

## **APPENDIX 3.5-A: PRECONSTRUCTION ELECTROMAGNETIC MEASUREMENT SURVEY ALONG THE SAN JOSE TO MERCED PROJECT SECTION**



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## Introduction

This appendix documents measurement results from a preconstruction electromagnetic survey of locations along the San Jose to Carlucci project extent corridor. The purpose of the survey was to: (1) provide a baseline characterization of the existing electromagnetic environment, (2) allow comparisons with the expected electromagnetic footprint from the planned California High-Speed Rail (HSR) system, and (3) provide guidance for electromagnetic compatibility (EMC) requirements by defining the typical electromagnetic environment that the HSR system must operate in without interference.

Land uses, existing facilities, and infrastructure along the alignment were reviewed, with a list of approximately 30 candidate sites evaluated. This review concentrated on identifying potentially electromagnetic interference (EMI)-sensitive facilities, as well as existing electromagnetic field (EMF) sources such as power generation, power distribution, and communications facilities. The selection criteria, taken from Technical Memorandum (TM) 3.4.11, Measurement Procedure for Assessment of CHSTP Alignment EMI Footprint, favored providing a balanced coverage of:

- The geographic extent of the segment
- High-emission sites
- Low-emission sites
- Sites with high-sensitivity receptors

A final group consisting of 10 sites was selected based upon the above considerations and to provide representative coverage of land uses. Two types of measurements were performed at each location. The first involved measurement of radiated electric fields from 10 kilohertz (kHz) to 6 gigahertz (GHz), meant to characterize the radio-frequency (RF) environment. These electric field strengths were measured using an RF spectrum analyzer and calibrated antennas. Expected sources of RF signals included:

- Cell towers (cellular telephone)
- Broadcast towers (radio and television broadcasts)
- Airport radars and aircraft communications equipment
- General high-frequency and very-high-frequency fixed and mobile communications systems (e.g., police, fire, emergency medical technician, utilities, and government)
- Local wireless (wireless fidelity [WiFi] and Worldwide Interoperability for Microwave Access [WiMAX])

The second part of the test procedure involved measurements of background direct current (DC) and power frequency magnetic fields along the alignment. These magnetic fields were recorded using a three-axis fluxgate sensor with a waveform recording data acquisition system. Expected sources of DC and low-frequency magnetic fields included:

- The geomagnetic field
- High-voltage transmission lines
- Electric distribution lines
- Traction power distribution facilities
- Geomagnetic perturbations due to passing vehicles and trains

The facilities most sensitive to shifts in the DC (geomagnetic perturbations) and alternating current (AC) magnetic fields are:

- High technology semiconductor (e.g., electron microscopes [transmission electron microscopes/scanning electron microscopes], electron-beam lithography, ion-writing systems, focused ion-beam systems)
- High technology biology (e.g., nuclear magnetic resonance, magnetic resonance imaging [MRI], electron microscopes)

- Medical imaging (e.g., computed tomography [CT] scanners, MRI systems)
- University/research (instrumentation for chemistry, physics, electrical engineering, and similar systems to those mentioned for high technology and medical facilities).

## Test Procedures and Equipment

Analysts characterized the RF environment along the project extent by measuring the prevailing electric field strength at each of the 10 test sites, over the frequency range from 10 kHz to 6 GHz. The RF and magnetic field measurements were performed between July 18, 2016, and July 22, 2016. Measurements were made using a vertical monopole antenna (AH Systems SAS-550-1) for the frequency range from 10 kHz to 30 MHz and a broadband biological antenna (AH Systems SAS-521-7) for the frequency range from 25 MHz to 6 GHz, connected to an Anritsu MS2721B Spectrum Analyzer. Measurements were made in eight contiguous frequency bands and recorded per Section 6.4 of TM 3.4.11. Where practical, the RF antennas were located approximately 50 feet from the proposed alignment.

Electric field measurement files from the spectrum analyzer include both min-hold and max-hold levels as a function of frequency across each of the measurement bands, and a complete file set will be preserved for each measurement location. Reported results include the low-frequency measurements with the omni-directional vertical monopole, plus measurements with the biological antenna in both horizontal and vertical positions, first facing the proposed alignment, and then in the direction that exhibited the maximum signal strength in each measurement band.

The magnetic field measurements characterized the prevailing background magnetic field levels, as well as the temporal variations caused by the passing of trains on the existing right-of-way. Measurements were made at two positions at each site, separated by approximately 30 feet. The magnetic field measurements were performed using a pair of three-axis 5 gauss Bartington fluxgate sensors (bandwidth DC to 3 kHz), connected to a National Instruments data acquisition system. Magnetic field waveforms were recorded so that DC and full frequency information is available over the entire sensor bandwidth.

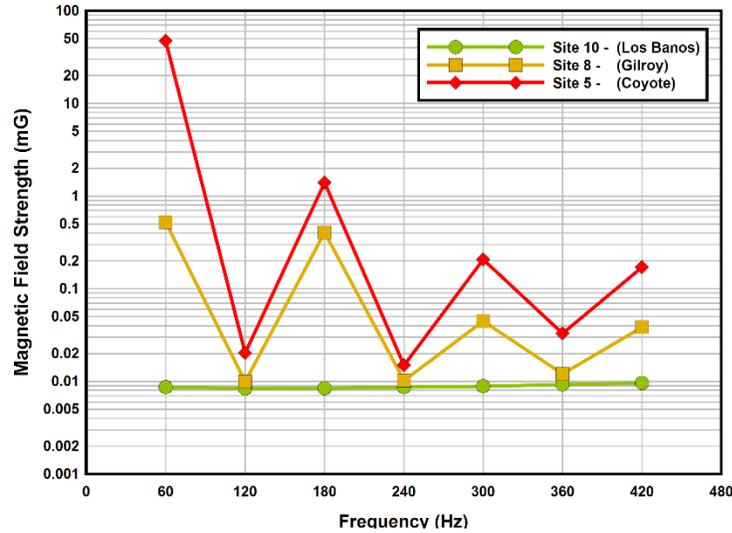
## Overview of the Measurement Results

### Magnetic Fields

The measured DC magnetic field strengths ranged from 388 milligauss (mG) to 488 mG across the 10 measurement sites. At individual sites, the difference in DC field strength between the two sensors ranged from 15 to 46 mG. These differentials typically are the result of the influence from passing vehicles or nearby steel objects.

AC magnetic field strengths at the 10 sites varied over a range of more than three orders of magnitude, from 0.009 mG to 47 mG. The levels depend almost entirely on a site's proximity to power lines (medium-voltage distribution and high-voltage transmission lines) and other electrical system infrastructure. Such a wide range in observed magnetic field strengths is expected, given the variable levels of development along the project extent.

Figure 1 provides an illustration of the measured AC magnetic field strengths for three representative measurement sites: rural (Los Banos, Site 10), suburban (Gilroy, Site 8), and in close proximity to high-voltage transmission lines (Coyote, Site 5). These sites encompass the full range of observed 60 hertz (Hz) magnetic field levels, with Site 10 the lowest, Site 5 the highest, and Site 6 representing the median level. Levels are plotted for the 60 Hz fundamental.



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**Figure 1 Average Measured AC Magnetic Field Strengths**

**Electric Fields**

Because of the very broad range of frequencies of interest, the electric field measurements at each site were divided into eight overlapping frequency bands to provide adequate frequency resolution in each band. Table 1 summarizes the maximum magnitude of the measured electric field values by frequency band for each site. The maximum electric fields strengths in bands B0 through B4 varied considerably across sites. Except for band B2 (the AM broadcast band), levels spanned a 30 decibel (dB) range. Even greater variation was seen at higher frequencies (bands B5 through B7), reflecting stronger differences in spectrum usage along the project alignment. Measured maximum levels in these bands varied by up to 45 dB. Variations of this magnitude are not unexpected when encompassing the range of urban, suburban, and rural settings found in the project extent.

**Table 1 Maximum Measured Electric Field Strengths by Frequency Band**

Measurement Site	B0 10-50 kHz	B1 50-550 KHz	B2 .50-3.0 MHz	B3 2.5-7.5 MHz	B4 5.0-30 MHz	B5 25- 200 MHz	B6 0.20- 2.2 GHz	B7 2.0- 6.0 GHz
<b>San Jose Diridon Station Approach Subsection</b>								
1 – San Jose (urban)	135.1	128.4	143.5	128.4	101.7	119.0	122.9	114.4
2 – San Jose (urban)	146.7	124.4	145.0	122.5	97.1	110.6	118.7	112.3
<b>Monterey Corridor Subsection</b>								
3 – San Jose (urban)	138.5	129.8	145.3	130.0	108.2	93.7	102.4	102.2
4 – San Jose (urban)	128.6	115.1	135.2	109.6	100.8	123.5	110.7	96.3
<b>Morgan Hill and Gilroy Subsection</b>								
5 – Coyote (rural)	154.8	143.7	144.0	118.6	102.8	117.6	107.4	74.3
6 – Morgan Hill (rural)	134.7	113.5	135.1	96.9	83.7	96.8	119.0	105.5
7 – Gilroy (suburban)	133.5	127.1	142.5	123.6	88.8	102.9	102.4	103.5

Measurement Site	B0 10-50 kHz	B1 50-550 KHz	B2 .50-3.0 MHz	B3 2.5-7.5 MHz	B4 5.0-30 MHz	B5 25- 200 MHz	B6 0.20- 2.2 GHz	B7 2.0- 6.0 GHz
<b>Pacheco Pass Subsection</b>								
8 – Hollister (rural)	128.1	119.8	136.1	109.8	84.9	82.7	90.6	68.9
<b>San Joaquin Valley Subsection</b>								
9 - Santa Nella (rural)	141.1	122.9	139.1	117.0	86.9	80.0	102.3	92.5
10 –Los Banos (rural)	148.4	131.3	134.7	112.3	107.4	83.9	80.4	69.8

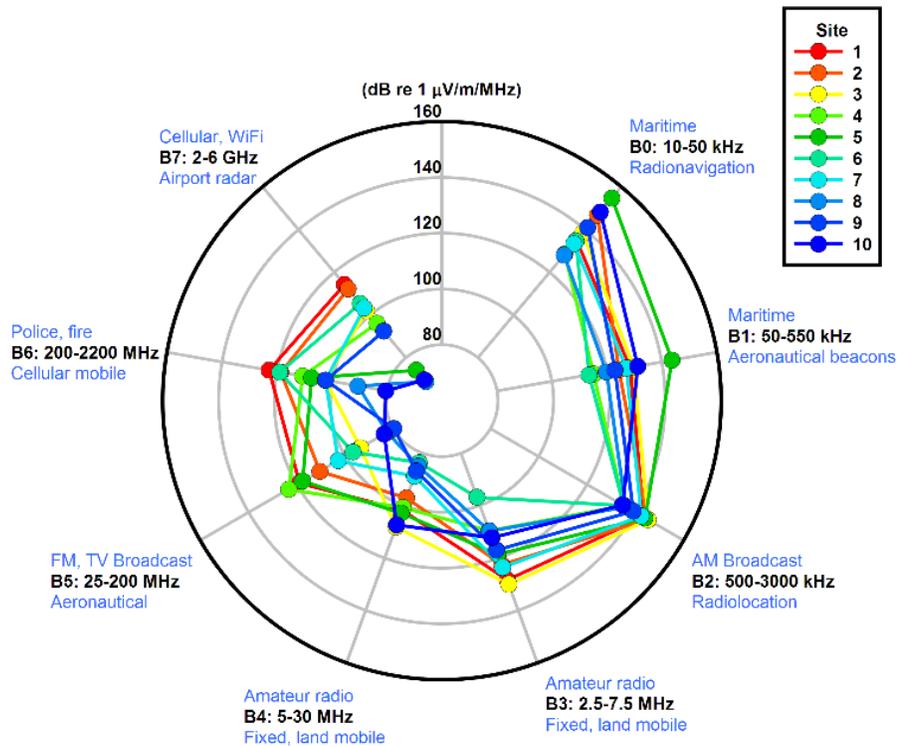
Field strength values are in decibel (dB), referenced to 1 microvolt meter/MHz.

GHz = gigahertz

KHz = kilohertz

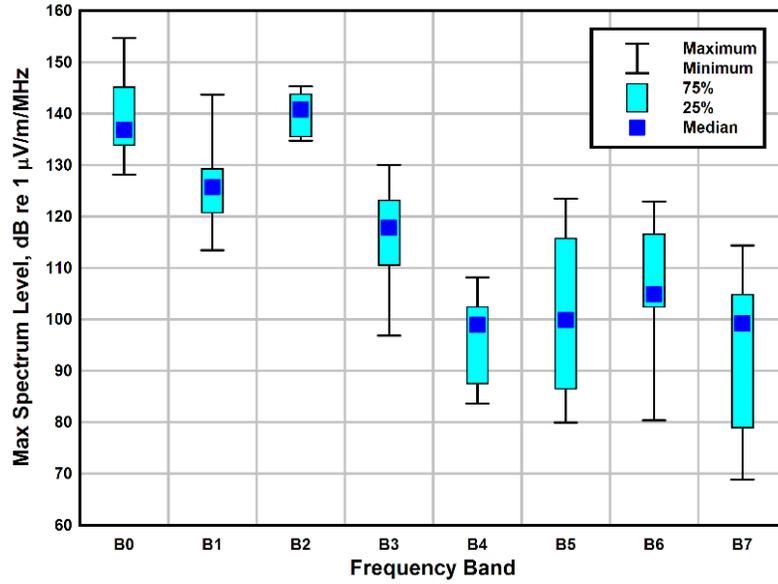
MHz = megahertz

Figure 2 graphically shows the maximum measured electric field strengths by frequency band for the 10 measurement sites. Typical spectrum uses in each frequency band are also indicated in Figure A3.5-2. Increasing distance from the plot origin indicates higher field strength. Figure 3 shows the variance in RF field strengths across the measurement sites by frequency band. Standard deviations ranged from 4.5 dB in band B2 to as great as 17 dB in band B7.



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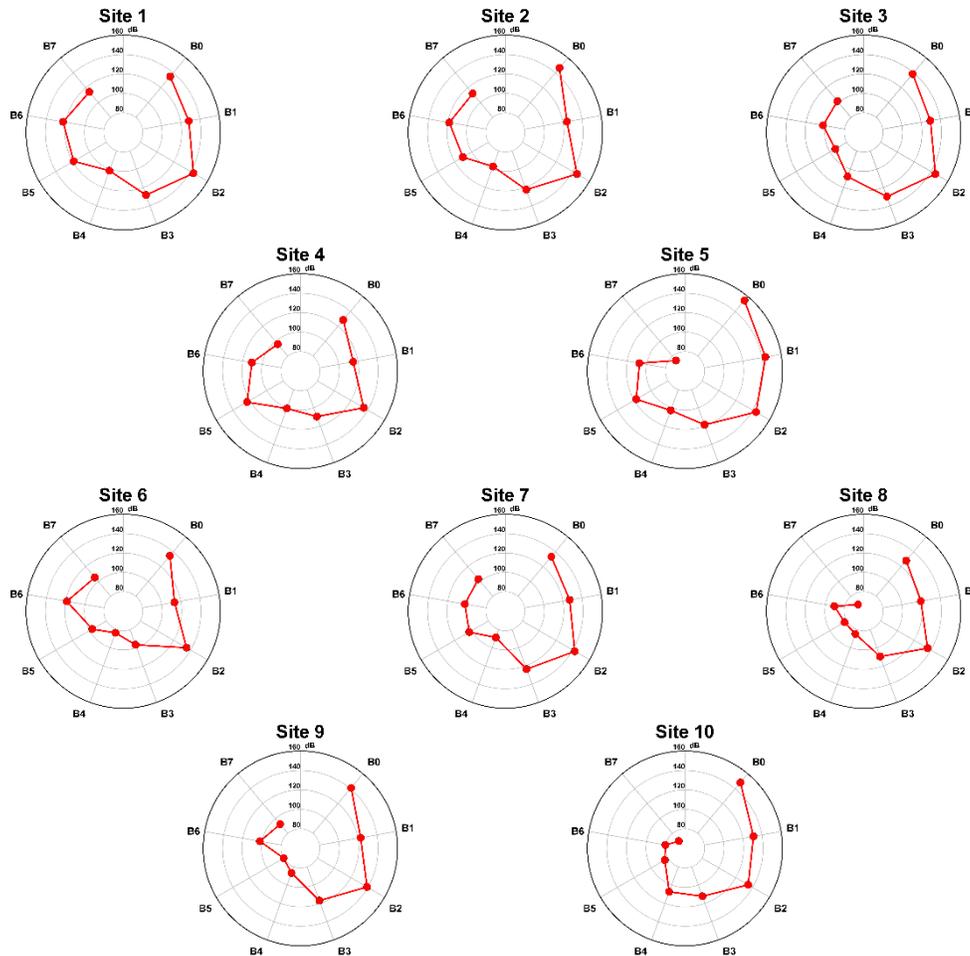
**Figure 2 Maximum Electric Field Strengths by Frequency Band**



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**Figure 3 Variation in Measured Maximum Electric Field Strengths**

The 10 panels in Figure A3.5-4 graphically show the tabulated electric field strength values from Table A3.5-1.



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**Figure 4 Maximum Measured Electric Field Strengths**

**Individual Site Observations**

The following discussion very briefly summarizes the EMF measurements conducted at each site. Complete measurement results are plotted and tabulated in the following section.

**Site 1 (Newhall Street / Newhall Drive)**

This measurement site was near Avaya Stadium. DC magnetic fields were quiet at this location. AC magnetic fields were due to overhead distribution lines. Magnetic fields show some variation due to varying load currents on the power lines, including a step change near the middle.

**Site 2 (Montgomery Street / Otterson Street)**

This location was South of Diridon Station adjacent to the Pacific Gas and Electric Company (PG&E) Distribution Substation. DC magnetic fields were relatively constant with very small variations. The first sensor had a total magnitude comparable to expected ambient, but the second was lower, indicating influence from nearby steel objects. Multiple trains moved along the alignment, but on the opposite side of the substation, they were sufficiently distant for the DC fluctuations to be quite small. AC magnetic fields in the 10-20 mG range are produced by the substation bus conductors and the power lines connected to the substation.

### **Site 3 (Communications Hill Boulevard / Curtner Avenue)**

Measurements were made near Communications Hill, in a park adjacent to the project extent alignment. Both DC and AC magnetic fields were relatively quiet. DC magnetic fields were comparable in magnitude to the expected geomagnetic ambient level, with a few small variations due to pedestrians in the park passing very near the sensors (e.g., cell phones, strollers). There were no nearby power lines or underground circuits.

### **Site 4 (Great Oaks Parkway / Las Colinas Road)**

This measurement site is immediately adjacent to tracks along Great Oak Parkway. DC magnetic field magnitudes were at expected ambient levels, with many small variations due to passing vehicles on Great Oak Parkway. AC magnetic fields were from overhead distribution lines on the opposite side of the tracks.

### **Site 5 (Metcalf Road / Coyote Ranch Road)**

Measurements were made in front of PG&E Station. Spikes in DC magnetic fields were from passing vehicles along the adjacent road. AC fields were predominantly from the overhead transmission lines—four circuits on two sets of steel lattice towers—with magnitudes of nearly 50 mG at both sensors.

### **Site 6 (Railroad Avenue / Barrett Avenue)**

This measurement site is in Morgan Hill, along Railroad Avenue, across from tracks. The DC magnetic fields were relatively constant with a few spikes due to passing vehicles. AC magnetic fields were less than 1 mG, with overhead distribution lines on the opposite side of the street along the tracks.

### **Site 7 (Monterey Highway / Las Animas Avenue)**

This measurement site is in Gilroy on a cul-de-sac off Las Animas Avenue. This is a quiet area with constant DC magnetic fields and very low AC fields. Adjacent fields are used for livestock grazing. An overhead distribution line runs along the tracks.

### **Site 8 (State Route 152 / Casa de Fruta Parkway)**

This measurement site is on Casa de Fruta Parkway, adjacent to State Route (SR) 152. This is a quiet area with virtually no DC magnetic field variations and essentially zero AC magnetic fields. There were no nearby AC power lines or sources.

### **Site 9 (Santa Nella Avenue / Fahey Road)**

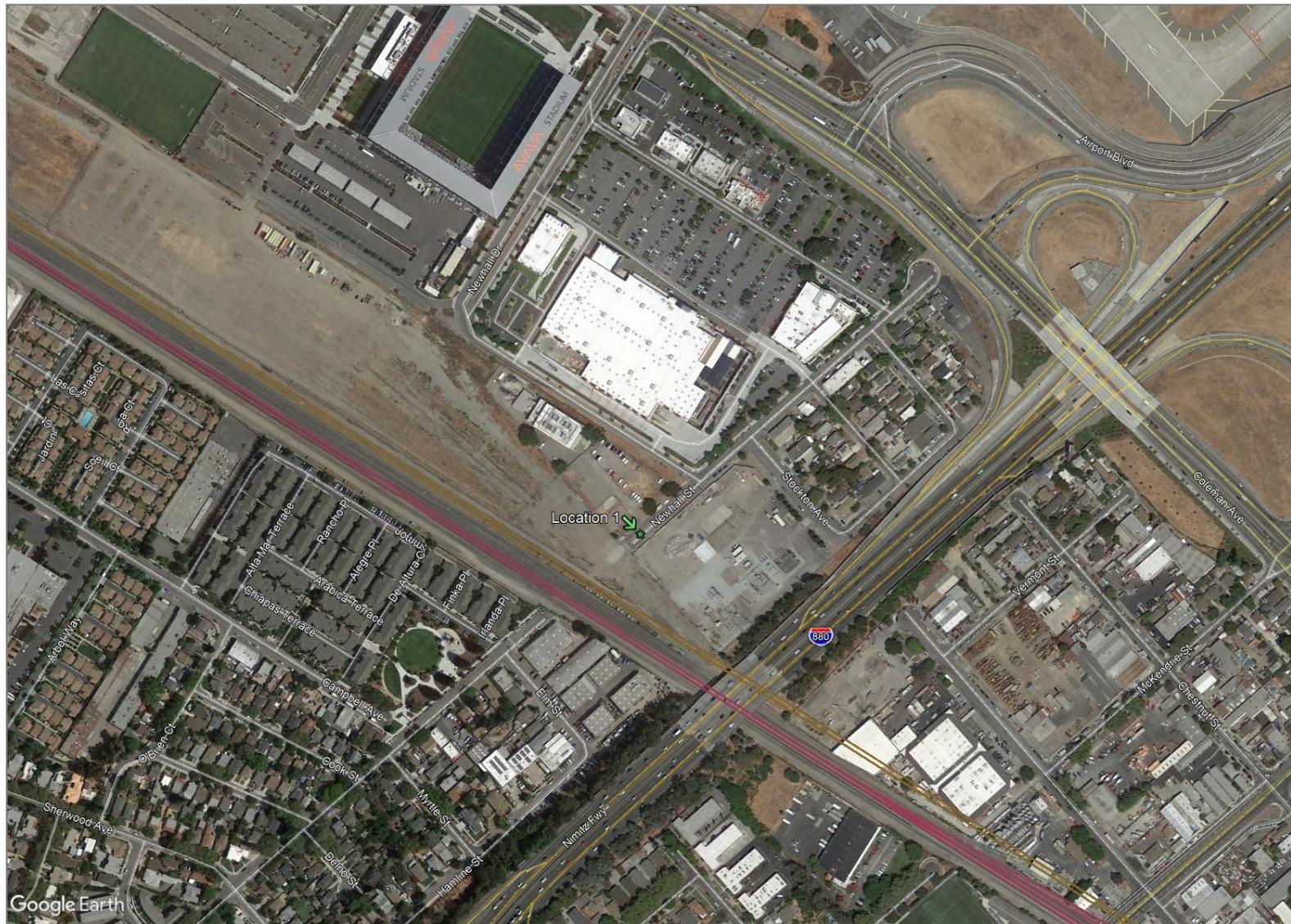
This measurement site is an agricultural area along Santa Nella Road. There were small DC field variations due to vehicles on SR 33. AC fields were in the 1-2 mG range due to distribution lines. AC fields showed variation over time.

### **Site 10 (Henry Miller Road / Carlucci Road)**

Measurements were taken in an agricultural area northeast of Los Banos along Henry Miller Road. DC magnetic field spikes were due to passing trucks. AC fields were quite low. There was a distribution line to the south side of the sensor positions. A shift of the AC fields occurred for several minutes followed by a quick transient, most likely due to a load change on the distribution line such as running of pumps for irrigation.

## **Site Photographs and Measurement Data**

The remainder of this appendix contains photographs and measurement results from each site.



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Figure 5(a) Location 1: Newhall Street / Newhall Drive, San Jose

Industrial/commercial area near the existing rail alignment, Avaya Stadium, and San Jose International airport (Lat 37.347447°, -121.923012°)



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Figure 5(b) Location 1: Measurement Location and Site Views

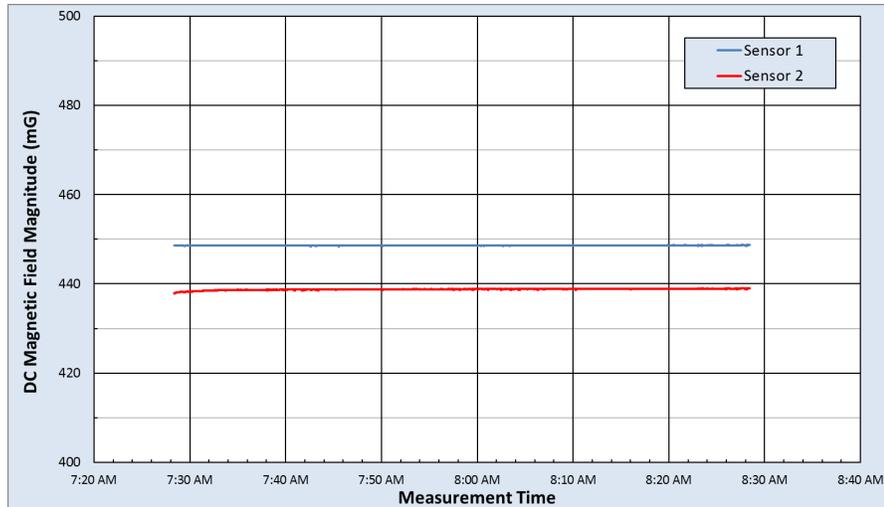
Photos depicting the site from the perspective of the RF measurement location. In the center is a satellite view, indicating the alignment (green line) and measurement points (red = RF, magenta = magnetometers). The satellite view is rotated so that the image at 0° faces the alignment.



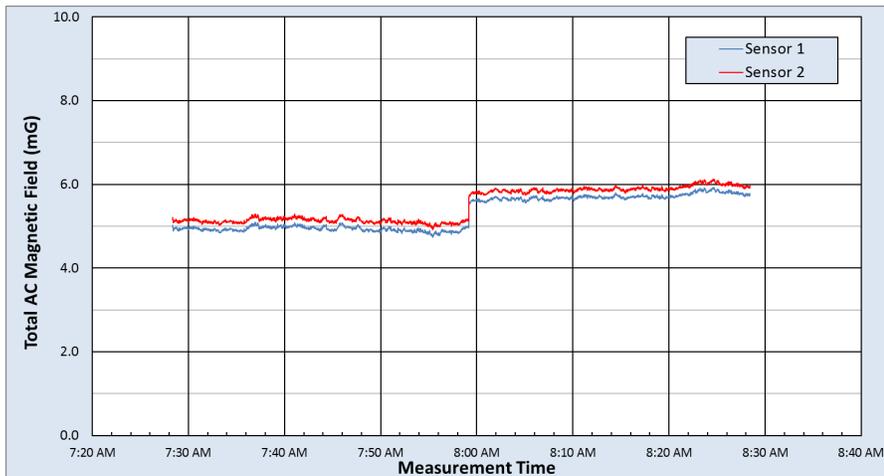
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**Figure 5(c) Location 1: Local EMF Sources**

Nearby emitters include cell towers, distribution lines parallel and perpendicular to the alignment, and a small electrical substation. Photos depict visible close-proximity emitters. Other emissions sources may exist, but are not visible from the site.



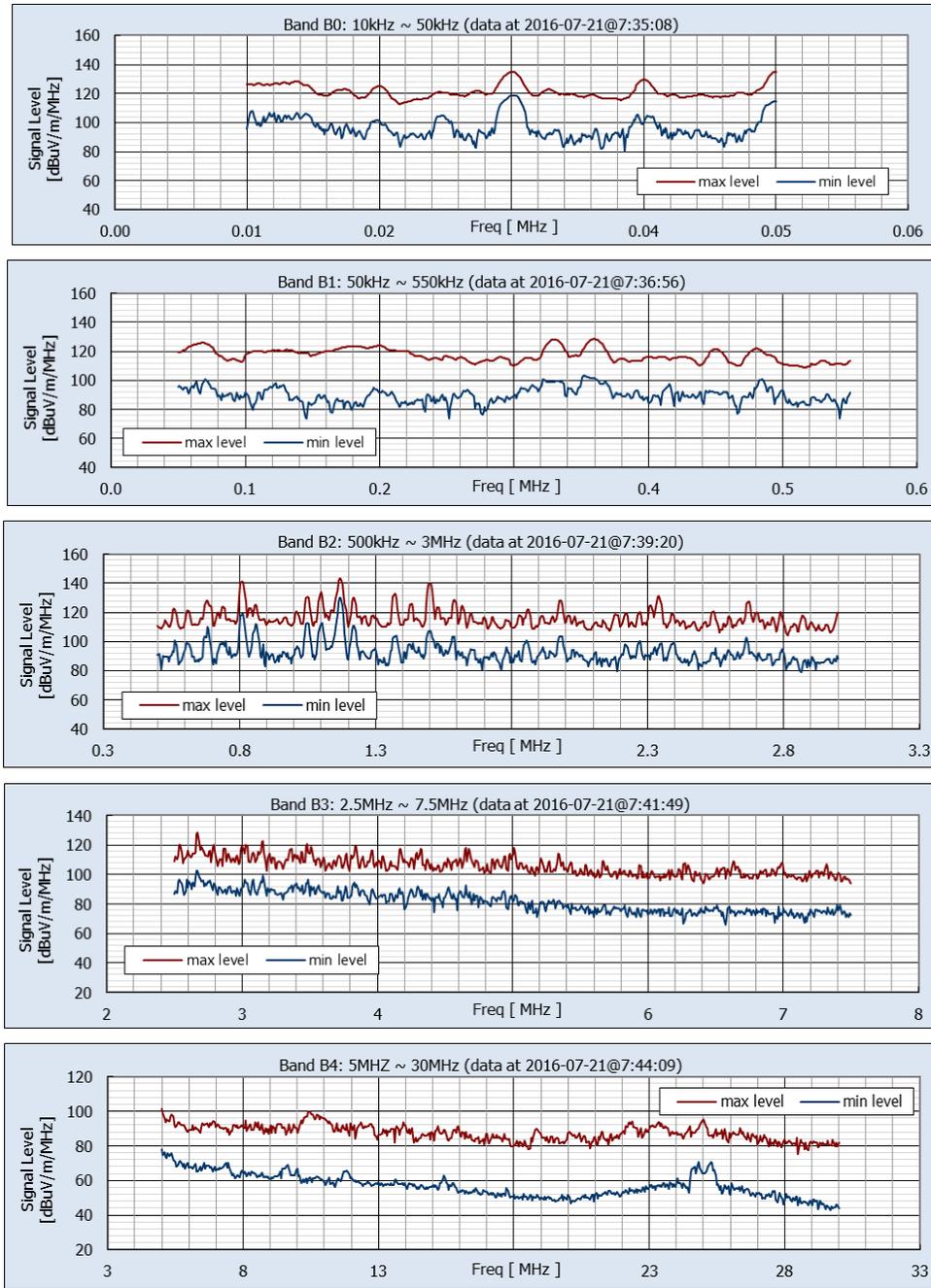
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	242.1	249.6	378.0	361.2	448.7	439.0
<b>Median</b>	241.8	249.4	377.9	361.0	448.6	438.8
<b>Min</b>	241.7	249.2	377.6	360.0	448.5	437.9
<b>Range</b>	0.4	0.5	0.4	1.3	0.2	1.1
<b>Std Dev</b>	0.1	0.1	0.0	0.2	0.0	0.2



rms AC Magnetic Field Measurement Statistics																
	Fund 60Hz (mG)		2nd (mG)		3rd (mG)		4th (mG)		5th (mG)		6th (mG)		7th (mG)		Total AC (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	5.910	6.109	0.023	0.034	0.110	0.116	0.019	0.058	0.494	0.543	0.021	0.027	0.098	0.099	5.925	6.127
<b>Median</b>	5.018	5.214	0.011	0.013	0.090	0.094	0.009	0.011	0.439	0.481	0.009	0.011	0.028	0.032	5.041	5.241
<b>Min</b>	4.709	4.891	0.002	0.003	0.068	0.071	0.002	0.003	0.364	0.388	0.002	0.002	0.008	0.008	4.733	4.920
<b>Range</b>	1.201	1.218	0.021	0.030	0.042	0.045	0.018	0.056	0.130	0.155	0.019	0.025	0.090	0.092	1.192	1.207
<b>Std Dev</b>	0.396	0.394	0.003	0.004	0.008	0.006	0.003	0.006	0.023	0.028	0.003	0.003	0.022	0.022	0.393	0.390

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Figure 5(d) Location 1: AC and DC Magnetic Field Measurement Results

