



Walt Disney Parks and Resorts US, Inc.
Magicband

FCC 15.247:2018
Proprietary 2.4 GHz GFSK Radio

Report # SYNA0267.1



NVLAP LAB CODE: 200676-0



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CERTIFICATE OF TEST

Last Date of Test: September 25, 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

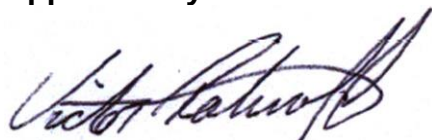
Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT.
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:



Victor Ratnoff, 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. As indicated in the Statement of Work sent with the quotation, Element's standard process is to always use the latest published version of the test methods even when earlier versions are cited in the test specification. Issuance of a purchase order was de facto acceptance of this approach. Otherwise, the client would have advised Element in writing of the specific version of the test methods they wanted applied to the subject testing.

REVISION HISTORY



Revision Number	Description	Date (yyyy-mm-dd)	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS



United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

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

European Union

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

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

SCOPE

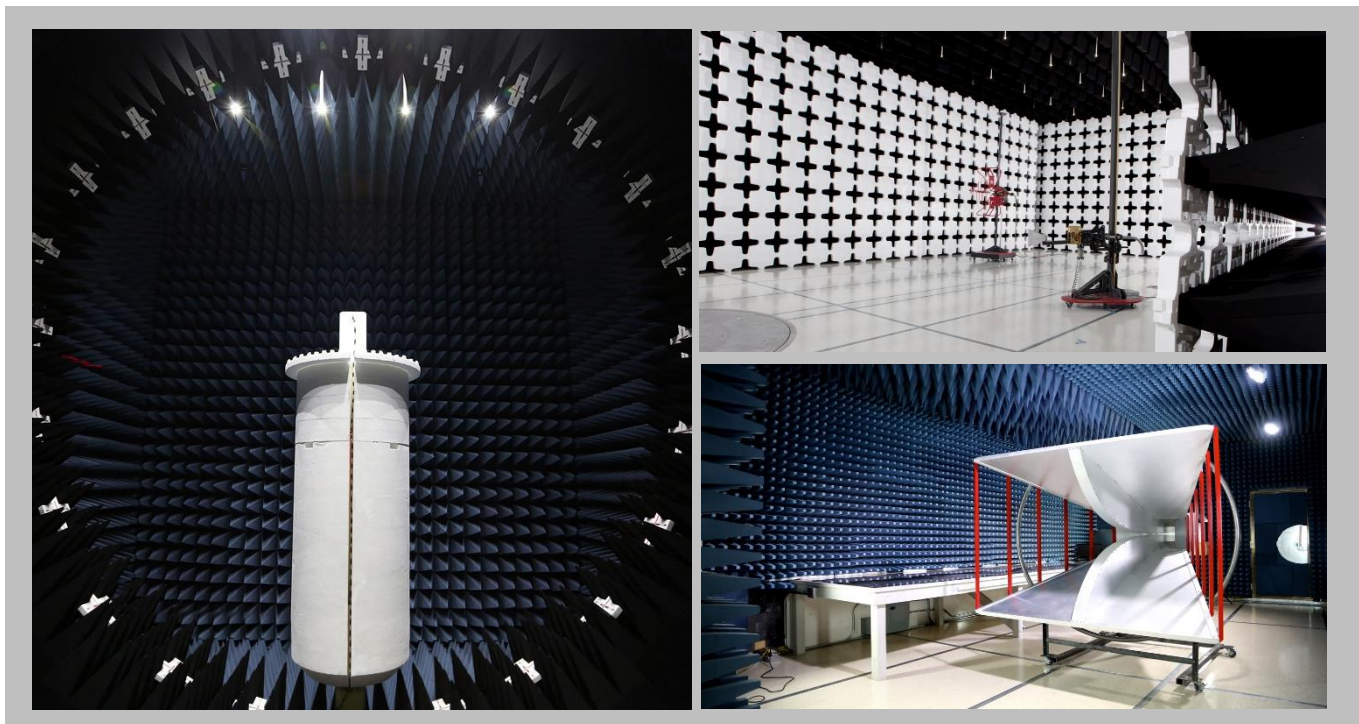
For details on the Scopes of our Accreditations, please visit:

<https://www.nwemc.com/emc-testing-accreditations>

FACILITIES



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



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.

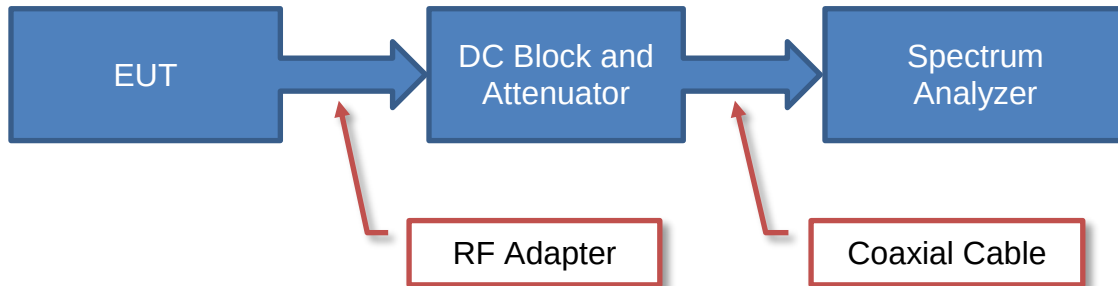
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable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

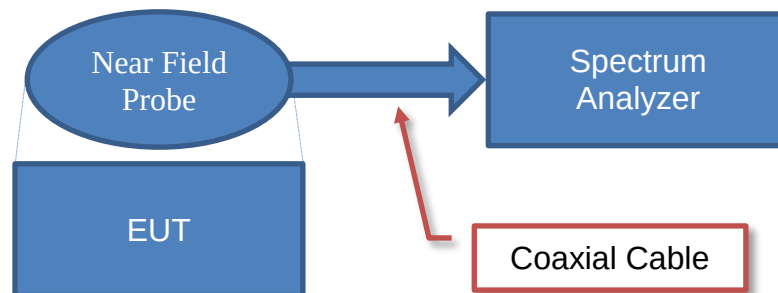
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

Test Setup Block Diagrams

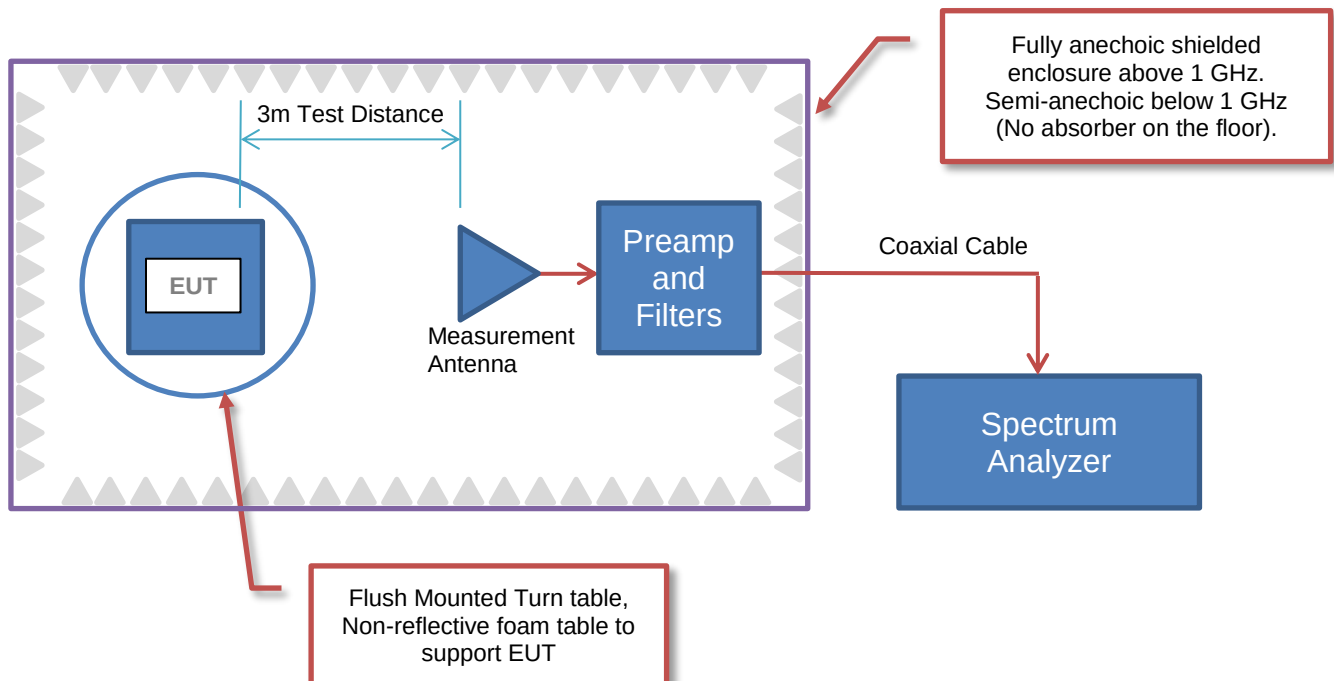
Antenna Port Conducted Measurements



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:	September 24, 2018
Last Date of Test:	September 25, 2018
Receipt Date of Samples:	September 21, 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 Proprietary 2.4 GHz GFSK radio to FCC 15.247 requirements.

CONFIGURATIONS



Configuration SYNA0267- 1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Magic Band	Walt Disney Parks and Resorts US, Inc.	00.0B.76.87.E7	None

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Battery Pack	None	None	None

Configuration SYNA0267- 2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Magic Band (Direct Connect)	Walt Disney Parks and Resorts US, Inc.	00.0B.76.84.19	None

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Battery Pack	None	None	None

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2018-09-24	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	2018-09-25	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.
3	2018-09-25	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.
4	2018-09-25	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.
5	2018-09-25	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.
6	2018-09-25	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2018-09-25	Duty Cycle	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 2018.05.04

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

MODES OF OPERATION

GFSK Low Ch. 2401 MHz, Mid Ch. 2450 MHz, High Ch. 2476 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

SYNA0267 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	24000 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	Northwest EMC	8-18GHz RE Cables	OCO	6-Sep-2018	12 mo
Cable	Northwest EMC	18-26GHz RE Cables	OCK	27-Dec-2017	12 mo
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	6-Sep-2018	12 mo
Antenna - Biconilog	Teseg	CBL 6141A	AYE	7-Nov-2017	24 mo
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	6-Sep-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOI	27-Dec-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOE	7-Sep-2018	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AHT	NCR	0 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHR	NCR	0 mo
Antenna - Standard Gain	ETS Lindgren	3160-09	AHN	NCR	0 mo
Antenna - Double Ridge	EMCO	3115	AHB	28-Mar-2018	24 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	21-Nov-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.

