

# Optoelectronic concepts for extreme wideband radio communications

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## Abstract

Radio communications with extreme bandwidths require also correspondingly high carrier frequencies. An effective method to create high carrier frequencies up the terahertz frequency range is utilizing optoelectronic mixing of semiconductor laser signals. The optoelectronic RF signal generation has the advantage that it even works in frequency ranges where no amplifiers are available. The optoelectronic mixing is typically carried out by combining two laser signals and detecting the combined (sum) signal with high-speed photodiodes or photoconductors. Signal modulation may be performed by modulating one of the laser signals with Mach-Zehnder modulators which show both linear and nonlinear distortions. Due to the high carrier frequencies, even for small distances between transmitter and receiver, high antenna gain is necessary. In order to track line-of-sight in case of moving or portable terminals, adaptive beamforming has to be used. Beamforming concepts which utilize multiple signal sources have the advantage that more transmit power compared with single source solutions is available.

## Bio



Andreas Czylik studied Electrical Engineering at the Technical University of Darmstadt, Germany, from 1978 to 1983. In 1988 he received the Dr.-Ing. degree and in 1994 the Habilitation degree, both from the Technical University of Darmstadt and both in the field of optical communications.

From 1994 to 2000 he was with the research and development center (Technologiezentrum) of Deutsche Telekom. In 2000 he became a full professor at the Technical University of Braunschweig heading the research group of Microcellular Radio Systems. Since 2002 he has been with University

Duisburg-Essen heading the Chair of Communication Systems. His research interests are mainly in the field of radio communications on link and system level with special focus on adaptive multicarrier MIMO techniques. Several research activities focus on utilizing high frequency (up to THz) electromagnetic waves with applications in the field of extreme wideband communications and radar systems.