

Douglas Young

From: Paul Moller [moller@itccom.net]
Sent: Monday, March 13, 2006 4:06 AM
To: Shahnaz Ghavami
Cc: Scott Kotler; Douglas Young
Subject: Follow up (2) to Questions Regarding Form 442 File Number: 0019-EX-ML-2006

Please see attached memo.

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March 13, 2006

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**Follow up (2) to Questions Regarding
Form 442 File Number: 0019-EX-ML-2006**

Shahnaz,

The attached is the additional information that was requested in support of our application and recent telephone conversations.

1. Link Budgets

The attached file, **Link_83_V01pm**, provides a link budget for the following:

Non-Spread Spectrum Carrier

Bit rate 2048 kbps

Occupied bandwidth = **2458** kHz

Low availability link – used for experimentation purposes

Power into Antenna = **7** dBW or **5** Watts

PSD into antenna = -57 dBW/Hz or **-21** dBW/4kHz

EIRP = **38.5** dBW

For vertical polarization transmission, the azimuth PSD plots provided previously show 1.4 dB of margin to comply with off axis emissions, thus a PSD into the antenna of -20.6 dBW/4kHz would meet the off axis emissions.

We request to operate this carrier at -21 dBW/4kHz into the antenna for vertical polarization between 14.0-14.5 GHz.

The attached file, **Link_84_V01pm**, provides a link budget for the following:

16x Spread Spectrum Carrier

Bit rate 384 kbps

Occupied bandwidth = **8602 kHz**

High availability including rain and link margins

Power into Antenna = **4 dBW** or **2 Watts**

PSD into antenna = -65 dBW/Hz or **-30 dBW/4kHz**

EIRP = **35 dBW**

We request to operate this carrier at -30 dBW/4kHz into the antenna for either vertical or horizontal polarization between 14.0-14.5 GHz.

2. Desired Satellites of Operation

Our current planned satellites of operation are AMC-2, AMC-5, IA-7 and IA-8. We have a signed carrier affidavit for AMC-2 while the others are in process.

Please feel free to contact me should there be additional questions.

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Digital Link Budget

Intellicom Technologies (www.ITCcom.net)

Monday, March 13, 2006

Service Name	Link 83
Coverage	CONUS, Non-Spread,Turbo Code, no margins
Uplink earth station	L3,SimiValley,CA, Intellicom Data
Downlink earth station	Torrey Pines,CA, Intellicom Data
Satellite name	AMC 2

Link Input Parameters

	Up	Down	Units
Site latitude	34.28N	32.90N	degrees
Site longitude	118.80W	117.23W	degrees
Site altitude	0	0	km
Frequency	14.250	11.950	GHz
Polarization	Vertical	Horizontal	
Rain model	ITU (0.0)	ITU (0.0)	(mm/h or zone)
Availability (average year)	95	95	%
Antenna aperture	.46	3.8	metres
Antenna efficiency / gain	+31.5	+53.2	% (+ prefix dBi)
Coupling loss	0	.5	dB
Antenna tracking / mispoint error	0.1	0.1	dB
LNB noise figure / temp		+50	dB (+ prefix K)
Antenna noise		45	K
Adjacent carrier interference	30	30	dB
Adjacent satellite interference	30	30	dB
Cross polarization interference	30	30	dB
Uplink station HPA output back-off	2		dB
Number of carriers / HPA	1		
HPA C/IM (up)	50		dB
Uplink power control	0		dB
Uplink filter truncation loss	0		dB
Required HPA power capability	MIN		W

Satellite Input Parameters

	Value	Units
Satellite longitude	85.00W	degrees
Transponder type	TWTA	
Receive G/T	6.	dB/K
Saturation flux density	-98.3	dBW/m2
Satellite attenuator pad	0	dB
Satellite ALC	0	dB
EIRP (saturation)	48.21	dBW
Transponder bandwidth	36	MHz
Input back off total	7	dB
Output back off total	4	dB
Intermodulation interference	16.5	dB
Number of transponder carriers	AUTO	

Carrier/Link Input Parameters

	Value	Units
Modulation	4-PSK	
Required bit error rate performance	10^-4	
Required Eb/No without FEC coding	8.40	dB
Required Eb/No with FEC coding	2.2	dB
Information rate	2.048	Mbps
Overhead	0	%
FEC code rate	0.5	
Spreading gain	0	dB
Reed Solomon code	1	
(1 + Roll off factor)	1.2	
Carrier spacing factor	1.4	
Bandwidth allocation step size	.01	MHz
System margin	0	dB

