

ISED CABid: ES1909

Test Report No:
NIE: 69534RRF.006

Test Report

USA FCC Part 15.247, 15.209

CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Automotive Infotainment System
(*) Trademark	Mercedes-Benz
(*) Model and /or type reference	NTG6NQ ENTRY/MID
Other identification of the product	HW version: D10 SW version: E875.014 FCC ID: T8GNTG6NQEM IC: 6434A-NTG6NQEM
(*) Features	FM, AM, DAB, USB, Bluetooth, WLAN (2,4 / 5 GHz), GNSS.
Applicant	HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH BECKER-GOERING-STR. 16; 76307 KARLSBAD GERMANY
Test method requested, standard	USA FCC Part 15.247 (10-1-20 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-20 Edition): Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 amendment 1 (March 2019). Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López EMC Consumer & RF Lab. Manager
Date of issue	2022-01-20
Report template No	FDT08_23 (*) "Data provided by the client"

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Acronyms

Acronym ID	Acronym Description
	Emission Bandwidth
Avg COT	Average Channel Occupancy Time
Detector	Detector used
Equipment	Equipment Type
Freq	Frequency
Freq Rng	Frequency Range
Freq Sep	Frequency Separation
Inband Peak Lvl	Inband Peak Level
Lvl	Level
MP	Measurement Point
Mod	Modulation
NHC	Number of Hopping Channels
NHp	Number of hops over the period
Occ Ch BW	Occupied Channel Bandwidth
Operation Band	Operation Band
Peak Power	Maximum Peak Conducted Output Power
Pol	Polarization
Unwanted Freq	Unwanted Emissions Frequency
Unwanted Lvl	Unwanted Emissions Level

Competences and guarantees

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DEKRA Testing and Certification is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that covers the performed tests in this report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory, CABid: ES1909, with the appropriate scope of accreditation that covers the performed tests in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification S.A.U. has a calibration and maintenance program for its measurement equipment.

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Uncertainty

Uncertainty (factor $k=2$) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample of the model NTG6NQ ENTRY/MID is an automotive head unit to be installed in cars with the following features: FM, AM, DAB, USB, Bluetooth, WLAN and GNSS.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of result.

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Usage of samples

Samples undergoing test have been selected by: The client.

- Sample S/01 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
69534/041	Automotive Infotainment System	NTG6NQ ENTRY/MID	HBM580M96DRU3M	2021/11/15
69534/074	Harness	---	---	2021/11/15
68534/102	BT/WLAN antenna	---	---	2021/11/15
69534/105	BT/WLAN antenna	---	---	2021/11/15

Auxiliary elements used with the Sample S/01:

Control N°	Description	Model	Serial N°	Date of reception
69534/084	USB to Ethernet adapter	UE300	---	2021/11/15
69534/092	Ethernet cable	---	---	2021/11/15
69534/112	SMA adapter	---	---	2021/11/15

Sample S/01 has undergone the following test(s): All the tests indicated in Appendix A .

Test sample description

Ports..... :	Port name and description		Cable				
			Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾	
	Car Connector A and B		>3m	☒	☒	☐	
	Display Connector CID/PIP / RVC		>3m	☐	☒	☐	
	USB, Eth. Connector		<3m, >3m	☐	☒	☐	
	BT / WLAN-Antenna		>3m	☐	☒	☐	
	FM/AM, TV/SDARS Antenna		>3m	☒	☐	☐	
	GPS Antenna		>3m	☒	☐	☐	
---			☐	☐	☐		
Supplementary information to the ports..... :	For EMC-Testing all cables should be connected to the connectors						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐ AC:	☐	☐	☐	☐	☐	
☒ DC: 12V Car battery / attenuator (9,5-15,5V normal operation)							
Rated Power	9,5-15,5V normal operation						
Clock frequencies..... :	see schematics						
Other parameters	FCC ID: T8GNTG6NQEM / IC: 6434A-NTG6NQEM						
Software version	E412.007						
Hardware version	D10 / Serial Product						
Dimensions in cm (W x H x D)	182 x 78 x 160 mm						
Mounting position	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: n/a - automotive headunit					
Modules/parts..... :	Module/parts of test item		Type		Manufacturer		

Accessories (not part of the test item)	Description		Type		Manufacturer		
	Display (vehicle touch display)		A247 905 69		DAIMLER original		
	CAN-Box				HBAS		
	Cable harness				HBAS		
	BT/WLAN-Antenna		A247 905 83		Hirschmann		
Documents as provided by the applicant..... :	Description		File name		Issue date		
	Technical Description						

⁽³⁾ Only for Medical Equipment

Identification of the client

HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH
BECKER-GOERING-STR. 16
76307 KARLSBAD, GERMANY

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2021-11-26
Date (finish)	2021-12-01

Document history

Report number	Date	Description
69534RRF.006	2022-01-20	First release.

