QUALCOMM INCORPORATED

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May 2, 1994

VIA HAND DELIVERY

Federal Communications Commission
Room 7326
2025 M Street N.W.
Washington, D.C. 20554

Attention: Mr. H. Franklin Wright
Chief, Frequency Liaison Branch
STOP CODE 1300A4

Re: QUALCOMM Incorporated
Quarterly Progress Report for
Personal Communication Services
Experimental License Call Sign: KK2XBJ
File Number: 2345-EX-PL91

Dear Mr. Wright:

Enclosed are three copies of QUALCOMM Incorporated's quarterly progress report for its personal communications services experimental license.

No filing fee is associated with this filing. Please contact the undersigned at (202) 223-1720 if any questions arise with respect to this report.

Sincerely,

Kevin J. Kelley

Kevin J. Kelley
Vice President-External Affairs

Enclosure
cc(w/encl.): Dr. Thomas P. Stanley

PCS Experimental License Progress Report

April - June 1993

FCC Experimental License: QUALCOMM Incorporated KK2XBJ

File Number: 2345-EX-PL91

QUALCOMM Incorporated
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1 Introduction

On February 21, 1992, the Federal Communications Commission (FCC) granted an experimental license to QUALCOMM Incorporated to conduct radio frequency (RF) propagation and system tests in San Diego California. QUALCOMM Incorporated is investigating the application of its wideband spread spectrum Code Division Multiple Access (CDMA) method of digital transmission to the Personal Communications Services (PCS) radio environment.

QUALCOMM, with the support and involvement of a number of carriers and licensed manufacturers, has been working on its CDMA technology for over four years and has been investigating its application to PCS for more than two years. During this quarter, QUALCOMM delivered equipment and supported continuing tests on a CDMA PCS test system for American Personal Communications (APC) in Washington D.C. and for the Korean Electronics and Telecommunications Research Institute (ETRI). A CDMA PCS system was delivered to MCI Telecommunications (MCI) in Richardson, Texas where PCS testing was supported. A major PCS effort at QUALCOMM has been performing a continuing series of joint tests in San Diego with Telesis Technologies Laboratory (TTL) to further characterize CDMA PCS performance.

This report is the third quarterly progress report that QUALCOMM has submitted to the FCC. This progress report covers research efforts completed through June 30, 1993. The tests during this quarter included continuing work in three research areas.

- The characterization of wideband spread spectrum CDMA in a PCS environment
- Spectrum sharing issues with PCS CDMA
- In-building performance of PCS CDMA

The information in this report is organized in the following chapters.

- Chapter 2, Executive Summary, provides an overview of CDMA PCS testing and shows spectrum sharing.
- Chapter 3, Test Overview, identifies the research areas and objectives for the tests performed during this test period.
- Chapter 4, Test Results, discusses the results of the in-building tests.
- Appendix A shows diagrams of the floor plans of test locations.
- Appendix B lists the field test runs and provides a brief summary for each test.

2 Executive Summary

2.1 Overview

From April through June of 1993, QUALCOMM Incorporated continued a series of comprehensive digital wireless system tests in San Diego using QUALCOMM-developed CDMA PCS infrastructure and subscriber equipment. The purpose of these tests was to more accurately determine the performance of CDMA in a PCS environment and study the interaction of CDMA PCS with other systems sharing the same spectrum. A vast amount of field test data was collected that supports the test objectives and goals. This chapter highlights the key findings of the PCS testing shown by QUALCOMM's analysis and review of this data.

2.2 Field Tests

Field tests were conducted using QUALCOMM's San Diego PCS field test system. This system consisted of three base stations, a switching office connected to a public switched telephone network, PCS subscriber units (mobiles), and microwave equipment. Coverage tests, interoperability tests, and spectrum sharing tests have all been conducted in the field. Appendix B contains a summary list of the many tests performed. These tests are continuing and details will be contained in future reports.

2.3 In-Building Tests

An in-building distributed antenna system was used to characterize multiple aspects of in-building propagation of a PCS system. The interaction of closely spaced nodes, the effect of movement and speed on PCS performance, and the gains from antenna diversity were all studied. The tests on performance improvements between a system with single element nodes and with two element diversity at each node have been completed and are reported here.

The addition of a second (diversity) antenna element at each of the nodes in the distributed antenna system produced significant performance improvement. The average receive level increased by between 2.7dB and 7.1dB with an average increase of 4dB. This increase was also shown in an average improvement in Ec/Io of 1.3dB. The Ec/Io measurements show the actual pilot signal energy used by the subscriber unit relative to interference from all other sources. The most important improvement is an additional 4dB decrease in required fad margin over average received level when diversity is used at each node. Propagation data from these tests shows a reasonable match to a Rayleigh distribution.

2.4 Summary of Spectrum Usage

The majority of PCS testing in San Diego used CDMA channel 47. The basestation transmit frequency was 1939.99MHz and the subscriber unit transmitted at 1859.99MHz. The CDMA signal spreading rate was 1.2288MHz. Other frequencies were used for specific tests on dates shown in Table 2-1. Frequency scans in the test area showed that these frequencies were clear of OFS users.

A variety of frequencies where occasionally used by manufacturing and engineering during system test and integration. The spectrum was scanned from the system antenna operation in order to avoid interference with other users on the PCS spectrum.

2.5 Future Plans

QUALCOMM plans to continue investigating the application of its wideband spread spectrum system (CDMA) in the San Diego area. Future plans for evaluation include: RF propagation utilizing a variety of antenna heights and configurations and optimizing system performance in areas such as over-the-water, forward scattering, interference, and edge of coverage.

