Referring to Table 2, we believe these sites represent a good mixture of real world scenarios because:

1. Five of the six sites (7, 1, 1A, 10A, and 3) are within 1 mile of the Northpoint transmitter. Three are within quarter of a mile (1, 1A, 10A)
2. Five of the six sites (1, 1A, 10A, 3, and 7) are among all the sites tested and exhibited highest signal strength from Northpoint transmitter.
3. Two of the sites (1 and 1A) are among the sites that exhibited substantially larger received power as measured compared to the calculated LOS power -- suggesting presence of additional propagation phenomena.
4. Four out of six sites (7, 10A, 3, and 19) are within the 3-dB beamwidth of the Northpoint transmitting antenna beam pattern.
5. Two of the six sites (3 and 19) are located such that Northpoint transmitter relative azimuth is close to the highest side lobe gain of the DBS antenna [11]. Relative azimuth of 180-degree occurs when DBS antenna is pointing away from the Northpoint transmitter.

Data Analysis Algorithm:

Our first objective is to see if the gathered data presents sufficient evidence to indicate that the DBS mean Eb/(No+Io) is less with the Northpoint transmitter turned ON. Secondly, we want to quantify this difference, if any, so that we can generalize the outcome to assess its impact on DBS performance and make comments concerning other untested scenarios.

To accomplish these two objectives we resort to the following statistical analysis procedure:

1. We examine the distribution of gathered data for each site and each event, Tx OFF and Tx ON. Approximately normal distribution shape is expected for an experiment of this nature.
2. We take two equal size array of data form each site and measured event, Tx OFF and Tx ON:

$$Y_1 = [\, y_{11} \ldots y_{1n} \,]$$

$$Y_2 = [\, y_{21} \ldots y_{2n} \,]$$

Where n>100.

[11] Reference DirecTV presentation of 2 March 99 filing to the FCC in the NPRM, page 10.

3. We form an array containing the difference of each paired sample sets[12]:

$$D = [\, d_1 \ldots d_n]$$

4. We calculate the mean d_{mean} and variance s_d^2 for the elements of this array.

$$d_{mean} = (\Sigma\, d_i)/n$$
$$s_d^2 = (\Sigma\, (d_i - d_{mean})^2)/(n-1)$$

5. We then test the hypothesis for the expected difference being zero. Specifically, we are concerned with detecting whether the ON period Eb/(No+Io) is less than the OFF period Eb/(No+Io). At first glance it would seem that there is a difference between the population means, we would like to check this conjecture with a statistical test outlined below. The proper analysis of the paired data would utilize the difference array to test the hypothesis that the average difference is equal to zero, a statement which is equivalent to:

$$H_o : \mu_d = 0$$

6. We will use a paired-set statistical test and the rejection region for the test will be located in the upper tail of the t-distribution.
7. Referring to standard tables[13] for t-distribution, we find the critical value of t. We use alpha=.025[14] for given data set degree of freedom, df. Note that for our large data sets the degree of freedom is approximately equal to the

[12] A t-test for two sets with unequal variance also yielded approximately the same results. However, it is not peculiar for the two-set unequal variance test to fail if a binomial paired test is the only appropriate test.
[13] Table of Percentage Points of the t-Distribution, Computed by Maxine Merington, Biometrika, Vol. 32, p300.
[14] For a two-tailed t statistic this means that 99.5% of the time we will make the right decision about the outcome.

aggregate number of data samples. Since this is larger than 100 [15] for each of the six sites, we can use $t_{0.025} = 1.960$ as the critical value for t from the table.

8. We calculate the value of test statistics, t, for each site:

$$t = d_{mean} / (\sqrt{s_d^2/n})$$

9. And compare calculated t with the critical value obtained above. If it does fall in the rejection region, i. e. greater than the critical value, we will conclude, with a 0.05 level of significance, that there is a reduction of mean of Eb/(No+Io). Otherwise we conclude the opposite if the calculated t is below the critical value.

