

# NORTHWEST EMC

**Walt Disney Parks and Resorts US, Inc.**

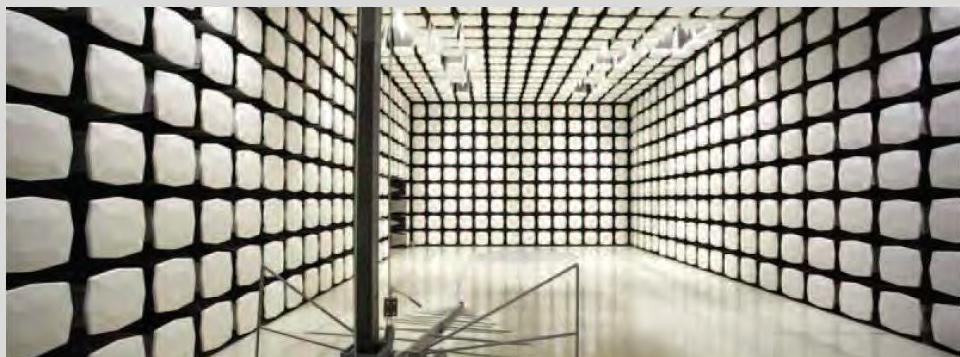
**TPv2 (DAP 2)**

**FCC 15.207:2016**

**FCC 15.247:2016**

**Bluetooth Low Energy Radio Module**

**Report # SYNA0194.3**



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: September 13, 2016  
Walt Disney Parks and Resorts US, Inc.  
Model: TPv2 (DAP 2)

## Radio Equipment Testing

### Standards

Specification	Method
FCC 15.207:2016	
FCC 15.247:2016	ANSI C63.10:2013

### Results

Method Clause	Test Description	Applied	Results	Comments
6.2	AC - Powerline Conducted Emissions	Yes	Pass	
6.5, 6.6, 11.12.1, 11.13.2	Spurious Radiated Emissions	Yes	Pass	
11.6	Duty Cycle	Yes	Pass	
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 Northwest EMC 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** – Validated by the European Commission 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 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.

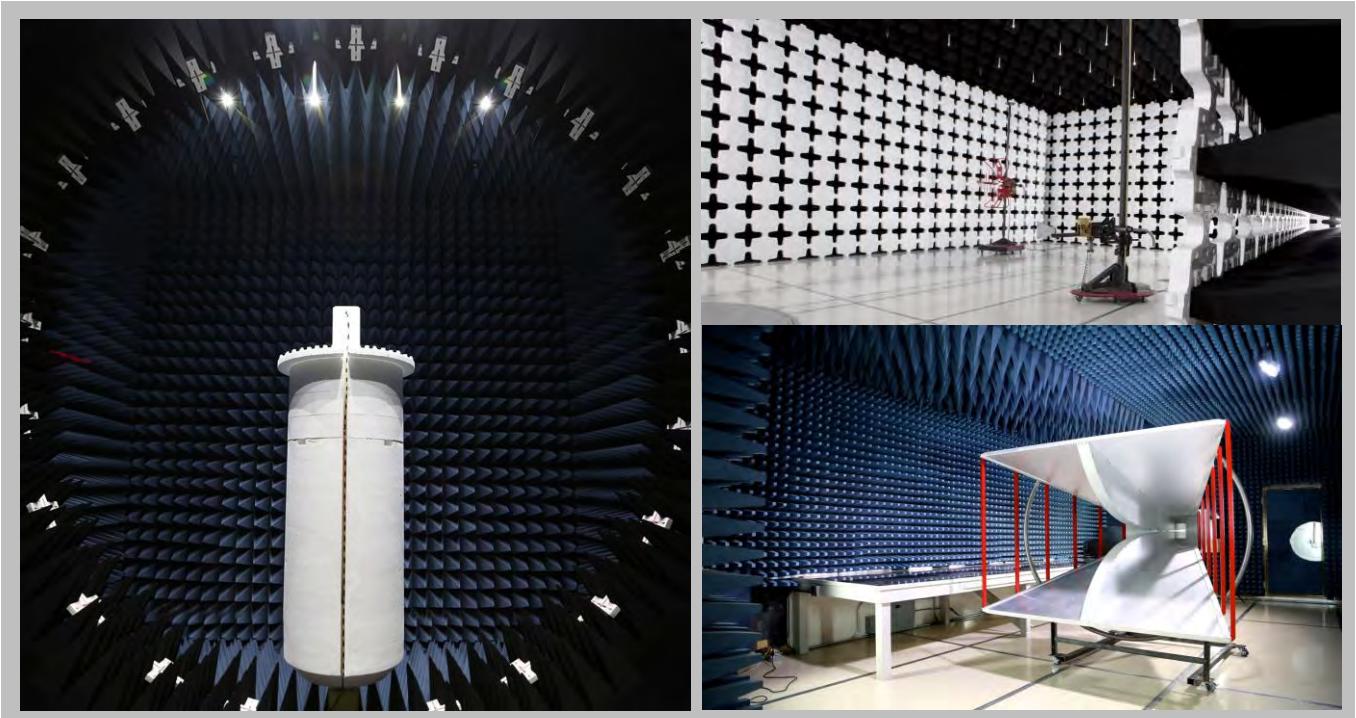
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

<u>Test</u>	<u>+ MU</u>	<u>- MU</u>
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)	2.4 dB	-2.4 dB

# FACILITIES



California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 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 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120 <sup>th</sup> Ave NE Bothell, WA 98011 (425)984-6600
<b>NVLAP</b>					
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
<b>Innovation, Science and Economic Development Canada</b>					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
<b>BSMI</b>					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
<b>VCCI</b>					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
<b>Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA</b>					
US0158	US0175	N/A	US0017	US0191	US0157



# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

<b>Company Name:</b>	Walt Disney Parks and Resorts US, Inc.
<b>Address:</b>	PO Box 10000
<b>City, State, Zip:</b>	Lake Buena Vista, FL 32830
<b>Test Requested By:</b>	Brian Piquette of Synapse Product Development LLC
<b>Model:</b>	TPv2 (DAP 2)
<b>First Date of Test:</b>	September 08, 2016
<b>Last Date of Test:</b>	September 13, 2016
<b>Receipt Date of Samples:</b>	August 31, 2016
<b>Equipment Design Stage:</b>	Production
<b>Equipment Condition:</b>	No Damage

## Information Provided by the Party Requesting the Test

<b>Functional Description of the EUT:</b>
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.
<b>Testing Objective:</b>
To demonstrate compliance of the Bluetooth Low Energy radio to FCC 15.247 requirements.

# CONFIGURATIONS

## Configuration SYNA0194- 1

Software/Firmware Running during test	
Description	Version
LRR Firmware (2.4 GHz)	0.10F

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Access Point	Walt Disney Parks and Resorts US, Inc.	TPv2	850-1631035

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Power Cable	No	.5m	No	Access Point	DC Power Supply

## Configuration SYNA0194- 6

Software/Firmware Running during test	
Description	Version
LRR Firmware (2.4 GHz)	0.10F

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Access Point	Walt Disney Parks and Resorts US, Inc.	TPv2	850-1631028

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Access Point Fixture	Walt Disney Parks and Resorts US, Inc.	310-019778-Rev-01	No
Scanner	Zebra	SE4710	Unknown

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
POE Injector	Unknown	Unknown	Unknown
Laptop	Apple	Macbook Air	C02NP2WDG5RQ

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Ethernet Cable	No	6m	No	Access Point	POE Injector
USB Cable	Yes	1m	No	Access Point	Scanner
Ethernet Cable	No	1m	No	POE Injector	Laptop

# CONFIGURATIONS

## Configuration SYNA0194- 7

Software/Firmware Running during test									
Description		Version							
UHFTool (900 MHz)									
EUT									
Description	Manufacturer	Model/Part Number		Serial Number					
Access Point	Walt Disney Parks and Resorts US, Inc.	TPv2		850-1631004					
Peripherals in test setup boundary									
Description	Manufacturer	Model/Part Number		Serial Number					
Access Point Fixture	Walt Disney Parks and Resorts US, Inc.	310-019778-Rev-01		No					
Scanner	Zebra	SE4710		Unknown					
Remote Equipment Outside of Test Setup Boundary									
Description	Manufacturer	Model/Part Number		Serial Number					
POE Injector	Unknown	Unknown		Unknown					
Laptop	Apple	Macbook Air		C02NP2WDG5RQ					
DC Power Supply	Topward Electronics	TPS-2000		TPD					
Cables									
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2				
DC Power Cable	No	.5m	No	Access Point	DC Power Supply				
Ethernet Cable	No	6m	No	Access Point	POE Injector				
USB Cable	Yes	1m	No	Access Point	Scanner				
Ethernet Cable	No	1m	No	POE Injector	Laptop				
AC Power	No	2.5m	No	DC Power Supply	AC mains				

# MODIFICATIONS

## Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	9/8/2016	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.
2	9/12/2016	AC - Powerline 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	9/13/2016	Duty Cycle	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	9/13/2016	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.
5	9/13/2016	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.
6	9/13/2016	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.
7	9/13/2016	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.
8	9/13/2016	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

# AC – 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. 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	Northwest EMC	EVG, HHD, RKA	EVGA	5/10/2016	5/10/2017
LISN	Solar Electronics	9252-50-R-24-BNC	LIP	1/27/2015	1/27/2017
Receiver	Rohde & Schwarz	ESCI	ARH	3/21/2016	3/21/2017
Power Supply - DC	Topward	TPS-2000	TPD	NCR	NCR

## MEASUREMENT UNCERTAINTY

Description			
Expanded k=2	2.4 dB		-2.4 dB

## CONFIGURATIONS INVESTIGATED

SYNA0194-6

## MODES INVESTIGATED

Transmit, BTLE Mid Ch 2442 MHz.

# AC – POWERLINE CONDUCTED EMISSIONS

EUT:	TPv2 (DAP 2)	Work Order:	SYNA0194
Serial Number:	850-1631004	Date:	09/12/2016
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	23.3°C
Attendees:	None	Relative Humidity:	40.5%
Customer Project:	None	Bar. Pressure:	1022 mb
Tested By:	Jared Ison	Job Site:	EV07
Power:	24 VDC	Configuration:	SYNA0194-6

## TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2016	ANSI C63.10:2013

## TEST PARAMETERS

Run #:	5	Line:	High Line	Add. Ext. Attenuation (dB):	0
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## COMMENTS

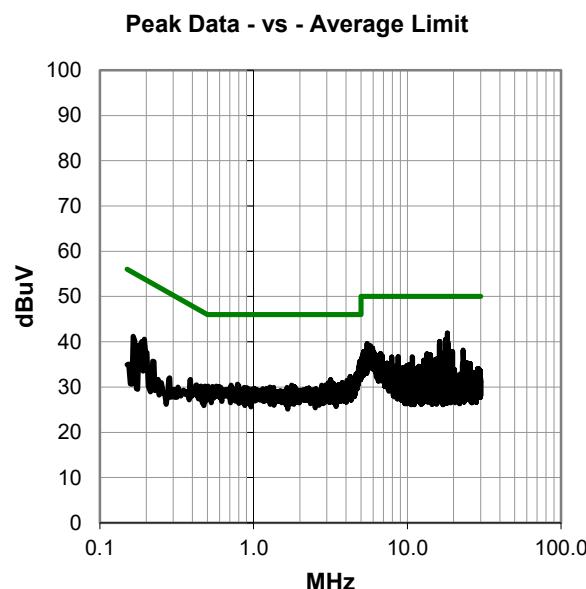
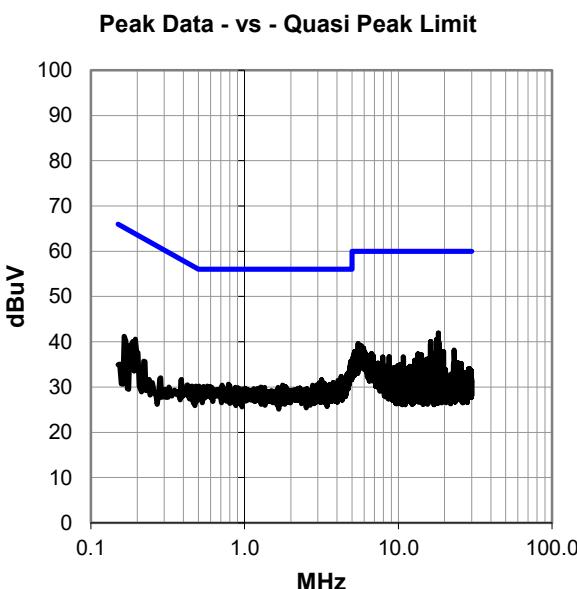
face plate # 3691-3605.

## EUT OPERATING MODES

Transmit, BTLE Mid Ch 2442 MHz.

## DEVIATIONS FROM TEST STANDARD

None.



