



3 January, 2012

Nokia Corporation
Joensuunkatu 7 Salo Finland

Dear Tero Lehtinen,

Enclosed you will find your file copy of a Part 15 report (FCC ID: PYABH-221).

For your reference, TCB will normally take another one week for reviewing the report. Approval will then be granted when no query is sorted.

Please contact me if you have any questions regarding the enclosed material.

Sincerely,

A handwritten signature in black ink, appearing to read "Shawn Xing", with a long horizontal stroke extending to the right.

Shawn Xing
Manager

Enclosure

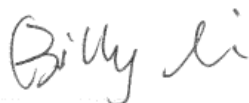
Nokia Corporation

**Application
For
Certification
(FCC ID: PYABH-221)**

Bluetooth Stereo Headset

Model: BH-221 (HW: V05(RE), MV: V63, SW: 2.2A)

2.4GHz Transceiver



SZ11120291-1

Billy Li

3 January, 2012

- The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
- This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to copy or distribute this report. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results referenced from this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.
- For Terms And Conditions of the services, it can be provided upon request.
- The evaluation data of the report will be kept for 3 years from the date of issuance.

TRF No.: FCC 15C_TXa

FCC ID: PYABH-221

Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch

6F, D Block, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China

Tel: (86 755) 8601 6288 Fax: (86 755) 8601 6751 Website: www.china.intertek-etlsemko.com

LIST OF EXHIBITS

INTRODUCTION

<i>EXHIBIT 1:</i>	General Description
<i>EXHIBIT 2:</i>	System Test Configuration
<i>EXHIBIT 3:</i>	Emission Results
<i>EXHIBIT 4:</i>	Equipment Photographs
<i>EXHIBIT 5:</i>	Product Labelling
<i>EXHIBIT 6:</i>	Technical Specifications
<i>EXHIBIT 7:</i>	Instruction Manual
<i>EXHIBIT 8:</i>	Miscellaneous Information
<i>EXHIBIT 9:</i>	Test Equipment List

INTERTEK TESTING SERVICES

MEASUREMENT/TECHNICAL REPORT

Nokia Corporation

MODEL: BH-221 (HW: V05(RE), MV: V63, SW: 2.2A)

FCC ID: PYABH-221

3 January, 2012

This report concerns (check one): Original Grant ☒ Class II Change ☐

Equipment Type: DSS - Part 15 Spread Spectrum Transmitter

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? Yes ☐ No ☒

If yes, defer until: _____
date

Company Name agrees to notify the Commission by: _____
date

of the intended date of announcement of the product so that the grant can be issued on that date.

Transition Rules Request per 15.37? Yes ☐ No ☒

If no, assumed Part 15, Subpart C for intentional radiator – the new 47 CFR [10-1-10 Edition] provision.

Report prepared by:

Shawn Xing
Intertek Testing Services Shenzhen Ltd.
Kejiyuan Branch
6F, Block D, Huahan Building, Langshan Road,
Nanshan District, Shenzhen, P. R. China
Phone: (86 755) 8601 6288
Fax: (86 755) 8601 6751

INTERTEK TESTING SERVICES

Table of Contents

1.0 General Description	2
1.1 Product Description	2
1.2 Test Methodology	2
1.3 Test Facility	2
2.0 System Test Configuration	4
2.1 Justification	4
2.2 EUT Exercising Software	4
2.3 Special Accessories	4
2.4 Equipment Modification	4
2.5 Measurement Uncertainty	5
2.6 Support Equipment List and Description	5
3.0 Test Results	7
3.1 Radiated Test Result	8
3.1.1 Field Strength Calculation	8
3.1.2 Radiated Emission Configuration Photograph	9
3.1.3 Radiated Emissions	9
3.1.4 Transmitter Spurious Emissions (Radiated)	11
3.2 Conducted Emissions at Mains Terminal	15
3.2.1 Conducted Emissions Configuration Photograph	15
3.2.2 Conducted Emissions	15
3.3 Peak Power	18
3.4 20dB Bandwidth	24
3.5 Channel Number (Number of Hopping Frequencies)	26
3.6 Channel Separation (Carrier Frequency Separation)	29
3.7 Dwell Time (Time of Occupancy)	31
3.8 Band Edge	37
3.9 Transmitter Spurious Emissions (Conducted)	39
4.0 Equipment Photographs	44
5.0 Product Labelling	46
6.0 Technical Specifications	48
7.0 Instruction Manual	50
8.0 Miscellaneous Information	52
8.1 Discussion of Pulse Desensitization	53
8.2 Transmitter Duty Cycle Calculation	54
8.3 Emissions Test Procedures	55
9.0 Test Equipment List	58
10.0 Annex	59

INTERTEK TESTING SERVICES

List of attached file

Exhibit type	File Description	filename
Test Report	Test Report	report.pdf
Operational Description	Technical Description	descri.pdf
Test Setup Photo	Radiated Emission	radiated photos.pdf
Test Setup Photo	Conducted Emission	conducted photos.pdf
External Photos	External Photo	external photos.pdf
Internal Photos	Internal Photo	internal photos.pdf
ID Label/Location Info	Label Artwork and Location	label.pdf
Block Diagram	Block Diagram	block.pdf
Schematics	Circuit Diagram	circuit.pdf
Users Manual	User Manual	manual.pdf
Cover Letter	Letter of Agency	letter of agency.pdf
RF Exposure	RF Exposure	RF Exposure.pdf

EXHIBIT 1

GENERAL DESCRIPTION

INTERTEK TESTING SERVICES

1.0 **General Description**

1.1 Product Description

The Equipment under Test (EUT) is a Bluetooth Stereo Headset model: BH-221 (HW: V05(RE), MV: V63, SW: 2.2A). It is powered by an internal 3.7V rechargeable battery and charged by an AC adapter with Input: 100-240V / 50-60Hz / 160mA, Output 5.0V / 1200mA.

Antenna Type: Integral antenna

For electronic filing, the brief circuit description is saved with filename: descri.pdf.

1.2 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (2003) and DA 00-705. Radiated emission measurement was performed in semi-anechoic chamber and conducted emission measurement was performed in shield room. For radiated emission measurement, preliminary scans were performed in the semi-anechoic chamber only to determine the worst case modes. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.3 Test Facility

The Semi-Anechoic chamber and shield room used to collect the radiated data and conducted data is **Interterk Testing Services Shenzhen Ltd. Kejiyuan Branch** and located at 6F, Block D, Huahan Building, Langshan Road, Nanshan District, Shenzhen, P. R. China. This test facility and site measurement data have been fully placed on file with the FCC.

EXHIBIT 2
SYSTEM TEST CONFIGURATION

INTERTEK TESTING SERVICES

2.0 **System Test Configuration**

2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2003).

The EUT was powered by a fully charged 3.7V internal rechargeable battery and charged by an AC adapter with Input: 100-240V / 50-60Hz / 160mA, Output 5.0V / 1200mA. Only the worst case data was reported.

All packets DH1, DH3 & DH5 mode in all modulation types GFSK, $\pi/4$ -DQPSK and 8-DPSK were tested.

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The unit was placed in the center of the turntable when powered by internal rechargeable battery and the rear of unit shall be flushed with the rear of the table when powered by adapter.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on a turn table, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

2.2 EUT Exercising Software

No software is used.

2.3 Special Accessories

N/A

2.4 Equipment Modification

Any modifications installed previous to testing by Nokia Corporation will be incorporated in each production model sold / leased in the United States.

No modifications were installed by Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch.

INTERTEK TESTING SERVICES

2.5 Measurement Uncertainty

When determining the test conclusion, the Measurement Uncertainty of test has been considered.

2.6 Support Equipment List and Description

This product was tested in the following configuration:

Refer List:

Description	Manufacturer	Model No.
AC Adapter	Nokia	AC-10U (Input: 100-240V / 50-60Hz / 160mA, Output 5.0V / 1200mA)
Wired headset	Nokia	HP-5, 90cm
Bluetooth Tester	R&S	CBT
Mobile Phone	Nokia	C7

All the items listed under section 2.0 of this report are

Confirmed by:

Shawn Xing
Manager
Intertek Testing Services Shenzhen Ltd. Kejiyuan Branch
Agent for Nokia Corporation



Signature

3 January, 2012

Date

EXHIBIT 3
TEST RESULTS

3.0 **Test Results**

Data is included worst-case configuration (the configuration which resulted in the highest emission levels).

INTERTEK TESTING SERVICES

3.1 **Radiated Test Results**

A sample calculation, configuration photographs and data tables of the emissions are included.

3.1.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

$$FS = RA + AF + CF - AG + PD + AV$$

Where

- FS = Field Strength in dB μ V/m
- RA = Receiver Amplitude (including preamplifier) in dB μ V
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB
- PD = Pulse Desensitization in dB
- AV = Average Factor in -dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

$$FS = RA + AF + CF - AG + PD + AV$$

Assume a receiver reading of 62.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted. The pulse desensitization factor of the spectrum analyzer was 0 dB, and the resultant average factor was -10 dB. The net field strength for comparison to the appropriate emission limit is 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

RA = 62.0 dB μ V
AF = 7.4 dB
CF = 1.6 dB
AG = 29.0 dB
PD = 0 dB

AV = -10 dB

$$FS = 62 + 7.4 + 1.6 - 29 + 0 + (-10) = 32 \text{ dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

INTERTEK TESTING SERVICES

3.1.2 Radiated Emission Configuration Photograph

For electronic filing, the worst case radiated emission configuration photograph is saved with filename: radiated photos. pdf.

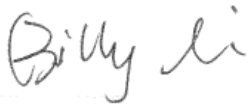
3.1.3 Radiated Emissions- FCC section 15.209

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Worst Case Radiated Emission
at
30.796 MHz

Judgement: Passed by 17.1 dB

TEST PERSONNEL:



Signature

Billy Li, Team Leader
Typed/Printed Name

3 January, 2012
Date

INTERTEK TESTING SERVICES

Applicant: Nokia Corporation
Model: BH-221 (HW: V05(RE), MV: V63, SW: 2.2A)
Sample: 2/2
Mode: BT Link With Cell Phone + AC-10U

Date of Test: 3 January, 2012

Table 1

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Limit at 3m (dB μ V/m)	Margin (dB)
Horizontal	30.970	24.4	20.0	18.3	22.7	40.0	-17.3
Horizontal	32.910	26.3	20.0	15.0	21.3	40.0	-18.7
Horizontal	42.125	24.5	20.0	11.3	15.8	40.0	-24.2
Vertical	30.796	32.0	20.0	10.9	22.9	40.0	-17.1
Vertical	38.245	27.7	20.0	9.7	17.4	40.0	-22.6
Vertical	140.095	27.4	20.0	8.5	15.9	43.5	-27.6

- NOTES:
1. Quasi-Peak detector is used except for others stated.
 2. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.
 3. Negative value in the margin column shows emission below limit.
 4. All emissions are below the QP limit.

Test Engineer: Billy Li

INTERTEK TESTING SERVICES

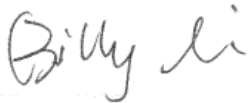
3.1.4 Transmitter Spurious Emissions (Radiated) - FCC section 15.209

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Worst Case Radiated Emission
at
7440 MHz

Judgement: Passed by 19.1 dB

TEST PERSONNEL:



Signature

Billy Li, Team Leader
Typed/Printed Name

3 January, 2012
Date

INTERTEK TESTING SERVICES

Applicant: Nokia Corporation
Model: BH-221 (HW: V05(RE), MV: V63, SW: 2.2A)
Sample: 2/2
Mode: TX-CH00 (2402MHz)

Date of Test: 3 January, 2012

Table 2

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
Vertical	**2402.000	109.4	36.7	28.5	101.2	--	--
Vertical	*4804.000	54.8	36.1	33.1	51.8	74.0	-22.2

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
Vertical	*4804.000	54.8	36.1	33.1	30.1	21.7	54.0	-32.3

- NOTES: 1. Peak detector is used except for others stated.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.
- * Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.
- ** Fundamental emission was measured for determining band-edge compliance of using delta measurement technique.

Test Engineer: Billy Li

INTERTEK TESTING SERVICES

Applicant: Nokia Corporation
Model: BH-221 (HW: V05(RE), MV: V63, SW: 2.2A)
Sample: 2/2
Mode: TX-CH39 (2441MHz)

Date of Test: 3 January, 2012

Table 3

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dB μ V/m)	Peak Limit at 3m (dB μ V/m)	Margin (dB)
Vertical	**2441.000	110.1	36.7	28.5	101.9	--	--
Vertical	*4882.000	55.1	36.1	33.3	52.3	74.0	-21.7
Vertical	*7323.000	51.9	36.2	37.9	53.6	74.0	-20.4

Polarization	Frequency (MHz)	Reading (dB μ V)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dB μ V/m)	Average Limit at 3m (dB μ V/m)	Margin (dB)
Vertical	*4882.000	55.1	36.1	33.3	30.1	22.2	54.0	-31.8
Vertical	*7323.000	51.9	36.2	37.9	30.1	23.5	54.0	-30.5

- NOTES: 1. Peak detector is used except for others stated.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.
- * Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.

Test Engineer: Billy Li

INTERTEK TESTING SERVICES

Applicant: Nokia Corporation
Model: BH-221 (HW: V05(RE), MV: V63, SW: 2.2A)
Sample: 2/2
Mode: TX-CH78 (2480MHz)

Date of Test: 3 January, 2012

Table 4

Radiated Emissions

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Net at 3m (dBμV/m)	Peak Limit at 3m (dBμV/m)	Margin (dB)
Horizontal	**2480.000	109.2	36.7	28.6	101.1	—	—
Vertical	*4960.000	54.0	36.1	33.4	51.3	74.0	-22.7
Vertical	*7440.000	52.9	36.2	38.2	54.9	74.0	-19.1

Polarization	Frequency (MHz)	Reading (dBμV)	Pre-Amp Gain (dB)	Antenna Factor (dB)	Average Factor (-dB)	Net at 3m (dBμV/m)	Average Limit at 3m (dBμV/m)	Margin (dB)
Vertical	*4960.000	54.0	36.1	33.4	30.1	21.2	54.0	-32.8
Vertical	*7440.000	52.9	36.2	38.2	30.1	24.8	54.0	-29.2

- NOTES: 1. Peak detector is used except for others stated.
2. All measurements were made at 3 meters. Radiated emissions not detected at the 3-meter distance were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other radiated emissions than those reported were detected at a test distance of 0.3-meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna used for the emission over 1000MHz.
- * Emission within the restricted band meets the requirement of section 15.205. The corresponding limit as per 15.209 is based on Quasi peak limit for frequencies below 1000 MHz and average limit for frequencies over 1000 MHz. The radio frequency emissions above 1GHz also meet corresponding 20dB permitted peak limit with a peak detector function.
- ** Fundamental emission was measured for determining band-edge compliance of using delta measurement technique.

