

Davis Instruments

TEST REPORT FOR

**EnviroMonitor Node
Model: 6810**

Tested To The Following Standard:

**FCC Part 15 Subpart C Section:
15.247
(DTS 2400-2483.5 MHz)**

Report No.: 97253-30

Date of issue: December 7, 2015



This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Davis Instruments
3465 Diablo Avenue
Hayward, CA 94545

REPRESENTATIVE: Perry Dillon
Customer Reference Number: 85378

DATE OF EQUIPMENT RECEIPT:

DATE(S) OF TESTING:

REPORT PREPARED BY:

Terri Rayle
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 97253

November 10, 2015

November 10-17, 2015

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information



Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
1120 Fulton Place
Fremont, CA 94539

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.02.00
EMITest Immunity	5.02.00

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Fremont	US0082	SL2-IN-E-1148R	3082B-1	958979	A-0149

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C

Test Procedure	Description	Modifications	Results
15.247(a)(2)	6dB Bandwidth	NA	Pass
15.247(b)(3)	Output Power	NA	Pass
15.247(e)	Power Spectral Density	NA	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	Pass
15.247(d)	Radiated Emissions & Band Edge	NA	Pass

NA = Not applicable

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

During testing numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
EnviroMonitor Node	Davis Instruments	6810	6810-1

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop Computer	Fujitsu	C1410 Dual-Core TS600	R6Z16003

Test Conditions / Notes:

Configuration 2

Equipment Tested:

Device	Manufacturer	Model #	S/N
EnviroMonitor Node	Davis Instruments	6810	6810-2

Support Equipment:

Device	Manufacturer	Model #	S/N
Temperature Probe	Davis Instruments	Product # 6470	NA
Temperature Probe	Davis Instruments	Product # 6470	NA
Temperature Probe	Davis Instruments	Product # 6470	NA
Temperature Probe	Davis Instruments	Product # 6470	NA
Laptop Computer	Fujitsu	C1410 Dual-Core TS600	R6Z16003

FCC PART 15 SUBPART C

15.247(a)(2) 6dB Bandwidth

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **15.247 a (2)-OBW Set up**
 Work Order #: **97253** Date: 11/10/2015
 Test Type: **Conducted Power Measurement**
 Tested By: Hieu Song Nguyenpham
 Software: EMITest 5.02.00

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	P06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
T2	P01211	Attenuator	23-10-34	3/31/2015	3/31/2017
	03471	Spectrum Analyzer	E4440A	12/19/2013	12/19/2015

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

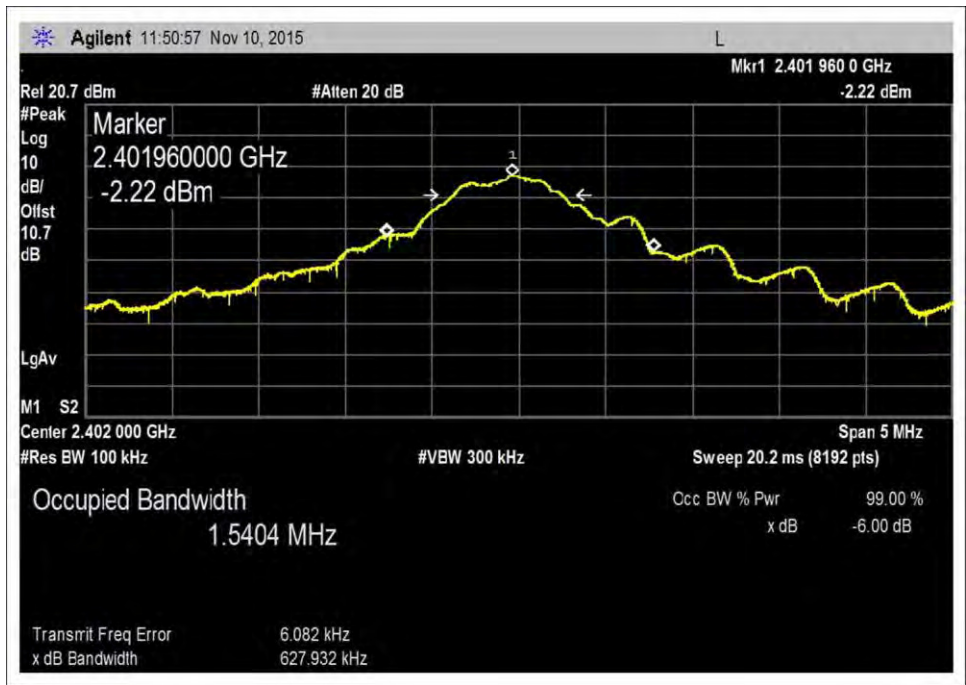
Test Conditions / Notes:

15.247 (a)(2): OBW Set up
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

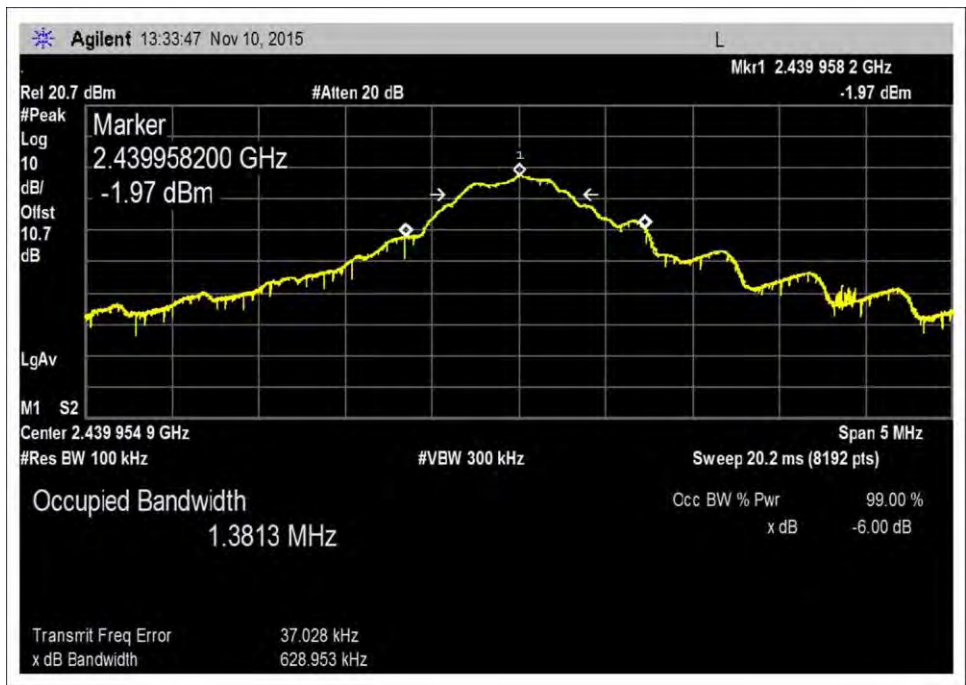
 Temperature: 21.7°C
 Relative Humidity: 45 %
 Atmospheric Pressure: 101.9 kPa

 High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: KDB 558074 v03r03 section 8.1
 RBW=100kHz
 VBW=300kHz
 The EUT is placed on the table and set continuously transmitting or receiving as intended.
BLE Band on TX Mode

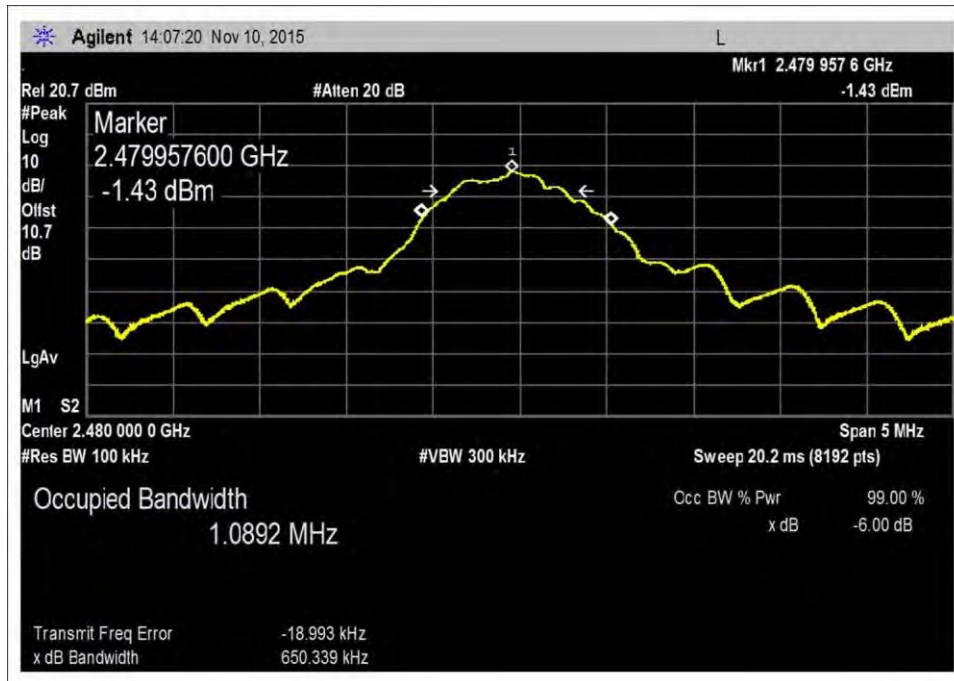
Plots



Low Channel



Middle Channel



High Channel

Test Setup Photo



15.247(b)(3) Output Power

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **15.247(b) Power Output (2400-2483.5 MHz DTS)**
 Work Order #: **97253** Date: 11/10/2015
 Test Type: **Conducted Power Measurement**
 Tested By: Hieu Song Nguyenpham
 Software: EMITest 5.02.00

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	P06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
T2	P01211	Attenuator	23-10-34	3/31/2015	3/31/2017
	03471	Spectrum Analyzer	E4440A	12/19/2013	12/19/2015

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Fundamental of the EUT
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

Temperature: 22.3°C
 Relative Humidity: 39 %
 Atmospheric Pressure: 101.2 kPa

High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: KDB 558074 v03r03 section 9.2.2.7

RBW=3MHz
 VBW=8MHz

The EUT is placed on the table and set continuously transmitting or receiving as intended.

BLE Band on TX Mode

Test Data - Voltage Variations

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **15.31e**
 Work Order #: **97253** Date: 11/10/2015
 Test Type: **Conducted Power Measurement**
 Tested By: Hieu Song Nguyenpham
 Software: EMITest 5.02.00

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	P06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
T2	P01211	Attenuator	23-10-34	3/31/2015	3/31/2017
	03471	Spectrum Analyzer	E4440A	12/19/2013	12/19/2015

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

Temperature: 22.3°C
 Relative Humidity: 39 %
 Atmospheric Pressure: 101.2 kPa

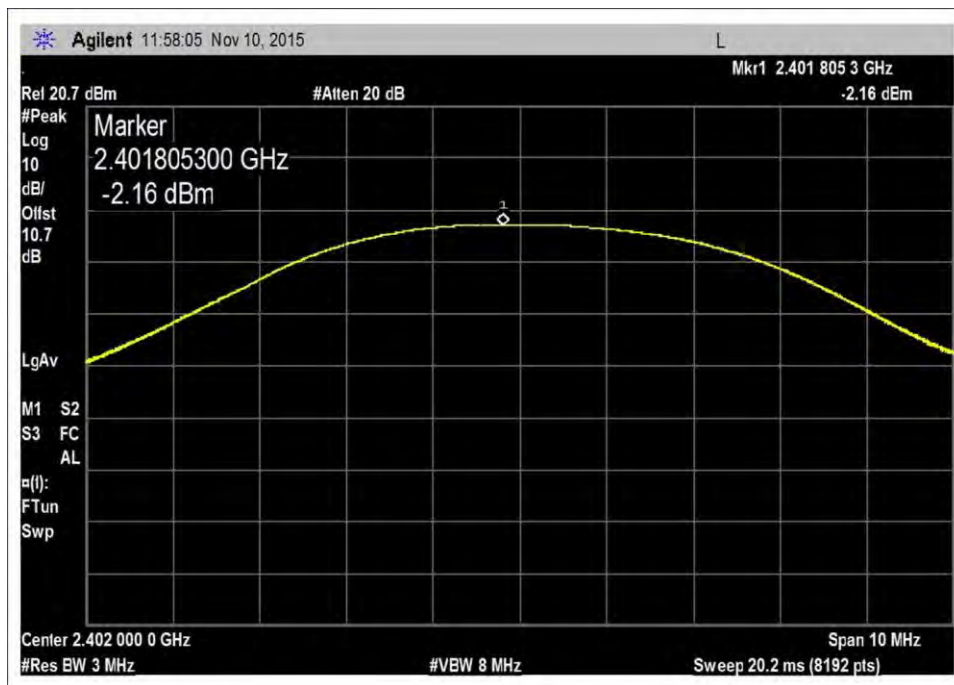
High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi

The EUT is placed on the table and set continuously transmitting or receiving as intended.

