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Report On

FCC and Industry Canada Testing of the
Yanfeng Visteon Automotive Electronics Co.,Ltd.
Bluetooth Module of R0-13 BTM01

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FCC ID: RQ9BTM01
IC ID: 5444A-BTM01

Document 57013010 Report 01 Issue 2

August 2013



Product Service

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COMMERCIAL-IN-CONFIDENCE

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PREPARED FOR


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PREPARED BY



Y He
Test Engineer

APPROVED BY



C Zhang
Test Manager


DATED

02 August 2013


ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47: Part 15 and Industry Canada RSS-210. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);



Y He



C Zhang



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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the Yanfeng Visteon Automotive Electronics Co.,Ltd.
Bluetooth Module of R0-13 BTM01



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1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Yanfeng Visteon Automotive Electronics Co.,Ltd. Bluetooth Module of R0-13 BTM01 to the requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210.

Objective	To perform FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Yanfeng Visteon Automotive Electronics Co.,Ltd.
Product Name	Bluetooth Module of R0-13
Product Type	BTM01
Serial Number(s)	ENGINEERING SAMPLE
Software Version	A05
Hardware Version	VPDNMF14E115FAA
Number of Samples Tested	1
Test Specification/Issue/Date	FCC CFR 47 Part 15: 2012 Industry Canada RSS-210 issue 8: 2010
Incoming Release Date	Declaration of Build Status 19 January 2013
Order Number Date	PTP 20 January 2013
Start of Test	21 January 2013
Finish of Test	28 January 2013
Name of Engineer(s)	Y He X Zhang

This report has been up-issued to Issue 2 due to amend the incorrect version of the specification using on page 4.



1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results in accordance with FCC CFR 47 Part 15 and Industry Canada RSS-210.

Configuration 1 - Bluetooth Module of R0-13							
Section	Spec Clause		Test Description	Mode	Mod State	Result	Comments
	FCC Part 15	RSS-210					
2.1	15.247(b)(1)	Annex 8.4(2)	Maximum Peak Output Power	2402 MHz	0	Pass	-
				2441 MHz	0	Pass	
				2480 MHz	0	Pass	
2.2	15.247(a)(1)	Annex 8.1(b)	20dB Bandwidth	2402 MHz	0	Pass	-
				2441 MHz	0	Pass	
				2480 MHz	0	Pass	
2.3	15.205,15.247(d)	Annex 8.5	Band Edge Compliance	2402 MHz	0	Pass	-
				2441 MHz	0	N/A	
				2480 MHz	0	Pass	
2.4	15.247(d)	Annex 8.5	Conducted Spurious Emissions	2402 MHz	0	Pass	-
				2441 MHz	0	Pass	
				2480 MHz	0	Pass	
2.5	15.209,15.247(d)	2.5, Annex 8.5	Radiated Spurious Emissions	2402 MHz	0	Pass	-
				2441 MHz	0	Pass	
				2480 MHz	0	Pass	
2.6	15.247(a)(1)(iii)	Annex 8.1(d)	Channel Dwell Time	Hopping	0	Pass	-
2.7	15.247(a)(1)	Annex 8.1(b)	Channel Separation	Hopping	0	Pass	-
2.8	15.247(a)(1)(iii)	Annex 8.1(d)	Number of Hopping Channels	Hopping	0	Pass	-
2.9	15.109	2.3	Receiver Spurious Emissions	Receiving	0	Pass	-

N/A – Not Applicable



1.3 DECLARATION OF BUILD STATUS

MAIN EUT		
Manufacture	Yanfeng Visteon Automotive Electronics Co.,Ltd.	
Product Name	Bluetooth Module of R0-13	
Product Type	BTM01	
Serial Number	ENGINEERING SAMPLE	
Radio Access Technology	Bluetooth	
Hardware Version	VPDNMF14E115FAA	
Software Version	A05	
Operating Frequency	2400MHz to 2483.5MHz	
Transfer Rate	1Mbps, 2Mbps, 3Mbps	
Number of channel	79	
Modulation Type	GFSK, $\pi/4$ DQPSK, 8DPSK	
Output Power (dBm)	4dBm	
OUTPUT POWER (mW or dBm)	2.51mW / 4dBm	
FCC ID	RQ9BTM01	
IC ID	5444A-BTM01	
IC Model NO	BTM01	
Environment temperature range(s)	Minimum	Maximum
	-35	85
DC Power source	3.3VDC	
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	BTM01 is a Bluetooth Module. The function of this Module is to establish Bluetooth communication.	

Jiangsu TÜV Product Service Ltd. formally certifies that the manufacturer's declaration as reproduced in this report is a true and accurate record of the original received from the applicant.



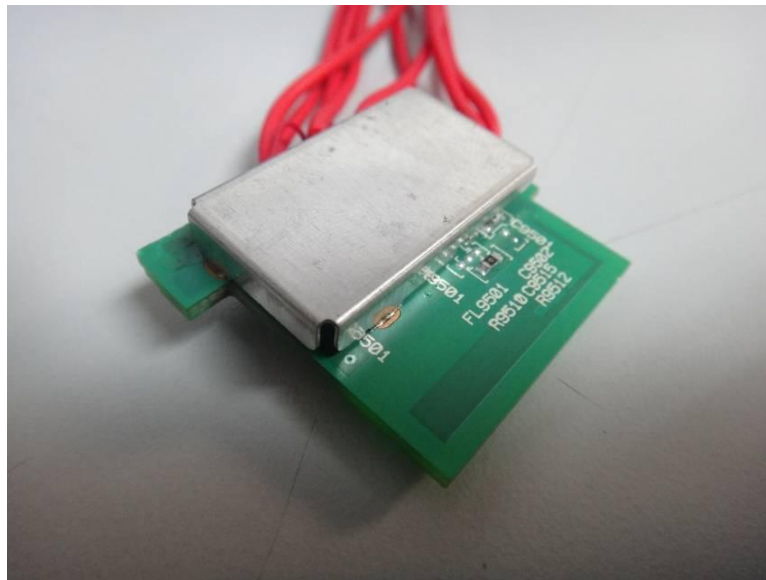
Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Yanfeng Visteon Automotive Electronics Co.,Ltd. Bluetooth Module of R0-13 BTM01 as shown in the photograph below. A full technical description is held by Yanfeng Visteon Automotive Electronics Co.,Ltd.

The Equipment Under Test (EUT) is shown in the photograph below. A full technical description can be found in the Manufacturers documentation.



Equipment Under Test



1.4.2 Test Configuration

Configuration 1: 2.4GHz Bluetooth Module

Packet type DH5 was found to be representative for all traffic scenarios when different packet types were tested to find the worst case setting. The settings were used for all measurements if not otherwise noted.

The EUT was powered by a +3.3VDC Power supply.

1.4.3 Modes of Operation

Modes of operation of the EUT during testing were as follows:

Test Mode 1 – 2402 MHz (Tx)
Test Mode 2 – 2441 MHz (Tx)
Test Mode 3 – 2480 MHz (Tx)
Test Mode 4 – Frequency Hopping (Tx)
Test Mode 5 – 2441MHz (Rx)

Information on the specific test modes utilised are detailed in the test procedure for each individual test.

1.5 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.7 MODIFICATION RECORD

No modifications were made to the EUT during testing.

1.8 ALTERNATIVE TEST SITE

The testing was conducted at following site registrations:

FCC Accreditation 910917:
The State Radio Monitoring Center, No.80 Beilishi Road Xicheng District Beijing, China.

Industry Canada Accreditation 7308A-1:
The State Radio Monitoring Center, No.80 Beilishi Road Xicheng District Beijing, China.



