



<b>Prüfbericht-Nr.:</b> Test Report No.:	<b>50304064 001</b>	<b>Auftrags-Nr.:</b> Order No.:	238105155	Seite 1 von 54 Page 1 of 54
<b>Kunden-Referenz-Nr.:</b> Client Reference No.:	N/A	<b>Auftragsdatum:</b> Order date:	14-Jun-2019	
<b>Auftraggeber:</b> Client:	Bang & Olufsen A/S Bang og Olufsen Allé 1, 7600 Struer, Denmark			
<b>Prüfgegenstand:</b> Test item:	Bluetooth Earphone			
<b>Bezeichnung / Typ-Nr.:</b> Identification / Type No.:	E8 3rd Gen Earbud L			
<b>Auftrags-Inhalt:</b> Order content:	FCC Part 15C/ISED RSS-247 Test report (BDR/EDR)			
<b>Prüfgrundlage:</b> Test specification:	FCC 47CFR Part 15: Subpart C Section 15.247 ISED RSS-247 ISSUE 2 FEB 2017			
<b>Wareneingangsdatum:</b> Date of receipt:	09-Sep-2019			
<b>Prüfmuster-Nr.:</b> Test sample No.:	A000987830-005 A000987830-006			
<b>Prüfzeitraum:</b> Testing period:	25-Sep-2019 – 04-Oct-2019			
<b>Ort der Prüfung:</b> Place of testing:	EMC/RF Laboratory Taipei			
<b>Prüflaboratorium:</b> Testing laboratory:	TUV Rheinland Taiwan Ltd.			
<b>Prüfergebnis*:</b> Test result*:	Pass			
<b>Report date / tested by:</b>		<b>kontrolliert von / reviewed by:</b>		
 23-Oct-2019 Mars Y.J. Lin/Project Engineer Datum Name / Stellung Unterschrift Date Name / Position Signature		 23-Oct-2019 Arvin Ho/Vice General Manager Datum Name / Stellung Unterschrift Date Name / Position Signature		
<b>Sonstiges / Other:</b>				
<b>Zustand des Prüfgegenstandes bei Anlieferung:</b> Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
<b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b> <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

## TEST SUMMARY

### **5.1.1 ANTENNA REQUIREMENT**

RESULT: *Passed*

### **5.1.2 PEAK OUTPUT POWER**

RESULT: *Passed*

### **5.1.3 20dB BANDWIDTH**

RESULT: *Passed*

### **5.1.4 99% BANDWIDTH**

RESULT: *Passed*

### **5.1.5 CONDUCTED SPURIOUS EMISSIONS AND FREQUENCY BAND EDGE MEASURED IN 100kHz BANDWIDTH**

RESULT: *Passed*

### **5.1.6 SPURIOUS EMISSION**

RESULT: *Passed*

### **5.1.7 FREQUENCY SEPARATION**

RESULT: *Passed*

### **5.1.8 NUMBER OF HOPPING FREQUENCY**

RESULT: *Passed*

### **5.1.9 TIME OF OCCUPANCY**

RESULT: *Passed*

### **6.1.1 ELECTROMAGNETIC FIELDS**

RESULT: *Passed*

## Contents

<b>1.</b>	<b>GENERAL REMARKS .....</b>	<b>5</b>
<b>1.1</b>	<b>COMPLEMENTARY MATERIALS.....</b>	<b>5</b>
<b>2.</b>	<b>TEST SITES .....</b>	<b>6</b>
<b>2.1</b>	<b>TEST LABORATORY .....</b>	<b>6</b>
<b>2.2</b>	<b>TEST FACILITY.....</b>	<b>6</b>
<b>2.3</b>	<b>LIST OF TEST AND MEASUREMENT INSTRUMENTS.....</b>	<b>7</b>
<b>2.4</b>	<b>TRACEABILITY .....</b>	<b>8</b>
<b>2.5</b>	<b>CALIBRATION .....</b>	<b>8</b>
<b>2.6</b>	<b>MEASUREMENT UNCERTAINTY .....</b>	<b>8</b>
<b>3.</b>	<b>GENERAL PRODUCT INFORMATION.....</b>	<b>9</b>
<b>3.1</b>	<b>PRODUCT FUNCTION AND INTENDED USE .....</b>	<b>9</b>
<b>3.2</b>	<b>SYSTEM DETAILS AND RATINGS.....</b>	<b>9</b>
<b>3.3</b>	<b>INDEPENDENT OPERATION MODES.....</b>	<b>11</b>
<b>3.4</b>	<b>NOISE GENERATING AND NOISE SUPPRESSING PARTS .....</b>	<b>12</b>
<b>3.5</b>	<b>SUBMITTED DOCUMENTS.....</b>	<b>12</b>
<b>4.</b>	<b>TEST SET-UP AND OPERATION MODES.....</b>	<b>13</b>
<b>4.1</b>	<b>PRINCIPLE OF CONFIGURATION SELECTION .....</b>	<b>13</b>
<b>4.2</b>	<b>TEST OPERATION AND TEST SOFTWARE.....</b>	<b>13</b>
<b>4.3</b>	<b>SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT .....</b>	<b>14</b>
<b>4.4</b>	<b>COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE.....</b>	<b>14</b>
<b>4.5</b>	<b>TEST SETUP DIAGRAM .....</b>	<b>14</b>
<b>5.</b>	<b>TEST RESULTS .....</b>	<b>16</b>
<b>5.1</b>	<b>TRANSMITTER REQUIREMENT &amp; TEST SUITES.....</b>	<b>16</b>
5.1.1	<i>Antenna Requirement .....</i>	<i>16</i>
5.1.2	<i>Peak Output Power .....</i>	<i>17</i>
5.1.3	<i>20dB Bandwidth .....</i>	<i>19</i>
5.1.4	<i>99% Bandwidth .....</i>	<i>25</i>
5.1.5	<i>Conducted spurious emissions and Frequency Band Edge measured in 100kHz Bandwidth.....</i>	<i>28</i>
5.1.6	<i>Spurious Emission .....</i>	<i>37</i>
5.1.7	<i>Frequency Separation.....</i>	<i>38</i>
5.1.8	<i>Number of hopping frequency.....</i>	<i>42</i>
5.1.9	<i>Time of Occupancy .....</i>	<i>46</i>
<b>6.</b>	<b>SAFETY HUMAN EXPOSURE .....</b>	<b>50</b>

**Prüfbericht - Nr.: 50304064 001**  
*Test Report No.***Seite 4 von 54**  
*Page 4 of 54*

<b>6.1</b>	<b>RADIO FREQUENCY EXPOSURE COMPLIANCE .....</b>	<b>50</b>
6.1.1	<i>Electromagnetic Fields.....</i>	<i>50</i>
<b>7.</b>	<b>PHOTOGRAPHS OF THE TEST SET-UP.....</b>	<b>51</b>
<b>8.</b>	<b>LIST OF TABLES .....</b>	<b>54</b>
<b>9.</b>	<b>LIST OF PHOTOGRAPHS.....</b>	<b>54</b>

## 1. General Remarks

### 1.1 Complementary Materials

The following attachments are integral parts of this test report:

**Appendix P: Photo Documentation**

(File Name: 50304064 001 APPENDIX P)

**Appendix D: Test Result of Radiated Emissions**

(File Name: 50304064 001 APPENDIX D)

Test Specifications

The following standards were applied

**Table 1: Applied Standard and Test Levels**

Radio
FCC CFR47 Part 15: Subpart C Section 15.247 RSS-247 Issue 2 Feb 2017 RSS-Gen, Issue 5, April 2018 ANSI C63.10:2013 KDB558074 D01 DTS Meas Guidance v05

## 2. Test Sites

### 2.1 Test Laboratory

TUV Rheinland Taiwan Ltd.  
Taipei Testing Laboratories

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.  
Taipei City 105  
Taiwan (R.O.C.)

### 2.2 Test Facility

TUV Rheinland Taiwan Ltd.

11F. No.758, Sec. 4, Bade Rd., Songshan Dist.  
Taipei City 105  
Taiwan (R.O.C.)

FCC Registration No.: 180491  
IC Canada Registration No.: 9465A  
TAF Accredited NCC Test Lab. No.:3567  
TAF ISO17025 Certification effective period: 6<sup>th</sup>-May-2019 to 05<sup>th</sup>-May-2022



Testing Laboratory  
**3567**

## 2.3 List of Test and Measurement Instruments

**Table 2: List of Test and Measurement Equipment**

Kind of Equipment	Manu- facturer	Type	S/N	Last Calibration	Next Calibration
Test Software	Audix	e3	Ver.9	N/A	N/A
EMI Test Receiver	R&S	ESR 7	101549	2018/11/12	2019/11/10
Spectrum Analyzer	R&S	FSV 40	100921	2019/04/30	2020/04/30
Preamplifier (30MHz -1GHz)	Hewlett Packard	8447D	2944A06641	2019/01/08	2020/01/08
Preamplifier (18 GHz -40 GHz)	EMC Instruments	EMC184045SE	980652	2019/02/25	2020/02/25
Pre-Amplifier (1GHz~18GHz)	EM Electronics	EM01G18G	60649	2019/09/11	2020/09/11
Bilog Antenna	TESEQ	CBL 6111D	29804	2019/07/12	2020/07/12
Horn Antenna	ETS-Lindgren	3117	218931	2018/12/27	2019/12/27
Horn Antenna (18GHz~40GHz)	COM-POWER	AH-840	101029	2018/12/22	2019/12/22
Loop Antenna	Schwarzbeck	FMZB 1513	1513-076	2019/07/11	2020/07/11
power Meter	Anritsu	ML2495A	1901008	2019/04/29	2020/04/28
Power Sensor	Anritsu	MA2411B	1725269	2019/04/29	2020/04/28

## 2.4 Traceability

All measurement equipment calibrations are traceable to NML(Taiwan)/NIST(USA) or where calibration is performed outside Taiwan, to equivalent nationally recognized standards organizations.

## 2.5 Calibration

Equipment requiring calibration is calibrated periodically in a suitably accredited Calibration Lab. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

## 2.6 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements:.

**Table 3: Emission Measurement Uncertainty**

Parameter	Uncertainty
Radio Frequency	$\pm 0.1$ ppm
RF power, conducted	$\pm 1.5$ dB
Adjacent channel power	$\pm 3$ dB
Radiated emission of transmitter, valid up to 26 GHz	$\pm 6$ dB
Radiated emission of receiver, valid up to 26 GHz	$\pm 6$ dB
Temperature	$\pm 2$ °C
Humidity	$\pm 10$ %



### 3. General Product Information

#### 3.1 Product Function and Intended Use

The EUT is a Bluetooth Earphone . It contains a Bluetooth 3.0 compatible module enabling the user to communicate data through a Wireless interface.  
For details refer to the User Guide, Data Sheet and Circuit Diagram.

#### 3.2 System Details and Ratings

**Table 4: Basic Information of EUT**

Item	EUT information
Kind of Equipment/Test Item	Bluetooth Earphone
Type Identification	E8 3rd Gen Earbud L
FCC ID	TTUBEOPLAYE8L3
Canada ID	3775B-BEOPLAYE8L3
Canada HVIN	E8 3rd Gen Earbud L

**Table 5: Technical Specification of EUT**

Technical Specification	Value
Operating Frequency	2402 MHz ~ 2480 MHz
Channel Spacing	1 MHz
Channel number	79
Operation Voltage	5Vdc
Modulation	GFSK, $\pi/4$ DQPSK, 8 DPSK
Antenna gain	-0.2dBi

**Table 6: Frequency hopping information**

Technical Specification	Description
Hopping Range	Hereby we declare that the maximum frequency of this device is: 2402-2480MHz. This is according the Bluetooth Core Specification V2.1+EDR for devices which will be operated in the USA. This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/04).
Hopping Sequence	Example of a 79 hopping sequence in data mode:  33,04,21,44,23,42,53,46,55,48,40,59,72,29,76,31,08,73,07,75,09,45,60,39,58,13,47,11,77,52,35,50,65,54,67,56,69,62,71,64, 7,25,27,66,57,70,74,61,78,63,10,41,05,43,15,44,64,68,02,70,06,01,51,03,55,05,03,66,53,49,36,47,
Receiver input bandwidth	<p>The input bandwidth of the receiver is 1MHz. In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence. The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master.</p> <p>Additionally the type of connection is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.</p> <p>Repeating of a packer has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case.</p> <p>That means a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.</p>

### **3.3 Independent Operation Modes**

The basic operation modes are:

- A. Transmitting
  - 1. Low channel
  - 2. Middle channel
  - 3. High channel
- B. Receiving
  - 1. Low channel
  - 2. Middle channel
  - 3. High channel
- C. Hopping

### **3.4 Noise Generating and Noise Suppressing Parts**

Refer to the Circuit Diagram.

### **3.5 Submitted Documents**

- Circuit Diagram
- Instruction Manual
- Rating Label
- Technical Description

## 4. Test Set-up and Operation Modes

### 4.1 Principle of Configuration Selection

The equipment under test (EUT) was configured to measure its maximum power level. The test modes were adapted accordingly in reference to the instructions for use.

During testing, Channel and Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

**Table 7: Table for Parameters of Test Software Setting**

Mode	Channel Frequency		
	2402 MHz	2441 MHz	2480 MHz
1-DH5	Default	Default	Default
2-DH5	Default	Default	Default
3-DH5	Default	Default	Default

### 4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 4. All testing were performed according to the procedures in ANSI C63.10: 2013

The samples were used as follows:  
Conducted sample: A000987830-003  
Radiation sample: A000987830-004

Full test was applied on all test modes, but only worst case was shown

Test Software	Bluesuite 3.2.2.144
---------------	---------------------

## 4.3 Special Accessories and Auxiliary Equipment

The product has been tested together with the following additional accessories:

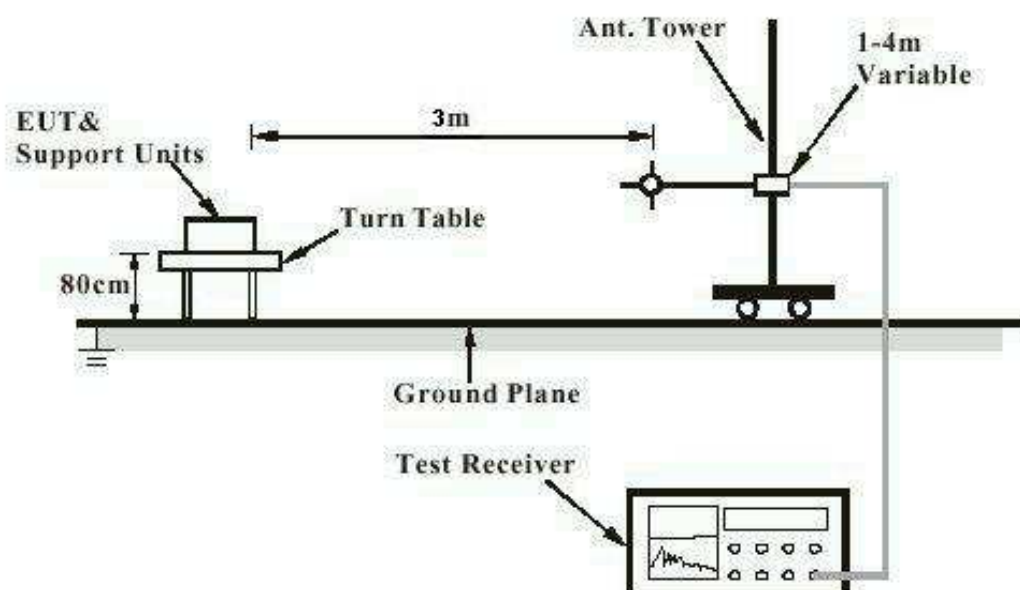
Description	Manufacturer	Model No.	Serial No.
Notebook(EMC-06)	Lenovo	TP00048A	PB-0F8B2

## 4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested containing the noise suppression parts as in the Photo Appendix and the Test Setup Photos. No additional measures were employed to achieve compliance.

