

FCC-ID: LYHMPCIE1V1

EMI - TEST REPORT

- FCC Part 15.407 and RSS210 -



Test Report No. :	T35222-06-01HS	11 May 2012 Date of issue
--------------------------	-----------------------	------------------------------

Type / Model Name : WLAN n-module MPCIE-R1-ABGN-U3

Product Description : Module for industrial WLAN applications 2.4 / 5 GHz

Applicant : Siemens AG, Industrial Automation Division

Address : Gleiwitzer Strasse 555

90475 NUERNBERG, GERMANY

Manufacturer : Siemens AG, Sensors & Communication

Address : Oestliche Rheinbrueckenstrasse 50

76187 KARLSRUHE, GERMANY

Licence holder : Siemens AG, Industrial Automation Division

Address : Gleiwitzer Strasse 555

90475 NUERNBERG, GERMANY

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
--	-----------------



The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test results
without the written permission of the test laboratory.

FCC-ID: LYHMPCIE1V1

Contents

1	<u>TEST STANDARDS</u>	3
2	<u>SUMMARY</u>	4
2.1	Test result summary	4
2.2	GENERAL REMARKS:	5
3	<u>EQUIPMENT UNDER TEST</u>	10
3.1	Photo documentation of the EUT	10
3.2	Power supply system utilised	12
3.3	Short description of the equipment under test (EUT)	12
4	<u>TEST ENVIRONMENT</u>	13
4.1	Address of the test laboratory	13
4.2	Environmental conditions	13
4.3	Statement of the measurement uncertainty	13
4.4	Measurement protocol for FCC and IC	13
4.5	Determination of worst case measurement conditions	14
5	<u>TEST CONDITIONS AND RESULTS</u>	15
5.1	Conducted emissions	15
5.2	Duty cycle	16
5.3	26 dB emission bandwidth and 99% OBW	18
5.4	Maximum conducted output power	26
5.5	Peak power spectral density	30
5.6	Peak excursion	36
5.7	Spurious emissions conducted	42
5.8	Spurious emissions conducted, in restricted bands	57
5.9	Spurious emissions radiated (cabinet radiation)	72
5.10	Frequency stability	83
5.11	Maximum permissible exposure (MPE)	85
5.12	Co-location and Co-transmission	88
5.13	Antenna application	89
6	<u>USED TEST EQUIPMENT AND ACCESSORIES</u>	90

FCC-ID: LYHMPCIE1V1

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September, 2011)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (September, 2011)

Part 15, Subpart C, Section 15.203	antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.212	Modular transmitters

FCC Rules and Regulations Part 15, Subpart E – Unlicensed National Information Infrastructure Devices (September, 2011)

Part 15, Subpart E, Section 15.407	Operation within the bands 5.15 - 5.25 GHz, 5.25 - 5.35 GHz, 5.47 - 5.725 GHz and 5.725 - 5.825 GHz
------------------------------------	---

FCC Rules and Regulations Part 1, Subpart I - Procedures Implementing the National Environmental Policy Act of 1969

Part 1, Subpart I, Section 1.1310	Radiofrequency radiation exposure limits
Part 1, Subpart 2, Section 2.1093	Radiofrequency radiation exposure evaluation: portable device

OET Bulletin 65, 65A, 65B, 65C Edition 97-01, August 1997 – Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

ANSI C63.4: 2009	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C63.10: 2009	Testing Unlicensed Wireless Devices
ANSI C95.1: 2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2003	Uncertainty in EMC measurement
CISPR 22: 2005	Information technology equipment
EN 55022: 2006	
OET 789033 D01, 25-10-2011	Guidelines for Compliance Testing of UNII Devices – Part 15, E

2 SUMMARY

2.1 Test result summary

WLAN devices using digital modulation:

Operating in the 5150 MHz - 5250 MHz:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS Gen, 7.2.4.	Conducted limits	not applicable
15.407(a)		EBW 26 dB	passed
15.407(a)	RSS210, A9.2	Conducted output power and PSD	passed
15.407(a)(6)		Peak excursion	passed
15.407(b)	RSS210, A9.2	Undesirable emissions	passed
15.205(a)	RSS-Gen, 7.2.2	Emissions in restricted bands	passed
15.407(g)	RSS-Gen, 7.2.6	Frequency stability	passed
15.407(f)	RSS210, A9.2	Maximum permissible exposure (MPE)	passed
15.407(h)(1)	RSS210, A9.2	TPC	not applicable
15.407(a)	RSS210, A9.2	antenna requirement	passed
OET Bulletin 65	RSS102, 3.2	Co-location, Co-transmission	passed
	RSS210, A9.2	OBW 99%	passed

The mentioned RSS Rule Parts in the above table are related to:

RSS Gen, Issue 3, December 2010

RSS 210, Issue 8, December 2010

RSS 102, Issue 4, March 2010

FCC-ID: LYHMPCIE1V1

2.2 GENERAL REMARKS:

The EUT is a WLAN module. The intent of this Test Report is a modular approval according to FCC 15.212(a). The EUT may be access point or client. The WLAN module is compatible with 802.11a, h and 802.11n standard. It supports the 5 GHz frequency bands. The EUT has radar detection and manually TPC. It supports MIMO at 3 antenna ports which is 2*3T3R. The firmware does not support the ad-hoc modes. The EUT use the MIMO function with multiple antennas without beam forming. The EUT have to be professionally installed to ensure the right power setting in combination with one of the listed antennas.

Test Jig

The used test jig provides the necessary power supply and control signals to operate the WLAN module for testing. The test jig is DC power supplied with the view to the industrial application in future. The test ports are connected via UFL-RSMA-Pigtail which will be used in the end application. The photos of the test jig are made without heat sink for a better view on the devices, for operating the EUT the test jig is embedded in a heat sink.

Channel plan:

HT20 mode and Legacy mode:

Channel	Frequency
36	5180
40	5200
44	5220
48	5240

HT40 mode:

Channel	Frequency
36up	5190
44up	5230

Transmit operating modes

It supports MIMO at 3 antenna ports which is 3T3R. The firmware does not support the ad-hoc modes. The EUT use the MIMO function with multiple antennas without beam forming.

Both modules use OFDM modulation and may provide following data rates:

- 802.11n	HT20	MCS 0 - 23	(MCS = modulation coding sequence)
- 802.11n	HT40	MCS 0 - 23	
- 802.11a/h	Legacy mode	54, 48, 36, 24, 18, 12, 9, 6 Mbps	(Mbps = megabits per second)

FCC-ID: LYHMPCIE1V1

HT20:

MCS parameters for mandatory 20 MHz, NSS = 1, NES = 1

MCS Index	Modulation	R	$N_{BPSCS(i_{SS})}$	N_{SD}	N_{SP}	N_{CBPS}	N_{DBPS}	Data rate (Mb/s)	
								800 ns GI	400 ns GI (see NOTE)
0	BPSK	1/2	1	52	4	52	26	6.5	7.2
1	QPSK	1/2	2	52	4	104	52	13.0	14.4
2	QPSK	3/4	2	52	4	104	78	19.5	21.7
3	16-QAM	1/2	4	52	4	208	104	26.0	28.9
4	16-QAM	3/4	4	52	4	208	156	39.0	43.3
5	64-QAM	2/3	6	52	4	312	208	52.0	57.8
6	64-QAM	3/4	6	52	4	312	234	58.5	65.0
7	64-QAM	5/6	6	52	4	312	260	65.0	72.2

NOTE—Support of 400 ns GI is optional on transmit and receive.

MCS parameters for optional 20 MHz, NSS = 2, NES = 1, EQM

MCS Index	Modulation	R	$N_{BPSCS(i_{SS})}$	N_{SD}	N_{SP}	N_{CBPS}	N_{DBPS}	Data rate (Mb/s)	
								800 ns GI	400 ns GI (see NOTE)
8	BPSK	1/2	1	52	4	104	52	13.0	14.4
9	QPSK	1/2	2	52	4	208	104	26.0	28.9
10	QPSK	3/4	2	52	4	208	156	39.0	43.3
11	16-QAM	1/2	4	52	4	416	208	52.0	57.8
12	16-QAM	3/4	4	52	4	416	312	78.0	86.7
13	64-QAM	2/3	6	52	4	624	416	104.0	115.6
14	64-QAM	3/4	6	52	4	624	468	117.0	130.0
15	64-QAM	5/6	6	52	4	624	520	130.0	144.4

NOTE—The 400 ns GI rate values are rounded to 1 decimal place.

