



Test Report

Date : 2017-10-18

No. : HM170857

Page 1 of 70

Applicant: Guangdong LEIYON Intelligence Technology Corp.
BBK Road of Wusha, Changan Town, Dongguan City Guangdong
Province, China

Manufacturer: Guangdong LEIYON Intelligence Technology Corp.
BBK Road of Wusha, Changan Town, Dongguan City Guangdong
Province, China

Description of Sample(s): Product: Portable Bluetooth Speaker
Brand Name: LEIYON
Model Number: LY-BX25
FCC ID: 2AJA3LYBX25

Date Sample(s) Received: 2017-07-26

Date Tested: 2017-08-14 to 2017-10-12

Investigation Requested: Perform ElectroMagnetic Interference measurement in accordance with FCC 47 CFR [Codes of Federal Regulations] Part 15: 2015 and ANSI C63.10: 2013 for FCC Certification.

Conclusion(s): The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

Remark(s): Bluetooth FHSS (GFSK/ $\pi/4$ -DQPSK/ 8DPSK)



CHEUNG Chi, Kenneth
Authorized Signatory
ElectroMagnetic Compatibility Department
For and on behalf of
The Hong Kong Standards and Testing Centre Ltd.

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Test Report

Date : 2017-10-18

No. : HM170857

Page 2 of 70

CONTENT:

Cover	Page 1 of 70
Content	Page 2 of 70

1.0 General Details

1.1 Test Laboratory	Page 3 of 70
1.2 Equipment Under Test [EUT] Description of EUT operation	Page 3 of 70
1.3 Date of Order	Page 3 of 70
1.4 Submitted Sample	Page 3 of 70
1.5 Test Duration	Page 3 of 70
1.6 Country of Origin	Page 3 of 70
1.7 Antenna Details	Page 4 of 70
1.8 Channel List	Page 4 of 70

2.0 Technical Details

2.1 Investigations Requested	Page 5 of 70
2.2 Test Standards and Results Summary	Page 5 of 70
2.3 Table for Test Modes	Page 6 of 70

3.0 Test Results

3.1 Emission	Page 7 - 63 of 70
--------------	-------------------

Appendix A

List of Measurement Equipment	Page 64 of 70
-------------------------------	---------------

Appendix B

Photographs	Page 65- 70 of 70
-------------	-------------------

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Test Report

Date : 2017-10-18

Page 3 of 70

No. : HM170857

1.0 General Details

1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd.
EMC Laboratory
10 Dai Wang Street, Taipo Industrial Estate

Telephone: (852) 26661888
Fax: (852) 26644353

1.2 Equipment Under Test [EUT]

Description of Sample(s)

Product:	Portable Bluetooth Speaker
Manufacturer:	Guangdong LEIYON Intelligence Technology Corp. BBK Road of Wusha, Changan Town, Dongguan City Guangdong Province, China
Brand Name:	LEIYON
Model Number:	LY-BX25
Additional Brand Name:	ewtto
Additional Model Number:	ET-P2532B
Rating:	15Vd.c (Tested with Power supply)

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is Bluetooth Speaker. The transmission signal is digital modulated with channel frequency range 2402-2480MHz. The R.F. signal was modulated by IC; the type of modulation used was frequency hopping spread spectrum Modulation.

1.3 Date of Order

2017-07-26

1.4 Submitted Sample(s):

1 Sample

1.5 Test Duration

2017-08-14 to 2017-08-18

1.6 Country of Origin

China

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Test Report

Date : 2017-10-18

Page 4 of 70

No. : HM170857

1.7 Antenna Details

Antenna Type (Bluetooth): Circuit board printed meander line antenna
Antenna Gain (Bluetooth): 0.0dBi

1.8 Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	42	2444
1	2403	43	2445
2	2404	44	2446
3	2405	45	2447
4	2406	46	2448
5	2407	47	2449
6	2408	48	2450
7	2409
8	2410	67	2469
9	2411	68	2470
...	...	69	2471
33	2435	70	2472
34	2436	71	2473
35	2437	72	2474
36	2438	73	2475
37	2439	74	2476
38	2440	75	2477
39	2441	76	2478
40	2442	77	2479
41	2443	78	2480

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Test Report

Date : 2017-10-18

No. : HM170857

2.0 Technical Details

2.1 Investigations Requested

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2016 Regulations. ANSI C63.10:2013 for FCC Certification.

2.2 Test Standards and Results Summary Tables

EMISSION (BLUETOOTH) Results Summary						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Fail	N/A
Maximum Peak Conducted Output Power	FCC 47CFR 15.247(b)(1)	ANSI C63.10:2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Spurious Emissions	FCC 47CFR 15.209	ANSI C63.10:2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AC Mains Conducted Emissions	FCC 47CFR 15.207	ANSI C63.10:2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Number of Hopping Frequency	FCC 47CFR 15.247 (b)(1)	ANSI C63.10:2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20dB Bandwidth	FCC 47CFR 15.247(a)(2)	ANSI C63.10: 2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hopping Channel Separation	FCC 47CFR 15.247(a)(1)	ANSI C63.10: 2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Band-edge measurement (Radiated)	FCC 47CFR 15.247(d)	ANSI C63.10: 2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pseudorandom Hopping Algorithm	FCC 47CFR 15.247(a)(1)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Time of Occupancy (Dwell Time)	FCC 47CFR 15.247(a)(1)(iii)	ANSI C63.10: 2013	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RF Exposure	FCC 47CFR 15.247(i)	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Note: N/A – Not Applicable

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Test Report

Date : 2017-10-18

Page 6 of 70

No. : HM170857

2.3 Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate in the table below is the worst case rate with respect to the specific test item.

Investigation has been done on all the possible configurations for searching the worst cases.

The following table is a list of the test modes shown in this test report.

Test Items

Maximum Peak Conducted Output Power	GFSK / $\pi/4$ -DQPSK/ 8DPSK
Hopping Channel Separation	GFSK / $\pi/4$ -DQPSK/ 8DPSK
Number of Hopping Frequency	GFSK / $\pi/4$ -DQPSK/ 8DPSK
Time of Occupancy(Dwell Time)	8DPSK (DH1 / DH3 / DH5)
Radiated Spurious Emissions	GFSK / $\pi/4$ -DQPSK/ 8DPSK

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Test Report

Date : 2017-10-18

No. : HM170857

3.0 Test Results

3.1 Emission

3.1.1 Maximum Peak Conducted Output Power

Test Requirement: FCC 47CFR 15.247(b)(2)

Test Method: ANSI C63.10:2013

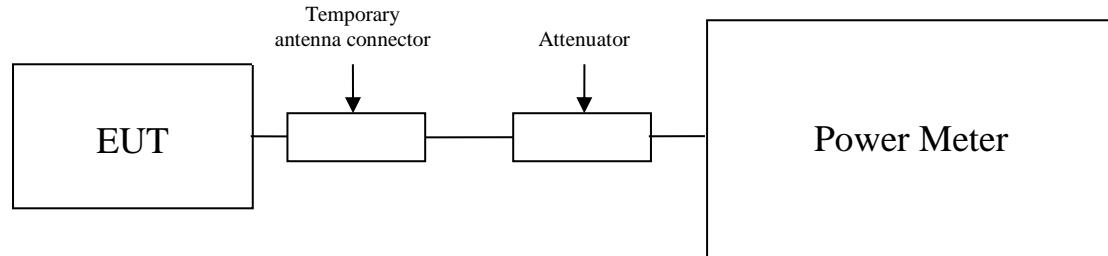
Test Date: 2017-08-14

Mode of Operation: Tx mode :GFSK/ $\pi/4$ -DQPSK/ 8DPSK

Test Method:

The RF output of the EUT was connected to the Power Meter. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in dBm.

Test Setup:



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Test Report

Date : 2017-10-18

Page 8 of 70

No. : HM170857

Limits for Maximum Peak Conducted Output Power [FCC 47CFR 15.247]:

2400–2483.5 MHz band:

The maximum peak output power shall not exceed the following limits:

For frequency hopping systems employing at least 75 hopping channels: 1 Watt

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 Watts

For Digital Transmission systems in 2400-2483.5 MHz Band: 1 Watt

Results of Bluetooth Communication mode (GFSK) (Fundamental Power): Pass

Maximum conducted output power

Channel	Frequency(MHz)	Output Power(Watt)
0	2402	0.00051
39	2441	0.00061
78	2480	0.00053

Results of Bluetooth Communication mode ($\pi/4$ -DQPSK) (Fundamental Power): Pass

Maximum conducted output power

Channel	Frequency(MHz)	Output Power(Watt)
0	2402	0.00027
39	2441	0.00031
78	2480	0.00029

Results of Bluetooth Communication mode (8DPSK) (Fundamental Power): Pass

Maximum conducted output power

Channel	Frequency(MHz)	Output Power(Watt)
0	2402	0.00031
39	2441	0.00037
78	2480	0.00028

Calculated measurement uncertainty : 30MHz to 1GHz 1.7dB
1GHz to 18GHz 1.7dB

Remark:

1. All test data for each data rate were verified, but only the worst case was reported.
2. The EUT is programmed to transmit signals continuously for all testing.

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Test Report

Date : 2017-10-18

Page 9 of 70

No. : HM170857

3.1.2 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement: FCC 47CFR 15.207

Test Method: ANSI C63.10:2013

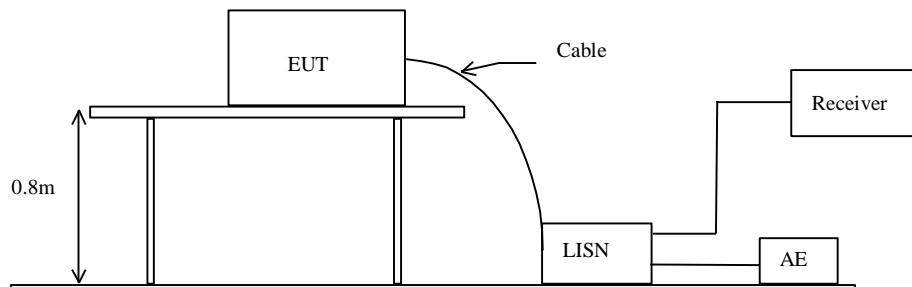
Test Date: 2017-10-12

Mode of Operation: Tx mode

Test Method:

The test was performed in accordance with ANSI C63.10:2013, with the following: an initial measurement was performed in peak and average detection mode on the live line, any emissions recorded within 30dB of the relevant limit line were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

Test Setup:



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Test Report

Date : 2017-10-18

Page 10 of 70

No. : HM170857

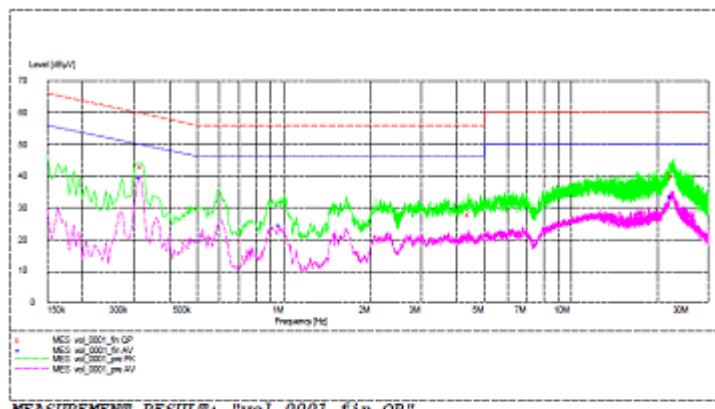
Limit for Conducted Emissions (FCC 47CFR 15.207):

Frequency Range [MHz]	Quasi-Peak Limits [dB μ V]	Average [dB μ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* Decreases with the logarithm of the frequency.

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

Results of Tx mode – Live: PASS



Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line	PE
0.320000	42.90	9.6	60	16.8	L1	GND
4.410000	27.90	9.7	56	28.1	L1	GND
22.605000	40.20	10.0	60	19.8	L1	GND

MEASUREMENT RESULT: "vol_0001_fin_AV"

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line	PE
0.315000	39.40	9.6	50	10.4	L1	GND
0.965000	24.30	9.6	46	21.7	L1	GND
22.265000	33.60	10.0	50	16.4	L1	GND

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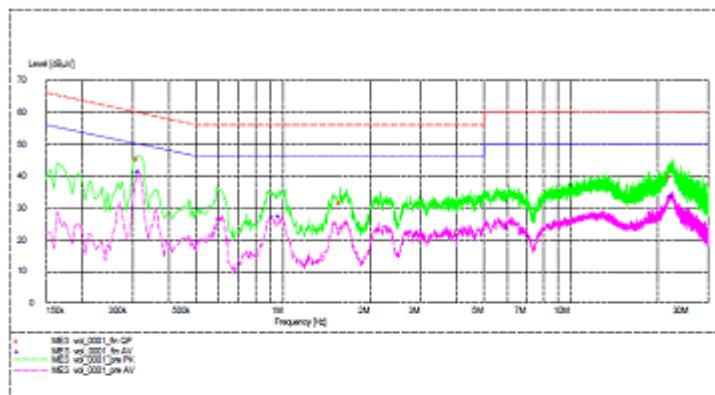
Test Report

Date : 2017-10-18

No. : HM170857

Results of Tx mode -Neutral: PASS

Page 11 of 70



MEASUREMENT RESULT: "vol_0001_fin_QP"

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line	PE
0.315000	45.40	9.6	60	14.4	N	GND
1.575000	31.70	9.6	56	24.3	N	GND
22.235000	39.70	10.0	60	20.3	N	GND

MEASUREMENT RESULT: "vol_0001_fin_AV"

Frequency MHz	Level dB μ V	Transd dB	Limit dB μ V	Margin dB	Line	PE
0.315000	41.50	9.6	50	9.3	N	GND
0.965000	27.50	9.6	46	18.5	N	GND
22.370000	33.80	10.0	50	16.2	N	GND

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Test Report

Date : 2017-10-18

Page 12 of 70

No. : HM170857

3.1.3 Radiated Spurious Emissions

Test Requirement: FCC 47CFR 15.209

Test Method: ANSI C63.10:2013

Test Date: 2017-08-15

Mode of Operation: Tx mode :GFSK/ π /4-DQPSK/8DPSK

Test Method:

For emission measurements at or below 1 GHz, the sample was placed 0.8m above the ground plane of semi-anechoic Chamber*. For emission measurements above 1 GHz, the sample was placed 1.5m above the ground plane of semi-anechoic Chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

* Semi-anechoic chamber located on the G/F of “The Hong Kong Standards and Testing Centre Ltd.” with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

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Test Report

Date : 2017-10-18

No. : HM170857

Spectrum Analyzer Setting:

Page 13 of 70

9KHz – 30MHz (Pk & Av)

RBW: 10kHz
 VBW: 30kHz
 Sweep: Auto
 Span: Fully capture the emissions being measured
 Trace: Max. hold

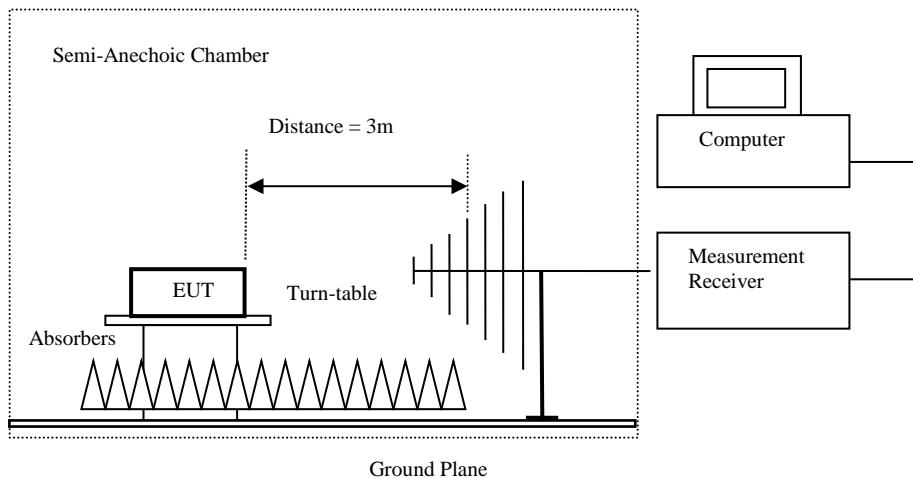
30MHz – 1GHz (QP)

RBW: 120kHz
 VBW: 120kHz
 Sweep: Auto
 Span: Fully capture the emissions being measured
 Trace: Max. hold

Above 1GHz (Pk & Av)

RBW: 1MHz
 VBW: 3MHz
 Sweep: Auto
 Span: Fully capture the emissions being measured
 Trace: Max. hold

Test Setup:



- Absorbers placed on top of the ground plane are for measurements above 1000MHz only.
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used, 9kHz to 30MHz loop antennas are used.