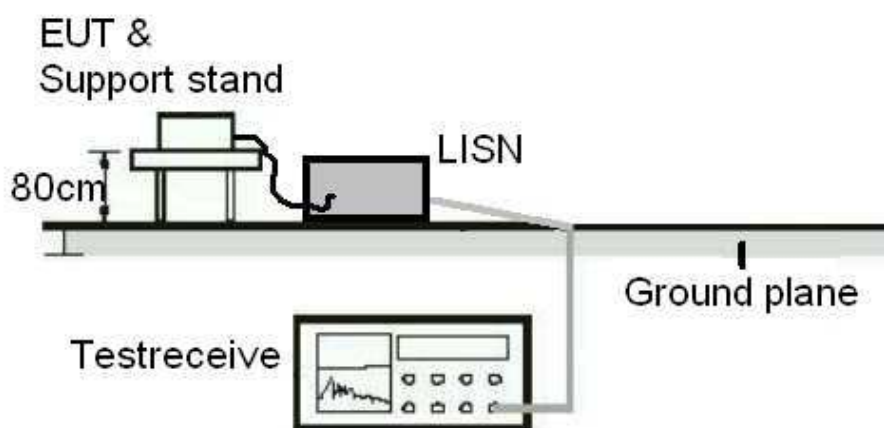
## 4.5 Test Setup Diagram

**Diagram of Measurement Configuration for Radiation Test**

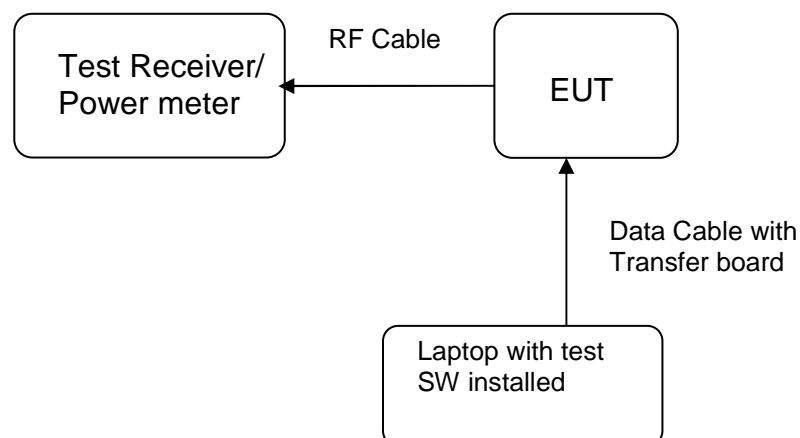


Note: Measurements above 1 GHz are done with a table height of 1.5m

### Diagram of Measurement Equipment Configuration for Mains Conduction Measurement



### Diagram of Measurement Equipment Configuration for Conducted Transmitter Measurement



## 5. Test Results

### 5.1 Transmitter Requirement & Test Suites

#### 5.1.1 Antenna Requirement

**RESULT:****Passed**

Test standard	:	LP0002(2018): 2.2, 3.10.1, (3) FCC Part 15.247(b)(4), Part 15.203 and RSS- Gen 8.3
Requirement	:	use of approved antennas only with directional gains that do not exceed 6 dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of -0.2dBi. The antenna is a printed PCB trace with no possibility of replacement with a non-approved antenna by the end-user. Therefore, the EUT is considered to comply with this provision.

Refer to EUT photo for details.



## 5.1.2 Peak Output Power

### RESULT:

**Passed**

Test standard : FCC Part 15.247(b)(1), RSS-247 5.4(2)

Basic standard : ANSI C63.10:2013

Kind of test site : Shielded room

### Test setup

Test Channel : Low/ Middle/ High

Operation Mode : A

Ambient temperature : 22-26 °C

Relative humidity : 50-65 %

Atmospheric pressure : 100-103 kPa

**Table 8: Test result of Peak Output Power, 1DH5**

Channel	Channel Frequency	Peak Output Power		Average Power	Limit
	(MHz)	(dBm)	(W)	(dBm)	(W)
Low Channel	2402	8.22	0.00664	8.01	0.125
Middle Channel	2441	7.85	0.00610	7.65	0.125
High Channel	2480	7.63	0.00579	7.51	0.125

**Table 9: Test result of Peak Output Power, 2DH5**

Channel	Channel Frequency	Peak Output Power		Average Power	Limit
	(MHz)	(dBm)	(dBm)	(dBm)	(W)
Low Channel	2402	9.65	0.00923	6.81	0.125
Middle Channel	2441	9.39	0.00869	6.55	0.125
High Channel	2480	9.63	0.00918	6.82	0.125

**Table 10: Test result of Peak Output Power, 3DH5**

Channel	Channel Frequency	Peak Output Power		Average Power	Limit
	(MHz)	(dBm)	(W)	(dBm)	(W)
Low Channel	2402	10.33	0.01079	6.96	0.125
Middle Channel	2441	9.96	0.00991	6.59	0.125
High Channel	2480	10.1	0.01023	6.85	0.125

### 5.1.3 20dB Bandwidth

**RESULT:**
**Passed**

Test standard : FCC Part 15.247(a)(1), RSS-247 5.1(1)

Basic standard : ANSI C63.10:2013

Kind of test site : Shielded room

**Test setup**

Test Channel : Low/ Middle/ High

Operation Mode : A

Ambient temperature : 22-26°C

Relative humidity : 50-65%

Atmospheric pressure : 100-103kPa

**Table 11: Test result of 20dB Bandwidth, 1DH5**

Channel	Channel Frequency (MHz)	20dB Bandwidth (kHz)	Limit (MHz)	Result
Low Channel	2402	955.1	1.5	Pass
Mid Channel	2441	944.3	1.5	Pass
High Channel	2480	960.9	1.5	Pass

Note: Limit is for Channel Separation of 1 MHz and a power limit of 125 mW.

**Table 12: Test result of 20dB Bandwidth, 2DH5**

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2402	1.340	1.5	Pass
Mid Channel	2441	1.340	1.5	Pass
High Channel	2480	1.343	1.5	Pass

Note: Limit is for Channel Separation of 1 MHz and a power limit of 125 mW.

**Table 13: Test result of 20dB Bandwidth, 3DH5**

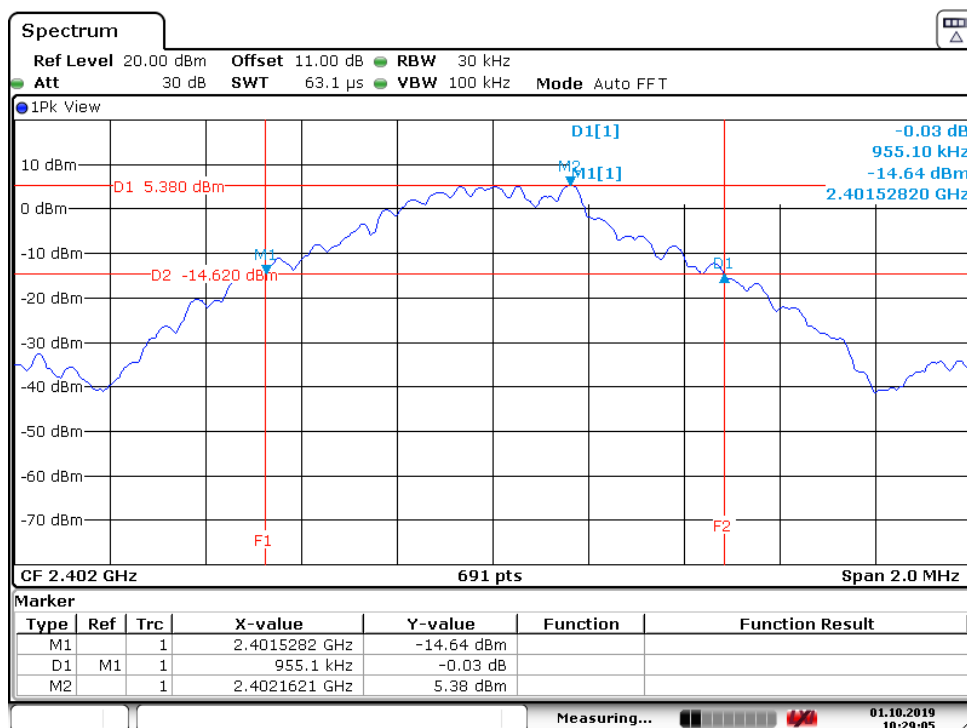
Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Result
Low Channel	2402	1.305	1.5	Pass
Mid Channel	2441	1.302	1.5	Pass
High Channel	2480	1.302	1.5	Pass

Note: Limit is for Channel Separation of 1 MHz and a power limit of 125 mW.

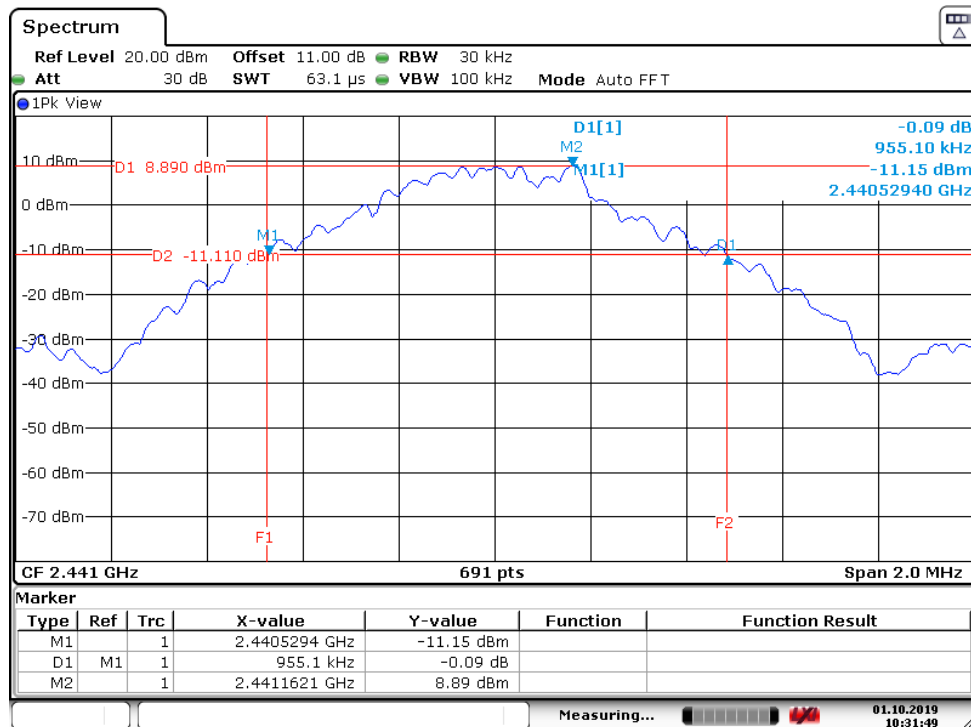
If the carrier separation frequency of a Bluetooth Device is set at 1 MHz due to the firmware setting and the Bluetooth Standard, then for power <125 mW the limit for the 20 dB Bandwidth, becomes 1 MHz / 0.66666 = 1.5 MHz.

