



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

**Magicband**

**FCC 15.247:2018**

**Bluetooth Radio**

**Report # SYNA0236.1**



NVLAP Lab Code: 200630-0



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# CERTIFICATE OF TEST

Last Date of Test: February 15, 2018  
Walt Disney Parks and Resorts US, Inc.  
Model: Magicband

## Radio Equipment Testing

### Standards

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

### Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
11.12.1, 11.13.2, 6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
11.6	Duty Cycle	No	N/A	Not required.
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:

Kyle Holgate, Operations Manager

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



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## 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

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## 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.

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## European Union

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

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## Australia/New Zealand

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

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## Korea

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

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## Japan

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

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## 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.

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## Singapore

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

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## Israel

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

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## Hong Kong

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

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## Vietnam

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

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## 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>

# 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.

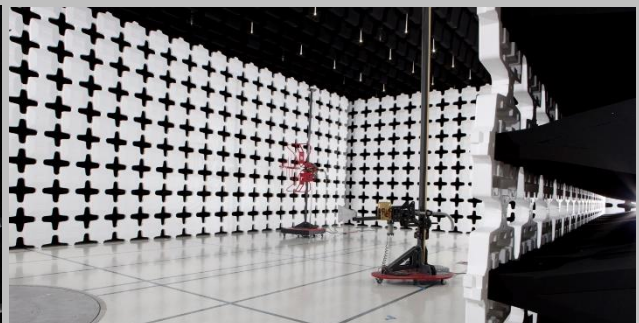
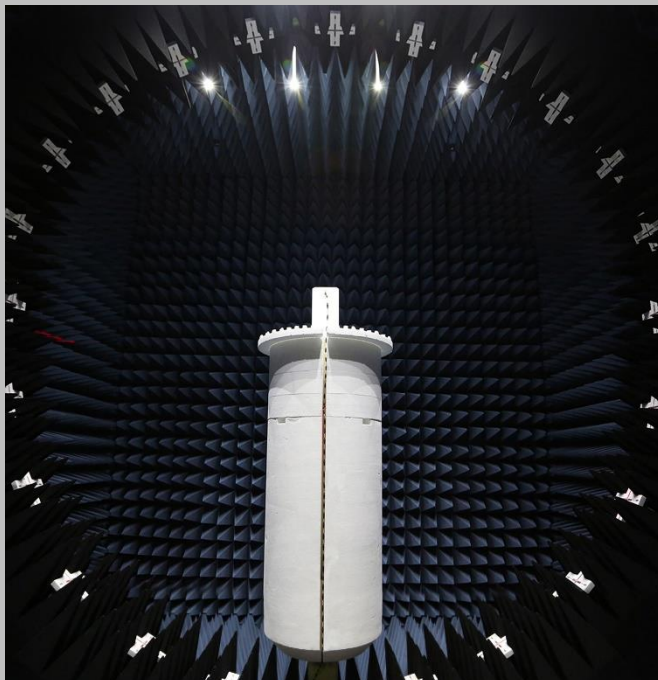
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

# FACILITIES

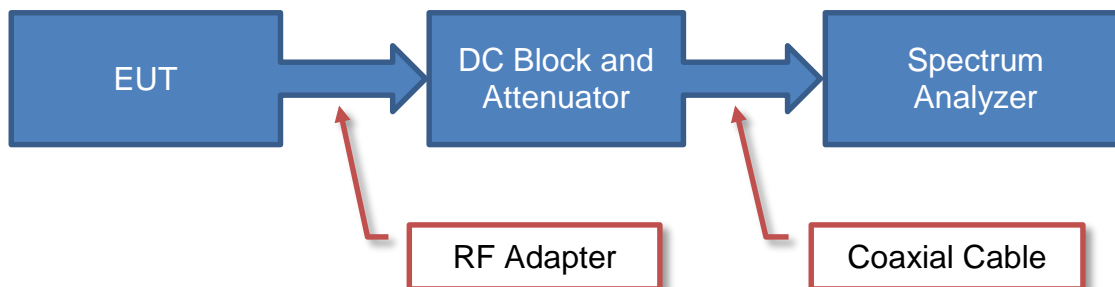


<b>California</b> Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	<b>Minnesota</b> Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	<b>New York</b> Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	<b>Oregon</b> Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro,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

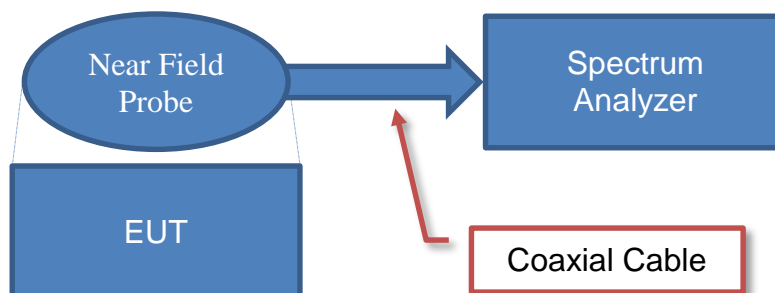


# Test Setup Block Diagrams

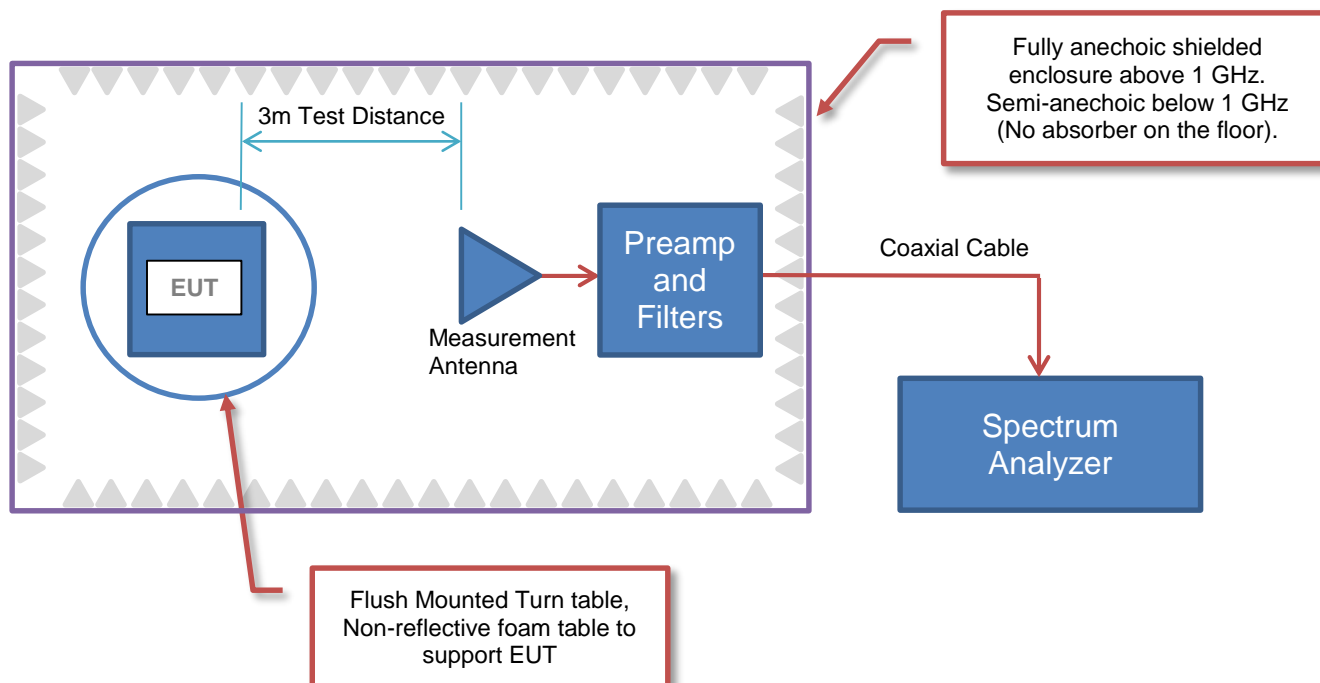
## Antenna Port Conducted Measurements



## Near Field Test Fixture Measurements



## Spurious Radiated Emissions







# PRODUCT DESCRIPTION

## Client and Equipment Under Test (EUT) Information

<b>Company Name:</b>	Walt Disney Parks and Resorts US, Inc.
<b>Address:</b>	PO Box 1000
<b>City, State, Zip:</b>	Lake Buena Vista, Florida 32830
<b>Test Requested By:</b>	Brian Piquette of Synapse Product Development on behalf of Walt Disney Parks and Resorts US, Inc.
<b>Model:</b>	Magicband
<b>First Date of Test:</b>	February 13, 2018
<b>Last Date of Test:</b>	February 15, 2018
<b>Receipt Date of Samples:</b>	February 12, 2018
<b>Equipment Design Stage:</b>	Production
<b>Equipment Condition:</b>	No Damage
<b>Purchase Authorization:</b>	Verified

## Information Provided by the Party Requesting the Test

<b>Functional Description of the EUT:</b>
Proprietary 2.4 GHz GFSK radio in a wristband form factor
<b>Testing Objective:</b>
To demonstrate compliance of the DTS to FCC 15.247 requirements for a Permissive Change under FCC ID: Q3E-MB-R1G2



# CONFIGURATIONS



## Configuration SYNA0236- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Magic Band Test Unit - Main	Walt Disney Parks and Resorts US, Inc.	J1 Yellow	xLRID 00.0A.5C.23.C2

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Battery Pack	Walt Disney Parks and Resorts US, Inc.	None	None

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
xBR Radio Unit	Walt Disney Parks and Resorts US, Inc.	xBR V3	0706
AC/DC Power Supply	Emerson	DA4-165US	1193HH009R01L
Laptop	HP	ProBook 450S	None
AC/DC Power Supply - Laptop	HP	PPP009C	F120881315056039

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Ethernet	No	0.9 m	No	xBR Radio Unit	Laptop
DC Power Cable	No	1.0 m	No	xBR Radio Unit	AC/DC Power Supply
AC Power Cable	No	1.0 m	No	AC/DC Power Supply - Laptop	AC Mains
DC Power Cable	No	1.0 m	No	Laptop	AC/DC Power Supply - Laptop

# CONFIGURATIONS



## Configuration SYNA0236- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Magic Band Test Unit - Female Coax	Walt Disney Parks and Resorts US, Inc.	C1 - Main	xLRID 00.0A.5C.20.A0