Table. 2-1 Spectrum Usage

DATE	Subscriber/Basestation Frequency MHz
5/6/93	1862.6/1942.6
5/7/93	1862.6/1942.6
5/11/93	1862.6/1942.6
5/12/93	1862.6/1942.6
5/13/93	1862.6/1942.6
5/14/93	1862.6/1942.6
5/19/93	1862.6/1942.6
4/20/93	1865/1945

3 Test Overview

3.1 Overview

A continuing series of field tests are being run in the San Diego area in the 1.8 GHz band to check the operation of the QUALCOMM CDMA system. These tests are providing data on CDMA signal propagation and coverage from single and multiple cell systems. They are also providing statistics on operational characteristics such as power levels and power control, hand-off regions, and intercell interference. In conjunction with an Operational Fixed Service (OFS) microwave link located in QUALCOMM building C, (4110 Sorrento Valley Blvd) data on the interaction of PCS and OFS service is being gathered. Test were also performed using the CDMA sector inside building A (10555 Sorrento Valley Road). Appendix B gives a summary listing of the tests performed during the 2nd quarter of 1993. Test descriptions are expanded in the objectives section below.

3.2 Objectives

The primary objectives of PCS testing efforts in San Diego include examining:

- Macrocell/microcell/picocell interoperability
- Spectrum sharing capabilities
- In-building wireless operations
- Capabilities and limitations of CDMA technology at 1800 MHz

Operational, interoperational, and spectrum sharing tests are being conducted in the field, in-building, and in the laboratory.

3.2.1 Macrocell/Microcell/Picocell Interoperability

Operational and interoperational tests address the PCS system operating in a combination of different environments including macrocells, microcells, and picocells.

Microcell coverage. These tests were performed using a 100 milliwatt microcell on QUALCOMM building Q at 6455 Lusk Blvd. This microcell was connected as a second (beta) sector to the basestation in building Q. The alpha sector, when enabled, was a 4 watt ERP omni-directional umbrella cell and could be configured to allow handoff or provide interference to the microcell. Microcell tests were run on a variety of routes around building Q and were operated over a range of loading from simulated and real users.

3.2.2 Spectrum Sharing Tests

The spectrum sharing tests were conducted between the QUALCOMM three-cell PCS CDMA system and a Farinon DM2-4A-12 digital microwave transceiver pair in QUALCOMM building C.

The first Farinon transceiver was connected to a 26dB gain dish for reception of CDMA interference. The received signal was combined with the signal from the second transceiver. The second transceiver was connected through a cable with variable attenuation between 60dB and 90dB. The receive input of the CDMA cell could also be connected to the dish antenna. This section briefly describes each type of spectrum sharing test.

Mobile interference to OFS - co-located cell. The beta sector of the building C CDMA basestation was used as a sensitive receiver to detect and record signals received by the microwave dish from a mobile operating from the alpha sector of the building C basestation. Various routes were driven near and far from building C.

Mobile interference to OFS - remote cell. The beta sector of the building C CDMA basestation was used as a sensitive receiver to detect and record signals received by the microwave dish from a mobile operating from the remote building A basestation. Various routes were driven near and far from building C and building A.

Mobile interference to OFS - near tests. The beta sector of the building C CDMA basestation was used as a sensitive receiver to detect and record signals received by the microwave dish from a mobile operating within a few hundred meters of the microwave dish. Various routes were driven in and out of the microwave dish beam.

Mobile on remote cell effect on OFS BER. The subscriber unit was operated from the remote building A basestation. The change in BER for the Farinon microwave pair was measured. The signal between the microwave units was highly attenuated so that the link operated at the level of a deep fade which produced a BER of 10^{-6} without interference.

Mobile on loaded remote cell effect on OFS BER. The subscriber unit was operated from the remote building A basestation which was loaded with a combination of 26 real and simulated users. The change in BER for the Farinon microwave pair was measured. The signal between the microwave units was highly attenuated so that the link operated at the level of a deep fade which produced a BER of 10^{-6} without interference.

Mobile on remote cell effect on OFS BER with margin. The subscriber unit was operated from the remote building A basestation. The change in BER for the Farinon microwave pair was measured. The signal between the microwave units was highly attenuated but was given 15dB of margin above the level of a deep fade which would produce a BER of 10^{-6} without interference.

OFS propagation. The subscriber unit was forced to transmit at a fixed power level. The CDMA signal from this mobile was received by the building C basestation using the microwave dish. The subscriber unit was driven in a van over multiple routes throughout the test area. Propagation maps for the OFS system were made by time correlating van position with basestation receive power.

OFS interference to PCS Mobile - far test. The subscriber unit was operated from a basestation remote from the OFS location. The tests were performed over routes which were in strong coverage, at the edge of coverage, and on a freeway passing through the coverage area. The OFS frequency was co-incident with the CDMA frequency and also offset by 2.5MHz.

The OFS transmitted signal was attenuated by between 0dB to 30dB. CDMA operating parameters including receive power, frame error rate, and pilot Ec/Io were recorded at the mobile during these tests to detect any changes caused by the OFS operation.

OFS interference to PCS Mobile - near test. The subscriber unit was operated from a basestation co-located with the OFS location. The tests were performed over routes which were in strong coverage, at the edge of coverage, and on a freeway passing through the coverage area. The OFS frequency was co-incident with the CDMA frequency and also offset by 2.5MHz. The OFS transmitted signal was attenuated by between 0dB to 12dB. CDMA operating parameters including receive power, frame error rate, and pilot Ec/Io were recorded at the mobile during these tests to detect any changes caused by the OFS operation.

3.2.3 In-Building Distributed Antenna Tests

Several in-building tests which utilize QUALCOMM's distributed antenna have been conducted at QUALCOMM to characterize how the distributed antenna propagates at 1.8 GHz.

Picocell baseline tests. These tests studied the operation of the in-building CDMA system under many different conditions. These conditions included various combinations of node locations, number of nodes, and nodes with and without diversity. The system was also operated with between two and twenty-six real and simulated users. Subscriber units were either stationary or moving at a slow or fast rates throughout the building. Subscriber units were tested in hallways, labs, conference rooms, and in open and closed offices.

