DEKRA Testing and Certification, S.A.U.
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C.I.F. A29507456

ISED CABid: ES1909

Test Report No:
NIE: 69534RRF.007

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/RF Lab. Manager  2022.01.20 11:28:46 +01'00'
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
	E.I.R.P.
	Emission Bandwidth
Avg Power	Maximum Average Conducted Output Power
Detector	Detector used
Equipment	Equipment Type
Freq	Frequency
Freq Rng	Frequency Range
Gain	Antenna Gain
Inband Peak Lvl	Inband Peak Level
Lvl	Level
MP	Measurement Point
Mod	Modulation
Occ Ch BW	Occupied Channel Bandwidth
Operation Band	Operation Band
PSD	Power Spectrum Density
Pol	Polarization
Unwanted Freq	Unwanted Emissions Frequency
Unwanted Lvl	Unwanted Emissions Level

Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

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.

DEKRA Testing and Certification S.A.U. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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General conditions

1. This report is only referred to the item that has undergone the test.

2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

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.

Usage of samples

Samples undergoing test have been selected by: The client.

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

Control Nº	Description	Model	Serial Nº	Date of reception
69534B/041	Automotive infotainment System	NTG6NQ ENTRY/MID	HBM580M96DRU3M	2021/11/15
68534B/102	BT/WLAN Antenna	--	--	2021/11/15
69534B/105	BT/WLAN Antenna (2on1)	--	--	2021/11/15
69534B/074	Harness	--	--	2021/11/15

Auxiliary elements used with the Sample S/01:

Control Nº	Description	Model	Serial Nº	Date of reception
69534B/084	USB to Ethernet Adapter	UE300	--	2021/11/15
69534B/092	Ethernet Cable	--	--	2021/11/15
69534B/112	SMA Adapter	--	--	2021/11/15

Sample S/01 has undergone the following test(s): The Radiated tests indicated in the 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: 12 V 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: 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.007	2022-01-20	First release.

Environmental conditions

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

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

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

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

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

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

Remarks and comments

The tests have been performed by the technical personnel: José Manuel Jiménez González and Nicolás Salguero Camarena.

Used instrumentation:

Equipment	Model	Vendor	Latest Calibration	Next Calibration
SEMIANECHOIC ABSORBER LINED CHAMBER	FACT 3 200 STP	ETS LINDGREN	N/A	N/A
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
HYBRID BILOG ANTENNA 30MHz-6GHz	3142E	EST LINDGREN	2020-04-30	2023-04-30
SIGNAL AND SPECTRUM ANALYZER 2Hz-50GHz	FSW50	ROHDE AND SCHWARZ	2020-07-06	2022-07-06
PRE-AMPLIFIER G>30dB 17-40GHz	BLMA 1840-4A	BONN ELEKTRONIK	2021-09-08	2022-09-08
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	--	--
SIGNAL AND SPECTRUM ANALYZER 10Hz-40GHz	FSV 40	ROHDE AND SCHWARZ	2021-02-26	2023-02-26
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

802.11 B/G/N 20 MHz 1x1

Requirement – Test case	FCC PART 15 PARAGRAPH / RSS-247	Verdict	Remark
RSS-247 5.2 (a) / FCC 15.247 (a) (2) [6dBw] 6 dB Bandwidth		Pass	
RSS-247 5.2 (b) / FCC 15.247 (e) [Psd] Power spectral density		Pass	
RSS-247 5.4 (d) / FCC 15.247 (b) [Pkcp] Maximum output power and antenna gain		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	
Supplementary information and remarks: None			

Appendix A: Test results. 802.11 B/G/N 20 MHz 1x1

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99dBw Occupied Channel Bandwidth 99% *15*
RSS-247 5.2 (a) / FCC 15.247 (a) (2) [6dBw] 6 dB Bandwidth *21*
RSS-247 5.2 (b) / FCC 15.247 (e) [Psd] Power spectral density *27*
FCC 15.247 (b) / RSS-247 5.4 (d) Maximum output power and antenna gain *33*
RSS-247 5.5 / FCC 15.247 (d) [Bndedge] Band-edge emissions compliance (Transmitter) *34*
RSS-247 5.5 / FCC 15.247 (d) [RSE] Emission limitations radiated (Transmitter) *40*

TEST CONDITIONS

POWER SUPPLY (V):

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

ANTENNA:

Type of Antenna:	External.
Maximum Declared Antenna Gain:	+2.2 dBi (antenna gain plus antenna cable loss).