Calculations at Saturation	Value	Units		
Gain 1m^2	44.53	dB/m2		
Uplink C/No	91.77	dB.Hz		
Downlink C/No	102.81	dB.Hz		
Total C/No	91.44	dB.Hz		
Uplink EIRP for saturation	64.62	dBW		
General Calculations	Up	Down	Units	
Elevation	36.38	38.46	degrees	
True azimuth	130.08	130.75	degrees	
Compass bearing	116.50	117.78	degrees	
Path distance to satellite	38066.14	37899.00	km	
Propagation time delay	0.126975	0.126417	seconds	
Antenna efficiency	29.94	92.27	%	
Antenna gain	31.50	53.20	dBi	
Availability (average year)	95	95	%	
Link downtime (average year)	438.300	438.300	hours	
Availability (worst month)	88.439	88.439	%	
Link downtime (worst month)	84.456	84.456	hours	
Spectral power density	-56.89	-38.81	dBW/Hz	
Uplink Calculation	Clear	Rain Up	Rain Dn	Units
Uplink transmit EIRP	38.51	38.51	38.51	dBW
Transponder input back-off (total)	7.00	7.00	7.00	dB
Input back-off per carrier	26.11	26.11	26.11	dB
Mispoint loss	0.10	0.10	0.10	dB
Free space loss	207.13	207.13	207.13	dB
Atmospheric absorption	0.11	0.11	0.11	dB
Tropospheric scintillation fading	0.11	0.11	0.11	dB
Atmospheric losses total	0.22	0.22	0.22	dB
Total path loss (excluding rain)	207.36	207.36	207.36	dB
Rain attenuation	0.00	0.00	0.00	dB
Uplink power control	0.00	0.00	0.00	dB
Uncompensated rain fade	0.00	0.00	0.00	dB
C/No (thermal)	65.66	65.66	65.66	dB.Hz
C/N (thermal)	1.75	1.75	1.75	dB
C/ACI	30.00	30.00	30.00	dB
C/ASI	30.00	30.00	30.00	dB
C/XPI	30.00	30.00	30.00	dB
C/IM	50.00	50.00	50.00	dB
Eb/(No+Io)	2.52	2.52	2.52	dB
Downlink Calculation	Clear	Rain Up	Rain Dn	Units
Satellite EIRP total	48.21	48.21	48.21	dBW
Transponder output back-off (total)	4.00	4.00	4.00	dB
Output back-off per carrier	23.11	23.11	23.11	dB
Satellite EIRP per carrier	25.10	25.10	25.10	dBW
Mispoint loss	0.10	0.10	0.10	dB
Free space loss	205.57	205.57	205.57	dB
Atmospheric absorption	0.09	0.09	0.09	dB
Tropospheric scintillation fading	0.08	0.08	0.08	dB
Atmospheric losses total	0.18	0.18	0.18	dB
Total path loss (excluding rain)	205.74	205.74	205.74	dB
Rain attenuation	0.00	0.00	0.00	dB
Noise increase due to precipitation	0.00	0.00	0.00	dB
Downlink degradation (DND)	0.00	0.00	0.00	dB
Total system noise	121.64	121.64	121.64	K
Figure of merit (G/T)	31.75	31.75	31.75	dB/K
C/No (thermal)	79.70	79.70	79.70	dB.Hz
C/N (thermal)	15.80	15.80	15.80	dB
C/ACI	30.00	30.00	30.00	dB
C/ASI	30.00	30.00	30.00	dB
C/XPI	30.00	30.00	30.00	dB

C/IM	16.50	16.50	16.50	dB
Eb/(No+Io)	13.66	13.66	13.66	dB

Totals per Carrier (End-to-End)	Clear	Rain Up	Rain Dn	Units
C/No (thermal)	65.49	65.49	65.49	dB.Hz
C/N (thermal)	1.58	1.58	1.58	dB
C/ACI	26.99	26.99	26.99	dB
C/ASI	26.99	26.99	26.99	dB
C/XPI	26.99	26.99	26.99	dB
C/IM	16.50	16.50	16.50	dB
C/(No+Io)	65.31	65.31	65.31	dB.Hz
C/(N+I)	1.41	1.41	1.41	dB
Eb/(No+Io)	2.20	2.20	2.20	dB
System margin	0.00	0.00	0.00	dB
Net Eb/(No+Io)	2.20	2.20	2.20	dB
Required Eb/(No+Io)	2.20	2.20	2.20	dB
Excess margin	0.00	0.00	0.00	dB

