

ANTOD 202

TRANSMISSION PLAN FORM
FORM-1 TELECOMMUNICATION LINK BUDGET

Customer Name:

USA, Hawaii: Honolulu
PC FEC=0.75, RS=No

From
to

USA, Hawaii: Honolulu
VANUATU: Port Vila

A. Satellite Characteristics

Parameter

1. Satellite name	Apstar-VI
2. Orbit location (deg.E)	134.00
3. Transponder number	C08A
4. Transponder gain step	34
4.1 Transponder Attenuation (dB)	15.0
5. Saturation EIRPS (dBw)	35.99
6. SFD (dBw/m ²)	-83.12
7. G/T (dB/k)	-5.02
8. Output backoff (dB)	2.50
9. Input backoff (dB)	5.50
10. Uplink frequency (MHz)	6145.00
11. Downlink frequency (MHz)	3920.00
12. Transponder bandwidth (MHz)	36.00

B. Earth Station Characteristics

1. Transmit Station Information

a. Antenna diameter (m)	13.00
b. Earth Station Location	USA, Hawaii: Honolulu
c. Longitude (deg.E)	-157.86
e. Latitude (deg.N)	21.31
f. Distance to satellite (km)	40395.59
g. Antenna elevation (deg)	11.80
h. Antenna azimuth (deg)	261.75
i. Feed loss (dB)	0.20
j. HPA to Feed waveguide loss (dB)	0.30
k. HPA type (KHPA or TWTA)	TWTA
l. HPA required output power (dBw)	13.04
l' HPA required output power (Watts)	20.16
l'' HPA required output power (Watts) (Including 1dB Backoff)	25.38
m. HPA Max output power (dBw)	16.99
m'' Margin of HPA Output power (dB)	3.95

n. Antenna efficiency (%)	60.00
o. Antenna Gain (dB)	56.23
p. Tracking capability	Manual
q. Antenna type	Fixed

2. Receive

a. Antenna diameter (meter)	4.50
b. E.S.Location	VANUATU: Port Vila
c. Longitude (deg. E)	168.32
d. Latitude (deg. N)	-17.73
e. Distance to satellite (km)	37352.65
f. Antenna elevation (deg)	45.88
g. Antenna azimuth (deg)	293.91
h. Antenna efficiency (%)	65.00
i. Antenna Gain (dB)	43.46
j. Receive system noise temp. (dBK)	19.57
k. System G/T (dB/k)	23.89
l. Tracking capability	Manual
m. Antenna type	Fixed

C. Misc Losses

1. Uplink rain Attn (dB)	1.00
2. Downlink rain Attn (dB)	0.50
3. Uplink path loss (dB)	200.35
4. Downlink path loss (dB)	195.76

D. Carrier Characteristics

1. Carrier type	Digital
2. Modulation technique	16QAM
3. Carrier info. rate (kbps)	10240.00
4. Reed Solomon	No
4.1 FEC Coding	TPC
5. FEC code rate	0.750
6. Carrier transmission rate (kbps)	13653.33
7. Overhead(%)	0.0%
8. Carrier noise bandwidth (kHz)	4096.00
9. Rolloff Factor (%)	35%
10. Carrier allocated bandwidth(kHz)	4808.00
11. Threshold Eb/N0 (dB)	8.20
12. Bit Error Rate Required	1x10e-8

E. Link budget

1. Uplink C/T	
a. Uplink EIRPE (dBw)	68.78
b. Uplink pass loss (dB)	200.35
c. Antenna point error (dB)	0.13
d. Gain of 1m ² antenna (dB/m ²)	37.22
e. Carrier PFD at satellite (dBw/m ²)	-95.48
f. Transponder SFD (dBw/m ²)	-83.12
g. Carrier input backoff (dB)	12.36
h. Satellite G/T (dB/k)	-5.02
i. Uplink C/T (dBw/k)	-137.72
2. Downlink C/T	
a. Saturation EIRPS (dBw)	35.99
b. Carrier output backoff (dB)	9.36
d. Carrier downlink EIRPS (dBw)	26.63
e. Downlink path loss (dB)	195.76
f. Receive antenna point error (dB)	0.13
g. Receive System G/T (dB/k)	23.89
h. Downlink C/T (dBw)	-145.88
3. C/T co-ch. interference (dBw/k)	-136.48
4. C/T IM interference (dBw/k)	-127.48
5. C/T adj. sat. interference (dBw/k)	-136.09
6. C/T and C/N total	
a. C/T total (dBw/k)	-147.30
b. Boltzmann's constant (dBw/k-Hz)	-228.60
c. Receive noise bandwidth (dB-Hz)	66.12
d. C/N total (dB)	15.18
e. Threshold Eb/N0 (dB)	8.20
f. Threshold C/N (dB)	12.18
g. Link margin (dB)	3.00

