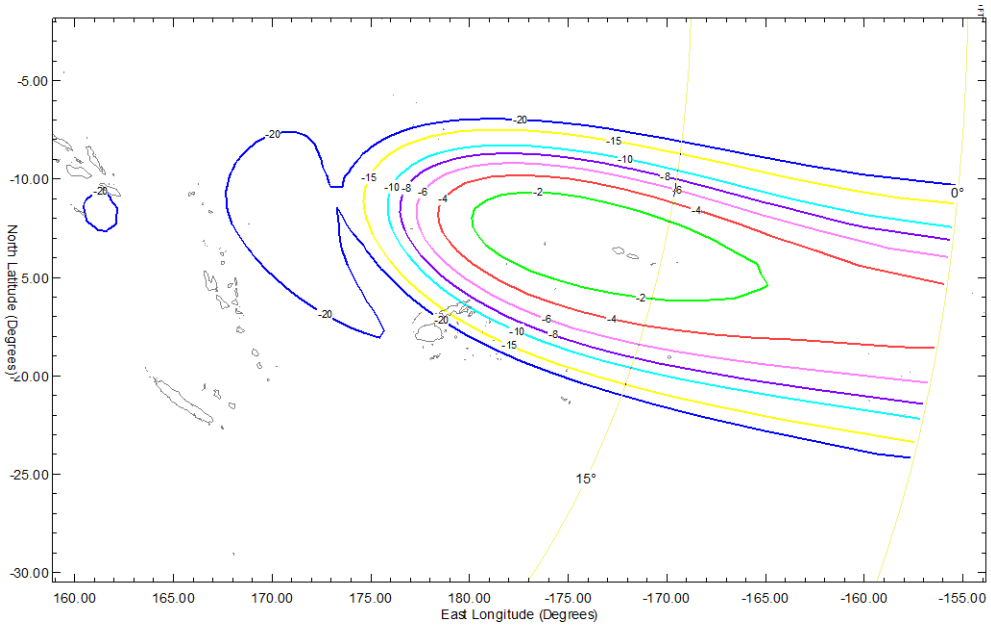
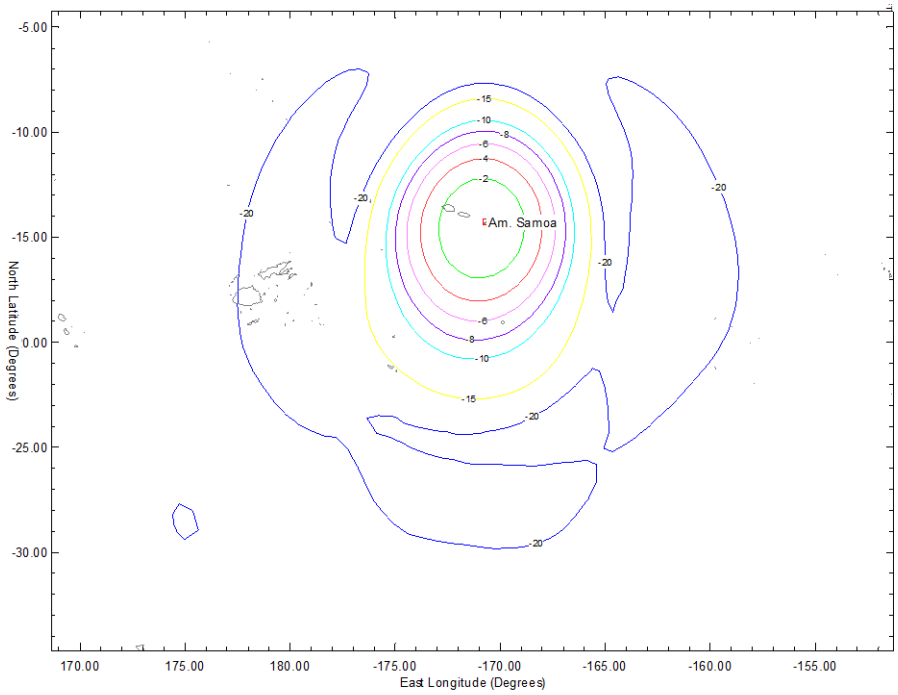


Figure B.4-2: Satellite antenna gain contours when O3b satellite is at 170°W

(a) Transmit



(b) Receive

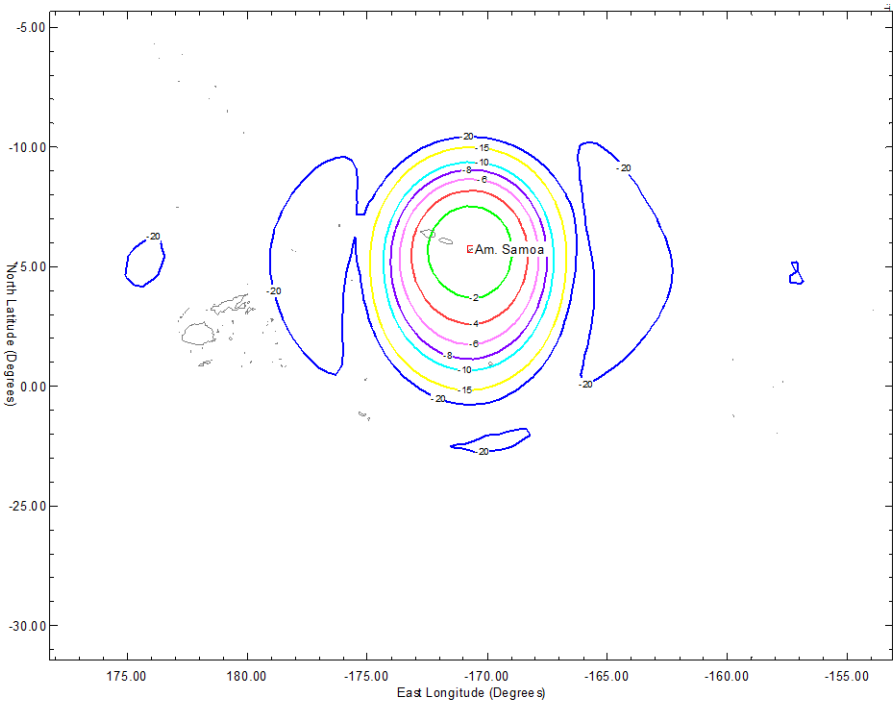
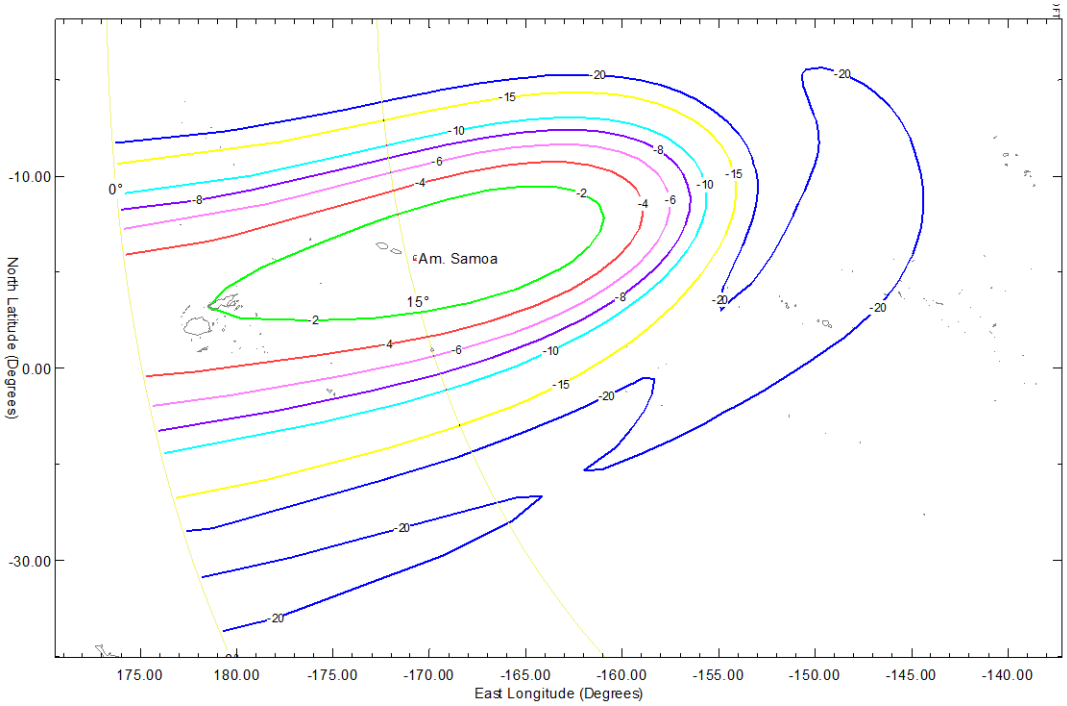
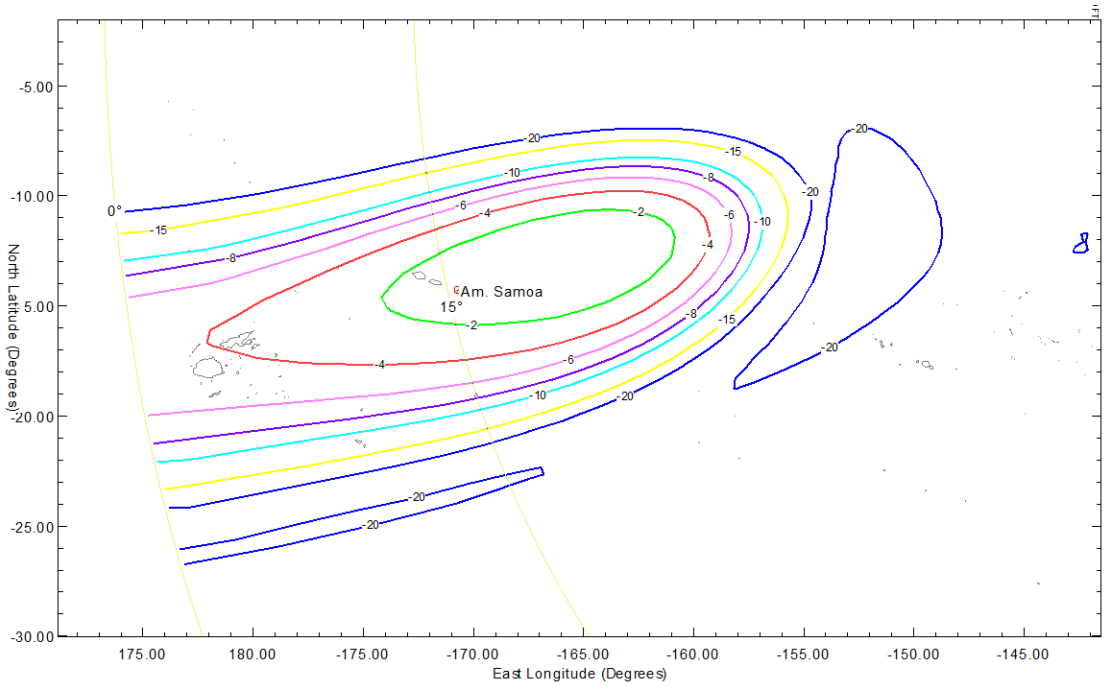


Figure B.4-3: Satellite antenna gain contours when O3b satellite is at 123°W

(a) Transmit



(b) Receive



B.5 Compliance with PFD Limits

ASTCA understands that the O3b system complies with all applicable FCC and ITU Power Flux Density ("PFD") limits, which are designed to protect the terrestrial Fixed Service ("FS") from downlink interference from the satellite transmissions. Demonstration of O3b's compliance with the FCC Power Flux Density ("PFD") limits under §25.208(c) (which are the same as the ITU PFD limits) was provided to the Commission as part of O3b's application for the Hawaii earth station. That demonstration is equally valid for the downlink transmissions to ASTCA's Gateway Earth Station.

