

# **Innovations in OFDM and DSSS for Very High Performance, Very High Bit Rate WLAN/802.11**

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## **ABSTRACT:**

Wireless LANs (local area networks) are gaining widespread popularity, with many analysts envisioning a doubling in sales every year for the next five years. Reasons underlying the success of Wireless LANs include: (1) the convenience they provide, connecting users with laptops or PDAs as they roam through homes, offices, buildings, campuses, airports or even Starbucks; and (2) a single set of standards has emerged in much of the world, namely the IEEE 802.11 set, which has gained substantial industry support and led to a reduced price point.

However, the IEEE 802.11 set of standards has room to grow. Currently, the most commonly implemented version (and one with a \$1.5 billion investment) is the IEEE 802.11b, based on DSSS and capable of supporting bit rates up to 11Mb/s. A more recent standard, ready for launch at the time of writing, is IEEE 802.11a, based on OFDM in the 5MHz band and capable of 54Mb/s data rates.

In this work, we present an overview of how to apply the carrier interferometry approach to the 802.11 standards. This approach introduces minor changes at the physical layer to create dramatic gains in both performance and bit rate. For example, in DSSS, by simply updating the chip shaping filter from the usual sinc/raised-cosine form to a frequency sampled sinc (known as the carrier interferometry (CI) chip shape), we are able to demonstrate a four-fold increase in bit rate AND an improvement in probability of error performance. Meanwhile, in IEEE 802.11a's adopted OFDM standard, by introducing a carrier interferometry (CI) phase coding at the transmitter side, we are able to double bit rate AND improve performance.

These CI methods, proposed to enhance IEEE 802.11 standards, are "fair": they do not require any increases in bandwidth, complexity, or any other system parameter of relevance. Based instead on smart signal processing technologies, they demonstrate the benefits of frequency based processing based on easy-to-implement FFT and IFFT technologies.