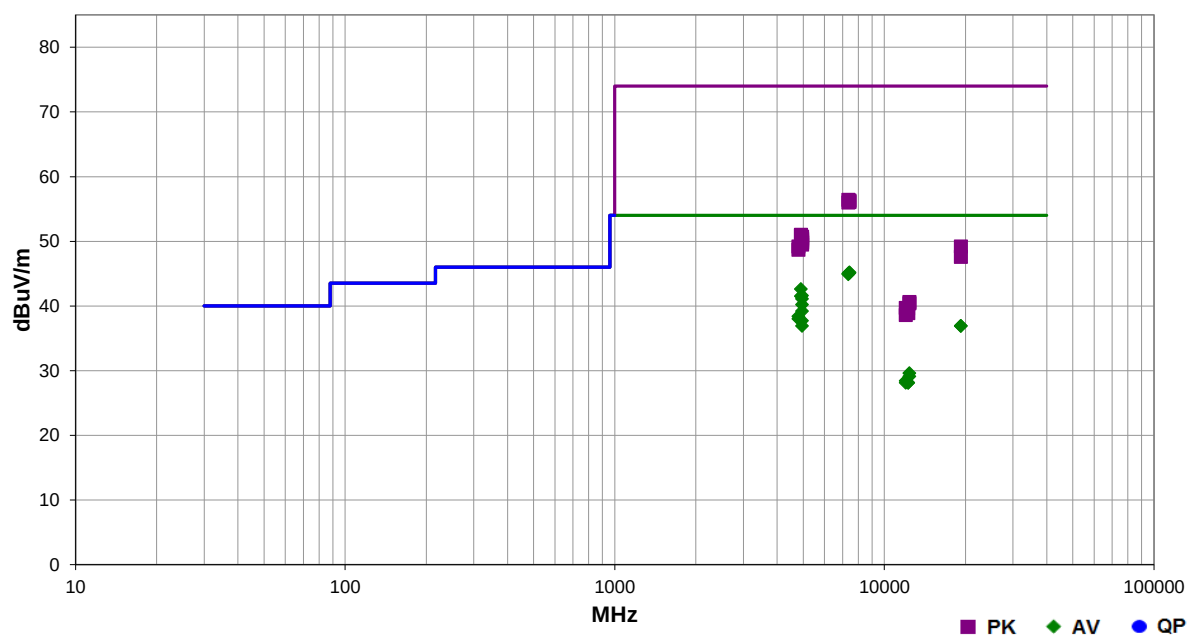
SPURIOUS RADIATED EMISSIONS



Work Order:	SYNA0267	Date:	24-Sep-2018	EMHS 2018.05.07 PSA-ESCI 2018.05.04	
Project:	None	Temperature:	22.2 °C		
Job Site:	OC10	Humidity:	51% RH		
Serial Number:	N/A	Barometric Pres.:	1015 mbar		
EUT:		Magicband			
Configuration:	1				
Customer:	Walt Disney Parks and Resorts US, Inc.				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	GFSK Low Ch. 2401 MHz, Mid Ch. 2450 MHz, High Ch. 2476 MHz				
Deviations:	None				
Comments:	None				

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

Run #	13	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
7427.375	27.5	17.7	1.0	266.0	3.0	0.0	Vert	AV	0.0	45.2	54.0	-8.8	EUT on Side, High Ch
7428.058	27.4	17.7	1.4	165.0	3.0	0.0	Horz	AV	0.0	45.1	54.0	-8.9	EUT Vert, High Ch
7349.850	27.6	17.4	1.0	231.0	3.0	0.0	Vert	AV	0.0	45.0	54.0	-9.0	EUT on Side, Mid Ch
7350.990	27.5	17.4	1.0	206.0	3.0	0.0	Horz	AV	0.0	44.9	54.0	-9.1	EUT Vert, Mid Ch
4900.155	30.3	12.3	1.0	50.0	3.0	0.0	Horz	AV	0.0	42.6	54.0	-11.4	EUT Vert, Mid Ch
4952.250	29.1	12.5	1.0	266.0	3.0	0.0	Horz	AV	0.0	41.6	54.0	-12.4	EUT Vert, High Ch
4900.085	29.2	12.3	1.0	37.0	3.0	0.0	Vert	AV	0.0	41.5	54.0	-12.5	EUT on Side, Mid Ch
4952.058	28.6	12.5	1.0	206.0	3.0	0.0	Vert	AV	0.0	41.1	54.0	-12.9	EUT on Side, High Ch
4952.100	27.7	12.5	1.0	108.0	3.0	0.0	Vert	AV	0.0	40.2	54.0	-13.8	EUT Vert, High Ch
4952.025	26.7	12.5	1.0	92.0	3.0	0.0	Horz	AV	0.0	39.2	54.0	-14.8	EUT on Side, High Ch
4802.185	27.1	11.3	1.0	290.0	3.0	0.0	Horz	AV	0.0	38.4	54.0	-15.6	EUT Vert, Low Ch
4802.125	26.7	11.3	1.0	157.0	3.0	0.0	Vert	AV	0.0	38.0	54.0	-16.0	EUT on Side, Low Ch
4952.075	25.2	12.5	1.0	348.0	3.0	0.0	Vert	AV	0.0	37.7	54.0	-16.3	EUT Horz, High CH
4952.142	24.4	12.5	1.0	251.0	3.0	0.0	Horz	AV	0.0	36.9	54.0	-17.1	EUT Horz, High CH
19209.330	40.8	-3.9	1.5	31.0	3.0	0.0	Horz	AV	0.0	36.9	54.0	-17.1	EUT Vert, Low Ch
19209.470	40.8	-3.9	1.5	38.0	3.0	0.0	Vert	AV	0.0	36.9	54.0	-17.1	EUT on Side, Low Ch
7350.300	39.0	17.4	1.0	231.0	3.0	0.0	Vert	PK	0.0	56.4	74.0	-17.6	EUT on Side, Mid Ch
7426.475	38.6	17.7	1.4	165.0	3.0	0.0	Horz	PK	0.0	56.3	74.0	-17.7	EUT Vert, High Ch

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
7429.158	38.4	17.7	1.0	266.0	3.0	0.0	Vert	PK	0.0	56.1	74.0	-17.9	EUT on Side, High Ch
7348.870	38.6	17.4	1.0	206.0	3.0	0.0	Horz	PK	0.0	56.0	74.0	-18.0	EUT Vert, Mid Ch
4900.390	38.7	12.3	1.0	37.0	3.0	0.0	Vert	PK	0.0	51.0	74.0	-23.0	EUT on Side, Mid Ch
4900.205	38.6	12.3	1.0	50.0	3.0	0.0	Horz	PK	0.0	50.9	74.0	-23.1	EUT Vert, Mid Ch
4951.508	38.2	12.5	1.0	206.0	3.0	0.0	Vert	PK	0.0	50.7	74.0	-23.3	EUT on Side, High Ch
4952.050	37.9	12.5	1.0	266.0	3.0	0.0	Horz	PK	0.0	50.4	74.0	-23.6	EUT Vert, High Ch
4952.608	37.7	12.5	1.0	251.0	3.0	0.0	Horz	PK	0.0	50.2	74.0	-23.8	EUT Horz, High CH
4952.217	37.4	12.5	1.0	108.0	3.0	0.0	Vert	PK	0.0	49.9	74.0	-24.1	EUT Vert, High Ch
4949.675	37.3	12.5	1.0	348.0	3.0	0.0	Vert	PK	0.0	49.8	74.0	-24.2	EUT Horz, High CH
12380.850	33.0	-3.4	1.0	163.0	3.0	0.0	Vert	AV	0.0	29.6	54.0	-24.4	EUT on Side, High Ch
4951.783	37.0	12.5	1.0	92.0	3.0	0.0	Horz	PK	0.0	49.5	74.0	-24.5	EUT on Side, High Ch
4803.095	37.9	11.3	1.0	290.0	3.0	0.0	Horz	PK	0.0	49.2	74.0	-24.8	EUT Vert, Low Ch
19206.990	53.1	-3.9	1.5	31.0	3.0	0.0	Horz	PK	0.0	49.2	74.0	-24.8	EUT Vert, Low Ch
12379.580	32.5	-3.4	1.0	94.0	3.0	0.0	Horz	AV	0.0	29.1	54.0	-24.9	EUT Vert, High Ch
4799.750	37.4	11.3	1.0	157.0	3.0	0.0	Vert	PK	0.0	48.7	74.0	-25.3	EUT on Side, Low Ch
12005.740	33.8	-5.4	1.0	179.0	3.0	0.0	Vert	AV	0.0	28.4	54.0	-25.6	EUT on Side, Low Ch
12251.210	31.6	-3.5	1.0	354.0	3.0	0.0	Vert	AV	0.0	28.1	54.0	-25.9	EUT on Side, Mid Ch
12251.280	31.6	-3.5	1.0	302.0	3.0	0.0	Horz	AV	0.0	28.1	54.0	-25.9	EUT Vert, Mid Ch
12006.030	33.5	-5.4	1.0	172.0	3.0	0.0	Horz	AV	0.0	28.1	54.0	-25.9	EUT Vert, Low Ch
19208.990	51.5	-3.9	1.5	38.0	3.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	EUT on Side, Low Ch
12378.840	44.0	-3.4	1.0	163.0	3.0	0.0	Vert	PK	0.0	40.6	74.0	-33.4	EUT on Side, Mid Ch
12379.350	43.8	-3.4	1.0	94.0	3.0	0.0	Horz	PK	0.0	40.4	74.0	-33.6	EUT Vert, High Ch
12005.840	45.1	-5.4	1.0	179.0	3.0	0.0	Vert	PK	0.0	39.7	74.0	-34.3	EUT on Side, Low Ch
12249.230	43.1	-3.5	1.0	354.0	3.0	0.0	Vert	PK	0.0	39.6	74.0	-34.4	EUT on Side, High Ch
12251.490	42.4	-3.5	1.0	302.0	3.0	0.0	Horz	PK	0.0	38.9	74.0	-35.1	EUT Vert, Mid Ch
12006.130	44.0	-5.4	1.0	172.0	3.0	0.0	Horz	PK	0.0	38.6	74.0	-35.4	EUT Vert, Low Ch

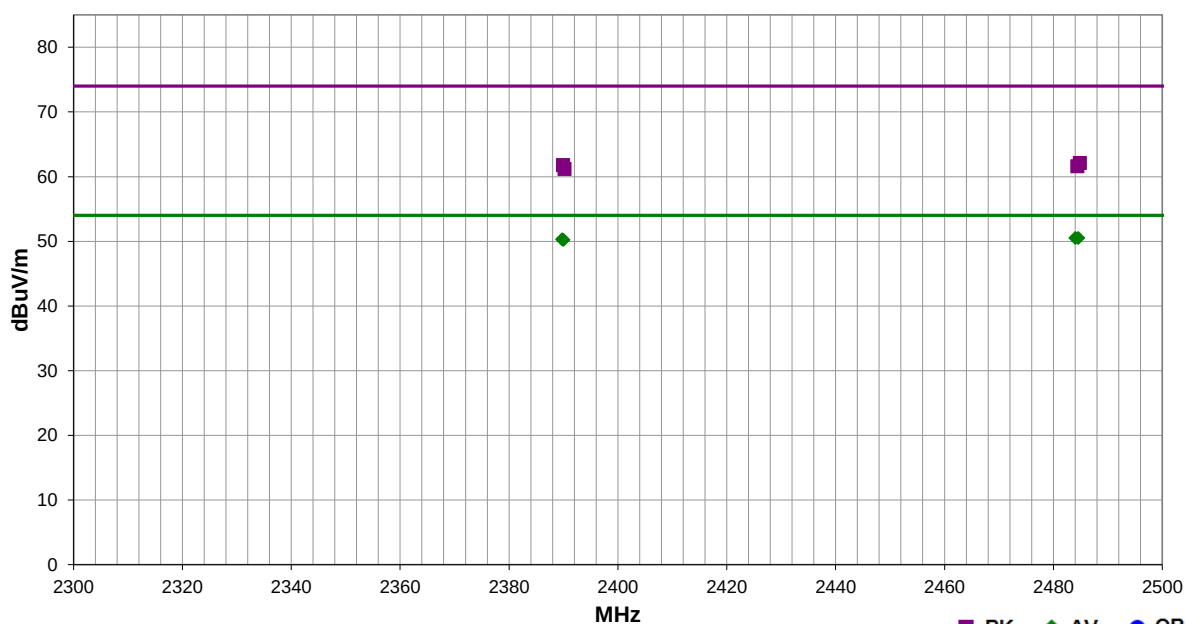
SPURIOUS RADIATED EMISSIONS



Work Order:	SYNA0267	Date:	24-Sep-2018	EMHS 2018.05.07		PSA-ESCI 2018.05.04
Project:	None	Temperature:	22.2 °C			
Job Site:	OC10	Humidity:	51% RH			
Serial Number:	N/A	Barometric Pres.:	1015 mbar			
EUT:		Magicband				
Configuration:	1					
Customer:	Walt Disney Parks and Resorts US, Inc.					
Attendees:	None					
EUT Power:	Battery					
Operating Mode:	GFSK Low Ch. 2401 MHz, High Ch. 2476 MHz					
Deviations:	None					
Comments:	Band Edge Measurement					

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

Run #	21	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2484.063	27.5	3.0	1.0	3.0	3.0	20.0	Horz	AV	0.0	50.5	54.0	-3.5	EUT Vert , High Ch
2484.568	27.5	3.0	1.0	32.0	3.0	20.0	Vert	AV	0.0	50.5	54.0	-3.5	EUT on Side, High Ch
2389.763	27.7	2.6	1.2	154.0	3.0	20.0	Horz	AV	0.0	50.3	54.0	-3.7	EUT Vert , Low Ch
2390.033	27.6	2.6	1.0	318.0	3.0	20.0	Vert	AV	0.0	50.2	54.0	-3.8	EUT on Side, Low Ch
2484.850	39.1	3.0	1.0	3.0	3.0	20.0	Horz	PK	0.0	62.1	74.0	-11.9	EUT Vert , High Ch
2389.902	39.2	2.6	1.2	154.0	3.0	20.0	Horz	PK	0.0	61.8	74.0	-12.2	EUT Vert , Low Ch
2484.407	38.6	3.0	1.0	32.0	3.0	20.0	Vert	PK	0.0	61.6	74.0	-12.4	EUT on Side, High Ch
2390.187	38.6	2.6	1.0	318.0	3.0	20.0	Vert	PK	0.0	61.2	74.0	-12.8	EUT on Side, Low Ch

DUTY CYCLE



XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	9-Nov-17	9-Nov-18
Block - DC	Fairview Microwave	SD3379	AMV	28-Dec-17	28-Dec-18
Attenuator	Fairview Microwave	SA18E-20	TKS	31-Jan-18	31-Jan-19
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR

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

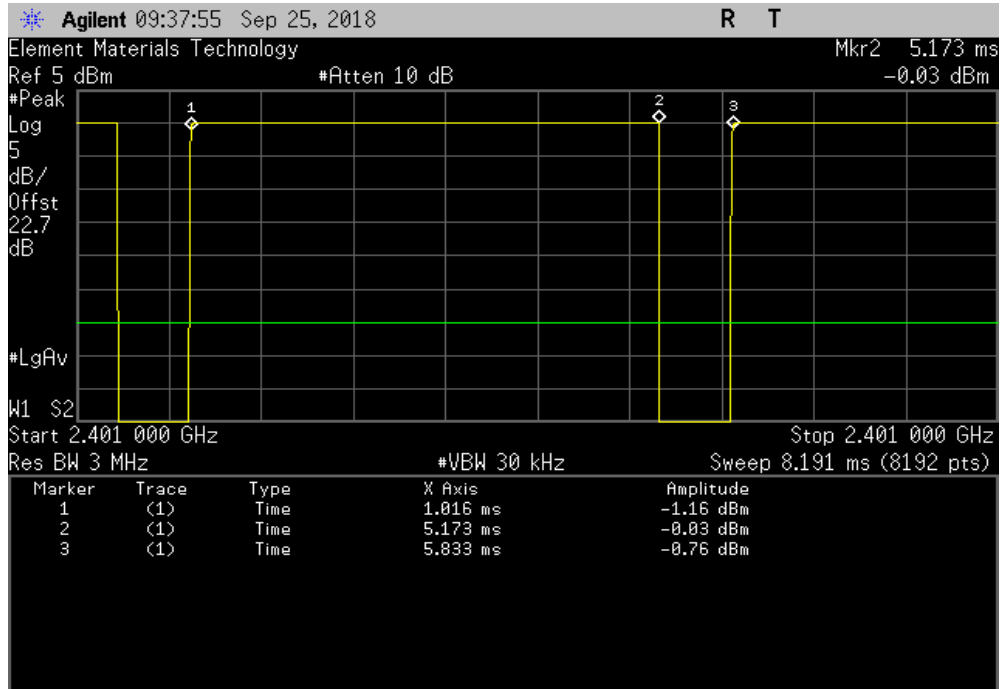
TbtTx 2018.06.19 XMit 2017.12.13

DUTY CYCLE

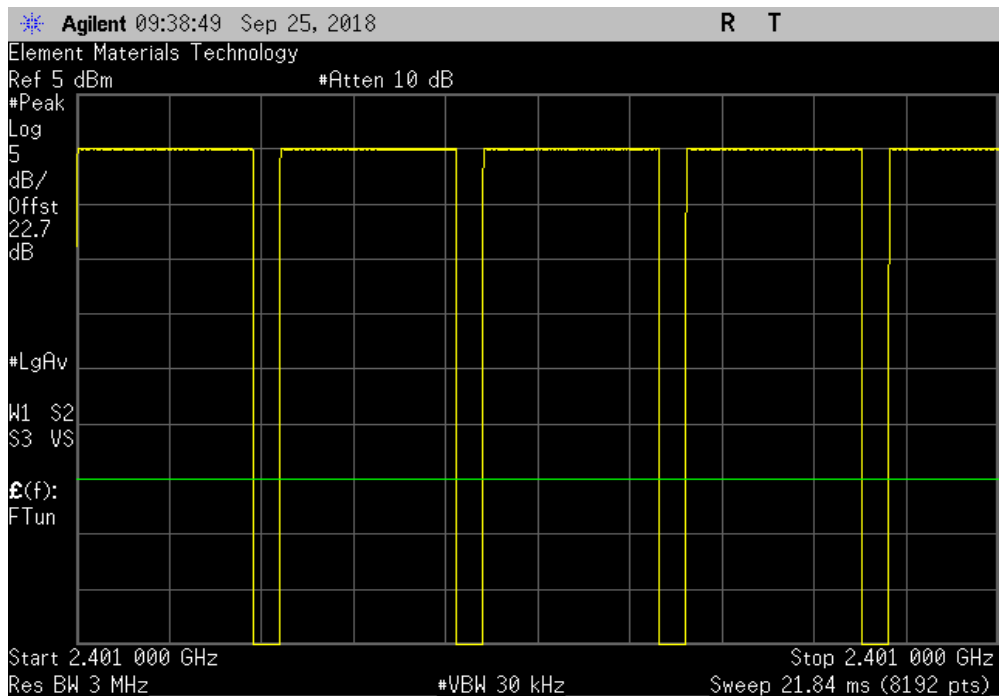


TMTx 2018.06.19 XMM 2017.12.13

GFSK Low Channel, 2401 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	4.157 ms	4.817 ms	1	86.3	N/A	N/A