Test Engineer: Billy Li

TRF No.: FCC 15C_Txa
FCC ID: PYABH-221

INTERTEK TESTING SERVICES

3.2 Conducted Emission at Mains Terminal

3.2.1 Conducted Emissions Configuration Photograph

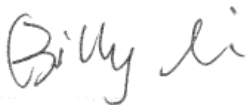
For electronic filing, the worst case conducted emission configuration photograph is saved with filename: conducted photos.pdf.

3.2.2 Conducted Emissions

Worst Case Neutral-Conducted Configuration
at
0.4875 MHz

Judgement: Passed by 25.0 dB margin

TEST PERSONNEL:



Signature

Billy Li, Team Leader
Typed/Printed Name

3 January, 2012
Date

INTERTEK TESTING SERVICES

Company: Nokia Corporation

Date of Test: 3 January, 2012

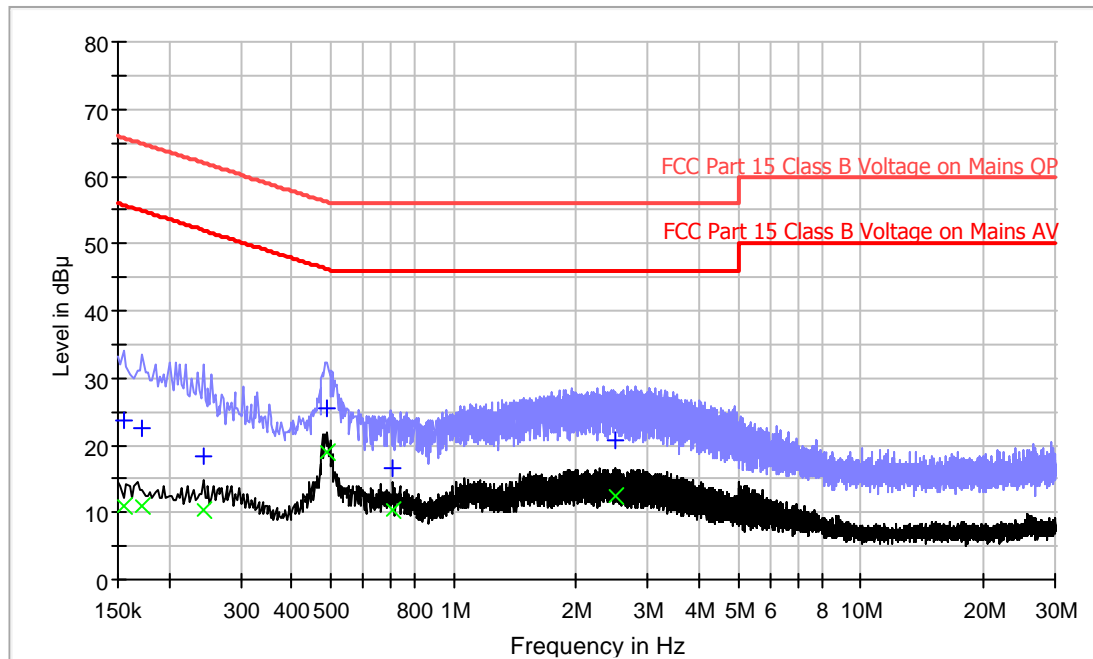
Model: BH-221 (HW: V05(RE), MV: V63, SW: 2.2A)

Sample: 2/2

Worst Case Operating Mode: BT Link With Cell Phone + AC-10U

Conducted Emission Test – FCC

Pursuant to 15.207 Emissions Requirement



Result Table-QP

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.155000	23.8	L1	9.6	41.9	65.7
0.172500	22.6	L1	9.6	42.2	64.8
0.242500	18.5	L1	9.6	43.5	62.0
0.488000	25.4	L1	9.6	30.8	56.2
0.710000	16.5	L1	9.7	39.5	56.0
2.506500	20.8	L1	9.8	35.2	56.0

Result Table-AV

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.155000	11.1	L1	9.6	44.6	55.7
0.172500	10.9	L1	9.6	43.9	54.8
0.242500	10.4	L1	9.6	41.6	52.0
0.488000	18.9	L1	9.6	27.3	46.2
0.710000	10.3	L1	9.7	35.7	46.0
2.506500	12.5	L1	9.8	33.5	46.0

INTERTEK TESTING SERVICES

Company: Nokia Corporation

Date of Test: 3 January, 2012

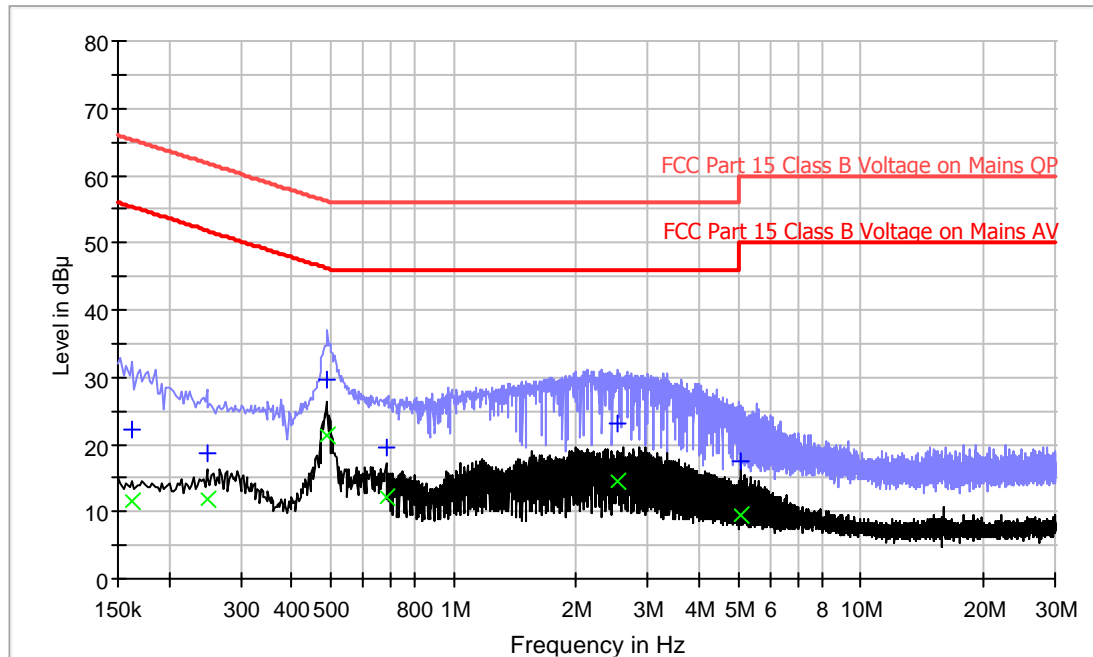
Model: BH-221 (HW: V05(RE), MV: V63, SW: 2.2A)

Sample: 2/2

Worst Case Operating Mode: BT Link With Cell Phone + AC-10U

Conducted Emission Test – FCC

Pursuant to 15.207 Emissions Requirement



Result Table-QP

Frequency (MHz)	QuasiPeak (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.162500	22.3	N	9.6	43.0	65.3
0.247500	18.7	N	9.6	43.1	61.8
0.487500	29.7	N	9.6	26.5	56.2
0.682500	19.6	N	9.6	36.4	56.0
2.537500	23.2	N	9.8	32.8	56.0
5.085000	17.5	N	9.9	42.5	60.0

Result Table-AV

Frequency (MHz)	Average (dB μ V)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.162500	11.6	N	9.6	43.7	55.3
0.247500	11.8	N	9.6	40.0	51.8
0.487500	21.2	N	9.6	25.0	46.2
0.682500	12.1	N	9.6	33.9	46.0
2.537500	14.6	N	9.8	31.4	46.0
5.085000	9.6	N	9.9	40.4	50.0

INTERTEK TESTING SERVICES

3.3 **Peak Power**

Maximum Conducted Output Power at Antenna Terminals, FCC Rules 15.247(b)(1)

The antenna port of the EUT was connected to the input of a spectrum analyzer. The analyzer was set for RBW > 20dB bandwidth and power was read directly in dBm.

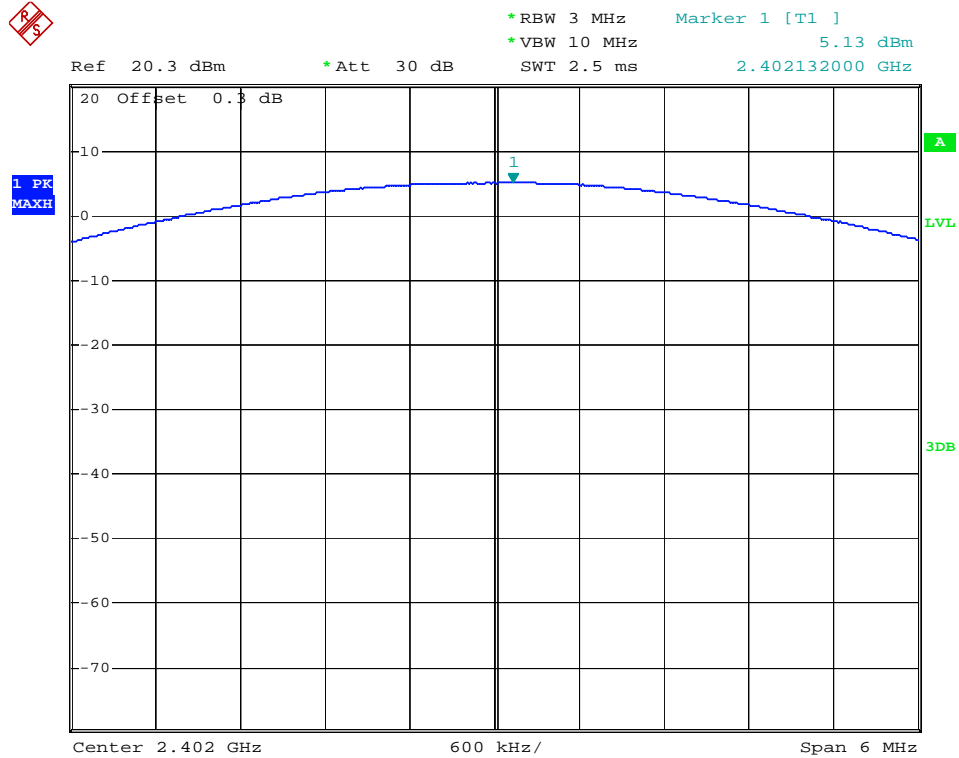
For antenna with gains of 6dBi or less, maximum allowed transmitter output 1 watt (+30dBm)

Antenna Gain = -2dBi			
Modulation Type	Frequency (MHz)	Output Power (dBm)	Output Power (mW)
GFSK	2402	5.13	3.26
	2441	5.19	3.30
	2480	5.16	3.28
$\pi/4$ -DQPSK	2402	1.93	1.56
	2441	1.59	1.44
	2480	1.44	1.39
8DPSK	2402	2.26	1.68
	2441	1.87	1.54
	2480	1.77	1.50

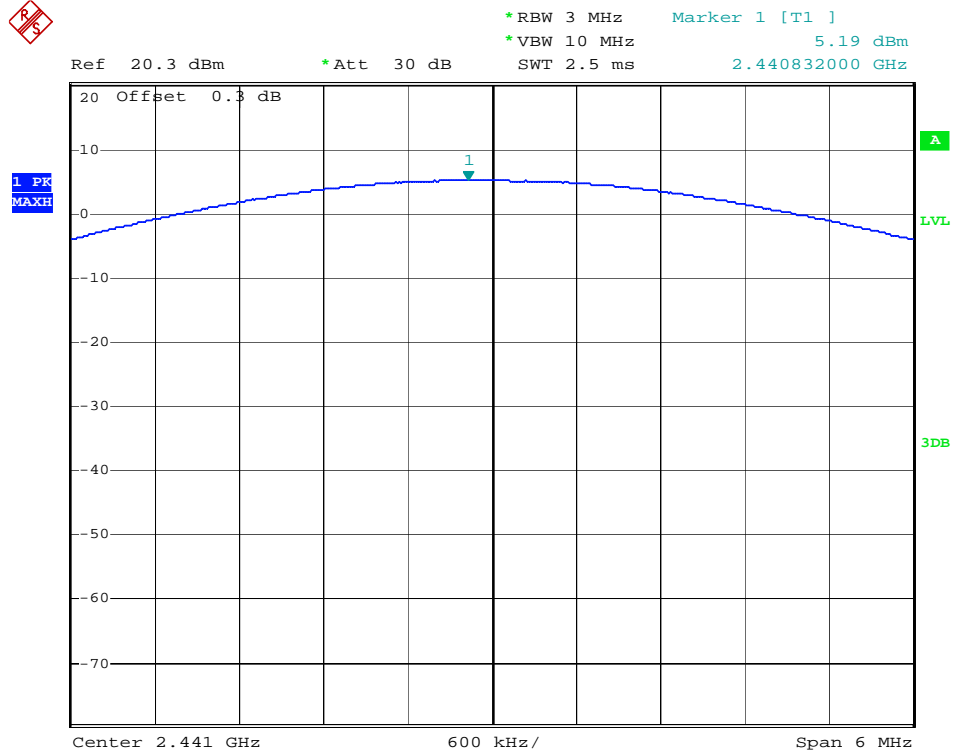
INTERTEK TESTING SERVICES

Modulation Type: GFSK

CH00



CH39

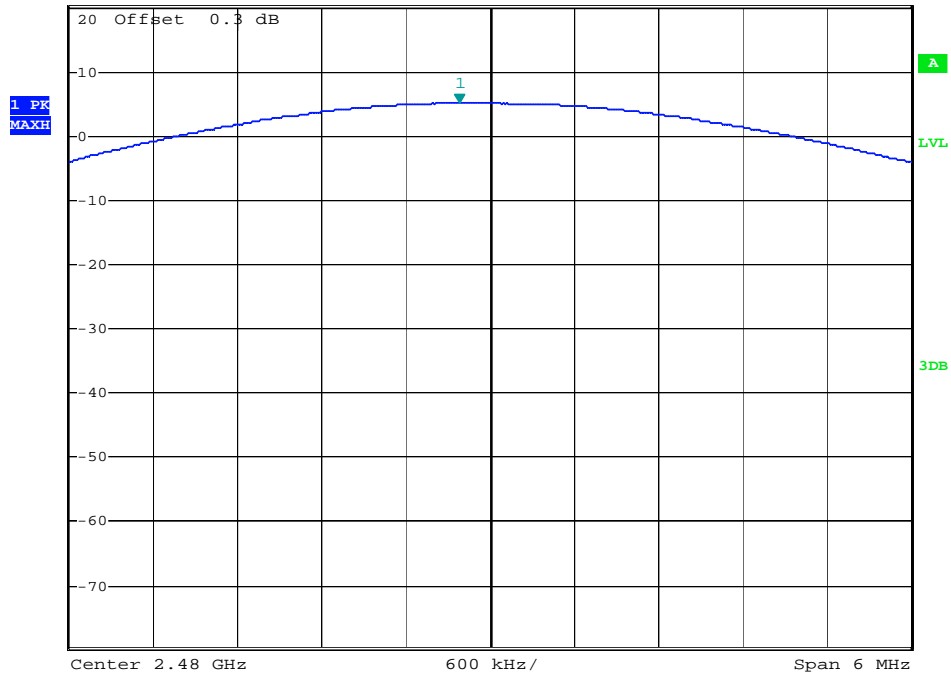


INTERTEK TESTING SERVICES

CH78



Ref 20.3 dBm *Att 30 dB *RBW 3 MHz Marker 1 [T1] *VBW 10 MHz 5.16 dBm SWT 2.5 ms 2.479784000 GHz