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: Javier Miguel Nadales Lisbona, José Manuel Jiménez González, Nicolás Salguero Camarena and Pablo Redondo Reyes.

Used instrumentation:

Equipment	Model	Vendor	Latest Calibration	Next Calibration
DIGITAL MULTIMETER	179	FLUKE	2021-10-19	2022-10-19
EMI TEST RECEIVER 9kHz-7GHz	ESR7	ROHDE AND SCHWARZ	2020-12-12	2022-12-12
HORN ANTENNA 1-18GHz	BBHA 9120 D	SCHWARZBECK MESS-ELEKTRONIK	2019-11-18	2022-11-18
HORN ANTENNA 18-40GHz	BBHA 9170	SCHWARZBECK	2020-05-05	2023-05-05
PRE-AMPLIFIER G>30dB 17-40GHz	BLMA 1840-4A	BONN ELEKTRONIK	2021-09-01	2022-09-01
HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	ETS LINDGREN	2020-04-30	2023-04-30
OPEN SWITCH UNIT UP TO 7.5 GHz	OSP-B157W8 PLUS	ROHDE & SCHWARZ	2021-08-20	2023-08-20
POWER SUPPLY DC 40 V / 40 A	NGPE 40/40	ROHDE AND SCHWARZ	--	--
PRE-AMPLIFIER G>40dB 1-18 GHz	BLMA 0118-3A	BONN ELEKTRONIK	2021-06-07	2022-06-07
SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV 40	ROHDE AND SCHWARZ	2021-02-26	2023-02-26
SIGNAL AND SPECTRUM ANALYZER 2Hz-50GHz	FSW50	ROHDE AND SCHWARZ	2020-07-06	2022-07-06
SIGNAL GENERATOR 8kHz-6GHz	SMB100B	ROHDE AND SCHWARZ	2021-11-03	2023-11-03
VECTOR SIGNAL GENERATOR 100kHz-7.5GHz	SMW200A	ROHDE AND SCHWARZ	2021-08-20	2023-08-20
WIRELESS CONNECTIVITY TESTER BW 160 MHz	CMW270	ROHDE AND SCHWARZ	2021-11-30	2022-11-30

Testing verdicts

Fail	F
Not applicable	N/A
Not measured	N/M
Pass	P

Summary

Bluetooth EDR

Requirement – Test case	FCC PART 15 PARAGRAPH / RSS-247	Verdict	Remark
RSS-247 5.1 (b) / FCC 15.247 (a) (1) [20dBW] 20 dB Bandwidth		Pass	
RSS-247 5.1 (d) / FCC 15.247 (a) (1) (iii) [DwT] Time of Occupancy (Dwell Time)		Pass	
RSS-247 5.4. (b) / FCC 15.247 (b) [Pkcp] Maximum peak output power and antenna gain		Pass	
RSS-247 5.1 (d) / FCC 15.247 (a) (1) (iii) [NHC] Number of hopping channels		Pass	
RSS-247 5.5 / FCC 15.247 (d) [Bndedge] Band-edge emissions compliance (Transmitter)		Pass	
RSS-247 5.5 / FCC 15.247 (d) [RSE] Emission limitations radiated (Transmitter)		Pass	
<u>Supplementary information and remarks:</u>			
None			

Appendix A: Test results. Bluetooth EDR

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TEST CASES DETAILS	15
FCC 47 CFR PART 15.247 / RSS-247	15
RSS-247 5.1 (b) / FCC 15.247 (a) (1) [20dBW] 20 dB Bandwidth	15
99dBw Occupied Channel Bandwidth 99%	21
RSS-247 5.1 (b) / FCC 15.247 (a) (1) [CFS] Carrier Frequency Separation.....	27
RSS-247 5.1 (d) / FCC 15.247 (a) (1) (iii) [DwT] Time of Occupancy (Dwell Time).....	30
RSS-247 5.1 (d) / FCC 15.247 (a) (1) (iii) [NHC] Number of hopping channels	33
FCC 15.247 (b) / RSS-247 5.4 (b) Maximum peak output power and antenna gain	36
RSS-247 5.5 / FCC 15.247 (d) [Bndedge] Band-edge emissions compliance (Transmitter)	43
RSS-247 5.5 / FCC 15.247 (d) [RSE] Emission limitations radiated (Transmitter)	52

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (V):

V nominal:	12 Vdc.
Type of Power Supply:	DC External (Car Battery).

ANTENNA:

Type of Antenna:	External antenna.
Maximum Declared Antenna Gain:	0.7 dBi

TEST FREQUENCIES:

Low Channel:	2402 MHz
Middle Channel:	2441 MHz
High Channel:	2480 MHz

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and it is connected to the TS8997 using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.



RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz and 1 GHz-17 GHz Double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1 m for the frequency range 17 GHz-26 GHz (antenna and 18 GHz-40 GHz horn antenna).

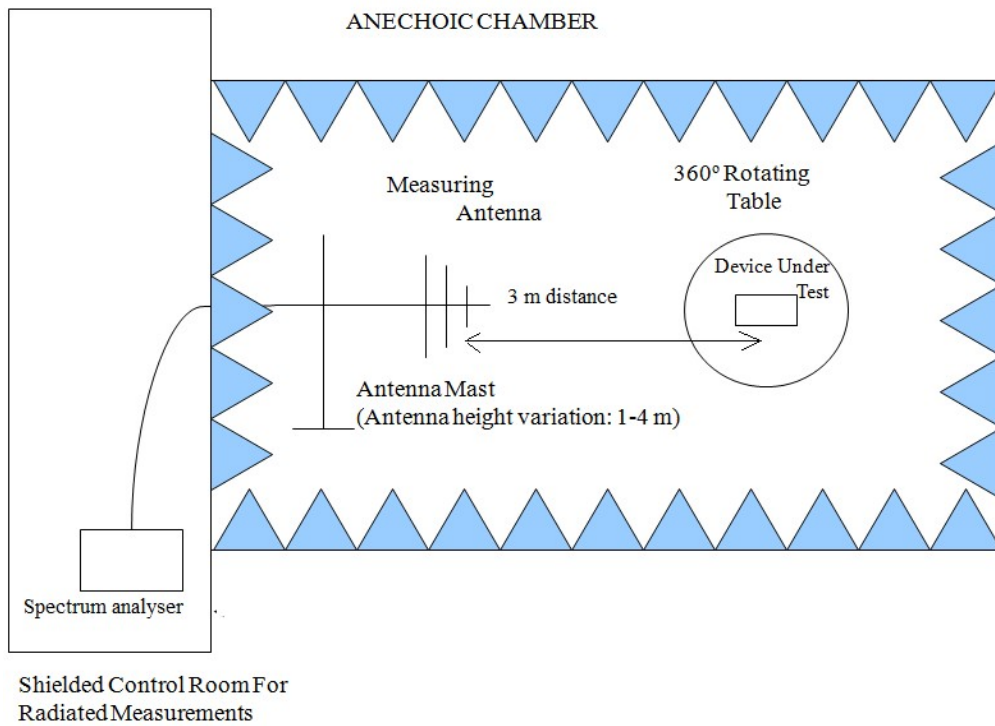
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

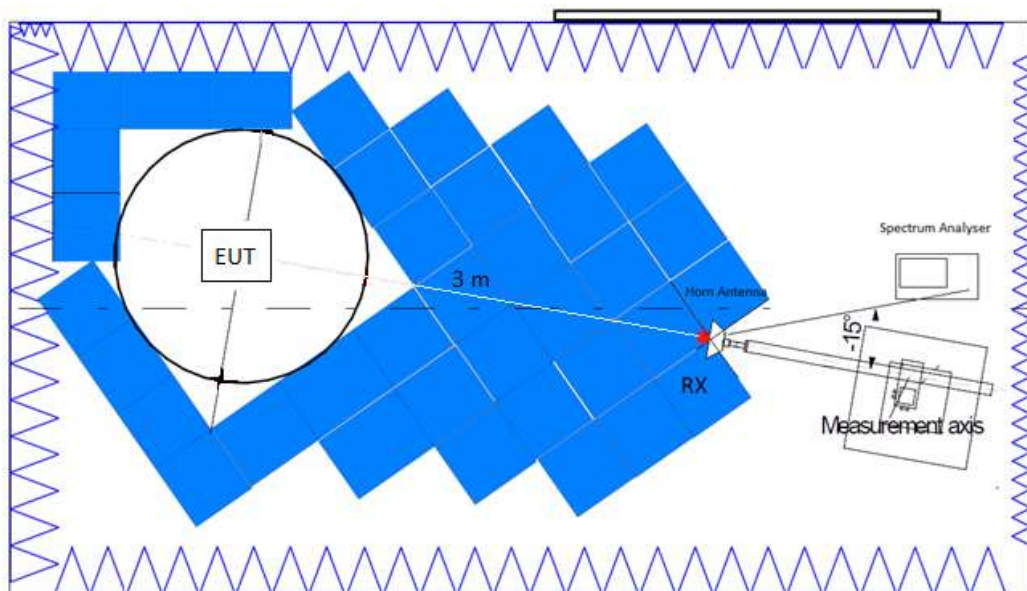
Measurements were made in both horizontal and vertical planes of polarization.