TEST FREQUENCIES FOR 802.11 bgn20:

Low Channel (1):	2412 MHz
Middle Channel (6):	2437 MHz
High Channel (11):	2462 MHz

The sample was used to configure the EUT to continuously transmit at a specified output power in all channels with different modes and modulation schemes.

The field strength at the band edges was evaluated for each mode for the channel under test.

During transmitter test the EUT was being controlled by the SW tool to operate in a continuous transmit mode on the test channel as required and in each of the different modulation modes.

The EUT has four separate antennas which correspond to one port of the equipment.

The data rates of 1 Mbps for 802.11 b, 6.5 Mbps for 802.11 g, MCS0 for 802.11 n20, were selected based on preliminary testing that identified those rates corresponding to the worst cases for output power and band edge levels at restricted bands.

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).

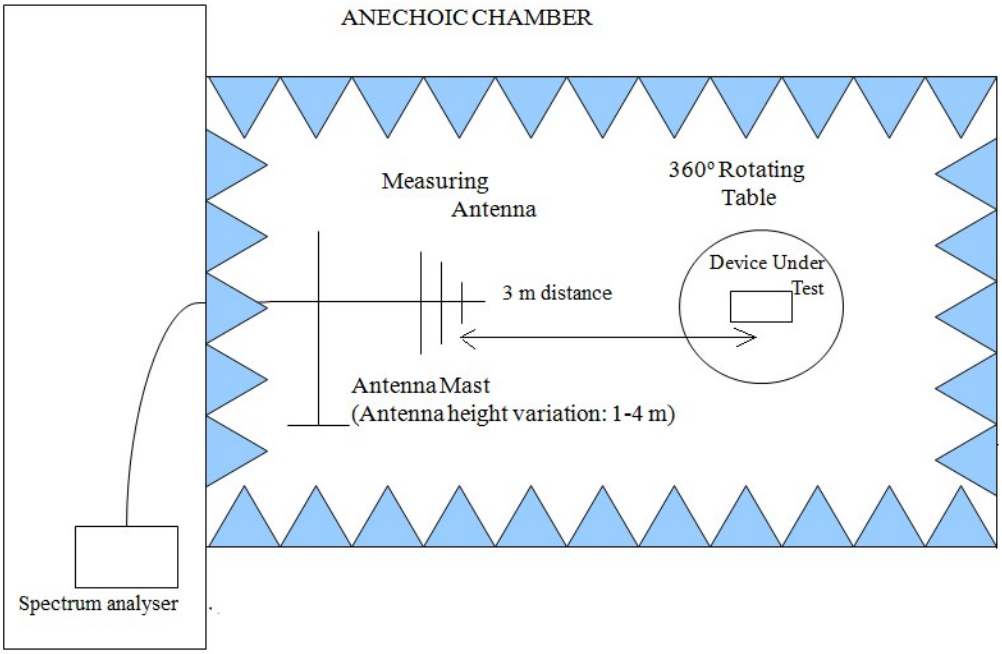
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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 360º and the antenna height (Bilog antenna and Double ridge horn antenna) was varied from 1 to 4 meters to find the maximum radiated emission.

