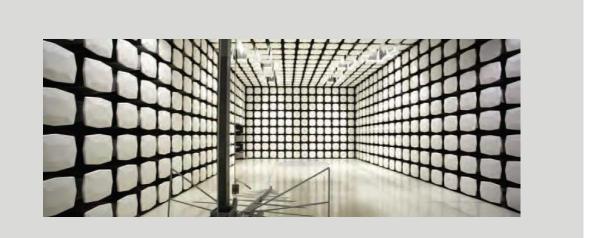


# WatchGuard Video

MIC-WRL-TRN-410

FCC 15.247:2018 902 – 928 MHz FHSS Transceiver

Report # WTVD0006.3 Rev 1



TESTING NVLAP LAB CODE: 201049-0



This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America. This Report shall not be reproduced, except in full without written approval of the laboratory.



#### Last Date of Test: July 11, 2018 WatchGuard Video Model: MIC-WRL-TRN-410

# **Radio Equipment Testing**

Standards	
Specification	Method
FCC 15.247:2018	ANSI C63.10:2013

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	Spurious Radiated Emissions	Yes	Pass	
7.5	Duty Cycle	Yes	N/A	Characterization of radio operation.
7.8.2	Carrier Frequency Separation	Yes	Pass	
7.8.3	Number of Hopping Frequencies	Yes	Pass	
7.8.4	Dwell Time	Yes	Pass	
7.8.5	Output Power	Yes	Pass	
7.8.6	Band Edge Compliance	Yes	Pass	
7.8.6	Band Edge Compliance - Hopping Mode	Yes	Pass	
7.8.7	Occupied Bandwidth	Yes	Pass	
7.8.8	Spurious Conducted Emissions	Yes	Pass	
11.10.2	Power Spectral Density	No	N/A	Not required for FHSS devices.

#### **Deviations From Test Standards**

None

**Approved By:** 

Jeremiah Darden, 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
01	Corrected Dwell Time to reflect 900 MHz limits.	7/18/2018	22-23

# 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

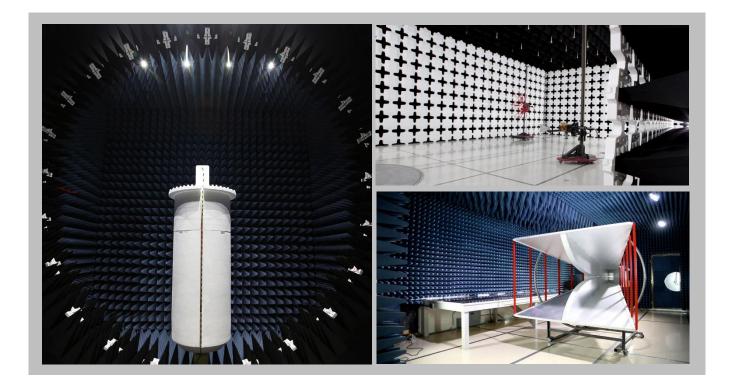
For details on the Scopes of our Accreditations, please visit: <u>http://portlandcustomer.element.com/ts/scope/scope.htm</u> <u>http://gsi.nist.gov/global/docs/cabs/designations.html</u>

# 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	<b>Texas</b> Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 <sup>th</sup> 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								
	Innov	ation, Science and Eco	nomic Development Can	ada									
2834B-1, 2834B-3	2834E-1, 2834E-3	N/A	2834D-1, 2834D-2	2834G-1	2834F-1								
		BS	МІ										
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R								
		VC	CI										
A-0029	A-0109	N/A	A-0108	A-0201	A-0110								
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA													
US0158	US0175	N/A	US0017	US0191	US0157								



# **MEASUREMENT UNCERTAINTY**



#### **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.

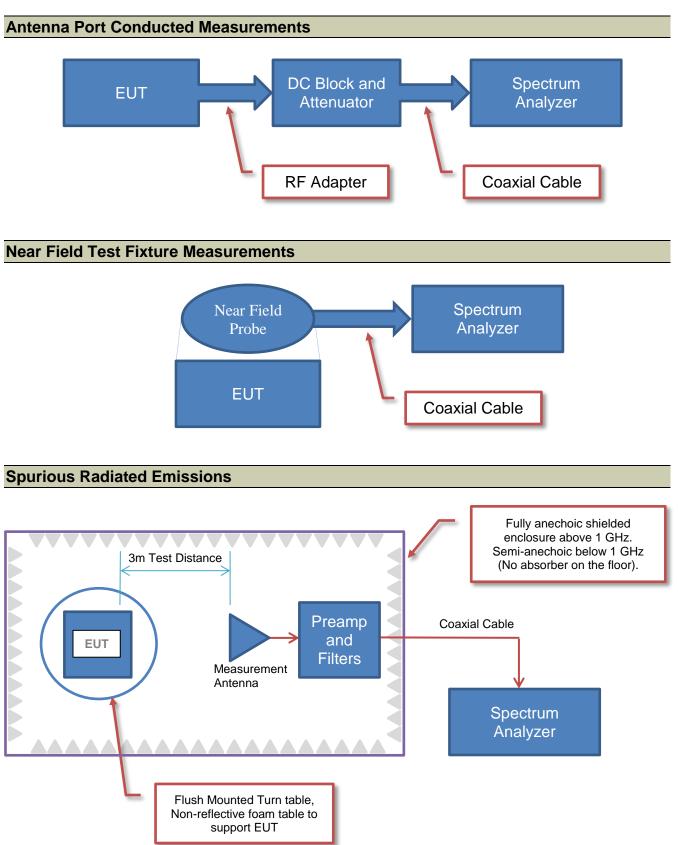
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable 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	<u>- MU</u>
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.1 dB	-5.1 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

# **Test Setup Block Diagrams**





# **PRODUCT DESCRIPTION**



#### **Client and Equipment Under Test (EUT) Information**

Company Name:	WatchGuard Video					
Address:	415 East Exchange Parkway					
City, State, Zip:	Allen, TX 75002					
Test Requested By:	Navaid Karimi					
Model:	MIC-WRL-TRN-410					
First Date of Test:	June 18, 2018					
Last Date of Test:	July 11, 2018					
Receipt Date of Samples:	June 15, 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:

The EUT is the MIC-WRL-TRN-410 "Transmitter" component. It communicates with the MIC-WRL-CHG-410 "Base" component. These two components operate as a pair and comprise the operational wireless microphone system.

#### **Testing Objective:**

Seeking to demonstrate compliance under FCC 15.247:2018 for operation in the 902-928 MHz Band.





# Configuration WTVD0006-1

EUT										
Description	Manufacturer	Model/Part Number	Serial Number							
Wireless Microphone	WatchGuard Video	MIC-WRL-TRN-410	Proto1a							

# **MODIFICATIONS**



# **Equipment Modifications**

Item	Date	Test	Modification	Note	Disposition of EUT
		Carrier	Tested as	No EMI suppression	EUT remained at
1	6/18/2018	Frequency	delivered to	devices were added or	Element following the
		Separation	Test Station.	modified during this test.	test.
		Number of	Tested as	No EMI suppression	EUT remained at
2	6/18/2018	Hopping	delivered to	devices were added or	Element following the
		Frequencies	Test Station.	modified during this test.	test.
		Output	Tested as	No EMI suppression	EUT remained at
3	6/18/2018	Power	delivered to	devices were added or	Element following the
		FOWEI	Test Station.	modified during this test.	test.
		Band Edge	Tested as	No EMI suppression	EUT remained at
4	6/18/2018	Compliance	delivered to	devices were added or	Element following the
		Compliance	Test Station.	modified during this test.	test.
		Band Edge	Tested as	No EMI suppression	EUT remained at
5	6/18/2018	Compliance	delivered to	devices were added or	Element following the
U	0,10,2010	– Hopping	Test Station.	modified during this test.	test.
		Mode		_	
		Occupied	Tested as	No EMI suppression	EUT remained at
6	6/18/2018	Bandwidth	delivered to	devices were added or	Element following the
			Test Station.	modified during this test.	test.
		Spurious	Tested as	No EMI suppression	EUT remained at
7	6/18/2018	Conducted	delivered to	devices were added or	Element following the
		Emissions	Test Station.	modified during this test.	test.
		Spurious	Tested as	No EMI suppression	EUT remained at
8	6/19/2018	Radiated	delivered to	devices were added or	Element following the
		Emissions	Test Station.	modified during this test.	test.
			Tested as	No EMI suppression	Scheduled testing
9	7/11/2018	Dwell Time	delivered to	devices were added or	was completed.
			Test Station.	modified during this test.	was completed.

