DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29 507 456

ENSAYOS Nº 51/LE147

Test report No:
NIE: 51929RRF.017

Partial test report

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

Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz.
Unlicensed National Information Infrastructure (U-NII) Devices. General technical requirements.
Radiated emission limits; general requirements.
Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices.
General Requirements and Information for the Certification of Radio Apparatus.

(*) Identification of item tested	Headunit with radio and Bluetooth
(*) Trademark	Panasonic
(*) Model and /or type reference	MIB3E_MQB37w_BTWIFI
Other identification of the product	FCC ID: WUQ-MIB3VBTWIFI IC: 216R-MIB3VBTWIFI PN: 5E3.035.869 HW version: X85 SW version: X495
(*) Features	Bluetooth, WLAN, FM, AM, DAB, USB.
Applicant	PANASONIC AUTOMOTIVE SYSTEMS EUROPE GMBH Robert Bosch Str. 27-29 – 63225 Langen - Germany
Test method requested, standard	USA FCC Part 15.407 10-1-18 Edition: Unlicensed National Information Infrastructure (U-NII) Devices. General technical requirements. USA FCC Part 15.247 10-1-18 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 10-1-18 Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (April 2018). -Transmitter out of band radiated emissions with simultaneous transmissions. 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. Guidance for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices 789033 D02 General U-NII Test Procedures New Rules v02r01 dated Dec 14, 2017. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Approved by (name / position & signature)	A. Llamas RF Lab. Manager Firmado digitalmente por ALEJANDRO LLAMAS RODRIGUEZ Fecha: 2019.08.06 09:25:56 +02'00'
Date of issue	2019-08-06
Report template No	FDT08_22 (*) "Data provided by the client"

Index

Competences and guarantees 4
General conditions 4
Uncertainty 4
Data provided by the client 4
Usage of samples 4
Test sample description 5
Identification of the client 6
Testing period and place 6
Document history 6
Environmental conditions 6
Remarks and comments 7
Testing verdicts 8
Summary 8
Appendix A: Test results. 9

Competences and guarantees

DEKRA Testing and Certification 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 include testing performed in this test report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report

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

DEKRA Testing and Certification 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 at the time of performance of the test.

DEKRA Testing and Certification 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 Testing and Certification.

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

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 results.

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
51929B/537	Head unit with radio and Bluetooth	MIB3E_MQB37w_BTWIFI	PM6-00108.01.19413F0111	2019/06/05
51292B/538	Harness	---	---	2019/06/05

Sample S/01 has undergone the following test(s): All RADIATED 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)		
			☐	☐	☐		
Rated power supply ……:	Voltage and Frequency	Reference poles					
		L1	L2	L3	N	PE	
	☒ DC: 12 Vdc						
Rated Power ……:							
Clock frequencies ……:							
Other parameters……:							
Software version ……:	X495						
Hardware version……:	X85						
Dimensions in cm (W x H x D)….:							
Mounting position……:	☒ Other: Installed in cars						
Modules/parts ……:	Module/parts of test item	Type	Manufacturer				
Accessories (not part of the test item) ……:	Description	Type	Manufacturer				

Documents as provided by the applicant.....:	Description	File name	Issue date

(3) Only for Medical Equipment

Identification of the client

PANASONIC AUTOMOTIVE SYSTEMS EUROPE GMBH

Robert Bosch Str. 27-29 – 63225 Langen - Germany

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2019-07-17
Date (finish)	2019-07-17

Document history

Report number	Date	Description
51929RRF.017	2019-08-06	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 %

Remarks and comments

The tests have been performed by the technical personnel: Miguel Ángel Torres and Ignacio Cabra.

Used instrumentation:

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N.A.	N.A.
2.	EMI Test Receiver ROHDE AND SCHWARZ ESR7	2018/10	2020/10
3.	RF Pre-amplifier 40 dB, 10 MHz-6 GHz BONN ELEKTRONIK BLNA 0160-01N	2019/02	2020/08
4.	Biconical/Log Antenna ETS LINDGREN 3142E	2017/09	2020/09
5.	Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2018/02	2020/02
6.	RF Pre-amplifier 30dB, 1-18GHz BONN ELEKTRONIK BLMA 0118-3A	2019/04	2020/04
7.	RF Pre-amplifier, 30dB, 18-40GHz BONN ELEKTRONIK BLMA 1840-1M	2019/02	2021/02
8.	Broadband Horn antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2018/01	2021/01
9.	Broadband Horn antenna 18-40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2018/07	2021/07
10.	DC Power Supply Keysight Technologies U8002A	---	---
11.	Digital multimeter FLUKE 179	2019/06	2020/06

Testing verdicts

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

Summary

FCC PART 15 PARAGRAPH / RSS-247		
Requirement – Test case	**Verdict**	**Remark**
FCC 15.209 (a), FCC 15.247 Subclause (d), FCC 15.407 (b) / RSS-Gen 8.9, RSS-247 5.5, RSS-247 6.2.1.2, 6.2.2.2, 6.2.3.2 & 6.2.4.2 - Emission limitations radiated (Transmitter)	P	
Supplementary information and remarks: (1) The Equipment Under Test supports Simultaneous-Dual-Band (SDB) and Simultaneous-In-Band (CoTx) transmission.		

Appendix A: Test results.