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Test Report

Date : 2017-10-18

Page 14 of 70

No. : HM170857

Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [μ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above 960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

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Test Report

Date : 2017-10-18

Page 15 of 70

No. : HM170857

Result of Tx mode (GFSK: 2402.0 MHz) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (GFSK: 2402.0 MHz) (30MHz – 1GHz): Pass

Field Strength of Spurious Emissions						
Quasi-Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (GFSK: 2402.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4804.0	6.3	42.4	48.7	74.0	25.3	Vertical
7206.0	3.1	46.7	49.8	74.0	24.2	Vertical
9608.0	2.2	48.4	50.6	74.0	23.4	Vertical
12010.0	1.3	53.1	54.4	74.0	19.6	Vertical

Result of Tx mode (GFSK: 2402.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4804.0	-6.9	42.4	35.5	54.0	18.5	Vertical
7206.0	-11.2	46.7	35.5	54.0	18.5	Vertical
9608.0	-11.7	48.4	36.7	54.0	17.3	Vertical
12010.0	-12.3	53.1	40.8	54.0	13.2	Vertical

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Test Report

Date : 2017-10-18

No. : HM170857

Result of Tx mode (GFSK: 2441.0 MHz) (9kHz – 30MHz): Pass

Page 16 of 70

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Results of Tx mode (GFSK: 2441.0 MHz) (30MHz – 1000MHz): PASS

Field Strength of Spurious Emissions Quasi-Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (GFSK: 2441.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4882.0	6.9	42.5	49.4	74.0	24.6	Vertical
7323.0	3.3	47.1	50.4	74.0	23.6	Vertical
9764.0	2.2	49.3	51.5	74.0	22.5	Vertical
12205.0	1.5	53.1	54.6	74.0	19.4	Vertical

Result of Tx mode (GFSK: 2441.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4882.0	-6.3	42.5	36.2	54.0	17.8	Vertical
7323.0	-8.4	47.1	38.7	54.0	15.3	Vertical
9764.0	-11.3	49.3	38.0	54.0	16.0	Vertical
12205.0	-12.1	53.1	41.0	54.0	13.0	Vertical

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Test Report

Date : 2017-10-18

Page 17 of 70

No. : HM170857

Result of Tx mode (GFSK: 2480.0 MHz) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Results of Tx mode (GFSK: 2480.0 MHz) (30MHz – 1000MHz): PASS

Field Strength of Spurious Emissions Quasi-Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (GFSK: 2480.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4960.0	6.4	43.2	49.6	74.0	24.4	Vertical
7440.0	3.2	46.2	49.4	74.0	24.6	Vertical
9920.0	2.1	50.9	53.0	74.0	21.0	Vertical
12400.0	1.5	54.3	55.8	74.0	18.2	Vertical

Result of Tx mode (GFSK: 2480.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4944.0	-9.4	43.2	33.8	54.0	20.2	Vertical
7416.0	-11.4	46.2	34.8	54.0	19.2	Vertical
9888.0	-12.1	50.9	38.8	54.0	15.2	Vertical
12360.0	-12.5	54.3	41.8	54.0	12.2	Vertical

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Test Report

Date : 2017-10-18

No. : HM170857

Result of Tx mode ($\pi/4$ -DQPSK: 2402.0 MHz) (9kHz – 30MHz): Pass

Page 18 of 70

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode ($\pi/4$ -DQPSK: 2402.0 MHz) (30MHz – 1GHz): Pass

Field Strength of Spurious Emissions						
Quasi-Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode ($\pi/4$ -DQPSK: 2402.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4804.0	6.3	42.4	48.7	74.0	25.3	Vertical
7206.0	3.3	46.7	50.0	74.0	24.0	Vertical
9608.0	2.2	48.4	50.6	74.0	23.4	Vertical
12010.0	1.1	53.1	54.2	74.0	19.8	Vertical

Result of Tx mode ($\pi/4$ -DQPSK: 2402.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4804.0	-6.8	42.4	35.6	54.0	18.4	Vertical
7206.0	-11.1	46.7	35.6	54.0	18.4	Vertical
9608.0	-11.7	48.4	36.7	54.0	17.3	Vertical
12010.0	-12.3	53.1	40.8	54.0	13.2	Vertical

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Test Report

Date : 2017-10-18

No. : HM170857

Result of Tx mode ($\pi/4$ -DQPSK: 2441.0 MHz) (9kHz – 30MHz): Pass

Page 19 of 70

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Results of Tx mode ($\pi/4$ -DQPSK: 2441.0 MHz) (30MHz – 1000MHz): PASS

Field Strength of Spurious Emissions Quasi-Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode ($\pi/4$ -DQPSK: 2441.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4882.0	6.1	42.5	48.6	74.0	25.4	Vertical
7323.0	3.1	47.1	50.2	74.0	23.8	Vertical
9764.0	2.4	49.3	51.7	74.0	22.3	Vertical
12205.0	1.5	53.1	54.6	74.0	19.4	Vertical

Result of Tx mode ($\pi/4$ -DQPSK: 2441.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4882.0	-6.6	42.5	35.9	54.0	18.1	Vertical
7323.0	-8.9	47.1	38.2	54.0	15.8	Vertical
9764.0	-11.1	49.3	38.2	54.0	15.8	Vertical
12205.0	-12.4	53.1	40.7	54.0	13.3	Vertical

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Test Report

Date : 2017-10-18

Page 20 of 70

No. : HM170857

Result of Tx mode ($\pi/4$ -DQPSK: 2480.0 MHz) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Results of Tx mode ($\pi/4$ -DQPSK: 2480.0 MHz) (30MHz – 1000MHz): PASS

Field Strength of Spurious Emissions Quasi-Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode ($\pi/4$ -DQPSK: 2480.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4960.0	6.5	43.2	49.7	74.0	24.3	Vertical
7440.0	3.3	46.2	49.5	74.0	24.5	Vertical
9920.0	2.1	50.9	53.0	74.0	21.0	Vertical
12400.0	1.3	54.3	55.6	74.0	18.4	Vertical

Result of Tx mode ($\pi/4$ -DQPSK: 2480.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4960.0	-6.9	43.2	36.3	54.0	17.7	Vertical
7440.0	-9.1	46.2	37.1	54.0	16.9	Vertical
9920.0	-11.3	50.9	39.6	54.0	14.4	Vertical
12400.0	-12.1	54.3	42.2	54.0	11.8	Vertical

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Test Report

Date : 2017-10-18

Page 21 of 70

No. : HM170857

Result of Tx mode (8DPSK: 2402.0 MHz) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (8DPSK: 2402.0 MHz) (30MHz – 1GHz): Pass

Field Strength of Spurious Emissions						
Quasi-Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (8DPSK: 2402.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4804.0	6.7	42.4	49.1	74.0	24.9	Vertical
7206.0	3.3	46.7	50.0	74.0	24.0	Vertical
9608.0	2.4	48.4	50.8	74.0	23.2	Vertical
12010.0	1.3	53.1	54.4	74.0	19.6	Vertical

Result of Tx mode (8DPSK: 2402.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4804.0	-6.9	42.4	35.5	54.0	18.5	Vertical
7206.0	-9.1	46.7	37.6	54.0	16.4	Vertical
9608.0	-11.2	48.4	37.2	54.0	16.8	Vertical
12010.0	-12.0	53.1	41.1	54.0	12.9	Vertical

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Test Report

Date : 2017-10-18

No. : HM170857

Result of Tx mode (8DPSK: 2441.0 MHz) (9kHz – 30MHz): Pass

Page 22 of 70

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Results of Tx mode (8DPSK: 2441.0 MHz) (30MHz – 1000MHz): PASS

Field Strength of Spurious Emissions Quasi-Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (8DPSK: 2441.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4882.0	6.6	42.5	49.1	74.0	24.9	Vertical
7323.0	3.7	47.1	50.8	74.0	23.2	Vertical
9764.0	2.5	49.3	51.8	74.0	22.2	Vertical
12205.0	1.4	53.1	54.5	74.0	19.5	Vertical

Result of Tx mode (8DPSK: 2441.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4882.0	-6.4	42.5	36.1	54.0	17.9	Vertical
7323.0	-9.3	47.1	37.8	54.0	16.2	Vertical
9764.0	-11.2	49.3	38.1	54.0	15.9	Vertical
12205.0	-11.9	53.1	41.2	54.0	12.8	Vertical

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Test Report

Date : 2017-10-18

Page 23 of 70

No. : HM170857

Result of Tx mode (8DPSK: 2480.0 MHz) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Results of Tx mode (8DPSK: 2480.0 MHz) (30MHz – 1000MHz): PASS

Field Strength of Spurious Emissions Quasi-Peak Value						
Frequency MHz	Measured Level dBuV	Correction Factor dB/m	Field Strength dBuV/m	Field Strength uV/m	Limit uV/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

Result of Tx mode (8DPSK: 2480.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4960.0	6.5	43.2	49.7	74.0	24.3	Vertical
7440.0	3.1	46.2	49.3	74.0	24.7	Vertical
9920.0	2.2	50.9	53.1	74.0	20.9	Vertical
12400.0	0.7	54.3	55.0	74.0	19.0	Vertical

Result of Tx mode (8DPSK: 2480.0 MHz) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
4960.0	-7.0	43.2	36.2	54.0	17.8	Vertical
7440.0	-10.2	46.2	36.0	54.0	18.0	Vertical
9920.0	-11.3	50.9	39.6	54.0	14.4	Vertical
12400.0	-11.9	54.3	42.4	54.0	11.6	Vertical

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Test Report

Date : 2017-10-18

Page 24 of 70

No. : HM170857

Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [μ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Result of TX mode, (9kHz – 30MHz): PASS

Emissions detected are more than 20 dB below the FCC Limits

Result of TX mode, (30MHz – 1GHz): PASS

Field Strength of Fundamental and Harmonics Emissions						
Quasi-Peak Value						
Frequency MHz	Measured Level @3m dB μ V/m	Correction Factor dB μ V/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
61.2	9.9	10.0	19.9	9.9	100	Vertical
79.3	10.1	7.2	17.3	7.3	150	Vertical
121.3	6.5	8.7	15.2	5.8	150	Horizontal
164.3	7.7	10.0	17.7	7.7	200	Horizontal
267.1	10.2	13.9	24.1	16.0	200	Horizontal
437.2	9.7	20.0	29.7	30.5	200	Horizontal

Result of CD Play mode, (1GHz – 26GHz): PASS

Emissions detected are more than 20 dB below the FCC Limits

Remarks:

- * Denotes restricted band of operation.
- Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty:
(9kHz - 30MHz): 2.4dB
(30MHz - 18GHz): 5.0dB
(18GHz - 26GHz): 5.24dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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Test Report

Date : 2017-10-18

Page 25 of 70

No. : HM170857

3.1.4 Number of Hopping Frequency

Limit of Number of Hopping Frequency

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels

Test Method:

The RF output of the EUT was connected to the spectrum analyzer by a low loss cable.

Spectrum Analyzer Setting:

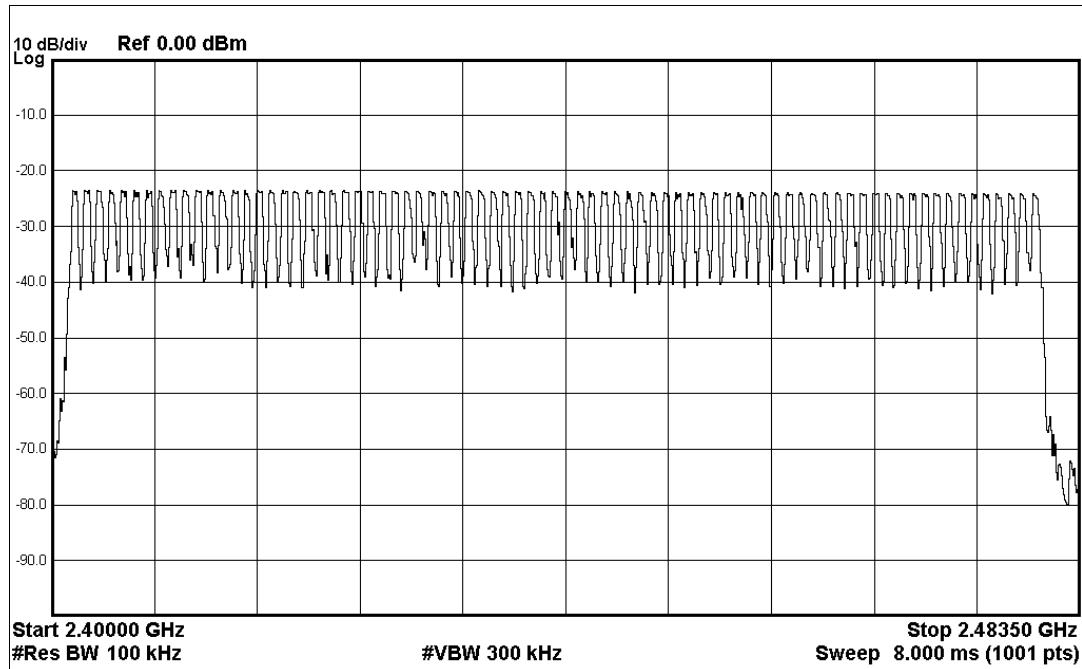
RBW = 300kHz, VBW \geq RBW, Sweep = Auto, Span = the frequency band of operation
Detector = Peak, Trace = Max. hold

Test Setup:

As Test Setup of clause 3.1.1 in this test report.

Measurement Data:

GFSK: 79 of 79 Channel



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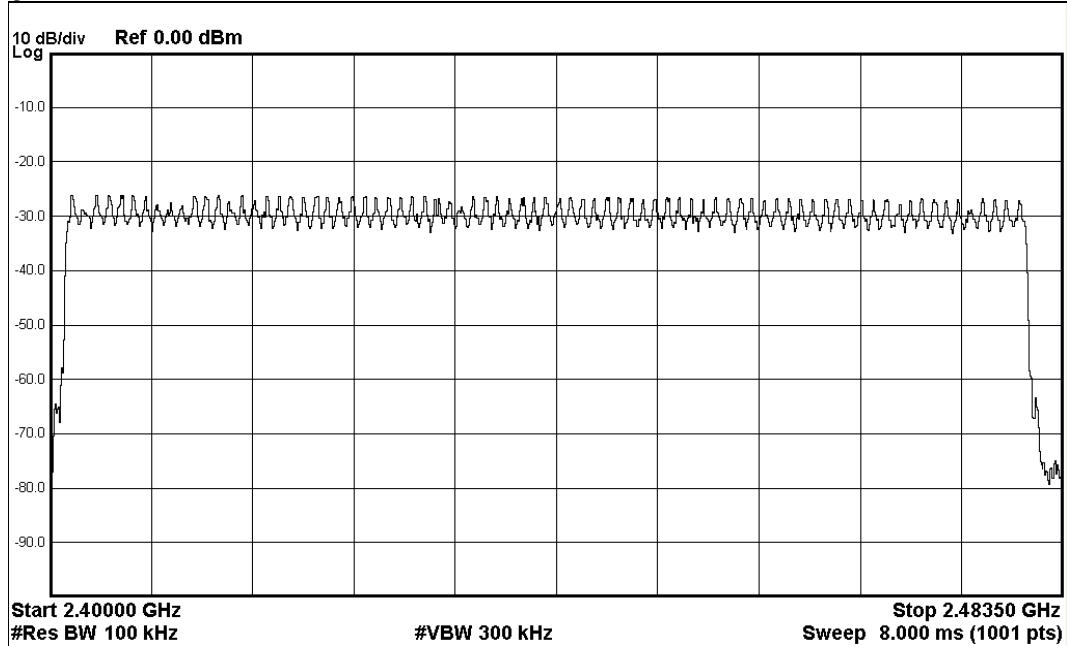
Test Report

Date : 2017-10-18

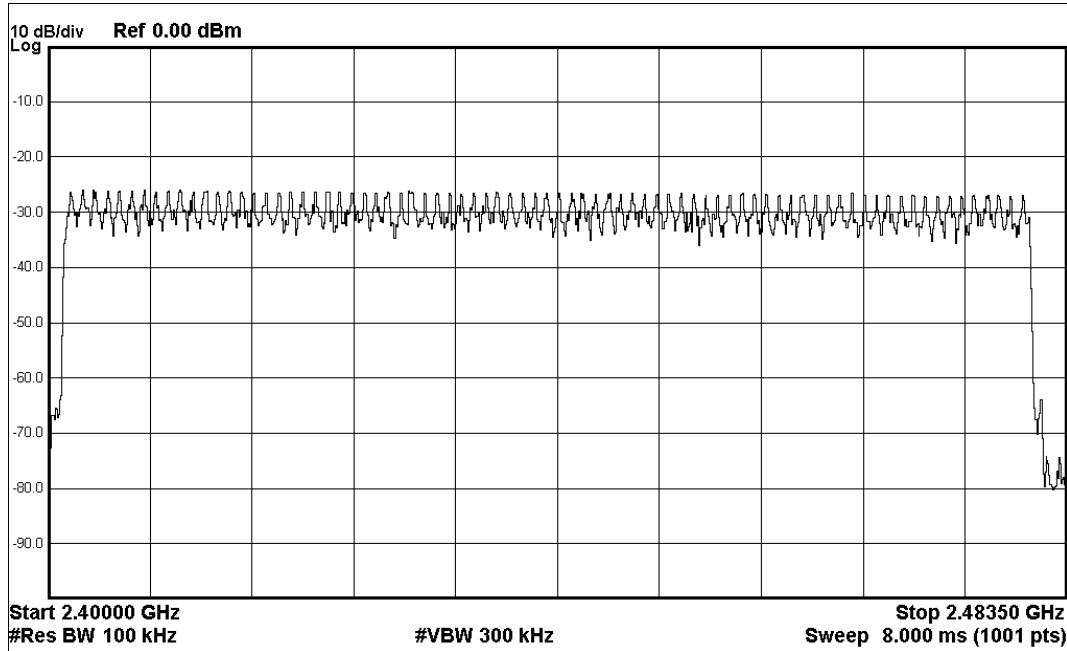
No. : HM170857

$\pi/4$ -DQPSK: 79 of 79 Channel

Page 26 of 70



8DPSK: 79 of 79 Channel



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Test Report

Date : 2017-10-18

Page 27 of 70

No. : HM170857

3.1.5 20dB Bandwidth

Test Requirement: FCC 47CFR 15.247(a)(1)

Test Method: ANSI C63.10:2013

Test Date: 2017-08-16

Mode of Operation: Tx mode :GFSK/ $\pi/4$ -DQPSK/8DPSK

Remark:

The result has been done on all the possible configurations for searching the worst cases.

Test Method:

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

Spectrum Analyzer Setting:

RBW = 30kHz, VBW \geq RBW, Sweep = Auto, Span = two times and five times the OBW
Detector = Peak, Trace = Max. hold

Test Setup:

As Test Setup of clause 3.1.1 in this test report.