# **SPURIOUS RADIATED EMISSIONS**



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

#### MODES OF OPERATION

Transmitting at Low Channel 902.25 MHz, Mid Channel at 914.75 MHz, and High Channel at 927.75 MHz.

#### POWER SETTINGS INVESTIGATED

Battery

#### **CONFIGURATIONS INVESTIGATED**

WTVD0006 - 1

#### FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz

Stop Frequency 12400 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
Antenna - Biconilog	ETS Lindgren	3143B	AYF	10-May-2018	24 mo
Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	10-Oct-2017	12 mo
Cable	Northwest EMC	8-18GHz	TXD	31-May-2018	12 mo
Cable	Northwest EMC	1-8.2 GHz	TXC	31-May-2018	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	PAK	9-Oct-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAJ	31-May-2018	12 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AJG	NCR	0 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AJF	NCR	0 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-2018	12 mo

#### **TEST DESCRIPTION**

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	WTVD0006	Date:	19-Jun-2018	22				
Project	None	Temperature:	23.5 °C	Marty	- 111	está		
Job Site	TX02	Humidity:	53.8% RH		incorry Ma			
Serial Number	Proto1a	Barometric Pres.:	1018 mbar	Tested by: Marty Martin				
EUT	MIC-WRL-TRN-410			•				
Configuration	: 1							
	WatchGuard Video							
Attendees	Paul Hunt and Navai	d Karimi						
EUT Power								
Operating Mode	Transmitting at Low 0	Channel 902.25 MHz, Mid	Channel at 914.75	MHz, and High Cha	nnel at 927.75 MH	Ζ.		
Deviations	None							
Comments		age duty cycle correction	-13.1dB = 20 log (2	22.24ms/100ms)				
st Specifications			Test Met	hod				
C 15.247:2018	+		ANSI C63					
<b>Run #</b> 8	Test Distance (m)	3 Antenna H	leight(s)	1 to 4(m)	Results	Pass		
<b>Run #</b> 8 80	Test Distance (m)	3 Antenna H	leight(s)	1 to 4(m)	Results	Pass		
80	Test Distance (m)	3 Antenna H	leight(s)	1 to 4(m)	Results	Pass		
	Test Distance (m)	3 Antenna H	leight(s)	1 to 4(m)	Results	Pass		
80	Test Distance (m)	3 Antenna H	leight(s)	1 to 4(m)	Results	Pass		
80	Test Distance (m)	3 Antenna H	leight(s)	1 to 4(m)	Results	Pass		
80	Test Distance (m)	3 Antenna H	leight(s)	1 to 4(m)	Results	Pass		
80	Test Distance (m)	3 Antenna H	leight(s)	1 to 4(m)	Results       Image: state	Pass		
80	Test Distance (m)	3 Antenna H	leight(s)	1 to 4(m)	Results       Image: state	Pass		
80 70 60 50 40 30	Test Distance (m)	3 Antenna H	leight(s)	1 to 4(m)	Results	Pass		
80 70 60 50 40	Test Distance (m)	3 Antenna H	leight(s)	1 to 4(m)	Results       Image: state	Pass		
80 70 60 50 40 30	Test Distance (m)	3 Antenna H	leight(s)	1 to 4(m)	Results	Pass		
80 70 60 50 40 30 20			leight(s)	1 to 4(m)		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
2706.800	67.5	-1.9	3.1	240.0	-13.1	0.0	Horz	AV	0.0	52.5	54.0	-1.5	Low Ch, Index 1, EUT Z
2706.865	66.9	-1.9	1.0	337.0	-13.1	0.0	Vert	AV	0.0	51.9	54.0	-2.1	Low Ch, Index 1, EUT Y
2706.835	66.7	-1.9	3.4	218.0	-13.1	0.0	Horz	AV	0.0	51.7	54.0	-2.3	Low Ch, Index 1, EUT Z Rerun
2706.670	66.7	-1.9	3.4	231.9	-13.1	0.0	Horz	AV	0.0	51.7	54.0	-2.3	Low Ch, Index 0, EUT Z
2706.900	66.0	-1.9	3.0	344.0	-13.1	0.0	Horz	AV	0.0	51.0	54.0	-3.0	Low Ch, Index 1, EUT X
2706.885	63.8	-1.9	3.0	7.0	-13.1	0.0	Horz	AV	0.0	48.8	54.0	-5.2	Low Ch, Index 1, EUT Y
2706.855	63.4	-1.9	3.2	164.0	-13.1	0.0	Vert	AV	0.0	48.4	54.0	-5.6	Low Ch, Index 1, EUT Z
2744.215	62.4	-1.9	3.6	225.0	-13.1	0.0	Horz	AV	0.0	47.4	54.0	-6.6	Mid Ch, Index 1, EUT Z
2707.230	69.1	-1.9	3.1	240.0	0.0	0.0	Horz	PK	0.0	67.2	74.0	-6.8	Low Ch, Index 1, EUT Z
2706.870	61.9	-1.9	1.0	306.0	-13.1	0.0	Vert	AV	0.0	46.9	54.0	-7.1	Low Ch, Index 1, EUT X
2707.030	68.4	-1.9	1.0	337.0	0.0	0.0	Vert	PK	0.0	66.5	74.0	-7.5	Low Ch, Index 1, EUT Y
2707.225	68.3	-1.9	3.4	218.0	0.0	0.0	Horz	PK	0.0	66.4	74.0	-7.6	Low Ch, Index 1, EUT Z Rerun
2706.965	67.8	-1.9	3.4	231.9	0.0	0.0	Horz	PK	0.0	65.9	74.0	-8.1	Low Ch, Index 0, EUT Z
2706.990	67.5	-1.9	3.0	344.0	0.0	0.0	Horz	PK	0.0	65.6	74.0	-8.4	Low Ch, Index 1, EUT X
3609.220	55.2	3.2	1.0	63.0	-13.1	0.0	Vert	AV	0.0	45.3	54.0	-8.7	Low Ch, Index 1, EUT Y
3712.280	60.9	3.7	1.0	63.0	0.0	0.0	Vert	PK	0.0	64.6	74.0	-9.4	High Ch, Index 1, EUT Y
3609.335	54.2	3.2	3.0	312.0	-13.1	0.0	Horz	AV	0.0	44.3	54.0	-9.7	Low Ch, Index 1, EUT Z
2744.205	66.1	-1.9	3.6	225.0	0.0	0.0	Horz	PK	0.0	64.2	74.0	-9.8	Mid Ch, Index 1, EUT Z
3658.810	60.4	3.4	3.2	313.0	0.0	0.0	Horz	PK	0.0	63.8	74.0	-10.2	Mid Ch, Index 1, EUT Z
2707.085	65.6	-1.9	3.0	7.0	0.0	0.0	Horz	PK	0.0	63.7	74.0	-10.3	Low Ch, Index 1, EUT Y
3659.055	53.3	3.4	3.2	313.0	-13.1	0.0	Horz	AV	0.0	43.6	54.0	-10.4	Mid Ch, Index 1, EUT Z
2784.335	65.1	-1.6	4.0	232.9	0.0	0.0	Horz	PK	0.0	63.5	74.0	-10.5	High Ch, Index 1, EUT Z

