

Test of Polycom Spectralink 8400 Series Wi-Fi
handset with Bluetooth

To: FCC 47 CFR Part 15, Collocation [FCC
15.31(h)]

Test Report Serial No.: POLY06-X2 Rev A



TEST REPORT

From



Test of: Polycom Spectralink 8400 Series Wi-Fi handset with Bluetooth

To: FCC 47 CFR Part 15, Collocation [FCC 15.31(h)]

Test Report Serial No.: POLY06-X2 Rev A

Reference Test Report(s): POLY06-U12, POLY06-U13, POLY06-U7, POLY06-U8

This report supersedes: None

Applicant: Polycom
4750 Willow Road
Pleasanton, CA 94588-2708
USA

Product Function: Wi-Fi handset with Bluetooth

Copy No: pdf **Issue Date:** 6th April 2011

This Test Report is Issued Under the Authority of:

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TESTING CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory



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1 ACCREDITATION, LISTINGS & RECOGNITION

1.1 TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard EN ISO/IEC 17025. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; <http://www.a2la.org/scopepdf/2381-01.pdf>



The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Laboratory

A2LA has accredited

MICOM LABS

Pleasanton, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Presented this 14th day of April 2010.



President & CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2011

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

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1.2 RECOGNITION

MiCOM Labs, Inc has widely recognized Electrical testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA** countries. Our test reports are widely accepted for global type approvals.

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	Listing #: 4143A
Japan	VCCI	-	-	No. 2959
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

**APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement.

Is a recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.

Phase I - recognition for product testing

Phase II – recognition for both product testing and certification

N/A – Not Applicable

**EU MRA – European Union Mutual Recognition Agreement.

Is a recognition agreement under which test lab is accredited to regulatory standards of the EU member countries.

**NB – Notified Body

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1.3 PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard EN ISO/IEC Guide 65. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; <http://www.a2la.org/scopepdf/2381-02.pdf>



The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Product Certification Body

A2LA has accredited

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Pleasanton, CA

for technical competence as a

Product Certification Body

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC Guide 65:1996 *General requirements for bodies operating product certification systems*. This accreditation demonstrates technical competence for a defined scope and the operation of a quality management system for a Telecommunications Certification Body (TCB) meeting FCC (U.S.), and IC (Canada) requirements.



Presented this 24th day of June 2010.

President & CEO
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2011

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

United States of America – Telecommunication Certification Body

TCB Identifier – US0159

Industry Canada – Certification Body

CAB Identifier – US0159

Europe – Notified Body

Notified Body Identifier - 2280

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2 DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft		
Rev A	6 th April 2011	Initial Release

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3 TEST RESULT CERTIFICATE

Applicant:	Polycom 4750 Willow Road Pleasanton California , 94588-2708, USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
Product:	Spectralink 8400 series Wi-Fi handsets	Telephone:	+1 925 462 0304
Model No.:	Spectralink 8450 Spectralink 8440	Fax:	+1 925 462 0306
S/No's:	600826769		
Date(s) Tested:	March 7th, 2011	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 15, SubPart C 15.247 & RSS-210 Annex 8	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

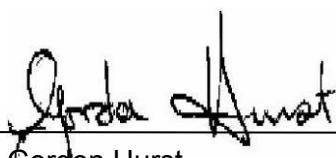


Approved & Released for MiCOM Labs, Inc. by:

TESTING CERTIFICATE #2381.01



Graeme Grieve
Quality Manager MiCOM Labs, Inc.



Gordon Hurst
President & CEO MiCOM Labs, Inc.

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4 REFERENCES AND MEASUREMENT UNCERTAINTY

4.1 Normative References

Ref.	Publication	Year	Title
i.	FCC 47 CFR Part 15,	2010	Title 47: Telecommunication PART 15—RADIO FREQUENCY DEVICES Subpart C—Intentional Radiators
ii.	RSS-210 Annex 8	2010	Radio Standards Specification 210, Issue 8, Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment,
iii.	RSS-GEN	2010	Radio Standards Specification-Gen, Issue 3, General Requirements and Information for the Certification of Radiocommunication Equipment,
iv.	47 CFR Part 15, SubPart B	2010	47 CFR Part 15, SubPart B; Unintentional Radiators
v.	ICES-003	2004	Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard Digital Apparatus; Issue 4
vi.	ANSI C63.4	2009	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
vii.	CISPR 22/ EN 55022	2008 2006+A1:2007	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
viii.	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
ix.	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
x.	ETSI TR 100 028	2001	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
xi.	A2LA	9th June 2010	Reference to A2LA Accreditation Status – A2LA Advertising Policy

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4.2 Test and Uncertainty Procedures

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.



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5 TEST SUMMARY

List of Measurements: The following table represents the list of measurements required under FCC 47 CFR Part 15, SubPart C 15.247 & Industry Canada RSS-210 Annex 8.

Standard Section(s)	Test Description	Condition	Result	Notes	Test Report Section
15.31 (h), 15.205, 15.209	Transmitter Radiated Spurious Emissions	Radiated	PASS	Note 1,2,3	7.1

Note 1: Test results reported in this document relate only to the items tested

Note 2: The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria

Note 3: Section 6.11 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix

Note 4: Radio's included within the Spectralink 8400 Series wireless handsets are identical. Unit and model with highest output power was utilized for testing.



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6 PRODUCT DETAILS AND TEST CONFIGURATIONS

6.1 Test Program Scope

The scope of the test program was to test the WiFi transmitter (802.11a/b/g/n) and Bluetooth transmitter (802.15.1) utilized in the Polycom Spectralink 8400 Series Wi-Fi handset with Bluetooth for compliance against multiple collocated transmitter requirements of FCC 47 CFR Part 15.

APPLICANT: Polycom **PRODUCT:** Spectralink 8450 handset Front



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APPLICANT: Polycom **PRODUCT:** Spectralink 8450 handset Back



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APPLICANT: Polycom **PRODUCT:** Spectralink 8440 handset Front



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APPLICANT: Polycom **PRODUCT:** Spectralink 8440 handset Back



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6.2 EUT Details

Detail	Description
Purpose:	The scope of the test program was to test the WiFi transmitter (802.11a/b/g/n) and Bluetooth transmitter (802.15.1) utilized in the Polycom Spectralink 8450 Wi-Fi handset with Bluetooth for compliance against multiple collocated transmitter requirements of FCC 47 CFR Part 15.
Applicant:	Polycom 4750 Willow Road Pleasanton, CA 94588-2708 USA
Manufacturer:	Same as Applicant
Test Laboratory:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	POLY06-X2 Rev A
Date EUT received:	11/11/2010
Dates of test (from - to):	03/07/2011
No of Units Tested:	S/N: 600826769
Product Name:	Spectralink 8400 series Wi-Fi handsets
Manufacturers Trade Name:	Polycom Spectralink 8400 series Wi-Fi handsets
Model No.:	Spectralink 8440 Spectralink 8450
Equipment Primary Function:	Wi-Fi handset with Bluetooth
Equipment Secondary Function(s):	Bar code reader (8450 only)
Type of Technology:	802.11a/b/g/n; 802.15.1 2.1+EDR
Installation type:	Portable
Construction/Location for Use:	Indoor/Outdoor
Software/Firmware Release:	fcc-1.8 (test software)
Test Software Release:	fcc-1.8 (test software)
Rated Input Voltage and Current DC:	Nominal:3.8V; Battery: 3.5V - 4.2V, Charger (USB or Base) supply: 5V +/- 10%
Operating Temperature Range °C:	Min: 0 °C Max: 40 °C
Equipment Dimensions:	5.75" x 2.125" x 0.9"
Weight:	8 oz
Long Term Frequency Stability:	20 p.p.m.
Transmit/Receive Operation:	Full Duplex
Output Power Type	Fixed

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6.3 External A.C. / D.C. Power Adaptor

Model	Description
SA106B-05	GCI Technologies switching adaptor: Input: 100 - 240V AC; 50-60 Hz; 0.25 Amp Output: 5V DC; 1 Amp

6.4 Operational Power Range

Declared O/P Power Range		
	Max	Min
Bluetooth Mode	7.42 dBm	4.33 dBm
802.11 Mode (2.4 GHz)	16.49 dBm	14.65 dBm
802.11 Mode (5 GHz)	17.32 dBm	14.71 dBm

6.5 Types of Modulation Supported

Modulation / Mode	Modulation Type
802.11b	DSSS
802.11g	OFDM
802.11a	OFDM
802.11n HT-20	OFDM
802.15.1 1Mbps	GFSK
802.15.1 2Mbps	$\pi/4$ -DPSK
802.15.1 3Mbps	8DPSK

6.6 Antenna Details

The following is a description of the EUT antennas.

