

NORTHWEST EMC

Supra, A Division of UTCFS

Supra DirectKey™ Module

FCC 15.207:2015

FCC 15.247:2015

Report # SUPR0149.1



NVLAP Lab Code: 200630-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America. This Report may only be duplicated in its entirety

CERTIFICATE OF TEST

Last Date of Test: March 31, 2015
Supra, A Division of UTCFS
Model: Supra DirectKey™ Module

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2015	ANSI C63.10:2009

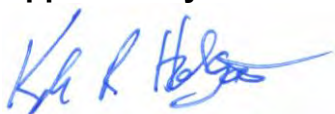
Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.7	Band Edge Compliance	Yes	Pass	
6.7	Spurious Conducted Emissions	Yes	Pass	
6.9.1	Occupied Bandwidth	Yes	Pass	
6.10.2	Output Power	Yes	Pass	
6.11.2	Power Spectral Density	Yes	Pass	
7.5	Duty Cycle	Yes	N/A	Characterization of radio operation.

Deviations From Test Standards

None

Approved By:



Kyle Holgate, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

REVISION HISTORY

Revision Number		Description	Date	Page Number
00		None		

ACCREDITATIONS AND AUTHORIZATIONS

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIP / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC – Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

For details on the Scopes of our Accreditations, please visit:

<http://www.nwemc.com/accreditations/>
<http://gsi.nist.gov/global/docs/cabs/designations.html>

MEASUREMENT UNCERTAINTY

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

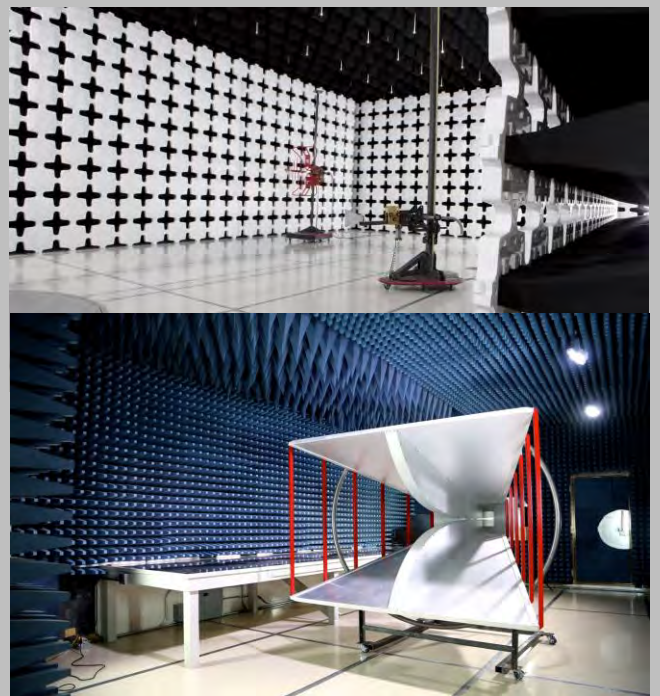
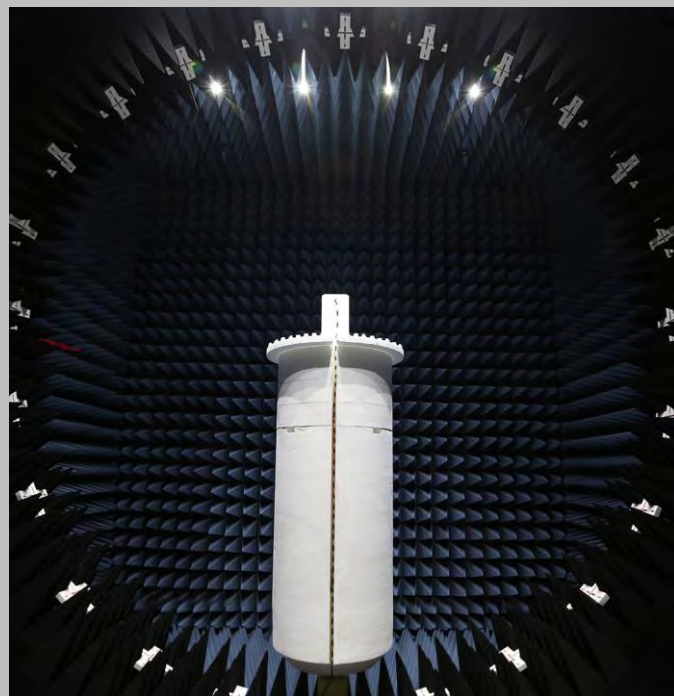
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.9 dB	-2.9 dB

FACILITIES



California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 9801 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Industry Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Supra, A Division of UTCFS
Address:	4001 Fairview Industrial Drive SE
City, State, Zip:	Salem, OR 97302-0167
Test Requested By:	Adam Purdue
Model:	Supra DirectKey™ Module
First Date of Test:	March 27, 2015
Last Date of Test:	March 31, 2015
Receipt Date of Samples:	March 25, 2015
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Bluetooth LE radio module with one antenna.
Testing Objective:
To demonstrate compliance of the Bluetooth radio to FCC 15.247 requirements.

CONFIGURATIONS

Configuration SUPR0149- 1

Software/Firmware Running during test	
Description	Version
Windows 7	Unknown
VCP Program	Unknown
Broker Diagnostic	Unknown

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
BTLE Module	Supra, A Division of UTCFS	Supra DirectKey™ Module	001755A35954

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
AC/DC adapter (laptop)	Dell	AA22850	None
Test Laptop	Dell	Latitude D630	HW343F1

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable	Unknown	.9m	No	AC/DC adapter (laptop)	AC Main
DC Cable	Unknown	1.8m	No	AC/DC adapter (laptop)	Test Laptop
USB Programming Cable	Unknown	1.8m	No	Test Laptop	BTLE Module

Configuration SUPR0149- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
BTLE Module	Supra, A Division of UTCFS	Supra DirectKey™ Module	001755A35950

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
3 V Lithium Battery	Varta Microbattery Gmbh	CR 2/3AH	None

Configuration SUPR0149- 3

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
BTLE Module	Supra, A Division of UTCFS	Supra DirectKey™ Module	001755A35950

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Plug (lisc)	No	1.8m	No	BTLE Module	LISN

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	3/27/2015	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	3/27/2015	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	3/27/2015	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	3/27/2015	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	3/27/2015	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
6	3/30/2015	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
7	3/31/2015	Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWERLINE CONDUCTED EMISSIONS

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50 Ω measuring port is terminated by a 50 Ω EMI meter or a 50 Ω resistive load. All 50 Ω measuring ports of the LISN are terminated by 50 Ω .

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Rohde & Schwarz	ESCI	ARH	3/11/2015	03/11/2016
EV07 Cables	N/A	Conducted Cables	EVG	2/3/2015	02/03/2016
High Pass Filter	TTE	H97-100K-50-720B	HHD	1/5/2015	01/05/2016
Attenuator, BNC 10 Watt	Fairview Microwave	SA6B10W-20	TQQ	11/20/2014	11/20/2015
LISN	Solar Electronics	9252-50-R-24-BNC	LIR	10/7/2014	10/07/2015

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

SUPR0149-3

MODES INVESTIGATED

Bluetooth Low Energy: Continuous single channel transmit mode. 2402MHz
Bluetooth Low Energy: Continuous single channel transmit mode. 2440 MHz
Bluetooth Low Energy: Continuous single channel transmit mode. 2480 MHz

POWERLINE CONDUCTED EMISSIONS

EUT:	Supra DirectKey™ Module	Work Order:	SUPR0149
Serial Number:	001755A35950	Date:	03/31/2015
Customer:	Supra, A Division of UTCFS	Temperature:	22.9°C
Attendees:	None	Relative Humidity:	39.4%
Customer Project:	None	Bar. Pressure:	1021.1 mb
Tested By:	Jared Ison	Job Site:	EV07
Power:	3 VDC	Configuration:	SUPR0149-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	5	Line:	High Line	Ext. Attenuation (dB):	20
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COMMENTS

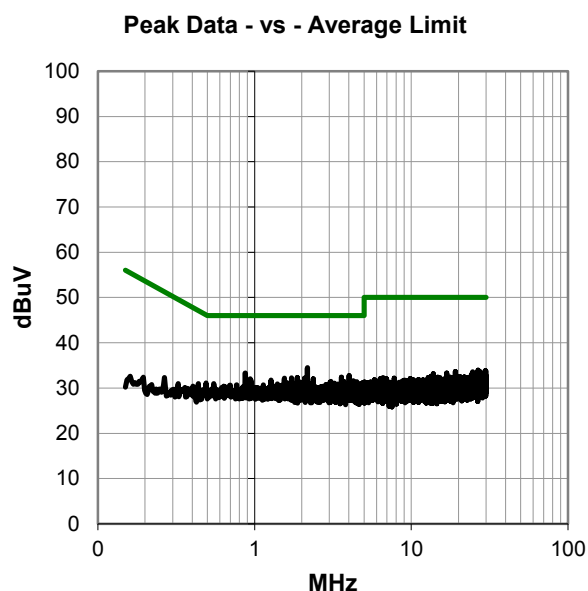
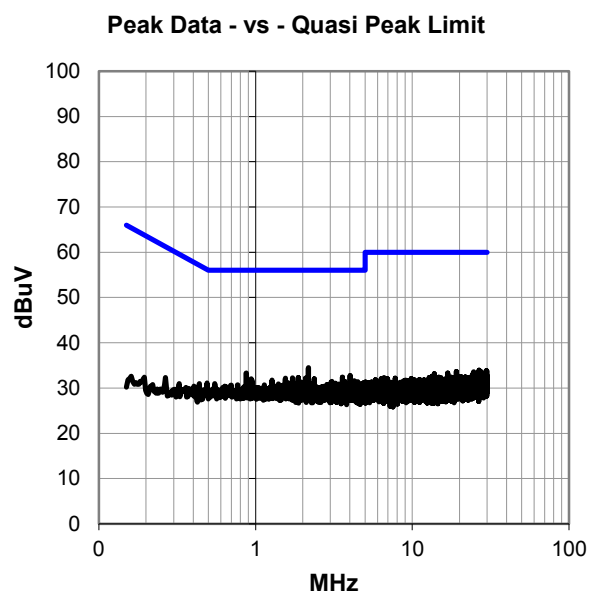
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EUT OPERATING MODES

Bluetooth Low Energy: Continuous single channel transmit mode. 2480 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #5

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
2.176	13.9	20.6	34.5	56.0	-21.5
0.870	12.8	20.5	33.3	56.0	-22.7
4.015	12.0	20.8	32.8	56.0	-23.2
3.582	11.7	20.7	32.4	56.0	-23.6
1.874	11.7	20.6	32.3	56.0	-23.7
1.724	11.7	20.6	32.3	56.0	-23.7
2.086	11.6	20.6	32.2	56.0	-23.8
1.549	11.6	20.6	32.2	56.0	-23.8
2.370	11.4	20.6	32.0	56.0	-24.0
0.937	11.5	20.5	32.0	56.0	-24.0
1.273	11.2	20.5	31.7	56.0	-24.3
0.952	11.1	20.5	31.6	56.0	-24.4
4.273	10.8	20.8	31.6	56.0	-24.4
3.705	10.8	20.7	31.5	56.0	-24.5
3.075	10.8	20.6	31.4	56.0	-24.6
2.139	10.8	20.6	31.4	56.0	-24.6
4.500	10.6	20.8	31.4	56.0	-24.6
4.142	10.6	20.8	31.4	56.0	-24.6
1.952	10.7	20.6	31.3	56.0	-24.7
3.023	10.6	20.6	31.2	56.0	-24.8
2.351	10.6	20.6	31.2	56.0	-24.8
3.679	10.5	20.7	31.2	56.0	-24.8
1.612	10.6	20.6	31.2	56.0	-24.8
3.635	10.5	20.7	31.2	56.0	-24.8
1.989	10.5	20.6	31.1	56.0	-24.9
4.869	10.3	20.8	31.1	56.0	-24.9

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
2.176	13.9	20.6	34.5	46.0	-11.5
0.870	12.8	20.5	33.3	46.0	-12.7
4.015	12.0	20.8	32.8	46.0	-13.2
3.582	11.7	20.7	32.4	46.0	-13.6
1.874	11.7	20.6	32.3	46.0	-13.7
1.724	11.7	20.6	32.3	46.0	-13.7
2.086	11.6	20.6	32.2	46.0	-13.8
1.549	11.6	20.6	32.2	46.0	-13.8
2.370	11.4	20.6	32.0	46.0	-14.0
0.937	11.5	20.5	32.0	46.0	-14.0
1.273	11.2	20.5	31.7	46.0	-14.3
0.952	11.1	20.5	31.6	46.0	-14.4
4.273	10.8	20.8	31.6	46.0	-14.4
3.705	10.8	20.7	31.5	46.0	-14.5
3.075	10.8	20.6	31.4	46.0	-14.6
2.139	10.8	20.6	31.4	46.0	-14.6
4.500	10.6	20.8	31.4	46.0	-14.6
4.142	10.6	20.8	31.4	46.0	-14.6
1.952	10.7	20.6	31.3	46.0	-14.7
3.023	10.6	20.6	31.2	46.0	-14.8
2.351	10.6	20.6	31.2	46.0	-14.8
3.679	10.5	20.7	31.2	46.0	-14.8
1.612	10.6	20.6	31.2	46.0	-14.8
3.635	10.5	20.7	31.2	46.0	-14.8
1.989	10.5	20.6	31.1	46.0	-14.9
4.869	10.3	20.8	31.1	46.0	-14.9

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	Supra DirectKey™ Module	Work Order:	SUPR0149
Serial Number:	001755A35950	Date:	03/31/2015
Customer:	Supra, A Division of UTCFS	Temperature:	22.9°C
Attendees:	None	Relative Humidity:	39.4%
Customer Project:	None	Bar. Pressure:	1021.1 mb
Tested By:	Jared Ison	Job Site:	EV07
Power:	3 VDC	Configuration:	SUPR0149-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	6	Line:	Neutral	Ext. Attenuation (dB):	20
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COMMENTS