DA handoff. These tests were performed with the 300 µwatt DA nodes operating under the umbrella of the basestation 1 watt alpha sector using the omni-directional antennas on the roof of building A. The performance, coverage, and handoff regions were studied.

DA interference. These tests were performed with the 300 µwatt DA nodes operating under the umbrella of the basestation 1 watt alpha sector using the omni-directional antennas on the roof of building A. Handoff to the omni sector was disabled. The performance, coverage, and interference regions were studied.

3.2.4 Capabilities and Limitations of CDMA Technology

FER vs Speed. The performance of the PCS CDMA system on a highway loop and on a freeway route through the test area was tested at speeds from 15MPH to 55MPH.

Voice Tests. Recordings and evaluations of live and recorded voice were made on a variety of outdoor and in-building routes.

3.3 Testbed Infrastructure

QUALCOMM's San Diego PCS field test system consists primarily of three cell sites (referred to as base stations), a switching office (referred to as a QTSO or QUALCOMM Telephone Switching Office) that connects to the public switched telephone network, PCS subscriber units (mobiles), and microwave equipment. The building A cell has a roof mounted omni antenna on one sector and an in-building distributed antenna system on a second sector. This San Diego system is the same as described in previous reports.

4 Test Results

4.1 Overview

The field tests being run in the San Diego area in the 1.8 GHz band are providing data on operational characteristics such as power levels and power control, hand-off regions, and intercell interference. The results presented in this report will be from data collected on indoor operation of a PCS system. Significant performance gains can be realized in the indoor environment by optimizing the antenna system. These gains can result in more reliable performance with no change to the subscriber unit.

4.2 Indoor Distributed Antenna with Diversity

Propagation inside a building is characterized by multipath with very short time delays. This results in fading with coherence bandwidths greater than the 1.23 MHz CDMA waveform. Shadowing from walls, file cabinets, elevators, and other building contents also occurs in the normal indoor environment.

The operation in this type of environment of a system with a Distributed Antenna (DA) was studied. The DA contained three nodes and was run with and without antenna diversity at each node. The diversity was supplied by a second antenna element at each node separated from the first by .75 meters. The second element operated with a transmit delay of 8 microseconds from the first element. An independent receive path to the CDMA demodulator was provided for the second element. The test data was recorded for mobiles operating on the first and second floor of QUALCOMM building A at 10555 Sorrento Valley Road in San Diego. The mobile data was taken at the fixed locations inside the building while the antenna was being moved randomly throughout a volume with 0.5 meter radius. (See Appendix A.)

Table 4-1 shows the increase in average mobile receive power as 4.6dB. This is consistent with the theoretical value of 4dB obtained by combining the received energy from two uncorrelated Rayleigh fading sources.

Table 4-2 shows an average 1.35 dB increase in mobile Ec/Io for the two element case. Ec/Io is determined from the received signals for the pilot channel. It is the energy per chip combined from all paths in the rake receiver relative to the interference from all other sources. The 1.35dB increase in usable energy is a measure of the gain from diversity above the 3dB increase in subscriber unit receive power due to the addition of a second transmit source.

Table 4-1. Mobile Receive Power Mean dBm

Location	Floor	1 Element	2 Elements	Difference
1	1	-89.0	-82.0	7.1
12	1	-77.4	-74.8	2.7
1	2	-82.0	-78.9	3.1
20	2	-79.2	-72.9	6.2
30	2	-83.8	-80.7	3.2
40	2	-87.5	-82.0	5.5
mean		-83.2	-78.5	4.6
Rayleigh		-77.0	-73.0	4.0

Table 4-2 Mobile Ec/Io dB

Point	Floor	1 Element	2 Elements	Difference
1	1	-5.624	-3.953	1.671
12	1	-5.225	-3.832	1.393
1	2	-5.273	-3.882	1.391
20	2	-5.299	-3.876	1.423
30	2	-4.779	-4.006	0.773
40	2	-5.425	-3.953	1.472
mean		-5.27	-3.92	1.35

An important criteria for performance is the amount of receive margin required to maintain the received signal above a required threshold. To maintain the receive signal above a threshold 99% of the time, a 14dB margin over the mean was required for the single element node but only 10dB for the two element node.

Pure Rayleigh fading predicts an 11dB margin (-73dBm mean to -84dBm 1%) for the two element node and a 19dB margin requirement for single element nodes. This reduction is shown between Table 4-1 and Table 4-3, and by the significant decrease in the probability tails for two element nodes shown in Figure 4-1.

Table 4-3. Mobile Receive Power 1% Threshold dBm

Point	Floor	1 Element	2 Elements	Difference
1	1	-100.0	-93.0	7.0
12	1	-93.0	-86.0	7.0
1	2	-97.0	-88.0	9.0
20	2	-93.0	-83.0	10.0
30	2	-97.0	-90.0	7.0
40	2	-100.0	-91.0	9.0
mean		-96.7	-88.5	8.2
Rayleigh		-96.0	-84.0	12.0

In-building propagation is assumed to follow a Rayleigh fading model. The model can be described with the following equations.

For a system with single element nodes, the Rayleigh probability distribution for receive power (z) in dB is given by:

$$Pz(z) = \frac{\ln(10)}{20b} * 10^{z/10} * e^{\left(\frac{10^{z/10}}{2b}\right)}$$

For a system with two element nodes, the Rayleigh probability distribution for receive power (z) in dB is given by:

$$Pz(z) = \frac{\ln(10)}{40b^2} * 10^{z/5} * e^{\left(\frac{10^{z/10}}{2b}\right)}$$

Figure 4-1 shows the Rayleigh distribution compared to data recorded with one and two element DA nodes. The Rayleigh values plotted are calculated with b=1, z in dBm and with z offset by -79dBm. The DA data was taken at test point 12 at the end of building A which was covered by node 3. The data has a reasonable fit to the Rayleigh model. The difference from Rayleigh fading for the DA data is partially due to signals received from other nodes since the Rayleigh model is for a single node system.

