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Space Communication Link Propagation Data for Selected Cities Within the Multiple Beam and Steerable Antenna Coverage Areas of the Advanced Communications Technology Satellite

Robert M. Manning
Lewis Research Center
Cleveland, Ohio

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SPACE COMMUNICATION LINK PROPAGATION DATA FOR SELECTED CITIES WITHIN THE MULTIPLE BEAM AND STEERABLE ANTENNA COVERAGE AREAS OF THE ADVANCED COMMUNICATIONS TECHNOLOGY SATELLITE

Robert M. Manning
National Aeronautics and Space Administration
Lewis Research Center
Cleveland, Ohio 44135

SUMMARY

This document presents rain attenuation propagation data for 68 cities within the coverage area of the multiple beam and steerable antennas of the Advanced Communications Technology Satellite (ACTS). This propagation data provides the necessary data base for purposes of communication link power budgeting and rain attenuation mitigation controller design. These propagation parameters are derived by applying the ACTS Rain Attenuation Prediction Model to these 68 locations that have links established with the ACTS spacecraft, which is placed at 100° west longitude in geostationary orbit operating at frequencies of 20 GHz (downlink) and 30 GHz (uplink). The propagation parameters enumerated in tabular form for each location are as follows: physical description of the link and location (e.g., latitude, longitude, antenna elevation angle, etc.), link availability versus attenuation margin (this is also given in graphical form), fading time across fade depths of 3, 5, 8, and 15 dB versus fade duration, and required fade control response time for controller availabilities of 99.999, 99.99, 99.9, and 99 percent versus sub-threshold attenuation levels.

The data for these specific locations can be taken to be representative of regions near these locations. However, in the spirit of the flexibility afforded by the use of the ACTS Rain Attenuation Prediction Model and for those geographical positions that are not represented by the 68 locations given here, the above mentioned attenuation model will be available in computer software form that is capable of differentiating rain attenuation statistics to within 0.5° accuracy (≈30.0 mi.) in latitude and longitude within the continental United States. For more information on this, write to COSMIC, NASA Software for Industry, The University of Georgia, Athens, GA 30602.

INTRODUCTION

The scanning spot beams and high data rate transmission and reception of the Advanced Communications Technology Satellite (ACTS) requires the use of a more detailed rain attenuation model than has hitherto been used in satellite systems design; each dwell area of the satellite multiple beam antenna (MBA), as well as each city within these dwell areas, must be differentiated from the others in terms of rain attenuation effects and characteristics for the accurate assessment of the prevailing propagation data necessary for power budgeting of the communications link to the satellite as well as for the specifications and design of control algorithms to counter power fade on the links due to rain. Thus, the ACTS Rain Attenuation Prediction Model (refs. 1 to 3) was developed which employs readily available location specific rain statistics

with a dynamic rain attenuation model that yields yearly predictions of the occurrence of attenuation on any satellite link as well as the temporal statistics on how the rain attenuation process evolves with time once it begins.

The purpose of this document is to present relevant rain attenuation propagation data for 68 locations within the coverage area of the MBA as well as the steerable antenna on ACTS. This propagation data was obtained by employing the ACTS Rain Attenuation Model at these 68 locations with communication links established to ACTS, which itself is located in a geostationary orbit at longitude 100° west and operates at frequencies of 20 GHz on the downlink and 30 GHz on the uplink.

The propagation parameters that are detailed here in tabular form for 20 and 30 GHz and for each of the 68 locations (these locations are listed in the next section in alphabetical order according to state) are the physical description of the link and location (e.g., latitude, longitude, antenna elevation angle, etc.), link availability versus attenuation margin, fading time across the fade depths of 3, 5, 8, and 15 dB versus fade duration, and the required fade control response times for the specified controller availabilities of 99.999, 99.99, 99.9, and 99 percent versus sub-threshold attenuation levels. Also, the link availability versus margin is displayed in graphical form for each city in a recommended format (ref. 4).

The work presented here supersedes an earlier and less detailed compilation (ref. 5) that dealt only with 33 cities. The propagation data for these 68 locations can be taken to be representative for regions near these cities, so long as there are no intervening geographical perturbations, such as large lakes, mountain ranges, etc. However, in the spirit of the ACTS Rain Attenuation Predication Model, the statistical data base that meteorologically characterizes specific locations (from which the model takes its input) has been interpolated to locations throughout the continental United States for which such meteorological parameters are not available. This affords the use of the ACTS Rain Attenuation Prediction Model at any location within the continental United States with position resolution of 0.5° in latitude and longitude with corresponds to ≈30.0 mi. resolution along the north/south and east/west directions. The only thing that one needs to know is the average yearly rainfall at the location of interest. The size of this data base, however, is such that it can only effectively be used in a disk file format on a personal computer. This data base, as well as the software implementing the ACTS Rain Attenuation Prediction Model for use with any satellite (so long as it has links to the continental U.S.) at any operating frequency (so long as it is in the range of 2.9 to 54 GHz), will be available to the private sector sometime in late 1988. For more information concerning this rain attenuation software, contact COSMIC, NASA Software for Industry, The University of Georgia, Athens, GA 30602.

DESCRIPTION OF DATA FORMAT

Rain propagation data for ACTS links have been calculated and are given here for the following cities listed according to alphabetically ordered states in which they are located.

ALABAMA
Huntsville

ALASKA
Anchorage
Fairbanks
Juneau
Prudhoe Bay

ARIZONA
Phoenix

CALIFORNIA
Fresno
Los Angeles
San Diego
San Francisco

COLORADO
Boulder
Denver

CONNECTICUT
Harford

DISTRICT OF COLUMBIA
Washington

FLORIDA
Jacksonville
Miami
Tampa

GEORGIA
Atlanta

HAWAII
Honolulu

ILLINOIS
Cairo
Chicago
Peoria
Springfield

INDIANA
Evansville
Fort Wayne
Indianapolis

KANSAS
Dodge City

KENTUCKY
Lexington
Louisville

LOUISIANA
New Orleans

MARYLAND
Baltimore

MASSACHUSETTS
Boston

MICHIGAN
Alpina
Detroit
Grand Rapids
Houghton
Lansing
Sault Ste. Marie

MISSOURI
Kansas City

NEBRASKA
Omaha

NEW JERSEY
Trenton

NEW MEXICO
White Sands

NEW YORK
Albany
Binghamton
Buffalo
New York
Rochester
Syracuse

OKLAHOMA
Oklahoma City

OHIO
Cincinnati
Cleveland
Columbus

OREGON
Portland

PENNSYLVANIA
Harrisburg
Pittsburg

TENNESSEE
Memphis
Nashville

TEXAS
Austin
Dallas
El Paso
Fort Worth
Houston
San Antonio

UTAH
Salt Lake City

VIRGINIA
Norfolk
Richmond

WASHINGTON
Seattle

WISCONSIN
Milwaukee

For each city there are three pages. On the first page appears a graph showing the cumulative probability distribution of attenuation on 20 and 30 GHz communications links to that city from ACTS. The second and third pages contain tabular information; the second one details the physical description

of the link including the rain statistics that characterize the location and calculated antenna elevation angle, the calculated attenuation statistics for 20 and 30 GHz for the link corresponding to the antenna elevation angle; atmospheric molecular (i.e., clear air) absorption for 20 and 30 GHz, and a small table of the calculated cumulative probability distribution of attenuation exceedance versus attenuation from which the preceding graph was derived. The third page gives the temporal aspects and behavior of rain attenuation on the link once the rain attenuation has occurred. There is a table of total fading time in a year that fades occur calculated at the depths of 3, 5, 8, and 15 dB for continuous fade durations from 0 to 100 min on the 20 GHz and 30 GHz links and two smaller tables, one for each frequency, showing the calculated required fade control response time for fade controller availabilities of 99 to 99.999 percent versus sub-threshold attenuation levels for control implementation thresholds of 3 dB for the 20 GHz downlink and 5 dB for the 30 GHz uplink. (It should be noted that although frequencies are used on the satellite that do not exactly correspond to 20 and 30 GHz (e.g., 27.5 to 30.0 GHz uplink and 17.7 to 20.2 GHz downlink), negligible differences are introduced into the predictions, and are no worse than the other variations not accounted for in rain attenuation modelling, e.g., rain drop size and canting angle variations, etc.) The use and interpretation of this data will now be discussed.

Attenuation Graphs

The graphs are in the form showing percent of total period (in this case, a typical year which is 365.25 days or 8.766 hr) attenuation is exceeded, versus the attenuation expressed in dB. The "percent of total period attenuation is exceeded" is actually the cumulative probability in percent of a year that the given attenuation (i.e., the path attenuation) occurs or is exceeded on the particular propagation path to the satellite. Thus, the value of 0.0100, for example, on the ordinate is 0.0100 percent of a year, or 0.8766 (hr) (=52.6 min) in a year that the corresponding path attenuation will occur. If this corresponding attenuation is the threshold after which communication on the link can no longer be maintained, the link will be "down" for an average of 52.6 min in a year.

The "availability," by the standard use of the word in satellite communications, corresponding to the point 0.0100 percent is given by the prescription 100 - 0.0100 percent = 99.99 percent. The conversion is straightforward; if the link is not available for 0.0100 percent of the year, it is available for the remaining 99.99 percent of the year. The following conversion table is provided for convenience:

Percent of total period attenuation is exceeded	Minutes per year link is down	Availability (percent)
10.000	52,596.0	90.0000
1.0000	5,259.6	99.0000
0.1000	526.0	99.9000
0.0100	52.6	99.9900
0.0010	5.3	99.9990
0.0001	0.5	99.9999

Link Description and Attenuation Statistics

The first page of data following the attenuation graph details the physical description of the location and the associated propagation link. This includes the location height, latitude and longitude and the antenna elevation angle that results from these and the ACTS position of 100° W in geostationary orbit. The propagation link slant data length through the potential rain region is the distance in kilometers of the propagation path through the region of the atmosphere that can contain rain. This number is obtained in an intermediate calculation in the ACTS Rain Attenuation Prediction Model[1] and, of course, relies on relationship of the maximum height of precipitation (sometimes called the freezing height). That is an empirical function of latitude of the location. The projection of this path length onto the surface of the Earth, taking into account the link (antenna) elevation angle is listed below this. Such a parameter may be useful in some experimental investigations if one wants to monitor rainfall on the propagation data with ground-based rainrate measurements. The next three parameters, PO, Rm, and SR are, respectively, the probability of any rainfall above 0 (mm) of water per hour (mm/hr) occurring, the mean rainrate in mm/hr, and the standard deviation of the logarithm of the rainrate that have been calculated for the particular location using readily available local meteorological rain data (refs. 1, 6, and 7). These parameters, that collectively for all locations compose the rain statistics data base mentioned earlier, completely characterize the site in terms of the rain phenomena that occur there; they are the three quantities that enter into the log-normal cumulative probability distribution that is taken to govern the rain attenuation process. These, however, only apply to a point anywhere in the location considered and not to an extended path like that of the propagation path of its projection mentioned above. What's more, what is needed is not so much the modified values of the rain statistics along an extended path but the attendant attenuation statistics. These can only be gotten by application of a propagation model to the situation of the transmission through rain along a path, where for any point along that path, the rain is described on a statistical basis via Po, Rm, and SR. This is the purpose and function of the ACTS Rain Attenuation Prediction Model. The model takes as some of its basic inputs Po, Rm, and SR and, given other information inputs such as frequency of operation, polarization angle and the link elevation angle, "transforms" these log-normal rain statistics into log-normal attenuation statistics specific to the link and frequency. These statistics are displayed in the next two groups of data, one for 20 GHz and the other for 30 GHz. In each case, there is displayed the probability of attenuation PL that occurs along an extended path (this number is the same for both frequencies since the probability of the occurrence of <u>any</u> attenuation is the same at any frequency of operation.), the mean attenuation Am in dB, and the standard deviation of attenuation SA (actually, of the logarithm of attenuation). Like those for the rain, these statistics enter into a log-normal cumulative probability distribution for attenuation occurrence on the link in question. These cumulative distributions are evaluated using the statistical parameters PL, Am, and SA for each of the link frequencies for a range of attenuations from 1 dB to 50 dB and the results of which appears at the bottom of the data page. This data is the source of the aforementioned attenuation curves. Also shown are the atmospheric molecular absorptions that occur at the link frequencies. These absorption calculations only take into account contributions due to the major atmospheric constituates, i.e., oxygen and water vapor (refs 1 and 8). Even

though, strictly speaking, the water vapor content Pw that enters into these calculations is itself location and time dependent, a nominal value of Pw = 10 grams/m^3 was assumed.

Fade Duration and Fade Control Statistics

The second page of data following the attenuation graph displays the temporal characteristics of attenuation events once these events have occurred on the link.[3] The first set of data shown gives the total time of minutes in a typical year that fades above given attenuation levels exist throughout the year versus continuous fade durations (in minutes) of individual fade events with fade times greater than those shown. The given attenuation or fade depths are 3, 5, 8, and 15 dB for each link frequency. For example, a fade duration of greater than 0 min means any continuous fade duration that can occur on the link; for fade depths of greater than 3, 5, 8, or 15 dB, the total fading time that is the sum of all such continuous fade durations of greater than 0 minutes is indicated. On the other hand, a continuous fade duration of greater than, e.g., 5 min, is a subset of that of 0 min and the total fading time t these fade depths will, necessarily, be smaller than those corresponding to 0 minutes duration. Such calculations are shown for fade durations of greater than 0 min to 100 min.

The other two groups of data shown detail the required response times that a rain fade controller will have to possess. If the controller is to have a given availability, versus sub-threshold attenuation levels for control implementation thresholds of 3dB for the 20 GHz downlink and 5 dB for the 30 GHz downlink. The controller availabilities, where availability for the controller is defined analogous to that for the satellite link in Section 2(a), are taken to be 99.999, 99.99, 99.9, and 99 percent. To use this information, one selects the desired control availability for a particular link and the minimum achievable control response time. One the can find the sub-threshold attenuation level at which the control will have to be implemented as an attenuation occurs on the link so that rain fade control can be in effect by the time the prevailing attenuation reaches the threshold level.

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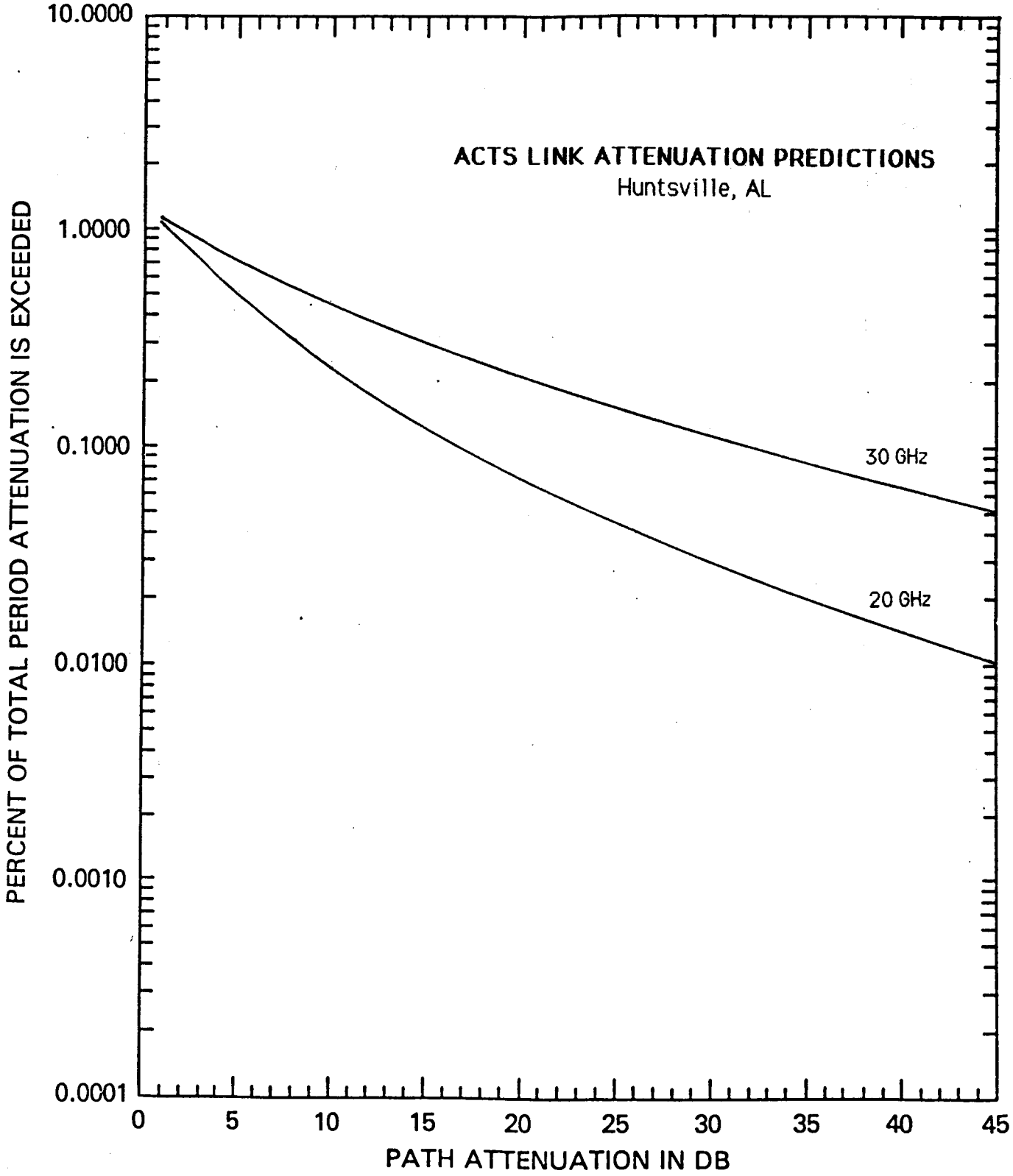

ACTS LINK ATTENUATION PREDICTIONS
Huntsville, AL
30 GHz
20 GHz
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : HUNTSVILLE, AL

STATION HEIGHT IN kM = 0.305
STATION LATITUDE IN DEG. N. = 34.73
TERMINAL LONGITUDE IN DEG. W. = 86.59
ANTENNA ELEV. ANGLE = 47.19
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.48
SLANT PATH PROJECTION ON EARTH IN kM = 3.73
P0 IN % = 0.377
Rm IN mm/hr =36.274
SR = 0.455
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.069 %
MEAN ATTENUATION Am = 4.662 dB
STANDARD DEV. OF ATTENUATION = 0.999

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.426 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.069 %
MEAN ATTENUATION Am = 8.850 dB
STANDARD DEV. OF ATTENUATION = 0.984

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.309 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.0032	1.0549
2.00	0.8569	0.9994
3.00	0.7168	0.9241
4.00	0.5997	0.8449
5.00	0.5048	0.7689
6.00	0.4281	0.6988
7.00	0.3658	0.6353
8.00	0.3149	0.5783
9.00	0.2729	0.5273
10.00	0.2380	0.4818
15.00	0.1295	0.3163
20.00	0.0776	0.2177
25.00	0.0496	0.1556
30.00	0.0334	0.1147
40.00	0.0168	0.0669
50.00	0.0094	0.0419

LOCATION OF TERMINAL: HUNTSVILLE, AL

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.069 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 4.662 dB; @ 30 GHz: 8.850 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 0.999; @ 30 GHz: 0.984

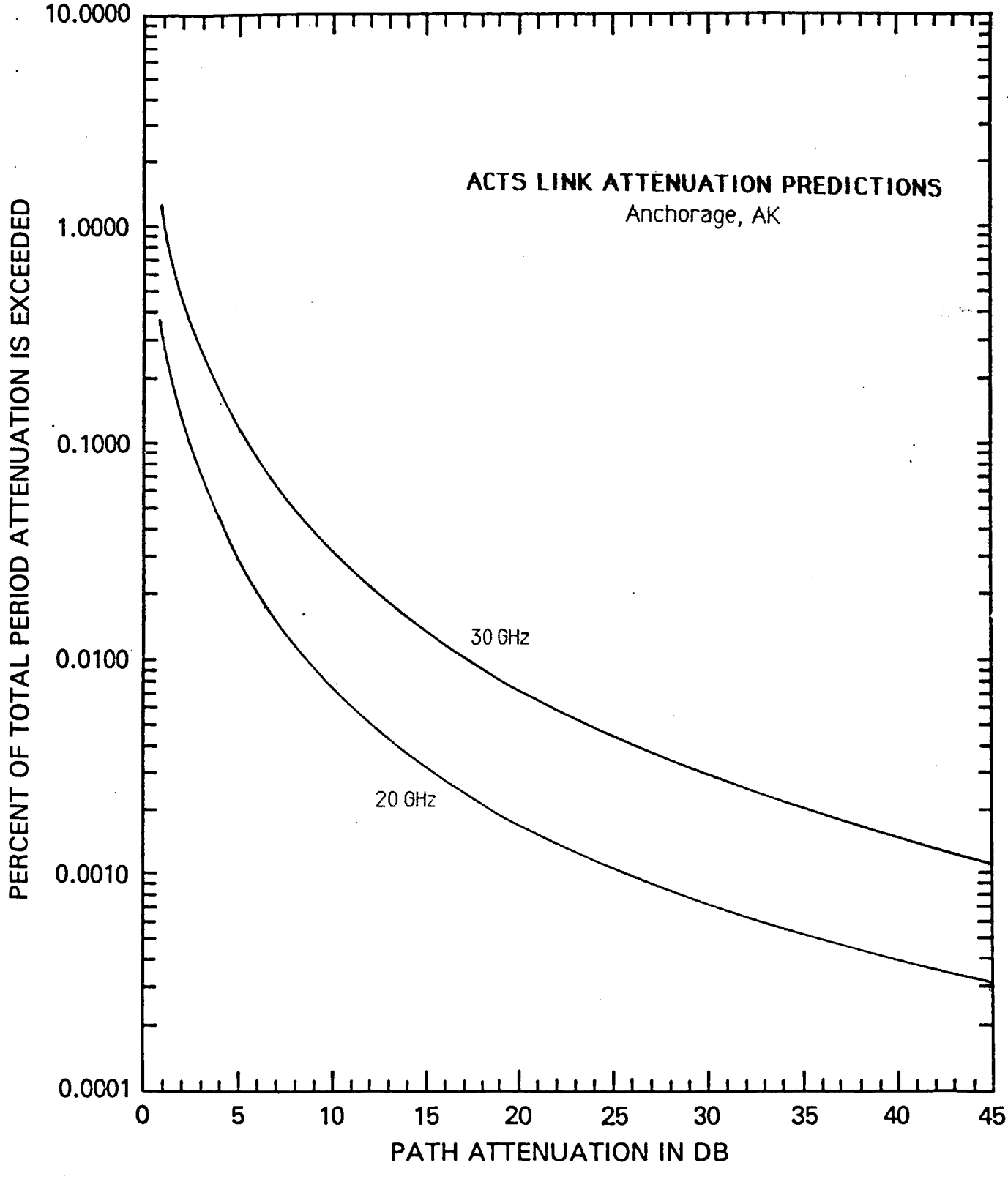
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3770.3	2654.9	1656.1	681.2	4860.2	4044.4	3041.6	1663.7
1	3726.8	2607.2	1614.9	657.3	4834.0	4003.8	2994.0	1622.4
2	3683.8	2560.3	1574.8	634.2	4807.8	3963.6	2947.1	1582.2
3	3641.3	2514.4	1535.6	611.9	4781.8	3923.9	2901.0	1543.0
4	3599.3	2469.2	1497.5	590.5	4756.0	3884.5	2855.6	1504.7
5	3557.7	2424.8	1460.2	569.7	4730.3	3845.6	2810.9	1467.4
10	3357.1	2214.7	1287.5	476.5	4603.7	3656.6	2597.7	1294.2
15	3167.8	2022.8	1135.3	398.5	4480.6	3476.9	2400.6	1141.5
20	2989.2	1847.6	1001.0	333.3	4360.8	3306.0	2218.5	1006.8
30	2661.5	1541.3	778.2	233.1	4130.6	2989.0	1894.7	783.3
40	2369.8	1285.7	605.0	163.0	3912.6	2702.5	1618.2	609.3
50	2110.1	1072.6	470.4	114.0	3706.1	2443.4	1382.0	474.0
60	1878.8	894.8	365.7	79.8	3510.6	2209.1	1180.3	368.7
70	1672.9	746.4	284.3	55.8	3325.3	1997.3	1008.0	286.9
80	1489.6	622.7	221.0	39.0	3149.8	1805.8	860.9	223.2
90	1326.3	519.5	171.8	27.3	2983.6	1632.7	735.2	173.6
100	1180.9	433.3	133.6	19.1	2826.1	1476.1	627.9	135.1

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	98.1	129.3	186.5	328.6
1.0	36.9	48.6	70.1	123.5
1.5	14.7	19.4	27.9	49.2
2.0	5.0	6.6	9.6	16.8
2.5	1.0	1.3	1.9	3.4

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	81.7	107.7	155.3	273.6
2.0	26.5	34.9	50.3	88.7
3.0	8.2	10.8	15.6	27.6
4.0	1.6	2.1	3.0	5.3


ACTS LINK ATTENUATION PREDICTIONS
Anchorage, AK
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : ANCHORAGE, AK

STATION HEIGHT IN kM = 0.028
STATION LATITUDE IN DEG. N. = 61.22
TERMINAL LONGITUDE IN DEG. W. = 149.89
ANTENNA ELEV. ANGLE = 9.51
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 9.98
SLANT PATH PROJECTION ON EARTH IN kM = 9.84
P0 IN % = 12.455
Rm IN mm/hr = 0.052
SR = 1.749
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 14.521 %
MEAN ATTENUATION Am = 0.033 dB
STANDARD DEV. OF ATTENUATION = 1.752

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 1.893 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 14.521 %
MEAN ATTENUATION Am = 0.099 dB
STANDARD DEV. OF ATTENUATION = 1.617

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 1.372 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.3673	1.1024
2.00	0.1361	0.4547
3.00	0.0713	0.2515
4.00	0.0438	0.1597
5.00	0.0295	0.1101
6.00	0.0211	0.0802
7.00	0.0158	0.0608
8.00	0.0122	0.0475
9.00	0.0097	0.0380
10.00	0.0078	0.0310
15.00	0.0034	0.0137
20.00	0.0018	0.0074
25.00	0.0011	0.0045
30.00	0.0007	0.0029
40.00	0.0004	0.0015
50.00	0.0002	0.0008

LOCATION OF TERMINAL: ANCHORAGE, AK

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 14.521 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.033 dB; @ 30 GHz: 0.099 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.752; @ 30 GHz: 1.617

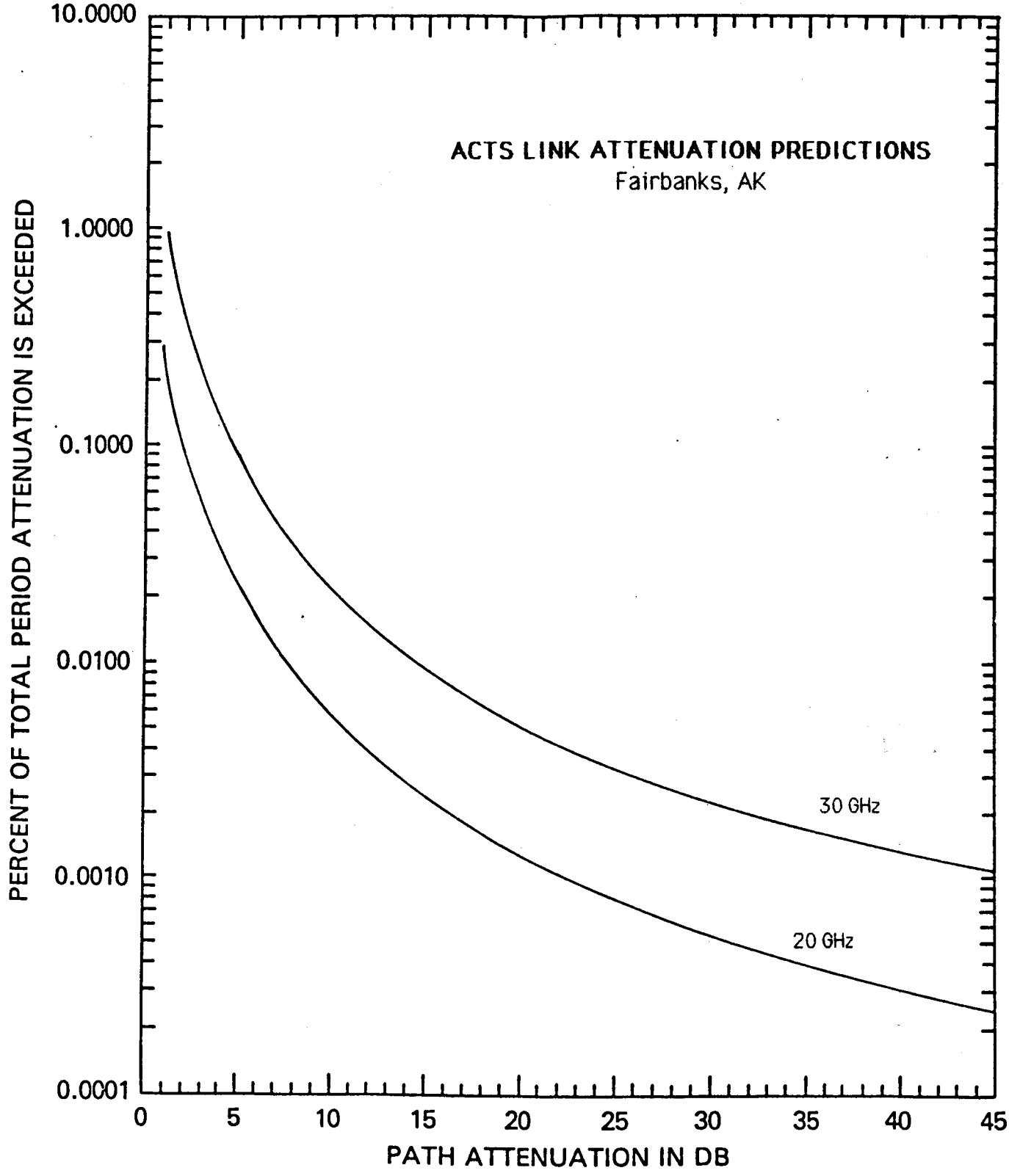
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	375.2	155.0	64.1	17.7	1322.7	578.9	249.8	71.9
1	352.5	144.8	59.6	16.4	1254.2	545.5	234.1	66.9
2	331.2	135.3	55.4	15.1	1189.2	514.1	219.4	62.2
3	311.2	126.4	51.5	13.9	1127.6	484.5	205.6	57.8
4	292.4	118.1	47.8	12.8	1069.2	456.6	192.6	53.7
5	274.7	110.3	44.4	11.9	1013.8	430.3	180.5	50.0
10	201.2	78.5	30.8	7.9	777.1	319.9	130.4	34.7
15	147.3	55.8	21.3	5.3	595.7	237.8	94.2	24.1
20	107.9	39.7	14.8	3.5	456.6	176.8	68.1	16.8
30	57.9	20.1	7.1	1.6	268.3	97.7	35.5	8.1
40	31.0	10.2	3.4	0.7	157.6	54.0	18.5	3.9
50	16.6	5.2	1.6	0.3	92.6	29.8	9.7	1.9
60	8.9	2.6	0.8	0.1	54.4	16.5	5.1	0.9
70	4.8	1.3	0.4	0.1	32.0	9.1	2.6	0.4
80	2.6	0.7	0.2	0.0	18.8	5.0	1.4	0.2
90	1.4	0.3	0.1	0.0	11.0	2.8	0.7	0.1
100	0.7	0.2	0.0	0.0	6.5	1.5	0.4	0.0

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	31.9	42.1	60.7	106.9
1.0	12.0	15.8	22.8	40.2
1.5	4.8	6.3	9.1	16.0
2.0	1.6	2.2	3.1	5.5
2.5	0.3	0.4	0.6	1.1

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	30.2	39.9	57.5	101.3
2.0	9.8	12.9	18.6	32.8
3.0	3.0	4.0	5.8	10.2
4.0	0.6	0.8	1.1	1.9


ACTS LINK ATTENUATION PREDICTIONS
Fairbanks, AK
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : FAIRBANKS, AK

STATION HEIGHT IN kM = 0.133
STATION LATITUDE IN DEG. N. = 64.85
TERMINAL LONGITUDE IN DEG. W. = 147.72
ANTENNA ELEV. ANGLE = 8.02
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 8.47
SLANT PATH PROJECTION ON EARTH IN kM = 8.39
P0 IN % = 12.455
Rm IN mm/hr = 0.052
SR = 1.749
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 14.216 %
MEAN ATTENUATION Am = 0.027 dB
STANDARD DEV. OF ATTENUATION = 1.770

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 2.241 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 14.216 %
MEAN ATTENUATION Am = 0.083 dB
STANDARD DEV. OF ATTENUATION = 1.636

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 1.624 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.2982	0.9084
2.00	0.1086	0.3666
3.00	0.0564	0.2004
4.00	0.0344	0.1263
5.00	0.0231	0.0866
6.00	0.0165	0.0628
7.00	0.0123	0.0474
8.00	0.0095	0.0370
9.00	0.0075	0.0295
10.00	0.0061	0.0240
15.00	0.0026	0.0105
20.00	0.0014	0.0057
25.00	0.0008	0.0034
30.00	0.0005	0.0022
40.00	0.0003	0.0011
50.00	0.0002	0.0006

LOCATION OF TERMINAL: FAIRBANKS, AK

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 14.216 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.027 dB; @ 30 GHz: 0.083 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.770; @ 30 GHz: 1.636

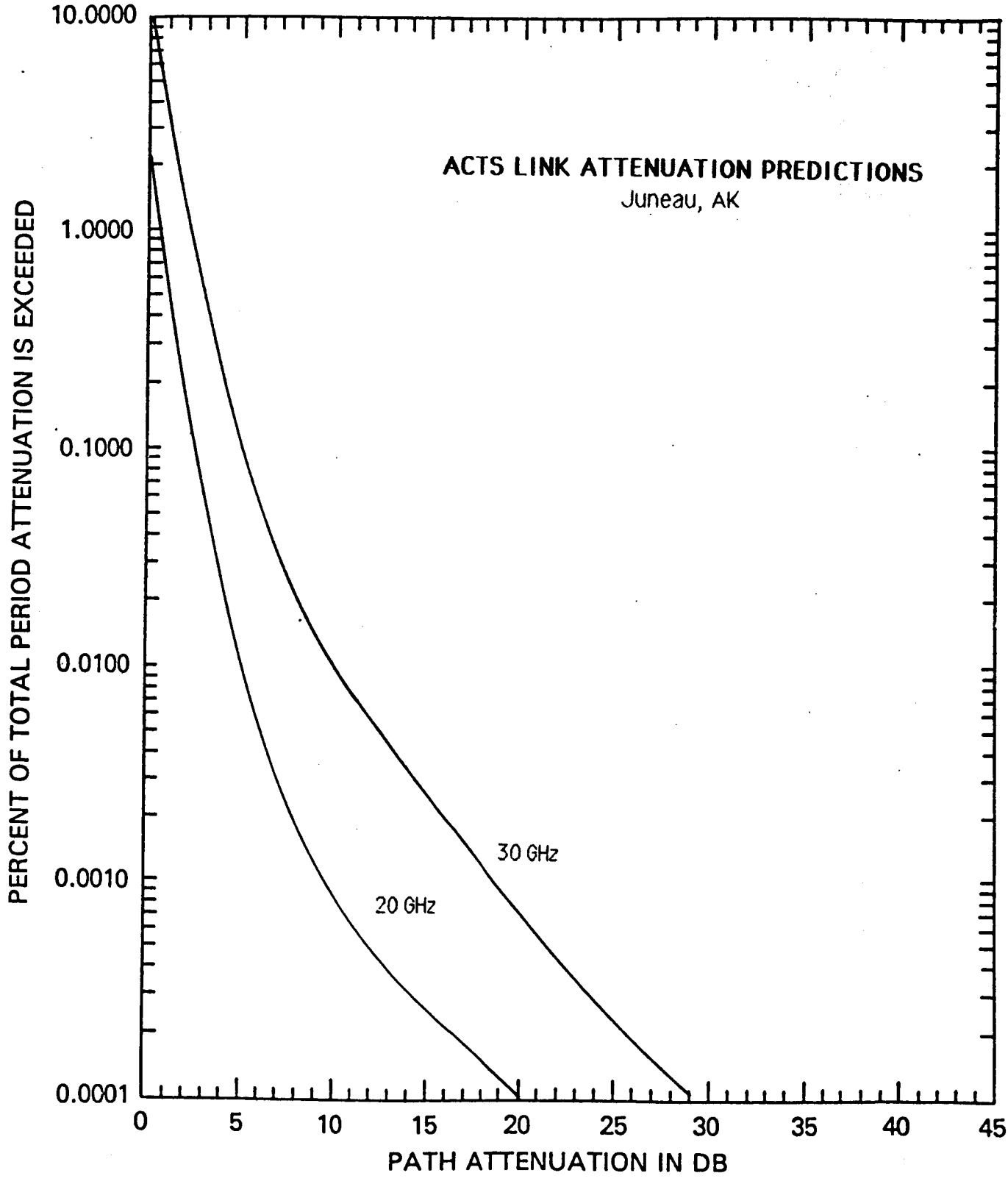
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	296.7	121.3	49.8	13.6	1054.0	455.3	194.4	55.3
1	278.4	113.2	46.2	12.6	997.8	428.4	181.9	51.4
2	261.2	105.6	42.9	11.6	944.7	403.1	170.2	47.7
3	245.0	98.5	39.8	10.7	894.3	379.4	159.3	44.3
4	229.9	91.9	36.9	9.8	846.7	357.0	149.0	41.1
5	215.7	85.7	34.3	9.1	801.6	335.9	139.4	38.2
10	156.8	60.6	23.6	6.0	609.6	247.8	100.0	26.3
15	114.0	42.8	16.2	4.0	463.6	182.8	71.7	18.2
20	82.9	30.2	11.2	2.6	352.5	134.9	51.4	12.5
30	43.8	15.1	5.3	1.2	203.9	73.4	26.4	6.0
40	23.2	7.5	2.5	0.5	117.9	40.0	13.6	2.8
50	12.3	3.8	1.2	0.2	68.2	21.7	7.0	1.4
60	6.5	1.9	0.6	0.1	39.4	11.8	3.6	0.6
70	3.4	0.9	0.3	0.0	22.8	6.4	1.8	0.3
80	1.8	0.5	0.1	0.0	13.2	3.5	1.0	0.1
90	1.0	0.2	0.1	0.0	7.6	1.9	0.5	0.1
100	0.5	0.1	0.0	0.0	4.4	1.0	0.3	0.0

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	31.3	41.2	59.5	104.8
1.0	11.8	15.5	22.4	39.4
1.5	4.7	6.2	8.9	15.7
2.0	1.6	2.1	3.0	5.4
2.5	0.3	0.4	0.6	1.1

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	29.5	39.0	56.2	99.0
2.0	9.6	12.6	18.2	32.1
3.0	3.0	3.9	5.7	10.0
4.0	0.6	0.7	1.1	1.9


ACTS LINK ATTENUATION PREDICTIONS
Juneau, AK
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : JUNEAU, AK

STATION HEIGHT IN kM = 0.005
STATION LATITUDE IN DEG. N. = 58.30
TERMINAL LONGITUDE IN DEG. W. = 134.42
ANTENNA ELEV. ANGLE = 17.41
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.57
SLANT PATH PROJECTION ON EARTH IN kM = 6.27
P0 IN % = 36.390
Rm IN mm/hr = 0.209
SR = 1.189
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 37.308 %
MEAN ATTENUATION Am = 0.103 dB
STANDARD DEV. OF ATTENUATION = 1.124

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 1.045 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 37.308 %
MEAN ATTENUATION Am = 0.282 dB
STANDARD DEV. OF ATTENUATION = 1.030

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.758 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.8086	4.0906
2.00	0.1559	1.0672
3.00	0.0507	0.4048
4.00	0.0212	0.1870
5.00	0.0104	0.0978
6.00	0.0056	0.0558
7.00	0.0033	0.0339
8.00	0.0020	0.0217
9.00	0.0013	0.0144
10.00	0.0009	0.0099
15.00	0.0002	0.0021
20.00	0.0001	0.0007
25.00	0.0000	0.0002
30.00	0.0000	0.0001
40.00	0.0000	0.0000
50.00	0.0000	0.0000

LOCATION OF TERMINAL: JUNEAU, AK

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 37.308 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.103 dB; @ 30 GHz: 0.282 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.124; @ 30 GHz: 1.030

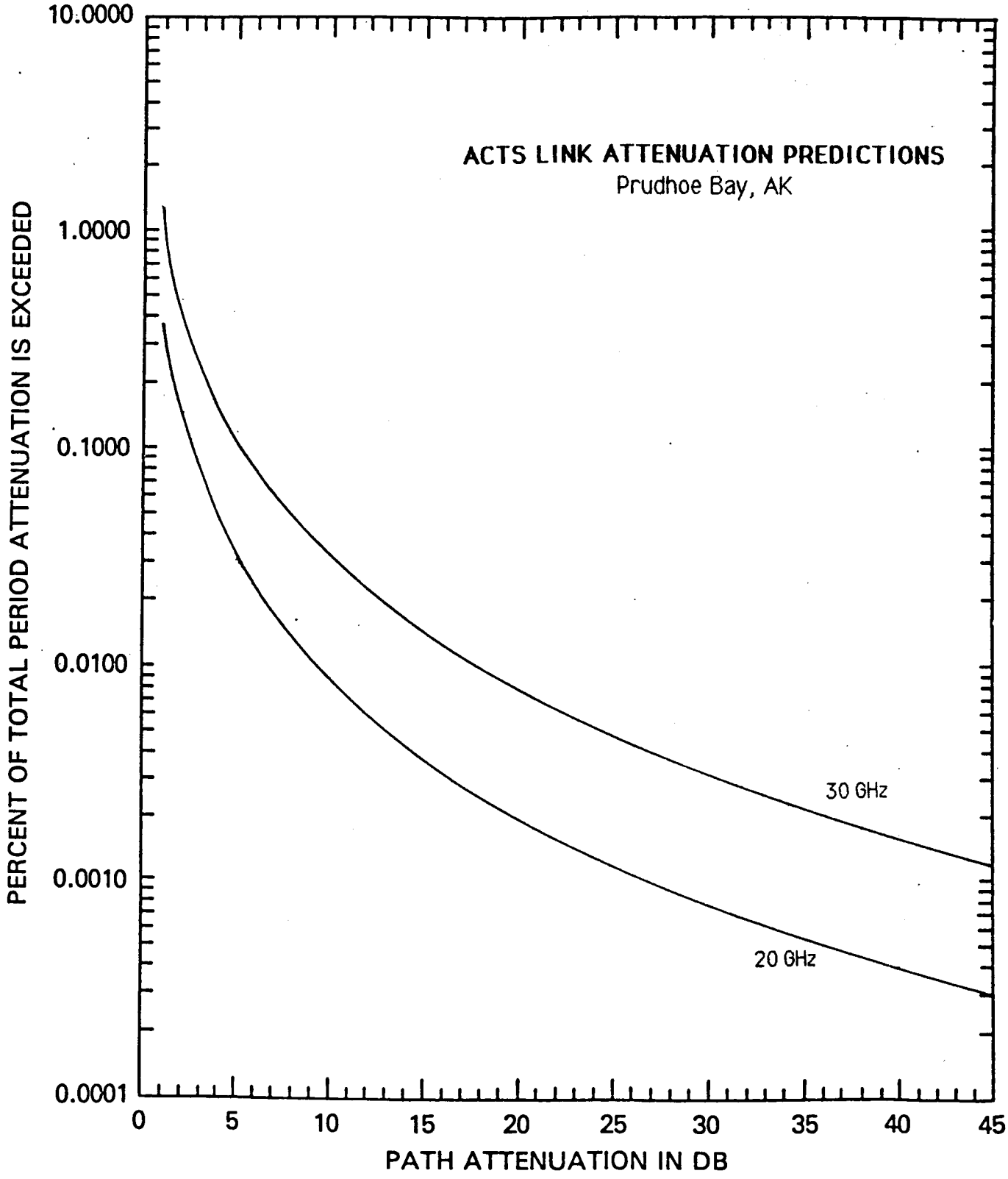
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	266.6	54.5	10.6	0.9	2129.3	514.4	113.9	11.2
1	248.5	50.3	9.7	0.8	2011.9	481.3	105.6	10.2
2	231.5	46.4	8.9	0.8	1900.9	450.4	97.9	9.4
3	215.8	42.9	8.2	0.7	1796.1	421.4	90.8	8.6
4	201.1	39.6	7.5	0.6	1697.1	394.3	84.2	7.9
5	187.4	36.6	6.8	0.6	1603.5	369.0	78.1	7.2
10	131.7	24.5	4.4	0.3	1207.6	264.7	53.5	4.6
15	92.5	16.5	2.8	0.2	909.5	189.9	36.7	3.0
20	65.0	11.1	1.8	0.1	684.9	136.2	25.1	1.9
30	32.1	5.0	0.8	0.0	388.4	70.1	11.8	0.8
40	15.9	2.2	0.3	0.0	220.3	36.1	5.5	0.3
50	7.8	1.0	0.1	0.0	124.9	18.6	2.6	0.1
60	3.9	0.5	0.1	0.0	70.9	9.5	1.2	0.1
70	1.9	0.2	0.0	0.0	40.2	4.9	0.6	0.0
80	0.9	0.1	0.0	0.0	22.8	2.5	0.3	0.0
90	0.5	0.0	0.0	0.0	12.9	1.3	0.1	0.0
100	0.2	0.0	0.0	0.0	7.3	0.7	0.1	0.0

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	77.6	102.3	147.5	259.9
1.0	29.2	38.5	55.5	97.7
1.5	11.6	15.3	22.1	38.9
2.0	4.0	5.2	7.6	13.3
2.5	0.8	1.1	1.5	2.7

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	74.6	98.3	141.8	249.8
2.0	24.2	31.9	46.0	81.0
3.0	7.5	9.9	14.3	25.2
4.0	1.4	1.9	2.7	4.8


ACTS LINK ATTENUATION PREDICTIONS
Prudhoe Bay, AK
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB
30 GHz
20 GHz

LOCATION OF TERMINAL : PRUDHOE BAY, AK

STATION HEIGHT IN kM = 0.015
STATION LATITUDE IN DEG. N. = 70.35
TERMINAL LONGITUDE IN DEG. W. = 148.50
ANTENNA ELEV. ANGLE = 4.22
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 10.19
SLANT PATH PROJECTION ON EARTH IN kM = 10.16
P0 IN % = 12.455
Rm IN mm/hr = 0.052
SR = 1.749
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 14.583 %
MEAN ATTENUATION Am = 0.033 dB
STANDARD DEV. OF ATTENUATION = 1.749

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 4.248 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 14.583 %
MEAN ATTENUATION Am = 0.101 dB
STANDARD DEV. OF ATTENUATION = 1.613

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 3.079 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.3763	1.1287
2.00	0.1396	0.4663
3.00	0.0732	0.2580
4.00	0.0449	0.1638
5.00	0.0302	0.1129
6.00	0.0216	0.0823
7.00	0.0162	0.0624
8.00	0.0125	0.0487
9.00	0.0099	0.0390
10.00	0.0080	0.0318
15.00	0.0035	0.0140
20.00	0.0018	0.0076
25.00	0.0011	0.0046
30.00	0.0007	0.0030
40.00	0.0004	0.0015
50.00	0.0002	0.0009

LOCATION OF TERMINAL: PRUDHOE BAY, AK

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 14.583 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.033 dB; @ 30 GHz: 0.101 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.749; @ 30 GHz: 1.613

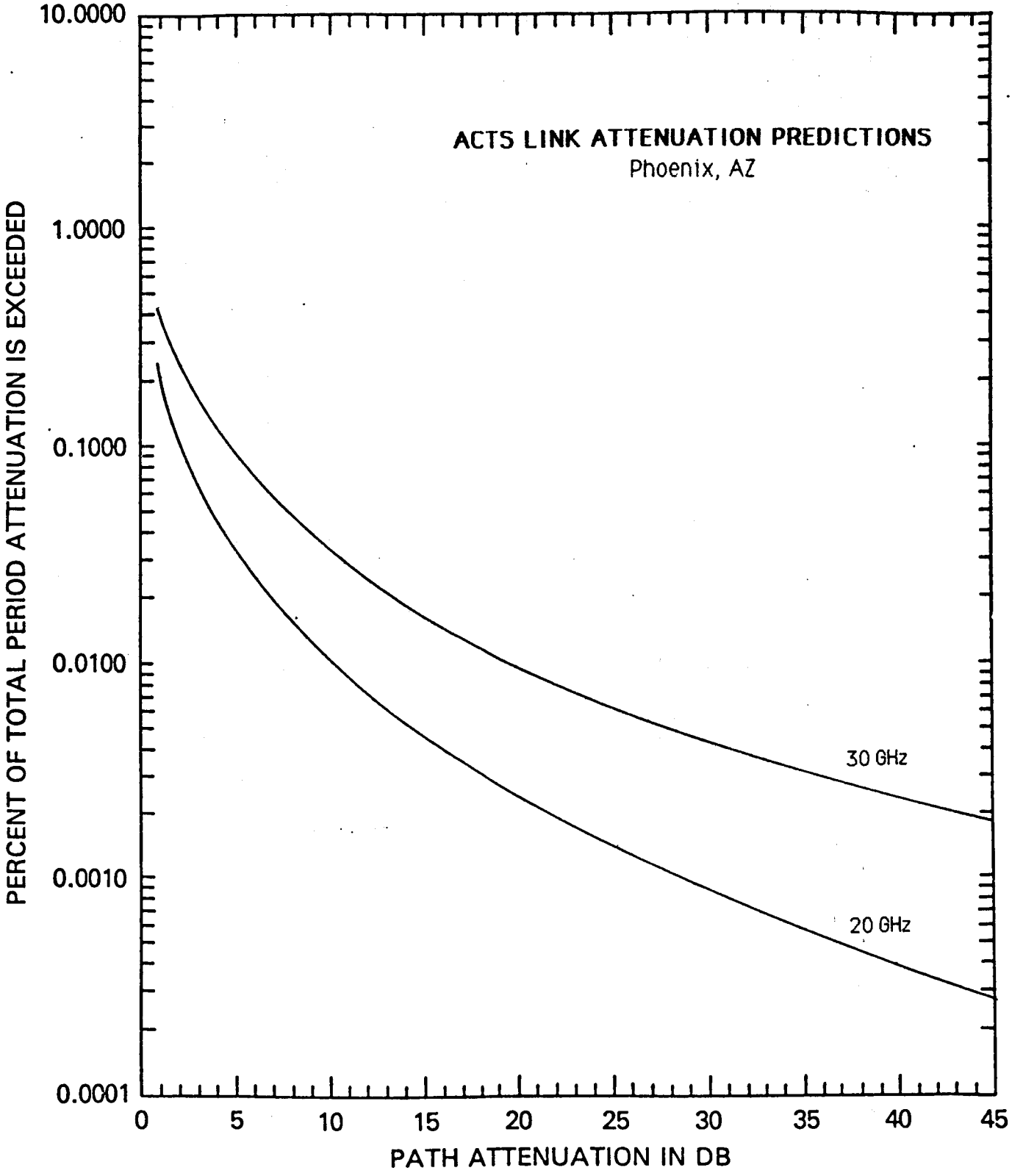
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	384.9	159.1	65.8	18.2	1356.9	594.1	256.4	73.7
1	361.7	148.6	61.1	16.8	1286.8	559.9	240.3	68.6
2	339.9	138.8	56.8	15.5	1220.4	527.8	225.2	63.8
3	319.4	129.7	52.8	14.3	1157.4	497.5	211.0	59.3
4	300.1	121.2	49.1	13.2	1097.6	468.9	197.8	55.1
5	282.0	113.2	45.6	12.2	1040.9	442.0	185.4	51.3
10	206.7	80.6	31.6	8.1	798.6	328.8	134.0	35.7
15	151.5	57.4	21.9	5.4	612.6	244.6	96.9	24.8
20	111.0	40.9	15.2	3.6	470.0	182.0	70.0	17.3
30	59.6	20.7	7.3	1.6	276.6	100.7	36.6	8.3
40	32.0	10.5	3.5	0.7	162.8	55.8	19.1	4.0
50	17.2	5.3	1.7	0.3	95.8	30.9	10.0	2.0
60	9.2	2.7	0.8	0.1	56.4	17.1	5.2	0.9
70	5.0	1.4	0.4	0.1	33.2	9.5	2.7	0.5
80	2.7	0.7	0.2	0.0	19.5	5.2	1.4	0.2
90	1.4	0.4	0.1	0.0	11.5	2.9	0.7	0.1
100	0.8	0.2	0.0	0.0	6.8	1.6	0.4	0.1

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	32.0	42.2	60.9	107.3
1.0	12.0	15.9	22.9	40.3
1.5	4.8	6.3	9.1	16.1
2.0	1.6	2.2	3.1	5.5
2.5	0.3	0.4	0.6	1.1

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	30.4	40.1	57.8	101.8
2.0	9.8	13.0	18.7	33.0
3.0	3.1	4.0	5.8	10.3
4.0	0.6	0.8	1.1	2.0


ACTS LINK ATTENUATION PREDICTIONS
Phoenix, AZ
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : PHOENIX, AZ

STATION HEIGHT IN kM = 0.335
STATION LATITUDE IN DEG. N. = 33.45
TERMINAL LONGITUDE IN DEG. W. = 112.07
ANTENNA ELEV. ANGLE = 49.00
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.46
SLANT PATH PROJECTION ON EARTH IN kM = 3.58
P0 IN % = 0.280
Rm IN mm/hr = 4.847
SR = 0.916
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 0.931 %
MEAN ATTENUATION Am = 0.412 dB
STANDARD DEV. OF ATTENUATION = 1.381

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.415 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 0.931 %
MEAN ATTENUATION Am = 0.903 dB
STANDARD DEV. OF ATTENUATION = 1.335

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.300 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.2424	0.4371
2.00	0.1176	0.2566
3.00	0.0701	0.1715
4.00	0.0465	0.1233
5.00	0.0329	0.0930
6.00	0.0244	0.0726
7.00	0.0187	0.0582
8.00	0.0148	0.0476
9.00	0.0119	0.0396
10.00	0.0097	0.0334
15.00	0.0043	0.0164
20.00	0.0023	0.0095
25.00	0.0014	0.0060
30.00	0.0009	0.0040
40.00	0.0004	0.0021
50.00	0.0002	0.0012

LOCATION OF TERMINAL: PHOENIX, AZ

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 0.931 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.412 dB; @ 30 GHz: 0.903 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.381; @ 30 GHz: 1.335

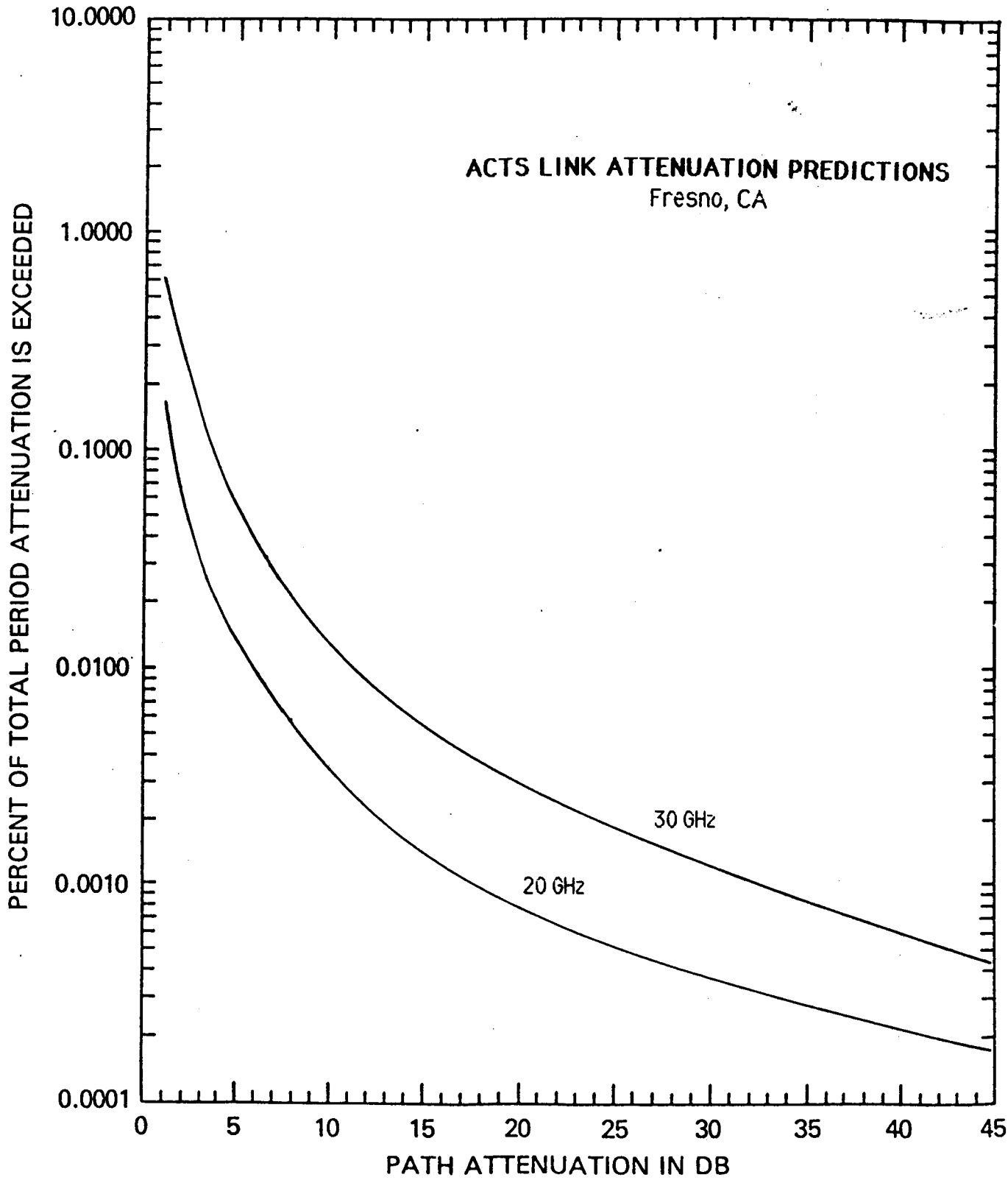
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	368.6	173.1	77.7	22.6	901.9	489.2	250.3	86.4
1	353.9	165.1	73.6	21.3	874.3	471.1	239.5	82.0
2	339.9	157.4	69.8	20.0	847.6	453.6	229.1	77.7
3	326.3	150.1	66.1	18.8	821.7	436.8	219.2	73.7
4	313.4	143.2	62.7	17.6	796.5	420.6	209.8	69.9
5	300.9	136.6	59.4	16.5	772.1	405.1	200.7	66.3
10	245.7	107.8	45.4	12.1	661.0	335.4	160.9	50.8
15	200.6	85.0	34.6	8.8	565.9	277.7	129.1	39.0
20	163.8	67.1	26.5	6.5	484.4	229.9	103.5	29.9
30	109.2	41.8	15.4	3.5	355.0	157.6	66.5	17.6
40	72.8	26.0	9.0	1.8	260.2	108.1	42.8	10.4
50	48.5	16.2	5.3	1.0	190.7	74.1	27.5	6.1
60	32.3	10.1	3.1	0.5	139.8	50.8	17.7	3.6
70	21.6	6.3	1.8	0.3	102.4	34.8	11.4	2.1
80	14.4	3.9	1.0	0.1	75.1	23.9	7.3	1.2
90	9.6	2.4	0.6	0.1	55.0	16.4	4.7	0.7
100	6.4	1.5	0.4	0.0	40.3	11.2	3.0	0.4

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	51.3	67.7	97.6	172.0
1.0	19.3	25.4	36.7	64.6
1.5	7.7	10.1	14.6	25.7
2.0	2.6	3.5	5.0	8.8
2.5	0.5	0.7	1.0	1.8

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	44.3	58.5	84.3	148.5
2.0	14.4	18.9	27.3	48.1
3.0	4.5	5.9	8.5	15.0
4.0	0.9	1.1	1.6	2.9


ACTS LINK ATTENUATION PREDICTIONS
Fresno, CA
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : FRESNO, CA

STATION HEIGHT IN kM = 0.101
STATION LATITUDE IN DEG. N. = 36.73
TERMINAL LONGITUDE IN DEG. W. = 119.78
ANTENNA ELEV. ANGLE = 42.58
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.95
SLANT PATH PROJECTION ON EARTH IN kM = 4.38
P0 IN % = 15.087
Rm IN mm/hr = 0.043
SR = 1.765
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 15.842 %
MEAN ATTENUATION Am = 0.016 dB
STANDARD DEV. OF ATTENUATION = 1.835

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.462 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 15.842 %
MEAN ATTENUATION Am = 0.048 dB
STANDARD DEV. OF ATTENUATION = 1.704

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.335 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.1854	0.5911
2.00	0.0648	0.2261
3.00	0.0330	0.1204
4.00	0.0199	0.0746
5.00	0.0132	0.0506
6.00	0.0094	0.0364
7.00	0.0070	0.0273
8.00	0.0053	0.0212
9.00	0.0042	0.0168
10.00	0.0034	0.0136
15.00	0.0014	0.0059
20.00	0.0008	0.0032
25.00	0.0005	0.0019
30.00	0.0003	0.0012
40.00	0.0002	0.0006
50.00	0.0001	0.0004

LOCATION OF TERMINAL: FRESNO, CA

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 15.842 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.016 dB; @ 30 GHz: 0.048 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.835; @ 30 GHz: 1.704

