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1. GENERAL INFORMATION

1.1 Verification of Compliance

EUT: TALELIGHT

Model: TL088A

Applicant: ULTIMATION LLC

Standards: FCC Part 15.249

Result: PASS

Tested by: ADVANCED COMPLIANCE LABORATORY

Test Completion Date: September 23, 2016

Report Number: 0048-160916-01

The above equipment was tested by Compliance Laboratory, Advanced Technologies, Inc. for compliance with the requirement set forth in the FCC & IC rules and regulations. This said equipment in the configuration described in the report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

The estimated uncertainty of the test result is given as following. The method of uncertainty calculation is provided in Advanced Compliance Lab. Doc. No. 0048-01-01.

	Prob. Dist.	Uncertainty(dB)	Uncertainty(dB)	Uncertainty(dB)
		30-1000MHz	1-6.5GHz	Conducted
Combined Std. Uncertainty u_c	norm.	± 2.36	± 2.99	± 1.83



Wei Li
Lab Manager
Advanced Compliance Lab

Date: September 23, 2016

1.2 Equipment Modifications

N/A

1.3 Product Information

System Configuration

ITEM	DESCRIPTION	ID	CABLE
Product	TALELIGHT ⁽¹⁾	FCC ID: 2AJS7-088A	
Housing	PLASTICS		
Power Supply	3.7~5VDC ⁽²⁾		
Operation Freq.	2402MHz to 2480MHz		
Max. Channel Number	40		
Channel Separation	2MHz		
Modulation	GFSK (BLE)		

(1) EUT submitted for grant.

(2) provided by internal Rechargeable battery or external AC/DC adaptor

1.4 Test Methodology

Radiated tests were performed according to the procedures in ANSI C63.4-2014/ C63.10-2013 at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The open area test site and conducted measurement facility used to collect the radiated and conducted data are located at Hillsborough, New Jersey, USA. This site is accepted by FCC to perform measurements under Part 15 or 18 (Registration # 90601) and also designated by IC as “ site IC 3130A”. The NVLAP Lab code for accreditation of FCC EMC Test Method is: 200101-0.

1.6 Test Equipment

Manufacture	Model	Serial No.	Description	Cal Due dd/mm/yy
Hewlett-Packard	HP8546A	3448A00290	EMI Receiver	15/10/16
EMCO	3104C	9307-4396	20-300MHz Biconical Antenna	15/01/17
EMCO	3146	9008-2860	200-1000MHz Log-Periodic Antenna	15/01/17
Electro-Meterics	ALR-25M/30	289	10KHz-30MHz Active Loop Antenna	28/05/17
Fischer Custom	LISN-2	900-4-0008	Line Impedance Stabilization Networks	18/03/17
Fischer Custom	LISN-2	900-4-0009	Line Impedance Stabilization Networks	24/03/17
EMCO	3115	4945	Double Ridge Guide Horn Antenna	22/01/17
Agilent	E4440A	US40420700	PSA Spectrum Analyzer	25/08/17

All Test Equipment Used are Calibrated Traceable to NIST Standards.

Standard Calibration interval: 2 year.

1.7 Statement for the Document Use

This report shall not be reproduced except in full, without the written approval of the laboratory. And this report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. & Canada Governments.

