Lab Code: 200167-0

FCC PART 15.247

MEASUREMENT AND TEST REPORT

For

Trimble Navigation Ltd.

935 Stewart Drive
Sunnyvale, CA 94085, USA

FCC ID: JUP-59646
Model: SNR910 + 2.4 GHz

Report Type:	**Product Type:**
☒Original Submission: Supplemental Report	Modular GPS Receiver with 900 & 2400 MHz FHSS Transceivers
Test Engineer:	Dan Coronia 
Report Number:	R0704044-247
Report Date:	2007-05-08
Reviewed By:	Daniel Deng: RF Engineering Lead 
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1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The *Trimble Navigation Ltd.* product, FCC ID: JUP-59646, model: SNR910 + 2.4 GHz, or the "EUT" as referred to in this report, is a GPS receiver plus 900/2400 MHz FHSS transceiver combo used in the construction industry. The 2400 MHz transceiver uses 75 channels for frequency hopping in the 2400 to 2483.5 MHz band and for 900 MHz uses 50 channels for frequency hopping in the 902 to 928 MHz band. The lowest channel for 2400 MHz is centered at 2401.530 and for 900 MHz is centered at 902.625 MHz. The highest channel for 2400 MHz is centered at 2469.750 and for 900 MHz is centered at 927.585 MHz. The transmitter uses direct BPSK modulation.

The primary functional purpose of the EUT radio is:

1. Receive GNSS corrections from base station and communicate to on-board control and display systems
2. Communicate two-way ATS command and location information
3. Communicate two-way data transfer from office to the machine for AccuGrade and CAES systems

1.2 Antennae Description

The antennae used are portable, center fed monopole omnidirectional antennae.

Item Number	Model/Type	
Antenna 1.	Model:	Antenna Mobile
	Manufacturer:	SAS (Signal Antenna Systems, Inc.)
	Frequency Range:	Dual Frequency: 902-928 MHz; 2.4 – 2.5 GHz
	Maximum Antenna Gain:	2 dBi at 915 MHz; 2 dBi at 2.5 GHz
	Antenna Type	Monopole omni
	Measurement:	23 cmH
Antenna 2.	Model:	SPDA17918
	Manufacturer:	Radiall Larsen
	Frequency Range:	890-960 MHz
	Maximum Antenna Gain:	2.14 dBi
	Antenna Type	Monopole omni
	Measurement:	23 cmH

1.3 Mechanical Description of EUT

The Trimble Navigation product, FCC ID: JUP-59646 measures approximately *178 mm (L) x 178 mm (W) x 64 mm (H)* and weighs approximately 2.7 kg. It is of metallic construction.

** The test data gathered are from typical production sample, serial number: 0827J00003 assigned by Manufacturer*

1.4 EUT Photograph

Please refer to Exhibit C for more EUT photographs

1.5 Objective

This report is prepared on behalf of *Trimble Navigation* in accordance with Part 2, Subpart J, Part 15, Subpart and C.

The objective of the manufacturer is to demonstrate compliance with RSS-210, Issue 6 for this device. The EUT has integrated into its design two FHSS radio modules already tested for compliance and submitted to the FCC under FCC ID's JUP-59645, and HSW-2410G, thus the testing in this report concerns the compilation of these modules along with a GPS receiver into the device herein featured. Only those tests affected by this assemblage (bold face type blow) are herein conducted and recorded; for all other test results please see those submission and reports mentioned in the following subsection.

Antenna Requirement
Conducted Emissions**
Radiated Emissions
Hopping Channel Separation*
Channel Bandwidth*
Number of Hopping Frequencies Used*
Dwell Time of Each Frequency*
Maximum Peak Output Power*
100 kHz Bandwidth of Frequency Band Edge*
RF Exposure*
Spurious Emissions at Antenna Terminals*

**Please see related test reports for details*
***N/A to this device*

1.6 Related Submittal(s)/Grant(s)

Please refer to FCC submissions for products FCC ID: JUP-59645 (BACL report number R0703211-247), and HSW-2410G (US Tech report number: 05-0311 prepared for Cirronet) for measurements and test results pertaining to 900 MHz and 2.4 GHz frequency hopping spread spectrum transceiver portions of this EUT.