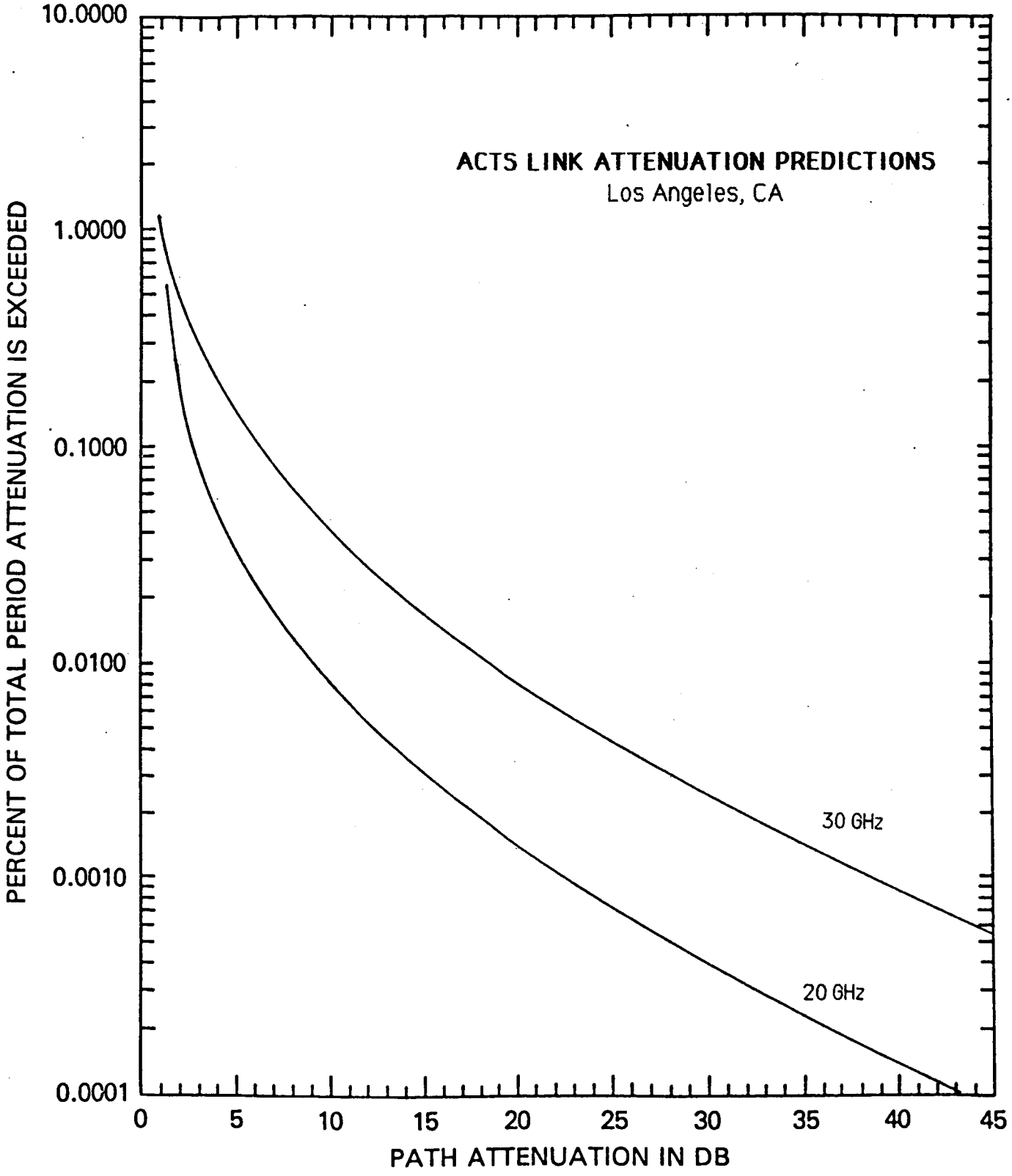
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	173.6	69.5	28.1	7.6	633.1	265.9	111.2	31.1
1	162.2	64.6	26.0	7.0	596.7	249.1	103.7	28.7
2	151.5	60.0	24.0	6.4	562.4	233.4	96.6	26.6
3	141.6	55.8	22.2	5.9	530.0	218.7	90.0	24.6
4	132.3	51.8	20.5	5.4	499.5	204.9	83.9	22.7
5	123.6	48.2	19.0	5.0	470.7	191.9	78.1	21.0
10	88.0	33.4	12.8	3.2	350.0	138.6	54.9	14.2
15	62.7	23.1	8.6	2.1	260.2	100.0	38.5	9.6
20	44.6	16.0	5.8	1.4	193.5	72.2	27.1	6.5
30	22.6	7.7	2.7	0.6	106.9	37.6	13.4	3.0
40	11.5	3.7	1.2	0.2	59.1	19.6	6.6	1.4
50	5.8	1.8	0.6	0.1	32.7	10.2	3.2	0.6
60	3.0	0.8	0.3	0.0	18.1	5.3	1.6	0.3
70	1.5	0.4	0.1	0.0	10.0	2.8	0.8	0.1
80	0.8	0.2	0.1	0.0	5.5	1.4	0.4	0.1
90	0.4	0.1	0.0	0.0	3.1	0.8	0.2	0.0
100	0.2	0.0	0.0	0.0	1.7	0.4	0.1	0.0

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	29.1	38.3	55.3	97.4
1.0	10.9	14.4	20.8	36.6
1.5	4.4	5.7	8.3	14.6
2.0	1.5	2.0	2.8	5.0
2.5	0.3	0.4	0.6	1.0

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	27.2	35.9	51.8	91.2
2.0	8.8	11.6	16.8	29.6
3.0	2.7	3.6	5.2	9.2
4.0	0.5	0.7	1.0	1.8


ACTS LINK ATTENUATION PREDICTIONS
Los Angeles, CA
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB
30 GHz
20 GHz

LOCATION OF TERMINAL : LOS ANGELES, CA

STATION HEIGHT IN kM = 0.061
STATION LATITUDE IN DEG. N. = 34.07
TERMINAL LONGITUDE IN DEG. W. = 118.25
ANTENNA ELEV. ANGLE = 45.85
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.04
SLANT PATH PROJECTION ON EARTH IN kM = 4.21
P0 IN % = 1.087
Rm IN mm/hr = 2.195
SR = 0.933
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.915 %
MEAN ATTENUATION Am = 0.512 dB
STANDARD DEV. OF ATTENUATION = 1.126

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.436 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.915 %
MEAN ATTENUATION Am = 1.187 dB
STANDARD DEV. OF ATTENUATION = 1.066

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.316 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.5283	1.0800
2.00	0.2163	0.5982
3.00	0.1112	0.3683
4.00	0.0648	0.2438
5.00	0.0410	0.1699
6.00	0.0275	0.1232
7.00	0.0193	0.0920
8.00	0.0140	0.0704
9.00	0.0104	0.0550
10.00	0.0079	0.0437
15.00	0.0026	0.0166
20.00	0.0011	0.0077
25.00	0.0005	0.0041
30.00	0.0003	0.0023
40.00	0.0001	0.0009
50.00	0.0000	0.0004

LOCATION OF TERMINAL: LOS ANGELES, CA

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.915 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.512 dB; @ 30 GHz: 1.187 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.126; @ 30 GHz: 1.066

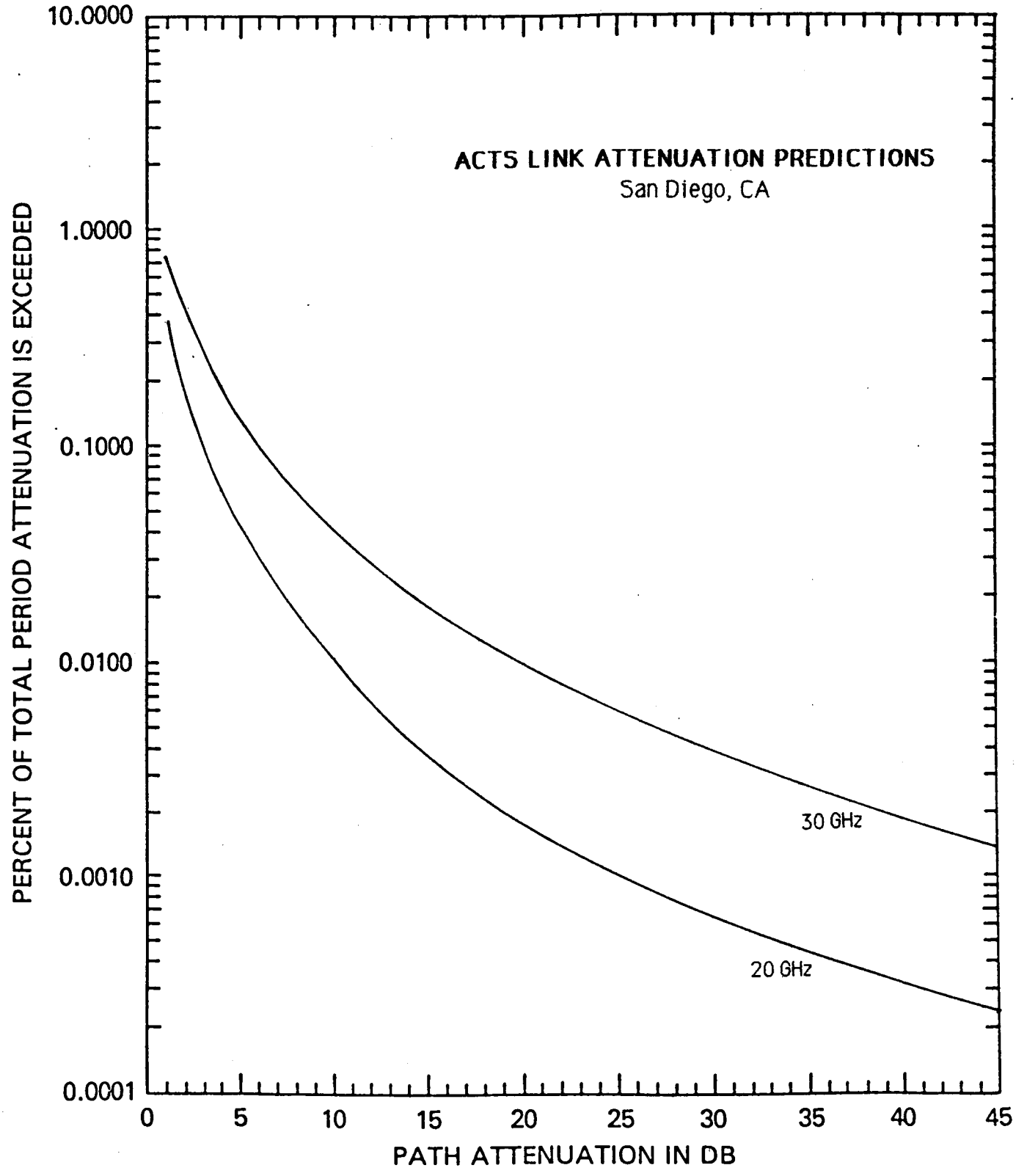
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	584.8	215.8	73.4	13.5	1937.0	893.8	370.4	87.4
1	560.2	205.0	69.2	12.6	1878.7	859.7	353.4	82.5
2	536.6	194.7	65.2	11.8	1822.1	826.8	337.1	77.8
3	514.0	184.9	61.4	11.0	1767.3	795.3	321.6	73.4
4	492.4	175.6	57.9	10.2	1714.1	764.9	306.9	69.2
5	471.7	166.8	54.5	9.5	1662.5	735.7	292.8	65.3
10	380.4	128.9	40.5	6.7	1426.9	605.5	231.4	48.8
15	306.8	99.7	30.0	4.7	1224.6	498.4	182.9	36.4
20	247.5	77.0	22.3	3.3	1051.1	410.2	144.5	27.2
30	161.0	46.0	12.3	1.6	774.2	277.9	90.3	15.2
40	104.7	27.5	6.8	0.8	570.3	188.3	56.4	8.5
50	68.1	16.4	3.7	0.4	420.1	127.6	35.2	4.7
60	44.3	9.8	2.1	0.2	309.5	86.4	22.0	2.6
70	28.8	5.9	1.1	0.1	228.0	58.5	13.8	1.5
80	18.8	3.5	0.6	0.0	167.9	39.7	8.6	0.8
90	12.2	2.1	0.3	0.0	123.7	26.9	5.4	0.5
100	7.9	1.3	0.2	0.0	91.1	18.2	3.4	0.3

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	77.3	102.0	147.0	259.0
1.0	29.1	38.3	55.3	97.4
1.5	11.6	15.3	22.0	38.8
2.0	4.0	5.2	7.5	13.3
2.5	0.8	1.1	1.5	2.7

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	69.5	91.7	132.2	233.0
2.0	22.5	29.7	42.9	75.5
3.0	7.0	9.2	13.3	23.5
4.0	1.3	1.8	2.5	4.5


ACTS LINK ATTENUATION PREDICTIONS
San Diego, CA
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : SAN DIEGO, CA

STATION HEIGHT IN kM = 0.006
STATION LATITUDE IN DEG. N. = 32.72
TERMINAL LONGITUDE IN DEG. W. = 117.15
ANTENNA ELEV. ANGLE = 47.68
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.12
SLANT PATH PROJECTION ON EARTH IN kM = 4.12
P0 IN % = 0.558
Rm IN mm/hr = 3.174
SR = 0.920
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.364 %
MEAN ATTENUATION Am = 0.471 dB
STANDARD DEV. OF ATTENUATION = 1.254

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.423 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.364 %
MEAN ATTENUATION Am = 1.065 dB
STANDARD DEV. OF ATTENUATION = 1.202

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.307 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.3742	0.7108
2.00	0.1699	0.4095
3.00	0.0954	0.2654
4.00	0.0601	0.1849
5.00	0.0407	0.1353
6.00	0.0290	0.1026
7.00	0.0214	0.0800
8.00	0.0163	0.0638
9.00	0.0127	0.0517
10.00	0.0101	0.0426
15.00	0.0039	0.0190
20.00	0.0019	0.0100
25.00	0.0010	0.0059
30.00	0.0006	0.0037
40.00	0.0003	0.0017
50.00	0.0001	0.0009

LOCATION OF TERMINAL: SAN DIEGO, CA

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.364 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.471 dB; @ 30 GHz: 1.065 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.254; @ 30 GHz: 1.202

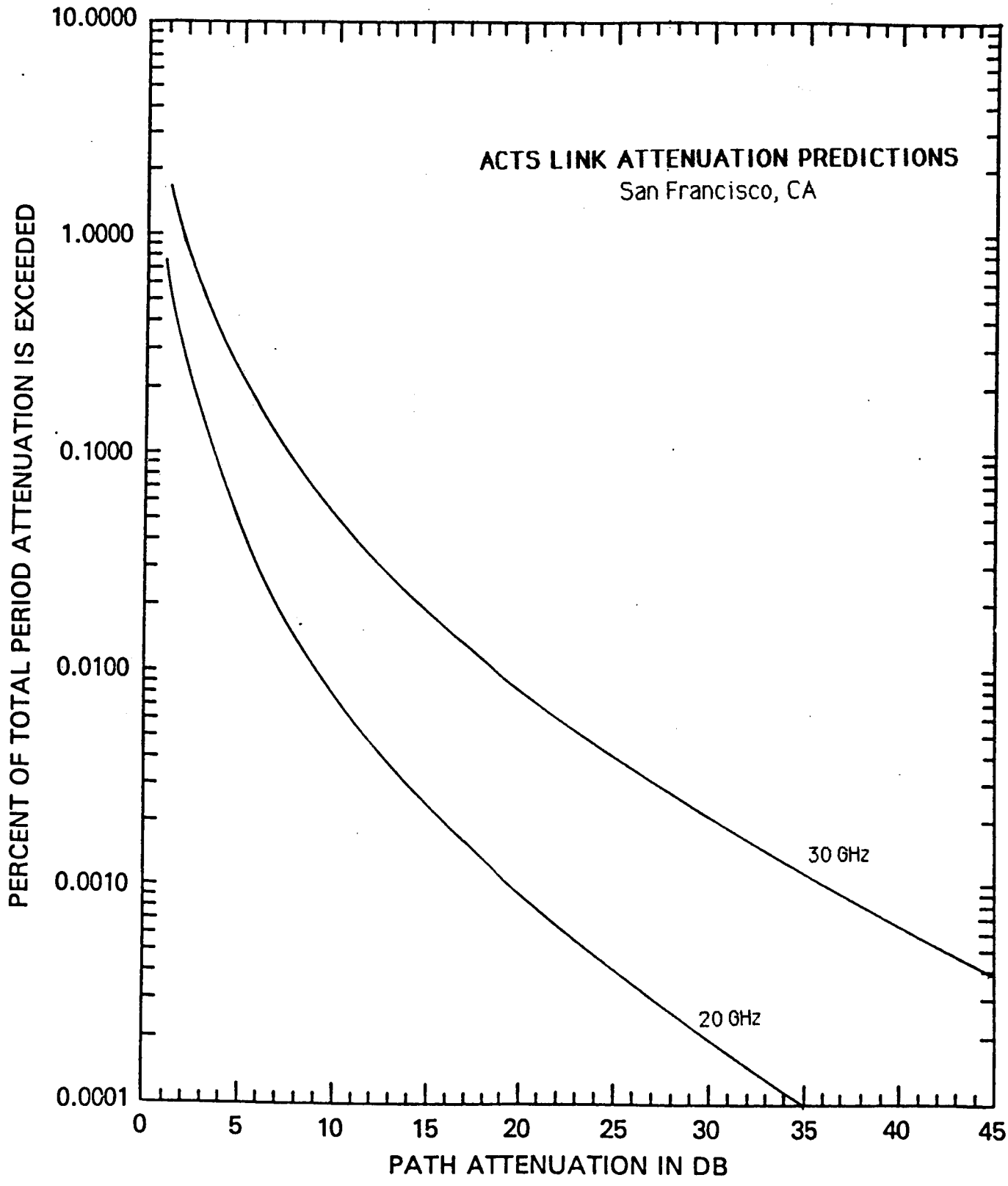
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	501.9	213.9	85.8	20.7	1395.9	711.6	335.4	99.7
1	481.6	203.7	81.1	19.4	1354.0	685.2	320.7	94.4
2	462.2	194.0	76.7	18.2	1313.5	659.8	306.6	89.4
3	443.5	184.8	72.5	17.0	1274.1	635.3	293.1	84.6
4	425.6	176.0	68.6	15.9	1235.9	611.7	280.2	80.1
5	408.4	167.6	64.8	14.9	1198.8	589.0	267.9	75.8
10	332.3	131.3	49.0	10.7	1029.6	487.5	214.0	57.6
15	270.3	102.8	37.0	7.7	884.3	403.5	170.9	43.8
20	220.0	80.6	28.0	5.6	759.5	334.0	136.5	33.3
30	145.6	49.4	16.0	2.9	560.2	228.8	87.1	19.2
40	96.4	30.3	9.1	1.5	413.2	156.8	55.5	11.1
50	63.8	18.6	5.2	0.8	304.8	107.4	35.4	6.4
60	42.2	11.4	3.0	0.4	224.8	73.6	22.6	3.7
70	28.0	7.0	1.7	0.2	165.8	50.4	14.4	2.1
80	18.5	4.3	1.0	0.1	122.3	34.5	9.2	1.2
90	12.3	2.6	0.6	0.1	90.2	23.7	5.9	0.7
100	8.1	1.6	0.3	0.0	66.6	16.2	3.7	0.4

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	62.3	82.2	118.5	208.8
1.0	23.4	30.9	44.6	78.5
1.5	9.3	12.3	17.7	31.2
2.0	3.2	4.2	6.1	10.7
2.5	0.6	0.9	1.2	2.2

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	54.7	72.1	104.0	183.2
2.0	17.7	23.4	33.7	59.4
3.0	5.5	7.3	10.5	18.5
4.0	1.1	1.4	2.0	3.5


ACTS LINK ATTENUATION PREDICTIONS
San Francisco, CA
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB
30 GHz
20 GHz

LOCATION OF TERMINAL : SAN FRANSICSO, CA

STATION HEIGHT IN kM = 0.009
STATION LATITUDE IN DEG. N. = 37.78
TERMINAL LONGITUDE IN DEG. W. = 112.42
ANTENNA ELEV. ANGLE = 44.33
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.74
SLANT PATH PROJECTION ON EARTH IN kM = 4.11
P0 IN % = 2.104
Rm IN mm/hr = 1.654
SR = 0.987
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 2.895 %
MEAN ATTENUATION Am = 0.517 dB
STANDARD DEV. OF ATTENUATION = 1.072

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.448 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 2.895 %
MEAN ATTENUATION Am = 1.224 dB
STANDARD DEV. OF ATTENUATION = 1.002

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.324 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.7792	1.6791
2.00	0.2996	0.9034
3.00	0.1462	0.5369
4.00	0.0815	0.3433
5.00	0.0496	0.2317
6.00	0.0321	0.1629
7.00	0.0218	0.1183
8.00	0.0154	0.0882
9.00	0.0111	0.0672
10.00	0.0083	0.0521
15.00	0.0024	0.0179
20.00	0.0009	0.0077
25.00	0.0004	0.0038
30.00	0.0002	0.0020
40.00	0.0001	0.0007
50.00	0.0000	0.0003

LOCATION OF TERMINAL: SAN FRANSICSO, CA

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 2.895 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.517 dB; @ 30 GHz: 1.224 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.072; @ 30 GHz: 1.002

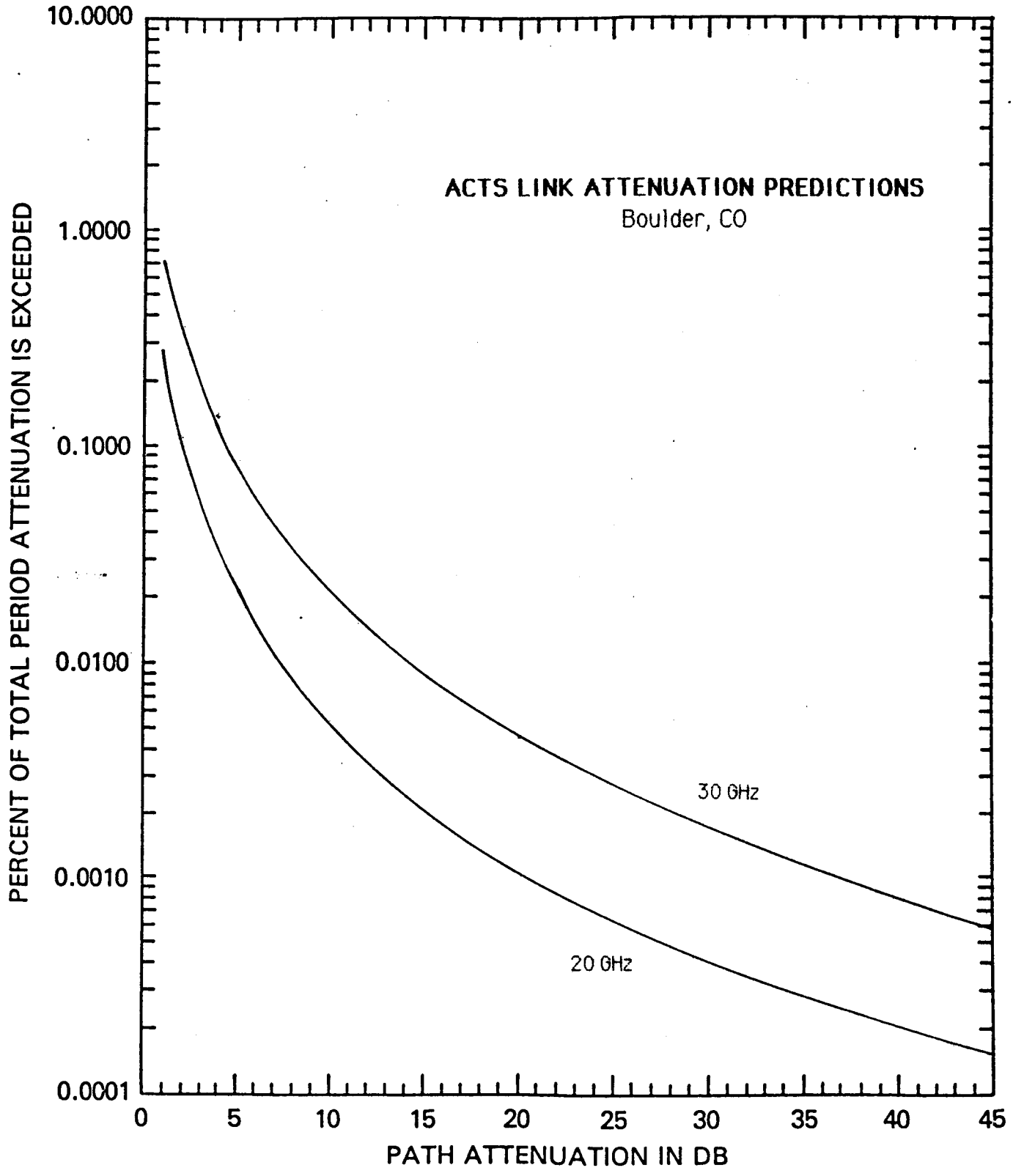
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	768.7	261.0	80.8	12.8	2823.6	1218.8	463.9	94.2
1	735.4	247.5	76.0	11.9	2737.4	1171.1	441.9	88.6
2	703.6	234.7	71.4	11.0	2653.9	1125.2	420.9	83.4
3	673.1	222.5	67.1	10.3	2572.9	1081.1	400.9	78.5
4	644.0	210.9	63.1	9.5	2494.4	1038.8	381.9	73.8
5	616.1	200.0	59.3	8.9	2418.2	998.1	363.8	69.5
10	493.7	153.2	43.6	6.1	2071.0	817.4	285.2	51.3
15	395.7	117.4	32.0	4.3	1773.7	669.4	223.7	37.9
20	317.1	90.0	23.5	2.9	1519.0	548.1	175.4	27.9
30	203.7	52.8	12.7	1.4	1114.1	367.6	107.8	15.2
40	130.8	31.0	6.8	0.7	817.2	246.5	66.3	8.3
50	84.0	18.2	3.7	0.3	599.4	165.3	40.8	4.5
60	54.0	10.7	2.0	0.2	439.6	110.9	25.1	2.5
70	34.7	6.3	1.1	0.1	322.4	74.4	15.4	1.3
80	22.3	3.7	0.6	0.0	236.5	49.9	9.5	0.7
90	14.3	2.2	0.3	0.0	173.5	33.4	5.8	0.4
100	9.2	1.3	0.2	0.0	127.2	22.4	3.6	0.2

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	85.2	112.4	162.1	285.6
1.0	32.0	42.3	60.9	107.4
1.5	12.8	16.8	24.3	42.7
2.0	4.4	5.8	8.3	14.6
2.5	0.9	1.2	1.7	3.0

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	78.8	103.9	149.8	263.9
2.0	25.5	33.7	48.6	85.5
3.0	7.9	10.5	15.1	26.6
4.0	1.5	2.0	2.9	5.1


ACTS LINK ATTENUATION PREDICTIONS
Boulder, CO
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : BOULDER, CO

STATION HEIGHT IN kM = 1.372
STATION LATITUDE IN DEG. N. = 40.01
TERMINAL LONGITUDE IN DEG. W. = 105.28
ANTENNA ELEV. ANGLE = 43.41
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 3.53
SLANT PATH PROJECTION ON EARTH IN kM = 2.57
P0 IN % = 2.714
Rm IN mm/hr = 0.646
SR = 1.363
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 3.077 %
MEAN ATTENUATION Am = 0.145 dB
STANDARD DEV. OF ATTENUATION = 1.450

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.455 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 3.077 %
MEAN ATTENUATION Am = 0.368 dB
STANDARD DEV. OF ATTENUATION = 1.350

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.330 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.2822	0.7067
2.00	0.1085	0.3232
3.00	0.0566	0.1850
4.00	0.0342	0.1189
5.00	0.0226	0.0821
6.00	0.0158	0.0596
7.00	0.0116	0.0449
8.00	0.0088	0.0348
9.00	0.0068	0.0276
10.00	0.0054	0.0223
15.00	0.0021	0.0093
20.00	0.0010	0.0048
25.00	0.0006	0.0027
30.00	0.0004	0.0017
40.00	0.0002	0.0008
50.00	0.0001	0.0004

LOCATION OF TERMINAL: BOULDER, CO

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 3.077 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.145 dB; @ 30 GHz: 0.368 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.450; @ 30 GHz: 1.350

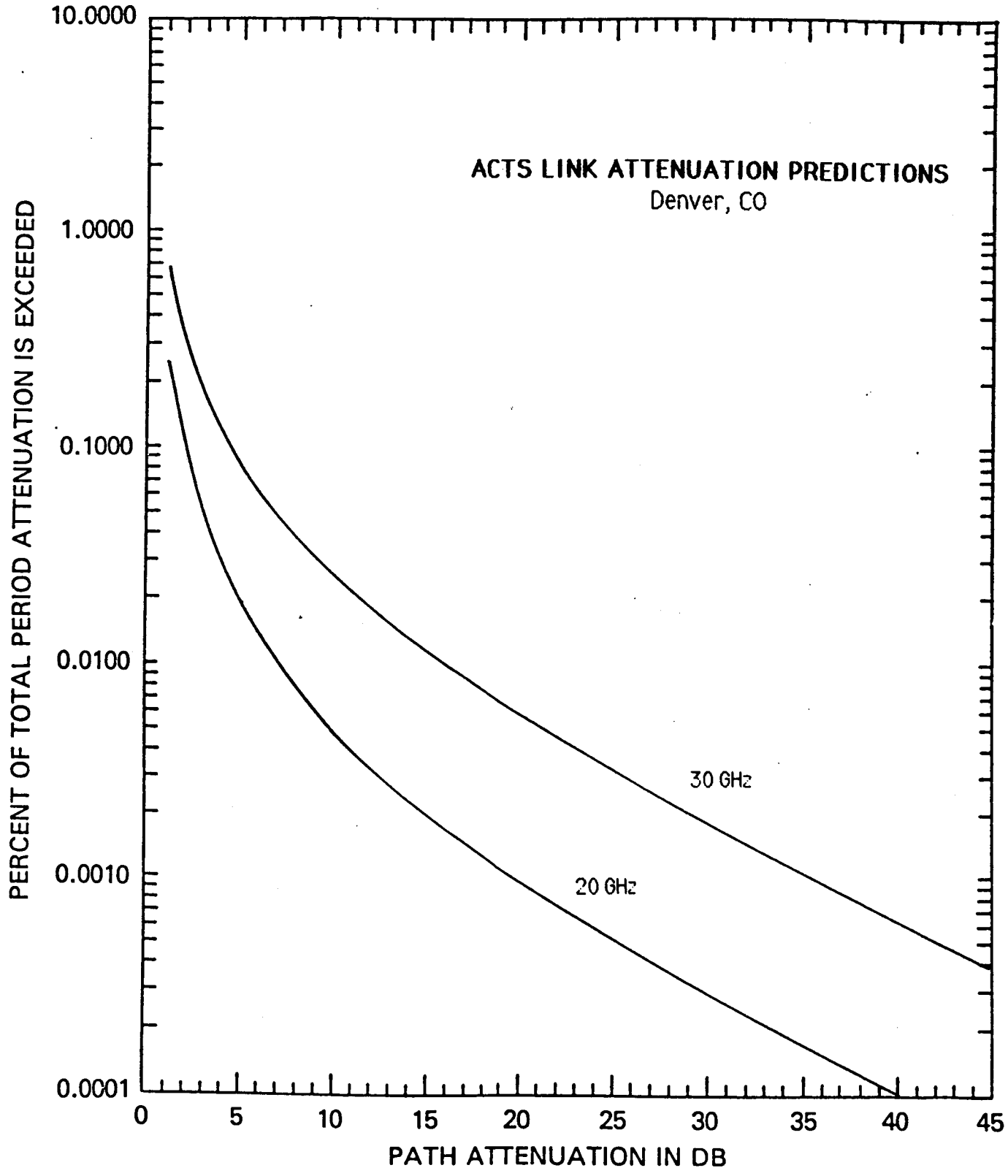
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	297.7	118.7	46.1	11.2	973.2	431.8	182.9	48.9
1	282.4	111.8	43.2	10.4	932.6	410.9	172.9	45.8
2	267.9	105.3	40.4	9.6	893.6	390.9	163.4	42.9
3	254.1	99.3	37.8	8.9	856.3	372.0	154.4	40.1
4	241.1	93.5	35.4	8.3	820.5	353.9	146.0	37.6
5	228.7	88.1	33.2	7.7	786.2	336.7	137.9	35.2
10	175.7	65.4	23.8	5.3	635.2	262.6	104.0	25.4
15	135.0	48.6	17.1	3.7	513.1	204.8	78.5	18.3
20	103.7	36.1	12.3	2.5	414.6	159.7	59.2	13.2
30	61.2	19.9	6.4	1.2	270.6	97.1	33.7	6.8
40	36.1	11.0	3.3	0.6	176.6	59.1	19.2	3.6
50	21.3	6.0	1.7	0.3	115.2	35.9	10.9	1.8
60	12.6	3.3	0.9	0.1	75.2	21.8	6.2	1.0
70	7.4	1.8	0.5	0.1	49.1	13.3	3.5	0.5
80	4.4	1.0	0.2	0.0	32.0	8.1	2.0	0.3
90	2.6	0.6	0.1	0.0	20.9	4.9	1.1	0.1
100	1.5	0.3	0.1	0.0	13.6	3.0	0.6	0.1

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	46.6	61.5	88.7	156.2
1.0	17.5	23.1	33.3	58.7
1.5	7.0	9.2	13.3	23.4
2.0	2.4	3.1	4.5	8.0
2.5	0.5	0.6	0.9	1.6

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	43.4	57.2	82.4	145.2
2.0	14.1	18.5	26.7	47.1
3.0	4.4	5.8	8.3	14.6
4.0	0.8	1.1	1.6	2.8


ACTS LINK ATTENUATION PREDICTIONS
Denver, CO
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : DENVER, CO

STATION HEIGHT IN kM = 1.600
STATION LATITUDE IN DEG. N. = 39.73
TERMINAL LONGITUDE IN DEG. W. = 104.98
ANTENNA ELEV. ANGLE = 43.76
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 3.22
SLANT PATH PROJECTION ON EARTH IN kM = 2.33
P0 IN % = 2.714
Rm IN mm/hr = 0.646
SR = 1.363
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 3.019 %
MEAN ATTENUATION Am = 0.135 dB
STANDARD DEV. OF ATTENUATION = 1.449

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.452 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 3.019 %
MEAN ATTENUATION Am = 0.342 dB
STANDARD DEV. OF ATTENUATION = 1.350

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.328 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.2526	0.6448
2.00	0.0951	0.2883
3.00	0.0490	0.1628
4.00	0.0293	0.1035
5.00	0.0192	0.0709
6.00	0.0134	0.0511
7.00	0.0097	0.0383
8.00	0.0073	0.0295
9.00	0.0057	0.0233
10.00	0.0045	0.0187
15.00	0.0017	0.0077
20.00	0.0009	0.0039
25.00	0.0005	0.0022
30.00	0.0003	0.0014
40.00	0.0001	0.0006
50.00	0.0001	0.0003

LOCATION OF TERMINAL: DENVER, CO

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 3.019 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.135 dB; @ 30 GHz: 0.342 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.449; @ 30 GHz: 1.350

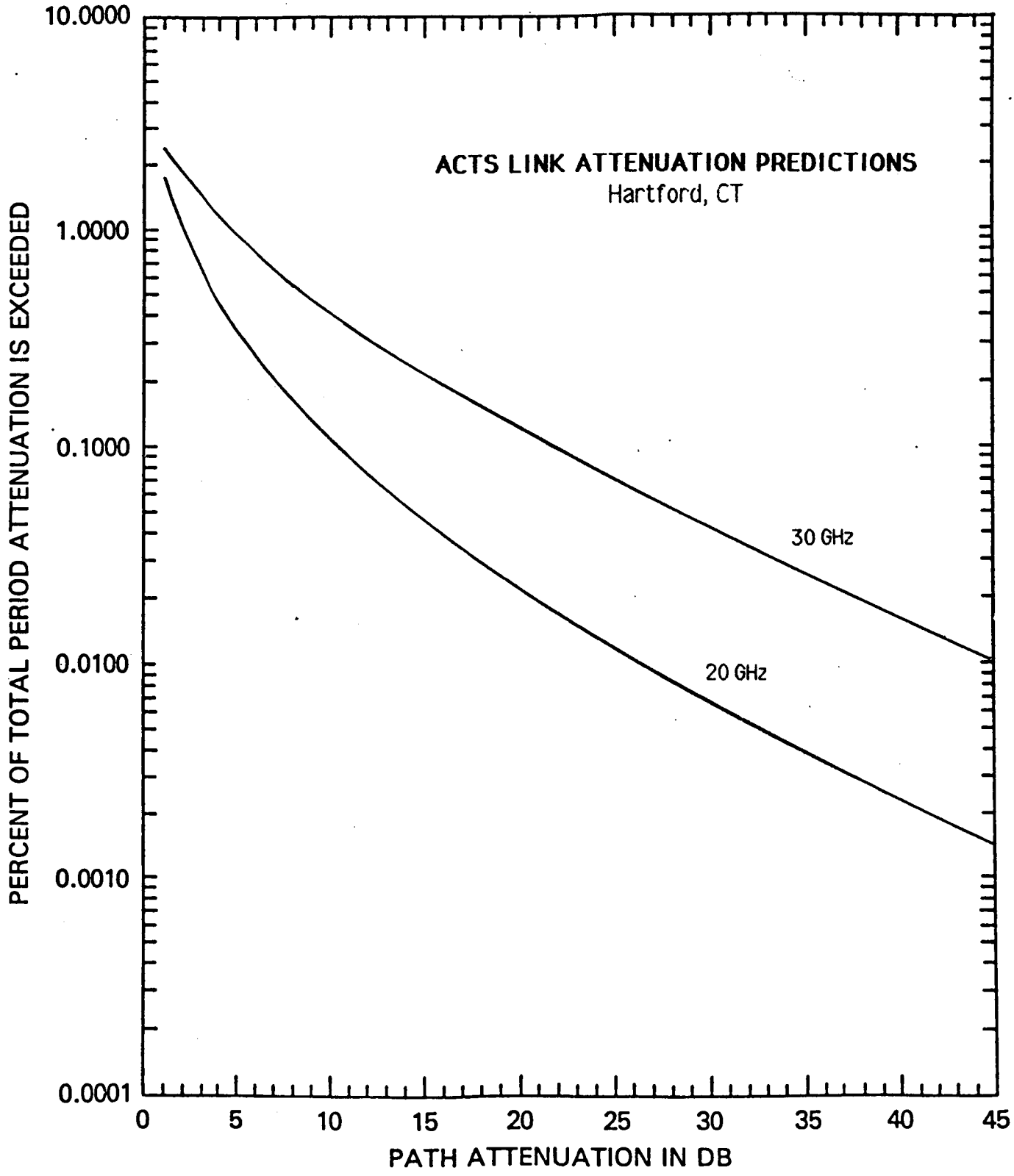
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	257.6	101.0	38.6	9.2	856.1	373.0	155.3	40.5
1	244.1	95.1	36.1	8.5	819.5	354.5	146.6	37.9
2	231.4	89.5	33.8	7.9	784.5	337.0	138.4	35.5
3	219.3	84.3	31.6	7.3	751.0	320.3	130.7	33.2
4	207.8	79.3	29.6	6.8	718.9	304.4	123.4	31.0
5	196.9	74.6	27.7	6.3	688.2	289.4	116.5	29.0
10	150.6	55.2	19.8	4.3	553.2	224.5	87.4	20.8
15	115.1	40.8	14.2	3.0	444.7	174.2	65.6	14.9
20	88.0	30.1	10.1	2.0	357.4	135.1	49.2	10.7
30	51.5	16.4	5.2	1.0	231.0	81.3	27.7	5.5
40	30.1	9.0	2.7	0.4	149.2	48.9	15.6	2.8
50	17.6	4.9	1.4	0.2	96.4	29.5	8.8	1.4
60	10.3	2.7	0.7	0.1	62.3	17.7	4.9	0.7
70	6.0	1.5	0.4	0.0	40.3	10.7	2.8	0.4
80	3.5	0.8	0.2	0.0	26.0	6.4	1.6	0.2
90	2.1	0.4	0.1	0.0	16.8	3.9	0.9	0.1
100	1.2	0.2	0.0	0.0	10.9	2.3	0.5	0.1

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	46.6	61.5	88.7	156.2
1.0	17.5	23.1	33.3	58.7
1.5	7.0	9.2	13.3	23.4
2.0	2.4	3.1	4.5	8.0
2.5	0.5	0.6	0.9	1.6

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	43.4	57.2	82.5	145.3
2.0	14.1	18.5	26.7	47.1
3.0	4.4	5.8	8.3	14.6
4.0	0.8	1.1	1.6	2.8


ACTS LINK ATTENUATION PREDICTIONS
Hartford, CT
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : HARTFORD, CT

STATION HEIGHT IN kM = 0.030
STATION LATITUDE IN DEG. N. = 41.77
TERMINAL LONGITUDE IN DEG. W. = 72.68
ANTENNA ELEV. ANGLE = 34.35
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.37
SLANT PATH PROJECTION ON EARTH IN kM = 5.26
P0 IN % = 1.457
Rm IN mm/hr = 6.168
SR = 0.848
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 2.591 %
MEAN ATTENUATION Am = 1.687 dB
STANDARD DEV. OF ATTENUATION = 1.014

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.554 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 2.591 %
MEAN ATTENUATION Am = 3.635 dB
STANDARD DEV. OF ATTENUATION = 0.960

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.402 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.8059	2.3595
2.00	1.1229	1.8998
3.00	0.7389	1.5010
4.00	0.5113	1.1927
5.00	0.3680	0.9584
6.00	0.2733	0.7794
7.00	0.2081	0.6410
8.00	0.1618	0.5326
9.00	0.1280	0.4468
10.00	0.1027	0.3779
15.00	0.0404	0.1810
20.00	0.0191	0.0980
25.00	0.0102	0.0577
30.00	0.0059	0.0361
40.00	0.0023	0.0161
50.00	0.0011	0.0082

LOCATION OF TERMINAL: HARTFORD, CT

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 2.591 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.687 dB; @ 30 GHz: 3.635 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.014; @ 30 GHz: 0.960

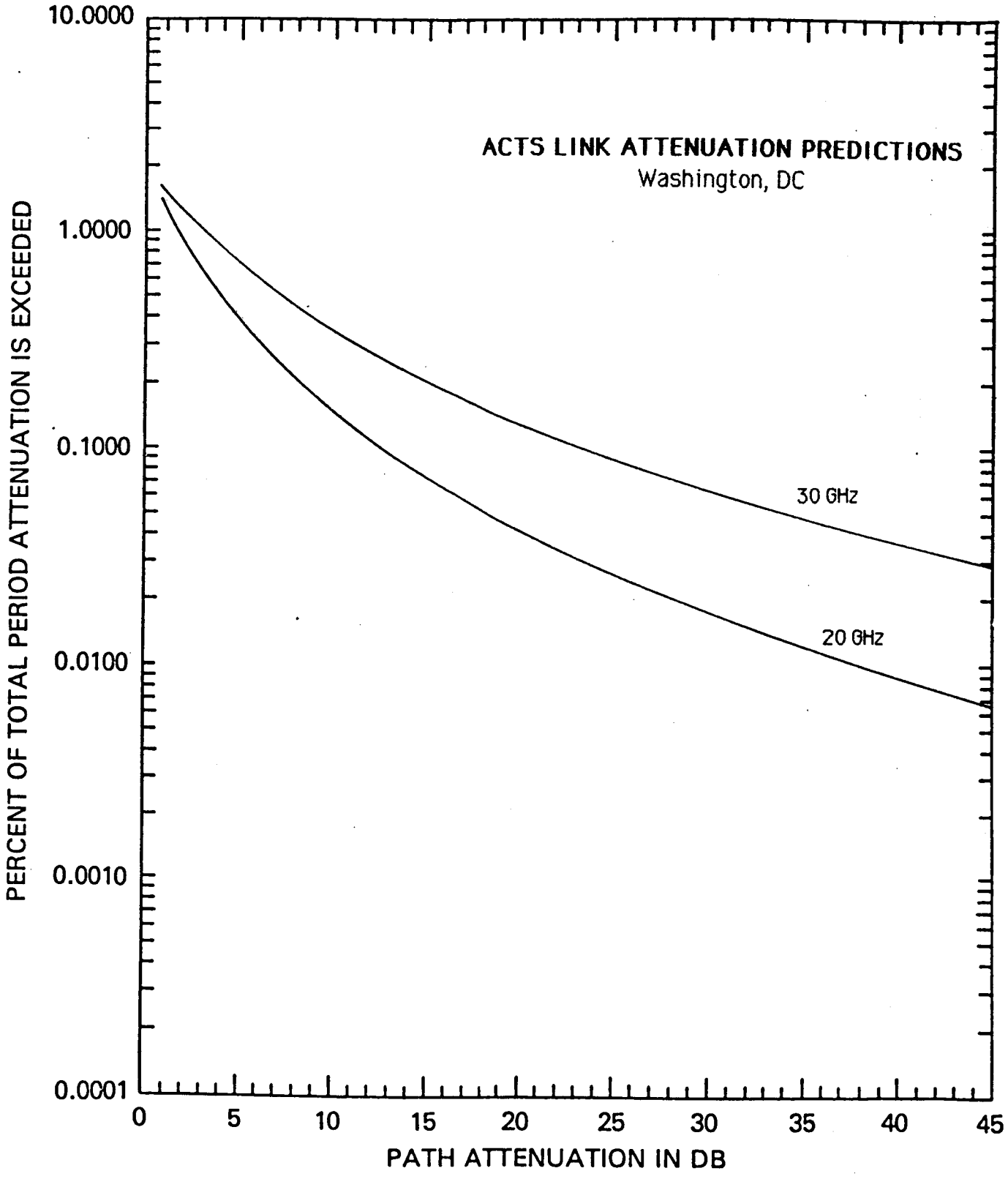
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3886.3	1935.6	850.8	212.6	7894.6	5040.7	2801.5	951.9
1	3788.0	1870.8	815.5	201.4	7780.9	4931.3	2719.3	913.5
2	3692.3	1808.2	781.8	190.8	7668.8	4824.3	2639.5	876.5
3	3598.9	1747.7	749.4	180.8	7558.3	4719.5	2562.1	841.1
4	3507.9	1689.3	718.3	171.3	7449.3	4617.1	2487.0	807.1
5	3419.2	1632.8	688.5	162.3	7342.0	4516.9	2414.0	774.5
10	3008.3	1377.3	557.2	123.9	6828.1	4047.4	2080.2	630.1
15	2646.8	1161.8	450.9	94.6	6350.1	3626.8	1792.5	512.6
20	2328.7	980.1	364.9	72.2	5905.6	3249.8	1544.6	417.0
30	1802.6	697.4	239.0	42.1	5107.7	2609.4	1146.9	276.0
40	1395.4	496.2	156.5	24.5	4417.7	2095.2	851.6	182.7
50	1080.2	353.1	102.5	14.3	3820.8	1682.4	632.4	120.9
60	836.2	251.3	67.1	8.3	3304.6	1350.8	469.5	80.0
70	647.3	178.8	44.0	4.9	2858.2	1084.6	348.7	53.0
80	501.0	127.2	28.8	2.8	2472.0	870.9	258.9	35.1
90	387.8	90.5	18.9	1.6	2138.0	699.3	192.2	23.2
100	300.2	64.4	12.4	1.0	1849.2	561.5	142.7	15.4

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	95.2	125.6	181.1	319.1
1.0	35.8	47.2	68.1	120.0
1.5	14.3	18.8	27.1	47.8
2.0	4.9	6.4	9.3	16.3
2.5	1.0	1.3	1.9	3.3

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	85.8	113.2	163.2	287.5
2.0	27.8	36.7	52.9	93.2
3.0	8.6	11.4	16.4	29.0
4.0	1.6	2.2	3.1	5.5


ACTS LINK ATTENUATION PREDICTIONS
Washington, DC
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : WASHINGTON, D. C.

STATION HEIGHT IN kM = 0.013
STATION LATITUDE IN DEG. N. = 38.90
TERMINAL LONGITUDE IN DEG. W. = 77.03
ANTENNA ELEV. ANGLE = 39.04
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.19
SLANT PATH PROJECTION ON EARTH IN kM = 4.81
P0 IN % = 0.477
Rm IN mm/hr =19.892
SR = 0.622
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.488 %
MEAN ATTENUATION Am = 2.470 dB
STANDARD DEV. OF ATTENUATION = 1.109

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.497 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.488 %
MEAN ATTENUATION Am = 4.895 dB
STANDARD DEV. OF ATTENUATION = 1.083

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.360 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.1795	1.3823
2.00	0.8565	1.1843
3.00	0.6406	1.0037
4.00	0.4940	0.8542
5.00	0.3906	0.7325
6.00	0.3152	0.6331
7.00	0.2587	0.5515
8.00	0.2153	0.4837
9.00	0.1813	0.4269
10.00	0.1543	0.3790
15.00	0.0773	0.2240
20.00	0.0441	0.1440
25.00	0.0275	0.0982
30.00	0.0181	0.0700
40.00	0.0090	0.0389
50.00	0.0050	0.0237

LOCATION OF TERMINAL: WASHINGTON, D. C.

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.488 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.470 dB; @ 30 GHz: 4.895 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.109; @ 30 GHz: 1.083

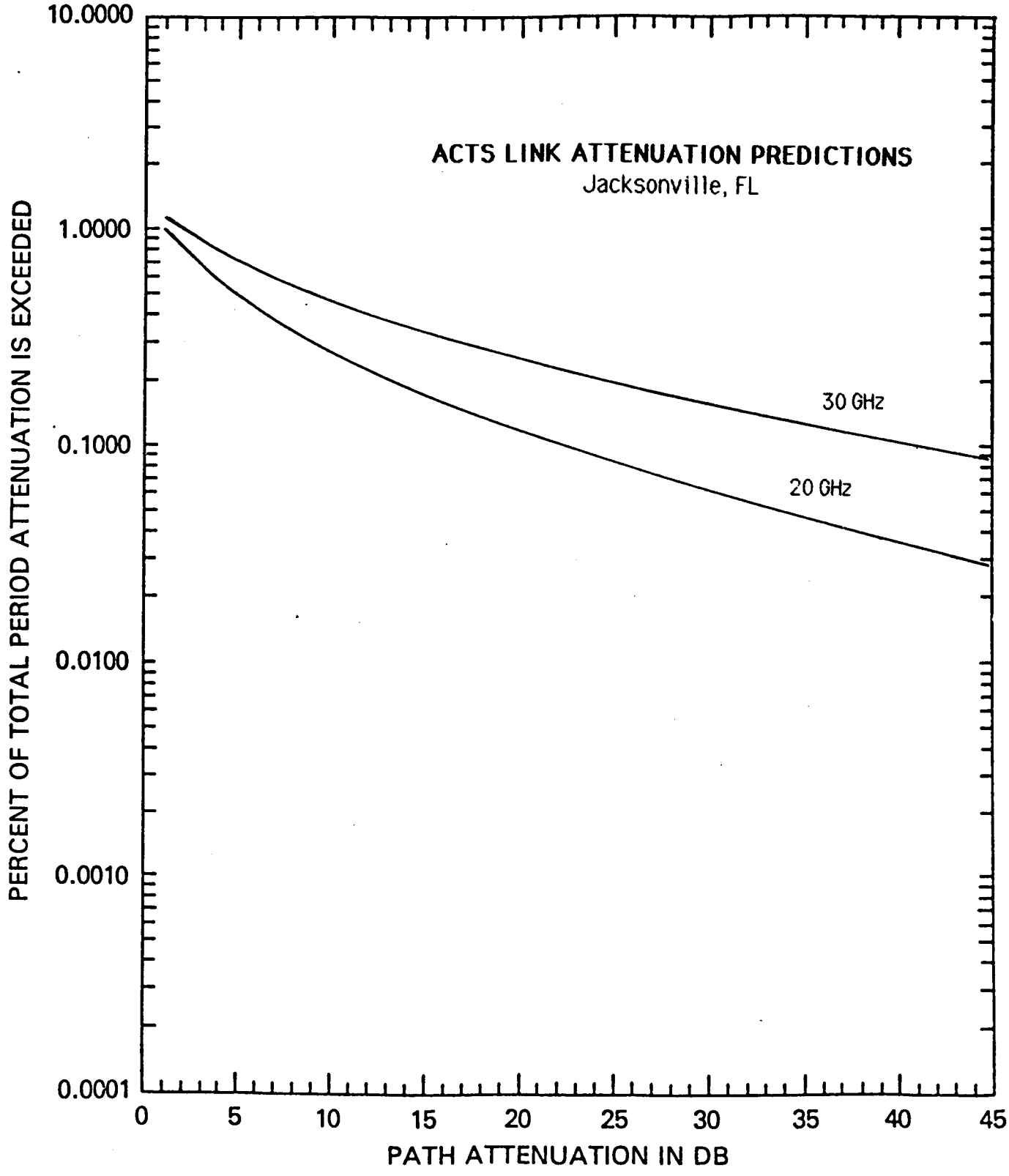
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3369.4	2054.3	1132.4	406.5	5279.2	3852.5	2544.0	1177.9
1	3303.9	2000.2	1094.7	389.0	5218.9	3785.9	2484.1	1139.2
2	3239.7	1947.5	1058.3	372.3	5159.3	3720.5	2425.6	1101.8
3	3176.7	1896.2	1023.1	356.2	5100.4	3656.2	2368.6	1065.6
4	3115.0	1846.2	989.1	340.9	5042.2	3593.1	2312.8	1030.6
5	3054.5	1797.6	956.2	326.2	4984.6	3531.0	2258.4	996.8
10	2769.0	1572.9	807.4	261.8	4706.5	3236.4	2004.9	843.5
15	2510.2	1376.3	681.8	210.1	4443.8	2966.3	1779.9	713.8
20	2275.5	1204.3	575.7	168.6	4195.9	2718.8	1580.1	604.1
30	1870.1	922.0	410.5	108.6	3740.7	2284.0	1245.3	432.6
40	1536.8	706.0	292.7	69.9	3334.9	1918.7	981.4	309.8
50	1263.0	540.5	208.7	45.0	2973.1	1611.9	773.4	221.9
60	1037.9	413.8	148.8	29.0	2650.6	1354.1	609.5	158.9
70	853.0	316.8	106.1	18.7	2363.0	1137.5	480.4	113.8
80	701.0	242.6	75.6	12.0	2106.7	955.6	378.6	81.5
90	576.1	185.7	53.9	7.7	1878.1	802.8	298.4	58.4
100	473.4	142.2	38.5	5.0	1674.4	674.4	235.1	41.8

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	79.6	105.0	151.4	266.8
1.0	29.9	39.5	56.9	100.3
1.5	11.9	15.7	22.7	39.9
2.0	4.1	5.4	7.8	13.7
2.5	0.8	1.1	1.6	2.8

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	67.4	88.9	128.2	225.9
2.0	21.9	28.8	41.6	73.2
3.0	6.8	9.0	12.9	22.8
4.0	1.3	1.7	2.5	4.3


ACTS LINK ATTENUATION PREDICTIONS
Jacksonville, FL
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : JACKSONVILLE, FL

STATION HEIGHT IN kM = 0.006
STATION LATITUDE IN DEG. N. = 30.33
TERMINAL LONGITUDE IN DEG. W. = 81.65
ANTENNA ELEV. ANGLE = 49.37
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.27
SLANT PATH PROJECTION ON EARTH IN kM = 4.08
P0 IN % = 0.271
Rm IN mm/hr =52.649
SR = 0.377
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.070 %
MEAN ATTENUATION Am = 4.926 dB
STANDARD DEV. OF ATTENUATION = 1.108

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.412 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.070 %
MEAN ATTENUATION Am = 9.104 dB
STANDARD DEV. OF ATTENUATION = 1.098

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.299 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.9894	1.0460
2.00	0.8472	0.9801
3.00	0.7197	0.9028
4.00	0.6146	0.8269
5.00	0.5291	0.7566
6.00	0.4593	0.6931
7.00	0.4017	0.6360
8.00	0.3539	0.5850
9.00	0.3137	0.5393
10.00	0.2796	0.4984
15.00	0.1684	0.3473
20.00	0.1102	0.2533
25.00	0.0763	0.1913
30.00	0.0551	0.1485
40.00	0.0314	0.0951
50.00	0.0195	0.0647

LOCATION OF TERMINAL: JACKSONVILLE, FL

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.070 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 4.926 dB; @ 30 GHz: 9.104 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.108; @ 30 GHz: 1.098

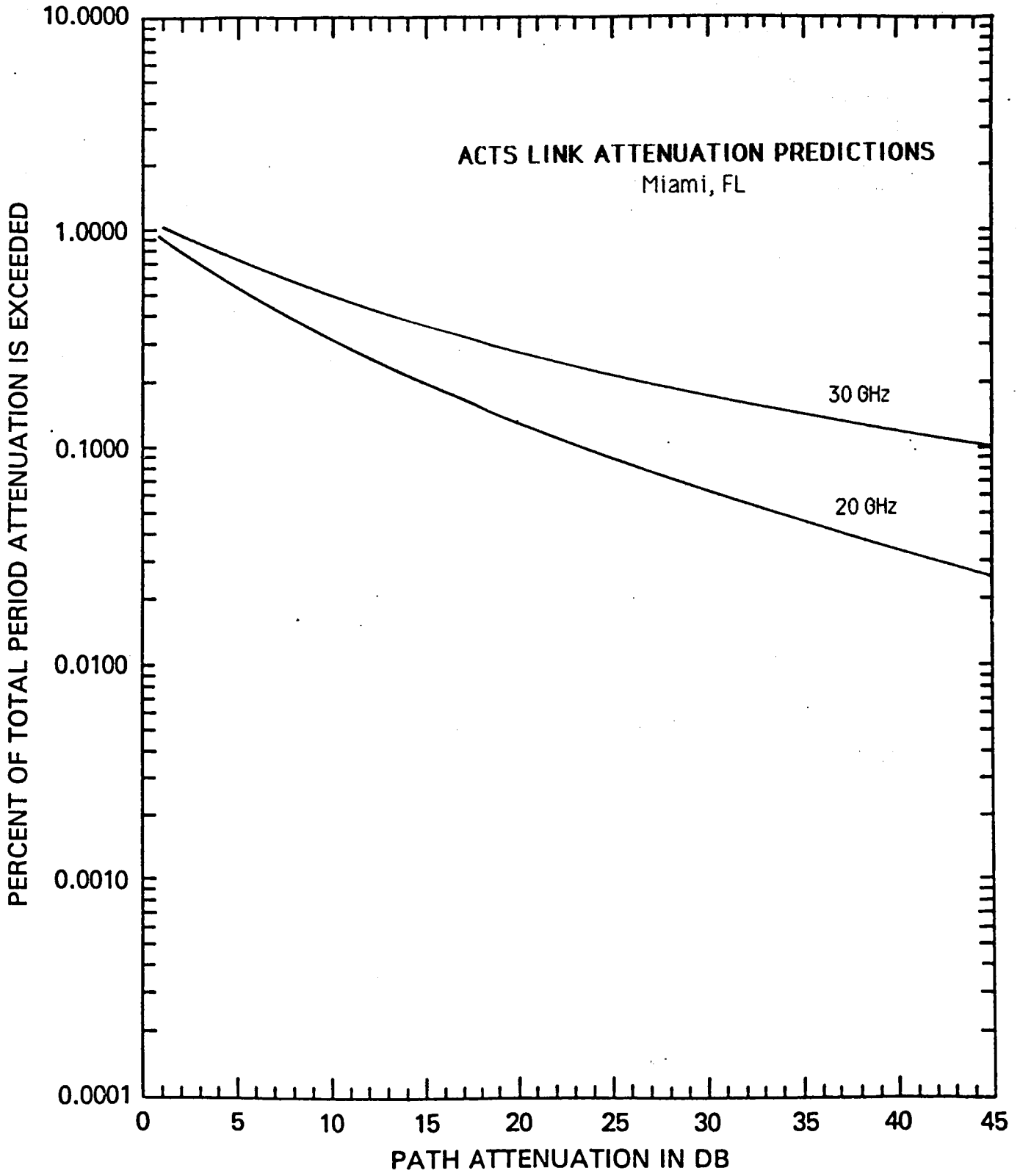
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3785.1	2782.8	1861.2	885.8	4748.1	3979.7	3076.7	1826.8
1	3741.7	2735.0	1817.8	857.2	4719.3	3938.3	3029.1	1783.8
2	3698.8	2688.0	1775.5	829.4	4690.6	3897.3	2982.3	1741.8
3	3656.3	2641.7	1734.2	802.6	4662.0	3856.8	2936.2	1700.8
4	3614.4	2596.3	1693.8	776.6	4633.7	3816.7	2890.8	1660.7
5	3572.9	2551.7	1654.3	751.5	4605.5	3777.0	2846.1	1621.6
10	3372.7	2339.7	1470.5	637.6	4467.2	3584.7	2632.8	1439.5
15	3183.6	2145.4	1307.0	540.9	4333.0	3402.2	2435.5	1277.8
20	3005.2	1967.2	1161.8	458.9	4202.8	3229.0	2253.0	1134.3
30	2677.7	1654.0	917.9	330.3	3954.1	2908.6	1928.0	893.8
40	2386.0	1390.6	725.2	237.8	3720.2	2620.0	1649.9	704.3
50	2126.0	1169.2	572.9	171.1	3500.0	2360.0	1411.8	555.0
60	1894.4	983.1	452.7	123.2	3292.9	2125.8	1208.2	437.3
70	1688.0	826.5	357.6	88.7	3098.0	1914.8	1033.9	344.6
80	1504.0	694.9	282.6	63.8	2914.7	1724.8	884.7	271.6
90	1340.2	584.3	223.2	45.9	2742.2	1553.7	757.1	214.0
100	1194.1	491.3	176.4	33.1	2580.0	1399.5	647.9	168.6

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	79.8	105.2	151.7	267.3
1.0	30.0	39.6	57.0	100.5
1.5	11.9	15.7	22.7	40.0
2.0	4.1	5.4	7.8	13.7
2.5	0.8	1.1	1.6	2.8

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	65.5	86.4	124.6	219.5
2.0	21.2	28.0	40.4	71.1
3.0	6.6	8.7	12.6	22.1
4.0	1.3	1.7	2.4	4.2


ACTS LINK ATTENUATION PREDICTIONS
Miami, FL
30 GHz
20 GHz
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : MIAMI, FL

STATION HEIGHT IN kM = 0.002
STATION LATITUDE IN DEG. N. = 25.78
TERMINAL LONGITUDE IN DEG. W. = 80.18
ANTENNA ELEV. ANGLE = 52.65
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.04
SLANT PATH PROJECTION ON EARTH IN kM = 3.66
P0 IN % = 0.318
Rm IN mm/hr =48.374
SR = 0.399
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 0.992 %
MEAN ATTENUATION Am = 6.062 dB
STANDARD DEV. OF ATTENUATION = 1.021

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.394 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 0.992 %
MEAN ATTENUATION Am = 11.273 dB
STANDARD DEV. OF ATTENUATION = 1.009

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.285 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.9536	0.9840
2.00	0.8545	0.9491
3.00	0.7486	0.8980
4.00	0.6529	0.8410
5.00	0.5703	0.7835
6.00	0.5001	0.7282
7.00	0.4405	0.6762
8.00	0.3898	0.6280
9.00	0.3466	0.5836
10.00	0.3095	0.5429
15.00	0.1860	0.3855
20.00	0.1202	0.2827
25.00	0.0820	0.2133
30.00	0.0582	0.1648
40.00	0.0320	0.1039
50.00	0.0192	0.0694

LOCATION OF TERMINAL: MIAMI, FL

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 0.992 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 6.062 dB; @ 30 GHz: 11.273 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.021; @ 30 GHz: 1.009