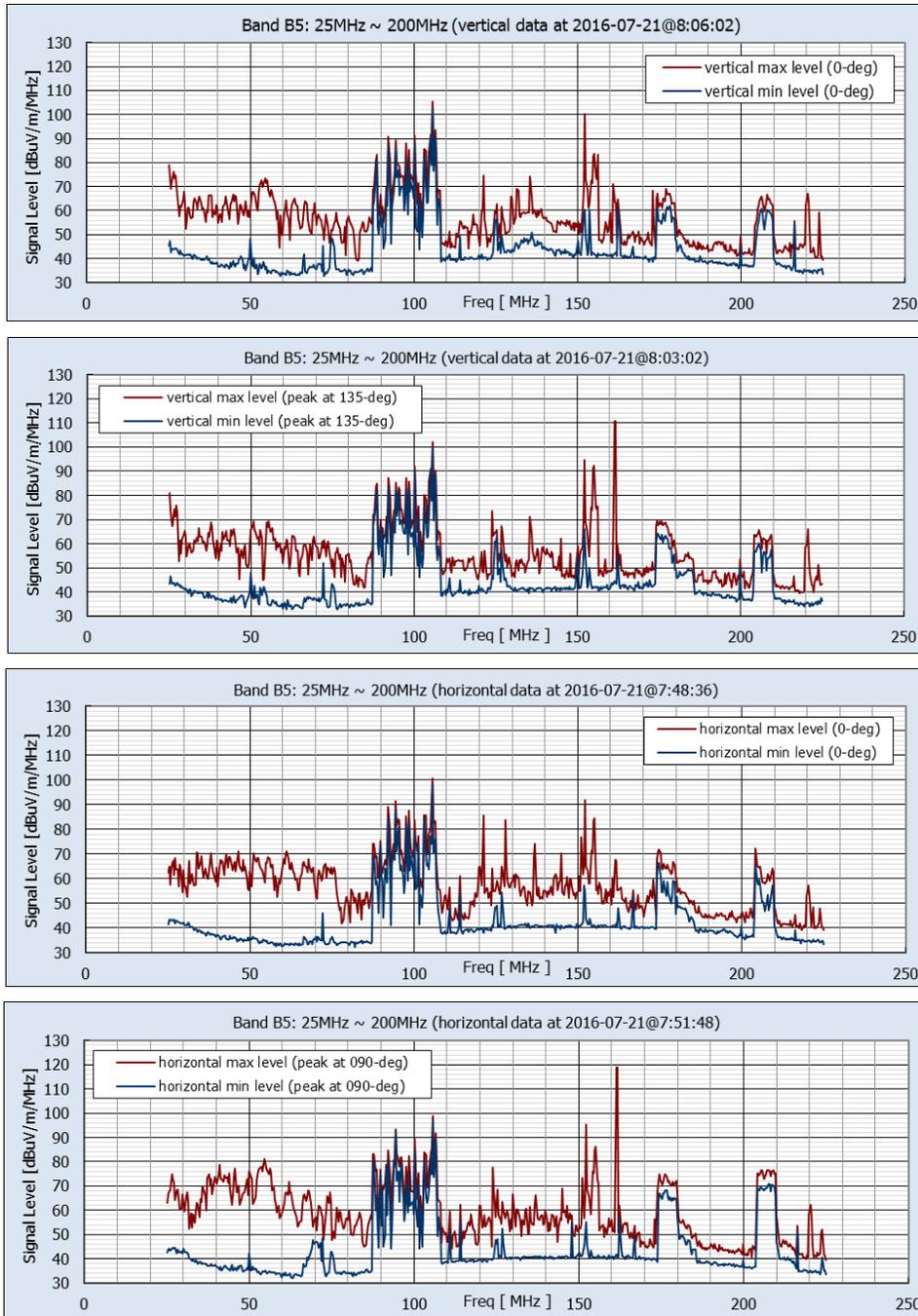


Maximum Levels					
Band number	Freq. Range (MHz)	Pk Min-Hold (dB uV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dB uV/m/MHz)	@ Freq. (MHz)
B0	0.01 ~ 0.05	118.8	0.0301	135.1	0.0500
B1	0.05 ~ 0.55	103.8	0.3518	128.4	0.3600
B2	0.50 ~ 3.00	130.1	1.1682	143.5	1.1682
B3	2.5 ~ 7.5	102.3	2.6636	128.4	2.6727
B4	5 ~ 30	77.8	5.0000	101.7	5.0000

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**Figure 5(e) Location 1: Measured Environmental RF Levels**

Non-Directional Data from Vertically Oriented Monopole Antenna, Bands 0-4

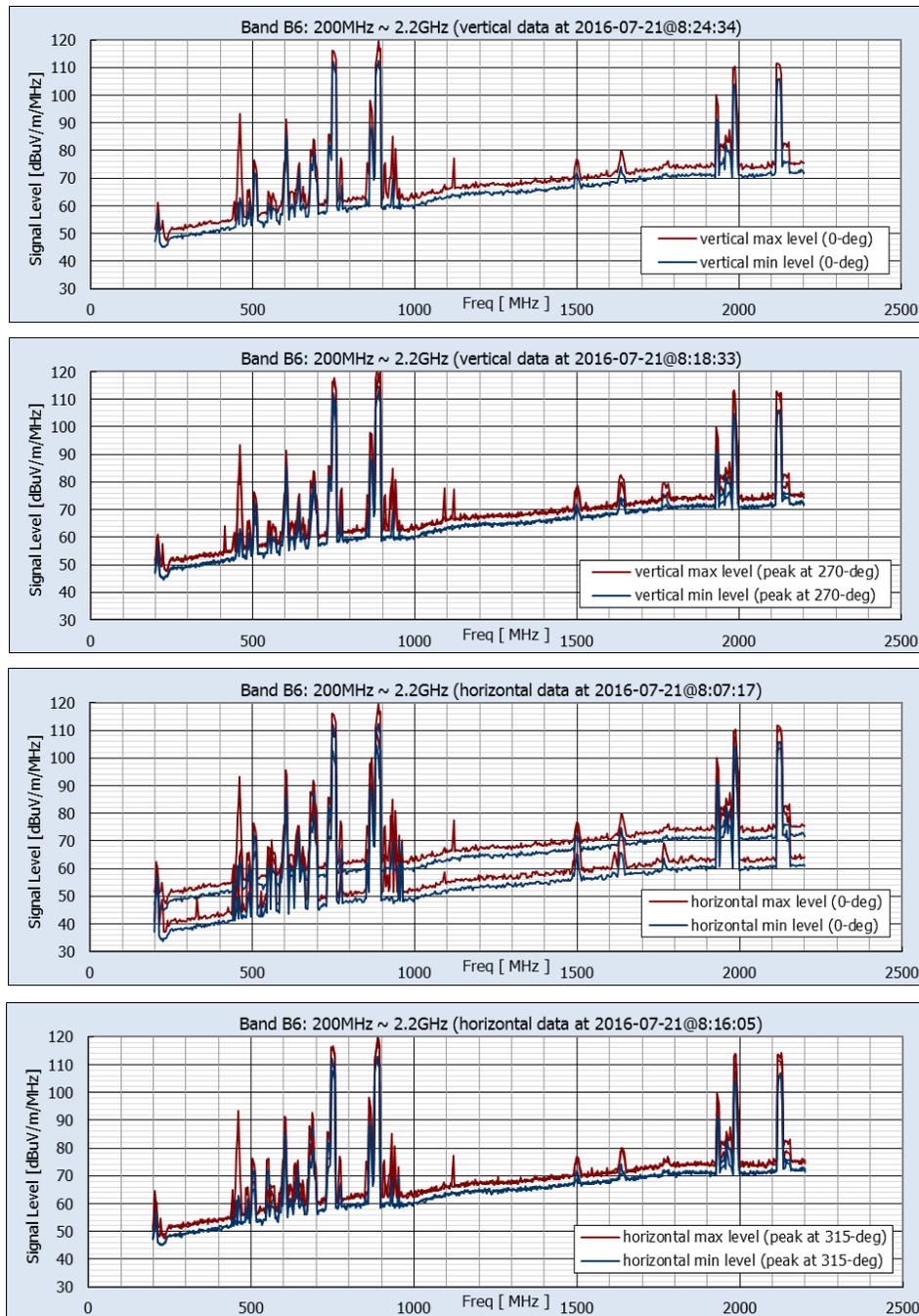


		Maximum Levels							
Band number	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B5	25 ~ 200	102.1	105.727	110.6	161.727	97.7	105.727	119.0	161.727

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**Figure 5(f) Location 1: Measured Environmental RF Levels**

Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation

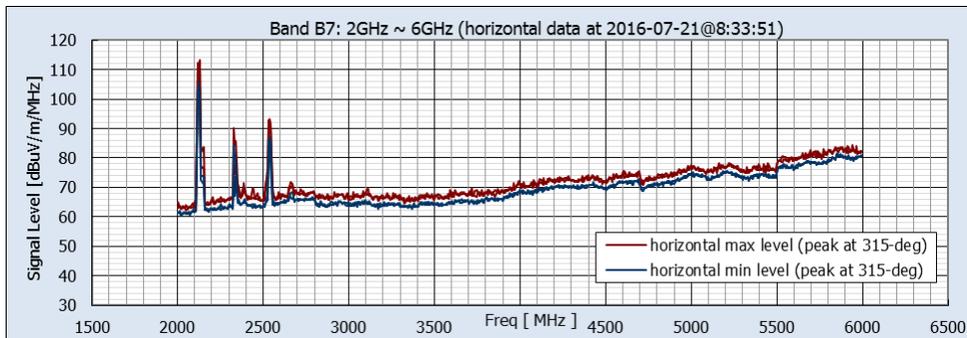
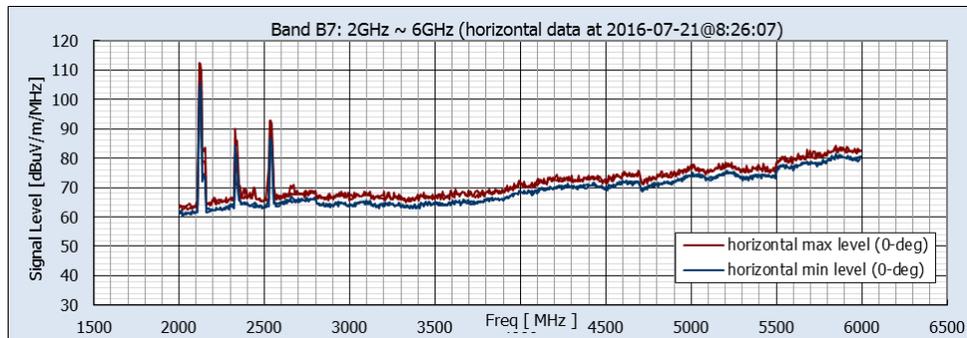
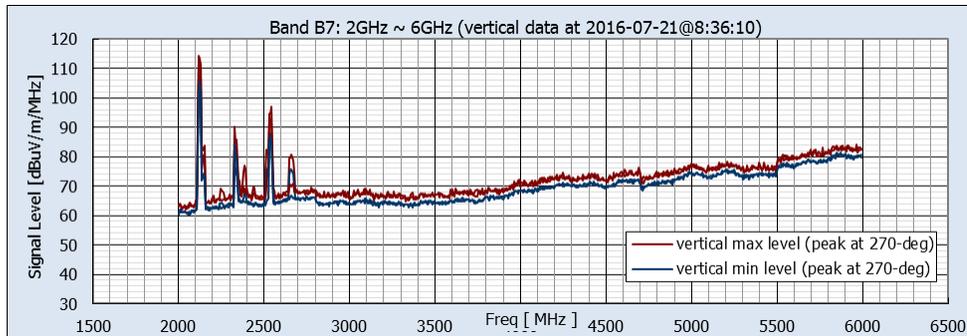
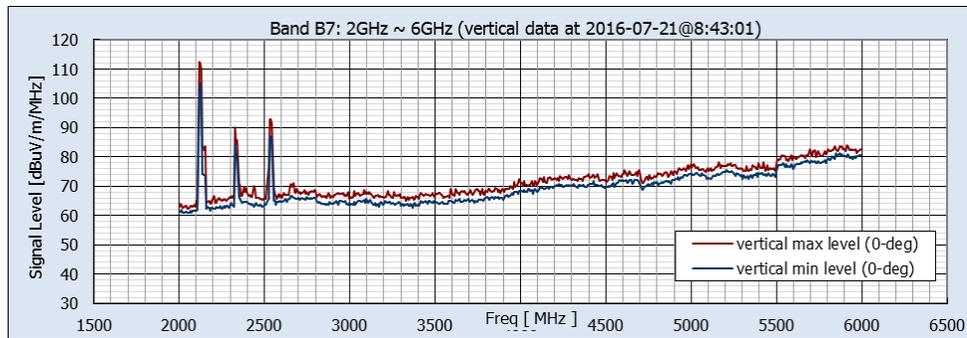


Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B6	200 ~ 2200	114.6	887.273	122.9	890.909	113.0	887.273	119.3	890.909

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**Figure 5(g) Location 1: Measured Environmental RF Levels**

Band 6 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation



Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B7	2000-6000	107.6	2116.364	114.4	2116.364	107.2	2123.636	113.3	2130.909

JANUARY 2019

**Figure 5(h) Location 1: Measured Environmental RF Levels**

Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation





JANUARY 2019

**Figure 6(b) Location 2: Measurement Location and Site Views**

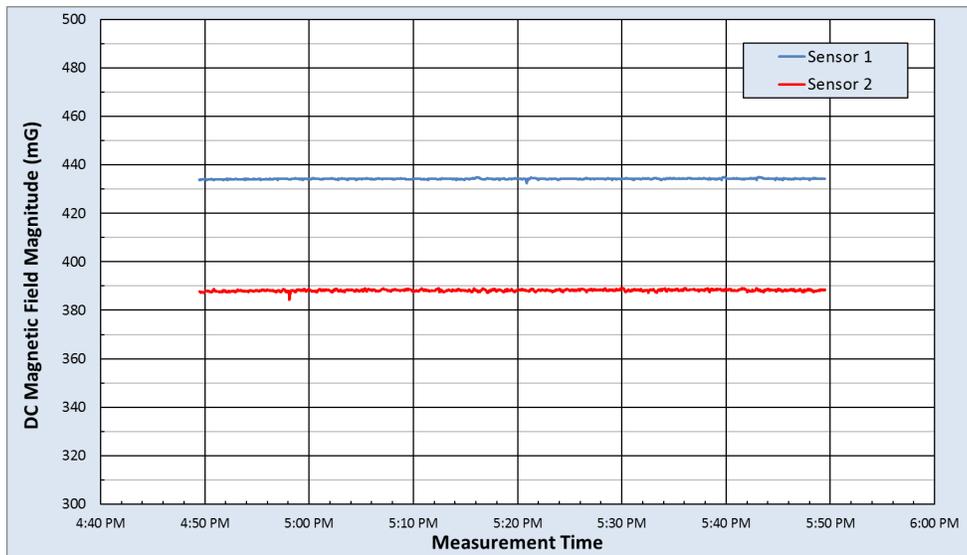
Photos depicting the site from the perspective of the RF measurement location. In the center is a satellite view, indicating the alignment (green line) and measurement points (red = RF, magenta = magnetometers). The satellite view is rotated so that the image at 0° faces the alignment.



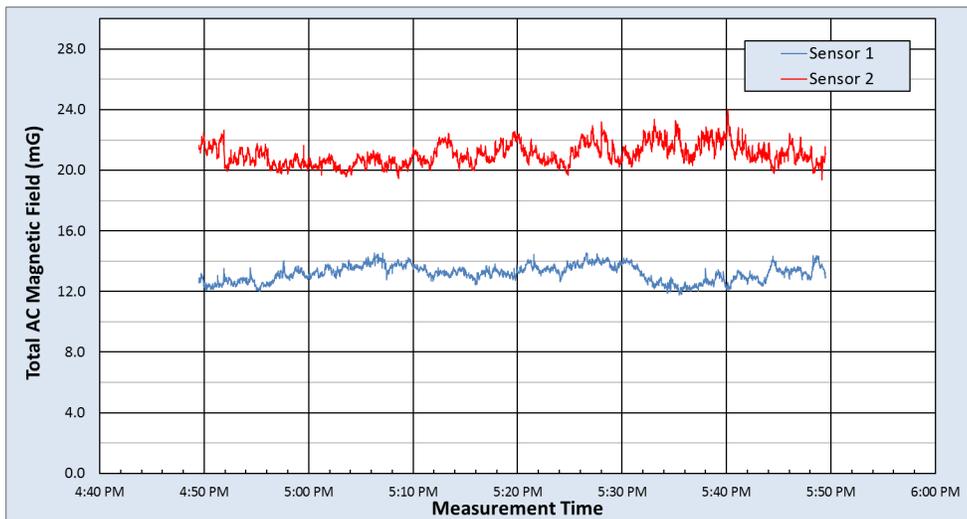
JANUARY 2019

**Figure 6(c) Location 2: Local EMF Sources**

Nearby emitters include high-voltage transmission lines and substation equipment, distribution lines, and cellular communications. Photos depict visible close-proximity emitters. Other emissions sources may exist, but are not visible from the site.



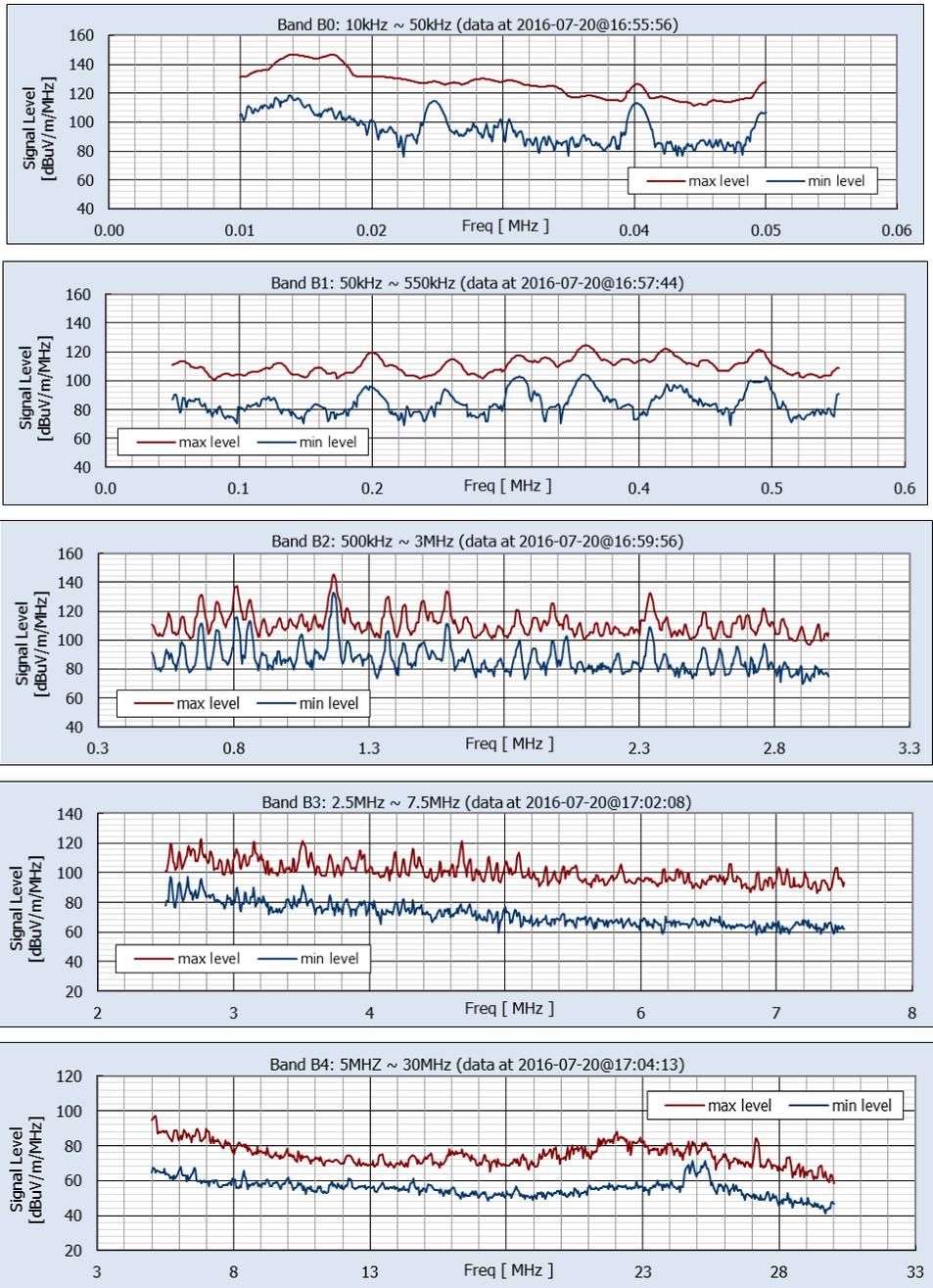
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	289.7	222.9	325.5	319.5	434.9	389.1
<b>Median</b>	288.9	222.2	324.1	318.4	434.2	388.2
<b>Min</b>	288.2	221.0	322.3	314.1	432.5	384.4
<b>Range</b>	1.5	1.9	3.2	5.5	2.4	4.7
<b>Std Dev</b>	0.2	0.4	0.3	0.5	0.2	0.4



rms AC Magnetic Field Measurement Statistics																
	Fund 60Hz (mG)		2nd (mG)		3rd (mG)		4th (mG)		5th (mG)		6th (mG)		7th (mG)		Total AC (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	14.402	23.718	0.107	0.229	2.078	4.397	0.073	0.092	0.699	0.727	0.076	0.244	0.314	0.488	14.556	24.043
<b>Median</b>	13.072	20.533	0.037	0.083	2.004	4.079	0.015	0.033	0.629	0.550	0.018	0.090	0.275	0.380	13.241	20.946
<b>Min</b>	11.594	18.948	0.007	0.010	1.937	3.729	0.003	0.006	0.576	0.381	0.005	0.019	0.231	0.303	11.791	19.387
<b>Range</b>	2.808	4.770	0.100	0.219	0.141	0.668	0.070	0.087	0.122	0.347	0.071	0.225	0.082	0.185	2.765	4.656
<b>Std Dev</b>	0.552	0.719	0.013	0.038	0.023	0.086	0.006	0.014	0.017	0.058	0.006	0.030	0.010	0.024	0.543	0.706

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Figure 6(d) Location 2: AC and DC Magnetic Field Measurement Results

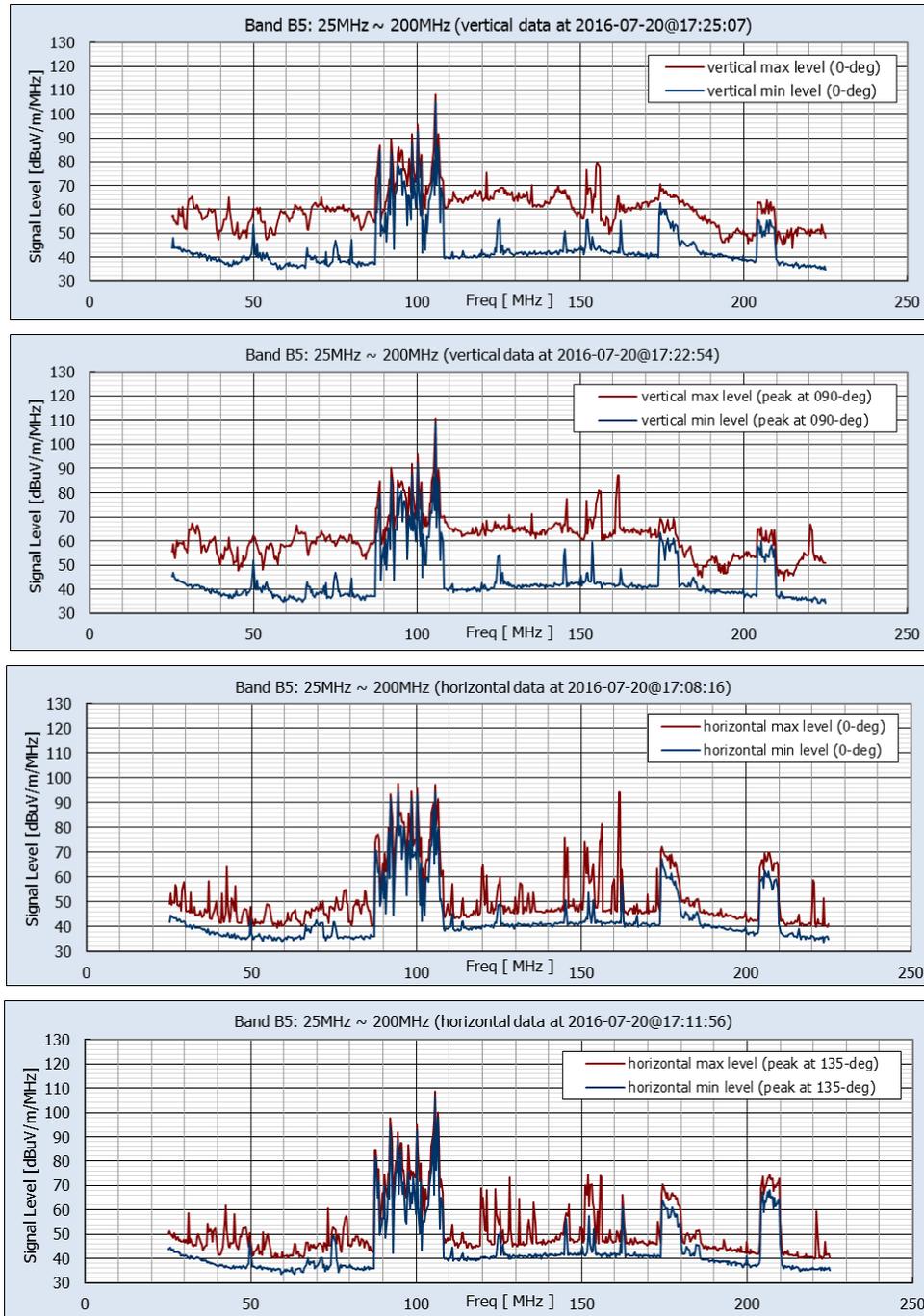


Maximum Levels					
Band number	Freq. Range (MHz)	Pk Min-Hold (dB uV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dB uV/m/MHz)	@ Freq. (MHz)
B0	0.01 ~ 0.05	118.7	0.0138	146.7	0.0170
B1	0.05 ~ 0.55	104.0	0.3591	124.4	0.3600
B2	0.50 ~ 3.00	132.7	1.1727	145.0	1.1682
B3	2.5 ~ 7.5	97.5	2.5364	122.5	2.7636
B4	5 ~ 30	71.2	25.2727	97.1	5.0909

JANUARY 2019

**Figure 6(e) Location 2: Measured Environmental RF Levels**

Non-Directional Data from Vertically Oriented Monopole Antenna, Bands 0-4

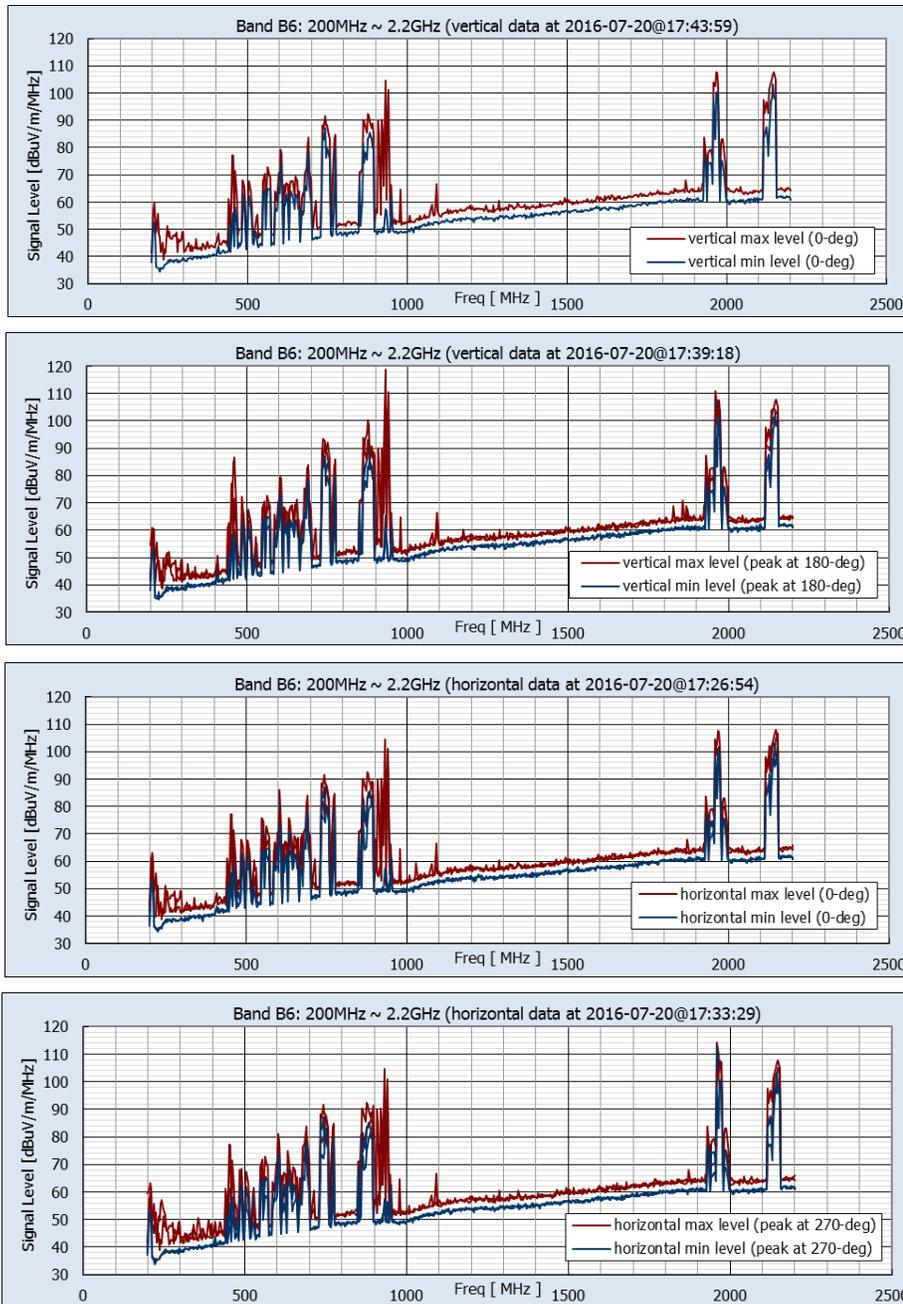


Maximum Levels									
Band number	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B5	25 ~ 200	108.5	105.727	110.6	105.727	106.3	105.727	108.6	105.727

JANUARY 2019

Figure 6(f) Location 2: Measured Environmental RF Levels

Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation

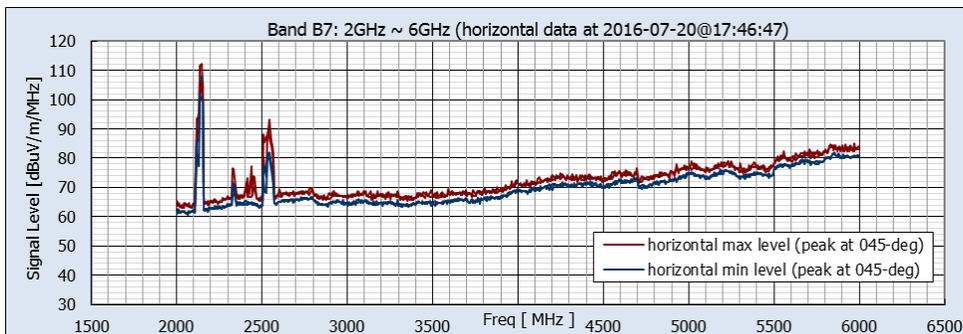
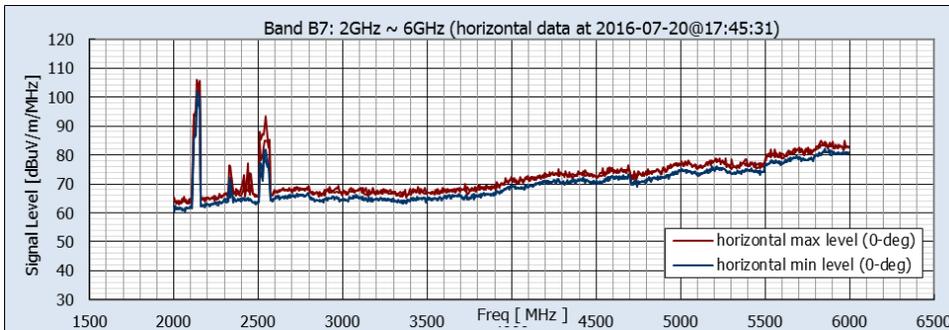
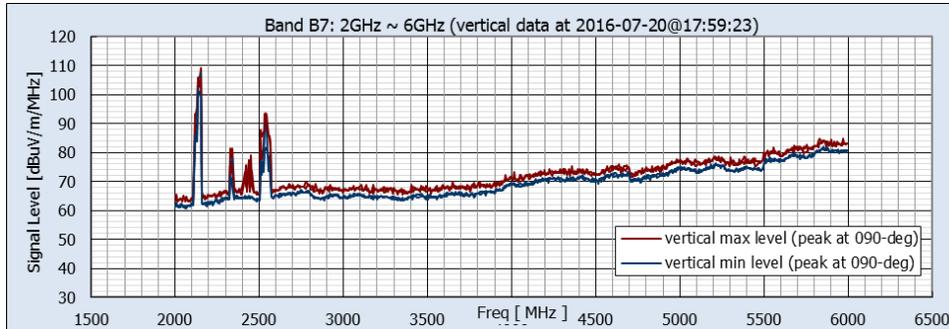
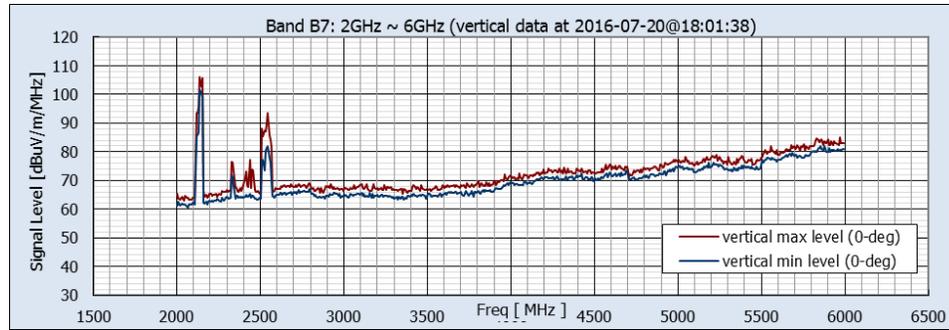


Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B6	200 ~ 2200	107.1	1960.000	118.7	930.909	112.7	1960.000	114.2	1960.000

JANUARY 2019

**Figure 6(g) Location 2: Measured Environmental RF Levels**

Band 6 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation

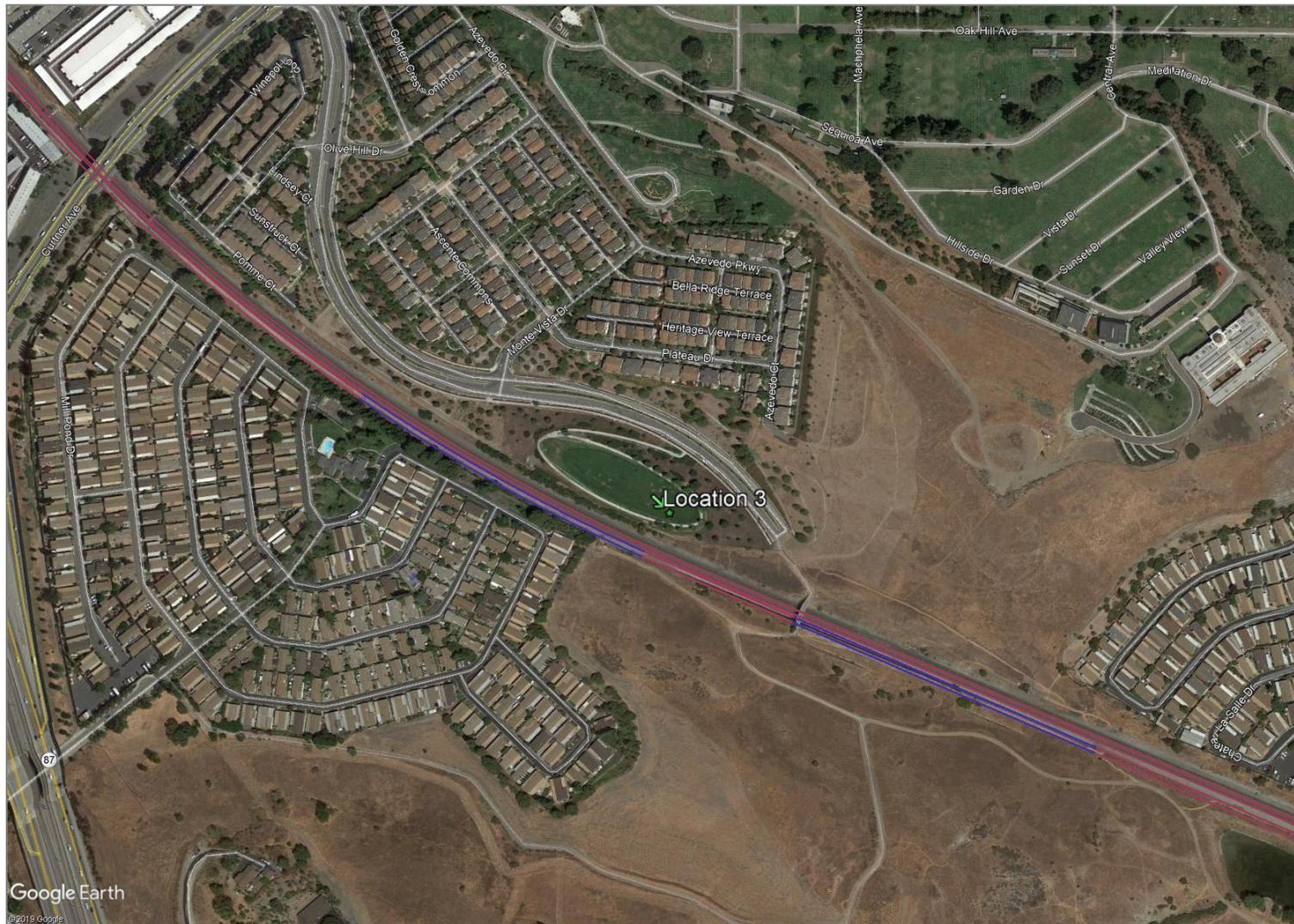


Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B7	2000-6000	107.4	2152.727	109.2	2152.727	108.3	2145.455	112.3	2145.455

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**Figure 6(h) Location 2: Measured Environmental RF Levels**

Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation



JANUARY 2020

**Figure 7(a) Location 3: Communications Hill Boulevard/Monte Vista Drive, San Jose**

Suburban setting near the existing rail alignment, with significant RF emitters (Lat 37.293722°, Lon -121.865194°)



JANUARY 2019

**Figure 7(b) Location 3: Measurement Location and Site Views**

Photos depicting the site from the perspective of the RF measurement location. In the center is a satellite view, indicating the alignment (green line) and measurement points (red = RF, magenta = magnetometers). The satellite view is rotated so that the image at 0° faces the alignment.