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
2707.030	65.0	-1.9	3.2	164.0	0.0	0.0	Vert	PK	0.0	63.1	74.0	-10.9	Low Ch, Index 1, EUT Z
3712.430	59.4	3.7	2.4	310.9	0.0	0.0	Horz	PK	0.0	63.1	74.0	-10.9	High Ch, Index 1, EUT Z
4574.265	56.8	6.0	3.5	207.9	0.0	0.0	Vert	PK	0.0	62.8	74.0	-11.2	Mid Ch, Index 1, EUT Y
2744.210	57.6	-1.9	1.0	303.9	-13.1	0.0	Vert	AV	0.0	42.6	54.0	-11.4	Mid Ch, Index 1, EUT Y
3659.085	59.2	3.4	1.0	182.0	0.0	0.0	Vert	PK	0.0	62.6	74.0	-11.4	Mid Ch, Index 1, EUT Y
4573.290	49.6	6.0	3.5	207.9	-13.1	0.0	Vert	AV	0.0	42.5	54.0	-11.5	Mid Ch, Index 1, EUT Y
4511.705	49.7	5.8	4.0	36.0	-13.1	0.0	Vert	AV	0.0	42.4	54.0	-11.6	Low Ch, Index 1, EUT Y
3659.040	52.0	3.4	1.0	182.0	-13.1	0.0	Vert	AV	0.0	42.3	54.0	-11.7	Mid Ch, Index 1, EUT Y
2784.250	63.7	-1.6	1.0	333.9	0.0	0.0	Vert	PK	0.0	62.1	74.0	-11.9	High Ch, Index 1, EUT Y
2707.195	63.6	-1.9	1.0	306.0	0.0	0.0	Vert	PK	0.0	61.7	74.0	-12.3	Low Ch, Index 1, EUT X
3608.615	58.1	3.2	1.0	63.0	0.0	0.0	Vert	PK	0.0	61.3	74.0	-12.7	Low Ch, Index 1, EUT Y
3609.465	57.3	3.2	3.0	312.0	0.0	0.0	Horz	PK	0.0	60.5	74.0	-13.5	Low Ch, Index 1, EUT Z
2744.450	61.7	-1.9	1.0	303.9	0.0	0.0	Vert	PK	0.0	59.8	74.0	-14.2	Mid Ch, Index 1, EUT Y
4510.555	53.9	5.8	4.0	36.0	0.0	0.0	Vert	PK	0.0	59.7	74.0	-14.3	Low Ch, Index 1, EUT Y
2784.175	53.5	-1.6	4.0	232.9	-13.1	0.0	Horz	AV	0.0	38.8	54.0	-15.2	High Ch, Index 1, EUT Z
3712.345	48.1	3.7	1.0	63.0	-13.1	0.0	Vert	AV	0.0	38.7	54.0	-15.3	High Ch, Index 1, EUT Y
4573.430	52.4	6.0	3.5	244.9	0.0	0.0	Horz	PK	0.0	58.4	74.0	-15.6	Mid Ch, Index 1, EUT Z
4511.705	45.2	5.8	2.9	55.0	-13.1	0.0	Horz	AV	0.0	37.9	54.0	-16.1	Low Ch, Index 1, EUT Z
4573.240	44.9	6.0	3.5	244.9	-13.1	0.0	Horz	AV	0.0	37.8	54.0	-16.2	Mid Ch, Index 1, EUT Z
2784.195	52.2	-1.6	1.0	333.9	-13.1	0.0	Vert	AV	0.0	37.5	54.0	-16.5	High Ch, Index 1, EUT Y
3712.345	46.8	3.7	2.4	310.9	-13.1	0.0	Horz	AV	0.0	37.4	54.0	-16.6	High Ch, Index 1, EUT Z
4512.105	50.6	5.8	2.9	55.0	0.0	0.0	Horz	PK	0.0	56.4	74.0	-17.6	Low Ch, Index 1, EUT Z
4639.950	47.0	6.3	1.0	357.0	0.0	0.0	Vert	PK	0.0	53.3	74.0	-20.7	High Ch, Index 1, EUT Y
4638.455	46.7	6.3	3.0	33.9	0.0	0.0	Horz	PK	0.0	53.0	74.0	-21.0	High Ch, Index 1, EUT Z
4638.180	39.4	6.3	1.0	357.0	-13.1	0.0	Vert	AV	0.0	32.6	54.0	-21.4	High Ch, Index 1, EUT Y
4638.285	38.5	6.3	3.0	33.9	-13.1	0.0	Horz	AV	0.0	31.7	54.0	-22.3	High Ch, Index 1, EUT Z

# **DUTY CYCLE**



#### **TEST DESCRIPTION**

The Duty Cycle (x) were measured for each of the EUT operating modes. 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. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used

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

The EUT operates at 100% Duty Cycle.

# **CARRIER FREQUENCY SEPARATION**



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
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-18	15-Mar-19

#### TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The channel carrier frequencies in the 902-928 MHz band must be separated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Or, if the output power is less than 125 mW, the channel separation can be 25 kHz or 2/3 of the 20dB bandwidth. The EUT was operated in pseudorandom hopping mode. The spectrum was scanned across two adjacent peaks. The separation between the peaks of these channels was measured.

# **CARRIER FREQUENCY SEPARATION**

2

						TbtTx 2017.12.14	XMit 2017.12.13
EUT:	MIC-WRL-TRN-410				Work Order:	WTVD0006	
Serial Number:	Proto1a				Date:	18-Jun-18	
Customer:	WatchGuard Video				Temperature:	23.2 °C	
Attendees:	Paul Hunt, Navaid Karimi				Humidity	52% RH	
Project:	None				Barometric Pres.:	1019 mbar	
Tested by:	Marty Martin		Pow	er: Battery	Job Site:	TX09	
TEST SPECIFICATI	IONS			Test Method			
FCC 15.247:2018				ANSI C63.10:2013			
COMMENTS				• •			
EUT operational.							
DEVIATIONS FROM	I TEST STANDARD						
None							
			22				
Configuration #	1	7	Martin	Marti			
-		Signature	, and	ricersta			
	•	×				Limit	
					Value	(≥)	Results
902 MHz - 928 MHz	Band						
	Index 1						
	Hopping 902.25 - 927.75	;			0.5 MHz	150 kHz	Pass

# **CARRIER FREQUENCY SEPARATION**



XMit 2017.12.13

TbtTx 2017.12.14

902 MHz - 928 MHz Band, Index 1, Hopping 902.25 - 927.75 Limit **(≥)** 150 kHz Value Results 0.5 MHz Pass 02:42:15 PM Jun 15, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P Keysight S RL ALIGN OFF #Avg Type: Log-Pwr SENSE:INT PNO: Wide Trig: Free Run IFGain:Low #Atten: 20 dB ΔMkr1 -493.5 kHz -0.38 dB Ref Offset 20.48 dB Ref 22.00 dBm 5 dB/div 1∆2 X ١, Center 914.750 MHz #Res BW 100 kHz Span 2.000 MHz Sweep 1.599 ms (3000 pts) #VBW 10 kHz STATUS

# NUMBER OF HOPPING FREQUENCIES



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
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-18	15-Mar-19

#### TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The number of hopping frequencies was measured across the authorized band. The hopping function of the EUT was enabled.