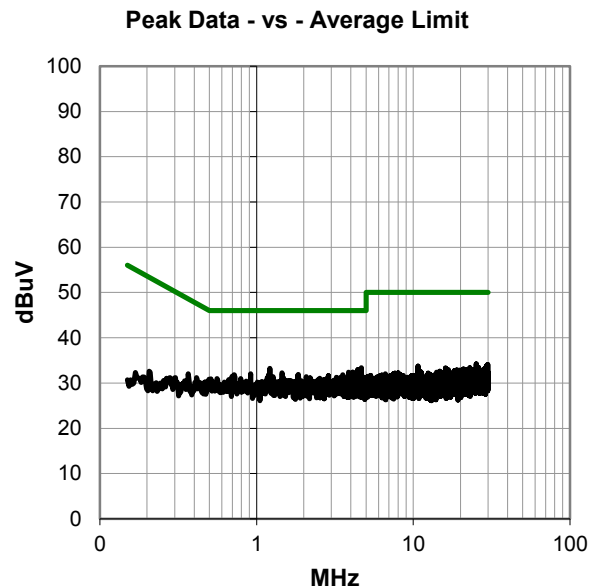
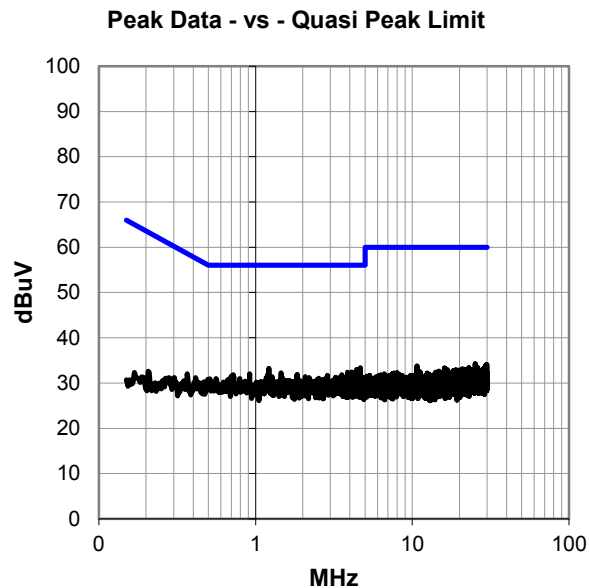
None

EUT OPERATING MODES

Bluetooth Low Energy: Continuous single channel transmit mode. 2480 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #6

Peak Data - vs - Quasi Peak Limit

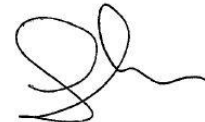
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.657	12.6	20.8	33.4	56.0	-22.6
1.217	12.7	20.5	33.2	56.0	-22.8
4.429	12.2	20.8	33.0	56.0	-23.0
3.873	11.7	20.7	32.4	56.0	-23.6
4.105	11.6	20.8	32.4	56.0	-23.6
1.456	11.7	20.5	32.2	56.0	-23.8
0.915	11.5	20.5	32.0	56.0	-24.0
1.851	11.3	20.6	31.9	56.0	-24.1
3.556	11.2	20.7	31.9	56.0	-24.1
1.191	11.3	20.5	31.8	56.0	-24.2
0.717	11.3	20.5	31.8	56.0	-24.2
1.829	11.1	20.6	31.7	56.0	-24.3
2.873	11.0	20.6	31.6	56.0	-24.4
0.698	11.0	20.5	31.5	56.0	-24.5
1.277	10.9	20.5	31.4	56.0	-24.6
2.075	10.8	20.6	31.4	56.0	-24.6
4.754	10.6	20.8	31.4	56.0	-24.6
4.258	10.6	20.8	31.4	56.0	-24.6
4.052	10.5	20.8	31.3	56.0	-24.7
3.441	10.6	20.6	31.2	56.0	-24.8
3.228	10.6	20.6	31.2	56.0	-24.8
3.493	10.5	20.6	31.1	56.0	-24.9
1.489	10.6	20.5	31.1	56.0	-24.9
2.198	10.5	20.6	31.1	56.0	-24.9
3.299	10.4	20.6	31.0	56.0	-25.0
2.527	10.4	20.6	31.0	56.0	-25.0

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.657	12.6	20.8	33.4	46.0	-12.6
1.217	12.7	20.5	33.2	46.0	-12.8
4.429	12.2	20.8	33.0	46.0	-13.0
3.873	11.7	20.7	32.4	46.0	-13.6
4.105	11.6	20.8	32.4	46.0	-13.6
1.456	11.7	20.5	32.2	46.0	-13.8
0.915	11.5	20.5	32.0	46.0	-14.0
1.851	11.3	20.6	31.9	46.0	-14.1
3.556	11.2	20.7	31.9	46.0	-14.1
1.191	11.3	20.5	31.8	46.0	-14.2
0.717	11.3	20.5	31.8	46.0	-14.2
1.829	11.1	20.6	31.7	46.0	-14.3
2.873	11.0	20.6	31.6	46.0	-14.4
0.698	11.0	20.5	31.5	46.0	-14.5
1.277	10.9	20.5	31.4	46.0	-14.6
2.075	10.8	20.6	31.4	46.0	-14.6
4.754	10.6	20.8	31.4	46.0	-14.6
4.258	10.6	20.8	31.4	46.0	-14.6
4.052	10.5	20.8	31.3	46.0	-14.7
3.441	10.6	20.6	31.2	46.0	-14.8
3.228	10.6	20.6	31.2	46.0	-14.8
3.493	10.5	20.6	31.1	46.0	-14.9
1.489	10.6	20.5	31.1	46.0	-14.9
2.198	10.5	20.6	31.1	46.0	-14.9
3.299	10.4	20.6	31.0	46.0	-15.0
2.527	10.4	20.6	31.0	46.0	-15.0

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	Supra DirectKey™ Module	Work Order:	SUPR0149
Serial Number:	001755A35950	Date:	03/31/2015
Customer:	Supra, A Division of UTCFS	Temperature:	22.9°C
Attendees:	None	Relative Humidity:	39.4%
Customer Project:	None	Bar. Pressure:	1021.1 mb
Tested By:	Jared Ison	Job Site:	EV07
Power:	3 VDC	Configuration:	SUPR0149-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	8	Line:	High Line	Ext. Attenuation (dB):	20
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COMMENTS

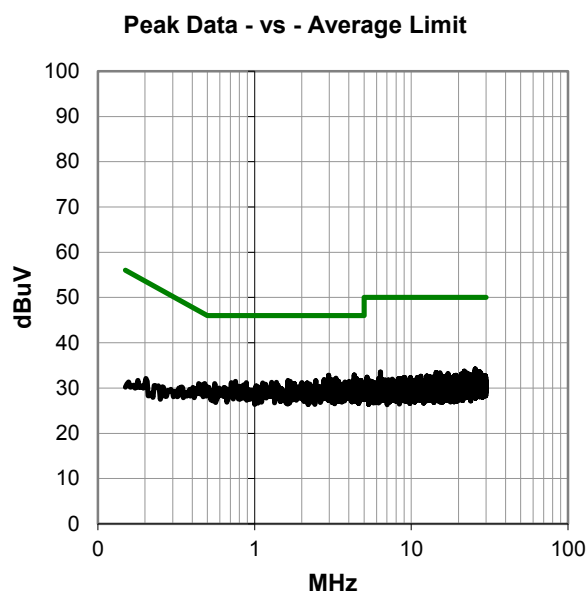
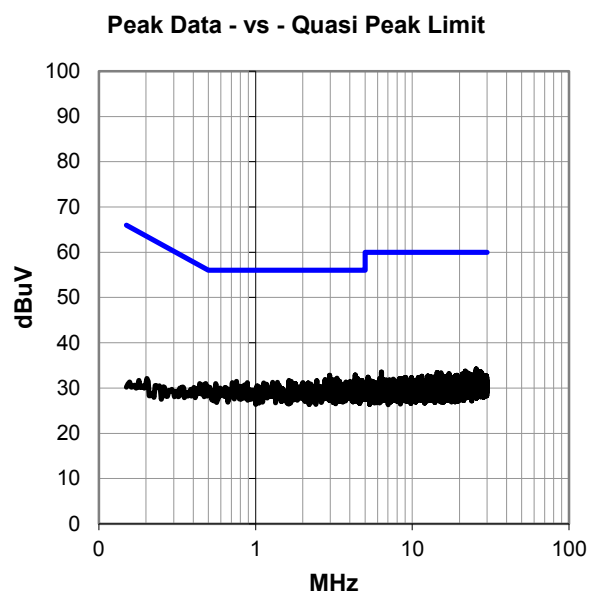
None

EUT OPERATING MODES

Bluetooth Low Energy: Continuous single channel transmit mode. 2440 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #8

Peak Data - vs - Quasi Peak Limit

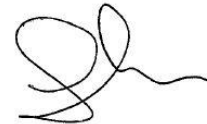
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.325	12.1	20.8	32.9	56.0	-23.1
2.970	12.2	20.6	32.8	56.0	-23.2
3.314	11.5	20.6	32.1	56.0	-23.9
4.478	11.3	20.8	32.1	56.0	-23.9
3.030	11.3	20.6	31.9	56.0	-24.1
2.784	11.3	20.6	31.9	56.0	-24.1
3.142	11.1	20.6	31.7	56.0	-24.3
2.997	11.1	20.6	31.7	56.0	-24.3
4.772	10.9	20.8	31.7	56.0	-24.3
1.631	11.1	20.6	31.7	56.0	-24.3
2.459	11.0	20.6	31.6	56.0	-24.4
4.261	10.8	20.8	31.6	56.0	-24.4
0.754	11.0	20.5	31.5	56.0	-24.5
1.691	10.9	20.6	31.5	56.0	-24.5
4.023	10.7	20.8	31.5	56.0	-24.5
3.437	10.8	20.6	31.4	56.0	-24.6
3.784	10.6	20.7	31.3	56.0	-24.7
4.672	10.5	20.8	31.3	56.0	-24.7
1.381	10.7	20.5	31.2	56.0	-24.8
1.288	10.7	20.5	31.2	56.0	-24.8
2.008	10.6	20.6	31.2	56.0	-24.8
0.710	10.7	20.5	31.2	56.0	-24.8
0.885	10.7	20.5	31.2	56.0	-24.8
4.161	10.4	20.8	31.2	56.0	-24.8
1.127	10.6	20.5	31.1	56.0	-24.9
2.168	10.5	20.6	31.1	56.0	-24.9

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.325	12.1	20.8	32.9	46.0	-13.1
2.970	12.2	20.6	32.8	46.0	-13.2
3.314	11.5	20.6	32.1	46.0	-13.9
4.478	11.3	20.8	32.1	46.0	-13.9
3.030	11.3	20.6	31.9	46.0	-14.1
2.784	11.3	20.6	31.9	46.0	-14.1
3.142	11.1	20.6	31.7	46.0	-14.3
2.997	11.1	20.6	31.7	46.0	-14.3
4.772	10.9	20.8	31.7	46.0	-14.3
1.631	11.1	20.6	31.7	46.0	-14.3
2.459	11.0	20.6	31.6	46.0	-14.4
4.261	10.8	20.8	31.6	46.0	-14.4
0.754	11.0	20.5	31.5	46.0	-14.5
1.691	10.9	20.6	31.5	46.0	-14.5
4.023	10.7	20.8	31.5	46.0	-14.5
3.437	10.8	20.6	31.4	46.0	-14.6
3.784	10.6	20.7	31.3	46.0	-14.7
4.672	10.5	20.8	31.3	46.0	-14.7
1.381	10.7	20.5	31.2	46.0	-14.8
1.288	10.7	20.5	31.2	46.0	-14.8
2.008	10.6	20.6	31.2	46.0	-14.8
0.710	10.7	20.5	31.2	46.0	-14.8
0.885	10.7	20.5	31.2	46.0	-14.8
4.161	10.4	20.8	31.2	46.0	-14.8
1.127	10.6	20.5	31.1	46.0	-14.9
2.168	10.5	20.6	31.1	46.0	-14.9

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	Supra DirectKey™ Module	Work Order:	SUPR0149
Serial Number:	001755A35950	Date:	03/31/2015
Customer:	Supra, A Division of UTCFS	Temperature:	22.9°C
Attendees:	None	Relative Humidity:	39.4%
Customer Project:	None	Bar. Pressure:	1021.1 mb
Tested By:	Jared Ison	Job Site:	EV07
Power:	3 VDC	Configuration:	SUPR0149-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	9	Line:	Neutral	Ext. Attenuation (dB):	20
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COMMENTS

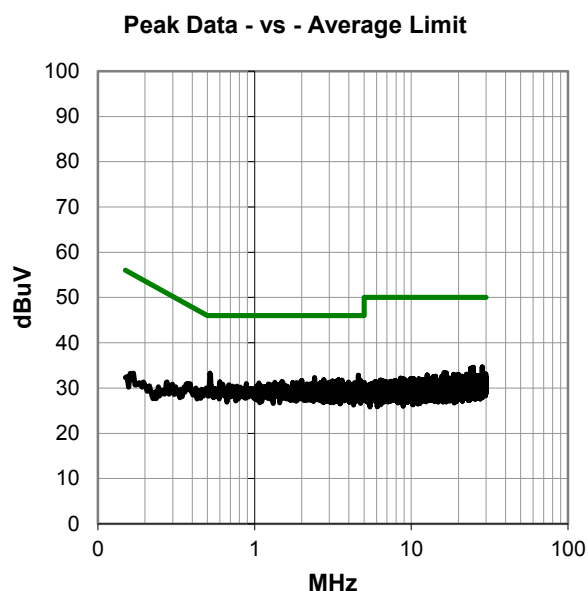
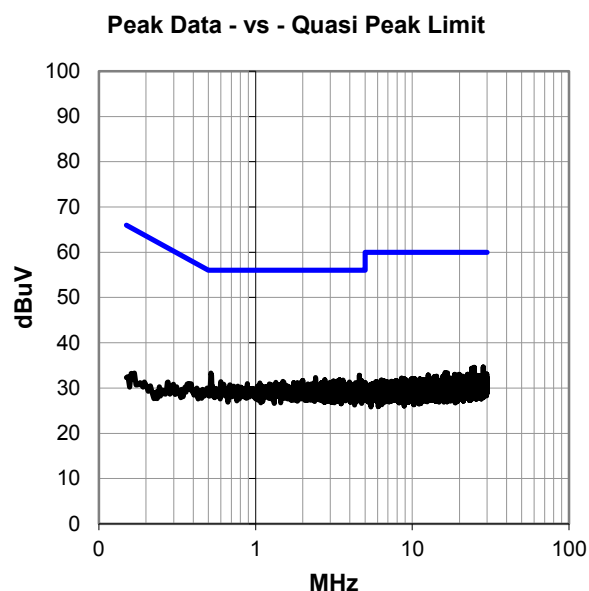
None

EUT OPERATING MODES

Bluetooth Low Energy: Continuous single channel transmit mode. 2440 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #9