## Test Plot of 20dB Bandwidth, 1DH5

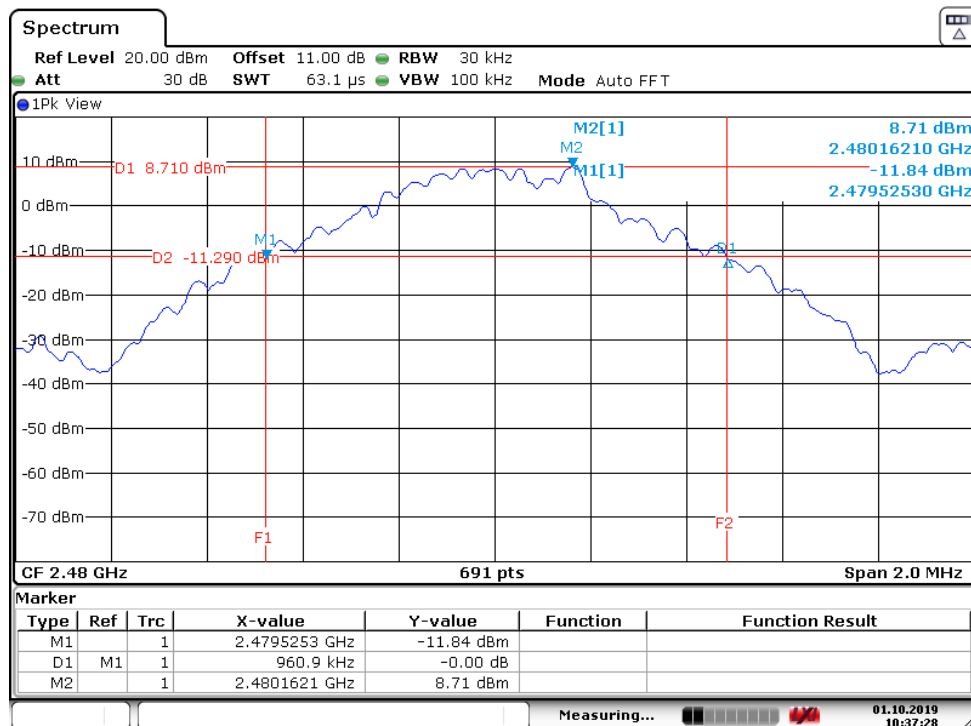
### Low Channel



Date: 1.OCT.2019 10:29:04

**Middle Channel**


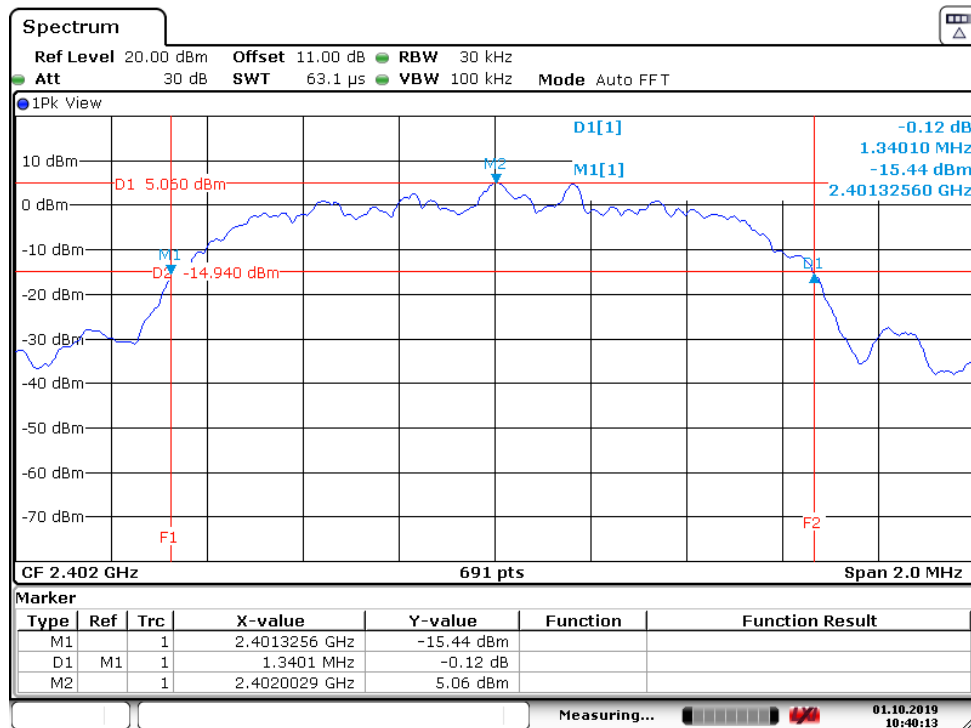
Date: 1.OCT.2019 10:31:49

**High Channel**


Date: 1.OCT.2019 10:37:28

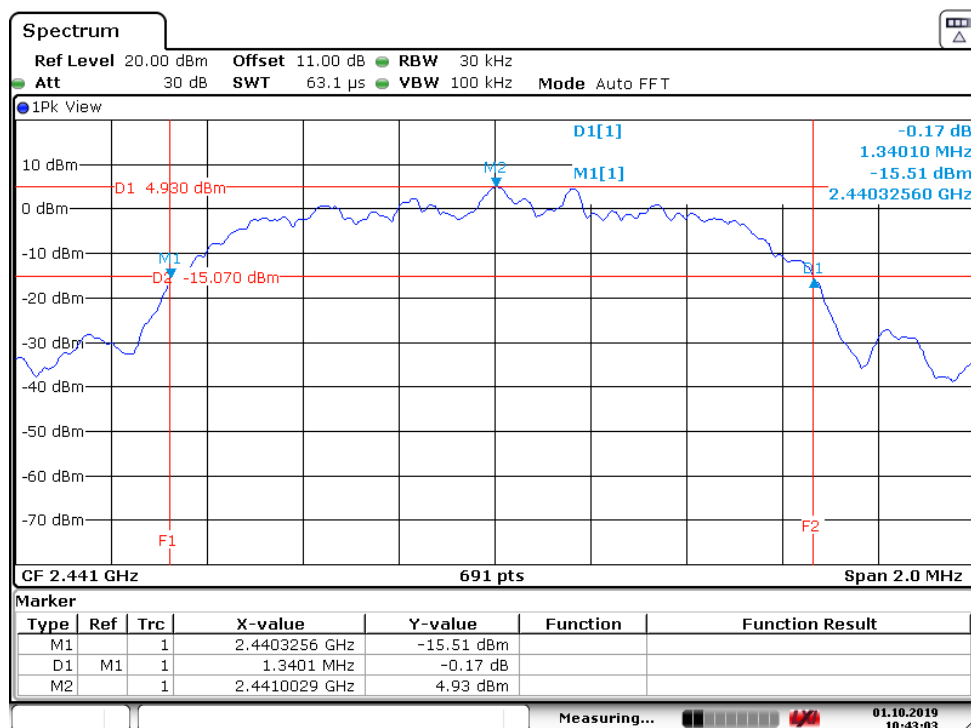
## Test Plot of 20dB Bandwidth, 2DH5

### Low Channel

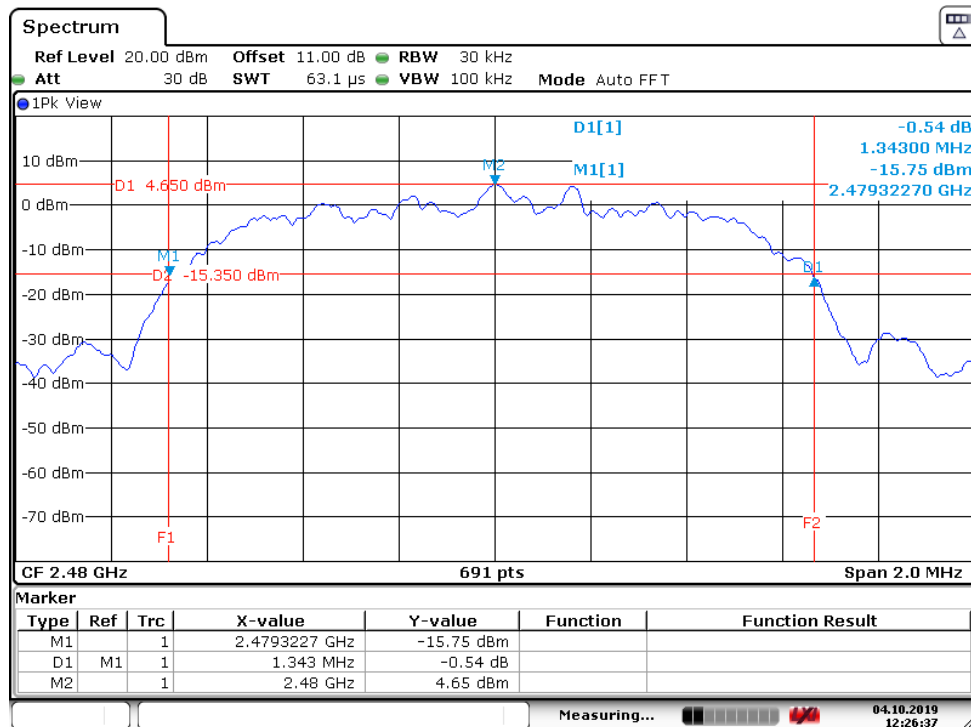


Date: 1.OCT.2019 10:40:13

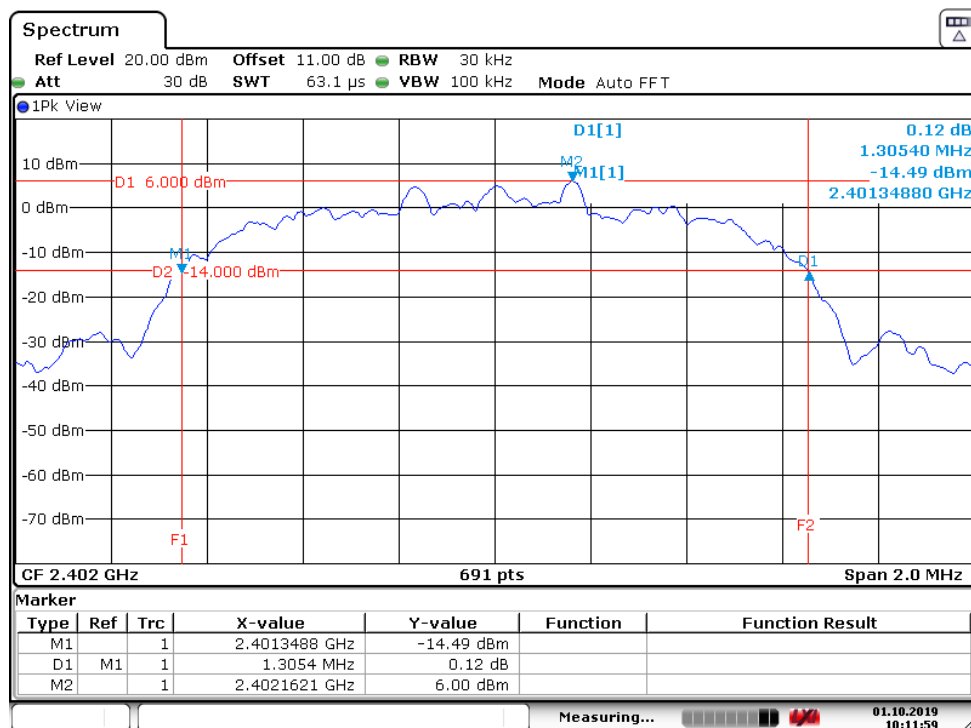
### Middle Channel



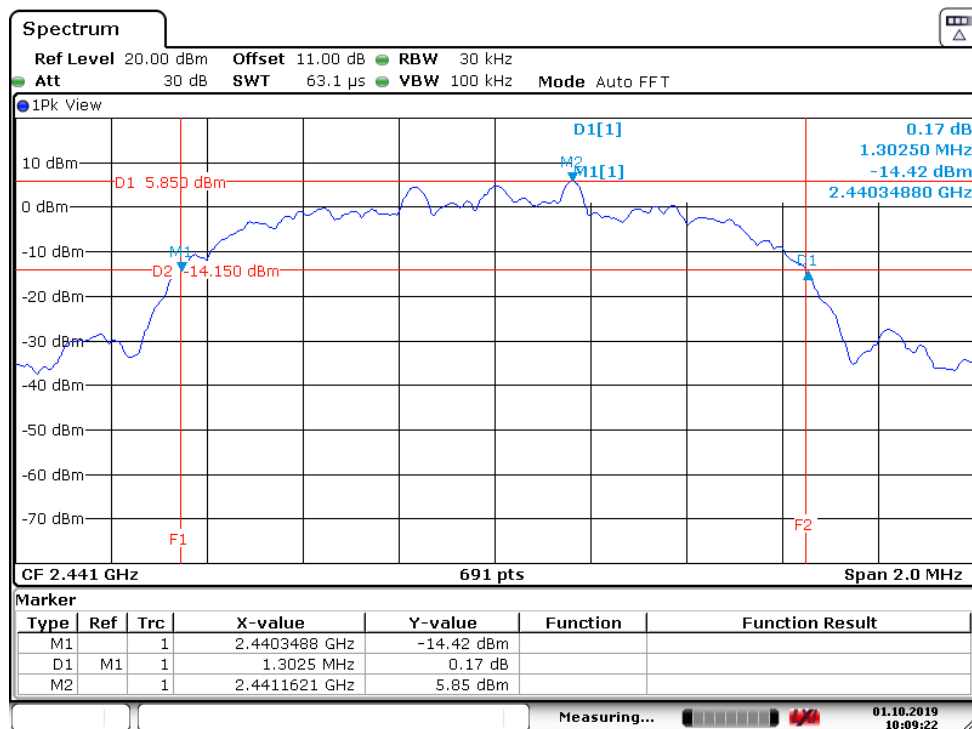
Date: 1.OCT.2019 10:43:03

**High Channel**


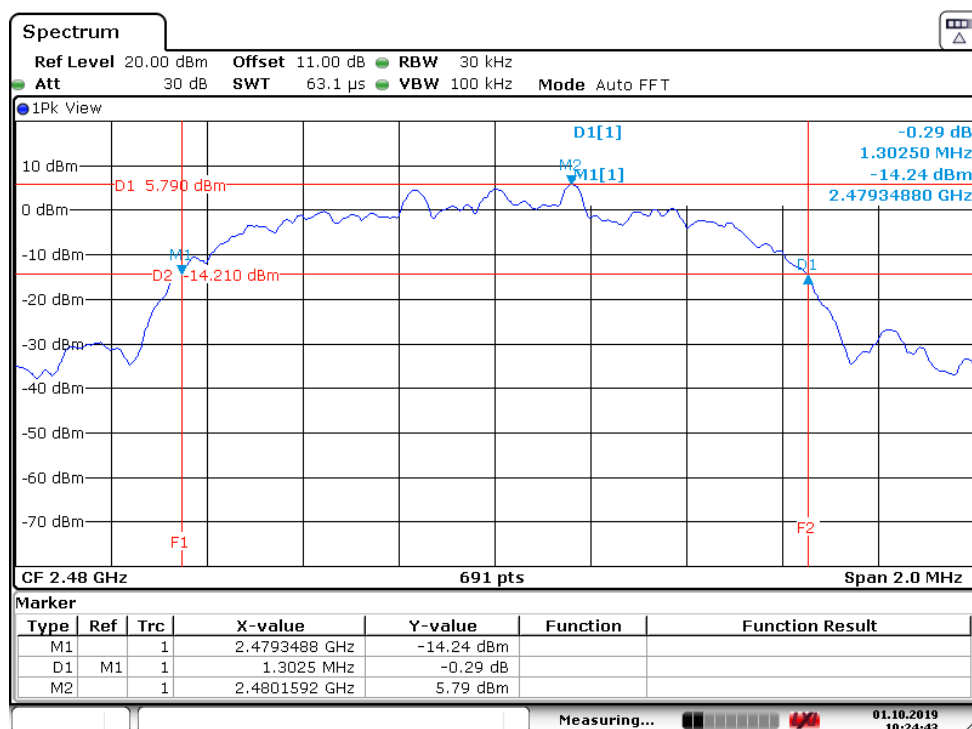
Date: 4.OCT.2019 12:26:37

**Test Plot of 20dB Bandwidth, 3DH5**
**Low Channel**


Date: 1.OCT.2019 10:11:59

**Middle Channel**


Date: 1.OCT.2019 10:09:21

**High Channel**


Date: 1.OCT.2019 10:24:43



### 5.1.4 99% Bandwidth

**RESULT:****Passed**

Test standard : RSS-Gen (Issue 5)  
Basic standard : RSS-Gen (Issue 5)  
Kind of test site : Shielded room

**Test setup**

Test Channel : Middle  
Operation Mode : A  
  
Ambient temperature : 22-26°C  
Relative humidity : 50-65%  
Atmospheric pressure : 100-103kPa

**Table 14: Test result of 99% Bandwidth, 1DH5**

Channel	Channel Frequency (MHz)	99% Bandwidth (kHz)
Mid Channel	2441	872.65

**Table 15: Test result of 99% Bandwidth, 2DH5**

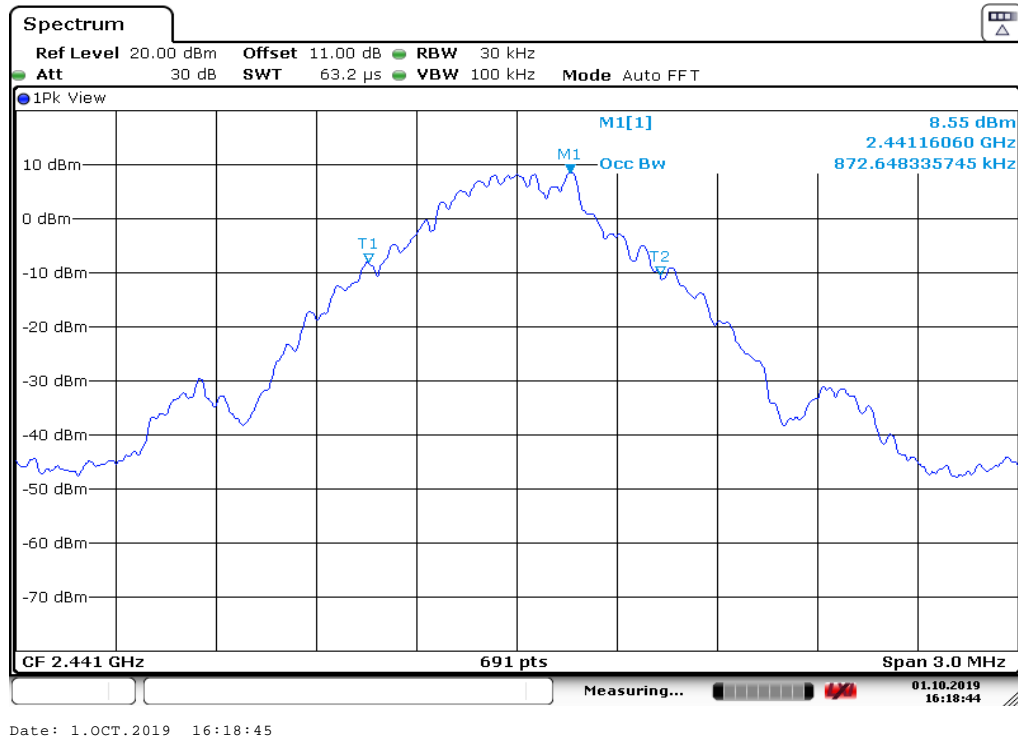
Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Mid Channel	2441	1.194

**Table 16: Test result of 99% Bandwidth, 3DH5**

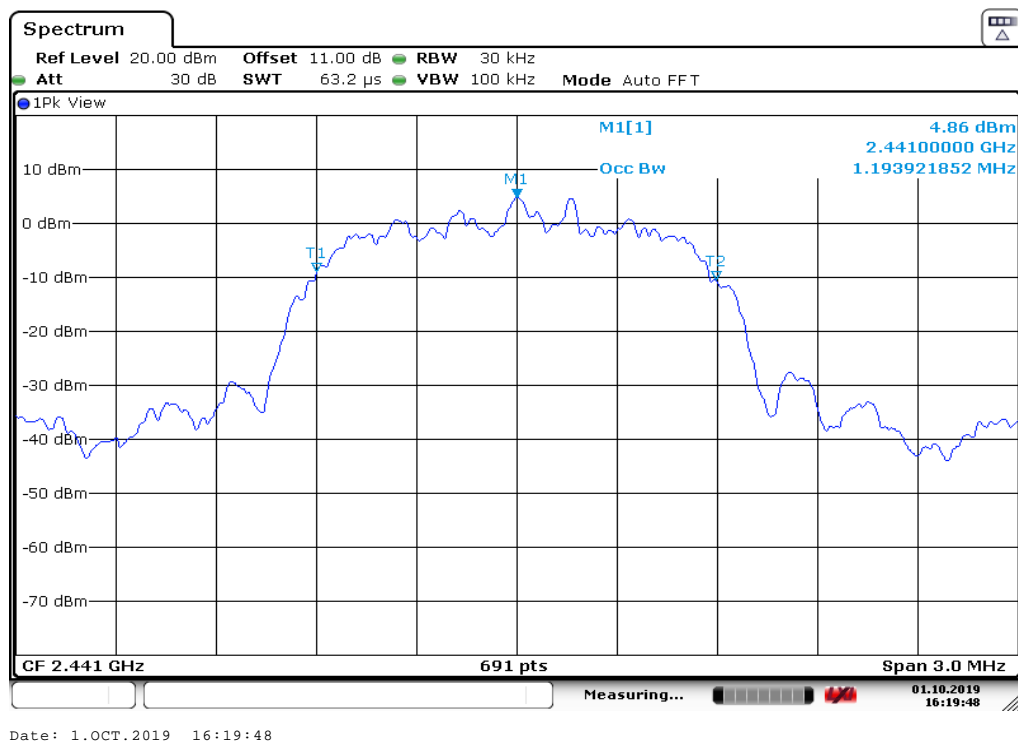
Channel	Channel Frequency (MHz)	99% Bandwidth (MHz)
Mid Channel	2441	1.181

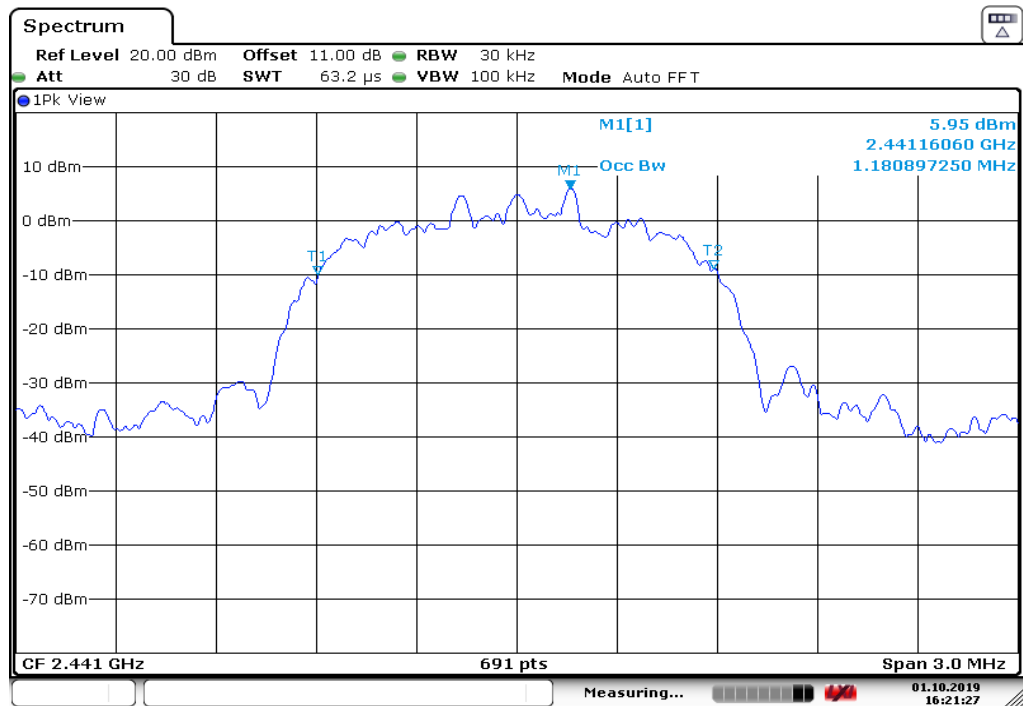
## Test Plot of 99% Bandwidth

### Middle Channel 1DH5



### Middle Channel 2DH5



**Middle Channel 3DH5**


Date: 1.OCT.2019 16:21:28

### 5.1.5 Conducted spurious emissions and Frequency Band Edge measured in 100kHz Bandwidth

**RESULT:****Passed**

Test standard	:	FCC part 15.247(d), RSS-247 5.5
Basic standard	:	ANSI C63.10:2013
Limit	:	20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power)
Kind of test site	:	Shielded room