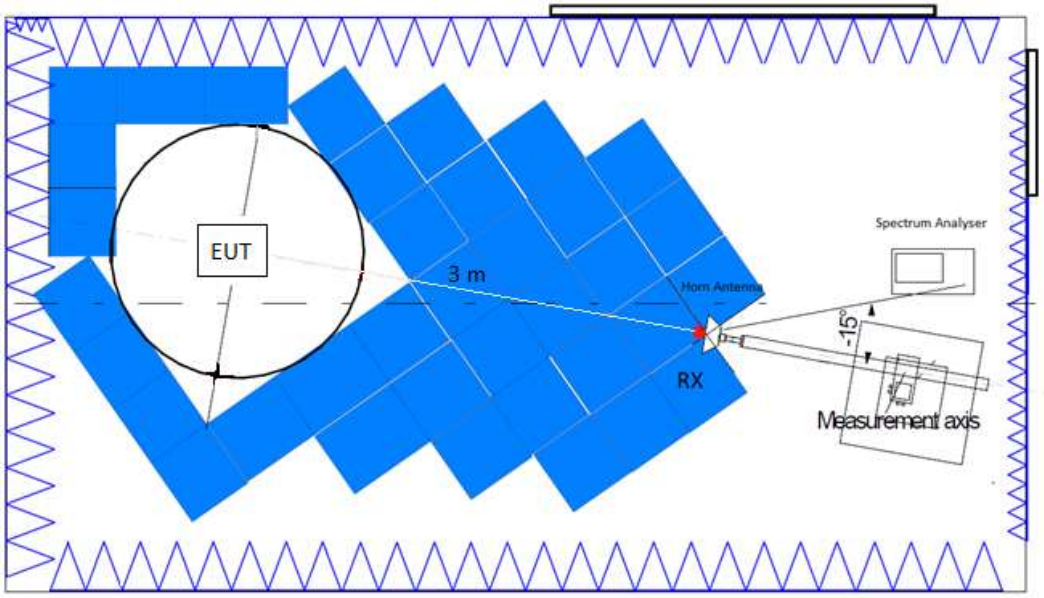
Measurements were made in both horizontal and vertical planes of polarization.

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.

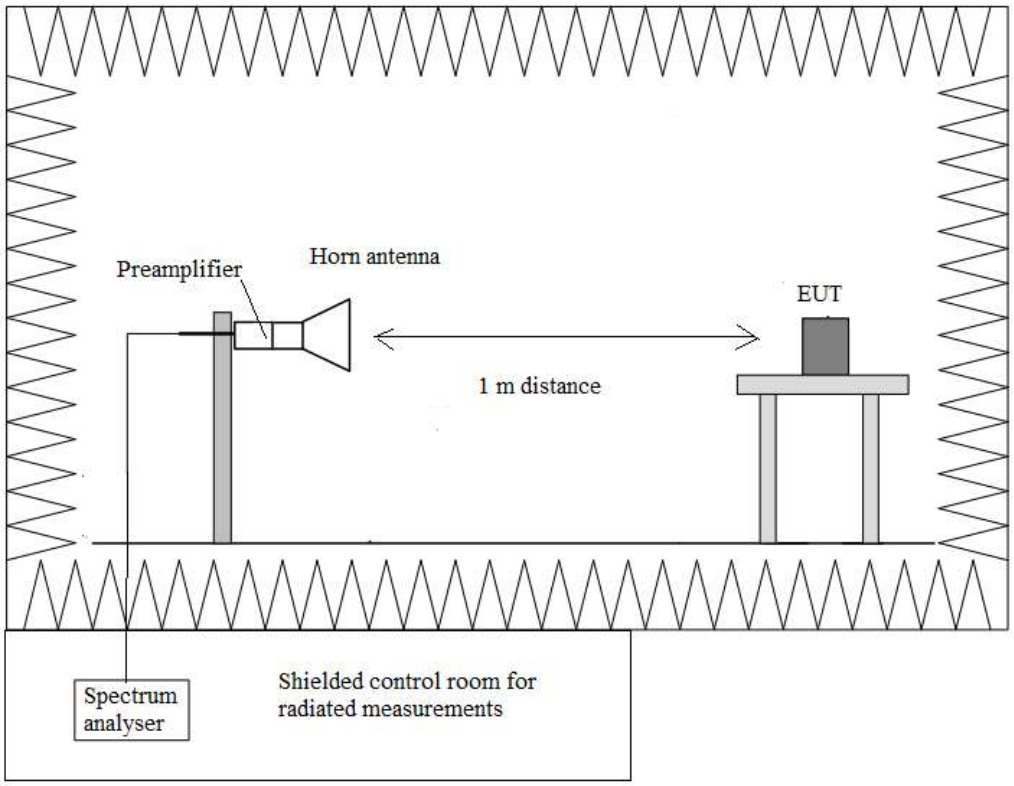
Radiated measurements setup from 30 MHz to 1 GHz:



Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



TEST CASES DETAILS

99dBw Occupied Channel Bandwidth 99%

Modulation: 802.11g (OFDM 6 Mbit/s)

Results

Freq (MHz)	Occ Ch BW (MHz)
2412.00000	16.600000
2442.00000	16.600000
2462.00000	16.600000