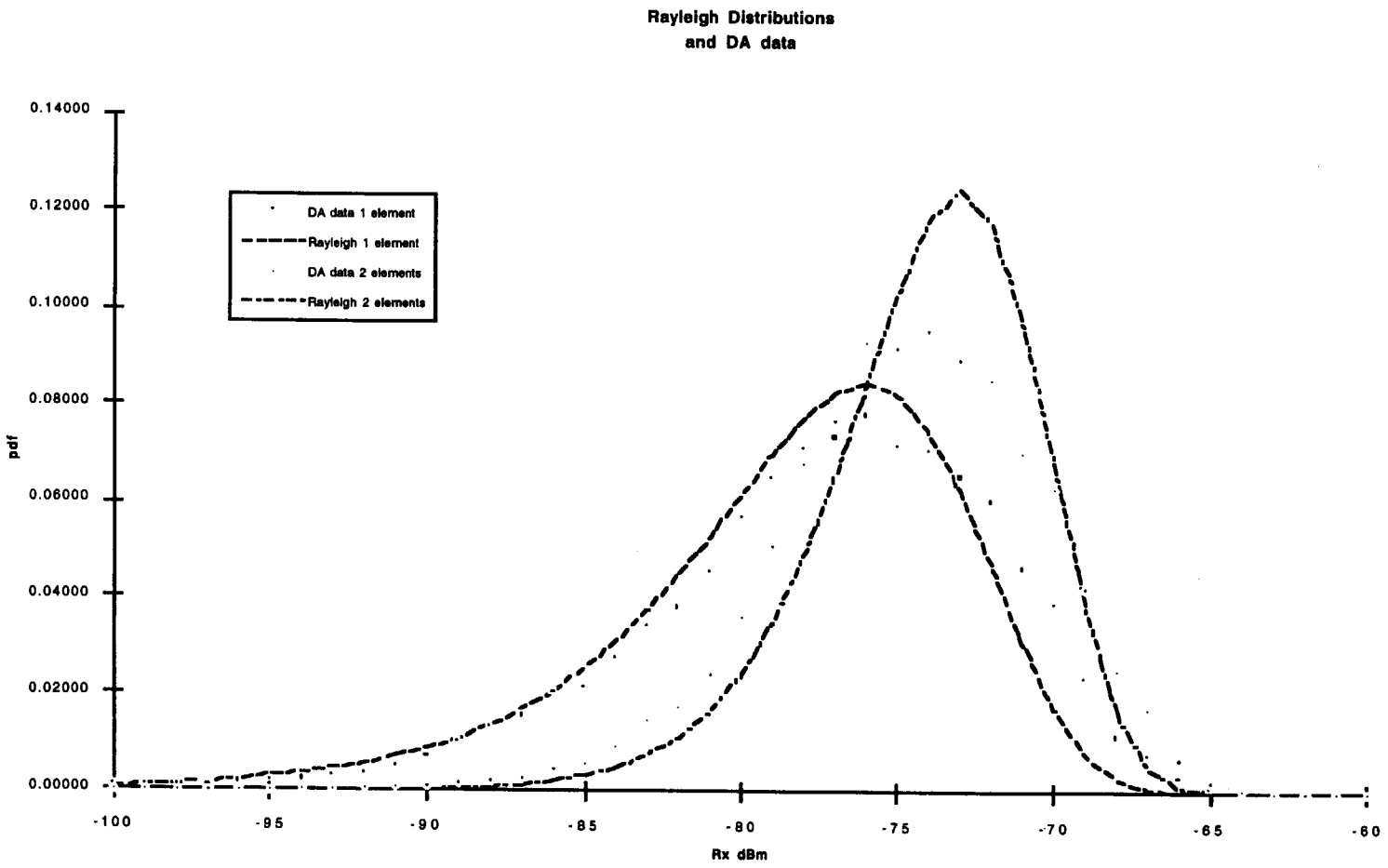
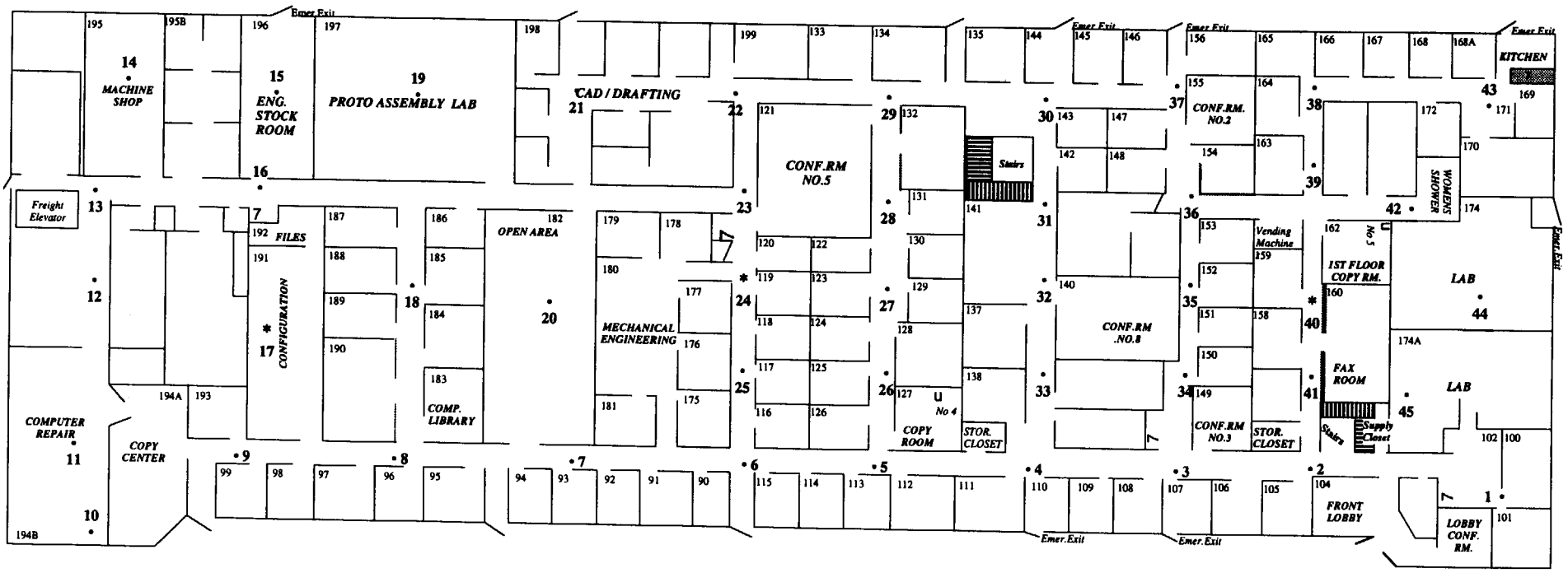


