SYNOPSYS®
Silicon to Software™

RSoft Application: Free-Space Optics Communication Link

Performance Bounds Due to Micrometeorological Atmospheric Effects

Overview

A North American space agency wanted to estimate signal fading limits due to atmospheric effects in a free-space optical (FSO) communication link.

The Challenge

Free-space channel behavior is subject to atmospheric attenuation and scatter that vary widely over micrometeorological areas. Scintillation, scattering, beam spread and beam wander can vary randomly due to wind and temperature gradients. Accurate performance estimates require complex multivariable stochastic analyses of electro-optic and thermal effects.

The Solution

RSoft™ OptSim™ provides intuitive, parametric Monte Carlo analyses with a choice of distributions, including flexible co-simulation options for modeling complex turbulence models and atmospheric effects of interest.

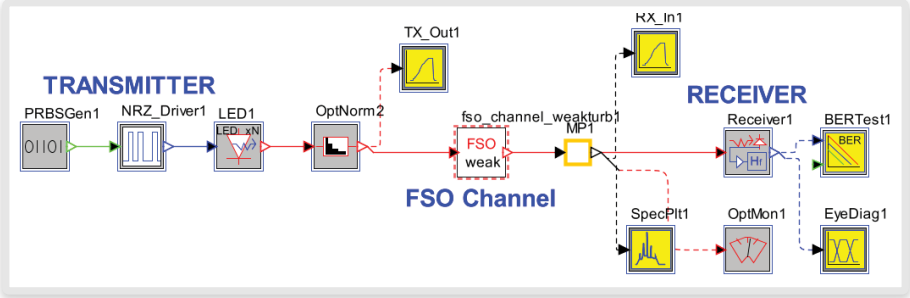

Figure 1. OptSim schematic of a free-space optics link

The Result

As shown in the OptSim analysis, in the weak turbulence regime, received power fluctuates due to atmospheric attenuation (Figure 2). The signal fading causes fluctuations in the Q-factor (Figure 3). Wide bandwidth on an unregulated spectrum makes FSO an attractive solution for the "last mile" connectivity problem and OptSim modeling helps estimate statistical performance bounds.

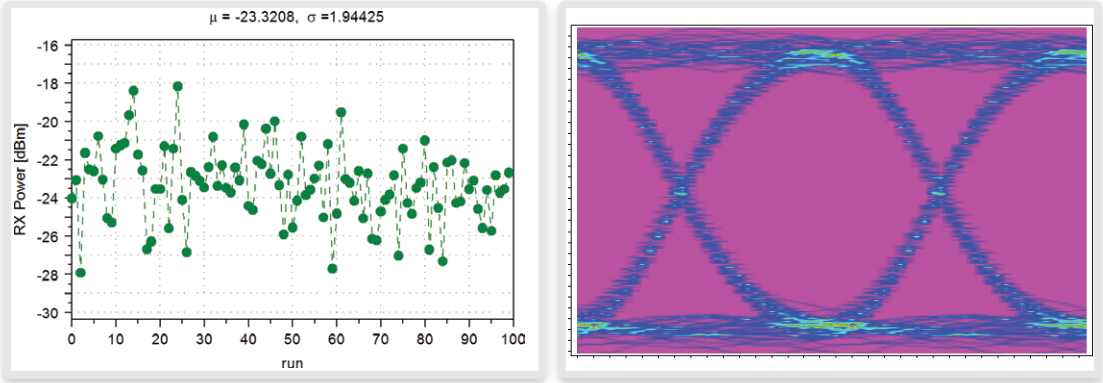

Figure 2. Data fluctuations due to environmental turbulence (left) and one of the eye diagrams (right)

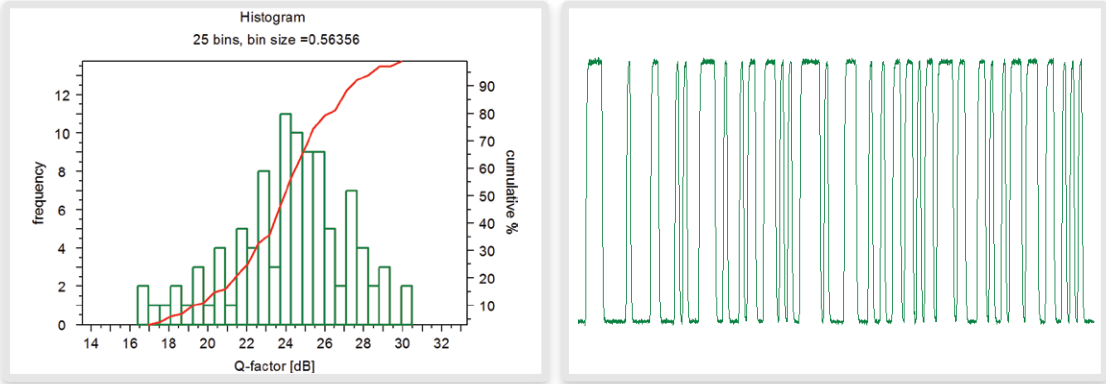

Figure 3. Histogram for the received input power (left) and received data signal (right)

For more information, please contact Synopsys' Optical Solutions Group at (626) 795-9101, visit http://optics.synopsys.com/rsoft/, or send an e-mail to rsoft_sales@synopsys.com.

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