1.7 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.4-2003.

1.8 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values range from $\pm$2.0 for Conducted Emissions tests and $\pm$4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL.

Detailed instrumentation measurement uncertainties can be found in BACL report QAP-018.

1.9 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test sites at BACL have been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission, Industry Canada, and Voluntary Control Council for Interference has the reports on file and is listed under FCC registration number: 90464, IC registration number: 3062A, and VCCI Registration Number: C-2463 and R-2698. The test site has been approved by the FCC, IC, and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

2 SYSTEM TEST CONFIGURATION

2.1 Justification

The EUT was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the engineering operating mode to represent *worst*-case results during the final qualification test.

2.2 EUT Exercise Software

The software is provided by customer. The EUT exercise program used during radiated testing was designed to exercise the system components.

2.3 Special Accessories

As shown in following test block diagram, all interface cables used for compliance testing are shielded.

2.4 Equipment Modifications

No modifications were made to the EUT.

2.5 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Dell	Laptop	PP11L	8273581345

2.6 Power Supply Lines

Manufacturer	Description	Model	Serial Number
Samlex Electric Company Limited	Regulated DC Power Supply	RPS 1204	01021-0406

2.7 Internal Configuration

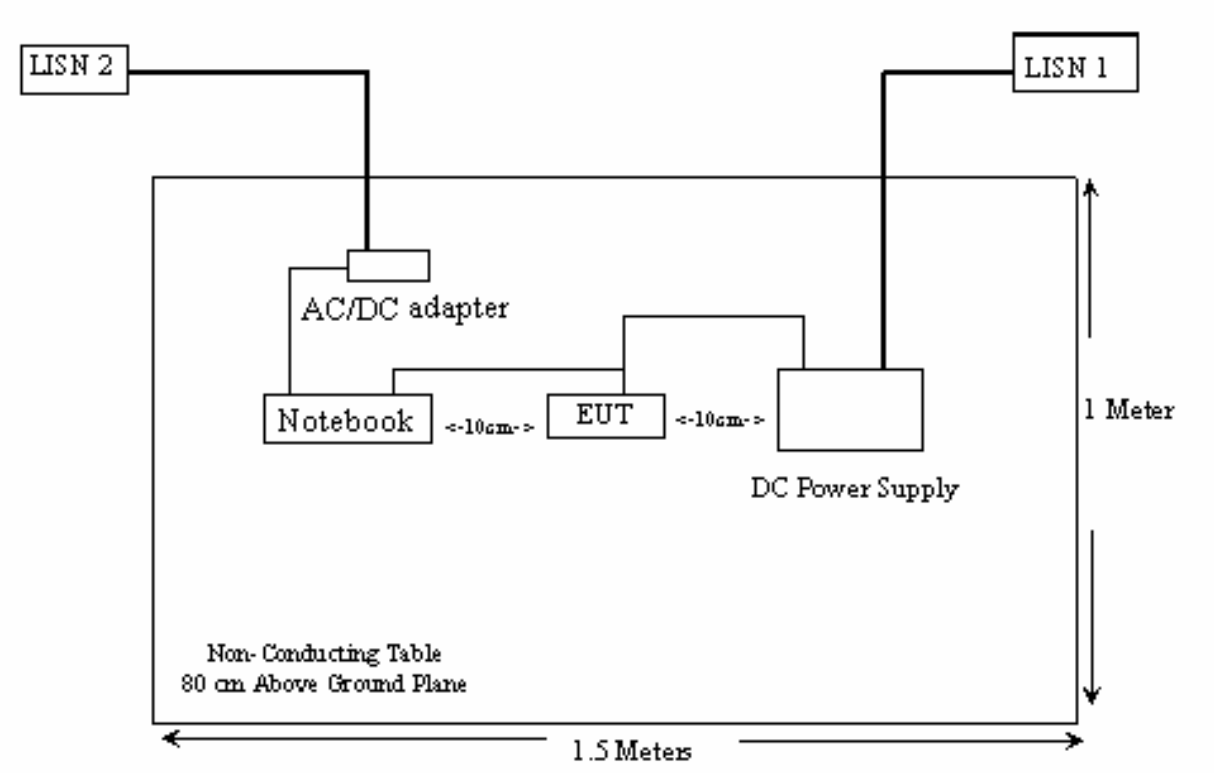
Manufacturer	Description	Part Number	Rev
Trimble Navigation	Control Board	58480-00-B	4
Trimble Navigation	RF Board	56889-00-C	1