# AC – 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)
18.241	21.3	20.6	41.9	60.0	-18.1
17.692	19.9	20.6	40.5	60.0	-19.5
16.226	19.7	20.4	40.1	60.0	-19.9
18.304	19.5	20.6	40.1	60.0	-19.9
4.914	15.7	20.0	35.7	56.0	-20.3
5.481	19.6	20.0	39.6	60.0	-20.4
16.166	19.2	20.4	39.6	60.0	-20.4
18.364	18.9	20.7	39.6	60.0	-20.4
4.881	15.3	19.9	35.2	56.0	-20.8
5.750	19.0	20.1	39.1	60.0	-20.9
5.601	19.0	20.0	39.0	60.0	-21.0
5.534	18.6	20.0	38.6	60.0	-21.4
5.933	18.5	20.1	38.6	60.0	-21.4
18.487	17.7	20.7	38.4	60.0	-21.6
23.128	17.4	20.8	38.2	60.0	-21.8
5.403	18.1	20.0	38.1	60.0	-21.9
5.381	18.0	20.0	38.0	60.0	-22.0
5.511	18.0	20.0	38.0	60.0	-22.0
5.966	17.9	20.1	38.0	60.0	-22.0
5.190	17.8	20.0	37.8	60.0	-22.2
19.707	17.1	20.7	37.8	60.0	-22.2
6.052	17.6	20.1	37.7	60.0	-22.3
17.569	17.1	20.6	37.7	60.0	-22.3
17.938	16.9	20.6	37.5	60.0	-22.5
6.701	17.3	20.1	37.4	60.0	-22.6
5.131	17.3	20.0	37.3	60.0	-22.7

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
18.241	21.3	20.6	41.9	50.0	-8.1
17.692	19.9	20.6	40.5	50.0	-9.5
16.226	19.7	20.4	40.1	50.0	-9.9
18.304	19.5	20.6	40.1	50.0	-9.9
4.914	15.7	20.0	35.7	46.0	-10.3
5.481	19.6	20.0	39.6	50.0	-10.4
16.166	19.2	20.4	39.6	50.0	-10.4
18.364	18.9	20.7	39.6	50.0	-10.4
4.881	15.3	19.9	35.2	46.0	-10.8
5.750	19.0	20.1	39.1	50.0	-10.9
5.601	19.0	20.0	39.0	50.0	-11.0
5.534	18.6	20.0	38.6	50.0	-11.4
5.933	18.5	20.1	38.6	50.0	-11.4
18.487	17.7	20.7	38.4	50.0	-11.6
23.128	17.4	20.8	38.2	50.0	-11.8
5.403	18.1	20.0	38.1	50.0	-11.9
5.381	18.0	20.0	38.0	50.0	-12.0
5.511	18.0	20.0	38.0	50.0	-12.0
5.966	17.9	20.1	38.0	50.0	-12.0
5.190	17.8	20.0	37.8	50.0	-12.2
19.707	17.1	20.7	37.8	50.0	-12.2
6.052	17.6	20.1	37.7	50.0	-12.3
17.569	17.1	20.6	37.7	50.0	-12.3
17.938	16.9	20.6	37.5	50.0	-12.5
6.701	17.3	20.1	37.4	50.0	-12.6
5.131	17.3	20.0	37.3	50.0	-12.7

## CONCLUSION

Pass



Tested By

# AC – POWERLINE CONDUCTED EMISSIONS

EUT:	TPv2 (DAP 2)	Work Order:	SYNA0194
Serial Number:	850-1631004	Date:	09/12/2016
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	23.3°C
Attendees:	None	Relative Humidity:	40.5%
Customer Project:	None	Bar. Pressure:	1022 mb
Tested By:	Jared Ison	Job Site:	EV07
Power:	24 VDC	Configuration:	SYNA0194-6

## TEST SPECIFICATIONS

Specification:	Method:
FCC 15.207:2016	ANSI C63.10:2013

## TEST PARAMETERS

Run #:	6	Line:	Neutral	Add. Ext. Attenuation (dB):	0
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## COMMENTS

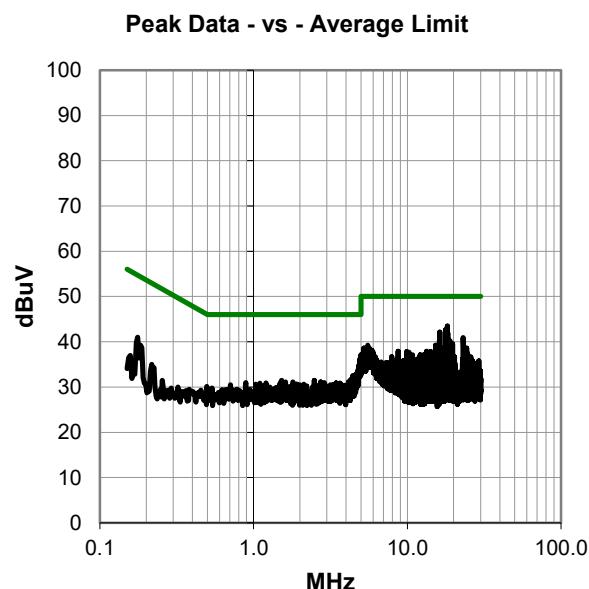
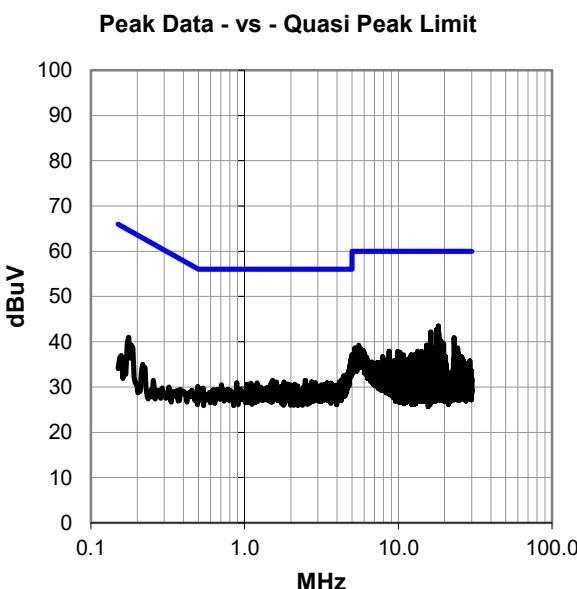
face plate # 3691-3605.

## EUT OPERATING MODES

Transmit, BTLE Mid Ch 2442 MHz.

## DEVIATIONS FROM TEST STANDARD

None.



# AC – 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)
18.241	22.9	20.6	43.5	60.0	-16.5
17.692	22.0	20.6	42.6	60.0	-17.4
16.226	21.7	20.4	42.1	60.0	-17.9
18.304	21.3	20.6	41.9	60.0	-18.1
4.996	17.1	20.0	37.1	56.0	-18.9
23.124	20.1	20.8	40.9	60.0	-19.1
18.364	20.1	20.7	40.8	60.0	-19.2
4.922	16.3	20.0	36.3	56.0	-19.7
16.166	19.9	20.4	40.3	60.0	-19.7
18.912	19.5	20.7	40.2	60.0	-19.8
19.707	18.8	20.7	39.5	60.0	-20.5
17.938	18.7	20.6	39.3	60.0	-20.7
5.537	19.2	20.0	39.2	60.0	-20.8
15.252	18.8	20.4	39.2	60.0	-20.8
18.487	18.5	20.7	39.2	60.0	-20.8
16.897	18.1	20.6	38.7	60.0	-21.3
5.220	18.6	20.0	38.6	60.0	-21.4
24.348	17.6	21.0	38.6	60.0	-21.4
5.280	18.5	20.0	38.5	60.0	-21.5
5.664	18.4	20.1	38.5	60.0	-21.5
17.386	17.8	20.6	38.4	60.0	-21.6
19.158	17.7	20.7	38.4	60.0	-21.6
15.618	17.9	20.4	38.3	60.0	-21.7
17.084	17.6	20.6	38.2	60.0	-21.8
5.265	18.1	20.0	38.1	60.0	-21.9
5.877	18.0	20.1	38.1	60.0	-21.9

Peak Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
18.241	22.9	20.6	43.5	50.0	-6.5
17.692	22.0	20.6	42.6	50.0	-7.4
16.226	21.7	20.4	42.1	50.0	-7.9
18.304	21.3	20.6	41.9	50.0	-8.1
4.996	17.1	20.0	37.1	46.0	-8.9
23.124	20.1	20.8	40.9	50.0	-9.1
18.364	20.1	20.7	40.8	50.0	-9.2
4.922	16.3	20.0	36.3	46.0	-9.7
16.166	19.9	20.4	40.3	50.0	-9.7
18.912	19.5	20.7	40.2	50.0	-9.8
19.707	18.8	20.7	39.5	50.0	-10.5
17.938	18.7	20.6	39.3	50.0	-10.7
5.537	19.2	20.0	39.2	50.0	-10.8
15.252	18.8	20.4	39.2	50.0	-10.8
18.487	18.5	20.7	39.2	50.0	-10.8
16.897	18.1	20.6	38.7	50.0	-11.3
5.220	18.6	20.0	38.6	50.0	-11.4
24.348	17.6	21.0	38.6	50.0	-11.4
5.280	18.5	20.0	38.5	50.0	-11.5
5.664	18.4	20.1	38.5	50.0	-11.5
17.386	17.8	20.6	38.4	50.0	-11.6
19.158	17.7	20.7	38.4	50.0	-11.6
15.618	17.9	20.4	38.3	50.0	-11.7
17.084	17.6	20.6	38.2	50.0	-11.8
5.265	18.1	20.0	38.1	50.0	-11.9
5.877	18.0	20.1	38.1	50.0	-11.9

## CONCLUSION

Pass



Tested By

# SPURIOUS RADIATED 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. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

## MODES OF OPERATION

Transmit, Low Channel 2402 MHz, GFSK Modulation.  
Transmit, Middle Channel 2442 MHz, GFSK Modulation.  
Transmit, High Channel 2480 MHz, GFSK Modulation.

## POWER SETTINGS INVESTIGATED

24 VDC  
POE

## CONFIGURATIONS INVESTIGATED

SYNA0194 - 7

## FREQUENCY RANGE INVESTIGATED

Start Frequency | 30 MHz | Stop Frequency | 26500 MHz

## 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
Cable	ESM Cable Corp.	KMMK-72	EVY	11/4/2015	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	11/4/2015	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AVI	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	3/11/2016	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHU	NCR	0 mo
Cable	None	Standard Gain Horns Cable	EVF	3/11/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	3/11/2016	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AHV	NCR	0 mo
Attenuator	Coaxicom	3910-20	AXZ	5/18/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	3/11/2016	12 mo
Cable	N/A	Double Ridge Horn Cables	EVB	3/11/2016	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIZ	2/3/2016	24 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	3/11/2016	12 mo
Cable	N/A	Bilog Cables	EVA	3/11/2016	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AXR	6/30/2016	24 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	4/22/2016	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

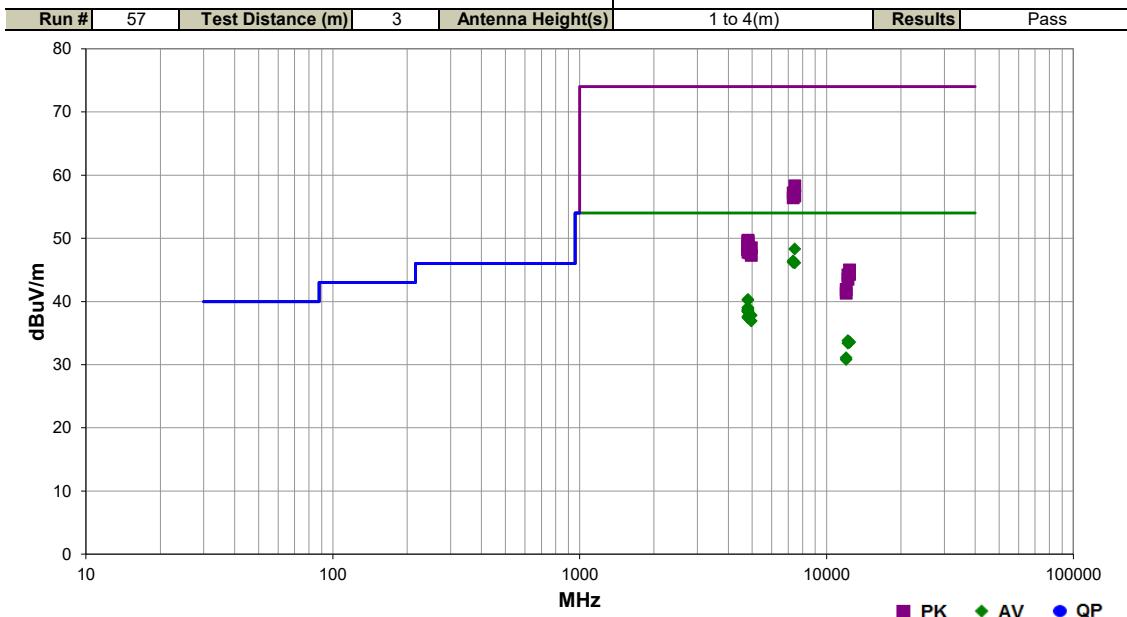
## TEST DESCRIPTION

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.

# SPURIOUS RADIATED EMISSIONS

Work Order:	SYNA0194	Date:	09/08/16	
Project:	None	Temperature:	23 °C	
Job Site:	EV01	Humidity:	46.3% RH	
Serial Number:	850-1631004	Barometric Pres.:	1028 mbar	Tested by: Jared Ison
EUT:	TPV2 (DAP 2)			
Configuration:	7			
Customer:	Walt Disney Parks and Resorts US, Inc.			
Attendees:	None			
EUT Power:	POE			
Operating Mode:	Transmit.			
Deviations:	None			
Comments:	face plate # 3691-3605.			