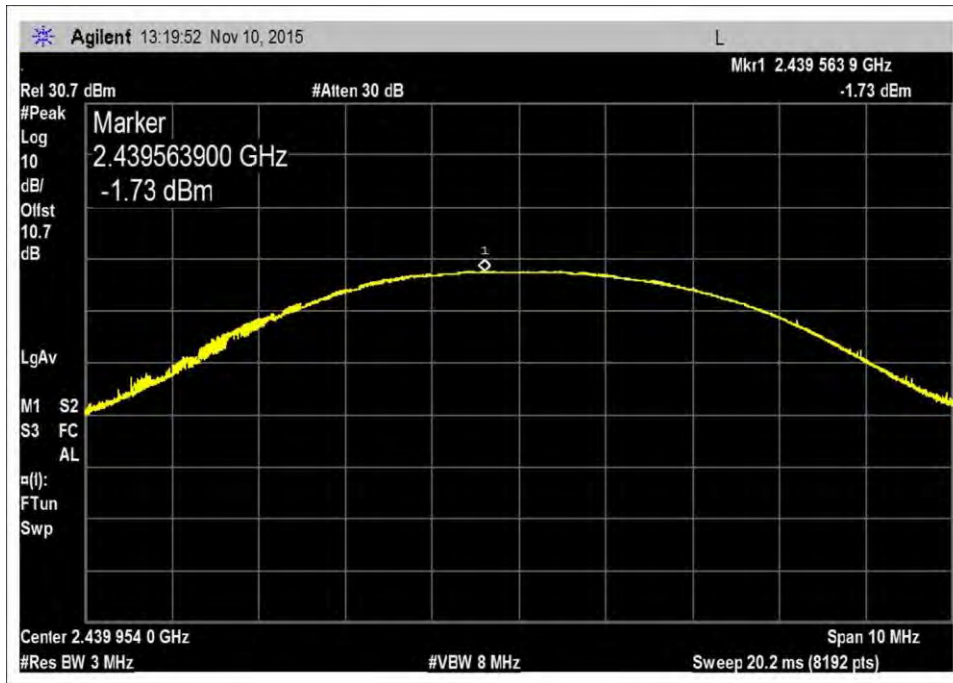
BLE Band on TX Mode
15.31e: new batteries were used

Test Data Summary - RF Conducted Measurement			
Frequency (MHz)	Measured Power in Watt	Power Limit in Watt	Pass/Fail
Low Channel 2402	0.000608135	1.00	Pass
Middle Channel 2440	0.000671429	1.00	Pass
High Channel 2480	0.000729458	1.00	Pass

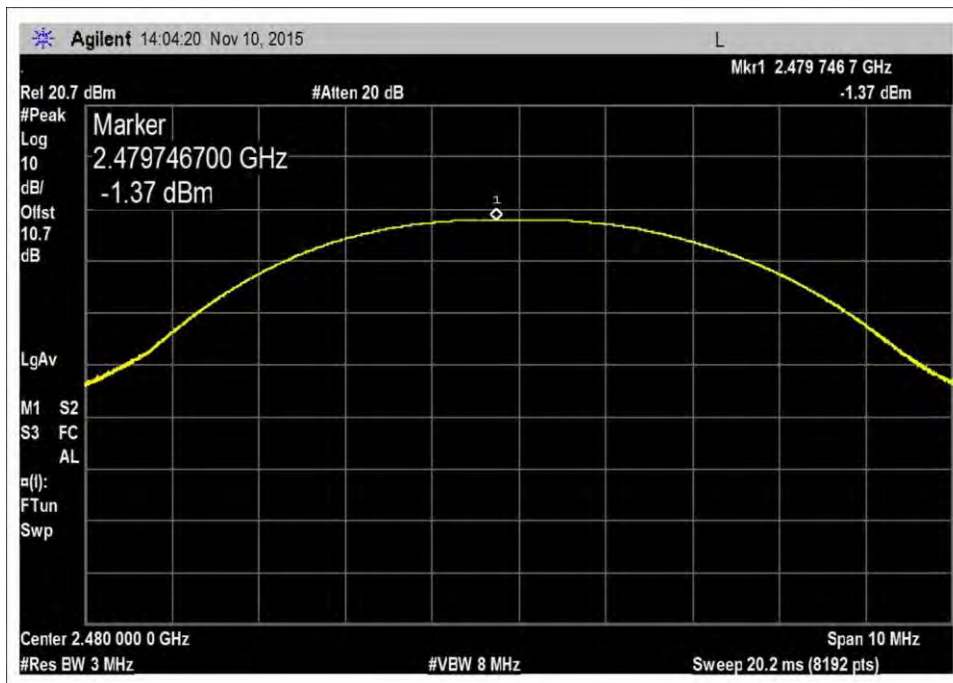
Plots



Low Channel

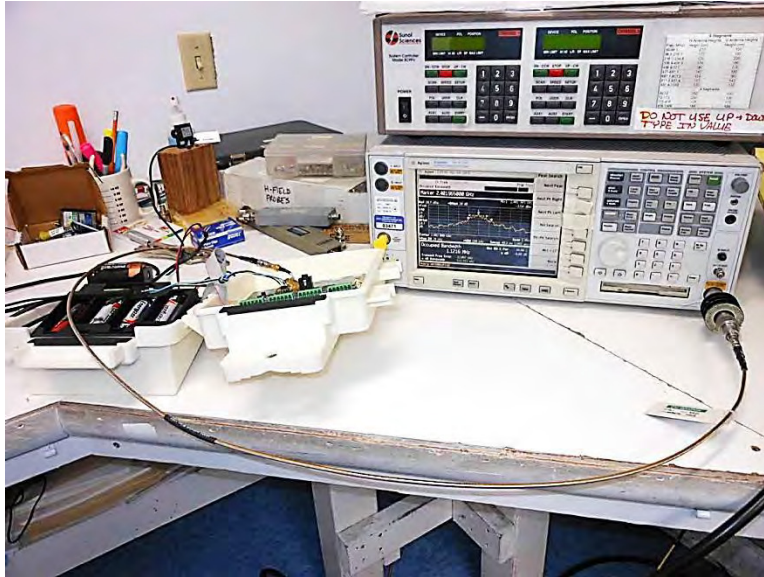


Middle Channel



High Channel

Test Setup Photo



15.247(e) Power Spectral Density

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)**
 Work Order #: **97253** Date: 11/10/2015
 Test Type: **Conducted Power Measurement**
 Tested By: Hieu Song Nguyenpham
 Software: EMITest 5.02.00

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	P06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
T2	P01211	Attenuator	23-10-34	3/31/2015	3/31/2017
	03471	Spectrum Analyzer	E4440A	12/19/2013	12/19/2015

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

PSD Set up
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

Temperature: 21.7°C
 Relative Humidity: 45 %
 Atmospheric Pressure: 101.8 kPa

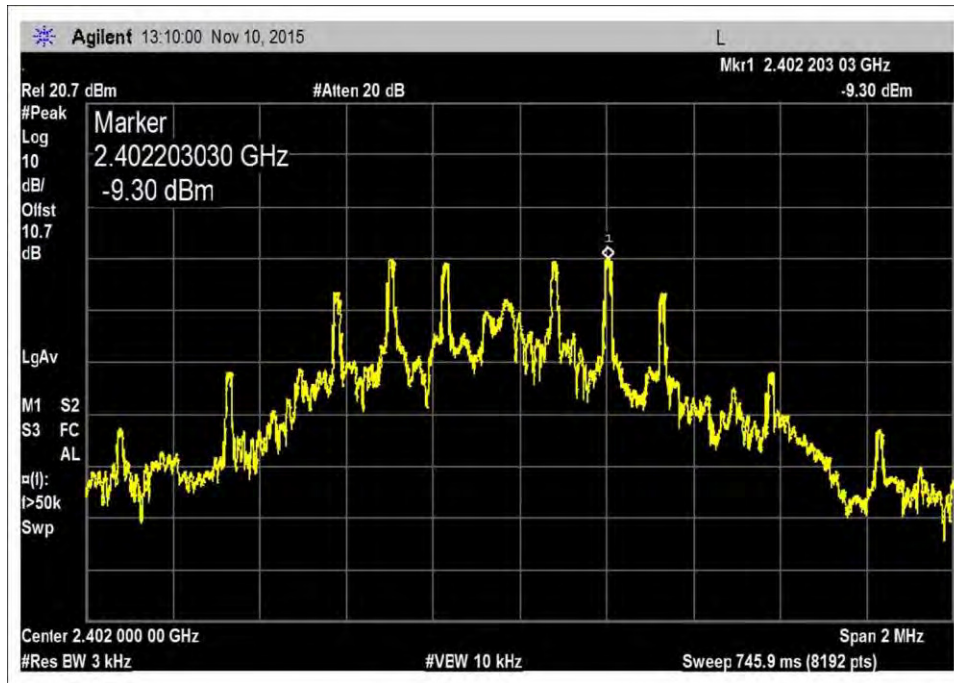
High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: KDB 558074 v03r03 section 10.2
 RBW=3 kHz and VBW=10 kHz

The EUT is placed on the table and set continuously transmitting or receiving as intended.

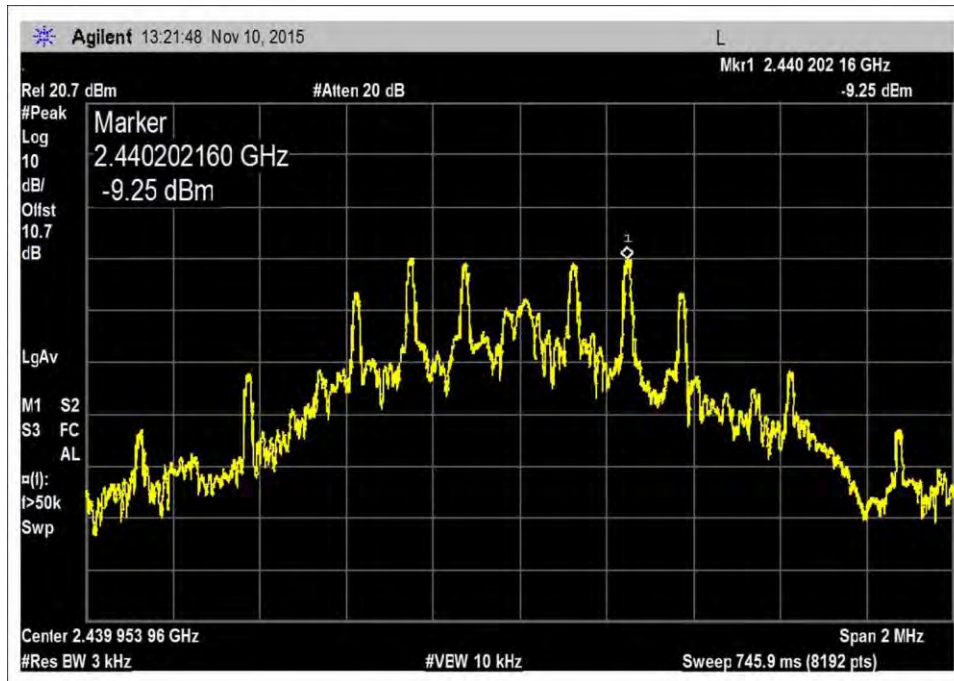
BLE Band on TX Mode

Test Result Summary			
Frequency (MHz)	Measured Power in (dBm/3kHz)	Power Limit in (dBm/kHz)	Pass/Fail
Low Channel 2402	-9.30	8	Pass
Middle Channel 2440	-9.25	8	Pass
High Channel 2480	-8.83	8	Pass