# NUMBER OF HOPPING FREQUENCIES

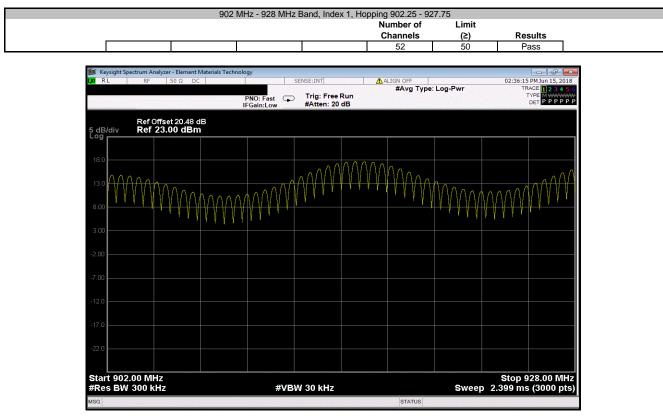


			TbtTx 2017.12.14	XMit 2017.12.13
EUT:	MIC-WRL-TRN-410	Work Order:	WTVD0006	
Serial Number:	Proto1a	Date:	18-Jun-18	
Customer:	WatchGuard Video	Temperature:	23.4 °C	
Attendees:	Paul Hunt, Navaid Karimi	Humidity:	52.5% RH	
Project:	None	Barometric Pres.:	1019 mbar	
Tested by:	Marty Martin Power: Battery	Job Site:	TX09	
TEST SPECIFICAT	ONS Test Method			
FCC 15.247:2018	ANSI C63.10:2013			
COMMENTS				
EUT operational.				
Lot operational				
DEVIATIONS FROM	TEST STANDARD			
None				
Configuration #	1 Monty Martin			
g	Signature			
	ognaat	Number of	Limit	
		Channels	(≥)	Results
902 MHz - 928 MHz	Rand	Ghannels	(-)	
302 WITH2 = 920 WITH2	Index 1			
		52	50	Pass
	Hopping 902.25 - 927.75	52	50	r ass

# NUMBER OF HOPPING FREQUENCIES



TbtTx 2017.12.14 XMit 2017.12.13







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
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-18	15-Mar-19
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20

#### TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The average dwell time per hopping channel was measured at one hopping channel in the authorized band. The hopping function of the EUT was enabled.

The dwell time limit is based on the Number of Hopping Channels \* 400 mS. For this propriatary radio, this would be 50 Channels \* 400 mS = 20.0 Sec.

On Time During 20 Seconds = Pulse Width \* Average Number of Pulses

# **DWELL TIME**



					TbtTx 2017.12.14	XMit 2017.12.
EUT: MIC-WRL-TRN-410				Work Order:		
Serial Number: Proto1a					11-Jul-18	
Customer: WatchGuard Video				Temperature:		
Attendees: Paul Hunt, Navaid Karimi				Humidity:		
Project: None				Barometric Pres.:		
Tested by: Marty Martin	Power: Battery			Job Site:	TX09	
TEST SPECIFICATIONS	Test Met					
FCC 15.247:2018	ANSI C63	3.10:2013				
COMMENTS						
None DEVIATIONS FROM TEST STANDARD None Configuration # 1	Mosty Ma	<i>T.</i>				
	Pulse Width Numb (ms) Pul	per of Average No.	Scale Factor	On Time (ms) During 20s	Limit (ms)	Results
Hopping Mode						
Index 1						
Hopping 902.25 - 927.75	22.24 N/		N/A	N/A	N/A	N/A
Linning 002 2E 027 7E	N/A N	/A 13	N/A	N/A	N/A	
Hopping 902.25 - 927.75						N/A

# **DWELL TIME**



TbtTx 2017.12.14 XMit 2017.12.13

Pulse W		•	opping 902.25 - 9 Scale	On Time (ms)	Limit	
(ms) 22.24	Pulses	of Pulses	Factor N/A	During 20s	(ms) N/A	Results N/A
	n Analyzer - Element Material					
	h Analyzer - Element Material RF 50 Ω DC		SENSE:INT Trig Delay-15.0	ALIGN OFF	Log-Pwr	11:25:11 AM Jun 19, 2018
		PNO: Fast +++		Avg Type		TRACE 2 3 4 5 6 TYPE DET P NNNN
Re	f Offset 20.48 dB	II GAILLOW				ΔMkr1 22.24 ms
10 dB/div Re	ef 40.48 dBm					19.30 dB
						*
30.5						
20.5		14	2			
10.5						
0.480	X <sub>2</sub>					
-9.52						
-19.5						
-29.5						
-39.5	n a d				n n h n	ana kirana si kata sa ila asira. Alaada si kasira si
-49.5 <mark>depaids and a</mark>						
Center 901.3 Res BW 300	kHz	Ho	W 30 kHz			Span 0 Hz p   100.5 ms (8192 pts)
Res BW 300	kHz idth Number c Pulses	Ho of Average No. of Pulses	opping 902.25 - 9 Scale Factor	27.75 On Time (ms) During 20s	Limit (ms)	p 100.5 ms (8192 pts)
Res BW 300 MSG Pulse W (ms) N/A	kHz idth Number o Pulses N/A	Ho Df Average No. of Pulses 13	opping 902.25 - 9 <b>Scale</b>	027.75 On Time (ms)	Limit	p 100.5 ms (8192 pts) Results N/A
Res BW 300 MSG Pulse W (ms) N/A	kHz idth Number c Pulses	Ho of Average No. of Pulses 13 sTechnology	opping 902.25 - 9 Scale Factor N/A	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results N/A 09:13:45 AMJun 19, 2018
Res BW 300 MSG Pulse W (ms) N/A	kHz idth Number o Pulses N/A Analyzer - Element Materiali	Ho of Average No. of Pulses 13 sTechnology	ppping 902.25 - 9 Scale Factor N/A SENSE:INTI Trig Delay-50.00	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	p 100.5 ms (8192 pts) Results N/A
Res BW 300 MSG Pulse W (ms) N/A Keysight Spectrum M RL R	kHz idth Number c Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results           N/A           09:13:45 AMJun 19, 2018           TRACE         2.3 4 5 0           TYPE         2.3 4 5 0           TYPE         2.3 4 5 0           Der P.P.P.P.P.         AMkr1 18,58 ms
Res BW 300 MSG Pulse W (ms) N/A Keysight Spectrum M RL R	KHz idth Number of Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results N/A 09:13:45 AMJun 19, 2018 TRACE 1 2 3 4 5 0 TPE
Res BW 300 MSG Pulse W (ms) N/A Keysight Spectrum M RL R	kHz idth Number c Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results           N/A           09:13:45 AMJun 19, 2018           TRACE         2.3 4 5 0           TYPE         2.3 4 5 0           TYPE         2.3 4 5 0           Der P.P.P.P.P.         AMkr1 18,58 ms
Res BW 300 MSG Pulse W (ms) N/A Keysight Spectrum X RL R 5 dB/div Re 38.5	kHz idth Number c Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results           N/A           09:13:45 AMJun 19, 2018           TRACE         2.3 4 5 0           TYPE         2.3 4 5 0           TYPE         2.3 4 5 0           Der P.P.P.P.P.         AMkr1 18,58 ms
Res BW 300 MSG Pulse W (ms) N/A Keysight Spectrum Keysight Spect	kHz idth Number c Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results           N/A           09:13:45 AMJun 19, 2018           TRACE         2.3 4 5 0           TYPE         2.3 4 5 0           TYPE         2.3 4 5 0           Der P.P.P.P.P.         AMkr1 18,58 ms
Res BW 300 MSG Pulse W (ms) N/A Keysight Spectrum X RL R 5 dB/div Re 38.5	kHz idth Number c Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results           N/A           09:13:45 AMJun 19, 2018           TRACE         2.3 4 5 0           TYPE         2.3 4 5 0           TYPE         2.3 4 5 0           Der P.P.P.P.P.         AMkr1 18,58 ms
Res BW 300 MSG Pulse W (ms) N/A Keysight Spectrum Re S dB/div Re S dB/div Re S 38.5	kHz idth Number c Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results           N/A           09:13:45 AMJun 19, 2018           TRACE         2.3 4 5 0           TYPE         2.3 4 5 0           TYPE         2.3 4 5 0           Der P.P.P.P.P.         AMkr1 18,58 ms
Res         BW 300           MSG         MSG           Pulse W         (ms)           N/A         N/A           Keysight Spectrum         RL           StdB/div         Re           38.5         33.5           28.5         23.5	kHz idth Number c Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results           N/A           09:13:45 AMJun 19, 2018           TRACE         2.3 4 5 0           TYPE         2.3 4 5 0           TYPE         2.3 4 5 0           Der P.P.P.P.P.         AMkr1 18,58 ms
Res BW 300           Misg           Pulse W           (ms)           N/A           Keysight Spectrum           X           RL           R           S           AB/div           Res           33.5           23.5           23.5           16.5	kHz idth Number c Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results           N/A           09:13:45 AMJun 19, 2018           TRACE         2.3 4 5 0           TYPE         2.3 4 5 0           TYPE         2.3 4 5 0           Der P.P.P.P.P.         AMkr1 18,58 ms
Res         BW 300           MSG         MSG           Pulse W         (ms)           N/A         N/A           Keysight Spectrum         RL           StdB/div         Re           38.5         33.5           28.5         23.5	kHz idth Number c Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results           N/A           09:13:45 AMJun 19, 2018           TRACE         2.3 4 5 0           TYPE         2.3 4 5 0           TYPE         2.3 4 5 0           Der P.P.P.P.P.         AMkr1 18,58 ms
Res BW 300           Misg           Pulse W           (ms)           N/A           Keysight Spectrum           X           RL           R           S           AB/div           Res           33.5           23.5           23.5           16.5	kHz idth Number c Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results           N/A           09:13:45 AMJun 19, 2018           TRACE         2.3 4 5 0           TYPE         2.3 4 5 0           Der PP PP P         AMkr1 18,58 ms
Res         BW 300           MSG	kHz idth Number c Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results           N/A           09:13:45 AMJun 19, 2018           TRACE         2.3 4 5 0           TYPE         2.3 4 5 0           Der PP PP P         AMkr1 18,58 ms
Res         BW 300           MISG         Pulse W           (ms)         N/A           Image: Sector model         N/A           Image: Sector model         N/A           Image: Sector model         R           Image: Sector model	kHz idth Number c Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results           N/A           09:13:45 AMJun 19, 2018           TRACE         2.3 4 5 0           TYPE         2.3 4 5 0           Der PP PP P         AMkr1 18,58 ms
Res         BW 300           MSG	kHz idth Number c Pulses N/A Analyzer - Element Materials F 50 Ω DC	Ho of Average No. of Pulses 13 s Technology	ppping 902.25 - 9 Scale Factor N/A SENSE:INT Trig Delay-50.00 Trig: Video	27.75 On Time (ms) During 20s N/A	Limit (ms) N/A	Results           N/A           09:13:45 AMJun 19, 2018           TRACE         2.3 4 5 0           TYPE         2.3 4 5 0           Der PP PP P         AMkr1 18,58 ms

