

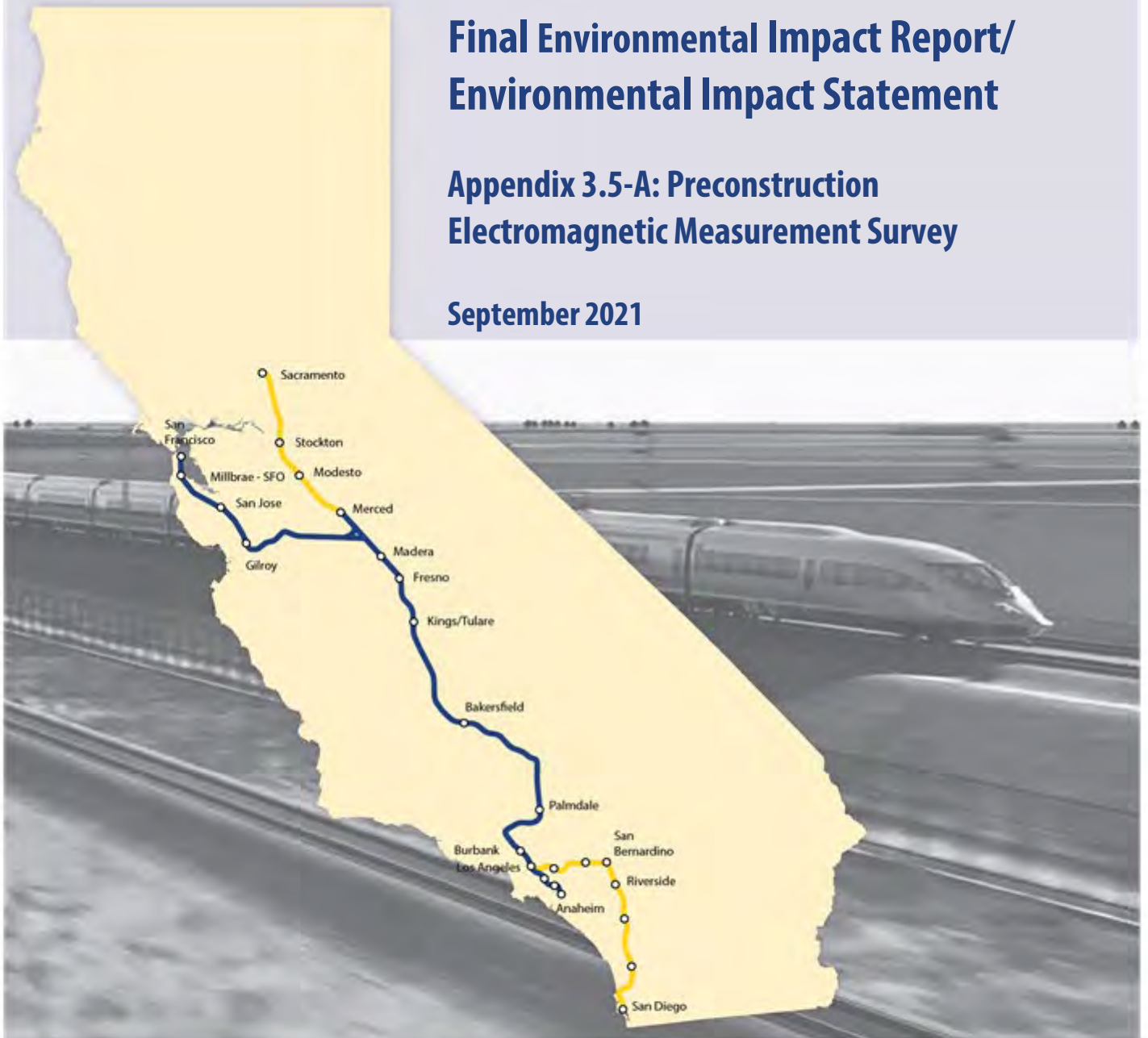
California High-Speed Rail Authority

# *Burbank to Los Angeles* *Project Section*

**Final Environmental Impact Report/  
Environmental Impact Statement**

**Appendix 3.5-A: Preconstruction  
Electromagnetic Measurement Survey**

**September 2021**



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## APPENDIX 3.5-A PRE-CONSTRUCTION ELECTROMAGNETIC MEASUREMENT SURVEY

### INTRODUCTION

This Appendix documents measurement results from a preconstruction electromagnetic survey of locations along the HSR Build Alternative between Burbank and Los Angeles. The purpose of the survey was to: (1) provide a baseline characterization of the existing electromagnetic environment, (2) permit comparisons with the expected electromagnetic footprint from the planned HSR Build Alternative, and (3) provide guidance for electromagnetic compatibility (EMC) requirements by defining the typical electromagnetic environment that the HSR Build Alternative must operate in without interference.

Land uses, existing facilities, and infrastructure for the HSR Build Alternative were reviewed, with a list of approximately 20 candidate sites evaluated. This review concentrated on identifying potentially EMI-sensitive facilities as well as existing EMF sources such as power generation, power distribution, and communications facilities. The selection criteria, taken from TM 3.4.11, 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 six 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 include:

- Cell towers (cellular telephone)
- Broadcast towers (radio and television broadcasts)
- Airport radars and aircraft communications equipment
- General high-frequency (HF) and very-high-frequency (VHF) fixed and mobile communications systems (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 include:

- The geomagnetic field
- High-voltage transmission lines
- Electric distribution lines
- Substations/generation facilities
- Geomagnetic perturbations due to passing vehicles and trains

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

- High-tech semiconductor (e.g., electron microscopes [transmission electron microscopes/scanning electron microscopes], electron-beam lithography, ion-writing systems, focused ion-beam systems)

- High-tech 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-tech and medical facilities).

## TEST PROCEDURES AND EQUIPMENT

Characterization of the radio-frequency (RF) environment for the HSR Build Alternative will be done by measuring the prevailing electric field strength at each of 6 test sites, over the frequency range from 10 kHz to 6 GHz.

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. Data were transferred to a laptop computer and backed up on USB flash drives for archiving and post-survey analysis. Where practical, the RF antennas were located approximately 50 feet from the proposed alignment.

Electric field measurement files from the spectrum analyzer included both min-hold and max-hold levels as a function of frequency across each of the measurement bands. 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. Measurement data were downloaded to a laptop computer in the field, and backed up on USB flash drives.

The RF and magnetic field measurements for the HSR Build Alternative were performed between 22 and 26 August, 2016 (Measurement sites 1 and 2) and between 12 and 16 September, 2016 (Measurement sites 3-6).

## OVERVIEW OF THE MEASUREMENT RESULTS

### Magnetic Fields

Figure A3.5-1 shows the measured AC magnetic field strengths at three measurement sites: an industrial location (Glendale, Site 4), a suburban setting (Burbank, Site 1), and a commercial area (Glendale, Site 5). These sites encompass the full range of observed 60 Hz magnetic field levels, with Site 5 the lowest, Site 4 the highest, and Site 1 representing the median level. Plotted are levels for the 60 Hz fundamental and the next 6 harmonics. The AC magnetic field strengths at the six sites varied by a factor of about twenty, from 0.06 mG to 1.11 mG. This is a typical range for heterogeneous, highly-developed settings such as the one found along the Burbank to Los Angeles project alignment. The AC ambient field is determined almost solely by the site's proximity to power (MV distribution and HV transmission) lines and other electrical system infrastructure.

The DC magnetic fields also varied, but by much smaller amounts, and were comparable to the expected ambient geomagnetic field strength. The measured values, across the six

measurement sites ranged from a low of 362 mG to a high of 510 mG. At individual sites, the difference in DC field strength between the two sensors ranged from 3 to 66 mG. These differentials are typically the result of the differing influence from passing vehicles, or from the influence of nearby steel objects.

Measured transient shifts in the DC magnetic field were generally very small and attributable to nearby vehicular traffic, with some exceptions noted at sites 2, 3 and 4. Site 2 (Burbank Metro Station) showed variations of approximately 10 mG due to arriving and departing trains. Sites 3 and 4 also showed shifts of about 10 mG resulting from Metrolink and Amtrak train passbys.

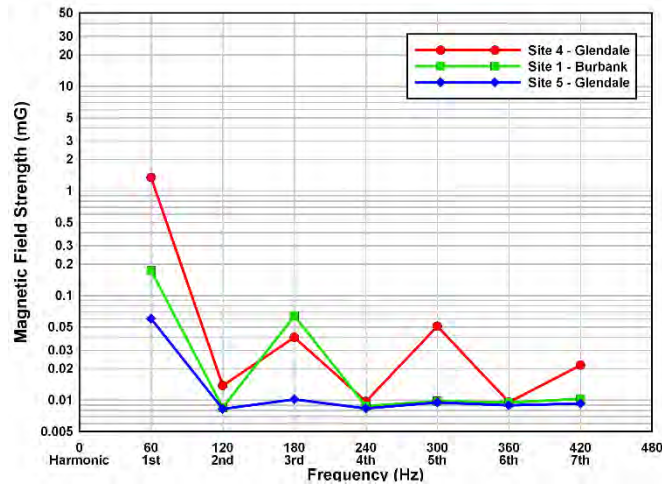


Figure A3.5-1 - Average Measured AC Magnetic Field Strengths

### Electric Fields

Because of the broad range of frequencies of interest, the electric field measurements were divided into eight overlapping frequency bands, in order to provide the desired frequency resolution in each band (Authority 2010a). Table A3.5-1 summarizes the magnitude of the maximum measured electric field by frequency band, at each site. The maximum electric field strengths in bands B1 through B4 were broadly consistent across the measurement sites, with standard deviations of just 2-4 dB in these bands. Somewhat greater variation was seen at higher frequencies (bands B5 – B7), reflecting stronger differences in spectrum usage along the project alignment with standard deviations of typically 6 dB. Such uniformity in levels is commonly encountered in highly-developed sections such as this one.

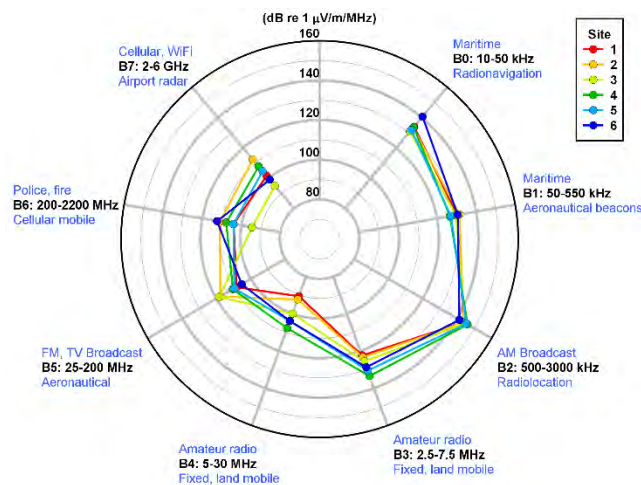
The Resource Study Area (RSA) is highly developed and includes a large number of RF sources. Approximately 100 television and radio (AM and FM broadcast) transmitters operate within the region. In addition, there are dozens of cellular communications towers and point-to-point microwave links operating in the region, as well as a significant number of intermittent fixed- and mobile RF sources. This activity results in uniform - and relatively high - background levels within RSA over much of the RF spectrum.

**Table A3.5-1 - Maximum Measured Electric Field Strengths by 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 0.2 2.2 GHz	B7 2.0 6.0 GHz
1 – Burbank (Empire / Catalina)	134.0	130.2	143.7	122.4	90.6	108.4	104.1	101.8
2 – Burbank (Olive / Flower)	133.2	131.5	143.8	123.5	92.4	117.8	111.1	112.5
3 – Glendale (San Fernando / Sonora)	130.9	129.8	144.6	125.8	99.9	118.4	94.7	95.2
4 – Glendale (San Fernando / Colorado)	133.7	126.6	146.1	133.5	107.8	110.5	107.8	107.9
5 – Glendale (Cerritos / Gardena)	131.9	127.1	145.3	130.6	103.9	109.7	104.2	104.8
6 – Cypress Park (San Fernando / Macon)	140.6	130.7	141.3	128.8	104.0	105.4	112.5	99.3

Source: Authority 2017  
 kHz = kilohertz  
 MHz = Megahertz

Figure A3.5 2 graphically shows the maximum measured electric field strengths by frequency band for the six measurement sites. Typical spectrum uses in each frequency band are also indicated. Increasing distance from the plot center indicates higher field strength. Because of the well-developed nature of the region, the band-by-band measured field strengths were notably consistent, with only one site falling more than 10 dB from the mean in any of the frequency bands. Figure A3.5-3 illustrates the variance in RF field strengths across the six sites, by frequency band.



**Figure A3.5-2 - Maximum Electric Field Strengths by Spectral Band**



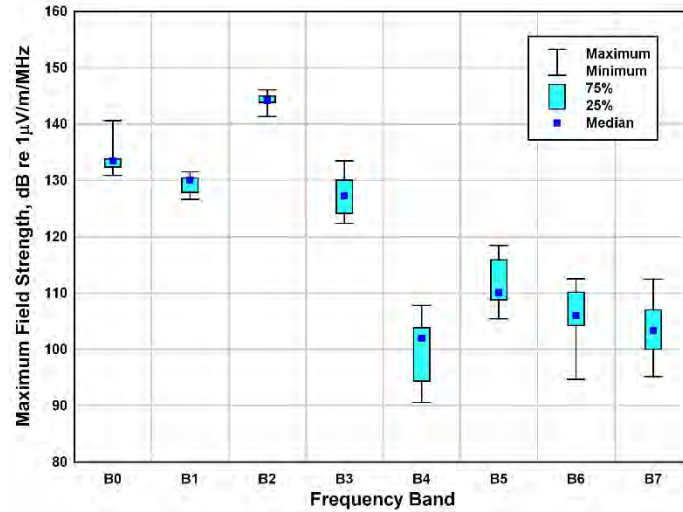


Figure A3.5-3 - Range of Electric Field Strengths Across All Sites

The six panels in Figure A3.5-4 separately illustrate the tabulated Electric field strength values in Table A3.5-1. (Field strength values are in dB re 1 μV/m/MHz).

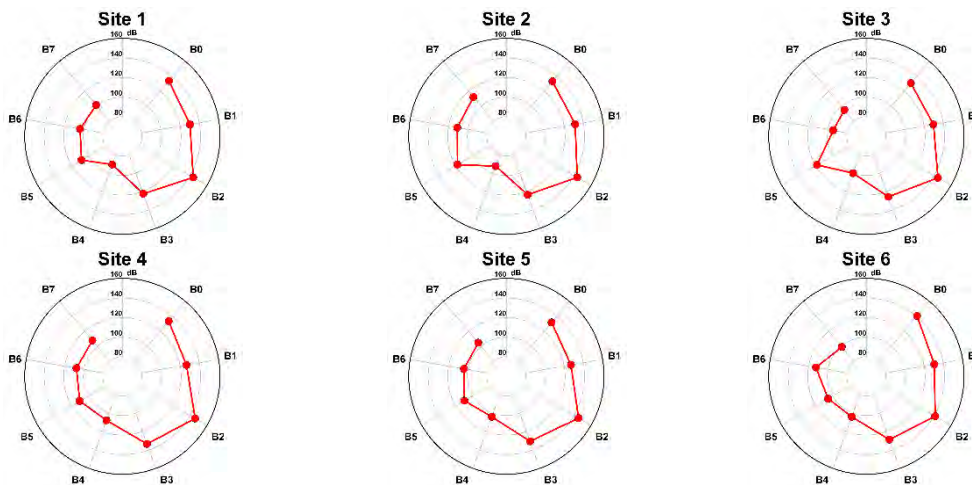


Figure A3.5-4 - Polar plots for BUR-LA Section

**INDIVIDUAL SITE OBSERVATIONS**

**Site 1 (Empire Ave / Catalina St)**

Located in Gross Park, along a walking path beside the fields; north side of tracks. DC magnetic fields at both positions are relatively quiet and comparable to the expected geomagnetic field magnitude. Being in the park, there are no nearby AC magnetic field sources. AC magnetic

fields are from overhead distribution lines on the south side of the tracks, but sufficiently distant that AC magnetic fields are quite low, near 0.2mG with small variations.

#### **Site 2 (Olive Ave / Flower St)**

Burbank Metrolink Station, adjacent to south platform. The first sensor position is strongly affected by nearby steel as evidenced by the lower magnitude. Both sensors record strong DC magnetic field variations from arriving and departing trains. The step changes occur when a train stops at the station, while spikes occur with passing trains. AC magnetic fields are relatively low, less than 0.2mG, with no nearby sources.

#### **Site 3 (San Fernando Road/ Sonora Ave)**

Located in Glendale, near Air Way and Sonora Avenue (sensors on north side of tracks along alley). DC magnetic field spikes are due to passing Metrolink trains in both directions and some vehicle traffic in the alley. AC magnetic fields of approximately 1mG are produced by large sets of overhead distribution lines along Sonora Avenue.

#### **Site 4 (San Fernando Road/ Colorado St)**

Located in Glendale, at Colorado Blvd and San Fernando Way, south side of tracks. Two large DC magnetic field spikes were recorded, the first due to a large truck on San Fernando Way, and the second due to an Amtrak train. In both cases, the transients created a 60Hz component that can be seen in the AC magnetic fields. AC magnetic fields are from overhead distribution lines on both sides of San Fernando Way. AC magnetic fields started at 1.4mG and a step decrease occurred before 11am, with fields ending near 1mG.

#### **Site 5 (Cerritos Ave / Gardena Ave)**

Measurements were made in the Glendale Metrolink/Amtrak Station parking lot. DC magnetic fields are quiet except for a period of variation near the end due to vehicle movements in the parking lot. AC magnetic fields are extremely low as there are no nearby sources of AC magnetic fields, only light poles in the parking lot.

#### **Site 6 (San Fernando Road/Macon Street)**

Cypress Park, in the Rio de Los Angeles State Park on the east side of the tracks. DC magnetic fields show small spikes due to passing trains (several Metrolink and a single Amtrak). AC magnetic fields of less than 0.2mG are due to distribution lines and transmission lines on the west side of the tracks.