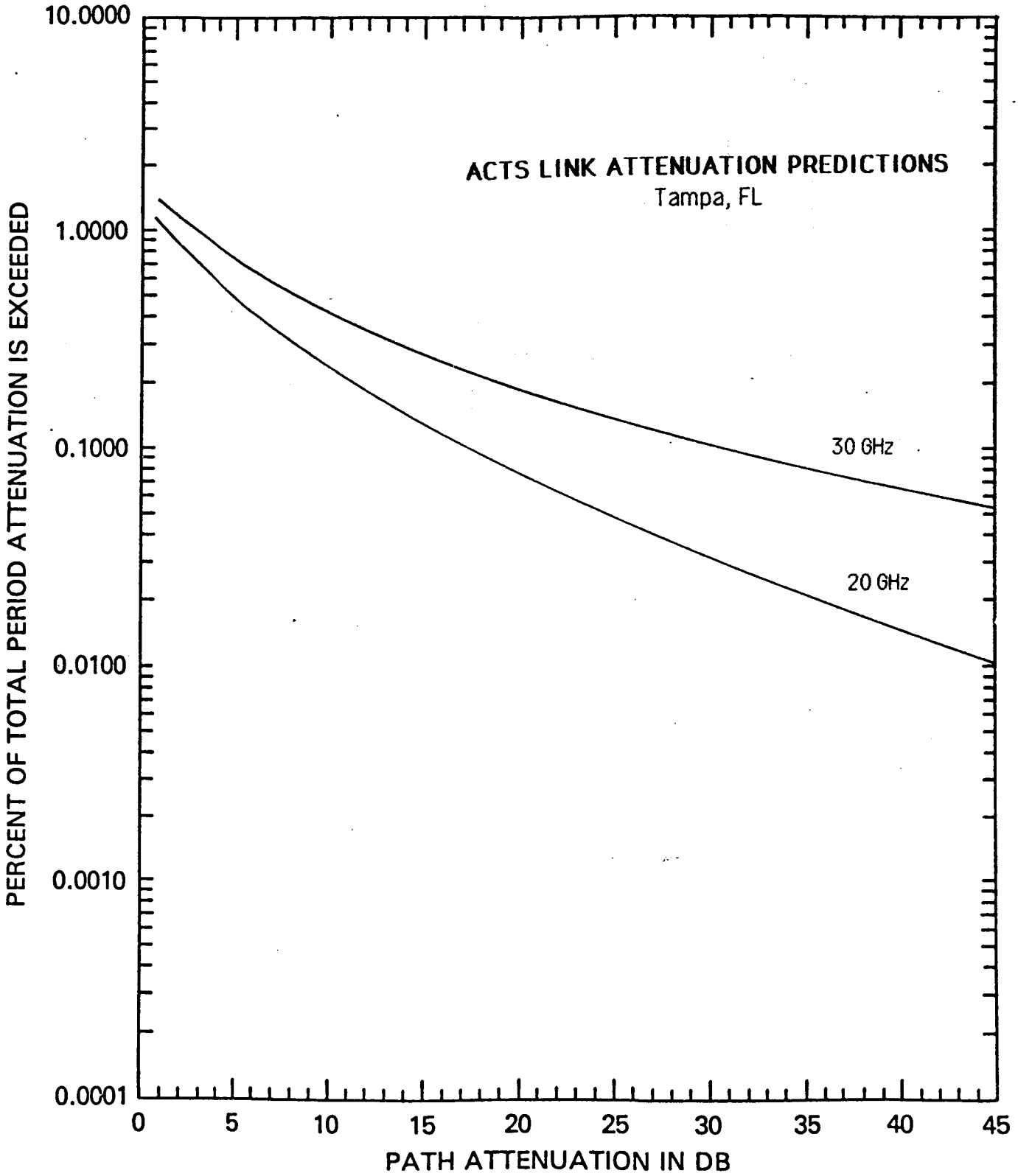
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	3937.5	2999.5	2050.4	978.1	4723.3	4120.9	3303.0	2027.6
1	3902.4	2955.9	2007.7	948.4	4704.4	4088.7	3261.1	1985.0
2	3867.5	2912.9	1965.9	919.6	4685.5	4056.7	3219.6	1943.4
3	3833.0	2870.5	1925.0	891.6	4666.8	4024.9	3178.7	1902.6
4	3798.8	2828.7	1884.9	864.5	4648.1	3993.5	3138.3	1862.7
5	3764.9	2787.5	1845.7	838.2	4629.5	3962.2	3098.4	1823.6
10	3599.8	2590.5	1661.4	718.3	4537.6	3809.7	2906.4	1640.1
15	3442.0	2407.4	1495.5	615.6	4447.6	3663.0	2726.4	1475.1
20	3291.1	2237.3	1346.1	527.5	4359.3	3522.0	2557.5	1326.6
30	3008.9	1932.2	1090.7	387.4	4188.0	3256.0	2250.4	1073.1
40	2750.9	1668.7	883.8	284.5	4023.4	3010.1	1980.2	868.0
50	2515.0	1441.2	716.1	208.9	3865.3	2782.7	1742.4	702.1
60	2299.3	1244.7	580.2	153.5	3713.4	2572.6	1533.2	567.9
70	2102.1	1074.9	470.1	112.7	3567.5	2378.3	1349.1	459.4
80	1921.8	928.4	380.9	82.8	3427.3	2198.7	1187.1	371.6
90	1757.0	801.8	308.6	60.8	3292.6	2032.6	1044.6	300.6
100	1606.3	692.4	250.1	44.6	3163.2	1879.1	919.1	243.1

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	94.0	123.9	178.7	314.8
1.0	35.3	46.6	67.2	118.4
1.5	14.1	18.5	26.7	47.1
2.0	4.8	6.3	9.2	16.1
2.5	1.0	1.3	1.9	3.3

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	77.6	102.3	147.6	260.0
2.0	25.2	33.2	47.8	84.3
3.0	7.8	10.3	14.9	26.2
4.0	1.5	2.0	2.8	5.0


ACTS LINK ATTENUATION PREDICTIONS
Tampa, FL
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : TAMPA, FL

STATION HEIGHT IN kM = 0.006
STATION LATITUDE IN DEG. N. = 27.95
TERMINAL LONGITUDE IN DEG. W. = 82.45
ANTENNA ELEV. ANGLE = 52.06
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.08
SLANT PATH PROJECTION ON EARTH IN kM = 3.74
P0 IN % = 0.449
Rm IN mm/hr =25.101
SR = 0.608
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.144 %
MEAN ATTENUATION Am = 4.075 dB
STANDARD DEV. OF ATTENUATION = 1.040

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.397 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.144 %
MEAN ATTENUATION Am = 7.942 dB
STANDARD DEV. OF ATTENUATION = 1.013

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.287 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.0433	1.1211
2.00	0.8619	1.0452
3.00	0.7047	0.9518
4.00	0.5803	0.8592
5.00	0.4830	0.7737
6.00	0.4062	0.6970
7.00	0.3450	0.6289
8.00	0.2956	0.5689
9.00	0.2553	0.5160
10.00	0.2220	0.4692
15.00	0.1203	0.3034
20.00	0.0722	0.2071
25.00	0.0464	0.1474
30.00	0.0314	0.1084
40.00	0.0161	0.0632
50.00	0.0091	0.0397

LOCATION OF TERMINAL: TAMPA, FL

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.144 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 4.075 dB; @ 30 GHz: 7.942 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.040; @ 30 GHz: 1.013

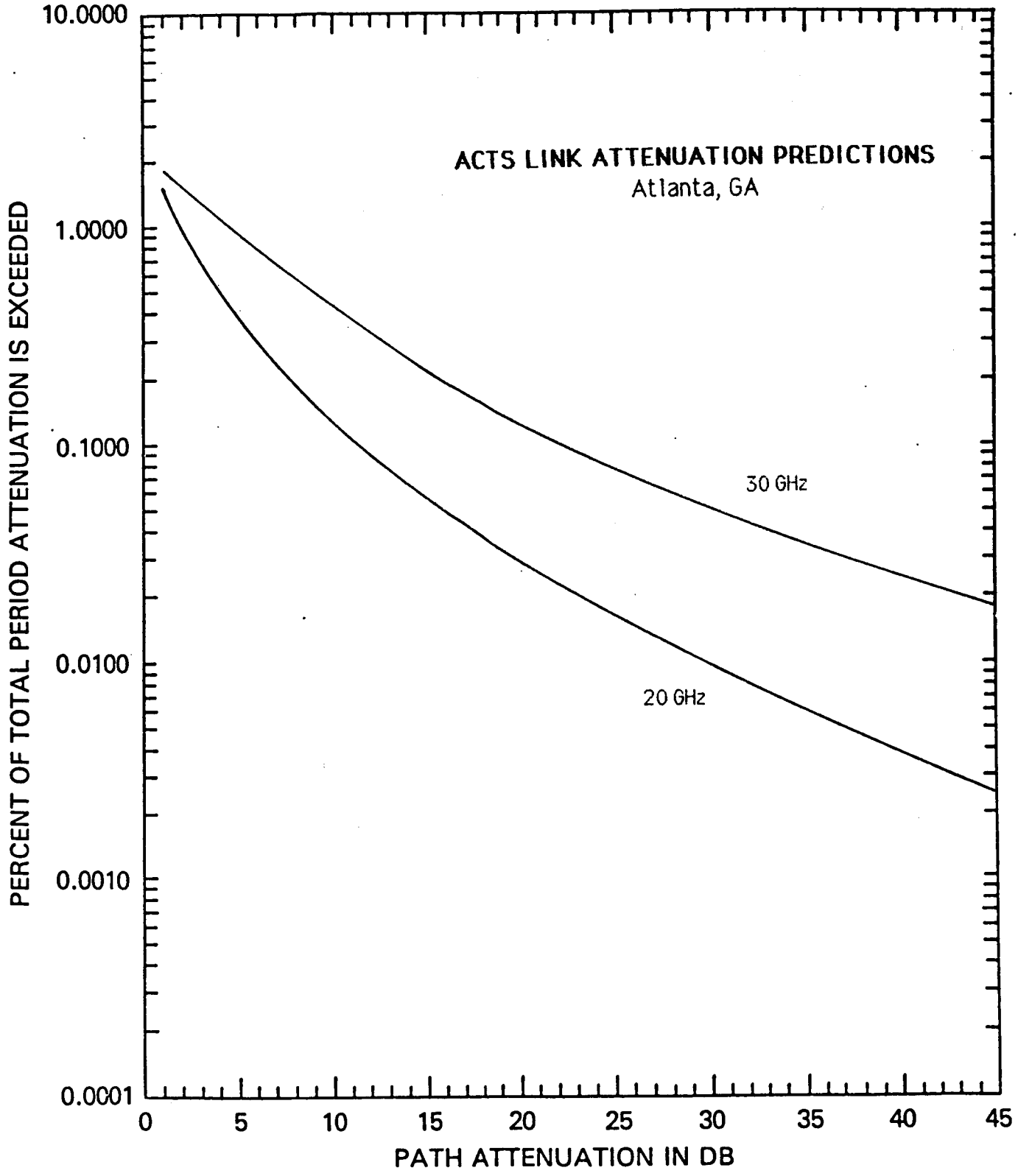
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3706.5	2540.2	1554.7	632.6	5006.2	4069.3	2992.2	1595.6
1	3657.4	2490.1	1513.4	609.4	4973.8	4023.0	2941.0	1553.7
2	3609.0	2440.9	1473.2	587.2	4941.5	3977.3	2890.7	1513.0
3	3561.1	2392.7	1434.1	565.7	4909.5	3932.1	2841.2	1473.3
4	3514.0	2345.5	1396.0	545.0	4877.7	3887.4	2792.6	1434.7
5	3467.4	2299.2	1358.9	525.1	4846.1	3843.2	2744.8	1397.1
10	3243.7	2081.1	1187.8	435.9	4691.1	3629.7	2518.0	1223.2
15	3034.4	1883.6	1038.3	361.9	4541.1	3428.0	2309.8	1071.0
20	2838.6	1704.9	907.6	300.4	4395.9	3237.6	2118.9	937.8
30	2484.1	1396.7	693.4	207.0	4119.3	2887.8	1783.1	718.9
40	2173.9	1144.3	529.8	142.7	3860.0	2575.9	1500.5	551.2
50	1902.4	937.4	404.8	98.3	3617.1	2297.6	1262.6	422.5
60	1664.8	768.0	309.3	67.8	3389.5	2049.4	1062.5	323.9
70	1456.9	629.2	236.3	46.7	3176.2	1828.0	894.1	248.3
80	1275.0	515.4	180.6	32.2	2976.3	1630.5	752.4	190.4
90	1115.8	422.3	138.0	22.2	2789.0	1454.4	633.2	146.0
100	976.4	345.9	105.4	15.3	2613.5	1297.3	532.8	111.9

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	90.6	119.4	172.2	303.4
1.0	34.0	44.9	64.7	114.1
1.5	13.6	17.9	25.8	45.4
2.0	4.6	6.1	8.8	15.5
2.5	0.9	1.2	1.8	3.1

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	77.0	101.6	146.5	258.0
2.0	25.0	32.9	47.5	83.6
3.0	7.8	10.2	14.8	26.0
4.0	1.5	2.0	2.8	5.0


ACTS LINK ATTENUATION PREDICTIONS
Atlanta, GA
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : ATLANTA, GA

STATION HEIGHT IN KM = 0.305
STATION LATITUDE IN DEG. N. = 33.75
TERMINAL LONGITUDE IN DEG. W. = 84.38
ANTENNA ELEV. ANGLE = 47.34
LINK SLANT PATH LGTH. THRU RAIN REGION IN KM = 5.60
SLANT PATH PROJECTION ON EARTH IN KM = 3.80
P0 IN % = 1.267
Rm IN mm/hr = 7.698
SR = 0.858
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.974 %
MEAN ATTENUATION Am = 2.190 dB
STANDARD DEV. OF ATTENUATION = 1.008

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.425 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.974 %
MEAN ATTENUATION Am = 4.644 dB
STANDARD DEV. OF ATTENUATION = 0.952

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.308 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.5428	1.8686
2.00	1.0576	1.6027
3.00	0.7448	1.3362
4.00	0.5427	1.1099
5.00	0.4072	0.9258
6.00	0.3130	0.7774
7.00	0.2456	0.6575
8.00	0.1959	0.5602
9.00	0.1586	0.4804
10.00	0.1300	0.4147
15.00	0.0555	0.2150
20.00	0.0278	0.1233
25.00	0.0155	0.0759
30.00	0.0093	0.0493
40.00	0.0039	0.0233
50.00	0.0019	0.0123

LOCATION OF TERMINAL: ATLANTA, GA

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.974 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.190 dB; @ 30 GHz: 4.644 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.008; @ 30 GHz: 0.952

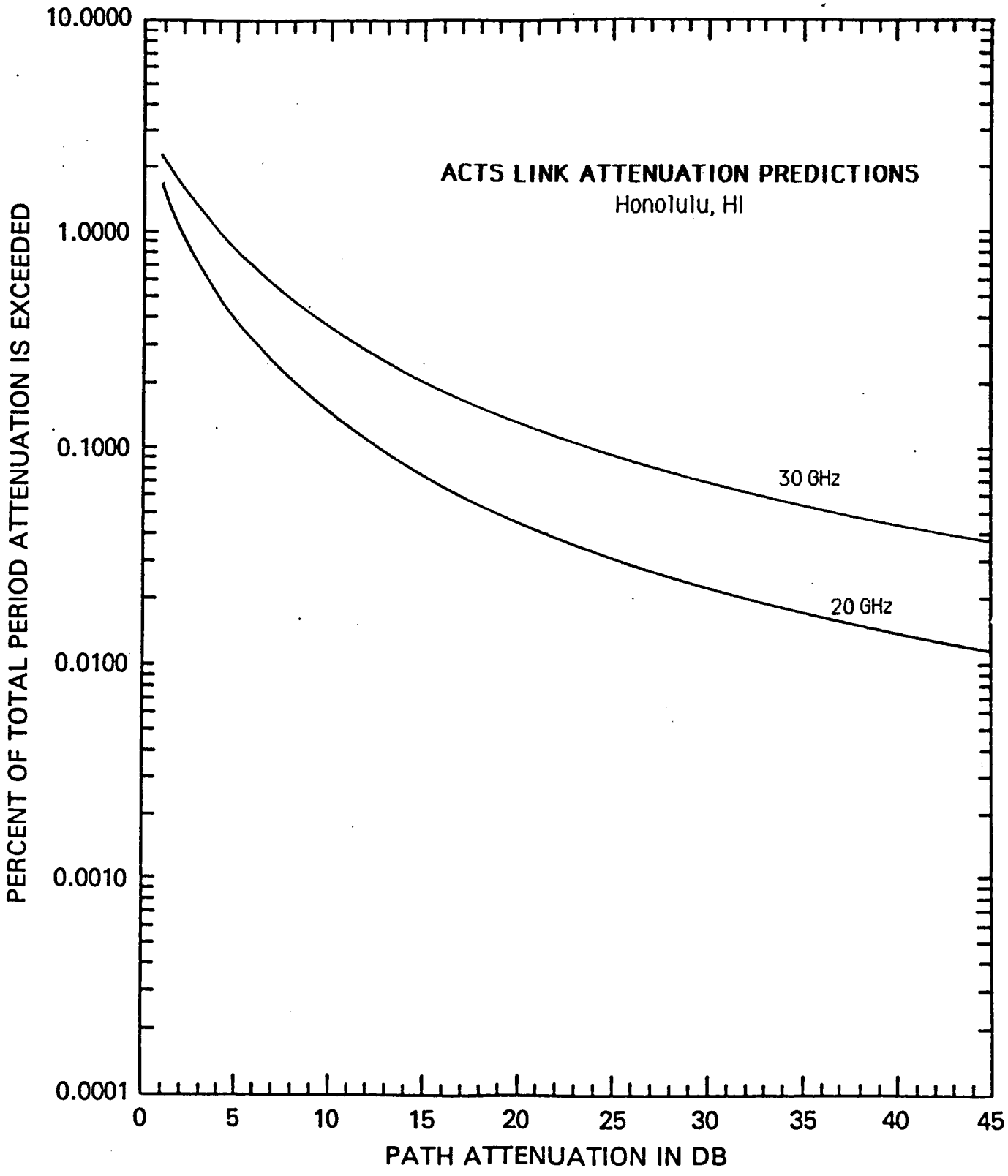
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3917.4	2141.6	1030.5	291.7	7027.7	4869.4	2946.2	1130.9
1	3833.5	2078.9	992.3	277.7	6948.0	4781.4	2871.6	1090.0
2	3751.3	2018.0	955.5	264.3	6869.2	4695.0	2798.8	1050.5
3	3671.0	1958.9	920.0	251.6	6791.3	4610.2	2727.8	1012.5
4	3592.4	1901.5	885.9	239.5	6714.3	4526.9	2658.7	975.9
5	3515.4	1845.8	853.0	228.0	6638.2	4445.1	2591.3	940.5
10	3154.8	1590.9	706.1	178.2	6270.3	4057.8	2279.2	782.2
15	2831.1	1371.2	584.4	139.2	5922.7	3704.2	2004.6	650.6
20	2540.6	1181.8	483.8	108.8	5594.5	3381.4	1763.1	541.1
30	2046.0	877.9	331.5	66.4	4991.5	2817.8	1363.9	374.3
40	1647.7	652.1	227.1	40.6	4453.5	2348.1	1055.1	258.9
50	1326.9	484.4	155.6	24.8	3973.5	1956.7	816.2	179.1
60	1068.6	359.9	106.6	15.1	3545.2	1630.6	631.4	123.9
70	860.6	267.3	73.0	9.2	3163.1	1358.8	488.5	85.7
80	693.1	198.6	50.0	5.6	2822.2	1132.3	377.9	59.3
90	558.1	147.5	34.3	3.4	2518.0	943.6	292.3	41.0
100	449.5	109.6	23.5	2.1	2246.6	786.3	226.1	28.4

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	96.5	127.2	183.4	323.1
1.0	36.3	47.8	69.0	121.5
1.5	14.4	19.0	27.5	48.4
2.0	4.9	6.5	9.4	16.5
2.5	1.0	1.3	1.9	3.3

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	87.3	115.1	166.0	292.4
2.0	28.3	37.3	53.8	94.8
3.0	8.8	11.6	16.7	29.5
4.0	1.7	2.2	3.2	5.6


ACTS LINK ATTENUATION PREDICTIONS
Honolulu, HI
30 GHz
20 GHz
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : HONOLULU, HI

STATION HEIGHT IN kM = 0.002
STATION LATITUDE IN DEG. N. = 21.32
TERMINAL LONGITUDE IN DEG. W. = 157.87
ANTENNA ELEV. ANGLE = 21.64
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 13.01
SLANT PATH PROJECTION ON EARTH IN kM = 12.09
P0 IN % = 0.349
Rm IN mm/hr =16.167
SR = 0.612
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 3.174 %
MEAN ATTENUATION Am = 1.032 dB
STANDARD DEV. OF ATTENUATION = 1.363

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.848 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 3.174 %
MEAN ATTENUATION Am = 2.076 dB
STANDARD DEV. OF ATTENUATION = 1.343

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.615 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.6167	2.2437
2.00	0.9961	1.6224
3.00	0.6886	1.2442
4.00	0.5086	0.9923
5.00	0.3923	0.8137
6.00	0.3122	0.6813
7.00	0.2544	0.5798
8.00	0.2112	0.5000
9.00	0.1781	0.4359
10.00	0.1520	0.3835
15.00	0.0788	0.2234
20.00	0.0471	0.1453
25.00	0.0308	0.1013
30.00	0.0213	0.0741
40.00	0.0116	0.0437
50.00	0.0070	0.0283

LOCATION OF TERMINAL: HONOLULU, HI

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 3.174 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.032 dB; @ 30 GHz: 2.076 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.363; @ 30 GHz: 1.343

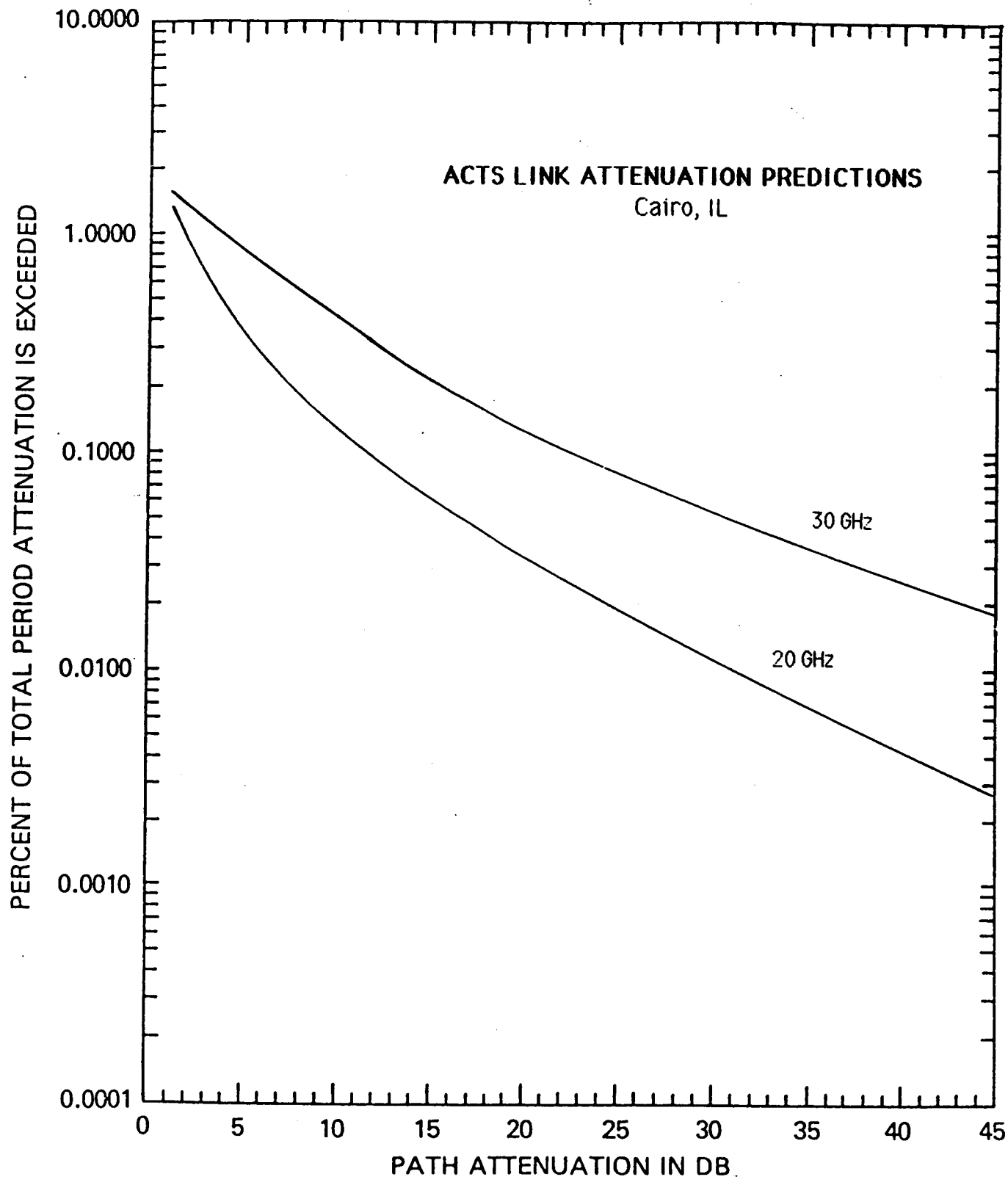
FADE DURATION	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS							
	20GHz				30GHz			
(Minutes)	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3622.0	2063.2	1111.0	414.3	6544.2	4279.7	2629.6	1175.0
1	3518.0	1991.2	1065.6	393.9	6407.7	4165.7	2544.6	1127.6
2	3417.1	1921.7	1022.0	374.6	6274.1	4054.6	2462.3	1082.1
3	3319.0	1854.6	980.2	356.2	6143.2	3946.6	2382.6	1038.4
4	3223.8	1789.8	940.2	338.7	6015.1	3841.4	2305.6	996.5
5	3131.3	1727.4	901.8	322.1	5889.6	3739.0	2231.0	956.3
10	2707.1	1446.2	732.0	250.4	5300.5	3266.7	1892.8	778.3
15	2340.4	1210.8	594.1	194.7	4770.3	2854.0	1605.9	633.4
20	2023.3	1013.7	482.3	151.4	4293.1	2493.4	1362.5	515.5
30	1512.3	710.5	317.7	91.5	3477.2	1903.2	980.7	341.4
40	1130.3	498.0	209.3	55.3	2816.3	1452.7	705.9	226.2
50	844.8	349.1	137.9	33.4	2281.1	1108.9	508.1	149.8
60	631.4	244.7	90.9	20.2	1847.5	846.4	365.7	99.2
70	471.9	171.5	59.9	12.2	1496.4	646.1	263.3	65.7
80	352.7	120.2	39.4	7.4	1212.0	493.1	189.5	43.5
90	263.6	84.3	26.0	4.5	981.7	376.4	136.4	28.8
100	197.0	59.1	17.1	2.7	795.1	287.3	98.2	19.1

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	52.7	69.5	100.2	176.6
1.0	19.8	26.1	37.7	66.4
1.5	7.9	10.4	15.0	26.4
2.0	2.7	3.6	5.1	9.0
2.5	0.5	0.7	1.0	1.8

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	43.8	57.8	83.4	146.9
2.0	14.2	18.7	27.0	47.6
3.0	4.4	5.8	8.4	14.8
4.0	0.8	1.1	1.6	2.8


ACTS LINK ATTENUATION PREDICTIONS
Cairo, IL
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : CAIRO, IL

STATION HEIGHT IN kM = 0.096
STATION LATITUDE IN DEG. N. = 37.05
TERMINAL LONGITUDE IN DEG. W. = 89.18
ANTENNA ELEV. ANGLE = 45.56
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.60
SLANT PATH PROJECTION ON EARTH IN kM = 3.92
P0 IN % = 0.883
Rm IN mm/hr =12.173
SR = 0.708
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.629 %
MEAN ATTENUATION Am = 2.802 dB
STANDARD DEV. OF ATTENUATION = 0.949

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.438 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.629 %
MEAN ATTENUATION Am = 5.751 dB
STANDARD DEV. OF ATTENUATION = 0.908

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.318 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.4030	1.5849
2.00	1.0407	1.4295
3.00	0.7678	1.2431
4.00	0.5764	1.0675
5.00	0.4412	0.9143
6.00	0.3440	0.7842
7.00	0.2726	0.6751
8.00	0.2190	0.5835
9.00	0.1782	0.5067
10.00	0.1466	0.4420
15.00	0.0628	0.2373
20.00	0.0312	0.1386
25.00	0.0172	0.0862
30.00	0.0102	0.0562
40.00	0.0041	0.0267
50.00	0.0019	0.0141

LOCATION OF TERMINAL: CAIRO, IL

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.629 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.802 dB; @ 30 GHz: 5.751 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 0.949; @ 30 GHz: 0.908

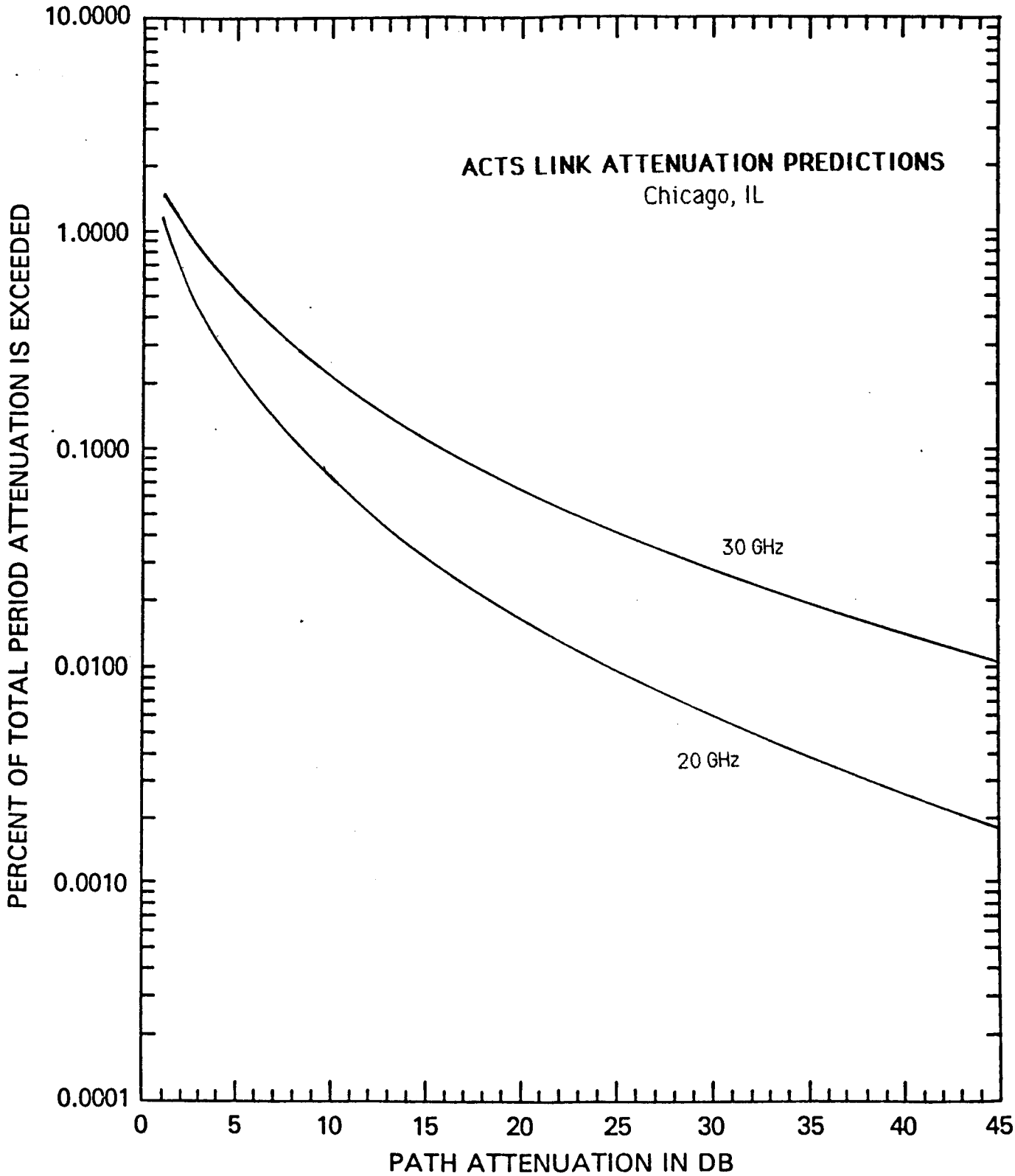
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	4038.5	2320.7	1152.1	330.1	6538.4	4808.7	3069.2	1248.2
1	3965.8	2260.5	1112.8	315.1	6481.8	4736.6	3001.1	1206.7
2	3894.5	2201.8	1075.0	300.7	6425.6	4665.6	2934.6	1166.7
3	3824.4	2144.7	1038.4	287.0	6370.0	4595.6	2869.5	1128.0
4	3755.6	2089.0	1003.0	273.9	6314.8	4526.7	2805.9	1090.5
5	3688.0	2034.8	968.9	261.4	6260.1	4458.9	2743.7	1054.4
10	3368.0	1784.2	814.9	207.0	5993.8	4134.5	2452.8	890.6
15	3075.8	1564.4	685.3	164.0	5738.7	3833.8	2192.7	752.3
20	2808.9	1371.7	576.4	129.9	5494.5	3554.9	1960.2	635.5
30	2342.6	1054.6	407.7	81.4	5036.8	3056.6	1566.5	453.5
40	1953.7	810.8	288.4	51.1	4617.3	2628.1	1251.9	323.6
50	1629.4	623.3	204.0	32.0	4232.7	2259.6	1000.5	230.9
60	1358.9	479.2	144.3	20.1	3880.1	1942.9	799.5	164.8
70	1133.3	368.4	102.1	12.6	3556.9	1670.5	639.0	117.6
80	945.2	283.2	72.2	7.9	3260.7	1436.3	510.6	83.9
90	788.3	217.8	51.1	5.0	2989.1	1234.9	408.1	59.9
100	657.4	167.4	36.1	3.1	2740.1	1061.8	326.1	42.7

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	108.8	143.5	206.9	364.5
1.0	40.9	53.9	77.8	137.0
1.5	16.3	21.5	31.0	54.5
2.0	5.6	7.3	10.6	18.7
2.5	1.1	1.5	2.1	3.8

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	95.8	126.3	182.1	320.8
2.0	31.0	40.9	59.0	104.0
3.0	9.6	12.7	18.3	32.3
4.0	1.8	2.4	3.5	6.2


ACTS LINK ATTENUATION PREDICTIONS
Chicago, IL
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : CHICAGO, IL

STATION HEIGHT IN kM = 0.186
STATION LATITUDE IN DEG. N. = 41.88
TERMINAL LONGITUDE IN DEG. W. = 87.63
ANTENNA ELEV. ANGLE = 40.02
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.33
SLANT PATH PROJECTION ON EARTH IN kM = 4.08
P0 IN % = 0.806
Rm IN mm/hr = 8.475
SR = 0.833
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.599 %
MEAN ATTENUATION Am = 1.624 dB
STANDARD DEV. OF ATTENUATION = 1.090

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.486 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.599 %
MEAN ATTENUATION Am = 3.421 dB
STANDARD DEV. OF ATTENUATION = 1.041

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.353 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.0743	1.4092
2.00	0.6784	1.1145
3.00	0.4584	0.8798
4.00	0.3263	0.7041
5.00	0.2415	0.5720
6.00	0.1842	0.4712
7.00	0.1439	0.3930
8.00	0.1146	0.3314
9.00	0.0928	0.2820
10.00	0.0762	0.2421
15.00	0.0330	0.1244
20.00	0.0170	0.0718
25.00	0.0097	0.0448
30.00	0.0060	0.0296
40.00	0.0026	0.0145
50.00	0.0013	0.0080

LOCATION OF TERMINAL: CHICAGO, IL

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.599 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.624 dB; @ 30 GHz: 3.421 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.090; @ 30 GHz: 1.041

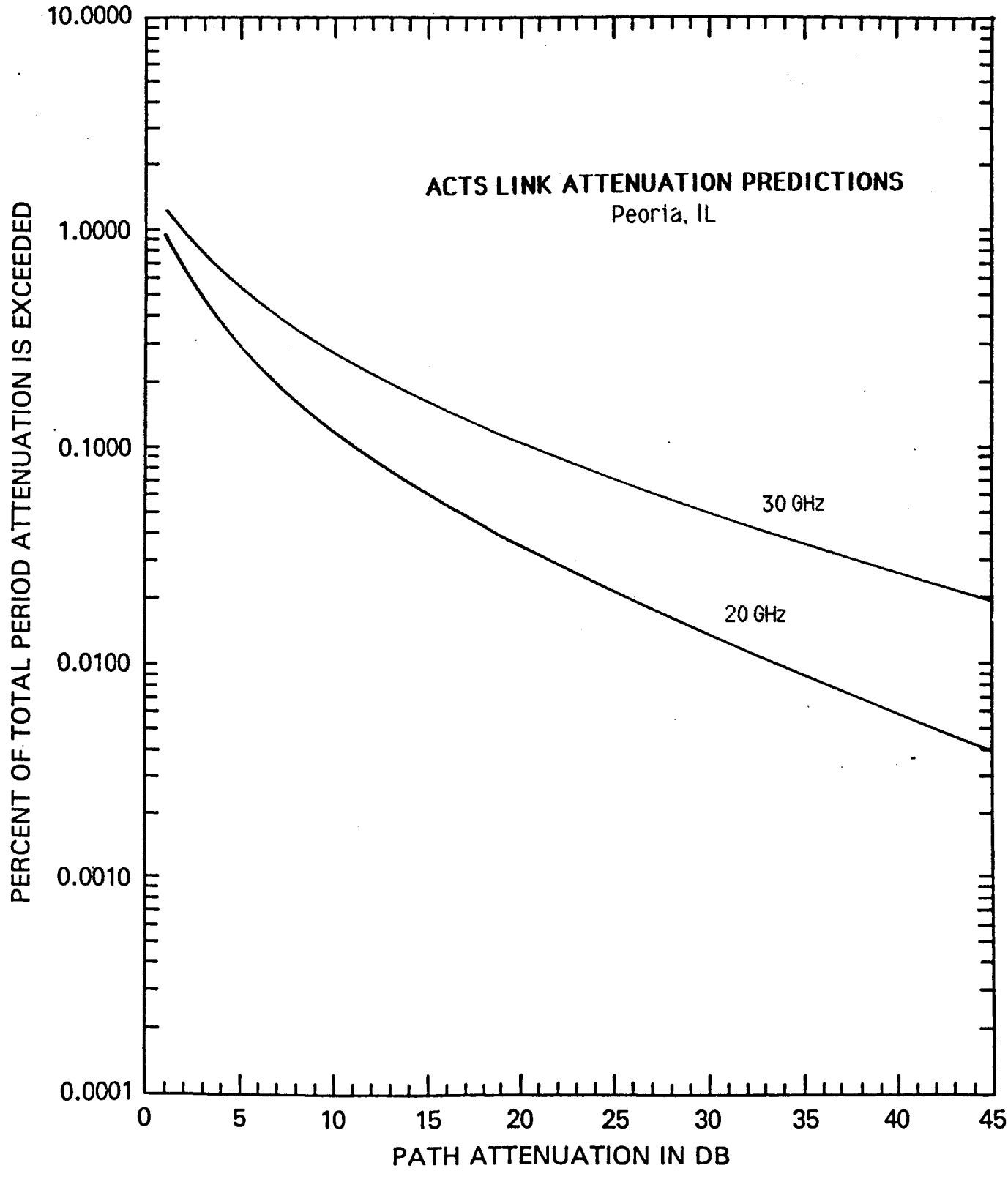
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	2411.0	1270.4	603.0	173.8	4627.4	3008.5	1742.8	654.3
1	2350.2	1228.7	578.8	165.0	4556.4	2941.8	1691.8	628.5
2	2291.0	1188.4	555.5	156.7	4486.4	2876.5	1642.4	603.7
3	2233.2	1149.5	533.2	148.8	4417.6	2812.7	1594.4	579.9
4	2176.9	1111.8	511.8	141.3	4349.8	2750.3	1547.7	557.1
5	2122.0	1075.3	491.2	134.2	4283.0	2689.2	1502.5	535.1
10	1867.7	910.2	400.1	103.6	3964.3	2403.8	1295.3	437.6
15	1643.8	770.4	325.9	79.9	3669.3	2148.7	1116.7	357.9
20	1446.8	652.1	265.5	61.7	3396.2	1920.7	962.8	292.7
30	1120.7	467.2	176.2	36.8	2909.6	1534.7	715.6	195.7
40	868.2	334.7	116.9	21.9	2492.6	1226.2	531.9	130.9
50	672.5	239.8	77.6	13.0	2135.4	979.8	395.3	87.5
60	521.0	171.8	51.5	7.8	1829.4	782.8	293.8	58.5
70	403.6	123.1	34.2	4.6	1567.3	625.5	218.4	39.2
80	312.6	88.2	22.7	2.8	1342.7	499.8	162.3	26.2
90	242.2	63.2	15.0	1.6	1150.3	399.3	120.6	17.5
100	187.6	45.3	10.0	1.0	985.5	319.1	89.7	11.7

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	82.5	108.8	156.9	276.4
1.0	31.0	40.9	59.0	103.9
1.5	12.3	16.3	23.5	41.4
2.0	4.2	5.6	8.0	14.2
2.5	0.9	1.1	1.6	2.9

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	73.0	96.2	138.7	244.4
2.0	23.6	31.2	45.0	79.2
3.0	7.3	9.7	14.0	24.6
4.0	1.4	1.8	2.7	4.7


ACTS LINK ATTENUATION PREDICTIONS
Peoria, IL
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : PEORIA, IL

STATION HEIGHT IN kM = 0.199
STATION LATITUDE IN DEG. N. = 40.70
TERMINAL LONGITUDE IN DEG. W. = 89.60
ANTENNA ELEV. ANGLE = 41.76
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.30
SLANT PATH PROJECTION ON EARTH IN kM = 3.96
P0 IN % = 0.386
Rm IN mm/hr =22.407
SR = 0.560
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.146 %
MEAN ATTENUATION Am = 2.521 dB
STANDARD DEV. OF ATTENUATION = 1.074

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.470 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.146 %
MEAN ATTENUATION Am = 4.953 dB
STANDARD DEV. OF ATTENUATION = 1.052

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.340 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.9227	1.0722
2.00	0.6705	0.9231
3.00	0.4990	0.7827
4.00	0.3821	0.6650
5.00	0.2999	0.5687
6.00	0.2401	0.4899
7.00	0.1956	0.4251
8.00	0.1616	0.3714
9.00	0.1351	0.3265
10.00	0.1142	0.2887
15.00	0.0554	0.1672
20.00	0.0308	0.1056
25.00	0.0187	0.0708
30.00	0.0121	0.0497
40.00	0.0057	0.0269
50.00	0.0031	0.0160

LOCATION OF TERMINAL: PEORIA, IL

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.146 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.521 dB; @ 30 GHz: 4.953 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.074; @ 30 GHz: 1.052

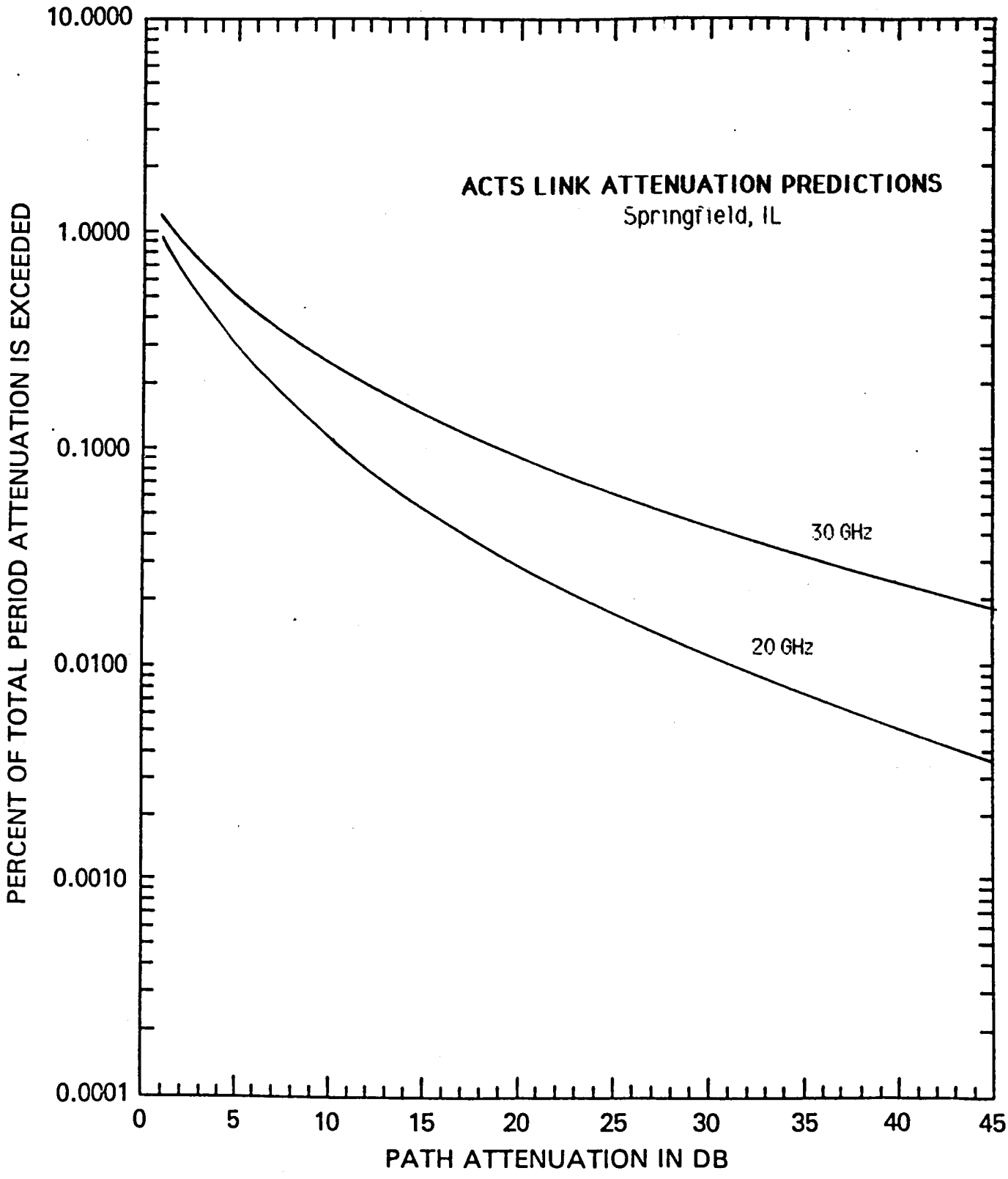
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	2624.7	1577.2	849.8	291.3	4116.7	2991.0	1953.4	879.6
1	2574.2	1535.6	821.3	278.5	4070.8	2939.8	1907.4	850.5
2	2524.6	1495.1	793.8	266.4	4025.5	2889.4	1862.4	822.3
3	2476.0	1455.7	767.2	254.7	3980.6	2839.9	1818.5	795.0
4	2428.4	1417.3	741.4	243.6	3936.3	2791.2	1775.7	768.6
5	2381.6	1379.9	716.6	233.0	3892.4	2743.4	1733.8	743.1
10	2161.1	1207.2	604.2	186.4	3680.3	2516.3	1539.0	627.8
15	1960.9	1056.1	509.5	149.1	3479.8	2308.0	1366.0	530.4
20	1779.3	924.0	429.6	119.2	3290.1	2117.0	1212.4	448.1
30	1465.0	707.2	305.5	76.3	2941.3	1781.0	955.2	319.8
40	1206.3	541.3	217.2	48.8	2629.5	1498.4	752.5	228.3
50	993.2	414.3	154.4	31.2	2350.8	1260.6	592.9	162.9
60	817.8	317.1	109.8	20.0	2101.5	1060.5	467.1	116.3
70	673.3	242.7	78.1	12.8	1878.7	892.2	368.0	83.0
80	554.4	185.8	55.5	8.2	1679.6	750.6	289.9	59.2
90	456.5	142.2	39.5	5.2	1501.5	631.5	228.4	42.3
100	375.8	108.8	28.1	3.3	1342.3	531.3	179.9	30.2

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	85.0	112.1	161.6	284.7
1.0	31.9	42.1	60.8	107.0
1.5	12.7	16.8	24.2	42.6
2.0	4.4	5.7	8.3	14.6
2.5	0.9	1.2	1.7	2.9

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	71.5	94.3	135.9	239.5
2.0	23.2	30.6	44.1	77.6
3.0	7.2	9.5	13.7	24.1
4.0	1.4	1.8	2.6	4.6


ACTS LINK ATTENUATION PREDICTIONS
Springfield, IL
30 GHz
20 GHz
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : SPRINGFIELD, IL

STATION HEIGHT IN kM = 0.183
STATION LATITUDE IN DEG. N. = 39.80
TERMINAL LONGITUDE IN DEG. W. = 89.65
ANTENNA ELEV. ANGLE = 42.73
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.36
SLANT PATH PROJECTION ON EARTH IN kM = 3.94
P0 IN % = 0.449
Rm IN mm/hr =17.737
SR = 0.644
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.203 %
MEAN ATTENUATION Am = 2.306 dB
STANDARD DEV. OF ATTENUATION = 1.082

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.461 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.203 %
MEAN ATTENUATION Am = 4.607 dB
STANDARD DEV. OF ATTENUATION = 1.053

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.334 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.9382	1.1145
2.00	0.6643	0.9454
3.00	0.4858	0.7916
4.00	0.3672	0.6656
5.00	0.2852	0.5641
6.00	0.2265	0.4822
7.00	0.1832	0.4156
8.00	0.1504	0.3609
9.00	0.1251	0.3155
10.00	0.1052	0.2776
15.00	0.0502	0.1576
20.00	0.0275	0.0981
25.00	0.0166	0.0650
30.00	0.0106	0.0451
40.00	0.0050	0.0241
50.00	0.0027	0.0141

LOCATION OF TERMINAL: SPRINGFIELD, IL

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.203 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.306 dB; @ 30 GHz: 4.607 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.082; @ 30 GHz: 1.053

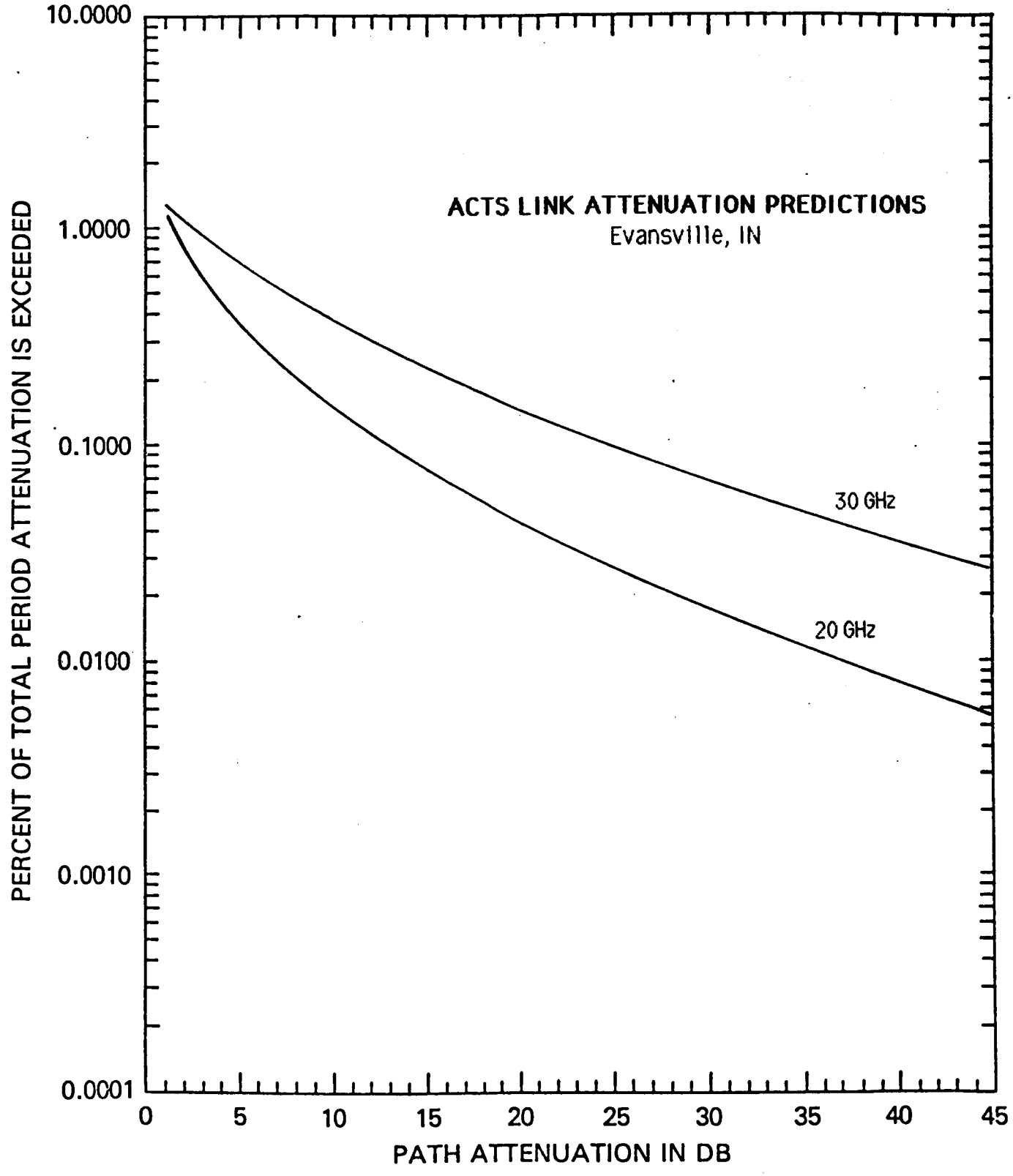
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	2554.9	1500.1	791.1	263.9	4163.6	2966.8	1898.0	828.9
1	2502.8	1458.7	763.6	252.0	4113.9	2913.2	1851.3	800.5
2	2451.7	1418.4	737.0	240.7	4064.9	2860.6	1805.7	773.0
3	2401.7	1379.2	711.4	229.9	4016.4	2808.9	1761.3	746.5
4	2352.7	1341.1	686.7	219.5	3968.5	2758.1	1717.9	720.9
5	2304.7	1304.1	662.8	209.7	3921.2	2708.3	1675.6	696.2
10	2078.9	1133.7	555.2	166.6	3693.0	2472.3	1479.3	584.7
15	1875.2	985.6	465.2	132.4	3478.0	2256.8	1306.0	491.1
20	1691.5	856.8	389.7	105.2	3275.5	2060.2	1153.0	412.4
30	1376.3	647.5	273.5	66.5	2905.3	1716.8	898.7	290.9
40	1119.9	489.4	191.9	42.0	2576.9	1430.6	700.5	205.2
50	911.2	369.8	134.7	26.5	2285.6	1192.1	546.0	144.7
60	741.4	279.5	94.5	16.7	2027.3	993.4	425.5	102.1
70	603.3	211.2	66.4	10.6	1798.2	827.8	331.7	72.0
80	490.9	159.6	46.6	6.7	1594.9	689.8	258.5	50.8
90	399.4	120.7	32.7	4.2	1414.6	574.8	201.5	35.8
100	325.0	91.2	22.9	2.7	1254.7	479.0	157.1	25.3

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	83.7	110.4	159.2	280.5
1.0	31.5	41.5	59.9	105.4
1.5	12.5	16.5	23.8	42.0
2.0	4.3	5.7	8.2	14.4
2.5	0.9	1.1	1.6	2.9

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	71.3	94.1	135.7	239.0
2.0	23.1	30.5	44.0	77.5
3.0	7.2	9.5	13.7	24.1
4.0	1.4	1.8	2.6	4.6


ACTS LINK ATTENUATION PREDICTIONS
Evansville, IN
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : EVANSVILLE, IN

STATION HEIGHT IN kM = 0.117
STATION LATITUDE IN DEG. N. = 37.97
TERMINAL LONGITUDE IN DEG. W. = 87.58
ANTENNA ELEV. ANGLE = 44.13
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.58
SLANT PATH PROJECTION ON EARTH IN kM = 4.01
P0 IN % = 0.423
Rm IN mm/hr =24.913
SR = 0.518
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.197 %
MEAN ATTENUATION Am = 3.201 dB
STANDARD DEV. OF ATTENUATION = 1.024

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.449 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.197 %
MEAN ATTENUATION Am = 6.242 dB
STANDARD DEV. OF ATTENUATION = 1.004

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.326 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.0441	1.1565
2.00	0.8105	1.0434
3.00	0.6289	0.9185
4.00	0.4955	0.8036
5.00	0.3970	0.7033
6.00	0.3230	0.6174
7.00	0.2663	0.5442
8.00	0.2222	0.4818
9.00	0.1872	0.4284
10.00	0.1592	0.3824
15.00	0.0787	0.2291
20.00	0.0441	0.1474
25.00	0.0268	0.1000
30.00	0.0173	0.0706
40.00	0.0082	0.0385
50.00	0.0044	0.0229

LOCATION OF TERMINAL: EVANSVILLE, IN

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.197 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 3.201 dB; @ 30 GHz: 6.242 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.024; @ 30 GHz: 1.004

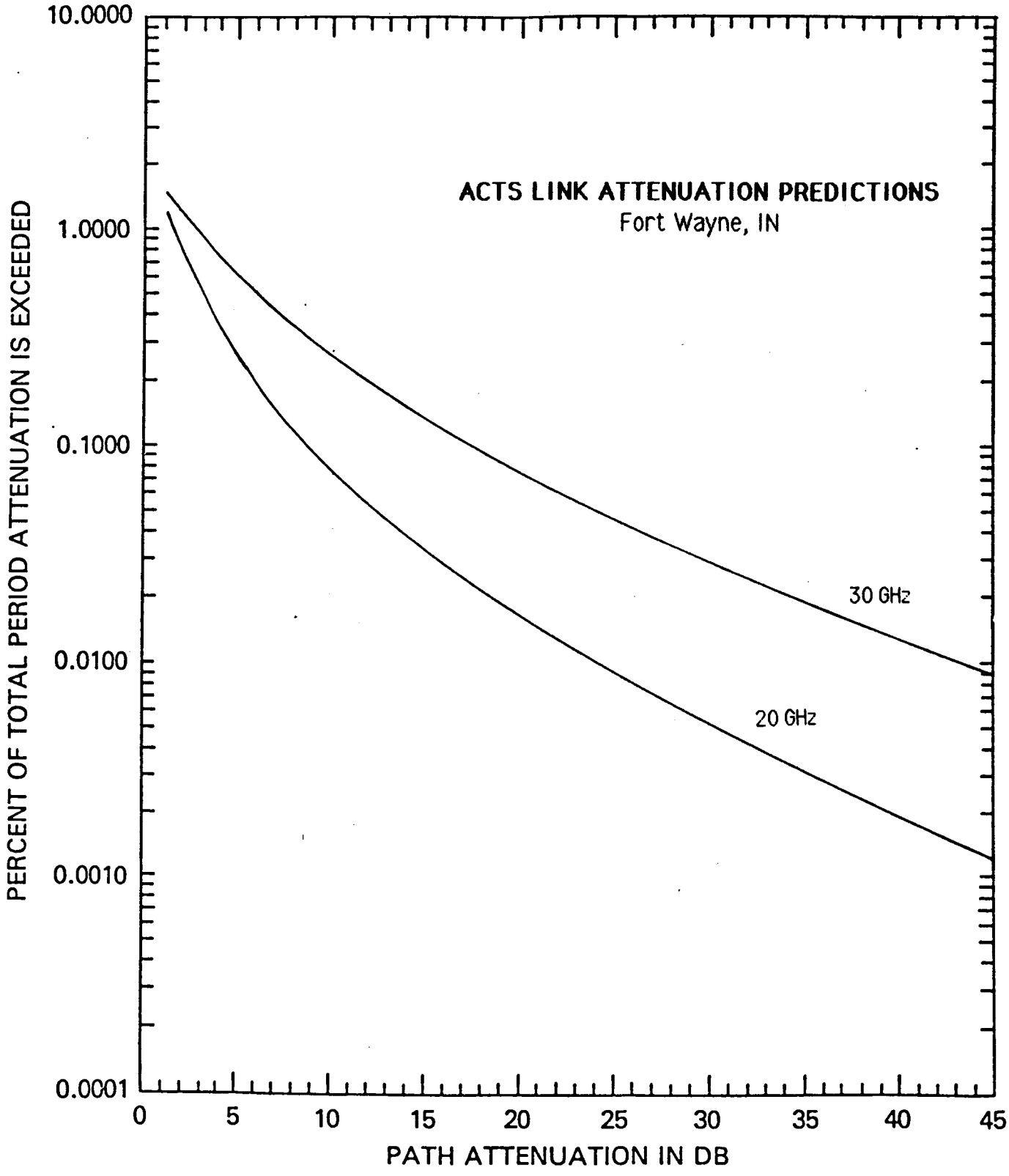
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3307.6	2088.2	1168.4	414.0	4831.0	3699.0	2534.1	1204.8
1	3254.1	2039.6	1132.8	397.1	4789.8	3646.7	2482.2	1168.5
2	3201.5	1992.2	1098.2	380.8	4748.9	3595.1	2431.4	1133.2
3	3149.7	1945.9	1064.7	365.2	4708.4	3544.2	2381.6	1099.0
4	3098.8	1900.6	1032.2	350.2	4668.2	3494.1	2332.9	1065.9
5	3048.7	1856.4	1000.7	335.9	4628.4	3444.6	2285.2	1033.7
10	2810.1	1650.4	857.1	272.5	4434.2	3207.7	2060.7	886.9
15	2590.2	1467.2	734.0	221.0	4248.2	2987.1	1858.3	761.0
20	2387.4	1304.4	628.7	179.3	4070.1	2781.6	1675.8	652.9
30	2028.3	1030.9	461.1	118.0	3735.8	2412.1	1362.8	480.7
40	1723.3	814.8	338.2	77.7	3429.0	2091.7	1108.2	353.9
50	1464.1	643.9	248.1	51.1	3147.3	1813.8	901.2	260.5
60	1243.9	508.9	182.0	33.6	2888.8	1572.9	732.9	191.8
70	1056.8	402.2	133.5	22.1	2651.6	1364.0	596.0	141.2
80	897.8	317.9	97.9	14.6	2433.8	1182.8	484.6	103.9
90	762.8	251.2	71.8	9.6	2233.9	1025.7	394.1	76.5
100	648.1	198.6	52.7	6.3	2050.4	889.4	320.5	56.3

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	93.4	123.2	177.6	312.9
1.0	35.1	46.3	66.8	117.6
1.5	14.0	18.4	26.6	46.8
2.0	4.8	6.3	9.1	16.0
2.5	1.0	1.3	1.8	3.2

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	78.4	103.3	149.0	262.5
2.0	25.4	33.5	48.3	85.1
3.0	7.9	10.4	15.0	26.4
4.0	1.5	2.0	2.9	5.0