§25.208(e) contains PFD limits that apply in the 18.8-19.3 GHz band, including for non-GSO systems. In the case of the O3b system these PFD limits are as follows:[2]

[2] For the O3b system the variable "X" given in the formulae in §25.208(e) is equal to zero because the number of satellites, "n", is less than 50.

- -115 dB(W/m^2) in any 1 MHz band for angles of arrival between 0 and 5 degrees above the horizontal plane;

- -115+(□-5)/2 dB(W/m^2) in any 1 MHz band for angles of arrival □ (in degrees) between 5 and 25 degrees above the horizontal plane; and

- -105 dB(W/m^2) in any 1 MHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

These PFD limits, insofar as they relate to the O3b system, are identical to the PFD limits in Article 21 of the ITU Radio Regulations.

B.6 Interference with Respect to GSO Networks

The ASTCA Gateway Earth Station will not cause unacceptable interference into any GSO satellite network by virtue of the fact that the ASTCA Gateway Earth Station is 14 degrees away from the Equator. Operation at this latitude ensures a certain separation angle between the GSO and O3b orbits as viewed from the ASTCA Gateway Earth Station.

B.7 Interference with Respect to Other Non-GSO Systems

The service to be provided to ASTCA by O3b presents no different interference environment with respect to other non-GSO satellite systems than was addressed in O3b's Hawaii gateway earth station application.[3]

[3] See O3b's Hawaii application, FCC File No. SES-LIC-20100723-00952, technical narrative at Section A.10.2.

B.8 Link Budgets for the ASTCA Gateway Earth Station

Representative link budgets are provided for the ASTCA Gateway Earth Station service. Adaptive coding and modulation is used in all the links.

	MODCOD	216M (180 Msps)
D1	32APSK/0.833	B-9*, B-10 *FWD clear sky to be at 32APSK/0.9
D2	16APSK/0.75	B-11, B-12
D3	8PSK/0.667	B-13, B-14
D4	QPSK/0.667	B-15, B-16
D5	QPSK/0.25	B-17, B-18

Ground Parameter		Teleport	Telco
Location		Sunset Beach east, United States	Pago Pago, American Samoa
Latitude	(°)	21.7	-14.3
Longitude (East)	(°)	202.0	189.3
E/S Maximum Range to SV	(km)	8852.6	8828.1
E/S Minimmum Elevation to SV	(°)	52.4	53.0
E/S Altitude	(km)	0.1	0.0
SV Beam Identifier	(#)	24	
Minutes Into Pass (Sample #75)	(Min)	35:49	
Telco Spot Beam Off-Angle	(°)	0.20	
Telco Spot Beam Diameter	(km)	58.70	
Maximum Roundtrip Latency	(msec)	117.95	
Modulation Parameters		**Forward**	**Return**
Enter Receiver	Type	DVB-S2	
Modem Overhead	(%)	3.2%	
Number of Carriers per Channel	(#)	1	
Available Bandwidth	(Hz)	216,000,000	
Channel Symbol Rate	(sps)	180,000,000	
Channel Modulation Type		32APSK	
Channel FEC Rate		0.90	
Channel Spectral Efficiency	(bits/Sym)	4.50	
Channel Throughput (100% / 100% of Full Rate)	(bps)	784,237,516.87	
Uplink		**Forward**	**Return**
E/S Tx Channels per HPA	(#)	5	
E/S Tx Carrier Frequency	(MHz)	28,709	
E/S Tx HPA Power Level	(W)	500	
E/S Tx OBO	(dB)	-8.00	
E/S Tx Post-HPA Losses	(dB)	-3.74	
E/S Tx Antenna Gain (7.3 m / 7.3 m)	(dB)	65.03	
E/S Tx EIRP Per Channel	(dBW)	73.29	
E/S Tx Pointing Loss	(dB)	-0.50	
E/S Tx RF Link Availability	(%)	75.000	
E/S Tx Atmospheric Losses	(dB)	-1.06	
E/S Tx Spreading Loss	(dB)	-149.93	
Satellite		**Forward**	**Return**
SV Number of Channels per HPA	(#)	1	
SV Rx G/T	(dB/K)	4.81	
SV Rx Power Per Tier	(dBW)	-124.01	
SV Rx Flux Density Per Tier	(dBW/m^2)	-78.21	
SV Tx OBO (ALC / ALC)	(dB)	-3.80	
SV Tx Post-TWTA Losses	(dB)	-1.50	
SV Tx Antenna Gain	(dBi)	31.47	
SV Tx EIRP Per Channel/Carrier	(dBW)	44.30	
SV Tx Pointing Loss	(dB)	0.00	
Downlink		**Forward**	**Return**
E/S Rx Carrier Frequency	(MHz)	18,909	
E/S Rx Wavelength	(m)	0.015854	
E/S Rx RF Link Availability	(%)	50.000	
E/S Rx Atmospheric Losses	(dB)	-0.79	
E/S Rx Pointing Loss	(dB)	-0.50	
E/S Rx Antenna Gain (7.3 m / 7.3 m)	(dBi)	62.24	
E/S Rx Effective G/T	(dB/K)	42.39	
E/S Rx Power Per Channel	(dBW)	-91.65	
E/S Rx Flux Density Per Channel	(dBW/m^2)	-106.90	
Total Link		**Forward**	**Return**
Carrier / Noise Bandwidth	(dB)	82.55	
Carrier / Noise Uplink	(dB)	22.03	
Carrier / Noise Downlink	(dB)	34.55	
Carrier / Intermodulation Im (C/Im)	(dB)	29.35	
(C/N) - Total Actual	(dB)	19.61	
(C/N) - Total Required	(dB)	18.60	
(E_b/N_o) - Total Actual	(dB)	13.08	
(E_b/N_o) - Total Required	(dB)	12.07	
Excess Margin	**(dB)**	**1.01**	
Fade Margin	**(dB)**	**21.81**	

O3b Network Link Analysis - Tier 1 Service For Pago Pago, American Samoa

Link Budget Creator - Rev 3.2.9: April 15, 2013		Tier 1	Tier 1
Ground Parameter		**Teleport**	**Telco**
Location		Sunset Beach east, United Stat	Pago Pago, American Samoa
Latitude	(°)	21.7	-14.3
Longitude (East)	(°)	202.0	189.3
E/S Maximum Range to SV	(km)	8852.6	8828.1
E/S Minimmum Elevation to SV	(°)	52.4	53.0
E/S Altitude	(km)	0.1	0.0
SV Beam Identifier	(#)	24	
Minutes Into Pass (Sample #75)	(Min)	35:49	
Telco Spot Beam Off-Angle	(°)	0.20	
Telco Spot Beam Diameter	(km)	58.70	
Maximum Roundtrip Latency	(msec)	117.95	
Modulation Parameters		**Forward**	**Return**
Enter Receiver	Type		DVB-S2
Modem Overhead	(%)		3.3%
Number of Carriers per Channel	(#)		1
Available Bandwidth	(Hz)		216,000,000
Channel Symbol Rate	(sps)		180,000,000
Channel Modulation Type			32APSK
Channel FEC Rate			0.83
Channel Spectral Efficiency	(bits/Sym)		4.17
Channel Throughput (100% / 100% of Full Rate)	(bps)		725,506,072.87
Uplink		**Forward**	**Return**
E/S Tx Channels per HPA	(#)		2
E/S Tx Carrier Frequency	(MHz)		28,709
E/S Tx HPA Power Level	(W)		500
E/S Tx OBO	(dB)		-9.00
E/S Tx Post-HPA Losses	(dB)		-2.24
E/S Tx Antenna Gain (7.3 m / 7.3 m)	(dB)		65.03
E/S Tx EIRP Per Channel	(dBW)		77.77
E/S Tx Pointing Loss	(dB)		-0.50
E/S Tx RF Link Availability	(%)		50.000
E/S Tx Atmospheric Losses	(dB)		-1.25
E/S Tx Spreading Loss	(dB)		-149.91
Satellite		**Forward**	**Return**
SV Number of Channels per HPA	(#)		5
SV Rx G/T	(dB/K)		4.12
SV Rx Power Per Tier	(dBW)		-120.38
SV Rx Flux Density Per Tier	(dBW/m^2)		-73.89
SV Tx OBO (ALC / ALC)	(dB)		-5.80
SV Tx Post-TWTA Losses	(dB)		-1.50
SV Tx Antenna Gain	(dBi)		31.64
SV Tx EIRP Per Channel/Carrier	(dBW)		35.48
SV Tx Pointing Loss	(dB)		0.00
Downlink		**Forward**	**Return**
E/S Rx Carrier Frequency	(MHz)		18,909
E/S Rx Spreading Loss	(dB)		-149.93
E/S Rx RF Link Availability	(%)		75.000
E/S Rx Atmospheric Losses	(dB)		-0.62
E/S Rx Pointing Loss	(dB)		-0.50
E/S Rx Antenna Gain (7.3 m / 7.3 m)	(dBi)		62.24
E/S Rx Effective G/T	(dB/K)		39.10
E/S Rx Power Per Channel	(dBW)		-100.33
E/S Rx Flux Density Per Channel	(dBW/m^2)		-115.58
Total Link		**Forward**	**Return**
Carrier / Noise Bandwidth	(dB)		82.55
Carrier / Noise Uplink	(dB)		25.66
Carrier / Noise Downlink	(dB)		22.58
Carrier / Intermodulation Im (C/Im)	(dB)		23.25
(C/N) - Total Actual	(dB)		17.92
(C/N) - Total Required	(dB)		16.60
(E_b/N_o) - Total Actual	(dB)		11.73
(E_b/N_o) - Total Required	(dB)		10.40
Excess Margin	**(dB)**		**1.32**
Fade Margin	**(dB)**		**20.12**