INDEX

TEST CONDITIONS 11

FCC 15.209 (a), FCC 15.247 Subclause (d), FCC 15.407 (b) / RSS-Gen 8.9, RSS-247 5.5, RSS-247 6.2.1.2, 6.2.2.2, 6.2.3.2 & 6.2.4.2 Emission limitations radiated (Transmitter) 15

TEST CONDITIONS

POWER SUPPLY (V):

V nonimal: 12. Vdc.

Type of Power Supply: Battery.

ANTENNA:

Type of Antenna: Internal.

Maximum Declared Gain for Bluetooth EDR:

Gain: +1.3 dBi

Maximum Declared Gain for 2.4 GHz WLAN:

Gain: +0.4 dBi

Maximum Declared Gain for 5 GHz WLAN:

Gain: +0.7 dBi

RADIOS AND CHANNELS TESTED:

	Bluetooth EDR (FHSS)	
Mode:	GFSK	
Channel Spacing:	1 MHz	
Frequency Range:	2400 MHz to 2483.5 MHz	
Transmit Channels:	Channel	Channel Frequency (MHz)
	1	2402

	Wi-Fi 2.4 GHz (IEEE 802.11 bn20) (Digital Transmission System, DTS)	
Mode:	802.11b: 1Mbps	
Channel Spacing:	20 MHz	
Frequency Range:	2412 MHz to 2472 MHz	
Transmit Channels:	Channel	Channel Frequency (MHz)
	11	2462

	WLAN (IEEE 802.11 n) / U-NII	
Mode:	802.11n HT20: MCS0	
Frequency Range:	5150 MHz to 5250 MHz	
Channel Spacing:	20 MHz	
Transmit Channels:	Channel	Channel Frequency (MHz)
	Middle: 48	5240
Frequency Range:	5725 MHz to 5850 MHz	
Channel Spacing:	20 MHz	
Transmit Channels:	Channel	Channel Frequency (MHz)
	Highest: 165	5825

The test set-up was made in accordance to the general provisions of FCC DTS Measurement 558074 D01 Meas Guidance v05r02 dated April 2, 2019 and FCC Unlicensed National Information Infrastructure (U-NII) Devices 789033 D02 General U-NII Test Procedures New Rules v02r01 dated Dec 14, 2017.

The EUT was tested in the following operating mode:

- Continuous transmission with a modulated carrier at maximum power in all required channels selecting the supported data rates/modulations types.

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.

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m. The EUT was placed at a height of 80 cm above the reference ground plane in the center of the chamber turntable to perform the measurements below 1GHz and The EUT was placed at a height of 1.5 meters above the test chamber floor in the center of the chamber turntable to perform the measurements above 1GHz. It was also rotated 360º 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 final measured value, for the given emission, in the tables below incorporates the calibrated antenna factor, preamplifier gain (if used) and cable losses.

Transmission modes selected with each radio:

* Bluetooth Basic Rate: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in Basic Rate mode because its power is higher than EDR mode.

* 2.4 GHz WLAN: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in 802.11b / 1 Mbps mode configuration as that mode was found to transmit higher PSD than all the other 2.4 GHz WLAN modes.

* 5 GHz WLAN: Transmitter radiated spurious emissions tests were performed with the EUT transmitting in 802.11n / HT20 / MSC0 mode configuration as that mode was found to transmit higher PSD than all the other 5 GHz WLAN modes.

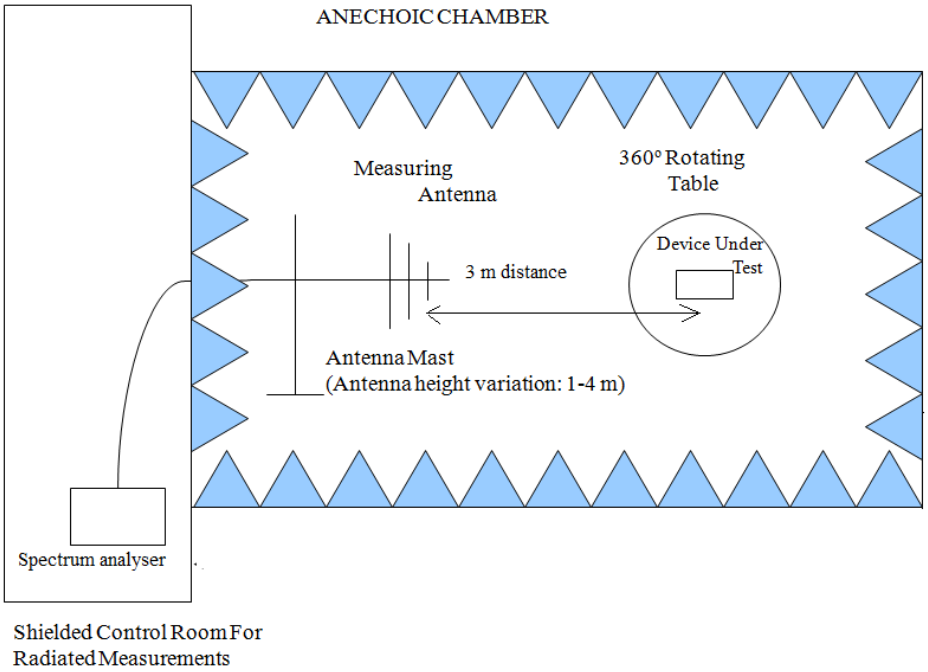
Simultaneous transmission modes selected:

The following configuration was selected based on preliminary testing that identified those corresponding to the worst case:

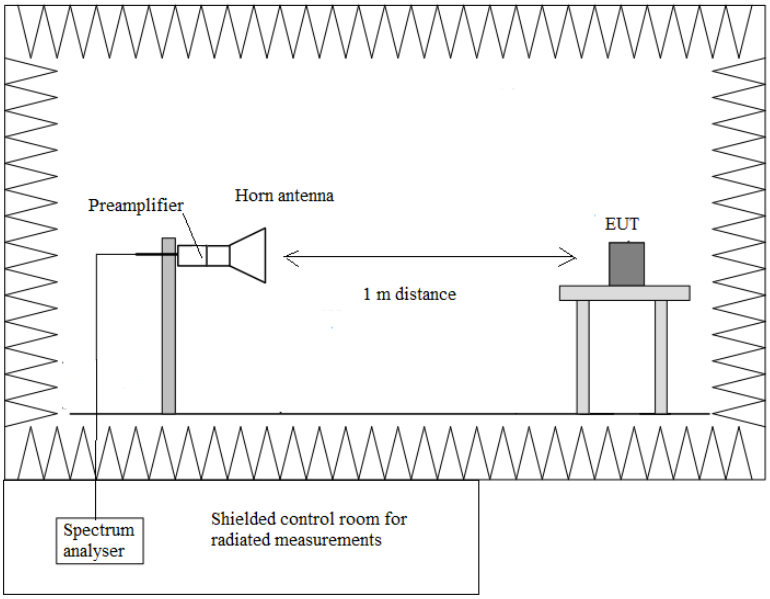
* 2.4 GHz WLAN, 5 GHz WLAN and Bluetooth Basic Rate co-location, with the EUT configured to simultaneously transmit two signals at maximum output power:

- 2.4GHz WLAN in 802.11b / 1 Mbps and Bluetooth Basic Rate with DH5.
- 5GHz WLAN in 802.11n / HT20 / MSC0 and Bluetooth Basic Rate with DH5.

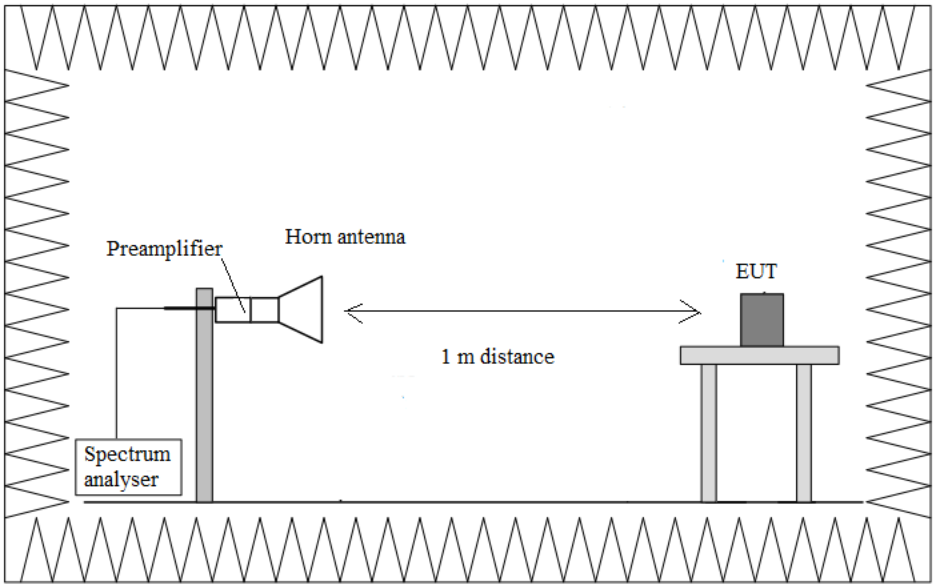
Radiated measurements setup f < 1 GHz



Radiated measurements setup f > 1 GHz up to 18 GHz.



Radiated measurements setup f > 18 GHz up to 40 GHz.



FCC 15.209 (a), FCC 15.247 Subclause (d), FCC 15.407 (b) / RSS-Gen 8.9, RSS-247 5.5, RSS-247 6.2.1.2, 6.2.2.2, 6.2.3.2 & 6.2.4.2 Emission limitations radiated (Transmitter)

SPECIFICATION:

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 (µV/m)	Field strength (dBµV/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.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º 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.

All tests were performed in a semi-anechoic chamber at a distance of 1m for the frequency range 1 GHz-40 GHz and a distance of 3m for frequency range 30MHz-1GHz.

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 performed on the following worst cases in all relevant tests channels.

Simultaneous transmission modes selected:

- Mode: 802.11b – 20MHz (2462MHz) and Bluetooth Basic Rate with DH5 (2402MHz).
- Mode: 802.11n HT20 – 20MHz (5825MHz) and Bluetooth Basic Rate with DH5 (2402MHz).

Mode: 802.11b – 20MHz (2462MHz) and Bluetooth Basic Rate with DH5 (2402MHz).

Frequency range 30 MHz - 1 GHz:

Note: The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode selected in the EUT.

