



Test Report

Date : 2017-02-21

No. : DM125641

Page 1 of 77

Applicant : China Electronics Shenzhen Company
33F, Tower A, Electronic Science and Technology Building, 2070
Shennan Zhonglu, Futian District, Shenzhen, China

Supplier / Manufacturer : China Electronics Shenzhen Company
33F, Tower A, Electronic Science and Technology Building, 2070
Shennan Zhonglu, Futian District, Shenzhen, China

Description of Sample(s) : Submitted sample(s) said to be
Product: Bluetooth Speaker
Brand Name: BETTO
Model No.: S-23
FCC ID: 2AAQFS23

Date Samples Received : 2016-11-04

Date Tested : 2017-01-06 to 2017-01-12

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

Conclusions : 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.

Remarks : Bluetooth FHSS (GFSK/ $\pi/4$ -DQPSK)
For additional model(s) details, please see page 3.


LONG Yun Jian / Along
Authorized Signatory
ElectroMagnetic Compatibility Department
For and on behalf of
STC (Dongguan) Company Limited

STC (Dongguan) Company Limited

68 Fumin Nan Road, Dalang, Dongguan, Guangdong, China. Zip Code: 523770

Tel : (86 769) 81119888 Fax : (86 769) 81116222 Email : dgstc@dgstc.org Website : www.dgstc.org

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Test Report

Date : 2017-02-21
No. : DM125641

Page 2 of 77

CONTENT:

Cover	Page 1 of 77	
Content	Page 2 of 77	
<u>1.0</u>	<u>General Details</u>	
1.1	Test Laboratory	Page 3 of 77
1.2	Equipment Under Test [EUT] Description of EUT operation	Page 3 of 77
1.3	Date of Order	Page 3 of 77
1.4	Submitted Sample(s)	Page 3 of 77
1.5	Test Duration	Page 3 of 77
1.6	Country of Origin	Page 3 of 77
1.7	RF Module Details	Page 4 of 77
1.8	Antenna Details	Page 4 of 77
<u>2.0</u>	<u>Technical Details</u>	
2.1	Investigations Requested	Page 5 of 77
2.2	Test Standards and Results Summary	Page 5 of 77
2.3	Table for Test Modes	Page 6 of 77
<u>3.0</u>	<u>Test Results</u>	
3.1	Emission	Page 7-72 of 77
<u>Appendix A</u>	List of Measurement Equipment	Page 73 of 77
<u>Appendix B</u>	Ancillary Equipment	Page 73 of 77
<u>Appendix C</u>	Photograph(s) of Product	Page 74-77 of 77

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Test Report

Date : 2017-02-21

Page 3 of 77

No. : DM125641

1.0 General Details

1.1 Test Laboratory

STC (Dongguan) Company Limited
EMC Laboratory
68 Fumin Nan Road, Dalang, Dongguan, Guangdong, China
Telephone: (86 769) 81119888
Fax: (86 769) 81116222

1.2 Equipment Under Test [EUT]

Description of Sample(s)

Product: Bluetooth Speaker
Manufacturer: China Electronics Shenzhen Company
33F, Tower A, Electronic Science and Technology Building,
2070 Shennan Zhonglu, Futian District, Shenzhen, China
Brand Name: BETTO
Model Number: S-23
Additional Brand Name: syv, arrco, PULSE, popwinds
Additional Model Number: SP236, SP237, SP238, SP239, PW-BS-23
Rating: 5.0Vd.c. (Powered by USB port) / 3.7Vd.c Li-ion polymer
rechargeable battery

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is a 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

2016-11-04

1.4 Submitted Sample(s):

1 Sample

1.5 Test Duration

2017-01-06 to 2017-01-12

1.6 Country of Origin

China

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Test Report

Date : 2017-02-21

No. : DM125641

Page 4 of 77

1.7 RF Module Details

Module Model Number: AC6905A
Module FCC ID: N/A
Module Transmission Type: Bluetooth V4.2
Modulation: FHSS (GFSK / $\pi/4$ -DQPSK)
Data Rates:
1Mbps: GFSK
2 Mbps: $\pi/4$ -DQPSK
Frequency Range: 2400-2483.5MHz
Carrier Frequencies: 2402MHz – 2480MHz

Module Specification (specification provided by manufacturer)

1.8 Antenna Details

Antenna Type: Inverted F Antenna
Antenna Gain: 0.68dBi

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Test Report

Date : 2017-02-21

No. : DM125641

Page 5 of 77

2.0 Technical Details

2.1 Investigations Requested

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2015 Regulations and ANSI C63.10:2013 for FCC Certification. According FCC KDB 558074 DTS Measurement Guidance, Duty cycle \cong 98%. The device was realized by test software.

2.2 Test Standards and Results Summary Tables

EMISSION Results Summary						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Failed	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"/>

Note: N/A - Not Applicable

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Test Report

Date : 2017-02-21

No. : DM125641

Page 6 of 77

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 device was realized by test software.

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

Test Items	Mode	Data Rate
Maximum Peak Conducted Output Power	GFSK / $\pi/4$ -DQPSK	1MBps / 2MBps
Hopping Channel Separation	GFSK / $\pi/4$ -DQPSK	1MBps / 2MBps
Number of Hopping Frequency	GFSK / $\pi/4$ -DQPSK	1MBps / 2MBps
Time of Occupancy(Dwell Time)	$\pi/4$ -DQPSK (DH1 / DH3 / DH5)	2MBps
Radiated Spurious Emissions	GFSK / $\pi/4$ -DQPSK	1MBps / 2MBps
Band-edge compliance of Conducted Emission	GFSK / $\pi/4$ -DQPSK	1MBps / 2MBps

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Test Report

Date : 2017-02-21
No. : DM125641

Page 7 of 77

3.0 Test Results

3.1 Emission

3.1.1 Maximum Peak Conducted Output Power

Test Requirement:	FCC 47CFR 15.247(b) (1)
Test Method:	ANSI C63.10: 2013
Test Date:	2017-01-11
Mode of Operation:	Tx mode

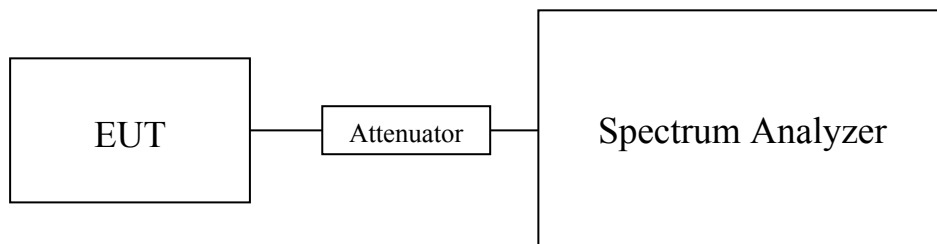
Test Method:

A temporary antenna connector was soldered to the RF output. The RF output of the EUT was connected to the spectrum analyzer. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in Watt.

Spectrum Analyzer Setting:

RBW = 3 MHz, VBW= 3MHz, Sweep = Auto, Span: Approximately five times the 20 dB bandwidth
Detector = Peak, Trace = Max. hold

Test Setup:



Note: a temporary antenna connector was soldered to the RF output.

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Test Report

Date : 2017-02-21

Page 8 of 77

No. : DM125641

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

The maximum peak output power shall not exceeded the following limits:
For Digital Transmission systems in 2400-2483.5 MHz Band: 1 Watt
Results of Bluetooth Communication mode (GFSK) (Fundamental Power): Pass

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

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2402	0.000389

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2441	0.000335

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2480	0.000262

The maximum peak output power shall not exceeded the following limits:
For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 Watts
Results of Bluetooth Communication mode ($\pi/4$ -DQPSK) (Fundamental Power): Pass

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2402	0.000472

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2441	0.000412

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2480	0.000321

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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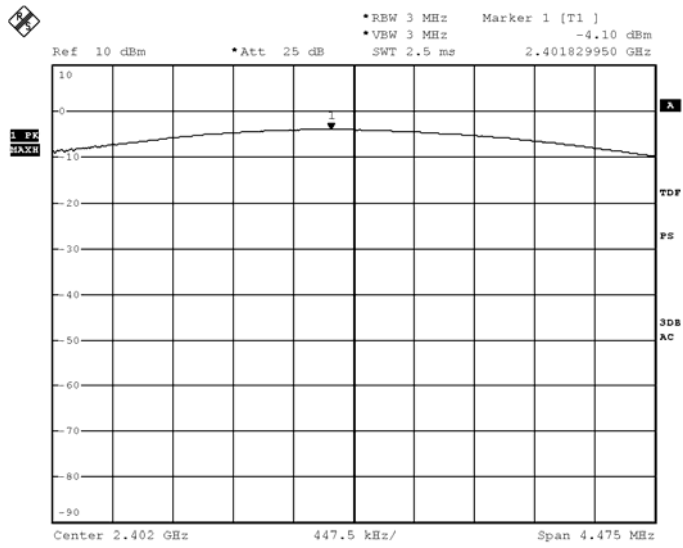
Test Report

Date : 2017-02-21
No. : DM125641

Page 9 of 77

Test plot of Maximum Peak Conducted Output Power :

Bluetooth Communication mode (GFSK, 2402MHz)



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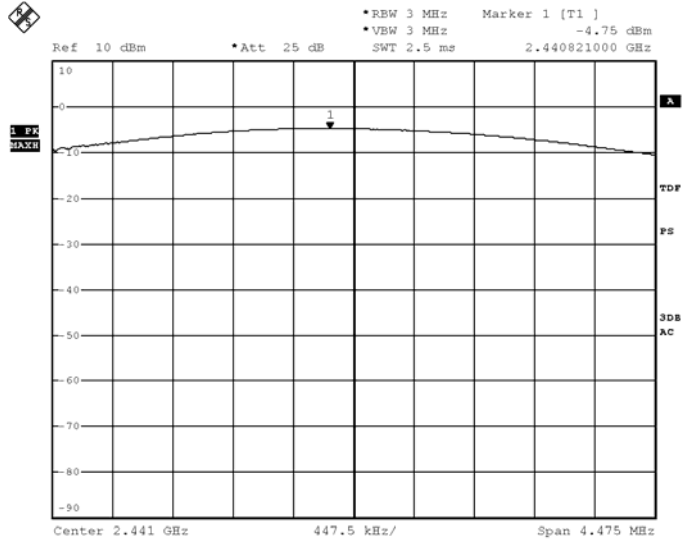


Test Report

Date : 2017-02-21
No. : DM125641

Page 10 of 77

Bluetooth Communication mode (GFSK, 2441MHz)



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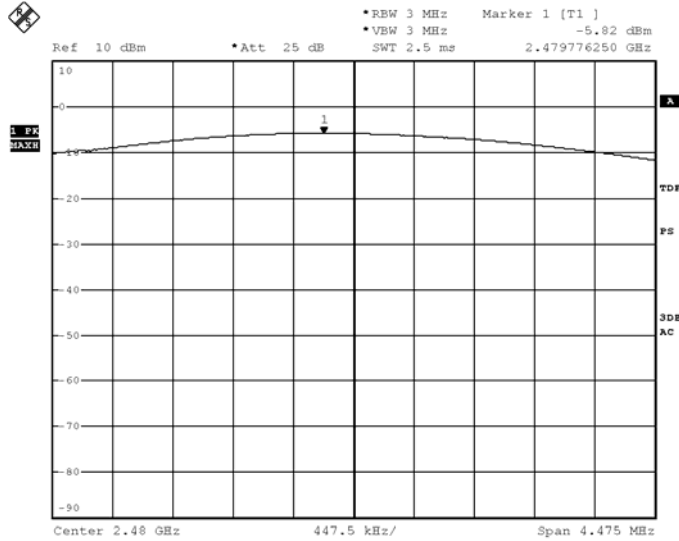


Test Report

Date : 2017-02-21
No. : DM125641

Page 11 of 77

Bluetooth Communication mode (GFSK, 2480MHz)



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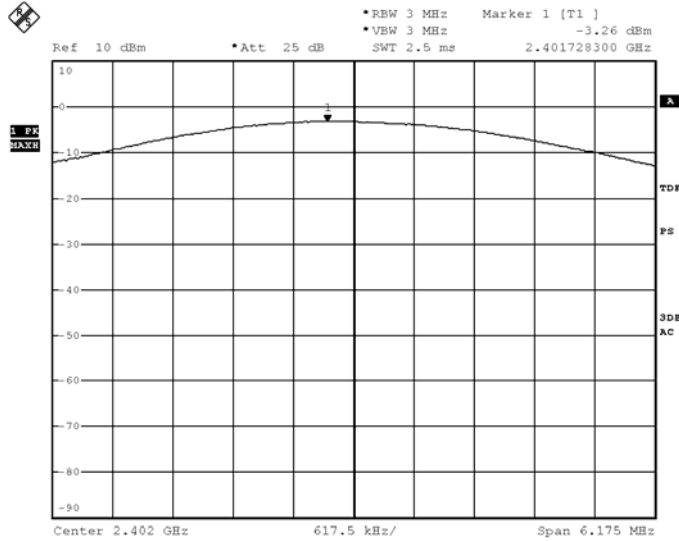


Test Report

Date : 2017-02-21
No. : DM125641

Page 12 of 77

Bluetooth Communication mode ($\pi/4$ DQPSK, 2402MHz)



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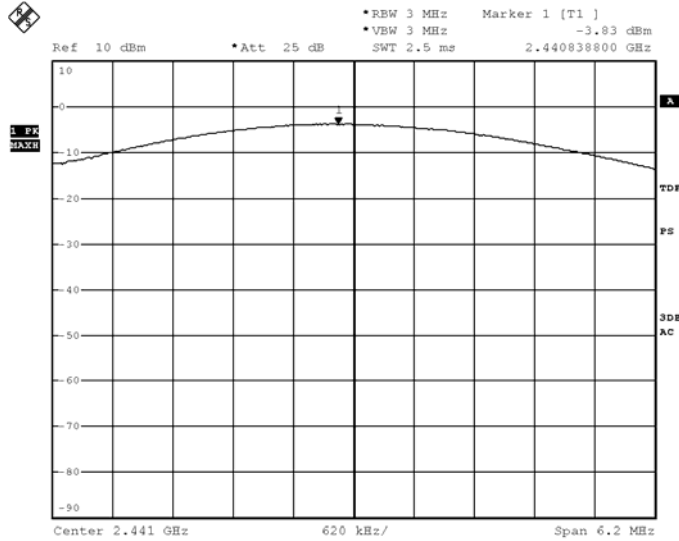


Test Report

Date : 2017-02-21
No. : DM125641

Page 13 of 77

Bluetooth Communication mode ($\pi/4$ DQPSK, 2441MHz)



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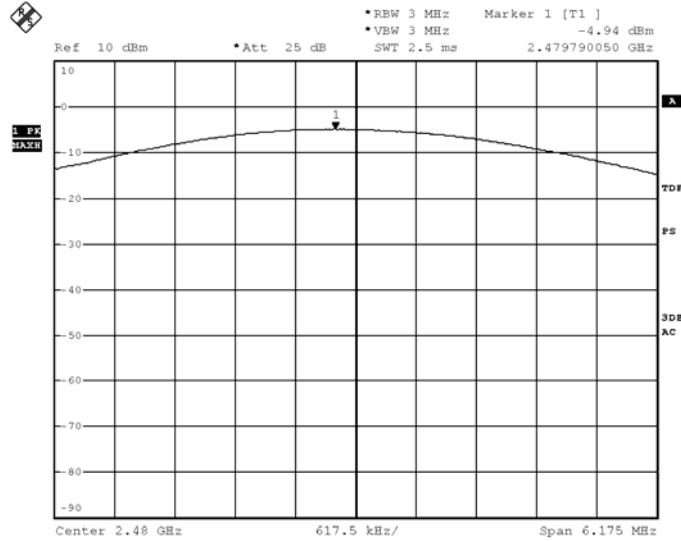


Test Report

Date : 2017-02-21
No. : DM125641

Page 14 of 77

Bluetooth Communication mode ($\pi/4$ DQPSK, 2480MHz)



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Test Report

Date : 2017-02-21

No. : DM125641

Page 15 of 77

3.1.2 Radiated Spurious Emissions

Test Requirement:	FCC 47CFR 15.209
Test Method:	ANSI C63.10:2013
Test Date:	2017-01-10
Mode of Operation:	Tx mode / Bluetooth Communication mode (GFSK)

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, rotated about all 3 axis (X, Y & Z) and 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 STC (Dongguan) Company Ltd. 68 Fumin Nan Road, Dalang, Dongguan, Guangdong, PRC with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 629686.

