

# 3G over Fiber

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## Abstract

In this part of the thesis we are going to develop a nonlinear model for Optical millimeter-wave signal generation by up and/or down-conversion system based on simple technologies which can tend to be low-cost, vital to future real deployment in access networks.

To achieve this, the simulation of radio-over-fiber (ROF) sub-systems which allow us to simultaneously generate the optical millimeter-wave (mm-wave) using one low-bandwidth intensity modulator (IM) and a low-frequency local oscillator (LO). The IM chosen for this first step is the Mach Zehnder Modulator that, with its sinusoidal response allows high flexibility in the control of the generated components just by adjusting the bias point. This technique allows simplifying the generation, since it requires low bandwidth electronic circuitry therefore impacting the cost of the base station (BS). Also, optical heterodyne detection at base station can help increasing robustness and again decrease cost. The local oscillator is an optical source offset from the original signal which is mixed optically to the signal, and, therefore, can be easily tuned to achieve whatever intermediate frequency required.

The efficiency of the generation and detection is characterized and modeled by means of analytical and simulation results. The overall system performance is also characterized in terms of the constellation recovery. With these results we aim at establishing a set of design rules and techniques which are able to further enable the deployment and robustness of these systems. Experimental validation is then aimed for support of the obtained results.