2. PRODUCT LABELING

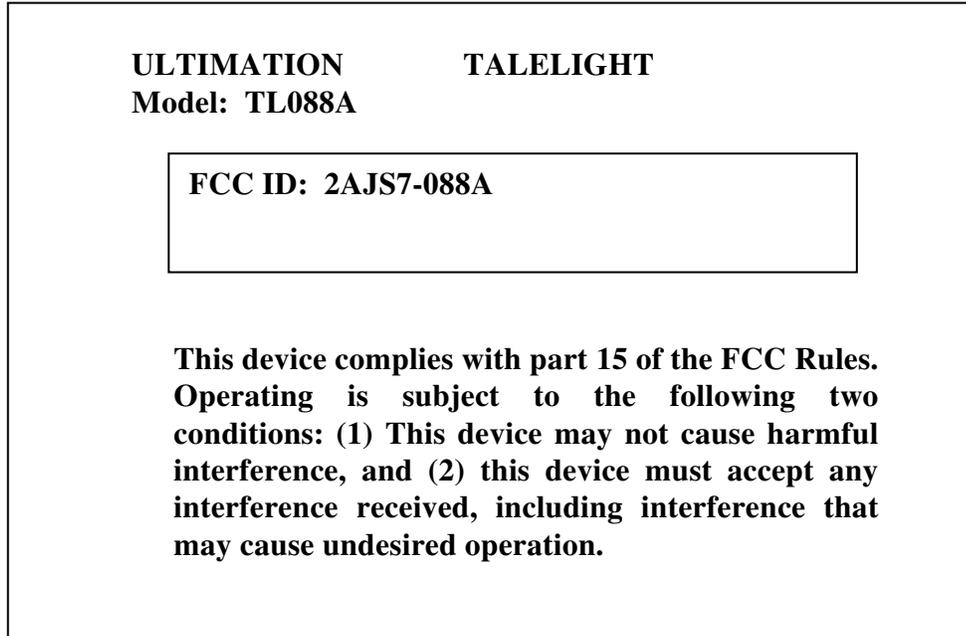


Figure 2.1 ID Label (statement shown in the manual)



Figure 2.2 ID Label Location

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The product was configured for testing in a typical fashion (as a customer would normally use it). EUT was properly orientated for being tested in the correct plane. Its antenna is permanently connected to PCB.

Testing was performed as EUT was continuously operated with modulation at the following frequency channels:

Low=2402MHz, Middle= 2440MHz, High=2480MHz.

EUT can be powered by internal rechargeable battery or external DC source. Based on pre-scan results, EUT with external DC source represents worse case and uses for final data collection.

3.2 Special Accessories

N/A

3.3 Configuration of Tested System

Figure 3.x illustrate this system, which is tested standing along.



Standard Orientation (Z)



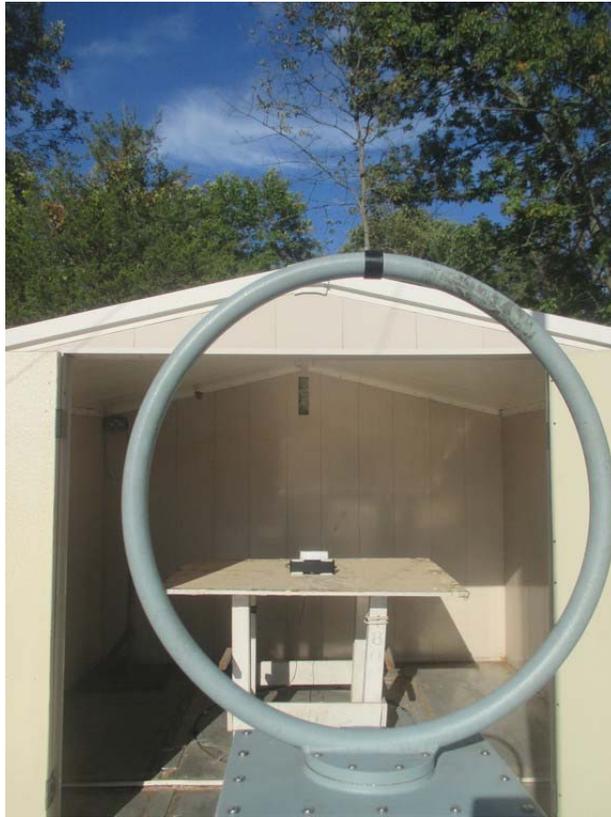


Figure 3.1 Radiated Test Setup



Figure 3.2 Conducted Test Setup

4. SYSTEM SCHEMATICS

See Attachment.