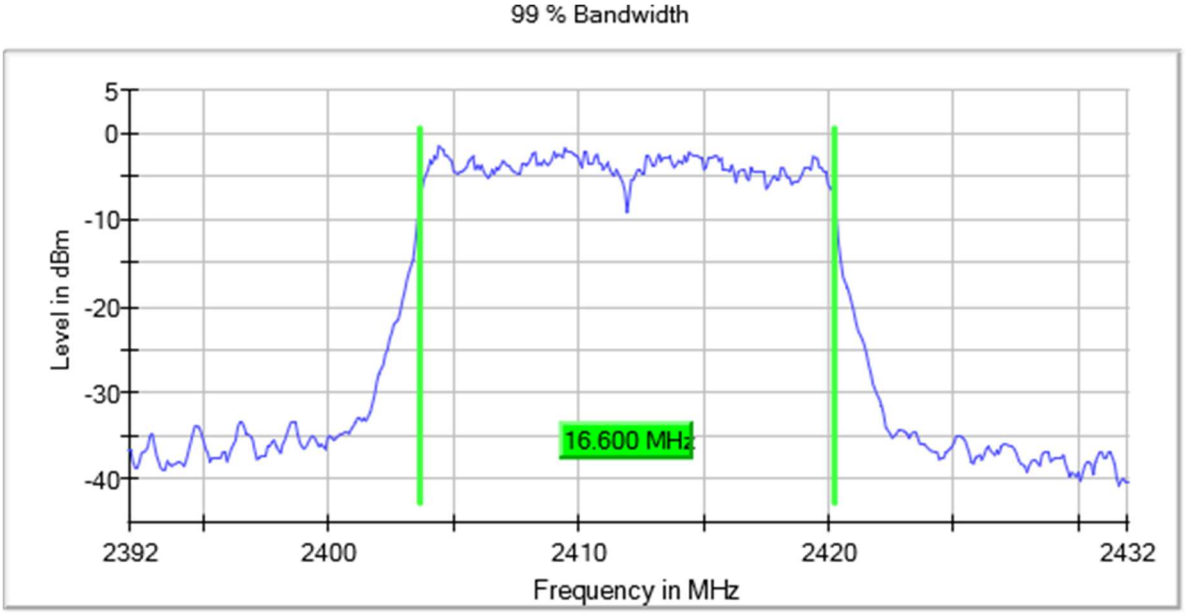
Uncertainty

Measurement uncertainty (%) <±1.40

Attachments

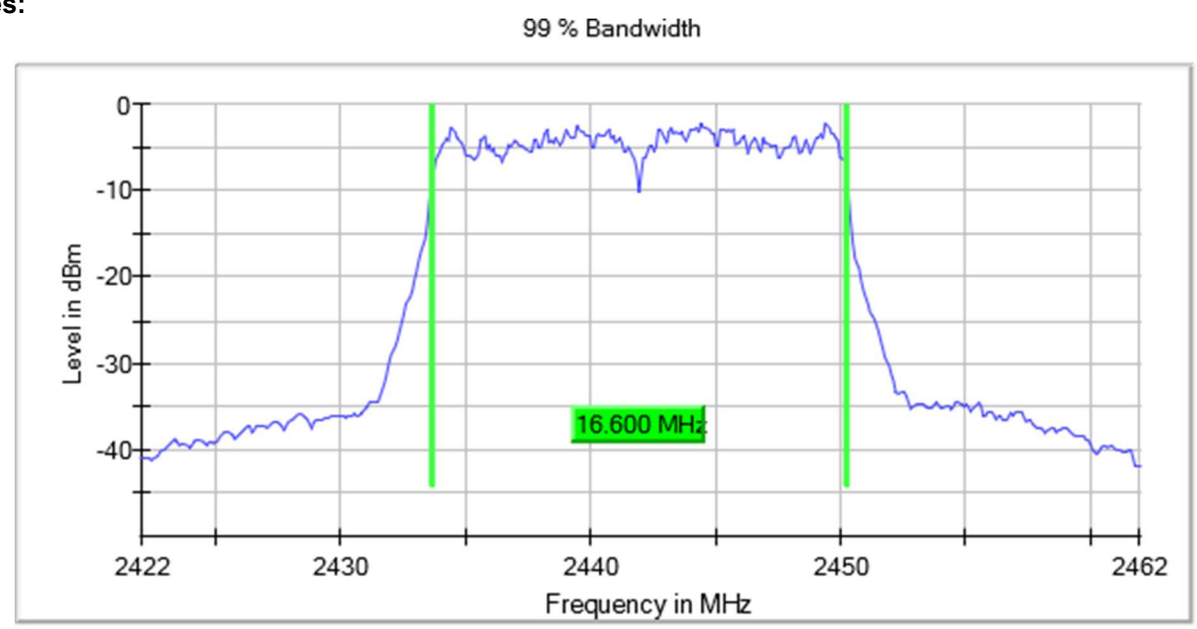
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s)

