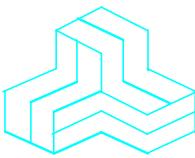


ENGINEERING TEST REPORT



PATROL SUITE PMD Model No.: PMD09 FCC ID: NSNPMDO9

Applicant:

G4S Justice Services Canada, Inc.
#103 – 6592, 176 Street
Surrey, BC
Canada V3S 4G5

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.247
Frequency Hopping System
Operating in 2402-2480 MHz Band

UltraTech's File No.: G4S-006F15C247

This Test report is Issued under the Authority of
Tri M. Luu, Professional Engineer,
Vice President of Engineering
UltraTech Group of Labs

Date: May 29, 2009



Report Prepared by: JaeWook Choi

Tested by: Hung Trinh, RFI Technician

Issued Date: May 29, 2009

Test Dates: May 14, 2009

- The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.
- This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.

UltraTech Group of Labs

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TABLE OF CONTENTS

EXHIBIT 1. INTRODUCTION	1
1.1. SCOPE.....	1
1.2. RELATED SUBMITTAL(S)/GRANT(S).....	1
1.3. NORMATIVE REFERENCES	1
EXHIBIT 2. PERFORMANCE ASSESSMENT	2
2.1. CLIENT INFORMATION	2
2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION	2
2.3. EUT'S TECHNICAL SPECIFICATIONS	3
2.4. LIST OF EUT'S PORTS.....	3
2.5. ANCILLARY EQUIPMENT	4
EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS	5
3.1. CLIMATE TEST CONDITIONS	5
3.2. OPEOPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS	5
EXHIBIT 4. SUMMARY OF TEST RESULTS	6
4.1. LOCATION OF TESTS	6
4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS	6
4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES	6
EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS.....	7
5.1. TEST PROCEDURES	7
5.2. MEASUREMENT UNCERTAINTIES.....	7
5.3. MEASUREMENT EQUIPMENT USED	7
5.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER	7
5.5. TRANSMITTER SPURIOUS RADIATED EMISSIONS AT 3 METERS [§§ 15.247(D), 15.209 & 15.205]	8
EXHIBIT 6. MEASUREMENT UNCERTAINTY.....	13
6.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY	13
6.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY	14

EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.247
Title:	Code of Federal Regulations (CFR), Title 47 – Telecommunication, Part 15
Purpose of Test:	Equipment Certification for Frequency Hopping System Transmitter Operating in the Frequency Band 2400-2483.5 MHz
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Environmental Classification:	<input checked="" type="checkbox"/> Commercial, industrial or business environment <input type="checkbox"/> Residential environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2008	Code of Federal Regulations – Telecommunication
ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CISPR 22 & EN 55022	2006	Information Technology Equipment - Radio Disturbance Characteristics – Limits and Methods of Measurement
CISPR 16-1-1 +A1 +A2	2006 2006 2007	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus
CISPR 16-1-2 +A1 +A2	2003 2004 2006	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-2: Conducted disturbances
KDB Publication No. 558074	2005	Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)
KDB Publication No. 447498	2008	Mobile and Portable Device RF Exposure Procedure and Equipment Authorization Policies

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	G4S Justice Services Canada, Inc.
Address:	#103 – 6592, 176 Street Surrey, BC Canada V3S 4G5
Contact Person:	Mr. Harv Hundal Phone #: (604)576-8658 x238 Fax #: (604)576-0436 Email Address: harv.hundal@ca-g4s.com

MANUFACTURER	
Name:	G4S Justice Services Canada, Inc.
Address:	#103 – 6592, 176 Street Surrey, BC Canada V3S 4G5
Contact Person:	Mr. Harv Hundal Phone #: (604)576-8658 x238 Fax #: (604)576-0436 Email Address: harv.hundal@ca-g4s.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name	G4S Justice Services Canada, Inc.
Product Name:	PATROL SUITE PMD
Model Name or Number:	PMD09
Serial Number:	Test Sample
Type of Equipment:	Remote Control/Security Device Transceiver
Input Power Supply Type:	5 VDC \pm 0.25V, 500 mA max via USB
Primary User Functions of EUT:	Used to remotely monitor presence and status of a PTX device worn by an offender, and to view the status information on a Bluetooth enabled PDA device. The PMD is also used to wake up a PTX device.