2.8 Interface Ports and Cabling

Cable Description	Length (m)	From	To
Serial Cable	< 3m	EUT	Laptop

2.9 Test Setup Block Diagrams

Radiated Emissions



3 SUMMARY OF TEST RESULTS FOR FCC PART 15

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirement	Compliant
§ 15.207 (a)	Conducted Emissions	NA*
§15.205, §15.209 & §15.247(c)	Radiated Emissions	Compliant
§15.247 (a) (1)	Hopping Channel Separation	Compliant, Please refer to FCC ID: **JUP-59645** for 900 MHz, FCC ID: **HSW-2410G** for 2400 MHz
§15.247 (a) (1) (i)	Channel Bandwidth	Compliant, Please refer to FCC ID: **JUP-59645** for 900 MHz, FCC ID: **HSW-2410G** for 2400 MHz
§15.247 (a) (1) (iii)	Number of Hopping Frequencies Used	Compliant, Please refer to FCC ID: **JUP-59645** for 900 MHz, FCC ID: **HSW-2410G** for 2400 MHz
§15.247 (a) (1) (iii)	Dwell Time of Each Frequency	Compliant, Please refer to FCC ID: **JUP-59645** for 900 MHz, FCC ID: **HSW-2410G** for 2400 MHz
§15.247 (b)(1)	Maximum Peak Output Power	Compliant, Please refer to FCC ID: **JUP-59645** for 900 MHz, FCC ID: **HSW-2410G** for 2400 MHz
§ 15.247 (c)	100 kHz Bandwidth of Frequency Band Edge	Compliant, Please refer to FCC ID: **JUP-59645** for 900 MHz, FCC ID: **HSW-2410G** for 2400 MHz
§15.247(e)(i) §2.1091	RF Exposure	Compliant, Please refer to FCC ID: **JUP-59645** for 900 MHz, FCC ID: **HSW-2410G** for 2400 MHz
§15.247(d) § 2.1051	Spurious Emissions at Antenna Terminals	Compliant, Please refer to FCC ID: **JUP-59645** for 900 MHz, FCC ID: **HSW-2410G** for 2400 MHz

*Note: The EUT is powered by DC power supply and does not require conducted emissions testing.

4 §15.203 - ANTENNA REQUIREMENT

4.1 Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, §15.213, §15.217, §15.219, or §15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

4.2 Result

The antennae, model: SPDA17918 and model: Antenna Mobile for this device are, center fed monopole whip antennae with TNC (reverse polarity) connectors and a maximum gain of 2.14 dBi and 2 dBi respectively.

☒ **Compliant** ☐ **N/A**

Please refer to the following antenna photo for details.