Figure 4.1 System Schematics

5. CONDUCTED EMISSION DATA

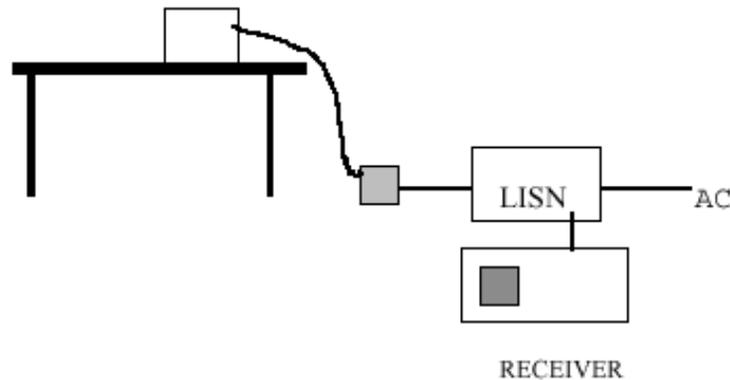
5.1 Test Methods and Conditions

The EUT was under normal operational mode during the conducted emission test. EMI Receiver was scanned from 150KHz to 30MHz with maximum hold mode for maximum emission. Recorded data was sent to the plotter to generate output in linear format. At the input of the spectrum analyzer, a HP transient limiter is inserted for protective purpose. This limiter has a 10 dB attenuation in the range of 150KHZ to 30MHZ. That factor was automatically compensated by the receiver, so the readings are the corrected readings. The reference of the plot is the CISPR 22 Class B limit in Figure 5.1 through Figure 5.2.

Conducted Emission Technical Requirements				
Frequency Range	Class A		Class B	
	Quasi-Peak dBuV	Average dBuV	Quasi-Peak DBuV	Average dBuV
150kHz -0.5MHz	79 (8912uV)	66 (1995uV)	66-56	56-46
0.5MHz-30MHz	73 (4467uV)	60 (1000uV)	---	---
0.5MHz- 5MHz	---	---	56	46 (250uV)
5MHz-30MHz	---	---	60	50

Emissions that have peak values close to the specification limit (if any) are also measured in the quasi-peak mode to determine compliance.

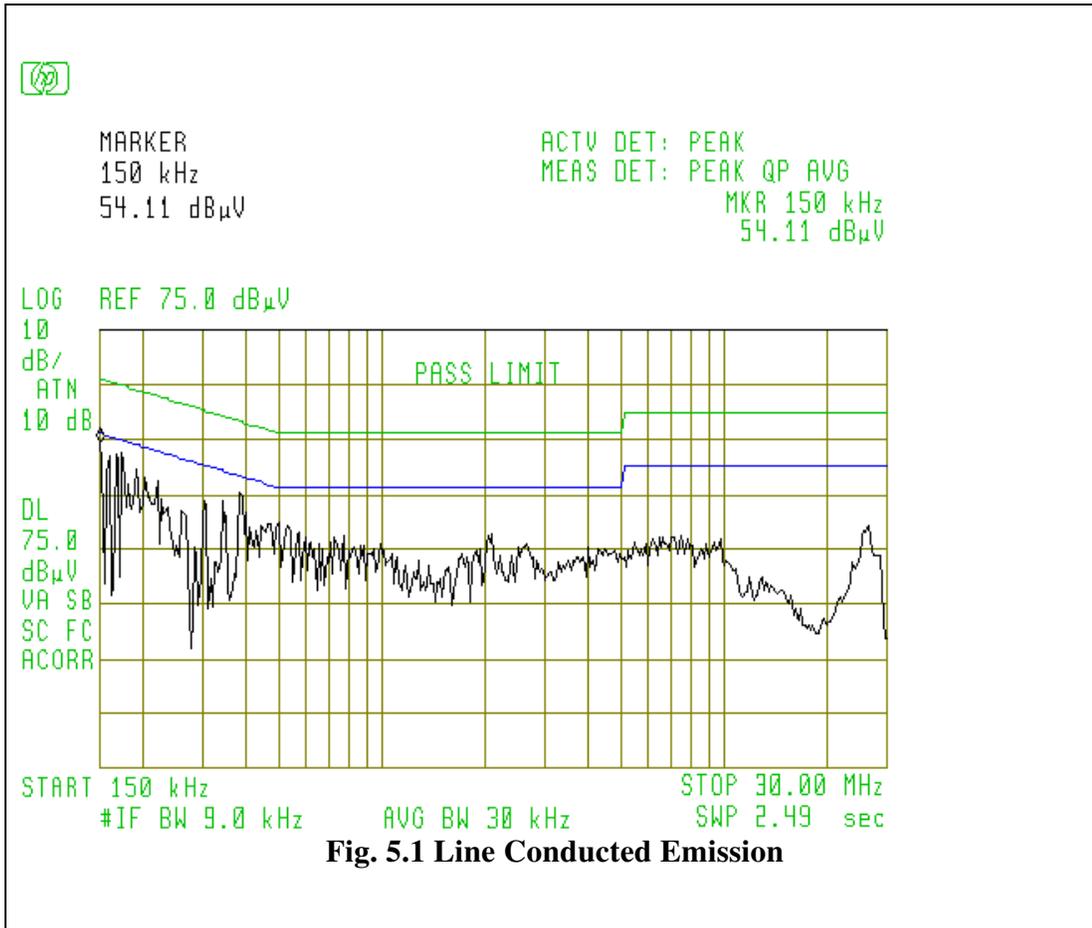
5.2 Measurement Instrument Configuration for Conducted Emission



