

## LB2 – LINK BUDGETS – GMR1R

<b>Table A-5: Next Generation GMR-1 Return Link Voice Budget</b>		
<b>Satellite and Earth Station Information</b>		
Downlink name	Las Vegas, (6.3 m)	Las Vegas, (9.3 m)
Satellite longitude (degrees) (- = West)	-111.1	-111.1
Uplink elevation angle (degrees)	36.1	36.1
<b>Carrier Information</b>		
Frequency reuse pattern	12.0	12.0
Beam pitch (deg)	0.25	0.25
Number of beams	280.0	280.0
Number of carriers per beam	26.7	26.7
Traffic channels per carrier	8.0	8.0
Information rate (kbps) plus overhead	4.4	4.4
Number of simultaneous voice channels per beam	213.3	213.3
Information burst rate (kbps)	35.1	35.1
Modulation	QPSK	QPSK
FEC code rate	0.75	0.75
Transmission rate (kbps)	46.8	46.8
Allocated bandwidth per carrier (kHz)	31.25	31.25
Required total C/N with margin (dB)	5.5	5.5
<b>Uplink</b>		
Uplink frequency (GHz)	2.0	2.0
Uplink EIRP (on-axis) (dBW)	0.0	0.0
Uplink atmospheric loss (dB)	0.1	0.1
Uplink free space loss (dB)	190.1	190.1
Fade + head loss(dB)	9.0	9.0
Transponder G/T dBi/K	21.5	21.5
Polarization loss (dB) or dual polarization gain (-)	0.0	0.0
Uplink C/N (dB)	7.2	7.2
C/I inband ATC (dB)	100.0	100.0
C/I inter-beam (dB)	14.8	14.8
C/I adj-channel (dB)	16.0	16.0
Composite uplink C/I (dB)	12.3	12.3
<b>Satellite Transponder</b>		
C/I ATC affecting amplifier backoff(dB)	-35.0	-35.0
Power control tolerance (dB)	1.0	1.0
Per carrier output backoff (dB)	45.3	45.3
Expected C/IM in digital carrier bandwidth at satellite (dB)	19.0	19.0
<b>Downlink</b>		
Downlink frequency (GHz)	11.0	11.0
Satellite EIRP per carrier (dBW)	9.2	9.2
Downlink free space pathloss (dB)	204.7	204.7
Downlink atmospheric loss (dB)	0.1	0.1
Rain availability (%)	99.99	99.99

Downlink rain fade (dB)	2.2	2.2
Pointing + line losses (dB)	1.0	1.0
Earth station on-axis G/T (dBi/K)	31.4	34.5
Downlink C/N (dB)	17.5	20.6
Expected composite downlink C/I (dB)	28.9	28.9
<b>Overall Performance Summary</b>		
Computed uplink or system margin (dB)	0.0	0.2
Downlink margin (dB)	0.6	3.7

<b>Table A-6: Next Generation GMR-1 Return Link Data Budget</b>		
<b>Satellite and Earth Station Information</b>		
Downlink name	Las Vegas, (6.3 m)	Las Vegas, (9.3 m)
Satellite longitude (degrees) (- = West)	-111.1	-111.1
Uplink elevation angle (degrees)	36.1	36.1
<b>Carrier Information</b>		
Frequency reuse pattern	12.0	12.0
Beam pitch (deg)	0.3	0.3
Number of carriers per beam	1.0	1.0
Information burst rate (kbps)	156.0	156.0
Modulation	QPSK	QPSK
FEC code rate	0.67	0.67
Transmission rate (kbps)	234.0	234.0
Allocated bandwidth per carrier (kHz)	156.3	156.3
Required total C/N with margin (dB)	4.3	4.3
<b>Uplink</b>		
Uplink frequency (GHz)	2.0	2.0
Uplink EIRP (on-axis) (dBW)	0.0	0.0
Uplink atmospheric loss (dB)	0.1	0.1
Uplink free space loss (dB)	190.1	190.1
Fade + head loss(dB)	3.0	3.0
Transponder G/T dBi/K	21.5	21.5
Polarization loss (dB) or dual polarization gain (-)	0.0	0.0
Uplink C/N (dB)	6.2	6.2
C/I inband ATC (dB)	100.0	100.0
C/I inter-beam (dB)	14.8	14.8
C/I adj-channel (dB)	16.0	16.0
Composite uplink C/I (dB)	12.3	12.3
<b>Satellite Transponder</b>		
C/I ATC affecting amplifier backoff(dB)	-35.0	-35.0
Power control tolerance (dB)	1.0	1.0
Per carrier output backoff (dB)	40.0	40.0
Expected C/IM in digital carrier bandwidth at satellite (dB)	19.0	19.0
<b>Downlink</b>		
Downlink frequency (GHz)	11.0	11.0
Satellite EIRP per carrier (dBW)	14.5	14.5

Downlink free space pathloss (dB)	204.7	204.7
Downlink atmospheric loss (dB)	0.1	0.1
Rain availability (%)	99.99	99.99
Downlink rain fade (dB)	2.2	2.2
Pointing + line losses (dB)	1.0	1.0
Earth station on-axis G/T (dBi/K)	31.4	34.5
Downlink C/N (dB)	15.8	18.9
Expected composite downlink C/I (dB)	28.9	28.9
<b>Overall Performance Summary</b>		
Computed uplink or system margin (dB)	0.4	0.6
Downlink margin (dB)	3.5	6.7