



Element Materials Technology

UltraTEV Plus2

FCC 15.247:2018

802.11bgn SISO Radio

Report # ELEM0052.1



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.



CERTIFICATE OF TEST

Last Date of Test: March 26, 2018
Element Materials Technology
Model: UltraTEV Plus2

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	Per KDB 996369 D02 a)2), referencing original module test data from FCC ID: Z64-WL18SBMOD, report: FR3N2752-01C.
11.12.1, 11.13.2, 6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
11.6	Duty Cycle	No	N/A	Per KDB 996369 D02 a)2), referencing original module test data from FCC ID: Z64-WL18SBMOD, report: FR3N2752-01C.
11.8.2	Occupied Bandwidth	No	N/A	Per KDB 996369 D02 a)2), referencing original module test data from FCC ID: Z64-WL18SBMOD, report: FR3N2752-01C.
11.9.2.2.4	Output Power	Yes	Pass	
11.10.2	Power Spectral Density	No	N/A	Per KDB 996369 D02 a)2), referencing original module test data from FCC ID: Z64-WL18SBMOD, report: FR3N2752-01C.
11.11	Band Edge Compliance	No	N/A	Per KDB 996369 D02 a)2), referencing original module test data from FCC ID: Z64-WL18SBMOD, report: FR3N2752-01C.
11.11	Spurious Conducted Emissions	No	N/A	Per KDB 996369 D02 a)2), referencing original module test data from FCC ID: Z64-WL18SBMOD, report: FR3N2752-01C.

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
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:

<http://portlandcustomer.element.com/ts/scope/scope.htm>

<http://gsi.nist.gov/global/docs/cabs/designations.html>

MEASUREMENT UNCERTAINTY



Measurement Uncertainty

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

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

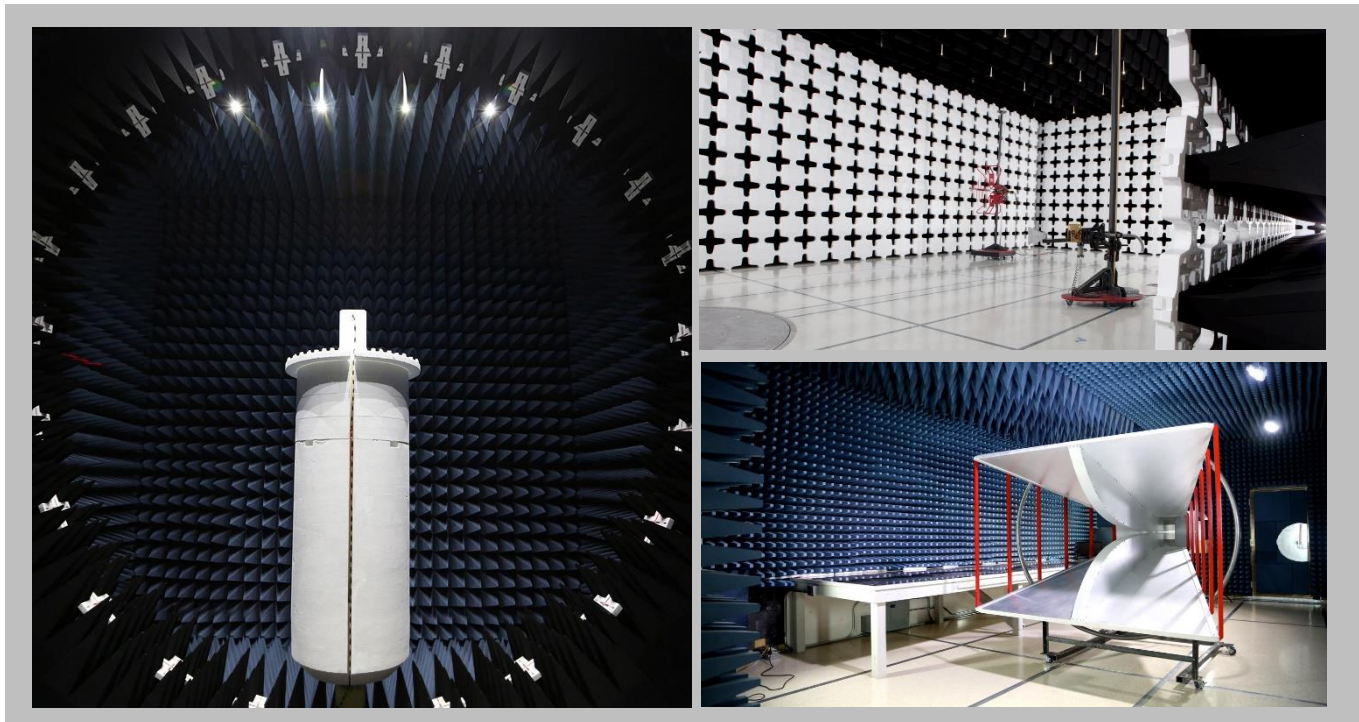
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	4.9 dB	-4.9 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

FACILITIES

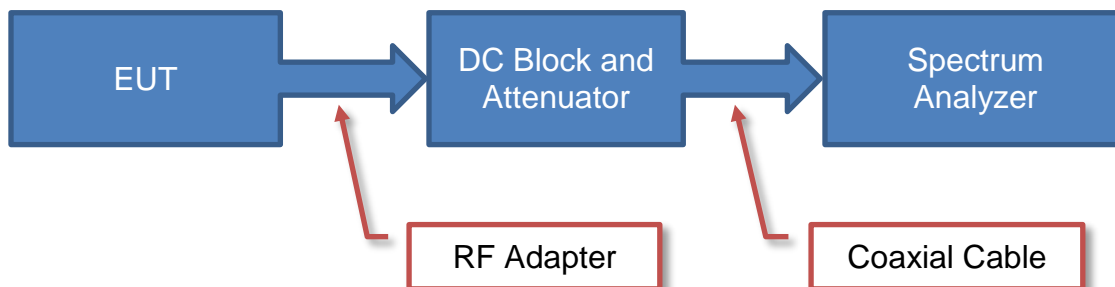


California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Oregon Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	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

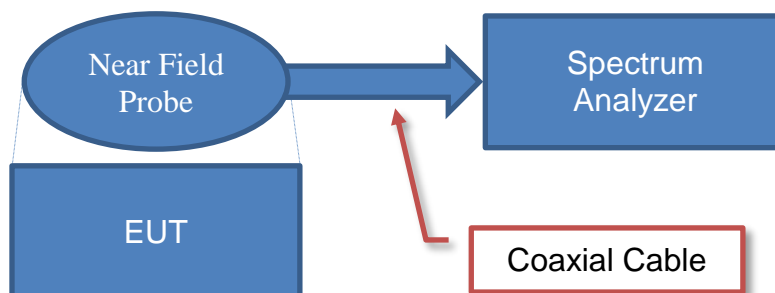


Test Setup Block Diagrams

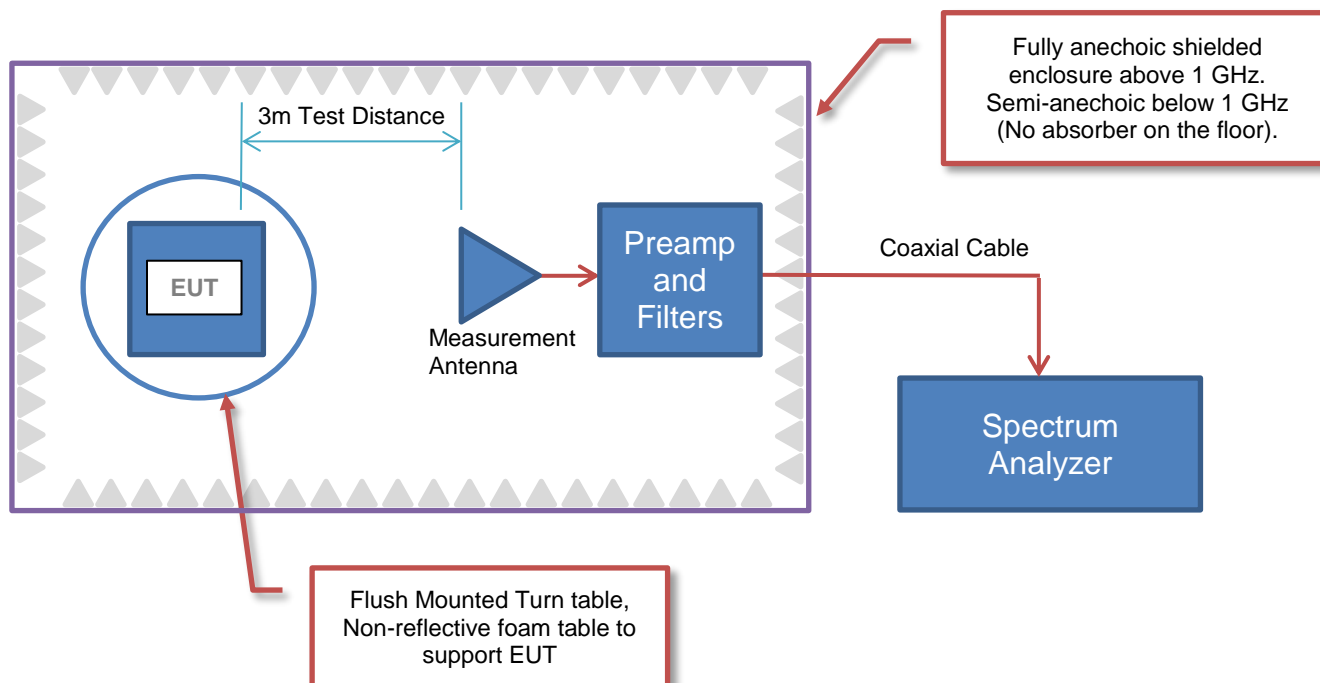
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions





PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Element Materials Technology
Address:	Unit E South Orbital Trading Park Hedon Road
City, State, Zip:	Hull, HU9 1NJ
Test Requested By:	Alex Toohie
Model:	UltraTEV Plus2
First Date of Test:	March 19, 2018
Last Date of Test:	March 26, 2018
Receipt Date of Samples:	March 16, 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 UTP2 is a handheld instrument for detecting and measuring Partial Discharge (PD) in electrical assets, through measurement of Transient Earth Voltages, Ultrasonic emissions and Current pulses. The UTP2 is a handheld instrument and conveys the captured information to the user both visually via the colour LCD touch screen, and audibly via optional headphones connected via the headphone jack.

Testing Objective:

To demonstrate C1PC compliance of the 802.11 radio under FCC 15.247 for operation in the 2.4 GHz band.