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Battery Pack	Walt Disney Parks and Resorts US, Inc.	None	None

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
xBR Radio Unit	Walt Disney Parks and Resorts US, Inc.	xBR V3	0706
AC/DC Power Supply	Emerson	DA4-165US	1193HH009R01L
Laptop	HP	ProBook 450S	None
AC/DC Power Supply - Laptop	HP	PPP009C	F120881315056039

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
Ethernet	No	0.9 m	No	xBR Radio Unit	Laptop
DC Power Cable	No	1.0 m	No	xBR Radio Unit	AC/DC Power Supply
AC Power Cable	No	1.0 m	No	AC/DC Power Supply - Laptop	AC Mains
DC Power Cable	No	1.0 m	No	Laptop	AC/DC Power Supply - Laptop

# MODIFICATIONS



## Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2/13/2018	Spurious Radiated 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.
2	2/15/2018	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.
3	2/15/2018	Occupied Bandwidth	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	2/15/2018	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.
5	2/15/2018	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.
6	2/15/2018	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

# SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2017.09.18

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

Continuous Tx, GFSK. Low channel - 2401 MHz, Mid channel - 2450 MHz, and High channel - 2476 MHz

## POWER SETTINGS INVESTIGATED

Battery

## CONFIGURATIONS INVESTIGATED

SYNA0236 - 1

## FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26500 MHz
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## SAMPLE CALCULATIONS

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

## TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Cable	ESM Cable Corp.	KMKM-72	EVY	31-Aug-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	31-Aug-2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AIV	NCR	0 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	30-Nov-2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AHV	NCR	0 mo
Filter - High Pass	Micro-Tronics	HPM50111	HFO	1-Feb-2018	12 mo
Cable	None	Standard Gain Horns Cable	EVF	30-Nov-2017	12 mo
Amplifier - Pre-Amplifier	L-3 Narda-MITEQ	AMF-6F-08001200-30-10P	PAO	30-Nov-2017	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHU	NCR	0 mo
Cable	N/A	Double Ridge Horn Cables	EVB	29-Nov-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	29-Nov-2017	12 mo
Antenna - Double Ridge	EMCO	3115	AHC	23-Jun-2016	24 mo
Cable	N/A	Bilog Cables	EVA	30-Nov-2017	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	LFD	19-Apr-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AOL	30-Nov-2017	12 mo
Antenna - Biconilog	Teseq	CBL 6141B	AXR	30-Jun-2016	24 mo
Attenuator	Coaxicom	3910-20	AXZ	4/19/2017	12 mo
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	13-Apr-2017	12 mo

## 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 ANSIC63.10). 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.

# SPURIOUS RADIATED EMISSIONS



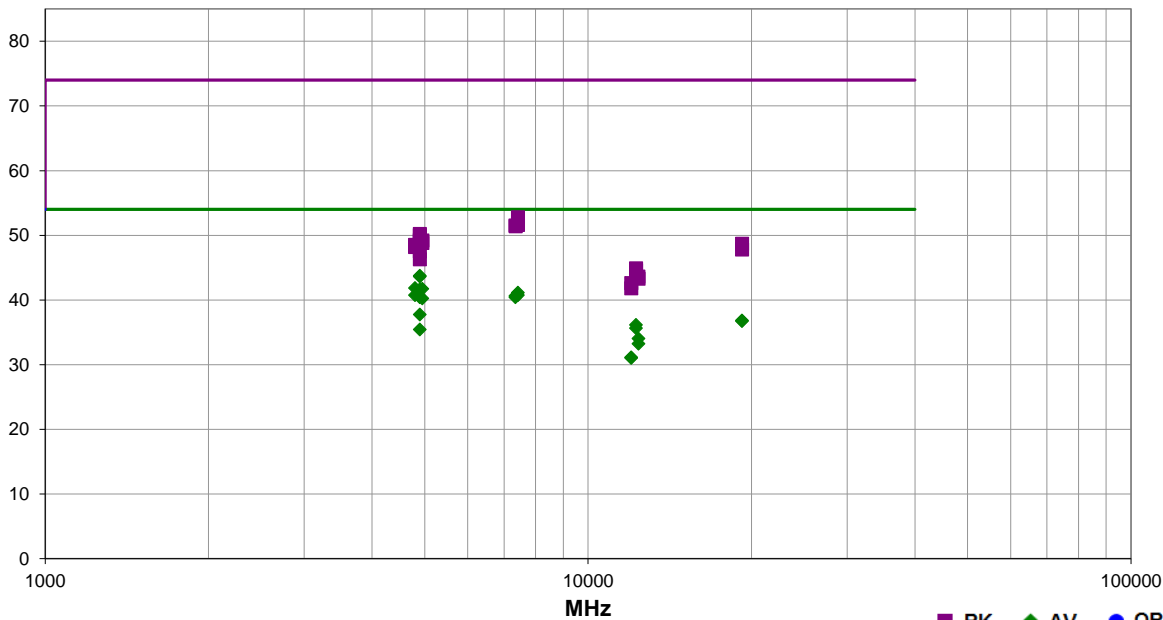
EmiR5 2017.09.18.2

PSA-ESCI 2017.09.18

Work Order:	SYNA0236	Date:	13-Feb-2018		
Project:	None	Temperature:	20.8 °C		
Job Site:	EV01	Humidity:	26.4% RH		
Serial Number:	xLRID 00.0A.5C.23.C2	Barometric Pres.:	1029 mbar	Tested by:	Jody House & Jeff Alcock
EUT:	Magicband				
Configuration:	1				
Customer:	Walt Disney Parks and Resorts US, Inc.				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Continuous Tx, GFSK. Low channel - 2401 MHz, Mid channel - 2450 MHz, and High channel - 2476 MHz				
Deviations:	None				
Comments:	See comments below for EUT channel and orientation. The Duty Cycle (D) of 86.7%, from the original FCC ID: Q3E-MB-R1G2 grant, was used in a Duty Cycle Correction Factor (DCCF) of $10\log(1/D)=0.62$ dB.				

<b>Test Specifications</b>	<b>Test Method</b>
FCC 15.247:2018	ANSI C63.10:2013

<b>Run #</b>	20	<b>Test Distance (m)</b>	3	<b>Antenna Height(s)</b>	1 to 4(m)	<b>Results</b>	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4900.183	37.4	5.7	2.5	181.0	0.6	0.0	Vert	AV	0.0	43.7	54.0	-10.3	Mid Ch, EUT On Side
4900.133	37.3	5.7	2.6	127.0	0.6	0.0	Horz	AV	0.0	43.6	54.0	-10.4	Mid Ch, EUT Horizontal
4802.150	37.1	4.1	1.0	301.0	0.6	0.0	Horz	AV	0.0	41.8	54.0	-12.2	Low Ch, EUT Horizontal
4952.100	35.5	5.6	3.6	0.0	0.6	0.0	Horz	AV	0.0	41.7	54.0	-12.3	High Ch, EUT Horizontal
4900.217	35.3	5.7	3.6	167.0	0.6	0.0	Horz	AV	0.0	41.6	54.0	-12.4	Mid Ch, EUT Vertical
7428.492	28.4	12.1	1.0	128.0	0.6	0.0	Vert	AV	0.0	41.1	54.0	-12.9	High Ch, EUT On Side
4802.283	36.0	4.1	1.3	15.0	0.6	0.0	Vert	AV	0.0	40.7	54.0	-13.3	Low Ch, EUT On Side
7427.250	28.0	12.1	3.3	47.0	0.6	0.0	Horz	AV	0.0	40.7	54.0	-13.3	High Ch, EUT Horizontal
7350.508	28.4	11.6	2.5	129.0	0.6	0.0	Vert	AV	0.0	40.6	54.0	-13.4	Mid Ch, EUT On Side
4900.200	34.1	5.7	3.8	77.0	0.6	0.0	Vert	AV	0.0	40.4	54.0	-13.6	Mid Ch, EUT Vertical
7349.892	28.2	11.6	3.3	222.0	0.6	0.0	Horz	AV	0.0	40.4	54.0	-13.6	Mid Ch, EUT Horizontal
4952.092	34.0	5.6	1.3	10.0	0.6	0.0	Vert	AV	0.0	40.2	54.0	-13.8	High Ch, EUT On Side
4900.233	31.4	5.7	1.0	302.0	0.6	0.0	Vert	AV	0.0	37.7	54.0	-16.3	Mid Ch, EUT Horizontal
19206.370	34.5	1.7	1.0	0.0	0.6	0.0	Horz	AV	0.0	36.8	54.0	-17.2	Low Ch, EUT Horizontal
19209.190	34.4	1.7	1.1	0.0	0.6	0.0	Vert	AV	0.0	36.7	54.0	-17.3	Low Ch, EUT On Side
12251.030	34.6	0.9	2.2	351.0	0.6	0.0	Vert	AV	0.0	36.1	54.0	-17.9	Mid Ch, EUT On Side
12250.950	34.1	0.9	2.6	360.0	0.6	0.0	Horz	AV	0.0	35.6	54.0	-18.4	Mid Ch, EUT Horizontal
4897.583	29.1	5.7	3.4	248.0	0.6	0.0	Horz	AV	0.0	35.4	54.0	-18.6	Mid Ch, EUT On Side


