

Test Report

Report Number:

F191416E1

Equipment under Test (EUT):

**EWLAN1
WLAN module**

Applicant:

Hirschmann Automation and Control GmbH

Manufacturer:

Hirschmann Automation and Control GmbH



Deutsche
Akkreditierungsstelle
D-PL-17186-01-01
D-PL-17186-01-02
D-PL-17186-01-03

References

- [1] **ANSI C63.26-2015**, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.
- [2] **FCC CFR 47 Part 90 Subpart Y**, Regulations Governing Licensing and Use of Frequencies in the 4940-4990 MHz Band
- [3] **971168 D02 Misc Rev Approv License Devices v02r01**, Radio Frequency Devices
- [4] **789033 D02**, General U-NII Test Procedures New Rules v02r01
- [5] **Inquiry 300709**, PSD measurement according to §90.1215

Test Result

The requirements of the tests performed as shown in the overview (clause 0) were fulfilled by the equipment under test.
The complete test results are presented in the following.

Test engineer:	Paul NEUFELD Name	 Signature	28.05.2020 Date
Authorized reviewer:	Bernd STEINER Name	 Signature	28.05.2020 Date

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1 Identification

1.1 Applicant

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Applicant represented during the test by the following person:	Partly: Mr. Daniel OBENLAND

1.2 Manufacturer

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Phone:	+49 7127 14 1750
eMail Address:	Bernd.Gaissert@belden.com
Applicant represented during the test by the following person:	Partly: Mr. Daniel OBENLAND

1.3 Test Laboratory

The tests were carried out by: **PHOENIX TESTLAB GmbH**
Königswinkel 10
32825 Blomberg
Germany

Accredited by Deutsche Akkreditierungsstelle GmbH (DAkkS) in compliance with DIN EN ISO/IEC 17025 under Reg. No. D-PL-17186-01-05 and D-PL-17186-01-06, FCC Test Firm Accreditation designation number DE0004, FCC Test Firm Registration Number 469623, CAB Identifier DE0003 and ISED# 3469A.

1.4 EUT (Equipment Under Test)

Test object: *	Wireless LAN Module
Type / PMN: *	EWLAN1
FCC ID: *	U99EWLAN1
IC: *	4019A-EWLAN1
Serial number: *	837599005060934767
EUT marking: *	-
PCB identifier: *	742386001 Z03G03
Hardware version: *	Z06S09
Software version: *	HiLCOS 10.12.RU4

Note: Phoenix Testlab GmbH does not take samples. The samples used for tests are provided exclusively by the applicant.

Unlicensed Radio channels

WLAN radio channels (802.11 b/g/n20 mode)

Channel 01	RX:	2412 MHz	TX:	2412 MHz
Channel 02	RX:	2417 MHz	TX:	2417 MHz
Channel 03	RX:	2422 MHz	TX:	2422 MHz
Channel 04	RX:	2427 MHz	TX:	2427 MHz
Channel 05	RX:	2432 MHz	TX:	2432 MHz
Channel 06	RX:	2437 MHz	TX:	2437 MHz
Channel 07	RX:	2442 MHz	TX:	2442 MHz
Channel 08	RX:	2447 MHz	TX:	2447 MHz
Channel 09	RX:	2452 MHz	TX:	2452 MHz
Channel 10	RX:	2457 MHz	TX:	2457 MHz
Channel 11	RX:	2462 MHz	TX:	2462 MHz

WLAN radio channels (802.11 n40 mode)

Channel 03	RX:	2422 MHz	TX:	2422 MHz
Channel 04	RX:	2427 MHz	TX:	2427 MHz
Channel 05	RX:	2432 MHz	TX:	2432 MHz
Channel 06	RX:	2437 MHz	TX:	2437 MHz
Channel 07	RX:	2442 MHz	TX:	2442 MHz
Channel 08	RX:	2447 MHz	TX:	2447 MHz
Channel 09	RX:	2452 MHz	TX:	2452 MHz

WLAN radio channels (802.11 a/n20 mode)

Channel 36	RX:	5180 MHz	TX:	5180 MHz
Channel 40	RX:	5200 MHz	TX:	5200 MHz
Channel 44	RX:	5220 MHz	TX:	5220 MHz
Channel 48	RX:	5240 MHz	TX:	5240 MHz
Channel 149	RX:	5745 MHz	TX:	5745 MHz
Channel 153	RX:	5765 MHz	TX:	5765 MHz
Channel 157	RX:	5785 MHz	TX:	5785 MHz
Channel 161	RX:	5805 MHz	TX:	5805 MHz
Channel 165	RX:	5825 MHz	TX:	5825 MHz

WLAN radio channels (802.11 n40 mode)

Channel 38	RX:	5190 MHz	TX:	5190 MHz
Channel 46	RX:	5230 MHz	TX:	5230 MHz
Channel 151	RX:	5755 MHz	TX:	5755 MHz
Channel 159	RX:	5795 MHz	TX:	5795 MHz

Licensed Radio channels

radio channels (5 MHz bandwidth aggregation)

Channel numbers FCC	Channel numbers in EUT menu	Rx Frequency	Tx Frequency
1 to 5*	218	4942.5 MHz	4942.5 MHz
6	219	4947.5 MHz	4947.5 MHz
7	220	4952.5 MHz	4952.5 MHz
8	221	4957.5 MHz	4957.5 MHz
9	222	4962.5 MHz	4962.5 MHz
10	223	4967.5 MHz	4967.5 MHz
11	224	4972.5 MHz	4972.5 MHz
12	225	4977.5 MHz	4977.5 MHz
13	226	4982.5 MHz	4982.5 MHz
14 to 18*	227	4987.5 MHz	4987.5 MHz

radio channels (10 MHz bandwidth aggregation)

Channel numbers FCC	Channel numbers in EUT menu	Rx Frequency	Tx Frequency
1 to 6*	19	4945 MHz	4945 MHz
6 & 7	20	4950 MHz	4950 MHz
7 & 8	21	4955 MHz	4955 MHz
8 & 9	22	4960 MHz	4960 MHz
9 & 10	23	4965 MHz	4965 MHz
10 & 11	24	4970 MHz	4970 MHz
11 & 12	25	4975 MHz	4975 MHz
12 & 13	26	4980 MHz	4980 MHz
13 to 18	27	4985 MHz	4985 MHz

* Licensees should avoid using these channels in aggregations unless all other channels are blocked.

radio channels (20 MHz bandwidth aggregation)

Channel numbers FCC	Channel numbers in EUT menu	Rx Frequency	Tx Frequency
1 to 8*	20	4950 MHz	4950 MHz
6 to 9	21	4955 MHz	4955 MHz
7 to 10	22	4960 MHz	4960 MHz
8 to 11	23	4965 MHz	4965 MHz
9 to 12	24	4970 MHz	4970 MHz
10 to 13	25	4975 MHz	4975 MHz
11 to 18*	26	4980 MHz	4980 MHz

* Licensees should avoid using these channels in aggregations unless all other channels are blocked.

1.5 Technical Data of Equipment

Fulfil specifications: *	IEEE, 802.11b, 802.11g, 802.11n, 802.11a		
Antenna type: *	See antenna specifications below		
Antenna name: *	See antenna specifications below		
Antenna gain: *	See antenna specifications below		
Antenna connector: *	U.FL		
Supply voltage 1 EUT: *	U _{nom} = 3.3 V DC	U _{min} = 3.135 V DC	U _{max} = 3.465 V DC
Supply voltage 2 EUT: *	U _{nom} = 1.28 V DC	U _{min} = 1.216 V DC	U _{max} = 1.344 V DC
Supply voltage Host device: *	U _{nom} = 24 V DC	U _{min} = 18 V DC	U _{max} = 36 V DC
Type of modulation: *	GFSK (1 Mbps only)		
Operating frequency range:*	802.11 a/b/g/n20: 2412 – 2462 MHz, 5180 – 5240 MHz, 5745 – 5825 MHz 802.11 n40: 2422 – 2452 MHz, 5190 – 5230 MHz, 5755 – 5795 MHz Licensed (5 MHz): 4942.5 – 4987.5 MHz Licensed (10 MHz): 4945 – 4985 MHz Licensed (20 MHz): 4950 - 4980 MHz		
Number of channels: *	802.11 a/b/g/n20: 20 802.11 n40: 11 Licensed (5 MHz): 10 Licensed (10 MHz): 9 Licensed (20 MHz): 7		
Temperature range: *	-40 °C to +70 °C		
Lowest / highest Internal clock frequency: *	40 MHz / 5825 MHz		

* Declared by the applicant

Ancillary Equipment	
Cables (connected to the EUT): *1	PCI express cable (~ 30 cm)
Ancillary device: *1	Hirschmann Belden BAT-R Access Point
Power cable (Ancillary device):*1	DC cable to laboratory power supply*2
Ethernet cable (Ancillary device):*2	Ethernet cable from BAT-R Access Point to ancillary laptop computer (~3 m)
Laptop PC:*2	Fujitsu Lifebook S751 (PM No. 201036)

*1 Provided by the applicant

*2 Provided by the test laboratory

1.6 Dates

Date of receipt of test sample:	09.03.2020
Start of test:	09.03.2020
End of test:	11.05.2020

2 Operational States

This test report contains the additional measurements for a class 3 permissive change, to combine the licensed frequency bands, tested in this report, together with the original results using the existing FCC ID.

The EUT only supports low power mode according to Part 90Y.

The equipment under test (EUT) is a WLAN module with a PCI express interface and 3 antenna ports. To set this module into operation it was connected to a Hirschmann Belden BAT-R Access Point via a PCI express ribbon cable with a length of 30 cm.

The tests were carried out with an unmodified sample of the EUT. The tests were carried out conducted at the antenna ports. Additionally, a radiated measurement of the housing emission was performed while the antenna ports are terminated symmetrically by 50 Ω resistors.

The BAT-R Access Point was connected via an Ethernet connection to a laptop computer. With a test-software running on the laptop the operation mode as seen in the table below could be chosen.

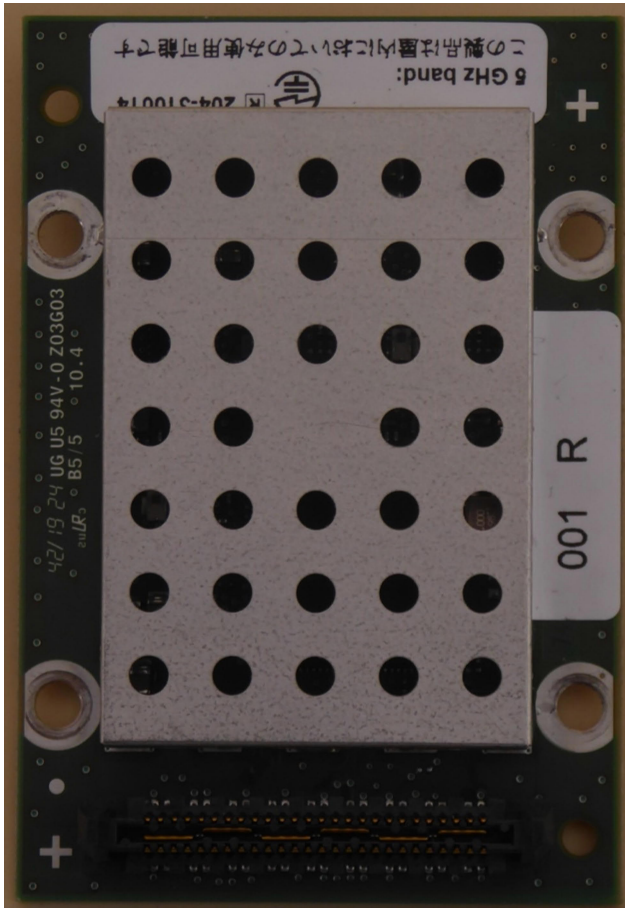
During the tests, the test samples were powered with 3.3 V and 1.28 V via PCI Express interface from the BAT-R access-point. This access-point was powered with 24 VDC from a laboratory power supply.