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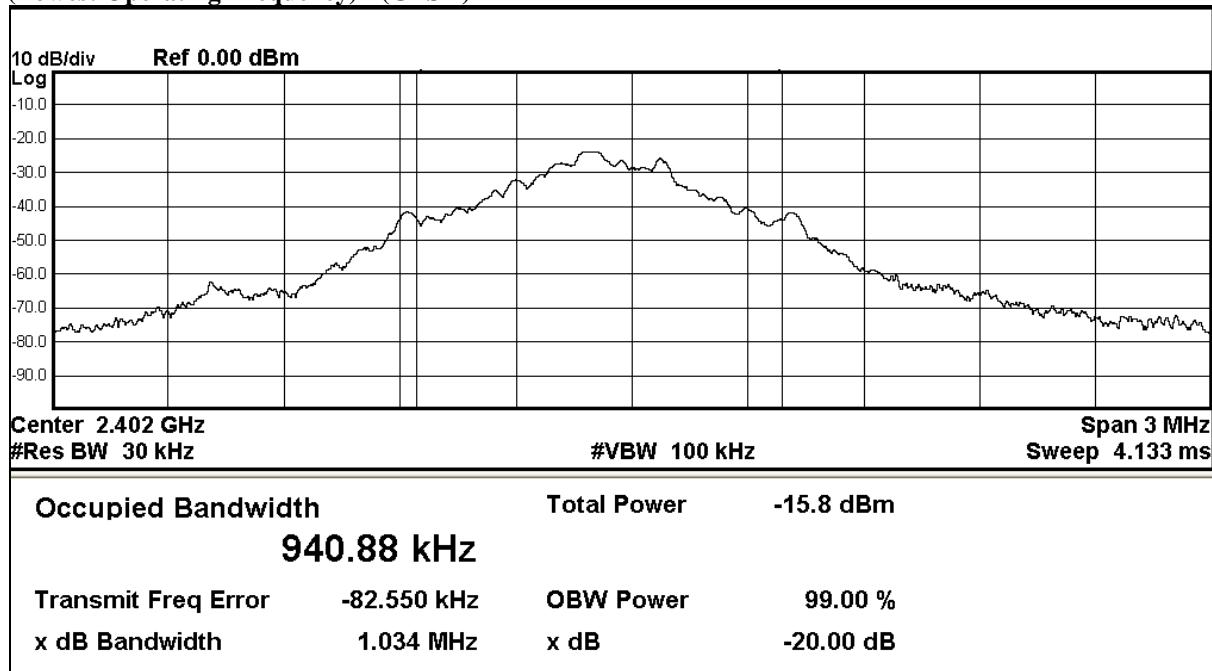
Date : 2017-10-18

No. : HM170857

Page 28 of 70

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.03	Within 2400-2483.5

(Lowest Operating Frequency) - (GFSK)



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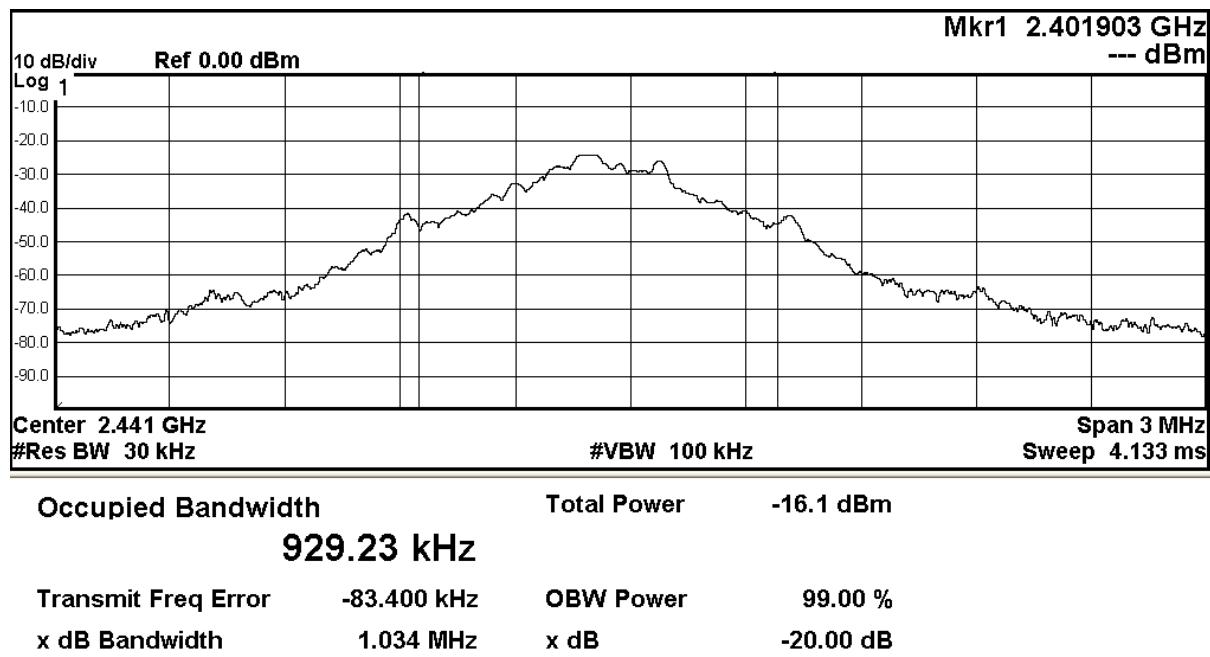
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No. : HM170857

Page 29 of 70

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.03	Within 2400-2483.5

(Middle Operating Frequency) - (GFSK)



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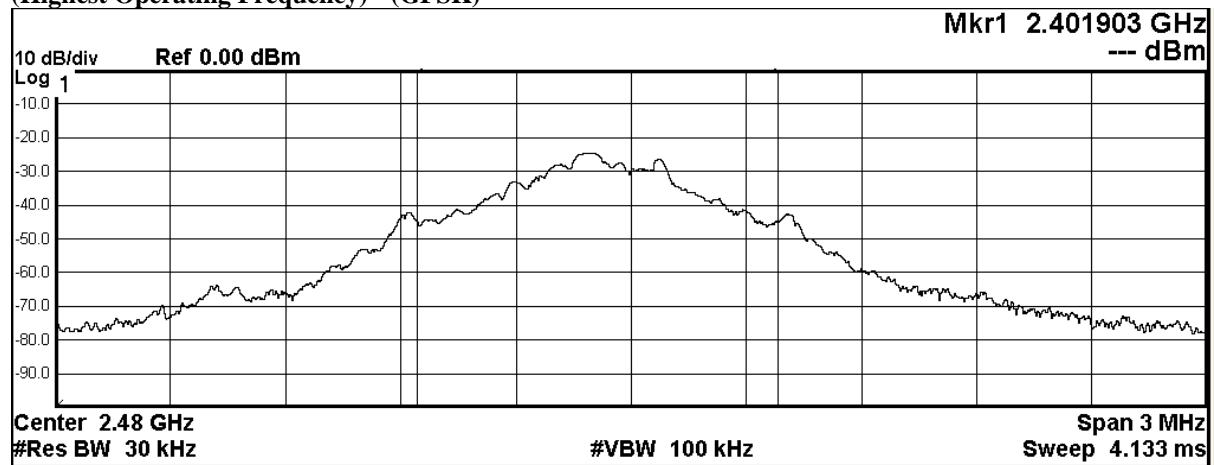
Date : 2017-10-18

Page 30 of 70

No. : HM170857

Fundamental Frequency [MHz]	20dB Bandwidth [KHz]	FCC Limits [MHz]
2480	1.03	Within 2400-2483.5

(Highest Operating Frequency) - (GFSK)



Occupied Bandwidth

Total Power

-16.6 dBm

5.89 kHz

Transmit Freq E

87.327 kHz

OBW

99.00 %

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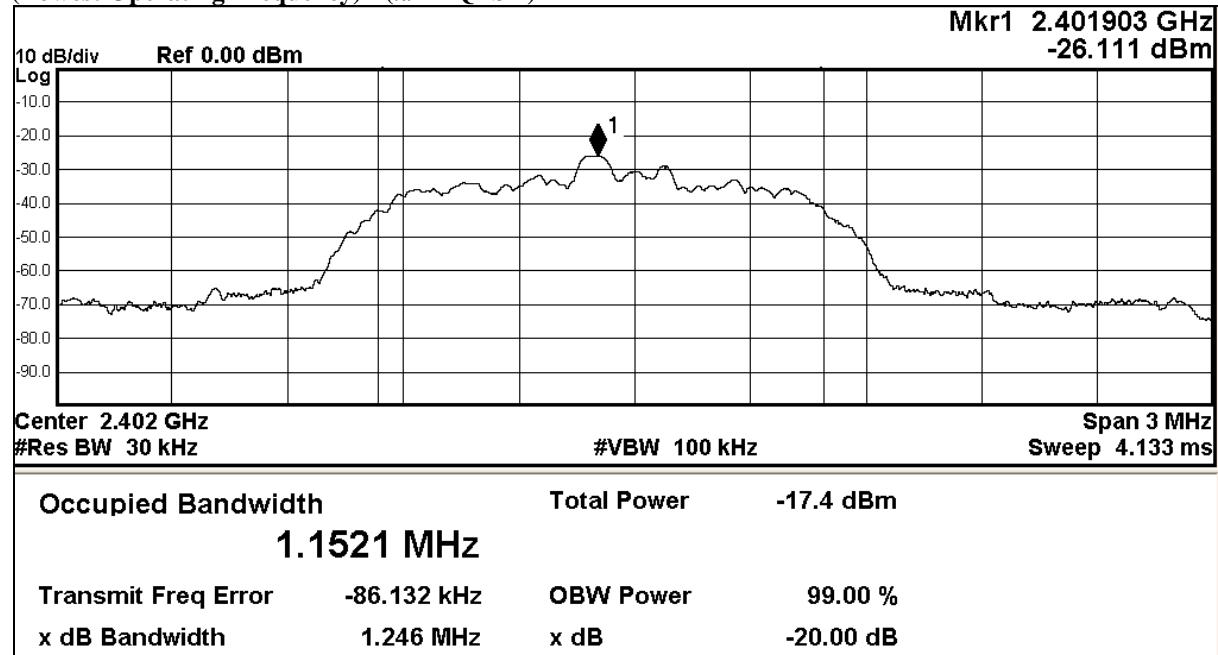
Date : 2017-10-18

No. : HM170857

Page 31 of 70

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.25	Within 2400-2483.5

(Lowest Operating Frequency) - ($\pi/4$ DQPSK)



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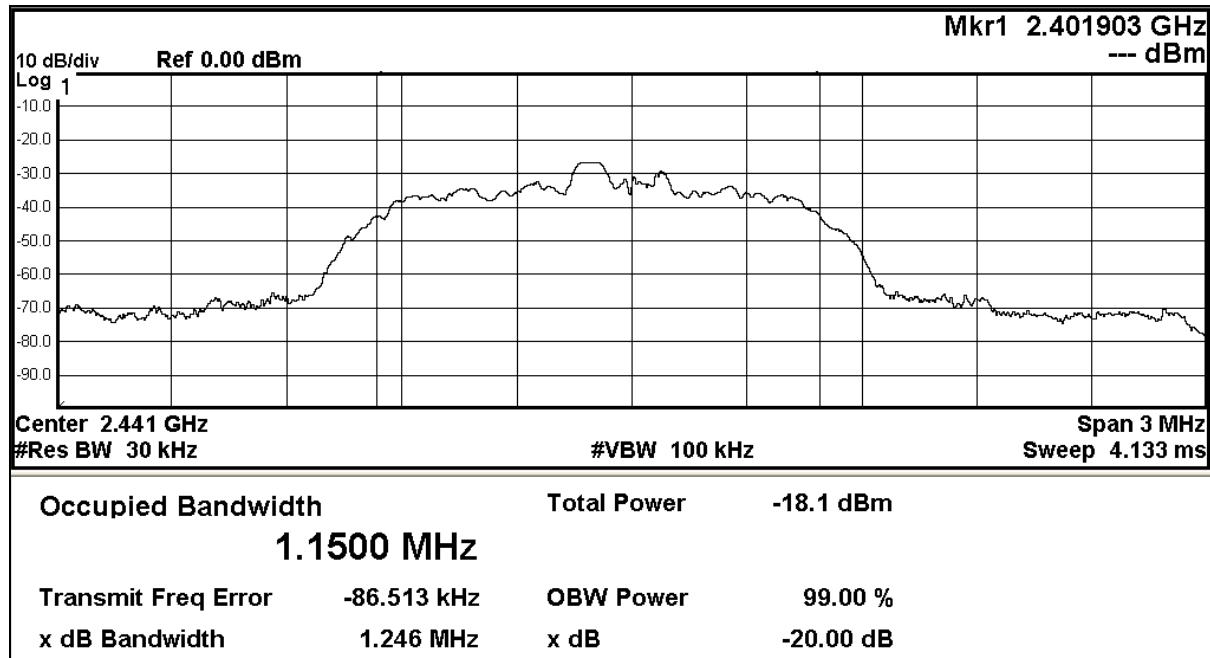
Date : 2017-10-18

Page 32 of 70

No. : HM170857

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.25	Within 2400-2483.5

(Middle Operating Frequency) - ($\pi/4$ DQPSK)



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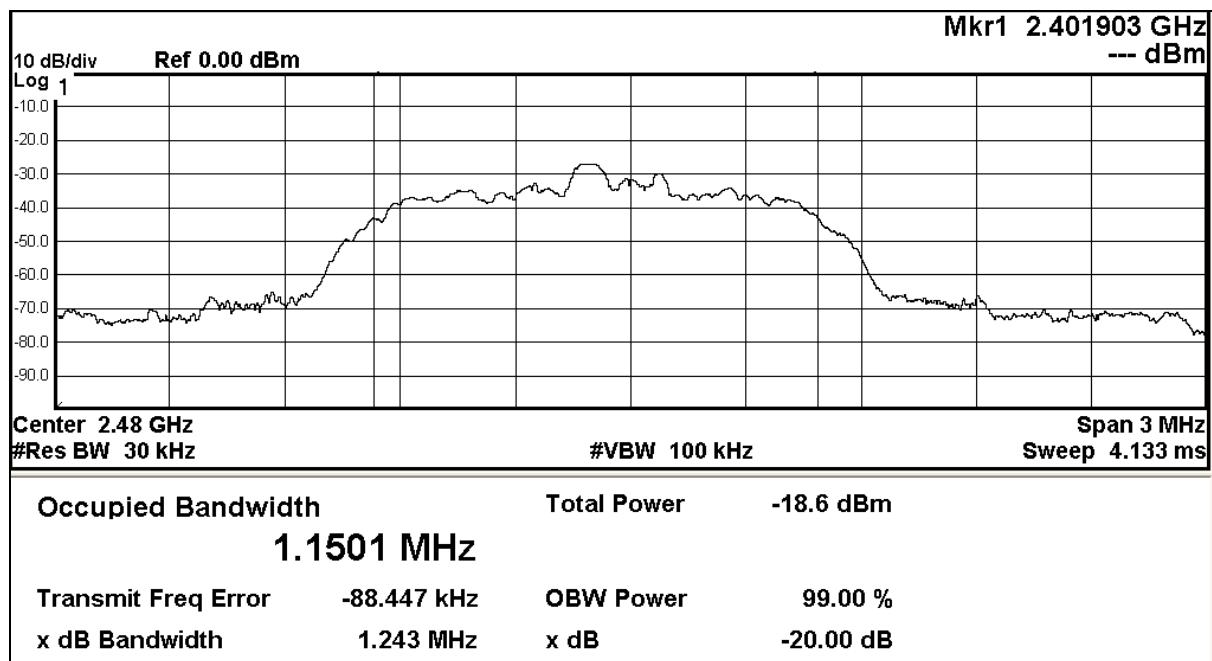
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Page 33 of 70

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.24	Within 2400-2483.5

(Highest Operating Frequency) - ($\pi/4$ DQPSK)



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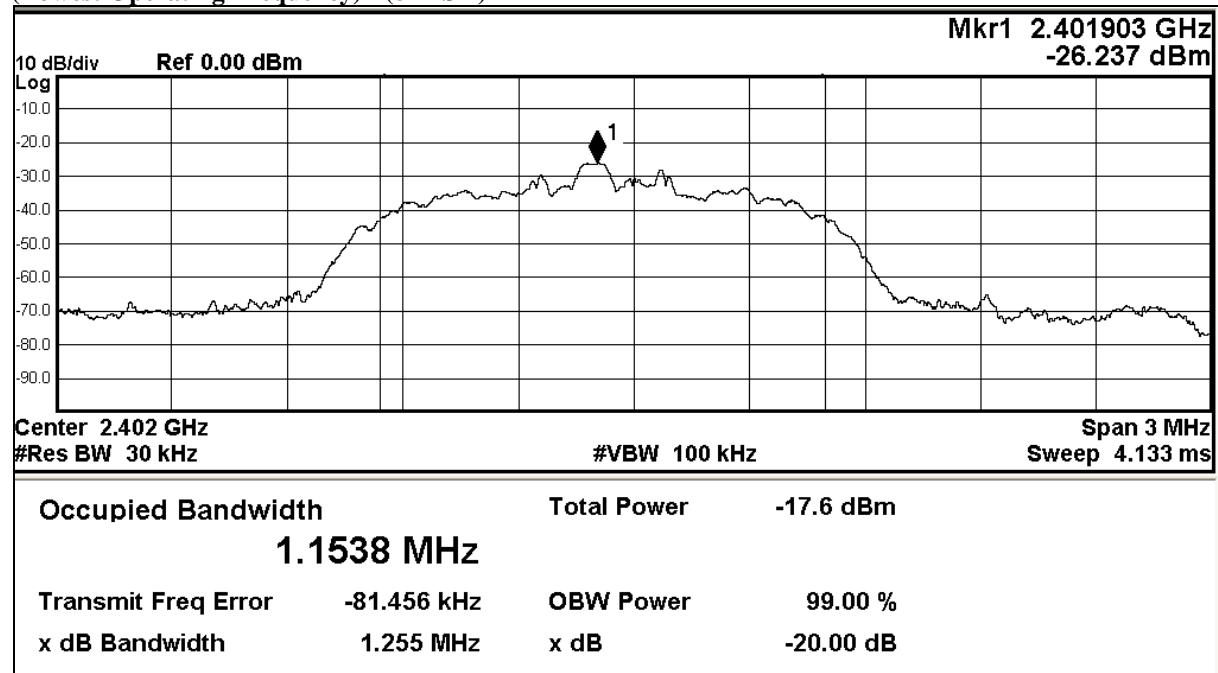
Date : 2017-10-18