Test Specifications	Test Method
FCC 15.247:2016	ANSI C63.10:2013



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
7439.550	29.8	18.5	1.7	208.0	3.0	0.0	Horz	AV	0.0	48.3	54.0	-5.7	High Ch. 2480 MHz, 24 VDC, EUT Vert
7325.458	28.6	17.8	1.0	73.0	3.0	0.0	Vert	AV	0.0	46.4	54.0	-7.6	Mid Ch. 2442 MHz, 24 VDC, EUT Horz
7325.392	28.4	17.8	1.0	213.0	3.0	0.0	Horz	AV	0.0	46.2	54.0	-7.8	Mid Ch. 2442 MHz, 24 VDC, EUT Vert
7438.450	27.6	18.5	1.6	285.0	3.0	0.0	Vert	AV	0.0	46.1	54.0	-7.9	High Ch. 2480 MHz, 24 VDC, EUT Horz
4804.092	31.3	9.0	1.0	251.0	3.0	0.0	Vert	AV	0.0	40.3	54.0	-13.7	Low Ch. 2402 MHz, POE, EUT Horz
4803.825	31.2	9.0	1.0	251.0	3.0	0.0	Vert	AV	0.0	40.2	54.0	-13.8	Low Ch. 2402 MHz, 24VDC, EUT Horz
4804.058	30.0	9.0	1.6	12.0	3.0	0.0	Horz	AV	0.0	39.0	54.0	-15.0	Low Ch. 2402 MHz, 24VDC, EUT Vert
4803.892	30.0	9.0	2.3	46.0	3.0	0.0	Horz	AV	0.0	39.0	54.0	-15.0	Low Ch. 2402 MHz, 24VDC, EUT On Side
4803.858	29.7	9.0	2.0	18.0	3.0	0.0	Horz	AV	0.0	38.7	54.0	-15.3	Low Ch. 2402 MHz, POE, EUT Vert
4803.900	29.7	9.0	1.0	13.0	3.0	0.0	Horz	AV	0.0	38.7	54.0	-15.3	Low Ch. 2402 MHz, POE, EUT Vert
4803.900	29.6	9.0	1.0	346.0	3.0	0.0	Vert	AV	0.0	38.6	54.0	-15.4	Low Ch. 2402 MHz, 24VDC, EUT Vert
4804.183	29.5	9.0	2.4	14.0	3.0	0.0	Horz	AV	0.0	38.5	54.0	-15.5	Low Ch. 2402 MHz, POE, EUT On Side
4803.933	29.4	9.0	1.6	20.0	3.0	0.0	Vert	AV	0.0	38.4	54.0	-15.6	Low Ch. 2402 MHz, 24VDC, EUT Horz
4803.867	29.4	9.0	1.0	335.0	3.0	0.0	Vert	AV	0.0	38.4	54.0	-15.6	Low Ch. 2402 MHz, POE, EUT On Side
7440.142	39.8	18.5	1.7	208.0	3.0	0.0	Horz	PK	0.0	58.3	74.0	-15.7	High Ch. 2480 MHz, 24 VDC, EUT Vert
4883.850	28.7	9.2	1.0	230.0	3.0	0.0	Vert	AV	0.0	37.9	54.0	-16.1	Mid Ch. 2442 MHz, 24 VDC, EUT Horz
4883.958	28.6	9.2	1.9	360.0	3.0	0.0	Horz	AV	0.0	37.8	54.0	-16.2	Mid Ch. 2442 MHz, 24 VDC, EUT Vert
4959.775	28.4	9.4	1.0	188.0	3.0	0.0	Horz	AV	0.0	37.8	54.0	-16.2	High Ch. 2480 MHz, 24 VDC, EUT Vert
4803.717	28.6	9.0	1.0	113.0	3.0	0.0	Horz	AV	0.0	37.6	54.0	-16.4	Low Ch. 2402 MHz, POE, EUT Horz
4803.808	28.4	9.0	1.0	283.0	3.0	0.0	Horz	AV	0.0	37.4	54.0	-16.6	Low Ch. 2402 MHz, 24VDC, EUT Horz
7325.417	39.4	17.8	1.0	73.0	3.0	0.0	Vert	PK	0.0	57.2	74.0	-16.8	Mid Ch. 2442 MHz, 24 VDC, EUT Horz
4959.192	27.5	9.4	1.0	247.0	3.0	0.0	Vert	AV	0.0	36.9	54.0	-17.1	High Ch. 2480 MHz, 24 VDC, EUT Horz
7440.367	38.2	18.5	1.6	285.0	3.0	0.0	Vert	PK	0.0	56.7	74.0	-17.3	High Ch. 2480 MHz, 24 VDC, EUT Vert
7326.117	38.6	17.8	1.0	213.0	3.0	0.0	Horz	PK	0.0	56.4	74.0	-17.6	Mid Ch. 2442 MHz, 24 VDC, EUT Vert
12208.860	29.4	4.4	3.8	189.0	3.0	0.0	Horz	AV	0.0	33.8	54.0	-20.2	Mid Ch. 2442 MHz, 24 VDC, EUT Vert
12398.700	28.6	5.0	4.0	84.0	3.0	0.0	Vert	AV	0.0	33.6	54.0	-20.4	High Ch. 2480 MHz, 24 VDC, EUT Horz
12398.670	28.5	5.0	1.4	218.0	3.0	0.0	Horz	AV	0.0	33.5	54.0	-20.5	High Ch. 2480 MHz, 24 VDC, 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
12208.890	29.0	4.4	3.9	84.0	3.0	0.0	Vert	AV	0.0	33.4	54.0	-20.6	Mid Ch. 2442 MHz, 24 VDC, EUT Horz
12011.300	27.8	3.3	4.0	83.0	3.0	0.0	Vert	AV	0.0	31.1	54.0	-22.9	Low Ch. 2402 MHz, 24VDC, EUT Horz
12011.830	27.5	3.3	1.0	28.0	3.0	0.0	Horz	AV	0.0	30.8	54.0	-23.2	Low Ch. 2402 MHz, 24VDC, EUT Vert
4803.925	40.7	9.0	1.0	251.0	3.0	0.0	Vert	PK	0.0	49.7	74.0	-24.3	Low Ch. 2402 MHz, 24VDC, EUT Horz
4803.442	40.6	8.9	1.0	251.0	3.0	0.0	Vert	PK	0.0	49.5	74.0	-24.5	Low Ch. 2402 MHz, POE, EUT Horz
4804.758	40.4	9.0	2.3	46.0	3.0	0.0	Horz	PK	0.0	49.4	74.0	-24.6	Low Ch. 2402 MHz, 24VDC, EUT On Side
4804.217	39.8	9.0	1.0	335.0	3.0	0.0	Vert	PK	0.0	48.8	74.0	-25.2	Low Ch. 2402 MHz, POE, EUT On Side
4803.217	39.7	8.9	2.0	18.0	3.0	0.0	Horz	PK	0.0	48.6	74.0	-25.4	Low Ch. 2402 MHz, POE, EUT Vert
4803.617	39.6	9.0	2.4	14.0	3.0	0.0	Horz	PK	0.0	48.6	74.0	-25.4	Low Ch. 2402 MHz, POE, EUT On Side
4960.508	39.1	9.4	1.0	188.0	3.0	0.0	Horz	PK	0.0	48.5	74.0	-25.5	High Ch. 2480 MHz, 24 VDC, EUT Vert
4803.258	39.5	8.9	1.6	12.0	3.0	0.0	Horz	PK	0.0	48.4	74.0	-25.6	Low Ch. 2402 MHz, 24VDC, EUT Vert
4804.083	39.3	9.0	1.0	346.0	3.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7	Low Ch. 2402 MHz, 24VDC, EUT Vert
4804.233	39.3	9.0	1.6	20.0	3.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7	Low Ch. 2402 MHz, 24VDC, EUT On Side
4801.525	39.3	8.9	1.0	283.0	3.0	0.0	Horz	PK	0.0	48.2	74.0	-25.8	Low Ch. 2402 MHz, 24VDC, EUT Horz
4802.983	39.3	8.9	1.0	13.0	3.0	0.0	Horz	PK	0.0	48.2	74.0	-25.8	Low Ch. 2402 MHz, POE, EUT Vert
4804.483	38.8	9.0	1.0	113.0	3.0	0.0	Horz	PK	0.0	47.8	74.0	-26.2	Low Ch. 2402 MHz, POE, EUT Horz
4883.200	38.6	9.2	1.9	360.0	3.0	0.0	Horz	PK	0.0	47.8	74.0	-26.2	Mid Ch. 2442 MHz, 24 VDC, EUT Vert
4883.583	38.5	9.2	1.0	230.0	3.0	0.0	Vert	PK	0.0	47.7	74.0	-26.3	Mid Ch. 2442 MHz, 24 VDC, EUT Horz
4958.575	37.9	9.4	1.0	247.0	3.0	0.0	Vert	PK	0.0	47.3	74.0	-26.7	High Ch. 2480 MHz, 24 VDC, EUT Horz
12398.790	40.0	5.0	1.4	218.0	3.0	0.0	Horz	PK	0.0	45.0	74.0	-29.0	High Ch. 2480 MHz, 24 VDC, EUT Vert
12398.880	39.3	5.0	4.0	84.0	3.0	0.0	Vert	PK	0.0	44.3	74.0	-29.7	High Ch. 2480 MHz, 24 VDC, EUT Horz
12208.430	39.8	4.4	3.9	84.0	3.0	0.0	Vert	PK	0.0	44.2	74.0	-29.8	Mid Ch. 2442 MHz, 24 VDC, EUT Horz
12210.090	39.1	4.4	3.8	189.0	3.0	0.0	Horz	PK	0.0	43.5	74.0	-30.5	Mid Ch. 2442 MHz, 24 VDC, EUT Vert
12011.610	38.6	3.3	4.0	83.0	3.0	0.0	Vert	PK	0.0	41.9	74.0	-32.1	Low Ch. 2402 MHz, 24VDC, EUT Horz
12007.970	38.0	3.3	1.0	28.0	3.0	0.0	Horz	PK	0.0	41.3	74.0	-32.7	Low Ch. 2402 MHz, 24VDC, EUT Vert

# SPURIOUS RADIATED EMISSIONS

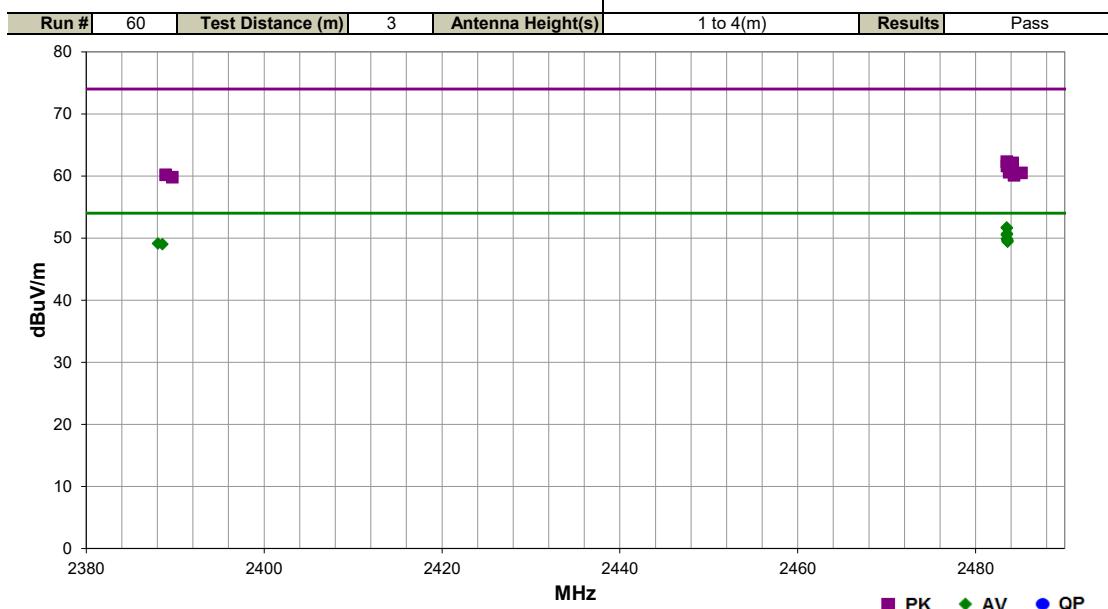
NORTHWEST  
**EMC**

PSA-ESCI 2016.07.22

EmiR5 2016.07.22.1

Work Order:	SYNA0194	Date:	09/08/16	
Project:	None	Temperature:	23 °C	
Job Site:	EV01	Humidity:	46.3% RH	
Serial Number:	850-1631004	Barometric Pres.:	1028 mbar	
EUT:	TPv2 (DAP 2)	Tested by:	Jared Ison	
Configuration:	7			
Customer:	Walt Disney Parks and Resorts US, Inc.			
Attendees:	None			
EUT Power:	POE			
Operating Mode:	Transmit.			
Deviations:	None			
Comments:	face plate # 3691-3605.			

Test Specifications	Test Method
FCC 15.247:2016	ANSI C63.10:2013



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
2483.503	32.8	-1.1	1.0	136.0	3.0	20.0	Vert	AV	0.0	51.7	54.0	-2.3	High Ch. 2480 MHz, POE, EUT Horz
2483.527	32.7	-1.1	1.0	142.0	3.0	20.0	Vert	AV	0.0	51.6	54.0	-2.4	High Ch. 2480 MHz, 24 VDC, EUT Horz
2483.540	31.8	-1.1	1.0	65.0	3.0	20.0	Horz	AV	0.0	50.7	54.0	-3.3	High Ch. 2480 MHz, 24 VDC, EUT Vert
2483.500	31.6	-1.1	1.0	56.0	3.0	20.0	Horz	AV	0.0	50.5	54.0	-3.5	High Ch. 2480 MHz, POE, EUT Vert
2483.530	31.0	-1.1	1.0	46.0	3.0	20.0	Horz	AV	0.0	49.9	54.0	-4.1	High Ch. 2480 MHz, 24 VDC, EUT On Side
2483.567	30.8	-1.1	1.0	0.0	3.0	20.0	Vert	AV	0.0	49.7	54.0	-4.3	High Ch. 2480 MHz, 24 VDC, EUT Vert
2483.593	30.7	-1.1	1.0	84.0	3.0	20.0	Horz	AV	0.0	49.6	54.0	-4.4	High Ch. 2480 MHz, 24 VDC, EUT Horz
2483.593	30.5	-1.1	1.0	128.0	3.0	20.0	Vert	AV	0.0	49.4	54.0	-4.6	High Ch. 2480 MHz, 24 VDC, EUT On Side
2388.073	30.7	-1.6	1.2	0.0	3.0	20.0	Horz	AV	0.0	49.1	54.0	-4.9	Low Ch. 2402 MHz, 24 VDC, EUT Vert
2388.567	30.6	-1.6	1.0	55.0	3.0	20.0	Vert	AV	0.0	49.0	54.0	-5.0	Low Ch. 2402 MHz, 24 VDC, EUT Horz
2483.510	43.4	-1.1	1.0	142.0	3.0	20.0	Vert	PK	0.0	62.3	74.0	-11.7	High Ch. 2480 MHz, 24 VDC, EUT Horz
2484.163	43.2	-1.1	1.0	65.0	3.0	20.0	Horz	PK	0.0	62.1	74.0	-11.9	High Ch. 2480 MHz, 24 VDC, EUT Vert
2483.517	42.7	-1.1	1.0	136.0	3.0	20.0	Vert	PK	0.0	61.6	74.0	-12.4	High Ch. 2480 MHz, POE, EUT Horz
2483.807	42.2	-1.1	1.0	56.0	3.0	20.0	Horz	PK	0.0	61.1	74.0	-12.9	High Ch. 2480 MHz, POE, EUT Vert
2483.773	42.0	-1.1	1.0	46.0	3.0	20.0	Horz	PK	0.0	60.9	74.0	-13.1	High Ch. 2480 MHz, 24 VDC, EUT On Side
2483.780	41.7	-1.1	1.0	0.0	3.0	20.0	Vert	PK	0.0	60.6	74.0	-13.4	High Ch. 2480 MHz, 24 VDC, EUT Vert
2485.150	41.6	-1.1	1.0	84.0	3.0	20.0	Horz	PK	0.0	60.5	74.0	-13.5	High Ch. 2480 MHz, 24 VDC, EUT Horz
2388.917	41.8	-1.6	1.0	55.0	3.0	20.0	Vert	PK	0.0	60.2	74.0	-13.8	Low Ch. 2402 MHz, 24 VDC, EUT Horz
2484.327	41.2	-1.1	1.0	128.0	3.0	20.0	Vert	PK	0.0	60.1	74.0	-13.9	High Ch. 2480 MHz, 24 VDC, EUT On Side
2389.677	41.4	-1.6	1.2	0.0	3.0	20.0	Horz	PK	0.0	59.8	74.0	-14.2	Low Ch. 2402 MHz, 24 VDC, EUT Vert

