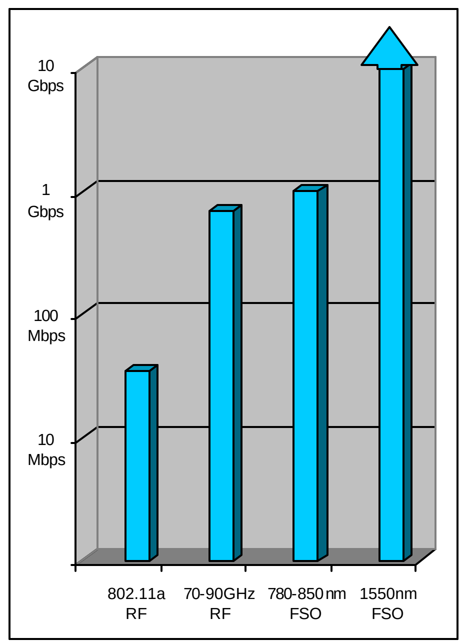
Application Note – 1550nm Transmission for Military Applications

A general scan of the current free-space optics (FSO) market shows that FSO products are conspicuously divided into two categories when it comes to transmission wavelength: 780-850nm and 1550nm. Both categories are considered "near-infrared" and are invisible to the naked eye. Both have similar light attenuation properties when propagating through the atmosphere. So what's the difference? Plenty. A closer look at the situation reveals that 1550nm transmission has some significant advantages, especially for military applications.

The Growing Trend in Technology



From the same scan of the market it is immediately obvious that the large majority of FSO products in fact fall into the 780-850nm category. This is understandable because, historically, efficient and reliable direct semiconductor diode-based sources have been more available in those wavelengths. Moreover, much of the technology used in the compact disc industry uses 780nm lasers, which offers a certain amount of cost savings as well.

However, *for almost a decade now the telecommunications industry has been steadily shifting the situation in favor of 1550nm technology*. Since this is the wavelength most commonly specified for terrestrial fiber-based optical communications, the supporting technical infrastructure for 1550nm (such as a wide selection of passive components, signal generators, practical optical amplifiers, and photodetectors) is vast and growing rapidly every year. Also, the intense cost competition that characterizes the fiber communications industry ensures that 1550nm-based systems will always be able to access new cost-effective technologies offering improved performance.

For example, 1550nm diode lasers are now widely available that can operate at 2.5 Gbps, with devices capable of 10 Gbps operation also beginning to appear. By contrast, the highest data rate possible with commercial 785nm diode lasers is ~ 1 Gbps. Moreover, the wide availability of WDM components for 1550nm systems opens up a straightforward approach for scaling to higher throughputs, while using standard commercial components. Such components are not readily available for devices in the 780 to 850nm spectral range. Consequently, *1550nm technology paves the way for higher-bandwidth communication and the latest state-of-the-art in voice, video, and data applications for all phases of military operation*.