



## Electronic System Group

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Field of study: communication transceiver design, multiple access technologies  
Key words: WiMax/4G, MIMO, OFDM, PAPR,  
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#### 1. The Subject and Aims of Research

Our recent research aims at WiMax and 4G communication. Topics including OFDM and MIMO. The ongoing projects include PAPR reduction, increasing capacity by precoding and IEEE 802.16 transceiver design.

#### 2. Related Recent Research Topics

- (a) IEEE 802.16 transceiver design: IEEE 802.16 is originally proposed in 1999 for last mile access. IEEE 802.16 specification are going to be ratified. Especially, IEEE 802.16e suitable for high mobility maybe be competitive to 3G in the near future. The core technologies including OFDM and MIMO has been proposed in 4G. Currently, we focus on transceiver design. We propose a high-performance synchronization and estimation algorithm with low complexity. In next step, we will cooperate with ITRI to develop prototype.
- (b) MIMO: MIMO use multiple transmitter antenna and multiple receiver antenna. Paulraj and Kailath originally propose MIMO in 1994. They find MIMO can much increase system capacity. In fact, OFDM-MIMO has been used in IEEE 802.11n. And it became a core technology in IEEE 802.16 and 4G mobile system. Our current research interest is to develop a new novel precoding structure with low complexity.
- (c) PAPR problems: We can easily modulate and demodulate OFDM signal by FFT and IFFT. That is, OFDM transceiver is much simpler than conventional single carrier transceiver. Besides, very simple resource management strategy is enough in OFDM systems. So OFDM have become the core technology in WiMax and 4G. The main drawback of OFDM is the high PAPR. This is because in OFDM symbol many bits are transmitted simultaneously by many different subcarriers. Fig 1 shows a OFDM signal profile with 4 subcarriers. We can see the dynamic range is very large. This make power amplifier difficultly be designed. Therefore, reducing PAPR is very important. Currently, we propose a new novel method to reduce PAPR. We want this method to be used in 4G standards.

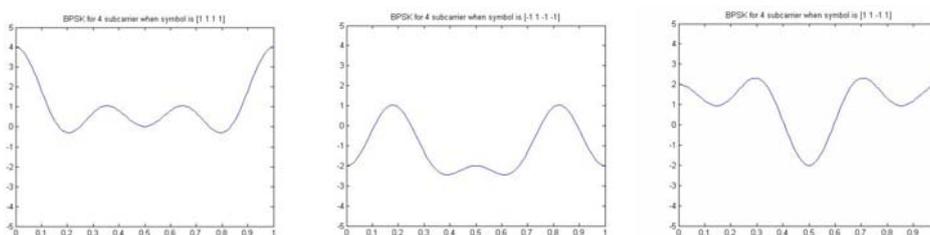


Fig.1 : OFDM signal with 4 subcarrier

#### 3. Selected Publications and Projects

Projects: 2004~

1. A fast decoder for MIMO systems (ITRI, 2008)
2. A low complexity decoder for IFDMA systems (ITRI, 2008)
3. A novel precoding technique for LTE systems (ITRI, 2006)

4. Design of 3GPP Rel-5 L1 WCDMA 之 Measurement(ITRI, 2004)

Publications: 2004~

1 SCI journal paper, 6 patents