



element

Logic PD, Inc.

SOMA3703-32-1780AKIR-A / 1027255 Rev B

FCC 15.247:2021

Bluetooth LE Radio

Report: LGPD0256.6, Issue Date: June 7, 2021



NVLAP LAB CODE: 200881-0



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CERTIFICATE OF TEST



Last Date of Test: March 26, 2021
Logic PD, Inc.
EUT: SOMA3703-32-1780AKIR-A / 1027255 Rev B

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2021	ANSI C63.10:2013, KDB 558074

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a C2PC related to part substitution of an oscillator
6.5, 6.6, 11.12.1, 11.13.2	Spurious Radiated Emissions	Yes	Pass	
11.6	Duty Cycle	No	N/A	Not required for a C2PC related to part substitution of an oscillator
11.8.2	Occupied Bandwidth	Yes	Pass	
11.9.1.1	Output Power	Yes	Pass	
11.9.1.1	Equivalent Isotropic Radiated Power	Yes	Pass	
11.10.2	Power Spectral Density	No	N/A	Not required for a C2PC related to part substitution of an oscillator
11.11	Band Edge Compliance	No	N/A	
11.11	Spurious Conducted Emissions	No	N/A	

Deviations From Test Standards

None

Approved By:

Eric Brandon, Department 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 – Recognized as an EU Notified Body validated for the EMCD and RED Directives.

United Kingdom

BEIS – Recognized by the UK as an Approved Body under the UK Radio Equipment and UK EMC Regulations.

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

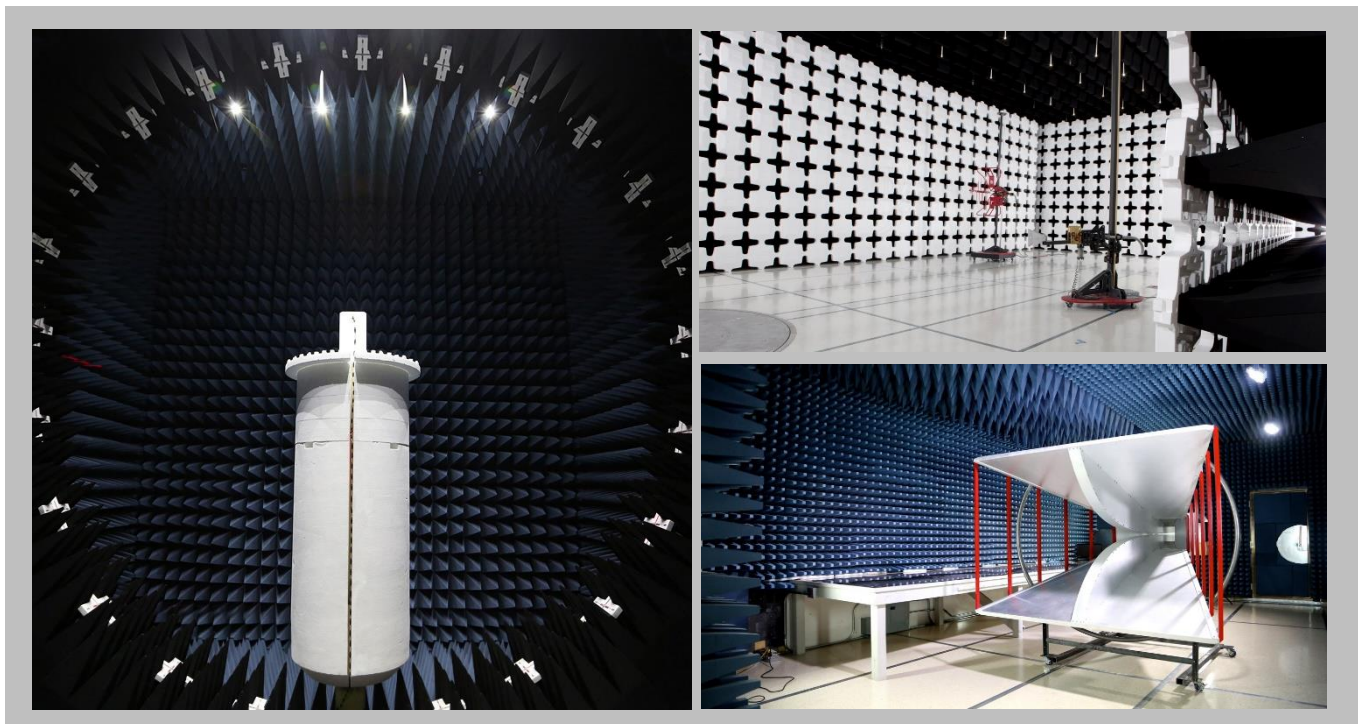
SCOPE

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

FACILITIES



California Labs OC01-17 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-11 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	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: 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



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.

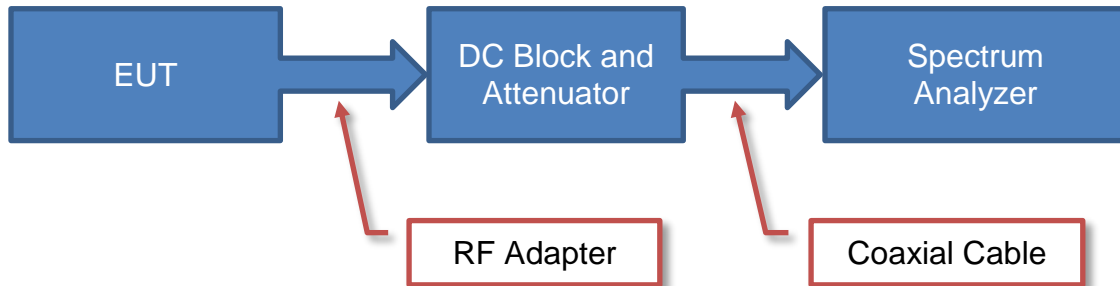
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found in the table below. A lab specific value may also be found in the applicable test description section. 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	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	1.2 dB	-1.2 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)	2.6 dB	-2.6 dB

Test Setup Block Diagrams

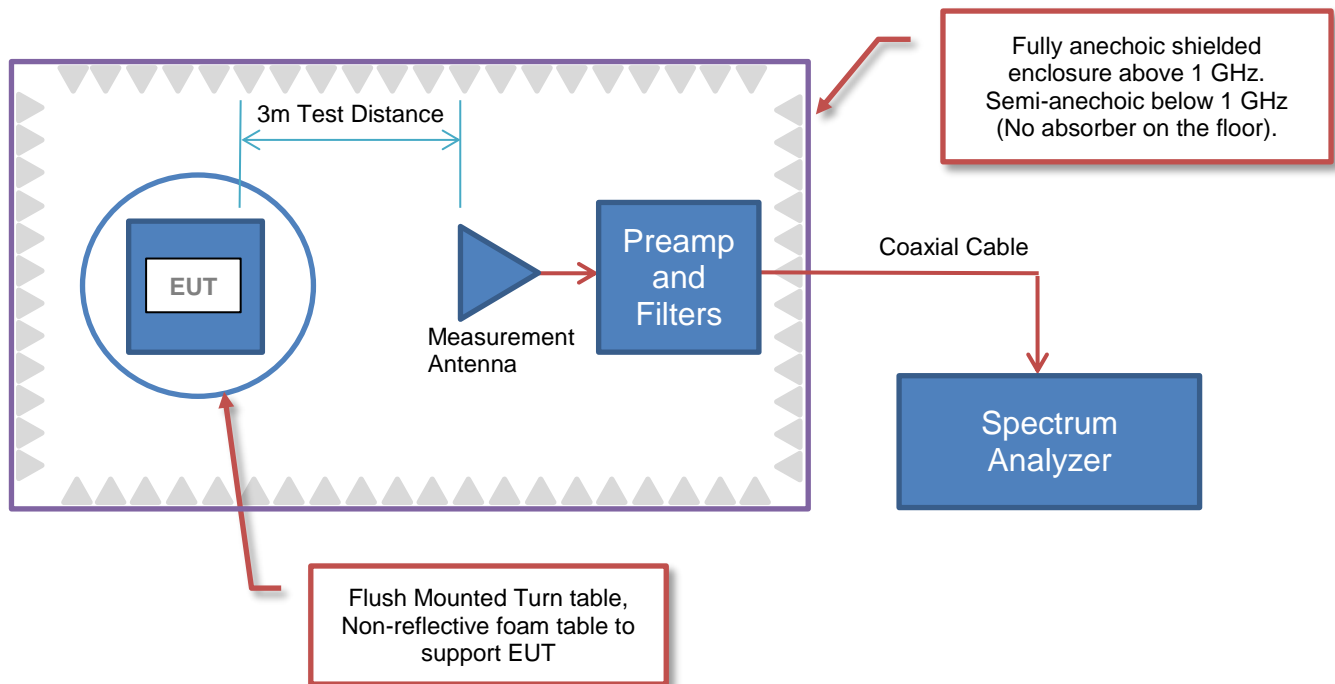
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



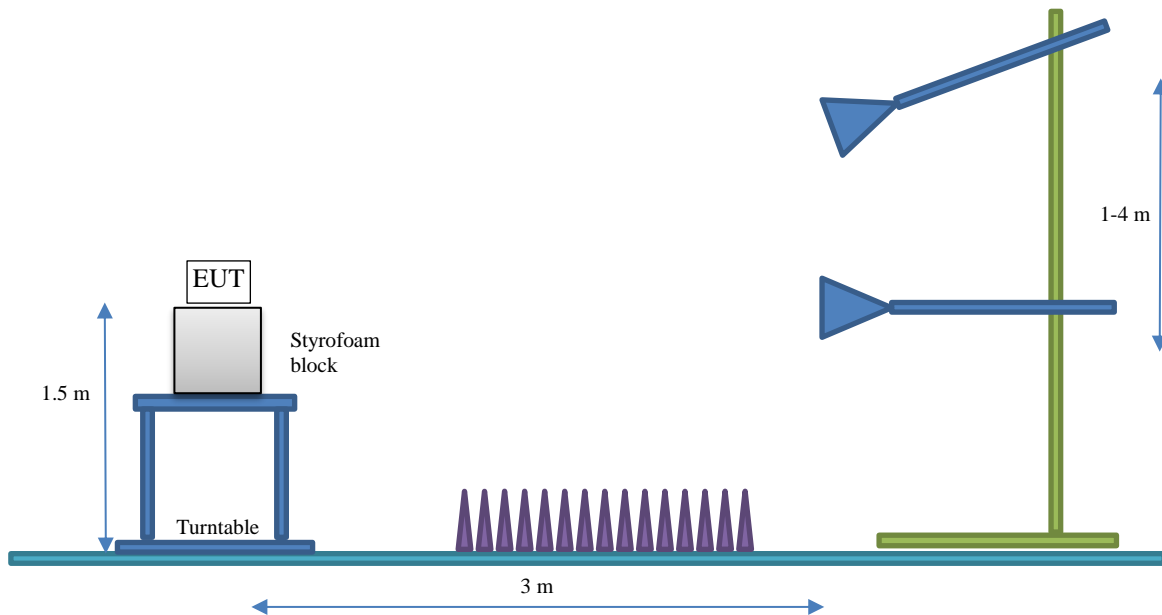
Spurious Radiated Emissions



Test Setup Block Diagrams

Bore Sighting (>1GHz)

The diameter of the illumination area is the dimension of the line tangent to the EUT formed by 3 dB beamwidth of the measurement antenna at the measurement distance. At a 3 meter test distance, the diameter of the illumination area was 3.8 meters at 1 GHz and greater than 2.1 meters up to 6 GHz. Above 1 GHz, when required by the measurement standard, the antenna is pointed for both azimuth and elevation to maintain the receive antenna within the cone of radiation from the EUT. The specified measurement detectors were used for comparison of the emissions to the peak and average specification limits.



PRODUCT DESCRIPTION



Client and Equipment Under Test (EUT) Information

Company Name:	Logic PD, Inc.
Address:	5602 105th Ave N
City, State, Zip:	Brooklyn Park, MN 55443
Test Requested By:	Nathan Kro
EUT:	SOMA3703-32-1780AKIR-A / 1027255 Rev B
First Date of Test:	March 11, 2021
Last Date of Test:	March 26, 2021
Receipt Date of Samples:	March 10, 2021
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Torpedo+WIFI SOM (System on Module) - C2PC due to EOL oscillator change
Testing Objective:
To demonstrate compliance of the Bluetooth LE radio to FCC 15.247 requirements.

CONFIGURATIONS



Configuration LGPD0256- 1

Software/Firmware Running during test	
Description	Version
Linux OS	3.0.101-BSP-dm37x-2.4-4
Wifi Radio Firmware	PLT 7.3.10.0.137
Bluetooth Radio Firmware	Logic_TlInit_tw32_10.6.15.bts

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
BT/2.4 GHz Wifi Antenna	Ethertronics	1000418	None
5 GHz Wifi Antenna	Ethertronics	1000418	None
Torpedo + Wireless SOM	Beason Embedded Works / Logic PD	SOMA3703-32-1780AKIR-A / 1027255 REV B	2420M00120

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
ITE Power Supply	Globtek, Inc	GT-46200-2005-T3	None

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop	Acer	NAV50	LUSAL0B137011586B91601
Laptop Power Supply	Delta Electronics	N17908	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
RF Cable (Ethertronics 5G Wifi Antenna)	No	0.11 m	No	5 GHz Wifi Antenna	Torpedo + Wireless SOM
RF Cable (Ethertronics BT Antenna)	No	0.05 m	No	Bluetooth Antenna	Torpedo + Wireless SOM
DC Cable (ITE power supply)	No	0.9 m	Yes	ITE Power Supply	Torpedo + Wireless SOM
AC Cable (ITE power supply)	No	1.9 m	No	ITE Power Supply	AC Mains
Serial Cable	No	>3 m	No	Torpedo + Wireless SOM	Laptop
DC Cable (Laptop power supply)	No	2.2 m	Yes	Laptop Power Supply	Laptop

CONFIGURATIONS



Configuration LGPD0256- 3

Software/Firmware Running during test	
Description	Version
Linux OS	3.0.101-BSP-dm37x-2.4-4
Wifi Radio Firmware	PLT 7.3.10.0.137
Bluetooth Radio Firmware	Logic_TlInit_tw32_10.6.15.bts

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Torpedo + Wireless SOM	Beason Embedded Works / Logic PD	SOMA3703-32-1780AKIR-A / 1027255 REV B	2420M00120

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
ITE Power Supply	Globtek, Inc	GT-46200-2005-T3	None

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop	Acer	NAV50	LUSAL0B137011586B91601
Laptop Power Supply	Delta Electronics	N17908	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
RF Cable (Ethertronics 5G Wifi Antenna)	No	0.11 m	No	5 GHz Wifi Antenna	Torpedo + Wireless SOM
RF Cable (Ethertronics BT Antenna)	No	0.05 m	No	Bluetooth Antenna	Torpedo + Wireless SOM
DC Cable (ITE power supply)	No	0.9 m	Yes	ITE Power Supply	Torpedo + Wireless SOM
AC Cable (ITE power supply)	No	1.9 m	No	ITE Power Supply	AC Mains
AC Cable	No		No	aptop Power Supply	AC Mains
DC Cable (Laptop power supply)	No	2.2 m	Yes	Laptop Power Supply	Laptop
Serial Cable	No	1.8 m	No	Torpedo + Wireless SOM	Laptop

CONFIGURATIONS



Configuration LGPD0256- 4

Software/Firmware Running during test	
Description	Version
Linux OS	3.0.101-BSP-dm37x-2.4-4
Wifi Radio Firmware	PLT 7.3.10.0.137
Bluetooth Radio Firmware	Logic_TlInit_tw32_10.6.15.bts

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Torpedo + Wireless SOM	Beason Embedded Works / Logic PD	SOMA3703-32-1780AKIR-A / 1027255 REV B	2420M00120
BT/2.4 GHz Wifi Antenna	Pulse Electronics	W3006	None
5GHz Wifi Antenna	Pulse Electronics	W3006	None

Peripherals in test setup boundary			
Description	Manufacturer	Model/Part Number	Serial Number
ITE Power Supply	Globtek, Inc	GT-46200-2005-T3	None

Remote Equipment Outside of Test Setup Boundary			
Description	Manufacturer	Model/Part Number	Serial Number
Laptop	Acer	NAV50	LUSAL0B137011586B91601
Laptop Power Supply	Delta Electronics	N17908	None

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Cable (ITE power supply)	No	0.9 m	Yes	ITE Power Supply	Torpedo + Wireless SOM
AC Cable (ITE power supply)	No	1.9 m	No	ITE Power Supply	AC Mains
Serial Cable	No	>3 m	No	Torpedo + Wireless SOM	Laptop
DC Cable (Laptop power supply)	No	2.2 m	Yes	Laptop Power Supply	Laptop
RF Cable (Pulse 5GHz Wifi Antenna)	No	.05 m	No	5 GHz Wifi Antenna	Torpedo + Wireless SOM
RF Cable (Pulse BT/2.4 GHz Antenna)	No	.05 m	No	Bluetooth Antenna	Torpedo + Wireless SOM

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2021-03-11	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.
2	2021-03-11	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	2021-03-11	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	2021-03-26	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 AND ANTENNAS



The power settings, antenna gain value(s) and cable loss (if applicable) used for the testing contained in this report were provided by the customer and will affect the validity of the results. Element assumes no responsibility for the accuracy of this information.

ANTENNA GAIN (dBi)

Type	Provided by:	Frequency Range (MHz)	Gain (dBi)
WiFi Dual Band Stamp Metal Embedded Antenna, PN 1000418	Ethertronics	2400-2485	4.0 @ 2400-2485 MHz
		5150-5825	4.2 @ 5150-5825 MHz
WLAN Dualband Ceramic PN W3006	Pulse Electronics	2400-2483.5	3.2 (peak) @ 2400-2483.5 MHz
		5150-5850	4.2 (peak) @ 5150-5850 MHz

No adjustable power settings were provided. The EUT was tested using power settings pre-defined by the manufacturer.

SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2021.01.22.0

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 BLE Low Ch 0 (2402 MHz), High Ch 39 (2480 MHz), 1 Mbps

Transmitting BLE Low Ch 0 (2402 MHz), Mid Ch 20 (2442 MHz), High Ch 39 (2480 MHz), 1 Mbps

POWER SETTINGS INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

LGPD0256 - 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.	Cal. Due
Attenuator	Fairview Microwave	SA18E-20	TWZ	2020-09-14	2021-09-14
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	2021-03-07	2022-03-07
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	2021-01-15	2022-01-15
Cable	ESM Cable Corp.	Bilog Cables	MNH	2020-10-06	2021-10-06
Filter - High Pass	Micro-Tronics	HPM50111	LFN	2020-09-14	2021-09-14
Filter - Low Pass	Micro-Tronics	LPM50004	LFK	2020-09-24	2021-09-24
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	NCR
Antenna - Biconilog	ETS Lindgren	3142D	AXO	2019-09-03	2021-09-03
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	2021-01-15	2022-01-15
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	2021-01-15	2022-01-15
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	2021-01-15	2022-01-15
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2020-10-06	2021-10-06
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNP	2020-09-11	2021-09-11
Amplifier - Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	2020-09-11	2021-09-11
Antenna - Standard Gain	ETS Lindgren	3160-09	AHG	NCR	NCR
Antenna - Double Ridge	ETS-Lindgren	3115	AJQ	2021-01-25	2023-01-25
Antenna - Standard Gain	ETS Lindgren	3160-08	AIQ	NCR	NCR
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	2020-12-27	2021-12-27

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

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 within 2 MHz of the allowable band may have been taken using the integration method from ANSI C63.10 clause 11.13.3. This procedure uses the channel power feature of the spectrum analyzer to integrate the power of the emission within a 1 MHz bandwidth.

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 $10 \cdot \log(1/dc)$.

SPURIOUS RADIATED EMISSIONS

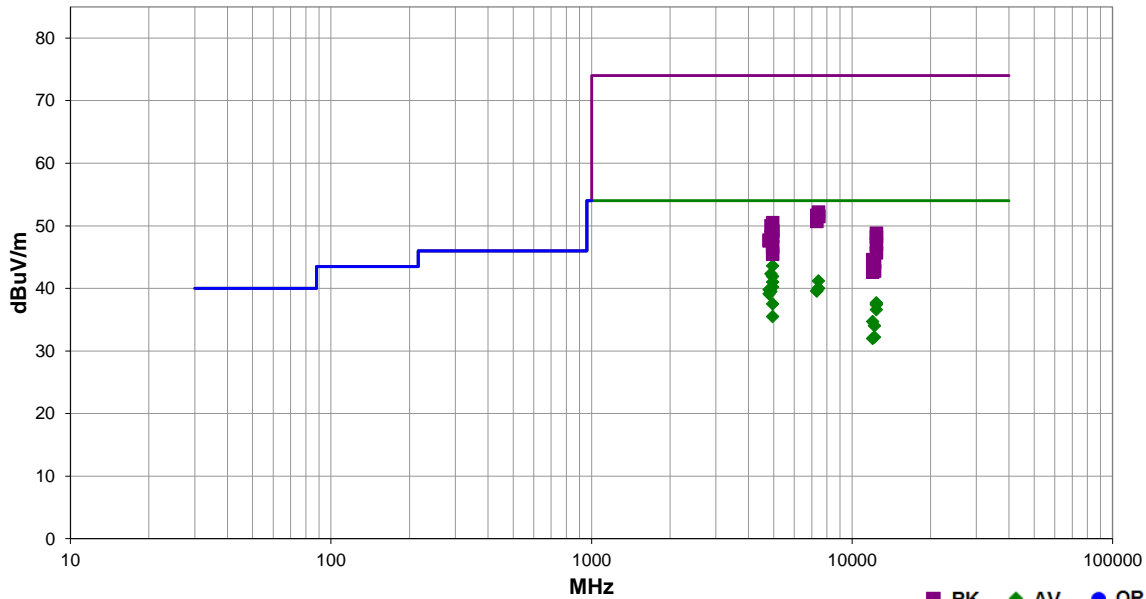


EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	LGPD0256	Date:	2021-03-16	
Project:	None	Temperature:	22.9 °C	
Job Site:	MN05	Humidity:	24.3% RH	
Serial Number:	2420M00120	Barometric Pres.:	1019 mbar	
EUT:	SOMA3703-32-1780AKIR-A / 1027255 Rev B			
Configuration:	1			
Customer:	Logic PD, Inc.			
Attendees:	Eric Fritz			
EUT Power:	120VAC/60Hz			
Operating Mode:	Transmitting BLE Low Ch 0 (2402 MHz), Mid Ch 20 (2442 MHz), High Ch 39 (2480 MHz), 1 Mbps			
Deviations:	None			
Comments:	Antenna located off the board. Loaded test script.			

Test Specifications	Test Method
FCC 15.247:2021	ANSI C63.10:2013

Run #	44	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4959.942	41.0	2.6	2.1	332.0	3.0	0.0	Horz	AV	0.0	43.6	54.0	-10.4	EUT On Side, High Ch, 1 Mbps
4883.908	39.8	2.5	3.0	132.9	3.0	0.0	Vert	AV	0.0	42.3	54.0	-11.7	EUT Vert, Mid Ch, 1 Mbps
4960.075	39.3	2.6	3.5	326.9	3.0	0.0	Vert	AV	0.0	41.9	54.0	-12.1	EUT Vert, High Ch, 1 Mbps
7439.775	32.0	9.2	2.0	70.0	3.0	0.0	Horz	AV	0.0	41.2	54.0	-12.8	EUT On Side, High Ch, 1 Mbps
4959.925	38.4	2.6	2.1	85.9	3.0	0.0	Horz	AV	0.0	41.0	54.0	-13.0	EUT Horz, High Ch, 1 Mbps
4959.892	37.6	2.6	2.7	243.9	3.0	0.0	Horz	AV	0.0	40.2	54.0	-13.8	EUT Vert, High Ch, 1 Mbps
7440.525	30.8	9.2	1.5	42.9	3.0	0.0	Horz	AV	0.0	40.0	54.0	-14.0	EUT On Side, High Ch, 1 Mbps
7439.667	30.8	9.2	1.5	304.0	3.0	0.0	Vert	AV	0.0	40.0	54.0	-14.0	EUT Vert, High Ch, 1 Mbps
4803.850	37.5	2.3	2.2	145.9	3.0	0.0	Horz	AV	0.0	39.8	54.0	-14.2	EUT On Side, Low Ch, 1 Mbps
7328.167	30.4	9.2	2.9	342.0	3.0	0.0	Vert	AV	0.0	39.6	54.0	-14.4	EUT Vert, Mid Ch, 1 Mbps
7328.250	30.4	9.2	1.5	6.9	3.0	0.0	Horz	AV	0.0	39.6	54.0	-14.4	EUT On Side, Mid Ch, 1 Mbps
4883.883	37.0	2.5	1.5	109.9	3.0	0.0	Horz	AV	0.0	39.5	54.0	-14.5	EUT On Side, High Ch, 1 Mbps
4803.800	36.8	2.3	3.6	131.0	3.0	0.0	Vert	AV	0.0	39.1	54.0	-14.9	EUT Vert, Low Ch, 1 Mbps
12398.970	36.7	1.0	1.9	70.0	3.0	0.0	Vert	AV	0.0	37.7	54.0	-16.3	EUT Vert, High Ch, 1 Mbps
4959.825	34.9	2.6	1.5	360.0	3.0	0.0	Vert	AV	0.0	37.5	54.0	-16.5	EUT Horz, High Ch, 1 Mbps
12400.930	31.5	6.0	1.9	120.9	3.0	0.0	Vert	AV	0.0	37.5	54.0	-16.5	EUT Vert, High Ch, 1 Mbps
12401.050	31.4	6.0	1.1	102.9	3.0	0.0	Horz	AV	0.0	37.4	54.0	-16.6	EUT On Side, High Ch, 1 Mbps
12398.820	35.6	1.0	1.8	142.9	3.0	0.0	Horz	AV	0.0	36.6	54.0	-17.4	EUT On Side, High Ch, 1 Mbps
4959.925	32.9	2.6	2.8	63.9	3.0	0.0	Vert	AV	0.0	35.5	54.0	-18.5	EUT On Side, High Ch, 1 Mbps
12008.940	34.8	-0.1	1.8	142.9	3.0	0.0	Horz	AV	0.0	34.7	54.0	-19.3	EUT On Side, Low Ch, 1 Mbps
12208.930	33.9	0.1	1.9	139.9	3.0	0.0	Horz	AV	0.0	34.0	54.0	-20.0	EUT On Side, Mid Ch, 1 Mbps
7440.875	43.0	9.2	2.0	70.0	3.0	0.0	Horz	PK	0.0	52.2	74.0	-21.8	EUT On Side, High Ch, 1 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
12208.990	32.1	0.1	3.7	88.0	3.0	0.0	Vert	AV	0.0	32.2	54.0	-21.8	EUT Vert, Mid Ch, 1 Mbps
12008.940	32.1	-0.1	2.4	142.0	3.0	0.0	Vert	AV	0.0	32.0	54.0	-22.0	EUT Vert, Low Ch, 1 Mbps
7327.683	42.5	9.2	2.9	342.0	3.0	0.0	Vert	PK	0.0	51.7	74.0	-22.3	EUT Vert, Mid Ch, 1 Mbps
7437.783	42.3	9.2	1.5	42.9	3.0	0.0	Horz	PK	0.0	51.5	74.0	-22.5	EUT On Side, High Ch, 1 Mbps
7442.117	42.3	9.2	1.5	304.0	3.0	0.0	Vert	PK	0.0	51.5	74.0	-22.5	EUT Vert, High Ch, 1 Mbps
7327.042	41.5	9.2	1.5	6.9	3.0	0.0	Horz	PK	0.0	50.7	74.0	-23.3	EUT On Side, Mid Ch, 1 Mbps
4959.567	47.9	2.6	2.1	332.0	3.0	0.0	Horz	PK	0.0	50.5	74.0	-23.5	EUT On Side, High Ch, 1 Mbps
4884.483	47.5	2.5	3.0	132.9	3.0	0.0	Vert	PK	0.0	50.0	74.0	-24.0	EUT Vert, Mid Ch, 1 Mbps
4959.808	46.6	2.6	2.1	85.9	3.0	0.0	Horz	PK	0.0	49.2	74.0	-24.8	EUT Horz, High Ch, 1 Mbps
4959.875	46.5	2.6	3.5	326.9	3.0	0.0	Vert	PK	0.0	49.1	74.0	-24.9	EUT Vert, High Ch, 1 Mbps
12400.810	42.8	6.0	1.9	120.9	3.0	0.0	Vert	PK	0.0	48.8	74.0	-25.2	EUT Vert, High Ch, 1 Mbps
4960.792	45.7	2.6	2.7	243.9	3.0	0.0	Horz	PK	0.0	48.3	74.0	-25.7	EUT Vert, High Ch, 1 Mbps
12401.000	42.2	6.0	1.1	102.9	3.0	0.0	Horz	PK	0.0	48.2	74.0	-25.8	EUT On Side, High Ch, 1 Mbps
4883.717	45.7	2.5	1.5	109.9	3.0	0.0	Horz	PK	0.0	48.2	74.0	-25.8	EUT On Side, Mid Ch, 1 Mbps
4803.667	45.4	2.3	2.2	145.9	3.0	0.0	Horz	PK	0.0	47.7	74.0	-26.3	EUT On Side, Low Ch, 1 Mbps
4804.025	45.3	2.3	3.6	131.0	3.0	0.0	Vert	PK	0.0	47.6	74.0	-26.4	EUT Vert, Low Ch, 1 Mbps
12398.670	46.0	1.0	1.9	70.0	3.0	0.0	Vert	PK	0.0	47.0	74.0	-27.0	EUT Vert, High Ch, 1 Mbps
4960.458	44.0	2.6	1.5	360.0	3.0	0.0	Vert	PK	0.0	46.6	74.0	-27.4	EUT Horz, High Ch, 1 Mbps
12398.750	44.7	1.0	1.8	142.9	3.0	0.0	Horz	PK	0.0	45.7	74.0	-28.3	EUT On Side, High Ch, 1 Mbps
4960.542	42.9	2.6	2.8	63.9	3.0	0.0	Vert	PK	0.0	45.5	74.0	-28.5	EUT On Side, High Ch, 1 Mbps
12008.680	44.7	-0.1	1.8	142.9	3.0	0.0	Horz	PK	0.0	44.6	74.0	-29.4	EUT On Side, Low Ch, 1 Mbps
12209.850	44.1	0.1	1.9	139.9	3.0	0.0	Horz	PK	0.0	44.2	74.0	-29.8	EUT On Side, Mid Ch, 1 Mbps
12208.730	42.7	0.1	3.7	88.0	3.0	0.0	Vert	PK	0.0	42.8	74.0	-31.2	EUT Vert, Mid Ch, 1 Mbps
12011.200	42.7	-0.1	2.4	142.0	3.0	0.0	Vert	PK	0.0	42.6	74.0	-31.4	EUT Vert, Low Ch, 1 Mbps

SPURIOUS RADIATED EMISSIONS

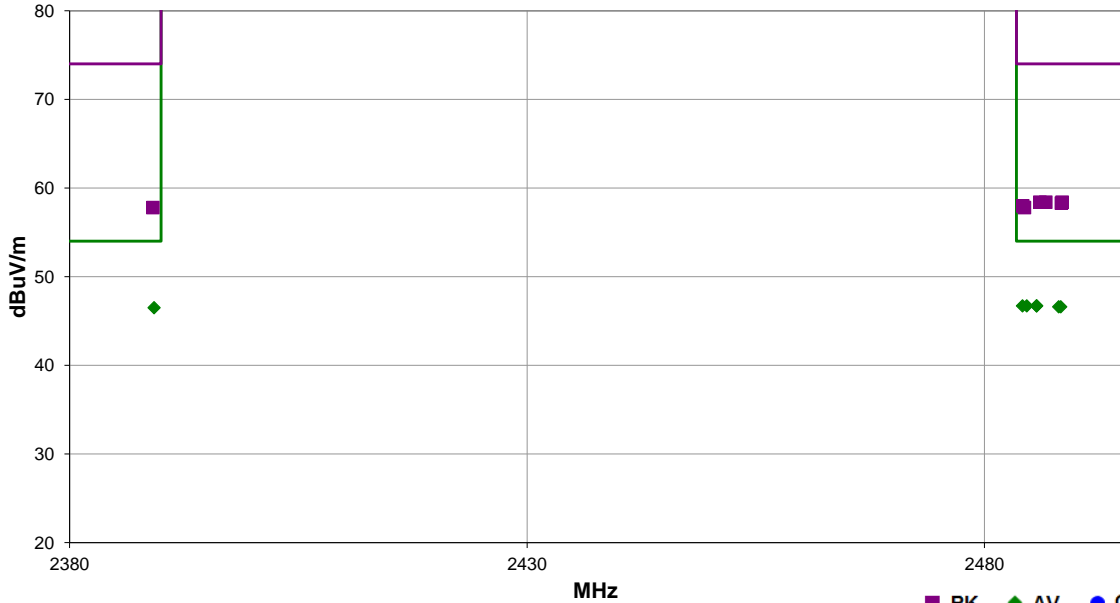


EmiR5 2021.01.08.0 PSA-ESCI 2021.01.22.0

Work Order:	LGPD0256	Date:	2021-03-16	
Project:	None	Temperature:	22.9 °C	
Job Site:	MN05	Humidity:	24.3% RH	
Serial Number:	2420M00120	Barometric Pres.:	1019 mbar	Tested by: Christopher Heintzelman, Eric Brandon
EUT:	SOMA3703-32-1780AKIR-A / 1027255 Rev B			
Configuration:	1			
Customer:	Logic PD, Inc.			
Attendees:	Eric Fritz			
EUT Power:	120VAC/60Hz			
Operating Mode:	Transmitting BLE Low Ch 0 (2402 MHz), High Ch 39 (2480 MHz), 1 Mbps			
Deviations:	None			
Comments:	Antenna located off the board. Loaded test script. Band edge.			

Test Specifications	Test Method
FCC 15.247:2021	ANSI C63.10:2013

Run #	51	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2485.725	31.5	-4.8	1.5	159.0	3.0	20.0	Vert	AV	0.0	46.7	54.0	-7.3	EUT Vert, High Ch, 1 Mbps
2485.708	31.5	-4.8	1.5	106.0	3.0	20.0	Horz	AV	0.0	46.7	54.0	-7.3	EUT On Side, High Ch, 1 Mbps
2484.167	31.5	-4.8	1.5	268.0	3.0	20.0	Horz	AV	0.0	46.7	54.0	-7.3	EUT Horz, High Ch, 1 Mbps
2484.642	31.5	-4.8	1.5	88.9	3.0	20.0	Vert	AV	0.0	46.7	54.0	-7.3	EUT Horz, High Ch, 1 Mbps
2488.125	31.5	-4.9	2.17	339.0	3.0	20.0	Horz	AV	0.0	46.6	54.0	-7.4	EUT Vert, High Ch, 1 Mbps
2488.350	31.5	-4.9	3.57	103.9	3.0	20.0	Vert	AV	0.0	46.6	54.0	-7.4	EUT On Side, High Ch, 1 Mbps
2389.233	31.1	-4.6	1.05	307.0	3.0	20.0	Vert	AV	0.0	46.5	54.0	-7.5	EUT Vert, Low Ch, 1 Mbps
2486.708	43.2	-4.8	2.17	339.0	3.0	20.0	Horz	PK	0.0	58.4	74.0	-15.6	EUT Vert, High Ch, 1 Mbps
2488.500	43.3	-4.9	1.5	159.0	3.0	20.0	Vert	PK	0.0	58.4	74.0	-15.6	EUT Vert, High Ch, 1 Mbps
2486.058	43.2	-4.8	1.5	88.9	3.0	20.0	Vert	PK	0.0	58.4	74.0	-15.6	EUT Horz, High Ch, 1 Mbps
2488.425	43.2	-4.9	1.5	268.0	3.0	20.0	Horz	PK	0.0	58.3	74.0	-15.7	EUT Horz, High Ch, 1 Mbps
2484.192	42.8	-4.8	1.5	106.0	3.0	20.0	Horz	PK	0.0	58.0	74.0	-16.0	EUT On Side, High Ch, 1 Mbps
2484.383	42.6	-4.8	3.57	103.9	3.0	20.0	Vert	PK	0.0	57.8	74.0	-16.2	EUT On Side, High Ch, 1 Mbps
2389.092	42.4	-4.6	1.05	307.0	3.0	20.0	Vert	PK	0.0	57.8	74.0	-16.2	EUT Vert, Low Ch, 1 Mbps

SPURIOUS RADIATED EMISSIONS



PSA-ESCI 2021.03.17.0

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 BLE High Ch (2480 MHz), Low Ch (2402 MHz); 1 Mbps
Transmitting BLE High Ch (2480 MHz), Mid Ch (2442 MHz), and Low Ch (2402 MHz); 1 Mbps

POWER SETTINGS INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

LGPD0256 - 4

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26500 MHz
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SAMPLE CALCULATIONS

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Attenuator	Fairview Microwave	SA18E-20	TWZ	2020-09-14	2021-09-14
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	2021-03-07	2022-03-07
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	2021-01-15	2022-01-15
Cable	ESM Cable Corp.	Bilog Cables	MNH	2020-10-06	2021-10-06
Filter - High Pass	Micro-Tronics	HPM50111	LFN	2020-09-14	2021-09-14
Filter - Low Pass	Micro-Tronics	LPM50004	LFK	2020-09-24	2021-09-24
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	NCR
Antenna - Biconilog	ETS Lindgren	3142D	AXO	2019-09-03	2021-09-03
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	2021-01-15	2022-01-15
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	2021-01-15	2022-01-15
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	2021-01-15	2022-01-15
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	2020-10-06	2021-10-06
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNP	2020-09-11	2021-09-11
Amplifier - Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	2020-09-11	2021-09-11
Antenna - Standard Gain	ETS Lindgren	3160-09	AHG	NCR	NCR
Antenna - Double Ridge	ETS-Lindgren	3115	AJQ	2021-01-25	2023-01-25
Antenna - Standard Gain	ETS Lindgren	3160-08	AIQ	NCR	NCR
Analyzer - Spectrum Analyzer	Keysight	N9010A (EXA)	AFQ	2020-12-27	2021-12-27

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

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 within 2 MHz of the allowable band may have been taken using the integration method from ANSI C63.10 clause 11.13.3. This procedure uses the channel power feature of the spectrum analyzer to integrate the power of the emission within a 1 MHz bandwidth.

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 $10 \cdot \log(1/dc)$.

SPURIOUS RADIATED EMISSIONS

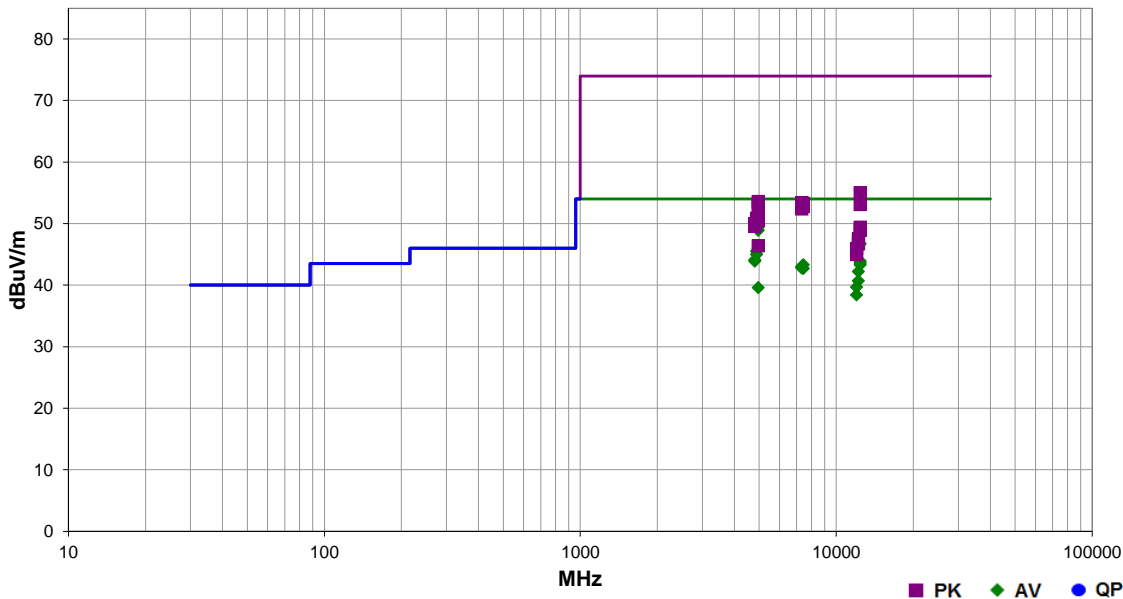


EmiRS 2021.01.08.0 PSA-ESCI 2021.03.17.0

Work Order:	LGPD0256	Date:	2021-03-26	
Project:	None	Temperature:	21.2 °C	
Job Site:	MN09	Humidity:	29% RH	
Serial Number:	2420M00120	Barometric Pres.:	1019 mbar	Tested by: Christopher Heintzelman, Eric Brandon
EUT:	SOMA3703-32-1780AKIR-A / 1027255 Rev B			
Configuration:	4			
Customer:	Logic PD, Inc.			
Attendees:	Eric Fritz			
EUT Power:	120VAC/60Hz			
Operating Mode:	Transmitting BLE High Ch (2480 MHz), Mid Ch (2442 MHz), and Low Ch (2402 MHz); 1 Mbps			
Deviations:	None			
Comments:	Antenna located off the board. See comments below for channel and EUT orientation.			

Test Specifications	Test Method
FCC 15.247:2021	ANSI C63.10:2013

Run #	38	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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
4960.000	45.0	4.7	3.8	28.0	3.0	0.0	Horz	AV	0.0	49.7	54.0	-4.3	EUT On Side, High Ch, 1 Mbps
4960.075	44.7	4.7	2.3	89.0	3.0	0.0	Horz	AV	0.0	49.4	54.0	-4.6	EUT Horz, High Ch, 1 Mbps
4960.050	44.2	4.7	1.1	39.0	3.0	0.0	Vert	AV	0.0	48.9	54.0	-5.1	EUT Vert, High Ch, 1 Mbps
12401.110	32.8	13.9	1.9	95.0	3.0	0.0	Vert	AV	0.0	46.7	54.0	-7.3	EUT Vert, High Ch, 1 Mbps
4960.042	41.5	4.7	3.9	290.0	3.0	0.0	Vert	AV	0.0	46.2	54.0	-7.8	EUT On Side, High Ch, 1 Mbps
4960.108	41.2	4.7	2.7	63.0	3.0	0.0	Vert	AV	0.0	45.9	54.0	-8.1	EUT Horz, High Ch, 1 Mbps
4884.050	40.8	4.7	1.0	117.0	3.0	0.0	Vert	AV	0.0	45.5	54.0	-8.5	EUT Vert, Mid Ch, 1 Mbps
4884.025	40.3	4.7	1.1	21.0	3.0	0.0	Horz	AV	0.0	45.0	54.0	-9.0	EUT On Side, Mid Ch, 1 Mbps
4804.100	39.2	4.9	1.0	123.0	3.0	0.0	Vert	AV	0.0	44.1	54.0	-9.9	EUT Vert, Low Ch, 1 Mbps
12398.760	44.6	-0.7	2.0	100.0	3.0	0.0	Vert	AV	0.0	43.9	54.0	-10.1	EUT Vert, High Ch, 1 Mbps
4804.042	39.0	4.9	4.0	23.0	3.0	0.0	Horz	AV	0.0	43.9	54.0	-10.1	EUT Horz, Low Ch, 1 Mbps
12401.040	29.7	13.9	1.9	105.0	3.0	0.0	Horz	AV	0.0	43.6	54.0	-10.4	EUT On Side, High Ch, 1 Mbps
7439.633	29.6	13.7	1.0	29.0	3.0	0.0	Vert	AV	0.0	43.3	54.0	-10.7	EUT Vert, High Ch, 1 Mbps
12398.920	44.0	-0.7	1.6	30.0	3.0	0.0	Horz	AV	0.0	43.3	54.0	-10.7	EUT On Side, High Ch, 1 Mbps
7326.592	29.9	13.1	1.4	22.0	3.0	0.0	Vert	AV	0.0	43.0	54.0	-11.0	EUT Vert, Mid Ch, 1 Mbps
7326.650	29.7	13.1	3.4	108.0	3.0	0.0	Horz	AV	0.0	42.8	54.0	-11.2	EUT On Side, Mid Ch, 1 Mbps
7439.325	29.0	13.7	1.5	15.0	3.0	0.0	Horz	AV	0.0	42.7	54.0	-11.3	EUT On Side, High Ch, 1 Mbps
12208.810	42.7	-0.5	1.8	34.0	3.0	0.0	Horz	AV	0.0	42.2	54.0	-11.8	EUT On Side, Mid Ch, 1 Mbps
12208.790	41.2	-0.5	2.0	103.0	3.0	0.0	Vert	AV	0.0	40.7	54.0	-13.3	EUT Vert, Mid Ch, 1 Mbps
12008.940	41.2	-1.5	1.8	21.0	3.0	0.0	Horz	AV	0.0	39.7	54.0	-14.3	EUT On Side, Low Ch, 1 Mbps
4960.017	34.9	4.7	1.5	345.0	3.0	0.0	Horz	AV	0.0	39.6	54.0	-14.4	EUT Vert, High Ch, 1 Mbps
12008.840	39.9	-1.5	1.9	358.0	3.0	0.0	Vert	AV	0.0	38.4	54.0	-15.6	EUT Vert, Low Ch, 1 Mbps
12401.060	41.1	13.9	1.9	95.0	3.0	0.0	Vert	PK	0.0	55.0	74.0	-19.0	EUT Vert, High Ch, 1 Mbps

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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
4960.550	48.9	4.7	2.3	89.0	3.0	0.0	Horz	PK	0.0	53.6	74.0	-20.4	EUT Horz, High Ch, 1 Mbps
7326.592	40.3	13.1	1.4	22.0	3.0	0.0	Vert	PK	0.0	53.4	74.0	-20.6	EUT Vert, Mid Ch, 1 Mbps
7440.192	39.6	13.7	1.0	29.0	3.0	0.0	Vert	PK	0.0	53.3	74.0	-20.7	EUT Vert, High Ch, 1 Mbps
4960.408	48.5	4.7	3.8	28.0	3.0	0.0	Horz	PK	0.0	53.2	74.0	-20.8	EUT On Side, High Ch, 1 Mbps
12401.080	39.2	13.9	1.9	105.0	3.0	0.0	Horz	PK	0.0	53.1	74.0	-20.9	EUT On Side, High Ch, 1 Mbps
4960.300	48.1	4.7	1.1	39.0	3.0	0.0	Vert	PK	0.0	52.8	74.0	-21.2	EUT Vert, High Ch, 1 Mbps
7439.383	39.1	13.7	1.5	15.0	3.0	0.0	Horz	PK	0.0	52.8	74.0	-21.2	EUT On Side, High Ch, 1 Mbps
7325.258	39.3	13.1	3.4	108.0	3.0	0.0	Horz	PK	0.0	52.4	74.0	-21.6	EUT On Side, Mid Ch, 1 Mbps
4884.533	46.2	4.7	1.0	117.0	3.0	0.0	Vert	PK	0.0	50.9	74.0	-23.1	EUT Vert, Mid Ch, 1 Mbps
4959.725	46.0	4.7	3.9	290.0	3.0	0.0	Vert	PK	0.0	50.7	74.0	-23.3	EUT On Side, High Ch, 1 Mbps
4883.550	45.9	4.7	1.1	21.0	3.0	0.0	Horz	PK	0.0	50.6	74.0	-23.4	EUT On Side, Mid Ch, 1 Mbps
4960.375	45.8	4.7	2.7	63.0	3.0	0.0	Vert	PK	0.0	50.5	74.0	-23.5	EUT Horz, High Ch, 1 Mbps
4804.325	45.1	4.9	4.0	23.0	3.0	0.0	Horz	PK	0.0	50.0	74.0	-24.0	EUT Horz, Low Ch, 1 Mbps
4804.308	44.7	4.9	1.0	123.0	3.0	0.0	Vert	PK	0.0	49.6	74.0	-24.4	EUT Vert, Low Ch, 1 Mbps
12398.660	50.1	-0.7	2.0	100.0	3.0	0.0	Vert	PK	0.0	49.4	74.0	-24.6	EUT Vert, High Ch, 1 Mbps
12398.730	49.6	-0.7	1.6	30.0	3.0	0.0	Horz	PK	0.0	48.9	74.0	-25.1	EUT On Side, High Ch, 1 Mbps
12208.600	48.0	-0.5	1.8	34.0	3.0	0.0	Horz	PK	0.0	47.5	74.0	-26.5	EUT On Side, Mid Ch, 1 Mbps
12211.280	47.2	-0.5	2.0	103.0	3.0	0.0	Vert	PK	0.0	46.7	74.0	-27.3	EUT Vert, Mid Ch, 1 Mbps
4959.750	41.7	4.7	1.5	345.0	3.0	0.0	Horz	PK	0.0	46.4	74.0	-27.6	EUT Vert, High Ch, 1 Mbps
12008.880	47.4	-1.5	1.8	21.0	3.0	0.0	Horz	PK	0.0	45.9	74.0	-28.1	EUT On Side, Low Ch, 1 Mbps
12011.080	46.5	-1.5	1.9	358.0	3.0	0.0	Vert	PK	0.0	45.0	74.0	-29.0	EUT Vert, Low Ch, 1 Mbps

SPURIOUS RADIATED EMISSIONS

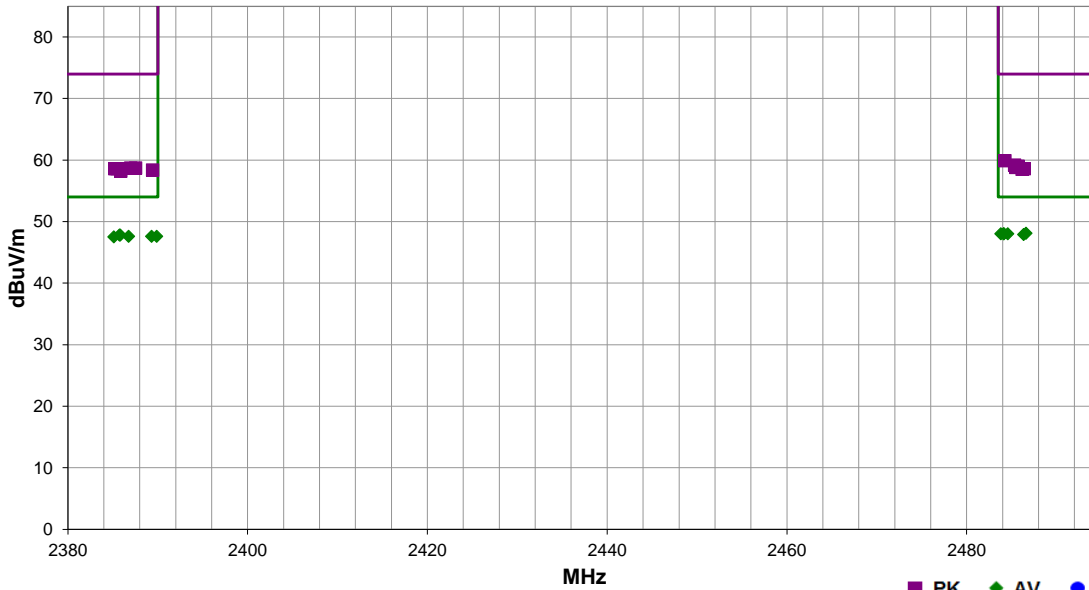


EmiR5 2021.01.08.0 PSA-ESCI 2021.03.17.0

Work Order:	LGPD0256	Date:	2021-03-26	
Project:	None	Temperature:	21.2 °C	
Job Site:	MN09	Humidity:	29% RH	
Serial Number:	2420M00120	Barometric Pres.:	1019 mbar	
Tested by:	Christopher Heintzelman, Eric Brandon			
EUT:	SOMA3703-32-1780AKIR-A / 1027255 Rev B			
Configuration:	4			
Customer:	Logic PD, Inc.			
Attendees:	Eric Fritz			
EUT Power:	120VAC/60Hz			
Operating Mode:	Transmitting BLE High Ch (2480 MHz), Low Ch (2402 MHz); 1 Mbps			
Deviations:	None			
Comments:	Antenna located off the board. Band edge.			

Test Specifications	Test Method
FCC 15.247:2021	ANSI C63.10:2013

Run #	46	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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
2486.608	31.3	-3.2	1.5	299.0	3.0	20.0	Horz	AV	0.0	48.1	54.0	-5.9	EUT Vert, High Ch, 1 Mbps
2483.817	31.2	-3.2	1.5	39.0	3.0	20.0	Vert	AV	0.0	48.0	54.0	-6.0	EUT Vert, High Ch, 1 Mbps
2484.133	31.2	-3.2	1.5	190.0	3.0	20.0	Vert	AV	0.0	48.0	54.0	-6.0	EUT On Side, High Ch, 1 Mbps
2484.133	31.2	-3.2	1.37	269.0	3.0	20.0	Horz	AV	0.0	48.0	54.0	-6.0	EUT Horz, High Ch, 1 Mbps
2484.592	31.2	-3.2	1.5	133.0	3.0	20.0	Vert	AV	0.0	48.0	54.0	-6.0	EUT Horz, High Ch, 1 Mbps
2486.358	31.1	-3.2	1.5	356.0	3.0	20.0	Horz	AV	0.0	47.9	54.0	-6.1	EUT On Side, High Ch, 1 Mbps
2385.825	31.3	-3.5	1.5	76.0	3.0	20.0	Horz	AV	0.0	47.8	54.0	-6.2	EUT Vert, Low Ch, 1 Mbps
2385.750	31.3	-3.5	1.5	167.0	3.0	20.0	Vert	AV	0.0	47.8	54.0	-6.2	EUT Vert, Low Ch, 1 Mbps
2389.883	31.1	-3.5	1.5	94.0	3.0	20.0	Horz	AV	0.0	47.6	54.0	-6.4	EUT Horz, Low Ch, 1 Mbps
2386.767	31.1	-3.5	1.5	271.0	3.0	20.0	Horz	AV	0.0	47.6	54.0	-6.4	EUT On Side, Low Ch, 1 Mbps
2389.325	31.1	-3.5	1.5	145.0	3.0	20.0	Vert	AV	0.0	47.6	54.0	-6.4	EUT On Side, Low Ch, 1 Mbps
2385.117	31.0	-3.5	1.5	225.0	3.0	20.0	Vert	AV	0.0	47.5	54.0	-6.5	EUT Vert, Low Ch, 1 Mbps
2484.267	43.1	-3.2	1.5	299.0	3.0	20.0	Horz	PK	0.0	59.9	74.0	-14.1	EUT Vert, High Ch, 1 Mbps
2485.342	42.4	-3.2	1.37	269.0	3.0	20.0	Horz	PK	0.0	59.2	74.0	-14.8	EUT Horz, High Ch, 1 Mbps
2485.717	42.2	-3.2	1.5	39.0	3.0	20.0	Vert	PK	0.0	59.0	74.0	-15.0	EUT Vert, High Ch, 1 Mbps
2485.483	42.0	-3.2	1.5	356.0	3.0	20.0	Horz	PK	0.0	58.8	74.0	-15.2	EUT On Side, High Ch, 1 Mbps
2387.542	42.2	-3.5	1.5	225.0	3.0	20.0	Vert	PK	0.0	58.7	74.0	-15.3	EUT Horz, Low Ch, 1 Mbps
2386.983	42.2	-3.5	1.5	167.0	3.0	20.0	Vert	PK	0.0	58.7	74.0	-15.3	EUT Vert, Low Ch, 1 Mbps
2486.408	41.8	-3.2	1.5	133.0	3.0	20.0	Vert	PK	0.0	58.6	74.0	-15.4	EUT Horz, High Ch, 1 Mbps
2385.217	42.1	-3.5	1.5	94.0	3.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	EUT Vert, Low Ch, 1 Mbps
2385.458	42.1	-3.5	1.5	76.0	3.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	EUT Vert, Low Ch, 1 Mbps
2486.175	41.7	-3.2	1.5	190.0	3.0	20.0	Vert	PK	0.0	58.5	74.0	-15.5	EUT On Side, High Ch, 1 Mbps
2389.417	41.9	-3.5	1.5	271.0	3.0	20.0	Horz	PK	0.0	58.4	74.0	-15.6	EUT On Side, Low Ch, 1 Mbps

Freq (MHz)	Amplitude (dBuV)	Factor (dB/m)	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
2385.883	41.7	-3.5	1.5	145.0	3.0	20.0	Vert	PK	0.0	58.2	74.0	-15.8	EUT On Side, Low Ch, 1 Mbps

OCCUPIED BANDWIDTH



XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E4422B	TGQ	2021-03-24	2024-03-24
Block - DC	Fairview Microwave	SD3379	AMZ	2020-11-04	2021-11-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2020-09-14	2021-09-14
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2020-07-14	2021-07-14

TEST DESCRIPTION

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



Tel: 2019.08.30.0 XMI: 2020.12.30.0

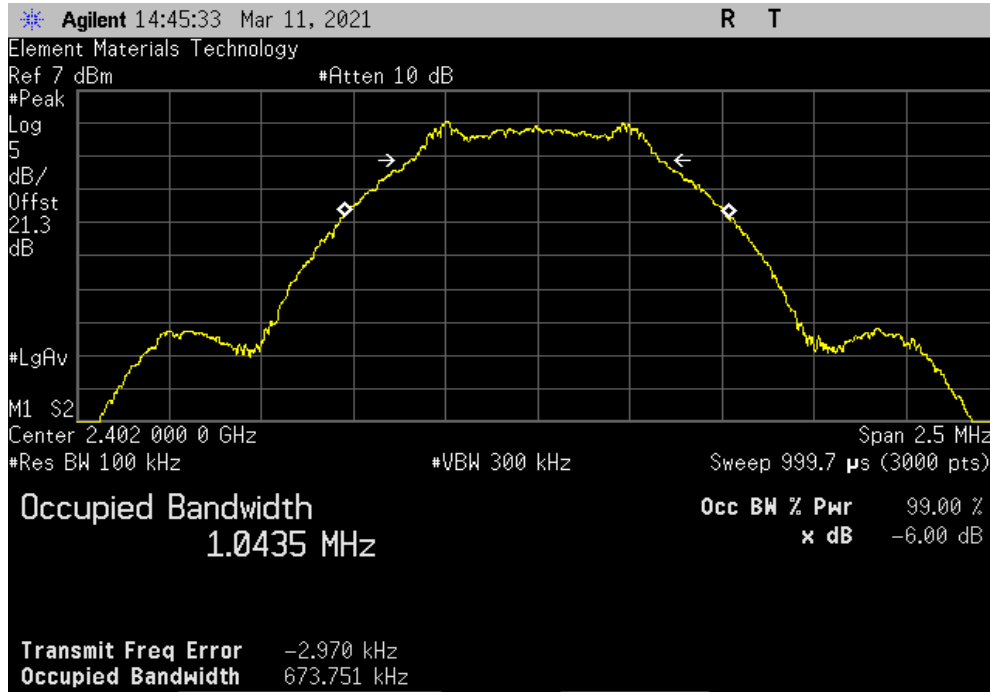
EUT: SOMA3703-32-1780AKIR-A / 1027255 Rev B		Work Order: LGPD0256	
Serial Number: 2420M00120		Date: 11-Mar-21	
Customer: Logic PD, Inc.		Temperature: 23.1 °C	
Attendees: Eric Fritz		Humidity: 30% RH	
Project: None		Barometric Pres.: 1021 mbar	
Tested by: Andrew Rogstad		Power: 120VAC/60Hz	
		Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2021		Test Method: ANSI C63.10:2013	
COMMENTS			
Reference level includes measurement cable, attenuator, and DC block.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	3	Signature <i>Andrew Rogstad</i>	
		Value	Limit (±) Result
BLE - Advertising			
	BLE/GFSK 1 Mbps Low Channel, 2402 MHz	673.751 kHz	500 kHz Pass
	BLE/GFSK 1 Mbps Mid Channel, 2426 MHz	695.814 kHz	500 kHz Pass
	BLE/GFSK 1 Mbps High Channel, 2480 MHz	677.176 kHz	500 kHz Pass
BLE - Data			
	BLE/GFSK 1 Mbps Low Channel, 2404 MHz	674.913 kHz	500 kHz Pass
	BLE/GFSK 1 Mbps Mid Channel, 2442 MHz	698.244 kHz	500 kHz Pass
	BLE/GFSK 1 Mbps High Channel, 2478 MHz	706.056 kHz	500 kHz Pass

OCCUPIED BANDWIDTH

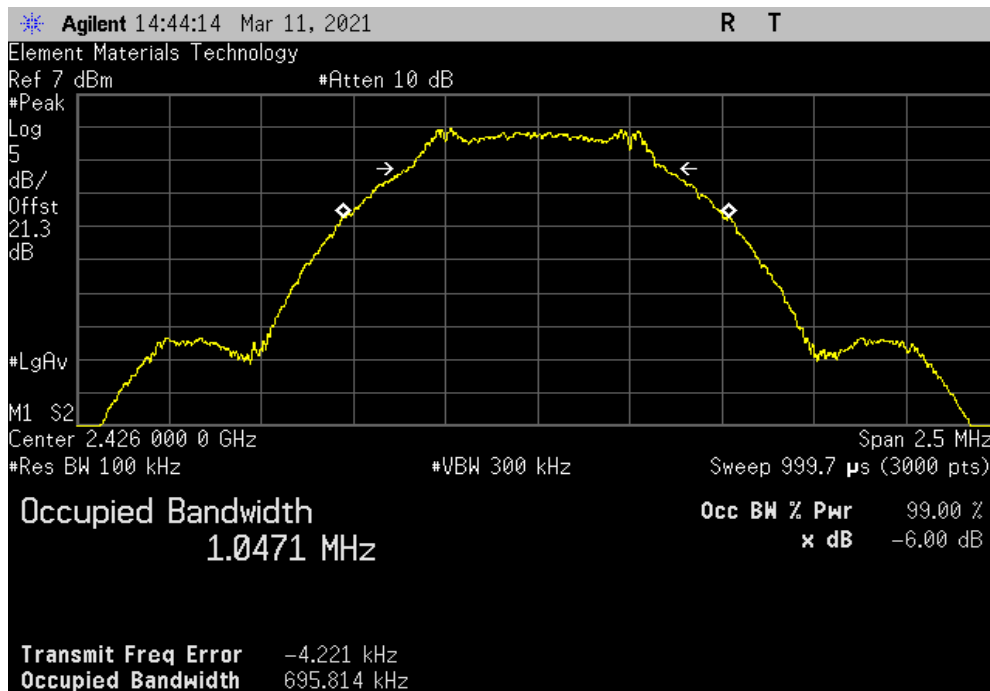


TuTx 2019.08.30.0 XMt 2020.12.30.0

BLE - Advertising, BLE/GFSK 1 Mbps Low Channel, 2402 MHz			
	Value	Limit (≥)	Result
	673.751 kHz	500 kHz	Pass



BLE - Advertising, BLE/GFSK 1 Mbps Mid Channel, 2426 MHz			
	Value	Limit (≥)	Result
	695.814 kHz	500 kHz	Pass

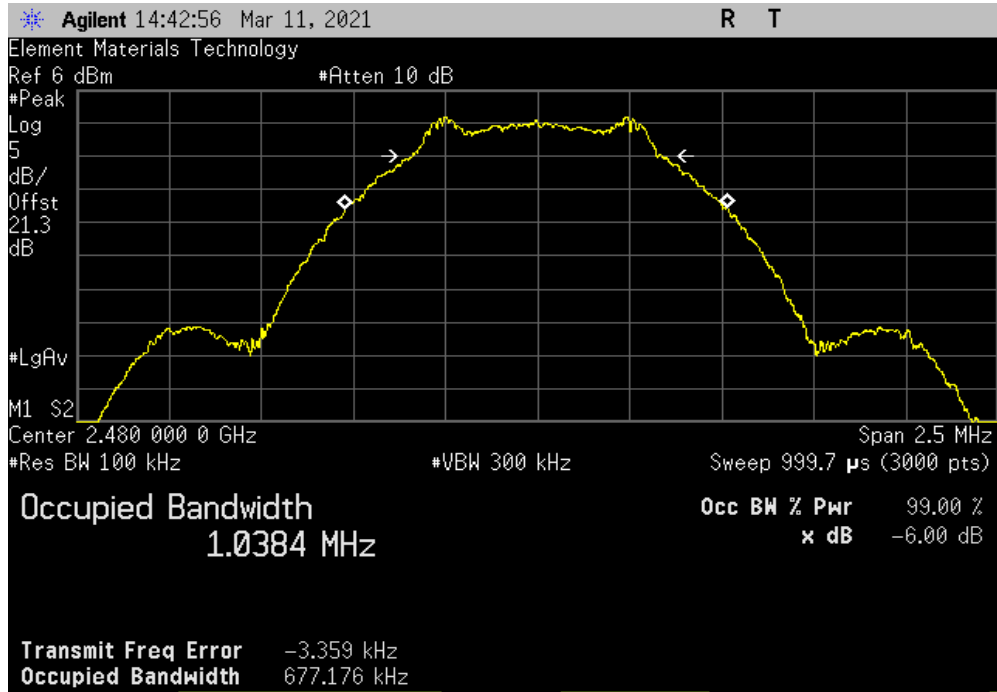


OCCUPIED BANDWIDTH

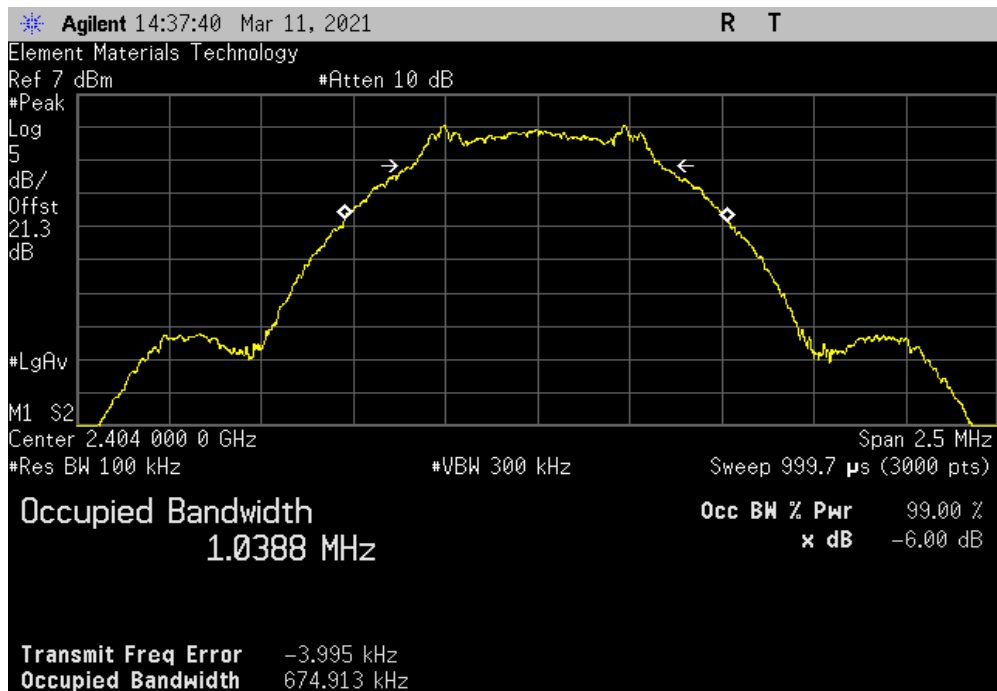


TuTx 2019.08.30.0 XMI 2020.12.30.0

BLE - Advertising, BLE/GFSK 1 Mbps High Channel, 2480 MHz			
	Value	Limit (≥)	Result
	677.176 kHz	500 kHz	Pass



BLE - Data, BLE/GFSK 1 Mbps Low Channel, 2404 MHz			
	Value	Limit (≥)	Result
	674.913 kHz	500 kHz	Pass

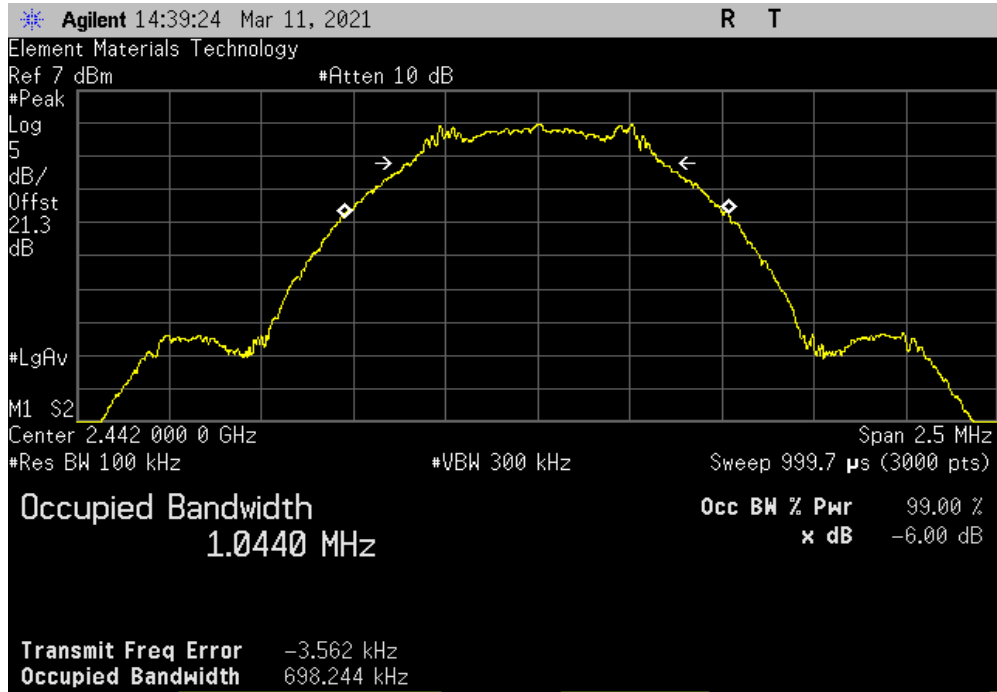


OCCUPIED BANDWIDTH

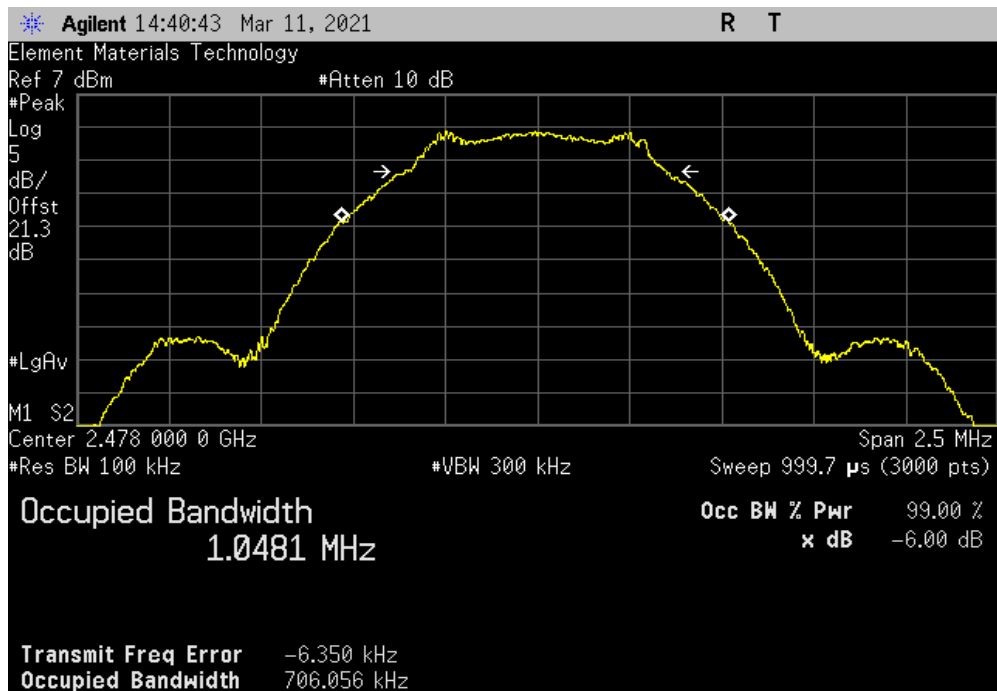


TbTx 2019.08.30.0 XMI 2020.12.30.0

BLE - Data, BLE/GFSK 1 Mbps Mid Channel, 2442 MHz			
	Value	Limit (≥)	Result
	698.244 kHz	500 kHz	Pass



BLE - Data, BLE/GFSK 1 Mbps High Channel, 2478 MHz			
	Value	Limit (≥)	Result
	706.056 kHz	500 kHz	Pass



OUTPUT POWER



XMH 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E4422B	TGQ	2018-03-15	2021-03-15
Block - DC	Fairview Microwave	SD3379	AMZ	2020-11-04	2021-11-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2020-09-14	2021-09-14
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2020-07-14	2021-07-14

TEST DESCRIPTION

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



TelTx 2019.08.30.0 XMI 2020.12.30.0

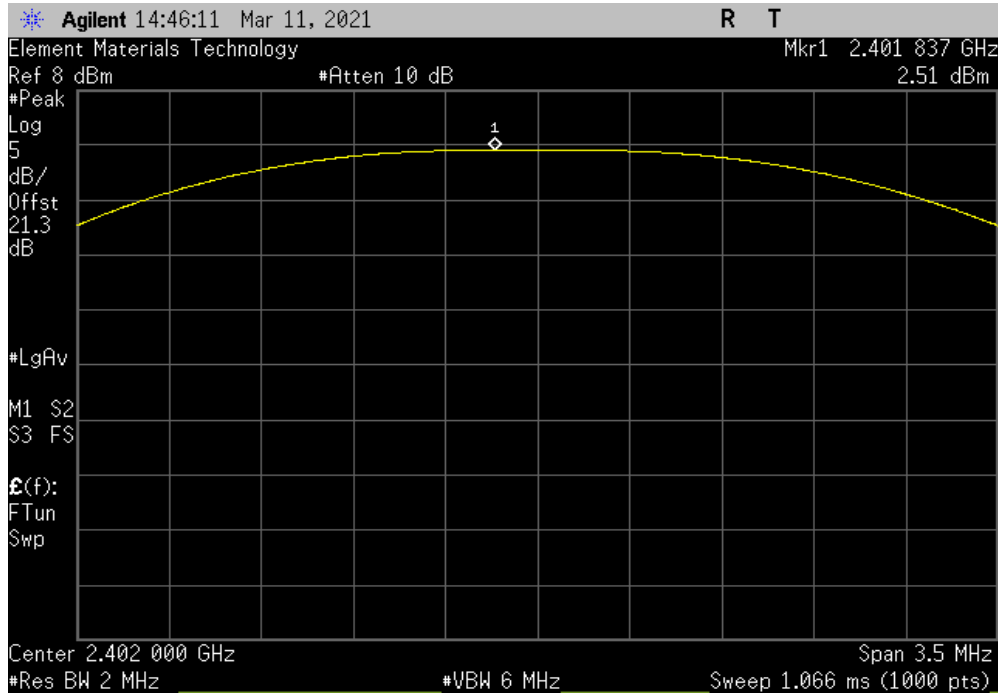
EUT: SOMA3703-32-1780AKIR-A / 1027255 Rev B		Work Order: LGPD0256	
Serial Number: 2420M00120		Date: 11-Mar-21	
Customer: Logic PD, Inc.		Temperature: 23.1 °C	
Attendees: Eric Fritz		Humidity: 30% RH	
Project: None		Barometric Pres.: 1021 mbar	
Tested by: Andrew Rogstad		Power: 120VAC/60Hz	
		Job Site: MN08	
TEST SPECIFICATIONS			
FCC 15.247:2021		Test Method	
		ANSI C63.10:2013	
COMMENTS			
Reference level offset includes measurement cable, attenuator, and DC block.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	3	Signature <i>Andrew Rogstad</i>	
		Out Pwr (dBm)	Limit (dBm) Result
BLE - Advertising			
	BLE/GFSK 1 Mbps Low Channel, 2402 MHz	2.507	30 Pass
	BLE/GFSK 1 Mbps Mid Channel, 2426 MHz	2.484	30 Pass
	BLE/GFSK 1 Mbps High Channel, 2480 MHz	2.237	30 Pass
BLE - Data			
	BLE/GFSK 1 Mbps Low Channel, 2404 MHz	2.501	30 Pass
	BLE/GFSK 1 Mbps Mid Channel, 2442 MHz	2.442	30 Pass
	BLE/GFSK 1 Mbps High Channel, 2478 MHz	2.261	30 Pass

OUTPUT POWER

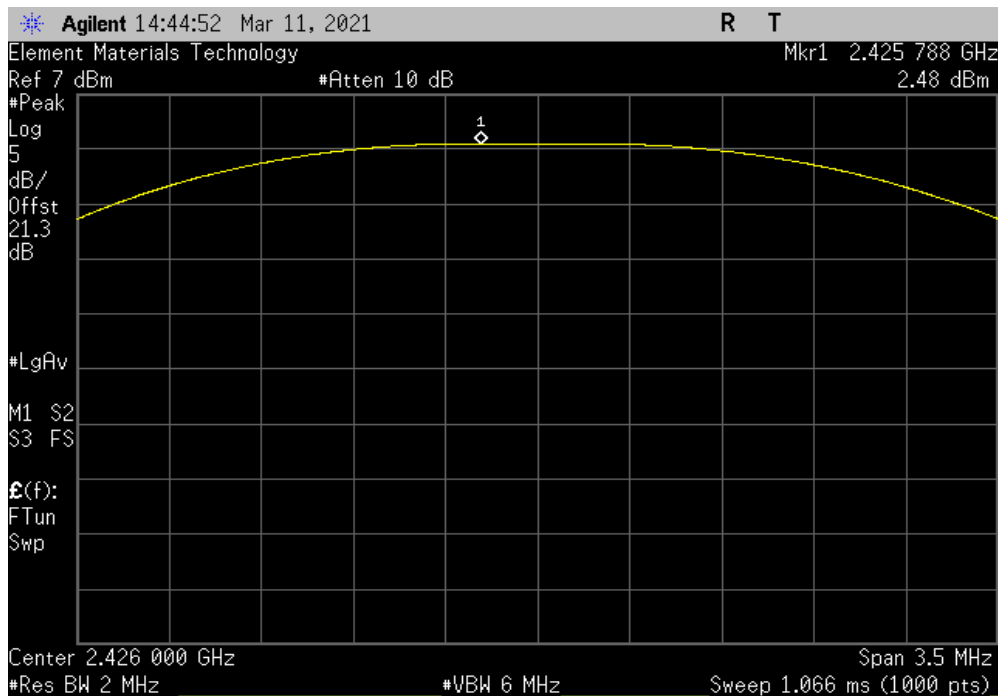


TbTx 2019.08.30.0 XMI 2020.12.30.0

BLE - Advertising, BLE/GFSK 1 Mbps Low Channel, 2402 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				2.507	30	Pass



BLE - Advertising, BLE/GFSK 1 Mbps Mid Channel, 2426 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				2.484	30	Pass

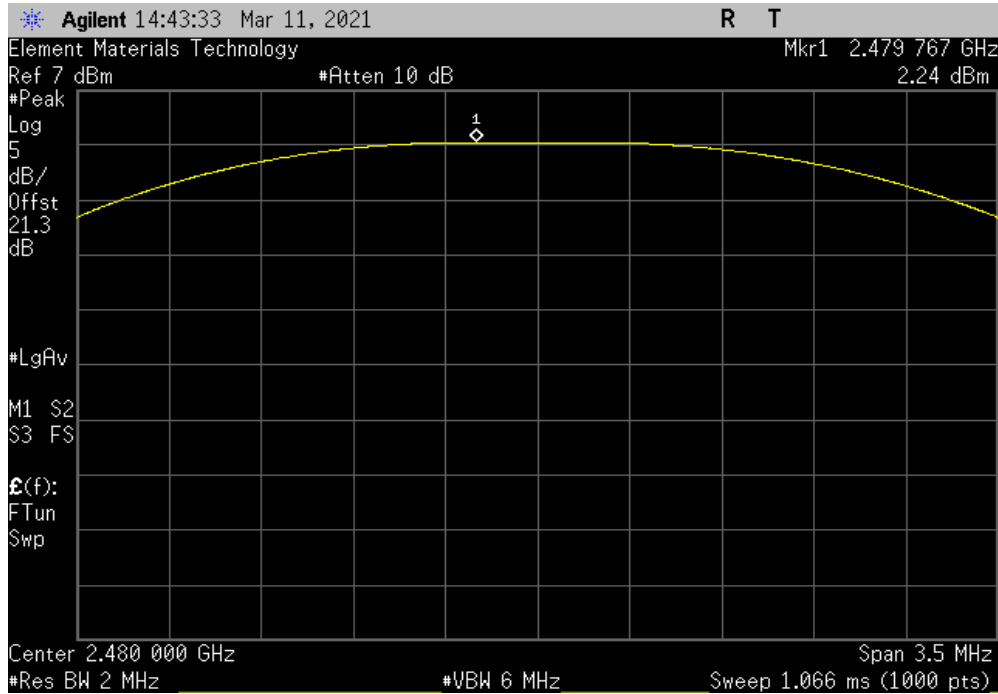


OUTPUT POWER

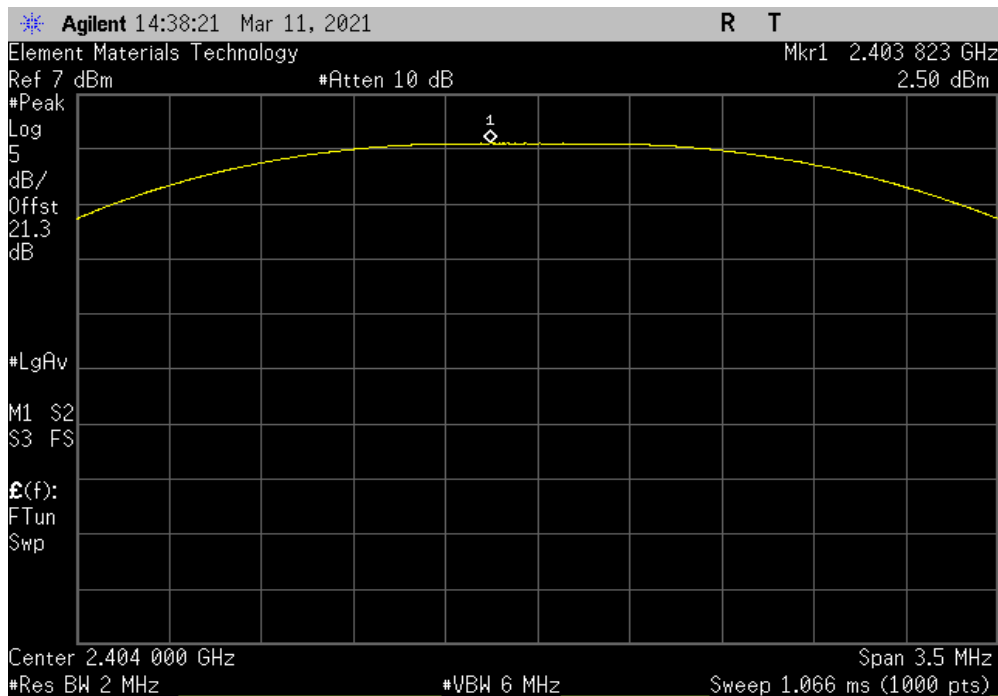


TuTx 2019.08.30.0 XMI 2020.12.30.0

BLE - Advertising, BLE/GFSK 1 Mbps High Channel, 2480 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				2.237	30	Pass



BLE - Data, BLE/GFSK 1 Mbps Low Channel, 2404 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				2.501	30	Pass

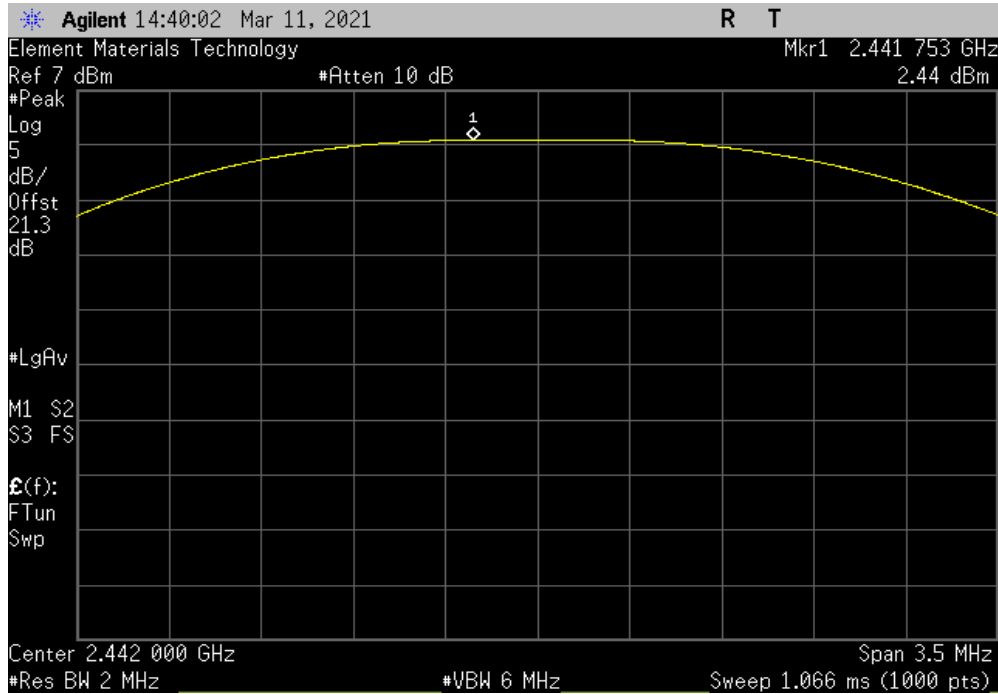


OUTPUT POWER

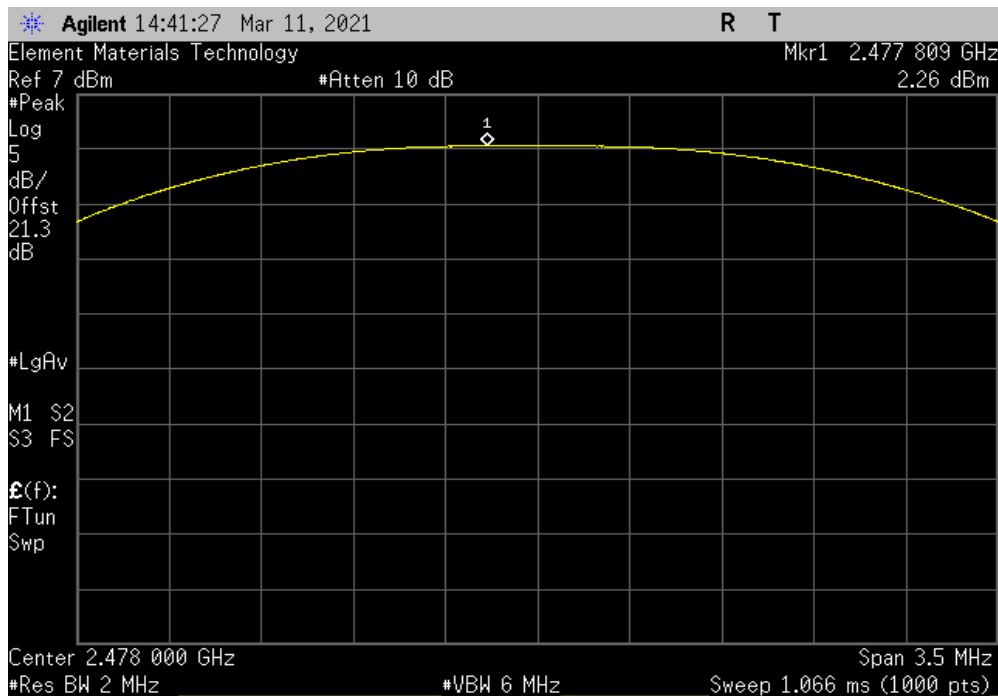


TuTx 2019.08.30.0 XMI 2020.12.30.0

BLE - Data, BLE/GFSK 1 Mbps Mid Channel, 2442 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				2.442	30	Pass



BLE - Data, BLE/GFSK 1 Mbps High Channel, 2478 MHz						
				Out Pwr (dBm)	Limit (dBm)	Result
				2.261	30	Pass



EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



element

XMit 2020.12.30.0

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Generator - Signal	Agilent	E4422B	TGQ	2021-03-24	2024-03-24
Block - DC	Fairview Microwave	SD3379	AMZ	2020-11-04	2021-11-04
Attenuator	S.M. Electronics	SA26B-20	RFW	2021-02-05	2022-02-05
Cable	Micro-Coax	UFD150A-1-0720-200200	MNL	2020-09-14	2021-09-14
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	2020-07-14	2021-07-14

TEST DESCRIPTION

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.

Equivalent Isotropic Radiated Power (EIRP) = Max Measured Power + Antenna gain (dBi)

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)



TelTx 2019.08.30.0 XMI 2020.12.30.0

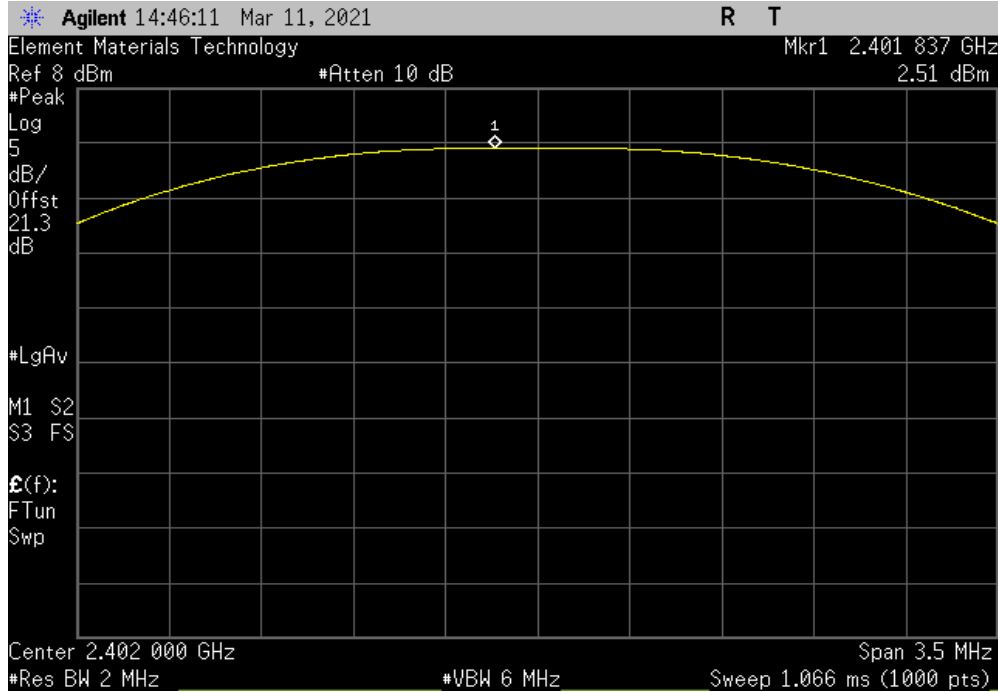
EUT: SOMA3703-32-1780AKIR-A / 1027255 Rev B		Work Order: LGPD0256				
Serial Number: 2420M00120		Date: 11-Mar-21				
Customer: Logic PD, Inc.		Temperature: 23.1 °C				
Attendees: Eric Fritz		Humidity: 30% RH				
Project: None		Barometric Pres.: 1021 mbar				
Tested by: Andrew Rogstad		Power: 120VAC/60Hz				
		Job Site: MN08				
TEST SPECIFICATIONS						
FCC 15.247:2021		Test Method				
		ANSI C63.10:2013				
COMMENTS						
Reference level includes measurement cable, attenuator, and DC block.						
DEVIATIONS FROM TEST STANDARD						
None						
Configuration #	3	Signature <i>Andrew Rogstad</i>				
		Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result
BLE - Advertising						
	BLE/GFSK 1 Mbps Low Channel, 2402 MHz	2.507	4	6.507	36	Pass
	BLE/GFSK 1 Mbps Mid Channel, 2426 MHz	2.484	4	6.484	36	Pass
	BLE/GFSK 1 Mbps High Channel, 2480 MHz	2.237	4	6.237	36	Pass
BLE - Data						
	BLE/GFSK 1 Mbps Low Channel, 2404 MHz	2.501	4	6.501	36	Pass
	BLE/GFSK 1 Mbps Mid Channel, 2442 MHz	2.442	4	6.442	36	Pass
	BLE/GFSK 1 Mbps High Channel, 2478 MHz	2.261	4	6.261	36	Pass

EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

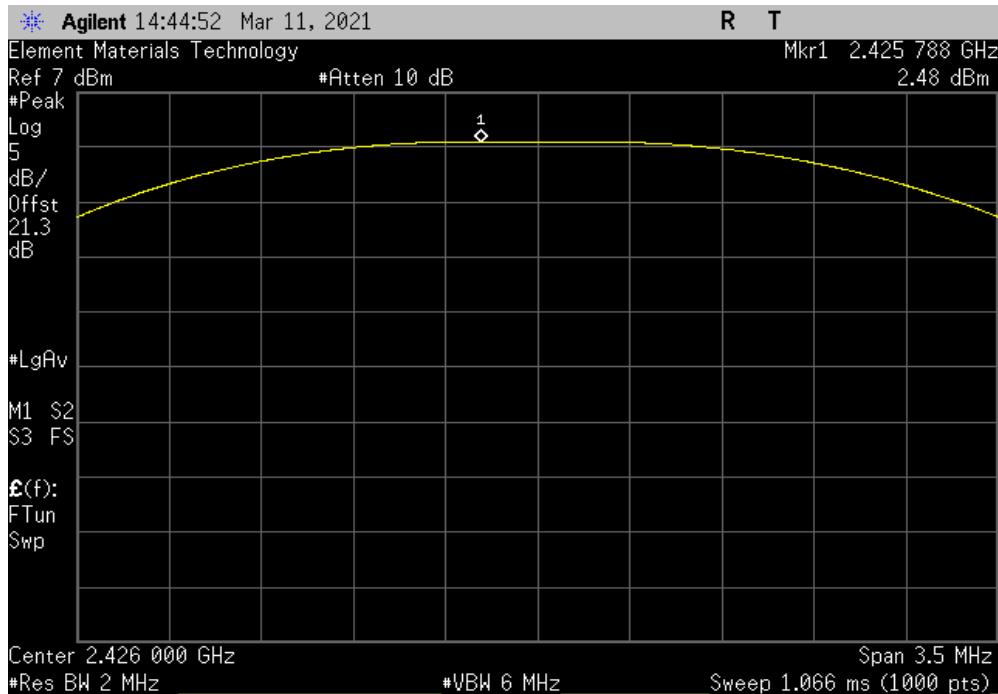


TbTx 2019.08.30.0 XMI 2020.12.30.0

BLE - Advertising, BLE/GFSK 1 Mbps Low Channel, 2402 MHz						
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result	
	2.507	4	6.507	36	Pass	



BLE - Advertising, BLE/GFSK 1 Mbps Mid Channel, 2426 MHz						
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result	
	2.484	4	6.484	36	Pass	

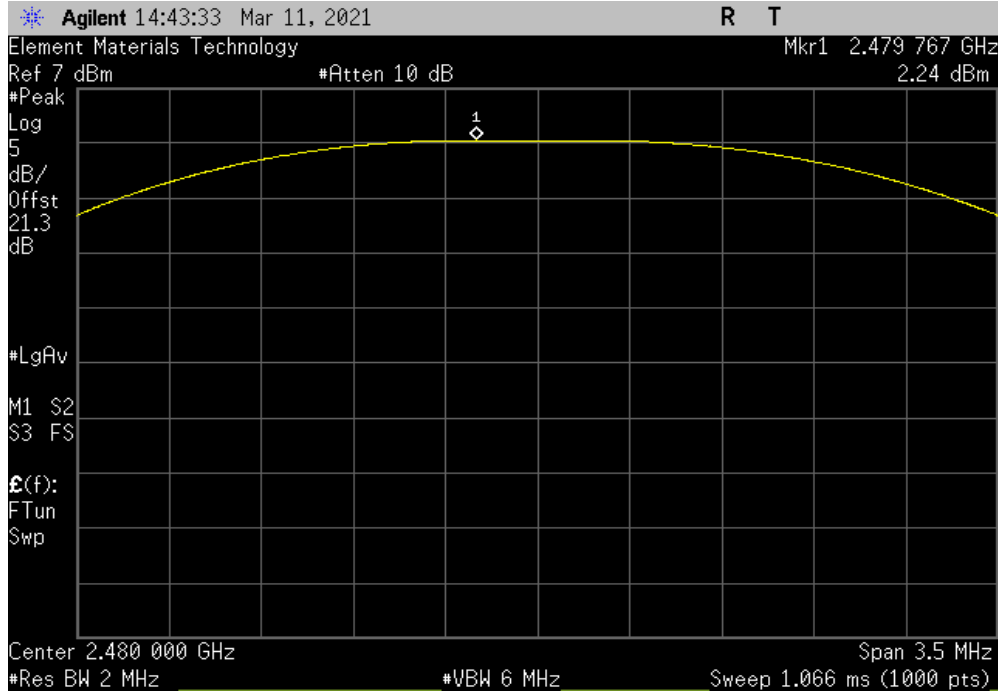


EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

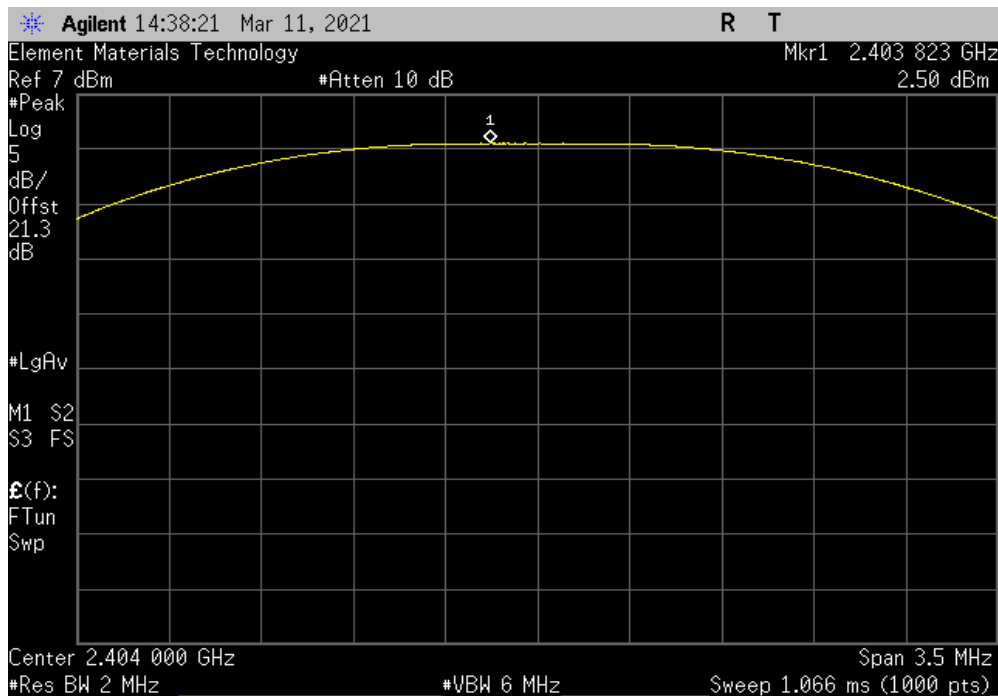


TbTx 2019.08.30.0 XMI 2020.12.30.0

BLE - Advertising, BLE/GFSK 1 Mbps High Channel, 2480 MHz						
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result	
	2.237	4	6.237	36	Pass	



BLE - Data, BLE/GFSK 1 Mbps Low Channel, 2404 MHz						
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result	
	2.501	4	6.501	36	Pass	

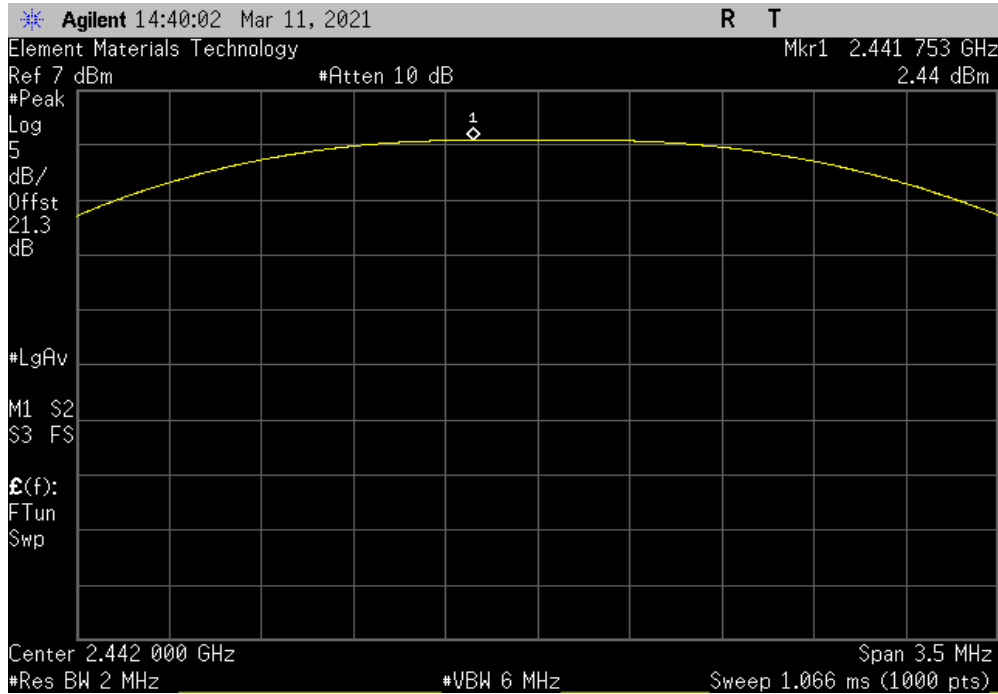


EQUIVALENT ISOTROPIC RADIATED POWER (EIRP)

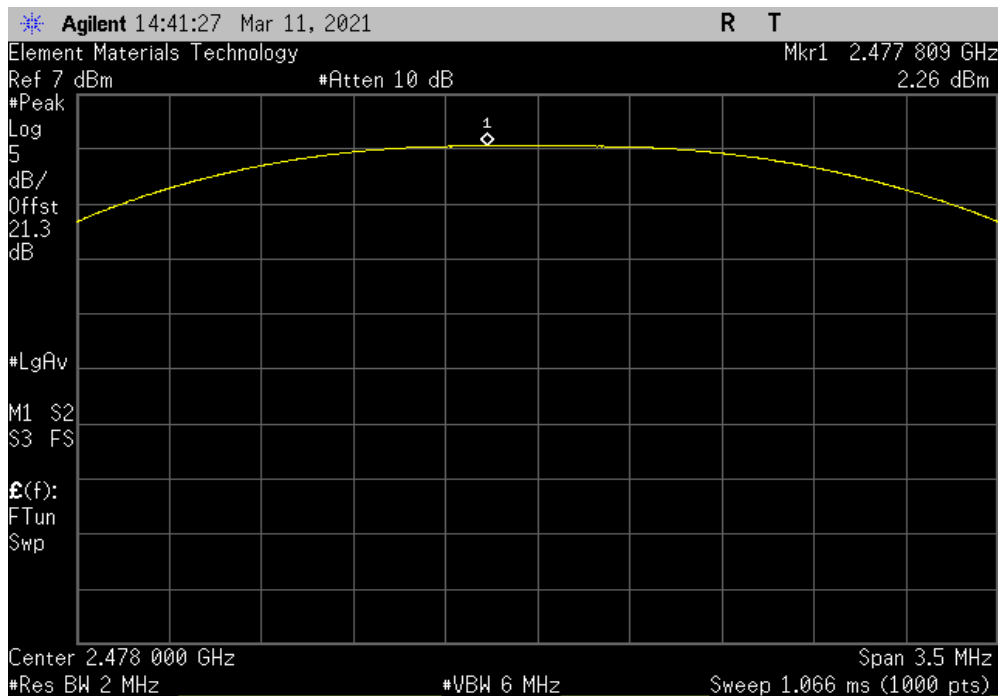


TuTx 2019.08.30.0 XMI 2020.12.30.0

BLE - Data, BLE/GFSK 1 Mbps Mid Channel, 2442 MHz						
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result	
	2.442	4	6.442	36	Pass	



BLE - Data, BLE/GFSK 1 Mbps High Channel, 2478 MHz						
	Out Pwr (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP Limit (dBm)	Result	
	2.261	4	6.261	36	Pass	



End of Test Report