ACTS LINK ATTENUATION PREDICTIONS
Fort Wayne, IN
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : FORT WAYNE, IN

STATION HEIGHT IN kM = 0.244
STATION LATITUDE IN DEG. N. = 41.67
TERMINAL LONGITUDE IN DEG. W. = 86.50
ANTENNA ELEV. ANGLE = 39.94
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.28
SLANT PATH PROJECTION ON EARTH IN kM = 4.05
P0 IN % = 0.841
Rm IN mm/hr = 8.650
SR = 0.794
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.624 %
MEAN ATTENUATION Am = 1.711 dB
STANDARD DEV. OF ATTENUATION = 1.043

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.487 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.624 %
MEAN ATTENUATION Am = 3.599 dB
STANDARD DEV. OF ATTENUATION = 0.997

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.353 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.1315	1.4626
2.00	0.7156	1.1729
3.00	0.4795	0.9297
4.00	0.3376	0.7436
5.00	0.2469	0.6022
6.00	0.1861	0.4939
7.00	0.1437	0.4098
8.00	0.1131	0.3435
9.00	0.0906	0.2907
10.00	0.0736	0.2480
15.00	0.0304	0.1236
20.00	0.0150	0.0694
25.00	0.0082	0.0421
30.00	0.0049	0.0272
40.00	0.0020	0.0128
50.00	0.0010	0.0067

LOCATION OF TERMINAL: FORT WAYNE, IN

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.624 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.711 dB; @ 30 GHz: 3.599 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.043; @ 30 GHz: 0.997

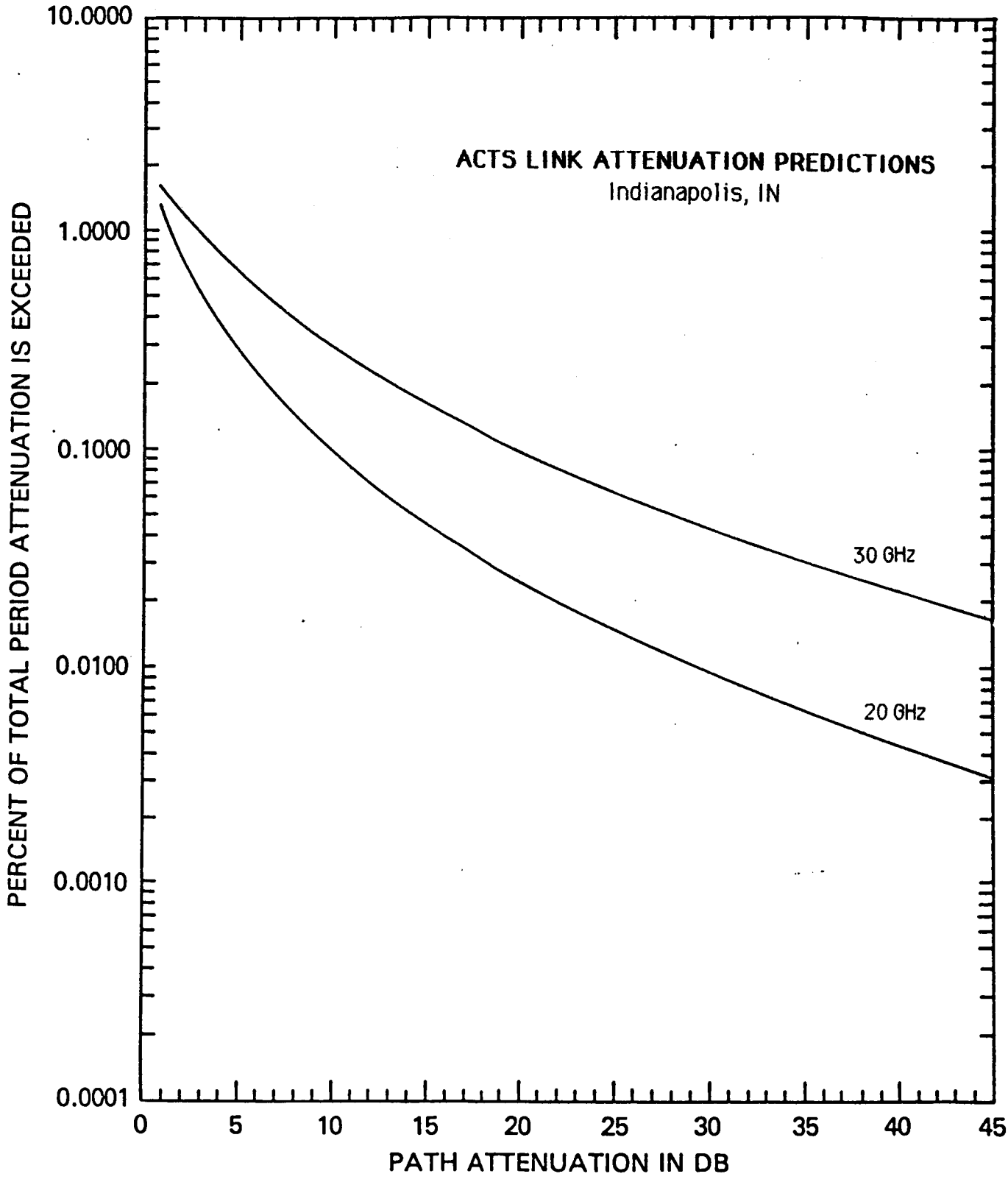
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	2522.0	1298.7	595.1	160.0	4890.1	3167.5	1806.9	650.3
1	2459.4	1256.2	571.0	151.8	4818.5	3098.8	1754.5	624.5
2	2398.3	1215.0	547.9	144.0	4748.0	3031.7	1703.6	599.8
3	2338.8	1175.3	525.8	136.6	4678.6	2966.0	1654.2	576.0
4	2280.7	1136.8	504.5	129.6	4610.1	2901.7	1606.3	553.2
5	2224.1	1099.6	484.1	123.0	4542.7	2838.8	1559.7	531.2
10	1961.4	931.1	393.8	94.6	4220.0	2544.2	1346.3	434.0
15	1729.7	788.4	320.3	72.7	3920.2	2280.2	1162.1	354.5
20	1525.4	667.5	260.6	55.9	3641.7	2043.6	1003.2	289.6
30	1186.3	478.6	172.4	33.0	3142.6	1641.5	747.5	193.3
40	922.6	343.1	114.1	19.5	2711.9	1318.5	556.9	129.0
50	717.5	246.0	75.5	11.5	2340.3	1059.0	415.0	86.1
60	558.0	176.4	50.0	6.8	2019.6	850.6	309.2	57.4
70	434.0	126.4	33.1	4.0	1742.8	683.3	230.4	38.3
80	337.5	90.7	21.9	2.4	1504.0	548.8	171.7	25.6
90	262.5	65.0	14.5	1.4	1297.9	440.8	127.9	17.1
100	204.1	46.6	9.6	0.8	1120.0	354.1	95.3	11.4

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	90.0	118.7	171.1	301.5
1.0	33.8	44.6	64.3	113.3
1.5	13.5	17.8	25.6	45.1
2.0	4.6	6.1	8.8	15.4
2.5	0.9	1.2	1.8	3.1

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	79.5	104.8	151.2	266.3
2.0	25.8	34.0	49.0	86.3
3.0	8.0	10.6	15.2	26.8
4.0	1.5	2.0	2.9	5.1


ACTS LINK ATTENUATION PREDICTIONS
Indianapolis, IN
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : INDIANAPOLIS, IN

STATION HEIGHT IN kM = 0.229
STATION LATITUDE IN DEG. N. = 39.77
TERMINAL LONGITUDE IN DEG. W. = 86.15
ANTENNA ELEV. ANGLE = 41.81
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.39
SLANT PATH PROJECTION ON EARTH IN kM = 4.02
P0 IN % = 0.610
Rm IN mm/hr =14.936
SR = 0.663
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.386 %
MEAN ATTENUATION Am = 2.470 dB
STANDARD DEV. OF ATTENUATION = 1.015

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.469 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.386 %
MEAN ATTENUATION Am = 4.997 dB
STANDARD DEV. OF ATTENUATION = 0.982

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.340 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.1279	1.3161
2.00	0.8075	1.1430
3.00	0.5879	0.9681
4.00	0.4400	0.8174
5.00	0.3376	0.6928
6.00	0.2646	0.5907
7.00	0.2112	0.5069
8.00	0.1711	0.4378
9.00	0.1404	0.3805
10.00	0.1166	0.3325
15.00	0.0523	0.1822
20.00	0.0272	0.1093
25.00	0.0156	0.0700
30.00	0.0096	0.0470
40.00	0.0042	0.0236
50.00	0.0021	0.0131

LOCATION OF TERMINAL: INDIANAPOLIS, IN

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.386 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.470 dB; @ 30 GHz: 4.997 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.015; @ 30 GHz: 0.982

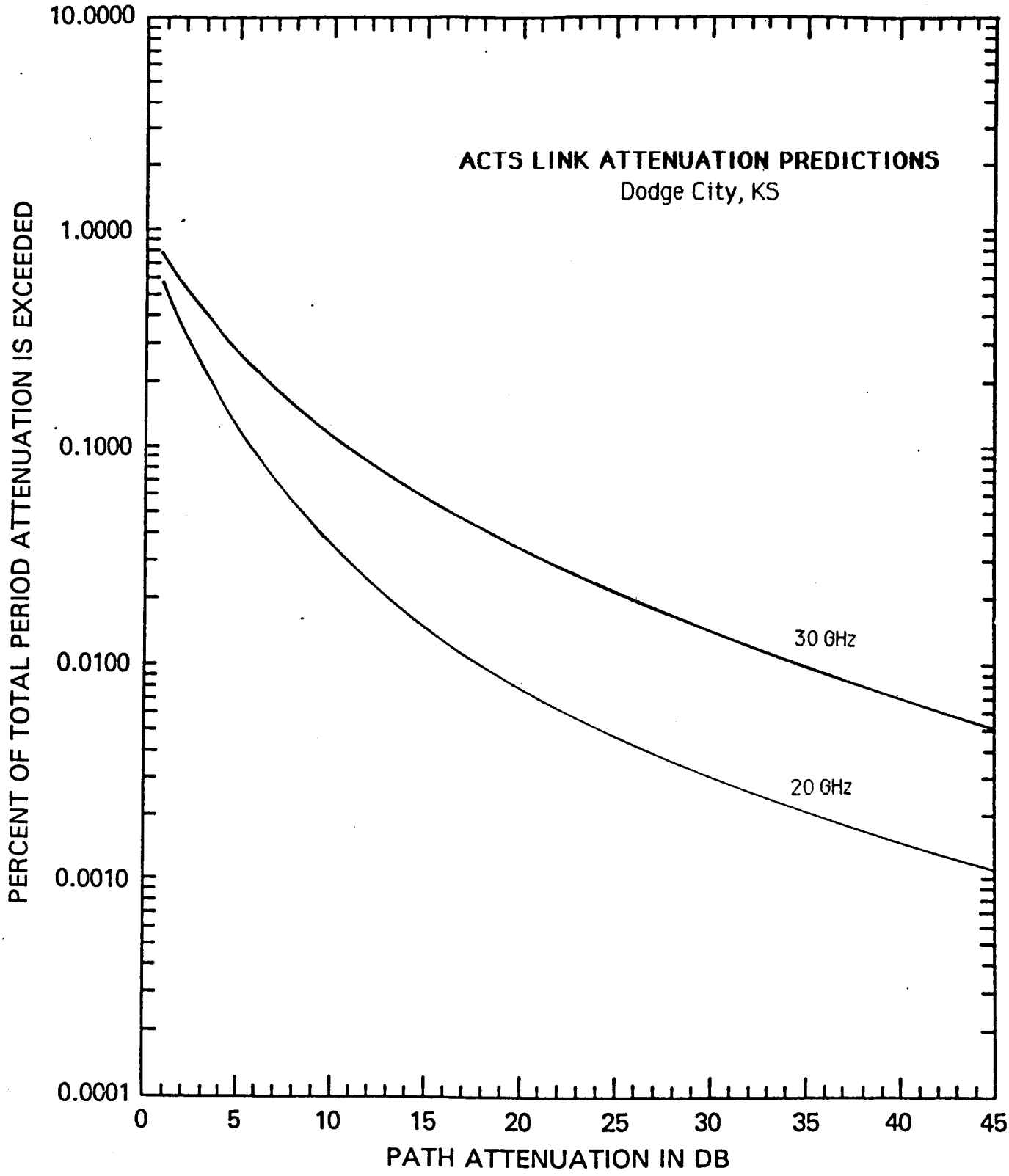
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3092.2	1775.8	899.8	275.1	5092.1	3643.8	2302.7	958.0
1	3031.4	1727.4	868.3	262.5	5037.7	3581.7	2247.6	925.2
2	2971.8	1680.2	838.0	250.5	4983.9	3520.8	2193.8	893.5
3	2913.3	1634.4	808.7	239.0	4930.7	3460.9	2141.3	862.9
4	2856.0	1589.8	780.5	228.1	4878.1	3402.0	2090.1	833.3
5	2799.9	1546.4	753.2	217.6	4826.0	3344.1	2040.1	804.7
10	2535.2	1346.6	630.6	172.2	4573.9	3069.0	1807.5	676.0
15	2295.5	1172.7	527.9	136.3	4335.0	2816.6	1601.4	567.8
20	2078.5	1021.2	441.9	107.8	4108.5	2584.9	1418.8	476.9
30	1704.1	774.4	309.7	67.5	3690.4	2177.2	1113.7	336.5
40	1397.2	587.2	217.1	42.3	3314.9	1833.8	874.2	237.4
50	1145.5	445.3	152.1	26.5	2977.6	1544.5	686.2	167.5
60	939.2	337.7	106.6	16.6	2674.6	1300.9	538.6	118.2
70	770.0	256.1	74.7	10.4	2402.4	1095.7	422.8	83.4
80	631.3	194.2	52.4	6.5	2157.9	922.9	331.9	58.8
90	517.6	147.2	36.7	4.1	1938.4	777.3	260.5	41.5
100	424.4	111.7	25.7	2.5	1741.1	654.7	204.5	29.3

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	95.2	125.5	181.0	318.8
1.0	35.8	47.2	68.0	119.8
1.5	14.2	18.8	27.1	47.7
2.0	4.9	6.4	9.3	16.3
2.5	1.0	1.3	1.9	3.3

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	82.0	108.2	156.0	274.8
2.0	26.6	35.1	50.6	89.1
3.0	8.3	10.9	15.7	27.7
4.0	1.6	2.1	3.0	5.3


ACTS LINK ATTENUATION PREDICTIONS
Dodge City, KS
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : DODGE CITY, KS

STATION HEIGHT IN kM = 0.791
STATION LATITUDE IN DEG. N. = 37.75
TERMINAL LONGITUDE IN DEG. W. = 100.02
ANTENNA ELEV. ANGLE = 46.26
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 4.48
SLANT PATH PROJECTION ON EARTH IN kM = 3.09
P0 IN % = 0.437
Rm IN mm/hr =10.015
SR = 0.793
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 0.949 %
MEAN ATTENUATION Am = 1.378 dB
STANDARD DEV. OF ATTENUATION = 1.128

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.433 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 0.949 %
MEAN ATTENUATION Am = 2.869 dB
STANDARD DEV. OF ATTENUATION = 1.085

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.314 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.5809	0.7919
2.00	0.3518	0.5982
3.00	0.2327	0.4590
4.00	0.1636	0.3604
5.00	0.1201	0.2889
6.00	0.0912	0.2356
7.00	0.0710	0.1951
8.00	0.0564	0.1635
9.00	0.0456	0.1386
10.00	0.0374	0.1186
15.00	0.0163	0.0605
20.00	0.0084	0.0349
25.00	0.0048	0.0218
30.00	0.0030	0.0145
40.00	0.0013	0.0072
50.00	0.0007	0.0040

LOCATION OF TERMINAL: DODGE CITY, KS

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 0.949 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.378 dB; @ 30 GHz: 2.869 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.128; @ 30 GHz: 1.085

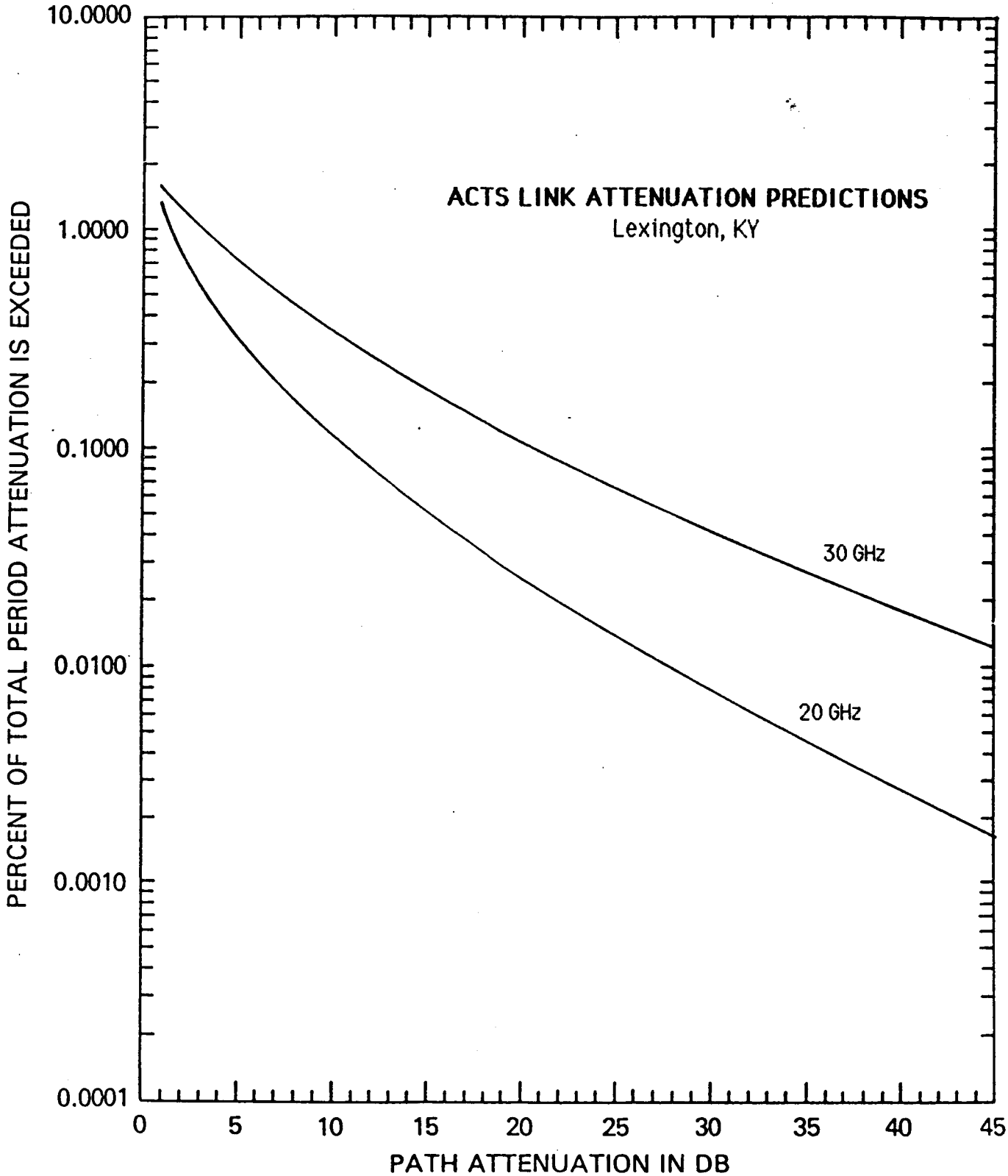
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	1224.0	631.9	296.7	85.5	2414.0	1519.3	860.1	318.0
1	1190.7	610.0	284.3	81.1	2371.6	1482.2	833.1	304.8
2	1158.3	588.8	272.4	76.9	2330.0	1446.0	807.0	292.3
3	1126.8	568.4	261.0	72.9	2289.0	1410.6	781.7	280.2
4	1096.1	548.7	250.0	69.1	2248.8	1376.2	757.2	268.6
5	1066.3	529.7	239.6	65.5	2209.3	1342.6	733.5	257.6
10	928.9	444.0	193.4	50.2	2021.9	1186.5	625.5	208.6
15	809.3	372.2	156.2	38.5	1850.5	1048.5	533.4	169.0
20	705.0	312.0	126.1	29.5	1693.5	926.6	454.8	136.9
30	535.1	219.3	82.2	17.3	1418.5	723.6	330.8	89.8
40	406.1	154.1	53.6	10.2	1188.1	565.1	240.5	58.9
50	308.2	108.3	34.9	6.0	995.1	441.3	174.9	38.7
60	233.9	76.1	22.8	3.5	833.5	344.6	127.2	25.4
70	177.5	53.5	14.9	2.1	698.1	269.1	92.5	16.7
80	134.7	37.6	9.7	1.2	584.7	210.2	67.3	10.9
90	102.3	26.4	6.3	0.7	489.7	164.1	48.9	7.2
100	77.6	18.6	4.1	0.4	410.2	128.2	35.6	4.7

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	77.0	101.6	146.5	258.1
1.0	29.0	38.2	55.1	97.0
1.5	11.5	15.2	21.9	38.6
2.0	3.9	5.2	7.5	13.2
2.5	0.8	1.1	1.5	2.7

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	67.1	88.5	127.7	224.9
2.0	21.8	28.7	41.4	72.9
3.0	6.8	8.9	12.9	22.7
4.0	1.3	1.7	2.5	4.3


ACTS LINK ATTENUATION PREDICTIONS
Lexington, KY
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : LEXINGTON, KY

STATION HEIGHT IN kM = 0.298
STATION LATITUDE IN DEG. N. = 38.50
TERMINAL LONGITUDE IN DEG. W. = 84.50
ANTENNA ELEV. ANGLE = 42.57
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.40
SLANT PATH PROJECTION ON EARTH IN kM = 3.98
P0 IN % = 0.921
Rm IN mm/hr =11.209
SR = 0.707
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.682 %
MEAN ATTENUATION Am = 2.511 dB
STANDARD DEV. OF ATTENUATION = 0.941

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.462 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.682 %
MEAN ATTENUATION Am = 5.185 dB
STANDARD DEV. OF ATTENUATION = 0.900

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.335 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.4067	1.6256
2.00	1.0020	1.4385
3.00	0.7151	1.2254
4.00	0.5222	1.0320
5.00	0.3905	0.8683
6.00	0.2983	0.7328
7.00	0.2321	0.6215
8.00	0.1835	0.5299
9.00	0.1471	0.4544
10.00	0.1194	0.3917
15.00	0.0484	0.2002
20.00	0.0231	0.1125
25.00	0.0123	0.0678
30.00	0.0070	0.0430
40.00	0.0027	0.0195
50.00	0.0012	0.0099

LOCATION OF TERMINAL: LEXINGTON, KY

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.682 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.511 dB; @ 30 GHz: 5.185 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 0.941; @ 30 GHz: 0.900

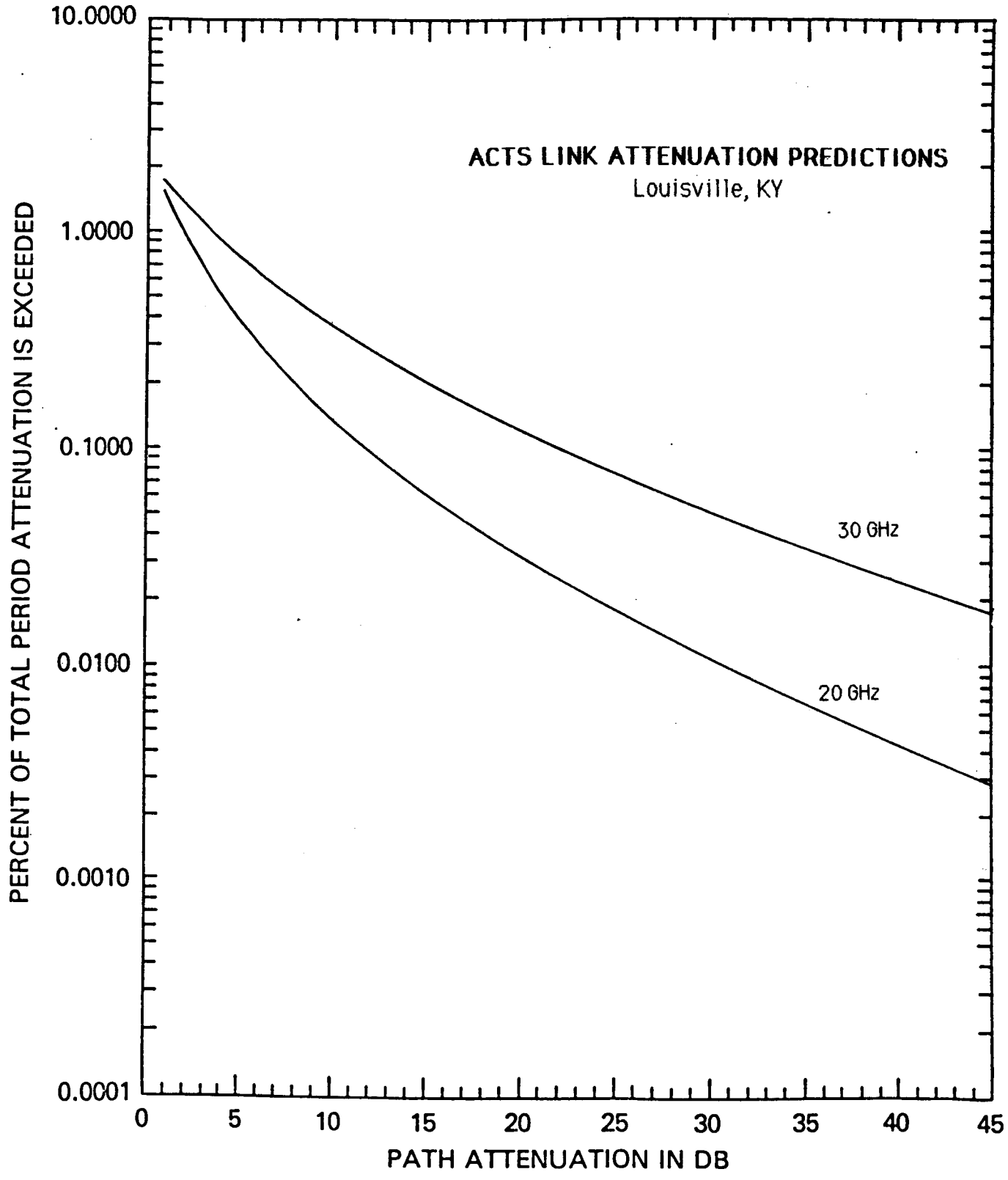
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	3761.2	2053.9	965.2	254.3	6444.9	4566.8	2787.3	1052.9
1	3687.4	1996.6	930.2	242.1	6382.1	4491.6	2720.5	1015.8
2	3615.0	1941.0	896.6	230.5	6319.9	4417.6	2655.4	979.9
3	3544.1	1886.9	864.2	219.5	6258.4	4344.9	2591.7	945.3
4	3474.5	1834.3	832.9	209.0	6197.4	4273.3	2529.6	912.0
5	3406.3	1783.1	802.8	198.9	6137.0	4202.9	2469.0	879.8
10	3084.8	1548.0	667.7	155.6	5843.8	3868.0	2187.1	735.1
15	2793.7	1344.0	555.4	121.7	5564.6	3559.8	1937.4	614.2
20	2530.1	1166.8	461.9	95.2	5298.7	3276.1	1716.2	513.2
30	2075.1	879.4	319.6	58.3	4804.5	2774.8	1346.6	358.3
40	1701.9	662.8	221.1	35.6	4356.4	2350.2	1056.6	250.1
50	1395.9	499.6	152.9	21.8	3950.1	1990.6	829.1	174.6
60	1144.9	376.5	105.8	13.3	3581.6	1686.0	650.6	121.9
70	939.0	283.8	73.2	8.2	3247.6	1428.0	510.5	85.1
80	770.1	213.9	50.6	5.0	2944.7	1209.5	400.6	59.4
90	631.6	161.2	35.0	3.1	2670.0	1024.4	314.3	41.5
100	518.0	121.5	24.2	1.9	2421.0	867.6	246.6	29.0

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	110.7	145.9	210.4	370.7
1.0	41.6	54.9	79.1	139.4
1.5	16.6	21.8	31.5	55.5
2.0	5.7	7.5	10.8	19.0
2.5	1.1	1.5	2.2	3.8

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	97.5	128.6	185.5	326.7
2.0	31.6	41.7	60.1	105.9
3.0	9.8	13.0	18.7	32.9
4.0	1.9	2.5	3.6	6.3


ACTS LINK ATTENUATION PREDICTIONS
Louisville, KY
30 GHz
20 GHz
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : LOUISVILLE, KY

STATION HEIGHT IN kM = 0.140
STATION LATITUDE IN DEG. N. = 38.25
TERMINAL LONGITUDE IN DEG. W. = 85.77
ANTENNA ELEV. ANGLE = 43.27
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.60
SLANT PATH PROJECTION ON EARTH IN kM = 4.07
P0 IN % = 0.819
Rm IN mm/hr =11.705
SR = 0.743
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.610 %
MEAN ATTENUATION Am = 2.452 dB
STANDARD DEV. OF ATTENUATION = 1.006

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.456 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.610 %
MEAN ATTENUATION Am = 5.046 dB
STANDARD DEV. OF ATTENUATION = 0.964

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.331 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.3101	1.5352
2.00	0.9343	1.3388
3.00	0.6772	1.1355
4.00	0.5046	0.9585
5.00	0.3856	0.8113
6.00	0.3010	0.6905
7.00	0.2393	0.5913
8.00	0.1932	0.5095
9.00	0.1580	0.4417
10.00	0.1308	0.3851
15.00	0.0579	0.2083
20.00	0.0298	0.1235
25.00	0.0169	0.0782
30.00	0.0103	0.0520
40.00	0.0045	0.0256
50.00	0.0022	0.0140

LOCATION OF TERMINAL: LOUISVILLE, KY

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.610 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.452 dB; @ 30 GHz: 5.046 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.006; @ 30 GHz: 0.964

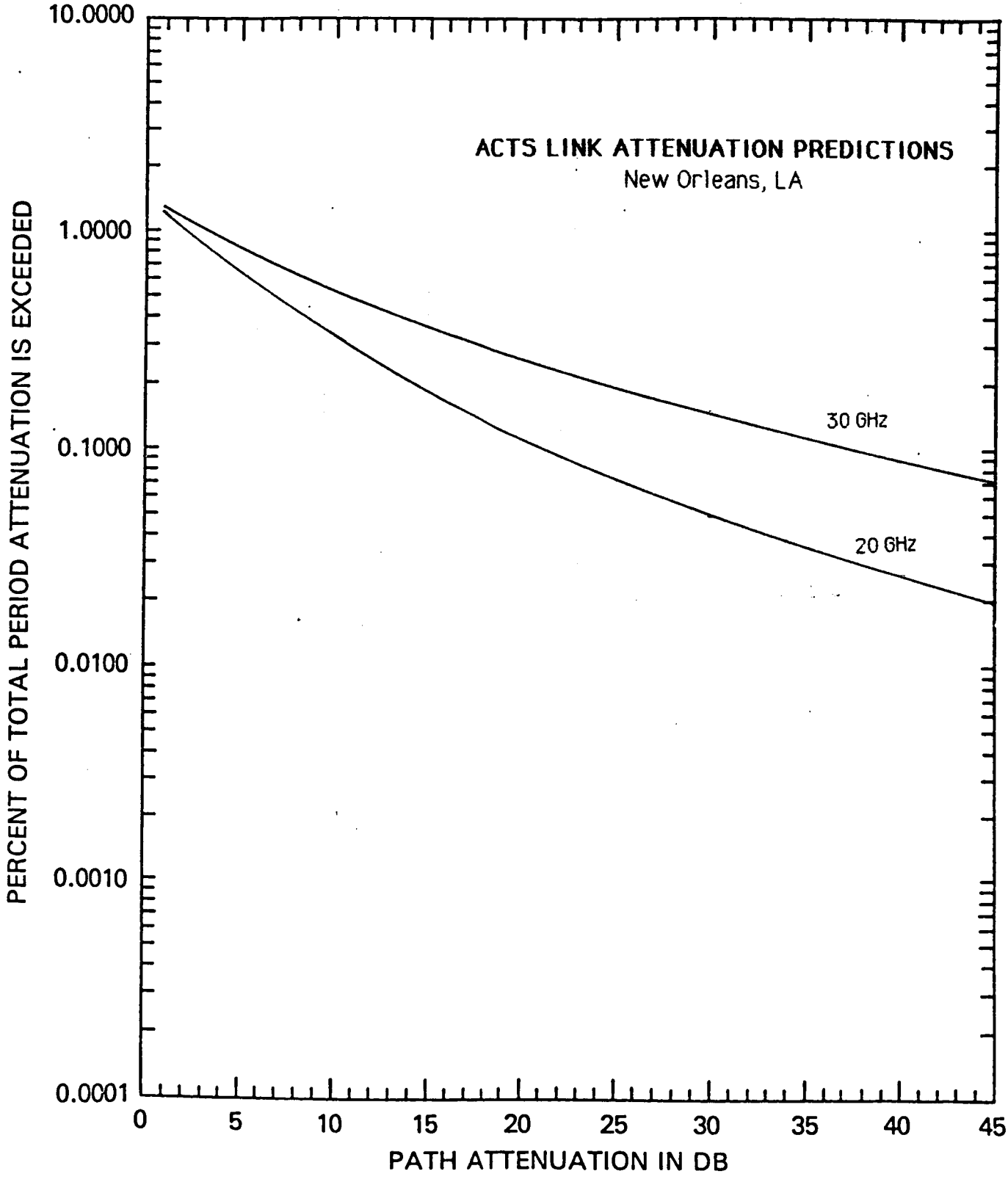
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3561.8	2027.9	1016.1	304.4	5972.3	4267.2	2679.9	1095.4
1	3491.3	1972.2	980.3	290.4	5909.8	4195.2	2615.8	1057.6
2	3422.2	1917.9	945.8	277.0	5848.0	4124.3	2553.3	1021.2
3	3354.4	1865.2	912.5	264.2	5786.8	4054.7	2492.3	986.0
4	3288.0	1813.9	880.3	252.0	5726.2	3986.3	2432.7	952.1
5	3223.0	1764.0	849.3	240.4	5666.3	3919.0	2374.6	919.3
10	2916.4	1534.5	709.9	189.8	5376.0	3599.1	2104.1	771.5
15	2638.9	1334.8	593.4	149.9	5100.5	3305.4	1864.4	647.5
20	2387.9	1161.1	496.1	118.3	4839.2	3035.7	1652.0	543.4
30	1955.2	878.6	346.6	73.8	4356.0	2560.4	1297.1	382.8
40	1600.9	664.8	242.2	46.0	3921.1	2159.6	1018.4	269.6
50	1310.8	503.0	169.2	28.7	3529.6	1821.5	799.6	189.9
60	1073.3	380.6	118.2	17.9	3177.1	1536.3	627.8	133.8
70	878.8	288.0	82.6	11.1	2859.9	1295.8	492.9	94.2
80	719.5	217.9	57.7	7.0	2574.3	1092.9	387.0	66.4
90	589.1	164.9	40.3	4.3	2317.3	921.8	303.9	46.7
100	482.4	124.8	28.2	2.7	2085.9	777.5	238.6	32.9

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	96.7	127.5	183.9	324.0
1.0	36.4	47.9	69.2	121.8
1.5	14.5	19.1	27.5	48.5
2.0	5.0	6.5	9.4	16.6
2.5	1.0	1.3	1.9	3.4

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	85.0	112.1	161.6	284.7
2.0	27.5	36.3	52.4	92.3
3.0	8.6	11.3	16.3	28.7
4.0	1.6	2.2	3.1	5.5


ACTS LINK ATTENUATION PREDICTIONS
New Orleans, LA
30 GHz
20 GHz
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : NEW ORLEANS, LA

STATION HEIGHT IN kM = 0.002
STATION LATITUDE IN DEG. N. = 29.97
TERMINAL LONGITUDE IN DEG. W. = 90.07
ANTENNA ELEV. ANGLE = 53.42
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.98
SLANT PATH PROJECTION ON EARTH IN kM = 3.56
P0 IN % = 0.444
Rm IN mm/hr =34.272
SR = 0.507
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.088 %
MEAN ATTENUATION Am = 5.914 dB
STANDARD DEV. OF ATTENUATION = 0.961

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.390 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.088 %
MEAN ATTENUATION Am = 11.271 dB
STANDARD DEV. OF ATTENUATION = 0.941

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.282 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.0532	1.0827
2.00	0.9472	1.0523
3.00	0.8270	1.0015
4.00	0.7160	0.9409
5.00	0.6195	0.8773
6.00	0.5375	0.8147
7.00	0.4683	0.7549
8.00	0.4098	0.6989
9.00	0.3602	0.6469
10.00	0.3180	0.5991
15.00	0.1810	0.4142
20.00	0.1114	0.2949
25.00	0.0726	0.2160
30.00	0.0495	0.1621
40.00	0.0254	0.0969
50.00	0.0143	0.0616

LOCATION OF TERMINAL: NEW ORLEANS, LA

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.088 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 5.914 dB; @ 30 GHz: 11.271 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 0.961; @ 30 GHz: 0.941

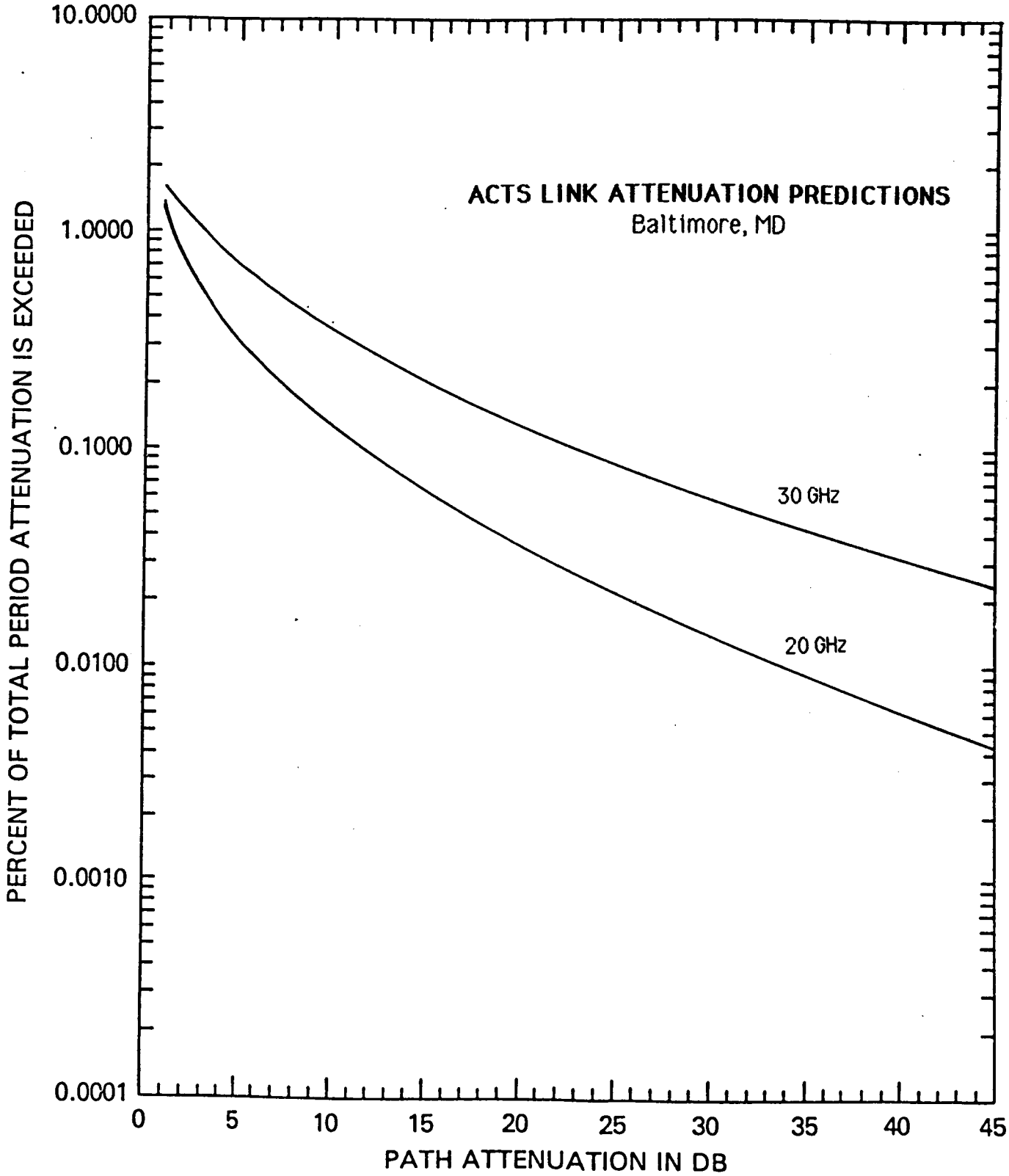
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	4349.8	3258.4	2155.2	951.9	5267.3	4614.4	3675.7	2178.3
1	4311.7	3210.4	2108.9	921.7	5249.1	4580.7	3630.1	2131.9
2	4273.9	3163.1	2063.7	892.5	5231.0	4547.3	3585.0	2086.5
3	4236.5	3116.5	2019.4	864.1	5212.9	4514.1	3540.4	2042.1
4	4199.4	3070.6	1976.1	836.7	5194.9	4481.2	3496.5	1998.6
5	4162.6	3025.4	1933.7	810.1	5176.9	4448.5	3453.0	1956.1
10	3983.5	2809.0	1735.1	689.5	5088.0	4288.5	3243.8	1756.5
15	3812.1	2608.2	1556.8	586.8	5000.7	4134.3	3047.3	1577.3
20	3648.1	2421.6	1396.9	499.4	4914.9	3985.6	2862.7	1416.4
30	3341.0	2087.7	1124.6	361.7	4747.6	3704.1	2526.4	1142.1
40	3059.7	1799.8	905.4	261.9	4586.0	3442.5	2229.5	921.0
50	2802.0	1551.6	728.9	189.7	4429.9	3199.4	1967.6	742.6
60	2566.1	1337.6	586.8	137.4	4279.1	2973.4	1736.4	598.8
70	2350.1	1153.1	472.4	99.5	4133.5	2763.4	1532.4	482.9
80	2152.2	994.1	380.3	72.1	3992.8	2568.2	1352.3	389.4
90	1971.0	857.0	306.2	52.2	3856.9	2386.8	1193.4	314.0
100	1805.0	738.8	246.5	37.8	3725.7	2218.3	1053.2	253.2

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	106.1	139.9	201.8	355.5
1.0	39.9	52.6	75.9	133.6
1.5	15.9	20.9	30.2	53.2
2.0	5.4	7.2	10.3	18.2
2.5	1.1	1.4	2.1	3.7

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	89.3	117.8	169.9	299.3
2.0	29.0	38.2	55.1	97.0
3.0	9.0	11.9	17.1	30.2
4.0	1.7	2.3	3.3	5.8


ACTS LINK ATTENUATION PREDICTIONS
Baltimore, MD
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : BALTIMORE, MD

STATION HEIGHT IN kM = 0.024
STATION LATITUDE IN DEG. N. = 39.28
TERMINAL LONGITUDE IN DEG. W. = 76.62
ANTENNA ELEV. ANGLE = 38.50
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.18
SLANT PATH PROJECTION ON EARTH IN kM = 4.84
P0 IN % = 0.827
Rm IN mm/hr =10.680
SR = 0.796
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.844 %
MEAN ATTENUATION Am = 2.085 dB
STANDARD DEV. OF ATTENUATION = 1.087

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.503 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.844 %
MEAN ATTENUATION Am = 4.319 dB
STANDARD DEV. OF ATTENUATION = 1.043

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.364 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.3840	1.6964
2.00	0.9502	1.4200
3.00	0.6803	1.1742
4.00	0.5061	0.9763
5.00	0.3882	0.8192
6.00	0.3051	0.6939
7.00	0.2445	0.5932
8.00	0.1992	0.5112
9.00	0.1646	0.4438
10.00	0.1376	0.3879
15.00	0.0641	0.2143
20.00	0.0346	0.1305
25.00	0.0206	0.0850
30.00	0.0131	0.0581
40.00	0.0061	0.0302
50.00	0.0032	0.0174

LOCATION OF TERMINAL: BALTIMORE, MD

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.844 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.085 dB; @ 30 GHz: 4.319 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.087; @ 30 GHz: 1.043

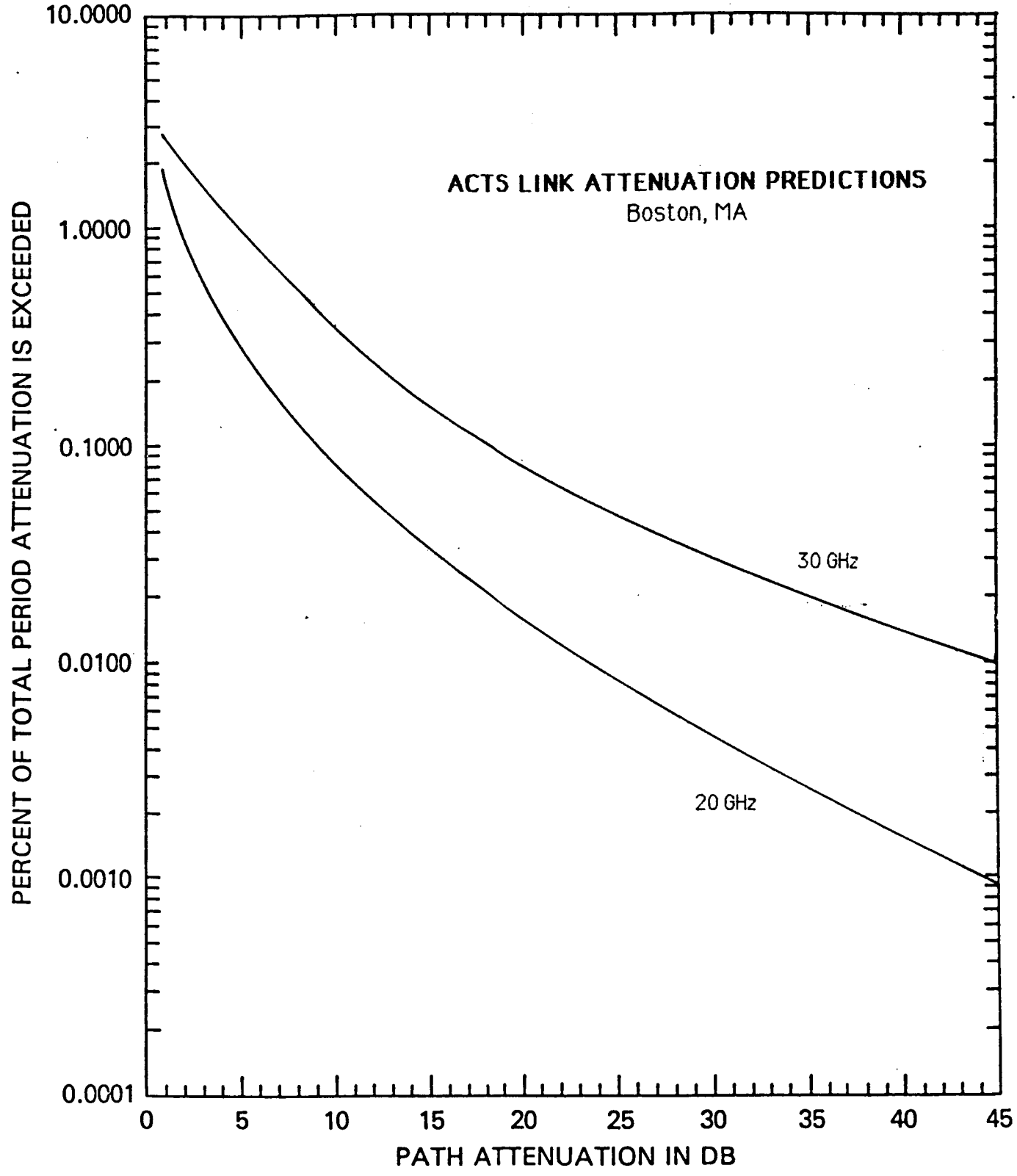
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	3578.2	2041.8	1047.9	336.9	6176.0	4308.5	2688.7	1127.1
1	3500.4	1982.4	1009.9	321.3	6098.2	4226.9	2619.7	1087.1
2	3424.3	1924.8	973.2	306.4	6021.4	4146.8	2552.5	1048.4
3	3349.8	1868.9	937.9	292.1	5945.5	4068.3	2487.0	1011.2
4	3277.0	1814.6	903.9	278.6	5870.6	3991.2	2423.2	975.2
5	3205.7	1761.9	871.1	265.7	5796.7	3915.6	2361.1	940.6
10	2871.9	1520.4	724.2	209.5	5440.7	3558.5	2073.4	784.9
15	2572.9	1312.0	602.0	165.1	5106.5	3234.0	1820.7	655.0
20	2305.0	1132.2	500.5	130.2	4792.9	2939.1	1598.9	546.6
30	1850.0	843.1	345.9	80.9	4222.3	2427.4	1233.0	380.6
40	1484.9	627.8	239.0	50.3	3719.6	2004.9	950.8	265.1
50	1191.8	467.5	165.2	31.3	3276.7	1655.9	733.2	184.6
60	956.5	348.1	114.2	19.4	2886.6	1367.6	565.4	128.5
70	767.7	259.2	78.9	12.1	2542.9	1129.6	436.0	89.5
80	616.2	193.0	54.5	7.5	2240.2	932.9	336.2	62.3
90	494.5	143.8	37.7	4.7	1973.5	770.5	259.3	43.4
100	396.9	107.0	26.0	2.9	1738.5	636.4	200.0	30.2

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	82.9	109.3	157.6	277.7
1.0	31.2	41.1	59.3	104.4
1.5	12.4	16.4	23.6	41.6
2.0	4.2	5.6	8.1	14.2
2.5	0.9	1.1	1.6	2.9

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	72.7	95.9	138.3	243.6
2.0	23.6	31.1	44.8	79.0
3.0	7.3	9.7	13.9	24.5
4.0	1.4	1.8	2.7	4.7


ACTS LINK ATTENUATION PREDICTIONS
Boston, MA
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : BOSTON, MA

STATION HEIGHT IN kM = 0.005
STATION LATITUDE IN DEG. N. = 42.37
TERMINAL LONGITUDE IN DEG. W. = 71.07
ANTENNA ELEV. ANGLE = 33.02
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.53
SLANT PATH PROJECTION ON EARTH IN kM = 5.47
P0 IN % = 1.566
Rm IN mm/hr = 5.729
SR = 0.834
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 2.762 %
MEAN ATTENUATION Am = 1.628 dB
STANDARD DEV. OF ATTENUATION = 0.989

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.574 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 2.762 %
MEAN ATTENUATION Am = 3.527 dB
STANDARD DEV. OF ATTENUATION = 0.935

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.416 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.9026	2.5162
2.00	1.1535	2.0103
3.00	0.7412	1.5705
4.00	0.5021	1.2330
5.00	0.3545	0.9791
6.00	0.2587	0.7870
7.00	0.1939	0.6402
8.00	0.1485	0.5264
9.00	0.1159	0.4371
10.00	0.0919	0.3661
15.00	0.0342	0.1680
20.00	0.0155	0.0877
25.00	0.0080	0.0501
30.00	0.0045	0.0305
40.00	0.0017	0.0130
50.00	0.0007	0.0063

LOCATION OF TERMINAL: BOSTON, MA

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 2.762 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.628 dB; @ 30 GHz: 3.527 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 0.989; @ 30 GHz: 0.935

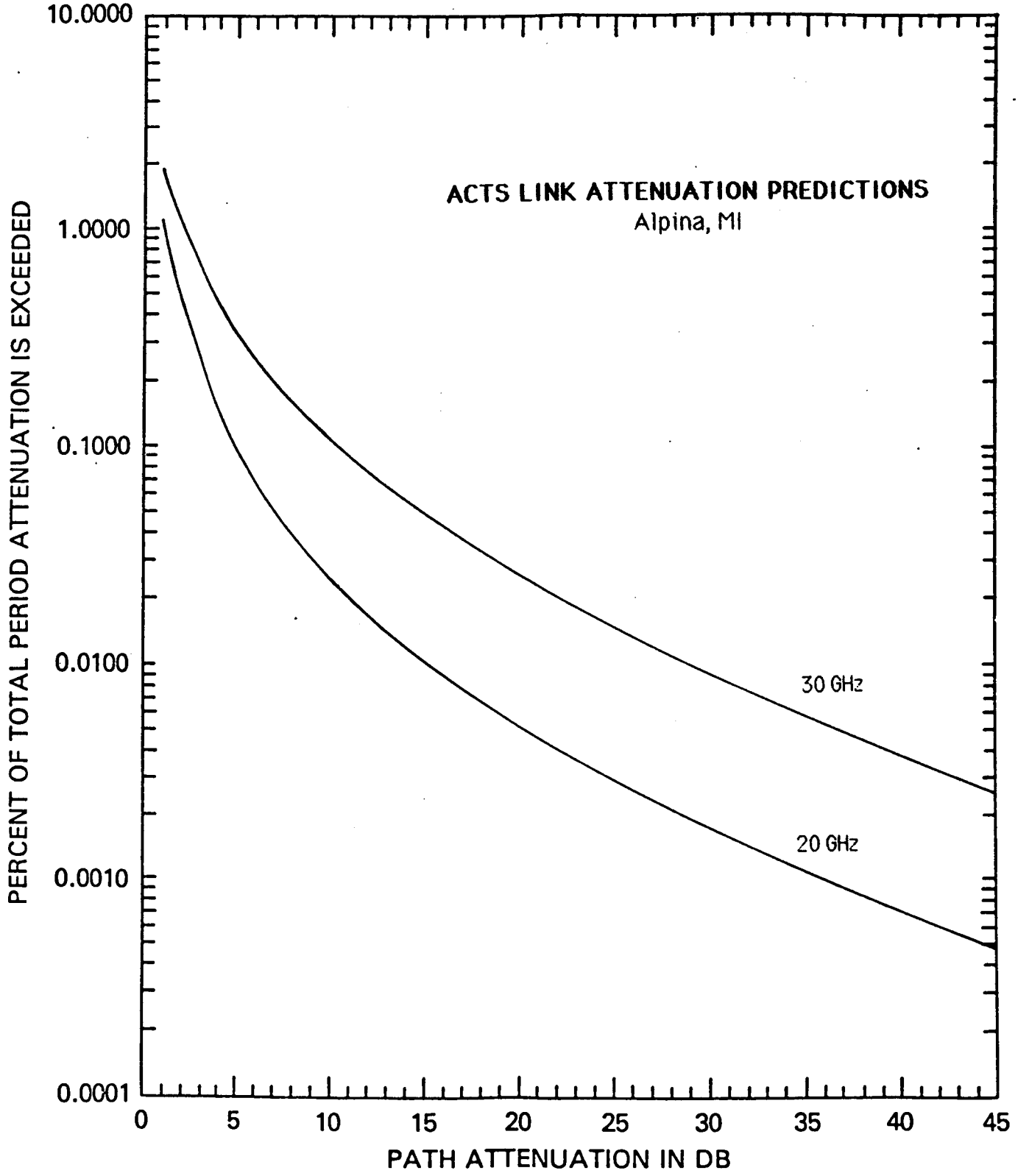
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3898.4	1864.8	781.3	180.1	8260.4	5149.5	2768.5	883.6
1	3796.7	1800.4	747.9	170.3	8138.5	5034.6	2684.9	846.8
2	3697.8	1738.2	715.9	161.1	8018.5	4922.2	2603.8	811.5
3	3601.4	1678.3	685.3	152.3	7900.2	4812.3	2525.1	777.7
4	3507.5	1620.3	656.0	144.1	7783.7	4704.9	2448.8	745.3
5	3416.1	1564.4	627.9	136.3	7668.8	4599.9	2374.9	714.2
10	2993.5	1312.4	504.7	103.1	7119.7	4109.1	2037.2	577.3
15	2623.2	1101.0	405.7	78.1	6609.9	3670.6	1747.5	466.6
20	2298.7	923.7	326.0	59.1	6136.5	3278.8	1499.0	377.2
30	1765.1	650.1	210.6	33.8	5289.1	2616.4	1103.1	246.4
40	1355.4	457.5	136.1	19.4	4558.8	2087.8	811.7	161.0
50	1040.8	322.0	87.9	11.1	3929.2	1665.9	597.3	105.2
60	799.2	226.6	56.8	6.4	3386.7	1329.3	439.5	68.7
70	613.7	159.5	36.7	3.6	2919.0	1060.8	323.4	44.9
80	471.2	112.3	23.7	2.1	2515.9	846.4	238.0	29.3
90	361.9	79.0	15.3	1.2	2168.5	675.4	175.1	19.2
100	277.9	55.6	9.9	0.7	1869.0	539.0	128.8	12.5

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	100.1	132.0	190.4	335.3
1.0	37.6	49.6	71.6	126.1
1.5	15.0	19.8	28.5	50.2
2.0	5.1	6.8	9.7	17.2
2.5	1.0	1.4	2.0	3.5

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	90.4	119.1	171.8	302.7
2.0	29.3	38.6	55.7	98.1
3.0	9.1	12.0	17.3	30.5
4.0	1.7	2.3	3.3	5.8


ACTS LINK ATTENUATION PREDICTIONS
Alpina, MI
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : ALPINA, MI

STATION HEIGHT IN kM = 0.179
STATION LATITUDE IN DEG. N. = 45.07
TERMINAL LONGITUDE IN DEG. W. = 83.45
ANTENNA ELEV. ANGLE = 35.56
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.35
SLANT PATH PROJECTION ON EARTH IN kM = 4.36
P0 IN % = 2.558
Rm IN mm/hr = 1.692
SR = 1.145
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 3.417 %
MEAN ATTENUATION Am = 0.521 dB
STANDARD DEV. OF ATTENUATION = 1.223

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.538 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 3.417 %
MEAN ATTENUATION Am = 1.232 dB
STANDARD DEV. OF ATTENUATION = 1.141

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.390 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.0151	1.9562
2.00	0.4640	1.1460
3.00	0.2605	0.7432
4.00	0.1636	0.5154
5.00	0.1103	0.3746
6.00	0.0782	0.2819
7.00	0.0576	0.2180
8.00	0.0437	0.1723
9.00	0.0340	0.1387
10.00	0.0269	0.1133
15.00	0.0103	0.0485
20.00	0.0049	0.0248
25.00	0.0027	0.0142
30.00	0.0016	0.0087
40.00	0.0007	0.0039
50.00	0.0003	0.0020

LOCATION OF TERMINAL: ALPINA, MI

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 3.417 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.521 dB; @ 30 GHz: 1.232 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.223; @ 30 GHz: 1.141

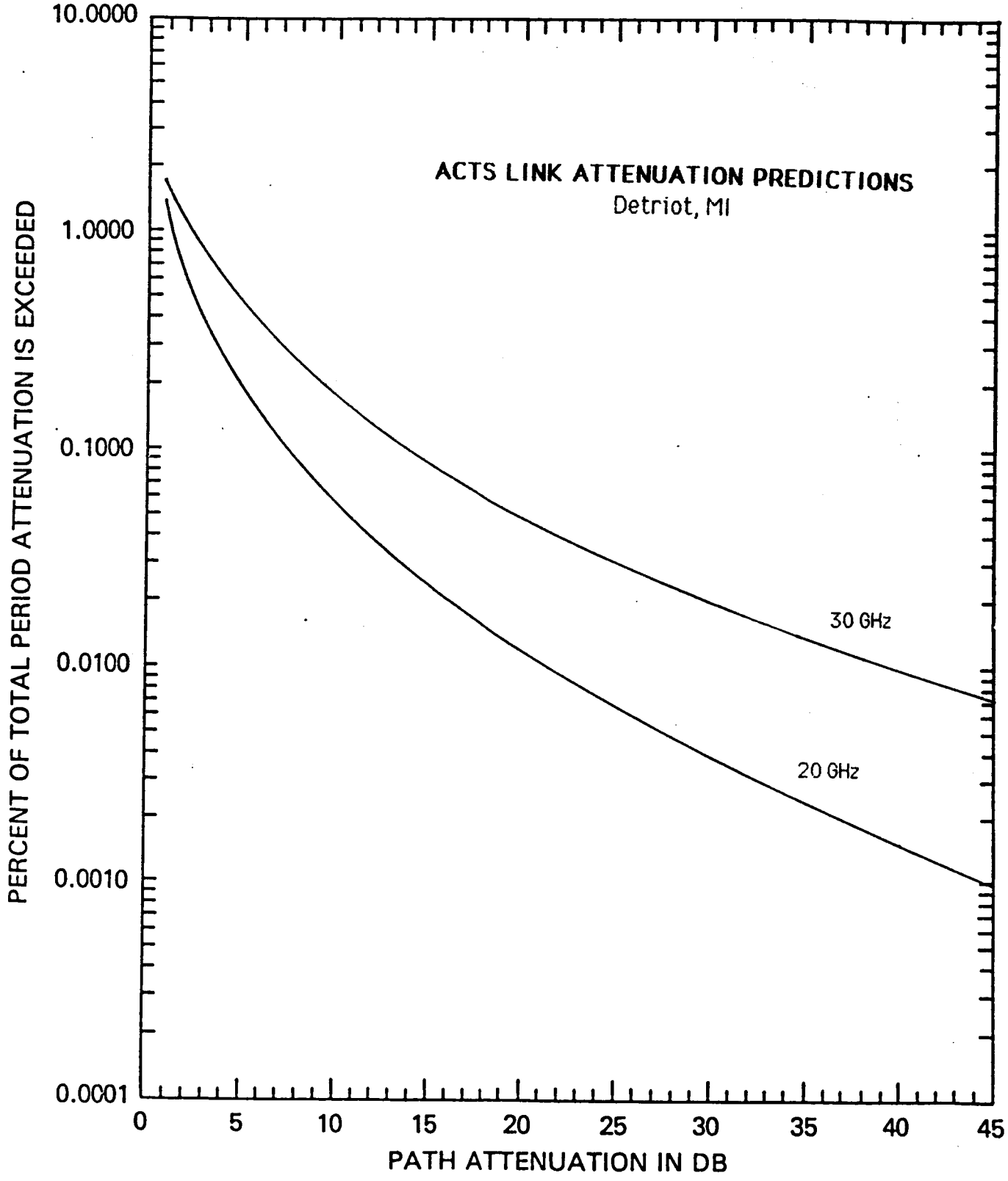
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	1370.3	580.1	229.9	54.2	3909.2	1970.2	906.5	255.1
1	1316.0	552.8	217.5	50.7	3797.1	1899.0	867.2	241.6
2	1263.9	526.9	205.7	47.5	3688.3	1830.4	829.6	228.7
3	1213.8	502.1	194.6	44.5	3582.6	1764.3	793.7	216.5
4	1165.7	478.5	184.1	41.7	3479.9	1700.6	759.3	205.0
5	1119.5	456.0	174.2	39.0	3380.1	1639.1	726.4	194.1
10	914.6	358.4	132.0	28.1	2922.7	1363.7	582.2	147.6
15	747.2	281.7	100.0	20.3	2527.2	1134.5	466.6	112.3
20	610.5	221.4	75.8	14.6	2185.2	943.9	373.9	85.4
30	407.5	136.8	43.5	7.6	1633.8	653.3	240.1	49.4
40	272.0	84.5	25.0	3.9	1221.5	452.2	154.2	28.6
50	181.5	52.2	14.3	2.0	913.3	313.0	99.1	16.6
60	121.2	32.3	8.2	1.1	682.8	216.6	63.6	9.6
70	80.9	19.9	4.7	0.6	510.5	150.0	40.9	5.5
80	54.0	12.3	2.7	0.3	381.7	103.8	26.2	3.2
90	36.0	7.6	1.6	0.1	285.4	71.8	16.9	1.9
100	24.1	4.7	0.9	0.1	213.4	49.7	10.8	1.1

