



CMA Testing and Certification Laboratories

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TEST REPORT

Report No. : AW0024543(4) Date : Apr 25, 2018

Application No. : LW005460(4)

Applicant : Origami Group Limited
Unit 913, 9/F., Tower 2, Cheung Sha Wan Plaza,
833 Cheung Sha Wan Road, Kowloon,
Hong Kong

Sample Description :	Sample Description	Model No.
	ORII Voice Assistant Smart Ring	1001

Date Received : February 22, 2018

Test Period : March 8, 2018 – April 18, 2018

Test Method : 47 CFR Part 15 (10-1-17 Edition),
ANSI C63.10 – 2013,
ANSI C63.4 – 2014
KDB 558074 D01 v04

Test Engineer : Mr. Leung Shu Kan, Ken

Conclusion : The submitted sample was found to comply with technical requirement of FCC
Part 15 Subpart C, section 15.247.

For and on behalf of
CMA Industrial Development Foundation Limited

Authorized Signature : _____


Mr. WONG Lap-pong, Andrew
Manager
Electrical Division

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1 Product Information

1.1 General Information

Product Description:	Model:
ORII Voice Assistant Smart Ring	1001

Primary function : Using Bluetooth communication for handfree function with mobile phone

Power supply : DC 3.7V (Li-ion rechargeable battery)
DC 5.0V (Charging docking)

RF related function : Bluetooth communication for handfree function

Electric Accessories sold with : Charging docking

Interconnection cable associated sold with : USB charging cable

Operating condition : Not specified

Model difference : Not applicable

1.2 Technical Information

Operating Frequency : 2402 – 2480MHz

Digital Modulation : FHSS

Modulation : GFSK, $\pi/4$ DQPSK, 8DPSK

Number of Channel : 79 (non-BLE mode)/40 (BLE mode)

Channel Bandwidth : 1MHz (non-BLE mode)/ 2MHz (BLE mode)

Occupied Bandwidth : 1.32MHz (non-BLE mode)/0.73MHz (BLE mode)

Signal Type : Data

Number of Antenna : One

Antenna Type : PCB Type Antenna

Antenna Gain : 1.5dBi

Rated Input Voltage : DC 3.7V (Li-ion rechargeable battery),
DC 5.0V (Charging docking)

RF Technology Used : Bluetooth 4.0+EDR and BLE dual mode

Simplex or Duplex : Half-duplex

Adaptivity : FHSS adaptivity

1.3 Associated Electric Accessories Information

Charging docking with micro usb port

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1.4 Associated Cables

USB cable : Cable Type: USB
Unshielded
Length: 23cm
Without ferrite

2.0 Equipment Units Tested (EUT)

Product Description : ORII Voice Assistant Smart Ring
Model : 1001
Serial No. : Not specified
Sample Type : Production Sample and engineering sample
Sample No. : RW009341-001(7) and RW009341-013(0)
Rationale of selection : Only one model number

3.0 Location of Test Facility

CMA Industrial Development Foundation Ltd.
Room 1302, Yan Hing Centre,
9-13 Wong Chuk Yeung,
Fo Tan, Shatin,
New Territories
Hong Kong.

FCC Accredited Lab (Designation Number: HK0004)
ISED Wireless Test Site (ISED Assigned Code: 4093A)

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4.0 List of test equipment, supporting equipment and cables

4.1 Test equipment

Equipment	Manufacturer	Model No.	Serial No.	Calibration Due Date	Calibration Period
EMI Test Receiver	Rohde & Schwarz	ESCS30	100001	01 Feb 2019	1Year
EMI Test Receiver	Rohde & Schwarz	ESCI	100152	07 Dec 2018	1Year
Spectrum Analyzer	R&S	FSV40	100964	08 Feb 2019	1Year
Spectrum Analyzer	Rohde & Schwarz	FSP30	100628	27 Mar 2019	1Year
Broadband Antenna	Schaffner	CBL6112B	2692	28 Mar 2020	2Years
Loop Antenna	EMCO	6502	00056620	25 Jan 2020	2Years
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-531	21 Dec 2018	2Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9718	9718-119	21 Dec 2018	2Years
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170442	02 Aug 2018	2Years
Broadband Pre-Amplifier	Schwarzbeck	BBV 9719	9719-010	02 Aug 2018	2Years
Coaxial Cable	Schaffner	RG 213/U	N/A	18 May 2018	1Year
Coaxial Cable	Suhner	RG 214/U	N/A	18 May 2018	1Year
Coaxial Cable	Suhner	Sucoflex_104	N/A	21 Dec 2018	1Year
LISN	Rohde & Schwarz	ENV216	101323	16 Jan 2019	1Year
Coaxial Cable	Tyco Electronics	RG 58C/U	N/A	24 Oct 2018	1Year
Rohde & Schwarz TS8997 Testing System					
Spectrum Analyzer	Rohde & Schwarz	FSV 40	101190	09 Aug 2018	1Year
Vector Generator	Rohde & Schwarz	SMBV100A	262024	09 Aug 2018	1Year
Generator	Rohde & Schwarz	SMB100A	103230	09 Aug 2018	1Year
OSP	Rohde & Schwarz	OSP	OSP120 V02	09 Aug 2018	1Year

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4.2 Supporting equipment

Equipment Name	Manufacturer	Model	Serial	Provided by
Test control board*	CSR	CSR USB-SPI	Not labelled	Applicant
AC/DC adaptor	Apple	A1299	Not specified	CMA

Remark: *only used for configure engineering mode

4.3 Cables

Cable Type	Length	Shielding	Ferrite used	Provided by
USB Cable*	1.62m	shielded	Two ferrite	Applicant

Remark: *only used for configure engineering mode

4.4 Software

Software Name	Version	Function	Provided by
CSR Bluetooth Test3	V2.6.8	Configure Engineering mode	Applicant

Remark: *only used for configure engineering mode

5.0 Measurement Uncertainty

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%.

Radiated emissions

Frequency	Uncertainty (U_{lab})
30MHz ~ 200MHz (Horizontal)	4.59dB
30MHz ~ 200MHz (Vertical)	4.49dB
200MHz ~ 1000MHz (Horizontal)	4.94dB
200MHz ~ 1000MHz (Vertical)	4.97dB
1GHz ~ 6GHz	4.52dB
6GHz ~ 18GHz	4.58dB

Line-conducted emissions

Frequency	Uncertainty (U_{lab})
150kHz~30MHz	2.80dB

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6.0 Measurement

6.1 General Test condition

Temperature : 24.5°C
Test Voltage : DC3.7V and AC 120V, 60Hz (for conducted emission)
Humidity : 69.2%
Atmosphere Pressure : 101.3kPa

6.2 Band-edge measurement

6.2.1 Measurement

Requirement : FCC Part 15 §15.247(d)
Measuring procedure : ANSI C63.10:2013, section 11.13, KDB 558074 D01 v04
Hopping mode : Enabled and Disable
RBW : 100kHz
VBW : 300kHz
Frequency range : 2310 – 2483.5MHz and 2400 – 2500MHz
Modulation tested : GFSK
Channel tested for non-hopping mode : 2402MHz for lowed band edge and 2480MHz for higher band edge
Additional measuring procedure : For lower band edge (2400MHz)
1. Using the “Measurement 1” setting shown below the scan plot within the frequency span from 2400 – 2483.5MHz to measure the maximum peak value of fundamental
2. Using the “Measurement 2” setting shown below the scan plot within the frequency span from 2310 – 2400MHz to measure the bandedge reading
3. Compare that reading in procedure with the limit which equal to the measured maximum peak in procedure 1 minus 20dB
For Upper bandedge (2483.5MHz)
1. Using the “Measurement 1” setting shown below the scan plot within the frequency span from 2400 – 2483.5MHz to measure the maximum peak value of fundamental
2. Using the “Measurement 2” setting shown below the scan plot within the frequency span from 2483.5 – 2500MHz to measure the bandedge reading
3. Compare that reading in procedure with the limit which equal to the measured maximum peak in procedure 1 minus 20dB

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6.2.2 Final Result

Bandedge frequency for lower bandedge (Worst Case)	Worst case (dBc) ²	Detector	Limit ¹ (dBc)	Result	Worst case
2399.925042MHz	52.3	Peak	≥ 20.0	PASS	GFSK
Bandedge frequency for higher bandedge (Worst Case)	Worst case in (dBc) ²	Detector	Limit ¹	Result	Worst case
2483.524924MHz	63.0	Peak	≥ 20.0	PASS	GFSK

Remark: 1) The limit is based on the transmitter demonstrated compliance with peak conducted power limit on section 6.3.2 of this report.