CONFIGURATIONS



Configuration ELEM0052- 1

Software/Firmware Running during test	
Description	Version
Blackbird	v3.1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Partial Discharge Detector	EA Technology	UltraTEV Plus2	1201

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Host Laptop	Lenovo	SL300	L3-C2189
Mouse	Lenovo	MOEUUO	44K4698
AC/DC Brick	Lenovo	42T5276	11S42T5276Z1ZD8V8BC1BS

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
AC Cable	No	1.5m	No	AC Mains	AC/DC Brick
DC Cable	No	1.5m	Yes	AC/DC Brick	Host Laptop
USB Cable	Yes	1.0m	No	Partial Discharge Detector	Host Laptop
USB Cable	Yes	1.4m	No	Mouse	Host Laptop

Configuration ELEM0052- 3

Software/Firmware Running during test	
Description	Version
Blackbird	v3.1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Partial Discharge Detector	EA Technology	UltraTEV Plus2	1203

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB Cable	Yes	1.0m	No	Partial Discharge Detector	TX09 Lab PC

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	3/19/2018	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	3/26/2018	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2017.12.19

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

Continuously Transmitting at Low Channel 2412 MHz, Mid Channel 2437 MHz, High Channel 2462 MHz

Continuously Transmitting at Low Channel 2412 MHz, High Channel 2462 MHz

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

ELEM0052 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26500 MHz
-----------------	--------	----------------	-----------

SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Cable	Element	8-18GHz	TXD	31-May-2017	12 mo
Cable	Element	1-8.2 GHz	TXC	31-May-2017	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-2017	12 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	12-Jan-2018	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJL	29-Sep-2016	24 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AJG	NCR	0 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AJF	NCR	NCR
Antenna - Double Ridge	A.H. Systems, Inc.	SAS-574	AXW	5-Aug-2016	24 mo
Amplifier - Pre-Amplifier	Miteq	JSDWK42-18004000-60-5P	PAM	NCR	NCR
Cable	Element	18-40GHz	TXE	NCR	NCR
Filter - High Pass	Micro-Tronics	HPM50111	HGC	16-Mar-2018	12 mo
Attenuator	Weinschel Corp	4H-20	AWB	16-Mar-2018	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	HHV	3-Aug-2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1551	PAH	10-Oct-2017	12 mo
Cable	Element	RE 9kHz - 1GHz	TXB	10-Oct-2017	12 mo
Antenna - Biconilog	ETS Lindgren	3143B	AYF	13-Apr-2016	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	15-Mar-2018	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:

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



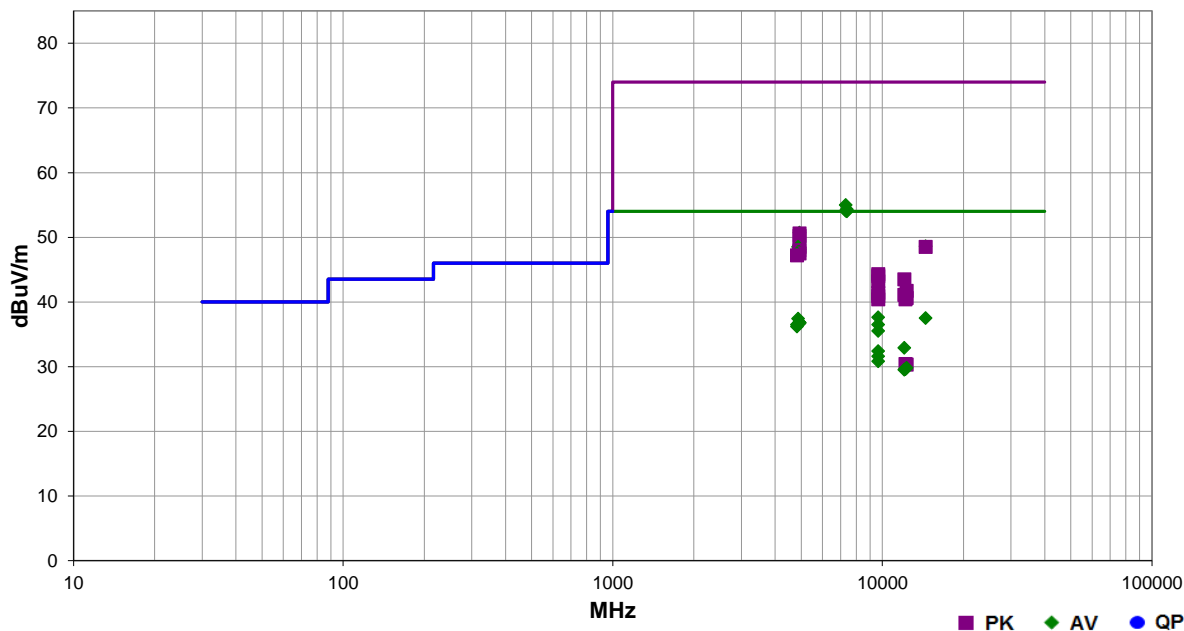
EmiRS 2018.02.06

PSA-ESCI 2017.12.19

Work Order:	ELEM0052	Date:	19-Mar-2018	
Project:	None	Temperature:	22.7 °C	
Job Site:	TX02	Humidity:	36.5% RH	
Serial Number:	1201	Barometric Pres.:	1010 mbar	
EUT:	UltraTEV Plus2			
Configuration:	1			
Customer:	Element Materials Technology			
Attendees:	None			
EUT Power:	110VAC/60Hz			
Operating Mode:	Continuously Transmitting at Low Channel 2412 MHz, Mid Channel 2437 MHz, High Channel 2462 MHz			
Deviations:	None			
Comments:	See comments for EUT orientation and data rate.			

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

Run #	25	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
-------	----	-------------------	---	-------------------	-----------	---------	------




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
4923.920	37.0	6.9	2.2	198.0	3.0	0.0	Horz	AV	0.0	43.9	54.0	-10.1	EUT Y, High Ch, 1mbps
7311.855	29.4	14.0	1.0	68.0	3.0	0.0	Vert	AV	0.0	43.4	54.0	-10.6	EUT Y, Mid Ch, 1mbps
7385.645	29.4	14.0	1.0	333.9	3.0	0.0	Vert	AV	0.0	43.4	54.0	-10.6	EUT Y, High Ch, 1mbps
7311.315	29.3	14.0	1.0	124.9	3.0	0.0	Horz	AV	0.0	43.3	54.0	-10.7	EUT Y, Mid Ch, 1mbps
4923.950	36.4	6.9	3.8	157.0	3.0	0.0	Vert	AV	0.0	43.3	54.0	-10.7	EUT Y, High Ch, 1mbps
7384.655	29.2	14.0	1.0	170.0	3.0	0.0	Horz	AV	0.0	43.2	54.0	-10.8	EUT Y, High Ch, 1mbps
4923.885	32.9	6.9	3.8	165.0	3.0	0.0	Horz	AV	0.0	39.8	54.0	-14.2	EUT Y, High Ch, 11mbps
4873.895	32.9	6.8	2.4	194.0	3.0	0.0	Horz	AV	0.0	39.7	54.0	-14.3	EUT Y, Mid Ch, 1mbps
14472.140	26.7	10.9	1.0	283.0	3.0	0.0	Vert	AV	0.0	37.6	54.0	-16.4	EUT Y, Low Ch, 1mbps
9647.920	40.1	-2.5	1.2	336.0	3.0	0.0	Vert	AV	0.0	37.6	54.0	-16.4	EUT Y, Low Ch, 1mbps
14470.820	26.6	10.9	1.0	280.9	3.0	0.0	Horz	AV	0.0	37.5	54.0	-16.5	EUT Y, Low Ch, 1mbps
4873.935	30.6	6.8	1.0	58.9	3.0	0.0	Vert	AV	0.0	37.4	54.0	-16.6	EUT Y, Mid Ch, 1mbps
4925.305	29.9	6.9	1.0	22.9	3.0	0.0	Horz	AV	0.0	36.8	54.0	-17.2	EUT Y, High Ch, 36mbps
4925.270	29.9	6.9	1.8	226.9	3.0	0.0	Horz	AV	0.0	36.8	54.0	-17.2	EUT Y, High Ch, 54mbps
4925.445	29.9	6.9	1.0	260.0	3.0	0.0	Horz	AV	0.0	36.8	54.0	-17.2	EUT Y, High Ch, 6mbps
4925.110	29.8	6.9	3.9	231.9	3.0	0.0	Horz	AV	0.0	36.7	54.0	-17.3	EUT Y, High Ch, MCS7
4925.395	29.8	6.9	1.0	9.0	3.0	0.0	Horz	AV	0.0	36.7	54.0	-17.3	EUT Y, High Ch, MCS0
9647.895	39.0	-2.5	1.1	93.9	3.0	0.0	Vert	AV	0.0	36.5	54.0	-17.5	EUT X, Low Ch, 1mbps

