BroadwaveUSA™
Creating Cable Competition with Northpoint Technology

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EX PARTE OR LATE FILED

March 2, 2001

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Via Hand Delivery

Magalie Roman Salas, Secretary
Federal Communications Commission
The Portals – 445 12th Street, SW
Counter TW-A325
Washington, DC 20554

Re: Ex Parte Meeting – In the Matter of Applications of BroadwaveUSA, et al., PDC Broadband Corporation, and Satellite Receivers, Ltd. to Provide a Fixed Service in the 12.2-12.7 GHz Band, ET Docket No. 98-206; RM-9147; RM-9245

Dear Ms. Salas:

Pursuant to 47 C.F. R. Section 1.1206, Northpoint Technology, Ltd. and BroadwaveUSA, Inc., submits this letter to report that on March 1, 2001, Sophia Collier, Katherine Reynolds and Antoinette Cook Bush met with Don Abelson, Tom Tycz, Christopher Murphy, Jennifer Gilsenan and Paul Locke of the International Bureau. The purpose of the meeting was to discuss the Further Notice of Proposed Rulemaking in the above-referenced proceedings and the attached materials.

Sincerely,

Linda L. Rickman
Vice President, Washington Operations

Attachments

Cc: Don Abelson
Tom Tycz
Christopher Murphy
Jennifer Gilsenan
Paul Locke

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ATTACHMENT 3
Sample Mathcad Worksheet

File Name: "Northpoint2BSS_c2i.MCD_tableV2" -- Updated -- Feb. 8, 2001

Disclaimers:
1) Absolutely no guarantees of accuracy or precision are made;
2) The use of this Mathcad sheet is limited to FCC Docket 98-206/TM-9147/RM-9245;
3) The Mathcad sheet shall not be used for personal of commercial purposes;
4) Mathcad is a copywritten product of MathSoft, Inc;
5) This sheet was prepared in Mathcad 6.0 Plus Professional Edition (revision e);

Description: This Mathcad sheet is based in part on ITU-R Rec. P.618-6, Section 2.2. The procedure in ITU-R P.618-6 Section 2.2 estimates the long-term statistics of slant path rain attenuation exceed over a satellite-to-earth path, for percentage of the year ranging from 0.001% to 5%, for a given location, up to 55 GHz. Where appropriate, portions other ITU Recommendations are included to make this worksheet as stand-alone as possible. In addition, some geometry calculations are included that are not in P.618 in order to simplify the input parameters.

The sheet also calculates the rain margin for the BSS system and using the rain-attenuation vs. probability relation from ITU-R Rec. P618-6, determines the percent of time that a rain outage can be expected for the average year and the maximum C/I that should be received at the BSS receiver from an MVDDS transmitter assuming that the MVDDS system increases the BSS outage time by 2.68% and other interference-caused outage values.

Some necessary constants

radians-to-degrees $d2r \quad \frac{\pi}{180}$ degrees-to-radians $r2d \quad \frac{180}{\pi}$

suggested value for effective radius of the earth for RF calculations (km) $R_e \quad 8500$

Earth physical radius (km) $erad \quad 6378.145$

GSO physical radius (km) $gsorad \quad 42164.2$

BSS System Inputs:

$f \quad 12.45$		: Frequency (GHz)
$satlon \quad 119.0$		: BSS satellite longitude (deg) (E=+, W=-)
$contour \quad 0.0$		: Relative eirp contour line (dB) at earth station
$\tau \quad 45$		: Polarization tilt angle of signal relative to horizontal, in degrees. For circular polarization τ is 45 degrees (typical of BSS systems), $\tau = 0$ for linear horizontal and 90 for linear vertical polarization. This term is used in ITU-R Rec. P.838-1
$cnup \quad 26.231$		: C/N BSS uplink carrier-to-noise ratio (dB)
$ciadj \quad 20.0$		: C/I BSS adjacent satellite interference (dB)
$citerr \quad 90.0$		: C/I for other terrestrial interference (dB)