### SITE PHOTOGRAPHS AND MEASUREMENT DATA



**Figure A3.5-1(a)**

**Location 1: Empire Avenue / Catalina Street, Burbank**

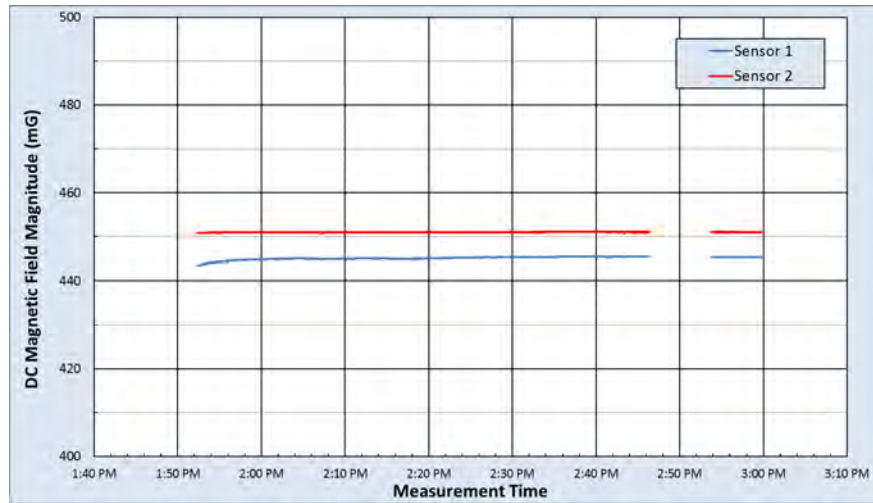
*Suburban setting near an existing rail alignment, with no visible RF emitters (Lat 34.190964°, Lon -118.341669°)*



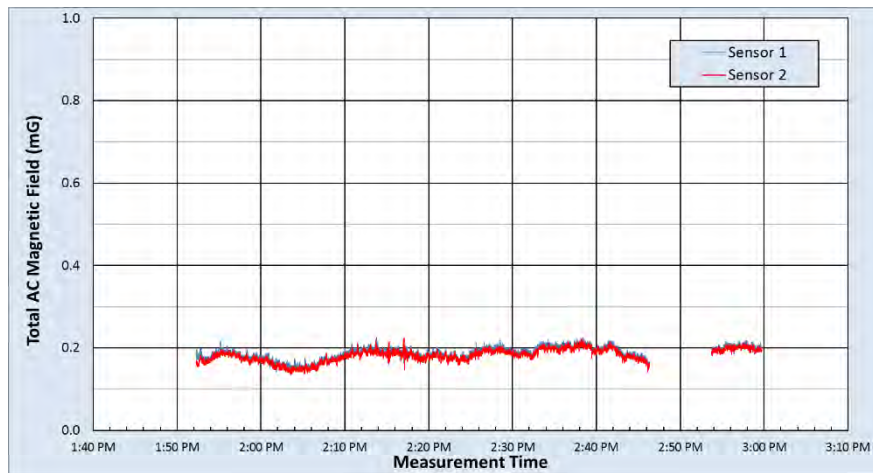


**Figure A3.5-1(b)**  
**Location 1: Measurement Location and Site Views**

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



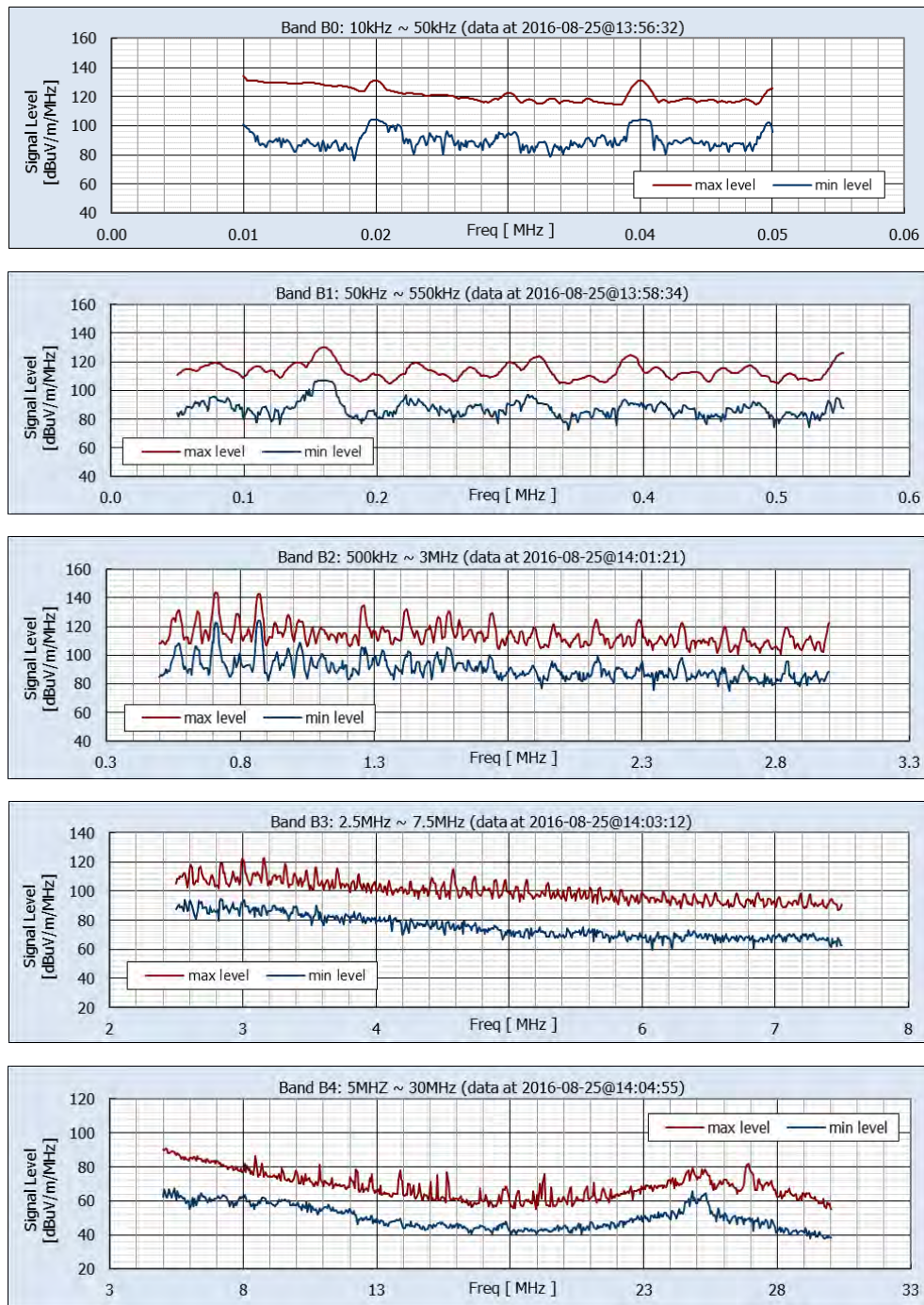
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
Max	217.8	240.7	390.0	381.7	445.5	451.1
Median	216.7	240.4	388.8	381.6	445.1	451.0
Min	214.3	240.3	387.6	380.9	443.4	450.6
Range	3.6	0.5	2.4	0.8	2.1	0.5
Std Dev	0.9	0.1	0.4	0.1	0.4	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
Max	0.212	0.210	0.060	0.055	0.116	0.110	0.081	0.061	0.065	0.064	0.065	0.062	0.067	0.060	0.225	0.223
Median	0.176	0.171	0.009	0.008	0.065	0.063	0.009	0.009	0.010	0.010	0.010	0.009	0.011	0.010	0.189	0.184
Min	0.115	0.121	0.002	0.002	0.034	0.038	0.002	0.002	0.002	0.002	0.001	0.001	0.002	0.002	0.136	0.137
Range	0.097	0.089	0.058	0.054	0.082	0.071	0.079	0.059	0.064	0.062	0.064	0.061	0.065	0.058	0.089	0.086
Std Dev	0.017	0.017	0.004	0.004	0.004	0.004	0.007	0.004	0.004	0.004	0.005	0.004	0.005	0.005	0.016	0.016

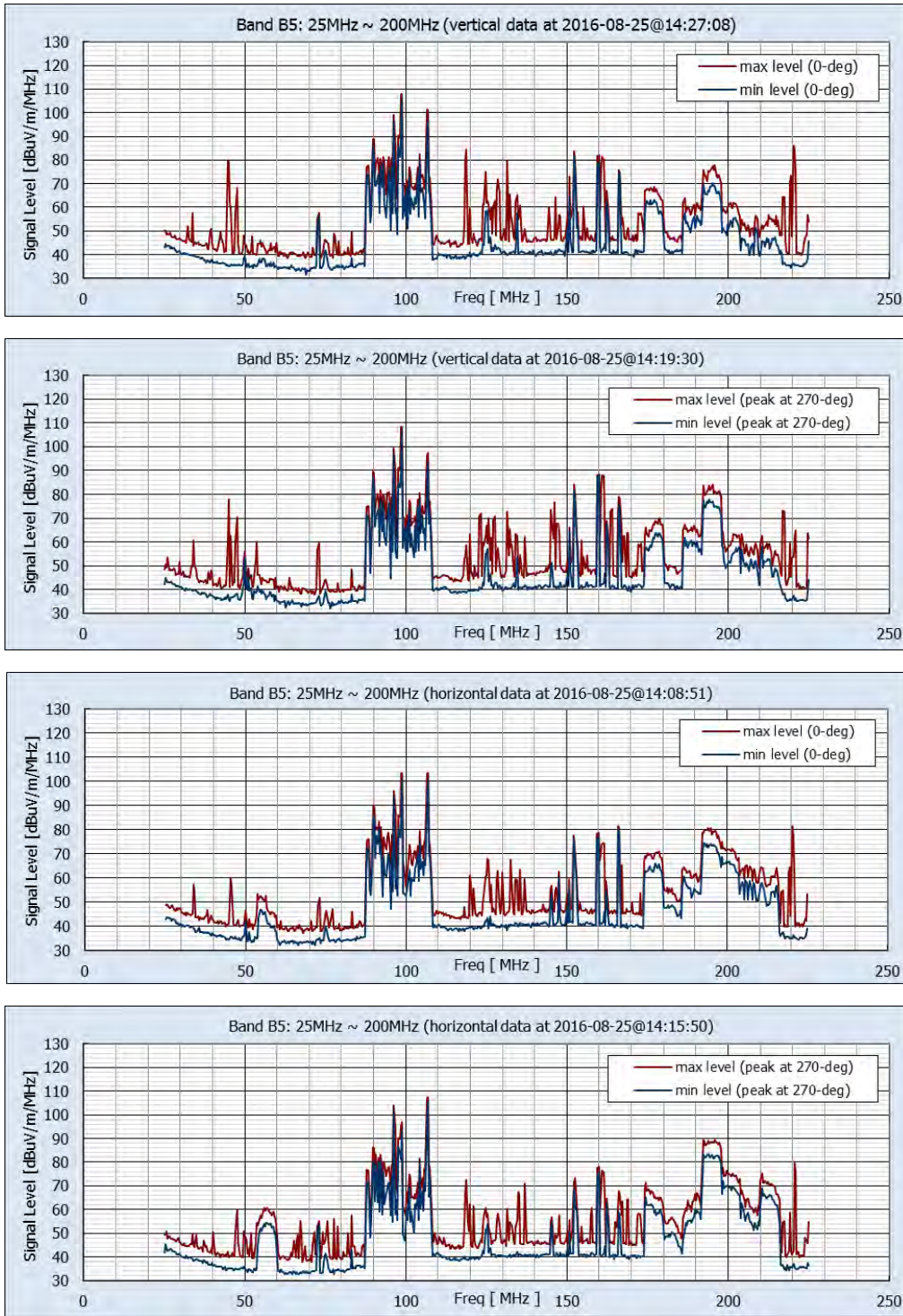
Figure A3.5-1(c)  
Location 1 (Burbank, CA): Measured DC and AC Magnetic Field Strengths





Maximum Levels					
Band number	Freq. Range	Pk Min-Hold	@ Freq.	Pk Max-Hold	@ Freq.
	(MHz)	dB uV/m/MHz	(MHz)	dB uV/m/MHz	(MHz)
B0	0.01 ~ 0.05	104.5	0.0199	134.0	0.0100
B1	0.05 ~ 0.55	107.1	0.1600	130.2	0.1600
B2	0.50 ~ 3.00	124.2	0.8682	143.7	0.7091
B3	2.5 ~ 7.5	94.9	2.8364	122.4	3.1636
B4	5 ~ 30	67.1	5.4091	90.6	5.0909

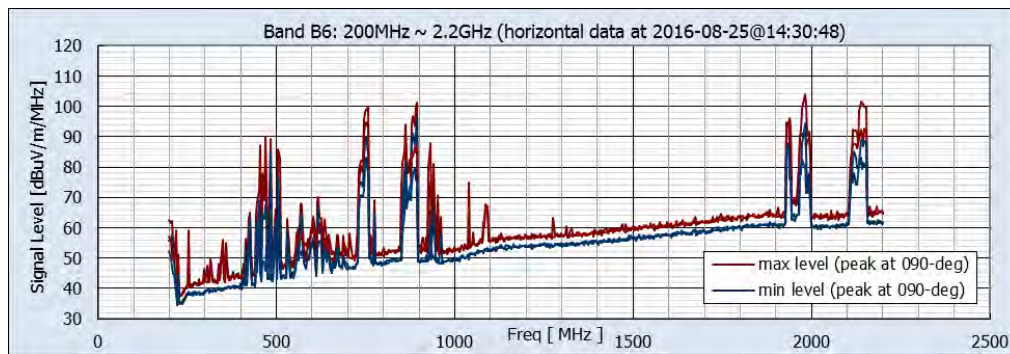
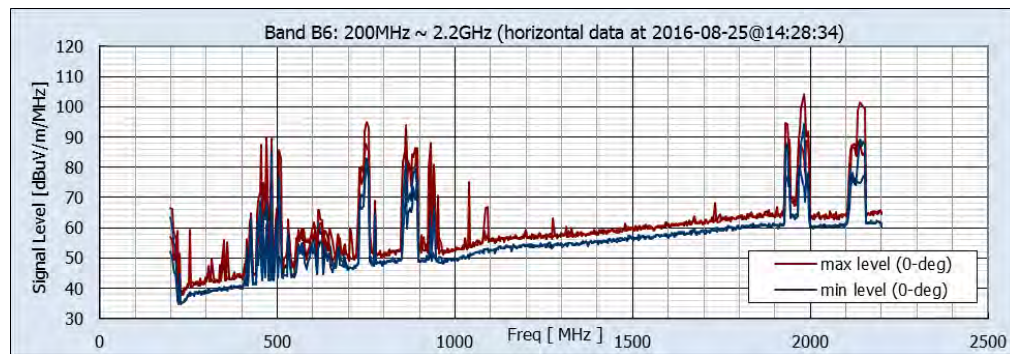
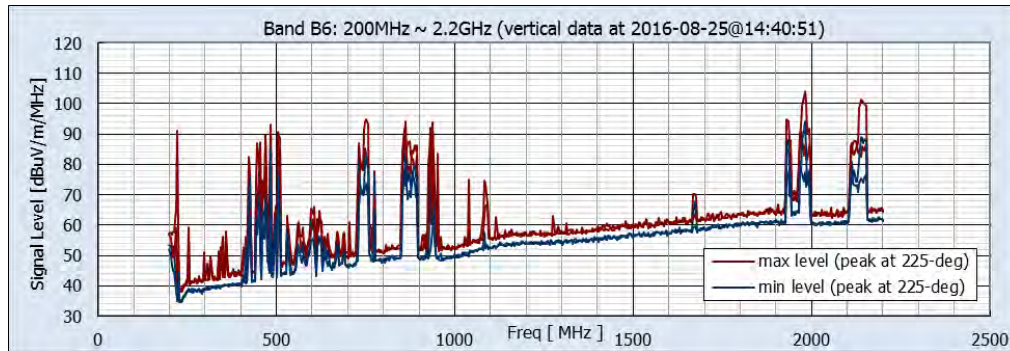
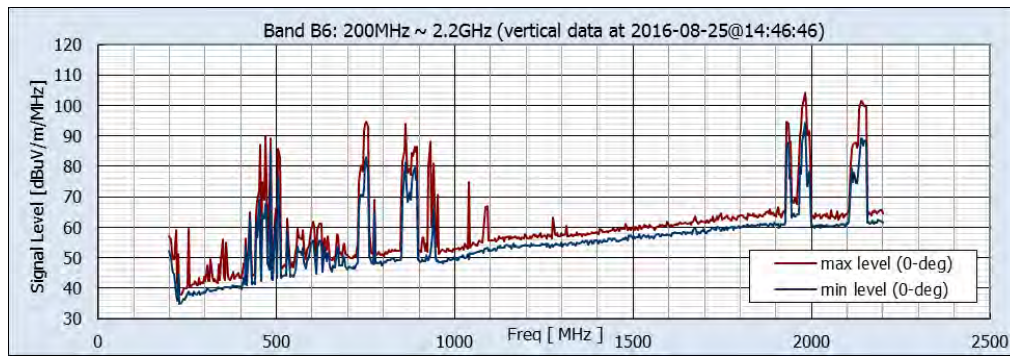
**Figure A3.5-1(d) - Location 1 (Burbank, CA): Measured Environmental RF Levels Non-Directional Data from Vertically-Oriented Monopole Antenna, Bands 0-4**



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	106.5	98.818	108.4	98.455	105.0	106.818	107.6	106.818

**Figure A3.5-1(e) - Location 1 (Burbank, CA): Measured Environmental RF Levels Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**

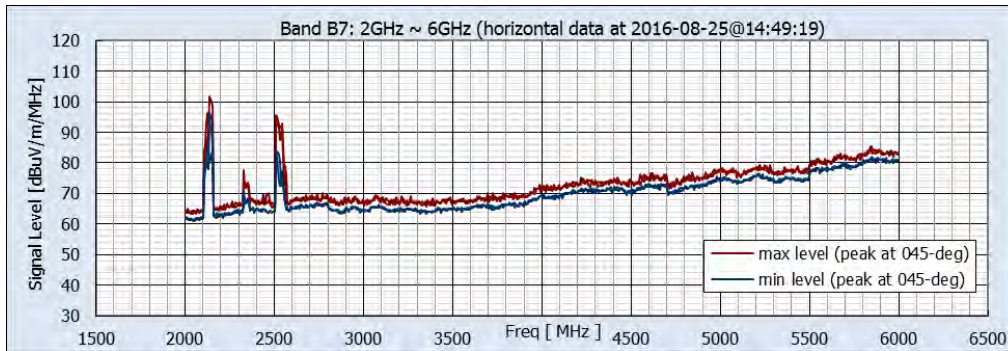
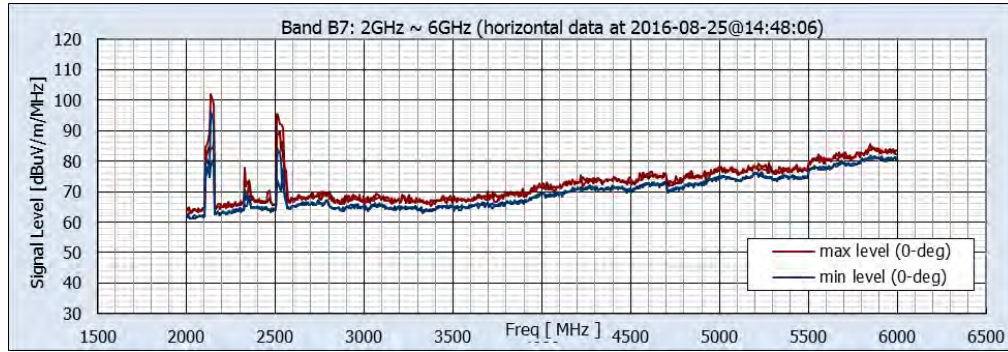
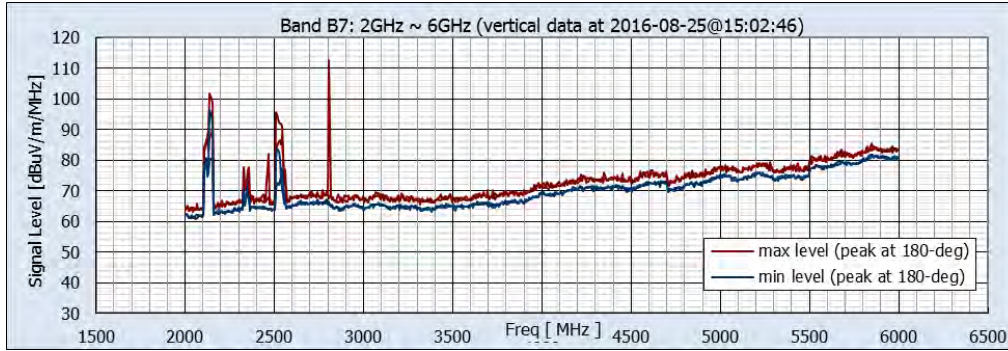
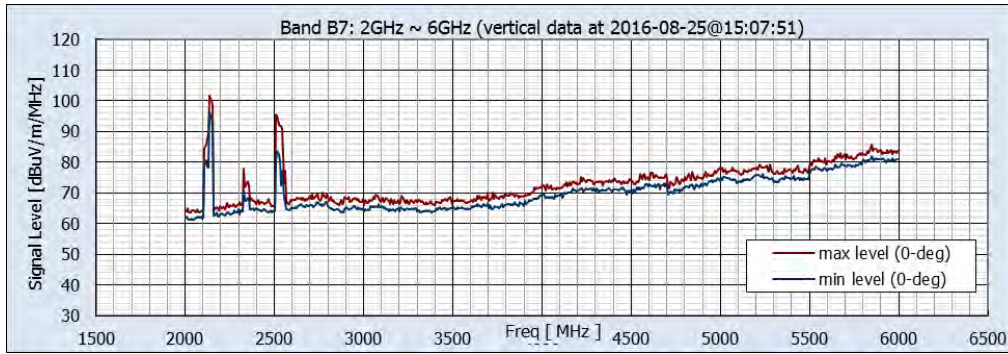




Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B6	200 ~ 2200	94.2	1981.818	104.1	1981.818	96.3	894.545	101.3	894.545

**Figure A3.5-1(f) - Location 1 (Burbank, CA): Measured Environmental RF Levels Band 6 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**