Worst case settings (including power setting)

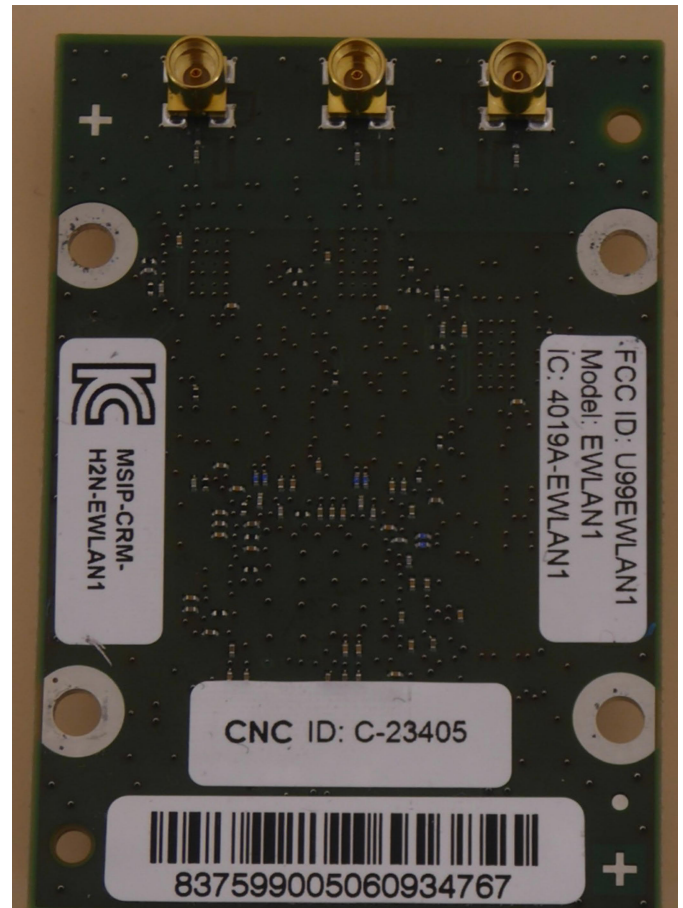
Operation mode	Description of the operation mode	mode	Active antennas	Power Reduction	Data rate / Mbps
1	Continuous transmitting on 4942.5 MHz	5 MHz	1	5	1.5 Mbps
2	Continuous transmitting on 4967.5 MHz	5 MHz	1	5	1.5 Mbps
3	Continuous transmitting on 4987.5 MHz	5 MHz	1	5	1.5 Mbps
4	Continuous transmitting on 4942.5 MHz	5 MHz	1+2	5	1.5 Mbps
5	Continuous transmitting on 4967.5 MHz	5 MHz	1+2	5	1.5 Mbps
6	Continuous transmitting on 4987.5 MHz	5 MHz	1+2	5	1.5 Mbps
7	Continuous transmitting on 4942.5 MHz	5 MHz	1+2+3	4	1.5 Mbps
8	Continuous transmitting on 4967.5 MHz	5 MHz	1+2+3	4	1.5 Mbps
9	Continuous transmitting on 4987.5 MHz	5 MHz	1+2+3	4	1.5 Mbps
10	Continuous transmitting on 4945 MHz	10 MHz	1	2	3 Mbps
11	Continuous transmitting on 4965 MHz	10 MHz	1	2	3 Mbps
12	Continuous transmitting on 4985 MHz	10 MHz	1	2	3 Mbps
13	Continuous transmitting on 4945 MHz	10 MHz	1+2	2	3 Mbps
14	Continuous transmitting on 4965 MHz	10 MHz	1+2	2	3 Mbps
15	Continuous transmitting on 4985 MHz	10 MHz	1+2	2	3 Mbps
16	Continuous transmitting on 4945 MHz	10 MHz	1+2+3	2	3 Mbps
17	Continuous transmitting on 4965 MHz	10 MHz	1+2+3	2	3 Mbps
18	Continuous transmitting on 4985 MHz	10 MHz	1+2+3	2	3 Mbps
19	Continuous transmitting on 4950 MHz	20 MHz	1	5	6 Mbps
20	Continuous transmitting on 4965 MHz	20 MHz	1	5	6 Mbps
21	Continuous transmitting on 4980 MHz	20 MHz	1	5	6 Mbps
22	Continuous transmitting on 4950 MHz	20 MHz	1+2	4	6 Mbps
23	Continuous transmitting on 4965 MHz	20 MHz	1+2	4	6 Mbps
24	Continuous transmitting on 4980 MHz	20 MHz	1+2	4	6 Mbps
25	Continuous transmitting on 4950 MHz	20 MHz	1+2+3	3	6 Mbps
26	Continuous transmitting on 4965 MHz	20 MHz	1+2+3	3	6 Mbps
27	Continuous transmitting on 4980 MHz	20 MHz	1+2+3	3	6 Mbps

3 Additional Information

All tests were performed with an unmodified sample.



EUT – top view



EUT – bottom view

4 Overview

Application	Frequency range [MHz]	FCC 47 CFR Part 90 subpart Y	Status	Refer page
Conducted Output Power Measurement	4942.5 - 4987.5 4945 – 4985 4950 - 4980	90.1215(c)	Passed	12 et seq
Power Spectral Density	4942.5 - 4987.5 4945 – 4985 4950 - 4980	90.1215(b)	Passed	14 et seq
26 dB Bandwidth / 99% Bandwidth	4942.5 - 4987.5 4945 – 4985 4950 - 4980	90.209	Passed	17 et seq
Peak Excursion	4942.5 - 4987.5 4945 – 4985 4950 - 4980	90.2015(e)	Passed	20 et seq
Emission Mask	4942.5 - 4987.5 4945 – 4985 4950 - 4980	90.210	Passed	27 et seq
Frequency Stability	4942.5 - 4987.5 4945 – 4985 4950 - 4980	90.1213	Passed	36 et seq

5 Results

5.1 Duty cycle

The EUT was transmitting continuously, therefore no duty cycle correction had to be performed. Subsequently no duty cycle had to be measured.

5.2 Maximum conducted output power

5.2.1 Method of measurement

The EUT was measured conducted on a sample with an antenna connector, which was provided by the applicant.

Acceptable measurement configurations

Procedure 5.2.4.2 in [1] was used for the following test.

5.2.2 Test results

Ambient temperature	22 °C	Relative humidity	62 %
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Since the EUT is only installed by professionals, the antenna and antenna cable choice must be selected in a way, that an antenna gain of 9 dBi is not exceeded. Hereby also an array gain for the operation of multiple antennas must be considered.

Operation mode	Mode [MHz]	Frequency [MHz]	Pwr chain 1 [dBm]	Pwr chain 2 [dBm]	Pwr chain 3 [dBm]	Pwr sum [dB]	Limit [dBm]
1	5	4942.5	13.4	-	-	13.4	14
2	5	4967.5	13.4	-	-	13.4	14
3	5	4987.5	12.8	-	-	12.8	14
4	5	4942.5	10	8.2	-	12.2	14
5	5	4967.5	9.7	8.4	-	12.1	14
6	5	4987.5	9.3	8.5	-	11.9	14
7	5	4942.5	8.6	6.8	7.7	12.5	14
8	5	4967.5	7.9	7.0	7.8	12.4	14
9	5	4987.5	8.0	7.1	8.3	12.6	14
10	10	4945	14.3	-	-	14.3	17
11	10	4965	13.7	-	-	13.7	17
12	10	4985	13.3	-	-	13.3	17
13	10	4945	12.8	11.6	-	15.3	17
14	10	4965	12.3	11.4	-	14.9	17
15	10	4985	12.2	11.0	-	14.7	17
16	10	4945	11.0	9.4	10.3	15.1	17
17	10	4965	10.7	9.1	10.4	14.9	17
18	10	4985	10.6	9.1	10.3	14.8	17
19	20	4950	13.4	-	-	13.4	20
20	20	4965	13.2	-	-	13.2	20
21	20	4980	13.0	-	-	13.0	20
22	20	4950	12.8	11.1	-	15.0	20
23	20	4965	12.7	11.5	-	15.2	20
24	20	4980	12.4	11.2	-	14.9	20
25	20	4950	12.6	10.7	11.9	16.6	20
26	20	4965	12.8	11.7	12.5	17.1	20
27	20	4980	12.5	10.8	12.5	16.8	20
Measurement uncertainty				+/- 0.13 dB			

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

11, 12, 29, 30

5.3 Power Spectral Density

5.3.1 Method of measurement

The bandwidth was measured conducted at the antenna connector. For the test an RF-Switch and additional cables were used to connect the EUT to the spectrum analyser. The attenuation of the additional cables, the RF-switch and the 10 dB attenuator were respected as a reference level offset.

Acceptable measurement configurations

According to an inquiry with the tracking number 300709 the FCC confirmed that the guidance in Publications 971168 D02 and 789033 D02 is applicable and valid.

Since the 971168 D02 Misc Rev Approv License Devices v02r01 has a reference in part V. Question 3 / Answer 3. Here the method of the UNII 15.407 is allowed, which was found in publication 789033 D02 General U-NII Test Procedures New Rules v02r01.

The method SA-1 from publication 789033 D02 was used for the following test:

The result is the Maximum PSD over 1 MHz reference bandwidth, since the 26 dB bandwidth is always greater than 1 MHz.

Since the EUT operates with 100 % duty cycle, no correction of the result value was done.