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SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the Yanfeng Visteon Automotive Electronics Co.,Ltd.
Bluetooth Module of R0-13 BTM01



Product Service

2.1 MAXIMUM PEAK OUTPUT POWER

2.1.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(b)(1)
Industry Canada RSS-210, Annex 8.4(2)

2.1.2 Equipment Under Test

Bluetooth Module of R0-13 BTM01, S/N: ENGINEERING SAMPLE

2.1.3 Date of Test and Modification State

21 January 2013 – Modification State 0

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210.

The EUT was connected to the spectrum analyzer via an RF cable. The path loss of the cable was measured and entered as an offset. The peak level was recorded and compared with the test limits.

The path loss was measured and entered as a reference level offset.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration1 - Mode 1
 - Mode 2
 - Mode 3

2.1.6 Environmental Conditions

21 January 2013

Ambient Temperature 25.0°C

Relative Humidity 50.0%



2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210 for Maximum Peak Output Power

The test results are shown below.

Configuration 1 - Mode 1, 2 & 3

GFSK

Frequency (MHz)	Path Loss (dB)	Gain (dBi)	Output Power (dBm)	Output Power (mW)
2402	1.6	0	6.37	4.34
2441	1.6	0	6.77	4.75
2480	1.6	0	7.01	5.02

$\pi/4$ DQPSK

Frequency (MHz)	Path Loss (dB)	Gain (dBi)	Output Power (dBm)	Output Power (mW)
2402	1.6	0	5.73	3.74
2441	1.6	0	6.10	4.07
2480	1.6	0	6.25	4.22

8DPSK

Frequency (MHz)	Path Loss (dB)	Gain (dBi)	Output Power (dBm)	Output Power (mW)
2402	1.6	0	5.84	3.84
2441	1.6	0	6.20	4.17
2480	1.6	0	6.37	4.34

Limit	$\leq 30\text{dBm}$ or $\leq 1000\text{mW}$
-------	---

Remarks

The EUT does not exceed 1000mW or 30dBm at the measured frequencies.



Product Service

2.2 20DB BANDWIDTH

2.2.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(a)(1)
Industry Canada RSS-210, Annex 8.1(b)

2.2.2 Equipment Under Test

Bluetooth Module of R0-13 BTM01, S/N: ENGINEERING SAMPLE

2.2.3 Date of Test and Modification State

21 and 22 January 2013 – Modification State 0

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210.

Using the spectrum analyzer to test the 20dB bandwidth. Set the

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1
 - Mode 2
 - Mode 3

2.2.6 Environmental Conditions

	21 January 2013	22 January 2013
Ambient Temperature	25.0°C	24.0°C
Relative Humidity	50.0%	50.0%



Product Service

2.2.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210 for Occupied Bandwidth.

The test results are shown below.

Configuration 1 - Mode 1, 2 & 3

GFSK





Product Service





Product Service

Configuration 1 - Mode 1, 2 & 3

π/4DQPSK





Product Service



Configuration 1 - Mode 1, 2 & 3

8DPSK





Product Service





Product Service

2.3 BAND EDGE COMPLIANCE

2.3.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.205, 15.247(d)
Industry Canada RSS-210, Annex 8.5

2.3.2 Equipment Under Test

Bluetooth Module of R0-13 BTM01, S/N: ENGINEERING SAMPLE

2.3.3 Date of Test and Modification State

21 January 2013 – Modification State 0

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210.

The EUT was transmitted at maximum power to the Spectrum Analyser. The Analyser settings were adjusted to display the resulting trace on screen. The peak point of the trace was measured and the markers positioned to give the -20dBc points of the displayed spectrum.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1
 - Mode 3

2.3.6 Environmental Conditions

21 January 2013

Ambient Temperature 25.0°C

Relative Humidity 50.0%



Product Service

2.3.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210 for Band Edge Compliance.

The test results are shown below.

Configuration 1 - Mode 1 & 3

GFSK





Product Service

Configuration 1 - Mode 1 & 3

$\pi/4$ DQPSK





Configuration 1 - Mode 1 & 3

8DPSK





Product Service

2.4 SPURIOUS CONDUCTED EMISSIONS ON ANTENNA PORT

2.4.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(d)
Industry Canada RSS-210, Annex 8.5

2.4.2 Equipment Under Test

Bluetooth Module of R0-13 BTM01, S/N: ENGINEERING SAMPLE

2.4.3 Date of Test and Modification State

21 January 2013 – Modification State 0

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210.

The Spurious Conducted Emissions from the antenna terminal were measured. The frequency spectrum investigated from 9kHz to 25 GHz. The EUT was set to transmit on full power. The spectrum analyser detector was set to Max Hold.

With the EUT transmitting at maximum power, the Spectrum Analyser was set to Max Hold and the fundamental peak measured in a RBW and VBW of 1MHz. The level was used to determine the limit line as displayed on the plots of -20dBc.

The maximum path loss across each measurement band was used as the reference level offset to ensure worst case results.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1
- Mode 2
- Mode 3

2.4.6 Environmental Conditions

21 January 2013

Ambient Temperature 25.0°C

Relative Humidity 50.0%



Product Service

2.4.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210 for Spurious Conducted Emissions on Antenna Port.

The plots of test results are shown below.

Remark:

The emission at 9kHz on the plots was not generated by the test object. A complementary measurement with a smaller span showed that it was related to the LO feedthrough.