10. If the above hypothesis is rejected, then we calculate the estimate of difference and the 95% confidence margin.

$$E(y1i-y2i) = d_{mean} +/- 1.96\sqrt{(s_d^2/n)}$$

Before proceeding with the analysis of the data, it is necessary to qualify some assumptions inherent with this algorithm -- "Moderate" departure from normal distribution for the test sample populations do not seriously affect the distribution of the test statistics and the confidence coefficient for the corresponding interval. However, it is essential to maintain a minimum variance in the measurements of the quality characteristics of a process. Measuring instruments must provide unbiased readings with relatively small error of measurement. Although bias can be corrected[16], the precision of the instrument is usually a function of instrument design, and can therefore not be corrected. Variance is fundamental to procedures for making inferences about population means. As will be discussed later, we take special precautions in our interpretation of the results so as to prevent any error due to a suspiciously large variance.

Data Analysis Results:

Figure 2 shows distribution of data for all six sites. We observe that the distribution for site #19 is excessively broad (Tx ON condition). We believe this

[15] A degree of freedom greater than 30 is considered reasonably large for statistical accuracy of this test.

[16] We randomized the order in which we took the measurements (ON/OFF, OFF/ON, OFF/ON/OFF as well as time of the measurement) for this purpose.

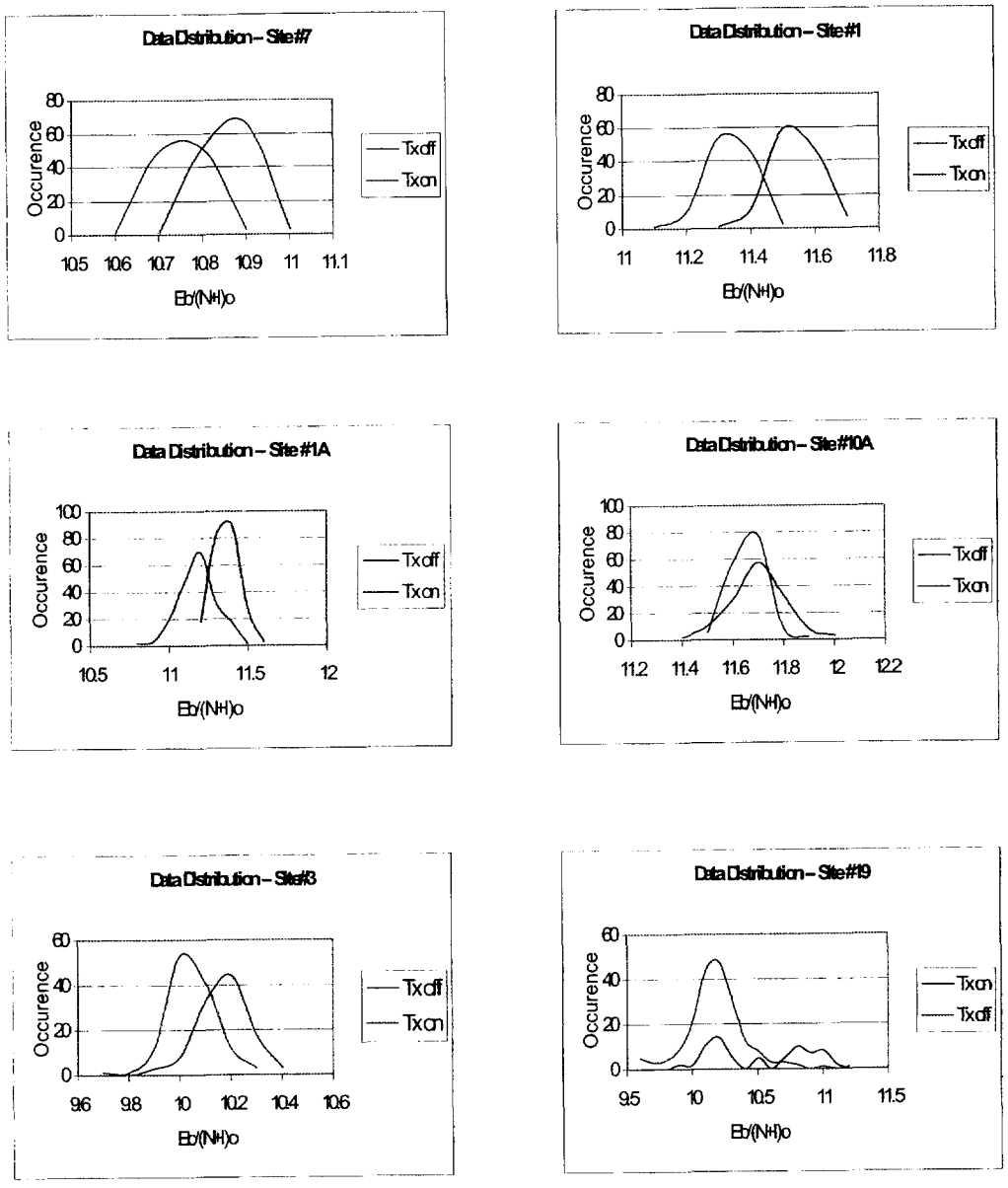


Figure 2: Distribution of test data for the six sites

10/22/99

anomaly is not caused by Northpoint interference, there is enough evidence to support this conclusion:

1. This site is considerably far from the transmitter, and the Northpoint signal intensity is the lowest for this site among all the tested sites(-123 dBm/MHz as seen from Table 1).
2. The received power difference far exceeds the compensating difference in the DBS antenna side-lobe gain[17].
3. There was no other report such as loss of sync or other receiver problems.
4. Double humped shape in the distribution of measured data is generally caused by inconsistent data due to intermittent setup.
5. Most importantly, the distribution mean suggests that the mean difference is negative, this is not meaningful since it implies DBS reception gets better when Northpoint signal is ON.

We believe these reasons are sufficient to pronounce this set of data as simply bad data and exclude it from further analysis.

Table 3: Data Analysis Summary

Site #	Distance from TX Km	d_m (dB)	Variance s^2	t	95% Confidence Interval (+/-)
7	1.38	0.098558	0.003589	16.7	0.011514
1	0.17	0.209469	0.010460	21.7	0.018858
1A	0.29	0.177732	0.021175	17.0	0.020477
10A	0.42	0.036099	0.015508	03.4	0.020555
3	1.14	0.119167	0.019359	8.9	0.026241

We will now examine the result of data analysis and make the following observations:

1. Considering our critical value for t, 1.96 for 95% confidence interval, we note that the case for site #10A is not very strong. Note also that the interval is quite wide (+/-0.020555), considering the small difference between the sample means (0.036099). This simply indicates that the estimate for this particular set of data is not accurate enough.