GFSK Low Channel, 2401 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

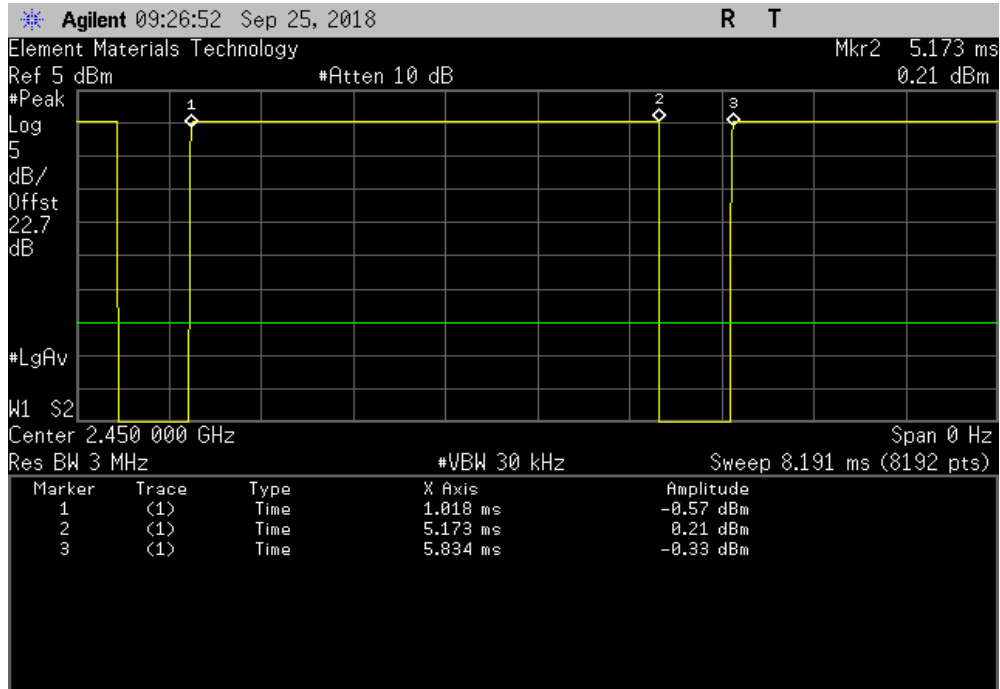


DUTY CYCLE

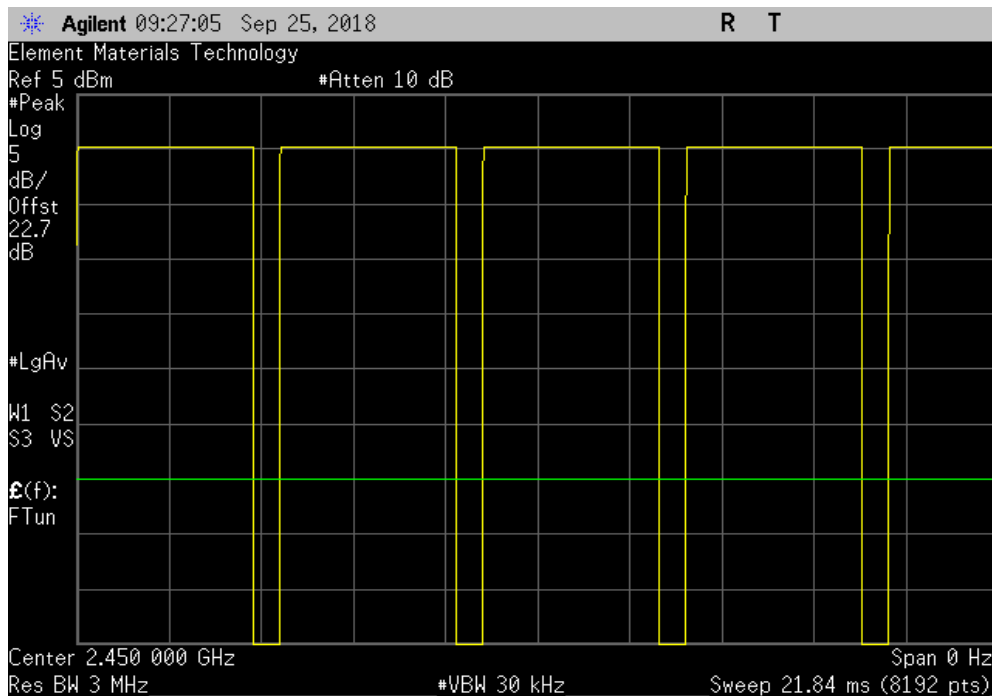


TMTx 2018.06.19 XMI 2017.12.13

GFSK Mid Channel, 2450 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	4.155 ms	4.816 ms	1	86.3	N/A	N/A



GFSK Mid Channel, 2450 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A

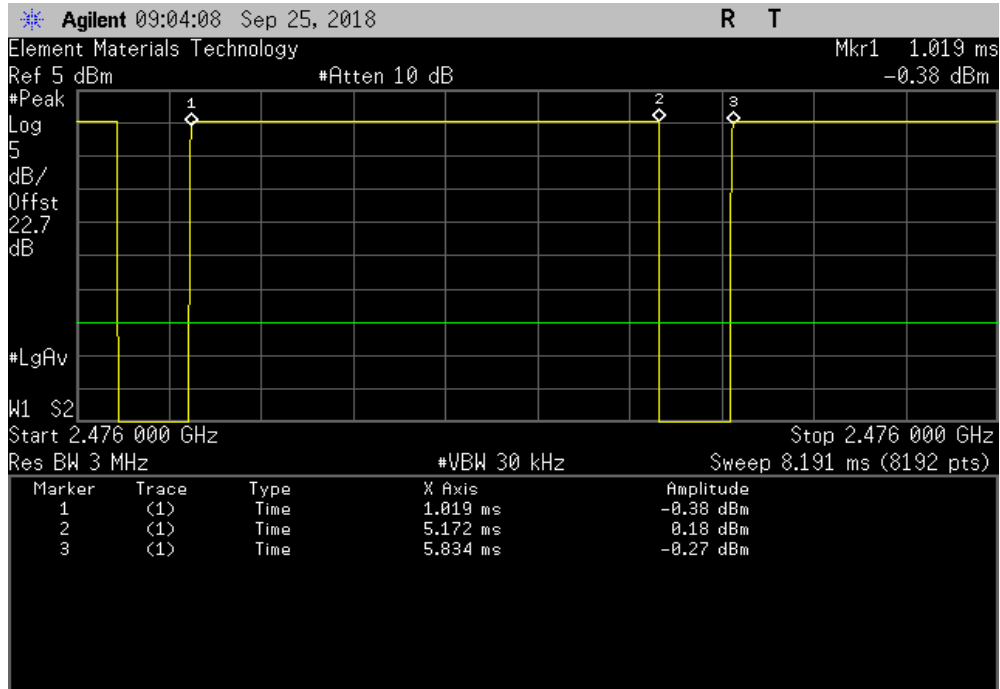


DUTY CYCLE

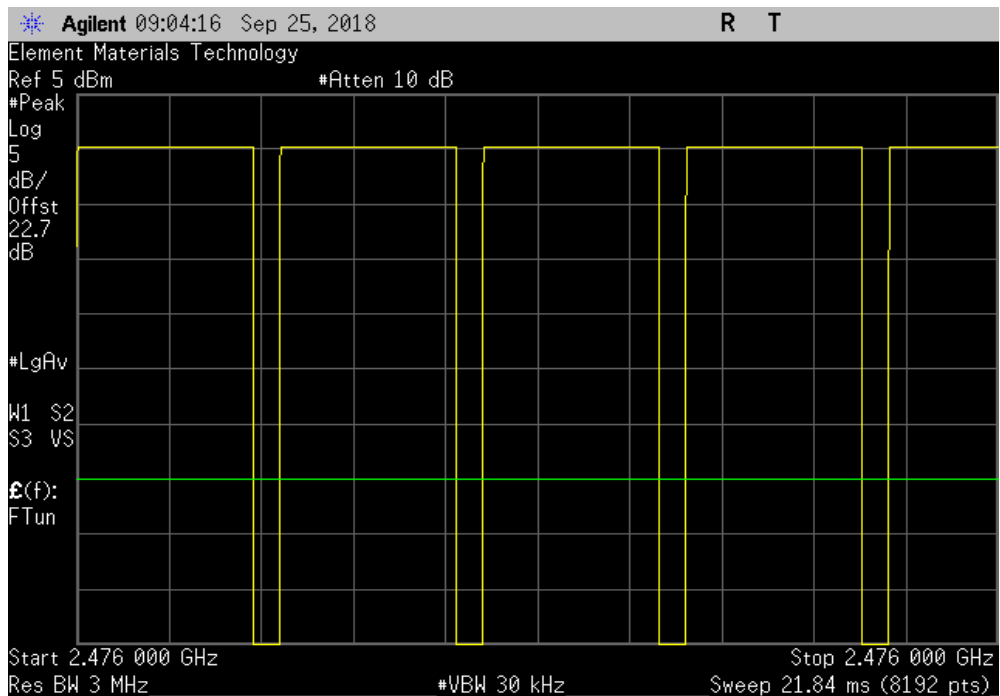


TMTx 2018.06.19 XMM 2017.12.13

GFSK High Channel, 2476 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	4.153 ms	4.815 ms	1	86.3	N/A	N/A



GFSK High Channel, 2476 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



OCCUPIED BANDWIDTH



XMR 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	9-Nov-17	9-Nov-18
Block - DC	Fairview Microwave	SD3379	AMV	28-Dec-17	28-Dec-18
Attenuator	Fairview Microwave	SA18E-20	TKS	31-Jan-18	31-Jan-19
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR

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



TbTf 2018.06.19 XMT 2017.12.13

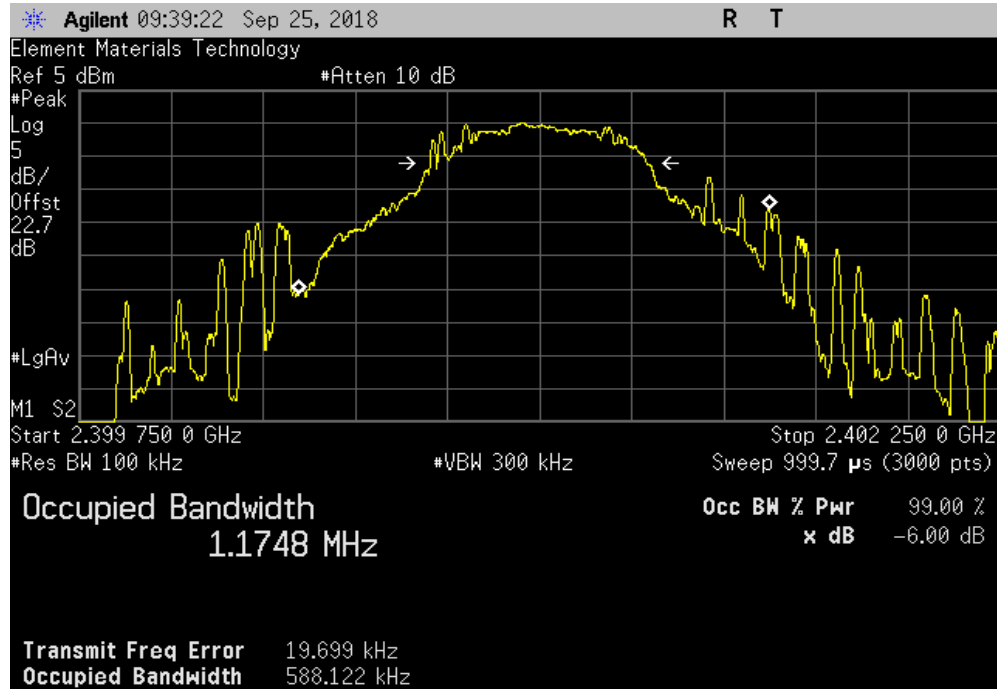
EUT: Magicband		Work Order: SYNA0267	
Serial Number: N/A		Date: 25-Sep-18	
Customer: Walt Disney Parks and Resorts US, Inc.		Temperature: 21.9 °C	
Attendees: None		Humidity: 53.3% RH	
Project: None		Barometric Pres.: 1017 mbar	
Tested by: Salvador Solorzano		Job Site: OC13	
Power: Battery			
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2018		ANSI C63.10:2013	
COMMENTS			
DC Block + 20dB attenuator + cable = 22.73 dB offset			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value	Limit (±) Result
GFSK Low Channel, 2401 MHz		588.122 kHz	500 kHz Pass
GFSK Mid Channel, 2450 MHz		612.031 kHz	500 kHz Pass
GFSK High Channel, 2476 MHz		661.762 kHz	500 kHz Pass