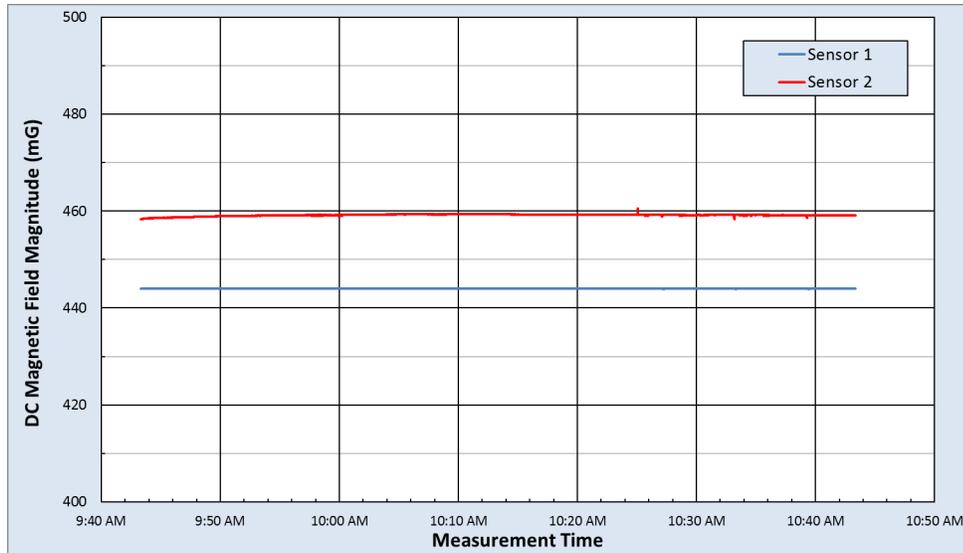


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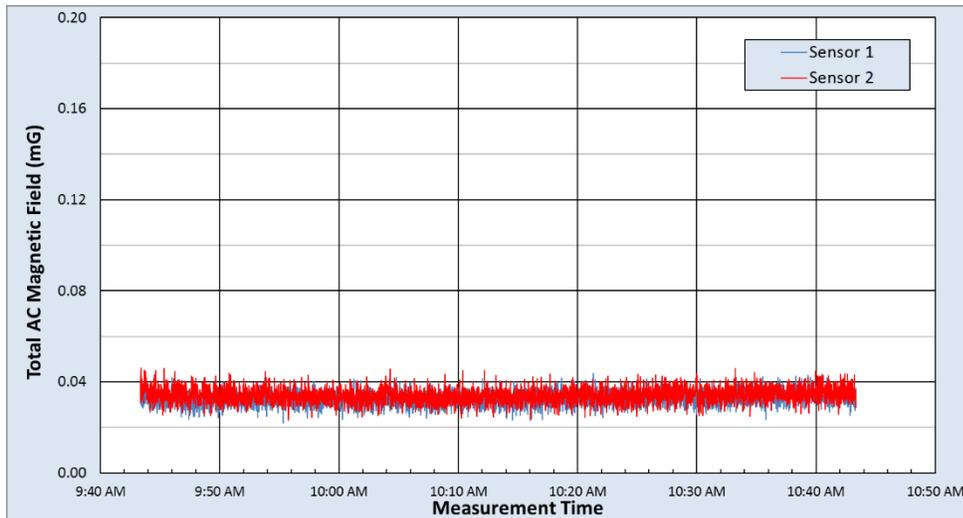
**Figure 7(c) Location 3: Local EMF Sources**

Nearby emitters include microwave towers, railway communications, and fixed land communications.

Photos depict visible close-proximity emitters. Other emissions sources may exist that are not readily visible from the site.



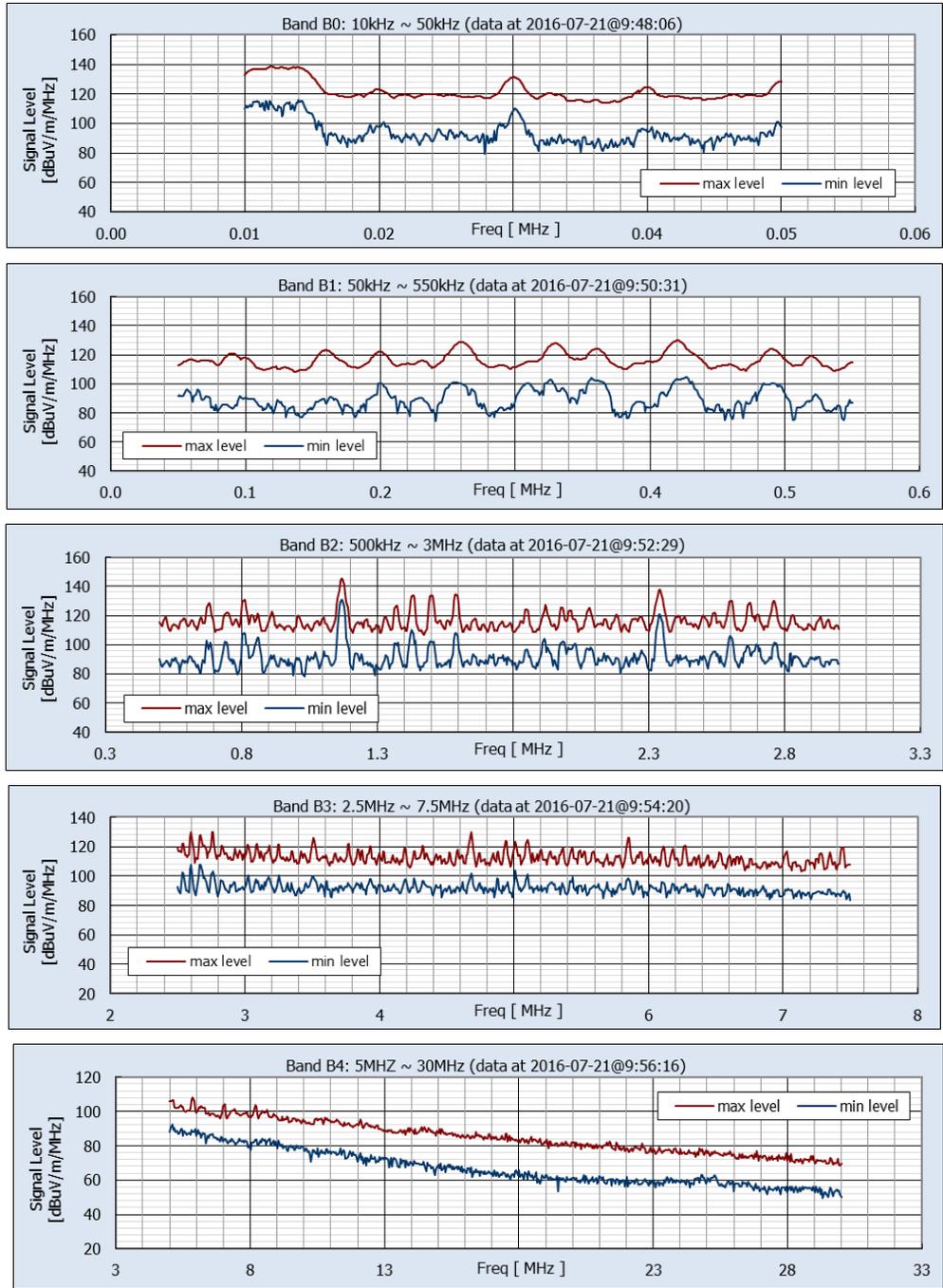
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	248.0	202.6	368.6	413.8	444.1	460.6
<b>Median</b>	247.7	201.2	368.5	412.9	444.0	459.2
<b>Min</b>	247.4	198.7	368.3	411.7	443.8	458.3
<b>Range</b>	0.5	3.9	0.3	2.2	0.2	2.3
<b>Std Dev</b>	0.1	0.8	0.1	0.3	0.0	0.2



rms AC Magnetic Field Measurement Statistics																
	Fund 60Hz (mG)		2nd (mG)		3rd (mG)		4th (mG)		5th (mG)		6th (mG)		7th (mG)		Total AC (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	0.028	0.030	0.019	0.020	0.031	0.032	0.020	0.028	0.022	0.026	0.020	0.022	0.021	0.024	0.044	0.046
<b>Median</b>	0.016	0.016	0.008	0.008	0.020	0.020	0.008	0.009	0.009	0.010	0.009	0.009	0.010	0.010	0.033	0.034
<b>Min</b>	0.004	0.004	0.002	0.002	0.008	0.007	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.003	0.022	0.023
<b>Range</b>	0.024	0.027	0.018	0.018	0.023	0.024	0.018	0.026	0.020	0.024	0.018	0.021	0.020	0.021	0.022	0.023
<b>Std Dev</b>	0.003	0.004	0.002	0.003	0.003	0.004	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003

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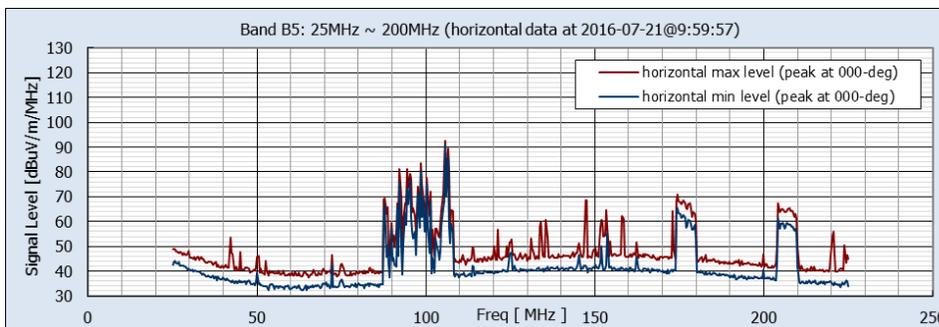
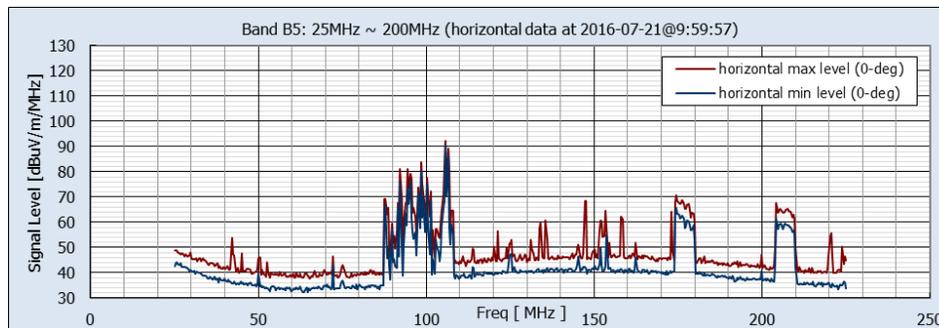
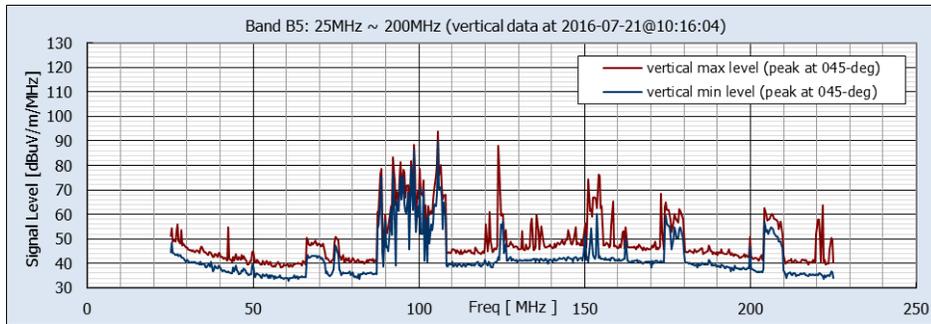
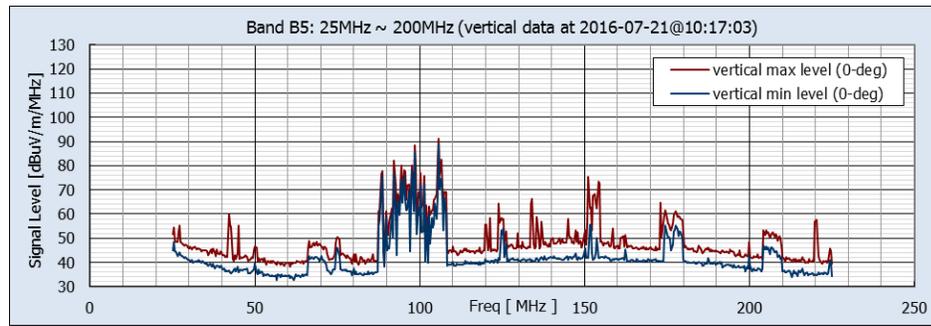
Figure 7(d) Location 3: Measured DC and AC Magnetic Field Strengths



Maximum Levels					
Band number	Freq. Range (MHz)	Pk Min-Hold (dB uV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dB uV/m/MHz)	@ Freq. (MHz)
B0	0.01 ~ 0.05	115.7	0.0140	138.5	0.0120
B1	0.05 ~ 0.55	104.6	0.4273	129.8	0.4200
B2	0.50 ~ 3.00	130.5	1.1682	145.3	1.1682
B3	2.5 ~ 7.5	107.7	2.6727	130.0	2.7636
B4	5 ~ 30	92.4	5.0909	108.2	5.8636

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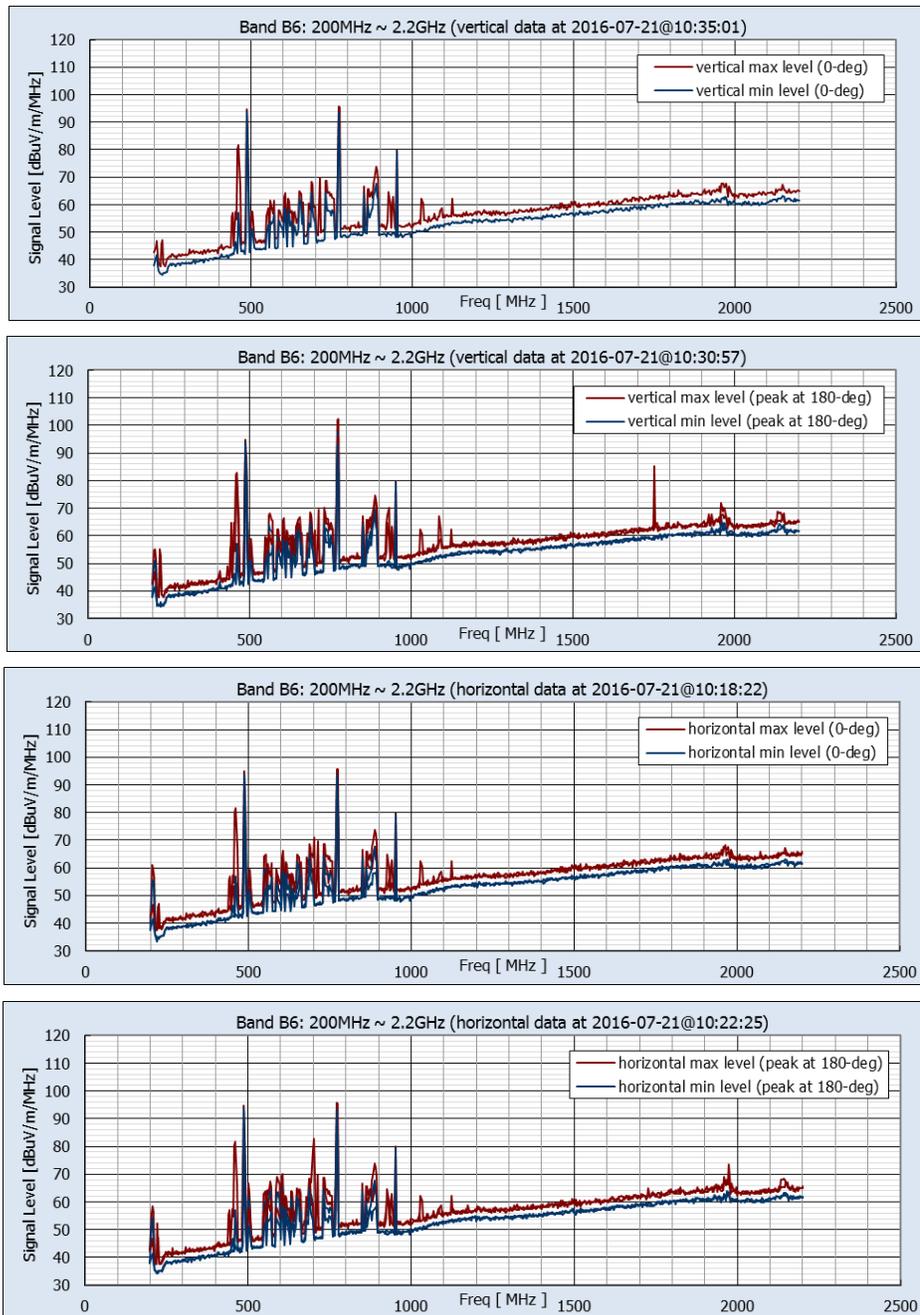
**Figure 7(e) Location 3: Measured Environmental RF Levels Non-Directional Data from Vertically Oriented Monopole Antenna, Bands 0-4**



Maximum Levels									
Band number	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B5	25 ~ 200	89.6	105.727	93.7	105.727	90.5	105.727	92.4	105.727

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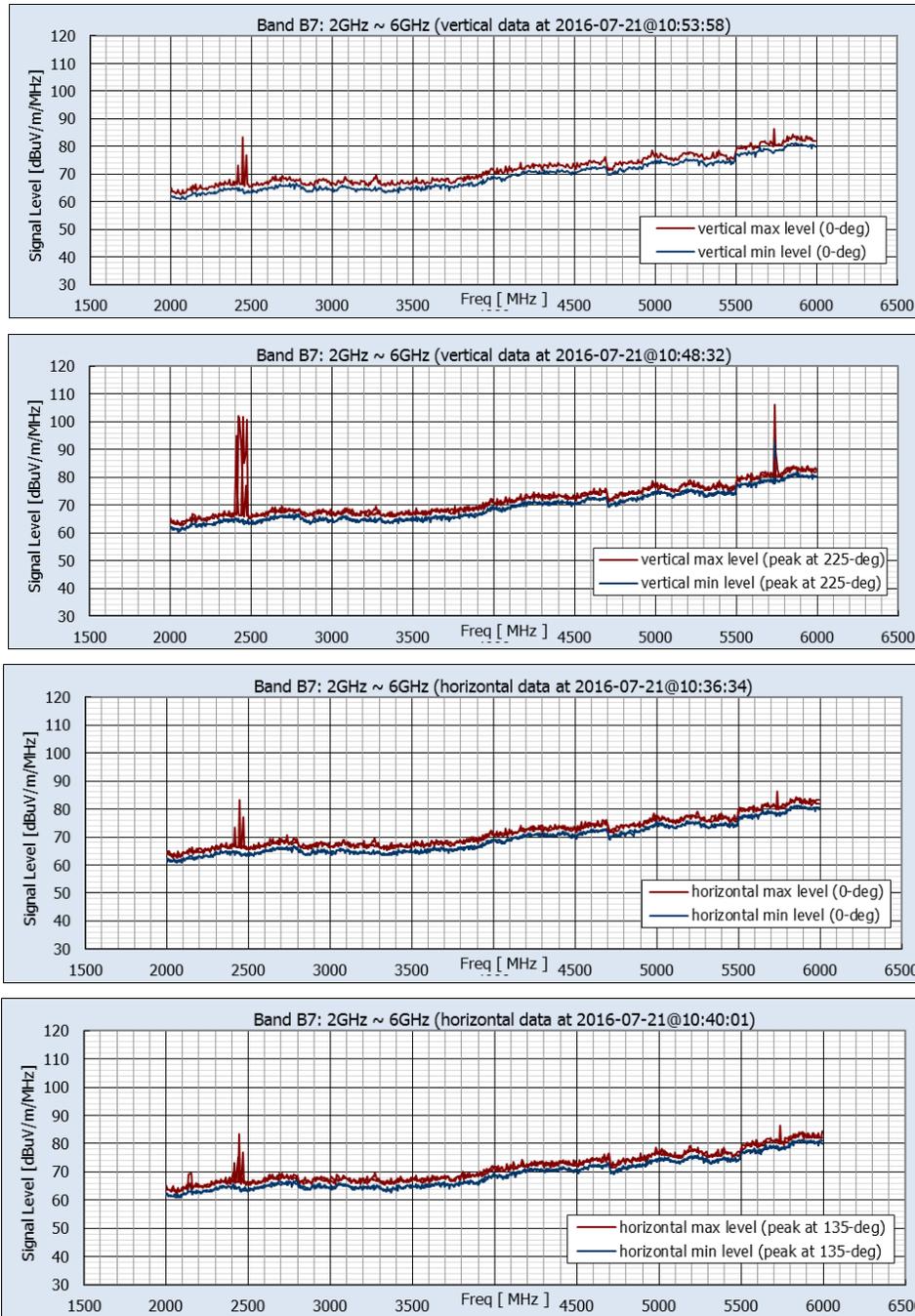
**Figure 7(f) Location 3: Measured Environmental RF Levels Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**



Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B6	200 ~ 2200	97.4	770.909	102.4	774.545	79.8	774.545	87.2	774.545

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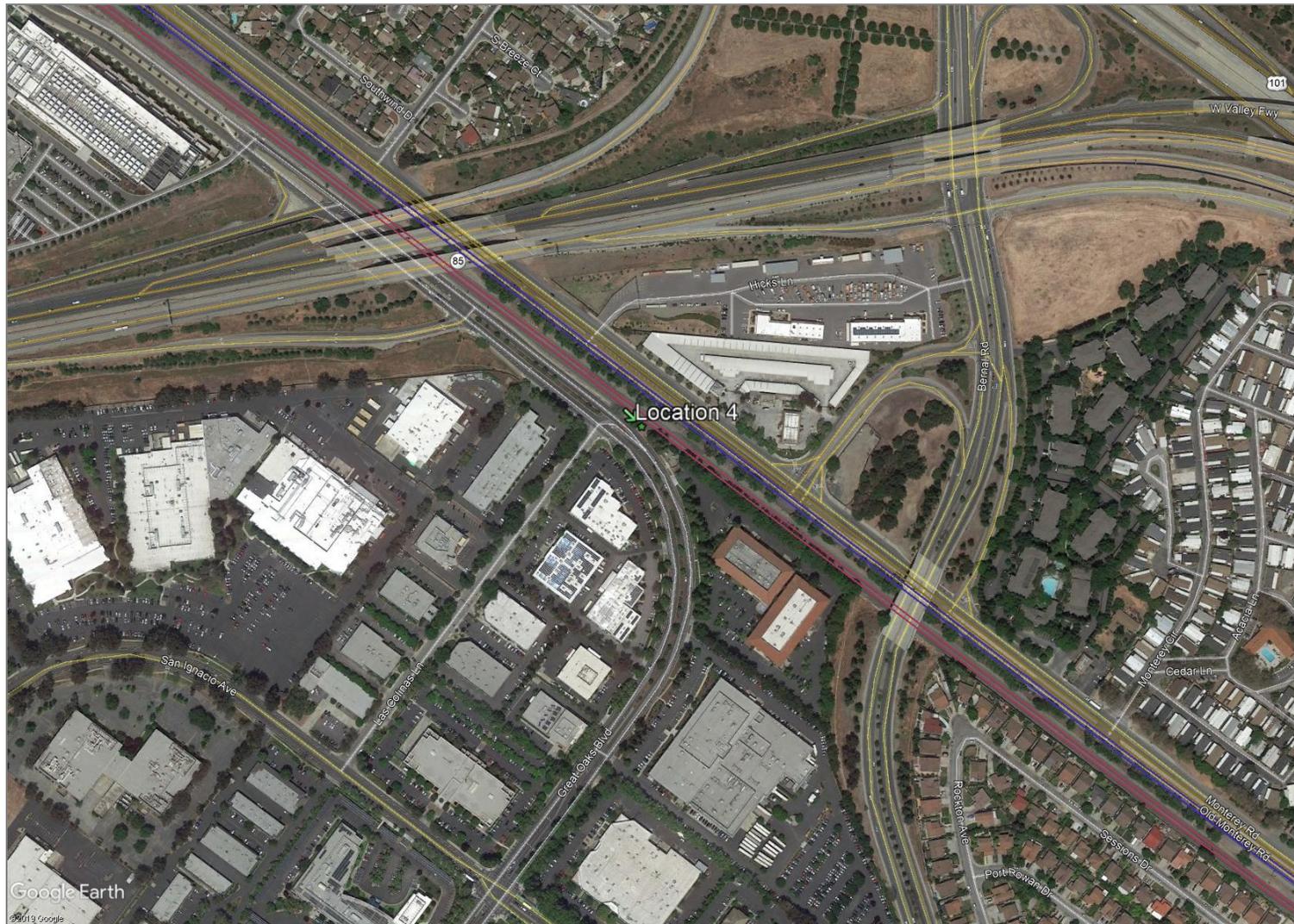
**Figure 7(g) Location 3: Measured Environmental RF Levels Band 6 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**



Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B7	2000-6000	66.3	2712.727	102.2	2421.818	66.8	2690.909	75.1	2436.364

JANUARY 2019

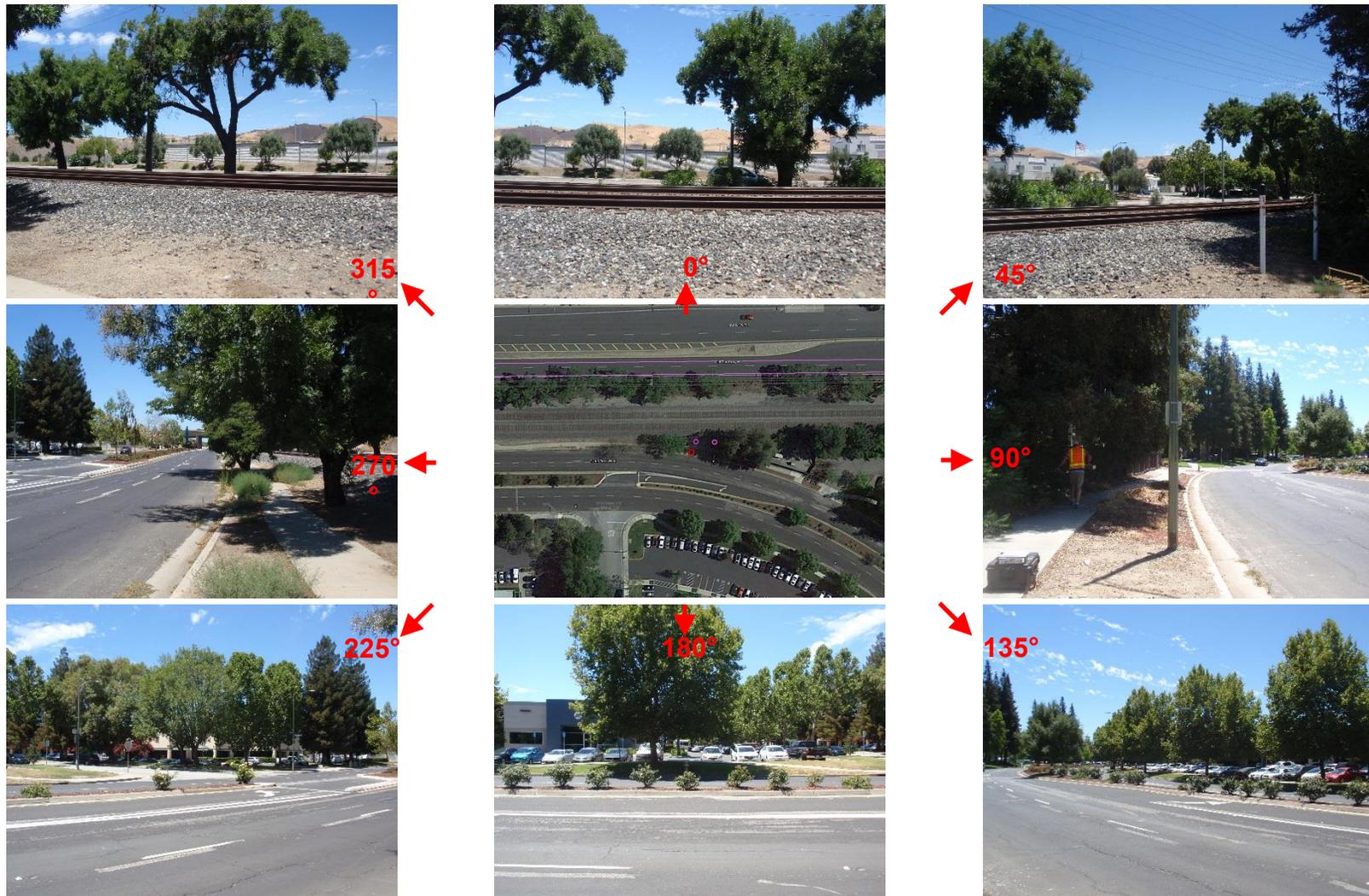
**Figure 7(h) Location 3: Measured Environmental RF Levels Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**



JANUARY 2020

**Figure 8(a) Location 4: Great Oaks Parkway/Las Colinas Road, San Jose**

Adjacent to high technology office park and near the existing rail; no visible RF emitters (Lat 37.239322°, Lon -121.776080°)



JANUARY 2019

**Figure 8(b) Location 4: Measurement Location and Site Views**

Photos depicting the site from the perspective of the RF measurement location. In the center is a satellite view, indicating the alignment (green line) and measurement points (red = RF, magenta = magnetometers). The satellite view is rotated so that the image at 0° faces the alignment.

