A coherence-multiplexed optical RF feeder network
Arjan Meijerink, Robert O. Taniman, Wim van Etten
Telecommunication Engineering group
Faculty of Electrical Engineering, Mathematics and Computer Science
University of Twente
POB 217, 7500 AE Enschede, The Netherlands
a.meijerink@ieee.org, r.o.taniman@utwente.nl, etten@ieee.org

An important issue in modern wireless LAN access systems is that the high transmission frequencies (several GHz up to several tens of GHz) limit the transmission range of the mobile terminals (MTs) to relatively small cells. Therefore, many radio access points (RAPs) are required in order to provide coverage to the MTs so that they can connect to the network from anywhere in the envisioned service area.

The costs of such an access network can be kept within reasonable bounds by concentrating complicated hardware functions like coding, modulation and frequency up-conversion in a central node (CN) and hence convert the signals into air wave format prior to distributing them through the feeder network, so that the CN in fact acts as a remote base station. Since copper cables do not provide enough bandwidth to distribute such signals over reasonable distances, optical fiber should be used as a transmission medium. In that case, the RAPs only need to contain an opto-electronic converter and a power amplifier. This concept is known as Radio over Fiber (RoF) transmission.

When part of the network consists of a common transmission fiber, optical multiplexing is required in order to enable the CN to distribute signals to several RAPs at the same time and hence serve multiple MTs simultaneously. Because of its potentially simple implementation, coherence multiplexing (CM) could be an interesting candidate to distinguish between RAPs. It relies on the mutual temporal coherence between broad band light waves and can be implemented by means of relatively straightforward optical sources like light-emitting diodes (LEDs) and simple optical encoders/decoders based on Mach-Zehnder interferometers.

More details on the operation principle and advantages of CM as an RoF feeder technique will be shown in the presentation. Some performance results regarding SNR will be described as well.