Earth Station Power Requirements	Value	Units
EIRP per carrier	38.51	dBW
Antenna gain	31.50	dBi
Antenna feed flange power per carrier	7.01	dBW
Uplink power control	0.00	dB
HPA output back off	2.00	dB
Waveguide loss	0	dB
Filter truncation loss	0	dB
Number of HPA carriers	1	
Total HPA power required	9.0123	dBW
Required HPA power capability	7.9658	W
Spectral power density	-56.89	dBW/Hz

Space Segment Utilization	Value	Units
Overall link availability	90.250	%
Information rate (inc overhead)	2.0480	Mbps
Transmit rate	4.0960	Mbps
Symbol rate	2.0480	Mbaud
Occupied bandwidth	2.4576	MHz
Noise bandwidth	63.91	dB.Hz
Minimum allocated bandwidth required	2.8672	MHz
Allocated transponder bandwidth	2.8700	MHz
Percentage transponder bandwidth used	7.97	%
Used transponder power	25.10	dBW
Percentage transponder power used	1.23	%
Max carriers by transponder bandwidth	12.54	
Max carriers by transponder power	81.51	
Max transponder carriers limited by:-	Bandwidth	[12.54]

Digital Link Budget

Intellicom Technologies (www.ITCcom.net)

Monday, March 13, 2006

Service Name	Link 84
Coverage	CONUS, Spread, Turbo Coded
Uplink earth station	L3, Simi Valley, CA, Intellicom Data
Downlink earth station	Torrey Pines, CA, Intellicom Data
Satellite name	AMC 2

Link Input Parameters

	Up	Down	Units
Site latitude	34.28N	32.90N	degrees
Site longitude	118.80W	117.23W	degrees
Site altitude	0	0	km
Frequency	14.250	11.950	GHz
Polarization	Vertical	Horizontal	
Rain model	Crane (F)	Crane (F)	(mm/h or zone)
Availability (average year)	99.5	99.5	%
Antenna aperture	.46	3.8	metres
Antenna efficiency / gain	+31.5	+53.2	% (+ prefix dBi)
Coupling loss	0	.5	dB
Antenna tracking / mispoint error	0.1	0.1	dB
LNB noise figure / temp		+50	dB (+ prefix K)
Antenna noise		45	K
Adjacent carrier interference	30	30	dB
Adjacent satellite interference	30	30	dB
Cross polarization interference	30	30	dB
Uplink station HPA output back-off	2		dB
Number of carriers / HPA	1		
HPA C/IM (up)	50		dB
Uplink power control	0		dB
Uplink filter truncation loss	0		dB
Required HPA power capability	MIN		W

Satellite Input Parameters

	Value	Units
Satellite longitude	85.00W	degrees
Transponder type	TWTA	
Receive G/T	6.	dB/K
Saturation flux density	-98.3	dBW/m2
Satellite attenuator pad	0	dB
Satellite ALC	0	dB
EIRP (saturation)	48.21	dBW
Transponder bandwidth	36	MHz
Input back off total	7	dB
Output back off total	4	dB
Intermodulation interference	16.5	dB
Number of transponder carriers	AUTO	

Carrier/Link Input Parameters

	Value	Units
Modulation	4-PSK	
Required bit error rate performance	10^-7	
Required Eb/No without FEC coding	11.31	dB
Required Eb/No with FEC coding	2.8	dB
Information rate	.384	Mbps
Overhead	0	%
FEC code rate	0.5	
Spreading gain	12	dB
Reed Solomon code	1	
(1 + Roll off factor)	1.4	
Carrier spacing factor	1.4	
Bandwidth allocation step size	.01	MHz
System margin	3	dB