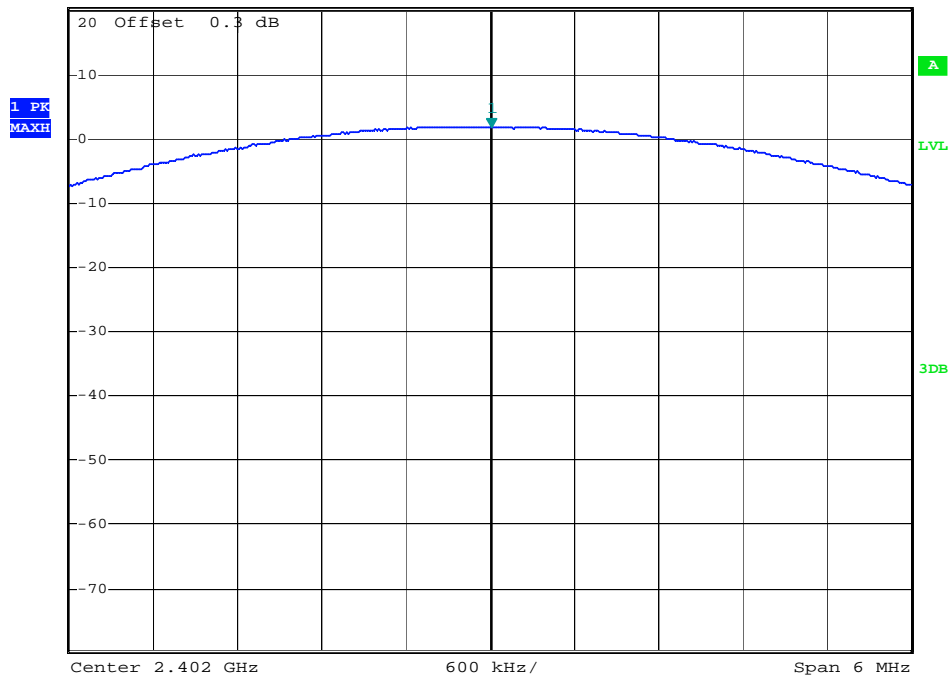


Modulation Type: $\pi/4$ -DQPSK

CH00



Ref 20.3 dBm *Att 30 dB *RBW 3 MHz Marker 1 [T1] *VBW 10 MHz 1.93 dBm SWT 2.5 ms 2.402012000 GHz

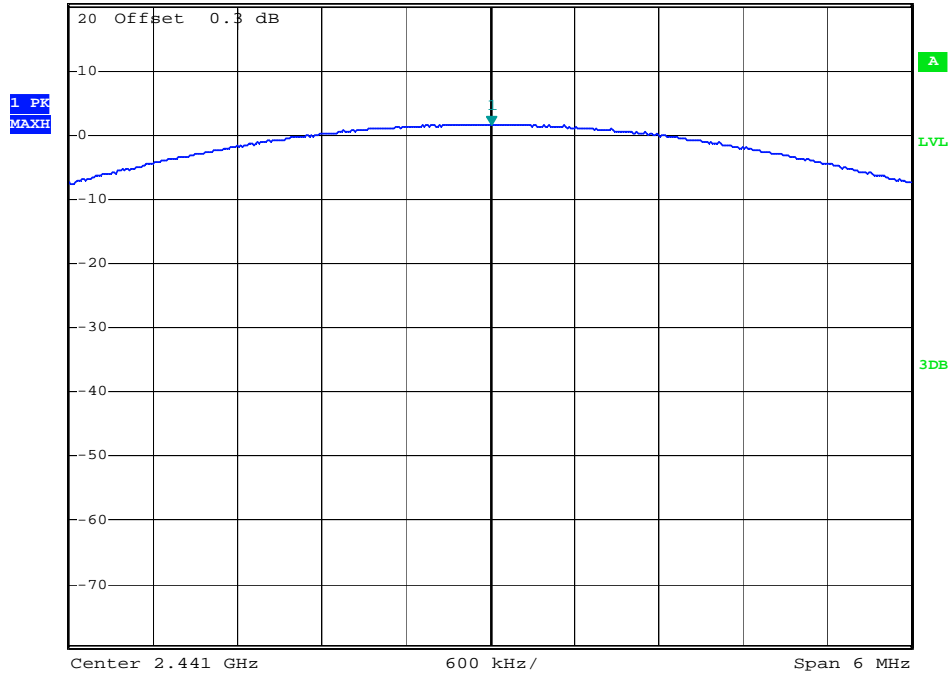


INTERTEK TESTING SERVICES

CH39



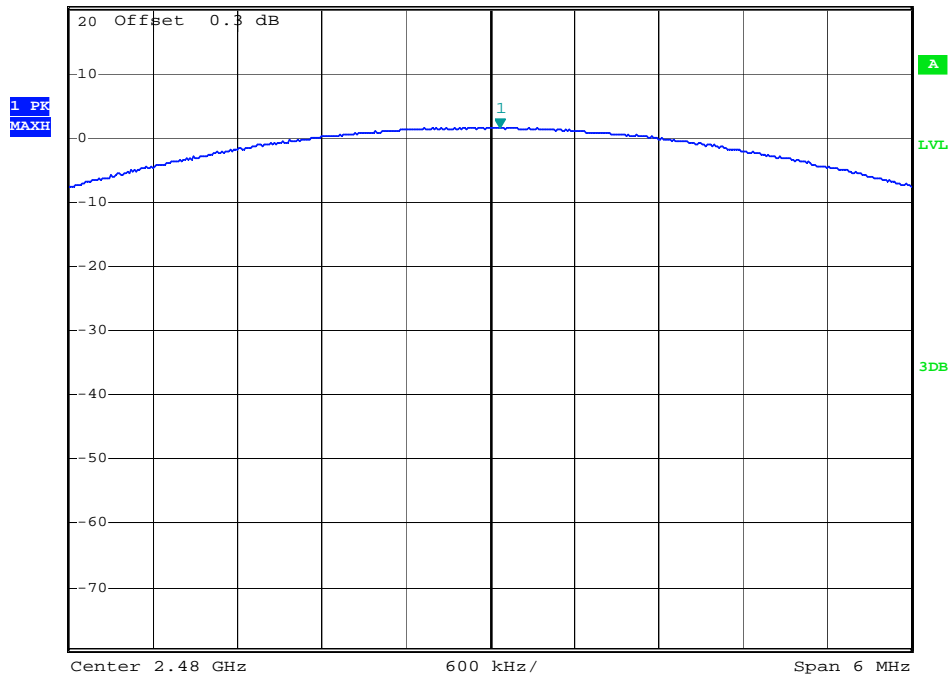
Ref 20.3 dBm *Att 30 dB *RBW 3 MHz Marker 1 [T1]
*VBW 10 MHz 1.59 dBm
SWT 2.5 ms 2.441012000 GHz



CH78



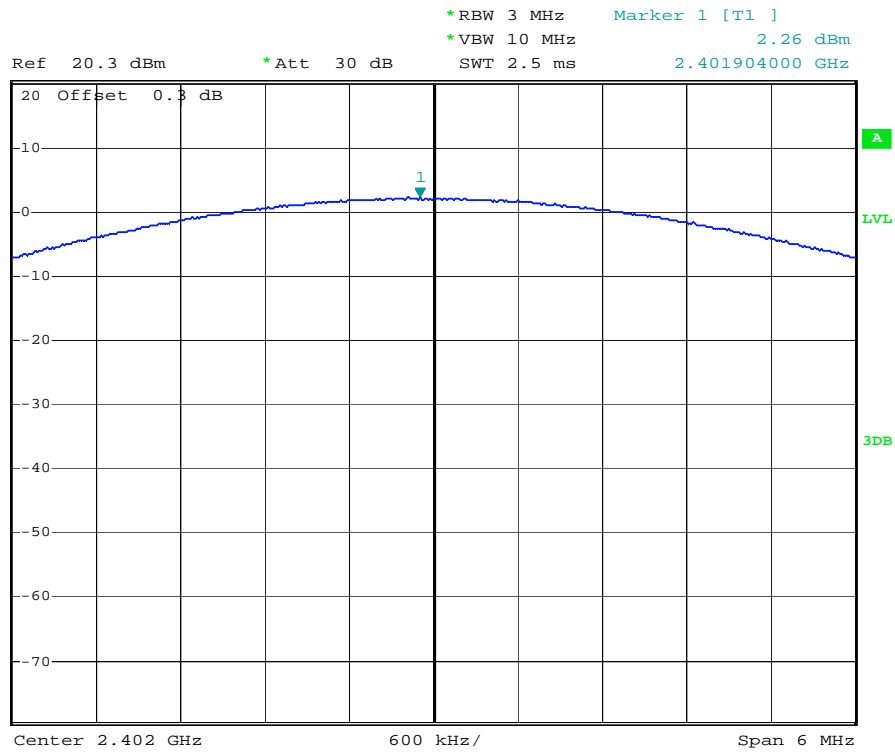
Ref 20.3 dBm *Att 30 dB *RBW 3 MHz Marker 1 [T1]
*VBW 10 MHz 1.44 dBm
SWT 2.5 ms 2.480072000 GHz



