Spectrum Sharing Study

San Diego, CA

Prepared on Behalf of
Qualcomm
November 22, 2006

COMSEARCH
An Andrew Company

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1.0 Executive Summary

On behalf of Qualcomm, Comsearch has completed a Spectrum Sharing Study in San Diego, CA to re-evaluate the interference impact into existing microwave systems from a their devices temporarily operating in 2110-2120 MHz. Comsearch utilized specific site information, base station operational parameters and locations provided by Qualcomm for the study. Interference calculations were made based on this cell layout using our iQ.clear XG software and our proprietary microwave database of incumbent systems. The results of this study determine the availability of the spectrum and identify any predicted victim active microwave links and their respective interference margins.

Summary of Results

Qualcomm's system will not create any harmful interference into any active MW path.

	2110 – 2120 MHz
Links considered in analysis	26
Links cleared by OH loss	26
Licensed 2.1 GHz victim links	0

2.0 Parameters and Assumptions

Spectrum Allocation

This study analyzed the use of frequencies 2110 – 2120 MHz.

Study Area

The study was conducted using 8 sites provided by Qualcomm and located in the San Diego, CA market (see table 1). All microwave links within the Bulletin 10-F derived coordination contour and within ±20 MHz of the band edges of the spectrum block were analyzed for potential interference.

Site	Latitude	Longitude	Radius (km)	Coord Dist (km)	Ant Ht(m)	EIRP (dBm)	Antenna	Tilt (deg)	Frequency Range (MHz)
4875 Eastgate Mall	32.87983	-117.2025	5	370.2	16.6	60	Omni	0	2110 - 2120
6455 Lusk Blvd	32.90242	-117.200328	5	367.4	27.4	60	Omni	0	2110 - 2120
5665 Morehouse Dr	32.89569	-117.196083	5	373.5	60.8	60	Omni	0	2110 - 2120
5745 Pacific Center Blvd	32.90353	-117.196717	5	374.5	62.5	60	Omni	0	2110 - 2120
6965 Lusk Blvd	32.90083	-117.208919	5	369.9	16	60	Omni	0	2110 - 2120
10290 Campus Point Dr	32.89102	-117.223133	5	370.4	23	60	Omni	0	2110 - 2120
10185 McKellar Ct	32.90417	-117.202317	5	364.8	18.6	60	Omni	0	2110 - 2120
5775 Morehouse Drive	32.89525	-117.195483	5	368.7	40	60	Omni	0	2110 - 2120

Table 1

AWS Parameters

Number of Sites	8
Base Station EIRP	60 dBm
Max BTS Cell Size (Radius)	5 kilometers
Antenna used	Omni
Frequency Division Duplex	Base Station Transmit at 2.1 GHz
Bandwidth of system	5 MHz

Interference Criteria

Propagation Model	OH Loss (base)
Analog Interference Criteria (C/I)	Threshold Degradation and Baseband Noise
Noise Objective	25 pWpO
Digital Interference Criteria	Receiver Threshold - T/I
Excess Fade Margin Based on	99.999% Link Reliability
Polarization	Co-polarization

3.0 Analysis Results

2.1 GHz Microwave Systems

Summary of Results

A table summarizing the analysis results is provided on the following pages.

Interference Calculations

Plot of victim links and Link Severity Reports are provided in Appendix B. They show the extent of interference from Qualcomm's system into each victim microwave receiver as compared to the interference objective calculated per Bulletin 10-F, the TSB standard document for these calculations.

The interference objective is the calculated required maximum level that microwave receivers can withstand from this proposed system. The interference level is the calculated aggregated level of interference into each receiver. The Margin depicts the difference between these two levels. If the Margins are negative, then interference from the proposed system is predicted. If the Margins are positive, then interference is not predicted. Receivers listed without calculated levels either have frequencies beyond co- and adjacent-channel, or are outside of the coordination contour.

Microwave Data

Detailed microwave data for each victim link is provided in Appendices B1.

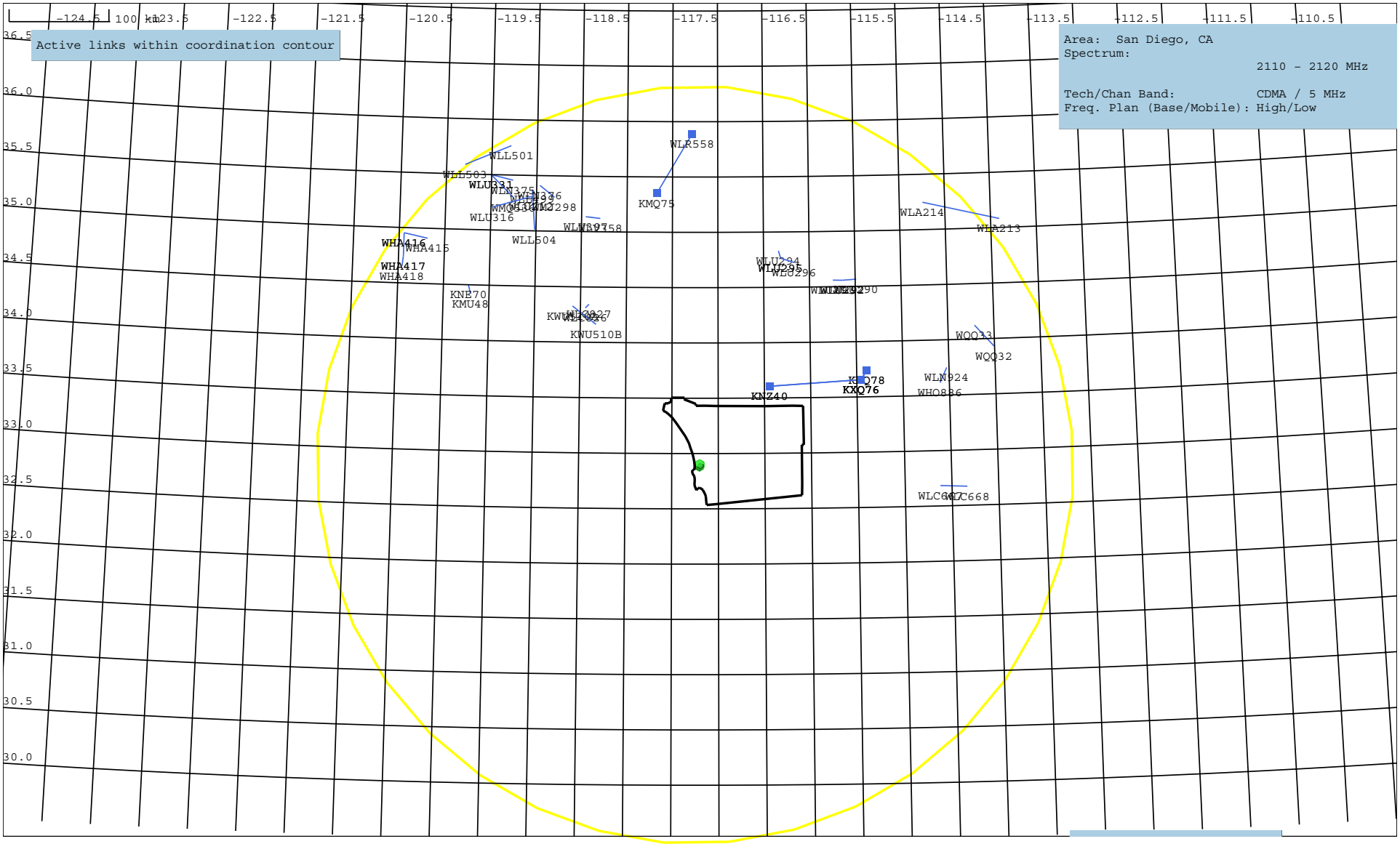
The reports in the Appendices contain status information for each link. The various statuses are defined as follows:

- Licensed - Licensed with the Federal Communications Commission (FCC).
- Replaced - Licensed with the FCC but a new application has been filed to replace the existing path. Once the new path becomes licensed by the FCC, the status changes to Relocated.
- Relocated – Within the 18-month build out period for a new license on a different frequency band.
- Expired – Past the FCC expiration date and no renewal filed.
- Operating - Confirmed by licensee to be operating, but actual site data does not match FCC license.
- Questionable - One side of the path is listed as licensed with the FCC while the other end has been canceled or expired. This occurs because the FCC maintains licenses by transmit site rather than by path.
- Secondary - Operating in a secondary capacity based on FCC special conditions.

The various microwave path statuses are maintained to most accurately describe the state of transition that the microwave path may be in at any given time. Further investigation into the application history of specific paths may be necessary to establish a final determination on its license validity.

