Clearance To Fresnel Zone Ratio Analysis

Clearance To Fresnel Zone (C/F) ratios provide a general analysis of possible reflection problems at critical points along the path profile. The C/F analysis helps derive optimum antenna heights. Basically, odd Fresnel zone numbers produce reflections along the path which are additive in signal while even numbered Fresnel zone clearances produces cancellation of the main beam signal by the reflected signal. (See Engineering Considerations for Microwave Communications Systems" for greater detail).

To use the table of Clearance To Fresnel Zone ratios and the attached chart: (chart to be added to Help. If you require this chart, request a fax copy from Micropath.)

1. Note that the clearance column of the Clearance Ratio Analysis table is the clearance of the antenna centerline to the elevation including earth curvature. The first Fresnel zone radius is stated in the first Fresnel Ht. column. The last column is the ratio between clearance and the first (F=1) Fresnel zone radius.

2. Look at the path profile and antenna requirements table and determine the critical point(s).

3. Look on the Clearance Ratio Analysis at the critical point numbers) for the C/F ratio column. The C/F ratio obtained from this column is compared to the C/F ratio along the bottom horizontal axis of the chart.

4. Compare this ratio to the Fresnel zone numbers on the top of the chart (or the square root of even numbers above 6). If the clearance ratio matches the square root of even Fresnel zones, there could be cancellation of signals due to reflection from the critical point. One would raise or lower one or both antennas and re-compute the ratio at the critical point.

5. For the Clearance Ratio Analysis to be valid, antenna heights should be included when computing C/F.

6. For determining antenna heights, normally run the Clearance Ratio Analysis program with K = 1 with your antenna heights meeting your strictest clearance requirements (Example: K=0.5, F=0 or K=2/3, F=0.3) and check to see that the ratio at the critical points(s) is not the square root of an even numbered Fresnel zone.

7. For space diversity systems, run the analysis for the lower antenna using K=4/3 and check if the antenna height avoids even numbered Fresnel zones at the critical point(s).

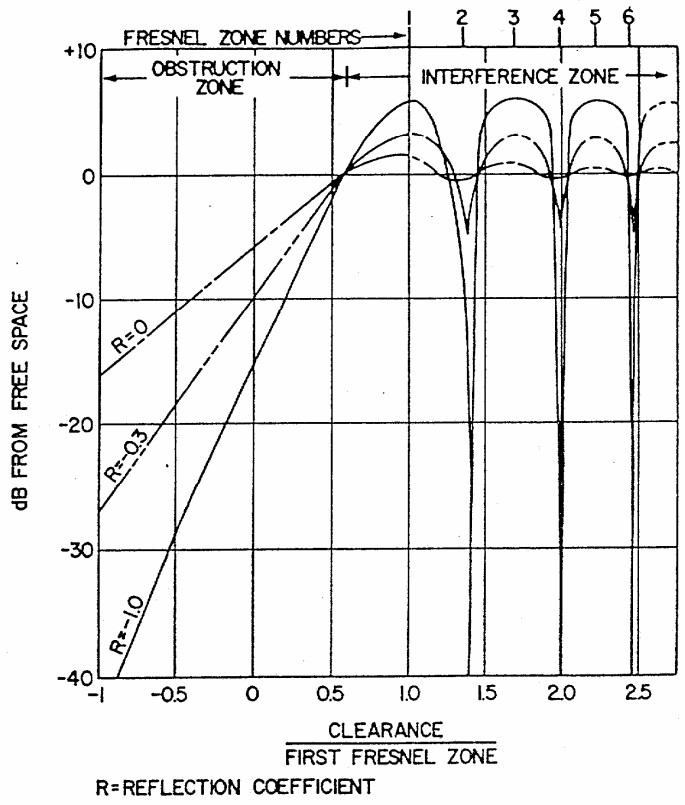

Figure 7-15

Multiplying Factor For Determining F_n when F_1 is Known. ($F_n = F_1 \sqrt{n}$)

