Walt Disney Parks and Resorts US, Inc.

TPv2/300-004278

FCC 15.247:2018

Bluetooth Low Energy Radio (DTS)

Report # SYNA0242.2

NVLAP LAB CODE: 200629-0

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More: https://www.bis.doc.gov/index.php/forms-documents/regulations-docs/14-commerce-country-chart/fileT

CERTIFICATE OF TEST

Last Date of Test: June 8, 2018
Walt Disney Parks and Resorts US, Inc.
Model: TPv2/300-004278

Radio Equipment Testing

Standards

Specification	Method
FCC 15.207:2018	ANSI C63.10:2013, KDB 558074
FCC 15.247:2018	

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
11.12.1, 11.13.2, 6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
11.6	Duty Cycle	Yes	N/A	Characterization of radio test software operation.
11.8.2	Occupied Bandwidth	Yes	Pass	
11.9.1.1	Output Power	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Rod Munro, 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. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

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 Element to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

Australia/New Zealand

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

Korea

MSIT / 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

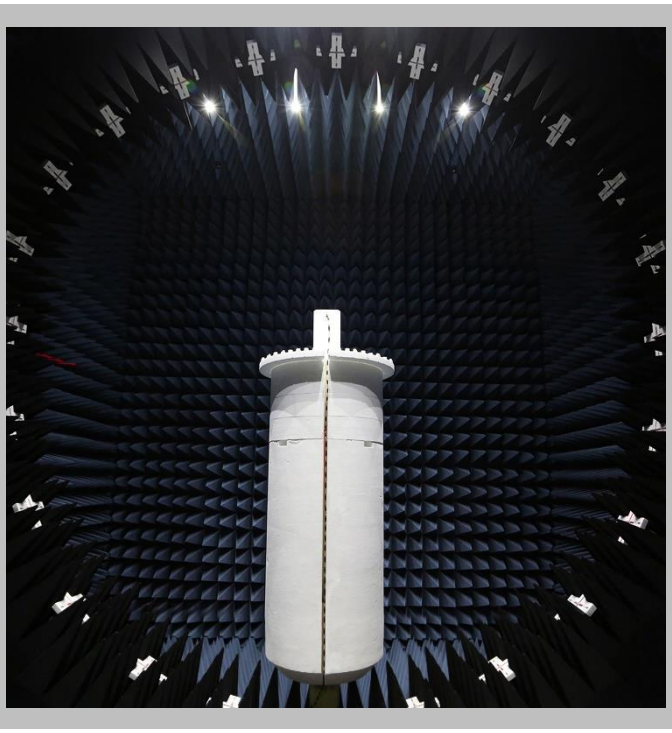
MIC – Recognized by MIC as a CAB for the acceptance of test data.

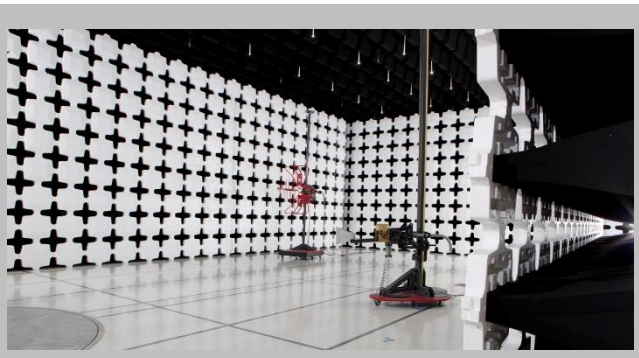
SCOPE

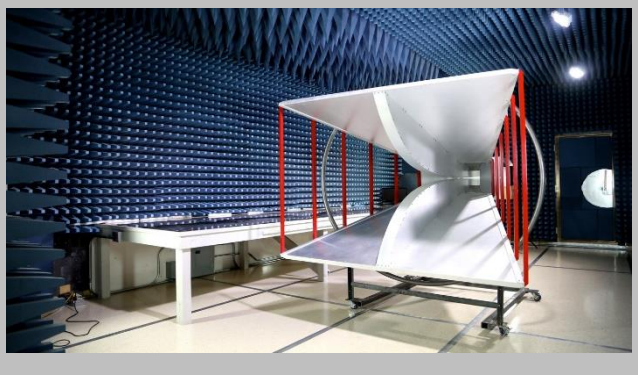
For details on the Scopes of our Accreditations, please visit:
http://portlandcustomer.element.com/ts/scope/scope.htm
http://gsi.nist.gov/global/docs/cabs/designations.html

FACILITIES

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (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
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1, 2834E-3	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/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

TMU.2015.07.10

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.

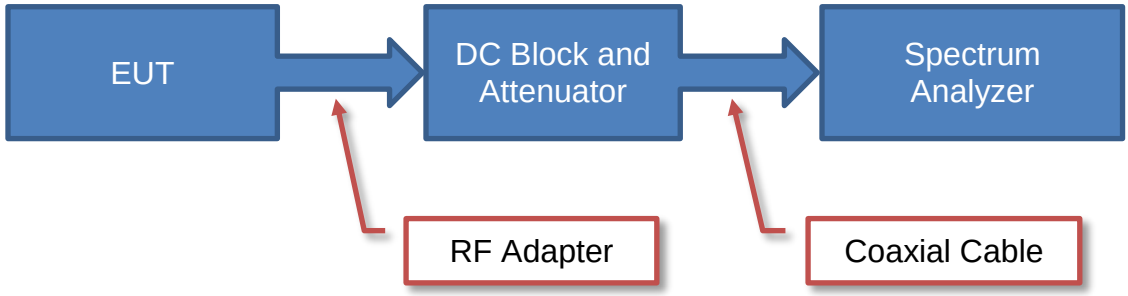
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. 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.

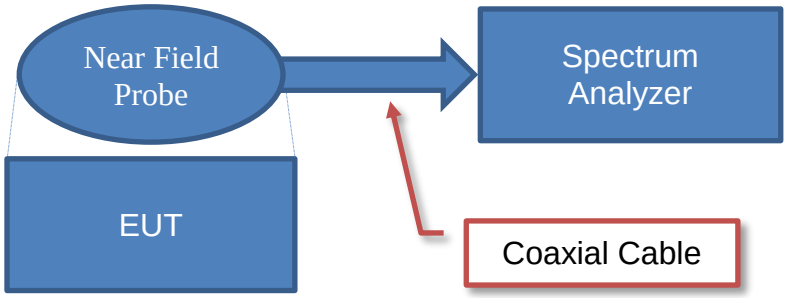
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	0	0
AC Powerline Conducted Emissions (dB)	0	0

Test Setup Block Diagrams

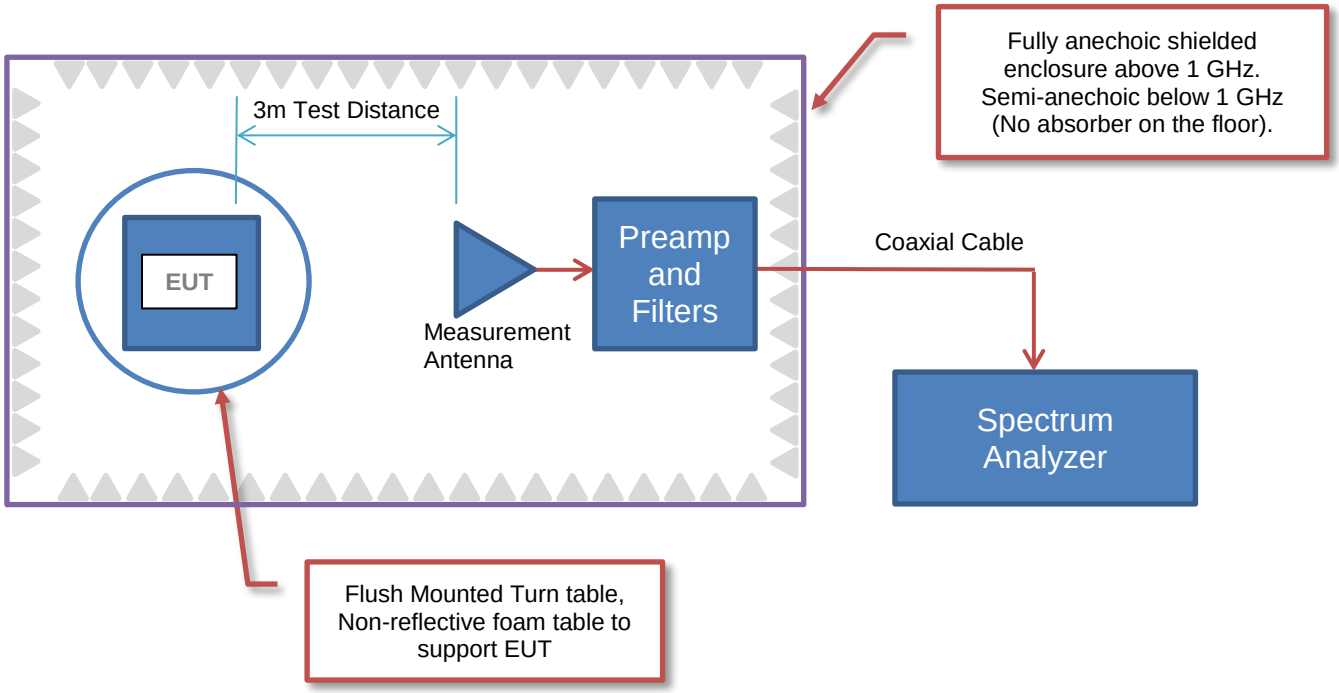
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Walt Disney Parks and Resorts US, Inc.
Address:	PO Box 1000
City, State, Zip:	Lake Buena Vista, Florida 32830
Test Requested By:	Brian Piquette of Synapse Product Development on behalf of Walt Disney Parks and Resorts US, Inc.
Model:	TPv2/300-004278
First Date of Test:	June 4, 2018
Last Date of Test:	June 8, 2018
Receipt Date of Samples:	June 4, 2018
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Multi-ticket media reader with Ethernet network interface Device containing an HF RFID reader (ISO 14443), UHF RFID Reader (ISO 18000), BT/BLE Radio, and proprietary 2.4GHz DTS radio.

Testing Objective:
To demonstrate compliance of the Bluetooth low energy radio (DTS) to FCC 15.247 requirements for a Permissive Change under FCC ID: 2AJS4-TP-R1G2.

CONFIGURATIONS

Configuration SYNA0242- 1

Software/Firmware Running during test	
Description	**Version**
LRR Firmware	N/A

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Access Point	Walt Disney Parks and Resorts US, Inc.	TPv2/300-004278	SN03

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop PC	Apple	MacBook Pro	None
DC Power Supply	Mastech	HY3003D-2	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power	No	0.7m	No	DC Power Supply	Access Point
3v3 FTDI Cable	No	1.0m	No	Access Point	Laptop PC
AC Power	No	1.8m	No	AC Mains	DC Power Supply

Configuration SYNA0242- 4

Software/Firmware Running during test	
Description	**Version**
LRR Firmware	N/A

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Access Point	Walt Disney Parks and Resorts US, Inc.	TPv2/300-004278	SN05

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop PC	Apple	MacBook Pro	None
DC Power Supply	Mastech	HY3003D-2	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	No	1.8m	No	AC Mains	DC Power Supply
DC Power	No	3.0m	No	DC Power Supply	Access Point
Ethernet	No	5.0m	No	Access Point	Laptop PC

CONFIGURATIONS

Configuration SYNA0242- 10

Software/Firmware Running during test	
Description	**Version**
LRR Firmware	N/A

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Access Point	Walt Disney Parks and Resorts US, Inc.	TPv2/300-004278	SN05

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power	No	0.8m	No	DC Mains	Access Point

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	6/4/2018	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	6/4/2018	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	6/4/2018	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	6/4/2018	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	6/4/2018	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	6/4/2018	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT was taken home by the client before the next scheduled test.
7	6/5/2018	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT was taken home by the client before the next scheduled test.
8	6/8/2018	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

element
WTD.2017.11.22.1

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. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. 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 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Cable - Conducted Cable Assembly	Element	NC4, HHF, TYL	NC4A	3/23/2018	3/23/2019
Receiver	Rohde & Schwarz	ESCI	ARE	8/23/2017	8/23/2018
LISN	Solar Electronics	9252-50-R-24-BNC	LIM	8/16/2017	8/16/2018

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

SYNA0242-10

MODES INVESTIGATED

Transmitting BLE at Default Max Power. Mid Channel, 2440 MHz.

POWERLINE CONDUCTED EMISSIONS

EUT:	TPv2/300-004278	Work Order:	SYNA0242
Serial Number:	SN05	Date:	06/08/2018
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	22.3°C
Attendees:	Reily Blackner	Relative Humidity:	46.5%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	24 VDC	Configuration:	SYNA0242-10

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2018	ANSI C63.10:2013

TEST PARAMETERS

Run #:	3	Line:	Positive Lead	Add. Ext. Attenuation (dB):	0

COMMENTS

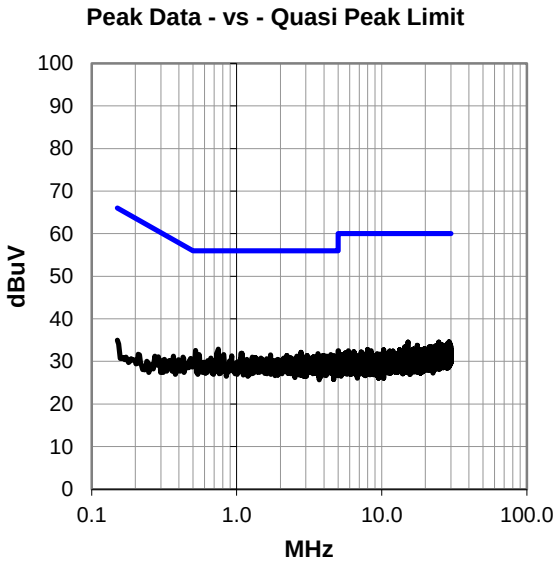
None

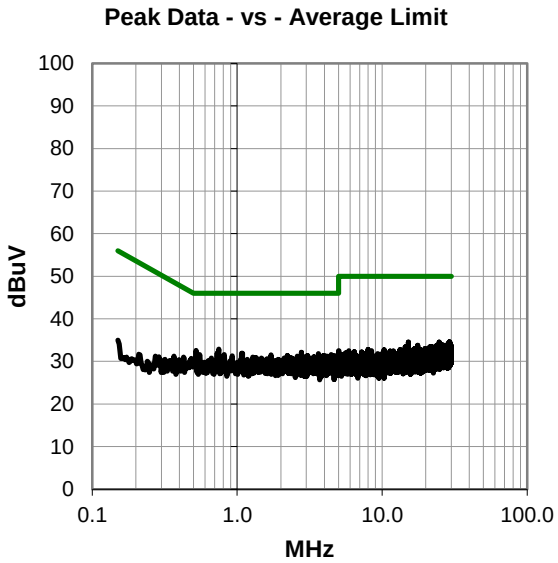
EUT OPERATING MODES

Transmitting BLE at Default Max Power. Mid Channel, 2440 MHz.