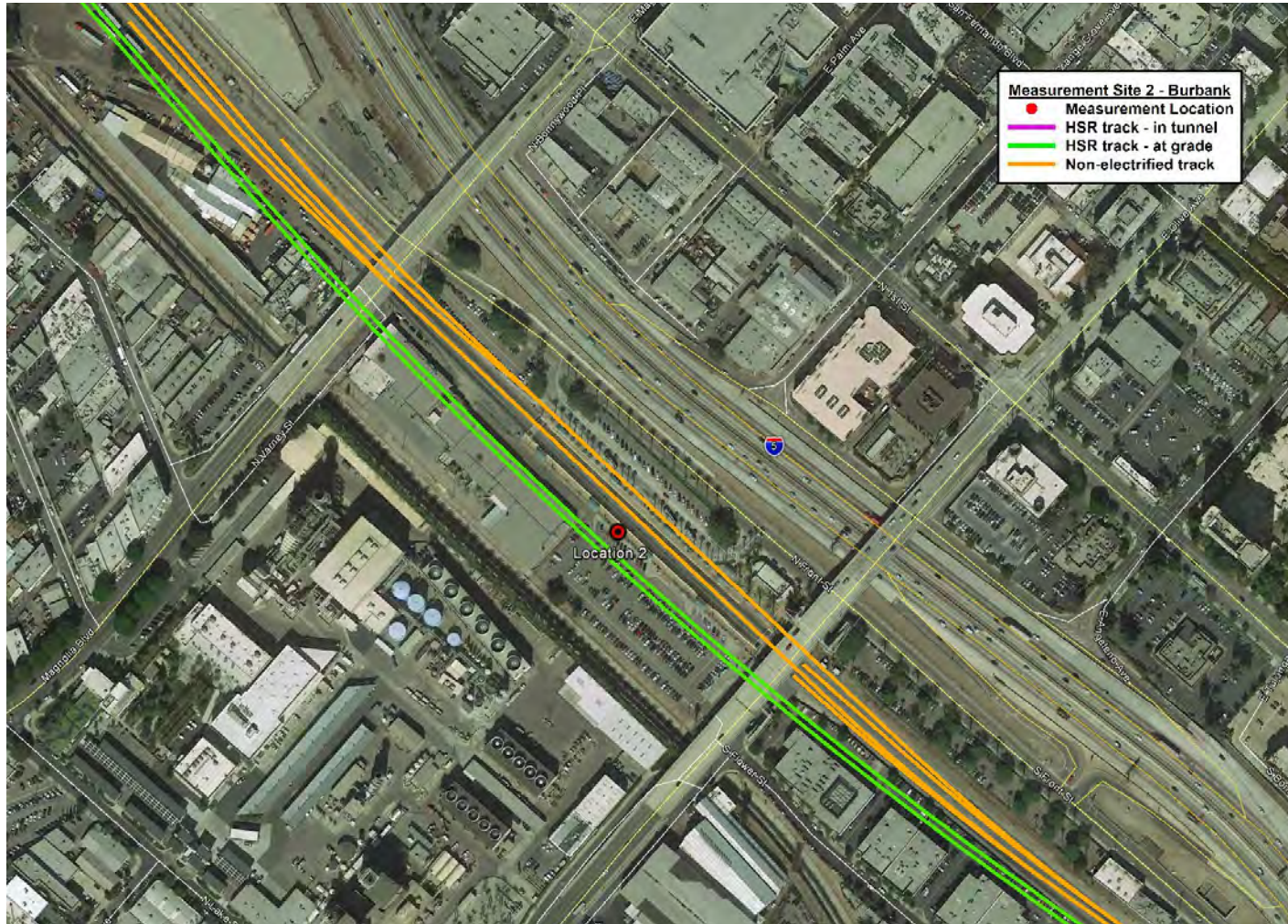




Maximum Levels									
Band	Freq. Range (MHz)	Vertical				Horizontal			
		Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Min-Hold (dBuV/m/MHz)	@ Freq. (MHz)	Pk Max-Hold (dBuV/m/MHz)	@ Freq. (MHz)
B7	2000~6000	96.3	2138.182	101.8	2138.182	86.7	2123.636	96.2	2123.636

**Figure A3.5-1(g) - Location 1 (Burbank, CA): Measured Environmental RF Levels Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**





**Figure A3.5-2(a)**  
**Location 2: Olive Avenue / Flower Street, Burbank**  
*At the Downtown Burbank Metrolink Station, with no local RF emitters visible (Lat 34.178848°, Lon -118.313265°)*

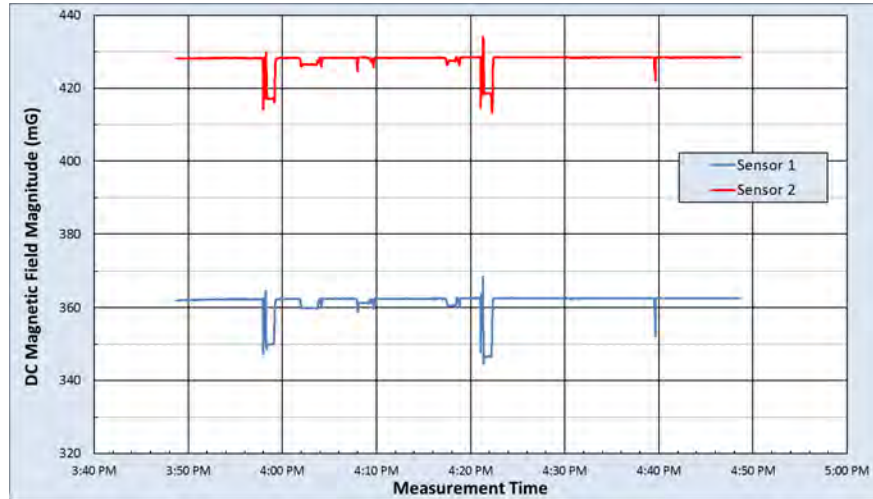




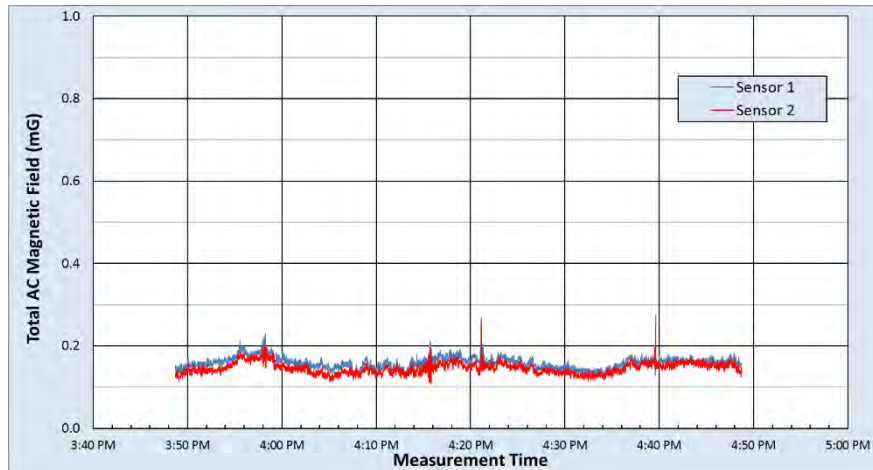
**Figure A3.5-2(b)**

**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 lines) and measurement points (red = RF, magenta = magnetometers). The view is rotated so that the image at 0° faces the alignment.*



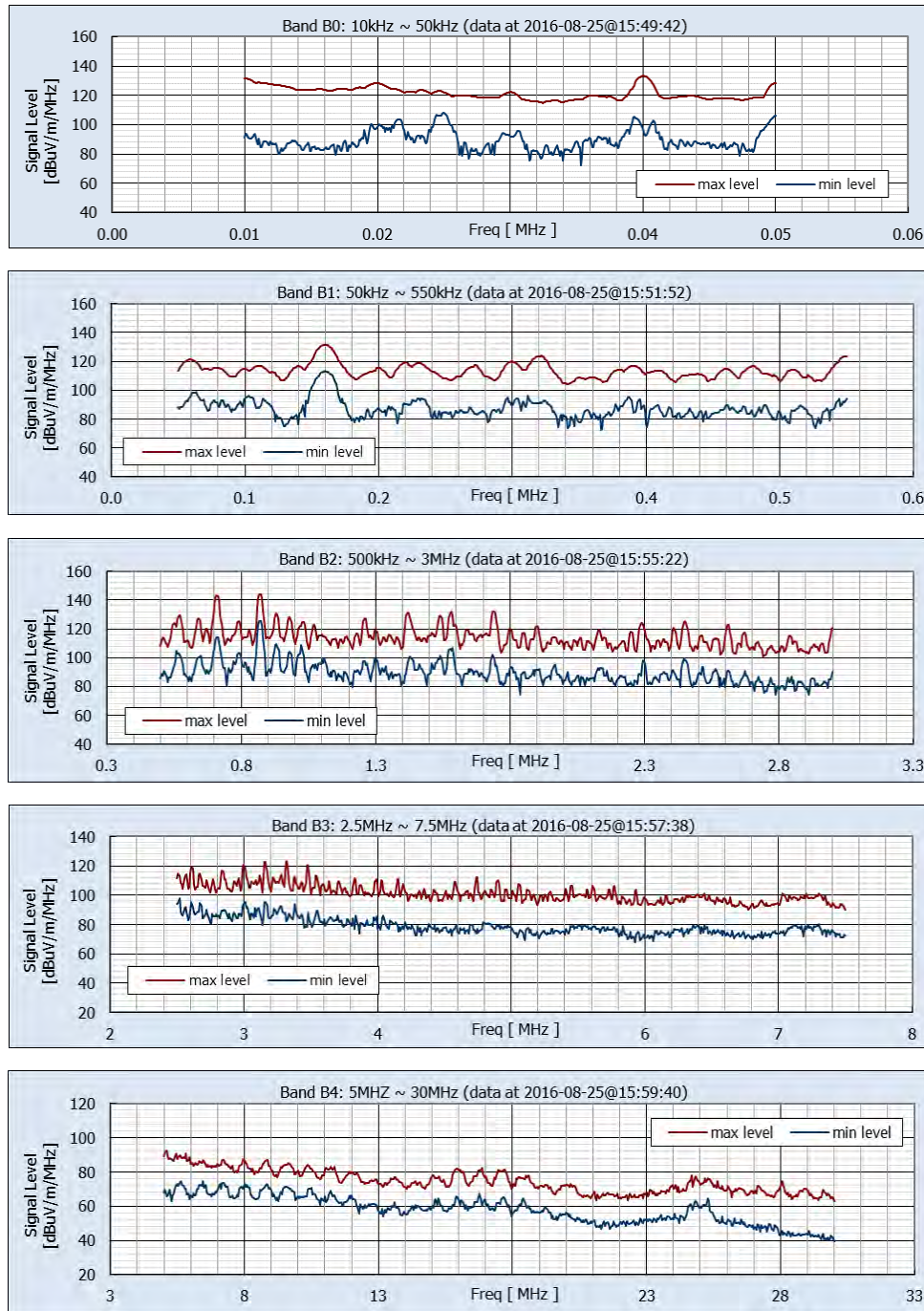
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
Max	241.1	280.6	290.8	341.7	368.5	434.1
Median	216.9	258.7	290.5	341.4	362.5	428.3
Min	200.6	243.9	275.2	327.6	344.7	413.3
Range	40.5	36.8	15.6	14.2	23.8	20.8
Std Dev	2.3	1.3	1.8	2.2	2.6	2.0



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
Max	0.268	0.236	0.070	0.065	0.080	0.076	0.063	0.059	0.070	0.060	0.069	0.062	0.070	0.072	0.275	0.256
Median	0.154	0.140	0.009	0.009	0.031	0.030	0.009	0.009	0.010	0.010	0.010	0.009	0.011	0.011	0.159	0.145
Min	0.110	0.102	0.002	0.002	0.015	0.017	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.003	0.115	0.108
Range	0.158	0.134	0.068	0.063	0.065	0.059	0.061	0.057	0.068	0.058	0.066	0.061	0.067	0.069	0.159	0.148
Std Dev	0.014	0.014	0.005	0.005	0.005	0.005	0.004	0.004	0.005	0.005	0.005	0.004	0.005	0.005	0.014	0.014

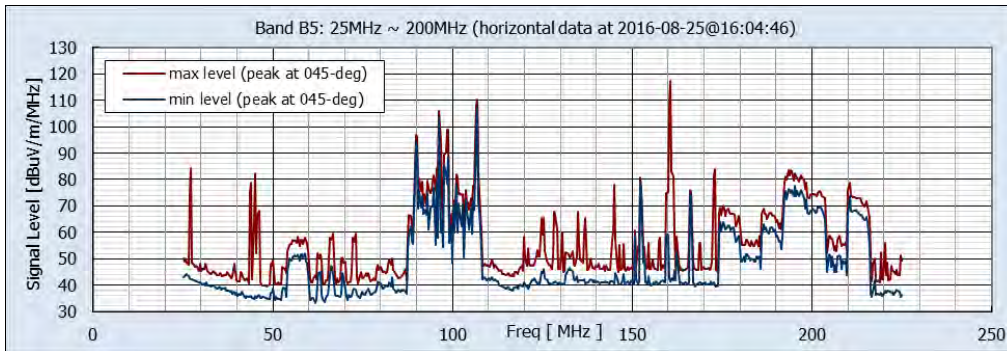
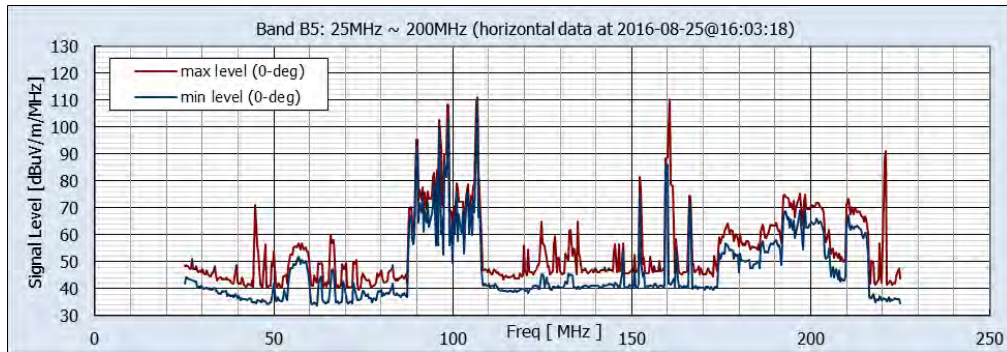
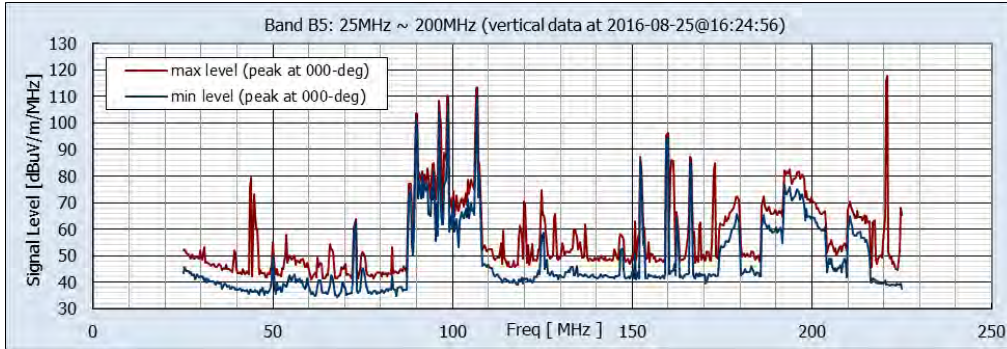
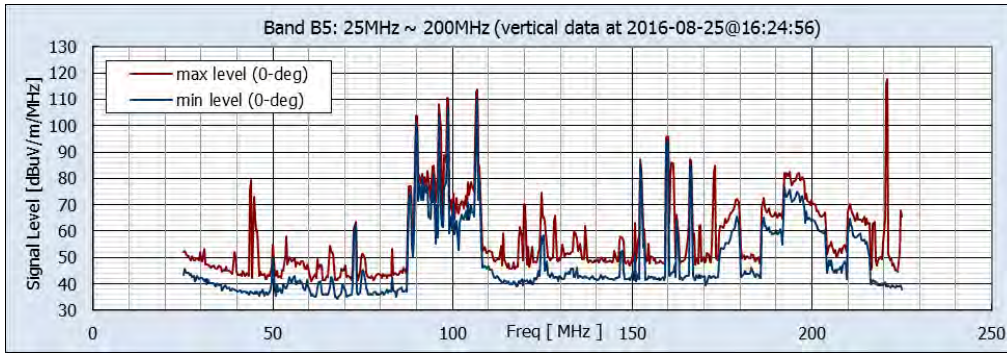
Figure A3.5-2(c)  
Location 2 (Burbank, CA): AC and DC Magnetic Field Measurement Results





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	108.0	0.0250	133.2	0.0400
B1	0.05 ~ 0.55	113.1	0.1600	131.5	0.1600
B2	0.50 ~ 3.00	125.7	0.8682	143.8	0.8682
B3	2.5 ~ 7.5	98.0	2.5182	123.5	3.3182
B4	5 ~ 30	74.4	5.6364	92.4	5.0909

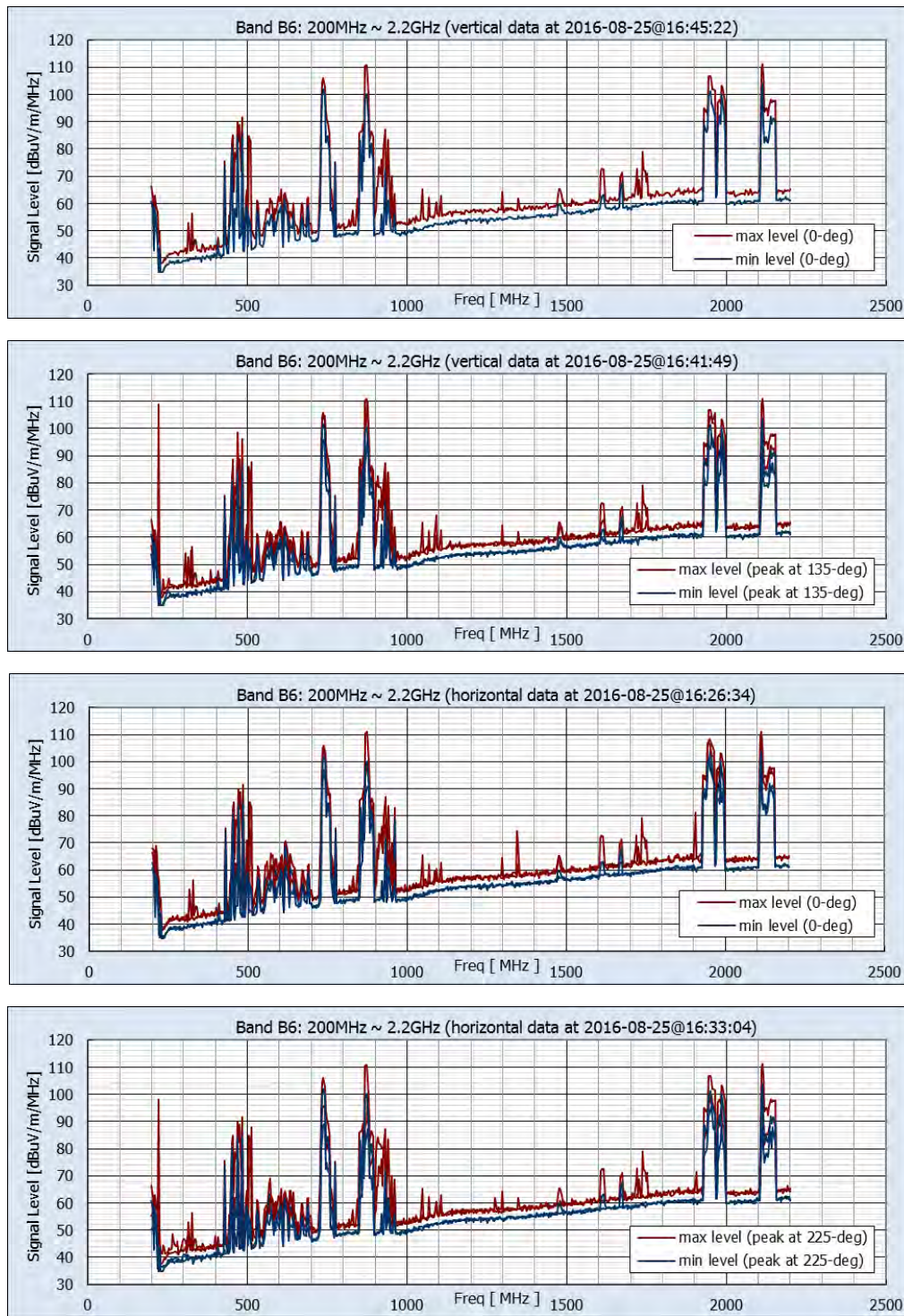
**Figure A3.5-2(d) - Location 2 (Burbank, CA): Measured Environmental RF Levels Non-Directional Data from Vertically-Oriented Monopole Antenna, Bands 0-4**



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	110.4	106.818	117.8	221.000	109.2	106.818	117.2	160.636

