



PRODUCT ASSURANCE ENGINEERING  
Wireless Transceiver Bluetooth Test Report

FCC ID: A94440108 IC: 3232A-440108



Test Type: Emissions  Immunity

Product Type: Wireless Headphones

Product Name/Number: Model Number(s): 440108  
FCC ID: A94440108  
IC: 3232A-440108

Prepared For: Product Assurance Engineering Department,  
Bose Corporation

Name of manufacturing agency applying for  
equipment type approval: Bose Corporation

Postal Address of manufacturing Agency: The Mountain  
Framingham, MA 01701  
USA

Test Results: Pass  Fail

Applicable Standards: FCC CFR 47 Part 15 Subpart C  
Industry Canada RSS-247 Issue 2  
Industry Canada RSS-GEN Issue 5

Report Number: EMC.440108.23.159.1

General Comments/Special Test Conditions:

This report relates only to the items tested. This report covers EMC marking requirements for model 440108

	Print Name	Signature	Date
Prepared By:	Bryan Cerqua	<i>Bryan H Cerqua</i>	June 9, 2023
Electrical Engineer Review* By:	Michael Royer	<i>Michael A. Royer</i>	June 9, 2023

\* Since every test result is separately reviewed after its completion, the electrical engineer review indicated above represents a higher-level review to ensure this report lists and contains all applicable and appropriate requirements.

If the report carries the "accredited" logo, the reviewer must verify all the tests in this report are covered under the current ISO17025 accreditation. The A2LA-accredited logo must be removed if any of the tests in the report are not performed under the current scope of accreditation. It is the responsibility of the reviewer to ensure the A2LA advertising policy is followed.



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# 1. Test Report Summary

## Product Information:

### Description

The EUT is a wireless headphone that contains Bluetooth DSS/DTS transceiver IC manufactured by Qualcomm Technologies. The EUT uses Adaptive Frequency Hopping (AFH) mode, using a reduced hop set if in band interference is detected, however a minimum of twenty channels is always maintained as defined in the Bluetooth core specification.

### Setup (Cables and Accessories)

For all radio tests, the EUT was configured using Qualcomm Blue Suite software (details provided in SOFTWARE AND FIRMWARE section).

### EUT Antenna Description

The antenna is PCB etch antenna with a maximum gain of 1.1 dBi.

### SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was version 0.2.15+g34dc106.  
The test utility software used during testing was Blue Suite version 3.3.16.

### Scope:

This report covers EMC requirements. FCC CFR 47 PART 15 SUBPART C, Industry Canada RSS-247 Issue 2, and Industry Canada RSS-GEN Issue 5.

All radiated emissions measurements performed using the internal non-removable PCB etch antenna. The antenna is permanently attached, complies with 15.203.

All conducted RF measurements were done with the trace to the internal PCB etch antenna cut. A short 8" coaxial cable with SMA connector soldered to the trace that would normally be connected to the internal EUT antenna.

### Test Objective:

Verify product meets all applicable EMC requirements.

### Measurement Methods:

ANSI C63.10 (2013).  
RSS-Gen Issue 5 (2018)

### Results:

Product complies with all applicable EMC requirements. All results represent worst-case emissions and/or immunity.

### Conclusions:

The device under test (D.U.T.):  
 meets all test standards selected in section 2 of this report.  
 does not meet all test standards selected in section 2 of this report.



## 2. Test Results Summary

TEST NAME	TEST RESULT PASS or N/A	COMMENT(S)
On Time and Duty Cycle	N/A	For reporting only
20 dB Occupied Bandwidth	N/A	For reporting only
99% Occupied Bandwidth	N/A	For reporting only
Conducted Output Power	Pass	
Hopping Frequency Separation	Pass	
Number of Hopping Channels	Pass	
Average Time of Occupancy	Pass	
Conducted Spurious Emissions	Pass	
Radiated Emissions 1 GHz to 25 GHz	Pass	
Radiated Emissions 30 MHz to 1000 MHz	Pass	
AC Line Conducted Emissions.	Pass	

### EUT serial numbers used for this test report:

Conducted RF: SN C1B002HDT6660F086  
Radiated emissions: SN C1B002HDT6660F061, SN C1B002HDT6660F145, SN 084617M3128F042AE  
Conducted AC mains emissions: SN C1B002HDT6660F145



# 3. Test Standards & Environmental Conditions

## Test Standards

### Emissions:

	<b>Standard</b>
<input checked="" type="checkbox"/>	FCC Part 15C
<input checked="" type="checkbox"/>	Canada RSS-247
<input checked="" type="checkbox"/>	Canada RSS-GEN

## Environmental Conditions

Ambient:	
Temperature:	22±4 °C
Humidity:	30-60 % RH
Internal Battery	3.7 VDC
Voltage:	Nominal



# 4. Lab Accreditations / Registrations

## FCC Test Site Accreditation.

Firm Name	Location	Expiration Date	Accreditation	MRA	Designation Number	Contact	Contact Title	Address	PO Box	Mail Stop	City	State	Zip Code	Country	Email	Phone	Fax
Bose Corporation	1 New York Avenue, Framingham, MA	07/31/2024	American Association for Laboratory Accreditation	N/A	US1088	Mr. Cable Best	Quality Manager	Mail Stop 450 The Mountain	N/A	450	Framingham	Massachusetts	01701	United States	Cable_Best@bose.com	1 508 766 6137	508 766 1145

## Canadian Test Site Registration.

<p>BOSE CORPORATION</p> <p>1 New York Avenue Framingham, MA 01701 UNITED STATES</p> <p><b>Company Number: 3232A</b></p> <p>Contact: Mario Espinal <a href="mailto:mario_espinal@bose.com">mario_espinal@bose.com</a></p>	US0210	<p>RSS-GEN (2019-02-11)</p> <p>RSS-210 (2019-02-11)</p> <p>RSS-247 (2019-02-11)</p> <p>RSS-248 (2021-11-19)</p>	<p><b>RECOGNIZED UNTIL: 2024-07-31</b></p> <p>A2LA ISO/IEC 17025:2017 Expires: 2024-07-31</p>
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## 5. On Time & Duty Cycle

### Requirement:

None; For reporting purposes only.

### Measurement Method:

KDB 558074 D01 15.247 Meas Guidance v05r02 April 2, 2019, Section 6 b), zero span method.

### On time & duty cycle test results:

All testing is done using the maximum packet length for maximum duty cycle shown in the table below.

Frequency (MHz)	Mode	Packet Type	Data Rate (Mbps)	Max Packet Length (Bytes)	On Time (ms)	Period (ms)	Duty Cycle (%)	1/Ton (Hz)	1/Period (Hz)
2441	BT GFSK	DH5	1	339	2.886	3.768	76.6	346.5	265.4
2441	BT DQPSK	2-DH5	2	679	2.886	3.768	76.6	346.5	265.4
2441	BT 8DPSK	3-DH5	3	1021	2.886	3.768	76.6	346.5	265.4



# 6. 20 dB and 99% Occupied Bandwidth

## Requirement:

None; for reporting purposes only.

FCC 15.247(a)(1)

RSS-247 5.1 (1) (a)

## Measurement Method:

ANSI C63.10-2013 Subclause 6.9.2 (20 dB Bandwidth)

ANSI C63.10-2013 Subclause 6.9.3 (99% Bandwidth)

RSS-Gen Issue 5, 6.7 (20 dB & 99% Bandwidth)

The EUT is connected to a spectrum analyzer. The 10 dB external pad and test cable loss (0.8 dB) is accounted for using the reference level offset feature of the spectrum analyzer. The reference level offset is set to 10.8 dB.

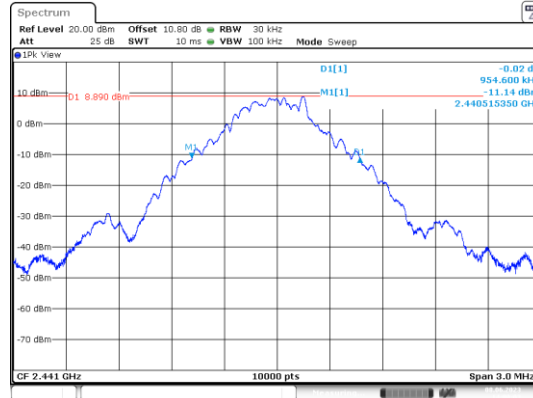
## 20 dB Occupied Bandwidth Results:

BT GFSK 20 dB OBW Summary Table					
Channel	Frequency (MHz)	Mode	Data Rate Mbps	20 dB OBW (kHz)	Limit NA
Low	2402	DH5	1	953	-
Middle	2441	DH5	1	955	-
High	2480	DH5	1	952	-
BT QPSK 20 dB OBW Summary Table					
Channel	Frequency (MHz)	Mode	Data Rate Mbps	20 dB OBW (kHz)	Limit NA
Low	2402	2-DH5	2	1337	-
Middle	2441	2-DH5	2	1337	-
High	2480	2-DH5	2	1337	-
BT 8DPSK 20 dB OBW Summary Table					
Channel	Frequency (MHz)	Mode	Data Rate Mbps	20 dB OBW (kHz)	Limit NA
Low	2402	3-DH5	3	1307	-
Middle	2441	3-DH5	3	1307	-
High	2480	3-DH5	3	1307	-



20 dB OBW plots for 2441 MHz, other frequencies measured the same way.

### DH5



Date: 8 JUN 2023 14:00:03

### 2-DH5



Date: 12 JAN 2023 17:22:29

### 3-DH5



Date: 12 JAN 2023 17:54:38



## 99% Occupied bandwidth test results:

BT GFSK 99% OBW Summary Table					
Channel	Frequency (MHz)	Mode	Data Rate Mbps	99% OBW (kHz)	Limit NA
Low	2402	DH5	1	887	-
Middle	2441	DH5	1	884	-
High	2480	DH5	1	878	-
BT DQPSK 99% OBW Summary Table					
Channel	Frequency (MHz)	Mode	Data Rate Mbps	99% OBW (kHz)	Limit NA
Low	2402	2-DH5	2	1187	-
Middle	2441	2-DH5	2	1189	-
High	2480	2-DH5	2	1187	-
BT 8DPSK 99% OBW Summary Table					
Channel	Frequency (MHz)	Mode	Data Rate Mbps	99% OBW (kHz)	Limit NA
Low	2402	3-DH5	3	1187	-
Middle	2441	3-DH5	3	1187	-
High	2480	3-DH5	3	1184	-



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99% OBW plots for 2441 MHz, other frequencies measured the same way.

## DH5



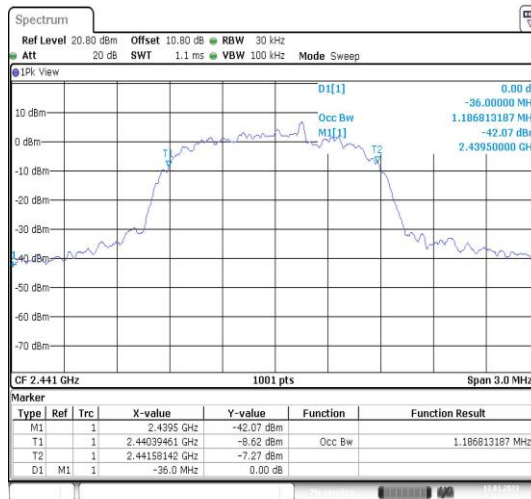
Date: 13 JAN 2023 15:42:31

## 2-DH5



Date: 13 JAN 2023 15:50:47

## 3-DH5



Date: 13 JAN 2023 16:03:25



# 7. Conducted Output Power

## Requirements:

### FCC 15.247 (b) (1)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts (21 dBm)

In adaptive frequency hopping mode, the number of hopping channels can be less than 75 therefore the power limit is 21 dBm.

### RSS-247 5.4 (b)

For frequency hopping systems operating in the band 2400-2483.5 MHz and employing at least 75 hopping channels, the maximum peak conducted output power shall not exceed 1 W; for all other frequency hopping systems in the band, the maximum peak conducted output power shall not exceed 0.125 W (21 dBm).

The e.i.r.p shall not exceed 4W, except as provide in section 5.4 (e).

In adaptive frequency hopping mode, the number of hopping channels can be less than 75 therefore the power limit is 21 dBm.

Maximum antenna gain is 1.1 dBi therefore maximum e.i.r.p will be less than 4W (36 dBm) at the maximum power limit of 21 dBm.

## Measurement Method:

ANSI C63.10-2013 Subclause 7.8.5

RSS-Gen Issue 5, 6.12

The EUT is connected to a spectrum analyzer, the 10 dB external pad and test cable loss (0.8 dB) is accounted for using the reference level offset feature of the spectrum analyzer. The reference level offset is set to 10.8 dB.

## Conducted output power test results:

Output Power Summary Table							
Channel	Frequency (MHz)	Mode	Data Rate Mbps	Output Power (dBm)	Limit (dBm)	Margin (dB)	Result
Low	2402	DH5	1	12.5	21	8.5	Pass
Middle	2441	DH5	1	12.3	21	8.7	Pass
High	2480	DH5	1	12.8	21	8.3	Pass
Output Power Summary Table							
Channel	Frequency (MHz)	Mode	Data Rate Mbps	Output Power (dBm)	Limit (dBm)	Margin (dB)	Result
Low	2402	2-DH5	2	11.6	21	9.5	Pass
Middle	2441	2-DH5	2	11.6	21	9.4	Pass
High	2480	2-DH5	2	11.7	21	9.3	Pass
Output Power Summary Table							
Channel	Frequency (MHz)	Mode	Data Rate Mbps	Output Power (dBm)	Limit (dBm)	Margin (dB)	Result
Low	2402	3-DH5	3	12.2	21	8.8	Pass
Middle	2441	3-DH5	3	12.1	21	8.9	Pass
High	2480	3-DH5	3	12.5	21	8.5	Pass



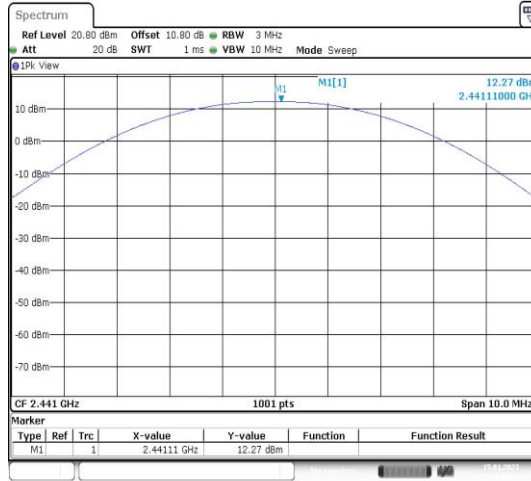
# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver Bluetooth Test Report

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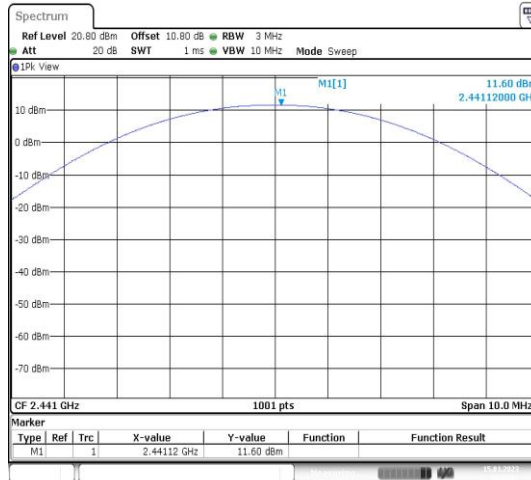
Output power plots for 2441 MHz, other frequencies measured the same way.