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Test Report

Date : 2017-02-21

No. : DM125641

Page 16 of 77

Spectrum Analyzer Setting:

9KHz – 30MHz (Pk & Av)

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

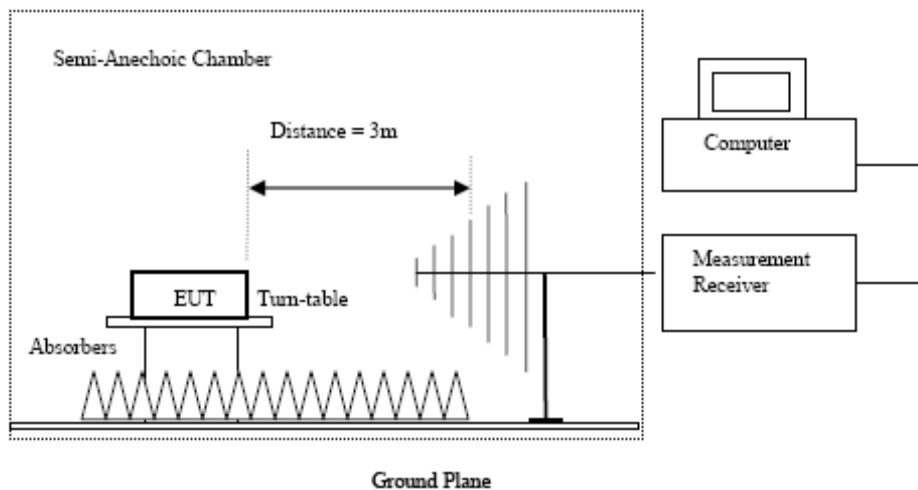
30MHz – 1GHz (QP)

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

Above 1GHz (Pk & Av)

RBW: 1MHz
VBW: 1MHz
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 : 2017-02-21
No. : DM125641

Page 17 of 77

Limits for Radiated Emissions FCC 47 CFR 15.247 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [μV/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 (2402.0 MHz) (GFSK) (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 (2402.0 MHz) (GFSK) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Limit @3m dBμV/m	Margin dBμV/m	E-Field Polarity
4804.0	16.1	41.5	57.6	74.0	16.4	Vertical
4804.0	14.9	42.4	57.3	74.0	16.7	Horizontal
7206.0	11.4	45.1	56.5	74.0	17.5	Vertical
7206.0	10.7	46.2	56.9	74.0	17.1	Horizontal
9608.0	7.1	48.0	55.1	74.0	18.9	Vertical
9608.0	6.5	48.8	55.3	74.0	18.7	Horizontal
12010.0	4.2	51.5	55.7	74.0	18.3	Vertical
12010.0	4.1	52.4	56.5	74.0	17.5	Horizontal

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Test Report

Date : 2017-02-21

Page 18 of 77

No. : DM125641

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 dBuV/m	E-Field Polarity
4804.0	0.5	41.5	42.0	54.0	12.0	Vertical
4804.0	-0.3	42.4	42.1	54.0	11.9	Horizontal
7206.0	-2.4	45.1	42.7	54.0	11.3	Vertical
7206.0	-4.7	46.2	41.5	54.0	12.5	Horizontal
9608.0	-7.6	48.0	40.4	54.0	13.6	Vertical
9608.0	-6.6	48.8	42.2	54.0	11.8	Horizontal
12010.0	-11.0	51.5	40.5	54.0	13.5	Vertical
12010.0	-9.9	52.4	42.5	54.0	11.5	Horizontal

Result of Tx mode (2441.0 MHz) (GFSK) (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 (2441.0 MHz) (GFSK) (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 dBuV/m	E-Field Polarity
4882.0	16.4	41.6	58.0	74.0	16.0	Vertical
4882.0	15.3	42.5	57.8	74.0	16.2	Horizontal
7323.0	11.7	45.2	56.9	74.0	17.1	Vertical
7323.0	10.4	46.3	56.7	74.0	17.3	Horizontal
9764.0	7.4	48.1	55.5	74.0	18.5	Vertical
9764.0	6.7	48.9	55.6	74.0	18.4	Horizontal
12205.0	2.8	51.6	54.4	74.0	19.6	Vertical
12205.0	4.0	52.5	56.5	74.0	17.5	Horizontal

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Test Report

Date : 2017-02-21

Page 19 of 77

No. : DM125641

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 dBuV/m	E-Field Polarity
4882.0	1.9	41.6	43.5	54.0	10.5	Vertical
4882.0	-0.4	42.5	42.1	54.0	11.9	Horizontal
7323.0	-4.2	45.2	41.0	54.0	13.0	Vertical
7323.0	-4.7	46.3	41.6	54.0	12.4	Horizontal
9764.0	-6.8	48.1	41.3	54.0	12.7	Vertical
9764.0	-8.9	48.9	40.0	54.0	14.0	Horizontal
12205.0	-11.3	51.6	40.3	54.0	13.7	Vertical
12205.0	-11.0	52.5	41.5	54.0	12.5	Horizontal

Result of Tx mode (2480.0 MHz) (GFSK) (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 (2480.0 MHz) (GFSK) (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 dBuV/m	E-Field Polarity
4960.0	16.2	41.4	57.6	74.0	16.4	Vertical
4960.0	14.4	42.7	57.1	74.0	16.9	Horizontal
7440.0	11.1	45.6	56.7	74.0	17.3	Vertical
7440.0	10.5	46.5	57.0	74.0	17.0	Horizontal
9920.0	6.5	48.6	55.1	74.0	18.9	Vertical
9920.0	5.3	49.7	55.0	74.0	19.0	Horizontal
12400.0	3.7	51.7	55.4	74.0	18.6	Vertical
12400.0	2.8	52.7	55.5	74.0	18.5	Horizontal

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Test Report

Date : 2017-02-21

Page 20 of 77

No. : DM125641

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 dBuV/m	E-Field Polarity
4960.0	0.6	41.4	42.0	54.0	12.0	Vertical
4960.0	-1.1	42.7	41.6	54.0	12.4	Horizontal
7440.0	-3.3	45.6	42.3	54.0	11.7	Vertical
7440.0	-4.5	46.5	42.0	54.0	12.0	Horizontal
9920.0	-8.9	48.6	39.7	54.0	14.3	Vertical
9920.0	-10.1	49.7	39.6	54.0	14.4	Horizontal
12400.0	-9.9	51.7	41.8	54.0	12.2	Vertical
12400.0	-12.3	52.7	40.4	54.0	13.6	Horizontal

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

Field Strength of Spurious Emissions						
Peak Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
4804.0	16.4	41.5	57.9	74.0	16.1	Vertical
4804.0	15.3	42.4	57.7	74.0	16.3	Horizontal
7206.0	12.3	45.1	57.4	74.0	16.6	Vertical
7206.0	10.6	46.2	56.8	74.0	17.2	Horizontal
9608.0	7.2	48.0	55.2	74.0	18.8	Vertical
9608.0	6.6	48.8	55.4	74.0	18.6	Horizontal
12010.0	4.1	51.5	55.6	74.0	18.4	Vertical
12010.0	3.8	52.4	56.2	74.0	17.8	Horizontal

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Test Report

Date : 2017-02-21

Page 21 of 77

No. : DM125641

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 dBuV/m	E-Field Polarity
4804.0	1.1	41.5	42.6	54.0	11.4	Vertical
4804.0	0.6	42.4	43.0	54.0	11.0	Horizontal
7206.0	-3.6	45.1	41.5	54.0	12.5	Vertical
7206.0	-3.8	46.2	42.4	54.0	11.6	Horizontal
9608.0	-6.5	48.0	41.5	54.0	12.5	Vertical
9608.0	-7.5	48.8	41.3	54.0	12.7	Horizontal
12010.0	-9.8	51.5	41.7	54.0	12.3	Vertical
12010.0	-11.2	52.4	41.2	54.0	12.8	Horizontal

Result of Tx mode (2441.0 MHz) ($\pi/4$ -DQPSK) (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 (2441.0 MHz) ($\pi/4$ -DQPSK) (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 dBuV/m	E-Field Polarity
4882.0	16.5	41.6	58.1	74.0	15.9	Vertical
4882.0	14.9	42.5	57.4	74.0	16.6	Horizontal
7323.0	12.7	45.2	57.9	74.0	16.1	Vertical
7323.0	11.0	46.3	57.3	74.0	16.7	Horizontal
9764.0	6.1	48.1	54.2	74.0	19.8	Vertical
9764.0	5.5	48.9	54.4	74.0	19.6	Horizontal
12205.0	4.9	51.6	56.5	74.0	17.5	Vertical
12205.0	3.0	52.5	55.5	74.0	18.5	Horizontal

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Test Report

Date : 2017-02-21

Page 22 of 77

No. : DM125641

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 dBuV/m	E-Field Polarity
4882.0	1.8	41.6	43.4	54.0	10.6	Vertical
4882.0	-0.3	42.5	42.2	54.0	11.8	Horizontal
7323.0	-2.2	45.2	43.0	54.0	11.0	Vertical
7323.0	-3.8	46.3	42.5	54.0	11.5	Horizontal
9764.0	-7.5	48.1	40.6	54.0	13.4	Vertical
9764.0	-8.7	48.9	40.2	54.0	13.8	Horizontal
12205.0	-10.2	51.6	41.4	54.0	12.6	Vertical
12205.0	-11.5	52.5	41.0	54.0	13.0	Horizontal

Result of Tx mode (2480.0 MHz) ($\pi/4$ -DQPSK) (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 (2480.0 MHz) ($\pi/4$ -DQPSK) (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 dBuV/m	E-Field Polarity
4960.0	15.5	41.4	56.9	74.0	17.1	Vertical
4960.0	14.3	42.7	57.0	74.0	17.0	Horizontal
7440.0	11.1	45.6	56.7	74.0	17.3	Vertical
7440.0	9.8	46.5	56.3	74.0	17.7	Horizontal
9920.0	7.4	48.6	56.0	74.0	18.0	Vertical
9920.0	4.6	49.7	54.3	74.0	19.7	Horizontal
12400.0	4.5	51.7	56.2	74.0	17.8	Vertical
12400.0	3	52.7	55.7	74.0	18.3	Horizontal

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Test Report

Date : 2017-02-21

Page 23 of 77

No. : DM125641

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 dBuV/m	E-Field Polarity
4960.0	0.4	41.4	41.8	54.0	12.2	Vertical
4960.0	-0.1	42.7	42.6	54.0	11.4	Horizontal
7440.0	-4.6	45.6	41.0	54.0	13.0	Vertical
7440.0	-5.7	46.5	40.8	54.0	13.2	Horizontal
9920.0	-7.5	48.6	41.1	54.0	12.9	Vertical
9920.0	-8.7	49.7	41.0	54.0	13.0	Horizontal
12400.0	-9.4	51.7	42.3	54.0	11.7	Vertical
12400.0	-12.0	52.7	40.7	54.0	13.3	Horizontal

Note: Above 13GHz Emissions detected are more than 20 dB below the FCC Limits .

Remarks:

No additional spurious emissions found between lowest internal used/generated frequency and 30 MHz

* 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 3.3dB
30MHz -1GHz 4.6dB
1GHz -26GHz 4.4dB

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 : 2017-02-21

Page 24 of 77

No. : DM125641

Radiated 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. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).

Result: RF Radiated Emissions (Lowest)-GFSK

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2390.0	17.3	36.8	54.1	74.0	19.9	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2390.0	4.1	36.8	40.9	54.0	13.1	Vertical

Result: RF Radiated Emissions (Highest) -GFSK

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2483.5	21.7	36.4	58.1	74.0	15.9	Horizontal

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2483.5	7.3	36.4	43.7	54.0	10.3	Horizontal

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Test Report

Date : 2017-02-21
No. : DM125641

Page 25 of 77

Radiated 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. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 5.205(c)).

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

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2390.0	17.0	36.8	53.8	74.0	20.2	Vertical

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2390.0	3.4	36.8	40.2	54.0	13.8	Vertical

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

Field Strength of Band-edge Compliance Peak Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2483.5	20.1	36.4	56.5	74.0	17.5	Horizontal

Field Strength of Band-edge Compliance Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Limit @3m dB μ V/m	Margin dB μ V/m	E-Field Polarity
2483.5	6.6	36.4	43.0	54.0	11.0	Horizontal

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Test Report

Date : 2017-02-21
 No. : DM125641

Page 26 of 77

Limits for Radiated Emissions FCC 47 CFR 15.247 Class B]:

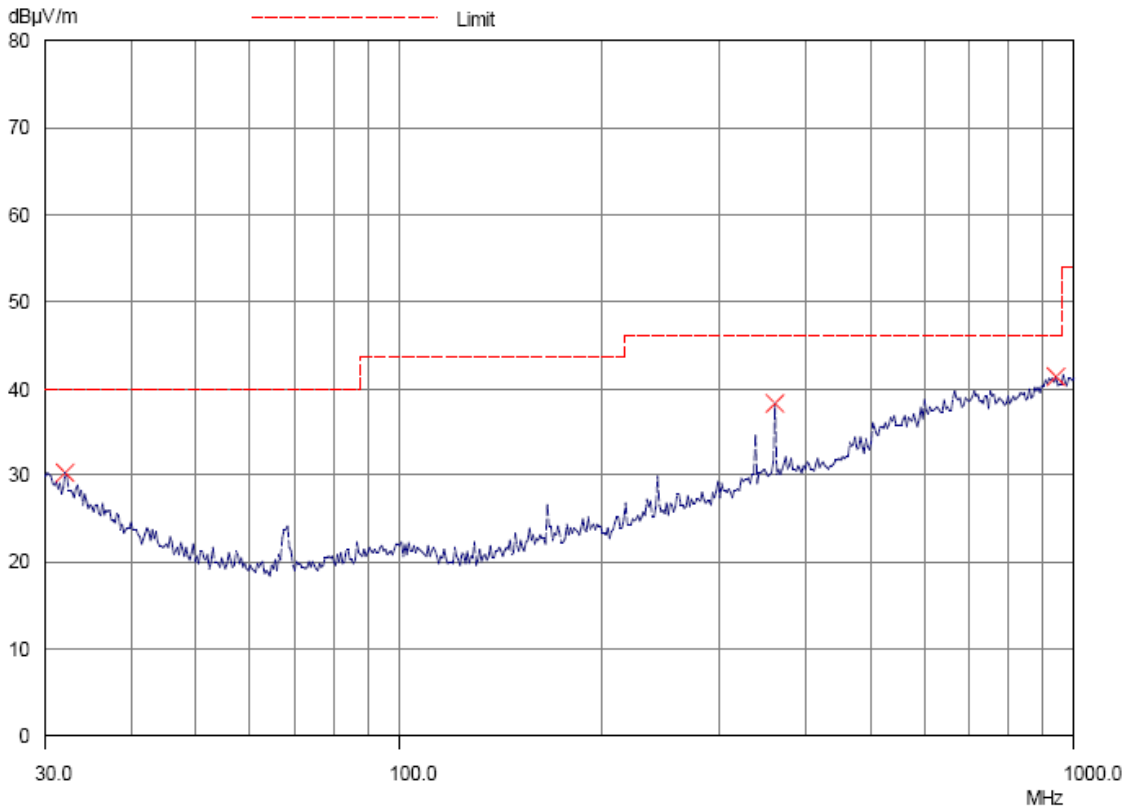
Frequency Range [MHz]	Quasi-Peak Limits [μ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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.

Results of Bluetooth Communication mode (GFSK 2402.0 MHz) (30MHz – 1GHz): Pass

Please refer to the following table for result details(The data is the worst cases)

Horizontal



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Test Report

Date : 2017-02-21
No. : DM125641

Page 27 of 77

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

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dB μ V/m	Limit @3m dB μ V/m	Level @3m μ V/m	Limit @3m μ V/m
32.0	Horizontal	27.8	40.0	24.5	100
360.0	Horizontal	38.0	46.0	79.4	200
936.4	Horizontal	37.2	46.0	72.4	200

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Test Report

Date : 2017-02-21

Page 28 of 77

No. : DM125641

Limits for Radiated Emissions FCC 47 CFR 15.247 Class B]:

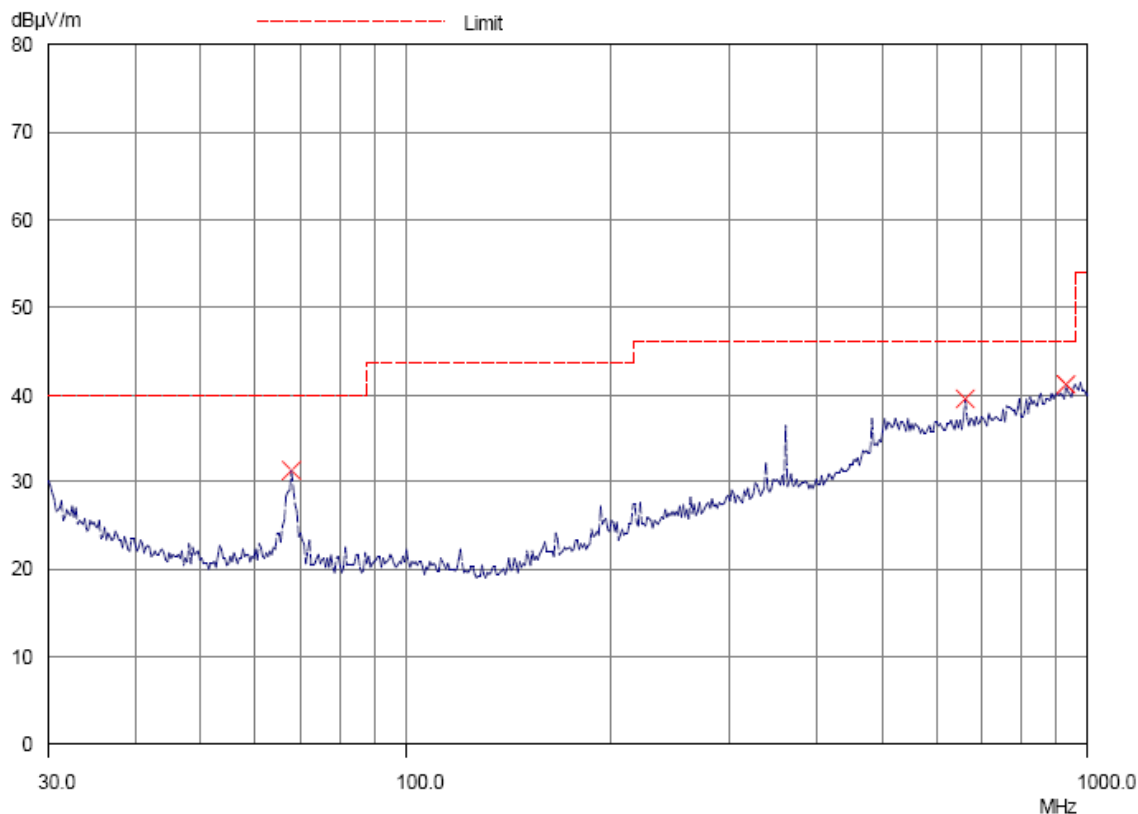
Frequency Range [MHz]	Quasi-Peak Limits [μ V/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

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.