Figure 4-1 Raleigh Comparison to DA Data

Appendix A

These drawings show the location of the distributed antenna nodes and test points inside building A.



Node 1 @ Pt. 40, Node 2 @ Pt. 24, Node 3 @ Pt. 17

Figure A-1 Floor Plan – Building A 1st Floor

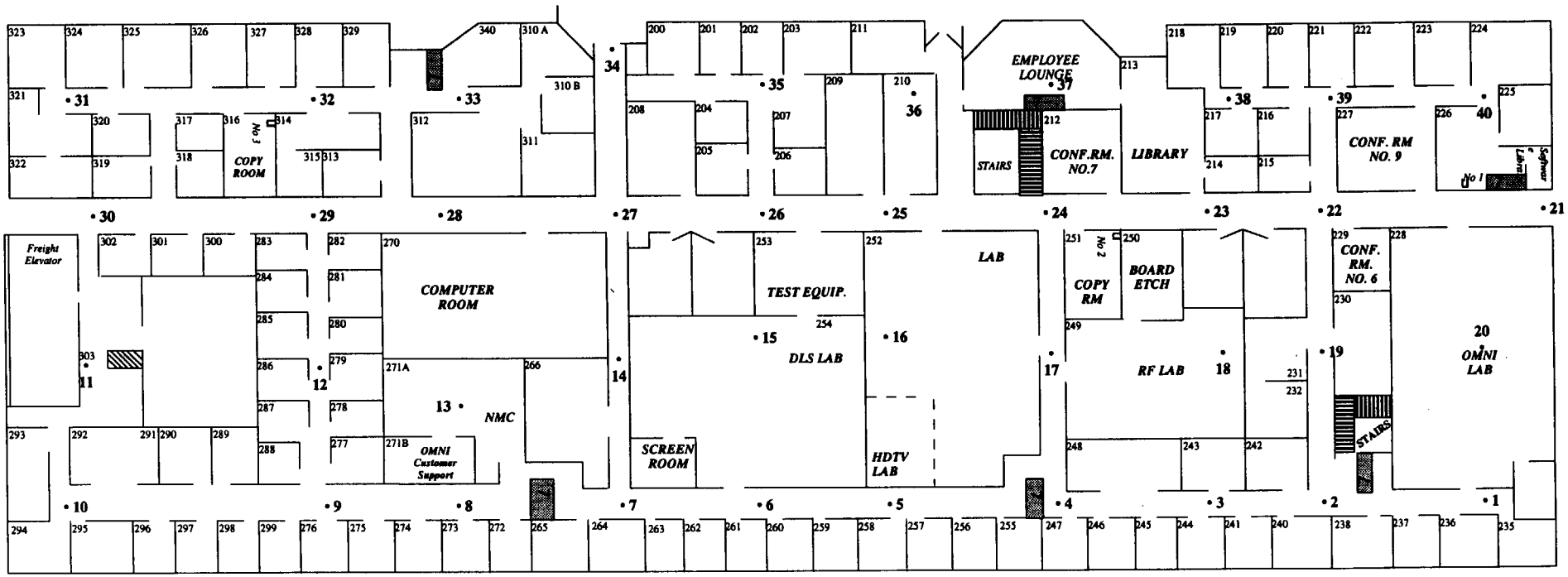


Figure A-2 Floor Plan – Building A 2nd Floor

Appendix B

Tables A-1 lists the PCS field test runs conducted. Note that the test section refers to the sections listed in the *PCS CDMA Baseline Test Procedures* (QUALCOMM document number 80-10723 Rev X1).

Table B-1. Field Test Runs

Test Section	Test #	Date	Run #	Freq. (MHz)	Comments
4.3.1.2.1	3	20-Apr	1	1865/1945	OFS propagation
4.3.1.2.1	2	20-Apr	2	1865/1945	OFS propagation
4.3.1.2.1	1	20-Apr	3	1865/1945	OFS propagation
4.3.1.2.1	5	21-Apr	1	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	6	21-Apr	3	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	4	21-Apr	6	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	4	28-Apr	1	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	5	28-Apr	2	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	7	28-Apr	3	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	6	28-Apr	4	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	8	28-Apr	5	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	9	28-Apr	6	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.3	3	5-May	14	1860/1940	Remote OFS interference from mobile
4.3.1.2.3	5	5-May	15	1860/1940	Remote OFS interference from mobile
4.3.1.2.3	7	5-May	16	1860/1940	Remote OFS interference from mobile
4.3.1.2.3	11	5-May	18	1860/1940	Remote OFS interference from mobile
4.3.1.2.3	11	5-May	19	1860/1940	Remote OFS interference from mobile
4.3.1.2.3	11a	5-May	20	1860/1940	Remote OFS interference from mobile
4.3.1.2.3	9	5-May	21	1860/1940	Remote OFS interference from mobile
4.3.1.2.3	9a	5-May	22	1860/1940	Remote OFS interference from mobile