Images:



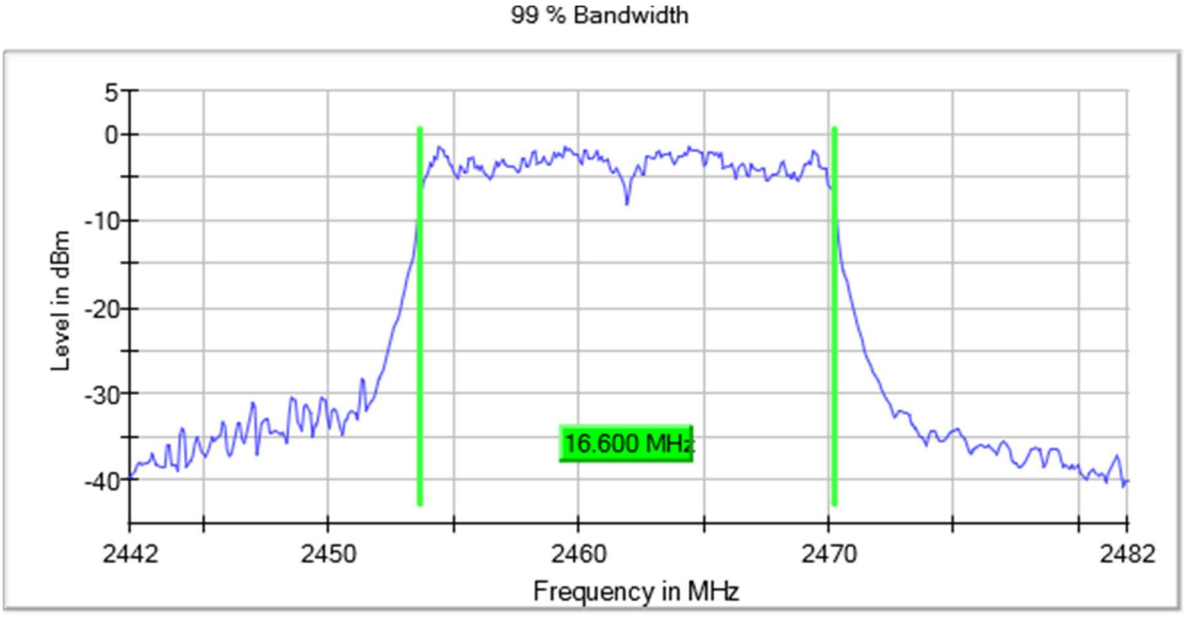
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s)

Images:



Operation Band MHz = [2400, 2483.5], Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11g (OFDM 6 Mbit/s)

Images:



Modulation: 802.11b (DSSS 1 Mbit/s)

Results

Freq (MHz)	Occ Ch BW (MHz)
2412.00000	13.400000
2442.00000	13.400000
2462.00000	13.300000