Ground Parameter		Teleport	Telco
Location		Sunset Beach east, United States	Pago Pago, American Samoa
Latitude	(°)	21.7	-14.3
Longitude (East)	(°)	202.0	189.3
E/S Maximum Range to SV	(km)	8853.3	8542.3
E/S Minimmum Elevation to SV	(°)	52.4	60.6
E/S Altitude	(km)	0.1	0.0
SV Beam Identifier	(#)	24	
Minutes Into Pass (Sample #60)	(Min)	28:33	
Telco Spot Beam Off-Angle	(°)	0.20	
Telco Spot Beam Diameter	(km)	58.70	
Maximum Roundtrip Latency	(msec)	116.05	
Modulation Parameters		**Forward**	**Return**
Enter Receiver	Type	DVB-S2	
Modem Overhead	(%)	3.5%	
Number of Carriers per Channel	(#)	1	
Available Bandwidth	(Hz)	216,000,000	
Channel Symbol Rate	(sps)	180,000,000	
Channel Modulation Type		16APSK	
Channel FEC Rate		0.75	
Channel Spectral Efficiency	(bits/Sym)	3.00	
Channel Throughput (100% / 100% of Full Rate)	(bps)	521,337,648.33	
Uplink		**Forward**	**Return**
E/S Tx Channels per HPA	(#)	5	
E/S Tx Carrier Frequency	(MHz)	28,709	
E/S Tx HPA Power Level	(W)	500	
E/S Tx OBO	(dB)	-8.00	
E/S Tx Post-HPA Losses	(dB)	-3.74	
E/S Tx Antenna Gain (7.3 m / 7.3 m)	(dB)	65.03	
E/S Tx EIRP Per Channel	(dBW)	73.29	
E/S Tx Pointing Loss	(dB)	-0.50	
E/S Tx RF Link Availability	(%)	99.000	
E/S Tx Atmospheric Losses	(dB)	-8.03	
E/S Tx Spreading Loss	(dB)	-149.93	
Satellite		**Forward**	**Return**
SV Number of Channels per HPA	(#)	1	
SV Rx G/T	(dB/K)	4.81	
SV Rx Power Per Tier	(dBW)	-130.98	
SV Rx Flux Density Per Tier	(dBW/m^2)	-85.18	
SV Tx OBO (ALC / ALC)	(dB)	-3.80	
SV Tx Post-TWTA Losses	(dB)	-1.50	
SV Tx Antenna Gain	(dBi)	31.39	
SV Tx EIRP Per Channel/Carrier	(dBW)	44.22	
SV Tx Pointing Loss	(dB)	0.00	
Downlink		**Forward**	**Return**
E/S Rx Carrier Frequency	(MHz)	18,909	
E/S Rx Wavelength	(m)	0.015854	
E/S Rx RF Link Availability	(%)	98.000	
E/S Rx Atmospheric Losses	(dB)	-4.44	
E/S Rx Pointing Loss	(dB)	-0.50	
E/S Rx Antenna Gain (7.3 m / 7.3 m)	(dBi)	62.24	
E/S Rx Effective G/T	(dB/K)	40.00	
E/S Rx Power Per Channel	(dBW)	-95.09	
E/S Rx Flux Density Per Channel	(dBW/m^2)	-110.34	
Total Link		**Forward**	**Return**
Carrier / Noise Bandwidth	(dB)	82.55	
Carrier / Noise Uplink	(dB)	15.06	
Carrier / Noise Downlink	(dB)	28.72	
Carrier / Intermodulation Im (C/Im)	(dB)	29.35	
(C/N) - Total Actual	(dB)	12.39	
(C/N) - Total Required	(dB)	12.30	
(E_b/N_o) - Total Actual	(dB)	7.62	
(E_b/N_o) - Total Required	(dB)	7.53	
Excess Margin	**(dB)**	**0.09**	
Fade Margin	**(dB)**	**14.59**	

O3b Network Link Analysis - Tier 1 Service For Pago Pago, American Samoa

Link Budget Creator - Rev 3.2.9: April 15, 2013		Tier 1	Tier 1
Ground Parameter		**Teleport**	**Telco**
Location		Sunset Beach east, United Stat	Pago Pago, American Samoa
Latitude	(°)	21.7	-14.3
Longitude (East)	(°)	202.0	189.3
E/S Maximum Range to SV	(km)	8853.3	8542.3
E/S Minimmum Elevation to SV	(°)	52.4	60.6
E/S Altitude	(km)	0.1	0.0
SV Beam Identifier	(#)	24	
Minutes Into Pass (Sample #60)	(Min)	28:33	
Telco Spot Beam Off-Angle	(°)	0.20	
Telco Spot Beam Diameter	(km)	58.70	
Maximum Roundtrip Latency	(msec)	116.05	
Modulation Parameters		**Forward**	**Return**
Enter Receiver	Type		DVB-S2
Modem Overhead	(%)		3.5%
Number of Carriers per Channel	(#)		1
Available Bandwidth	(Hz)		216,000,000
Channel Symbol Rate	(sps)		180,000,000
Channel Modulation Type			16APSK
Channel FEC Rate			0.75
Channel Spectral Efficiency	(bits/Sym)		3.00
Channel Throughput (100% / 100% of Full Rate)	(bps)		521,337,648.33
Uplink		**Forward**	**Return**
E/S Tx Channels per HPA	(#)		2
E/S Tx Carrier Frequency	(MHz)		28,709
E/S Tx HPA Power Level	(W)		500
E/S Tx OBO	(dB)		-9.00
E/S Tx Post-HPA Losses	(dB)		-2.24
E/S Tx Antenna Gain (7.3 m / 7.3 m)	(dB)		65.03
E/S Tx EIRP Per Channel	(dBW)		77.77
E/S Tx Pointing Loss	(dB)		-0.50
E/S Tx RF Link Availability	(%)		98.000
E/S Tx Atmospheric Losses	(dB)		-9.43
E/S Tx Spreading Loss	(dB)		-149.62
Satellite		**Forward**	**Return**
SV Number of Channels per HPA	(#)		5
SV Rx G/T	(dB/K)		3.94
SV Rx Power Per Tier	(dBW)		-128.46
SV Rx Flux Density Per Tier	(dBW/m^2)		-81.78
SV Tx OBO (ALC / ALC)	(dB)		-5.80
SV Tx Post-TWTA Losses	(dB)		-1.50
SV Tx Antenna Gain	(dBi)		31.64
SV Tx EIRP Per Channel/Carrier	(dBW)		35.48
SV Tx Pointing Loss	(dB)		0.00
Downlink		**Forward**	**Return**
E/S Rx Carrier Frequency	(MHz)		18,909
E/S Rx Spreading Loss	(dB)		-149.93
E/S Rx RF Link Availability	(%)		99.000
E/S Rx Atmospheric Losses	(dB)		-3.83
E/S Rx Pointing Loss	(dB)		-0.50
E/S Rx Antenna Gain (7.3 m / 7.3 m)	(dBi)		62.24
E/S Rx Effective G/T	(dB/K)		37.47
E/S Rx Power Per Channel	(dBW)		-103.54
E/S Rx Flux Density Per Channel	(dBW/m^2)		-118.79
Total Link		**Forward**	**Return**
Carrier / Noise Bandwidth	(dB)		82.55
Carrier / Noise Uplink	(dB)		17.59
Carrier / Noise Downlink	(dB)		17.74
Carrier / Intermodulation Im (C/Im)	(dB)		23.25
(C/N) - Total Actual	(dB)		12.40
(C/N) - Total Required	(dB)		12.30
(E_b/N_o) - Total Actual	(dB)		7.63
(E_b/N_o) - Total Required	(dB)		7.53
Excess Margin	**(dB)**		**0.10**
Fade Margin	**(dB)**		**14.60**

Ground Parameter		Teleport	Telco
Location		Sunset Beach east, United States	Pago Pago, American Samoa
Latitude	(°)	21.7	-14.3
Longitude (East)	(°)	202.0	189.3
E/S Maximum Range to SV	(km)	10069.2	8891.9
E/S Minimmum Elevation to SV	(°)	31.2	51.5
E/S Altitude	(km)	0.1	0.0
SV Beam Identifier	(#)	24	
Minutes Into Pass (Sample #5)	(Min)	1:56	
Telco Spot Beam Off-Angle	(°)	0.20	
Telco Spot Beam Diameter	(km)	58.70	
Maximum Roundtrip Latency	(msec)	126.49	
Modulation Parameters		**Forward**	**Return**
Enter Receiver	Type	DVB-S2	
Modem Overhead	(%)	3.2%	
Number of Carriers per Channel	(#)	1	
Available Bandwidth	(Hz)	216,000,000	
Channel Symbol Rate	(sps)	180,000,000	
Channel Modulation Type		8PSK	
Channel FEC Rate		0.67	
Channel Spectral Efficiency	(bits/Sym)	2.00	
Channel Throughput (100% / 100% of Full Rate)	(bps)	348,418,491.48	
Uplink		**Forward**	**Return**
E/S Tx Channels per HPA	(#)	5	
E/S Tx Carrier Frequency	(MHz)	28,709	
E/S Tx HPA Power Level	(W)	500	
E/S Tx OBO	(dB)	-4.00	
E/S Tx Post-HPA Losses	(dB)	-3.74	
E/S Tx Antenna Gain (7.3 m / 7.3 m)	(dB)	65.03	
E/S Tx EIRP Per Channel	(dBW)	77.29	
E/S Tx Pointing Loss	(dB)	-0.50	
E/S Tx RF Link Availability	(%)	99.500	
E/S Tx Atmospheric Losses	(dB)	-15.76	
E/S Tx Spreading Loss	(dB)	-151.05	
Satellite		**Forward**	**Return**
SV Number of Channels per HPA	(#)	1	
SV Rx G/T	(dB/K)	5.24	
SV Rx Power Per Tier	(dBW)	-135.40	
SV Rx Flux Density Per Tier	(dBW/m^2)	-90.02	
SV Tx OBO (ALC / ALC)	(dB)	-3.80	
SV Tx Post-TWTA Losses	(dB)	-1.50	
SV Tx Antenna Gain	(dBi)	31.47	
SV Tx EIRP Per Channel/Carrier	(dBW)	44.30	
SV Tx Pointing Loss	(dB)	0.00	
Downlink		**Forward**	**Return**
E/S Rx Carrier Frequency	(MHz)	18,909	
E/S Rx Wavelength	(m)	0.015854	
E/S Rx RF Link Availability	(%)	99.400	
E/S Rx Atmospheric Losses	(dB)	-8.87	
E/S Rx Pointing Loss	(dB)	-0.50	
E/S Rx Antenna Gain (7.3 m / 7.3 m)	(dBi)	62.24	
E/S Rx Effective G/T	(dB/K)	37.99	
E/S Rx Power Per Channel	(dBW)	-99.80	
E/S Rx Flux Density Per Channel	(dBW/m^2)	-115.05	
Total Link		**Forward**	**Return**
Carrier / Noise Bandwidth	(dB)	82.55	
Carrier / Noise Uplink	(dB)	10.64	
Carrier / Noise Downlink	(dB)	22.00	
Carrier / Intermodulation Im (C/Im)	(dB)	23.53	
(C/N) - Total Actual	(dB)	9.35	
(C/N) - Total Required	(dB)	8.20	
(E_b/N_o) - Total Actual	(dB)	6.34	
(E_b/N_o) - Total Required	(dB)	5.19	
Excess Margin	**(dB)**	**1.15**	
Fade Margin	**(dB)**	**11.55**	