Analysis of Precision Needed to Represent Availability Numbers

Type	Criterion	Claimed DBS "availability"	Implicit DBS "unavailability"	Number	Decimal Places of Precision needed to accurately represent number
Lowest	2.86%	99.70%	0.30%	0.000085800	7
Average	2.86%	99.95%	0.05%	0.000014300	7
Highest	2.86%	99.99%	0.01%	0.000002860	7
Lowest	20.00%	99.70%	0.30%	0.000600000	4
Average	20.00%	99.95%	0.05%	0.000100000	4
Highest	20.00%	99.99%	0.01%	0.000020000	5
Lowest	100.00%	99.70%	0.30%	0.003000000	3
Average	100.00%	99.95%	0.05%	0.000500000	4
Highest	100.00%	99.99%	0.01%	0.000100000	4

Results for Echostar

		New York	Los Angeles	Chicago	Philadelphia	San Francisco	Boston
Earth station latitude	decimal deg	40.752	34.054	41.874	39.949	37.778	42.357
Earth station longitude	decimal deg	73.994	118.242	87.639	75.156	122.412	71.056
Earth station AMSL	km	0.01	0.1	0.18	0	0.03	0.01
EIRP in direction of earth station	dBW	53.6	47.6	50.9	53.6	47.6	52.6
Distance from GSO satellite to earth station	km	39121	37053	38425	39001	37338	39399
Elevation angle	Degrees	24.471	50.406	32.121	25.735	46.067	21.583
Free space path loss	dB	206.191	205.72	206.036	206.165	205.786	206.253
Clear sky C/(N+I)	dB	14.285	9.943	12.432	14.302	9.884	13.548
Link margin	dB	8.185	3.843	6.332	8.202	3.784	7.448
~~Rain margin~~	~~dB~~	~~4.76~~	~~1.41~~	~~3.02~~	~~4.78~~	~~1.39~~	~~3.99~~
Rain margin	dB	4.77	1.42	3.03	4.79	1.39	4.00
~~Rain intensity exceeded 0.01% of average year~~	~~mm/hr~~	~~44~~	~~18.5~~	~~43.6~~	~~47.9~~	~~33.9~~	~~37.7~~
Rain intensity exceeded 0.01% of average year	mm/hr	44.15	18.87	43.84	47.90	33.63	37.79
~~Average yearly DBS outage~~	~~%~~	~~0.0594~~	~~0.0707~~	~~0.0757~~	~~0.0672~~	~~0.1456~~	~~0.0699~~
Average yearly DBS outage	%	0.0454	0.0937	0.0709	0.0499	0.1672	0.0554
	~~minutes~~	~~312.2~~	~~371.6~~	~~397.9~~	~~353.2~~	~~765.3~~	~~367.4~~
	minutes	239.0	429.9	372.7	262.2	879.4	291.3
~~Worst month DBS outage~~	~~%~~	~~0.2446~~	~~0.2846~~	~~0.302~~	~~0.2723~~	~~0.5333~~	~~0.2818~~
Worst month DBS outage	%	0.1936	0.3634	0.2849	0.2098	0.6013	0.2299
	~~minutes~~	~~107.1~~	~~124.6~~	~~132.3~~	~~119.3~~	~~233.6~~	~~123.4~~
	minutes	84.8	159.3	124.9	92.0	263.5	100.8
~~Average yearly DBS outage + 2.86%~~	~~%~~	~~0.0611~~	~~0.0727~~	~~0.0779~~	~~0.0691~~	~~0.1498~~	~~0.0719~~
Average yearly DBS outage + 2.86%	%	0.0467	0.0964	0.0729	0.0513	0.1720	0.0570
	~~minutes~~	~~321.1~~	~~382.2~~	~~409.3~~	~~363.3~~	~~787.2~~	~~377.9~~
	minutes	245.8	507.0	338.4	269.7	904.6	299.6
~~Increase in DBS outage~~	~~minutes~~	~~8.9~~	~~10.6~~	~~11.4~~	~~10.1~~	~~21.9~~	~~10.5~~
Increase in DBS outage	minutes	6.8	77.1	-34.3	7.5	25.2	8.3
~~Equivalent rain attenuation~~	~~dB~~	~~4.693~~	~~1.388~~	~~2.973~~	~~4.713~~	~~1.366~~	~~3.931~~
Equivalent rain attenuation	dB	4.703	1.397	2.984	4.722	1.366	3.942
~~DBS availability~~	~~%~~	~~99.9389~~	~~99.9273~~	~~99.9221~~	~~99.9309~~	~~99.8502~~	~~99.9281~~
DBS availability	%	99.9533	99.9036	99.9271	99.9487	99.828	99.943
~~C/I terrestrial system must meet~~	~~dB~~	~~23~~	~~24.3~~	~~24~~	~~23~~	~~25.5~~	~~23~~