STATUS



		Нор	ping 902.25 - 92	27.75		
Pulse Width	Number of	Average No.	Scale	On Time (ms)	Limit	
(ms)	Pulses	of Pulses	Factor	During 20s	(ms)	Results
22.24	N/A	13	N/A	289.12	400	Pass

**Calculation Only** 

No Screen Capture Required



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
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-18	15-Mar-19

#### 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.



						TbtTx 2017.12.14	XMit 2017.12.13
EUT:	MIC-WRL-TRN-410				Work Order:	WTVD0006	
Serial Number:	Proto1a				Date:	18-Jun-18	
Customer:	WatchGuard Video				Temperature:		
	Paul Hunt, Navaid Karim	i				52.7% RH	
Project:					Barometric Pres.:		
	Marty Martin		Powe	er: Battery	Job Site:	TX09	
TEST SPECIFICAT	IONS			Test Method			
FCC 15.247:2018				ANSI C63.10:2013			
COMMENTS							
EUT operational.							
	W TEST STANDARD						
None		-					
Configuration #	1		Monty	Mati			
-		Signature	in a significant of the second s	ricersta			
						Limit	
					Value	(<)	Result
902 MHz - 928 MHz	Band						
	Index 0						
		I 0, 902.25 MHz			29.316 mW	1 W	Pass
		25, 914.75 MHz			51.128 mW	1 W	Pass
		el 51, 927.75 MHz			38.248 mW	1 W	Pass
	Index 1						
		l 0, 902.25 MHz			29.487 mW	1 W	Pass
		25, 914.75 MHz			51.753 mW	1 W	Pass
	High Channe	el 51, 927.75 MHz			38.894 mW	1 W	Pass



TbtTx 2017.12.14 XMit 2017.12.13 902 MHz - 928 MHz Band, Index 0, Low Channel 0, 902.25 MHz Limit Value **(<)** 1 W Result 29.316 mW Pass 02:00:51 PMJun 15, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P P Keysight ! RL ALIGN #Avg Type: Log-Pwr Avg|Hold: 100/100 PNO: Wide ++ Trig: Free Run IFGain:Low #Atten: 20 dB Mkr1 902.228 60 MHz 29.316 mW Ref Offset 20.48 dB Ref 150.0 mW 5 dB/div Log I **≜**1 Center 902.2500 MHz #Res BW 150 kHz Span 250.0 kHz Sweep 1.066 ms (1000 pts) #VBW 470 kHz STATUS 902 MHz - 928 MHz Band, Index 0, Mid Channel 25, 914.75 MHz Limit Value Result (<) 51.128 mW 1 W Pass 02:04:15 PM Jun 15, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P 📜 Keysight Sp 💴 R L ectrum Analyzer - Element Materials Technology ALIGN OFF #Avg Type: Log-Pwr Avg|Hold: 100/100 PNO: Wide ---- Trig: Free Run IFGain:Low #Atten: 20 dB Mkr1 914.776 65 MHz 51.128 mW Ref Offset 20.48 dB Ref 200.0 mW 5 dB/div Log r

20.0 µW					
63.2 µW					
632 μW					
2.00 mW					
20.0 mW					
63.2 mW	 	 ~	<b>♦</b> <sup>1</sup>	 	



TbtTx 2017.12.14 XMit 2017.12.13 902 MHz - 928 MHz Band, Index 0, High Channel 51, 927.75 MHz Limit Value **(<)** 1 W Result 38.248 mW Pass Keysight ! 02:06:57 PM Jun 15, 2018 RL ALIGN TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P #Avg Type: Log-Pwr Avg|Hold: 100/100 PNO: Wide ++ Trig: Free Run IFGain:Low #Atten: 20 dB Mkr1 927.778 90 MHz 38.248 mW Ref Offset 20.48 dB Ref 150.0 mW 5 dB/div Log I 1 Center 927.7500 MHz #Res BW 150 kHz Span 250.0 kHz Sweep 1.066 ms (1000 pts) #VBW 470 kHz STATUS 902 MHz - 928 MHz Band, Index 1, Low Channel 0, 902.25 MHz Limit Value (<) Result 29.487 mW 1 W Pass Keysight Spectrum Analyzer - Element Materials Technology
RL RF 50 Ω DC 02:10:26 PM Jun 15, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P ALIGN OFF #Avg Type: Log-Pwr Avg|Hold: 100/100 SENSE:INT PNO: Fast ++ Trig: Free Run IFGain:Low #Atten: 20 dB Mkr1 902.209 5 MHz 29.487 mW Ref Offset 20.48 dB Ref 150.0 mW 5 dB/div Log I 1

#VBW 910 kHz

Center 902.2500 MHz #Res BW 300 kHz Span 1.000 MHz Sweep 1.066 ms (1000 pts)