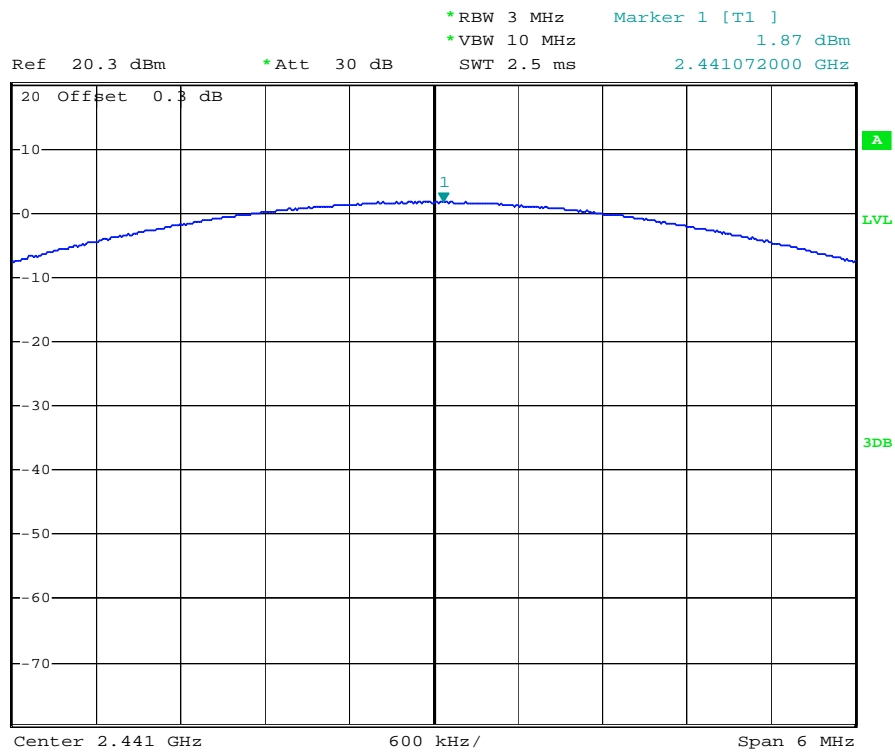
INTERTEK TESTING SERVICES

Modulation Type: 8DPSK

CH00



CH39



INTERTEK TESTING SERVICES

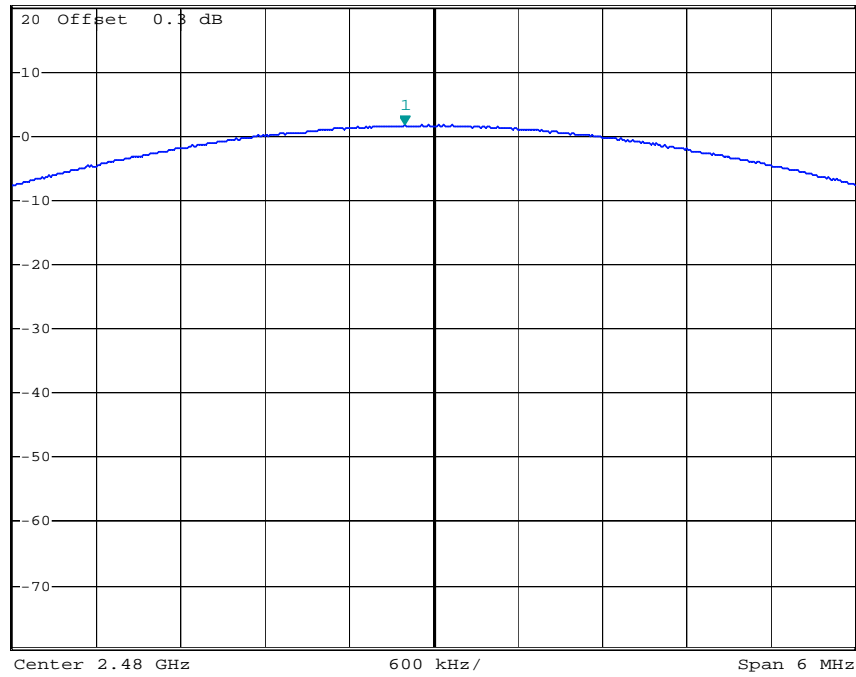
CH78



*RBW 3 MHz Marker 1 [T1]
*VBW 10 MHz 1.77 dBm
SWT 2.5 ms 2.479796000 GHz

Ref 20.3 dBm

*Att 30 dB



INTERTEK TESTING SERVICES

3.4 20dB Bandwidth

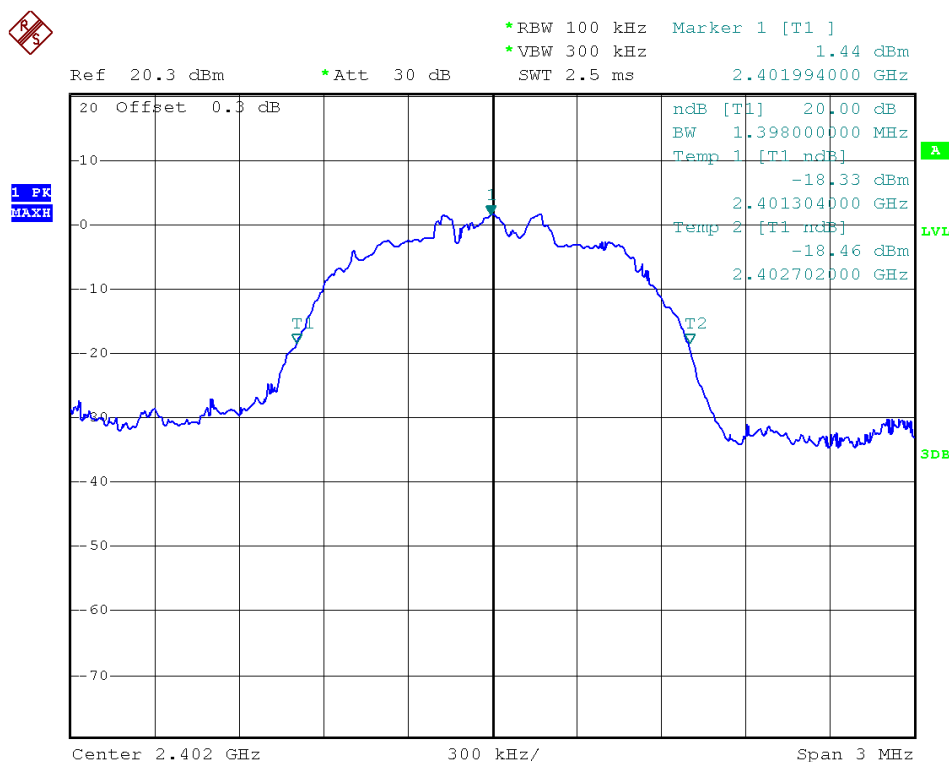
Maximum 20dB RF Bandwidth, FCC Rule 15.247(a) (1):

The antenna port of the EUT was connected to the input of a spectrum analyzer. Analyzer RBW was chosen so that the display was a result of the hopping channel modulation. For each RF output channel investigated, the spectrum analyzer center frequency was set to the channel carrier. Use the spectrum 20dB down delta function to measure the bandwidth.

Frequency (MHz)	20 dB Bandwidth (MHz)
2402	1.398
2441	1.398
2480	1.398

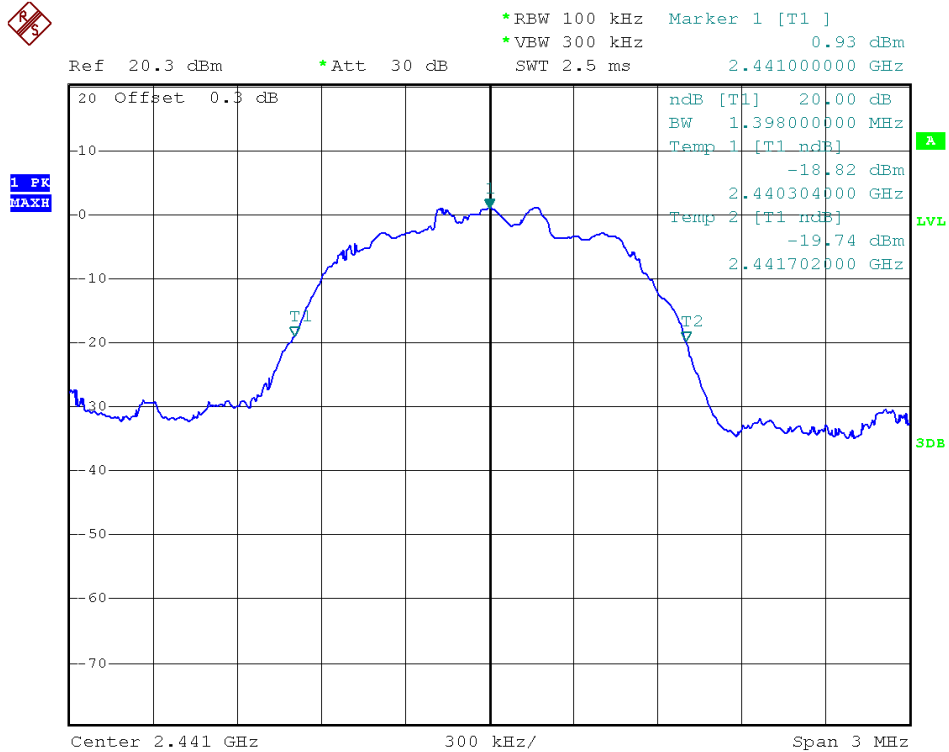
Modulation Type: 8DPSK

CH00

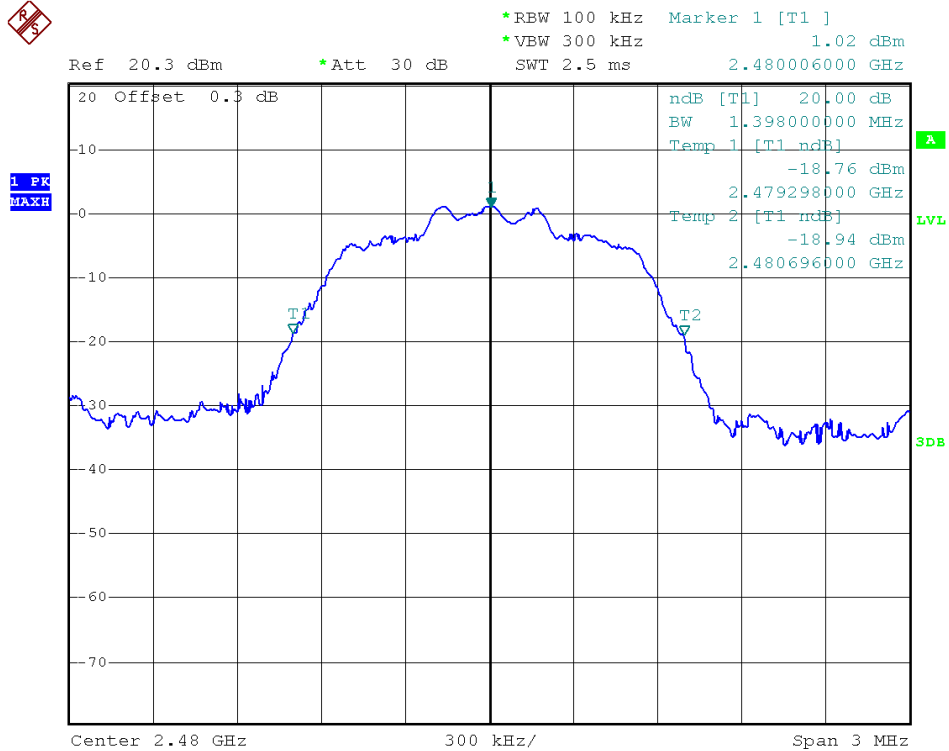


INTERTEK TESTING SERVICES

CH39



CH78



INTERTEK TESTING SERVICES

3.5 Channel Number (Number of Hopping Frequencies)

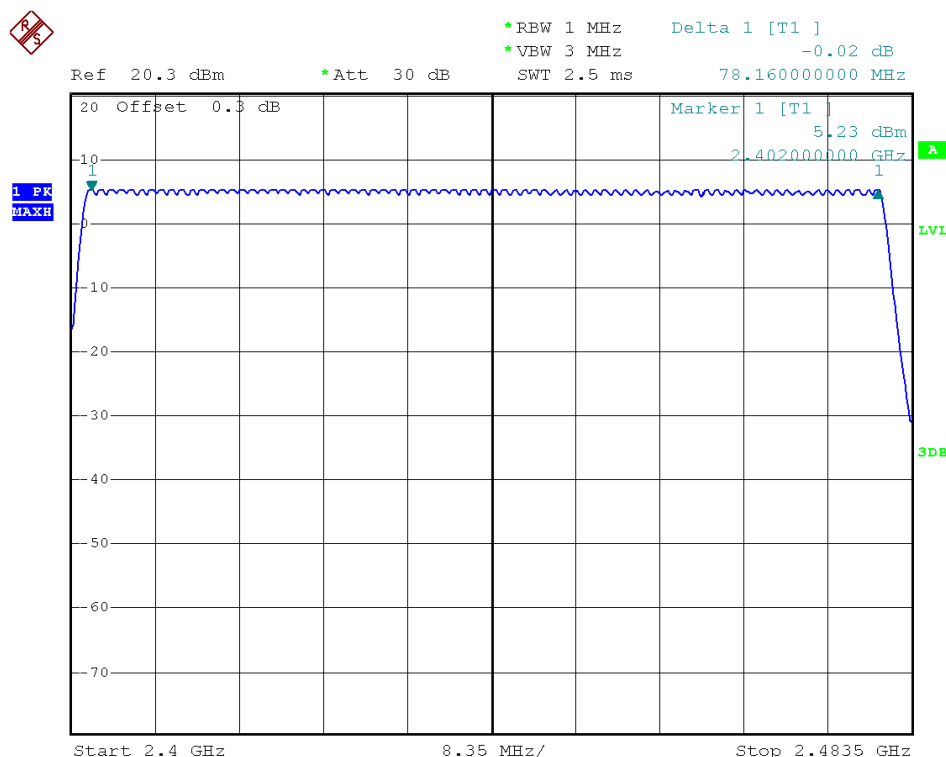
Minimum Number of Hopping Frequencies, FCC Rule 15.247(a) (1) (iii):

The RF passband of the EUT was divided into 3 approximately equal bands. With the analyzer set to MAX HOLD readings were taken for 2-3 minutes. The channel peaks so recorded were added together, and the total number compared to the minimum number of channels required in the regulation.