Results of Bluetooth Communication mode (GFSK 2402.0 MHz) (30MHz – 1GHz): Pass

Please refer to the following table for result details(The data is the worst cases)

Vertical



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Test Report

Date : 2017-02-21

Page 29 of 77

No. : DM125641

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

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dB μ V/m	Limit @3m dB μ V/m	Level @3m μ V/m	Limit @3m μ V/m
67.9	Vertical	31.1	40.0	35.9	100
660.0	Vertical	38.0	46.0	79.4	200
925.4	Vertical	37.3	46.0	73.3	200

Remarks:

Calculated measurement uncertainty (30MHz – 1GHz): 4.6dB

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 : 2017-02-21
No. : DM125641

Page 30 of 77

3.1.3 AC Mains Conducted Emissions (0.15MHz to 30MHz)

Test Requirement:	FCC 47CFR 15.207
Test Method:	ANSI C63.10:2013
Test Date:	2017-01-09
Mode of Operation:	Charging mode
Test Voltage:	120Va.c. 60Hz

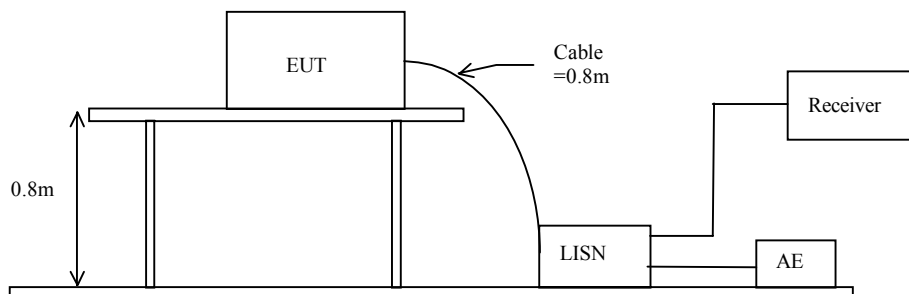
Test Method:

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.

Receiver Setting:

Bandw. = 9 kHz, Meas. Time= 10.0 ms, Step Width = 5.0kHz
Detector = MaxPeak and CISPR AV

Test Setup:



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Test Report

Date : 2017-02-21
No. : DM125641

Page 31 of 77

Limits for Conducted Emissions (FCC 47 CFR 15.207):

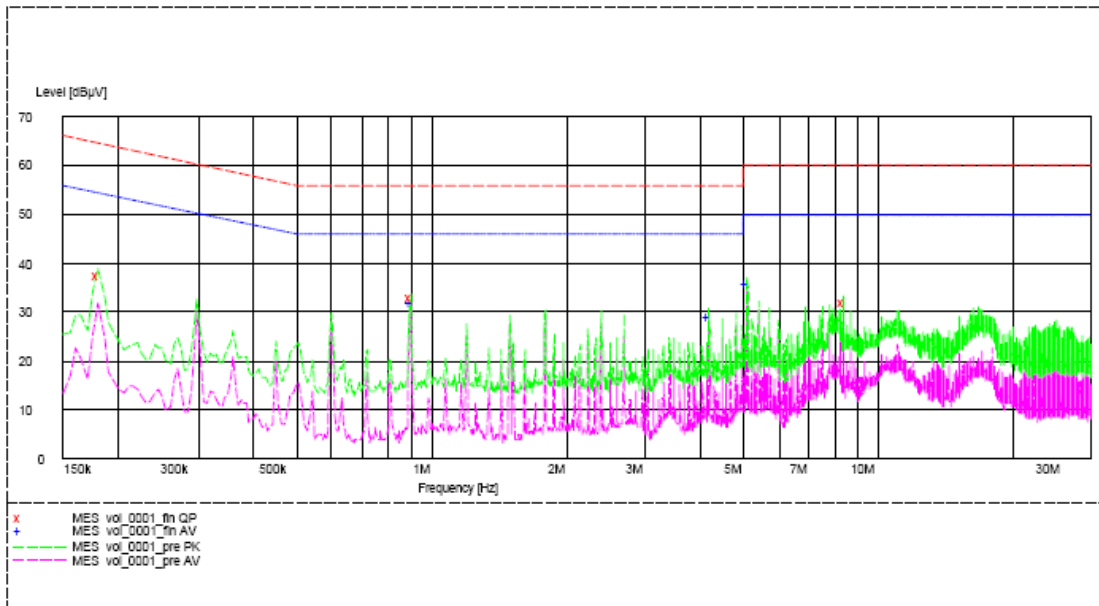
Frequency Range [MHz]	Quasi-Peak Limits [dBμV]	Average [dBμV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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 Charging mode (L): PASS

Please refer to the following diagram for individual results.



Conductor Live or Neutral	Frequency MHz	Quasi-peak		Average	
		Level dBμV	Limit dBμV	Level dBμV	Limit dBμV
Live	0.180	37.3	65.0	-*-	-*-
Live	0.900	33.0	56.0	-*-	-*-
Live	8.395	32.2	60.0	-*-	-*-
Live	0.900	-*-	-*-	32.0	46.0
Live	4.195	-*-	-*-	28.8	46.0
Live	5.095	-*-	-*-	35.9	50.0

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Test Report

Date : 2017-02-21

Page 32 of 77

No. : DM125641

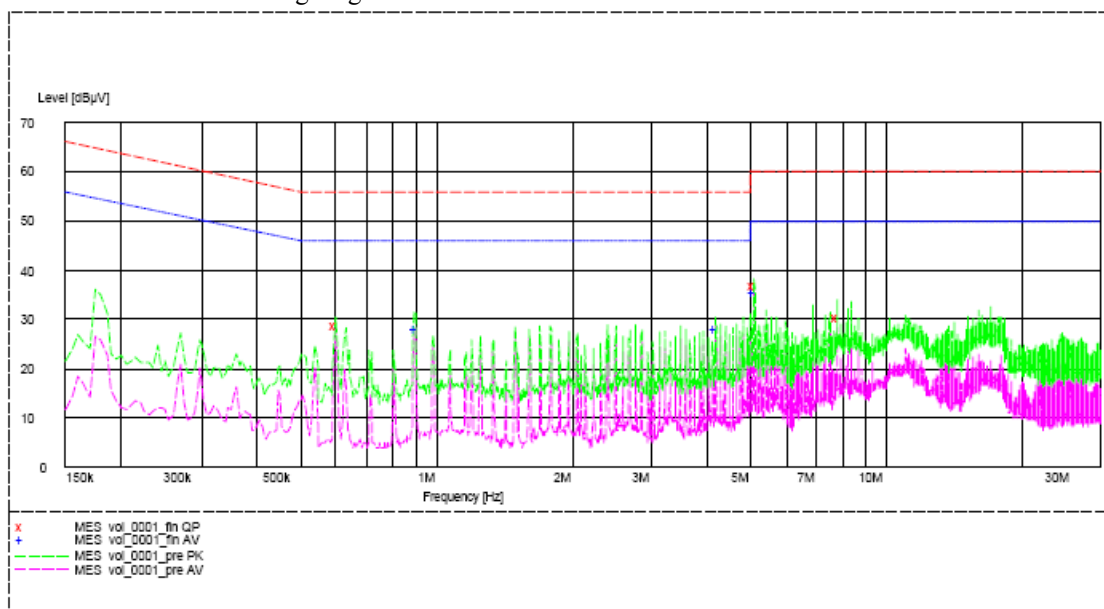
Frequency Range [MHz]	Quasi-Peak Limits [dB μ V]	Average [dB μ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* 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 Charging mode (N): PASS

Please refer to the following diagram for individual results.



Conductor Live or Neutral	Frequency MHz	Quasi-peak		Average	
		Level dB μ V	Limit dB μ V	Level dB μ V	Limit dB μ V
Neutral	0.600	28.5	56.0	-*-	-*-
Neutral	5.095	36.8	60.0	-*-	-*-
Neutral	7.790	30.5	60.0	-*-	-*-
Neutral	0.900	-*-	-*-	28.3	46.0
Neutral	4.195	-*-	-*-	28.4	46.0
Neutral	5.095	-*-	-*-	35.6	50.0

Remarks:

Calculated measurement uncertainty (0.15MHz – 30MHz): 3.2dB

-*- Emission(s) that is far below the corresponding limit line.

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Test Report

Date : 2017-02-21

Page 33 of 77

No. : DM125641

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:

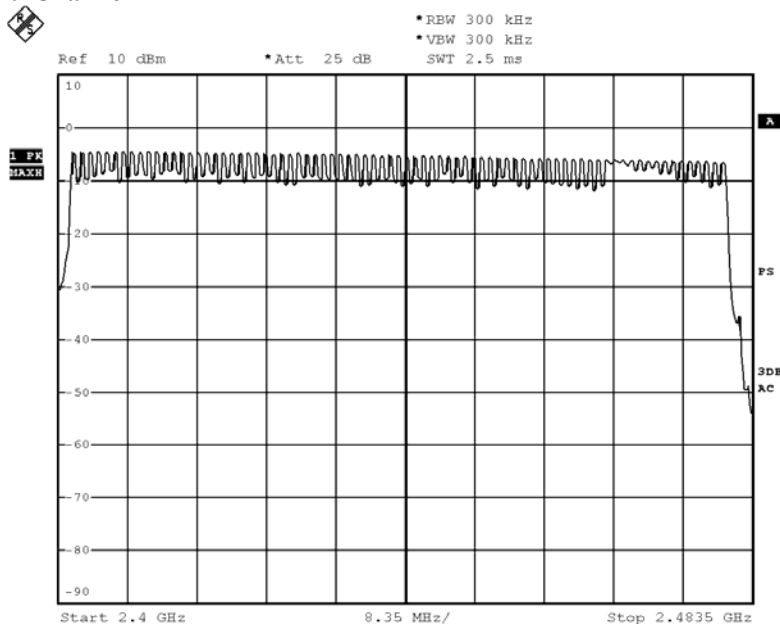
RBW = 300kHz, VBW \geq RBW, Sweep = Auto, Span = the frequency band of operation
Detector = Peak, Trace = Max. hold

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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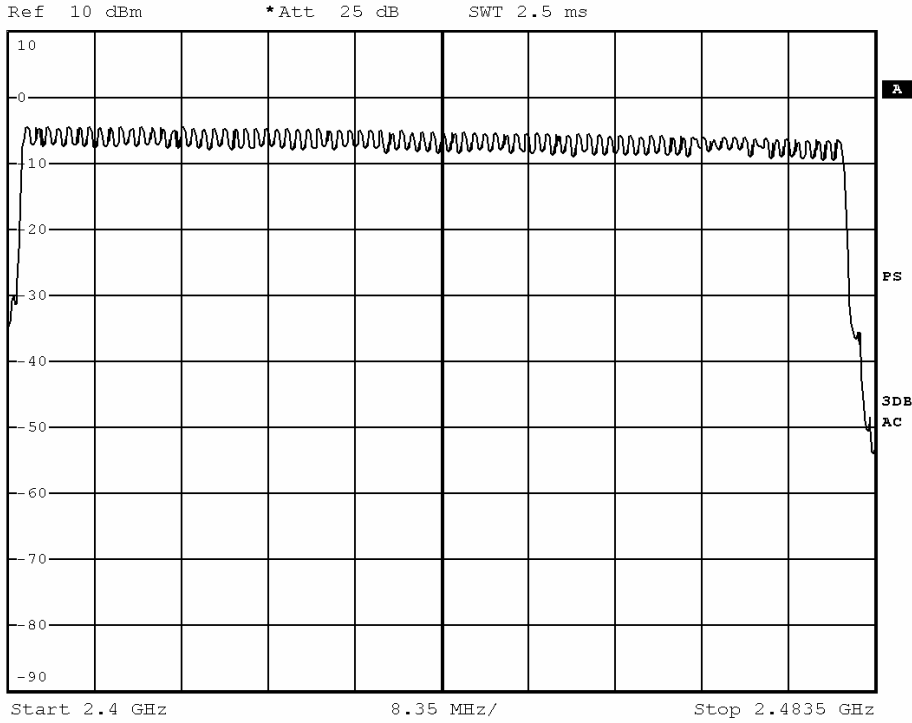
Date : 2017-02-21
No. : DM125641

Page 34 of 77

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



*RBW 300 kHz
*VBW 300 kHz
SWT 2.5 ms



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Test Report

Date : 2017-02-21

No. : DM125641

Page 35 of 77

3.1.5 20dB Bandwidth

Test Requirement: FCC 47CFR 15.247(a)(1)
Test Method: ANSI C63.10:2013
Test Date: 2017-01-06
Mode of Operation: Tx mode

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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Test Report

Date : 2017-02-21
 No. : DM125641

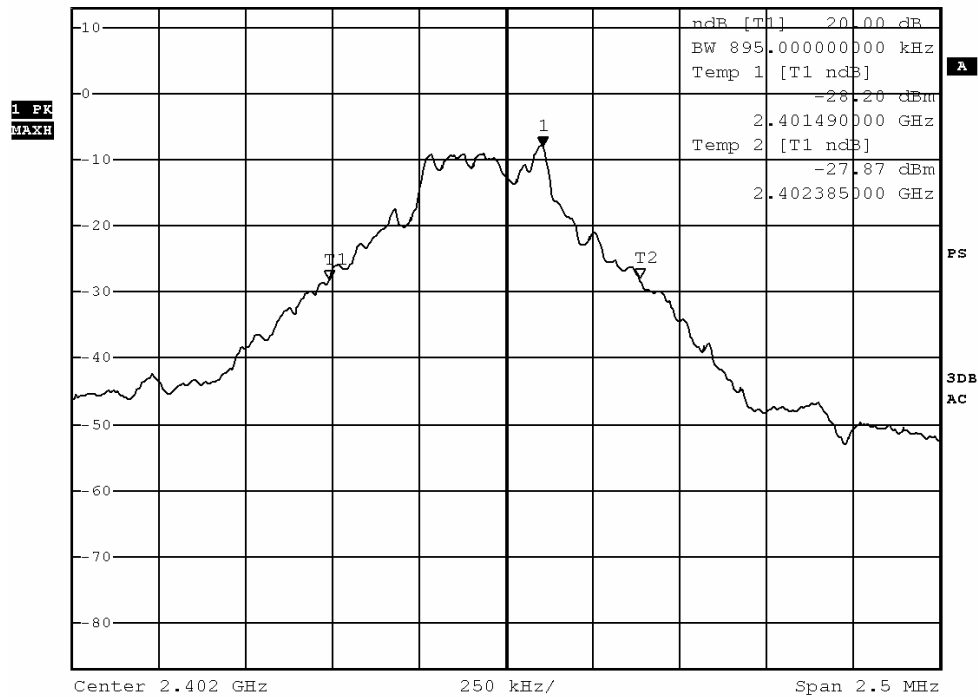
Page 36 of 77

Fundamental Frequency [MHz]	20dB Bandwidth [kHz]	FCC Limits [MHz]
2402	895.0	Within 2400-2483.5

(Lowest Operating Frequency) - (GFSK)



*RBW 30 kHz Marker 1 [T1]
 *VBW 100 kHz -7.93 dBm
 Ref 13 dBm *Att 30 dB SWT 5 ms 2.402105000 GHz



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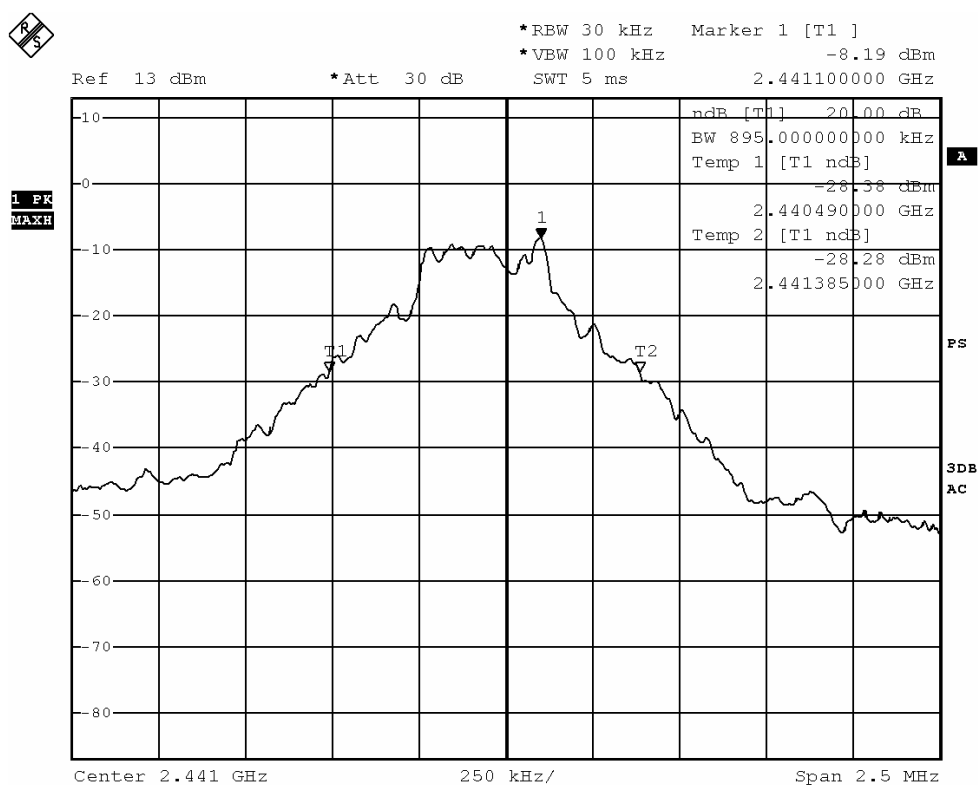
Date : 2017-02-21

Page 37 of 77

No. : DM125641

Fundamental Frequency [MHz]	20dB Bandwidth [kHz]	FCC Limits [MHz]
2441	895.0	Within 2400-2483.5

(Middle Operating Frequency) - (GFSK)