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	65.4	86.3	124.4	219.2
1.0	24.6	32.4	46.8	82.4
1.5	9.8	12.9	18.6	32.8
2.0	3.4	4.4	6.4	11.2
2.5	0.7	0.9	1.3	2.3

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	60.8	80.1	115.5	203.6
2.0	19.7	26.0	37.5	66.0
3.0	6.1	8.1	11.6	20.5
4.0	1.2	1.5	2.2	3.9


ACTS LINK ATTENUATION PREDICTIONS
Detriot, MI
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : DETROIT, MI

STATION HEIGHT IN kM = 0.198
STATION LATITUDE IN DEG. N. = 42.33
TERMINAL LONGITUDE IN DEG. W. = 83.05
ANTENNA ELEV. ANGLE = 38.20
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.45
SLANT PATH PROJECTION ON EARTH IN kM = 4.28
P0 IN % = 1.032
Rm IN mm/hr = 5.831
SR = 0.895
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.883 %
MEAN ATTENUATION Am = 1.265 dB
STANDARD DEV. OF ATTENUATION = 1.102

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.506 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.883 %
MEAN ATTENUATION Am = 2.737 dB
STANDARD DEV. OF ATTENUATION = 1.047

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.367 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.1005	1.5665
2.00	0.6381	1.1633
3.00	0.4081	0.8757
4.00	0.2790	0.6750
5.00	0.2001	0.5318
6.00	0.1487	0.4268
7.00	0.1136	0.3480
8.00	0.0888	0.2876
9.00	0.0707	0.2405
10.00	0.0572	0.2031
15.00	0.0234	0.0980
20.00	0.0116	0.0540
25.00	0.0064	0.0325
30.00	0.0038	0.0209
40.00	0.0016	0.0098
50.00	0.0008	0.0052

LOCATION OF TERMINAL: DETROIT, MI

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.883 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.265 dB; @ 30 GHz: 2.737 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.102; @ 30 GHz: 1.047

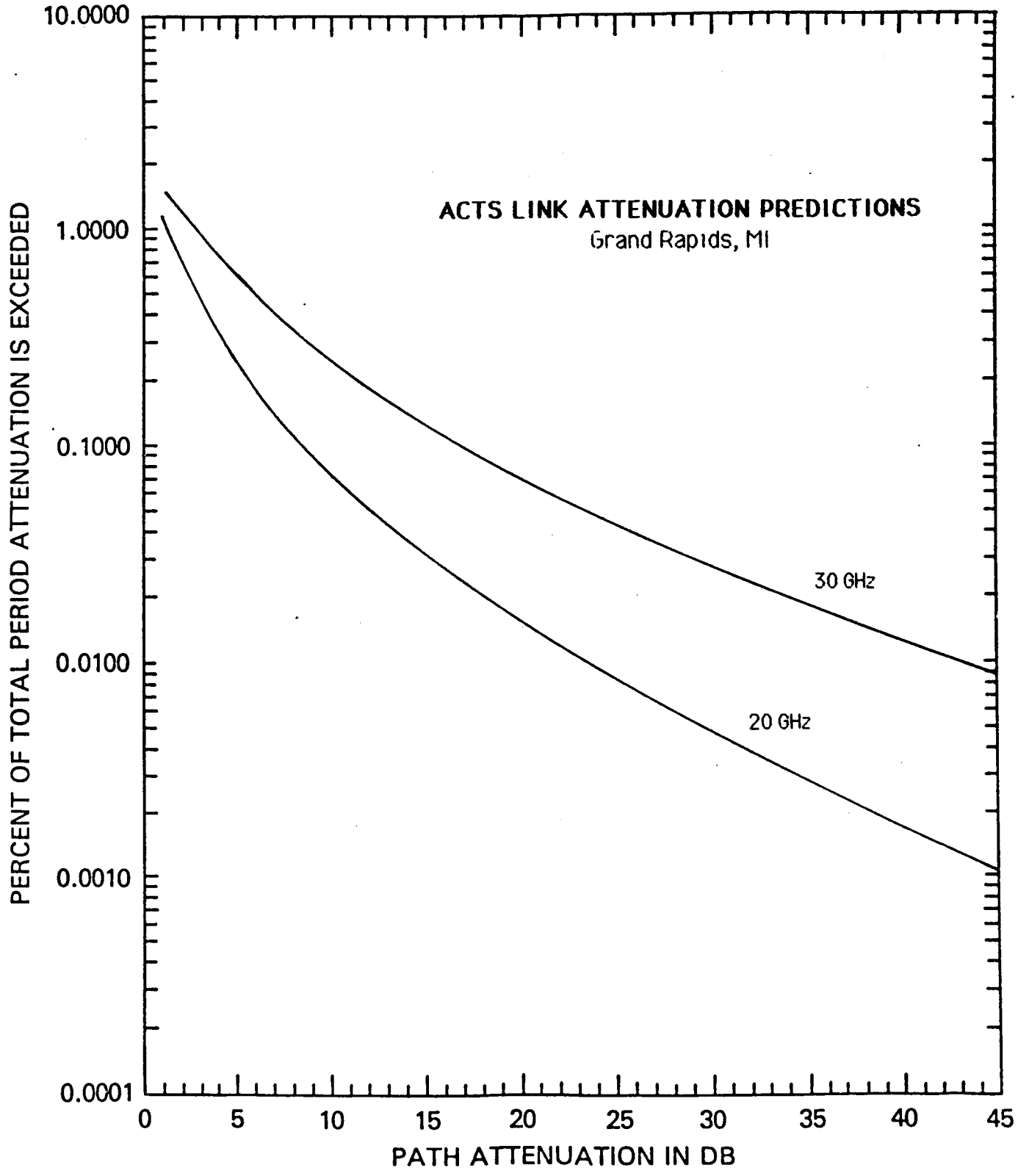
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	2146.5	1052.4	467.1	123.2	4605.9	2796.8	1512.6	515.4
1	2084.9	1014.1	446.6	116.5	4522.0	2725.7	1463.2	493.2
2	2025.1	977.2	427.0	110.2	4439.7	2656.5	1415.4	472.0
3	1966.9	941.6	408.3	104.3	4358.9	2589.0	1369.1	451.6
4	1910.5	907.3	390.4	98.6	4279.5	2523.2	1324.4	432.2
5	1855.7	874.2	373.2	93.3	4201.6	2459.1	1281.1	413.6
10	1604.2	726.1	298.2	70.6	3832.9	2162.2	1085.0	331.9
15	1386.8	603.2	238.3	53.4	3496.4	1901.1	919.0	266.4
20	1198.9	501.0	190.4	40.4	3189.6	1671.6	778.3	213.8
30	896.0	345.7	121.6	23.2	2654.2	1292.3	558.3	137.7
40	669.6	238.5	77.6	13.3	2208.8	999.0	400.5	88.7
50	500.4	164.5	49.5	7.6	1838.0	772.3	287.3	57.1
60	374.0	113.5	31.6	4.4	1529.6	597.1	206.1	36.8
70	279.5	78.3	20.2	2.5	1272.8	461.6	147.8	23.7
80	208.9	54.0	12.9	1.4	1059.2	356.9	106.0	15.3
90	156.1	37.3	8.2	0.8	881.4	275.9	76.1	9.8
100	116.7	25.7	5.3	0.5	733.5	213.3	54.6	6.3

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	80.6	106.3	153.3	270.0
1.0	30.3	40.0	57.6	101.5
1.5	12.1	15.9	22.9	40.4
2.0	4.1	5.4	7.9	13.8
2.5	0.8	1.1	1.6	2.8

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	72.2	95.1	137.2	241.7
2.0	23.4	30.8	44.5	78.4
3.0	7.3	9.6	13.8	24.4
4.0	1.4	1.8	2.6	4.6


ACTS LINK ATTENUATION PREDICTIONS
Grand Rapids, MI
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : GRAND RAPIDS, MI

STATION HEIGHT IN kM = 0.198
STATION LATITUDE IN DEG. N. = 42.97
TERMINAL LONGITUDE IN DEG. W. = 85.67
ANTENNA ELEV. ANGLE = 38.36
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.33
SLANT PATH PROJECTION ON EARTH IN kM = 4.18
P0 IN % = 0.793
Rm IN mm/hr = 9.411
SR = 0.760
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.615 %
MEAN ATTENUATION Am = 1.755 dB
STANDARD DEV. OF ATTENUATION = 1.035

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.504 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.615 %
MEAN ATTENUATION Am = 3.669 dB
STANDARD DEV. OF ATTENUATION = 0.992

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.365 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.1410	1.4612
2.00	0.7262	1.1781
3.00	0.4879	0.9372
4.00	0.3438	0.7513
5.00	0.2515	0.6096
6.00	0.1895	0.5006
7.00	0.1463	0.4157
8.00	0.1151	0.3487
9.00	0.0921	0.2952
10.00	0.0748	0.2520
15.00	0.0308	0.1257
20.00	0.0151	0.0705
25.00	0.0083	0.0428
30.00	0.0049	0.0276
40.00	0.0020	0.0129
50.00	0.0010	0.0068

LOCATION OF TERMINAL: GRAND RAPIDS, MI

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.615 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.755 dB; @ 30 GHz: 3.669 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.035; @ 30 GHz: 0.992

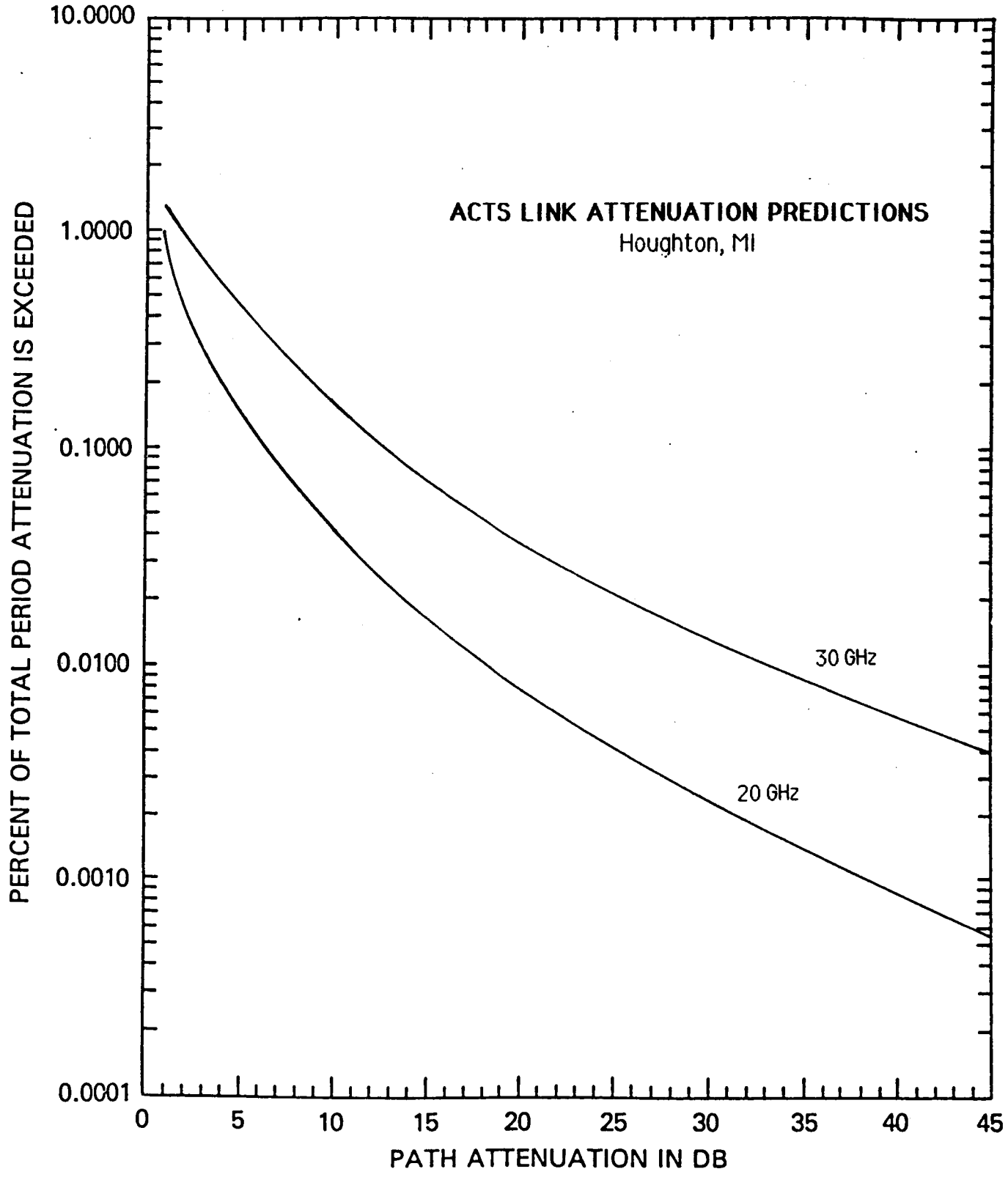
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	2566.1	1323.0	605.5	161.8	4929.2	3206.1	1834.3	661.3
1	2503.2	1280.0	581.1	153.5	4858.3	3137.4	1781.5	635.3
2	2441.8	1238.5	557.7	145.7	4788.5	3070.3	1730.3	610.2
3	2381.9	1198.3	535.3	138.2	4719.7	3004.5	1680.6	586.2
4	2323.5	1159.4	513.7	131.2	4651.8	2940.2	1632.3	563.0
5	2266.5	1121.8	493.1	124.5	4585.0	2877.2	1585.3	540.8
10	2002.0	951.1	401.5	95.8	4264.8	2582.1	1370.2	442.3
15	1768.3	806.4	327.0	73.7	3967.0	2317.3	1184.3	361.7
20	1561.9	683.8	266.3	56.7	3689.9	2079.6	1023.6	295.8
30	1218.6	491.6	176.6	33.6	3192.6	1674.9	764.6	197.9
40	950.7	353.4	117.1	19.9	2762.3	1348.9	571.2	132.3
50	741.7	254.1	77.7	11.8	2389.9	1086.4	426.7	88.5
60	578.7	182.7	51.5	7.0	2067.8	875.0	318.7	59.2
70	451.5	131.3	34.2	4.1	1789.1	704.7	238.1	39.6
80	352.2	94.4	22.7	2.4	1547.9	567.5	177.9	26.5
90	274.8	67.9	15.0	1.4	1339.3	457.1	132.9	17.7
100	214.4	48.8	10.0	0.9	1158.8	368.1	99.3	11.8

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	91.5	120.7	174.0	306.6
1.0	34.4	45.4	65.4	115.3
1.5	13.7	18.1	26.0	45.9
2.0	4.7	6.2	8.9	15.7
2.5	0.9	1.2	1.8	3.2

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	80.3	105.9	152.8	269.1
2.0	26.0	34.3	49.5	87.2
3.0	8.1	10.7	15.4	27.1
4.0	1.5	2.0	2.9	5.2


ACTS LINK ATTENUATION PREDICTIONS
Houghton, MI
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : HOUGHTON, MI

STATION HEIGHT IN kM = 0.191
STATION LATITUDE IN DEG. N. = 47.12
TERMINAL LONGITUDE IN DEG. W. = 88.57
ANTENNA ELEV. ANGLE = 34.71
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.09
SLANT PATH PROJECTION ON EARTH IN kM = 4.18
P0 IN % = 0.822
Rm IN mm/hr = 7.253
SR = 0.785
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.645 %
MEAN ATTENUATION Am = 1.298 dB
STANDARD DEV. OF ATTENUATION = 1.048

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.549 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.645 %
MEAN ATTENUATION Am = 2.765 dB
STANDARD DEV. OF ATTENUATION = 1.003

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.398 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.9842	1.3896
2.00	0.5592	1.0308
3.00	0.3487	0.7691
4.00	0.2326	0.5861
5.00	0.1629	0.4562
6.00	0.1184	0.3617
7.00	0.0887	0.2914
8.00	0.0680	0.2380
9.00	0.0531	0.1968
10.00	0.0422	0.1644
15.00	0.0161	0.0755
20.00	0.0074	0.0399
25.00	0.0039	0.0231
30.00	0.0022	0.0143
40.00	0.0009	0.0063
50.00	0.0004	0.0032

LOCATION OF TERMINAL: HOUGHTON, MI

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.645 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.298 dB; @ 30 GHz: 2.765 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.048; @ 30 GHz: 1.003

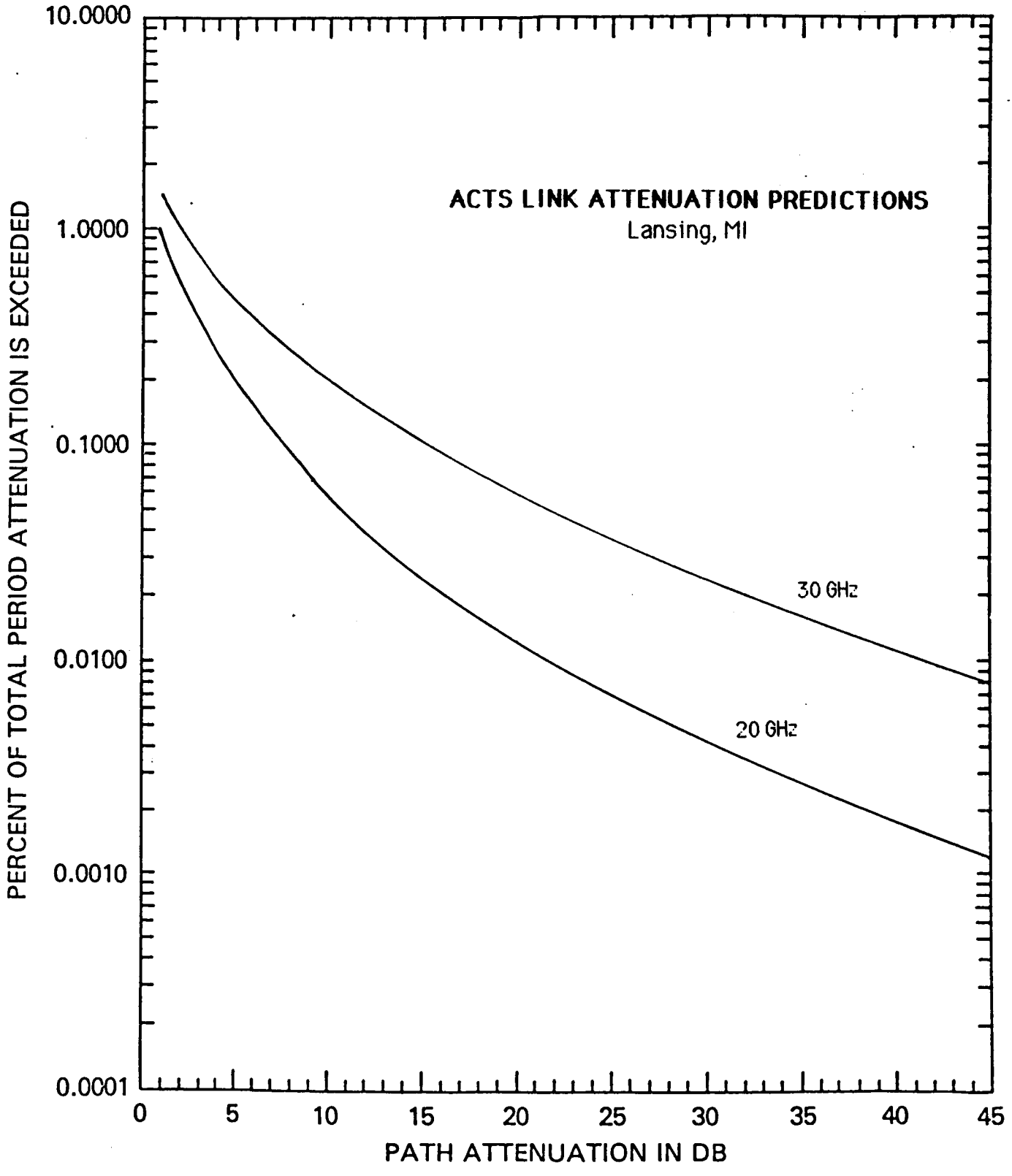
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	1834.1	856.9	357.5	84.4	4045.2	2399.4	1251.9	396.9
1	1781.0	825.1	341.4	79.7	3971.9	2337.8	1210.2	379.4
2	1729.4	794.4	326.0	75.3	3899.9	2277.9	1170.0	362.6
3	1679.3	764.9	311.4	71.1	3829.2	2219.5	1131.1	346.6
4	1630.6	736.5	297.4	67.1	3759.8	2162.5	1093.4	331.3
5	1583.4	709.2	284.0	63.3	3691.7	2107.1	1057.1	316.7
10	1367.0	587.0	225.6	47.5	3369.1	1850.4	892.6	252.7
15	1180.1	485.8	179.2	35.6	3074.7	1625.0	753.7	201.7
20	1018.8	402.1	142.3	26.7	2806.0	1427.0	636.4	161.0
30	759.3	275.4	89.8	15.0	2337.0	1100.5	453.8	102.5
40	565.9	188.6	56.7	8.5	1946.4	848.7	323.6	65.3
50	421.8	129.2	35.8	4.8	1621.1	654.6	230.7	41.6
60	314.4	88.5	22.6	2.7	1350.2	504.8	164.5	26.5
70	234.3	60.6	14.2	1.5	1124.5	389.3	117.3	16.9
80	174.6	41.5	9.0	0.8	936.6	300.2	83.6	10.7
90	130.1	28.4	5.7	0.5	780.0	231.5	59.6	6.8
100	97.0	19.5	3.6	0.3	649.7	178.6	42.5	4.4

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	89.2	117.6	169.7	298.9
1.0	33.5	44.2	63.8	112.4
1.5	13.4	17.6	25.4	44.7
2.0	4.6	6.0	8.7	15.3
2.5	0.9	1.2	1.8	3.1

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	78.6	103.6	149.4	263.3
2.0	25.5	33.6	48.4	85.3
3.0	7.9	10.4	15.1	26.5
4.0	1.5	2.0	2.9	5.1


ACTS LINK ATTENUATION PREDICTIONS
Lansing, MI
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : LANSING, MI

STATION HEIGHT IN kM = 0.261
STATION LATITUDE IN DEG. N. = 42.73
TERMINAL LONGITUDE IN DEG. W. = 84.55
ANTENNA ELEV. ANGLE = 38.27
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.27
SLANT PATH PROJECTION ON EARTH IN kM = 4.14
P0 IN % = 0.753
Rm IN mm/hr = 8.260
SR = 0.802
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.564 %
MEAN ATTENUATION Am = 1.462 dB
STANDARD DEV. OF ATTENUATION = 1.082

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.505 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.564 %
MEAN ATTENUATION Am = 3.086 dB
STANDARD DEV. OF ATTENUATION = 1.036

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.366 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.9969	1.3477
2.00	0.6039	1.0359
3.00	0.3961	0.7991
4.00	0.2754	0.6274
5.00	0.1999	0.5016
6.00	0.1500	0.4075
7.00	0.1155	0.3357
8.00	0.0908	0.2799
9.00	0.0727	0.2358
10.00	0.0590	0.2006
15.00	0.0245	0.0993
20.00	0.0122	0.0557
25.00	0.0068	0.0340
30.00	0.0041	0.0220
40.00	0.0017	0.0105
50.00	0.0009	0.0056

LOCATION OF TERMINAL: LANSING, MI

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.564 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.462 dB; @ 30 GHz: 3.086 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.082; @ 30 GHz: 1.036

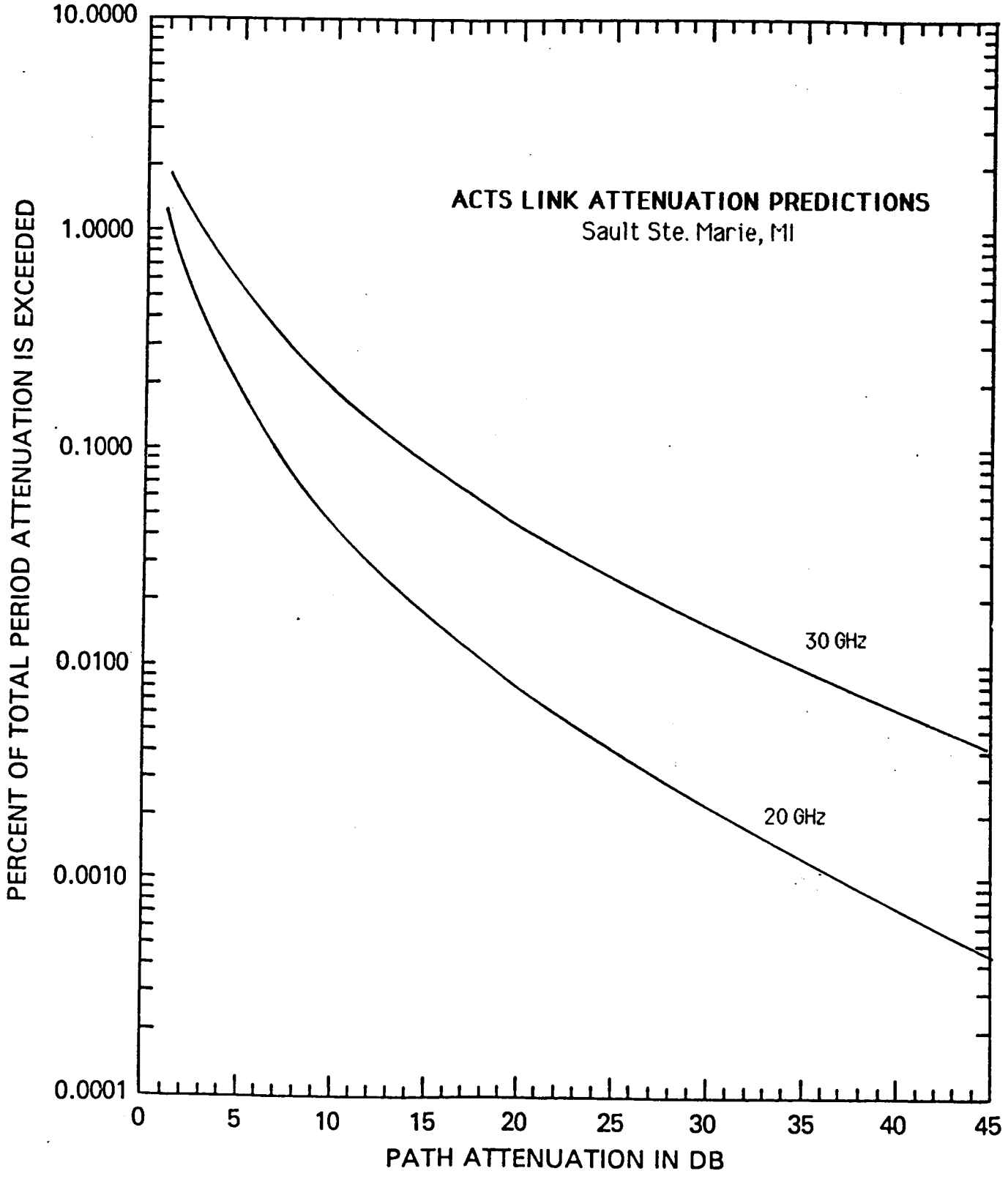
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	2083.2	1051.6	477.6	129.0	4202.9	2638.2	1472.1	522.3
1	2027.3	1015.3	457.5	122.2	4132.9	2575.7	1426.5	500.7
2	1973.0	980.2	438.3	115.8	4064.1	2514.6	1382.4	480.0
3	1920.1	946.3	419.8	109.7	3996.5	2455.0	1339.7	460.2
4	1868.7	913.6	402.2	103.9	3930.0	2396.7	1298.2	441.2
5	1818.6	882.0	385.2	98.5	3864.6	2339.9	1258.1	423.0
10	1587.6	739.8	310.7	75.2	3553.5	2075.3	1075.2	342.6
15	1385.9	620.5	250.6	57.4	3267.4	1840.6	918.9	277.5
20	1209.9	520.4	202.1	43.8	3004.4	1632.5	785.3	224.7
30	922.1	366.1	131.5	25.6	2540.2	1284.2	573.6	147.4
40	702.7	257.6	85.5	14.9	2147.7	1010.2	419.0	96.7
50	535.5	181.2	55.6	8.7	1815.8	794.6	306.0	63.4
60	408.1	127.5	36.2	5.1	1535.3	625.1	223.5	41.6
70	311.0	89.7	23.6	3.0	1298.1	491.7	163.3	27.3
80	237.0	63.1	15.3	1.7	1097.5	386.8	119.2	17.9
90	180.7	44.4	10.0	1.0	927.9	304.3	87.1	11.7
100	137.7	31.2	6.5	0.6	784.5	239.3	63.6	7.7

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	83.8	110.4	159.3	280.6
1.0	31.5	41.5	59.9	105.5
1.5	12.5	16.5	23.8	42.0
2.0	4.3	5.7	8.2	14.4
2.5	0.9	1.1	1.6	2.9

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	73.6	97.1	140.0	246.7
2.0	23.9	31.5	45.4	80.0
3.0	7.4	9.8	14.1	24.9
4.0	1.4	1.9	2.7	4.7


ACTS LINK ATTENUATION PREDICTIONS
Sault Ste. Marie, MI
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : SAULT STE. MARIE, MI

STATION HEIGHT IN kM = 0.220
STATION LATITUDE IN DEG. N. = 46.50
TERMINAL LONGITUDE IN DEG. W. = 84.35
ANTENNA ELEV. ANGLE = 34.36
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.19
SLANT PATH PROJECTION ON EARTH IN kM = 4.28
P0 IN % = 1.126
Rm IN mm/hr = 6.205
SR = 0.811
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.977 %
MEAN ATTENUATION Am = 1.366 dB
STANDARD DEV. OF ATTENUATION = 1.005

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.554 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.977 %
MEAN ATTENUATION Am = 2.942 dB
STANDARD DEV. OF ATTENUATION = 0.954

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.402 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.2293	1.7216
2.00	0.6960	1.2988
3.00	0.4284	0.9722
4.00	0.2814	0.7387
5.00	0.1941	0.5716
6.00	0.1390	0.4498
7.00	0.1026	0.3594
8.00	0.0775	0.2910
9.00	0.0598	0.2385
10.00	0.0469	0.1974
15.00	0.0169	0.0868
20.00	0.0075	0.0441
25.00	0.0038	0.0246
30.00	0.0021	0.0148
40.00	0.0008	0.0062
50.00	0.0003	0.0030

LOCATION OF TERMINAL: SAULT STE. MARIE, MI

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.977 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.366 dB; @ 30 GHz: 2.942 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.005; @ 30 GHz: 0.954

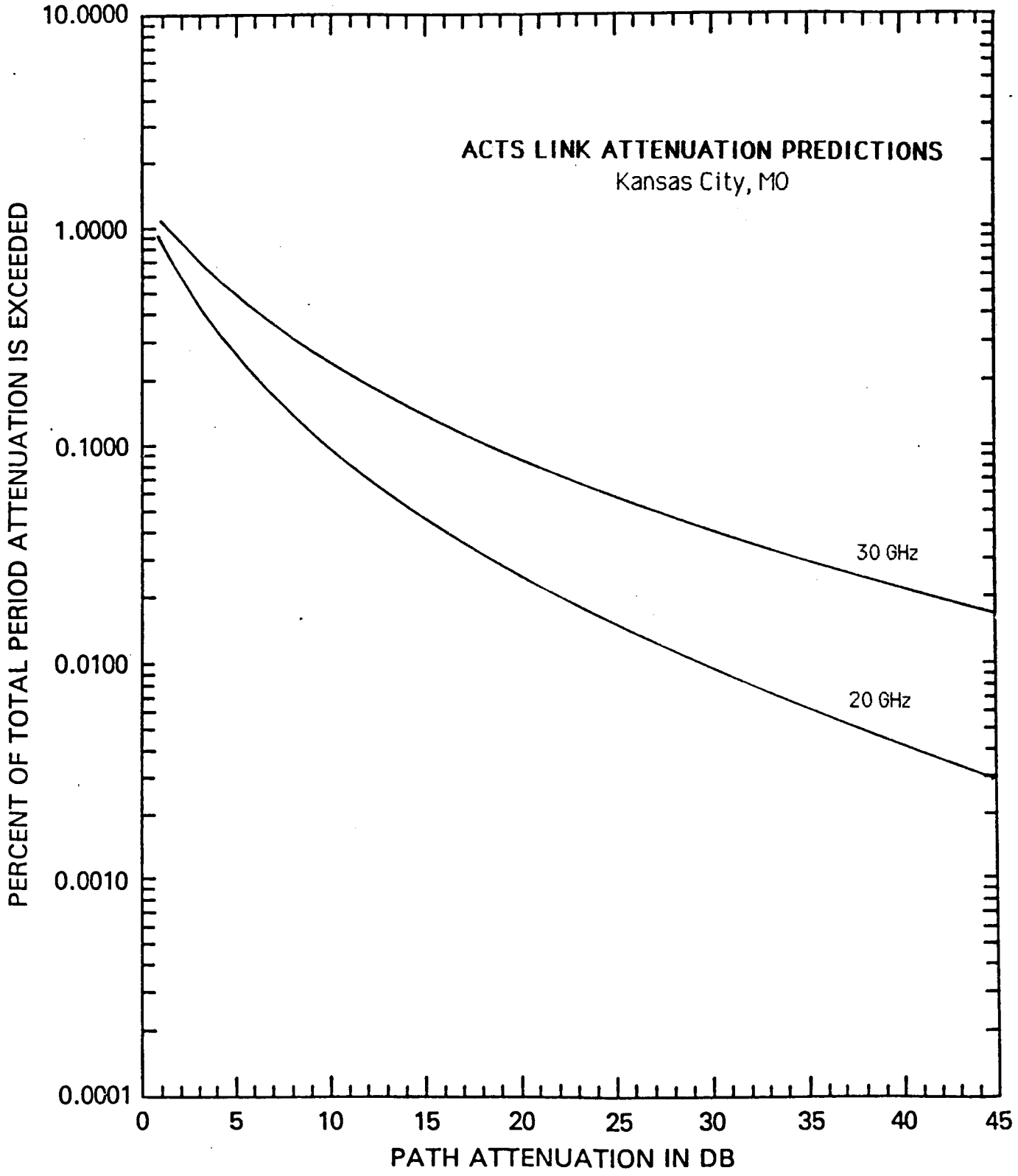
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	2253.1	1021.0	407.8	88.6	5113.3	3006.3	1530.7	456.4
1	2188.4	983.0	389.3	83.6	5024.9	2930.8	1480.1	436.1
2	2125.6	946.4	371.6	78.9	4938.0	2857.3	1431.1	416.7
3	2064.6	911.2	354.7	74.4	4852.6	2785.6	1383.8	398.2
4	2005.3	877.3	338.6	70.2	4768.7	2715.6	1338.0	380.5
5	1947.8	844.6	323.2	66.2	4686.3	2647.5	1293.8	363.5
10	1683.8	698.7	256.2	49.4	4294.9	2331.5	1093.5	289.5
15	1455.6	578.0	203.0	36.9	3936.3	2053.2	924.3	230.6
20	1258.3	478.2	160.9	27.5	3607.6	1808.1	781.2	183.7
30	940.4	327.3	101.1	15.3	3030.2	1402.2	558.1	116.5
40	702.8	224.0	63.5	8.6	2545.3	1087.5	398.7	73.9
50	525.2	153.3	39.9	4.8	2137.9	843.4	284.8	46.9
60	392.5	104.9	25.1	2.7	1795.8	654.0	203.5	29.7
70	293.3	71.8	15.7	1.5	1508.4	507.2	145.4	18.9
80	219.2	49.1	9.9	0.8	1267.0	393.4	103.8	12.0
90	163.8	33.6	6.2	0.5	1064.2	305.1	74.2	7.6
100	122.4	23.0	3.9	0.3	893.9	236.6	53.0	4.8

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	97.1	128.0	184.6	325.2
1.0	36.5	48.1	69.4	122.3
1.5	14.5	19.2	27.6	48.7
2.0	5.0	6.6	9.5	16.7
2.5	1.0	1.3	1.9	3.4

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	86.8	114.4	165.0	290.8
2.0	28.1	37.1	53.5	94.2
3.0	8.7	11.5	16.6	29.3
4.0	1.7	2.2	3.2	5.6


ACTS LINK ATTENUATION PREDICTIONS
Kansas City, MO
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : KANSAS CITY, MO

STATION HEIGHT IN KM = 0.226
STATION LATITUDE IN DEG. N. = 39.10
TERMINAL LONGITUDE IN DEG. W. = 94.58
ANTENNA ELEV. ANGLE = 44.40
LINK SLANT PATH LGTH. THRU RAIN REGION IN KM = 5.24
SLANT PATH PROJECTION ON EARTH IN KM = 3.74
P0 IN % = 0.458
Rm IN mm/hr =16.256
SR = 0.675
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.154 %
MEAN ATTENUATION Am = 2.231 dB
STANDARD DEV. OF ATTENUATION = 1.082

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.447 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.154 %
MEAN ATTENUATION Am = 4.484 dB
STANDARD DEV. OF ATTENUATION = 1.050

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.324 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.8898	1.0661
2.00	0.6236	0.8993
3.00	0.4526	0.7493
4.00	0.3402	0.6272
5.00	0.2630	0.5296
6.00	0.2081	0.4511
7.00	0.1677	0.3876
8.00	0.1373	0.3356
9.00	0.1139	0.2927
10.00	0.0956	0.2569
15.00	0.0451	0.1444
20.00	0.0246	0.0892
25.00	0.0147	0.0587
30.00	0.0094	0.0406
40.00	0.0044	0.0215
50.00	0.0023	0.0125

LOCATION OF TERMINAL: KANSAS CITY, MO

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.154 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.231 dB; @ 30 GHz: 4.484 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.082; @ 30 GHz: 1.050

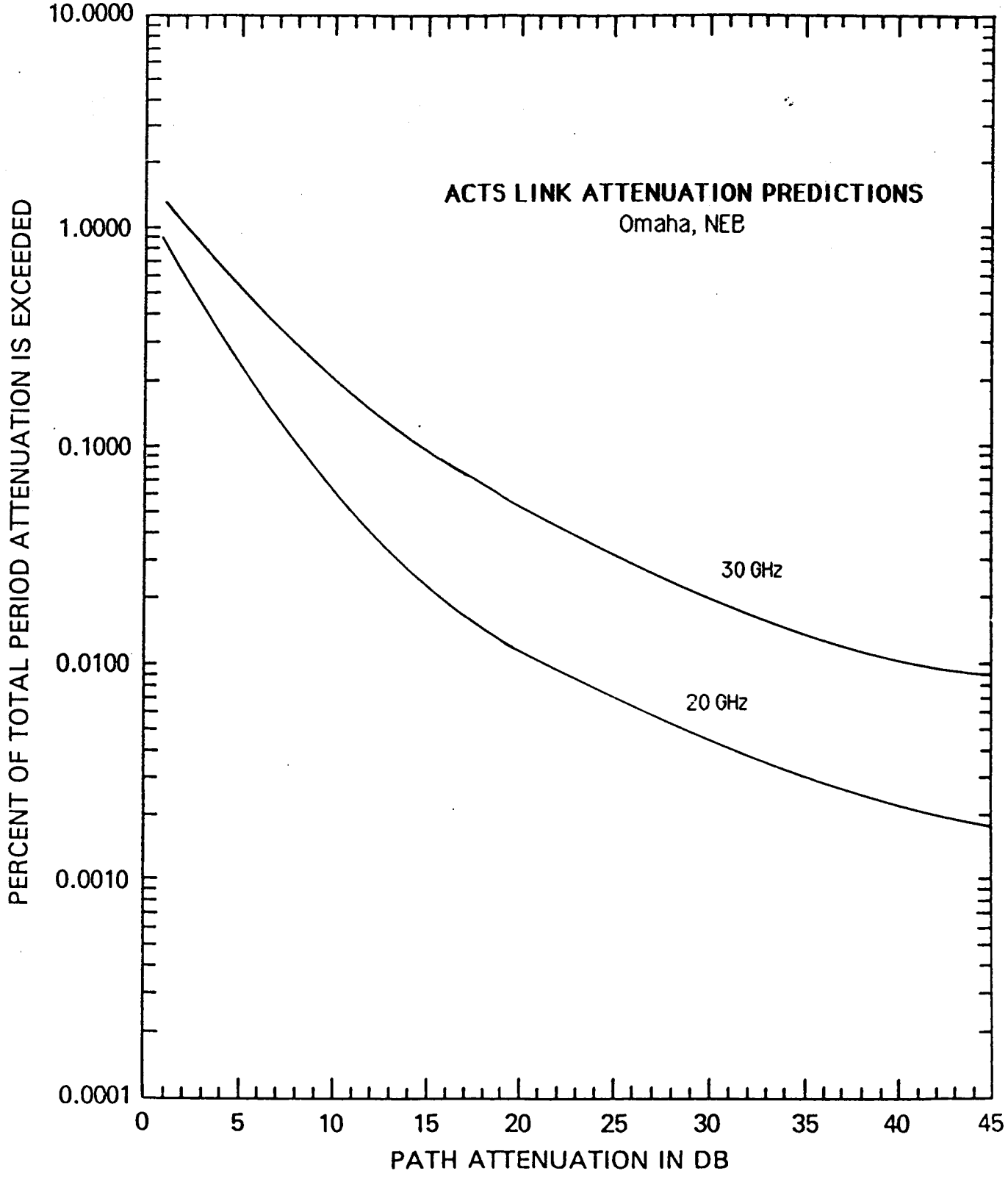
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	2380.6	1383.4	722.2	237.4	3941.0	2785.3	1765.3	759.6
1	2331.0	1344.5	696.7	226.6	3892.9	2733.9	1721.1	733.2
2	2282.4	1306.7	672.1	216.3	3845.4	2683.6	1678.0	707.7
3	2234.8	1270.0	648.3	206.5	3798.4	2634.1	1636.0	683.0
4	2188.2	1234.3	625.5	197.1	3752.1	2585.6	1595.1	659.3
5	2142.5	1199.6	603.4	188.1	3706.3	2537.9	1555.2	636.3
10	1928.3	1040.3	504.1	149.1	3485.5	2312.5	1370.0	533.1
15	1735.4	902.1	421.2	118.1	3277.9	2107.2	1207.0	446.6
20	1561.9	782.3	351.9	93.6	3082.6	1920.0	1063.3	374.2
30	1265.1	588.2	245.7	58.8	2726.3	1594.1	825.2	262.6
40	1024.7	442.3	171.5	36.9	2411.2	1323.6	640.5	184.3
50	830.0	332.6	119.7	23.2	2132.5	1098.9	497.1	129.4
60	672.3	250.1	83.6	14.6	1886.0	912.4	385.8	90.8
70	544.5	188.1	58.4	9.1	1668.0	757.5	299.4	63.7
80	441.1	141.4	40.7	5.7	1475.2	629.0	232.4	44.7
90	357.3	106.4	28.4	3.6	1304.7	522.2	180.3	31.4
100	289.4	80.0	19.9	2.3	1153.9	433.6	140.0	22.0

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	83.7	110.3	159.1	280.3
1.0	31.5	41.5	59.8	105.4
1.5	12.5	16.5	23.8	41.9
2.0	4.3	5.6	8.1	14.4
2.5	0.9	1.1	1.6	2.9

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	71.7	94.5	136.3	240.1
2.0	23.2	30.6	44.2	77.8
3.0	7.2	9.5	13.7	24.2
4.0	1.4	1.8	2.6	4.6


ACTS LINK ATTENUATION PREDICTIONS
Omaha, NEB
30 GHz
20 GHz
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : OMAHA, NEB

STATION HEIGHT IN kM = 0.299
STATION LATITUDE IN DEG. N. = 41.28
TERMINAL LONGITUDE IN DEG. W. = 96.02
ANTENNA ELEV. ANGLE = 42.14
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.03
SLANT PATH PROJECTION ON EARTH IN kM = 3.73
P0 IN % = 0.880
Rm IN mm/hr = 6.674
SR = 0.891
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.569 %
MEAN ATTENUATION Am = 1.371 dB
STANDARD DEV. OF ATTENUATION = 1.106

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.466 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.569 %
MEAN ATTENUATION Am = 2.938 dB
STANDARD DEV. OF ATTENUATION = 1.051

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.338 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.9611	1.3301
2.00	0.5751	1.0089
3.00	0.3759	0.7723
4.00	0.2613	0.6035
5.00	0.1899	0.4809
6.00	0.1428	0.3899
7.00	0.1102	0.3207
8.00	0.0869	0.2671
9.00	0.0697	0.2250
10.00	0.0568	0.1913
15.00	0.0239	0.0948
20.00	0.0121	0.0533
25.00	0.0068	0.0326
30.00	0.0041	0.0212
40.00	0.0018	0.0102
50.00	0.0009	0.0055

LOCATION OF TERMINAL: OMAHA, NEB

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.569 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.371 dB; @ 30 GHz: 2.938 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.106; @ 30 GHz: 1.051

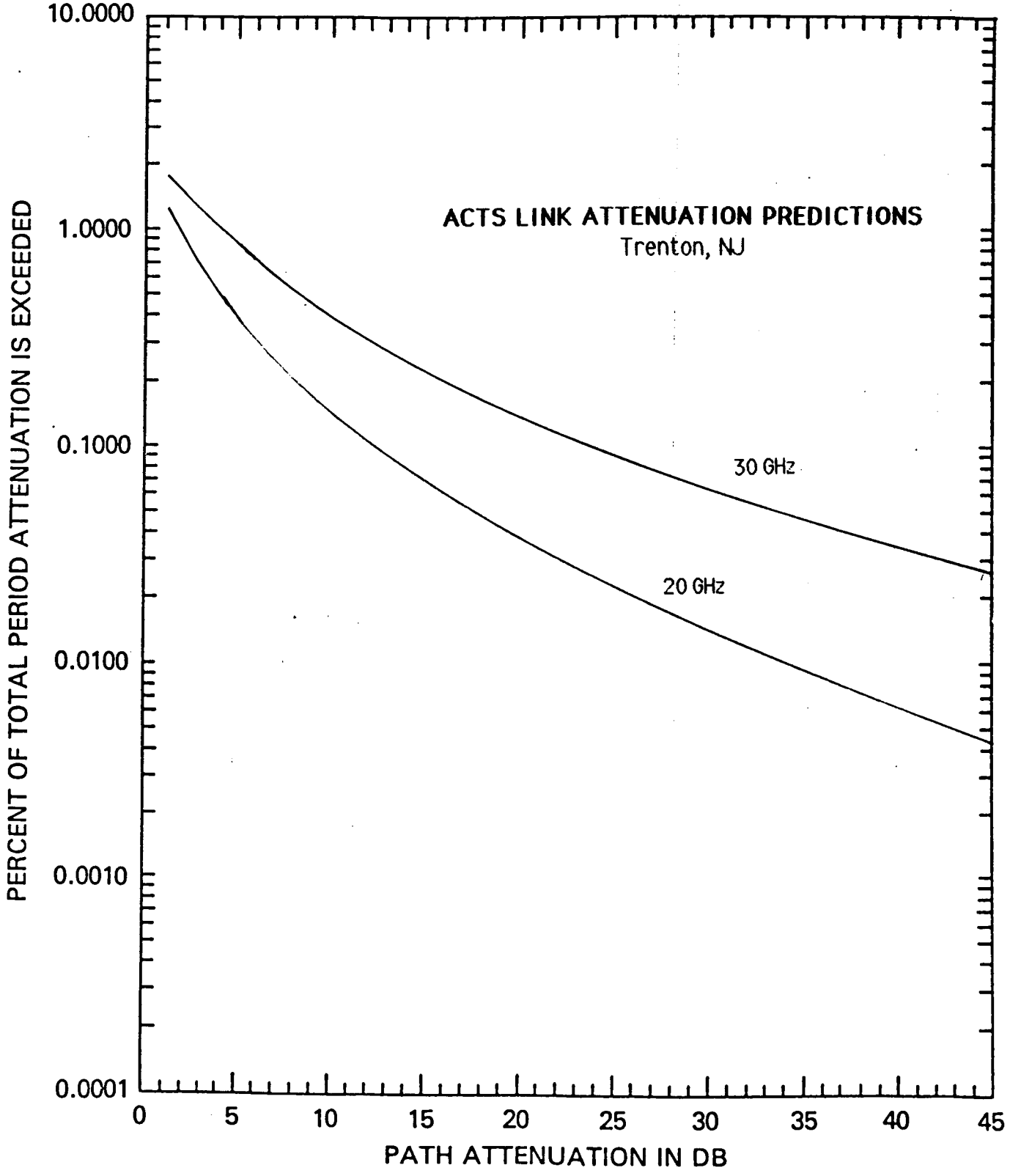
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	1976.9	999.0	457.0	125.9	4062.2	2529.5	1405.1	498.4
1	1922.5	963.9	437.6	119.3	3992.0	2468.0	1360.8	477.6
2	1869.6	930.0	419.0	113.0	3923.0	2408.0	1318.0	457.7
3	1818.2	897.3	401.2	107.0	3855.3	2349.4	1276.5	438.6
4	1768.2	865.8	384.1	101.4	3788.6	2292.2	1236.3	420.3
5	1719.6	835.4	367.8	96.0	3723.2	2236.4	1197.4	402.7
10	1495.9	698.6	296.0	73.3	3412.5	1977.3	1020.4	325.4
15	1301.2	584.3	238.2	55.9	3127.7	1748.2	869.5	262.9
20	1131.9	488.6	191.7	42.6	2866.7	1545.6	741.0	212.5
30	856.5	341.7	124.2	24.8	2408.2	1208.2	538.1	138.7
40	648.1	239.0	80.4	14.4	2023.0	944.4	390.8	90.6
50	490.4	167.2	52.1	8.4	1699.5	738.3	283.8	59.1
60	371.1	116.9	33.7	4.9	1427.7	577.1	206.1	38.6
70	280.8	81.8	21.9	2.8	1199.3	451.1	149.7	25.2
80	212.5	57.2	14.2	1.7	1007.5	352.6	108.7	16.5
90	160.8	40.0	9.2	1.0	846.4	275.6	78.9	10.7
100	121.7	28.0	5.9	0.6	711.0	215.5	57.3	7.0

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	80.1	105.6	152.3	268.4
1.0	30.1	39.7	57.3	100.9
1.5	12.0	15.8	22.8	40.2
2.0	4.1	5.4	7.8	13.7
2.5	0.8	1.1	1.6	2.8

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	71.6	94.4	136.2	239.9
2.0	23.2	30.6	44.1	77.7
3.0	7.2	9.5	13.7	24.2
4.0	1.4	1.8	2.6	4.6


ACTS LINK ATTENUATION PREDICTIONS
Trenton, NJ
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : TRENTON, NJ

STATION HEIGHT IN kM = 0.017
STATION LATITUDE IN DEG. N. = 40.23
TERMINAL LONGITUDE IN DEG. W. = 74.77
ANTENNA ELEV. ANGLE = 36.74
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.29
SLANT PATH PROJECTION ON EARTH IN kM = 5.04
P0 IN % = 0.659
Rm IN mm/hr =14.928
SR = 0.666
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.737 %
MEAN ATTENUATION Am = 2.386 dB
STANDARD DEV. OF ATTENUATION = 1.055

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.523 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.737 %
MEAN ATTENUATION Am = 4.827 dB
STANDARD DEV. OF ATTENUATION = 1.023

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.379 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.3814	1.6297
2.00	0.9841	1.3993
3.00	0.7194	1.1796
4.00	0.5423	0.9952
5.00	0.4197	0.8447
6.00	0.3319	0.7223
7.00	0.2672	0.6222
8.00	0.2184	0.5397
9.00	0.1809	0.4712
10.00	0.1515	0.4138
15.00	0.0707	0.2325
20.00	0.0381	0.1430
25.00	0.0225	0.0937
30.00	0.0142	0.0644
40.00	0.0065	0.0336
50.00	0.0034	0.0194

LOCATION OF TERMINAL: TRENTON, NJ

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.737 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.386 dB; @ 30 GHz: 4.827 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.055; @ 30 GHz: 1.023

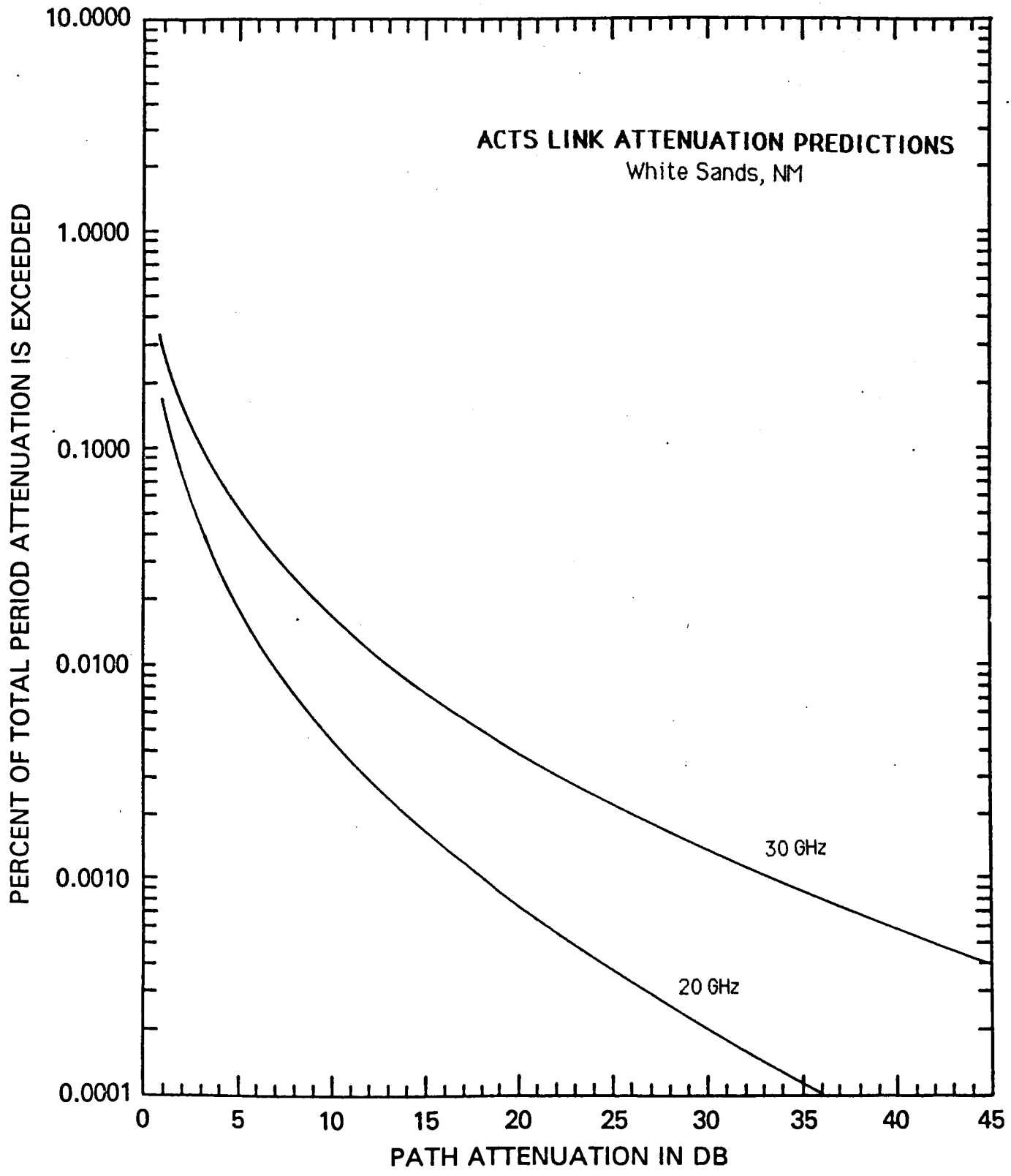
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3783.9	2207.4	1148.9	371.8	6204.2	4443.0	2838.7	1222.9
1	3708.1	2147.0	1109.0	355.0	6134.3	4365.4	2770.2	1181.2
2	3633.8	2088.2	1070.5	339.0	6065.1	4289.1	2703.3	1140.9
3	3561.1	2031.0	1033.3	323.7	5996.7	4214.1	2638.0	1102.0
4	3489.7	1975.3	997.4	309.1	5929.1	4140.5	2574.3	1064.5
5	3419.8	1921.2	962.8	295.2	5862.3	4068.1	2512.2	1028.2
10	3090.8	1672.2	806.8	234.3	5539.1	3724.9	2223.2	864.5
15	2793.4	1455.4	676.1	186.0	5233.8	3410.6	1967.5	726.9
20	2524.6	1266.7	566.6	147.7	4945.3	3122.8	1741.1	611.2
30	2062.2	959.6	397.9	93.1	4415.2	2618.0	1363.6	432.1
40	1684.5	726.9	279.4	58.6	3941.9	2194.8	1067.9	305.5
50	1375.9	550.7	196.2	37.0	3519.3	1840.0	836.4	216.0
60	1123.9	417.1	137.8	23.3	3142.1	1542.6	655.0	152.7
70	918.0	316.0	96.8	14.7	2805.2	1293.3	513.0	107.9
80	749.9	239.4	67.9	9.2	2504.5	1084.2	401.8	76.3
90	612.5	181.3	47.7	5.8	2236.0	909.0	314.6	53.9
100	500.3	137.4	33.5	3.7	1996.3	762.0	246.4	38.1

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	88.0	116.1	167.4	294.9
1.0	33.1	43.6	62.9	110.9
1.5	13.2	17.4	25.1	44.1
2.0	4.5	5.9	8.6	15.1
2.5	0.9	1.2	1.7	3.1

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	75.5	99.6	143.6	253.1
2.0	24.5	32.3	46.6	82.0
3.0	7.6	10.0	14.5	25.5
4.0	1.5	1.9	2.8	4.9


ACTS LINK ATTENUATION PREDICTIONS
White Sands, NM
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB
30 GHz
20 GHz

LOCATION OF TERMINAL : WHITE SANDS, NM

STATION HEIGHT IN kM = 1.372
STATION LATITUDE IN DEG. N. = 45.73
TERMINAL LONGITUDE IN DEG. W. = 106.48
ANTENNA ELEV. ANGLE = 36.99
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 3.08
SLANT PATH PROJECTION ON EARTH IN kM = 2.46
P0 IN % = 0.250
Rm IN mm/hr = 6.416
SR = 0.834
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 0.596 %
MEAN ATTENUATION Am = 0.498 dB
STANDARD DEV. OF ATTENUATION = 1.221

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.520 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 0.596 %
MEAN ATTENUATION Am = 1.069 dB
STANDARD DEV. OF ATTENUATION = 1.177

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.377 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.1692	0.3117
2.00	0.0759	0.1773
3.00	0.0421	0.1136
4.00	0.0262	0.0782
5.00	0.0175	0.0567
6.00	0.0123	0.0426
7.00	0.0090	0.0329
8.00	0.0068	0.0260
9.00	0.0053	0.0210
10.00	0.0042	0.0172
15.00	0.0016	0.0074
20.00	0.0007	0.0038
25.00	0.0004	0.0022
30.00	0.0002	0.0014
40.00	0.0001	0.0006
50.00	0.0000	0.0003

LOCATION OF TERMINAL: WHITE SANDS, NM

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 0.596 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.498 dB; @ 30 GHz: 1.069 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.221; @ 30 GHz: 1.177

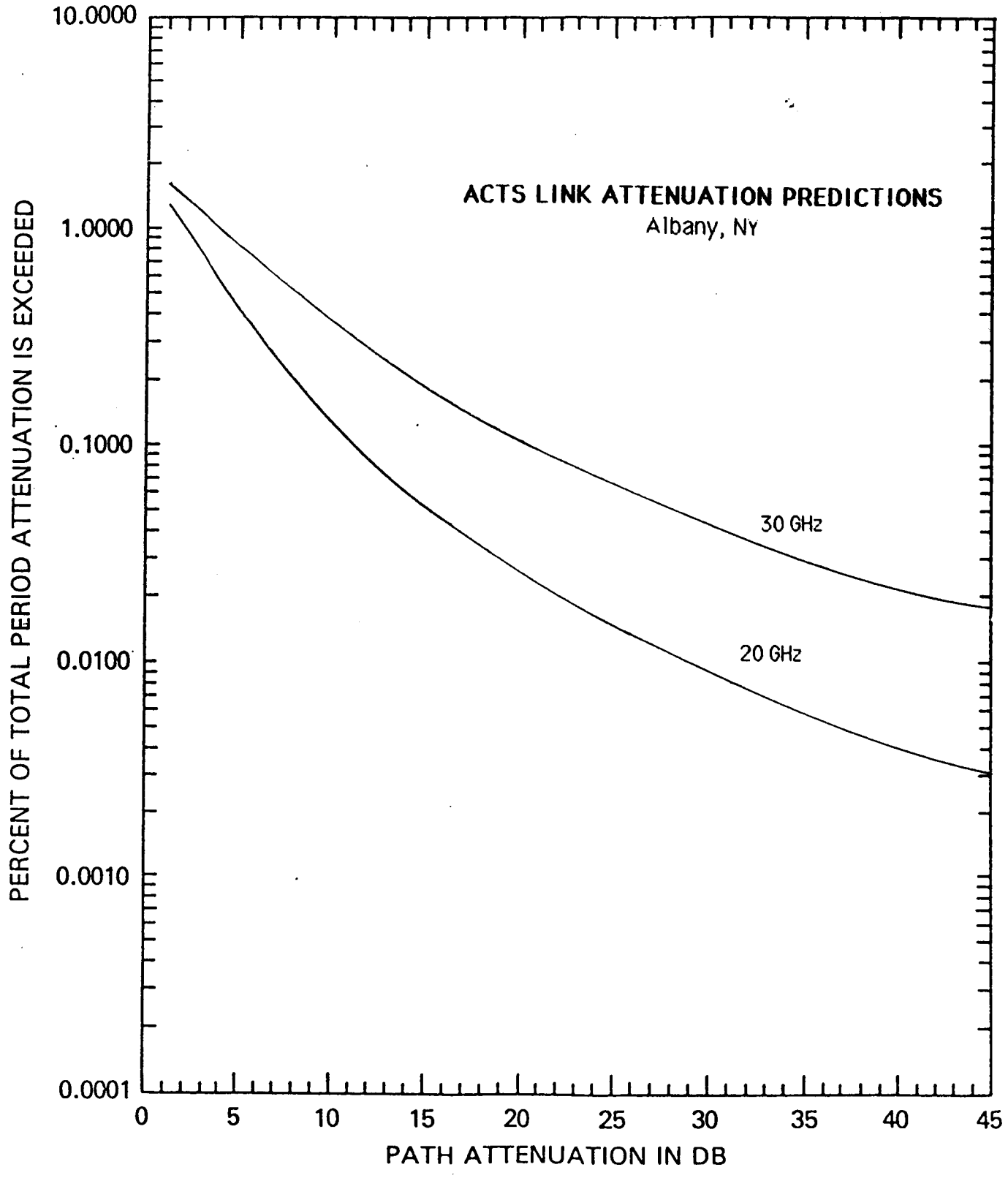
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	221.2	92.1	35.9	8.3	597.2	298.1	137.0	39.0
1	212.3	87.7	33.9	7.7	579.2	286.9	130.9	36.9
2	203.7	83.5	32.1	7.2	561.7	276.2	125.0	34.9
3	195.5	79.5	30.3	6.8	544.7	265.8	119.5	33.0
4	187.6	75.7	28.6	6.3	528.3	255.8	114.2	31.2
5	180.1	72.1	27.1	5.9	512.3	246.2	109.1	29.5
10	146.6	56.4	20.4	4.2	439.4	203.4	86.9	22.3
15	119.3	44.2	15.4	3.0	376.9	168.0	69.2	16.9
20	97.1	34.6	11.6	2.2	323.3	138.7	55.1	12.8
30	64.3	21.2	6.6	1.1	237.9	94.6	34.9	7.3
40	42.6	13.0	3.8	0.6	175.0	64.5	22.1	4.2
50	28.2	8.0	2.1	0.3	128.8	44.0	14.0	2.4
60	18.7	4.9	1.2	0.2	94.8	30.0	8.9	1.4
70	12.4	3.0	0.7	0.1	69.7	20.5	5.6	0.8
80	8.2	1.8	0.4	0.0	51.3	14.0	3.6	0.5
90	5.4	1.1	0.2	0.0	37.7	9.5	2.3	0.3
100	3.6	0.7	0.1	0.0	27.8	6.5	1.4	0.1