C/I terrestrial system must meet	dB	22.8	24.1	22.8	22.8	24.0	22.7
~~Average yearly DBS outage + 60 minutes~~	~~%~~	~~0.0708~~	~~0.0821~~	~~0.0871~~	~~0.0786~~	~~0.157~~	~~0.0813~~
	~~minutes~~	~~372.6~~	~~431.6~~	~~457.9~~	~~413.2~~	~~825.3~~	~~427.4~~
Average yearly DBS outage + 60 minutes	%	0.0569	0.1051	0.0823	0.0613	0.1786	0.0668
	minutes	299.0	489.9	432.7	322.2	939.4	351.3
~~Increase in DBS unavailability~~	~~%~~	~~19.2~~	~~16.1~~	~~15.1~~	~~17.0~~	~~7.8~~	~~16.3~~
Increase in DBS unavailability	%	25.3	12.2	16.1	22.8	6.8	20.6
~~Equivalent rain attenuation~~	~~dB~~	~~4.346~~	~~1.294~~	~~2.796~~	~~4.404~~	~~1.328~~	~~3.861~~
Equivalent rain attenuation	dB	4.256	1.328	2.793	4.310	1.335	3.626
~~DBS availability~~	~~%~~	~~99.9292~~	~~99.9179~~	~~99.9129~~	~~99.9214~~	~~99.843~~	~~99.9187~~
DBS availability	%	99.9431	99.8949	99.9177	99.9387	99.8214	99.9332
~~C/I terrestrial system must meet~~	~~dB~~	~~15.4~~	~~18.3~~	~~17.3~~	~~15.8~~	~~21.3~~	~~19.9~~
C/I terrestrial system must meet	dB	13.8	18.1	15.5	14.1	20.3	14.5
~~Average yearly DBS outage + 30 minutes~~	~~%~~	~~0.0651~~	~~0.0764~~	~~0.0814~~	~~0.0729~~	~~0.1513~~	~~0.0756~~
Average yearly DBS outage + 30 minutes	%	0.0511	0.0994	0.0766	0.0556	0.1729	0.0611
	~~minutes~~	~~342.2~~	~~401.6~~	~~427.9~~	~~383.2~~	~~796.3~~	~~397.4~~
	minutes	269.0	459.9	402.7	292.2	909.4	321.3
~~Increase in DBS unavailability~~	~~%~~	~~9.6~~	~~8.1~~	~~7.5~~	~~8.5~~	~~3.9~~	~~8.2~~
Increase in DBS unavailability	%	12.6	6.1	8.0	11.4	3.4	10.3
~~Equivalent rain attenuation~~	~~dB~~	~~4.641~~	~~1.349~~	~~2.903~~	~~4.583~~	~~1.358~~	~~3.827~~
Equivalent rain attenuation	dB	4.493	1.372	2.905	4.533	1.362	3.801
~~DBS availability~~	~~%~~	~~99.9349~~	~~99.9236~~	~~99.9186~~	~~99.9271~~	~~99.8487~~	~~99.9244~~
DBS availability	%	99.9489	99.9006	99.9234	99.9444	99.8271	99.9389
~~C/I terrestrial system must meet~~	~~dB~~	~~18.1~~					
C/I terrestrial system must meet	dB	16.6	21.0	18.4	16.9	23.3	17.3

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Sample Mathcad Worksheet

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Earth physical radius (km) erad 6378.145

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BSS System Inputs:

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τ 45	: Polarization tilt angle of signal relative to horizontal, in degrees. For circular polarization τ is 45 degrees (typical of BSS systems), τ = 0 for linear horizontal and 90 for linear vertical polarization. This term is used in ITU-R Rec. P.838-1
cnup 26.231	: C/N BSS uplink carrier-to-noise ratio (dB)
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Rain intensity exceeded 0.01% of average year	mm/hr	44.15	18.87	43.84	47.90	33.63	37.79
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Average yearly DBS outage	%	0.0454	0.0937	0.0709	0.0499	0.1672	0.0554
	~~minutes~~	~~312.2~~	~~371.6~~	~~397.9~~	~~353.2~~	~~765.3~~	~~367.4~~
	minutes	239.0	429.9	372.7	262.2	879.4	291.3
~~Worst month DBS outage~~	~~%~~	~~0.2446~~	~~0.2846~~	~~0.302~~	~~0.2723~~	~~0.5333~~	~~0.2818~~
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	~~minutes~~	~~107.1~~	~~124.6~~	~~132.3~~	~~119.3~~	~~233.6~~	~~123.4~~
	minutes	84.8	159.3	124.9	92.0	263.5	100.8
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Average yearly DBS outage + 2.86%	%	0.0467	0.0964	0.0729	0.0513	0.1720	0.0570
	~~minutes~~	~~321.1~~	~~382.2~~	~~409.3~~	~~363.3~~	~~787.2~~	~~377.9~~
	minutes	245.8	507.0	338.4	269.7	904.6	299.6
~~Increase in DBS outage~~	~~minutes~~	~~8.9~~	~~10.6~~	~~11.4~~	~~10.1~~	~~21.9~~	~~10.5~~
Increase in DBS outage	minutes	6.8	77.1	-34.3	7.5	25.2	8.3
~~Equivalent rain attenuation~~	~~dB~~	~~4.693~~	~~1.388~~	~~2.973~~	~~4.713~~	~~1.366~~	~~3.931~~
Equivalent rain attenuation	dB	4.703	1.397	2.984	4.722	1.366	3.942
~~DBS availability~~	~~%~~	~~99.9389~~	~~99.9273~~	~~99.9221~~	~~99.9309~~	~~99.8502~~	~~99.9281~~
DBS availability	%	99.9533	99.9036	99.9271	99.9487	99.828	99.943
~~C/I terrestrial system must meet~~	~~dB~~	~~23~~	~~24.3~~	~~24~~	~~23~~	~~25.5~~	~~23~~

C/I terrestrial system must meet	dB	22.8	24.1	22.8	22.8	24.0	22.7
Average yearly DBS outage + 60 minutes	%	0.0708	0.0821	0.0871	0.0786	0.157	0.0813
	minutes	372.6	431.6	457.9	413.2	825.3	427.4
Average yearly DBS outage + 60 minutes	%	0.0569	0.1051	0.0823	0.0613	0.1786	0.0668
	minutes	299.0	489.9	432.7	322.2	939.4	351.3
Increase in DBS unavailability	%	19.2	16.1	15.1	17.0	7.8	16.3
Increase in DBS unavailability	%	25.3	12.2	16.1	22.8	6.8	20.6
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DBS availability	%	99.9431	99.8949	99.9177	99.9387	99.8214	99.9332
C/I terrestrial system must meet	dB	15.4	18.3	17.3	15.8	21.3	19.9
C/I terrestrial system must meet	dB	13.8	18.1	15.5	14.1	20.3	14.5
Average yearly DBS outage + 30 minutes	%	0.0651	0.0764	0.0814	0.0729	0.1513	0.0756
Average yearly DBS outage + 30 minutes	%	0.0511	0.0994	0.0766	0.0556	0.1729	0.0611
	minutes	342.2	401.6	427.9	383.2	795.3	397.4
	minutes	269.0	459.9	402.7	292.2	909.4	321.3
Increase in DBS unavailability	%	9.6	8.1	7.5	8.5	3.9	8.2
Increase in DBS unavailability	%	12.6	6.1	8.0	11.4	3.4	10.3
Equivalent rain attenuation	dB	4.541	1.349	2.903	4.583	1.358	3.827
Equivalent rain attenuation	dB	4.493	1.372	2.905	4.533	1.362	3.801
DBS availability	%	99.9349	99.9236	99.9186	99.9271	99.8487	99.9244
DBS availability	%	99.9489	99.9006	99.9234	99.9444	99.8271	99.9389
C/I terrestrial system must meet	dB	18.1					
C/I terrestrial system must meet	dB	16.6	21.0	18.4	16.9	23.3	17.3

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The sheet also calculates the rain margin for the BSS system and using the rain-attenuation vs. probability relation from ITU-R Rec. P618-6, determines the percent of time that a rain outage can be expected for the average year and the maximum C/I that should be received at the BSS receiver from an MVDDS transmitter assuming that the MVDDS system increases the BSS outage time by 2.68% and other interference-caused outage values.