**Test setup**

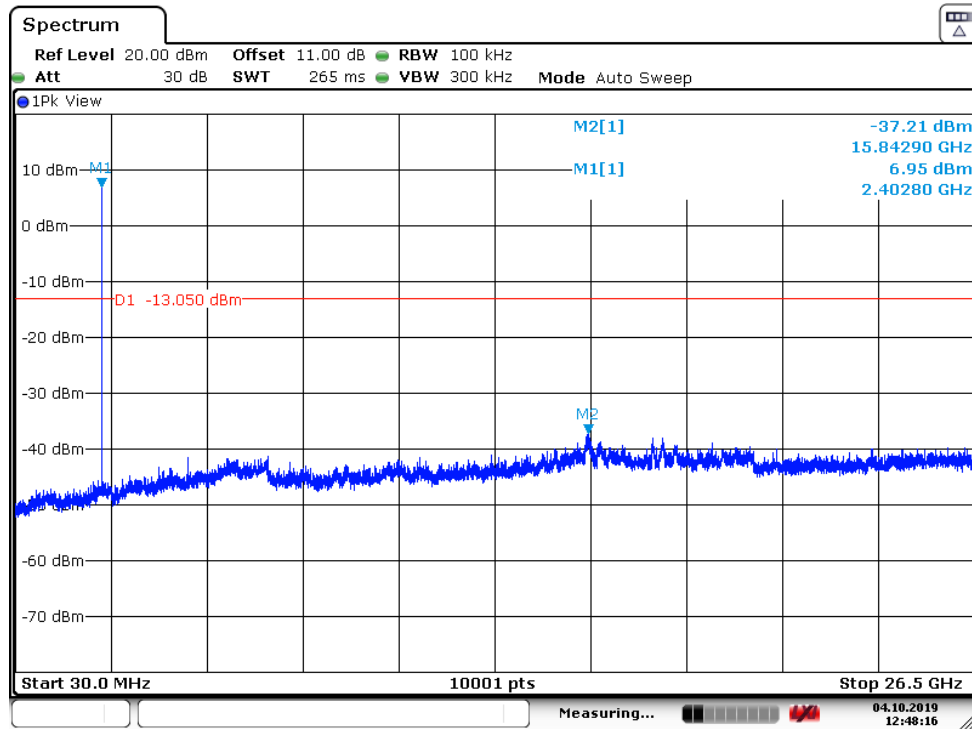
Test Channel	:	Low/ Middle/ High for Conducted Spurious Emissions Low/ High/ Hopping on for Frequency Band Edge
Operation Mode	:	A
Ambient temperature	:	22-26°C
Relative humidity	:	50-65%
Atmospheric pressure	:	100-103 kPa

All emissions are more than 20dB below fundamental, details refer to following test plot, and compliance is achieved as well.

Due to the small size of the RF circuit and that there are no inductive components of significant size connected to the antenna port, 9kHz to 30MHz frequency range is not tested based on technical judgment.

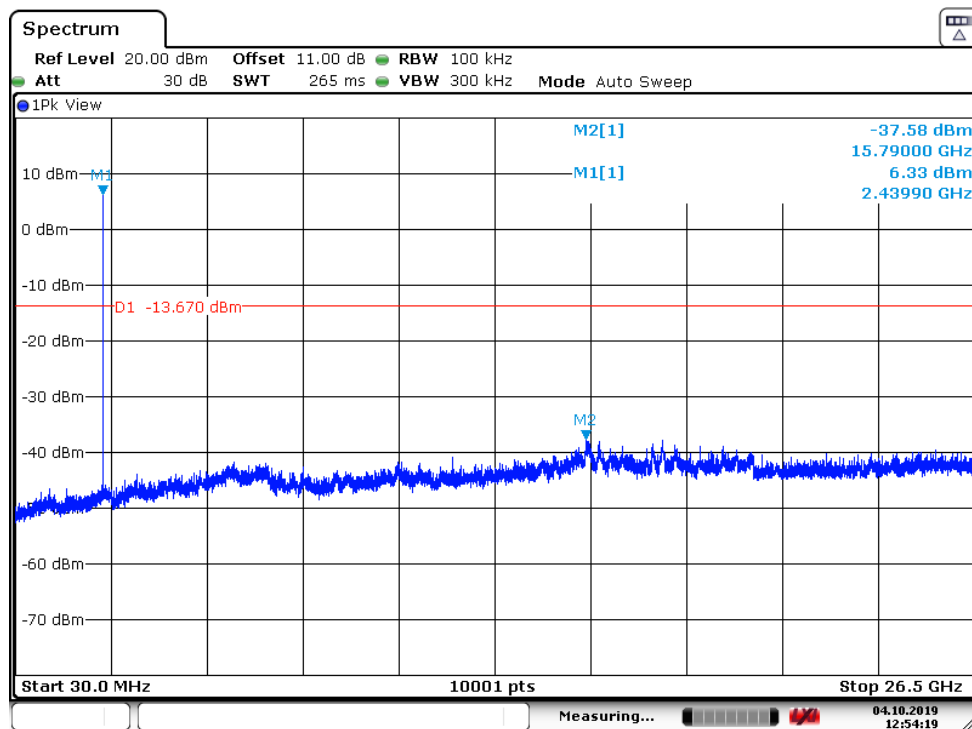
## Test Plot of 100kHz Conducted Emissions, 1DH5