O3b Network Link Analysis - Tier 1 Service For Pago Pago, American Samoa			
Link Budget Creator - Rev 3.2.9: April 15, 2013		**Tier 1**	**Tier 1**
Ground Parameter		**Teleport**	**Telco**
Location		Sunset Beach east, United Stat	Pago Pago, American Samoa
Latitude	(°)	21.7	-14.3
Longitude (East)	(°)	202.0	189.3
E/S Maximum Range to SV	(km)	10069.2	8891.9
E/S Minimmum Elevation to SV	(°)	31.2	51.5
E/S Altitude	(km)	0.1	0.0
SV Beam Identifier	(#)	24	
Minutes Into Pass (Sample #5)	(Min)	1:56	
Telco Spot Beam Off-Angle	(°)	0.20	
Telco Spot Beam Diameter	(km)	58.70	
Maximum Roundtrip Latency	(msec)	126.49	
Modulation Parameters		**Forward**	**Return**
Enter Receiver	Type		DVB-S2
Modem Overhead	(%)		3.2%
Number of Carriers per Channel	(#)		1
Available Bandwidth	(Hz)		216,000,000
Channel Symbol Rate	(sps)		180,000,000
Channel Modulation Type			8PSK
Channel FEC Rate			0.67
Channel Spectral Efficiency	(bits/Sym)		2.00
Channel Throughput (100% / 100% of Full Rate)	(bps)		348,418,491.48
Uplink		**Forward**	**Return**
E/S Tx Channels per HPA	(#)		2
E/S Tx Carrier Frequency	(MHz)		28,709
E/S Tx HPA Power Level	(W)		500
E/S Tx OBO	(dB)		-4.00
E/S Tx Post-HPA Losses	(dB)		-2.24
E/S Tx Antenna Gain (7.3 m / 7.3 m)	(dB)		65.03
E/S Tx EIRP Per Channel	(dBW)		82.77
E/S Tx Pointing Loss	(dB)		-0.50
E/S Tx RF Link Availability	(%)		99.400
E/S Tx Atmospheric Losses	(dB)		-18.66
E/S Tx Spreading Loss	(dB)		-149.97
Satellite		**Forward**	**Return**
SV Number of Channels per HPA	(#)		5
SV Rx G/T	(dB/K)		4.12
SV Rx Power Per Tier	(dBW)		-132.86
SV Rx Flux Density Per Tier	(dBW/m^2)		-86.36
SV Tx OBO (ALC / ALC)	(dB)		-5.80
SV Tx Post-TWTA Losses	(dB)		-1.50
SV Tx Antenna Gain	(dBi)		31.77
SV Tx EIRP Per Channel/Carrier	(dBW)		35.61
SV Tx Pointing Loss	(dB)		0.00
Downlink		**Forward**	**Return**
E/S Rx Carrier Frequency	(MHz)		18,909
E/S Rx Spreading Loss	(dB)		-151.05
E/S Rx RF Link Availability	(%)		99.500
E/S Rx Atmospheric Losses	(dB)		-7.86
E/S Rx Pointing Loss	(dB)		-0.50
E/S Rx Antenna Gain (7.3 m / 7.3 m)	(dBi)		62.24
E/S Rx Effective G/T	(dB/K)		36.63
E/S Rx Power Per Channel	(dBW)		-108.55
E/S Rx Flux Density Per Channel	(dBW/m^2)		-123.80
Total Link		**Forward**	**Return**
Carrier / Noise Bandwidth	(dB)		82.55
Carrier / Noise Uplink	(dB)		13.19
Carrier / Noise Downlink	(dB)		11.89
Carrier / Intermodulation Im (C/Im)	(dB)		22.89
(C/N) - Total Actual	(dB)		8.64
(C/N) - Total Required	(dB)		8.20
(E_b/N_o) - Total Actual	(dB)		5.62
(E_b/N_o) - Total Required	(dB)		5.19
Excess Margin	**(dB)**		**0.44**
Fade Margin	**(dB)**		**10.84**

Ground Parameter		Teleport	Telco
Location		Sunset Beach east, United States	Pago Pago, American Samoa
Latitude	(°)	21.7	-14.3
Longitude (East)	(°)	202.0	189.3
E/S Maximum Range to SV	(km)	10033.2	8866.6
E/S Minimmum Elevation to SV	(°)	31.7	52.1
E/S Altitude	(km)	0.1	0.0
SV Beam Identifier	(#)	24	
Minutes Into Pass (Sample #6)	(Min)	2:25	
Telco Spot Beam Off-Angle	(°)	0.20	
Telco Spot Beam Diameter	(km)	58.70	
Maximum Roundtrip Latency	(msec)	126.09	
Modulation Parameters		**Forward**	**Return**
Enter Receiver	Type	DVB-S2	
Modem Overhead	(%)	3.2%	
Number of Carriers per Channel	(#)	1	
Available Bandwidth	(Hz)	216,000,000	
Channel Symbol Rate	(sps)	180,000,000	
Channel Modulation Type		QPSK	
Channel FEC Rate		0.67	
Channel Spectral Efficiency	(bits/Sym)	1.33	
Channel Throughput (100% / 100% of Full Rate)	(bps)	232,341,806.38	
Uplink		**Forward**	**Return**
E/S Tx Channels per HPA	(#)	5	
E/S Tx Carrier Frequency	(MHz)	28,709	
E/S Tx HPA Power Level	(W)	500	
E/S Tx OBO	(dB)	-4.00	
E/S Tx Post-HPA Losses	(dB)	-3.74	
E/S Tx Antenna Gain (7.3 m / 7.3 m)	(dB)	65.03	
E/S Tx EIRP Per Channel	(dBW)	77.29	
E/S Tx Pointing Loss	(dB)	-0.50	
E/S Tx RF Link Availability	(%)	99.700	
E/S Tx Atmospheric Losses	(dB)	-20.50	
E/S Tx Spreading Loss	(dB)	-151.02	
Satellite		**Forward**	**Return**
SV Number of Channels per HPA	(#)	1	
SV Rx G/T	(dB/K)	5.24	
SV Rx Power Per Tier	(dBW)	-140.12	
SV Rx Flux Density Per Tier	(dBW/m^2)	-94.74	
SV Tx OBO (ALC / ALC)	(dB)	-3.80	
SV Tx Post-TWTA Losses	(dB)	-1.50	
SV Tx Antenna Gain	(dBi)	31.47	
SV Tx EIRP Per Channel/Carrier	(dBW)	44.30	
SV Tx Pointing Loss	(dB)	0.00	
Downlink		**Forward**	**Return**
E/S Rx Carrier Frequency	(MHz)	18,909	
E/S Rx Wavelength	(m)	0.015854	
E/S Rx RF Link Availability	(%)	99.650	
E/S Rx Atmospheric Losses	(dB)	-11.91	
E/S Rx Pointing Loss	(dB)	-0.50	
E/S Rx Antenna Gain (7.3 m / 7.3 m)	(dBi)	62.24	
E/S Rx Effective G/T	(dB/K)	37.52	
E/S Rx Power Per Channel	(dBW)	-102.81	
E/S Rx Flux Density Per Channel	(dBW/m^2)	-118.06	
Total Link		**Forward**	**Return**
Carrier / Noise Bandwidth	(dB)	82.55	
Carrier / Noise Uplink	(dB)	5.93	
Carrier / Noise Downlink	(dB)	18.52	
Carrier / Intermodulation Im (C/Im)	(dB)	23.53	
(C/N) - Total Actual	(dB)	5.33	
(C/N) - Total Required	(dB)	4.80	
(E_b/N_o) - Total Actual	(dB)	4.08	
(E_b/N_o) - Total Required	(dB)	3.55	
Excess Margin	**(dB)**	**0.53**	
Fade Margin	**(dB)**	**7.53**	

O3b Network Link Analysis - Tier 1 Service For Pago Pago, American Samoa			
Link Budget Creator - Rev 3.2.9: April 15, 2013		**Tier 1**	**Tier 1**
Ground Parameter		**Teleport**	**Telco**
Location		Sunset Beach east, United Stat	Pago Pago, American Samoa
Latitude	(°)	21.7	-14.3
Longitude (East)	(°)	202.0	189.3
E/S Maximum Range to SV	(km)	10033.2	8866.6
E/S Minimmum Elevation to SV	(°)	31.7	52.1
E/S Altitude	(km)	0.1	0.0
SV Beam Identifier	(#)	24	
Minutes Into Pass (Sample #6)	(Min)	2:25	
Telco Spot Beam Off-Angle	(°)	0.20	
Telco Spot Beam Diameter	(km)	58.70	
Maximum Roundtrip Latency	(msec)	126.09	
Modulation Parameters		**Forward**	**Return**
Enter Receiver	Type		DVB-S2
Modem Overhead	(%)		3.2%
Number of Carriers per Channel	(#)		1
Available Bandwidth	(Hz)		216,000,000
Channel Symbol Rate	(sps)		180,000,000
Channel Modulation Type			QPSK
Channel FEC Rate			0.67
Channel Spectral Efficiency	(bits/Sym)		1.33
Channel Throughput (100% / 100% of Full Rate)	(bps)		232,341,806.38
Uplink		**Forward**	**Return**
E/S Tx Channels per HPA	(#)		2
E/S Tx Carrier Frequency	(MHz)		28,709
E/S Tx HPA Power Level	(W)		500
E/S Tx OBO	(dB)		-4.00
E/S Tx Post-HPA Losses	(dB)		-2.24
E/S Tx Antenna Gain (7.3 m / 7.3 m)	(dB)		65.03
E/S Tx EIRP Per Channel	(dBW)		82.77
E/S Tx Pointing Loss	(dB)		-0.50
E/S Tx RF Link Availability	(%)		99.650
E/S Tx Atmospheric Losses	(dB)		-24.61
E/S Tx Spreading Loss	(dB)		-149.95
Satellite		**Forward**	**Return**
SV Number of Channels per HPA	(#)		5
SV Rx G/T	(dB/K)		4.12
SV Rx Power Per Tier	(dBW)		-138.78
SV Rx Flux Density Per Tier	(dBW/m^2)		-92.29
SV Tx OBO (ALC / ALC)	(dB)		-5.80
SV Tx Post-TWTA Losses	(dB)		-1.50
SV Tx Antenna Gain	(dBi)		31.77
SV Tx EIRP Per Channel/Carrier	(dBW)		35.61
SV Tx Pointing Loss	(dB)		0.00
Downlink		**Forward**	**Return**
E/S Rx Carrier Frequency	(MHz)		18,909
E/S Rx Spreading Loss	(dB)		-151.02
E/S Rx RF Link Availability	(%)		99.700
E/S Rx Atmospheric Losses	(dB)		-10.23
E/S Rx Pointing Loss	(dB)		-0.50
E/S Rx Antenna Gain (7.3 m / 7.3 m)	(dBi)		62.24
E/S Rx Effective G/T	(dB/K)		36.33
E/S Rx Power Per Channel	(dBW)		-110.89
E/S Rx Flux Density Per Channel	(dBW/m^2)		-126.14
Total Link		**Forward**	**Return**
Carrier / Noise Bandwidth	(dB)		82.55
Carrier / Noise Uplink	(dB)		7.27
Carrier / Noise Downlink	(dB)		9.25
Carrier / Intermodulation Im (C/Im)	(dB)		22.89
(C/N) - Total Actual	(dB)		4.80
(C/N) - Total Required	(dB)		4.80
(E_b/N_o) - Total Actual	(dB)		3.55
(E_b/N_o) - Total Required	(dB)		3.55
Excess Margin	**(dB)**		**0.00**
Fade Margin	**(dB)**		**7.00**