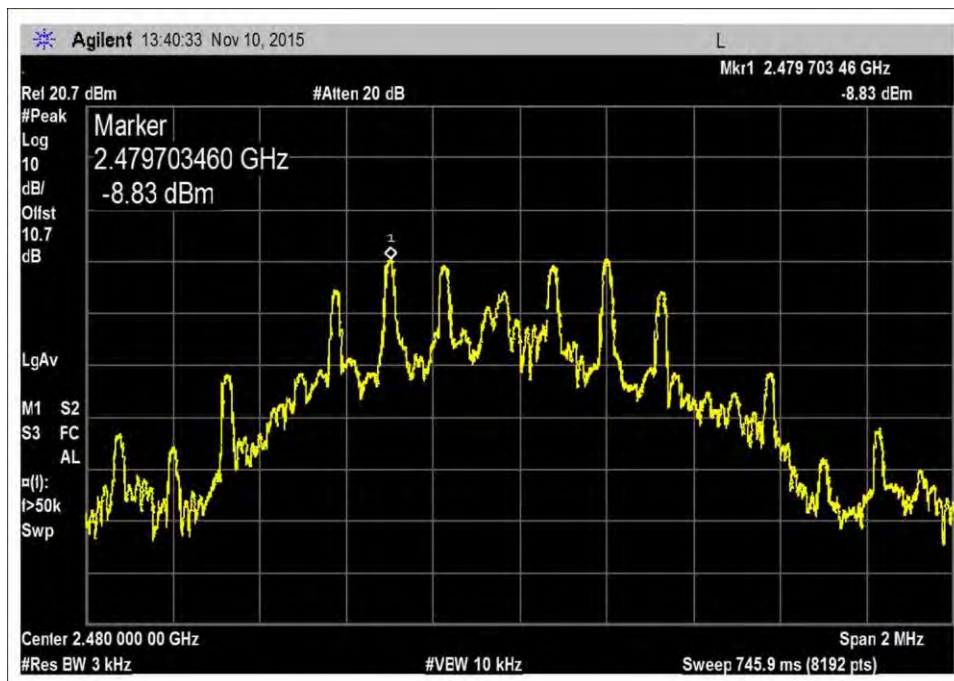
Plots



Low Channel



Middle Channel



High Channel

Test Setup Photo



15.247(d) RF Conducted Emissions & Band Edge

Test Conditions

The Reference level measurement for Emission in non-restricted frequency bands were made using the methods set out in KDB "558074 D01 DTS Meas Guidance v03r03", Section 11 Emissions in non-restricted frequency band.
 NOTE: The Reference Level is the limit line for Conducted Spurious Emission for Non-Restricted Frequency Band

Reference Limit in 100kHz			
Channel	dBm in 100kHz	dBuV in 100kHz	Reference Limit dBuV
Low	-2.18	104.82	84.82
Middle	-1.96	105.04	85.04
High	-1.46	105.54	85.54

Choose the worst case for the limit 84.82

Test Data

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **97253** Date: 11/10/2015
 Test Type: **Conducted Spurious Emission** Time: 3:24:12 PM
 Tested By: Hieu Song Nguyenpham Sequence#: 6
 Software: EMITest 5.02.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Conducted Spurious Emission
 Frequency Range: 9kHz to 25000MHz
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

 Temperature: 21.7°C
 Relative Humidity: 45 %
 Atmospheric Pressure: 101.9 kPa

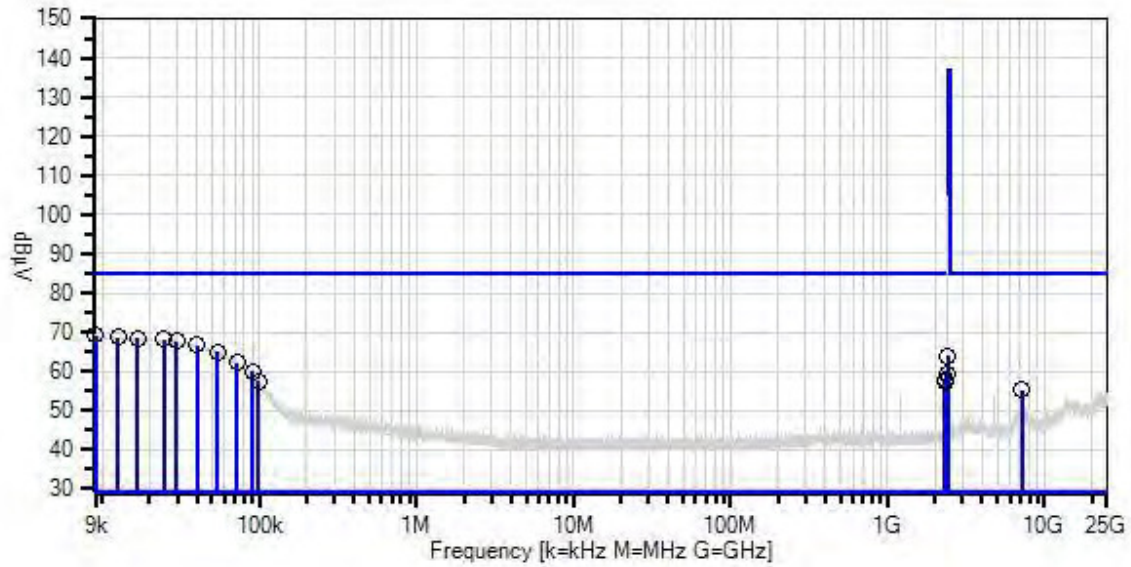
 High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: KDB "558074 D01 DTS Meas Guidance v03r03", Section 11

 RBW=100kHz
 VBW=300kHz

 The EUT is connected straight to the spectrum analyzer and set continuously transmitting as intended.

BLE Band on TX Mode
Low Channel

Davis Instruments WD#: 97253 Sequence#: 6 Date: 11/10/2015
15.247(d) Conducted Spurious Emissions Test Distance: None



- Sweep Data
 - Peak Readings
 - * Average Readings
 - Readings
 - × QP Readings
 - ▼ Ambient
 - 1 - 15.247(d) Conducted Spurious Emissions
- Software Version: 5.02.00

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T2	ANP06239	Attenuator	54A-10	7/9/2014	7/9/2016

Measurement Data:

Reading listed by margin.

Test Distance: None

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	dB	dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	9.000k	59.5	+0.0	+9.8			+0.0	69.3	84.8	-15.5	None
2	12.519k	58.8	+0.0	+9.8			+0.0	68.6	84.8	-16.2	None
3	16.861k	58.7	+0.0	+9.8			+0.0	68.5	84.8	-16.3	None
4	24.662k	58.4	+0.0	+9.8			+0.0	68.2	84.8	-16.6	None
5	29.789k	57.8	+0.0	+9.8			+0.0	67.6	84.8	-17.2	None
6	39.944k	56.8	+0.0	+9.8			+0.0	66.6	84.8	-18.2	None
7	53.854k	55.1	+0.0	+9.8			+0.0	64.9	84.8	-19.9	None
8	2399.412M	53.4	+0.7	+9.9			+0.0	64.0	84.8	-20.8	None
9	72.360k	52.5	+0.0	+9.8			+0.0	62.3	84.8	-22.5	None
10	89.931k	50.2	+0.0	+9.8			+0.0	60.0	84.8	-24.8	None
11	2391.488M	48.6	+0.7	+9.9			+0.0	59.2	84.8	-25.6	None
12	2361.112M	47.5	+0.7	+9.9			+0.0	58.1	84.8	-26.7	None
13	98.794k	47.8	+0.0	+9.8			+0.0	57.6	84.8	-27.2	None
14	2304.984M	47.0	+0.7	+9.9			+0.0	57.6	84.8	-27.2	None
15	7205.360M	44.0	+1.3	+9.9			+0.0	55.2	84.8	-29.6	None

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **97253** Date: 11/10/2015
 Test Type: **Conducted Spurious Emission** Time: 3:52:24 PM
 Tested By: Hieu Song Nguyenpham Sequence#: 7
 Software: EMITest 5.02.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Conducted Spurious Emission
 Frequency Range: 9kHz to 25000MHz
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

Temperature: 21.7°C
 Relative Humidity: 45 %
 Atmospheric Pressure: 101.9 kPa

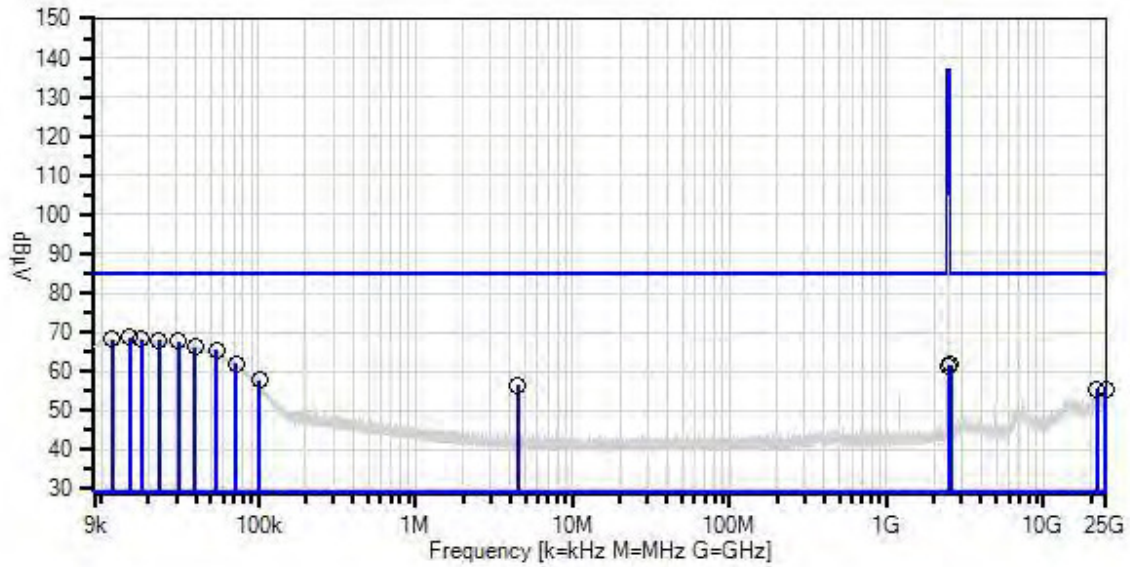
High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: KDB "558074 D01 DTS Meas Guidance v03r03", Section 11

RBW=100kHz
 VBW=300kHz

The EUT is connected straight to the spectrum analyzer and set continuously transmitting as intended.

BLE Band on TX Mode
Middle Channel

Davis Instruments WD#: 97253 Sequence#: 7 Date: 11/10/2015
15.247(d) Conducted Spurious Emissions Test Distance: None



- Sweep Data
 - Peak Readings
 - * Average Readings
 - QP Readings
 - × QP Readings
 - ▼ Ambient
 - Readings
 - 1 - 15.247(d) Conducted Spurious Emissions
- Software Version: 5.02.00

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T2	ANP06239	Attenuator	54A-10	7/9/2014	7/9/2016

Measurement Data:

Reading listed by margin.

