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Radio over Fiber System for DVB-S2 Signal

ABSTRACT - Masterthesis

Radio over Fiber (RoF) links offers the promise of providing the flexibility and capability to wireless communication services for achieving broadband access. RoF uses analogue fiber optic links to transmit and distribute radio signals from a central location where the base stations are situated to the number of remote locations. RoF is beneficial due to higher bandwidth, no interference to electromagnetic radiations, low power consumption which makes it reliable and cost effective.

The thesis proposes the implementation and evaluation of Intensity Modulation Direct Detection (IMDD) based RoF link in the 1.4-1.8GHz frequency band. First, the laser diode and photo detector are analyzed in the RF aspect and are modeled as a parallel RC network. Similarly, the RoF link is modeled in AWR software. The S_{11} , S_{21} , and S_{22} of the modeled RoF link shows the range in which practical RoF link should work. The impedance match circuit between laser diode and RF generator and between photo detector and RF detector is essential for less reflection losses. Therefore, matching network is designed for 400MHz bandwidth in the AWR software. After implementation, the current flow of RoF system, insertion loss, and noise figure is evaluated. The insertion loss is 18.85dB, where as noise figure is 12.46dB. It has been found that insertion loss is higher due to lossy laser diode, photo detector. The noise figure is frequency dependant due to inherent non-linearity of RoF link.

Key words: Radio over fiber, IMDD, RoF model, modeling laser diode and photo detector, matching network circuit, noise figure, power flow of RoF link.