5.3.2 Test result

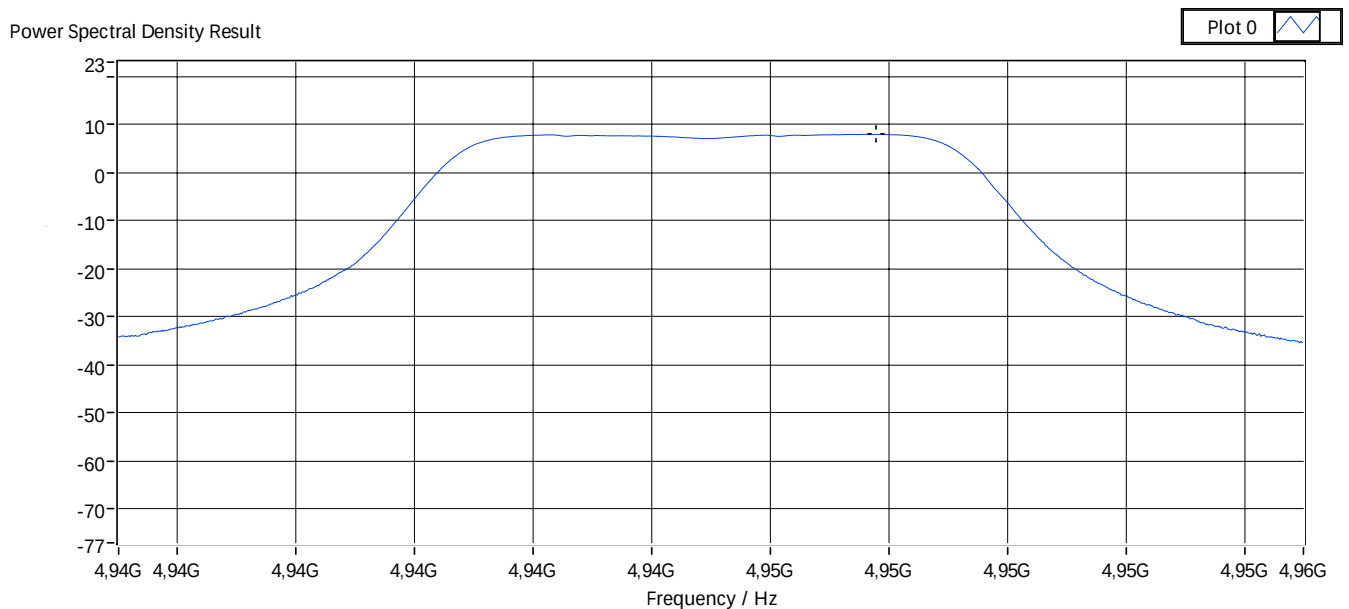
Ambient temperature	22 °C	Relative humidity	59 %
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The plots show an exemplary measurement result for the worst documented case. The other results are listed in the following tables.

Since the EUT is only installed by professionals, the antenna and antenna cable choice must be selected in a way, that an antenna gain of 9 dBi is not exceeded. Hereby also an array gain for the operation of multiple antennas must be considered.

For the tests where multiple antenna ports transmitted simultaneously, the spectrum of each port was measured separately. Subsequently the individual spectra were added linearly. In this case the peak value is the peak of the linear summed spectra.

PSD_10MHz_2Ant_2dB-Red_ch19.wmf: Average Power Spectral Density (operation mode 13):



Remark: the figure above shows the worst case power spectral density of the antenna ports in the particular mode. The traces were added in linear terms.

Operation Mode	Mode [MHz]	Active antenna ports	Peak Frequency [MHz]	AvPSD Reading [dBm/MHz]	Margin [dB]	AvPSD Limit [dBm/MHz]
1	5	1	4941.570	7.9	0.1	8
2	5	1	4966.600	7.6	0.4	8
3	5	1	4988.490	7.6	0.4	8
4	5	2	4943.467	7.4	0.6	8
5	5	2	4968.467	7.4	0.6	8
6	5	2	4988.482	6.8	1.2	8
7	5	3	4943.422	7.6	0.4	8
8	5	3	4968.347	7.6	0.4	8
9	5	3	4988.497	7.6	0.4	8
10	10	1	4947.560	7.3	0.7	8
11	10	1	4967.520	6.2	1.8	8
12	10	1	4987.740	6.2	1.8	8
13	10	2	4947.787	8.0	0.0	8
14	10	2	4967.468	7.7	0.3	8
15	10	2	4987.647	7.6	0.4	8
16	10	3	4947.647	7.6	0.4	8
17	10	3	4967.527	7.7	0.3	8
18	10	3	4987.687	7.6	0.4	8
19	20	1	4965.100	1.9	6.1	8
20	20	1	4971.030	2.2	5.8	8
21	20	1	4985.490	2.0	6.0	8
22	20	2	4956.459	4.6	3.4	8
23	20	2	4971.069	4.0	4.0	8
24	20	2	4985.529	4.5	3.5	8
25	20	3	4956.578	6.5	1.5	8
26	20	3	4971.099	6.3	1.7	8
27	20	3	4985.529	6.1	1.9	8
Measurement uncertainty				+/- 2.51 dB		

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

9, 11, 12, 31, 32

5.4 26 dB Bandwidth / 99% Bandwidth

5.4.1 Method of measurement

The bandwidth was measured conducted at the antenna connector. For the test an RF-Switch and additional cables were used to connect the EUT to the spectrum analyser.

Acceptable measurement configurations

The measurement for the 99 % bandwidth procedure refers to part 5.4.4 of document [1].

The OBW is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5 % of the total mean power of the given emission.

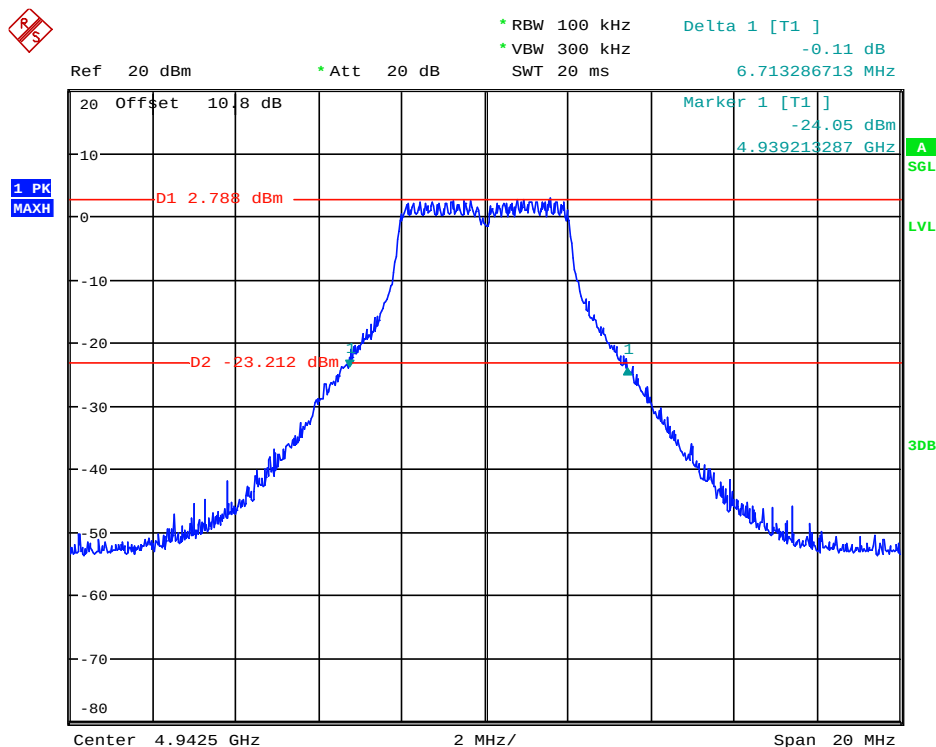
The 26-dB measurement was performed using procedure 5.4.3 in document [1].

5.4.2 Test result

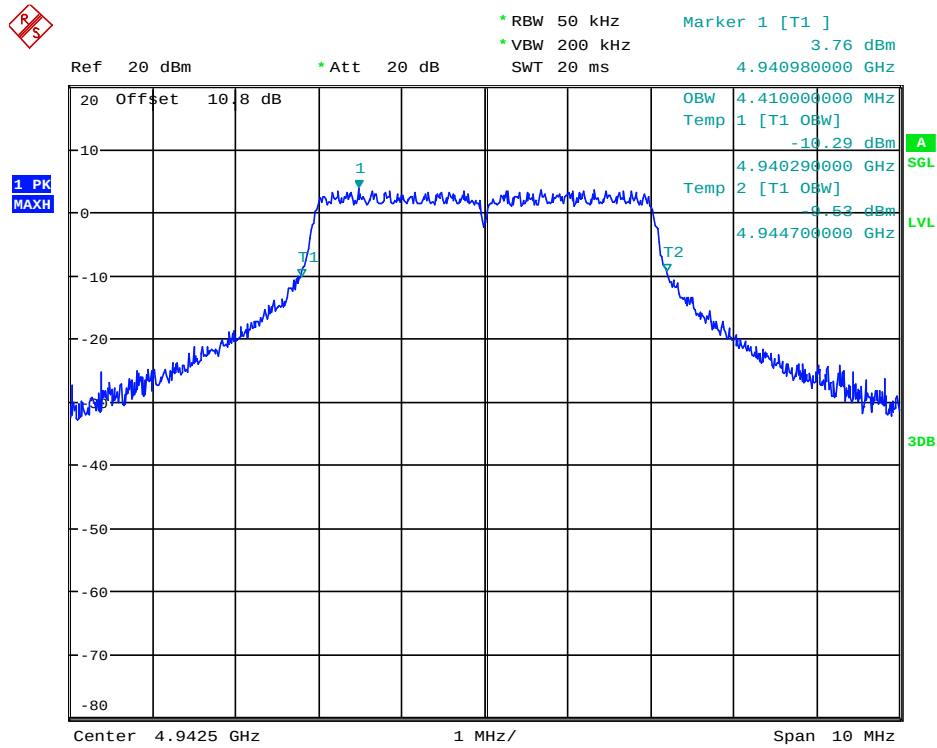
Ambient temperature	22 °C	Relative humidity	59 %
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The plots show an exemplary measurement result for the lowest documented bandwidth. The other results are listed in the following tables.