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
12380.870	32.1	1.3	2.1	354.0	0.6	0.0	Vert	AV	0.0	34.0	54.0	-20.0	High Ch, EUT On Side
12380.800	31.3	1.3	2.2	334.0	0.6	0.0	Horz	AV	0.0	33.2	54.0	-20.8	High Ch, EUT Horizontal
7428.208	40.7	12.1	1.0	128.0	0.0	0.0	Vert	PK	0.0	52.8	74.0	-21.2	High Ch, EUT On Side
7425.725	39.5	12.1	3.3	47.0	0.0	0.0	Horz	PK	0.0	51.6	74.0	-22.4	High Ch, EUT Horizontal
7349.708	39.9	11.6	3.3	222.0	0.0	0.0	Horz	PK	0.0	51.5	74.0	-22.5	Mid Ch, EUT Horizontal
7352.417	39.8	11.6	2.5	129.0	0.0	0.0	Vert	PK	0.0	51.4	74.0	-22.6	Mid Ch, EUT On Side
12005.790	29.6	0.9	1.5	310.0	0.6	0.0	Horz	AV	0.0	31.1	54.0	-22.9	Low Ch, EUT Horizontal
12004.030	29.5	0.9	2.9	217.0	0.6	0.0	Vert	AV	0.0	31.0	54.0	-23.0	Low Ch, EUT On Side
4899.575	44.5	5.7	2.6	127.0	0.0	0.0	Horz	PK	0.0	50.2	74.0	-23.8	Mid Ch, EUT Horizontal
4900.542	44.3	5.7	2.5	181.0	0.0	0.0	Vert	PK	0.0	50.0	74.0	-24.0	Mid Ch, EUT On Side
4899.717	43.6	5.7	3.6	167.0	0.0	0.0	Horz	PK	0.0	49.3	74.0	-24.7	Mid Ch, EUT Vertical
4951.858	43.6	5.6	3.6	0.0	0.0	0.0	Horz	PK	0.0	49.2	74.0	-24.8	High Ch, EUT Horizontal
4899.967	43.4	5.7	3.8	77.0	0.0	0.0	Vert	PK	0.0	49.1	74.0	-24.9	Mid Ch, EUT Vertical
4952.208	43.2	5.6	1.3	10.0	0.0	0.0	Vert	PK	0.0	48.8	74.0	-25.2	High Ch, EUT On Side
19210.290	47.0	1.7	1.0	0.0	0.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	Low Ch, EUT Horizontal
4802.133	44.4	4.1	1.0	301.0	0.0	0.0	Horz	PK	0.0	48.5	74.0	-25.5	Low Ch, EUT Horizontal
4801.850	44.1	4.1	1.3	15.0	0.0	0.0	Vert	PK	0.0	48.2	74.0	-25.8	Low Ch, EUT On Side
19207.600	46.1	1.7	1.1	0.0	0.0	0.0	Vert	PK	0.0	47.8	74.0	-26.2	Low Ch, EUT On Side
4899.617	41.8	5.7	1.0	302.0	0.0	0.0	Vert	PK	0.0	47.5	74.0	-26.5	Mid Ch, EUT Horizontal
4897.667	40.6	5.7	3.4	248.0	0.0	0.0	Horz	PK	0.0	46.3	74.0	-27.7	Mid Ch, EUT On Side
12250.730	44.0	0.9	2.2	351.0	0.0	0.0	Vert	PK	0.0	44.9	74.0	-29.1	Mid Ch, EUT On Side
12250.460	43.7	0.9	2.6	360.0	0.0	0.0	Horz	PK	0.0	44.6	74.0	-29.4	Mid Ch, EUT Horizontal
12378.880	42.3	1.3	2.1	354.0	0.0	0.0	Vert	PK	0.0	43.6	74.0	-30.4	High Ch, EUT On Side
12380.780	42.0	1.3	2.2	334.0	0.0	0.0	Horz	PK	0.0	43.3	74.0	-30.7	High Ch, EUT Horizontal
12007.340	41.6	1.0	2.9	217.0	0.0	0.0	Vert	PK	0.0	42.6	74.0	-31.4	Low Ch, EUT On Side
12004.380	40.9	0.9	1.5	310.0	0.0	0.0	Horz	PK	0.0	41.8	74.0	-32.2	Low Ch, EUT Horizontal



# SPURIOUS RADIATED EMISSIONS

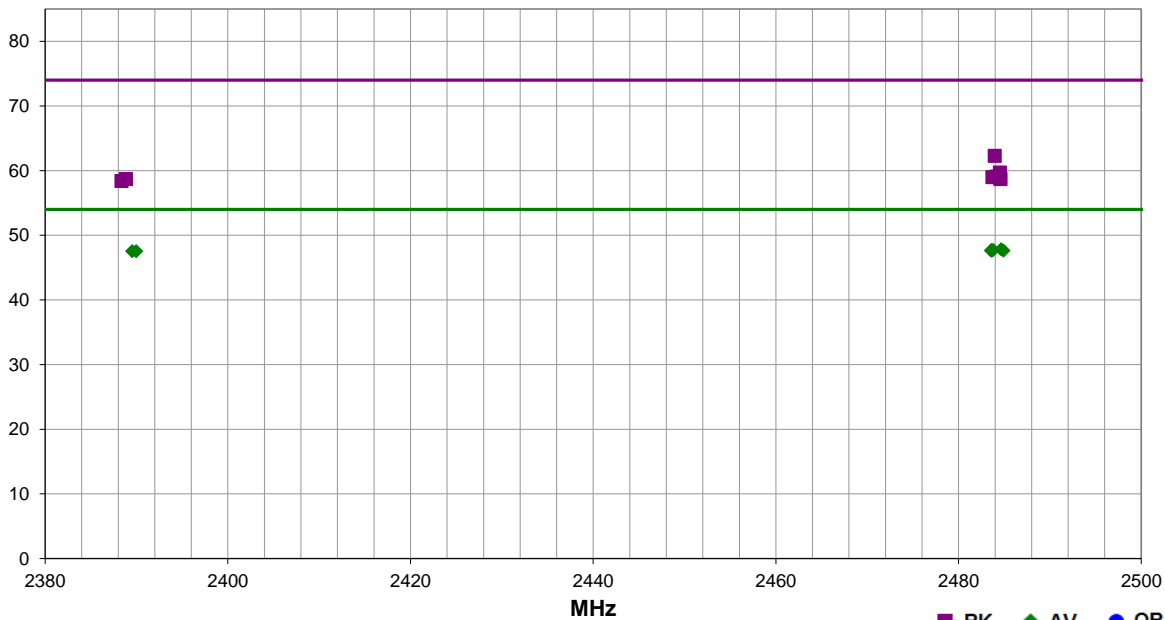


EmiR5 2017.09.18.2 PSA-ESCI 2017.09.18

Work Order:	SYNA0236	Date:	13-Feb-2018		
Project:	None	Temperature:	21.9 °C		
Job Site:	EV01	Humidity:	25.6% RH		
Serial Number:	KLRI00.0A.5C.23.C2	Barometric Pres.:	1028 mbar	Tested by:	Jody House & Jeff Alcock
EUT:	Magicband				
Configuration:	1				
Customer:	Walt Disney Parks and Resorts US, Inc.				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Continuous Tx, GFSK. Low channel - 2401 MHz, Mid channel - 2450 MHz, and High channel - 2476 MHz				
Deviations:	None				
Comments:	See comments for EUT channel and orientation. Band edge measurements. The Duty Cycle (D) of 86.7%, from the original FCC ID: Q3E-MB-R1G2 grant, was used in a Duty Cycle Correction Factor (DCCF) of 10log(1/D)=0.62 dB.				

<b>Test Specifications</b>	<b>Test Method</b>
FCC 15.247:2018	ANSI C63.10:2013

<b>Run #</b>	23	<b>Test Distance (m)</b>	3	<b>Antenna Height(s)</b>	1 to 4(m)	<b>Results</b>	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2484.677	31.2	-4.0	3.4	214.0	0.6	20.0	Horz	AV	0.0	47.8	54.0	-6.2	High Ch, EUT On Side
2483.780	31.1	-4.0	1.0	89.0	0.6	20.0	Horz	AV	0.0	47.7	54.0	-6.3	High Ch, EUT Horizontal
2483.627	31.1	-4.0	1.0	121.0	0.6	20.0	Horz	AV	0.0	47.7	54.0	-6.3	High Ch, EUT Vertical
2483.547	31.0	-4.0	4.0	217.0	0.6	20.0	Vert	AV	0.0	47.6	54.0	-6.4	High Ch, EUT On Side
2484.920	31.0	-4.0	1.0	225.0	0.6	20.0	Vert	AV	0.0	47.6	54.0	-6.4	High Ch, EUT Horizontal
2483.643	31.0	-4.0	1.8	13.0	0.6	20.0	Vert	AV	0.0	47.6	54.0	-6.4	High Ch, EUT Vertical
2389.973	31.3	-4.4	1.0	88.0	0.6	20.0	Horz	AV	0.0	47.5	54.0	-6.5	Low Ch, EUT On Side
2389.527	31.3	-4.4	1.0	35.0	0.6	20.0	Vert	AV	0.0	47.5	54.0	-6.5	Low Ch, EUT On Side
2483.953	46.3	-4.0	1.0	121.0	0.0	20.0	Horz	PK	0.0	62.3	74.0	-11.7	High Ch, EUT Vertical
2484.527	43.7	-4.0	3.4	214.0	0.0	20.0	Horz	PK	0.0	59.7	74.0	-14.3	High Ch, EUT On Side
2484.170	43.1	-4.0	1.0	89.0	0.0	20.0	Horz	PK	0.0	59.1	74.0	-14.9	High Ch, EUT Horizontal
2483.700	43.0	-4.0	1.0	225.0	0.0	20.0	Vert	PK	0.0	59.0	74.0	-15.0	High Ch, EUT Horizontal
2484.543	42.9	-4.0	1.8	13.0	0.0	20.0	Vert	PK	0.0	58.9	74.0	-15.1	High Ch, EUT Vertical
2484.577	42.7	-4.0	4.0	217.0	0.0	20.0	Vert	PK	0.0	58.7	74.0	-15.3	High Ch, EUT On Side
2388.833	43.1	-4.4	1.0	35.0	0.0	20.0	Vert	PK	0.0	58.7	74.0	-15.3	Low Ch, EUT On Side
2388.360	42.8	-4.4	1.0	88.0	0.0	20.0	Horz	PK	0.0	58.4	74.0	-15.6	Low Ch, EUT On Side

# 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
Generator - Signal	Agilent	N5183A	TID	25-Apr-17	25-Apr-19
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	30-May-17	30-May-18
Attenuator	S.M. Electronics	SA26B-20	AUY	30-May-17	30-May-18
Block - DC	Fairview Microwave	SD3379	AMW	5-Jun-17	5-Jun-18
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	14-Aug-17	14-Aug-18