Peak Data - vs - Quasi Peak Limit

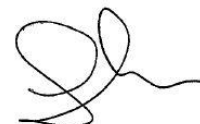
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.519	12.9	20.4	33.3	56.0	-22.7
4.597	12.0	20.8	32.8	56.0	-23.2
2.418	11.7	20.6	32.3	56.0	-23.7
3.437	11.2	20.6	31.8	56.0	-24.2
2.765	11.2	20.6	31.8	56.0	-24.2
3.612	11.1	20.7	31.8	56.0	-24.2
2.000	11.1	20.6	31.7	56.0	-24.3
4.728	10.9	20.8	31.7	56.0	-24.3
3.314	10.9	20.6	31.5	56.0	-24.5
3.142	10.9	20.6	31.5	56.0	-24.5
1.497	10.9	20.5	31.4	56.0	-24.6
0.601	11.0	20.4	31.4	56.0	-24.6
3.982	10.6	20.7	31.3	56.0	-24.7
2.396	10.7	20.6	31.3	56.0	-24.7
1.348	10.7	20.5	31.2	56.0	-24.8
2.978	10.6	20.6	31.2	56.0	-24.8
2.642	10.6	20.6	31.2	56.0	-24.8
2.366	10.6	20.6	31.2	56.0	-24.8
1.930	10.6	20.6	31.2	56.0	-24.8
4.340	10.4	20.8	31.2	56.0	-24.8
1.754	10.6	20.6	31.2	56.0	-24.8
1.064	10.6	20.5	31.1	56.0	-24.9
4.810	10.3	20.8	31.1	56.0	-24.9
1.848	10.5	20.6	31.1	56.0	-24.9
4.008	10.3	20.8	31.1	56.0	-24.9
3.254	10.4	20.6	31.0	56.0	-25.0

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.519	12.9	20.4	33.3	46.0	-12.7
4.597	12.0	20.8	32.8	46.0	-13.2
2.418	11.7	20.6	32.3	46.0	-13.7
3.437	11.2	20.6	31.8	46.0	-14.2
2.765	11.2	20.6	31.8	46.0	-14.2
3.612	11.1	20.7	31.8	46.0	-14.2
2.000	11.1	20.6	31.7	46.0	-14.3
4.728	10.9	20.8	31.7	46.0	-14.3
3.314	10.9	20.6	31.5	46.0	-14.5
3.142	10.9	20.6	31.5	46.0	-14.5
1.497	10.9	20.5	31.4	46.0	-14.6
0.601	11.0	20.4	31.4	46.0	-14.6
3.982	10.6	20.7	31.3	46.0	-14.7
2.396	10.7	20.6	31.3	46.0	-14.7
1.348	10.7	20.5	31.2	46.0	-14.8
2.978	10.6	20.6	31.2	46.0	-14.8
2.642	10.6	20.6	31.2	46.0	-14.8
2.366	10.6	20.6	31.2	46.0	-14.8
1.930	10.6	20.6	31.2	46.0	-14.8
4.340	10.4	20.8	31.2	46.0	-14.8
1.754	10.6	20.6	31.2	46.0	-14.8
1.064	10.6	20.5	31.1	46.0	-14.9
4.810	10.3	20.8	31.1	46.0	-14.9
1.848	10.5	20.6	31.1	46.0	-14.9
4.008	10.3	20.8	31.1	46.0	-14.9
3.254	10.4	20.6	31.0	46.0	-15.0

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	Supra DirectKey™ Module	Work Order:	SUPR0149
Serial Number:	001755A35950	Date:	03/31/2015
Customer:	Supra, A Division of UTCFS	Temperature:	22.9°C
Attendees:	None	Relative Humidity:	39.4%
Customer Project:	None	Bar. Pressure:	1021.1 mb
Tested By:	Jared Ison	Job Site:	EV07
Power:	3 VDC	Configuration:	SUPR0149-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	11	Line:	Neutral	Ext. Attenuation (dB):	20
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COMMENTS

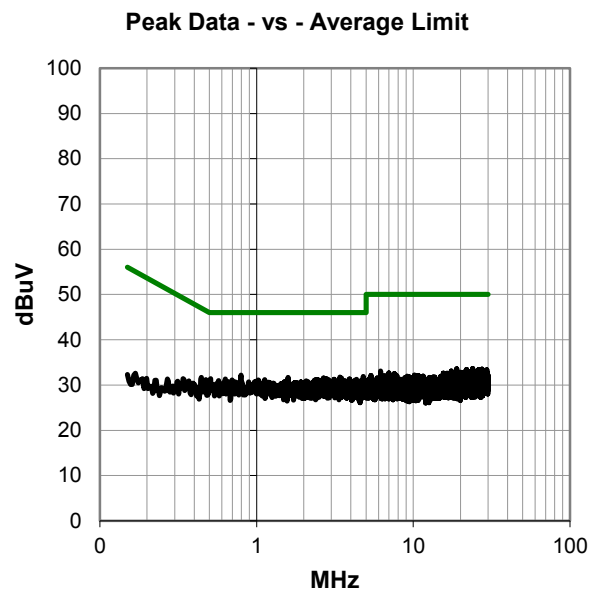
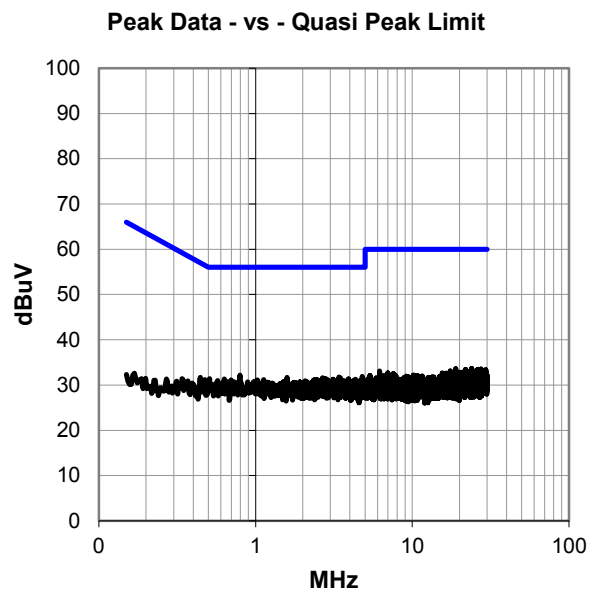
None

EUT OPERATING MODES

Bluetooth Low Energy: Continuous single channel transmit mode. 2402MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #11

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.795	11.7	20.5	32.2	56.0	-23.8
4.806	11.1	20.8	31.9	56.0	-24.1
3.411	11.1	20.6	31.7	56.0	-24.3
1.586	11.1	20.6	31.7	56.0	-24.3
3.493	10.9	20.6	31.5	56.0	-24.5
3.433	10.9	20.6	31.5	56.0	-24.5
2.679	10.9	20.6	31.5	56.0	-24.5
2.769	10.8	20.6	31.4	56.0	-24.6
0.508	11.0	20.4	31.4	56.0	-24.6
0.631	10.9	20.4	31.3	56.0	-24.7
3.922	10.6	20.7	31.3	56.0	-24.7
2.810	10.7	20.6	31.3	56.0	-24.7
4.340	10.5	20.8	31.3	56.0	-24.7
3.127	10.6	20.6	31.2	56.0	-24.8
2.859	10.6	20.6	31.2	56.0	-24.8
2.459	10.6	20.6	31.2	56.0	-24.8
2.392	10.6	20.6	31.2	56.0	-24.8
1.127	10.7	20.5	31.2	56.0	-24.8
1.027	10.6	20.5	31.1	56.0	-24.9
0.698	10.6	20.5	31.1	56.0	-24.9
4.217	10.3	20.8	31.1	56.0	-24.9
2.582	10.4	20.6	31.0	56.0	-25.0
2.333	10.4	20.6	31.0	56.0	-25.0
0.572	10.6	20.4	31.0	56.0	-25.0
3.664	10.3	20.7	31.0	56.0	-25.0
2.963	10.3	20.6	30.9	56.0	-25.1

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.795	11.7	20.5	32.2	46.0	-13.8
4.806	11.1	20.8	31.9	46.0	-14.1
3.411	11.1	20.6	31.7	46.0	-14.3
1.586	11.1	20.6	31.7	46.0	-14.3
3.493	10.9	20.6	31.5	46.0	-14.5
3.433	10.9	20.6	31.5	46.0	-14.5
2.679	10.9	20.6	31.5	46.0	-14.5
2.769	10.8	20.6	31.4	46.0	-14.6
0.508	11.0	20.4	31.4	46.0	-14.6
0.631	10.9	20.4	31.3	46.0	-14.7
3.922	10.6	20.7	31.3	46.0	-14.7
2.810	10.7	20.6	31.3	46.0	-14.7
4.340	10.5	20.8	31.3	46.0	-14.7
3.127	10.6	20.6	31.2	46.0	-14.8
2.859	10.6	20.6	31.2	46.0	-14.8
2.459	10.6	20.6	31.2	46.0	-14.8
2.392	10.6	20.6	31.2	46.0	-14.8
1.127	10.7	20.5	31.2	46.0	-14.8
1.027	10.6	20.5	31.1	46.0	-14.9
0.698	10.6	20.5	31.1	46.0	-14.9
4.217	10.3	20.8	31.1	46.0	-14.9
2.582	10.4	20.6	31.0	46.0	-15.0
2.333	10.4	20.6	31.0	46.0	-15.0
0.572	10.6	20.4	31.0	46.0	-15.0
3.664	10.3	20.7	31.0	46.0	-15.0
2.963	10.3	20.6	30.9	46.0	-15.1

CONCLUSION

Pass



Tested By

POWERLINE CONDUCTED EMISSIONS

EUT:	Supra DirectKey™ Module	Work Order:	SUPR0149
Serial Number:	001755A35950	Date:	03/31/2015
Customer:	Supra, A Division of UTCFS	Temperature:	22.9°C
Attendees:	None	Relative Humidity:	39.4%
Customer Project:	None	Bar. Pressure:	1021.1 mb
Tested By:	Jared Ison	Job Site:	EV07
Power:	3 VDC	Configuration:	SUPR0149-3

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2015	ANSI C63.10:2009

TEST PARAMETERS

Run #:	12	Line:	High Line	Ext. Attenuation (dB):	20
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COMMENTS

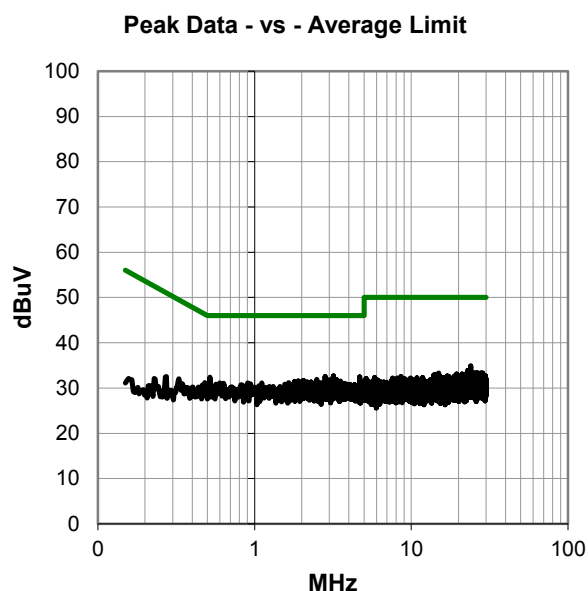
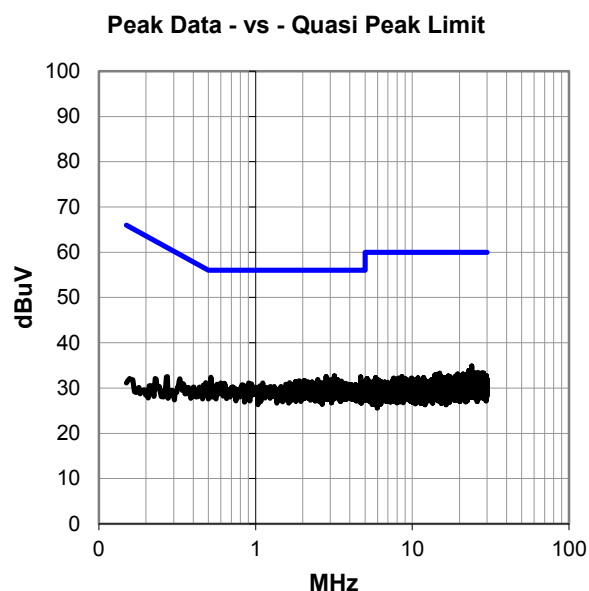
None

EUT OPERATING MODES

Bluetooth Low Energy: Continuous single channel transmit mode. 2402 MHz

DEVIATIONS FROM TEST STANDARD

None



POWERLINE CONDUCTED EMISSIONS

RESULTS - Run #12

Peak Data - vs - Quasi Peak Limit

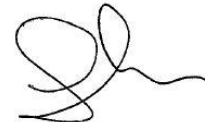
Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
3.191	12.0	20.6	32.6	56.0	-23.4
2.818	11.9	20.6	32.5	56.0	-23.5
4.687	11.7	20.8	32.5	56.0	-23.5
0.519	12.0	20.4	32.4	56.0	-23.6
3.112	11.3	20.6	31.9	56.0	-24.1
2.497	11.3	20.6	31.9	56.0	-24.1
3.344	11.2	20.6	31.8	56.0	-24.2
2.970	11.1	20.6	31.7	56.0	-24.3
2.049	11.1	20.6	31.7	56.0	-24.3
1.903	11.0	20.6	31.6	56.0	-24.4
3.541	10.9	20.7	31.6	56.0	-24.4
2.153	10.8	20.6	31.4	56.0	-24.6
1.997	10.8	20.6	31.4	56.0	-24.6
4.795	10.6	20.8	31.4	56.0	-24.6
1.795	10.8	20.6	31.4	56.0	-24.6
2.291	10.7	20.6	31.3	56.0	-24.7
2.635	10.6	20.6	31.2	56.0	-24.8
1.654	10.6	20.6	31.2	56.0	-24.8
1.113	10.6	20.5	31.1	56.0	-24.9
0.601	10.7	20.4	31.1	56.0	-24.9
0.904	10.6	20.5	31.1	56.0	-24.9
1.851	10.5	20.6	31.1	56.0	-24.9
3.717	10.4	20.7	31.1	56.0	-24.9
2.366	10.4	20.6	31.0	56.0	-25.0
1.952	10.4	20.6	31.0	56.0	-25.0
3.855	10.2	20.7	30.9	56.0	-25.1