OCCUPIED BANDWIDTH

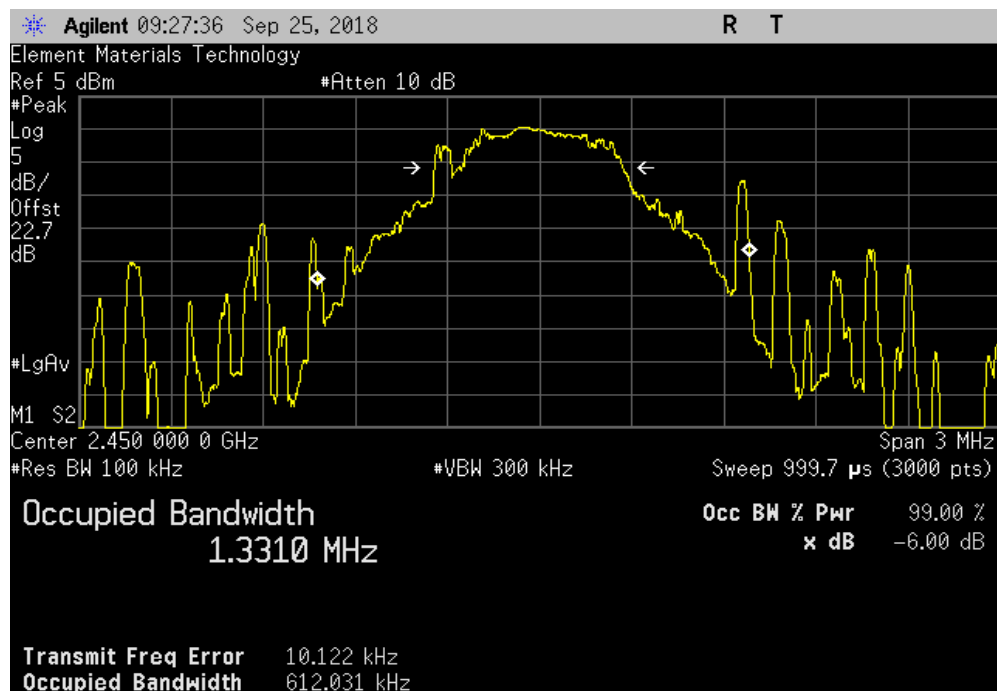


TMTx 2018.06.19 XMM 2017.12.13

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



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

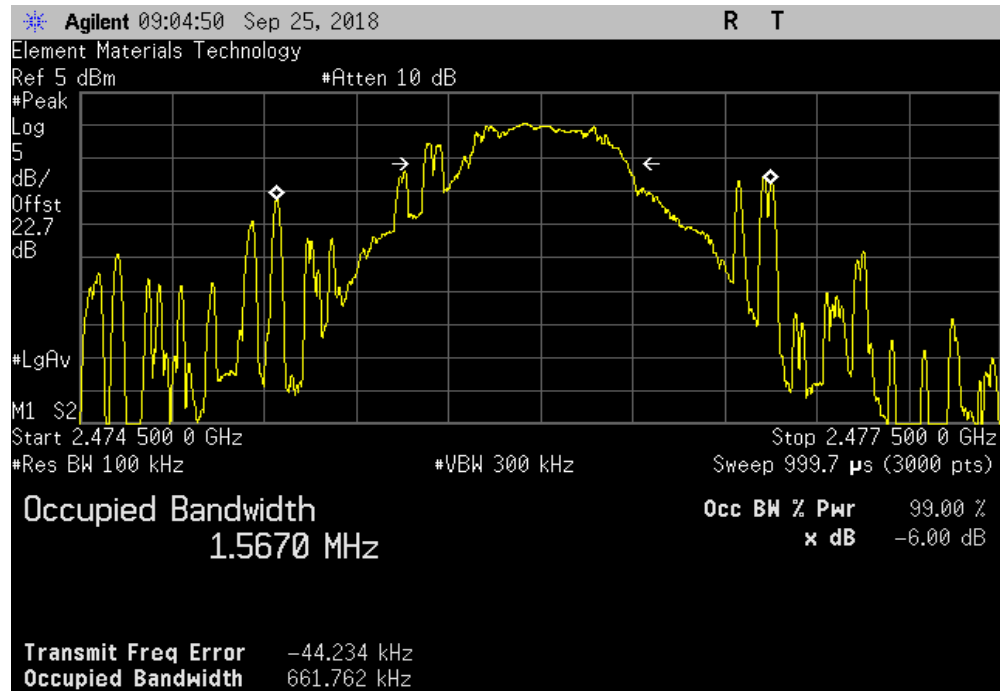


OCCUPIED BANDWIDTH



TMTx 2018.06.19 XMI 2017.12.13

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



OUTPUT POWER



XMR 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	9-Nov-17	9-Nov-18
Block - DC	Fairview Microwave	SD3379	AMV	28-Dec-17	28-Dec-18
Attenuator	Fairview Microwave	SA18E-20	TKS	31-Jan-18	31-Jan-19
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR

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 2018.06.19 XM 2017.12.13

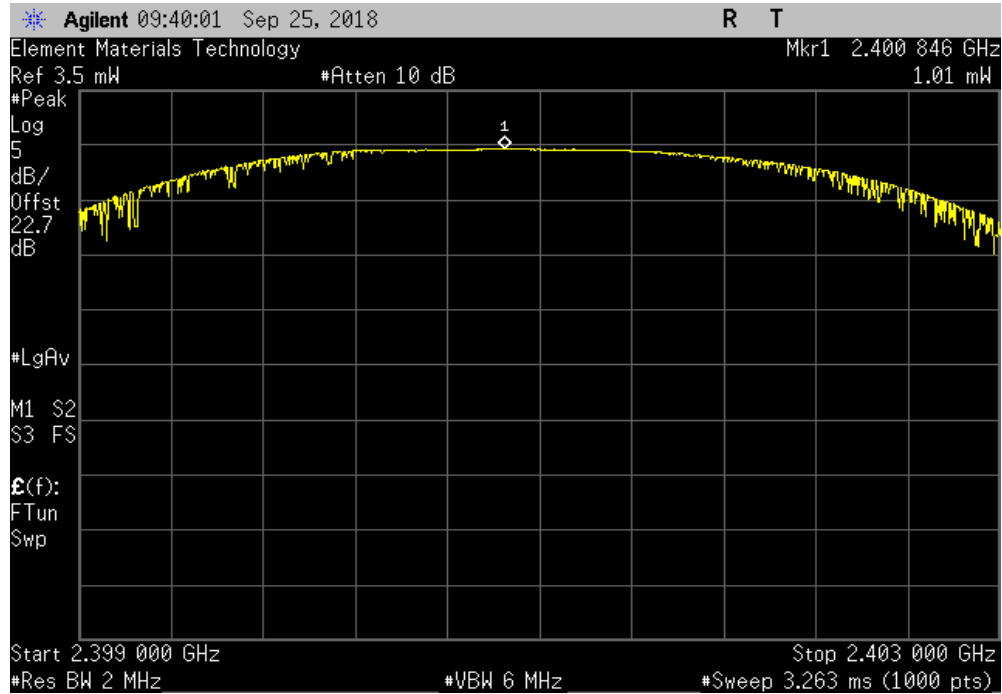
EUT: Magicband		Work Order: SYNA0267	
Serial Number: N/A		Date: 25-Sep-18	
Customer: Walt Disney Parks and Resorts US, Inc.		Temperature: 21.9 °C	
Attendees: None		Humidity: 53.3% RH	
Project: None		Barometric Pres.: 1017 mbar	
Tested by: Salvador Solorzano		Job Site: OC13	
Power: Battery			
TEST SPECIFICATIONS			
FCC 15.247:2018		ANSI C63.10:2013	
Test Method			
COMMENTS			
DC Block + 20dB attenuator + cable = 22.73 dB offset			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value	Limit (<) Result
GFSK Low Channel, 2401 MHz		1.01 mW	1 W Pass
GFSK Mid Channel, 2450 MHz		1.069 mW	1 W Pass
GFSK High Channel, 2476 MHz		1.066 mW	1 W Pass

OUTPUT POWER

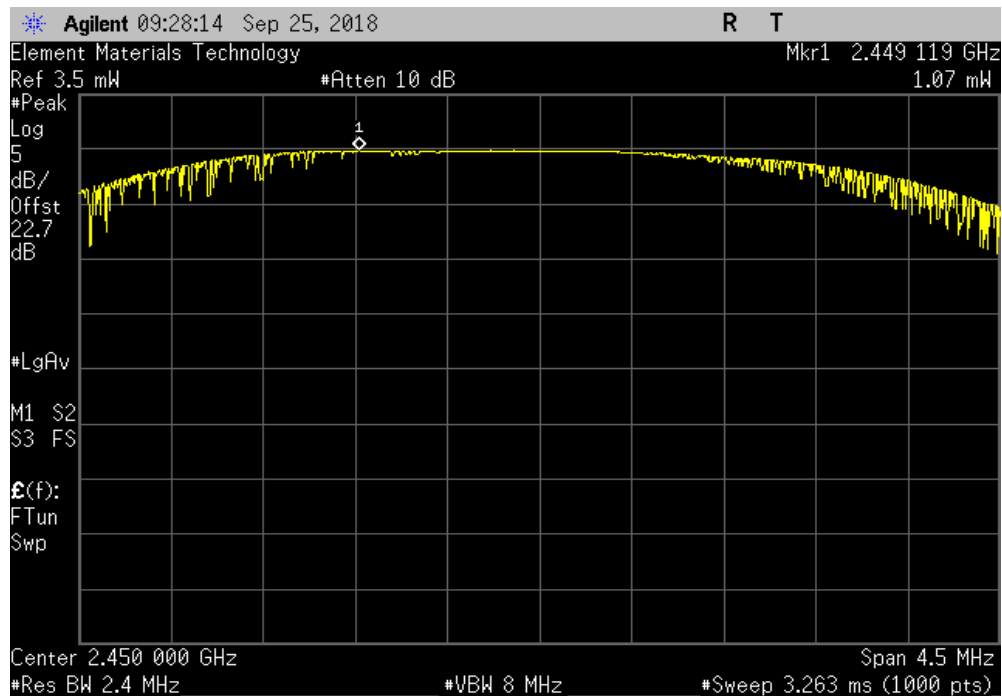


TMTx 2018.06.19 XMM 2017.12.13

GFSK Low Channel, 2401 MHz						
				Value	Limit (<)	Result
				1.01 mW	1 W	Pass



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

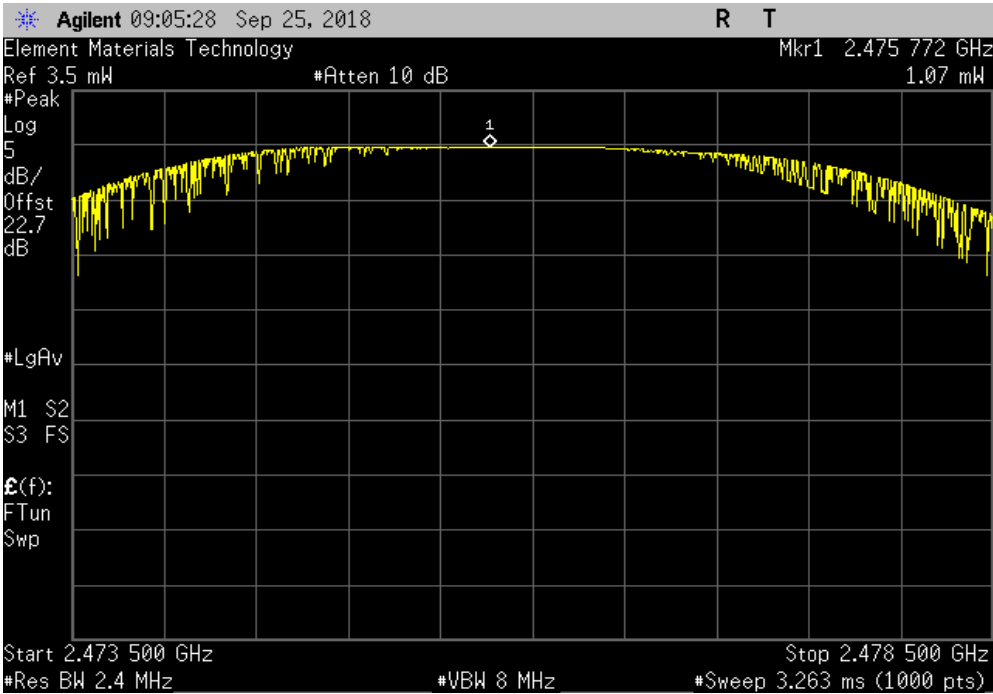


OUTPUT POWER



TMTx 2018.06.19 XMI 2017.12.13

GFSK High Channel, 2476 MHz						
				Value	Limit (<)	Result
				1.066 mW	1 W	Pass



POWER SPECTRAL DENSITY



XMR 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
Block - DC	Fairview Microwave	SD3379	AMV	28-Dec-17	28-Dec-18
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	9-Nov-17	9-Nov-18
Attenuator	Fairview Microwave	SA18E-20	TKS	31-Jan-18	31-Jan-19
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR

TEST DESCRIPTION

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

The method AVGPSD-1 in section 11.10.3 of ANSI C63.10:2013 was used to make the measurement. This method uses trace averaging and RMS detection across the full power of the burst. This method is allowed as the same method has been used to determine the conducted output power.