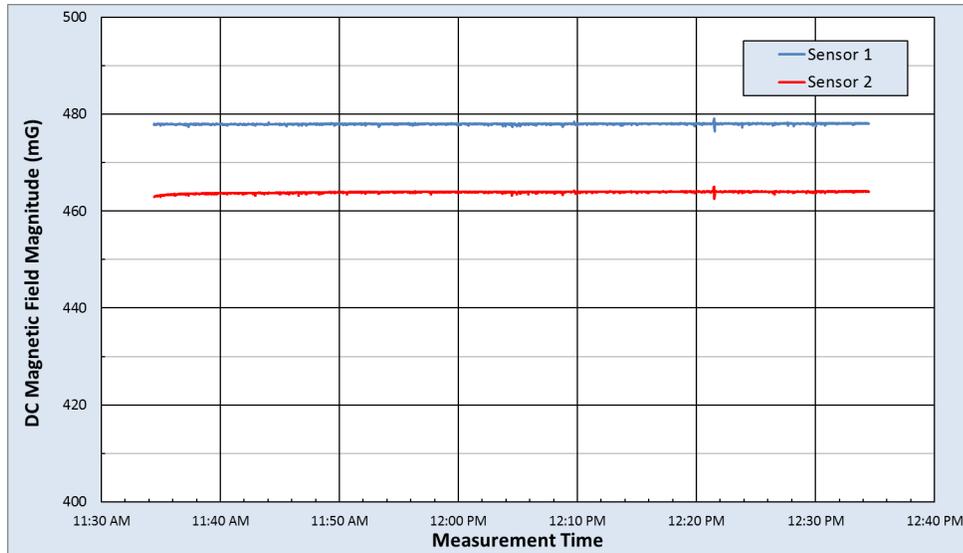


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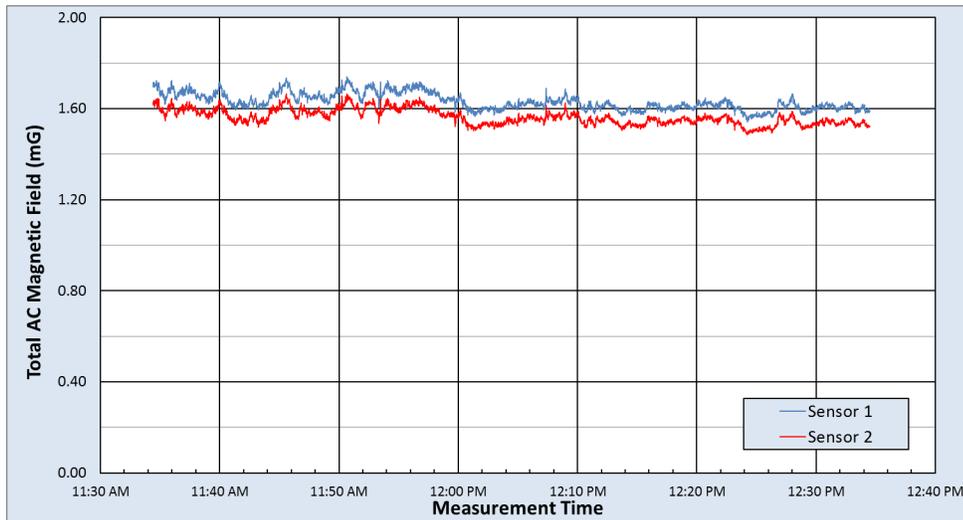
**Figure 8(c) Location 4: Local EMF Sources**

Nearby emitters included a single local distribution line.

Photos depict visible close-proximity emitters. Other emissions sources may exist, but are not visible from the site.



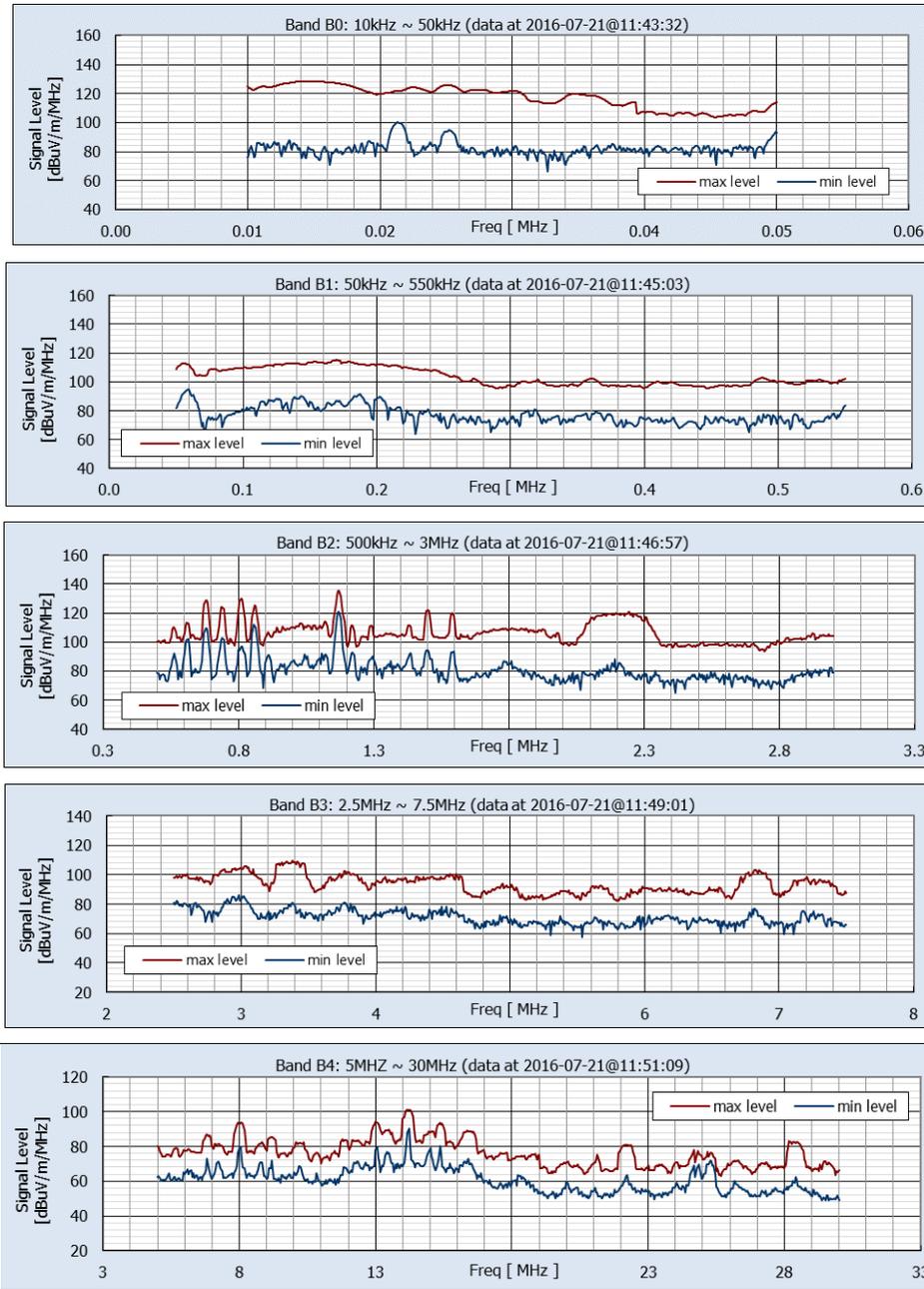
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	245.1	254.0	412.4	389.9	479.1	465.0
<b>Median</b>	242.4	251.9	411.9	389.6	478.0	463.9
<b>Min</b>	240.0	249.6	411.1	388.4	476.4	462.6
<b>Range</b>	5.1	4.4	1.3	1.5	2.7	2.4
<b>Std Dev</b>	0.2	0.1	0.1	0.2	0.1	0.2



rms AC Magnetic Field Measurement Statistics																
	Fund 60Hz (mG)		2nd (mG)		3rd (mG)		4th (mG)		5th (mG)		6th (mG)		7th (mG)		Total AC (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	0.990	0.916	0.023	0.024	1.488	1.443	0.025	0.027	0.162	0.155	0.030	0.029	0.075	0.072	1.740	1.664
<b>Median</b>	0.722	0.657	0.011	0.011	1.446	1.402	0.012	0.012	0.135	0.127	0.015	0.015	0.059	0.057	1.624	1.558
<b>Min</b>	0.557	0.507	0.002	0.002	1.381	1.340	0.003	0.002	0.107	0.094	0.004	0.004	0.044	0.043	1.541	1.485
<b>Range</b>	0.433	0.409	0.021	0.021	0.107	0.104	0.022	0.025	0.056	0.061	0.026	0.025	0.032	0.029	0.199	0.179
<b>Std Dev</b>	0.097	0.093	0.003	0.003	0.020	0.020	0.004	0.004	0.009	0.009	0.004	0.004	0.004	0.004	0.037	0.034

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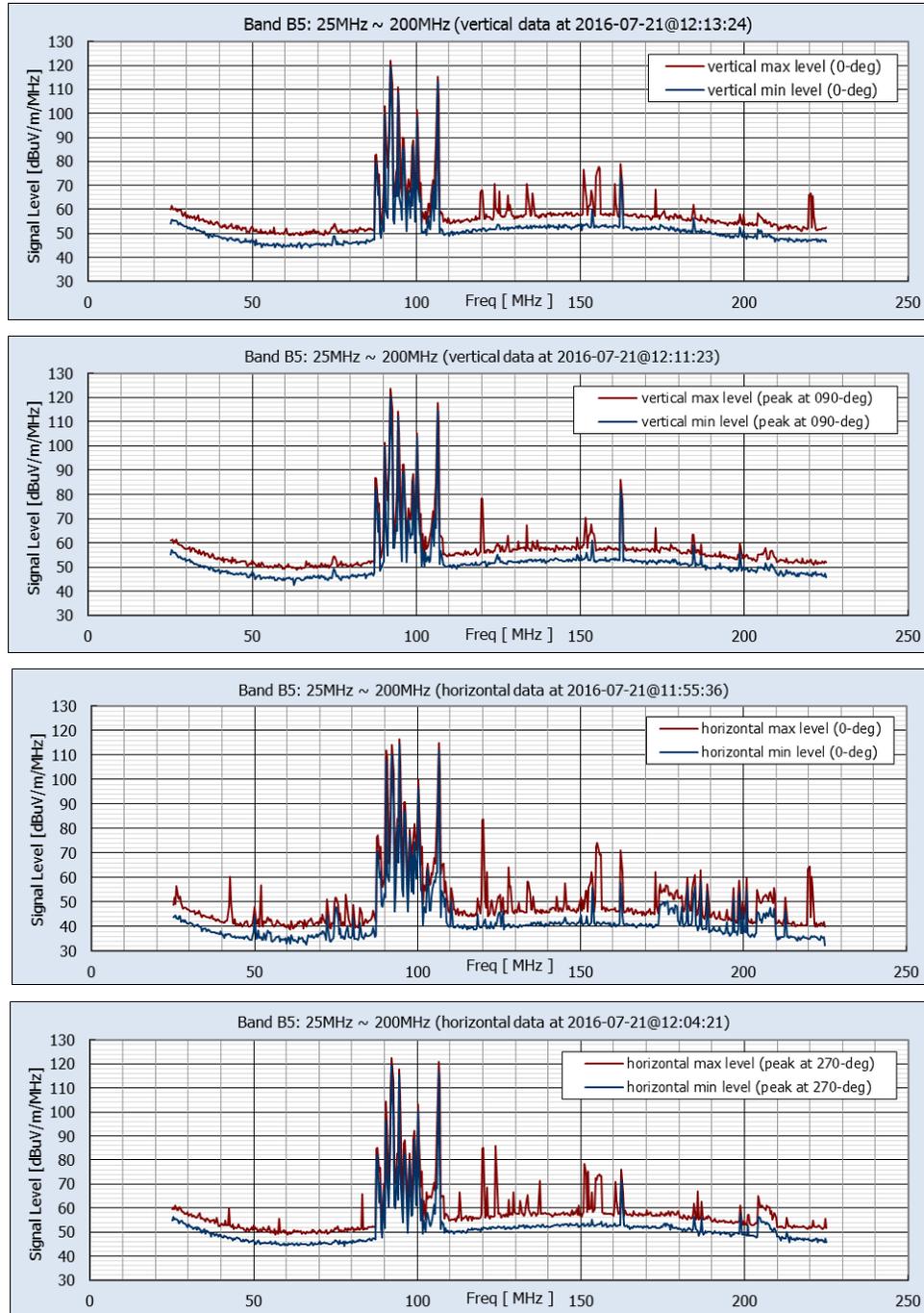
Figure 8(d) Location 4: AC and DC Magnetic Field Measurement Results



Maximum Levels					
Band number	Freq. Range (MHz)	Pk Min-Hold (dB uV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dB uV/m/MHz)	@ Freq. (MHz)
B0	0.01 ~ 0.05	100.1	0.0213	128.6	0.0146
B1	0.05 ~ 0.55	94.7	0.0591	115.1	0.1700
B2	0.50 ~ 3.00	120.8	1.1682	135.2	1.1727
B3	2.5 ~ 7.5	86.1	2.9818	109.6	3.3818
B4	5 ~ 30	90.4	14.2273	100.8	14.2273

JANUARY 2019

**Figure 8(e) Location 4: Measured Environmental RF Levels  
Non-Directional Data from Vertically Oriented Monopole Antenna, Bands 0-4**

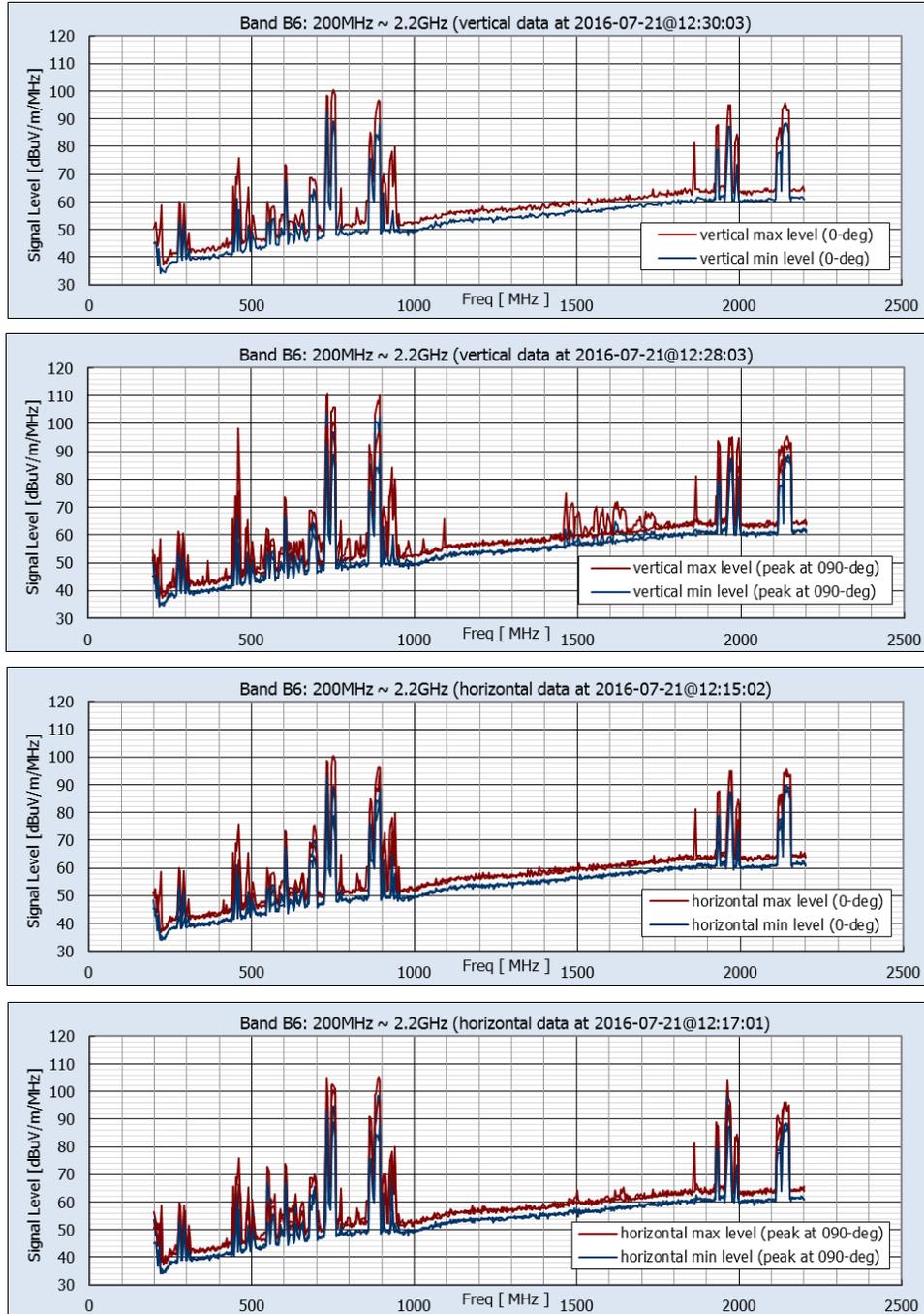


Band number	Freq. Range (MHz)	Maximum Levels							
		Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B5	25 ~ 200	120.5	92.273	123.5	92.273	119.5	92.273	122.5	92.273

JANUARY 2019

**Figure 8(f) Location 4: Measured Environmental RF Levels**

Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation

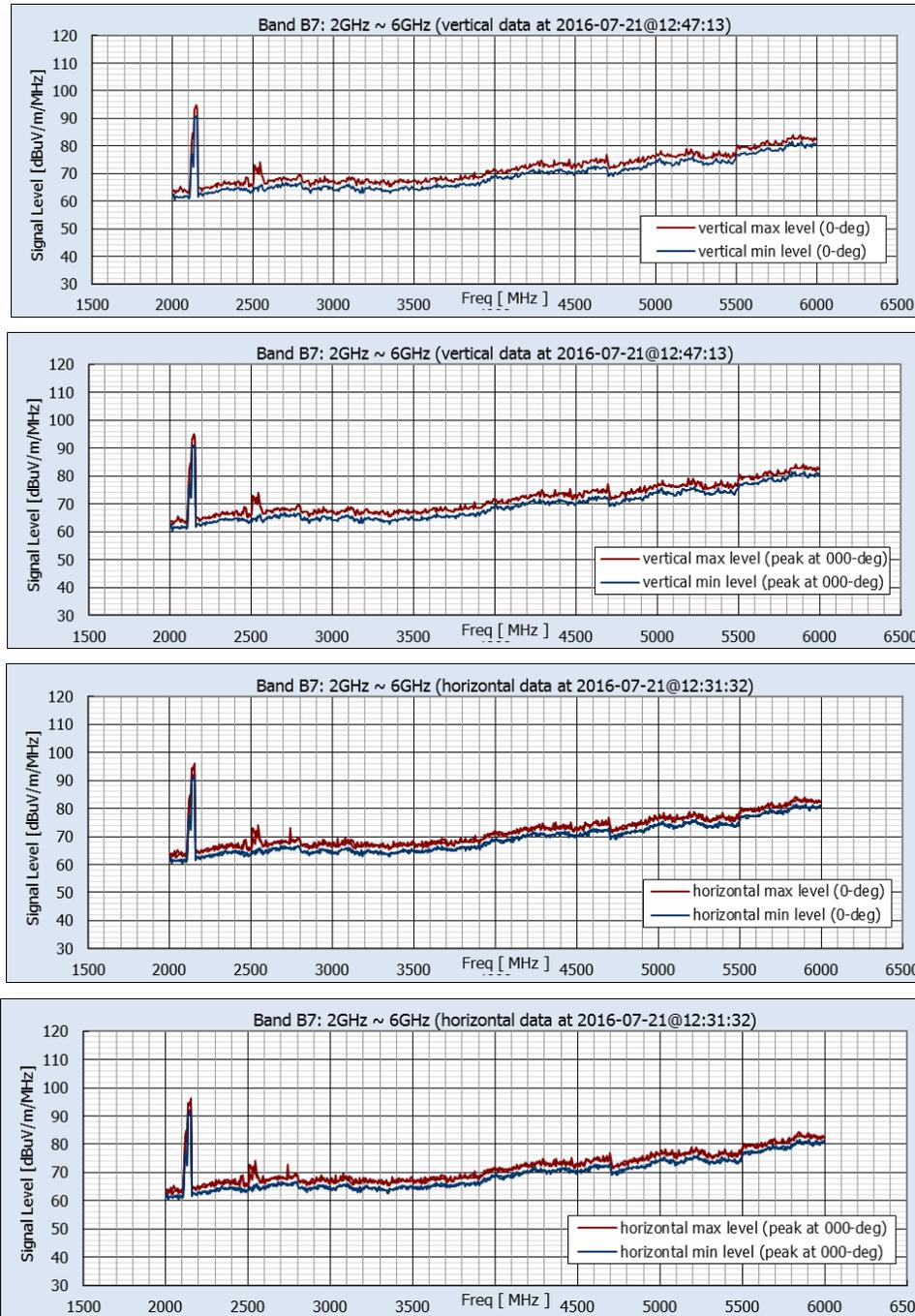


Band	Freq. Range (MHz)	Maximum Levels							
		Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B6	200 ~ 2200	103.7	730.909	110.7	734.545	98.5	887.273	105.4	890.909

JANUARY 2019

**Figure 8(g) Location 4: Measured Environmental RF Levels**

Band 6 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation



Band	Freq. Range (MHz)	Maximum Levels							
		Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B7	2000-6000	90.9	2152.727	95.0	2145.455	92.2	2152.727	96.3	2152.727

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**Figure 8(h) Location 4: Measured Environmental RF Levels**

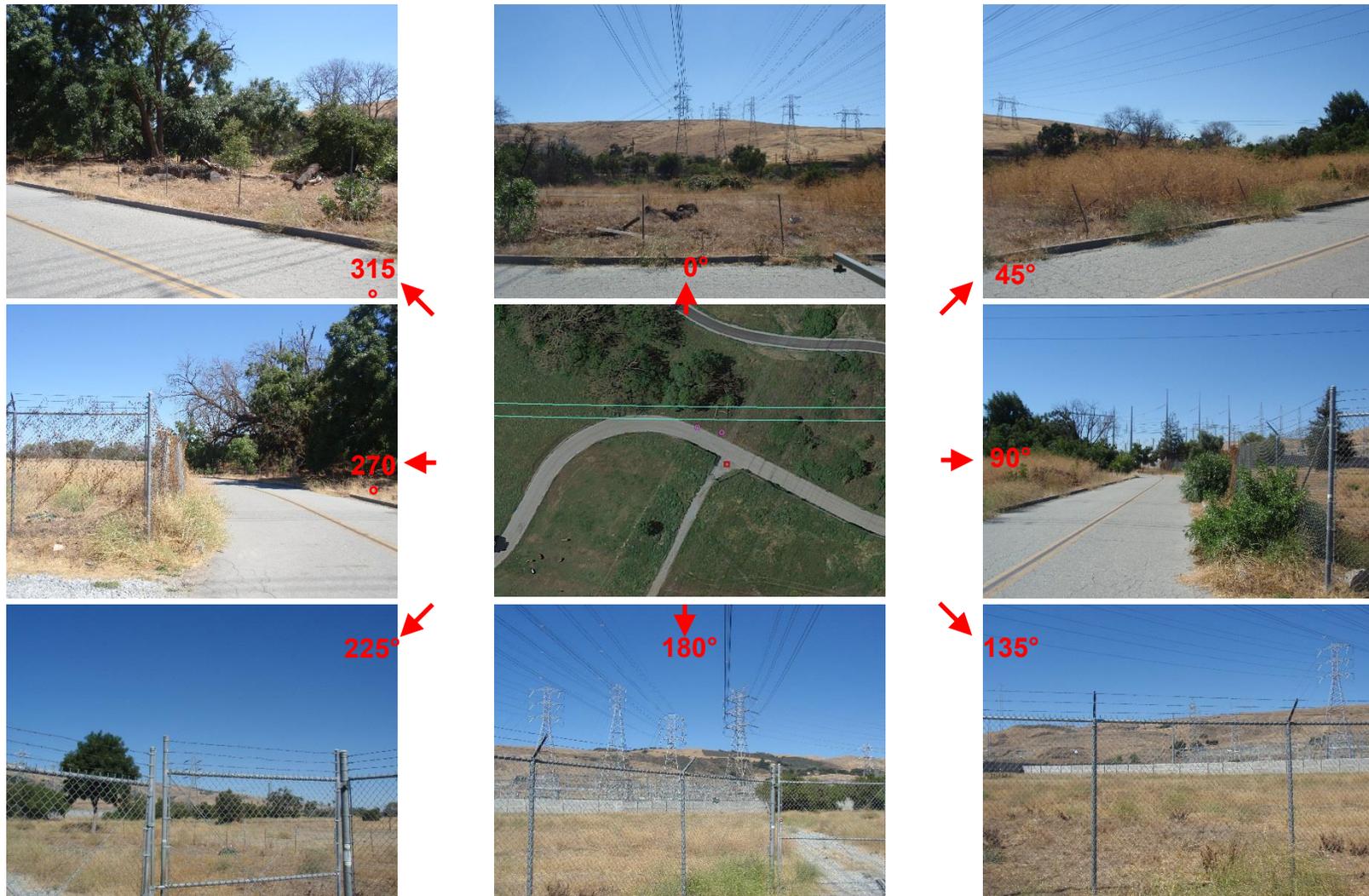
Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation



JANUARY 2020

**Figure 9(a) Location 5: Metcalf Energy Center, San Jose**

Adjacent to the PG&E Metcalf Substation (Lat 37.223022°, Lon -121.744592°)



JANUARY 2019

**Figure 9(b) Location 5: Measurement Location and Site Views**

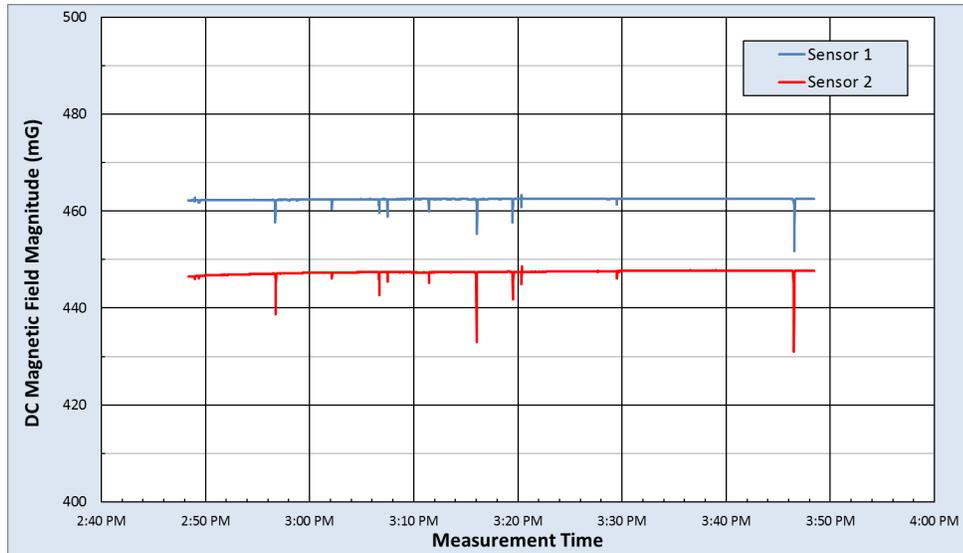
Photos depicting the site from the perspective of the RF measurement location. In the center is a satellite view, indicating the alignment (green line) and measurement points (red = RF, magenta = magnetometers). The satellite view is rotated so that the image at 0° faces the alignment.



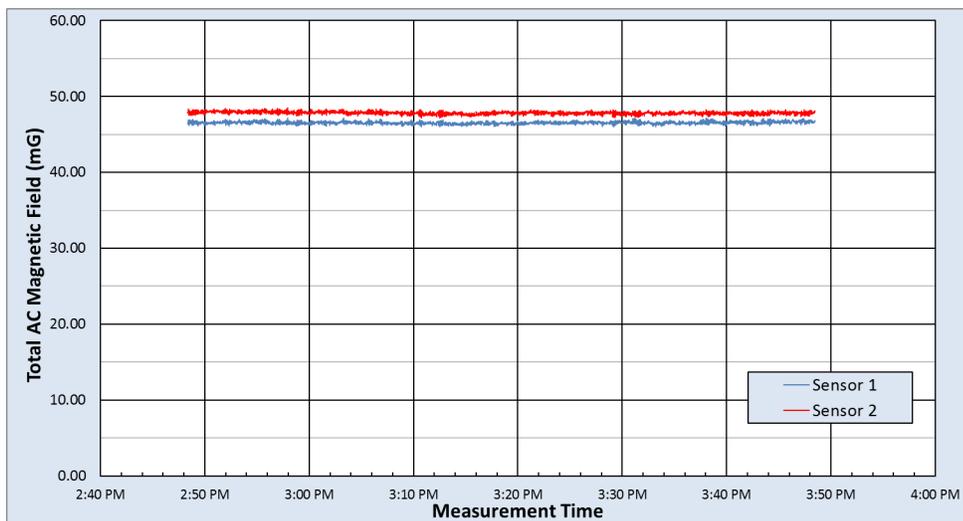
JANUARY 2019

**Figure 9(c) Location 5: Local EMF Sources**

Immediately adjacent to the PG&E Substation. Nearby emitters include high-voltage transmission lines and substation equipment. Photos depict visible close-proximity emitters. Other emissions sources are assumed to exist, but are not visible from the site.



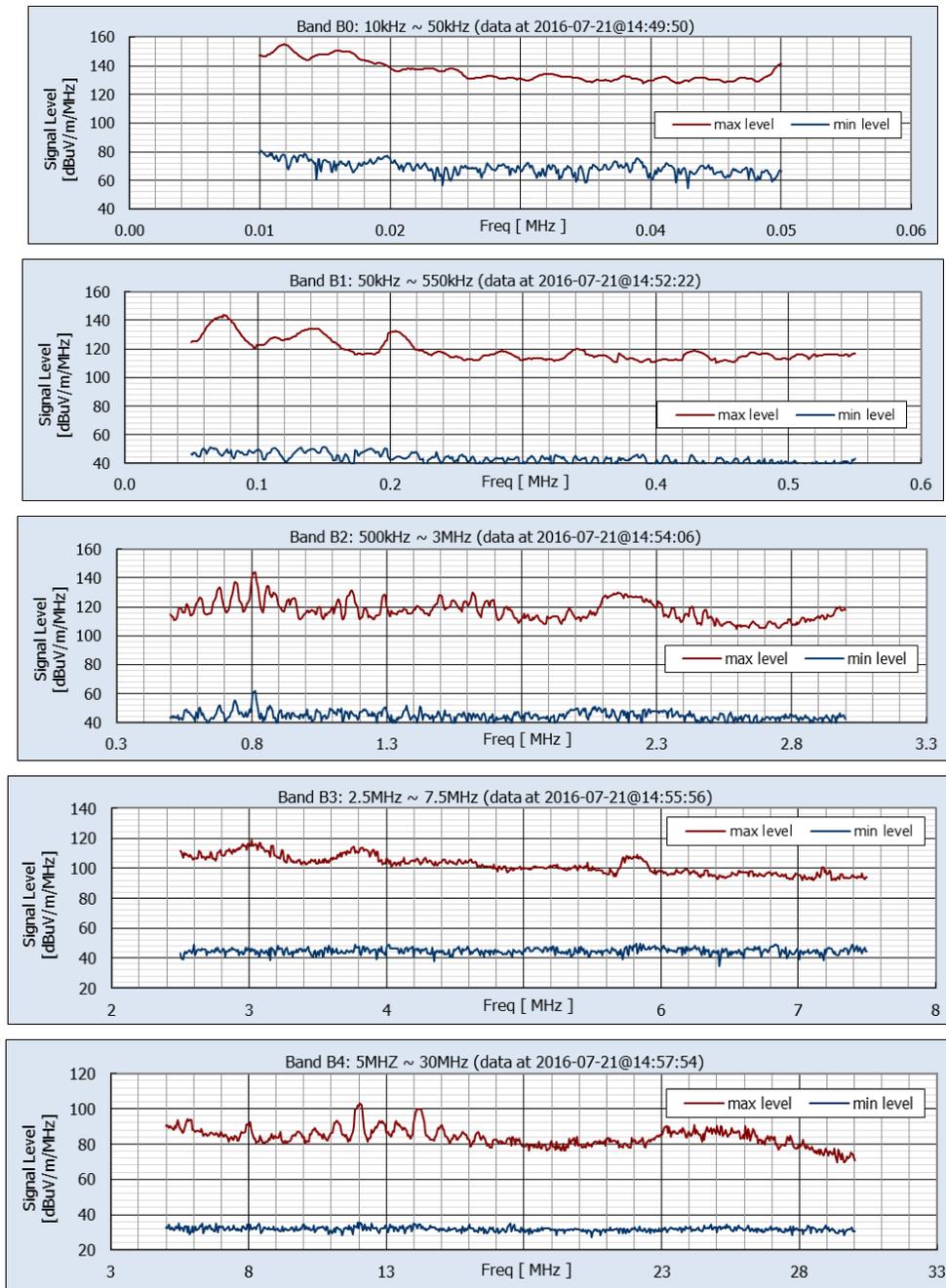
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	244.0	241.9	398.1	381.9	463.3	448.6
<b>Median</b>	235.8	234.1	397.8	381.4	462.5	447.4
<b>Min</b>	232.0	228.3	382.4	358.9	451.8	431.1
<b>Range</b>	12.0	13.5	15.7	23.0	11.5	17.6
<b>Std Dev</b>	0.3	0.4	0.4	0.7	0.3	0.6



rms AC Magnetic Field Measurement Statistics																
	Fund 60Hz (mG)		2nd (mG)		3rd (mG)		4th (mG)		5th (mG)		6th (mG)		7th (mG)		Total AC (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	47.175	48.472	0.075	0.105	1.282	1.630	0.074	0.070	0.248	0.255	0.087	0.089	0.232	0.223	47.192	48.499
<b>Median</b>	46.512	47.805	0.017	0.023	1.226	1.578	0.016	0.014	0.200	0.215	0.034	0.032	0.175	0.167	46.529	47.832
<b>Min</b>	46.002	47.107	0.003	0.005	1.186	1.543	0.003	0.003	0.163	0.184	0.014	0.010	0.150	0.140	46.019	47.135
<b>Range</b>	1.173	1.364	0.072	0.100	0.096	0.086	0.071	0.067	0.085	0.072	0.072	0.079	0.082	0.083	1.173	1.364
<b>Std Dev</b>	0.174	0.189	0.007	0.009	0.018	0.015	0.005	0.005	0.006	0.007	0.007	0.007	0.007	0.007	0.174	0.189

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Figure 9(d) Location 5: AC and DC Magnetic Field Measurement Results