### Low Channel

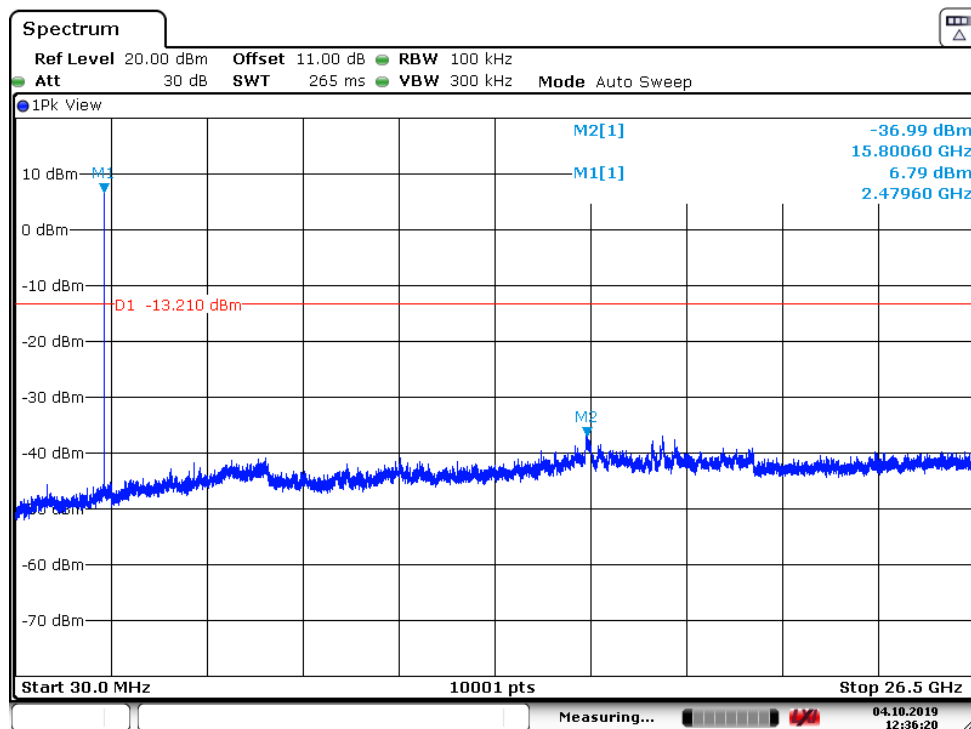


Date: 4.OCT.2019 12:48:16

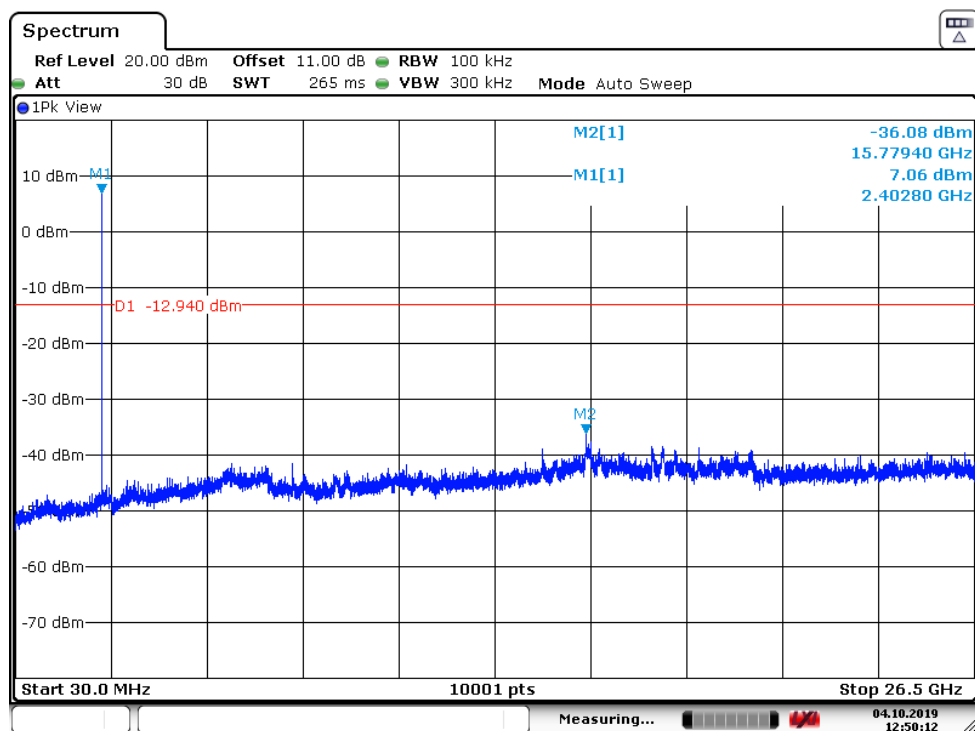
### Middle Channel



Date: 4.OCT.2019 12:54:20

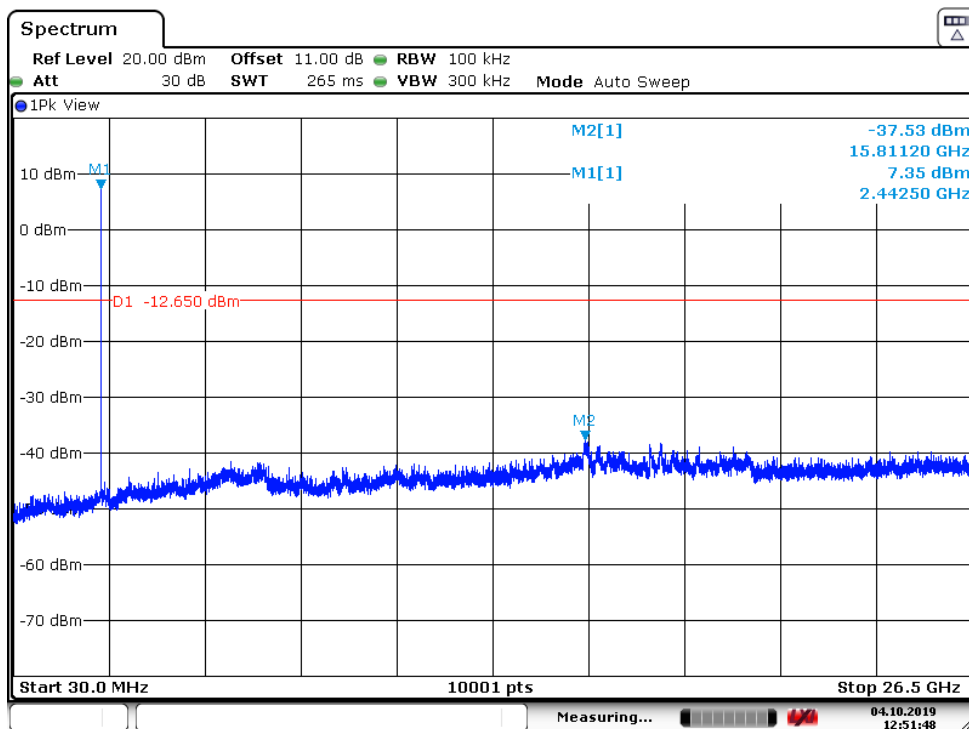
**High Channel**


Date: 4.OCT.2019 12:36:21

**Test Plot of 100kHz Conducted Emissions, 2DH5**
**Low Channel**


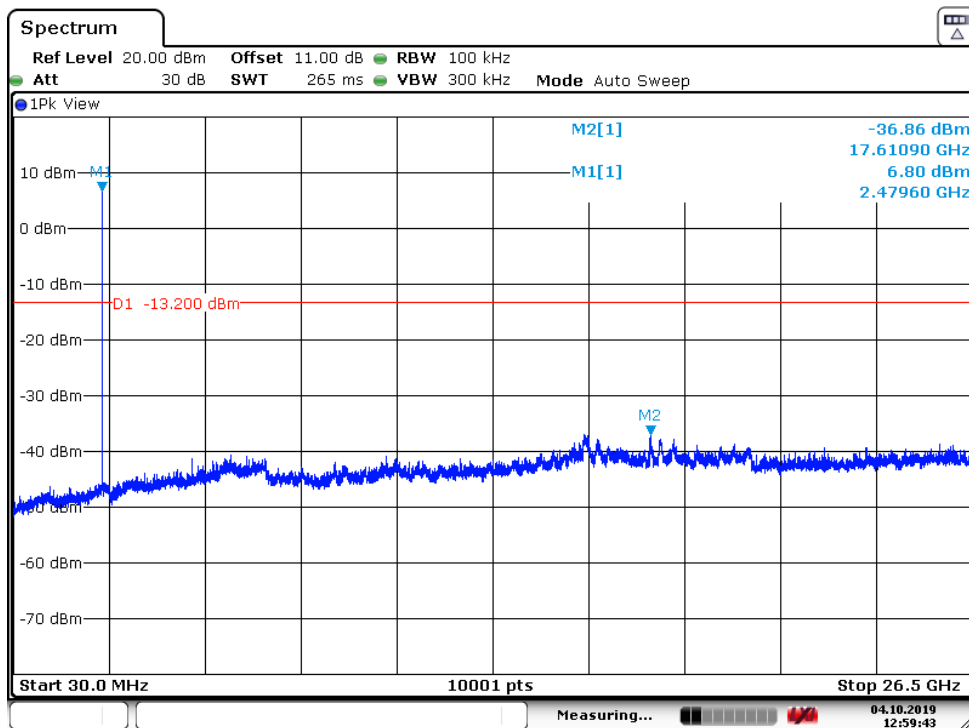
Date: 4.OCT.2019 12:50:12

### Middle Channel



Date: 4.OCT.2019 12:51:48

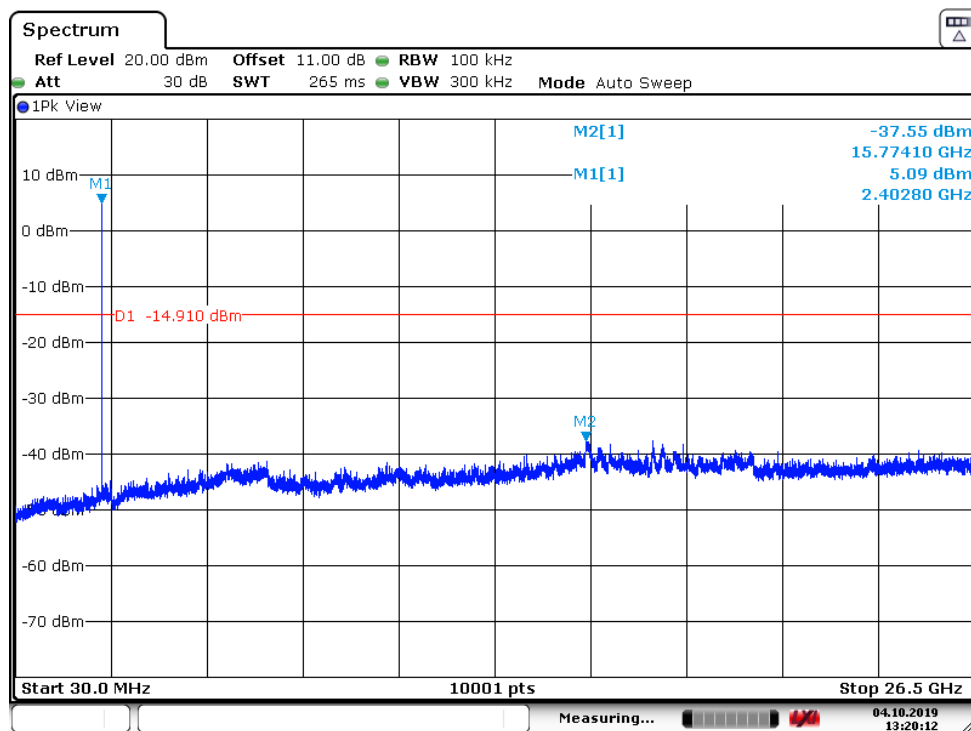
### High Channel



Date: 4.OCT.2019 12:59:43

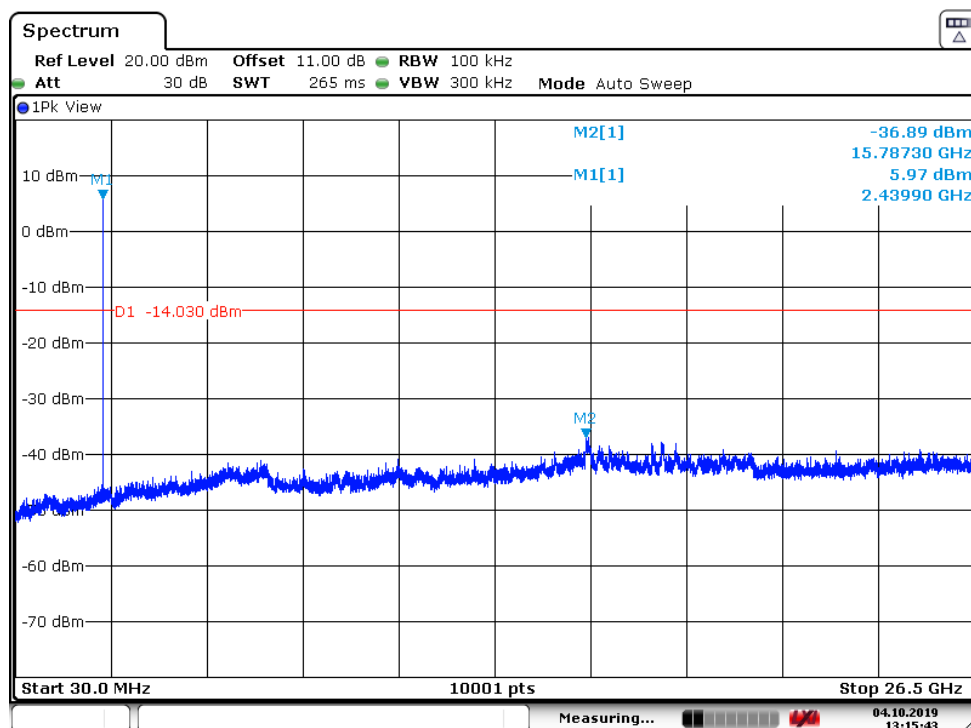
## Test Plot of 100kHz Conducted Emissions, 3DH5

### Low Channel



Date: 4.OCT.2019 13:20:12

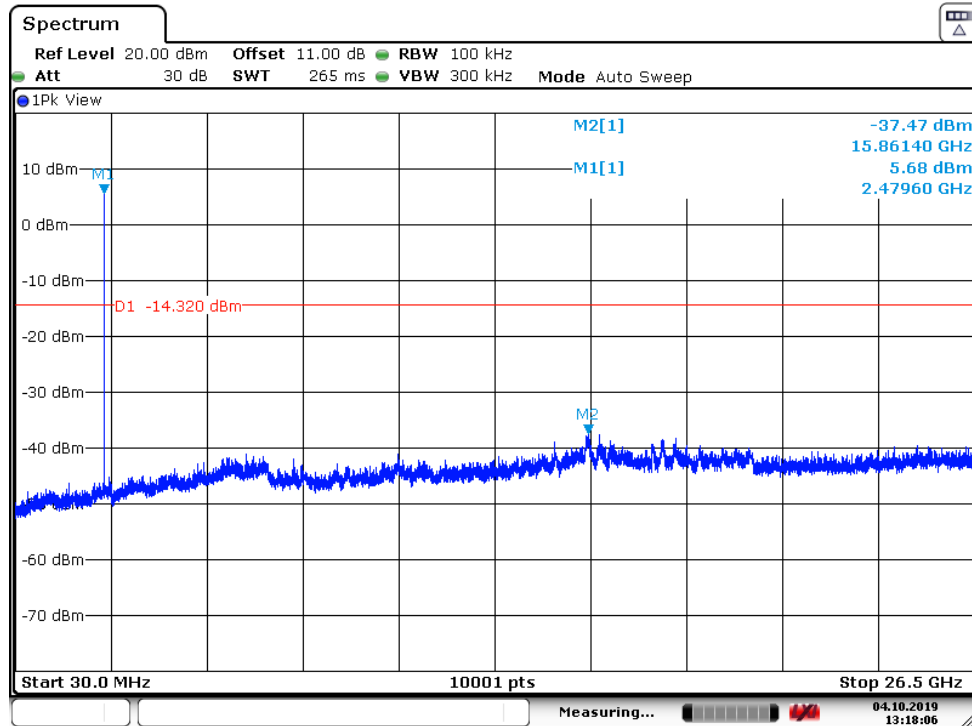
### Middle Channel



Date: 4.OCT.2019 13:15:43



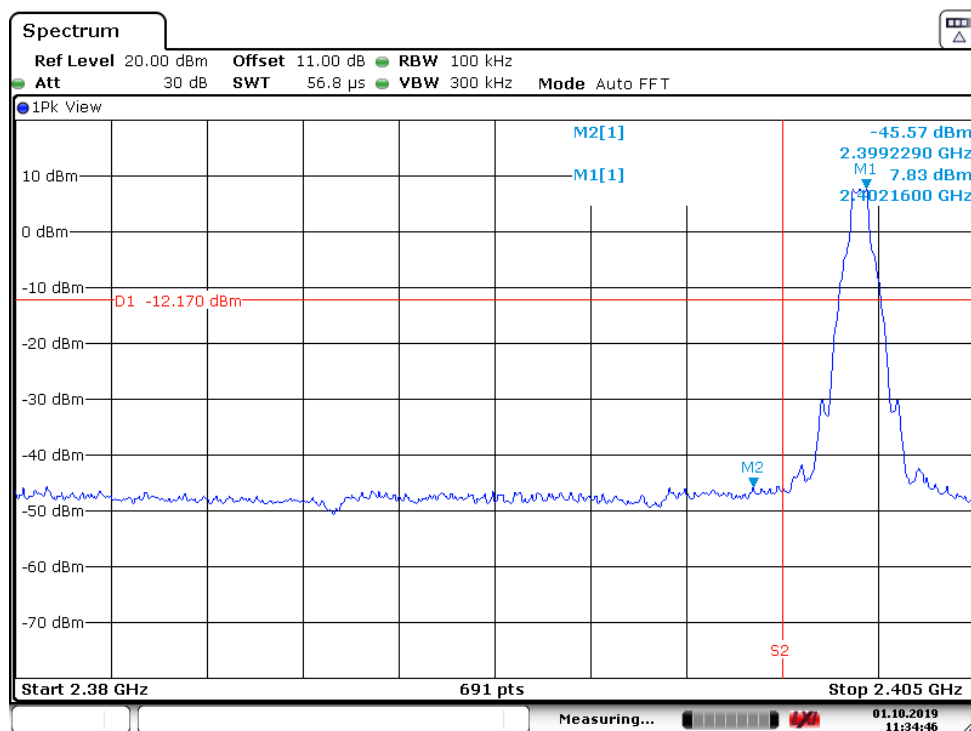
## High Channel



Date: 4.OCT.2019 13:18:06

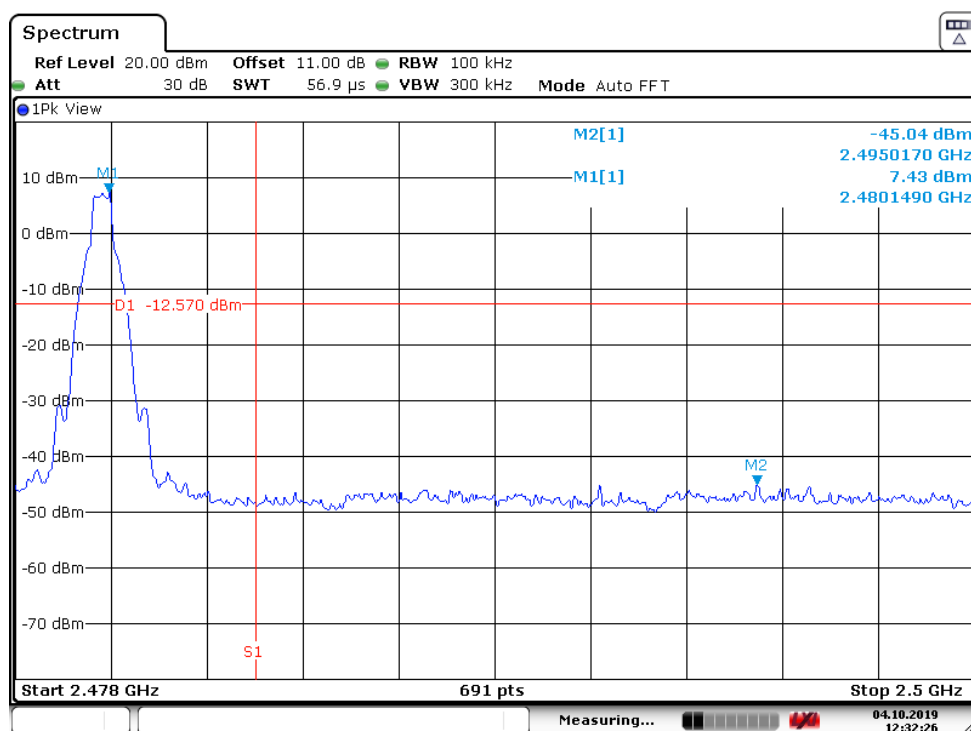
## Test Plot of 100kHz Bandwidth of Frequency Band Edge, 1DH5

### Low Channel



Date: 1.OCT.2019 11:34:46

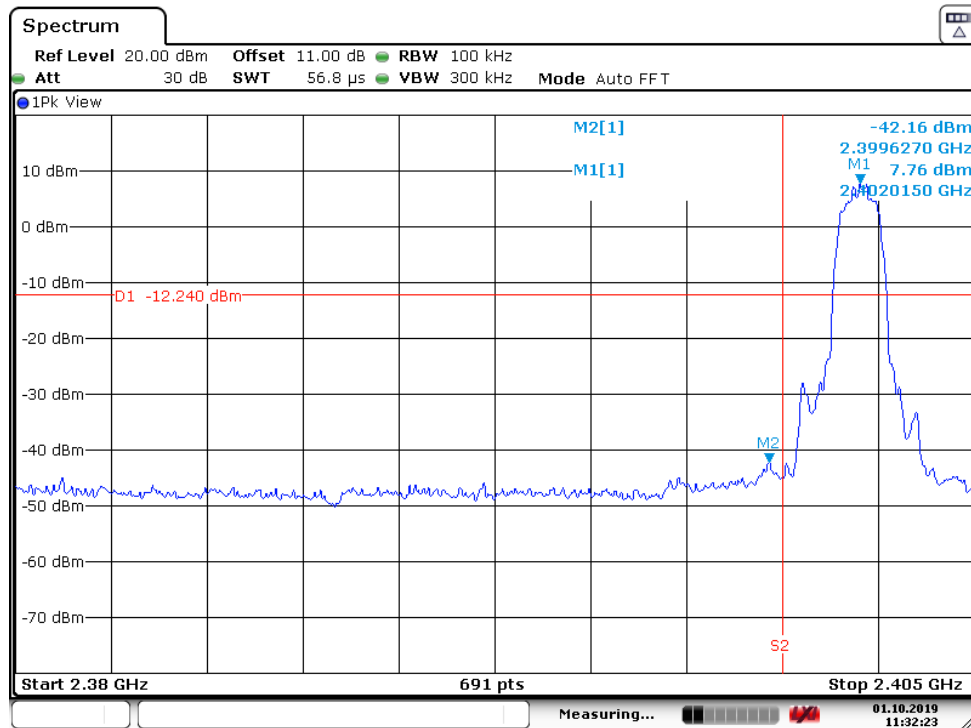
### High Channel



Date: 4.OCT.2019 12:32:26

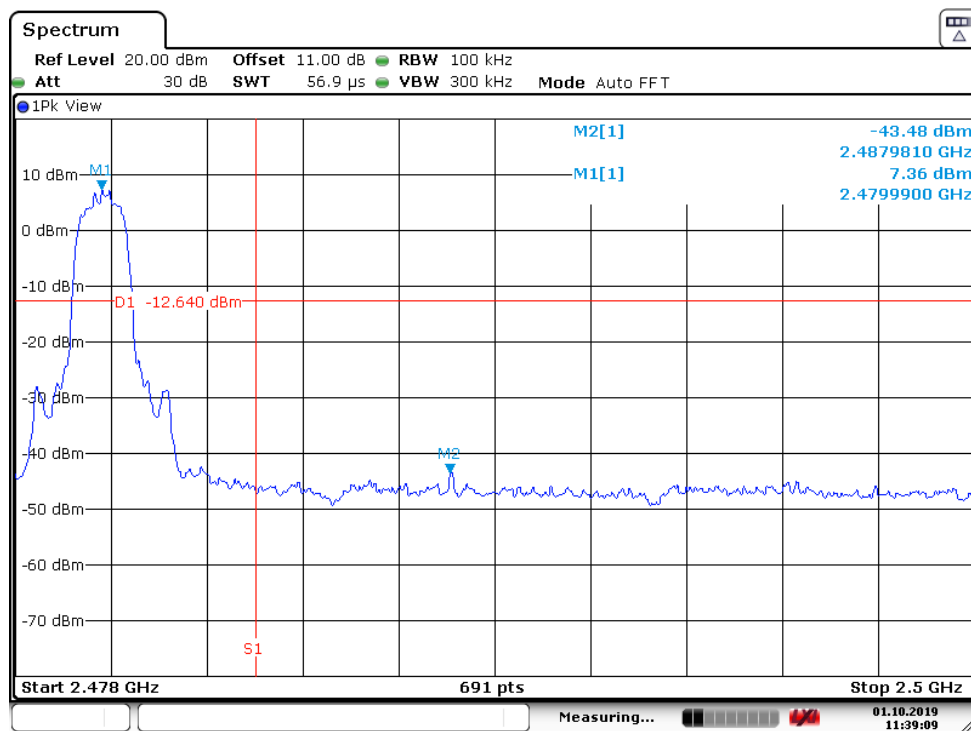
## Test Plot of 100kHz Bandwidth of Frequency Band Edge, 2DH5