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Test Report

Date : 2017-02-21

Page 38 of 77

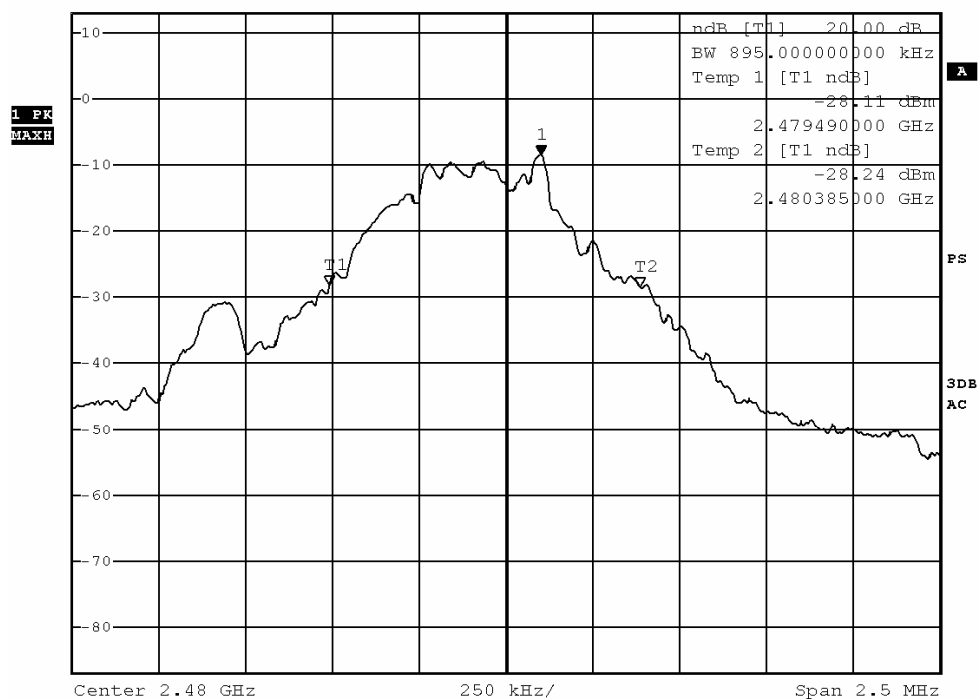
No. : DM125641

Fundamental Frequency [MHz]	20dB Bandwidth [kHz]	FCC Limits [MHz]
2480	895.0	Within 2400-2483.5

(Highest Operating Frequency) - (GFSK)



*RBW 30 kHz Marker 1 [T1]
 *VBW 100 kHz -8.36 dBm
 Ref 13 dBm *Att 30 dB SWT 5 ms 2.480100000 GHz



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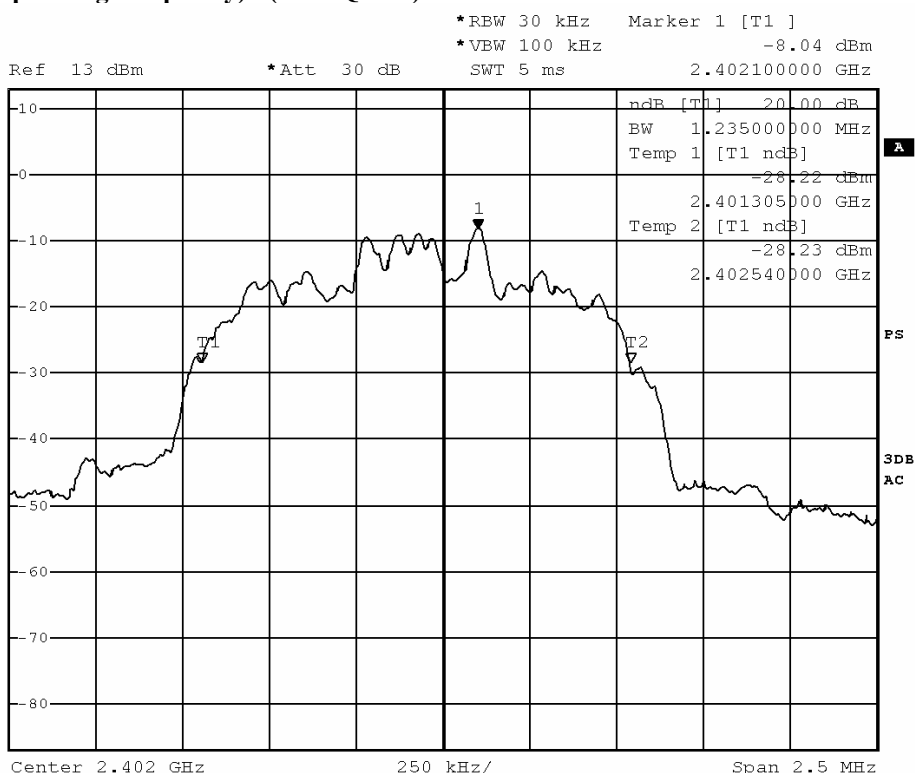
Date : 2017-02-21

Page 39 of 77

No. : DM125641

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.235	Within 2400-2483.5

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



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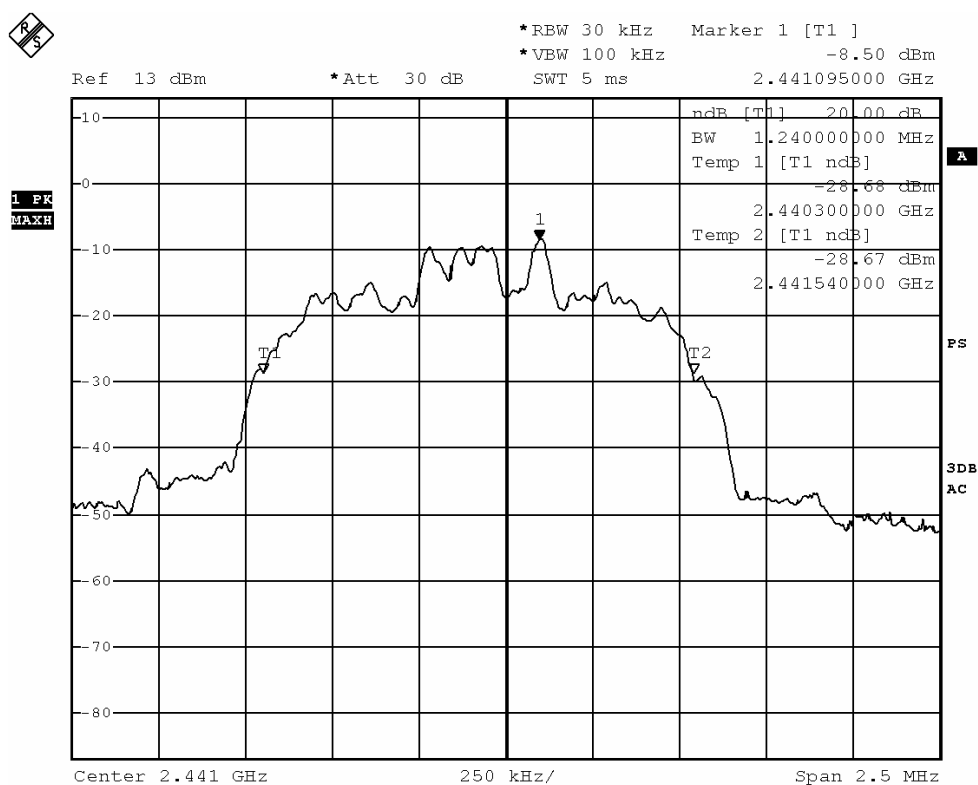
Date : 2017-02-21

Page 40 of 77

No. : DM125641

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.240	Within 2400-2483.5

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



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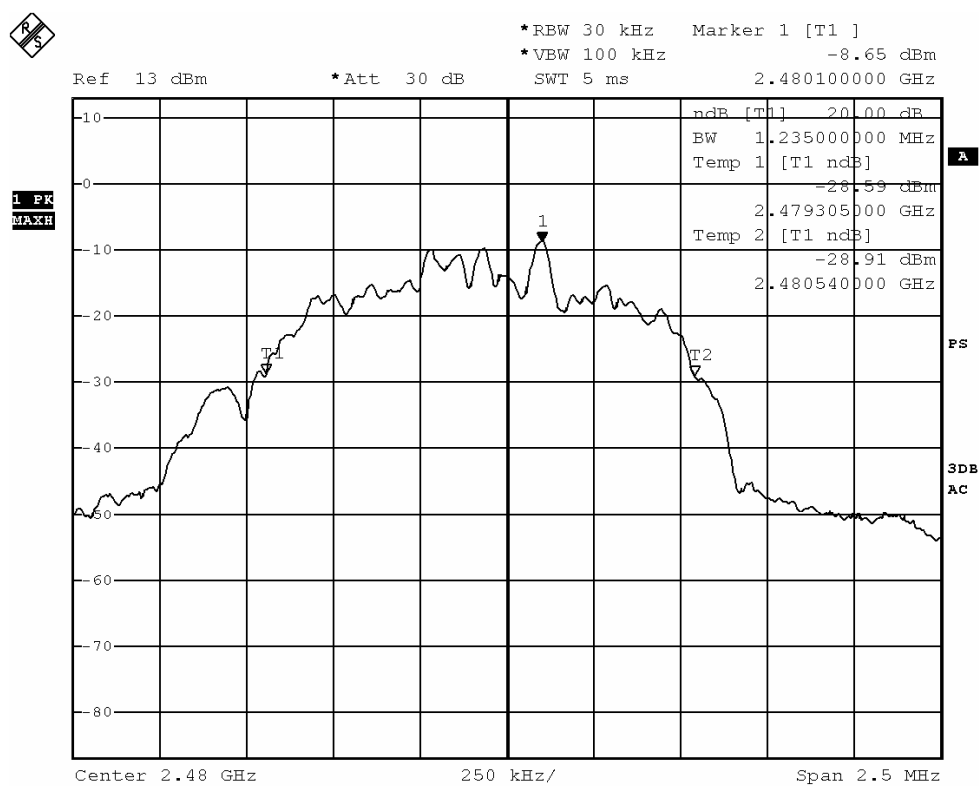
Date : 2017-02-21

Page 41 of 77

No. : DM125641

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.235	Within 2400-2483.5

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



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Test Report

Date : 2017-02-21
No. : DM125641

Page 42 of 77

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:

The measured maximum bandwidth = 895KHz (GFSK)

The measured maximum bandwidth * 2/3 = 1.24MHz * 2/3 = 826.7kHz($\pi/4$ DQPSK)

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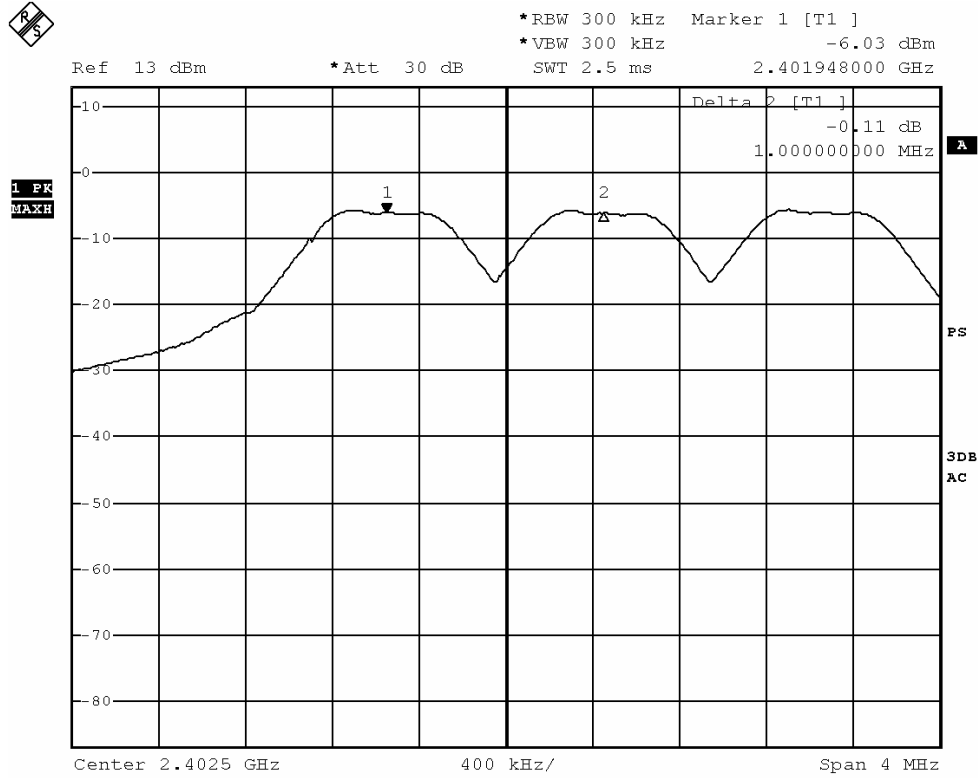


Test Report

Date : 2017-02-21
No. : DM125641

Page 43 of 77

Channel separation = 1MHz (>895kHz) (Lowest) (GFSK)



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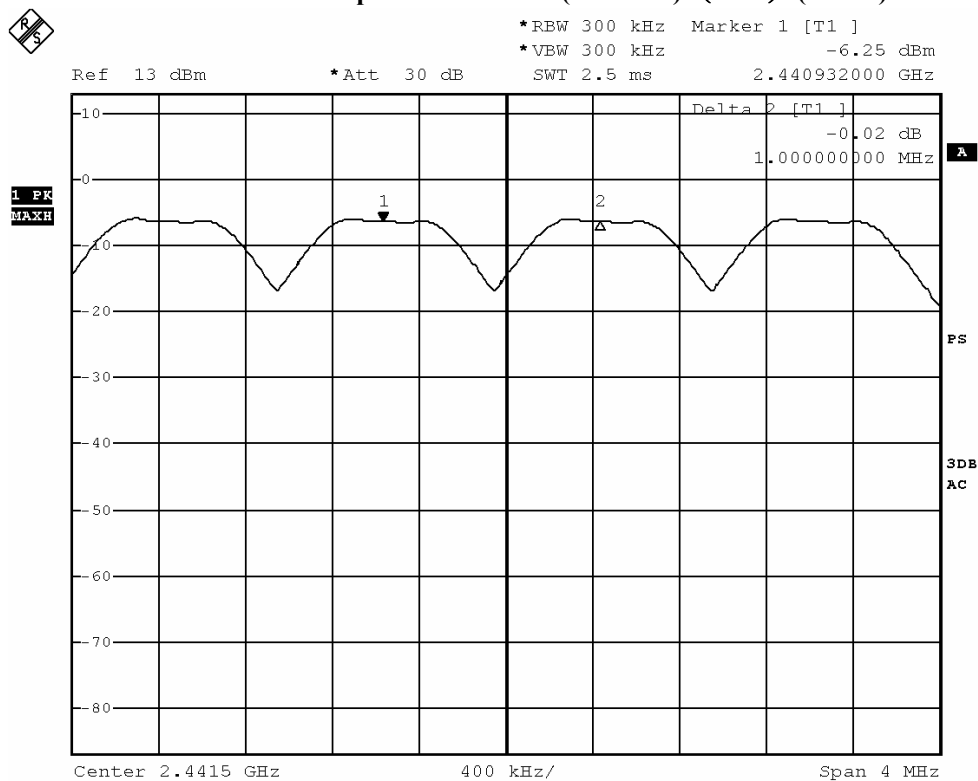
Test Report

Date : 2017-02-21

No. : DM125641

Page 44 of 77

Channel separation = 1MHz (>895kHz) (Mid) (GFSK)



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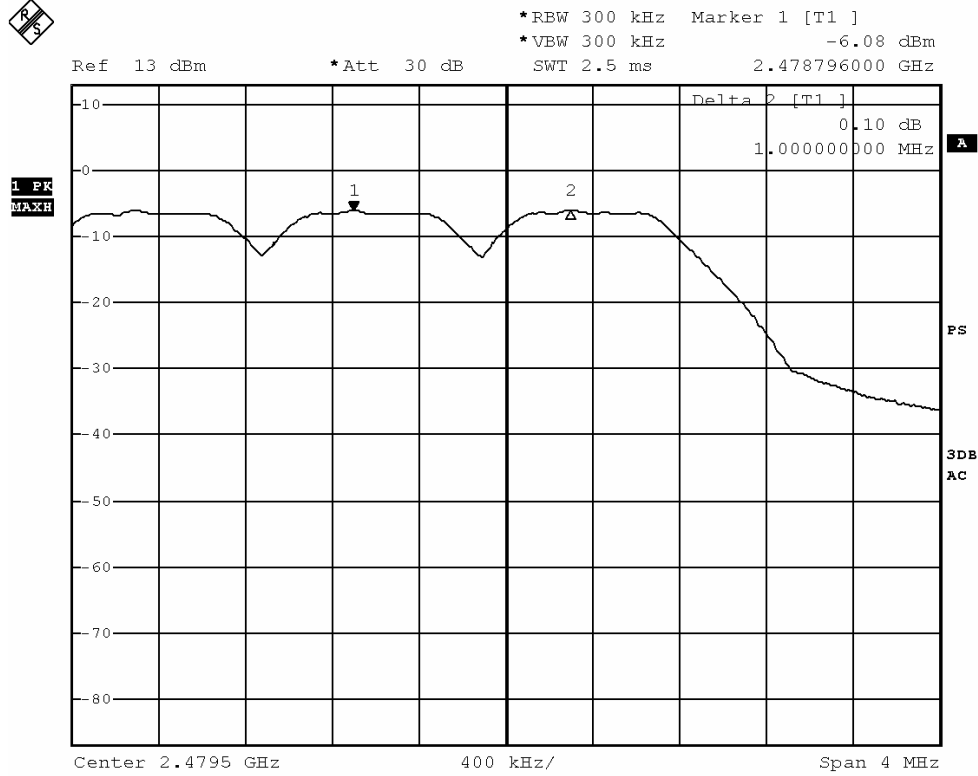