Number of hopping channels =	79
------------------------------	----

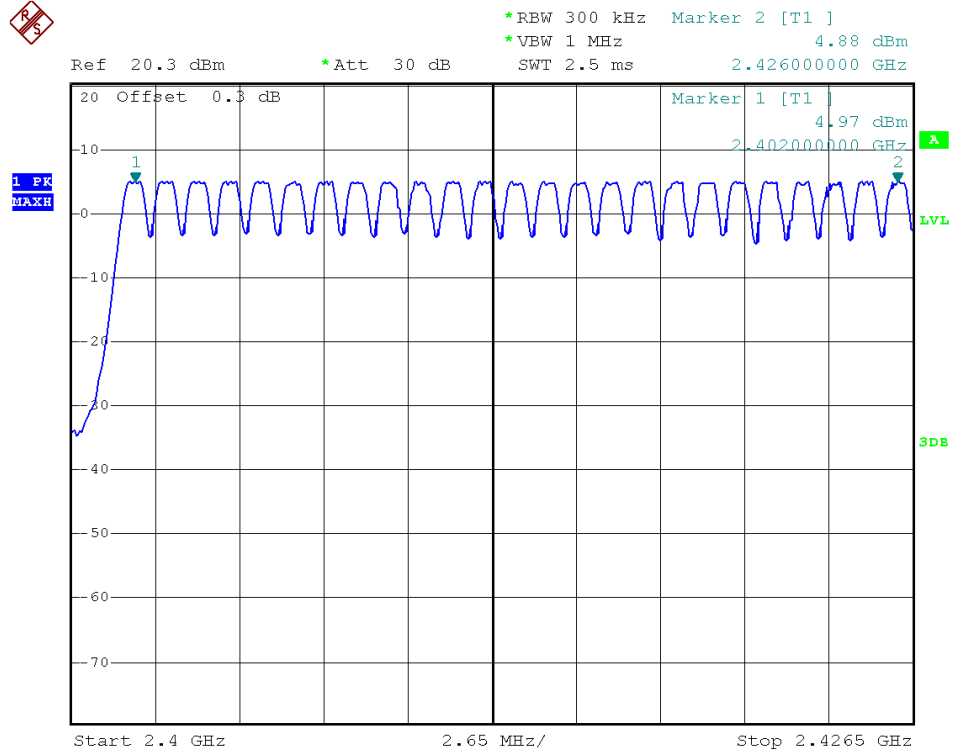
Modulation Type: GFSK

CH00-CH78

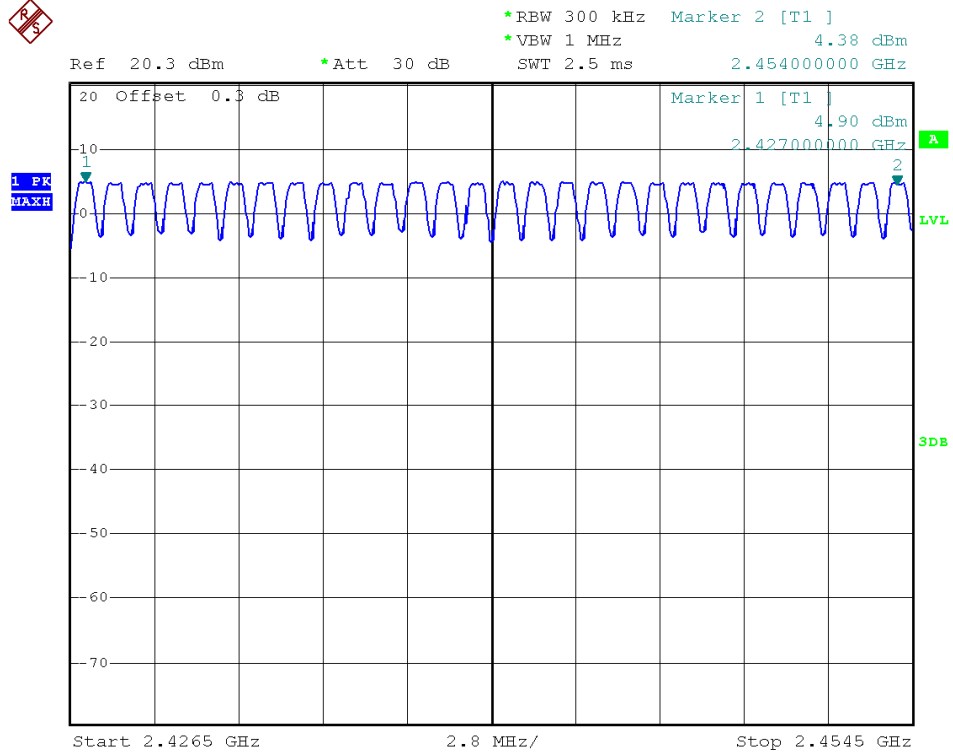


INTERTEK TESTING SERVICES

CH00-CH24

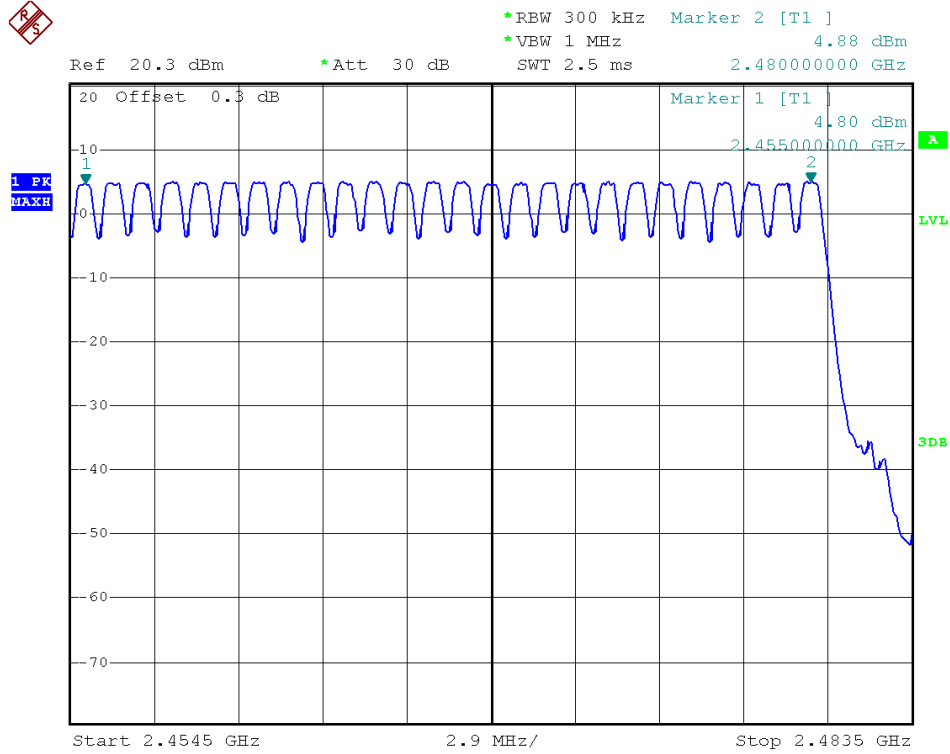


CH25-CH52



INTERTEK TESTING SERVICES

CH53-CH78



INTERTEK TESTING SERVICES

3.6 Channel Separation (Carrier Frequency Separation)

Minimum Hopping Channel Carrier Frequency Separation, FCC Ref: 15.247(a)(1):

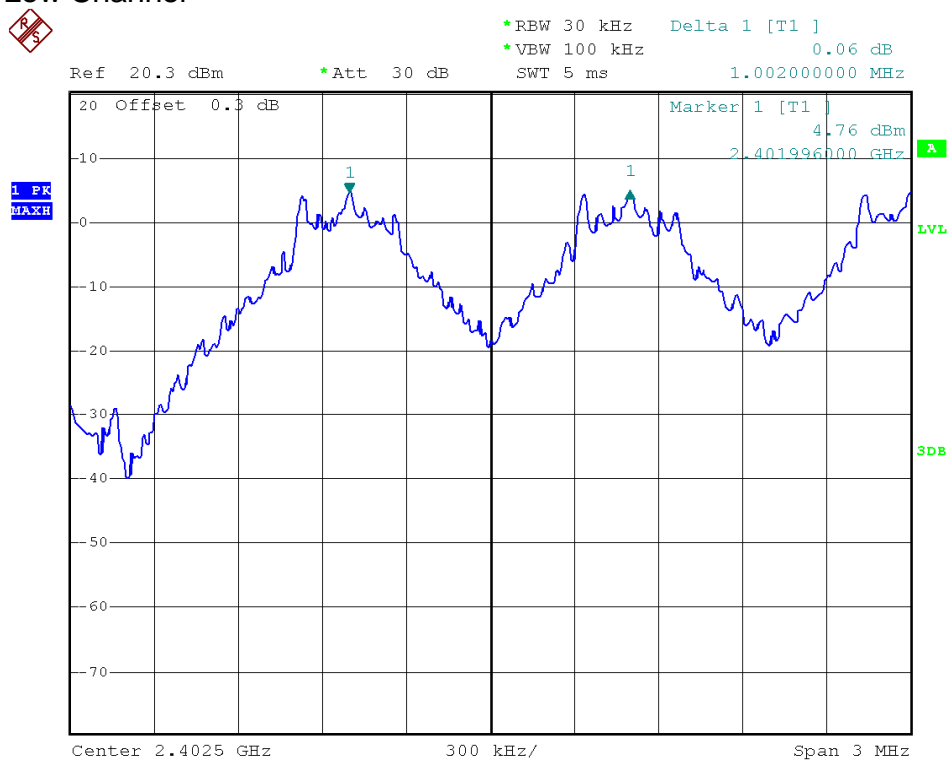
Using the DELTA MARKER function of the analyzer, the frequency separation between two adjacent channels was measured and compared against the limit:

Not less than 2/3 of 20dB bandwidth of hopping channel: $1.398 \times 2/3 = 0.932$ MHz

Channel Separation	1.002 MHz
--------------------	-----------

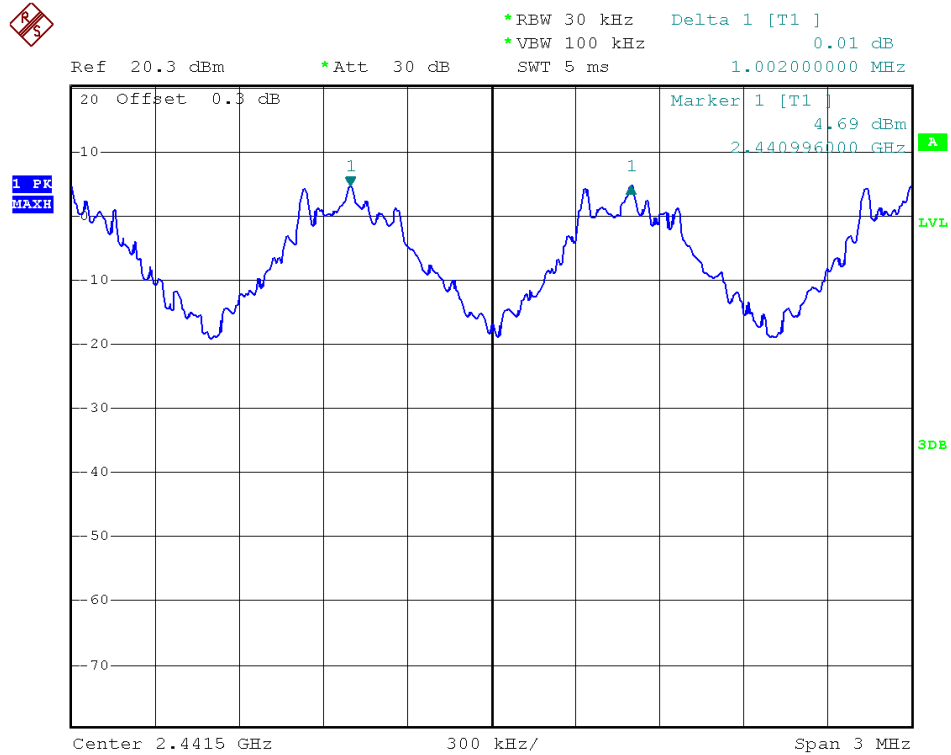
Modulation Type: GFSK

Low Channel

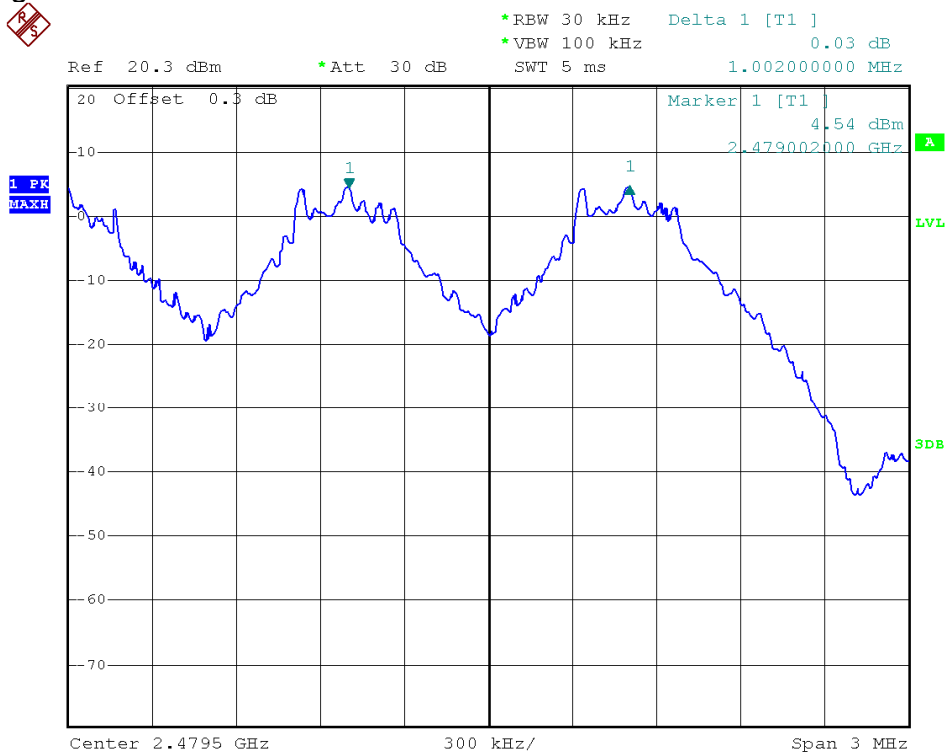


INTERTEK TESTING SERVICES

Middle Channel



High Channel



INTERTEK TESTING SERVICES

3.7 Dwell Time (Time of Occupancy)

Average Channel Occupancy Time, FCC Ref: 15.247(a)(1)(iii):

The spectrum analyzer center frequency was set to one of the known hopping channels. The SWEEP was set to 10ms, the SPAN was set to ZERO SPAN, and the TRIGGER was set to VIDEO. The time duration of the transmissions so captured was measured with the MARKER DELTA function.