## 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 6 dB 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



TbTx 2017.12.14 XMt 2017.12.13

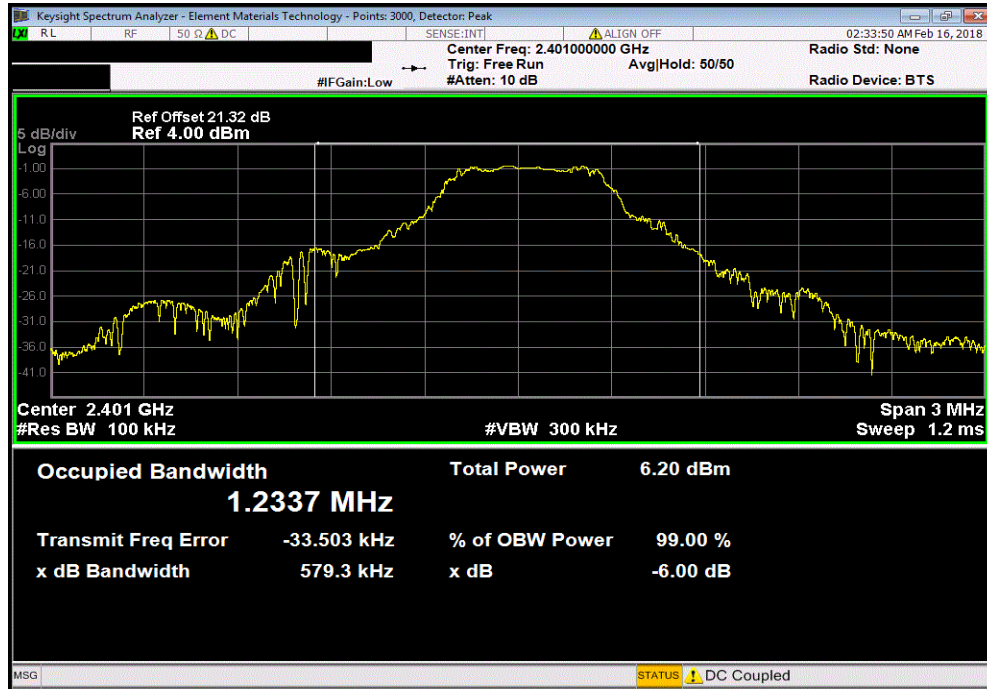
EUT: Magicband		Work Order: SYNA0236	
Serial Number: xLRID 00.0A.5C.20.A0		Date: 15-Feb-18	
Customer: Walt Disney Parks and Resorts US, Inc.		Temperature: 22.4 °C	
Attendees: None		Humidity: 32.6% RH	
Project: None		Barometric Pres.: 1035 mbar	
Tested by: Jody House & Jeff Alcock		Power: Battery	
Job Site: EV06			
TEST SPECIFICATIONS			
FCC 15.247:2018		Test Method	
		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value	Limit (±)
GFSK Low Channel, 2401 MHz		579.347 kHz	500 kHz
GFSK Mid Channel, 2450 MHz		701.044 kHz	500 kHz
GFSK High Channel, 2476 MHz		743.488 kHz	500 kHz
			Result
			Pass
			Pass
			Pass

# OCCUPIED BANDWIDTH

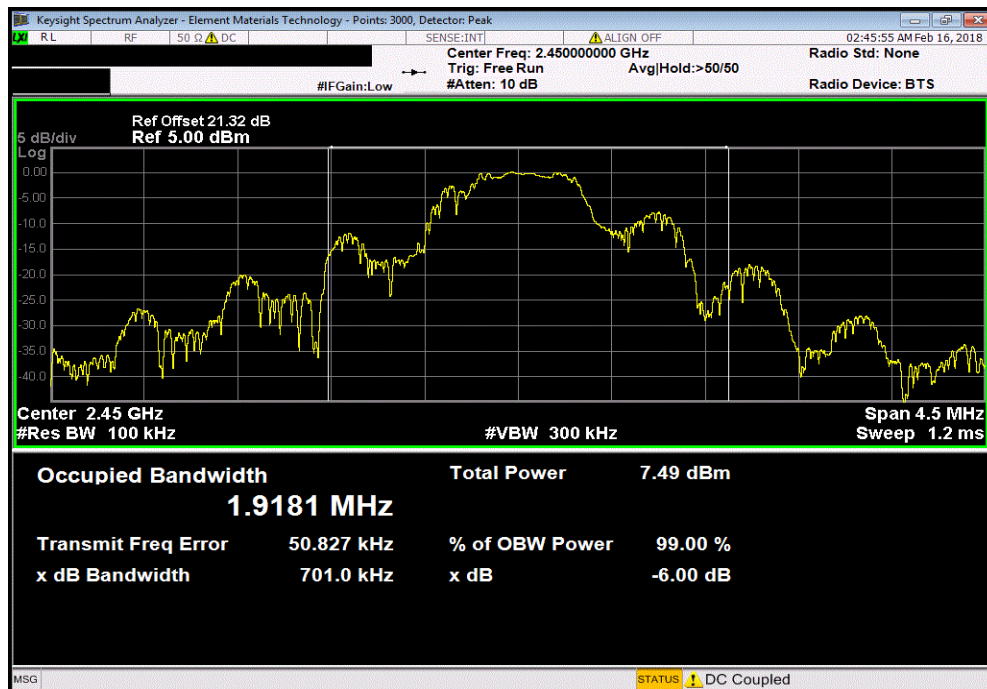


TMTx 2017.12.14 XMI 2017.12.13

GFSK Low Channel, 2401 MHz						
				Value	Limit (≥)	Result
				579.347 kHz	500 kHz	Pass



GFSK Mid Channel, 2450 MHz						
				Value	Limit (≥)	Result
				701.044 kHz	500 kHz	Pass

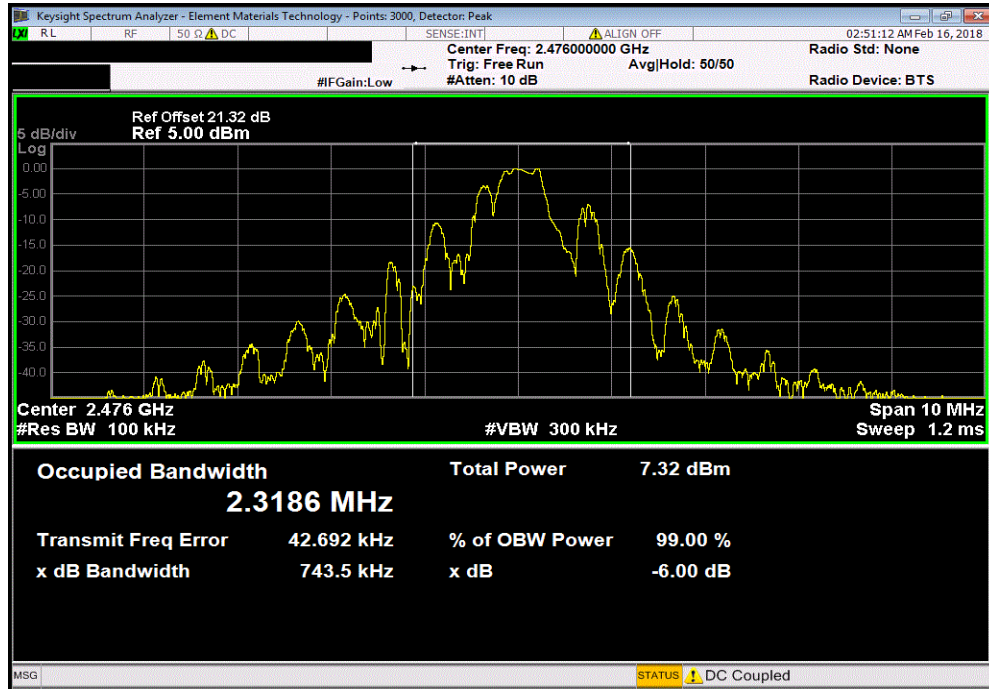


# OCCUPIED BANDWIDTH



TbTx 2017.12.14 XMt 2017.12.13

GFSK High Channel, 2476 MHz						
Value				Limit	Result	
				(≥)		
			743.488 kHz	500 kHz	Pass	



# OUTPUT POWER



XMII 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
Generator - Signal	Agilent	N5183A	TID	25-Apr-17	25-Apr-19
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	30-May-17	30-May-18
Attenuator	S.M. Electronics	SA26B-20	AUY	30-May-17	30-May-18
Block - DC	Fairview Microwave	SD3379	AMW	5-Jun-17	5-Jun-18
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	14-Aug-17	14-Aug-18

## 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



TbTx 2017.12.14 XMt 2017.12.13

EUT: Magicband		Work Order: SYNA0236	
Serial Number: xLRID 00.0A.5C.20.A0		Date: 15-Feb-18	
Customer: Walt Disney Parks and Resorts US, Inc.		Temperature: 22.4 °C	
Attendees: None		Humidity: 32.6% RH	
Project: None		Barometric Pres.: 1035 mbar	
Tested by: Jody House & Jeff Alcock		Power: Battery	
Job Site: EV06			
TEST SPECIFICATIONS			
FCC 15.247:2018		Test Method	
		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value	Limit (<)
GFSK Low Channel, 2401 MHz		916.02 uW	1 W
GFSK Mid Channel, 2450 MHz		1.05 mW	1 W
GFSK High Channel, 2476 MHz		1.06 mW	1 W
			Result
			Pass
			Pass
			Pass