Test Distance: None

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	dB	dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	15.154k	58.8	+0.0	+9.8			+0.0	68.6	84.8	-16.2	None
2	17.874k	58.4	+0.0	+9.8			+0.0	68.2	84.8	-16.6	None
3	11.785k	58.3	+0.0	+9.8			+0.0	68.1	84.8	-16.7	None
4	23.178k	58.1	+0.0	+9.8			+0.0	67.9	84.8	-16.9	None
5	30.981k	57.8	+0.0	+9.8			+0.0	67.6	84.8	-17.2	None
6	39.738k	56.4	+0.0	+9.8			+0.0	66.2	84.8	-18.6	None
7	53.983k	55.6	+0.0	+9.8			+0.0	65.4	84.8	-19.4	None
8	72.236k	52.3	+0.0	+9.8			+0.0	62.1	84.8	-22.7	None
9	2555.252M	51.1	+0.7	+9.9			+0.0	61.7	84.8	-23.1	None
10	2484.596M	50.8	+0.7	+9.9			+0.0	61.4	84.8	-23.4	None
11	101.966k	48.0	+0.0	+9.8			+0.0	57.8	84.8	-27.0	None
12	4.478M	46.6	+0.0	+9.8			+0.0	56.4	84.8	-28.4	None
13	21748.908 M	43.0	+2.4	+10.0			+0.0	55.4	84.8	-29.4	None
14	24959.753 M	42.7	+2.7	+10.0			+0.0	55.4	84.8	-29.4	None
15	21900.954 M	42.9	+2.4	+10.0			+0.0	55.3	84.8	-29.5	None

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **15.247(d) Conducted Spurious Emissions**
 Work Order #: **97253** Date: 11/10/2015
 Test Type: **Conducted Spurious Emission** Time: 4:17:08 PM
 Tested By: Hieu Song Nguyenpham Sequence#: 8
 Software: EMITest 5.02.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Conducted Spurious Emission
 Frequency Range: 9kHz to 25000MHz
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

Temperature: 21.7°C
 Relative Humidity: 45 %
 Atmospheric Pressure: 101.9 kPa

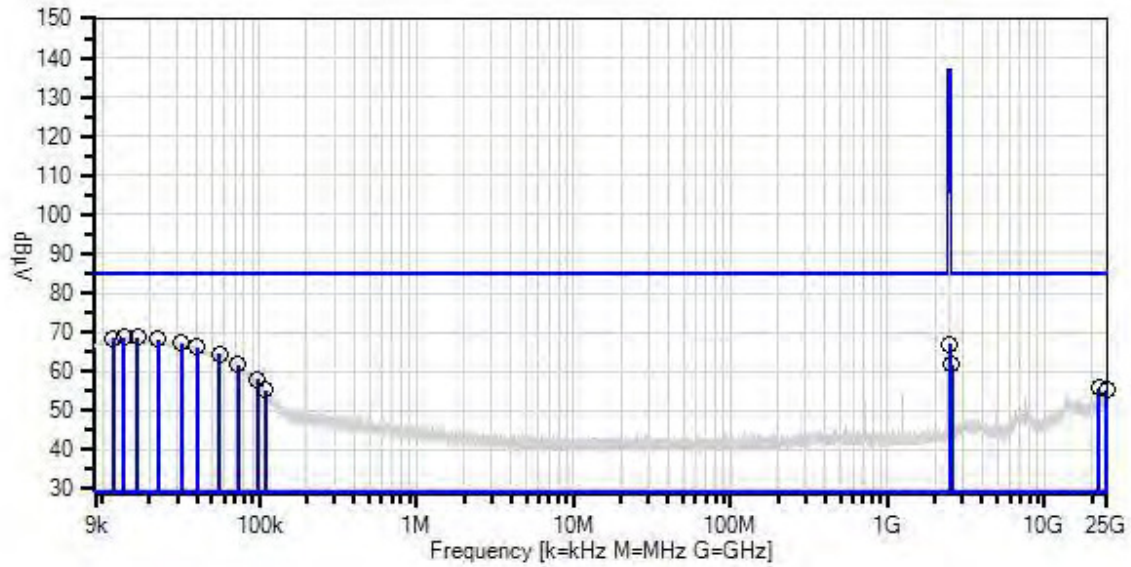
High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: KDB "558074 D01 DTS Meas Guidance v03r03", Section 11

RBW=100kHz
 VBW=300kHz

The EUT is connected straight to the spectrum analyzer and set continuously transmitting as intended.

BLE Band on TX Mode
High Channel

Davis Instruments WD#: 97253 Sequence#: 8 Date: 11/10/2015
15.247(d) Conducted Spurious Emissions Test Distance: None



- Sweep Data
 - Peak Readings
 - * Average Readings
 - Readings
 - × QP Readings
 - ▼ Ambient
 - 1 - 15.247(d) Conducted Spurious Emissions
- Software Version: 5.02.00

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
T2	ANP06239	Attenuator	54A-10	7/9/2014	7/9/2016

Measurement Data:

Reading listed by margin.

Test Distance: None

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	dB	dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar Ant
1	16.844k	59.0	+0.0	+9.8			+0.0	68.8	84.8	-16.0	None
2	13.661k	58.8	+0.0	+9.8			+0.0	68.6	84.8	-16.2	None
3	11.801k	58.6	+0.0	+9.8			+0.0	68.4	84.8	-16.4	None
4	22.738k	58.4	+0.0	+9.8			+0.0	68.2	84.8	-16.6	None
5	31.837k	57.4	+0.0	+9.8			+0.0	67.2	84.8	-17.6	None
6	2484.596M	56.3	+0.7	+9.9			+0.0	66.9	84.8	-17.9	None
7	40.095k	56.3	+0.0	+9.8			+0.0	66.1	84.8	-18.7	None
8	55.864k	54.7	+0.0	+9.8			+0.0	64.5	84.8	-20.3	None
9	73.526k	52.0	+0.0	+9.8			+0.0	61.8	84.8	-23.0	None
10	2555.252M	51.2	+0.7	+9.9			+0.0	61.8	84.8	-23.0	None
11	97.925k	48.3	+0.0	+9.8			+0.0	58.1	84.8	-26.7	None
12	22017.224 M	43.4	+2.4	+10.0			+0.0	55.8	84.8	-29.0	None
13	22097.718 M	43.4	+2.4	+10.0			+0.0	55.8	84.8	-29.0	None
14	109.112k	45.5	+0.0	+9.8			+0.0	55.3	84.8	-29.5	None
15	24771.932 M	42.7	+2.6	+10.0			+0.0	55.3	84.8	-29.5	None

Band Edge

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **Band Edge Set up**
 Work Order #: **97253** Date: 11/10/2015
 Test Type: **Conducted Power Measurement**
 Tested By: Hieu Song Nguyenpham
 Software: EMITest 5.02.00

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	P06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
T2	P01211	Attenuator	23-10-34	3/31/2015	3/31/2017
	03471	Spectrum Analyzer	E4440A	12/19/2013	12/19/2015

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

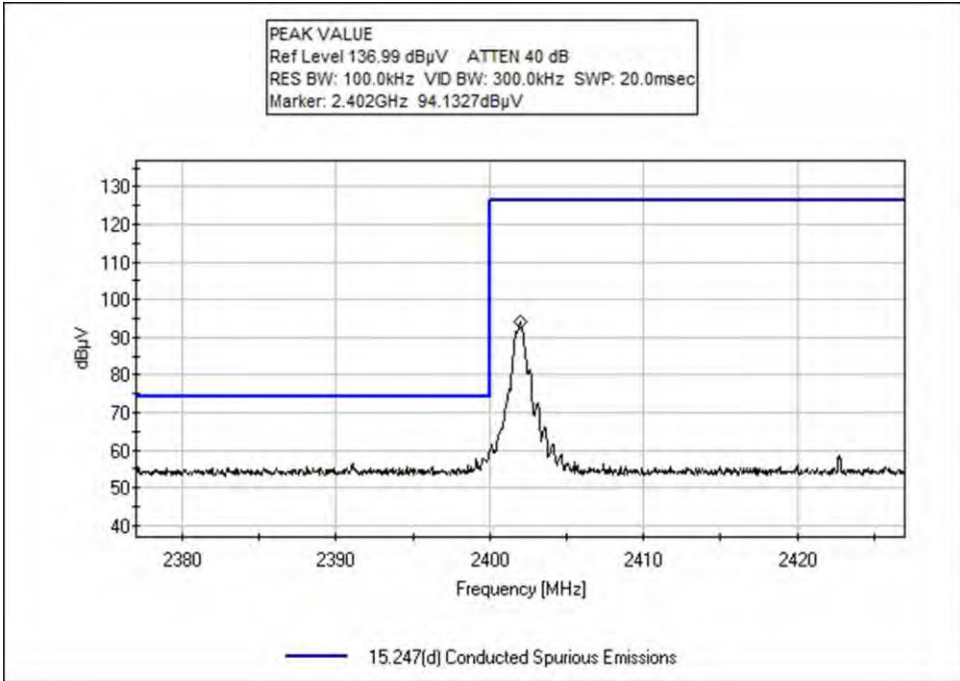
Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

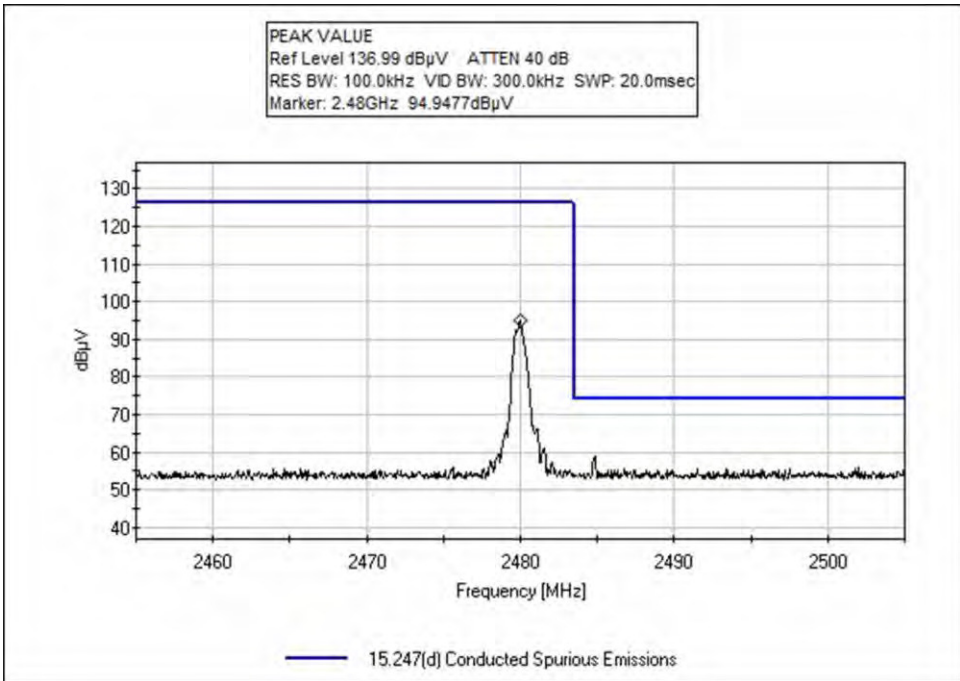
Test Conditions / Notes:

Band Edge Set up
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module
 Temperature: 21.7°C
 Relative Humidity: 45 %
 Atmospheric Pressure: 101.8 kPa
 High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: KDB 558074 v03r03 section 13.2
 The EUT is placed on the table and set continuously transmitting or receiving as intended.
BLE Band on TX Mode