[17] +6 dB side lobe difference vs -15 dB power difference, compared to the closest site at the River Place.

2. A second glance at the mean difference for site 10A reveals a marked inconsistency with the general and expected trend of results for increasing distance (see the order 1>1A >10A >3 >7).

3. Due to the above uncertainties, it is reasonable to discard the result for 10A. if we do so, then there is a logical correspondence between the distance from Northpoint transmitter and the mean difference.

4. The above finding is quite interesting since it suggests that there is little evidence to indicate that other propagation phenomena such as diffused and multipath reflections will have an important effect on Northpoint interference to DBS. We make this conclusion because the sites under consideration had profoundly different characteristics with respect to their immediate surroundings.

5. Our statistical calculation suggests that the interference from Northpoint test transmitter to the DBS consumer located at the site #1, which was only 0.17 Km away from NP experimental transmitter, will not exceed 0.23 dB on average with 95% confidence[18].

6. The above level of interference is insignificant considering the DBS clear air margin of 6 to 7 dB[19] with nominal received Eb/No of 11.6 dB, the equivalent Eb/Io would be 24 dB[20].

Conclusion:

We have provided a straightforward methodology and procedure for precise characterization of Northpoint small interference to DBS services. This technique was used to analyze six cases of field measurements in Washington DC with various distances, all less than one Km, from Northpoint experimental transmitter. Our analysis shows that for test receiver at a distance of 0.17 Km from Northpoint experimental transmitter, measured degradation of received Eb/No is less than 0.23 dB with 95% confidence. Further, This reduction corresponds to a C/I of 24 dB under the test conditions. For general applicability, these figures can be scaled to other link conditions in conjunction with the DBS link budget and interpreted with respect to the link availability in terms of

[18] Reference Table 3, (0.209469+0.018858).
[19] Link margin reported by the test receiver was nominally 6.8 dB. Eb/No for QPSK modulation with ¾ inner code concatenated with Reed-Solomon RS(294, 188, 8) is about 5.5 dB for Quasi Error Free (QEF) operation.
[20] Output error measurement data indicated virtually no error (default value of 10^-25).

percentage of time and places. It is our opinion that for this level of interference the impact on the DBS services is negligible in all weather conditions. It should also be noted that there is no evidence in the analysis results to indicate that other propagation phenomena such as diffused and multipath reflections will have an important effect on Northpoint interference to DBS. We make this conclusion because the sites under consideration had profoundly different characteristics with respect to their immediate surroundings yet the analysis result did not indicate this to be a difference.