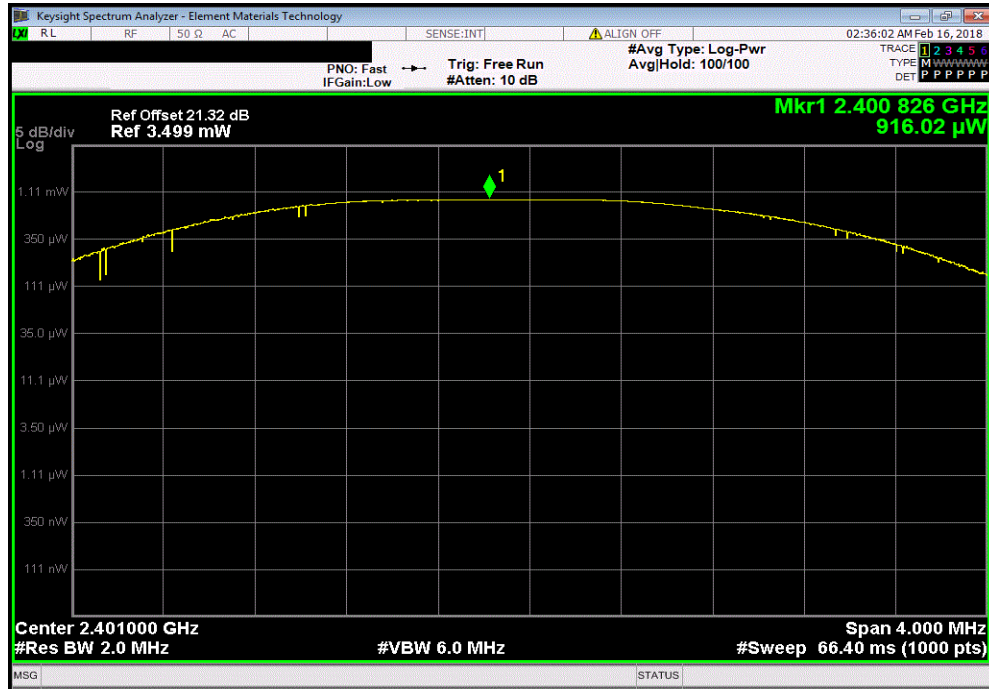


# OUTPUT POWER

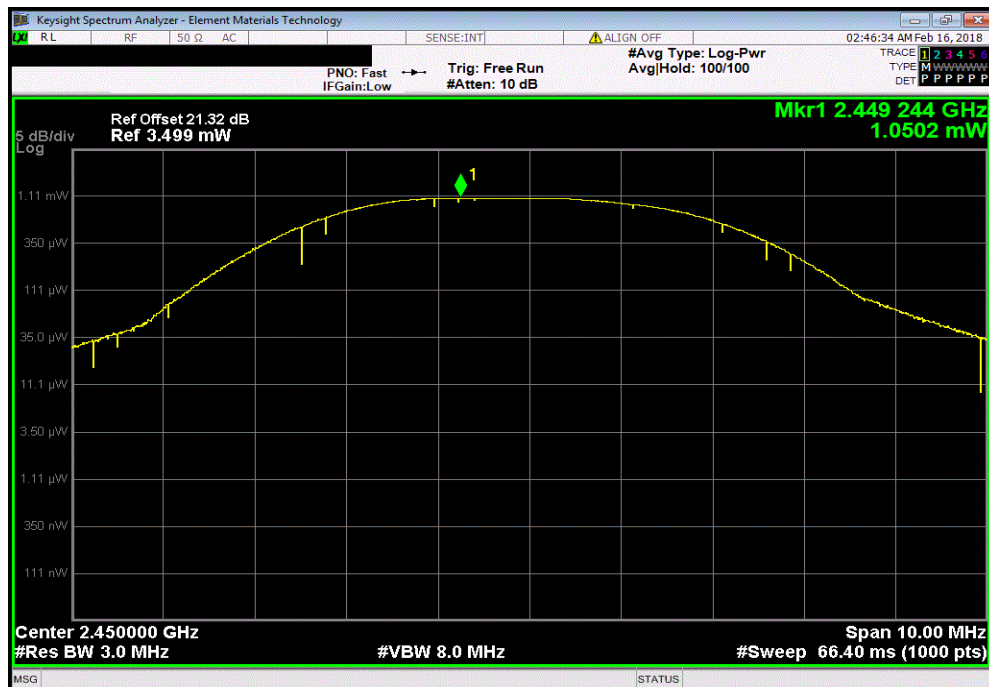


TMTx 2017.12.14 XMI 2017.12.13

GFSK Low Channel, 2401 MHz						
				Value	Limit (<)	Result
				916.02 $\mu$ W	1 W	Pass



GFSK Mid Channel, 2450 MHz						
				Value	Limit (<)	Result
				1.05 mW	1 W	Pass

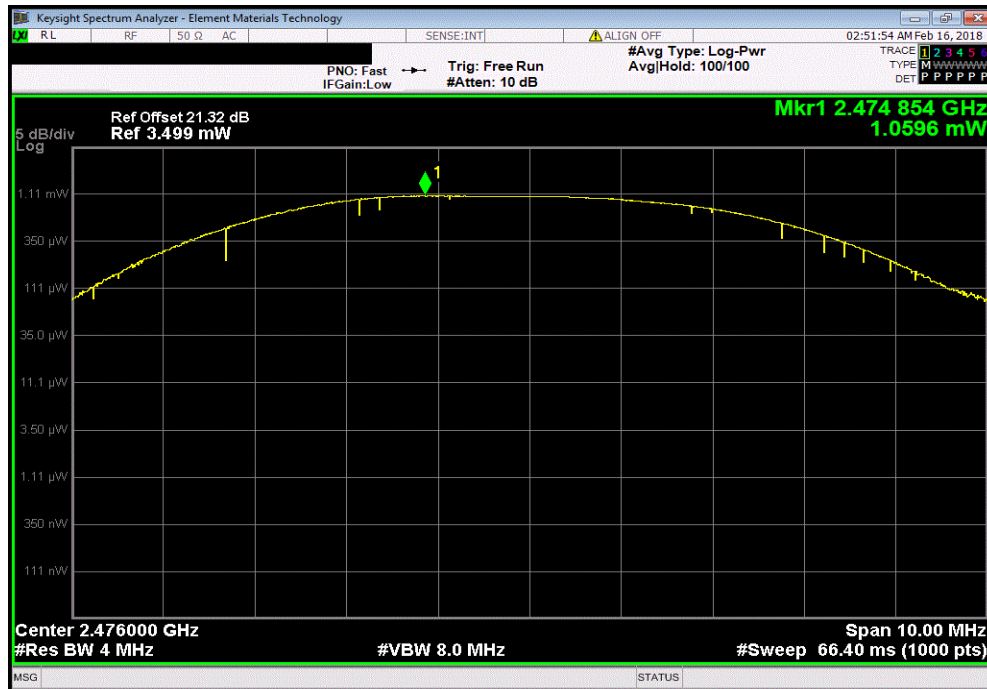


# OUTPUT POWER



TMTx 2017.12.14 XMI 2017.12.13

GFSK High Channel, 2476 MHz						
				Value	Limit (<)	Result
				1.06 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
Generator - Signal	Agilent	N5183A	TID	25-Apr-17	25-Apr-19
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	30-May-17	30-May-18
Attenuator	S.M. Electronics	SA26B-20	AUY	30-May-17	30-May-18
Block - DC	Fairview Microwave	SD3379	AMW	5-Jun-17	5-Jun-18
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	14-Aug-17	14-Aug-18

## 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



TbTx 2017.12.14 XMt 2017.12.13

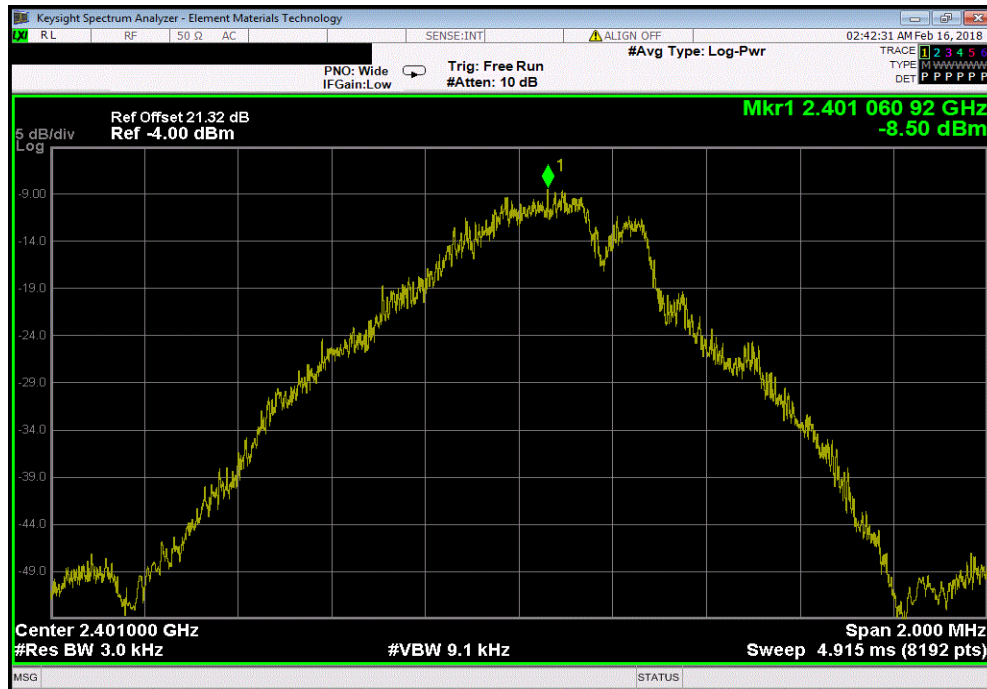
EUT: Magicband		Work Order: SYNA0236	
Serial Number: xLRID 00.0A.5C.20.A0		Date: 15-Feb-18	
Customer: Walt Disney Parks and Resorts US, Inc.		Temperature: 22.5 °C	
Attendees: None		Humidity: 32.6% RH	
Project: None		Barometric Pres.: 1035 mbar	
Tested by: Jody House & Jeff Alcock		Power: Battery	
Job Site: EV06			
TEST SPECIFICATIONS			
FCC 15.247:2018		Test Method	
		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value dBm/3kHz	Limit < dBm/3kHz
GFSK Low Channel, 2401 MHz		-8.501	8
GFSK Mid Channel, 2450 MHz		-7.819	8
GFSK High Channel, 2476 MHz		-7.857	8
			Results
			Pass
			Pass
			Pass