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
3.191	12.0	20.6	32.6	46.0	-13.4
2.818	11.9	20.6	32.5	46.0	-13.5
4.687	11.7	20.8	32.5	46.0	-13.5
0.519	12.0	20.4	32.4	46.0	-13.6
3.112	11.3	20.6	31.9	46.0	-14.1
2.497	11.3	20.6	31.9	46.0	-14.1
3.344	11.2	20.6	31.8	46.0	-14.2
2.970	11.1	20.6	31.7	46.0	-14.3
2.049	11.1	20.6	31.7	46.0	-14.3
1.903	11.0	20.6	31.6	46.0	-14.4
3.541	10.9	20.7	31.6	46.0	-14.4
2.153	10.8	20.6	31.4	46.0	-14.6
1.997	10.8	20.6	31.4	46.0	-14.6
4.795	10.6	20.8	31.4	46.0	-14.6
1.795	10.8	20.6	31.4	46.0	-14.6
2.291	10.7	20.6	31.3	46.0	-14.7
2.635	10.6	20.6	31.2	46.0	-14.8
1.654	10.6	20.6	31.2	46.0	-14.8
1.113	10.6	20.5	31.1	46.0	-14.9
0.601	10.7	20.4	31.1	46.0	-14.9
0.904	10.6	20.5	31.1	46.0	-14.9
1.851	10.5	20.6	31.1	46.0	-14.9
3.717	10.4	20.7	31.1	46.0	-14.9
2.366	10.4	20.6	31.0	46.0	-15.0
1.952	10.4	20.6	31.0	46.0	-15.0
3.855	10.2	20.7	30.9	46.0	-15.1

CONCLUSION

Pass



Tested By

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

CHANNELS OF OPERATION

2402 MHz
2440 MHz
2480 MHz

MODULATION OF OPERATION

Bluetooth Low Energy

POWER SETTINGS INVESTIGATED

3 VDC

CONFIGURATIONS INVESTIGATED

SUPR0149 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26.5 GHz
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SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
High Pass Filter, 2.8 - 18 GHz	Micro-Tronics	HPM50111	HFO	7/6/2013	24 mo
Attenuator - 20dB, HF (1000MHz - 18000MHz)	Coaxicom	3910-20	AXZ	6/19/2014	12 mo
Cable	ESM Cable Corp.	KMKM-72	EVY	11/9/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	11/9/2014	12 mo
Antenna, Horn	ETS Lindgren	3160-09	AIV	NCR	0 mo
EV01 Cables	N/A	Standard Gain Horns Cables	EVF	12/15/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	12/15/2014	12 mo
Antenna, Horn	ETS	3160-08	AHV	NCR	0 mo
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	12/15/2014	12 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	12/15/2014	12 mo
Antenna, Horn	ETS	3115	AIZ	1/24/2014	24 mo
Signal Analyzer	Keysight	KT-N9010A	AFN	2/10/2015	12 mo

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

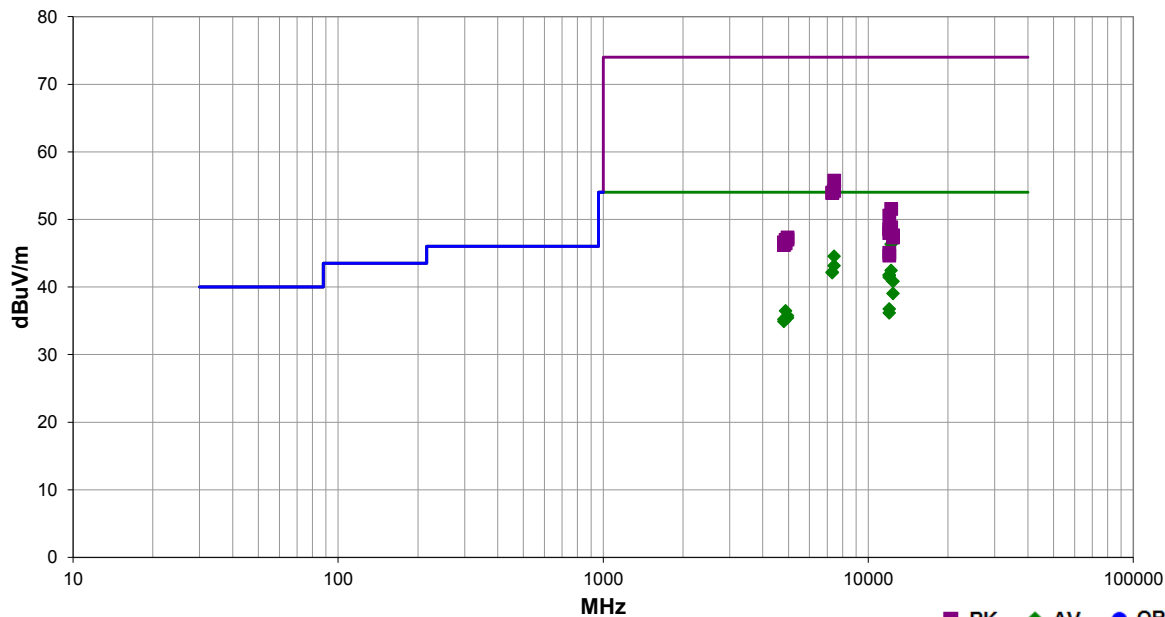
TEST DESCRIPTION

The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization. A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

Work Order:	SUPR0149	Date:	03/30/15	
Project:	None	Temperature:	21.4 °C	
Job Site:	EV01	Humidity:	41% RH	
Serial Number:	001755A35950	Barometric Pres.:	1020.1 mbar	
EUT:	Supra DirectKey™ Module			
Configuration:	2			
Customer:	Supra, A Division of UTCFS			
Attendees:	None			
EUT Power:	3 VDC			
Operating Mode:	Bluetooth Low Energy: Continuous single channel transmit.			
Deviations:	None			
Comments:	Reference data comments for EUT channel and orientation.			

Test Specifications	Test Method
FCC 15.247:2015	ANSI C63.10:2009

Run #	14	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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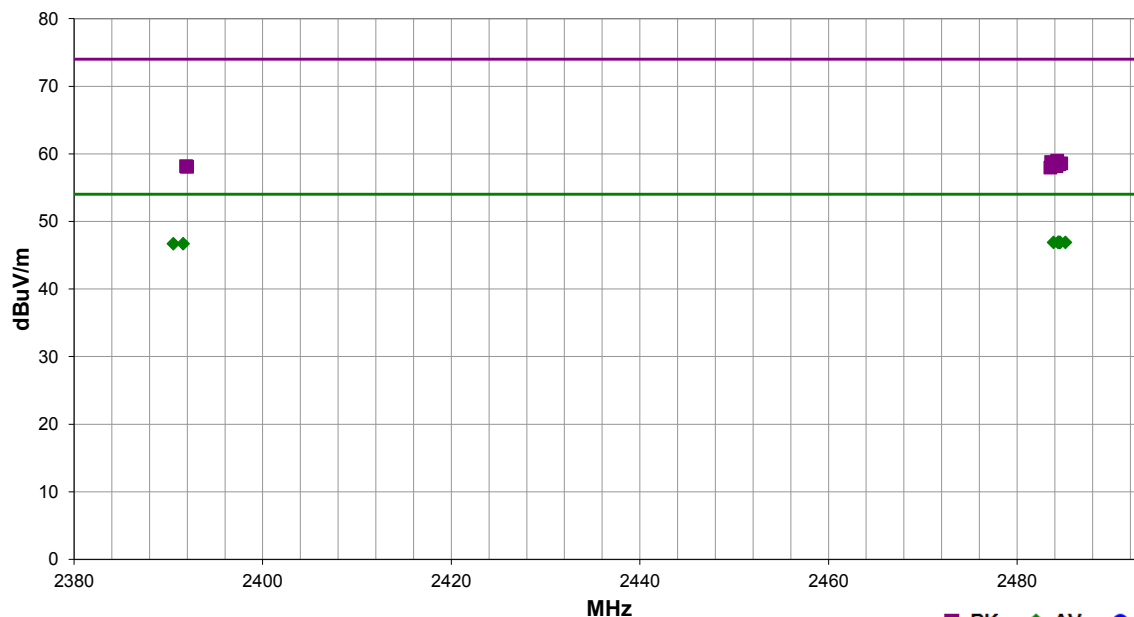
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
12198.760	47.0	-0.7	1.3	113.0	3.0	0.0	Horz	AV	0.0	46.3	54.0	-7.7	Ch. 2440 MHz, EUT On Side
12008.760	47.2	-2.4	1.3	68.0	3.0	0.0	Horz	AV	0.0	44.8	54.0	-9.2	Ch. 2402 MHz, EUT On Side
7439.300	29.8	14.7	1.9	64.0	3.0	0.0	Horz	AV	0.0	44.5	54.0	-9.5	Ch. 2480 MHz, EUT On Side
7439.192	28.4	14.7	1.0	10.0	3.0	0.0	Vert	AV	0.0	43.1	54.0	-10.9	Ch. 2480 MHz, EUT Vert
12198.640	43.1	-0.7	1.3	126.0	3.0	0.0	Vert	AV	0.0	42.4	54.0	-11.6	Ch. 2440 MHz, EUT Vert
7320.592	28.1	14.1	1.0	60.0	3.0	0.0	Horz	AV	0.0	42.2	54.0	-11.8	Ch. 2440 MHz, EUT On Side
7319.800	28.0	14.1	1.0	176.0	3.0	0.0	Vert	AV	0.0	42.1	54.0	-11.9	Ch. 2402 MHz, EUT Vert
12008.770	44.1	-2.4	1.3	126.0	3.0	0.0	Vert	AV	0.0	41.7	54.0	-12.3	Ch. 2402 MHz, EUT Vert
12008.760	44.1	-2.4	1.2	121.0	3.0	0.0	Horz	AV	0.0	41.7	54.0	-12.3	Ch. 2402 MHz, EUT Vert
12008.800	43.8	-2.4	1.3	70.0	3.0	0.0	Vert	AV	0.0	41.4	54.0	-12.6	Ch. 2402 MHz, EUT On Side
12398.740	41.5	-0.7	1.3	114.0	3.0	0.0	Horz	AV	0.0	40.8	54.0	-13.2	Ch. 2480MHz, EUT On Side
12398.750	39.7	-0.7	1.2	97.0	3.0	0.0	Vert	AV	0.0	39.0	54.0	-15.0	Ch. 2480MHz, EUT Vert
12008.680	39.1	-2.4	1.0	8.0	3.0	0.0	Vert	AV	0.0	36.7	54.0	-17.3	Ch. 2402 MHz, EUT Horz
4879.775	30.5	6.0	1.0	360.0	3.0	0.0	Horz	AV	0.0	36.5	54.0	-17.5	Ch. 2440 MHz, EUT On Side
12008.740	38.5	-2.4	1.0	0.0	3.0	0.0	Horz	AV	0.0	36.1	54.0	-17.9	Ch. 2402 MHz, EUT Horz
7439.467	41.0	14.7	1.9	64.0	3.0	0.0	Horz	PK	0.0	55.7	74.0	-18.3	Ch. 2480 MHz, EUT On Side
4959.908	29.4	6.3	1.4	45.0	3.0	0.0	Vert	AV	0.0	35.7	54.0	-18.3	Ch. 2480 MHz, EUT Vert
4959.983	29.1	6.3	1.0	213.0	3.0	0.0	Horz	AV	0.0	35.4	54.0	-18.6	Ch. 2480 MHz, EUT On Side
4879.933	29.3	6.0	1.0	121.0	3.0	0.0	Vert	AV	0.0	35.3	54.0	-18.7	Ch. 2440 MHz, EUT Vert
4804.175	29.5	5.7	1.0	148.0	3.0	0.0	Horz	AV	0.0	35.2	54.0	-18.8	Ch. 2402 MHz, EUT On Side
4803.675	29.2	5.7	1.0	129.0	3.0	0.0	Vert	AV	0.0	34.9	54.0	-19.1	Ch. 2402 MHz, EUT Vert
7440.733	39.5	14.7	1.0	10.0	3.0	0.0	Vert	PK	0.0	54.2	74.0	-19.8	Ch. 2480 MHz, EUT Vert
7317.742	39.9	14.1	1.0	60.0	3.0	0.0	Horz	PK	0.0	54.0	74.0	-20.0	Ch. 2440 MHz, EUT On Side
7319.600	39.8	14.1	1.0	176.0	3.0	0.0	Vert	PK	0.0	53.9	74.0	-20.1	Ch. 2440 MHz, EUT Vert

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
12198.780	52.2	-0.7	1.3	113.0	3.0	0.0	Horz	PK	0.0	51.5	74.0	-22.5	Ch. 2440 MHz, EUT On Side
12010.950	52.9	-2.3	1.3	68.0	3.0	0.0	Horz	PK	0.0	50.6	74.0	-23.4	Ch. 2402 MHz, EUT On Side
12198.760	49.5	-0.7	1.3	126.0	3.0	0.0	Vert	PK	0.0	48.8	74.0	-25.2	Ch. 2440 MHz, EUT Vert
12011.180	50.9	-2.3	1.3	70.0	3.0	0.0	Vert	PK	0.0	48.6	74.0	-25.4	Ch. 2402 MHz, EUT On Side
12008.610	50.9	-2.4	1.3	126.0	3.0	0.0	Vert	PK	0.0	48.5	74.0	-25.5	Ch. 2402 MHz, EUT Vert
12011.100	50.3	-2.3	1.2	121.0	3.0	0.0	Horz	PK	0.0	48.0	74.0	-26.0	Ch. 2402 MHz, EUT Vert
12398.430	48.3	-0.7	1.3	114.0	3.0	0.0	Horz	PK	0.0	47.6	74.0	-26.4	Ch. 2480MHz, EUT On Side
4959.983	41.0	6.3	1.4	45.0	3.0	0.0	Vert	PK	0.0	47.3	74.0	-26.7	Ch. 2480 MHz, EUT Vert
12398.640	48.0	-0.7	1.2	97.0	3.0	0.0	Vert	PK	0.0	47.3	74.0	-26.7	Ch. 2480MHz, EUT Vert
4959.925	40.7	6.3	1.0	213.0	3.0	0.0	Horz	PK	0.0	47.0	74.0	-27.0	Ch. 2480 MHz, EUT On Side
4880.042	41.0	6.0	1.0	360.0	3.0	0.0	Horz	PK	0.0	47.0	74.0	-27.0	Ch. 2440 MHz, EUT On Side
4803.525	40.9	5.7	1.0	129.0	3.0	0.0	Vert	PK	0.0	46.6	74.0	-27.4	Ch. 2402 MHz, EUT Vert
4877.817	40.5	6.0	1.0	121.0	3.0	0.0	Vert	PK	0.0	46.5	74.0	-27.5	Ch. 2440 MHz, EUT Vert
4804.083	40.5	5.7	1.0	148.0	3.0	0.0	Horz	PK	0.0	46.2	74.0	-27.8	Ch. 2402 MHz, EUT On Side
12010.820	47.4	-2.3	1.0	8.0	3.0	0.0	Vert	PK	0.0	45.1	74.0	-28.9	Ch. 2402 MHz, EUT Horz
12008.990	47.0	-2.4	1.0	0.0	3.0	0.0	Horz	PK	0.0	44.7	74.0	-29.4	Ch. 2402 MHz, EUT Horz

Work Order:	SUPR0149	Date:	03/30/15	
Project:	None	Temperature:	21.4 °C	
Job Site:	EV01	Humidity:	41% RH	
Serial Number:	001755A35950	Barometric Pres.:	1020.1 mbar	
EUT:	Supra DirectKey™ Module			
Configuration:	2			
Customer:	Supra, A Division of UTCFS			
Attendees:	None			
EUT Power:	3 VDC			
Operating Mode:	Bluetooth Low Energy: Continuous single channel transmit.			
Deviations:	None			
Comments:	Reference data comments for EUT channel and orientation.			