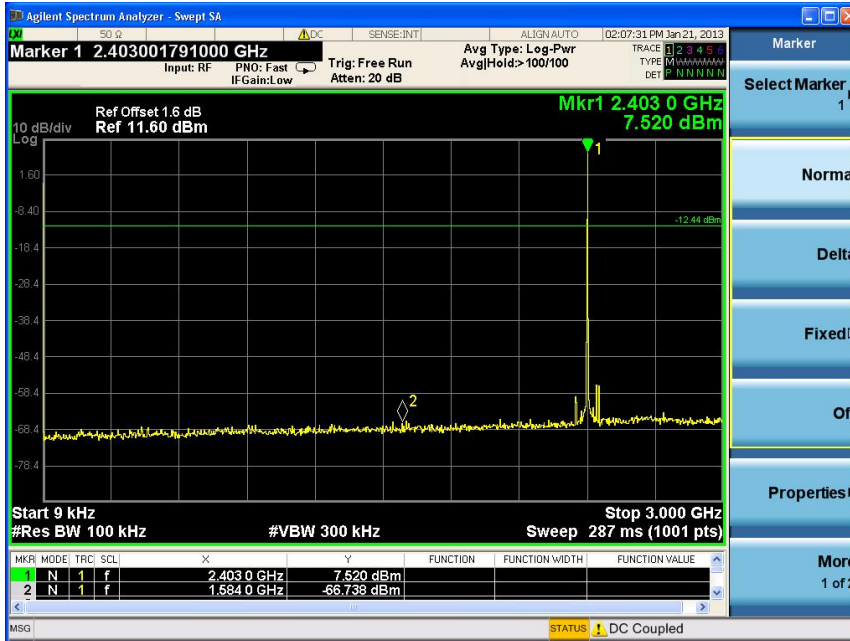


Product Service

GFSK

Configuration 1 - Mode 1

9kHz – 3GHz



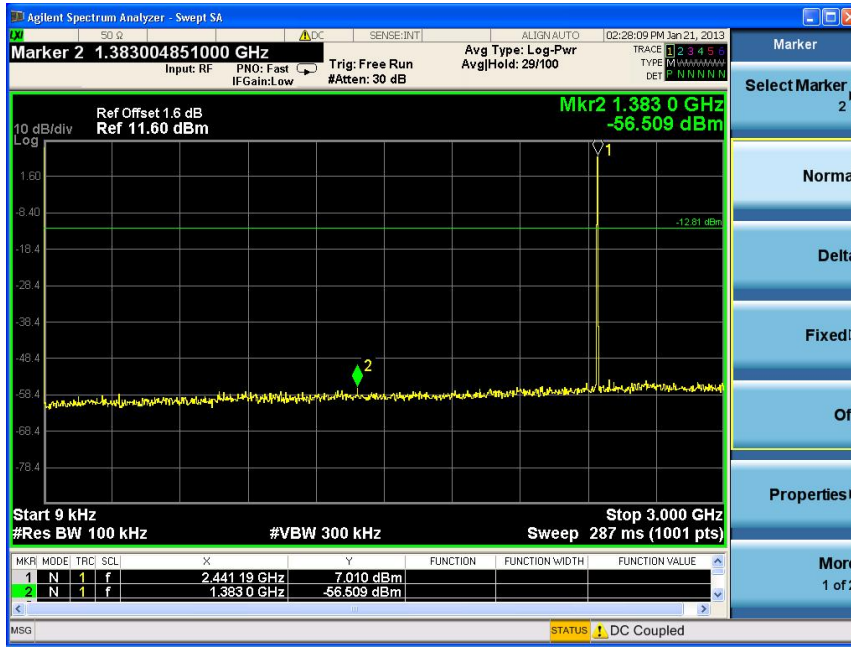
3GHz – 25GHz





Configuration 1 - Mode 2

9kHz – 3GHz



3GHz – 25GHz

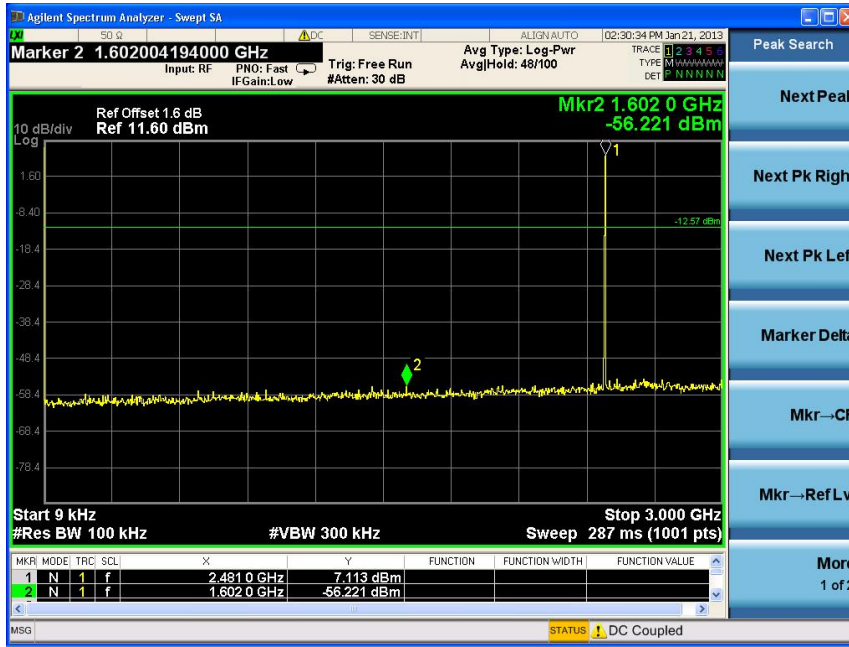




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Configuration 1 - Mode 3

9kHz – 3GHz



3GHz – 25GHz



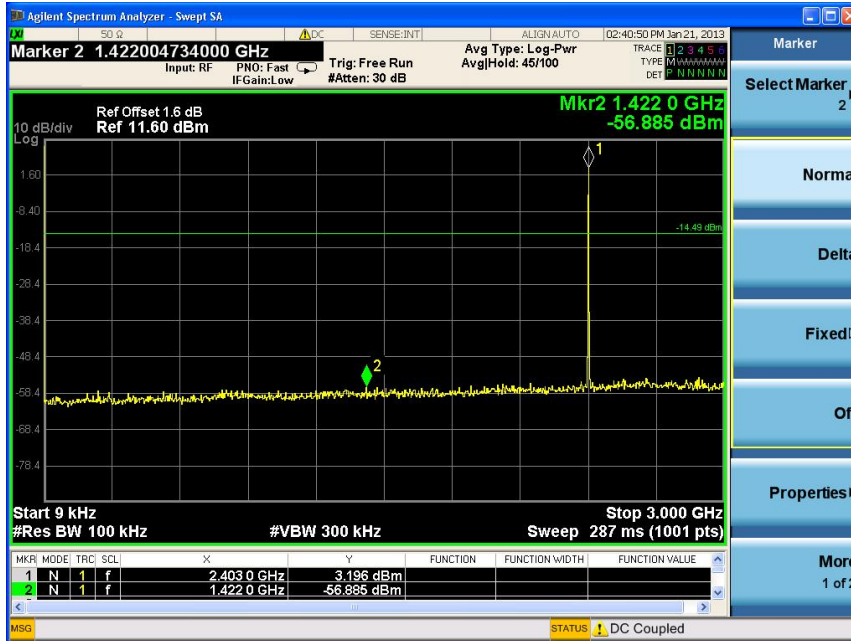


Product Service

$\pi/4$ DQPSK

Configuration 1 - Mode 1

9kHz – 3GHz



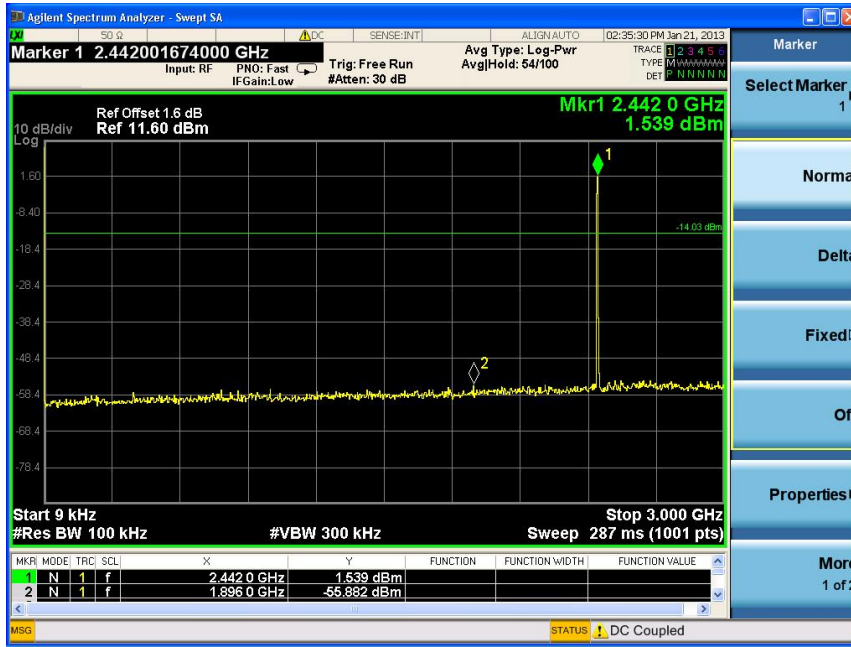
3GHz – 25GHz





Configuration 1 - Mode 2

9kHz – 3GHz



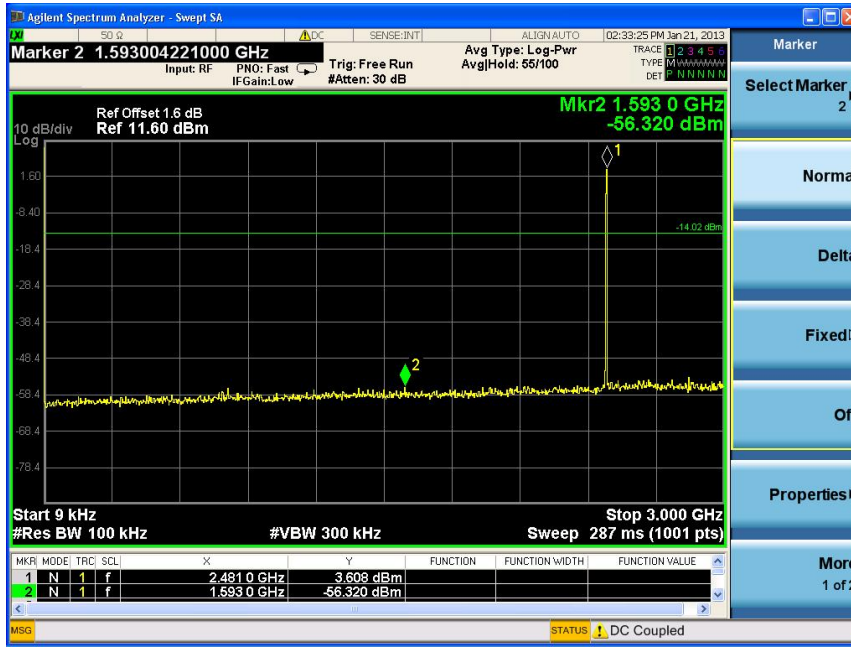
3GHz – 25GHz





Configuration 1 - Mode 3

9kHz – 3GHz



3GHz – 25GHz



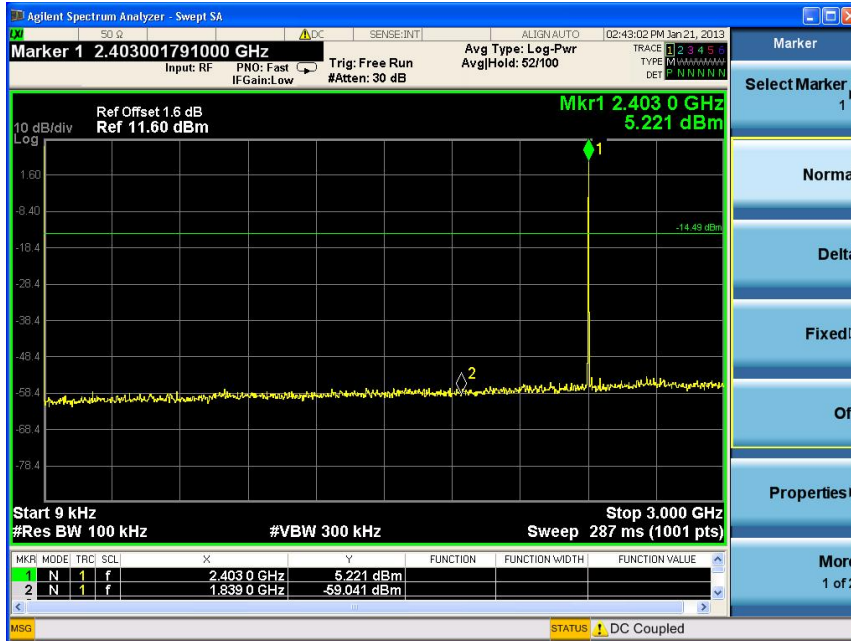


Product Service

8DPSK

Configuration 1 - Mode 1

9kHz – 3GHz



3GHz – 25GHz

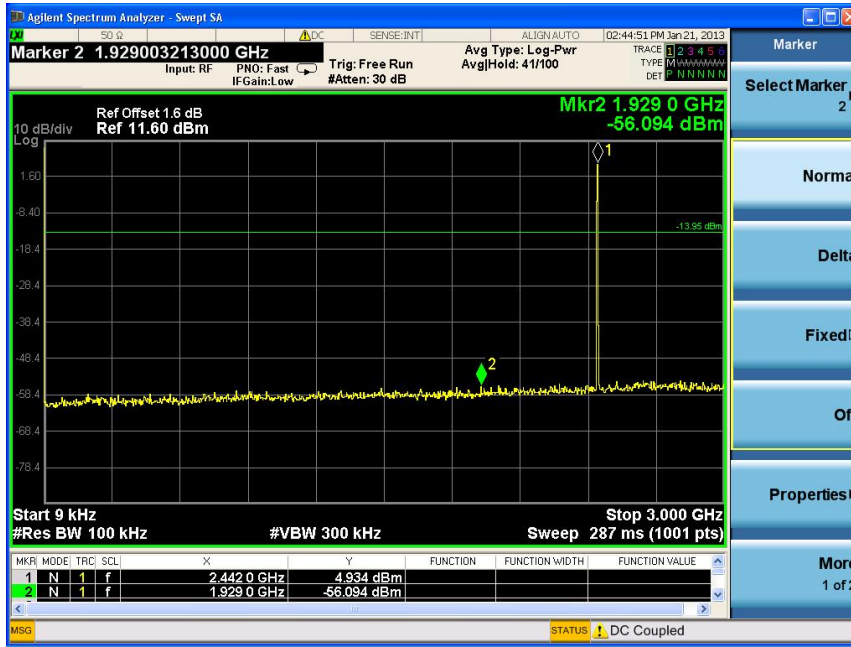




Product Service

Configuration 1 - Mode 2

9kHz – 3GHz



3GHz – 25GHz

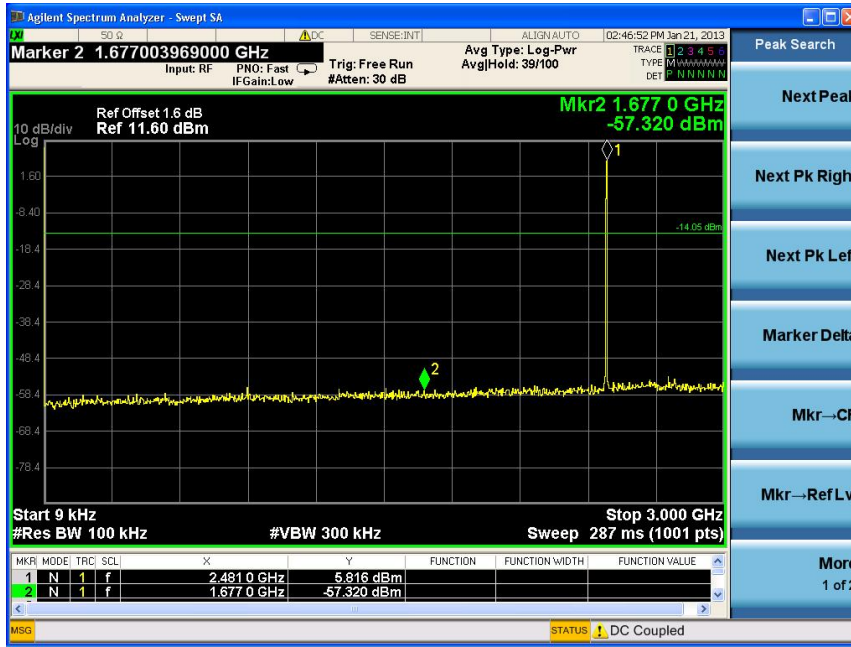




Product Service

Configuration 1 - Mode 3

9kHz – 3GHz



3GHz – 25GHz





Product Service

2.5 RADIATED SPURIOUS EMISSIONS

2.5.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.209, 15.247(d), 15.205
Industry Canada RSS-210, Clause 2.5, Annex 8.5

2.5.2 Equipment Under Test

Bluetooth Module of R0-13 BTM01, S/N: ENGINEERING SAMPLE

2.5.3 Date of Test and Modification State

28 January 2013 – Modification State 0

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within the chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations.

Emissions identified within the range 30MHz – 25GHz were then formally measured using a Peak detector as the worst case.

In the frequency Range 30MHz – 25GHz, the measurement was performed with a resolution bandwidth of 1MHz.

The measurements were performed at a 3m distance unless otherwise stated.

The test was performed with the EUT in the following configurations and modes of operation:

- Configuration 1 - Mode 1
- Mode 2
- Mode 3

2.5.6 Environmental Conditions

28 January 2013

Ambient Temperature 22.9°C

Relative Humidity 24.2%



2.5.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210 Radiated Spurious Emissions.

The test results are shown below.

