

Analysis of 31.4GHz Atmospheric Noise Temperature Measurements

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The atmospheric noise temperature at 31.4GHz was measured at NASA's Deep Space Communications Complex at Madrid (MDSCC) from September 1990 to December 1996 excluding February 1991 and May 1992. This data is used to obtain the cumulative distribution for the atmospheric noise temperature at 30 degrees elevation for each month. Based on these, for each month the percentage weather and its associated atmospheric noise temperature for which maximum data return is attained is calculated. It is determined that by designing the link for the optimum weather percentage for each month the link achieves 73% of the upper limit of the total data return volume. Furthermore, if the link is designed for the fixed atmospheric noise temperature of 33K for all months, the link can achieve 69% of the upper limit of the total data return volume. Finally, this data was used to compare the data return volume of a deep space X-Band link designed for 90% weather at 34m BWG station at Madrid to the data return volume of a deep space Ka-Band link designed 33K atmospheric noise temperature (81% weather). It was calculated that the Ka-Band link returns 4.25dB more data than the X-Band link.