# POWER SPECTRAL DENSITY

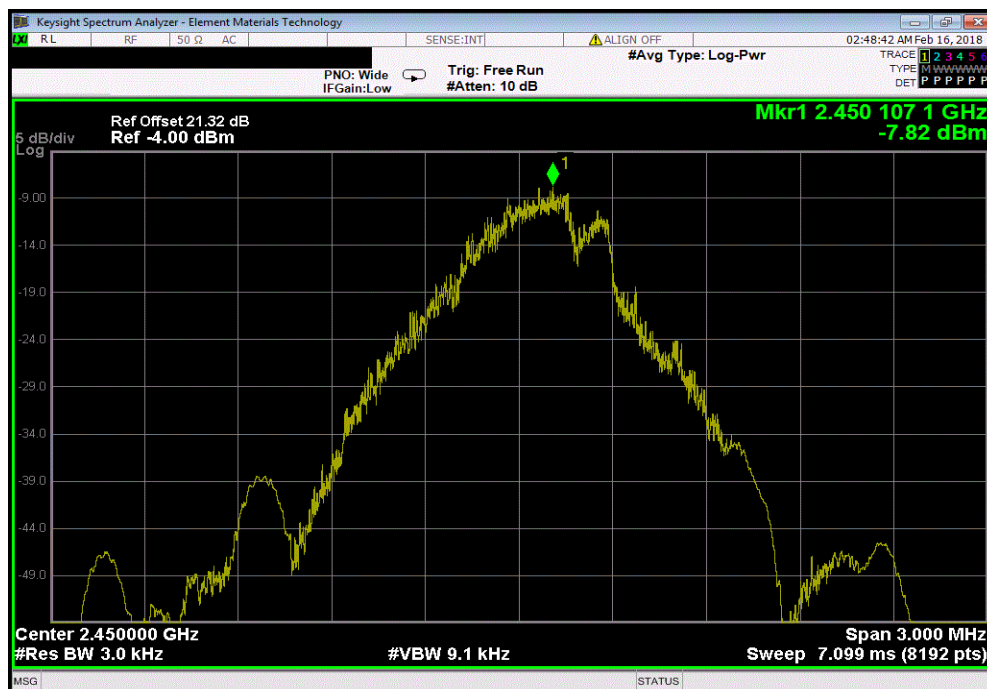


TMTx 2017.12.14 XMI 2017.12.13

GFSK Low Channel, 2401 MHz						
				Value	Limit	Results
				dBm/3kHz	< dBm/3kHz	
				-8.501	8	Pass



GFSK Mid Channel, 2450 MHz						
				Value	Limit	Results
				dBm/3kHz	< dBm/3kHz	
				-7.819	8	Pass

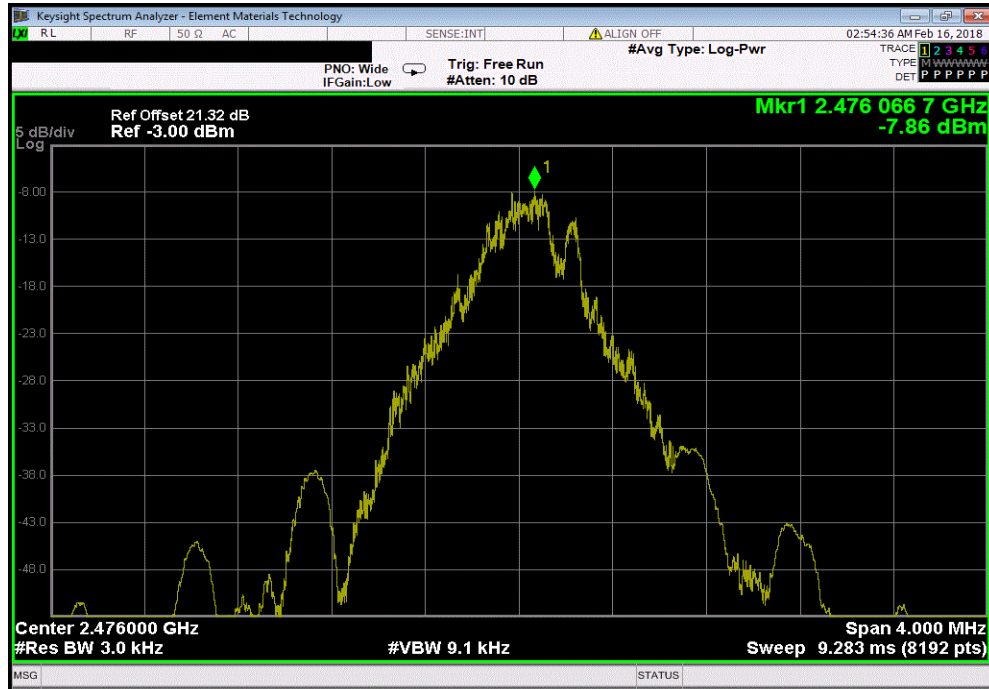


# POWER SPECTRAL DENSITY



TMTx 2017.12.14 XMI 2017.12.13

GFSK High Channel, 2476 MHz						
				Value	Limit	Results
				dBm/3kHz	< dBm/3kHz	
				-7.857	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
Generator - Signal	Agilent	N5183A	TID	25-Apr-17	25-Apr-19
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	30-May-17	30-May-18
Attenuator	S.M. Electronics	SA26B-20	AUY	30-May-17	30-May-18
Block - DC	Fairview Microwave	SD3379	AMW	5-Jun-17	5-Jun-18
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	14-Aug-17	14-Aug-18

## 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



TbTx 2017.12.14 XMt 2017.12.13

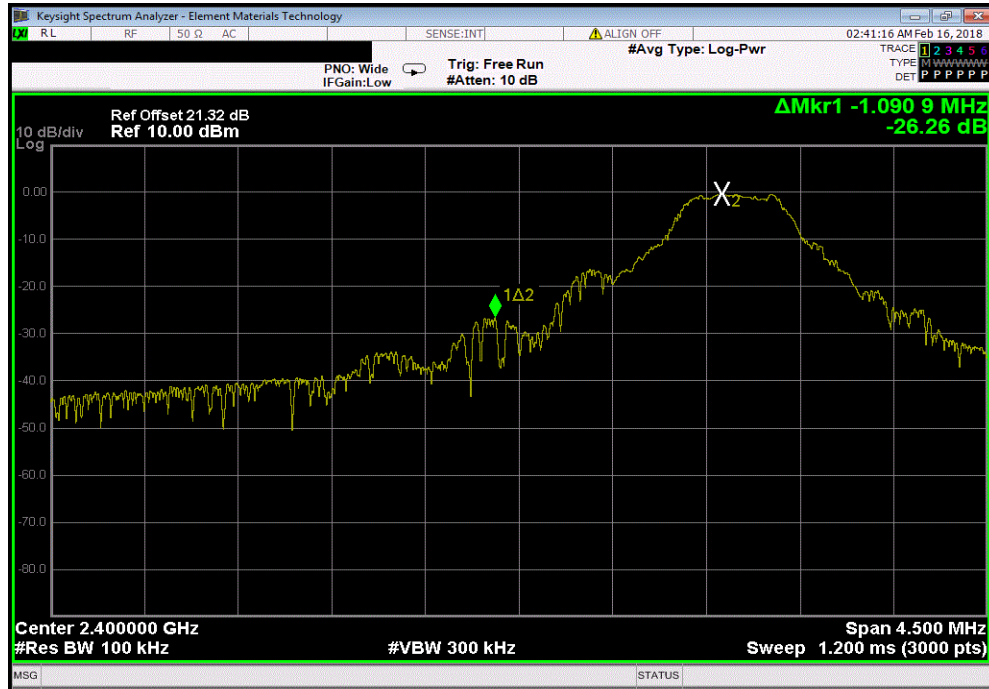
EUT: Magicband		Work Order: SYNA0236	
Serial Number: xLRID 00.0A.5C.20.A0		Date: 15-Feb-18	
Customer: Walt Disney Parks and Resorts US, Inc.		Temperature: 22.3 °C	
Attendees: None		Humidity: 32.6% RH	
Project: None		Barometric Pres.: 1035 mbar	
Tested by: Jody House & Jeff Alcock		Power: Battery	
Job Site: EV06			
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2018		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value (dBc)	Limit ≤ (dBc) Result
GFSK Low Channel, 2401 MHz		-26.26	-20 Pass
GFSK High Channel, 2476 MHz		-49.31	-20 Pass

# BAND EDGE COMPLIANCE

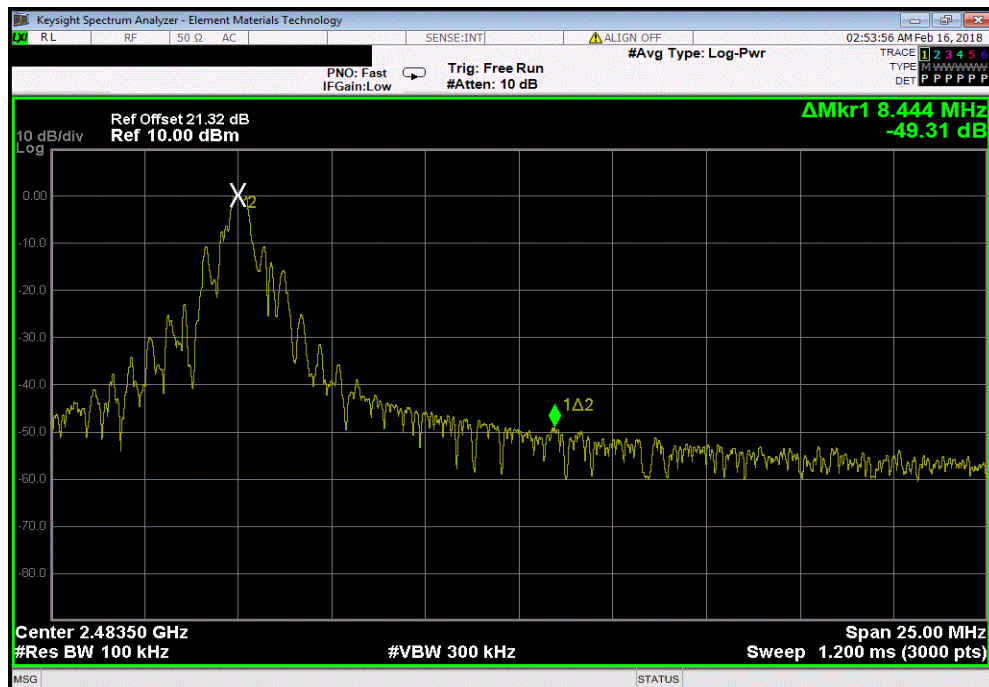


TMTx 2017.12.14 XMI 2017.12.13

GFSK Low Channel, 2401 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-26.26	-20	Pass



GFSK High Channel, 2476 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-49.31	-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
Generator - Signal	Agilent	N5183A	TID	25-Apr-17	25-Apr-19
Cable	Micro-Coax	UFD150A-1-0720-200200	EVH	30-May-17	30-May-18
Attenuator	S.M. Electronics	SA26B-20	AUY	30-May-17	30-May-18
Block - DC	Fairview Microwave	SD3379	AMW	5-Jun-17	5-Jun-18
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFP	14-Aug-17	14-Aug-18