Band Edge Plots

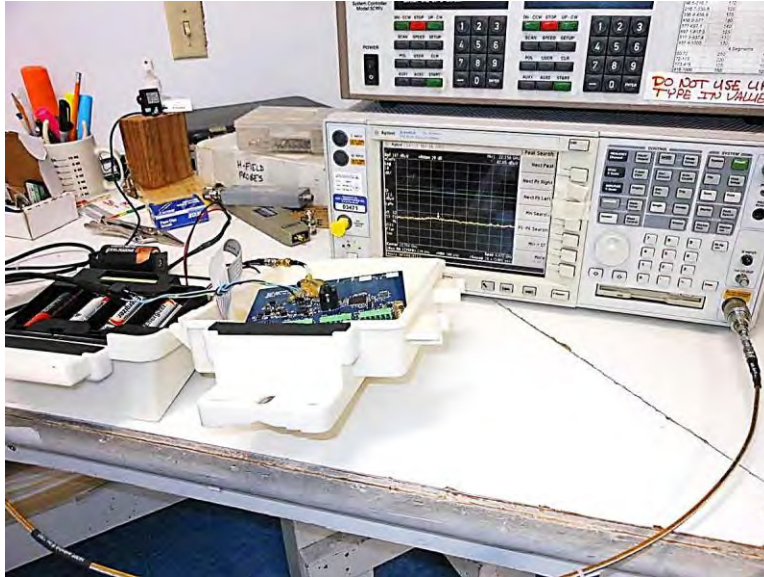


Low Channel



High Channel

Test Setup Photo



15.247(d) Radiated Emissions & Band Edge

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **97253** Date: 11/17/2015
 Test Type: **Radiated Scan** Time: 13:43:11
 Tested By: Hieu Song Nguyenpham Sequence#: 81
 Software: EMITest 5.02.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
 Frequency Range: 9kHz to 1000MHz
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

Temperature: 19.9°C
 Relative Humidity: 46 %
 Atmospheric Pressure: 102.8 kPa

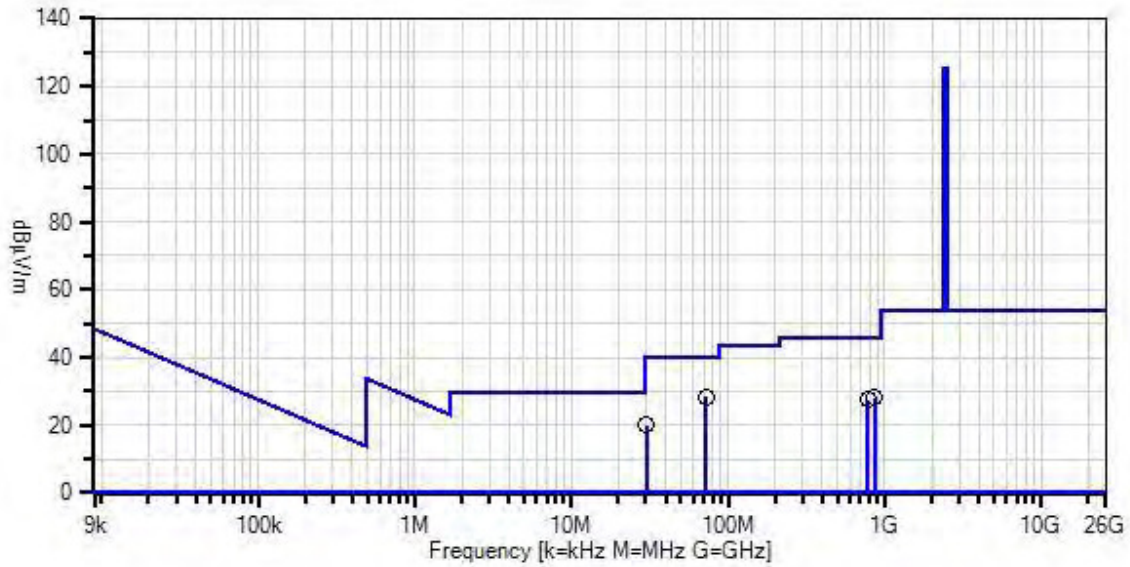
High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: ANSI C 63.4 2009

The EUT is placed on the table and set continuously transmitting or receiving as intended.
 The EUT is connected to four temperature probes to maximize a full load.

Frequency range of measurement = 9 kHz- 25GHz.
 9 kHz - 150 kHz - RBW=200 Hz VBW=200Hz
 150 kHz - 30 MHz - RBW=9 kHz VBW=9kHz
 30 MHz - 1000MHz - RBW=120 kHz VBW=120kHz
 1000MHz -25000MHz- RBW =1MHz VBW=1MHz

BLE on TX Mode
Low Channel

Davis Instruments WO#: 97253 Sequence#: 81 Date: 11/17/2015
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters



- Sweep Data
 - Peak Readings
 - * Average Readings
 - Readings
 - × QP Readings
 - ▼ Ambient
 - 1 - 15.247(d) / 15.209 Radiated Spurious Emissions
- Software Version: 5.02.00

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN00567	Preamp	8447D	1/2/2015	1/2/2017
T2	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP01187	Cable	CNT-195	12/30/2014	12/30/2016
T5	ANP06691	Cable	PE3062-180	8/8/2014	8/8/2016
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
	AN00432	Loop Antenna	6502	5/8/2015	5/8/2017

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5				Table	dB μ V/m	dB μ V/m	dB	Ant
			dB	dB	dB	dB					
1	72.259M	48.5	-27.8 +0.3	+6.5	+0.7	+0.2	+0.0	28.4	40.0	-11.6	Horiz
2	861.473M	28.4	-28.0 +1.3	+22.7	+3.1	+0.6	+0.0	28.1	46.0	-17.9	Vert
3	785.918M	28.8	-28.0 +1.3	+21.7	+2.9	+0.7	+0.0	27.4	46.0	-18.6	Vert
4	30.200M	28.3	-27.9 +0.2	+18.8	+0.4	+0.1	+0.0	19.9	40.0	-20.1	Vert

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **97253** Date: 11/13/2015
 Test Type: **Radiated Scan** Time: 17:23:35
 Tested By: Hieu Song Nguyenpham Sequence#: 41
 Software: EMITest 5.02.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
 Frequency Range: 1000MHz to 25000MHz
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

 Temperature: 19.9°C
 Relative Humidity: 46 %
 Atmospheric Pressure: 102.8 kPa

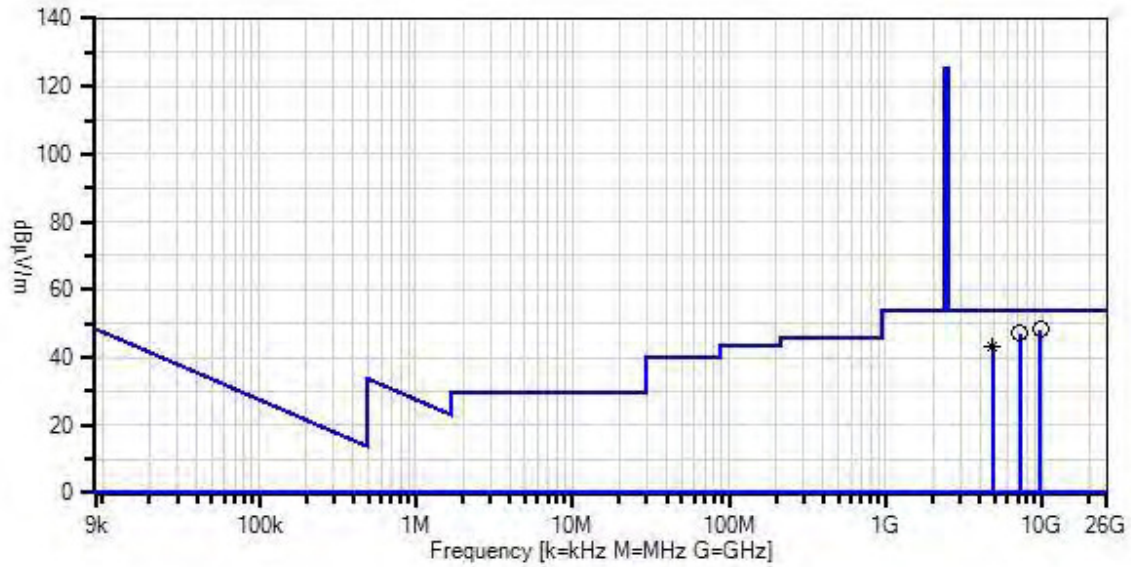
 High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: ANSI C63.4 2009

 The EUT is placed on the table and set continuously transmitting or receiving as intended.
 The EUT is connected to four temperature probes to maximize a full load.

 Frequency range of measurement = 9 kHz- 25GHz.
 9 kHz - 150 kHz -RBW=200 Hz VBW=200Hz
 150 kHz - 30 MHz -RBW=9 kHz VBW=9kHz
 30 MHz - 1000MHz - RBW=120 kHz VBW=120kHz
 1000MHz - 25000MHz- RBW =1MHz VBW=1MHz

BLE on TX Mode
Low Channel

Davis Instruments WO#: 97253 Sequence#: 41 Date: 11/13/2015
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters



- Sweep Data
- Peak Readings
- * Average Readings
- Software Version: 5.02.00
- Readings
- × QP Readings
- ▼ Ambient
- 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN03114	Preamp	AMF-7D-00101800-30-10P	4/22/2015	4/22/2017
T2	AN02157	Horn Antenna-ANSI C63.5 Calibration	3115	12/2/2014	12/2/2016
T3	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T4	ANP01210	Cable	FSJ1P-50A-4A	1/15/2015	1/15/2017
T5	ANP06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
	AN02694	Horn Antenna-ANSI C63.5 3m	AMFW-5F-18002650-20-10P	5/7/2015	5/7/2017
	ANP00928	Cable	various	1/23/2014	1/23/2016
	ANP00929	Cable	various	1/23/2014	1/23/2016
T6	AN03309	High Pass Filter	11SH10-3000/T10000-O/O	4/2/2014	4/2/2016
	AN02693	Active Horn Antenna-ANSI C63.5 3m	AMFW-5F-12001800-20-10P	5/6/2015	5/6/2017
	AN03143	Cable	32022-29094K-144TC	3/18/2015	3/18/2017

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	9799.793M	56.8	-57.6 +1.7	+39.1 +0.2	+2.4	+5.6	+0.0	48.2	54.0	-5.8	Vert
2	7205.170M	61.1	-58.3 +1.3	+35.9 +0.2	+2.0	+5.0	+0.0	47.2	54.0	-6.8	Vert
3	4803.380M Ave	61.0	-57.8 +1.1	+33.2 +0.2	+1.7	+3.8	+0.0	43.2	54.0	-10.8	Vert
^	4803.380M	75.5	-57.8 +1.1	+33.2 +0.2	+1.7	+3.8	+0.0	57.7	54.0	+3.7	Vert

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **97253** Date: 11/17/2015
 Test Type: **Radiated Scan** Time: 14:19:20
 Tested By: Hieu Song Nguyenpham Sequence#: 84
 Software: EMITest 5.02.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
 Frequency Range: 9kHz to 1000MHz
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

 Temperature: 19.9°C
 Relative Humidity: 46 %
 Atmospheric Pressure: 102.8 kPa

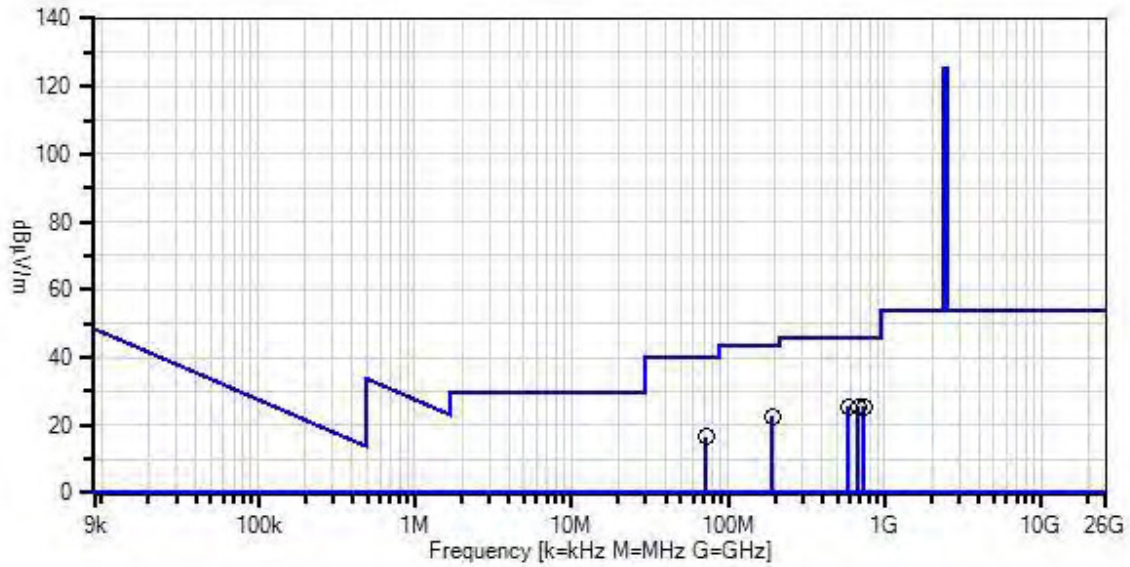
 High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: ANSI C 63.4 2009

 The EUT is placed on the table and set continuously transmitting or receiving as intended.
 The EUT is connected to four temperature probes to maximize a full load.