Antenna Type	Manufacturer	Model	Gain	Frequency Range
Plated antenna on PCB	Polycom	N/A	2.5 dBi	2400 - 2483.5 MHz
Plated antenna on PCB	Polycom	N/A	5.51 dBi	5150 - 5850 MHz

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6.7 Cabling and I/O Ports

The following is a description of the cable and input, output ports available on the EUT.

Type of I/O Ports	Description	Screened (Y/N)	Length	Qty	Tested (Y/N)
Enclosure	EUT Enclosure	N/A	N/A	1	Y
Battery terminal	Battery connections for removable battery	N	N/A	1	N
1/8th" Stereo connector	Connection to hands free headset	Y	< 3 meters	1	N
AC-DC Adapter/Charger	Power connector - mini USB for charging using power supply SA106B-05	Y	< 3 meters	1	N
Charging terminals	Charging terminal for charging EUT with docking options	N	N/A	1	N

6.8 EUT Channel plan and spacing

802.11 Operation

Band (GHz)	Mode	Freq Band (MHz)	Freq Range (MHz)	Low Ch	Mid Ch	High Ch	# Ch	Ch Spacing (MHz)
2.4	802.11 b	2400 - 2483.5	2412 - 2472	2412	2442	2472	13	20
2.4	802.11 g	2400 - 2483.5	2412 - 2472	2412	2442	2472	13	20
2.4	802.11 n HT-20	2400 - 2483.5	2412 - 2472	2412	2442	2472	13	20

Band (GHz)	Mode	Freq Band (MHz)	Freq Range (MHz)	Low Ch	High Ch	# Ch	Ch Spacing (MHz)
5.2	802.11 a	5150-5350	5180-5320	5180	5320	8	20
5.2	802.11 a	5470-5725	5500-5700	5500	5700	11	20
5.5	802.11 n HT-20	5150-5350	5180-5320	5180	5320	8	20
5.5	802.11 n HT-20	5470-5725	5500-5700	5500	5700	11	20

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802.15.1 Operation

Band (GHz)	Mode	Freq Band (MHz)	Freq. Range (MHz)	Low Ch.	Mid Ch.	High Ch.	# Ch.	Ch. Spacing (MHz)
2.4	Bluetooth	2400 - 2483.5	2402- 2480	2402	2441	2480	79	1 MHz

6.9 Equipment Details

The following is a description of supporting equipment used during the test program.

Equipment	Equipment Description	Manufacturer	Model No.	Serial No (s).	Tested
Battery	Alpha SAMPLE	Polycom	ESB-RS657+002	AC10103200B7	Y
Battery	Alpha SAMPLE	Polycom	ESB-RS658+002	AD101032019C	N
AC-DC Adapter/Charger	Switching Adapter	GCI technologies	SA106B-05	N/A	N

6.10 Test Configurations

Testing was performed on a sample of frequency combinations possible with Bluetooth and WLAN operation. Testing was performed in the highest power density mode available on the device [WLAN - 802.11b 1Mbps; BT = 802.15.1 1 Mbps]

WLAN-2412MHz/ BT-2480MHz - TX: WLAN-Ch.1; BT-Ch. 78
WLAN-5280MHz/ BT-2441MHz - TX: WLAN-Ch.56; BT-Ch. 39
WLAN-5500MHz/ BT-2402MHz - TX: WLAN-Ch.100; BT-Ch. 0
WLAN-5825MHz/ BT-2441MHz - TX: WLAN-Ch.165; BT-Ch. 39

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6.11 Equipment Modifications

The following modifications were required to bring the equipment into compliance:

1. NONE

6.12 Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE



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7 TEST RESULTS

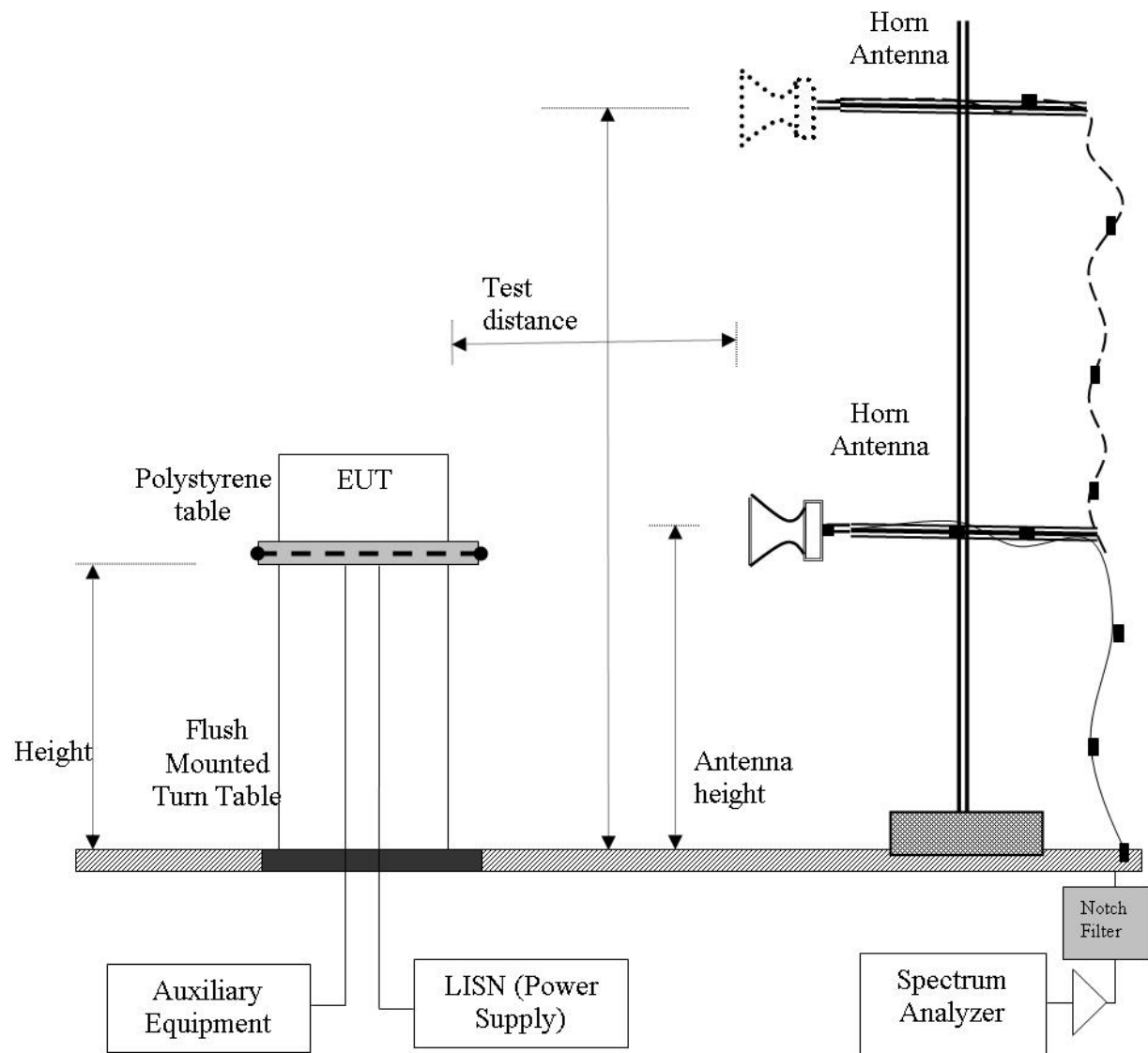
7.1 Radiated Spurious Emissions

Test Procedure

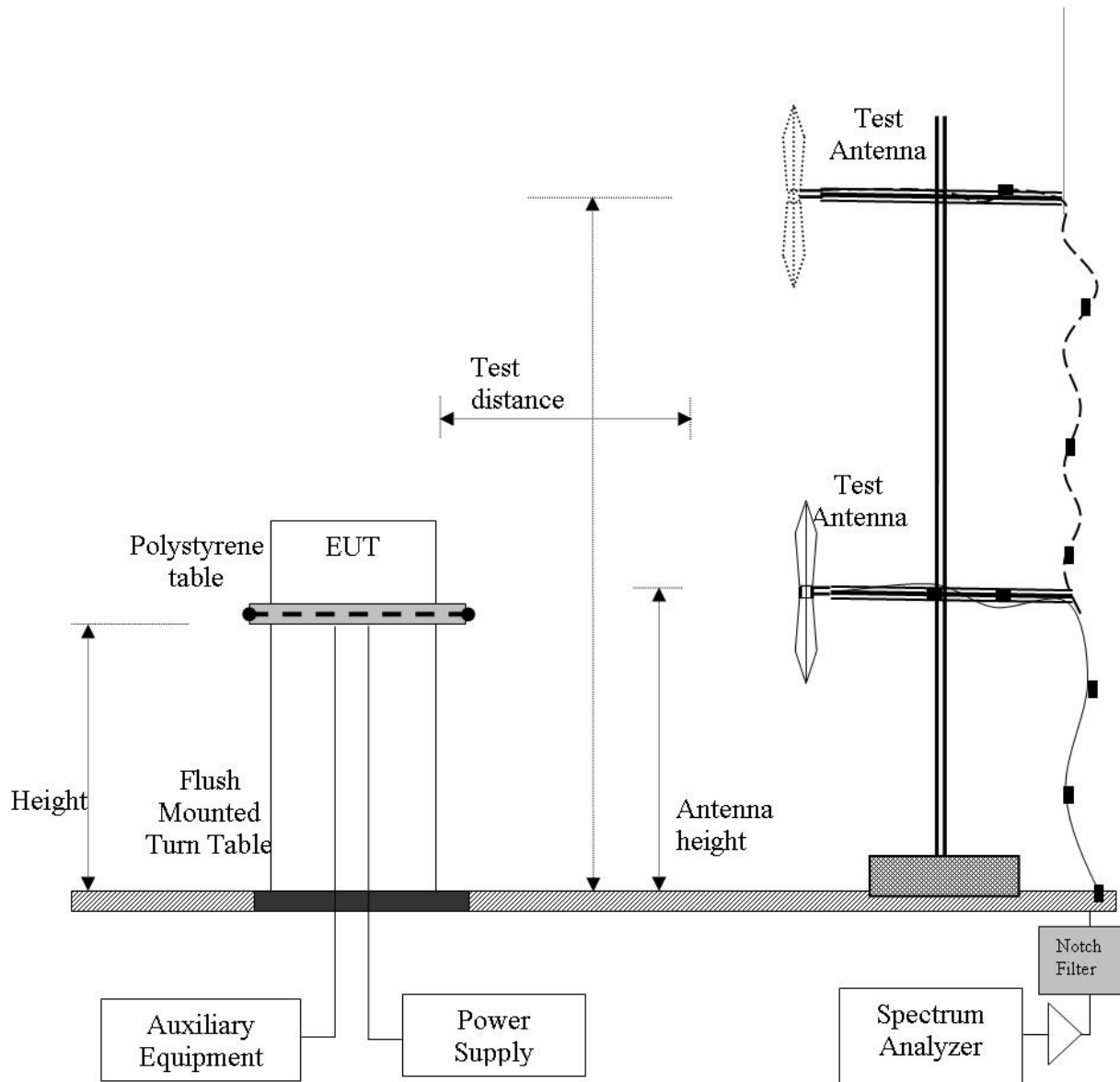
Testing was performed in a 3-meter anechoic chamber. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. Preliminary emissions were recorded with in Spectrum Analyzer mode, using a maximum peak detector while in peak hold mode.

Emissions nearest the limits were chosen for maximization and formal measurement using a CISPR Compliant receiver. Emissions above 1000 MHz are measured utilizing a CISPR compliant average detector with a tuned receiver, using a bandwidth of 1 MHz. Emissions from 30 MHz – 1000 MHz are measured utilizing a CISPR compliant quasi-peak detector with a tuned receiver, using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed.

Radiated Emission Measurement Setup – Above 1 GHz



Radiated Emission Measurement Setup – Below 1 GHz





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Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

$$FS = R + AF + CORR - FO$$

FS = Field Strength

R = Measured Spectrum analyzer Input Amplitude

AF = Antenna Factor

$$CORR = \text{Correction Factor} = CL - AG + NFL$$

CL = Cable Loss

AG = Amplifier Gain

FO = Distance Falloff Factor

NFL = Notch Filter Loss or Waveguide Loss

Field Strength Calculation Example:

Given receiver input reading of 51.5 dB μ V; Antenna Factor of 8.5 dB; Cable Loss of 1.3 dB; Falloff Factor of 0 dB, an Amplifier Gain of 26 dB and Notch Filter Loss of 1 dB. The Field Strength of the measured emission is:

$$FS = 51.5 + 8.5 + 1.3 - 26.0 + 1 = 36.3 \text{ dB}\mu\text{V/m}$$

Conversion between dB μ V/m (or dB μ V) and μ V/m (or μ V) are done as:

$$\text{Level (dB}\mu\text{V/m)} = 20 * \text{Log (level (\mu V/m))}$$

$$40 \text{ dB}\mu\text{V/m} = 100 \mu\text{V/m}$$

$$48 \text{ dB}\mu\text{V/m} = 250 \mu\text{V/m}$$



Specification for FCC Part 15 Radiated Spurious Emissions

FCC §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 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 §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(a)).

§15.407 (b)(2)

All emissions outside of the 5,150-5,350MHz band shall not exceed an EIRP of -27dBm/MHz.

FCC §15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

FCC §15.205 (a) Except as shown in paragraphs (d) and (e) of this section, 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.

FCC §15.209 (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.

Table 1: FCC 15.209 Spurious Emissions Limits

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3



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Specification for FCC 47 CFR Part 15 - Collocation

FCC §15.31 (h)

For a composite system that incorporates devices contained either in a single enclosure or in separate enclosures connected by wire or cable, testing for compliance with the standards in this part shall be performed with all of the devices in the system functioning. If an intentional radiator incorporates more than one antenna or other radiating source and these radiating sources are designed to emit at the same time, measurements of conducted and radiated emissions shall be performed with all radiating sources that are to be employed emitting. A device which incorporates a carrier current system shall be tested as if the carrier current system were incorporated in a separate device; that is, the device shall be tested for compliance with whatever rules would apply to the device were the carrier current system not incorporated, and the carrier current system shall be tested for compliance with the rules applicable to carrier current systems.

Specification for Industry Canada RSS-210 Radiated Spurious Emissions

RSS-210 §2.1 RSS-Gen Compliance

In addition to RSS-210, the requirements in RSS-Gen, General Requirements and Information for the Certification of Radio Apparatus, must be met.

RSS-210 §2.2 Emissions Falling Within Restricted Frequency Bands

Category I license-exempt equipment is required to comply with the provisions in RSS-Gen with respect to emissions falling within restricted frequency bands. These restricted frequency bands are listed in RSS-Gen.

RSS-210 §2.3 Receivers

Category I equipment receivers for use with transmitters subject to RSS-210 must comply with the applicable requirements set out in RSS-Gen and be certified under RSS-210. Category II equipment receivers for use with transmitters subject to RSS-210 are exempt from certification, but are subject to compliance with RSS-Gen and RSS-310.