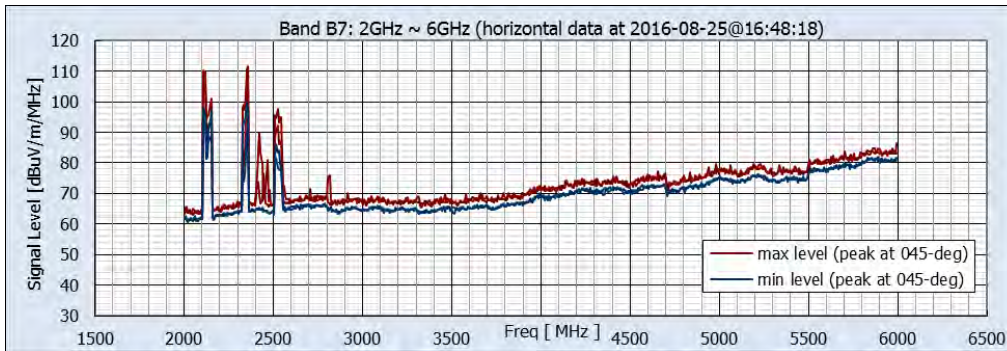
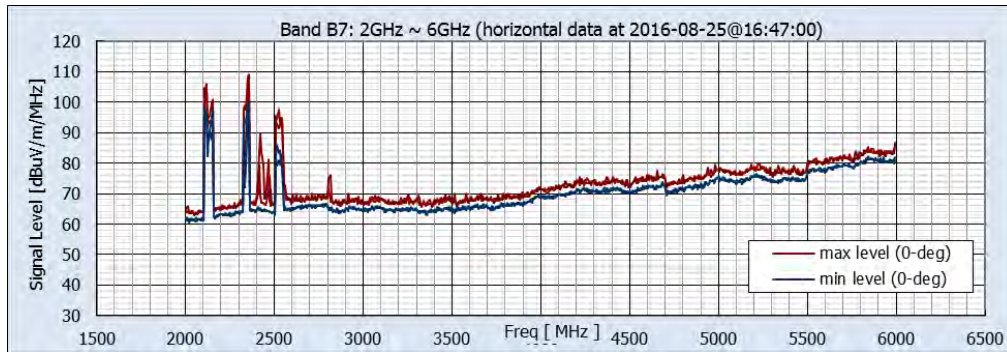
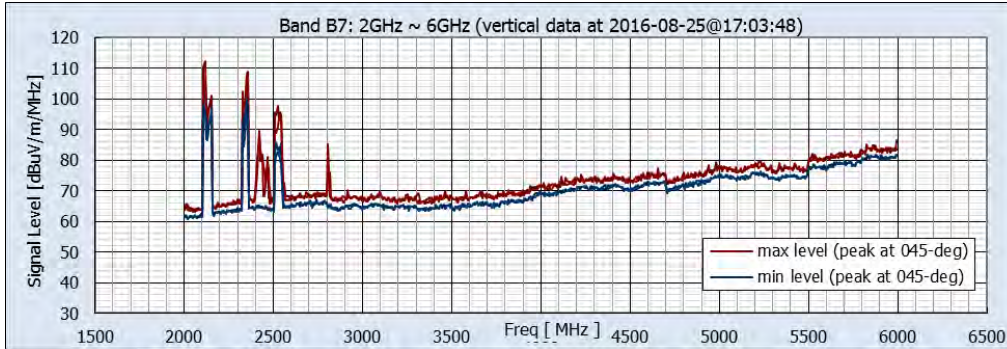
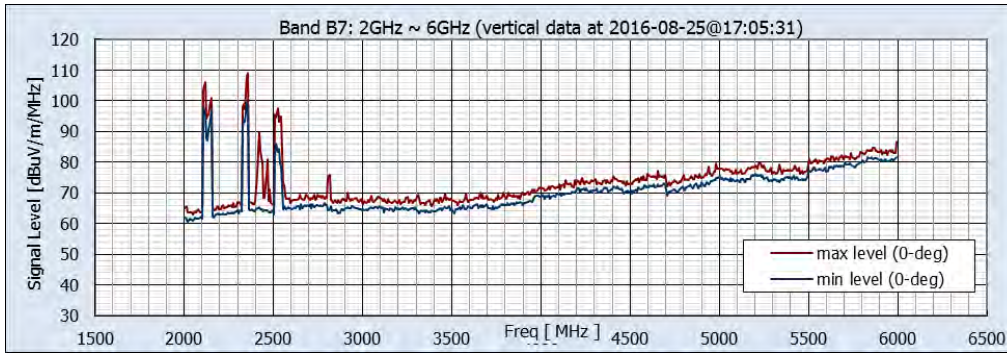
**Figure A3.5-2(e) - Location 2 (Burbank, CA): Measured Environmental RF Levels Band 5 Vertical and Horizontal Components, Facing Alignment (0-degree) and at Peak Orientation**





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	103.8	2112.727	111.1	2112.727	104.3	1952.727	108.9	2109.091

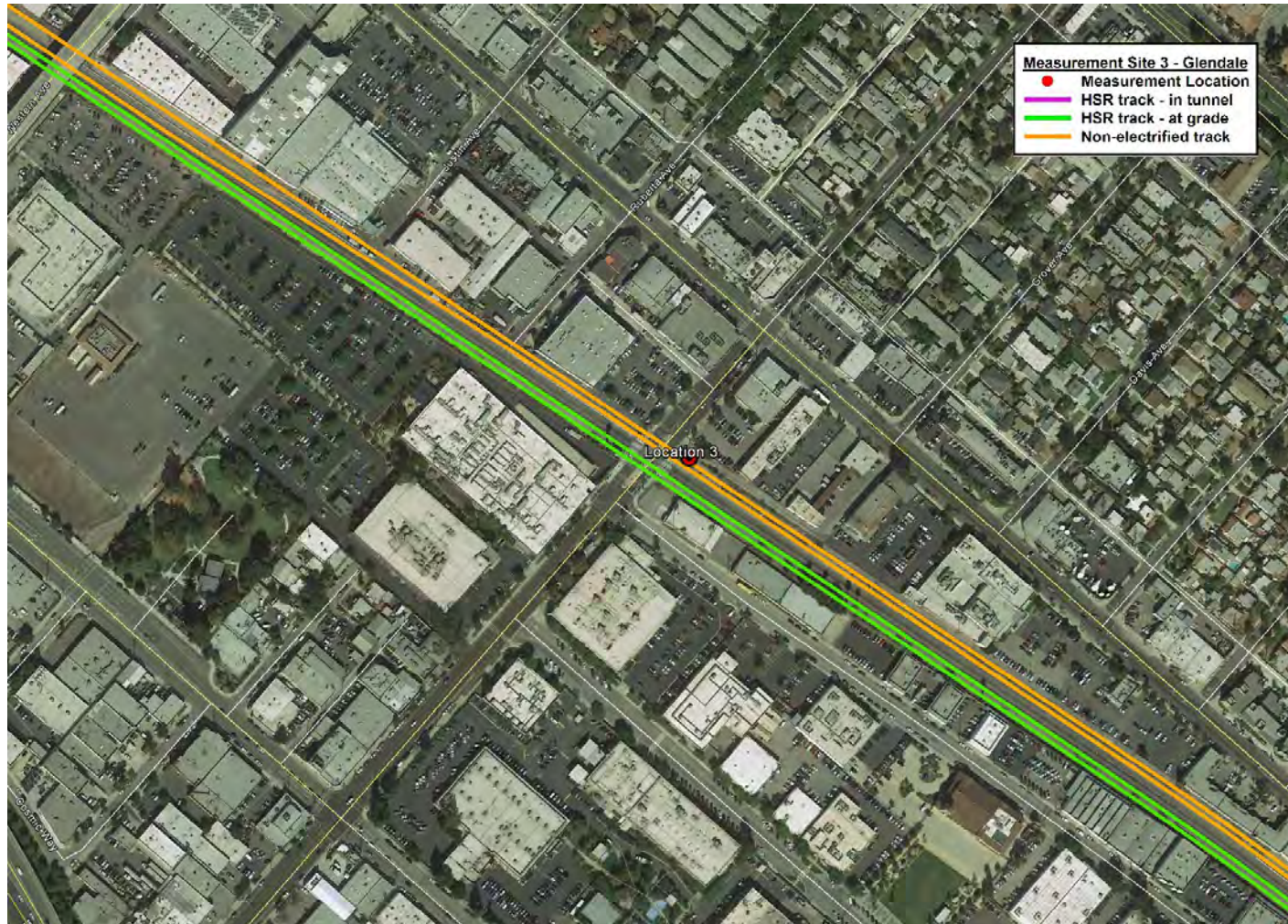
**Figure A3.5-2(f) - Location 2 (Burbank, CA): Measured Environmental RF Levels Band 6 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**



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	102.8	2116.364	112.5	2116.364	96.3	2349.091	111.4	2356.364

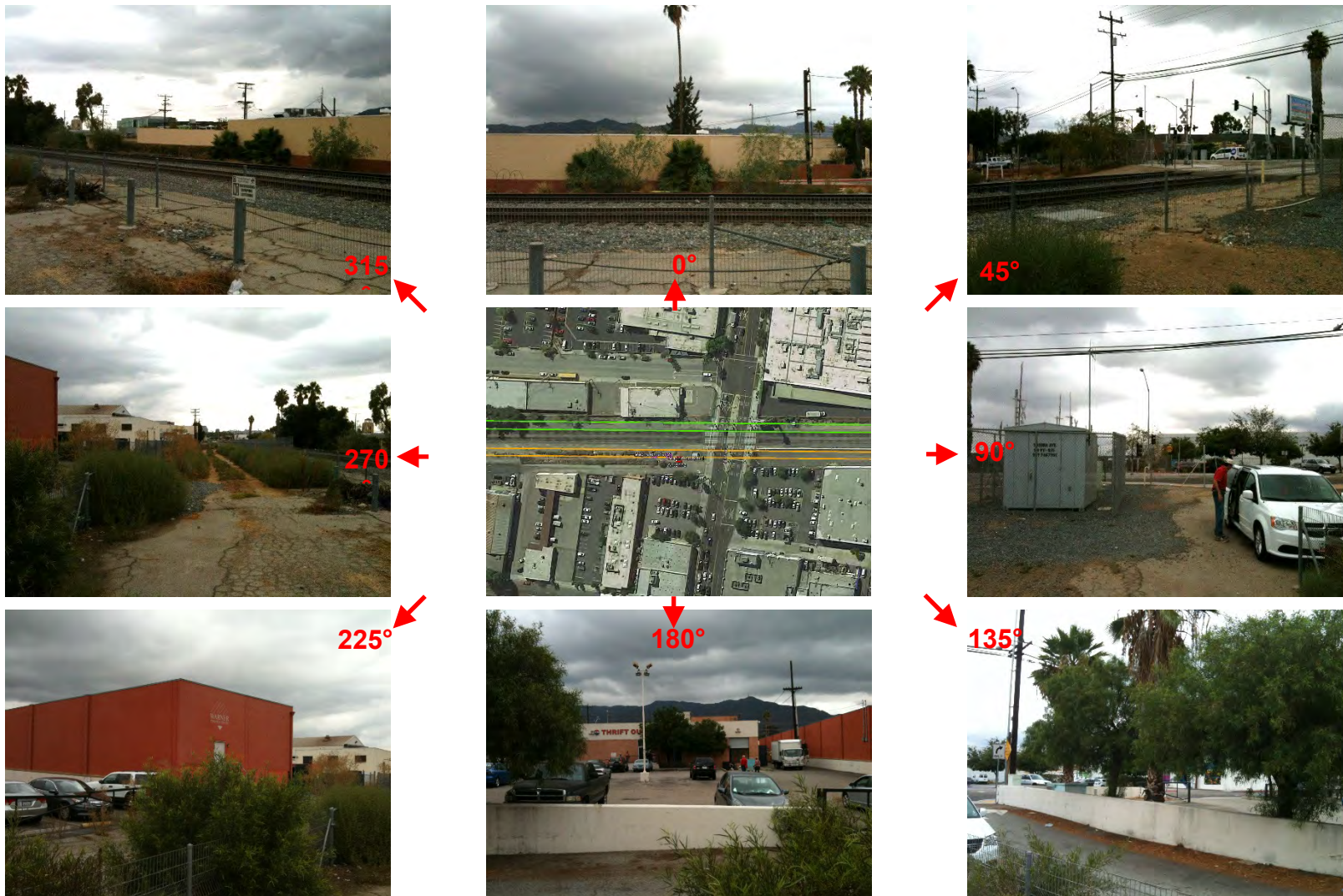
**Figure A3.5-2(g) - Location 2 (Burbank, CA): Measured Environmental RF Levels Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**





**Figure A3.5-3(a)**  
**Location 3: San Fernando Road / Sonora Avenue, Burbank**  
*Urban/ Industrial setting (Lat 34.165169°, Lon -118.288816°)*





**Figure A3.5-3(b)**

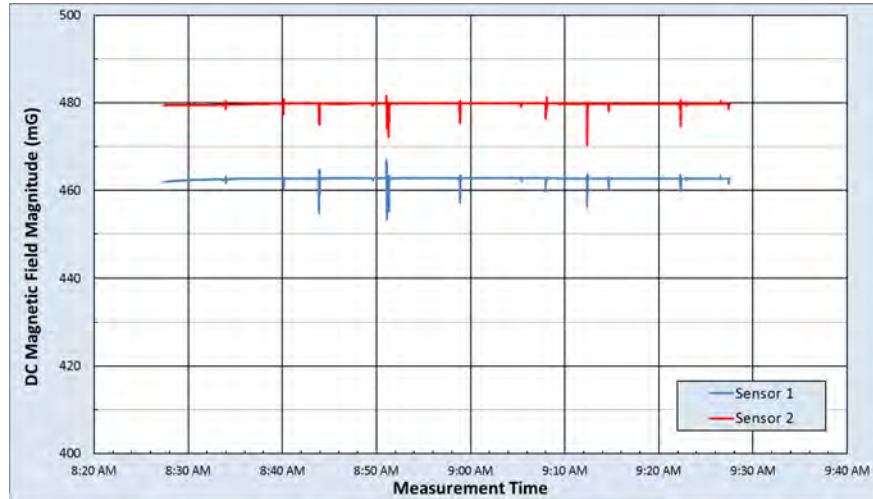
**Location 3: Measurement Location and Site Views**

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

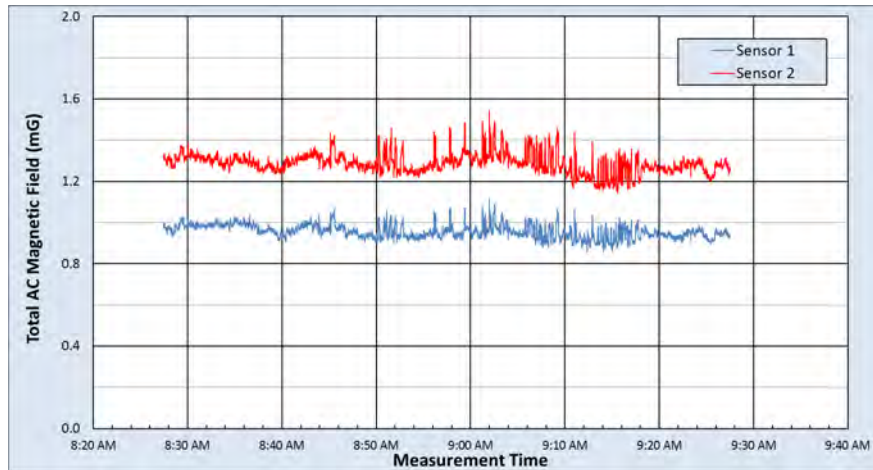


**Figure A3.5-3(c)**  
**Location 3: Local EMF Sources**

Nearby emitters include cell towers, railway communications, and distribution lines parallel to the alignment.  
*Photos depicting visible close-proximity emitters. Other emissions sources may exist but are not visible from the site.*



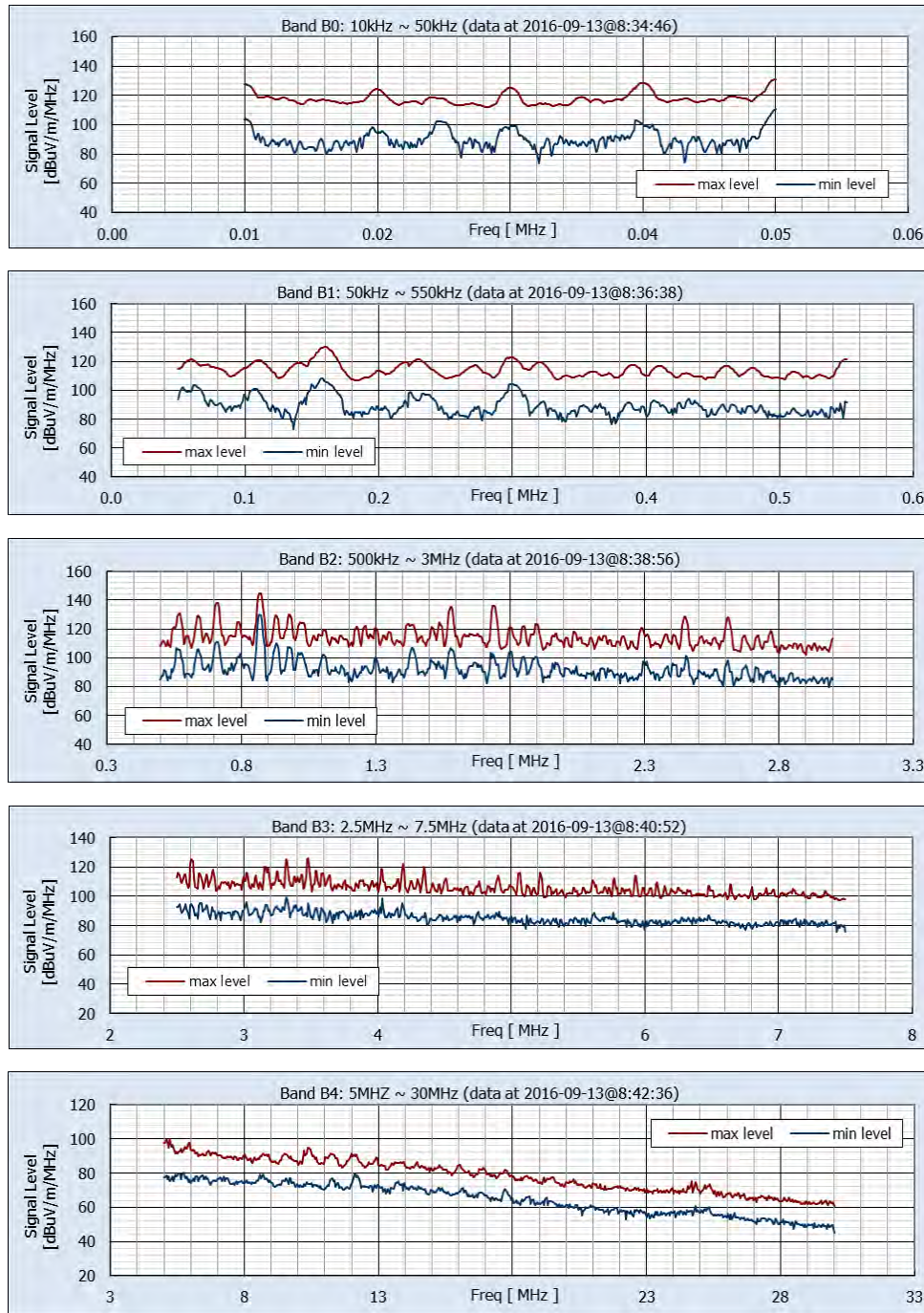
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	251.7	255.5	397.1	412.5	466.9	481.6
<b>Median</b>	237.8	245.5	396.9	412.2	462.7	479.8
<b>Min</b>	227.2	234.2	387.4	403.6	453.4	470.3
<b>Range</b>	24.6	21.2	9.7	9.0	13.6	11.3
<b>Std Dev</b>	0.6	0.5	0.5	0.4	0.4	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>	1.108	1.533	0.134	0.089	0.155	0.195	0.073	0.046	0.058	0.058	0.055	0.031	0.041	0.036	1.116	1.543
<b>Median</b>	0.947	1.277	0.012	0.013	0.108	0.140	0.010	0.009	0.025	0.032	0.010	0.010	0.016	0.021	0.953	1.286
<b>Min</b>	0.847	1.135	0.003	0.003	0.082	0.102	0.002	0.002	0.010	0.013	0.002	0.002	0.005	0.007	0.859	1.144
<b>Range</b>	0.261	0.398	0.131	0.086	0.073	0.093	0.072	0.044	0.048	0.046	0.053	0.029	0.036	0.029	0.257	0.399
<b>Std Dev</b>	0.033	0.049	0.005	0.005	0.007	0.009	0.004	0.003	0.005	0.006	0.003	0.003	0.004	0.004	0.033	0.049