 Frequency range of measurement = 9 kHz- 25GHz.
 9 kHz - 150 kHz - RBW=200 Hz VBW=200Hz
 150 kHz - 30 MHz -RBW=9 kHz VBW=9kHz
 30 MHz - 1000MHz - RBW=120 kHz VBW=120 kHz
 1000MHz - 25000MHz- RBW =1MHz VBW=1MHz

BLE on TX Mode
Middle Channel

Davis Instruments WO#: 97253 Sequence#: 84 Date: 11/17/2015
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters



Software Version: 5.02.00

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN00567	Preamp	8447D	1/2/2015	1/2/2017
T2	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP01187	Cable	CNT-195	12/30/2014	12/30/2016
T5	ANP06691	Cable	PE3062-180	8/8/2014	8/8/2016
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
	AN00432	Loop Antenna	6502	5/8/2015	5/8/2017

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5				Table	dB μ V/m	dB μ V/m	dB	Ant
			dB	dB	dB	dB					
1	591.083M	30.0	-28.0 +1.1	+19.5	+2.5	+0.5	+0.0	25.6	46.0	-20.4	Vert
2	680.813M	28.7	-28.0 +1.2	+20.3	+2.7	+0.7	+0.0	25.6	46.0	-20.4	Vert
3	734.266M	27.8	-28.0 +1.3	+21.0	+2.8	+0.7	+0.0	25.6	46.0	-20.4	Horiz
4	192.885M	39.6	-27.9 +0.5	+9.1	+1.2	+0.2	+0.0	22.7	43.5	-20.8	Horiz
5	72.458M	36.8	-27.8 +0.3	+6.5	+0.7	+0.2	+0.0	16.7	40.0	-23.3	Vert

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **97253** Date: 11/13/2015
 Test Type: **Radiated Scan** Time: 16:37:25
 Tested By: Hieu Song Nguyenpham Sequence#: 38
 Software: EMITest 5.02.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
 Frequency Range: 1000MHz to 25000MHz
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

 Temperature: 19.9°C
 Relative Humidity: 46 %
 Atmospheric Pressure: 102.8 kPa

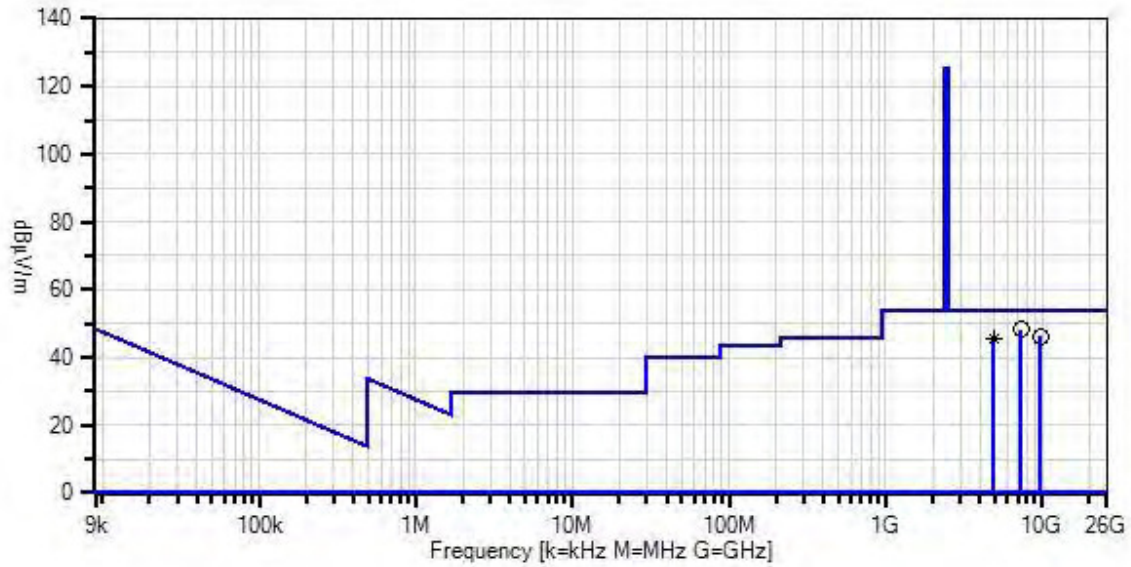
 High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: ANSI C63.4 2009

 The EUT is placed on the table and set continuously transmitting or receiving as intended.
 The EUT is connected to four temperature probes to maximize a full load.

 Frequency range of measurement = 9 kHz- 25GHz.
 9 kHz - 150 kHz -RBW=200 Hz VBW=200Hz
 150 kHz - 30 MHz - RBW=9 kHz VBW=9kHz
 30 MHz - 1000MHz - RBW=120 kHz VBW=120kHz
 1000MHz - 25000MHz- RBW =1MHz VBW=1MHz

BLE on TX Mode
Middle Channel

Davis Instruments WO#: 97253 Sequence#: 38 Date: 11/13/2015
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters



- Sweep Data
- Peak Readings
- * Average Readings
- Software Version: 5.02.00
- Readings
- × QP Readings
- ▼ Ambient
- 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN03114	Preamp	AMF-7D-00101800-30-10P	4/22/2015	4/22/2017
T2	AN02157	Horn Antenna-ANSI C63.5 Calibration	3115	12/2/2014	12/2/2016
T3	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T4	ANP01210	Cable	FSJ1P-50A-4A	1/15/2015	1/15/2017
T5	ANP06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
	AN02694	Horn Antenna-ANSI C63.5 3m	AMFW-5F-18002650-20-10P	5/7/2015	5/7/2017
	ANP00928	Cable	various	1/23/2014	1/23/2016
	ANP00929	Cable	various	1/23/2014	1/23/2016
T6	AN03309	High Pass Filter	11SH10-3000/T10000-O/O	4/2/2014	4/2/2016
	AN02693	Active Horn Antenna-ANSI C63.5 3m	AMFW-5F-12001800-20-10P	5/6/2015	5/6/2017
	AN03143	Cable	32022-29094K-144TC	3/18/2015	3/18/2017

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	7320.316M	61.6	-58.3 +1.3	+36.4 +0.2	+2.1	+5.0	+0.0	48.3	54.0	-5.7	Vert
2	9758.880M	54.9	-57.6 +1.6	+39.0 +0.2	+2.4	+5.6	+0.0	46.1	54.0	-7.9	Vert
3	4879.532M Ave	63.1	-57.6 +1.1	+33.4 +0.2	+1.7	+3.8	+0.0	45.7	54.0	-8.3	Vert
^	4879.532M	74.6	-57.6 +1.1	+33.4 +0.2	+1.7	+3.8	+0.0	57.2	54.0	+3.2	Vert

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **97253** Date: 11/17/2015
 Test Type: **Radiated Scan** Time: 14:49:47
 Tested By: Hieu Song Nguyenpham Sequence#: 87
 Software: EMITest 5.02.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
 Frequency Range: 9kHz to 1000MHz
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

 Temperature: 19.9°C
 Relative Humidity: 46 %
 Atmospheric Pressure: 102.8 kPa

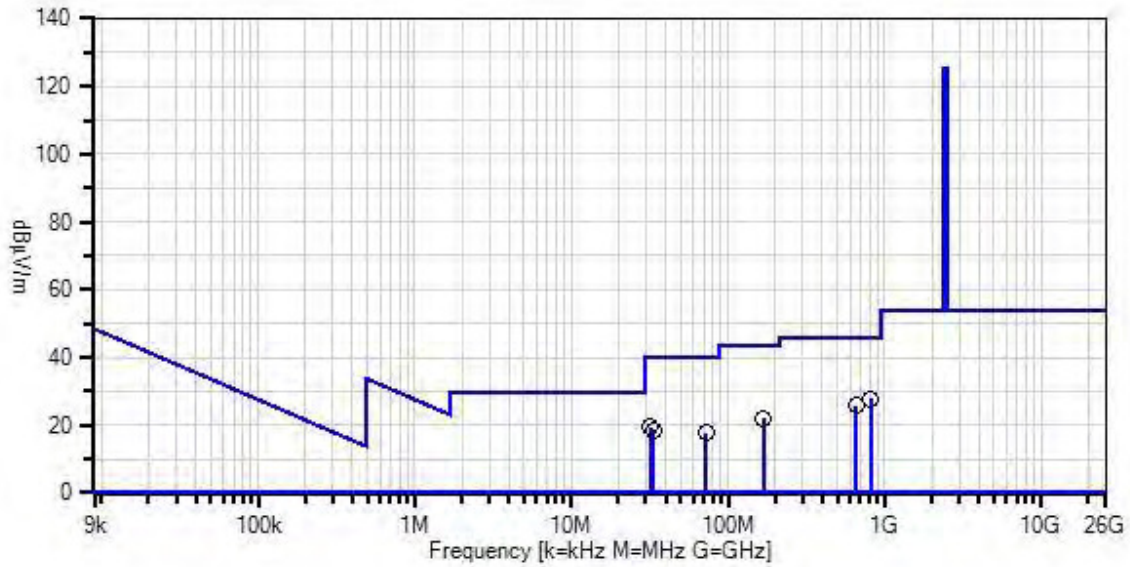
 High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: ANSI C 63.4 2009

 The EUT is placed on the table and set continuously transmitting or receiving as intended.
 The EUT is connected to four temperature probes to maximize a full load.

 Frequency range of measurement = 9 kHz- 25GHz.
 9 kHz - 150 kHz - RBW=200 Hz VBW=200Hz
 150 kHz - 30 MHz - RBW=9 kHz VBW=9kHz
 30 MHz - 1000MHz - RBW=120 kHz VBW=120kHz
 1000MHz - 25000MHz- RBW =1MHz VBW=1MHz

BLE on TX Mode
High Channel

Davis Instruments WO#: 97253 Sequence#: 87 Date: 11/17/2015
 15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters



Sweep Data
 ○ Peak Readings
 * Average Readings
 Software Version: 5.02.00
 Readings
 × QP Readings
 ▼ Ambient
 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN00567	Preamp	8447D	1/2/2015	1/2/2017
T2	AN00852	Biconilog Antenna	CBL 6111C	11/24/2014	11/24/2016
T3	ANP00880	Cable	RG214U	6/13/2014	6/13/2016
T4	ANP01187	Cable	CNT-195	12/30/2014	12/30/2016
T5	ANP06691	Cable	PE3062-180	8/8/2014	8/8/2016
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
	AN00432	Loop Antenna	6502	5/8/2015	5/8/2017

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5 dB	dB	dB	dB	Table	dB μ V/m	dB μ V/m	dB	Ant
1	817.990M	28.7	-28.0 +1.3	+22.1	+3.0	+0.7	+0.0	27.8	46.0	-18.2	Vert
2	661.233M	29.2	-28.0 +1.2	+20.2	+2.6	+0.6	+0.0	25.8	46.0	-20.2	Vert
3	31.863M	28.5	-27.9 +0.2	+18.0	+0.5	+0.1	+0.0	19.4	40.0	-20.6	Horiz
4	33.194M	28.3	-27.9 +0.2	+17.3	+0.5	+0.1	+0.0	18.5	40.0	-21.5	Vert
5	168.861M	38.0	-27.9 +0.5	+9.9	+1.2	+0.2	+0.0	21.9	43.5	-21.6	Horiz
6	72.458M	37.8	-27.8 +0.3	+6.5	+0.7	+0.2	+0.0	17.7	40.0	-22.3	Horiz

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
 Work Order #: **97253** Date: 11/13/2015
 Test Type: **Radiated Scan** Time: 15:47:25
 Tested By: Hieu Song Nguyenpham Sequence#: 35
 Software: EMITest 5.02.00

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Radiated Emission
 Frequency Range: 1000MHz to 25000MHz
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

Temperature: 19.9°C
 Relative Humidity: 46 %
 Atmospheric Pressure: 102.8 kPa

High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: ANSI C63.4 2009

The EUT is placed on the table and set continuously transmitting or receiving as intended.
 The EUT is connected to four temperature probes to maximize a full load.