### Low Channel



Date: 1.OCT.2019 11:32:23

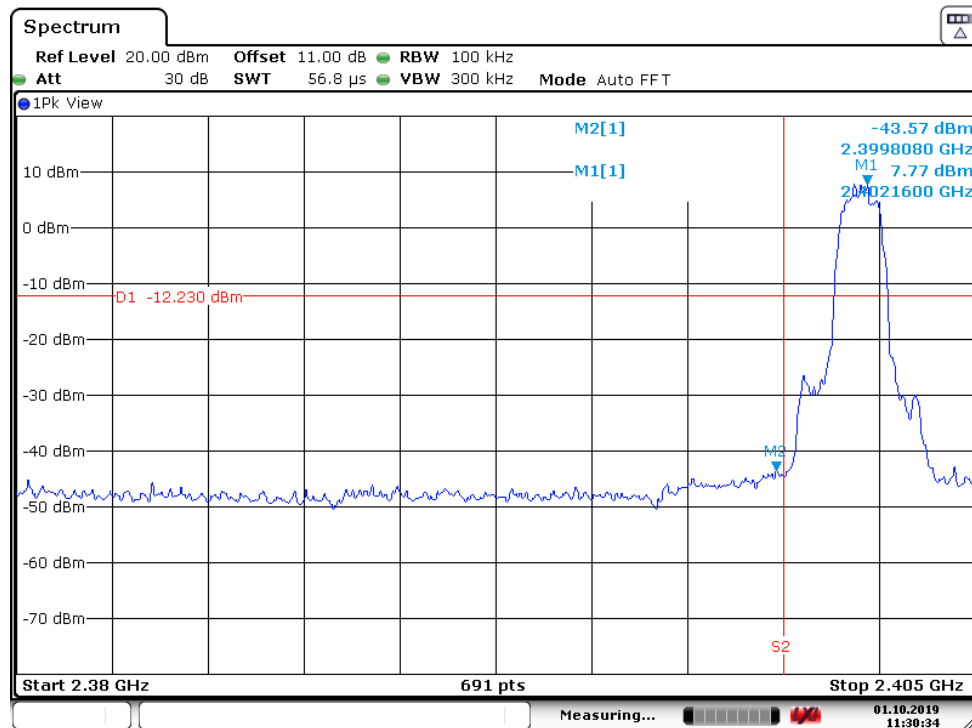
### High Channel



Date: 1.OCT.2019 11:39:09

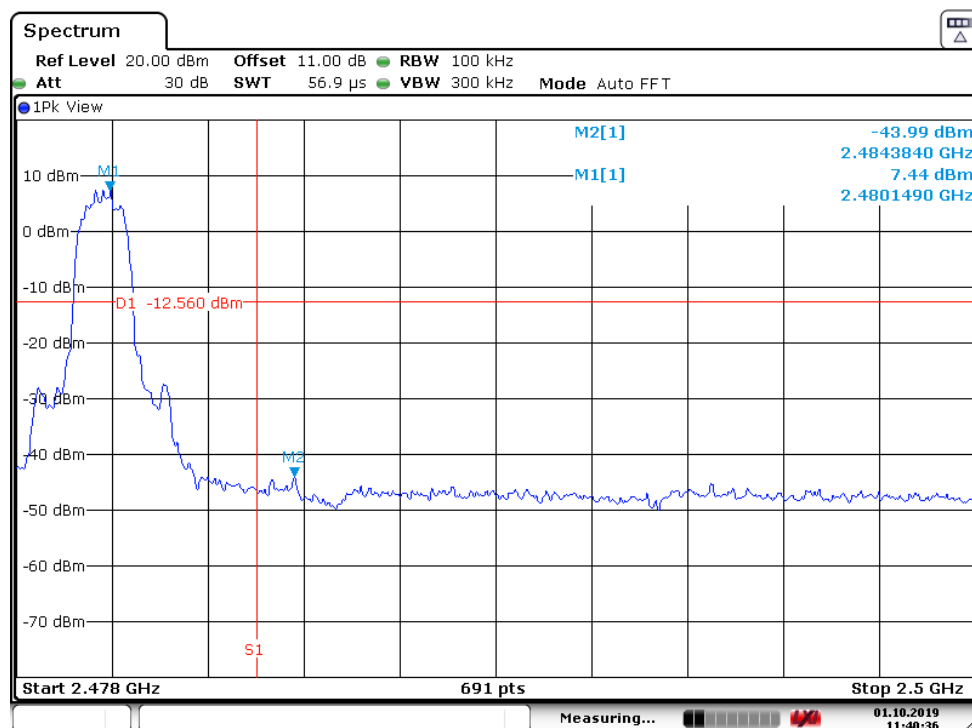
## Test Plot of 100kHz Bandwidth of Frequency Band Edge, 3DH5

### Low Channel



Date: 1.OCT.2019 11:30:34

### High Channel



Date: 1.OCT.2019 11:40:35

## 5.1.6 Spurious Emission

### RESULT:

**Passed**

Test standard	:	FCC part 15.247(d), FCC 15.205, FCC 15.209 and RSS-Gen 8.9
Basic standard	:	ANSI C63.10: 2013
Limits	:	Radiated emissions which fall in the restricted bands, as defined in FCC 15.205(a) and RSS-Gen i5, 8.10 (Table 7), must comply with the radiated emission limits specified in FCC 15.209(a) and RSS-Gen 5, 8.9 (Table 5 and 6). Emission radiated outside the restricted and authorized frequency bands must either comply with the radiated emission limits specified for the restricted bands or in FCC15.247(d) and RSS-247 i2, 5.5
Kind of test site	:	3m Semi-Anechoic Chamber

### Test setup

Test Channel	:	Low/ Middle/ High
Operation Mode	:	A
Ambient temperature	:	22-26°C
Relative humidity	:	50-65%
Atmospheric pressure	:	100-103 kPa

Remark: Testing was carried out within frequency range 9kHz to the tenth harmonic. For details refer to Appendix D. The Radiated Emissions testing was performed in the X, Y and Z axis orientation. The worst-case Axis orientation is recorded in this test report.

## 5.1.7 Frequency Separation

**RESULT:**
**Passed**

Test standard : FCC part 15.247(a)(1), RSS-247 5.1

Basic standard : ANSI C63.10:2013

Limit :  $\geq 25\text{kHz}$  or  $2/3$  of 20dB bandwidth, whichever is greater

Kind of test site : Shielded room

**Test setup**

Test Channel : Hopping On

Operation Mode : C

Ambient temperature : 22-26°C

Relative humidity : 50-65%

Atmospheric pressure : 100-103 kPa

**Table 17: Test result of Frequency Separation, 1DH5**

Channel	Channel Frequency (MHz)	Measured Channel Separation (MHz)	Limit (kHz)	Result
Record Channel	2441	1	$\geq 25\text{kHz}$ or $2/3$ of 20dB bandwidth	Pass
Record Channel adj 1	2440			
Record Channel adj 2	2442			

**Table 18: Test result of Frequency Separation, 2DH5**

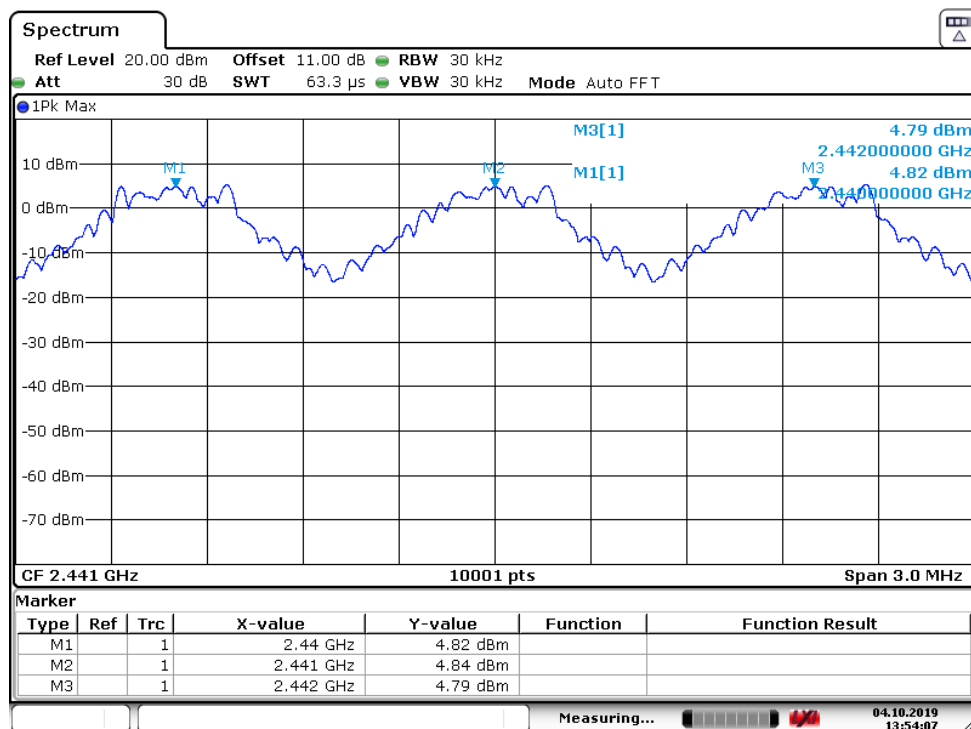
Channel	Channel Frequency (MHz)	Measured Channel Separation (MHz)	Limit (kHz)	Result
Record Channel	2441	1	$\geq 25\text{kHz}$ or $2/3$ of 20dB bandwidth	Pass
Record Channel adj 1	2440			
Record Channel adj 2	2442			

**Table 19: Test result of Frequency Separation, 3DH5**

Channel	Channel Frequency (MHz)	Measured Channel Separation (MHz)	Limit (kHz)	Result
Record Channel	2441	1	$\geq 25\text{kHz}$ or 2/3 of 20dB bandwidth	Pass
Record Channel adj 1	2440			
Record Channel adj 2	2442			

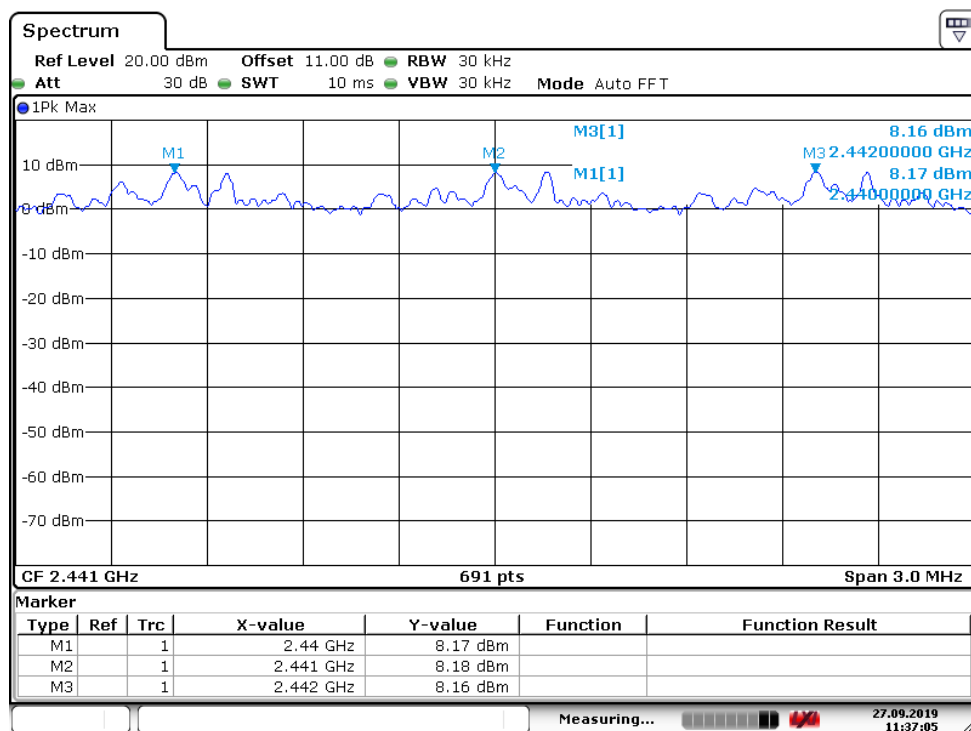
## Test Plot of Frequency Separation

### 1DH5



Date: 4.OCT.2019 13:54:07

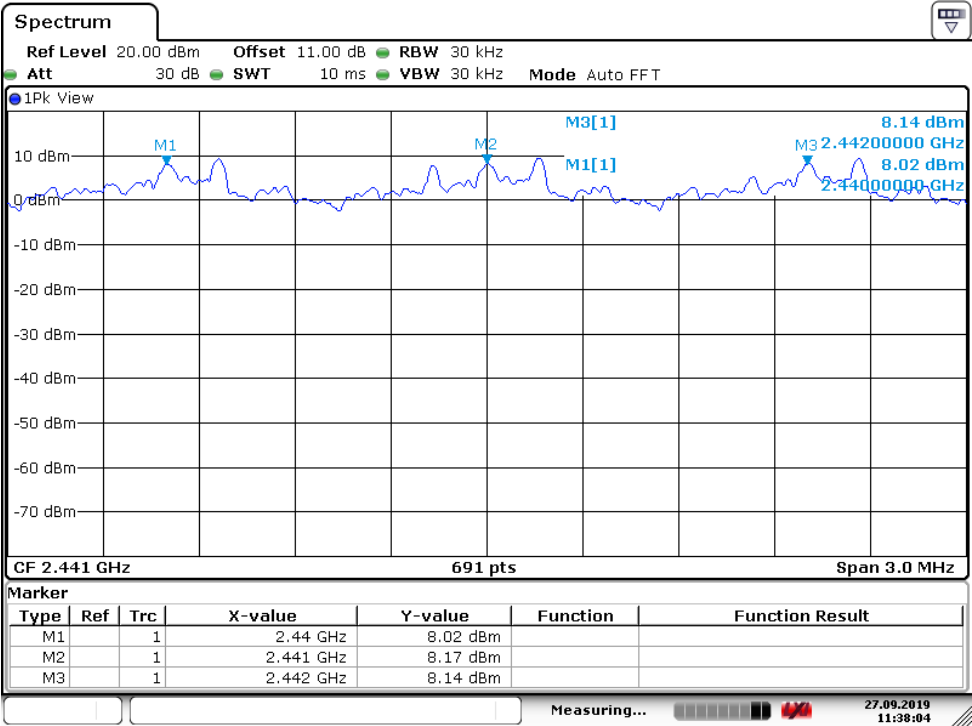
### 2DH5



Date: 27.SEP.2019 11:37:05



3DH5



Date: 27.SEP.2019 11:38:04

**5.1.8 Number of hopping frequency****RESULT:****Passed**

Test standard : FCC part 15.247(a)(1)(iii), RSS-247 5.1(5)

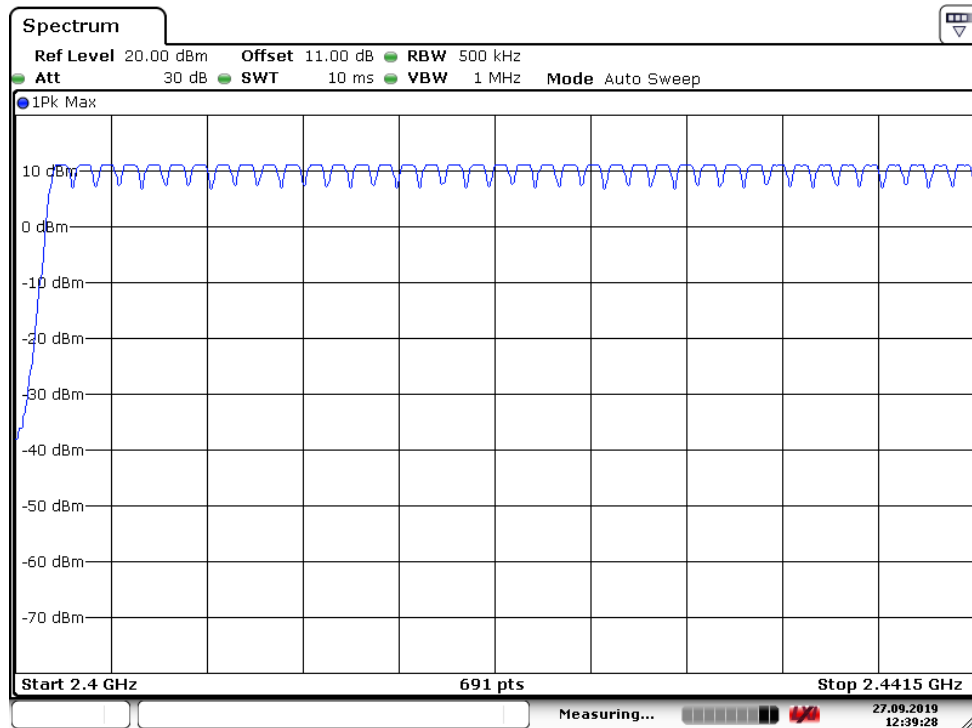
Basic standard : ANSI C63.10:2013

Kind of test site : Shielded room

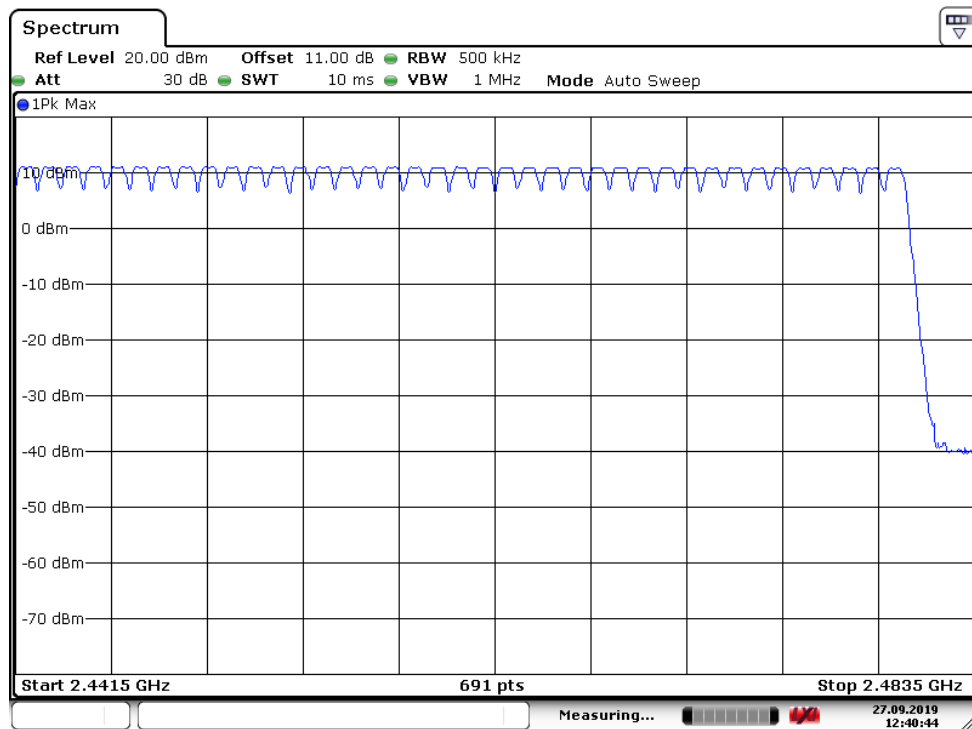
**Test setup**Test Channel : Hopping On  
Operation Mode : CAmbient temperature : 22-26°C  
Relative humidity : 50-65%  
Atmospheric pressure : 100-103 kPa**Table 20: Test result of Number of hopping frequency**