5MHz Ant2 5dB-Red ch218 26dB-BW.wmf: 26-dB Bandwidth (operation mode 4):



5MHz_Ant1_5dB-Red_ch218_99%BW.wmf: 99% Bandwidth (operation mode 1):



Operation Mode	Mode [MHz]	Frequency [MHz]	Antenna port	26 dB Bandwidth [MHz]	99 % Bandwidth [MHz]
1	5	4942.5	1	7.832	4.410
2	5	4967.5	1	7.632	4.968
3	5	4987.5	1	8.552	4.989
4	5	4942.5	2	6.713	4.941
5	5	4967.5	2	6.793	4.967
6	5	4987.5	2	6.713	4.989
7	5	4942.5	3	6.793	4.943
8	5	4967.5	3	6.773	4.967
9	5	4987.5	3	6.773	4.989
10	10	4945	1	13.816	8.505
11	10	4965	1	14.446	8.520
12	10	4985	1	14.745	8.505
13	10	4945	2	12.617	8.415
14	10	4965	2	12.587	8.415
15	10	4985	2	12.587	8.415
16	10	4945	3	12.468	8.400
17	10	4965	3	12.528	8.400
18	10	4985	3	12.258	8.400
19	20	4950	1	28.125	17.160
20	20	4965	1	26.503	17.130
21	20	4980	1	32.372	17.160
22	20	4950	2	25.321	16.950
23	20	4965	2	25.240	16.950
24	20	4980	2	24.998	16.920
25	20	4950	3	24.359	16.920
26	20	4965	3	25.881	16.920
27	20	4980	3	26.923	16.950
Measurement uncertainty			4.54*10 ⁻⁸ at 40 GHz		

TEST EQUIPMENT USED FOR THE TEST:

9, 11, 12, 31, 32

5.5 Peak Excursion

5.5.1 Method of measurement (Peak Excursion)

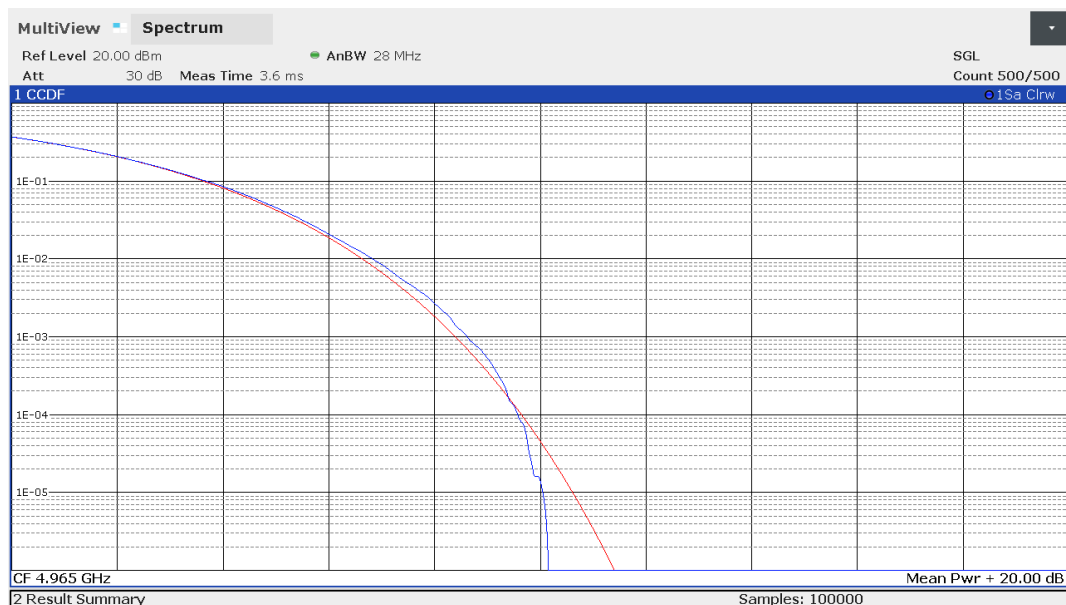
The bandwidth was measured conducted at the antenna connector. For the test an RF-Switch and additional cables were used to connect the EUT to the spectrum analyser.

Acceptable measurement configurations

The peak-to-average-ratio (PAPR) for narrowband CW-like signals has to be measured according to 5.2.6 in [1]. For broadband noise-like signals method 5.2.3.4 in [1] shall be used. Since the emissions in this test are broadband noise-like signals, method 5.2.3.4 was used for the following tests.

The plots show an exemplary measurement result for the lowest documented bandwidth. The other results are listed in the following tables.

10MHz Ant1 CCDF Mid.png: CCDF (operation mode 11):



5.5.2 Test result (Peak Excursion)

Operation Mode	Mode [MHz]	Frequency [MHz]	Antenna port	Peak excursion [dB]	Limit [dB]	Result
1	5	4942.5	1	8.14	13	Passed
2	5	4967.5	1	8.16	13	Passed
3	5	4987.5	1	8.20	13	Passed
4	5	4942.5	2	8.32	13	Passed
5	5	4967.5	2	8.22	13	Passed
6	5	4987.5	2	8.44	13	Passed
7	5	4942.5	3	8.14	13	Passed
8	5	4967.5	3	8.36	13	Passed
9	5	4987.5	3	8.34	13	Passed
10	10	4945	1	8.46	13	Passed
11	10	4965	1	8.62	13	Passed
12	10	4985	1	8.36	13	Passed
13	10	4945	2	8.20	13	Passed
14	10	4965	2	8.18	13	Passed
15	10	4985	2	8.28	13	Passed
16	10	4945	3	8.34	13	Passed
17	10	4965	3	8.34	13	Passed
18	10	4985	3	8.30	13	Passed
19	20	4950	1	8.56	13	Passed
20	20	4965	1	8.42	13	Passed
21	20	4980	1	8.62	13	Passed
22	20	4950	2	8.30	13	Passed
23	20	4965	2	8.48	13	Passed
24	20	4980	2	8.34	13	Passed
25	20	4950	3	8.52	13	Passed
26	20	4965	3	8.50	13	Passed
27	20	4980	3	8.30	13	Passed
Measurement uncertainty				+/- 2.71 dB		

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

10 – 12, 31, 32

5.5.3 Method of measurement (Emission Mask L - conducted)

The bandwidth was measured conducted at the antenna connector. For the test an RF-Switch and additional cables were used to connect the EUT to the spectrum analyser.

Acceptable measurement configurations

The following settings were used for the following measurements:

Emission mask frequency within 150 % of the authorized bandwidth

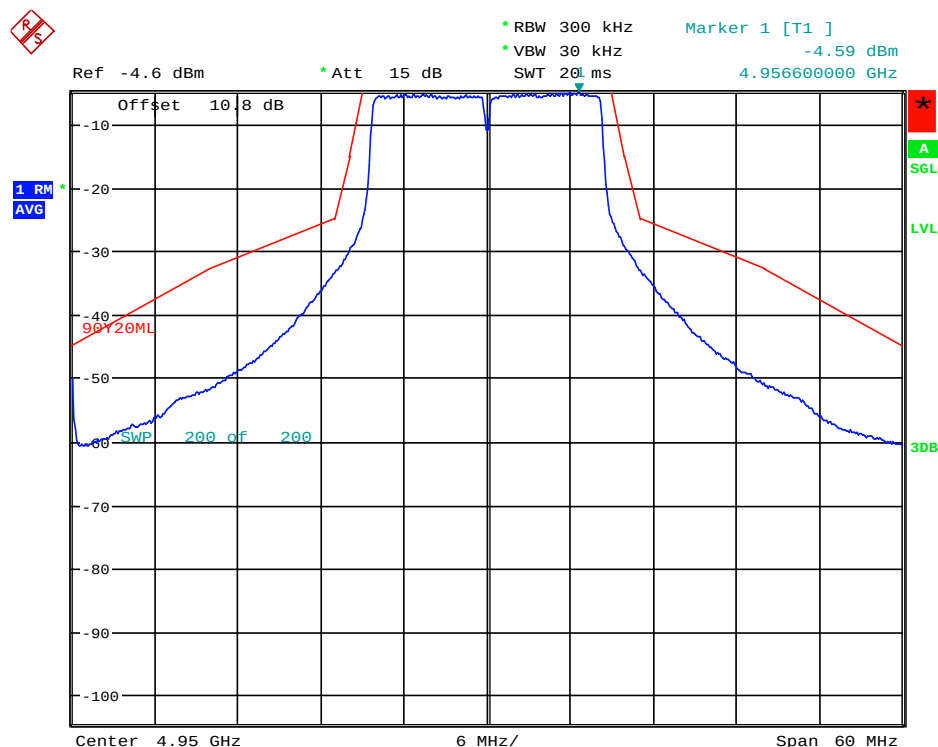
RBW (5 MHz signal): 200 kHz (at least 1 % of the occupied bandwidth)
 RBW (10 MHz signal): 200 kHz (at least 1 % of the occupied bandwidth)
 RBW (20 MHz signal): 300 kHz (at least 1 % of the occupied bandwidth)
 VBW: 30 kHz
 Detector: RMS
 Sweep type: Average
 Number of sweeps: 200

Emission mask f outside 150 % of the authorized bandwidth

RBW: 1 MHz (at least 1 % of the occupied bandwidth)
 VBW: 30 kHz
 Detector: RMS
 Sweep type: Average
 Number of sweeps: 20

5.5.4 Test result (Emission mask frequency within 150 % of the authorized bandwidth)

20M 2ANT 4950M MASKL: conducted mask L (operation mode 22):

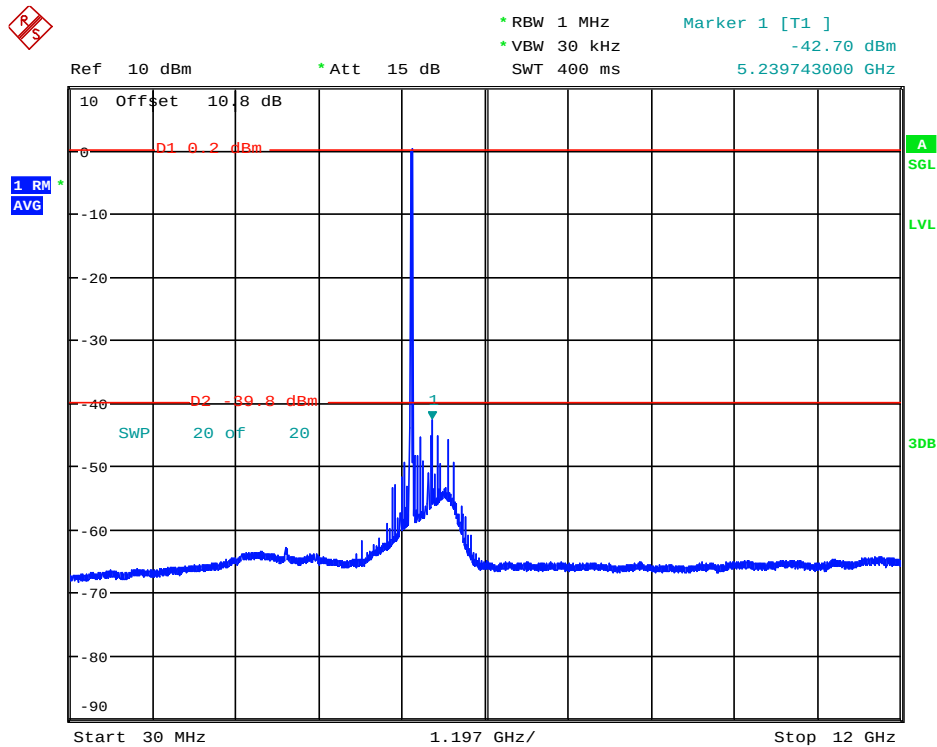


Only one exemplary plot of the qualitative worst case is shown above, because no quantitative worst case could be determined.