RSS-210 §2.5 General Field Strength Limits

RSS-Gen includes the general field strength limits of unwanted emissions, where applicable, for transmitters and receivers operating in accordance with the provisions specified in this standard.

Unwanted emissions of transmitters and receivers are permitted to fall within the restricted bands listed in RSS-Gen, and including the TV bands, but fundamental emissions are prohibited in the restricted bands.



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Specification for Industry Canada RSS-Gen Radiated Transmitter Spurious Emissions

RSS-Gen §7.2.5 Transmitter Spurious Emissions Limits

Spurious emissions from license-exempt transmitters shall comply with the field strength limits shown below. Additionally, the level of any transmitter spurious emission shall not exceed the level of the transmitter's fundamental emission.

Table 1: RSS-Gen §7.2.5 Radiated Transmitter Spurious Emissions Limits

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Field Strength ($\text{dB}\mu\text{V/m}$)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Specification for Industry Canada RSS-Gen Radiated Receiver Spurious Emissions

RSS-Gen §6.1 Receiver Spurious Emissions Limits

Radiated spurious emission measurements shall be performed with the receiver antenna connected to the receiver antenna terminals.

Spurious emissions from receivers shall not exceed the radiated limits shown in the table below.

Table 1: RSS-Gen §6.1 Radiated Receiver Spurious Emissions Limits

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Field Strength ($\text{dB}\mu\text{V/m}$)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

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Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement Uncertainty	+5.6/ -4.5 dB
--------------------------------	---------------

Traceability:

Method	Test Equipment Used
Work instruction WI-03	0287, 0193, 0342, 0158, 0303, 0304, 0134, 0310, 0312

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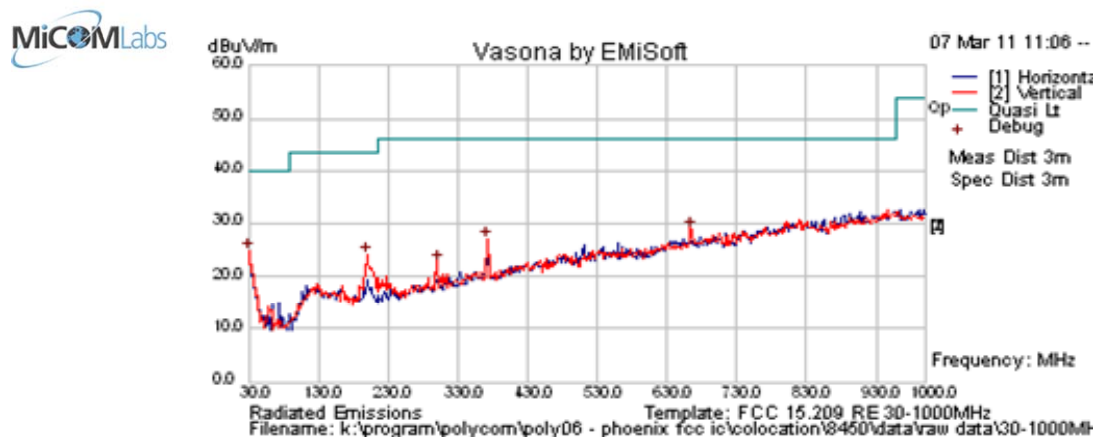


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7.1.1 Collocation - 30MHz - 1000 MHz

No radio emissions were present below 1GHz. The following plots represent the worst case conditions with both 802.11 (WiFi) and 802.15.1 (Bluetooth) transmitters operating at the same time.

Test Freq.	WLAN-2412MHz/ BT-2480MHz	Engineer	EVF
Variant	Collocation	Temp (°C)	18.5
Freq. Range	30 MHz - 1000 MHz	Rel. Hum.(%)	44
Power Setting	18 in test utility	Press. (mBars)	1004
Antenna	integral		
Test Notes 1	Handset (Spectralink Model: 8450) with fully charged battery		
Test Notes 2	TX: WLAN-Ch.1; BT-Ch. 78		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
30.113	30.7	3.4	-9.3	24.8	Peak [Scan]	V	98	360	40.0	-15.2	Pass	
200.425	37.2	4.8	-17.9	24.1	Peak [Scan]	V	98	360	43.5	-19.4	Pass	
300.694	34.0	5.2	-16.9	22.4	Peak [Scan]	V	98	360	46.0	-23.6	Pass	
372.244	36.7	5.6	-15.3	27.0	Peak [Scan]	V	98	360	46.0	-19.0	Pass	
663.871	32.6	6.6	-10.3	28.8	Peak [Scan]	V	98	360	46.0	-17.2	Pass	

Legend: DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
 NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

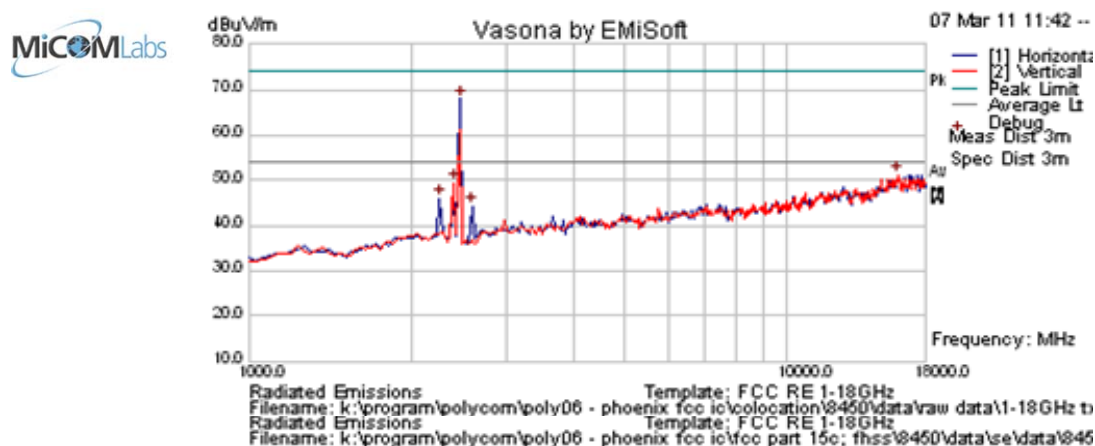
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7.1.2 Collocation - WLAN-2412MHz/ BT-2480MHz

Test Freq.	WLAN-2412MHz/ BT-2480MHz	Engineer	EVF
Variant	Collocation	Temp (°C)	18.5
Freq. Range	1-18 GHz	Rel. Hum.(%)	44
Power Setting	18 in test utility	Press. (mBars)	1004
Antenna	integral		
Test Notes 1	Handset (Spectralink Model: 8450) with fully charged battery		
Test Notes 2	TX: WLAN-Ch.1; BT-Ch. 78		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2480.190	76.0	3.0	-11.0	67.9	Peak [Scan]	H	--	--	--	--	n/a	FUNDBT
16058.116	41.4	9.0	0.8	51.2	Peak [Scan]	H	200	0	54.0	-2.8	Pass	noise floor
2412.906	57.3	3.0	-10.9	49.4	Peak [Scan]	V	--	--	--	--	n/a	FUNDWLAN
2260.521	54.4	2.9	-11.3	46.0	Peak [Scan]	H	200	0	54.0	-8.0	Pass	New
2601.202	52.5	3.1	-11.3	44.3	Peak [Scan]	H	200	0	54.0	-9.7	Pass	New

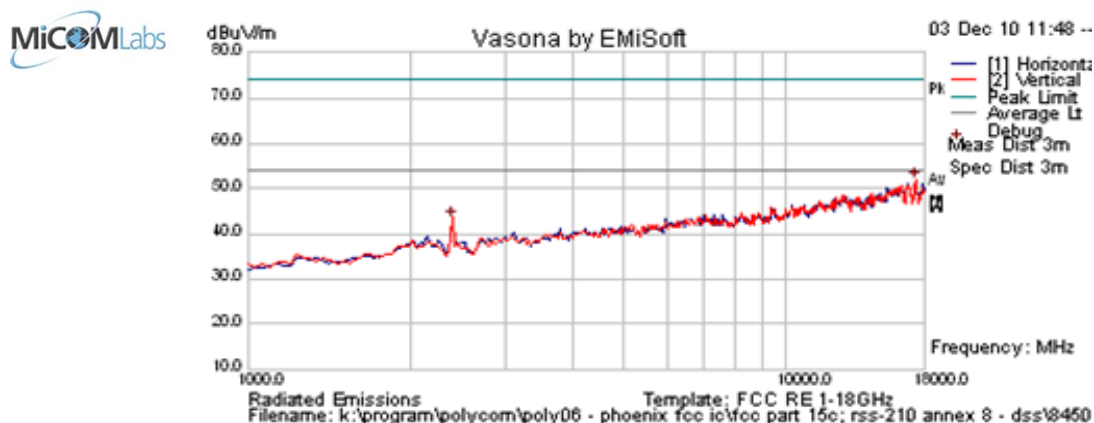
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 NRB = Non-Restricted Band. RB = Restricted Band.