Calculations at Saturation	Value	Units		
Gain 1m^2	44.53	dB/m2		
Uplink C/No	91.77	dB.Hz		
Downlink C/No	102.73	dB.Hz		
Total C/No	91.43	dB.Hz		
Uplink EIRP for saturation	64.73	dBW		
General Calculations	Up	Down	Units	
Elevation	36.38	38.46	degrees	
True azimuth	130.08	130.75	degrees	
Compass bearing	116.50	117.78	degrees	
Path distance to satellite	38066.14	37899.00	km	
Propagation time delay	0.126975	0.126417	seconds	
Antenna efficiency	29.94	92.27	%	
Antenna gain	31.50	53.20	dBi	
Availability (average year)	99.5	99.5	%	
Link downtime (average year)	43.830	43.830	hours	
Availability (worst month)	98.440	98.440	%	
Link downtime (worst month)	11.393	11.393	hours	
Spectral power density	-65.53	-47.55	dBW/Hz	
Uplink Calculation	Clear	Rain Up	Rain Dn	Units
Uplink transmit EIRP	35.28	35.28	35.28	dBW
Transponder input back-off (total)	7.00	7.00	7.00	dB
Input back-off per carrier	29.45	29.93	29.45	dB
Mispoint loss	0.10	0.10	0.10	dB
Free space loss	207.13	207.13	207.13	dB
Atmospheric absorption	0.11	0.11	0.11	dB
Tropospheric scintillation fading	0.22	0.22	0.22	dB
Atmospheric losses total	0.33	0.33	0.33	dB
Total path loss (excluding rain)	207.46	207.46	207.46	dB
Rain attenuation	0.00	0.48	0.00	dB
Uplink power control	0.00	0.00	0.00	dB
Uncompensated rain fade	0.00	0.48	0.00	dB
C/No (thermal)	62.31	61.84	62.31	dB.Hz
C/N (thermal)	-6.99	-7.47	-6.99	dB
C/ACI	30.00	29.52	30.00	dB
C/ASI	30.00	29.52	30.00	dB
C/XPI	30.00	29.52	30.00	dB
C/IM	50.00	50.00	50.00	dB
Eb/(No+Io)	6.47	5.99	6.47	dB
Downlink Calculation	Clear	Rain Up	Rain Dn	Units
Satellite EIRP total	48.21	48.21	48.21	dBW
Transponder output back-off (total)	4.00	4.00	4.00	dB
Output back-off per carrier	26.45	26.93	26.45	dB
Satellite EIRP per carrier	21.76	21.28	21.76	dBW
Mispoint loss	0.10	0.10	0.10	dB
Free space loss	205.57	205.57	205.57	dB
Atmospheric absorption	0.09	0.09	0.09	dB
Tropospheric scintillation fading	0.16	0.16	0.16	dB
Atmospheric losses total	0.26	0.26	0.26	dB
Total path loss (excluding rain)	205.82	205.82	205.82	dB
Rain attenuation	0.00	0.00	0.31	dB
Noise increase due to precipitation	0.00	0.00	0.57	dB
Downlink degradation (DND)	0.00	0.00	0.88	dB
Total system noise	121.64	121.64	138.57	K
Figure of merit (G/T)	31.75	31.75	31.18	dB/K
C/No (thermal)	76.28	75.81	75.41	dB.Hz
C/N (thermal)	6.98	6.50	6.10	dB
C/ACI	30.00	29.52	30.00	dB
C/ASI	30.00	29.52	30.00	dB
C/XPI	30.00	29.52	30.00	dB

C/IM	16.50	16.02	16.50	dB
Eb/(No+Io)	19.92	19.44	19.13	dB

Totals per Carrier (End-to-End)	Clear	Rain Up	Rain Dn	Units
C/No (thermal)	62.14	61.67	62.11	dB.Hz
C/N (thermal)	-7.16	-7.64	-7.20	dB
C/ACI	26.99	26.51	26.99	dB
C/ASI	26.99	26.51	26.99	dB
C/XPI	26.99	26.51	26.99	dB
C/IM	16.50	16.02	16.50	dB
C/(No+Io)	62.12	61.64	62.08	dB.Hz
C/(N+I)	-7.18	-7.66	-7.22	dB
Eb/(No+Io)	6.28	5.80	6.24	dB
System margin	3.00	3.00	3.00	dB
Net Eb/(No+Io)	3.28	2.80	3.24	dB
Required Eb/(No+Io)	2.80	2.80	2.80	dB
Excess margin	0.48	0.00	0.44	dB

Earth Station Power Requirements	Value	Units
EIRP per carrier	35.28	dBW
Antenna gain	31.50	dBi
Antenna feed flange power per carrier	3.78	dBW
Uplink power control	0.00	dB
HPA output back off	2.00	dB
Waveguide loss	0	dB
Filter truncation loss	0	dB
Number of HPA carriers	1	
Total HPA power required	5.7764	dBW
Required HPA power capability	3.7813	W
Spectral power density	-65.53	dBW/Hz

Space Segment Utilization	Value	Units
Overall link availability	99.002	%
Information rate (inc overhead)	0.3840	Mbps
Transmit rate	0.7680	Mbps
Symbol rate	6.0860	Mbaud
Occupied bandwidth	8.5204	MHz
Noise bandwidth	69.30	dB.Hz
Minimum allocated bandwidth required	8.5204	MHz
Allocated transponder bandwidth	8.5300	MHz
Percentage transponder bandwidth used	23.69	%
Used transponder power	21.76	dBW
Percentage transponder power used	0.57	%
Max carriers by transponder bandwidth	4.22	
Max carriers by transponder power	175.90	
Max transponder carriers limited by:-	Bandwidth	[4.22]