Ground Parameter		Teleport	Telco
Location		Sunset Beach east, United States	Pago Pago, American Samoa
Latitude	(°)	21.7	-14.3
Longitude (East)	(°)	202.0	189.3
E/S Maximum Range to SV	(km)	10069.2	8891.9
E/S Minimmum Elevation to SV	(°)	31.2	51.5
E/S Altitude	(km)	0.1	0.0
SV Beam Identifier	(#)	24	
Minutes Into Pass (Sample #5)	(Min)	1:56	
Telco Spot Beam Off-Angle	(°)	0.20	
Telco Spot Beam Diameter	(km)	58.70	
Maximum Roundtrip Latency	(msec)	126.49	
Modulation Parameters		**Forward**	**Return**
Enter Receiver	Type	DVB-S2	
Modem Overhead	(%)	4.3%	
Number of Carriers per Channel	(#)	1	
Available Bandwidth	(Hz)	216,000,000	
Channel Symbol Rate	(sps)	180,000,000	
Channel Modulation Type		QPSK	
Channel FEC Rate		0.25	
Channel Spectral Efficiency	(bits/Sym)	0.50	
Channel Throughput (100% / 100% of Full Rate)	(bps)	86,143,861.55	
Uplink		**Forward**	**Return**
E/S Tx Channels per HPA	(#)	5	
E/S Tx Carrier Frequency	(MHz)	28,709	
E/S Tx HPA Power Level	(W)	500	
E/S Tx OBO	(dB)	-4.00	
E/S Tx Post-HPA Losses	(dB)	-3.74	
E/S Tx Antenna Gain (7.3 m / 7.3 m)	(dB)	65.03	
E/S Tx EIRP Per Channel	(dBW)	77.29	
E/S Tx Pointing Loss	(dB)	-0.50	
E/S Tx RF Link Availability	(%)	99.830	
E/S Tx Atmospheric Losses	(dB)	-26.27	
E/S Tx Spreading Loss	(dB)	-151.05	
Satellite		**Forward**	**Return**
SV Number of Channels per HPA	(#)	1	
SV Rx G/T	(dB/K)	5.24	
SV Rx Power Per Tier	(dBW)	-145.92	
SV Rx Flux Density Per Tier	(dBW/m^2)	-100.54	
SV Tx OBO (ALC / ALC)	(dB)	-3.80	
SV Tx Post-TWTA Losses	(dB)	-1.50	
SV Tx Antenna Gain	(dBi)	31.47	
SV Tx EIRP Per Channel/Carrier	(dBW)	44.30	
SV Tx Pointing Loss	(dB)	0.00	
Downlink		**Forward**	**Return**
E/S Rx Carrier Frequency	(MHz)	18,909	
E/S Rx Wavelength	(m)	0.015854	
E/S Rx RF Link Availability	(%)	99.800	
E/S Rx Atmospheric Losses	(dB)	-15.38	
E/S Rx Pointing Loss	(dB)	-0.50	
E/S Rx Antenna Gain (7.3 m / 7.3 m)	(dBi)	62.24	
E/S Rx Effective G/T	(dB/K)	37.25	
E/S Rx Power Per Channel	(dBW)	-106.31	
E/S Rx Flux Density Per Channel	(dBW/m^2)	-121.55	
Total Link		**Forward**	**Return**
Carrier / Noise Bandwidth	(dB)	82.55	
Carrier / Noise Uplink	(dB)	0.13	
Carrier / Noise Downlink	(dB)	14.76	
Carrier / Intermodulation Im (C/Im)	(dB)	23.53	
(C/N) - Total Actual	(dB)	-0.12	
(C/N) - Total Required	(dB)	-2.20	
(E_b/N_o) - Total Actual	(dB)	2.89	
(E_b/N_o) - Total Required	(dB)	0.81	
Excess Margin	**(dB)**	**2.08**	
Fade Margin	**(dB)**	**2.08**	

O3b Network Link Analysis - Tier 1 Service For Pago Pago, American Samoa

Link Budget Creator - Rev 3.2.9: April 15, 2013		Tier 1	Tier 1
Ground Parameter		**Teleport**	**Telco**
Location		Sunset Beach east, United Stat	Pago Pago, American Samoa
Latitude	(°)	21.7	-14.3
Longitude (East)	(°)	202.0	189.3
E/S Maximum Range to SV	(km)	10069.2	8891.9
E/S Minimmum Elevation to SV	(°)	31.2	51.5
E/S Altitude	(km)	0.1	0.0
SV Beam Identifier	(#)	24	
Minutes Into Pass (Sample #5)	(Min)	1:56	
Telco Spot Beam Off-Angle	(°)	0.20	
Telco Spot Beam Diameter	(km)	58.70	
Maximum Roundtrip Latency	(msec)	126.49	
Modulation Parameters		**Forward**	**Return**
Enter Receiver	Type		DVB-S2
Modem Overhead	(%)		4.3%
Number of Carriers per Channel	(#)		1
Available Bandwidth	(Hz)		216,000,000
Channel Symbol Rate	(sps)		180,000,000
Channel Modulation Type			QPSK
Channel FEC Rate			0.25
Channel Spectral Efficiency	(bits/Sym)		0.50
Channel Throughput (100% / 100% of Full Rate)	(bps)		86,143,861.55
Uplink		**Forward**	**Return**
E/S Tx Channels per HPA	(#)		2
E/S Tx Carrier Frequency	(MHz)		28,709
E/S Tx HPA Power Level	(W)		500
E/S Tx OBO	(dB)		-4.00
E/S Tx Post-HPA Losses	(dB)		-2.24
E/S Tx Antenna Gain (7.3 m / 7.3 m)	(dB)		65.03
E/S Tx EIRP Per Channel	(dBW)		82.77
E/S Tx Pointing Loss	(dB)		-0.50
E/S Tx RF Link Availability	(%)		99.800
E/S Tx Atmospheric Losses	(dB)		-31.31
E/S Tx Spreading Loss	(dB)		-149.97
Satellite		**Forward**	**Return**
SV Number of Channels per HPA	(#)		5
SV Rx G/T	(dB/K)		4.12
SV Rx Power Per Tier	(dBW)		-145.51
SV Rx Flux Density Per Tier	(dBW/m^2)		-99.01
SV Tx OBO (ALC / ALC)	(dB)		-5.80
SV Tx Post-TWTA Losses	(dB)		-1.50
SV Tx Antenna Gain	(dBi)		31.77
SV Tx EIRP Per Channel/Carrier	(dBW)		35.61
SV Tx Pointing Loss	(dB)		0.00
Downlink		**Forward**	**Return**
E/S Rx Carrier Frequency	(MHz)		18,909
E/S Rx Spreading Loss	(dB)		-151.05
E/S Rx RF Link Availability	(%)		99.830
E/S Rx Atmospheric Losses	(dB)		-13.47
E/S Rx Pointing Loss	(dB)		-0.50
E/S Rx Antenna Gain (7.3 m / 7.3 m)	(dBi)		62.24
E/S Rx Effective G/T	(dB/K)		36.08
E/S Rx Power Per Channel	(dBW)		-114.17
E/S Rx Flux Density Per Channel	(dBW/m^2)		-129.42
Total Link		**Forward**	**Return**
Carrier / Noise Bandwidth	(dB)		82.55
Carrier / Noise Uplink	(dB)		0.54
Carrier / Noise Downlink	(dB)		5.72
Carrier / Intermodulation Im (C/Im)	(dB)		22.89
(C/N) - Total Actual	(dB)		-0.70
(C/N) - Total Required	(dB)		-2.20
(E_b/N_o) - Total Actual	(dB)		2.31
(E_b/N_o) - Total Required	(dB)		0.81
Excess Margin	**(dB)**		**1.50**
Fade Margin	**(dB)**		**1.50**

CERTIFICATION OF PERSON RESPONSIBLE FOR PREPARING

ENGINEERING INFORMATION

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this application, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this application and that it is complete and accurate to the best of my knowledge and belief.

/s/ 19-09-2013

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Radiation Hazard Study

The following pages provide the radiation hazard study results for the ASTCA Gateway Earth Station Antennas, manufactured by ViaSat.

Analysis of Non-Ionizing Radiation for a 7.3-Meter Earth Station System

This report analyzes the non-ionizing radiation levels for a 7.3-meter earth station system. The analysis and calculations performed in this report comply with the methods described in the FCC Office of Engineering and Technology Bulletin, No. 65 first published in 1985 and revised in 1997 in Edition 97-01. The radiation safety limits used in the analysis are in conformance with the FCC R&O 96-326. Bulletin No. 65 and the FCC R&O specifies that there are two separate tiers of exposure limits that are dependant on the situation in which the exposure takes place and/or the status of the individuals who are subject to the exposure. The Maximum Permissible Exposure (MPE) limits for persons in a General Population/Uncontrolled environment are shown in Table 1. The General Population/Uncontrolled MPE is a function of transmit frequency and is for an exposure period of thirty minutes or less. The MPE limits for persons in an Occupational/Controlled environment are shown in Table 2. The Occupational MPE is a function of transmit frequency and is for an exposure period of six minutes or less. The purpose of the analysis described in this report is to determine the power flux density levels of the earth station in the far-field, near-field, transition region, between the subreflector or feed and main reflector surface, at the main reflector surface, and between the antenna edge and the ground and to compare these levels to the specified MPEs.