Verdict

Pass

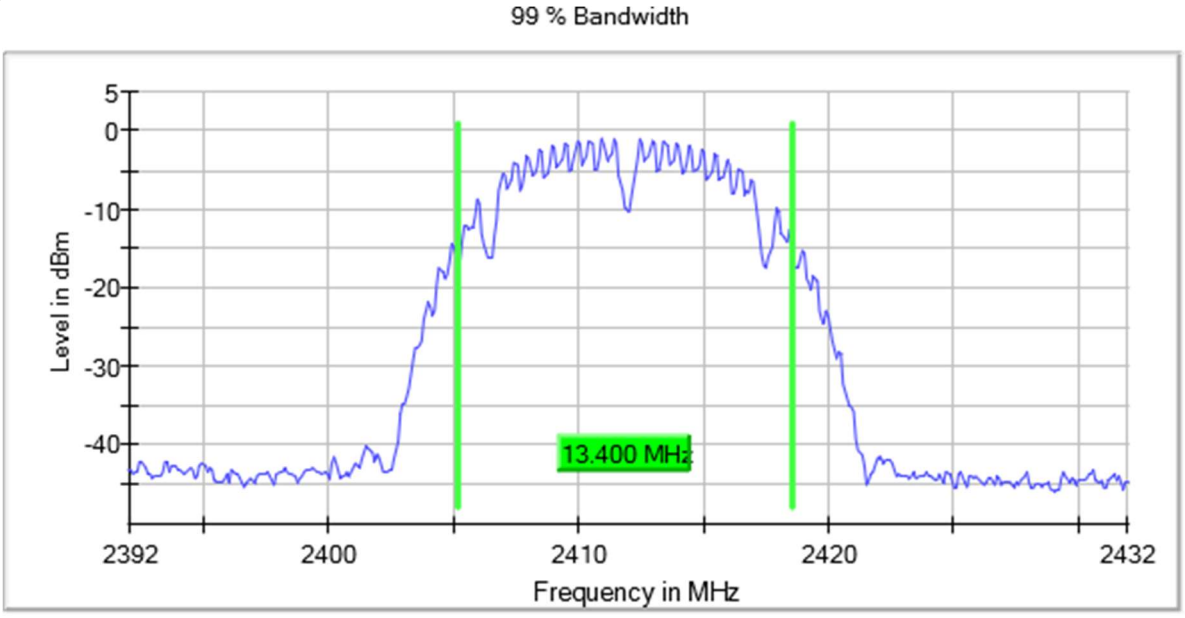
Uncertainty

Measurement uncertainty (%) <±1.40

Attachments

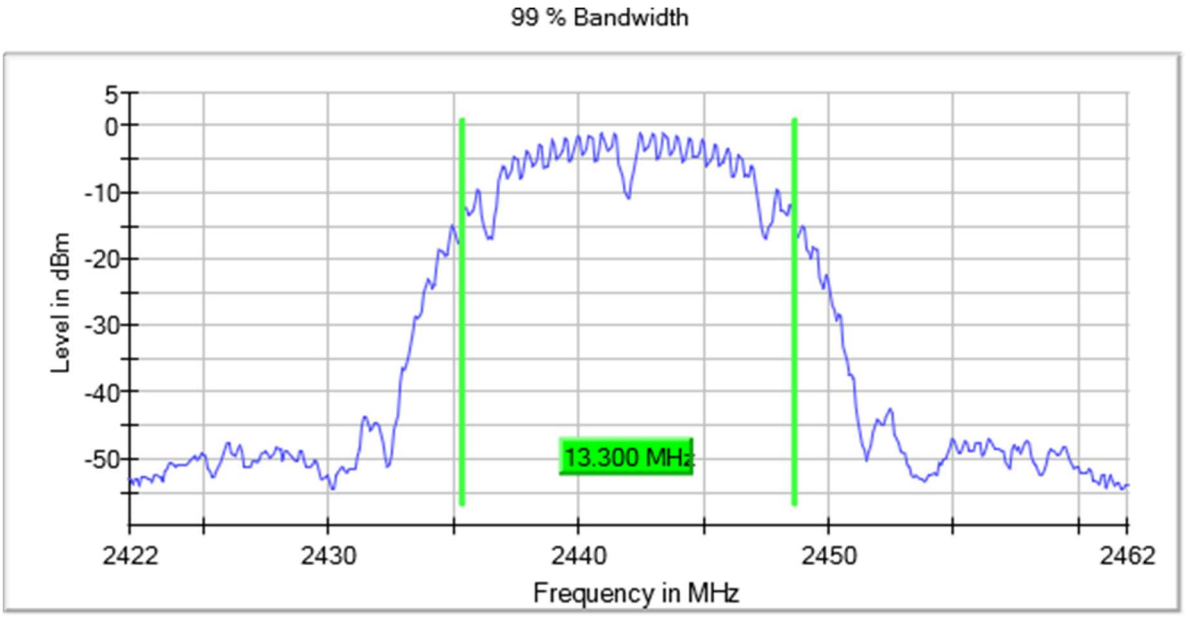
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s)