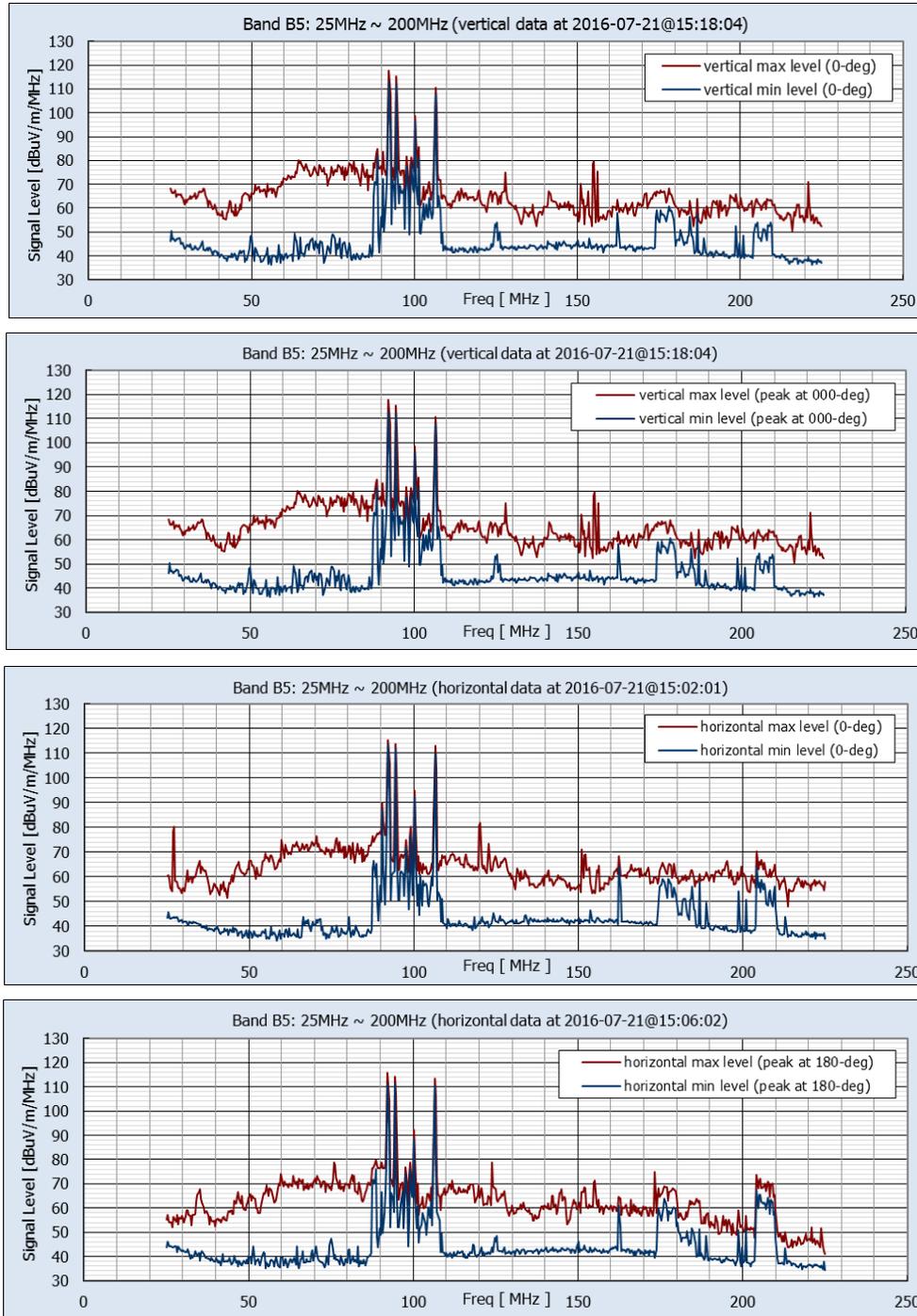


Maximum Levels					
Band number	Freq. Range (MHz)	Pk Min-Hold (dB uV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dB uV/m/MHz)	@ Freq. (MHz)
B0	0.01 ~ 0.05	81.0	0.0101	154.8	0.0118
B1	0.05 ~ 0.55	51.5	0.1327	143.7	0.0745
B2	0.50 ~ 3.00	61.6	0.8091	144.0	0.8091
B3	2.5 ~ 7.5	49.8	5.8182	118.6	3.0182
B4	5 ~ 30	35.6	12.0455	102.8	12.0455

JANUARY 2019

**Figure 9(e) Location 5: Measured Environmental RF Levels**

Non-Directional Data from Vertically Oriented Monopole Antenna, Bands 0-4

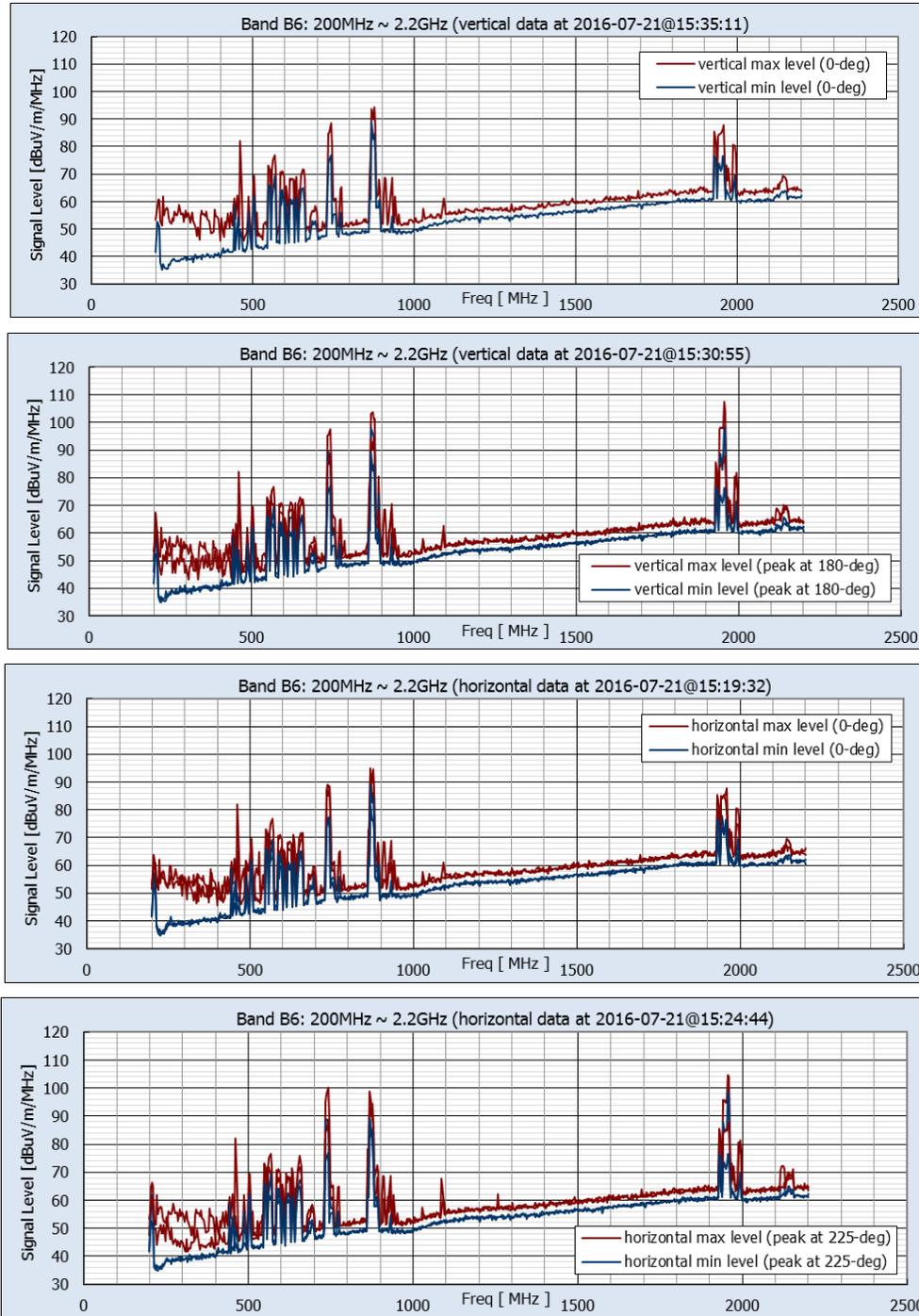


Maximum Levels									
Band number	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B5	25 ~ 200	113.0	92.273	117.6	92.273	113.4	92.273	115.9	92.273

JANUARY 2019

**Figure 9(f) Location 5: Measured Environmental RF Levels**

Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation

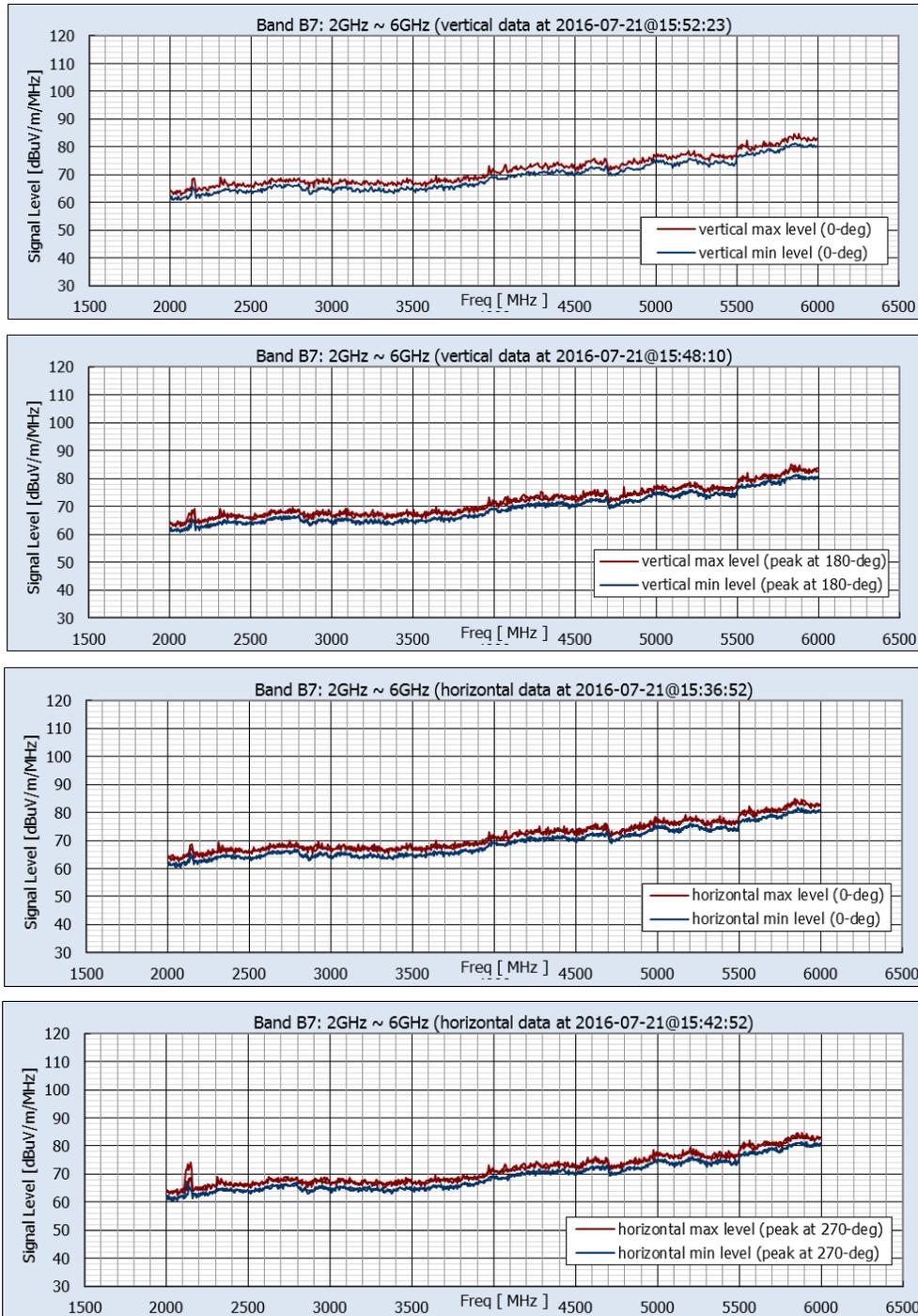


Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B6	200 ~ 2200	98.4	1956.364	107.4	1956.364	98.8	1956.364	104.5	1956.364

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**Figure 9(g) Location 5: Measured Environmental RF Levels**

Band 6 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation



Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B7	2000-6000	66.4	2720.000	69.2	2312.727	68.8	2145.455	74.3	2145.455

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**Figure 9(h) Location 5: Measured Environmental RF Levels**

Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation



JANUARY 2020

**Figure 10(a) Location 6: Railroad Avenue/Barrett Avenue, Morgan Hill**

Commercial area across from Morgan Hill Police Department, (Lat 37.118225°, Lon -121.638550°)



JANUARY 2019

**Figure 10(b) Location 6: Measurement Location and Site Views**

Photos depicting the site from the perspective of the RF measurement location. In the center is a satellite view, indicating the alignment (green line) and measurement points (red = RF, magenta = magnetometers). The satellite view is rotated so that the image at 0° faces the alignment.

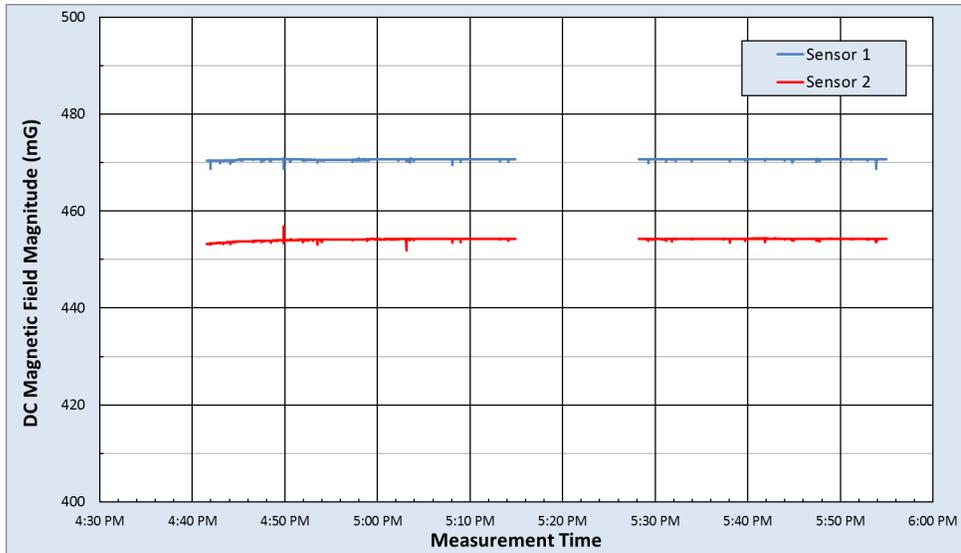


JANUARY 2019

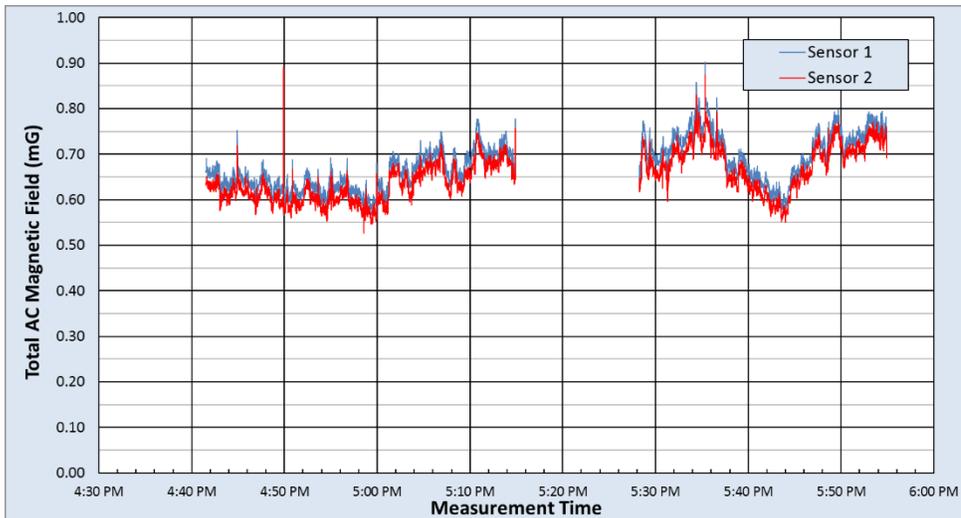
**Figure 10(c) Location 6: Local EMF Sources**

Nearby emitters include cell towers, fixed land communications, and distribution lines parallel to the alignment.

Photos depict visible close-proximity emitters. Other emissions sources may exist that are not readily visible from the site.



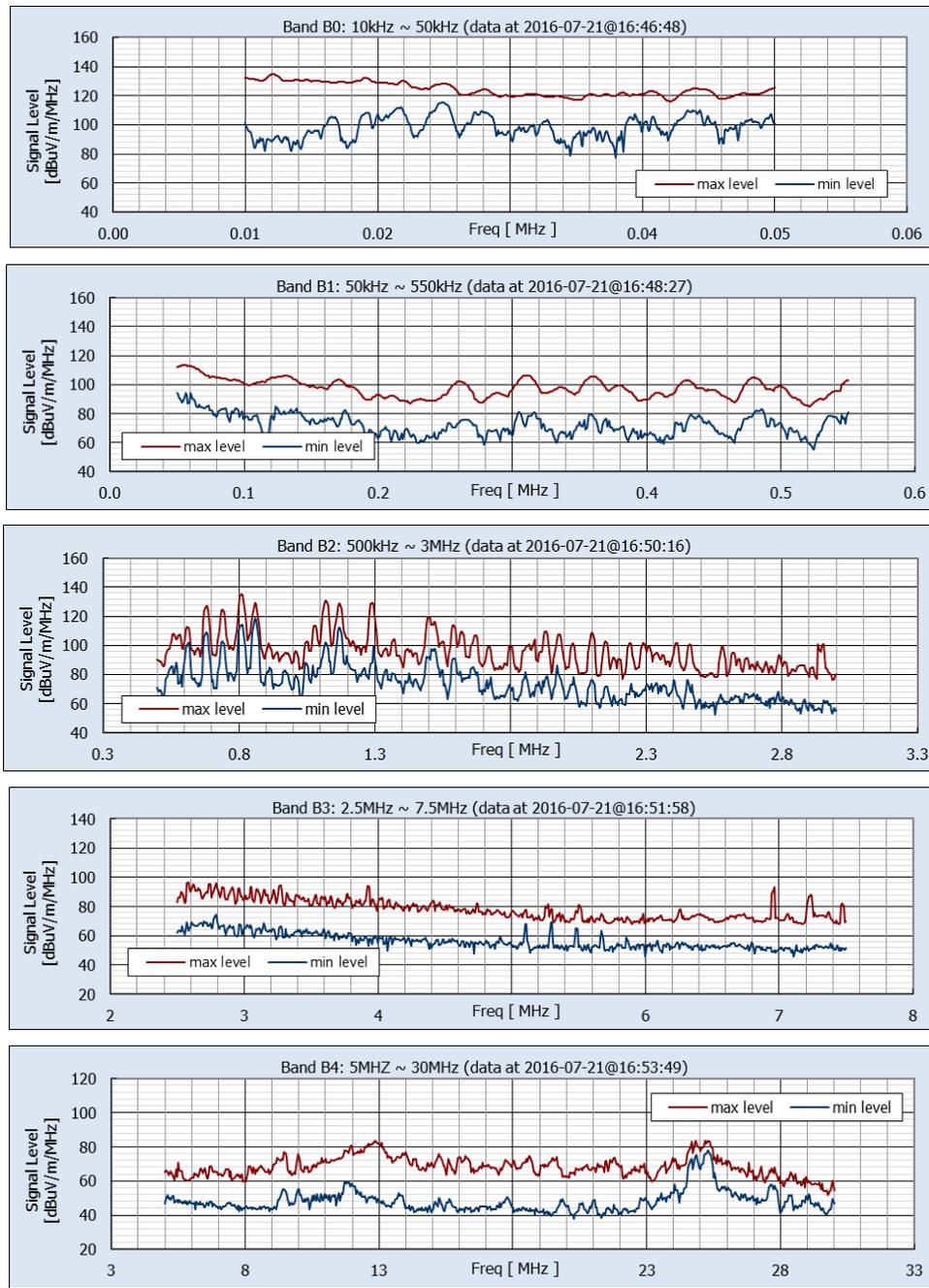
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	221.7	239.2	416.6	393.8	470.9	456.9
<b>Median</b>	219.5	227.1	416.3	393.3	470.6	454.2
<b>Min</b>	216.6	226.0	413.9	389.3	468.8	451.8
<b>Range</b>	5.1	13.2	2.7	4.5	2.1	5.1
<b>Std Dev</b>	0.2	0.3	0.1	0.2	0.1	0.2



rms AC Magnetic Field Measurement Statistics																
	Fund 60Hz (mG)		2nd (mG)		3rd (mG)		4th (mG)		5th (mG)		6th (mG)		7th (mG)		Total AC (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	0.808	0.786	0.065	0.206	0.469	0.476	0.068	0.105	0.107	0.102	0.075	0.072	0.094	0.092	0.902	0.891
<b>Median</b>	0.528	0.516	0.010	0.010	0.417	0.389	0.010	0.010	0.046	0.044	0.012	0.012	0.041	0.036	0.673	0.647
<b>Min</b>	0.359	0.354	0.003	0.002	0.375	0.345	0.001	0.002	0.028	0.023	0.003	0.002	0.025	0.019	0.554	0.526
<b>Range</b>	0.449	0.432	0.062	0.204	0.094	0.131	0.066	0.104	0.079	0.078	0.073	0.070	0.069	0.073	0.348	0.365
<b>Std Dev</b>	0.067	0.065	0.006	0.006	0.012	0.013	0.007	0.007	0.008	0.008	0.010	0.009	0.009	0.009	0.053	0.052

JANUARY 2019

Figure 10(d) Location 6: AC and DC Magnetic Field Measurement Results

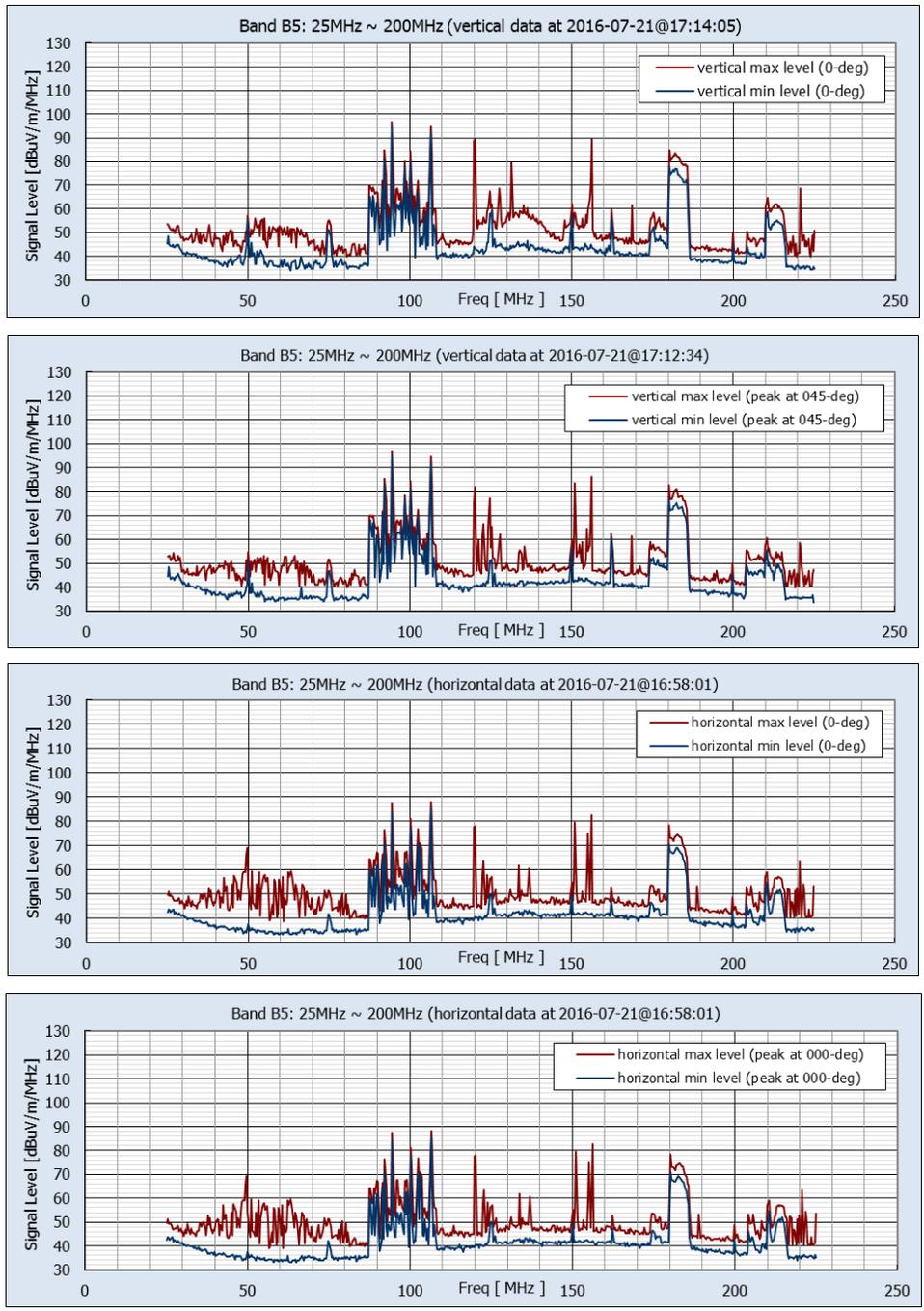


Maximum Levels					
Band number	Freq. Range (MHz)	Pk Min-Hold (dB uV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dB uV/m/MHz)	@ Freq. (MHz)
B0	0.01 ~ 0.05	115.2	0.0248	134.7	0.0120
B1	0.05 ~ 0.55	94.2	0.0564	113.5	0.0555
B2	0.50 ~ 3.00	118.6	0.8591	135.1	0.8091
B3	2.5 ~ 7.5	74.7	2.7909	96.9	2.5818
B4	5 ~ 30	78.0	25.2727	83.7	12.8636

JANUARY 2019

**Figure 10(e) Location 6: Measured Environmental RF Levels**

Non-Directional Data from Vertically Oriented Monopole Antenna, Bands 0-4

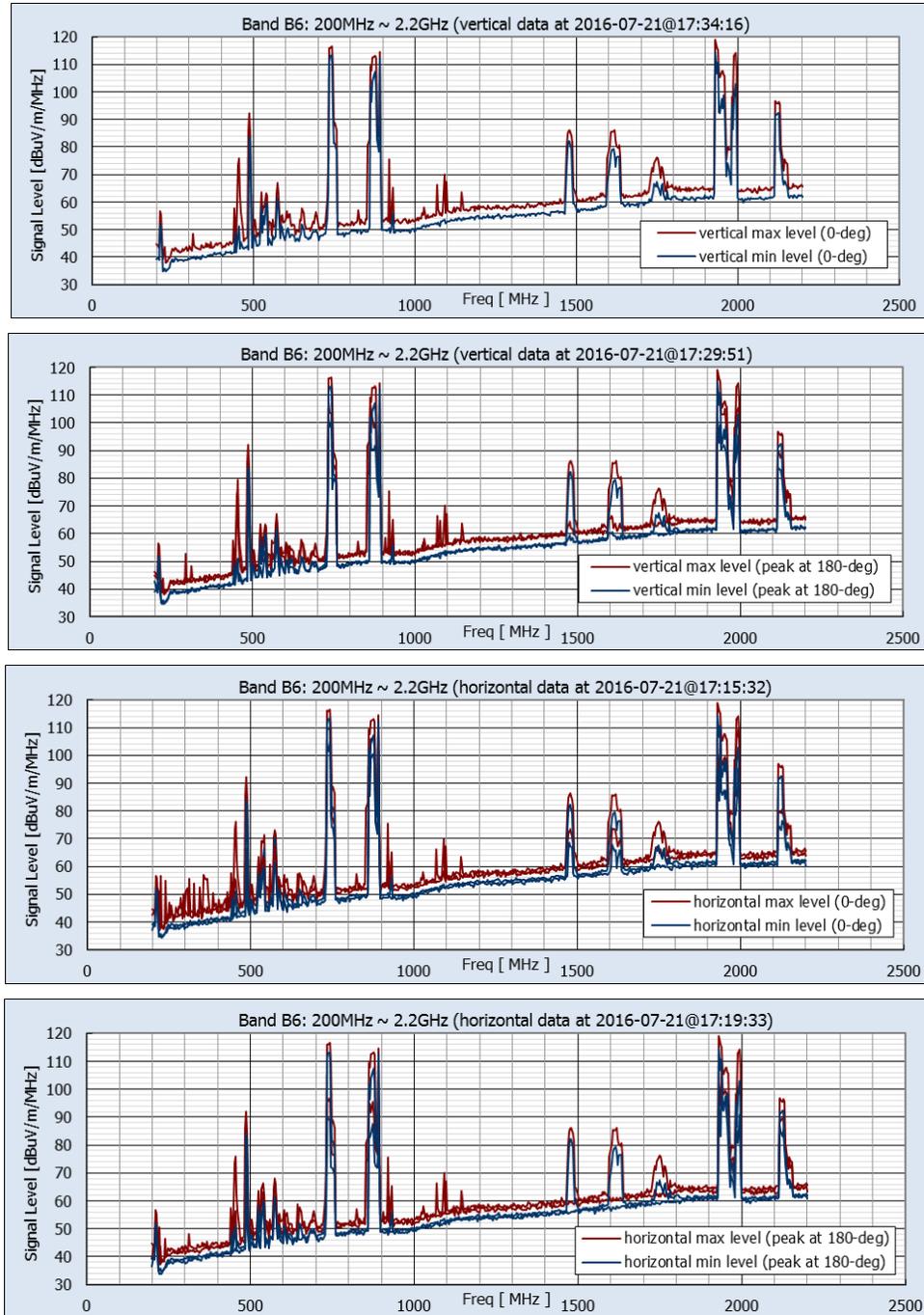


Maximum Levels									
Band number	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B5	25 ~ 200	95.1	94.455	96.8	94.455	85.4	106.455	88.1	106.455

JANUARY 2019

**Figure 10(f) Location 6: Measured Environmental RF Levels**

Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation

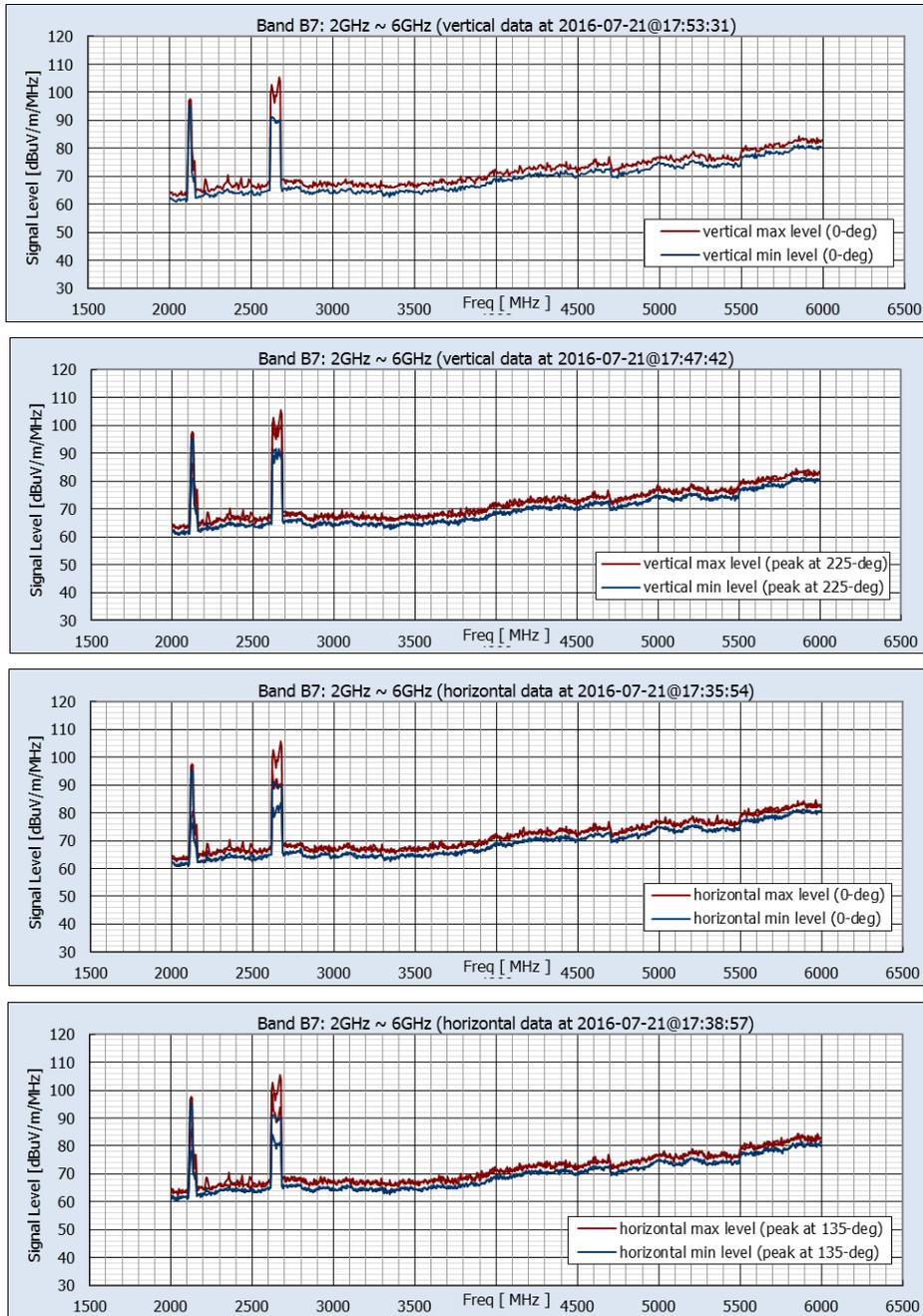


Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B6	200 ~ 2200	114.6	1930.909	119.0	1930.909	106.8	890.909	110.1	741.818