A resolution bandwidth/video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

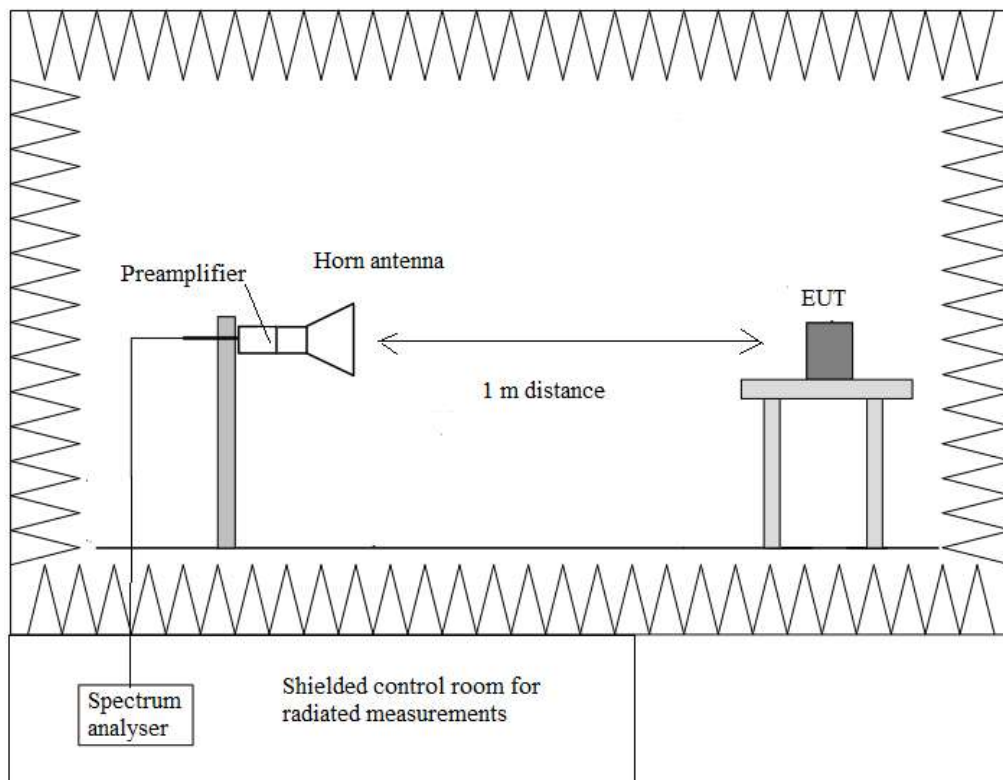
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup $f > 17$ GHz:



TEST CASES DETAILS

FCC 47 CFR Part 15.247 / RSS-247

RSS-247 5.1 (b) / FCC 15.247 (a) (1) [20dBW] 20 dB Bandwidth

Limits

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.

Modulation: BT (GFSK 1-DH5)

Results

Freq (MHz)	Emission Bandwidth (MHz)
2402.00000	0.9000
2441.00000	0.8950
2480.00000	0.8950