# DUTY CYCLE

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
Meter - Multimeter	Tektronix	DMM912	MMH	2/17/2016	2/17/2019
Power Supply - DC	Topward	TPS-2000	TPD	NCR	NCR
Attenuator	S.M. Electronics	SA26B-20	AUY	6/27/2016	6/27/2017
Block - DC	Pasternack	PE8210	AME	10/1/2015	10/1/2016
Cable	ESM Cable Corp.	TT	EV1	NCR	NCR
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	8/10/2016	8/10/2017
Generator - Signal	Keysight	N5182B	TFU	10/27/2015	10/27/2018

## 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.

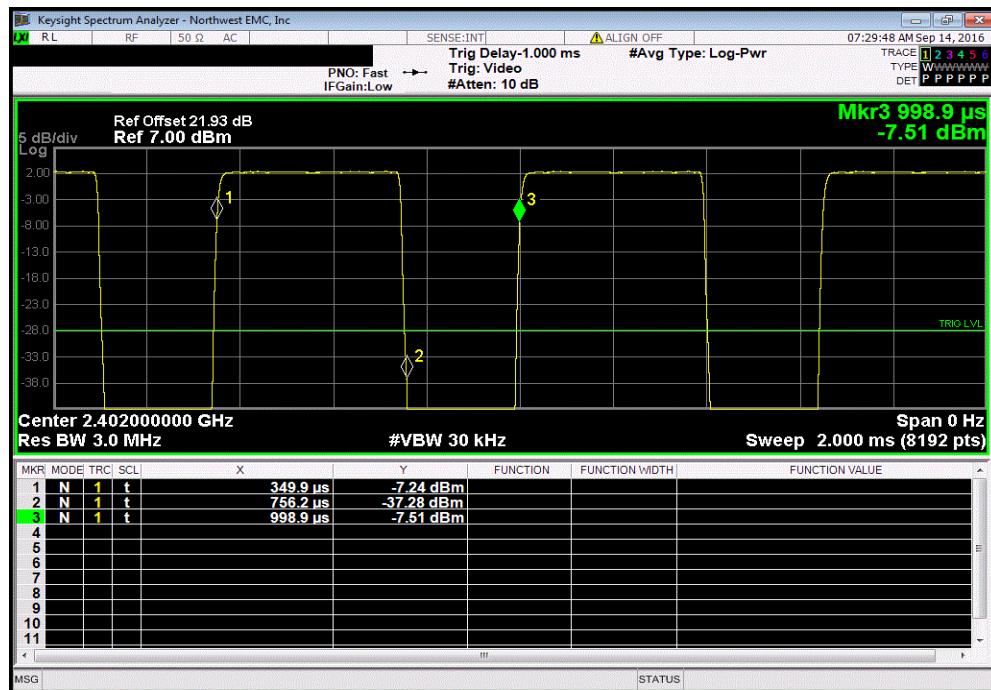
# DUTY CYCLE

EUT:	TPv2 (DAP 2)		Work Order:	SYNA0194	
Serial Number:	850-1631035		Date:	09/13/16	
Customer:	Walt Disney Parks and Resorts US, Inc.		Temperature:	23.7 °C	
Attendees:	None		Humidity:	37.9% RH	
Project:	None		Barometric Pres.:	1015 mbar	
Tested by:	Jared Ison	Power:	24 VDC	Job Site:	EV06
TEST SPECIFICATIONS			Test Method		
FCC 15.247:2016			ANSI C63.10:2013		
COMMENTS					
None					
DEVIATIONS FROM TEST STANDARD					
None					
Configuration #	1	Signature			
			Pulse Width	Period	Number of Pulses
BLE/GFSK Low Channel, 2402 MHz			406.3 us	649 us	1
BLE/GFSK Low Channel, 2402 MHz			N/A	N/A	5
BLE/GFSK Mid Channel, 2442 MHz			407.2 us	649 us	1
BLE/GFSK Mid Channel, 2442 MHz			N/A	N/A	5
BLE/GFSK High Channel, 2480 MHz			407.5 us	649.2 us	1
BLE/GFSK High Channel, 2480 MHz			N/A	N/A	5
					Value (%)
					Limit (%)
					Results

# DUTY CYCLE

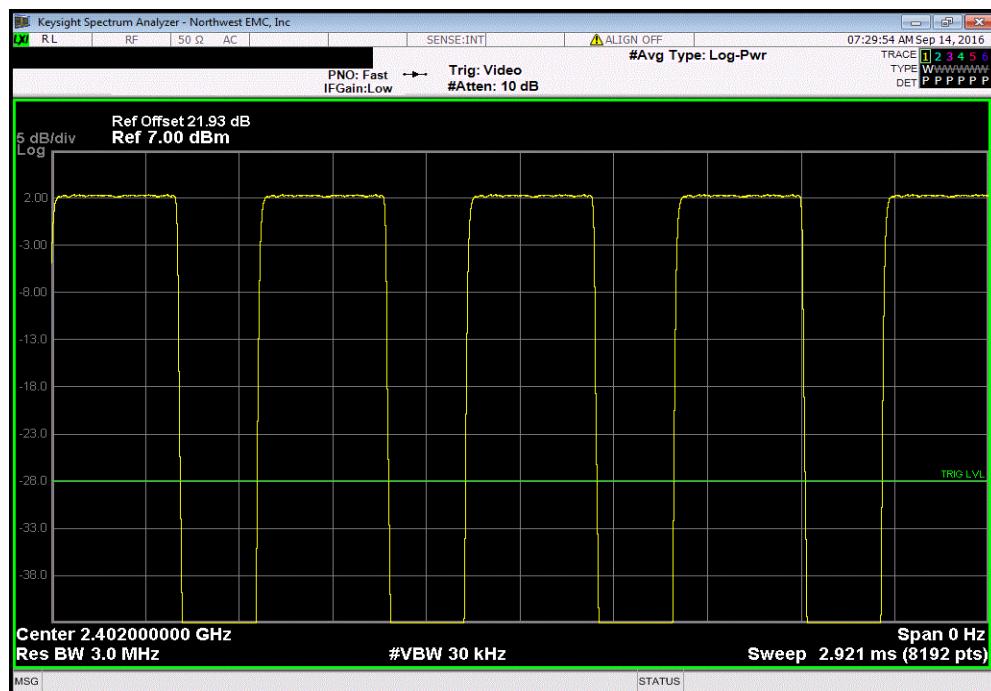
## BLE/GFSK Low Channel, 2402 MHz

Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
406.3 us	649 us	1	62.6	N/A	N/A



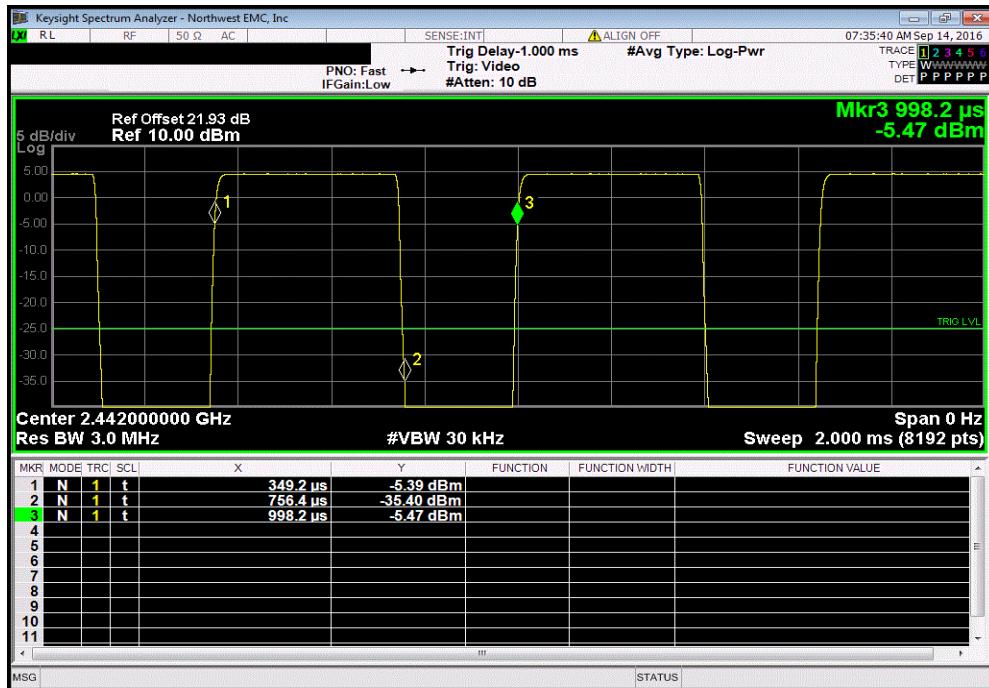
## BLE/GFSK Low Channel, 2402 MHz

Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
N/A	N/A	5	N/A	N/A	N/A

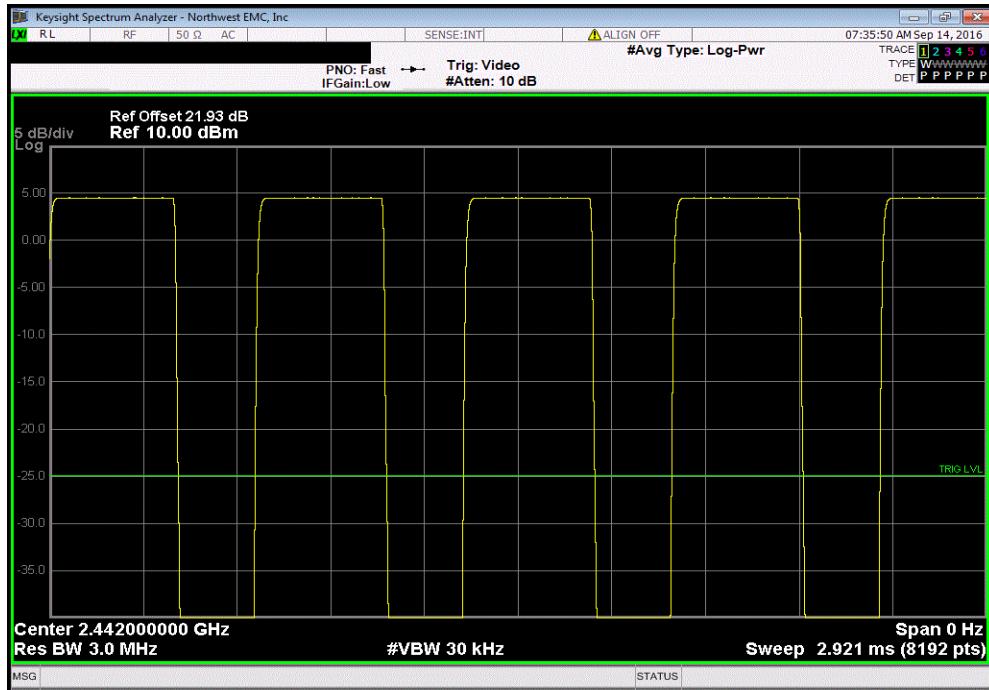


# DUTY CYCLE

BLE/GFSK Mid Channel, 2442 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
407.2 us	649 us	1	62.7	N/A	N/A	