Table 1. Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Power Density (mW/cm^2)
30-300	0.2
300-1500	Frequency (MHz)*(0.8/1200)
1500-100,000	1.0

Table 2. Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Power Density (mW/cm^2)
30-300	1.0
300-1500	Frequency (MHz)*(4.0/1200)
1500-100,000	5.0

Table 3. Formulas and Parameters Used for Determining Power Flux Densities

Parameter	Symbol	Formula	Value	Units
Antenna Diameter	D	Input	7.3	m
Antenna Surface Area	$A_{surface}$	$\pi D^2 / 4$	41.85	m^2
Feed Flange Diameter	D_{fa}	Input	61.0	cm
Area of Feed Flange	A_{fa}	$\pi D_{fa}^2/4$	2922.47	cm^2
Frequency	F	Input	29089	MHz
Wavelength	λ	300 / F	0.010313	m
Transmit Power	P	Input	500.00	W
Antenna Gain (dBi)	G_{es}	Input	65.0	dBi
Antenna Gain (factor)	G	$10^{Ges/10}$	3162277.7	n/a
Pi	π	Constant	3.1415927	n/a
Antenna Efficiency	η	$G\lambda^2/(\pi^2D^2)$	0.64	n/a

1. Far Field Distance Calculation

The distance to the beginning of the far field can be determined from the following equation:

Distance to the Far Field Region

$$R_{ff} = 0.60\ D^2 / \lambda = 3100.3\ m \quad (1)$$

The maximum main beam power density in the far field can be determined from the following equation:

On-Axis Power Density in the Far Field

$$S_{ff} = G\ P / (4\ \pi\ R_{ff}^2) = 13.090\ W/m^2 = 1.309\ mW/cm^2 \quad (2)$$

2. Near Field Calculation

Power flux density is considered to be at a maximum value throughout the entire length of the defined Near Field region. The region is contained within a cylindrical volume having the same diameter as the antenna. Past the boundary of the Near Field region, the power density from the antenna decreases linearly with respect to increasing distance.

The distance to the end of the Near Field can be determined from the following equation:

Extent of the Near Field

$$R_{nf} = D^2 / (4\ \lambda) = 1291.8\ m \quad (3)$$

The maximum power density in the Near Field can be determined from the following equation:

Near Field Power Density

$$S_{nf} = 16.0\ \eta\ P / (\pi\ D^2) = 30.559\ W/m^2 = 3.056\ mW/cm^2 \quad (4)$$

3. Transition Region Calculation

The Transition region is located between the Near and Far Field regions. The power density begins to decrease linearly with increasing distance in the Transition region. While the power density decreases inversely with distance in the Transition region, the power density decreases inversely with the square of the distance in the Far Field region. The maximum power density in the Transition region will not exceed that calculated for the Near Field region. The power density calculated in Section 1 is the highest power density the antenna can produce in any of the regions away from the antenna. The power density at a distance R_t can be determined from the following equation:

Transition Region Power Density

$$S_t = S_{nf}\ R_{nf} / R_t = 3.056\ mW/cm^2 \quad (5)$$

4. Region between the Feed Assembly and the Antenna Reflector

Transmissions from the feed assembly are directed toward the antenna reflector surface, and are confined within a conical shape defined by the type of feed assembly. The most common feed assemblies are waveguide flanges, horns or subreflectors. The energy between the feed assembly and reflector surface can be calculated by determining the power density at the feed assembly surface. This can be determined from the following equation:

Power Density at the Feed Flange

$$S_{fa} = 4000\ P / A_{fa} = 684.353\ mW/cm^2 \quad (6)$$

5. Main Reflector Region

The power density in the main reflector is determined in the same manner as the power density at the feed assembly. The area is now the area of the reflector aperture and can be determined from the following equation:

Power Density at the Reflector Surface

$$S_{surface} = 4\ P / A_{surface} = 47.785\ W/m^2 = 4.779\ mW/cm^2 \quad (7)$$

6. Region between the Reflector and the Ground

Assuming uniform illumination of the reflector surface, the power density between the antenna and the ground can be determined from the following equation:

Power Density between Reflector and Ground

$$S_g = P / A_{surface} = 11.946\ W/m^2 = 1.195\ mW/cm^2 \quad (8)$$

7. Summary of Calculations

Table 4. Summary of Expected Radiation levels for Uncontrolled Environment

Region	Calculated Maximum Radiation Power Density Level (mW/cm^2)		Hazard Assessment
1. Far Field (R_{ff} = 3100.3 m)	S_{ff}	1.309	Potential Hazard
2. Near Field (R_{nf} = 1291.8 m)	S_{nf}	3.056	Potential Hazard
3. Transition Region ($R_{nf} < R_t < R_{ff}$)	S_t	3.056	Potential Hazard
4. Between Feed Assembly and Antenna Reflector	S_{fa}	684.353	Potential Hazard
5. Main Reflector	$S_{surface}$	4.779	Potential Hazard
6. Between Reflector and Ground	S_g	1.195	Potential Hazard

Table 5. Summary of Expected Radiation levels for Controlled Environment

Region	Calculated Maximum Radiation Power Density Level (mW/cm^2)		Hazard Assessment
1. Far Field (R_{ff} = 3100.3 m)	S_{ff}	1.309	Satisfies FCC MPE
2. Near Field (R_{nf} = 1291.8 m)	S_{nf}	3.056	Satisfies FCC MPE
3. Transition Region ($R_{nf} < R_t < R_{ff}$)	S_t	3.056	Satisfies FCC MPE
4. Between Feed Assembly and Antenna Reflector	S_{fa}	684.353	Potential Hazard
5. Main Reflector	$S_{surface}$	4.779	Satisfies FCC MPE
6. Between Reflector and Ground	S_g	1.195	Satisfies FCC MPE

It is the applicant's responsibility to ensure that the public and operational personnel are not exposed to harmful levels of radiation.

8. Conclusions

Based on the above analysis it is concluded that the FCC MPE guidelines have been exceeded (or met) in the regions of Table 4 and 5. The applicant proposes to comply with the MPE limits by one or more of the following methods.

The ASTCA earth station will be enclosed in a fence designed to control access to the antenna area for RF safety, physical safety and security purposes. The size of the enclosed area will consider the RF hazards, moving antenna swept volume and the surrounding terrain. In addition to fencing, the area will contain signage which clearly states the standard Radiation Hazard warning.

The earth station's operational staff will not have access to the areas that exceed the MPE levels while the earth station is in operation.

The transmitters will be turned off during antenna maintenance

The applicant agrees to abide by the conditions specified in Condition 5208 provided below:

> *Condition 5208 - The licensee shall take all necessary measures to ensure that the antenna does not create potential exposure of humans to radiofrequency radiation in excess of the FCC exposure limits defined in 47 CFR 1.1307(b) and 1.1310 wherever such exposures might occur. Measures must be taken to ensure compliance with limits for both occupational/controlled exposure and for general population/uncontrolled exposure, as defined in these rule sections. Compliance can be accomplished in most cases by appropriate restrictions such as fencing. Requirements for restrictions can be determined by predictions based on calculations, modeling or by field measurements. The FCC's OET Bulletin 65 (available on-line at www.fcc.gov/oet/rfsafety) provides information on predicting exposure levels and on methods for ensuring compliance, including the use of warning and alerting signs and protective equipment for worker.*

I HEREBY CERTIFY THAT I AM THE TECHNICALLY QUALIFIED PERSON RESPONSIBLE FOR THE PREPARATION OF THE RADIATION HAZARD REPORT, AND THAT IT IS COMPLETE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

BY: _ 

Gary K. Edwards
Senior Manager
COMSEARCH
19700 Janelia Farm Boulevard
Ashburn, VA 20147

DATED: July 26, 2013

Frequency Coordination Reports

The following pages provide the frequency coordination reports for the 18 and 28 GHz frequencies on which the ASTCA Gateway Earth Station will operate.

Ka-Band Earth Station – Taputimu, AS

Frequency Coordination Report

28 GHz

Prepared on Behalf of
American Samoa
Telecommunications
Authority

February 25, 2014

COMSEARCH
A CommScope Company

Table of Contents

1. Summary of Results

On behalf of the American Samoa Telecommunications Authority's proposed earth station in Taputimu, AS, transmitting at 28 GHz[1], Comsearch performed a prior coordination for all existing and proposed terrestrial licenses within the station's coordination contours. The earth station coordination was finalized on September 6, 2013.

No active licensees were found within the coordination contours of the Ka-Band station and therefore, no coordination notifications to any incumbent 28 GHz systems were required.

2. 28 GHz Common Carrier and LTTS Coordination

28 GHz common carrier fixed microwave licensees are authorized to operate temporary fixed operations from 27.5 – 29.5 GHz on a statewide or nationwide basis. In accordance with FCC Rules and Regulations, the proposed Ka-Band earth station in Taputimu, AS was prior coordinated by Comsearch. No licensees were found within the coordination contours of the earth station.

Licensee	Authorized Geographic Area
-- No Common Carrier licensees found --	

Similiarly, 28 GHz local television transmission licensees are authorized to operate temporary fixed operations from 27.5 – 29.5 GHz on a nationwide basis, but this is limited to the continental United States. Therefore, no LTTS coordination was needed.

Licensee	Authorized Geographic Area
-- No LTTS licensees found --	

[1] The proposed earth station will operate in the 27.6 – 29.1 GHz portion of the Ka-Band.

3. 28 GHz LMDS Coordination

The proposed earth station will operate on frequencies that overlap Block A of 28 GHz LMDS services. The total frequency allocation for Block A of the LMDS spectrum appears below.

Block A: 27.500-28.350 GHz
29.100-29.250 GHz
31.075-31.225 GHz

Licensee	Market	Market Name	Status	Expiration Date
American Pacific Inc.	BTA492	American Samoa	Expired	7/1/2008

No active LMDS services were found within the coordination contour of the earth station.

4. Earth Station Coordination Data

This section presents the data pertinent to the proposed Ka-Band earth station in Taputimu, AS.