2) The Worst case dBc is the peak values measured in procedure 1 minus the worst case bandedge emission

3) Detail test result and equipment setting refer to appendix A5-6, A13-14

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6.3 Output Power

6.3.1 Measurement

Requirement : FCC Part 15 §15.247(b) (3)
Measuring procedure : ANSI C63.10:2013, section 11.9.1.3, KDB 558074 D01 v04
Hopping mode : Disable
Modulation tested : GFSK
Channel tested for non-hopping mode : 2402MHz, 2440MHz, 2480MHz
Additional measuring procedure : Nil
Remark :

6.3.2 Final Result

(a) Maximum peak conducted output power

Maximum peak conducted output power	Limit(s) ¹	Result	Modulation
7.0dBm	≤30.0dBm	PASS	GFSK

Remark: 1) Detail test result and equipment setting refer to appendix A2, A7, A10



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6.4 Spectral Power Density

6.4.1 Measurement

Requirement : FCC Part 15 §15.247(e)
Measuring procedure : ANSI C63.10:2013, section 11.10 and section 11.10.2,
KDB 558074 D01 v04
Hopping mode : Disable
Modulation tested : GFSK
Channel tested for non-
hopping mode : 2402MHz, 2440MHz, 2480MHz
Additional measuring
procedure : Nil
Remark :

6.4.2 Final Result

(a) Maximum peak conducted output power

Maximum peak spectral power density	Limit(s) ¹	Result	Modulation
-12.183dBm/3kHz	≤8.0dBm/3kHz	PASS	GFSK

Remark: 1) Detail test result and equipment setting refer to appendix A3, A8, A11



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6.5 6dB Bandwidth

6.5.1 Measurement

Requirement : FCC Part 15 §15.247(a)(2)
Measuring procedure : ANSI C63.10:2013, section 11.8.2, KDB 558074 D01 v04
Hopping mode : Disable
Modulation tested : GFSK
Channel tested for non-hopping mode : 2402MHz, 2440MHz, 2480MHz
Additional measuring procedure : Nil
Remark :

6.5.2 Final Result

20dB bandwidth	Modulation
0.725490MHz	GFSK

Remark: 1) Detail test result and equipment setting refer to appendix A4, A9, A12

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6.6 Conducted Spurious emission (Transmitter)

6.6.1 Measurement

Requirement	: FCC Part 15 §15.247(d)
Measuring procedure	: ANSI C63.10:2013, section 11.12.2.1, KDB 558074 D01 v04
Hopping mode	: Disable
RBW	: Refer to pre-measurement and final measurement setting
Detector	: Refer to pre-measurement and final measurement setting
Modulation tested	: GFSK ¹
Packet Type tested	: DH5 ²
Channel tested for non-hopping mode	: 2402MHz, 2440MHz, 2480MHz
Additional measuring procedure	: 1) Setup engineering sample to channel 2402MHz to perform the measurement according to ANSI C63.10, section 7.8.8 with pre-measurement setting 2) If the pre-measurement is over the limit, the final measurement is performed for the specific frequency according to final measurement setting or restricted band frequency 3) For non-restricted band frequency, peak detector and 100kHz RBW will be used for final measurement. 4) Repeat the procedure 1 to 3 for channel frequency of 2441MHz and 2480MHz

Remark :

6.6.2 Final Result

Worst case spurious emission frequency	Worst case spurious emission power ¹	Limit ²	Margin	Result	Worst case mode
2483.749972MHz	-45.0dBm	-41.2dBm	3.8dB	PASS	GFSK

Remark: 1) Spurious emission power = measured conducted power + antenna gain(dBi) + ground reflection factor according to ANSI C63.10 section 11.12.2.2 for restricted band emission.

2) For restricted band emission, limit = restricted band field strength limit (dBuV/m) + 4.7dB – 104.8dB according to ANSI C63.10 section 11.12.2.2 For non-restricted band, limit = SPD/100kHz – 20dB.

3) Detail test result and equipment setting refer to appendix A15-23

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6.7 Radiated Spurious emission (Transmitter)

6.7.1 Measurement

The equipment under test (EUT) was placed on a non-conductive turntable with dimensions of 1.5m x 0.4m and 0.8m high above the ground for below 1GHz measurement and 1.5m high above the ground for above 1GHz measurement. 3m from the EUT, a broadband antenna mounting on the mast received the signal strength. The turntable was rotated to maximize the emission level. The antenna was then moving along the mast from 1m up to 4m until no more higher value was found. Both horizontal and vertical polarization of the antenna were placed and investigated.

For below 30MHz, a loop antenna with its vertical plane is placed 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1 m above the ground.

For 30MHz to 300MHz, biconical antenna with its vertical and horizontal plane is placed 3m from the EUT and rotated about its vertical and horizontal axis for maximum response at each azimuth about the EUT. And the reference point of antenna shall be 1 m above the ground. Same procedure for frequency 300MHz to 1000MHz but Log-periodic antenna is used for final measurements.

For above 1GHz, horn antenna with its vertical and horizontal plane is placed 3m from the EUT and rotated about its vertical and horizontal axis for maximum response at each azimuth about the EUT. Preamplifier and High Pass filter was used for measurements. The reference point of antenna shall be 1 m above the ground.

The device was rotated through three X, Y, Z orthogonal to determine which attitude and configuration produce the highest emission during measurement for Radiated Emission measurement.

The Frequencies from fundamental up to the tenth harmonics were investigated, and emissions more 20dB below limit were not reported.

BLE hopping is selected as worst case mode for spurious radiated emission test from cabinet.

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6.7.2 Final Result

a) Test mode: BLE hopping

Polarization	Frequency (MHz)	Reading at 3m (dBμV)	Transducer Factor (dB/m)	Field Strength at 3m ¹ (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)	Detector (PK/QP/AV)
V	*2390.000	44.7	-6.7	38.0	54.0	-16.0	PK
V	2400.000	72.6	-4.7	67.9	74.0	-6.1	PK
V	2400.000	52.9	-4.7	48.2	54.0	-5.8	AV
V	2483.500	62.3	-4.7	57.6	74.0	-16.4	PK
V	2483.500	43.1	-4.7	38.4	54.0	-15.6	AV
V	*2500.000	40.0	-4.7	35.3	54.0	-18.7	PK
H	4804.468	55.3	2.3	57.6	74.0	-16.4	PK
H	4803.916	40.5	2.3	42.8	54.0	-11.2	AV
H	4879.460	55.3	2.3	57.6	74.0	-16.4	PK
H	4879.928	40.5	2.3	42.8	54.0	-11.2	AV
H	4959.396	51.5	2.8	54.3	74.0	-19.7	PK
H	4959.932	38.0	2.8	40.8	54.0	-13.2	AV
V	*7205.288	40.2	9.6	49.8	54.0	-4.2	PK
V	*7319.194	43.9	9.6	53.5	54.0	-0.5	PK
V	*7439.132	41.8	9.6	51.4	54.0	-2.6	PK

Remark: 1) Field Strength = Reading + transducer factor.

2) Other emission with more than 20dB margin are not reported in this report.

3) * Since the peak values of emission are below the average limit, no average value is measured for average limit.