Spurious levels operating (radiated) closest to the limit.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Measurement Uncertainty (dB)
305.658	Horizontal	Quasi-Peak	33.3	46	12.7	± 3.88
574.995	Horizontal	Quasi-Peak	26.7	46	19.3	± 3.88
620.940	Horizontal	Quasi-Peak	33.8	46	12.2	± 3.88
622.589	Vertical	Quasi-Peak	32.8	46	13.2	± 3.88
775.009	Vertical	Quasi-Peak	32.0	46	14.0	± 3.88

Frequency range 1 GHz-40 GHz

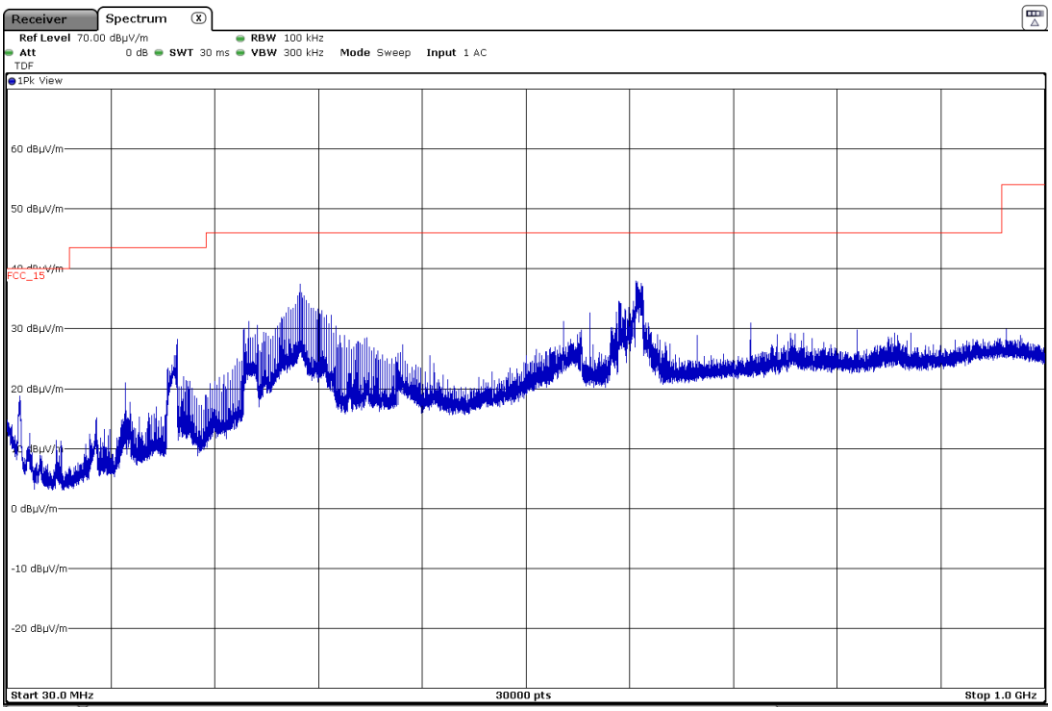
The results in the next tables show the maximum measured levels in the 1-40 GHz range.

Spurious signals with peak levels above the average limit (54 dBµV/m at 3 m) are measured with average detector for checking compliance with the average limit.

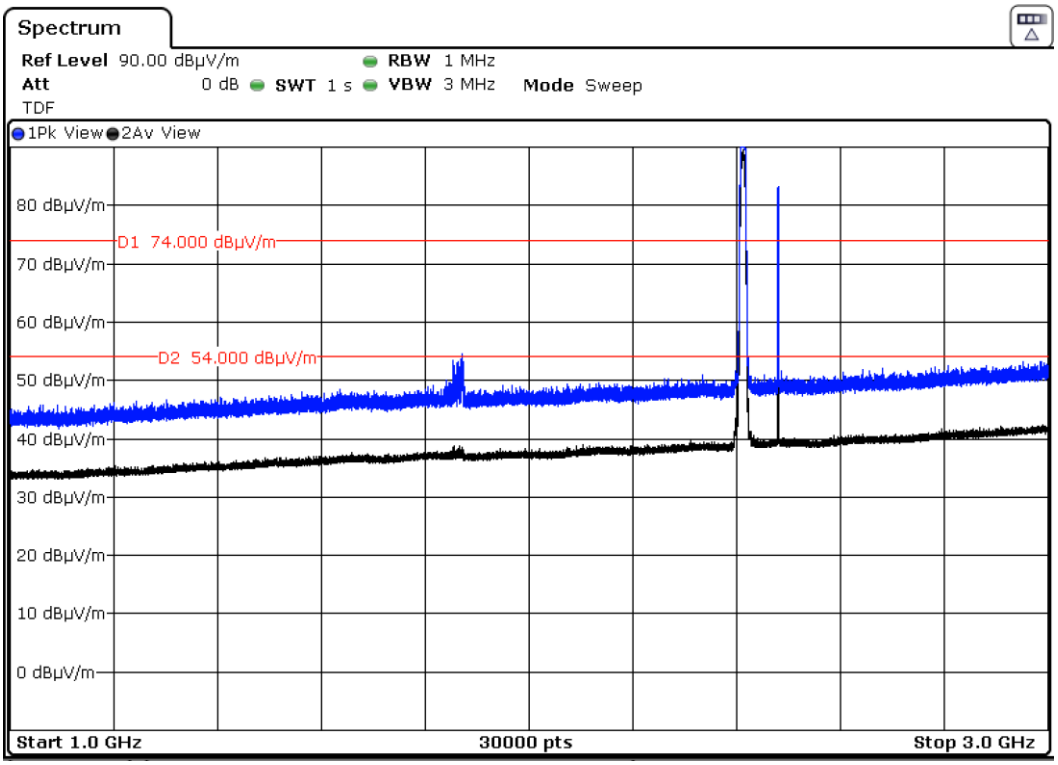
Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Measurement Uncertainty (dB)
3.08797	Vertical	Peak	48.36	74	25.64	± 3.70
3.11083	Horizontal	Peak	46.90	74	27.10	± 3.70
3.50470	Horizontal	Peak	42.40	74	31.60	± 3.70
4.33957	Vertical	Peak	46.97	74	27.03	± 3.70
4.36897	Horizontal	Peak	46.97	74	27.03	± 3.70
7.38737	Horizontal	Peak	45.51	74	28.49	± 3.70

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

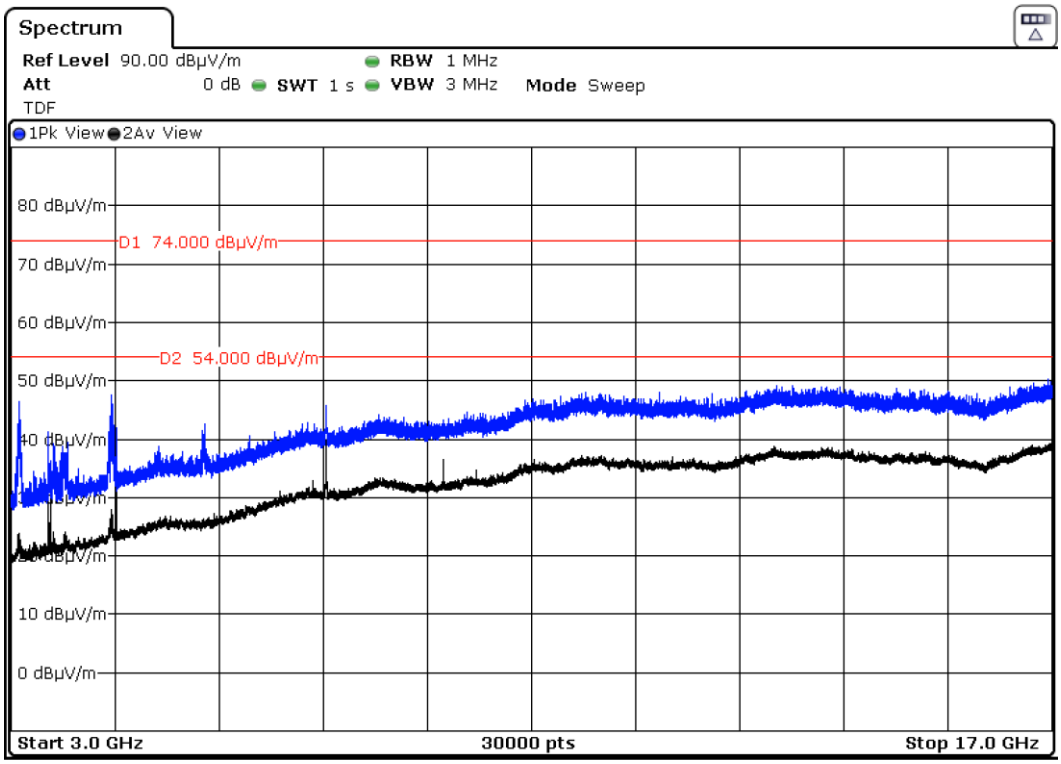


FREQUENCY RANGE 1 - 3 GHz.