POWER SPECTRAL DENSITY



Tb1Tx 2018.06.19 XMit 2017.12.13

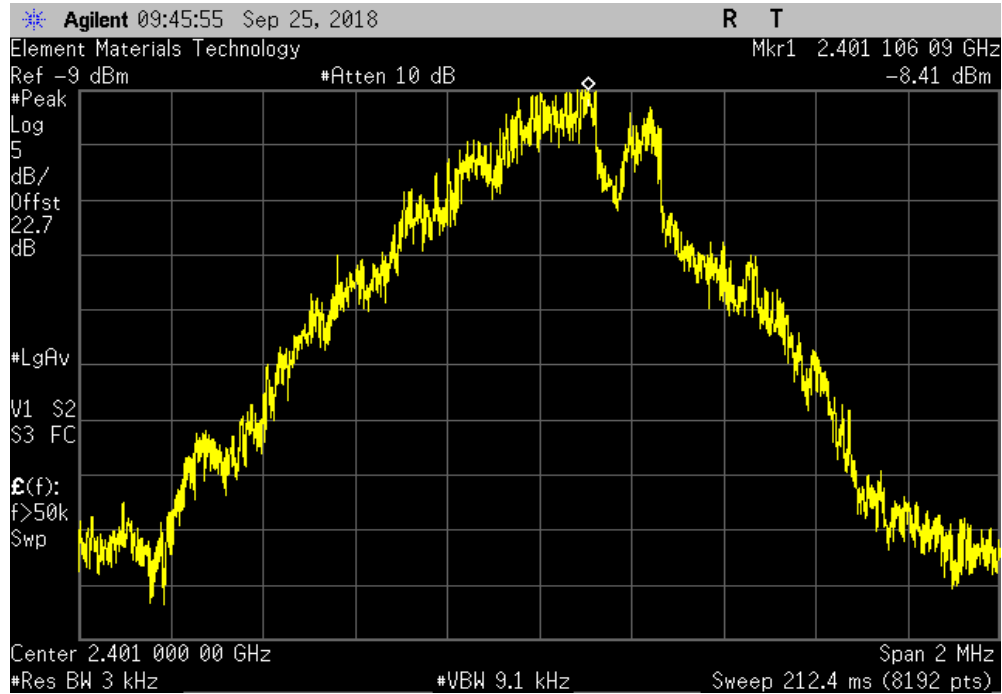
EUT: Magicband		Work Order: SYNA0267	
Serial Number: N/A		Date: 25-Sep-18	
Customer: Walt Disney Parks and Resorts US, Inc.		Temperature: 21.9 °C	
Attendees: None		Humidity: 53.3% RH	
Project: None		Barometric Pres.: 1017 mbar	
Tested by: Salvador Solorzano		Job Site: OC13	
Power: Battery			
TEST SPECIFICATIONS			
FCC 15.247:2018		ANSI C63.10:2013	
Test Method			
COMMENTS			
DC Block + 20dB attenuator + cable = 22.73 dB offset			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value dBm/3kHz	Limit < dBm/3kHz
GFSK Low Channel, 2401 MHz		-8.409	8
GFSK Mid Channel, 2450 MHz		-9.252	8
GFSK High Channel, 2476 MHz		-8.098	8
			Results
			Pass
			Pass
			Pass

POWER SPECTRAL DENSITY



TMTx 2018.06.19 XMt 2017.12.13

GFSK Low Channel, 2401 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-8.409	8	Pass



GFSK Mid Channel, 2450 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-9.252	8	Pass

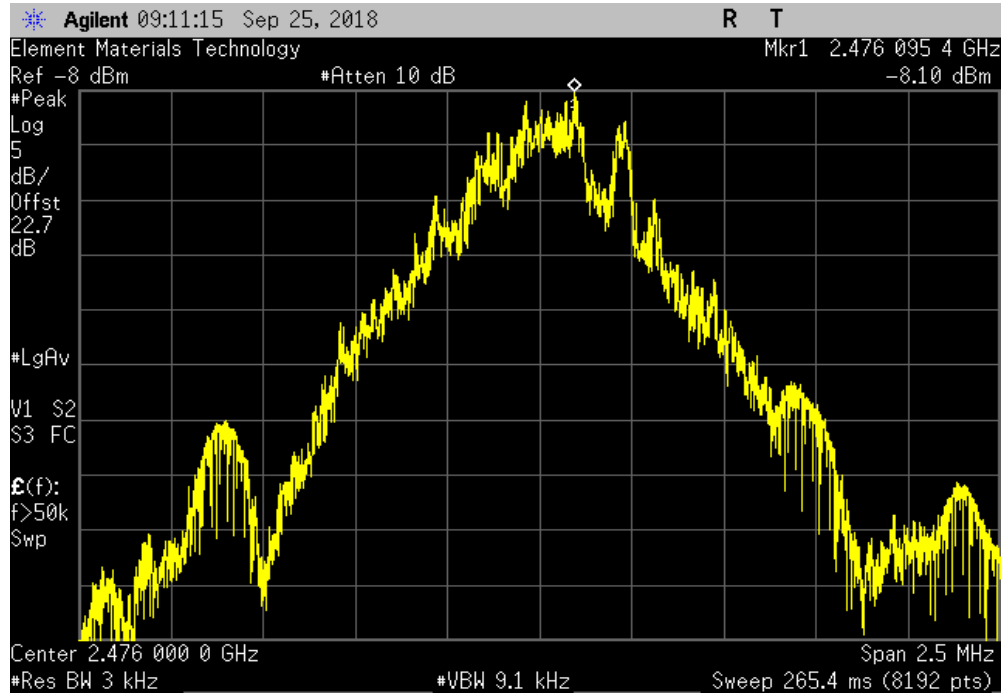


POWER SPECTRAL DENSITY



TMTx 2018.06.19 XMI 2017.12.13

GFSK High Channel, 2476 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				-8.098	8	Pass



BAND EDGE COMPLIANCE



XMR 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
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Attenuator	Fairview Microwave	SA18E-20	TKS	31-Jan-18	31-Jan-19
Block - DC	Fairview Microwave	SD3379	AMV	28-Dec-17	28-Dec-18
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	9-Nov-17	9-Nov-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



TbT v 2018.06.19 XMt 2017.12.13

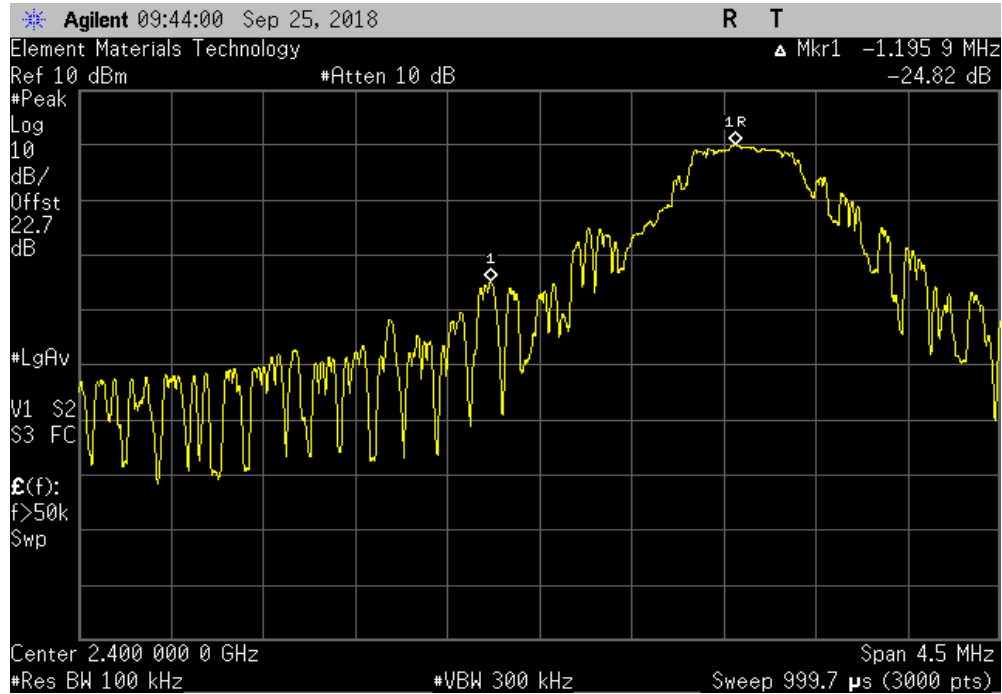
EUT: Magicband		Work Order: SYNA0267	
Serial Number: N/A		Date: 25-Sep-18	
Customer: Walt Disney Parks and Resorts US, Inc.		Temperature: 21.9 °C	
Attendees: None		Humidity: 53.3% RH	
Project: None		Barometric Pres.: 1017 mbar	
Tested by: Salvador Solorzano		Power: Battery	
Job Site: OC13			
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2018		ANSI C63.10:2013	
COMMENTS			
DC Block + 20dB attenuator + cable = 22.73 dB offset			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value (dBc)	Limit ≤ (dBc)
GFSK Low Channel, 2401 MHz		-24.82	-20
GFSK High Channel, 2476 MHz		-50.5	-20
			Result
			Pass
			Pass