MCS parameters for optional 20 MHz, NSS = 3, NES = 1, EQM

MCS Index	Modulation	R	$N_{BPSCS(i_{SS})}$	N_{SD}	N_{SP}	N_{CBPS}	N_{DBPS}	Data rate (Mb/s)	
								800 ns GI	400 ns GI
16	BPSK	1/2	1	52	4	156	78	19.5	21.7
17	QPSK	1/2	2	52	4	312	156	39.0	43.3
18	QPSK	3/4	2	52	4	312	234	58.5	65.0
19	16-QAM	1/2	4	52	4	624	312	78.0	86.7
20	16-QAM	3/4	4	52	4	624	468	117.0	130.0
21	64-QAM	2/3	6	52	4	936	624	156.0	173.3
22	64-QAM	3/4	6	52	4	936	702	175.5	195.0
23	64-QAM	5/6	6	52	4	936	780	195.0	216.7

FCC-ID: LYHMPCIE1V1

HT40:

MCS parameters for optional 40 MHz, NSS = 1, NES = 1

MCS Index	Modulation	R	$N_{BPSCS}(i_{SS})$	N_{SD}	N_{SP}	N_{CBPS}	N_{DBPS}	Data rate (Mb/s)	
								800 ns GI	400 ns GI
0	BPSK	1/2	1	108	6	108	54	13.5	15.0
1	QPSK	1/2	2	108	6	216	108	27.0	30.0
2	QPSK	3/4	2	108	6	216	162	40.5	45.0
3	16-QAM	1/2	4	108	6	432	216	54.0	60.0
4	16-QAM	3/4	4	108	6	432	324	81.0	90.0
5	64-QAM	2/3	6	108	6	648	432	108.0	120.0
6	64-QAM	3/4	6	108	6	648	486	121.5	135.0
7	64-QAM	5/6	6	108	6	648	540	135.0	150.0

MCS parameters for optional 40 MHz, NSS = 2, NES = 1, EQM

MCS Index	Modulation	R	$N_{BPSCS}(i_{SS})$	N_{SD}	N_{SP}	N_{CBPS}	N_{DBPS}	Data rate (Mb/s)	
								800 ns GI	400 ns GI
8	BPSK	1/2	1	108	6	216	108	27.0	30.0
9	QPSK	1/2	2	108	6	432	216	54.0	60.0
10	QPSK	3/4	2	108	6	432	324	81.0	90.0
11	16-QAM	1/2	4	108	6	864	432	108.0	120.0
12	16-QAM	3/4	4	108	6	864	648	162.0	180.0
13	64-QAM	2/3	6	108	6	1296	864	216.0	240.0
14	64-QAM	3/4	6	108	6	1296	972	243.0	270.0
15	64-QAM	5/6	6	108	6	1296	1080	270.0	300.0

MCS parameters for optional 40 MHz, NSS = 3, EQM

MCS Index	Modulation	R	$N_{BPSCS}(i_{SS})$	N_{SD}	N_{SP}	N_{CBPS}	N_{DBPS}	N_{ES}	Data rate (Mb/s)	
									800 ns GI	400 ns GI
16	BPSK	1/2	1	108	6	324	162	1	40.5	45.0
17	QPSK	1/2	2	108	6	648	324	1	81.0	90.0
18	QPSK	3/4	2	108	6	648	486	1	121.5	135.0
19	16-QAM	1/2	4	108	6	1296	648	1	162.0	180.0
20	16-QAM	3/4	4	108	6	1296	972	1	243.0	270.0
21	64-QAM	2/3	6	108	6	1944	1296	2	324.0	360.0
22	64-QAM	3/4	6	108	6	1944	1458	2	364.5	405.0
23	64-QAM	5/6	6	108	6	1944	1620	2	405.0	450.0

FCC-ID: LYHMPCIE1V1

Symbol	Explanation
N_{SS}	Number of spatial streams
R	Coding rate
N_{BPSC}	Number of coded bits per single carrier (total across spatial streams)
$N_{BPSC}(i_{SS})$	Number of coded bits per single carrier for each spatial stream, $i_{SS} = 1, \dots, N_{SS}$
N_{SD}	Number of complex data numbers per spatial stream per OFDM symbol
N_{SP}	Number of pilot values per OFDM symbol
N_{CBPS}	Number of coded bits per OFDM symbol
N_{DBPS}	Number of data bits per OFDM symbol
N_{ES}	Number of BCC encoders for the DATA field
N_{TBPS}	Total bits per subcarrier

Antennas

Antennas intended for use are classified into 3 gain groups:

- Ant. group 1: Antennas up to 6 dBi
- Ant. group 2: Antennas 7 to 9 dBi
- Ant. group 3: Antennas 10 to 14 dBi

The following listed antennas shall be used with the EUT:

Ant. group 1 antennas with max 0 to 6 dBi gain:

Number	Characteristic	Certification name	Plug	Frequency range (GHz)	Gain (dBi)
1	Omni	ANT795-4MC	N	2.4, 5	3, 5
2	Omni	ANT795-4MD	N	2.4, 5	3, 5
3	Omni	ANT795-4MS	R-SMA	2.4, 5	3, 5
4	Omni	ANT793-6MN	N	5	6
5	Omni	ANT793-4MN	N	5	6
6	Omni	A5E002280427-06	integrated	2.4, 5	3, 5
7	Rcoax	Rcoax 5G	N	5	0

Ant. group 2 antennas with max 7 to 9 dBi gain:

Number	Characteristic	Certification name	Plug	Frequency range (GHz)	Gain (dBi)
1	Wide angle	ANT793-6DT	3*QMA	5	9
2	Wide angle	ANT793-6DG	N	5	9
3	Wide angle	ANT795-6DC	N	2.4, 5	9, 9
4	Omni	ANT795-4MN	N	2.4, 5	6, 8
5	Omni	ANT795-6MT	3*QMA	2.4, 5	5, 7

Ant. group 3 antennas with max 10 to 14 dBi gain:

Number	Characteristic	Certification name	Plug	Frequency range (GHz)	Gain (dBi)	Cable loss	Effective Gain
1	Directed	ANT793-8DJ	N	5	18	4.4	14.2
2	Directed	ANT793-8DK	N	5	23	8.8	13.6

Note: The directed antenna number 1 may be used only with minimum 5 m antenna cable, Type 6XV 1875-5CH50 with cable loss 4.4 dB at 5.7 GHz.
The directed antenna number 2 may be used only with minimum 10 m antenna cable, Type 6XV 1875-5CN10 with cable loss 8.8 dB at 5.7 GHz.

FCC-ID: LYHMPCIE1V1**FINAL ASSESSMENT:**

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 21 November 2011

Testing concluded on : 21 March 2012

Checked by:

Tested by:

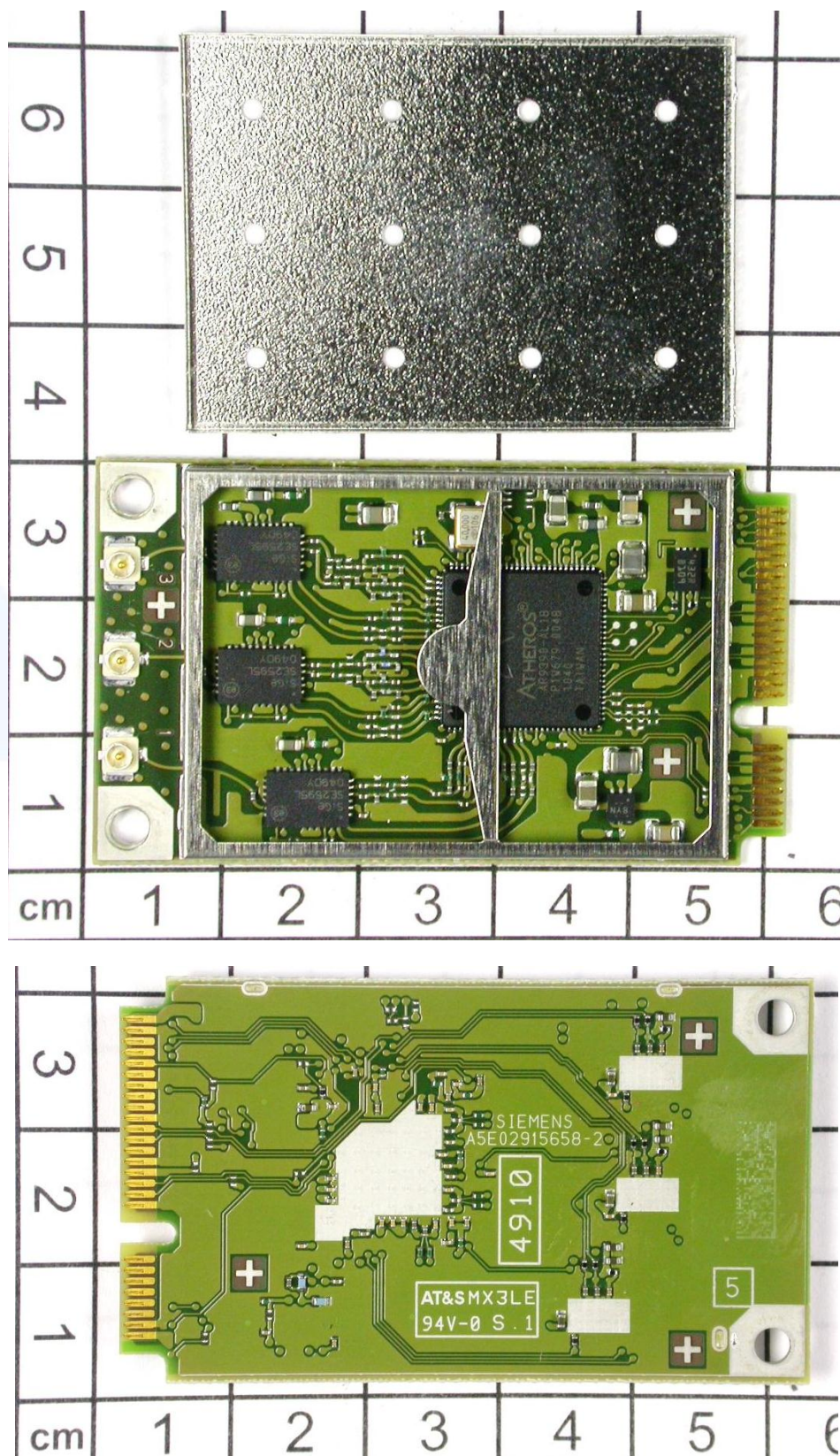
Klaus Gegenfurtner
Dipl.-Ing.(FH)
Manager: Radio Group

