Flexceiver™ – An Innovative Swept Carrier Ultra Wideband Software Defined Radio

Product Sheet

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Description

The swept carrier Flexible Transceiver (*Flexceiver*™) is an innovative approach to **Ultra Wideband (UWB**) Software Defined Radio (SDR) systems, providing a foundation for a wireless network. Unlike traditional UWB systems, the *Flexceiver*™ has **long-range** performance capabilities (hundreds of miles).

The basic concept of the swept UWB *Flexceiver*™ is to sweep the carrier frequency of a modulated signal very rapidly (on the order of 1THz/s) across a wide bandwidth (planned to 500 MHz). The *Flexceiver*™ **avoids interfering** with narrowband radio systems operating in dedicated bands by constructing frequency profiles that dynamically hop over the frequencies occupied by those systems. RF interference from other systems is avoided in the same manner. The use of a wide operational bandwidth provides Low Probability of Detection & Intercept **(LPD/I)**, and Anti-Jamming **(AJ)** protection.

While the total occupied bandwidth is wide, the instantaneous bandwidth of the waveform is narrow, consistent with that of the rate and type of modulation resulting in a simpler, **less expensive** receiver design.

The *Flexceiver*™ is **tolerant of multipath**. Channel fades (caused by multipath) that occur at specific frequencies can be very deep, but are narrow and low duty cycle compared to the total occupied bandwidth. By sweeping rapidly, individual fades can be limited in time to single bit duration or less. Furthermore, forward error correction is employed to recover faded bits. This processing has the added benefit of eliminating the need for a fading allowance from the link budget, resulting in increased range performance.

Extremely low latency results from rapid synchronization (on the order of twenty bit-periods) using a preamble waveform to establish frequency, phase, and timing. An economical correlation algorithm for this waveform has been developed which is tolerant of unknown carrier frequency offsets. This facilitates rapid acquisition and successful communication between mobile operating units.

The layout of the analog sections reveals that the *Flexceiver*™ can be packaged in a **miniaturized** version. Figure 1 illustrates the *Flexceiver*™ power supply. The remaining boards stack and interlock around the capacitor resulting in an electronics package that is approximately 1" × ¾ "× ¾ " with a volume of ½ cubic inch.

Features

- Ultra Wideband
- Swept Carrier Frequency
- LPD/LPI/AJ
- Multipath tolerant
- EMI/EMC
- Reconfigurable to multiple waveforms for interoperability advantages
- Programmable date rate (1 Kbs – 10 Mbs)
- Selectable modulation (AM,FM,M-FSK, BPSK, OQPSK)
- Configurable Medium Access Control (MAC) layer
- Configurable Routing Layer

Development Status

The 2nd generation *Flexceiver*™ prototype was developed and delivered in December of 2005 under a Phase II SBIR, jointly funded by the Navy and the National Security Agency. This prototype, Figure 2, has an instantaneous bandwidth of 12.5 MHz and an operational bandwidth of 150 MHz.

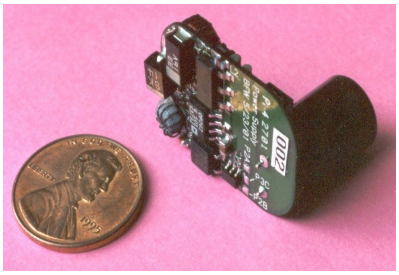

Figure 1: Flexceiver Power Supply

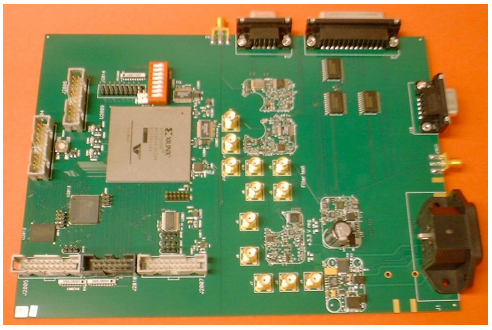

Figure 2: Flexceiver Prototype Breadboard