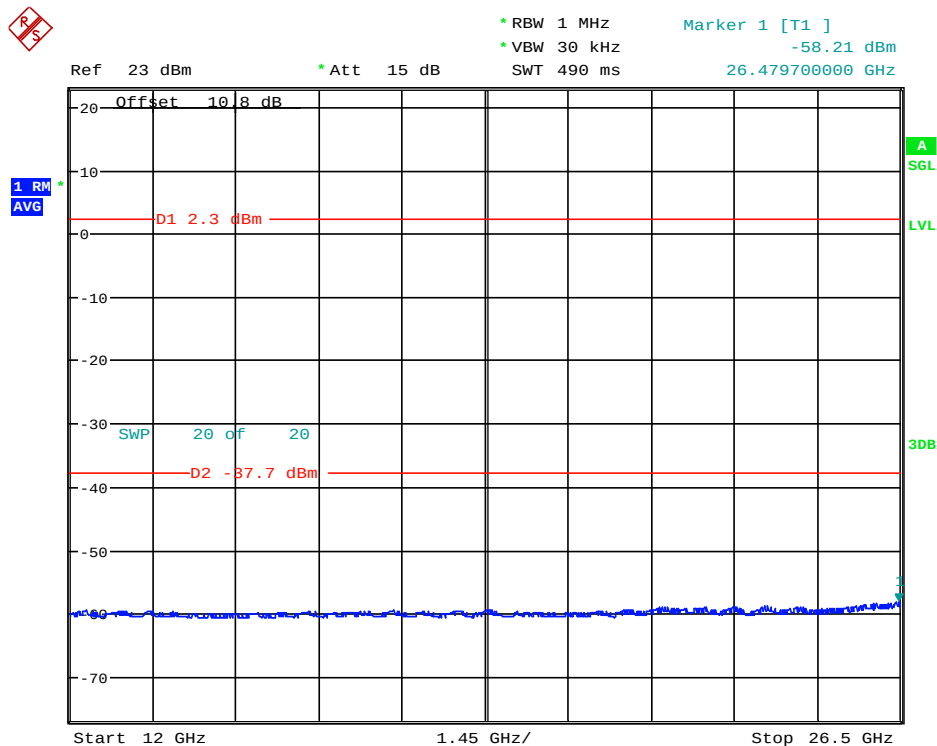
Operation Mode	Mode [MHz]	Frequency [MHz]	Antenna port	Result
1	5	4942.5	1	Passed
2	5	4967.5	1	Passed
3	5	4987.5	1	Passed
4	5	4942.5	2	Passed
5	5	4967.5	2	Passed
6	5	4987.5	2	Passed
7	5	4942.5	3	Passed
8	5	4967.5	3	Passed
9	5	4987.5	3	Passed
10	10	4945	1	Passed
11	10	4965	1	Passed
12	10	4985	1	Passed
13	10	4945	2	Passed
14	10	4965	2	Passed
15	10	4985	2	Passed
16	10	4945	3	Passed
17	10	4965	3	Passed
18	10	4985	3	Passed
19	20	4950	1	Passed
20	20	4965	1	Passed
21	20	4980	1	Passed
22	20	4950	2	Passed
23	20	4965	2	Passed
24	20	4980	2	Passed
25	20	4950	3	Passed
26	20	4965	3	Passed
27	20	4980	3	Passed
Measurement uncertainty			+/- 2.71 dB	

5.5.5 Test result (Emission mask frequency outside 150 % of the authorized bandwidth)

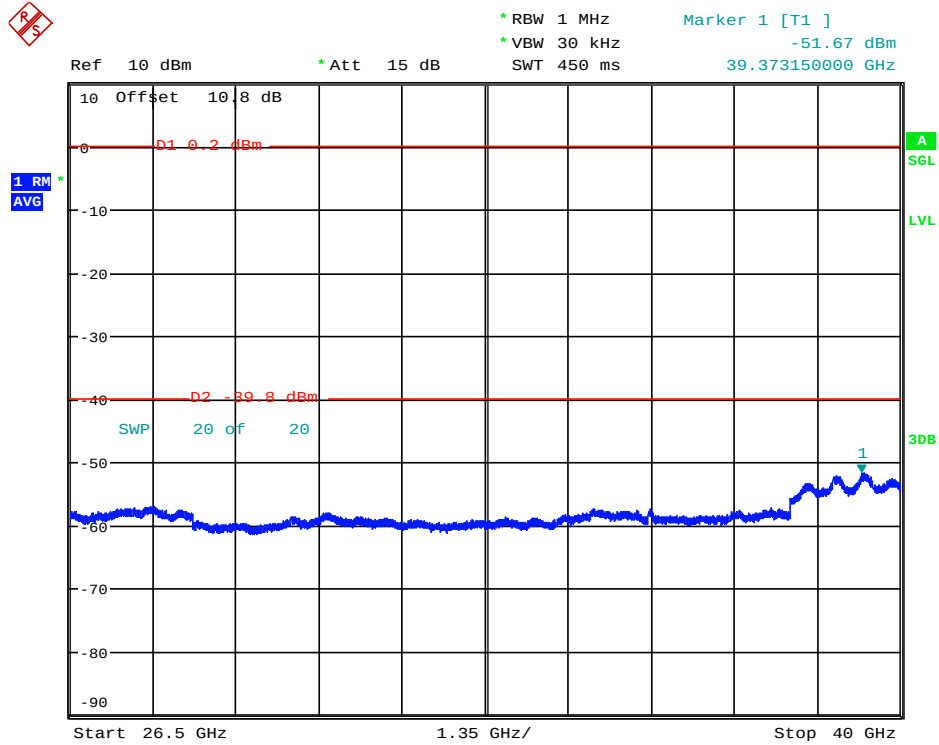
20M 2ANT 4950M SPUR30M-12: conducted Emission 30 MHz – 12 GHz (operation mode 22):



10M 3ANT 4945M SPUR12-26G: conducted Emission 12 - 18 GHz (operation mode 16):



20M 2ANT 4950M SPUR26-40: conducted Emission 26.5 - 40 GHz (operation mode 22):



Only one plot for each worst case frequency range is reported above.

Operation Mode	Mode [MHz]	Frequency [MHz]	Antenna port	Peak 30M – 12G [dBm]	Peak 12-26.5G [dBm]	Peak 26.5-40G [dBm]	Limit [dBm]	Result
1	5	4942.5	1	-48.8	-60.4	-51.6	-32.6	Passed
2	5	4967.5	1	-49.9	-60.5	-51.5	-33.0	Passed
3	5	4987.5	1	-51.1	-60.4	-58.0	-33.1	Passed
4	5	4942.5	2	-42.8	-60.3	-51.6	-37.4	Passed
5	5	4967.5	2	-44.5	-60.8	-51.7	-37.1	Passed
6	5	4987.5	2	-44.0	-60.8	-51.8	-37.0	Passed
7	5	4942.5	3	-50.9	-60.5	-51.6	-37.7	Passed
8	5	4967.5	3	-50.8	-60.5	-51.7	-37.4	Passed
9	5	4987.5	3	-52.6	-60.8	-51.6	-37.2	Passed
10	10	4945	1	-49.2	-58.1	-50.9	-33.8	Passed
11	10	4965	1	-50.6	-58.2	-51.0	-34.4	Passed
12	10	4985	1	-50.6	-58.2	-51.0	-34.5	Passed
13	10	4945	2	-46.1	-58.2	-51.1	-36.4	Passed
14	10	4965	2	-45.6	-58.2	-51.1	-36.6	Passed
15	10	4985	2	-44.6	-58.1	-51.0	-36.5	Passed
16	10	4945	3	-50.5	-58.2	-51.0	-37.7	Passed
17	10	4965	3	-51.0	-58.2	-50.8	-36.6	Passed
18	10	4985	3	-51.1	-58.2	-51.0	-37.5	Passed
19	20	4950	1	-52.0	-60.8	-51.5	-38.5	Passed
20	20	4965	1	-52.8	-60.8	-51.7	-38.5	Passed
21	20	4980	1	-53.8	-60.9	-51.6	-38.8	Passed
22	20	4950	2	-42.7	-60.8	-51.7	-39.8	Passed
23	20	4965	2	-43.6	-60.6	-51.7	-39.3	Passed
24	20	4980	2	-43.5	-60.9	-51.7	-39.7	Passed
25	20	4950	3	-50.3	-60.9	-51.8	-37.8	Passed
26	20	4965	3	-49.5	-60.9	-51.7	-37.8	Passed
27	20	4980	3	-48.6	-60.9	-51.7	-37.9	Passed
Measurement uncertainty					+/- 2.71 dB			

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:

9, 11, 12, 31, 32

5.6 Maximum unwanted emissions

5.6.1 Method of measurement (radiated emissions)

The radiated emission measurement is subdivided into five stages.

- A preliminary measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range 30 MHz to 230 MHz and 230 MHz to 1 GHz.
- A final measurement carried out on an open area test site with reflecting ground plane and various antenna height in the frequency range 30 MHz to 230 MHz and 230 MHz to 1 GHz.
- A preliminary measurement carried out in a fully anechoic chamber with a variable antenna distance and height in the frequency range above 1 GHz.
- A final measurement carried out in a fully anechoic chamber with a fixed antenna height in the frequency range above 1 GHz.

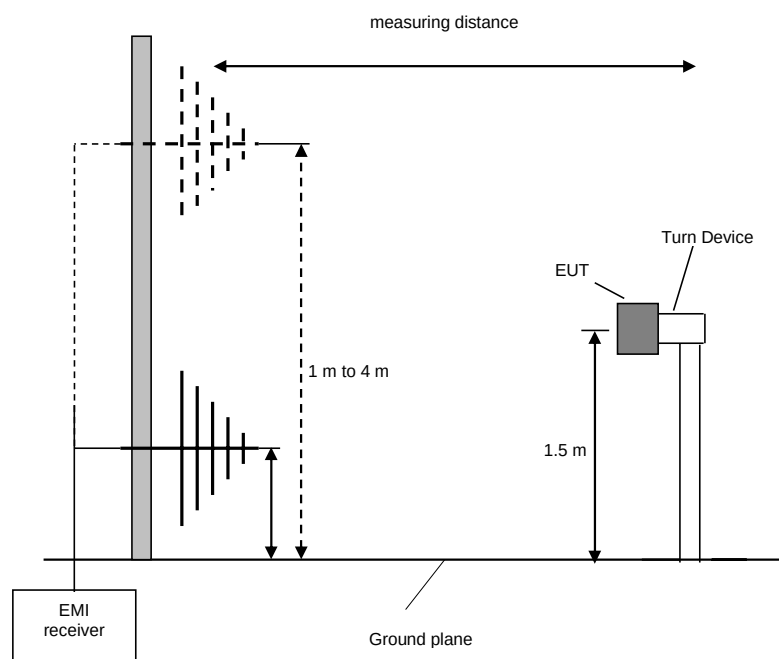
Preliminary and final measurement (30 MHz to 1 GHz)

In the first stage a preliminary measurement will be performed in a semi anechoic chamber with a measuring distance of 3 meter. Table top devices will set up on a non-conducting turn device on the height of 1.5m. Floor-standing devices will be placed directly on the turntable/ground plane. The set-up of the Equipment under test will be in accordance to [1].