Test Specifications	Test Method
FCC 15.247.2015	ANSI C63.10:2009

Run #	15	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2485.137	31.3	-4.4	2.2	269.0	3.0	20.0	Vert	AV	0.0	46.9	54.0	-7.1	Ch. 2480 MHz, EUT Vert
2484.563	31.3	-4.4	3.0	125.0	3.0	20.0	Vert	AV	0.0	46.9	54.0	-7.1	Ch. 2480 MHz, EUT Horz
2484.487	31.3	-4.4	3.3	61.0	3.0	20.0	Horz	AV	0.0	46.9	54.0	-7.1	Ch. 2480 MHz, EUT Vert
2484.383	31.3	-4.4	1.0	264.0	3.0	20.0	Vert	AV	0.0	46.9	54.0	-7.1	Ch. 2480 MHz, EUT On Side
2484.377	31.3	-4.4	3.9	252.0	3.0	20.0	Horz	AV	0.0	46.9	54.0	-7.1	Ch. 2480 MHz, EUT Horz
2483.870	31.3	-4.4	1.0	117.0	3.0	20.0	Horz	AV	0.0	46.9	54.0	-7.1	Ch. 2480 MHz, EUT On Side
2390.537	31.3	-4.6	1.0	266.0	3.0	20.0	Vert	AV	0.0	46.7	54.0	-7.3	Ch. 2402 MHz, EUT Vert
2391.570	31.3	-4.6	1.0	7.0	3.0	20.0	Horz	AV	0.0	46.7	54.0	-7.3	Ch. 2402 MHz, EUT Vert
2484.253	43.4	-4.4	3.3	61.0	3.0	20.0	Horz	PK	0.0	59.0	74.0	-15.0	Ch. 2480 MHz, EUT Vert
2483.607	43.2	-4.4	3.0	125.0	3.0	20.0	Vert	PK	0.0	58.8	74.0	-15.2	Ch. 2480 MHz, EUT Horz
2484.667	43.0	-4.4	1.0	117.0	3.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	Ch. 2480 MHz, EUT On Side
2484.460	42.9	-4.4	2.2	269.0	3.0	20.0	Vert	PK	0.0	58.5	74.0	-15.5	Ch. 2480 MHz, EUT Vert
2484.180	42.6	-4.4	1.0	264.0	3.0	20.0	Vert	PK	0.0	58.2	74.0	-15.8	Ch. 2480 MHz, EUT On Side
2391.880	42.8	-4.6	1.0	7.0	3.0	20.0	Horz	PK	0.0	58.2	74.0	-15.8	Ch. 2402 MHz, EUT Vert
2391.970	42.7	-4.6	1.0	266.0	3.0	20.0	Vert	PK	0.0	58.1	74.0	-15.9	Ch. 2402 MHz, EUT Vert
2483.533	42.4	-4.4	3.9	252.0	3.0	20.0	Horz	PK	0.0	58.0	74.0	-16.0	Ch. 2480 MHz, EUT Horz

BAND EDGE COMPLIANCE

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
DC Block, 40 GHz	Fairview Microwave	SD3379	AMK	12/11/2014	12
Power Meter	Gigatronics	8651A	SPM	9/17/2014	12
Power Sensor	Gigatronics	80701A	SPL	5/28/2014	12
MXG Analog Signal Generator	Agilent	N5181A	TIG	3/28/2014	36
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
Spectrum Analyzer	Agilent	E4446A	AAQ	3/10/2015	12

TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet.

The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE

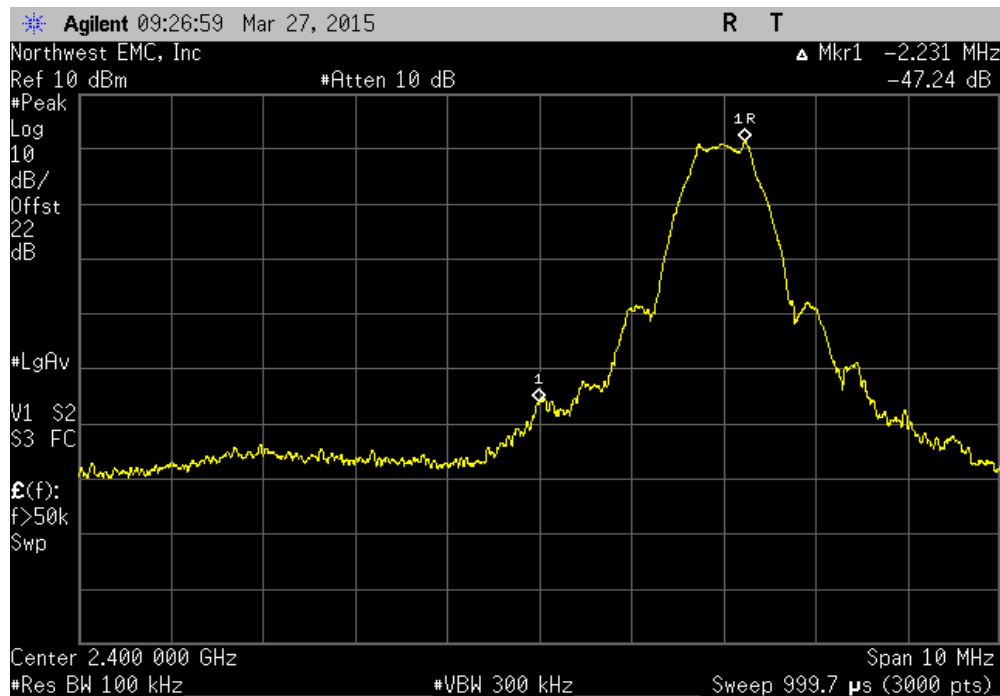


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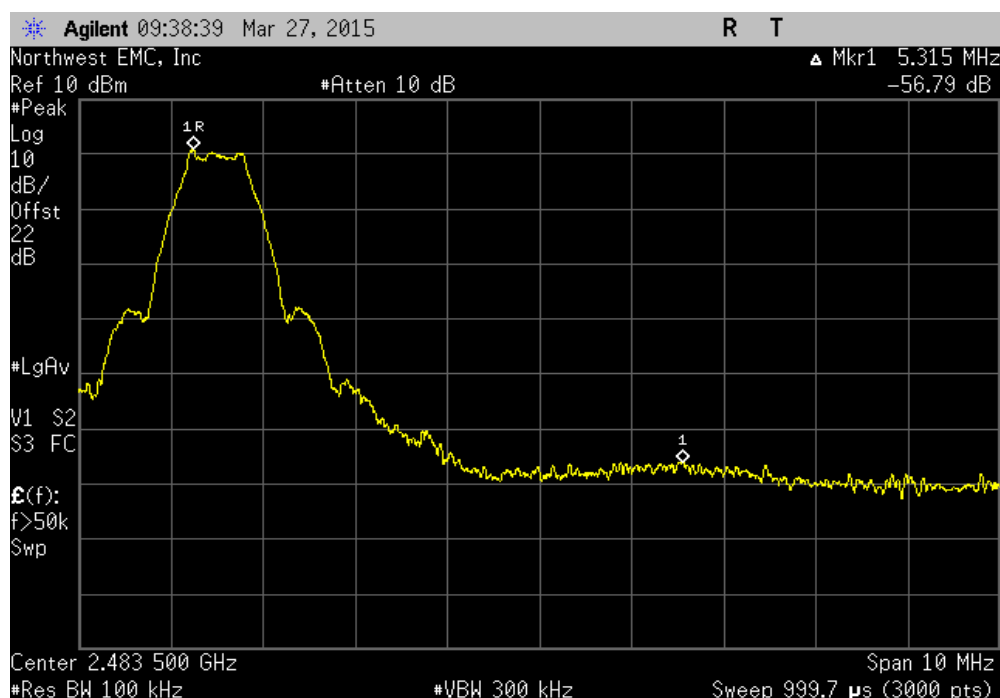
EUT: Supra DirectKey™ Module		Work Order: SUPR0149	
Serial Number: 001755A35954		Date: 03/27/15	
Customer: Supra, A Division of UTCFS		Temperature: 22°C	
Attendees: None		Humidity: 44%	
Project: None		Barometric Pres.: 1025.1	
Tested by: Jared Ison	Power: 3 VDC	Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
Single channel continuous transmission enabled using VCP program.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value (dBc)	Limit ≤ (dBc) Result
BLE			
Low Channel, 2402 MHz		-47.24	-20 Pass
High Channel, 2480 MHz		-56.79	-20 Pass

BAND EDGE COMPLIANCE

BLE, Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-47.24	-20	Pass



BLE, High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-56.79	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
Power Meter	Gigatronics	8651A	SPM	9/17/2014	12
Power Sensor	Gigatronics	80701A	SPL	5/28/2014	12
MXG Analog Signal Generator	Agilent	N5181A	TIG	3/28/2014	36
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
DC Block, 40 GHz	Fairview Microwave	SD3379	AMK	12/11/2014	12
Spectrum Analyzer	Agilent	E4446A	AAQ	3/10/2015	12

TEST DESCRIPTION

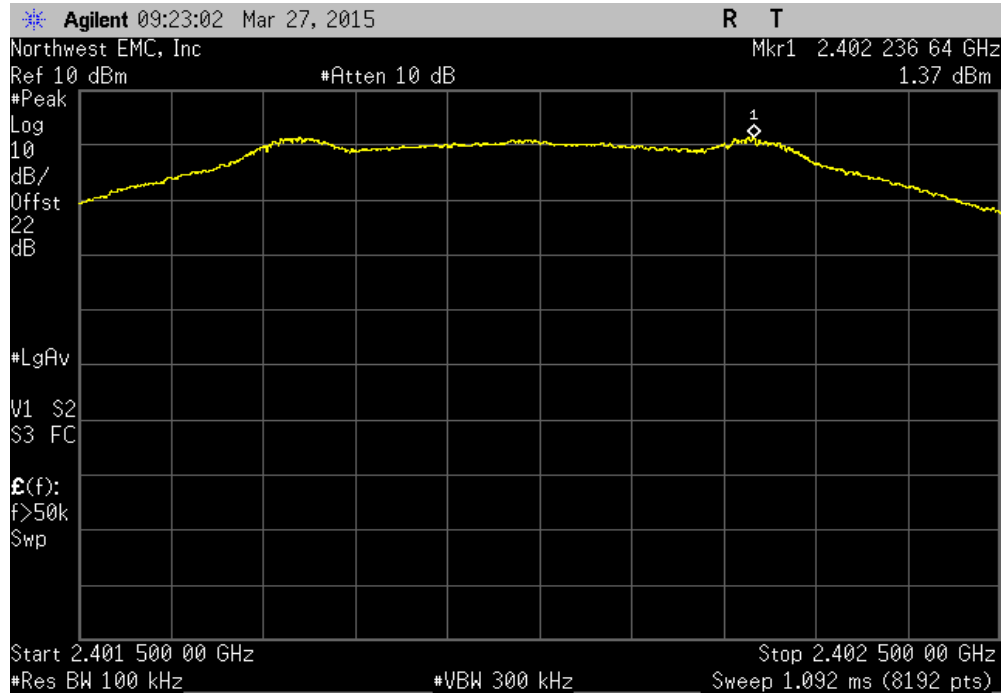
The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

SPURIOUS CONDUCTED EMISSIONS

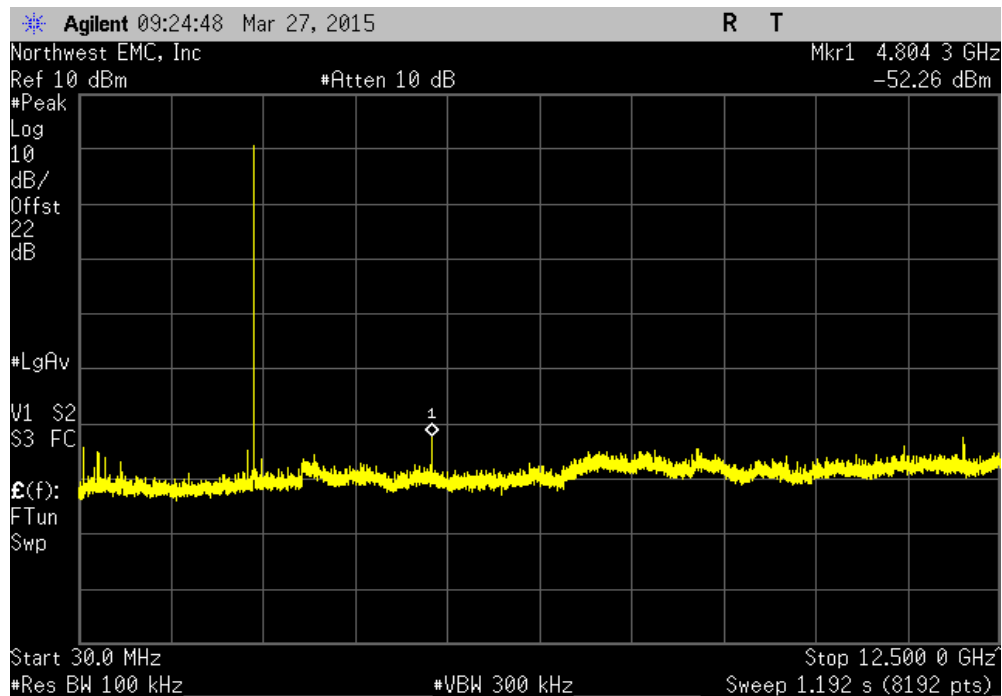
EUT: Supra DirectKey™ Module		Work Order: SUPR0149			
Serial Number: 001755A35954		Date: 03/27/15			
Customer: Supra, A Division of UTCFS		Temperature: 22°C			
Attendees: None		Humidity: 44%			
Project: None		Barometric Pres.: 1025.1			
Tested by: Jared Ison	Power: 3 VDC	Job Site: EV06			
TEST SPECIFICATIONS		Test Method			
FCC 15.247:2015		ANSI C63.10:2009			
COMMENTS					
Single channel continuous transmission enabled using VCP program.					
DEVIATIONS FROM TEST STANDARD					
None					
Configuration #	1	Signature 			
		Frequency Range	Value (dBc)		
			Limit ≤ (dBc)		
			Result		
BLE	Low Channel, 2402 MHz	Fundamental	N/A	N/A	N/A
	Low Channel, 2402 MHz	30 MHz - 12.5 GHz	-53.63	-20	Pass
	Low Channel, 2402 MHz	12.5 GHz - 25 GHz	-48.86	-20	Pass
	Mid Channel, 2440 MHz	Fundamental	N/A	N/A	N/A
	Mid Channel, 2440 MHz	30 MHz - 12.5 GHz	-54.38	-20	Pass
	Mid Channel, 2440 MHz	12.5 GHz - 25 GHz	-49.28	-20	Pass
	High Channel, 2480 MHz	Fundamental	N/A	N/A	N/A
	High Channel, 2480 MHz	30 MHz - 12.5 GHz	-53.06	-20	Pass
	High Channel, 2480 MHz	12.5 GHz - 25 GHz	-47.73	-20	Pass