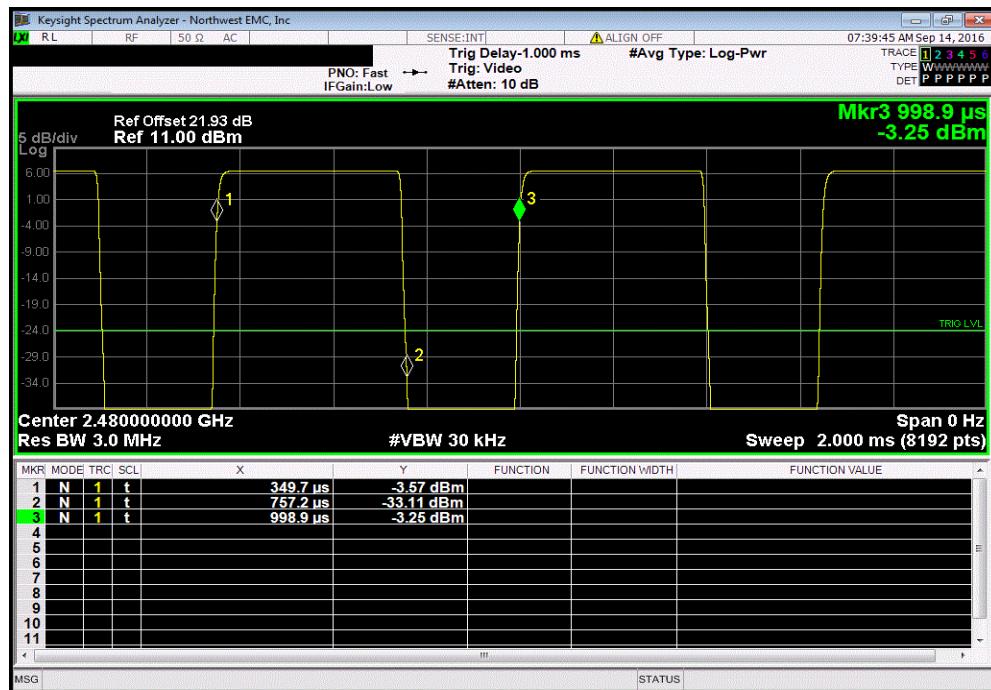


BLE/GFSK Mid Channel, 2442 MHz						
Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results	
N/A	N/A	5	N/A	N/A	N/A	N/A

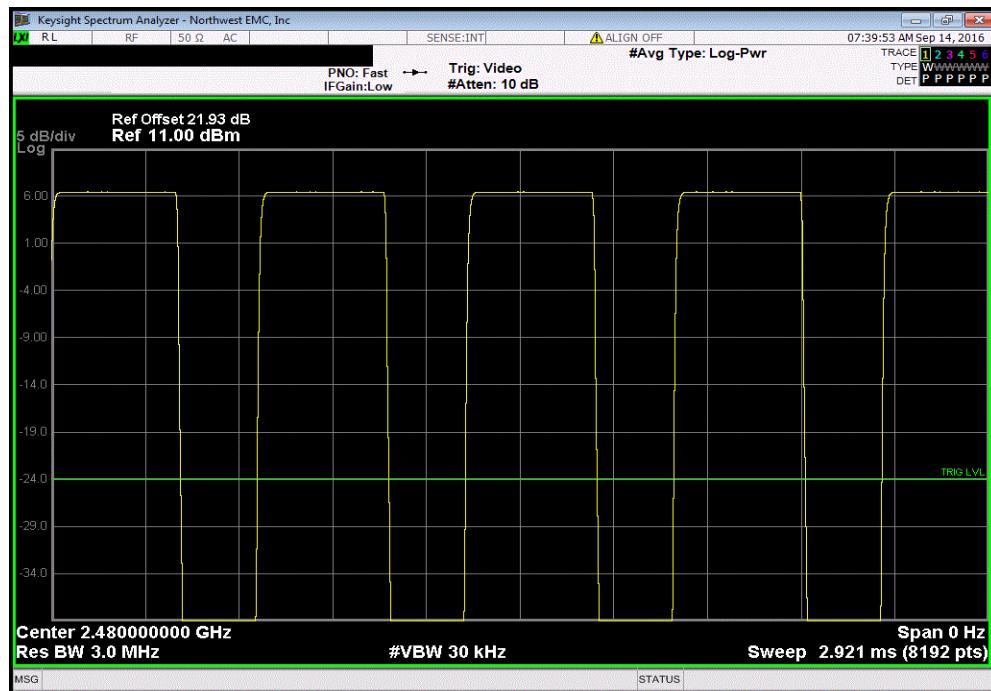


# DUTY CYCLE

BLE/GFSK High Channel, 2480 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	407.5 us	649.2 us	1	62.8	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

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
Meter - Multimeter	Tektronix	DMM912	MMH	2/17/2016	2/17/2019
Power Supply - DC	Topward	TPS-2000	TPD	NCR	NCR
Generator - Signal	Keysight	N5182B	TFU	10/27/2015	10/27/2018
Attenuator	S.M. Electronics	SA26B-20	AUY	6/27/2016	6/27/2017
Block - DC	Pasternack	PE8210	AME	10/1/2015	10/1/2016
Cable	ESM Cable Corp.	TT	EV1	NCR	NCR
Generator - Signal	Keysight	N5182B	TFU	10/27/2015	10/27/2018
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	8/10/2016	8/10/2017

## 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.

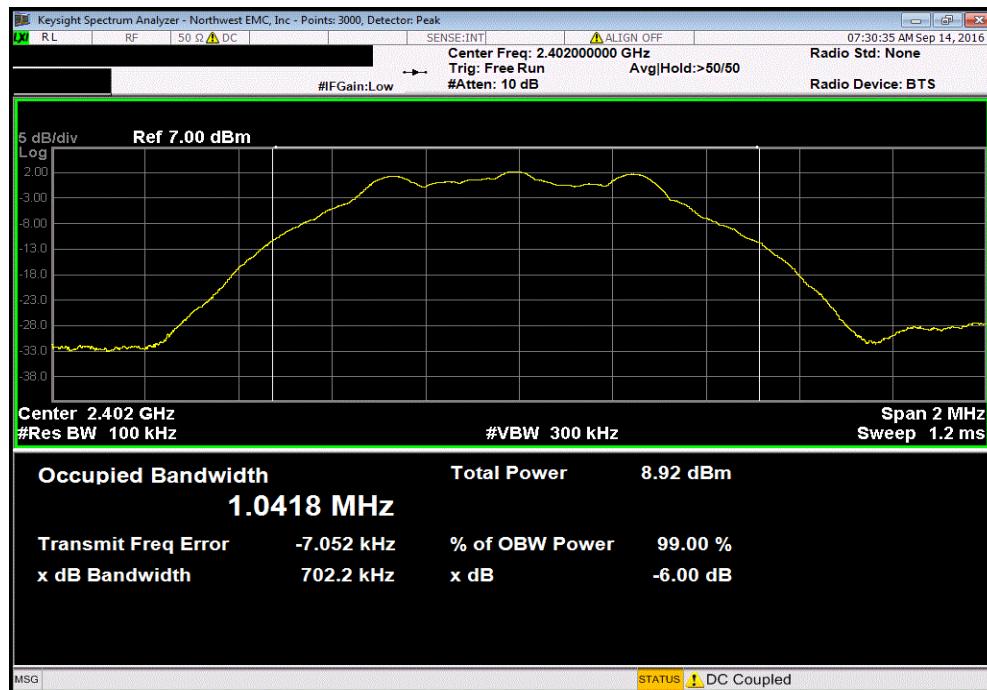
# OCCUPIED BANDWIDTH

EUT:	TPv2 (DAP 2)	Work Order:	SYNA0194
Serial Number:	850-1631035	Date:	09/13/16
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	23.7 °C
Attendees:	None	Humidity:	37.8% RH
Project:	None	Barometric Pres.:	1015 mbar
Tested by:	Jared Ison	Power:	24 VDC
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2016		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature	
		Value	Limit (±)
		702.195 kHz	500 kHz
		708.677 kHz	500 kHz
		711.805 kHz	500 kHz

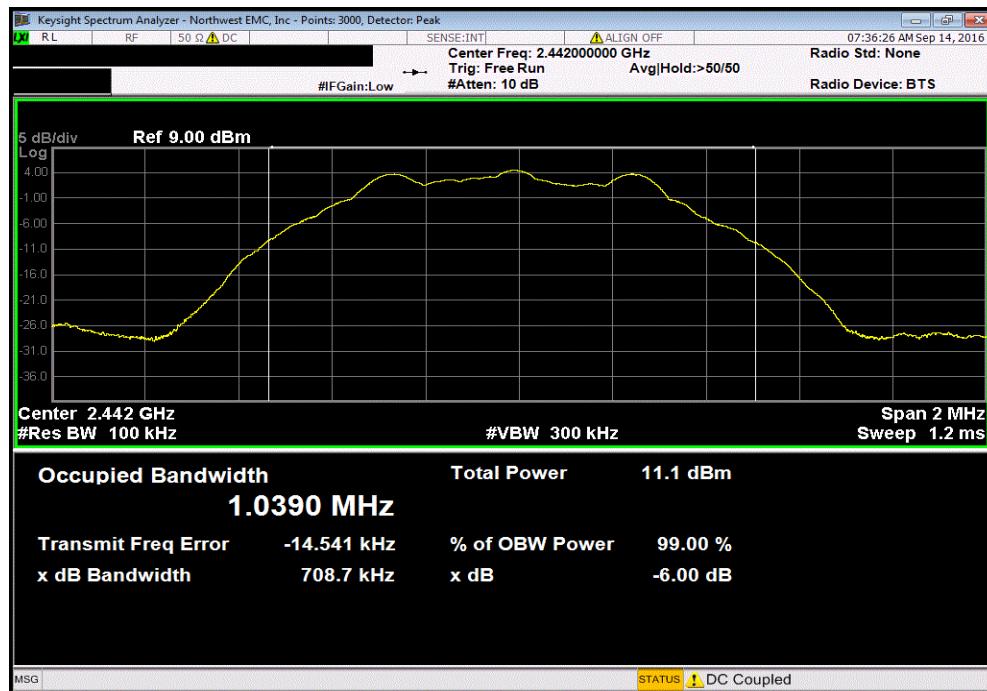
BLE/GFSK Low Channel, 2402 MHz  
BLE/GFSK Mid Channel, 2442 MHz  
BLE/GFSK High Channel, 2480 MHz

# OCCUPIED BANDWIDTH

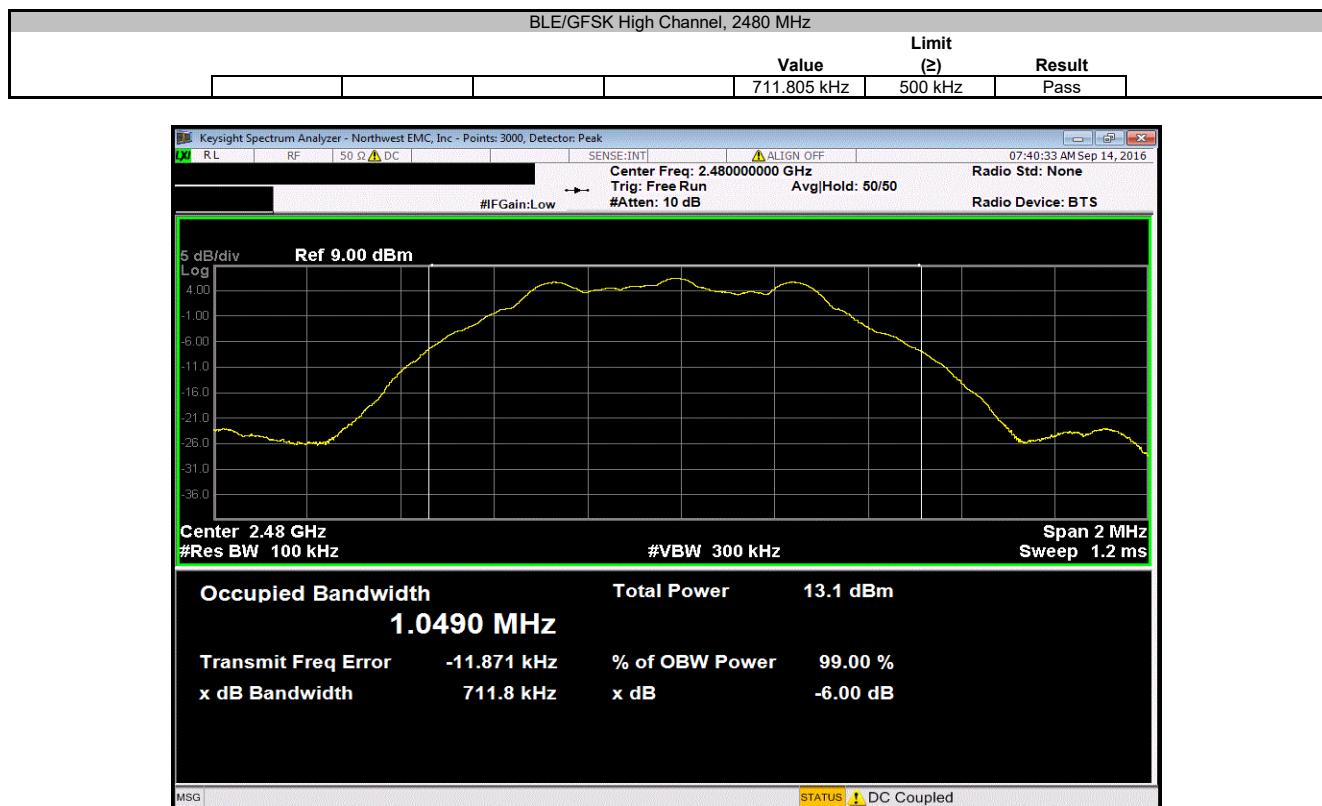
BLE/GFSK Low Channel, 2402 MHz			Value	Limit	Result
			702.195 kHz	500 kHz	Pass



BLE/GFSK Mid Channel, 2442 MHz			Value	Limit	Result
			708.677 kHz	500 kHz	Pass



# OCCUPIED BANDWIDTH



# 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.	Cal. Due
Meter - Multimeter	Tektronix	DMM912	MMH	2/17/2016	2/17/2019
Power Supply - DC	Topward	TPS-2000	TPD	NCR	NCR
Attenuator	S.M. Electronics	SA26B-20	AUY	6/27/2016	6/27/2017
Block - DC	Pasternack	PE8210	AME	10/1/2015	10/1/2016
Cable	ESM Cable Corp.	TT	EV1	NCR	NCR
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	8/10/2016	8/10/2017
Generator - Signal	Keysight	N5182B	TFU	10/27/2015	10/27/2018

## 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) 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 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.