2dBi Antenna Mobile

2.14 dBi PDA17RP918 890-

§15.205, §15.209 & §15.247 - RADIATED EMISSIONS

5.1 Applicable Standard

FCC §15.205 Restricted bands of operation

(a) Except as shown in 15.205 paragraphs (d), only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	MHz	GHz	GHz
0.090 – 0.110	8.291 – 8.294	16.69475 – 16.69525	156.7 – 156.9	1435 – 1626.5	3.332 – 3.339	10.6 – 12.7
0.495 – 0.505	8.362 – 8.366	25.5 – 25.67	162.0125 –167.17	1645.5 – 1646.5	3.3458 – 3.358	13.25 – 13.4
2.1735 – 2.1905	8.37625 – 8.38675	37.5 – 38.25	167.72 – 173.2	1660 – 1710	3.600 – 4.400	14.47 – 14.5
4.125 – 4.128	8.41425 – 8.41475	73 – 74.6	240 – 285	1718.8 – 1722.2	4.5 – 5.15	15.35 – 16.2
4.17725 – 4.17775	12.29 – 12.293	74.8 – 75.2	322 – 335.4	2200 – 2300	5.35 – 5.46	17.7 – 21.4
4.20725 – 4.20775	12.51975 – 12.52025	108 – 121.94	399.9 – 410	2310 – 2390	7.25 – 7.75	22.01 – 23.12
6.215 – 6.218	12.57675 – 12.57725	123 – 138	608 – 614	2483.5 – 2500	8.025 – 8.5	23.6 – 24.0
6.26775 – 6.26825	13.36 – 13.41	149.9 – 150.05	960 – 1240	2690 – 2900	9.0 – 9.2	31.2 – 31.8
6.31175 – 6.31225	16.42 – 16.423	156.52475 – 156.52525	1300 – 1427	3260 – 3267	9.3 – 9.5	36.43 – 36.5
						Above 38.6

(b) Except as provided in 15.205 paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

(c) Except as provided in paragraphs (d) and (e), regardless of the field strength limits specified elsewhere in this Subpart, the provisions of this Section apply to emissions from any intentional radiator.

☒ **Compliant** ☐ **N/A**

FCC §15.209 Radiated emission limits, general requirements.

(a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

*** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.*

(b) In the emission table above, the tighter limit applies at the band edges.

☒ **Compliant** ☐ **N/A**

FCC §15.247 Radiated emission limits.

(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

☒ **Compliant** ☐ **N/A**

5.2 Test Setup

The radiated emissions tests were performed in the 3-meter semi-anechoic chamber test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

5.3 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date
Spectrum Analyzer	E4440A	Agilent	MY44303352	2007-02-23
HP	Pre, Amplifier (1 ~ 26.5 GHz)	8449B	3147A00400	2006-08-21
Sonoma Instrument	Amplifier Broadband (10 KHz - 2500 MHz)	317	260407	2007-04-26
A.R.A	Antenna, Horn, DRG	DRG-118/A	1132	2005-08-17*
Sunol Science Corp.	30MHz ~ 3 GHz Antenna	JB3	A020106-3/S006628	2007-03-05

**Two year calibration cycle*

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

5.4 Environmental Conditions

Temperature:	20 °C
Relative Humidity:	59 %
ATM Pressure:	102.0 kPa

** The testing was performed by Dan Coronia on 2007-05-03 to 04*

5.5 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data were recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limits), and are distinguished with a "**QP**" in the data table.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Cord. Amp. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Cord. Amp. – Limit

Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247 standard's radiated emissions limits for class B devices, and had the worst margin of:

Mode: 900 MHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel**
-17.6	1805.2500	Horizontal	Low
-19.3	1830.7320	Vertical	Middle
-27.5	2782.7550	Vertical	High

Mode: 2400 MHz			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Channel**
-11.1	7204.5900	Vertical	Low
-11.6	9742.8400	Vertical	Middle
-10.4	9878.7202	Vertical	High

Please refer to the following tables for full test results

5.6 Spurious Radiated Emissions Test Data

Run#1 Radiated Harmonics and Spurious Emissions

1GHz – 25GHz

Low Channel: (900 MHz)

Frequency MHz	Reading (dBµV)	Azimuth Degrees	Height (m)	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC Part 15 C		Comments
									Limit (dBuV/m)	Margin (dB)	
902.6250	125.9	117	1.4	V	23.6	0.7	28.4	121.8			Fund/Peak
902.6250	125.7	83	1.2	H	23.6	0.7	28.4	121.6			Fund/Peak
902.6250	125.2	180	1.3	V	23.6	0.7	28.4	121.1			Ave
902.6250	125.1	180	1.2	H	23.6	0.7	28.4	121.0			Ave
1805.2500	46.0	245	1.1	H	24.8	1.5	35.9	36.4	54	-17.6	Ave
1805.2500	38.3	239	1.1	V	24.8	1.5	35.9	28.7	54	-25.3	Ave
2707.8750	32.0	210	1.0	V	28.9	1.5	35.5	26.9	54	-27.1	Ave
2707.8750	26.3	181	1.0	H	28.9	1.5	35.5	21.2	54	-32.8	Ave
2707.8750	47.2	210	1.0	V	28.9	1.5	35.5	42.1	74	-31.9	Peak
1805.2500	46.5	239	1.1	V	24.8	1.5	35.9	36.9	74	-37.1	Peak
1805.2500	45.3	245	1.1	H	24.8	1.5	35.9	35.7	74	-38.3	Peak
2707.8750	37.3	181	1.0	H	28.9	1.5	35.5	32.2	74	-41.8	Peak