Verdict

Pass

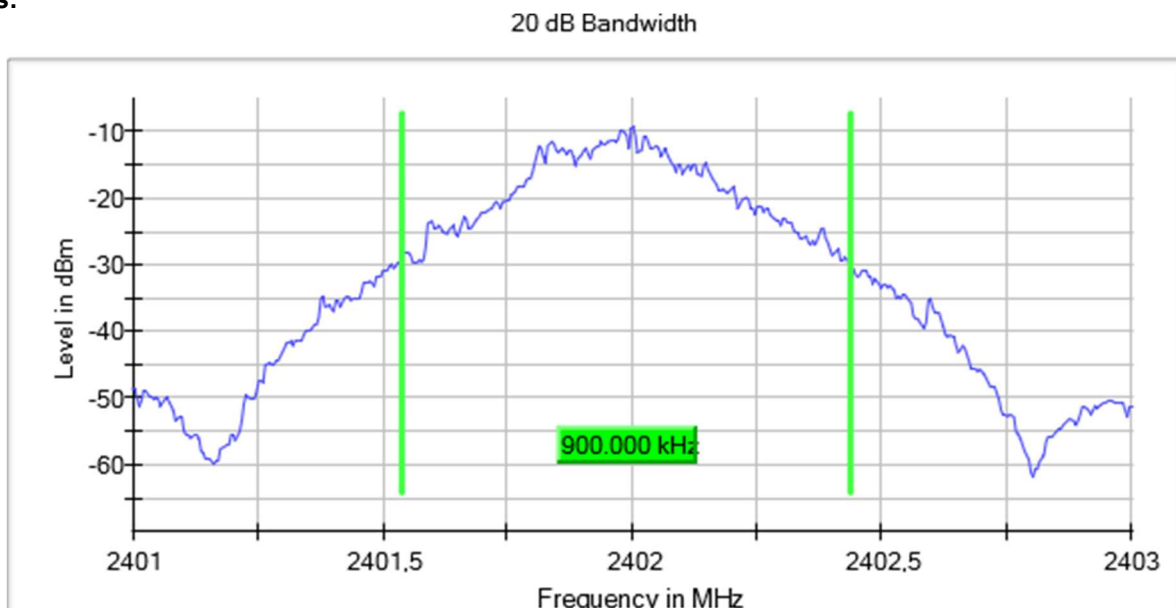
Uncertainty

Measurement uncertainty (%) $\leq \pm 1.24$

Attachments

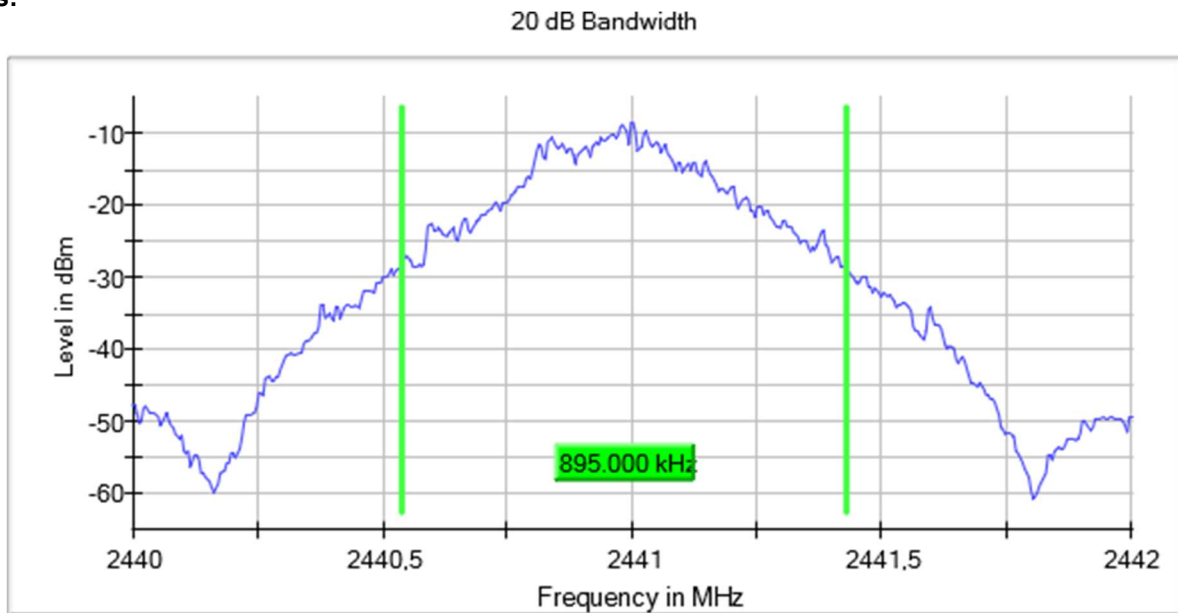
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5)

Images:



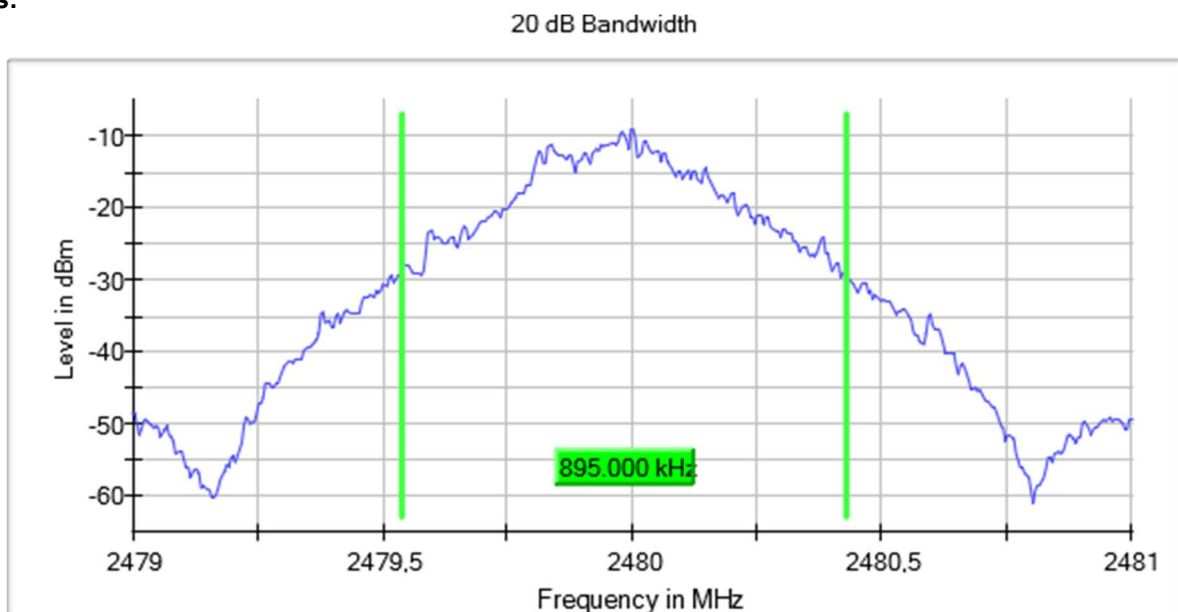
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5)