2.3. EUT'S TECHNICAL SPECIFICATIONS

BLUETOOTH TRANSMITTER	
Equipment Type:	Portable
Intended Operating Environment:	Commercial, industrial or business environment
RF Output Power Rating:	1.63 mW
Operating Frequency Range:	2402-2480 MHz
Duty Cycle:	5.39 %
20 dB Bandwidth:	1023 kHz
Modulation Type:	G1D
Antenna Connector Type:	Integral antenna housed inside the enclosure.
Antenna Description:	Manufacturer: n/a Type Chip antenna mounted on PCB Model n/a Gain: -1.48 dBi Frequency Range: n/a

2.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	USB Power, changing only	1	MicroUSB B	Shielded

2.5. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Switching Power Supply
Brand Name:	Phihong
Model Name or Number:	PSB05R-050Q
Serial Number:	N/A
Cable Length & Type:	< 3 m, Non-shielded
Connected to EUT's Port:	USB

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	For testing purpose only, the EUT was set to transmit continuously by setting the unit into the 1 st test state.
Special Test Software:	None.
Special Hardware Used:	None.
Transmitter Test Antenna:	The EUT is tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment.

Transmitter Test Signals	
Frequency Band(s):	2402-2480 MHz
RF Power Output:	1.63 mW
Normal Test Modulation:	Bluetooth
Modulating Signal Source:	Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).

Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2011-05-01.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Compliance (Yes/No)
2.1093	Radiofrequency radiation exposure evaluation: portable devices	Yes, see attached RF exposure exhibit
15.203	Antenna requirements	Yes*
15.207(a)	Power Line Conducted Emissions	Yes**
15.247(a)(1)	Hopping Frequency Separation	Yes*** (§ 7.1..2)
15.247(a)(1)(iii)	Number of Hopping Channels and Average Time of Occupancy	Yes *** (§§ 7.1..3 & 7.1.4)
15.247(b)(1)	Peak Output Power	Yes *** (§7.1.5)
15.247(c)	Band-Edge and RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes *** (§7.1.9)
15.247(d) & 15.247(f)	Peak Power Spectral Density	Yes *** (§7.1.8)
15.247(d), 15.209 & 15.205	Transmitter Spurious Radiated Emissions	Yes****

PATROL SUITE PMD, Model No.: PMD09, by **G4S Justice Service Canada, Inc** has also been tested and found to comply with **FCC Part 15, Subpart B - Class B Digital Devices**. The engineering test report has been documented and kept on file and it is available upon request.

* This device has integral antenna permanently mounted on the PCB.

** The power line conducted emission test results are incorporated in the § 15.225 report of this filing.

***Refer to the attached original test report for the Bluetooth module (FCC ID: ED9LMX9838, M/N: LMX9838SB).

****Simultaneous transmitters' radiated emissions was checked and verified to be compliant.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

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File #: G4S-006F15C247

May 29, 2009

EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in ANSI C63.4; FCC KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems.

5.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to EXHIBIT 6. for Measurement Uncertainties.

5.3. MEASUREMENT EQUIPMENT USED

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4 and CISPR 16-1-1.

5.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER

To remotely monitor presence and status of a PTX device worn by an offender, and to view the status information on a Bluetooth enabled PDA device. The PMD is also used to wake up a PTX device.

5.5. TRANSMITTER SPURIOUS RADIATED EMISSIONS AT 3 METERS [§§ 15.247(d), 15.209 & 15.205]

5.5.1. Limit(s)

§ 15.247 (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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Section 15.205(a) - Restricted Bands of Operation

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
¹ 0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2655–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	(²)
13.36–13.41.			

¹Until February 1, 1999, this restricted band shall be 0.490–0.510 MHz.