The frequency range 30 MHz to 230 MHz and 230 MHz to 1 GHz will be measured with an EMI Receiver set to Average detector mode and a resolution bandwidth of 1 MHz and a video bandwidth of 30 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °. This measurement is repeated. The measurement antenna will be positioned from 1 to 4 m in 0.5 m steps. The position for each antenna position, turntable position and antenna polarization for each measurement point will be stored in the measurement software.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
30 MHz to 200 MHz	1 MHz
200 MHz to 1 GHz	1 MHz



For the final measurement the highest emissions, closest to the limit line will be selected for the final measurement. For each emission a continuous partial scan for 1 m antenna height and 50° azimuth at the turntable will be performed, to determine the worst case. The final measurement will be performed in the position and the azimuth of the determined position with an Average detector.

The correction factor for the measurement values was determined using the substitution method described in 5.5.3 of [1].

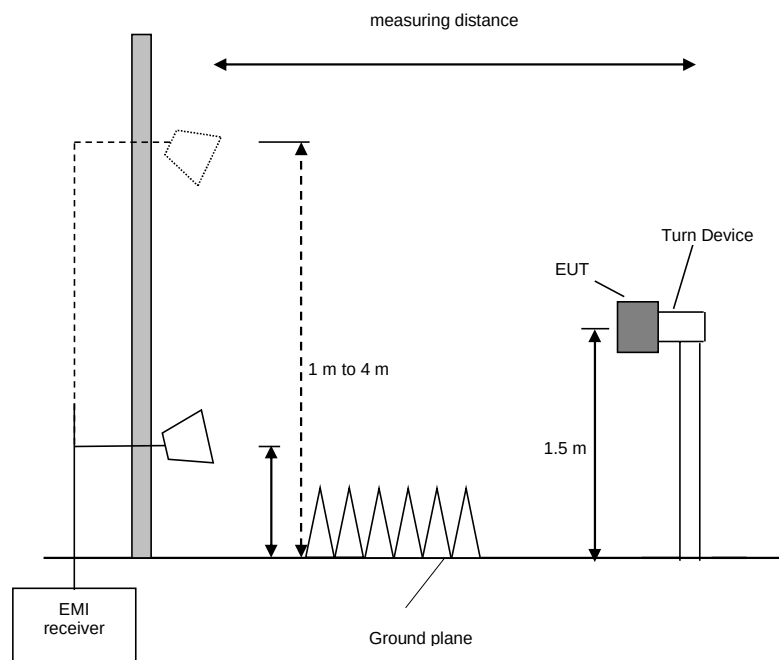
Preliminary and final measurement (1 MHz to 40 GHz)

In the first stage a preliminary measurement will be performed in a semi anechoic chamber with ground absorbers and a measuring distance of 3 meter. Table top devices will set up on a non-conducting turn device on the height of 1.5m. Floor-standing devices will be placed directly on the turntable/ground plane. The set-up of the Equipment under test will be in accordance to [1].

The frequency range from 1 - 40 GHz will be measured with an EMI Receiver set to Average detector mode and a resolution bandwidth of 1 MHz and a video bandwidth of 30 kHz. The measurement will be performed in horizontal and vertical polarisation of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 ° to 360 °. This measurement is repeated The measurement antenna will be positioned from 1 to 4 m in 0.5 m steps, whereby the measurement antenna is tilted towards the EUT. The position for each antenna position, turntable position and antenna polarization for each measurement point will be stored in the measurement software.

The resolution bandwidth of the EMI Receiver will be set to the following values:

Frequency range	Resolution bandwidth
1 – 12 GHz	1 MHz
12 – 18 GHz	1 MHz
18 – 26.5 GHz	1 MHz
26.5 – 40 GHz	1 MHz



For the final measurement the highest emissions, closest to the limit line will be selected for the final measurement. For each emission a continuous partial scan for 1 m antenna height and 50° azimuth at the turntable will be performed, to determine the worst case.
The final measurement will be performed in the position and the azimuth of the determined position with an Average detector.

The correction factor for the measurement values was determined using the substitution method described in 5.5.3 of [1].

5.6.2 Test results (radiated emissions) – Emissions from 30 MHz – 26.5 GHz

5.6.2.1 Preliminary radiated emission measurement 30 MHz – 26.5 GHz

Ambient temperature	22 °C	Relative humidity	59 %
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Position of EUT: The EUT was set-up on an EUT turn device of a height of 1.5 m. The distance between EUT and antenna was 3 m.

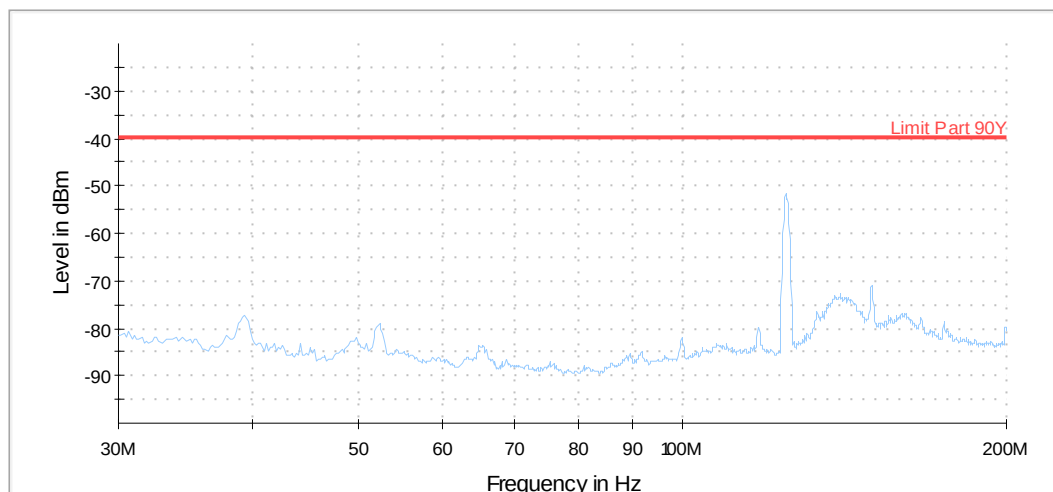
Cable guide: For detail information of test set-up and the cable guide refer to the pictures in the annex A in the test report.

Test record: Only the worst case test modes from the conducted measurements were tested as radiated. The plots below only show the worst cases of the radiated measurement results.

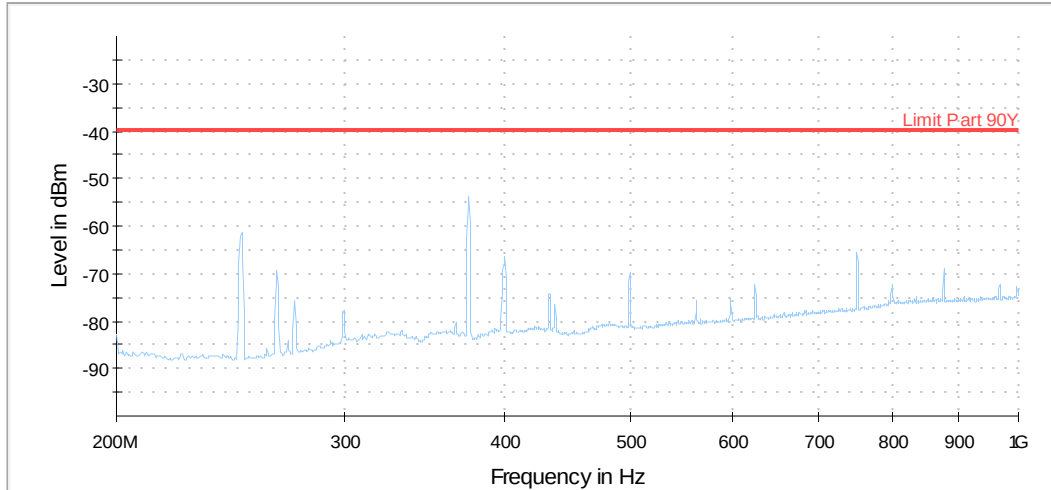
Remark: Measurement performed with terminated antenna ports

Plots of the worst case transmitter spurious emissions

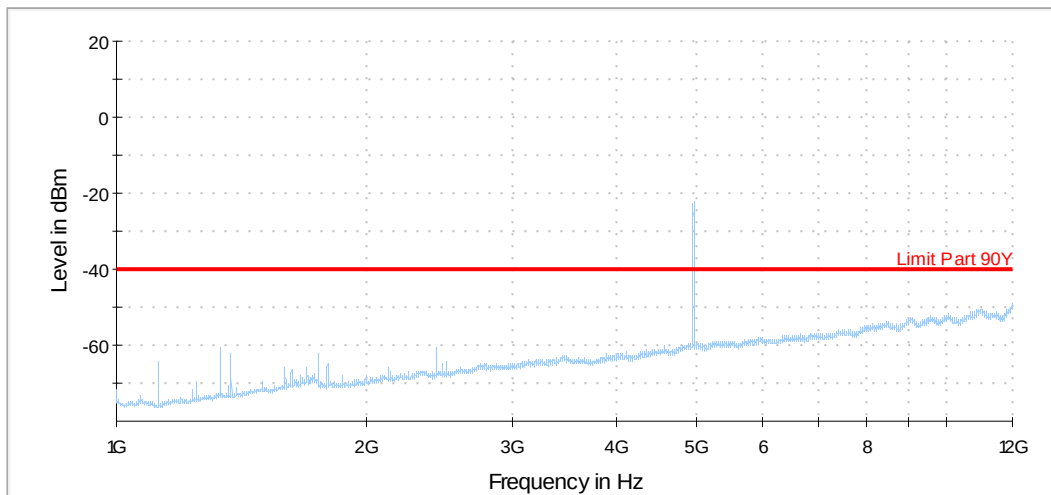
Spurious emissions from 30 MHz to 200 MHz (operation mode 22):



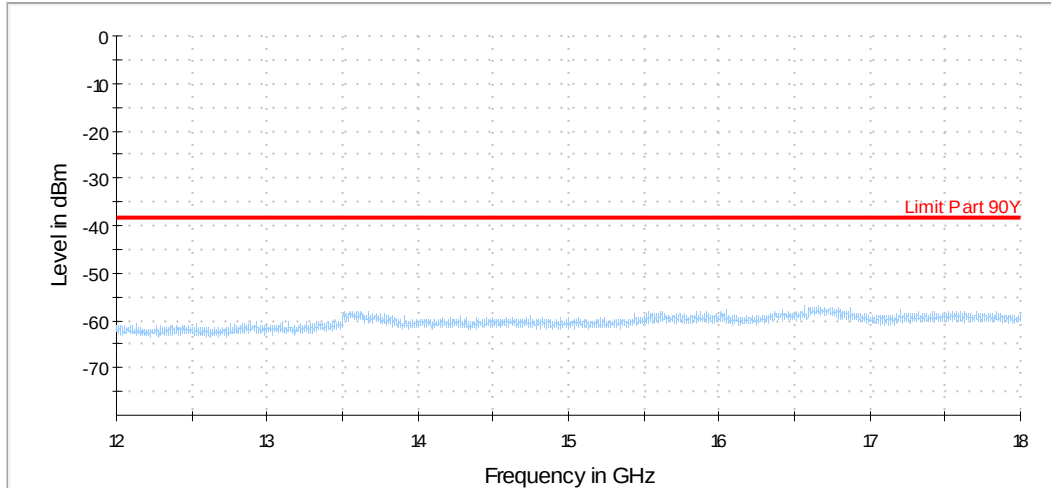
Spurious emissions from 200 MHz – 1 GHz (operation mode 22):



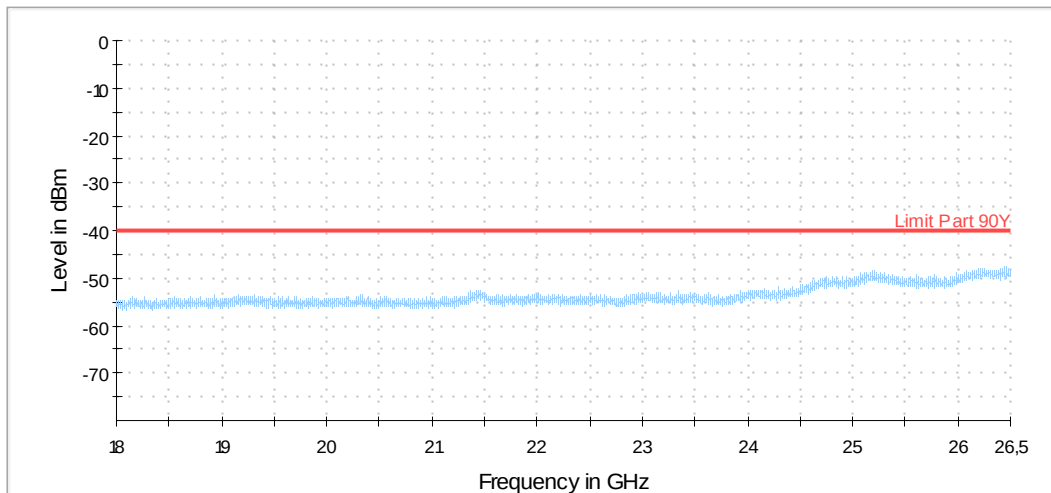
Spurious emissions from 1 GHz to 12 GHz (operation mode 22):



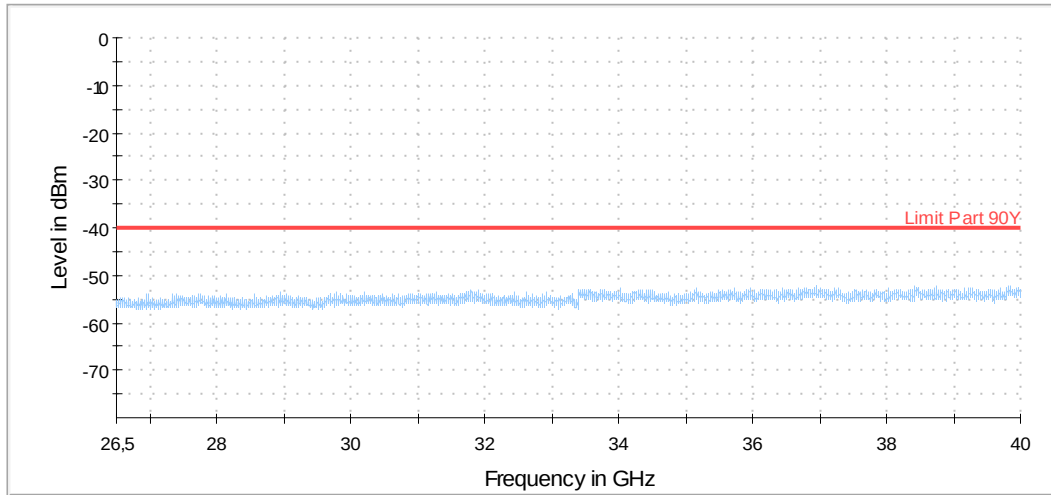
Spurious emissions from 12 GHz to 18 GHz (operation mode 19):



Spurious emissions from 18 GHz to 26.5 GHz (operation mode 22):



Spurious emissions from 26.5 – 40 GHz (operation mode 22):



5.6.2.2 Final radiated measurements

Transmitter operates at the lower end of the assigned frequency band with 1 antenna (operation mode 19)

Frequency [MHz]	Coverage [dBm]	Limit [dBm]	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
39.180	-77.7	-38.5	39.2	100	V	263	-88.3
52.100	-78.4	-38.5	39.9	100	V	94	-86.7
100.040	-82.1	-38.5	43.6	100	V	349	-85.1
117.720	-79.4	-38.5	40.9	100	V	145	-85.4
124.860	-52.2	-38.5	13.7	100	V	8	-85.0
140.500	-72.4	-38.5	33.9	100	V	328	-83.5
150.190	-70.6	-38.5	32.1	100	V	6	-82.7
166.850	-77.2	-38.5	38.7	100	V	330	-82.0
250.000	-61.8	-38.5	23.3	100	H	11	-86.6
266.500	-68.7	-38.5	30.2	100	H	0	-85.8
375.000	-54.2	-38.5	15.7	100	H	3	-83.7
400.000	-66.2	-38.5	27.7	100	H	170	-82.9
500.000	-70.0	-38.5	31.5	200	H	137	-82.0
750.000	-65.5	-38.5	27.0	100	V	24	-75.6
875.000	-69.9	-38.5	31.4	100	V	254	-74.0
1124.882	-64.7	-38.5	26.2	150	H	179	-106.1
1333.235	-61.6	-38.5	23.1	200	H	231	-103.2
1374.647	-60.6	-38.5	22.1	200	H	141	-103.0
1749.618	-62.1	-38.5	23.6	100	V	182	-100.0
2433.235	-60.3	-38.5	21.8	300	V	340	-96.2
4954.176	-26.6	Fund.	-	150	V	230	-85.7
15440.000	-58.5	-38.5	20.0	200	H	288	-81.4
16570.000	-56.8	-38.5	18.3	250	V	211	-80.7
24600.250	-50.3	-38.5	11.8	100	V	255	-76.2
25158.889	-48.3	-38.5	9.8	300	H	316	-75.2
25337.389	-48.5	-38.5	10.0	300	V	57	-75
26440.028	-47.6	-38.5	9.1	100	H	345	-72.7
27756.464	-53.8	-38.5	15.3	200	H	52	-74.4
29805.089	-53.9	-38.5	15.4	250	H	84	-74.6
31208.607	-53.5	-38.5	15.0	100	H	161	-74.4
31809.357	-53.0	-38.5	14.5	300	H	119	-74
33541.214	-52.3	-38.5	13.8	400	H	181	-73.1
36801.946	-52.4	-38.5	13.9	150	H	6	-72.1
37273.482	-51.9	-38.5	13.4	150	V	138	-72.2
38461.000	-52.1	-38.5	13.6	300	H	161	-72.5
Measurement uncertainty				+ / - 4.8 dB			

Transmitter operates at the lower end of the assigned frequency band with 2 antennas (operation mode 22)

Frequency [MHz]	Coverage [dBm]	Limit [dBm]	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
39.350	-77.5	-39.8	37.7	100	V	23	-88.3
124.860	-51.6	-39.8	11.8	100	V	330	-85.0
150.020	-71.1	-39.8	31.3	100	V	6	-82.7
250.000	-61.3	-39.8	21.5	100	H	356	-86.6
375.000	-53.7	-39.8	13.9	100	H	6	-83.7
400.000	-66.3	-39.8	26.5	100	H	6	-82.9
500.000	-69.6	-39.8	29.8	200	H	136	-82.0
750.000	-65.4	-39.8	25.6	100	H	208	-78.0
875.000	-69.0	-39.8	29.2	100	V	264	-74.0
1333.235	-60.8	-39.8	21.0	250	H	239	-103.2
1749.941	-62.0	-39.8	22.2	100	V	188	-100.0
2433.235	-60.8	-39.8	21.0	300	V	332	-96.2
4945.765	-22.4	Fund.	-	100	V	227	-85.9
4954.824	-22.3	Fund.	-	100	V	227	-85.7
18701.250	-53.9	-39.8	14.1	300	V	6	-77.1
19156.472	-53.6	-39.8	13.8	100	V	151	-77.2
20323.333	-53.5	-39.8	13.7	350	H	212	-77.7
21419.361	-52.6	-39.8	12.8	150	H	102	-77.8
23345.083	-52.6	-39.8	12.8	100	V	304	-77.2
24504.389	-51.5	-39.8	11.7	200	V	273	-76.5
25204.222	-48.4	-39.8	8.6	150	H	10	-75.1
26440.028	-47.7	-39.8	7.9	400	V	118	-72.6
26971.536	-53.8	-39.8	14.0	100	H	330	-75.2
27768.518	-53.9	-39.8	14.1	300	H	13	-74.3
29798.821	-53.5	-39.8	13.7	400	H	96	-74.6
30204.786	-53.5	-39.8	13.7	350	H	190	-74.4
31801.161	-53.3	-39.8	13.5	200	V	275	-74.1
33517.107	-52.9	-39.8	13.1	250	H	295	-73.2
35148.196	-52.7	-39.8	12.9	400	V	253	-72.1
35721.946	-52.5	-39.8	12.7	350	V	160	-72.1
36963.464	-52.2	-39.8	12.4	400	H	182	-72.0
39816.786	-52.0	-39.8	12.2	250	H	40	-72.9
Measurement uncertainty				+ / - 4.8 dB			

Transmitter operates at the lower end of the assigned frequency band with 3 antennas (operation mode 25)

Frequency [MHz]	Coverage [dBm]	Limit [dBm]	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
39.010	-78.4	-37.8	40.6	100	V	175	-88.2
52.440	-79.3	-37.8	41.5	250	V	6	-86.6
91.540	-84.0	-37.8	46.2	150	V	63	-86.0
100.040	-82.0	-37.8	44.2	100	V	47	-85.1
124.860	-52.2	-37.8	14.4	100	V	319	-85.0
149.850	-70.6	-37.8	32.8	100	V	9	-82.8
166.510	-77.5	-37.8	39.7	100	V	358	-82.0
250.000	-61.4	-37.8	23.6	100	H	6	-86.6
375.000	-53.9	-37.8	16.1	100	H	6	-83.7
400.000	-66.7	-37.8	28.9	100	H	357	-82.9
500.000	-70.0	-37.8	32.2	200	H	137	-82.0
750.000	-65.6	-37.8	27.8	100	H	205	-78.0
875.000	-69.3	-37.8	31.5	100	V	255	-74.0
1333.235	-61.6	-37.8	23.8	250	H	234	-103.2
1374.971	-61.6	-37.8	23.8	250	H	135	-103.0
2433.235	-60.0	-37.8	22.2	300	V	339	-96.2
4959.029	-21.8	Fund.	-	100	V	344	-85.5
4969.706	-21.9	Fund.	-	100	V	318	-86.2
16616.000	-56.3	-37.8	18.5	350	V	118	-80.8
18158.667	-53.6	-37.8	15.8	200	V	6	-77.3
19095.083	-53.4	-37.8	15.6	350	V	316	-77.1
21457.139	-52.4	-37.8	14.6	350	H	42	-77.7
23019.722	-52.5	-37.8	14.7	350	V	6	-77.4
24441.583	-51.5	-37.8	13.7	350	V	299	-76.4
25229.250	-48.4	-37.8	10.6	300	H	316	-75.1
26439.556	-47.5	-37.8	9.7	200	H	206	-72.7
27290.714	-53.5	-37.8	15.7	400	H	6	-75.1
29221.214	-53.6	-37.8	15.8	100	H	288	-74.6
31220.179	-53.5	-37.8	15.7	400	H	6	-74.5
31769.339	-53.1	-37.8	15.3	400	H	118	-74.0
33578.821	-52.6	-37.8	14.8	100	V	137	-73.1
36709.375	-52.3	-37.8	14.5	200	H	244	-72.1
36936.464	-52.4	-37.8	14.6	100	V	6	-72.1
39838.964	-51.9	-37.8	14.1	250	V	97	-73.0
Measurement uncertainty				+ / - 4.8 dB			

TEST EQUIPMENT USED FOR THE TEST:

11 - 28

5.7 Frequency stability

5.7.1 Method of measurement

The EUT was measured conducted at the antenna connector. The EUT was placed inside a temperature chamber

Acceptable measurement configurations

The measurement for the frequency stability procedure refers to part 5.6 of document [1].

