

Investment Recommendations for Free Space Optical Communications Networking

1. The major issue emerging from this experiment was robust Pointing, Acquisition and Tracking (PAT) of all the links. Establishing a single link (air-ground or air-air) became rather routine, but getting a series of multiple network links up and running simultaneously still is a challenge.
2. Locating the beacon while buried in the background clutter still is an issue. Often the brightness of the beacon could be lower than that of many features in the collected images making thresholding schemes unusable, even with synchronous detection and background subtraction, acquisition could be challenging.
3. Migrating the beacon to an in-band wavelength would provide many advantages. At 1550 nm, the eye-safety limit is higher allowing for about five times higher launch powers. Atmospheric losses and solar background are also lower at 1550 nm by about a factor of 3-4X. For example, if EDFAs are used, higher peak powers can be launched since these kinds of amplifiers are average power limited and eye safety limits are set due to the thermal damage response of the eye. There is much work that could be done on beacon algorithms to improve detection/tracking in challenging background conditions.
4. Finally, better Adaptive Optics (AO) gain models, as well as AO systems for, mitigating turbulence effects are need to be invested in.