Middle Channel: (900 MHz)

Frequency MHz	Reading (dBµV)	Azimuth Degrees	Height (m)	Polar H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC Part 15 C		Comments
									Limit (dBuV/m)	Margin (dB)	
915.3660	125.8	360	1.5	V	23.2	0.7	37.0	112.7			Fund/Peak
915.3660	125.6	321	1.1	H	23.2	0.7	37.0	112.5			Fund/Peak
915.3660	125.3	180	1.3	V	23.2	0.7	37.0	112.2			Ave
915.3660	125.2	180	1.2	H	23.2	0.7	37.0	112.1			Ave
1830.7320	44.3	270	2.4	V	24.8	1.5	35.9	34.7	54	-19.3	Ave
1830.7320	43.9	90	2.1	H	24.8	1.5	35.9	34.3	54	-19.7	Ave
2746.0980	38.5	270	2.4	V	28.9	1.5	35.1	33.8	54	-20.2	Ave
2746.0980	37.9	90	2.1	H	28.9	1.5	35.1	33.2	54	-20.8	Ave
1830.7320	48.3	160	1.5	V	24.8	1.5	35.9	38.7	74	-35.3	Peak
1830.7320	45.3	162	2.0	H	24.8	1.5	35.9	35.7	74	-38.3	Peak
2746.0980	40.3	270	2.4	V	28.9	1.5	35.1	35.6	74	-38.4	Peak
2746.0980	40.1	90	2.1	H	28.9	1.5	35.1	35.4	74	-38.6	Peak

High Channel: 900 (MHz)

Frequency MHz	Reading (dBµV)	Azimuth Degrees	Height (m)	Polar. H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC Part 15 C		Comments
									Limit (dBuV/m)	Margin (dB)	
927.5850	125.9	291	1.7	V	23.4	0.7	28.3	121.7			Fund/Peak
927.5850	125.8	255	1.3	H	23.4	0.7	28.3	121.6			Fund/Peak
927.5850	125.4	180	1.3	V	23.4	0.7	28.3	121.2			Ave
927.5850	125.3	180	1.2	H	23.4	0.7	28.3	121.1			Ave
2782.7550	31.6	297	1.0	V	28.9	1.5	35.5	26.5	54	-27.5	Ave
2782.7550	28.0	221	2.0	H	28.9	1.5	35.5	23.0	54	-31.1	Ave
1855.1700	32.5	235	1.5	V	24.8	1.5	36.3	22.4	54	-31.7	Ave
1855.1700	25.9	253	1.9	H	24.8	1.5	36.3	15.8	54	-38.2	Ave
2782.7550	38.7	194	1.8	V	28.9	1.5	35.5	33.6	74	-40.4	Peak
2782.7550	38.5	202	1.5	H	28.9	1.5	35.5	33.4	74	-40.6	Peak
1855.1700	40.3	165	1.6	V	24.8	1.5	36.3	30.2	74	-43.9	Peak
1855.1700	37.3	243	2.0	H	24.8	1.5	36.3	27.2	74	-46.8	Peak

Low Channel: (2400 MHz)