Frequency range of measurement = 9 kHz- 25GHz.
 9 kHz - 150 kHz - RBW=200 Hz VBW=200Hz
 150 kHz - 30 MHz - RBW=9 kHz VBW=9kHz
 30 MHz - 1000MHz - RBW=120 kHz VBW=120 kHz
 1000MHz -25000MHz- RBW =1MHz VBW=1MHz

BLE on TX Mode
High Channel

Davis Instruments WO#: 97253 Sequence#: 35 Date: 11/13/2015
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters



- Sweep Data
- Peak Readings
- * Average Readings
- Software Version: 5.02.00
- Readings
- × QP Readings
- ▼ Ambient
- 1 - 15.247(d) / 15.209 Radiated Spurious Emissions

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN03114	Preamp	AMF-7D-00101800-30-10P	4/22/2015	4/22/2017
T2	AN02157	Horn Antenna-ANSI C63.5 Calibration	3115	12/2/2014	12/2/2016
T3	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
T4	ANP01210	Cable	FSJ1P-50A-4A	1/15/2015	1/15/2017
T5	ANP06712	Cable	32022-29094K-29094K-48TC	9/18/2014	9/18/2016
	AN03471	RF Characteristics Analyzer	E4440A	12/19/2013	12/19/2015
	AN02694	Horn Antenna-ANSI C63.5 3m	AMFW-5F-18002650-20-10P	5/7/2015	5/7/2017
	ANP00928	Cable	various	1/23/2014	1/23/2016
	ANP00929	Cable	various	1/23/2014	1/23/2016
T6	AN03309	High Pass Filter	11SH10-3000/T10000-O/O	4/2/2014	4/2/2016
	AN02693	Active Horn Antenna-ANSI C63.5 3m	AMFW-5F-12001800-20-10P	5/6/2015	5/6/2017
	AN03143	Cable	32022-29094K-144TC	3/18/2015	3/18/2017

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq MHz	Rdng dB μ V	T1 T5 dB	T2 T6 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	7439.435M	62.6	-58.2 +1.4	+36.6 +0.2	+2.1	+5.1	+0.0	49.8	54.0	-4.2	Vert
2	9791.785M	56.1	-57.6 +1.7	+39.1 +0.2	+2.4	+5.6	+0.0	47.5	54.0	-6.5	Vert
3	4959.300M Ave	58.4	-57.3 +1.1	+33.5 +0.2	+1.7	+3.8	+0.0	41.4	54.0	-12.6	Vert
^	4959.300M	71.7	-57.3 +1.1	+33.5 +0.2	+1.7	+3.8	+0.0	54.7	54.0	+0.7	Vert

Band Edge

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
 Customer: **Davis Instruments**
 Specification: **Band Edge Set up**
 Work Order #: **97253** Date: 11/13/2015
 Test Type: **Radiated Measurement**
 Tested By: Hieu Song Nguyenpham
 Software: EMITest 5.02.00

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna - ANSI C63.5 Calibration	3115	12/2/2014	12/2/2016
T2	ANP01210	Cable	FSJ1P-50A-4A	1/15/2015	1/15/2017
T3	AN03302	Cable	32026-29094K-29094K-72TC	3/24/2014	3/24/2016
	03471	Spectrum Analyzer	E4440A	12/19/2013	12/19/2015

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 2			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 2			

Test Conditions / Notes:

Band Edge Set up
 Application: Tera-Term version 4.68 as a terminal Program for ISM radio and Nordic Master Control panel version 1.17 for BTLE module

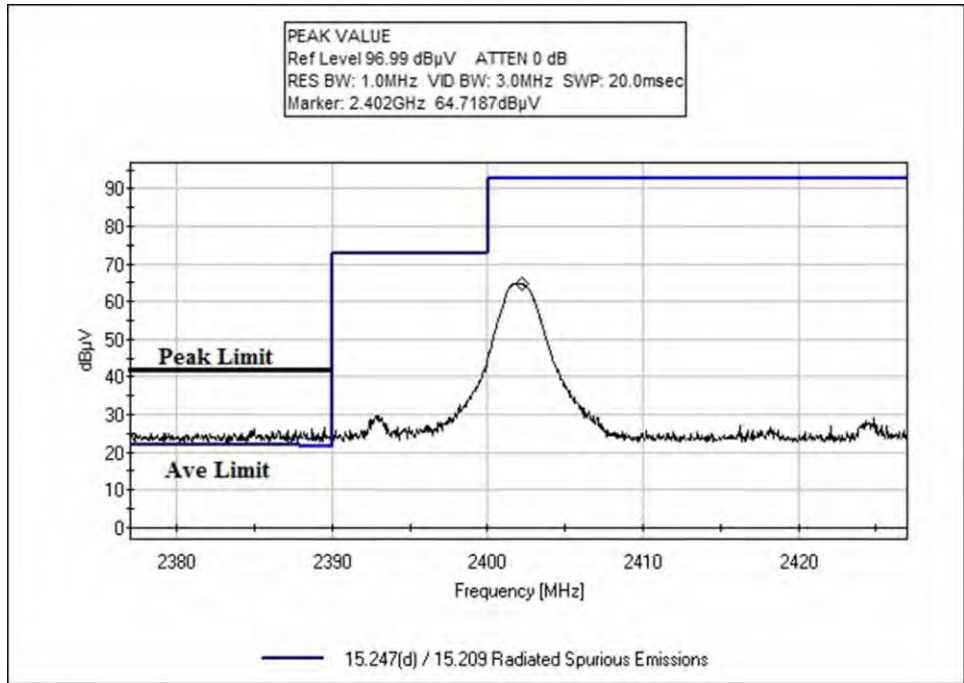
Temperature: 21.7°C
 Relative Humidity: 45 %
 Atmospheric Pressure: 101.8 kPa

High Clock: 40MHz
 Transmitting operating frequency= 2402, 2440 and 2480MHz for Bluetooth
 Transmitting operating frequency= 902.5, 915 and 927MHz for ISM
 Gain of the antenna for Bluetooth= 1dBi
 Gain of the antenna for ISM= 2dBi
 Method: KDB 558074 v03r03 section 13.2

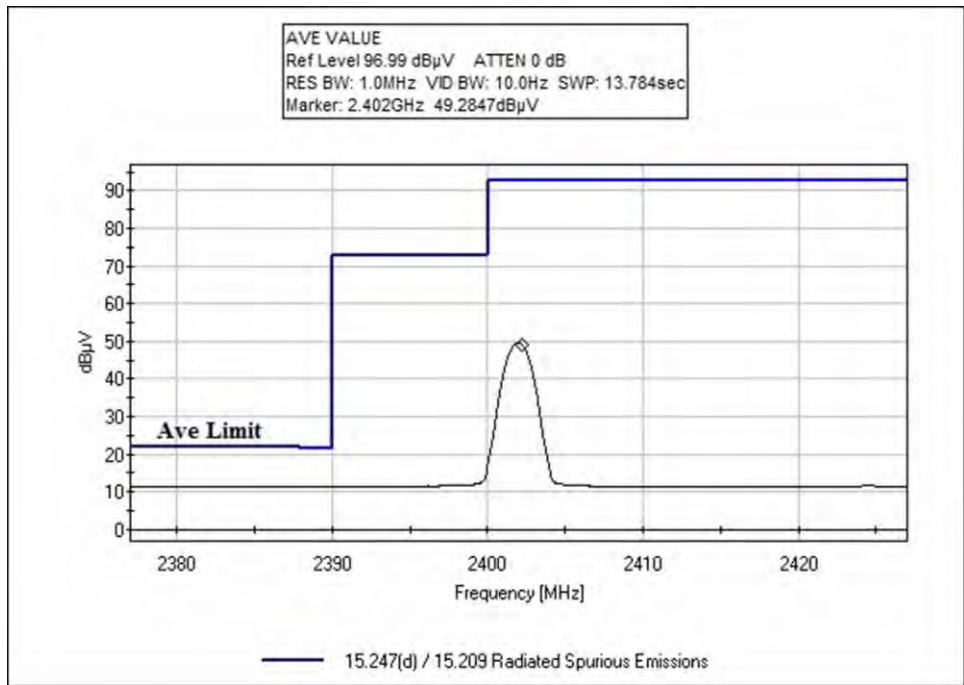
The EUT is placed on the table and set continuously transmitting or receiving as intended.
 The EUT is connected to four temperature probes to maximize a full load.