Images:



Operation Band MHz = [2400, 2483.5], Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (GFSK 1-DH5)

Images:



Modulation: BT (Pi/4 DQPSK 2-DH5)

Results

Freq (MHz)	Emission Bandwidth (MHz)
2402.00000	1.260000
2441.00000	1.260000
2480.00000	1.255000

Verdict

Pass

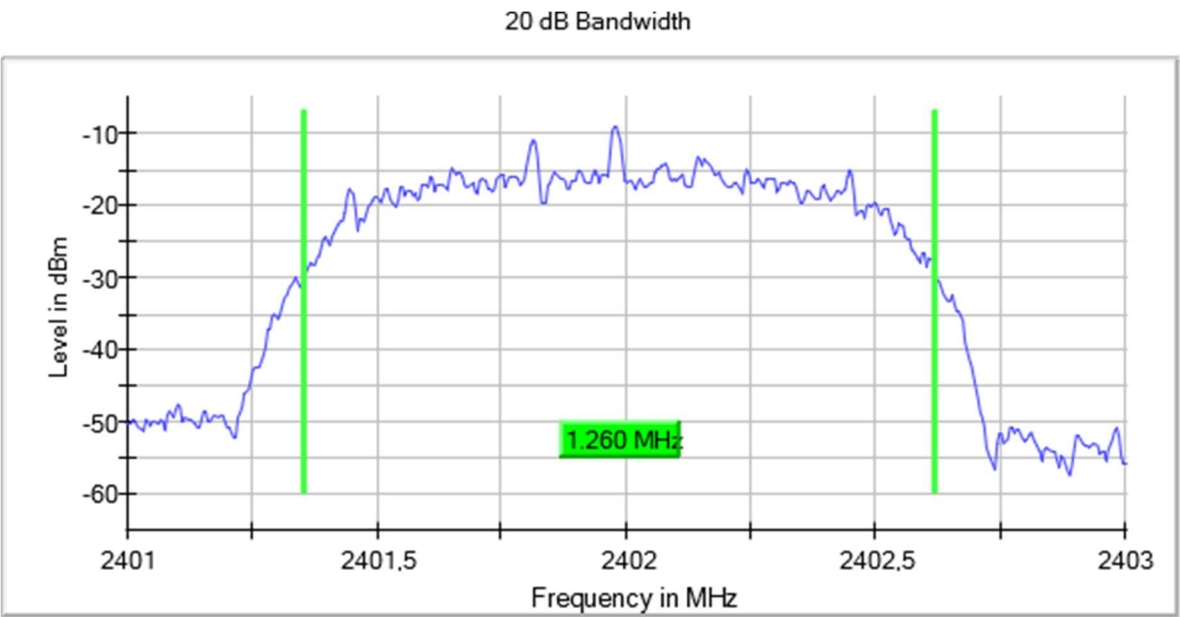
Uncertainty

Measurement uncertainty (%) <±1.24

Attachments

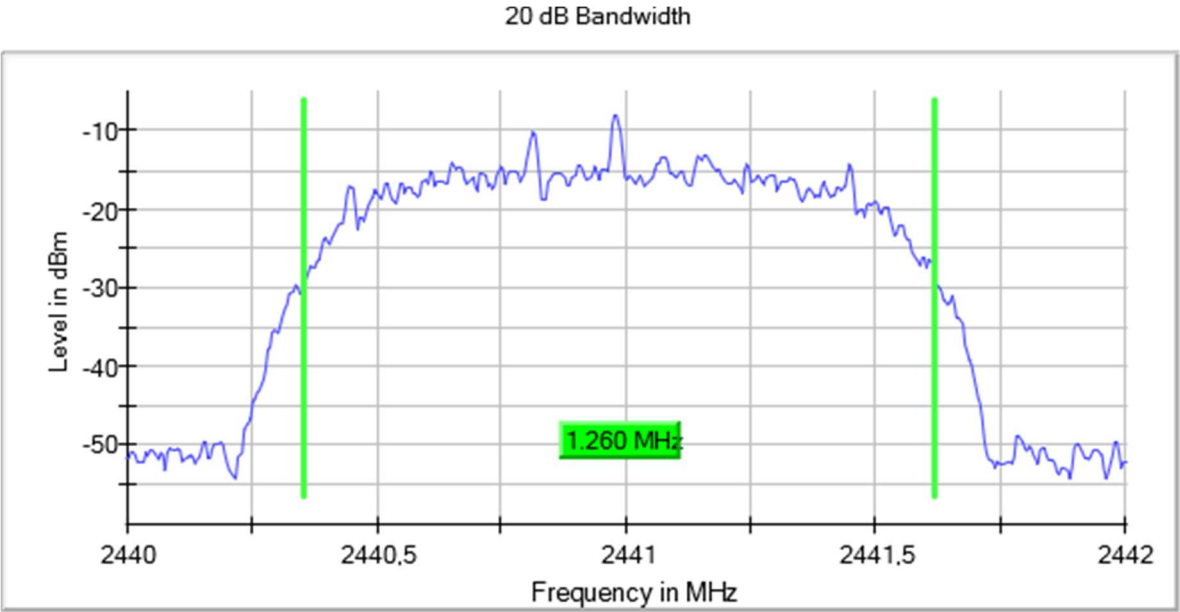