JANUARY 2019

**Figure 10(g) Location 6: Measured Environmental RF Levels**

Band 6 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation



Band	Freq. Range (MHz)	Maximum Levels							
		Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B7	2000~6000	95.3	2123.636	105.5	2669.091	84.1	2625.455	98.7	2625.455

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**Figure 10(h) Location 6: Measured Environmental RF Levels**

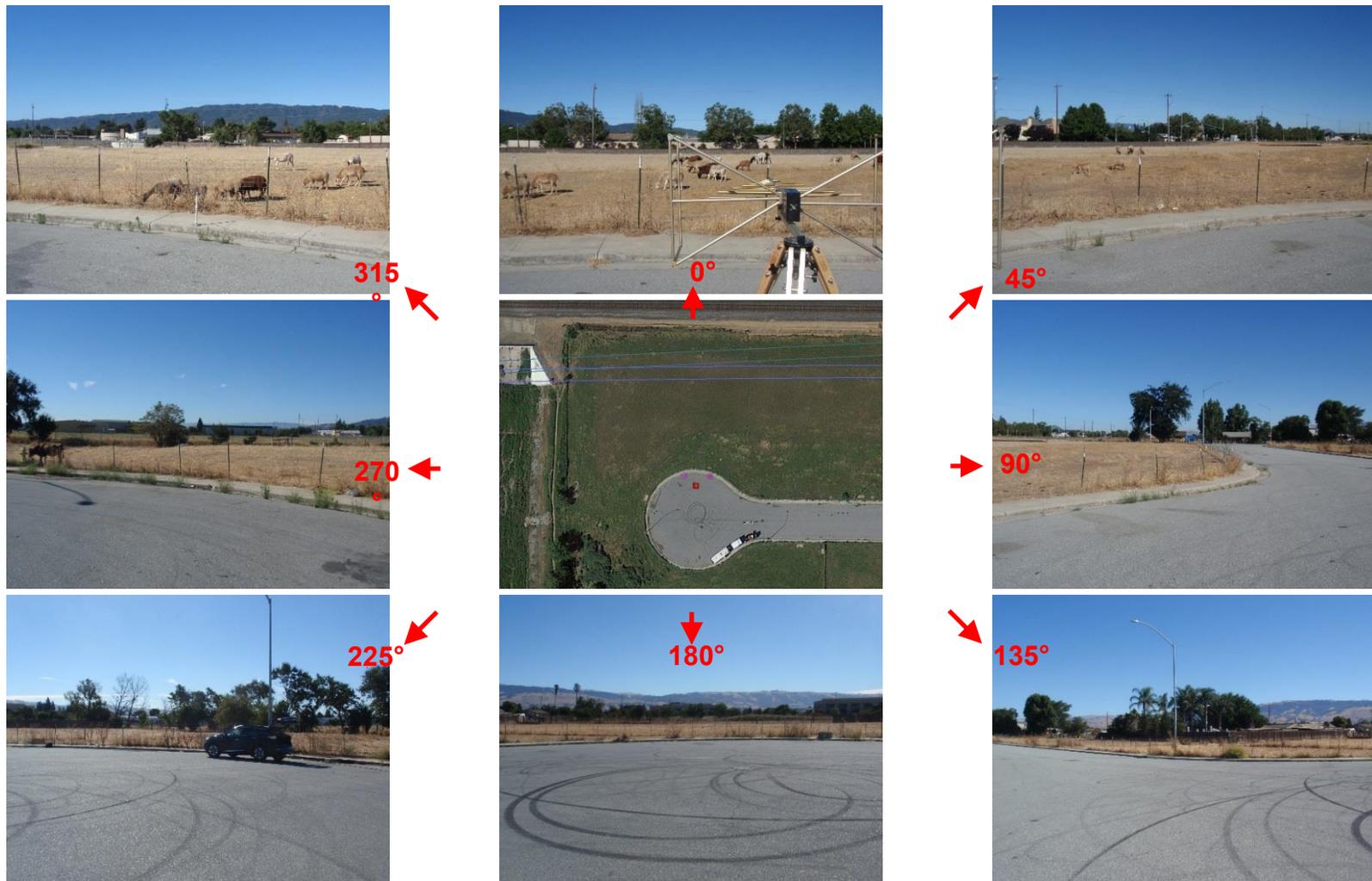
Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation



JANUARY 2020

**Figure 11(a) Location 7: Monterey Highway/Las Animas Avenue, Gilroy**

Suburban setting, with relatively few local RF emitters (Lat 37.028851°, Lon -121.578510°)



JANUARY 2019

**Figure 11(b) Location 7: Measurement Location and Site Views**

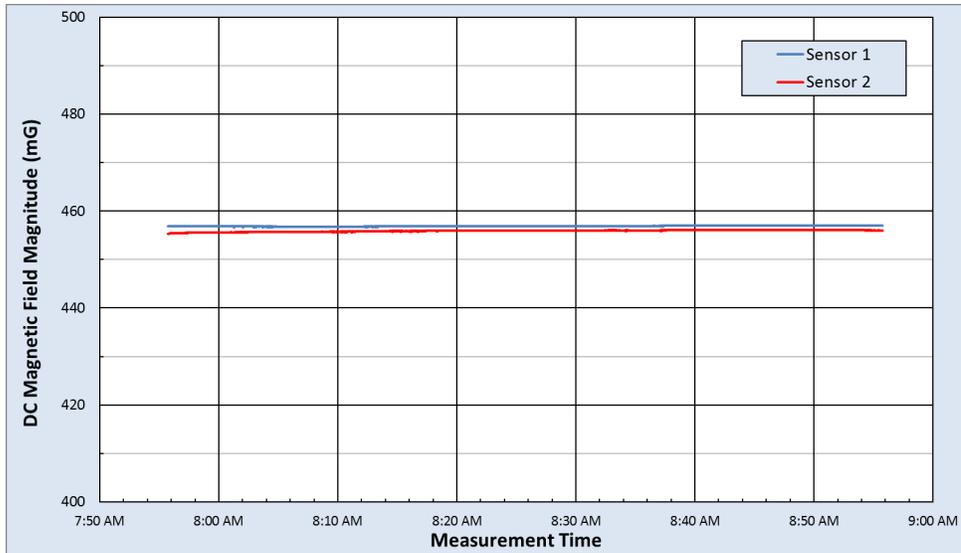
Photos depicting the site from the perspective of the RF measurement location. In the center is a satellite view, indicating the alignment (green line) and measurement points (red = RF, magenta = magnetometers). The satellite view is rotated so that the image at 0° faces the alignment.



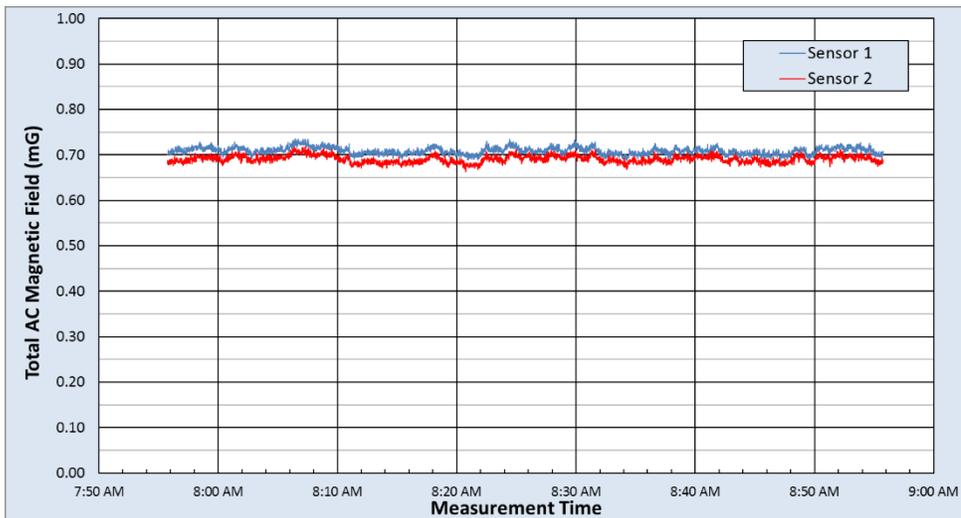
JANUARY 2020

**Figure 11(c) Location 7: Local EMF Sources**

Nearby emitters include microwave towers, railway communications, and distribution lines parallel to the alignment. Photos depict visible close-proximity emitters. Other emissions sources may exist that are not readily visible from the site.



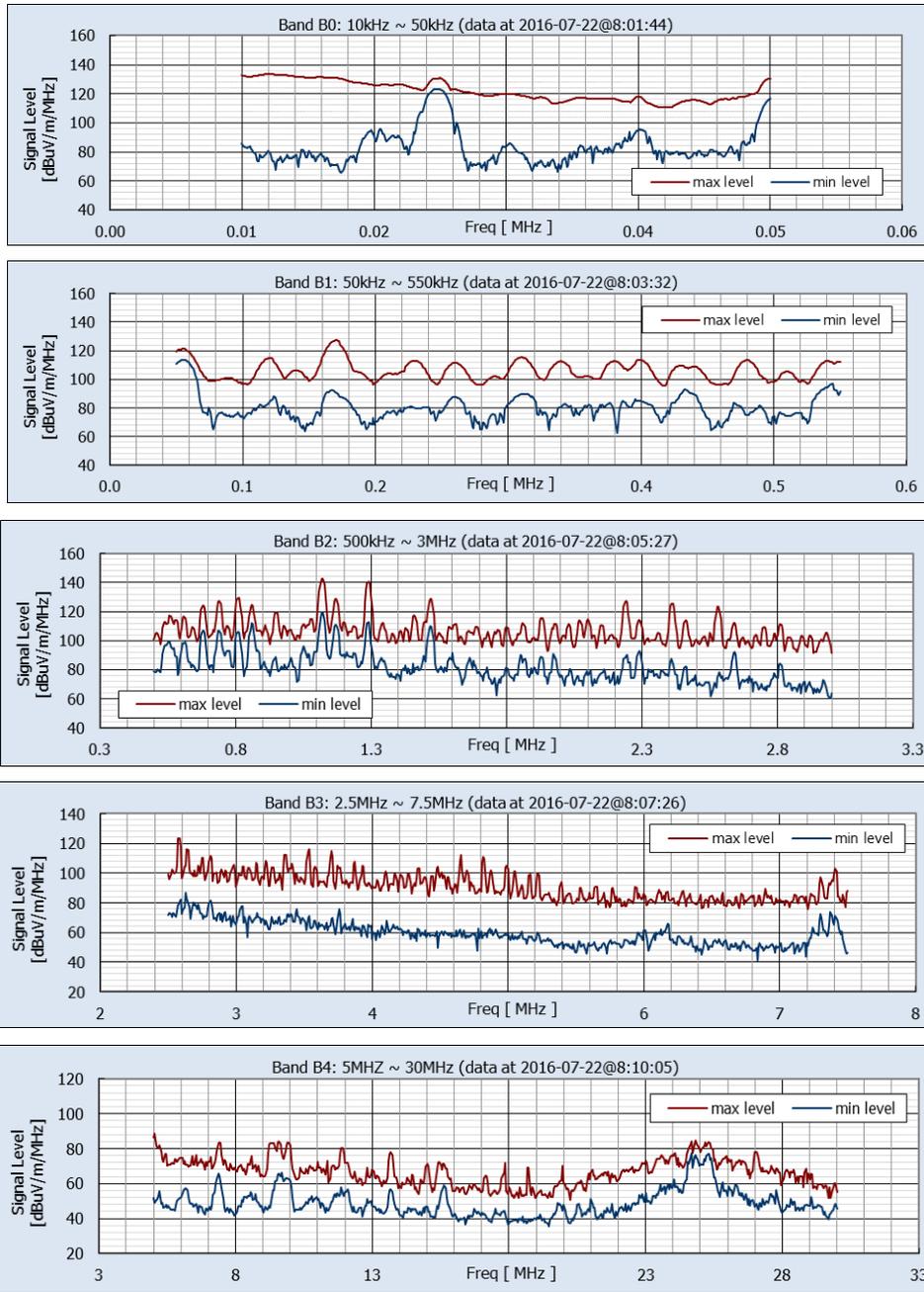
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	230.3	226.2	395.5	396.6	457.0	456.1
<b>Median</b>	230.0	225.3	394.8	396.3	456.9	456.0
<b>Min</b>	228.8	224.0	394.5	396.0	456.8	455.3
<b>Range</b>	1.6	2.2	1.0	0.6	0.2	0.8
<b>Std Dev</b>	0.2	0.5	0.1	0.2	0.1	0.2



rms AC Magnetic Field Measurement Statistics																
	Fund 60Hz (mG)		2nd (mG)		3rd (mG)		4th (mG)		5th (mG)		6th (mG)		7th (mG)		Total AC (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	0.222	0.225	0.021	0.022	0.713	0.694	0.020	0.021	0.063	0.057	0.019	0.023	0.027	0.030	0.735	0.717
<b>Median</b>	0.135	0.139	0.008	0.009	0.694	0.674	0.009	0.009	0.045	0.043	0.010	0.010	0.014	0.014	0.709	0.691
<b>Min</b>	0.057	0.061	0.002	0.001	0.673	0.651	0.001	0.002	0.030	0.027	0.002	0.002	0.002	0.003	0.687	0.664
<b>Range</b>	0.165	0.164	0.019	0.021	0.041	0.043	0.019	0.020	0.032	0.030	0.017	0.021	0.025	0.027	0.048	0.052
<b>Std Dev</b>	0.025	0.026	0.003	0.003	0.006	0.006	0.003	0.003	0.004	0.004	0.003	0.003	0.004	0.004	0.008	0.008

JANUARY 2020

Figure 11(d) Location 7: AC and DC Magnetic Field Measurement Results

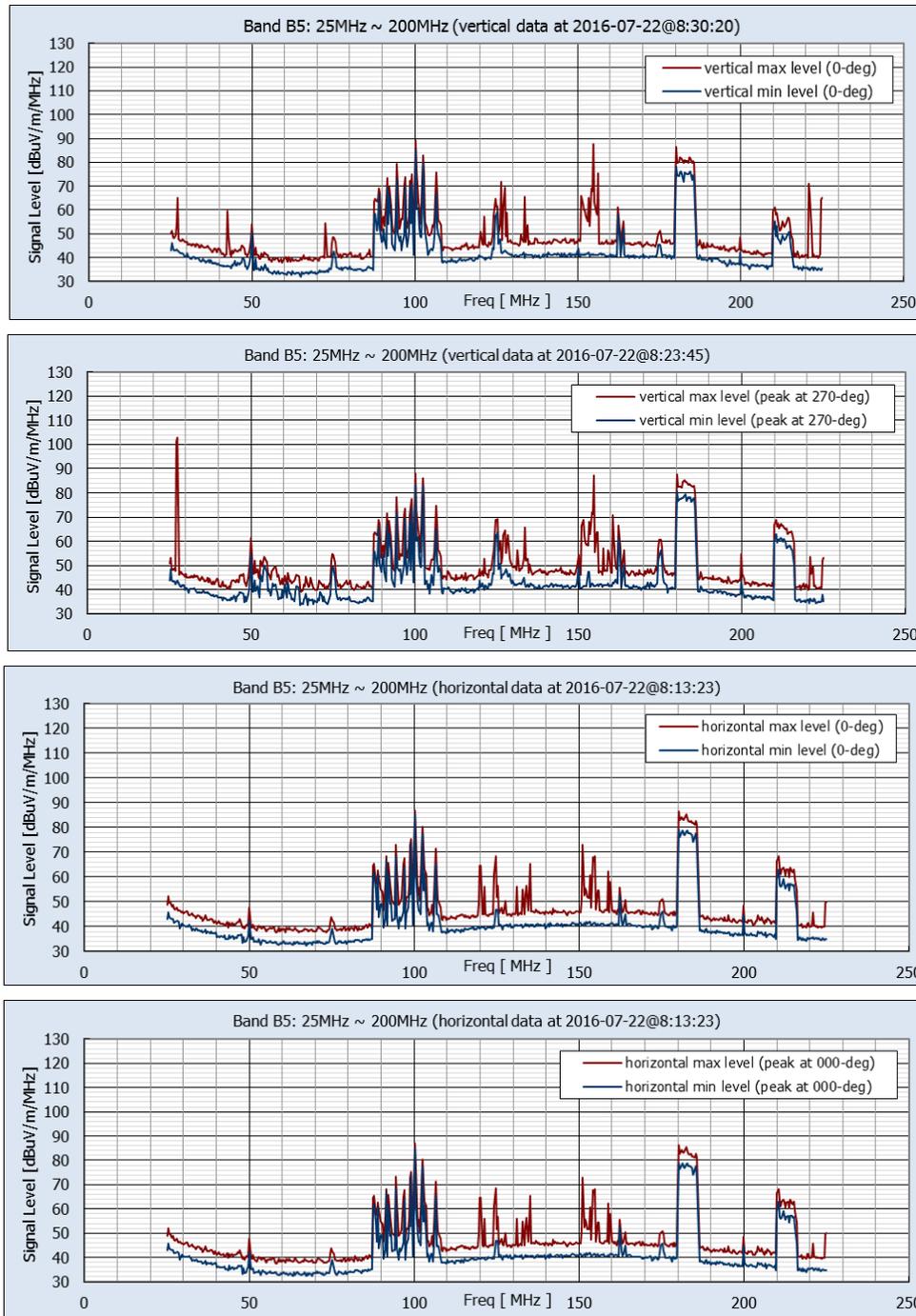


Maximum Levels					
Band number	Freq. Range (MHz)	Pk Min-Hold (dB uV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dB uV/m/MHz)	@ Freq. (MHz)
B0	0.01 ~ 0.05	123.3	0.0248	133.5	0.0120
B1	0.05 ~ 0.55	113.5	0.0555	127.1	0.1709
B2	0.50 ~ 3.00	119.4	1.1182	142.5	1.1182
B3	2.5 ~ 7.5	86.6	2.6273	123.6	2.5818
B4	5 ~ 30	77.2	24.6818	88.8	5.0455

JANUARY 2019

**Figure 11(e) Location 7: Measured Environmental RF Levels**

Non-Directional Data from Vertically Oriented Monopole Antenna, Bands 0-4

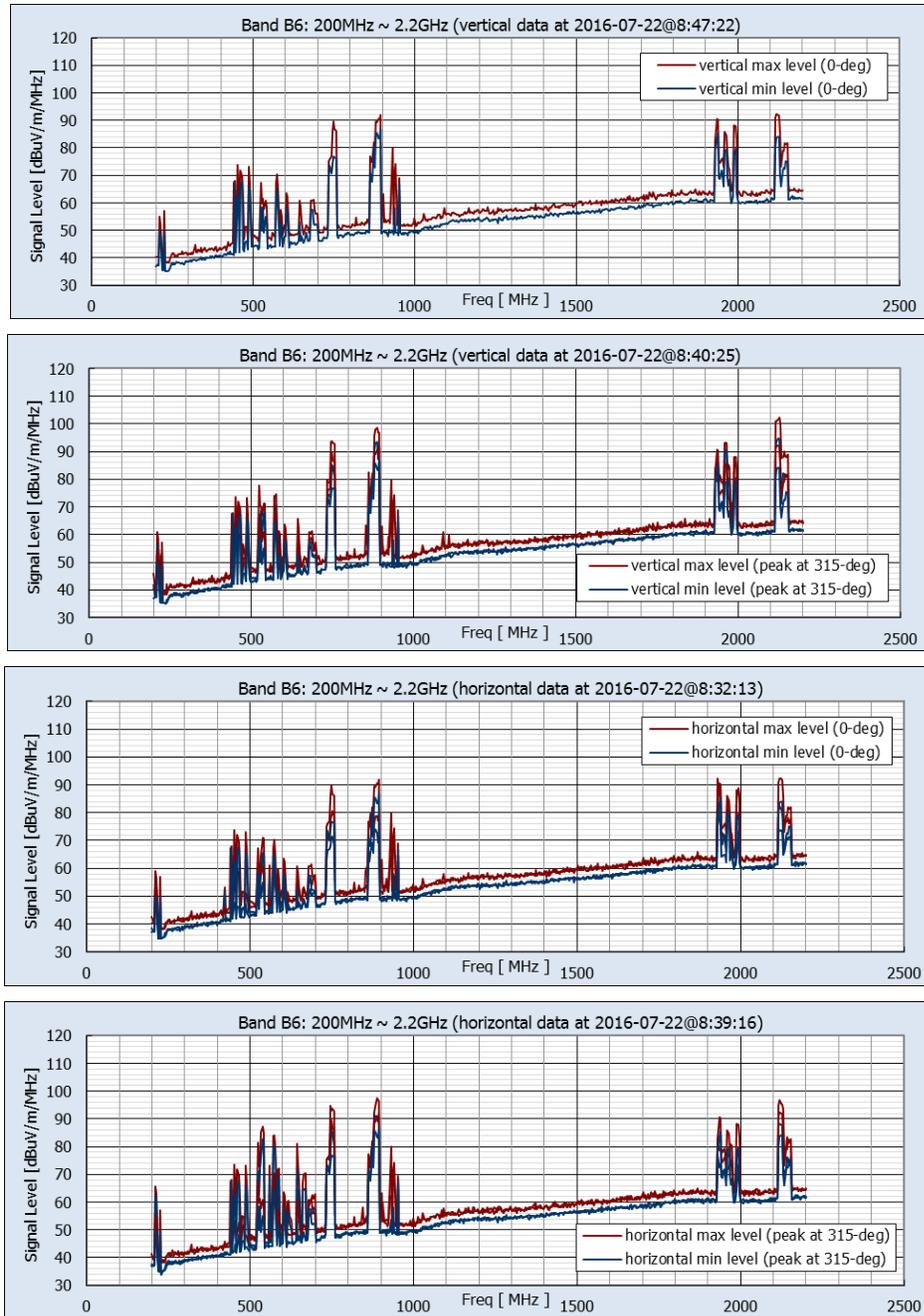


Maximum Levels									
Band number	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B5	25 ~ 200	85.1	100.273	102.9	27.545	85.2	100.273	86.9	100.273

JANUARY 2019

**Figure 11(f) Location 7: Measured Environmental RF Levels**

Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation

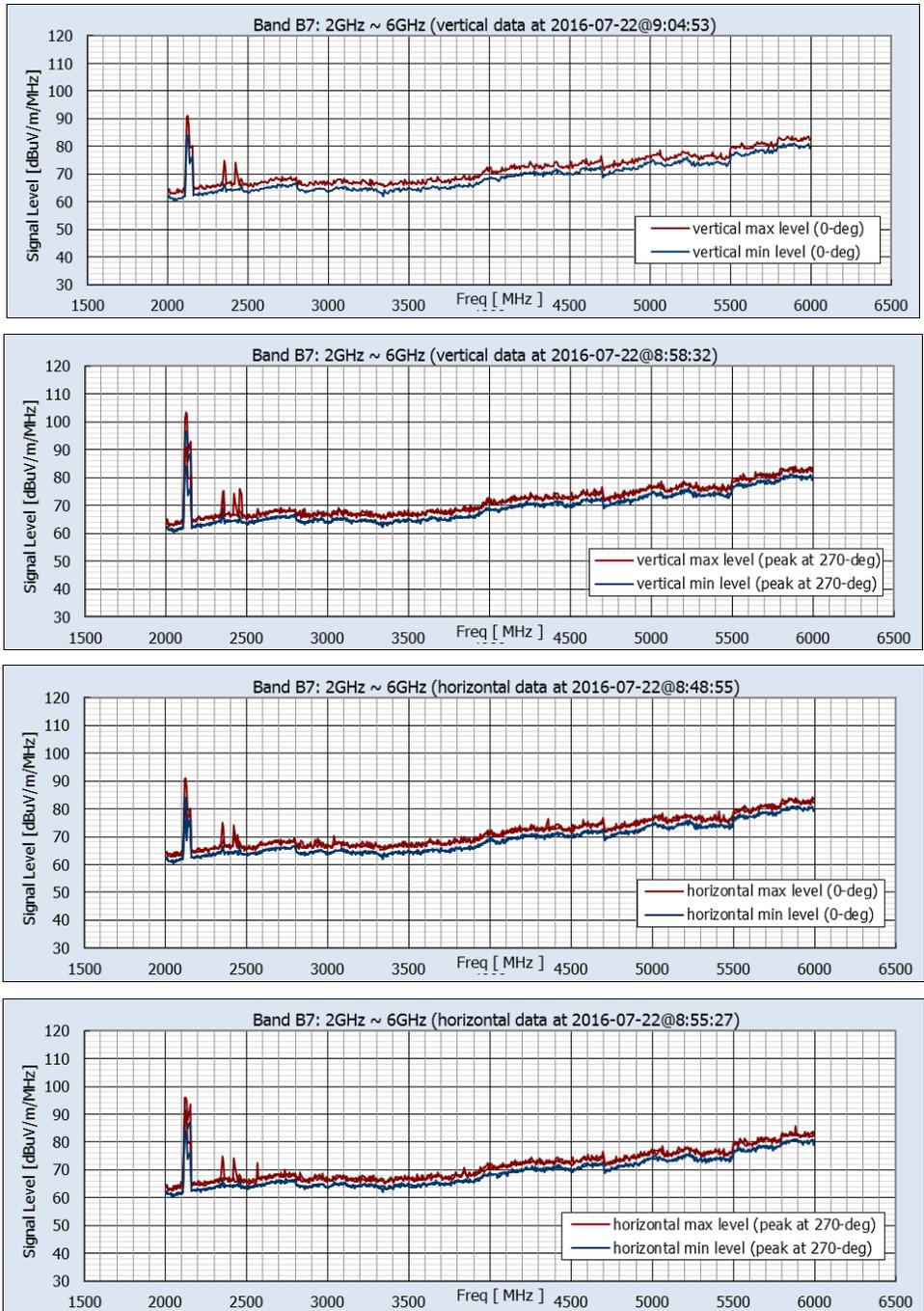


Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B6	200 ~ 2200	94.9	2123.636	102.4	2127.273	90.9	883.636	97.5	887.273

JANUARY 2019

**Figure 11(g) Location 7: Measured Environmental RF Levels**

Band 6 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation

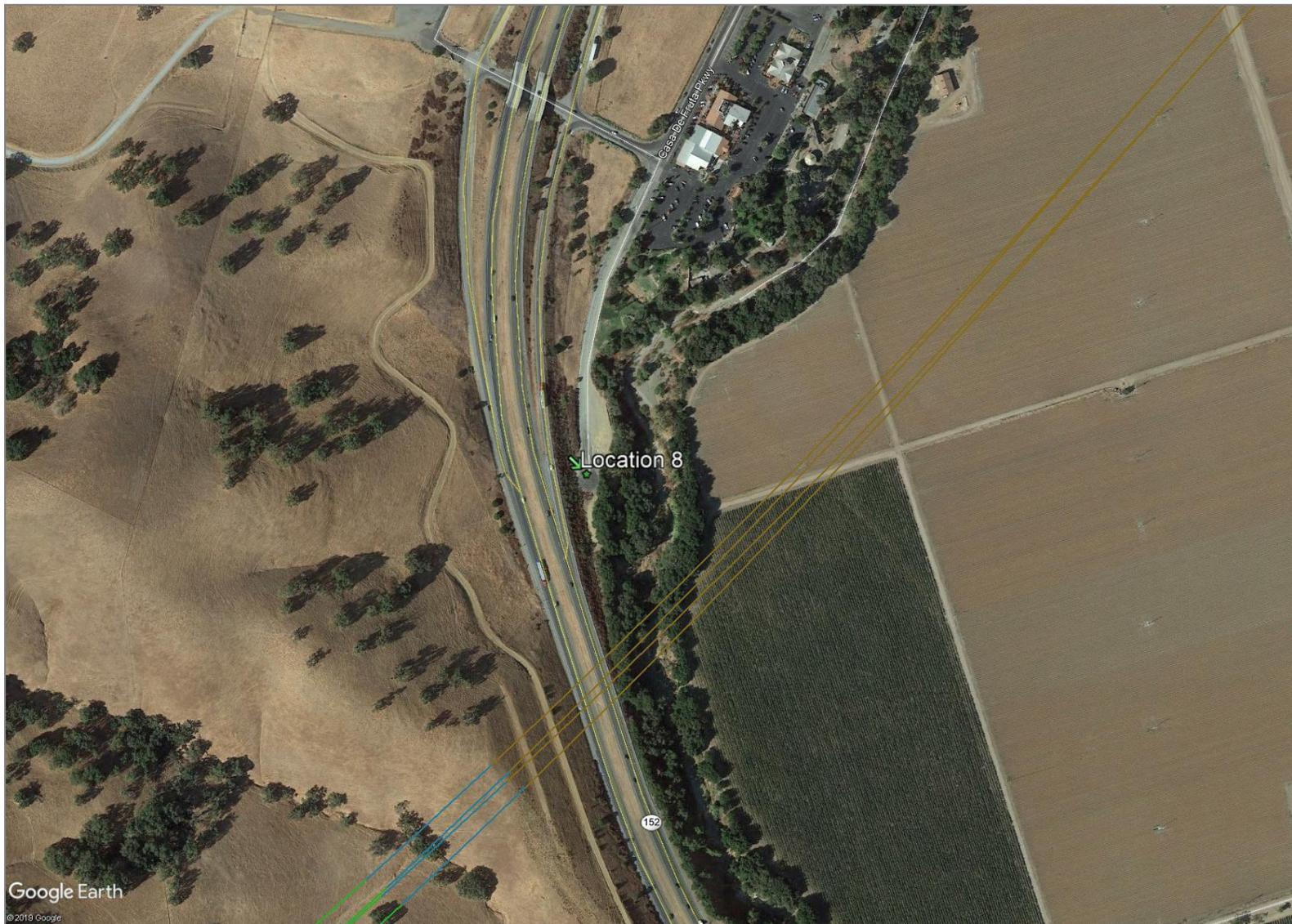


Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B7	2000~6000	96.8	2123.636	103.5	2123.636	91.6	2123.636	95.9	2116.364

JANUARY 2019

**Figure 11(h) Location 7: Measured Environmental RF Levels**

Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation



JANUARY 2020

**Figure 12(a) Location 8: SR 152/Casa de Fruta Parkway, Hollister**

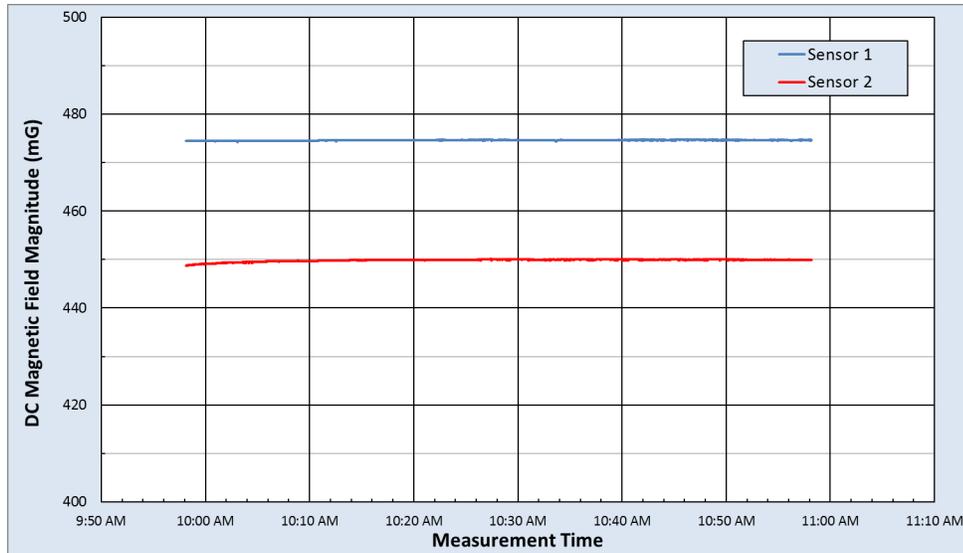
Rural setting adjacent to Casa de Fruta, no visible RF emitters (Lat 36.985247°, Lon -121.383899°)



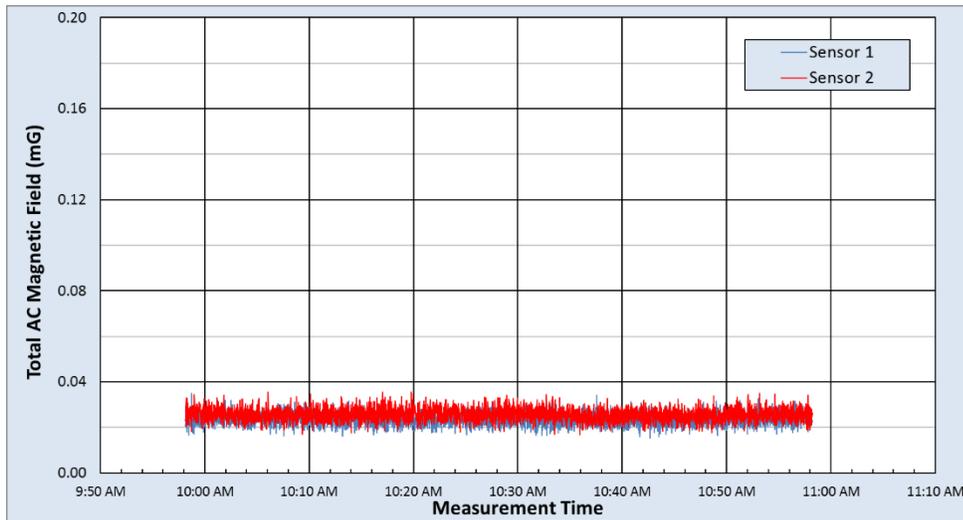
JANUARY 2019

**Figure 12(b) Location 8: Measurement Location and Site Views**

Photos depicting the site from the perspective of the RF measurement location. In the center is a satellite view, indicating the alignment (green line) and measurement points (red = RF, magenta = magnetometers). The satellite view is rotated so that the image at 0° faces the alignment.