F. Off-axis emission EIRP density at 30

1. Transmit antenna diameter (m)	13.00
2. Carrier EIRPE (dBw)	68.78

3. Transmit antenna gain (dB)	56.23
4. Power at antenna feed (dBw)	12.74
5. Sidelobe envelope formula	$29-25*\log(q)$
6. Off-axis antenna gain (dB)	17.07
7. Off-axis EIRP density(dBw/4kHz)	-0.29
8. Off-axis EIRP criteria (dBw/4kHz)	$32-25*\log(q)$
9. Off-axis EIRP constraint (dBw/4kHz)	20.07
10. Margin (dB)	20.36

G. Summary

1. Occupied transponder power (dBw)	26.63
2. Percentage occupied transponder power(%)	20.60
3. Percentage occupied bandwidth(%)	13.36
4. Power equivalent bandwidth usage (kHz)	7416.28
5. Occupied bandwidth (kHz)	4808.00
6. Link margin (dB)	3.00
7. Total percentage occupied transponder power (%)	
8. Total percentage occupied bandwidth (%)	
9. Total power equivalent bandwidth usage (kHz)	
10. Total occupied bandwidth (kHz)	

**u (13m) - VANUATU: P
- 5120kbps(16QAM, TP**

VANUATU: Port Vila
USA,Hawaii: Honolulu

Parameter

Apstar-VI

134.00

C08A

34

15.0

38.76

-80.16

-7.98

2.50

5.50

6145.00

3920.00

36.00

4.50

VANUATU: Port Vila

168.32

-17.73

37352.65

45.88

293.91

0.20

0.30

TWTA

14.71

29.60

37.26

16.99

2.28

**A: USA,Hawaii: Honolulu (13m) - VANUATU: P
PC FEC=0.75, RS=No) - 5120kbps(16QAM, TP**

USA,Hawaii: Honolulu VANUATU: Port Vila
VANUATU: Port Vila USA,Hawaii: Honolulu

Parameter

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36.00

13.00

USA,Hawaii: Honolulu VANUATU: Port Vila

-157.86

21.31

40395.59

11.80

261.75

0.20

0.30

TWTA

11.87

15.37

19.35

16.99

5.12

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Apstar-VI

134.00

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15.0

38.76

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-7.98

2.50

5.50

6145.00

3920.00

36.00

4.50

VANUATU: Port Vila

168.32

-17.73

37352.65

45.88

293.91

0.20

0.30

TWTA

13.53

22.56

28.40

16.99

3.46

60.00		60.00	60.00
47.02		56.23	47.02
Manual		Manual	Manual
Fixed		Fixed	Fixed
13.00		4.50	13.00
USA,Hawaii: Honolulu		VANUATU: Port Vila	USA,Hawaii: Honolulu
-157.86		168.32	-157.86
21.31		-17.73	21.31
40395.59		37352.65	40395.59
11.80		45.88	11.80
261.75		293.91	261.75
65.00		65.00	65.00
52.67		43.46	52.67
20.26		19.57	20.26
32.42		23.89	32.42
Manual		Manual	Manual
Fixed		Fixed	Fixed
1.00		1.00	1.00
0.50		0.50	0.50
199.67		200.35	199.67
196.44		195.76	196.44
Digital		Digital	Digital
16QAM		16QAM	16QAM
5120.00		10240.00	5120.00
No		No	No
TPC		TPC	TPC
0.750		0.750	0.750
6826.67		13653.33	6826.67
0.0%		0.0%	0.0%
2048.00		4096.00	2048.00
35%		35%	35%
2419.20		4808.00	2419.20
8.20		8.20	8.20
1x10e-8		1x10e-8	1x10e-8

61.23	67.60	60.05
199.67	200.35	199.67
0.13	0.13	0.13
37.22	37.22	37.22
-102.35	-96.66	-103.53
-80.16	-83.12	-80.16
22.19	13.54	23.37
-7.98	-5.02	-7.98
-147.55	-138.90	-148.73
38.76	35.99	38.76
19.19	10.54	20.37
19.57	25.45	18.39
196.44	195.76	196.44
0.13	0.13	0.13
32.42	23.89	32.42
-145.08	-147.05	-146.26
-139.49	-136.48	-139.49
-139.49	-127.48	-139.49
-126.76	-136.09	-126.76
-150.31	-148.30	-151.31
-228.60	-228.60	-228.60
63.11	66.12	63.11
15.18	14.18	14.18
8.20	8.20	8.20
12.18	12.18	12.18
3.00	2.00	2.00
4.50	13.00	4.50
61.23	67.60	60.05

47.02
14.41
29-25*log(q)
17.07
4.39
32-25*log(q)
20.07
15.68

56.23
11.57
29-25*log(q)
17.07
-1.46
32-25*log(q)
20.07
21.54

47.02
13.23
29-25*log(q)
17.07
3.21
32-25*log(q)
20.07
16.86

19.57
2.14
6.72
771.87
2419.20
3.00
22.74
20.08
8188.15
7227.20

25.45
15.71
13.36
5654.58
4808.00
2.00

18.39
1.63
6.72
588.34
2419.20
2.00
17.34
20.08
6242.92
7227.20