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	65.7	86.7	125.0	220.3
1.0	24.7	32.6	47.0	82.8
1.5	9.8	13.0	18.7	33.0
2.0	3.4	4.4	6.4	11.3
2.5	0.7	0.9	1.3	2.3

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	57.0	75.2	108.5	191.1
2.0	18.5	24.4	35.2	61.9
3.0	5.7	7.6	10.9	19.3
4.0	1.1	1.4	2.1	3.7


ACTS LINK ATTENUATION PREDICTIONS
Albany, NY
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : ALBANY, NY

STATION HEIGHT IN kM = 0.006
STATION LATITUDE IN DEG. N. = 42.65
TERMINAL LONGITUDE IN DEG. W. = 73.75
ANTENNA ELEV. ANGLE = 34.10
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.29
SLANT PATH PROJECTION ON EARTH IN kM = 5.21
P0 IN % = 0.674
Rm IN mm/hr =12.040
SR = 0.700
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.804 %
MEAN ATTENUATION Am = 1.862 dB
STANDARD DEV. OF ATTENUATION = 1.082

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.558 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.804 %
MEAN ATTENUATION Am = 3.825 dB
STANDARD DEV. OF ATTENUATION = 1.047

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.404 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.2937	1.6231
2.00	0.8543	1.3204
3.00	0.5946	1.0672
4.00	0.4326	0.8711
5.00	0.3258	0.7198
6.00	0.2520	0.6018
7.00	0.1993	0.5086
8.00	0.1604	0.4339
9.00	0.1310	0.3733
10.00	0.1085	0.3236
15.00	0.0485	0.1732
20.00	0.0254	0.1031
25.00	0.0148	0.0659
30.00	0.0092	0.0444
40.00	0.0041	0.0226
50.00	0.0021	0.0127

LOCATION OF TERMINAL: ALBANY, NY

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.804 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.862 dB; @ 30 GHz: 3.825 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.082; @ 30 GHz: 1.047

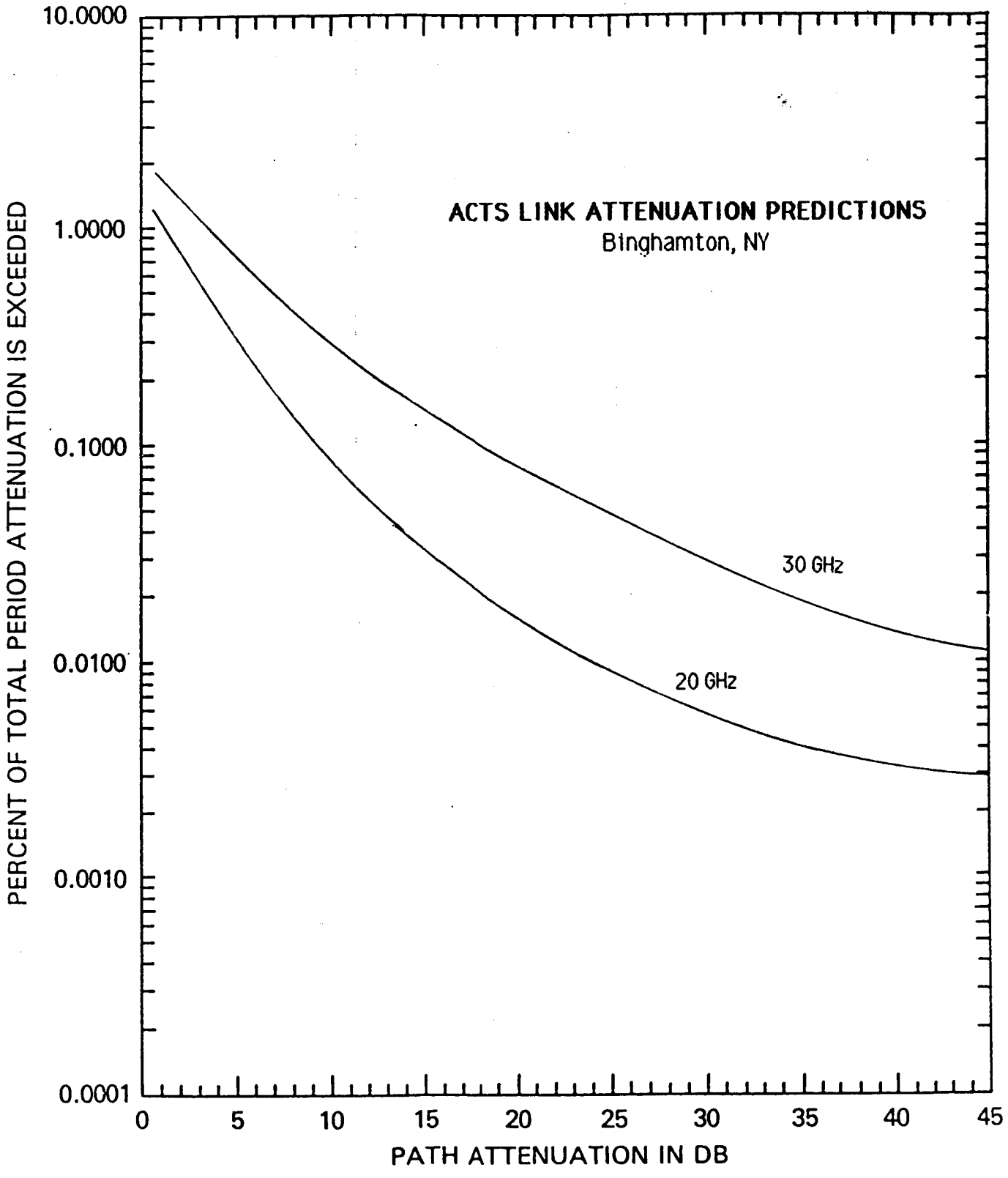
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	3127.4	1713.5	843.6	255.2	5613.2	3785.7	2282.1	910.8
1	3054.5	1660.7	811.4	242.8	5534.5	3707.8	2219.5	876.7
2	2983.2	1609.5	780.4	231.1	5457.0	3631.4	2158.6	843.9
3	2913.6	1559.9	750.6	219.9	5380.5	3556.7	2099.4	812.3
4	2845.6	1511.8	721.9	209.2	5305.1	3483.4	2041.7	781.9
5	2779.2	1465.2	694.4	199.1	5230.8	3411.7	1985.7	752.6
10	2469.7	1252.9	571.6	155.3	4874.4	3074.7	1727.8	621.9
15	2194.7	1071.4	470.5	121.1	4542.2	2770.9	1503.4	513.9
20	1950.3	916.1	387.3	94.5	4232.8	2497.1	1308.2	424.7
30	1540.1	669.9	262.5	57.5	3675.6	2028.1	990.4	290.0
40	1216.2	489.8	177.8	35.0	3191.8	1647.2	749.9	198.0
50	960.4	358.2	120.5	21.3	2771.7	1337.8	567.8	135.2
60	758.4	261.9	81.7	13.0	2406.9	1086.5	429.9	92.3
70	598.9	191.5	55.3	7.9	2090.0	882.4	325.5	63.0
80	473.0	140.0	37.5	4.8	1814.9	716.7	246.4	43.0
90	373.5	102.4	25.4	2.9	1576.0	582.1	186.6	29.4
100	294.9	74.9	17.2	1.8	1368.6	472.7	141.2	20.1

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	83.7	110.4	159.2	280.4
1.0	31.5	41.5	59.8	105.4
1.5	12.5	16.5	23.8	42.0
2.0	4.3	5.7	8.2	14.4
2.5	0.9	1.1	1.6	2.9

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	72.0	95.0	137.0	241.3
2.0	23.4	30.8	44.4	78.2
3.0	7.3	9.6	13.8	24.3
4.0	1.4	1.8	2.6	4.6


ACTS LINK ATTENUATION PREDICTIONS
Binghamton, NY
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : BINGHAMTON, NY

STATION HEIGHT IN kM = 0.366
STATION LATITUDE IN DEG. N. = 42.10
TERMINAL LONGITUDE IN DEG. W. = 75.92
ANTENNA ELEV. ANGLE = 35.60
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.54
SLANT PATH PROJECTION ON EARTH IN kM = 4.50
P0 IN % = 0.881
Rm IN mm/hr = 9.028
SR = 0.766
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.799 %
MEAN ATTENUATION Am = 1.757 dB
STANDARD DEV. OF ATTENUATION = 1.030

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.537 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.799 %
MEAN ATTENUATION Am = 3.685 dB
STANDARD DEV. OF ATTENUATION = 0.987

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.390 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.2733	1.6313
2.00	0.8095	1.3170
3.00	0.5429	1.0478
4.00	0.3819	0.8398
5.00	0.2789	0.6809
6.00	0.2098	0.5587
7.00	0.1617	0.4636
8.00	0.1270	0.3886
9.00	0.1015	0.3287
10.00	0.0823	0.2803
15.00	0.0336	0.1392
20.00	0.0164	0.0778
25.00	0.0090	0.0471
30.00	0.0053	0.0302
40.00	0.0022	0.0141
50.00	0.0010	0.0074

LOCATION OF TERMINAL: BINGHAMTON, NY

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.799 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.757 dB; @ 30 GHz: 3.685 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.030; @ 30 GHz: 0.987

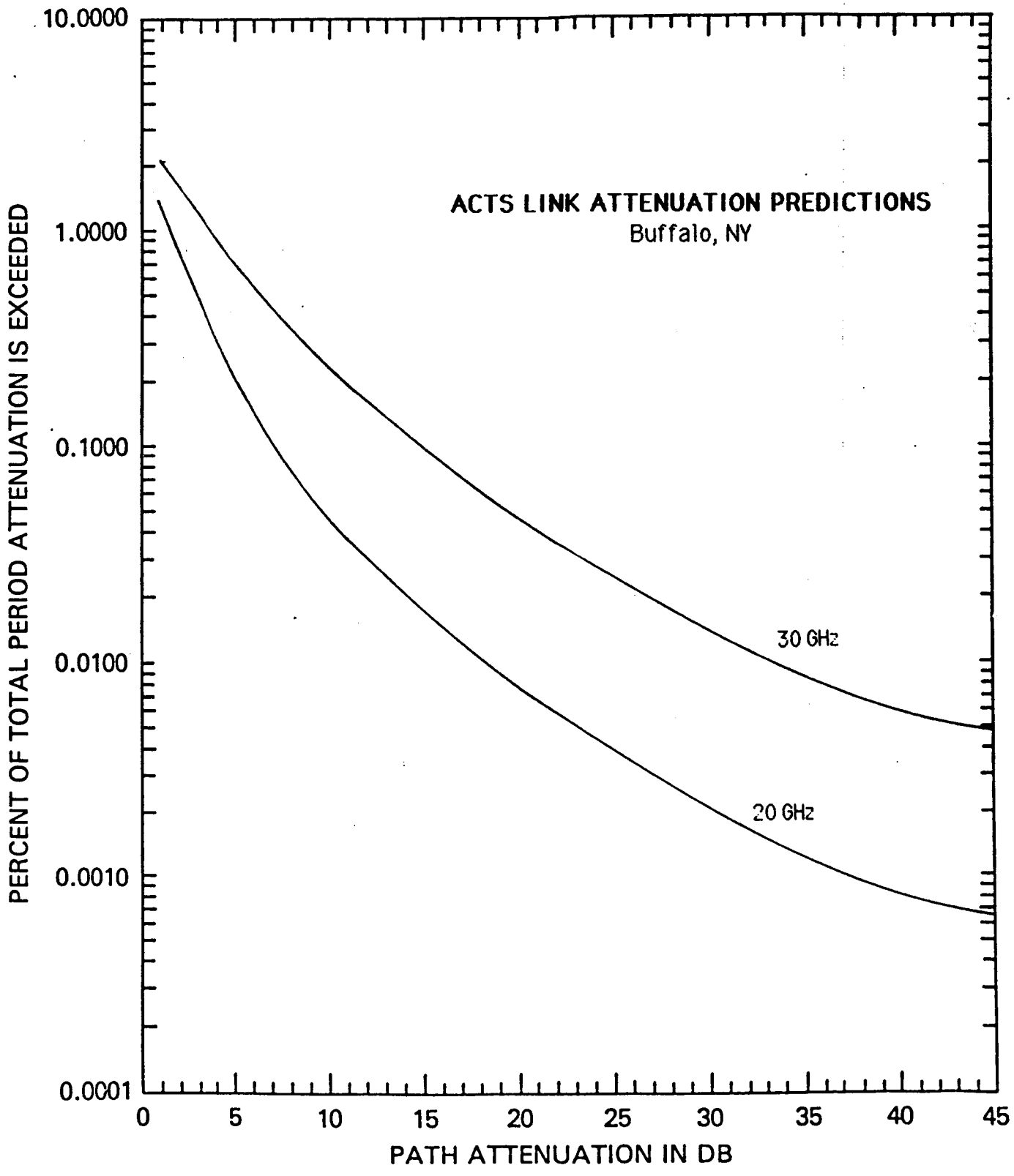
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	2855.6	1467.1	668.2	177.0	5511.2	3581.3	2043.9	732.4
1	2785.6	1419.4	641.3	167.9	5432.4	3504.7	1985.1	703.5
2	2717.3	1373.2	615.4	159.3	5354.7	3429.8	1928.1	675.7
3	2650.6	1328.6	590.6	151.1	5278.0	3356.5	1872.7	649.0
4	2585.6	1285.4	566.8	143.4	5202.5	3284.8	1818.8	623.4
5	2522.1	1243.6	543.9	136.1	5128.1	3214.6	1766.6	598.8
10	2227.6	1054.2	442.7	104.6	4771.6	2885.5	1526.9	489.6
15	1967.4	893.6	360.4	80.4	4439.9	2590.0	1319.7	400.3
20	1737.7	757.5	293.4	61.8	4131.3	2324.8	1140.6	327.2
30	1355.5	544.3	194.4	36.5	3576.8	1873.1	852.1	218.7
40	1057.4	391.1	128.8	21.6	3096.8	1509.2	636.5	146.2
50	824.8	281.0	85.3	12.8	2681.2	1216.0	475.5	97.7
60	643.4	201.9	56.5	7.5	2321.4	979.7	355.2	65.3
70	501.9	145.1	37.5	4.5	2009.9	789.4	265.4	43.7
80	391.5	104.3	24.8	2.6	1740.1	636.0	198.2	29.2
90	305.4	74.9	16.4	1.6	1506.6	512.4	148.1	19.5
100	238.2	53.8	10.9	0.9	1304.4	412.9	110.6	13.0

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	92.3	121.7	175.5	309.2
1.0	34.7	45.7	66.0	116.2
1.5	13.8	18.2	26.3	46.3
2.0	4.7	6.2	9.0	15.8
2.5	1.0	1.3	1.8	3.2

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	81.2	107.0	154.4	271.9
2.0	26.3	34.7	50.0	88.1
3.0	8.2	10.8	15.6	27.4
4.0	1.6	2.1	3.0	5.2


ACTS LINK ATTENUATION PREDICTIONS
Buffalo, NY
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : BUFFALO, NY

STATION HEIGHT IN kM = 0.211
STATION LATITUDE IN DEG. N. = 42.88
TERMINAL LONGITUDE IN DEG. W. = 78.88
ANTENNA ELEV. ANGLE = 36.12
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.60
SLANT PATH PROJECTION ON EARTH IN kM = 4.52
P0 IN % = 1.846
Rm IN mm/hr = 3.826
SR = 0.930
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 2.760 %
MEAN ATTENUATION Am = 1.119 dB
STANDARD DEV. OF ATTENUATION = 1.037

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.531 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 2.760 %
MEAN ATTENUATION Am = 2.495 dB
STANDARD DEV. OF ATTENUATION = 0.973

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.385 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.4994	2.2811
2.00	0.7944	1.6284
3.00	0.4716	1.1728
4.00	0.3028	0.8661
5.00	0.2056	0.6554
6.00	0.1455	0.5066
7.00	0.1064	0.3988
8.00	0.0799	0.3189
9.00	0.0613	0.2584
10.00	0.0479	0.2119
15.00	0.0170	0.0900
20.00	0.0075	0.0447
25.00	0.0038	0.0246
30.00	0.0021	0.0146
40.00	0.0008	0.0060
50.00	0.0003	0.0028

LOCATION OF TERMINAL: BUFFALO, NY

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 2.760 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.119 dB; @ 30 GHz: 2.495 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.037; @ 30 GHz: 0.973

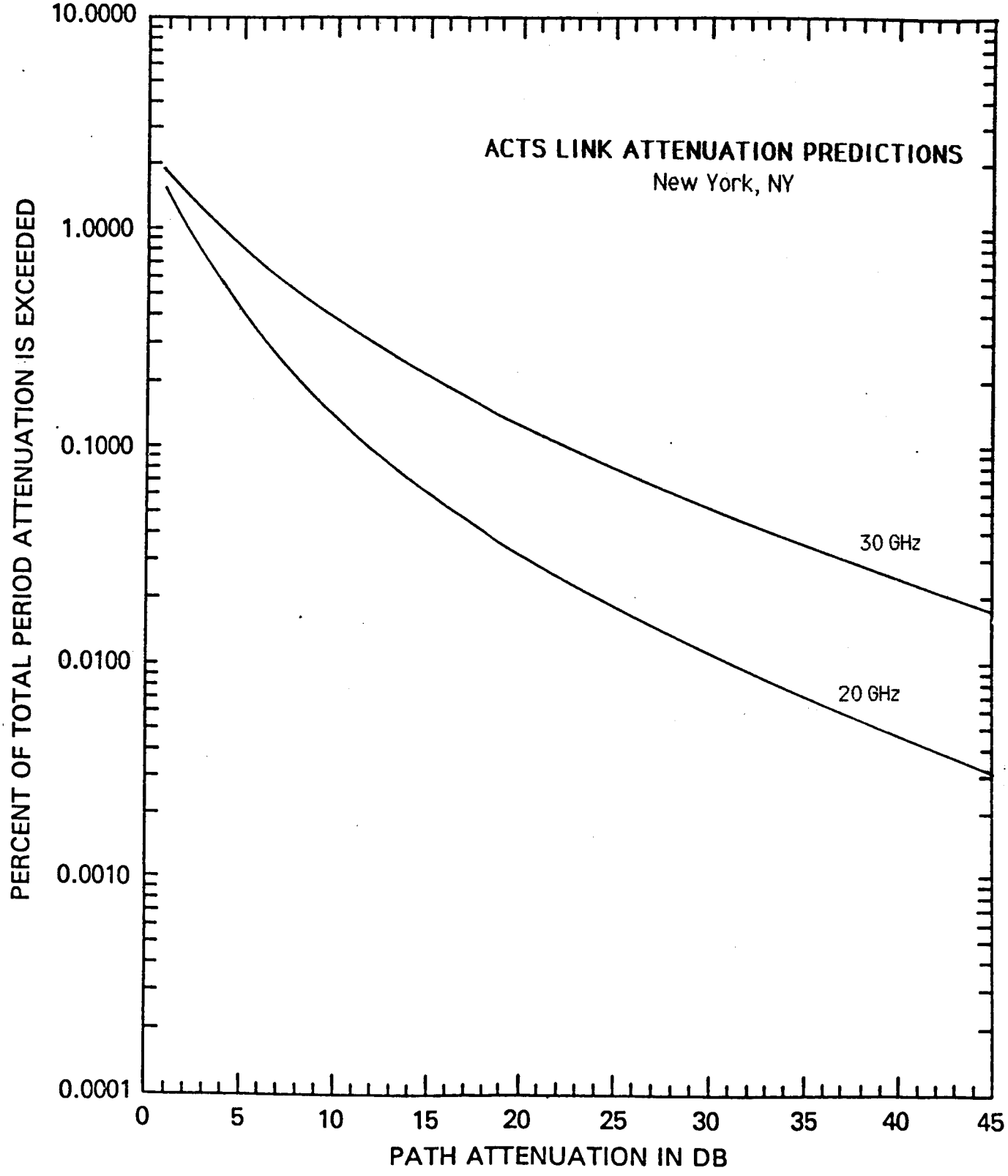
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	2480.5	1081.1	420.3	89.5	6168.4	3447.3	1677.2	473.3
1	2402.5	1038.1	400.2	84.2	6047.3	3352.1	1617.5	451.1
2	2327.0	996.7	381.0	79.3	5928.5	3259.6	1559.9	429.9
3	2253.8	957.0	362.8	74.6	5812.1	3169.6	1504.3	409.8
4	2182.9	918.9	345.4	70.2	5698.0	3082.2	1450.8	390.5
5	2114.3	882.3	328.9	66.1	5586.1	2997.1	1399.2	372.2
10	1802.1	720.0	257.3	48.8	5058.7	2605.7	1167.2	292.7
15	1536.0	587.5	201.3	36.0	4581.2	2265.4	973.7	230.1
20	1309.3	479.5	157.5	26.6	4148.7	1969.6	812.3	181.0
30	951.2	319.3	96.4	14.5	3402.4	1488.7	565.4	111.9
40	691.0	212.6	59.0	7.9	2790.3	1125.3	393.5	69.2
50	502.0	141.6	36.1	4.3	2288.4	850.6	273.8	42.8
60	364.7	94.3	22.1	2.3	1876.7	642.9	190.6	26.5
70	265.0	62.8	13.5	1.3	1539.1	486.0	132.6	16.4
80	192.5	41.8	8.3	0.7	1262.2	367.3	92.3	10.1
90	139.9	27.9	5.1	0.4	1035.2	277.6	64.2	6.3
100	101.6	18.5	3.1	0.2	848.9	209.9	44.7	3.9

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	91.1	120.1	173.2	305.1
1.0	34.2	45.1	65.1	114.7
1.5	13.6	18.0	25.9	45.7
2.0	4.7	6.1	8.9	15.6
2.5	0.9	1.2	1.8	3.2

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	83.5	110.1	158.8	279.8
2.0	27.1	35.7	51.5	90.7
3.0	8.4	11.1	16.0	28.2
4.0	1.6	2.1	3.1	5.4


ACTS LINK ATTENUATION PREDICTIONS
New York, NY
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : NEW YORK, NY

STATION HEIGHT IN kM = 0.006
STATION LATITUDE IN DEG. N. = 40.72
TERMINAL LONGITUDE IN DEG. W. = 74.00
ANTENNA ELEV. ANGLE = 35.92
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.34
SLANT PATH PROJECTION ON EARTH IN kM = 5.14
P0 IN % = 0.935
Rm IN mm/hr =10.133
SR = 0.755
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 2.040 %
MEAN ATTENUATION Am = 2.110 dB
STANDARD DEV. OF ATTENUATION = 1.032

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.533 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 2.040 %
MEAN ATTENUATION Am = 4.387 dB
STANDARD DEV. OF ATTENUATION = 0.990

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.386 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.5609	1.9017
2.00	1.0620	1.6037
3.00	0.7476	1.3248
4.00	0.5460	1.0957
5.00	0.4112	0.9127
6.00	0.3174	0.7668
7.00	0.2501	0.6497
8.00	0.2005	0.5548
9.00	0.1631	0.4773
10.00	0.1343	0.4134
15.00	0.0585	0.2186
20.00	0.0299	0.1279
25.00	0.0169	0.0804
30.00	0.0103	0.0532
40.00	0.0045	0.0261
50.00	0.0022	0.0143

LOCATION OF TERMINAL: NEW YORK, NY

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 2.040 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.110 dB; @ 30 GHz: 4.387 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.032; @ 30 GHz: 0.990

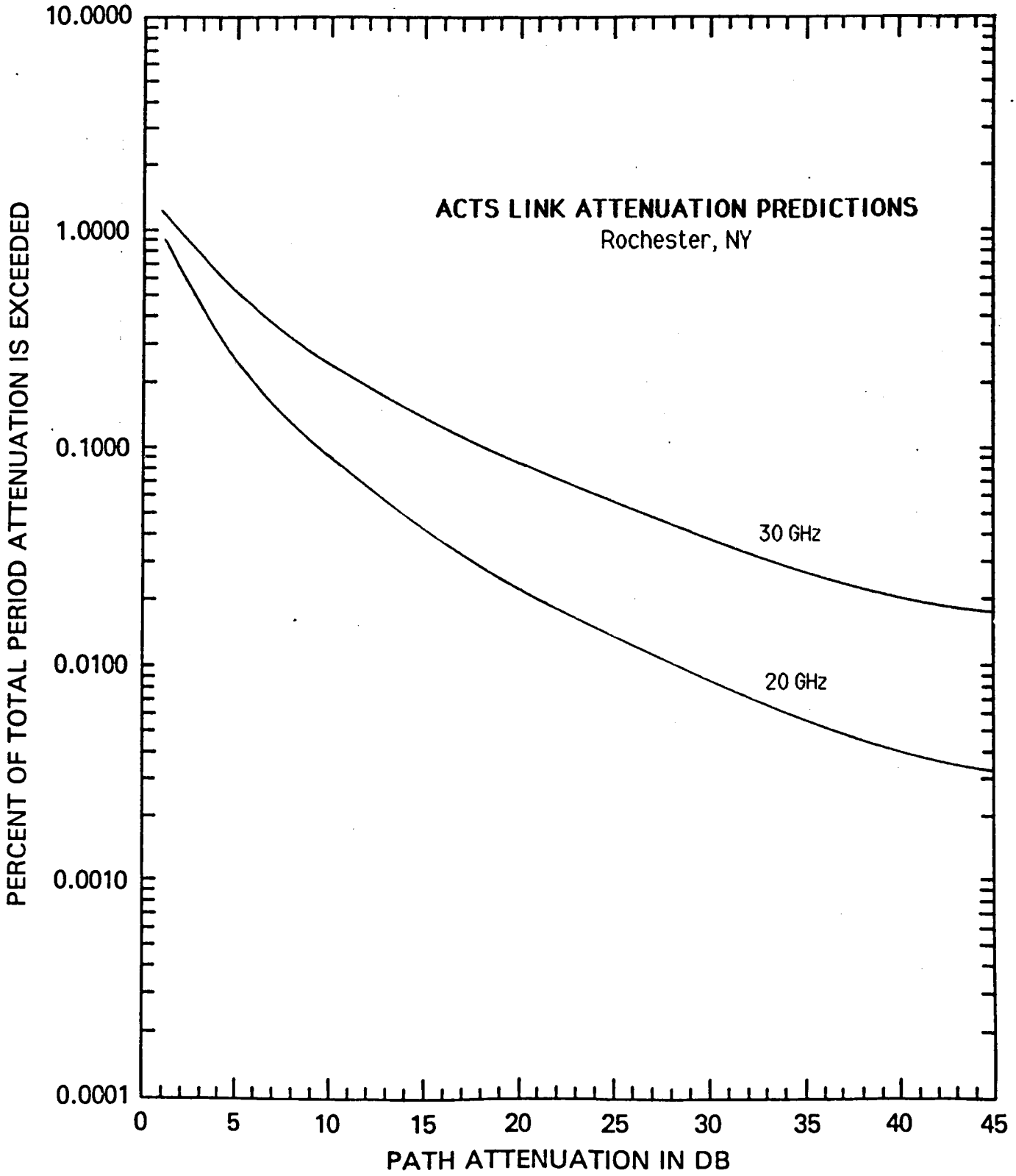
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3932.2	2162.7	1054.5	307.8	6967.8	4800.6	2918.0	1149.7
1	3846.3	2098.7	1015.3	293.1	6882.8	4710.2	2842.5	1107.9
2	3762.3	2036.7	977.5	279.0	6798.9	4621.6	2768.9	1067.6
3	3680.1	1976.5	941.2	265.7	6716.0	4534.6	2697.2	1028.8
4	3599.7	1918.1	906.2	252.9	6634.1	4449.2	2627.3	991.4
5	3521.1	1861.4	872.5	240.8	6553.2	4365.5	2559.3	955.4
10	3153.0	1602.1	721.8	188.3	6163.3	3969.7	2244.7	793.9
15	2823.4	1378.9	597.2	147.3	5796.5	3609.9	1968.7	659.7
20	2528.3	1186.8	494.0	115.2	5451.6	3282.7	1726.7	548.2
30	2027.3	879.1	338.2	70.5	4822.2	2714.5	1328.2	378.6
40	1625.6	651.2	231.5	43.1	4265.4	2244.7	1021.7	261.4
50	1303.5	482.4	158.4	26.4	3772.9	1856.2	785.9	180.5
60	1045.3	357.4	108.4	16.1	3337.2	1535.0	604.6	124.7
70	838.2	264.7	74.2	9.9	2951.9	1269.3	465.1	86.1
80	672.1	196.1	50.8	6.0	2611.1	1049.6	357.7	59.4
90	538.9	145.3	34.8	3.7	2309.6	868.0	275.2	41.1
100	432.1	107.6	23.8	2.3	2042.9	717.7	211.7	28.3

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	91.9	121.2	174.9	308.0
1.0	34.6	45.6	65.7	115.8
1.5	13.8	18.1	26.2	46.1
2.0	4.7	6.2	9.0	15.8
2.5	1.0	1.3	1.8	3.2

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	80.6	106.3	153.4	270.2
2.0	26.1	34.5	49.7	87.6
3.0	8.1	10.7	15.4	27.2
4.0	1.6	2.0	2.9	5.2


ACTS LINK ATTENUATION PREDICTIONS
Rochester, NY
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : ROCHESTER, NY

STATION HEIGHT IN kM = 0.166
STATION LATITUDE IN DEG. N. = 43.17
TERMINAL LONGITUDE IN DEG. W. = 77.62
ANTENNA ELEV. ANGLE = 35.34
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.73
SLANT PATH PROJECTION ON EARTH IN kM = 4.68
P0 IN % = 0.441
Rm IN mm/hr =17.264
SR = 0.592
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.415 %
MEAN ATTENUATION Am = 1.876 dB
STANDARD DEV. OF ATTENUATION = 1.106

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.541 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.415 %
MEAN ATTENUATION Am = 3.755 dB
STANDARD DEV. OF ATTENUATION = 1.082

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.392 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.0118	1.2580
2.00	0.6746	1.0182
3.00	0.4747	0.8235
4.00	0.3491	0.6744
5.00	0.2656	0.5597
6.00	0.2074	0.4703
7.00	0.1654	0.3996
8.00	0.1343	0.3428
9.00	0.1106	0.2965
10.00	0.0922	0.2585
15.00	0.0426	0.1419
20.00	0.0229	0.0864
25.00	0.0136	0.0565
30.00	0.0086	0.0388
40.00	0.0040	0.0204
50.00	0.0021	0.0118

LOCATION OF TERMINAL: ROCHESTER, NY

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.415 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.876 dB; @ 30 GHz: 3.755 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.106; @ 30 GHz: 1.082

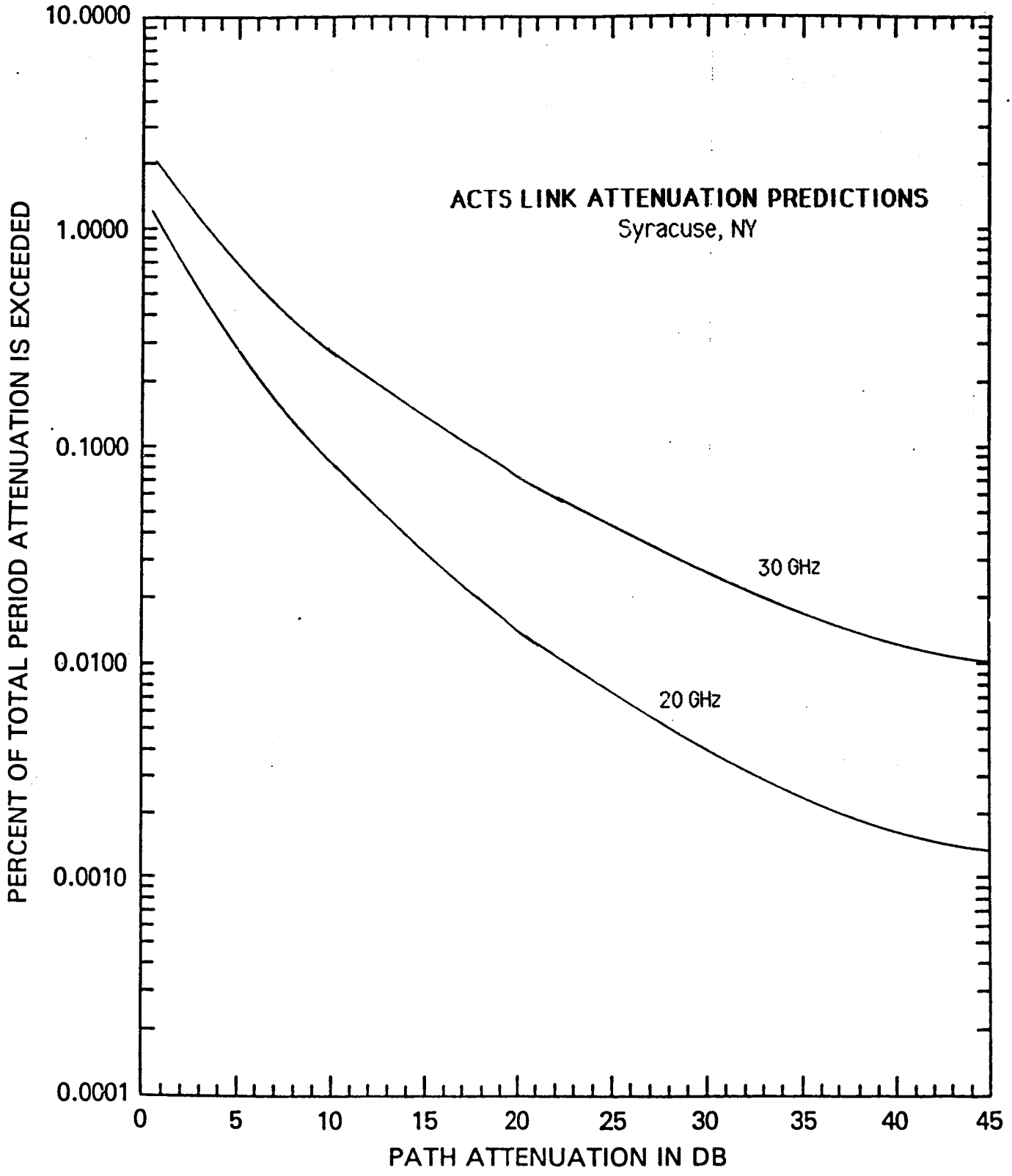
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	2497.0	1396.8	706.1	223.9	4331.5	2943.8	1802.9	746.4
1	2439.3	1354.3	679.6	213.3	4269.5	2882.8	1753.6	718.8
2	2383.0	1313.2	654.1	203.1	4208.3	2823.1	1705.6	692.2
3	2328.0	1273.3	629.5	193.5	4148.1	2764.6	1658.9	666.6
4	2274.2	1234.6	605.9	184.3	4088.7	2707.3	1613.6	641.9
5	2221.7	1197.1	583.1	175.5	4030.1	2651.2	1569.4	618.2
10	1976.8	1026.0	481.6	137.5	3749.7	2387.7	1366.2	511.9
15	1758.9	879.3	397.7	107.8	3488.8	2150.4	1189.3	424.0
20	1565.0	753.6	328.5	84.5	3246.1	1936.7	1035.3	351.1
30	1239.0	553.5	224.0	51.9	2810.1	1570.8	784.6	240.8
40	980.9	406.6	152.8	31.9	2432.7	1274.1	594.6	165.2
50	776.5	298.6	104.2	19.6	2105.9	1033.4	450.6	113.3
60	614.8	219.4	71.1	12.0	1823.1	838.2	341.4	77.7
70	486.7	161.1	48.5	7.4	1578.2	679.9	258.8	53.3
80	385.3	118.3	33.1	4.5	1366.2	551.4	196.1	36.6
90	305.0	86.9	22.5	2.8	1182.7	447.3	148.6	25.1
100	241.5	63.8	15.4	1.7	1023.9	362.8	112.6	17.2

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	80.0	105.5	152.2	268.2
1.0	30.1	39.7	57.2	100.8
1.5	12.0	15.8	22.8	40.1
2.0	4.1	5.4	7.8	13.7
2.5	0.8	1.1	1.6	2.8

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	67.5	89.0	128.3	226.1
2.0	21.9	28.8	41.6	73.3
3.0	6.8	9.0	12.9	22.8
4.0	1.3	1.7	2.5	4.3


ACTS LINK ATTENUATION PREDICTIONS
Syracuse, NY
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : SYRACUSE, NY

STATION HEIGHT IN kM = 0.129
STATION LATITUDE IN DEG. N. = 43.05
TERMINAL LONGITUDE IN DEG. W. = 76.15
ANTENNA ELEV. ANGLE = 34.83
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.89
SLANT PATH PROJECTION ON EARTH IN kM = 4.84
P0 IN % = 1.353
Rm IN mm/hr = 5.706
SR = 0.877
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 2.365 %
MEAN ATTENUATION Am = 1.453 dB
STANDARD DEV. OF ATTENUATION = 1.048

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.548 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 2.365 %
MEAN ATTENUATION Am = 3.147 dB
STANDARD DEV. OF ATTENUATION = 0.991

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.397 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.5117	2.0724
2.00	0.8989	1.5994
3.00	0.5779	1.2281
4.00	0.3945	0.9565
5.00	0.2815	0.7574
6.00	0.2078	0.6091
7.00	0.1577	0.4966
8.00	0.1223	0.4099
9.00	0.0966	0.3419
10.00	0.0775	0.2880
15.00	0.0306	0.1362
20.00	0.0146	0.0734
25.00	0.0078	0.0432
30.00	0.0046	0.0271
40.00	0.0018	0.0122
50.00	0.0009	0.0062

LOCATION OF TERMINAL: SYRACUSE, NY

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 2.365 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.453 dB; @ 30 GHz: 3.147 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.048; @ 30 GHz: 0.991

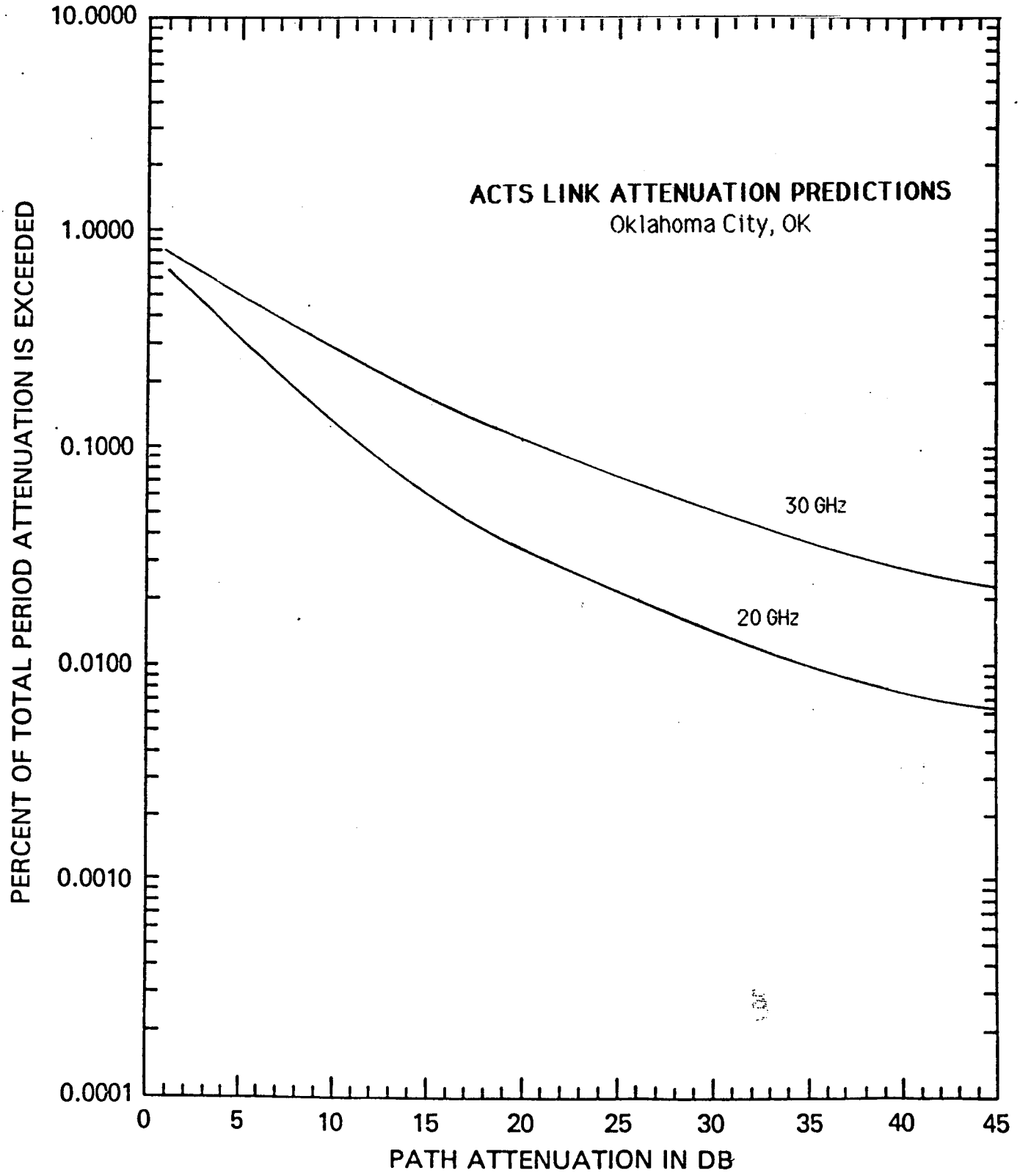
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3039.7	1480.5	643.2	160.8	6459.2	3983.6	2155.9	716.4
1	2956.9	1428.3	615.5	152.1	6353.5	3889.0	2088.4	686.2
2	2876.3	1377.8	589.0	143.9	6249.5	3796.7	2023.1	657.3
3	2798.0	1329.2	563.6	136.1	6147.3	3706.6	1959.8	629.6
4	2721.7	1282.3	539.3	128.8	6046.7	3618.7	1898.5	603.0
5	2647.6	1237.0	516.1	121.9	5947.7	3532.8	1839.1	577.6
10	2306.0	1033.6	414.0	92.4	5476.7	3133.0	1568.8	465.7
15	2008.5	863.6	332.2	70.0	5043.0	2778.5	1338.3	375.5
20	1749.4	721.6	266.5	53.1	4643.6	2464.0	1141.7	302.7
30	1327.2	503.8	171.6	30.5	3937.3	1937.9	830.8	196.8
40	1006.8	351.7	110.4	17.5	3338.4	1524.1	604.6	127.9
50	763.8	245.6	71.1	10.1	2830.6	1198.7	440.0	83.2
60	579.5	171.4	45.8	5.8	2400.0	942.7	320.2	54.1
70	439.6	119.7	29.5	3.3	2034.9	741.4	233.0	35.1
80	333.5	83.6	19.0	1.9	1725.4	583.1	169.5	22.8
90	253.0	58.3	12.2	1.1	1462.9	458.6	123.4	14.9
100	191.9	40.7	7.9	0.6	1240.4	360.7	89.8	9.7

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	89.2	117.7	169.7	299.0
1.0	33.6	44.2	63.8	112.4
1.5	13.4	17.6	25.4	44.7
2.0	4.6	6.0	8.7	15.3
2.5	0.9	1.2	1.8	3.1

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	80.4	106.1	153.0	269.5
2.0	26.1	34.4	49.6	87.3
3.0	8.1	10.7	15.4	27.1
4.0	1.5	2.0	2.9	5.2


ACTS LINK ATTENUATION PREDICTIONS
Oklahoma City, OK
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : OKLAHOMA CITY, OK

STATION HEIGHT IN KM = 0.384
STATION LATITUDE IN DEG. N. = 35.50
TERMINAL LONGITUDE IN DEG. W. = 97.50
ANTENNA ELEV. ANGLE = 48.71
LINK SLANT PATH LGTH. THRU RAIN REGION IN KM = 5.15
SLANT PATH PROJECTION ON EARTH IN KM = 3.40
P0 IN % = 0.254
Rm IN mm/hr =31.098
SR = 0.499
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 0.852 %
MEAN ATTENUATION Am = 2.848 dB
STANDARD DEV. OF ATTENUATION = 1.113

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.416 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 0.852 %
MEAN ATTENUATION Am = 5.466 dB
STANDARD DEV. OF ATTENUATION = 1.096

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.302 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.7039	0.8000
2.00	0.5319	0.6988
3.00	0.4099	0.6029
4.00	0.3237	0.5213
5.00	0.2610	0.4534
6.00	0.2142	0.3970
7.00	0.1784	0.3498
8.00	0.1505	0.3101
9.00	0.1283	0.2764
10.00	0.1103	0.2476
15.00	0.0577	0.1520
20.00	0.0340	0.1007
25.00	0.0217	0.0704
30.00	0.0146	0.0512
40.00	0.0075	0.0295
50.00	0.0043	0.0185

LOCATION OF TERMINAL: OKLAHOMA CITY, OK

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 0.852 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.848 dB; @ 30 GHz: 5.466 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.113; @ 30 GHz: 1.096

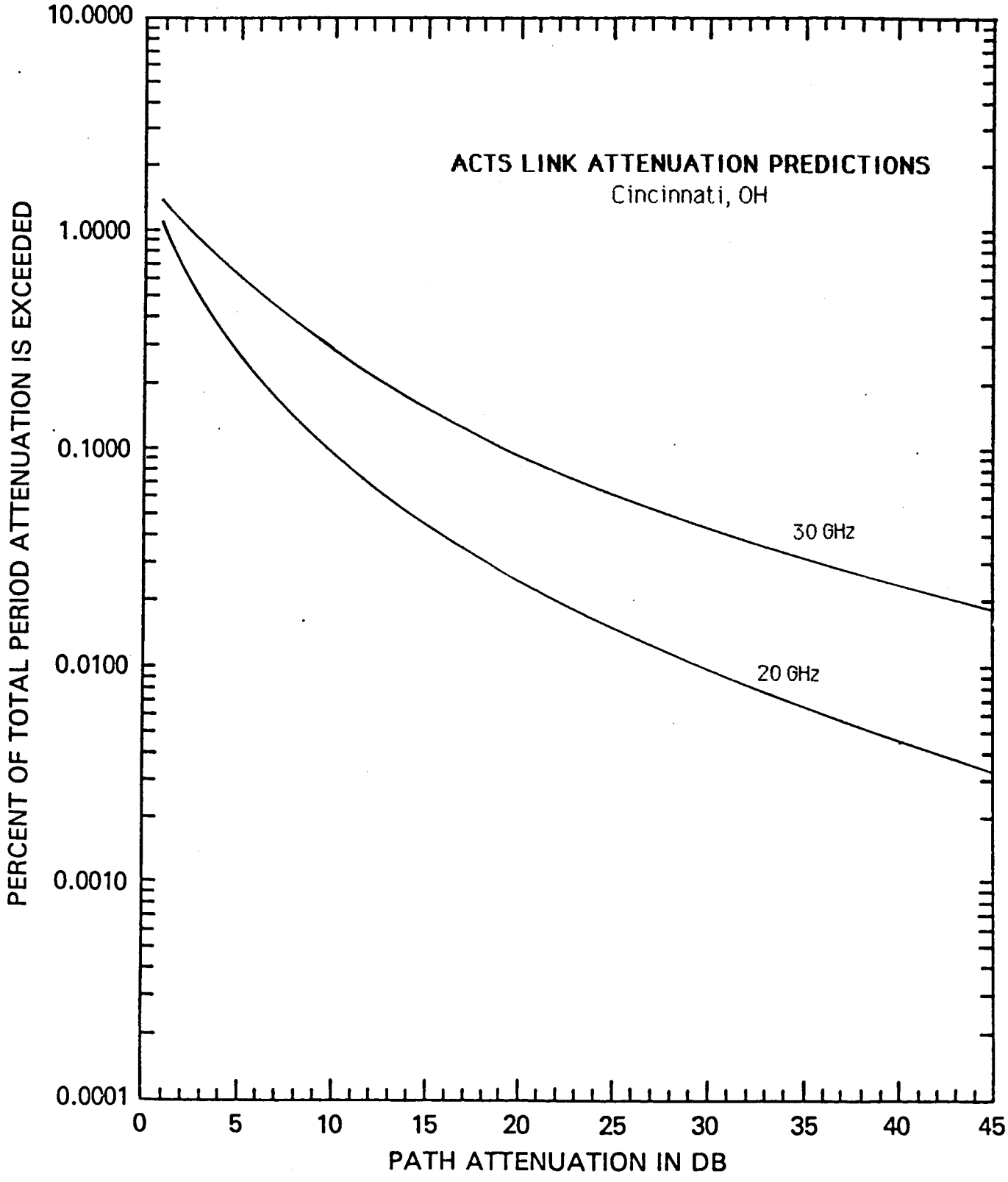
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	2156.1	1373.0	791.4	303.4	3171.0	2384.7	1630.9	799.6
1	2118.1	1339.6	766.9	291.1	3138.1	2346.7	1595.1	774.8
2	2080.7	1307.0	743.0	279.2	3105.5	2309.3	1560.1	750.8
3	2044.0	1275.2	719.9	267.8	3073.3	2272.6	1525.9	727.6
4	2007.9	1244.2	697.6	256.9	3041.4	2236.3	1492.4	705.1
5	1972.5	1213.9	675.9	246.5	3009.8	2200.7	1459.7	683.3
10	1804.5	1073.3	577.2	200.2	2856.9	2030.9	1306.5	583.9
15	1650.9	948.9	493.0	162.7	2711.7	1874.2	1169.3	498.9
20	1510.3	839.0	421.0	132.1	2573.9	1729.6	1046.6	426.3
30	1264.0	655.9	307.0	87.2	2318.9	1473.0	838.4	311.3
40	1057.9	512.7	223.9	57.6	2089.2	1254.5	671.6	227.3
50	885.4	400.8	163.3	38.0	1882.3	1068.3	538.0	166.0
60	741.0	313.3	119.1	25.1	1695.8	909.8	431.0	121.2
70	620.2	244.9	86.9	16.5	1527.8	774.9	345.3	88.5
80	519.0	191.4	63.4	10.9	1376.5	659.9	276.6	64.6
90	434.4	149.7	46.2	7.2	1240.1	562.0	221.6	47.2
100	363.6	117.0	33.7	4.8	1117.3	478.6	177.5	34.5

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	79.1	104.3	150.4	265.0
1.0	29.7	39.2	56.5	99.6
1.5	11.8	15.6	22.5	39.7
2.0	4.1	5.3	7.7	13.6
2.5	0.8	1.1	1.6	2.7

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	65.8	86.8	125.1	220.4
2.0	21.3	28.1	40.6	71.4
3.0	6.6	8.7	12.6	22.2
4.0	1.3	1.7	2.4	4.2


ACTS LINK ATTENUATION PREDICTIONS
Cincinnati, OH
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : CINCINNATI, OH

STATION HEIGHT IN kM = 0.183
STATION LATITUDE IN DEG. N. = 39.10
TERMINAL LONGITUDE IN DEG. W. = 84.51
ANTENNA ELEV. ANGLE = 41.97
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.54
SLANT PATH PROJECTION ON EARTH IN kM = 4.12
P0 IN % = 0.515
Rm IN mm/hr =15.698
SR = 0.661
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.323 %
MEAN ATTENUATION Am = 2.240 dB
STANDARD DEV. OF ATTENUATION = 1.068

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.468 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.323 %
MEAN ATTENUATION Am = 4.514 dB
STANDARD DEV. OF ATTENUATION = 1.037

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.339 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.0249	1.2261
2.00	0.7172	1.0367
3.00	0.5188	0.8640
4.00	0.3884	0.7228
5.00	0.2991	0.6095
6.00	0.2357	0.5184
7.00	0.1892	0.4447
8.00	0.1544	0.3844
9.00	0.1276	0.3346
10.00	0.1067	0.2931
15.00	0.0496	0.1633
20.00	0.0267	0.1000
25.00	0.0158	0.0654
30.00	0.0100	0.0449
40.00	0.0046	0.0234
50.00	0.0024	0.0135

LOCATION OF TERMINAL: CINCINNATI, OH

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.323 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.240 dB; @ 30 GHz: 4.514 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.068; @ 30 GHz: 1.037

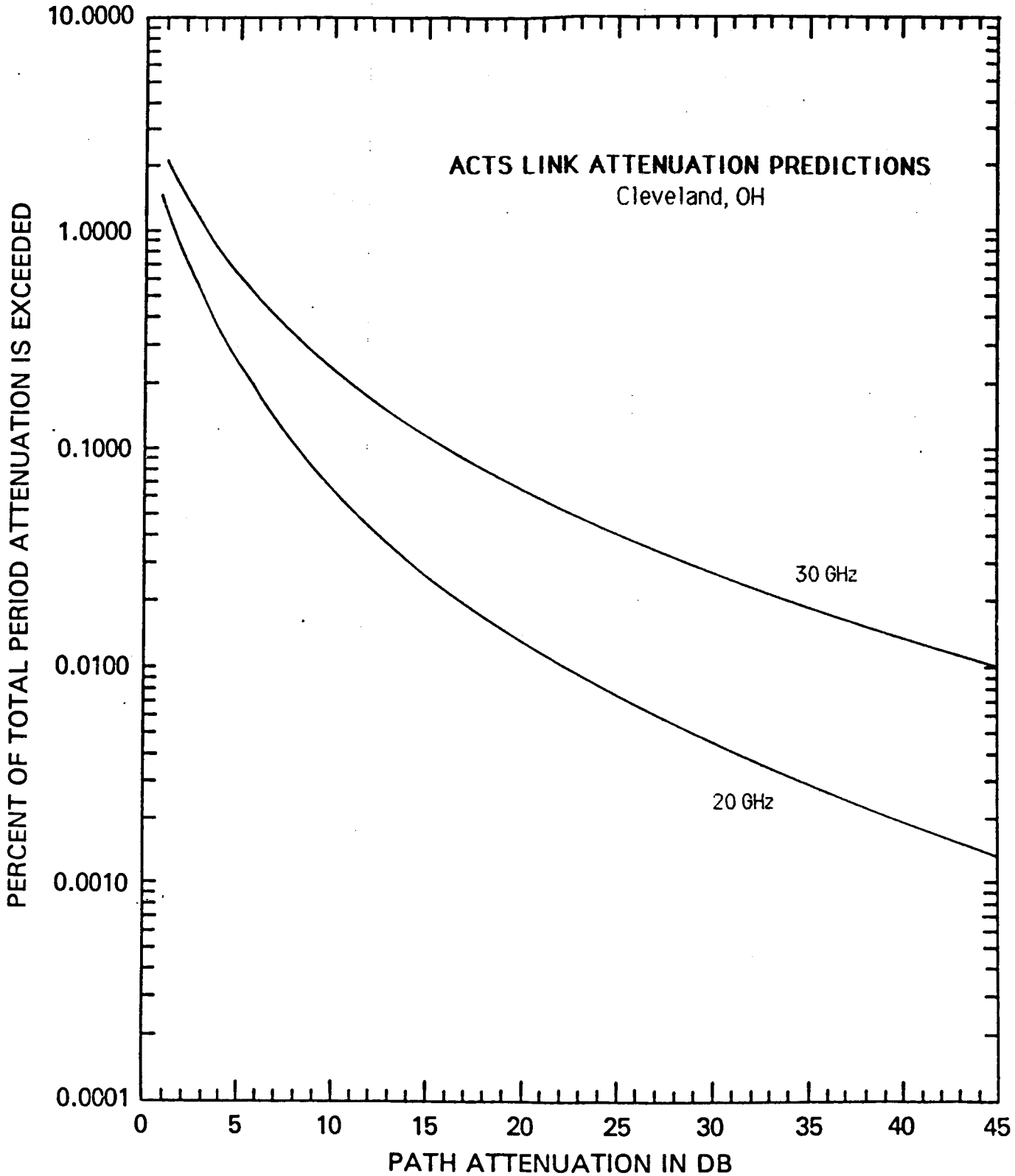
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	2728.7	1573.1	811.9	261.1	4544.5	3205.6	2021.7	859.1
1	2671.9	1528.7	783.0	249.1	4489.7	3146.8	1971.1	829.1
2	2616.1	1485.6	755.2	237.7	4435.4	3089.0	1921.7	800.2
3	2561.6	1443.7	728.4	226.8	4381.8	3032.3	1873.6	772.2
4	2508.2	1403.0	702.6	216.5	4328.9	2976.6	1826.7	745.3
5	2455.9	1363.5	677.6	206.5	4276.6	2922.0	1781.0	719.2
10	2210.3	1181.8	565.6	163.4	4024.5	2663.4	1568.9	602.1
15	1989.3	1024.3	472.1	129.2	3787.2	2427.8	1382.1	504.1
20	1790.4	887.8	394.1	102.2	3564.0	2213.0	1217.6	422.0
30	1450.3	667.0	274.5	64.0	3156.1	1838.7	944.9	295.8
40	1174.8	501.1	191.3	40.0	2794.9	1527.7	733.3	207.3
50	951.6	376.4	133.3	25.1	2475.1	1269.3	569.0	145.3
60	770.8	282.8	92.8	15.7	2191.9	1054.6	441.6	101.8
70	624.4	212.4	64.7	9.8	1941.0	876.3	342.7	71.4
80	505.8	159.6	45.1	6.1	1718.9	728.1	266.0	50.0
90	409.7	119.9	31.4	3.8	1522.2	604.9	206.4	35.1
100	331.8	90.1	21.9	2.4	1348.0	502.6	160.2	24.6

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	85.8	113.2	163.2	287.5
1.0	32.3	42.5	61.4	108.1
1.5	12.8	16.9	24.4	43.0
2.0	4.4	5.8	8.4	14.7
2.5	0.9	1.2	1.7	3.0

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	73.5	96.9	139.7	246.1
2.0	23.8	31.4	45.3	79.8
3.0	7.4	9.8	14.1	24.8
4.0	1.4	1.9	2.7	4.7


ACTS LINK ATTENUATION PREDICTIONS
Cleveland, OH
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : CLEVELAND, OH

STATION HEIGHT IN kM = 0.213
STATION LATITUDE IN DEG. N. = 41.50
TERMINAL LONGITUDE IN DEG. W. = 81.70
ANTENNA ELEV. ANGLE = 38.55
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.52
SLANT PATH PROJECTION ON EARTH IN kM = 4.31
P0 IN % = 1.239
Rm IN mm/hr = 5.395
SR = 0.926
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 2.097 %
MEAN ATTENUATION Am = 1.319 dB
STANDARD DEV. OF ATTENUATION = 1.098

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.502 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 2.097 %
MEAN ATTENUATION Am = 2.869 dB
STANDARD DEV. OF ATTENUATION = 1.037

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.364 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.2574	1.7726
2.00	0.7386	1.3339
3.00	0.4760	1.0127
4.00	0.3272	0.7851
5.00	0.2355	0.6212
6.00	0.1756	0.5002
7.00	0.1345	0.4089
8.00	0.1054	0.3386
9.00	0.0840	0.2836
10.00	0.0681	0.2399
15.00	0.0280	0.1162
20.00	0.0139	0.0642
25.00	0.0077	0.0387
30.00	0.0046	0.0248
40.00	0.0020	0.0116
50.00	0.0010	0.0062

LOCATION OF TERMINAL: CLEVELAND, OH

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 2.097 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.319 dB; @ 30 GHz: 2.869 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.098; @ 30 GHz: 1.037

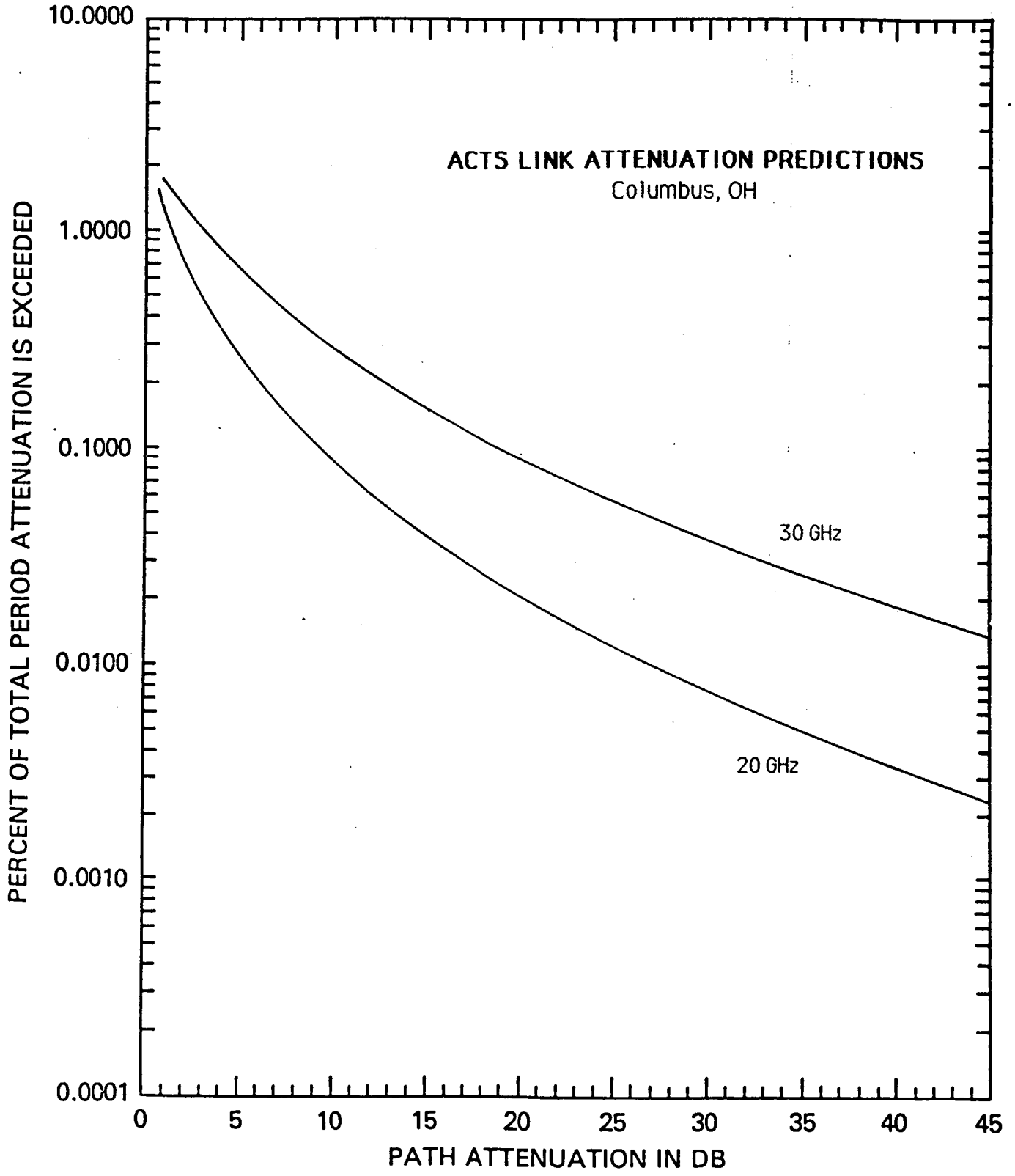
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	2503.6	1238.9	554.1	147.5	5326.2	3267.1	1781.0	611.3
1	2433.1	1194.4	530.1	139.5	5232.5	3186.1	1723.8	585.3
2	2364.6	1151.6	507.1	132.1	5140.4	3107.1	1668.6	560.4
3	2298.1	1110.2	485.2	125.0	5050.0	3030.1	1615.0	536.6
4	2233.4	1070.4	464.1	118.3	4961.1	2955.0	1563.2	513.8
5	2170.5	1032.0	444.0	111.9	4873.9	2881.8	1513.1	492.0
10	1881.7	859.7	355.8	84.9	4459.9	2541.9	1285.5	396.0
15	1631.4	716.1	285.1	64.5	4081.2	2242.2	1092.2	318.7
20	1414.3	596.5	228.4	48.9	3734.6	1977.8	927.9	256.5
30	1063.0	413.9	146.6	28.2	3127.2	1538.8	669.8	166.2
40	799.0	287.2	94.2	16.2	2618.6	1197.3	483.5	107.6
50	600.5	199.3	60.4	9.4	2192.7	931.5	349.0	69.7
60	451.3	138.3	38.8	5.4	1836.0	724.8	251.9	45.2
70	339.2	96.0	24.9	3.1	1537.4	563.9	181.8	29.3
80	255.0	66.6	16.0	1.8	1287.4	438.8	131.3	18.9
90	191.6	46.2	10.3	1.0	1078.0	341.4	94.7	12.3
100	144.0	32.1	6.6	0.6	902.7	265.6	68.4	8.0

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	81.3	107.2	154.7	272.4
1.0	30.6	40.3	58.1	102.4
1.5	12.2	16.0	23.1	40.8
2.0	4.2	5.5	7.9	14.0
2.5	0.8	1.1	1.6	2.8

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	73.4	96.8	139.7	246.0
2.0	23.8	31.4	45.3	79.7
3.0	7.4	9.8	14.1	24.8
4.0	1.4	1.9	2.7	4.7


ACTS LINK ATTENUATION PREDICTIONS
Columbus, OH
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : COLUMBUS, OH

STATION HEIGHT IN kM = 0.229
STATION LATITUDE IN DEG. N. = 39.97
TERMINAL LONGITUDE IN DEG. W. = 83.00
ANTENNA ELEV. ANGLE = 40.55
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.50
SLANT PATH PROJECTION ON EARTH IN kM = 4.18
P0 IN % = 0.679
Rm IN mm/hr =12.413
SR = 0.694
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.502 %
MEAN ATTENUATION Am = 2.159 dB
STANDARD DEV. OF ATTENUATION = 1.020

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.481 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.502 %
MEAN ATTENUATION Am = 4.426 dB
STANDARD DEV. OF ATTENUATION = 0.984

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.349 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.1636	1.4038
2.00	0.7959	1.1868
3.00	0.5611	0.9817
4.00	0.4097	0.8125
5.00	0.3082	0.6769
6.00	0.2376	0.5686
7.00	0.1869	0.4816
8.00	0.1496	0.4112
9.00	0.1215	0.3535
10.00	0.0998	0.3060
15.00	0.0431	0.1614
20.00	0.0219	0.0942
25.00	0.0123	0.0590
30.00	0.0074	0.0389
40.00	0.0032	0.0190
50.00	0.0016	0.0103

LOCATION OF TERMINAL: COLUMBUS, OH

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.502 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.159 dB; @ 30 GHz: 4.426 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.020; @ 30 GHz: 0.984

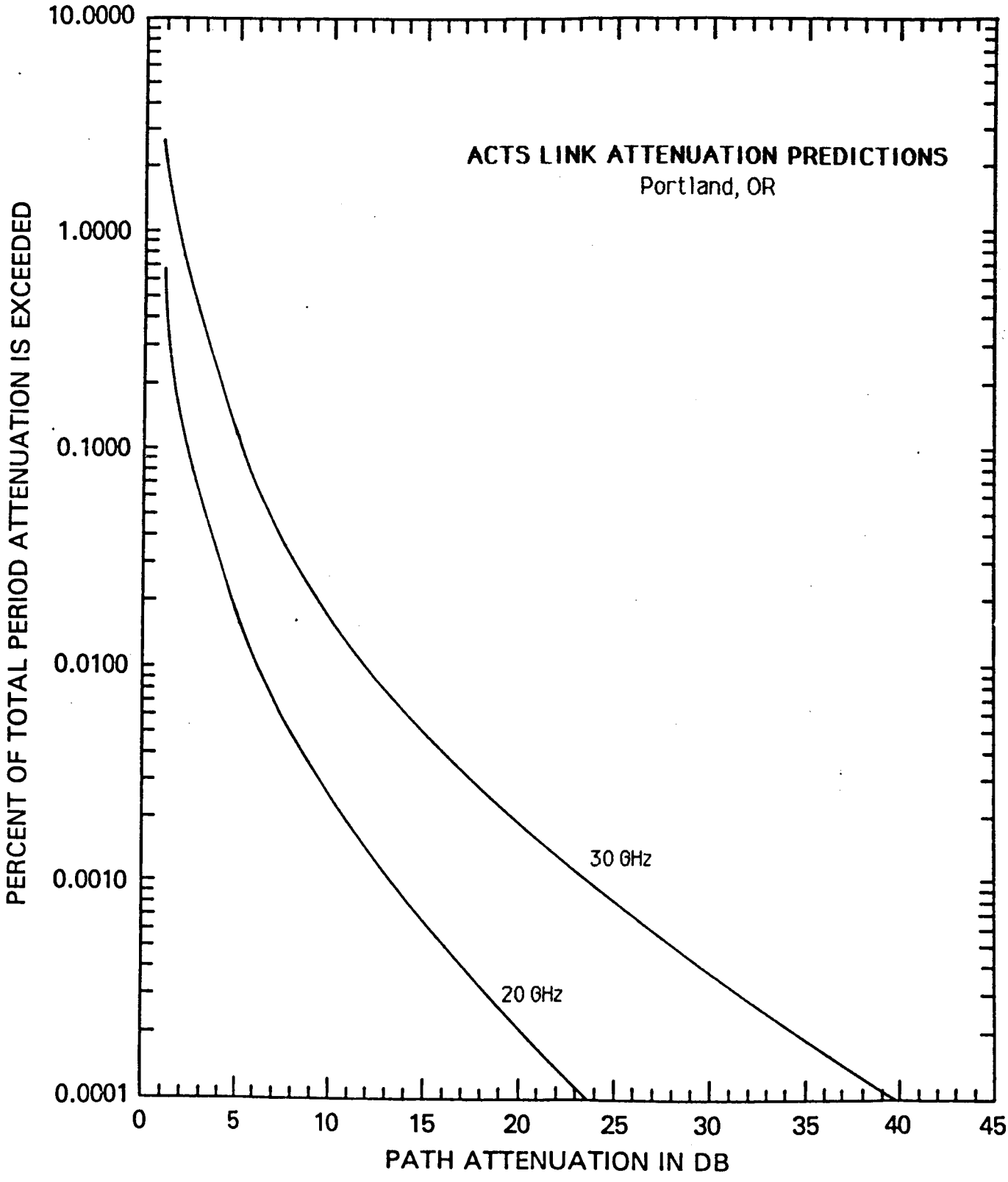
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	2951.3	1621.2	786.8	226.8	5163.3	3560.2	2162.5	848.7
1	2887.7	1573.7	757.7	216.0	5101.0	3493.6	2106.7	817.9
2	2825.4	1527.5	729.6	205.6	5039.5	3428.2	2052.3	788.2
3	2764.5	1482.6	702.5	195.7	4978.7	3364.1	1999.3	759.6
4	2704.9	1439.1	676.5	186.4	4918.6	3301.1	1947.7	732.0
5	2646.5	1396.9	651.4	177.4	4859.3	3239.4	1897.4	705.4
10	2373.3	1203.6	539.3	138.8	4573.1	2947.4	1664.9	586.2
15	2128.2	1037.0	446.5	108.6	4303.8	2681.8	1460.8	487.2
20	1908.4	893.5	369.6	84.9	4050.4	2440.1	1281.8	404.9
30	1534.6	663.3	253.3	51.9	3587.4	2020.1	986.8	279.7
40	1234.1	492.5	173.6	31.8	3177.3	1672.4	759.8	193.2
50	992.3	365.6	119.0	19.4	2814.1	1384.6	584.9	133.4
60	798.0	271.4	81.6	11.9	2492.5	1146.3	450.3	92.2
70	641.7	201.5	55.9	7.3	2207.6	949.0	346.7	63.7
80	516.0	149.6	38.3	4.5	1955.2	785.7	266.9	44.0
90	414.9	111.0	26.3	2.7	1731.7	650.4	205.5	30.4
100	333.7	82.4	18.0	1.7	1533.8	538.5	158.2	21.0

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	94.1	124.1	179.0	315.4
1.0	35.4	46.7	67.3	118.6
1.5	14.1	18.6	26.8	47.2
2.0	4.8	6.4	9.2	16.1
2.5	1.0	1.3	1.9	3.3

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	81.6	107.6	155.2	273.4
2.0	26.5	34.9	50.3	88.6
3.0	8.2	10.8	15.6	27.5
4.0	1.6	2.1	3.0	5.3


ACTS LINK ATTENUATION PREDICTIONS
Portland, OR
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : PORTLAND, OR

STATION HEIGHT IN kM = 0.009
STATION LATITUDE IN DEG. N. = 45.53
TERMINAL LONGITUDE IN DEG. W. = 122.62
ANTENNA ELEV. ANGLE = 33.02
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.94
SLANT PATH PROJECTION ON EARTH IN kM = 4.98
P0 IN % = 17.325
Rm IN mm/hr = 0.273
SR = 1.288
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 18.209 %
MEAN ATTENUATION Am = 0.117 dB
STANDARD DEV. OF ATTENUATION = 1.277

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.574 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 18.209 %
MEAN ATTENUATION Am = 0.314 dB
STANDARD DEV. OF ATTENUATION = 1.177

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.416 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.8453	2.9652
2.00	0.2385	1.0563
3.00	0.1007	0.5039
4.00	0.0517	0.2798
5.00	0.0298	0.1708
6.00	0.0186	0.1115
7.00	0.0123	0.0764
8.00	0.0085	0.0543
9.00	0.0061	0.0399
10.00	0.0045	0.0300
15.00	0.0013	0.0093
20.00	0.0005	0.0038
25.00	0.0002	0.0018
30.00	0.0001	0.0010
40.00	0.0000	0.0003
50.00	0.0000	0.0002

LOCATION OF TERMINAL: PORTLAND, OR

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 18.209 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.117 dB; @ 30 GHz: 0.314 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.277; @ 30 GHz: 1.177

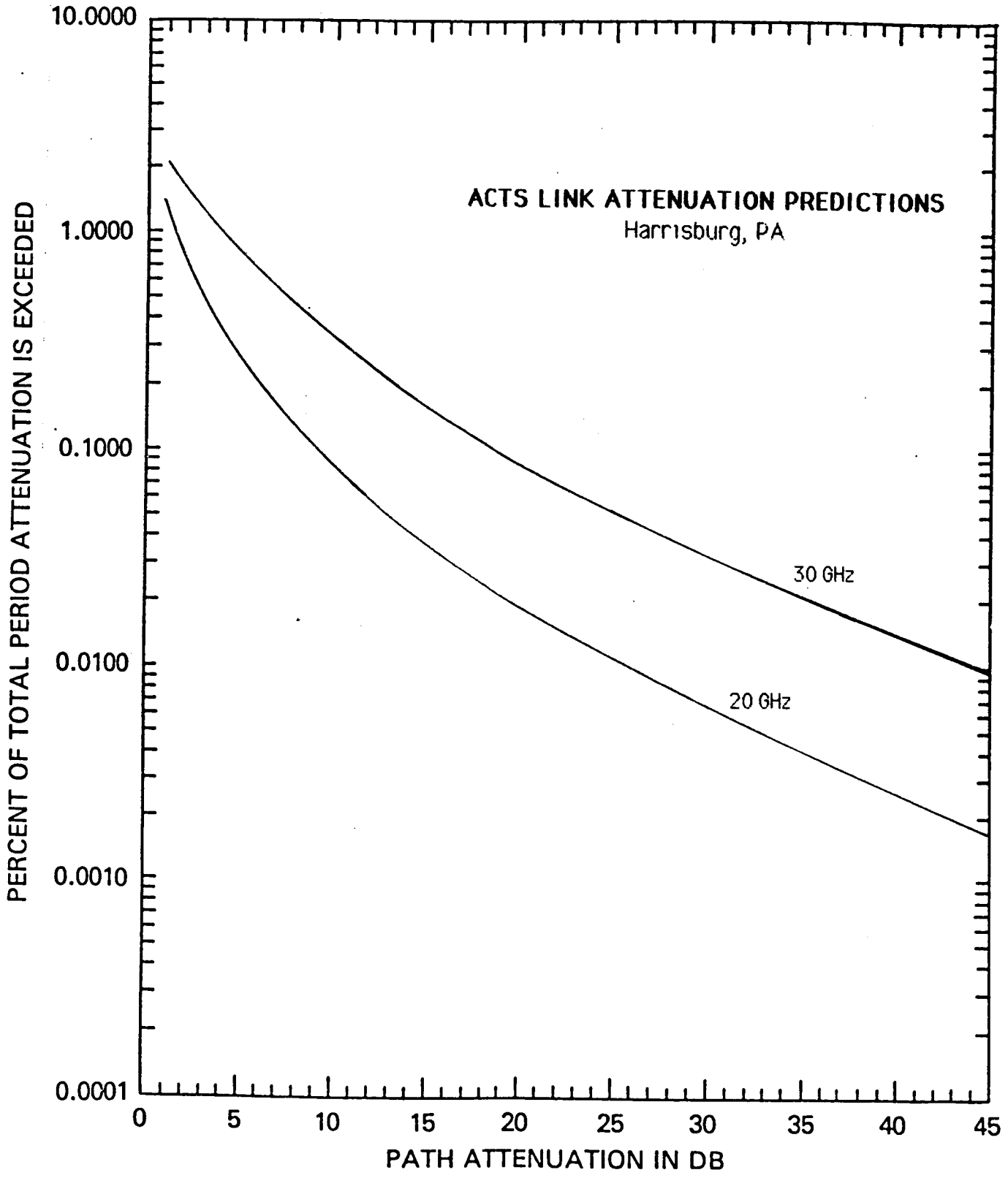
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	529.6	156.8	44.9	6.9	2650.1	898.6	285.8	49.1
1	498.0	146.3	41.6	6.3	2522.3	848.1	267.7	45.5
2	468.3	136.4	38.5	5.8	2400.6	800.5	250.7	42.1
3	440.4	127.3	35.6	5.3	2284.8	755.6	234.8	39.0
4	414.1	118.8	33.0	4.9	2174.6	713.2	219.9	36.2
5	389.4	110.8	30.6	4.5	2069.7	673.1	205.9	33.5
10	286.3	78.3	20.8	2.9	1616.4	504.3	148.3	22.9
15	210.5	55.3	14.2	1.9	1262.4	377.7	106.8	15.6
20	154.8	39.1	9.7	1.2	985.9	283.0	77.0	10.7
30	83.7	19.5	4.5	0.5	601.4	158.8	39.9	5.0
40	45.3	9.8	2.1	0.2	366.8	89.1	20.7	2.3
50	24.5	4.9	1.0	0.1	223.7	50.0	10.7	1.1
60	13.2	2.4	0.4	0.0	136.5	28.1	5.6	0.5
70	7.2	1.2	0.2	0.0	83.2	15.7	2.9	0.2
80	3.9	0.6	0.1	0.0	50.8	8.8	1.5	0.1
90	2.1	0.3	0.0	0.0	31.0	5.0	0.8	0.1
100	1.1	0.2	0.0	0.0	18.9	2.8	0.4	0.0

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	60.1	79.2	114.2	201.2
1.0	22.6	29.8	42.9	75.6
1.5	9.0	11.9	17.1	30.1
2.0	3.1	4.1	5.8	10.3
2.5	0.6	0.8	1.2	2.1

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	57.0	75.2	108.5	191.1
2.0	18.5	24.4	35.2	61.9
3.0	5.7	7.6	10.9	19.3
4.0	1.1	1.4	2.1	3.7


ACTS LINK ATTENUATION PREDICTIONS
Harrisburg, PA
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : HARRISBURG, PA

STATION HEIGHT IN kM = 0.102
STATION LATITUDE IN DEG. N. = 40.27
TERMINAL LONGITUDE IN DEG. W. = 76.88
ANTENNA ELEV. ANGLE = 37.71
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.00
SLANT PATH PROJECTION ON EARTH IN kM = 4.75
P0 IN % = 1.329
Rm IN mm/hr = 5.636
SR = 0.911
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 2.315 %
MEAN ATTENUATION Am = 1.463 dB
STANDARD DEV. OF ATTENUATION = 1.082

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.511 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 2.315 %
MEAN ATTENUATION Am = 3.173 dB
STANDARD DEV. OF ATTENUATION = 1.023

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.371 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.4754	2.0147
2.00	0.8942	1.5601
3.00	0.5867	1.2078
4.00	0.4082	0.9500
5.00	0.2964	0.7600
6.00	0.2225	0.6174
7.00	0.1713	0.5085
8.00	0.1348	0.4237
9.00	0.1079	0.3567
10.00	0.0876	0.3031
15.00	0.0365	0.1493
20.00	0.0181	0.0833
25.00	0.0101	0.0505
30.00	0.0061	0.0325
40.00	0.0026	0.0153
50.00	0.0013	0.0082

LOCATION OF TERMINAL: HARRISBURG, PA

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 2.315 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.463 dB; @ 30 GHz: 3.173 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.082; @ 30 GHz: 1.023

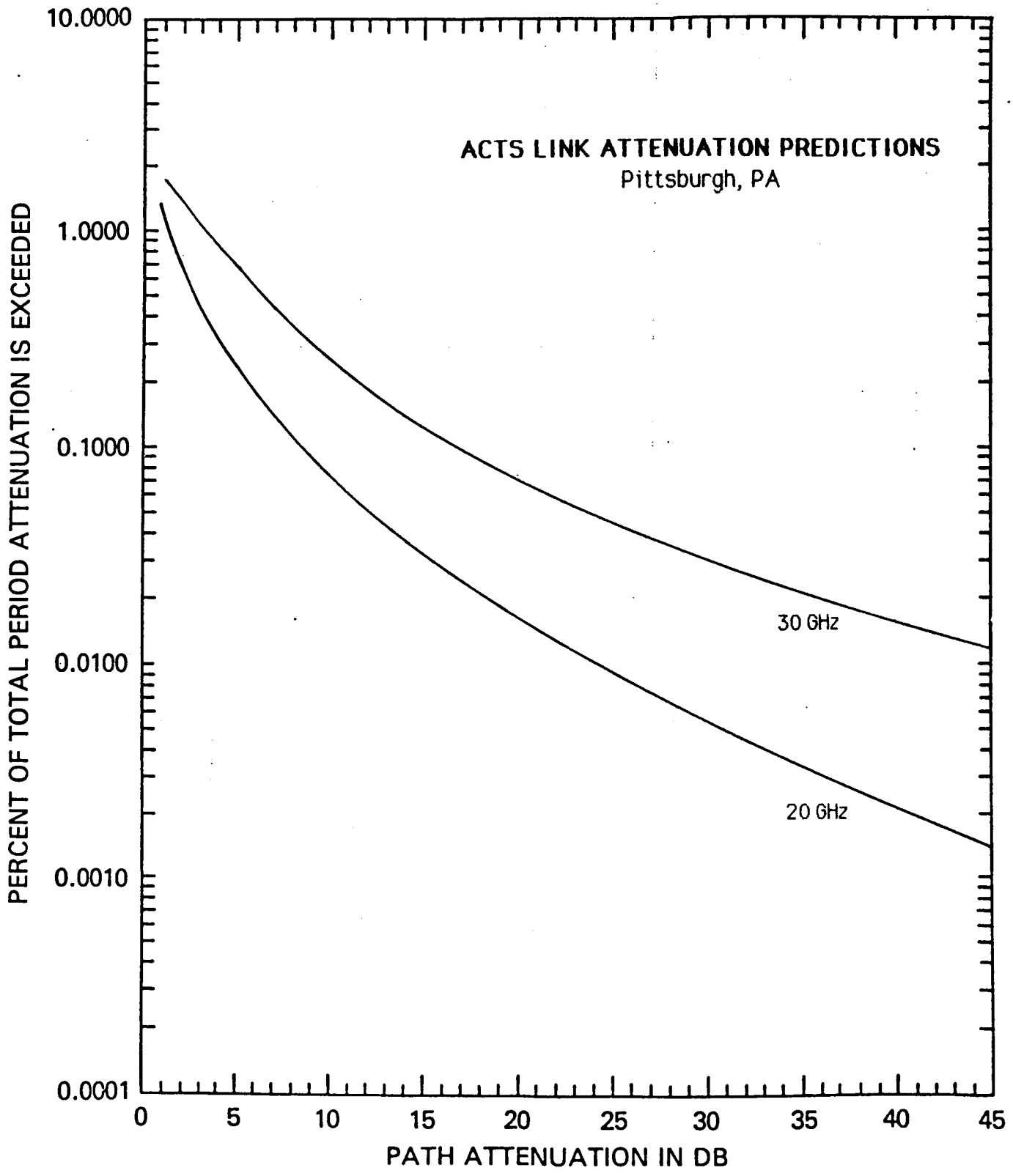
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3086.0	1559.1	708.8	191.7	6352.7	3997.3	2228.4	785.1
1	3003.3	1505.2	679.0	181.7	6249.3	3903.8	2160.1	752.8
2	2922.8	1453.3	650.4	172.1	6147.6	3812.5	2093.8	721.8
3	2844.6	1403.1	623.1	163.1	6047.5	3723.3	2029.6	692.1
4	2768.3	1354.6	596.9	154.5	5949.0	3636.2	1967.4	663.6
5	2694.2	1307.8	571.8	146.4	5852.2	3551.2	1907.0	636.3
10	2352.1	1097.0	461.2	111.8	5391.1	3154.8	1632.0	515.7
15	2053.5	920.2	372.1	85.4	4966.3	2802.7	1396.6	418.0
20	1792.8	771.9	300.1	65.2	4575.0	2489.9	1195.2	338.8
30	1366.5	543.1	195.3	38.0	3882.4	1965.2	875.3	222.6
40	1041.5	382.1	127.1	22.2	3294.7	1551.0	641.0	146.2
50	793.9	268.9	82.7	12.9	2796.0	1224.1	469.4	96.0
60	605.1	189.2	53.8	7.5	2372.7	966.1	343.8	63.1
70	461.2	133.1	35.0	4.4	2013.5	762.5	251.8	41.4
80	351.5	93.7	22.8	2.6	1708.7	601.8	184.4	27.2
90	267.9	65.9	14.8	1.5	1450.1	475.0	135.0	17.9
100	204.2	46.4	9.6	0.9	1230.6	374.9	98.9	11.8

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	83.6	110.3	159.1	280.2
1.0	31.4	41.5	59.8	105.3
1.5	12.5	16.5	23.8	41.9
2.0	4.3	5.6	8.1	14.3
2.5	0.9	1.1	1.6	2.9

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	75.5	99.5	143.6	252.9
2.0	24.5	32.3	46.5	82.0
3.0	7.6	10.0	14.5	25.5
4.0	1.5	1.9	2.8	4.9


ACTS LINK ATTENUATION PREDICTIONS
Pittsburgh, PA
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : PITTSBURGH, PA

STATION HEIGHT IN kM = 0.305
STATION LATITUDE IN DEG. N. = 40.44
TERMINAL LONGITUDE IN DEG. W. = 80.01
ANTENNA ELEV. ANGLE = 38.92
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.49
SLANT PATH PROJECTION ON EARTH IN kM = 4.27
P0 IN % = 1.005
Rm IN mm/hr = 7.397
SR = 0.834
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.853 %
MEAN ATTENUATION Am = 1.623 dB
STANDARD DEV. OF ATTENUATION = 1.050

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.498 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.853 %
MEAN ATTENUATION Am = 3.452 dB
STANDARD DEV. OF ATTENUATION = 1.000

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.361 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.2560	1.6541
2.00	0.7807	1.3114
3.00	0.5177	1.0303
4.00	0.3619	0.8182
5.00	0.2633	0.6589
6.00	0.1976	0.5378
7.00	0.1520	0.4443
8.00	0.1194	0.3711
9.00	0.0954	0.3130
10.00	0.0773	0.2663
15.00	0.0317	0.1313
20.00	0.0156	0.0731
25.00	0.0086	0.0441
30.00	0.0051	0.0283
40.00	0.0021	0.0132
50.00	0.0010	0.0069

LOCATION OF TERMINAL: PITTSBURGH, PA

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.853 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.623 dB; @ 30 GHz: 3.452 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.050; @ 30 GHz: 1.000

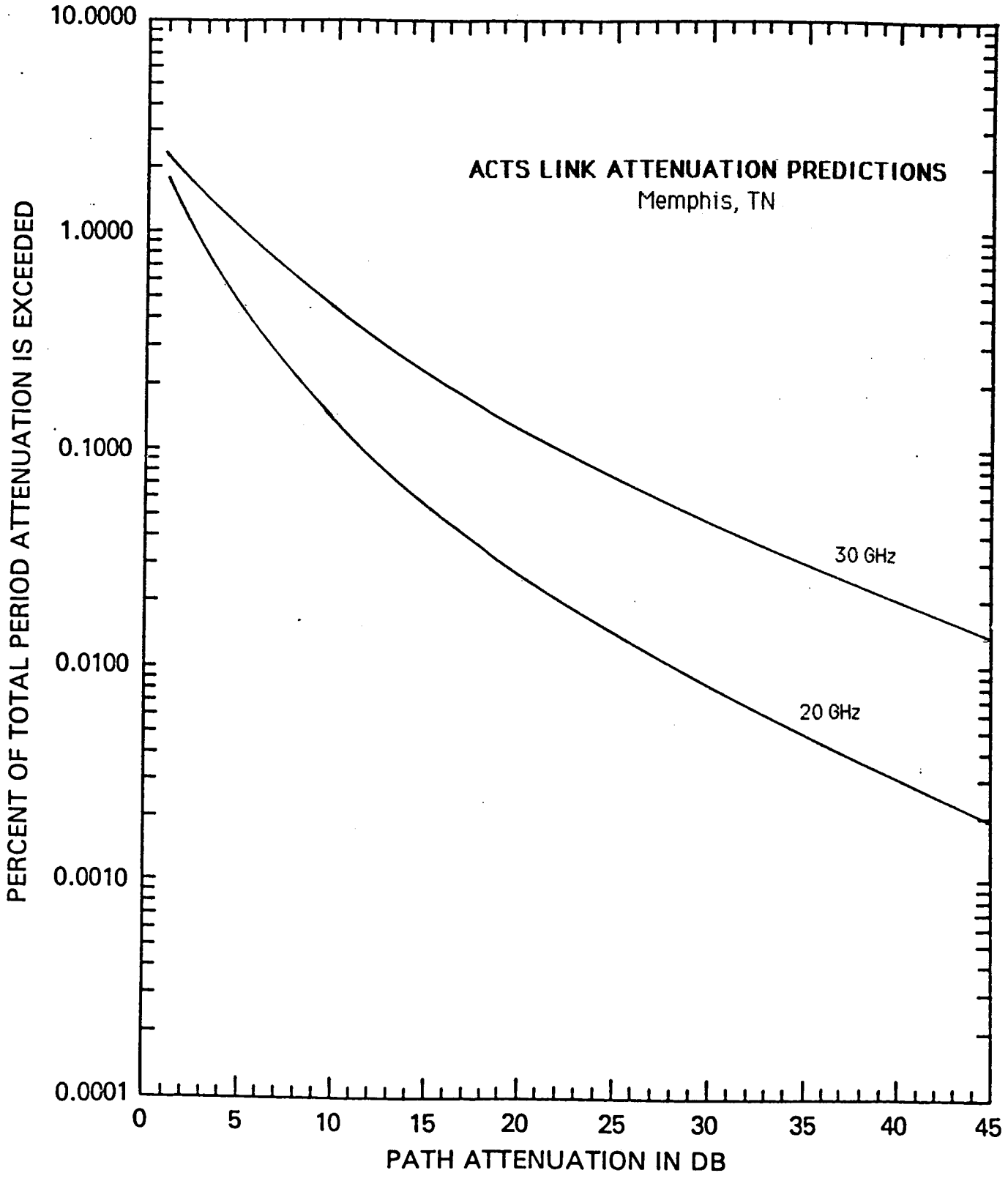
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	2723.0	1384.7	628.0	166.9	5418.9	3465.4	1952.0	690.4
1	2653.5	1338.4	602.2	158.3	5336.7	3388.2	1894.1	662.6
2	2585.7	1293.6	577.4	150.1	5255.8	3312.7	1838.0	635.9
3	2519.6	1250.3	553.6	142.3	5176.1	3238.9	1783.5	610.3
4	2455.2	1208.5	530.8	134.9	5097.6	3166.8	1730.6	585.7
5	2392.5	1168.1	509.0	127.9	5020.3	3096.2	1679.3	562.1
10	2102.1	985.3	412.5	98.0	4651.0	2766.3	1444.8	457.6
15	1846.9	831.2	334.3	75.1	4308.9	2471.6	1243.0	372.5
20	1622.7	701.1	271.0	57.5	3991.9	2208.3	1069.4	303.3
30	1252.6	498.9	178.0	33.8	3426.2	1762.8	791.6	201.0
40	967.0	355.0	116.9	19.8	2940.7	1407.2	585.9	133.2
50	746.4	252.6	76.8	11.6	2524.0	1123.3	433.7	88.3
60	576.2	179.8	50.4	6.8	2166.3	896.7	321.0	58.5
70	444.8	127.9	33.1	4.0	1859.3	715.8	237.6	38.8
80	343.4	91.0	21.8	2.4	1595.9	571.4	175.9	25.7
90	265.1	64.8	14.3	1.4	1369.7	456.1	130.2	17.0
100	204.6	46.1	9.4	0.8	1175.6	364.1	96.3	11.3

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	88.8	117.1	168.9	297.5
1.0	33.4	44.0	63.5	111.8
1.5	13.3	17.5	25.3	44.5
2.0	4.5	6.0	8.6	15.2
2.5	0.9	1.2	1.7	3.1

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	79.1	104.3	150.4	265.0
2.0	25.6	33.8	48.8	85.9
3.0	8.0	10.5	15.2	26.7
4.0	1.5	2.0	2.9	5.1


ACTS LINK ATTENUATION PREDICTIONS
Memphis, TN
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : MEMPHIS, TN

STATION HEIGHT IN kM = 0.081
STATION LATITUDE IN DEG. N. = 35.13
TERMINAL LONGITUDE IN DEG. W. = 90.05
ANTENNA ELEV. ANGLE = 47.85
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.67
SLANT PATH PROJECTION ON EARTH IN kM = 3.81
P0 IN % = 1.437
Rm IN mm/hr = 7.344
SR = 0.835
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 2.145 %
MEAN ATTENUATION Am = 2.246 dB
STANDARD DEV. OF ATTENUATION = 0.963

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.422 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 2.145 %
MEAN ATTENUATION Am = 4.780 dB
STANDARD DEV. OF ATTENUATION = 0.907

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.306 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.7155	2.0546
2.00	1.1755	1.7841
3.00	0.8192	1.4936
4.00	0.5888	1.2396
5.00	0.4354	1.0301
6.00	0.3298	0.8603
7.00	0.2550	0.7230
8.00	0.2007	0.6116
9.00	0.1603	0.5206
10.00	0.1297	0.4459
15.00	0.0521	0.2224
20.00	0.0248	0.1229
25.00	0.0132	0.0731
30.00	0.0076	0.0460
40.00	0.0030	0.0206
50.00	0.0014	0.0103

LOCATION OF TERMINAL: MEMPHIS, TN

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 2.145 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.246 dB; @ 30 GHz: 4.780 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 0.963; @ 30 GHz: 0.907

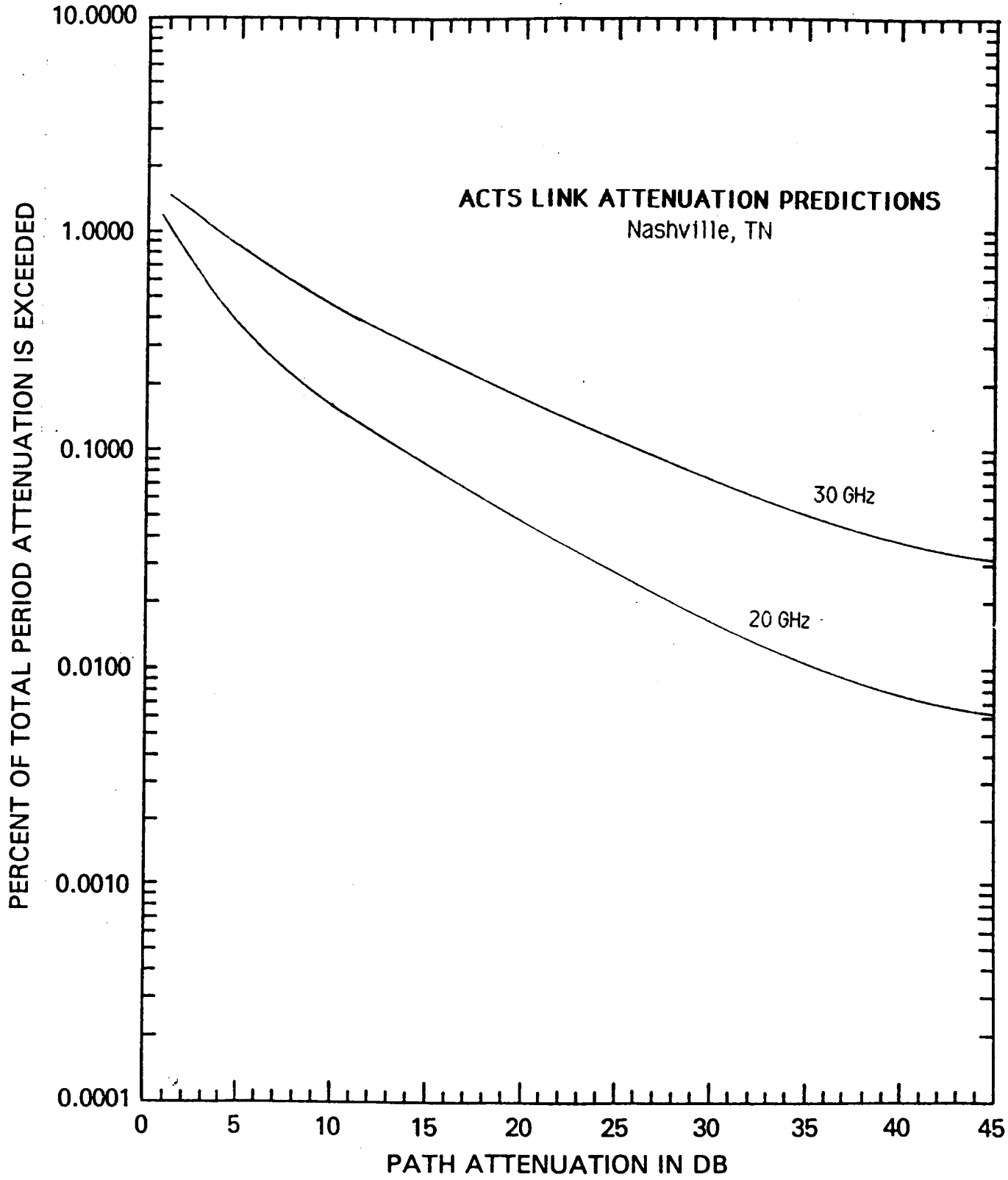
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	4308.7	2289.9	1055.4	274.1	7855.5	5418.2	3216.5	1169.8
1	4217.1	2222.4	1015.6	260.6	7771.1	5322.3	3135.2	1126.9
2	4127.6	2156.9	977.3	247.8	7687.7	5228.2	3055.9	1085.6
3	4039.9	2093.3	940.5	235.6	7605.1	5135.7	2978.6	1045.8
4	3954.0	2031.6	905.1	224.0	7523.4	5044.9	2903.3	1007.4
5	3870.0	1971.7	871.0	213.0	7442.6	4955.7	2829.9	970.4
10	3476.1	1697.7	718.8	165.4	7051.3	4532.7	2489.7	805.1
15	3122.2	1461.8	593.2	128.5	6680.6	4145.8	2190.5	667.9
20	2804.3	1258.6	489.5	99.8	6329.4	3792.0	1927.2	554.0
30	2262.4	933.1	333.4	60.3	5681.5	3172.3	1491.7	381.3
40	1825.2	691.8	227.0	36.4	5099.8	2653.9	1154.7	262.4
50	1472.5	512.9	154.6	21.9	4577.7	2220.2	893.8	180.6
60	1188.0	380.2	105.3	13.2	4109.1	1857.4	691.8	124.3
70	958.4	281.9	71.7	8.0	3688.4	1553.8	535.5	85.5
80	773.2	209.0	48.8	4.8	3310.8	1299.9	414.5	58.9
90	623.8	154.9	33.3	2.9	2971.9	1087.5	320.8	40.5
100	503.3	114.9	22.7	1.8	2667.6	909.8	248.3	27.9

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	105.7	139.3	200.9	354.0
1.0	39.7	52.4	75.5	133.1
1.5	15.8	20.9	30.1	53.0
2.0	5.4	7.1	10.3	18.1
2.5	1.1	1.4	2.1	3.7

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	96.1	126.7	182.7	321.8
2.0	31.1	41.1	59.2	104.3
3.0	9.7	12.8	18.4	32.4
4.0	1.8	2.4	3.5	6.2


ACTS LINK ATTENUATION PREDICTIONS
Nashville, TN
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : NASHVILLE, TN

STATION HEIGHT IN KM = 0.176
STATION LATITUDE IN DEG. N. = 36.17
TERMINAL LONGITUDE IN DEG. W. = 86.78
ANTENNA ELEV. ANGLE = 45.76
LINK SLANT PATH LGTH. THRU RAIN REGION IN KM = 5.59
SLANT PATH PROJECTION ON EARTH IN KM = 3.90
P0 IN % = 0.658
Rm IN mm/hr =17.330
SR = 0.647
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.400 %
MEAN ATTENUATION Am = 3.310 dB
STANDARD DEV. OF ATTENUATION = 0.973

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.437 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.400 %
MEAN ATTENUATION Am = 6.625 dB
STANDARD DEV. OF ATTENUATION = 0.940

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.316 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.2468	1.3688
2.00	0.9767	1.2579
3.00	0.7563	1.1202
4.00	0.5920	0.9858
5.00	0.4702	0.8646
6.00	0.3788	0.7586
7.00	0.3091	0.6672
8.00	0.2552	0.5887
9.00	0.2128	0.5211
10.00	0.1792	0.4630
15.00	0.0844	0.2694
20.00	0.0452	0.1680
25.00	0.0264	0.1105
30.00	0.0165	0.0758
40.00	0.0073	0.0391
50.00	0.0037	0.0221

LOCATION OF TERMINAL: NASHVILLE, TN

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.400 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 3.310 dB; @ 30 GHz: 6.625 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 0.973; @ 30 GHz: 0.940

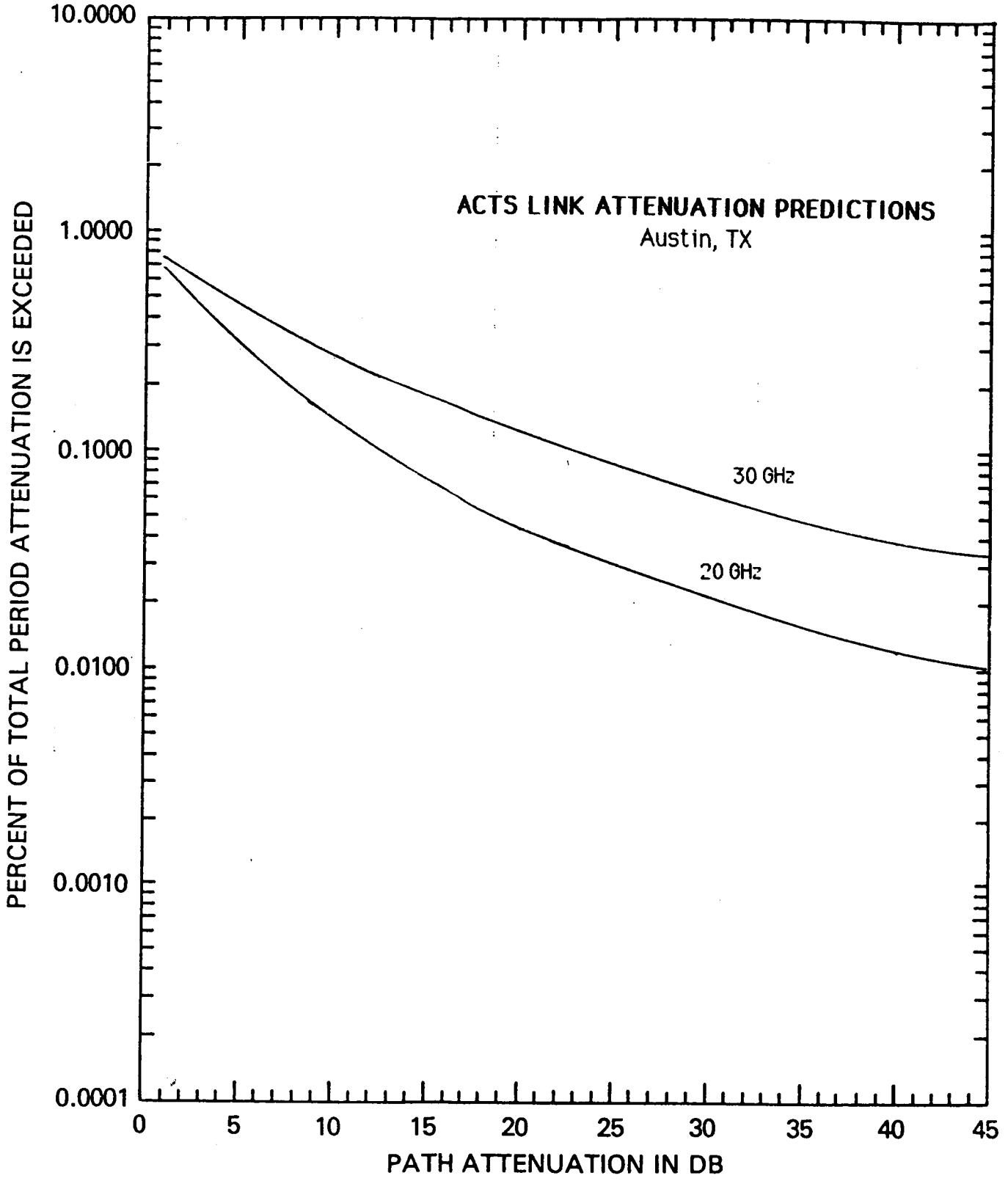
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	3977.9	2472.9	1342.1	443.7	5891.7	4547.2	3096.1	1416.8
1	3915.6	2415.9	1300.9	425.1	5847.6	4487.2	3034.9	1374.1
2	3854.2	2360.1	1260.9	407.4	5803.8	4428.0	2974.8	1332.8
3	3793.8	2305.6	1222.2	390.4	5760.3	4369.6	2915.9	1292.7
4	3734.3	2252.4	1184.6	374.1	5717.2	4312.0	2858.2	1253.8
5	3675.8	2200.5	1148.2	358.4	5674.3	4255.1	2801.6	1216.0
10	3396.7	1958.0	982.4	289.6	5465.0	3981.7	2535.1	1043.7
15	3138.7	1742.3	840.5	234.0	5263.4	3725.8	2293.9	895.8
20	2900.3	1550.3	719.1	189.0	5069.2	3486.5	2075.7	768.9
30	2476.5	1227.5	526.4	123.4	4702.0	3052.8	1699.5	566.4
40	2114.7	971.9	385.3	80.6	4361.5	2673.1	1391.5	417.3
50	1805.7	769.5	282.0	52.6	4045.6	2340.7	1139.4	307.4
60	1541.8	609.3	206.4	34.3	3752.6	2049.5	932.9	226.4
70	1316.5	482.4	151.1	22.4	3480.8	1794.6	763.8	166.8
80	1124.1	382.0	110.6	14.6	3228.7	1571.4	625.4	122.9
90	959.9	302.4	81.0	9.5	2994.9	1376.0	512.1	90.5
100	819.6	239.5	59.3	6.2	2778.0	1204.8	419.3	66.7

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	103.4	136.4	196.7	346.5
1.0	38.9	51.3	73.9	130.3
1.5	15.5	20.4	29.4	51.9
2.0	5.3	7.0	10.1	17.7
2.5	1.1	1.4	2.0	3.6

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	89.4	117.8	169.9	299.4
2.0	29.0	38.2	55.1	97.0
3.0	9.0	11.9	17.1	30.2
4.0	1.7	2.3	3.3	5.8


ACTS LINK ATTENUATION PREDICTIONS
Austin, TX
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : AUSTIN, TX

STATION HEIGHT IN kM = 0.187
STATION LATITUDE IN DEG. N. = 30.28
TERMINAL LONGITUDE IN DEG. W. = 97.75
ANTENNA ELEV. ANGLE = 54.64
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.62
SLANT PATH PROJECTION ON EARTH IN kM = 3.25
P0 IN % = 0.251
Rm IN mm/hr =31.569
SR = 0.535
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 0.809 %
MEAN ATTENUATION Am = 3.341 dB
STANDARD DEV. OF ATTENUATION = 1.119

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.384 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 0.809 %
MEAN ATTENUATION Am = 6.406 dB
STANDARD DEV. OF ATTENUATION = 1.100

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.278 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.6950	0.7718
2.00	0.5472	0.6915
3.00	0.4353	0.6104
4.00	0.3527	0.5384
5.00	0.2906	0.4764
6.00	0.2430	0.4235
7.00	0.2057	0.3783
8.00	0.1760	0.3396
9.00	0.1520	0.3062
10.00	0.1323	0.2772
15.00	0.0726	0.1776
20.00	0.0444	0.1215
25.00	0.0292	0.0872
30.00	0.0202	0.0648
40.00	0.0107	0.0387
50.00	0.0063	0.0250

LOCATION OF TERMINAL: AUSTIN, TX

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 0.809 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 3.341 dB; @ 30 GHz: 6.406 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.119; @ 30 GHz: 1.100

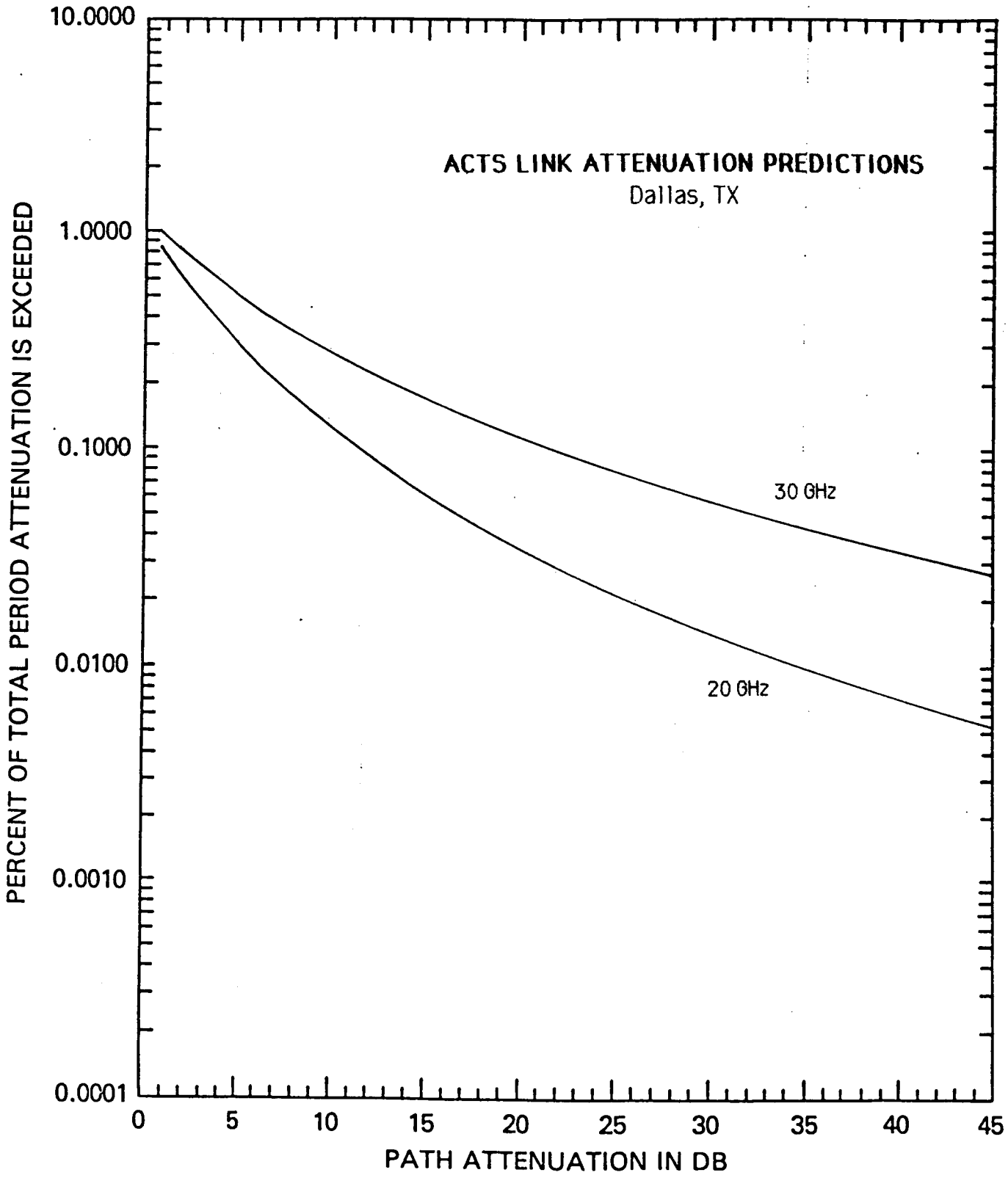
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	2289.7	1528.4	925.7	382.0	3210.4	2505.7	1786.1	933.9
1	2253.7	1494.6	899.2	367.5	3181.8	2470.3	1750.7	907.2
2	2218.2	1461.5	873.4	353.5	3153.4	2435.5	1716.0	881.3
3	2183.3	1429.2	848.4	340.0	3125.3	2401.2	1682.0	856.2
4	2148.9	1397.6	824.1	327.1	3097.4	2367.3	1648.6	831.7
5	2115.1	1366.7	800.5	314.6	3069.8	2334.0	1616.0	808.0
10	1953.9	1222.0	692.2	259.1	2935.3	2174.0	1462.1	699.1
15	1804.9	1092.7	598.5	213.4	2806.7	2025.1	1322.8	604.8
20	1667.3	977.0	517.6	175.8	2683.8	1886.3	1196.9	523.3
30	1422.7	781.2	387.0	119.2	2453.8	1636.6	979.7	391.7
40	1214.0	624.6	289.4	80.9	2243.5	1420.0	802.0	293.2
50	1036.0	499.4	216.4	54.9	2051.3	1232.1	656.5	219.5
60	884.0	399.3	161.8	37.2	1875.5	1069.0	537.4	164.3
70	754.4	319.2	121.0	25.2	1714.7	927.5	440.0	123.0
80	643.7	255.2	90.4	17.1	1567.8	804.8	360.1	92.0
90	549.3	204.1	67.6	11.6	1433.4	698.3	294.8	68.9
100	468.7	163.2	50.6	7.9	1310.6	605.8	241.3	51.6

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	78.2	103.1	148.7	262.0
1.0	29.4	38.8	55.9	98.5
1.5	11.7	15.4	22.3	39.2
2.0	4.0	5.3	7.6	13.4
2.5	0.8	1.1	1.5	2.7

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	65.3	86.2	124.3	218.9
2.0	21.2	27.9	40.3	71.0
3.0	6.6	8.7	12.5	22.1
4.0	1.3	1.7	2.4	4.2


ACTS LINK ATTENUATION PREDICTIONS
Dallas, TX
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : DALLAS, TX

STATION HEIGHT IN kM = 0.148
STATION LATITUDE IN DEG. N. = 32.78
TERMINAL LONGITUDE IN DEG. W. = 96.82
ANTENNA ELEV. ANGLE = 51.72
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.57
SLANT PATH PROJECTION ON EARTH IN kM = 3.45
P0 IN % = 0.326
Rm IN mm/hr =21.608
SR = 0.622
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 0.939 %
MEAN ATTENUATION Am = 2.615 dB
STANDARD DEV. OF ATTENUATION = 1.116

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.399 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 0.939 %
MEAN ATTENUATION Am = 5.152 dB
STANDARD DEV. OF ATTENUATION = 1.089

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.289 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.7567	0.8772
2.00	0.5589	0.7585
3.00	0.4237	0.6484
4.00	0.3303	0.5560
5.00	0.2636	0.4800
6.00	0.2145	0.4174
7.00	0.1773	0.3656
8.00	0.1485	0.3223
9.00	0.1259	0.2858
10.00	0.1077	0.2549
15.00	0.0552	0.1534
20.00	0.0320	0.1001
25.00	0.0202	0.0691
30.00	0.0135	0.0497
40.00	0.0068	0.0281
50.00	0.0038	0.0174

LOCATION OF TERMINAL: DALLAS, TX

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 0.939 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.615 dB; @ 30 GHz: 5.152 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.116; @ 30 GHz: 1.089

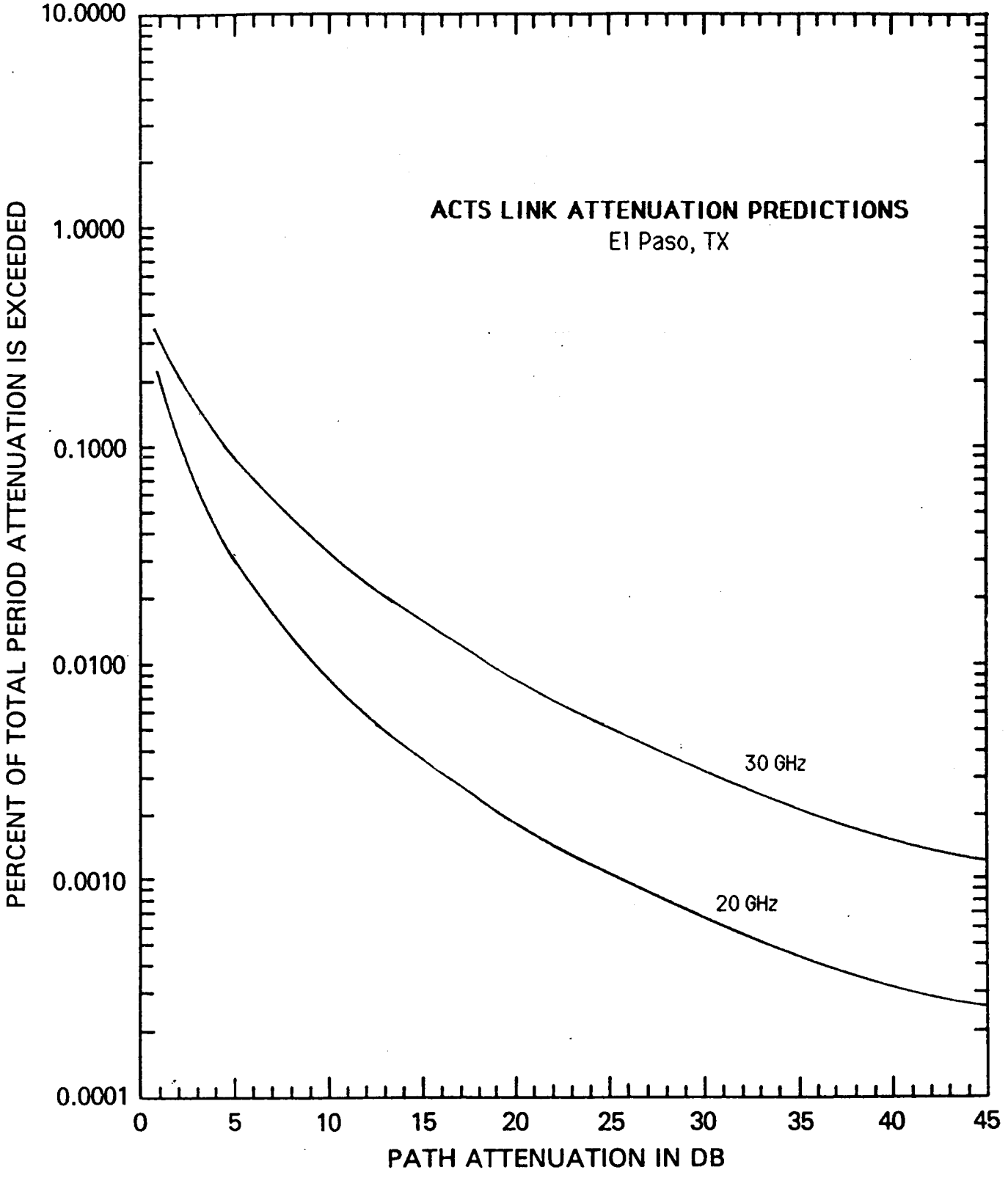
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	2228.5	1386.6	781.3	290.1	3410.1	2524.5	1695.2	806.8
1	2186.8	1351.3	756.0	277.9	3372.8	2482.5	1656.6	781.0
2	2145.9	1316.9	731.6	266.3	3335.9	2441.2	1618.9	756.1
3	2105.8	1283.3	708.0	255.1	3299.5	2400.5	1582.0	731.9
4	2066.4	1250.6	685.1	244.4	3263.4	2360.6	1546.0	708.5
5	2027.8	1218.7	663.0	234.1	3227.8	2321.3	1510.8	685.9
10	1845.2	1071.1	562.6	188.9	3055.2	2134.5	1346.3	583.1
15	1679.0	941.4	477.4	152.5	2891.9	1962.7	1199.8	495.7
20	1527.8	827.4	405.2	123.0	2737.3	1804.7	1069.3	421.4
30	1265.0	639.1	291.8	80.1	2452.4	1525.9	849.2	304.6
40	1047.4	493.6	210.1	52.2	2197.2	1290.1	674.4	220.1
50	867.2	381.3	151.3	34.0	1968.5	1090.8	535.6	159.1
60	718.0	294.5	109.0	22.1	1763.7	922.3	425.4	115.0
70	594.5	227.5	78.5	14.4	1580.2	779.8	337.8	83.1
80	492.3	175.7	56.5	9.4	1415.7	659.3	268.3	60.1
90	407.6	135.7	40.7	6.1	1268.4	557.4	213.1	43.4
100	337.5	104.9	29.3	4.0	1136.4	471.3	169.2	31.4

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	78.7	103.8	149.7	263.6
1.0	29.6	39.0	56.3	99.1
1.5	11.8	15.5	22.4	39.5
2.0	4.0	5.3	7.7	13.5
2.5	0.8	1.1	1.5	2.7

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	66.6	87.8	126.7	223.1
2.0	21.6	28.5	41.1	72.3
3.0	6.7	8.8	12.8	22.5
4.0	1.3	1.7	2.4	4.3


ACTS LINK ATTENUATION PREDICTIONS
El Paso, TX
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
30 GHz
20 GHz
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : EL PASO, TX

STATION HEIGHT IN kM = 1.195
STATION LATITUDE IN DEG. N. = 31.75
TERMINAL LONGITUDE IN DEG. W. = 106.48
ANTENNA ELEV. ANGLE = 52.38
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 4.33
SLANT PATH PROJECTION ON EARTH IN kM = 2.64
P0 IN % = 0.250
Rm IN mm/hr = 6.416
SR = 0.834
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 0.642 %
MEAN ATTENUATION Am = 0.630 dB
STANDARD DEV. OF ATTENUATION = 1.245

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.395 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 0.642 %
MEAN ATTENUATION Am = 1.353 dB
STANDARD DEV. OF ATTENUATION = 1.203

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.286 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.2281	0.3849
2.00	0.1135	0.2393
3.00	0.0674	0.1631
4.00	0.0442	0.1180
5.00	0.0309	0.0890
6.00	0.0226	0.0692
7.00	0.0170	0.0551
8.00	0.0132	0.0448
9.00	0.0105	0.0370
10.00	0.0085	0.0309
15.00	0.0035	0.0146
20.00	0.0018	0.0081
25.00	0.0010	0.0049
30.00	0.0006	0.0032
40.00	0.0003	0.0016
50.00	0.0001	0.0009