Test Report

Date : 2017-02-21
No. : DM125641

Page 45 of 77

Channel separation = 1MHz (>895kHz) (Highest) (GFSK)



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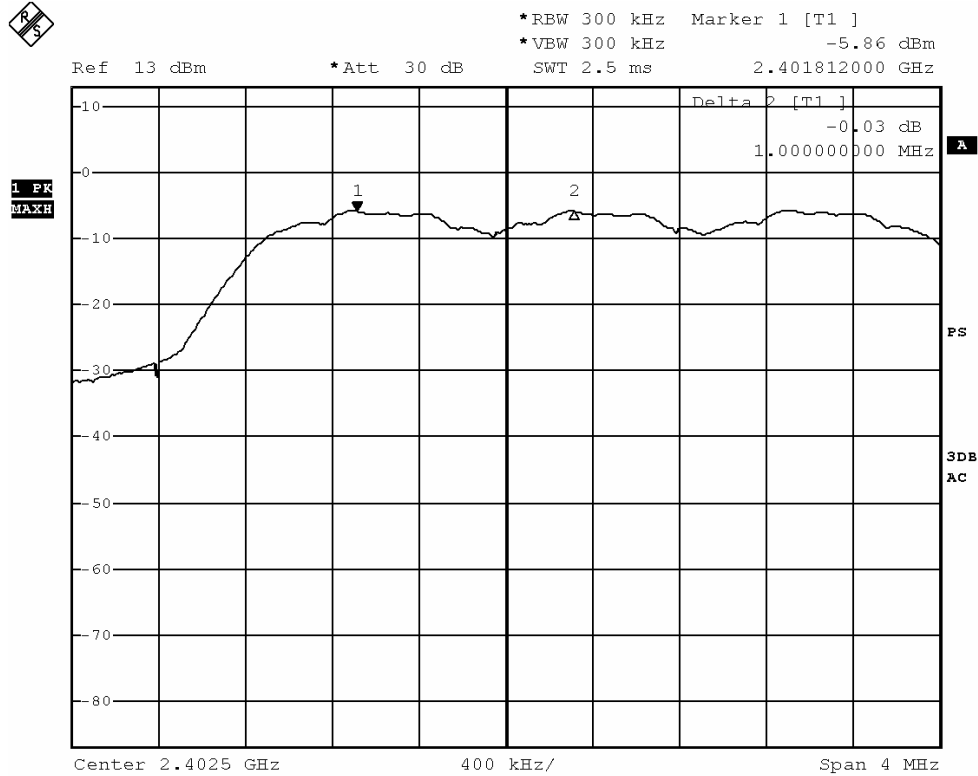


Test Report

Date : 2017-02-21
No. : DM125641

Page 46 of 77

Channel separation = 1MHz (>826.7kHz) (Lowest) ($\pi/4$ DQPSK)



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Test Report

Date : 2017-02-21
No. : DM125641

Page 47 of 77

Channel separation = 1MHz (>826.7kHz) (Mid) ($\pi/4$ DQPSK)

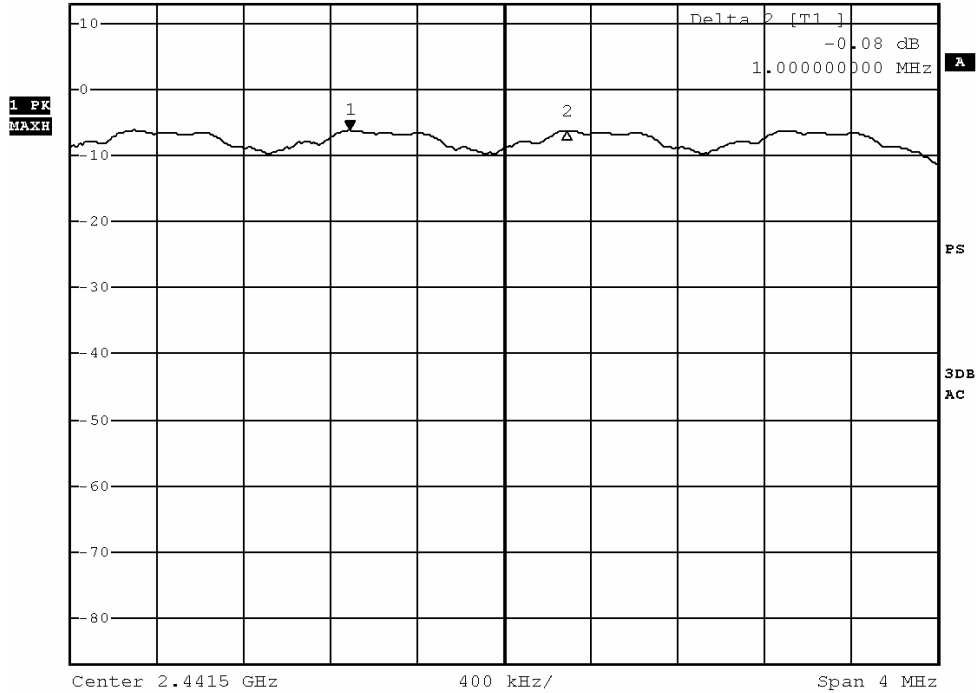


*RBW 300 kHz Marker 1 [T1]
*VBW 300 kHz -6.15 dBm
SWT 2.5 ms 2.440788000 GHz

Ref 13 dBm

*Att 30 dB

2.440788000 GHz



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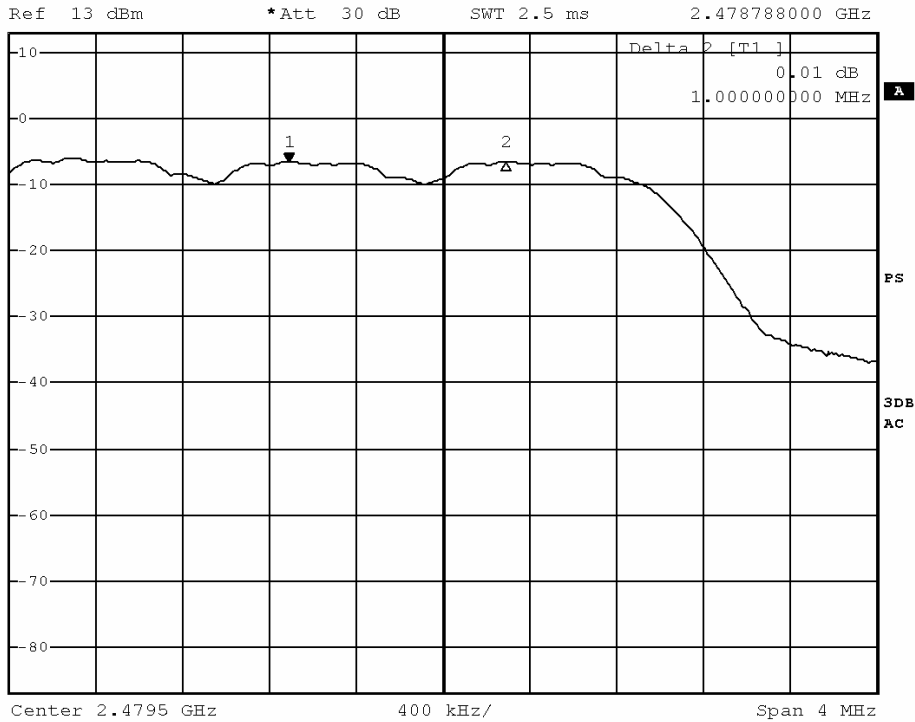
Date : 2017-02-21
No. : DM125641

Page 48 of 77

Channel separation = 1MHz (>826.7kHz) (Highest) ($\pi/4$ DQPSK)



*RBW 300 kHz Marker 1 [T1]
*VBW 300 kHz -6.44 dBm
SWT 2.5 ms 2.478788000 GHz



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Test Report

Date : 2017-02-21

No. : DM125641

Page 49 of 77

3.1.7 Band-edge Compliance of RF Conducted 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.

According to the test method DA 00-705.

Spectrum Analyzer Setting:

RBW = 100kHz, VBW= 300kHz, Sweep = Coupled,

Span = Wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products that fall outside of the authorized band of operation.

Detector = Peak, Trace = Max. hold

Remark: Emissions under the fixed frequency mode and hopping mode have been investigated, the worst-case measurement results were recorded in the test report

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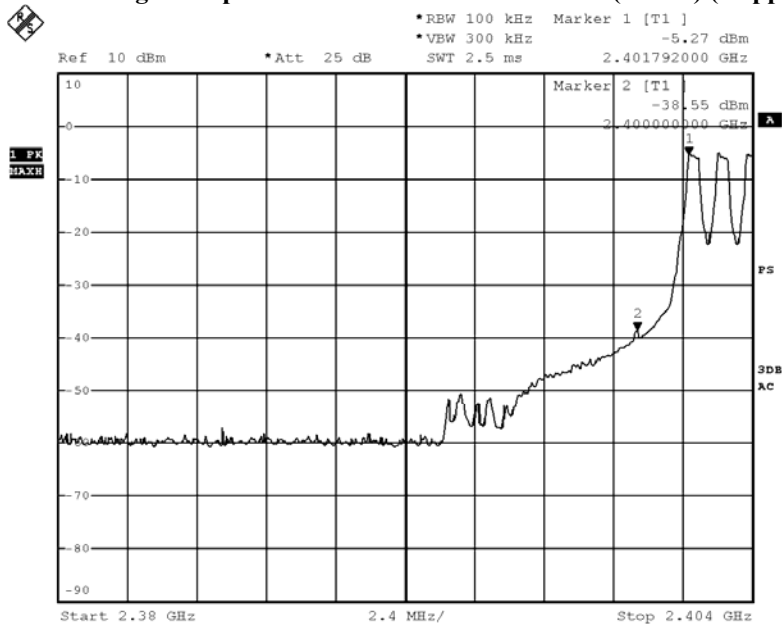
Date : 2017-02-21
No. : DM125641

Page 50 of 77

Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	33.28

Band-edge Compliance of RF Emissions – Lowest (GFSK) (Hopping on)



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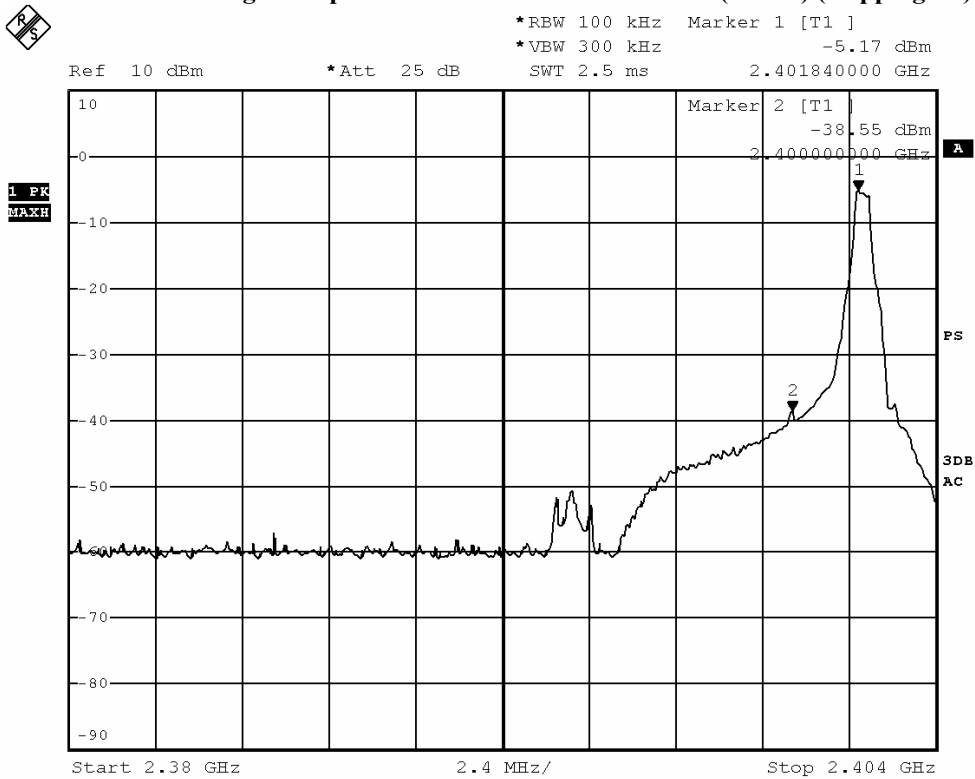
Date : 2017-02-21
 No. : DM125641

Page 51 of 77

Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	33.38

Band-edge Compliance of RF Emissions – Lowest (GFSK) (Hopping off)



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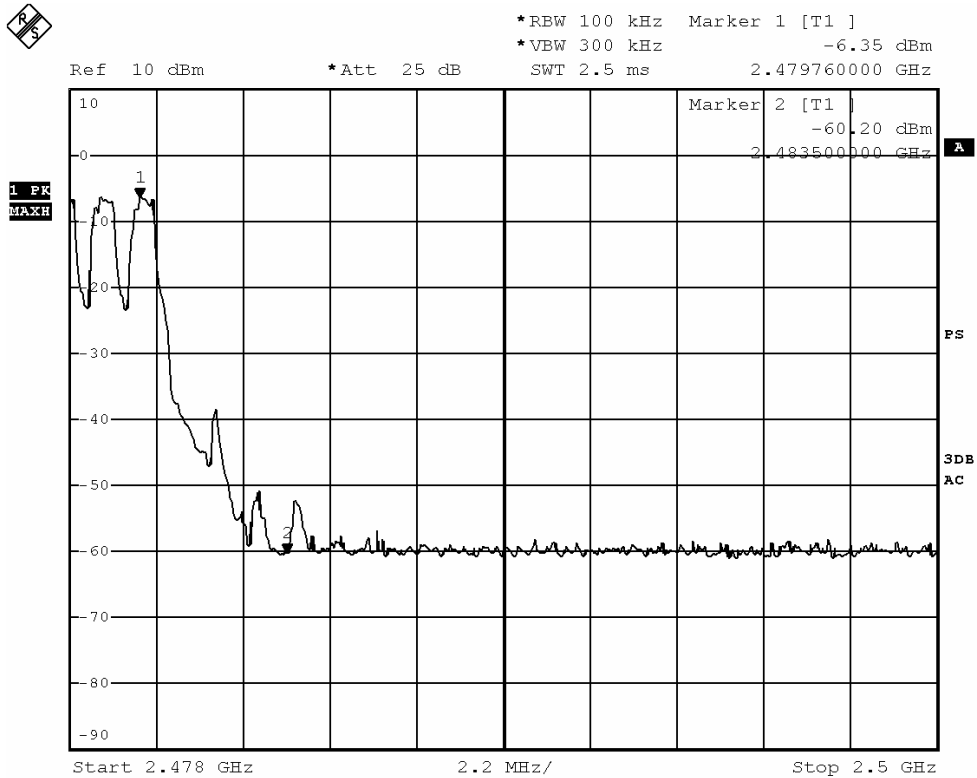
Date : 2017-02-21
 No. : DM125641

Page 52 of 77

Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	53.85

Band-edge Compliance of RF Emissions – Highest (GFSK) (Hopping on)



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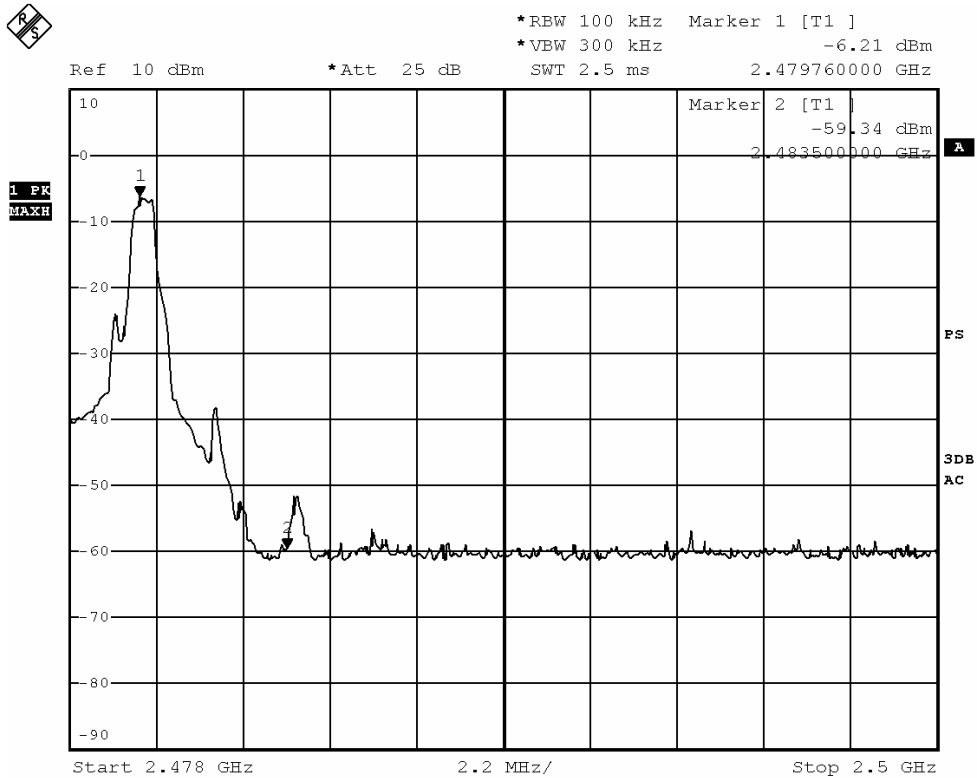
Date : 2017-02-21
 No. : DM125641

Page 53 of 77

Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	53.13

Band-edge Compliance of RF Emissions – Highest (GFSK) (Hopping off)



