



### *OFDM – Current Solution for Your Future Wireless Deployment*

In today's world of ever increasing wireless license free usage, what has considered long range performance are now short range due to the increasing interference challenges of shared spectrum, or license free fair usage. Along with the general challenges of signal-to-noise ratio, the main types of problems are inferior RF hardware design causing self-interference and fading owing to multipath effects, which occur when the same signal arrives at a receiver via different paths. Orthogonal Frequency Division Multiplexing (OFDM) meets these challenges and has dealt with the unruly ways in which radio signals misbehaves in the real world.

OFDM is a wireless signal modulation technique which utilizes multiple subcarrier waves. Compared to wider single carrier modulation to transport data information, smaller multiple carrier waves are divided to carry only a slice of the whole data information. When wireless transmission is interrupted or corrupted, only the slice of the transmission is affected compared to the whole providing higher performance throughout the transmission process. When all the mathematical language and formulation is not considered, OFDM is a method for chopping a large frequency channel into a number of subchannels. The subchannels are then used in parallel for higher throughput.

The IEEE 802.11a and IEEE 802.11g standards are designed based on OFDM. OFDM is not a new technique. Most of the fundamental work was done in the late 1960s, and U.S. patent number 3,488,445 was issued in January 1970. Inscape Data outdoor wireless radios offer OFDM modulation and proprietary range extension algorithm for robust high-bandwidth capabilities offering immediate advantage over competing proprietary wireless technologies.

The widespread interests of OFDM become clear from a glance at OFDM characteristics. In 802.11a, OFDM provides raw data rates up to 54 Mb/s in a 20-MHz channel. In addition to supporting high data capacity and resisting degradation from various types of radio effects, OFDM makes highly efficient use of the available spectrum. The latter characteristic will become crucial in coming years as wireless networks are built out.

#### OFDM Simple Architecture Overcomes

- Noise
- Signal to Noise Ratio Challenges
- Multipath Fading
- Adjacent Channel Interference
- Non-Adjacent Channel Interference

OFDM is currently used in digital cable, DSL, digital TV, European Telecommunications' HiperLan, power-line networking products, and many more. Table

I list technology using OFDM as the robust and reliable modulation technique. Cellular carriers are also considering migrating from CDMA or TDMA into OFDM for use in 4G cellular systems. 4G cellular systems consist of video, voice, and data. Currently 3G networks cannot cost-effectively provide the whole Internet experience to the mobile user. Because OFDM can overcome signaling transmission barriers and increase transmissions speeds, while dealing with unpredictable changes of the radio frequency environment.

Digital Cable	Power Line Networks
DSL / ADSL	WiMax (IEEE 802.16)
Digital TV	WiFi
HiperLan/2 (Europe)	<b>IEEE 802.11 a/g</b>
Mobile Multimedia Access Comm. (Japan)	Digital Audio Broadcasting
IEEE 802.11n (MIMO)	Digital Video Broadcasting

Table I. Industry Technology Using OFDM

Inscape Data's IEEE 802.11a/g standards based outdoor wireless system utilizes OFDM as its primary modulation technique. Couple with proprietary range extension algorithm, Inscape Data outdoor IEEE 802.11 b/g radios can achieve link distances of 30km or more. IEEE 802.11 a/g standards based device compared to similar technology items using OFDM have economy of scale and has one of the largest install base in the world. IEEE 802.11 a/g is well proven and it is also one of the most successful industry standards in history. IEEE 802.11 a/g is experiencing rapid advancement with newer extensions released to enhance wireless performance. Table II. list Inscape Data OFDM enabled outdoor wireless radio, operating frequency, and range extension capability.

Model Number	Frequency	Real World Link Distance
AB54 / E	2.4 GHz	16km
AB54E PRO	2.4 GHz	30km
CB54 Broadband Access	2.4 GHz	16km
BR108	5.1 ~ 5.8 GHz	32km

Table II.

Serious wireless players are considering the use of OFDM modulation technique for 4G mobile networks to enhance voice, data, and video. OFDM is reliable, robust, and highly efficient use of available frequency. Long range cost competitive OFDM wireless equipment by Inscape Data is available today and brings host of benefits to the wireless broadband and IP video surveillance market. For further inquiries on Inscape Data's OFDM radios for your broadband access and IP video surveillance application, please contact your Inscape Data reseller partners or visit our website at [www.inscapedata.com](http://www.inscapedata.com).