Frequency MHz	Reading (dBµV)	Azimuth Degrees	Height (m)	Polar. H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC Part 15 C		Comments
									Limit (dBuV/m)	Margin (dB)	
2401.5300	110.9	45	1.1	V	28.7	2.7	35.8	106.4			Fund/Peak
2401.5300	110.7	64	1.0	H	28.7	2.7	35.8	106.2			Fund/Peak
2401.5300	107.6	45	1.1	V	28.7	2.7	35.8	103.1			Ave
2401.5300	107.4	64	1.0	H	28.7	2.7	35.8	102.9			Ave
7204.5900	36.4	77	1.2	V	36.7	4.8	34.9	42.9	54	-11.1	Ave
9606.1200	35.4	70	1.3	V	38.1	5.5	36.9	42.1	54	-11.9	Ave
7204.5900	34.9	70	1.2	H	36.7	4.8	34.9	41.4	54	-12.6	Ave
4803.0600	37.9	101	1.2	V	32.5	3.8	34.8	39.4	54	-14.6	Ave
4803.0600	37.7	180	1.2	H	32.5	3.8	34.8	39.2	54	-14.8	Ave
9606.1200	30.0	74	1.6	H	38.1	5.5	36.9	36.7	54	-17.3	Ave
7204.5900	48.5	77	1.2	V	36.7	4.8	34.9	55.0	74	-19.0	Peak
4803.0600	52.4	101	1.2	V	32.5	3.8	34.8	53.9	74	-20.1	Peak
7204.5900	46.6	70	1.2	H	36.7	4.8	34.9	53.1	74	-20.9	Peak
9606.1200	44.7	70	1.3	V	38.1	5.5	36.9	51.4	74	-22.6	Peak
4803.0600	49.6	180	1.2	H	32.5	3.8	34.8	51.1	74	-22.9	Peak
9606.1200	42.2	74	1.6	H	38.1	5.5	36.9	49.0	74	-25.0	Peak

Middle Channel: (2400 MHz)

Frequency MHz	Reading (dBµV)	Azimuth Degrees	Height (m)	Polar. H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC Part 15 C		Comments
									Limit (dBuV/m)	Margin (dB)	
2435.7100	114.6	66	1.1	V	28.7	2.7	35.8	110.1			Fund/Peak
2435.7100	112.3	224	1.2	H	28.7	2.7	35.8	107.8			Fund/Peak
2435.7100	111.3	66	1.1	V	28.7	2.7	35.8	106.8			Ave
2435.7100	109.0	224	1.2	H	28.7	2.7	35.8	104.5			Ave
9742.8400	35.3	82	1.1	V	38.1	5.6	36.7	42.4	54	-11.6	Ave
4871.4200	40.2	155	1.2	H	32.5	3.8	34.8	41.7	54	-12.3	Ave
7307.1300	34.6	143	1.1	H	36.7	4.8	35.1	41.0	54	-13.0	Ave
4871.4200	38.1	108	1.2	V	32.5	3.8	34.8	39.7	54	-14.3	Ave
7307.1300	33.2	24	1.2	V	36.7	4.8	35.1	39.6	54	-14.4	Ave
9742.8400	31.2	100	1.2	H	38.1	5.6	36.7	38.3	54	-15.7	Ave
7307.1300	49.6	24	1.2	V	36.7	4.8	35.1	55.9	74	-18.1	Peak
7307.1300	49.1	143	1.1	H	36.7	4.8	35.1	55.4	74	-18.6	Peak
4871.4200	52.1	155	1.2	H	32.5	3.8	34.8	53.6	74	-20.4	Peak
4871.4200	51.1	108	1.2	V	32.5	3.8	34.8	52.6	74	-21.4	Peak
9742.8400	42.6	82	1.1	V	38.1	5.6	36.7	49.7	74	-24.3	Peak
9742.8400	41.3	100	1.2	H	38.1	5.6	36.7	48.4	74	-25.6	Peak

High Channel: (2400 MHz)