Hermann Smetana
Dipl.-Ing.(FH)
Radio Expert

FCC-ID: LYHMPCIE1V1

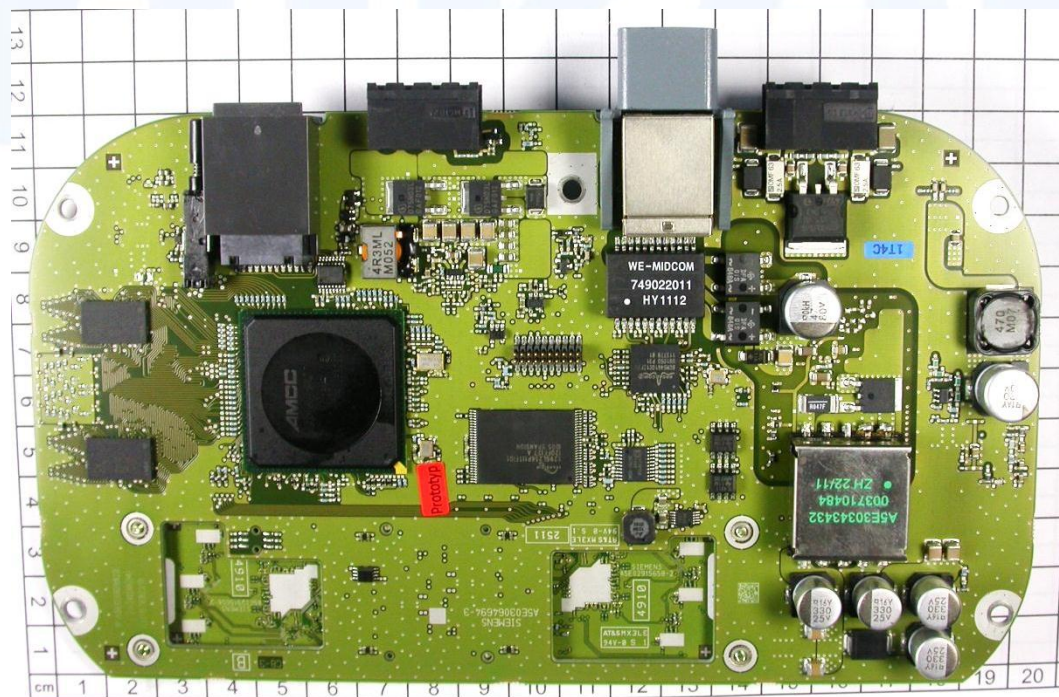
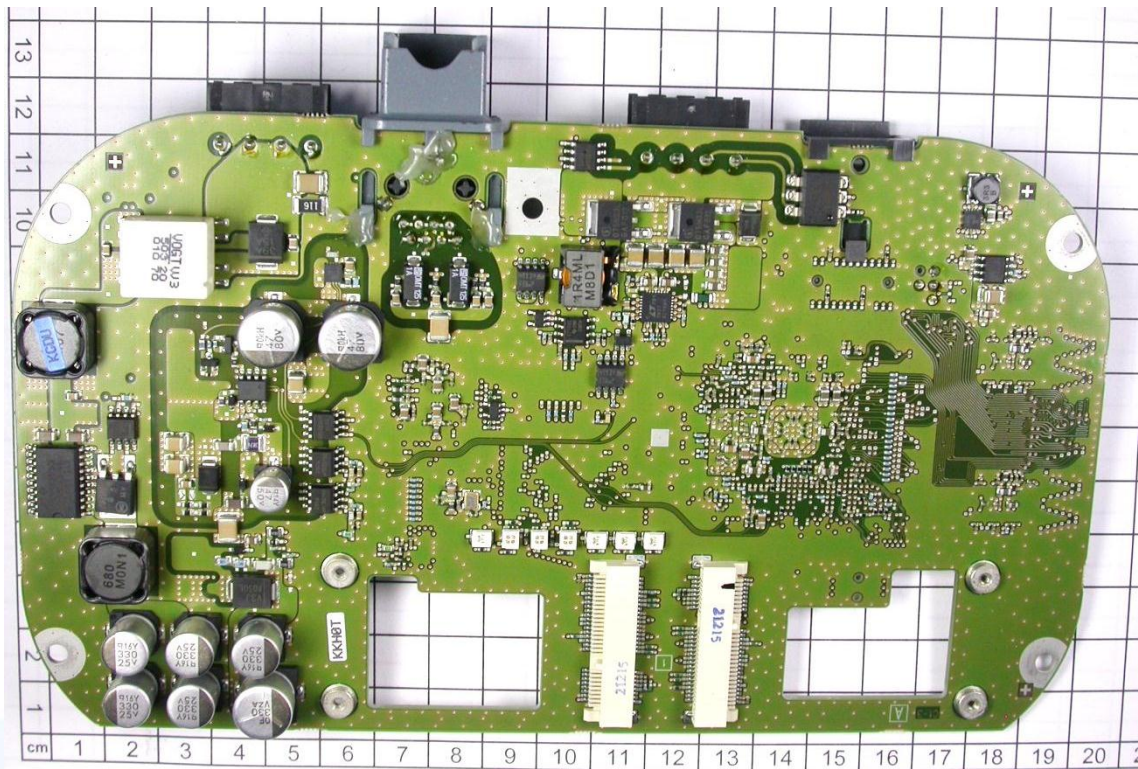
3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT



FCC-ID: LYHMPDIE1V1

Test jig:



FCC-ID: LYHMPCIE1V1

3.2 Power supply system utilised

Power supply voltage, V_{nom} : 24 VDC

The extreme voltages for the EUT are: $V_{min} = 19.2$ VDC
 $V_{max} = 28.8$ VDC

3.3 Short description of the equipment under test (EUT)

The EUT is a WLAN module for industrial applications in the 5 GHz frequency range.

Number of tested samples: 1
Serial number: #45

EUT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- TX continuous, HT20 mode

- TX continuous, HT40 mode

- TX continuous, Legacy mode

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurements:

- Test jig	Model : self-made
- LAN cable, 3m	Model : CAT5
- Power supply cable, 1m	Model : Self-made
- C-Plug-Adaptor for test mode control	Model : Self-made

FCC-ID: LYHMPCIE1V1

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

mikes-testingpartners gmbh
Ohmstrasse 2-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the mikes-testingpartners gmbh quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, mikes-testingpartners gmbh, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component diversity and modifications in production process of devices may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for the specific test. The manufacturer has the sole responsibility of continued compliance of the EUT.

4.4 Measurement protocol for FCC and IC

4.4.1 GENERAL INFORMATION

4.4.1.1 Test methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

The open area test site is listed under the Canadian Test-Sites File-No:

IC 3009A-1

In compliance with RSS 210 testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

FCC-ID: LYHMPCIE1V1

4.4.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left without termination. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.1.3 Details of test procedures

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4, ANSI C63.10 and applying the CISPR 22 limits.

4.5 Determination of worst case measurement conditions

Measurements have been made in all three orthogonal axes and the settings of the EUT were changed to locate at which position and at what setting of the EUT produce the maximum of the emissions. For the further measurement the EUT is set in X position.

The tests are carried out in the following frequency bands:

5.15 - 5.25 GHz

Preliminary tests were performed to find the worst case mode from all possible combinations between available modulations, data rates and small antenna system is determined through pre-scans. The maximum output power depends on used data rate. The worst case mode from all possible combinations between available modulations, data rates and small antenna system is determined through pre-scans. As worse case the HT20 mode (MCS 8 with 2 spatial streams, BW=20 MHz, 2 TX chains), HT40 mode (MCS 16 with 3 spatial streams, BW=40 MHz, 3 TX chains) and the legacy mode (data rate of 6 Mbps, BW=20 MHz, with 1 TX chain) is selected for final measurements.

Following channels and test modes were selected for the final test as listed below:

HT20 mode:

Technology	Available channels	Tested channels	Modulation	Modulation type	Data rate (Mbps)
802.11n	36 - 48	36, 40, 48	OFDM	BPSK	MCS=8 (BW=20 MHz)

HT40 mode:

Technology	Available channels	Tested channels	Modulation	Modulation type	Data rate (Mbps)
802.11n	36up, 44up	36up, 44up	OFDM	BPSK	MCS=16 (BW=40 MHz)

802.11a/h mode:

Technology	Available channels	Tested channels	Modulation	Modulation type	Data rate (Mbps)
802.11a	36 - 48	36, 40, 48	OFDM	BPSK	6 Mbps (BW=20 MHz)

FCC-ID: LYHMPCIE1V1

5 TEST CONDITIONS AND RESULTS**5.1 Conducted emissions**

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: NONE

Remarks: Not applicable, the EUT has no AC mains connection.

