

A. Applicants Qualifications

QCT (www.cdmatech.com), a division of QUALCOMM Incorporated, is a developer and supplier of CDMA chipsets, hardware and software solutions, and tools, with 163 million cumulative shipments of MSM chips worldwide. QCT offers wireless position location technology by SnapTrack™, a wholly owned subsidiary of QUALCOMM. QCT supplies chipsets to the world's leading CDMA handset and infrastructure.

QUALCOMM Incorporated (www.qualcomm.com) is a leader in developing and delivering innovative digital wireless communications products and services based on the Company's CDMA digital technology. The Company's business areas include CDMA chipsets and system software; technology licensing; the BREW applications platform; Eudora® e-mail software; digital cinema systems; and satellite-based systems including portions of the Globalstar™ system and wireless fleet management systems, OmniTRACS® and OmniExpress™. QUALCOMM owns patents that are essential to all of the CDMA wireless telecommunications standards that have been adopted or proposed for adoption by standards-setting bodies worldwide. QUALCOMM has licensed its essential CDMA patent portfolio to more than 100 telecommunications equipment manufacturers worldwide. Headquartered in San Diego, Calif., QUALCOMM is included in the S&P 500 Index and is a 2001 FORTUNE 500® company traded on The Nasdaq Stock Market® under the ticker symbol QCOM.

B. Experimentation Proposal

QUALCOMM is complimenting its CDMA developed technology with the emerging WCDMA technology in the development of single and multi-mode chipsets. To fully evaluate the performance of the WCDMA design, QUALCOMM must perform over the air testing on platforms hosting the WCDMA chipsets.

QUALCOMM is proposing to install four WCDMA cell sites on QUALCOMM owned buildings with service over a 15 mile radius in San Diego, California. Cell sites will also be installed on Qualcomm buildings located in Boulder, Colorado. QUALCOMM is designing and manufacturing a small number of experimental handsets for the purpose of doing over the air testing within the experimental WCDMA network.

Motorola Inc. was issued a license for ITU-2000 frequencies similar to the experimental license Qualcomm desires. For reference, the Motorola Inc. license call sign is "WC2XLI" and the file number is "0010-EX-ML-2001".

C. Required bands

	Downlink	Uplink
Low range	2110 to 2122.5 MHz	1920 to 1932.5 MHz
Mid range	2137.5 to 2142.5 MHz	1947.5 to 1952.5 MHz
High range	2157.5 to 2170 MHz	1967.5 to 1980 MHz

D. Tx Power

	Base Station	Mobile
Max Conducted	43 dBm (20 W)	25 dBm
Max ERP	54.86 dBm	21.83 dBm (average)
Max EIRP	57 dBm	24 dBm (average)

Assuming BS Antenna Gains of 17 dBi and cable Loss of 3 dB. Power levels can be reduced for interference protection.

E. Emissions Designator

WCDMA Emission Designator: 5M00F9W

F Interference Protection

Prior to beginning any over the air experiments, QUALCOMM will conduct an interference analysis to verify no interference shall occur with licensed microwave operations in the respective frequency bands. This interference analysis will consist of spectrum measurements and coordination with external spectrum consultation resources such as the company Comsearch. The transmission power and frequencies used for the actual experiments will comply with the results of the interference analysis to prevent any interference with existing microwave links..

A portion of the IMT-2000 up-link frequencies is located in the Unlicensed PCS band (1920-1930). QUALCOMM shall coordinate with UTAM, Inc, the designee for coordination of the 1910-1930 MHz band, prior to beginning any over the air experimentation. The IMT-2000 mobile units will also comply with Unlicensed PCS transmit power requirements specified by Part 15.319 (c), which defines the peak transmit power as 100 microwatts multiplied by the square root of the emission bandwidth in hertz. For a WCDMA device, this limits the power to $[100\mu W * \sqrt{4.6848 \text{ MHz}}] = 216.44\mu W$, or 23.35 dBm.

G. Objective's Of Experiment

- To fully evaluate the chipset hardware and software to ensure successful integration of the WCDMA technology in an over the air environment.
- To test new releases of software used in the chipsets and ensure ongoing compliance with WCDMA standards.
- To evaluate the performance of the chipset receive-chain over the entire IMT-2000 band.
- To investigate interference issues associated with different wireless technologies.
- To study the RF propagation behavior in a 5 MHz wide RF channel.

H. Antennae Locations and Heights

San Diego, California Locations

Building	N	W	Elevation (ft)
E	32 deg 52 min 46.68 sec	117 deg 12 min 9.96 sec	469
AA	32 deg 53 min 27.66 sec	117 deg 13 min 23.28 sec	440
R	32 deg 54 min 15 sec	117 deg 12 min 8.34 sec	408
L	32 deg 53 min 42.9 sec	117 deg 11 min 43.74 sec	509

Boulder, Colorado Locations

Building	N	W	Elevation (ft)
E	40 deg 4 min 12 sec	105 deg 12 min 36 sec	5222

I. Additional Information On Proposed Experiment

The intent is to set up an experimental WCDMA Over The Air (OTA) system in the San Diego area with cells on top of four QUALCOMM buildings. The experiment requires that we transmit on at least 3 down link channels, each 5MHz wide.

The WCDMA signal is QPSK modulated with a modulating chip rate of 3.84 Mcps (Mega chips per second.) The pulse shaping method applied to the transmitted chips is root-raised cosine filtering with roll-off factor of 0.22. The required bandwidth to transmit the WCDMA signal is computed as follows:

$$W = (1+r) R_c$$

Where

W is the required bandwidth

r is the roll-off factor

R_c is the chip rate

The above gives us:

$$W = (1+0.22) \times 3.84 \times 10^6$$
$$W = 4.6848 \times 10^6 \text{ Hz}$$

Allowing for some guard band, the required bandwidth for the experiment is 5 MHz.

Furthermore, it is essential to evaluate the performance of the chipset receive-chain over the entire IMT-2000 band. To achieve that, the experiment has to be performed using 3 bands of 5 MHz each. These 3 bands are located at the low, mid and high ranges of the IMT-2000 band.

J. Conclusion

This experimentation is necessary for the successful development of multi-mode chipsets. The Qualcomm chipsets will be used in wireless devices capable of worldwide operation in existing and next generation networks.