STATUS



TbtTx 2017.12.14 XMit 2017.12.13 902 MHz - 928 MHz Band, Index 1, Mid Channel 25, 914.75 MHz Limit Value **(<)** 1 W Result 51.753 mW Pass Keysight ! 02:13:56 PM Jun 15, 2018 RL ALIGN TRACE 1 2 3 4 5 6 TYPE M WWWW DET P P P P P #Avg Type: Log-Pwr Avg|Hold: 100/100 PNO: Fast ++ Trig: Free Run IFGain:Low #Atten: 20 dB Mkr1 914.806 6 MHz 51.753 mW Ref Offset 20.48 dB Ref 200.0 mW 5 dB/div Log I ø Center 914.7500 MHz #Res BW 300 kHz Span 1.000 MHz Sweep 1.066 ms (1000 pts) #VBW 910 kHz STATUS 902 MHz - 928 MHz Band, Index 1, High Channel 51, 927.75 MHz Limit Value (<) Result 38.894 mW 1 W Pass Keysight Spectrum Analyzer - Element Materials Technology
RL RF 50 Ω DC 02:16:38 PM Jun 15, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P ALIGN OFF #Avg Type: Log-Pwr Avg|Hold: 100/100 PNO: Fast ++ Trig: Free Run IFGain:Low #Atten: 20 dB Mkr1 927.807 6 MHz 38.894 mW Ref Offset 20.48 dB Ref 150.0 mW 5 dB/div Log I ▲1

150 mW 4.74 mV 1.50 mW 474 µW 474 µW 474 µW 474 µW 474 µW 150 µW 47.4 µW 150 µW 47



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
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-18	15-Mar-19

#### 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.



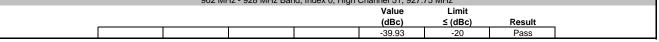
			TbtTx 2017.12.14	XMit 2017.12.13
EUT:	MIC-WRL-TRN-410	Work Order:	WTVD0006	
Serial Number:	Proto1a		18-Jun-18	
Customer:	WatchGuard Video	Temperature:	23.7 °C	
	Paul Hunt, Navaid Karimi		50.5% RH	
Project:		Barometric Pres.:		
	Marty Martin Power: Battery	Job Site:	TX09	
TEST SPECIFICAT	ONS Test Method			
FCC 15.247:2018	ANSI C63.10:2013			
COMMENTS				
EUT operational.				
DEVIATIONS FROM	I TEST STANDARD			
None				
Configuration #	1 Simature Marti			
	Signature			
		Value	Limit	
		(dBc)	≤ (dBc)	Result
902 MHz - 928 MHz	Band			
	Index 0			
	Low Channel 0, 902.25 MHz	-36.11	-20	Pass
	High Channel 51, 927.75 MHz	-39.93	-20	Pass
	Index 1			
	Low Channel 0, 902.25 MHz	-29.8	-20	Pass
	High Channel 51, 927.75 MHz	-34.29	-20	Pass

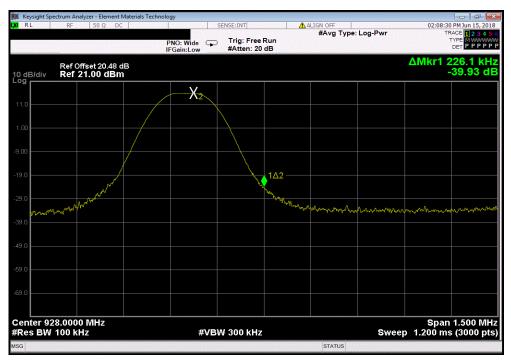


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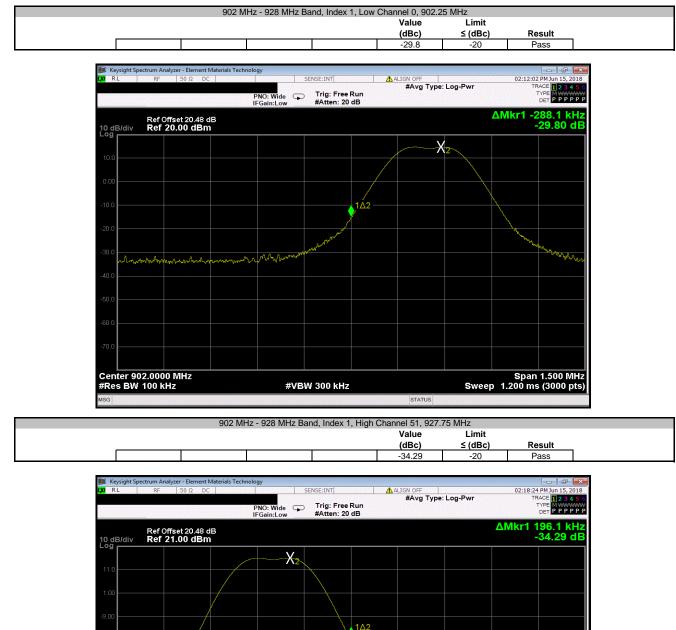
902 MHz - 928 MHz Band, Index 0, Low Channel 0, 902.25 MHz Value Limit (dBc) ≤ (dBc) Result 36.11 -20 Pass 02:02:24 PM Jun 15, 2018 RL 🚺 🗘 ALI #Avg Type: Log-Pwr TRACE 1 2 3 4 5 PNO: Wide Trig: Free Run IFGain:Low #Atten: 20 dB TYPE M WWWWW ΔMkr1 -228.1 kHz -36.11 dB Ref Offset 20.48 dB Ref 20.00 dBm 10 dB/div Log X<sub>2</sub> 1Δ<sup>2</sup> when Center 902.0000 MHz #Res BW 100 kHz Span 1.500 MHz Sweep 1.200 ms (3000 pts) #VBW 300 kHz STATUS 902 MHz - 928 MHz Band, Index 0, High Channel 51, 927.75 MHz







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-9.00		/							
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-29.0	montenant	<u> </u>			لوار مور مر	Manhoundan	MMmmmhmmn	www.www.	mmmmm
-39.0									
-49.0									
-59.0									
-69.0									
	ter 928.000 s BW 100 k		#VB	W 300 kHz			Sweep	Span 1.200 ms	1.500 MHz (3000 pts)
MSG						STATUS			

# **BAND EDGE COMPLIANCE -HOPPING MODE**



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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	N9010A	AFL	15-Mar-18	15-Mar-19
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-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 band were measured with the EUT set to its normal pseudo-random hopping sequence. 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 -HOPPING MODE**

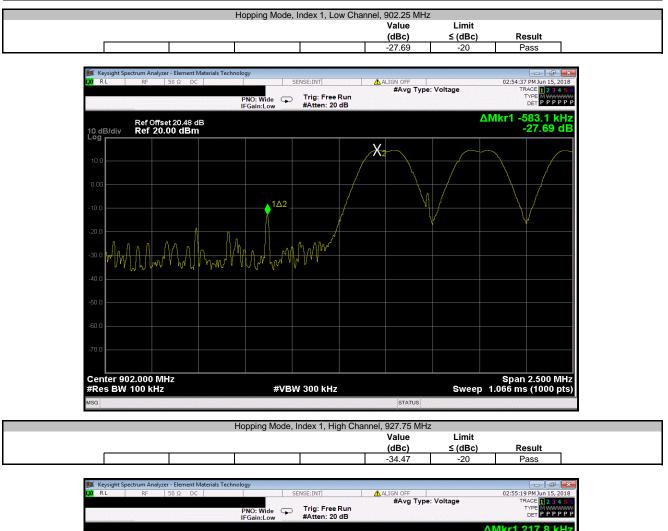


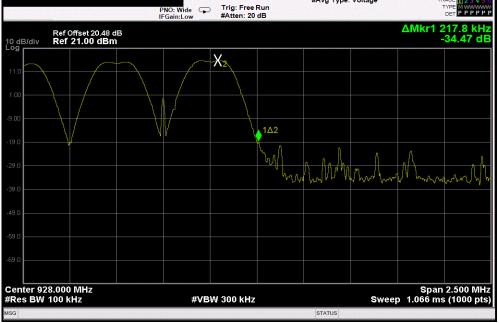
			TbtTx 2017.12.14	XMit 2017.12.13
EUT:	MIC-WRL-TRN-410	Work Order:	WTVD0006	
Serial Number:	Proto1a	Date:	18-Jun-18	
Customer:	WatchGuard Video	Temperature:	21.8 °C	
Attendees:	Paul Hunt, Navaid Karimi	Humidity:	55.4% RH	
Project:	None	Barometric Pres.:	1021 mbar	
Tested by:	Marty Martin Power: Battery	Job Site:	TX09	
TEST SPECIFICAT	ONS Test Method			
FCC 15.247:2018	ANSI C63.10:2013			
COMMENTS	·			
EUT operational.	I TEST STANDARD			
None				
Configuration #	1 Signature Martin			
		Value (dBc)	Limit ≤ (dBc)	Result
Hopping Mode	Index 1			
	Low Channel, 902.25 MHz	-27.69	-20	Pass
	High Channel, 927.75 MHz	-34.47	-20	Pass