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 http://www.comsearch.com

Date:	08/23/2013
Job Number:	<PCNJobCode>

Administrative Information

Status	ENGINEER PROPOSAL
Call Sign	<PCNCallSign>
Licensee Code	AMSATA
Licensee Name	American Samoa Telecommunications Authority

Site Information — TAPUTIMU, AS

Venue Name	
Latitude (NAD 83)	14° 19' 47.3" S
Longitude (NAD 83)	170° 43' 12.9" W
Climate Zone	C
Rain Zone	4
Ground Elevation (AMSL)	14.0 m / 45.9 ft

Link Information

Satellite Type	Medium Earth Orbit
Mode	TR - Transmit-Receive
Modulation	Digital
Minimum Elevation Angle	5.1°
Azimuth Range	0.0° to 360°
Antenna Centerline (AGL)	3.66 m / 12.0 ft

Antenna Information

	Receive - FCC32	Transmit - FCC32
Manufacturer	ViaSat	ViaSat
Model	8073	8073
Gain / Diameter	61.2 dBi / 7.3 m	65.0 dBi / 7.3 m
3-dB / 15-dB Beamwidth	0.02° / 0.04°	0.01° / 0.02°
Max Available RF Power (dBW/4 kHz)		5.0
Max Available RF Power (dBW/MHz)		29.0
Maximum EIRP (dBW/4 kHz)		70.0
Maximum EIRP (dBW/MHz)		94.0
Interference Objectives: Long Term	-156.0 dBW/MHz 20%	-151.0 dBW/4 kHz 20%
Short Term	-146.0 dBW/MHz 0.01%	-128.0 dBW/4 kHz 0.0025%

Frequency Information

	Receive 18.0 GHz	Transmit 28.0 GHz
Emission / Frequency Range (MHz)	24K0G7D - 720MG7D / 17852.0 - 18068.0	24K0G7D - 720MG7D / 27652.0 - 27868.0
	24K0G7D - 720MG7D / 18112.0 - 18328.0	24K0G7D - 720MG7D / 27912.0 - 28128.0
	24K0G7D - 720MG7D / 18372.0 - 18588.0	24K0G7D - 720MG7D / 28172.0 - 28388.0
	24K0G7D - 720MG7D / 18801.0 - 19017.0	24K0G7D - 720MG7D / 28601.0 - 28817.0
	24K0G7D - 720MG7D / 19055.0 - 19271.0	24K0G7D - 720MG7D / 28855.0 - 29071.0
	24K0G7D - 720MG7D / 19296.6 - 19299.6	24K0G7D - 720MG7D / 29088.5
Max Great Circle Coordination Distance	338.1 km / 210.1 mi	319.3 km / 198.4 mi
Precipitation Scatter Contour Radius	100.0 km / 62.1 mi	148.7 km / 92.4 mi

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 http://www.comsearch.com

Coordination Values	**TAPUTIMU, AS**			
Licensee Name	American Samoa Telecommunications Auth.			
Latitude (NAD 83)	14° 19' 47.3" S			
Longitude (NAD 83)	170° 43' 12.9" W			
Ground Elevation (AMSL)	14.0 m / 45.9 ft			
Antenna Centerline (AGL)	3.66 m / 12.0 ft			
Antenna Model	ViaSat 7.3 Meter			
Antenna Mode	Receive 18.0 GHz		Transmit 28.0 GHz	
Interference Objectives: Long Term	-156.0 dBW/MHz	20%	-151.0 dBW/4 kHz	20%
Short Term	-146.0 dBW/MHz	0.01%	-128.0 dBW/4 kHz	0.0025%
Max Available RF Power			5.0 (dBW/4 kHz)	

			Receive 18.0 GHz		Transmit 28.0 GHz	
Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	102.31	-10.00	193.90	-10.00	191.60
5	0.00	101.54	-10.00	193.90	-10.00	191.60
10	0.00	100.69	-10.00	193.90	-10.00	191.60
15	0.00	99.76	-10.00	193.90	-10.00	191.60
20	0.00	98.75	-10.00	193.90	-10.00	191.60
25	0.00	97.69	-10.00	193.90	-10.00	191.60
30	0.00	96.56	-10.00	193.90	-10.00	191.60
35	0.00	95.39	-10.00	193.90	-10.00	191.60
40	0.00	94.18	-9.49	196.70	-9.49	193.80
45	0.00	92.94	-8.32	202.90	-8.32	198.50
50	0.00	91.67	-6.99	210.10	-6.99	204.30
55	0.00	90.40	-5.47	218.40	-5.47	211.00
60	0.00	89.12	-3.69	228.10	-3.69	219.00
65	0.00	87.85	-1.54	239.00	-1.54	228.70
70	0.00	86.60	1.14	254.50	1.14	241.30
75	0.00	85.37	4.59	275.50	4.59	257.70
80	0.00	84.17	9.18	305.20	9.18	280.10
85	0.00	83.01	13.91	338.10	13.91	319.30
90	0.00	81.91	12.12	325.40	12.12	293.90
95	0.00	80.86	7.01	290.90	7.01	269.40
100	0.00	79.88	2.96	265.40	2.96	249.90
105	0.00	78.98	-0.12	247.20	-0.12	235.30
110	0.00	78.16	-2.55	233.40	-2.55	224.10
115	0.00	77.43	-4.56	223.30	-4.56	215.00
120	0.00	76.79	-6.27	214.00	-6.27	207.50
125	0.00	76.25	-7.74	206.00	-7.74	201.00
130	0.00	75.82	-9.05	199.00	-9.05	195.70
135	0.00	75.50	-10.00	193.90	-10.00	191.60
140	0.00	75.30	-10.00	193.90	-10.00	191.60
145	0.00	75.20	-10.00	193.90	-10.00	191.60
150	0.00	75.22	-10.00	193.90	-10.00	191.60
155	0.00	75.36	-10.00	193.90	-10.00	191.60
160	0.00	75.61	-10.00	193.90	-10.00	191.60
165	0.00	75.97	-10.00	193.90	-10.00	191.60
170	0.00	76.44	-10.00	193.90	-10.00	191.60
175	0.00	77.02	-10.00	193.90	-10.00	191.60
180	0.00	77.69	-10.00	193.90	-10.00	191.60
185	0.00	78.46	-10.00	193.90	-10.00	191.60

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5662 http://www.comsearch.com

Coordination Values	**TAPUTIMU, AS**			
Licensee Name	American Samoa Telecommunications Auth.			
Latitude (NAD 83)	14° 19' 47.3" S			
Longitude (NAD 83)	170° 43' 12.9" W			
Ground Elevation (AMSL)	14.0 m / 45.9 ft			
Antenna Centerline (AGL)	3.66 m / 12.0 ft			
Antenna Model	ViaSat 7.3 Meter			
Antenna Mode	Receive 18.0 GHz		Transmit 28.0 GHz	
Interference Objectives: Long Term	-156.0 dBW/MHz	20%	-151.0 dBW/4 kHz	20%
Short Term	-146.0 dBW/MHz	0.01%	-128.0 dBW/4 kHz	0.0025%
Max Available RF Power			5.0 (dBW/4 kHz)	

			Receive 18.0 GHz		Transmit 28.0 GHz	
Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	79.31	-10.00	193.90	-10.00	191.60
195	0.00	80.24	-10.00	193.90	-10.00	191.60
200	0.00	81.25	-10.00	193.90	-10.00	191.60
205	0.00	82.31	-10.00	193.90	-10.00	191.60
210	0.00	83.44	-10.00	193.90	-10.00	191.60
215	0.00	84.61	-10.00	193.90	-10.00	191.60
220	0.00	85.82	-10.00	193.90	-10.00	191.60
225	0.00	87.06	-10.00	193.90	-10.00	191.60
230	0.00	88.33	-9.09	198.80	-9.09	195.50
235	0.00	89.60	-7.80	205.70	-7.80	200.70
240	0.00	90.88	-6.34	213.70	-6.34	207.10
245	0.00	92.15	-4.65	222.80	-4.65	214.60
250	0.00	93.40	-2.67	232.70	-2.67	223.60
255	0.00	94.63	-0.28	246.20	-0.28	234.60
260	0.00	95.83	2.72	263.90	2.72	248.80
265	0.00	96.99	6.58	288.10	6.58	267.30
270	0.00	98.09	11.23	319.20	11.23	289.40
275	0.00	99.14	12.93	331.10	12.93	309.60
280	0.00	100.12	8.86	303.10	8.86	278.50
285	0.00	101.02	4.51	275.00	4.51	257.30
290	0.00	101.84	1.12	254.40	1.12	241.20
295	0.00	102.57	-1.54	239.00	-1.54	228.70
300	0.00	103.21	-3.69	228.10	-3.69	219.00
305	0.00	103.75	-5.47	218.40	-5.47	211.00
310	0.00	104.18	-6.99	210.10	-6.99	204.40
315	0.00	104.50	-8.32	202.90	-8.32	198.50
320	0.00	104.70	-9.49	196.70	-9.49	193.80
325	0.00	104.80	-10.00	193.90	-10.00	191.60
330	0.00	104.78	-10.00	193.90	-10.00	191.60
335	0.00	104.64	-10.00	193.90	-10.00	191.60
340	0.00	104.39	-10.00	193.90	-10.00	191.60
345	0.00	104.03	-10.00	193.90	-10.00	191.60
350	0.00	103.56	-10.00	193.90	-10.00	191.60
355	0.00	102.98	-10.00	193.90	-10.00	191.60

5. Contact Information

For questions or information regarding the 28 GHz Frequency Coordination Report, please contact:

Contact person:	Joanna Lynch
Title:	Manager, Spectrum & Data Solutions
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5711
Fax:	703-726-5599
Email:	jlynch@comsearch.com
Web site:	www.comsearch.com

INTERFERENCE ANALYSIS REPORT

Prepared for
American Samoa Telecommunications Auth.
TAPUTIMU, American Samoa
(18 GHz)
Satellite Earth Station

Prepared By:
COMSEARCH
19700 Janelia Farm Boulevard
Ashburn, VA 20147
February 25, 2014

TABLE OF CONTENTS

1. CONCLUSIONS

An interference study considering all existing, proposed and prior coordinated microwave facilities within the coordination contours of the proposed earth station demonstrates that this site will operate satisfactorily with the 18 GHz common carrier microwave environment. Further, there will be no restrictions of its operation due to interference considerations.

2. SUMMARY OF RESULTS

No great circle interference cases were identified within the coordination contours of the proposed earth station. The study indicated that there are no terrestrial microwave paths operating in the proposed receive band of this earth station site.

3. SUPPLEMENTAL SHOWING

Pursuant to Part 25.203(c) of the FCC Rules and Regulations, the satellite earth station proposed in this application was coordinated by Comsearch using computer techniques and in accordance with Part 25 of the FCC Rules and Regulations.

Coordination data for this earth station was sent to the below listed 18 GHz carriers with a letter dated 09/05/2013.

