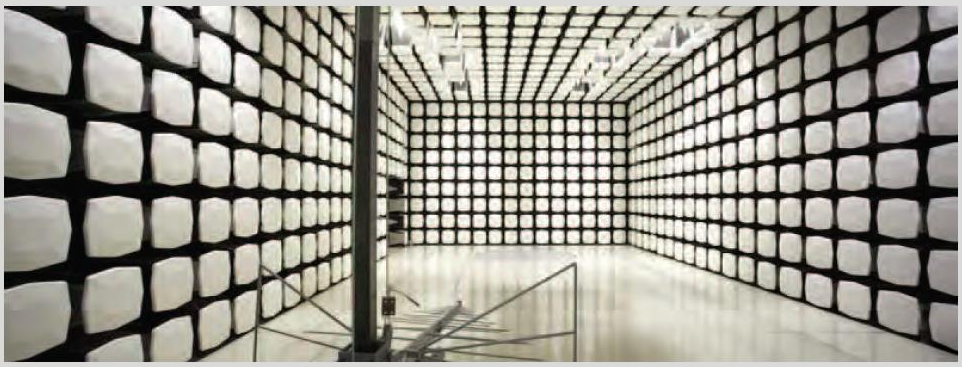
Allazo Electronics

AS2T

FCC 15.247:2019
DTS Transceiver

Report # ALLA0001.1



NVLAP LAB CODE: 201049-0

CERTIFICATE OF TEST

Last Date of Test: October 8, 2019
Allazo Electronics
EUT: AS2T

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2019	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions (Transmitter)	No	N/A	Not required for a battery powered EUT.
6.5, 6.6, 11.12.1, 11.13.2	Spurious Radiated Emissions	Yes	Pass	
11.6	Duty Cycle	Yes	Pass	
7.8.2	Carrier Frequency Separation	No	N/A	Not required for DTS devices.
7.8.3	Number of Hopping Frequencies	No	N/A	Not required for DTS devices.
7.8.4	Dwell Time	No	N/A	Not required for DTS devices.
11.9.1.1	Output Power	Yes	Pass	
11.9.1.1	Equivalent Isotropic Radiated Power	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
7.8.6	Band Edge Compliance - Hopping Mode	No	N/A	Not required for DTS devices.
11.8.2	Occupied Bandwidth	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	

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

REVISION HISTORY

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

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB) and as a CAB for the acceptance of test data.

European Union

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

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

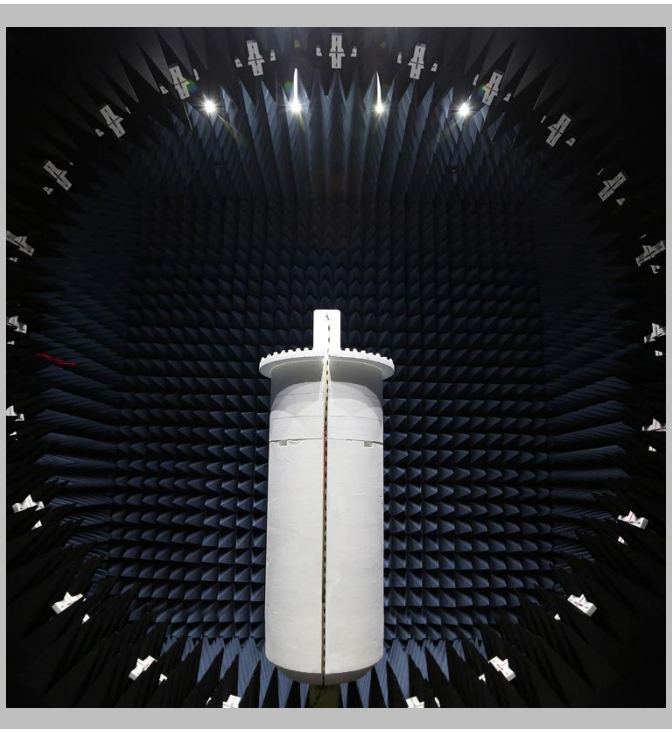
MIC – Recognized by MIC as a CAB for the acceptance of test data.

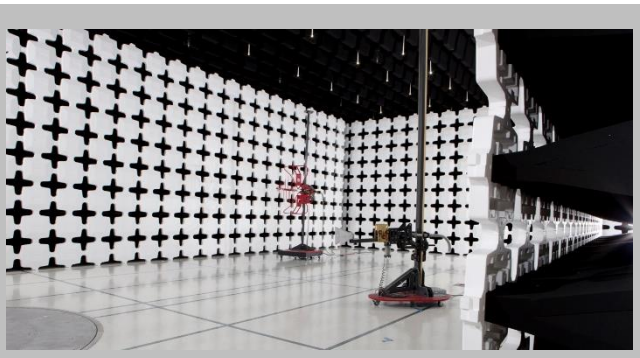
SCOPE

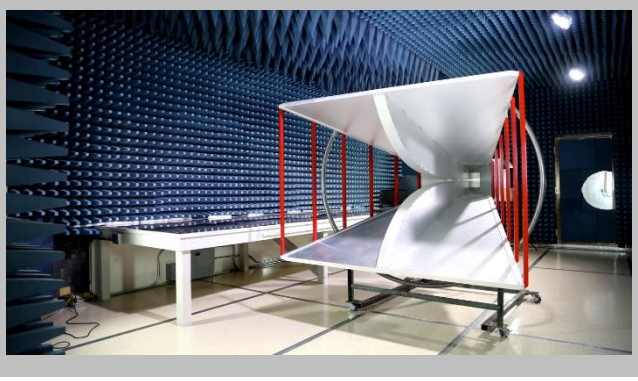
For details on the Scopes of our Accreditations, please visit:
https://www.nwemc.com/emc-testing-accreditations

FACILITIES

California	Minnesota	Oregon	Texas	Washington
Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs EV01-12 6775 NE Evergreen Pkwy #400 Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
NVLAP				
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 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	2834D-1	2834G-1	2834F-1
BSMI				
SL2-IN-E-1154R	SL2-IN-E-1152R	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI				
A-0029	A-0109	A-0108	A-0201	A-0110
Recognized Phase I CAB for ISED, ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA				
US0158	US0175	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

WTD.2016.12.19

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.

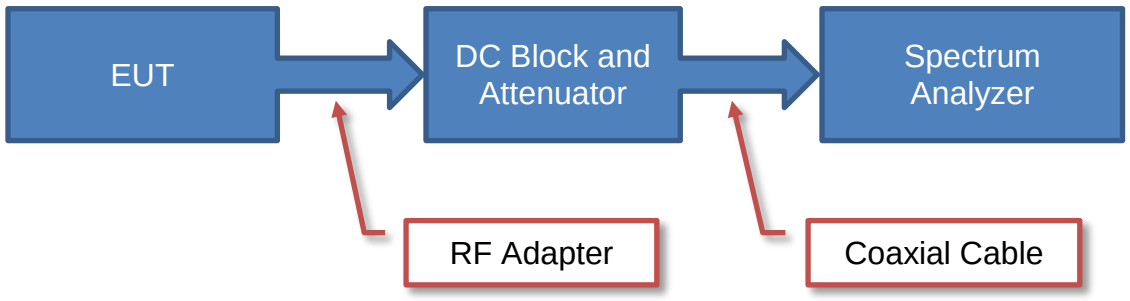
A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

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

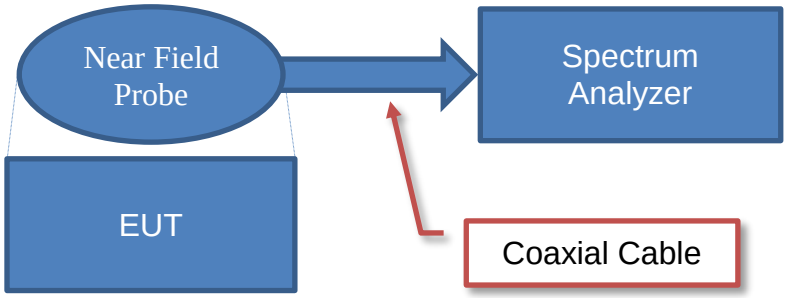
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

Test Setup Block Diagrams

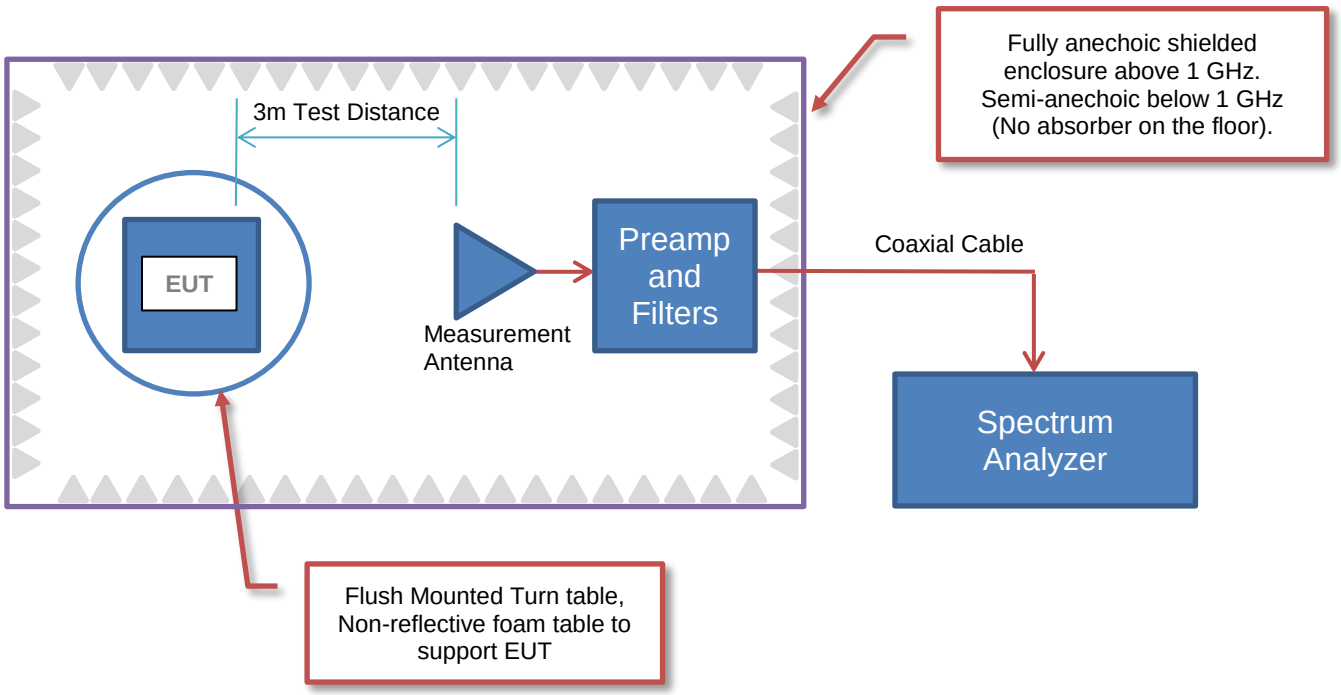
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Allazo Electronics
Address:	1860 Crown Drive STE 1406
City, State, Zip:	Dallas, TX 75234
Test Requested By:	Justin Beres
EUT:	AS2T
First Date of Test:	October 8, 2019
Last Date of Test:	October 8, 2019
Receipt Date of Samples:	October 1, 2019
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:

Transmitter is a wearable; it transmits two messages for a duration of 1 ms every 6.6 seconds; works at 915 MHz. Separate Receiver (AS2R) receives the messages.

Highest frequency generated or used in the device:

Assumes: 928 MHz

Testing Objective:

To demonstrate compliance of the ISM radio under FCC 15.247 for operation in the 902-928 MHz band.

Duty Cycle Justification:

Justin Beres of Allazo Electronics provided the following information about the protocol limited duty cycle of the AS2T radio:

> "The AS2-Tx is a wearable device intended to monitor proximity of an individual to a central location or base station. The product requires the device to be able to operate for 7 days and be small enough that the individual not experience any discomfort from wearing it. These two requirements have dictate a small battery but one that is able to last 7 days. To get the life out of the battery transmission frequency and duration is limited. By transmitting only once every 6 seconds, for a duration of 1ms, we are able to manage the battery life of a small coin cell and achieve a minimum of 7 days. A more frequent transmission or longer message length would consume more current and violate the 7 day requirement."

CONFIGURATIONS

Configuration ALLA0001- 2

Software/Firmware Running during test	
Description	**Version**
Base Firmware 170 kHz Bandwidth TX 6dB Output	FCC 98 170 kHz

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AS2T Transmitter	Allazo Electronics	AS2-TX-ASY-PCB	544-9580-00-01F1

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
3VDC Coin Cell Battery	Unknown	Unknown	Unknown

Configuration ALLA0001- 3

Software/Firmware Running during test	
Description	**Version**
Base Firmware 170 kHz Bandwidth TX 6dB Output	FCC 98 170 kHz

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
AS2T Conducted Transmitter	Allazo Electronics	AS2-TX-ASY-PCB	4544-9580-00-01F3

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
3VDC Coin Cell Battery	Unknown	Unknown	Unknown

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power	No	10cm	No	AS2T Transmitter	3VDC Coin Cell Battery

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2019-10-08	Duty Cycle	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	2019-10-08	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	2019-10-08	Equivalent Isotropic Radiated Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	2019-10-08	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	2019-10-08	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	2019-10-08	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	2019-10-08	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
8	2019-10-08	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

POWER SETTINGS

The EUT was tested using the power settings provided by the manufacturer:

SETTINGS FOR ALL TESTS IN THIS REPORT

Modulation Types	Position	Frequency (MHz)	Power Setting
FSK	Single Channel	915	6 dBm

SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2019.05.10

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 Single Channel 915 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

ALLA0001 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	18000 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	Northwest EMC	8-18GHz	TXD	14-May-2019	12 mo
Cable	Northwest EMC	1-8.2 GHz	TXC	14-May-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	PAK	18-Sep-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAJ	17-Mar-2019	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AJL	11-Oct-2018	24 mo
Antenna - Standard Gain	ETS Lindgren	3160-08	AJG	NCR	0 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AJF	NCR	0 mo
Amplifier - Pre-Amplifier	Fairview Microwave	FMAM63001	PAS	24-Jan-2019	12 mo
Filter - Low Pass	Micro-Tronics	LPM50004	HHV	1-Aug-2019	12 mo
Cable	Northwest EMC	RE 9kHz - 1GHz	TXB	1-Aug-2019	12 mo
Antenna - Biconilog	ETS Lindgren	3143B	AYF	10-May-2018	24 mo
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFL	27-Feb-2019	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	PAL	18-Sep-2019	12 mo

SPURIOUS RADIATED EMISSIONS

TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These “pre-scans” are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

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

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

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

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

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

Where the radio test software does not provide for a duty cycle at continuous transmit conditions (> 98%) and the RMS (power average) measurements were made across the on and off times of the EUT transmissions, a duty cycle correction is added to the measurements using the formula of 10*LOG(dc).

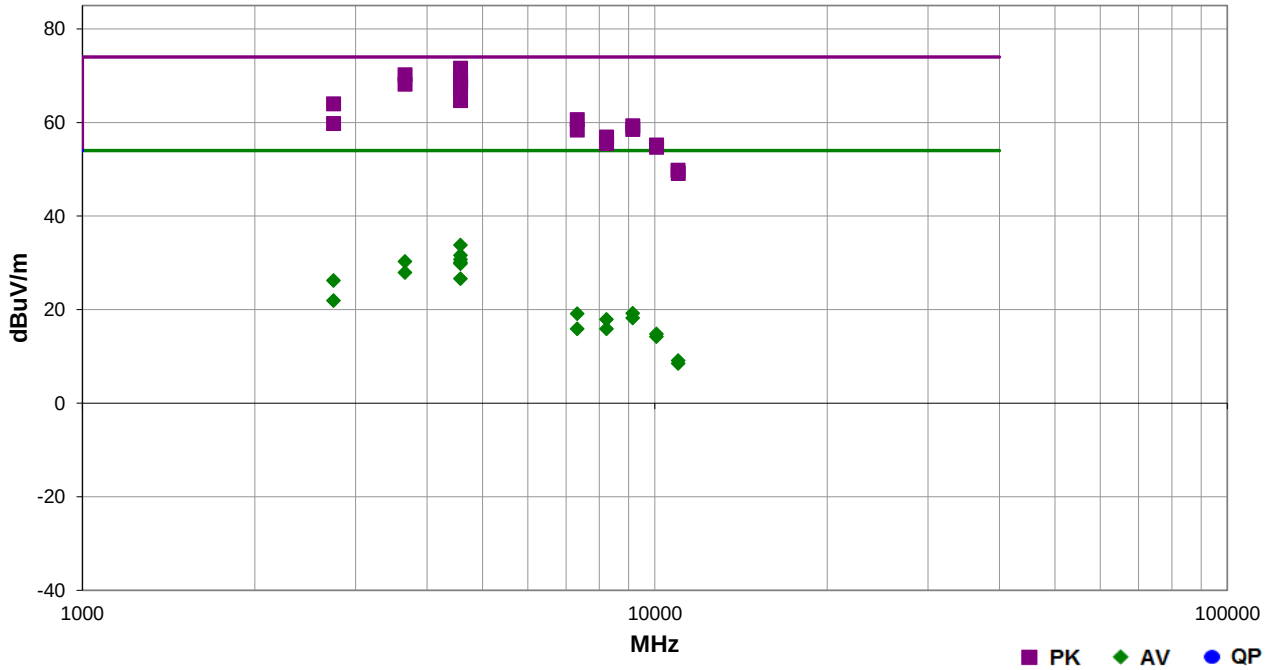
SPURIOUS RADIATED EMISSIONS

EmiR5 2019.08.01 PSA-ESCI 2019.05.10

Work Order:	ALLA0001	**Date:**	8-Oct-2019		
Project:	None	**Temperature:**	22.2 °C		
Job Site:	TX02	**Humidity:**	43.3% RH		
Serial Number:	544-9580-00-01F1	**Barometric Pres.:**	1024 mbar	**Tested by:**	Marty Martin
EUT:	AS2T				
Configuration:	2				
Customer:	Allazo Electronics				
Attendees:	Kenneth Campbell, Ronald Landry				
EUT Power:	Battery				
Operating Mode:	Transmitting at Single Channel 915 MHz				
Deviations:	None				
Comments:	6 dBm output power. Overall DCCF of -33.5 dB (55.5% testing duty cycle = 10*log(1/.555) = 2.557 dB. Worst case normal production duty cycle based upon on maximum time of 1.56 ms within any 100ms window: (1.56% duty cycle = 20*log(.0156) = -36.1 dB). All RMS measurements with DCCF's applied are related to the fundamental and use the same duty cycle as the fundamental.				

Test Specifications	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

Run #	48	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Duty Cycle Correction Factor (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4575.933	68.5	3.1	1.9	278.0	0.0	0.0	Horz	PK	0.0	71.6	74.0	-2.4	EUT Horz
3660.542	69.0	1.2	2.6	273.9	0.0	0.0	Horz	PK	0.0	70.2	74.0	-3.8	EUT Horz
4575.867	66.3	3.1	1.6	242.0	0.0	0.0	Horz	PK	0.0	69.4	74.0	-4.6	EUT Vert
4575.883	65.6	3.1	1.9	231.9	0.0	0.0	Vert	PK	0.0	68.7	74.0	-5.3	EUT on Side
3660.925	67.0	1.2	2.4	294.0	0.0	0.0	Vert	PK	0.0	68.2	74.0	-5.8	EUT on Side
4575.900	64.9	3.1	2.0	21.9	0.0	0.0	Horz	PK	0.0	68.0	74.0	-6.0	EUT on Side
4575.892	64.6	3.1	3.6	54.0	0.0	0.0	Vert	PK	0.0	67.7	74.0	-6.3	EUT on Side
4575.817	61.6	3.1	3.9	333.0	0.0	0.0	Vert	PK	0.0	64.7	74.0	-9.3	EUT Horz
2745.508	67.5	-3.5	3.2	273.0	0.0	0.0	Horz	PK	0.0	64.0	74.0	-10.0	EUT Horz
7321.292	48.9	11.7	3.8	310.9	0.0	0.0	Horz	PK	0.0	60.6	74.0	-13.4	EUT Horz
2745.558	63.3	-3.5	3.4	307.0	0.0	0.0	Vert	PK	0.0	59.8	74.0	-14.2	EUT on Side
9151.742	64.7	-5.4	1.5	360.0	0.0	0.0	Horz	PK	0.0	59.3	74.0	-14.7	EUT Horz

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
9148.117	63.9	-5.4	2.1	183.9	0.0	0.0	Vert	PK	0.0	58.5	74.0	-15.5	EUT on Side
7321.608	46.7	11.7	1.5	249.0	0.0	0.0	Vert	PK	0.0	58.4	74.0	-15.6	EUT on Side
8236.667	63.4	-6.5	1.5	278.0	0.0	0.0	Horz	PK	0.0	56.9	74.0	-17.1	EUT Horz
8236.542	62.0	-6.5	2.7	306.0	0.0	0.0	Vert	PK	0.0	55.5	74.0	-18.5	EUT on Side
10066.870	59.3	-4.1	1.3	114.0	0.0	0.0	Horz	PK	0.0	55.2	74.0	-18.8	EUT Horz
10065.000	58.8	-4.1	2.0	267.0	0.0	0.0	Vert	PK	0.0	54.7	74.0	-19.3	EUT on Side
10977.620	54.8	-5.0	1.9	314.0	0.0	0.0	Vert	PK	0.0	49.8	74.0	-24.2	EUT on Side
10981.930	54.1	-5.0	1.0	285.0	0.0	0.0	Horz	PK	0.0	49.1	74.0	-24.9	EUT Horz
4575.883	64.2	3.1	1.9	278.0	-33.5	0.0	Horz	AV	0.0	33.8	54.0	-20.2	EUT Horz
4575.850	62.0	3.1	1.6	242.0	-33.5	0.0	Horz	AV	0.0	31.6	54.0	-22.4	EUT Vert
4575.858	61.1	3.1	1.9	231.9	-33.5	0.0	Vert	AV	0.0	30.7	54.0	-23.3	EUT on Side
3660.608	62.6	1.2	2.6	273.9	-33.5	0.0	Horz	AV	0.0	30.3	54.0	-23.7	EUT Horz
4575.883	60.5	3.1	2.0	21.9	-33.5	0.0	Horz	AV	0.0	30.1	54.0	-23.9	EUT on Side
4575.850	60.2	3.1	3.6	54.0	-33.5	0.0	Vert	AV	0.0	29.8	54.0	-24.2	EUT on Side
3660.483	60.2	1.2	2.4	294.0	-33.5	0.0	Vert	AV	0.0	27.9	54.0	-26.1	EUT on Side
4575.908	57.0	3.1	3.9	333.0	-33.5	0.0	Vert	AV	0.0	26.6	54.0	-27.4	EUT Horz
2745.358	63.2	-3.5	3.2	273.0	-33.5	0.0	Horz	AV	0.0	26.2	54.0	-27.8	EUT Horz
2745.317	58.9	-3.5	3.4	307.0	-33.5	0.0	Vert	AV	0.0	21.9	54.0	-32.1	EUT on Side
9151.708	58.1	-5.4	1.5	360.0	-33.5	0.0	Horz	AV	0.0	19.2	54.0	-34.8	EUT Horz
7321.292	40.9	11.7	3.8	310.9	-33.5	0.0	Horz	AV	0.0	19.1	54.0	-34.9	EUT Horz
9148.167	57.1	-5.4	2.1	183.9	-33.5	0.0	Vert	AV	0.0	18.2	54.0	-35.8	EUT on Side
8236.558	57.9	-6.5	1.5	278.0	-33.5	0.0	Horz	AV	0.0	17.9	54.0	-36.1	EUT Horz
7321.575	37.7	11.7	1.5	249.0	-33.5	0.0	Vert	AV	0.0	15.9	54.0	-38.1	EUT on Side
8236.592	55.9	-6.5	2.7	306.0	-33.5	0.0	Vert	AV	0.0	15.9	54.0	-38.1	EUT on Side
10067.010	52.4	-4.1	1.3	114.0	-33.5	0.0	Horz	AV	0.0	14.8	54.0	-39.2	EUT Horz
10066.930	51.8	-4.1	2.0	267.0	-33.5	0.0	Vert	AV	0.0	14.2	54.0	-39.8	EUT on Side
10982.190	47.6	-5.0	1.9	314.0	-33.5	0.0	Vert	AV	0.0	9.1	54.0	-44.9	EUT on Side
10982.090	47.0	-5.0	1.0	285.0	-33.5	0.0	Horz	AV	0.0	8.5	54.0	-45.5	EUT Horz

DUTY CYCLE

XMit 2019.09.05

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	18-Sep-19	18-Sep-20
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Attenuator	Fairview Microwave	SA4018-20	TYE	18-Sep-19	18-Sep-20
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

There is no compliance requirement to be met by this test, so therefore no Pass / Fail criteria.

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum.

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

If the transmit duty cycle < 98 percent, burst gating may have been used during some of the other tests in this report to only take the measurement during the burst duration.

DUTY CYCLE

element

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	AS2T			**Work Order:**	ALLA0001
Serial Number:	4544-9580-00-01F3			**Date:**	8-Oct-19
Customer:	Allazo Electronics			**Temperature:**	22.2 °C
Attendees:	Kenneth Campbell, Ronald Landry			**Humidity:**	45.3% RH
Project:	None			**Barometric Pres.:**	1024 mbar
Tested by:	Marty Martin	**Power:**	Battery	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

6 dBm output power.

DEVIATIONS FROM TEST STANDARD

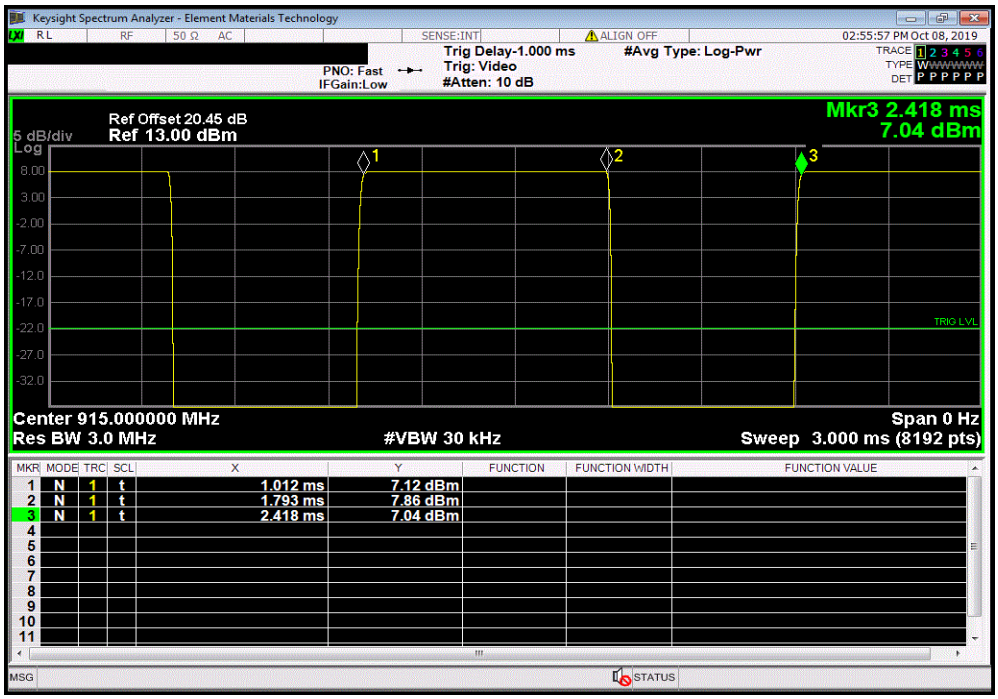
None

Configuration #	3	Signature

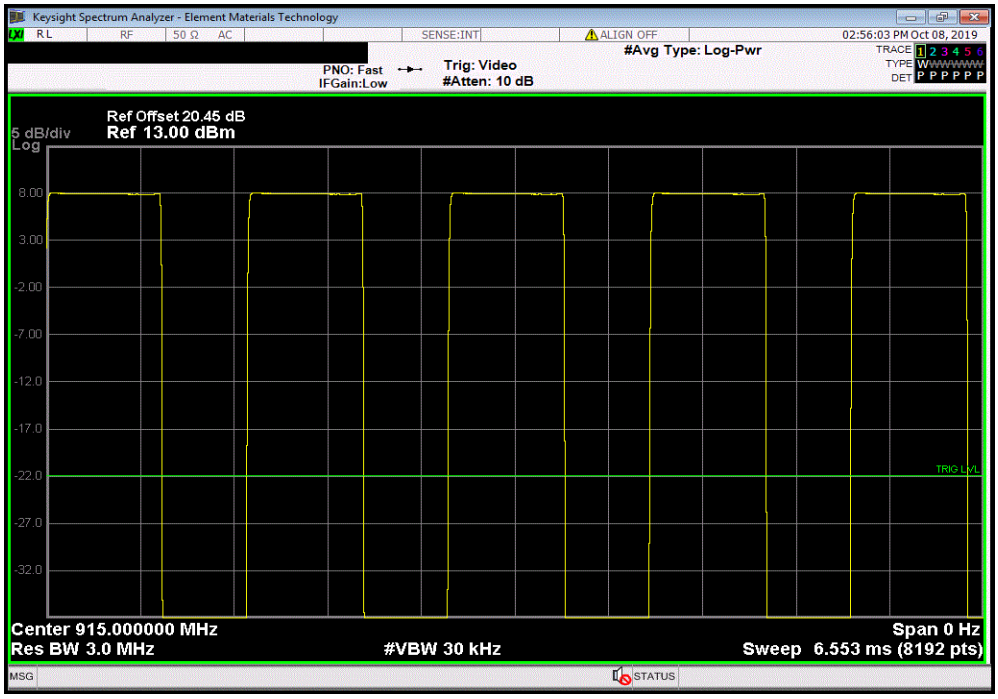
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
Single Channel, 915 MHz	780.54 us	1.406 ms	1	55.5	N/A	N/A
Single Channel, 915 MHz	N/A	N/A	5	N/A	N/A	N/A

DUTY CYCLE

Single Channel, 915 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	780.54 us	1.406 ms	1	55.5	N/A	N/A



Single Channel, 915 MHz						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit (%)	Results
	N/A	N/A	5	N/A	N/A	N/A



OUTPUT POWER

XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Block - DC	Fairview Microwave	SD3379	AMT	18-Sep-19	18-Sep-20
Attenuator	Fairview Microwave	SA4018-20	TYE	18-Sep-19	18-Sep-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

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.

OUTPUT POWER

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	AS2T			Work Order:	ALLA0001
Serial Number:	4544-9580-00-01F3			Date:	8-Oct-19
Customer:	Allazo Electronics			Temperature:	22.5 °C
Attendees:	Kenneth Campbell, Ronald Landry			Humidity:	45.1% RH
Project:	None			Barometric Pres.:	1024 mbar
Tested by:	Marty Martin	Power:	Battery	Job Site:	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

6 dBm output power. Reference Level Offset: DC block + 20 dB Attenuator + Coax Cable + Patch Cable = 20.45 dB Total Offset

DEVIATIONS FROM TEST STANDARD

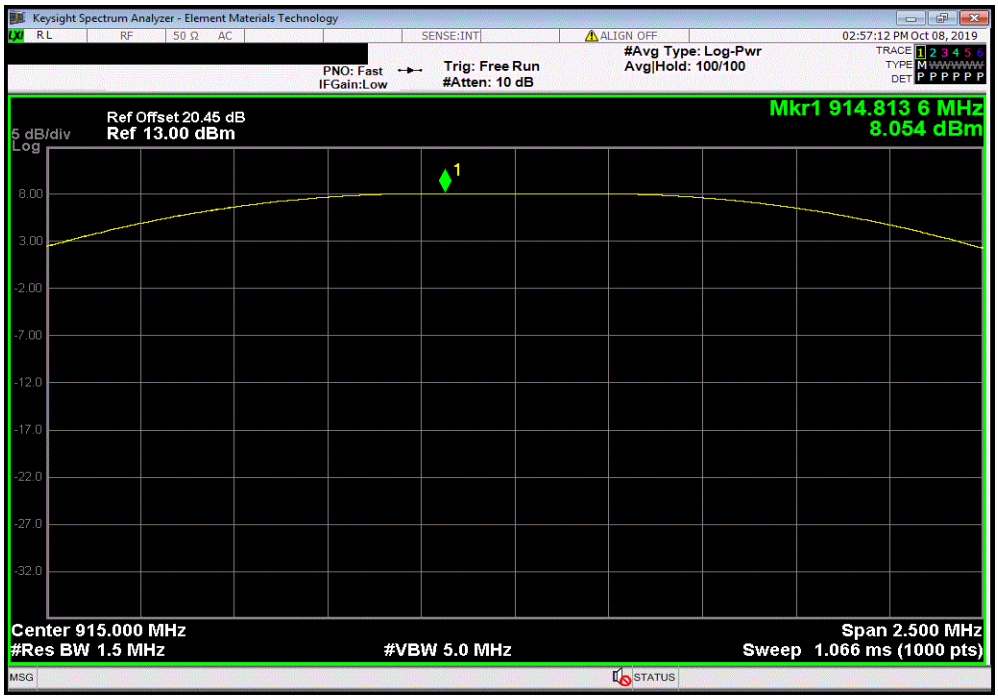
None

Configuration #	3	Signature

	Out Pwr (dBm)	Limit (dBm)	Result
Single Channel, 915 MHz	8.054	30	Pass

OUTPUT POWER

Single Channel, 915 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				8.054	30	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Attenuator	Fairview Microwave	SA4018-20	TYE	18-Sep-19	18-Sep-20
Block - DC	Fairview Microwave	SD3379	AMT	18-Sep-19	18-Sep-20
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The peak output power was measured with the EUT set to low, medium and high transmit frequencies. A field strength measurement was made of the fundamental with the carrier fully maximized for its highest radiated power.

The final data was converted from field strength to a radiated power value using equations found in ANSI C63.10:2013 Annex G.2

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	AS2T			**Work Order:**	ALLA0001
Serial Number:	4544-9580-00-01F3			**Date:**	8-Oct-19
Customer:	Allazo Electronics			**Temperature:**	22.1 °C
Attendees:	Kenneth Campbell, Ronald Landry			**Humidity:**	46.1% RH
Project:	None			**Barometric Pres.:**	1024 mbar
Tested by:	Marty Martin	**Power:**	Battery	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

6 dBm output power. Reference Level Offset: DC block + 20 dB Attenuator + Coax Cable + Patch Cable = 20.45 dB Total Offset

DEVIATIONS FROM TEST STANDARD

None

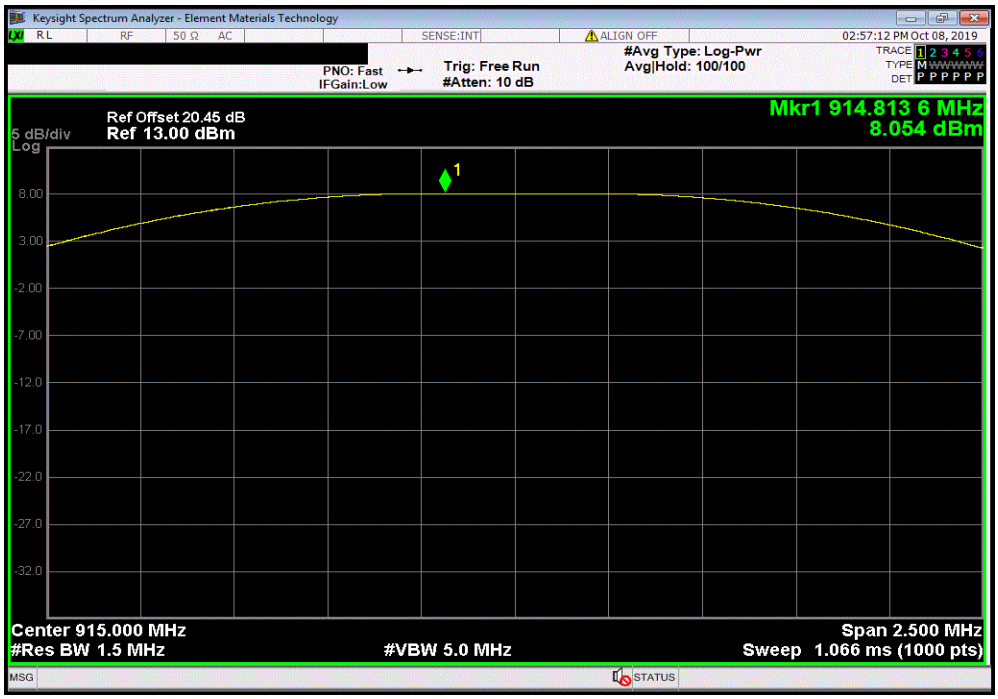
Configuration #	3	Signature

	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
Single Channel, 915 MHz	8.054	0	8.054	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

TbtTx 2019.08.30.0 XMit 2019.09.05

Single Channel, 915 MHz						
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
		8.054	0	8.054	36	Pass



BAND EDGE COMPLIANCE

XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Attenuator	Fairview Microwave	SA4018-20	TYE	18-Sep-19	18-Sep-20
Block - DC	Fairview Microwave	SD3379	AMT	18-Sep-19	18-Sep-20
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The EUT was transmitting at the data rate(s) listed in the datasheet.

The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	AS2T			Work Order:	ALLA0001
Serial Number:	4544-9580-00-01F3			Date:	8-Oct-19
Customer:	Allazo Electronics			Temperature:	22.5 °C
Attendees:	Kenneth Campbell, Ronald Landry			Humidity:	44.3% RH
Project:	None			Barometric Pres.:	1024 mbar
Tested by:	Marty Martin	Power:	Battery	Job Site:	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

6 dBm output power. Reference Level Offset: DC block + 20 dB Attenuator + Coax Cable + Patch Cable = 20.45 dB Total Offset

DEVIATIONS FROM TEST STANDARD

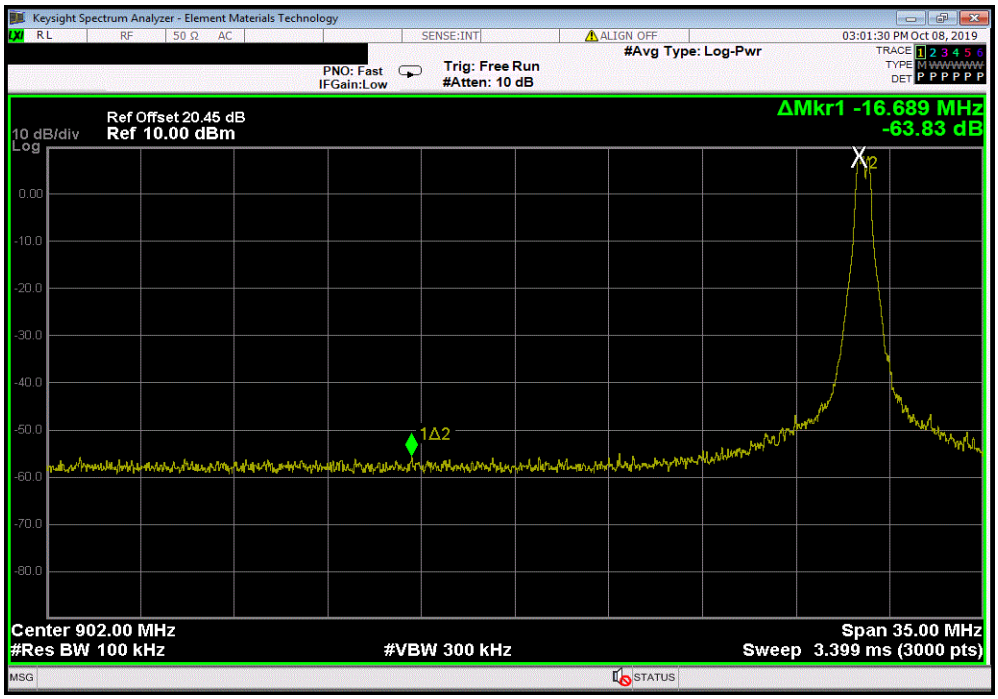
None

Configuration #	3	Signature

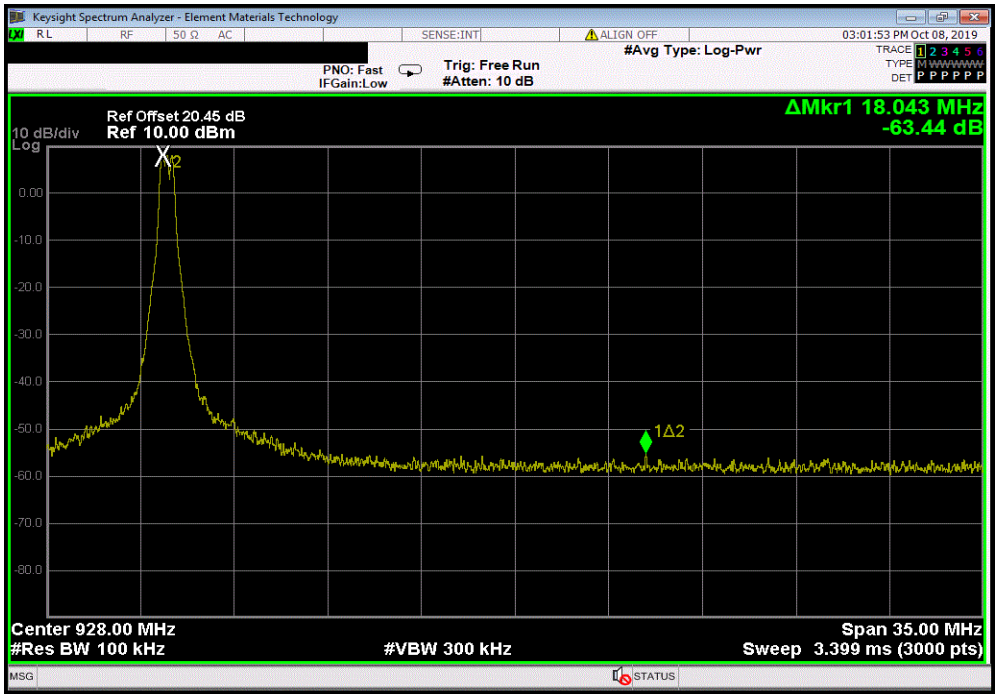
	Value (dBc)	Limit ≤ (dBc)	Result
Low Channel, 915 MHz	-63.83	-20	Pass
High Channel, 915 MHz	-63.44	-20	Pass

BAND EDGE COMPLIANCE

Low Channel, 915 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-63.83	-20	Pass



High Channel, 915 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-63.44	-20	Pass



OCCUPIED BANDWIDTH

XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Block - DC	Fairview Microwave	SD3379	AMT	18-Sep-19	18-Sep-20
Attenuator	Fairview Microwave	SA4018-20	TYE	18-Sep-19	18-Sep-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-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 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth. The 99.0% occupied bandwidth was also measured at the same time which can be needed during Output Power depending on the applicable method.

OCCUPIED BANDWIDTH

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	AS2T			**Work Order:**	ALLA0001
Serial Number:	4544-9580-00-01F3			**Date:**	8-Oct-19
Customer:	Allazo Electronics			**Temperature:**	22.4 °C
Attendees:	Kenneth Campbell, Ronald Landry			**Humidity:**	45% RH
Project:	None			**Barometric Pres.:**	1024 mbar
Tested by:	Marty Martin	**Power:**	Battery	**Job Site:**	TX09

TEST SPECIFICATIONS	**Test Method**
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

6 dBm output power. Reference Level Offset: DC block + 20 dB Attenuator + Coax Cable + Patch Cable = 20.45 dB Total Offset

DEVIATIONS FROM TEST STANDARD

None

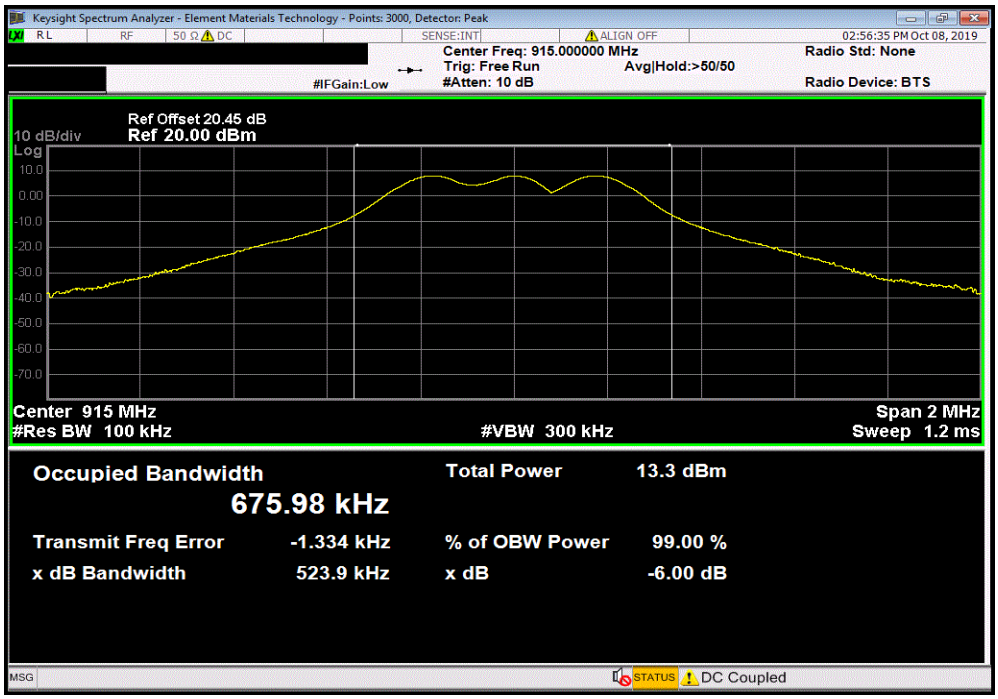
Configuration #	3	*Signature* Marty Martin

	Value	**Limit (>)**	**Result**
Single Channel, 915 MHz	523.853 kHz	500 kHz	Pass

OCCUPIED BANDWIDTH

TbtTx 2019.08.30.0 XMit 2019.09.05

Single Channel, 915 MHz						
				Value	Limit (>)	Result
				523.853 kHz	500 kHz	Pass



SPURIOUS CONDUCTED EMISSIONS

XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Block - DC	Fairview Microwave	SD3379	AMT	18-Sep-19	18-Sep-20
Attenuator	Fairview Microwave	SA4018-20	TYE	18-Sep-19	18-Sep-20
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

SPURIOUS CONDUCTED EMISSIONS

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	AS2T			**Work Order:**	ALLA0001
Serial Number:	4544-9580-00-01F3			**Date:**	8-Oct-19
Customer:	Allazo Electronics			**Temperature:**	22 °C
Attendees:	Kenneth Campbell, Ronald Landry			**Humidity:**	45.8% RH
Project:	None			**Barometric Pres.:**	1024 mbar
Tested by:	Marty Martin	**Power:**	Battery	**Job Site:**	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

6 dBm output power. Reference Level Offset: DC block + 20 dB Attenuator + Coax Cable + Patch Cable = 20.45 dB Total Offset

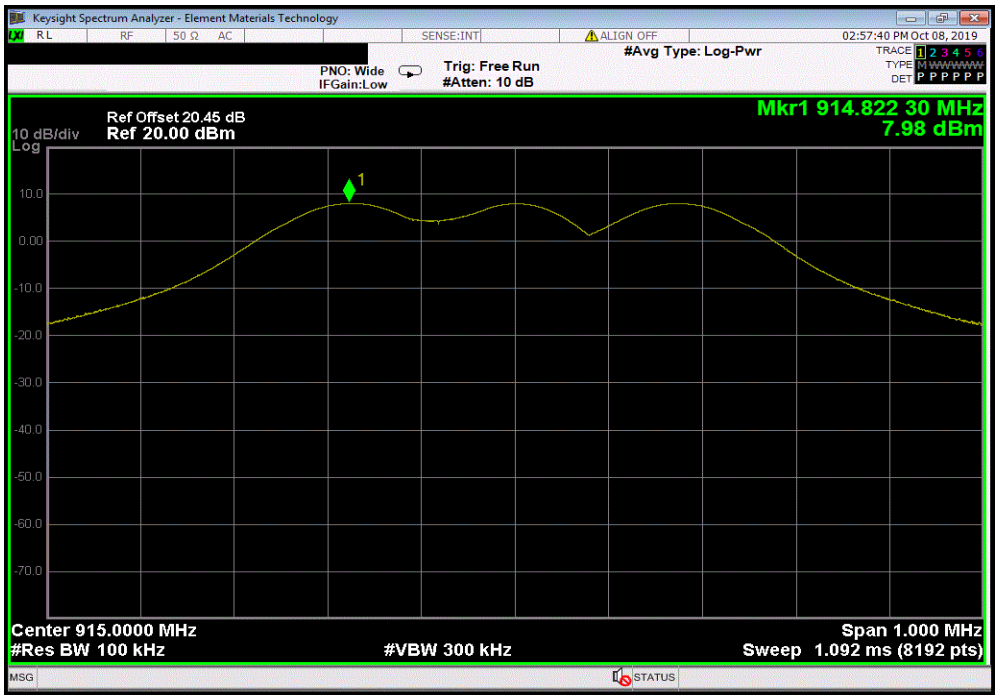
DEVIATIONS FROM TEST STANDARD

None

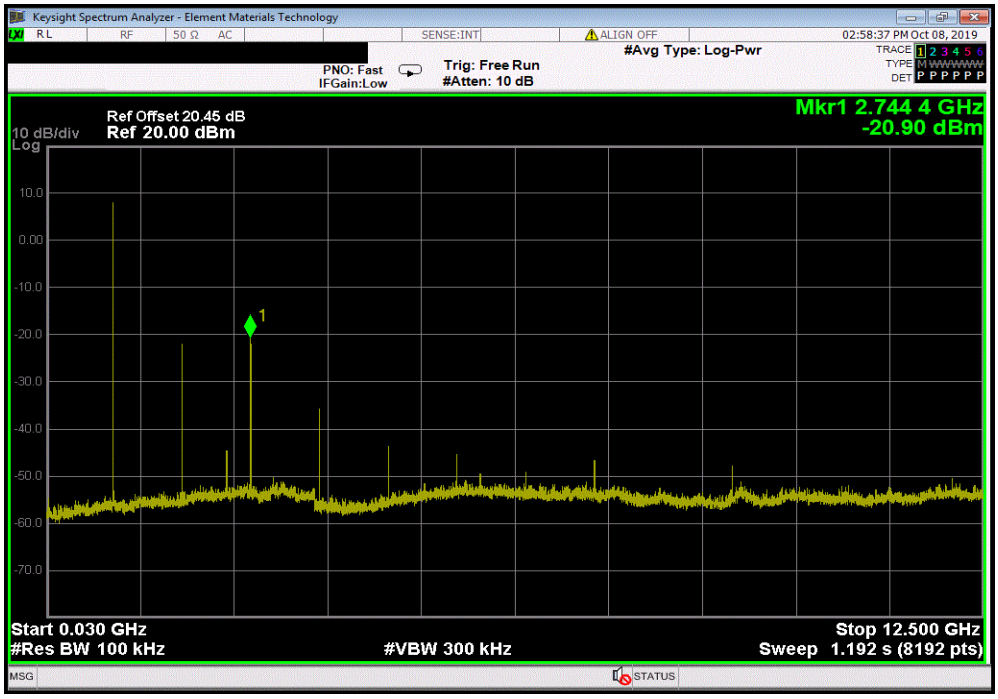
Configuration #	3	Signature

	Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
Single Channel, 915 MHz	Fundamental	914.82	N/A	N/A	N/A
Single Channel, 915 MHz	30 MHz - 12.5 GHz	2744.44	-28.88	-20	Pass
Single Channel, 915 MHz	12.5 GHz - 25 GHz	24992.37	-47.84	-20	Pass

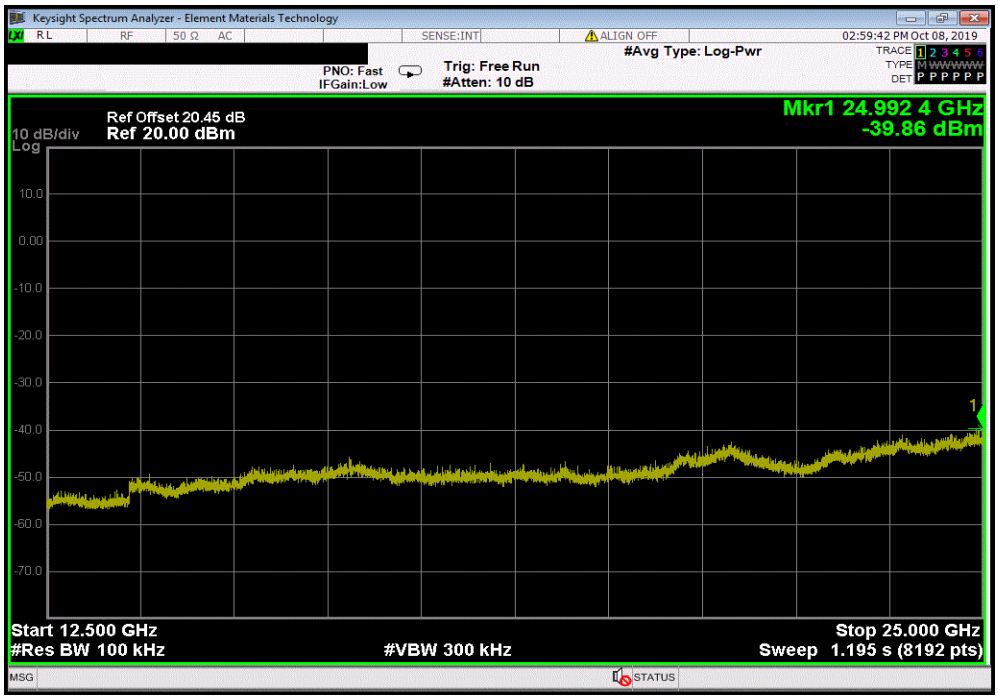
Single Channel, 915 MHz					
Frequency Range		Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
	Fundamental	914.82	N/A	N/A	N/A



Single Channel, 915 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
30 MHz - 12.5 GHz	2744.44	-28.88	-20	Pass



Single Channel, 915 MHz				
Frequency Range	Measured Freq (MHz)	Max Value (dBc)	Limit ≤ (dBc)	Result
12.5 GHz - 25 GHz	24992.37	-47.84	-20	Pass



POWER SPECTRAL DENSITY

XMit 2019.09.05

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Keysight	N5171B-506	TEW	2-May-18	2-May-21
Attenuator	Fairview Microwave	SA4018-20	TYE	18-Sep-19	18-Sep-20
Block - DC	Fairview Microwave	SD3379	AMT	18-Sep-19	18-Sep-20
Cable	Micro-Coax	UFD150A-1-0720-200200	TXG	18-Sep-19	18-Sep-20
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFM	19-Mar-19	19-Mar-20

TEST DESCRIPTION

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

Per the procedure outlined in ANSI C63.10 the peak power spectral density was measured in a 3 kHz RBW.

POWER SPECTRAL DENSITY

TbtTx 2019.08.30.0 XMit 2019.09.05

EUT:	AS2T			Work Order:	ALLA0001
Serial Number:	4544-9580-00-01F3			Date:	8-Oct-19
Customer:	Allazo Electronics			Temperature:	22.6 °C
Attendees:	Kenneth Campbell, Ronald Landry			Humidity:	44.3% RH
Project:	None			Barometric Pres.:	1024 mbar
Tested by:	Marty Martin	Power:	Battery	Job Site:	TX09

TEST SPECIFICATIONS	Test Method
FCC 15.247:2019	ANSI C63.10:2013

COMMENTS

6 dBm output power. Reference Level Offset: DC block + 20 dB Attenuator + Coax Cable + Patch Cable = 20.45 dB Total Offset

DEVIATIONS FROM TEST STANDARD

None

Configuration #	3	Signature

	Value dBm/3kHz	Limit < dBm/3kHz	Results
Single Channel, 915 MHz	1.912	8	Pass

Single Channel, 915 MHz						
				Value dBm/3kHz	Limit < dBm/3kHz	Results
				1.912	8	Pass