DEVIATIONS FROM TEST STANDARD

None





POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

RESULTS - Run #3

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.747	13.0	19.9	32.9	56.0	-23.1
0.519	12.7	19.9	32.6	56.0	-23.4
2.776	12.0	20.1	32.1	56.0	-23.9
0.728	12.1	19.9	32.0	56.0	-24.0
1.072	11.9	20.0	31.9	56.0	-24.1
1.086	11.9	20.0	31.9	56.0	-24.1
3.638	11.7	20.1	31.8	56.0	-24.2
0.549	11.7	19.9	31.6	56.0	-24.4
0.814	11.6	20.0	31.6	56.0	-24.4
4.444	11.3	20.3	31.6	56.0	-24.4
1.713	11.5	20.0	31.5	56.0	-24.5
2.217	11.3	20.1	31.4	56.0	-24.6
3.053	11.3	20.1	31.4	56.0	-24.6
3.959	11.2	20.2	31.4	56.0	-24.6
4.675	11.1	20.3	31.4	56.0	-24.6
0.922	11.3	20.0	31.3	56.0	-24.7
3.907	11.1	20.2	31.3	56.0	-24.7
2.590	11.1	20.1	31.2	56.0	-24.8
4.064	11.0	20.2	31.2	56.0	-24.8
4.179	10.9	20.3	31.2	56.0	-24.8
2.683	11.0	20.1	31.1	56.0	-24.9
2.862	11.0	20.1	31.1	56.0	-24.9
3.381	11.0	20.1	31.1	56.0	-24.9
1.277	11.0	20.0	31.0	56.0	-25.0
1.329	10.9	20.0	30.9	56.0	-25.1
2.347	10.8	20.1	30.9	56.0	-25.1

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.747	13.0	19.9	32.9	46.0	-13.1
0.519	12.7	19.9	32.6	46.0	-13.4
2.776	12.0	20.1	32.1	46.0	-13.9
0.728	12.1	19.9	32.0	46.0	-14.0
1.072	11.9	20.0	31.9	46.0	-14.1
1.086	11.9	20.0	31.9	46.0	-14.1
3.638	11.7	20.1	31.8	46.0	-14.2
0.549	11.7	19.9	31.6	46.0	-14.4
0.814	11.6	20.0	31.6	46.0	-14.4
4.444	11.3	20.3	31.6	46.0	-14.4
1.713	11.5	20.0	31.5	46.0	-14.5
2.217	11.3	20.1	31.4	46.0	-14.6
3.053	11.3	20.1	31.4	46.0	-14.6
3.959	11.2	20.2	31.4	46.0	-14.6
4.675	11.1	20.3	31.4	46.0	-14.6
0.922	11.3	20.0	31.3	46.0	-14.7
3.907	11.1	20.2	31.3	46.0	-14.7
2.590	11.1	20.1	31.2	46.0	-14.8
4.064	11.0	20.2	31.2	46.0	-14.8
4.179	10.9	20.3	31.2	46.0	-14.8
2.683	11.0	20.1	31.1	46.0	-14.9
2.862	11.0	20.1	31.1	46.0	-14.9
3.381	11.0	20.1	31.1	46.0	-14.9
1.277	11.0	20.0	31.0	46.0	-15.0
1.329	10.9	20.0	30.9	46.0	-15.1
2.347	10.8	20.1	30.9	46.0	-15.1

CONCLUSION

Pass

Tested By

POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

EUT:	TPv2/300-004278	Work Order:	SYNA0242
Serial Number:	SN05	Date:	06/08/2018
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	22.3°C
Attendees:	Reily Blackner	Relative Humidity:	46.5%
Customer Project:	None	Bar. Pressure:	1020 mb
Tested By:	Richard Mellroth	Job Site:	NC05
Power:	24 VDC	Configuration:	SYNA0242-10

TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2018	ANSI C63.10:2013

TEST PARAMETERS

Run #:	4	Line:	Negative Lead	Add. Ext. Attenuation (dB):	0

COMMENTS

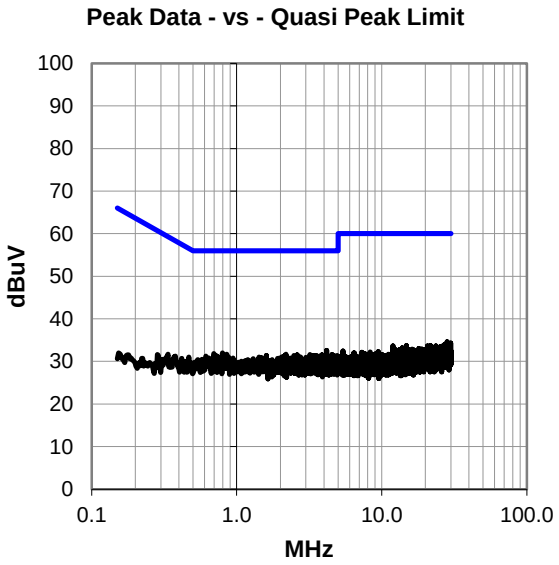
None

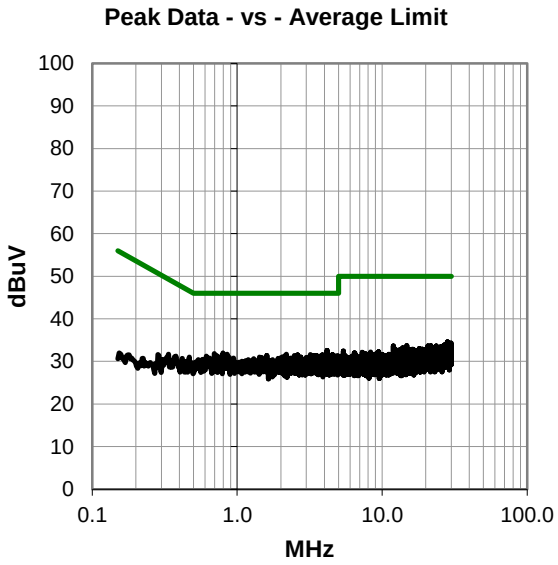
EUT OPERATING MODES

Transmitting BLE at Default Max Power. Mid Channel, 2440 MHz.

DEVIATIONS FROM TEST STANDARD

None





POWERLINE CONDUCTED EMISSIONS

element
WTD.2017.11.22.1

RESULTS - Run #4

Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.164	12.3	20.3	32.6	56.0	-23.4
0.795	12.0	20.0	32.0	56.0	-24.0
0.695	11.9	19.9	31.8	56.0	-24.2
0.851	11.7	20.0	31.7	56.0	-24.3
2.187	11.6	20.1	31.7	56.0	-24.3
3.191	11.5	20.1	31.6	56.0	-24.4
4.549	11.3	20.3	31.6	56.0	-24.4
2.612	11.4	20.1	31.5	56.0	-24.5
3.855	11.4	20.1	31.5	56.0	-24.5
3.873	11.3	20.2	31.5	56.0	-24.5
4.198	11.2	20.3	31.5	56.0	-24.5
0.721	11.5	19.9	31.4	56.0	-24.6
1.601	11.4	20.0	31.4	56.0	-24.6
2.150	11.3	20.1	31.4	56.0	-24.6
2.485	11.3	20.1	31.4	56.0	-24.6
3.366	11.3	20.1	31.4	56.0	-24.6
3.526	11.3	20.1	31.4	56.0	-24.6
4.940	11.1	20.3	31.4	56.0	-24.6
0.613	11.3	19.9	31.2	56.0	-24.8
3.709	11.1	20.1	31.2	56.0	-24.8
4.761	10.9	20.3	31.2	56.0	-24.8
0.743	11.2	19.9	31.1	56.0	-24.9
2.056	11.0	20.1	31.1	56.0	-24.9
3.396	11.0	20.1	31.1	56.0	-24.9
4.638	10.8	20.3	31.1	56.0	-24.9
1.426	11.0	20.0	31.0	56.0	-25.0

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
4.164	12.3	20.3	32.6	46.0	-13.4
0.795	12.0	20.0	32.0	46.0	-14.0
0.695	11.9	19.9	31.8	46.0	-14.2
0.851	11.7	20.0	31.7	46.0	-14.3
2.187	11.6	20.1	31.7	46.0	-14.3
3.191	11.5	20.1	31.6	46.0	-14.4
4.549	11.3	20.3	31.6	46.0	-14.4
2.612	11.4	20.1	31.5	46.0	-14.5
3.855	11.4	20.1	31.5	46.0	-14.5
3.873	11.3	20.2	31.5	46.0	-14.5
4.198	11.2	20.3	31.5	46.0	-14.5
0.721	11.5	19.9	31.4	46.0	-14.6
1.601	11.4	20.0	31.4	46.0	-14.6
2.150	11.3	20.1	31.4	46.0	-14.6
2.485	11.3	20.1	31.4	46.0	-14.6
3.366	11.3	20.1	31.4	46.0	-14.6
3.526	11.3	20.1	31.4	46.0	-14.6
4.940	11.1	20.3	31.4	46.0	-14.6
0.613	11.3	19.9	31.2	46.0	-14.8
3.709	11.1	20.1	31.2	46.0	-14.8
4.761	10.9	20.3	31.2	46.0	-14.8
0.743	11.2	19.9	31.1	46.0	-14.9
2.056	11.0	20.1	31.1	46.0	-14.9
3.396	11.0	20.1	31.1	46.0	-14.9
4.638	10.8	20.3	31.1	46.0	-14.9
1.426	11.0	20.0	31.0	46.0	-15.0

CONCLUSION

Pass

Tested By

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2018.05.04

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.

MODES OF OPERATION

Transmitting BLE at Default Max Power

MODES OF OPERATION

Low Channel, 2402 MHz

Mid Channel, 2440 MHz

High Channel, 2480 MHz

POWER SETTINGS INVESTIGATED

24 VDC

CONFIGURATIONS INVESTIGATED

SYNA0242 - 4

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26.5 GHz

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
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFE	24-Jun-2017	12 mo
Filter - High Pass	Micro-Tronics	HPM50111	HHI	19-Oct-2017	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	LFF	13-Dec-2017	12 mo
Attenuator	Fairview Microwave	SA18E-20	AQV	18-Aug-2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AYL	11-Aug-2017	24 mo
Antenna - Double Ridge	ETS Lindgren	3115	AHW	12-Jul-2016	24 mo
Antenna - Standard Gain	EMCO	3160-07	AHP	NCR	0 mo
Antenna - Standard Gain	EMCO	3160-08	AHO	NCR	0 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AIY	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	PAB	11-Jul-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVZ	4-May-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOK	18-Aug-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOJ	18-Aug-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOD	9-Mar-2018	12 mo
Cable	Northwest EMC	Bilog Cables	NC1	11-Jul-2017	12 mo
Cable	Northwest EMC	3115 Horn Cable	NC2	4-May-2018	12 mo
Cable	Northwest EMC	Standard Gain Horn Cable	NC3	4-May-2018	12 mo
Cable	Northwest EMC	N/A	NC8	9-Mar-2018	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 antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector
PK = Peak Detector
AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

Where the radio test software does not provide for a duty cycle at continuous transmit conditions (> 98%) and the RMS (power average) measurements were made across the on and off times of the EUT transmissions, a duty cycle correction is added to the measurements using the formula of 10*LOG(dc).

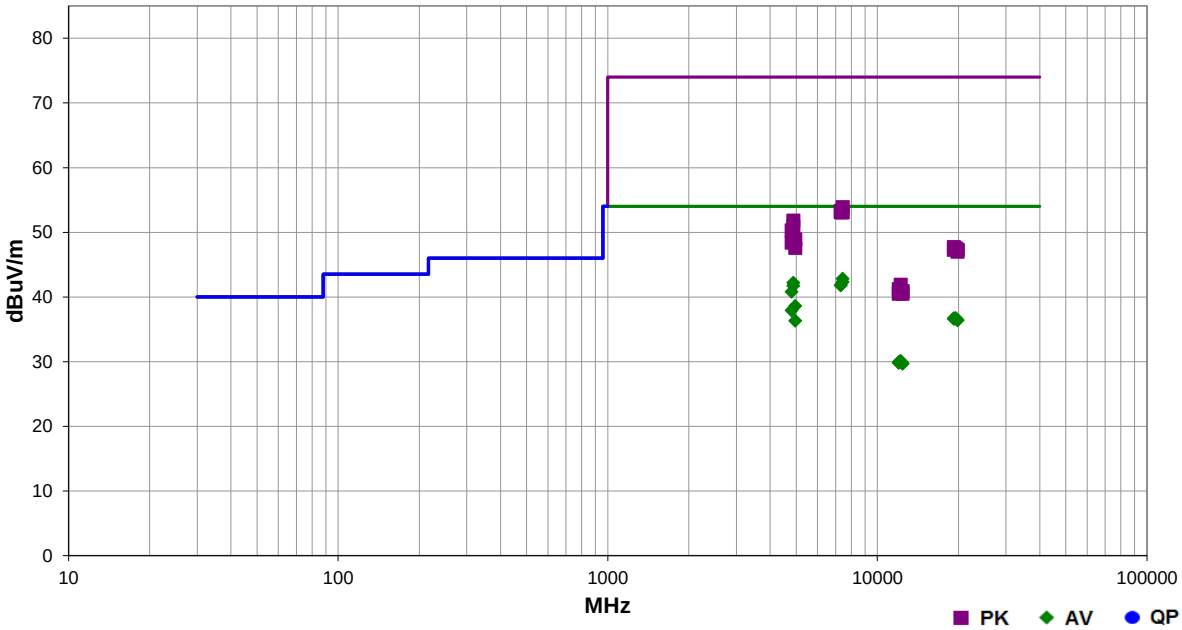
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.05.07 PSA-ESCI 2018.05.04

Work Order:	SYNA0242	**Date:**	5-Jun-2018		
Project:	None	**Temperature:**	22.8 °C		
Job Site:	NC01	**Humidity:**	37.2% RH		
Serial Number:	SN05	**Barometric Pres.:**	1019 mbar	**Tested by:**	Richard Mellroth
EUT:	TPv2/300-004278				
Configuration:	4				
Customer:	Walt Disney Parks and Resorts US, Inc.				
Attendees:	Reily Blackner				
EUT Power:	24 VDC				
Operating Mode:	Transmitting BLE at Default Max Power				
Deviations:	None				
Comments:	See comments next to data points for EUT channel and orientation				

Test Specifications	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

Run #	26,27,66	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



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
7439.275	28.6	14.2	1.6	331.0	3.0	0.0	Vert	AV	0.0	42.8	54.0	-11.2	High Ch, EUT on Side
7439.335	28.1	14.2	1.6	216.0	3.0	0.0	Horz	AV	0.0	42.3	54.0	-11.7	High Ch, EUT Normal
4879.900	33.0	9.2	2.6	334.0	3.0	0.0	Horz	AV	0.0	42.2	54.0	-11.8	Mid Ch, EUT Normal
7319.010	28.1	13.7	1.9	181.0	3.0	0.0	Horz	AV	0.0	41.8	54.0	-12.2	Mid Ch, EUT Normal
7319.810	28.1	13.7	1.6	190.0	3.0	0.0	Vert	AV	0.0	41.8	54.0	-12.2	Mid Ch, EUT on Side
4879.830	32.5	9.2	1.1	332.0	3.0	0.0	Vert	AV	0.0	41.7	54.0	-12.3	Mid Ch, EUT on Side
4803.820	31.8	9.0	2.8	340.0	3.0	0.0	Horz	AV	0.0	40.8	54.0	-13.2	Low Ch, EUT Normal
4959.855	29.4	9.2	1.0	26.0	3.0	0.0	Horz	AV	0.0	38.6	54.0	-15.4	High Ch, EUT Normal
4803.965	28.9	9.0	1.6	29.0	3.0	0.0	Vert	AV	0.0	37.9	54.0	-16.1	Low Ch, EUT on Side
19216.670	36.0	0.7	1.5	181.0	3.0	0.0	Vert	AV	0.0	36.7	54.0	-17.3	Low Ch, EUT on Side
19519.750	35.9	0.8	1.5	241.0	3.0	0.0	Vert	AV	0.0	36.7	54.0	-17.3	Mid Ch, EUT on Side
19520.700	35.9	0.8	1.5	215.0	3.0	0.0	Horz	AV	0.0	36.7	54.0	-17.3	Mid Ch, EUT Normal
19214.820	36.0	0.6	1.5	69.0	3.0	0.0	Horz	AV	0.0	36.6	54.0	-17.4	Low Ch, EUT Normal
19840.380	35.7	0.7	1.5	17.0	3.0	0.0	Horz	AV	0.0	36.4	54.0	-17.6	High Ch, EUT Normal
19838.620	35.7	0.7	1.5	173.0	3.0	0.0	Vert	AV	0.0	36.4	54.0	-17.6	High Ch, EUT on Side
4958.530	27.1	9.2	1.6	150.0	3.0	0.0	Vert	AV	0.0	36.3	54.0	-17.7	High Ch, EUT on Side
7439.700	39.7	14.2	1.6	331.0	3.0	0.0	Vert	PK	0.0	53.9	74.0	-20.1	High Ch, EUT on Side
7320.560	39.6	13.7	1.6	190.0	3.0	0.0	Vert	PK	0.0	53.3	74.0	-20.7	Mid Ch, EUT on Side