The maximum number of hopping channels in 31.6s for DH1
 $=1600 / 2 / 79 * 31.6 = 320$

The maximum number of hopping channels in 31.6s for DH3
 $=1600 / 4 / 79 * 31.6 = 160$

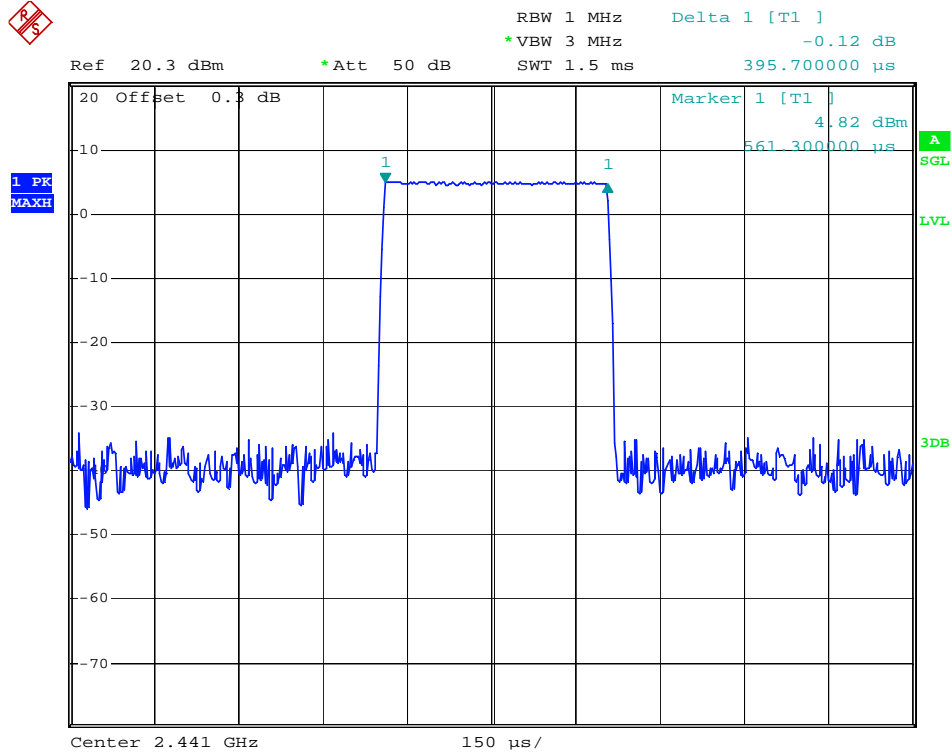
The maximum number of hopping channels in 31.6s for DH5
 $=1600 / 6 / 79 * 31.6 = 107$

Modulation Type	Packet	Max Dwell Time	Limit (s)	Result
GFSK	DH1	0.396 ms * 320 = 126.72 ms	0.4	Pass
	DH3	1.662 ms * 160 = 265.92 ms	0.4	Pass
	DH5	2.912 ms * 107 = 311.58 ms	0.4	Pass
π/4-DQPSK	DH1	0.405 ms * 320 = 129.60 ms	0.4	Pass
	DH3	1.668 ms * 160 = 266.88 ms	0.4	Pass
	DH5	2.912 ms * 107 = 311.58 ms	0.4	Pass
8DPSK	DH1	0.408 ms * 320 = 130.56 ms	0.4	Pass
	DH3	1.668 ms * 160 = 266.88 ms	0.4	Pass
	DH5	2.922 ms * 107 = 312.65 ms	0.4	Pass

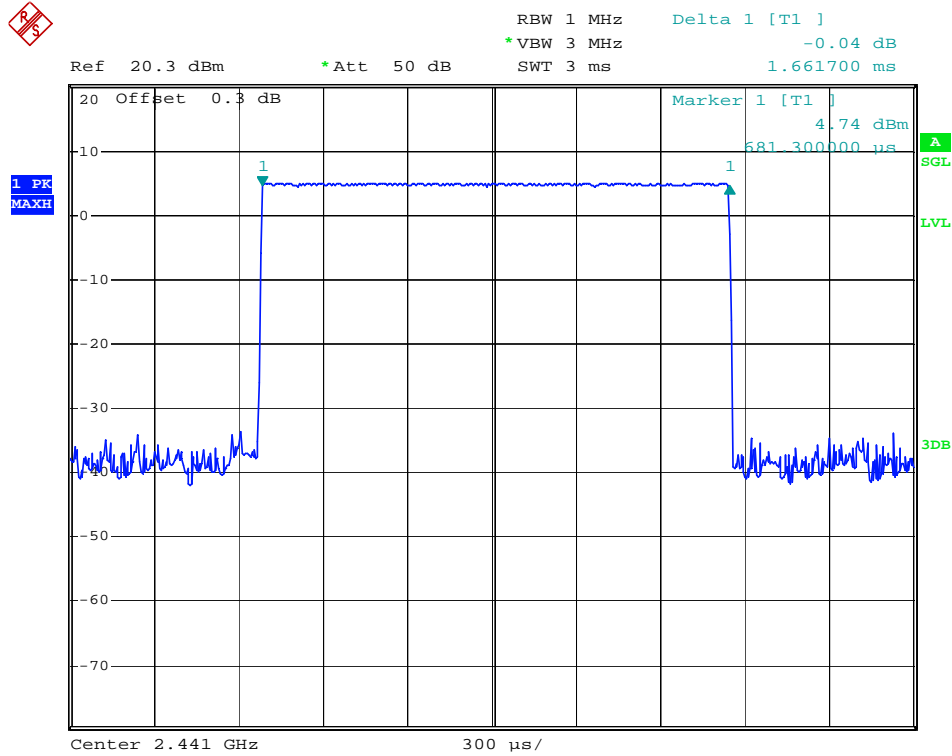
INTERTEK TESTING SERVICES

Modulation Type: GFSK

Packet: DH1

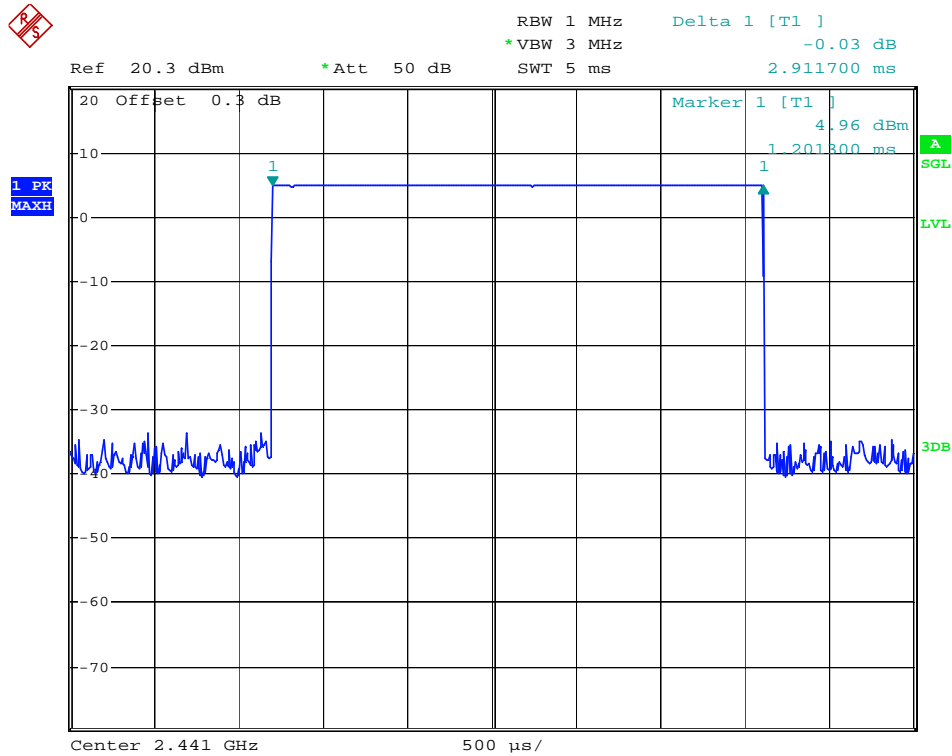


Packet: DH3



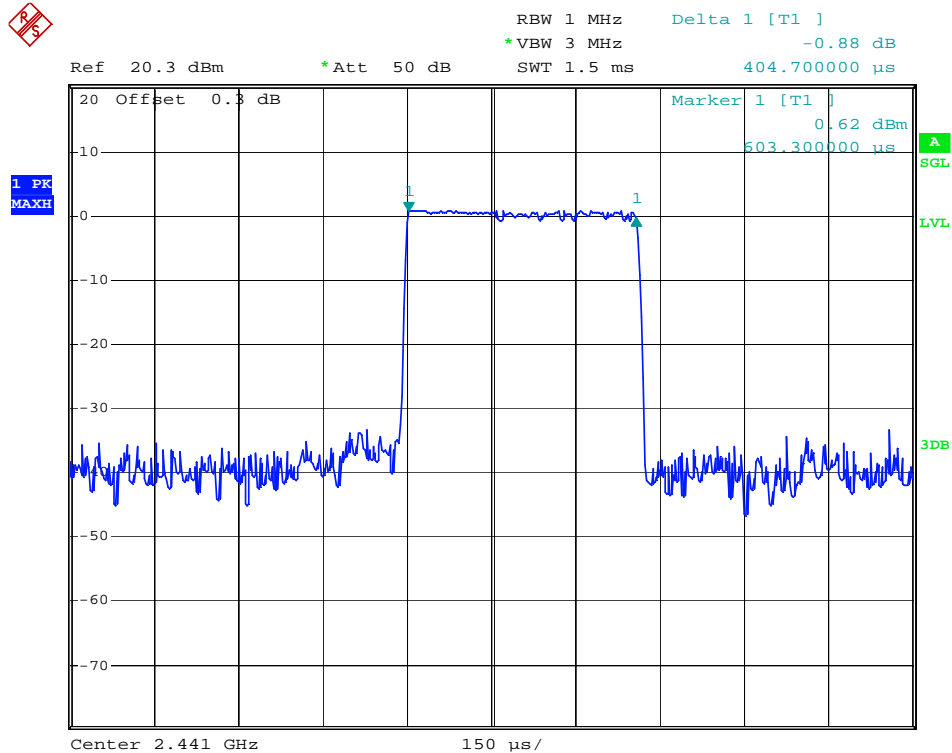
INTERTEK TESTING SERVICES

Packet: DH5



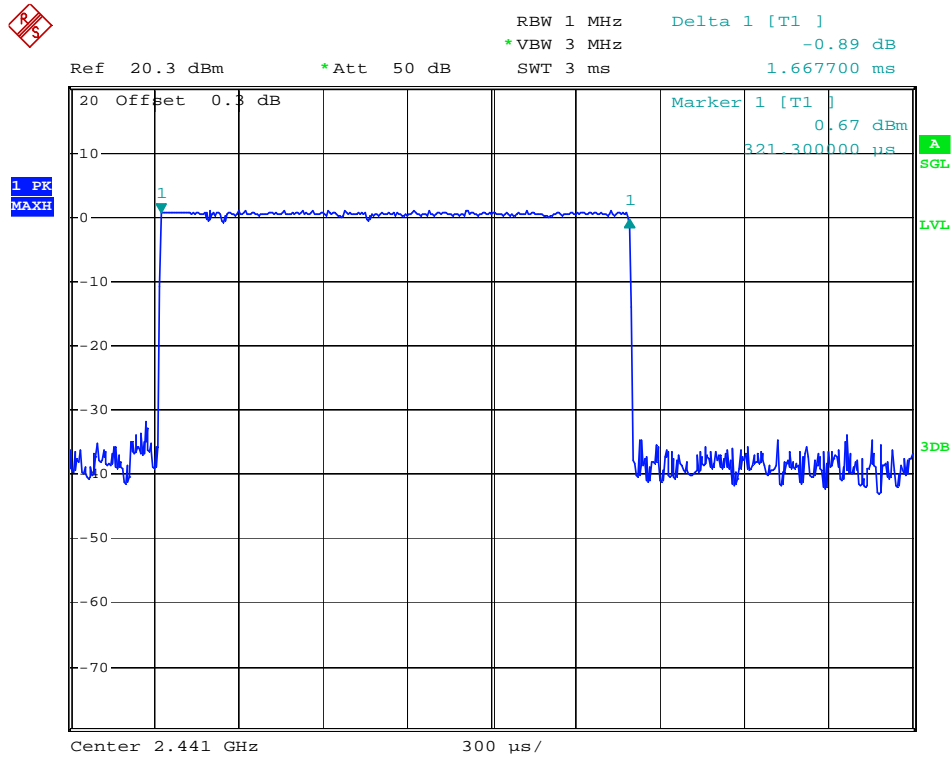
Modulation Type: $\pi/4$ -DQPSK

Packet: DH1

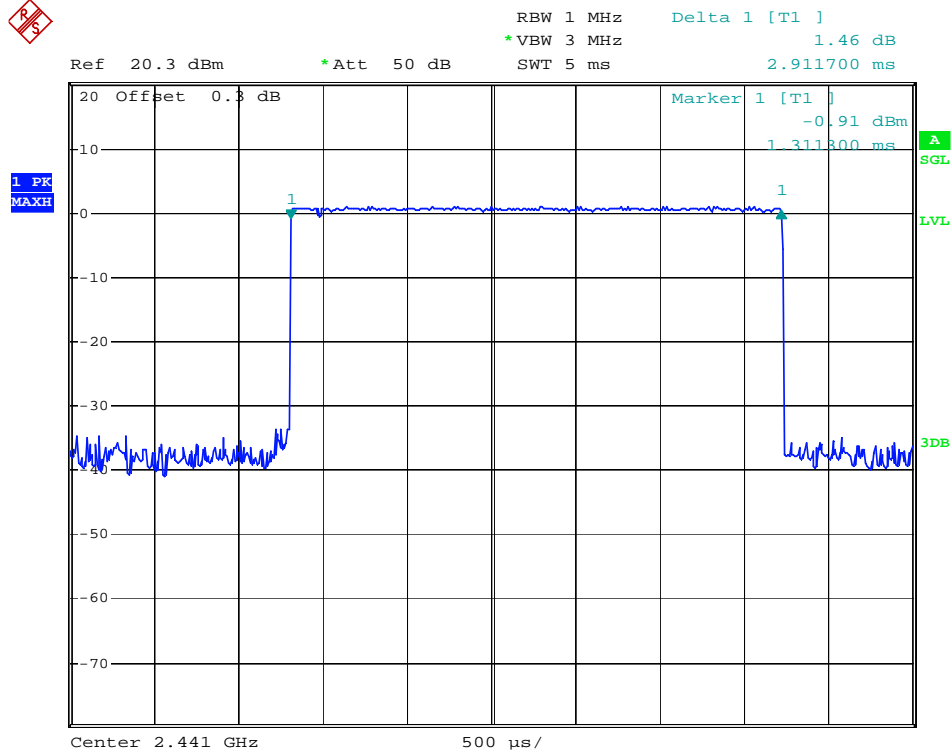


INTERTEK TESTING SERVICES

Packet: DH3



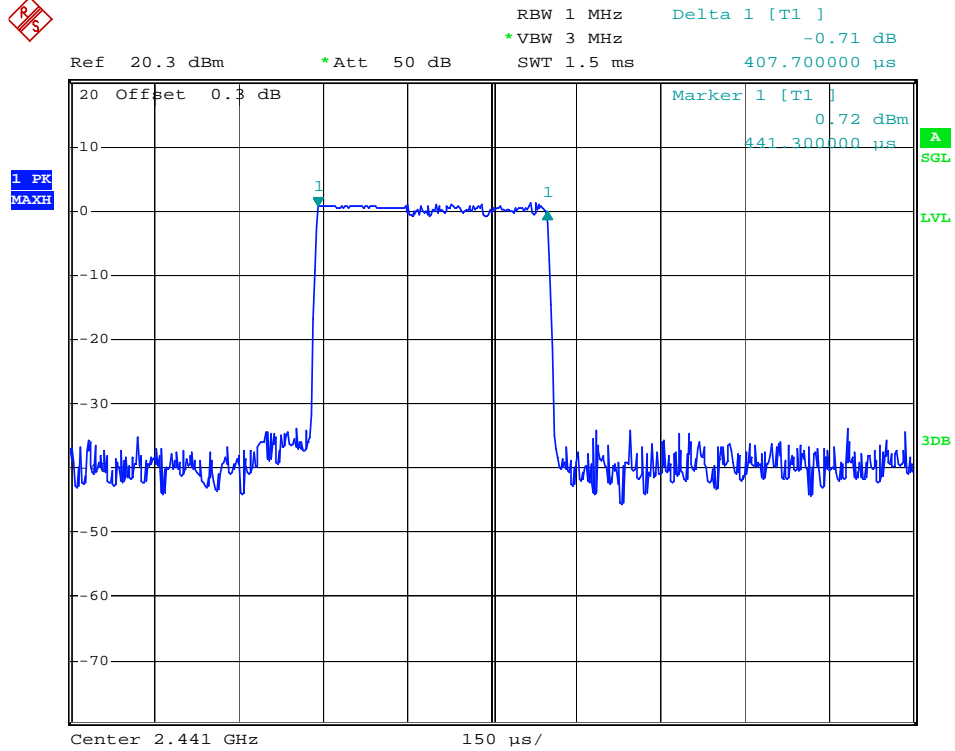
Packet: DH5



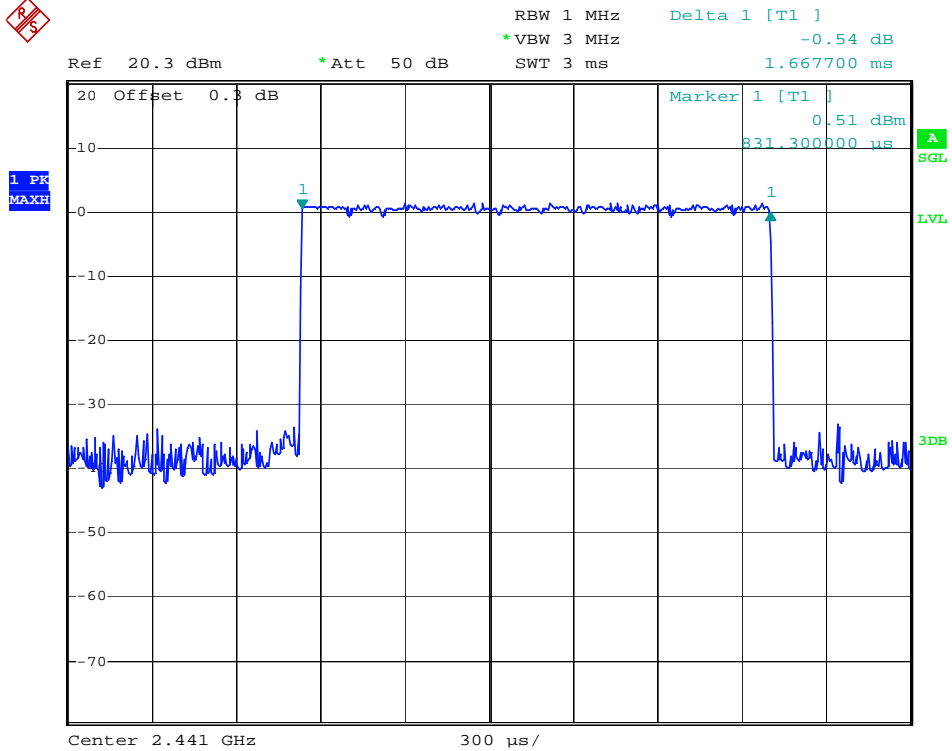
INTERTEK TESTING SERVICES

Modulation Type: 8DPSK

Packet: DH1

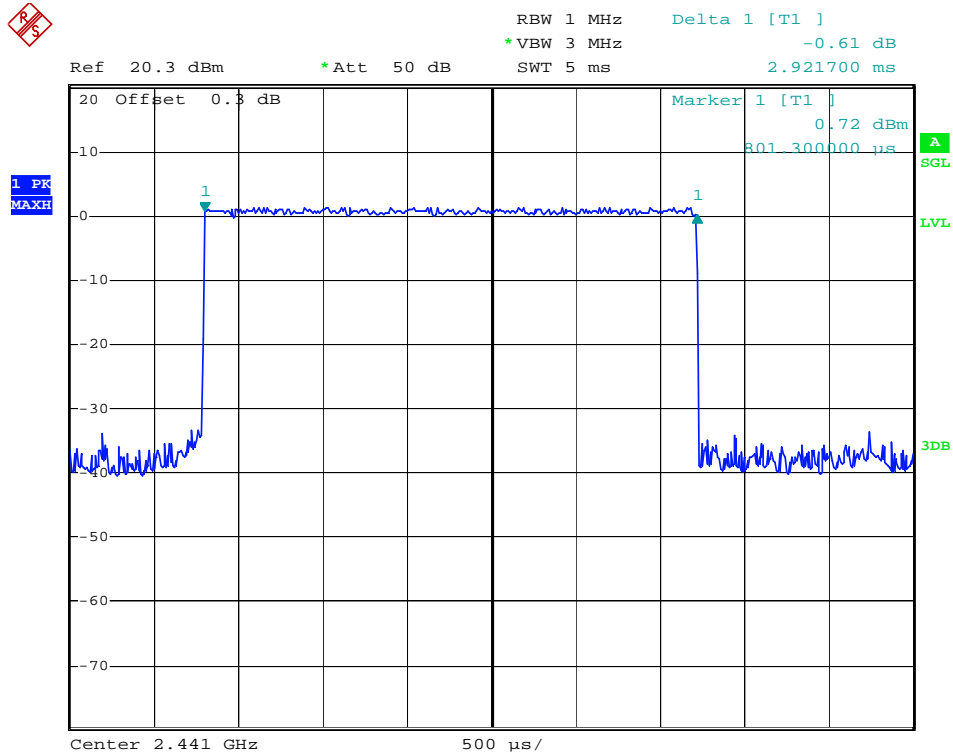


Packet: DH3



INTERTEK TESTING SERVICES

Packet: DH5



3.8 Band Edge

Out of Band Conducted Emissions, FCC Rule 15.247(d):

In any 100 KHz bandwidth outside the EUT passband, the RF power produced by the modulation products of the spreading sequence, the information sequence, and the carrier frequency shall be at least 20 dB below that of the maximum in-band 100 kHz emission, or else shall meet the general limits for radiated emissions at frequencies outside the passband, whichever results in lower attenuation.

Furthermore, delta measurement technique for measuring bandage emissions was shown as below:

(i) Lower channel 2402MHz:

Peak Resultant field strength = Fundamental emissions (peak value) – delta
from the bandedge plot

$$\begin{aligned} &= 101.2\text{dB}\mu\text{v/m}-33.8\text{dB} \\ &= 67.4\text{dB}\mu\text{v/m} \end{aligned}$$

$$\begin{aligned} \text{Average field strength} &= 67.4\text{dB}\mu\text{v/m}-30.1\text{ dB} \\ &= 37.3\text{ dB}\mu\text{v/m} \end{aligned}$$

(ii) Upper channel 2480MHz:

Peak Resultant field strength = Fundamental emissions (peak value) – delta
from the bandedge plot

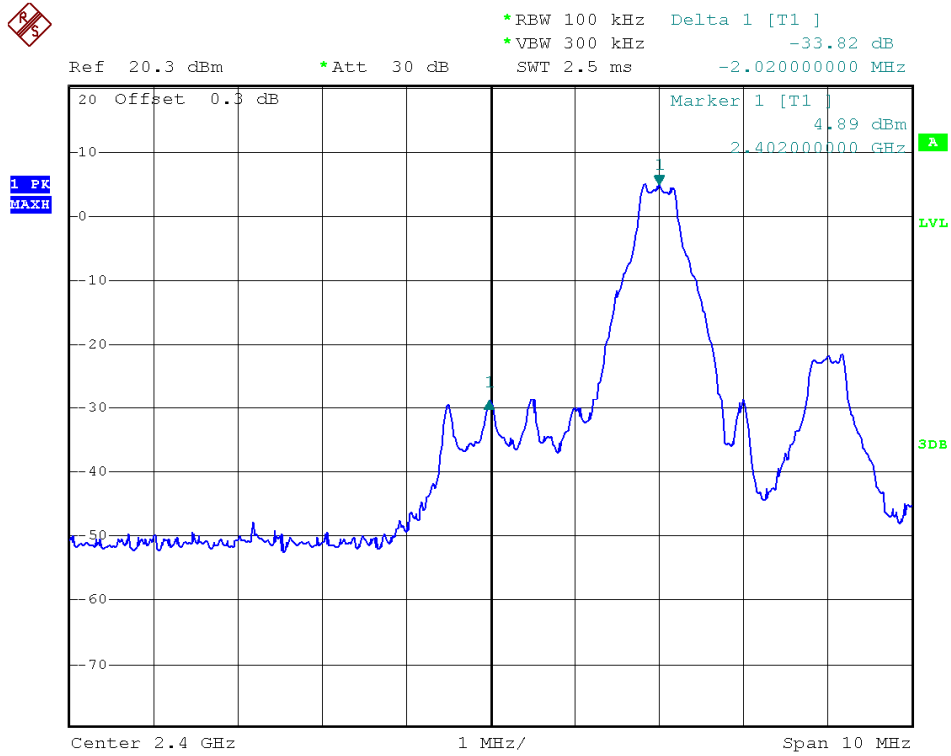
$$\begin{aligned} &= 101.1\text{dB}\mu\text{v/m}-54.4\text{dB} \\ &= 46.7\text{dB}\mu\text{v/m} \end{aligned}$$

$$\begin{aligned} \text{Average field strength} &= 46.7\text{dB}\mu\text{v/m}-30.1\text{ dB} \\ &= 16.6\text{ dB}\mu\text{v/m} \end{aligned}$$

The resultant field strength meets the general radiated emission limit in section 15.209, which does not exceed 74 dBμv/m (Peak Limit) and 54dBμv/m (Average Limit).

INTERTEK TESTING SERVICES

Modulation Type: GFSK



3.9 Transmitter Spurious Emissions (Conducted)

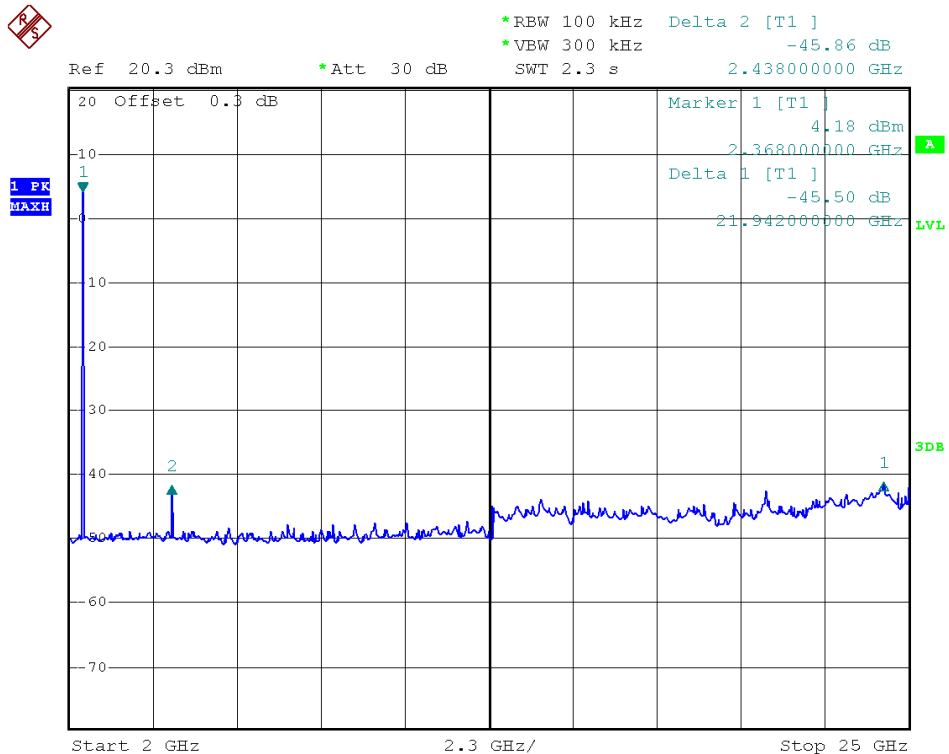
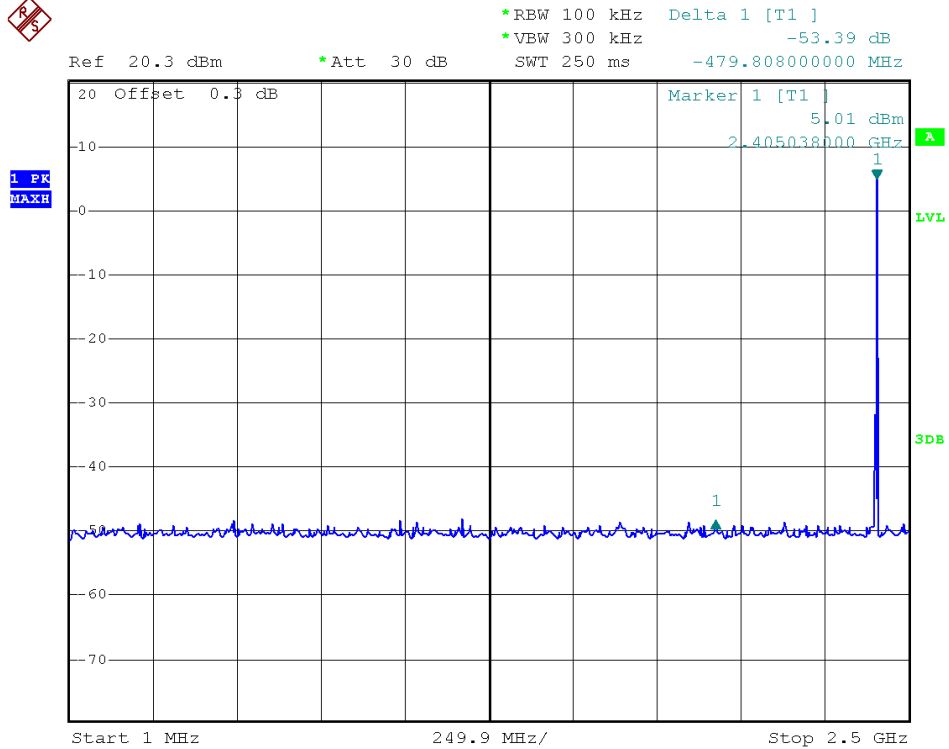
Out of Band Conducted Spurious Emissions, FCC Rule 15.247(d):

All spurious emission and up to the tenth harmonic was measured and they were found to be at least 20 dB below the highest level of the desired power in the passband.

INTERTEK TESTING SERVICES

Modulation Type: GFSK

CH00



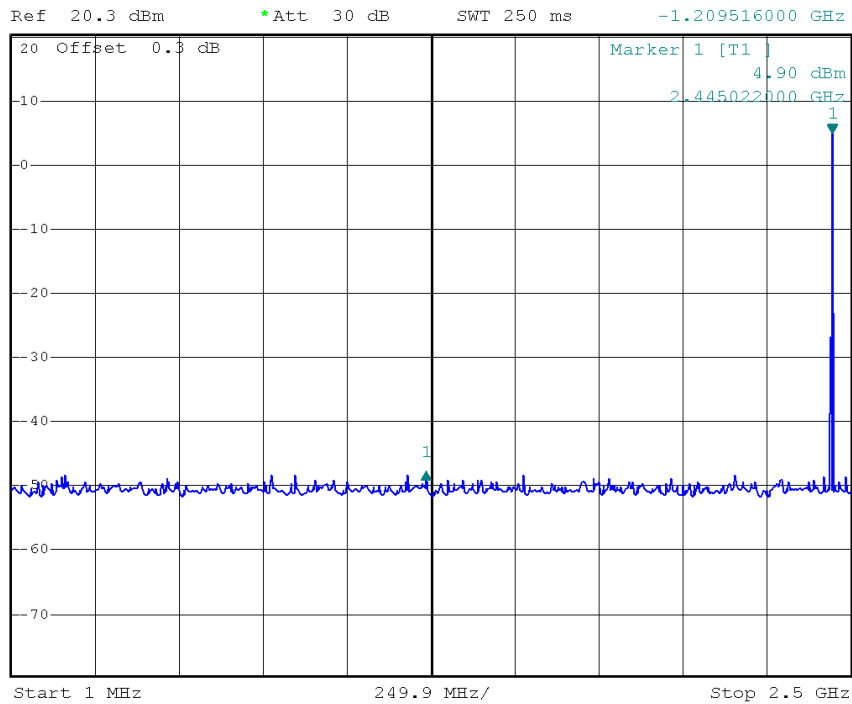
TRF No.: FCC 15C_Txa
FCC ID: PYABH-221

INTERTEK TESTING SERVICES

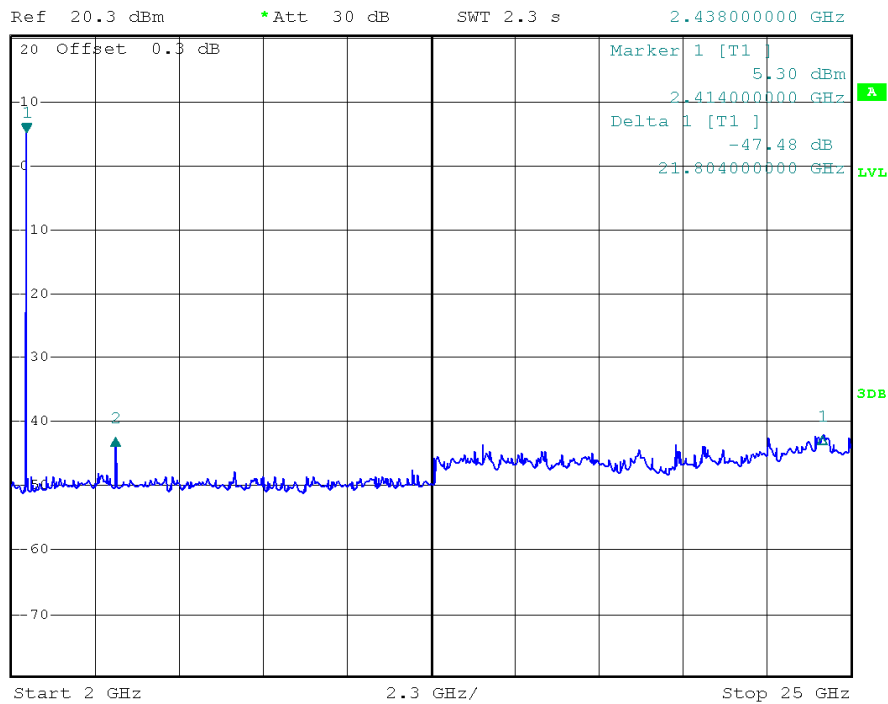
CH39



*RBW 100 kHz Delta 1 [T1]
 *VBW 300 kHz -52.61 dB
 SWT 250 ms -1.209516000 GHz

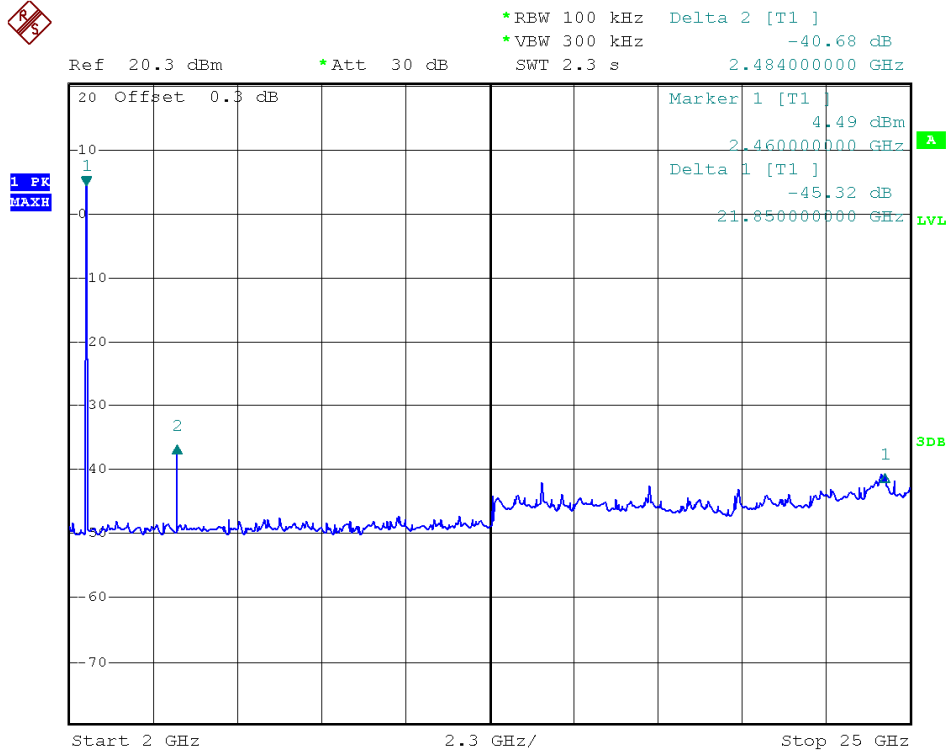
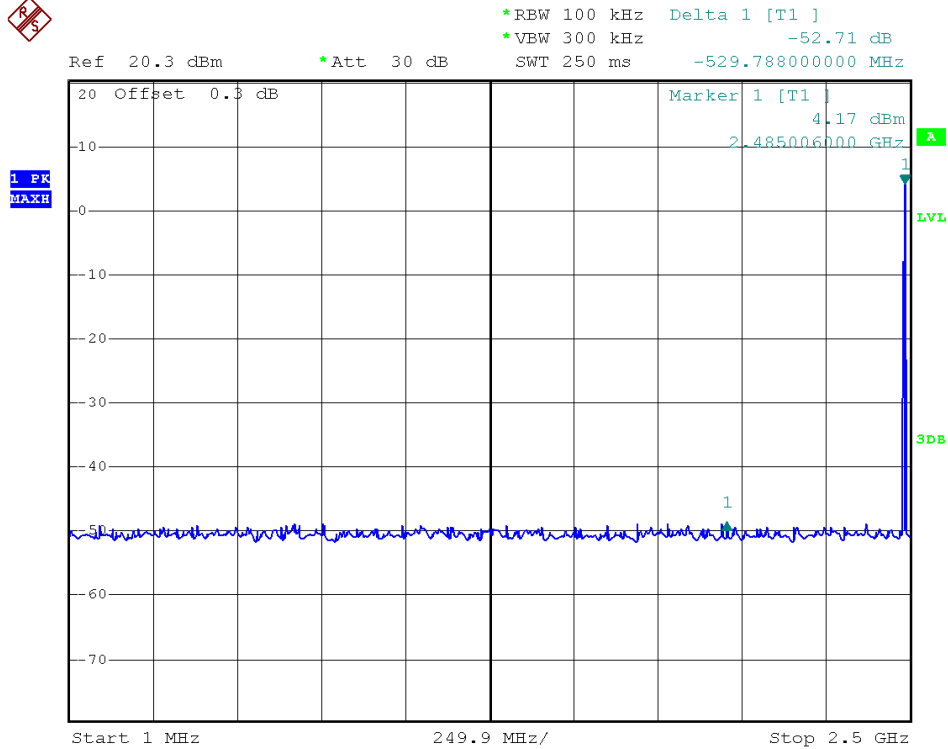


*RBW 100 kHz Delta 2 [T1]
 *VBW 300 kHz -47.93 dB
 SWT 2.3 s 2.438000000 GHz



INTERTEK TESTING SERVICES

CH78



TRF No.: FCC 15C_Txa
 FCC ID: PYABH-221

EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

4.0 **Equipment Photographs**

For electronic filing, the photographs of the tested EUT are saved with filename: external photos.pdf & internal photos.pdf.

INTERTEK TESTING SERVICES

EXHIBIT 5

PRODUCT LABELLING

INTERTEK TESTING SERVICES

5.0 **Product Labelling**

For electronic filing, the FCC ID label artwork and the label location are saved with filename: label.pdf.

INTERTEK TESTING SERVICES

EXHIBIT 6

TECHNICAL SPECIFICATIONS

INTERTEK TESTING SERVICES

6.0 Technical Specifications

For electronic filing, the block diagram and schematics of the tested EUT are saved with filename: block.pdf and circuit.pdf respectively.

INTERTEK TESTING SERVICES

EXHIBIT 7

INSTRUCTION MANUAL

INTERTEK TESTING SERVICES

7.0 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: manual.pdf.

This manual will be provided to the end-user with each unit sold/leased in the United States.

INTERTEK TESTING SERVICES

EXHIBIT 8

MISCELLANEOUS INFORMATION

INTERTEK TESTING SERVICES

8.0 **Miscellaneous Information**

This miscellaneous information includes details of the measured bandedge, the test procedure and calculation of factor such as pulse desensitization.

INTERTEK TESTING SERVICES

8.1 Discussion of Pulse Desensitization

Pulse desensitivity is not applicable for this device. The effective period (T_{eff}) is approximately 360 μ s for Bluetooth. With a resolution bandwidth (3dB) of 1MHz, so the pulse desensitivity factor is 0dB.

INTERTEK TESTING SERVICES

8.2 Transmitter Duty Cycle Calculation, FCC Rule 15.35(b, c)

Based on the Bluetooth Specification Version 2.1+ EDR, transmitter ON time is independent of packet type (DH1, DH3 and DH5) and packet length (single-slot and multi-slot). The maximum transmitter ON time for the Bluetooth is 625µs.

Each TX and RX time slot is 625µs in length. A TDD scheme is used where master and slave alternately transmit. For one period for a pseudo-random hopping through all 79 RF channels, for DH5:

Time of 1 hopset (5 TX slots + 1 RX slot) = $0.625 \text{ ms} \times 6 = 3.75 \text{ ms}$

Time of 1 cycle = $3.75 \text{ ms} \times 79 = 296.25 \text{ ms}$

Average factor = $20 \log (3.125 / 100) = -30.1 \text{ dB}$

INTERTEK TESTING SERVICES

8.3 **Emissions Test Procedures**

The following is a description of the test procedure used by Intertek Testing Services in the measurements of transmitters operating under Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 2003.

The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjust through all three orthogonal axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 150 kHz to 30 MHz.

INTERTEK TESTING SERVICES

8.3 Emissions Test Procedures (cont'd)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements are made as described in ANSI C63.4 - 2003.

The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz and 120 kHz for emission from 30 MHz to 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the restricted bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, but those measurements taken at a closer distance are so marked.

INTERTEK TESTING SERVICES

EXHIBIT 9

TEST EQUIPMENT LIST

INTERTEK TESTING SERVICES

9.0 Test Equipment List

Equipment No.	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
SZ061-03	BiConiLog Antenna	ETS	3142C	00066460	02-Jul-11	02-Jan-13
SZ185-01	EMI Receiver	R&S	ESCI	100547	08-Mar-11	08-Mar-12
SZ061-08	Horn Antenna	ETS	3115	00092346	15-Oct-11	15-Oct-12
SZ056-03	Spectrum Analyzer	R&S	FSP 30	101148	08-Mar-11	08-Mar-12
SZ181-04	Preamplifier	Agilent	8449B	3008A02474	08-Mar-11	08-Mar-12
SZ188-01	Anechoic Chamber	ETS	RFD-F/A-100	4102	15-Jan-11	15-Jan-12
SZ062-02	RF Cable	RADIAL	RG 213U	--	24-Sep-11	24-Mar-12
SZ062-06	RF Cable	RADIAL	0.04-26.5GHz	--	03-Sep-11	03-Mar-12
SZ062-12	RF Cable	RADIAL	0.04-26.5GHz	--	03-Sep-11	03-Mar-12
SZ067-04	Notch Filter	Micro-Tronics	BRM5070 2-02	--	15-Jul-11	15-Jul-12
SZ185-02	EMI Test Receiver	R&S	ESCI	100692	05-Nov-11	05-Nov-12
SZ187-01	Two-Line V-Network	R&S	ENV216	100072	05-Nov-11	05-Nov-12
SZ187-02	Two-Line V-Network	R&S	ENV216	100073	05-Nov-11	05-Nov-12
SZ188-03	Shielding Room	ETS	RFD-100	4100	16-Sep-10	16-Sep-13

INTERTEK TESTING SERVICES

10.0 Annex

Document History

Report No.	Issue Date	Change
SZ11120291-1	3 January, 2012	Original