²Above 38.6

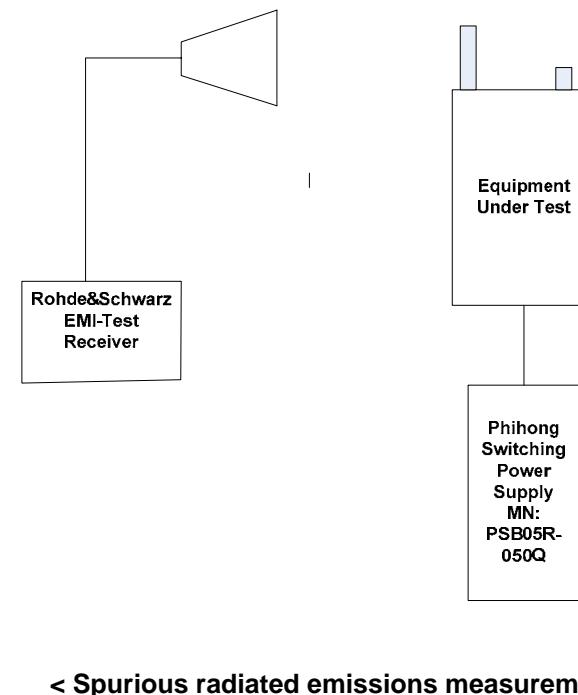
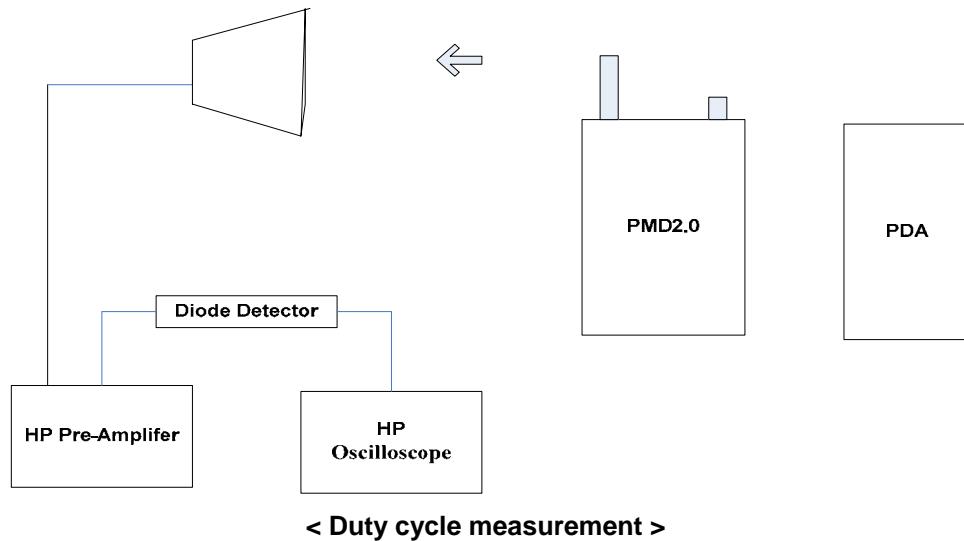
Section 15.209(a) -- Field Strength Limits within Restricted Frequency Bands --

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2,400 / F (kHz)	300
0.490 - 1.705	24,000 / 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

5.5.2. Method of Measurements

KDB Publication No. 558074: Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)