GFSK

Configuration 1 - Mode 1

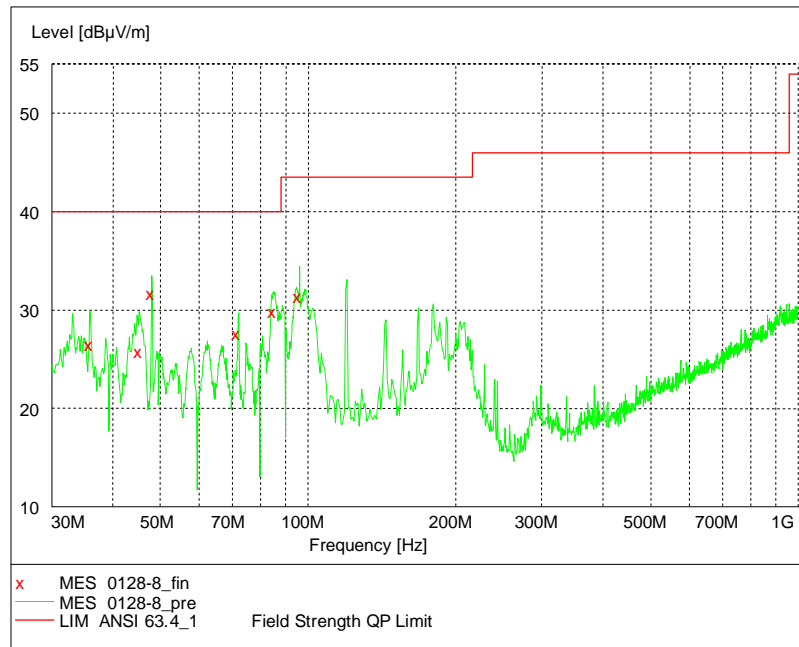
No emissions were detected within 20dB of the limit.

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

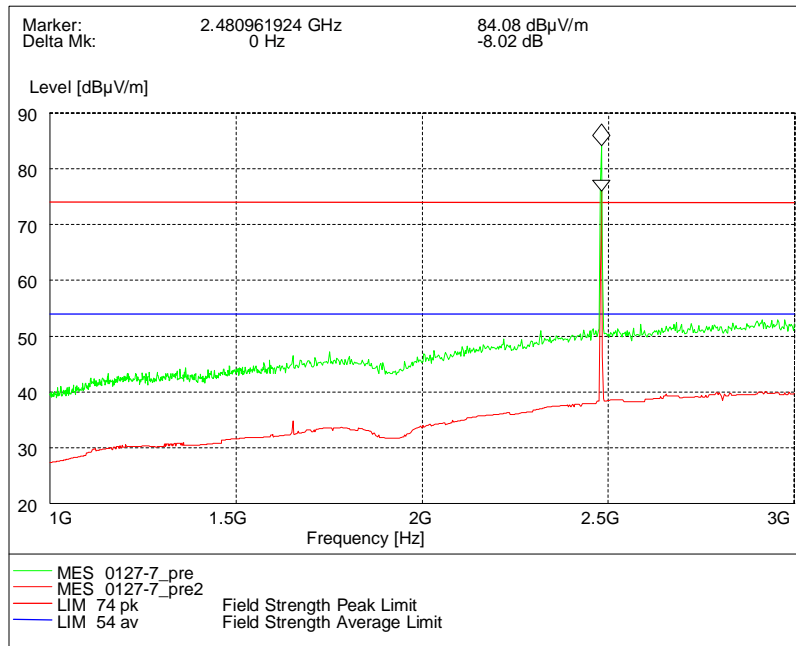
Configuration 1 - Mode 3

30MHz – 1GHz



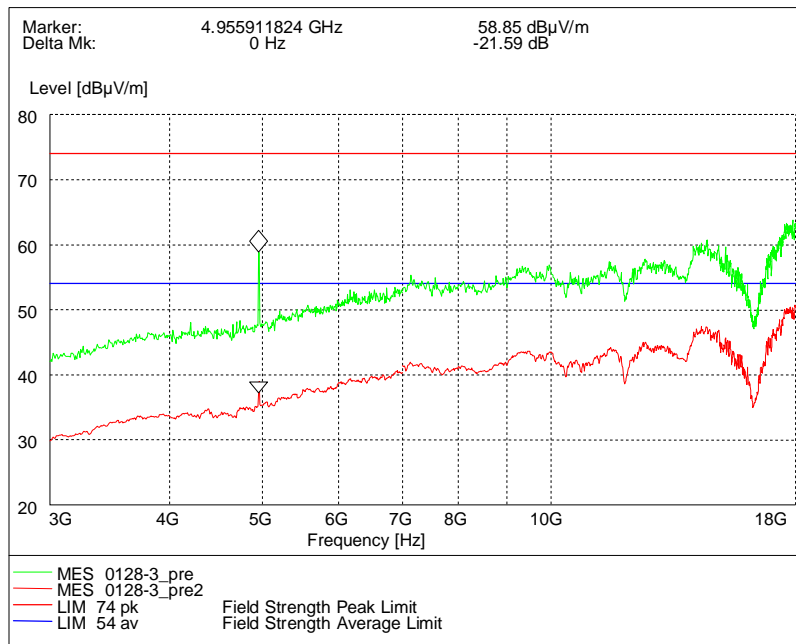


1GHz – 3GHz



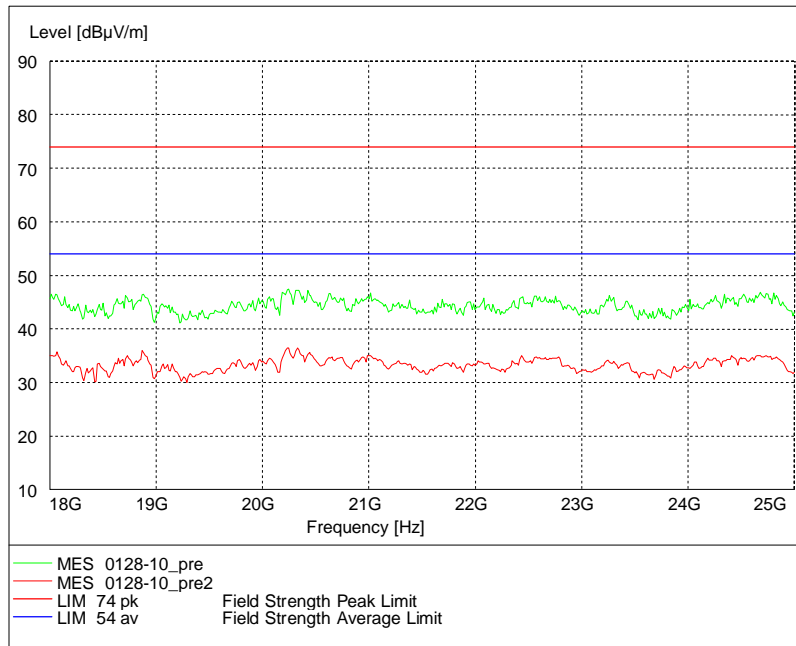
Note: The emission beyond the limit is the operating frequency.

3GHz – 18GHz





18GHz – 25GHz



$\pi/4$ DQPSK

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

8DPSK

Configuration 1 - Mode 2

No emissions were detected within 20dB of the limit.

Frequency range	Limit
30 MHz to 88 MHz	40dBµV/m
88 MHz to 216 MHz	43.5dBµV/m
216 MHz to 960 MHz	46dBµV/m
>960MHz	Average:54dBµV/m, Peak:74dBµV/m

Remarks

The EUT does not exceed the limit during the test.



Product Service

2.6 CHANNEL DWELL TIME

2.6.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(a)(1)(iii)

2.6.2 Equipment Under Test

Bluetooth Module of R0-13 BTM01, S/N: ENGINEERING SAMPLE

2.6.3 Date of Test and Modification State

21 January 2013 – Modification State 0

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Method and Operating Modes

The test was applied in accordance with 15.247.