LOCATION OF TERMINAL: EL PASO, TX

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 0.642 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.630 dB; @ 30 GHz: 1.353 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.245; @ 30 GHz: 1.203

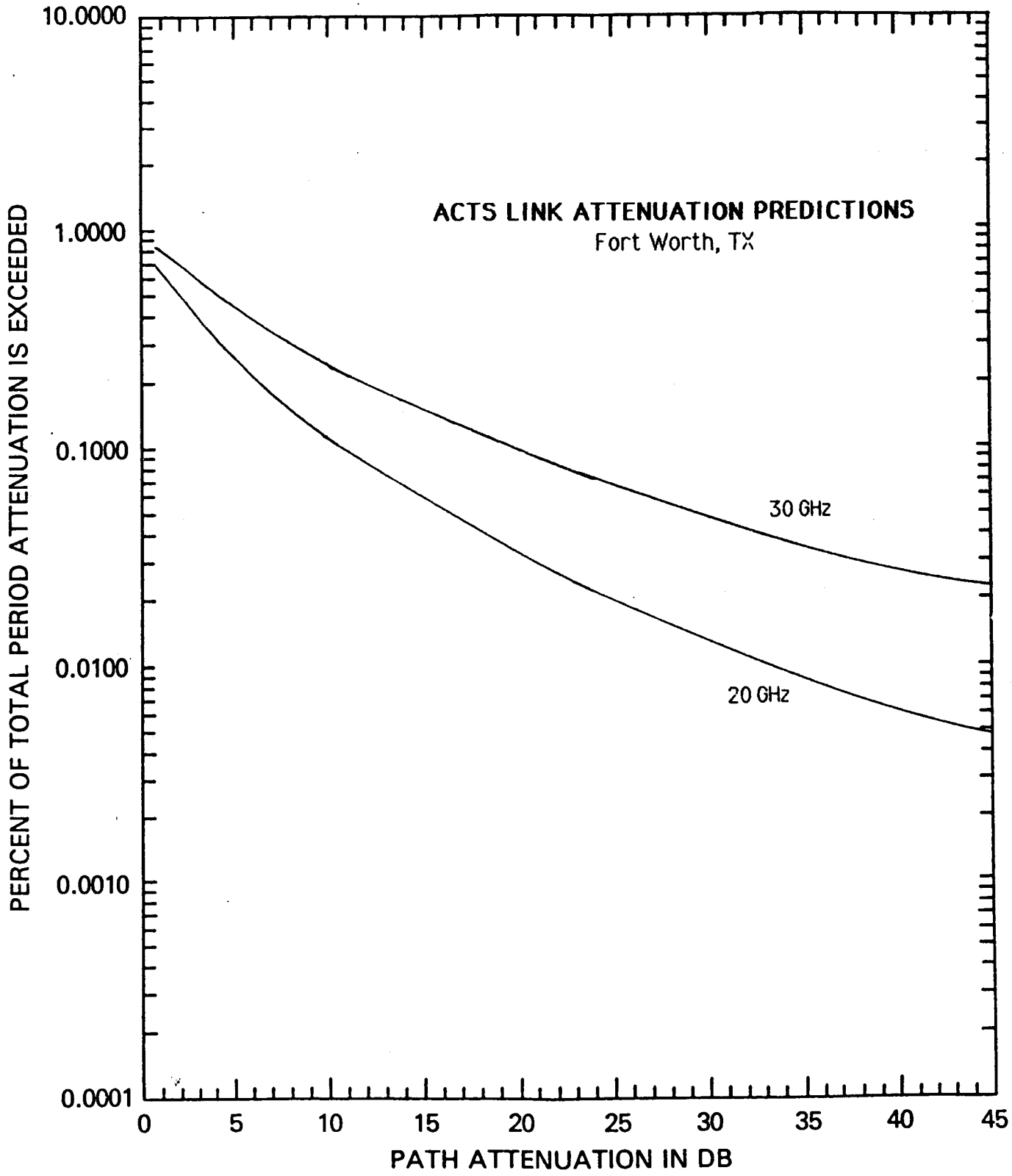
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	354.6	162.3	69.6	18.4	857.8	468.0	235.6	76.8
1	341.6	155.2	66.1	17.3	834.9	452.2	226.1	73.0
2	329.1	148.4	62.7	16.3	812.5	437.0	216.9	69.3
3	317.1	142.0	59.6	15.3	790.8	422.2	208.2	65.9
4	305.5	135.7	56.6	14.4	769.6	408.0	199.7	62.6
5	294.3	129.8	53.7	13.5	749.0	394.3	191.7	59.5
10	244.3	103.8	41.5	9.9	654.0	332.1	155.9	46.1
15	202.8	83.0	32.0	7.3	571.0	279.8	126.8	35.7
20	168.4	66.4	24.7	5.4	498.6	235.7	103.2	27.7
30	116.0	42.5	14.7	2.9	380.1	167.3	68.3	16.6
40	79.9	27.1	8.8	1.6	289.8	118.7	45.2	10.0
50	55.1	17.4	5.2	0.8	220.9	84.2	29.9	6.0
60	38.0	11.1	3.1	0.5	168.4	59.8	19.8	3.6
70	26.2	7.1	1.9	0.2	128.4	42.4	13.1	2.2
80	18.0	4.5	1.1	0.1	97.9	30.1	8.7	1.3
90	12.4	2.9	0.7	0.1	74.6	21.4	5.7	0.8
100	8.6	1.9	0.4	0.0	56.9	15.2	3.8	0.5

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	63.2	83.3	120.1	211.6
1.0	23.8	31.3	45.2	79.6
1.5	9.5	12.5	18.0	31.7
2.0	3.2	4.3	6.2	10.8
2.5	0.7	0.9	1.2	2.2

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	54.6	72.1	103.9	183.1
2.0	17.7	23.4	33.7	59.3
3.0	5.5	7.3	10.5	18.4
4.0	1.1	1.4	2.0	3.5


ACTS LINK ATTENUATION PREDICTIONS
Fort Worth, TX
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : FORT WORTH, TX

STATION HEIGHT IN kM = 0.183
STATION LATITUDE IN DEG. N. = 32.75
TERMINAL LONGITUDE IN DEG. W. = 97.28
ANTENNA ELEV. ANGLE = 51.80
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.53
SLANT PATH PROJECTION ON EARTH IN kM = 3.42
P0 IN % = 0.306
Rm IN mm/hr =23.731
SR = 0.568
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 0.910 %
MEAN ATTENUATION Am = 2.736 dB
STANDARD DEV. OF ATTENUATION = 1.097

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.398 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 0.910 %
MEAN ATTENUATION Am = 5.354 dB
STANDARD DEV. OF ATTENUATION = 1.075

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.289 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.7464	0.8558
2.00	0.5571	0.7461
3.00	0.4244	0.6413
4.00	0.3316	0.5521
5.00	0.2649	0.4779
6.00	0.2156	0.4164
7.00	0.1782	0.3652
8.00	0.1492	0.3223
9.00	0.1263	0.2860
10.00	0.1079	0.2551
15.00	0.0549	0.1536
20.00	0.0317	0.1001
25.00	0.0199	0.0689
30.00	0.0132	0.0495
40.00	0.0066	0.0279
50.00	0.0037	0.0171

LOCATION OF TERMINAL: FORT WORTH, TX

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 0.910 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.736 dB; @ 30 GHz: 5.354 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.097; @ 30 GHz: 1.075

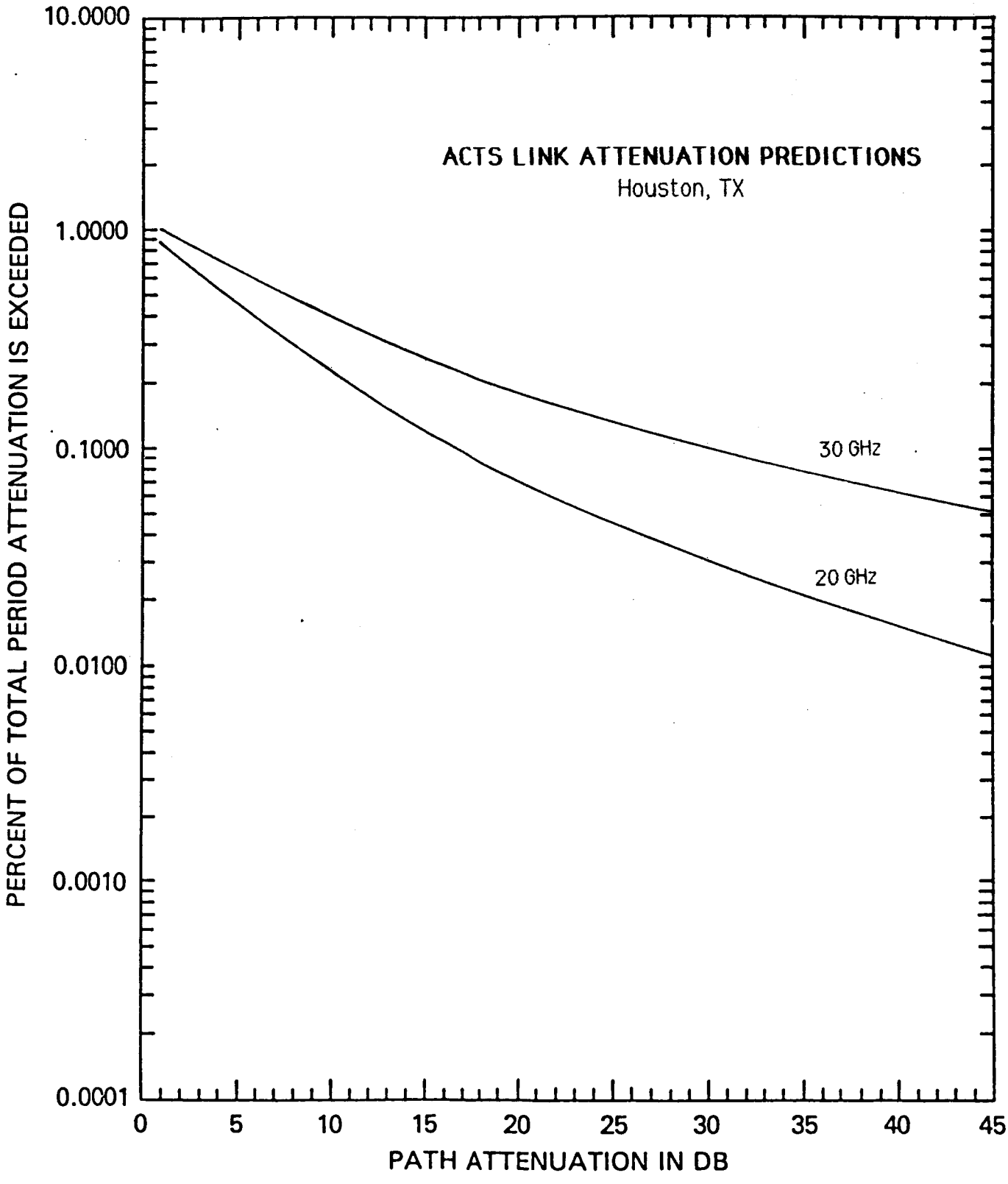
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	2232.0	1393.5	784.5	289.0	3373.2	2513.5	1695.0	807.8
1	2191.5	1358.6	759.5	276.9	3337.9	2472.9	1657.2	782.2
2	2151.7	1324.6	735.3	265.4	3303.0	2432.9	1620.2	757.5
3	2112.7	1291.5	711.8	254.3	3268.4	2393.6	1584.0	733.6
4	2074.3	1259.2	689.1	243.7	3234.2	2354.9	1548.6	710.5
5	2036.6	1227.7	667.1	233.5	3200.3	2316.8	1514.0	688.0
10	1858.4	1081.7	567.3	188.7	3036.3	2135.5	1352.4	586.0
15	1695.7	953.1	482.4	152.5	2880.7	1968.4	1208.0	499.2
20	1547.2	839.7	410.2	123.2	2733.1	1814.4	1079.1	425.2
30	1288.2	651.9	296.6	80.4	2460.1	1541.6	861.0	308.5
40	1072.5	506.0	214.5	52.5	2214.4	1309.8	686.9	223.8
50	893.0	392.8	155.1	34.3	1993.3	1112.8	548.1	162.4
60	743.5	305.0	112.1	22.4	1794.2	945.5	437.3	117.8
70	619.0	236.7	81.1	14.6	1615.0	803.3	348.9	85.5
80	515.4	183.8	58.6	9.5	1453.7	682.5	278.4	62.0
90	429.1	142.7	42.4	6.2	1308.5	579.9	222.1	45.0
100	357.2	110.7	30.7	4.1	1177.8	492.7	177.2	32.6

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	81.4	107.4	154.9	272.8
1.0	30.6	40.4	58.2	102.6
1.5	12.2	16.1	23.2	40.8
2.0	4.2	5.5	7.9	14.0
2.5	0.8	1.1	1.6	2.8

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	68.5	90.3	130.2	229.3
2.0	22.2	29.3	42.2	74.3
3.0	6.9	9.1	13.1	23.1
4.0	1.3	1.7	2.5	4.4


ACTS LINK ATTENUATION PREDICTIONS
Houston, TX
30 GHz
20 GHz
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : HOUSTON, TX

STATION HEIGHT IN kM = 0.015
STATION LATITUDE IN DEG. N. = 29.77
TERMINAL LONGITUDE IN DEG. W. = 95.37
ANTENNA ELEV. ANGLE = 54.93
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.85
SLANT PATH PROJECTION ON EARTH IN kM = 3.36
P0 IN % = 0.379
Rm IN mm/hr =29.284
SR = 0.561
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 0.966 %
MEAN ATTENUATION Am = 4.571 dB
STANDARD DEV. OF ATTENUATION = 1.022

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.382 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 0.966 %
MEAN ATTENUATION Am = 8.811 dB
STANDARD DEV. OF ATTENUATION = 0.998

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.277 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.8995	0.9514
2.00	0.7636	0.8992
3.00	0.6372	0.8302
4.00	0.5330	0.7585
5.00	0.4490	0.6902
6.00	0.3814	0.6275
7.00	0.3267	0.5708
8.00	0.2819	0.5200
9.00	0.2449	0.4746
10.00	0.2142	0.4341
15.00	0.1182	0.2868
20.00	0.0717	0.1987
25.00	0.0465	0.1430
30.00	0.0316	0.1061
40.00	0.0163	0.0626
50.00	0.0093	0.0396

LOCATION OF TERMINAL: HOUSTON, TX

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 0.966 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 4.571 dB; @ 30 GHz: 8.811 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.022; @ 30 GHz: 0.998

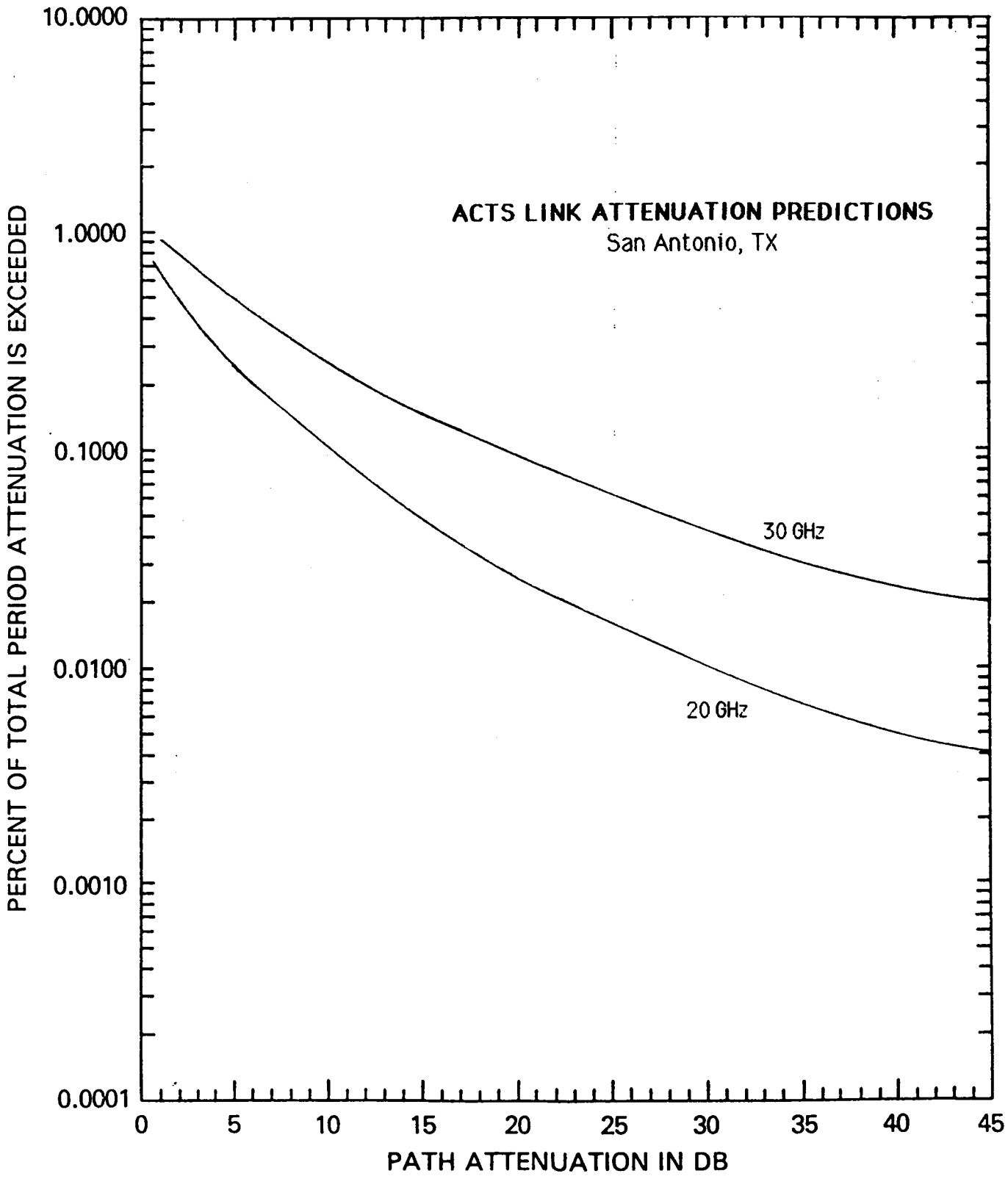
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3351.4	2361.7	1482.6	621.6	4366.3	3630.3	2735.0	1508.6
1	3311.7	2318.7	1445.5	599.9	4342.0	3593.4	2692.0	1471.3
2	3272.4	2276.5	1409.4	578.9	4317.9	3556.9	2649.6	1434.8
3	3233.5	2235.1	1374.2	558.6	4293.9	3520.7	2608.0	1399.3
4	3195.1	2194.4	1339.9	539.1	4270.0	3484.9	2566.9	1364.7
5	3157.2	2154.4	1306.4	520.2	4246.3	3449.5	2526.6	1330.9
10	2974.2	1965.3	1151.3	435.3	4129.6	3277.7	2334.0	1174.2
15	2801.9	1792.8	1014.5	364.3	4016.1	3114.5	2156.1	1036.0
20	2639.5	1635.4	894.0	304.8	3905.7	2959.4	1991.8	914.0
30	2342.4	1360.9	694.2	213.4	3694.0	2672.0	1699.8	711.4
40	2078.8	1132.4	539.1	149.5	3493.8	2412.6	1450.5	553.7
50	1844.8	942.3	418.6	104.7	3304.4	2178.3	1237.9	431.0
60	1637.2	784.2	325.1	73.3	3125.2	1966.7	1056.4	335.5
70	1452.9	652.5	252.4	51.3	2955.8	1775.7	901.5	261.1
80	1289.4	543.0	196.0	35.9	2795.6	1603.3	769.3	203.3
90	1144.3	451.8	152.2	25.2	2644.0	1447.6	656.5	158.2
100	1015.5	376.0	118.2	17.6	2500.7	1307.0	560.3	123.1

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	93.8	123.7	178.5	314.4
1.0	35.3	46.5	67.1	118.2
1.5	14.0	18.5	26.7	47.0
2.0	4.8	6.3	9.1	16.1
2.5	1.0	1.3	1.8	3.3

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	79.3	104.6	150.8	265.7
2.0	25.7	33.9	48.9	86.1
3.0	8.0	10.5	15.2	26.8
4.0	1.5	2.0	2.9	5.1


ACTS LINK ATTENUATION PREDICTIONS
San Antonio, TX
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : SAN ANTONIO, TX

STATION HEIGHT IN kM = 0.241
STATION LATITUDE IN DEG. N. = 29.42
TERMINAL LONGITUDE IN DEG. W. = 98.50
ANTENNA ELEV. ANGLE = 55.66
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.52
SLANT PATH PROJECTION ON EARTH IN kM = 3.11
P0 IN % = 0.467
Rm IN mm/hr =13.702
SR = 0.745
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 0.984 %
MEAN ATTENUATION Am = 2.498 dB
STANDARD DEV. OF ATTENUATION = 1.074

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.379 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 0.984 %
MEAN ATTENUATION Am = 5.085 dB
STANDARD DEV. OF ATTENUATION = 1.035

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.275 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.7905	0.9273
2.00	0.5730	0.8037
3.00	0.4256	0.6841
4.00	0.3255	0.5825
5.00	0.2551	0.4986
6.00	0.2041	0.4296
7.00	0.1661	0.3728
8.00	0.1371	0.3255
9.00	0.1146	0.2860
10.00	0.0968	0.2527
15.00	0.0468	0.1456
20.00	0.0260	0.0914
25.00	0.0158	0.0609
30.00	0.0102	0.0425
40.00	0.0048	0.0227
50.00	0.0026	0.0134

LOCATION OF TERMINAL: SAN ANTONIO, TX

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 0.984 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.498 dB; @ 30 GHz: 5.085 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.074; @ 30 GHz: 1.035

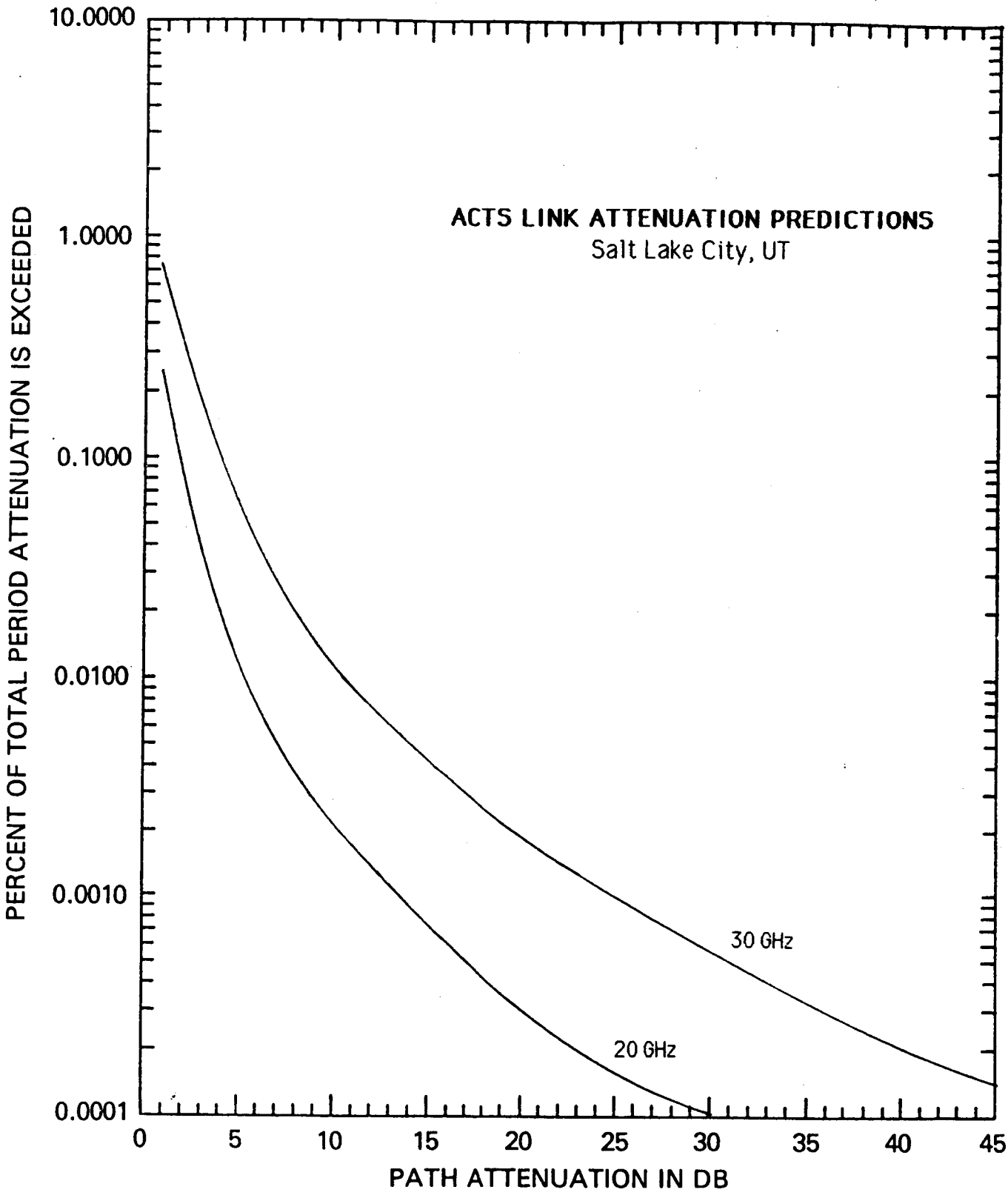
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	2238.6	1341.8	721.2	246.4	3598.2	2622.3	1712.2	765.7
1	2195.3	1306.3	696.9	235.6	3559.4	2578.3	1672.3	740.4
2	2152.8	1271.6	673.5	225.3	3521.0	2535.0	1633.4	716.0
3	2111.1	1237.9	650.8	215.4	3483.1	2492.4	1595.3	692.3
4	2070.2	1205.1	628.9	206.0	3445.5	2450.6	1558.1	669.5
5	2030.1	1173.2	607.7	196.9	3408.4	2409.4	1521.9	647.3
10	1841.0	1025.7	512.1	157.4	3228.6	2213.8	1352.7	547.3
15	1669.5	896.7	431.5	125.8	3058.3	2034.1	1202.3	462.7
20	1514.0	784.0	363.6	100.6	2896.9	1868.9	1068.7	391.2
30	1245.1	599.3	258.2	64.3	2599.4	1577.8	844.3	279.6
40	1023.9	458.1	183.3	41.1	2332.3	1332.0	667.0	199.8
50	842.1	350.2	130.2	26.2	2092.8	1124.5	527.0	142.8
60	692.5	267.7	92.4	16.8	1877.8	949.3	416.3	102.1
70	569.5	204.6	65.6	10.7	1684.9	801.4	328.9	73.0
80	468.3	156.4	46.6	6.8	1511.8	676.6	259.8	52.2
90	385.2	119.5	33.1	4.4	1356.5	571.2	205.3	37.3
100	316.8	91.4	23.5	2.8	1217.2	482.2	162.2	26.6

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	84.9	112.0	161.5	284.4
1.0	31.9	42.1	60.7	106.9
1.5	12.7	16.8	24.2	42.6
2.0	4.3	5.7	8.3	14.6
2.5	0.9	1.2	1.7	2.9

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	73.8	97.3	140.4	247.3
2.0	23.9	31.6	45.5	80.2
3.0	7.4	9.8	14.1	24.9
4.0	1.4	1.9	2.7	4.8


ACTS LINK ATTENUATION PREDICTIONS
Salt Lake City, UT
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB
30 GHz
20 GHz

LOCATION OF TERMINAL : SALT LAKE CITY, UT

STATION HEIGHT IN kM = 1.289
STATION LATITUDE IN DEG. N. = 40.75
TERMINAL LONGITUDE IN DEG. W. = 111.88
ANTENNA ELEV. ANGLE = 41.34
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 3.69
SLANT PATH PROJECTION ON EARTH IN kM = 2.77
P0 IN % = 3.292
Rm IN mm/hr = 0.630
SR = 1.233
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 3.704 %
MEAN ATTENUATION Am = 0.151 dB
STANDARD DEV. OF ATTENUATION = 1.298

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.474 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 3.704 %
MEAN ATTENUATION Am = 0.382 dB
STANDARD DEV. OF ATTENUATION = 1.207

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.343 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.2676	0.7872
2.00	0.0856	0.3149
3.00	0.0391	0.1622
4.00	0.0213	0.0955
5.00	0.0129	0.0612
6.00	0.0083	0.0416
7.00	0.0057	0.0295
8.00	0.0041	0.0217
9.00	0.0030	0.0163
10.00	0.0023	0.0126
15.00	0.0007	0.0044
20.00	0.0003	0.0019
25.00	0.0002	0.0010
30.00	0.0001	0.0006
40.00	0.0000	0.0002
50.00	0.0000	0.0001

LOCATION OF TERMINAL: SALT LAKE CITY, UT

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 3.704 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.151 dB; @ 30 GHz: 0.382 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.298; @ 30 GHz: 1.207

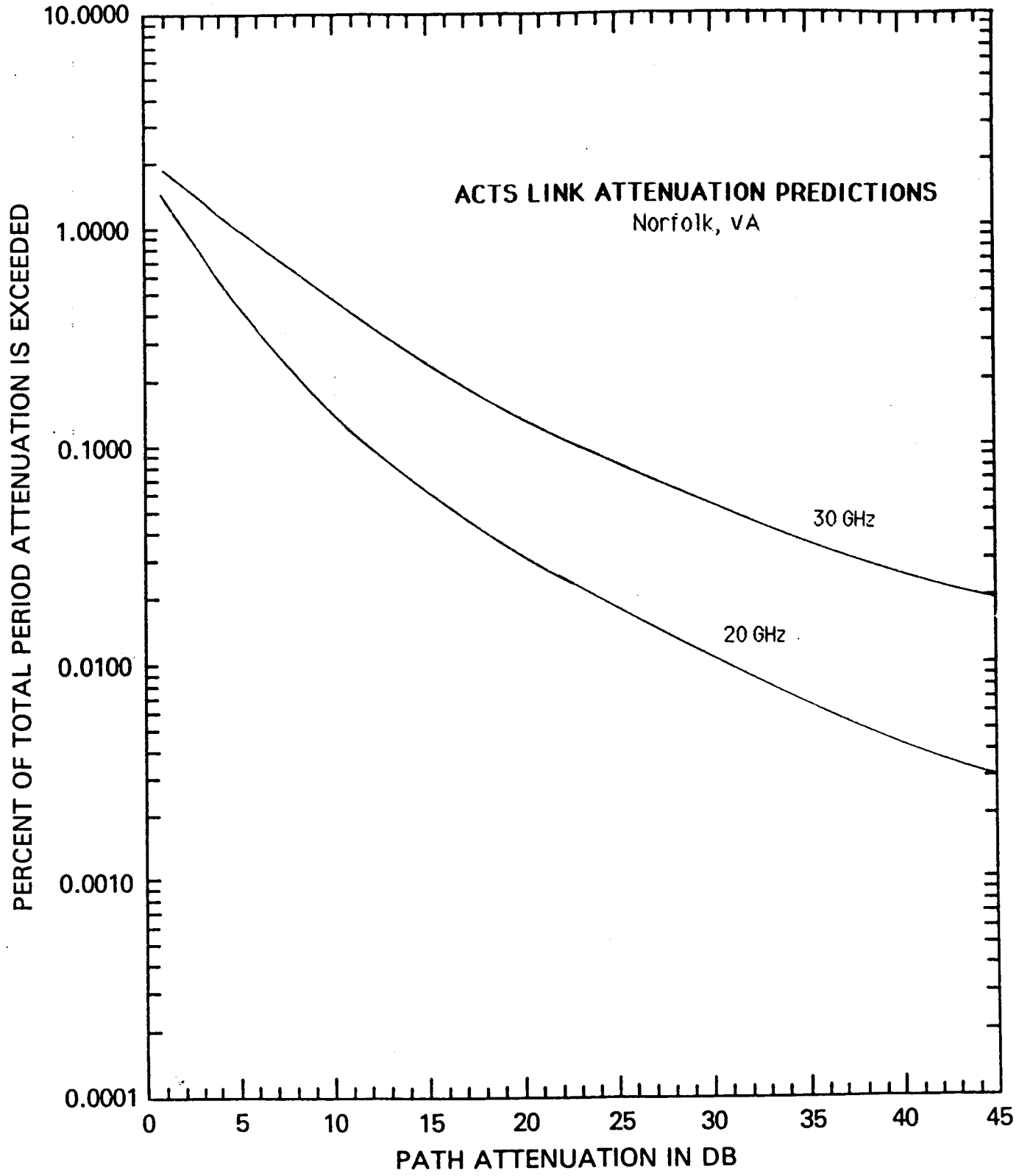
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	205.6	67.6	21.4	3.8	853.3	321.9	114.0	22.9
1	194.2	63.4	19.9	3.5	815.3	305.1	107.2	21.3
2	183.5	59.4	18.6	3.2	779.0	289.2	100.9	19.8
3	173.3	55.7	17.3	3.0	744.4	274.1	94.9	18.5
4	163.7	52.2	16.1	2.7	711.2	259.8	89.3	17.2
5	154.7	48.9	15.0	2.5	679.6	246.3	84.0	16.0
10	116.4	35.4	10.4	1.7	541.2	188.4	61.9	11.2
15	87.6	25.6	7.3	1.1	431.0	144.2	45.6	7.8
20	65.9	18.6	5.1	0.7	343.3	110.3	33.6	5.5
30	37.3	9.7	2.5	0.3	217.7	64.6	18.2	2.7
40	21.1	5.1	1.2	0.1	138.1	37.8	9.9	1.3
50	11.9	2.7	0.6	0.1	87.6	22.1	5.4	0.6
60	6.8	1.4	0.3	0.0	55.5	13.0	2.9	0.3
70	3.8	0.7	0.1	0.0	35.2	7.6	1.6	0.2
80	2.2	0.4	0.1	0.0	22.3	4.4	0.9	0.1
90	1.2	0.2	0.0	0.0	14.2	2.6	0.5	0.0
100	0.7	0.1	0.0	0.0	9.0	1.5	0.3	0.0

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	58.2	76.7	110.6	194.9
1.0	21.9	28.8	41.6	73.3
1.5	8.7	11.5	16.6	29.2
2.0	3.0	3.9	5.7	10.0
2.5	0.6	0.8	1.1	2.0

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	54.3	71.6	103.2	181.9
2.0	17.6	23.2	33.5	58.9
3.0	5.5	7.2	10.4	18.3
4.0	1.0	1.4	2.0	3.5


ACTS LINK ATTENUATION PREDICTIONS
Norfolk, VA
30 GHz
20 GHz
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : NORFOLK, VA

STATION HEIGHT IN KM = 0.006
STATION LATITUDE IN DEG. N. = 36.85
TERMINAL LONGITUDE IN DEG. W. = 76.28
ANTENNA ELEV. ANGLE = 40.52
LINK SLANT PATH LGTH. THRU RAIN REGION IN KM = 6.32
SLANT PATH PROJECTION ON EARTH IN KM = 4.81
P0 IN % = 1.093
Rm IN mm/hr = 8.694
SR = 0.802
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 2.099 %
MEAN ATTENUATION Am = 2.134 dB
STANDARD DEV. OF ATTENUATION = 1.023

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.481 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 2.099 %
MEAN ATTENUATION Am = 4.486 dB
STANDARD DEV. OF ATTENUATION = 0.974

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.349 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.6174	1.9690
2.00	1.1023	1.6714
3.00	0.7755	1.3854
4.00	0.5655	1.1476
5.00	0.4250	0.9563
6.00	0.3274	0.8032
7.00	0.2575	0.6800
8.00	0.2059	0.5801
9.00	0.1672	0.4984
10.00	0.1374	0.4310
15.00	0.0593	0.2261
20.00	0.0301	0.1312
25.00	0.0169	0.0818
30.00	0.0102	0.0537
40.00	0.0044	0.0260
50.00	0.0021	0.0140

LOCATION OF TERMINAL: NORFOLK, VA

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 2.099 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.134 dB; @ 30 GHz: 4.486 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.023; @ 30 GHz: 0.974

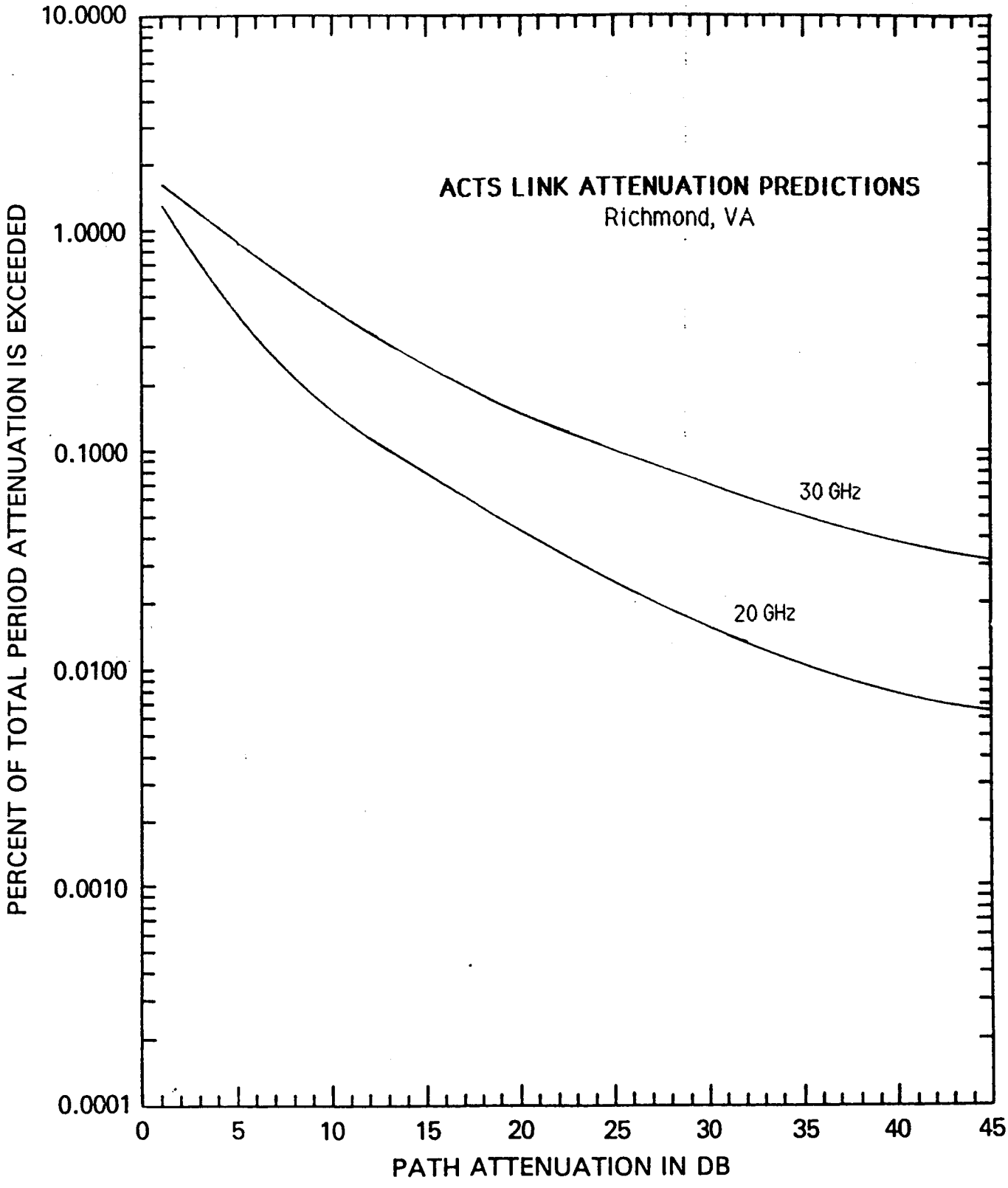
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz 3dB	5dB	8dB	15dB	30GHz 3dB	5dB	8dB	15dB
0	4078.6	2235.4	1083.2	312.0	7286.9	5030.0	3050.9	1189.2
1	3990.0	2169.4	1042.9	297.0	7200.5	4936.8	2972.5	1146.0
2	3903.3	2105.4	1004.1	282.7	7115.1	4845.3	2896.1	1104.4
3	3818.5	2043.3	966.7	269.1	7030.7	4755.5	2821.7	1064.4
4	3735.6	1983.0	930.7	256.2	6947.3	4667.3	2749.3	1025.7
5	3654.4	1924.5	896.1	243.9	6864.9	4580.8	2678.6	988.5
10	3274.4	1656.8	741.3	190.6	6467.3	4171.8	2351.8	821.7
15	2933.9	1426.4	613.2	149.0	6092.7	3799.2	2064.9	683.0
20	2628.7	1228.0	507.3	116.5	5739.9	3460.0	1813.0	567.7
30	2110.4	910.2	347.2	71.2	5094.3	2869.6	1397.6	392.2
40	1694.3	674.6	237.6	43.5	4521.3	2380.0	1077.3	271.0
50	1360.2	500.0	162.6	26.6	4012.8	1973.9	830.5	187.2
60	1092.0	370.6	111.3	16.2	3561.4	1637.1	640.2	129.4
70	876.7	274.7	76.1	9.9	3160.8	1357.8	493.5	89.4
80	703.8	203.6	52.1	6.1	2805.3	1126.1	380.4	61.8
90	565.0	150.9	35.7	3.7	2489.8	934.0	293.3	42.7
100	453.6	111.9	24.4	2.3	2209.7	774.6	226.1	29.5

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	93.7	123.5	178.1	313.8
1.0	35.2	46.4	67.0	118.0
1.5	14.0	18.5	26.7	47.0
2.0	4.8	6.3	9.1	16.1
2.5	1.0	1.3	1.8	3.2

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	83.2	109.7	158.3	278.8
2.0	27.0	35.6	51.3	90.4
3.0	8.4	11.1	15.9	28.1
4.0	1.6	2.1	3.0	5.4


ACTS LINK ATTENUATION PREDICTIONS
Richmond, VA
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : RICHMOND, VA

STATION HEIGHT IN kM = 0.049
STATION LATITUDE IN DEG. N. = 37.55
TERMINAL LONGITUDE IN DEG. W. = 77.45
ANTENNA ELEV. ANGLE = 40.48
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 6.15
SLANT PATH PROJECTION ON EARTH IN kM = 4.68
P0 IN % = 0.656
Rm IN mm/hr =15.384
SR = 0.686
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.629 %
MEAN ATTENUATION Am = 2.610 dB
STANDARD DEV. OF ATTENUATION = 1.053

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.482 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.629 %
MEAN ATTENUATION Am = 5.267 dB
STANDARD DEV. OF ATTENUATION = 1.019

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.349 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.3336	1.5448
2.00	0.9768	1.3502
3.00	0.7285	1.1558
4.00	0.5578	0.9877
5.00	0.4372	0.8475
6.00	0.3494	0.7315
7.00	0.2839	0.6353
8.00	0.2340	0.5551
9.00	0.1951	0.4878
10.00	0.1645	0.4309
15.00	0.0787	0.2478
20.00	0.0432	0.1550
25.00	0.0259	0.1029
30.00	0.0166	0.0714
40.00	0.0078	0.0379
50.00	0.0041	0.0221

LOCATION OF TERMINAL: RICHMOND, VA

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.629 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 2.610 dB; @ 30 GHz: 5.267 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.053; @ 30 GHz: 1.019

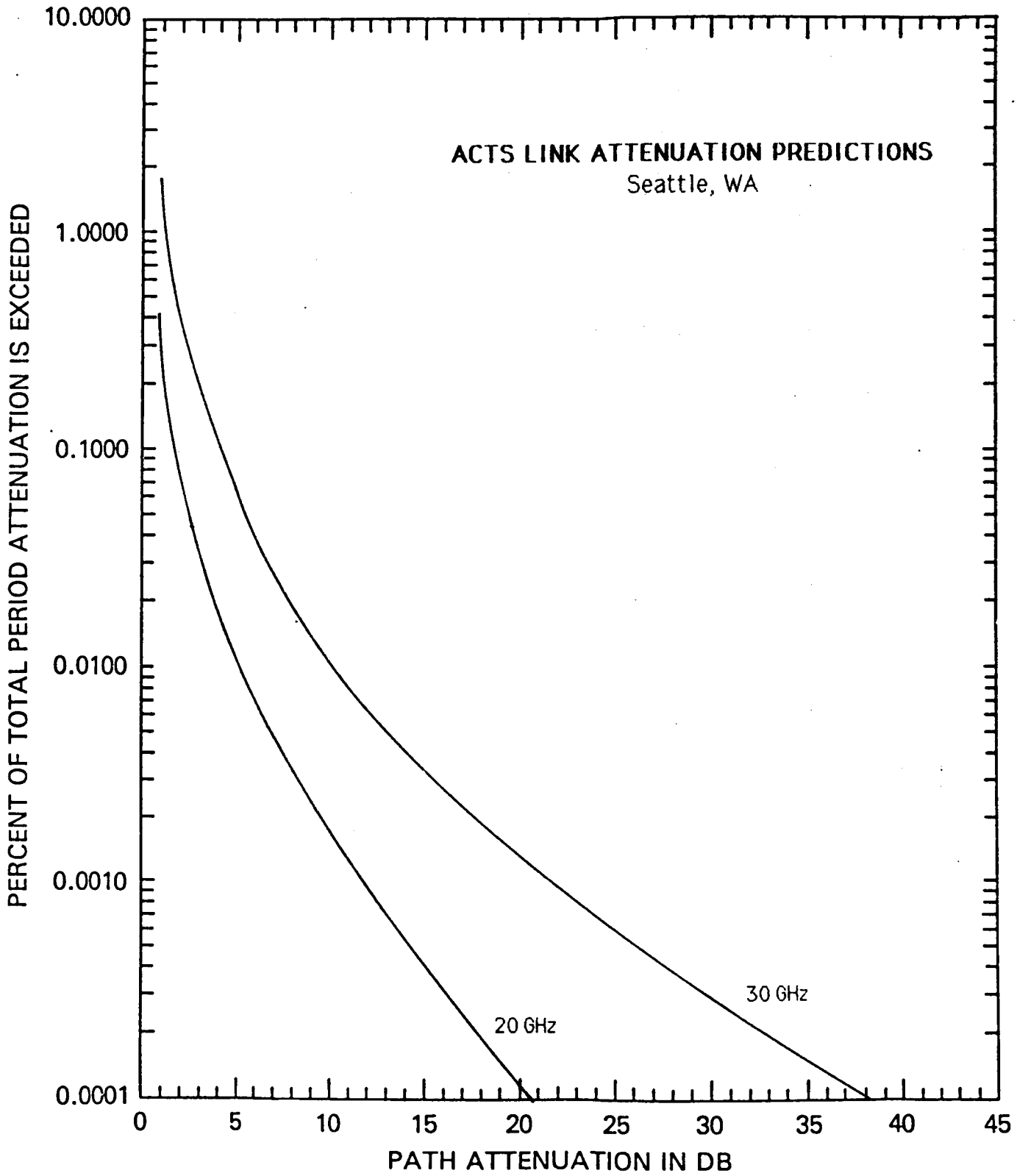
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	3831.9	2299.3	1230.6	414.2	6079.3	4457.6	2919.5	1303.4
1	3759.7	2239.4	1189.6	396.1	6016.5	4384.8	2852.8	1260.8
2	3688.9	2181.0	1149.9	378.8	5954.4	4313.2	2787.5	1219.5
3	3619.5	2124.2	1111.6	362.2	5892.9	4242.8	2723.7	1179.6
4	3551.3	2068.8	1074.5	346.4	5832.1	4173.5	2661.4	1141.0
5	3484.4	2014.9	1038.7	331.3	5771.9	4105.4	2600.6	1103.7
10	3168.5	1765.6	876.8	265.0	5480.1	3781.0	2316.5	934.6
15	2881.2	1547.2	740.1	212.0	5203.0	3482.2	2063.4	791.4
20	2620.0	1355.8	624.7	169.5	4940.0	3207.0	1838.0	670.1
30	2166.4	1041.1	445.1	108.5	4453.1	2720.2	1458.3	480.5
40	1791.4	799.5	317.1	69.4	4014.2	2307.3	1157.1	344.5
50	1481.3	613.9	225.9	44.4	3618.5	1957.1	918.1	247.0
60	1224.8	471.4	161.0	28.4	3261.9	1660.0	728.4	177.1
70	1012.8	362.0	114.7	18.2	2940.4	1408.0	578.0	127.0
80	837.5	278.0	81.7	11.6	2650.6	1194.3	458.6	91.1
90	692.5	213.5	58.2	7.4	2389.3	1013.0	363.8	65.3
100	572.6	163.9	41.5	4.8	2153.8	859.2	288.7	46.8

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	88.4	116.5	168.1	296.1
1.0	33.2	43.8	63.2	111.3
1.5	13.2	17.4	25.2	44.3
2.0	4.5	6.0	8.6	15.2
2.5	0.9	1.2	1.7	3.1

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	76.1	100.4	144.8	255.1
2.0	24.7	32.5	46.9	82.7
3.0	7.7	10.1	14.6	25.7
4.0	1.5	1.9	2.8	4.9


ACTS LINK ATTENUATION PREDICTIONS
Seattle, WA
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB
30 GHz
20 GHz

LOCATION OF TERMINAL : SEATTLE, WA

STATION HEIGHT IN kM = 0.004
STATION LATITUDE IN DEG. N. = 47.60
TERMINAL LONGITUDE IN DEG. W. = 122.33
ANTENNA ELEV. ANGLE = 31.17
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.87
SLANT PATH PROJECTION ON EARTH IN kM = 5.02
P0 IN % = 52.991
Rm IN mm/hr = 0.076
SR = 1.432
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 53.498 %
MEAN ATTENUATION Am = 0.031 dB
STANDARD DEV. OF ATTENUATION = 1.435

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.604 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 53.498 %
MEAN ATTENUATION Am = 0.090 dB
STANDARD DEV. OF ATTENUATION = 1.326

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.438 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	0.4028	1.8535
2.00	0.0954	0.5169
3.00	0.0372	0.2185
4.00	0.0182	0.1126
5.00	0.0102	0.0654
6.00	0.0062	0.0411
7.00	0.0041	0.0274
8.00	0.0028	0.0191
9.00	0.0020	0.0137
10.00	0.0015	0.0102
15.00	0.0004	0.0030
20.00	0.0002	0.0012
25.00	0.0001	0.0006
30.00	0.0000	0.0003
40.00	0.0000	0.0001
50.00	0.0000	0.0001

LOCATION OF TERMINAL: SEATTLE, WA

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 53.498 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 0.031 dB; @ 30 GHz: 0.090 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.435; @ 30 GHz: 1.326

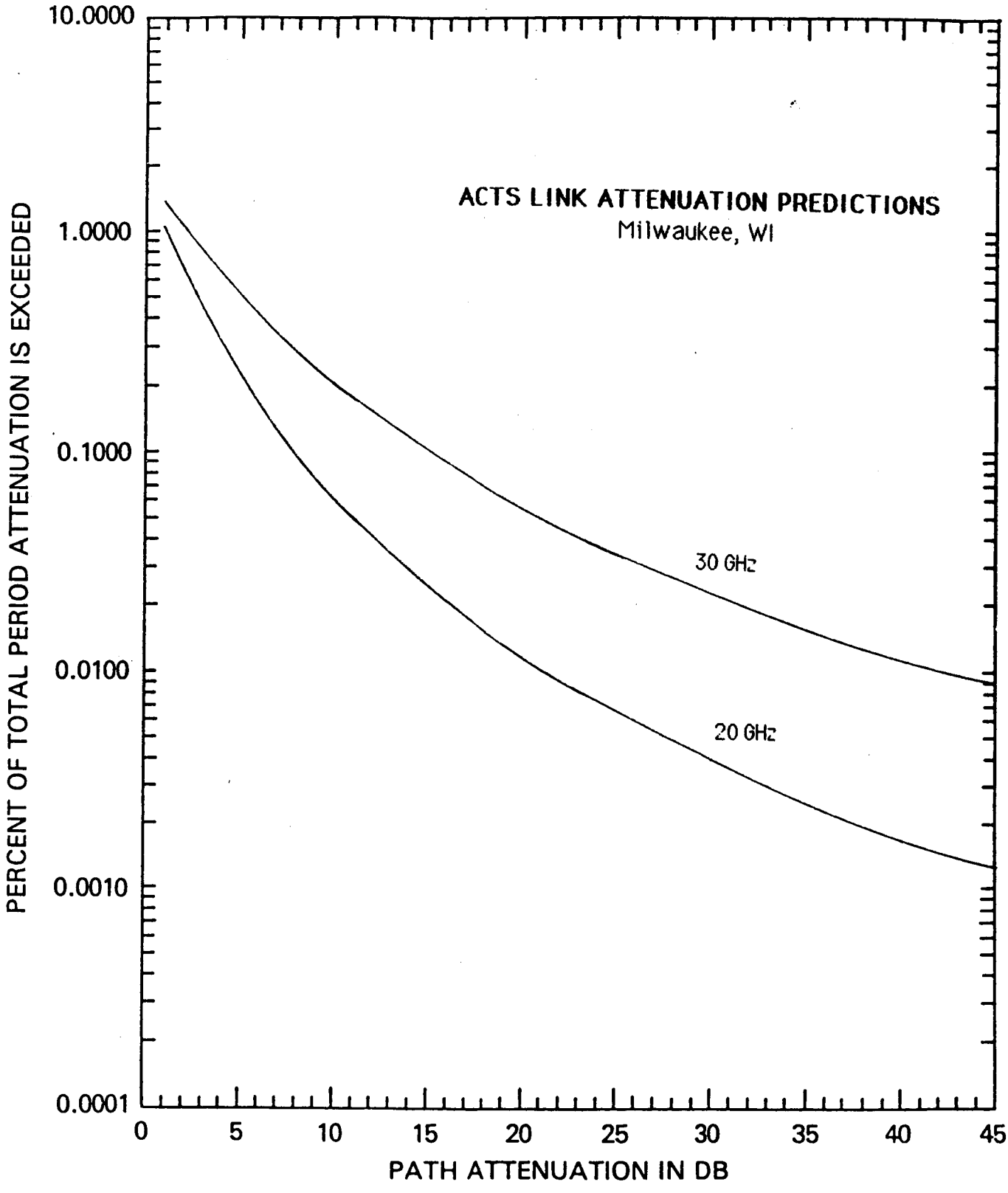
FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	195.5	53.6	14.7	2.2	1149.2	343.8	100.2	16.0
1	181.5	49.4	13.4	2.0	1078.4	320.1	92.7	14.7
2	168.4	45.5	12.3	1.8	1012.0	298.1	85.7	13.4
3	156.3	42.0	11.2	1.6	949.7	277.6	79.2	12.3
4	145.1	38.7	10.3	1.5	891.3	258.6	73.3	11.3
5	134.7	35.6	9.4	1.4	836.4	240.8	67.8	10.3
10	92.8	23.7	6.1	0.8	608.7	168.7	45.8	6.7
15	63.9	15.7	3.9	0.5	443.0	118.1	31.0	4.3
20	44.0	10.5	2.5	0.3	322.4	82.8	20.9	2.8
30	20.9	4.6	1.0	0.1	170.8	40.6	9.6	1.1
40	9.9	2.0	0.4	0.0	90.5	19.9	4.4	0.5
50	4.7	0.9	0.2	0.0	47.9	9.8	2.0	0.2
60	2.2	0.4	0.1	0.0	25.4	4.8	0.9	0.1
70	1.1	0.2	0.0	0.0	13.4	2.4	0.4	0.0
80	0.5	0.1	0.0	0.0	7.1	1.2	0.2	0.0
90	0.2	0.0	0.0	0.0	3.8	0.6	0.1	0.0
100	0.1	0.0	0.0	0.0	2.0	0.3	0.0	0.0

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
0.5	47.6	62.8	90.5	159.5
1.0	17.9	23.6	34.0	59.9
1.5	7.1	9.4	13.5	23.9
2.0	2.4	3.2	4.6	8.2
2.5	0.5	0.6	0.9	1.7

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS 99.999%	99.99%	99.9%	99%
1.0	45.0	59.3	85.5	150.6
2.0	14.6	19.2	27.7	48.8
3.0	4.5	6.0	8.6	15.2
4.0	0.9	1.1	1.6	2.9


ACTS LINK ATTENUATION PREDICTIONS
Milwaukee, WI
30 GHz
20 GHz
PERCENT OF TOTAL PERIOD ATTENUATION IS EXCEEDED
10.0000
1.0000
0.1000
0.0100
0.0010
0.0001
0
5
10
15
20
25
30
35
40
45
PATH ATTENUATION IN DB

LOCATION OF TERMINAL : MILWAUKEE, WI

STATION HEIGHT IN kM = 0.195
STATION LATITUDE IN DEG. N. = 43.03
TERMINAL LONGITUDE IN DEG. W. = 87.92
ANTENNA ELEV. ANGLE = 38.88
LINK SLANT PATH LGTH. THRU RAIN REGION IN kM = 5.26
SLANT PATH PROJECTION ON EARTH IN kM = 4.09
P0 IN % = 0.856
Rm IN mm/hr = 7.363
SR = 0.840
POLARIZATION ANGLE IN DEGREES = 45.0

LOG-NORMAL ATTENUATION STATISTICS FOR 20 GHz DOWNLINK:

PROBABILITY OF ATTENUATION PL = 1.653 %
MEAN ATTENUATION Am = 1.435 dB
STANDARD DEV. OF ATTENUATION = 1.083

ATMOSPHERIC MOLECULAR ABSORPTION FOR 20 GHz LINK = 0.498 dB

LOG-NORMAL ATTENUATION STATISTICS FOR 30 GHz UPLINK:

PROBABILITY OF ATTENUATION PL = 1.653 %
MEAN ATTENUATION Am = 3.053 dB
STANDARD DEV. OF ATTENUATION = 1.033

ATMOSPHERIC MOLECULAR ABSORPTION FOR 30 GHz LINK = 0.361 dB

ATTENUATION (dB)	PROBABILITY OF ATTENUATION BEING EXCEEDED (% OF YEAR)	
	20 GHz DOWNLINK	30 GHz UPLINK
1.00	1.0423	1.4215
2.00	0.6274	1.0890
3.00	0.4098	0.8376
4.00	0.2842	0.6559
5.00	0.2058	0.5231
6.00	0.1541	0.4241
7.00	0.1185	0.3486
8.00	0.0931	0.2902
9.00	0.0744	0.2441
10.00	0.0604	0.2073
15.00	0.0250	0.1019
20.00	0.0124	0.0569
25.00	0.0069	0.0346
30.00	0.0041	0.0223
40.00	0.0018	0.0106
50.00	0.0009	0.0056

LOCATION OF TERMINAL: MILWAUKEE, WI

PROBABILITY OF ATTENUATION ON AN ACTS LINK AT THIS LOCATION: 1.653 %
MEAN ATTENUATION ON AN ACTS LINK; @ 20 GHz: 1.435 dB; @ 30 GHz: 3.053 dB
STNDRD. DEVIATION OF ATTENUATION; @ 20 GHz: 1.083; @ 30 GHz: 1.033

FADE DURATION (Minutes)	TOTAL FADING TIME (IN MINUTES) ACROSS FADE DEPTHS 20GHz				30GHz			
	3dB	5dB	8dB	15dB	3dB	5dB	8dB	15dB
0	2155.5	1082.6	489.5	131.4	4405.5	2751.5	1526.2	536.2
1	2097.1	1044.9	468.7	124.5	4331.5	2685.8	1478.7	513.9
2	2040.4	1008.5	448.9	117.9	4258.8	2621.6	1432.6	492.5
3	1985.2	973.4	429.9	111.7	4187.4	2558.9	1388.0	472.1
4	1931.4	939.5	411.7	105.8	4117.1	2497.8	1344.8	452.5
5	1879.1	906.8	394.2	100.2	4048.0	2438.1	1302.9	433.7
10	1638.2	759.5	317.5	76.4	3719.5	2160.4	1112.3	350.7
15	1428.2	636.1	255.7	58.3	3417.7	1914.4	949.5	283.7
20	1245.1	532.8	206.0	44.4	3140.3	1696.3	810.6	229.5
30	946.3	373.7	133.6	25.8	2651.3	1331.9	590.8	150.1
40	719.2	262.2	86.7	15.0	2238.5	1045.8	430.5	98.2
50	546.7	183.9	56.2	8.7	1889.9	821.1	313.8	64.2
60	415.5	129.0	36.5	5.1	1595.6	644.7	228.7	42.0
70	315.8	90.5	23.7	3.0	1347.2	506.2	166.7	27.5
80	240.0	63.5	15.4	1.7	1137.4	397.5	121.5	18.0
90	182.4	44.5	10.0	1.0	960.3	312.1	88.5	11.8
100	138.6	31.2	6.5	0.6	810.8	245.1	64.5	7.7

FADE CONTROL ON 20 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 3 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
0.5	83.5	110.1	158.8	279.8
1.0	31.4	41.4	59.7	105.2
1.5	12.5	16.5	23.8	41.9
2.0	4.3	5.6	8.1	14.3
2.5	0.9	1.1	1.6	2.9

FADE CONTROL ON 30 GHz LINK

IF ATTENUATION LEVEL (IN dB) IS	THEN MAXIMUM TIME (IN SECONDS) TO IMPLEMENT CONTROL WITH 5 dB THRESHOLD AT GIVEN AVAILABILITY IS			
	99.999%	99.99%	99.9%	99%
1.0	74.0	97.6	140.8	248.1
2.0	24.0	31.6	45.6	80.4
3.0	7.5	9.8	14.2	25.0
4.0	1.4	1.9	2.7	4.8

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16. Abstract

This document presents rain attenuation propagation data for 68 cities within the coverage area of the multiple beam and steerable antennas of the Advanced Communications Technology Satellite (ACTS). This propagation data provides the necessary data base for purposes of communication link power budgeting and rain attenuation mitigation controller design. These propagation parameters are derived by applying the ACTS Rain Attenuation Prediction Model to these 68 locations that have links established with the ACTS spacecraft, which is placed at 100° west longitude in geostationary orbit operating at frequencies of 20 GHz (downlink) and 30 GHz (uplink). The propagation parameters enumerated in tabular form for each location are as follows: physical description of the link and location (e.g., latitude, longitude, antenna elevation angle, etc.), link availability versus attenuation margin (this is also given in graphical form), fading time across fade depths of 3, 5, 8, and 15 dB versus fade duration, and required fade control response time for controller availabilities of 99.999, 99.99, 99.9, and 99 percent versus sub-threshold attenuation levels. The data for these specific locations can be taken to be representative of regions near these locations. However, in the spirit of the flexibility afforded by the use of the ACTS Rain Attenuation Prediction Model and for those geographical positions that are not represented by the 68 locations given here, the above mentioned attenuation model will be available in computer software form that is capable of differentiating rain attenuation statistics to within 0.5° accuracy (≈30.0 mi.) in latitude and longitude within the continental United States. For more information on this, write to COSMIC, NASA Software for Industry, The University of Georgia, Athens, GA 30602.

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