No. : HM170857

Page 34 of 70

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.26	Within 2400-2483.5

(Lowest Operating Frequency) - (8DPSK)



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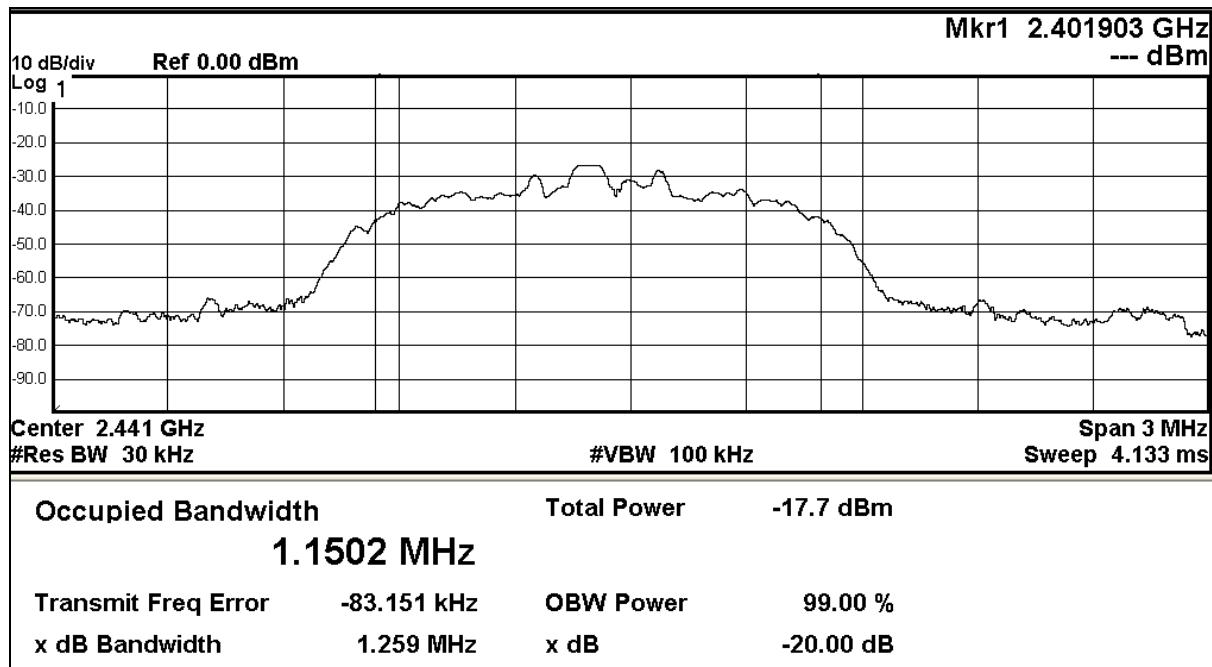
Date : 2017-10-18

No. : HM170857

Page 35 of 70

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.26	Within 2400-2483.5

(Middle Operating Frequency) - (8DPSK)



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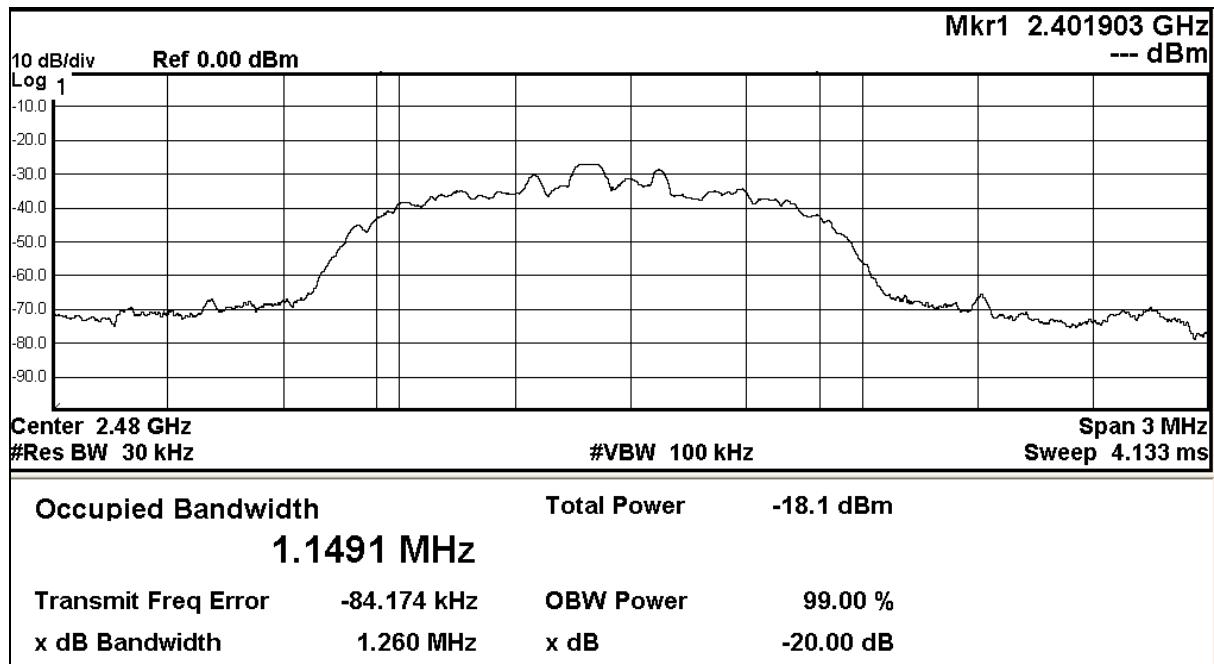
Date : 2017-10-18

No. : HM170857

Page 36 of 70

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.26	Within 2400-2483.5

(Highest Operating Frequency) - (8DPSK)



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Test Report

Date : 2017-10-18

Page 37 of 70

No. : HM170857

3.1.6 Hopping Channel Separation

Requirements:

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Spectrum Analyzer Setting:

RBW = 300kHz, VBW \geq RBW, Sweep = Auto,
Span = Wide enough to capture the peaks of two adjacent channels
Detector = Peak, Trace = Max. hold

Limit:

GFSK: The measured maximum bandwidth * 2/3 = 1.03MHz * 2/3 = 686.7kHz

$\pi/4$ DQPSK: The measured maximum bandwidth * 2/3 = 1.25MHz * 2/3 = 833.3kHz

8DPSK: The measured maximum bandwidth * 2/3 = 1.26MHz * 2/3 = 840kHz

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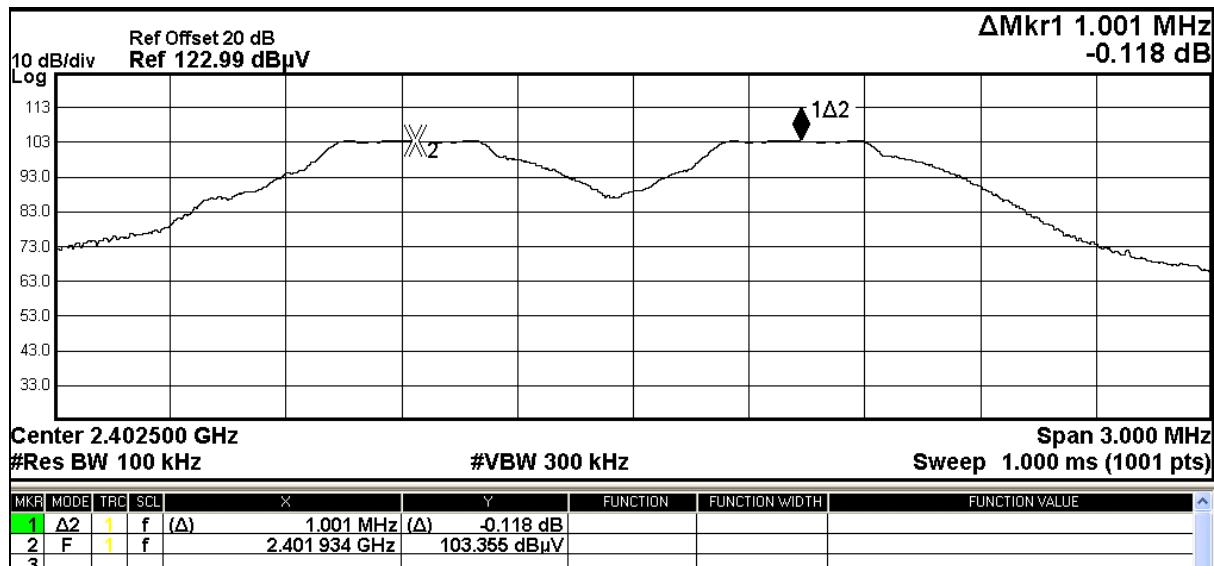
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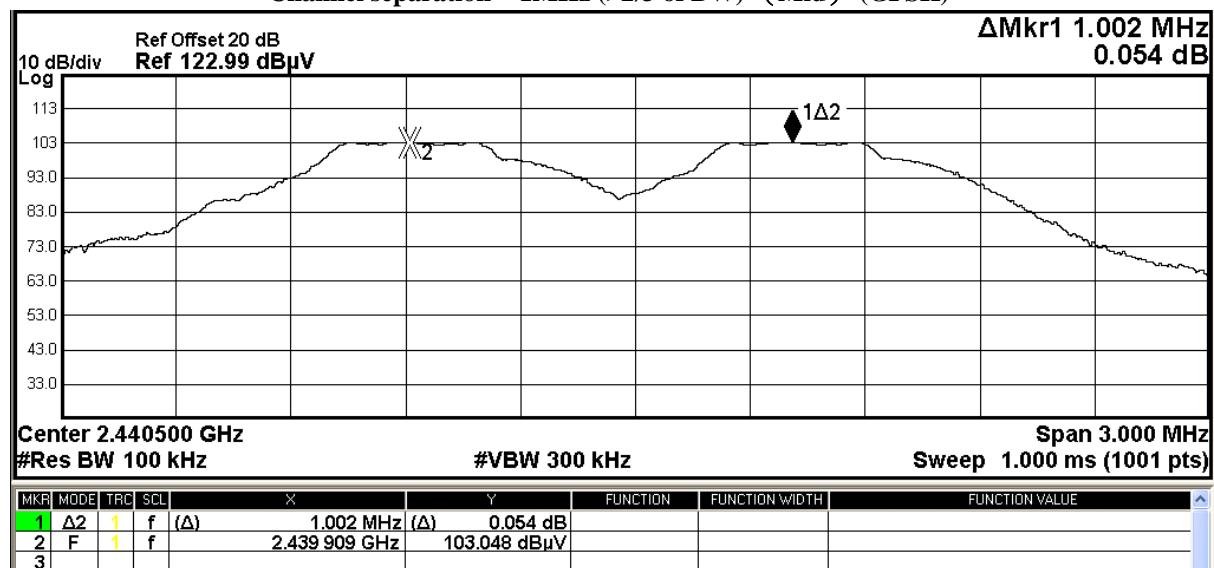
Page 38 of 70

No. : HM170857

Channel separation = 1MHz (>2/3 of BW) (Lowest) (GFSK)



Channel separation = 1MHz (>2/3 of BW) (Mid) (GFSK)



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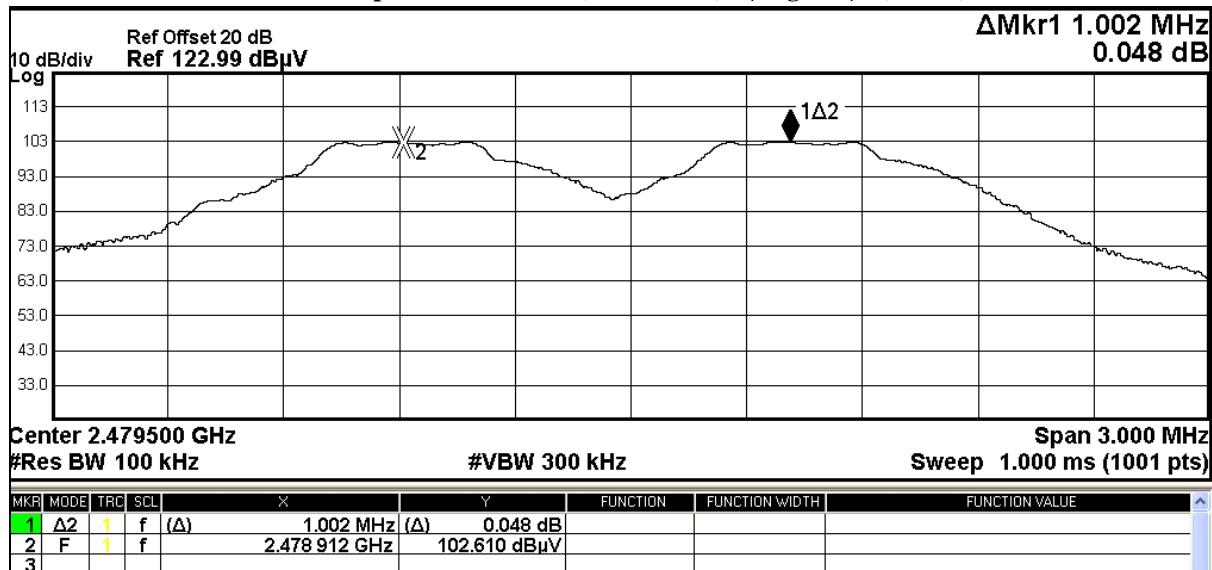
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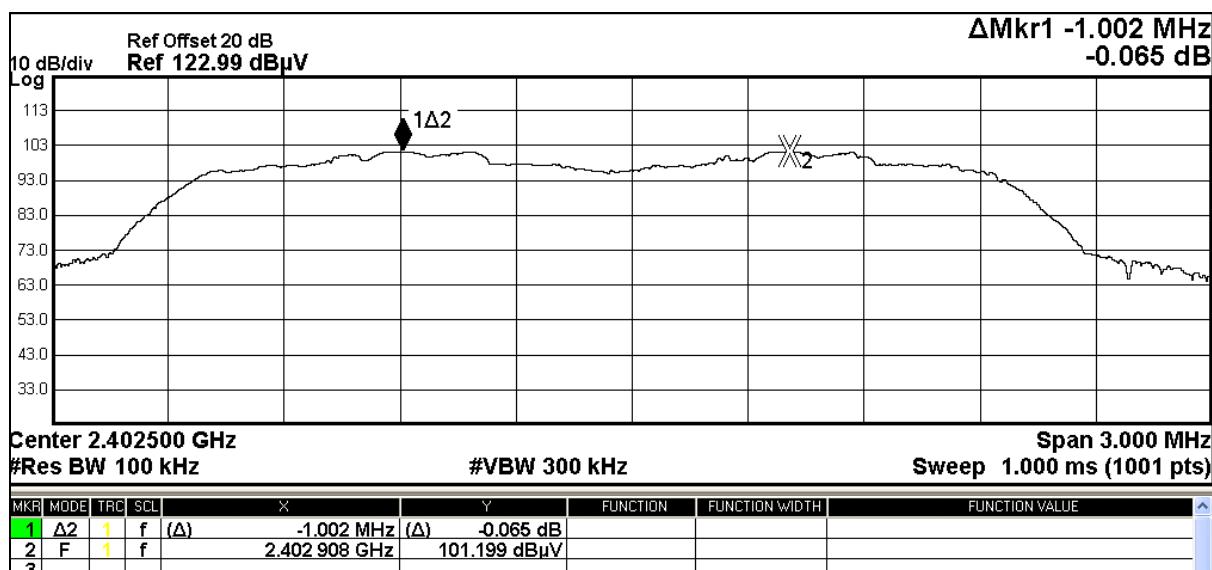
Page 39 of 70

No. : HM170857

Channel separation = 1MHz (>2/3 of BW) (Highest) (GFSK)



Channel separation = 1MHz (>2/3 of BW) (Lowest) ($\pi/4$ DQPSK)