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
7319.270	39.4	13.7	1.9	181.0	3.0	0.0	Horz	PK	0.0	53.1	74.0	-20.9	Mid Ch, EUT Normal
7439.620	38.9	14.2	1.6	216.0	3.0	0.0	Horz	PK	0.0	53.1	74.0	-20.9	High Ch, EUT Normal
4879.810	42.6	9.2	2.6	334.0	3.0	0.0	Horz	PK	0.0	51.8	74.0	-22.2	Mid Ch, EUT Normal
4879.545	41.7	9.2	1.1	332.0	3.0	0.0	Vert	PK	0.0	50.9	74.0	-23.1	Mid Ch, EUT on Side
4803.555	41.3	9.0	2.8	340.0	3.0	0.0	Horz	PK	0.0	50.3	74.0	-23.7	Low Ch, EUT Normal
12199.270	31.4	-1.3	1.6	234.0	3.0	0.0	Vert	AV	0.0	30.1	54.0	-23.9	Mid Ch, EUT on Side
12198.770	31.3	-1.3	1.6	179.0	3.0	0.0	Horz	AV	0.0	30.0	54.0	-24.0	Mid Ch, EUT Normal
12010.060	31.4	-1.5	1.6	294.0	3.0	0.0	Vert	AV	0.0	29.9	54.0	-24.1	Low Ch, EUT on Side
12009.630	31.3	-1.5	1.6	251.0	3.0	0.0	Horz	AV	0.0	29.8	54.0	-24.2	Low Ch, EUT Normal
12399.750	31.4	-1.7	1.6	8.0	3.0	0.0	Vert	AV	0.0	29.7	54.0	-24.3	High Ch, EUT on Side
12398.920	31.4	-1.7	1.6	297.0	3.0	0.0	Horz	AV	0.0	29.7	54.0	-24.3	High Ch, EUT Normal
4959.120	39.7	9.2	1.0	26.0	3.0	0.0	Horz	PK	0.0	48.9	74.0	-25.1	High Ch, EUT Normal
4804.505	39.4	9.0	1.6	29.0	3.0	0.0	Vert	PK	0.0	48.4	74.0	-25.6	Low Ch, EUT on Side
19214.790	47.1	0.6	1.5	69.0	3.0	0.0	Horz	PK	0.0	47.7	74.0	-26.3	Low Ch, EUT Normal
4960.360	38.4	9.2	1.6	150.0	3.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	High Ch, EUT on Side
19518.520	46.7	0.8	1.5	241.0	3.0	0.0	Vert	PK	0.0	47.5	74.0	-26.5	Mid Ch, EUT on Side
19520.460	46.6	0.8	1.5	215.0	3.0	0.0	Horz	PK	0.0	47.4	74.0	-26.6	Mid Ch, EUT Normal
19214.770	46.7	0.6	1.5	181.0	3.0	0.0	Vert	PK	0.0	47.3	74.0	-26.7	Low Ch, EUT on Side
19840.240	46.6	0.7	1.5	173.0	3.0	0.0	Vert	PK	0.0	47.3	74.0	-26.7	High Ch, EUT on Side
19838.980	46.3	0.7	1.5	17.0	3.0	0.0	Horz	PK	0.0	47.0	74.0	-27.0	High Ch, EUT Normal
12199.940	43.2	-1.3	1.6	234.0	3.0	0.0	Vert	PK	0.0	41.9	74.0	-32.1	Mid Ch, EUT on Side
12009.500	42.7	-1.5	1.6	294.0	3.0	0.0	Vert	PK	0.0	41.2	74.0	-32.8	Low Ch, EUT on Side
12399.990	42.6	-1.7	1.6	8.0	3.0	0.0	Vert	PK	0.0	40.9	74.0	-33.1	High Ch, EUT on Side
12200.760	42.0	-1.3	1.6	179.0	3.0	0.0	Horz	PK	0.0	40.7	74.0	-33.3	Mid Ch, EUT Normal
12009.310	42.0	-1.5	1.6	251.0	3.0	0.0	Horz	PK	0.0	40.5	74.0	-33.5	Low Ch, EUT Normal
12399.300	42.2	-1.7	1.6	297.0	3.0	0.0	Horz	PK	0.0	40.5	74.0	-33.5	High Ch, EUT Normal

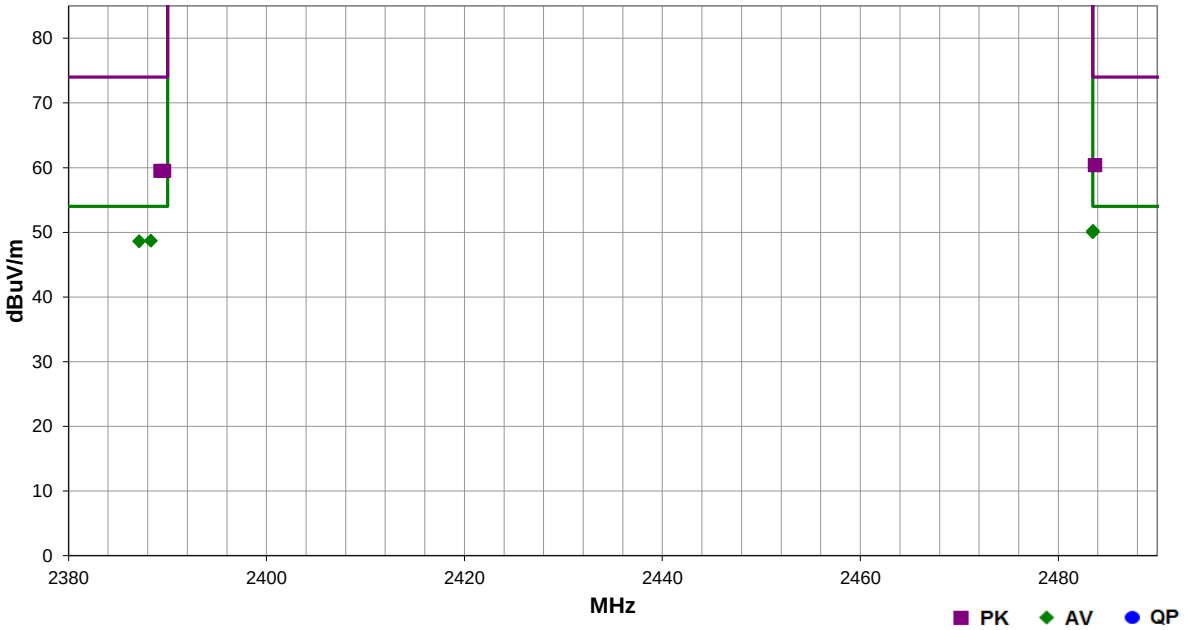
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.05.07 PSA-ESCI 2018.05.04

Work Order:	SYNA0242	**Date:**	5-Jun-2018		
Project:	None	**Temperature:**	22.8 °C		
Job Site:	NC01	**Humidity:**	37.2% RH		
Serial Number:	SN05	**Barometric Pres.:**	1019 mbar	**Tested by:**	Richard Mellroth
EUT:	TPv2/300-004278				
Configuration:	4				
Customer:	Walt Disney Parks and Resorts US, Inc.				
Attendees:	Reily Blackner				
EUT Power:	24 VDC				
Operating Mode:	Transmitting BLE at Default Max Power				
Deviations:	None				
Comments:	See comments next to data points for EUT channel and orientation				

Test Specifications	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

Run #	24	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



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
2483.510	31.0	-0.8	3.0	109.0	3.0	20.0	Horz	AV	0.0	50.2	54.0	-3.8	High Ch, EUT on Back
2483.505	30.8	-0.8	1.6	193.0	3.0	20.0	Vert	AV	0.0	50.0	54.0	-4.0	High Ch, EUT on Side
2388.330	29.3	-0.6	1.6	102.0	3.0	20.0	Horz	AV	0.0	48.7	54.0	-5.3	Low Ch, EUT on Side
2387.135	29.2	-0.6	1.6	345.0	3.0	20.0	Vert	AV	0.0	48.6	54.0	-5.4	Low Ch, EUT Normal
2483.725	41.2	-0.8	1.6	193.0	3.0	20.0	Vert	PK	0.0	60.4	74.0	-13.6	High Ch, EUT on Side
2483.685	41.2	-0.8	3.0	109.0	3.0	20.0	Horz	PK	0.0	60.4	74.0	-13.6	High Ch, EUT on Back
2389.665	40.1	-0.6	1.6	102.0	3.0	20.0	Horz	PK	0.0	59.5	74.0	-14.5	Low Ch, EUT on Side
2389.270	40.1	-0.6	1.6	345.0	3.0	20.0	Vert	PK	0.0	59.5	74.0	-14.5	Low Ch, EUT Normal

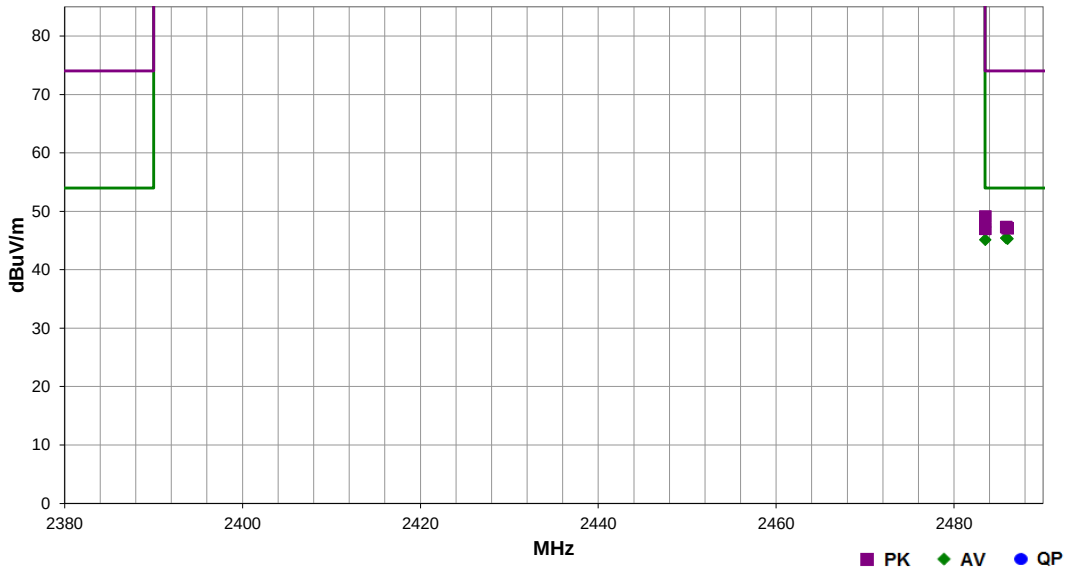
SPURIOUS RADIATED EMISSIONS

EmiR5 2018.05.07 PSA-ESCI 2018.05.04

Work Order:	SYNA0242	**Date:**	5-Jun-2018		
Project:	None	**Temperature:**	22.8 °C		
Job Site:	NC01	**Humidity:**	37.2% RH		
Serial Number:	SN05	**Barometric Pres.:**	1019 mbar	**Tested by:**	Richard Mellroth
EUT:	TPv2/300-004278				
Configuration:	4				
Customer:	Walt Disney Parks and Resorts US, Inc.				
Attendees:	Reily Blackner				
EUT Power:	24 VDC				
Operating Mode:	Transmitting BLE at Default Max Power				
Deviations:	None				
Comments:	See comments next to data points for EUT channel and orientation				

Test Specifications	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

Run #	25	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass

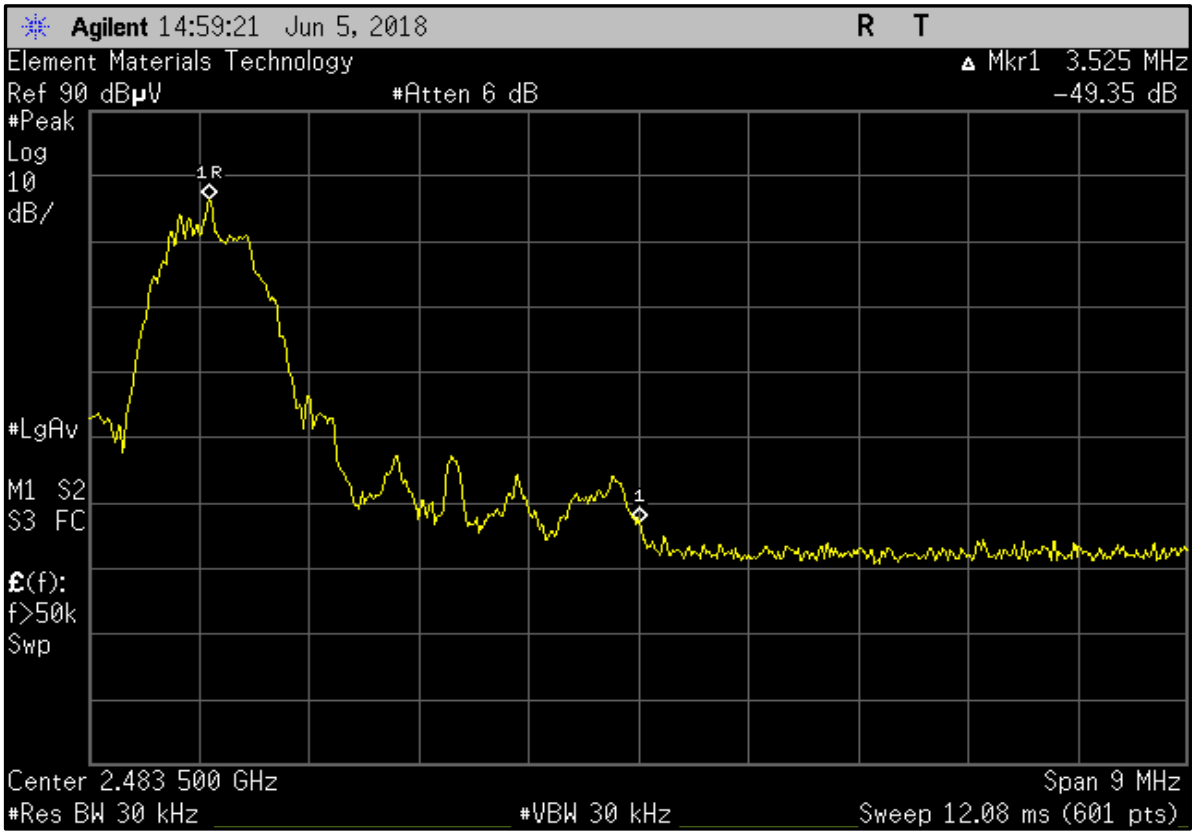


Freq (MHz)	Calculated Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Marker Delta Comments
2483.515	28.1	-0.8	3.1	304.0	3.0	20.0	Horz	AV	0.0	47.3	54.0	-6.7	High Ch, BLE, EUT on Side, Ant Horz: Fund 77.5dBuV + -49.4dBc = 28.1dBuV (calc. amp.)
2485.870	26.2	-0.8	2.3	1.0	3.0	20.0	Horz	AV	0.0	45.4	54.0	-8.6	High Ch, BLE, EUT Normal, Ant Horz: Fund 74.7dBuV + -48.5dBc = 26.2dBuV (calc. amp.)
2486.020	26.1	-0.8	1.6	221.0	3.0	20.0	Vert	AV	0.0	45.3	54.0	-8.7	High Ch, BLE, EUT on Back, Ant Vert: Fund 74.7dBuV + -48.6dBc = 26.1dBuV (calc. amp.)
2483.530	25.9	-0.8	3.0	12.0	3.0	20.0	Vert	AV	0.0	45.1	54.0	-8.9	High Ch, BLE, EUT Normal, Ant Vert: Fund 76.0dBuV + -50.1dBc = 25.9dBuV (calc. amp.)
2483.515	29.9	-0.8	3.1	304.0	3.0	20.0	Horz	PK	0.0	49.1	74.0	-24.9	High Ch, BLE, EUT on Side, Ant Horz: Fund 79.3dBuV + -49.4dBc = 29.9dBuV (calc. amp.)
2485.870	28.1	-0.8	2.3	1.0	3.0	20.0	Horz	PK	0.0	47.3	74.0	-26.7	High Ch, BLE, EUT Normal, Ant Horz: Fund 76.6dBuV + -48.5dBc = 28.1dBuV (calc. amp.)
2486.020	27.9	-0.8	1.6	221.0	3.0	20.0	Vert	PK	0.0	47.1	74.0	-26.9	High Ch, BLE, EUT on Back, Ant Vert: Fund 76.5dBuV + -48.6dBc = 27.9dBuV (calc. amp.)
2483.530	27.8	-0.8	3.0	12.0	3.0	20.0	Vert	PK	0.0	47.0	74.0	-27.0	High Ch, BLE, EUT Normal, Ant Vert: Fund 77.9dBuV + -50.1dBc = 27.8dBuV (calc. amp.)