All emissions that were not present during stand-alone transmitter emissions testing are indicated as "New". Peak values of these emissions are all less than 6dB below the average limit. Please see plots below for stand-alone transmitter emissions results.



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Test Freq.	2412 MHz	Engineer	EVF
Variant	802.11b; 1 Mbs	Temp (°C)	21.4
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	33
Power Setting	24 in test utility (maximum)	Press. (mBars)	1010
Antenna	Integral	Duty Cycle (%)	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Mdel: 8450) with battery (SN: AC101032008E) , also connected to charger (Mdel: SA106B-05)		
Test Notes 2	Mdel: WLAN Channel 01 Transmit; WLAN=1, BT=0, BC=0, DK=0		



Formally measured emission peaks

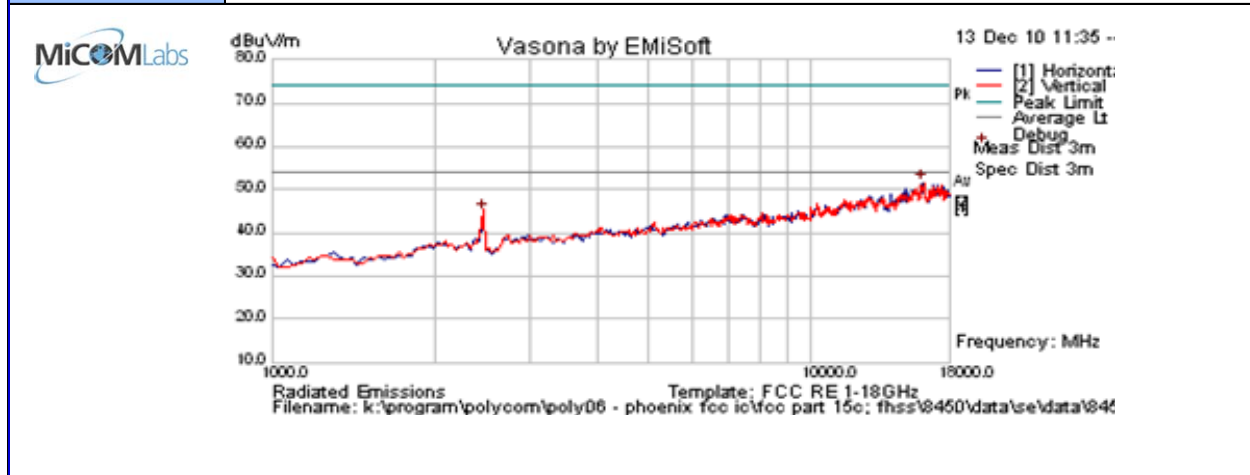
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
17352.705	41.1	8.7	2	51.9	Peak [Scan]	V	150	0	54	-2.1	Pass	noise floor
2399.787	51.1	3	-11.1	43	Peak [Scan]	V	98	0	54	-11	Pass	FUND
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission NRB = Non-Restricted Band. RB = Restricted Band.												

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Test Freq.	2480 MHz	Engineer	EVF
Variant	Bluetooth - CW Mode	Temp (°C)	21.4
Freq. Range	1000 - 18000 MHz	Rel. Hum.(%)	33
Power Setting	Maximum	Press. (mBars)	1010
Antenna	integral	Duty Cycle (%)	0
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Model: 8450) with battery (SN: AC101032008E) , also connected to charger (Model: SA106B-05)		
Test Notes 2	Mode: BT Channel 78 Transmit; rate: CW; WLAN=0, BT=1, BC=0, DK=0		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
16058.116	41.9	9.0	0.8	51.6	Peak [Scan]	H	100	0	54.0	-2.4	Pass	noise floor
2464.451	53.1	3.0	-11.1	44.9	Peak [Scan]	V	98	360	54.0	-9.1	Pass	FUND
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission NRB = Non-Restricted Band. RB = Restricted Band.												

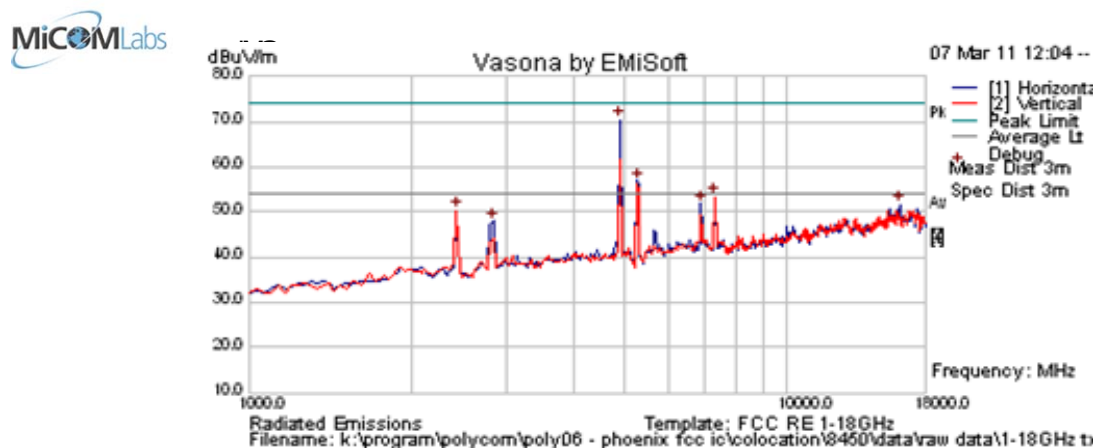
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7.1.3 Collocation - WLAN-5280MHz/ BT-2441MHz

Test Freq.	WLAN-5280MHz/ BT-2441MHz	Engineer	EVF
Variant	Collocation	Temp (°C)	21
Freq. Range	1-18GHz	Rel. Hum.(%)	39
Power Setting	16 in test utility	Press. (mBars)	1005
Antenna	integral		
Test Notes 1	Handset (Spectralink Model: 8450) with fully charged battery		
Test Notes 2	TX: WLAN-Ch.56; BT-Ch. 39		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
4881.733	72.8	4.5	-9.3	68.0	Peak Max	H	175	191	74.0	-6.1	Pass	New
7322.806	53.1	5.5	-5.1	53.5	Peak Max	V	188	85	74.0	-20.5	Pass	New
4881.733	50.9	4.5	-9.3	46.1	Average Max	H	175	191	54.0	-7.9	Pass	New
7322.806	35.2	5.5	-5.1	35.5	Average Max	V	188	85	54.0	-18.5	Pass	New
5273.186	62.0	4.6	-9.8	56.9	Peak [Scan]	H	--	--	--	--	n/a	FUNDWLAN
6920.401	51.9	5.3	-5.5	51.7	Peak [Scan]	H	100	0	54.0	-2.3	Pass	WLAN
16126.253	41.5	9.0	1.0	51.5	Peak [Scan]	H	200	0	54.0	-2.6	Pass	noise floor
2441.145	58.3	3.0	-11.0	50.3	Peak [Scan]	V	--	--	--	--	n/a	FUNDBT
2840.521	56.0	3.3	-11.4	47.9	Peak [Scan]	H	200	0	54.0	-6.1	Pass	
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission												
NRB = Non-Restricted Band. RB = Restricted Band.												