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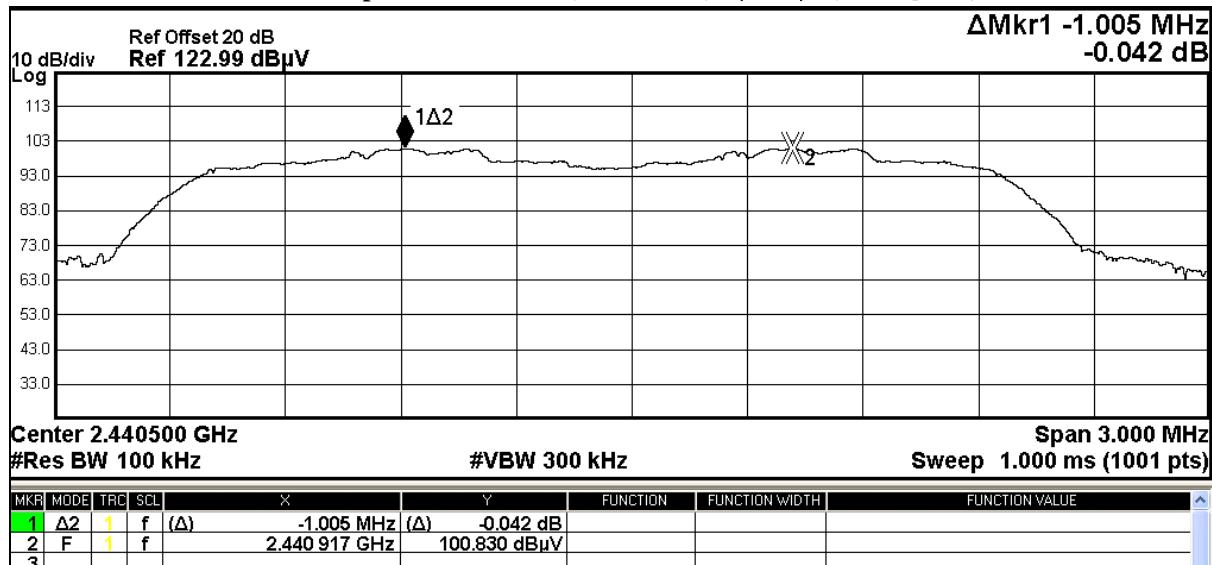
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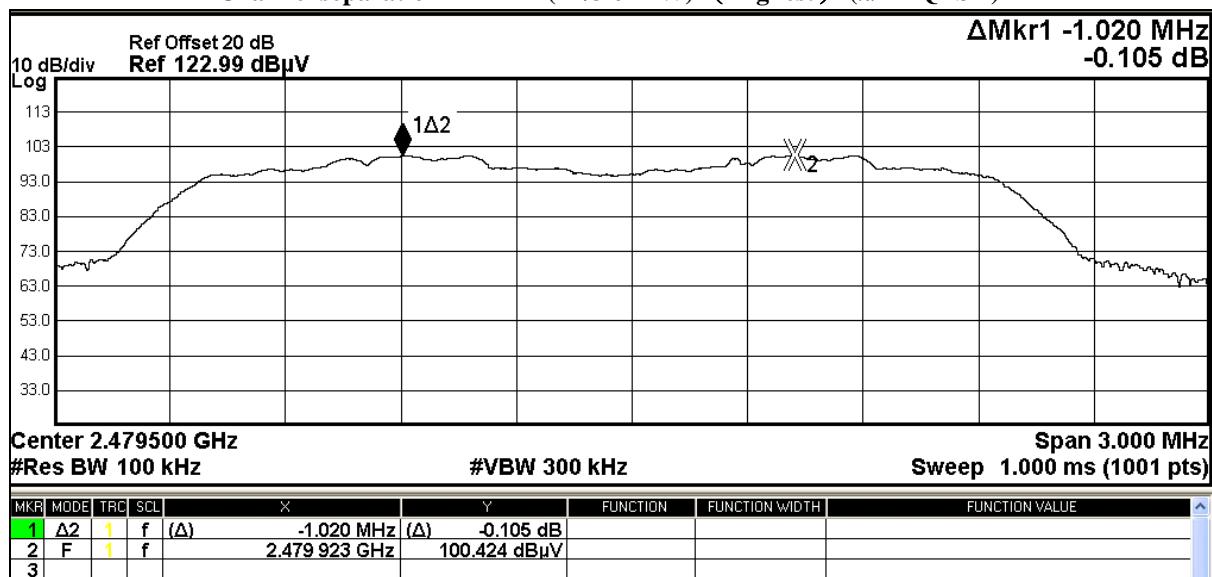
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Channel separation = 1MHz (>2/3 of BW) (Mid) ($\pi/4$ DQPSK)

Page 40 of 70



Channel separation = 1MHz (>2/3 of BW) (Highest) ($\pi/4$ DQPSK)



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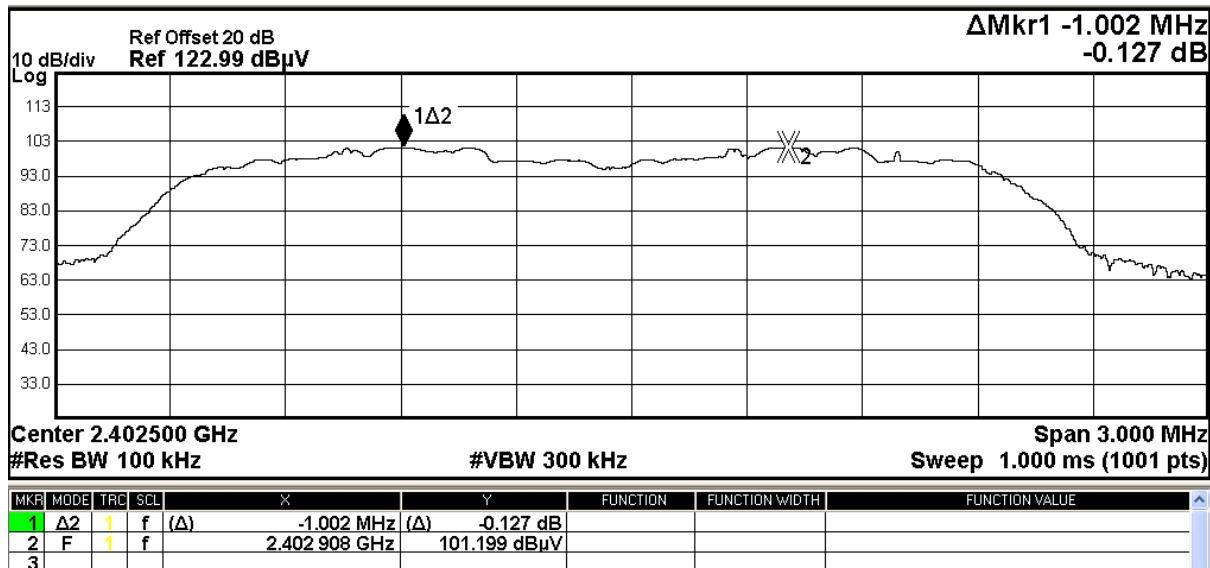
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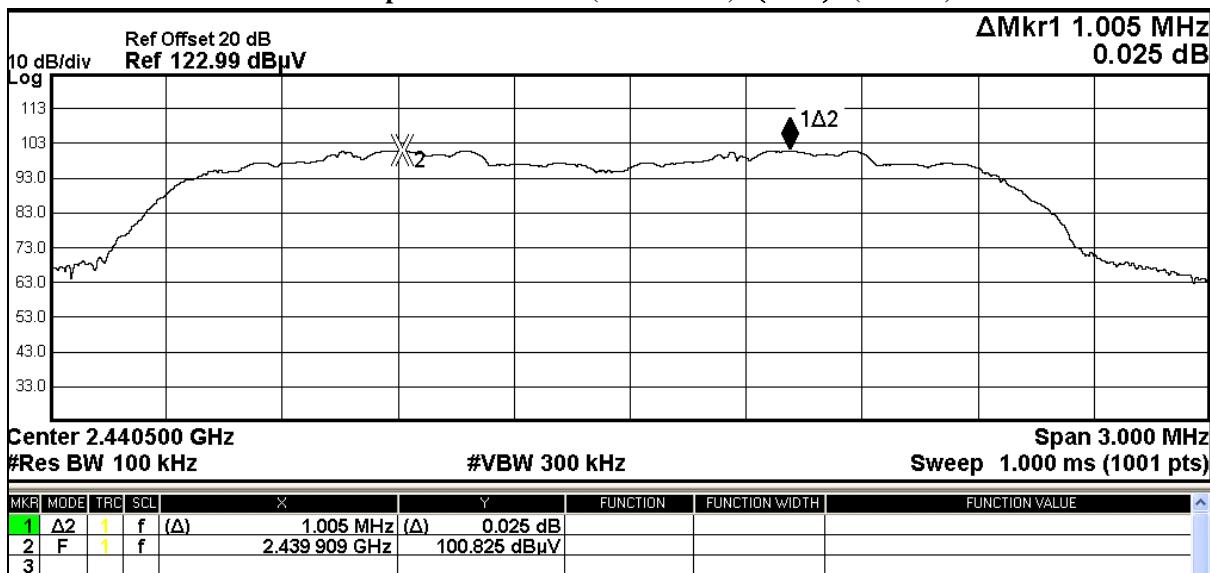
Page 41 of 70

No. : HM170857

Channel separation = 1MHz (>2/3 of BW) (Lowest) (8DPSK)



Channel separation = 1MHz (>2/3 of BW) (Mid) (8DPSK)



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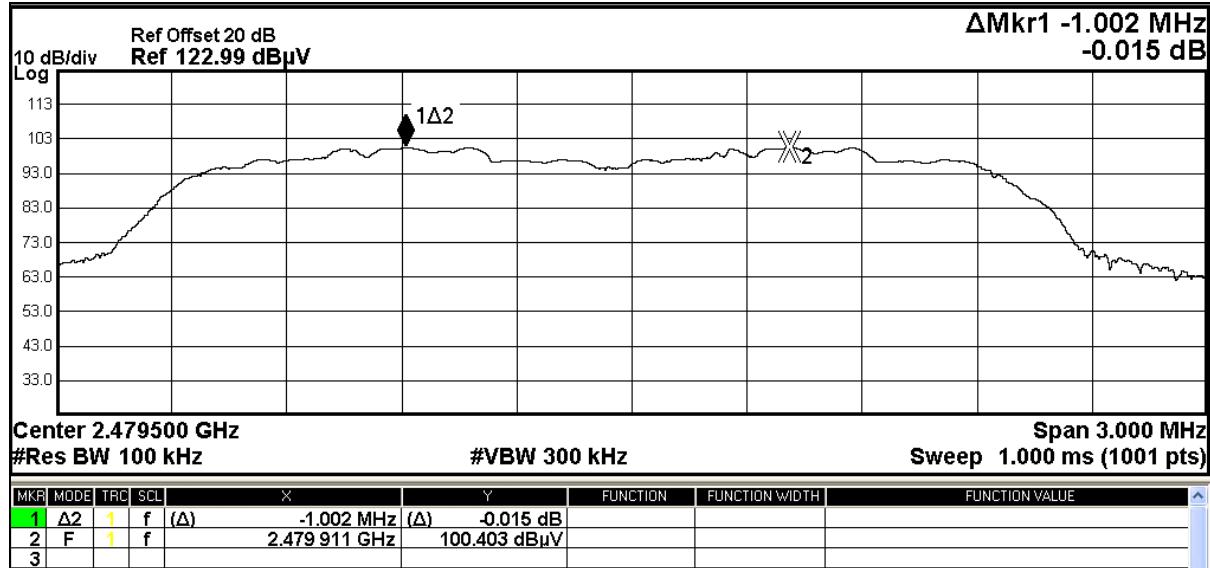
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Page 42 of 70

No. : HM170857

Channel separation = 1MHz (>2/3 of BW) (Highest) (8DPSK)



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Test Report

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Page 43 of 70

No. : HM170857

3.1.7 Band-edge Emissions Measurement:

Limit :

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

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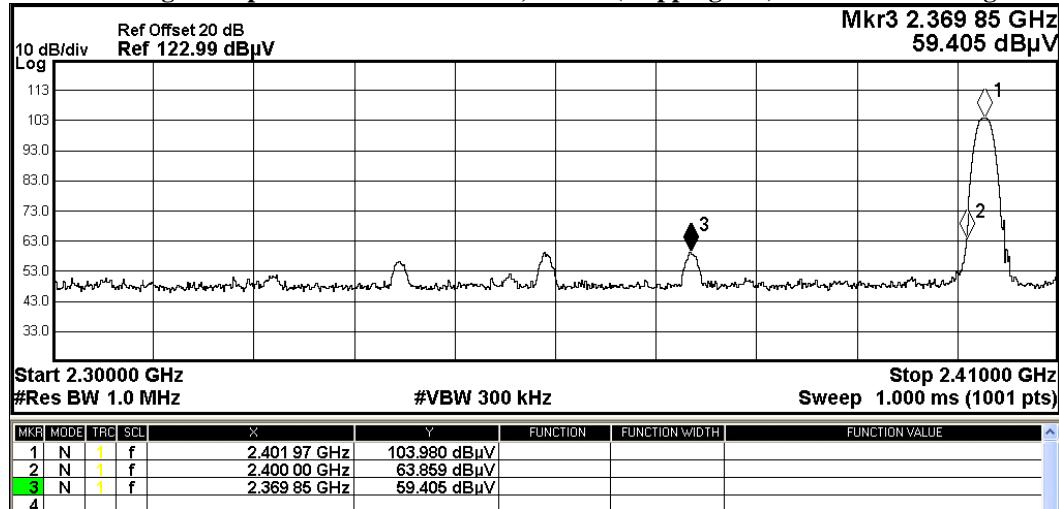
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No. : HM170857

Page 44 of 70

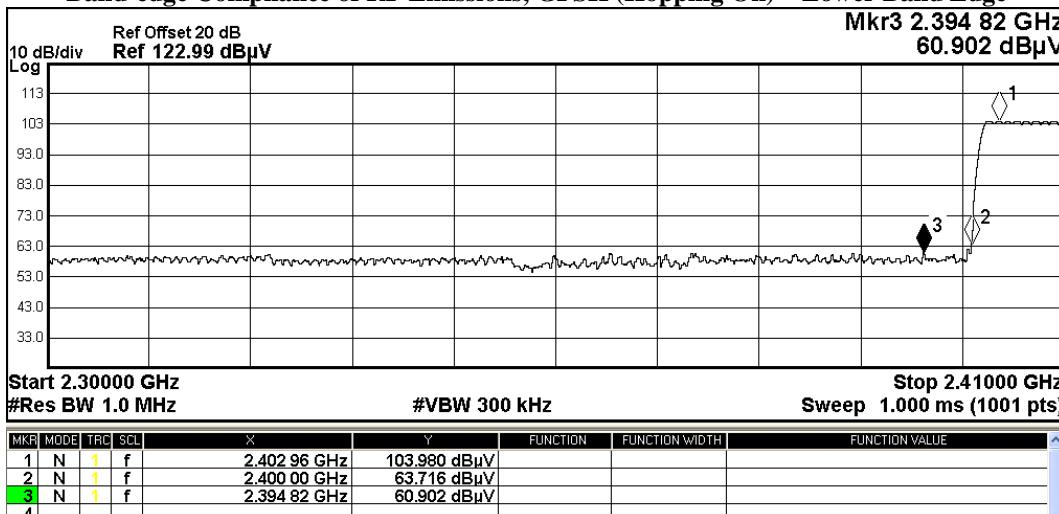
Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	40.1

Band-edge Compliance of RF Emissions, GFSK (Hopping Off) – Lower Band Edge



Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	40.3

Band-edge Compliance of RF Emissions, GFSK (Hopping On) – Lower Band Edge



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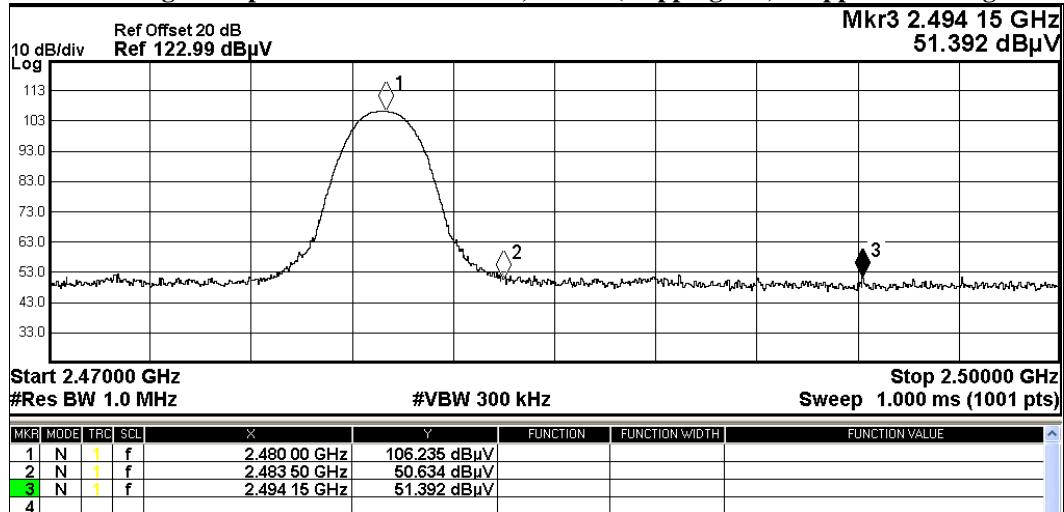
Date : 2017-10-18

No. : HM170857

Page 45 of 70

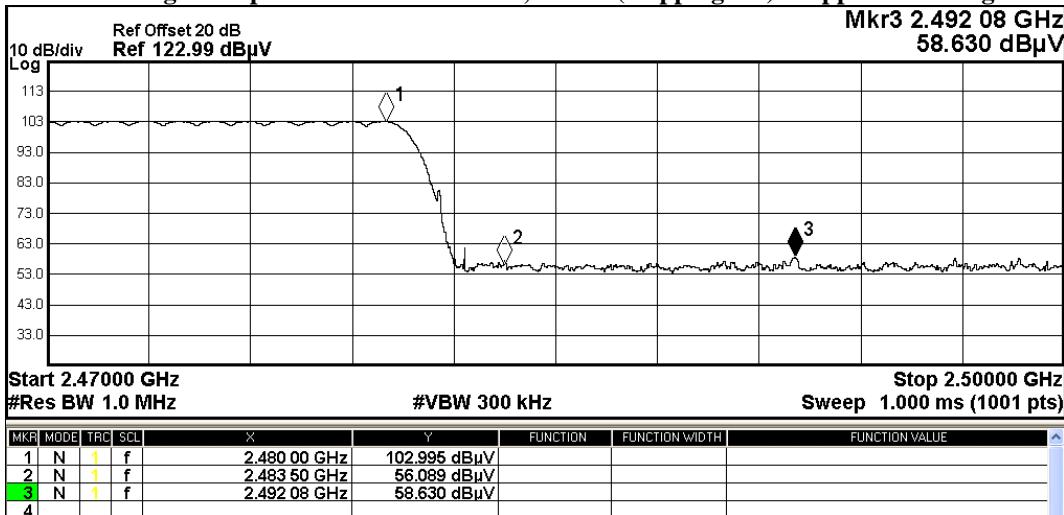
Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	55.6