n	$\sqrt{n}$	n	$\sqrt{n}$	n	$\sqrt{n}$	n	$\sqrt{n}$	n	$\sqrt{n}$
1	1.000	16	4.000	31	5.568	46	6.782	61	7.810
2	1.414	17	4.123	32	5.657	47	6.856	62	7.874
3	1.732	18	4.243	33	5.745	48	6.928	63	7.937
4	2.000	19	4.359	34	5.831	49	7.000	64	8.000
5	2.236	20	4.472	35	5.916	50	7.071	65	8.062
6	2.449	21	4.583	36	6.000	51	7.141		
7	2.646	22	4.690	37	6.083	52	7.211		
8	2.828	23	4.796	38	6.164	53	7.280		
9	3.000	24	4.899	39	6.245	54	7.348		
10	3.162	25	5.000	40	6.325	55	7.416		
11	3.317	26	5.099	41	6.403	56	7.483		
12	3.464	27	5.196	42	6.481	57	7.550		
13	3.606	28	5.291	43	6.557	58	7.616		
14	3.742	29	5.385	44	6.633	59	7.681		
15	3.873	30	5.477	45	6.708	60	7.746		

Figure 7-13

Rocky Mtn. Communications, Inc.
12844 W. Iliff Avenue
Lakewood, Colorado 80228

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* Clearance Ratio Analysis *
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04-21-1989
12:15:23

WHT
40-48-08.0N
074-14-48.0W

- To -

Bolling Green
41-00-32.0N
074-32-27.0W

20.990 Miles

K = 1.00 F = .6 Freq: 2000 MHz File Name: WHT-BOW.03S

Point #	Distance (Miles)	Elevation	Earth Curvature	(C) Clearance	(F) First Fresnel	C/F Ratio
1	0.000	620 + 150	0	0.00	0.00	0.00
2	0.040	636	1	134.36	6.11	21.98
3	0.080	644	1	127.73	8.64	14.79
4	0.120	646	2	126.09	10.57	11.93
5	0.160	622	2	151.45	12.19	12.43
6	0.200	600	3	173.81	13.61	12.77
7	0.240	583	3	192.18	14.90	12.90
8	0.280	569	4	206.54	16.08	12.85
9	0.320	553	4	223.90	17.17	13.04
10	0.360	530	5	247.26	18.20	13.59
11	0.400	523	5	255.63	19.16	13.34
12	0.440	508	6	270.99	20.08	13.50
13	0.480	504	7	275.35	20.95	13.14
14	0.520	495	7	285.71	21.78	13.12
15	0.560	480	8	301.08	22.58	13.33
16	0.600	471	8	311.44	23.35	13.34
17	0.640	454	9	328.80	24.10	13.65
18	0.680	444	9	340.16	24.81	13.71
19	0.720	435	10	349.53	25.51	13.70
20	0.760	426	10	359.89	26.18	13.75
21	0.800	415	11	371.25	26.83	13.84
22	0.840	408	11	379.61	27.47	13.82
23	0.880	405	12	382.98	28.09	13.64
24	0.920	405	12	384.34	28.69	13.40
25	0.960	407	13	382.70	29.28	13.07
26	1.000	414	13	377.06	29.85	12.63
27	1.040	424	14	367.43	30.41	12.08
28	1.080	437	14	355.79	30.96	11.49
29	1.120	446	15	347.15	31.50	11.02
30	1.160	458	15	336.51	32.02	10.51
31	1.200	469	16	325.88	32.54	10.02
32	1.240	476	16	320.24	33.04	9.69
33	1.280	488	17	308.60	33.54	9.20
34	1.320	495	17	302.96	34.02	8.91
35	1.360	506	18	292.33	34.50	8.47
36	1.400	531	18	268.69	34.97	7.68
37	1.440	549	19	251.05	35.43	7.09
38	1.480	568 + 100	19	133.41	35.88	3.72
39	1.520	579	20	222.78	36.32	6.13
40	1.560	587	20	216.14	36.76	5.88