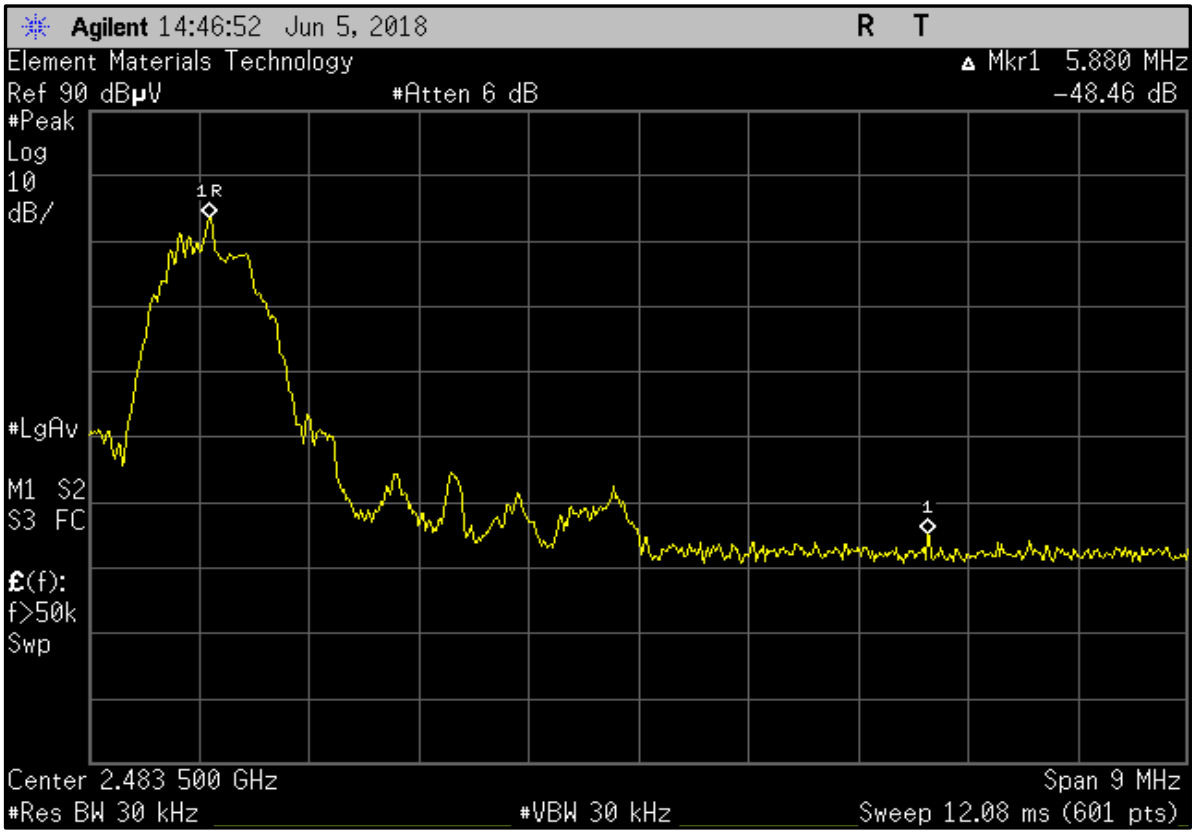
SPURIOUS RADIATED EMISSIONS

High Channel, EUT on Side, Antenna Horizontal

PSA-ESCI 2018.05.04



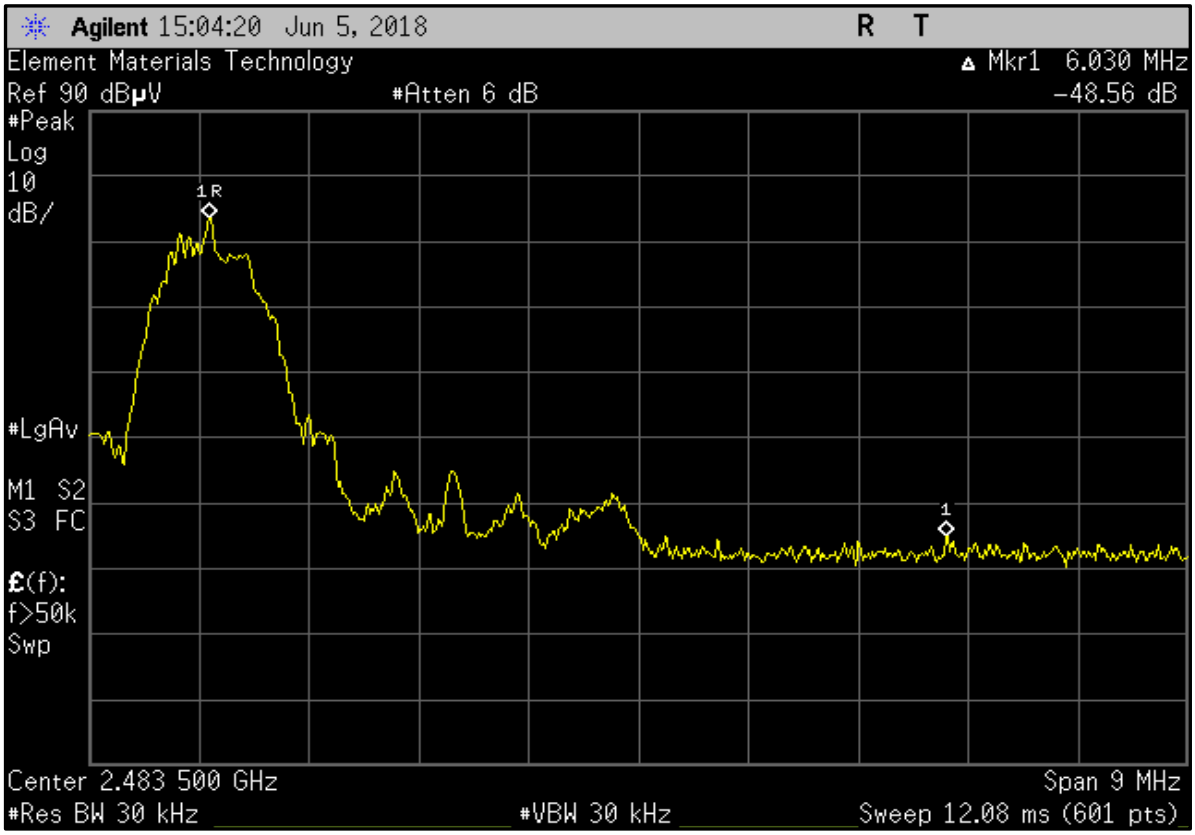
High Channel, EUT Normal, Antenna Horizontal



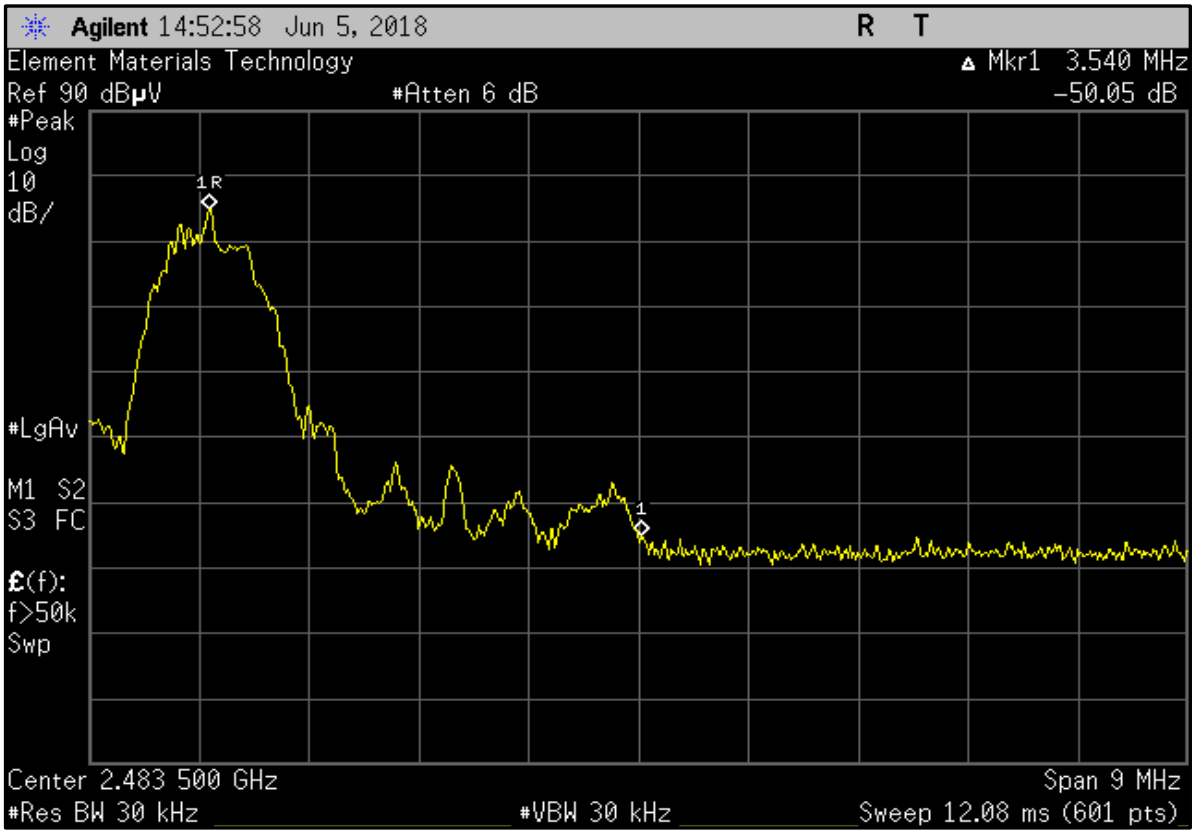
SPURIOUS RADIATED EMISSIONS

High Channel, EUT on Back, Antenna Vertical

PSA-ESCI 2018.05.04



High Channel, EUT Normal, Antenna Vertical



DUTY CYCLE

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	1-May-18	1-May-19
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	19-Feb-18	19-Feb-19
Attenuator	Fairview Microwave	SA4014-20	TKV	19-Feb-18	19-Feb-19
Block - DC	Fairview Microwave	SD3379	AMU	19-Feb-18	19-Feb-19
Generator - Signal	Agilent	N5183A	TIA	25-Apr-18	25-Apr-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. 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.

There is no compliance requirement to be met by this test, so therefore no Pass / Fail criteria.

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.

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

If the transmit duty cycle < 98 percent, burst gating may have been used during some of the other tests in this report to only take the measurement during the burst duration.

DUTY CYCLE

TbtTx 2018.01.25 BETA XMit 2017.12.13

EUT:	TPv2/300-004278	Work Order:	SYNA0242
Serial Number:	SN03	Date:	4-Jun-18
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	22.4 °C
Attendees:	Reily Blackner	Humidity:	42.7% RH
Project:	None	Barometric Pres.:	1022 mbar
Tested by:	Richard Mellroth	Power: 24 VDC	Job Site: NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default Max

DEVIATIONS FROM TEST STANDARD

None

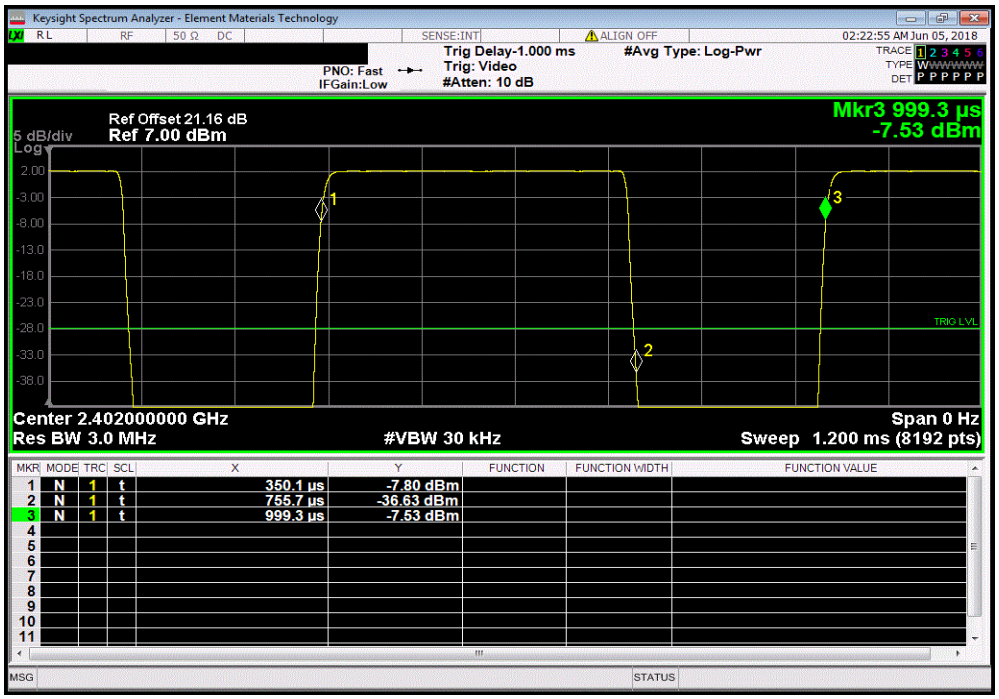
Configuration #	1	Signature

	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
BLE/GFSK						
Low Channel, 2402 MHz	405.6 us	649.2 us	1	62.5	N/A	N/A
Low Channel, 2402 MHz	N/A	N/A	5	N/A	N/A	N/A
Mid Channel, 2440 MHz	406.4 us	649.1 us	1	62.6	N/A	N/A
Mid Channel, 2440 MHz	N/A	N/A	5	N/A	N/A	N/A
High Channel, 2480 MHz	407.2 us	649.1 us	1	62.7	N/A	N/A
High Channel, 2480 MHz	N/A	N/A	5	N/A	N/A	N/A