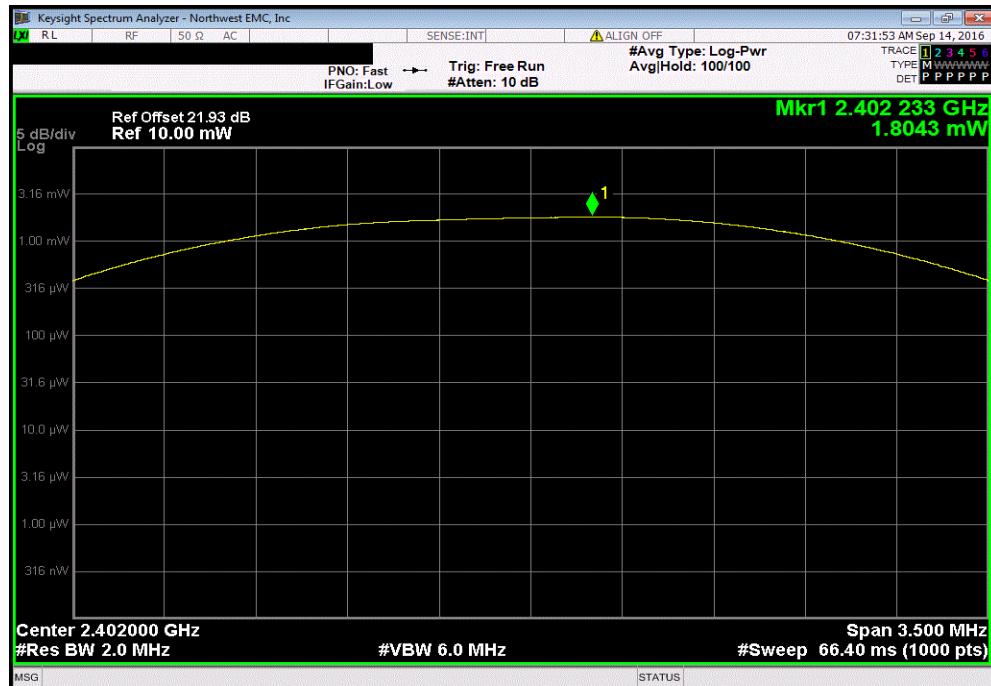
# OUTPUT POWER

EUT:	TPv2 (DAP 2)	Work Order:	SYNA0194
Serial Number:	850-1631035	Date:	09/13/16
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	23.7 °C
Attendees:	None	Humidity:	37.8% RH
Project:	None	Barometric Pres.:	1015 mbarr
Tested by:	Jared Ison	Power:	24 VDC
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2016		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature	
		Value	Limit (<)
		1.804 mW	1 W
		2.956 mW	1 W
		4.584 mW	1 W
		Pass	
		Pass	
		Pass	

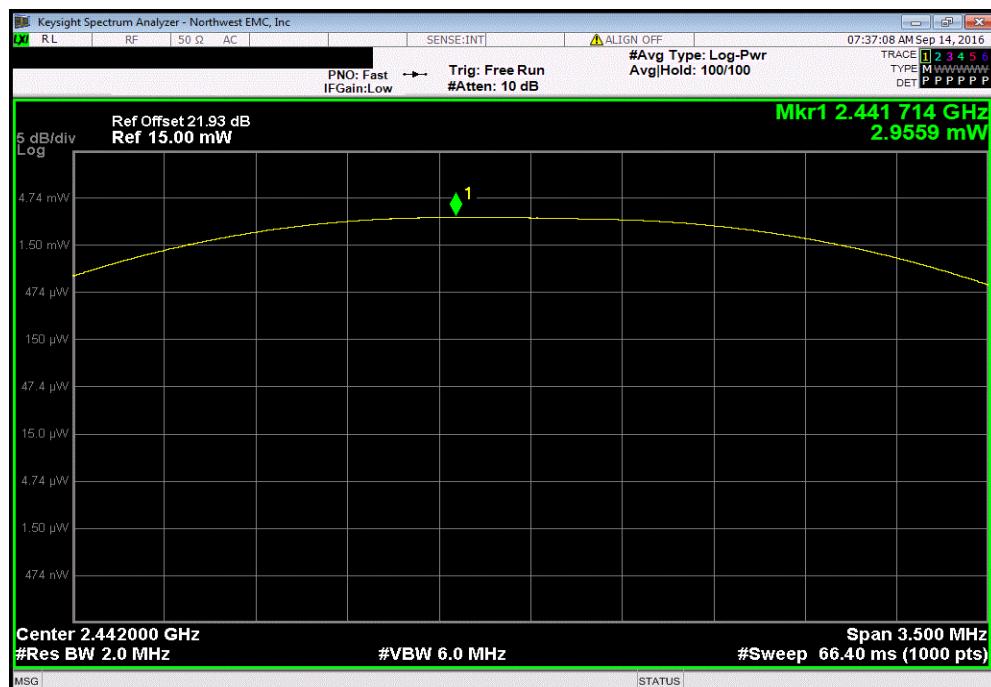
BLE/GFSK Low Channel, 2402 MHz  
BLE/GFSK Mid Channel, 2442 MHz  
BLE/GFSK High Channel, 2480 MHz

## OUTPUT POWER

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

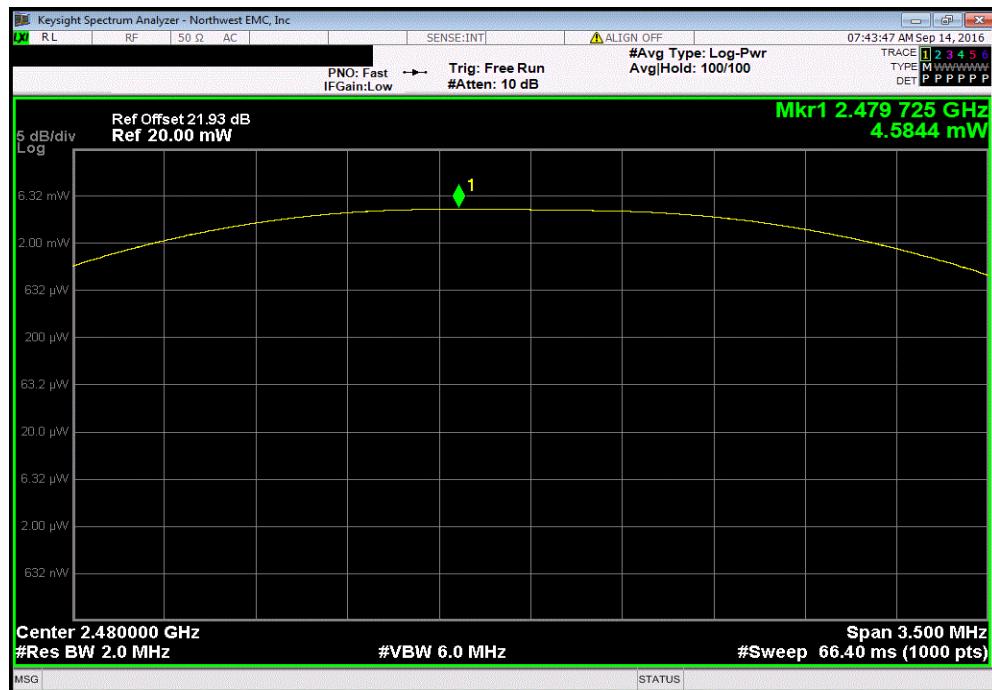


BLE/GFSK Mid Channel, 2442 MHz						
			Value	Limit (<)	Result	
			2.956 mW	1 W	Pass	



# OUTPUT POWER

BLE/GFSK High Channel, 2480 MHz			Limit	
Value	(<)	Result		
4.584 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.	Cal. Due
Meter - Multimeter	Tektronix	DMM912	MMH	2/17/2016	2/17/2019
Power Supply - DC	Topward	TPS-2000	TPD	NCR	NCR
Attenuator	S.M. Electronics	SA26B-20	AUY	6/27/2016	6/27/2017
Block - DC	Pasternack	PE8210	AME	10/1/2015	10/1/2016
Cable	ESM Cable Corp.	TT	EV1	NCR	NCR
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	8/10/2016	8/10/2017
Generator - Signal	Keysight	N5182B	TFU	10/27/2015	10/27/2018

## 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.

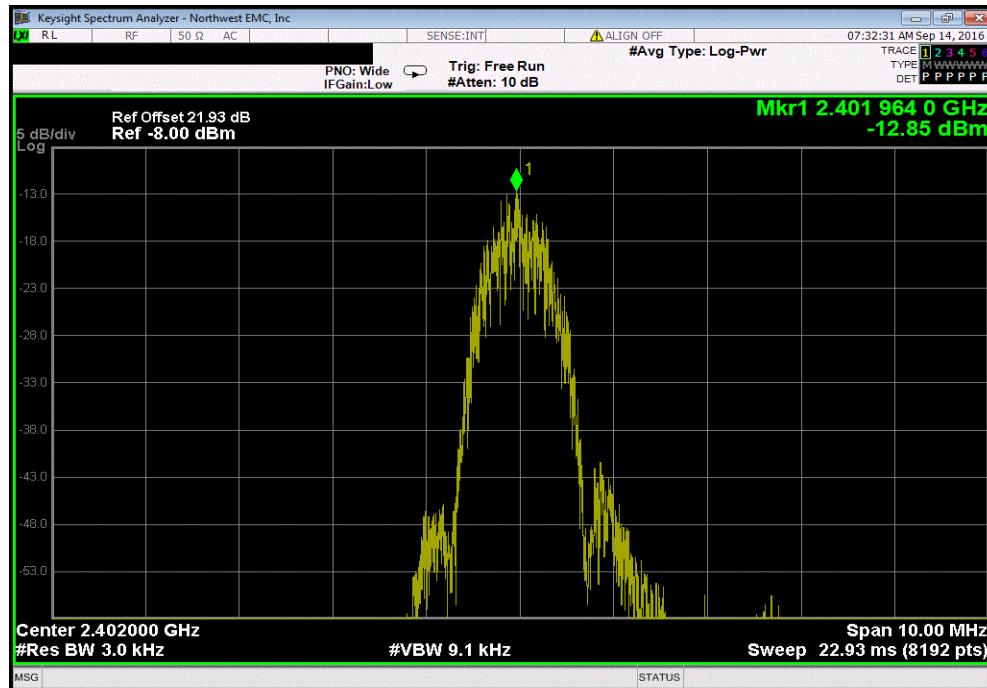
Per the procedure outlined in ANSI C63.10 the peak power spectral density was measured in a 3 kHz RBW.

# POWER SPECTRAL DENSITY

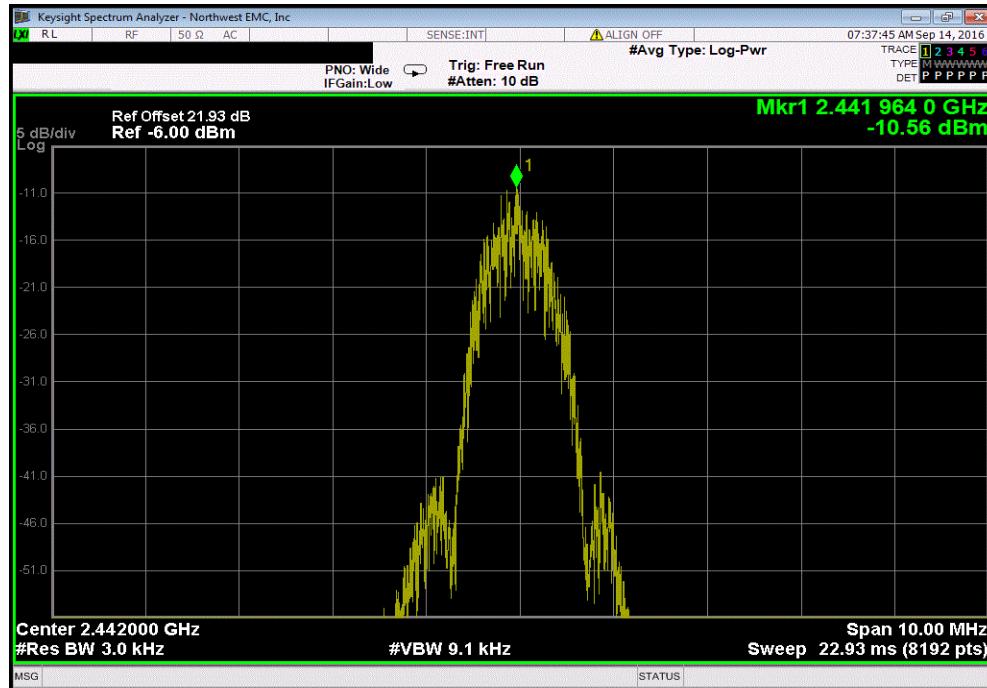
EUT:	TPv2 (DAP 2)	Work Order:	SYNA0194	
Serial Number:	850-1631035	Date:	09/13/16	
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	23.7 °C	
Attendees:	None	Humidity:	37.8% RH	
Project:	None	Barometric Pres.:	1015 mbar	
Tested by:	Jared Ison	Power:	24 VDC	
TEST SPECIFICATIONS		Test Method		
FCC 15.247:2016		ANSI C63.10:2013		
COMMENTS				
None				
DEVIATIONS FROM TEST STANDARD				
None				
Configuration #	1	Signature		
		Value dBm/3kHz	Limit < dBm/3kHz	Results
		-12.848	8	Pass
		-10.562	8	Pass
		-8.758	8	Pass
BLE/GFSK Low Channel, 2402 MHz				
BLE/GFSK Mid Channel, 2442 MHz				
BLE/GFSK High Channel, 2480 MHz				

# POWER SPECTRAL DENSITY

BLE/GFSK Low Channel, 2402 MHz				Value	Limit	Results
				dBm/3kHz	< dBm/3kHz	
				-12.848	8	Pass