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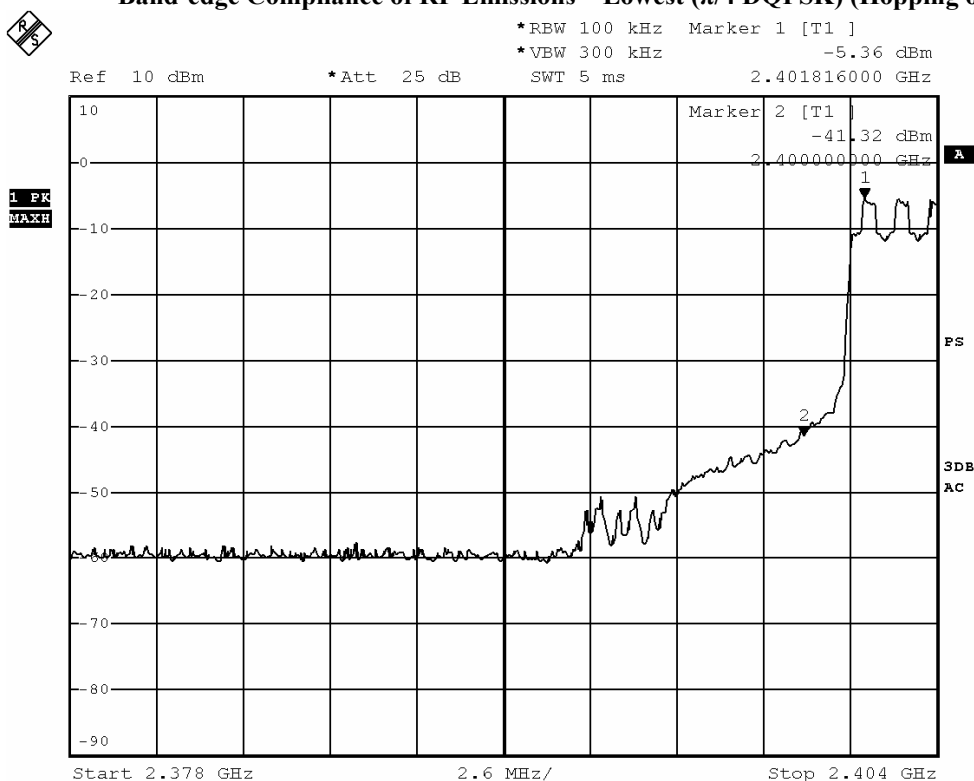
Page 54 of 77

No. : DM125641

Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	35.96

Band-edge Compliance of RF Emissions – Lowest ($\pi/4$ DQPSK) (Hopping on)



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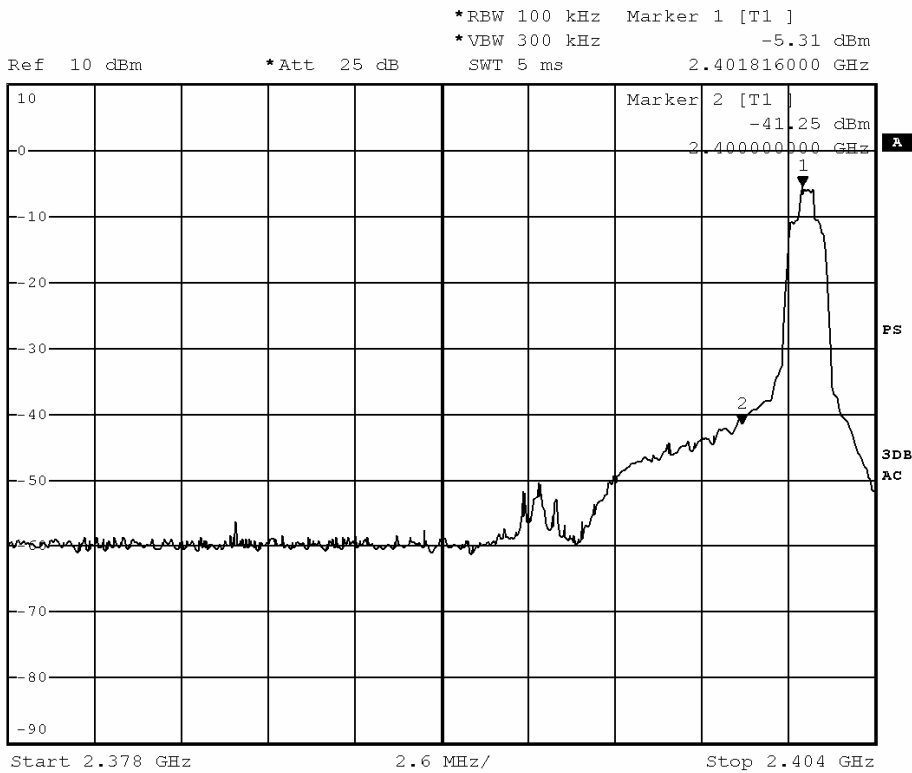
Date : 2017-02-21
 No. : DM125641

Page 55 of 77

Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2400 – Lowest Fundamental (2402)	35.94

Band-edge Compliance of RF Emissions – Lowest ($\pi/4$ DQPSK) (Hopping off)



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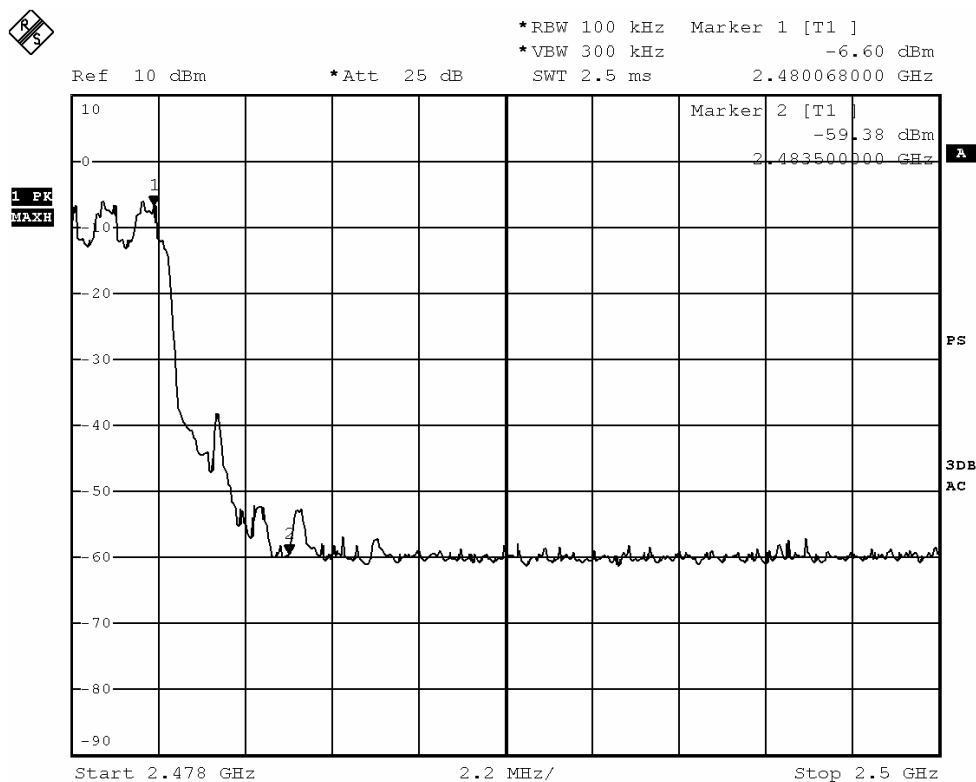
Page 56 of 77

No. : DM125641

Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	52.78

Band-edge Compliance of RF Emissions – Highest ($\pi/4$ DQPSK) (Hopping on)



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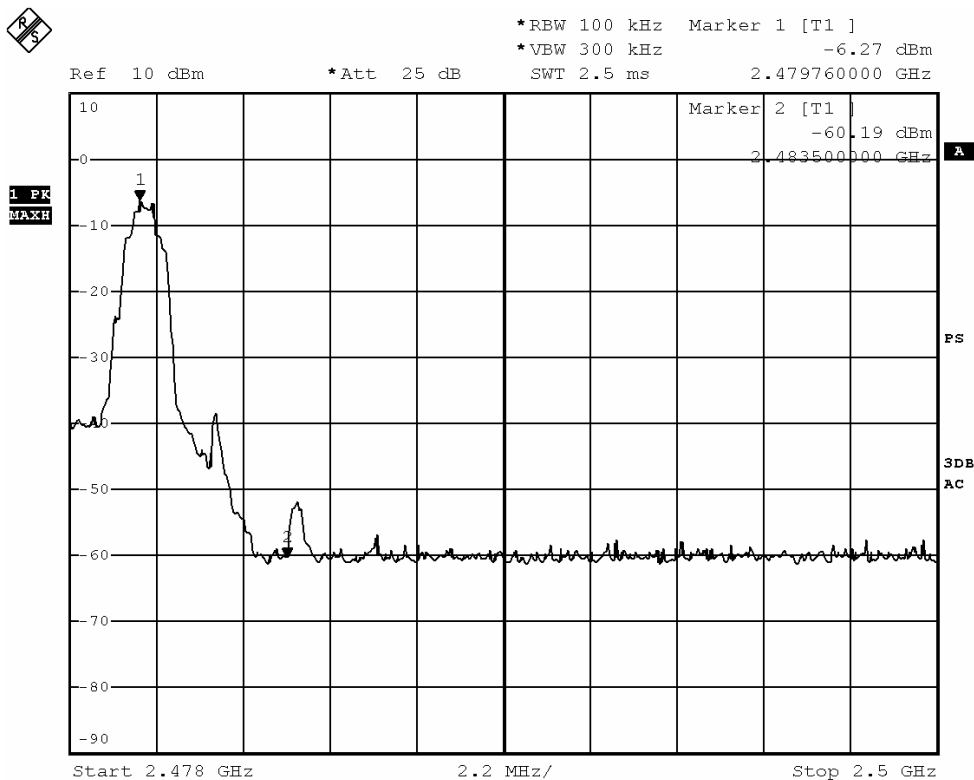
Page 57 of 77

No. : DM125641

Band-edge Compliance of RF Conducted Emissions Measurement:

Frequency Range [MHz]	Radiated Emission Attenuated below the Fundamental [dB]
2483.5 - Highest Fundamental (2480)	53.92

Band-edge Compliance of RF Emissions – Highest ($\pi/4$ DQPSK) (Hopping off)



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No. : DM125641

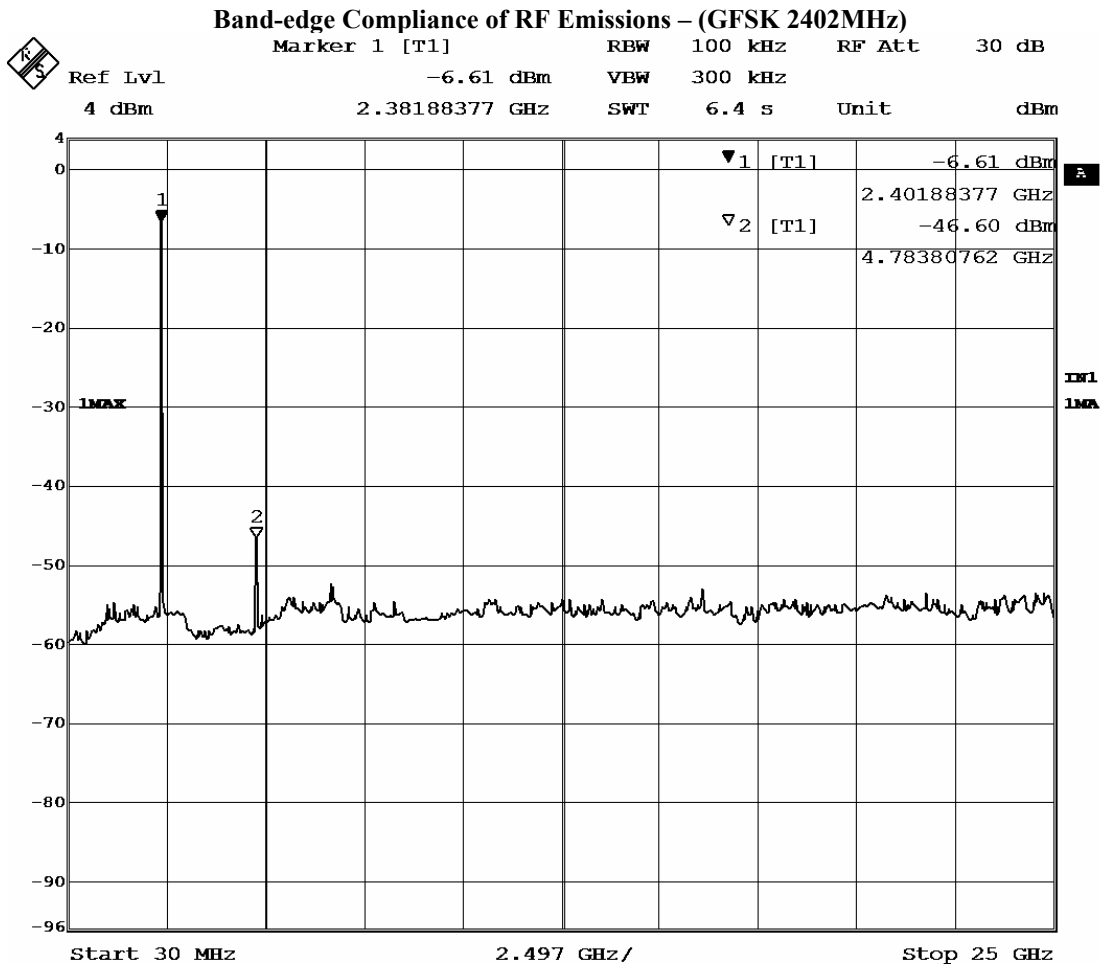
Page 58 of 77

Band-edge Compliance of RF Conducted 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.

Remark: Emissions under the fixed frequency mode and hopping mode have been investigated, the worst-case measurement results were recorded in the test report



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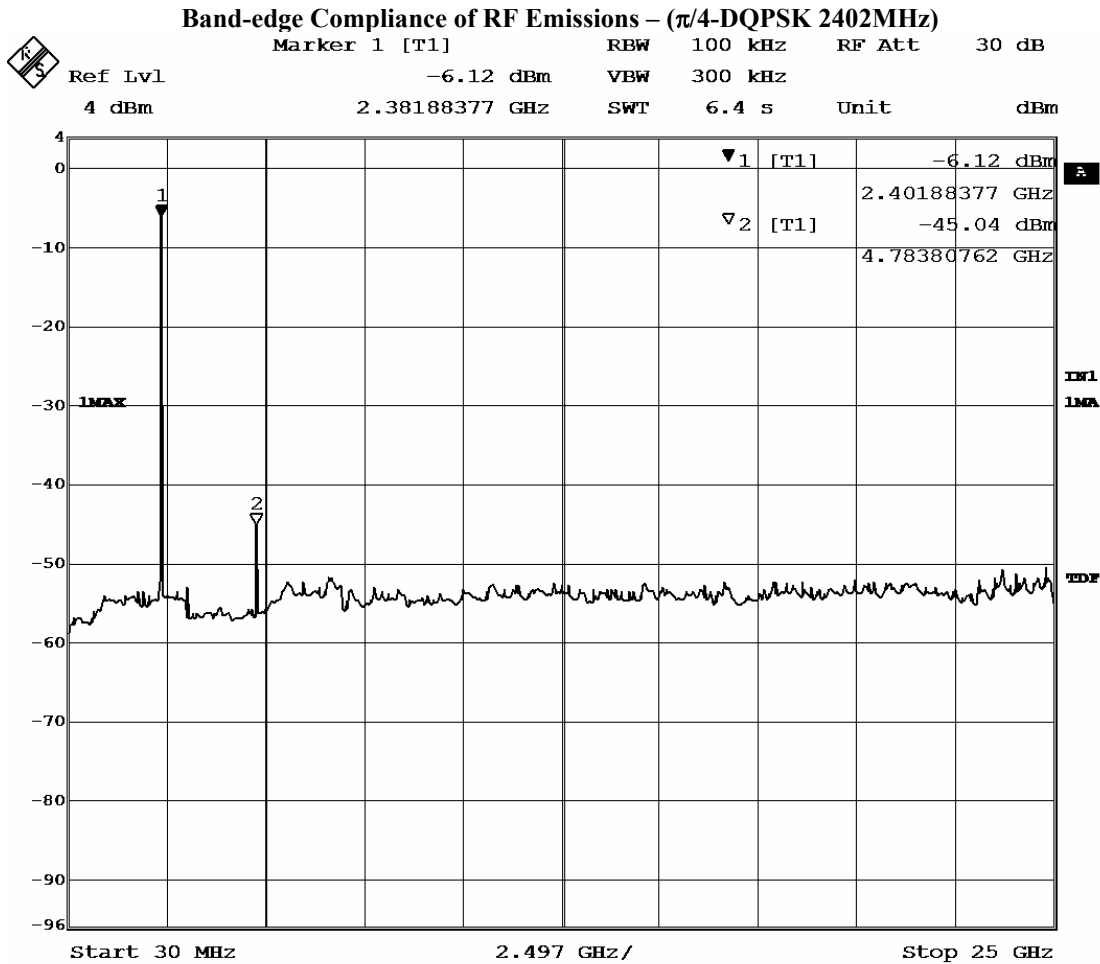
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Test Report