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
4822.610	29.7	6.8	1.0	123.9	3.0	0.0	Horz	AV	0.0	36.5	54.0	-17.5	EUT Y, Low Ch, 1mbps
4822.995	29.4	6.8	1.0	63.9	3.0	0.0	Vert	AV	0.0	36.2	54.0	-17.8	EUT Y, Low Ch, 1mbps
9647.905	38.0	-2.5	3.0	200.0	3.0	0.0	Horz	AV	0.0	35.5	54.0	-18.5	EUT Y, Low Ch, 1mbps
7311.485	41.0	14.0	1.0	68.0	3.0	0.0	Vert	PK	0.0	55.0	74.0	-19.0	EUT Y, Mid Ch, 1mbps
7387.400	40.3	14.0	1.0	333.9	3.0	0.0	Vert	PK	0.0	54.3	74.0	-19.7	EUT Y, High Ch, 1mbps
7309.730	40.1	14.0	1.0	124.9	3.0	0.0	Horz	PK	0.0	54.1	74.0	-19.9	EUT Y, Mid Ch, 1mbps
7386.990	40.0	14.0	1.0	170.0	3.0	0.0	Horz	PK	0.0	54.0	74.0	-20.0	EUT Y, High Ch, 1mbps
12058.650	33.8	-0.9	1.0	273.9	3.0	0.0	Vert	AV	0.0	32.9	54.0	-21.1	EUT Y, Low Ch, 1mbps
9647.885	34.9	-2.5	1.0	214.9	3.0	0.0	Horz	AV	0.0	32.4	54.0	-21.6	EUT Z, Low Ch, 1mbps
9647.875	34.1	-2.5	1.0	85.0	3.0	0.0	Horz	AV	0.0	31.6	54.0	-22.4	EUT X, Low Ch, 1mbps
9647.890	33.3	-2.5	1.0	63.9	3.0	0.0	Vert	AV	0.0	30.8	54.0	-23.2	EUT Z, Low Ch, 1mbps
4923.890	43.8	6.9	2.2	198.0	3.0	0.0	Horz	PK	0.0	50.7	74.0	-23.3	EUT Y, High Ch, 1mbps
4923.850	43.7	6.9	3.8	157.0	3.0	0.0	Vert	PK	0.0	50.6	74.0	-23.4	EUT Y, High Ch, 1mbps
12184.010	31.0	-0.6	2.4	81.9	3.0	0.0	Vert	AV	0.0	30.4	54.0	-23.6	EUT Y, Mid Ch, 1mbps
12311.300	30.6	-0.3	1.0	310.9	3.0	0.0	Vert	AV	0.0	30.3	54.0	-23.7	EUT Y, High Ch, 1mbps
4923.990	43.3	6.9	3.8	165.0	3.0	0.0	Horz	PK	0.0	50.2	74.0	-23.8	EUT Y, High Ch, 1mbps
12309.650	30.1	-0.3	1.0	156.0	3.0	0.0	Horz	AV	0.0	29.8	54.0	-24.2	EUT Y, High Ch, 1mbps
12186.250	30.2	-0.6	1.0	200.0	3.0	0.0	Horz	AV	0.0	29.6	54.0	-24.4	EUT Y, Mid Ch, 1mbps
14470.710	37.7	10.9	1.0	280.9	3.0	0.0	Horz	PK	0.0	48.6	74.0	-25.4	EUT Y, Low Ch, 1mbps
12058.610	30.4	-0.9	1.0	336.0	3.0	0.0	Horz	AV	0.0	29.5	54.0	-24.5	EUT Y, Low Ch, 1mbps
4924.855	41.6	6.9	3.9	231.9	3.0	0.0	Horz	PK	0.0	48.5	74.0	-25.5	EUT Y, High Ch, MCS7
14472.580	37.6	10.9	1.0	283.0	3.0	0.0	Vert	PK	0.0	48.5	74.0	-25.5	EUT Y, Low Ch, 1mbps
4925.355	41.2	6.9	1.8	226.9	3.0	0.0	Horz	PK	0.0	48.1	74.0	-25.9	EUT Y, High Ch, 54mbps
4873.930	41.7	6.8	2.4	194.0	3.0	0.0	Horz	PK	0.0	48.5	74.0	-25.5	EUT Y, Mid Ch, 1mbps
4922.925	41.1	6.9	1.0	22.9	3.0	0.0	Horz	PK	0.0	48.0	74.0	-26.0	EUT Y, High Ch, 36mbps
4923.065	40.8	6.9	1.0	9.0	3.0	0.0	Horz	PK	0.0	47.7	74.0	-26.3	EUT Y, High Ch, MCS0
4874.115	40.9	6.8	1.0	58.9	3.0	0.0	Vert	PK	0.0	47.7	74.0	-26.3	EUT Y, Mid Ch, 1mbps
4923.270	40.6	6.9	1.0	260.0	3.0	0.0	Horz	PK	0.0	47.5	74.0	-26.5	EUT Y, High Ch, 6mbps
4824.890	40.8	6.7	1.0	123.9	3.0	0.0	Horz	PK	0.0	47.5	74.0	-26.5	EUT Y, Low Ch, 1mbps
4823.435	40.4	6.8	1.0	63.9	3.0	0.0	Vert	PK	0.0	47.2	74.0	-26.8	EUT Y, Low Ch, 1mbps
9647.795	46.8	-2.5	1.1	93.9	3.0	0.0	Vert	PK	0.0	44.3	74.0	-29.7	EUT X, Low Ch, 1mbps
9647.615	46.5	-2.5	1.2	336.0	3.0	0.0	Vert	PK	0.0	44.0	74.0	-30.0	EUT Y, Low Ch, 1mbps
12059.430	44.4	-0.9	1.0	273.9	3.0	0.0	Vert	PK	0.0	43.5	74.0	-30.5	EUT Y, Low Ch, 1mbps
9648.015	45.7	-2.5	3.0	200.0	3.0	0.0	Horz	PK	0.0	43.2	74.0	-30.8	EUT Y, Low Ch, 1mbps
12309.360	42.0	-0.3	1.0	310.9	3.0	0.0	Vert	PK	0.0	41.7	74.0	-32.3	EUT Y, High Ch, 1mbps
9648.275	43.9	-2.5	1.0	85.0	3.0	0.0	Horz	PK	0.0	41.4	74.0	-32.6	EUT X, Low Ch, 1mbps
12185.840	41.7	-0.6	2.4	81.9	3.0	0.0	Vert	PK	0.0	41.1	74.0	-32.9	EUT Y, Mid Ch, 1mbps
12059.850	42.0	-0.9	1.0	336.0	3.0	0.0	Horz	PK	0.0	41.1	74.0	-32.9	EUT Y, Low Ch, 1mbps
9647.805	43.4	-2.5	1.0	214.9	3.0	0.0	Horz	PK	0.0	40.9	74.0	-33.1	EUT Z, Low Ch, 1mbps
12310.400	40.9	-0.3	1.0	156.0	3.0	0.0	Horz	PK	0.0	40.6	74.0	-33.4	EUT Y, High Ch, 1mbps
12184.600	41.0	-0.6	1.0	200.0	3.0	0.0	Horz	PK	0.0	40.4	74.0	-33.6	EUT Y, Mid Ch, 1mbps
9647.730	42.9	-2.5	1.0	63.9	3.0	0.0	Vert	PK	0.0	40.4	74.0	-33.6	EUT Z, Low Ch, 1mbps

SPURIOUS RADIATED EMISSIONS

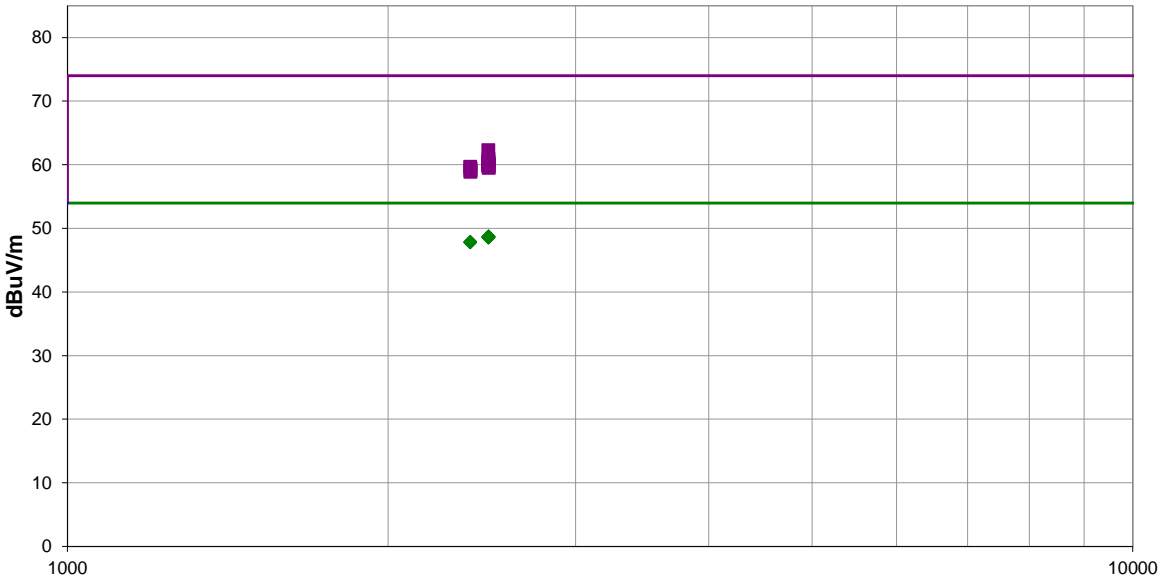


EmiRS 2018.02.06 PSA-ESCI 2017.12.19

Work Order:	ELEM0052	Date:	19-Mar-2018	
Project:	None	Temperature:	23.5 °C	
Job Site:	TX02	Humidity:	45.2% RH	
Serial Number:	1201	Barometric Pres.:	1016 mbar	Tested by: Marty Martin
EUT:	UltraTEV Plus2			
Configuration:	1			
Customer:	Element Materials Technology			
Attendees:	None			
EUT Power:	110VAC/60Hz			
Operating Mode:	Continuously Transmitting at Low Channel 2412 MHz, High Channel 2462 MHz			
Deviations:	None			
Comments:	Transmit Band Edge. See comments for EUT orientation and data rate.			

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

Run #	56	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
-------	----	-------------------	---	-------------------	-----------	---------	------



■ PK ◆ AV ● QP

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
2484.433	32.7	-4.0	1.0	318.0	3.0	20.0	Horz	AV	0.0	48.7	54.0	-5.3	EUT X, High Ch, 6 MBPS
2485.073	32.7	-4.0	1.0	118.9	3.0	20.0	Vert	AV	0.0	48.7	54.0	-5.3	EUT X, High Ch, 6 MBPS
2484.663	32.7	-4.0	1.0	244.9	3.0	20.0	Horz	AV	0.0	48.7	54.0	-5.3	EUT Y, High Ch, 6 MBPS
2485.057	32.7	-4.0	1.0	248.0	3.0	20.0	Vert	AV	0.0	48.7	54.0	-5.3	EUT Y, High Ch, 6 MBPS
2485.287	32.7	-4.0	1.0	310.9	3.0	20.0	Horz	AV	0.0	48.7	54.0	-5.3	EUT X, High Ch, 54 MBPS
2485.293	32.7	-4.0	1.5	122.0	3.0	20.0	Horz	AV	0.0	48.7	54.0	-5.3	EUT X, High Ch, MCS0
2485.203	32.6	-4.0	1.0	195.0	3.0	20.0	Horz	AV	0.0	48.6	54.0	-5.4	EUT Z, High Ch, 6 MBPS
2483.530	32.6	-4.0	1.0	286.9	3.0	20.0	Vert	AV	0.0	48.6	54.0	-5.4	EUT Z, High Ch, 6 MBPS
2484.543	32.6	-4.0	1.0	69.0	3.0	20.0	Horz	AV	0.0	48.6	54.0	-5.4	EUT X, High Ch, 1 MBPS
2484.900	32.6	-4.0	1.0	238.9	3.0	20.0	Horz	AV	0.0	48.6	54.0	-5.4	EUT X, High Ch, 36 MBPS
2485.450	32.6	-4.0	1.0	195.0	3.0	20.0	Horz	AV	0.0	48.6	54.0	-5.4	EUT X, High Ch, MCS7
2484.927	32.5	-4.0	1.0	196.9	3.0	20.0	Horz	AV	0.0	48.5	54.0	-5.5	EUT X, High Ch, 11 MBPS
2389.003	32.6	-4.7	1.0	237.0	3.0	20.0	Horz	AV	0.0	47.9	54.0	-6.1	EUT X, Low Ch, 6 MBPS
2388.757	32.5	-4.7	1.0	200.0	3.0	20.0	Horz	AV	0.0	47.8	54.0	-6.2	EUT X, Low Ch, 1 MBPS
2388.143	32.5	-4.7	1.0	69.9	3.0	20.0	Vert	AV	0.0	47.8	54.0	-6.2	EUT X, Low Ch, 1 MBPS
2388.553	32.5	-4.7	1.0	345.0	3.0	20.0	Vert	AV	0.0	47.8	54.0	-6.2	EUT X, Low Ch, 6 MBPS
2483.983	46.3	-4.0	1.0	310.9	3.0	20.0	Horz	PK	0.0	62.3	74.0	-11.7	EUT X, High Ch, 54 MBPS
2484.273	44.9	-4.0	1.0	248.0	3.0	20.0	Vert	PK	0.0	60.9	74.0	-13.1	EUT Y, High Ch, 6 MBPS
2483.760	44.4	-4.0	1.0	244.9	3.0	20.0	Horz	PK	0.0	60.4	74.0	-13.6	EUT Y, High Ch, 6 MBPS
2483.783	44.4	-4.0	1.0	238.9	3.0	20.0	Horz	PK	0.0	60.4	74.0	-13.6	EUT X, High Ch, 36 MBPS

Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.917	44.3	-4.0	1.0	196.9	3.0	20.0	Horz	PK	0.0	60.3	74.0	-13.7	EUT X, High Ch, 11 MBPS
2484.390	44.2	-4.0	1.0	118.9	3.0	20.0	Vert	PK	0.0	60.2	74.0	-13.8	EUT X, High Ch, 6 MBPS
2484.333	44.2	-4.0	1.0	69.0	3.0	20.0	Horz	PK	0.0	60.2	74.0	-13.8	EUT X, High Ch, 1 MBPS
2484.647	44.1	-4.0	1.0	318.0	3.0	20.0	Horz	PK	0.0	60.1	74.0	-13.9	EUT X, High Ch, 6 MBPS
2483.593	43.9	-4.0	1.0	195.0	3.0	20.0	Horz	PK	0.0	59.9	74.0	-14.1	EUT Z, High Ch, 6 MBPS
2484.543	43.8	-4.0	1.0	286.9	3.0	20.0	Vert	PK	0.0	59.8	74.0	-14.2	EUT Z, High Ch, 6 MBPS
2485.370	43.7	-4.0	1.0	195.0	3.0	20.0	Horz	PK	0.0	59.7	74.0	-14.3	EUT X, High Ch, MCS7
2388.443	44.4	-4.7	1.0	69.9	3.0	20.0	Vert	PK	0.0	59.7	74.0	-14.3	EUT X, Low Ch, 1 MBPS
2485.153	43.5	-4.0	1.5	122.0	3.0	20.0	Horz	PK	0.0	59.5	74.0	-14.5	EUT X, High Ch, MCS0
2389.937	44.1	-4.7	1.0	237.0	3.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	EUT X, Low Ch, 6 MBPS
2389.873	43.8	-4.7	1.0	200.0	3.0	20.0	Horz	PK	0.0	59.1	74.0	-14.9	EUT X, Low Ch, 1 MBPS
2389.430	43.6	-4.7	1.0	345.0	3.0	20.0	Vert	PK	0.0	58.9	74.0	-15.1	EUT X, Low Ch, 6 MBPS

OUTPUT POWER



XMit 2017.12.13

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3379	AMT	11-Oct-17	11-Oct-18
Attenuator	Fairview Microwave	SA4018-20	TYE	17-Nov-17	17-Nov-18
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.

OUTPUT POWER



TbTx 2017.12.14 XMt 2017.12.13

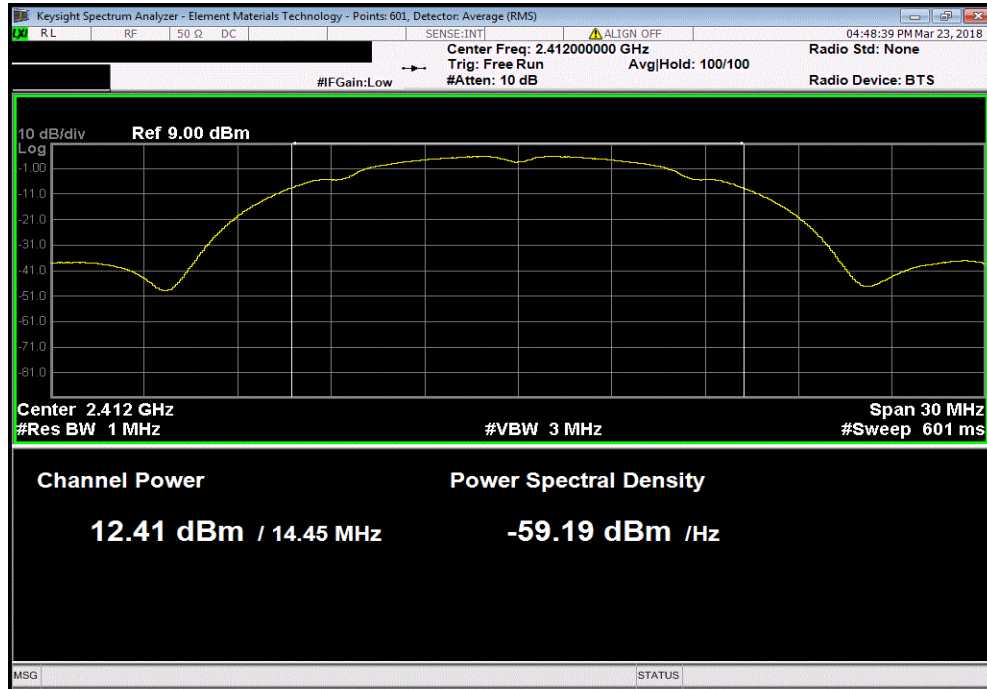
EUT: UltraTEV Plus2		Work Order: ELEM0052	
Serial Number: 1201		Date: 26-Mar-18	
Customer: Element Materials Technology		Temperature: 23.3 °C	
Attendees: None		Humidity: 48% RH	
Project: None		Barometric Pres.: 1014 mbar	
Tested by: Marty Martin		Power: 110VAC/60Hz	
		Job Site: TX09	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2018		ANSI C63.10:2013	
COMMENTS			
None			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	3	Signature <i>Marty Martin</i>	
		Avg Cond Pwr (dBm)	Duty Cycle Factor (dB)
		Value (dBm)	Limit (dBm)
			Results
2400 MHz - 2483.5 MHz Band			
802.11(b) 1 Mbps			
	Low Channel 1, 2412 MHz	12.41	0.5
	Mid Channel 6, 2437 MHz	12.461	0.5
	High Channel 11, 2462 MHz	11.985	0.5
802.11(b) 11 Mbps			
	Low Channel 1, 2412 MHz	10.969	2.7
	Mid Channel 6, 2437 MHz	10.609	2.7
	High Channel 11, 2462 MHz	10.11	2.7
802.11(g) 6 Mbps			
	Low Channel 1, 2412 MHz	8.32	2.3
	Mid Channel 6, 2437 MHz	10.812	2.3
	High Channel 11, 2462 MHz	7.526	2.3
802.11(g) 36 Mbps			
	Low Channel 1, 2412 MHz	4.205	6.7
	Mid Channel 6, 2437 MHz	4.955	6.7
	High Channel 11, 2462 MHz	3.541	6.7
802.11(g) 54 Mbps			
	Low Channel 1, 2412 MHz	2.715	8.1
	Mid Channel 6, 2437 MHz	2.441	7.9
	High Channel 11, 2462 MHz	1.531	7.9
802.11(n) MCS0			
	Low Channel 1, 2412 MHz	8.217	2.6
	Mid Channel 6, 2437 MHz	9.805	2.5
	High Channel 11, 2462 MHz	7.501	2.5
802.11(n) MCS7			
	Low Channel 1, 2412 MHz	1.505	8
	Mid Channel 6, 2437 MHz	1.337	8.1
	High Channel 11, 2462 MHz	0.915	8.1

OUTPUT POWER

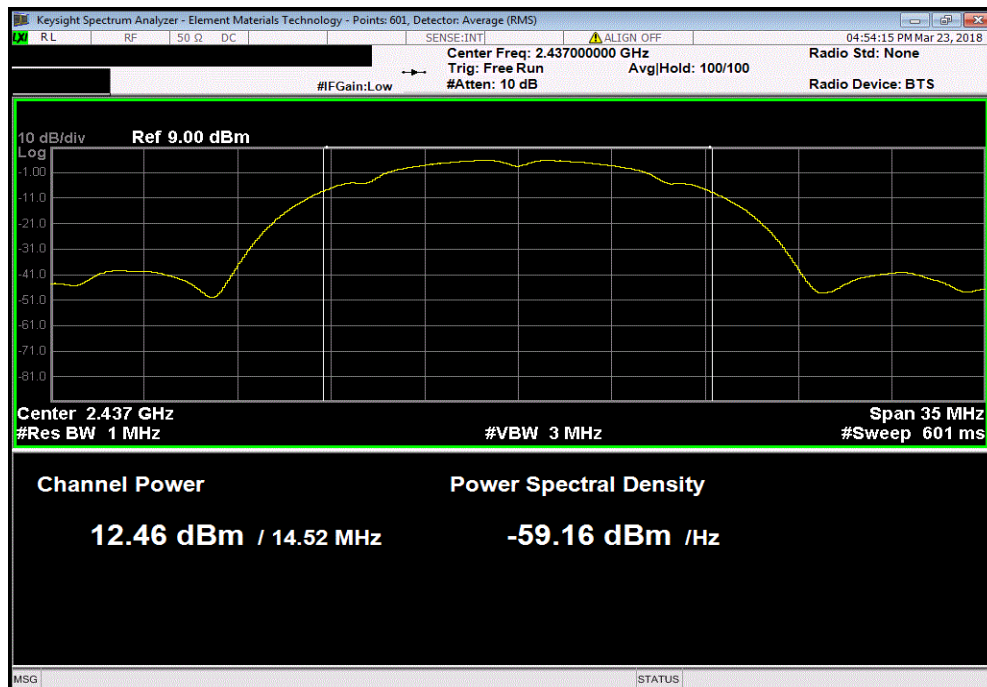


TMTx 2017.12.14 XMI 2017.12.13

2400 MHz - 2483.5 MHz Band, 802.11(b) 1 Mbps, Low Channel 1, 2412 MHz						
Avg Cond	Duty Cycle	Value	Limit	Results		
Pwr (dBm)	Factor (dB)	(dBm)	(dBm)			
12.41	0.5	12.9	30	Pass		



2400 MHz - 2483.5 MHz Band, 802.11(b) 1 Mbps, Mid Channel 6, 2437 MHz						
Avg Cond	Duty Cycle	Value	Limit	Results		
Pwr (dBm)	Factor (dB)	(dBm)	(dBm)			
12.461	0.5	12.9	30	Pass		

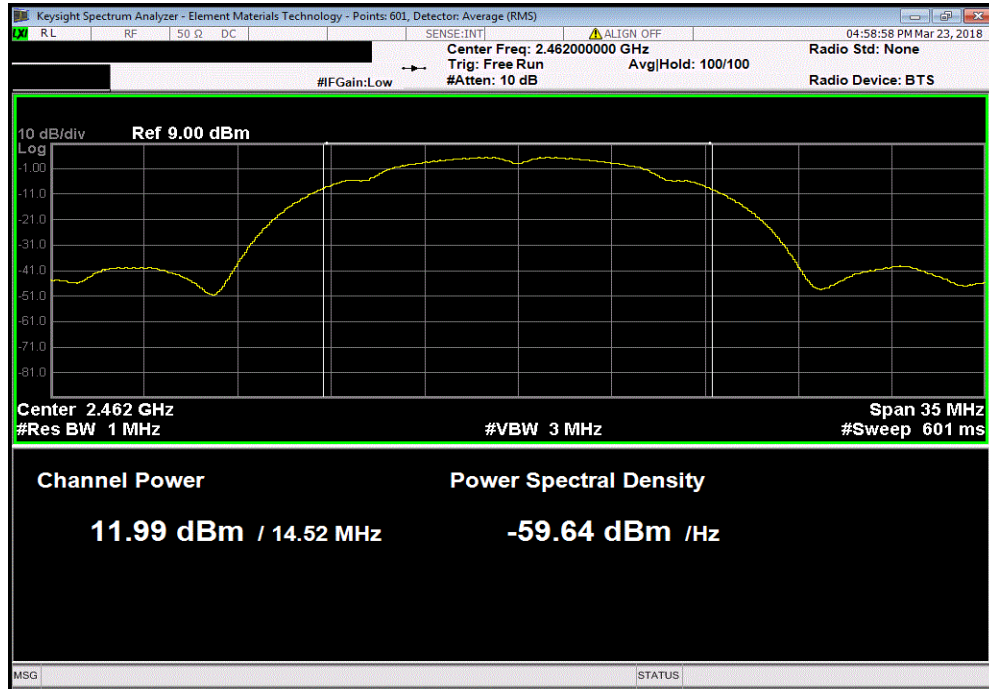


OUTPUT POWER

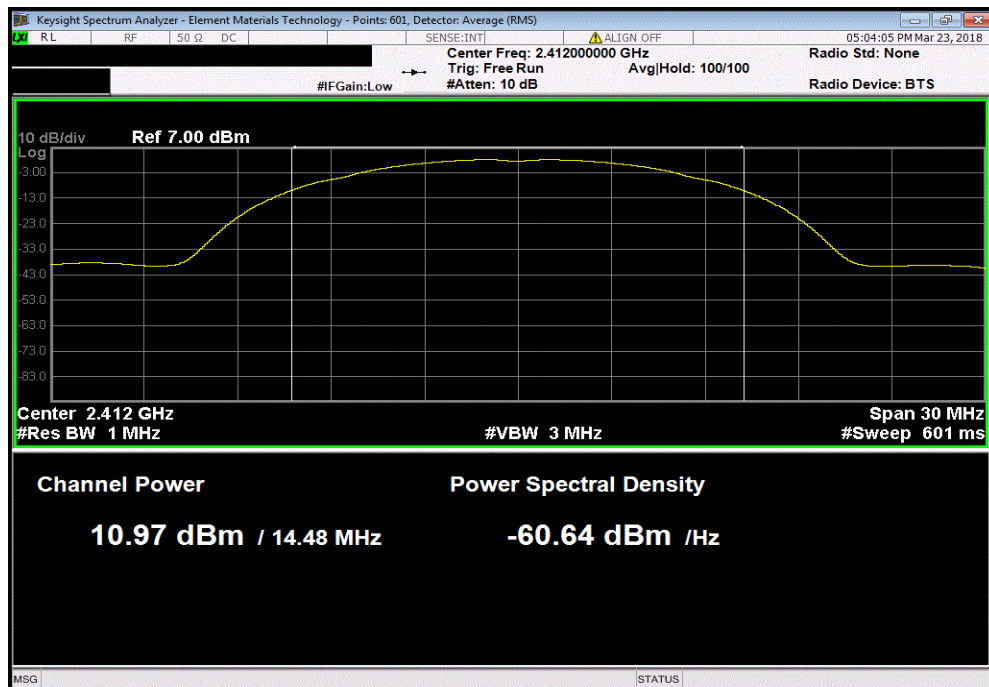


TMTx 2017.12.14 XMI 2017.12.13

2400 MHz - 2483.5 MHz Band, 802.11(b) 1 Mbps, High Channel 11, 2462 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
11.985	0.5		12.4	30	Pass	



2400 MHz - 2483.5 MHz Band, 802.11(b) 11 Mbps, Low Channel 1, 2412 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
10.969	2.7		13.7	30	Pass	

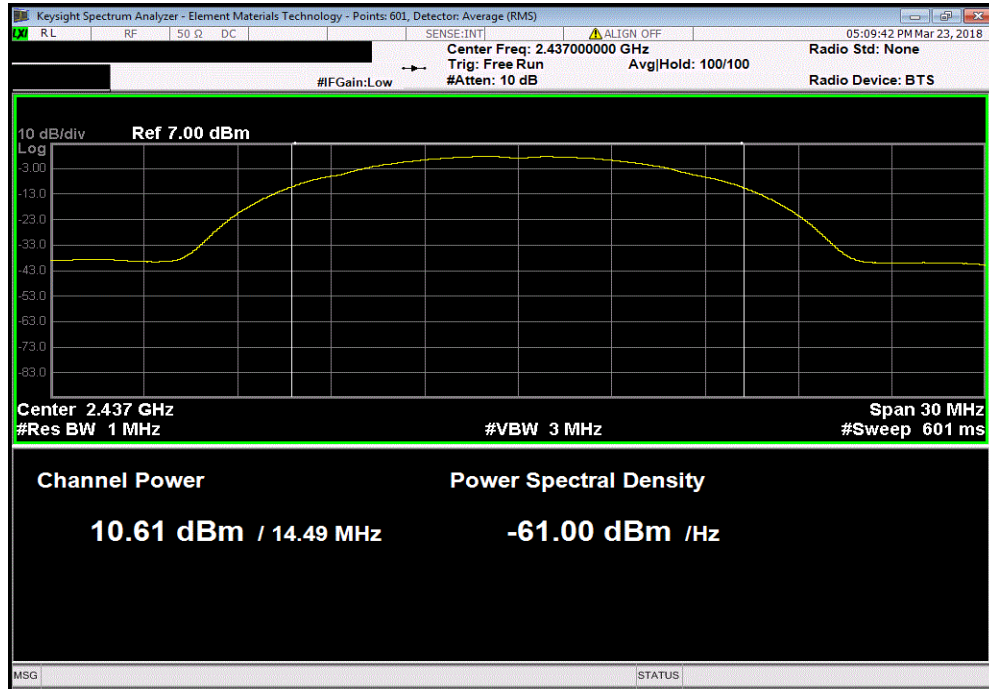


OUTPUT POWER

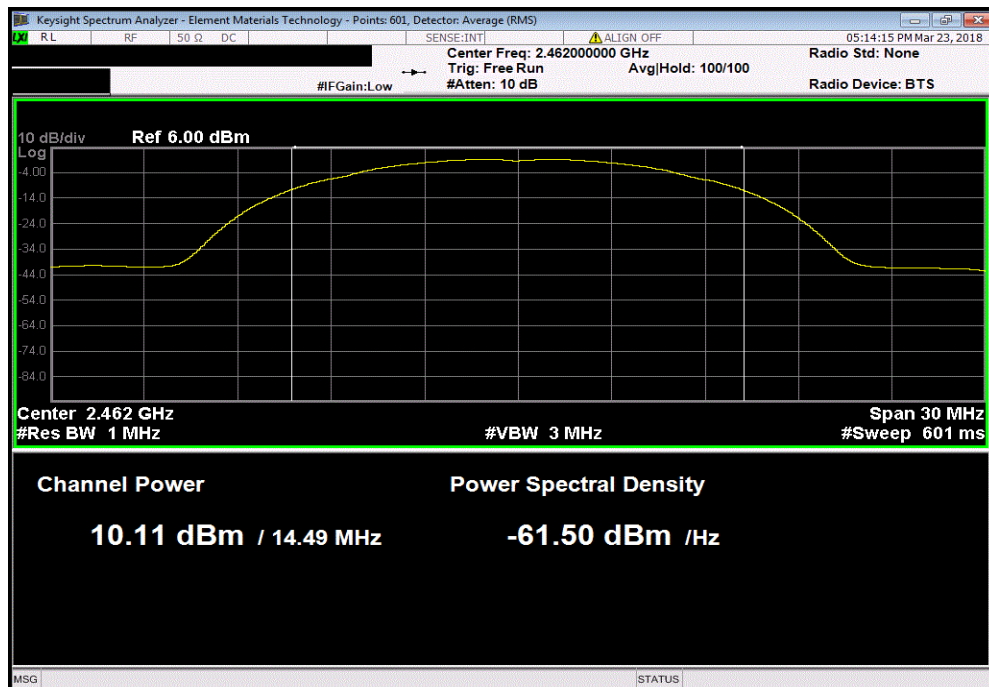


TMTx 2017.12.14 XMI 2017.12.13

2400 MHz - 2483.5 MHz Band, 802.11(b) 11 Mbps, Mid Channel 6, 2437 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
10.609	2.7		13.3	30	Pass	



2400 MHz - 2483.5 MHz Band, 802.11(b) 11 Mbps, High Channel 11, 2462 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
10.11	2.7		12.8	30	Pass	

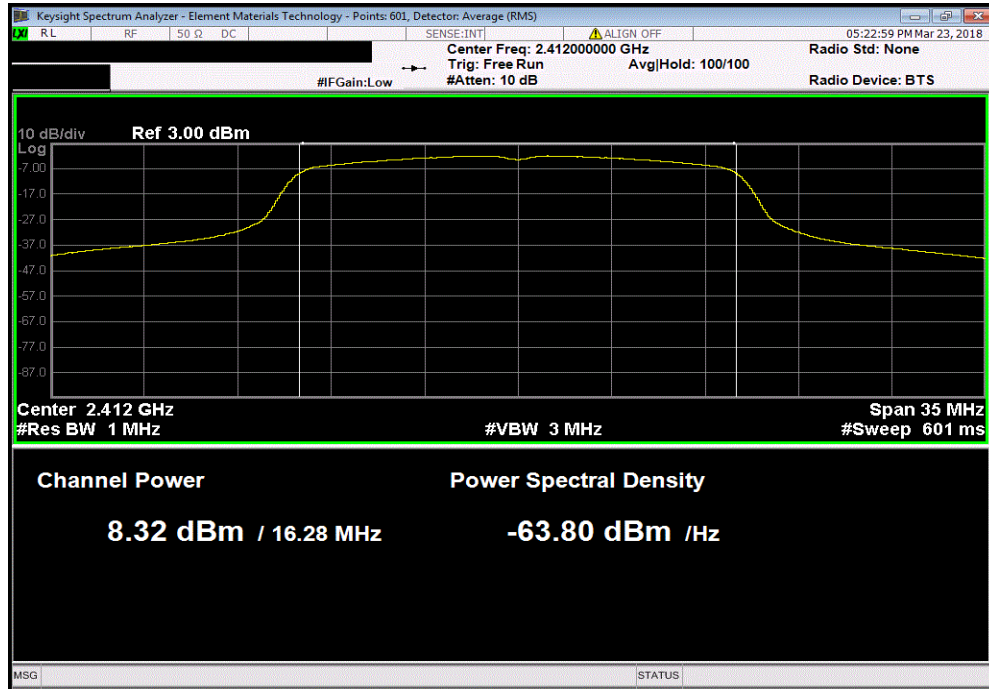


OUTPUT POWER

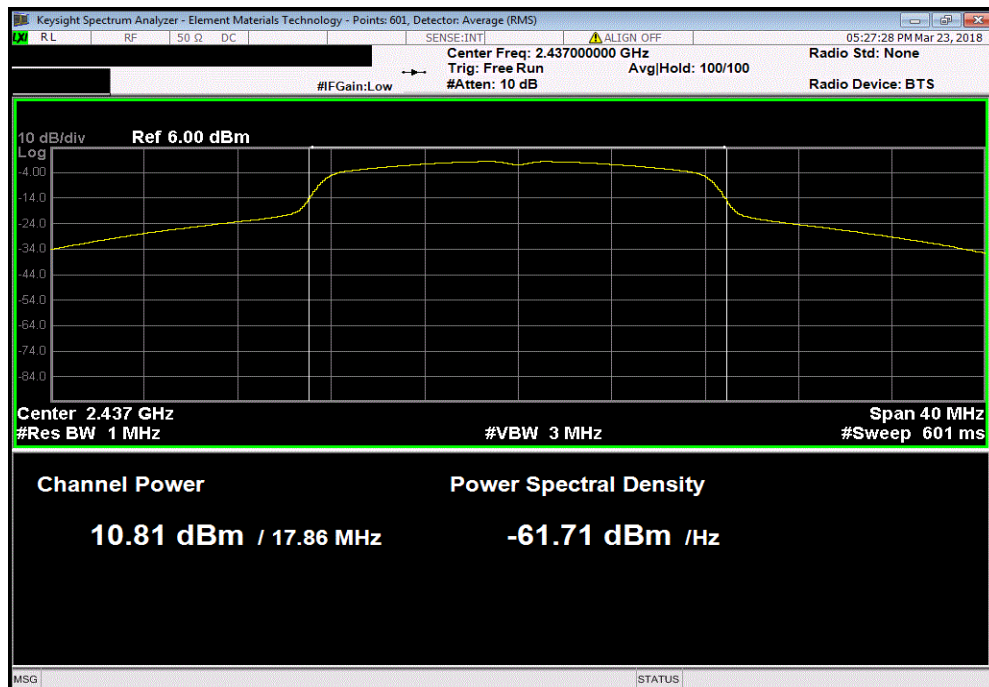


TMTx 2017.12.14 XMI 2017.12.13

2400 MHz - 2483.5 MHz Band, 802.11(g) 6 Mbps, Low Channel 1, 2412 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
8.32	2.3		10.6	30	Pass	



2400 MHz - 2483.5 MHz Band, 802.11(g) 6 Mbps, Mid Channel 6, 2437 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
10.812	2.3		13.1	30	Pass	

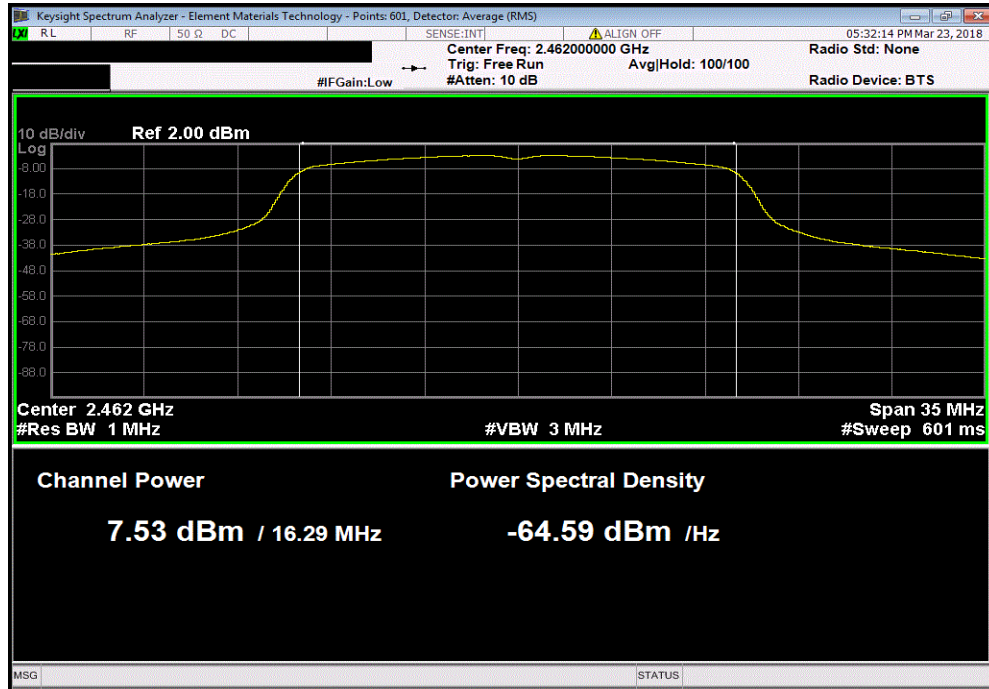


OUTPUT POWER

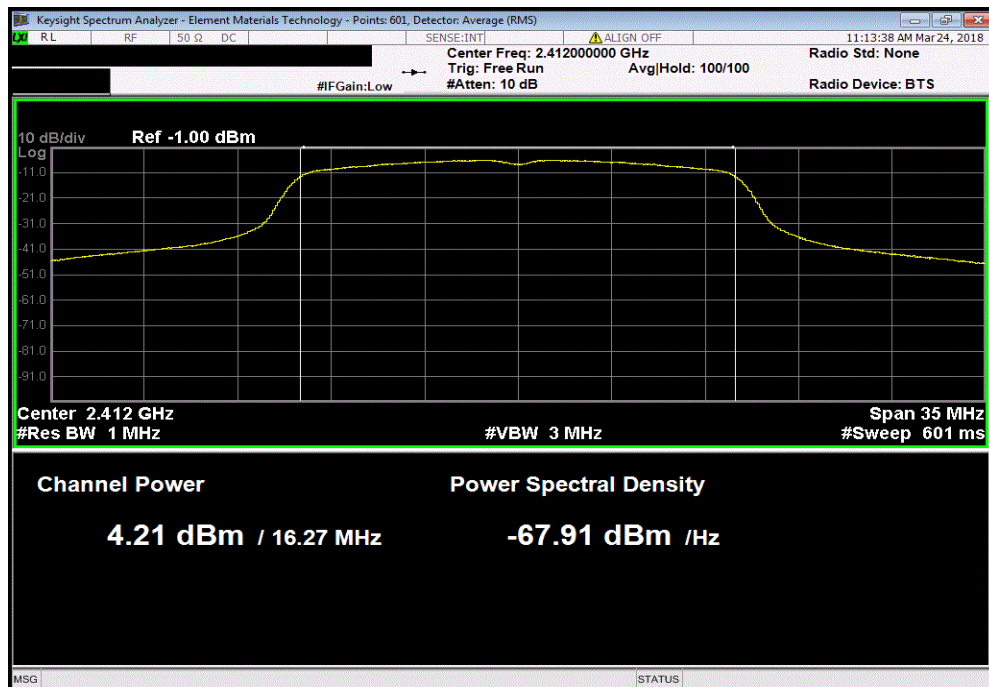


TMTx 2017.12.14 XMI 2017.12.13

2400 MHz - 2483.5 MHz Band, 802.11(g) 6 Mbps, High Channel 11, 2462 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
7.526	2.3		9.8	30	Pass	



2400 MHz - 2483.5 MHz Band, 802.11(g) 36 Mbps, Low Channel 1, 2412 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
4.205	6.7		10.9	30	Pass	

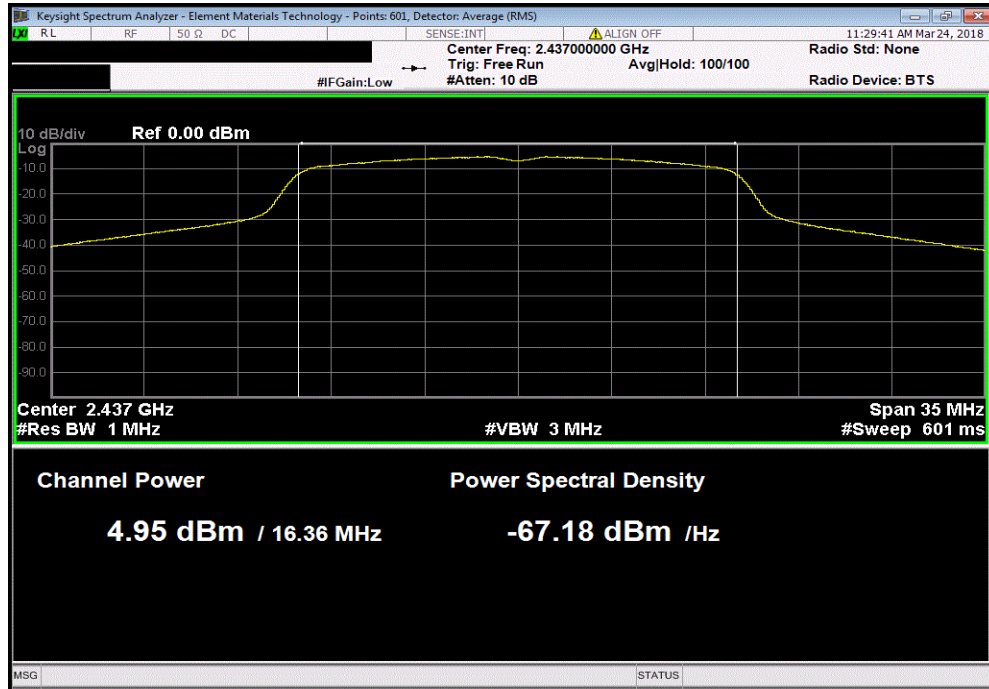


OUTPUT POWER

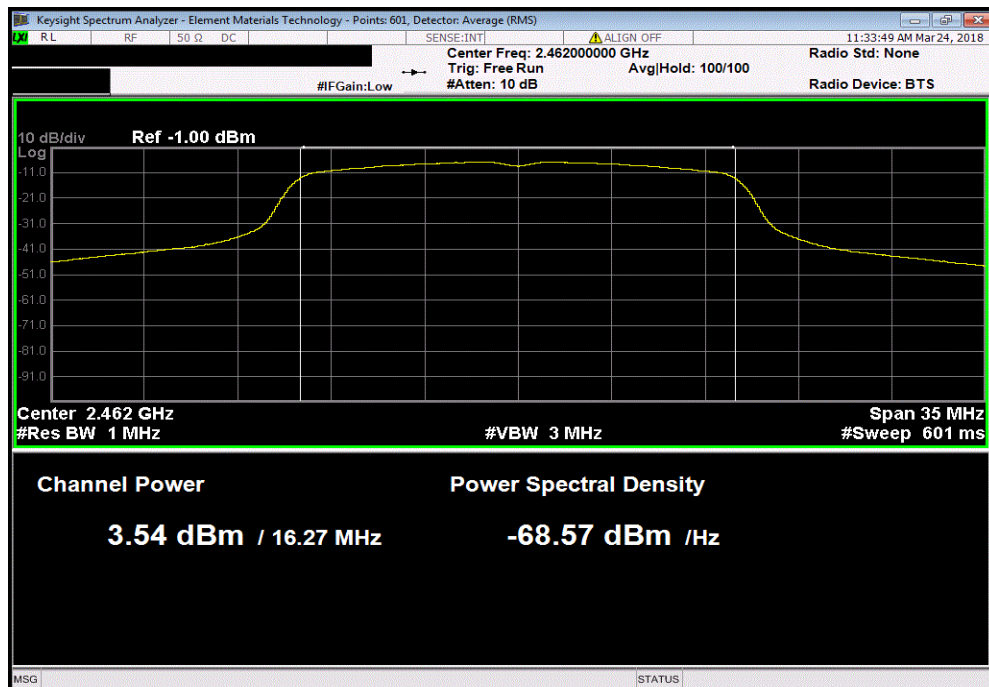


TMTx 2017.12.14 XMI 2017.12.13

2400 MHz - 2483.5 MHz Band, 802.11(g) 36 Mbps, Mid Channel 6, 2437 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
4.955	6.7		11.7	30	Pass	



2400 MHz - 2483.5 MHz Band, 802.11(g) 36 Mbps, High Channel 11, 2462 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
3.541	6.7		10.2	30	Pass	

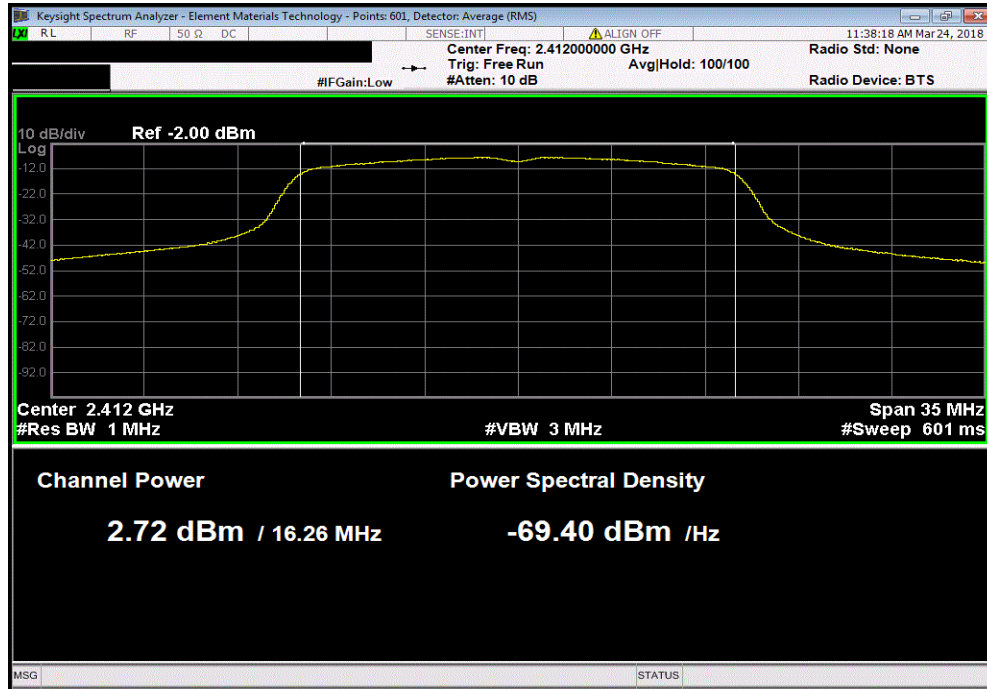


OUTPUT POWER

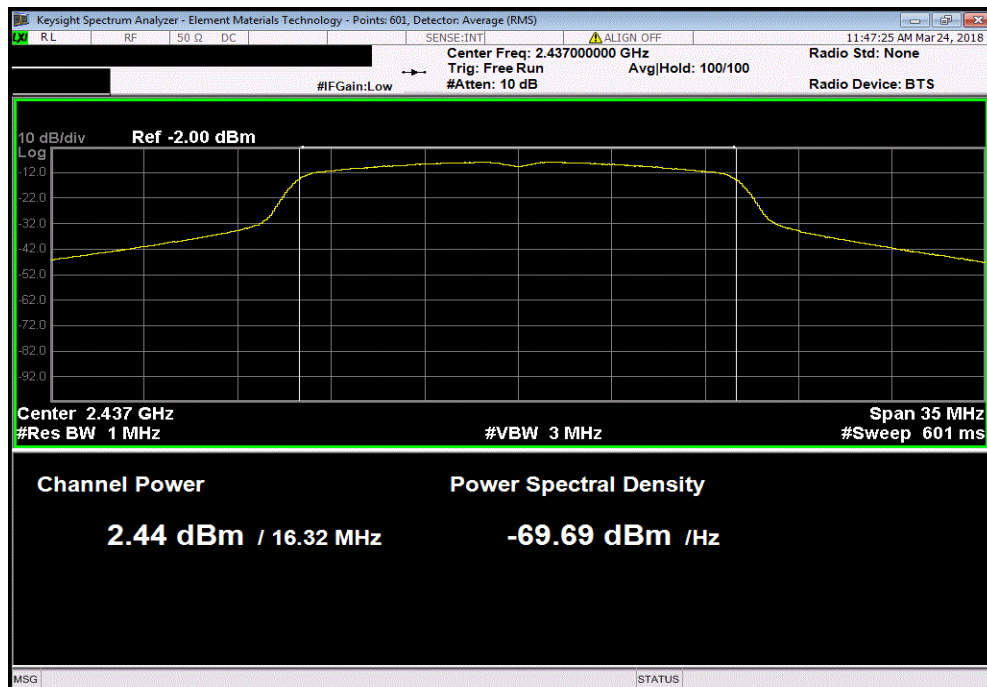


TMTx 2017.12.14 XMI 2017.12.13

2400 MHz - 2483.5 MHz Band, 802.11(g) 54 Mbps, Low Channel 1, 2412 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
2.715	8.1		10.8	30	Pass	



2400 MHz - 2483.5 MHz Band, 802.11(g) 54 Mbps, Mid Channel 6, 2437 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
2.441	7.9		10.3	30	Pass	

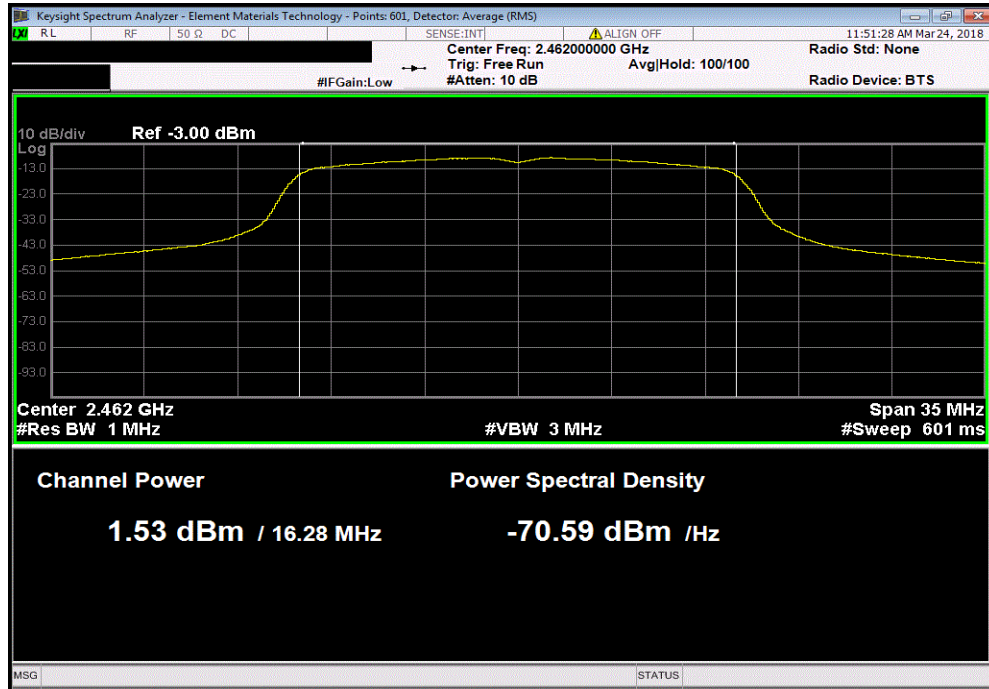


OUTPUT POWER

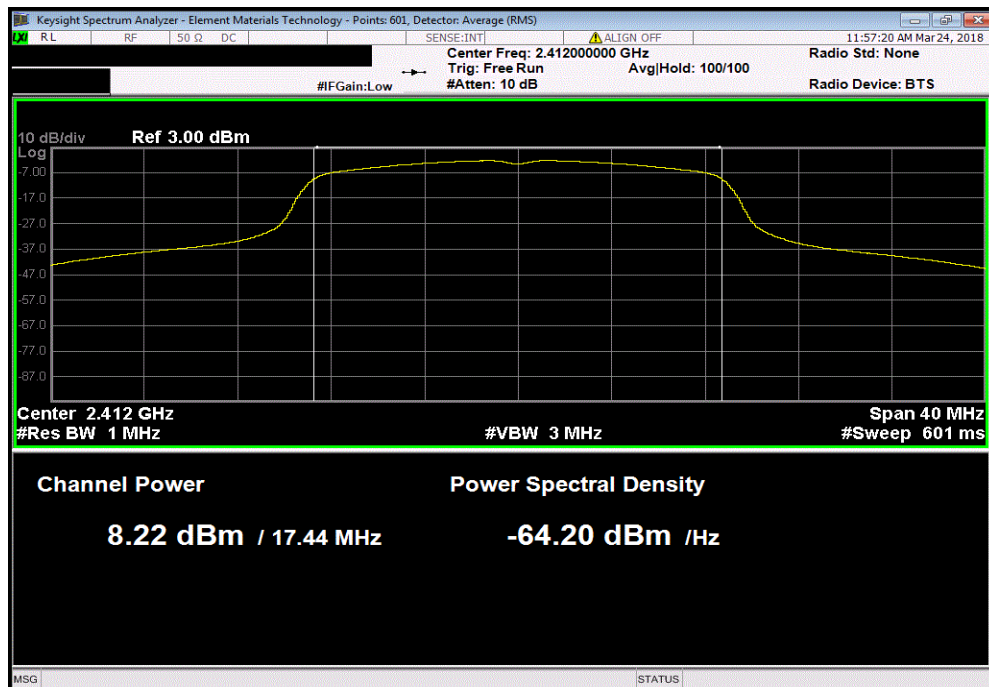


TMTx 2017.12.14 XMI 2017.12.13

2400 MHz - 2483.5 MHz Band, 802.11(g) 54 Mbps, High Channel 11, 2462 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
1.531	7.9		9.5	30	Pass	