BLE Band on TX Mode

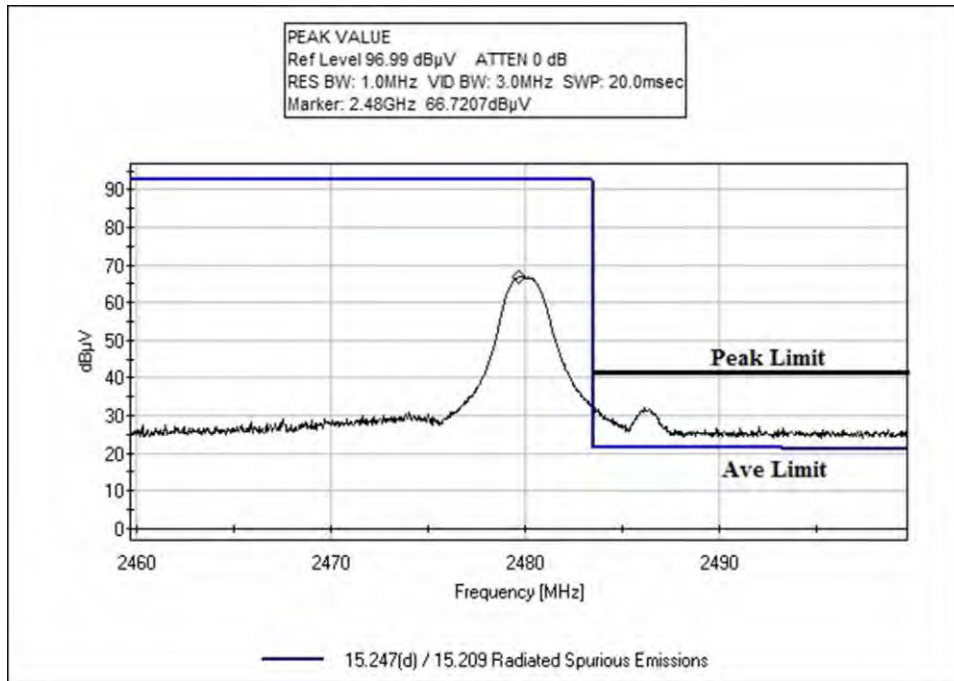
Band Edge Plots



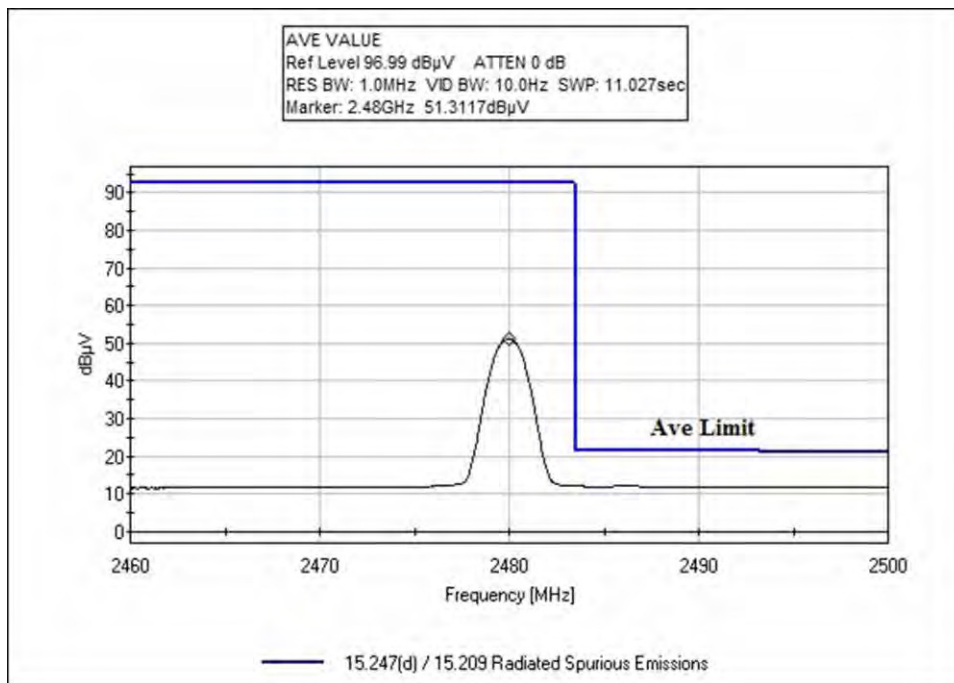
Low Channel



Low Channel



High Channel

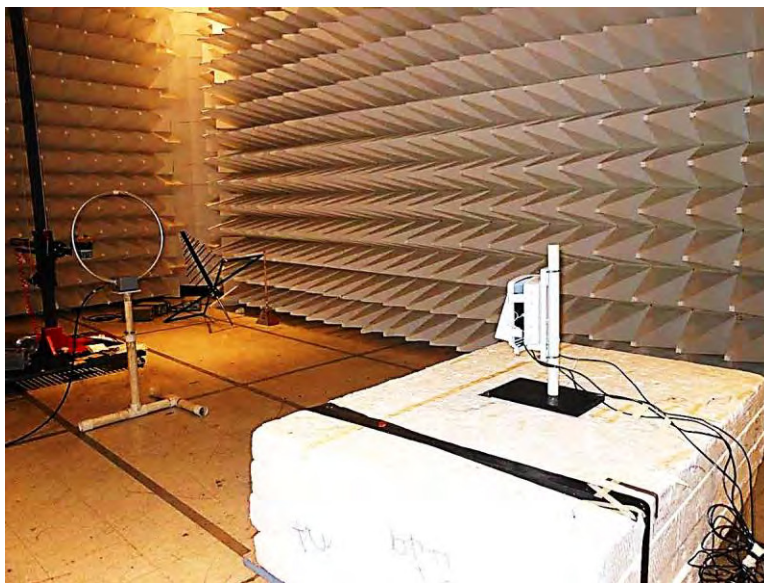


High Channel

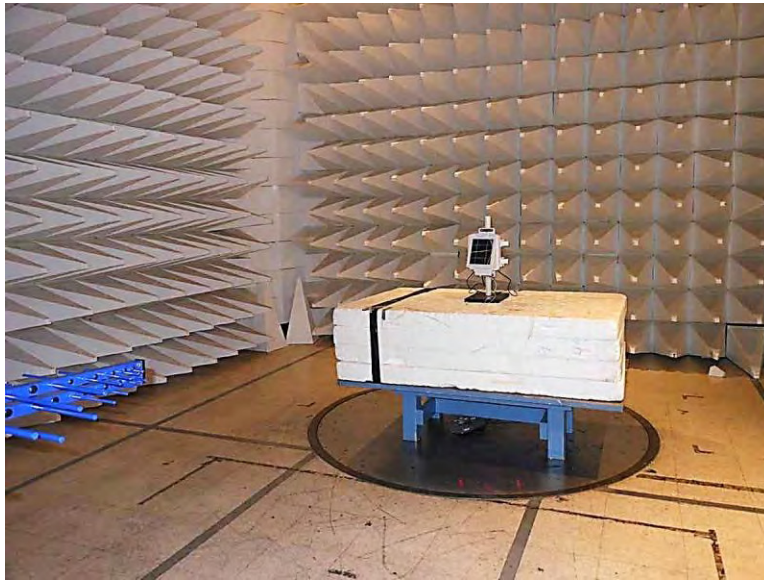
Test Setup Photos



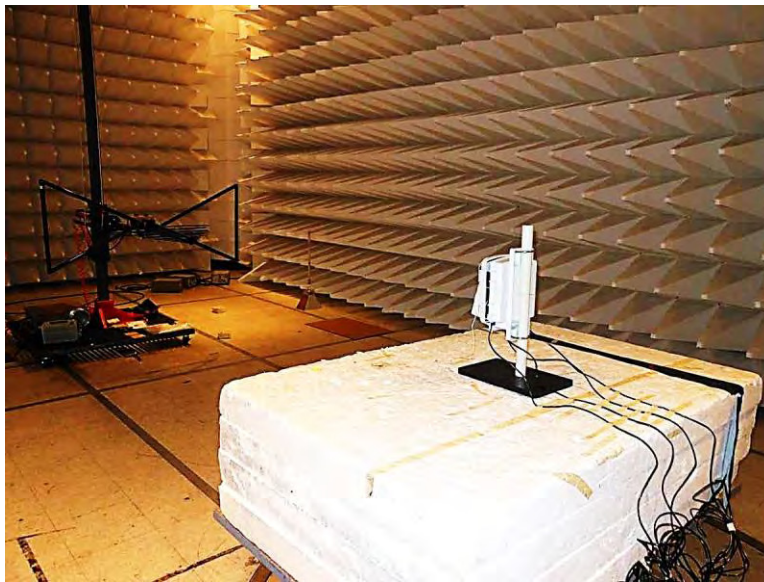
9kHz – 30MHz



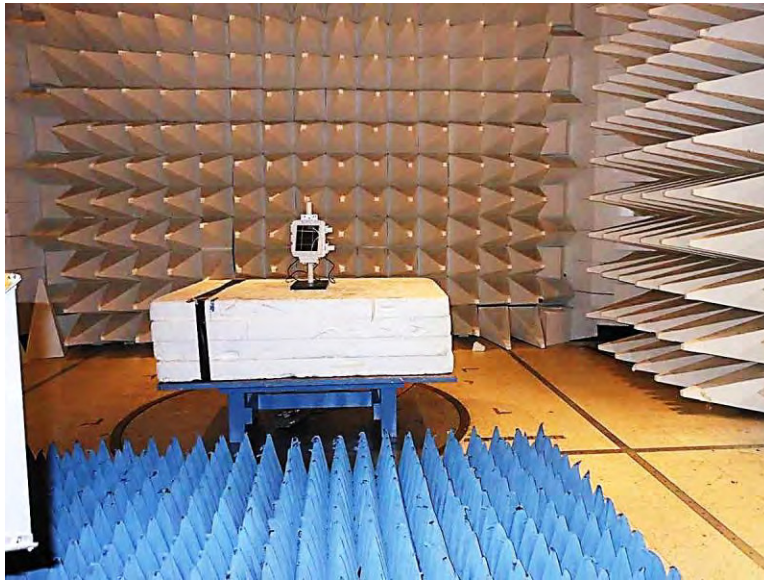
9kHz – 30MHz



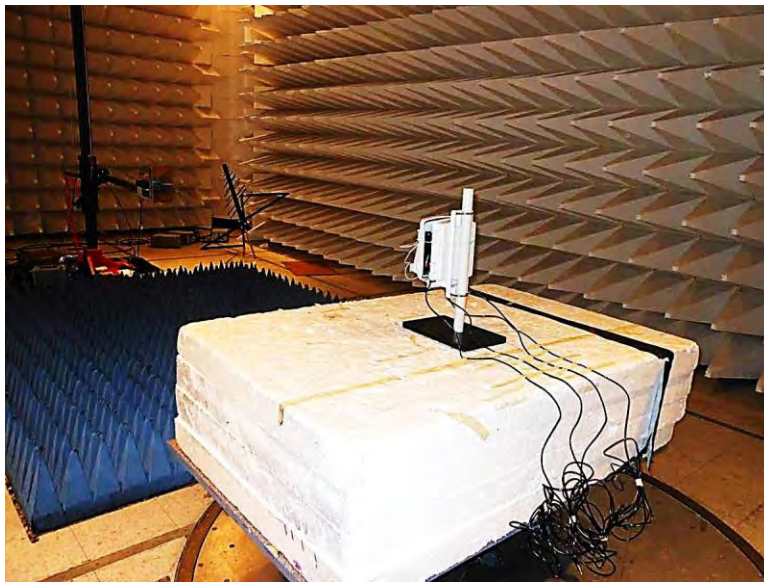
30MHz – 1GHz



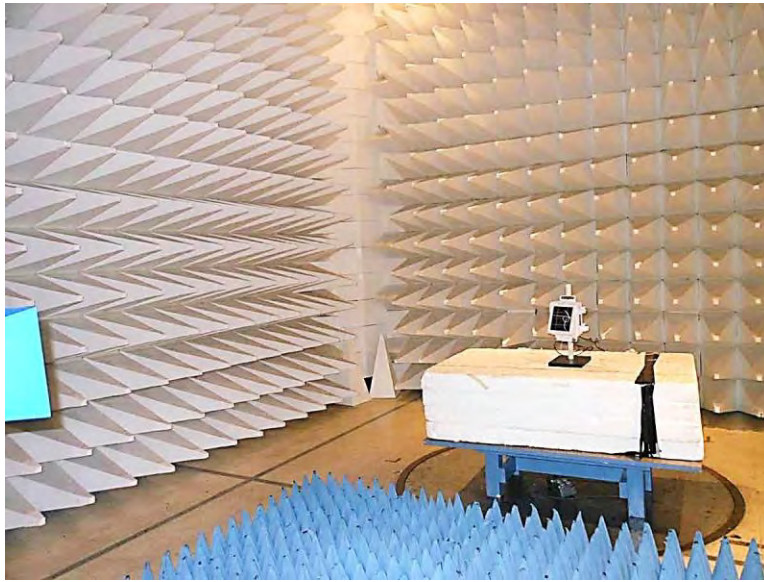
30MHz – 1GHz



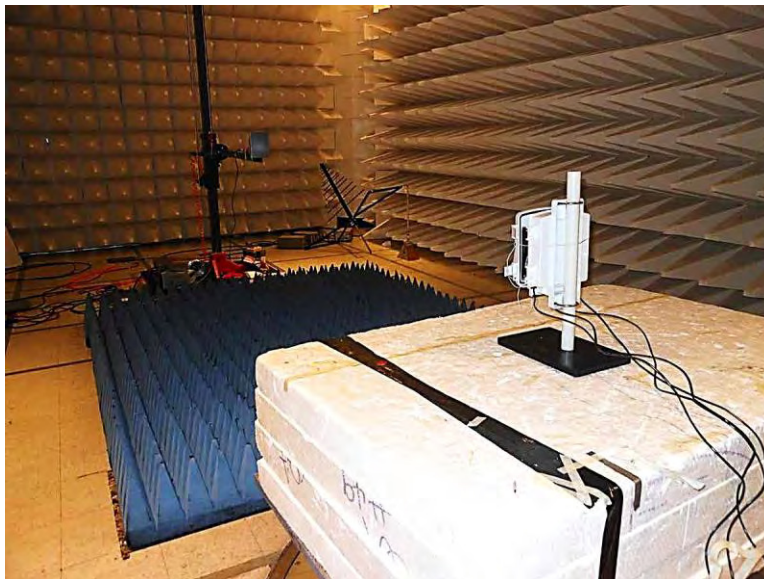
1 – 12GHz



1 – 12GHz



12 – 25GHz



12 – 25GHz

SUPPLEMENTAL INFORMATION

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBμV/m, the spectrum analyzer reading in dBμV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on the limit value subtracting the corrected measured value; a negative margin represents a measurement exceeding the limit while a positive margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBμV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBμV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.