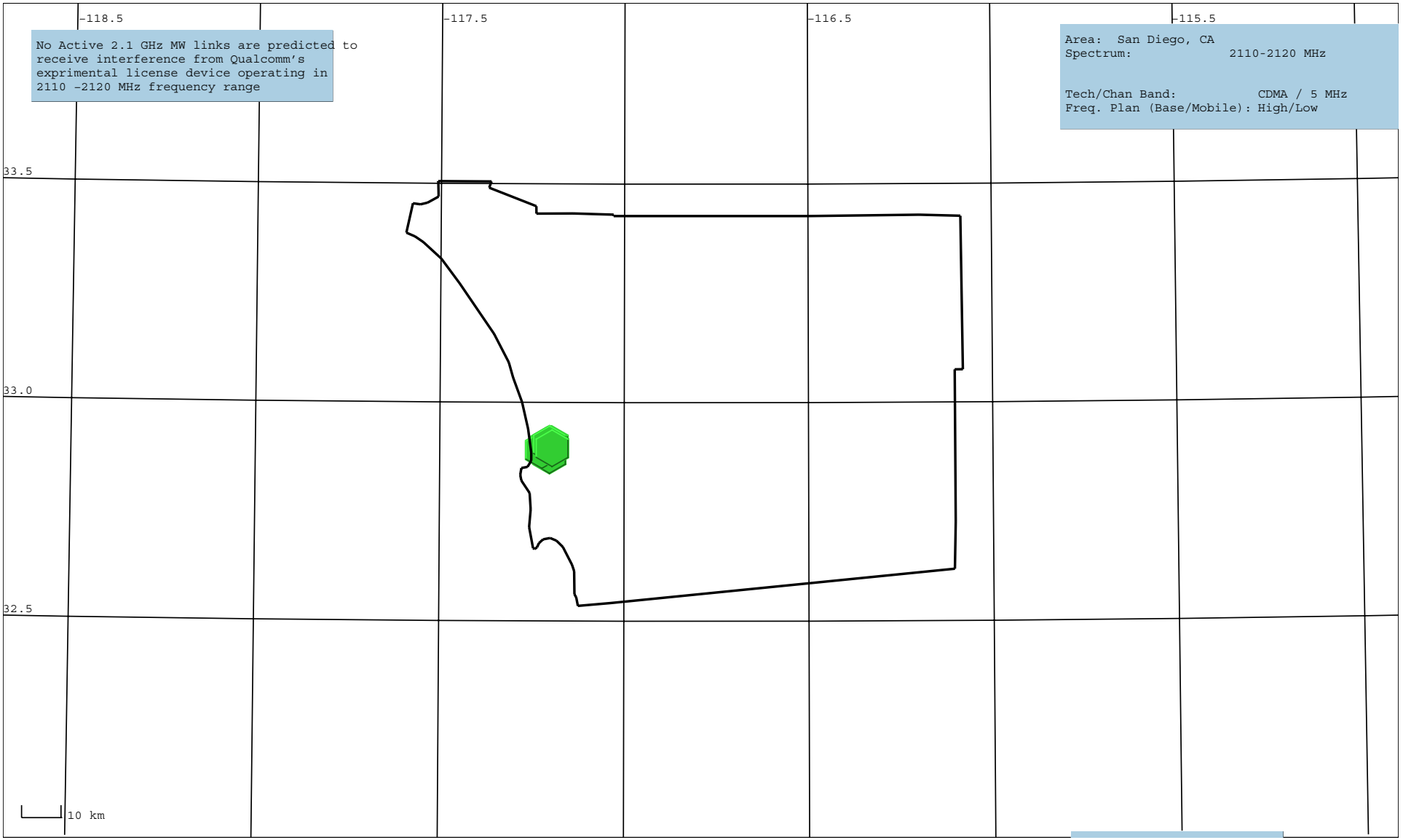
APPENDIX A:

Cell Layout and Coordination Contour


Active links within coordination contour
Area: San Diego, CA
Spectrum:
2110 - 2120 MHz
Tech/Chan Band: CDMA / 5 MHz
Freq. Plan (Base/Mobile): High/Low
100 km
-124.5
-123.5
-122.5
-121.5
-120.5
-119.5
-118.5
-117.5
-116.5
-115.5
-114.5
-113.5
-112.5
-111.5
-110.5
36.5
36.0
35.5
35.0
34.5
34.0
33.5
33.0
32.5
32.0
31.5
31.0
30.5
30.0
WLR558
WLL501
WLL503
WLU331
KMQ75
WLU316
WLL504
WLA214
WLA213
WHA416
WHA415
WHA417
WHA418
WLU294
WLU295
KNE70
KMU48
KWU510B
WQQ33
WQQ32
KNZ40
KXQ78
KXQ76
WLN924
WHO886
WLC668

APPENDIX B1:

Interference Calculations – 2110- 2120 MHz


No Active 2.1 GHz MW links are predicted to receive interference from Qualcomm's exprimental license device operating in 2110 -2120 MHz frequency range
Area: San Diego, CA
Spectrum: 2110-2120 MHz
Tech/Chan Band: CDMA / 5 MHz
Freq. Plan (Base/Mobile): High/Low
-118.5
-117.5
-116.5
-115.5
33.5
33.0
32.5
10 km

Link Severity Report

Interference Calculation from Qualcomm's System to all Active 2.1 GHz MW Links

Link ID	Call Signs	Status	Frequency	IntLev(dBm)	IntObj(dBm)	Margin(dB)	Owner
210121000	WHA415	Licensed	2114.6	-172.6	-100.2	72.4	Arch Wireless License C
	WHA416	Licensed	2164.6				
210121010	WHA417	Licensed	2120.4	-166.7	-91.5	75.2	Arch Wireless License C
	WHA416	Licensed	2170.4				
211475400	WHA418	Licensed	2163.6	-159	-90.2	68.8	Arch Wireless License C
	WHA417	Licensed	2113.6				
211158760	WLR558	Relocated	2168.4	-173.9	-111.1	62.9	AT&T California
	KMQ75	Questionable	2118.4				
211169040	WLU293	Licensed	2119.2	-179.7	-78	101.7	AT&T California
	WLU292	Licensed	2169.2				
211169050	WLU292	Licensed	2119.2	-177.2	-80.9	96.3	AT&T California
	WLU290	Licensed	2169.2				
211169070	WLU295	Licensed	2120.8	-169.1	-47.9	121.2	AT&T California
	WLU294	Licensed	2170.8				
211169080	WLU296	Licensed	2120.8	-174.1	-51.2	123	AT&T California
	WLU295	Licensed	2170.8				
210135740	WLU331	Licensed	2162.8	-187.9	-105.7	82.2	Fresno MSA Limited Par
	WMQ536	Licensed	2112.8				
210135870	WLU331	Licensed	2168.4	-191	-88.2	102.8	Fresno MSA Limited Par
	WLN375	Licensed	2118.4				
210444970	WMJ298	Licensed	2115.2	-182.4	-88.2	94.2	Fresno MSA Limited Par
	WLN376	Licensed	2165.2				
211550700	WLU212	Secondary	2165.2	-179.8	-94.4	85.4	Fresno MSA Limited Par
	WLU316	Licensed	2115.2				
210135240	WLV397	Questionable	2165.2	-126.8	-71.7	55.1	New Cingular Wireless P
	WLV358	Questionable	2115.2				
210135830	WLL499	Licensed	2118.4	-162.3	-104.3	58.1	New Cingular Wireless P
	WLL504	Licensed	2168.4				
211839710	KWU510A	Licensed	2170.4	-169.4	-72.8	96.6	SKYTEL CORPORATION
	KWU510B	Licensed	2120.4				
210080130	WQQ33	Licensed	2115.2	-173.7	-104.5	69.2	Verizon California Inc.
	WQQ32	Licensed	2165.2				

Link Severity Report

Interference Calculation from Qualcomm's System to all Active 2.1 GHz MW Links

210080380	KXQ76	Licensed	2114.8	-135.1	-82.2	52.8	Verizon California Inc.
	KXQ78	Licensed	2164.8				
210080390	KXQ76	Licensed	2119.6	-135.1	-82.5	52.5	Verizon California Inc.
	KXQ78	Licensed	2169.6				
210080570	KNZ40	Licensed	2162.4	-112.2	-103.4	8.9	Verizon California Inc.
	KXQ76	Licensed	2112.4				
210080571	KNZ40	Licensed	2167.2	-112.2	-103.4	8.9	Verizon California Inc.
	KXQ76	Licensed	2117.2				
210111180	WLC826	Licensed	2165.2	-104.2	-58.3	45.9	Verizon California Inc.
	WLC827	Licensed	2115.2				
210119880	KMU48	Questionable	2168.4	-141.7	-88.7	53.1	Verizon California Inc.
	KNE70	Licensed	2118.4				
211158760	WLR558	Relocated	2168.4	-173.9	-111.1	62.9	Verizon California Inc.
	KMQ75	Questionable	2118.4				
210132800	WLA213	Licensed	2165.2	-169.5	-86.9	82.6	Wecom Inc.
	WLA214	Licensed	2115.2				
210080110	WHO886	Licensed	2168.4	-166.1	-92.5	73.6	WWC License L.L.C.
	WLN924	Licensed	2118.4				
211555440	WLC668	Licensed	2160.8	-154.5	-102.1	52.3	WWC License L.L.C.
	WLC667	Licensed	2110.8				