SPURIOUS CONDUCTED EMISSIONS

BLE, Low Channel, 2402 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
Fundamental		N/A	N/A	N/A		

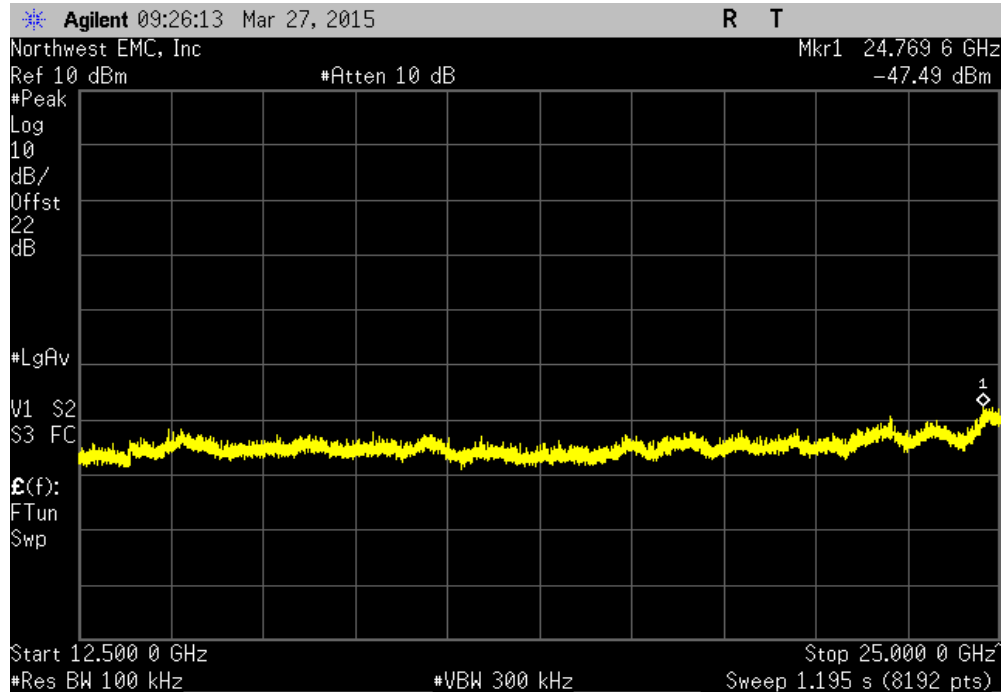


BLE, Low Channel, 2402 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
30 MHz - 12.5 GHz		-53.63	-20	Pass		

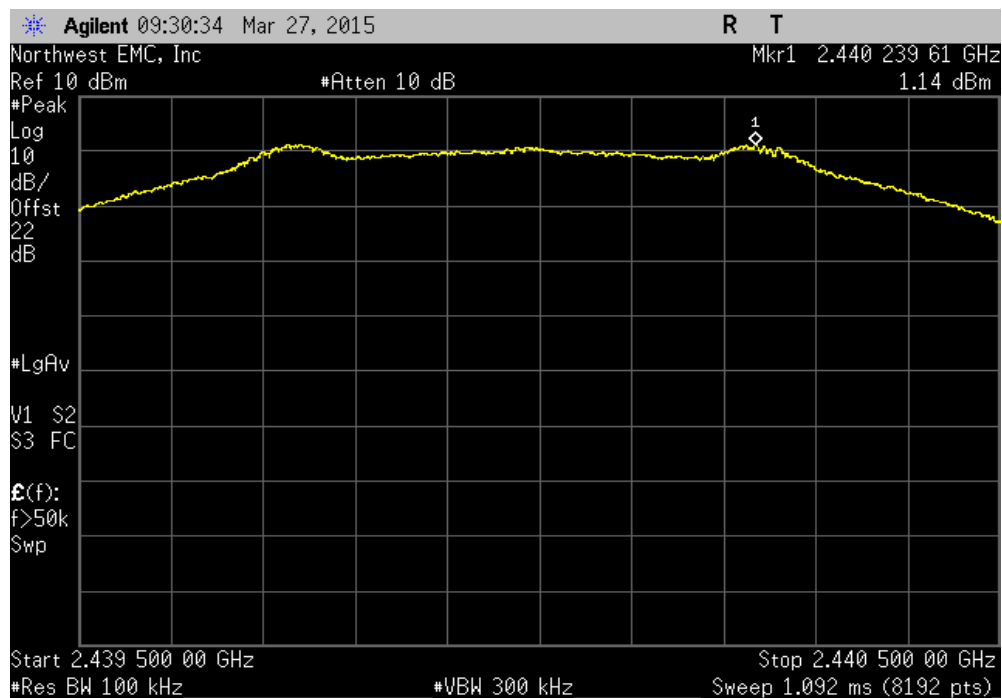


SPURIOUS CONDUCTED EMISSIONS

BLE, Low Channel, 2402 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-48.86	-20	Pass	

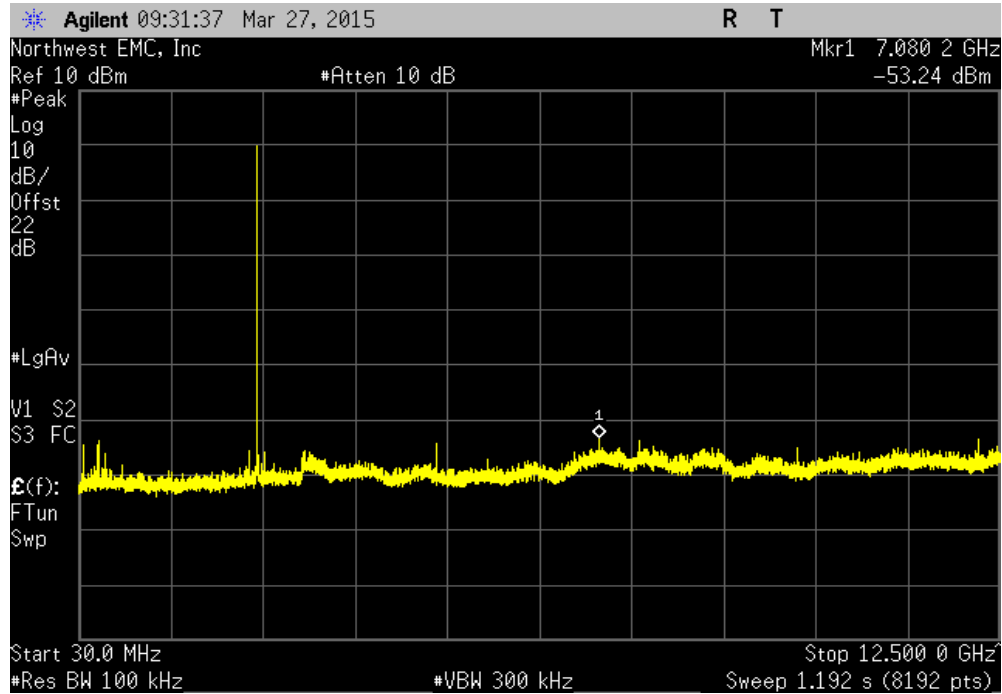


BLE, Mid Channel, 2440 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	N/A	N/A	N/A	

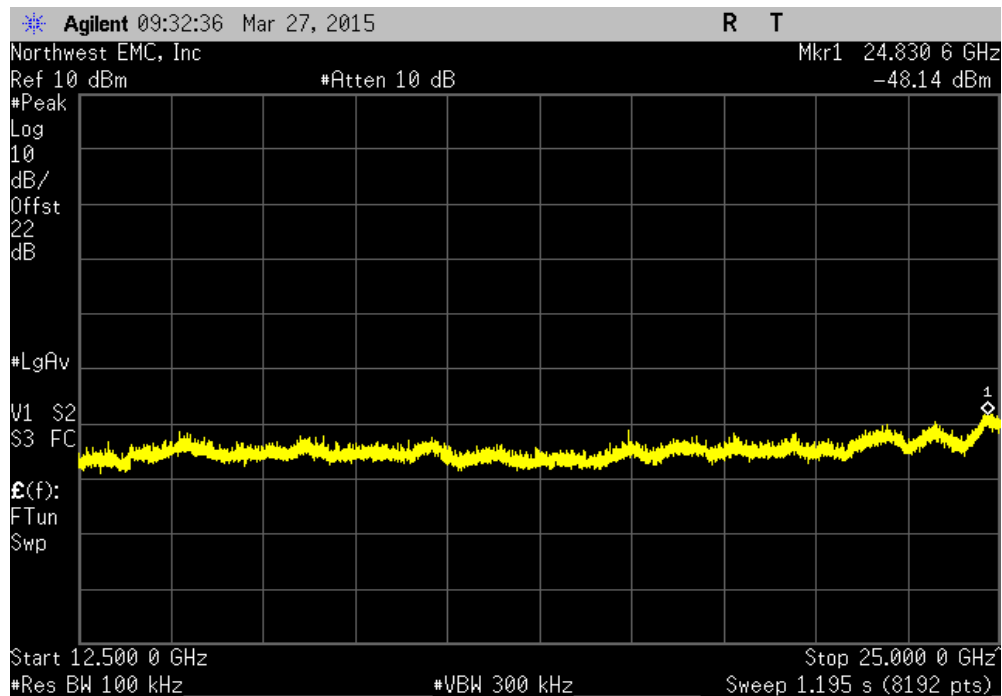


SPURIOUS CONDUCTED EMISSIONS

BLE, Mid Channel, 2440 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-54.38	-20	Pass	

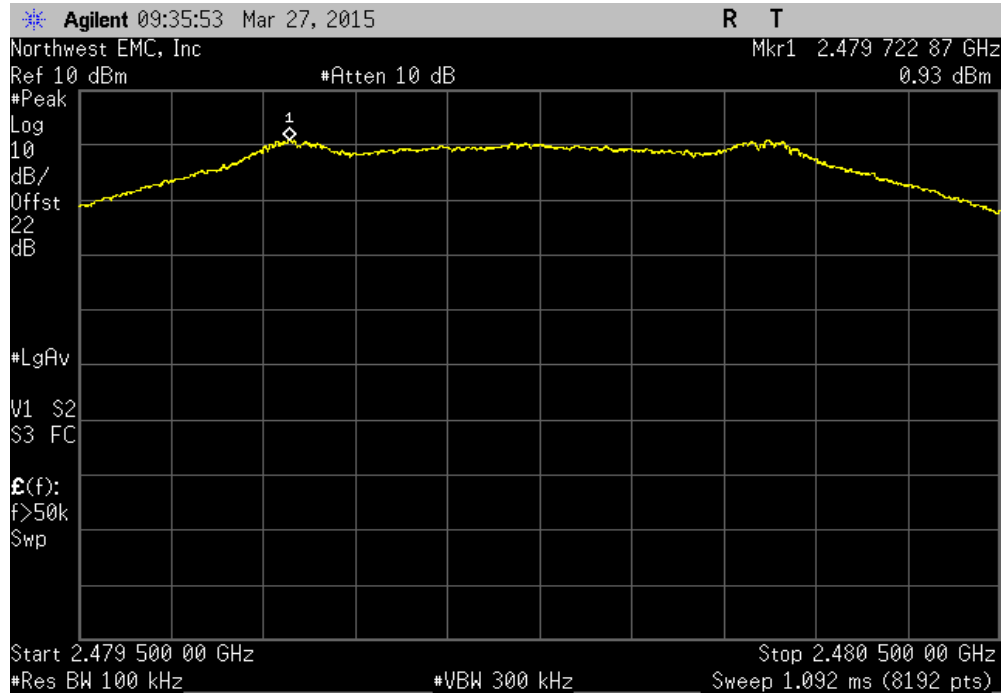


BLE, Mid Channel, 2440 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-49.28	-20	Pass	

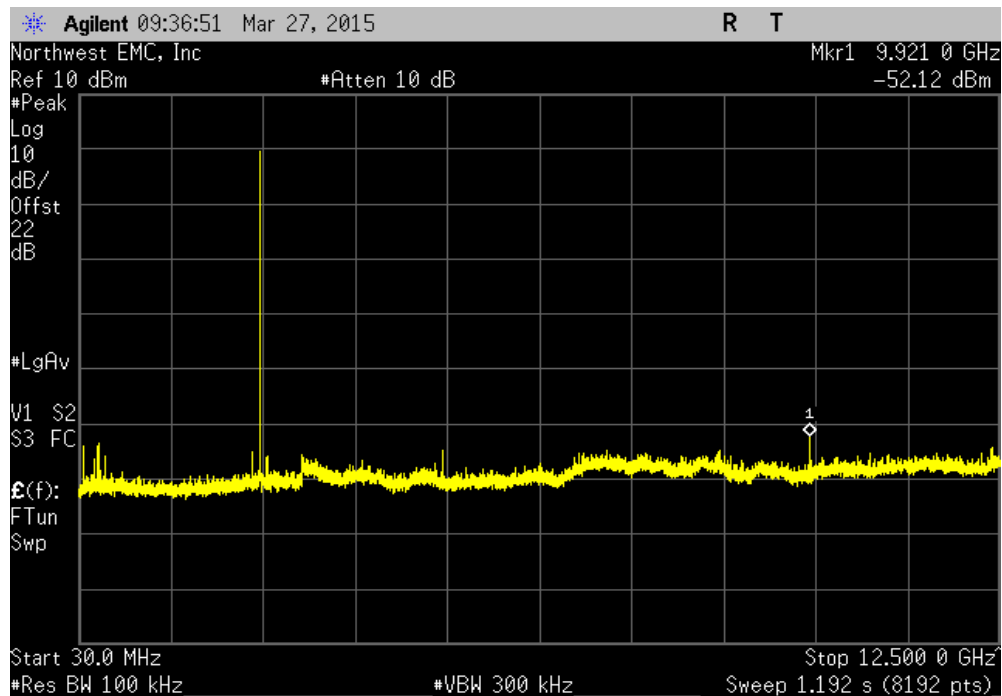


SPURIOUS CONDUCTED EMISSIONS

BLE, High Channel, 2480 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
Fundamental		N/A	N/A	N/A		