Test Section	Test #	Date	Run#	Freq. (MHz)	Comments
4.3.1.2.2	10	6-May	1	1860/1940	Co-located OFS interference from mobile
4.3.1.2.2	10a	6-May	2	1860/1940	Co-located OFS interference from mobile
4.3.2.2.1	38	6-May	3	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	38A	6-May	4	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	7	6-May	5	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	8	6-May	6	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	9	6-May	7	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	10	6-May	8	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	11	6-May	9	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	43	6-May	10	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	44	6-May	11	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	45	6-May	12	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	46	6-May	13	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	47	6-May	14	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	37	6-May	15	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	37A	6-May	16	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	1	6-May	17	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	2	6-May	18	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	12	7-May	2	1862.6/1942.6	OFS interference to PCS mobile–near test
4.3.2.2.1	18	7-May	3	1862.6/1942.6	OFS interference to PCS mobile–near test
4.3.2.2.1	39	7-May	4	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	13	7-May	5	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	14	7-May	6	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	15	7-May	7	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	16	7-May	8	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	17	7-May	9	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	41	7-May	10	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	25	7-May	11	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	26	7-May	12	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	27	7-May	13	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	28	7-May	14	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	29	7-May	15	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	40	7-May	16	1860/1940	OFS interference to PCS mobile–near test

Test Section	Test #	Date	Run #	Freq. (MHz)	Comments
4.3.2.2.1	0	11-May	1	1862.6/1942.6	OFS interference to PCS mobile–near test
4.3.2.2.1	24R	11-May	2	1862.6/1942.6	OFS interference to PCS mobile–near test
4.3.2.2.1	24	11-May	3	1862.6/1942.6	OFS interference to PCS mobile–near test
4.3.2.2.1	42	11-May	7	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	31	11-May	8	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	32	11-May	9	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	33	11-May	10	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	34	11-May	11	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	35	11-May	12	1860/1940	OFS interference to PCS mobile–near test
4.3.2.2.1	36	12-May	4	1862.6/1942.6	OFS interference to PCS mobile–near test
4.3.2.2.2	43	12-May	6	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	44	12-May	7	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	45	12-May	8	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	46	12-May	9	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	47	12-May	10	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	37	12-May	11	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	1	12-May	12	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	2	12-May	13	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	3	12-May	14	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	4	12-May	15	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	5	12-May	16	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	37	13-May	2	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	1	13-May	3	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	2	13-May	4	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	3	13-May	5	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	4	13-May	6	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	5	13-May	7	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	6	13-May	10	1862.6/1942.6	OFS interference to PCS mobile–far test
4.3.2.2.2	6	13-May	11	1862.6/1942.6	OFS interference to PCS mobile–far test
4.3.2.2.2	18	13-May	13	1862.6/1942.6	OFS interference to PCS mobile–far test
4.3.2.2.2	12	13-May	15	1862.6/1942.6	OFS interference to PCS mobile–far test
4.3.2.2.2	39	13-May	17	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	13	13-May	18	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	14	13-May	19	1860/1940	OFS interference to PCS mobile–far test

Test Section	Test #	Date	Run #	Freq. (MHz)	Comments
4.3.1.2.1	4	14-May	4	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	2	14-May	5	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	3	14-May	6	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	4	14-May	7	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	5	14-May	8	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	6	14-May	9	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	7	14-May	10	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	8	14-May	11	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	9	14-May	12	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	10	14-May	13	1860/1940	Mobile interference to OFS–near tests
4.3.2.2.1	36R	14-May	20	1862.6/1942.6	OFS interference to PCS mobile–near test
4.3.2.2.1	36	14-May	21	1862.6/1942.6	OFS interference to PCS mobile–near test
4.3.2.2.1	30R	14-May	22	1862.6/1942.6	OFS interference to PCS mobile–near test
4.3.2.2.1	30	14-May	23	1862.6/1942.6	OFS interference to PCS mobile–near test
4.3.2.2.1	24R	14-May	24	1862.6/1942.6	OFS interference to PCS mobile–near test
4.3.2.2.1	24	14-May	25	1862.6/1942.6	OFS interference to PCS mobile–near test
4.3.1.2.1	18	18-May	2	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	19	18-May	3	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	20	18-May	4	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	21	18-May	5	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	22	18-May	6	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	23	18-May	7	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	24	18-May	8	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	25	18-May	9	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	26	18-May	10	1860/1940	Mobile interference to OFS–near tests
4.3.2.2.2	43	18-May	18	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	40	18-May	20	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	40A	18-May	21	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	19	18-May	22	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	20	18-May	23	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	21	18-May	24	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	22	18-May	25	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	23	18-May	26	1860/1940	OFS interference to PCS mobile–far test
4.3.2.2.2	41R	18-May	27	1860/1940	OFS interference to PCS mobile–far test