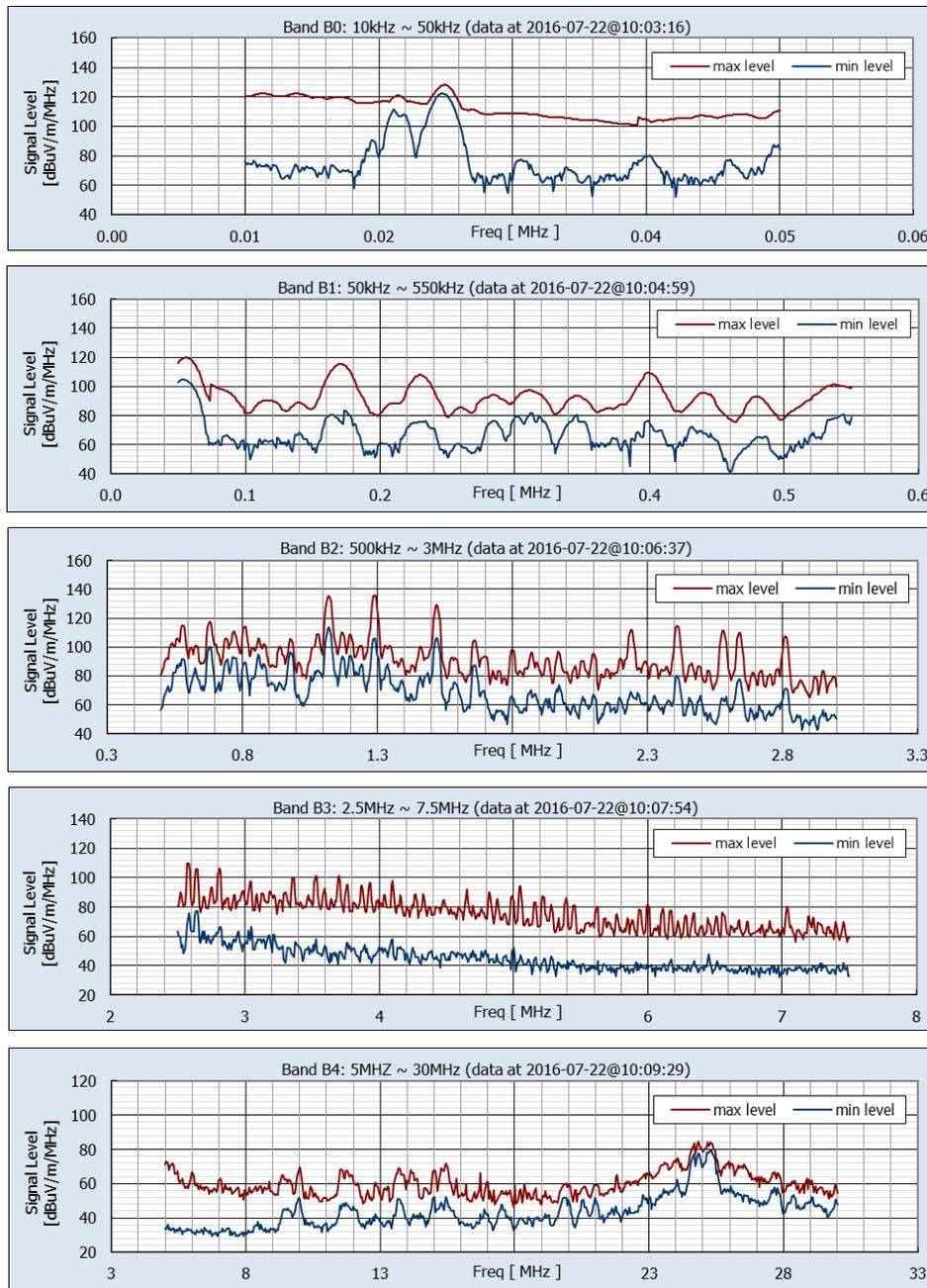
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	227.4	212.4	417.2	396.9	474.8	450.1
<b>Median</b>	226.8	212.2	416.9	396.8	474.6	449.9
<b>Min</b>	226.2	211.2	416.5	395.9	474.4	448.8
<b>Range</b>	1.1	1.2	0.7	0.9	0.4	1.4
<b>Std Dev</b>	0.2	0.2	0.1	0.2	0.1	0.2



rms AC Magnetic Field Measurement Statistics																
	Fund 60Hz (mG)		2nd (mG)		3rd (mG)		4th (mG)		5th (mG)		6th (mG)		7th (mG)		Total AC (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	0.018	0.023	0.019	0.021	0.019	0.018	0.020	0.020	0.018	0.021	0.020	0.022	0.023	0.027	0.035	0.035
<b>Median</b>	0.008	0.009	0.008	0.009	0.008	0.009	0.008	0.009	0.009	0.009	0.009	0.010	0.009	0.010	0.024	0.026
<b>Min</b>	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.015	0.017
<b>Range</b>	0.016	0.021	0.017	0.019	0.018	0.017	0.019	0.019	0.016	0.019	0.019	0.020	0.021	0.025	0.019	0.019
<b>Std Dev</b>	0.002	0.003	0.002	0.003	0.002	0.003	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003

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Figure 12(c) Location 8: AC and DC Magnetic Field Measurement Results

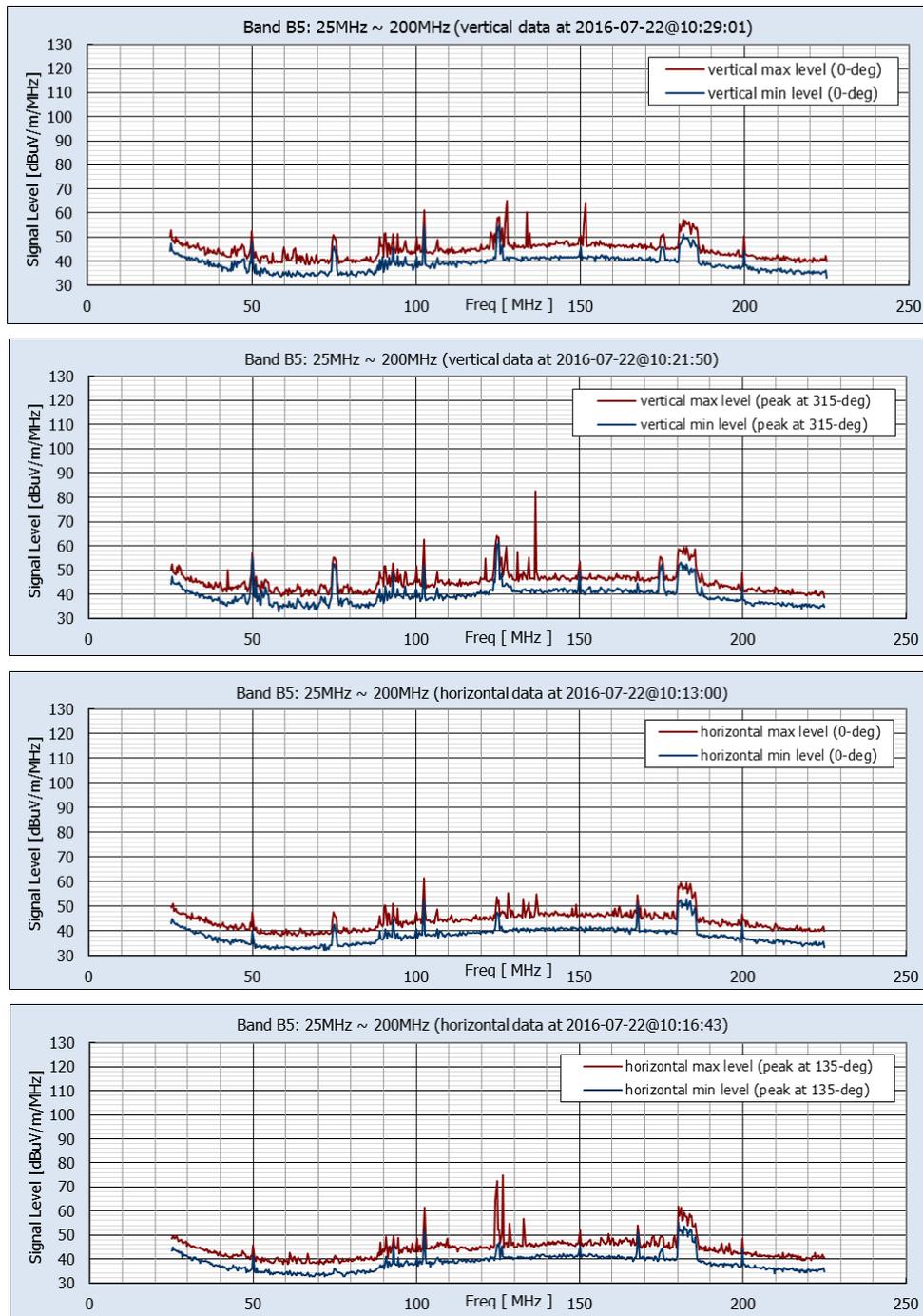


Maximum Levels					
Band number	Freq. Range (MHz)	Pk Min-Hold (dB uV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dB uV/m/MHz)	@ Freq. (MHz)
B0	0.01 ~ 0.05	122.1	0.0248	128.1	0.0249
B1	0.05 ~ 0.55	104.7	0.0536	119.8	0.0564
B2	0.50 ~ 3.00	113.6	1.1182	136.1	1.2909
B3	2.5 ~ 7.5	77.0	2.6364	109.8	2.5818
B4	5 ~ 30	79.8	25.2727	84.9	24.8182

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**Figure 12(d) Location 8: Measured Environmental RF Levels**

Non-Directional Data from Vertically Oriented Monopole Antenna, Bands 0-4

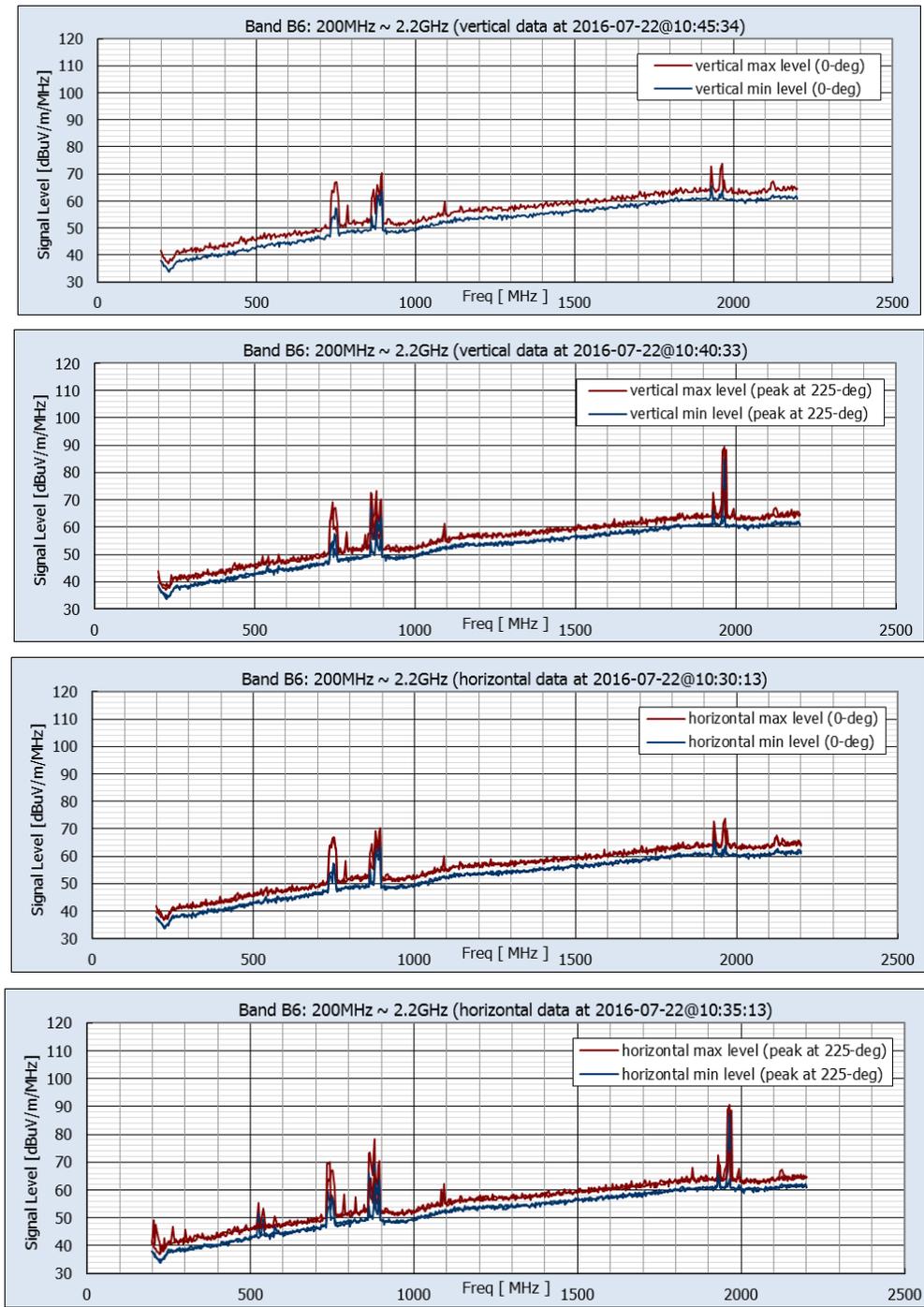


Maximum Levels									
Band number	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B5	25 ~ 200	61.6	125.364	82.7	136.636	55.3	180.273	74.7	126.455

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**Figure 12(e) Location 8: Measured Environmental RF Levels**

Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation

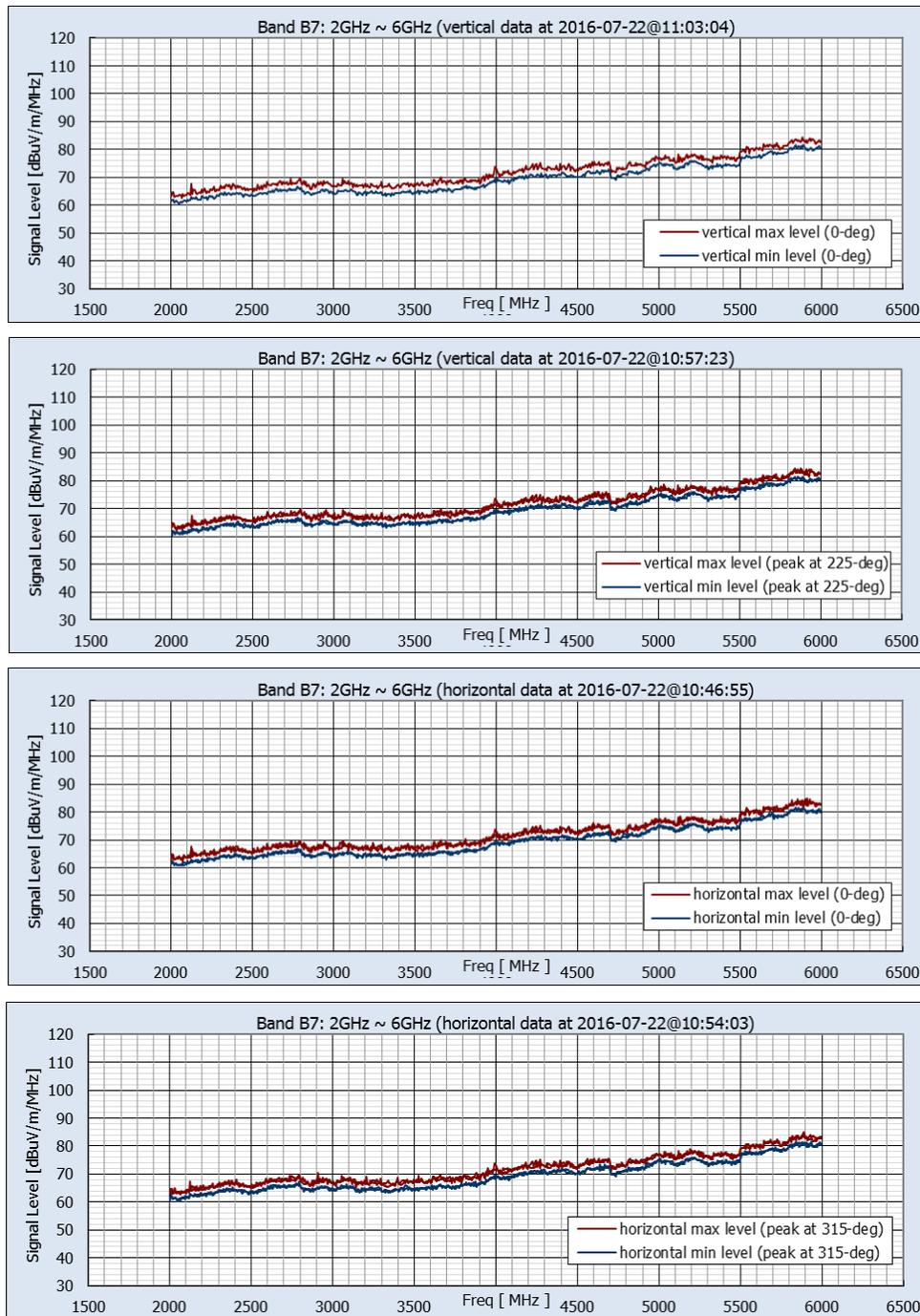


Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B6	200 ~ 2200	84.9	1963.636	89.4	1963.636	87.4	1963.636	90.6	1963.636

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**Figure 12(f) Location 8: Measured Environmental RF Levels**

Band 6 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation

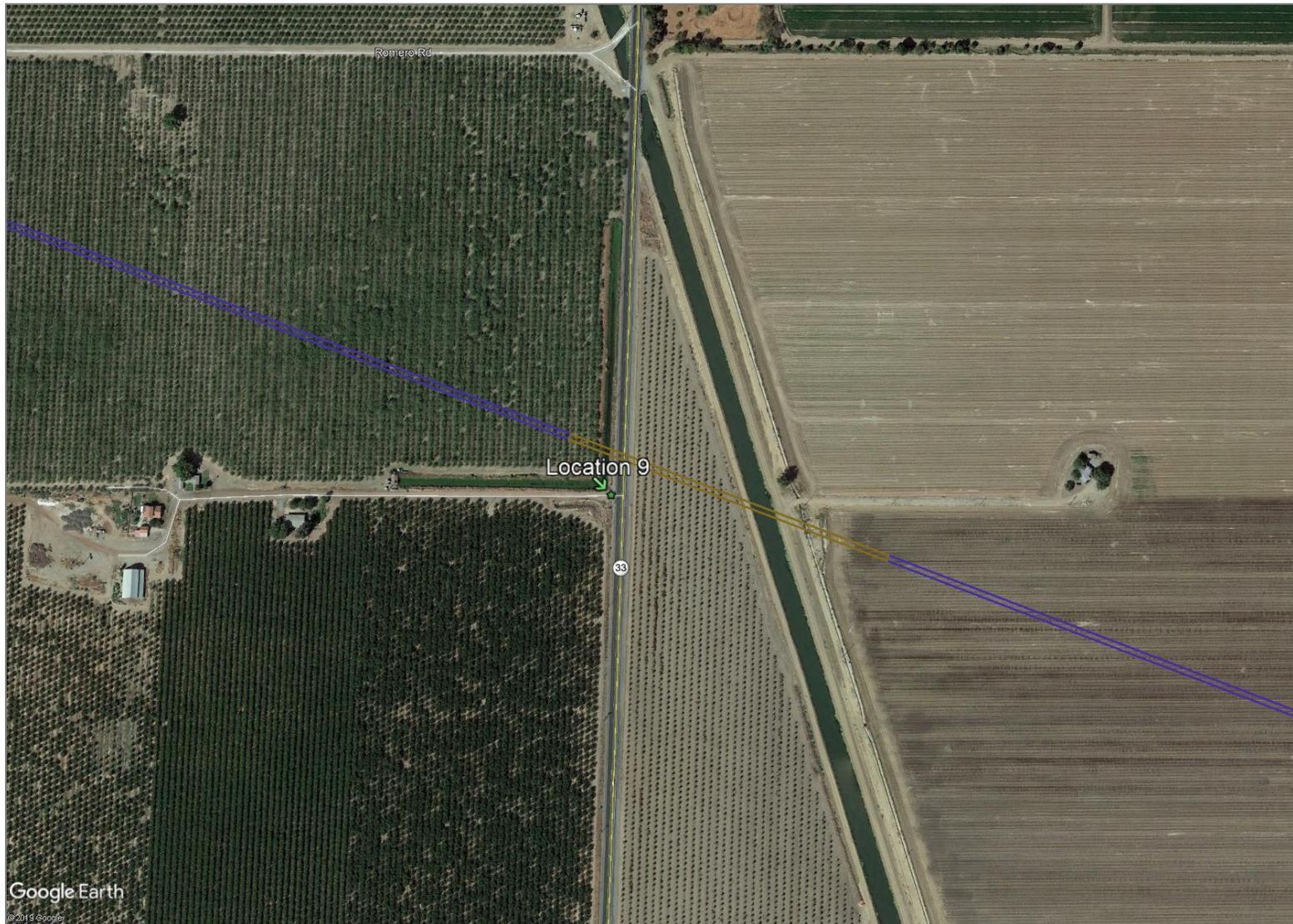


Band	Freq. Range (MHz)	Maximum Levels							
		Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B7	2000-6000	66.2	2654.545	68.8	2669.091	66.2	2720.000	68.9	2705.455

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**Figure 12(h) Location 8: Measured Environmental RF Levels**

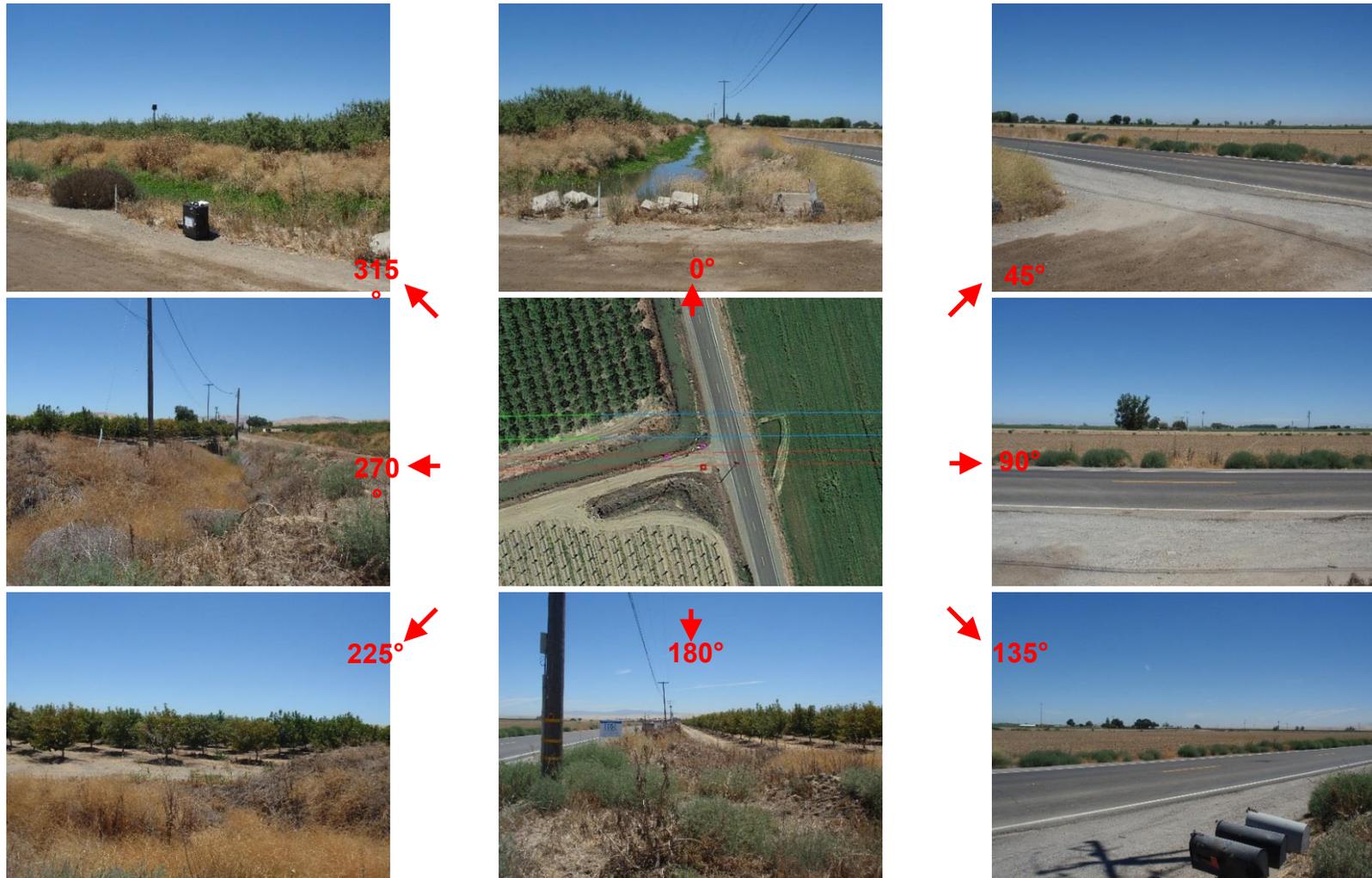
Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation



JANUARY 2020

**Figure 13(a) Location 9: Santa Nella Avenue/Fahey Road, Santa Nella**

Rural setting with no visible RF sources (Lat 37.126085°, Lon -121.015302°)



JANUARY 2019

**Figure 13(b) Location 9: Measurement Location and Site Views**

Photos depicting the site from the perspective of the RF measurement location. In the center is a satellite view, indicating the alignment (green line) and measurement points (red = RF, magenta = magnetometers). The satellite view is rotated so that the image at 0° faces the alignment.

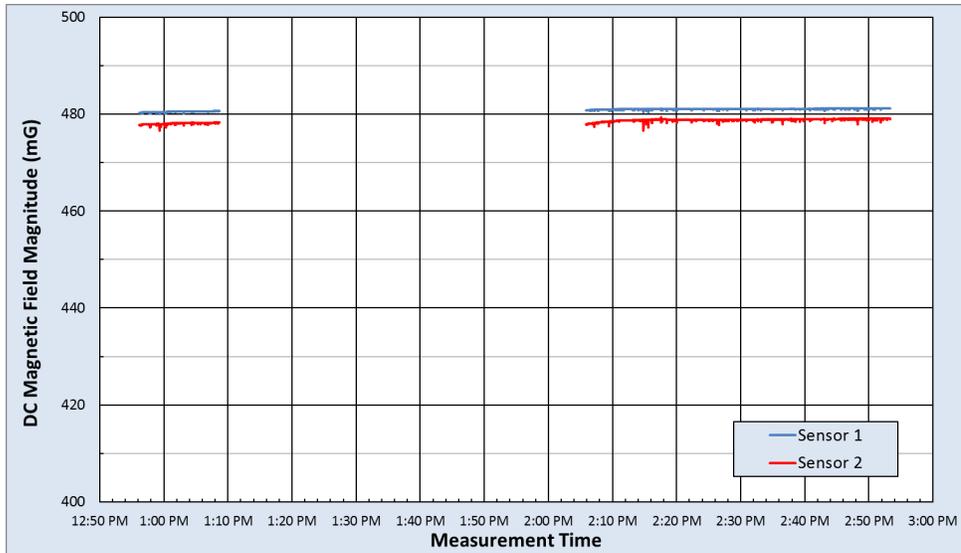


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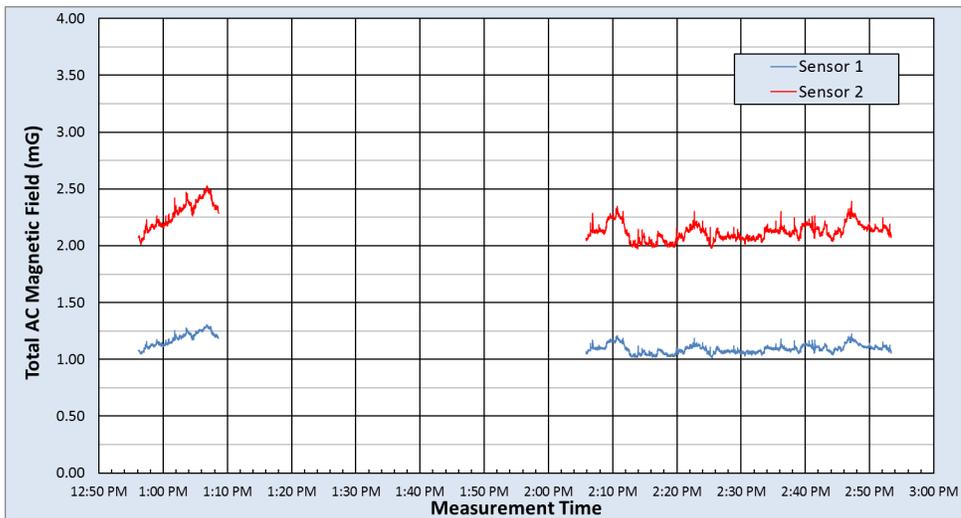
**Figure 13(c) Location 9: Local EMF Sources**

Nearby emitters include distribution lines perpendicular and parallel to the alignment.

Photos depict visible close-proximity emitters. Other emissions sources may exist, but are not visible from the site.



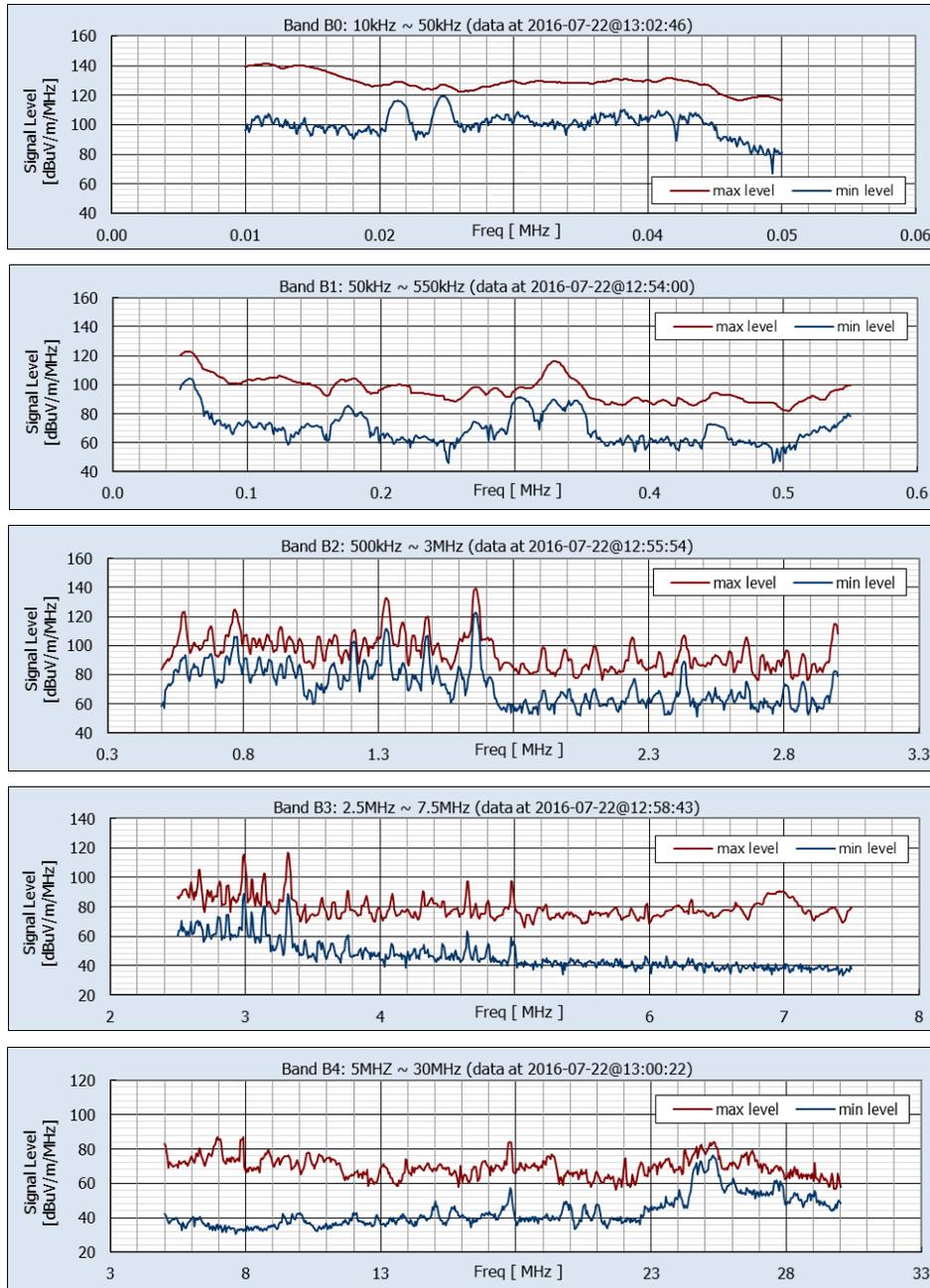
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	237.7	274.5	418.8	394.3	481.2	479.4
<b>Median</b>	237.0	273.0	418.6	393.4	481.0	478.8
<b>Min</b>	235.7	271.5	417.8	391.0	480.0	476.6
<b>Range</b>	2.0	2.9	1.0	3.3	1.2	2.8
<b>Std Dev</b>	0.3	0.3	0.2	0.6	0.2	0.4



rms AC Magnetic Field Measurement Statistics																
	Fund 60Hz (mG)		2nd (mG)		3rd (mG)		4th (mG)		5th (mG)		6th (mG)		7th (mG)		Total AC (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	1.304	2.526	0.052	0.050	0.054	0.061	0.060	0.095	0.135	0.069	0.064	0.108	0.139	1.306	2.529	
<b>Median</b>	1.096	2.127	0.010	0.010	0.018	0.026	0.010	0.010	0.046	0.092	0.011	0.056	0.103	1.098	2.131	
<b>Min</b>	1.012	1.968	0.002	0.002	0.004	0.005	0.002	0.003	0.026	0.054	0.002	0.003	0.072	1.015	1.974	
<b>Range</b>	0.293	0.558	0.050	0.048	0.050	0.056	0.059	0.057	0.069	0.081	0.067	0.061	0.077	0.067	0.291	0.555
<b>Std Dev</b>	0.057	0.108	0.003	0.003	0.005	0.009	0.004	0.004	0.006	0.010	0.004	0.004	0.007	0.010	0.057	0.107

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Figure 13(d) Location 9: AC and DC Magnetic Field Measurement Results