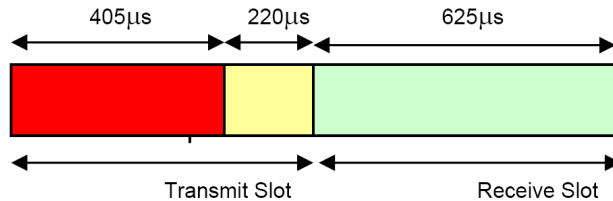
The Bluetooth system hops at a rate of 1600 times per second. Thus, this equates to 1600 timeslots in 1 second.

Thus:

$$1 \text{ Timeslot} = \frac{1}{1600} = 625\mu\text{s}$$

(a) The DH1 data rate operates on a Transmit on 1 timeslot and Receive on 1 timeslot basis. Thus, in 1 second, there are 800 Transmit timeslots and 800 Receive timeslots.

In 1 transmit timeslot, the transmit on time is only 405µs. 220µs is reserved as off time for the synthesizer to re-tune ready for the next transmit frequency. The following timeslot is a receive slot. This process continues assuming the data rate remains the same.



DH1 Timeslot Arrangement Showing One Complete Transmit and Receive Cycle

So, with 800 Tx and 800 Rx timeslots, the transmitter is on for 800 x 405µs = 0.324 seconds.

$$\frac{\text{Total Tx Time On}}{\text{No of Channels}} = \frac{0.324}{79} = 4.10\text{ms}$$

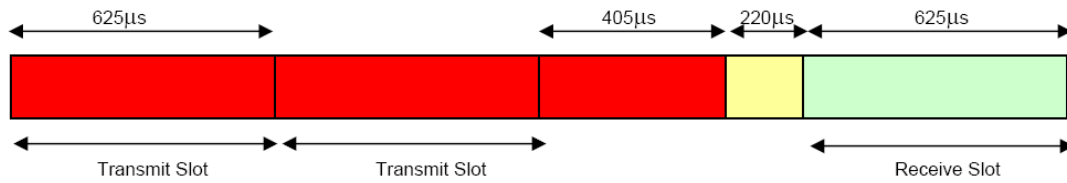
So, in 31.6 seconds, the transmitter dwell time per channel is:

$$31.6 \times 4.10\text{ms} = 0.1296 \text{ seconds}$$



(b) With data rate DH3, the data payload is higher and can use up to 3 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 3 slots, (ie. no receive slot in-between the 3 transmit slots). The 220µs off time for synthesizer re-tuning at the end of a slot is only used on the final slot. Thus, for one cycle, there are 3 transmit timeslots. 2 are 625µs long and the final slot is transmitting for 405µs.

The first 2 Transmit timeslots are transmitting for the complete 625µs. In the third transmit slot, the transmit on time is only 405µs. 220µs is reserved as off time for the synthesizer to re-tune ready for the next transmit frequency. The following timeslot is a receive slot. This process continues assuming the data rate remains the same.



DH3 Timeslot Arrangement Showing One Complete Transmit and Receive Cycle

Thus, the transmitter for one complete transmit and receive cycle would be on for:

$$\text{Tx} \quad (2 \times 625\mu\text{s}) + (1 \times 405\mu\text{s}) = 1.655\text{ms}$$

So:

$$800 \times 625\mu\text{s} = 0.5 \text{ seconds}$$

$$400 \times 405 \mu\text{s} = 0.162 \text{ seconds}$$

$$\text{Thus: } 0.5 + 0.162 = 0.662 \text{ seconds}$$

$$\frac{\text{Total Tx Time On}}{\text{No of Channels}} = \frac{0.662}{79} = 8.379\text{ms}$$

So, in 31.6 seconds, the transmitter dwell time per channel is:

$$31.6 \times 8.379\text{ms} = 0.2648 \text{ seconds}$$

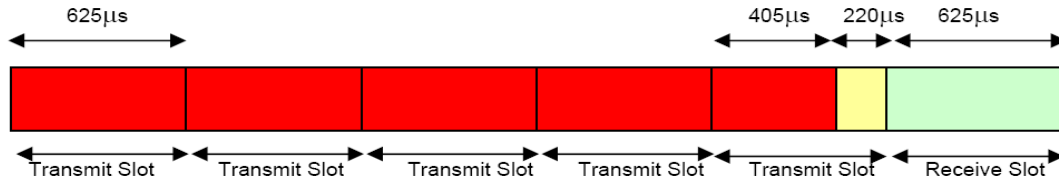
(c) With data rate DH5, the data payload is higher and can use up to 5 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 5 slots, (ie. no receive slot in-between the 5 transmit slots). The 220µs off time for synthesizer re-tuning at the end of a slot is only used on the final slot. Thus, for one cycle, there are 5 transmit timeslots. 4 are 625µs long and the final slot is transmitting for 405µs.

The DH5 data rate operates on a Transmit on 5 timeslots and Receives on 1 timeslot basis, (assuming maximum data payload). The frequency-hopping rate is the same. Thus, in 1 second, there are 1333.3 Transmit timeslots and 266.7 Receive timeslots.

The first 4 Transmit timeslots are transmitting for the complete 625µs. In the fifth transmit slot, the transmit on time is only 405µs. 220µs is reserved as off time for the synthesizer to re-tune ready for the next transmit frequency. The following timeslot is a receive slot. This process continues assuming the data rate remains the same.



Product Service



DH5 Timeslot Arrangement Showing One Complete Transmit and Receive Cycle

Thus, the transmitter for one complete transmit and receive cycle would be on for:

$$\text{Tx} \quad (4 \times 625\mu\text{s}) + (1 \times 405\mu\text{s}) = 2.905\text{ms}$$

So:

$$\begin{aligned} 1066.7 \times 625\mu\text{s} &= 0.666 \text{ seconds} \\ 266.7 \times 405\mu\text{s} &= 0.108 \text{ seconds} \end{aligned}$$

$$\text{Thus: } 0.666 + 0.108 = 0.774 \text{ seconds}$$

$$\frac{\text{Total Tx Time On}}{\text{No of Channels}} = \frac{0.774}{79} = 9.797\text{ms}$$

So, in 31.6 seconds, the transmitter dwell time per channel is:

$$31.6 \times 9.797 \text{ ms} = 0.31 \text{ seconds}$$

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 4

2.6.6 Environmental Conditions

21 January 2013

Ambient Temperature 25.0°C

Relative Humidity 50.0%



Product Service

2.6.7 Test Results

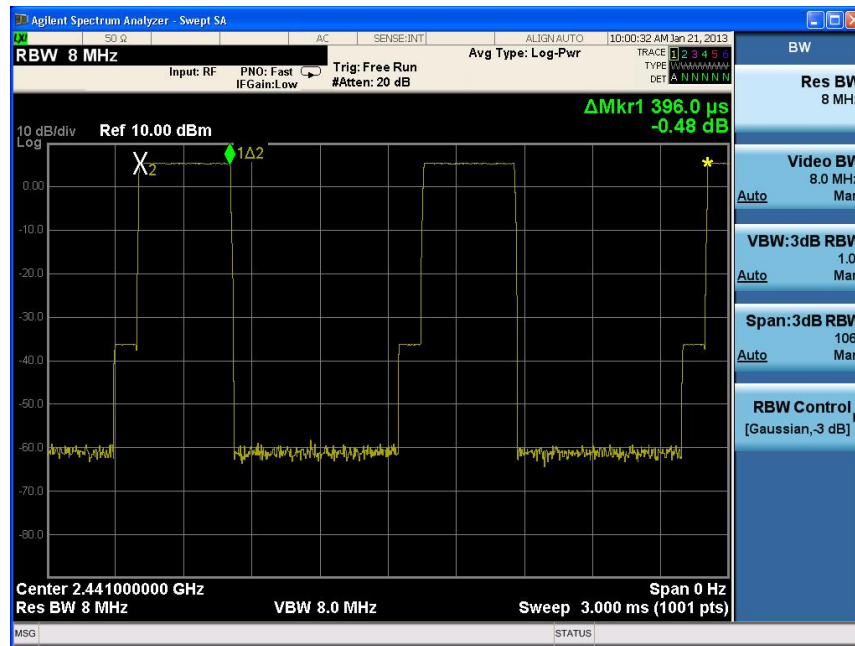
For the period of test the EUT met the requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210 for Dwell Time.