### **BAND EDGE COMPLIANCE -HOPPING MODE**



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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
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-18	15-Mar-19
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20

#### **TEST DESCRIPTION**

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

The 20 dB occupied bandwidth was measured with the EUT set to low, medium and high transmit frequencies in the band. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode.



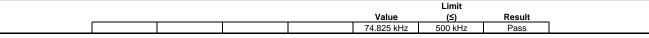
						TbtTx 2017.12.14	XMit 2017.12.13
EUT	MIC-WRL-TRN-410				Work Order	WTVD0006	
Serial Number:						18-Jun-18	
	: WatchGuard Video				Temperature		
	Paul Hunt, Navaid Karim	ni				49.8% RH	
Project					Barometric Pres.		
	: Marty Martin		Power	Battery	Job Site	TX09	
TEST SPECIFICAT	TIONS			Test Method			
FCC 15.247:2018				ANSI C63.10:2013			
COMMENTS							
EUT operational.							
DEVIATIONS FROM	M TEST STANDARD						
None							
Configuration #	1		Monty	Mat			
		Signature	incong	11 austa			
						Limit	
					Value	(≤)	Result
902 MHz - 928 MHz	z Band						
	Index 0						
	Low Channe	el 0, 902.25 MHz			72.674 kHz	500 kHz	Pass
							Pass
	Mid Channel	I 25, 914.75 MHz			74.825 kHz	500 kHz	1 0 0 0
		l 25, 914.75 MHz el 51, 927.75 MHz			74.825 kHz 73.017 kHz	500 kHz 500 kHz	Pass
	High Channe Index 1	el 51, 927.75 MHz			73.017 kHz		Pass
	High Channe Index 1						
	High Channe Index 1 Low Channe	el 51, 927.75 MHz			73.017 kHz	500 kHz	Pass
	High Channe Index 1 Low Channe Mid Channel	el 51, 927.75 MHz el 0, 902.25 MHz			73.017 kHz 133.556 kHz	500 kHz 500 kHz	Pass Pass

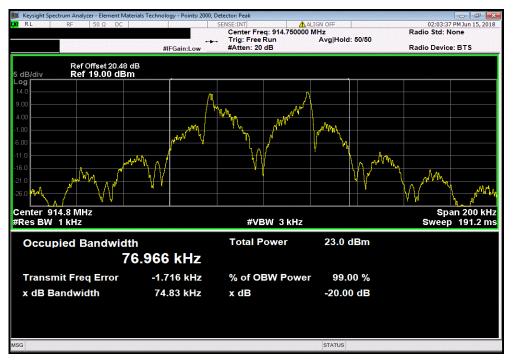


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902 MHz - 928 MHz Band, Index 0, Low Channel 0, 902.25 MHz Limit Value Result (≤) 72.674 kHz 500 kHz Pass NSE:INT ALIGN OFF Center Freq: 902.250000 MHz Trig: Free Run Avg|Hold: 50/50 #Atten: 20 dB 02:00:13 PM Jun 15, 2018 RI Radio Std: None -Radio Device: BTS #IFGain:Low Ref Offset 20.48 dB Ref 16.00 dBm dBidi Center 902.3 MHz #Res BW 1 kHz Span 200 kHz Sweep 191.2 ms #VBW 3 kHz Total Power 20.8 dBm **Occupied Bandwidth** 75.062 kHz -2.124 kHz Transmit Freq Error % of OBW Power 99.00 % x dB Bandwidth 72.67 kHz x dB -20.00 dB STATUS 902 MHz - 928 MHz Band, Index 0, Mid Channel 25, 914.75 MHz Limit



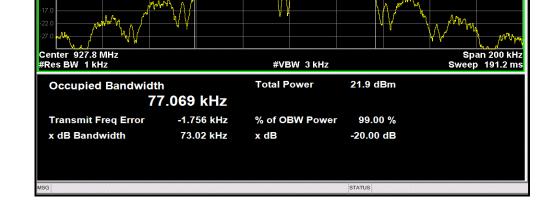


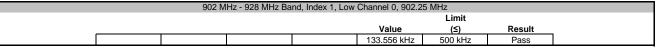
RL

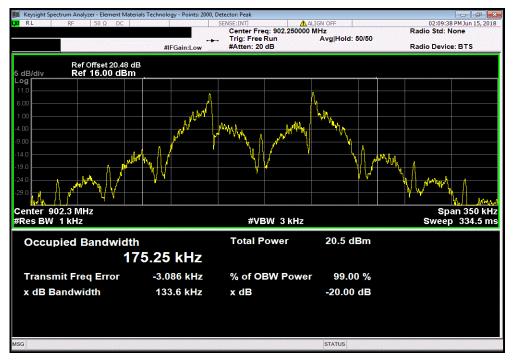
dB/d



TbtTx 2017.12.14 XMit 2017.12.13 902 MHz - 928 MHz Band, Index 0, High Channel 51, 927.75 MHz Limit Value Result (≤) 73.017 kHz 500 kHz Pass NSE:INT ALIGN OFF Center Freq: 927.750000 MHz Trig: Free Run Avg|Hold: 50/50 #Atten: 20 dB 02:06:20 PM Jun 15, 2018 Radio Std: None ----Radio Device: BTS #IFGain:Low Ref Offset 20.48 dB Ref 18.00 dBm ٨N

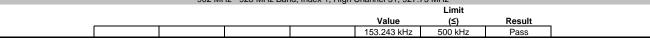








TbtTx 2017.12.14 XMit 2017.12.13 902 MHz - 928 MHz Band, Index 1, Mid Channel 25, 914.75 MHz Limit Value Result (≤) 142.886 kHz 500 kHz Pass NSE:INT ALIGN OFF Center Freq: 914.750000 MHz Trig: Free Run Avg|Hold: 50/50 #Atten: 20 dB 02:13:17 PM Jun 15, 2018 RI Radio Std: None ----Radio Device: BTS #IFGain:Low Ref Offset 20.48 dB Ref 19.00 dBm dB/d Center 914.8 MHz #Res BW 1 kHz Span 400 kHz Sweep 382.3 ms #VBW 3 kHz Total Power 23.0 dBm **Occupied Bandwidth** 172.57 kHz -1.049 kHz Transmit Freq Error % of OBW Power 99.00 % x dB Bandwidth 142.9 kHz x dB -20.00 dB STATUS 902 MHz - 928 MHz Band, Index 1, High Channel 51, 927.75 MHz







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
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	28-Nov-17	28-Nov-18
Generator - Signal	Agilent	N5173B	TIW	5-Jul-17	5-Jul-20
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-18	15-Mar-19