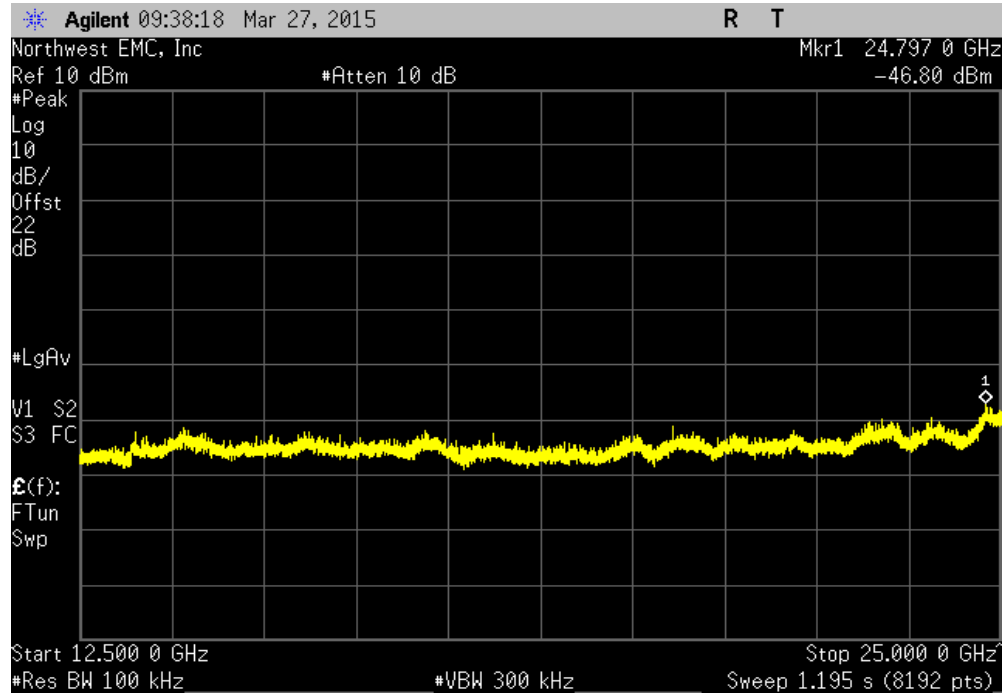


BLE, High Channel, 2480 MHz						
Frequency Range		Value (dBc)	Limit ≤ (dBc)	Result		
30 MHz - 12.5 GHz		-53.06	-20	Pass		



SPURIOUS CONDUCTED EMISSIONS

BLE, High Channel, 2480 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-47.73	-20	Pass	



OCCUPIED BANDWIDTH

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
Power Meter	Gigatronix	8651A	SPM	9/17/2014	12
Power Sensor	Gigatronix	80701A	SPL	5/28/2014	12
MXG Analog Signal Generator	Agilent	N5181A	TIG	3/28/2014	36
DC Block, 40 GHz	Fairview Microwave	SD3379	AMK	12/11/2014	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Spectrum Analyzer	Agilent	E4446A	AAQ	3/10/2015	12

TEST DESCRIPTION

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.9% (approximate 26 dB) emission bandwidth (EBW) was also measured at the same time.

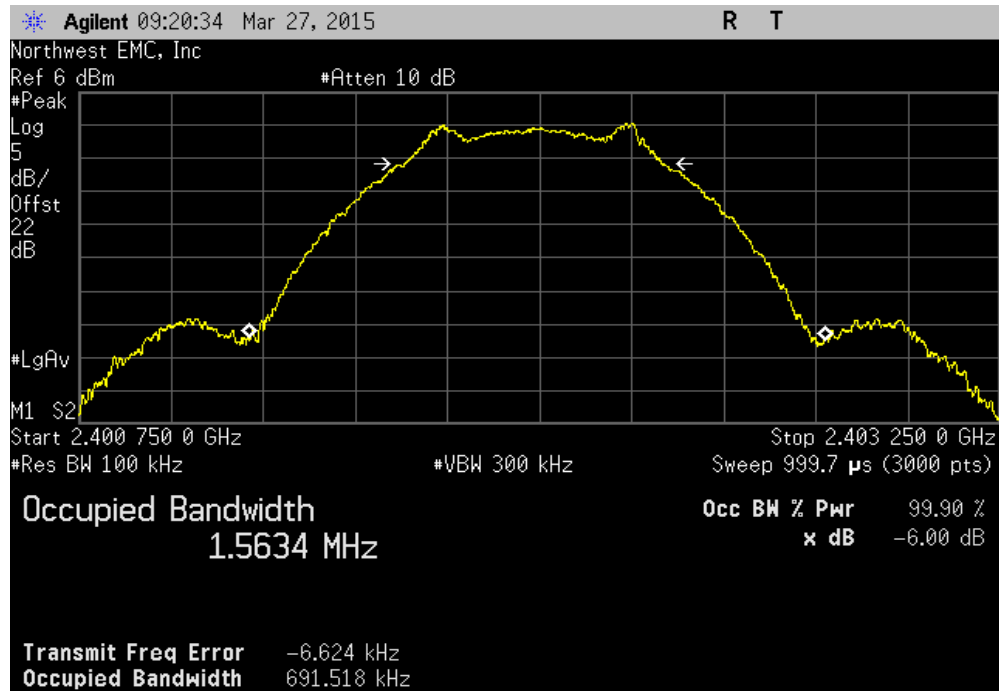
The EUT was set to the channels and modes listed in the datasheet. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer.

OCCUPIED BANDWIDTH

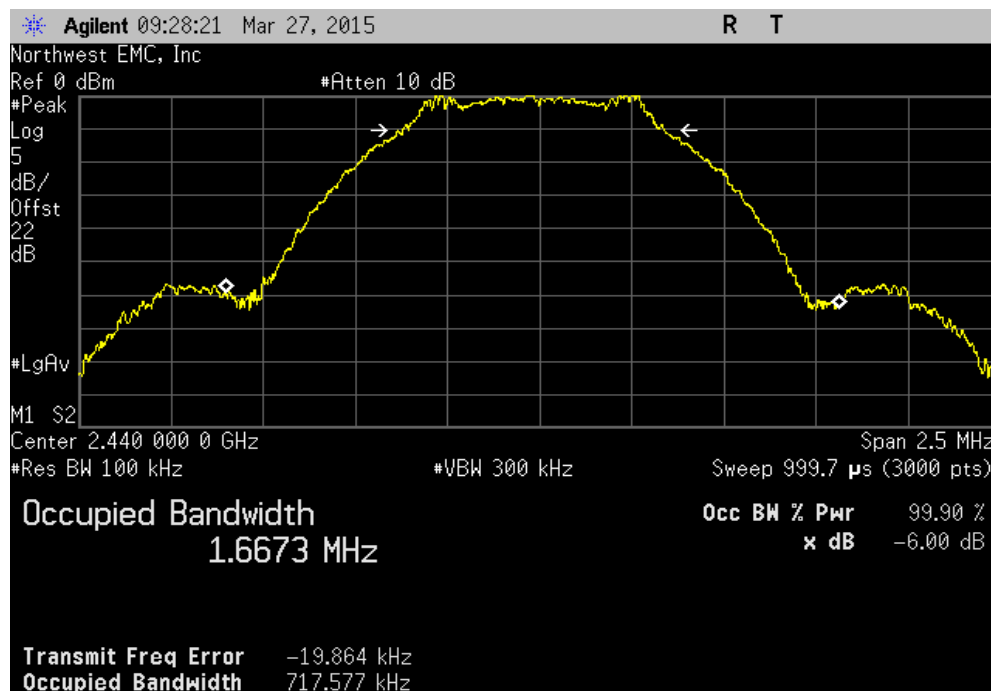
EUT: Supra DirectKey™ Module		Work Order: SUPR0149	
Serial Number: 001755A35954		Date: 03/27/15	
Customer: Supra, A Division of UTCFS		Temperature: 22°C	
Attendees: None		Humidity: 44%	
Project: None		Barometric Pres.: 1025.1	
Tested by: Jared Ison	Power: 3 VDC	Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
Single channel continuous transmission enabled using VCP program.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (±) Result
BLE			
Low Channel, 2402 MHz		691.518 kHz	500 kHz Pass
Mid Channel, 2440 MHz		717.577 kHz	500 kHz Pass
High Channel, 2480 MHz		714.821 kHz	500 kHz Pass

OCCUPIED BANDWIDTH

BLE, Low Channel, 2402 MHz						
				Value	Limit (≥)	Result
				691.518 kHz	500 kHz	Pass

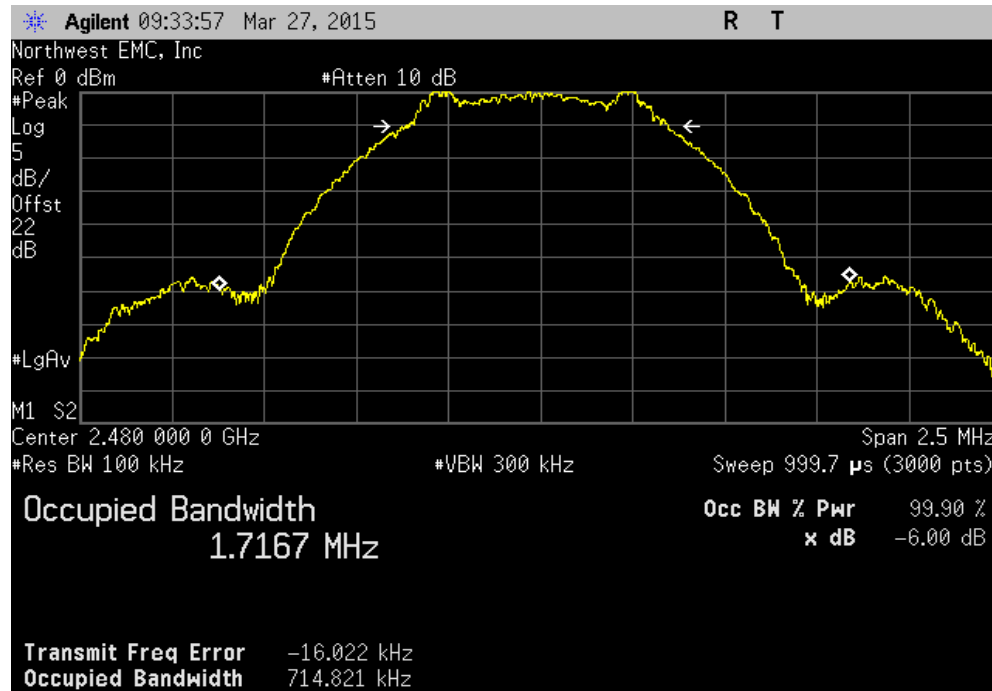


BLE, Mid Channel, 2440 MHz						
				Value	Limit (≥)	Result
				717.577 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

BLE, High Channel, 2480 MHz						
				Value	Limit (≥)	Result
				714.821 kHz	500 kHz	Pass



OUTPUT POWER

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Power Meter	Gigatronics	8651A	SPM	9/17/2014	12
Power Sensor	Gigatronics	80701A	SPL	5/28/2014	12
MXG Analog Signal Generator	Agilent	N5181A	TIG	3/28/2014	36
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
DC Block, 40 GHz	Fairview Microwave	SD3379	AMK	12/11/2014	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Spectrum Analyzer	Agilent	E4446A	AAQ	3/10/2015	12

TEST DESCRIPTION

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used. The reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

Prior to measuring peak transmit power the DTS bandwidth (B) and the transmission pulse duration (T) were measured. Both are required to determine the method of measuring Maximum Conducted Output Power. The transmission pulse duration (T) was measured using a zero span on the spectrum analyzer to see the pulses in the time domain.

The method found in KDB 558074 DTS D01 Measurement Section 9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

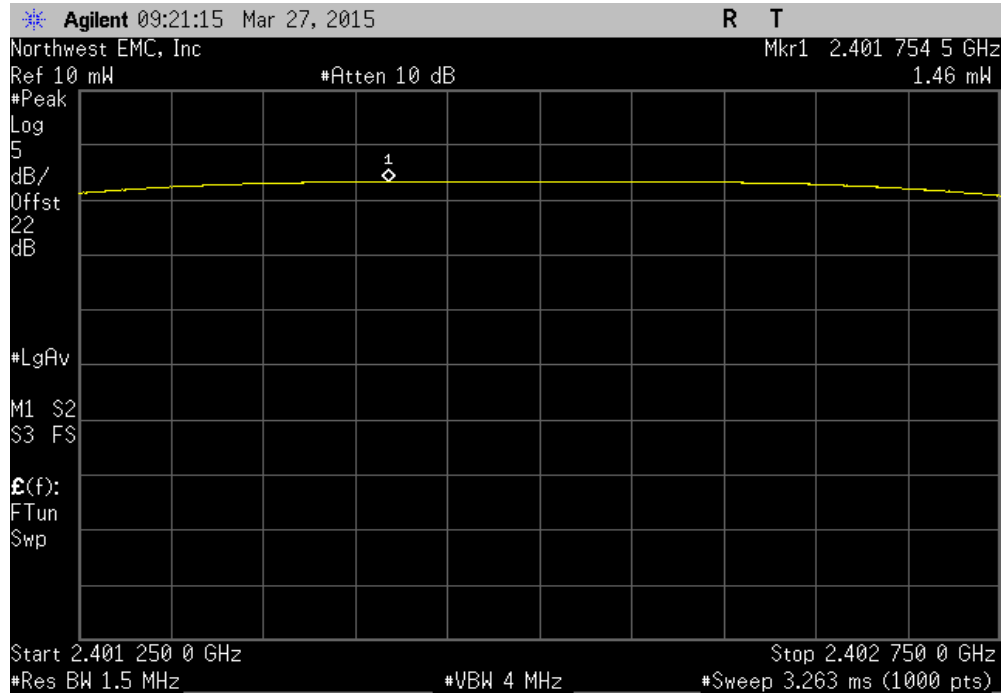
De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER

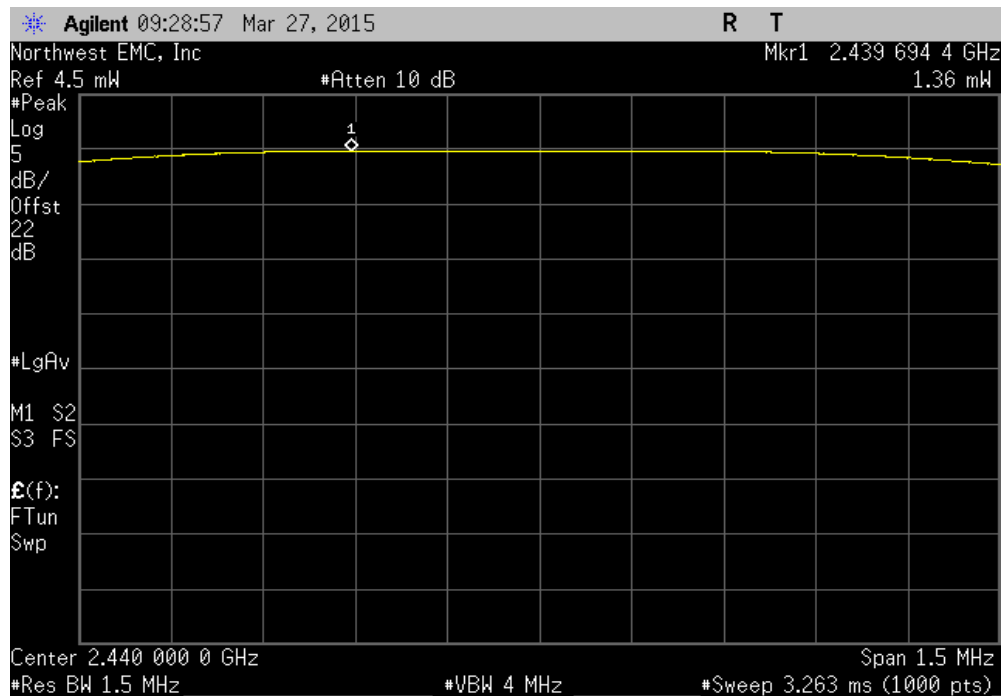
EUT: Supra DirectKey™ Module		Work Order: SUPR0149	
Serial Number: 001755A35954		Date: 03/27/15	
Customer: Supra, A Division of UTCFS		Temperature: 22°C	
Attendees: None		Humidity: 44%	
Project: None		Barometric Pres.: 1025.1	
Tested by: Jared Ison	Power: 3 VDC	Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
Single channel continuous transmission enabled using VCP program.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (<) Result
BLE			
Low Channel, 2402 MHz		1.455 mW	1 W Pass
Mid Channel, 2440 MHz		1.364 mW	1 W Pass
High Channel, 2480 MHz		1.286 mW	1 W Pass

OUTPUT POWER

BLE, Low Channel, 2402 MHz						
				Value	Limit (<)	Result
				1.455 mW	1 W	Pass

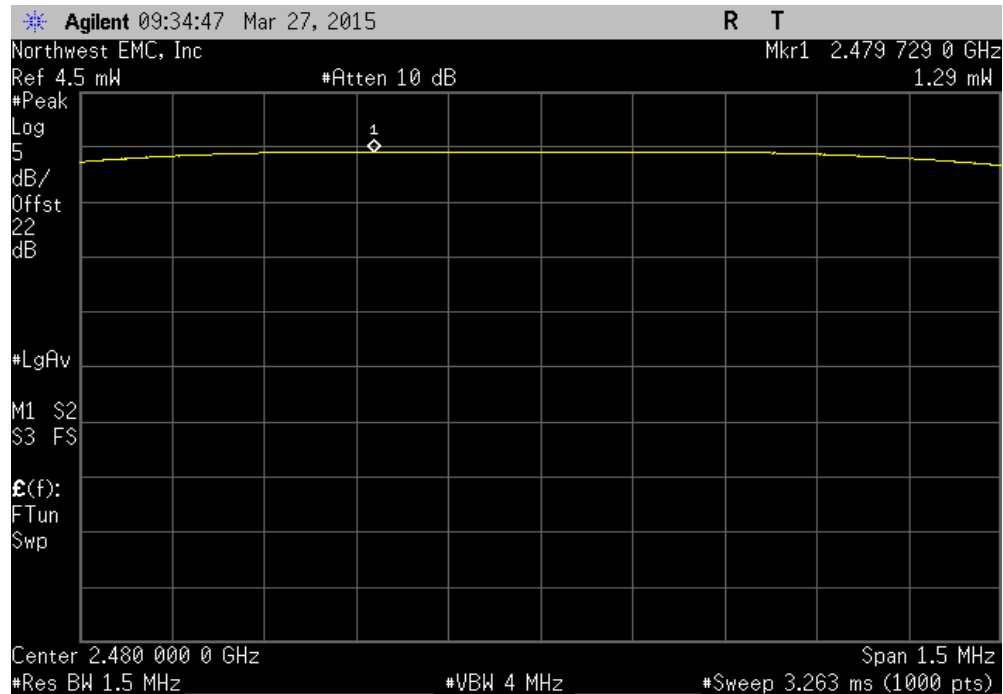


BLE, Mid Channel, 2440 MHz						
				Value	Limit (<)	Result
				1.364 mW	1 W	Pass



OUTPUT POWER

BLE, High Channel, 2480 MHz						
				Value	Limit (<)	Result
				1.286 mW	1 W	Pass



POWER SPECTRAL DENSITY

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Power Meter	Gigatronics	8651A	SPM	9/17/2014	12
Power Sensor	Gigatronics	80701A	SPL	5/28/2014	12
MXG Analog Signal Generator	Agilent	N5181A	TIG	3/28/2014	36
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
DC Block, 40 GHz	Fairview Microwave	SD3379	AMK	12/11/2014	12
Spectrum Analyzer	Agilent	E4446A	AAQ	3/10/2015	12

TEST DESCRIPTION

The maximum power spectral density measurements were measured with the EUT set to the required transmit frequencies in each band. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the lowest, middle, and maximum data rate for each modulation type available.

Per the procedure outlined in FCC KDB 558074 D01 DTS Measurement Section 5.3.1, the spectrum analyzer was used as follows:

- RBW = 100 kHz
- VBW = 300 kHz
- Detector = Peak (to match method used for power measurement)
- Trace = Max hold

The observed power level is then scaled to an equivalent value in 3 kHz by adding a Bandwidth Correction Factor (BWCF) where:

$$\text{BWCF} = 10 \cdot \text{LOG} (3 \text{ kHz} / 100 \text{ kHz}) = -15.2 \text{ dB}$$

POWER SPECTRAL DENSITY

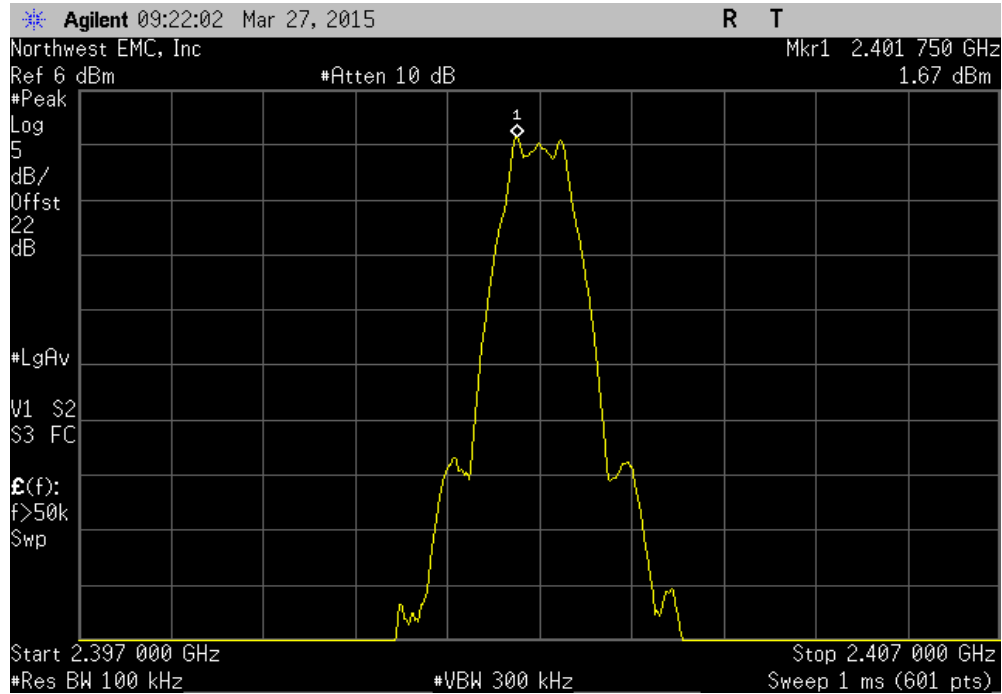


XMR 2015.01.14

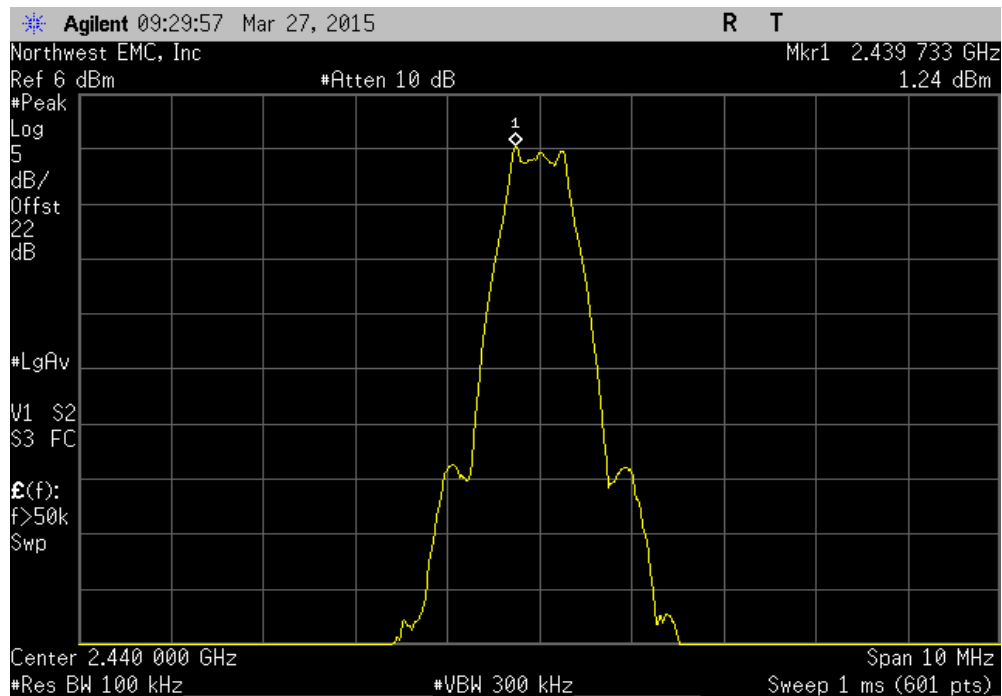
EUT: Supra DirectKey™ Module		Work Order: SUPR0149	
Serial Number: 001755A35954		Date: 03/27/15	
Customer: Supra, A Division of UTCFS		Temperature: 22°C	
Attendees: None		Humidity: 44%	
Project: None		Barometric Pres.: 1025.1	
Tested by: Jared Ison	Power: 3 VDC	Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
Single channel continuous transmission enabled using VCP program.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz
		Value dBm/3kHz	Limit dBm/3kHz
			Results
BLE			
	Low Channel, 2402 MHz	1.675	-15.2
	Mid Channel, 2440 MHz	1.238	-15.2
	High Channel, 2480 MHz	0.828	-15.2
		-13.525	8
		-13.962	8
		-14.372	8
			Pass
			Pass
			Pass

POWER SPECTRAL DENSITY

BLE, Low Channel, 2402 MHz					
	Value	dBm/100kHz	Value	Limit	Results
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz	
	1.675	-15.2	-13.525	8	Pass

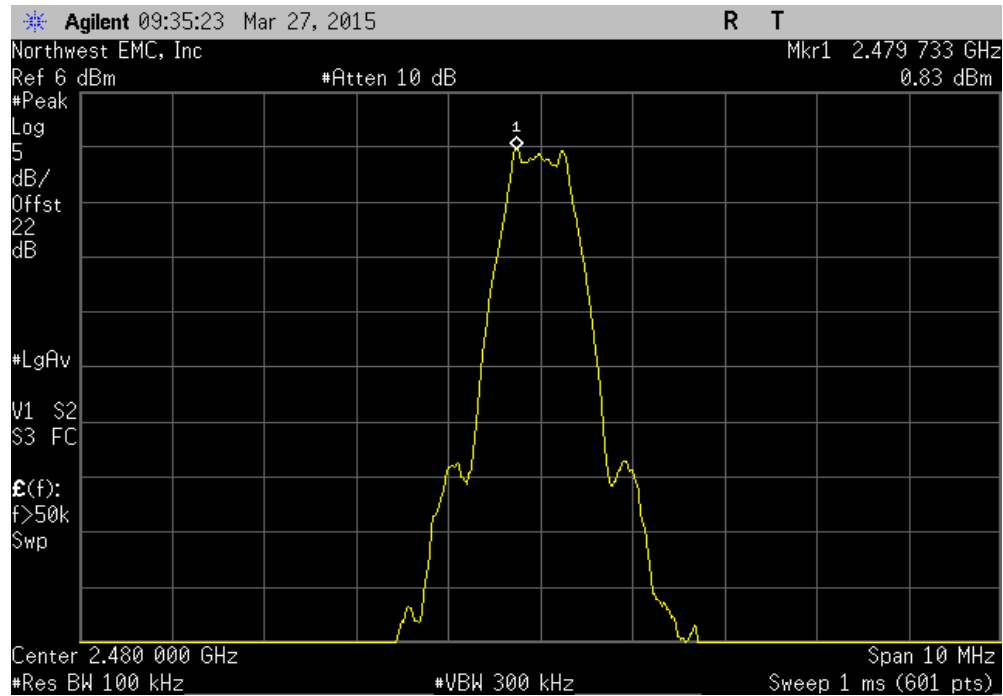


BLE, Mid Channel, 2440 MHz					
	Value	dBm/100kHz	Value	Limit	Results
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz	
	1.238	-15.2	-13.962	8	Pass



POWER SPECTRAL DENSITY

BLE, High Channel, 2480 MHz						
	Value	dBm/100kHz	Value	Limit	Results	
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz		
	0.828	-15.2	-14.372	8	Pass	



DUTY CYCLE

TEST DESCRIPTION

The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used

The test software provided for operation in a fixed, single channel mode allows the EUT to operate continuously at 100% Duty Cycle.