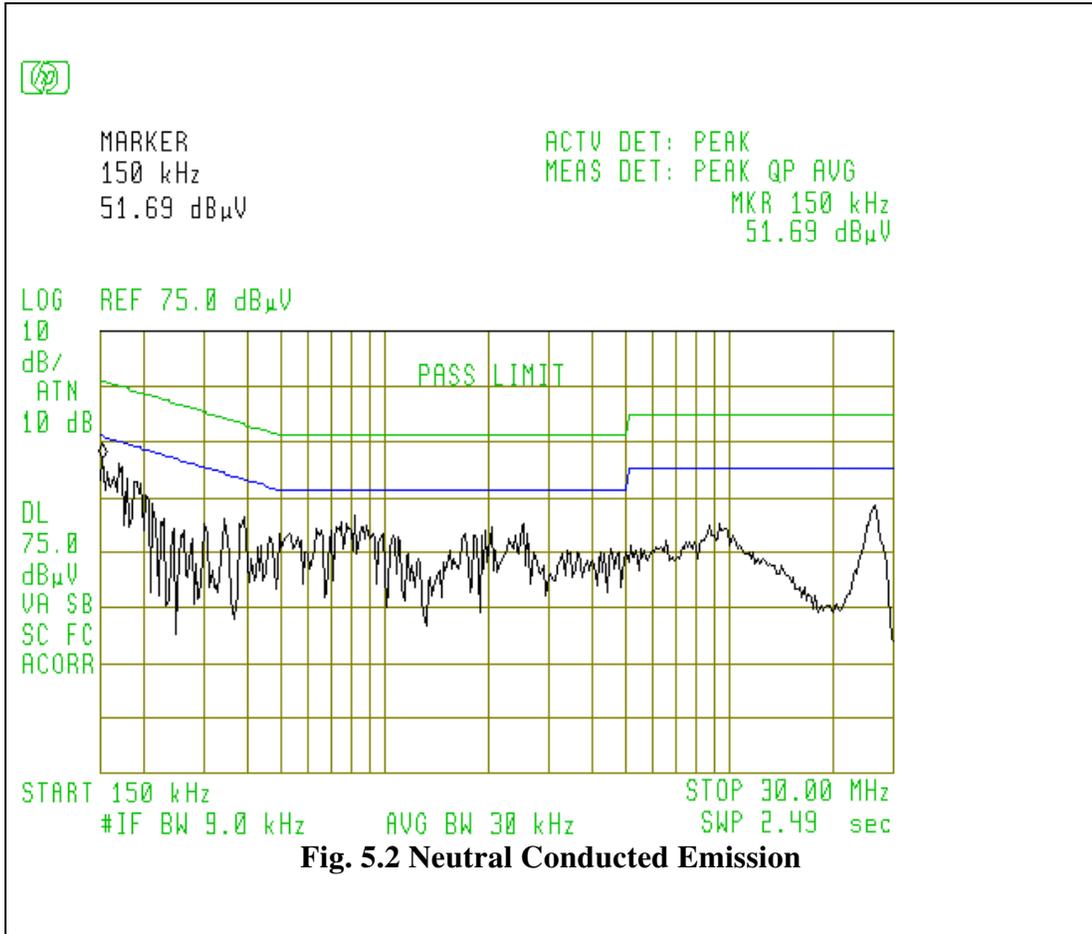
5.3 Testing Data

The following plots show the neutral and line conducted emissions for the typical operation condition (mainly for charging battery). The conducted test data shows the worst case emissions still below the FCC Part 15/CISPR22 Class B limits.

Operation Mode: Normal



Operation Mode: Normal



6. RADIATED EMISSION DATA

6.1 Field Strength Calculation

The corrected field strength is automatically calculated by EMI Receiver using following:

$$FS = RA + AF + CF + AG$$

where FS: Corrected Field Strength in dB μ V/m

RA: Amplitude of EMI Receiver before correction in dB μ V

AF: Antenna Factor in dB/m

CF: Cable Attenuation Factor in dB

AG: Built-in Preamplifier Gain in dB (Stored in receiver as part of the calibration data)

6.2 Test Methods and Conditions

The initial step in collecting radiated data is a EMI Receiver scan of the measurement range below 30MHz using peak detector and 9KHz IF bandwidth / 30KHz video bandwidth. For the range under 1GHz, 120KHz IF bandwidth / 120KHz video bandwidth are used. Both bandwidths are 1MHz for above 1GHz measurement. The frequency range from the lowest clock frequency in EUT circuitry to 10th harmonics were investigated.

6.3 Test Data