#### **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.



	IC-WRL-TRN-410				Work Order:		
Serial Number: Pro						18-Jun-18	
Customer: Wa	atchGuard Video				Temperature:	23.2 °C	
Attendees: Pau	aul Hunt, Navaid Karimi				Humidity:		
Project: Nor					<b>Barometric Pres.:</b>	1019 mbar	
Tested by: Mar			F	Power: Battery	Job Site:	TX09	
EST SPECIFICATIONS	IS			Test Method			
CC 15.247:2018				ANSI C63.10:2013			
COMMENTS							
EUT operational.							
•							
DEVIATIONS FROM TE	EST STANDARD						
DEVIATIONS FROM TE	EST STANDARD						
	EST STANDARD	Signature	Monty	Marti			
lone	EST STANDARD	Signature	Monty	Frequency	Max Value	Limit	
None Configuration #	1	Signature	Monty		Max Value (dBc)	Limit ≤ (dBc)	Result
Configuration # 02 MHz - 928 MHz Ban	1 Ind	Signature	Morty	Frequency			Result
Configuration # 02 MHz - 928 MHz Ban	1 ind dex 0	•	Metty	Frequency Range		≤ (dBc)	
Configuration # 102 MHz - 928 MHz Ban	1 ind dex 0 Low Channel (	), 902.25 MHz	Marty	Frequency Range 30 MHz - 10 GHz	(dBc) -39.08		Result
Configuration # 02 MHz - 928 MHz Ban	1 ind dex 0	), 902.25 MHz	Merry.	Frequency Range	(dBc)	≤ (dBc)	
onfiguration # 02 MHz - 928 MHz Ban Inde	1 Ind dex 0 Low Channel 0 High Channel 2 High Channel	), 902.25 MHz	Metty	Frequency Range 30 MHz - 10 GHz	(dBc) -39.08	<b>≤ (dBc)</b> -20	Pass
onfiguration # 02 MHz - 928 MHz Ban Inde	1 ind dex 0 Low Channel 0 Mid Channel 2	), 902.25 MHz 5, 914.75 MHz	Morty.	Frequency Range 30 MHz - 10 GHz 30 MHz - 10 GHz	(dBc) -39.08 -38.36	≤ (dBc) -20 -20	Pass Pass
onfiguration # 02 MHz - 928 MHz Ban Inde	1 Ind dex 0 Low Channel 0 High Channel 2 High Channel	), 902.25 MHz 5, 914.75 MHz 51, 927.75 MHz	Merriy.	Frequency Range 30 MHz - 10 GHz 30 MHz - 10 GHz	(dBc) -39.08 -38.36	≤ (dBc) -20 -20	Pass Pass
lone Configuration # 02 MHz - 928 MHz Ban Inde	1 Ind dex 0 Low Channel 0 Mid Channel 2 High Channel dex 1	0, 902.25 MHz 5, 914.75 MHz 51, 927.75 MHz 0, 902.25 MHz	Marty	Frequency Range 30 MHz - 10 GHz 30 MHz - 10 GHz 30 MHz - 10 GHz	(dBc) -39.08 -38.36 -39.95	≤ (dBc) -20 -20 -20	Pass Pass Pass

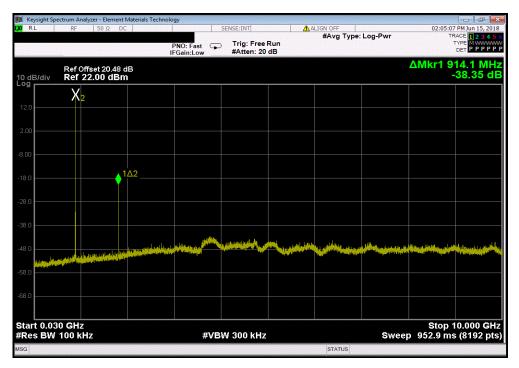


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902 MHz - 928 MHz Band, Index 0, Low Channel 0, 902.25 MHz Frequency Max Value Limit ≤ (dBc) Range (dBc) Result 30 MHz - 10 GHz 39.08 -20 Pass Element Materials Tec 02:01:53 PM Jun 15, 2018 RL ALI #Avg Type: Log-Pwr TRACE 1 2 3 4 5 PNO: Fast Trig: Free Run IFGain:Low #Atten: 20 dB TYPE M WWWWW ΔMkr1 901.9 MHz -39.08 dB Ref Offset 20.48 dB Ref 20.00 dBm 10 dB/div Log  $\chi_2$ 12 and a last of a last Start 0.030 GHz #Res BW 100 kHz Stop 10.000 GHz Sweep 952.9 ms (8192 pts) #VBW 300 kHz STATUS

902 MHz - 928 MHz Band, Index 0, Mid Channel 25, 914.75 MHz						
Frequency		Max Value	Limit			
Range		(dBc)	≤ (dBc)	Result		
30 MHz - 10 GHz		-38.36	-20	Pass		





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902 MHz - 928 MHz Band, Index 0, High Channel 51, 927.75 MHz Frequency Max Value Limit Range 30 MHz - 10 GHz ≤ (dBc) (dBc) Result 39.95 -20 Pass alyzer - Element Materials Technology 02:07:59 PM Jun 15, 2018 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P P Keysight Sp RL ALIGN OFF #Avg Type: Log-Pwr PNO: Fast Trig: Free Run IFGain:Low #Atten: 20 dB ΔMkr1 927.5 MHz -39.95 dB Ref Offset 20.48 dB Ref 21.00 dBm 10 dB/div Log  $X_2$ 1<u>Δ</u>2 ۵ A las antifa Stop 10.000 GHz Sweep 952.9 ms (8192 pts) Start 0.030 GHz #Res BW 100 kHz #VBW 300 kHz STATUS

902 MHz - 928 MHz Band, Index 1, Low Channel 0, 902.25 MHz								
Frequency		Max Value	Limit					
Range		(dBc)	≤ (dBc)	Result	_			
30 MHz - 10 GHz		-39.15	-20	Pass				

			Aaterials Technolo	igy						
RL	RF 5	0Ω DC			SENSE:INT	A	ALIGN OFF	_		34 PM Jun 15, 201
			I	PNO: Fast G	Trig: Free #Atten: 20		#Avg Type	: Log-Pwr		RACE 1 2 3 4 5 TYPE MWWW DET PPPP
	Ref Offset	20 48 d	в						ΔMkr1 §	01.9 MH
0 dB/div	Ref 20.0	0 dBm								-39.15 d
09	X <sub>2</sub>									
10.0										
.00										
0.0										
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50.0	and the state of the local division of the l		وسأناف فالترد والدر		We with the second second	The second second	والمالية والمتشاور والم	وفاقتدو بالأفاقي		والملي والمحداد الملافة
		and the local district								
60.0										
70.0										
tart 0.03 Res BW	i0 GHz 100 kHz			#VI	3W 300 kHz			Swee	Stop p 952.9 m	10.000 GH
ICCS DW	100 111/2						STATUS		р- эодлэ III	e to los pr



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TbtTx 2017.12.14

902 MHz - 928 MHz Band, Index 1, Mid Channel 25, 914.75 MHz Frequency Max Value Limit ≤ (dBc) Range (dBc) Result 30 MHz - 10 GHz 38.4 -20 Pass - Element Materials Tec Keysight 02:14:49 PM Jun 15, 2018 RL ALIGN #Avg Type: Log-Pwr TRACE 1 2 3 4 5 PNO: Fast Trig: Free Run IFGain:Low #Atten: 20 dB TYPE M WWWWW ΔMkr1 914.1 MHz -38.40 dB Ref Offset 20.48 dB Ref 22.00 dBm 10 dB/div Log  $X_2$ 1Δ2 المقرر المراطات Start 0.030 GHz #Res BW 100 kHz Stop 10.000 GHz Sweep 952.9 ms (8192 pts) #VBW 300 kHz STATUS

902 MHz - 928 MHz Band, Index 1, High Channel 51, 927.75 MHz						
	Frequency		Max Value	Limit		
	Range		(dBc)	≤ (dBc)	Result	
	30 MHz - 10 GHz		-40.18	-20	Pass	