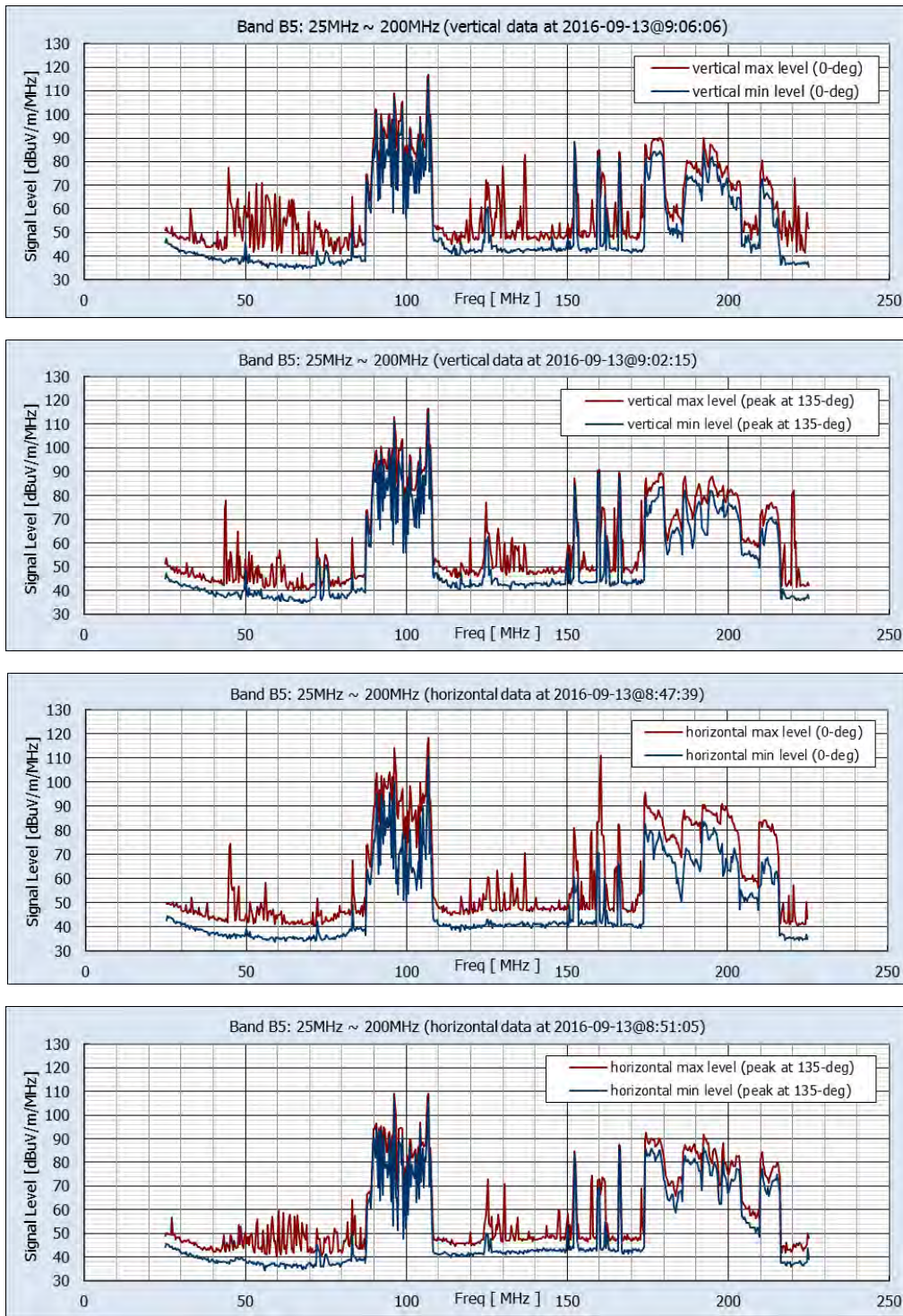
**Figure A3.5-3(d)**  
**Location 3 (Burbank, CA): AC and DC Magnetic Field Measurement Results**





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	110.6	0.0500	130.9	0.0500
B1	0.05 ~ 0.55	108.4	0.1573	129.8	0.1600
B2	0.50 ~ 3.00	129.9	0.8682	144.6	0.8682
B3	2.5 ~ 7.5	99.3	3.3182	125.8	3.4818
B4	5 ~ 30	80.0	5.7273	100.0	5.2273

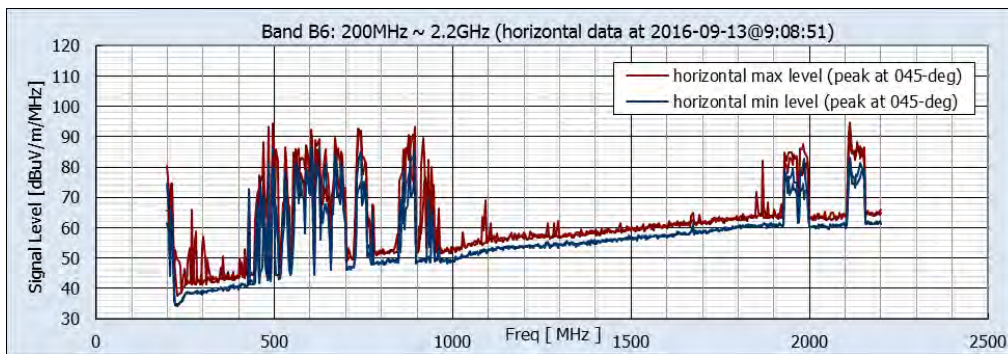
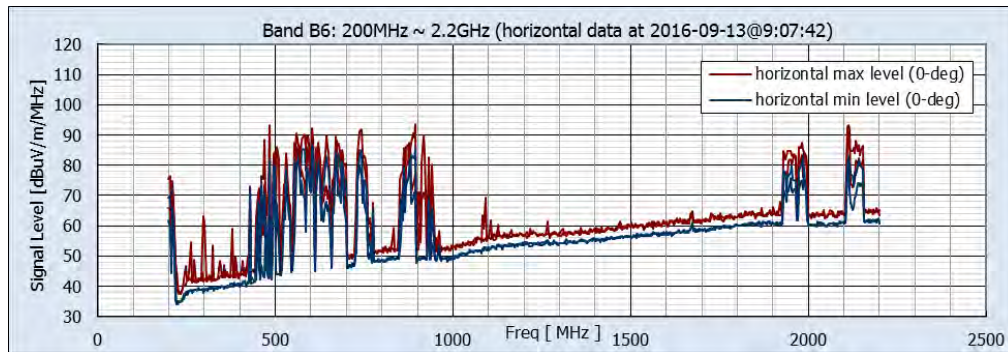
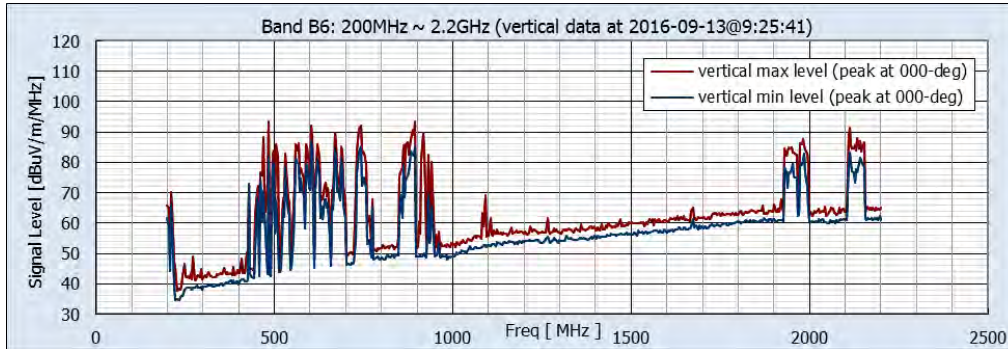
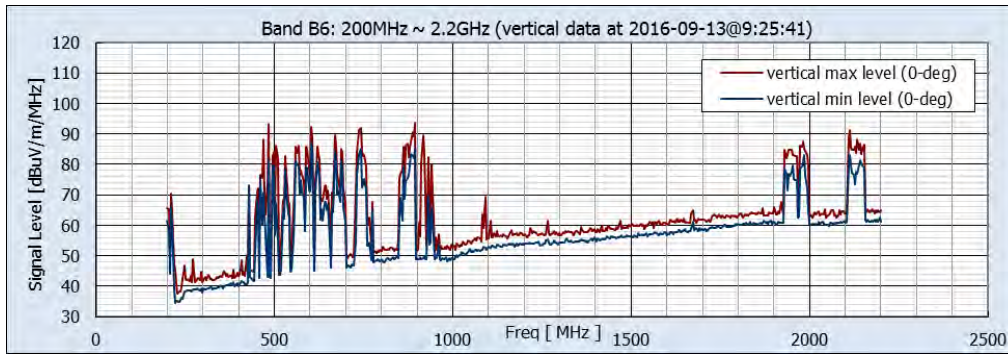
**Figure A3.5-3(e) - Location 3 (Burbank, CA): Measured Environmental RF Levels Non-Directional Data from Vertically-Oriented Monopole Antenna, Bands 0-4**



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	114.6	106.818	116.7	106.818	110.6	106.818	118.5	106.818

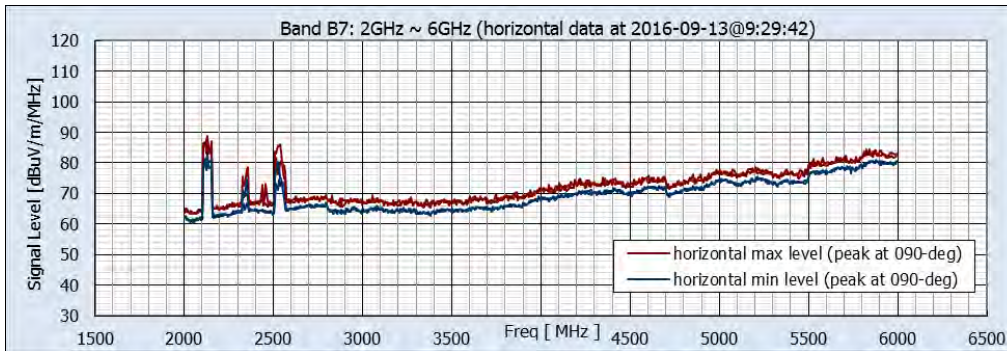
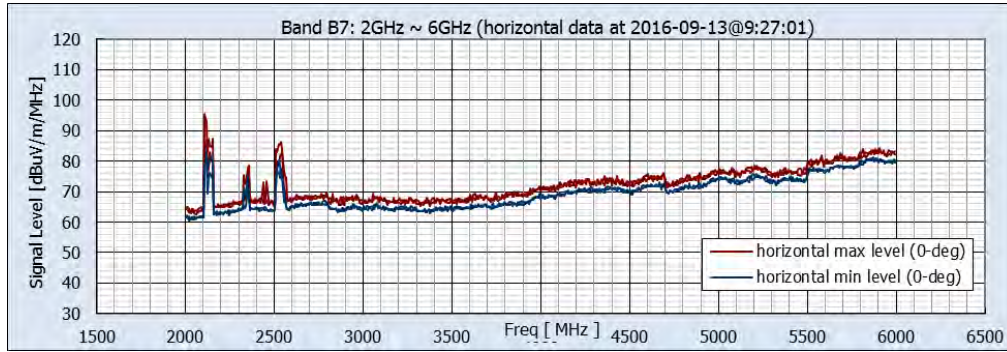
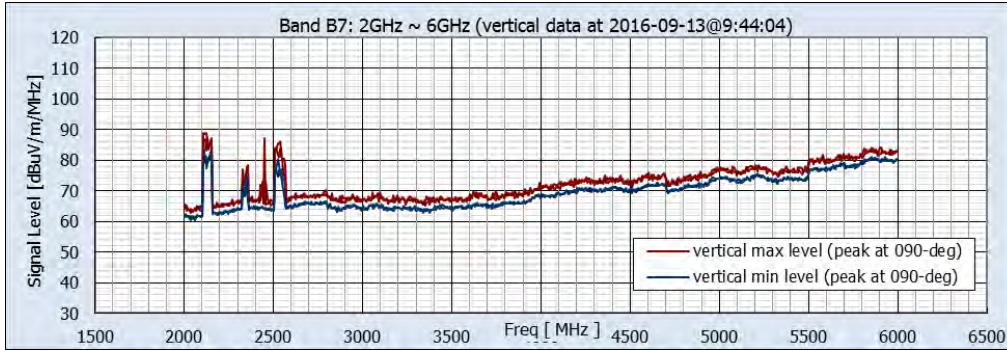
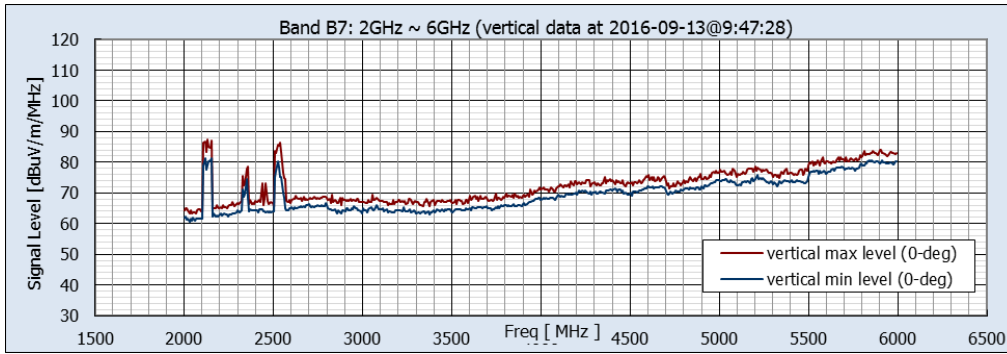
**Figure A3.5-3(f) - Location 3 (Burbank, CA): Measured Environmental RF Levels Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**





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	86.8	603.636	93.5	894.545	86.0	625.455	94.8	2112.727

**Figure A3.5-3(g) - Location 3 (Burbank, CA): 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	86.0	2109.091	88.9	2109.091	85.2	2109.091	95.3	2109.091

**Figure A3.5-3(h) - Location 3 (Burbank, CA): Measured Environmental RF Levels Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**





**Figure A3.5-4(a)**  
**Location 4: San Fernando Road / Colorado Street, Glendale**  
*Urban/Industrial setting with numerous local EMF sources, (Lat 34.141646°, Lon -118.269653°)*





**Figure A3.5-4(b)**

**Location 4: Measurement Location and Site Views**

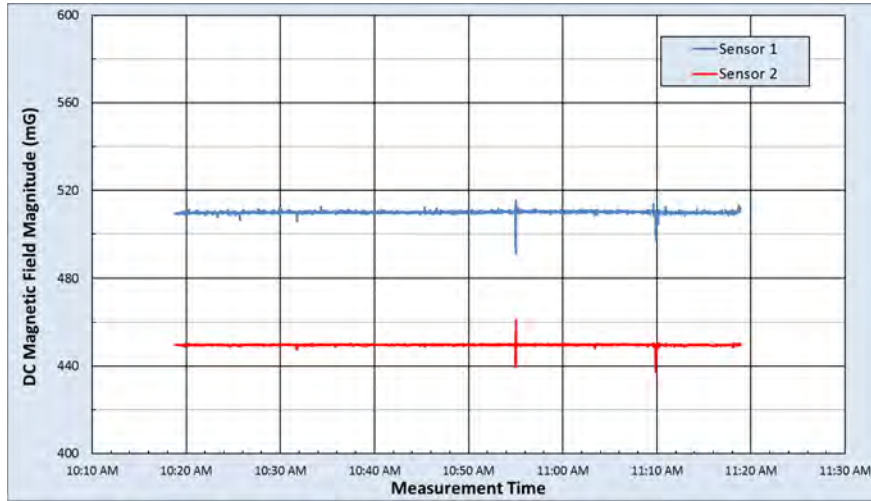
*Photos depicting the site from the perspective of the RF measurement location. In the center is a satellite view, indicating the alignment (green lines) and measurement points (red = RF, magenta = magnetometers). The satellite view is rotated so that the image at 0° faces the alignment.*



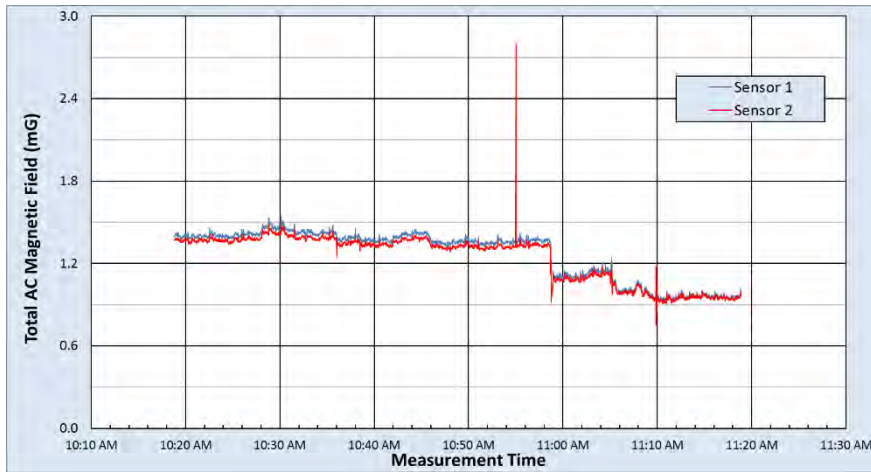


**Figure A3.5-4(c)**  
**Location 4: Local EMF Sources**

Nearby emitters include cell towers, railway communications, and distribution lines parallel to the alignment.  
*Photos depicting visible close-proximity emitters. Other emissions sources may exist but are not visible from the site.*



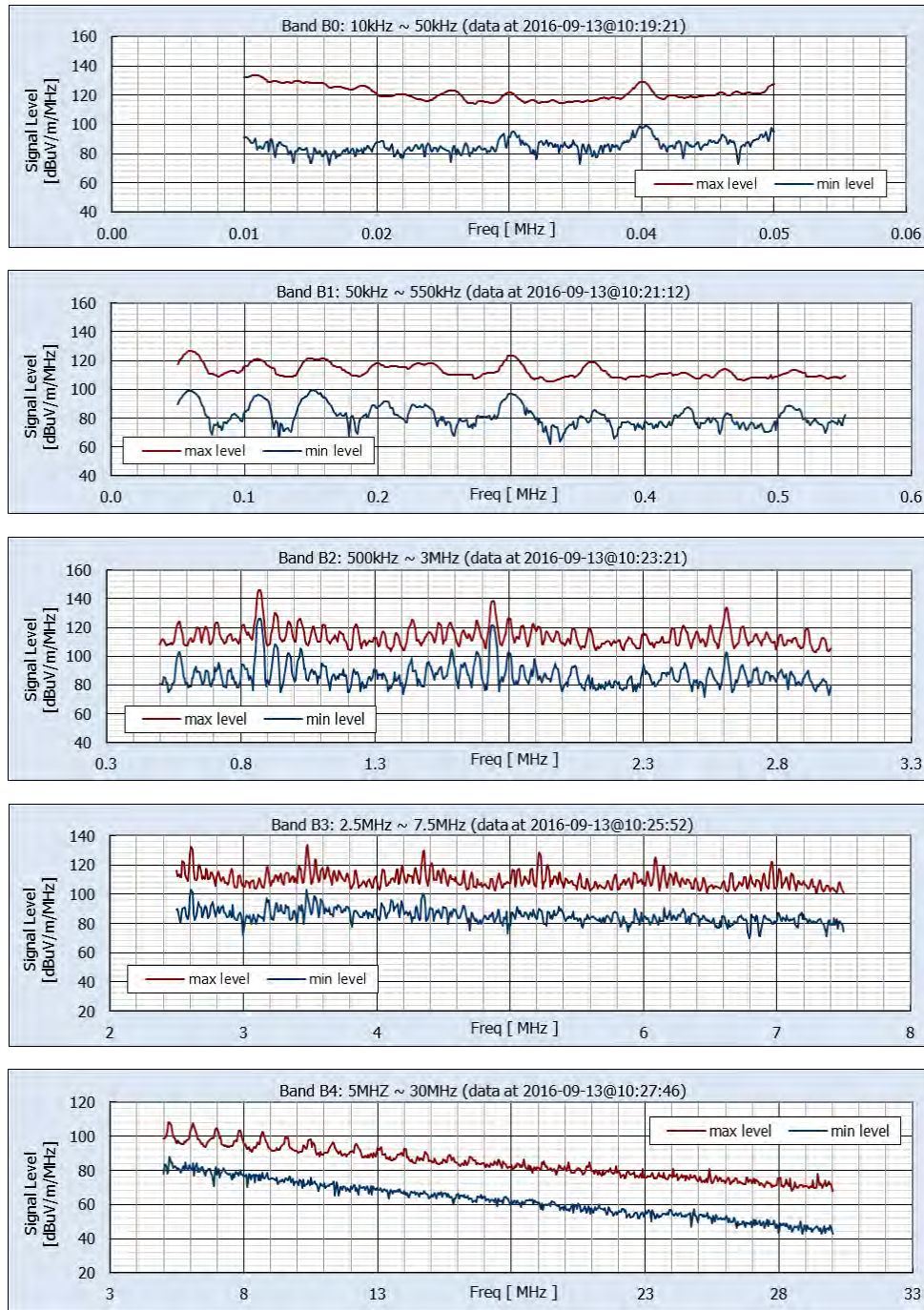
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
Max	403.0	312.6	339.1	341.7	515.5	461.1
Median	382.1	292.9	337.6	341.1	509.9	449.7
Min	363.5	280.2	321.5	324.6	491.3	437.3
Range	39.5	32.5	17.6	17.2	24.2	23.8
Std Dev	0.8	0.5	0.5	0.5	0.7	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
Max	1.544	2.527	0.311	0.819	0.204	0.549	0.163	0.431	0.149	0.336	0.113	0.298	0.100	0.268	1.548	2.796
Median	1.362	1.328	0.014	0.014	0.042	0.038	0.010	0.009	0.051	0.051	0.010	0.009	0.022	0.022	1.364	1.330
Min	0.853	0.726	0.002	0.003	0.027	0.024	0.001	0.002	0.024	0.023	0.002	0.002	0.004	0.005	0.856	0.755
Range	0.691	1.801	0.309	0.817	0.178	0.526	0.161	0.429	0.125	0.313	0.111	0.296	0.096	0.263	0.692	2.041
Std Dev	0.183	0.175	0.009	0.015	0.006	0.010	0.005	0.008	0.010	0.010	0.004	0.006	0.006	0.007	0.183	0.175