2400 MHz - 2483.5 MHz Band, 802.11(n) MCS0, Low Channel 1, 2412 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
8.217	2.6		10.8	30	Pass	

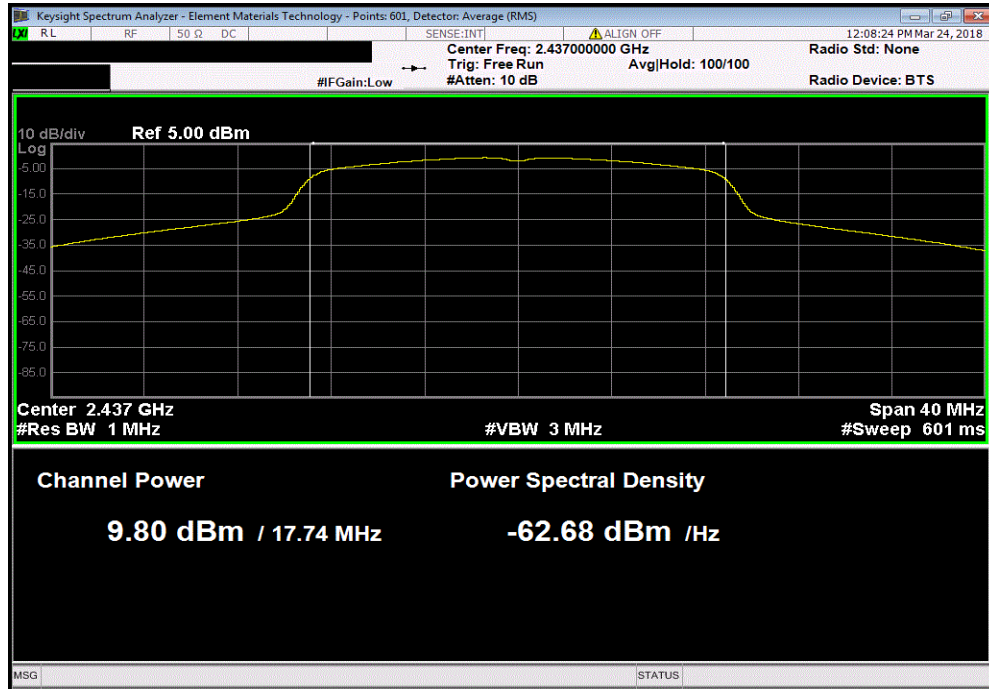


OUTPUT POWER

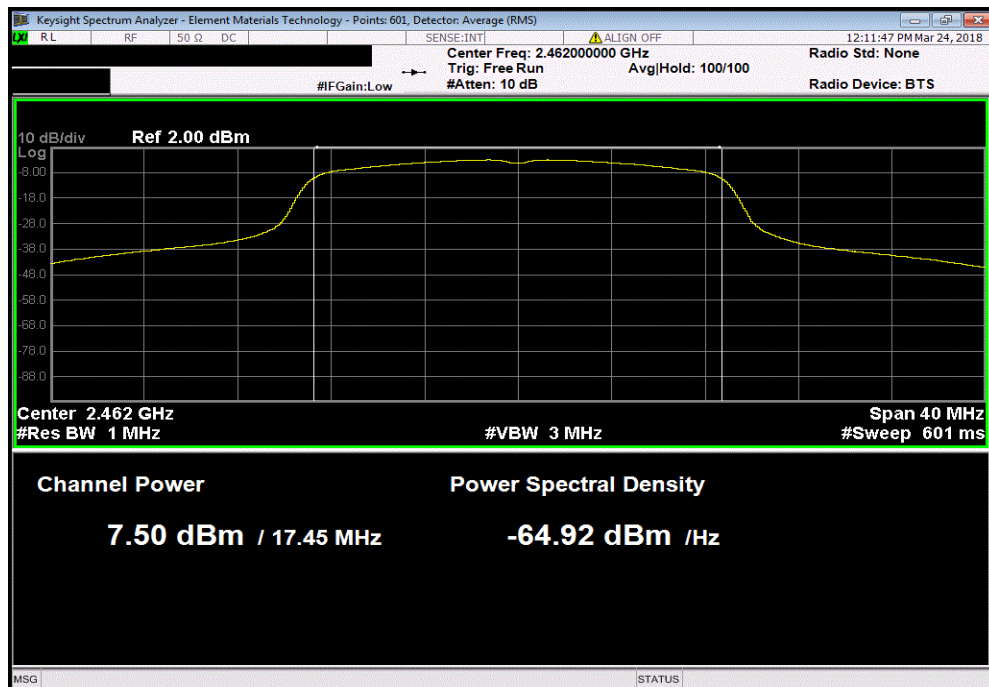


TMTx 2017.12.14 XMI 2017.12.13

2400 MHz - 2483.5 MHz Band, 802.11(n) MCS0, Mid Channel 6, 2437 MHz						
Avg Cond	Duty Cycle	Value	Limit	Results		
Pwr (dBm)	Factor (dB)	(dBm)	(dBm)			
9.805	2.5	12.4	30	Pass		



2400 MHz - 2483.5 MHz Band, 802.11(n) MCS0, High Channel 11, 2462 MHz						
Avg Cond	Duty Cycle	Value	Limit	Results		
Pwr (dBm)	Factor (dB)	(dBm)	(dBm)			
7.501	2.5	10.1	30	Pass		

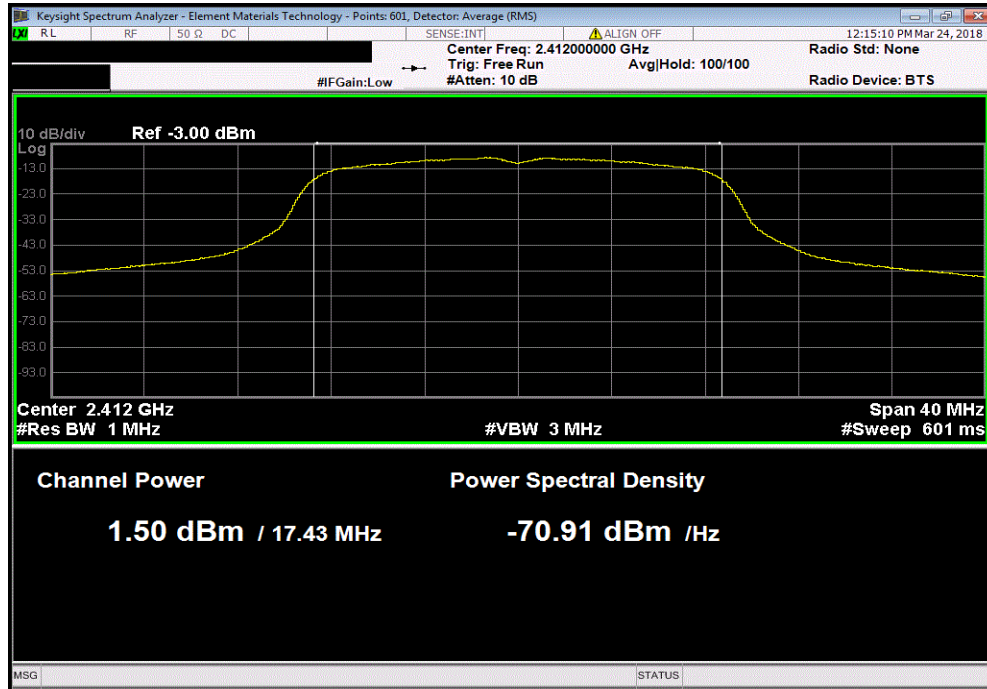


OUTPUT POWER

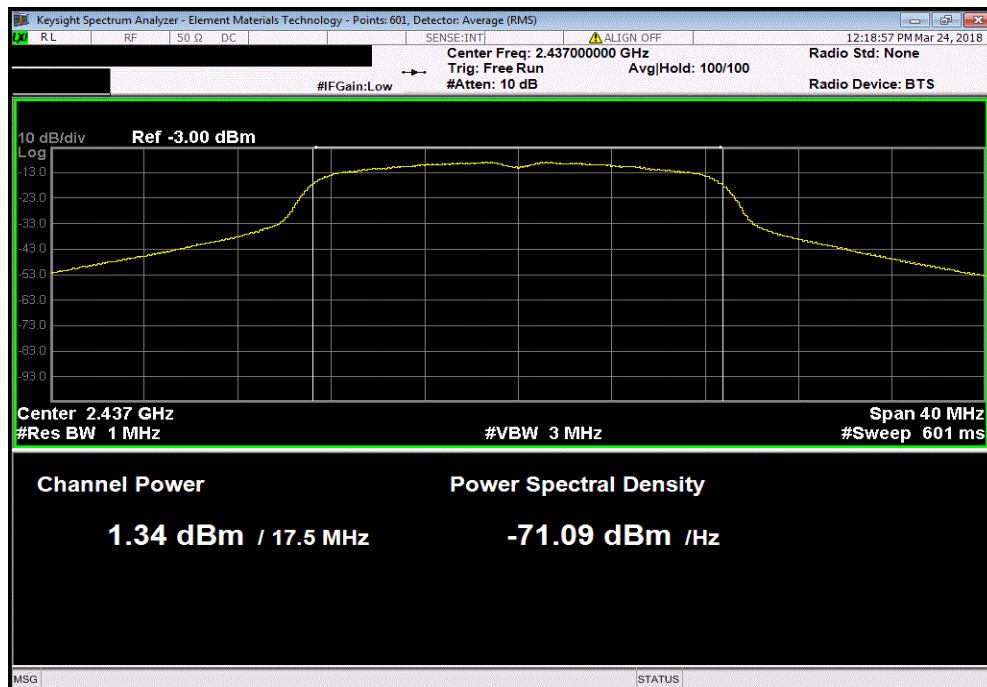


TMTx 2017.12.14 XMI 2017.12.13

2400 MHz - 2483.5 MHz Band, 802.11(n) MCS7, Low Channel 1, 2412 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
1.505	8		9.5	30	Pass	



2400 MHz - 2483.5 MHz Band, 802.11(n) MCS7, Mid Channel 6, 2437 MHz						
Avg Cond	Duty Cycle		Value	Limit	Results	
Pwr (dBm)	Factor (dB)		(dBm)	(dBm)		
1.337	8.1		9.5	30	Pass	



OUTPUT POWER



TMTx 2017.12.14 XMI 2017.12.13

2400 MHz - 2483.5 MHz Band, 802.11(n) MCS7, High Channel 11, 2462 MHz						
Avg Cond	Duty Cycle	Value	Limit	Results		
Pwr (dBm)	Factor (dB)	(dBm)	(dBm)			
0.915	8.1	9	30	Pass		