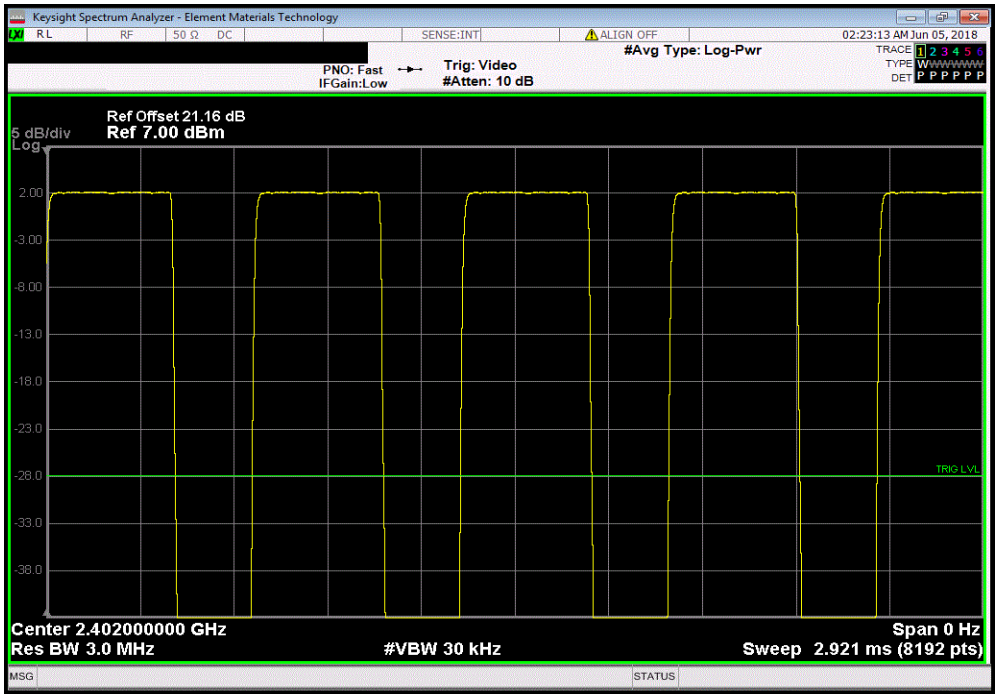
DUTY CYCLE

TbtTx 2018.01.25 BETA XMit 2017.12.13

BLE/GFSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	405.6 us	649.2 us	1	62.5	N/A	N/A



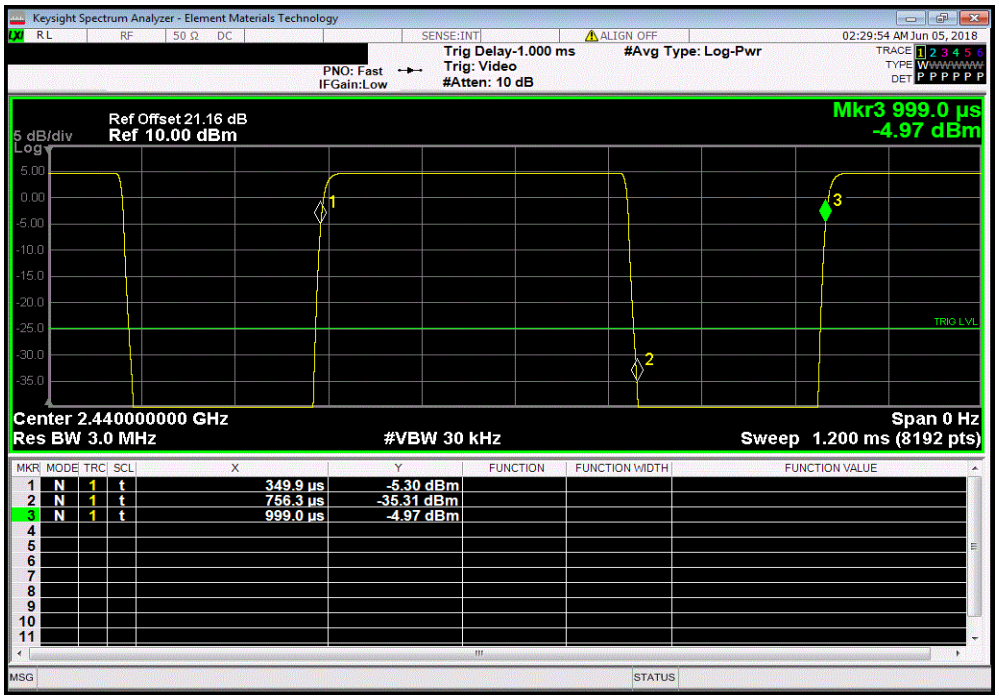
BLE/GFSK, Low Channel, 2402 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



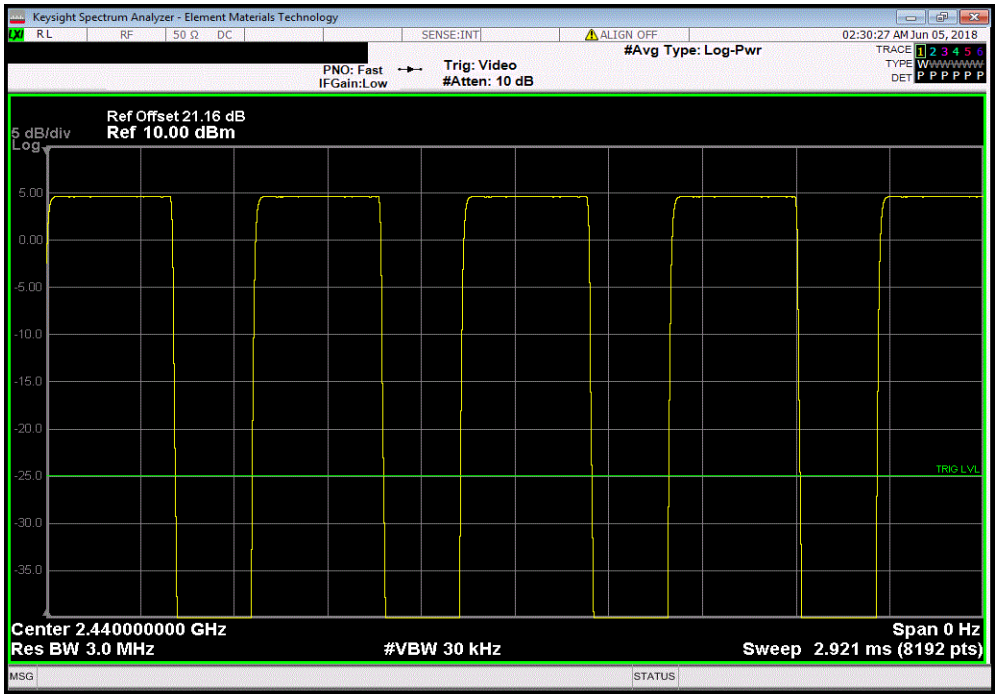
DUTY CYCLE

TbtTx 2018.01.25 BETA XMit 2017.12.13

BLE/GFSK, Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	406.4 us	649.1 us	1	62.6	N/A	N/A



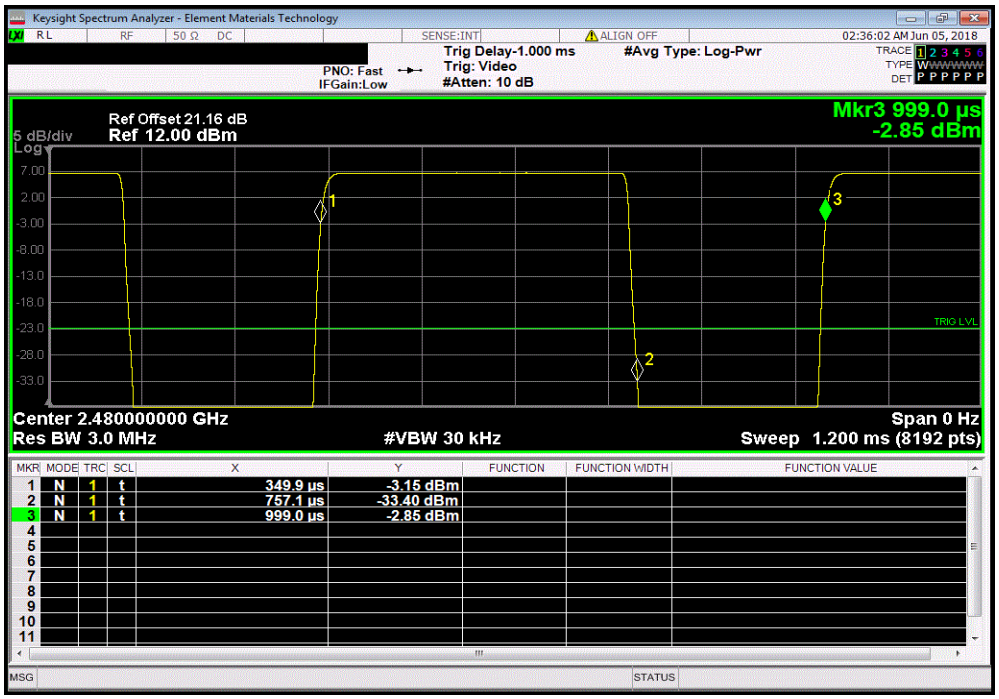
BLE/GFSK, Mid Channel, 2440 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



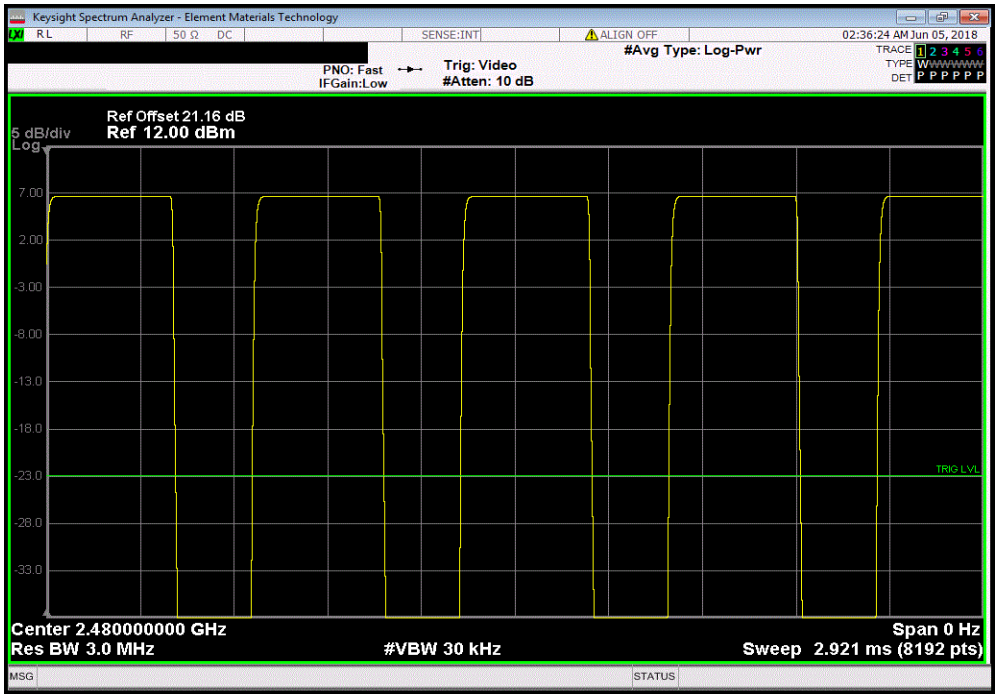
DUTY CYCLE

TbtTx 2018.01.25 BETA XMit 2017.12.13

BLE/GFSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	407.2 us	649.1 us	1	62.7	N/A	N/A



BLE/GFSK, High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



OCCUPIED BANDWIDTH

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	1-May-18	1-May-19
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	19-Feb-18	19-Feb-19
Attenuator	Fairview Microwave	SA4014-20	TKV	19-Feb-18	19-Feb-19
Block - DC	Fairview Microwave	SD3379	AMU	19-Feb-18	19-Feb-19
Generator - Signal	Agilent	N5183A	TIA	25-Apr-18	25-Apr-20

TEST DESCRIPTION

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

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.0% occupied bandwidth was also measured at the same time which can be needed during Output Power depending on the applicable method.

OCCUPIED BANDWIDTH

TbtTx 2018.01.25 BETA XMit 2017.12.13

EUT:	TPv2/300-004278	Work Order:	SYNA0242
Serial Number:	SN03	Date:	4-Jun-18
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	22.5 °C
Attendees:	Reily Blackner	Humidity:	42.5% RH
Project:	None	Barometric Pres.:	1022 mbar
Tested by:	Richard Mellroth	Power: 24 VDC	Job Site: NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default Max

DEVIATIONS FROM TEST STANDARD

None

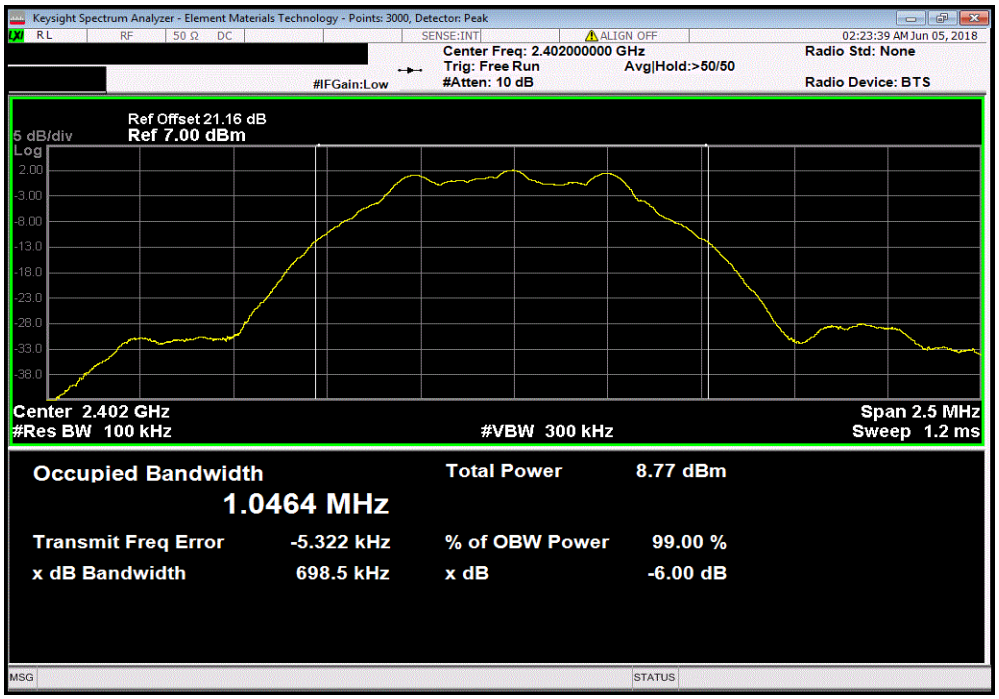
Configuration #	1	Signature

	Value	Limit (≥)	Result
BLE/GFSK			
Low Channel, 2402 MHz	698.472 kHz	500 kHz	Pass
Mid Channel, 2440 MHz	693.426 kHz	500 kHz	Pass
High Channel, 2480 MHz	693.745 kHz	500 kHz	Pass

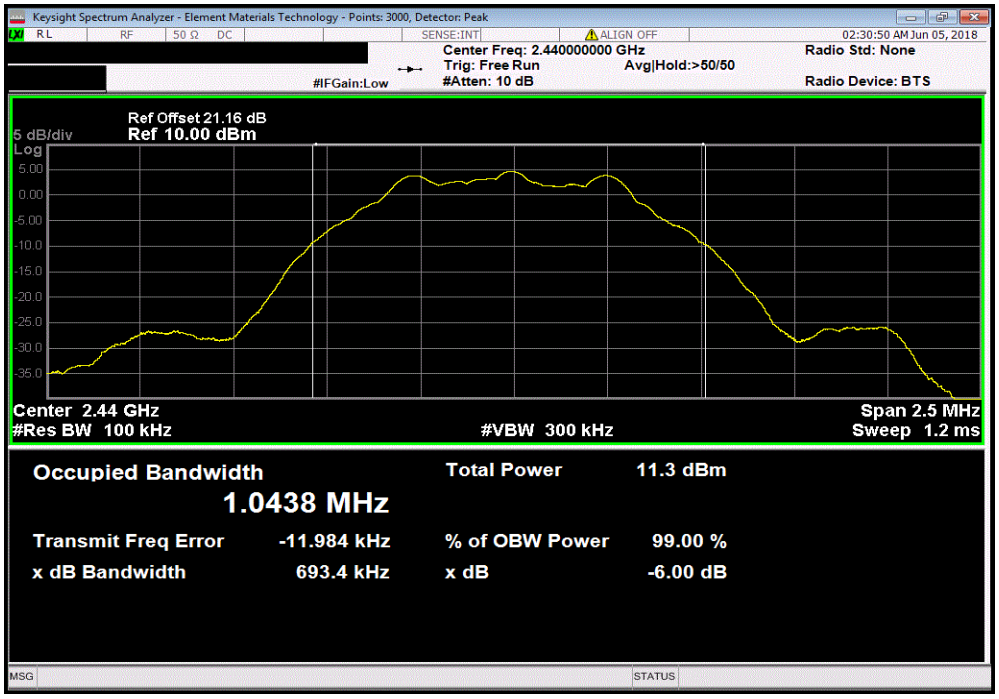
OCCUPIED BANDWIDTH

TbtTx 2018.01.25 BETA XMit 2017.12.13

BLE/GFSK, Low Channel, 2402 MHz						
				Value	Limit (≥)	Result
				698.472 kHz	500 kHz	Pass



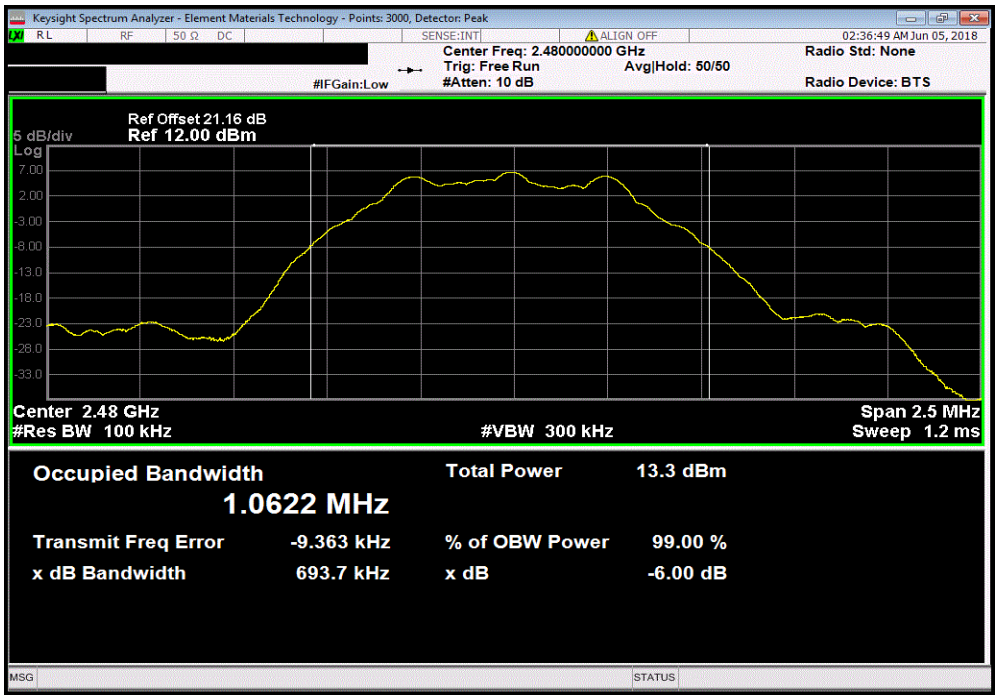
BLE/GFSK, Mid Channel, 2440 MHz						
				Value	Limit (≥)	Result
				693.426 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

TbtTx 2018.01.25 BETA XMit 2017.12.13

BLE/GFSK, High Channel, 2480 MHz						
				Value	Limit (≥)	Result
				693.745 kHz	500 kHz	Pass



OUTPUT POWER

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	1-May-18	1-May-19
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	19-Feb-18	19-Feb-19
Attenuator	Fairview Microwave	SA4014-20	TKV	19-Feb-18	19-Feb-19
Block - DC	Fairview Microwave	SD3379	AMU	19-Feb-18	19-Feb-19
Generator - Signal	Agilent	N5183A	TIA	25-Apr-18	25-Apr-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

Prior to measuring peak transmit power the DTS bandwidth (B) was measured.

The method found in ANSI C63.10:2013 Section 11.9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

De Facto EIRP Limit: The EUT meets the de facto EIRP limit of +36 dBm.

OUTPUT POWER

TbtTx 2018.01.25 BETA XMit 2017.12.13

EUT:	TPv2/300-004278	Work Order:	SYNA0242
Serial Number:	SN03	Date:	4-Jun-18
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	22.4 °C
Attendees:	Reily Blackner	Humidity:	42.6% RH
Project:	None	Barometric Pres.:	1022 mbar
Tested by:	Richard Mellroth	Power: 24 VDC	Job Site: NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default Max

DEVIATIONS FROM TEST STANDARD

None

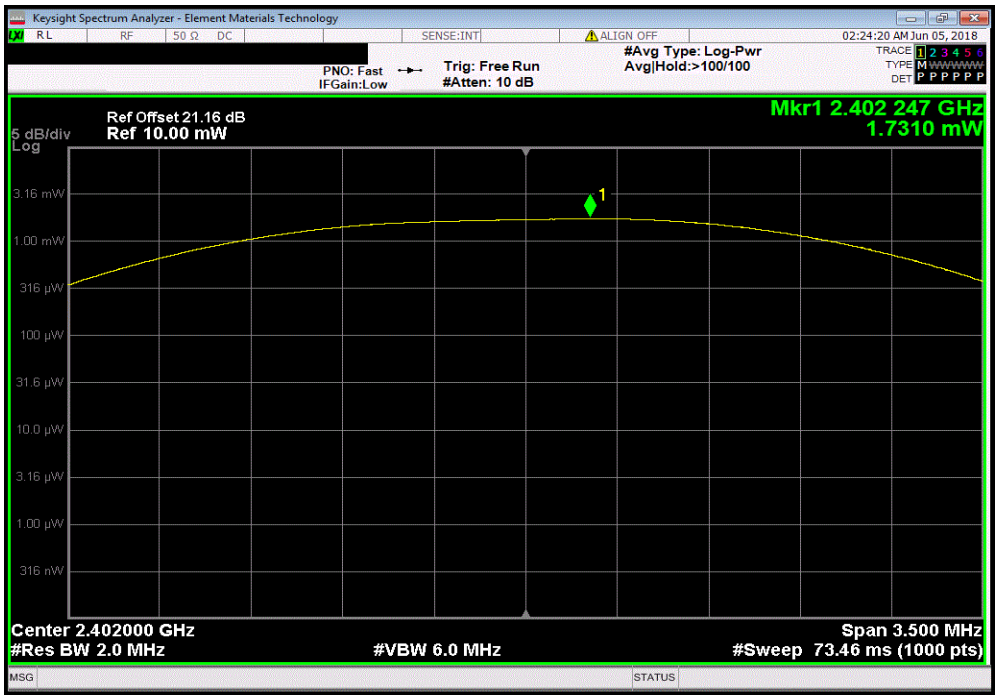
Configuration #	1	Signature

	Value	Limit (<)	Result
BLE/GFSK			
Low Channel, 2402 MHz	1.731 mW	1 W	Pass
Mid Channel, 2440 MHz	3.053 mW	1 W	Pass
High Channel, 2480 MHz	4.811 mW	1 W	Pass

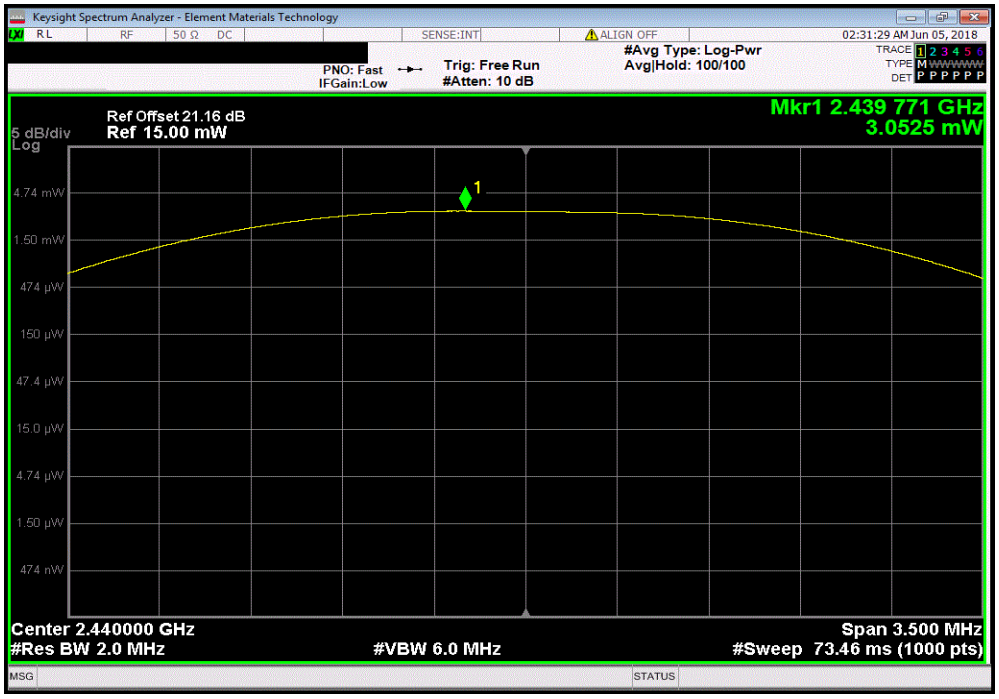
OUTPUT POWER

TbtTx 2018.01.25 BETA XMit 2017.12.13

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



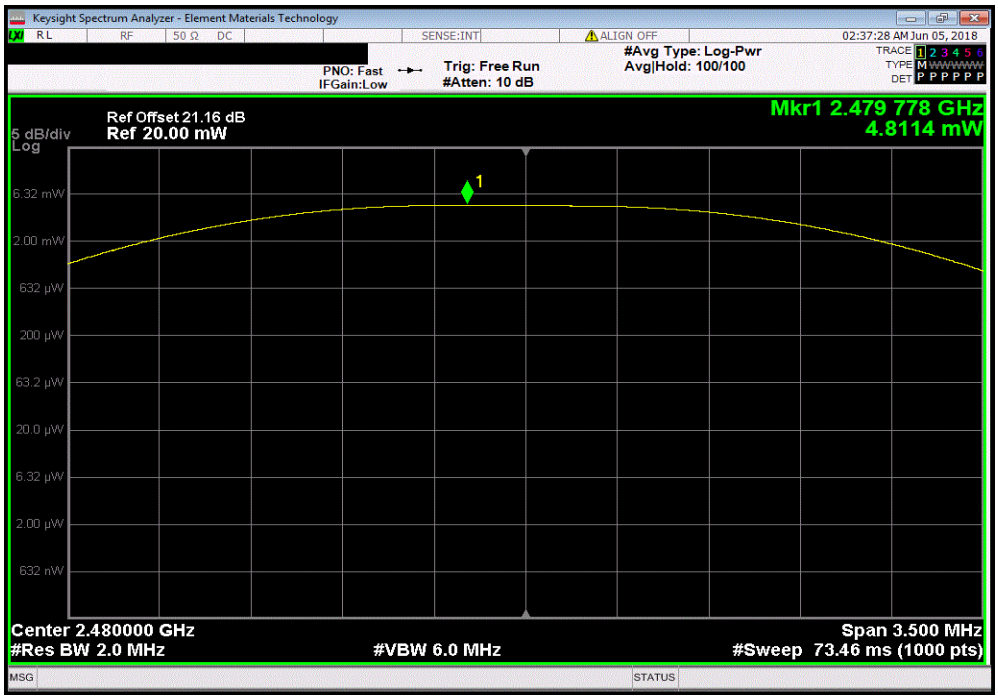
BLE/GFSK, Mid Channel, 2440 MHz						
				Value	Limit (<)	Result
				3.053 mW	1 W	Pass



OUTPUT POWER

TbtTx 2018.01.25 BETA XMit 2017.12.13

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



POWER SPECTRAL DENSITY

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	1-May-18	1-May-19
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	19-Feb-18	19-Feb-19
Attenuator	Fairview Microwave	SA4014-20	TKV	19-Feb-18	19-Feb-19
Block - DC	Fairview Microwave	SD3379	AMU	19-Feb-18	19-Feb-19
Generator - Signal	Agilent	N5183A	TIA	25-Apr-18	25-Apr-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The maximum power spectral density measurements was measured using the channels and modes as called out on the following data sheets.

Per the procedure outlined in ANSI C63.10 the peak power spectral density was measured in a 3 kHz RBW.

POWER SPECTRAL DENSITY

TbtTx 2018.01.25 BETA XMit 2017.12.13

EUT:	TPv2/300-004278	Work Order:	SYNA0242
Serial Number:	SN03	Date:	4-Jun-18
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	22.4 °C
Attendees:	Reily Blackner	Humidity:	42.8% RH
Project:	None	Barometric Pres.:	1022 mbar
Tested by:	Richard Mellroth	Power: 24 VDC	Job Site: NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default Max

DEVIATIONS FROM TEST STANDARD

None

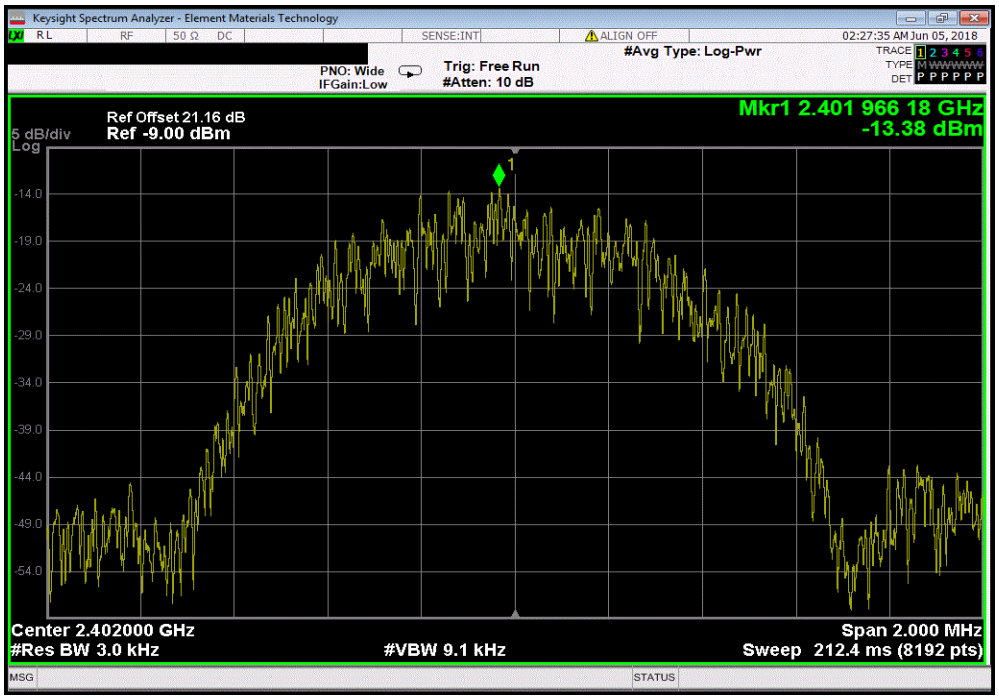
Configuration #	1	Signature

	Value dBm/3kHz	Limit < dBm/3kHz	Results
BLE/GFSK			
Low Channel, 2402 MHz	-13.384	8	Pass
Mid Channel, 2440 MHz	-10.771	8	Pass
High Channel, 2480 MHz	-8.776	8	Pass