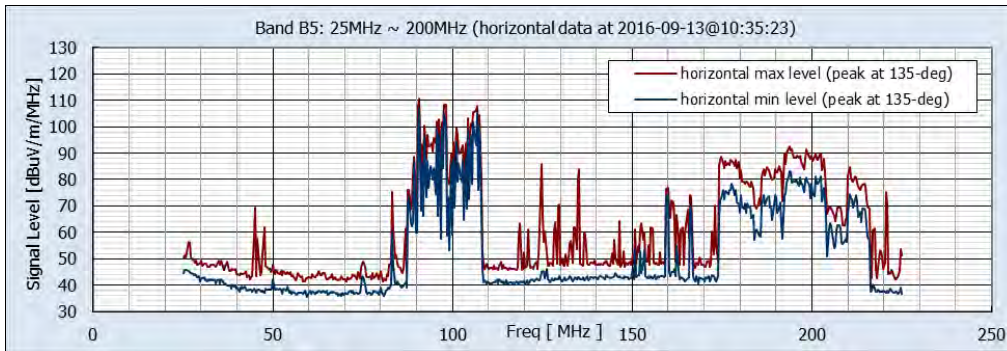
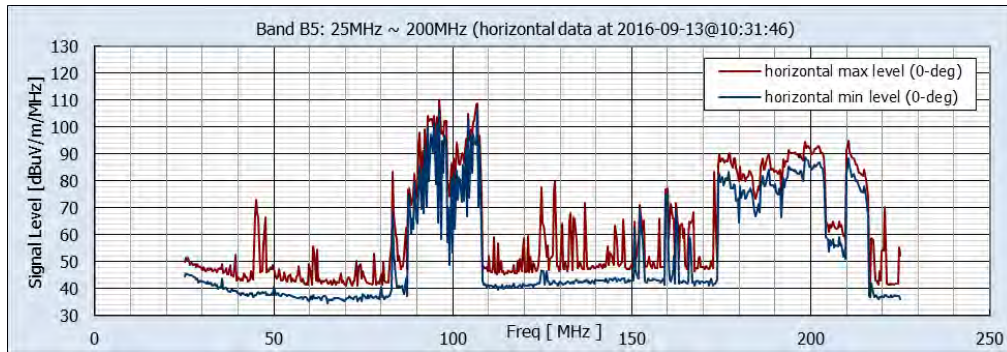
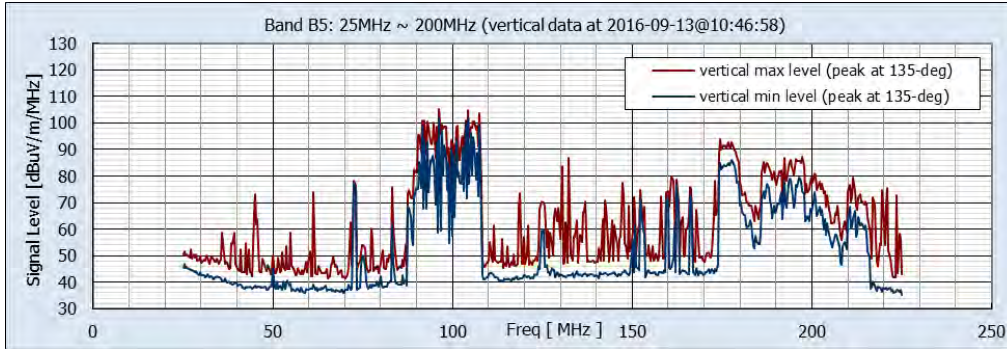
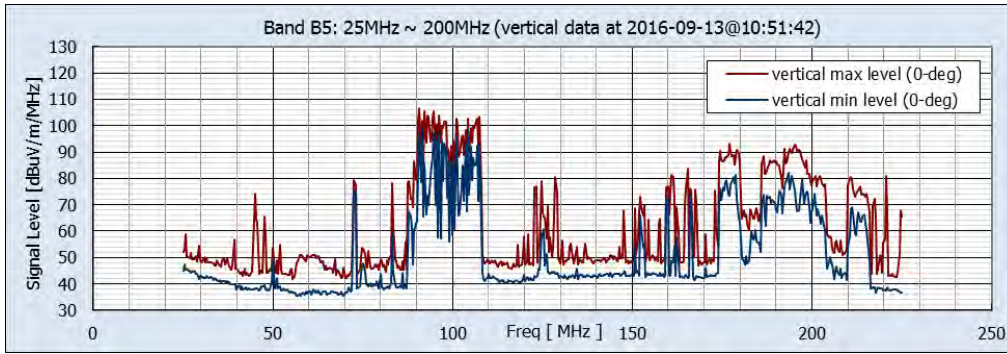
**Figure A3.5-4(d)**  
**Location 4 (Glendale, CA): AC and DC Magnetic Field Measurement Results**





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	99.5	0.0403	133.7	0.0108
B1	0.05 ~ 0.55	99.4	0.1518	126.7	0.0600
B2	0.50 ~ 3.00	125.9	0.8682	146.1	0.8682
B3	2.5 ~ 7.5	103.2	2.6091	133.5	3.4818
B4	5 ~ 30	87.8	5.2273	107.9	5.1818

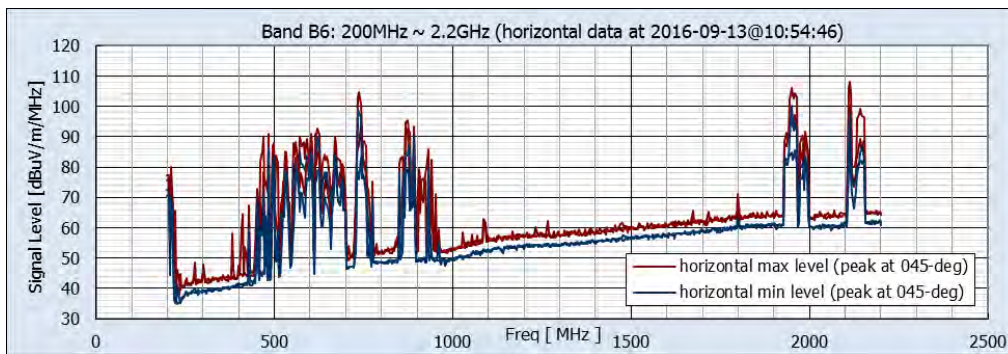
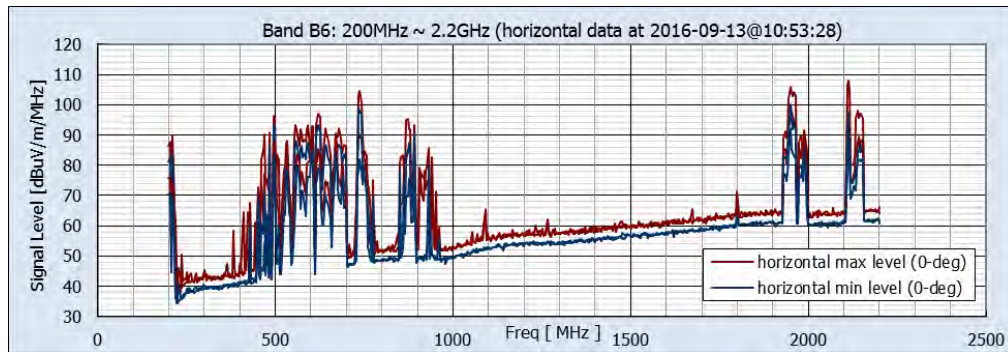
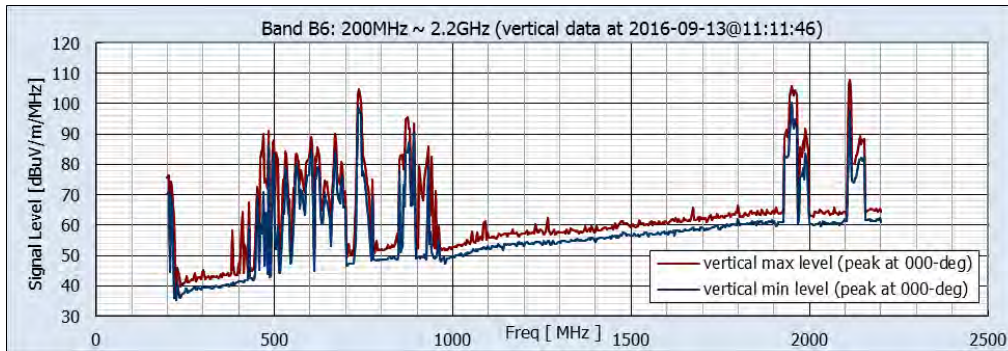
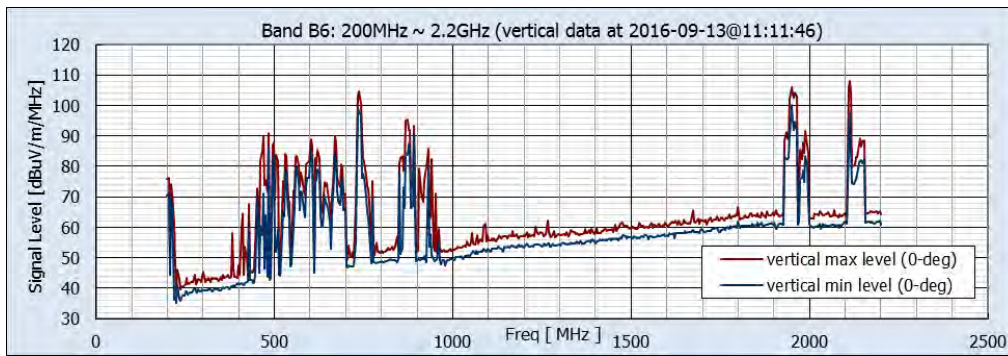
**Figure A3.5-4(e) - Location 4 (Glendale, CA): Measured Environmental RF Levels Non-Directional Data from Vertically-Oriented Monopole Antenna, Bands 0-4**



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	101.8	96.273	106.6	90.818	107.2	90.818	110.5	90.818

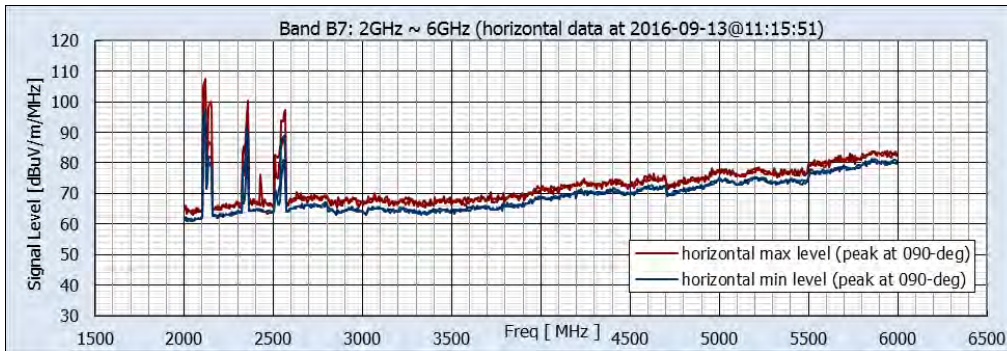
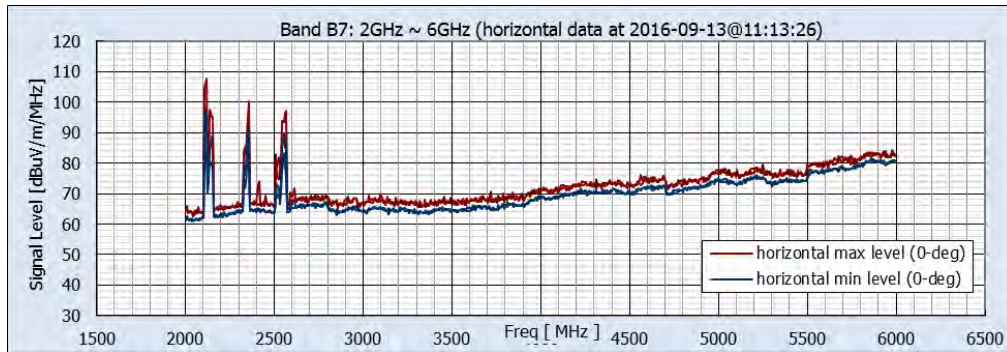
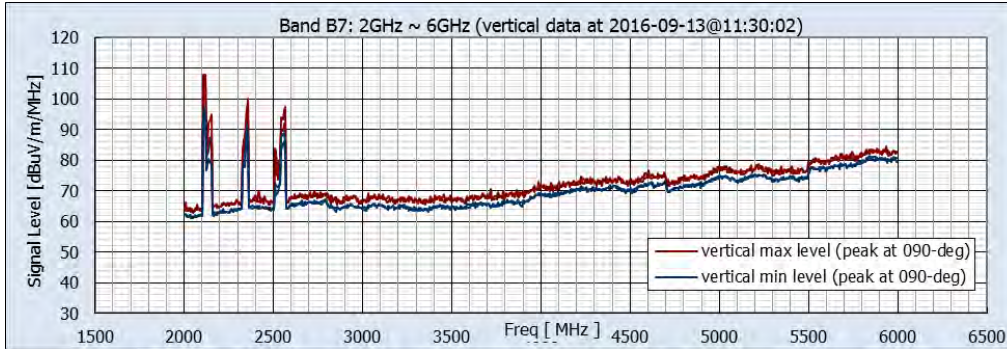
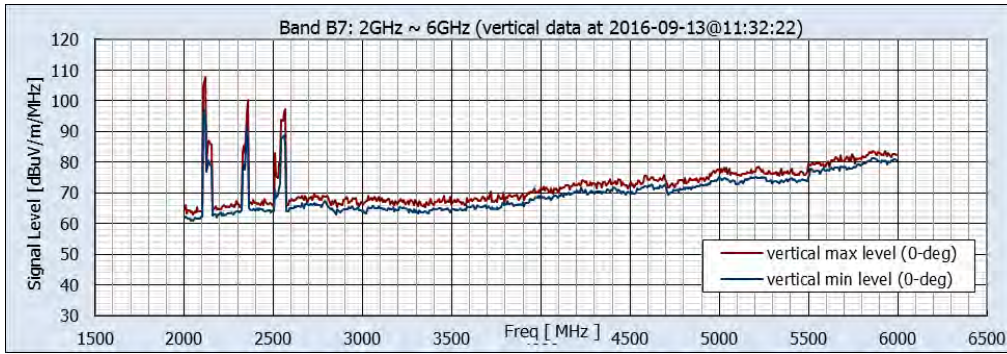
**Figure A3.5-4(f) - Location 4 (Glendale, CA): Measured Environmental RF Levels Band 5 Vertical and Horizontal Components, Facing Alignment (0-degree) and at Peak Orientation**





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	100.2	1949.091	108.0	2112.727	93.6	494.545	100.4	2112.727

**Figure A3.5-4(g) - Location 4 (Glendale, CA): 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	96.9	2109.091	108.0	2116.364	94.2	2109.091	105.3	2109.091

**Figure A3.5-4(h) - Location 4 (Glendale, CA): Measured Environmental RF Levels Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**









**Figure A3.5-5(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 lines) and measurement points (red = RF, magenta = magnetometers). The satellite view is rotated so that the image at 0° faces the alignment.*

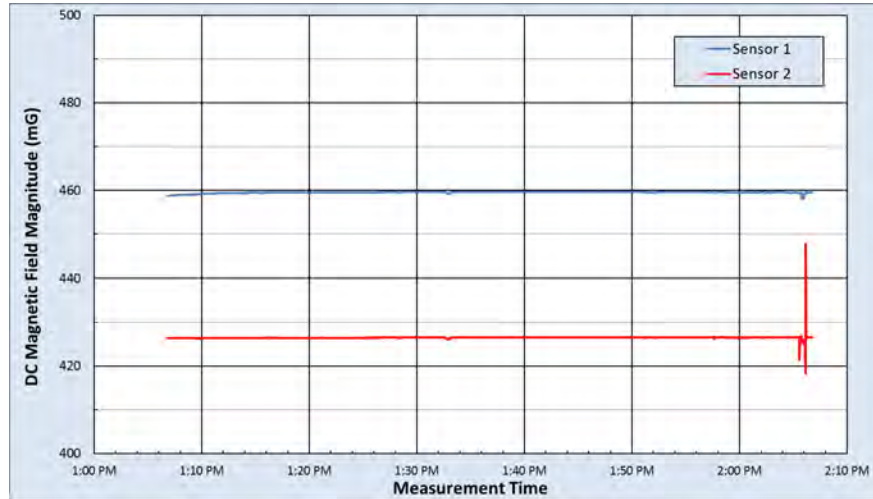




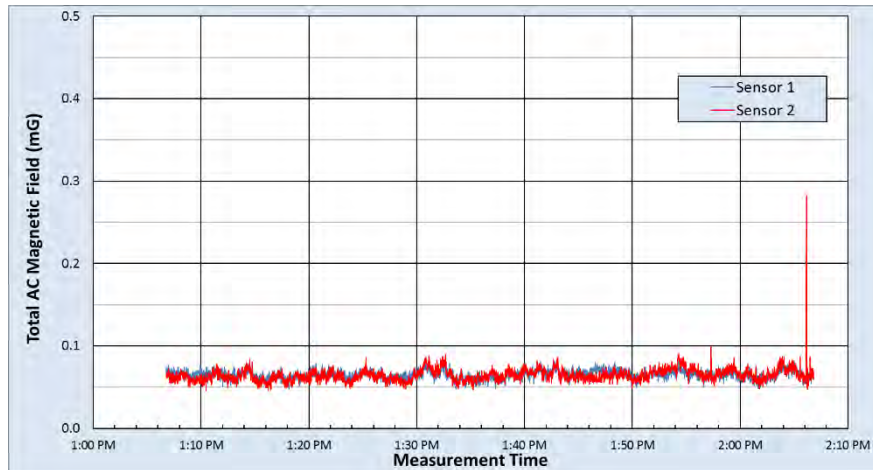
**Figure A3.5-5(c)**  
**Location 5: Local EMF Sources**

Nearby sources included a single local distribution line.