Frequency Range	Measured Quantity of Hopping Channel	Limit	Result
2400 to 2483.5 MHz	79	≥15	Pass

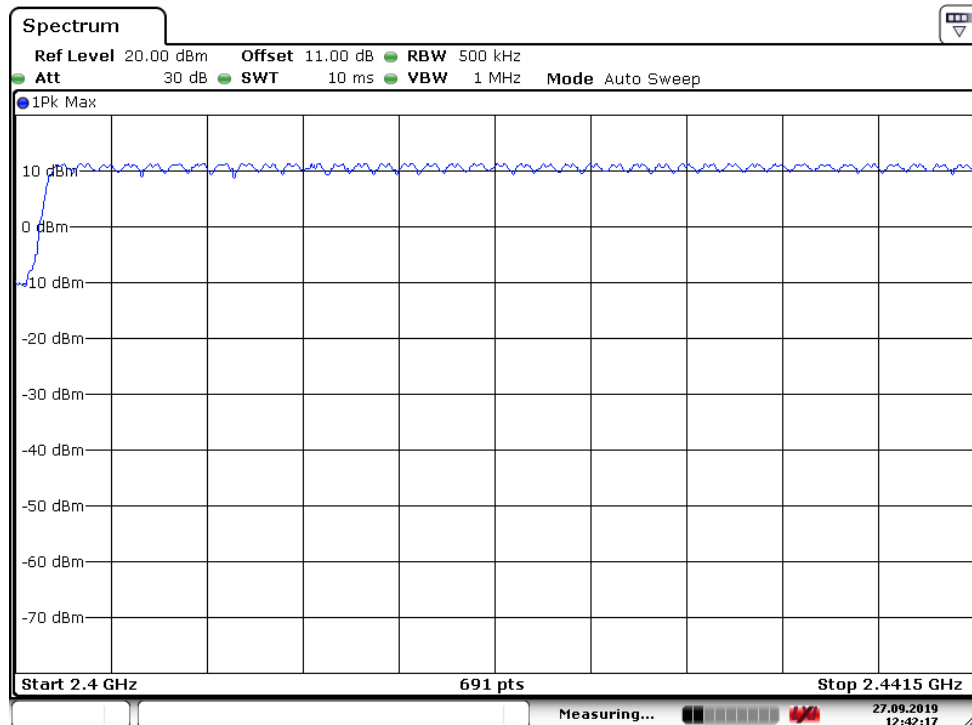
## Test Plot of Number of hopping frequencies

**1DH5**


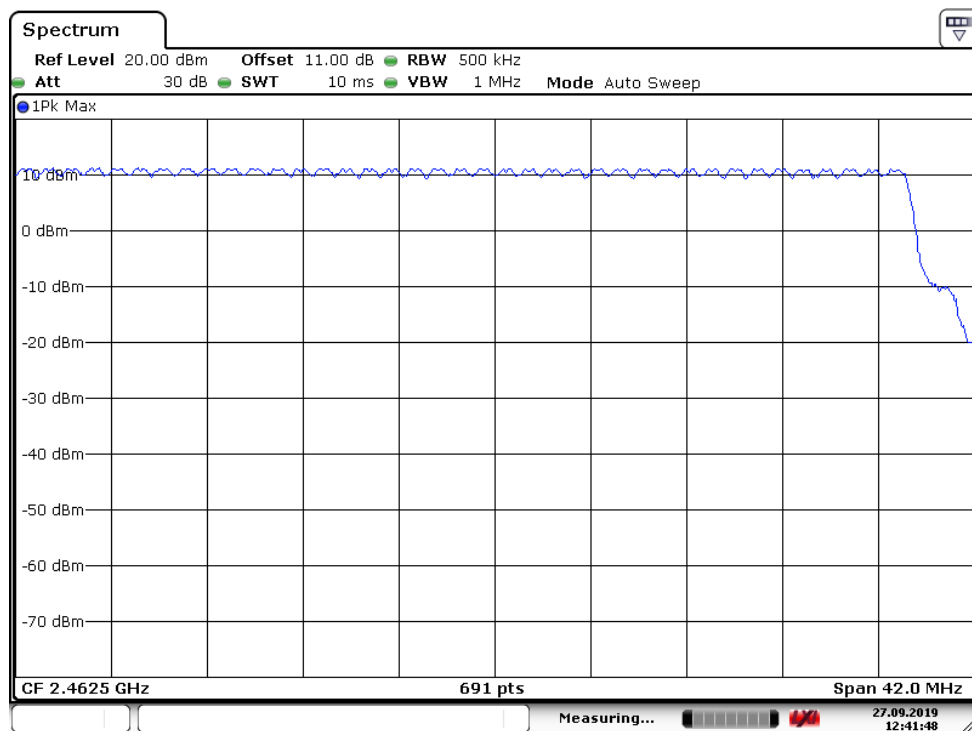
Date: 27.SEP.2019 12:39:29



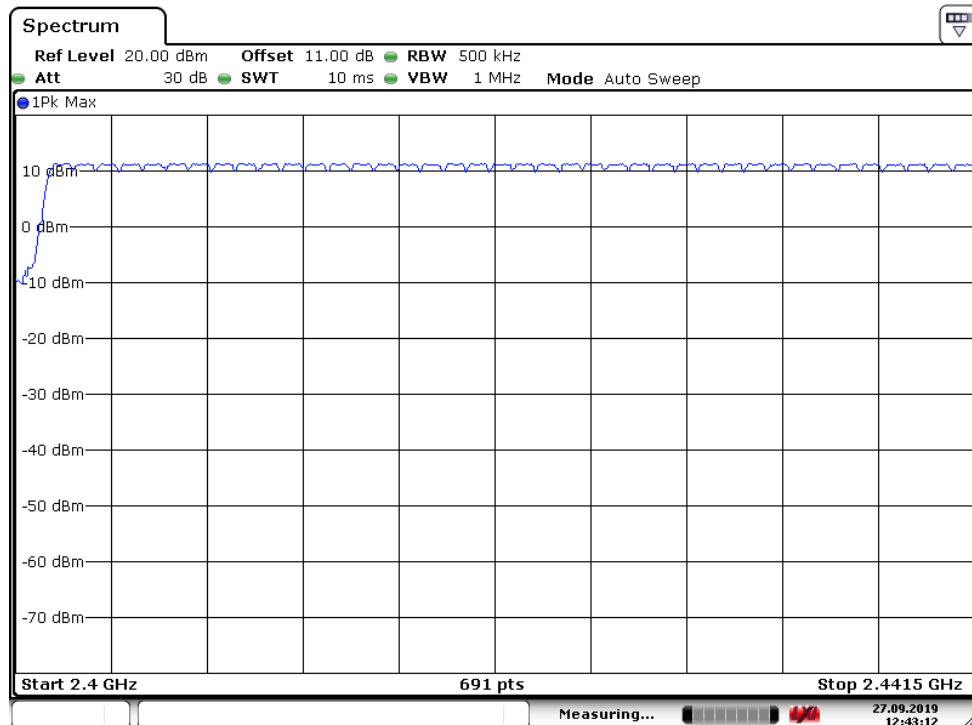
Date: 27.SEP.2019 12:40:45

**2DH5**


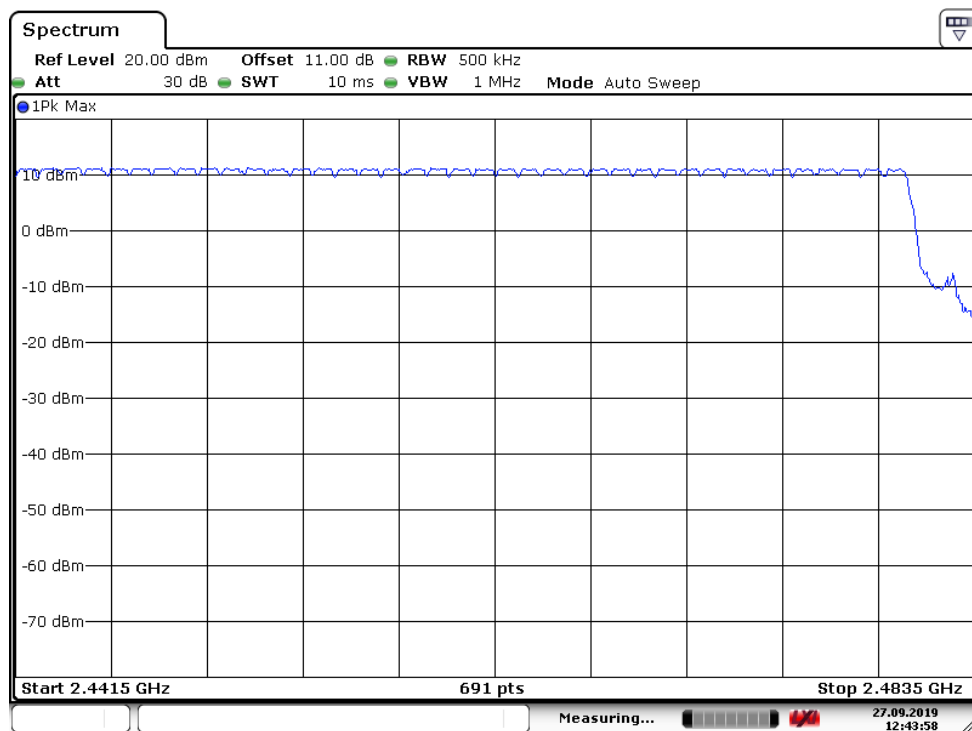
Date: 27.SEP.2019 12:42:17



Date: 27.SEP.2019 12:41:48

**3DH5**


Date: 27.SEP.2019 12:43:11



Date: 27.SEP.2019 12:43:58

## 5.1.9 Time of Occupancy

### RESULT:

**Passed**

Test standard : FCC part 15.247(a)(1)(iii), RSS-247 5.1(5)

Basic standard : ANSI C63.10:2013  
LP0002(2018) Appendix II

Limits : 0.4s

Kind of test site : Shield room

### Test setup

Test Channel : Low

Operation Mode : A

Ambient temperature : 22-26°C

Relative humidity : 50-65%

Atmospheric pressure : 100-103 kPa

**Table 21: Test result of Time of Occupancy**

Data Mode	Captured Burst (s)	Dwell time (s)	On+Off time (s)	Limit (s)	Result
1DH5	0.002923	0.186	0.006273	0.4	Pass
2DH5	0.002911	0.186	0.006273	0.4	Pass
3DH5	0.002906	0.186	0.006264	0.4	Pass

Note:

Dwell time = Pulse width x (Hopping rate / Number of channels) x Period

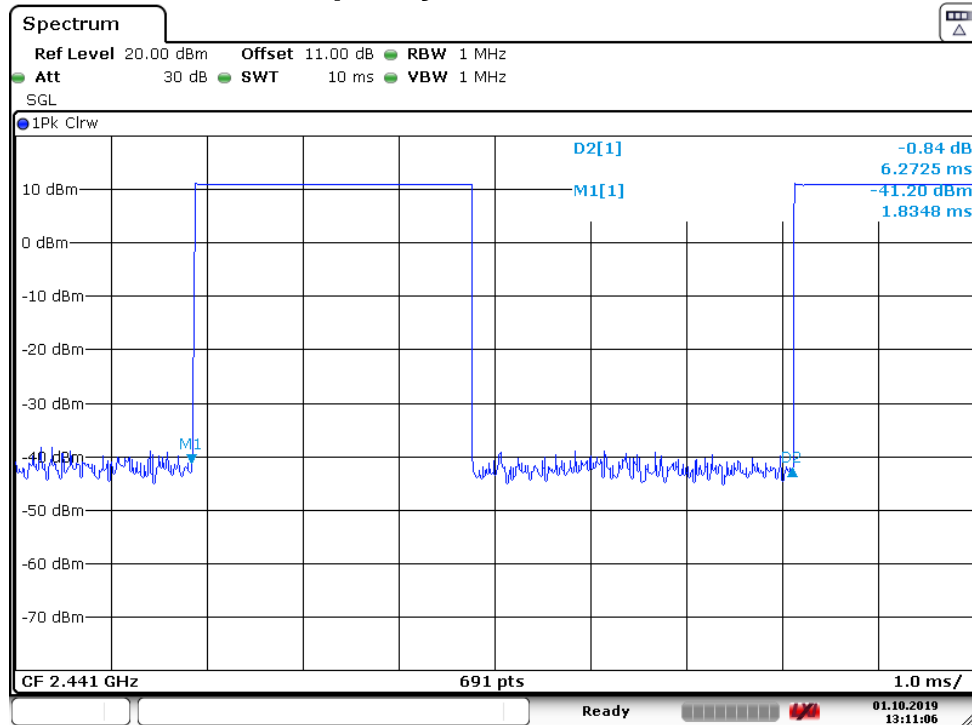
Period = 0.4 (seconds/ channel) x 79 (channel) = 31.6 seconds.