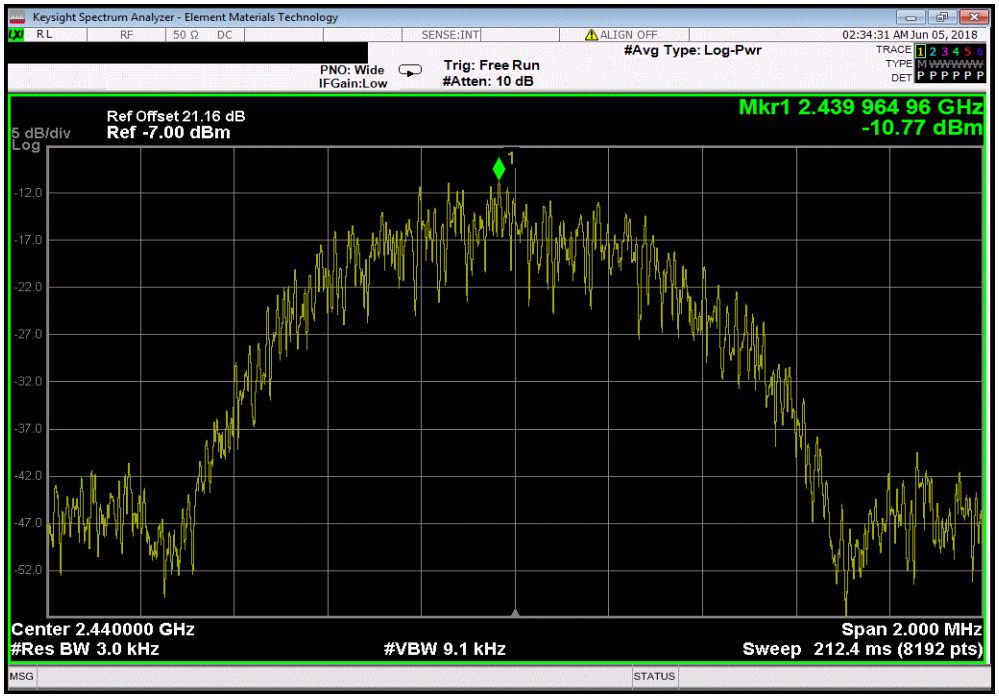
POWER SPECTRAL DENSITY

TbtTx 2018.01.25 BETA XMit 2017.12.13

BLE/GFSK, Low Channel, 2402 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-13.384	8	Pass



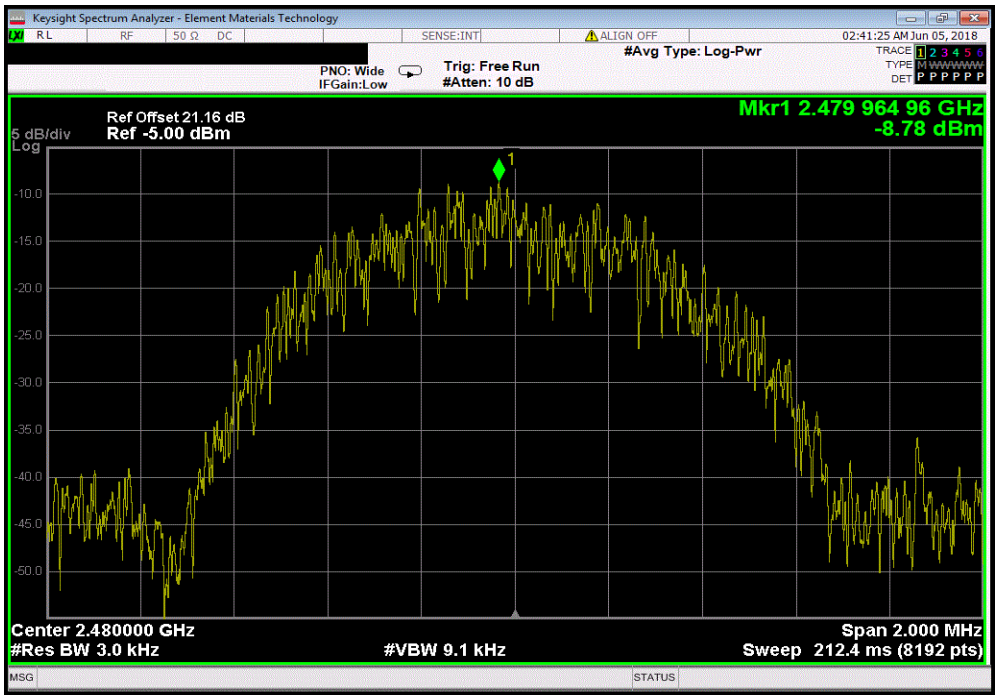
BLE/GFSK, Mid Channel, 2440 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-10.771	8	Pass



POWER SPECTRAL DENSITY

TbtTx 2018.01.25 BETA XMit 2017.12.13

BLE/GFSK, High Channel, 2480 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-8.776	8	Pass



BAND EDGE COMPLIANCE

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	1-May-18	1-May-19
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	19-Feb-18	19-Feb-19
Attenuator	Fairview Microwave	SA4014-20	TKV	19-Feb-18	19-Feb-19
Block - DC	Fairview Microwave	SD3379	AMU	19-Feb-18	19-Feb-19
Generator - Signal	Agilent	N5183A	TIA	25-Apr-18	25-Apr-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. 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 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

TbtTx 2018.01.25 BETA XMit 2017.12.13

EUT:	TPv2/300-004278	Work Order:	SYNA0242
Serial Number:	SN03	Date:	4-Jun-18
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	22.5 °C
Attendees:	Reily Blackner	Humidity:	42.7% RH
Project:	None	Barometric Pres.:	1022 mbar
Tested by:	Richard Mellroth	Power: 24 VDC	Job Site: NC02

TEST SPECIFICATIONS	Test Method
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default Max

DEVIATIONS FROM TEST STANDARD

None

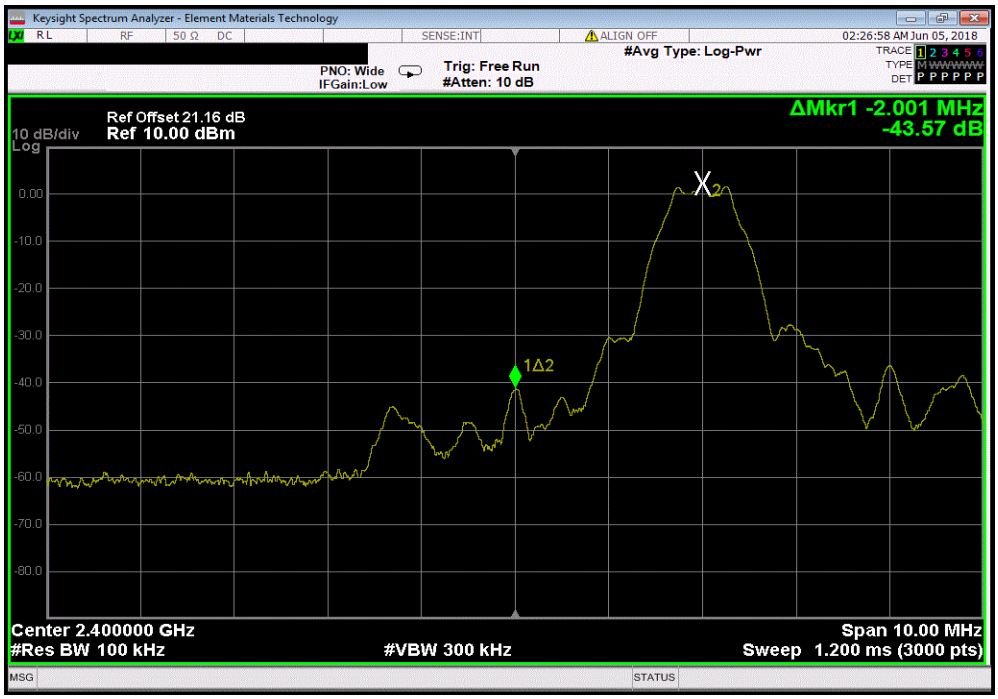
Configuration #	1	Signature

	Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK			
Low Channel, 2402 MHz	-43.57	-20	Pass
High Channel, 2480 MHz	-52.4	-20	Pass

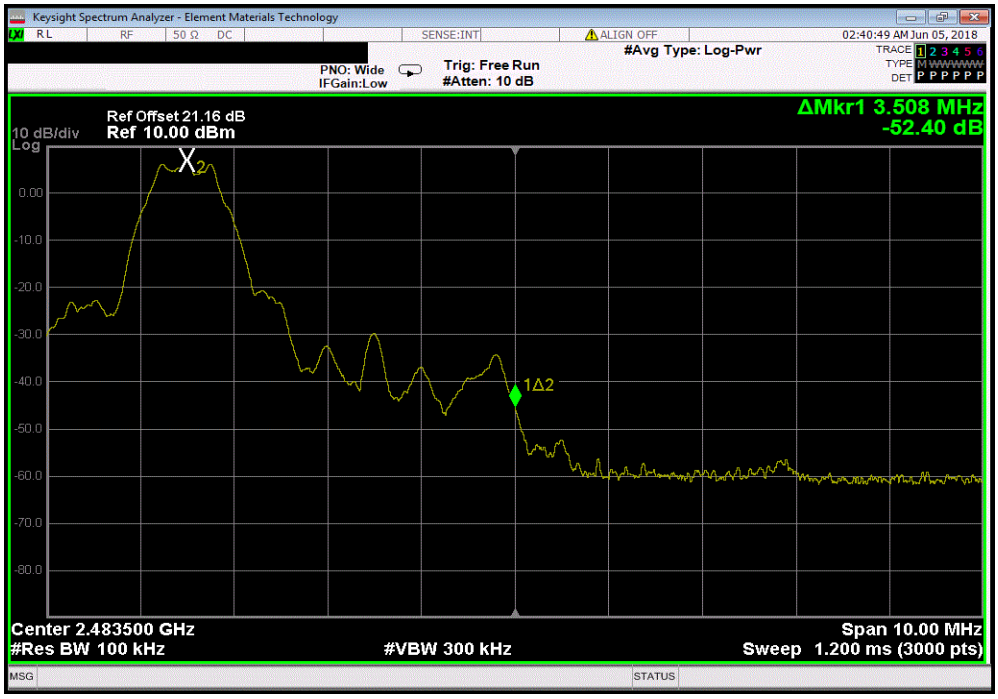
BAND EDGE COMPLIANCE

TbtTx 2018.01.25 BETA XMit 2017.12.13

BLE/GFSK, Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-43.57	-20	Pass



BLE/GFSK, High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-52.4	-20	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2017.12.13

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.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFO	1-May-18	1-May-19
Cable	Micro-Coax	UFD150A-1-0720-200200	NCS	19-Feb-18	19-Feb-19
Attenuator	Fairview Microwave	SA4014-20	TKV	19-Feb-18	19-Feb-19
Block - DC	Fairview Microwave	SD3379	AMU	19-Feb-18	19-Feb-19
Generator - Signal	Agilent	N5183A	TIA	25-Apr-18	25-Apr-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. 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

TbtTx 2018.01.25 BETA XMit 2017.12.13

EUT:	**TPv2/300-004278**	**Work Order:**	**SYNA0242**
Serial Number:	**SN03**	**Date:**	**4-Jun-18**
Customer:	**Walt Disney Parks and Resorts US, Inc.**	**Temperature:**	**22.4 °C**
Attendees:	**Reily Blackner**	**Humidity:**	**42.8% RH**
Project:	**None**	**Barometric Pres.:**	**1022 mbar**
Tested by:	**Richard Mellroth** **Power:** **24 VDC**	**Job Site:**	**NC02**

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2018	ANSI C63.10:2013

COMMENTS

Power Setting = Default Max

DEVIATIONS FROM TEST STANDARD

None

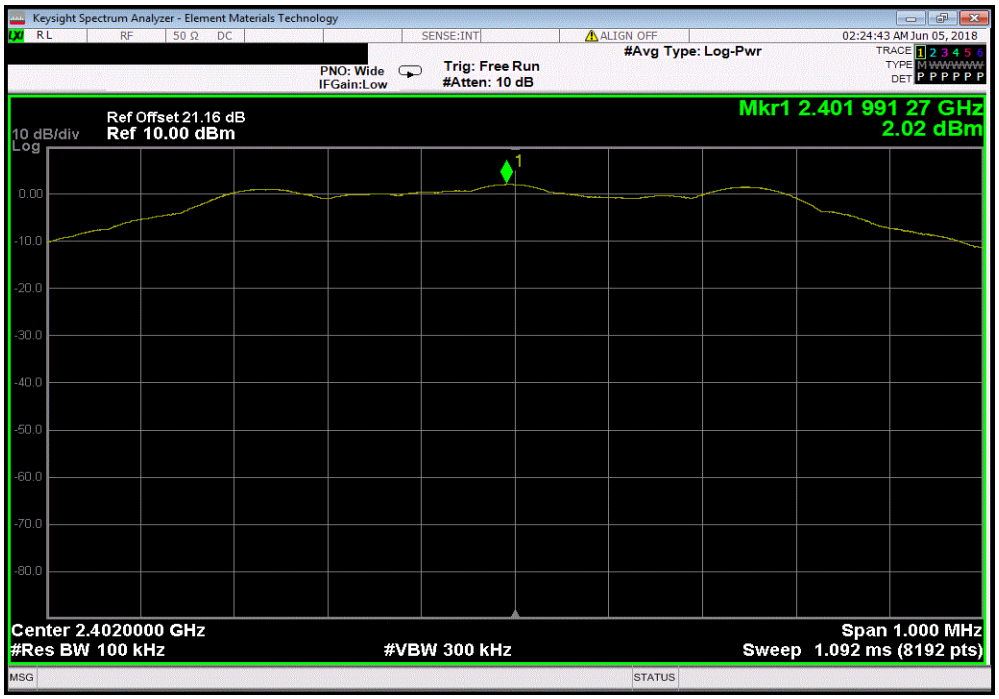
Configuration #	**1**	*Signature*

	Frequency Range	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
BLE/GFSK				
Low Channel, 2402 MHz	Fundamental	N/A	N/A	N/A
Low Channel, 2402 MHz	30 MHz - 12.5 GHz	-48.82	-20	Pass
Low Channel, 2402 MHz	12.5 GHz - 25 GHz	-53.77	-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	-56.59	-20	Pass
High Channel, 2480 MHz	Fundamental	N/A	N/A	N/A
High Channel, 2480 MHz	30 MHz - 12.5 GHz	-56.34	-20	Pass
High Channel, 2480 MHz	12.5 GHz - 25 GHz	-58.28	-20	Pass

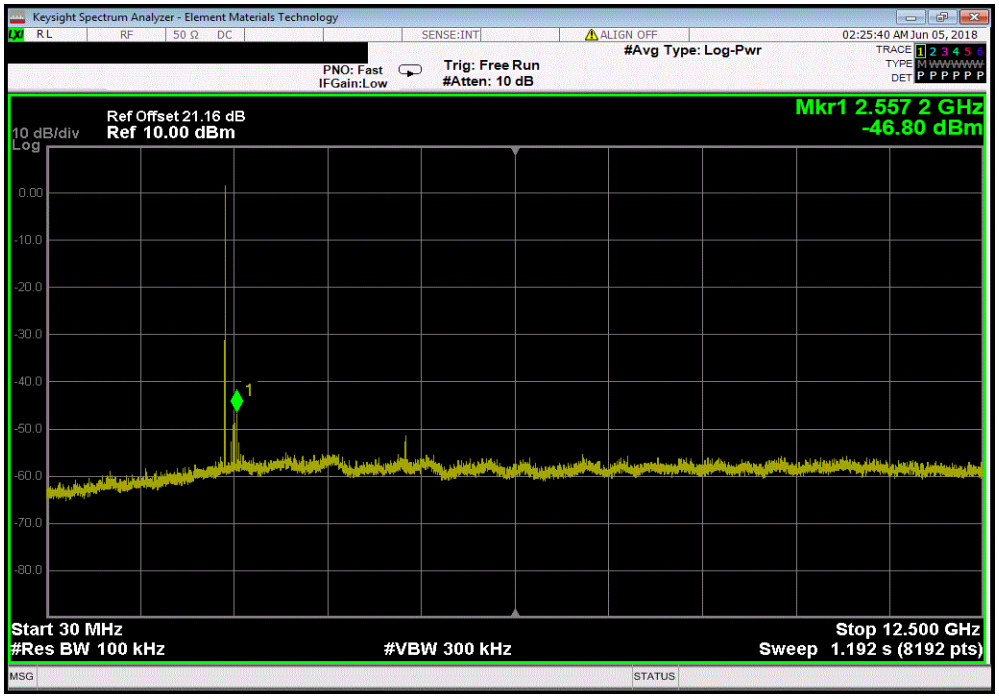
SPURIOUS CONDUCTED EMISSIONS

TbtTx 2018.01.25 BETA XMit 2017.12.13

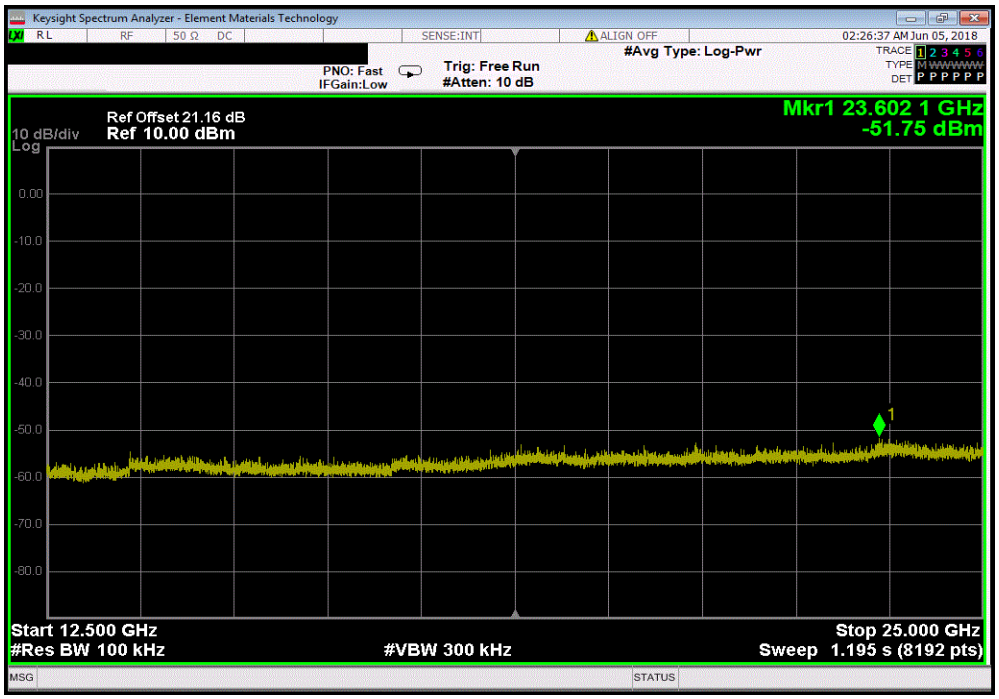
BLE/GFSK, Low Channel, 2402 MHz						
Frequency Range				Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