5.7.2 Test result

Ambient temperature	22 °C	Relative humidity	59 %
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Operation mode: worst case 5 MHz, EUT modulated with 1.5 Mbps

Temperature	Lower Frequency [MHz]	Lower Limit [MHz]	Upper Frequency [MHz]	Upper Limit [MHz]	Result
70°C	4940.220	4940.000	4989.720	4990.000	Passed
60°C	4940.270	4940.000	4989.660	4990.000	Passed
50°C	4940.270	4940.000	4989.670	4990.000	Passed
40°C	4940.300	4940.000	4989.680	4990.000	Passed
30°C	4940.300	4940.000	4989.700	4990.000	Passed
20°C	4940.310	4940.000	4989.720	4990.000	Passed
10°C	4940.330	4940.000	4989.740	4990.000	Passed
0°C	4940.350	4940.000	4989.750	4990.000	Passed
-10°C	4940.340	4940.000	4989.760	4990.000	Passed
-20°C	4940.350	4940.000	4989.750	4990.000	Passed
-30°C	4940.320	4940.000	4989.750	4990.000	Passed
-40°C	4940.290	4940.000	4989.700	4990.000	Passed
Measurement uncertainty			4.54*10 ⁻⁸ at 40 GHz		

TEST EQUIPMENT USED FOR THE TEST:

9, 11, 12, 31, 32, 33

5.8 Conducted emissions on power supply lines (150 kHz to 30 MHz)

Ambient temperature	20 °C	Relative humidity	52 %
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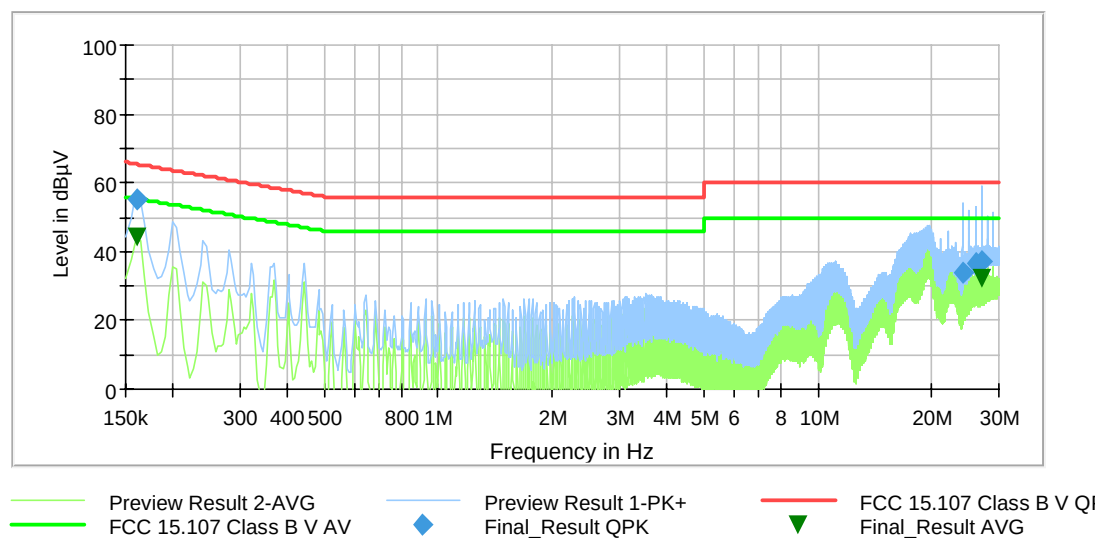
Position of EUT: For this test, the EUT was operated in test mode with 3 active antennas and with 6 Mbps data rate.

Cable guide: For detail information of test set-up and the cable guide refer to the pictures in annex A of this test report.

Test record: All results are shown in the following.

Supply voltage: Measurement performed with US 120V/60Hz.
For the test an AC/DC Adaptor from Phoenix Contact Model MINI-PS-100-240AC/24DC/2 was used, which had an output voltage of 24.0 V DC.

The curves in the diagram only represent for each frequency point the maximum measured value of all preliminary measurements which were made for each power supply line. The top measured curve represents the peak measurement and the bottom measured curve the average measurement. The quasi-peak measured points are marked by "◆" and the average measured points by "▼".



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Transducer (dB)
0.160800	55.22	---	65.42	10.21	5000.0	9.000	N	FLO	9.8
0.160800	---	44.11	55.42	11.31	5000.0	9.000	N	GND	9.8
24.048600	34.12	---	60.00	25.88	5000.0	9.000	L1	FLO	11.0
26.058300	36.59	---	60.00	23.41	5000.0	9.000	N	GND	11.2
27.026700	---	32.12	50.00	17.88	5000.0	9.000	L1	GND	11.1
27.064500	36.91	---	60.00	23.09	5000.0	9.000	N	GND	11.2
Measurement uncertainty				+2.76 dB / -2.76 dB					

Test: Passed

TEST EQUIPMENT USED FOR THE TEST:
1 – 7, 11, 12

6 Test equipment and ancillaries used for tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal. Due
1	Shielded chamber M4	-	Albatross Projects	B83117-C6439-T262	480662	Calibration not necessary	
2	EMI Receiver	ESIB 26	Rohde & Schwarz	1088.7490	481182	12.02.2020	02.2022
3	LISN	NSLK8128	Schwarzbeck	8128155	480058	11.02.2020	02.2022
4	High pass filter	HR 0.13-5ENN	FSY Microwave	DC 0109 SN 002	480340	Calibration not necessary	
5	EMI Software	ES-K1	Rohde & Schwarz	-	480111	Calibration not necessary	
6	AC power supply	AC6803A AC Quelle 2000VA	Keysight	JPVJ002509	482350	Calibration not necessary	
7	EMI Software	EMC32	Rohde & Schwarz	100061	481022	Calibration not necessary	
8	HF-Cable	Sucoflex 104	Huber+Suhner	517406	482391	Calibration not necessary	
9	Spectrum Analyser	FSU46	Rohde & Schwarz	200125	480956	27.03.2019	03.2021
10	Spectrum Analyser	FSW	Rohde & Schwarz	200125		04.03.2020	03.2020
11	Power Supply	TOE8752-32 (DC)	Toellner Electronic Inst.	31566	480010	Calibration not necessary	
12	Multimeter	971A	Hewlett Packard	JP39009358	480721	22.01.2020	02.2022
13	Semi anechoic chamber	M276	Albatross Projects	C62128-A540-A138-10-0006	483227	Calibration not necessary	
14	Antenna mast	BAM4.5-P-10kg	maturio	222/2612.01	483225	Calibration not necessary	
15	Turntable		Deisel	412/316	480087	Calibration not necessary	
16	Controller	HD100	Deisel	100/349	480139	Calibration not necessary	
17	Software	EMC32	Rohde & Schwarz	ID: 1300.7010.12-100970-Be	482972	Calibration not necessary	
18	EMI Testreceiver	ESW	Rohde & Schwarz	101828	482979	12.04.2019	04.2021
19	Bikon Antenna	VHA 9103B + VHBB 9124	Schwarzbeck	768	483278	Calibration not necessary	
20	Log Per Antenna	VUSLP 9111B	Schwarzbeck	464	483279	Calibration not necessary	
21	Log Per Antenna	HL050	Rohde & Schwarz	4062.4063.02-100908	482977	13.08.2019	08.2022
22	Low Noise Amplifier 100 MHz - 18 GHz	LNA-30-00101800-25-10P	Narda-Miteq	2110917	482967	18.02.2020	02.2022
23	Standard Gain Horn 12 GHz - 18 GHz	18240-20	Pro Nova	269813	483215	Calibration not necessary	
24	Low Noise Amplifier 12 GHz - 18 GHz	LNA-30-12001800-13-10P	Narda-Miteq	2089798	482968	17.02.2020	02.2022
25	Standard Gain Horn, 18 GHz - 26 GHz	20240-20	Flann	266399	483026	Calibration not necessary	
26	Low Noise Amplifier 18 GHz - 26.5 GHz	LNA-30-18002650-20-10P	Narda-Miteq	2110911	492969	17.02.2020	02.2022
27	Standard Gain Horn, 26 GHz - 40 GHz	22240-20	Flann	266405	483027	Calibration not necessary	
28	Low Noise Amplifier 26 MHz - 40 GHz	LNA-30-26004000-27-10P	Narda-Miteq	2110293	482970	17.02.2020	02.2022
29	Power Meter	NRVD	Rohde & Schwarz	833697/030	480589	Calibration not necessary	
30	Thermal power probe	NRV-Z51	Rohde & Schwarz	825948/004	480247	12.02.2020	02.2022
31	RF-Switch	87104D	Agilent	ATO-66369 MY52310550	482935	Calibration not necessary	

32	RF cable	-	Insulated Wire	KPS-1533-400-KPS	480300	Calibration not necessary	
33	temperature chamber	9120-0021	WTB Binder Labortechnik	05-79022	480462	07.05.2019	05.2020

7 Test site Validation

Test equipment	PM. No.	Frequency range	Type of validation	According to	Val. Date	Val Due
Semi anechoic chamber M276	483227	30 – 1000 MHz	NSA	ANSI C63.4-2017	19.09.2019	18.09.2021
Semi anechoic chamber M276	483227	1 -18 GHz	SVSWR ^{*1}	CISPR 16-1-4 + Cor1:2010 + A1:2012 +A2:2017	19.09.2019	18.09.2021
Shielded chamber M4	480088	9 kHz – 30 MHz	GND-Plane	ANSI C63.4-2014	06.11.2018	05.11.2020

8 Report History

Report Number	Date	Comment
F191416E1	28.05.2020	Initial Test Report

9 List of Annexes

ANNEX A	TEST SETUP PHOTOS	11 pages
ANNEX B	EXTERNAL PHOTOS	2 pages
ANNEX C	INTERNAL PHOTOS	1 page