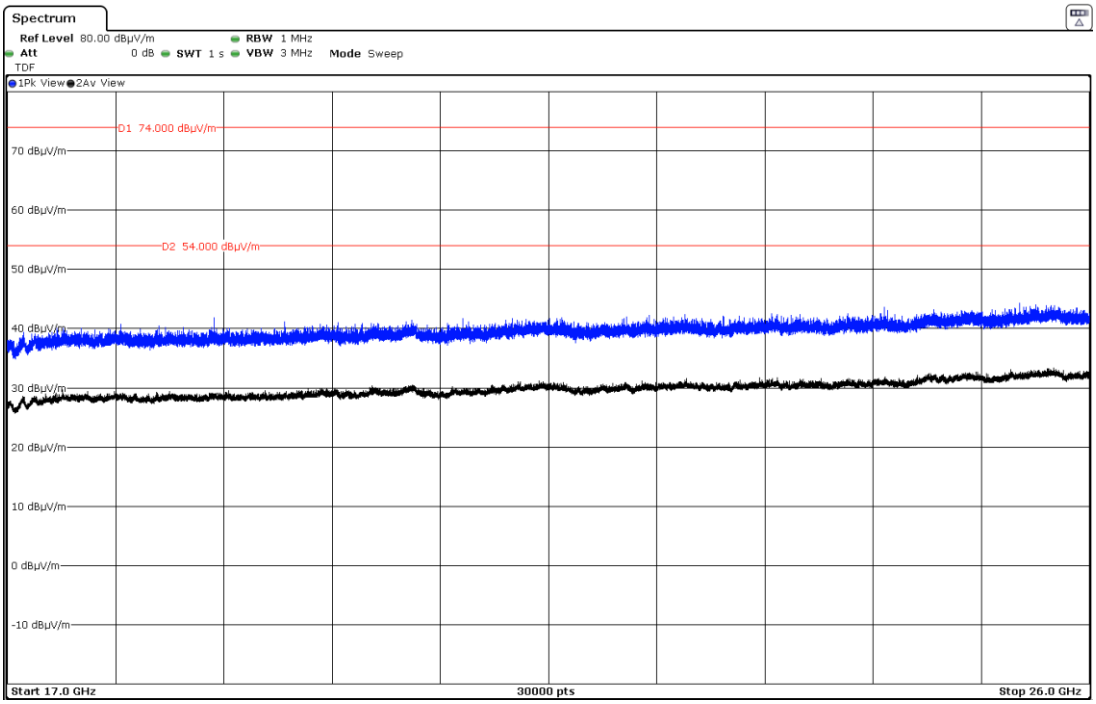


Note: The peaks shown in the plot above the limit are the carrier frequencies.

FREQUENCY RANGE 3 - 17 GHz.



FREQUENCY RANGE 17 - 26 GHz.



Mode: 802.11n HT20 – 20MHz (5825MHz) and Bluetooth Basic Rate with DH5 (2402MHz).

Frequency range 30 MHz - 1 GHz:

The spurious frequencies do not depend neither on the operating channel nor the modulation.

Spurious frequencies closest to the limit:

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Measurement Uncertainty (dB)
305.723	Horizontal	Quasi-Peak	31.8	46	14.2	± 3.88
326.675	Vertical	Quasi-Peak	28.1	46	17.9	± 3.88
574.995	Horizontal	Quasi-Peak	28.4	46	17.6	± 3.88
621.878	Horizontal	Quasi-Peak	29.9	46	16.1	± 3.88
624.141	Vertical	Quasi-Peak	32.7	46	13.3	± 3.88
725.021	Vertical	Quasi-Peak	33.4	46	12.6	± 3.88

Frequency range 1 GHz-40 GHz

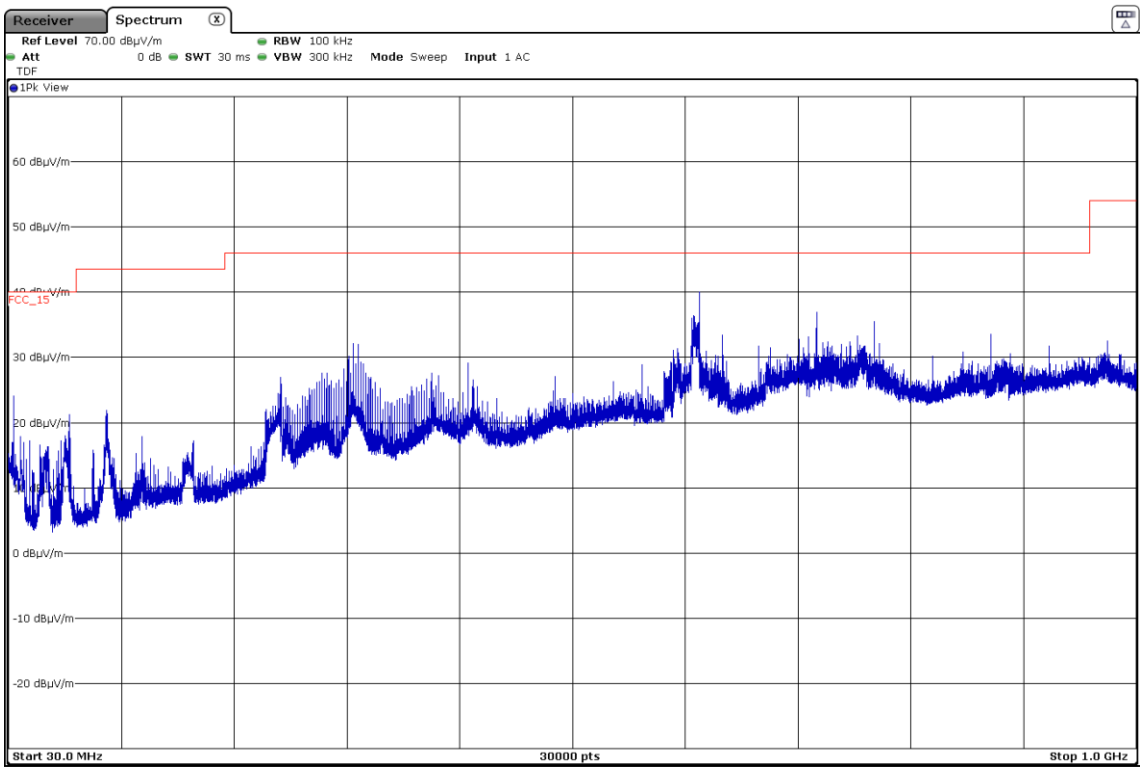
The results in the next tables show the maximum measured levels in the 1-40 GHz range.

Spurious signals with peak levels above the average limit (54 dBµV/m at 3 m) are measured with average detector for checking compliance with the average limit.