## 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



TbTx 2017.12.14 XMt 2017.12.13

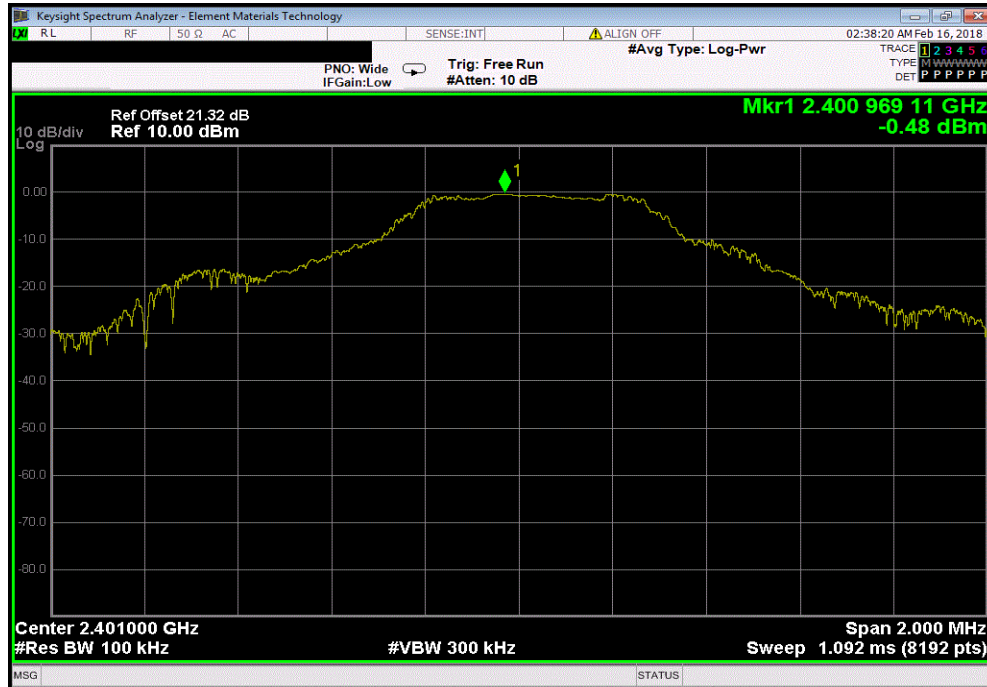
EUT: Magicband		Work Order: SYNA0236	
Serial Number: xLRID 00.0A.5C.20.A0		Date: 15-Feb-18	
Customer: Walt Disney Parks and Resorts US, Inc.		Temperature: 22.5 °C	
Attendees: None		Humidity: 32.5% RH	
Project: None		Barometric Pres.: 1035 mbar	
Tested by: Jody House & Jeff Alcock		Power: Battery	
Job Site: EV06			
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2018		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Frequency Range	Max Value (dBc)
			Limit ≤ (dBc)
			Result
GFSK Low Channel, 2401 MHz		Fundamental	N/A
GFSK Low Channel, 2401 MHz		30 MHz - 12.5 GHz	-40.56
GFSK Low Channel, 2401 MHz		12.5 GHz - 25 GHz	-37.97
GFSK Mid Channel, 2450 MHz		Fundamental	N/A
GFSK Mid Channel, 2450 MHz		30 MHz - 12.5 GHz	-43.3
GFSK Mid Channel, 2450 MHz		12.5 GHz - 25 GHz	-38.18
GFSK High Channel, 2476 MHz		Fundamental	N/A
GFSK High Channel, 2476 MHz		30 MHz - 12.5 GHz	-42.96
GFSK High Channel, 2476 MHz		12.5 GHz - 25 GHz	-37.98
			-20
			Pass

# SPURIOUS CONDUCTED EMISSIONS

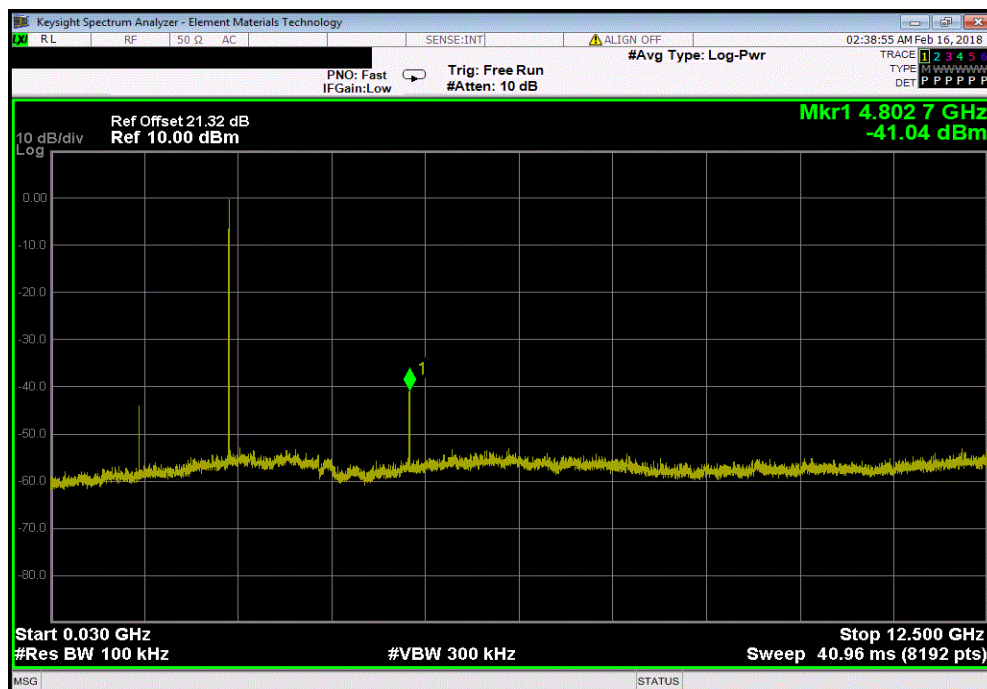


TMTx 2017.12.14 XMI 2017.12.13

GFSK Low Channel, 2401 MHz						
Frequency Range		Max Value (dBc)		Limit ≤ (dBc)	Result	
Fundamental		N/A		N/A	N/A	



GFSK Low Channel, 2401 MHz						
Frequency Range		Max Value (dBc)		Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz		-40.56		-20	Pass	

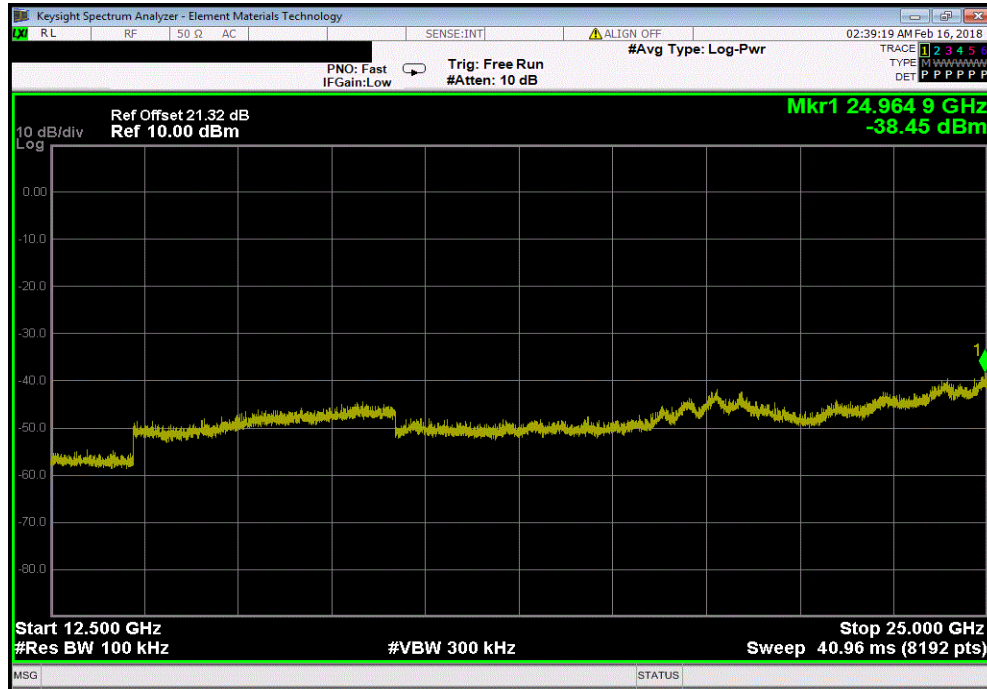


# SPURIOUS CONDUCTED EMISSIONS

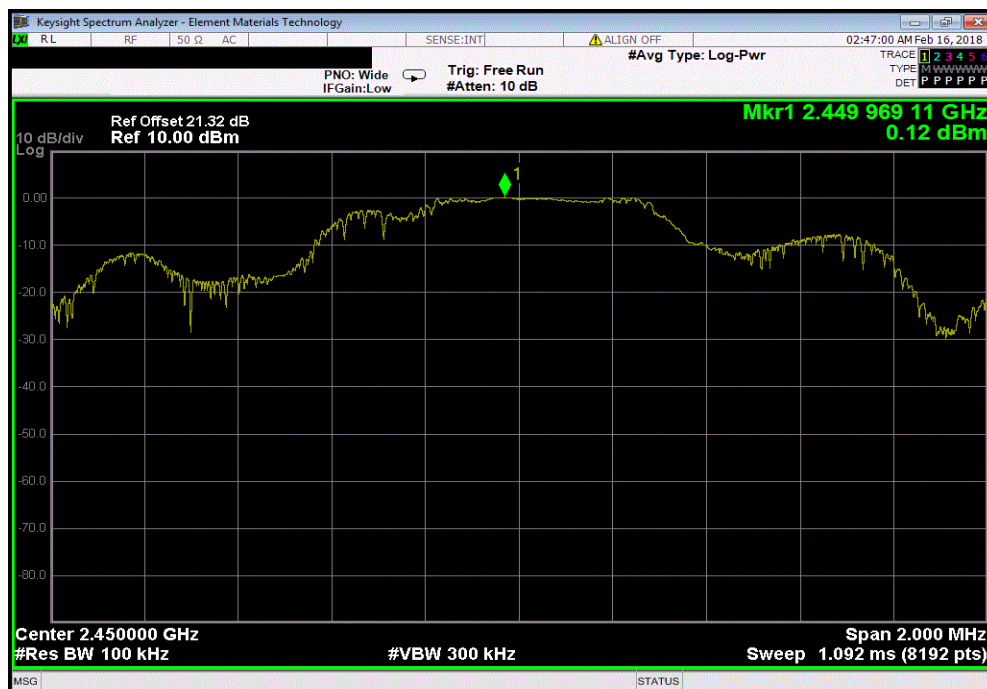


TbTx 2017.12.14 XMI 2017.12.13

GFSK Low Channel, 2401 MHz				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-37.97	-20	Pass	



GFSK Mid Channel, 2450 MHz				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
Fundamental	N/A	N/A	N/A	

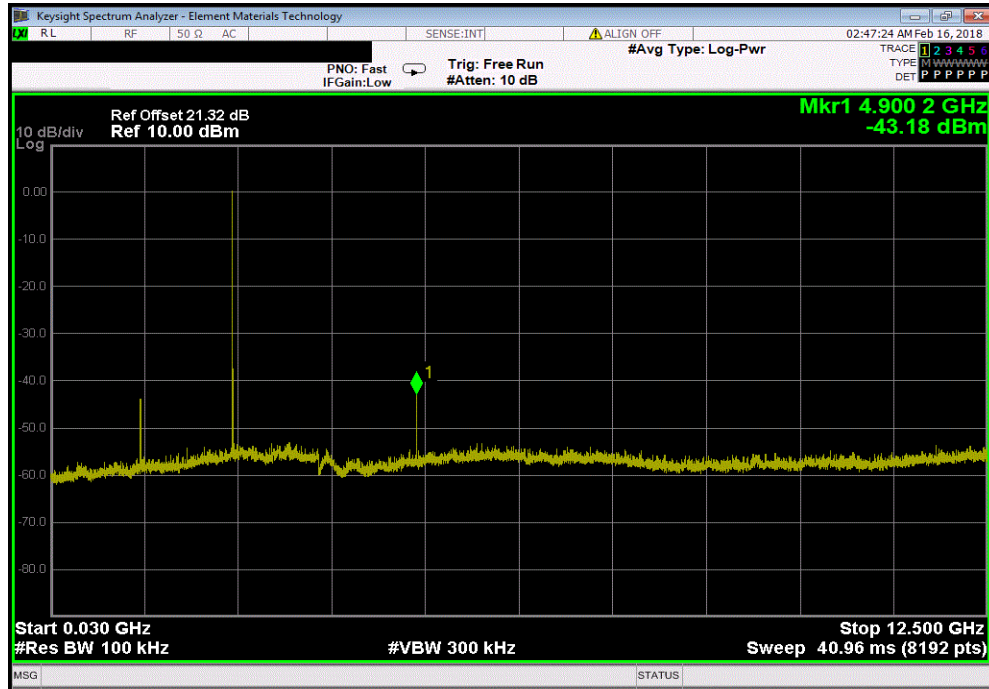


# SPURIOUS CONDUCTED EMISSIONS

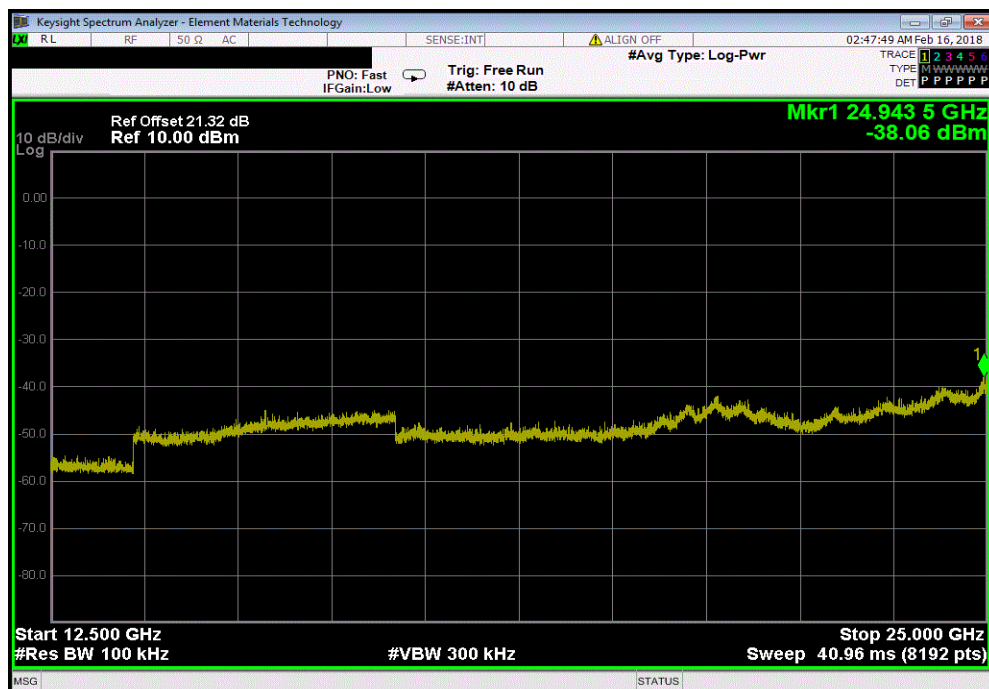


TMTx 2017.12.14 XMI 2017.12.13

GFSK Mid Channel, 2450 MHz				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-43.3	-20	Pass	



GFSK Mid Channel, 2450 MHz				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-38.18	-20	Pass	



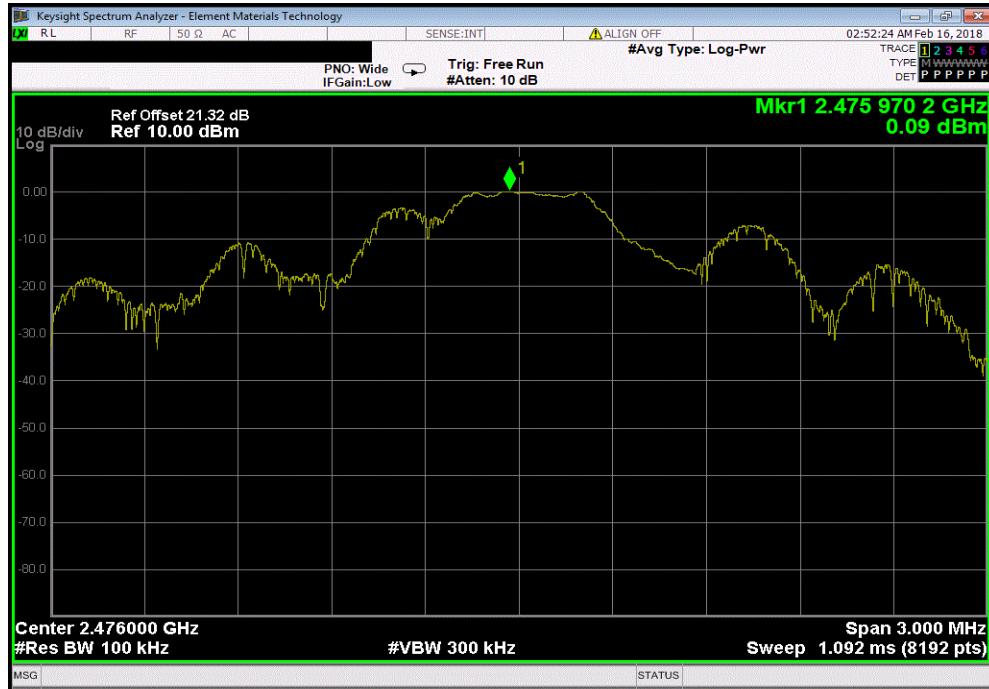


# SPURIOUS CONDUCTED EMISSIONS

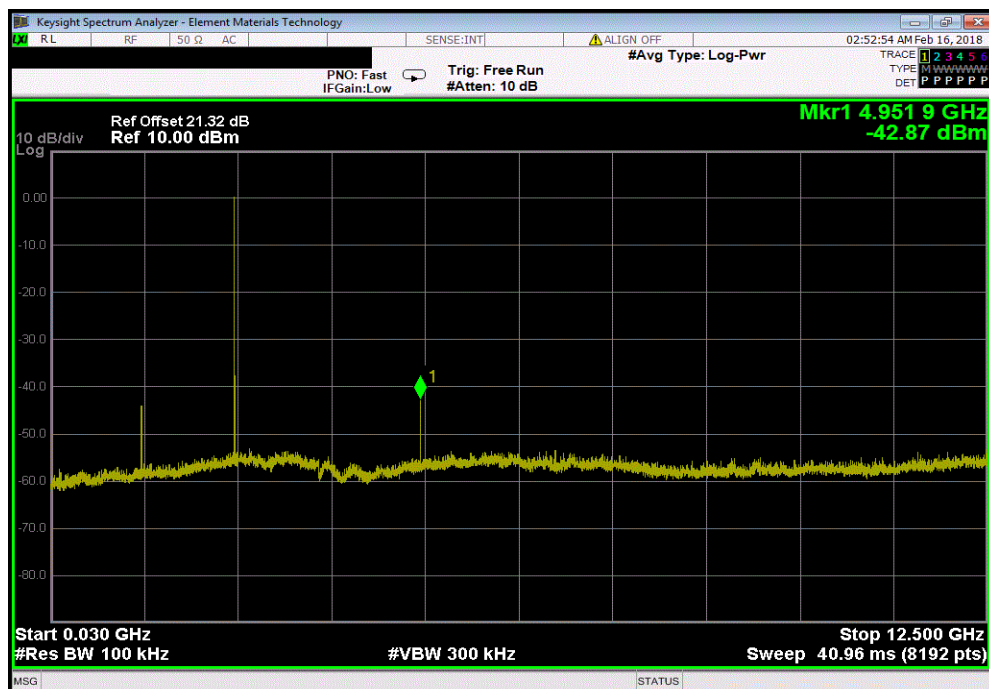


TbTx 2017.12.14 XMI 2017.12.13

GFSK High Channel, 2476 MHz						
Frequency Range		Max Value (dBc)		Limit ≤ (dBc)	Result	
Fundamental		N/A		N/A	N/A	



GFSK High Channel, 2476 MHz						
Frequency Range		Max Value (dBc)		Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz		-42.96		-20	Pass	



# SPURIOUS CONDUCTED EMISSIONS



TMTx 2017.12.14 XMI 2017.12.13

GFSK High Channel, 2476 MHz				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-37.98	-20	Pass	