FCC-ID: LYHMPCIE1V1

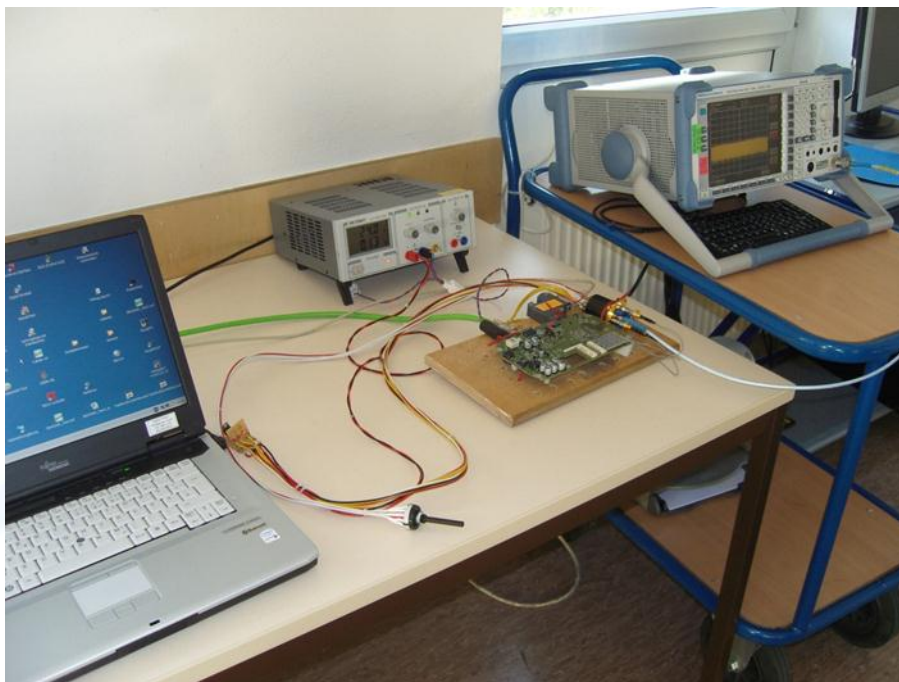
5.2 Duty cycle

For test instruments and accessories used see section 6 Part DC.

5.2.1 Description of the test location

Test location: AREA4

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15C, Section 15.35(c):

The emissions from intentional radiators shall not exceed the effective field strength limits.

5.2.4 Description of Measurement

The Duty cycle factor (dB) is calculated applying the following formula:

$$KE = 10 \log ((t_{on} * p) / T_w)$$

<i>KE</i> :	pulse operation correction factor	(dB)
<i>t_{on}</i>	pulse duration for one pulse	(ms)
<i>t_{off}</i>	duration for one pulse off-time	(ms)
<i>T_w</i>	a period of the pulse track	(ms)
<i>p</i>	number of pulses in 100 ms	

FCC-ID: LYHMPCIE1V1

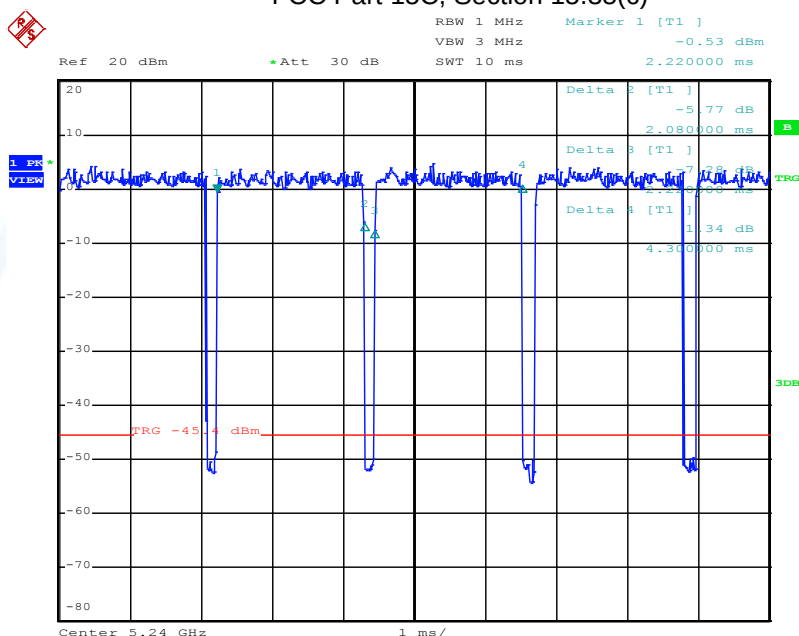
5.2.5 Test result

Duty cycle	t_{on} (ms)	t_{off} (ms)	T_w (ms)	p	KE (dB)
Duty cycle	2.08	0.14	2.22		
Within 100 ms	93.7	6.3		45.045	0.3

Remarks: The puls is shorter 100 ms, the duty cycle is calculated within 100 ms.

5.2.6 Test protocol duty cycle

FCC Part 15C, Section 15.35(c)

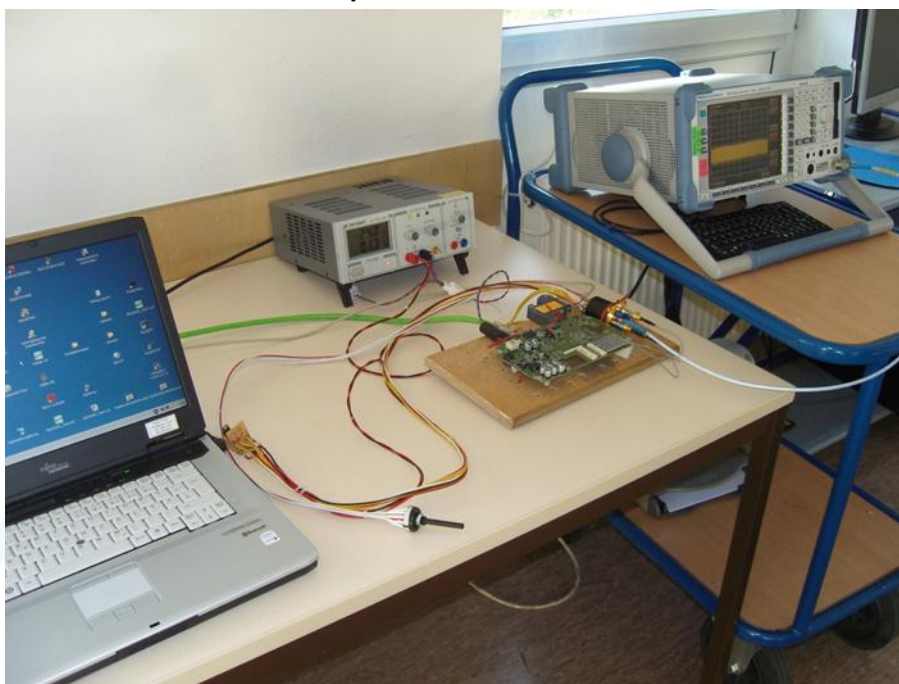


FCC-ID: LYHMPCIE1V1**5.3 26 dB emission bandwidth and 99% OBW**

For test instruments and accessories used see section 6 Part MB.

5.3.1 Description of the test location

Test location: AREA4

5.3.2 Photo documentation of the test set-up**5.3.3 Applicable standard**

According to FCC Part 15E, Section 15.407(i):

The emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier centre frequency and one above the carrier centre frequency, that are 26 dB down relative to the maximum of the modulated carrier.

5.3.4 Description of Measurement

The bandwidth is measured following the procedure set out in 789033 D01. The spectrum analyser function “n-dB-down” is used to determine the bandwidth. The RBW is approximately 1% of the EBW. For the 99% bandwidth RBW is approximately 1% of the span.

