Abstracts

A mobile broad-band communication system based on mode-locked lasers

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A concept is proposed for a pico-cellular network for broad-band mobile communication on a millimeter-wave basis. How microwave optical-signal-processing techniques based on mode-locked lasers (MLLs), optical modulators, and high-speed photo diodes (PD's) can advantageously be applied in the optical feeder lines of a pico-cellular network at 60 GHz is investigated. The external cavity MLL (at 81.25 GHz) used for the experiments showed a single-sideband (SSB) phase noise of -59 dBc/Hz at 100-Hz offset, when actively locked at 6.25 GHz. With the PD, and limited by the V-band mixer equipment, spectral harmonics up to 100 GHz could be detected. For the downlink configuration, a 400-MHz subcarrier is modulated with a 155-Mb/s data signal and upconverted to 62.9 GHz using an MLL and a fast PD. The upconverted sideband at 62.9 GHz was received with an optical power of -14.3-dBm at a bit-error-rate (BER) equal to 10/sup -9/ without any additional penalty due to transmitting the signal over 3 km of optical fiber. BER measurements at 155 Mb/s down to 10/sup -11/ were made. For the uplink, the digitally encoded RF signal is downconverted also by optical microwave signal processing. A 155-Mb/s data encoded 19.21-GHz signal is downconverted to 460 MHz using a mode-locked laser, an optical modulator, and a 600-MHz optical receiver front end. A receiver sensitivity of -24.5 dBm (BER equal to 10/sup -9/) is demonstrated with the microwave signal being transmitted over a 1-m radio link and 3 km of optical fiber.

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