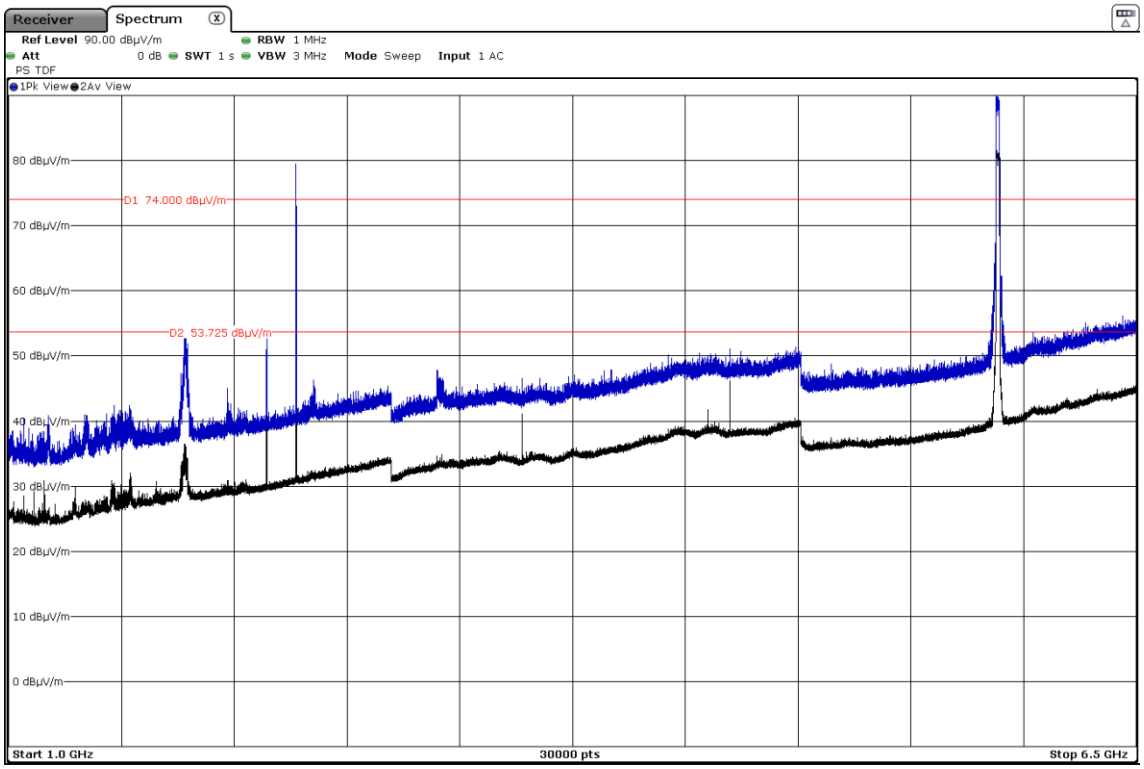
Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Measurement Uncertainty (dB)
1.86084	Vertical	Peak	53.65	74	20.35	± 3.70
2.25923	Vertical	Peak	53.96	74	20.04	± 3.70
4.51808	Vertical	Peak	51.12	74	22.88	± 3.70
6.77703	Vertical	Peak	45.25	74	28.75	± 3.70

Verdict: PASS

FREQUENCY RANGE 30 MHz-1000 MHz.