Images:



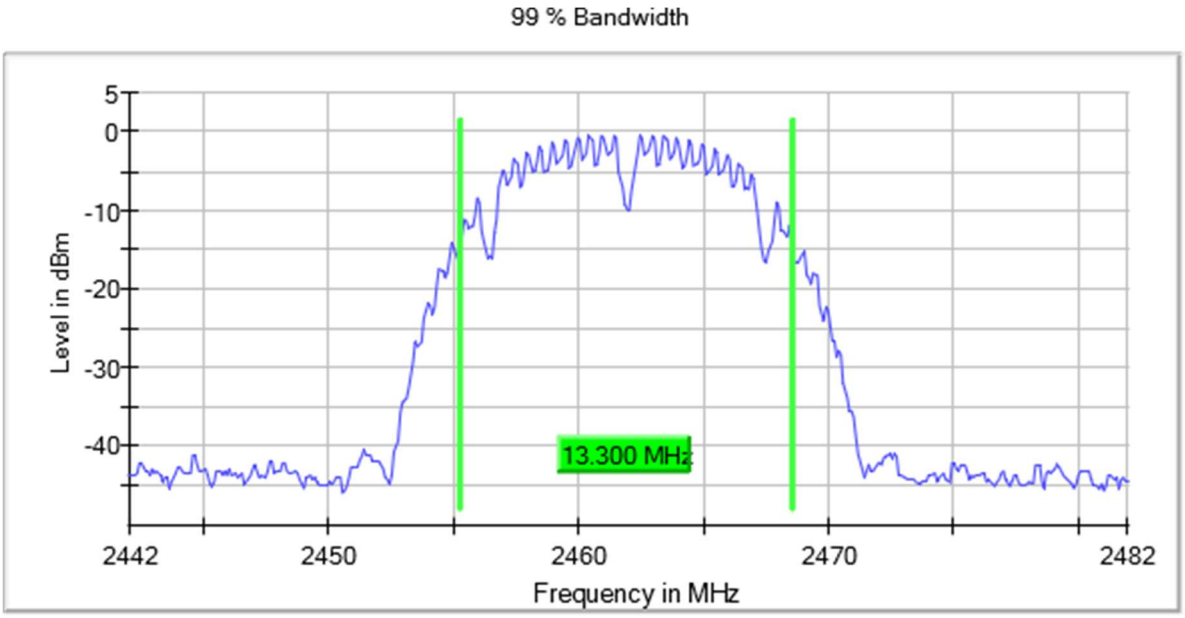
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s)

Images:



Operation Band MHz = [2400, 2483.5], Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11b (DSSS 1 Mbit/s)

Images:



Modulation: 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Results

Freq (MHz)	Occ Ch BW (MHz)
2412.00000	17.700000
2442.00000	17.700000
2462.00000	17.600000