The following data lists the significant emission frequencies, polarity and position, peak reading of the EMI Receiver, the FCC limit, and the difference between the peak reading and the limit. Explanation of the correction and calculation are given in section 6.1.

Test Personnel: 

Typed/Printed Name: Edward Lee

Date: September 23, 2016,

Radiated Test Data for Fundamental and Harmonics per 15.249 (CH-2402MHz/2440MHz/2480MHz)

Low Channel: 2402MHz, Z - Orientation

Freq.(4) (MHz)	Worst H/V, Z(1)	Height. (m)	Azimuth	Peak@3m (2) (dBuV/m)	QP/Avg @3m (dBuV/m)	PK Lim (3)(dB uV/m)	QP /Avg. Lim (1) (dBuV/m)	PK Mar (dBuV/ m)	QP /Avg.Mar. (dBuV/m)
2402	H	1.1	160	86.7		114	94	-27.3	-7.3
4804	H	1.1	160	46.1		74	54	-27.9	-7.9
7206	H	1.1	160	43.5		74	54	-30.5	-10.5
2402	V	1.0	180	90.4		114	94	-23.6	-3.6
4804	V	1.0	180	48.0		74	54	-26	-6
7206	V	1.0	180	44.2		74	54	-29.8	-9.8

Middle Channel: 2440MHz, Z - Orientation

Freq.(4) (MHz)	Worst H/V, Z(1)	Height. (m)	Azimuth	Peak@3m (2) (dBuV/m)	QP/Avg @3m (dBuV/m)	PK Lim (3)(dB uV/m)	QP /Avg. Lim (1) (dBuV/m)	PK Mar (dBuV/ m)	QP /Avg.Mar. (dBuV/m)
2440	H	1.1	160	87.6		114	94	-26.4	-6.4
4880	H	1.1	160	47.3		74	54	-26.7	-6.7
7320	H	1.1	160	43.8		74	54	-30.2	-10.2
2440	V	1.0	180	91.3		114	94	-22.7	-2.7
4880	V	1.0	180	49.2		74	54	-24.8	-4.8
7320	V	1.0	180	44.5		74	54	-29.5	-9.5

