
Environmental Performance Test Report

Wireless Laser Communication
Performance under Adverse Weather
Conditions

Performance under Adverse Weather Conditions

This is a brief summary of current environmental testing done to date with the 4000 meter 155 Mbps OC-3 SkySeries 800 infrared laser link. The purpose of these tests is to evaluate operation under conditions ranging from moderate to severe weather extremes, show effects at different link distances, and evaluate acceptability of rated maximum link distance which for the tested product is 4,000 meters.

As is the case with almost all environmental and stress tests, conditions created during these tests include extreme limits of what might be encountered under meteorological conditions, and definitely do not imply an inability to operate properly in most climates on the planet.

As observed in earlier long-term field tests that included air temperatures above 100°F plus solar loading, satisfactory operation was obtained at temperatures of 65°C (150°F). More recent tests were conducted regarding performance in under adverse rain and snow conditions. Fog tests will be conducted as soon as the proper facility has been constructed. A comprehensive report will be prepared once tests have been completed.

It is normal to expect that performance of any wireless technology, including infrared laser, would be affected by weather. Weather introduces signal attenuation in a wireless link path, and signal strength is reduced incrementally along the link distance. Allowable link length for infrared laser is a function of the integration of weather- based attenuation at each point along the link path. Allowable link distance depends not only on weather intensity, but also on weather depth.

Weather Intensity

Weather intensity is the quantitative amount of rainfall, snowfall or fog. In these tests rainfall was created and measured at intensities of 2 inches/hour, 5 inches/hour and 9.5 inches/hour. Snowfall was created and measured at 5.8 inches/hour, 10 inches/hour, and 23.3 inches/hour. There are only a handful of locations on the planet where rainfall in excess of 9 inches/hour occur with reasonable frequency. Rainfall of 6 inches/hour is more commonly found, but still rare. Snowfall measured in feet per hour are similarly rare. Extreme weather is seldom uniform over wide areas, such as a multi-kilometer link. Very heavy rain normally is seen in localized shower bursts. Heavy snow often consists of localized heavy falls and drifting.

Weather Depth

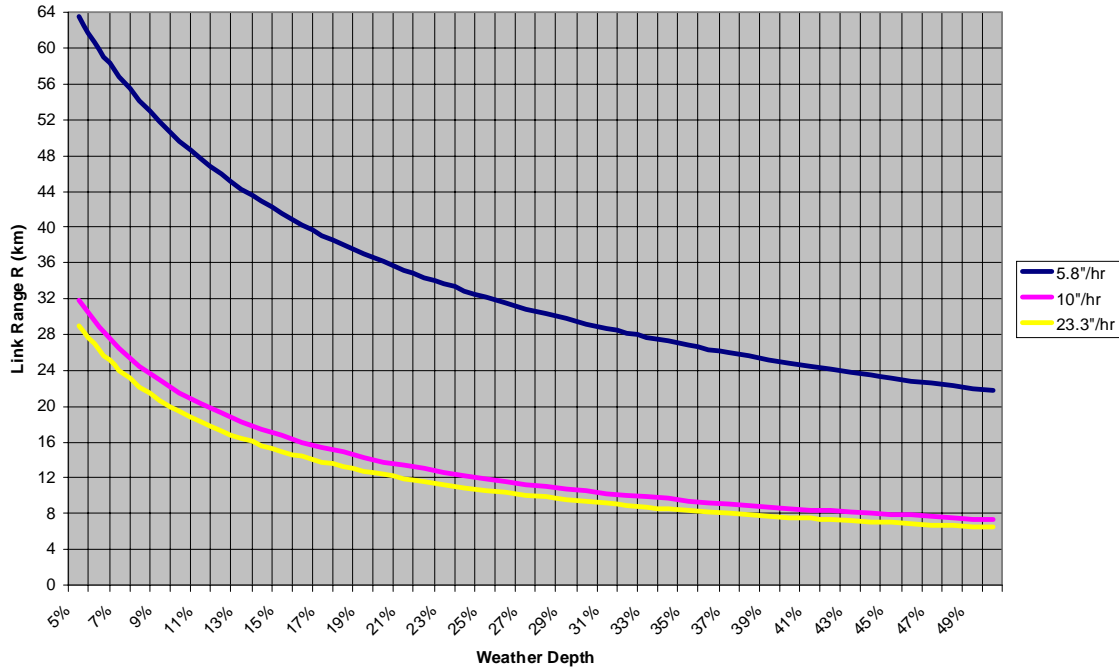
Weather attenuation is very dependant on localized intensity since the effect is exponential. About the only weather-condition that can be expected to be completely uniform over the four kilometer (2.46 mile) range for the SkyNet laser transceivers is clear air. For conditions other than clear air, weather depth indicates the percentage of the link length encountering maximum weather intensity. A localized downburst of rain or snow perhaps 5-10% of the link length, can for example, constitute almost the entire attenuation for the length of the link even though there may be a lesser amount of snow or rain in the remainder of the link.

Results

The following charts show the effective Link Range for snow and rain as derived from the measurements taken in these tests over a range of weather depths. This verifies that specification of maximum link distances for SkySeries laser links is conservative to allow for severe meteorological conditions applicable for much of the planet.

The following charts show the effective Link Range for snow and rain as derived from the measurements taken in these tests over a range of weather depths. This verifies that specification of maximum link distances for SkySeries laser links is conservative to allow for severe meteorological conditions applicable to much of the planet.

Snow Site B



Rain - Site B