Frequency MHz	Reading (dBµV)	Azimuth Degrees	Height (m)	Polar. H / V	Antenna Loss dB	Cable loss dB	Amplifier dB	Corrected Reading dBuV/m	FCC Part 15 C		Comments
									Limit (dBuV/m)	Margin (dB)	
2469.6800	113.9	300	1.1	V	28.7	2.7	35.8	109.4			Fund/Peak
2469.6800	111.5	256	1.2	H	28.7	2.7	35.8	107.0			Fund/Peak
2469.680	110.6	300	1.5	V	28.7	2.7	35.8	106.1			Ave
2469.6800	108.2	256	1.2	H	28.7	2.7	35.8	103.7			Ave
9878.7202	36.2	200	1.5	V	38.1	5.7	36.4	43.6	54	-10.4	Ave
4939.3608	41.3	50	1.0	H	32.5	3.9	35.0	42.7	54	-11.3	Ave
7409.0410	35.2	200	1.5	H	36.7	4.8	35.6	41.1	54	-12.9	Ave
7409.0410	34.6	185	1.3	V	36.7	4.8	35.6	40.5	54	-13.5	Ave
4939.3608	39.0	180	1.5	V	32.5	3.9	35.0	40.4	54	-13.6	Ave
9878.7202	32.8	180	1.3	H	38.1	5.7	36.4	40.2	54	-13.8	Ave
7409.0410	50.3	185	1.3	V	36.7	4.8	35.6	56.2	74	-17.8	Peak
7409.0410	49.6	200	1.5	H	36.7	4.8	35.6	55.5	74	-18.5	Peak
4939.3608	52.6	50	1.0	H	32.5	3.9	35.0	54.0	74	-20.0	Peak
4939.3608	51.5	180	1.5	V	32.5	3.9	35.0	52.9	74	-21.1	Peak
9878.7202	43.2	200	1.5	V	38.1	5.7	36.4	50.6	74	-23.4	Peak
9878.7202	42.1	180	1.3	H	38.1	5.7	36.4	49.5	74	-24.5	Peak

Run#3 Radiated Harmonics and Spurious Emissions: Co-location test data

Low Channel (900 MHz & 2.4 GHz)

Frequency (MHz)	Reading (dBµV)	Cable loss (dB)	AF + Pre-Amplifier Gain (dB/m)	Corrected Reading (dBµV/m)	Azimuth (Degrees)	Height (m)	Polarization (H / V)	FCC PART 15 C		Measurements Type
								Limit (dBuV/m)	Margin（dB）	
2401.800	51.30	2.22	-6.09	47.43	150	152	H			Fund/Peak
2401.800	47.99	2.22	-6.09	44.12	307	157	V			Average
7221.000	37.25	3.53	2.93	43.71	20	98	V	54	-10.29	Average Max
4803.600	39.89	3.13	0.61	43.63	216	186	V	54	-10.37	Average Max
3610.500	44.25	2.73	-3.89	43.09	162	98	H	54	-10.91	Average Max
4513.125	39.81	2.81	-1.46	41.16	170	125	H	54	-12.84	Average Max
6318.375	34.85	3.42	2.19	40.46	70	157	H	54	-13.54	Average Max
1802.870	45.38	2.05	-7.74	39.69	162	106	V	54	-14.31	Average Max
8112.915	29.01	3.94	5.02	37.97	123	159	H	54	-16.03	Average Max
11252.027	23.15	5.00	7.95	36.10	70	157	V	54	-17.90	Average Max
11252.027	39.56	5.00	7.95	52.51	70	98	H	74	-21.49	Peak Max
8112.915	41.20	3.94	5.02	50.16	170	156	V	74	-23.84	Peak Max
7221.000	40.56	3.53	2.93	47.02	78	107	V	74	-26.98	Peak Max
4803.600	43.20	3.13	0.61	46.94	216	200	V	74	-27.06	Peak Max
3610.500	47.56	2.73	-3.89	46.40	162	98	V	74	-27.60	Peak Max
4513.125	43.12	2.81	-1.46	44.47	219	106	H	74	-29.53	Peak Max
6318.375	38.16	3.42	2.19	43.77	56	156	V	74	-30.23	Peak Max
1802.870	47.97	2.05	-7.74	42.28	120	98	V	74	-31.72	Peak Max

Middle Channel (900 MHz & 2.4 GHz)

Frequency (MHz)	Reading (dBµV)	Cable loss (dB)	AF + Pre-Amplifier Gain (dB/m)	Corrected Reading (dBµV/m)	Azimuth (Degrees)	Height (m)	Polarization (H / V)	FCC PART 15 C		Measurements Type
								Limit (dBuV/m)	Margin （dB）	
2435.943	50.46	2.23	-6.09	46.6	362	167	H			Fund/Peak
2435.943	47.15	2.23	-6.09	43.29	307	157	V			Average
4871.886	38.45	3.29	0.61	42.35	216	186	V	54	-11.65	Average Max
3661.464	43.79	2.62	-4.26	42.15	162	98	H	54	-11.85	Average Max
4576.830	38.99	2.97	-1.38	40.58	170	125	H	54	-13.42	Average Max
7322.928	31.33	3.85	4.53	39.71	20	98	V	54	-14.29	Average Max
8238.294	27.93	4.10	5.82	37.85	123	159	H	54	-16.15	Average Max
6407.562	30.61	3.58	2.99	37.18	70	157	H	54	-16.82	Average Max
11687.359	22.34	5.17	8.52	36.03	236	151	H	54	-17.97	Average Max
1830.732	20.04	2.05	-7.75	14.34	120	202	H	54	-39.66	Average Max
11687.359	38.30	5.17	8.52	51.99	236	151	H	74	-22.01	Peak Max
8238.294	40.12	4.10	5.82	50.04	170	156	V	74	-23.96	Peak Max
7322.928	40.79	3.85	4.53	49.17	78	107	V	74	-24.83	Peak Max
4871.886	42.16	3.29	0.61	46.06	216	200	V	74	-27.94	Peak Max
3661.464	46.96	2.62	-4.26	45.32	162	98	V	74	-28.68	Peak Max
4576.830	42.30	2.97	-1.38	43.89	219	106	H	74	-30.11	Peak Max
6407.562	37.23	3.58	2.99	43.80	56	156	V	74	-30.20	Peak Max
1830.732	36.87	2.05	-7.75	31.17	53	165	V	74	-42.83	Peak Max

High Channel (900 MHz & 2.4 GHz)

Frequency (MHz)	Reading (dBµV)	Cable loss (dB)	AF + Pre-Amplifier Gain (dB/m)	Corrected Reading (dBµV/m)	Azimuth (Degrees)	Height (m)	Polarization (H / V)	FCC PART 15 C		Measurements Type
								Limit (dBuV/m)	Margin （dB）	
2469.560	49.26	2.39	-5.29	46.36	198	110	H			Fund/Peak
2469.560	45.95	2.39	-5.29	43.05	120	152	V			Average
7408.682	32.18	4.01	5.33	41.52	56	107	V	54	-10.95	Average Max
12347.803	22.35	5.19	9.23	36.77	307	98	H	54	-11.57	Average Max
3710.353	43.11	2.78	-3.46	42.43	219	98	H	54	-12.48	Average Max
1855.177	45.03	2.03	-7.30	39.76	70	157	H	54	-13.36	Average Max
6499.466	20.47	3.74	3.79	28.00	123	159	H	54	-14.24	Average Max
5565.548	35.78	3.45	1.41	40.64	162	106	V	54	-15.41	Average Max
8348.289	27.71	4.26	6.62	38.59	20	156	H	54	-17.23	Average Max
8348.289	39.90	4.26	6.62	50.78	78	98	V	74	-20.57	Peak Max
3710.353	46.82	2.78	-3.46	46.14	94	201	V	74	-23.02	Peak Max
5565.548	42.16	3.45	1.41	47.02	162	106	V	74	-23.22	Peak Max
4939.146	33.85	3.13	-0.58	36.40	216	186	H	74	-26.00	Peak Max
1855.177	47.62	2.03	-7.30	42.35	70	157	V	74	-26.98	Peak Max
7408.682	41.64	4.01	5.33	50.98	56	107	V	74	-27.64	Peak Max
12347.803	39.01	5.19	9.23	53.43	150	166	H	74	-27.86	Peak Max
4939.146	41.37	3.13	-0.58	43.92	216	186	H	74	-30.04	Peak Max
6499.466	36.43	3.74	3.79	43.96	170	125	V	74	-31.65	Peak Max