Some necessary constants

radians-to-degrees $d2r \quad \frac{\pi}{180}$ degrees-to-radians $r2d \quad \frac{180}{\pi}$

suggested value for effective radius of the earth for RF calculations (km) $R_e \quad 8500$

Earth physical radius (km) $erad \quad 6378.145$

GSO physical radius (km) $gsorad \quad 42164.2$

BSS System Inputs:

$f \quad 12.45$	: Frequency (GHz)
$satlon \quad -119.0$	: BSS satellite longitude (deg) (E=+, W=-)
$contour \quad 0.0$	: Relative eirp contour line (dB) at earth station
$\tau \quad 45$	: Polarization tilt angle of signal relative to horizontal, in degrees. For circular polarization τ is 45 degrees (typical of BSS systems), $\tau = 0$ for linear horizontal and 90 for linear vertical polarization. This term is used in ITU-R Rec. P.838-1
$cnup \quad 26.231$	: C/N BSS uplink carrier-to-noise ratio (dB)
$ciadj \quad 20.0$	: C/I BSS adjacent satellite interference (dB)
$citerr \quad 90.0$	: C/I for other terrestrial interference (dB)

Analysis of Precision Needed to Represent Availability Numbers

Type	Criterion	Claimed DBS "availability"	Implicit DBS "unavailability"	Number	Decimal Places of Precision needed to accurately represent number
Lowest	2.86%	99.70%	0.30%	0.000085800	7
Average	2.86%	99.95%	0.05%	0.000014300	7
Highest	2.86%	99.99%	0.01%	0.000002860	7
Lowest	20.00%	99.70%	0.30%	0.000600000	4
Average	20.00%	99.95%	0.05%	0.000100000	4
Highest	20.00%	99.99%	0.01%	0.000020000	5
Lowest	100.00%	99.70%	0.30%	0.003000000	3
Average	100.00%	99.95%	0.05%	0.000500000	4
Highest	100.00%	99.99%	0.01%	0.000100000	4

Results for Echostar

		New York	Los Angeles	Chicago	Philadelphia	San Francisco	Boston
Earth station latitude	decimal deg	40.752	34.054	41.874	39.949	37.778	42.357
Earth station longitude	decimal deg	73.994	118.242	87.639	75.156	122.412	71.056
Earth station AMSL	km	0.01	0.1	0.18	0	0.03	0.01
EIRP in direction of earth station	dBW	53.6	47.6	50.9	53.6	47.6	52.6
Distance from GSO satellite to earth station	km	39121	37053	38425	39001	37338	39399
Elevation angle	Degrees	24.471	50.406	32.121	25.735	46.067	21.583
Free space path loss	dB	206.191	205.72	206.036	206.165	205.786	206.253
Clear sky C/(N+I)	dB	14.285	9.943	12.432	14.302	9.884	13.548
Link margin	dB	8.185	3.843	6.332	8.202	3.784	7.448
~~Rain margin~~	~~dB~~	~~4.76~~	~~1.41~~	~~3.02~~	~~4.78~~	~~1.39~~	~~3.99~~
Rain margin	dB	4.77	1.42	3.03	4.79	1.39	4.00
~~Rain intensity exceeded 0.01% of average year~~	~~mm/hr~~	~~44~~	~~18.5~~	~~43.6~~	~~47.9~~	~~33.9~~	~~37.7~~
Rain intensity exceeded 0.01% of average year	mm/hr	44.15	18.87	43.84	47.90	33.63	37.79
~~Average yearly DBS outage~~	~~%~~	~~0.0594~~	~~0.0707~~	~~0.0757~~	~~0.0672~~	~~0.1456~~	~~0.0699~~
Average yearly DBS outage	%	0.0454	0.0937	0.0709	0.0499	0.1672	0.0554
	~~minutes~~	~~312.2~~	~~371.6~~	~~397.9~~	~~353.2~~	~~765.3~~	~~367.4~~
	minutes	239.0	429.9	372.7	262.2	879.4	291.3
~~Worst month DBS outage~~	~~%~~	~~0.2446~~	~~0.2846~~	~~0.302~~	~~0.2723~~	~~0.5333~~	~~0.2818~~
Worst month DBS outage	%	0.1936	0.3634	0.2849	0.2098	0.6013	0.2299
	~~minutes~~	~~107.1~~	~~124.6~~	~~132.3~~	~~119.3~~	~~233.6~~	~~123.4~~
	minutes	84.8	159.3	124.9	92.0	263.5	100.8
~~Average yearly DBS outage + 2.86%~~	~~%~~	~~0.0611~~	~~0.0727~~	~~0.0779~~	~~0.0691~~	~~0.1498~~	~~0.0719~~
Average yearly DBS outage + 2.86%	%	0.0467	0.0964	0.0729	0.0513	0.1720	0.0570
	~~minutes~~	~~321.1~~	~~382.2~~	~~409.3~~	~~363.3~~	~~787.2~~	~~377.9~~
	minutes	245.8	507.0	338.4	269.7	904.6	299.6
~~Increase in DBS outage~~	~~minutes~~	~~8.9~~	~~10.6~~	~~11.4~~	~~10.1~~	~~21.9~~	~~10.5~~
Increase in DBS outage	minutes	6.8	77.1	-34.3	7.5	25.2	8.3
~~Equivalent rain attenuation~~	~~dB~~	~~4.693~~	~~1.388~~	~~2.973~~	~~4.715~~	~~1.366~~	~~3.931~~
Equivalent rain attenuation	dB	4.703	1.397	2.984	4.722	1.366	3.942
~~DBS availability~~	~~%~~	~~99.9389~~	~~99.9273~~	~~99.9221~~	~~99.9309~~	~~99.8502~~	~~99.9281~~
DBS availability	%	99.9533	99.9036	99.9271	99.9487	99.828	99.943
~~C/I terrestrial system must meet~~	~~dB~~	~~23~~	~~24.3~~	~~24~~	~~23~~	~~25.5~~	~~23~~