BAND EDGE COMPLIANCE

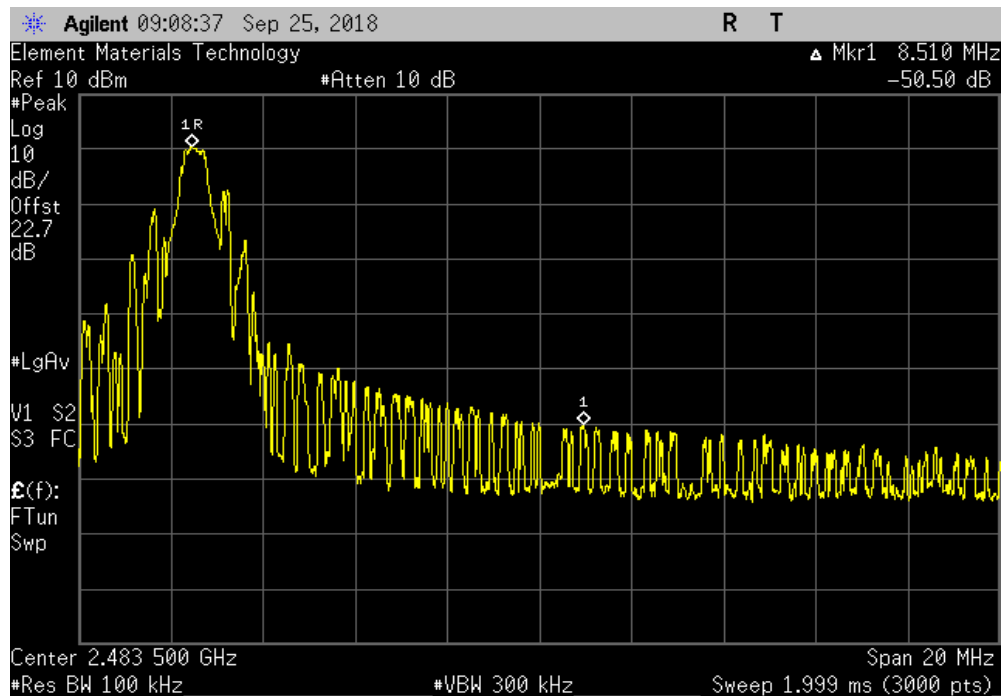


TMTx 2018.06.19 XMM 2017.12.13

GFSK Low Channel, 2401 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-24.82	-20	Pass



GFSK High Channel, 2476 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-50.5	-20	Pass



SPURIOUS CONDUCTED EMISSIONS



XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	9-Nov-17	9-Nov-18
Block - DC	Fairview Microwave	SD3379	AMV	28-Dec-17	28-Dec-18
Attenuator	Fairview Microwave	SA18E-20	TKS	31-Jan-18	31-Jan-19
Generator - Signal	Agilent	E8257D	TGU	15-Feb-18	15-Feb-21
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	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 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



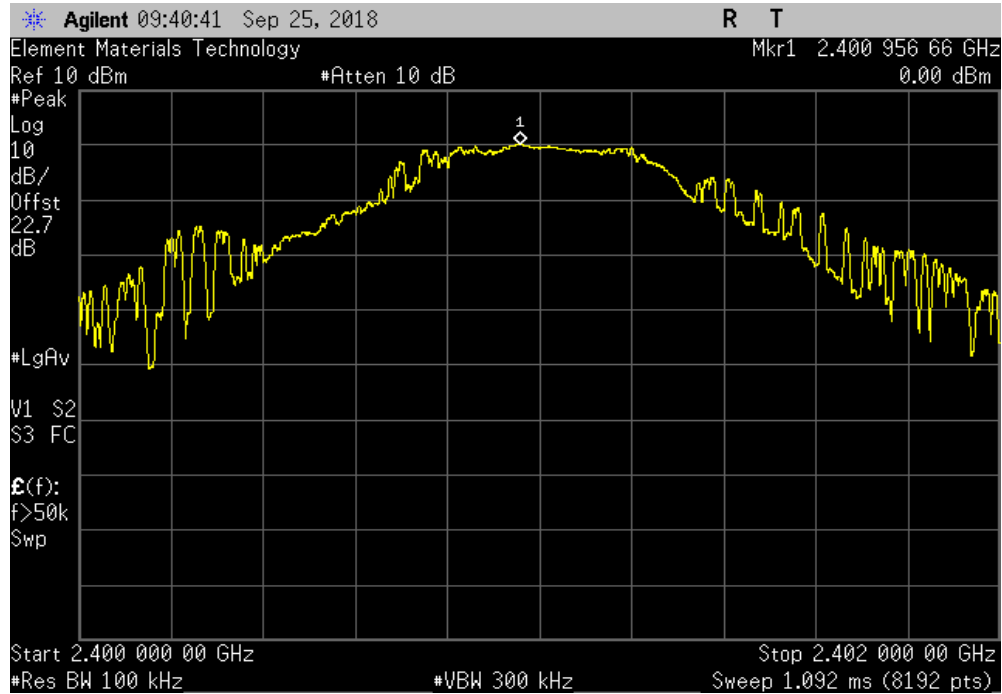
EUT: Magicband		Work Order: SYNA0267			
Serial Number: N/A		Date: 25-Sep-18			
Customer: Walt Disney Parks and Resorts US, Inc.		Temperature: 21.9 °C			
Attendees: None		Humidity: 53.3% RH			
Project: None		Barometric Pres.: 1017 mbar			
Tested by: Salvador Solorzano		Power: Battery			
		Job Site: OC13			
TEST SPECIFICATIONS		Test Method			
FCC 15.247:2018		ANSI C63.10:2013			
COMMENTS					
DC Block + 20dB attenuator + cable = 22.73 dB offset					
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	
GFSK Low Channel, 2401 MHz		30 MHz - 12.5 GHz	-40.72	-20	Pass
GFSK Low Channel, 2401 MHz		12.5 GHz - 25 GHz	-51.99	-20	Pass
GFSK Mid Channel, 2450 MHz		Fundamental	N/A	N/A	N/A
GFSK Mid Channel, 2450 MHz		30 MHz - 12.5 GHz	-41.89	-20	Pass
GFSK Mid Channel, 2450 MHz		12.5 GHz - 25 GHz	-52.75	-20	Pass
GFSK High Channel, 2476 MHz		Fundamental	N/A	N/A	N/A
GFSK High Channel, 2476 MHz		30 MHz - 12.5 GHz	-43.04	-20	Pass
GFSK High Channel, 2476 MHz		12.5 GHz - 25 GHz	-52.39	-20	Pass

SPURIOUS CONDUCTED EMISSIONS

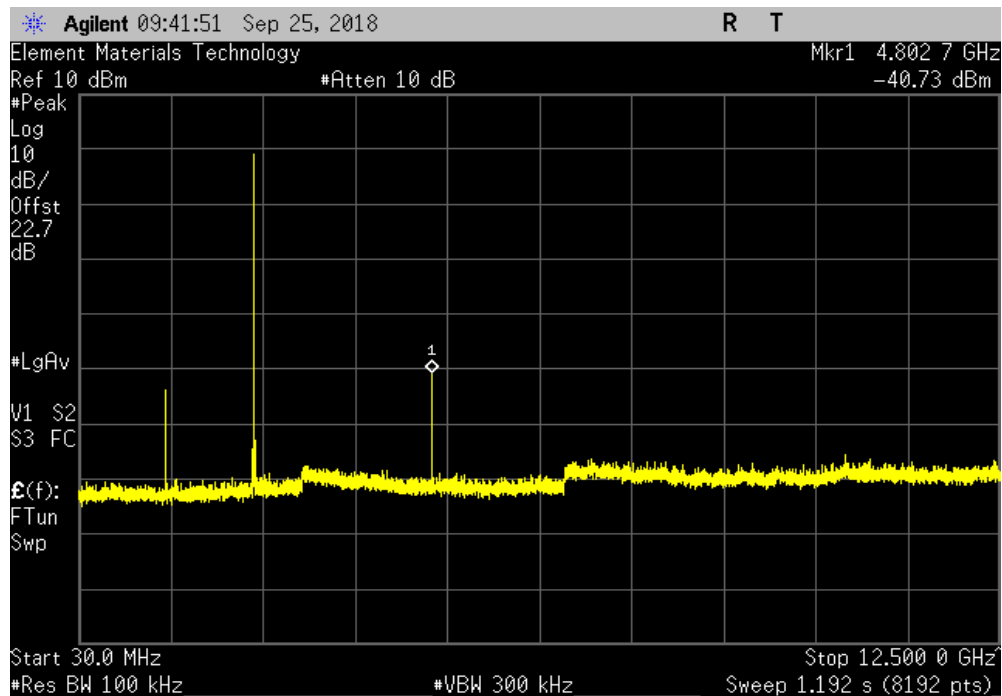


TMTx 2018.06.19 XMI 2017.12.13

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		-40.72		-20	Pass	

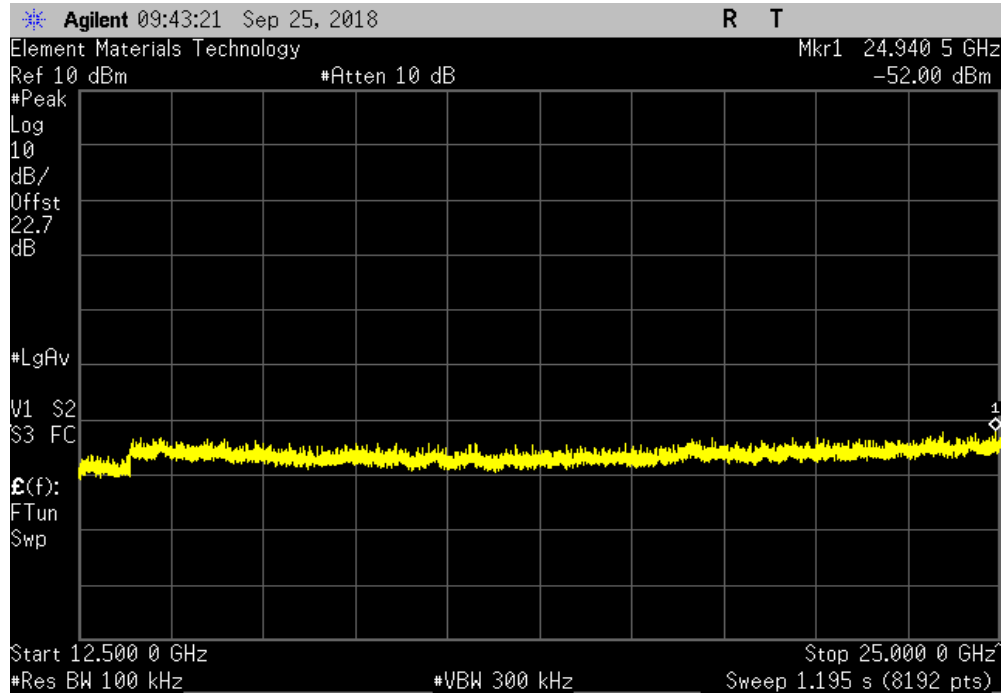


SPURIOUS CONDUCTED EMISSIONS

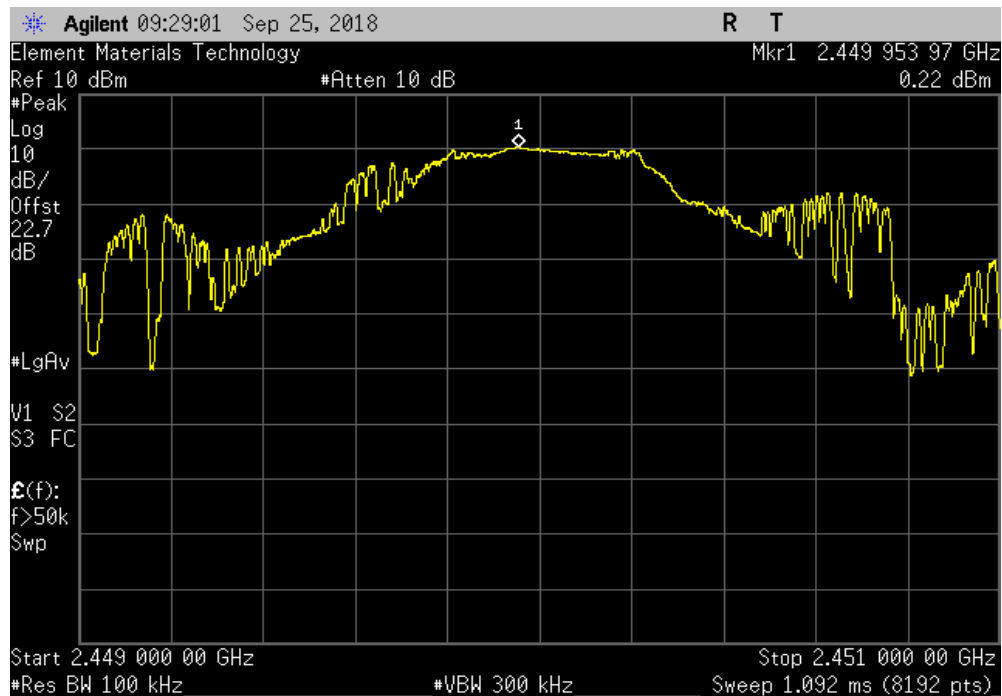


TMTx 2018.06.19 XMI 2017.12.13

GFSK Low Channel, 2401 MHz				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-51.99	-20	Pass	