Test Section	Test #	Date	Run #	Freq. (MHz)	Comments
4.1.3.1.3	–	19-May	2	1860/1940	FERRO vs Speed
4.3.1.2.1	33	19-May	13	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	34	19-May	14	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	35	19-May	15	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	23	19-May	17	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	30	19-May	18	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	31	19-May	19	1860/1940	Mobile interference to OFS–near tests
4.3.2.2.2	24R	19-May	31	1862.6/1942.6	OFS interference to PCS mobile–far test
4.3.2.2.2	24	19-May	32	1862.6/1942.6	OFS interference to PCS mobile–far test
4.3.2.2.2	30	19-May	34	1862.6/1942.6	OFS interference to PCS mobile–far test
4.3.2.2.2	36R	19-May	35	1862.6/1942.6	OFS interference to PCS mobile–far test
4.3.2.2.2	36	19-May	36	1862.6/1942.6	OFS interference to PCS mobile–far test
4.3.1.2.1	23	20-May	17	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	30	20-May	18	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	31	20-May	19	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	18	20-May	T12	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	19	20-May	T13	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	20	20-May	T14	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	21	20-May	T15	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	22	20-May	T16	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	24	20-May	T17	1860/1940	Mobile interference to OFS–near tests
4.1.3.1.2	19	20-May	T25	1860/1940	Picocell baseline tests
4.1.3.1.2	15	20-May	T26	1860/1940	Picocell baseline tests
4.1.3.1.2	17	20-May	T27	1860/1940	Picocell baseline tests
4.1.3.1.2	17	20-May	T28	1860/1940	Picocell baseline tests
4.1.3.1.2	17	20-May	T29	1860/1940	Picocell baseline tests
4.1.3.1.2	17	20-May	T31	1860/1940	Picocell baseline tests
4.1.3.1.2	17	20-May	T32	1860/1940	Picocell baseline tests
4.1.3.1.2	17	20-May	T33	1860/1940	Picocell baseline tests
4.3.2.2.2	42	20-May	T5	1860/1940	OFS interference to PCS Mobile–far test
4.3.2.2.2	31	20-May	T6	1860/1940	OFS interference to PCS Mobile–far test
4.3.2.2.2	32	20-May	T7	1860/1940	OFS interference to PCS Mobile–far test
4.3.2.2.2	33	20-May	T8	1860/1940	OFS interference to PCS Mobile–far test
4.3.2.2.2	34	20-May	T9	1860/1940	OFS interference to PCS Mobile–far test

Test Section	Test #	Date	Run #	Freq. (MHz)	Comments
4.1.3.1.2	19	25-May	1	1860/1940	Picocell baseline tests
4.1.3.1.2	20	25-May	2	1860/1940	Picocell baseline tests
4.1.3.1.2	20	25-May	3	1860/1940	Picocell baseline tests
4.1.3.1.2	15	25-May	4	1860/1940	Picocell baseline tests
4.1.3.1.2	16	25-May	5	1860/1940	Picocell baseline tests
4.1.3.1.2	17	25-May	6	1860/1940	Picocell baseline tests
4.1.3.1.2	17	25-May	7	1860/1940	Picocell baseline tests
4.1.3.1.2	17	25-May	8	1860/1940	Picocell baseline tests
4.1.3.1.2	17	25-May	9	1860/1940	Picocell baseline tests
4.1.3.1.2	17	25-May	10	1860/1940	Picocell baseline tests
4.1.3.1.2	17	25-May	11	1860/1940	Picocell baseline tests
4.1.3.1.2	15	25-May	31	1860/1940	Picocell baseline tests
4.1.3.1.2	16	25-May	32	1860/1940	Picocell baseline tests
4.1.3.1.2	19	25-May	33	1860/1940	Picocell baseline tests
4.1.3.1.2	20	25-May	34	1860/1940	Picocell baseline tests
4.1.3.1.2	18	26-May	20	1860/1940	Picocell baseline tests
4.1.3.1.2	18	26-May	30	1860/1940	Picocell baseline tests
4.1.3.1.2	21	27-May	59	1860/1940	Picocell baseline tests
4.1.3.1.2	24	1-June	21	1860/1940	Picocell baseline tests
4.1.3.1.2	26	2-June	20	1860/1940	Picocell baseline tests
4.1.3.1.2	29	2-June	21	1860/1940	Picocell baseline tests
4.1.3.1.2	23	3-June	41	1860/1940	Picocell baseline tests
4.1.3.1.2	23	3-June	42	1860/1940	Picocell baseline tests
4.1.3.1.2	1	8-June	1	1860/1940	Picocell baseline tests
4.1.3.1.2	7	8-June	2	1860/1940	Picocell baseline tests
4.1.3.1.2	11	8-June	10	1860/1940	Picocell baseline tests
4.1.3.1.2	3	8-June	11	1860/1940	Picocell baseline tests
4.1.3.1.2	5	8-June	13	1860/1940	Picocell baseline tests
4.1.3.1.2	13	8-June	14	1860/1940	Picocell baseline tests
4.2.3.1	11	9-June	4	1860/1940	DA handoff route 4 16 OUNS
4.2.3.1	2	9-June	6	1860/1940	DA handoff route 1 16 OUNS
4.2.3.1	2	9-June	7	1860/1940	DA handoff route 1 16 OUNS