High Channel: 2480MHz, Z - Orientation

Freq.(4) (MHz)	Worst H/V, Z(1)	Height. (m)	Azimuth	Peak@3m (2) (dBuV/m)	QP/Avg @3m (dBuV/m)	PK Lim (3)(dB uV/m)	QP /Avg. Lim (1) (dBuV/m)	PK Mar (dBuV/ m)	QP /Avg.Mar. (dBuV/m)
2480	H	1.1	160	88.3		114	94	-25.7	-5.7
4960	H	1.1	160	48.2		74	54	-25.8	-5.8
7440	H	1.1	160	43.7		74	54	-30.3	-10.3
2480	V	1.0	180	92.1		114	94	-21.9	-1.9
4960	V	1.0	180	49.9		74	54	-24.1	-4.1
7440	V	1.0	180	45.0		74	54	-29	-9

(1) The limit for emissions within the 2400-2483.5MHz band is 50mV(94dB) per FCC Sec. 15.249 & IC RSS-210 Annex 2.9. The limit for its harmonics is 500uV (54dB). Other spurious emissions shall be lower than either its fundamental by 50dB or the limit defined in Sec. 15.209, whichever is higher.

(2) If the peak reading is less than the FCC/IC quasi-peak or average limit, it'll be not necessary to show the measured/ calculated quasi-peak or average reading.

(3) For above 1GHz range, peak reading shall meet the limit: average Limit+20dB.

(4) Comparing to the limit defined in FCC Sec. 15.249, emissions below the limit by 20dB were not recorded.