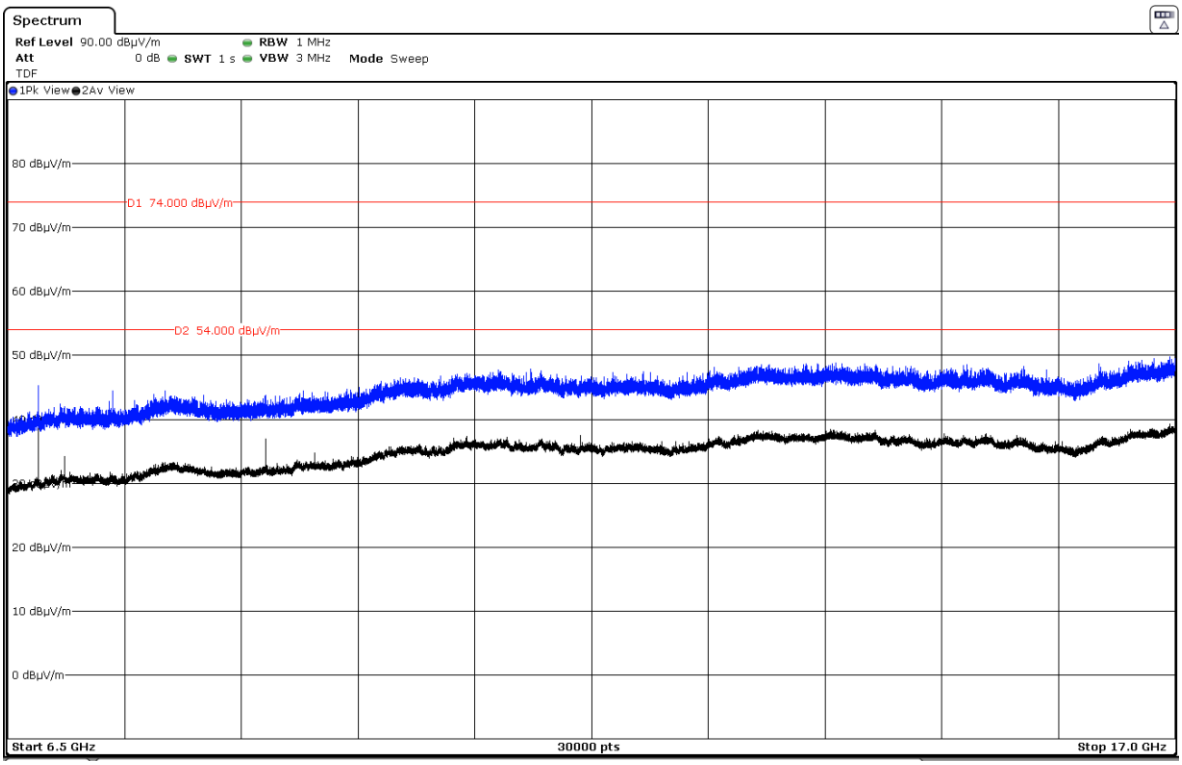
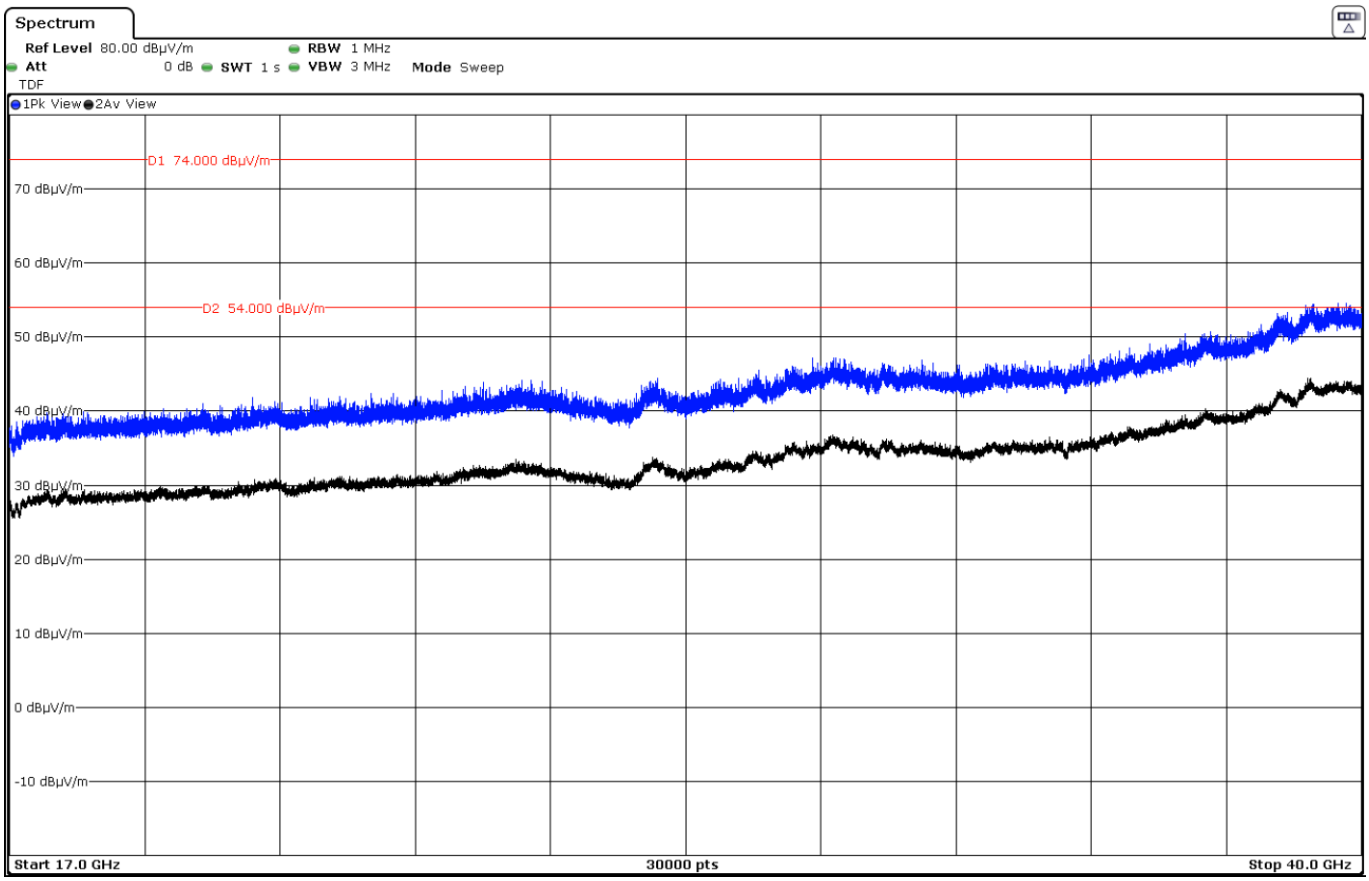


FREQUENCY RANGE 1 – 6.5 GHz.



Note: The peaks shown in the plot above the limit are the carrier frequencies.

FREQUENCY RANGE 6.5 – 17 GHz.



FREQUENCY RANGE 17 – 40 GHz.