Band-edge Compliance of RF Emissions, GFSK (Hopping Off) – Upper Band Edge



Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	46.9

Band-edge Compliance of RF Emissions, GFSK (Hopping On) – Upper Band Edge



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No. : HM170857

Band-edge Emissions Measurement:

Result: RF Radiated Emissions - GFSK

Page 46 of 70

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2369.9	22.6	36.8	59.4	74.0	14.6	Vertical
2394.8	24.1	36.8	60.9	74.0	13.1	Vertical
2494.2	14.5	36.9	51.4	74.0	22.6	Vertical
2492.1	21.7	36.9	58.6	74.0	15.4	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2369.9	6.5	36.8	43.3	54.0	10.7	Vertical
2394.8	4.7	36.8	41.5	54.0	12.5	Vertical
2494.2	0.7	36.9	37.6	54.0	16.4	Vertical
2492.1	-1.3	36.9	35.6	54.0	18.4	Vertical

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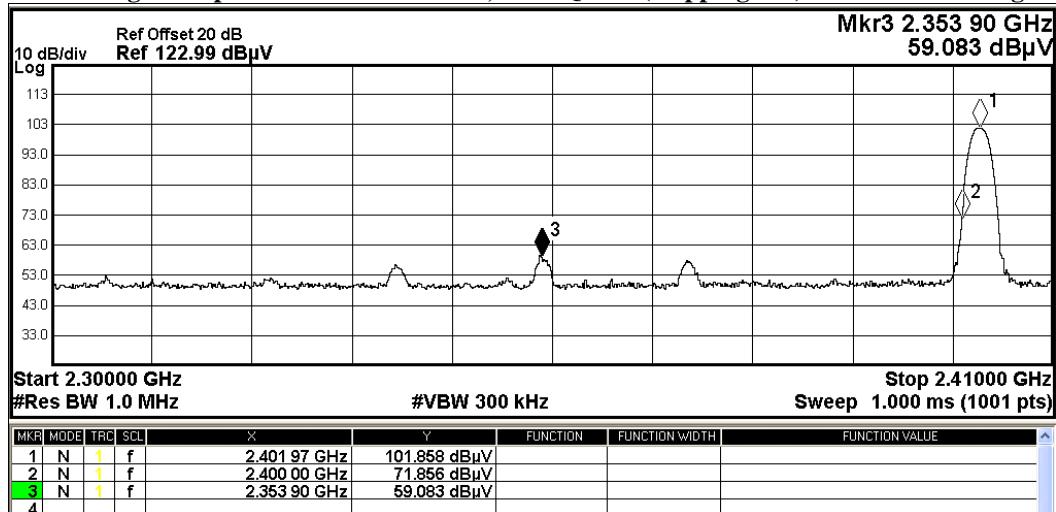
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No. : HM170857

Page 47 of 70

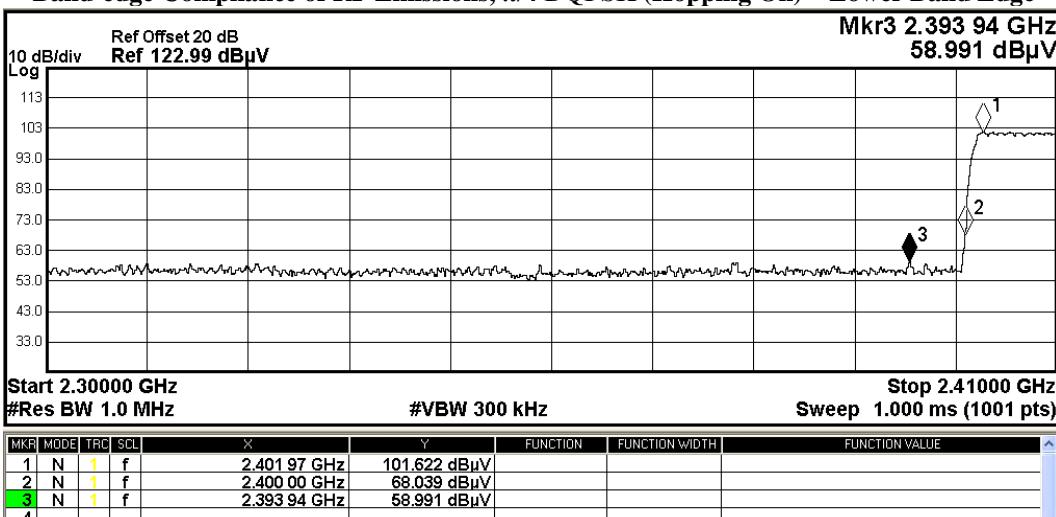
Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	30.0

Band-edge Compliance of RF Emissions, $\pi/4$ DQPSK (Hopping Off) – Lower Band Edge



Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	33.6

Band-edge Compliance of RF Emissions, $\pi/4$ DQPSK (Hopping On) – Lower Band Edge



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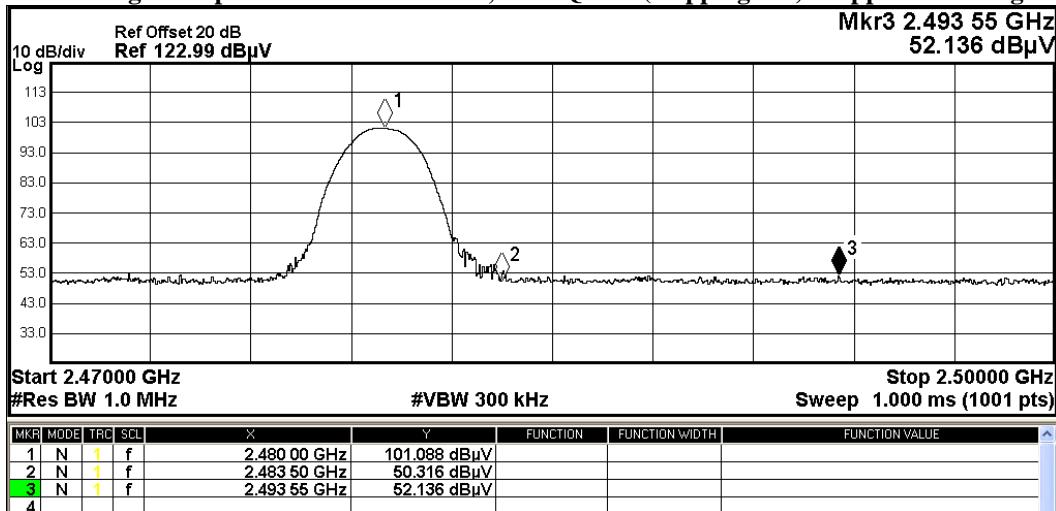
Date : 2017-10-18

No. : HM170857

Page 48 of 70

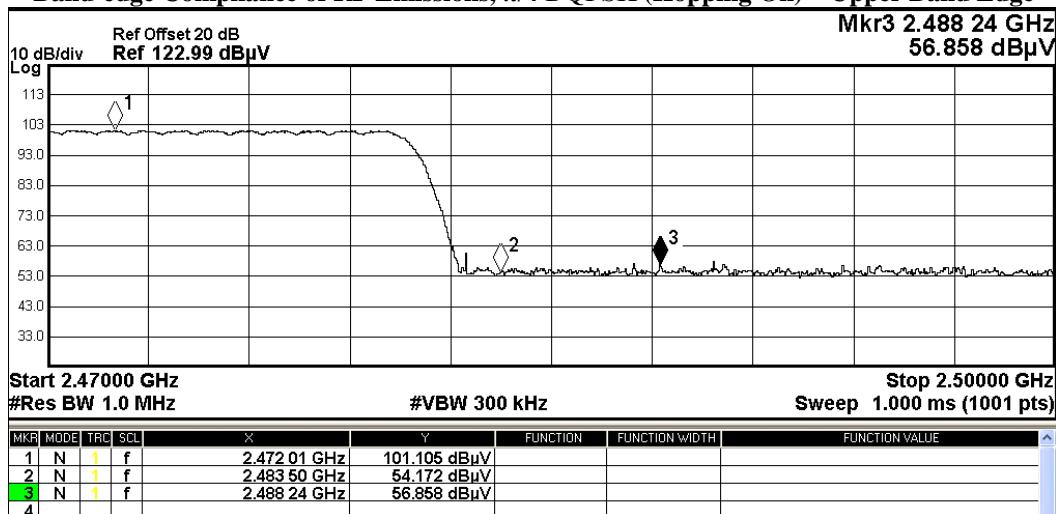
Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	51.7

Band-edge Compliance of RF Emissions, $\pi/4$ DQPSK (Hopping Off) – Upper Band Edge



Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	46.9

Band-edge Compliance of RF Emissions, $\pi/4$ DQPSK (Hopping On) – Upper Band Edge



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Test Report

Date : 2017-10-18

Page 49 of 70

No. : HM170857

Band-edge Emissions Measurement:

Result: RF Radiated Emissions - $\pi/4$ DQPSK

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2383.9	22.3	36.8	59.1	74.0	14.9	Vertical
2393.9	22.2	36.8	59.0	74.0	15.0	Vertical
2493.7	15.2	36.9	52.1	74.0	21.9	Vertical
2488.2	20.0	36.9	56.9	74.0	17.1	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2383.9	7.7	36.8	44.5	54.0	9.5	Vertical
2393.9	3.8	36.8	40.6	54.0	13.4	Vertical
2493.7	2.1	36.9	39.0	54.0	15.0	Vertical
2488.2	-1.7	36.9	35.2	54.0	18.8	Vertical

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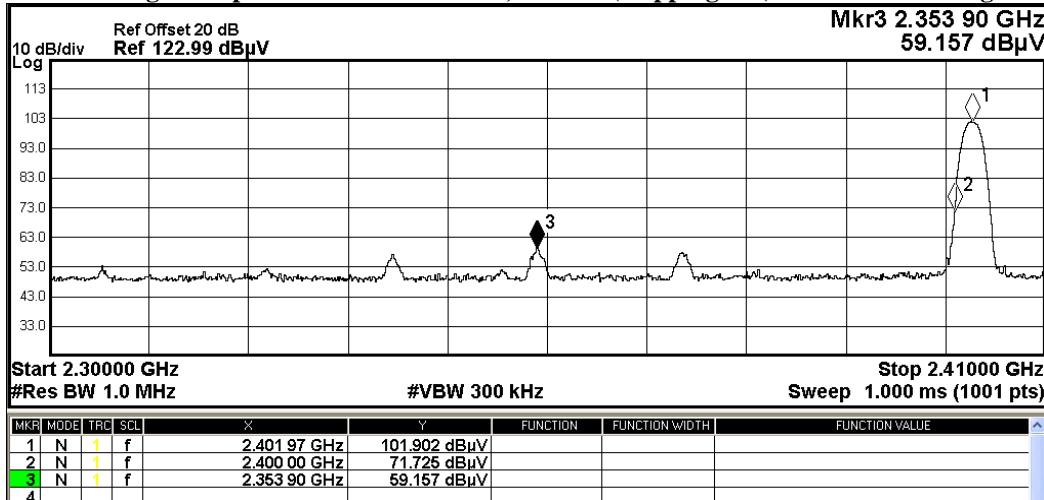
Date : 2017-10-18

No. : HM170857

Page 50 of 70

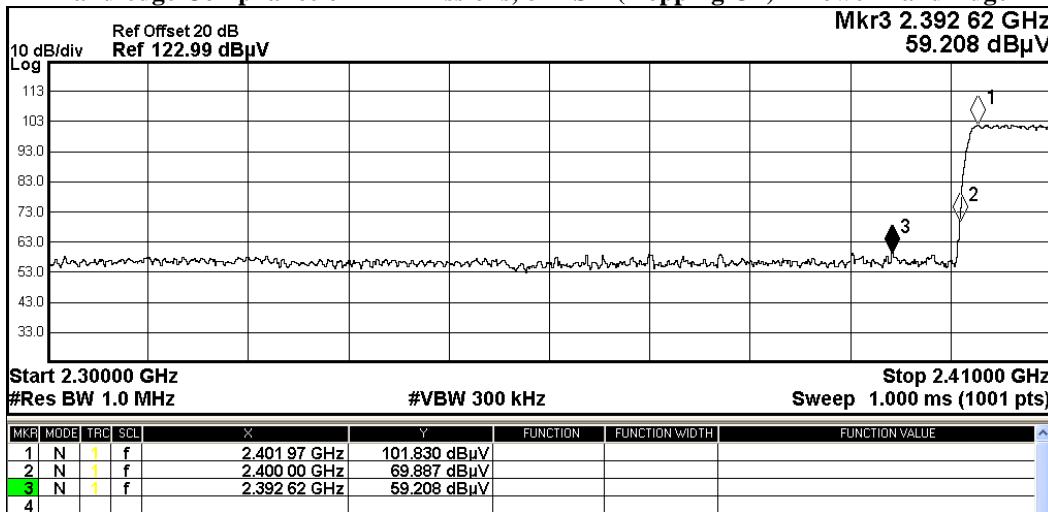
Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	30.2

Band-edge Compliance of RF Emissions, 8DPSK (Hopping Off) – Lower Band Edge



Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	31.9

Band-edge Compliance of RF Emissions, 8DPSK (Hopping On) – Lower Band Edge



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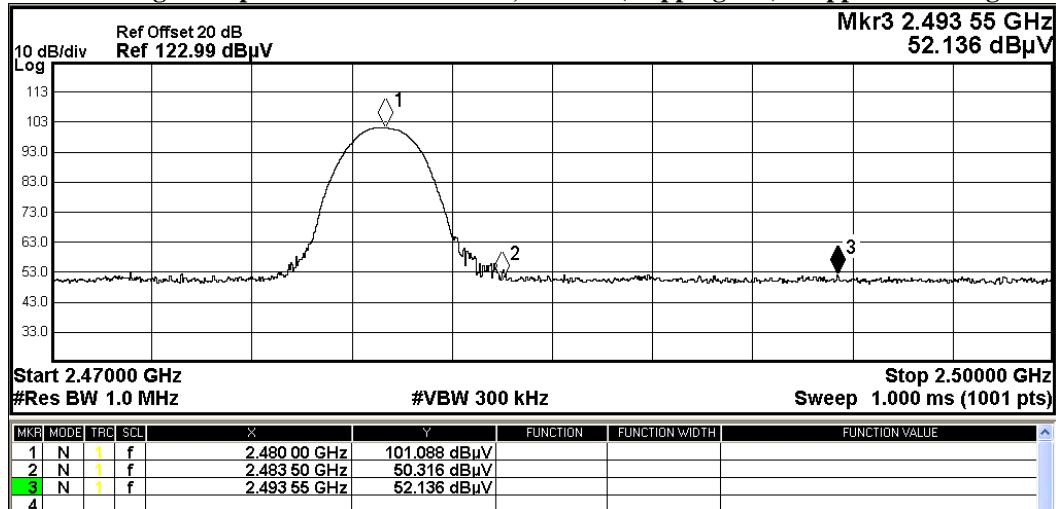
Date : 2017-10-18

No. : HM170857

Page 51 of 70

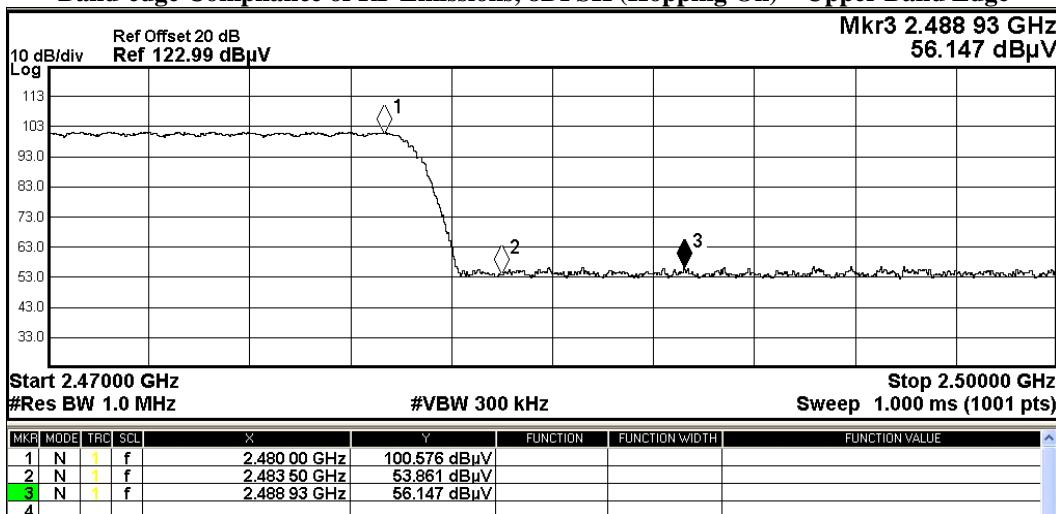
Frequency Range [MHz]	Radiated Emission Attenuate below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	50.8

Band-edge Compliance of RF Emissions, 8DPSK (Hopping Off) – Upper Band Edge



Frequency Range [MHz]	Radiated Emission Attenuate below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	46.7

Band-edge Compliance of RF Emissions, 8DPSK (Hopping On) – Upper Band Edge



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No. : HM170857

Band-edge Emissions Measurement:

Result: RF Radiated Emissions – 8DPSK

Page 52 of 70

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2353.9	22.4	36.8	59.2	74.0	14.8	Vertical
2392.6	22.4	36.8	59.2	74.0	14.8	Vertical
2493.6	15.2	36.9	52.1	74.0	21.9	Vertical
2488.9	19.2	36.9	56.1	74.0	17.9	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dBuV	Correction Factor dB/m	Field Strength dBuV/m	Limit @3m dBuV/m	Margin dB	E-Field Polarity
2353.9	5.7	36.8	42.5	54.0	11.5	Vertical
2392.6	0.9	36.8	37.7	54.0	16.3	Vertical
2493.6	1.1	36.9	38.0	54.0	16.0	Vertical
2488.9	-3.3	36.9	33.6	54.0	20.4	Vertical

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Test Report

Date : 2017-10-18

Page 53 of 70

No. : HM170857

3.1.8 Time of Occupancy (Dwell Time)

Requirements:

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channel employed.

No requirements for Digital Transmission System.

Spectrum Analyzer Setting:

RBW = 300kHz, VBW \geq RBW,

Sweep = A longer sweep time to show two successive hops on a channel,

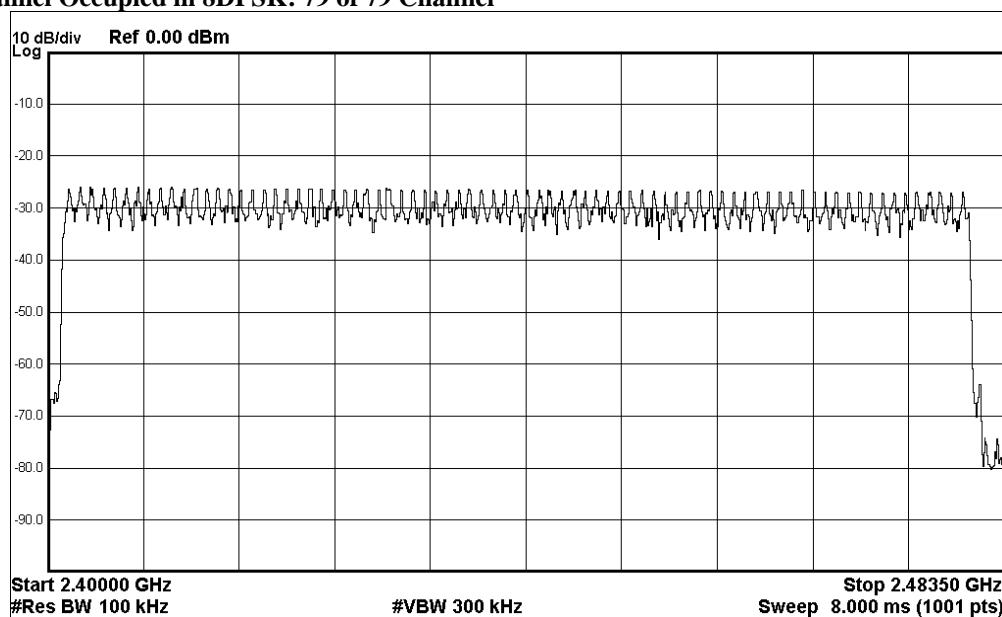
Span = Zero, Detector = Peak, Trace = Max. hold

Dwell Time = Pulse Duration * hop rate / number of channel * observation duration

Observed duration: 0.4s x 79 = 31.6s

Measurement Data:

Channel Occupied in 8DPSK: 79 of 79 Channel



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Test Report

Date : 2017-10-18

Page 54 of 70

No. : HM170857

DH5 Packet:

DH5 Packet permit maximum $1600/79/6 = 3.37$ hops per second in each channel (5 time slots RX, 1 time slot TX). The Dwell time is the time duration of the pulse times $3.37 \times 31.6 = 106.6$ within 31.6 seconds

Fig. A
[Pulse duration of Lowest Channel]

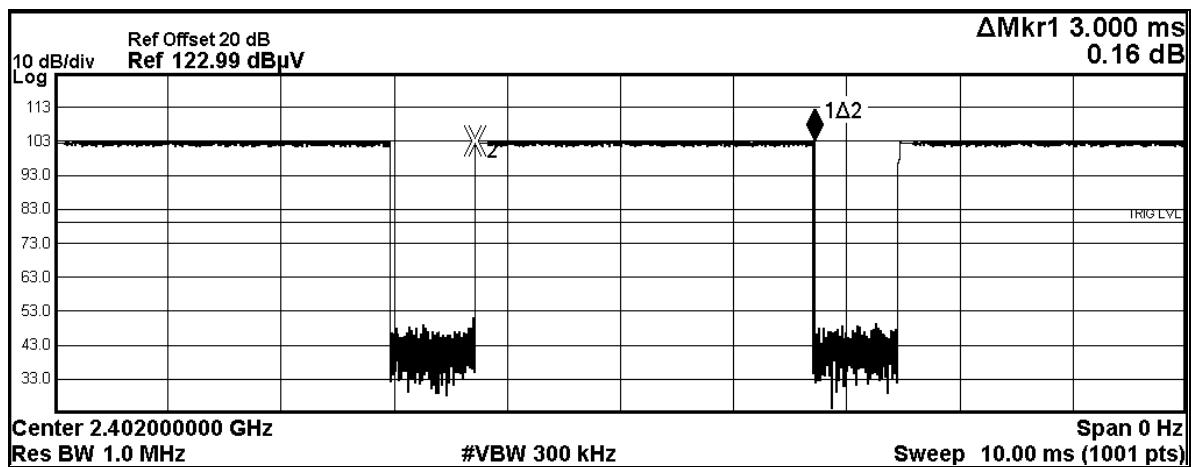
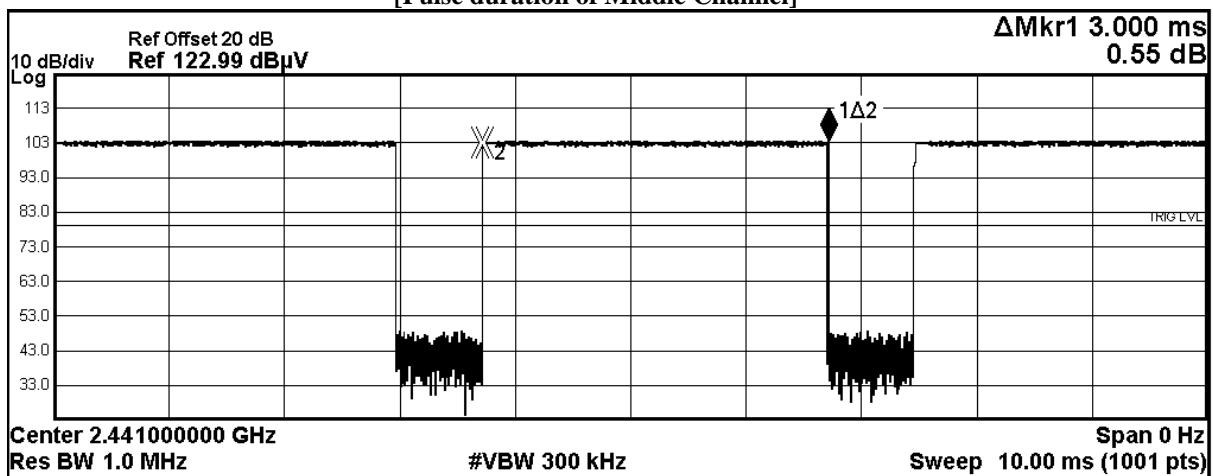


Fig. B
[Pulse duration of Middle Channel]



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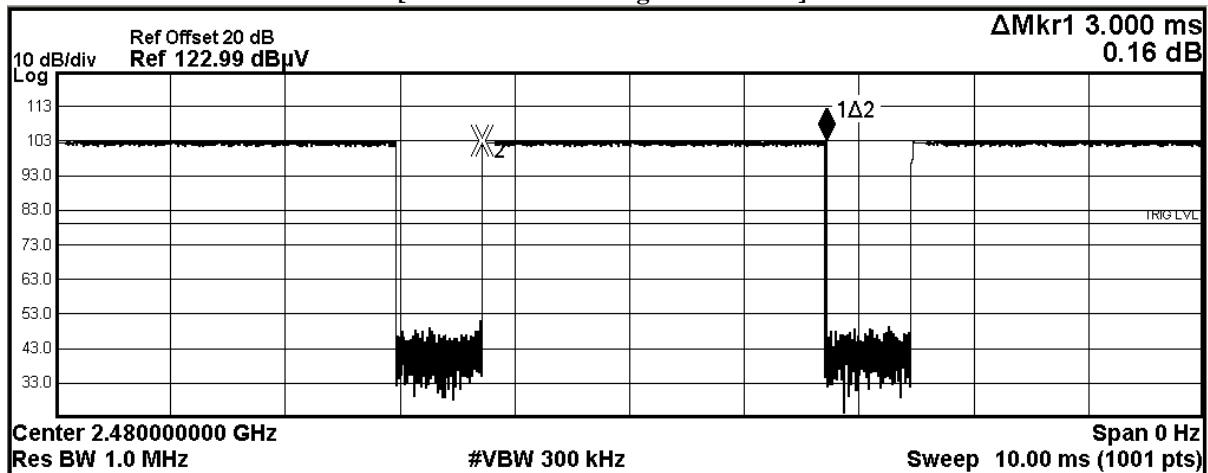
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Date : 2017-10-18

No. : HM170857

Page 55 of 70

Fig. C
[Pulse duration of Highest Channel]



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No. : HM170857

DH3 Packet:

Page 56 of 70

DH3 Packet permit maximum $1600/79/4 = 5.06$ hops per second in each channel (3 time slots RX, 1 time slot TX). The Dwell time is the time duration of the pulse times $5.06 \times 31.6 = 160$ within 31.6 seconds

Fig. D
[Pulse duration of Lowest Channel]

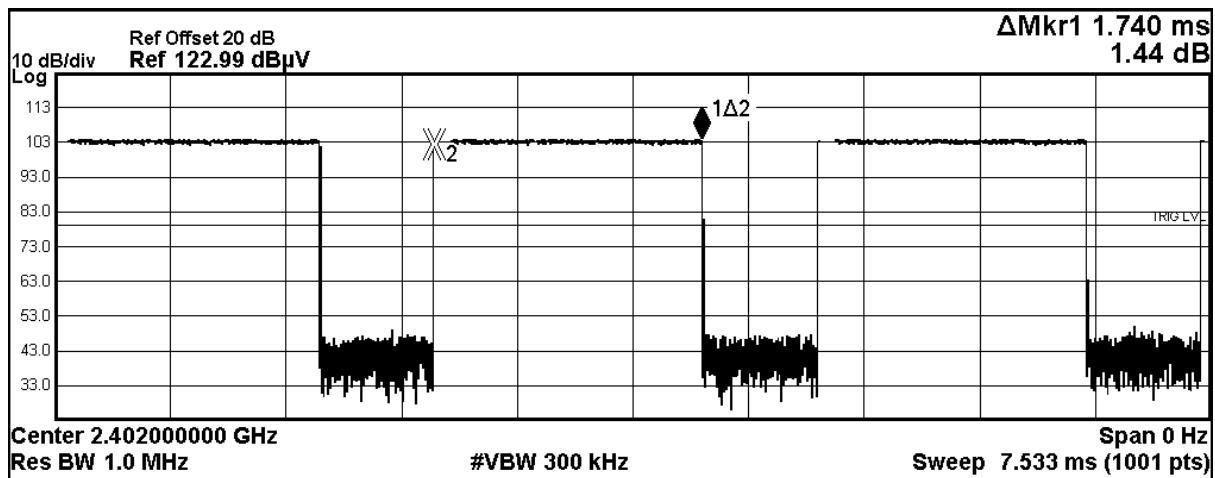
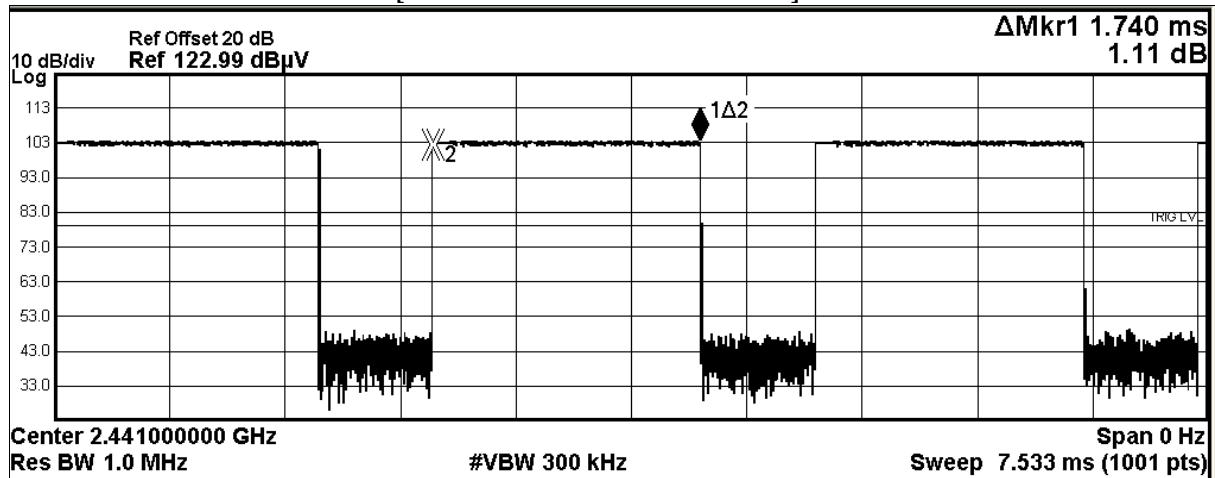


Fig. E
[Pulse duration of Middle Channel]



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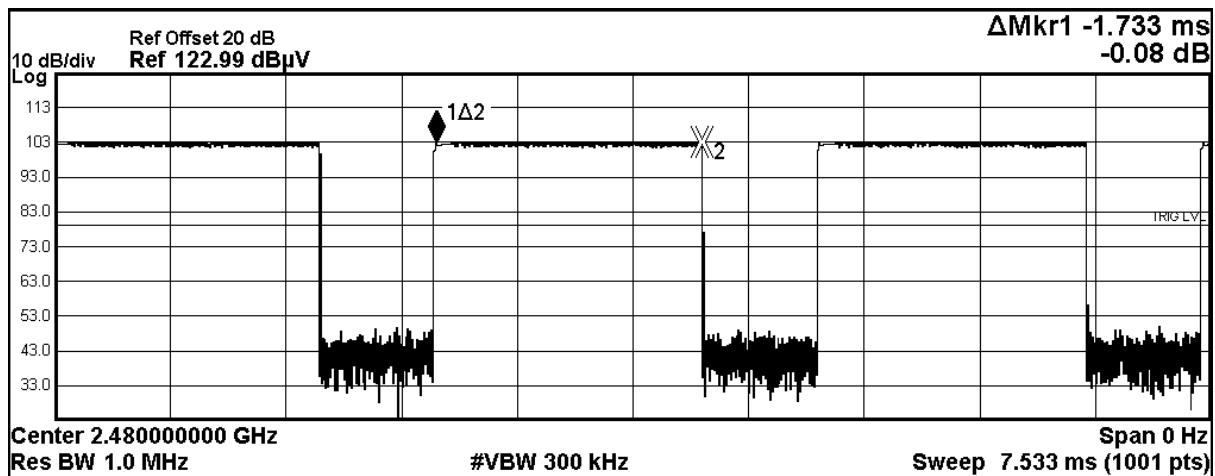
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Date : 2017-10-18

No. : HM170857

Page 57 of 70

Fig. F
[Pulse duration of Highest Channel]



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Date : 2017-10-18

No. : HM170857

DH1 Packet:

Page 58 of 70

DH1 Packet permit maximum $1600/79/2 = 10.12$ hops per second in each channel (3 time slots RX, 1 time slot TX). The Dwell time is the time duration of the pulse times $10.12 \times 31.6 = 320$ within 31.6 seconds

Fig. G
[Pulse duration of Lowest Channel]

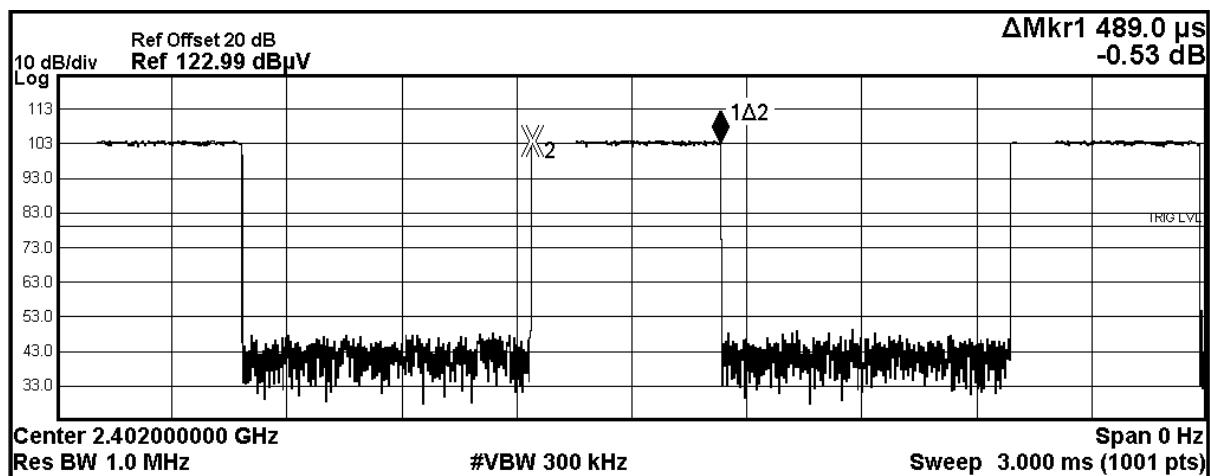
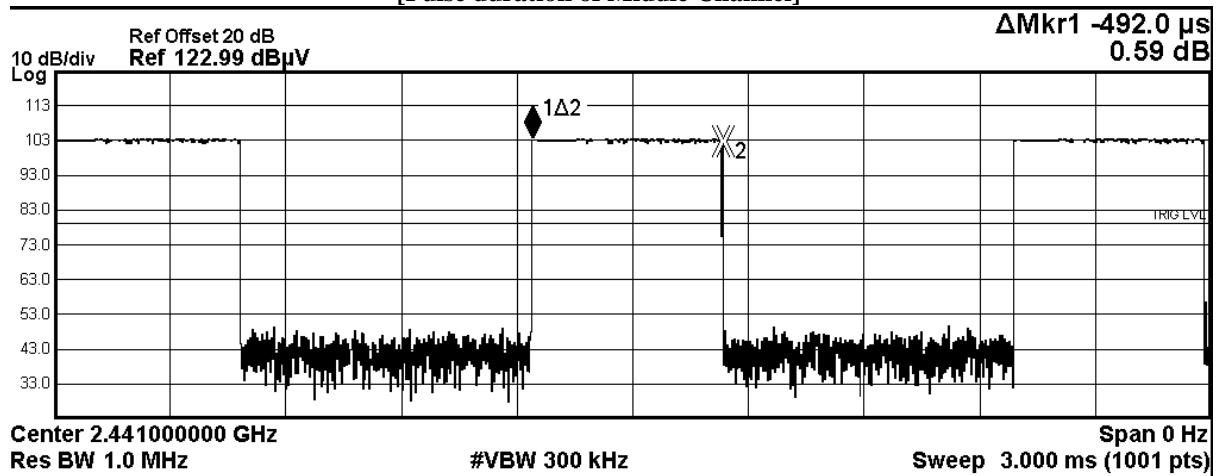


Fig. H
[Pulse duration of Middle Channel]



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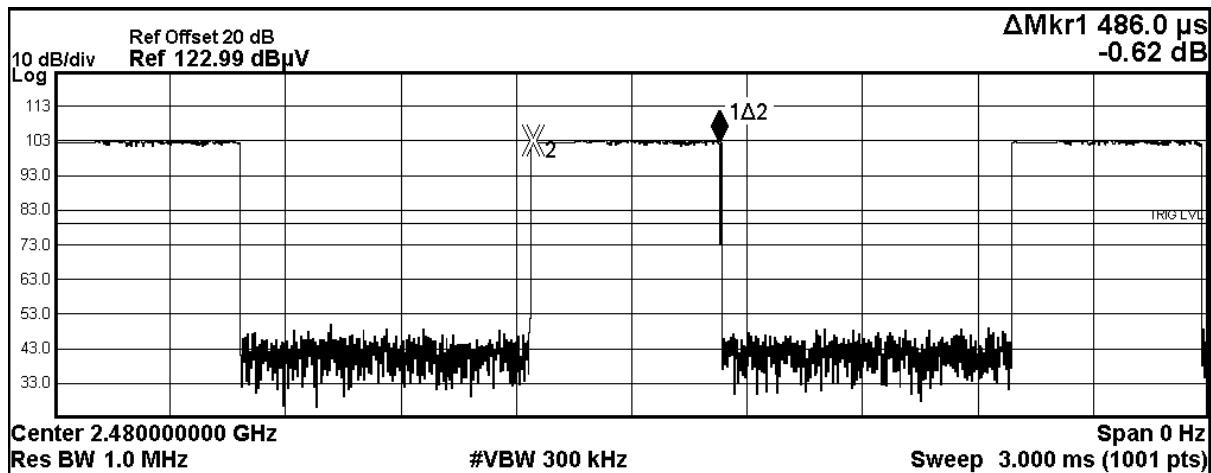
Test Report

Date : 2017-10-18

No. : HM170857

Page 59 of 70

Fig. I
[Pulse duration of Highest Channel]



Time of occupancy (Dwell Time):

Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)	Test Results
DH5	2402	3.000	0.319	0.400	Complies
DH5	2441	3.000	0.319	0.400	Complies
DH5	2480	3.000	0.319	0.400	Complies
DH3	2402	1.740	0.278	0.400	Complies
DH3	2441	1.740	0.277	0.400	Complies
DH3	2480	1.733	0.262	0.400	Complies
DH1	2402	0.489	0.156	0.400	Complies
DH1	2441	0.492	0.157	0.400	Complies
DH1	2480	0.486	0.156	0.400	Complies

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Test Report

Date : 2017-10-18

Page 60 of 70

No. : HM170857

3.1.9 Channel Centre Frequency

Requirements:

Frequency hopping system in the 2400-2483.5MHz band shall use at least 79 (Channel 1 to 79) non-overlapping channels.

The EUT operates in according with the Bluetooth system specification within the 2400 - 2483.5 MHz frequency band.

RF channels for Bluetooth systems are spaced 1 MHz and are ordered in channel number k. In order to comply with out-of-band regulations, a lower frequency guard band of 2.0 MHz and a higher frequency guard band of 3.5MHz is used.

The operating frequencies of each channel are as follows:

First RF channel start from 2400MHz + 2MHz guard band = 2402MHz

Frequency of RF Channel = 2402+k MHz, k = 1,...,79 (Channel separation = 1MHz)

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Test Report

Date : 2017-10-18

Page 61 of 70

No. : HM170857

3.1.10 Pseudorandom Hopping Algorithm

Requirements:

The channel frequencies shall be selected from a pseudorandom ordered list of hopping frequencies. Each frequency must be used equally by the transmitter.

EUT Pseudorandom Hopping Algorithm

The EUT is a Bluetooth device, the Pseudo-random hopping pattern; hopping characteristics and algorithm are based on the Bluetooth specification.

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Test Report

Date : 2017-10-18

No. : HM170857

Page 62 of 70

3.1.11 Antenna Requirement

Test Requirements: § 15.203

Test Specification:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Test Results:

This is Circuit printed meander line antenna. There is no external antenna, the antenna gain = 0dBi. User is unable to remove or changed the Antenna.

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Test Report

Date : 2017-10-18

No. : HM170857

3.1.12 RF Exposure

Page 63 of 70

Test Requirement: FCC 47CFR 15.247(i)
Test Date: 2017-08-14
Mode of Operation: Tx mode (GFSK)

Test Method:

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

Test Results:

N/A, exemption according to KDB 447498, peak power <1mW

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Test Report

Date : 2017-10-18

No. : HM170857

Page 64 of 70

Appendix A

List of Measurement Equipment

LIST OF MEASUREMENT EQUIPMENT

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2017/04/24	2018/04/24
EM356	ANTENNA POSITIONING TOWER	ETS-LINDGREN	2171B	00150346	N/A	N/A
EM354	BICONILOG ANTENNA	ETS-LINDGREN	3143B	00142073	2016/02/29	2018/02/29
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2017/06/01	2018/06/01
EM299	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS-LINDGREN	3115	00114120	2016/04/27	2018/04/27
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2016/05/13	2018/05/13
EM301	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-10	00130988	2016/05/13	2018/05/13
EM302	PRECISION OMNIDIRECTIONAL DIPOLE (1 – 6GHZ)	SEIBERSDORF LABORATORIES	POD 16	161806/L	2016/05/11	2018/05/11
EM303	PRECISION OMNIDIRECTIONAL DIPOLE (6 – 18GHZ)	SEIBERSDORF LABORATORIES	POD 618	6181908/L	2016/05/11	2018/05/11
EM318	USB WIDEBAND POWER SENSOR	AGILENT	U2022XA	MY53470001	2017/03/23	2019/03/23
EM353	LOOP ANTENNA	ETS LINDGREN	6502	00206533	2016/03/16	2018/03/16

Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM119	LISN	R & S	ESH3-Z5	0831.5518.52	2016/11/29	2017/11/29
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	100072	2017/06/01	2018/06/01
EM179	IMPULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	357-8810.52/54	2017/01/11	2018/01/11
EM154	SHIELDING ROOM	SIEMENS MATSUSHITA COMPONENTS	N/A	803-740-057-99A	2017/02/02	2022/02/02
N/A	MEASUREMENT AND EVALUATION SOFTWARE	ROHDE & SCHWARZ	ESIB-K1	V1.20	N/A	N/A

Remarks:-

CM Corrective Maintenance

N/A Not Applicable or Not Available

TBD To Be Determined

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Date : 2017-10-18

No. : HM170857

Page 65 of 70

Appendix B

Photographs of EUT

Front View of the product



Rear View of the product



Rear View of the product



Rear View of the product



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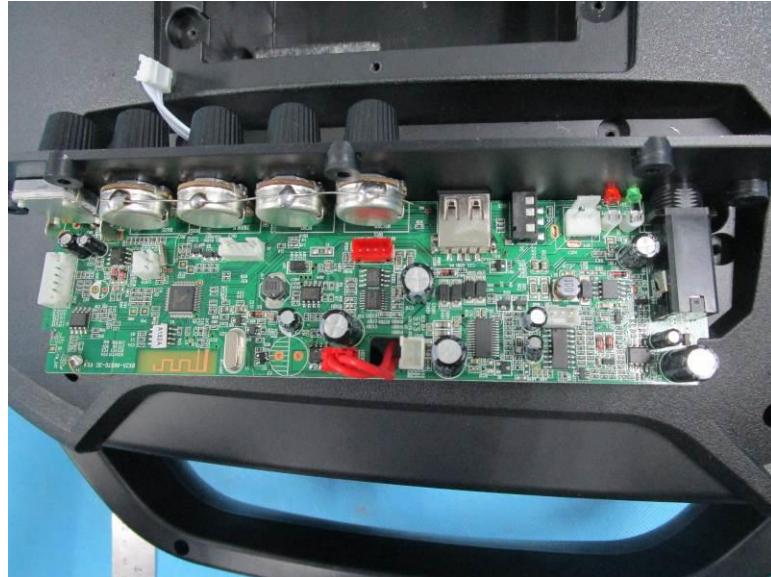
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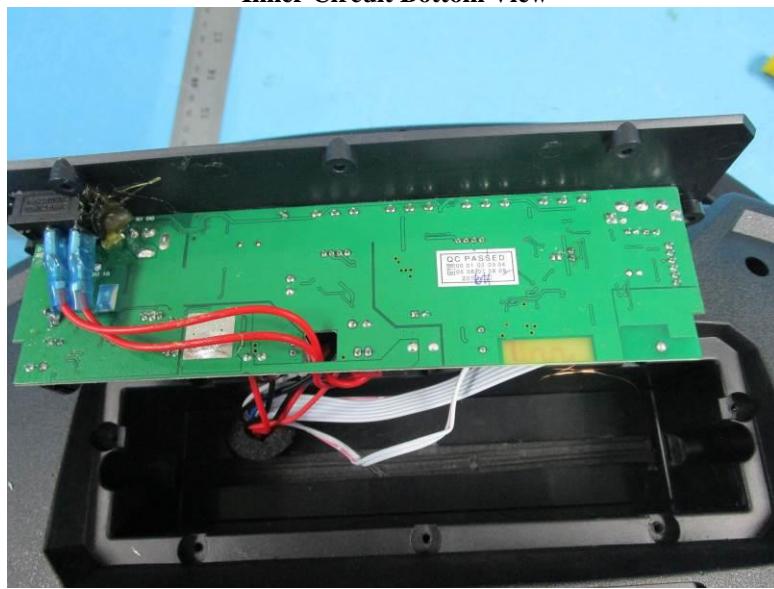
Page 66 of 70

Photographs of EUT

Inner Circuit Top View



Inner Circuit Bottom View



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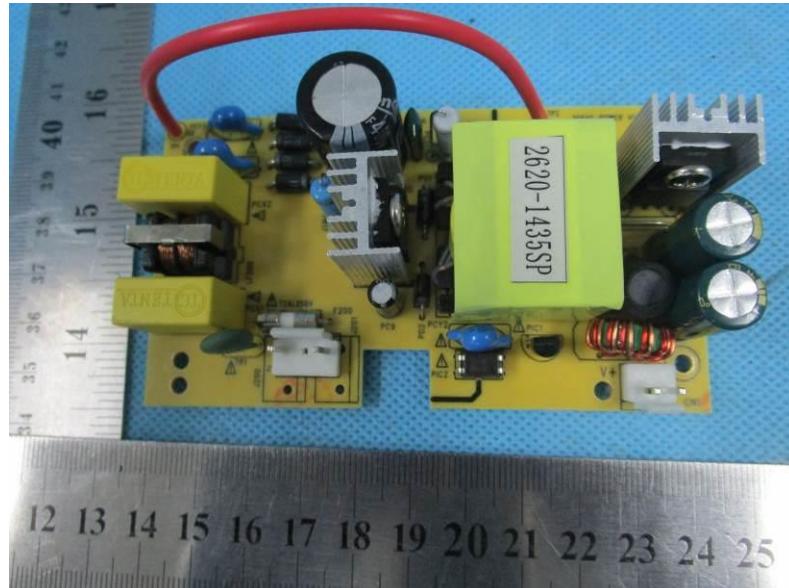
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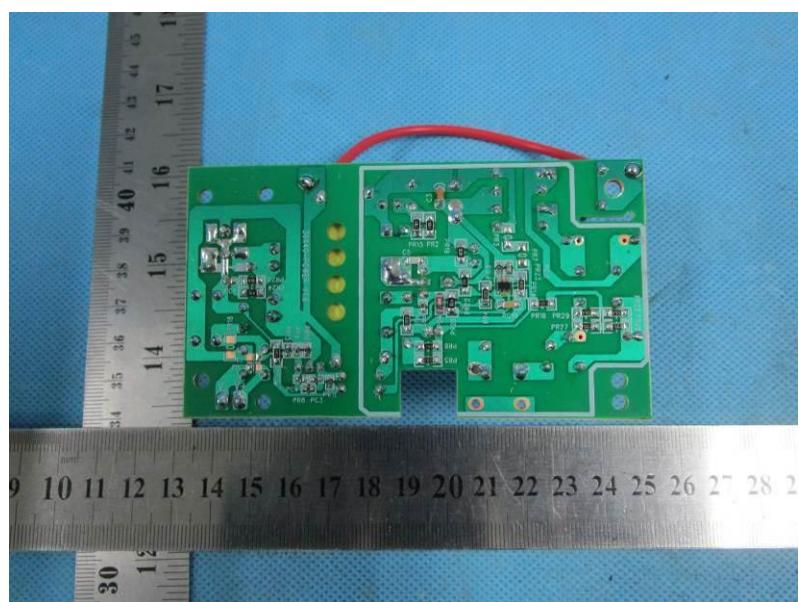
Page 67 of 70

Photographs of EUT

Inner Circuit Top View



Inner Circuit Bottom View



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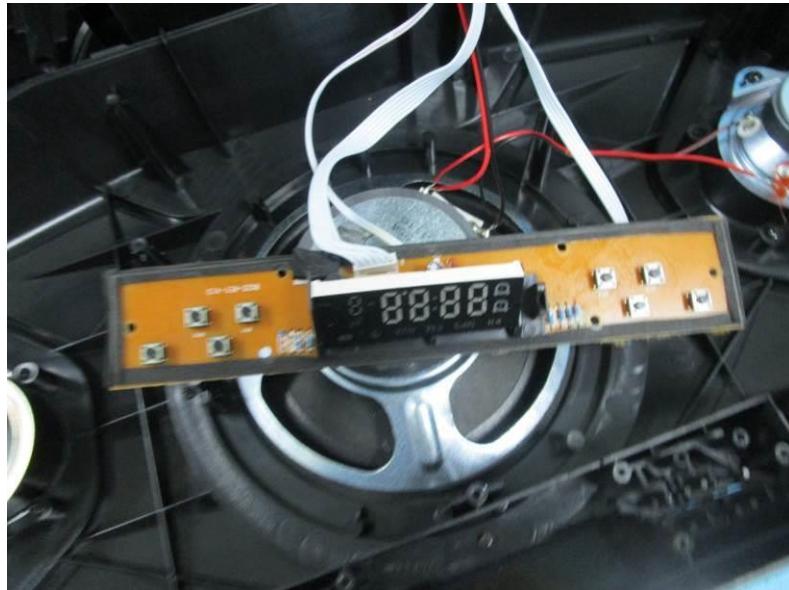
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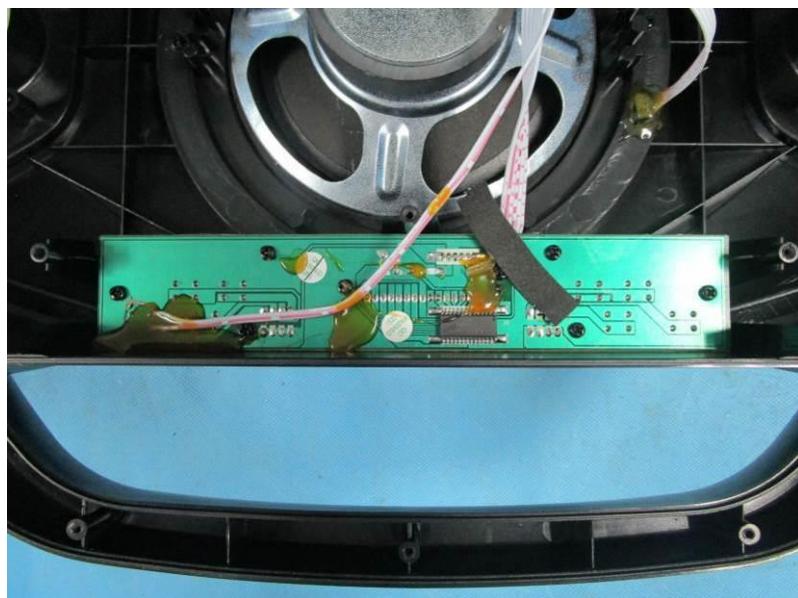
Page 68 of 70

Photographs of EUT

Inner Circuit Top View



Inner Circuit Bottom View



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No. : HM170857

Page 69 of 70

Photographs of EUT

Measurement of Radiated Emission Test Set Up



Measurement of Radiated Emission Test Set Up



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Page 70 of 70

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Measurement of Radiated Emission Test Set Up



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

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