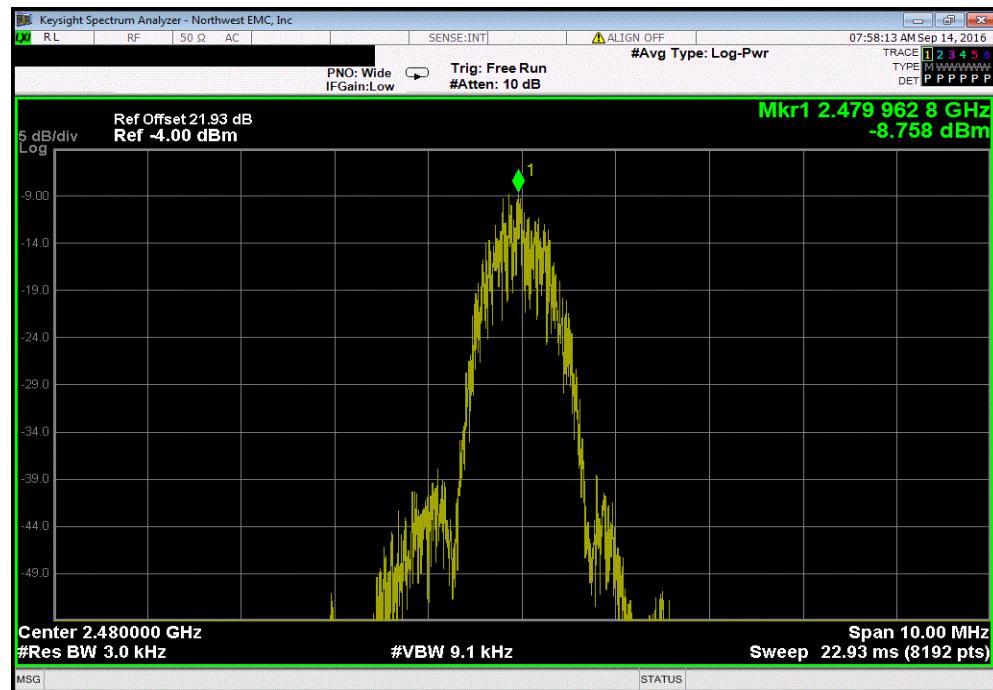


BLE/GFSK Mid Channel, 2442 MHz				Value	Limit	Results
				dBm/3kHz	< dBm/3kHz	
				-10.562	8	Pass



# POWER SPECTRAL DENSITY

BLE/GFSK High Channel, 2480 MHz				Value	Limit	Results
				dBm/3kHz	< dBm/3kHz	
				-8.758	8	Pass



# 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.	Cal. Due
Meter - Multimeter	Tektronix	DMM912	MMH	2/17/2016	2/17/2019
Generator - Signal	Keysight	N5182B	TFU	10/27/2015	10/27/2018
Attenuator	S.M. Electronics	SA26B-20	AUY	6/27/2016	6/27/2017
Block - DC	Pasternack	PE8210	AME	10/1/2015	10/1/2016
Cable	ESM Cable Corp.	TT	EV1	NCR	NCR
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	8/10/2016	8/10/2017
Power Supply - DC	Topward	TPS-2000	TPD	NCR	NCR

## 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.

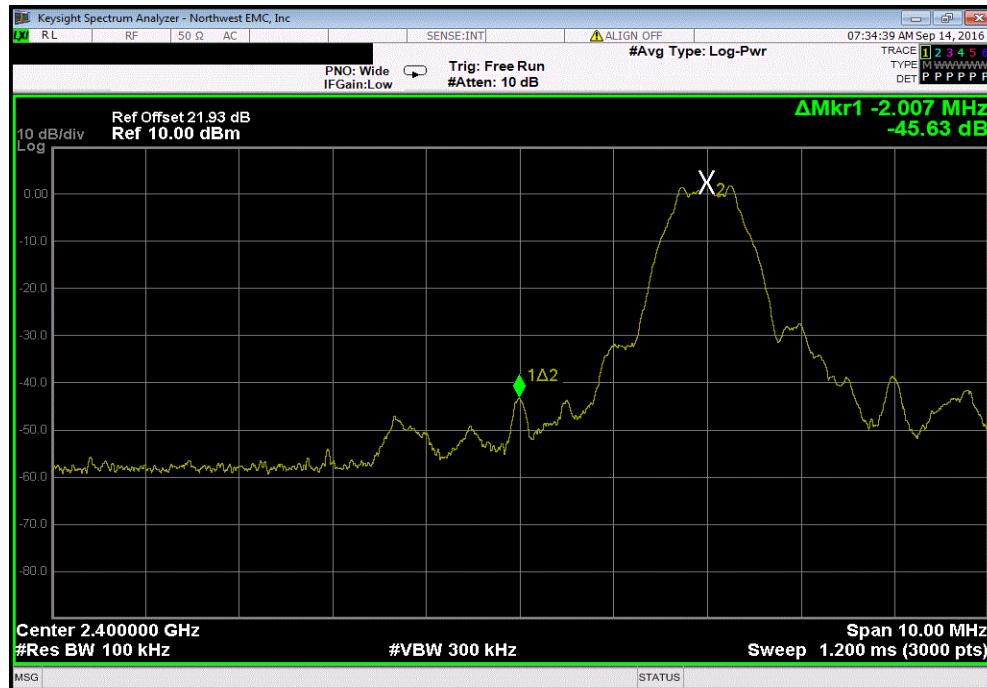
The spectrum was scanned below the lower band edge and above the higher band edge.

# BAND EDGE COMPLIANCE

EUT:	TPv2 (DAP 2)	Work Order:	SYNA0194	
Serial Number:	850-1631035	Date:	09/13/16	
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	23.7 °C	
Attendees:	None	Humidity:	37.7% RH	
Project:	None	Barometric Pres.:	1015 mbar	
Tested by:	Jared Ison	Power:	24 VDC	
TEST SPECIFICATIONS		Test Method		
FCC 15.247:2016		ANSI C63.10:2013		
COMMENTS				
None				
DEVIATIONS FROM TEST STANDARD				
None				
Configuration #	1	Signature		
		Value (dBc)	Limit ≤ (dBc)	Result
BLE/GFSK Low Channel, 2402 MHz		-45.63	-20	Pass
BLE/GFSK High Channel, 2480 MHz		-56.34	-20	Pass

# BAND EDGE COMPLIANCE

BLE/GFSK Low Channel, 2402 MHz		
Value (dBc)	Limit ≤ (dBc)	Result
-45.63	-20	Pass



BLE/GFSK High Channel, 2480 MHz		
Value (dBc)	Limit ≤ (dBc)	Result
-56.34	-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.	Cal. Due
Meter - Multimeter	Tektronix	DMM912	MMH	2/17/2016	2/17/2019
Power Supply - DC	Topward	TPS-2000	TPD	NCR	NCR
Attenuator	S.M. Electronics	SA26B-20	AUY	6/27/2016	6/27/2017
Block - DC	Pasternack	PE8210	AME	10/1/2015	10/1/2016
Cable	ESM Cable Corp.	TT	EV1	NCR	NCR
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	8/10/2016	8/10/2017
Generator - Signal	Keysight	N5182B	TFU	10/27/2015	10/27/2018

## TEST DESCRIPTION

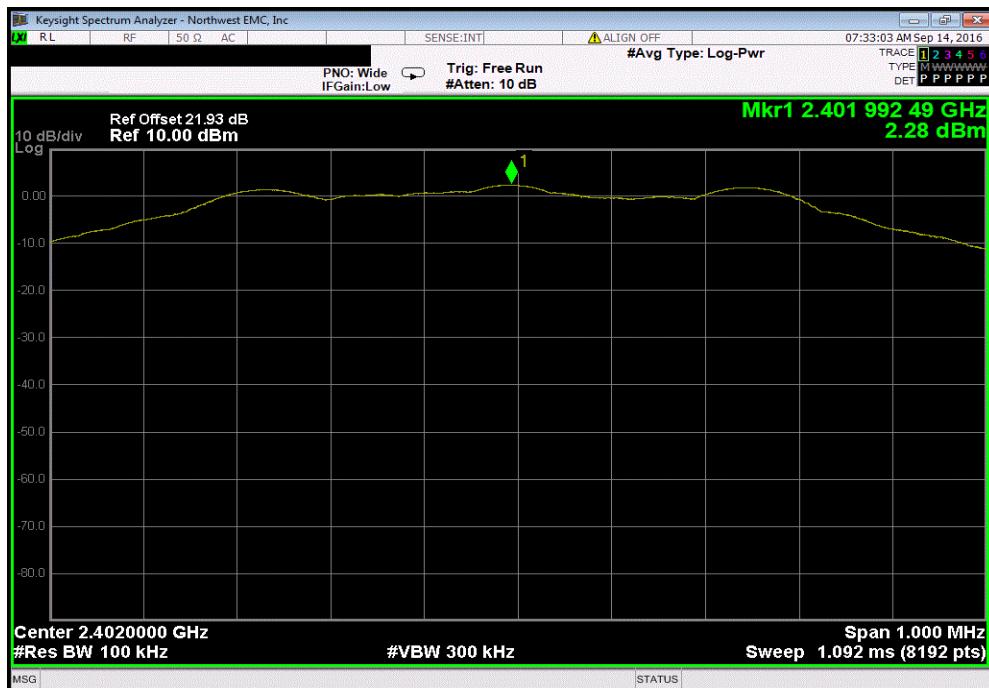
The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet. For each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

# SPURIOUS CONDUCTED EMISSIONS

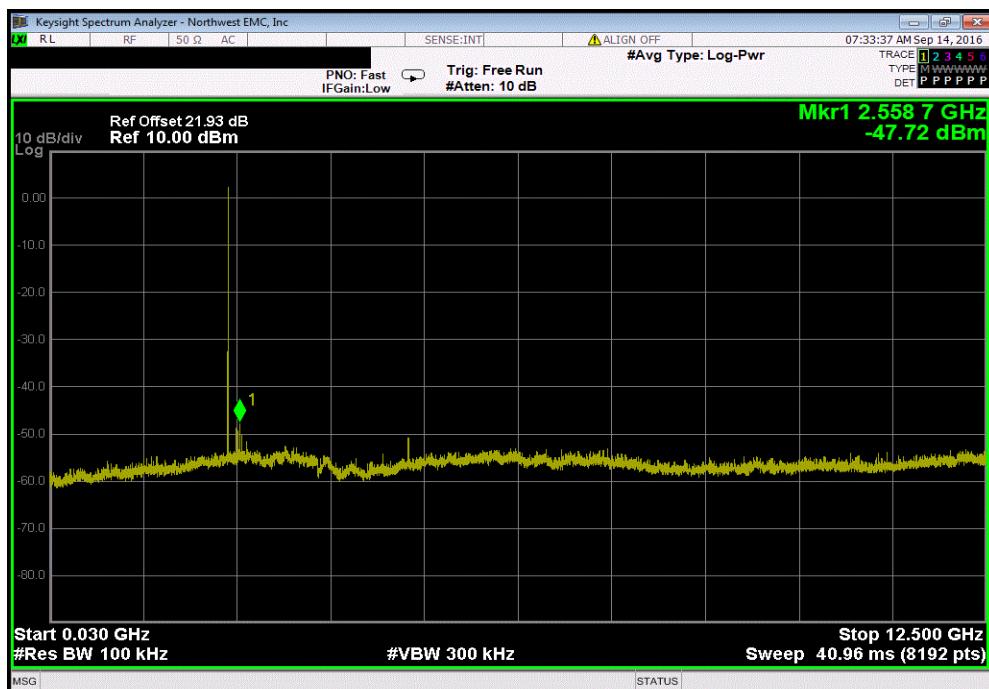
EUT:	TPv2 (DAP 2)	Work Order:	SYNA0194		
Serial Number:	850-1631035	Date:	09/13/16		
Customer:	Walt Disney Parks and Resorts US, Inc.	Temperature:	23.7 °C		
Attendees:	None	Humidity:	37.9% RH		
Project:	None	Barometric Pres.:	1015 mbar		
Tested by:	Jared Ison	Power:	24 VDC		
TEST SPECIFICATIONS		Test Method			
FCC 15.247:2016		ANSI C63.10:2013			
COMMENTS					
None					
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
BLE/GFSK Low Channel, 2402 MHz		30 MHz - 12.5 GHz	-50	-20	Pass
BLE/GFSK Low Channel, 2402 MHz		12.5 GHz - 25 GHz	-39.91	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz		Fundamental	N/A	N/A	N/A
BLE/GFSK Mid Channel, 2442 MHz		30 MHz - 12.5 GHz	-53.61	-20	Pass
BLE/GFSK Mid Channel, 2442 MHz		12.5 GHz - 25 GHz	-42.72	-20	Pass
BLE/GFSK High Channel, 2480 MHz		Fundamental	N/A	N/A	N/A
BLE/GFSK High Channel, 2480 MHz		30 MHz - 12.5 GHz	-55.68	-20	Pass
BLE/GFSK High Channel, 2480 MHz		12.5 GHz - 25 GHz	-44.3	-20	Pass