Test Section	Test #	Date	Run #	Freq. (MHz)	Comments
4.2.3.2	5	10-June	6	1860/1940	DA interference route 2 16 OUNS
4.2.3.2	9	10-June	10	1860/1940	DA interference route 3 26 OUNS
4.2.3.2	8	10-June	12	1860/1940	DA interference route 3 16 OUNS
4.1.3.1.2	32	10-June	21	1860/1940	Picocell baseline tests
4.1.3.1.2	31	10-June	22	1860/1940	Picocell baseline tests
4.1.3.1.2	30	10-June	23	1860/1940	Picocell baseline tests
4.1.3.1.2	33	10-June	25	1860/1940	Picocell baseline tests
4.1.3.1.2	34	10-June	26	1860/1940	Picocell baseline tests
4.1.3.1.2	35	10-June	27	1860/1940	Picocell baseline tests
dry run		11-June	1	1860/1940	Microcell pilot coverage survey
dry run		11-June	2	1860/1940	Microcell pilot coverage survey
dry run		11-June	3	1860/1940	All cells on, bldg. A has 20dB pad on alpha
dry run		11-June	4	1860/1940	All cells on, bldg. A has 20dB pad on alpha
4.1.2.1.1	-	14-June	2	1860/1940	Micro route 1 with 0 OUNS/OCNS
4.1.2.1.2	1	14-June	3	1860/1940	Micro route 2 with 0 OUNS/OCNS
4.1.2.1.2	1	14-June	4	1860/1940	Micro route 2 with 0 OUNS/OCNS
4.1.2.1.3	4	14-June	6	1860/1940	Micro route 4 with 0 OUNS/OCNS
4.1.2.1.1	-	14-June	15	1860/1940	Micro route 1 with 16 OUNS/OCNS
4.1.2.1.2	2	14-June	16	1860/1940	Micro route 2 with 16 OUNS/OCNS
4.1.2.1.3	2	14-June	17	1860/1940	Micro route 3 with 16 OUNS/OCNS
4.1.2.1.3	5	14-June	18	1860/1940	Micro route 4 with 16 OUNS/OCNS
4.1.2.1.1	-	14-June	19	1860/1940	Micro route 1 with 26 OUNS/OCNS
4.3.1.2.1	3	16-June	5	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	4	16-June	6	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	5	16-June	7	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	6	16-June	8	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	7	16-June	9	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	8	16-June	10	1860/1940	Mobile interference to OFS–near tests
4.3.1.2.1	9	16-June	11	1860/1940	Mobile interference to OFS–near tests
4.2	2	17-June	1	1860/1940	Voice tests DC route 1
4.2	3	17-June	2	1860/1940	Voice tests DC route 2
4.2	4	17-June	3	1860/1940	Voice tests DC route 3
4.2	5	17-June	4	1860/1940	Voice tests DC route 4
4.2	6	17-June	5	1860/1940	Voice tests bldg. C route 3

Test Section	Test #	Date	Run #	Freq. (MHz)	Comments
4.3.1.2.4	1	18-June	4	1860/1940	Mobile on remote cell effect on OFS BER
4.3.1.2.4	1	18-June	5	1860/1940	Mobile on remote cell effect on OFS BER
4.3.1.2.4	2	18-June	6	1860/1940	Mobile on remote cell effect on OFS BER
4.3.1.2.4	3	18-June	8	1860/1940	Mobile on remote cell effect on OFS BER
4.3.1.2.4	4	18-June	9	1860/1940	Mobile on remote cell effect on OFS BER
4.3.1.2.4	5	18-June	11	1860/1940	Mobile on remote cell effect on OFS BER
4.3.1.2.4	6	18-June	12	1860/1940	Mobile on remote cell effect on OFS BER
4.3.1.2.6	2	18-June	18	1860/1940	Mobile on remote cell effect on OFS BER w/ margin
4.3.1.2.6	1	18-June	21	1860/1940	Mobile on remote cell effect on OFS BER w/ margin
4.3.1.2.6	1	18-June	23	1860/1940	Mobile on remote cell effect on OFS BER w/ margin
4.3.1.2.6	3	18-June	25	1860/1940	Mobile on remote cell effect on OFS BER w/ margin
4.3.1.2.6	4	18-June	27	1860/1940	Mobile on remote cell effect on OFS BER w/ margin
4.3.1.2.6	5	18-June	29	1860/1940	Mobile on remote cell effect on OFS BER w/ margin
4.3.1.2.6	6	18-June	31	1860/1940	Mobile on remote cell effect on OFS BER w/ margin
4.3.1.2.8	2	18-June	33	1860/1940	Mobile on loaded remote cell effect on OFS BER
4.3.1.2.8	1	18-June	36	1860/1940	Mobile on loaded remote cell effect on OFS BER
4.3.1.2.8	1	18-June	38	1860/1940	Mobile on loaded remote cell effect on OFS BER
4.3.1.2.8	3	18-June	40	1860/1940	Mobile on loaded remote cell effect on OFS BER
4.3.1.2.8	5	18-June	42	1860/1940	Mobile on loaded remote cell effect on OFS BER
4.3.1.2.10	1	18-June	49	1860/1940	Mobile on loaded remote cell effect on OFS BER
4.3.1.2.10	1	18-June	51	1860/1940	Mobile on loaded remote cell effect on OFS BER
4.3.1.2.10	3	18-June	53	1860/1940	Mobile on loaded remote cell effect on OFS BER

Test Section	Test #	Date	Run #	Freq. (MHz)	Comments
4.2	2	22-June	2	1860/1940	Voice tests C route 5
4.2	3	22-June	3	1860/1940	Voice tests DC route 3
4.2	4	22-June	4	1860/1940	Voice tests DC route 2
4.2	5	22-June	5	1860/1940	Voice tests DC route 4
4.2	6	22-June	6	1860/1940	Voice tests bldg. C route 3
4.2	7	22-June	7	1860/1940	Voice tests bldg. C route 3
4.2	8	22-June	8	1860/1940	Voice tests bldg. C route 4
4.2	9	22-June	9	1860/1940	Voice tests stationary
4.2	13	22-June	11	1860/1940	Voice tests C route 5
4.2	14	22-June	12	1860/1940	Voice tests DC route 2
4.2	15	22-June	13	1860/1940	Voice tests DC route 3
4.2	16	22-June	14	1860/1940	Voice tests DC route 4
4.2	17	22-June	15	1860/1940	Voice tests bldg. C route 3
4.2	18	22-June	16	1860/1940	Voice tests bldg. C route 4
4.2	19	22-June	17	1860/1940	Voice tests stationary
4.2	11	22-June	18	1860/1940	Voice tests in bldg. 2nd floor
4.2	21	22-June	22	1860/1940	Voice tests in bldg. 2nd floor