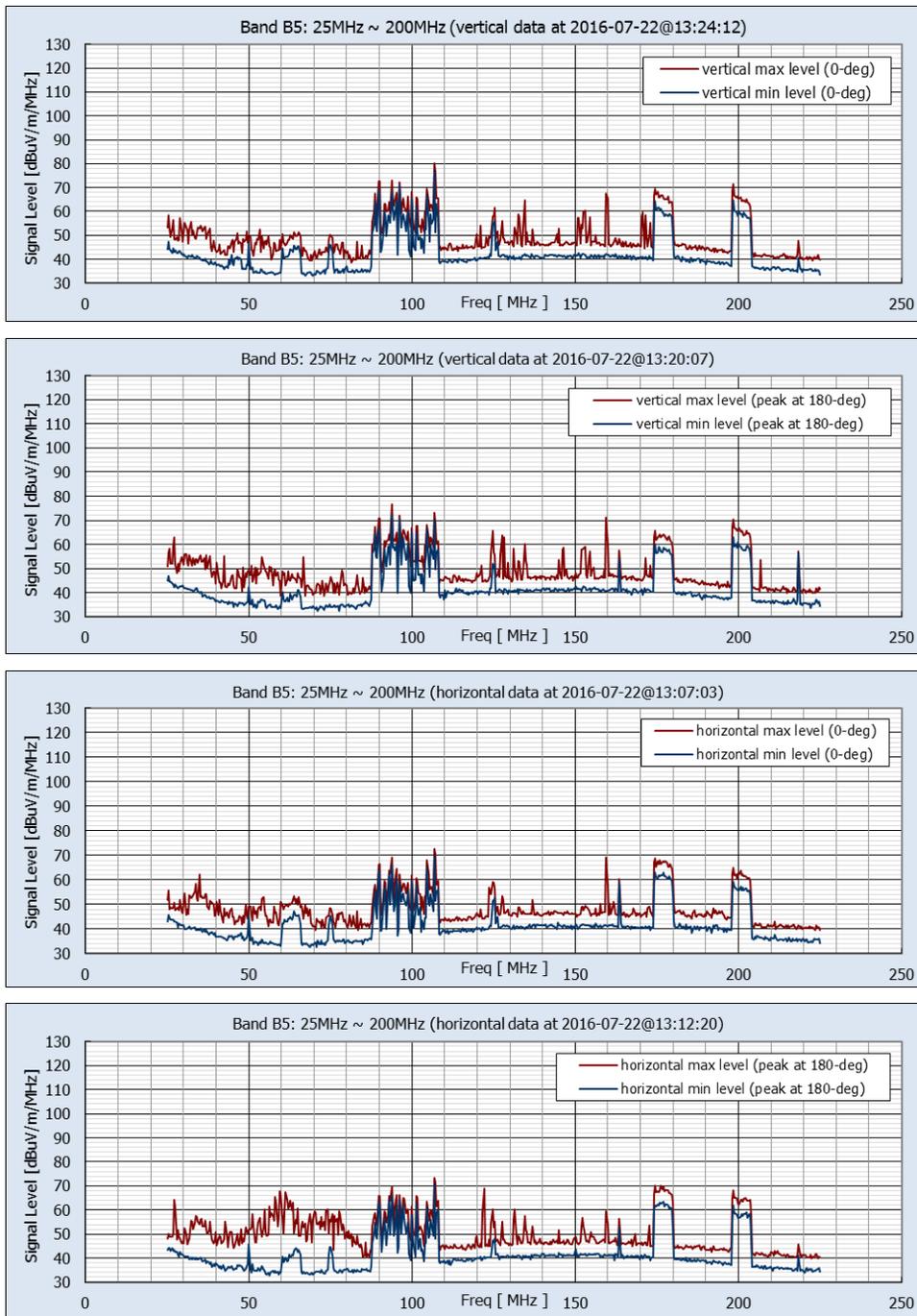


Maximum Levels					
Band number	Freq. Range (MHz)	Pk Min-Hold (dB uV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dB uV/m/MHz)	@ Freq. (MHz)
B0	0.01 ~ 0.05	119.4	0.0248	141.1	0.0115
B1	0.05 ~ 0.55	104.0	0.0573	122.9	0.0564
B2	0.50 ~ 3.00	122.5	1.6591	139.1	1.6591
B3	2.5 ~ 7.5	88.8	3.3182	117.0	3.3182
B4	5 ~ 30	76.1	25.2727	86.9	7.9091

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**Figure 13(e) Location 9: Measured Environmental RF Levels**

Non-Directional Data from Vertically Oriented Monopole Antenna, Bands 0-4

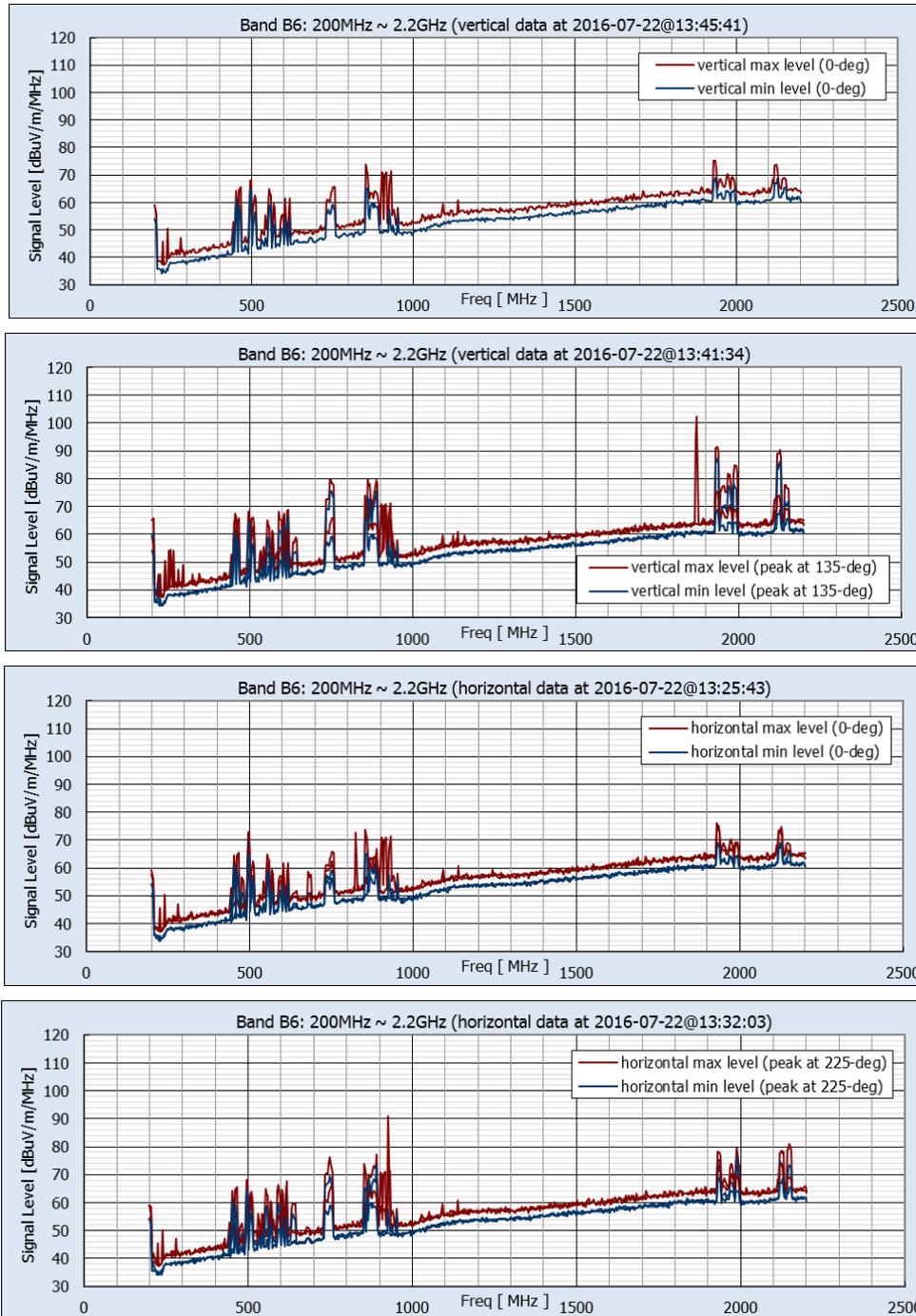


Maximum Levels									
Band number	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B5	25 ~ 200	76.7	106.818	80.0	106.818	70.6	106.818	73.4	106.818

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**Figure 13(f) Location 9: Measured Environmental RF Levels**

Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation

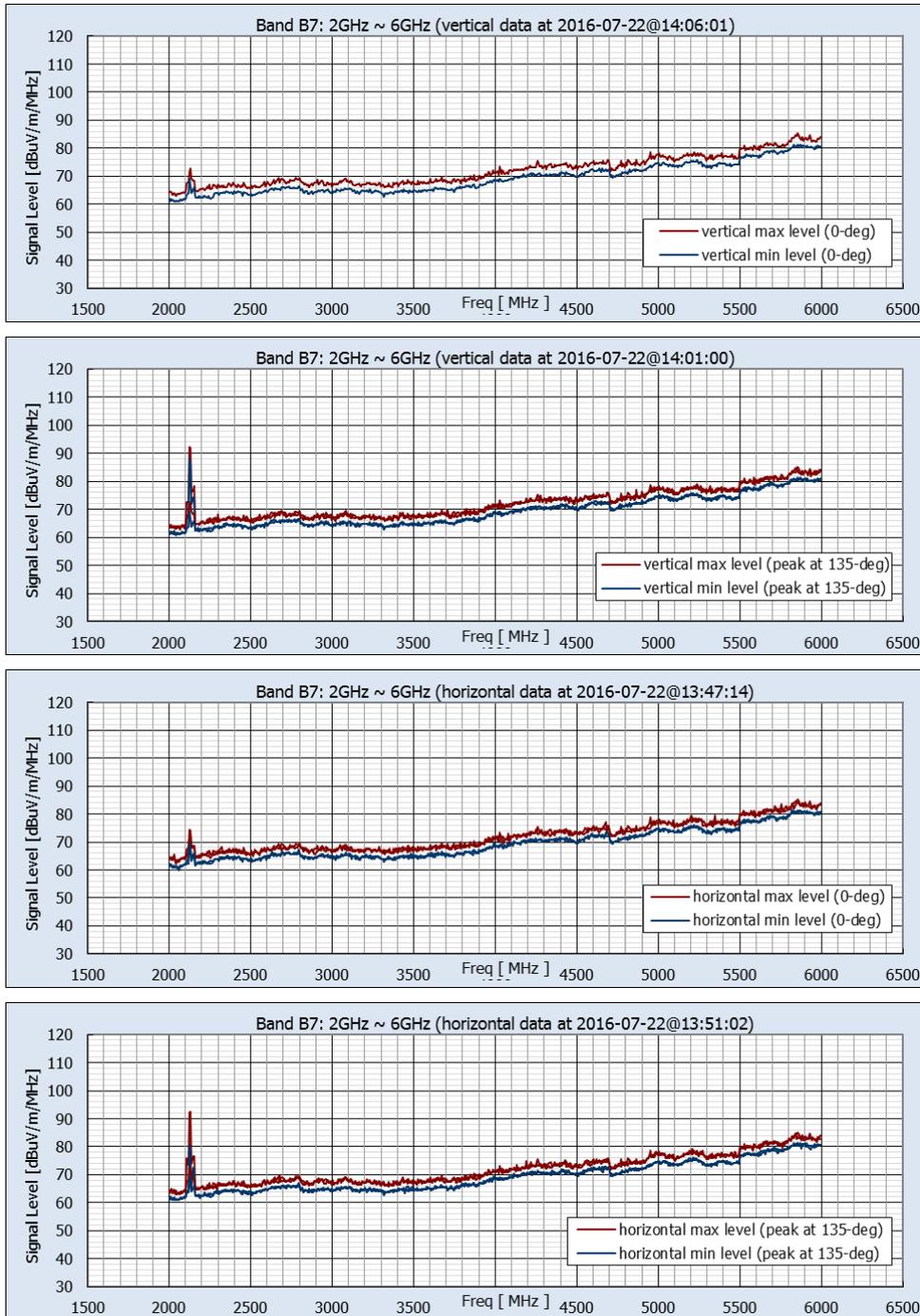


Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B6	200 ~ 2200	87.2	1934.545	102.3	1872.727	76.7	1989.091	91.1	927.273

JANUARY 2019

**Figure 13(g) Location 9: Measured Environmental RF Levels**

Band 6 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation



Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B7	2000-6000	88.2	2123.636	92.3	2123.636	80.6	2123.636	92.5	2130.909

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**Figure 13(h) Location 9: Measured Environmental RF Levels**

Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation



JANUARY 2020

**Figure 14(a) Location 10: Henry Miller Road/Carlucci Road, Dos Palos**

Rural setting, with one cell tower approximately 3.5 miles distant (Lat 37.097787°, Lon -120.680892°)



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**Figure 14(b) Location 10: Measurement Location and Site Views**

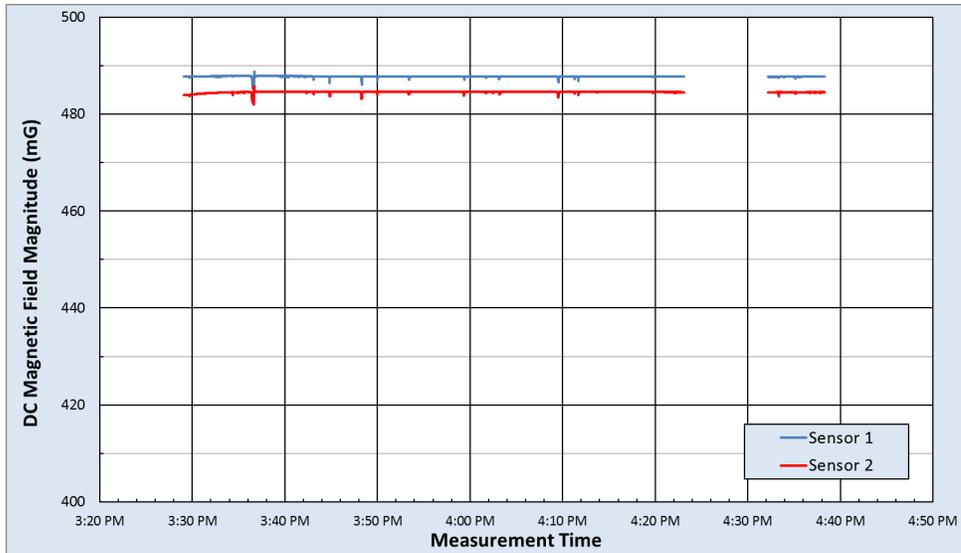
Photos depicting the site from the perspective of the RF measurement location. In the center is a satellite view, indicating the alignment (green line) and measurement points (red = RF, magenta = magnetometers). The satellite view is rotated so that the image at 0° faces the alignment.



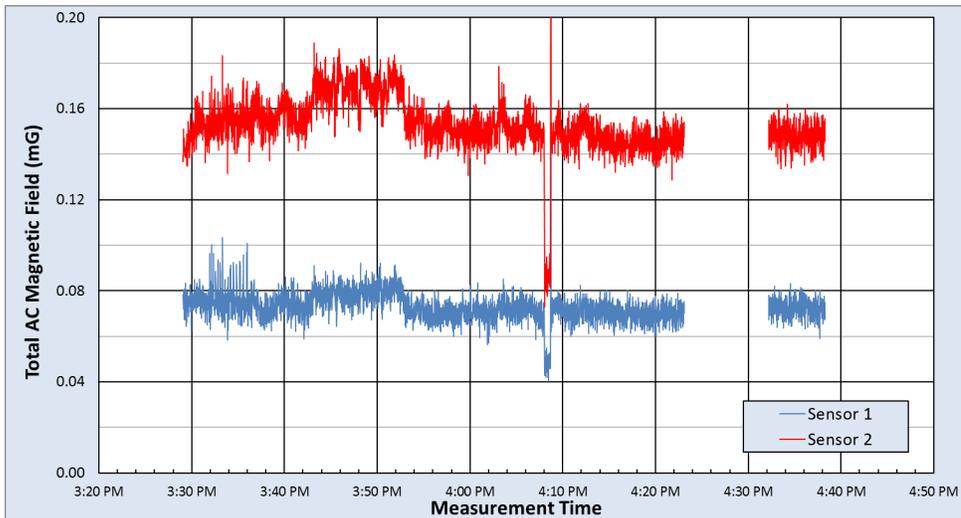
JANUARY 2019

**Figure 14(c) Location 10: Local EMF sources**

Nearby emitters include distribution lines parallel and perpendicular to the alignment and a distant (3.5 mi) cell tower. Photos depict visible close-proximity emitters. Other emissions sources may exist that are not readily visible from the site.



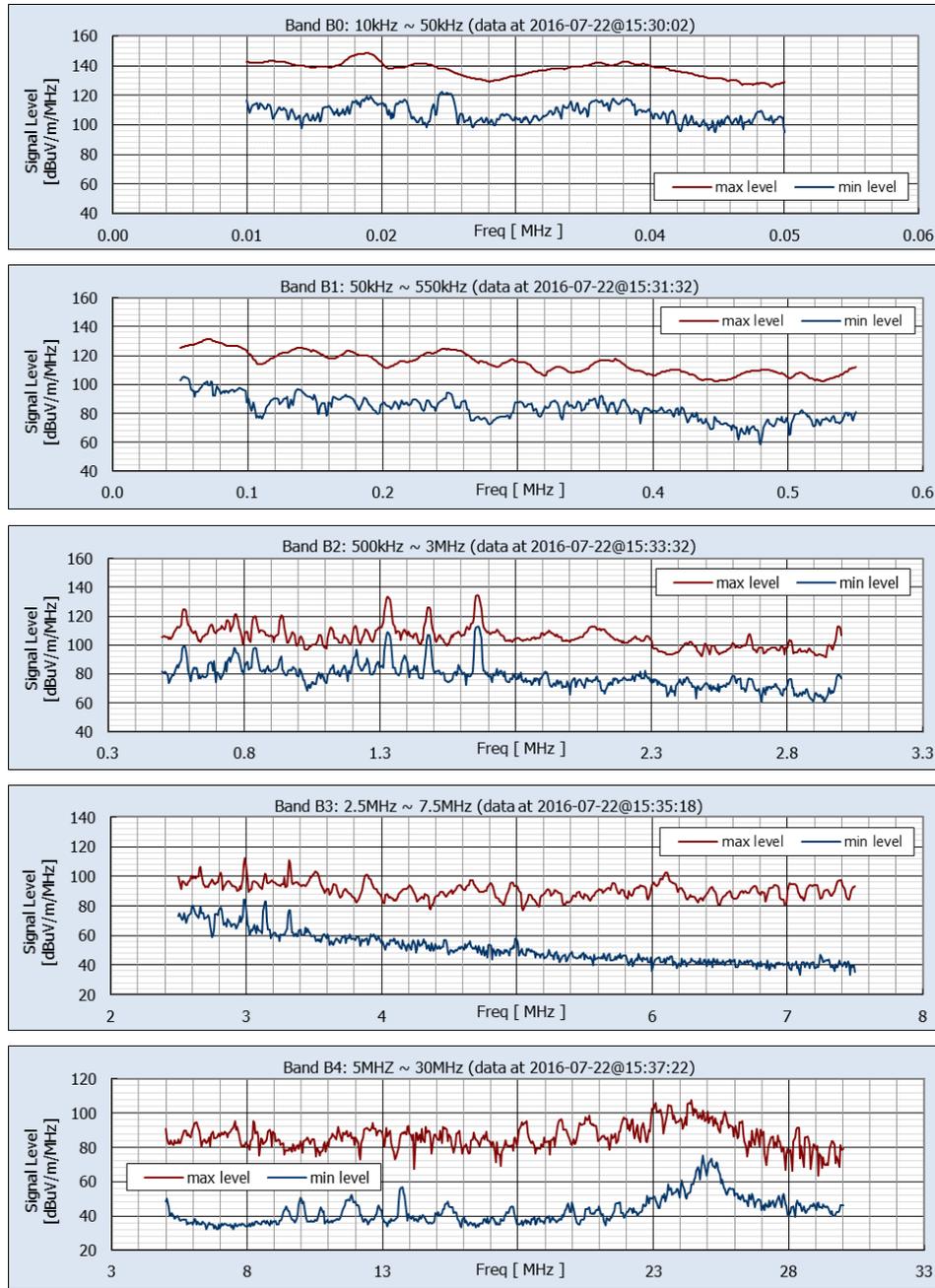
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	238.2	263.4	427.8	409.3	488.8	485.7
<b>Median</b>	234.7	260.0	427.6	408.9	487.8	484.6
<b>Min</b>	229.9	256.1	425.6	406.9	485.2	482.1
<b>Range</b>	8.3	7.4	2.2	2.5	3.6	3.6
<b>Std Dev</b>	0.2	0.3	0.1	0.3	0.1	0.1



rms AC Magnetic Field Measurement Statistics																
	Fund 60Hz (mG)		2nd (mG)		3rd (mG)		4th (mG)		5th (mG)		6th (mG)		7th (mG)		Total AC (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	0.156	0.361	0.058	0.058	0.055	0.059	0.056	0.059	0.065	0.070	0.068	0.068	0.071	0.065	0.158	0.363
<b>Median</b>	0.067	0.148	0.009	0.009	0.010	0.011	0.010	0.010	0.013	0.022	0.010	0.010	0.011	0.014	0.073	0.152
<b>Min</b>	0.032	0.065	0.001	0.002	0.002	0.003	0.002	0.002	0.002	0.009	0.001	0.002	0.002	0.003	0.041	0.073
<b>Range</b>	0.124	0.297	0.057	0.056	0.053	0.056	0.054	0.057	0.063	0.061	0.067	0.066	0.070	0.062	0.117	0.290
<b>Std Dev</b>	0.006	0.013	0.003	0.003	0.003	0.004	0.003	0.003	0.004	0.005	0.004	0.004	0.004	0.004	0.006	0.013

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Figure 14(d) Location 10: AC and DC Magnetic Field Measurement Results

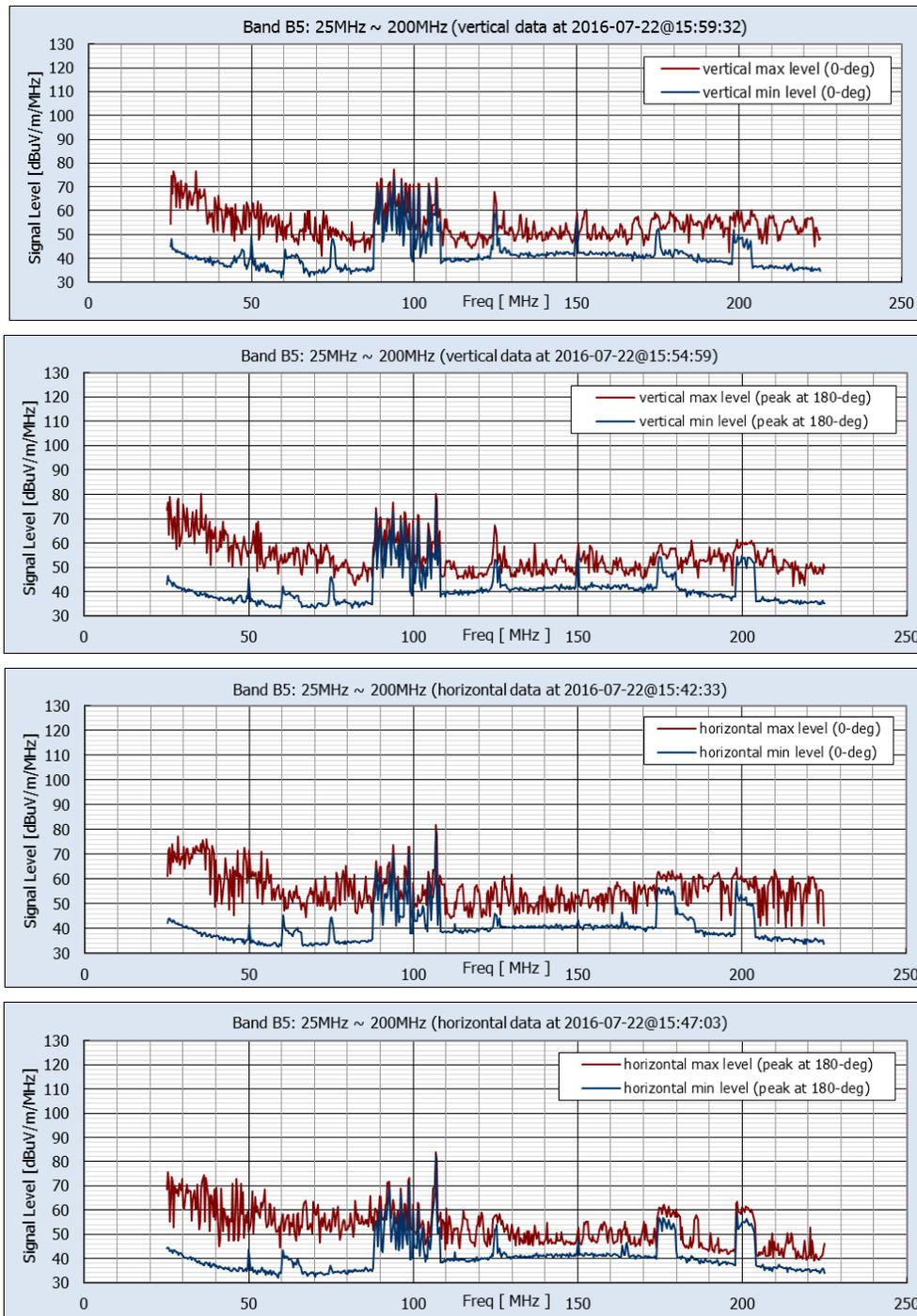


Maximum Levels					
Band number	Freq. Range (MHz)	Pk Min-Hold (dB uV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dB uV/m/MHz)	@ Freq. (MHz)
B0	0.01 ~ 0.05	122.3	0.0245	148.4	0.0189
B1	0.05 ~ 0.55	105.2	0.0527	131.3	0.0718
B2	0.50 ~ 3.00	112.8	1.6591	134.7	1.6591
B3	2.5 ~ 7.5	84.4	2.9909	112.3	2.9909
B4	5 ~ 30	75.1	24.8182	107.4	24.4091

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**Figure 14(e) Location 10: Measured Environmental RF Levels**

Non-Directional Data from Vertically Oriented Monopole Antenna, Bands 0-4

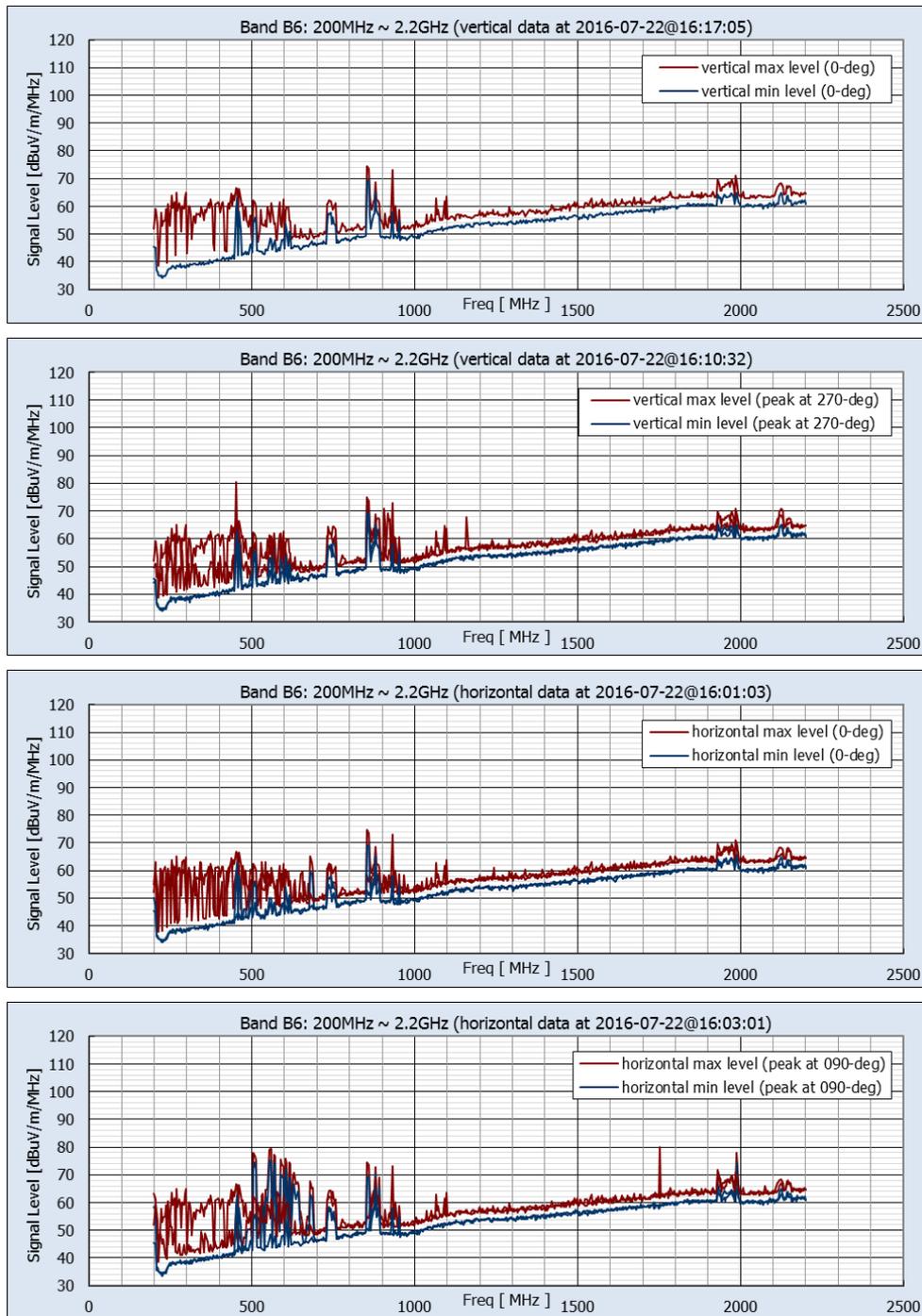


Maximum Levels									
Band number	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B5	25 ~ 200	77.3	106.818	80.1	106.818	82.4	106.818	83.9	106.818

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**Figure 14(f) Location 10: Measured Environmental RF Levels**

Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation

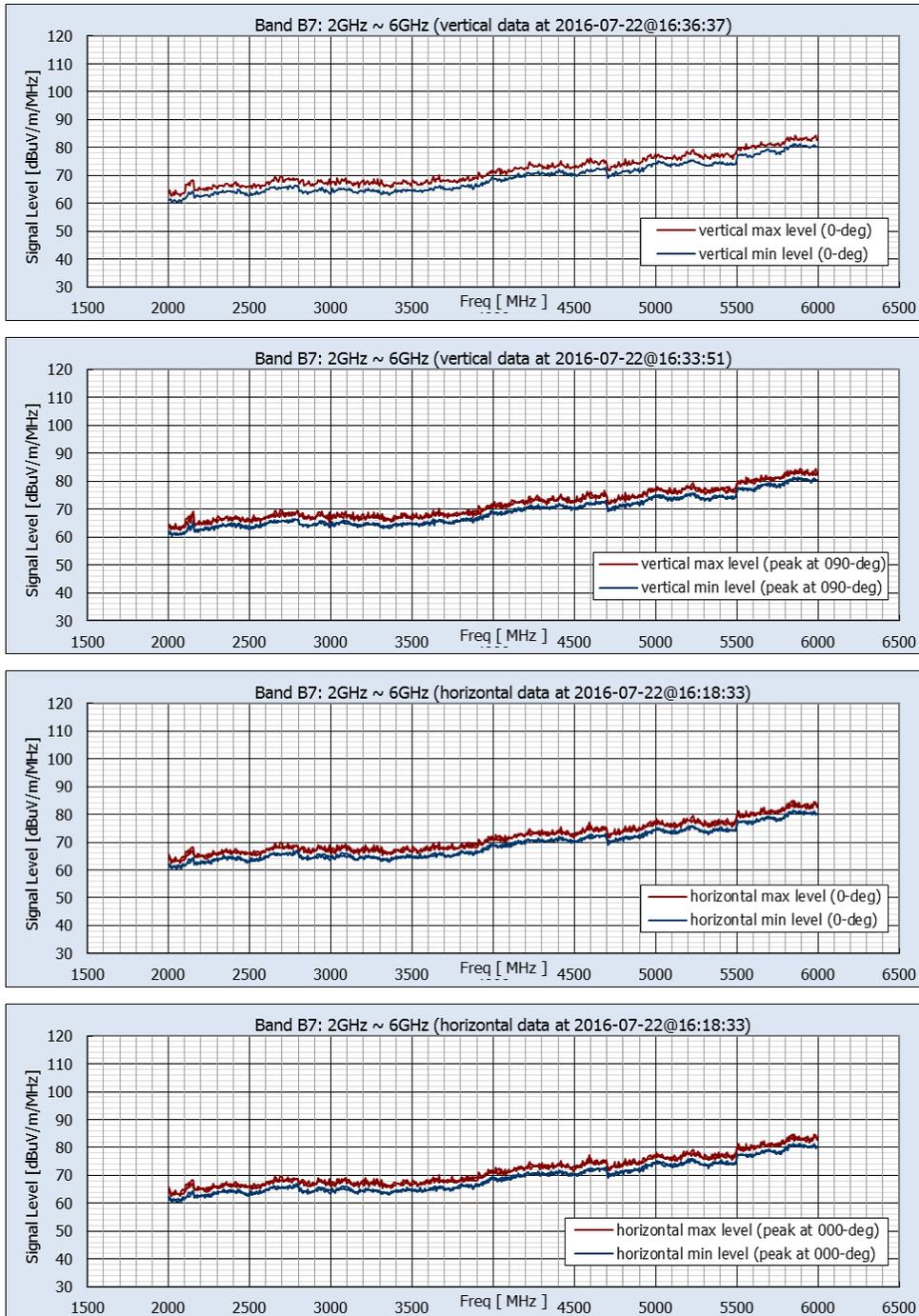


Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B6	200 ~ 2200	73.6	854.545	80.4	450.909	75.4	556.364	80.2	1752.727

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**Figure 14(g) Location 10: Measured Environmental RF Levels**

Band 6 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation



Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B7	2000-6000	66.1	2727.273	69.8	2690.909	66.3	2647.273	68.5	2698.182

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**Figure 14(h) Location 10: Measured Environmental RF Levels**

Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation