

Fast frequency hopping spread spectrum for code division multiple access communications networks (FFH-CDMA)

An improved method and apparatus for optical and radio frequency implementation of a fast frequency hopping spread spectrum communication for code division multiple access systems is disclosed.

The method avoids the frequency hopping synthesizer requirements in the transmitter as well as in the receiver. In a system where a pool of CDMA users share a channel characterized by a number of F available frequencies (or frequency bands), each user is assigned a subset of M (M less than or equal to F) frequencies from the F available frequencies, selected and ordered in time as prescribed by his own code (or address).

In the transmitter, the information bit sequence modulates a broadband source so that the energy assigned to a data bit is concentrated on just a short interval of the bit period which is less than or equal to the so-called chip interval. The data modulated signal enters equipment which simultaneously or sequentially performs three functions: 1) spectral slicing of the input signal into chip pulses, 2) a chip-pulse modulation and 3) a chip-pulse delaying.

The output is an FFHSS signal composed from M sub-pulses (or chip-pulses), each of which is centered at different frequency and ordered in time as fixed by the FFH code. In an optical implementation, a broadband source and a set of in-line fiber Bragg gratings performs the FFHSS encoding and decoding operations with ASK chip-modulation. The gratings can be tuned to allow the programmability of the encoding/decoding system.