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



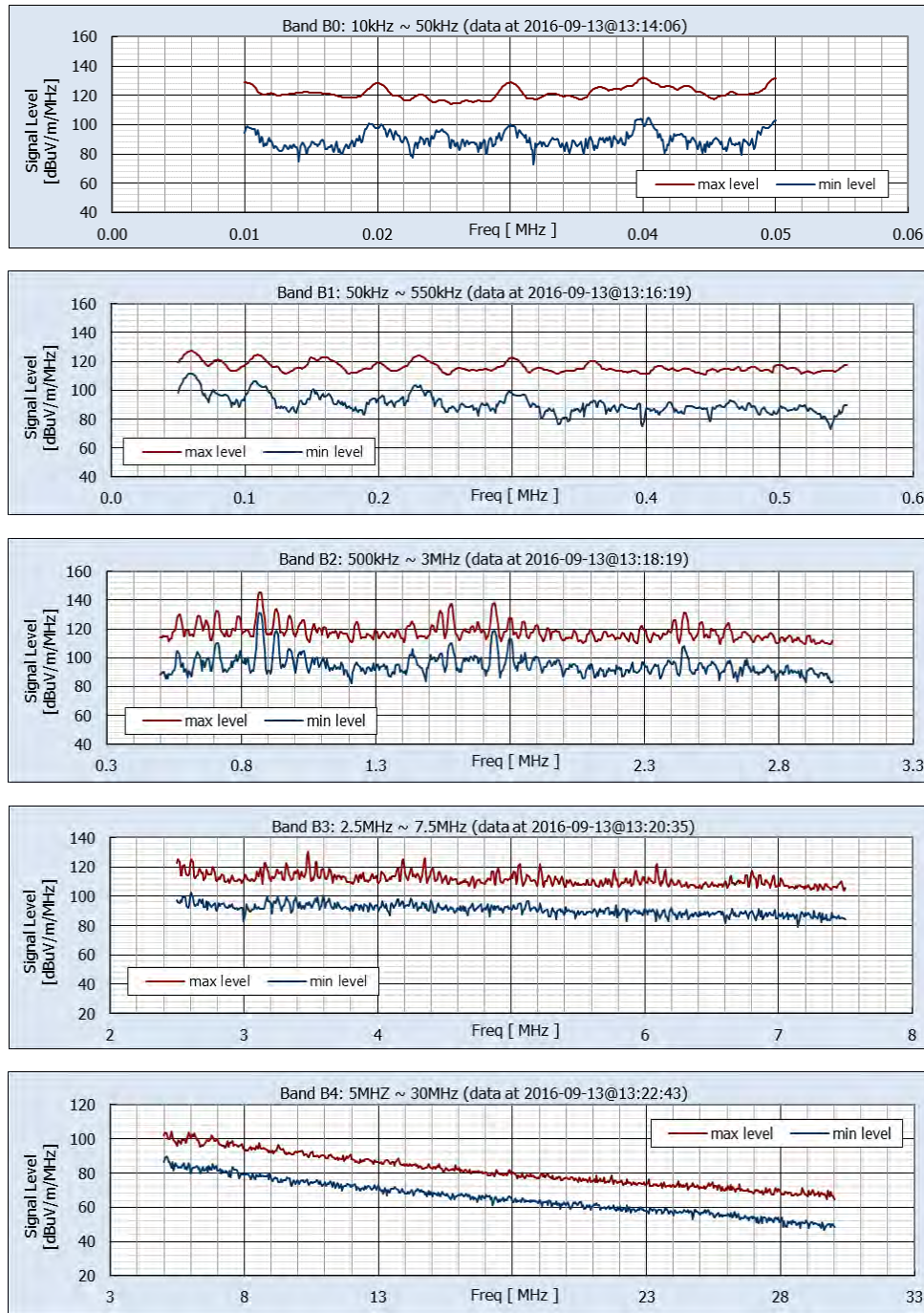
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
Max	246.6	253.2	389.0	370.4	459.8	447.8
Median	245.1	213.0	388.8	369.5	459.6	426.5
Min	244.6	205.7	386.9	364.4	458.0	418.4
Range	2.0	47.5	2.1	6.0	1.7	29.3
Std Dev	0.2	0.9	0.2	0.2	0.2	0.5



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
Max	0.084	0.232	0.020	0.105	0.021	0.078	0.022	0.056	0.030	0.045	0.023	0.040	0.023	0.048	0.087	0.282
Median	0.060	0.060	0.009	0.008	0.010	0.010	0.009	0.008	0.010	0.010	0.009	0.009	0.010	0.009	0.065	0.064
Min	0.042	0.041	0.002	0.001	0.003	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.002	0.047	0.046
Range	0.042	0.192	0.019	0.104	0.019	0.076	0.020	0.054	0.028	0.043	0.021	0.039	0.022	0.046	0.040	0.237
Std Dev	0.006	0.008	0.003	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.006	0.009

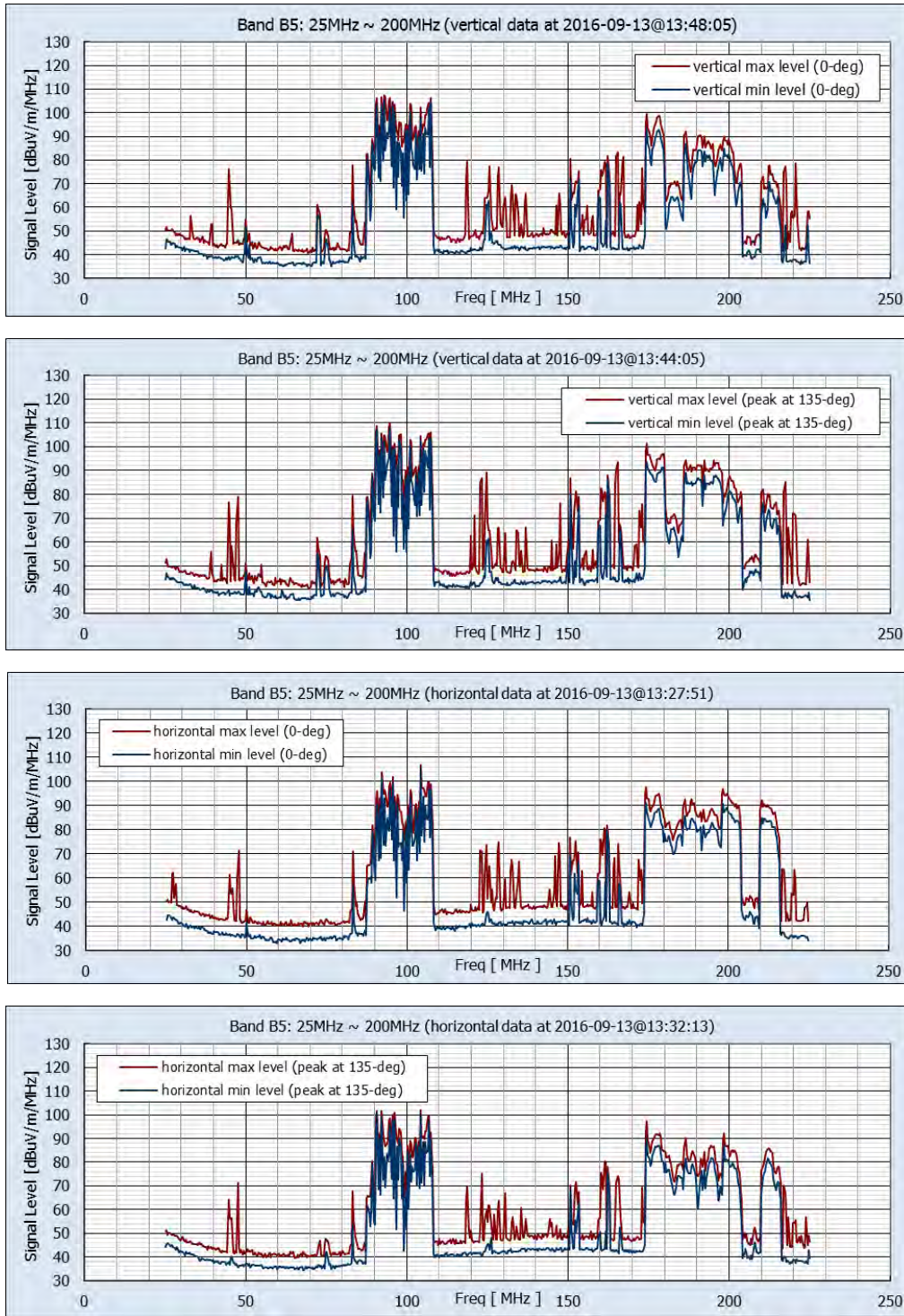
Figure A3.5-5(d)  
Location 5 (Glendale, CA): AC and DC Magnetic Field Measurement Results





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	104.6	0.0404	131.9	0.0400
B1	0.05 ~ 0.55	111.4	0.0591	127.1	0.0600
B2	0.50 ~ 3.00	131.1	0.8682	145.3	0.8682
B3	2.5 ~ 7.5	102.3	2.6091	130.7	3.4818
B4	5 ~ 30	89.5	5.0909	104.0	5.2727

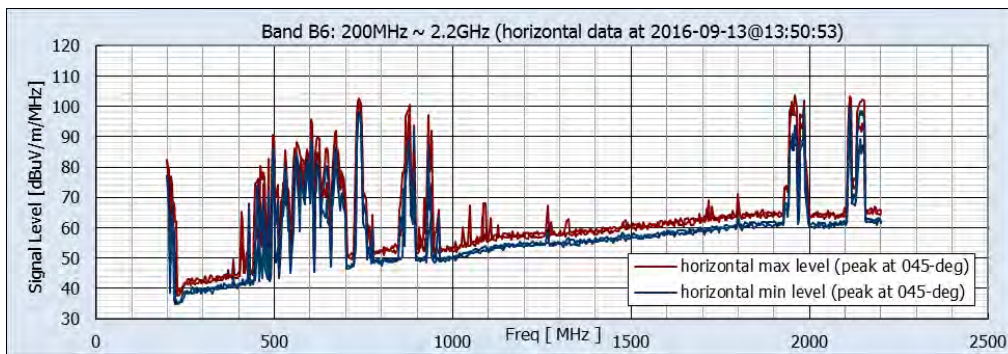
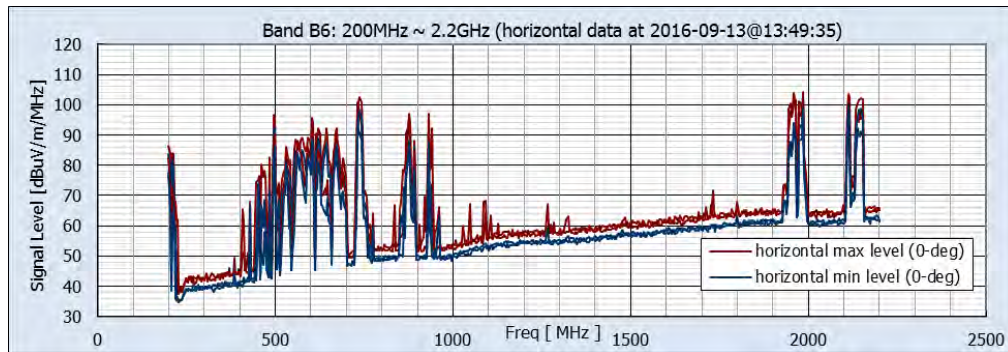
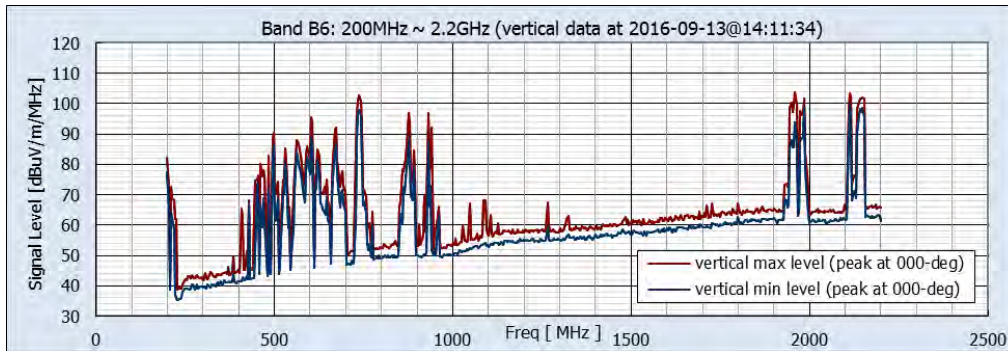
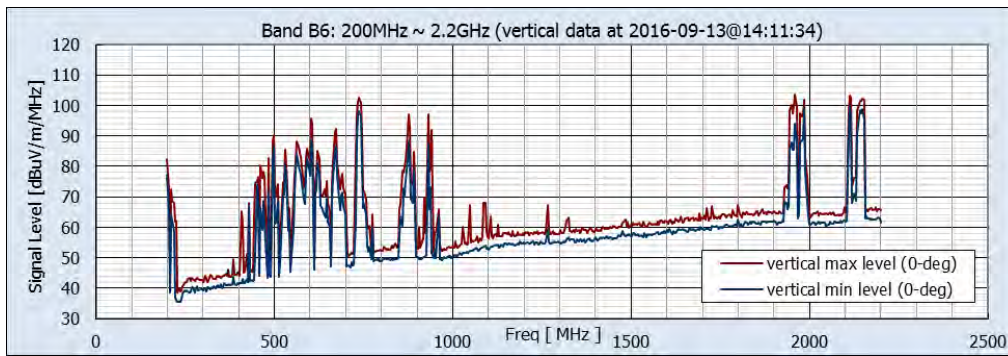
**Figure A3.5-5(e) - Location 5 (Glendale, CA): Measured Environmental RF Levels Non-Directional Data from Vertically-Oriented Monopole Antenna, Bands 0-4**



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	107.5	94.818	109.7	94.818	105.0	104.273	106.9	104.273

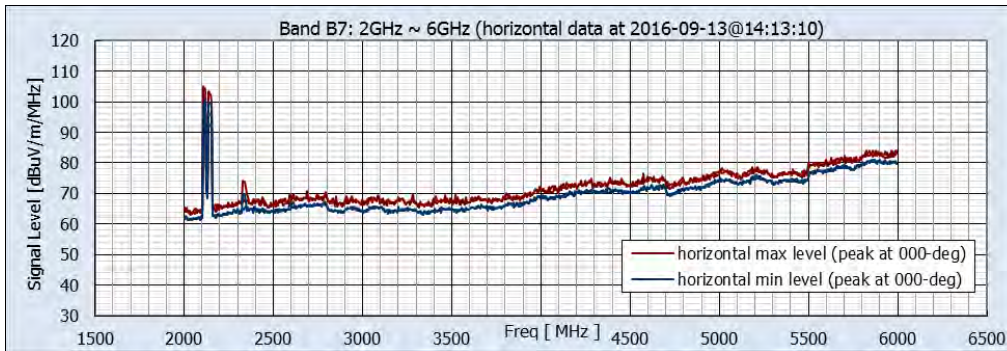
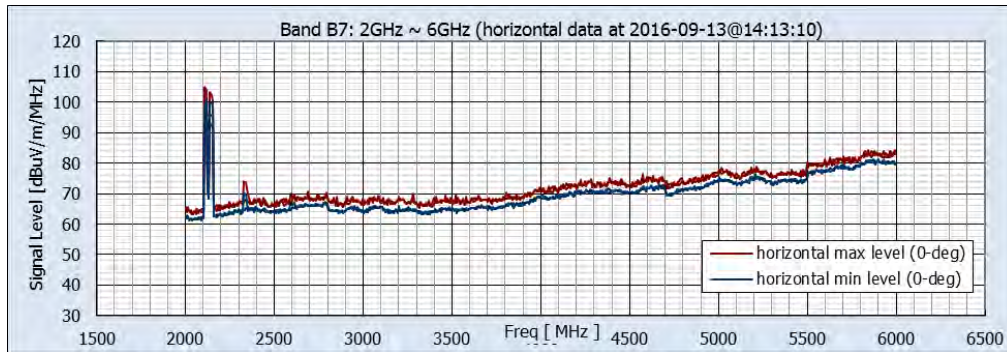
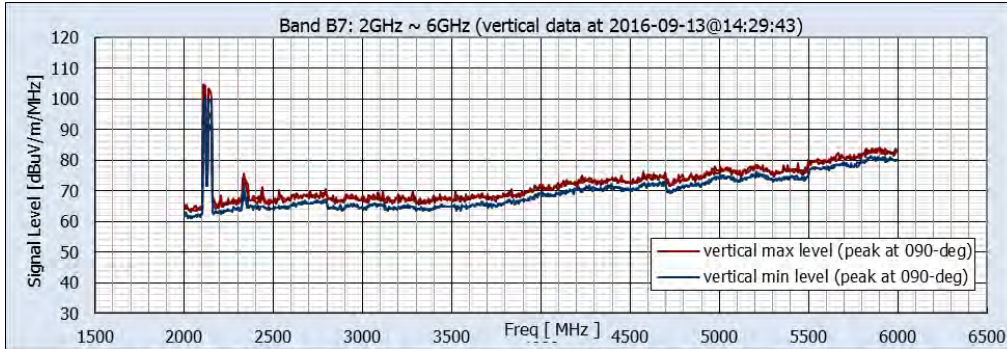
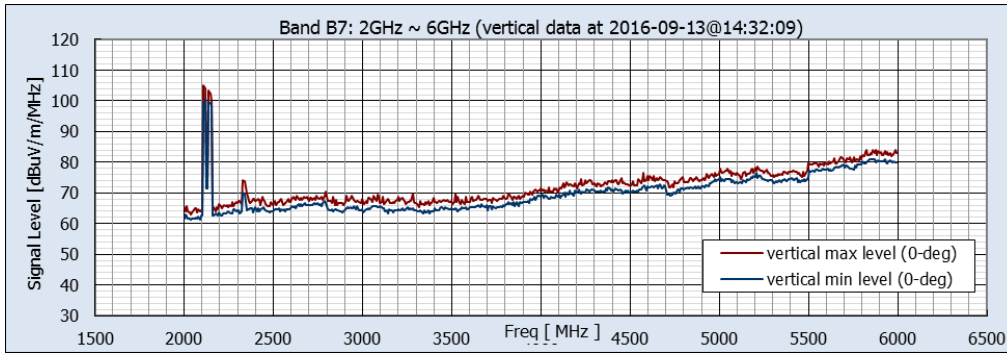
**Figure A3.5-5(f) - Location 5 (Glendale, CA): Measured Environmental RF Levels Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**





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	99.7	2112.727	103.7	1960.000	102.0	1985.455	104.3	1985.455

**Figure A3.5-5(g) - Location 5 (Glendale, CA): 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	101.5	2109.091	105.0	2109.091	94.7	2109.091	98.6	2109.091

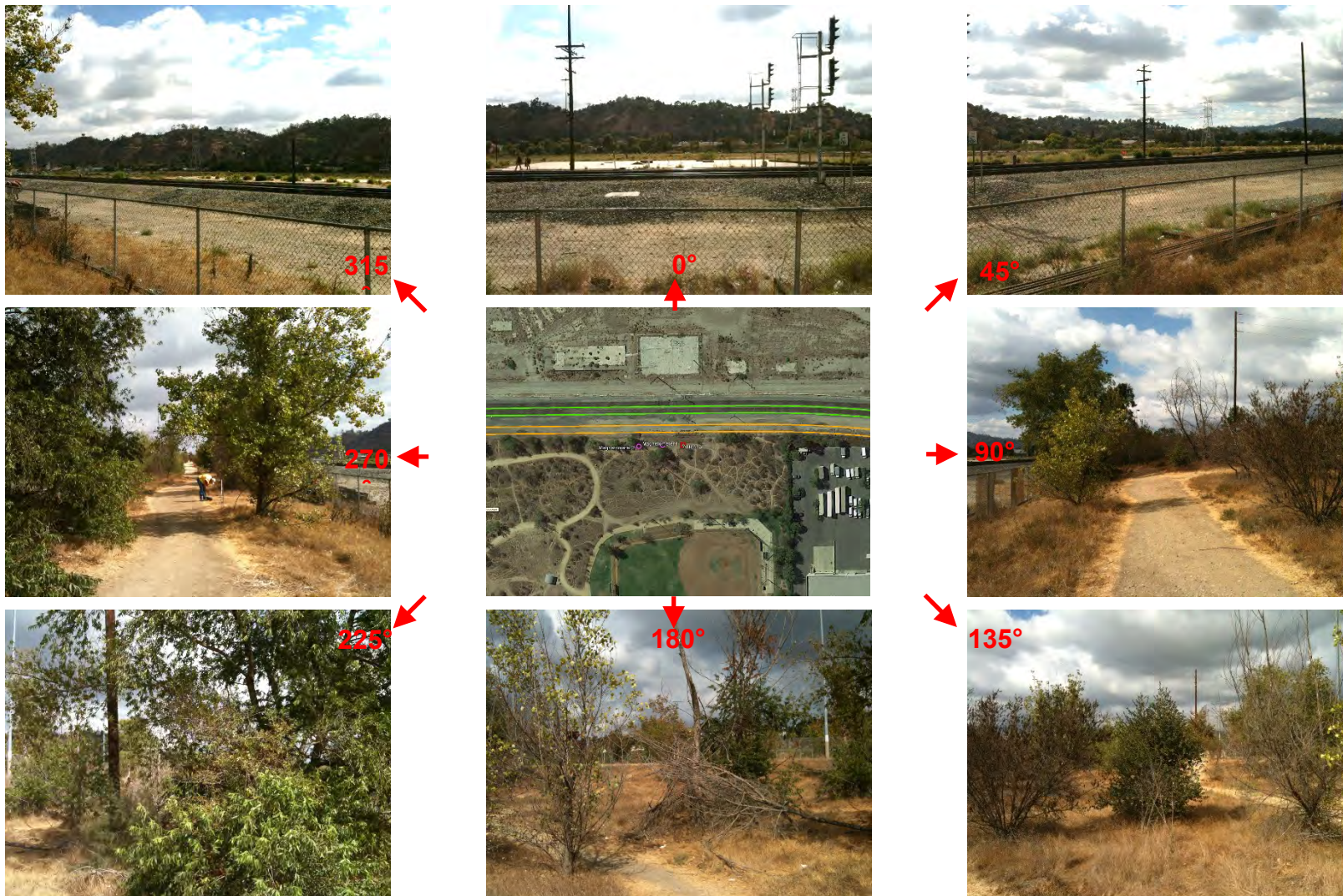
**Figure A3.5-5(h) - Location 5 (Glendale, CA): Measured Environmental RF Levels Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**





**Figure A3.5-6(a)**  
**Location 6: San Fernando Road / Macon Street, Cypress Park**  
*Open Space/Commercial location, with relatively few RF emitters (Lat 34.099254°, Lon -118.238545°)*





**Figure A3.5-6(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 lines) and measurement points (red = RF, magenta = magnetometers). The satellite view is rotated so that the image at 0° faces the alignment.*