Other Spurious (non-harmonics) outside of 2400-2483.5MHz band per 15.209

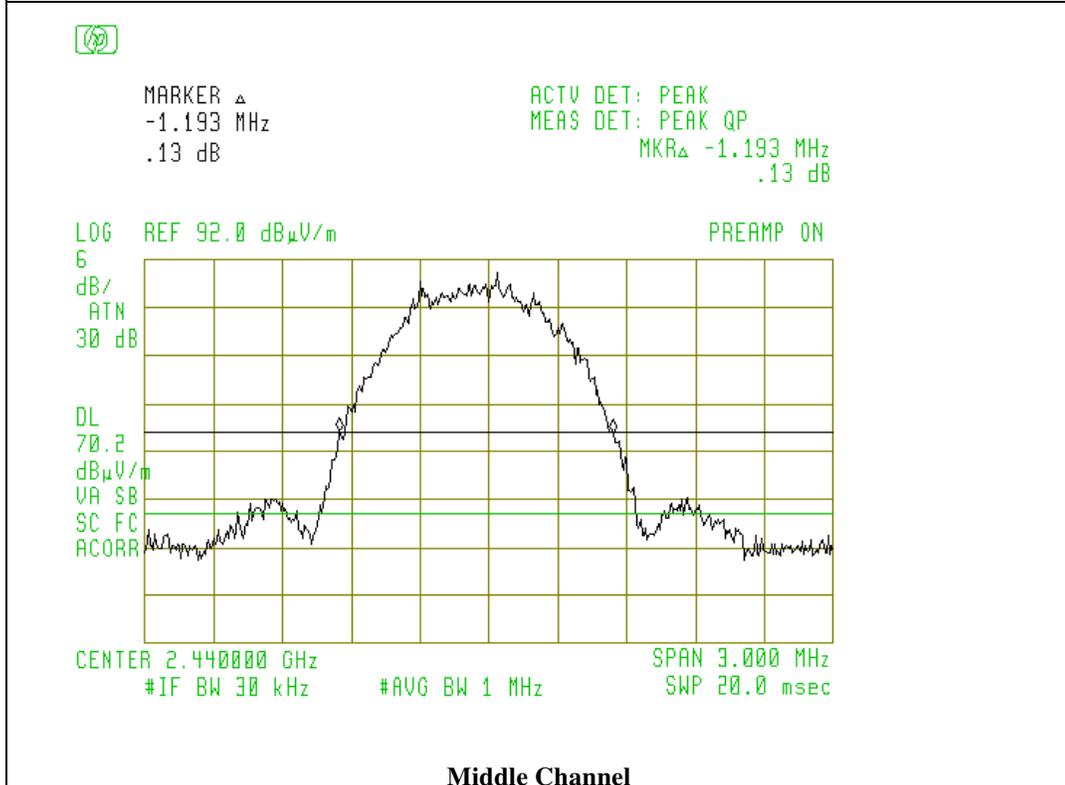
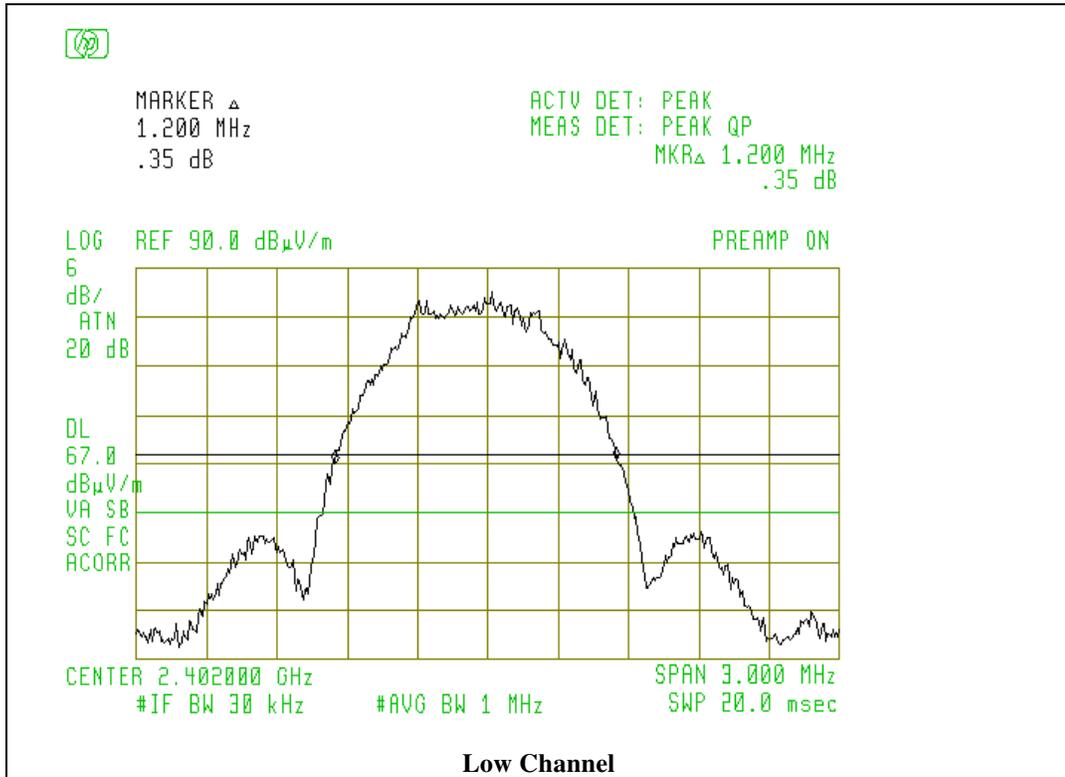
(Transmitting & Receiving Modes)**