# SPURIOUS CONDUCTED EMISSIONS

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

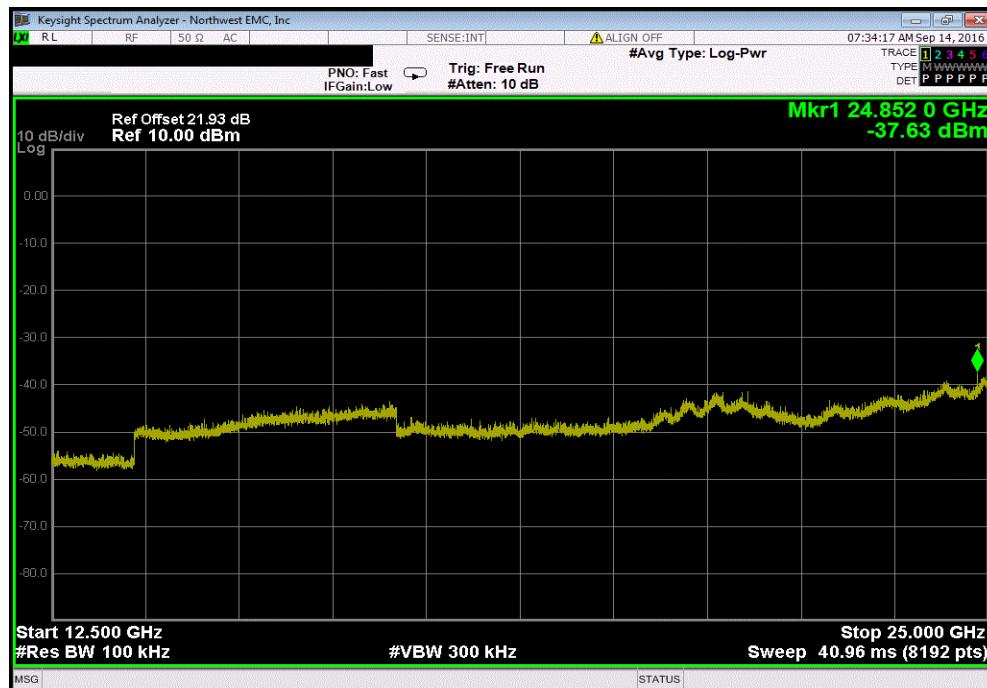


BLE/GFSK Low Channel, 2402 MHz				
Frequency Range	Max Value (dBc)	Limit $\leq$ (dBc)	Result	
30 MHz - 12.5 GHz	-50	-20	Pass	

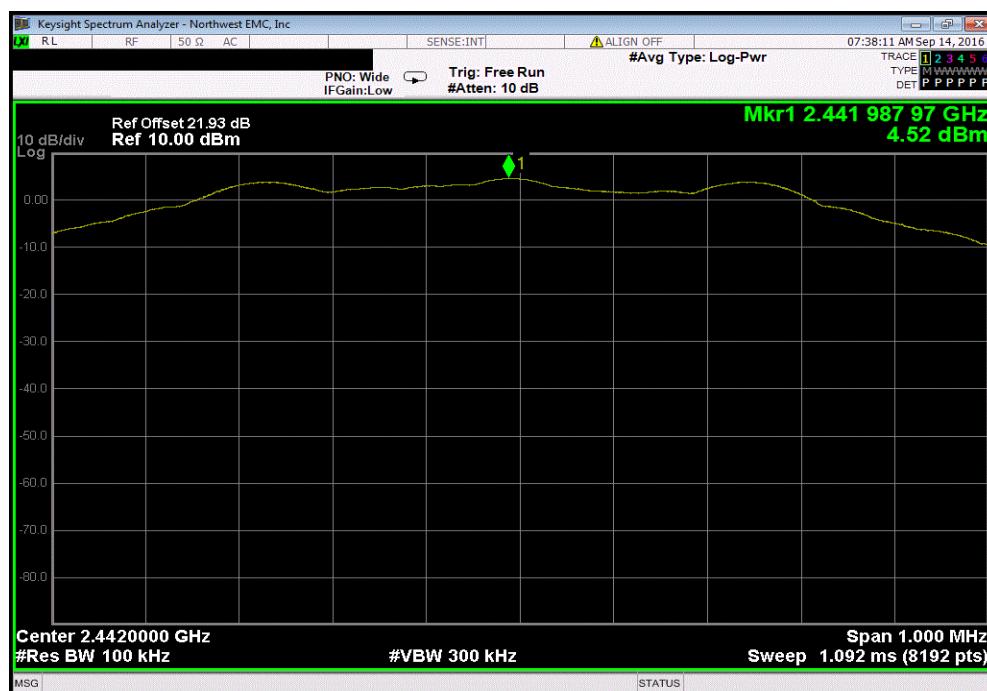


# SPURIOUS CONDUCTED EMISSIONS

Frequency Range		Max Value (dBc)	Limit $\leq$ (dBc)	Result
12.5 GHz - 25 GHz		-39.91	-20	Pass

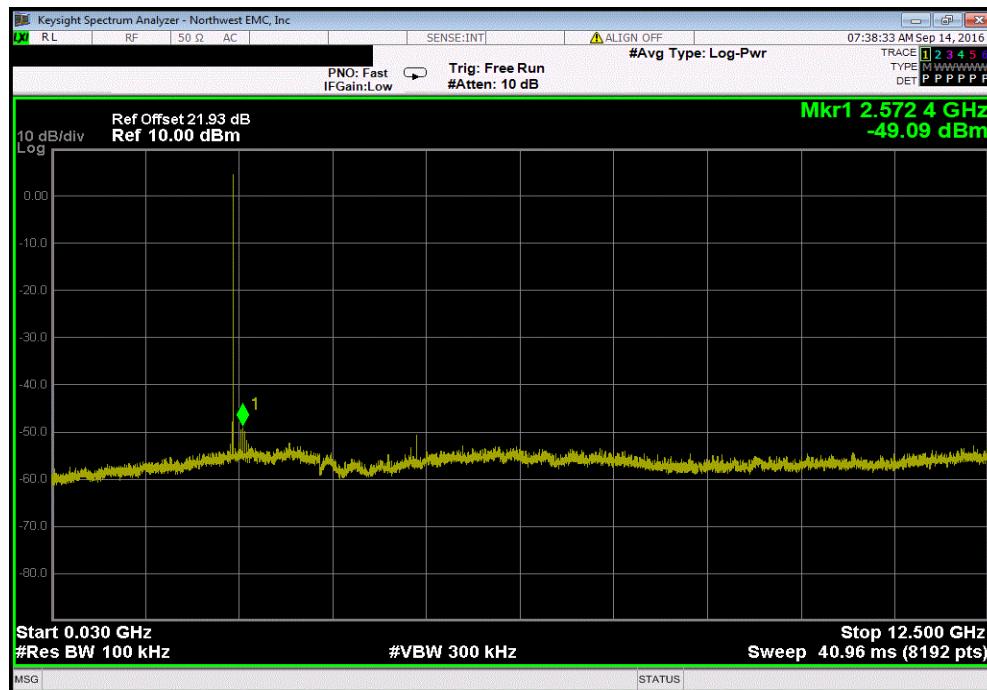


Frequency Range		Max Value (dBc)	Limit $\leq$ (dBc)	Result
Fundamental		N/A	N/A	N/A

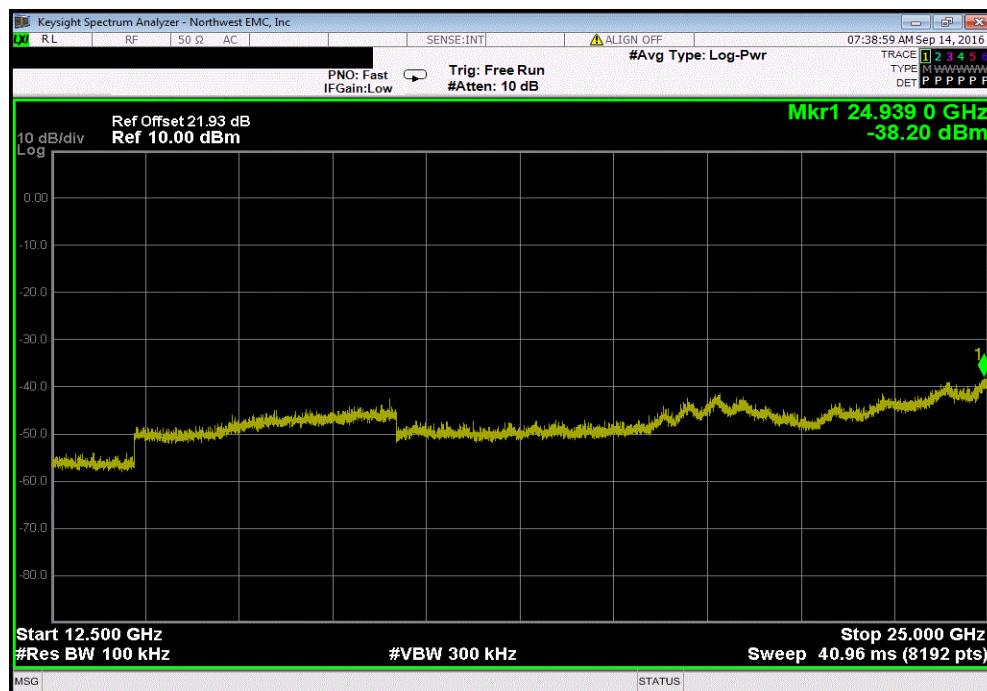


# SPURIOUS CONDUCTED EMISSIONS

BLE/GFSK Mid Channel, 2442 MHz			
Frequency Range	Max Value (dBc)	Limit $\leq$ (dBc)	Result
30 MHz - 12.5 GHz	-53.61	-20	Pass

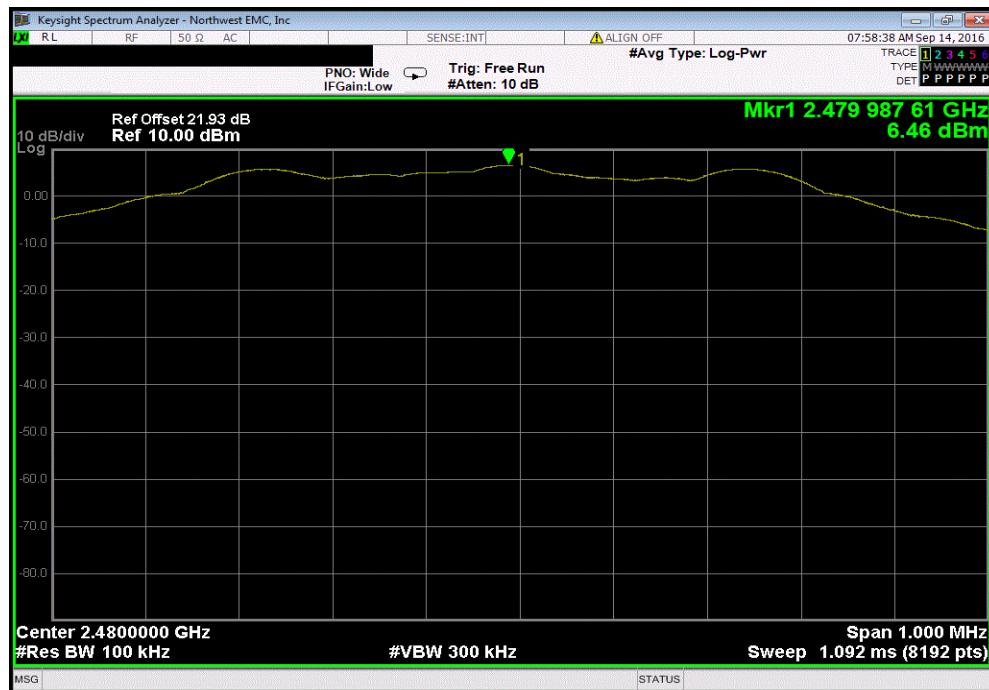


BLE/GFSK Mid Channel, 2442 MHz			
Frequency Range	Max Value (dBc)	Limit $\leq$ (dBc)	Result
12.5 GHz - 25 GHz	-42.72	-20	Pass

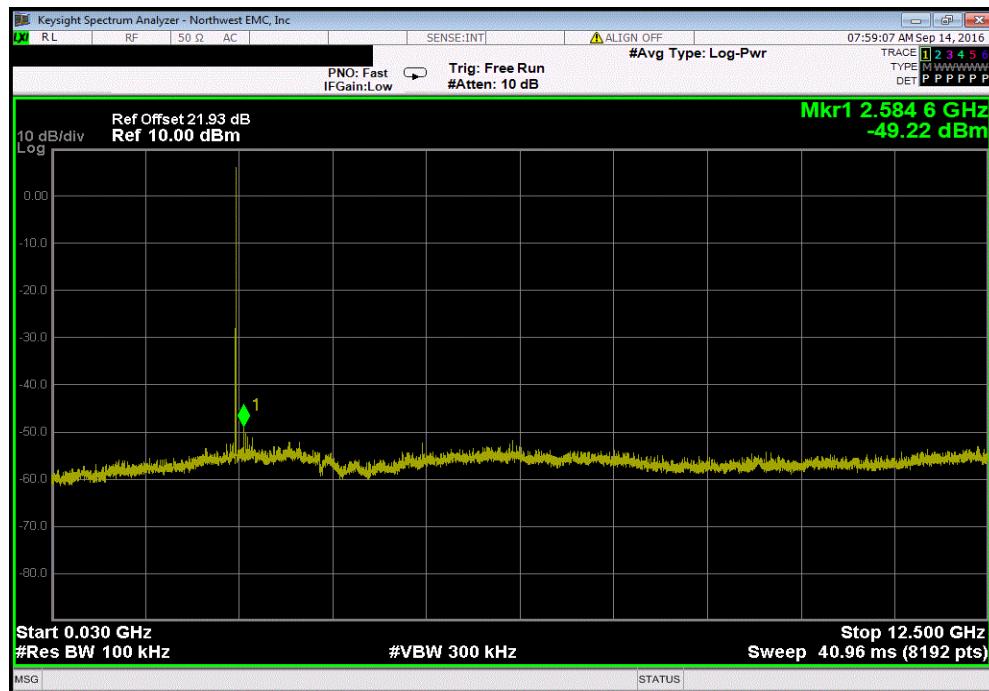


# SPURIOUS CONDUCTED EMISSIONS

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



BLE/GFSK High Channel, 2480 MHz					
Frequency Range	Max Value (dBc)	Limit $\leq$ (dBc)	Result		
30 MHz - 12.5 GHz	-55.68	-20	Pass		



# SPURIOUS CONDUCTED EMISSIONS

BLE/GFSK High Channel, 2480 MHz			
Frequency Range	Max Value (dBc)	Limit $\leq$ (dBc)	Result
12.5 GHz - 25 GHz	-44.3	-20	Pass