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (Pi/4 DQPSK 2-DH5)

Images:



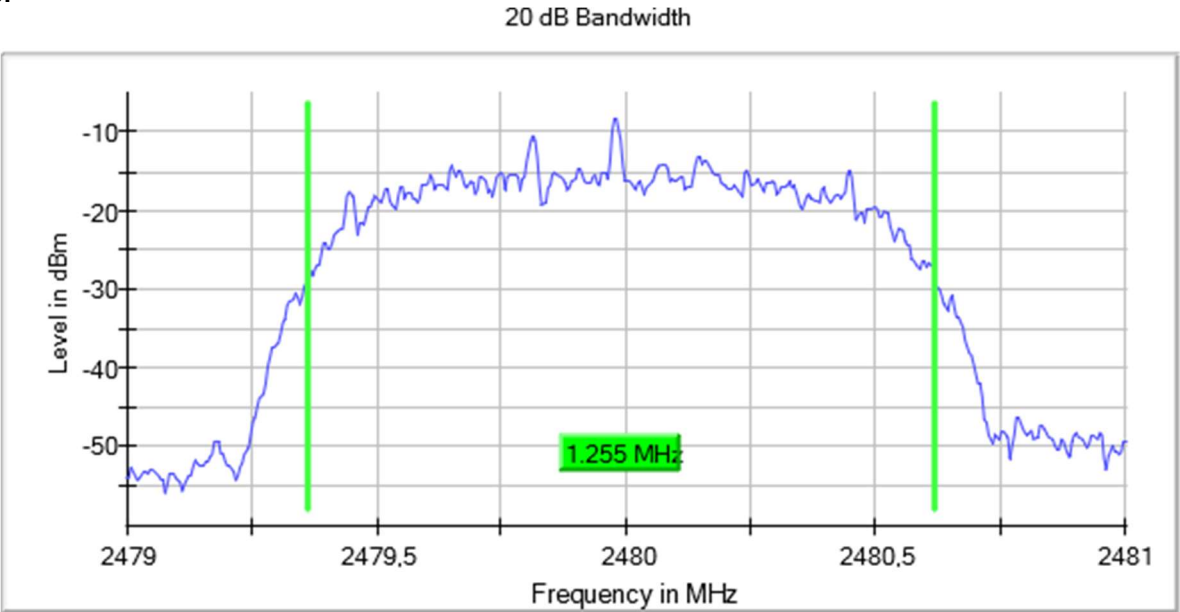
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (Pi/4 DQPSK 2-DH5)

Images:



Operation Band MHz = [2400, 2483.5], Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (Pi/4 DQPSK 2-DH5)

Images:



Modulation: BT (8DPSK 3-DH5)

Results

Freq (MHz)	Emission Bandwidth (MHz)
2402.00000	1.2450
2441.00000	1.2300
2480.00000	1.2300