Date : 2017-02-21
No. : DM125641

Page 59 of 77



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Test Report

Date : 2017-02-21

Page 60 of 77

No. : DM125641

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,

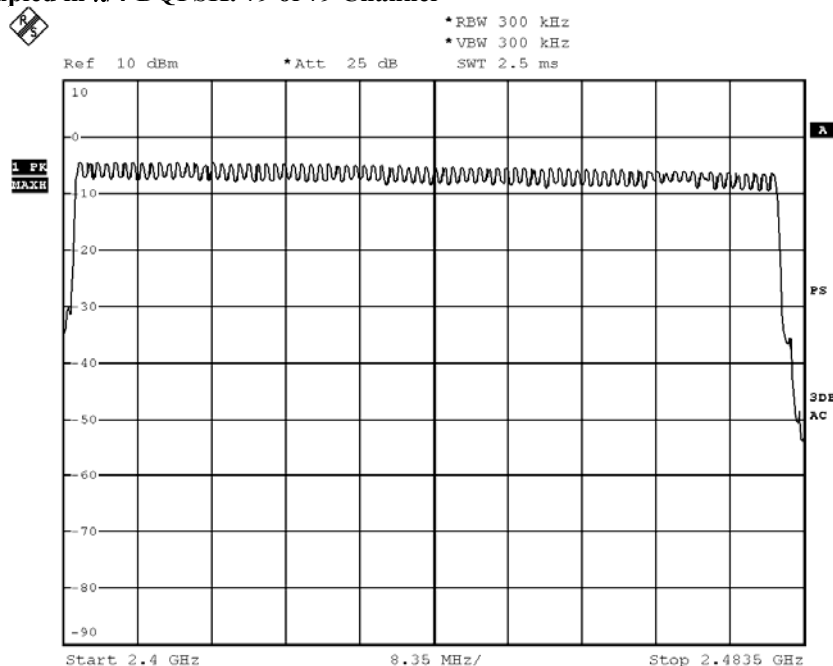
Span = Zero, Detector = Peak, Trace = Max. hold

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

Observed duration: 0.4s x 79 = 31.6s

Measurement Data:

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



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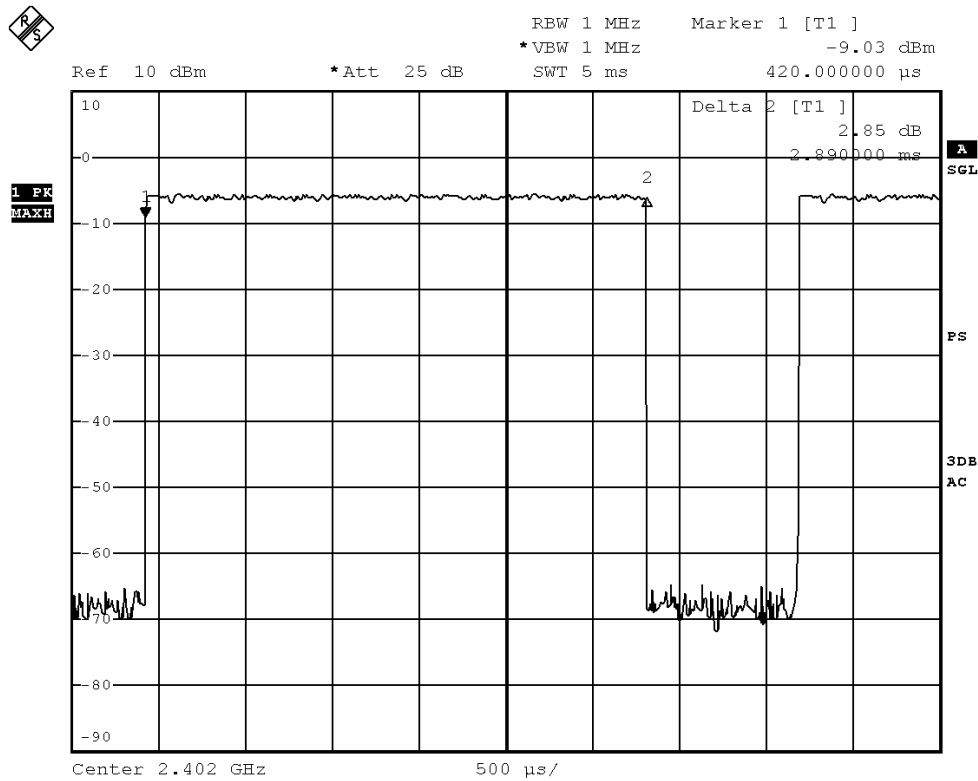
Date : 2017-02-21
No. : DM125641

Page 61 of 77

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]



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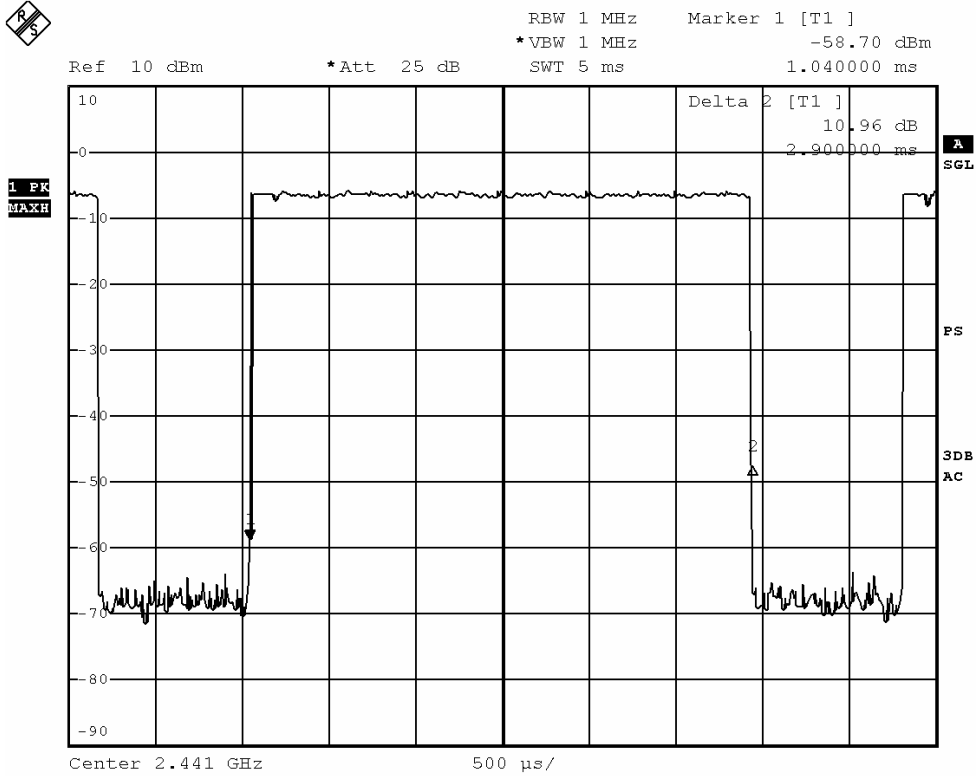


Test Report

Date : 2017-02-21
No. : DM125641

Page 62 of 77

Fig. B
[Pulse duration of Middle Channel]



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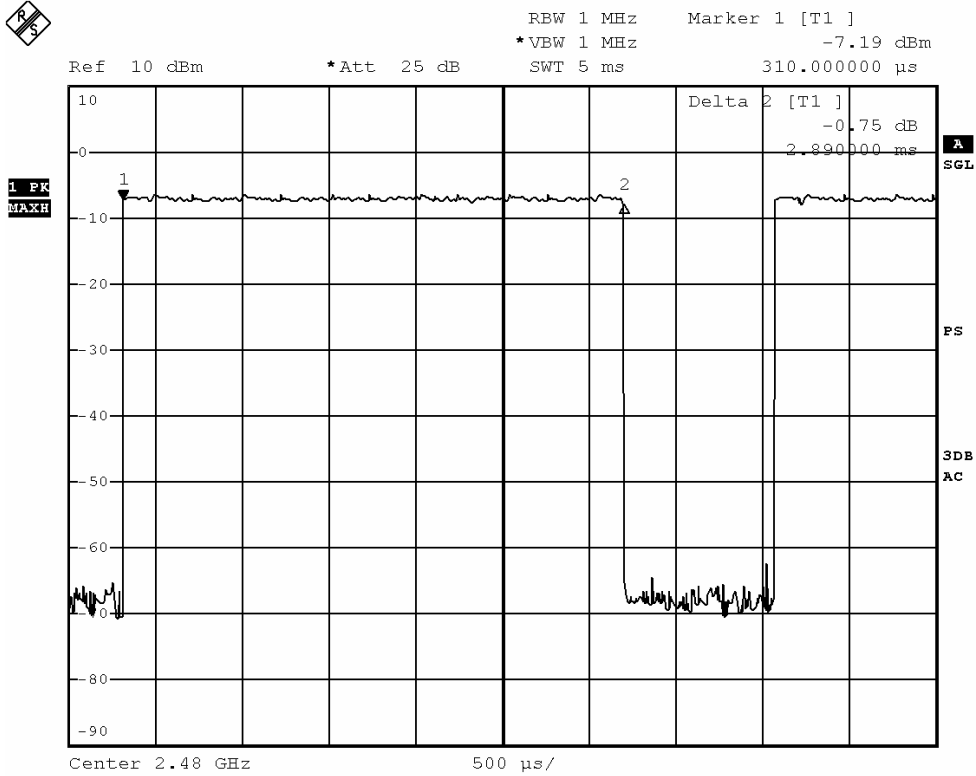


Test Report

Date : 2017-02-21
No. : DM125641

Page 63 of 77

Fig. C
[Pulse duration of Highest Channel]



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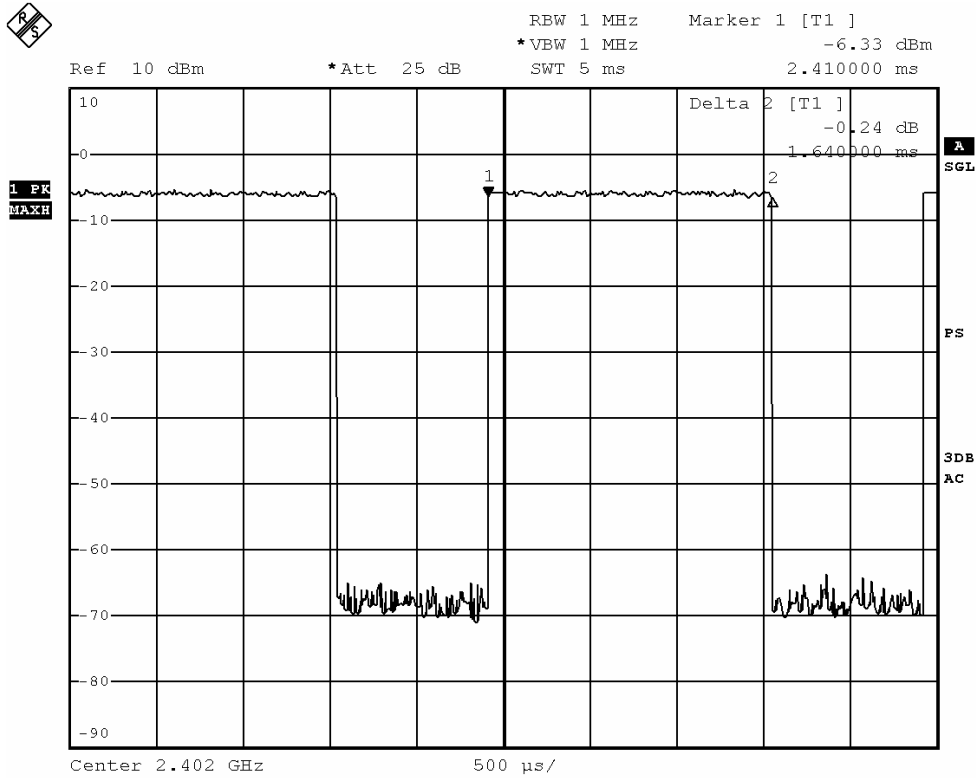
Date : 2017-02-21
No. : DM125641

Page 64 of 77

DH3 Packet:

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]



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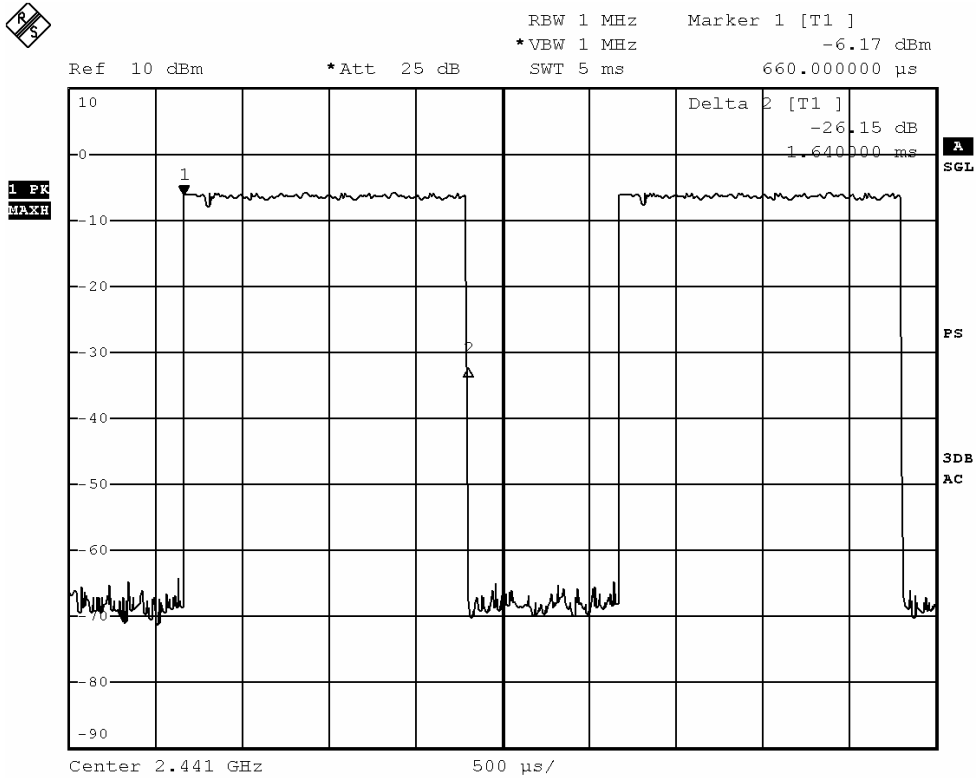


Test Report

Date : 2017-02-21
No. : DM125641

Page 65 of 77

Fig. E
[Pulse duration of Middle Channel]



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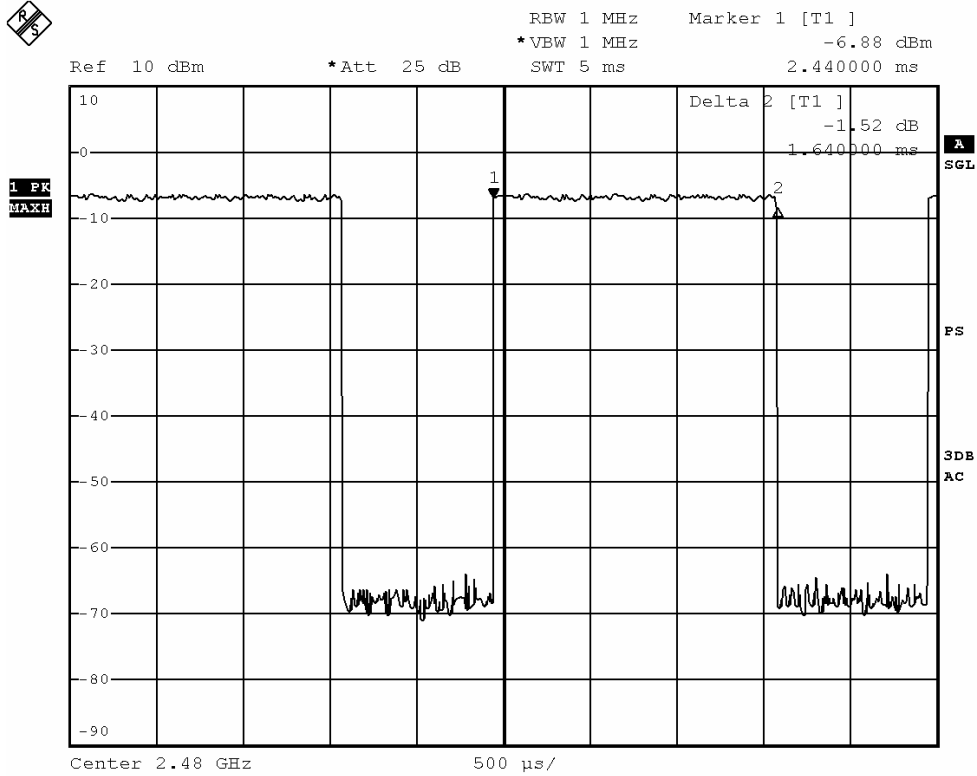


Test Report

Date : 2017-02-21
No. : DM125641

Page 66 of 77

Fig. F
[Pulse duration of Highest Channel]



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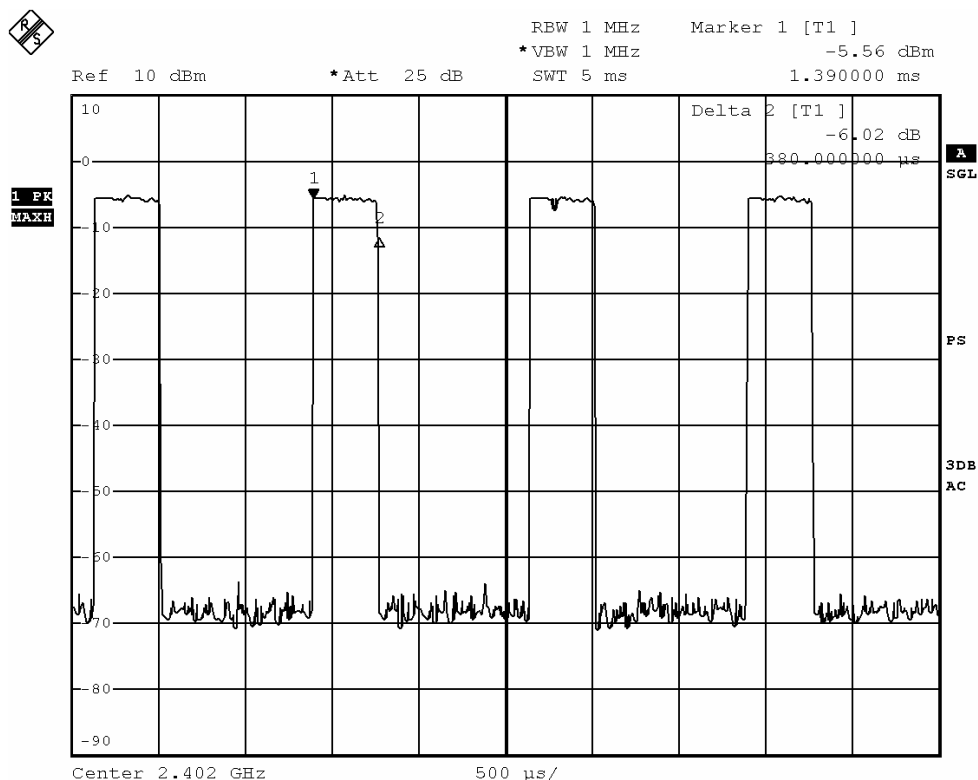
Page 67 of 77