5.5.3. Test Arrangement



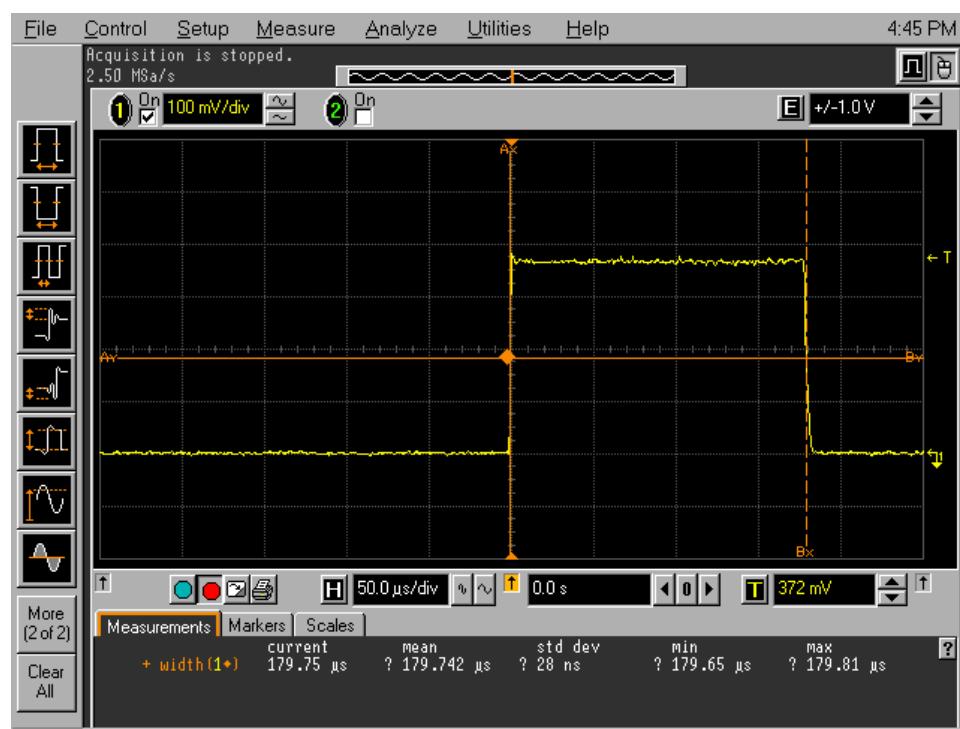
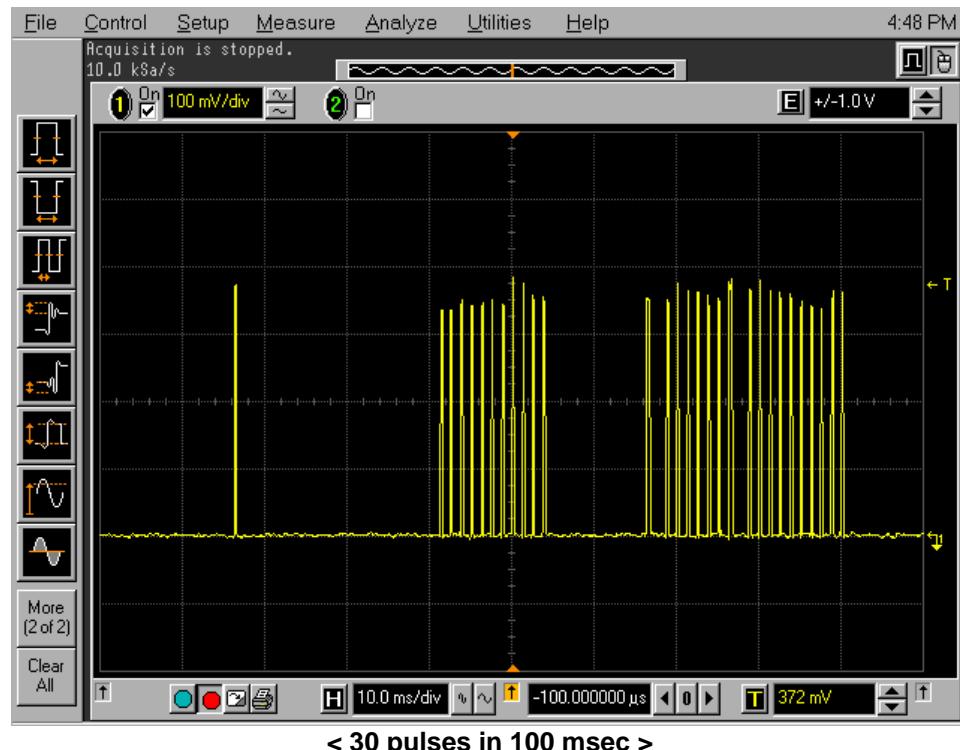
5.5.4. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer	Rhode & Schwarz	FSEK30	100077	20 Hz - 40 GHz
RF Amplifier	Hewlett Packard	8447F	2944A04098	0.1 - 1300 MHz
RF Amplifier	Hewlett Packard	8449B	3008A00769	1 - 26.5 GHz
Biconilog antenna	EMCO	3142C	34792	26 - 3000 MHz
Diode Detector	NARDA	503A-03	0105	0.01 - 18 GHz
Horn Antenna	EMCO	3155	6570	1 - 18 GHz
Horn Antenna	EMCO	3160-09	1007	18 - 26.5 GHz
Horn Antenna	EMCO	3160-10	1001	26.5 - 40 GHz
Oscilloscope	Hewlett Packard	54810A	US38380192	500 MHz BW, 1 GSa/s

5.5.5. Test Data

Remarks:

- All spurious emissions that are within 20 dB below the specified limit are recorded below in the table.
- EUT is tested in three orthogonal positions to measure highest emission.
- 5.39 % duty cycle or -25.36 dB duty cycle correction factor was applied.
 - **Duty cycle:** $30 \times 179.75 \mu\text{sec} = 5392.5 \mu\text{sec} = 5.3925 \text{ msec}$
 - **Duty cycle correction factor:** $20 \times \log(5.3925 \text{ msec} / 100 \text{ msec}) = -25.36 \text{ dB}$
- Only this transmitter was transmitting during test; however it was checked and confirmed that turning on other two transmitters which made all three transmitters transmit simultaneously did not affect test results.



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File #: G4S-006F15C247

May 29, 2009

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

Fundamental Frequency:	2402 MHz						
Test Frequency Range:	30 MHz – 25 GHz						

Frequency (MHz)	RF Peak Level (dB μ V/m)	RF Avg Level (dB μ V/m)	Antenna Plane (H/V)	Limit 15.209 (dB μ V/m)	Limit 15.247 (dB μ V/m)	Margin (dB)	Pass/ Fail
2402	96.01	--	V	--	--	--	--
2402	97.79	--	H	--	--	--	--
4804*	58.15	32.79	V	54	77.79	-21.21	Pass
4804*	59.43	34.07	H	54	77.79	-19.93	Pass

Fundamental Frequency:	2437 MHz						
Test Frequency Range:	30 MHz – 25 GHz						

Frequency (MHz)	RF Peak Level (dB μ V/m)	RF Avg Level (dB μ V/m)	Antenna Plane (H/V)	Limit 15.209 (dB μ V/m)	Limit 15.247 (dB μ V/m)	Margin (dB)	Pass/ Fail
2437	93.81	--	V	--	--	--	--
2437	96.75	--	H	--	--	--	--
4882*	57.34	31.98	V	54	76.75	-22.02	Pass
4882*	59.59	34.23	H	54	76.75	-19.77	Pass

Fundamental Frequency:	2480 MHz						
Test Frequency Range:	30 MHz – 25 GHz						

Frequency (MHz)	RF Peak Level (dB μ V/m)	RF Avg Level (dB μ V/m)	Antenna Plane (H/V)	Limit 15.209 (dB μ V/m)	Limit 15.247 (dB μ V/m)	Margin (dB)	Pass/ Fail
2480	94.52	--	V	--	--	--	--
2480	97.48	--	H	--	--	--	--
4960*	58.67	33.31	V	54	77.48	-20.69	Pass
4960*	58.72	33.36	H	54	77.48	-20.64	Pass
7440*	53.50	28.14	V	54	77.48	-25.86	Pass
7440*	51.55	26.19	H	54	77.48	-27.81	Pass
9920	57.87	32.51	V	54	77.48	-44.97	Pass
9920	54.85	29.49	H	54	77.48	-47.99	Pass

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EXHIBIT 6. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

6.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Line Conducted)	PROBABILITY DISTRIBUTION	UNCERTAINTY (dB)	
		9-150 kHz	0.15-30 MHz
EMI Receiver specification	Rectangular	± 1.5	± 1.5
LISN coupling specification	Rectangular	± 1.5	± 1.5
Cable and Input Transient Limiter calibration	Normal (k=2)	± 0.3	± 0.5
Mismatch: Receiver VRC $\Gamma_1 = 0.03$ LISN VRC $\Gamma_R = 0.8(9 \text{ kHz}) 0.2 (30 \text{ MHz})$ Uncertainty limits $20\text{Log}(1 \pm \Gamma_1 \Gamma_R)$	U-Shaped	± 0.2	± 0.3
System repeatability	Std. deviation	± 0.2	± 0.05
Repeatability of EUT	--	--	--
Combined standard uncertainty	Normal	± 1.25	± 1.30
Expanded uncertainty U	Normal (k=2)	± 2.50	± 2.60

Sample Calculation for Measurement Accuracy in 450 kHz to 30 MHz Band:

$$u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)} = \pm \sqrt{(1.5^2 + 1.5^2)/3 + (0.5/2)^2 + (0.05/2)^2 + 0.35^2} = \pm 1.30 \text{ dB}$$

$$U = 2u_c(y) = \pm 2.6 \text{ dB}$$

6.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (\pm dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	± 1.0	± 1.0
Cable Loss Calibration	Normal (k=2)	± 0.3	± 0.5
EMI Receiver specification	Rectangular	± 1.5	± 1.5
Antenna Directivity	Rectangular	$+0.5$	$+0.5$
Antenna factor variation with height	Rectangular	± 2.0	± 0.5
Antenna phase center variation	Rectangular	0.0	± 0.2
Antenna factor frequency interpolation	Rectangular	± 0.25	± 0.25
Measurement distance variation	Rectangular	± 0.6	± 0.4
Site imperfections	Rectangular	± 2.0	± 2.0
Mismatch: Receiver VRC $\Gamma_1 = 0.2$ Antenna VRC $\Gamma_R = 0.67(B_i) 0.3 (L_p)$ Uncertainty limits $20\log(1 \pm \Gamma_1 \Gamma_R)$	U-Shaped	+1.1 -1.25	± 0.5
System repeatability	Std. Deviation	± 0.5	± 0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k = 2 is used:

$$U = 2u_c(y) = 2x(+2.19) = +4.38 \text{ dB} \quad \text{And} \quad U = 2u_c(y) = 2x(-2.21) = -4.42 \text{ dB}$$