FCC-ID: LYHMPCIE1V1

5.3.5 Test result

HT20 mode, MCS8, Port1:

Spectrum analyser settings:

EBW	Span: 40 MHz,	RBW: 300 kHz,	VBW: 1 MHz,	Detector: Peak
OBW	Span: 30 MHz,	RBW: 300 kHz,	VBW: 1 MHz,	Detector: Peak

Channel	Centre frequency	26 dB bandwidth	99% OBW
	(MHz)	(MHz)	(MHz)
36	5180	24.16	18.42
40	5200	23.36	18.42
48	5240	21.60	18.42

HT20 mode, MCS8, Port2:

Channel	Centre frequency	26 dB bandwidth	99% OBW
	(MHz)	(MHz)	(MHz)
36	5180	24.00	18.54
40	5200	23.76	18.42
48	5240	23.20	18.48

HT40 mode, MCS16, Port1:

Spectrum analyser settings:

EBW	Span: 80 MHz,	RBW: 300 kHz,	VBW: 1 MHz,	Detector: Peak
OBW	Span: 60 MHz,	RBW: 1 MHz,	VBW: 3 MHz,	Detector: Peak

Channel	Centre frequency	26 dB bandwidth	99% OBW
	(MHz)	(MHz)	(MHz)
36up	5190	46.72	38.64
44up	5230	49.28	38.64

HT40 mode, MCS16, Port2:

Channel	Centre frequency	26 dB bandwidth	99% OBW
	(MHz)	(MHz)	(MHz)
36up	5190	49.28	38.28
44up	5230	49.76	38.52

HT40 mode, MCS16, Port3:

Channel	Centre frequency	26 dB bandwidth	99% OBW
	(MHz)	(MHz)	(MHz)
36up	5190	47.84	38.28
44up	5230	46.72	38.28

FCC-ID: LYHMPCIE1V1

802.11a mode, 6 Mbps, Port1:

Spectrum analyser settings:

EBW Span: 40 MHz, RBW: 300 kHz, VBW: 1 MHz, Detector: Peak
OBW Span: 30 MHz, RBW: 300 kHz, VBW: 1 MHz, Detector: Peak

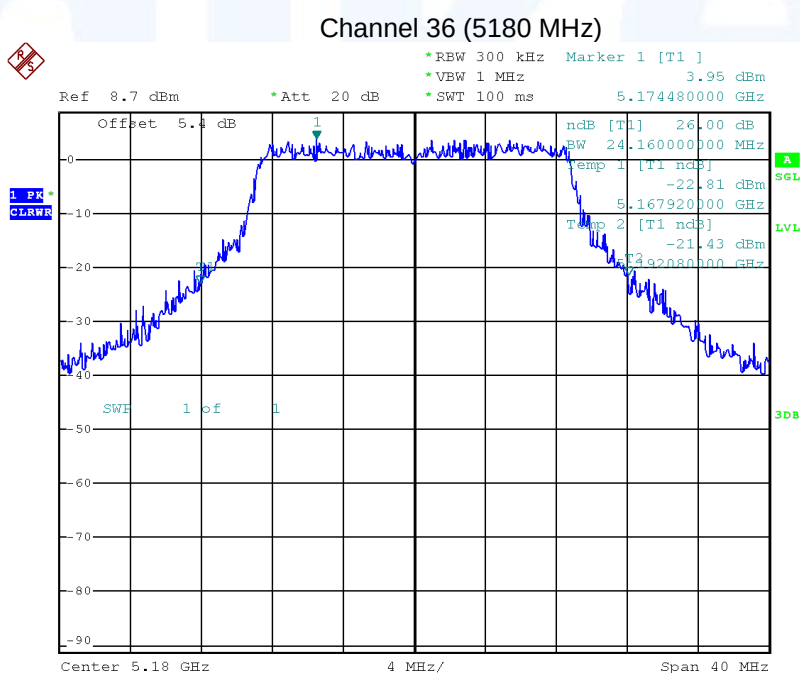
Channel	Centre frequency	26 dB bandwidth	99% OBW
	(MHz)	(MHz)	(MHz)
36	5180	23.04	17.46
40	5200	22.48	17.40
48	5240	22.88	17.40

Note: The RSS Gen defines no limit for the OBW!

Remarks: For detailed test results please see the following test protocols. Only the worst case of the plots are listed.

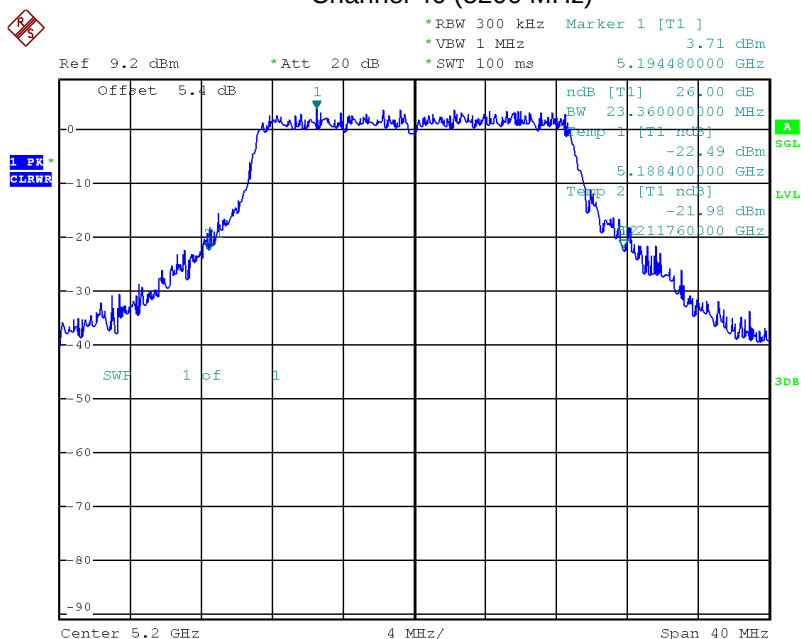
5.3.6 Test protocols EBW 26 dB

5.3.6.1 Measurement plots, HT20, Port1

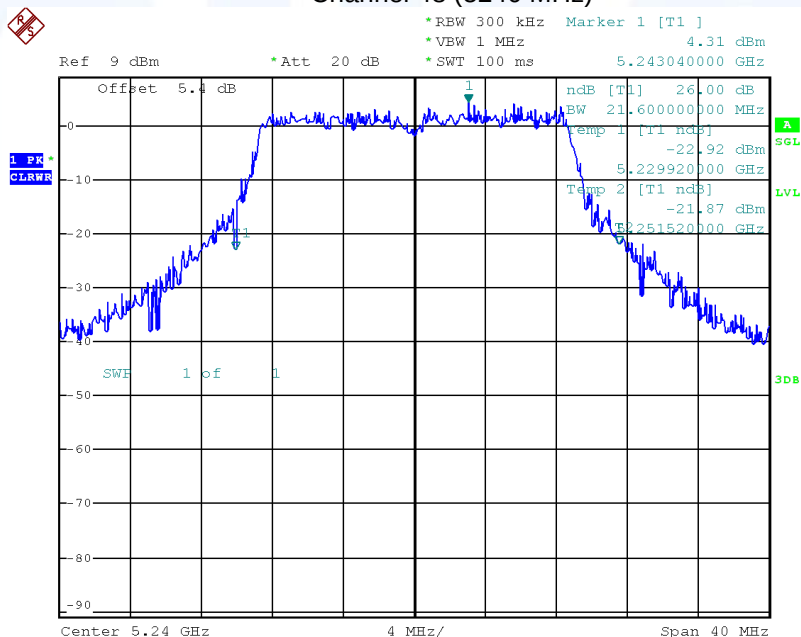


FCC-ID: LYHMPCIE1V1

Channel 40 (5200 MHz)

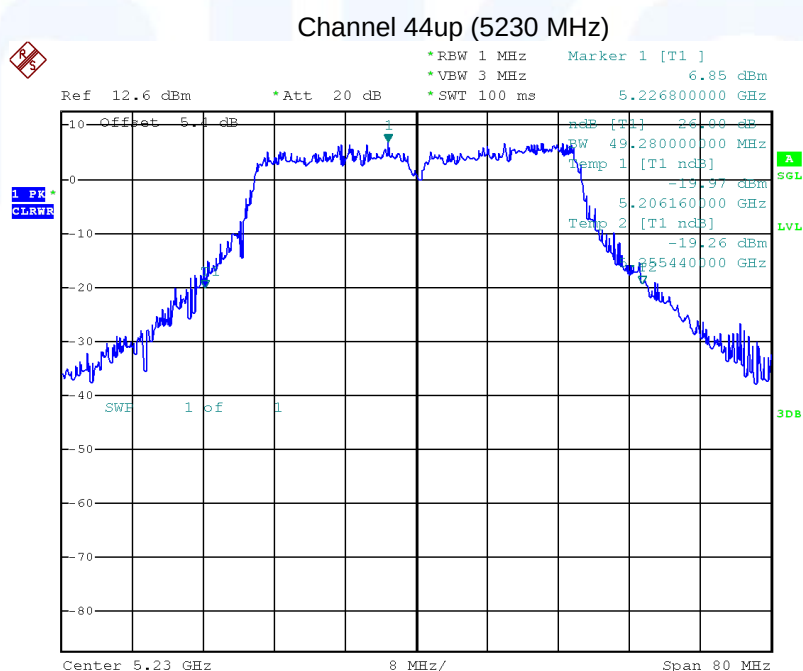
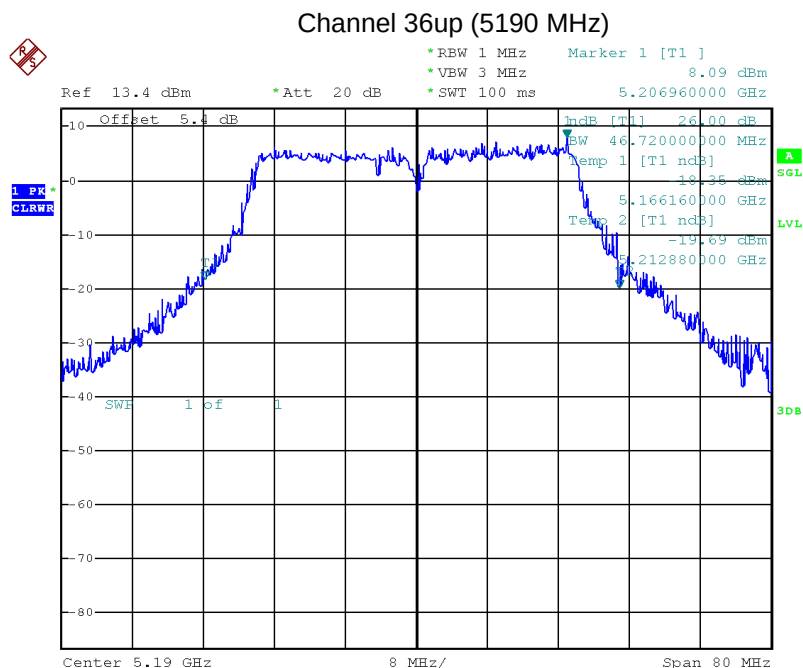