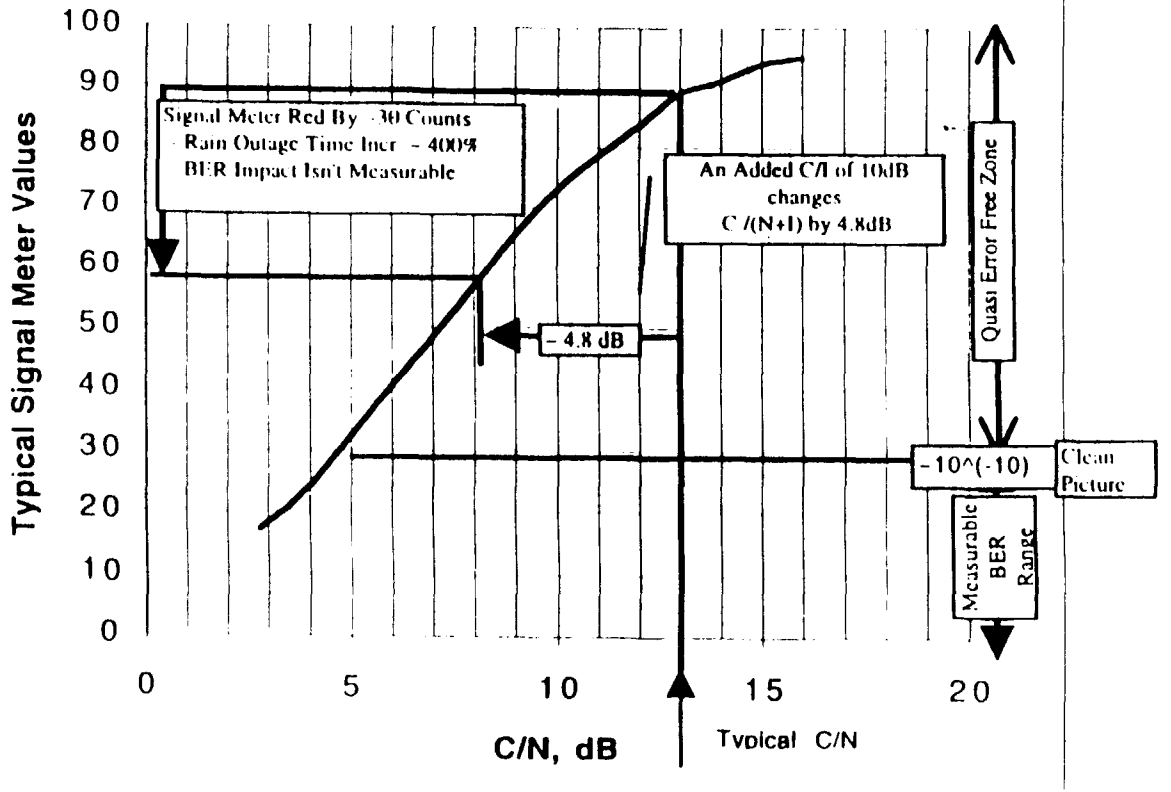
Acknowledgment:

This project provided an opportunity to work with Northpoint technical staff and Broadwave USA management during their tests which were performed in the months of August and September of 1999 in Washington DC. We observed desire to use due diligence in safeguarding the DBS customers. At the same time, we found them to have incomparable passion for bringing innovative alternatives to the consumer.

Finally, we would like to thank Northpoint, D.C. Engineering staff and Dr. Darrell Word for their support in providing background information and performing field measurements to provide data for this analysis.

EXHIBIT G

Generic Digital DBS System

DIRECTV.

Significant Rain Outage Time degradation
Is Best Measured By Change In Signal Meter (not BER)