Verdict

Pass

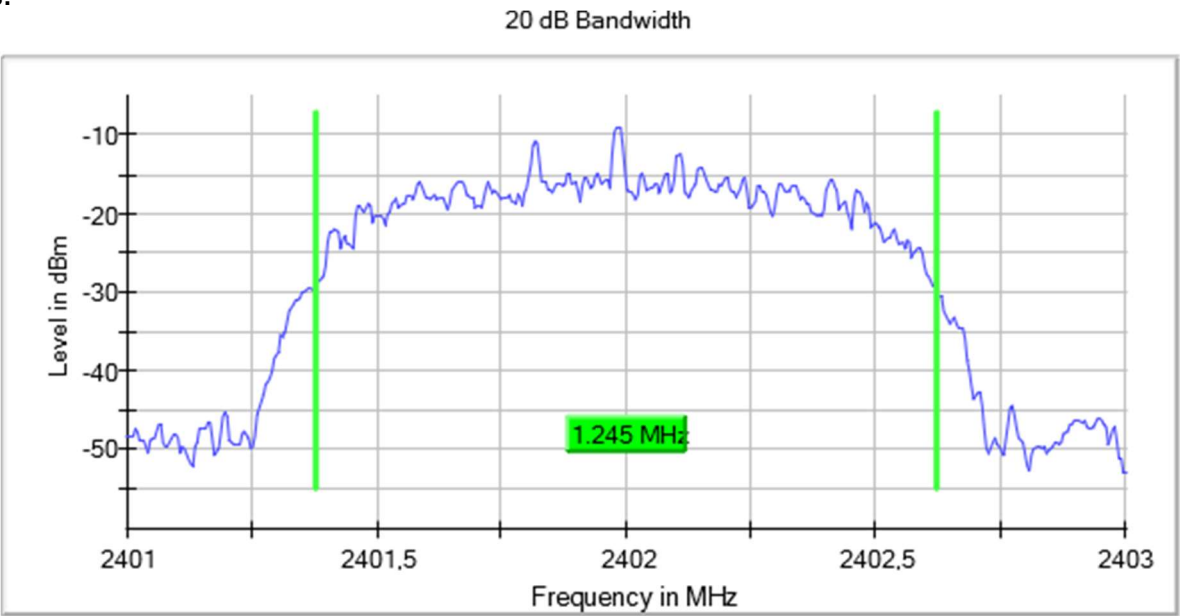
Uncertainty

Measurement uncertainty (%) <±1.24

Attachments

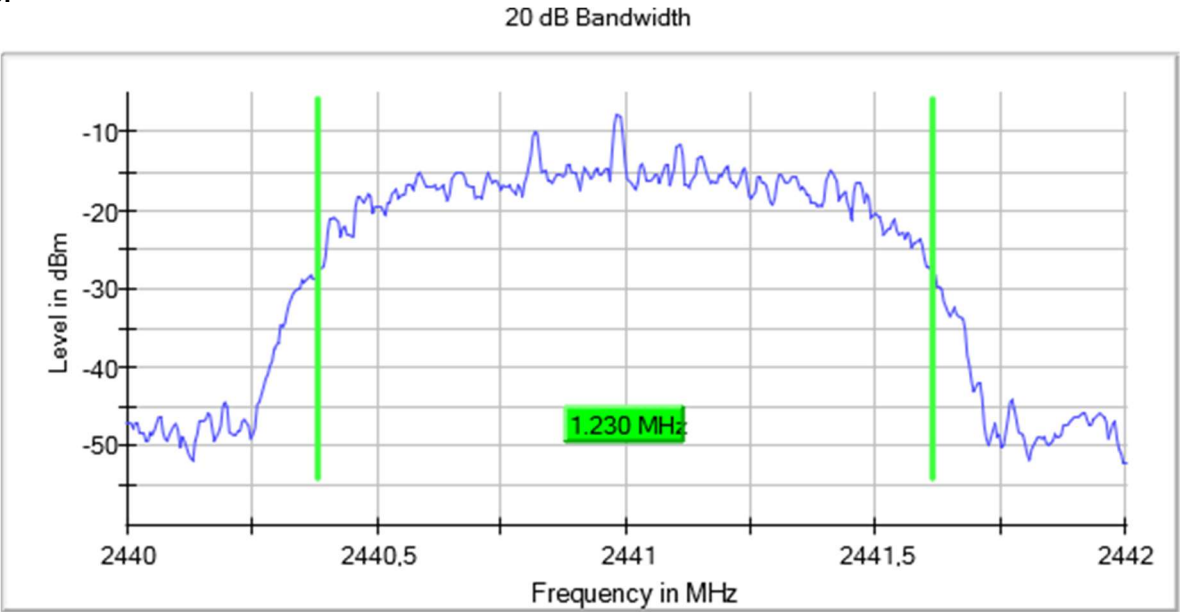
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2402.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5)

Images:



Operation Band MHz = [2400, 2483.5], Frequency MHz = 2441.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5)

Images:



Operation Band MHz = [2400, 2483.5], Frequency MHz = 2480.00000, Equipment Type = Frequency Hopping Spread Spectrum systems (DSS), Modulation = BT (8DPSK 3-DH5)

Images:

