



FCC LISTED, REGISTRATION
NUMBER: 2764.01

ISED LISTED REGISTRATION
NUMBER: 23595-1

Test report No:
3844ERM.011A1

Test report

USA FCC Part 15.247, 15.407 15.209, 15.207 CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Automotive infotainment System
(*) Trademark	Mercedes-Benz
(*) Model and /or type reference tested	NTG7Q MID LF2
Other identification of the product	FCC ID: 2AOUZNTG7QMIDLF2 IC: 23650-NTG7QMIDLF2
(*) Features	FM/AM/DAB, USB, Bluetooth, WLAN, GNSS. HW Version: D11 SW Version: E329.1
Manufacturer	Continental Automotive Technologies GmbH VDO-Strasse 1, 64832 Babenhausen, Germany
Test method requested, standard	USA FCC Part 15.247, 10-1-21 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz USA FCC Part 15.407 10-1-21 Edition : Unlicensed National Information Infrastructure Devices. General technical requirements. USA FCC Part 15.209 10-1-21 Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (April 2018). 558074 D01 15.247 Meas Guidance v05r02. Guidance for Compliance Measurements on Digital Transmission Systems, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under section §15.247 of the FCC Rules ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	01-19-2023
Report template No	FDT08_23 (*) "Data provided by the client"

Index

Competences and guarantees	3
General conditions	3
Uncertainty.....	3
Data provided by the client.....	4
Usage of samples	4
Test sample description	4
Identification of the client.....	7
Testing period and place.....	7
Document history	7
Environmental conditions	7
Remarks and comments	8
Testing verdicts.....	8
Summary	8
List of equipment used during the test.....	10
Appendix A: Test results (Multi-transmitter).....	11

Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01

DEKRA Certification Inc. is a testing laboratory competent to carry out the tests described in this report.

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

DEKRA Certification Inc. 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 Certification at the time of performance of the test.

DEKRA Certification Inc. 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.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA Certification Inc.

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 Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Certification internal document PODT000.

Test case	Frequency (MHz)	U (k=2)	Units
Radiated Spurious Emission	30-180	4.27	dB
	180-1000	3.14	dB
	1000-18000	3.30	dB
	18000-40000	3.49	dB

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 consists of an Automotive head unit to be installed in cars with the following features: FM/AM/DAB, USB, Bluetooth, WLAN and GNSS .

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples used for test have been selected by: The client.

Sample S/01 is composed of the following elements:

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	3844/23	Infotainment Head Unit	NTG7Q MID LF2	COM652NB000377	9/13/2022	Element Under Test

Sample S/01 is composed of the following accessories:

Id	Control Number	Description	Model	Serial N°	Date of Reception	Application
S/01	3844/26	Harness	-	-	9/13/2022	Accessory
S/01	3844/27	RF antenna cable	-	-	9/13/2022	Accessory
S/01	3844/05	BT/WLAN Antenna 1	-	-	9/13/2022	Accessory
S/01	3844/06	BT/WLAN Antenna 2	-	-	9/13/2022	Accessory
S/01	3844/07	BT/WLAN Antenna 3	-	-	9/13/2022	Accessory
S/01	3844/08	BT/WLAN Antenna 4	-	-	9/13/2022	Accessory

1. Sample S/01 Was Used For The Test(S): All Radiated Tests Indicated In Appendix B.

Test sample description

Ports.....:	Port name and description	Cable					
		Specified max length [m]	Attached during test	Shielded	Coupled to patient ⁽³⁾		
	Car Connector A	>3m	[X]	[]	[]		
	Car Connector B	>3m	[X]	[]	[]		
	Display Connector CID/PIP / RVC	>3m	[X]	[X]	[]		
	USB Connector	<3m	[X]	[X]	[]		
	Eth Connector	>3m	[X]	[]	[]		
	BT/WLAN-Antenna	>3m	[X]	[X]	[]		
	FM/AM/DAB Ant	>3m	[X]	[X]	[]		
	GNSS Antenna	>3m	[X]	[X]	[]		
Supplementary information to the ports.....:							
Rated power supply	Voltage and Frequency	Reference poles					
		L1	L2	L3	N		
		[]	AC:	[]	[]	[]	[]
		[]	AC:	[]	[]	[]	[]
	[X]	DC: 12V car battery /attenuator (9,5-15,5v normal operation)					
Rated Power	12V						
Clock frequencies.....:	See schematics						
Other parameters	See technical description						
Software version	E329.1						
Hardware version	D11						
Dimensions in cm (W x H x D).....:	182 x 78 x 160 mm						
Mounting position	[]	Table top equipment					

	<input type="checkbox"/> Wall/Ceiling mounted equipment <input type="checkbox"/> Floor standing equipment <input type="checkbox"/> Hand-held equipment <input checked="" type="checkbox"/> Other: Automotive Infotainment Head Unit		
Modules/parts.....:	Module/parts of test item	Type	Manufacturer
	N/A
Accessories (not part of the test item).....:
	Description	Type	Manufacturer
	HARMANeco (with Display or headless)		HBAS
	Cable harness		HBAS
	Display		L.G.
Documents as provided by the applicant.....:	BT/WLAN-Antenna		HIRSCHMANN
	Description	File name	Issue date
	Technical description	Technical Description NTG7Q_A20 200717 SOP2 AllVariant_NXP DRAFT.pdf	
	Testing Guide	NTG7QTestsetupS cript_220704_v3 2.pdf	

Copy of marking plate:



Identification of the client

CONTINENTAL AUTOMOTIVE TECHNOLOGIES GMBH
VDO-Strasse 1,
64832 Babenhausen,
Germany

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	10-03-2022
Date (finish)	10-13-2022

Document history

Report number	Date	Description
3844ERM.011	11-29-2022	First release
3844ERM.011A1	01-19-2023	Second release. TC#02 was removed. This modification of the test report cancels and replaces the test report 3844ERM.011.

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. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

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

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

1. The tests have been performed by the technical personnel: Koji Nishimoto.

Testing verdicts

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

Summary

FCC PART 15 PARAGRAPH / RSS-247 (Bluetooth BR/EDR)					
Report Section	15.247 Spec Clause	RSS Spec Clause	Test Description	Verdict	Remark
-	§ 2.1049 & § 15.247 (a) (1)	RSS-247 5.1 (b)	20dB Emission Bandwidth, Occupied Bandwidth & Carrier Frequency Separation	N/M	Refer 1
-	§ 15.247 (a) (1) (iii)	RSS-247 5.1 (d)	Number of hopping channels	N/M	Refer 1
-	§ 15.247 (a) (1) (iii)	RSS-247 5.1 (d)	Time of Occupancy (Dwell Time)	N/M	Refer 1
-	§ 15.247 (b) (3)	RSS-247 5.4 (b)	Maximum peak conducted output power and antenna gain	N/M	Refer 1
-	§ 15.247 (d)	RSS-247 5.5	Band-edge conducted emissions compliance (Transmitter)	N/M	Refer 1
-	§ 15.247 (d)	RSS-247 5.5	Emission limitations Conducted (Transmitter)	N/M	Refer 1
A.1	§ 15.247 (d)	RSS-247 5.5	Emission limitations Radiated (Transmitter)	P	N/A
<u>Supplementary information and remarks:</u>					
1) Only multi-transmitter radiated spurious emission test was requested.					

FCC PART 15 PARAGRAPH (Wi-Fi 2.4GHz)					
Report Section	15.247 Spec Clause	RSS Spec Clause	Test Description	Verdict	Remark
-	§ 2.1049 & §15.247 (a) (2)	RSS-247 5.2 (a)	99% Occupied Bandwidth & 6dB Bandwidth	N/M	Refer 1
-	§ 15.247 (b)	RSS-247 5.4 (d)	Maximum Output Power and antenna gain	N/M	Refer 1
-	§ 15.247 (d)	RSS-247 5.5	Band-edge conducted emissions compliance (Transmitter)	N/M	Refer 1
-	§ 15.247 (e)	RSS-247 5.2 (b)	Power Spectral Density	N/M	Refer 1
-	§15.247(d)	RSS-247 5.5	Emission limitations Conducted (Transmitter)	N/M	Refer 1
A.1	§15.247 (d)	RSS-247 5.5	Emission limitations Radiated (Transmitter)	P	N/A
<u>Supplementary information and remarks:</u>					
1) Only multi-transmitter radiated spurious emission test was requested.					

FCC PART 15 PARAGRAPH / RSS-247 (Wi-Fi 5GHz) UNII-1 5.150 - 5.250 GHz Band, UNII-3 5.725 - 5.825 GHz Band					
Report Section	15.407 Spec Clause	RSS Spec Clause	Test Description	Verdict	Remark
	§ 15.403 KDB 789033 D02	RSS 247 6.2.4	26dB Emission Bandwidth & Occupied Bandwidth	N/M	Refer 1
	§ 15.407 (e)	RSS 247 6.2.4.1	6dB Bandwidth	N/M	Refer 1
	§ 15.407 (a)(3)	RSS 247 6.2.4.1	Power Limits. Maximum Output Power	N/M	Refer 1
	§ 15.407 (a)(3)	RSS-247 6.2.4.1	Maximum Power Spectral Density	N/M	Refer 1
	§ 15.407 (b)(4)	RSS-247 6.2.4.2	Band-edge conducted emissions compliance (Transmitter)	N/M	Refer 1
	§ 15.407 (b)(6) § 15.207	RSS-Gen 8.8	Emission limitations Conducted (Transmitter)	N/M	Refer 1
A.1	§ 15.407 (b)(4),(7) § 15.209 § 15.205	RSS-247 6.2.4.2 RSS-Gen 8.9 & 8.10	Undesirable radiated emissions (Transmitter)	P	N/A
	§ 15.407 (g)	RSS-Gen 6.11 & 8.11	Frequency Stability	N/M	Refer 1
<u>Supplementary information and remarks:</u>					
1) Only multi-transmitter radiated spurious emission test was requested.					

List of equipment used during the test

Radiated Measurements

CONTROL NUMBER	DESCRIPTION	MANUFACTURER	MODEL	LAST CALIBRATION	NEXT CALIBRATION
981	RF pre-amplifier	Bonn Elektronik	BLMA0118-2A	2020/11	2022/11
1012	EMI Test Receiver	Rohde & Schwarz	ESR26	2022/04	2024/04
1014	FSV40 Signal Analyzer 40GHz	Rohde & Schwarz	FSV40	2021/05	2023/05
1055	3116C Double-Ridged Waveguide Horn Antennas	ETS Lindgren	3116C	2019/12	2022/12
1057	Double-ridge Waveguide Horn antenna	ETS Lindgren	3115	2020/06	2023/06
1065	Biconical Log antenna	ETS Lindgren	3142E	2020/08	2023/08
1108	Ethernet SNMP Thermometer- CR Room	HW Group	HWg-STE Plain	2022/10	2024/10
1111	Ethernet SNMP T Thermometer	HW Group	HWg-STE Plain	2022/10	2024/10
1179	Semi anechoic Absorber Lined Chamber	Frankonia	SAC 3 plus "L"	N/A	N/A
1314	Wireless Measurement Software R&S EMC32	Rohde & Schwarz	N/A	N/A	N/A

Appendix A: Test results (Multi-transmitter)

Appendix A Content

PRODUCT INFORMATION	13
DESCRIPTION OF TEST CONDITIONS	14
TEST A.1: EMISSION LIMITATIONS RADIATED (TRANSMITTER).....	15

PRODUCT INFORMATION

Information	Description
Modulation	BR/EDR: GFSK, π/4-DQPSK, 8-DPSK Wi-Fi 2.4 GHz: DSSS, OFDM Wi-Fi 5 GHz: QPSK, BPSK, 16QAM, 64QAM, 256QAM
Operation mode 1: Single Antenna Equipment	
- Operating Frequency Range	BR/EDR: 2400 - 2483.5 MHz Wi-Fi 2.4 GHz: 2.402 - 2.483.5 GHz Wi-Fi 5 GHz: 5.150 - 5.250 GHz 5.725 - 5.850 GHz
- Nominal Channel Bandwidth	BR/EDR: 1 MHz Wi-Fi 2.4 GHz: 20MHz Wi-Fi 5GHz: 20MHz, 40MHz, 80MHz
- RF Output Power	BR/EDR: 7 dBm Wi-Fi 2.4 GHz: 15 dBm Wi-Fi 5 GHz: 17 dBm
Antenna type	External antenna
Antenna gain	BR/EDR: 1.8 dBi Wi-Fi 2.4 GHz: 2.4 dBi Wi-Fi 5 GHz: 2.5 dBi
Nominal Voltage	
- Supply Voltage	12 Vdc
- Type of power source	DC voltage
Equipment type	Bluetooth, Wi-Fi 2.4 GHz, and Wi-Fi 5 GHz
Geo-location capability	No

DESCRIPTION OF TEST CONDITIONS

TEST CONDITIONS	DESCRIPTION																			
TC#01 ⁽¹⁾	<p><u>Power supply (V):</u> DC 12 V</p> <p><u>Test Frequencies for Radiated tests:</u></p> <table border="1"><thead><tr><th>Technology</th><th>Tested Frequency</th><th>BW (MHz)</th><th>Modulation</th><th>Mode</th></tr></thead><tbody><tr><td>Bluetooth</td><td>2402</td><td>1</td><td>8DPSK</td><td>N/A</td></tr><tr><td>Wi-Fi 2.4 GHz SISO</td><td>2412</td><td>20</td><td>OFDM</td><td>g mode</td></tr></tbody></table> <p>The test was performed with the equipment transmitting with Bluetooth and Wi-Fi 2.4GHz radios simultaneously. These measurements have been performed in order to check the impact of the multi-transmitter of all radio interfaces that can be transmitting simultaneously.</p>					Technology	Tested Frequency	BW (MHz)	Modulation	Mode	Bluetooth	2402	1	8DPSK	N/A	Wi-Fi 2.4 GHz SISO	2412	20	OFDM	g mode
Technology	Tested Frequency	BW (MHz)	Modulation	Mode																
Bluetooth	2402	1	8DPSK	N/A																
Wi-Fi 2.4 GHz SISO	2412	20	OFDM	g mode																

Note (1): Preliminary scan was performed to determine the worst case and the following tables and plots show the results for the worst case in SISO (2.4 GHz) + BT.

TEST A.1: EMISSION LIMITATIONS RADIATED (TRANSMITTER)

LIMITS:	Product standard:	Part 15 Subpart C §15.247, Part 15.31(h), and RSS-247	
	Test standard:	Part 15 Subpart C §15.247 (d) and RSS-Gen 8.9 and 8.10	

LIMITS

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) / RSS-Gen):

Frequency Range (MHz)	Field strength (μ V/m)	Field strength (dB μ V/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

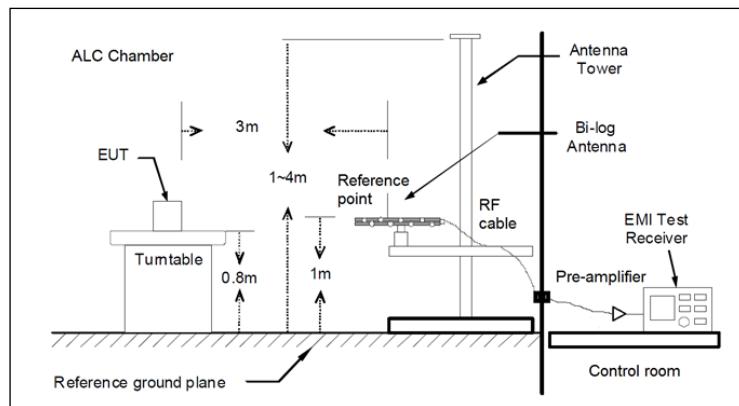
The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

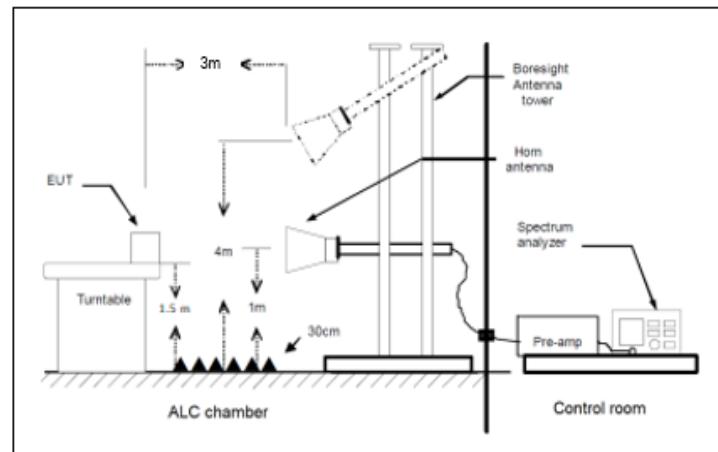
TEST SETUP	
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at 3 m for the frequency range 30-1000 MHz (Bilog antenna) and 1-18 GHz (Double ridge horn antenna), and 1m for the frequency range 18 GHz- 40 GHz (Double ridge horn antenna).	
For radiated emissions in the range 18 - 40 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 was varied from 1 to 4 meters to find the maximum radiated emission.	
Measurements were made in both horizontal and vertical planes of polarization.	
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.	

TEST SETUP (CONT.)

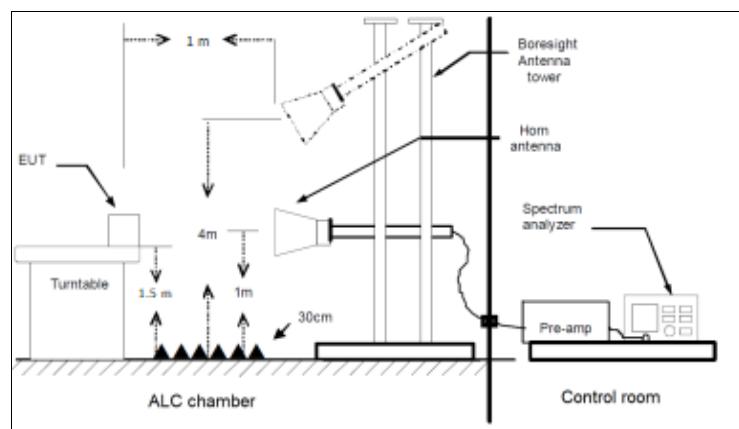
Radiated measurements Setup f < 1 GHz



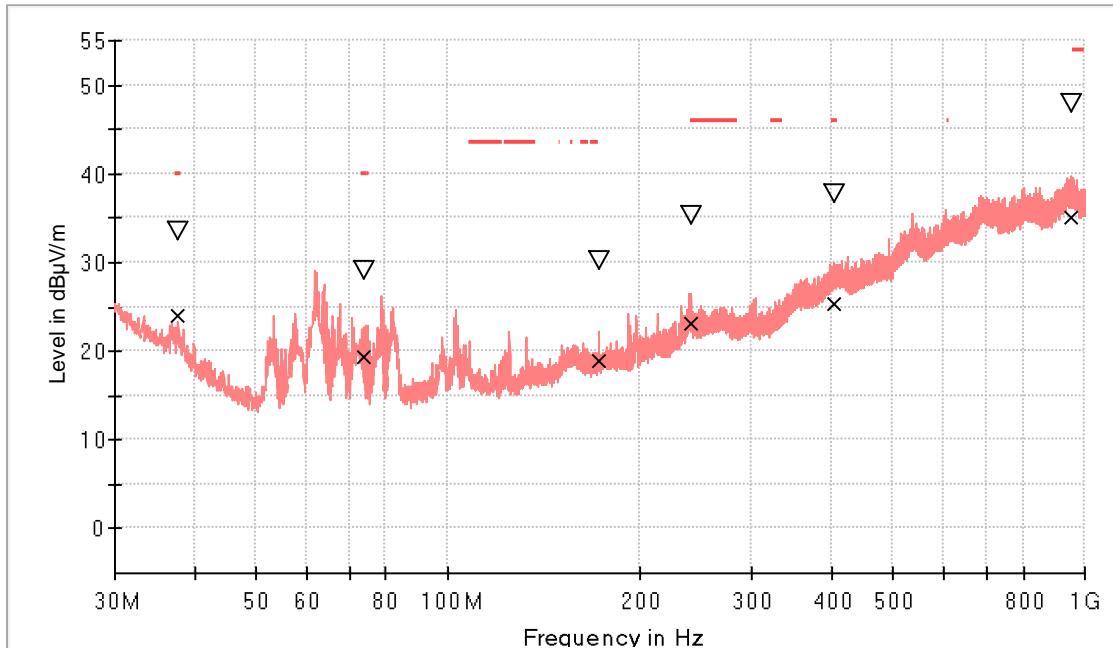
Radiated measurements setup f > 1-18 GHz



Radiated measurements setup f > 18 GHz



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS :	30-1000 MHz



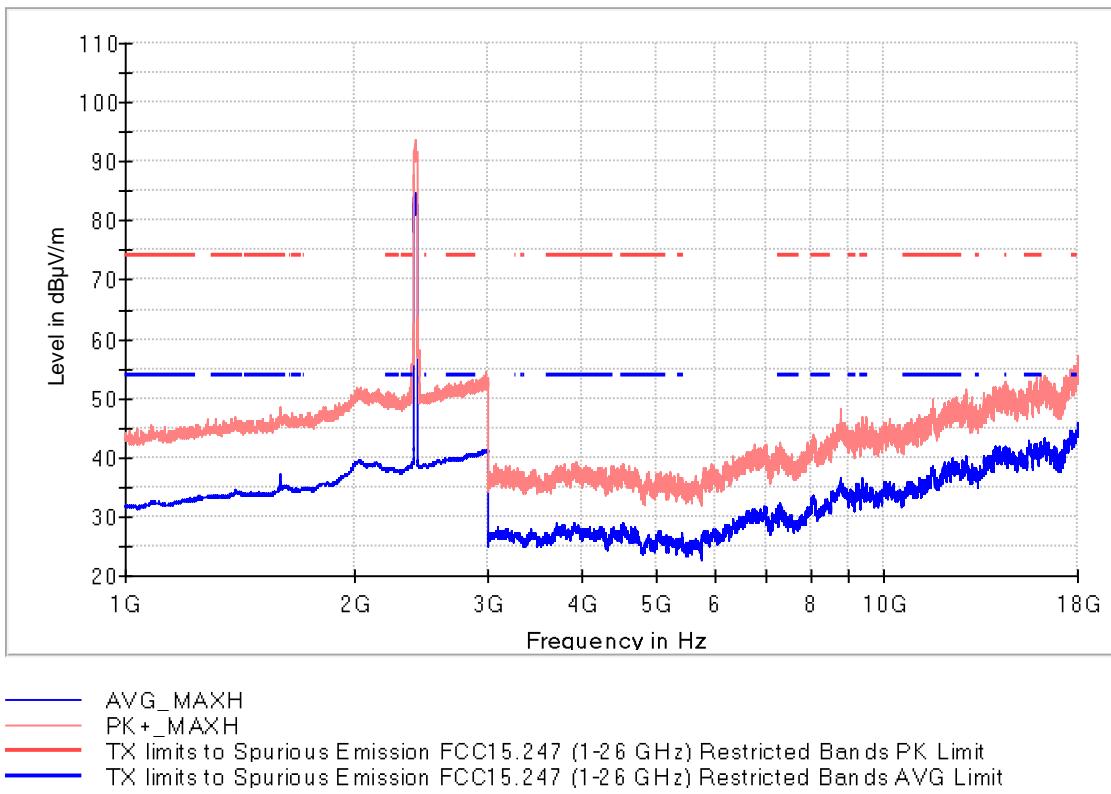
— PK+_MAXH
— TX limits to Spurious Emission FCC15.247 (30MHz to 1GHz) Restricted Bands QPK Limit
▽ MaxPeak-PK+ (Single)
× QuasiPeak-QPK (Single)

Final Result

Frequency (MHz)	MaxPeak (dB μ V/m)	QuasiPeak (dB μ V/m)	Pol	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
37.760000	33.5	24.0	V	16.0	40.0
73.601500	29.0	19.4	V	20.6	40.0
172.978000	30.2	18.8	V	24.7	43.5
241.508500	35.3	23.0	H	23.0	46.0
404.468500	37.8	25.4	V	20.6	46.0
950.045000	47.8	35.2	V	---	---

TEST RESULTS (Cont.):

1-18 GHz

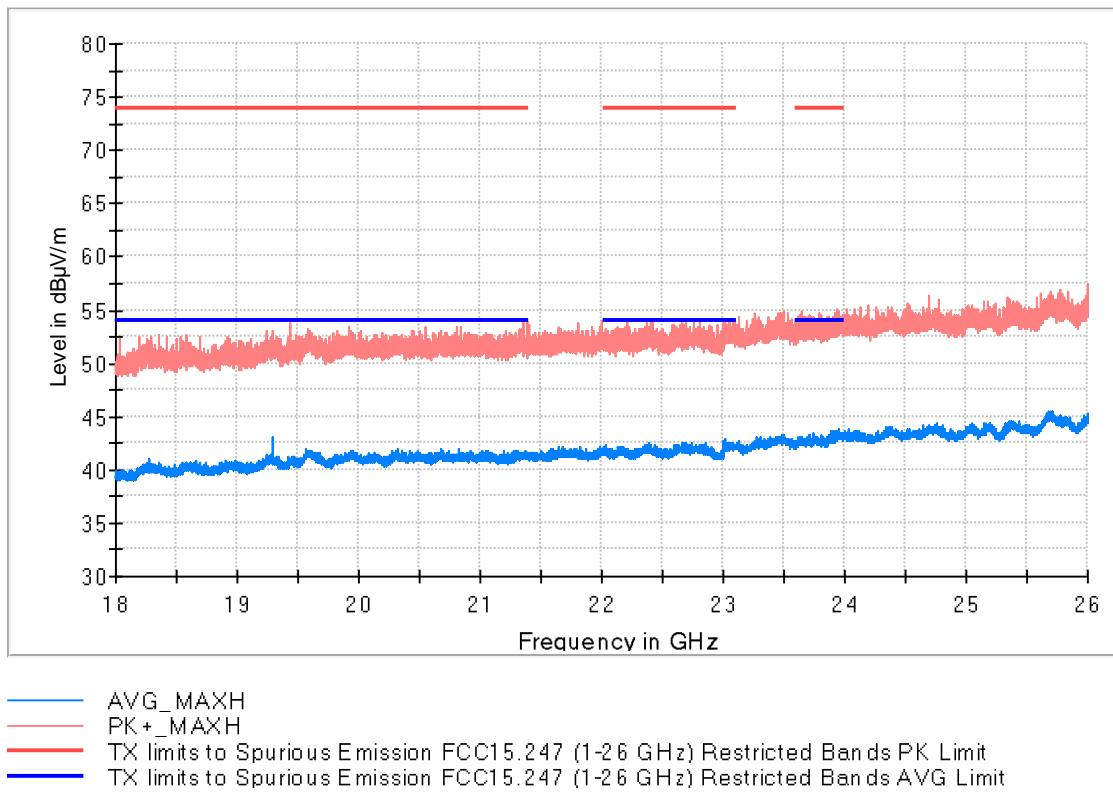


Final Result

Frequency (MHz)	PK+_MAXH (dB μ V/m)	AVG_MAXH (dB μ V/m)	Pol	Margin - AVG (dB)	Limit - AVG (dB μ V/m)	Comment
1597.500000	48.4	37.2	H	16.8	54.0	
2402.000000	87.6	84.2	H	---	---	Fundamental
2405.000000	93.6	84.7	V	---	---	Fundamental

TEST RESULTS (Cont.):

18 – 26 GHz



Final Result

Frequency (MHz)	PK+ MAXH (dB μ V/m)	AVG MAXH (dB μ V/m)	Pol	Margin - AVG (dB)	Limit - AVG (dB μ V/m)
19295.500000	51.2	43.4	V	10.8	54.0

TEST RESULTS (Cont.):

Restricted Bands (2.31 GHz – 2.5 GHz)