Hopping rate for 1DH5= 159 Hz

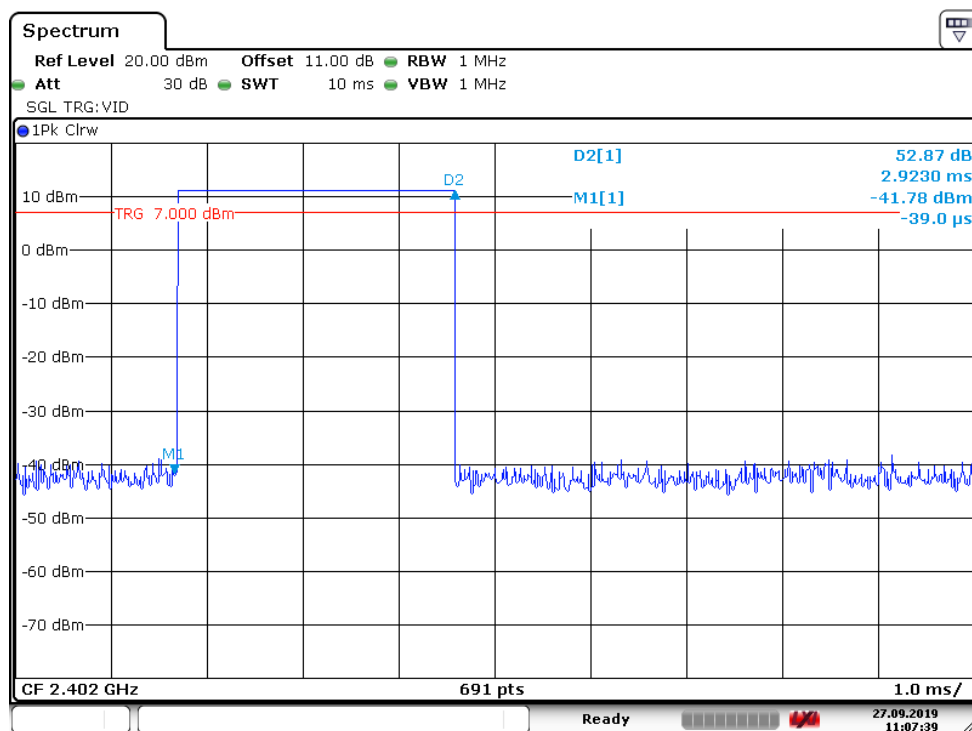
Hopping rate for 2DH5= 159 Hz

Hopping rate for 3DH5= 160 Hz

## Test Plot of Time of Occupancy, 1DH5

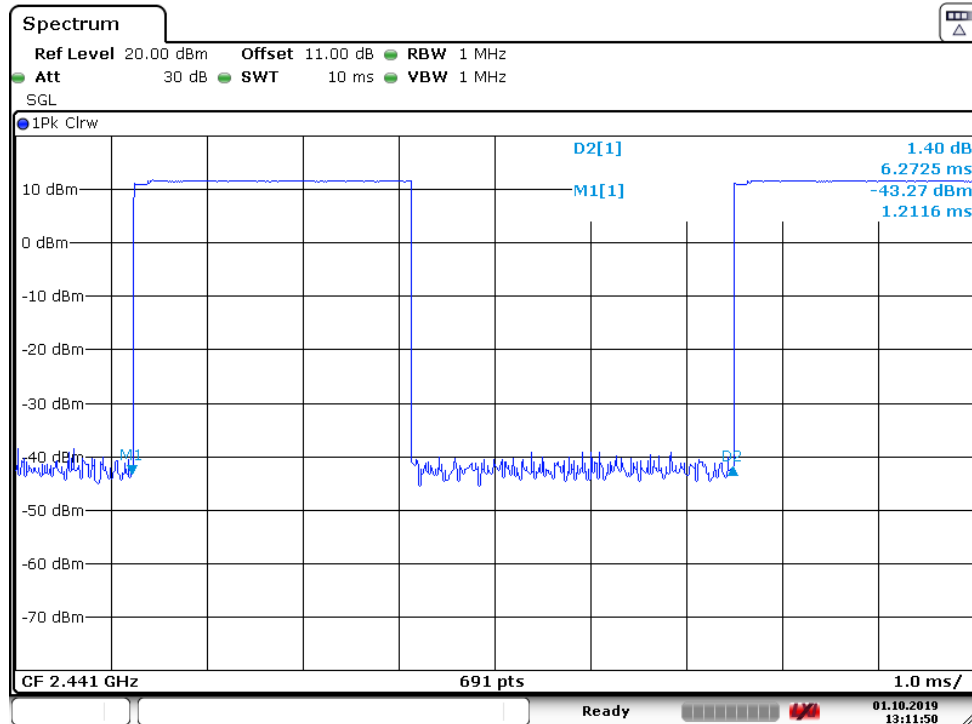


Date: 1.OCT.2019 13:11:07

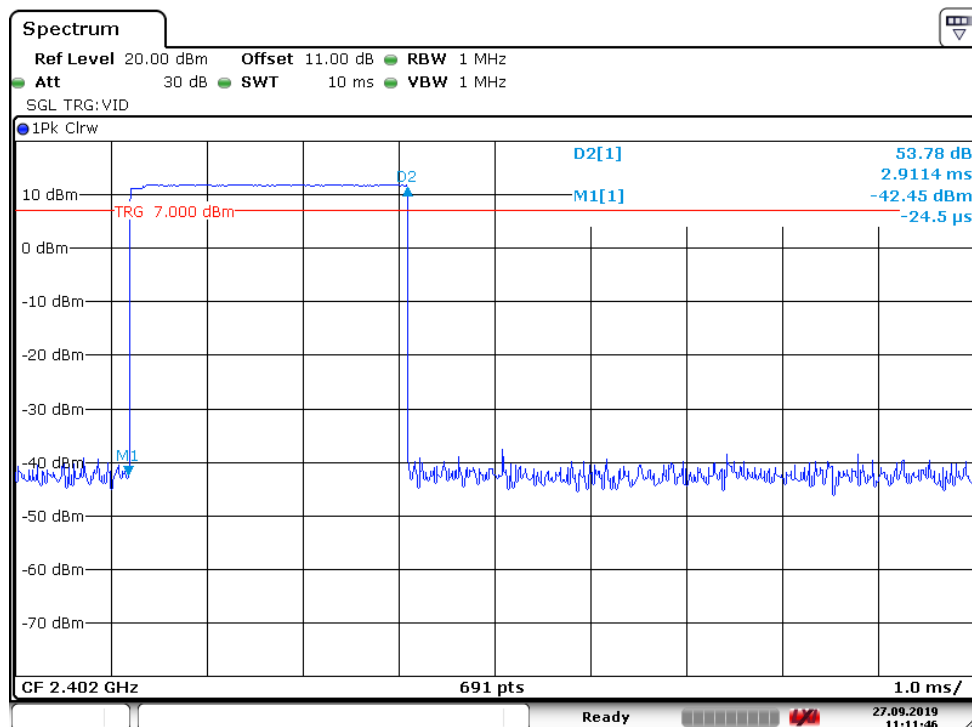


Date: 27.SEP.2019 11:07:40

## Test Plot of Time of Occupancy, 2DH5



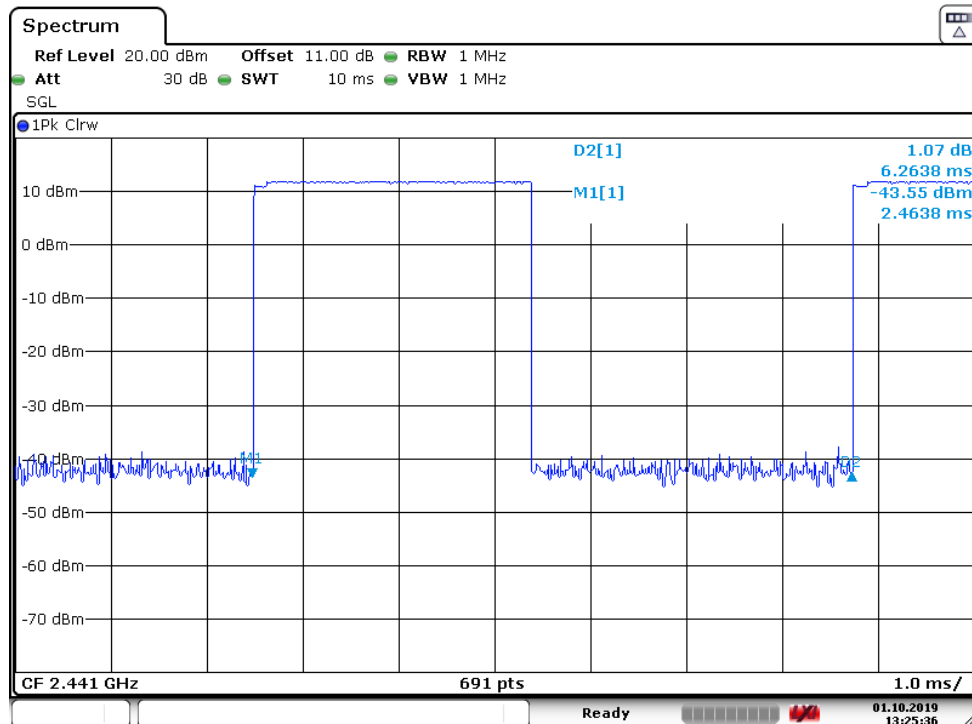
Date: 1.OCT.2019 13:11:50



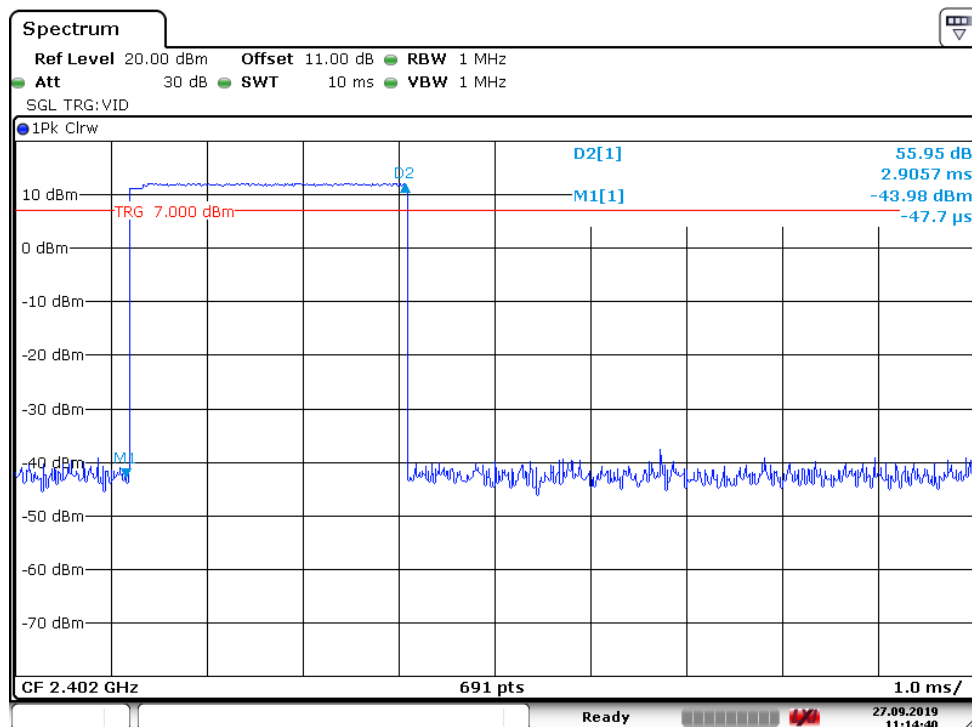
Date: 27.SEP.2019 11:11:46



## Test Plot of Time of Occupancy, 3DH5



Date: 1.OCT.2019 13:25:37



Date: 27.SEP.2019 11:14:41

## 6. Safety Human exposure

### 6.1 Radio Frequency Exposure Compliance

#### 6.1.1 Electromagnetic Fields

**RESULT:****Passed**

Test standard : FCC KDB Publication 447498 D01,  
RSS-102 issue 5, Table 1

The maximum of Average output power is 8.01dBm(6.32mW)

FCC:

Since maximum peak output power of the transmitter is 6.3 mW < 10mW, hence the EUT is excluded from SAR evaluation according to FCC KDB publication 447498: Mobile Portable RF Exposure

Canada:

Please refer to the SAR test report BTL-ISED SAR-1-1910T078 R00.

## 7. Photographs of the Test Set-Up

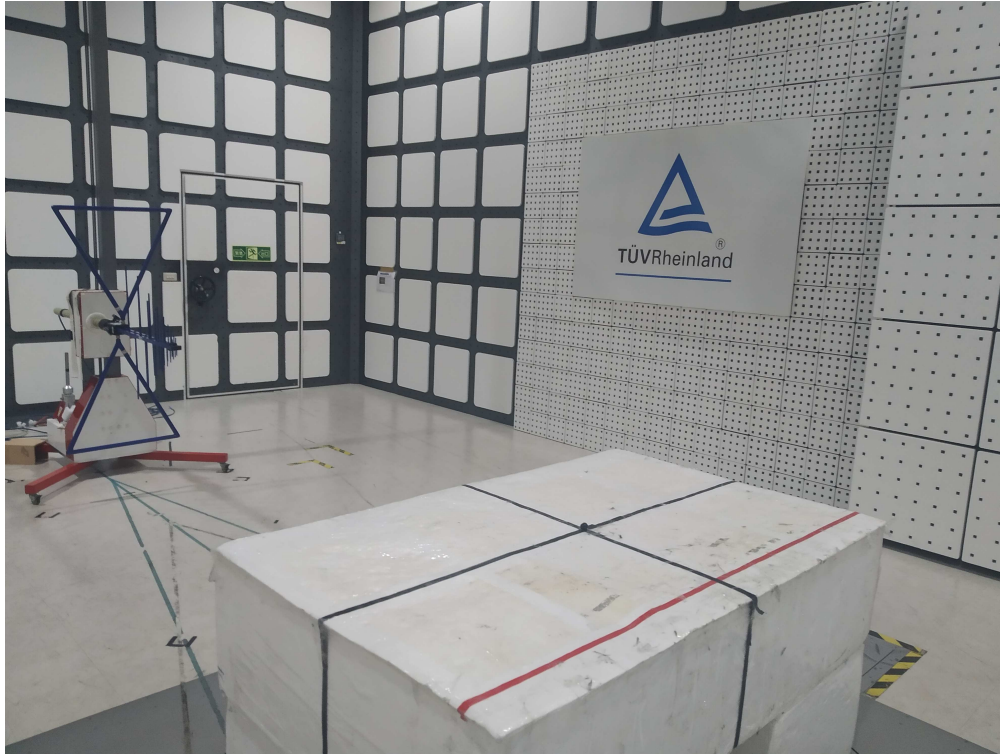
**Photograph 1: Set-up for Spurious Emissions (Front View 1)**



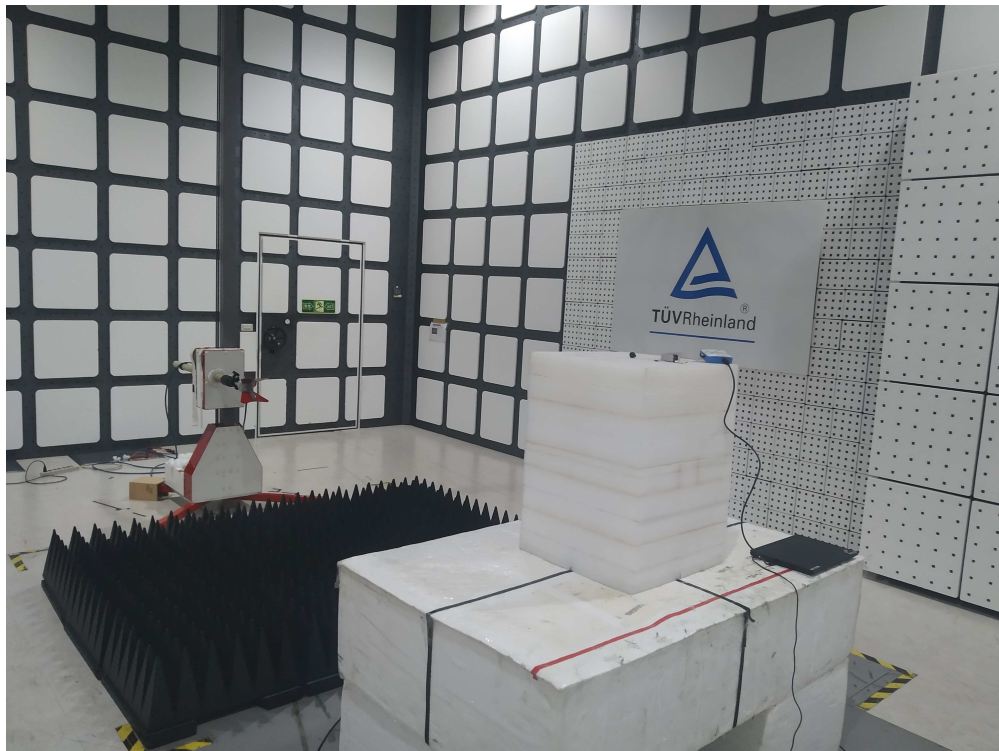
**Photograph 2: Set-up for Spurious Emissions (Front View 2)**



**Photograph 3: Set-up for Spurious Emissions (Back View 1)**



**Photograph 4: Set-up for Spurious Emissions (Back View 2)**



**Photograph 5: Set-up for Conducted testing**





## 8. List of Tables

Table 1: Applied Standard and Test Levels .....	5
Table 2: List of Test and Measurement Equipment .....	7
Table 3: Emission Measurement Uncertainty.....	8
Table 4: Basic Information of EUT .....	9
Table 5: Technical Specification of EUT .....	9
Table 6: Frequency hopping information.....	10
Table 7: Table for Parameters of Test Software Setting .....	13
Table 8: Test result of Peak Output Power, 1DH5 .....	17
Table 9: Test result of Peak Output Power, 2DH5 .....	17
Table 10: Test result of Peak Output Power, 3DH5 .....	18
Table 11: Test result of 20dB Bandwidth, 1DH5 .....	19
Table 12: Test result of 20dB Bandwidth, 2DH5 .....	19
Table 13: Test result of 20dB Bandwidth, 3DH5 .....	20
Table 14: Test result of 99% Bandwidth, 1DH5 .....	25
Table 15: Test result of 99% Bandwidth, 2DH5 .....	25
Table 16: Test result of 99% Bandwidth, 3DH5 .....	25
Table 14: Test result of Frequency Separation, 1DH5 .....	38
Table 15: Test result of Frequency Separation, 2DH5 .....	38
Table 16: Test result of Frequency Separation, 3DH5 .....	39
Table 17: Test result of Number of hopping frequency .....	42
Table 18: Test result of Time of Occupancy.....	46

## 9. List of Photographs

Photograph 1: Set-up for Spurious Emissions (Front View 1).....	51
Photograph 2: Set-up for Spurious Emissions (Front View 2).....	51
Photograph 3: Set-up for Spurious Emissions (Back View 1) .....	52
Photograph 4: Set-up for Spurious Emissions (Back View 2) .....	52
Photograph 5: Set-up for Conducted testing .....	53