No. : DM125641

DH1 Packet:

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]



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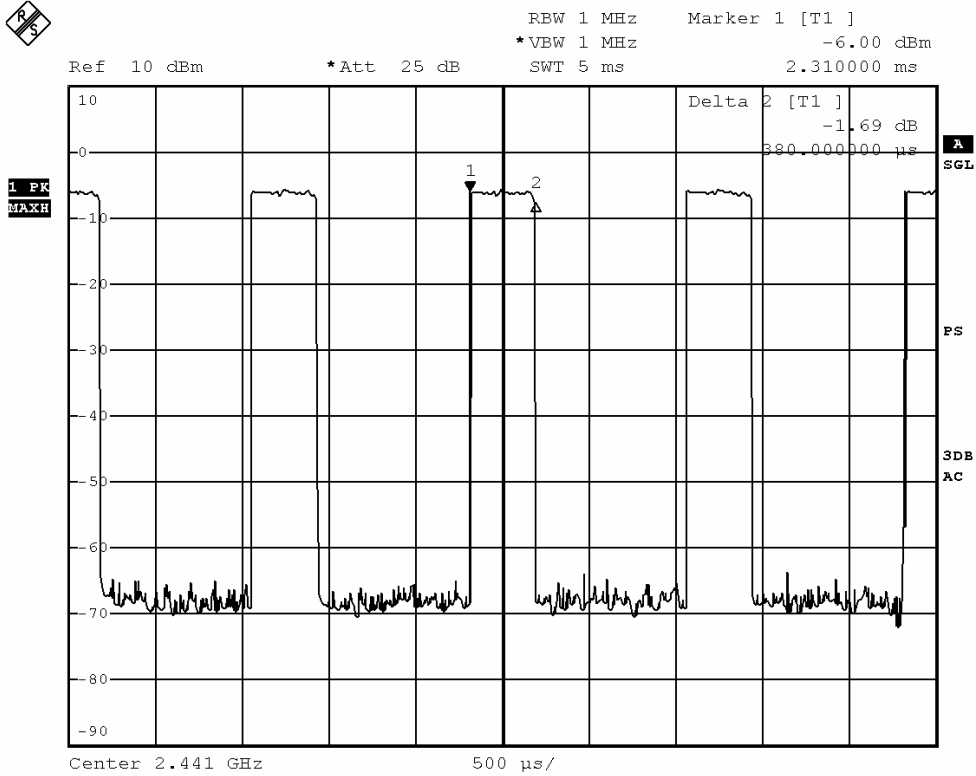


Test Report

Date : 2017-02-21
No. : DM125641

Page 68 of 77

Fig. H
[Pulse duration of Middle Channel]



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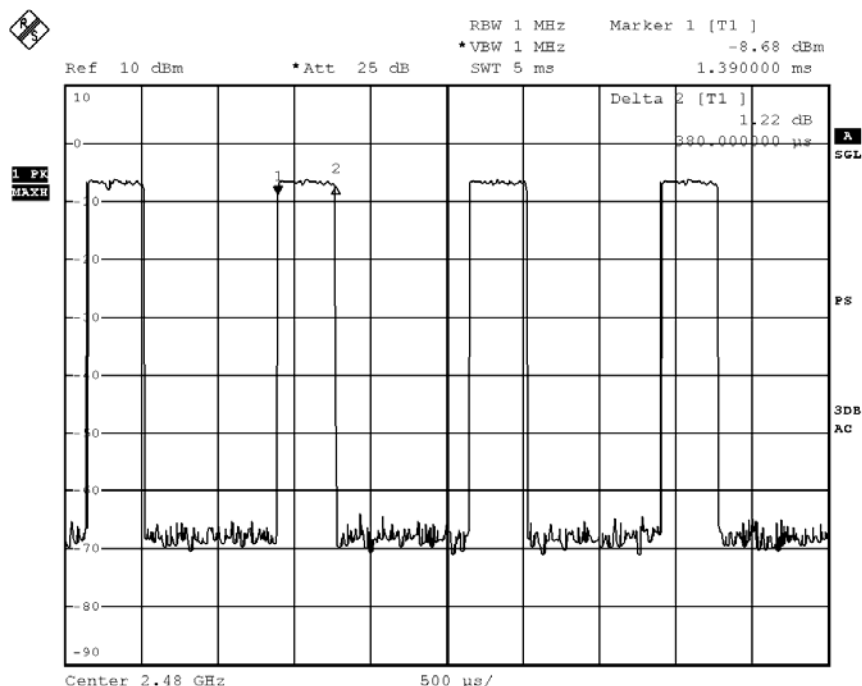
Test Report

Date : 2017-02-21

Page 69 of 77

No. : DM125641

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	2.890	0.308	0.400	Complies
DH5	2441	2.900	0.309	0.400	Complies
DH5	2480	2.890	0.308	0.400	Complies
DH3	2402	1.640	0.262	0.400	Complies
DH3	2441	1.640	0.262	0.400	Complies
DH3	2480	1.640	0.262	0.400	Complies
DH1	2402	0.380	0.122	0.400	Complies
DH1	2441	0.380	0.122	0.400	Complies
DH1	2480	0.380	0.122	0.400	Complies

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Test Report

Date : 2017-02-21

Page 70 of 77

No. : DM125641

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 : 2017-02-21

No. : DM125641

Page 71 of 77

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 : 2017-02-21

No. : DM125641

Page 72 of 77

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 Inverted F antenna. There is no external antenna, the antenna gain = 0.68dBi. User is unable to remove or changed the Antenna.

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Test Report

Date : 2017-02-21

No. : DM125641

Page 73 of 77

Appendix A

List of Measurement Equipment

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EMD004	LISN	ROHDE & SCHWARZ	ESH3-Z5	100102	2016.3.29	2017.3.29
EMD022	EMI Test Receiver	ROHDE & SCHWARZ	ESCS30	100314	2016.3.29	2017.3.29
EMD035	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	100441	2016.3.29	2017.3.29
EMD036	EMI Test Receiver	ROHDE & SCHWARZ	ESIB 26	100388	2016.3.29	2017.3.29
EMD041	TWO-LINE V-NETWORK	ROHDE & SCHWARZ	ENV216	100261	2016.3.29	2017.3.29
EMD061	Biconilog Antenna	ETS.LINDGREN	3142C	00060439	2016.12.30	2018.12.30
EMD062	Double-Ridged Waveguide (1GHz – 18GHz)	ETS.LINDGREN	3117	00075933	2014.11.15	2017.11.15
EMD084	MULTI-DVICE CONTROLLER	ETS.LINDGREN	2090	00060107	N/A	N/A
EMD088	Video Contol Unit	ETS.LINDGREN	Y21953A	2601073	N/A	N/A
EMD093	Monitor	ViewSonic	VA9036	Q8X064201876	N/A	N/A
EMD102	Intelligent Frequency	Ainuo Instrument Co., Ltd	AN97005SS	79707454	N/A	N/A
EMD103	Intelligent Frequency	Ainuo Instrument Co., Ltd	AN97005SS	79707455	N/A	N/A
EMD105	FACT-3 EMC Chamber	ETS.LINDGREN	FACT-3	3803	N/A	N/A
EMD106	Shielding Room #1	ETS.LINDGREN	RFD-100	3802	N/A	N/A
EMD111	Power meter	ROHDE & SCHWARZ	NRVD	102051	2016.3.29	2017.3.29
	100V Insertion Unit	ROHDE & SCHWARZ	URV5-Z4	100464	2016.3.29	2017.3.29
EMD113	Pre-Amplifier	ROHDE & SCHWARZ	N/A	1129588	2016.3.29	2017.3.29
EMD124	Loop Antenna	ETS-Lindgren	6502	00104905	2016.05.23	2017.05.23
EMD131	Standard Gain Horn Antenna (18GHz – 26.5GHz)	Chengdu AINFO Inc.	JXTXLB-42-15-C-KF	J2021100721001	2015.04.09	2017.04.09
RE01	RF cable	N/A	N/A	N/A	2016-9-28	2018-9-27
RE02	RF cable	N/A	N/A	N/A	2016-9-28	2018-9-27

Remarks:-

N/A Not Applicable or Not Available

Appendix B

Ancillary Equipment

ITEM NO.	DESCRIPTION	MODEL NO.	FCC ID	REMARK
1	DELL COMPUTER	DCSM	N/A	CONNECTED TO THE EUT INPUT PORT
2	USB Cable	N/A	N/A	80 cm unshielded cable

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Test Report

Date : 2017-02-21
No. : DM125641

Page 74 of 77

Appendix C

Photographs of EUT

Front View of the product



Rear View of the product



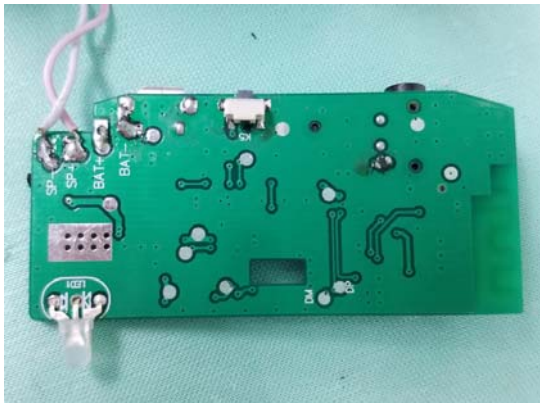
Inside View of the product



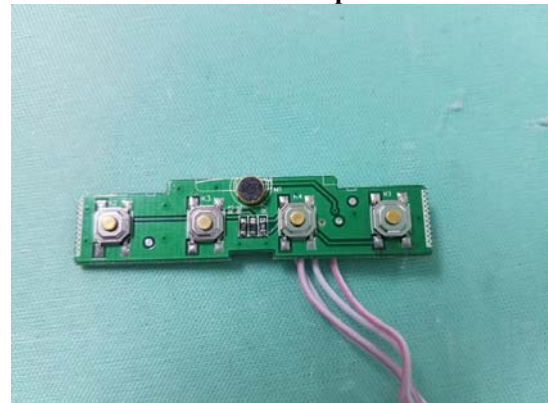
Inner Circuit Top View



Inner Circuit Bottom View



Inner Circuit Top View



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Test Report

Date : 2017-02-21
No. : DM125641

Page 75 of 77

Photographs of EUT

Inner Circuit Bottom View



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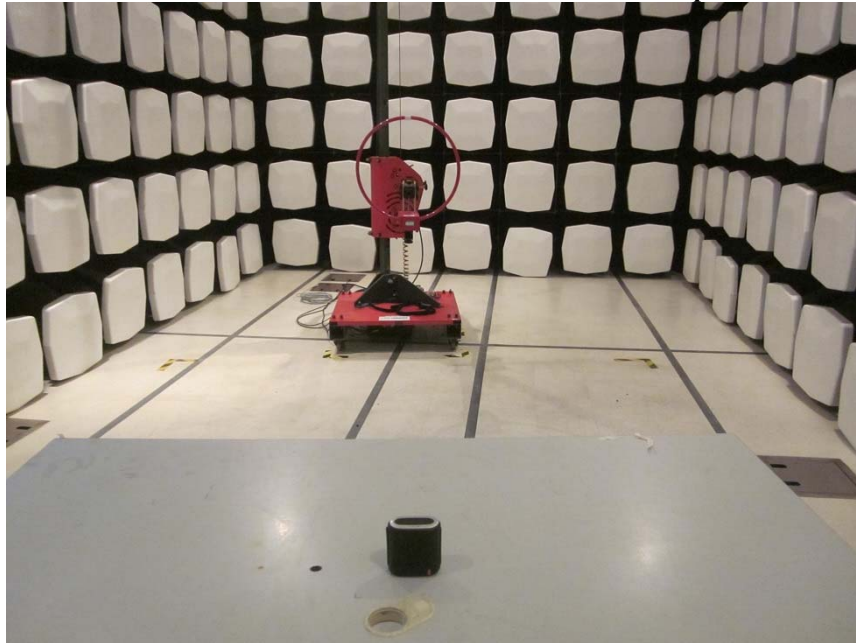
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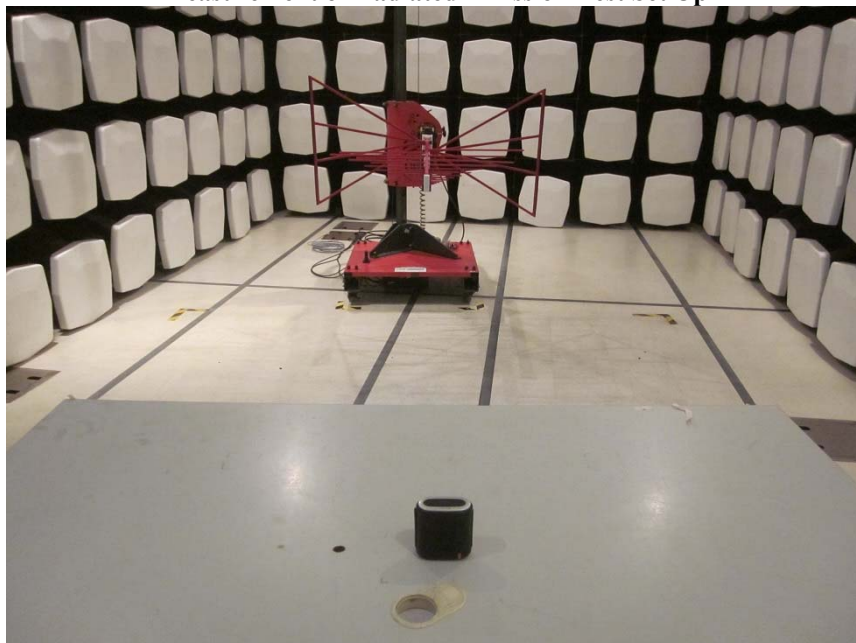
Page 76 of 77

Photographs of EUT

Measurement of Radiated Emission Test Set Up



Measurement of Radiated Emission Test Set Up



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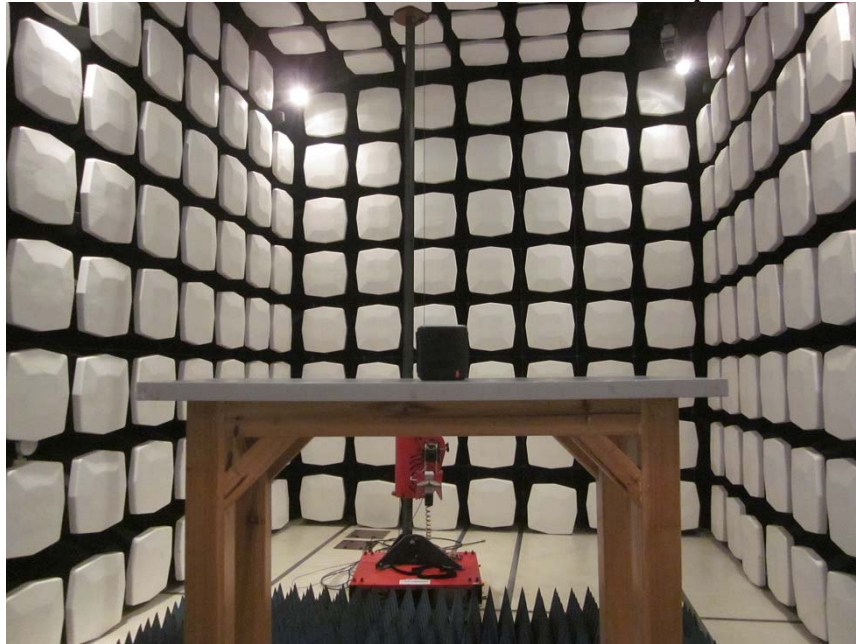
Test Report

Date : 2017-02-21
No. : DM125641

Page 77 of 77

Photographs of EUT

Measurement of Radiated Emission Test Set Up



Measurement of Conducted Emission Test Set Up



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Conditions of Issuance of Test Reports

1. All samples and goods are accepted by The STC (Dongguan) Company Limited (the “Company”) solely for testing and reporting in accordance with the following terms and conditions. The Company provides its services on the basis that such terms and conditions constitute express agreement between the Company and any person, firm or company requesting its services (the “Clients”).
2. Any report issued by the Company as a result of this application for testing service (the “Report”) shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to his customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.
3. The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.
4. The Report refers only to the sample tested and does not apply to the bulk, unless the sampling has been carried out by the Company and is stated as such in the Report.
5. In the event of the improper use the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.
6. Sample submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.
7. The Company will not be liable for or accept responsibility for any loss or damage howsoever arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.
8. Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.
9. Subject to the variable length of retention time for test data and report stored hereinto as to otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of this test report for a period of three years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after the retention period. Under no circumstances shall we be liable for damages of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.
10. Issuance records of the Report are available on the internet at dgstc@dgstc.org. Further enquiry of validity or verification of the Reports should be addressed to the Company.