C/I terrestrial system must meet	dB	22.8	24.1	22.8	22.8	24.0	22.7
Average yearly DBS outage + 60 minutes	%	0.0708	0.0821	0.0871	0.0786	0.157	0.0813
	minutes	372.6	431.6	457.9	413.2	825.3	427.4
Average yearly DBS outage + 60 minutes	%	0.0569	0.1051	0.0823	0.0613	0.1786	0.0668
	minutes	299.0	489.9	432.7	322.2	939.4	351.3
Increase in DBS unavailability	%	19.2	16.1	15.1	17.0	7.8	16.3
Increase in DBS unavailability	%	25.3	12.2	16.1	22.8	6.8	20.6
Equivalent rain attenuation	dB	4.346	1.294	2.796	4.404	1.328	3.861
Equivalent rain attenuation	dB	4.256	1.328	2.793	4.310	1.335	3.626
DBS availability	%	99.9292	99.9179	99.9129	99.9214	99.843	99.9187
DBS availability	%	99.9431	99.8949	99.9177	99.9387	99.8214	99.9332
C/I terrestrial system must meet	dB	15.4	18.3	17.3	15.8	21.3	19.9
C/I terrestrial system must meet	dB	13.8	18.1	15.5	14.1	20.3	14.5
Average yearly DBS outage + 30 minutes	%	0.0651	0.0764	0.0814	0.0729	0.1513	0.0756
Average yearly DBS outage + 30 minutes	%	0.0511	0.0994	0.0766	0.0556	0.1729	0.0611
	minutes	342.2	401.6	427.9	383.2	795.3	397.4
	minutes	269.0	459.9	402.7	292.2	909.4	321.3
Increase in DBS unavailability	%	9.6	8.1	7.5	8.5	3.9	8.2
Increase in DBS unavailability	%	12.6	6.1	8.0	11.4	3.4	10.3
Equivalent rain attenuation	dB	4.541	1.349	2.903	4.583	1.358	3.827
Equivalent rain attenuation	dB	4.493	1.372	2.905	4.533	1.362	3.801
DBS availability	%	99.9349	99.9236	99.9186	99.9271	99.8487	99.9244
DBS availability	%	99.9489	99.9006	99.9234	99.9444	99.8271	99.9389
C/I terrestrial system must meet	dB	18.1					
C/I terrestrial system must meet	dB	16.6	21.0	18.4	16.9	23.3	17.3