Item 4(G) — Necessary Bandwidth; Item 10 — Narrative Statement

Necessary Bandwidth, Program of Research

The purpose of this research is to determine the performance of the wideband code-division multiple-access (CDMA) wireless-local-loop (WLL) communications equipment that is being developed by InterDigital Communications Corporation (IDC). The suite of equipment consists of a base station which transmits a single set of subscriber CDMA signals to each of N of subscriber units, and which receives a single set of subscriber CDMA signals from each of the 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 global pilot used by all subscriber units for channel estimation, code synchronization, and carrier recover, a fast broadcast signal used for controlling access to the base station by the subscriber units, and a slow broadcast signal used to notify subscriber units of incoming calls. Each subscriber unit also transmits a subscriber pilot, which is used by the base station for channel estimation, code synchronization, and carrier recover. 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 average effective radiated power of the base station will be 1000 watts. The collection of sets of subscriber CDMA signals transmitted by the subscriber units in combination with the subscriber pilots transmitted by the subscriber units is referred to as the uplink or reverse link. The maximum experimental average effective radiated power from any subscriber unit will be 6.3 watts. There may be up to 100 subscriber units per base station. The uplink and downlink are frequency-division multiplexed, *i.e.* each uses a separate radio-frequency carrier for the purpose of achieving isolation.

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 (PN) code consisting of L chips (a chip is a very short pulse), 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 its unique PN code, and multiplying the received baseband signal by that code, summing the product over L chips. The bandwidth of the shared spectrum is inversely proportional to the width of the chips used. The maximum IDC experimental BW will be 15 MHz. Uplink and downlink RF carriers will be in the range of 3.4 to ~~3.8~~ 3.7 GHz. see amendment

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Objectives

The following objectives will guide the experiment:

- Demonstrate that all transmitters reliably transmit intended signals.
- Demonstrate that the level of unintended radiation from equipment is within regulatory guidelines.
- Demonstrate that a subscriber unit will successfully establish a link with a base station.
- Demonstrate that a base station will successfully establish a link with multiple subscriber units.
- Determine the quality of the links established between the base station and subscriber units.
- Determine the maximum distance over which a base station will establish a link with a subscriber unit.
- Determine the maximum distance over which a subscriber unit will establish a link with a base station.
- Determine the maximum number of subscriber units that can simultaneously establish a link with a base station.
- Determine the maximum number of subscriber units with which a base station can simultaneously establish a link.
- Determine the impact on performance of subscriber-unit movement.
- Determine the impact on performance of terrain and building blockage.
- Determine the impact on performance of weather.
- Determine the impact on performance of stationary and moving reflectors.
- Determine the impact on performance of age.
- Determine the length of time over which a two-way link can be maintained.
- Identify equipment malfunctions and design errors.

Contribution of Experiment to the Art of Radio

Very little is known about the performance of wideband CDMA operating in the 3.5 GHz. range, yet the global demand for 3.5 GHz wireless communications service is extensive. This experiment will prove the reliability of wideband CDMA operating in the 3.5 GHz range, and thereby establish the viability of wideband CDMA as a technique for meeting the global demands for 3.5 GHz wireless service.

Item 5 — Area of Operation

The proposed experimentation will consist of two base stations located at the following coordinates (all in NAD27):

Base Station #1:

40-46-15 N Latitude, 73-25-00 W Longitude

Base Station #2:

40-48-35 N Latitude, 73-29-25 W Longitude

The mobile units will operate within a 30 km radius of the above-stated coordinates for each base station.