The plots of test results are shown below.

Configuration 1 - Mode 4

Dwell time:

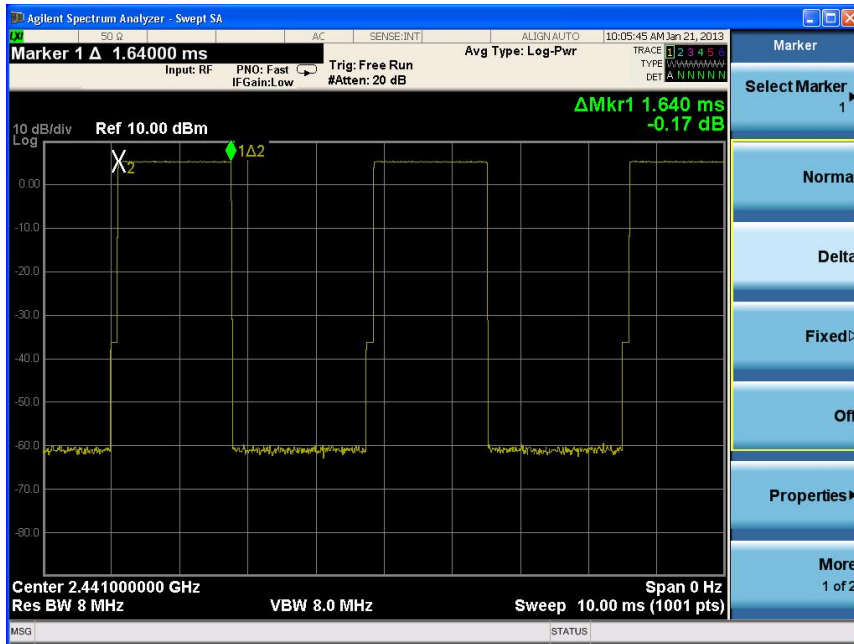
Packet Type	Dwell Time Calculate Formula	Result(ms)
DH1	$79 * 0.4 * 1600 / 79 / 2 * 0.396$	126.72
DH3	$79 * 0.4 * 1600 / 79 / 4 * 1.640$	262.40
DH5	$79 * 0.4 * 1600 / 79 / 6 * 2.880$	307.20



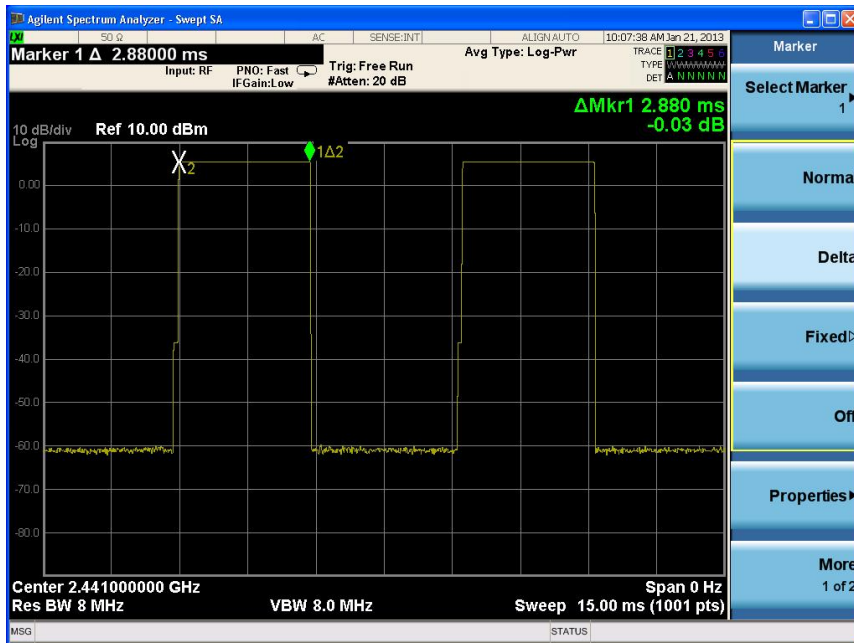
DH1 Timeslot



Product Service



DH3 Timeslot



DH5 Timeslot

Limit	$\leq 0.4s$
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Product Service

2.7 CHANNEL SEPARATION

2.7.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(a)(1)
Industry Canada RSS-210, Annex 8.1(b)

2.7.2 Equipment Under Test

Bluetooth Module of R0-13 BTM01, S/N: ENGINEERING SAMPLE

2.7.3 Date of Test and Modification State

21 January 2013 – Modification State 0

2.7.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210.

The EUT was transmitted at maximum power into a Spectrum Analyser. The trace was set to Max Hold to store several adjacent channels on screen. Using the marker delta function, the marker were positioned to show the separation between adjacent channels.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 4

2.7.6 Environmental Conditions

21 January 2013

Ambient Temperature 25.0°C

Relative Humidity 50.0%



Product Service

2.7.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210 for Channel Separation.

The test results are shown below.

Configuration 1 - Mode 4



The system channel separation is specified as being 1MHz. The measured channel separation from the plt above is: 1000kHz.

Limit	>25 kHz
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Remarks

The channel separation of the EUT is more than 25 kHz.



Product Service

2.8 NUMBER OF HOPPING CHANNELS

2.8.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.247(a)(1)
Industry Canada RSS-210, Annex 8.1(d)

2.8.2 Equipment Under Test

Bluetooth Module of R0-13 BTM01, S/N: ENGINEERING SAMPLE

2.8.3 Date of Test and Modification State

21 January 2013 – Modification State 0

2.8.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.8.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210.

The EUT was connected to a spectrum Analyser via a cable. The EUT was set to transmit on maximum power and hopping on all channels. The span was adjusted to show the individual channels. To reasonably display the number of channels, the occupied band was split into two traces. The display trace was set to Max Hold and the plots recorded.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 4

2.8.6 Environmental Conditions

21 January 2013

Ambient Temperature 25.0°C

Relative Humidity 50.0%



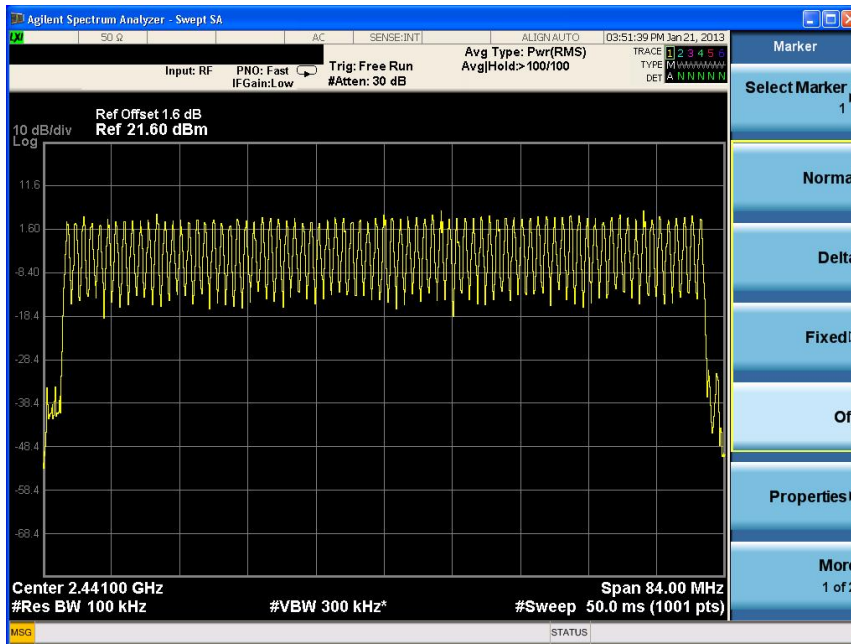
Product Service

2.8.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210 for Number of Hopping Channels.

The test results are shown below.

Configuration 1 - Mode 4



Limit	>15 channels
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Product Service

2.9 RECEIVER SPURIOUS EMISSIONS

2.9.1 Specification Reference

FCC CFR 47 Part 15, Clause 15.109
Industry Canada RSS-210, Clause 2.3

2.9.2 Equipment Under Test

Bluetooth Module of R0-13 BTM01, S/N: ENGINEERING SAMPLE

2.9.3 Date of Test and Modification State

28 January 2013 – Modification State 0

2.9.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.9.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210.

A preliminary profile of the Receiver Spurious Emissions was obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Emissions identified within the range 30MHz – 1GHz were formally measured using a CISPR Quasi-Peak detector. 1GHz – 15GHz were formally measured using Peak and Average detector.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 5

2.9.6 Environmental Conditions

28 January 2013

Ambient Temperature 22.9°C

Relative Humidity 24.2%



Product Service

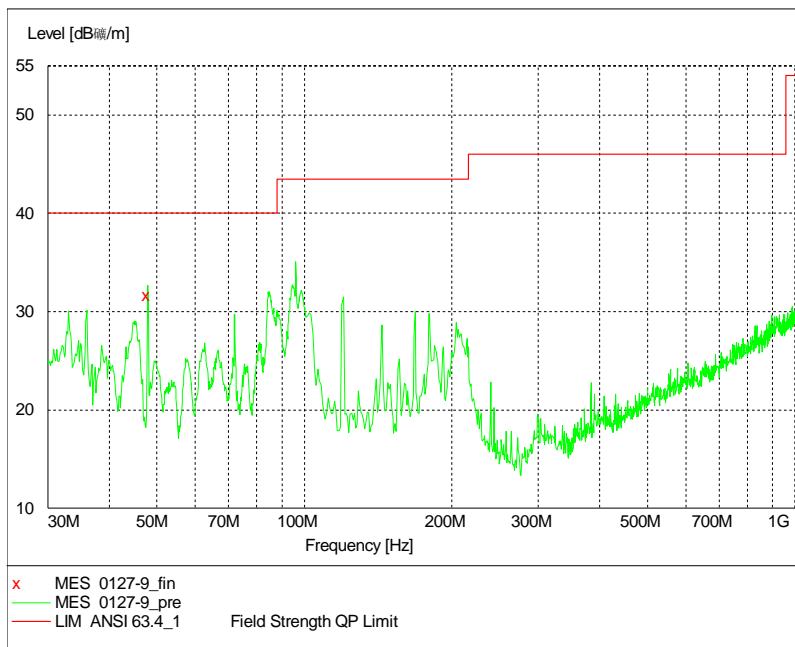
2.9.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15 and Industry Canada RSS-210 for Number of Hopping Channels.

The test results are shown below.

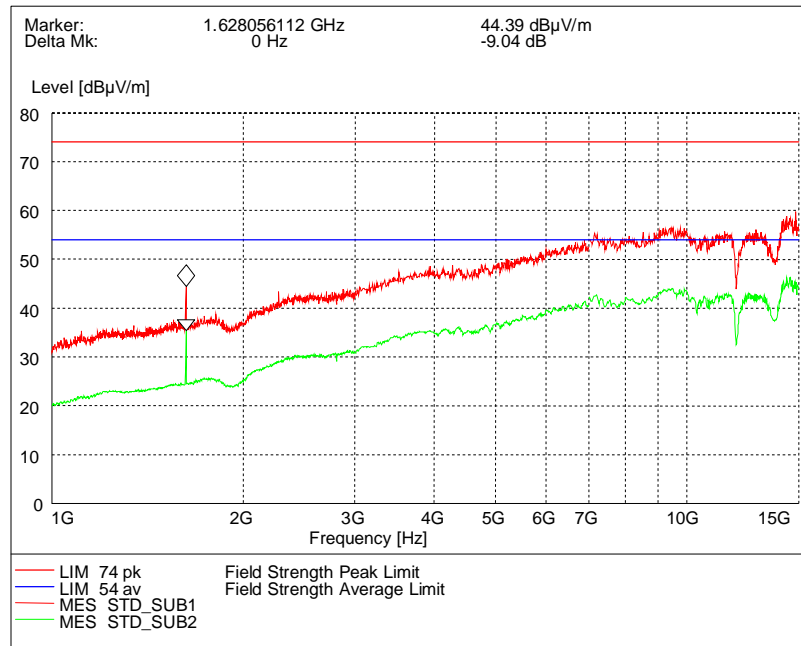
Configuration 1 - Mode 5

30MHz – 1GHz





1GHz - 15GHz



Frequency range	Limit
30 MHz to 88 MHz	40dB μ V/m
88 MHz to 216 MHz	43.5dB μ V/m
216 MHz to 960 MHz	46dB μ V/m
>960MHz	Average:54dB μ V/m, Peak:74dB μ V/m

Remarks

The EUT does not exceed the limit during the test.



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	Serial No.	Calibration Period (months)	Calibration Due
Section 2.1, 2.2, 2.3 2.4, 2.6. 2.7 and 2.8 – Maximum Peak Output Power, 20dB Bandwidth, Band Edge Compliance, Conducted Spurious Emissions, Channel Dwell Time, Channel Separation, Number of Hopping Channels.					
Spectrum Analyzer	Agilent	N9020A	MY48010771	12	19-Aug-2013
Power Meter	Agilent	E4416A	MY45101138	12	19-Aug-2013
Power Sensor	Agilent	8482A	MY41092445	12	19-Aug-2013
Temperature Chamber	Espec	SH-241	92000390	12	19-Aug-2013
Power Supply	Agilent	E3645A	MY40000747	12	19-Aug-2013
Digital Multimeter	FLUKE	179	91820401	12	13-Dec-2013
Thermo-hygrometer	AZ Instruments	8705	9151655	12	16-Dec-2013
Section 2.5 and 2.9 – Radiated Spurious Emissions and Receiver Spurious Emissions.					
EMI Receiver	Rohde & Schwarz	ESI 40	100015	12	19-Aug-2013
Ultra log test antenna	Rohde & Schwarz	HL562	100167	12	19-Aug-2013
Double-Ridged Wave-guide Horn Antenna	Rohde & Schwarz	HF 906	100029	12	19-Aug-2013
Pyramidal Horn Antenna	EMCO	3160-09	-	-	-
Antenna master	Frankonia	MA 260	-	12	19-Aug-2013
Relay Switch Unit	Rohde & Schwarz	331.1601.31	338965002	-	TU
Semi Anechoic Chamber	Frankonia	23.18m x 16.88 m x 9.60m	-	12	19-Aug-2013
Digital Multimeter	FLUKE	179	91820401	12	13-Dec-2013
Thermo-hygrometer	AZ Instruments	8705	9151655	12	16-Dec-2013

O/P MON Output monitored with calibration equipment
 TU Traceability Unscheduled



Product Service

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	Frequency / Parameter	MU
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Substitution Antenna, Radiated Field	30MHz to 22GHz Amplitude	2.6dB
Worst case error for both Time and Frequency measurement 12 parts in 10 ⁶ .		

* In accordance with CISPR 16-4



Product Service

SECTION 4

DISCLAIMERS AND COPYRIGHT



Product Service

4.1 DISCLAIMERS AND COPYRIGHT

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