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6.8 Conducted Emission

6.8.1 Measurement

Requirement : FCC Part 15 §15.207(a)
Measuring procedure : ANSI C63.4:2014, section 7.3
Test mode : charging mode
RBW : 9kHz
VBW : 30kHz
Modulation tested : GFSK
Packet Type tested : DH5
Additional measuring procedure : Nil
Remark : Nil

6.8.2 Final Result

Worst case conducted emission frequency	Worst case conducted emission	Limit	Margin	Detector	Lines	Worst case mode	Result
0.5135MHz	35.77dBμV	45.99dBμV	-10.22dB	AV	N	Charging	PASS

Remark: 1) Detail test result and equipment setting refer to appendix A24-26

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APPENDIX A Test Result

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FCC Part 47 §15.247 2400-2483.5 MHz 2015

Hardware Setup: WMS Measurements\WMS Hardware Setup

Spectrum Analyzer: SA FSV 40 (SA FSV 40) @ VISA (ADR
TCPIP::192.168.48.148::INST0::INSTR), SN
1321.3008K39/101190, FW 2.30 SP4

Vector Generator: VG SMBV100A (VG SMBV100A) @ VISA (ADR
TCPIP::192.168.48.149::INST0::INSTR), SN 262024, FW 5.1.0

Generator: SMB100A (SMB100A) @ VISA (ADR
TCPIP::192.168.48.152::INST0::INSTR), SN 103230, FW Rev
2.20.1, 08/2012, CVI 2009

OSP: TS8997 OSP (OSP) @ VISA (ADR
TCPIP::192.168.48.147::INST0::INSTR), SN OSP120 V02,
101611, FW 2.55.150506

Power Meter: OSP-B157 Power Meter (OSP-B157 Power Meter) @ USB (ADR
20), SN 27873972, FW 3.1

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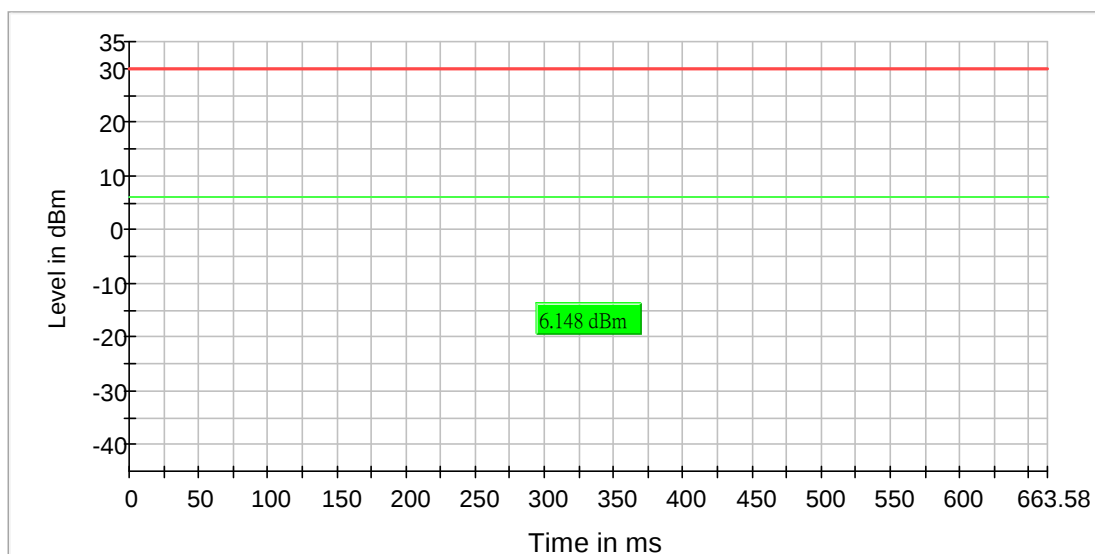
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RF output power (2402 MHz; GFSK)

Result

DUT Frequency (MHz)	Gated (dBm)	Limit Max (dBm)	DutyCycle (%)	Result
2402.000000	6.1	30.0	66.400	PASS



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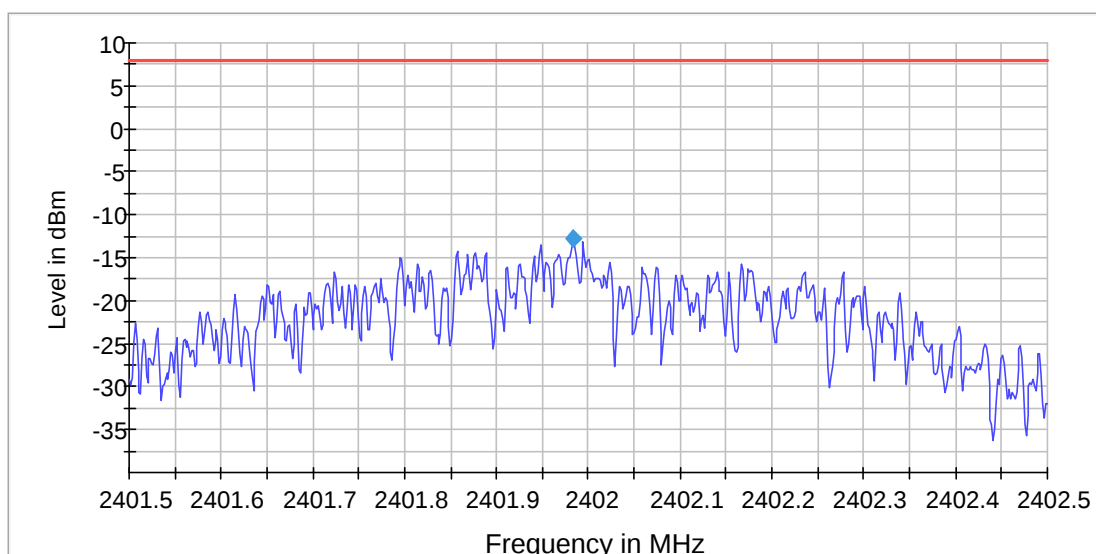
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Power Spectral Density (2402 MHz; GFSK)

Result

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2402.000000	2401.984281	-12.810	8.0	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.40150 GHz	2.40150 GHz
Stop Frequency	2.40250 GHz	2.40250 GHz
Span	1.000 MHz	1.000 MHz
RBW	3.000 kHz	<= 3.000 kHz
VBW	10.000 kHz	>= 9.000 kHz
SweepPoints	667	~ 667
SweepTime	667.000 ms	667.000 ms
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	RMS	RMS
SweepCount	1	1
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	3 / max. 150	max. 150
Stable	3 / 3	3

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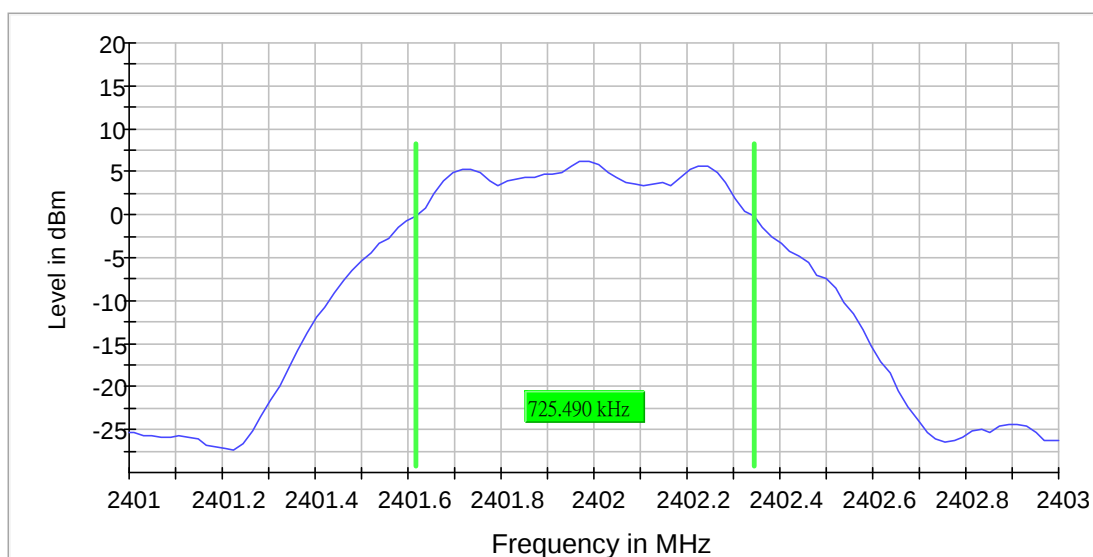
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Minimum Emission Bandwidth 6 dB (2402 MHz; GFSK)

6 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2402.000000	0.725490	0.500000	---	2401.617647	2402.343137	6.2	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.40100 GHz	2.40100 GHz
Stop Frequency	2.40300 GHz	2.40300 GHz
Span	2.000 MHz	2.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	101	~ 20
SweepTime	18.938 μ s	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	20 / max. 150	max. 150
Stable	15 / 15	15

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Band Edge low (2402 MHz; GFSK)

