Coherent Optical System Design

Pieter W Hooijmans

Coherent detection technologies, which are commonplace in radio and cable television (CATV) transmission systems, had been investigated for optical transmission since the 1980s as a means to increase transmission distances. However during that period, the linewidth of distributed feedback (DFB) lasers was around 50 megahertz (MHz), and it was technically challenging to lock the frequency and phase of a receive laser with the analog carrier recovery technologies available at that time. More significantly, the emergence of cost-effective, multi-wavelength optical amplification in the form of Recent coherent optical communication systems address modulation and detection techniques for high spectral efficiency and robustness against transmission impairments. As a consequence of this technical reality and its potential achievements, the proposed objective of this project is to develop and demonstrate the coherent optical infrastructure and signal processing to produce robust high-capacity links over the 1.5-micron spectral band. In this thesis an optical coherent communication system is designed and implemented. These types of systems have some advantages over others based on direct detection, which have been used historically in optical communications.