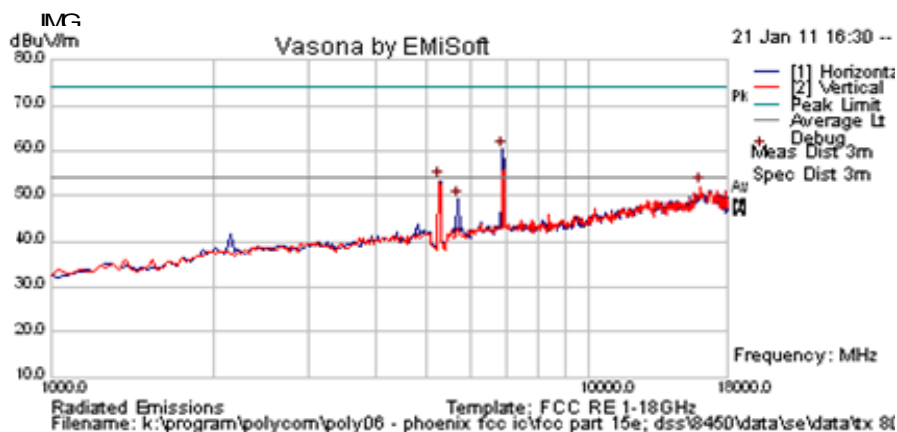
All emissions that were not present during stand-alone transmitter emissions testing are indicated as "New". Peak values of these emissions are all less than 6dB below the average limit. Please see plots below for stand-alone transmitter emissions results.

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Test Freq.	5280 MHz	Engineer	EVF
Variant	Collocation	Temp (°C)	21
Freq. Range	1-18GHz	Rel. Hum.(%)	39
Power Setting	16 in test utility	Press. (mBars)	1005
Antenna	integral	Duty Cycle (%)	0
Test Notes 1	Handset (Spectralink Model: 8450) with fully charged battery		
Test Notes 2	Mode: WLAN Channel 56 Transmit; WLAN=1, BT=0, BC=0, DK=0		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
6919.760	60.4	5.3	-5.6	60.2	Peak [Scan]	H	100	0	68.2	-8.0	Pass	NRB
5280.802	58.3	4.6	-9.7	53.3	Peak [Scan]	V	--	--	--	--	n/a	FUND
16058.116	42.3	9.0	0.8	52.0	Peak [Scan]	V	100	0	54	-2.0	Pass	noise floor
5720.120	52.9	4.7	-8.4	49.2	Peak [Scan]	H	100	0	68.2	-19.0	Pass	NRB

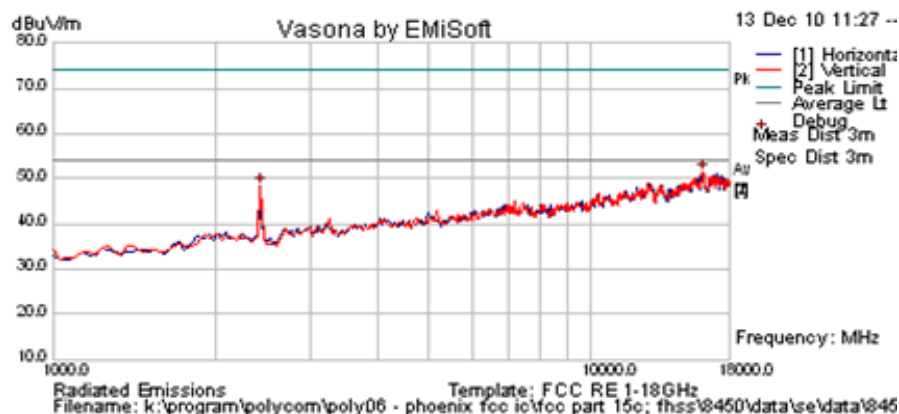
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
NRB = Non-Restricted Band. RB = Restricted Band.

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Test Freq.	2441 MHz	Engineer	EVF
Variant	Bluetooth - CW/Mbde	Temp (°C)	21
Freq. Range	1000 - 18000 MHz	Rel. Hum.(%)	39
Power Setting	Maximum	Press. (mBars)	1005
Antenna	Integral	Duty Cycle (%)	0
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Mdel: 8450) with battery (SN: AC101032008E) , also connected to charger (Mdel: SA106B-05)		
Test Notes 2	Mdb: BT Channel 39 Transmit; rate: CW; WLAN=0, BT=1, BC=0, DK=0		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
16092.184	41.5	9.0	0.8	51.2	Peak [Scan]	V	150	0	54.0	-2.8	Pass	noise floor
2430.86172	56.4	3.0	-11.1	48.2	Peak [Scan]	V	100	0	54.0	-5.8	Pass	FUND
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission												
NRB = Non-Restricted Band. RB = Restricted Band.												

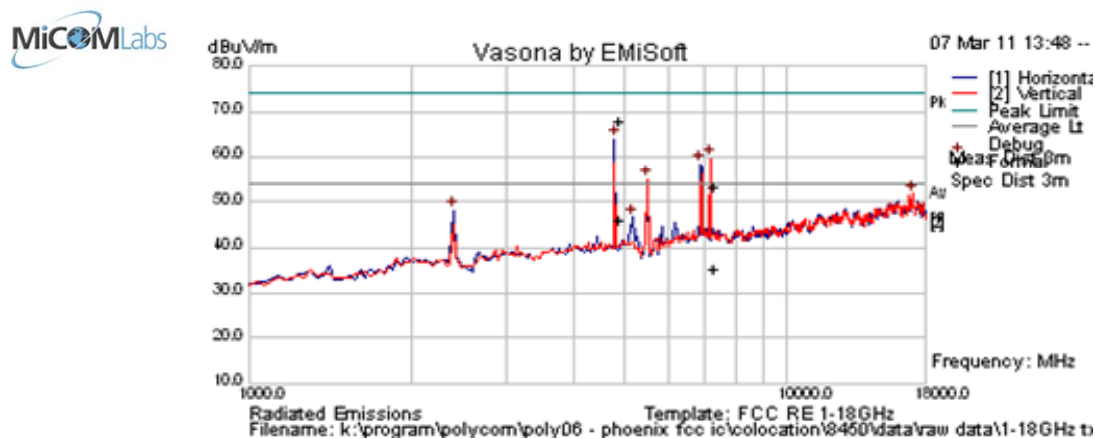
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7.1.4 Collocation - WLAN-5500MHz/ BT-2402MHz

Test Freq.	WLAN-5500MHz/ BT-2402MHz	Engineer	EVF
Variant	Collocation	Temp (°C)	18.5
Freq. Range	1-18 GHz	Rel. Hum.(%)	44
Power Setting	16 in test utility	Press. (mBars)	1004
Antenna	integral		
Test Notes 1	Handset (Spectralink Model: 8450) with fully charged battery		
Test Notes 2	TX: WLAN-Ch.100; BT-Ch. 0		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
4804.358	63.7	4.5	-9.3	58.8	Peak Max	H	201	212	74.0	-15.2	Pass	New
7205.571	60.6	5.4	-5.3	60.8	Peak Max	V	142	303	74.0	-13.2	Pass	New
4804.358	42.0	4.5	-9.3	37.1	Average Max	H	201	212	54.0	-16.9	Pass	New
7205.571	38.9	5.4	-5.3	39.0	Average Max	V	142	303	54.0	-15.0	Pass	New
6916.313	58.6	5.3	-5.6	58.3	Peak [Scan]	H	200	0	68.2	-9.9	Pass	WLAN
5492.505	59.2	4.6	-8.8	55.1	Peak [Scan]	V	--	--	--	--	n/a	FUNDWLAN
17114.228	42.6	8.5	0.8	51.9	Peak [Scan]	V	100	0	54.0	-2.1	Pass	noise floor
2402.004	56.2	3.0	-11.1	48.1	Peak [Scan]	H	--	--	--	--	n/a	FUNDBT
5156.292	51.1	4.6	-9.0	46.7	Peak [Scan]	H	100	0	54.0	-7.3	Pass	WLAN

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 NRB = Non-Restricted Band. RB = Restricted Band.