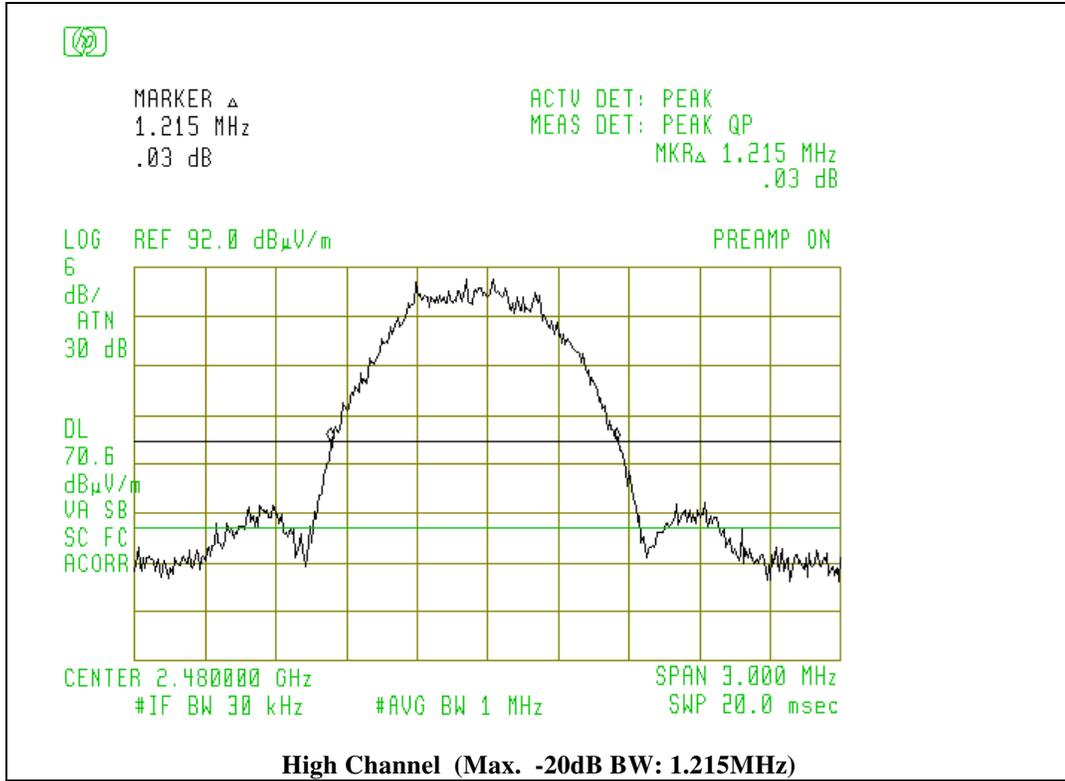
Frequency (MHz)	Polarity (V,H) Position (Z)	Antenna Height (m)	Azimuth (Degree)	Peak Reading at 3m (2) (dBuV/m)	QP/Average Reading (dBuV/m)	FCC 3m Limit (1) (dBuV/m)	Difference (dBuV/m)
47.4	H	1.8	110	30.6		40	-9.4
54.7	H	1.7	95	33.8		40	-6.2
115.9	H	1.8	100	32.0		43.5	-11.5
174.9	H	1.6	120	35.2		43.5	-8.3
240.0	H	1.2	160	32.5		46.5	-14
280.0	H	1.2	180	36.1		46.5	-10.4
300.0*	H	1.3	155	40.2		46.5	-6.3
320.0	H	1.3	160	43.5	35.2	46.5	-11.3
420.0	H	1.2	165	35.7		46.5	-10.8
2399.9*	H	1.1	180	52.7	49.5	54.0	-4.5
2483.6*	H	1.1	180	53.2	50.1	54.0	-3.9
40.2	V	1.2	190	32.7		40.0	-7.3
48.3	V	1.2	190	36.0		40.0	-4
115.0	V	1.1	210	35.2		43.5	-8.3
120.0	V	1.2	210	36.1		43.5	-7.4
140.0*	V	1.2	220	40.4	37.2	43.5	-6.3
160.0	V	1.1	200	38.4		43.5	-5.1
200.0	V	1.1	190	36.6		43.5	-6.9
240.0	V	1.1	190	32.5		46.5	-14
300.0	V	1.2	180	34.7		46.5	-11.8
600.0	V	1.0	170	37.1		46.5	-9.4
860.0	V	1.0	240	40.6		46.5	-5.9
2399.9*	V	1.0	180	54.8	51.6	54.0	-2.4
2483.6*	V	1.0	180	55.7	52.5	54.0	-1.5

* If the peak reading is less than the FCC/IC quasi-peak or average limit, it'll be not necessary to show the measured/ calculated quasi-peak or average reading.

**Comparing to the limit defined in FCC Sec. 15.209, emissions below the limit by 20dB were not recorded. Per prescan results, non-harmonics spurious with Transmitting mode are higher than those with receiving mode and they are chosen for final data record.

6.4 Occupied Bandwidth





6.1 Occupied Bandwidth