## DH5



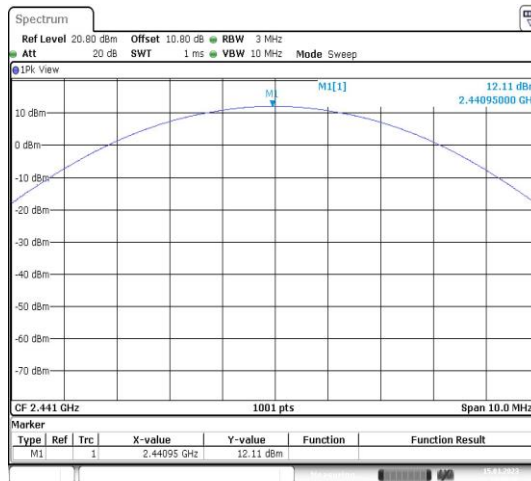
Date: 15 JAN 2023 13:17:56

## 2-DH5



Date: 15 JAN 2023 13:27:07

## 3-DH5



Date: 15 JAN 2023 13:35:45

# 8. Hopping Frequency Separation

## Requirements:

FCC 15.247 (a) (1)

RSS-247 5.1 (b)

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

$$2/3 * (955 \text{ kHz } 20 \text{ dB OBW}) = 636 \text{ kHz (DH5)}$$

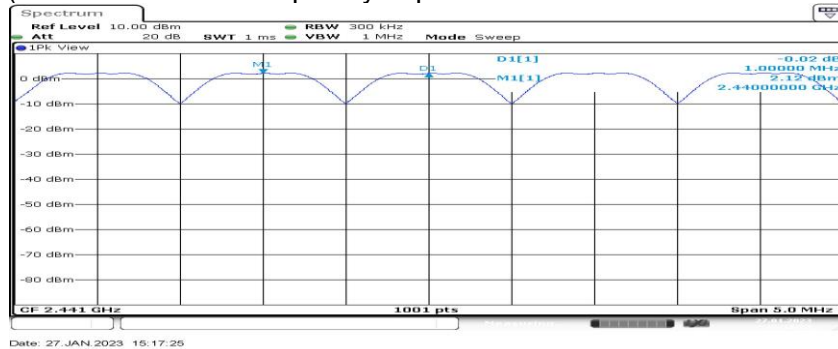
$$2/3 * (1337 \text{ kHz } 20 \text{ dB OBW}) = 891 \text{ kHz (2-DH5, 3-DH5)}$$

## Measurement Method:

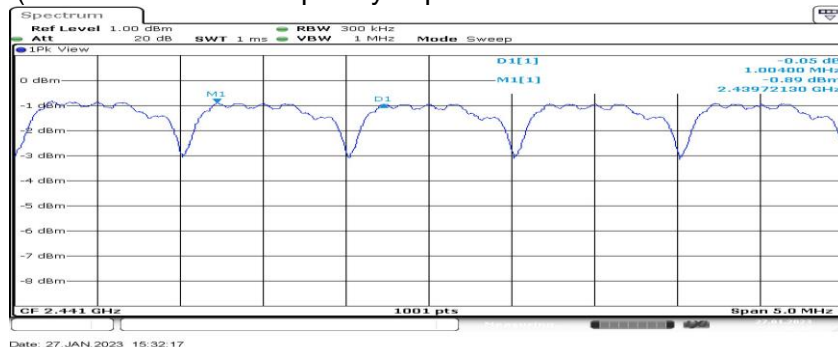
ANSI C63.10-2013 Subclause 7.8.2

## Hopping frequency separation test results:

**DH5** (Measured 1 MHz frequency separation > 25 kHz > 2/3 of 20dB OBW)



**3-DH5** (Measured 1 MHz frequency separation > 25 kHz > 2/3 of 20 dB OBW)



# 9. Number of Hopping Channels

## Requirements:

FCC 15.247 (a) (1) (iii)

RSS-247 5.1 (d)

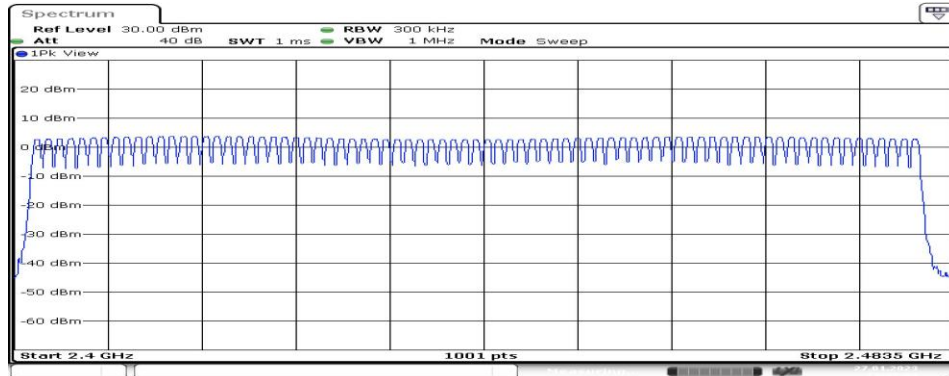
Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

## Measurement Method:

ANSI 63.10-2013 Subclause 7.8.3

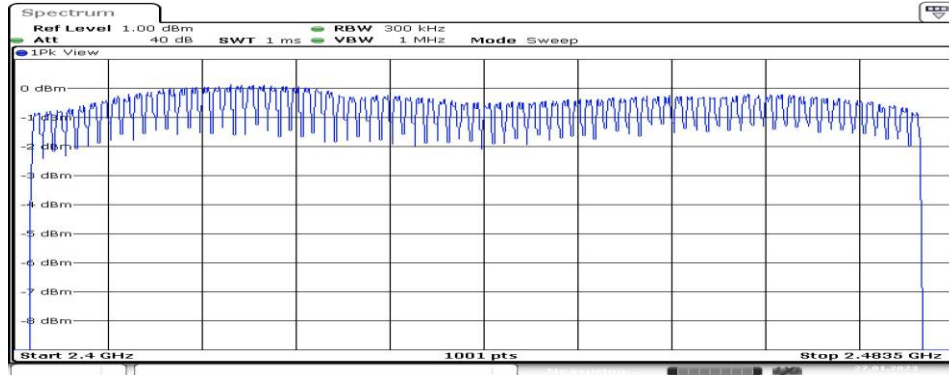
## Number of hopping channels test results:

DH5 (Hopping Mode), Counted 79 channels > 15 channel minimum



Date: 27.JAN.2023 15:48:04

3-DH5 (Hopping Mode), Counted 79 channels > 15 channel minimum



Date: 27.JAN.2023 15:56:43





# 10. Average Time of Occupancy

## Requirements:

FCC 15.247 (a) (1) (iii)

IC RSS-247 5.1 (d)

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

## Measurement Method

ANSI C63.10-2013 Subclause 7.8.4

Observation time = (79 hopping Channels) \* 400mS = 31.6 Seconds.

## Average time of occupancy test results:

**Time of Occupancy Summary Table**

DH1 Hopping mode									
Channel	Frequency (MHz)	Mode	Pulse Width (mS)	Number of pulses in 3.16 S	Number of pulses in 31.6 S (X 10)	Time of occupancy (Pulse Width X Number of pulses) (mS)	Limit (mS)	Margin (mS)	Result
Middle	2441	DH1	0.391	32	320	125.2	400	274.8	Pass
Middle	2441	2-DH1	0.394	32	320	126.2	400	273.8	Pass
Middle	2441	3-DH1	0.394	32	320	126.2	400	273.8	Pass
DH3 Hopping mode									
Channel	Frequency (MHz)	Mode	Pulse Width (mS)	Number of pulses in 3.16 S	Number of pulses in 31.6 S (X 10)	Time of occupancy (Pulse Width X Number of pulses) (mS)	Limit (mS)	Margin (mS)	Result
Middle	2441	DH3	1.649	17	170	280.4	400	119.6	Pass
Middle	2441	2-DH3	1.649	16	160	263.9	400	136.1	Pass
Middle	2441	3-DH3	1.646	17	170	279.8	400	120.2	Pass
DH5 Hopping mode									
Channel	Frequency (MHz)	Mode	Pulse Width (mS)	Number of pulses in 3.16 S	Number of pulses in 31.6 S (X 10)	Time of occupancy (Pulse Width X Number of pulses) (mS)	Limit (mS)	Margin (mS)	Result
Middle	2441	DH5	2.895	11	110	318.5	400	81.5	Pass
Middle	2441	2-DH5	2.895	12	120	347.4	400	52.6	Pass
Middle	2441	3-DH5	2.895	12	120	347.4	400	52.6	Pass





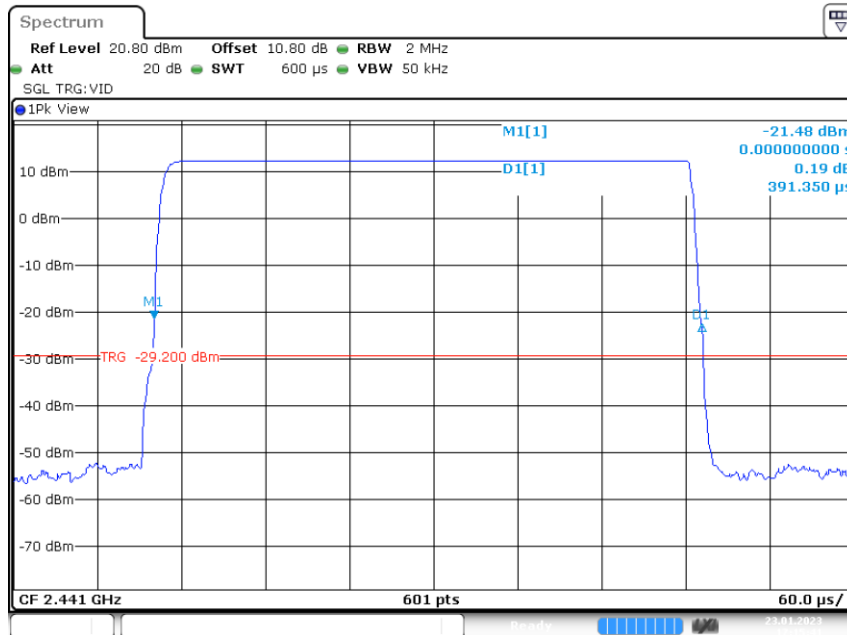
# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver Bluetooth Test Report

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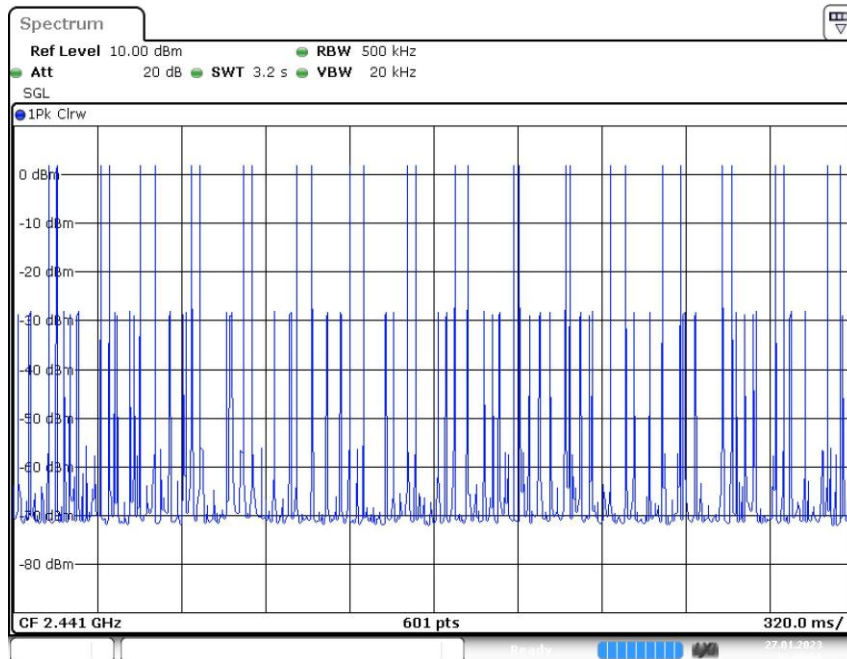


DH1 2441 MHz, (2-DH1, 3-DH1 similar)

## Pulse Width



## Pulse Count = 32



Lower amplitude pulses due to adjacent channels being attenuated by analyzer RBW.



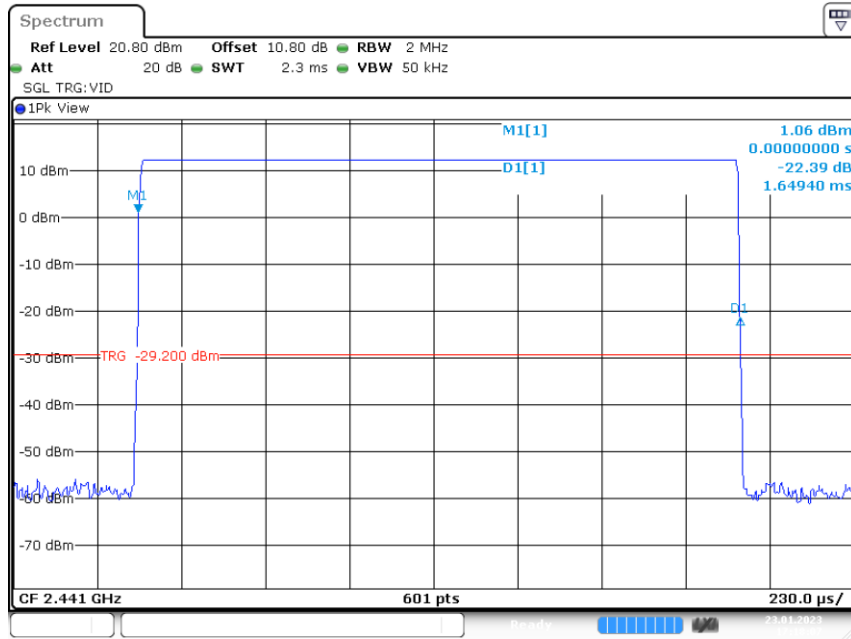
# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver Bluetooth Test Report

FCC ID: A94440108 IC: 3232A-440108

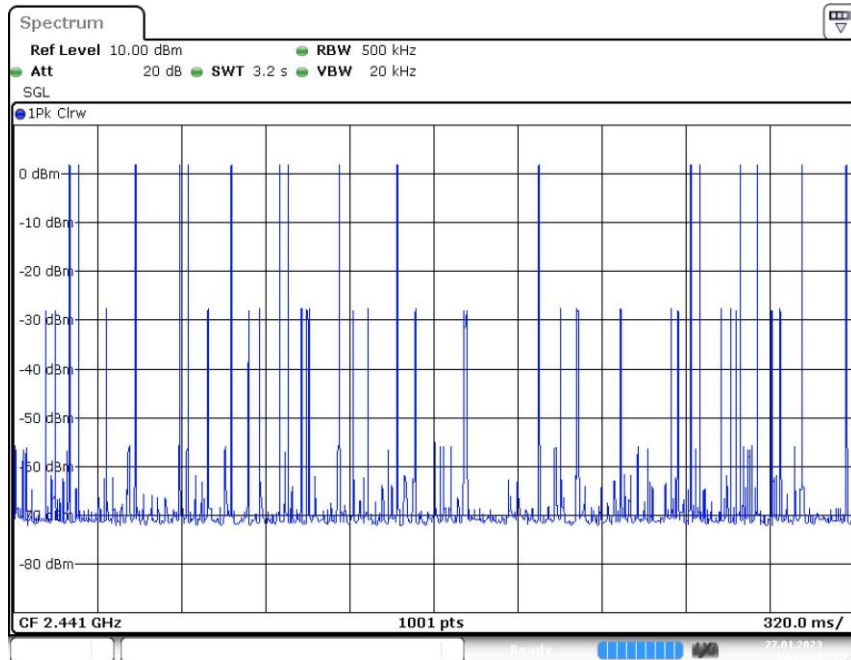


DH3 2441 MHz, (2-DH3, 3-DH3 similar)

## Pulse Width



## Pulse Count = 17



Lower amplitude pulses due to adjacent channels being attenuated by analyzer RBW.



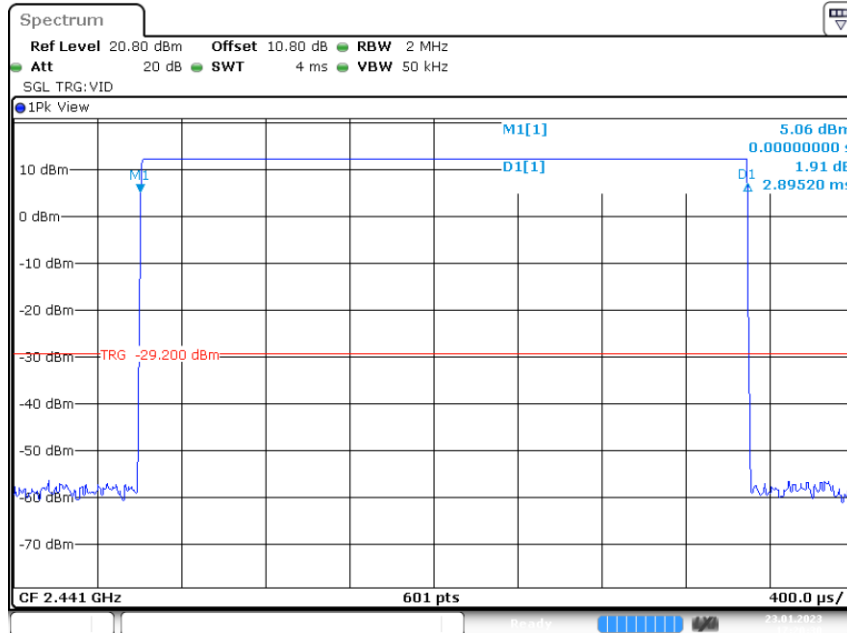
# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver Bluetooth Test Report

FCC ID: A94440108 IC: 3232A-440108



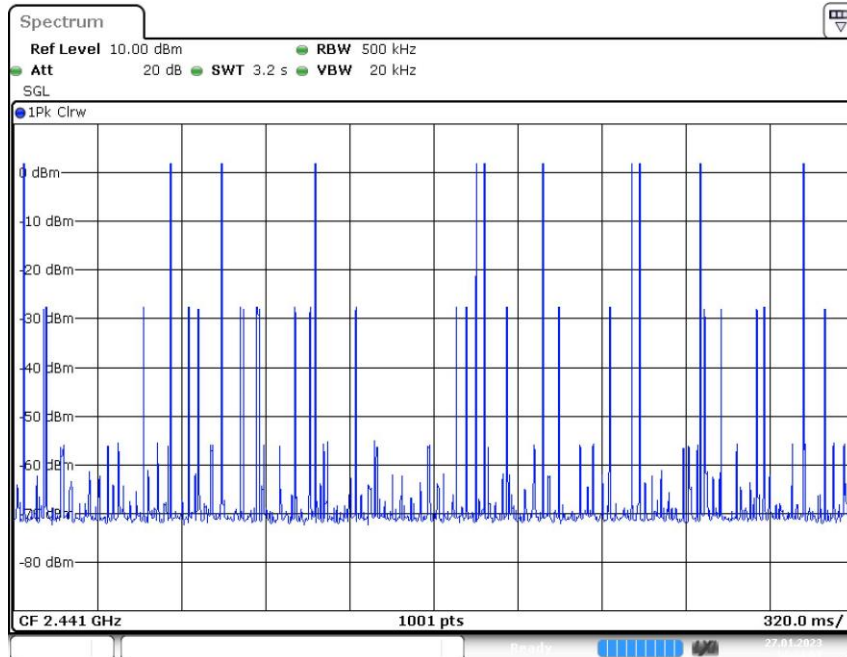
DH5 2441 MHz, (2-DH5, 3-DH5 similar)

## Pulse Width



Plot7 2441 TX pulse width DH5  
Date: 23. JAN 2023 17:20:30

## Pulse Count = 11



Date: 27. JAN 2023 14:24:57

Lower amplitude pulses due to adjacent channels being attenuated by analyzer RBW.



# 11. Conducted Spurious Emissions

## Requirements:

### FCC 15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in 15.205(a), must also comply with the radiated emission limits specified in 15.209(a) (see 15.205(c)).

### IC RSS-247 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section A8.4 (4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Note: Antenna gain outside of the wanted band was assumed to be zero. The conducted spurious readings are for additional information as the radiated readings take precedence.

## Measurement Method:

ANSI C63.10-2013 Subclauses 6.10.4, 7.8.8

The EUT was evaluated at the maximum power setting for each mode.

Note analyzer marker search limit feature used to block out peak search from finding in band emissions.

The EUT is connected to a spectrum analyzer, the 10 dB external pad and test cable loss (0.8 dB) is accounted for using the reference level offset feature of the spectrum analyzer. The reference level offset is set to 10.8 dB.

Auto sweep mode was used on the spectrum analyzer for the following measurements.

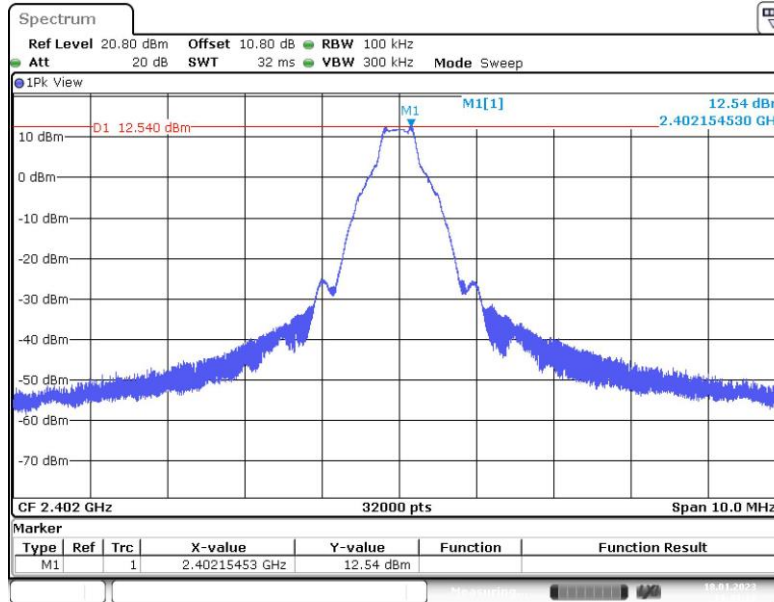
# Conducted spurious emissions test results:

Note analyzer marker search limit featured used to block out peak search from finding in band emissions.

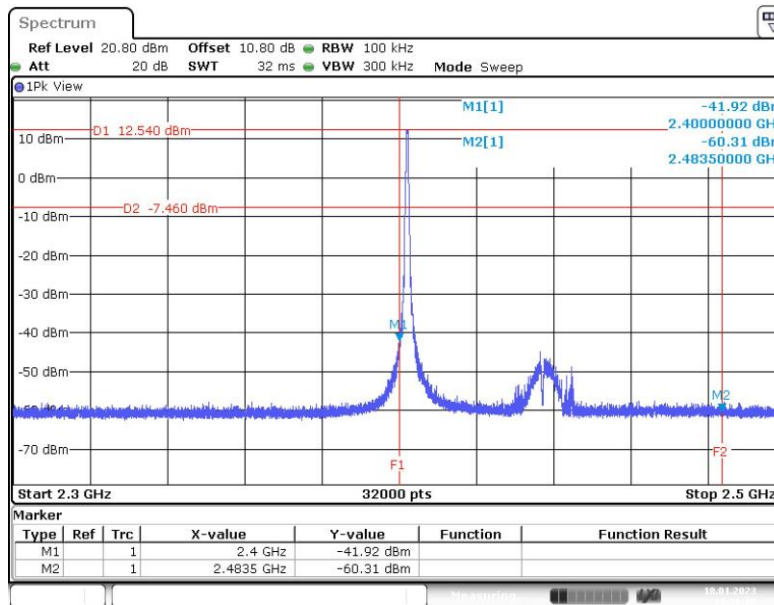
## Low Channel

CH0 (2402 MHz), BR (GFSK) DH5, (Non-Hopping Mode)

D1 = reference peak of fundamental



Date: 18.JAN.2023 14:44:13



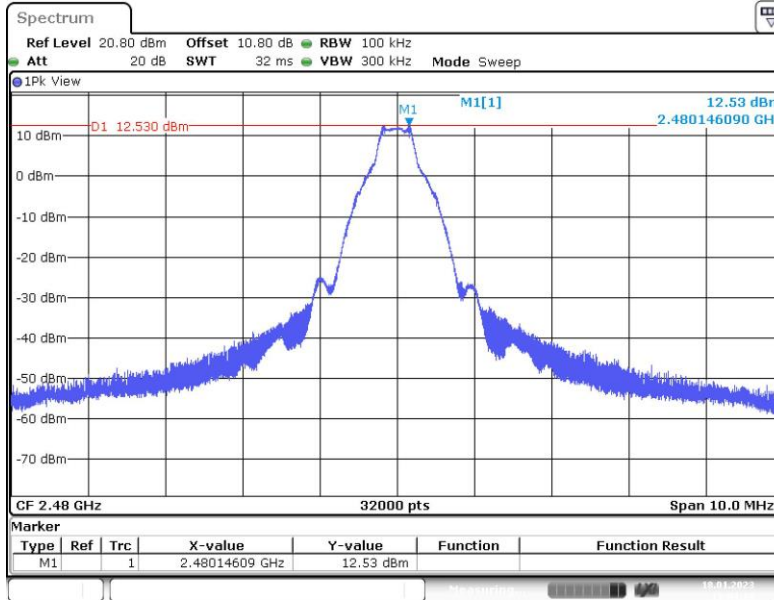
Date: 18.JAN.2023 14:58:28

F1 = 2400 MHz, F2 = 2483.5 MHz (In band), D2 is at 20 dBc  
Emissions are more than 20 dBc, pass.

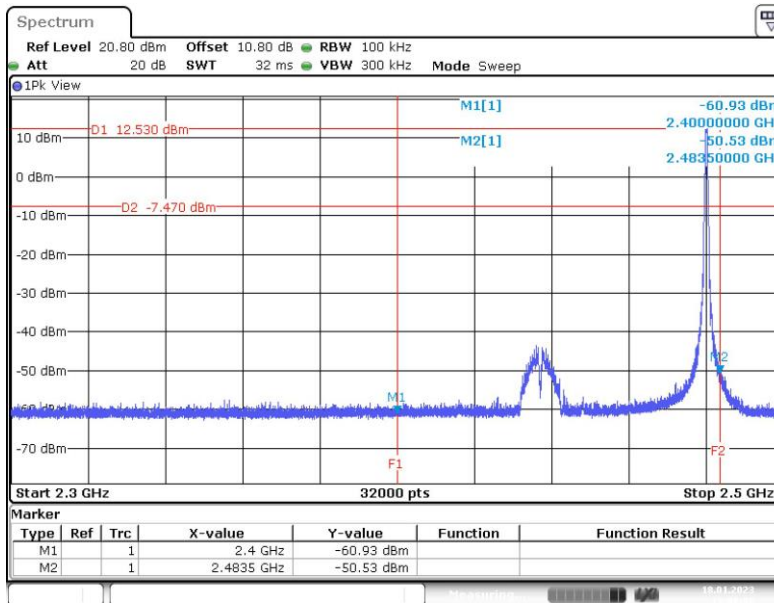
**High Channel**

CH78 (2480 MHz), BR (GFSK) DH5, (Non-Hopping Mode)

D1 = reference peak of fundamental



Date: 18 JAN 2023 15:04:14



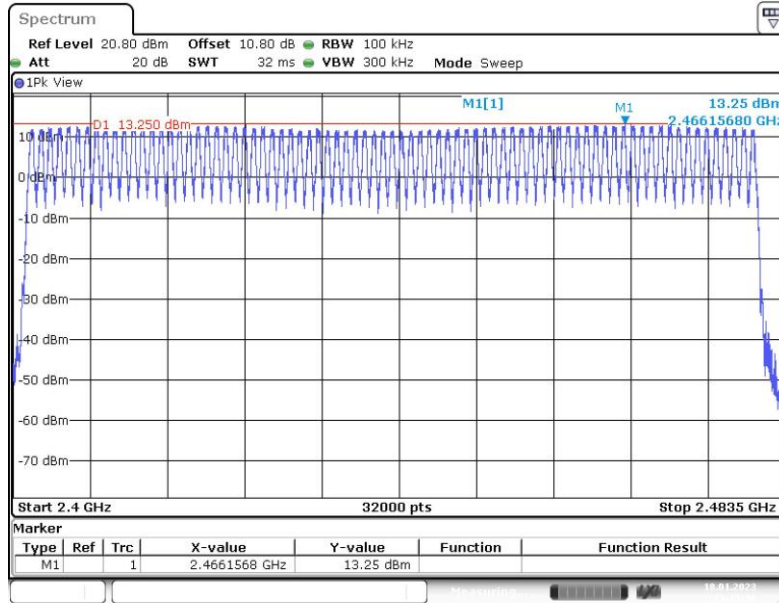
Date: 18 JAN 2023 15:08:39

F1 = 2400 MHz, F2 = 2483.5 MHz (In band), D2 is at 20 dBc  
Emissions are more than 20 dBc, pass.

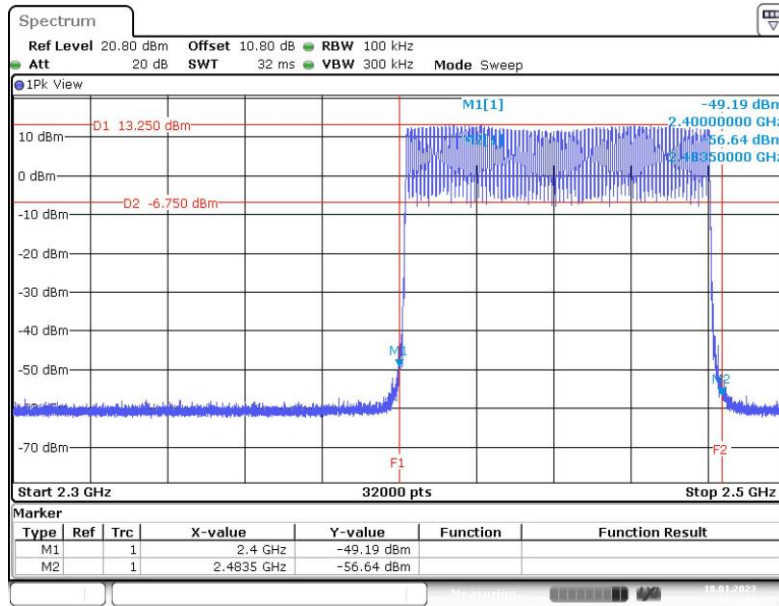


BR (GFSK) DH5, (Hopping Mode)

D1 = reference peak of fundamental



Date: 18, JAN 2023 15:15:50



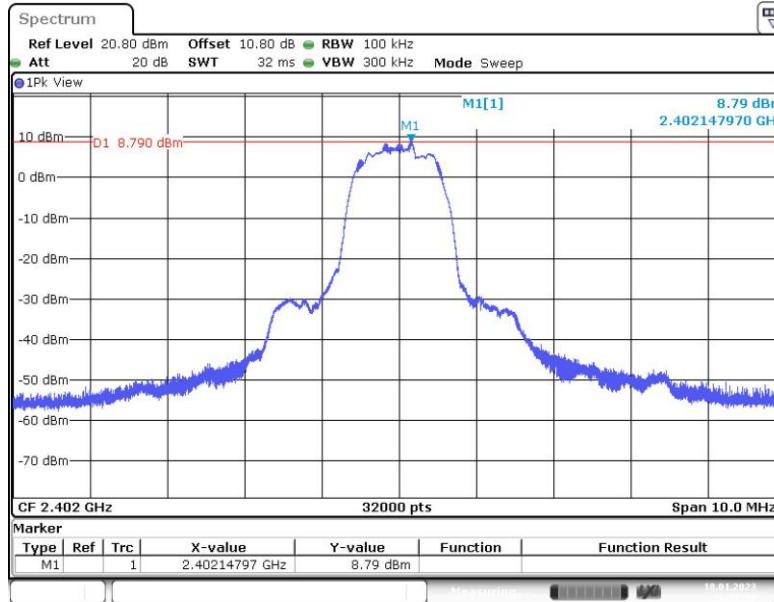
Date: 18, JAN 2023 15:20:34

F1 = 2400 MHz, F2 = 2483.5 MHz (In band), D2 is at 20 dBc  
Emissions are more than 20 dBc, pass.

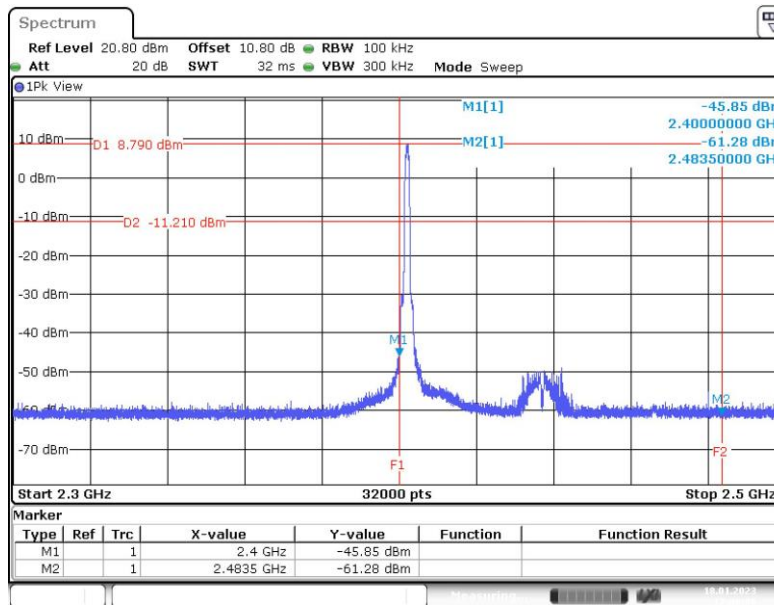
Low Channel

CH0 (2402 MHz), EDR (8DPSK) 3-DH5, (Non-Hopping Mode)

D1 = reference peak of fundamental



Date: 18 JAN 2023 16:57:33



Date: 18 JAN 2023 17:00:39

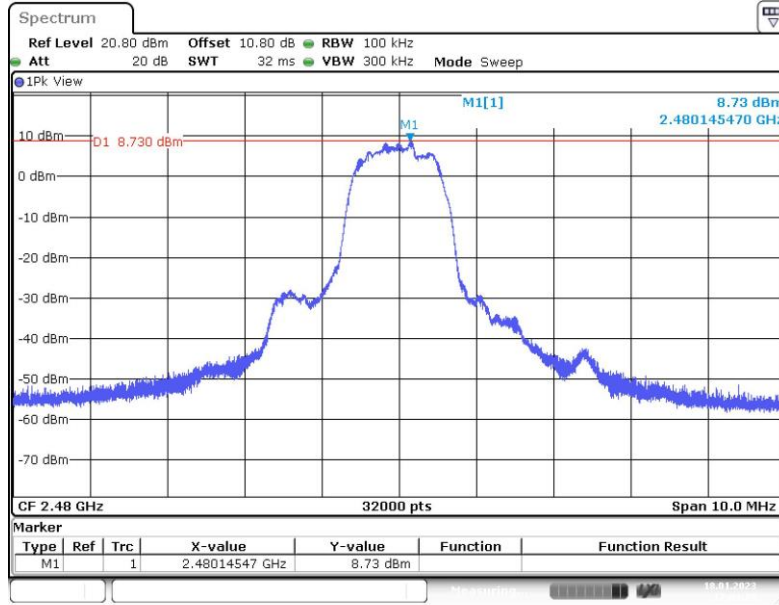
F1 = 2400 MHz, F2 = 2483.5 MHz (In band), D2 is at 20 dBc  
Emissions are more than 20 dBc, pass.



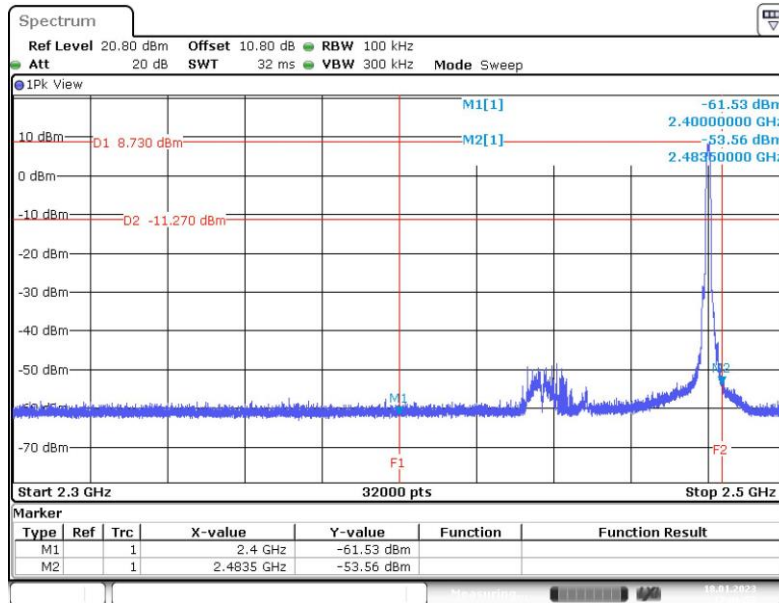
### High Channel

CH78 (2480 MHz), EDR (8DPSK) 3-DH5, (Non-Hopping Mode)

D1 = reference peak of fundamental



Date: 18 JAN 2023 17:03:25

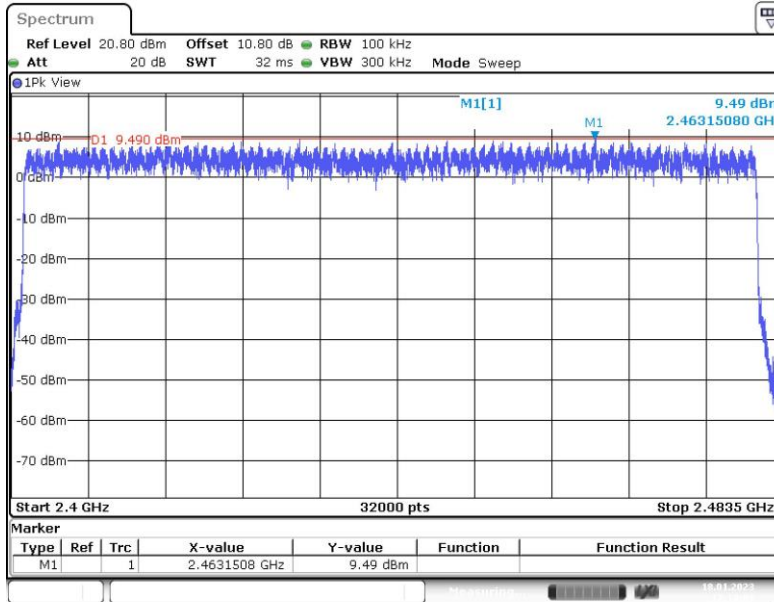


Date: 18 JAN 2023 17:06:58

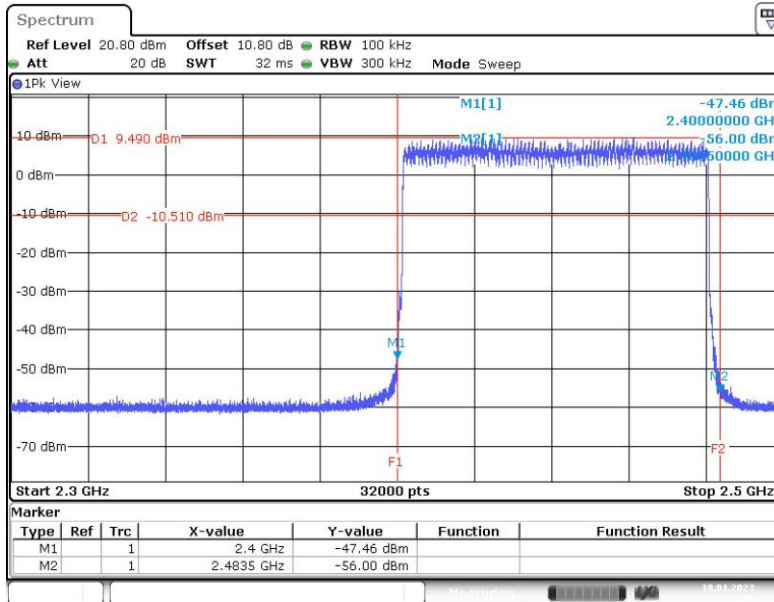
F1 = 2400 MHz, F2 = 2483.5 MHz (In band), D2 is at 20 dBc  
Emissions are more than 20 dBc, pass.

EDR 8DPSK) 3-DH5, (Hopping Mode)

D1 = reference peak of fundamental



Date: 18 JAN 2023 17:10:03



Date: 18 JAN 2023 17:18:29

F1 = 2400 MHz, F2 = 2483.5 MHz (In band), D2 is at 20 dBc  
Emissions are more than 20 dBc, pass.



**PRODUCT ASSURANCE ENGINEERING**  
**Wireless Transceiver Bluetooth Test Report**

FCC ID: A94440108 IC: 3232A-440108

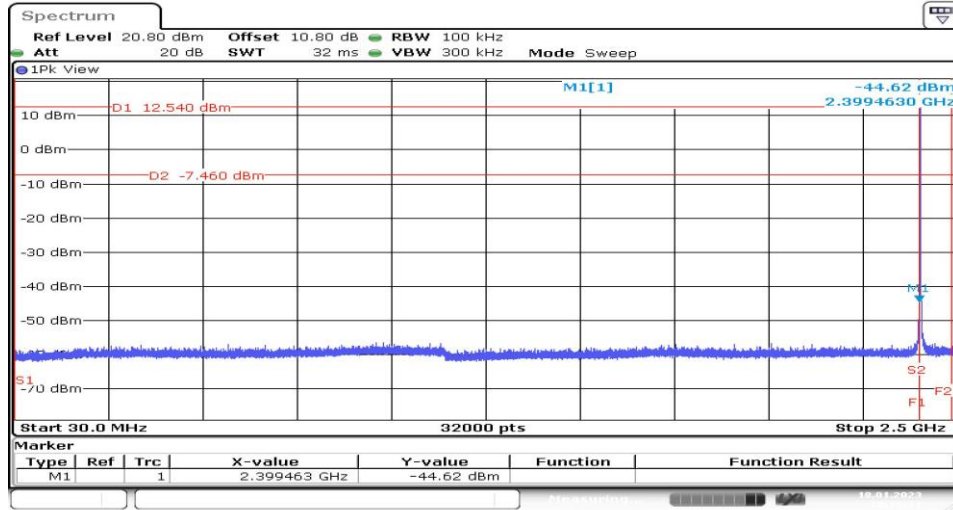


**Conducted spurious emissions, 30 MHz to 2500 MHz**

Marker search limits: S1 = 30 MHz, S2 = 2400 MHz.  
 F1 = 2400 MHz, F2 = 2483.5 MHz

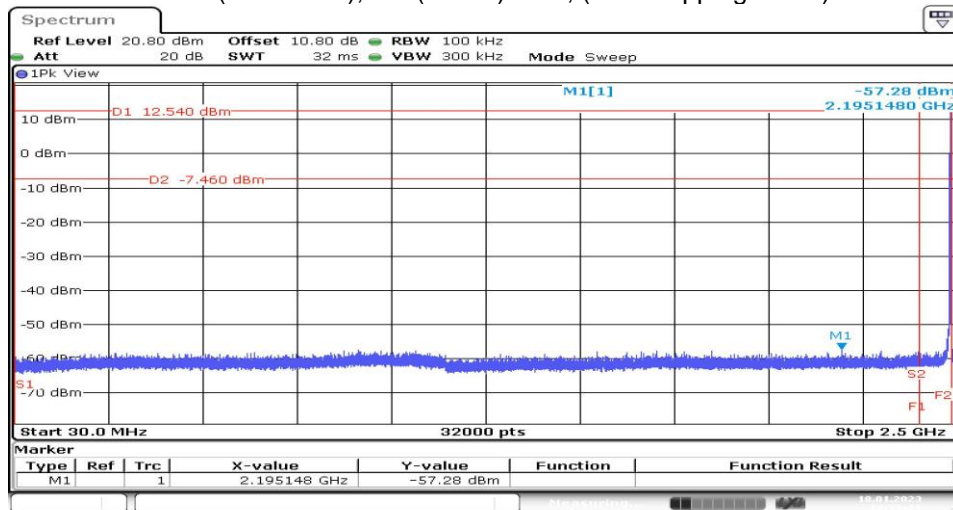
Note: In band peak power reference based on previous measurement for the same channel and mode.

**Low Channel**  
 CH0 (2402 MHz), BR (GFSK) DH5, (Non-Hopping Mode)



Date: 18.JAN.2023 18:15:31

**High Channel**  
 CH78 (2480 MHz), BR (GFSK) DH5, (Non-Hopping Mode)



Date: 18.JAN.2023 18:18:22

Emissions are more than 20 dBc, pass.

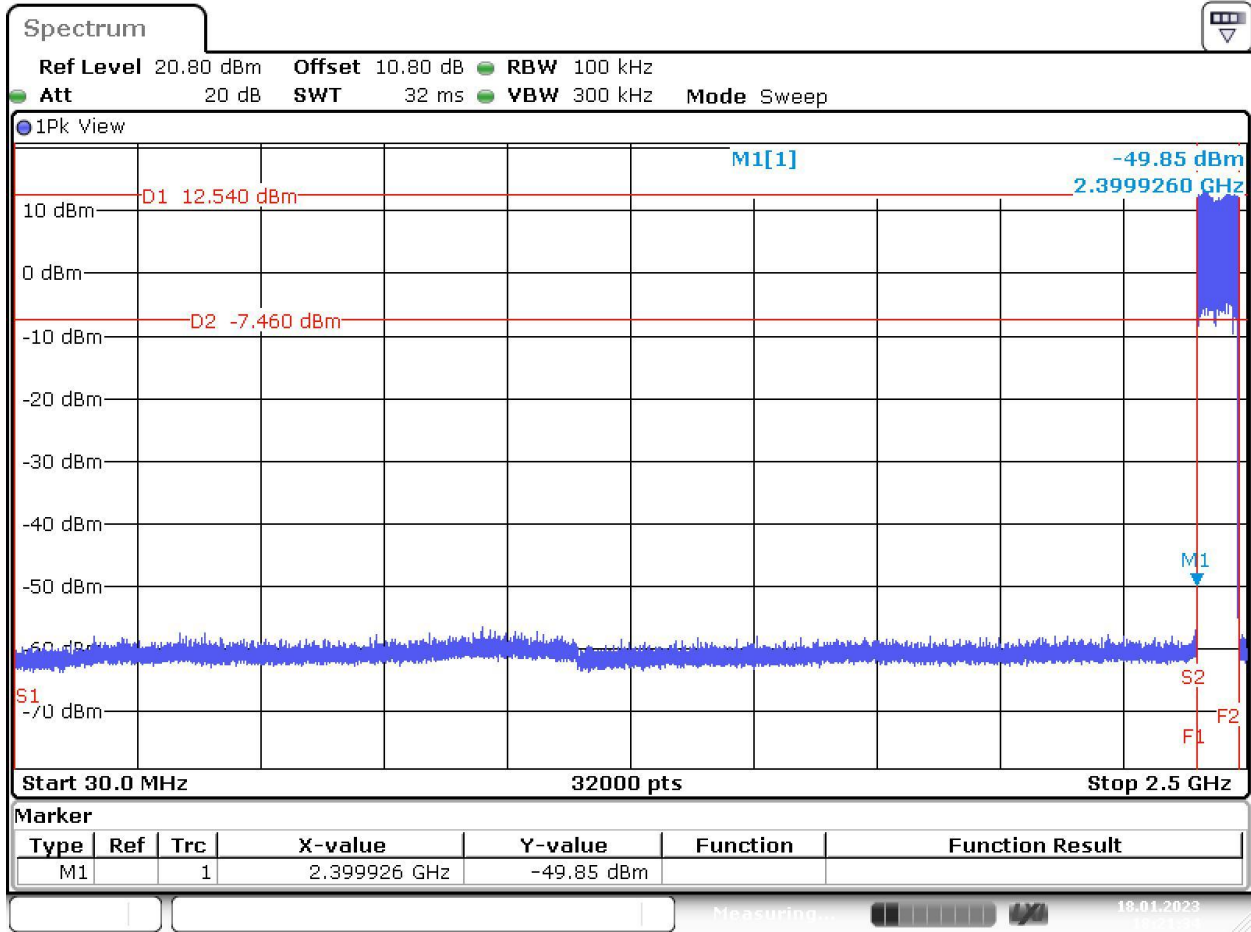


PRODUCT ASSURANCE ENGINEERING  
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FCC ID: A94440108 IC: 3232A-440108



DH5 Hopping Mode



Date: 18.JAN.2023 18:21:34

Emissions are more than 20 dBc, pass.



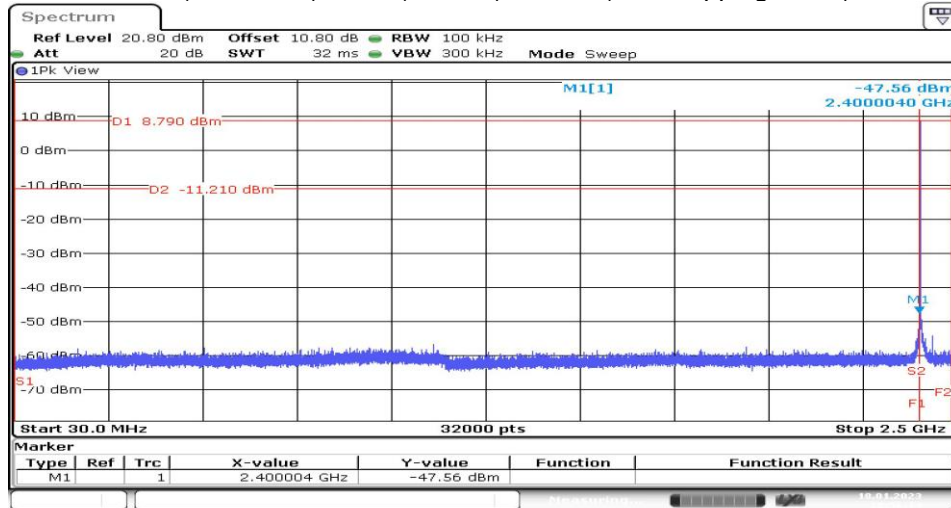
# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver Bluetooth Test Report

FCC ID: A94440108 IC: 3232A-440108



## Low Channel

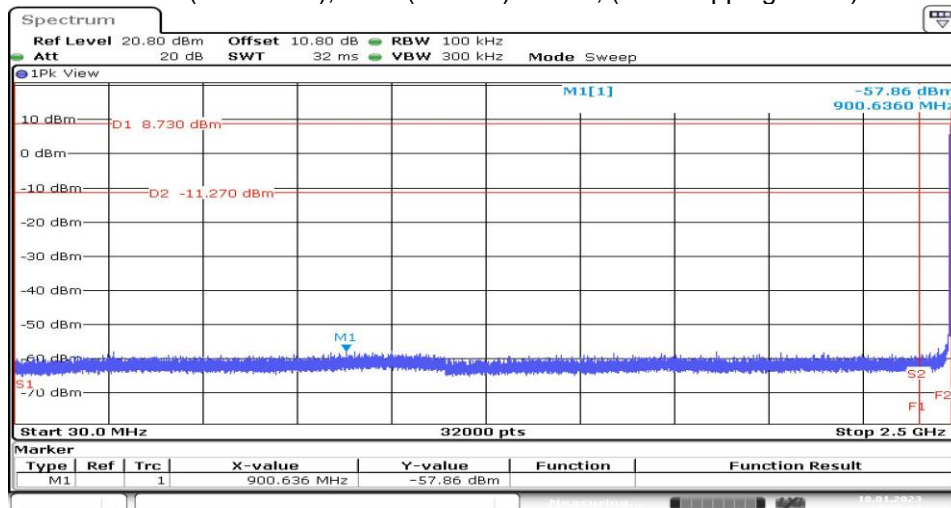
CH0 (2402 MHz), EDR (8DPSK) 3-DH5, (Non-Hopping Mode)



Date: 18.JAN.2023 18:56:13

## High Channel

CH78 (2480 MHz), EDR (8DPSK) 3-DH5, (Non-Hopping Mode)



Date: 18.JAN.2023 18:59:03

Emissions are more than 20 dBc, pass.

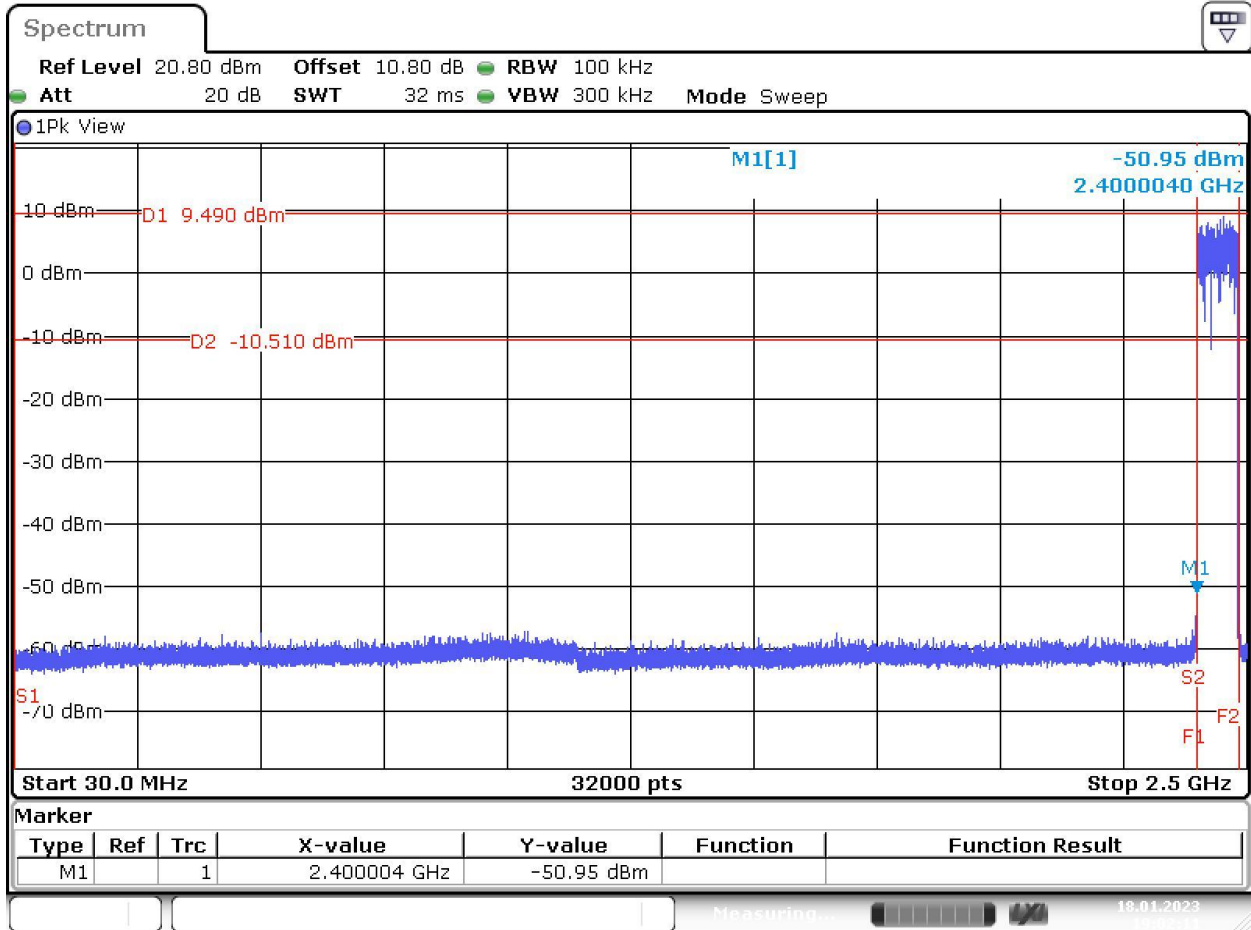


PRODUCT ASSURANCE ENGINEERING  
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FCC ID: A94440108 IC: 3232A-440108



3-DH5 Hopping Mode



Date: 18.JAN.2023 19:02:11

Emissions are more than 20 dBc, pass.



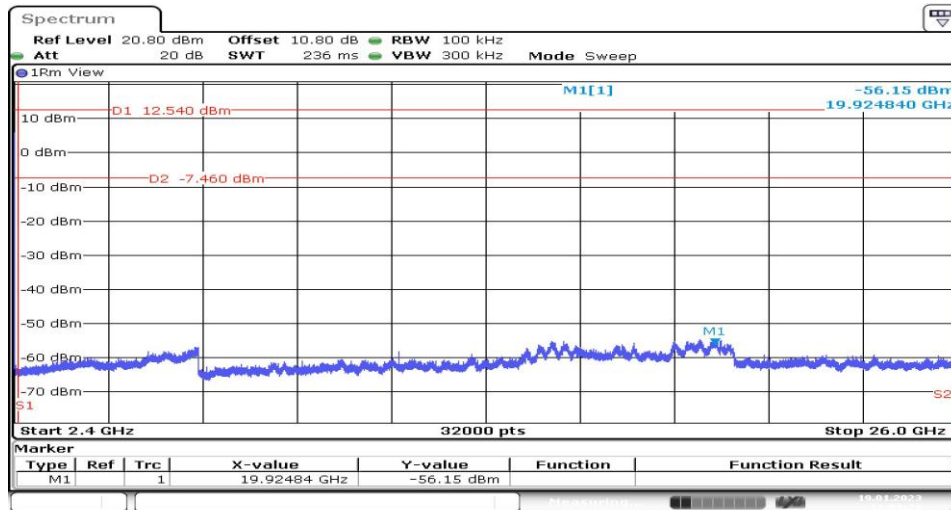
Conducted spurious emissions, 2400 MHz to 26 GHz

Marker search limits: S1 = 2483.5 MHz, S2 = 26 GHz.  
F1 = 2400 MHz, F2 = 2483.5 MHz

Note: In band peak power reference based on previous measurement for the same channel and mode.

Low Channel

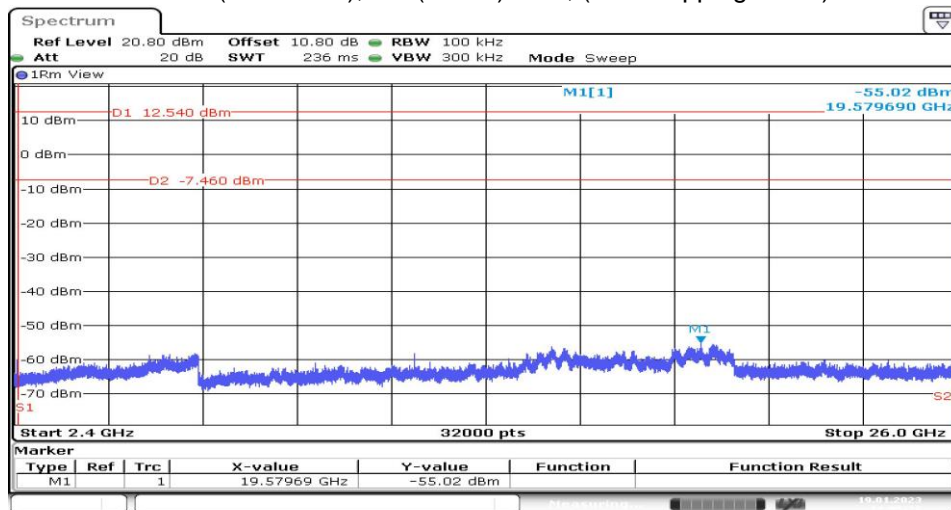
CH0 (2402 MHz), BR (GFSK) DH5, (Non-Hopping Mode)



Date: 19.JAN.2023 12:03:27

High Channel

CH78 (2480 MHz), BR (GFSK) DH5, (Non-Hopping Mode)



Date: 19.JAN.2023 12:05:29

Emissions are more than 20 dBc, pass.

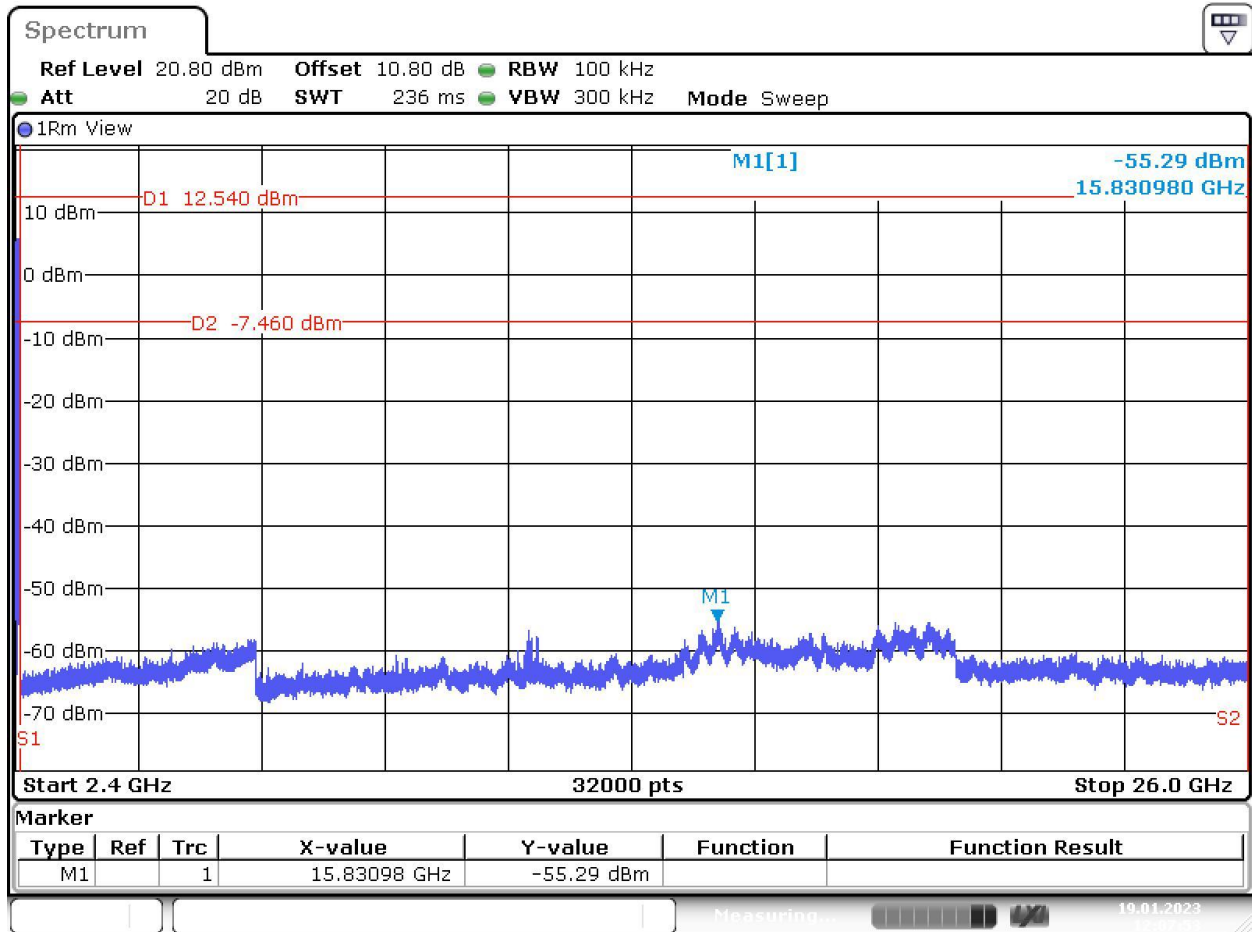


PRODUCT ASSURANCE ENGINEERING  
Wireless Transceiver Bluetooth Test Report

FCC ID: A94440108 IC: 3232A-440108



DH5 Hopping Mode



Date: 19.JAN.2023 12:07:53

Emissions are more than 20 dBc, pass.





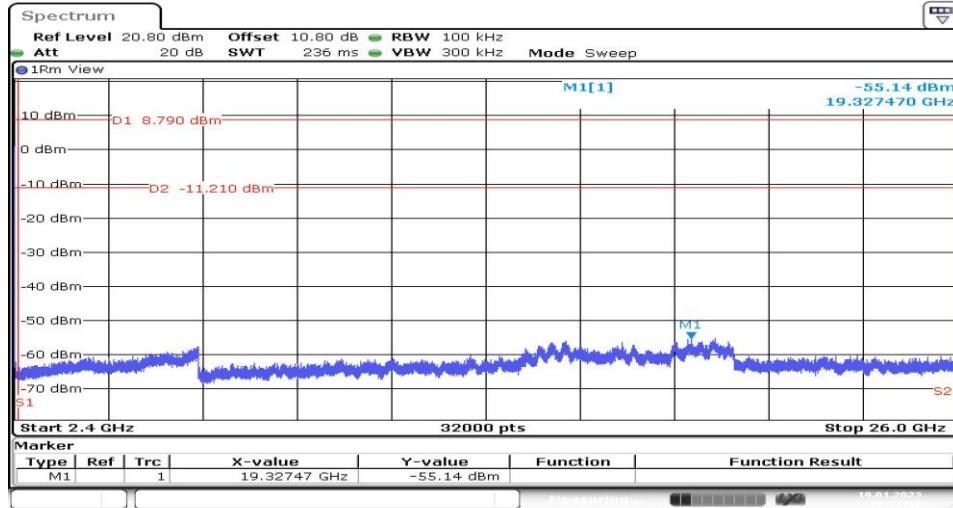
PRODUCT ASSURANCE ENGINEERING  
Wireless Transceiver Bluetooth Test Report

FCC ID: A94440108 IC: 3232A-440108



Low Channel

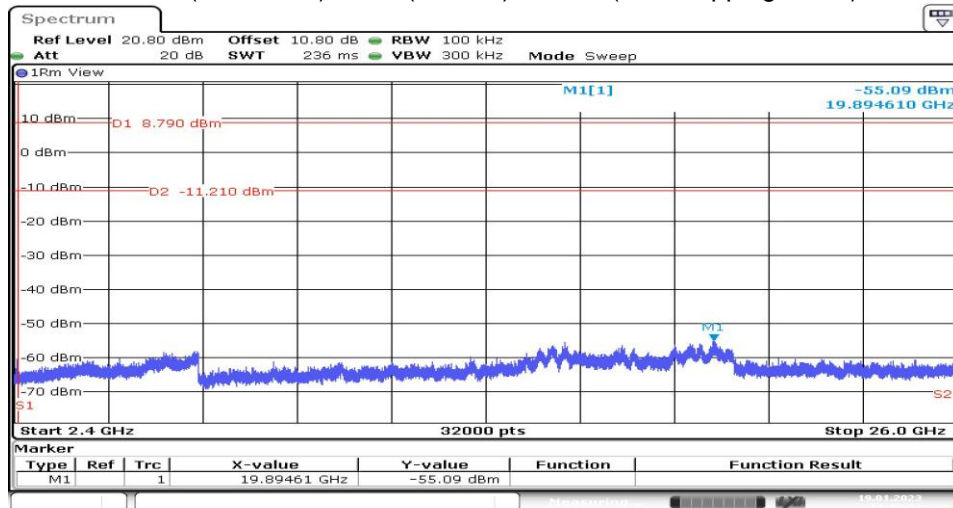
CH0 (2402 MHz), EDR (8DPSK) 3-DH5, (Non-Hopping Mode)



Date: 19 JAN 2023 12:17:58

High Channel

CH78 (2480 MHz), EDR (8DPSK) 3-DH5, (Non-Hopping Mode)



Date: 19 JAN 2023 12:19:31

Emissions are more than 20 dBc, pass.

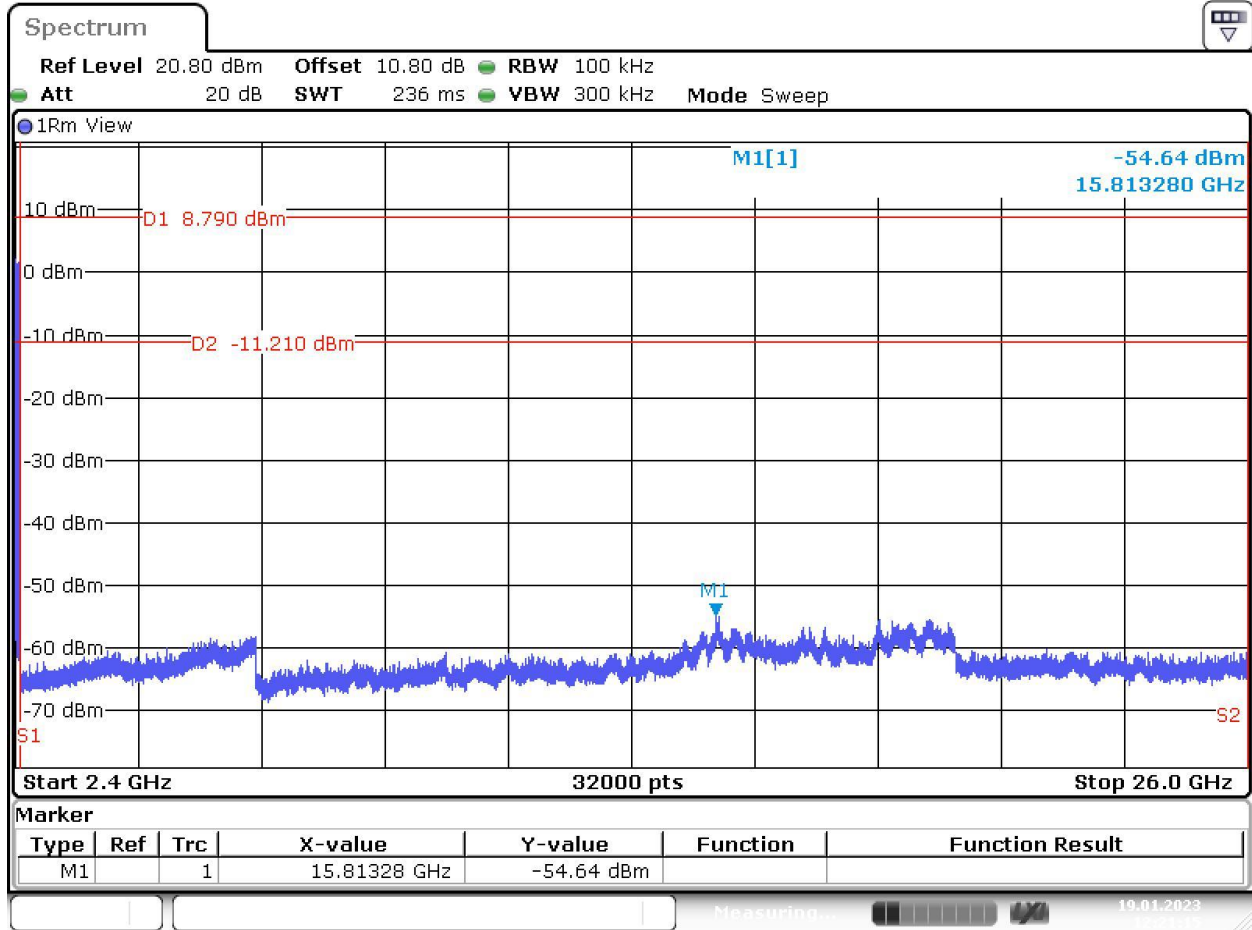


PRODUCT ASSURANCE ENGINEERING  
Wireless Transceiver Bluetooth Test Report

FCC ID: A94440108 IC: 3232A-440108



3-DH5 Hopping Mode



Date: 19.JAN.2023 12:21:15

Emissions are more than 20 dBc, pass.



**PRODUCT ASSURANCE ENGINEERING**  
**Wireless Transceiver Bluetooth Test Report**



FCC ID: A94440108 IC: 3232A-440108

**Conducted Spurious Harmonics (Pre-Screen)**

**Analyzer settings:** RBW = 1 MHz, VBW = 3 MHz, Span = 50 MHz, **Peak Detector**, ATTN = 0 dB  
 Auto sweep time, Trace Max hold for 3 seconds

Reference level offset on analyzer set to 10.8 dB to account for 10 dB pad and 0.8 dB SMA test cable loss.

**Setup:** EUT output => 10 dB Pad => 2.4 GHz notch filter input, 2.4 GHz notch filter output => analyzer input.

**Using if peak value is below the average conducted limit of -41 dBm then it is considered passing.** This is a more stringent requirement than using the equivalent conducted peak limit of -21 dBm. The average conducted limit is derived from the 54 dBuV/m radiated limit at 3 meters minus a 95.2 dB correction factor which equals -41 dBm based on 0 dBi out of band EUT antenna gain. Note maximum in-band antenna gain is 1.1 dBi.

**Note:** Radiated emissions are the preferred method and will be shown later in this report.

**Conducted Spurious Harmonics Summary Table (BR GFSK)**

Mode	Harmonic	CF (MHz)	Measured Frequency (MHz)	Max Peak Conducted (dBm)	Limit (dBm)	Margin (dB)	Test Results (P/F)
BT (GFSK 1 Mbps)	1	2402	2402.1	-48.6	NA	NA	NA
BT (GFSK 1 Mbps)	2	4804	4791.2	-65.4	-41	24.4	Pass
BT (GFSK 1 Mbps)	3	7206	7205.7	-56.2	-41	15.2	Pass
BT (GFSK 1 Mbps)	4	9608	9607.3	-55.7	-41	14.7	Pass
BT (GFSK 1 Mbps)	5	12010	12010.9	-53.9	-41	12.9	Pass
BT (GFSK 1 Mbps)	6	14412	14412.9	-64.5	-41	23.5	Pass
BT (GFSK 1 Mbps)	7	16814	16812.8	-61.1	-41	20.1	Pass
BT (GFSK 1 Mbps)	8	19216	19214.6	-57.0	-41	16.0	Pass
BT (GFSK 1 Mbps)	9	21618	21619.3	-64.7	-41	23.7	Pass
BT (GFSK 1 Mbps)	10	24020	24006.9	-65.2	-41	24.2	Pass
Mode	Harmonic	CF (MHz)	Measured Frequency (MHz)	Max Peak Conducted (dBm)	Limit (dBm)	Margin (dB)	Test Results (P/F)
BT (GFSK 1 Mbps)	1	2441	2441.2	-44.8	NA	NA	NA
BT (GFSK 1 Mbps)	2	4882	4883.1	-65.5	-41	24.5	Pass
BT (GFSK 1 Mbps)	3	7323	7323.4	-58.9	-41	17.9	Pass
BT (GFSK 1 Mbps)	4	9764	9763.4	-55.4	-41	14.4	Pass
BT (GFSK 1 Mbps)	5	12205	12205.8	-48.9	-41	7.9	Pass
BT (GFSK 1 Mbps)	6	14646	14646.1	-64.4	-41	23.4	Pass
BT (GFSK 1 Mbps)	7	17087	17102.8	-61.9	-41	20.9	Pass
BT (GFSK 1 Mbps)	8	19528	19529.3	-55.6	-41	14.6	Pass
BT (GFSK 1 Mbps)	9	21969	21944.1	-64.0	-41	23.0	Pass
BT (GFSK 1 Mbps)	10	24410	24411.4	-64.2	-41	23.2	Pass
Mode	Harmonic	CF (MHz)	Measured Frequency (MHz)	Max Peak Conducted (dBm)	Limit (dBm)	Margin (dB)	Test Results (P/F)
BT (GFSK 1 Mbps)	1	2480	2479.9	-42.2	NA	NA	NA
BT (GFSK 1 Mbps)	2	4960	4983.4	-65.3	-41	24.3	Pass
BT (GFSK 1 Mbps)	3	7440	7440.4	-60.9	-41	19.9	Pass
BT (GFSK 1 Mbps)	4	9920	9919.3	-52.8	-41	11.8	Pass
BT (GFSK 1 Mbps)	5	12400	12400.6	-50.7	-41	9.7	Pass
BT (GFSK 1 Mbps)	6	14880	14893.9	-63.7	-41	22.7	Pass
BT (GFSK 1 Mbps)	7	17360	17358.6	-61.3	-41	20.3	Pass
BT (GFSK 1 Mbps)	8	19840	19838.4	-57.5	-41	16.5	Pass
BT (GFSK 1 Mbps)	9	22320	22318.5	-65.0	-41	24.0	Pass
BT (GFSK 1 Mbps)	10	24800	24787.2	-65.6	-41	24.6	Pass

Note: The fundamental is being attenuated by about 60 dB due to the 2.4 GHz notch filter.



**PRODUCT ASSURANCE ENGINEERING**  
**Wireless Transceiver Bluetooth Test Report**

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**Conducted Spurious Harmonics Summary Table (EDR 8DPSK)**

Mode	Harmonic	CF (MHz)	Measured Frequency (MHz)	Max Peak Conducted (dBm)	Limit (dBm)	Margin (dB)	Test Results (P/F)
BT (8DPSK 3 Mbps)	1	2402	2402.0	-49.6	NA	NA	NA
BT (8DPSK 3 Mbps)	2	4804	4804.0	-64.6	-41	23.6	Pass
BT (8DPSK 3 Mbps)	3	7206	7205.9	-56.6	-41	15.6	Pass
BT (8DPSK 3 Mbps)	4	9608	9607.9	-56.3	-41	15.3	Pass
BT (8DPSK 3 Mbps)	5	12010	12009.2	-55.7	-41	14.7	Pass
BT (8DPSK 3 Mbps)	6	14412	14430.1	-64.0	-41	23.0	Pass
BT (8DPSK 3 Mbps)	7	16814	16812.8	-61.5	-41	20.5	Pass
BT (8DPSK 3 Mbps)	8	19216	19217.0	-57.7	-41	16.7	Pass
BT (8DPSK 3 Mbps)	9	21618	21626.2	-64.8	-41	23.8	Pass
BT (8DPSK 3 Mbps)	10	24020	24011.5	-65.2	-41	24.2	Pass
Mode	Harmonic	CF (MHz)	Measured Frequency (MHz)	Max Peak Conducted (dBm)	Limit (dBm)	Margin (dB)	Test Results (P/F)
BT (8DPSK 3 Mbps)	1	2441	2441.0	-45.6	NA	NA	NA
BT (8DPSK 3 Mbps)	2	4882	4888.6	-65.4	-41	24.4	Pass
BT (8DPSK 3 Mbps)	3	7323	7323.5	-58.9	-41	17.9	Pass
BT (8DPSK 3 Mbps)	4	9764	9764.5	-56.4	-41	15.4	Pass
BT (8DPSK 3 Mbps)	5	12205	12204.8	-49.9	-41	8.9	Pass
BT (8DPSK 3 Mbps)	6	14646	14646.1	-64.9	-41	23.9	Pass
BT (8DPSK 3 Mbps)	7	17087	17093.1	-62.5	-41	21.5	Pass
BT (8DPSK 3 Mbps)	8	19528	19527.4	-56.7	-41	15.7	Pass
BT (8DPSK 3 Mbps)	9	21969	21958.6	-64.6	-41	23.6	Pass
BT (8DPSK 3 Mbps)	10	24410	24409.6	-64.7	-41	23.7	Pass
Mode	Harmonic	CF (MHz)	Measured Frequency (MHz)	Max Peak Conducted (dBm)	Limit (dBm)	Margin (dB)	Test Results (P/F)
BT (8DPSK 3 Mbps)	1	2480	2479.9	-43.2	NA	NA	NA
BT (8DPSK 3 Mbps)	2	4960	4945.3	-64.6	-41	23.6	Pass
BT (8DPSK 3 Mbps)	3	7440	7439.8	-61.9	-41	20.9	Pass
BT (8DPSK 3 Mbps)	4	9920	9919.2	-54.3	-41	13.3	Pass
BT (8DPSK 3 Mbps)	5	12400	12400.0	-52.1	-41	11.1	Pass
BT (8DPSK 3 Mbps)	6	14880	14884.3	-63.8	-41	22.8	Pass
BT (8DPSK 3 Mbps)	7	17360	17384.6	-62.1	-41	21.1	Pass
BT (8DPSK 3 Mbps)	8	19840	19839.3	-58.6	-41	17.6	Pass
BT (8DPSK 3 Mbps)	9	22320	22320.2	-64.9	-41	23.9	Pass
BT (8DPSK 3 Mbps)	10	24800	24778.8	-65.2	-41	24.2	Pass

Note: The fundamental is being attenuated by about 60 dB due to the 2.4 GHz notch filter.



## 12. Radiated Emissions 1 GHz to 25 GHz

### Requirement:

FCC 15.205, 15.209, 15.247 (d)

RSS-GEN Clause 8.9 (Transmitter)

### Measurement Method:

ANSI C63.10-2013 6.3 to 6.6 (6.10.5 restricted band edge)  
RSS-Gen 6.13

ANSI C63.10-2013 4.1.4.2.3

Reduced video bandwidth method used for making average measurements for lower and upper adjacent restricted bands. Note: The procedure listed in ANSI C63.10-2013 footnote **23** on page 28 was used to demonstrate that the proper analyzer settings were used for an average measurement using reduced video bandwidth method. The result was -6 dB different between peak using VBW = 3 MHz and average using VBW = 1 Hz.

For radiated emissions above 1 GHz the EUT is positioned on a foam stand 1.5m off the ground plane. The EUT was evaluated in three orientations per ANSI C63.10-2013 6.3.1. The EUT was evaluated at the maximum power setting for each mode.

For emissions **other** than the lower and upper adjacent restricted bands a 2.4 GHz notch filter is used between the measurement horn antenna and measurement preamp to prevent overload to the preamp due to the EUT fundamental. The restricted band edge measurement is done using high dynamic range preamp.

#### Reference: ANSI C63.10-2013 6.6.4.1:

*Install an appropriate filter at the input of the measurement system power amplifier. This filter shall attenuate the fundamental emission of the EUT and allow an accurate measurement of the associated harmonics and spurious emissions. The filter shall be characterized, and any attenuation/loss factors shall be accounted for in the measurement results.*

EUT was evaluated in **3 orientations with vertical orientation being worst case** showing the highest emissions.

Radiated emission measurements performed using both horizontal and vertical measurement antenna polarizations with worst case highest emission being with **vertical** antenna polarization.

Spectrum analyzer auto sweep mode used on the following plots.

#### For lower restricted band:

Marker search limits used: Left S1 = 2310 MHz, Right S2 = 2390 MHz  
F1 = 2310 MHz, F2 = 2390 MHz

#### For higher restricted band:

Marker search limits used: Left S1 = 2483.5 MHz, Right S2 = 2500 MHz  
F1 = 2483.5 MHz, F2 = 2500 MHz

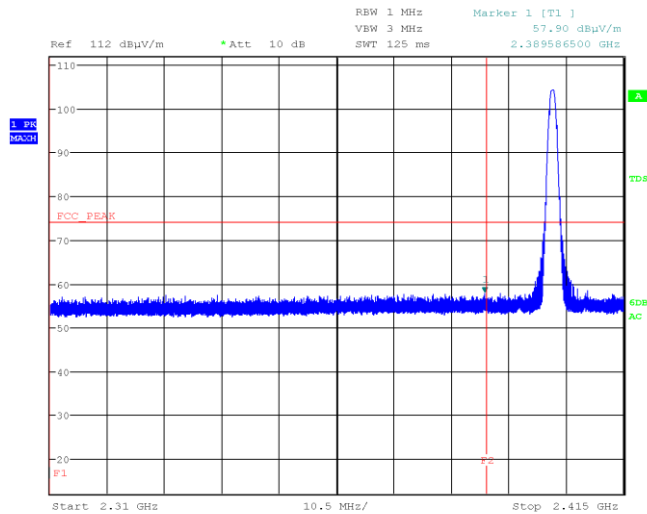
# Radiated emissions 1 GHz to 25 GHz test results:

The following radiated measurements are done at a 3 meter distance.

Emissions were measured using both vertical and horizontal antenna polarizations with vertical polarization being worst case.

## Lower restricted band: BR DH5 (CH0, 2402 MHz)

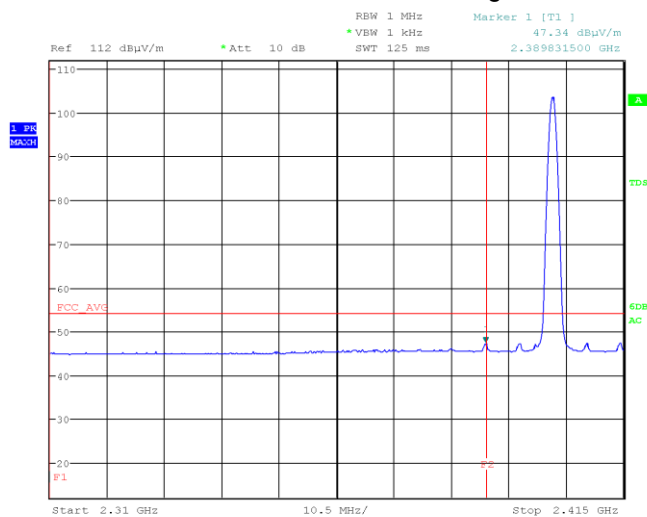
Peak detector; Peak emissions are below the peak limit.



Date: 9.MAY.2023 13:38:32

Average measurement using reduced video bandwidth of 1 kHz.

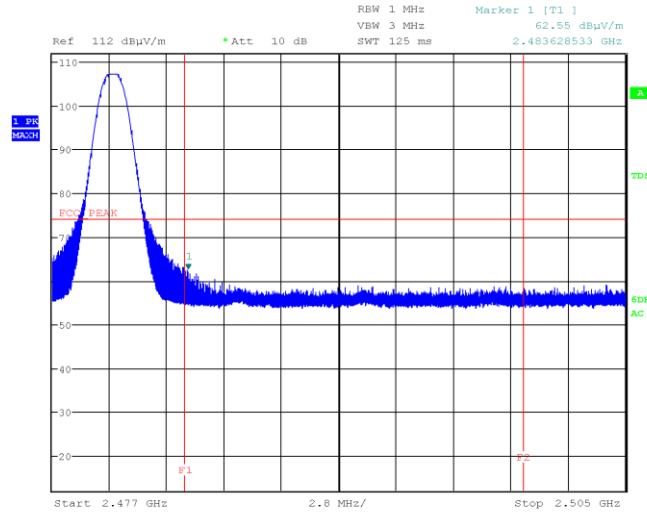
Emissions are below average limit.



Date: 9.MAY.2023 13:41:29

**Upper restricted band; BR DH5 (CH78, 2480 MHz)**

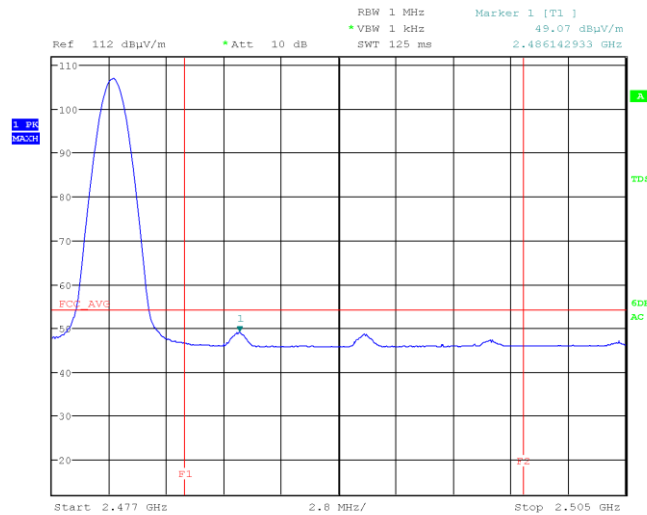
Peak detector; Peak emissions are below the peak limit.



Date: 9.MAY.2023 13:22:54

Average measurement using reduced video bandwidth of 1 kHz.

Emissions are below average limit.



Date: 9.MAY.2023 13:20:23

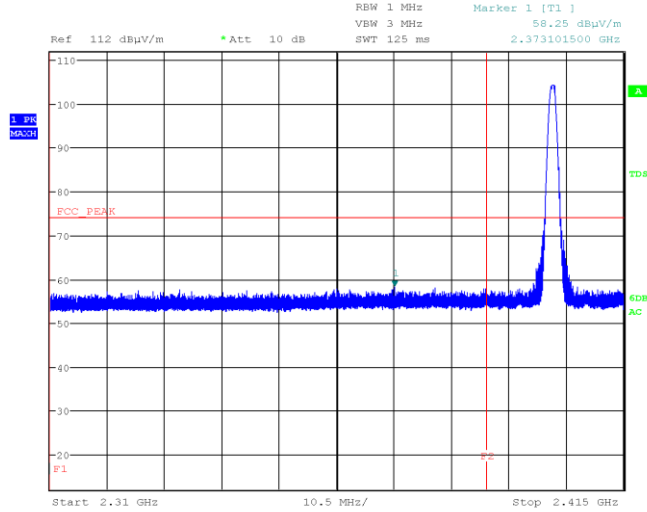


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**Lower restricted band: EDR 3-DH5 (CH0, 2402 MHz)**

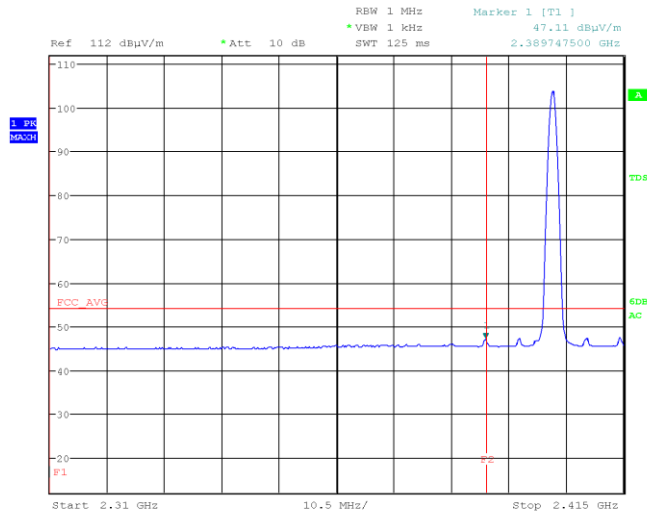
Peak detector; Peak emissions are below the peak limit.



Date: 9.MAY.2023 13:47:31

Average measurement using reduced video bandwidth of 1 kHz.

Emissions are below average limit.



Date: 9.MAY.2023 13:49:54



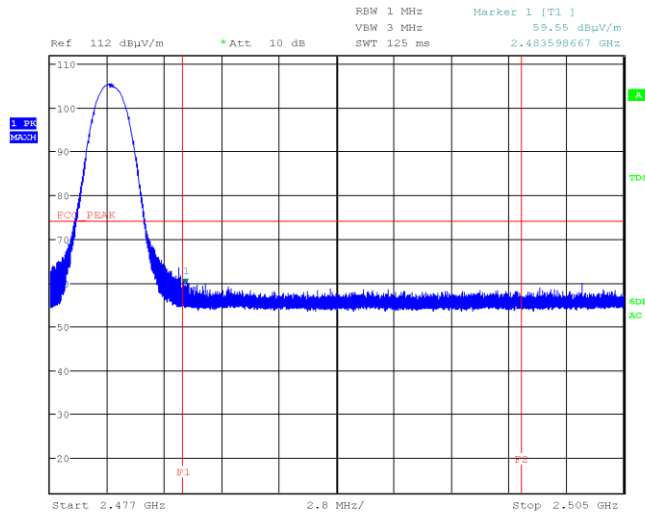


# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver Bluetooth Test Report



## Upper restricted band; EDR 3-DH5 (CH78, 2480 MHz)

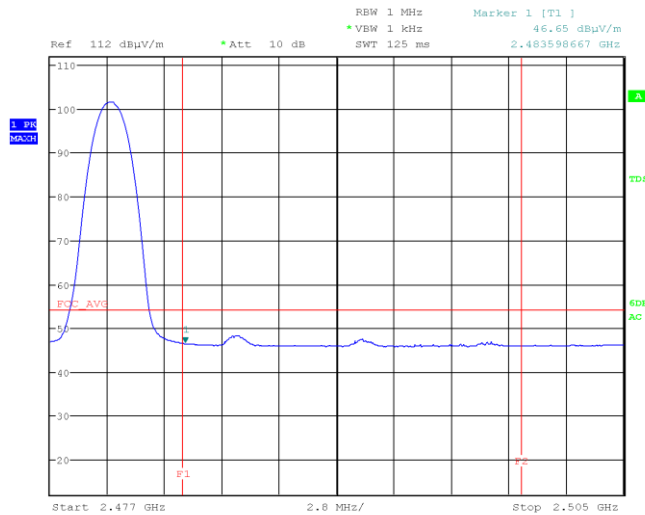
Peak detector; Peak emissions are below the peak limit.



Date: 9.MAY.2023 13:28:15

Average measurement using reduced video bandwidth of 1 kHz.

Emissions are below average limit.



Date: 9.MAY.2023 13:31:59



# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver Bluetooth Test Report

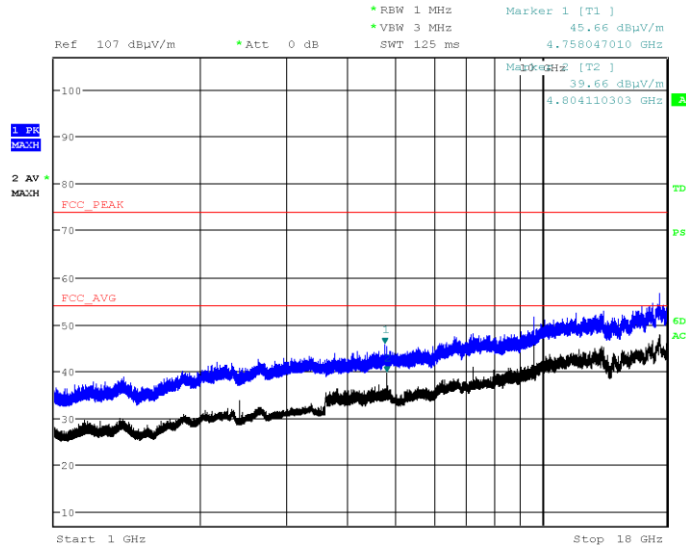


## Radiated emissions 1 GHz to 18 GHz

Measurements made at a 3 meter distance.

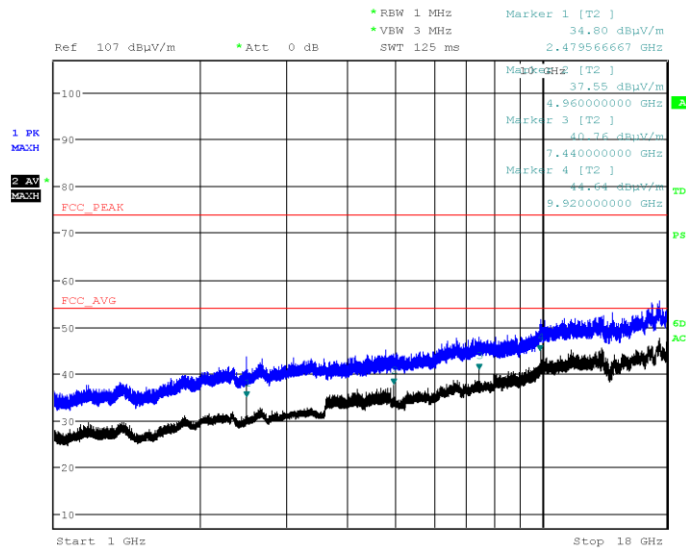
Blue trace is peak detector; black trace is average detector. (30,000 sweep points)  
Measurement noise floor more than 6 dB below the respective limits.

### Low Channel CH0 (2402 MHz) BR DH5



Date: 21.FEB.2023 10:22:28

### High Channel CH78 (2480 MHz) BR DH5



Date: 21.FEB.2023 12:19:24

Emissions are below their respective limits, pass

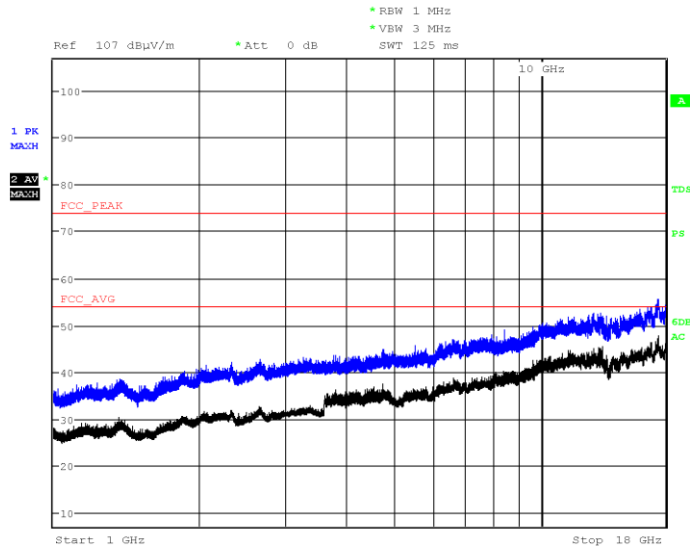
Fundamental emission is attenuated by approximately 60 dB due to the usage of a 2.4 GHz notch filter.



# PRODUCT ASSURANCE ENGINEERING Wireless Transceiver Bluetooth Test Report

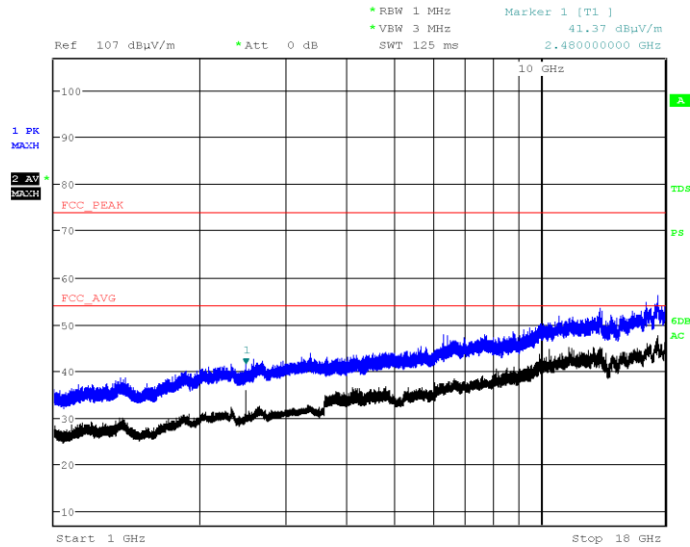


## Low Channel CH0 (2402 MHz) EDR 3-DH5



Date: 21.FEB.2023 12:36:51

## High Channel CH78 (2480 MHz) EDR 3-DH5



Date: 21.FEB.2023 13:20:03

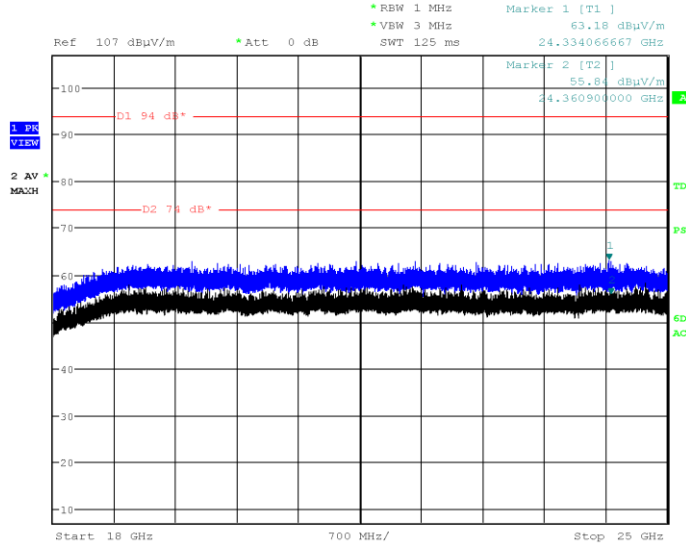
Emissions are below their respective limits, pass.

Fundamental emission is attenuated by approximately 60 dB due to the usage of a 2.4 GHz notch filter.

**Radiated emissions 18 GHz to 25 GHz at 30-centimeter distance.**

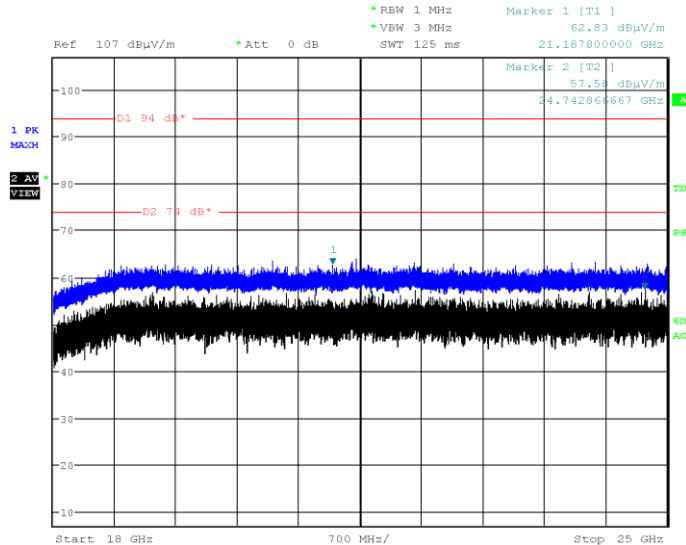
Distance is 30cm (0.3 meters), Limit lines settings based on scaling of  $20\text{Log}(D1/D2) = 20\text{Log}(3\text{m}/0.3) = 20\text{Log}(10) = 20\text{ dB}$   
 Peak limit =  $74 + 20 = 94\text{ dBuV/m}$  (Display line 1)  
 Average limit =  $54 + 20 = 74\text{ dBuV/m}$  (Display line 2)

**DH5, CH0 = 2402 MHz @ 30cm distance.  
Measurement horn antenna polarization = Vertical**



Date: 7.MAR.2023 11:29:19

**DH5, CH0 = 2402 MHz @ 30cm distance.  
Measurement horn antenna polarization = Horizontal**



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Peak emissions below the average limit.



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The following table summarizes radiated emissions for LMH Channels for DH5 and 3-DH5

Plots for other frequencies are similar to plots above and will not be shown.

**Radiated Emissions 18 to 25 GHz @ 30cm distance.**

Mode	Channel Frequency (MHz)	18 GHz to 25 GHz @ 30 centimeter distance								Measurement Antenna Polarization
		Emission Frequency Average (MHz)	Emission Frequency Peak (MHz)	Measured Amplitude (dBµV/m) AVG	Measured Amplitude (dBµV/m) Peak	FCC 15.247 (d)				
						Limit (dBµV/m) AVG	Limit (dBµV/m) Peak	Margin (dB) AVG	Margin (dB) Peak	
DH5	2402	24361.0	24334.0	55.80	63.20	74.0	94.0	18.2	30.8	Vertical
DH5	2402	24742.0	21187.0	57.60	62.80	74.0	94.0	16.4	31.2	Horizontal
DH5	2441	21550.0	20940.0	58.20	62.80	74.0	94.0	15.8	31.2	Vertical
DH5	2441	22077.0	19067.0	58.90	63.70	74.0	94.0	15.1	30.3	Horizontal
DH5	2480	23790.0	24386.0	58.40	63.30	74.0	94.0	15.6	30.7	Vertical
DH5	2480	21660.0	21660.0	59.40	63.60	74.0	94.0	14.6	30.4	Horizontal
3-DH5	2402	21552.0	19851.0	59.40	62.70	74.0	94.0	14.6	31.3	Vertical
3-DH5	2402	22167.0	22849.0	58.10	63.20	74.0	94.0	15.9	30.8	Horizontal
3-DH5	2441	24230.0	21778.0	58.70	63.10	74.0	94.0	15.3	30.9	Vertical
3-DH5	2441	19275.0	19480.0	58.40	63.20	74.0	94.0	15.6	30.8	Horizontal
3-DH5	2480	23338.0	24230.0	58.00	63.30	74.0	94.0	16.0	30.7	Vertical
3-DH5	2480	22094.0	22495.0	58.30	63.20	74.0	94.0	15.7	30.8	Horizontal

Emissions are more than 10 dB below their respective limits.

# 13. Radiated Emissions 30 MHz to 1 GHz

## Requirement:

FCC 15.205, 15.209

RSS-Gen Clause 8.9

## Measurement Method:

ANSI C63.10-2013 Subclause 6.5

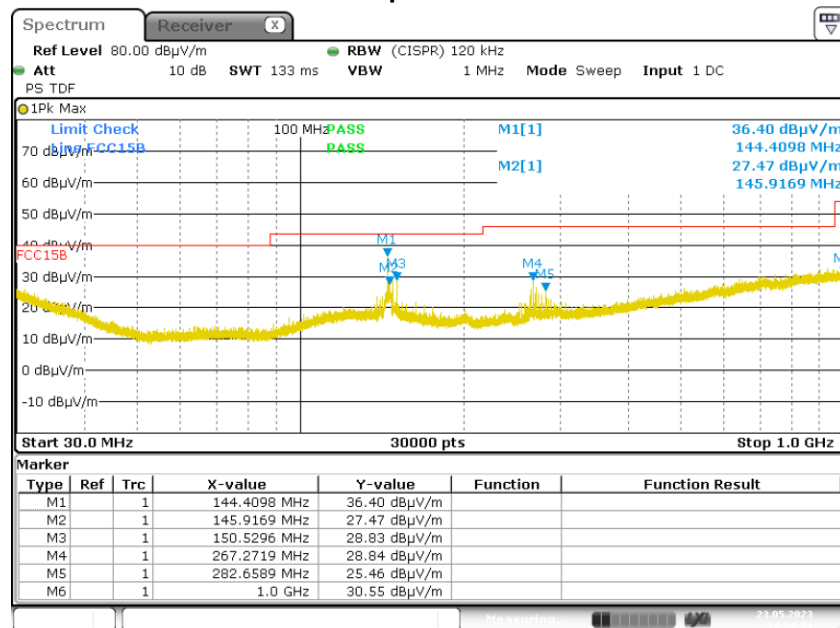
EUT on wooden table 80cm off ground plane.

## Radiated emissions below 1 GHz test results:

**Bluetooth mode:** Playing maximum volume pink noise via Bluetooth connection from iPod.

EUT tested in 3 different orientations with and without cables attached with worst case orientation being EUT facing down on turn table without cables attached. See separate test setup photos document for details.

**Horizontal antenna polarization is worst case.**



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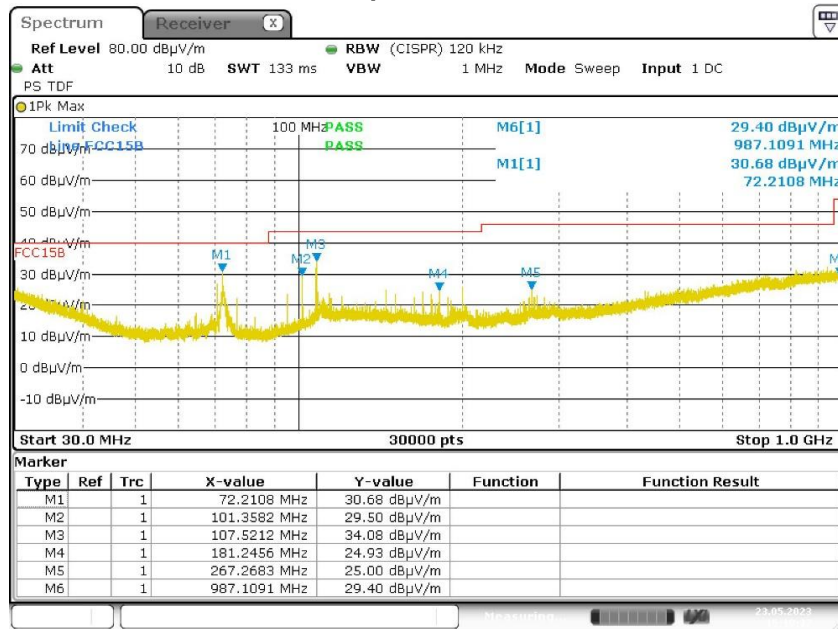


QP Measurements for plot on previous page.

Emission Frequency (MHz)	Measured Amplitude (dBµV/m) QP/AVG*	Measured Amplitude (dBµV/m) Peak	15.247 (d)				Table Azimuth (0° closest to ant)	Receiving Antenna	
			Limit (dBµV/m) QP/AVG*	Limit (dBµV/m) Peak	Margin (dB) QP/AVG*	Margin (dB) Peak		Pol (H/V)	Height (Meters)
144.396	36.10	38.30	43.5	N/A	7.4	N/A	360	H	2.0
144.410	35.40	37.90	43.5	N/A	8.1	N/A	160	H	1.9
145.917	26.20	31.60	43.5	N/A	17.3	N/A	360	H	2.1
150.530	27.10	30.50	43.5	N/A	16.4	N/A	0	H	1.9
267.272	27.90	31.40	46.0	N/A	18.1	N/A	237	H	1.0
282.659	21.70	27.10	46.0	N/A	24.3	N/A	69	H	1.0
999.999	22.00	31.80	54.0	N/A	32.0	N/A	69	H	1.0

**AUX Input mode:** Playing maximum volume pink noise via supplied AUX cable between EUT AUX input and iPod 3.5mm output. EUT tested in 3 different orientations with worst case being with EUT facing down on turn table with all cables connected. See separate test setup photos document for details.

Vertical antenna polarization is worst case.



Date: 23.MAY.2023 15:10:37

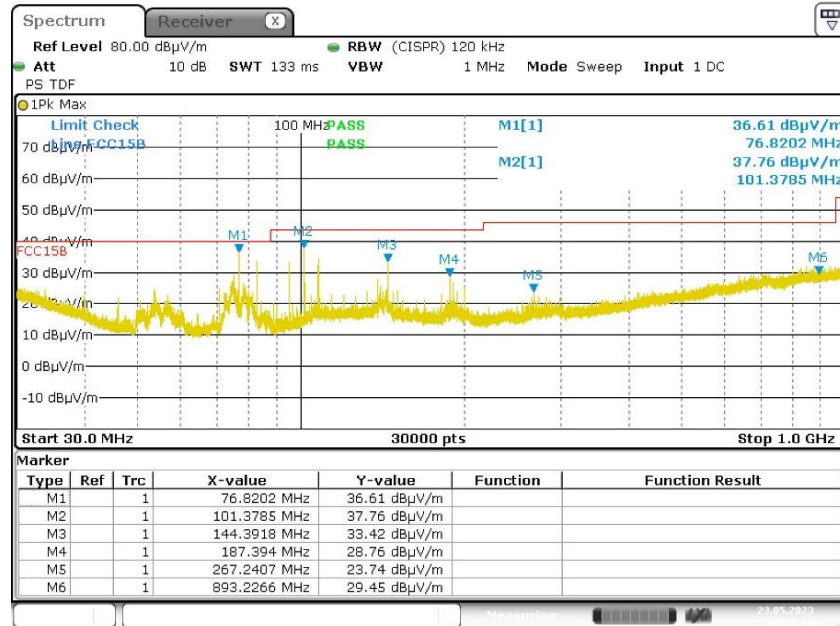
QP Measurements for above plot.

Emission Frequency (MHz)	Measured Amplitude (dBµV/m) QP/AVG*	Measured Amplitude (dBµV/m) Peak	15.247 (d)				Table Azimuth (0° closest to ant)	Receiving Antenna	
			Limit (dBµV/m) QP/AVG*	Limit (dBµV/m) Peak	Margin (dB) QP/AVG*	Margin (dB) Peak		Pol (H/V)	Height (Meters)
72.211	27.80	33.00	40.0	N/A	12.2	N/A	187	V	1.9
101.358	28.40	30.10	43.5	N/A	15.1	N/A	60	V	1.0
107.521	33.30	34.90	43.5	N/A	10.2	N/A	360	V	1.0
181.246	23.30	26.30	43.5	N/A	20.2	N/A	177	V	1.0
267.268	25.00	29.00	46.0	N/A	21.0	N/A	188	V	1.0
987.109	21.90	32.10	54.0	N/A	32.1	N/A	188	V	1.0



**Charging mode:** EUT 's supplied USBC cable plugged into 5V USB charger plugged into 120VAC 60Hz. AUX cable plugged into EUT AUX port, far end of AUX cable is not connected to anything. See separate test setup photos document for details.

Vertical antenna polarization is worst case.



Date: 23.MAY.2023 15:29:14

QP Measurements for above plot.

Emission Frequency (MHz)	Measured Amplitude (dBμV/m) QP/AVG*	Measured Amplitude (dBμV/m) Peak	15.247 (d)				Table Azimuth (0° closest to ant)	Receiving Antenna	
			Limit (dBμV/m) QP/AVG*	Limit (dBμV/m) Peak	Margin (dB) QP/AVG*	Margin (dB) Peak		Pol (H/V)	Height (Meters)
76.820	36.10	37.40	40.0	N/A	3.9	N/A	176	V	1.1
101.379	36.90	37.70	43.5	N/A	6.6	N/A	360	V	1.0
144.392	32.00	34.60	43.5	N/A	11.5	N/A	109	V	1.1
187.394	27.40	30.40	43.5	N/A	16.1	N/A	71	V	1.0
267.241	22.80	26.90	46.0	N/A	23.2	N/A	119	V	1.0
893.227	20.90	30.90	46.0	N/A	25.1	N/A	0	V	1.0

# 14. Conducted AC Mains Emission

## Requirement:

FCC 15.207 (a)

RSS-Gen 8.8

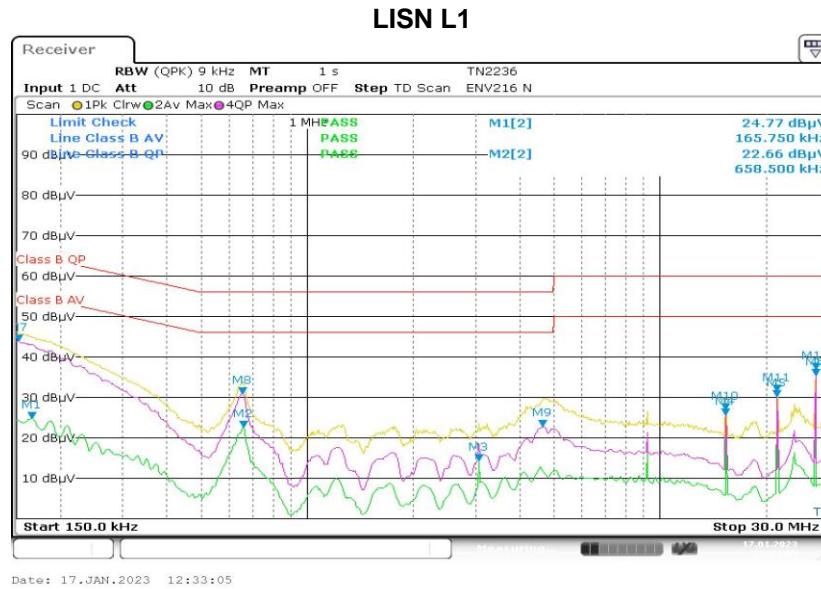
## Measurement Method:

ANSI C63.10-2013 Subclause 6.2

EUT on wooden table 80cm off ground plane.

## AC Line conducted emissions test results:

EUT paired with iPod playing 1.5 kHz tone with power supply connected to 120VAC 60 Hz.



Mk #	Frequency MHz	MEASURED		LIMIT		MARGIN		Notes
		dBµV QP	dBµV AVG	dBµV QP	dBµV AVG	dB QP	dB AVG	
1	27.65	37.00	35.40	60.0	50.0	23.0	14.6	LISN L1: EUT Charging & Operating BT, 120VAC 60Hz
2	27.65	37.00	35.40	60.0	50.0	23.0	14.6	LISN L1: EUT Charging & Operating BT, 120VAC 60Hz
3	21.50	31.50	30.20	60.0	50.0	28.5	19.8	LISN L1: EUT Charging & Operating BT, 120VAC 60Hz
4	21.50	31.50	30.20	60.0	50.0	28.5	19.8	LISN L1: EUT Charging & Operating BT, 120VAC 60Hz
5	0.15	43.90	24.50	65.9	55.9	22.0	31.4	LISN L1: EUT Charging & Operating BT, 120VAC 60Hz
6	0.17	43.10	24.80	65.2	55.2	22.1	30.4	LISN L1: EUT Charging & Operating BT, 120VAC 60Hz
7	0.66	30.60	22.70	56.0	46.0	25.4	23.3	LISN L1: EUT Charging & Operating BT, 120VAC 60Hz
8	0.65	30.90	22.60	56.0	46.0	25.1	23.4	LISN L1: EUT Charging & Operating BT, 120VAC 60Hz
9	15.36	26.90	25.60	60.0	50.0	33.1	24.4	LISN L1: EUT Charging & Operating BT, 120VAC 60Hz
10	15.36	26.90	25.60	60.0	50.0	33.1	24.4	LISN L1: EUT Charging & Operating BT, 120VAC 60Hz
11	3.07	18.60	14.30	56.0	46.0	37.4	31.7	LISN L1: EUT Charging & Operating BT, 120VAC 60Hz
12	4.66	22.70	11.80	56.0	46.0	33.3	34.2	LISN L1: EUT Charging & Operating BT, 120VAC 60Hz

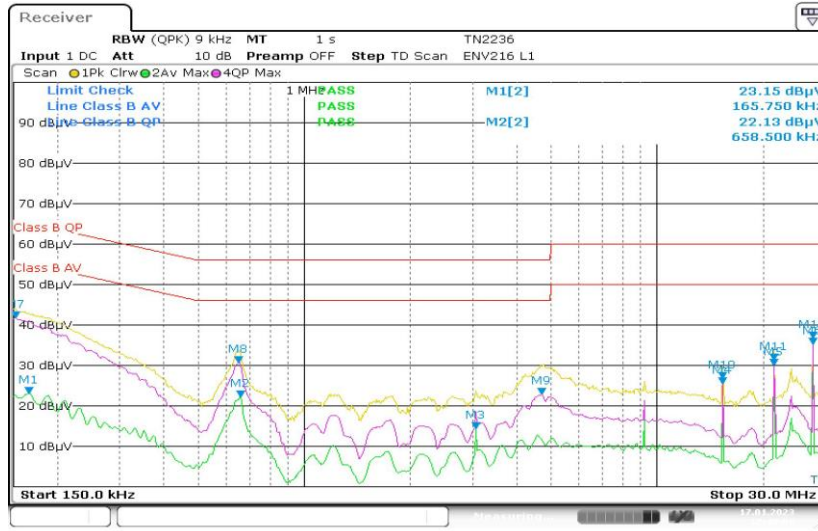


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### LISN Neutral



Date: 17.JAN.2023 12:40:09

Mk #	Frequency MHz	MEASURED		LIMIT		MARGIN		Notes
		dBµV QP	dBµV AVG	dBµV QP	dBµV AVG	dB QP	dB AVG	
1	27.65	36.70	35.20	60.0	50.0	23.3	14.8	LISN N: EUT Charging & Operating BT, 120VAC 60Hz
2	27.65	36.70	35.20	60.0	50.0	23.3	14.8	LISN N: EUT Charging & Operating BT, 120VAC 60Hz
3	21.50	31.40	30.10	60.0	50.0	28.6	19.9	LISN N: EUT Charging & Operating BT, 120VAC 60Hz
4	21.50	31.40	30.10	60.0	50.0	28.6	19.9	LISN N: EUT Charging & Operating BT, 120VAC 60Hz
5	0.66	30.10	22.10	56.0	46.0	25.9	23.9	LISN N: EUT Charging & Operating BT, 120VAC 60Hz
6	0.15	41.70	22.60	65.9	55.9	24.2	33.3	LISN N: EUT Charging & Operating BT, 120VAC 60Hz
7	0.17	41.00	23.10	65.2	55.2	24.2	32.1	LISN N: EUT Charging & Operating BT, 120VAC 60Hz
8	0.65	30.70	21.60	56.0	46.0	25.3	24.4	LISN N: EUT Charging & Operating BT, 120VAC 60Hz
9	15.36	26.80	25.40	60.0	50.0	33.2	24.6	LISN N: EUT Charging & Operating BT, 120VAC 60Hz
10	15.36	26.80	25.40	60.0	50.0	33.2	24.6	LISN N: EUT Charging & Operating BT, 120VAC 60Hz
11	3.07	18.50	14.20	56.0	46.0	37.5	31.8	LISN N: EUT Charging & Operating BT, 120VAC 60Hz
12	4.72	22.80	11.70	56.0	46.0	33.2	34.3	LISN N: EUT Charging & Operating BT, 120VAC 60Hz



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## 15. Equipment List

Used For	Tracking Number	Description	Model	Make	Serial Number	Most recent calibration	Calibration Due Date	Most Recent Verification	Verification Due Date
AC Mains CE	2247	Spectrum Analyzer	ESR7	Rohde & Schwarz	101263	3/21/2022	3/20/2023		
AC Mains CE	2236	USN	NV216	Rohde & Schwarz	101193	3/29/2022	3/28/2024		
AC Mains CE	1380	Comb Generator	CGC-510	Com-Power	311559	7/13/2022	7/13/2023		
AC Mains CE	2114	Henry Screen Room	N/A	Panashield	1698C			10/7/2022	10/7/2023
AC Mains CE	3724	Cable	RG223 16' with N connectors	Pasternack	N/A			7/6/2022	7/6/2023
RE Below 1 GHz	1375	Positioner	SC99V	Sunol Sciences	050905-1	NA	NA	NA	NA
RE Below 1 GHz	2319	EMI Analyzer	ESR26	Rohde & Schwarz	101276	3/29/2023	3/28/2024		
RE Below 1 GHz	644	3m Chamber	AP191	Rantec	1698A	10/7/2022	10/7/2023		
RE Below 1 GHz	1541	Antenna	JB6	Sunol Sciences	A050807	12/14/2021	12/14/2023		
RE Below 1 GHz	2077	Pre-Amp	Bose	MN ZX60-3018G+	N/A			9/1/2022	9/1/2023
RE Below 1 GHz	1445	Cable Set	4G	NA	NA			9/1/2022	9/1/2023
RE Below 1 GHz	2281	iPod	4G	Apple	CCQM2PAUFFCJ	N/A	N/A	N/A	N/A
RE Above 1 GHz	2602	Pre-Amp	AFS42-01001800-28-10P-42	Miteq	N/A			7/7/2022	7/7/2023
RE Above 1 GHz	1663	EMI Analyzer	ESU40	Rohde & Schwarz	100098	3/20/2022	3/19/2024		
RE Above 1 GHz	2414	2.4 GHz Notch Filter	BRM50702-07	Micro-Tronics	003			3/28/2022	3/27/2023
RE Above 1 GHz	2342	2.4 GHz Notch Filter	BRM50702-07	Micro-Tronics	001			3/28/2022	3/27/2023
RE Above 1 GHz	2385	Chamber	3 Meter	AP Americas	N/A	10/7/2022	10/7/2023		
RE Above 1 GHz	1757	Pre-Amp	JS4018004000-30-8P-A1	Miteq	1406279			7/7/2022	7/7/2023
RE Above 1 GHz	1596	Horn	AT4640	Amplifier Research	309234			7/7/2022	7/7/2023
RE Above 1 GHz	2349	Horn	3117	ETS Lindgren	00152406	2/24/2023	2/23/2025		
RE Above 1 GHz	2368	Cable	TRU-210	TRU Corporation	TRU-12767-35			3/28/2023	3/27/2024
RE Above 1 GHz	3685	Cable Set	2373, 2479, 2357	N/A	N/A			3/28/2022	3/27/2023
RE Restricted Bands	2602	Pre-Amp	AFS42-01001800-28-10P-42	Miteq	N/A			7/7/2022	7/7/2023
RE Restricted Bands	1663	EMI Analyzer	ESU40	Rohde & Schwarz	100098	3/20/2022	3/19/2024		
RE Restricted Bands	2385	Chamber	3 Meter	AP Americas	N/A	10/7/2022	10/7/2023		
RE Restricted Bands	2349	Horn	3117	ETS Lindgren	00152406	2/24/2023	2/23/2025	3/28/2023	3/28/2024
RE Restricted Bands	3685	Cable Set	2373, 2479, 2357	N/A	N/A			3/28/2022	3/27/2023
RF Conducted	2342	2.4 GHz Notch Filter	BRM50702-07	Micro-Tronics	001			3/28/2022	3/27/2023
RF Conducted	2408	EMI Analyzer	FSV40	Rohde & Schwarz	101414	3/23/2022	3/22/2023		
RF Conducted	2409	EMI Analyzer	FSV40	Rohde & Schwarz	101413	3/21/2023	3/21/2024		
RF Conducted	2404	ETS Probe	7002-008	ETS Lindgren	160035	10/24/2022	10/24/2023		

# 16 Measurement Uncertainty

## AC Mains conducted emissions uncertainty.

Uncertainty Budget (AC mains measurements)				
Title:		Conducted RF Emissions (Mains)		
Source of Uncertainty	Value units:± dB	Distribution	Divisor	Uncertainty (± dB)
Receiver - absolute level	0.3	Rect.	1.73	0.17
Receiver - frequency response	1.0	Rect.	1.73	0.58
Receiver - attenuator switching	0.2	Rect.	1.73	0.12
Receiver - bandwidth switching	0.2	Rect.	1.73	0.12
Receiver - display	0.5	Rect.	1.73	0.29
LISN impedance	2.6	Triang.	2.45	1.06
LISN insertion loss	0.6	Norm.	2.00	0.30
Cable correction factor	0.1	Norm.	2.00	0.05
Combined uncertainty (RSS):				1.30
Coverage factor (2 sigma):				2.00
Extended uncertainty (95% confidence):				<b>2.60</b>

## Radiated emission uncertainty (30 MHz – 1 GHz)

Uncertainty Budget				
Title:		Radiated RF Emissions (30MHz-1GHz)		
Source of Uncertainty	Value units:± dB	Distribution	Divisor	Uncertainty (± dB)
Receiver - absolute level	0.3	Rect.	1.73	0.17
Receiver - frequency response	0.8	Rect.	1.73	0.46
Receiver - attenuator switching	0.2	Rect.	1.73	0.12
Receiver - bandwidth switching	0.2	Rect.	1.73	0.12
Receiver - display	0.5	Rect.	1.73	0.29
Antenna factor	0.8	Norm.	2.00	0.38
Antenna directivity	1.0	Norm.	2.00	0.50
Preamp correction factor	0.5	Norm.	2.00	0.25
Cable correction factor	0.5	Norm.	2.00	0.25
Site imperfection - NSA	4.0	Triang.	2.45	1.63
Test table impact	1.1	Rect.	1.73	0.64
Combined uncertainty (RSS):				1.98
Coverage factor (2 sigma):				2.00
Extended uncertainty (95% confidence):				<b>3.97</b>

## Radiated emissions above 1 GHz

Uncertainty Budget				
Title:		Radiated Emissions above 1 GHz		
Source of Uncertainty	Value units:+/- dB	Distribution	Divisor	Uncertainty (± dB)
RF spec anal-level-Ref.	0.6	Rect.	1.73	0.35
RF spec anal-level-Freq resp.	1.0	Rect.	1.73	0.58
RF spec anal-level-Display	0.3	Rect.	1.73	0.17
RF spec anal-level-QP det.	1.0	Rect.	1.73	0.58
Antenna factor	0.9	Norm.	2.00	0.45
Preamp corr. Factor	0.5	Rect.	1.73	0.29
Cable corr. Factor	0.5	Rect.	1.73	0.29
Combined uncertainty (RSS):				1.09
Coverage factor (2 sigma):				2.00
Extended uncertainty (95% confidence):				<b>2.18</b>

## Conducted RF measurements.

Uncertainty Budget				
Title:		Conducted RF measurements		
Source of Uncertainty	Value units:± dB	Distribution	Divisor	Uncertainty (± dB)
Analyzer - absolute level	0.3	Rect.	1.73	0.17
Analyzer - frequency response	0.5	Rect.	1.73	0.29
Analyzer - attenuator switching	0.2	Rect.	1.73	0.12
Analyzer - bandwidth switching	0.2	Rect.	1.73	0.12
Analyzer - display	0.5	Rect.	1.73	0.29
Cable correction factor	0.5	Norm.	2.00	0.25
Combined uncertainty (RSS):				0.54
Coverage factor (2 sigma):				2.00
Extended uncertainty (95% confidence):				<b>1.07</b>



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End of Report