Verdict

Pass

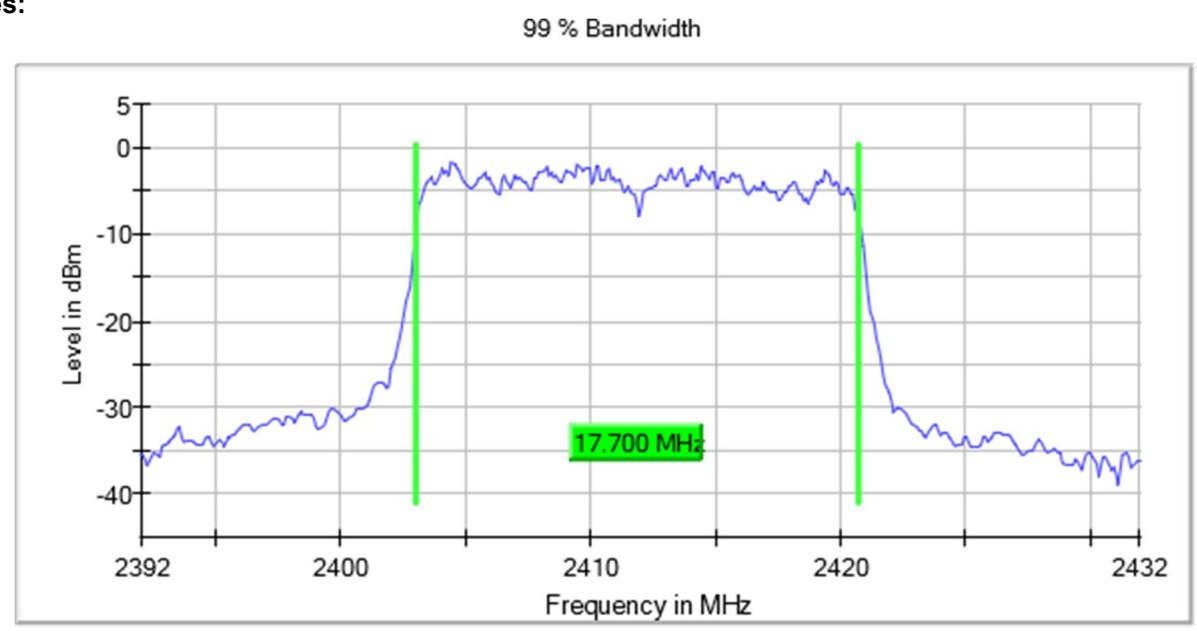
Uncertainty

Measurement uncertainty (%) <±1.40

Attachments

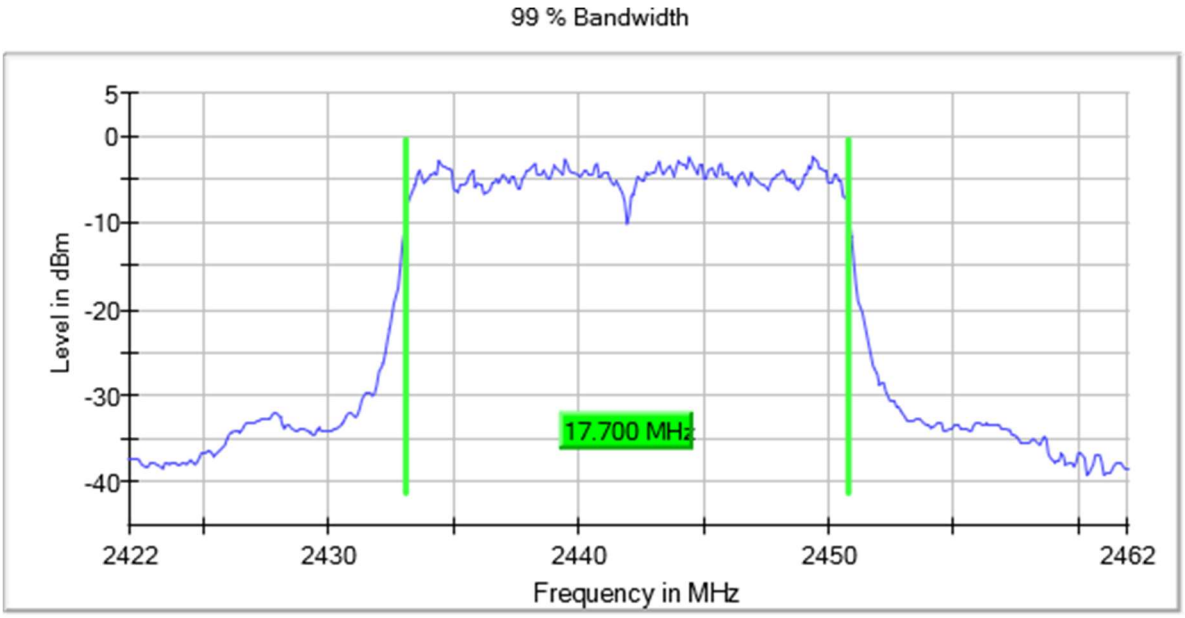
Operation Band MHz = [2400, 2483.5], Frequency MHz = 2412.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Images:



Operation Band MHz = [2400, 2483.5], Frequency MHz = 2442.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Images:



Operation Band MHz = [2400, 2483.5], Frequency MHz = 2462.00000, Equipment Type = Digital Transmission System (DTS), Modulation = 802.11n HT20 (OFDM MCS0 6.5 Mbit/s)

Images:

