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

2017.6.12

United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

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

European Union

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

Australia/New Zealand

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

Korea

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://portlandcustomer.element.com/ts/scope/scope.htm
http://gsi.nist.gov/global/docs/cabs/designations.html

MEASUREMENT UNCERTAINTY

TMU.2015.07.10

Measurement Uncertainty

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

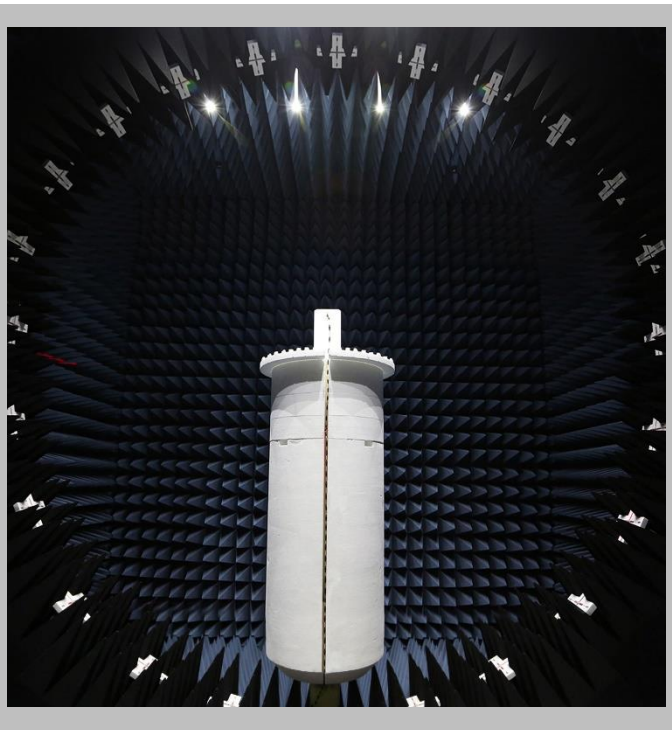
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

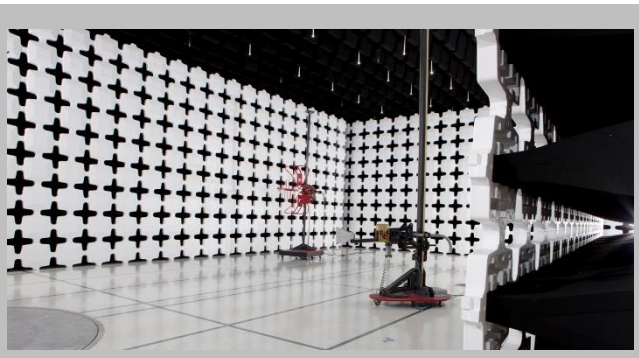
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

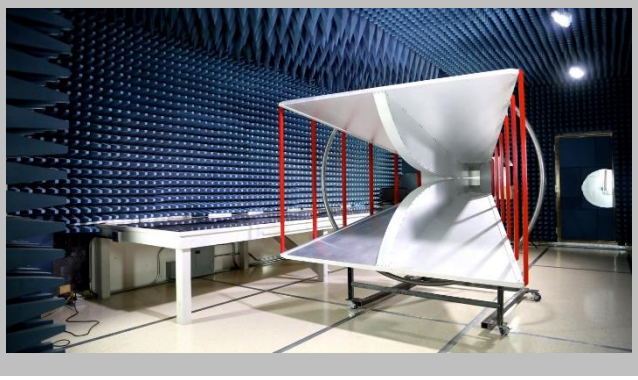
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	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 OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Innovation, Science and Economic Development Canada					
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-*2*	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157

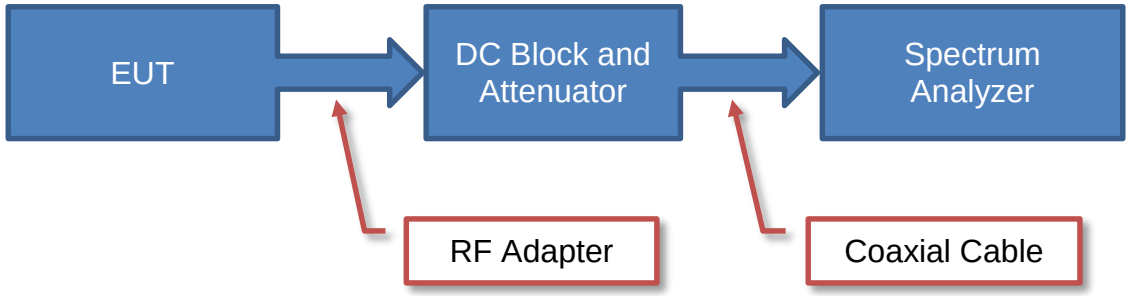




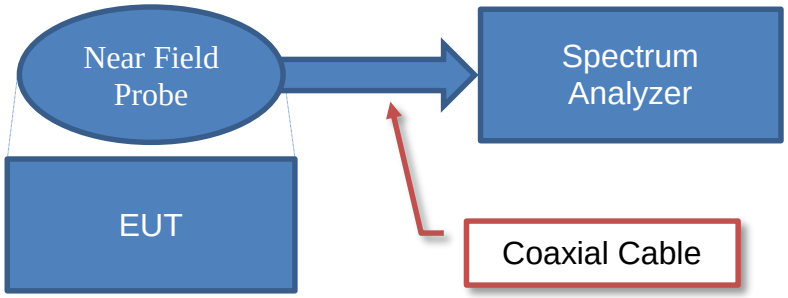


Test Setup Block Diagrams

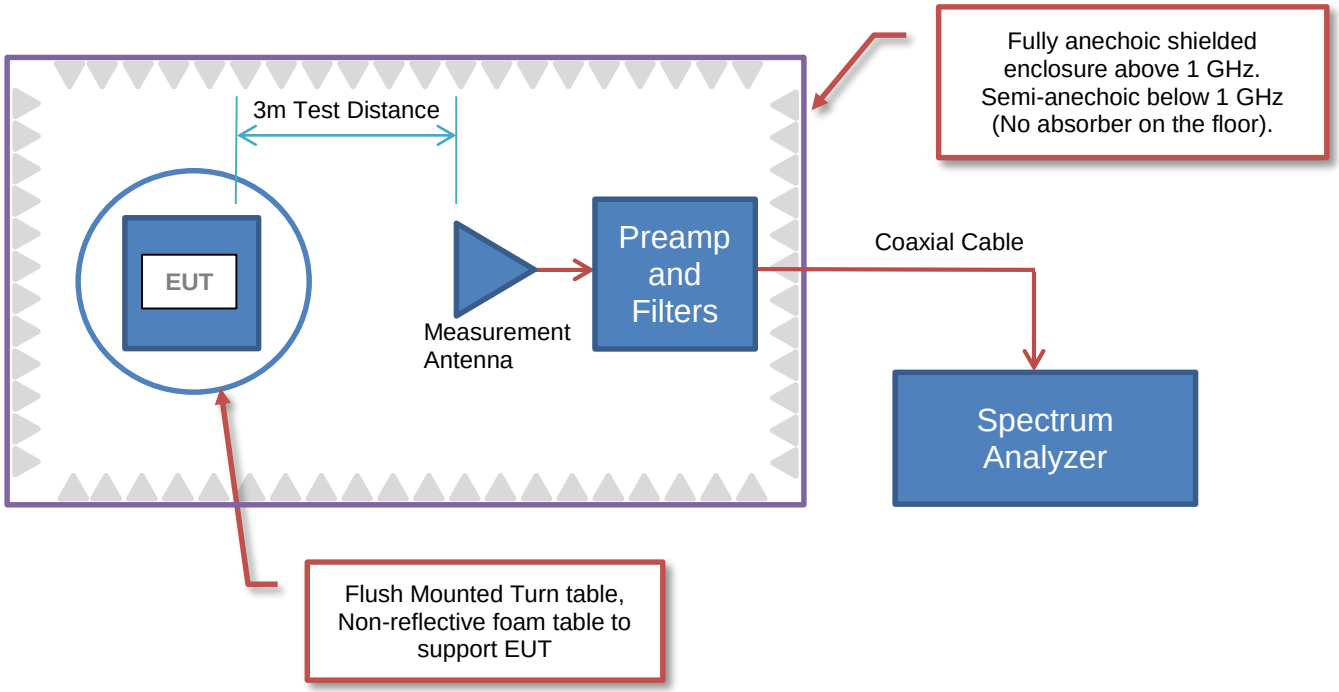
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

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

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Proprietary 2.4 GHz GFSK radio in a wristband form factor

Testing Objective:
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

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 ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

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

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

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

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

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

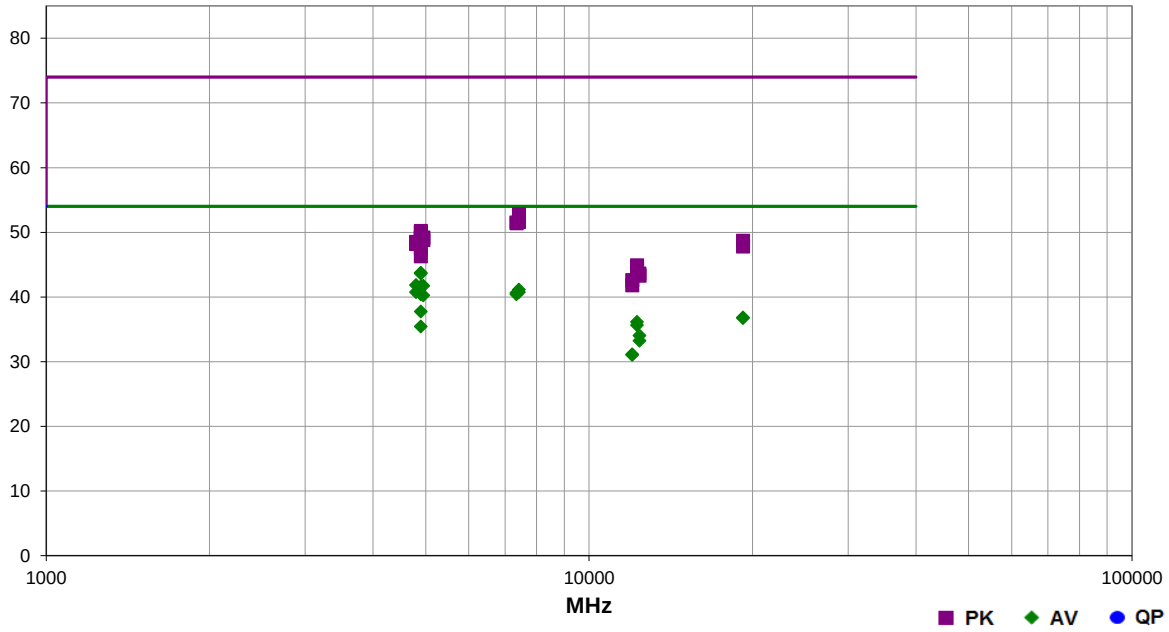
SPURIOUS RADIATED EMISSIONS

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 Alcoke
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 10log(1/D)=0.62 dB.				

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

Run #	20	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



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

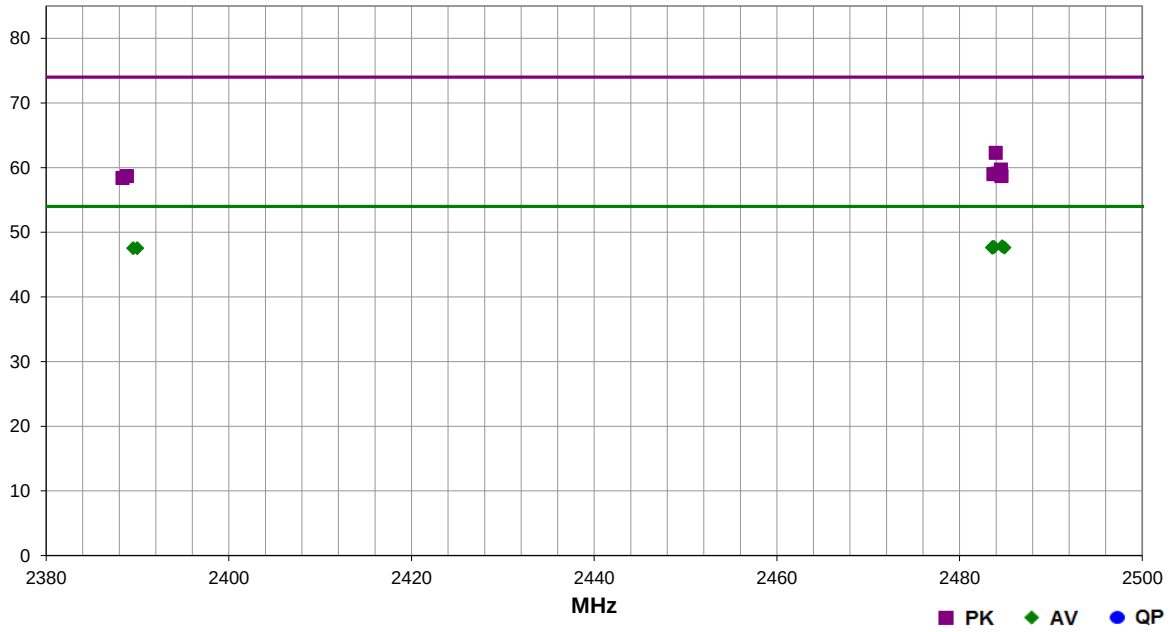
SPURIOUS RADIATED EMISSIONS

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:	xLRID 00.0A.5C.23.C2	**Barometric Pres.:**	1028 mbar	**Tested by:**	Jody House & Jeff Alcoke
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.				

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

Run #	23	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass



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

TbtTx 2017.12.14 XMit 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 Alcoke**	**Power:** **Battery**	**Job Site:** **EV06**

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

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

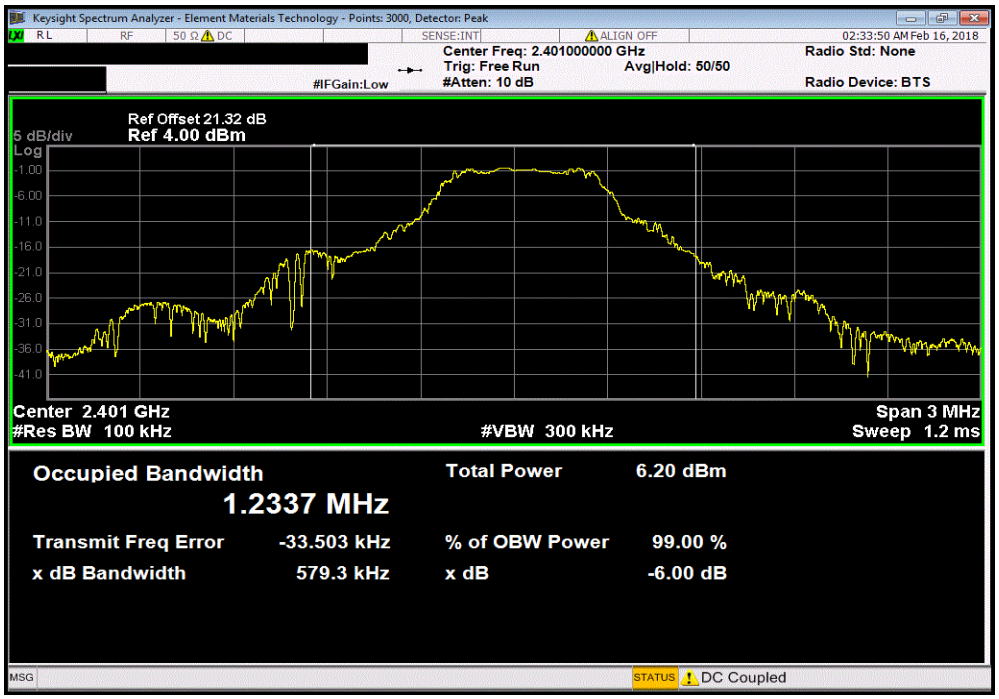
Configuration #	**2**	*Signature*

	Value	**Limit (≥)**	**Result**
GFSK Low Channel, 2401 MHz	579.347 kHz	500 kHz	Pass
GFSK Mid Channel, 2450 MHz	701.044 kHz	500 kHz	Pass
GFSK High Channel, 2476 MHz	743.488 kHz	500 kHz	Pass

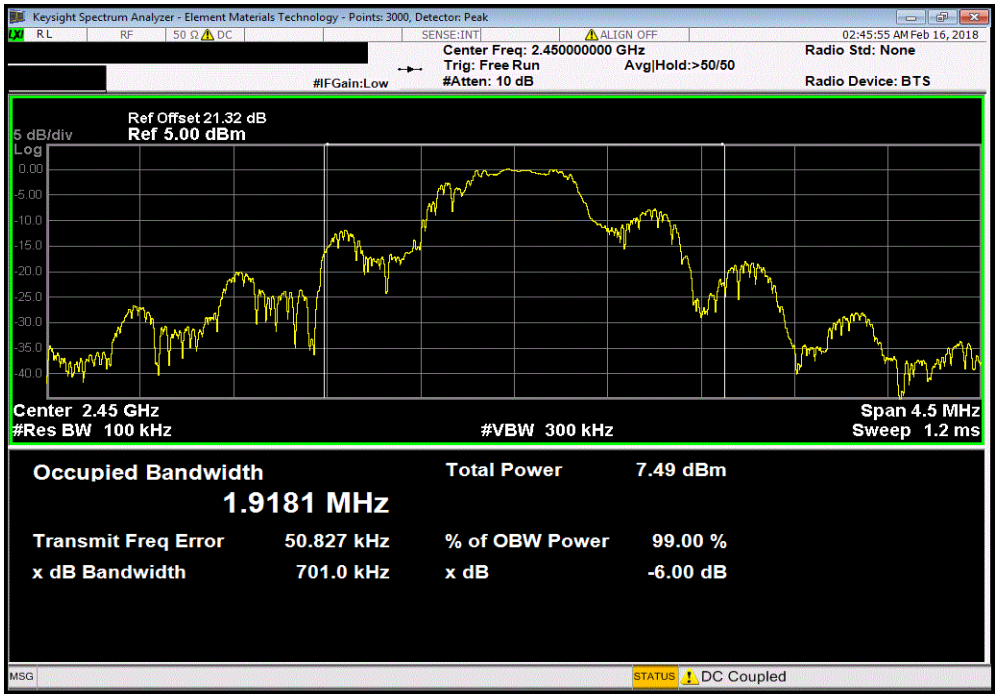
OCCUPIED BANDWIDTH

TbtTx 2017.12.14 XMit 2017.12.13

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



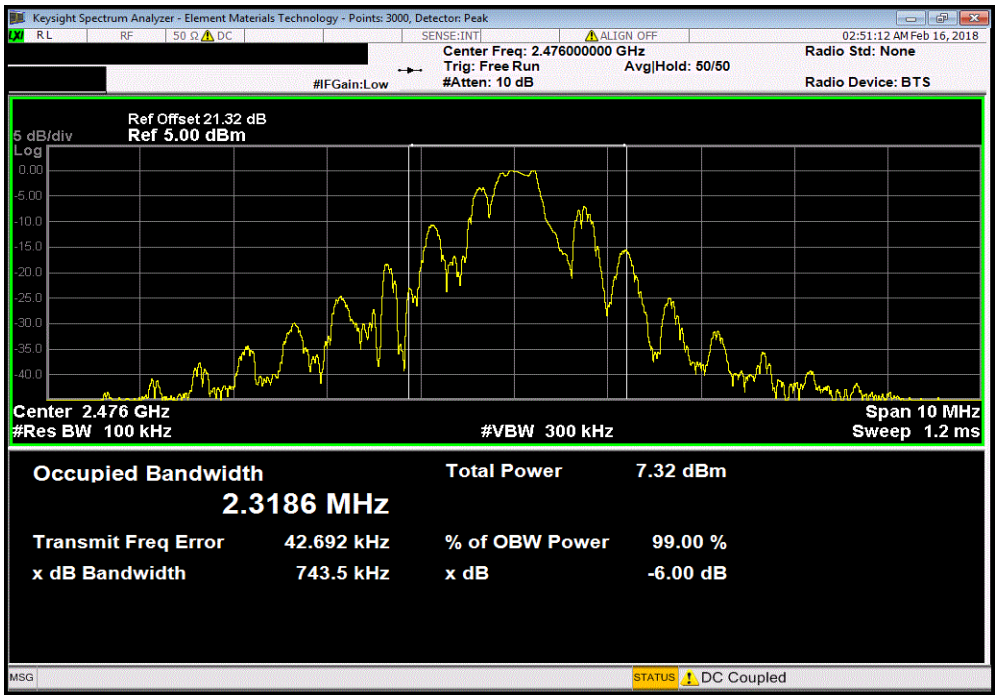
GFSK Mid Channel, 2450 MHz						
				Value	Limit (≥)	Result
				701.044 kHz	500 kHz	Pass



OCCUPIED BANDWIDTH

TbtTx 2017.12.14 XMit 2017.12.13

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



OUTPUT POWER

XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
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

TbtTx 2017.12.14 XMit 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 Alcoke	Power:	Battery	Job Site:	EV06

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

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

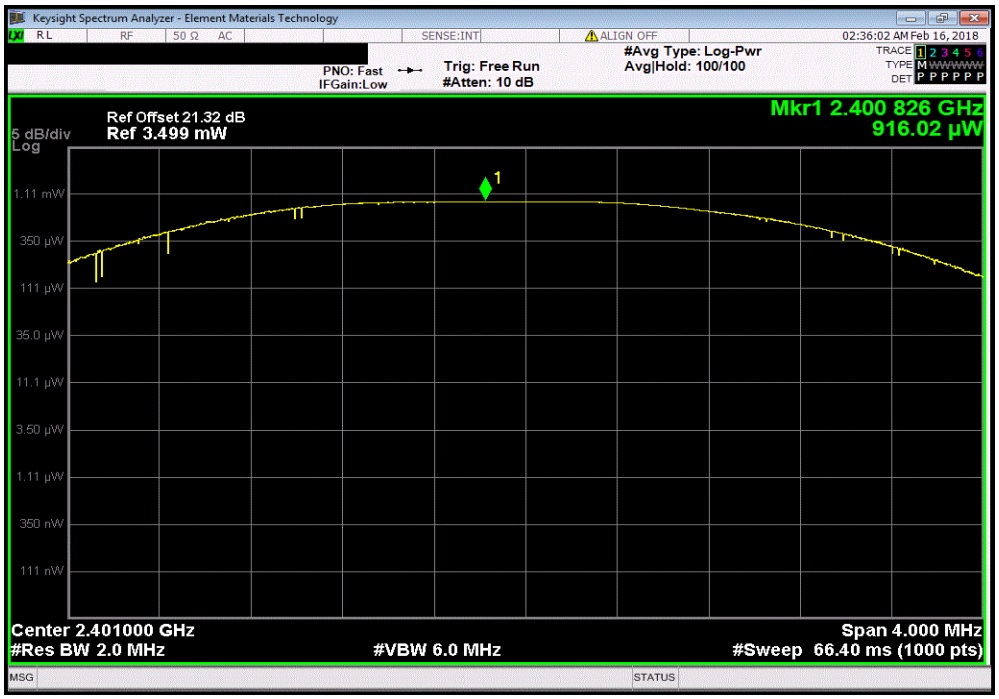
Configuration #	2	Signature

	Value	Limit (<)	Result
GFSK Low Channel, 2401 MHz	916.02 uW	1 W	Pass
GFSK Mid Channel, 2450 MHz	1.05 mW	1 W	Pass
GFSK High Channel, 2476 MHz	1.06 mW	1 W	Pass

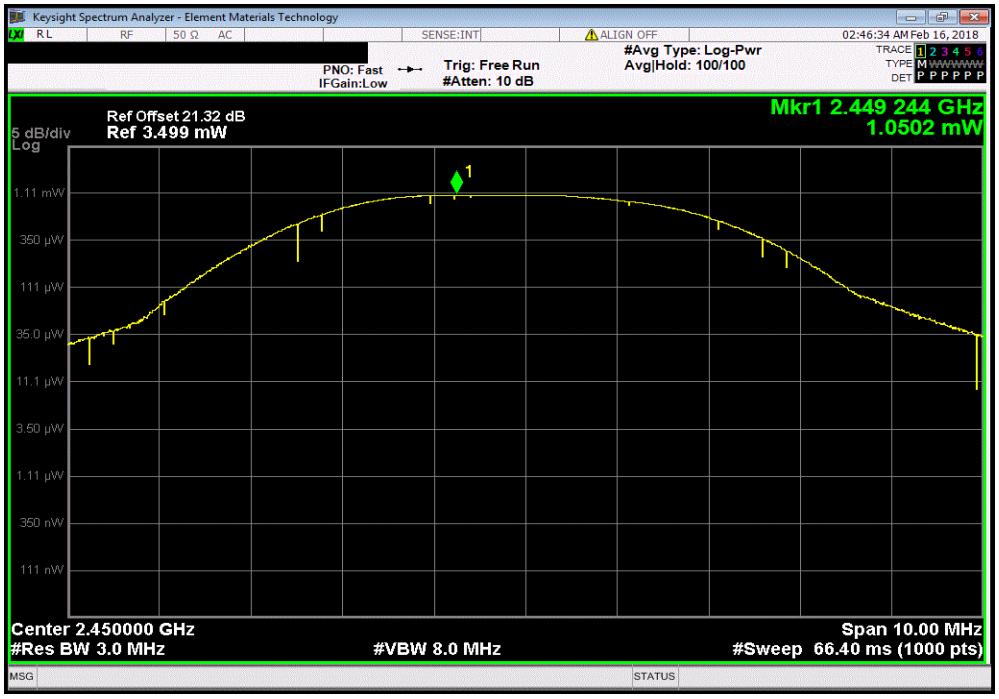
OUTPUT POWER

TbtTx 2017.12.14 XMit 2017.12.13

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



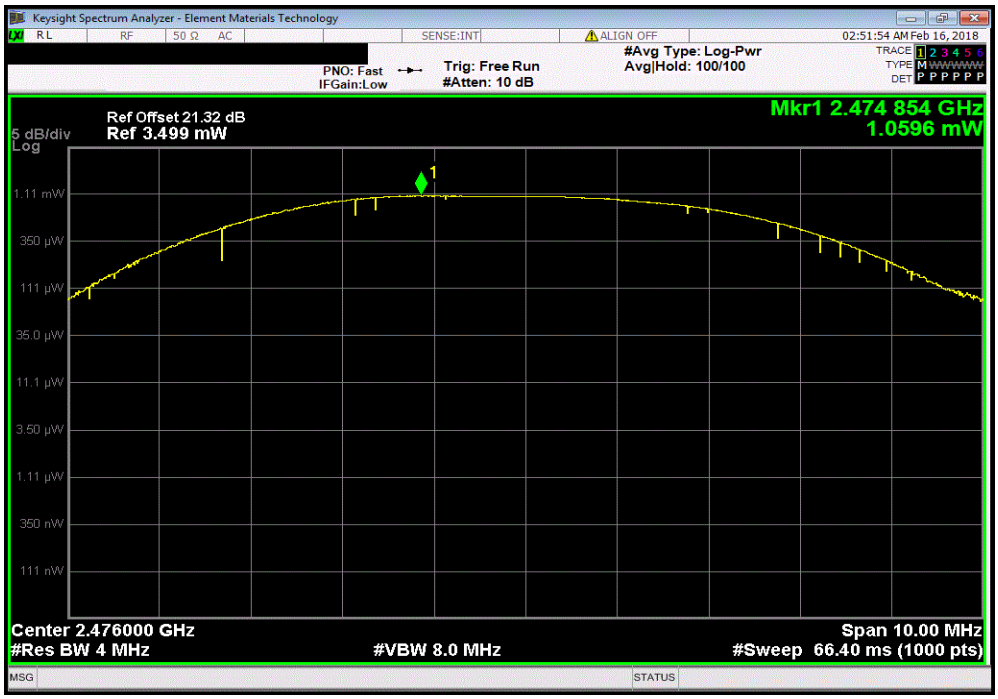
GFSK Mid Channel, 2450 MHz						
				Value	Limit (<)	Result
				1.05 mW	1 W	Pass



OUTPUT POWER

TbtTx 2017.12.14 XMit 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

TbtTx 2017.12.14 XMit 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 Alcoke**	**Power:**	**Battery**	**Job Site:**	**EV06**

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

COMMENTS

None

DEVIATIONS FROM TEST STANDARD

None

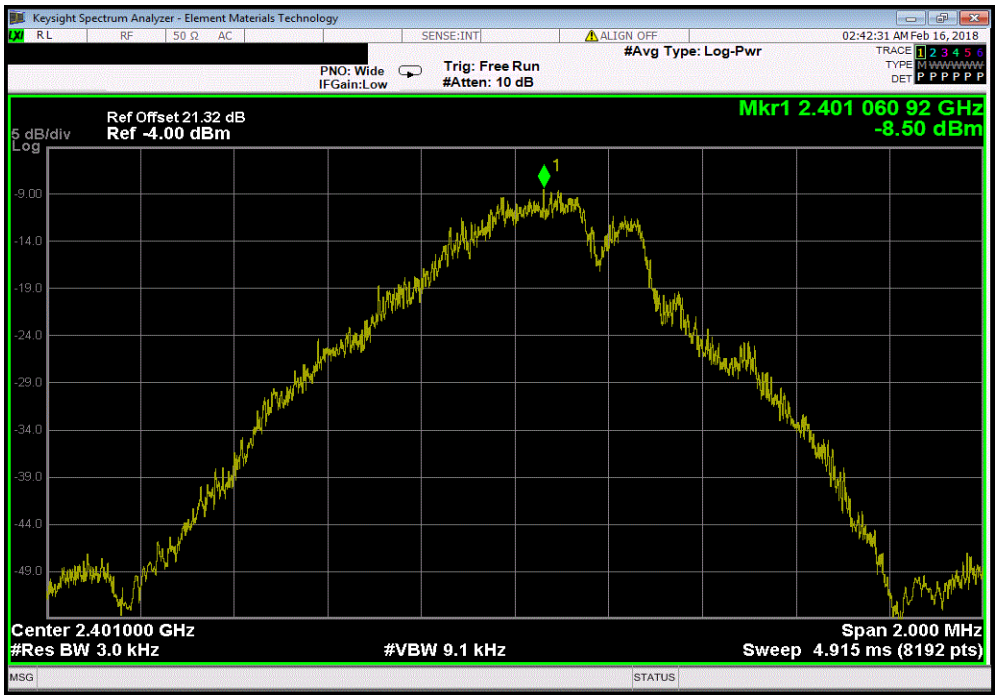
Configuration #	**2**	*Signature*

	Value dBm/3kHz	**Limit < dBm/3kHz**	**Results**
GFSK Low Channel, 2401 MHz	-8.501	8	Pass
GFSK Mid Channel, 2450 MHz	-7.819	8	Pass
GFSK High Channel, 2476 MHz	-7.857	8	Pass

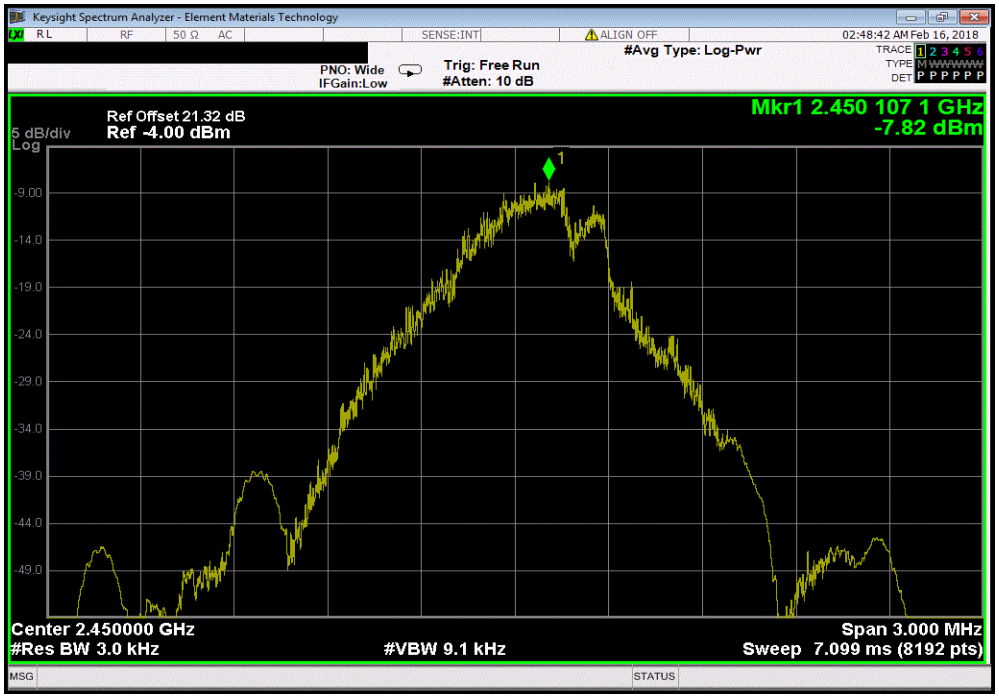
POWER SPECTRAL DENSITY

TbtTx 2017.12.14 XMit 2017.12.13

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



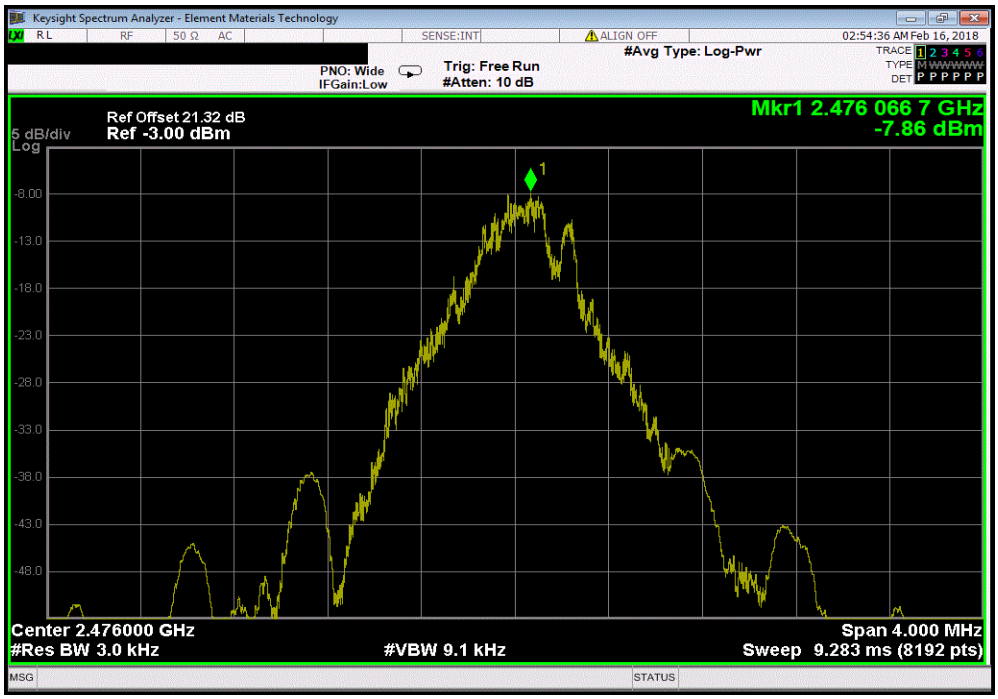
GFSK Mid Channel, 2450 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-7.819	8	Pass



POWER SPECTRAL DENSITY

TbtTx 2017.12.14 XMit 2017.12.13

GFSK High Channel, 2476 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-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

TbtTx 2017.12.14 XMit 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 Alcoke	Power: Battery	Job Site: EV06

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

COMMENTS

None

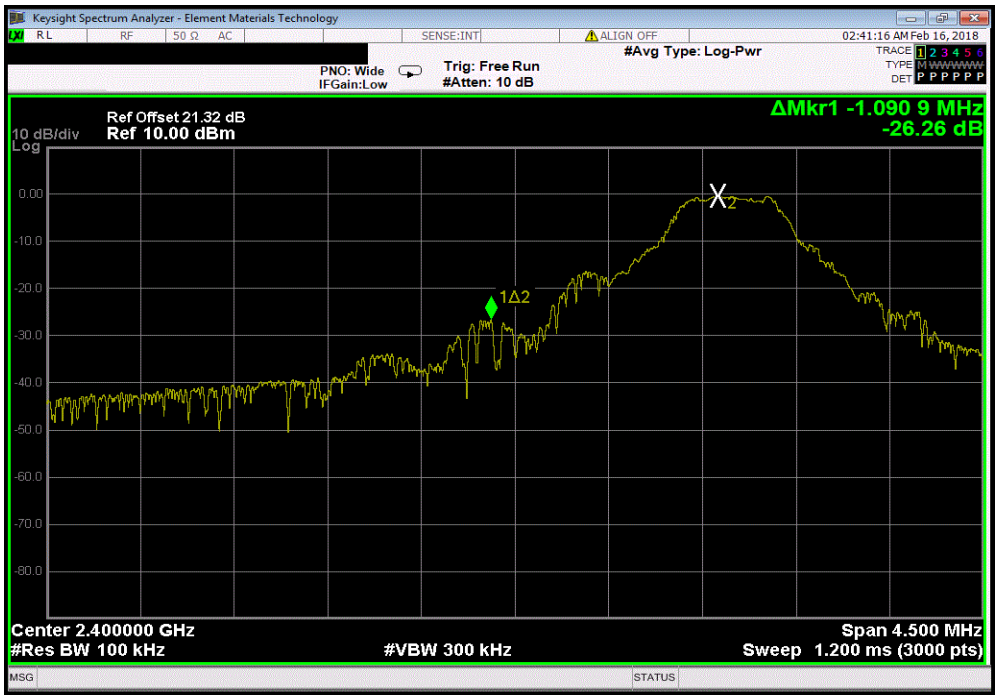
DEVIATIONS FROM TEST STANDARD

None

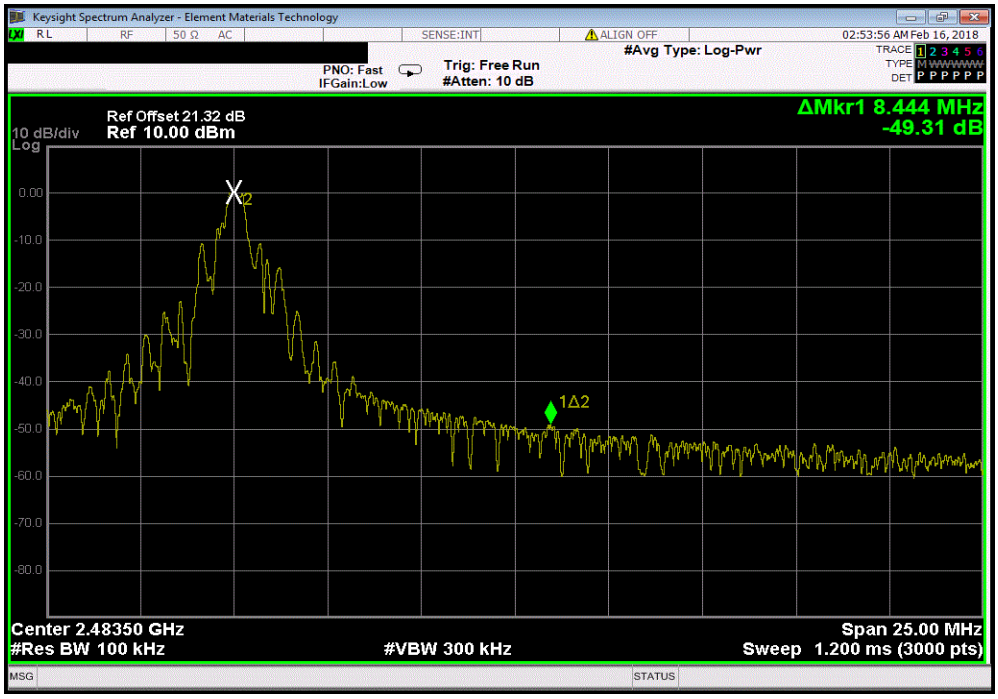
Configuration #	2	Signature

	Value (dBc)	Limit ≤ (dBc)	Result
GFSK Low Channel, 2401 MHz	-26.26	-20	Pass
GFSK High Channel, 2476 MHz	-49.31	-20	Pass

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

TbtTx 2017.12.14 XMit 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 Alcoke**	**Power:** **Battery**	**Job Site:** **EV06**

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

COMMENTS

None

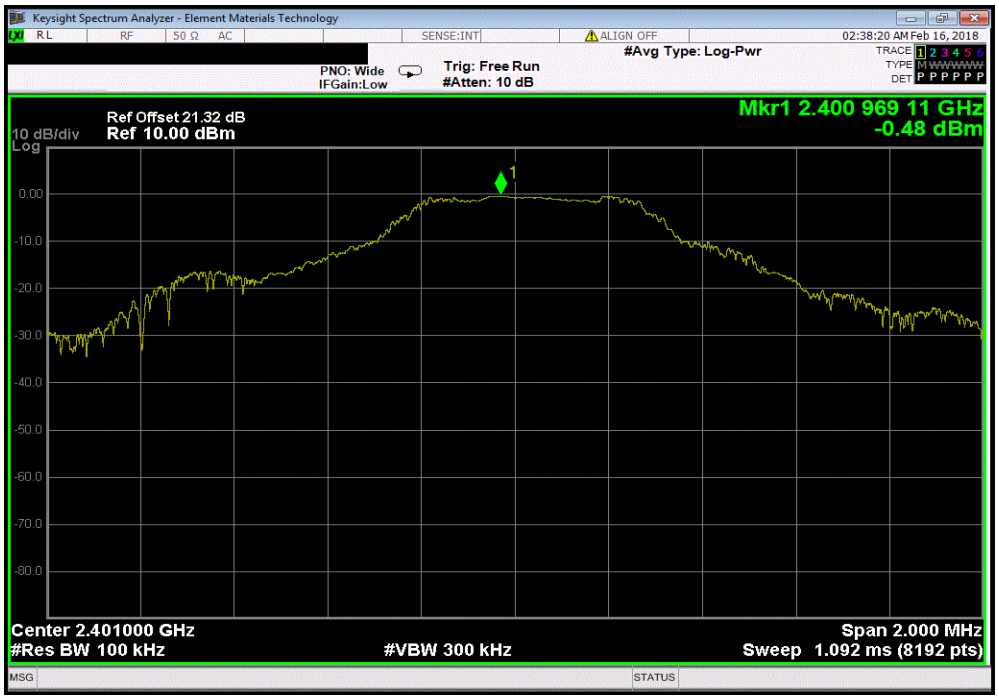
DEVIATIONS FROM TEST STANDARD

None

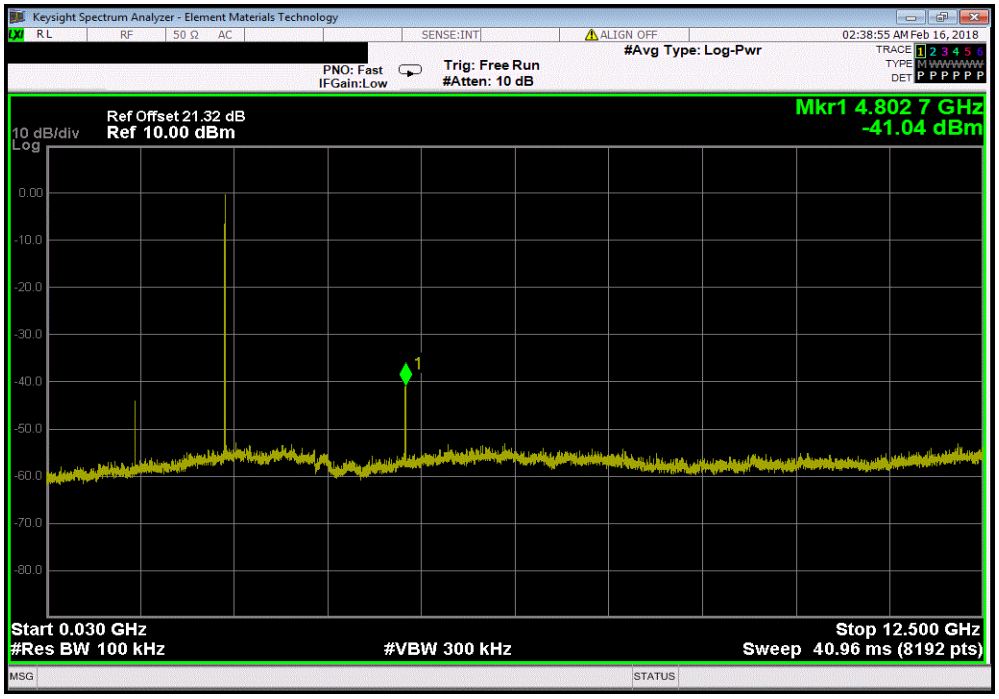
Configuration #	**2**	*Signature*

	Frequency Range	**Max Value (dBc)**	**Limit ≤ (dBc)**	**Result**
GFSK Low Channel, 2401 MHz	Fundamental	N/A	N/A	N/A
GFSK Low Channel, 2401 MHz	30 MHz - 12.5 GHz	-40.56	-20	Pass
GFSK Low Channel, 2401 MHz	12.5 GHz - 25 GHz	-37.97	-20	Pass
GFSK Mid Channel, 2450 MHz	Fundamental	N/A	N/A	N/A
GFSK Mid Channel, 2450 MHz	30 MHz - 12.5 GHz	-43.3	-20	Pass
GFSK Mid Channel, 2450 MHz	12.5 GHz - 25 GHz	-38.18	-20	Pass
GFSK High Channel, 2476 MHz	Fundamental	N/A	N/A	N/A
GFSK High Channel, 2476 MHz	30 MHz - 12.5 GHz	-42.96	-20	Pass
GFSK High Channel, 2476 MHz	12.5 GHz - 25 GHz	-37.98	-20	Pass

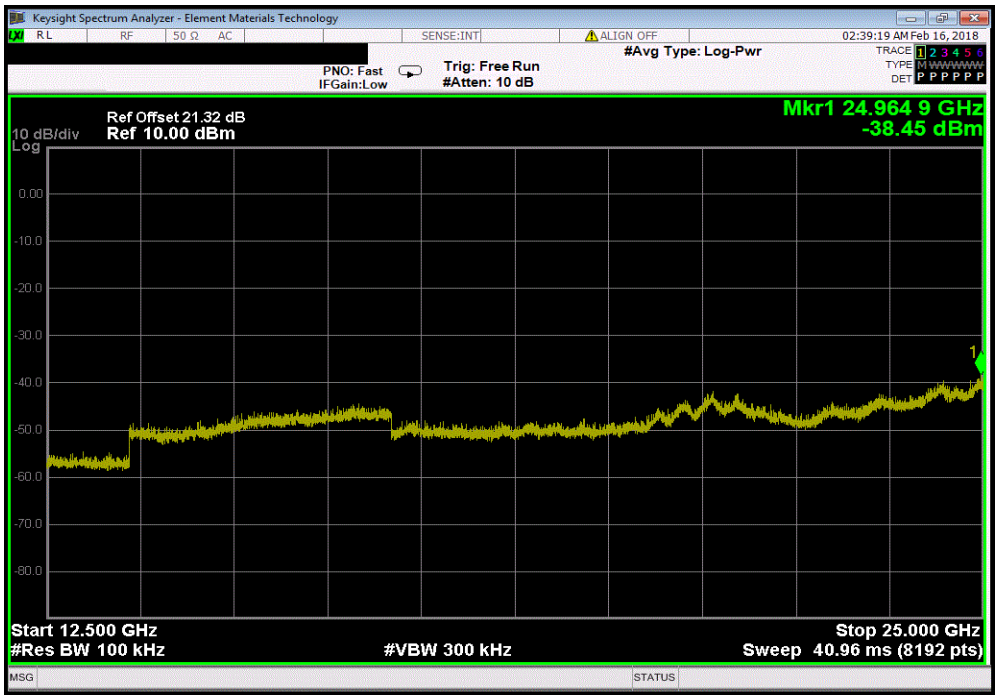
GFSK Low Channel, 2401 MHz						
Frequency Range				Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



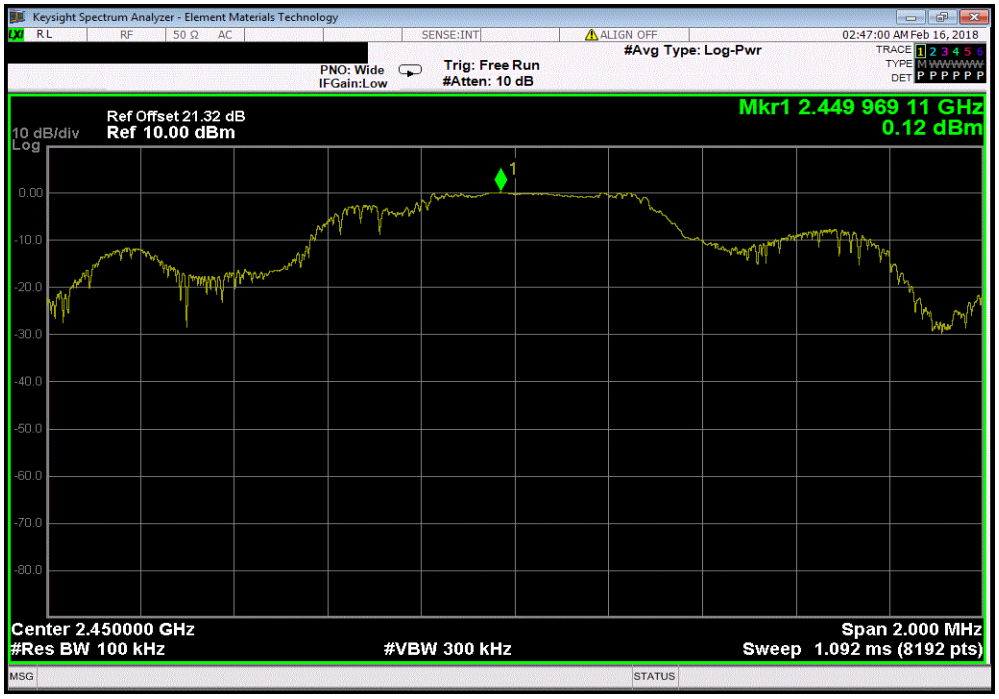
GFSK Low Channel, 2401 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-40.56	-20	Pass



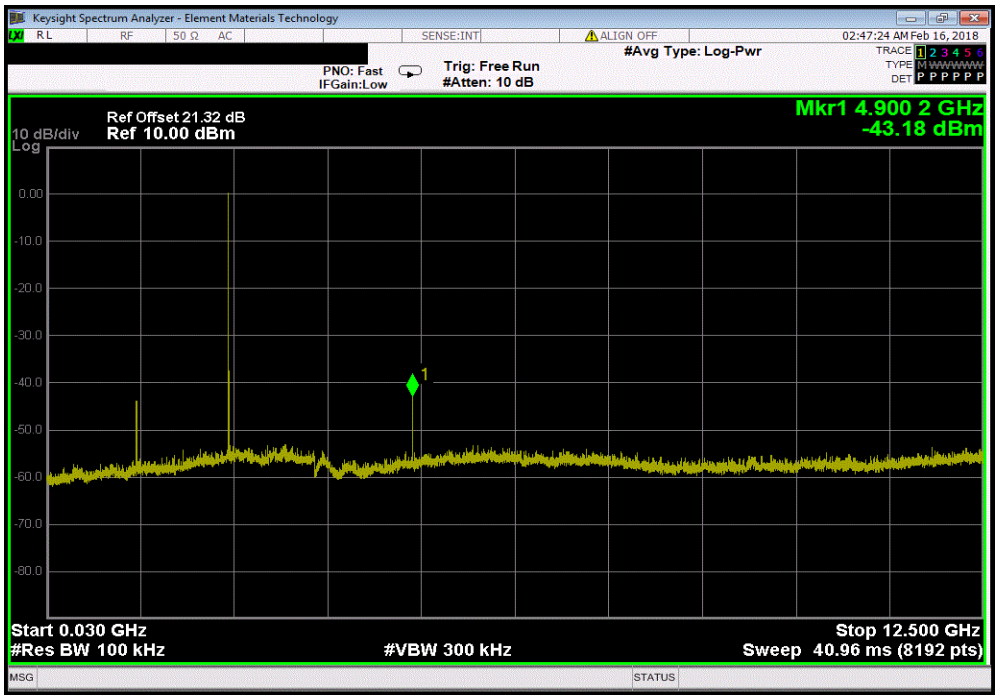
GFSK Low Channel, 2401 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-37.97	-20	Pass



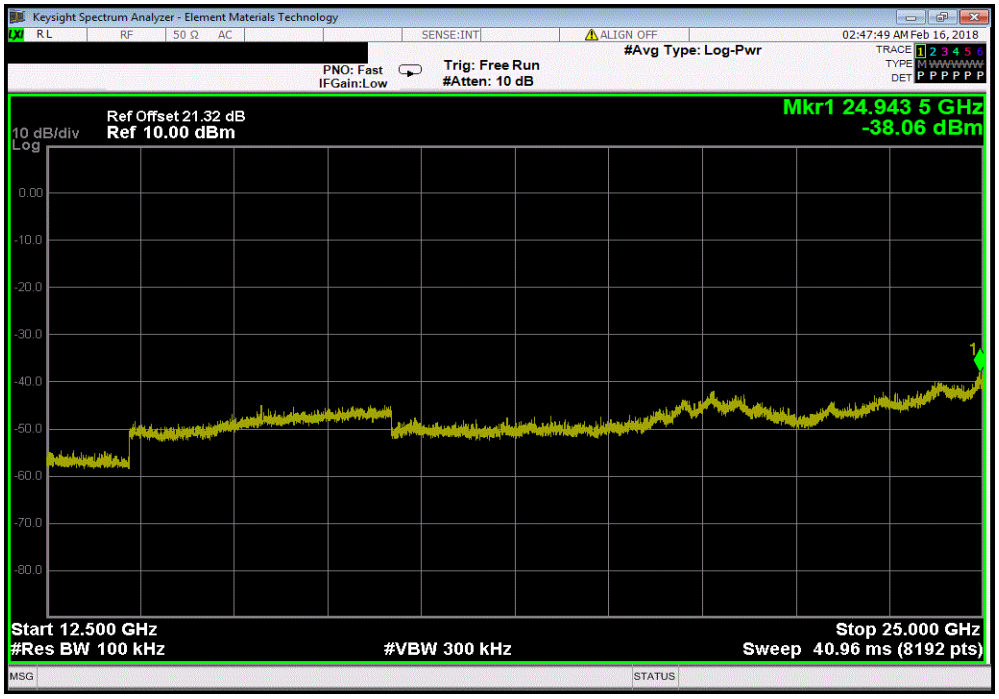
GFSK Mid Channel, 2450 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
Fundamental		N/A	N/A	N/A



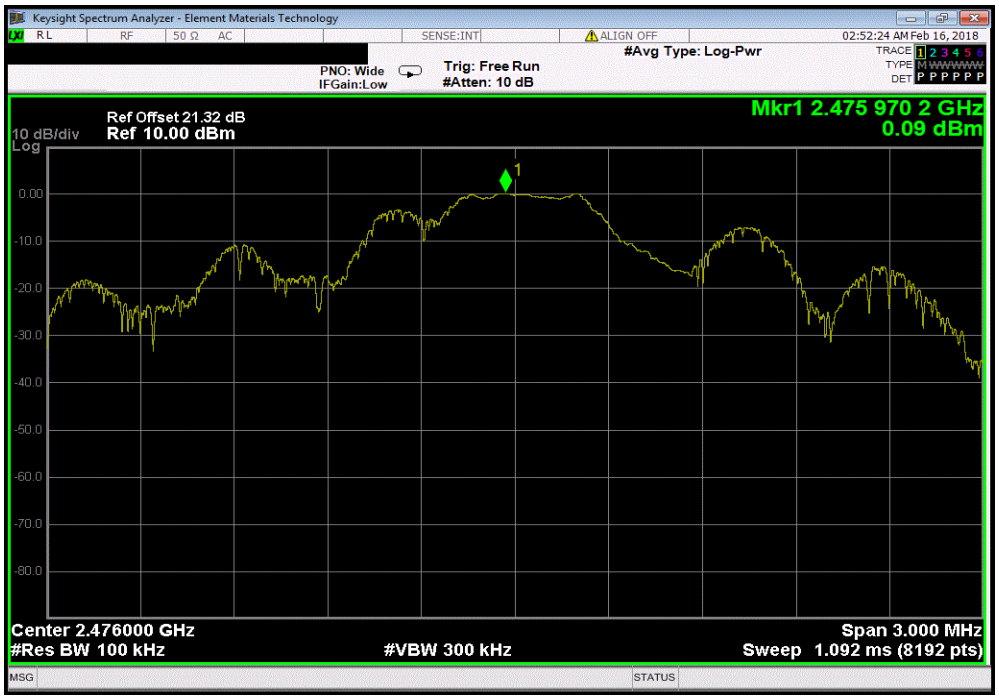
GFSK Mid Channel, 2450 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz		-43.3	-20	Pass



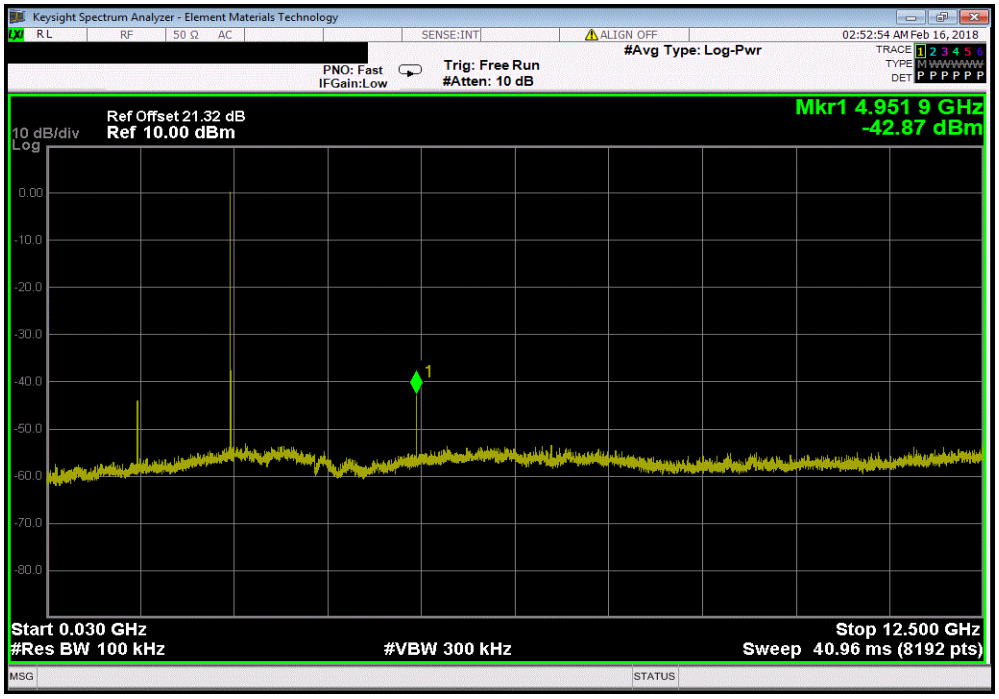
GFSK Mid Channel, 2450 MHz				
Frequency Range		Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz		-38.18	-20	Pass



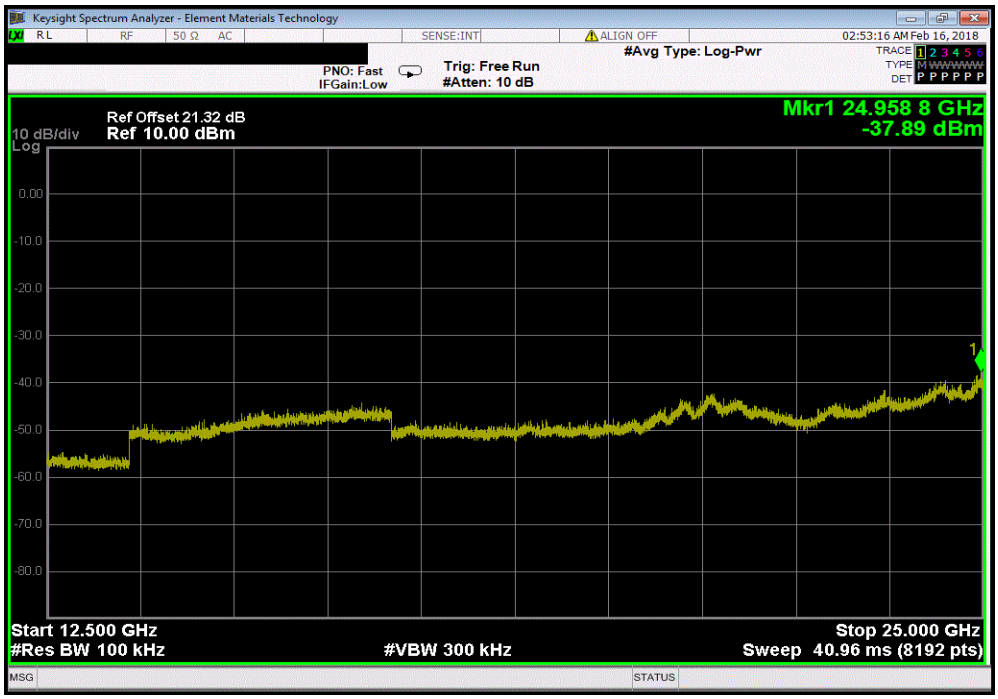
GFSK High Channel, 2476 MHz						
	Frequency Range			Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental			N/A	N/A	N/A



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

TbtTx 2017.12.14 XMit 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