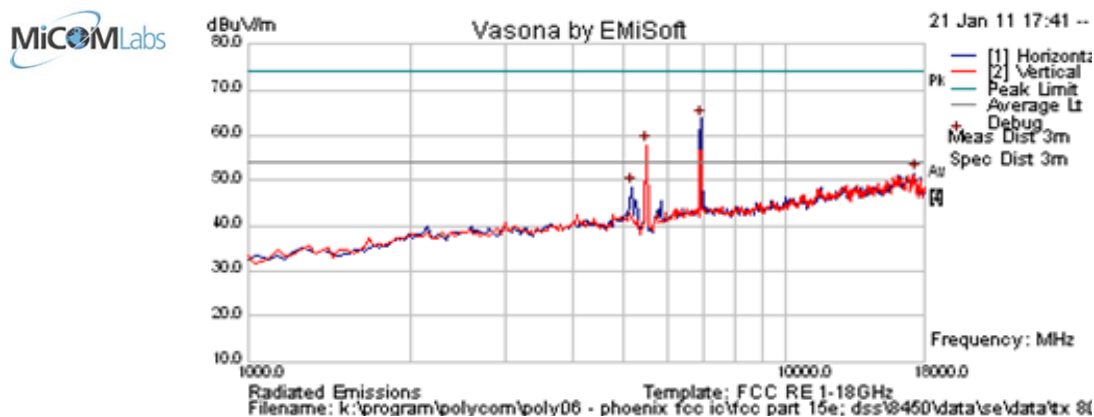
All emissions that were not present during stand-alone transmitter emissions testing are indicated as "New". Peak values of these emissions are all less than 6dB below the average limit. Please see plots below for stand-alone transmitter emissions results.

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Test Freq.	5500 MHz	Engineer	EVF
Variant	802.11a; 6 Mbs	Temp (°C)	20
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	38
Power Setting	16 in test utility	Press. (mBars)	1005
Antenna	integral	Duty Cycle (%)	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Mdel: 8450) with battery (SN: AC1010320232) , also connected to charger (Mdel: SA106B-05)		
Test Notes 2	Mdel: WLAN Channel 100 Transmit; WLAN=1, BT=0, BC=0, DK=0		



Formally measured emission peaks

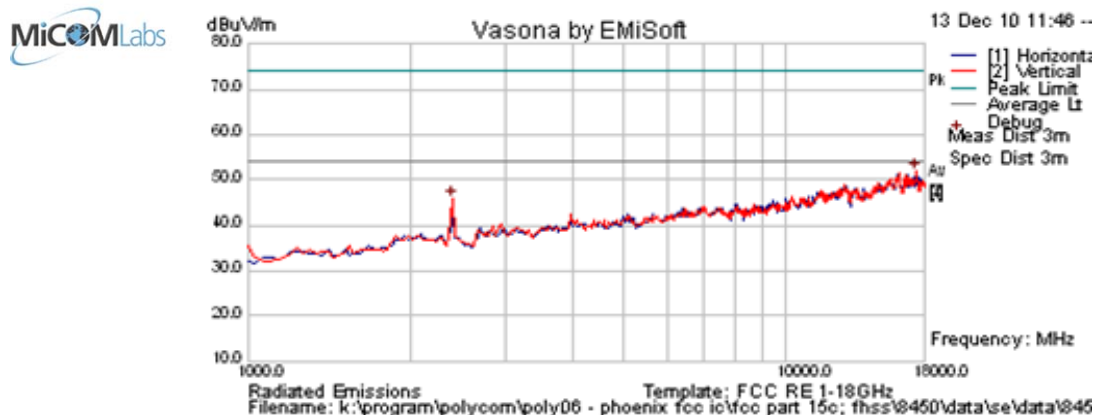
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
6920.321	63.9	5.3	-5.5	63.7	Peak [Scan]	H	100	0	68.2	-4.5	Pass	NRB
5498.236	62.1	4.6	-8.7	58.0	Peak [Scan]	H	--	--	--	--	n/a	FUND
17284.569	41.3	8.6	1.6	51.5	Peak [Scan]	H	200	0	54	-2.5	Pass	noise floor
5156.152	52.9	4.6	-9.0	48.6	Peak [Scan]	H	100	0	68.2	-19.7	Pass	NRB
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission NRB = Non-Restricted Band. RB = Restricted Band.												

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Test Freq.	2402 MHz	Engineer	EVF
Variant	Bluetooth - CW/Mbde	Temp (°C)	20
Freq. Range	1000 - 18000 MHz	Rel. Hum.(%)	47
Power Setting	Maximum	Press. (mBars)	1007
Antenna	Integral	Duty Cycle (%)	10
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Mdel: 8450) with battery (SN: AC101032008E) , also connected to charger (Mdel: SA106B-05)		
Test Notes 2	Mbde: BT Channel 0 Transmit; rate: CW; WLAN=0, BT=1, BC=0, DK=0		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
17420.842	41.2	8.7	1.9	51.9	Peak [Scan]	V	100	0	54.0	-2.1	Pass	noise floor
2397.347	53.9	3.0	-11.1	45.7	Peak [Scan]	V	98	360	54.0	-8.3	Pass	FUND
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission												
NRB = Non-Restricted Band. RB = Restricted Band.												

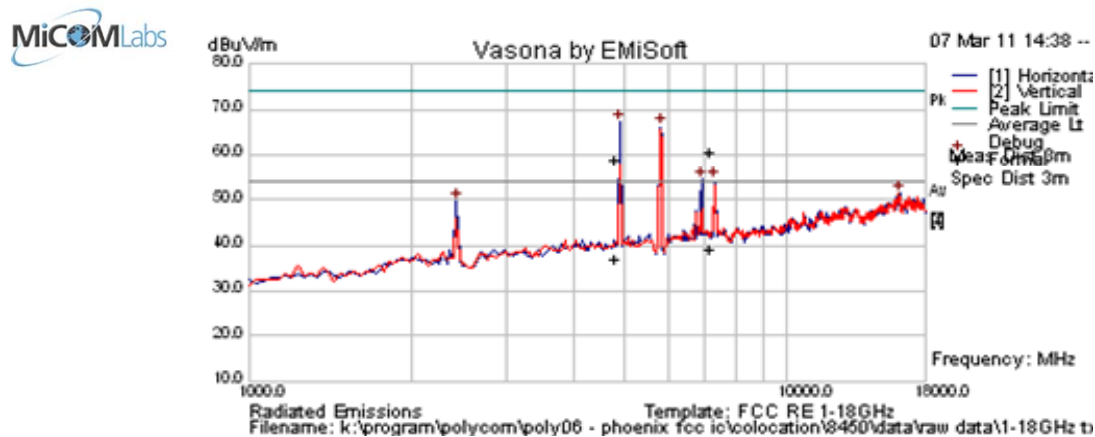
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7.1.5 Collocation - WLAN-5825MHz/ BT-2441MHz

Test Freq.	WLAN-5825MHz/ BT-2441MHz	Engineer	EVF
Variant	Collocation	Temp (°C)	22
Freq. Range	1-18GHz	Rel. Hum.(%)	33
Power Setting	16 in test utility	Press. (mBars)	1000
Antenna	integral		
Test Notes 1	Handset (Spectralink Model: 8450) with fully charged battery		
Test Notes 2	TX: WLAN-Ch.165; BT-Ch. 39		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
4881.703	70.5	4.5	-9.3	65.7	Peak Max	H	98	147	74.0	-8.3	Pass	New
7322.485	51.5	5.5	-5.1	51.9	Peak Max	H	187	3	74.0	-22.2	Pass	New
4881.703	48.2	4.5	-9.3	43.4	Average Max	H	98	147	54.0	-10.6	Pass	New
7322.485	33.7	5.5	-5.1	34.0	Average Max	H	187	3	54.0	-20.0	Pass	New
5821.323	69.5	4.8	-8.3	66.1	Peak [Scan]	H	--	--	--	--	n/a	FUNDWLAN
6925.21	54.4	5.3	-5.5	54.2	Peak [Scan]	H	100	0	74.0	-19.8	Pass	WLAN
16160.321	41.5	9.0	1.0	51.4	Peak [Scan]	H	100	0	54	-2.6	Pass	noise floor
2441.022	57.6	3.0	-11.0	49.5	Peak [Scan]	H	--	--	--	--	n/a	FUNDBT

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 NRB = Non-Restricted Band. RB = Restricted Band.