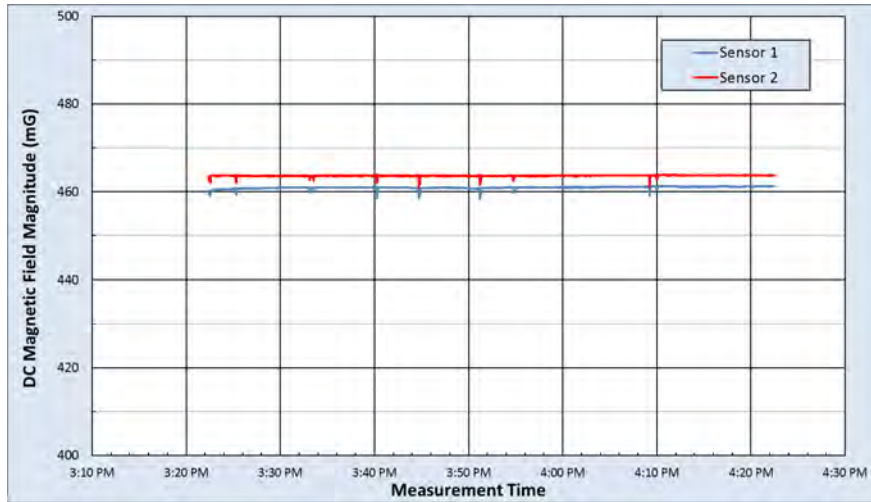




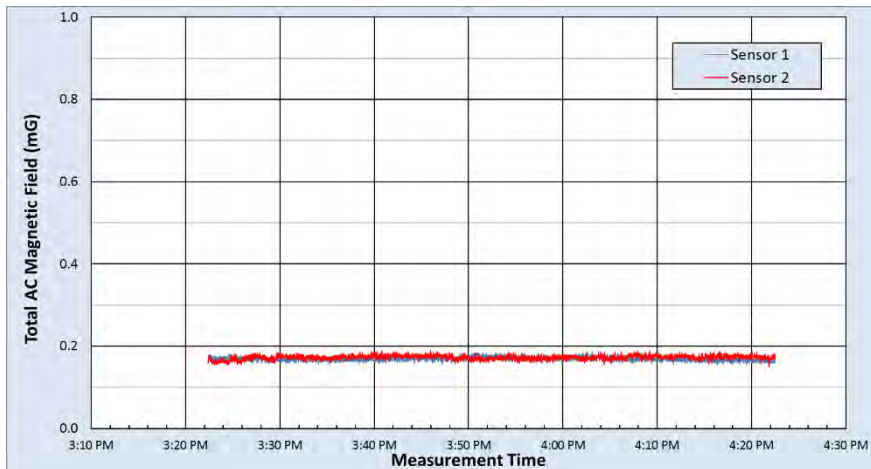
**Figure A3.5-6(c)**

**Location 6 (Cypress Park, CA): Local EMF Sources**

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



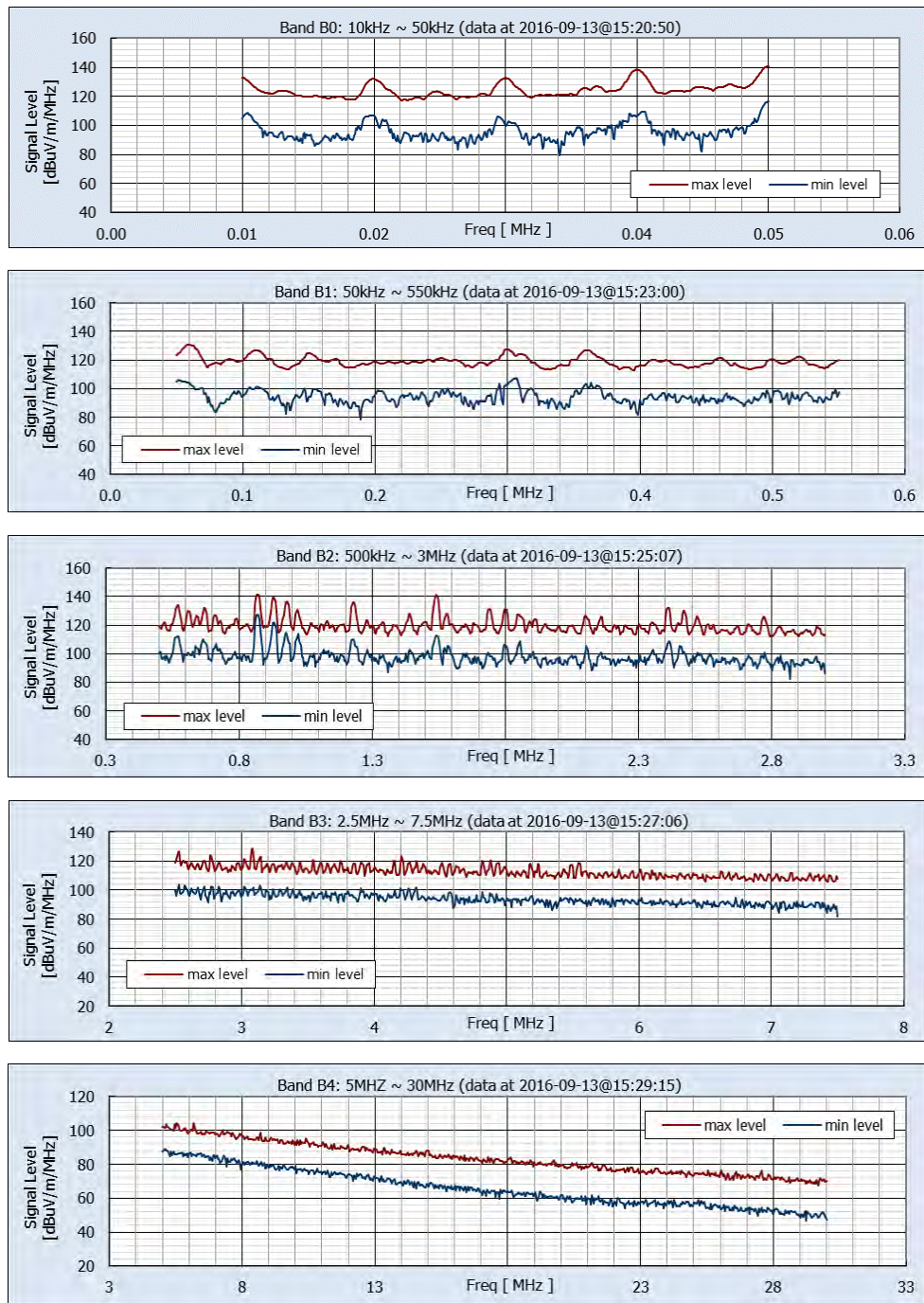
DC Magnetic Field Measurement Statistics						
	B Horizontal (mG)		B Vertical (mG)		B Total (mG)	
	Sensor 1	Sensor 2	Sensor 1	Sensor 2	Sensor 1	Sensor 2
<b>Max</b>	249.7	231.4	388.9	403.8	461.4	463.9
<b>Median</b>	248.2	229.1	388.5	403.2	461.0	463.7
<b>Min</b>	245.7	226.3	386.7	401.4	458.4	461.0
<b>Range</b>	4.0	5.1	2.2	2.4	3.0	3.0
<b>Std Dev</b>	0.4	0.4	0.2	0.2	0.2	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>	0.185	0.188	0.035	0.034	0.023	0.020	0.022	0.017	0.020	0.019	0.022	0.020	0.021	0.021	0.186	0.189
<b>Median</b>	0.168	0.172	0.009	0.009	0.010	0.009	0.009	0.008	0.009	0.009	0.009	0.009	0.010	0.009	0.169	0.173
<b>Min</b>	0.146	0.144	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.002	0.001	0.001	0.151	0.149
<b>Range</b>	0.039	0.044	0.033	0.032	0.021	0.017	0.020	0.016	0.018	0.017	0.021	0.018	0.019	0.019	0.036	0.040
<b>Std Dev</b>	0.005	0.005	0.003	0.003	0.003	0.003	0.003	0.002	0.003	0.003	0.003	0.003	0.003	0.003	0.005	0.005

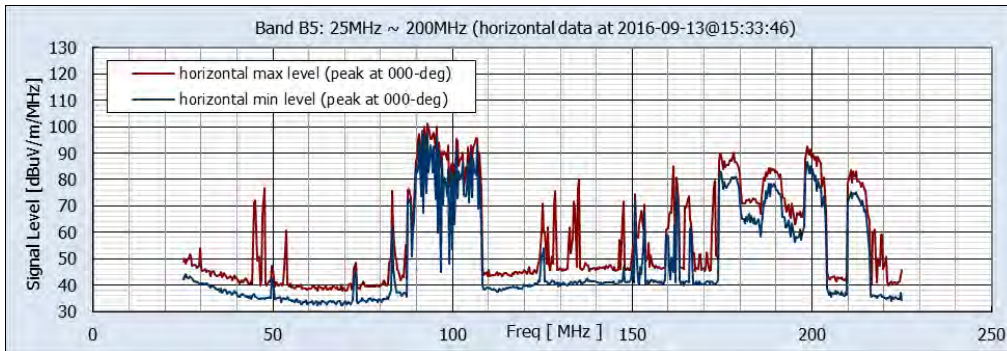
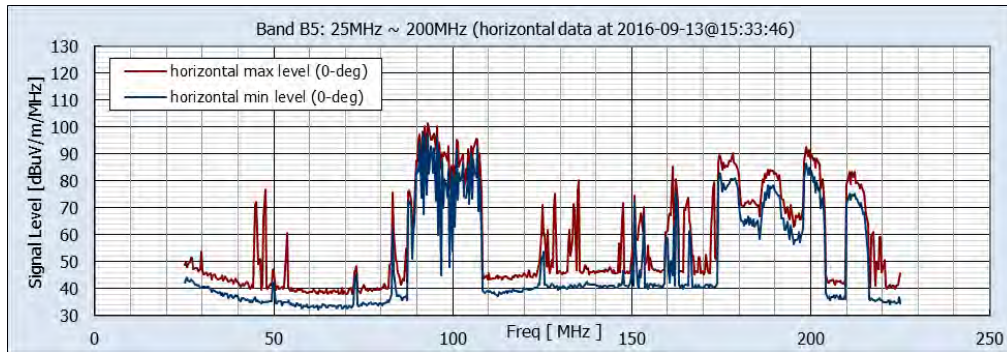
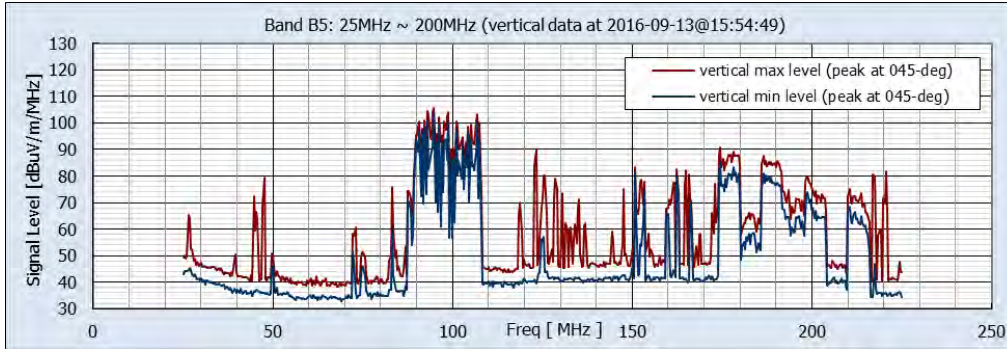
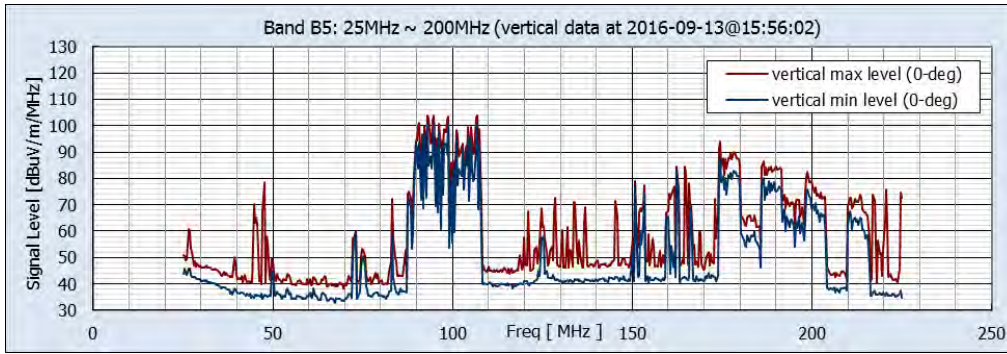
**Figure A3.5-6(d)**  
**Location 6 (Cypress Park, CA): AC and DC Magnetic Field Measurement Results**





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	116.8	0.0500	140.6	0.0500
B1	0.05 ~ 0.55	107.1	0.3064	130.7	0.0600
B2	0.50 ~ 3.00	127.1	0.8682	141.3	0.8682
B3	2.5 ~ 7.5	103.8	2.5273	128.8	3.0818
B4	5 ~ 30	89.0	5.0909	104.0	6.1818

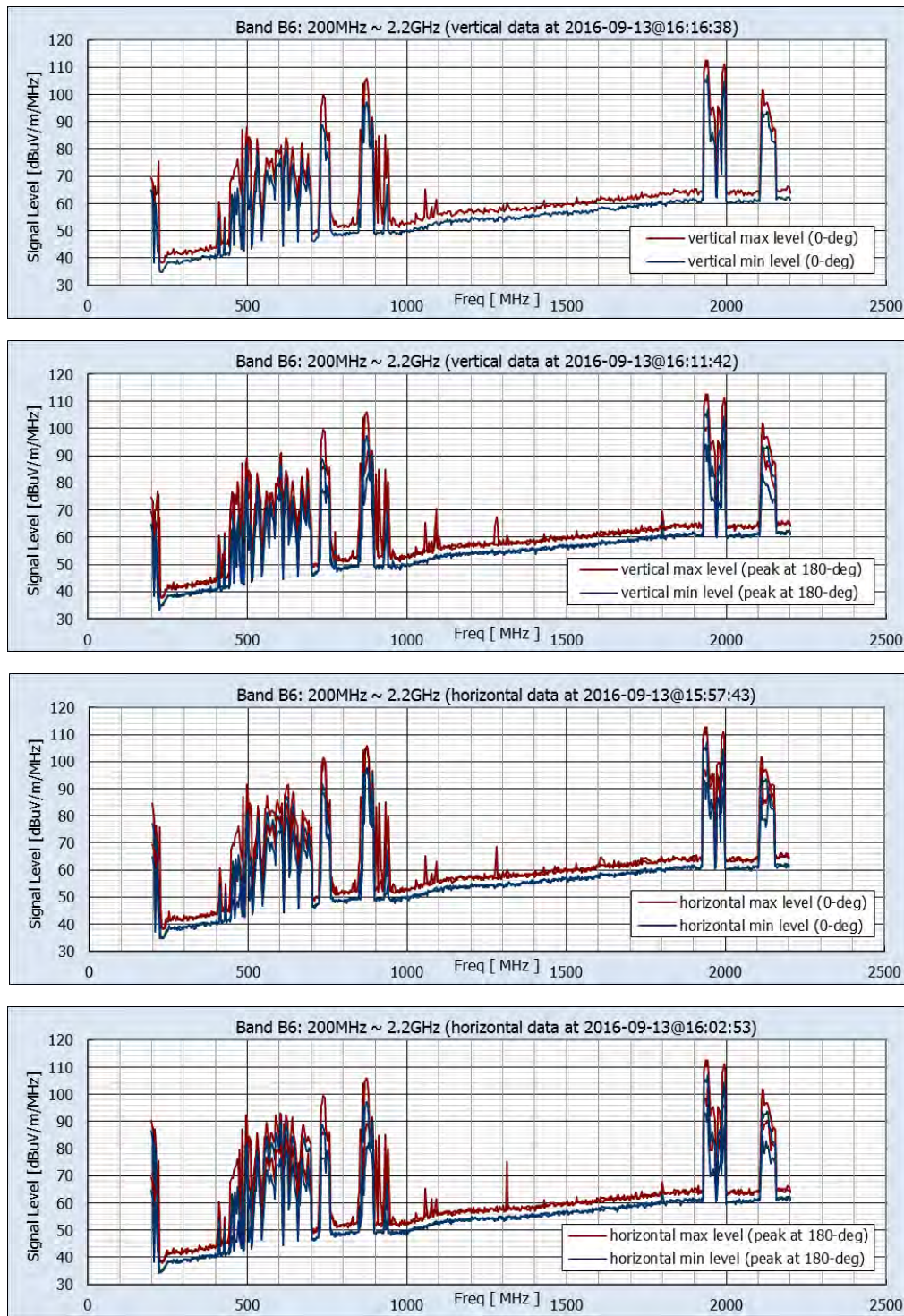
**Figure A3.5-6(e) - Location 6 (Cypress Park, CA): Measured Environmental RF Levels Non-Directional Data from Vertically-Oriented Monopole Antenna, Bands 0-4**



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	103.1	94.818	105.4	94.818	97.6	91.545	101.4	93.000

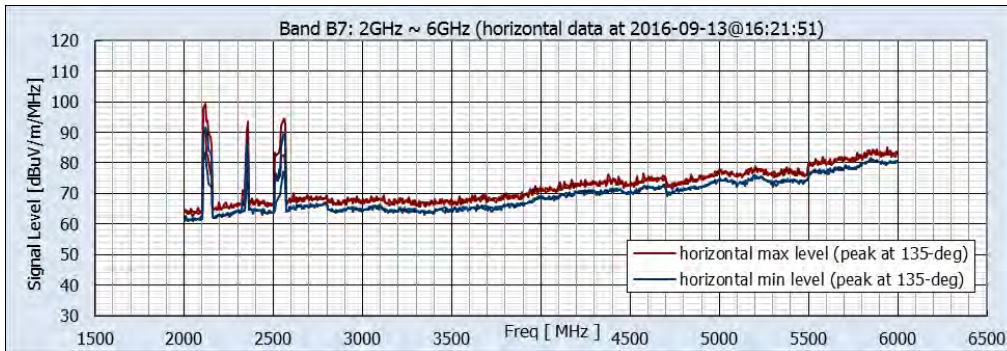
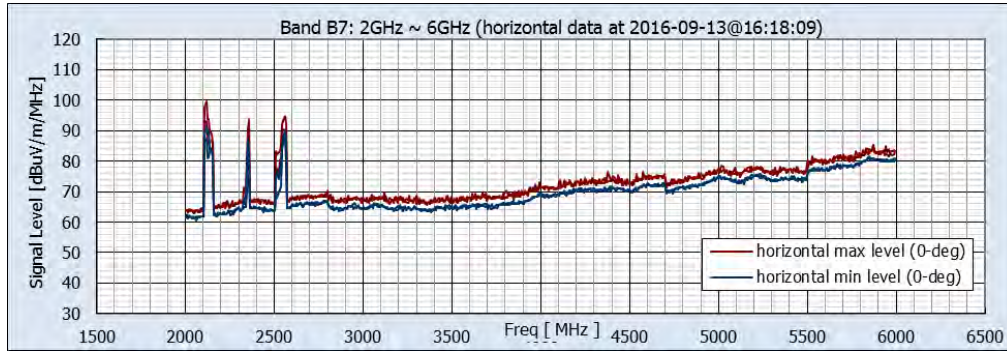
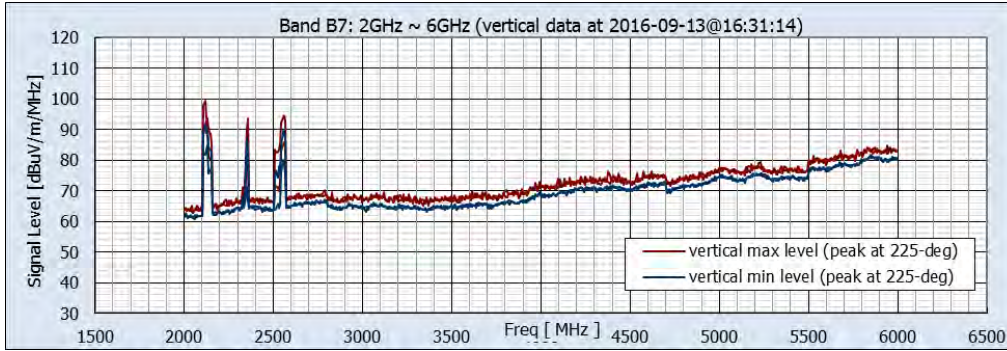
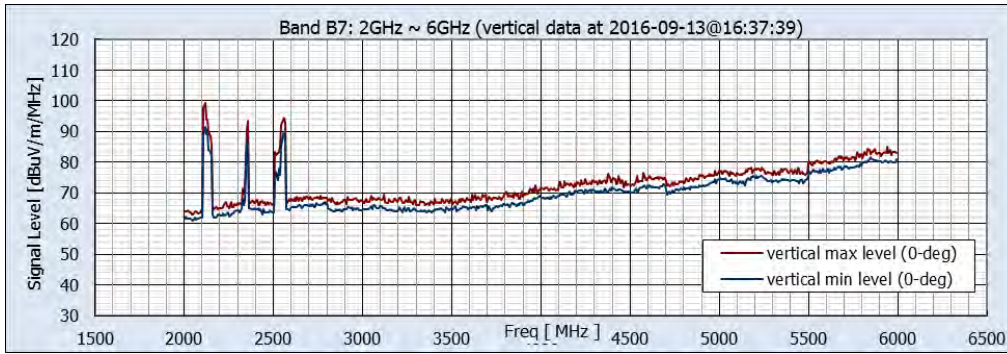
**Figure A3.5-6(f) - Location 6 (Cypress Park, CA): Measured Environmental RF Levels Band 5 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**





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	106.9	1941.818	112.7	1934.545	97.6	872.727	105.5	872.727

**Figure A3.5-6(g) - Location 6 (Cypress Park, CA): 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	91.5	2116.364	99.4	2116.364	87.6	2552.727	93.0	2116.364

**Figure A3.5-6(h) - Location 6 (Cypress Park, CA): Measured Environmental RF Levels Band 7 Vertical and Horizontal Components, Facing Alignment (0-deg) and at Peak Orientation**



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