Result

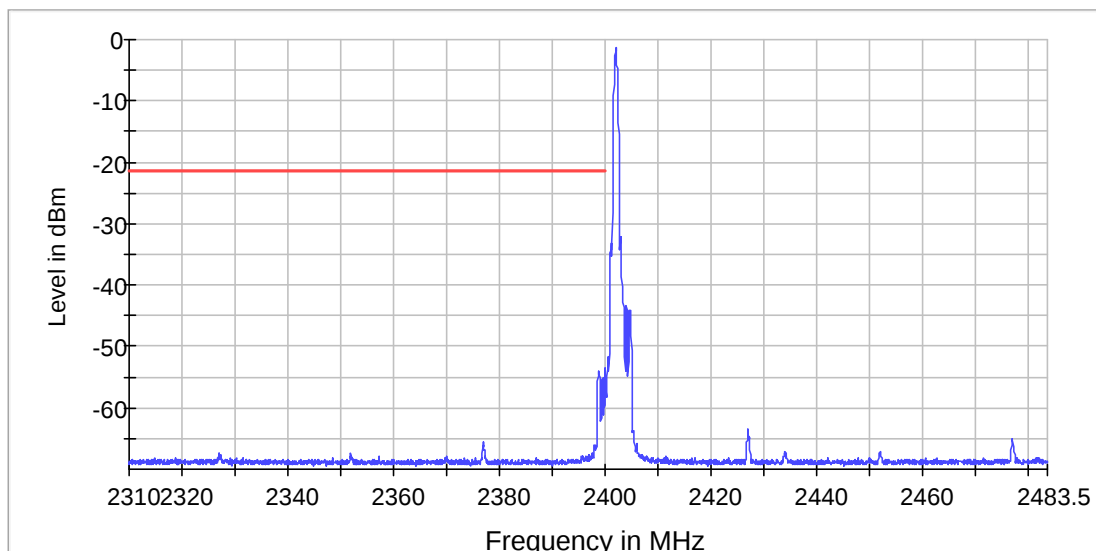
DUT Frequency (MHz)	Result
2402.000000	PASS

Inband Peak

Frequency (MHz)	Level (dBm)
2401.973818	-1.3

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.925042	-53.7	32.3	-21.3	PASS
2398.775680	-54.1	32.7	-21.3	PASS
2398.725708	-54.1	32.8	-21.3	PASS
2398.675736	-54.4	33.1	-21.3	PASS
2398.625763	-54.6	33.2	-21.3	PASS
2398.825652	-54.7	33.4	-21.3	PASS
2398.575791	-54.8	33.5	-21.3	PASS
2399.475292	-55.1	33.8	-21.3	PASS
2398.875625	-55.2	33.9	-21.3	PASS
2399.425319	-55.3	34.0	-21.3	PASS
2398.525819	-55.6	34.3	-21.3	PASS
2398.925597	-56.3	34.9	-21.3	PASS
2399.875069	-56.3	34.9	-21.3	PASS
2399.525264	-56.3	34.9	-21.3	PASS
2399.375347	-56.7	35.4	-21.3	PASS



FCC ID: 2AOJQ1001



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TEST REPORT

Report No. : AW0024543(4)

Date : Apr 25, 2018

Measurement 1

Setting	Instrument Value	Target Value
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	1.670 s	1.670 s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	RMS	RMS
SweepCount	3	3
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	3 / max. 15	max. 15
Stable	3 / 3	3

Measurement 2

Setting	Instrument Value	Target Value
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1800	~ 1800
SweepTime	1.800 s	1.800 s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	RMS	RMS
SweepCount	3	3
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	3 / max. 15	max. 15
Stable	3 / 3	3

FCC ID: 2AOJQ1001



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TEST REPORT

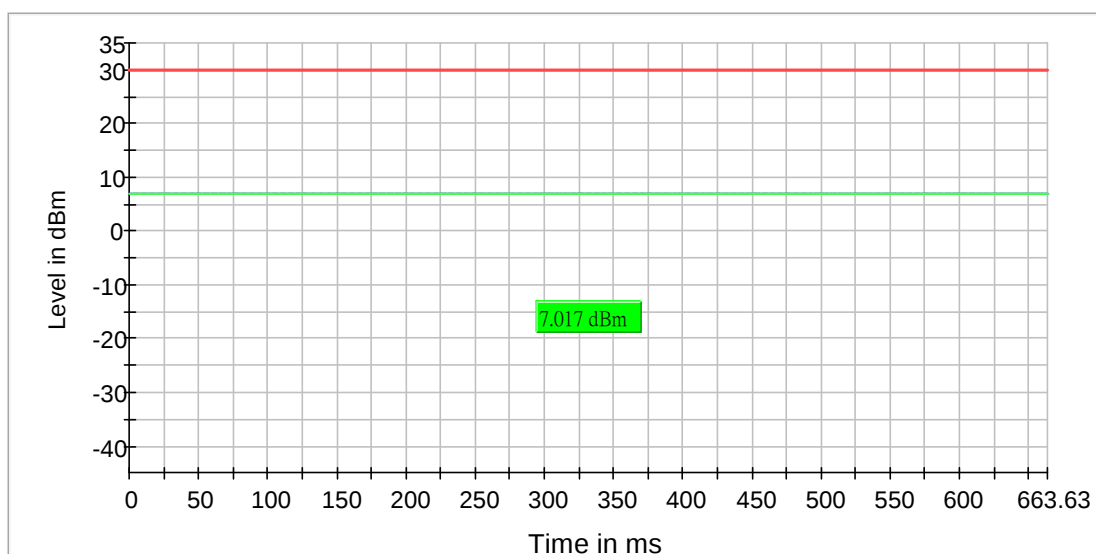
Report No. : AW0024543(4)

Date : Apr 25, 2018

RF output power (2440 MHz; GFSK)

Result

DUT Frequency (MHz)	Gated (dBm)	Limit Max (dBm)	Duty Cycle (%)	Result
2440.000000	7.0	30.0	66.405	PASS



FCC ID: 2AOJQ1001



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TEST REPORT

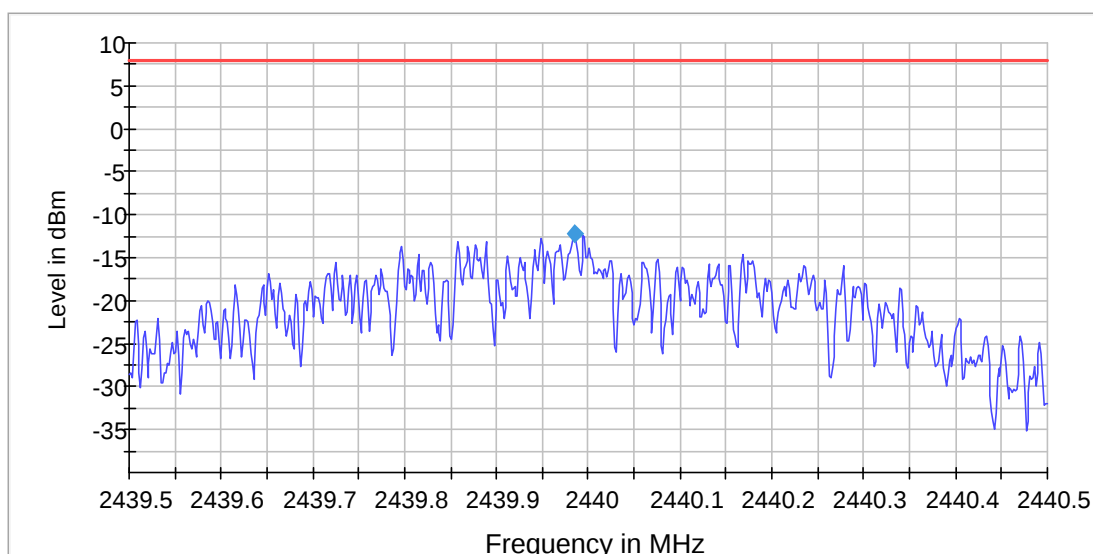
Report No. : AW0024543(4)

Date : Apr 25, 2018

Power Spectral Density (2440 MHz; GFSK)

Result

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2440.000000	2439.985778	-12.183	8.0	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.43950 GHz	2.43950 GHz
Stop Frequency	2.44050 GHz	2.44050 GHz
Span	1.000 MHz	1.000 MHz
RBW	3.000 kHz	<= 3.000 kHz
VBW	10.000 kHz	>= 9.000 kHz
SweepPoints	667	~ 667
SweepTime	667.000 ms	667.000 ms
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	RMS	RMS
SweepCount	1	1
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	3 / max. 150	max. 150
Stable	3 / 3	3

FCC ID: 2A0JQ1001



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TEST REPORT

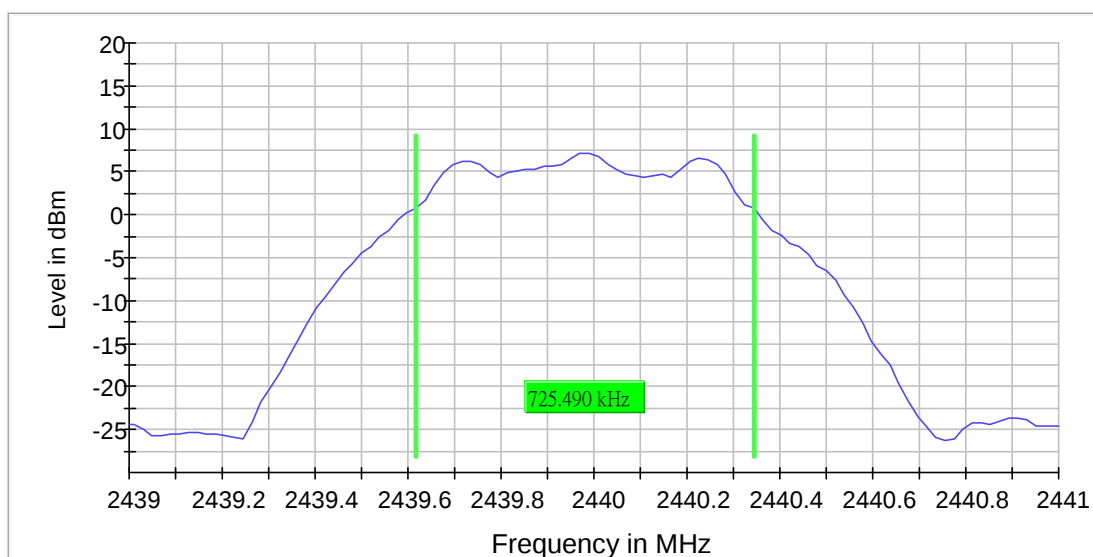
Report No. : AW0024543(4)

Date : Apr 25, 2018

Minimum Emission Bandwidth 6 dB (2440 MHz; GFSK)

6 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2440.000000	0.725490	0.500000	---	2439.617647	2440.343137	7.1	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.43900 GHz	2.43900 GHz
Stop Frequency	2.44100 GHz	2.44100 GHz
Span	2.000 MHz	2.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	101	~ 20
SweepTime	18.938 μ s	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	20 / max. 150	max. 150
Stable	15 / 15	15

FCC ID: 2A0JQ1001



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TEST REPORT

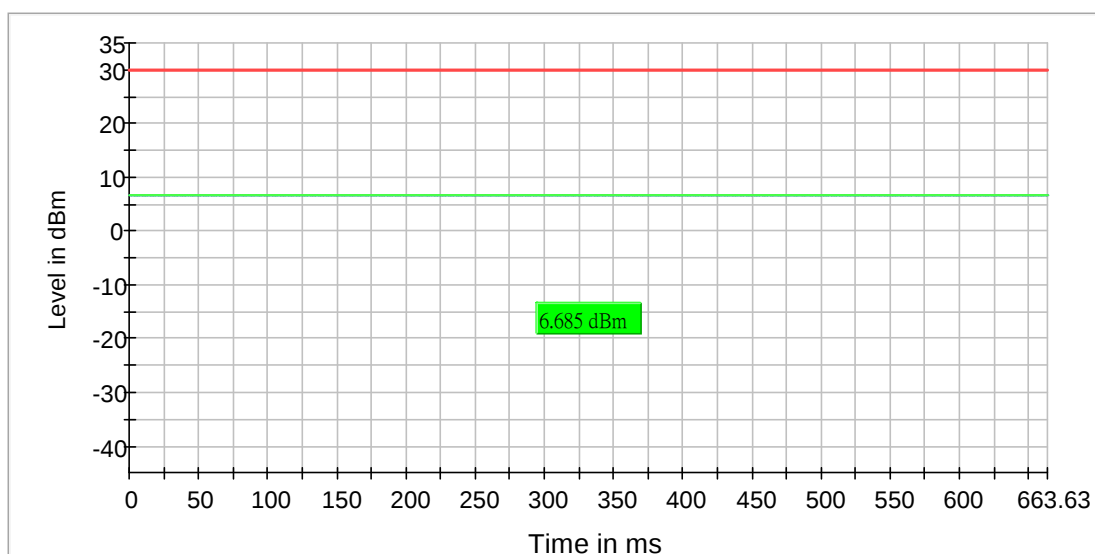
Report No. : AW0024543(4)

Date : Apr 25, 2018

RF output power (2480 MHz; GFSK)

Result

DUT Frequency (MHz)	Gated (dBm)	Limit Max (dBm)	Duty Cycle (%)	Result
2480.000000	6.7	30.0	66.405	PASS



FCC ID: 2AOJQ1001



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TEST REPORT

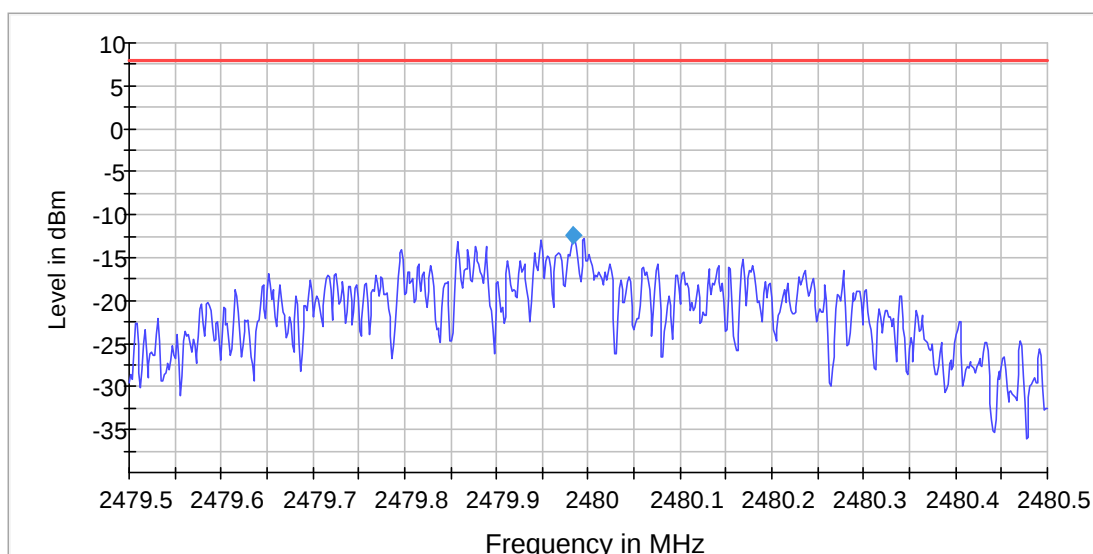
Report No. : AW0024543(4)

Date : Apr 25, 2018

Power Spectral Density (2480 MHz; GFSK)

Result

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2480.000000	2479.984281	-12.479	8.0	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47950 GHz	2.47950 GHz
Stop Frequency	2.48050 GHz	2.48050 GHz
Span	1.000 MHz	1.000 MHz
RBW	3.000 kHz	<= 3.000 kHz
VBW	10.000 kHz	>= 9.000 kHz
SweepPoints	667	~ 667
SweepTime	667.000 ms	667.000 ms
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	RMS	RMS
SweepCount	1	1
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	3 / max. 150	max. 150
Stable	3 / 3	3

FCC ID: 2AOJQ1001



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TEST REPORT

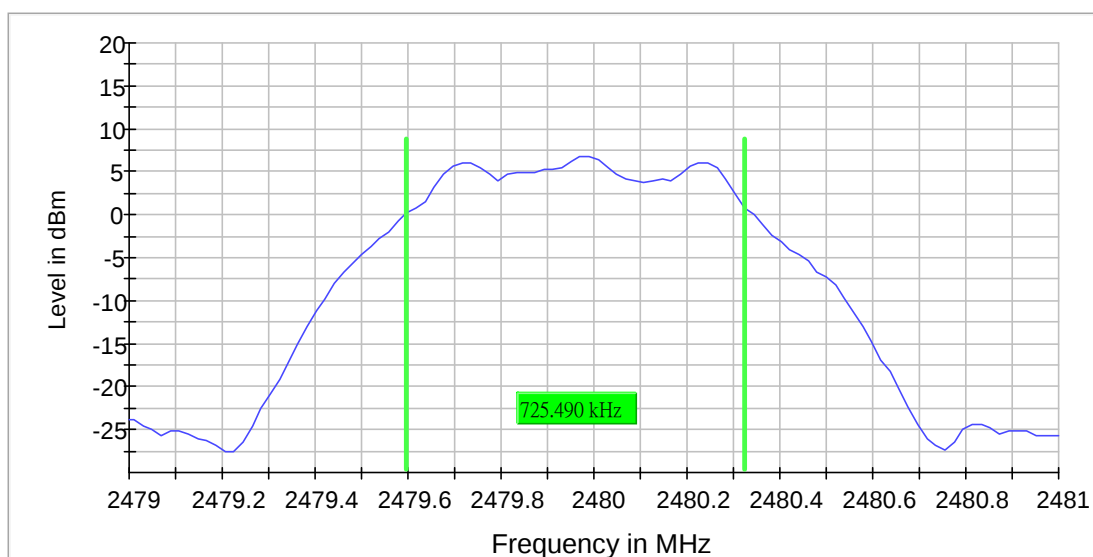
Report No. : AW0024543(4)

Date : Apr 25, 2018

Minimum Emission Bandwidth 6 dB (2480 MHz; GFSK)

6 dB Bandwidth

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2480.000000	0.725490	0.500000	---	2479.598039	2480.323529	6.8	PASS



Measurement

Setting	Instrument Value	Target Value
Start Frequency	2.47900 GHz	2.47900 GHz
Stop Frequency	2.48100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz
RBW	100.000 kHz	~ 100.000 kHz
VBW	300.000 kHz	~ 300.000 kHz
SweepPoints	101	~ 20
SweepTime	18.938 μ s	AUTO
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	FFT	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	20 / max. 150	max. 150
Stable	15 / 15	15

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Band Edge high (2480 MHz; GFSK)

Result

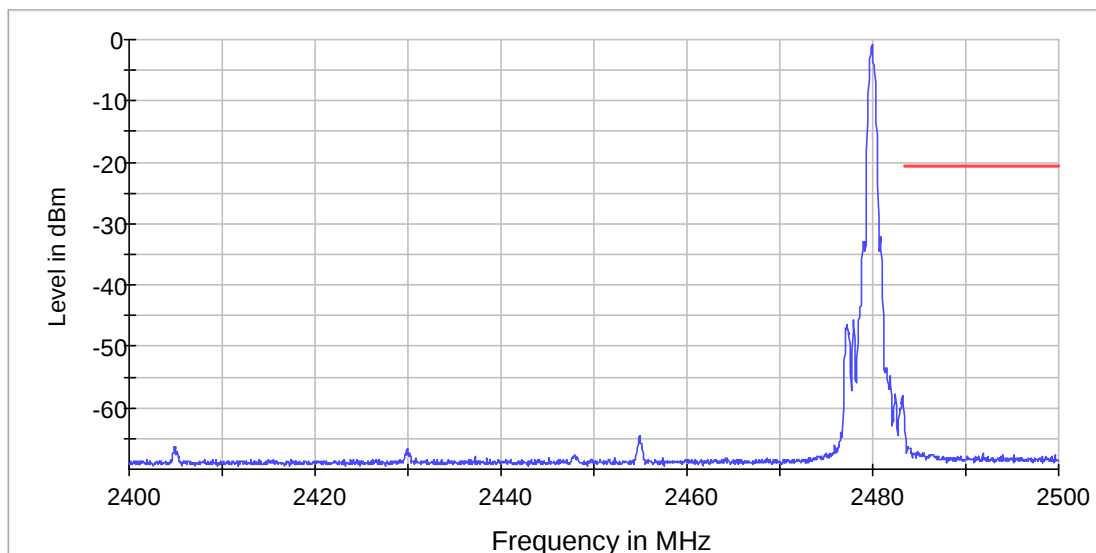
DUT Frequency (MHz)	Result
2480.000000	PASS

Inband Peak

Frequency (MHz)	Level (dBm)
2479.927139	-0.7

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.524924	-63.7	43.0	-20.7	PASS
2483.574773	-65.2	44.5	-20.7	PASS
2483.824018	-66.4	45.7	-20.7	PASS
2484.023414	-66.6	45.9	-20.7	PASS
2483.973565	-66.6	45.9	-20.7	PASS
2484.073263	-66.7	45.9	-20.7	PASS
2483.923716	-66.7	45.9	-20.7	PASS
2483.873867	-66.7	46.0	-20.7	PASS
2483.724320	-66.7	46.0	-20.7	PASS
2483.774169	-66.7	46.0	-20.7	PASS
2483.624622	-66.8	46.0	-20.7	PASS
2484.222810	-67.1	46.4	-20.7	PASS
2484.771148	-67.1	46.4	-20.7	PASS
2484.123112	-67.2	46.4	-20.7	PASS
2483.674471	-67.3	46.5	-20.7	PASS



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TEST REPORT

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Date : Apr 25, 2018

Measurement 1

Setting	Instrument Value	Target Value
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	1670	~ 1670
SweepTime	1.670 s	1.670 s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	RMS	RMS
SweepCount	3	3
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	3 / max. 15	max. 15
Stable	3 / 3	3

Measurement 2

Setting	Instrument Value	Target Value
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	330	~ 330
SweepTime	330.000 ms	330.000 ms
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	AUTO
Detector	RMS	RMS
SweepCount	3	3
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	3 / max. 15	max. 15
Stable	3 / 3	3

FCC ID: 2AOJQ1001



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TEST REPORT

Report No. : AW0024543(4)

Date : Apr 25, 2018

Tx Spurious Emission (2402 MHz; GFSK)

Result

DUT Frequency (MHz)	Result
2402.000000	PASS

Final measurements

Frequency (MHz)	Level Pre Measurement (dBm)	level (dBm)	Limit (dBm)	Margin (dB)	Result
---	---	---	---	---	---

Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
4804.493054	-48.5	7.3	-41.2
4803.493165	-48.6	7.3	-41.2
4803.993109	-48.6	7.3	-41.2
4804.992999	-49.1	7.9	-41.2
4802.993220	-49.7	8.4	-41.2
4805.492943	-55.1	13.9	-41.2
2251.802928	-55.4	14.2	-41.2
2252.302749	-55.4	14.2	-41.2
4802.493275	-55.8	14.5	-41.2
2251.303106	-55.8	14.5	-41.2
2252.802571	-56.7	15.5	-41.2
12011.233673	-57.3	16.1	-41.2
2277.293824	-57.4	16.1	-41.2
2276.794002	-57.4	16.1	-41.2
12011.827386	-57.8	16.5	-41.2

Measurement Settings

Start Frequency (MHz)	Stop Frequency (MHz)	Pre Measurement	Final Measurement
30.000000	1000.000000	1	1
1000.000000	2400.000000	2	2
2400.000000	2483.500000	2	2
2483.500000	7000.000000	2	2
7000.000000	26000.000000	2	2

FCC ID: 2AOJQ1001



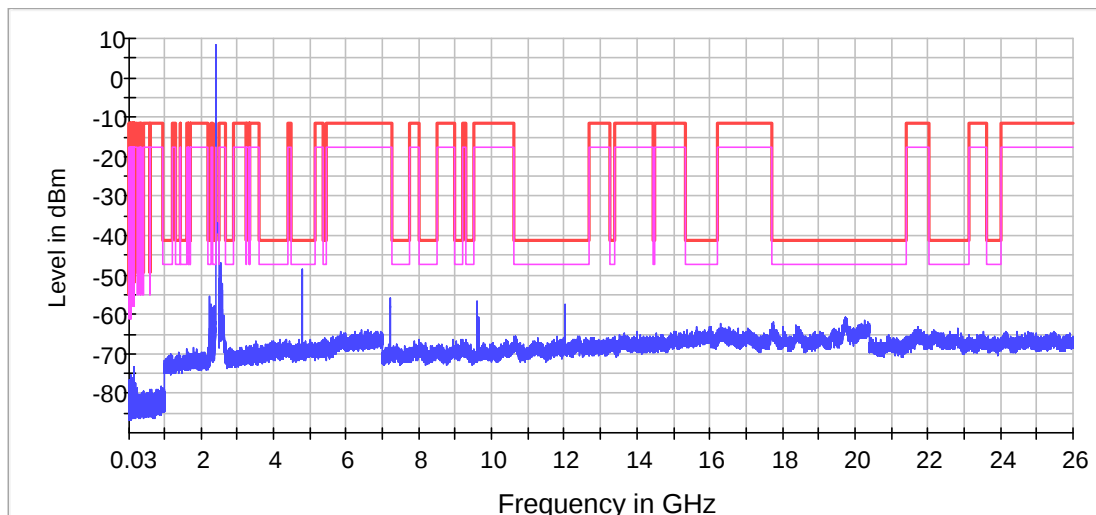
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TEST REPORT

Report No. : AW0024543(4)

Date : Apr 25, 2018



× Limit [limit.Result:1] × Sum Level [trace.Result:1]

Pre Measurement 1

Setting	Instrument Value	Target Value
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	19400	~ 19400
SweepTime	19.400 ms	AUTO
Reference Level	-30.000 dBm	-30.000 dBm
Attenuation	0.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	30	30
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	3 / max. 150	max. 150
Stable	3 / 3	3

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Date : Apr 25, 2018

Pre Measurement 2

Setting	Instrument Value	Target Value
RBW	1.000 MHz	<= 1.000 MHz
VBW	3.000 MHz	>= 3.000 MHz
SweepPoints	2800	~ 2800
SweepTime	2.800 ms	AUTO
Reference Level	-30.000 dBm	-30.000 dBm
Attenuation	0.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	30	30
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	3 / max. 150	max. 150
Stable	3 / 3	3

FCC ID: 2AOJQ1001



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TEST REPORT

Report No. : AW0024543(4)

Date : Apr 25, 2018

Tx Spurious Emission (2440 MHz; GFSK)

Result

DUT Frequency (MHz)	Result
2440.000000	PASS

Final measurements

Frequency (MHz)	Level Pre Measurement (dBm)	level (dBm)	Limit (dBm)	Margin (dB)	Result
4880.484641	-46.5	-52.0	-41.2	10.8	PASS

Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
4880.484641	-46.5	5.2	-41.2
4879.484752	-46.6	5.3	-41.2
4879.984697	-46.8	5.5	-41.2
4880.984586	-47.2	6.0	-41.2
4878.984807	-47.7	6.4	-41.2
7320.901819	-52.0	10.8	-41.2
4881.484531	-52.7	11.4	-41.2
7321.495532	-53.0	11.7	-41.2
7320.308106	-53.1	11.9	-41.2
7319.714393	-53.5	12.3	-41.2
7319.120680	-53.6	12.4	-41.2
4878.484863	-54.1	12.8	-41.2
2290.289182	-54.1	12.9	-41.2
2289.789361	-54.1	12.9	-41.2
2288.289896	-54.4	13.2	-41.2

Measurement Settings

Start Frequency (MHz)	Stop Frequency (MHz)	Pre Measurement	Final Measurement
30.000000	1000.000000	1	1
1000.000000	2400.000000	2	2
2400.000000	2483.500000	2	2
2483.500000	7000.000000	2	2
7000.000000	26000.000000	2	2

FCC ID: 2AOJQ1001



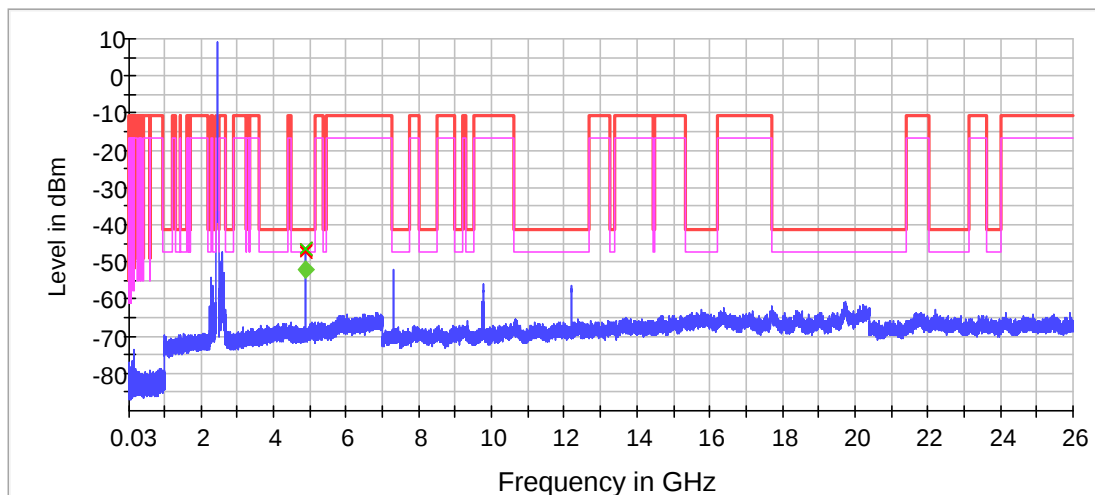
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TEST REPORT

Report No. : AW0024543(4)

Date : Apr 25, 2018



× Limit [limit.Result:1] × Sum Level [trace.Result:1]
◆ Threshold [limit 2.Result:1] ◆ Critical [Over Limit.Result:1]

Pre Measurement 1

Setting	Instrument Value	Target Value
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	19400	~ 19400
SweepTime	19.400 ms	AUTO
Reference Level	-30.000 dBm	-30.000 dBm
Attenuation	0.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	30	30
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	3 / max. 150	max. 150
Stable	3 / 3	3

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Date : Apr 25, 2018

Pre Measurement 2

Setting	Instrument Value	Target Value
RBW	1.000 MHz	<= 1.000 MHz
VBW	3.000 MHz	>= 3.000 MHz
SweepPoints	2800	~ 2800
SweepTime	2.800 ms	AUTO
Reference Level	-30.000 dBm	-30.000 dBm
Attenuation	0.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	30	30
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	3 / max. 150	max. 150
Stable	3 / 3	3

Final Measurement 2

Setting	Instrument Value	Target Value
Span	ZeroSpan	ZeroSpan
RBW	1.000 MHz	~ 1.000 MHz
VBW	3.000 MHz	~ 3.000 MHz
SweepPoints	10001	~ 10001
SweepTime	1.000 s	1.000 s
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	0.000 dB	0.000 dB
Detector	RMS	RMS
SweepCount	1	1
Filter	3 dB	3 dB
Trace Mode	Clear Write	Clear Write
SweepType	Sweep	AUTO
Preamp	off	off

FCC ID: 2AOJQ1001



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TEST REPORT

Report No. : AW0024543(4)

Date : Apr 25, 2018

Tx Spurious Emission (2480 MHz; GFSK)

Result

DUT Frequency (MHz)	Result
2480.000000	PASS

Final measurements

Frequency (MHz)	Level Pre Measurement (dBm)	level (dBm)	Limit (dBm)	Margin (dB)	Result
2483.749972	-45.0	-55.9	-41.2	14.7	PASS

Pre Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)
2483.749972	-45.0	3.8	-41.2
2484.249917	-46.1	4.9	-41.2
4959.475897	-47.9	6.7	-41.2
4959.975841	-48.0	6.8	-41.2
4960.475786	-48.3	7.1	-41.2
4960.975731	-48.6	7.4	-41.2
4958.975952	-48.9	7.6	-41.2
7439.050684	-51.0	9.8	-41.2
7439.644397	-51.5	10.3	-41.2
7440.238110	-52.5	11.3	-41.2
7440.831823	-52.7	11.5	-41.2
4958.476007	-52.8	11.6	-41.2
2484.749862	-53.2	11.9	-41.2
7438.456971	-53.4	12.2	-41.2
2329.775080	-54.3	13.1	-41.2

Measurement Settings

Start Frequency (MHz)	Stop Frequency (MHz)	Pre Measurement	Final Measurement
30.000000	1000.000000	1	1
1000.000000	2400.000000	2	2
2400.000000	2483.500000	2	2
2483.500000	7000.000000	2	2
7000.000000	26000.000000	2	2

FCC ID: 2AOJQ1001



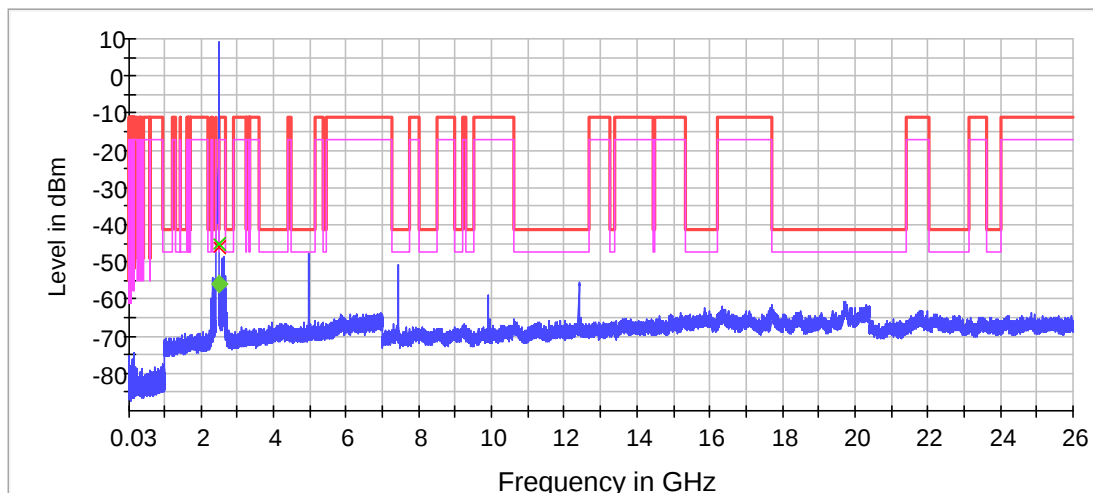
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TEST REPORT

Report No. : AW0024543(4)

Date : Apr 25, 2018



× Limit [limit.Result:1] × Sum Level [trace.Result:1]
◆ Threshold [limit 2.Result:1] ◆ Critical [Over Limit.Result:1]

Pre Measurement 1

Setting	Instrument Value	Target Value
RBW	100.000 kHz	<= 100.000 kHz
VBW	300.000 kHz	>= 300.000 kHz
SweepPoints	19400	~ 19400
SweepTime	19.400 ms	AUTO
Reference Level	-30.000 dBm	-30.000 dBm
Attenuation	0.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	30	30
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	3 / max. 150	max. 150
Stable	3 / 3	3

FCC ID: 2A0JQ1001



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TEST REPORT

Report No. : AW0024543(4)

Date : Apr 25, 2018

Pre Measurement 2

Setting	Instrument Value	Target Value
RBW	1.000 MHz	<= 1.000 MHz
VBW	3.000 MHz	>= 3.000 MHz
SweepPoints	2800	~ 2800
SweepTime	2.800 ms	AUTO
Reference Level	-30.000 dBm	-30.000 dBm
Attenuation	0.000 dB	AUTO
Detector	MaxPeak	MaxPeak
SweepCount	30	30
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
SweepType	Sweep	AUTO
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.30	0.30
Run	3 / max. 150	max. 150
Stable	3 / 3	3

Final Measurement 2

Setting	Instrument Value	Target Value
Span	ZeroSpan	ZeroSpan
RBW	1.000 MHz	~ 1.000 MHz
VBW	3.000 MHz	~ 3.000 MHz
SweepPoints	10001	~ 10001
SweepTime	1.000 s	1.000 s
Reference Level	-10.000 dBm	-10.000 dBm
Attenuation	0.000 dB	0.000 dB
Detector	RMS	RMS
SweepCount	1	1
Filter	3 dB	3 dB
Trace Mode	Clear Write	Clear Write
SweepType	Sweep	AUTO
Preamp	off	off

FCC ID: 2AOJQ1001



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AW0024543(4)

Date : Apr 25, 2018

Conducted Emission

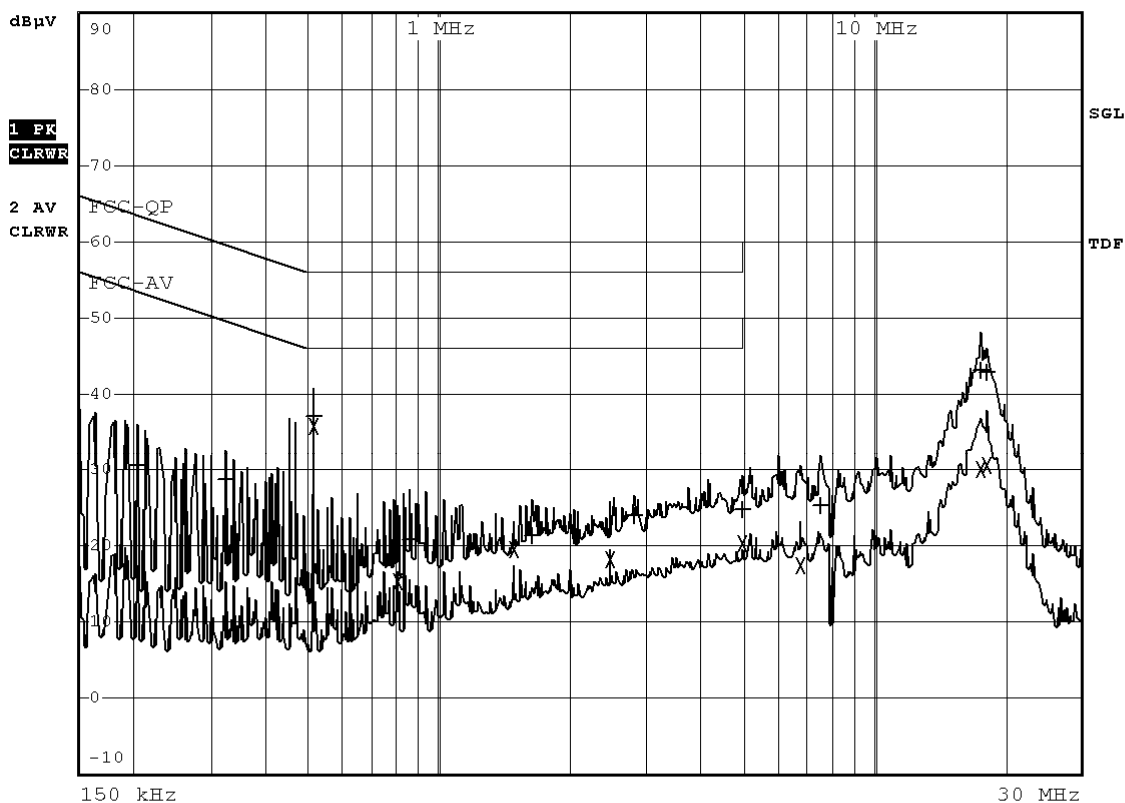
1) Bluetooth mode



RBW 9 kHz

MT 1 s

Att 10 dB AUTO PREAMP OFF



Date: 5.MAR.2018 14:53:12

FCC ID: 2AOJQ1001



CMA Testing and Certification Laboratories

廠商會檢定中心

TEST REPORT

Report No. : AW0024543(4)

Date : Apr 25, 2018

EDIT PEAK LIST (Final Measurement Results)			
Trace1:	FCC-QP		
Trace2:	FCC-AV		
Trace3:	---		
TRACE	FREQUENCY	LEVEL dBμV	DELTA LIMIT dB
1 Quasi Peak	204 kHz	30.57 L1 gnd	-32.87
1 Quasi Peak	325.5 kHz	28.66 N gnd	-30.90
1 Quasi Peak	513.5 kHz	37.21 L1 gnd	-18.78
2 Average	513.5 kHz	35.77 N gnd	-10.22
2 Average	801.5 kHz	15.43 N gnd	-30.56
1 Quasi Peak	855.5 kHz	20.76 L1 gnd	-35.23
2 Average	1.4945 MHz	19.50 N gnd	-26.49
1 Quasi Peak	1.6385 MHz	21.28 N gnd	-34.71
2 Average	2.48 MHz	18.22 N gnd	-27.77
1 Quasi Peak	2.8085 MHz	24.09 N gnd	-31.90
1 Quasi Peak	4.9955 MHz	24.80 N gnd	-31.19
2 Average	4.9955 MHz	20.25 N gnd	-25.74
2 Average	6.8045 MHz	17.47 L1 gnd	-32.52
1 Quasi Peak	7.529 MHz	25.21 L1 gnd	-34.78
1 Quasi Peak	17.591 MHz	43.15 N gnd	-16.84
2 Average	17.6225 MHz	29.89 N gnd	-20.10
1 Quasi Peak	18.176 MHz	42.92 N gnd	-17.07
2 Average	18.176 MHz	30.48 N gnd	-19.51

Date: 5.MAR.2018 14:53:00

***** End of Report *****

FCC ID: 2AOJQ1001

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