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

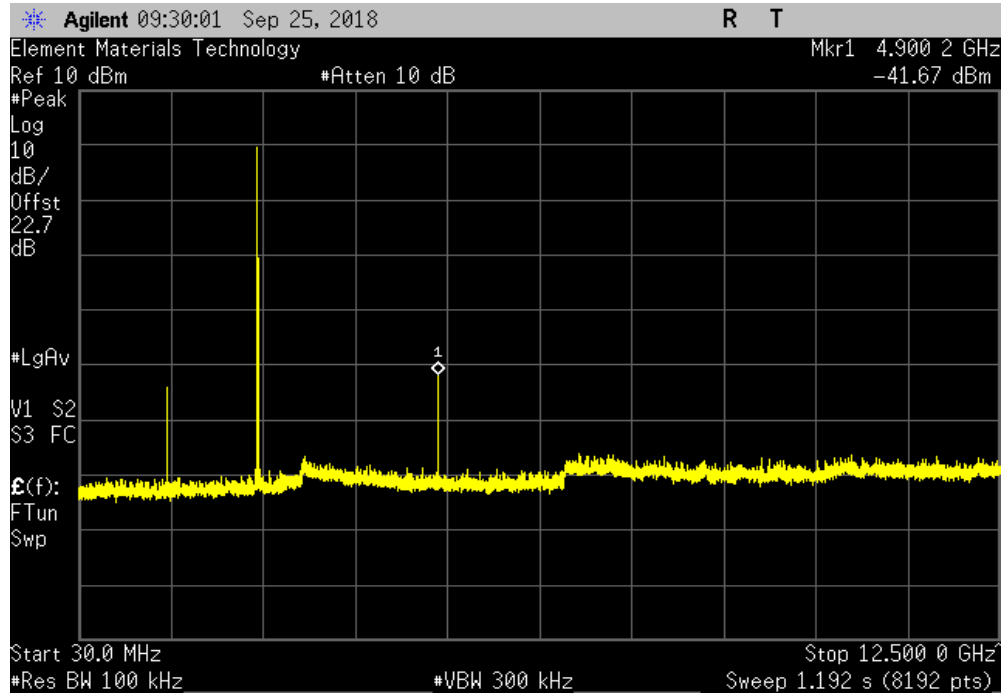


SPURIOUS CONDUCTED EMISSIONS

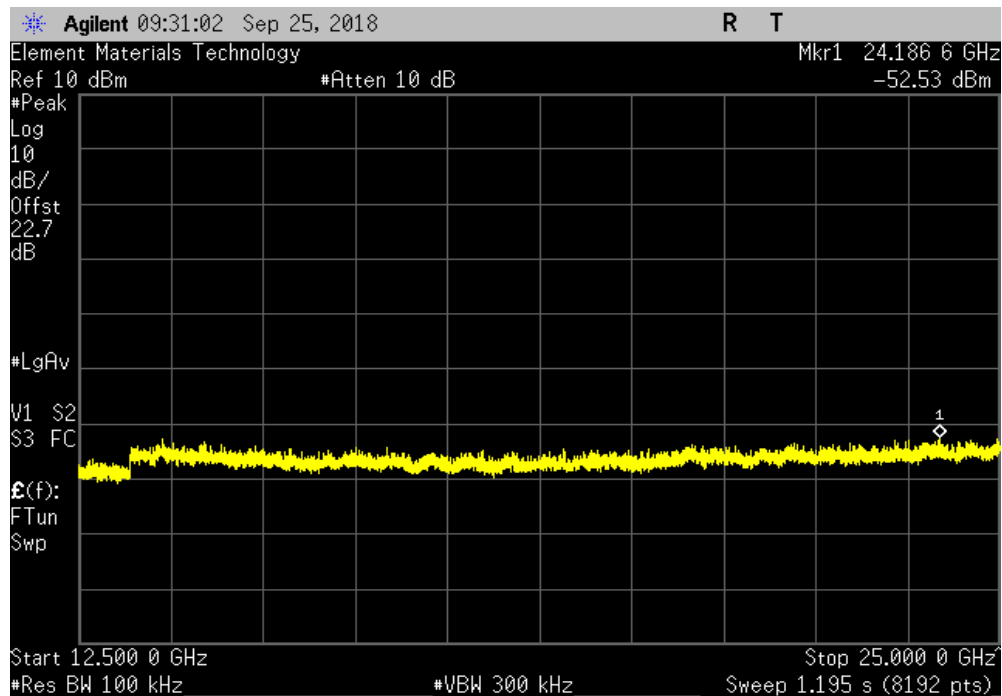


TMTx 2018.06.19 XMI 2017.12.13

GFSK Mid Channel, 2450 MHz				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-41.89	-20	Pass	



GFSK Mid Channel, 2450 MHz				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-52.75	-20	Pass	

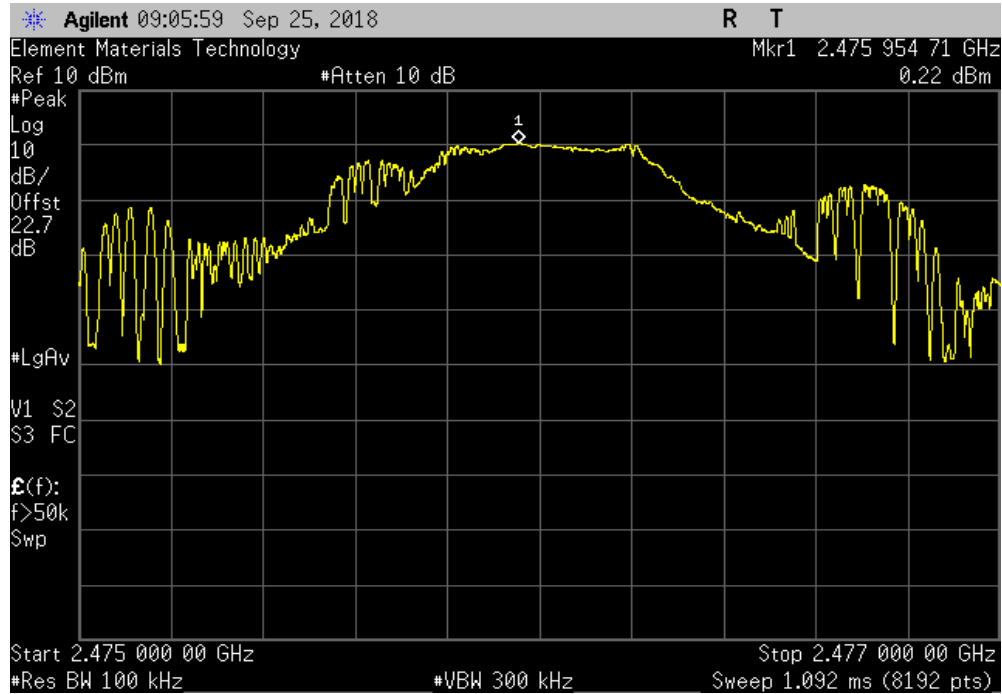


SPURIOUS CONDUCTED EMISSIONS

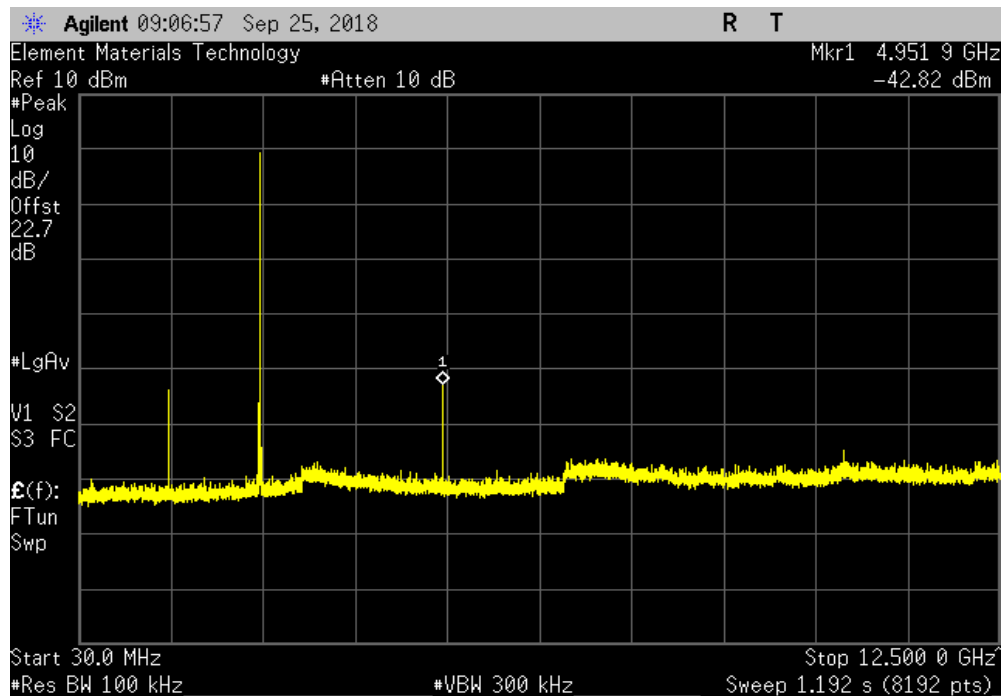


TMTx 2018.06.19 XMI 2017.12.13

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		-43.04		-20	Pass	



SPURIOUS CONDUCTED EMISSIONS



TMTx 2018.06.19 XMM 2017.12.13

GFSK High Channel, 2476 MHz				
Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-52.39	-20	Pass	