Company
Comsearch

4. EARTH STATION COORDINATION DATA

This section presents the data pertinent to frequency coordination of the proposed earth station that was circulated to all 18 GHz carriers within its coordination contours.

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5500 http://www.comsearch.com

Date:	09/09/2013
Job Number:	130905COMSGE01

Administrative Information

Status	ENGINEER PROPOSAL
Call Sign	
Licensee Code	AMSATA
Licensee Name	American Samoa Telecommunications Auth.

Site Information — TAPUTIMU, American Samoa

Venue Name	
Latitude (NAD 83)	14° 19' 47.3" S
Longitude (NAD 83)	170° 43' 12.9" W
Climate Zone	C
Rain Zone	4
Ground Elevation (AMSL)	14.0 m / 45.9 ft

Link Information

Satellite Type	Medium Earth Orbit
Mode	TR - Transmit-Receive
Modulation	Digital
Minimum Elevation Angle	5.1°
Azimuth Range	0.0° to 360°
Antenna Centerline (AGL)	3.66 m / 12.0 ft

Antenna Information		Receive - FCC32		Transmit - FCC32	
Manufacturer		ViaSat		ViaSat	
Model		8073		8073	
Gain / Diameter		61.2 dBi / 7.3 m		65.0 dBi / 7.3 m	
3-dB / 15-dB Beamwidth		0.02° / 0.04°		0.01° / 0.02°	
Max Available RF Power	(dBW/4 kHz)			5.0	
	(dBW/MHz)			29.0	
Maximum EIRP	(dBW/4 kHz)			70.0	
	(dBW/MHz)			94.0	
Interference Objectives:	Long Term	-156.0 dBW/MHz	20%	-151.0 dBW/4 kHz	20%
	Short Term	-146.0 dBW/MHz	0.01%	-128.0 dBW/4 kHz	0.0025%

Frequency Information	Receive 18.0 GHz	Transmit 28.0 GHz
Emission / Frequency Range (MHz)	24K0G7D - 720MG7D / 17852.0 - 18068.0	24K0G7D - 720MG7D / 27652.0 - 27868.0
	24K0G7D - 720MG7D / 18112.0 - 18328.0	24K0G7D - 720MG7D / 27912.0 - 28128.0
	24K0G7D - 720MG7D / 18372.0 - 18588.0	24K0G7D - 720MG7D / 28172.0 - 28388.0
	24K0G7D - 720MG7D / 18801.0 - 19017.0	24K0G7D - 720MG7D / 28601.0 - 28817.0
	24K0G7D - 720MG7D / 19055.0 - 19271.0	24K0G7D - 720MG7D / 28855.0 - 29071.0
	24K0G7D - 720MG7D / 19296.6 - 19299.6	24K0G7D - 720MG7D / 29088.5
Max Great Circle Coordination Distance	338.1 km / 210.1 mi	319.3 km / 198.4 mi
Precipitation Scatter Contour Radius	100.0 km / 62.1 mi	148.7 km / 92.4 mi

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5500 http://www.comsearch.com

Coordination Values	**TAPUTIMU, AS**			
Licensee Name	American Samoa Telecommunications Auth.			
Latitude (NAD 83)	14° 19' 47.3" S			
Longitude (NAD 83)	170° 43' 12.9" W			
Ground Elevation (AMSL)	14.0 m / 45.9 ft			
Antenna Centerline (AGL)	3.66 m / 12.0 ft			
Antenna Model	ViaSat 7.3 Meter			
Antenna Mode	Receive 18.0 GHz		Transmit 28.0 GHz	
Interference Objectives: Long Term	-156.0 dBW/MHz	20%	-151.0 dBW/4 kHz	20%
Short Term	-146.0 dBW/MHz	0.01%	-128.0 dBW/4 kHz	0.0025%
Max Available RF Power			5.0 (dBW/4 kHz)	

			Receive 18.0 GHz		Transmit 28.0 GHz	
Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
0	0.00	102.31	-10.00	193.90	-10.00	191.60
5	0.00	101.54	-10.00	193.90	-10.00	191.60
10	0.00	100.69	-10.00	193.90	-10.00	191.60
15	0.00	99.76	-10.00	193.90	-10.00	191.60
20	0.00	98.75	-10.00	193.90	-10.00	191.60
25	0.00	97.69	-10.00	193.90	-10.00	191.60
30	0.00	96.56	-10.00	193.90	-10.00	191.60
35	0.00	95.39	-10.00	193.90	-10.00	191.60
40	0.00	94.18	-9.49	196.70	-9.49	193.80
45	0.00	92.94	-8.32	202.90	-8.32	198.50
50	0.00	91.67	-6.99	210.10	-6.99	204.30
55	0.00	90.40	-5.47	218.40	-5.47	211.00
60	0.00	89.12	-3.69	228.10	-3.69	219.00
65	0.00	87.85	-1.54	239.00	-1.54	228.70
70	0.00	86.60	1.14	254.50	1.14	241.30
75	0.00	85.37	4.59	275.50	4.59	257.70
80	0.00	84.17	9.18	305.20	9.18	280.10
85	0.00	83.01	13.91	338.10	13.91	319.30
90	0.00	81.91	12.12	325.40	12.12	293.90
95	0.00	80.86	7.01	290.90	7.01	269.40
100	0.00	79.88	2.96	265.40	2.96	249.90
105	0.00	78.98	-0.12	247.20	-0.12	235.30
110	0.00	78.16	-2.55	233.40	-2.55	224.10
115	0.00	77.43	-4.56	223.30	-4.56	215.00
120	0.00	76.79	-6.27	214.00	-6.27	207.50
125	0.00	76.25	-7.74	206.00	-7.74	201.00
130	0.00	75.82	-9.05	199.00	-9.05	195.70
135	0.00	75.50	-10.00	193.90	-10.00	191.60
140	0.00	75.30	-10.00	193.90	-10.00	191.60
145	0.00	75.20	-10.00	193.90	-10.00	191.60
150	0.00	75.22	-10.00	193.90	-10.00	191.60
155	0.00	75.36	-10.00	193.90	-10.00	191.60
160	0.00	75.61	-10.00	193.90	-10.00	191.60
165	0.00	75.97	-10.00	193.90	-10.00	191.60
170	0.00	76.44	-10.00	193.90	-10.00	191.60
175	0.00	77.02	-10.00	193.90	-10.00	191.60
180	0.00	77.69	-10.00	193.90	-10.00	191.60
185	0.00	78.46	-10.00	193.90	-10.00	191.60

COMSEARCH

Earth Station Data Sheet

19700 Janelia Farm Boulevard, Ashburn, VA 20147
(703)726-5500 http://www.comsearch.com

Coordination Values	**TAPUTIMU, AS**			
Licensee Name	American Samoa Telecommunications Auth.			
Latitude (NAD 83)	14° 19' 47.3" S			
Longitude (NAD 83)	170° 43' 12.9" W			
Ground Elevation (AMSL)	14.0 m / 45.9 ft			
Antenna Centerline (AGL)	3.66 m / 12.0 ft			
Antenna Model	ViaSat 7.3 Meter			
Antenna Mode	Receive 18.0 GHz		Transmit 28.0 GHz	
Interference Objectives: Long Term	-156.0 dBW/MHz	20%	-151.0 dBW/4 kHz	20%
Short Term	-146.0 dBW/MHz	0.01%	-128.0 dBW/4 kHz	0.0025%
Max Available RF Power			5.0 (dBW/4 kHz)	

			Receive 18.0 GHz		Transmit 28.0 GHz	
Azimuth (°)	Horizon Elevation (°)	Antenna Discrimination (°)	Horizon Gain (dBi)	Coordination Distance (km)	Horizon Gain (dBi)	Coordination Distance (km)
190	0.00	79.31	-10.00	193.90	-10.00	191.60
195	0.00	80.24	-10.00	193.90	-10.00	191.60
200	0.00	81.25	-10.00	193.90	-10.00	191.60
205	0.00	82.31	-10.00	193.90	-10.00	191.60
210	0.00	83.44	-10.00	193.90	-10.00	191.60
215	0.00	84.61	-10.00	193.90	-10.00	191.60
220	0.00	85.82	-10.00	193.90	-10.00	191.60
225	0.00	87.06	-10.00	193.90	-10.00	191.60
230	0.00	88.33	-9.09	198.80	-9.09	195.50
235	0.00	89.60	-7.80	205.70	-7.80	200.70
240	0.00	90.88	-6.34	213.70	-6.34	207.10
245	0.00	92.15	-4.65	222.80	-4.65	214.60
250	0.00	93.40	-2.67	232.70	-2.67	223.60
255	0.00	94.63	-0.28	246.20	-0.28	234.60
260	0.00	95.83	2.72	263.90	2.72	248.80
265	0.00	96.99	6.58	288.10	6.58	267.30
270	0.00	98.09	11.23	319.20	11.23	289.40
275	0.00	99.14	12.93	331.10	12.93	309.60
280	0.00	100.12	8.86	303.10	8.86	278.50
285	0.00	101.02	4.51	275.00	4.51	257.30
290	0.00	101.84	1.12	254.40	1.12	241.20
295	0.00	102.57	-1.54	239.00	-1.54	228.70
300	0.00	103.21	-3.69	228.10	-3.69	219.00
305	0.00	103.75	-5.47	218.40	-5.47	211.00
310	0.00	104.18	-6.99	210.10	-6.99	204.40
315	0.00	104.50	-8.32	202.90	-8.32	198.50
320	0.00	104.70	-9.49	196.70	-9.49	193.80
325	0.00	104.80	-10.00	193.90	-10.00	191.60
330	0.00	104.78	-10.00	193.90	-10.00	191.60
335	0.00	104.64	-10.00	193.90	-10.00	191.60
340	0.00	104.39	-10.00	193.90	-10.00	191.60
345	0.00	104.03	-10.00	193.90	-10.00	191.60
350	0.00	103.56	-10.00	193.90	-10.00	191.60
355	0.00	102.98	-10.00	193.90	-10.00	191.60

5. CERTIFICATION

I HEREBY CERTIFY THAT I AM THE TECHNICALLY QUALIFIED PERSON RESPONSIBLE FOR THE PREPARATION OF THE FREQUENCY COORDINATION DATA CONTAINED IN THIS APPLICATION, THAT I AM FAMILIAR WITH PARTS 101 AND 25 OF THE FCC RULES AND REGULATIONS, THAT I HAVE EITHER PREPARED OR REVIEWED THE FREQUENCY COORDINATION DATA SUBMITTED WITH THIS APPLICATION, AND THAT IT IS COMPLETE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

BY: 

Gary K. Edwards
Senior Manager
COMSEARCH
19700 Janelia Farm Boulevard
Ashburn, VA 20147

DATED: February 25, 2014