Particulars of Operation and Narrative Statement

Necessary Bandwidth, Modulating Signal and Program of Research

InterDigital Communications Corporation ("InterDigital") seeks experimental authority to perform limited, in-building testing to determine the performance of the Universal Mobile Telecommunications System Terrestrial Radio Access ("UTRA") Time Division Duplex ("TDD") communications equipment that is being developed by InterDigital. The suite of equipment consists of a base station which transmits a single set of subscriber wideband code division multiple access ("CDMA") signals to each of N subscriber units, and which receives a single set of subscriber CDMA signals from each of N subscriber units. Each set of subscriber CDMA signals includes one or more traffic channels, and a control channel. The base station also transmits to all subscriber units a set of global CDMA signals which includes a synchronization channel ("SCH"), a broadcast channel ("BCH"), a forward access channel ("FACH"), a paging channel ("PCH"), and a paging indicator channel ("PICH"). As explained in more detail below, because the equipment will be operated at low power and in the confined environment of an office building, InterDigital expects no interference to be caused to other radio services.

The SCH enables the subscriber units to synchronize with the base station timing and carrier frequency, as well as determine the CDMA code sequences to use for transmit and receive communication with the base station. The BCH provides the subscriber units with system information required for access to the base station and handover to other base stations. The FACH is a global channel in which control and traffic for multiple subscriber units is multiplexed; it is used for communication with subscriber units prior to assignment of subscriber-specific traffic and control channels and/or for fast delivery of small amounts of traffic data. The PCH and PICH are used to notify subscriber units of incoming calls. Each subscriber unit can also transmit a random access channel ("RACH"). The RACH is a randomly selected channel from a set of available channels that can be used by subscriber units for communication with the base station when subscriber-specific channels have not been assigned.

The collection of the sets of subscriber CDMA signals transmitted by the base station in combination with the global CDMA signals transmitted by the base station is referred to as the downlink or forward link. The maximum total experimental effective radiated power of the base station will be 15 Watts (+41.5 dBm). The collection of sets of subscriber CDMA signals transmitted by the subscriber units is referred to as the uplink or reverse link. The maximum experimental effective power radiated from the subscriber units will be 3 Watts. There may be up to 4 subscriber units per base station. The uplink and downlink are time-division multiplexed, i.e. each uses different timeslots of a 10 ms radio frame for the purpose of achieving isolation. For a given base station, one carrier frequency is used for both the uplink and downlink. As the laboratory is located in the center of the building, there is little if any chance of emissions leakage outside of the building. Further, because the laboratory is an inside room with no

windows, no transmissions will be directed at any windows and no mobile devices will be used near a window.

CDMA is a spread-spectrum technique in which all signals in a link share the same spectrum. A CDMA signal is created by multiplying a baseband signal by a unique pseudo-random code consisting of a certain number ("Q") of chips (a measurement of information) and then converting it to the common RF carrier of the link. A CDMA receiver recovers a particular CDMA signal from the shared spectrum by knowing the unique pseudo-noise ("PN") code, and multiplying the received baseband signal by that code, and summing the product over Q chips. The bandwidth of the shared spectrum is inversely proportional to the width of the chips used. The maximum necessary bandwidth will be 5 MHz (as defined by the 3G Partnership Project Standard).

The 3rd Generation Partnership Project was originally established to produce globally applicable Technical Specifications and Technical Reports for a 3rd Generation Mobile System based on evolved Global System for Mobile communication ("GSM") core networks and the radio access technologies that they support. The scope was subsequently amended to include the maintenance and development of the GSM Technical Specifications and Technical Reports including evolved radio access technologies (*e.g.*, General Packet Radio Service ("GPRS") and Enhanced Data rates for GSM Evolution ("EDGE")). See www.3gpp.org for additional information.

The CDMA signal has a chip rate (repetition period) of 3.84 Mchips per second and is QPSK modulated. The data is spread orthogonally with Q chips per symbol where $Q = 2^p$, $0 <= p <= 4$. The symbol rate duration T_s depends on the spreading factor Q and the chip duration T_c: $T_s = Q \times T_c$, where $T_c = 1/\text{chiprate}$. The modulated signal is passed through a root raised cosign pulse shaping filter with a roll-off factor of 0.22.

Objectives

The experiment will be laboratory-based and governed by the following objectives:

- Demonstrate that all transmitters reliably transmit intended signals.
- Demonstrate that radiated emissions from the equipment will remain within acceptable levels.
- Demonstrate that the subscriber unit will successfully establish a link with the base station.
- Demonstrate that a base station will successfully establish a link with multiple subscriber units.
- Determine that a subscriber unit with an established link to a base station will successfully transfer from one base station to another while maintaining a link with the core network.
- Determine the quality of the links established between the base station and the subscriber units.

Contribution of Experiment to the Art of Radio

Little is known about the performance of UTRA-TDD CDMA systems operating in the 1910-1920 MHz range. This experiment will prove the reliability and performance of such systems and thereby establish the viability of the technology.

InterDigital understands that the 1910-1920 MHz band is currently allocated for asynchronous unlicensed PCS ("UPCS") devices under Part 15 of the FCC's rules. InterDigital seeks an experimental license for this band so that it can test isochronous devices utilizing this spectrum. It is InterDigital's understanding that no UPCS equipment has been authorized for this band and a search of the FCC's database has not revealed any licenses utilizing this spectrum in InterDigital's area of interest. In any event, pursuant to Section 5.111 of the FCC's rules, InterDigital will use every precaution to avoid causing harmful interference to any stations operating in the area.

Area of Operation

The operation will consist of four base stations located within the Myer Center office building located in Fort Monmouth, New Jersey. The street address of the office building is Myer Center, Building 2700 North, Fort Monmouth, New Jersey. The coordinates of this location are 40-17-46.8 North Latitude, 74-5-16.2 West Longitude. As the base station antennas will be located entirely inside an office building, no FAA issues are involved.

InterDigital will be demonstrating its TDD Laboratory System to the U.S. Army Research Development, and Engineering Command, Communications-Electronics Research, Development and Engineering Center. As such, InterDigital has been given permission by the U.S. Army to operate in the Myer Center.