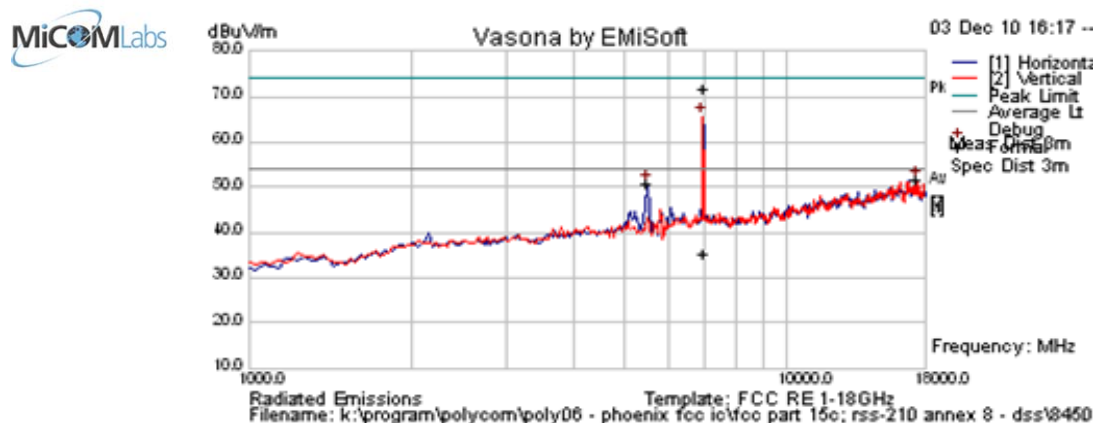
All emissions that were not present during stand-alone transmitter emissions testing are indicated as "New". Peak values of these emissions are all less than 6dB below the average limit. Please see plots below for stand-alone transmitter emissions results.

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Test Freq.	5825 MHz	Engineer	EVF
Variant	Colocation	Temp (°C)	22
Freq. Range	1-18GHz	Rel. Hum.(%)	33
Power Setting	16 in test utility	Press. (mBars)	1000
Antenna	integral	Duty Cycle (%)	0
Test Notes 1	Handset (Spectralink Model: 8450) with fully charged battery		
Test Notes 2	Mmode: WLAN Channel 165 Transmit; WLAN=1, BT=0, BC=0, DK=0		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
6971.703	71.4	5.4	-5.2	71.6	Peak Max	V	178	181	74.0	-2.4	Pass	NRB
6971.703	35.2	5.4	-5.2	35.4	Average Max	V	178	181	54.0	-18.6	Pass	NRB
17284.569	41.3	8.6	1.6	51.5	Peak [Scan]	V	150	0	54	-2.5	Pass	noise floor
5496.994	54.7	4.6	-8.7	50.6	Peak [Scan]	H	200	0	54	-3.4	Pass	RB see band edge

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission

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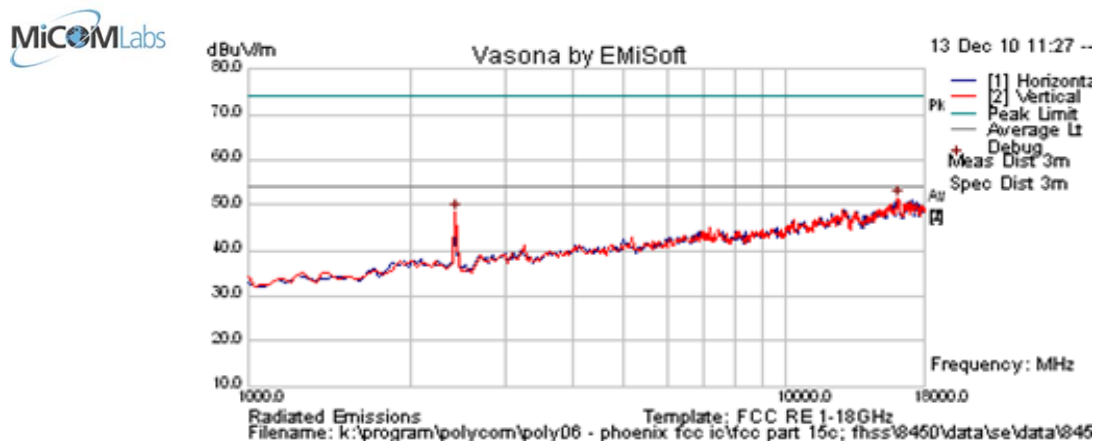
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Test Freq.	2441 MHz	Engineer	EVF
Variant	Bluetooth - CW/Mbde	Temp (°C)	22
Freq. Range	1000 - 18000 MHz	Rel. Hum.(%)	33
Power Setting	Maximum	Press. (mBars)	1000
Antenna	integral	Duty Cycle (%)	0
Test Notes 1	Fundamental attenuated by band-stop filter. Handset (Mdel: 8450) with battery (SN: AC101032008E) , also connected to charger (Mdel: SA106B-05)		
Test Notes 2	Mdb: BT Channel 78 Transmit; rate: CW; WLAN=0, BT=1, BC=0, DK=0		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
16092.184	41.5	9.0	0.8	51.2	Peak [Scan]	V	150	0	54.0	-2.8	Pass	noise floor
2430.86172	56.4	3.0	-11.1	48.2	Peak [Scan]	V	100	0	54.0	-5.8	Pass	FUND
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission												
NRB = Non-Restricted Band. RB = Restricted Band.												

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8 Photographs

8.1 Transmitter Radiated Spurious Emission above 1 GHz



8.2 Transmitter Radiated Spurious Emission below 1 GHz





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9 TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Serial #
0134	Amplifier	Com Power	PA 122	181910
0158	Barometer /Thermometer	Control Co.	4196	E2846
0287	EMI Receiver	Rhode & Schwartz	ESIB 40	100201
0193	EMI Receiver	Rhode & Schwartz	ESIB 7	838496/007
0252	SMA Cable	Megaphase	Sucoflex 104	None
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	209092-001
0313	Coupler	Hewlett Packard	86205A	3140A01285
0314	30dB N-Type Attenuator	ARRA	N9444-30	1623
0070	Power Meter	Hewlett Packard	437B	3125U11552
0116	Power Sensor	Hewlett Packard	8485A	3318A19694
0117	Power Sensor	Hewlett Packard	8487D	3318A00371
0184	Pulse Limiter	Rhode & Schwartz	ESH3Z2	357.8810.52
0190	LISN	Rhode & Schwartz	ESH3Z5	836679/006
0293	BNC Cable	Megaphase	1689 1GVT4	15F50B001
0301	5.6 GHz Notch Filter	Micro-Tronics	RBC50704	001
0302	5.25 GHz Notch Filter	Micro-Tronics	BRC50703	002
0303	5.8 GHz Notch Filter	Micro-Tronics	BRC50705	003
0304	2.4GHzHz Notch Filter	Micro-Tronics	--	001
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002
0335	1-18GHz Horn Antenna	ETS- Lindgren	3117	00066580
0337	Amplifier	MiCOM Labs	--	--
0338	Antenna	Sunol Sciences	JB-3	A052907
0342	2.4 GHz Notch Filter	EWT	EWT-14-0203	H1

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