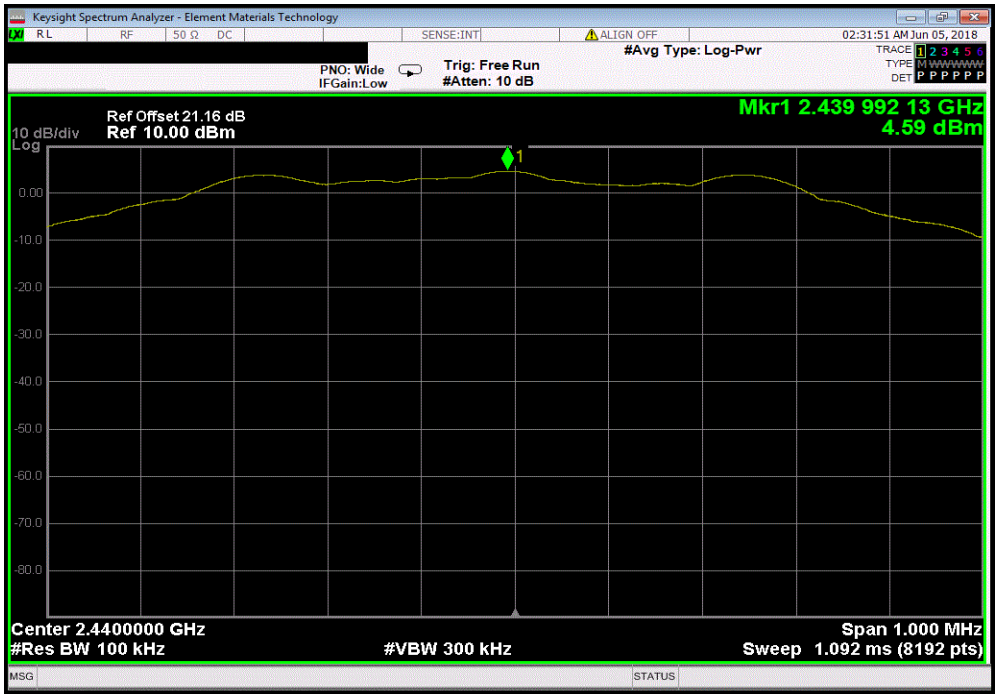
BLE/GFSK, Low Channel, 2402 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-48.82	-20	Pass



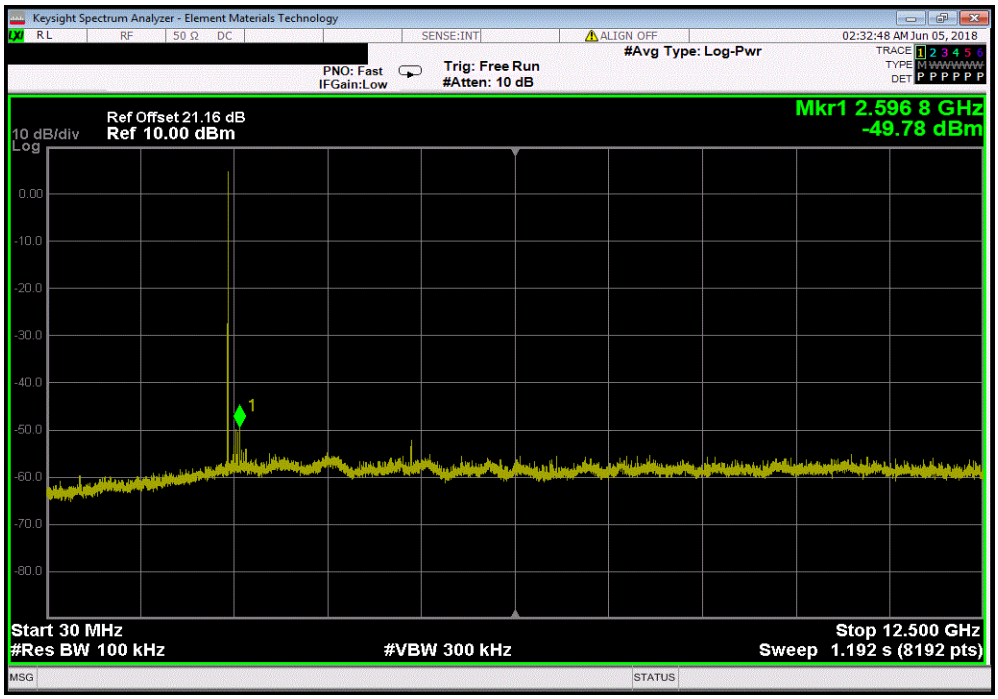
BLE/GFSK, Low Channel, 2402 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-53.77	-20	Pass



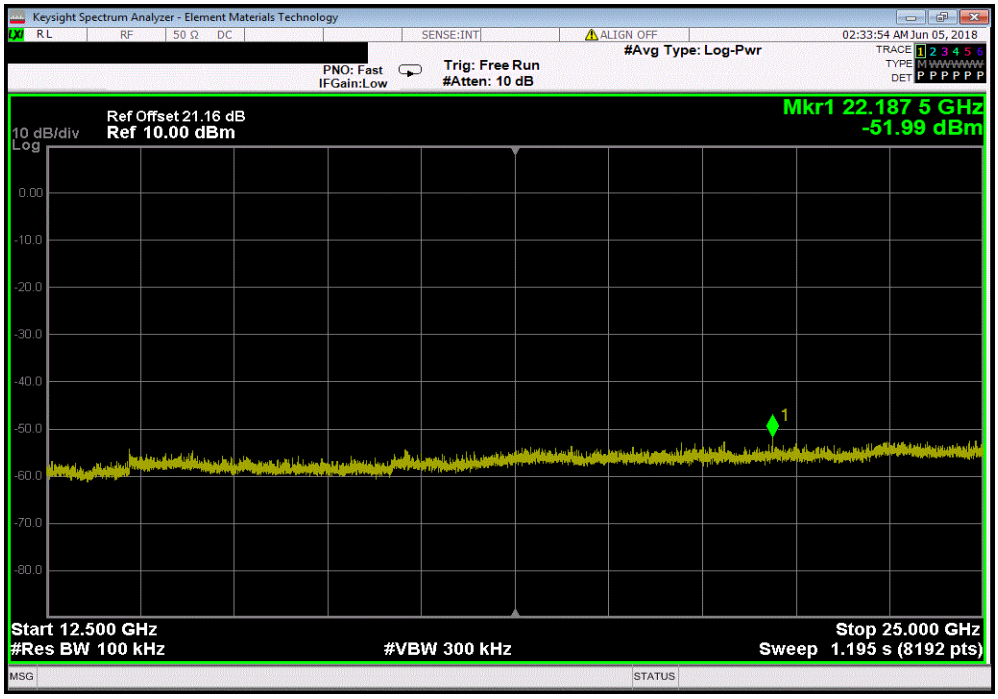
BLE/GFSK, Mid Channel, 2440 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental		N/A	N/A	N/A



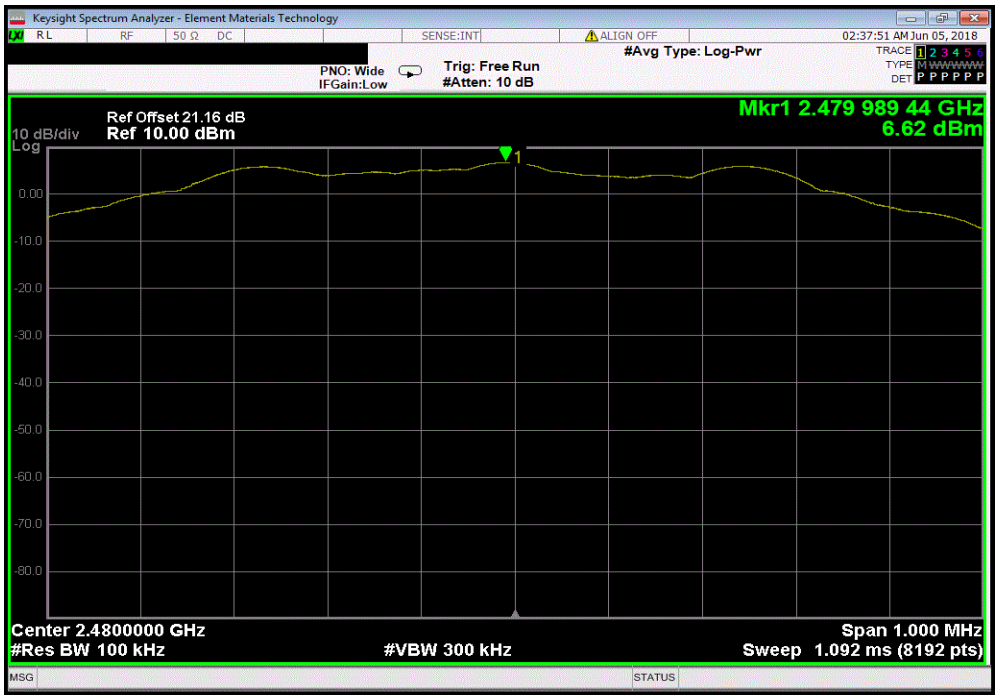
BLE/GFSK, Mid Channel, 2440 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-54.38	-20	Pass



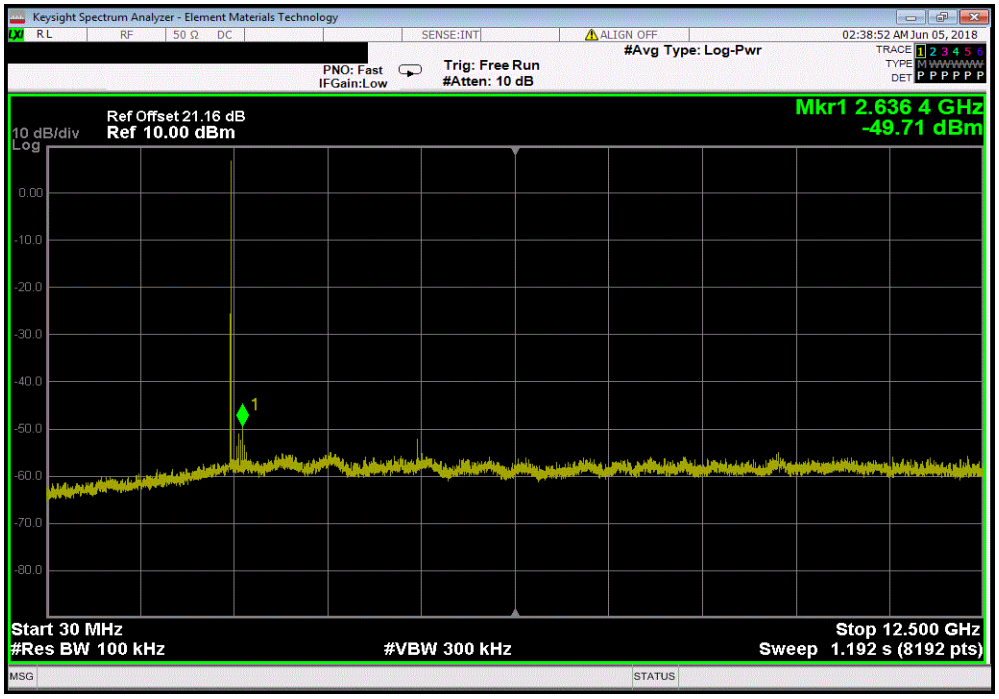
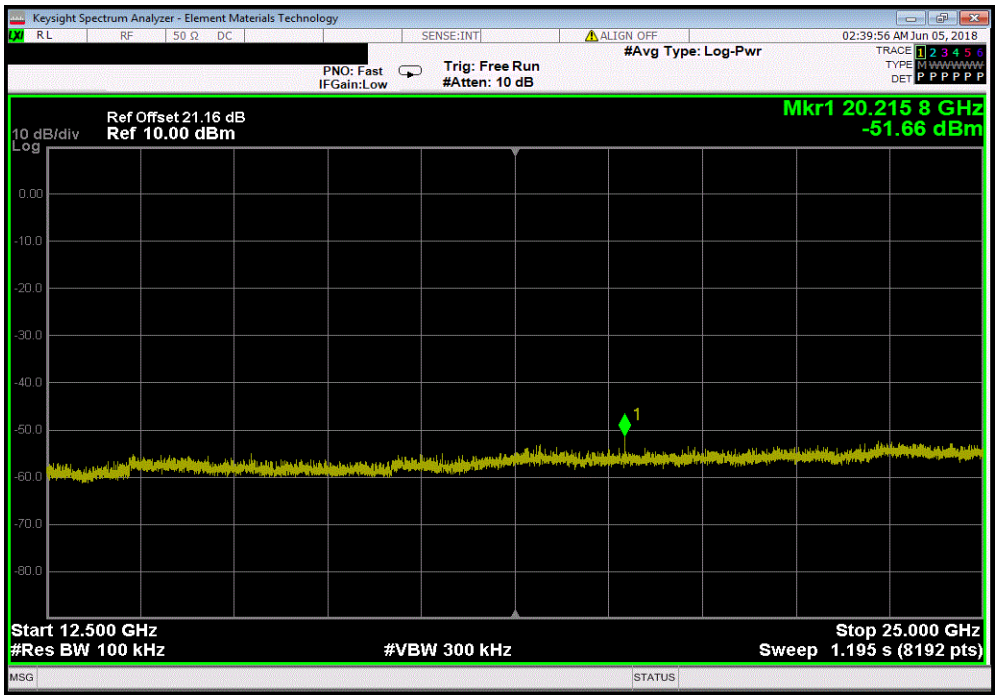
BLE/GFSK, Mid Channel, 2440 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-56.59	-20	Pass



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



BLE/GFSK, High Channel, 2480 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-56.34	-20	Pass



BLE/GFSK, High Channel, 2480 MHz				
Frequency Range		**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
12.5 GHz - 25 GHz		-58.28	-20	Pass