Channel 48 (5240 MHz)



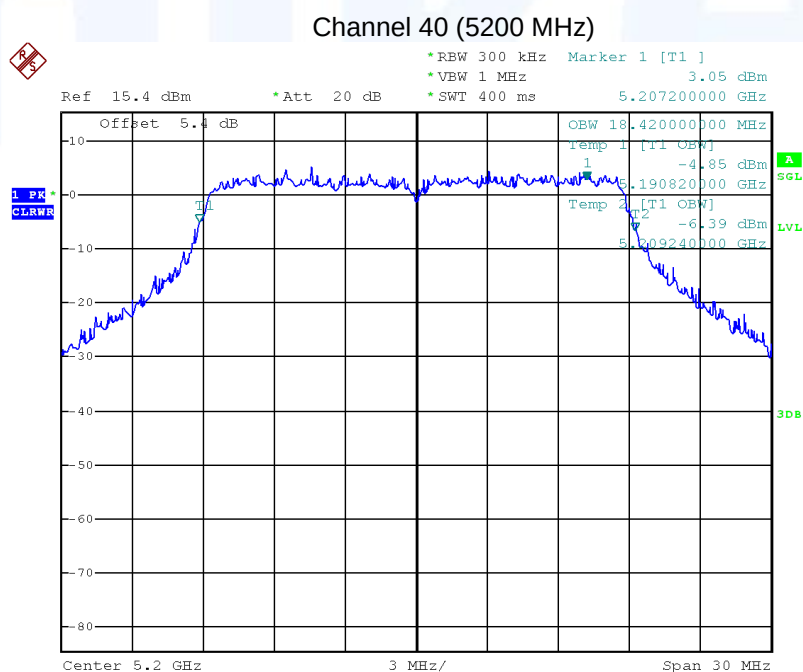
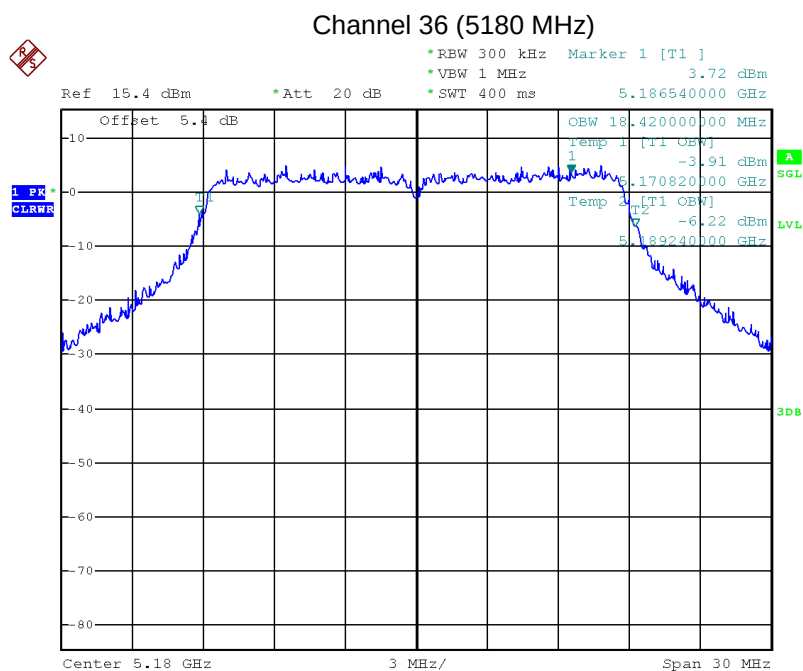
FCC-ID: LYHMPCIE1V1

5.3.6.2 Measurement plots, HT40, Port1



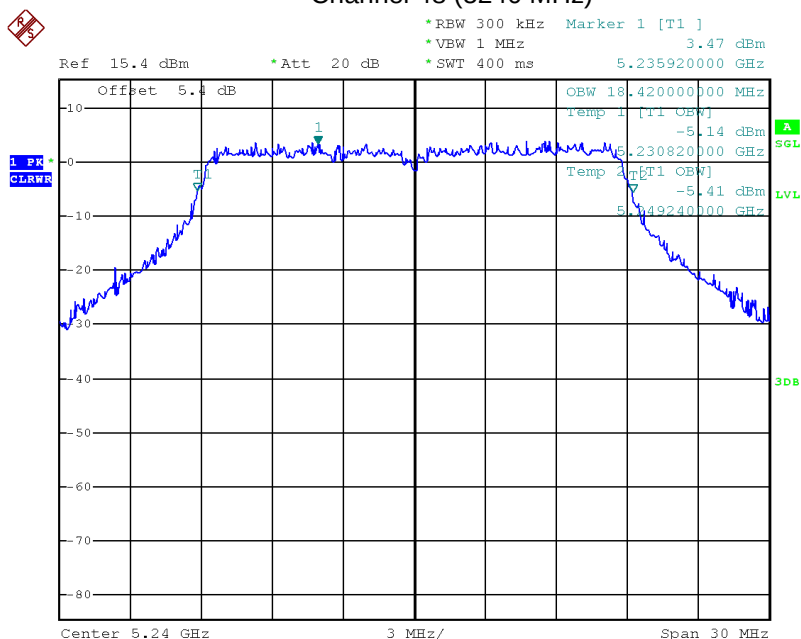
FCC-ID: LYHMPCIE1V1

5.3.6.3 OBW 99% Measurement plots, HT20, Port1



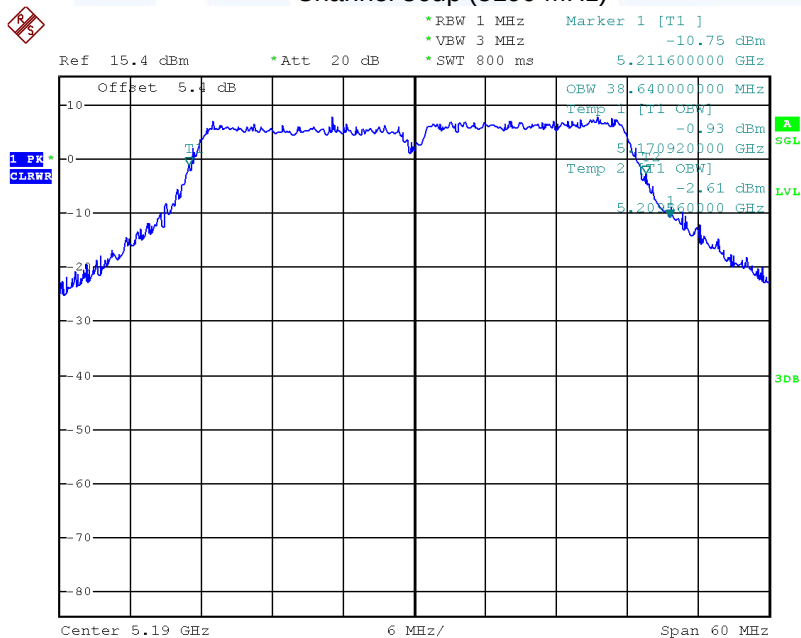
FCC-ID: LYHMPCIE1V1

Channel 48 (5240 MHz)



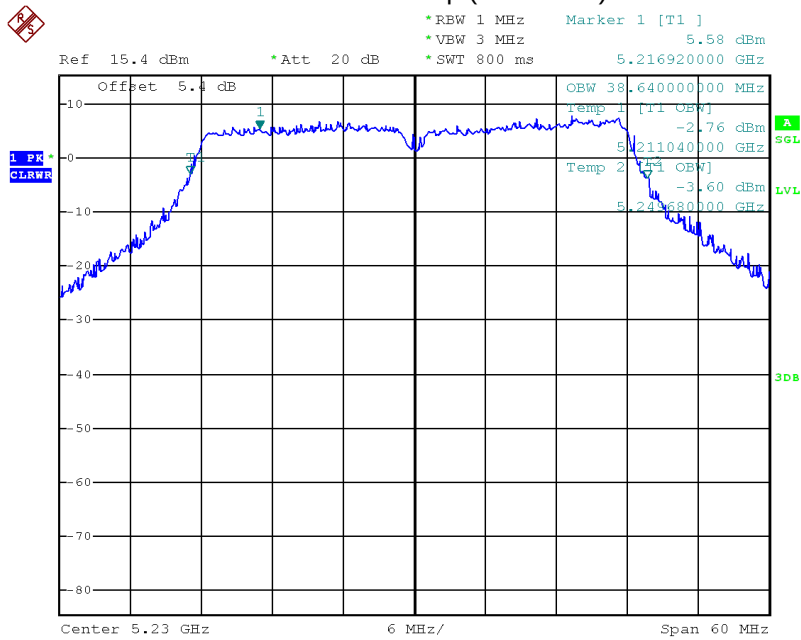
5.3.6.4 OBW 99% Measurement plots, HT40

Channel 36up (5190 MHz)



FCC-ID: LYHMPCIE1V1

Channel 44up (5230 MHz)



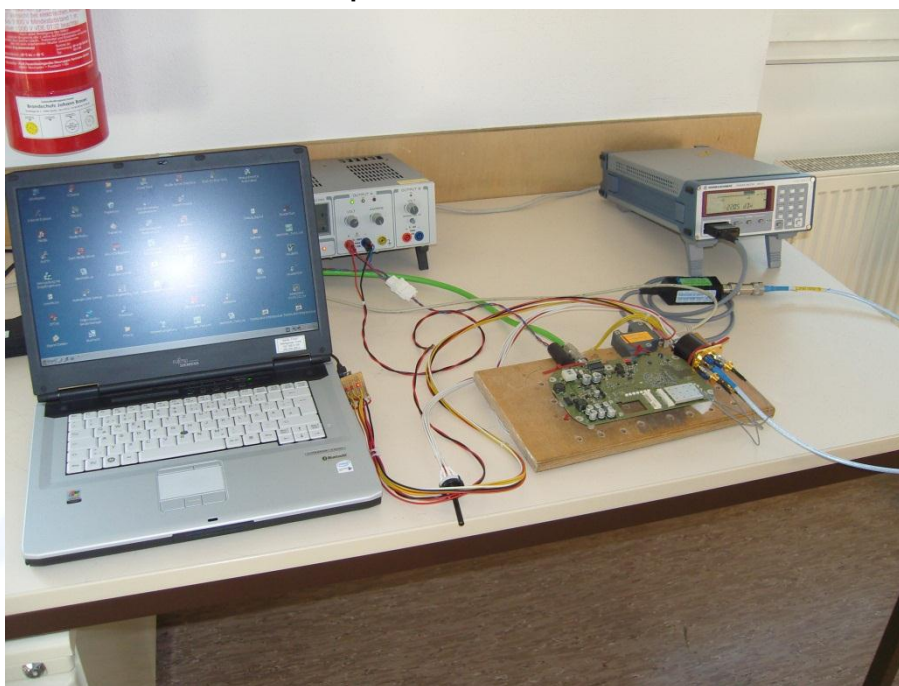
mikes

FCC-ID: LYHMPCIE1V1**5.4 Maximum conducted output power**

For test instruments and accessories used see section 6 Part **CPC 3**.

5.4.1 Description of the test location

Test location: AREA4

5.4.2 Photo documentation of the test set-up**5.4.3 Applicable standard**

According to FCC Part 15E, Section 15.407(a):

The maximum conducted output power over the frequency band of operation shall not exceed the effective values. If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.4.4 Description of Measurement

The output power is measured using the power meter method according ANSI C63.10, clause 6.10.2.2. The EUT is set while measuring in TX continuous mode with a duty cycle, $x = 0.937$. The total output power is summed over all antenna terminals of the multiple antenna system.

FCC-ID: LYHMPCIE1V1

5.4.5 Test result

Test conditions:					
HT20, MCS8, 2 TX chains		Test results			
Duty cycle: 100%	A [P8]	A [P11]	A [P14]	A [P17]	A [P20]
Chain1	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
CH36	3.5		9.2	12.2	
CH40	3.7		9.1	12.3	
CH48	3.4		9.3	11.9	

Test conditions:					
HT20, MCS8, 2 TX chains		Test results			
Duty cycle: 100%	A [P8]	A [P11]	A [P14]	A [P17]	A [P20]
Chain2	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
CH36	3.4		9.1	12.2	
CH40	3.4		9.0	12.3	
CH48	2.8		8.5	11.6	

Calculating of the conducted power and EIRP:

Test conditions:								
CH36	Test results							
Duty cycle: 100%	P set	Ant gain	A1 + A2	Limit	Margin	EIRP	Limit	Margin
Chain1 + 2		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P17	6.0	15.5	17.0	-1.5	21.5	23.0	-1.5
Ant_group2	P14	9.0	12.5	17.0	-4.5	21.5	23.0	-1.5
Ant_group3	P8	14.2	6.7	17.0	-10.3	20.9	23.0	-2.1

Note: The duty cycle is corrected with 0.3 dB at the level of A1 + A2.

Test conditions:								
CH40	Test results							
Duty cycle: 100%	P set	Ant gain	A1 + A2	Limit	Margin	EIRP	Limit	Margin
Chain1 + 2		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P17	6.0	15.6	17.0	-1.4	21.6	23.0	-1.4
Ant_group2	P14	9.0	12.3	17.0	-4.7	21.3	23.0	-1.7
Ant_group3	P8	14.2	6.8	17.0	-10.2	21.0	23.0	-2.0

Test conditions:								
CH48	Test results							
Duty cycle: 100%	P set	Ant gain	A1 + A2	Limit	Margin	EIRP	Limit	Margin
Chain1 + 2		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P17	6.0	15.1	17.0	-1.9	21.1	23.0	-1.9
Ant_group2	P14	9.0	12.2	17.0	-4.8	21.2	23.0	-1.8
Ant_group3	P8	14.2	6.4	17.0	-10.6	20.6	23.0	-2.4

FCC-ID: LYHMPCIE1V1

Test conditions:					
HT40, MCS16	Test results				
Duty cycle: 100%	A [P8]	A [P11]	A [P14]	A [P17]	A [P20]
Chain1	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
CH36up	2.4		7.9	11.3	
CH44up	2.5		8.5	11.2	

Test conditions:					
HT40, MCS16	Test results				
Duty cycle: 100%	A [P8]	A [P11]	A [P14]	A [P17]	A [P20]
Chain2	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
CH36up	1.4		7.3	10.6	
CH44up	1.5		7.1	10.4	

Test conditions:					
HT40, MCS16	Test results				
Duty cycle: 100%	A [P8]	A [P11]	A [P14]	A [P17]	A [P20]
Chain3	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
CH36up	2.2		8.1	11.0	
CH44up	2.6		8.9	11.6	

Calculating of the conducted power and EIRP:

Test conditions:								
CH36up	Test results							
Duty cycle: 100%	P set	Ant gain	A1+2+3	Limit	Margin	EIRP	Limit	Margin
Chain1 + 2 + 3		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P17	6.0	16.0	17.0	-1.0	22.0	23.0	-1.0
Ant_group2	P14	9.0	12.9	17.0	-4.1	21.9	23.0	-1.1
Ant_group3	P8	14.2	7.1	17.0	-9.9	21.3	23.0	-1.7

Note: The summed power is calculated from the measured power of Port1, Port2 and Port3;

Test conditions:								
CH44up	Test results							
Duty cycle: 100%	P set	Ant gain	A1+2+3	Limit	Margin	EIRP	Limit	Margin
Chain1 + 2 + 3		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P17	6.0	16.1	17.0	-0.9	22.1	23.0	-0.9
Ant_group2	P14	9.0	13.3	17.0	-3.7	22.3	23.0	-0.7
Ant_group3	P8	14.2	7.3	17.0	-9.7	21.5	23.0	-1.5

FCC-ID: LYHMPCIE1V1

Test conditions:					
Legacy, 6 Mbps	Test results				
Duty cycle: 100%	A [P8]	A [P11]	A [P14]	A [P17]	A [P20]
Chain1	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)
CH36	6.5		12.3	14.4	
CH40	6.9		12.3	14.6	
CH48	6.5		12.0	14.4	

Calculating of the conducted power and EIRP:

Test conditions:								
CH36	Test results							
Duty cycle: 100%	P set	Ant gain	A1	Limit	Margin	EIRP	Limit	Margin
Chain1		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P17	6.0	14.7	17.0	-2.3	20.7	23.0	-2.3
Ant_group2	P14	9.0	12.6	17.0	-4.4	21.6	23.0	-1.4
Ant_group3	P8	14.2	6.8	17.0	-10.2	21.0	23.0	-2.0

Test conditions:								
CH40	Test results							
Duty cycle: 100%	P set	Ant gain	A1	Limit	Margin	EIRP	Limit	Margin
Chain1		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P17	6.0	14.9	17.0	-2.1	20.9	23.0	-2.1
Ant_group2	P14	9.0	12.6	17.0	-4.4	21.6	23.0	-1.4
Ant_group3	P8	14.2	7.2	17.0	-9.8	21.4	23.0	-1.6

Test conditions:								
CH48	Test results							
Duty cycle: 100%	P set	Ant gain	A1	Limit	Margin	EIRP	Limit	Margin
Chain1		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P17	6.0	14.7	17.0	-2.3	20.7	23.0	-2.3
Ant_group2	P14	9.0	12.3	17.0	-4.7	21.3	23.0	-1.7
Ant_group3	P8	14.2	6.8	17.0	-10.2	21.0	23.0	-2.0

Peak power limit according to FCC Part 15E, Section 15.407(a):

The lower limit applies. The defacto EIRP limit is calculated using a 6 dBi antenna.

Frequency	Conducted power limit		
(GHz)		(dBm)	(dBm)
5.150 - 5.250	HT20, $4 + 10 \log B =$	17.8	17.0
	HT40, $4 + 10 \log B =$	21.0	17.0
	Legacy, $4 + 10 \log B =$	17.6	17.0

The requirements are **FULFILLED**.

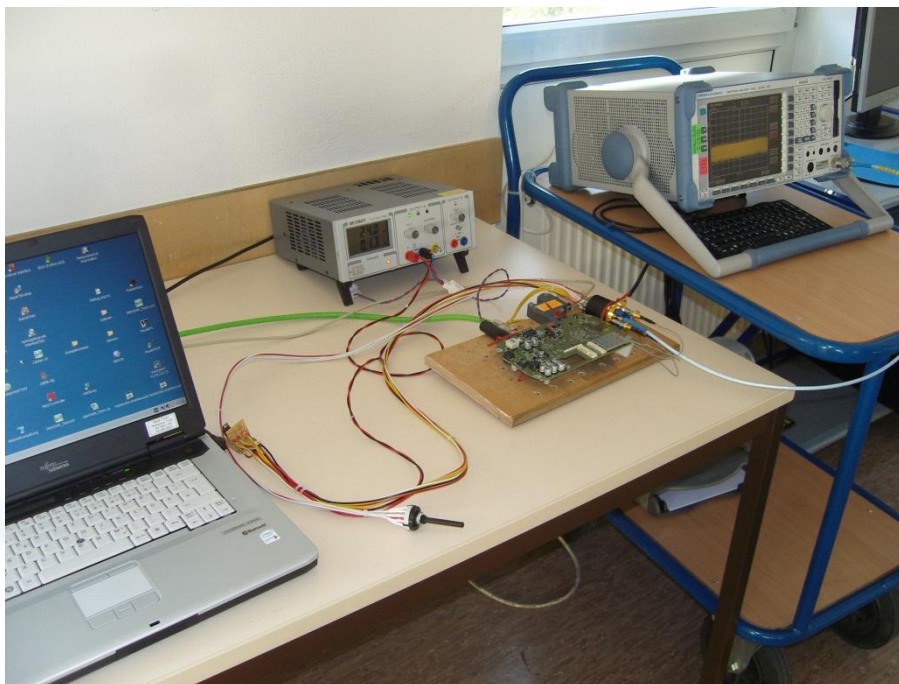
Remarks:

FCC-ID: LYHMPCIE1V1**5.5 Peak power spectral density**

For test instruments and accessories used see section 6 Part **CPC 3**.

5.5.1 Description of the test location

Test location: AREA4

5.5.2 Photo documentation of the test set-up**5.5.3 Applicable standard**

According to FCC Part 15E, Section 15.407(a):

For the defined operating bands the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than the appropriate limit in any 1 MHz band during any time interval of continuous transmission.

5.5.4 Description of Measurement

The measurement is performed using the procedure set out in 789033 D01, PPSPD Method SA-2. For this MIMO transmitter the antenna outputs are measured and summed according OET 662911. A duty cycle of 0.3 dB is taken into account.

Settings on the spectrum analyser:

RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto, Detector: RMS, Sweep count: 100

5.5.5 Test result

Note: In case of HT20 and HT40 is falling back into CDD-Modes the firmware will compensate automatically the array gain for this kind of correlating signals depending of used ports.

FCC-ID: LYHMPCIE1V1

Test conditions: HT20, MCS8, conducted						
Duty cycle: 100%	Test results					
Chain1, 2	Power setting	D1	D2	D1 + D2	PPSD limit	Margin
		(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
CH36	P8	-7.7	-7.9	-4.5	4	-8.5
	P14	-2.0	-2.2	1.2	4	-2.8
	P16	0.0	0.0	3.3	4	-0.7
CH40	P8	-7.8	-8.4	-4.7	4	-8.7
	P14	-2.3	-2.8	0.8	4	-3.2
	P17	0.7	0.5	3.9	4	-0.1
CH48	P8	-8.1	-8.7	-5.1	4	-9.1
	P14	-2.3	-3.3	0.5	4	-3.5
	P17	0.3	0.0	3.5	4	-0.5

Test conditions: HT40, MCS16, conducted							
Duty cycle: 100%	Test results						
Chain1, 2, 3	Power setting	D1	D2	D3	D1+D2+D3	PPSD limit	Margin
		(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
CH36up	P8	-10.6	-12.3	-11.3	-6.3	4	-10.3
	P14	-5.5	-6.6	-5.2	-0.6	4	-4.6
	P17	-2.3	-3.2	-2.2	2.5	4	-1.5
CH44up	P8	-10.6	-12.3	-10.8	-6.1	4	-10.1
	P14	-5.2	-6.4	-4.5	-0.2	4	-4.2
	P17	-2.0	-3.1	-1.7	2.8	4	-1.2

Test conditions: Legacy, 6 Mbps, conducted				
Duty cycle: 100%	Test results			
Chain1	Power setting	D1	PPSD limit	Margin
		(dBm/MHz)	(dBm/MHz)	(dB)
CH36	P8	-4.0	4	-8.0
	P14	1.7	4	-2.3
	P17	3.9	4	-0.1
CH40	P8	-4.0	4	-8.0
	P14	1.7	4	-2.3
	P17	3.7	4	-0.3
CH48	P8	-4.5	4	-8.5
	P14	1.0	4	-3.0
	P17	3.4	4	-0.7

Peak power limit according to FCC Part 15E, Section 15.407(a):

Frequency	Peak power spectral density limit
(GHz)	(dBm/MHz)
5.150 - 5.250	4

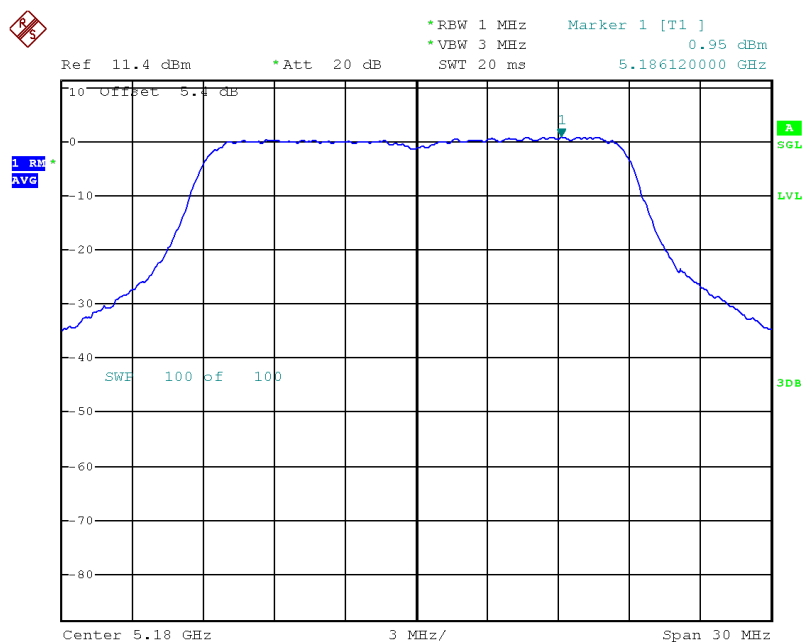
The requirements are **FULFILLED**.

Remarks: For detailed test results please see the following test protocols. Only the worst case of the plots are listed

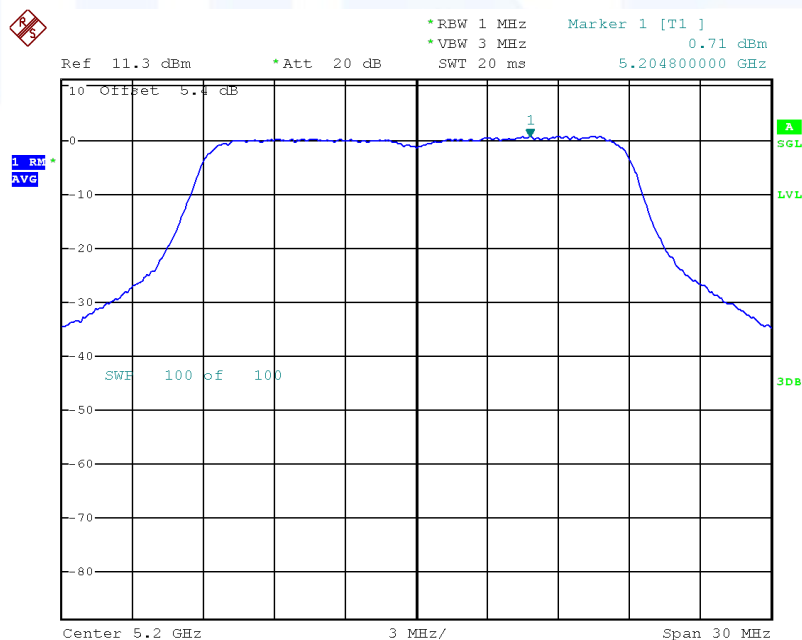
FCC-ID: LYHMPCIE1V1

5.5.5.1 Peak Power spectral density plots

HT20, Port1:
Channel 36 (5180 MHz)

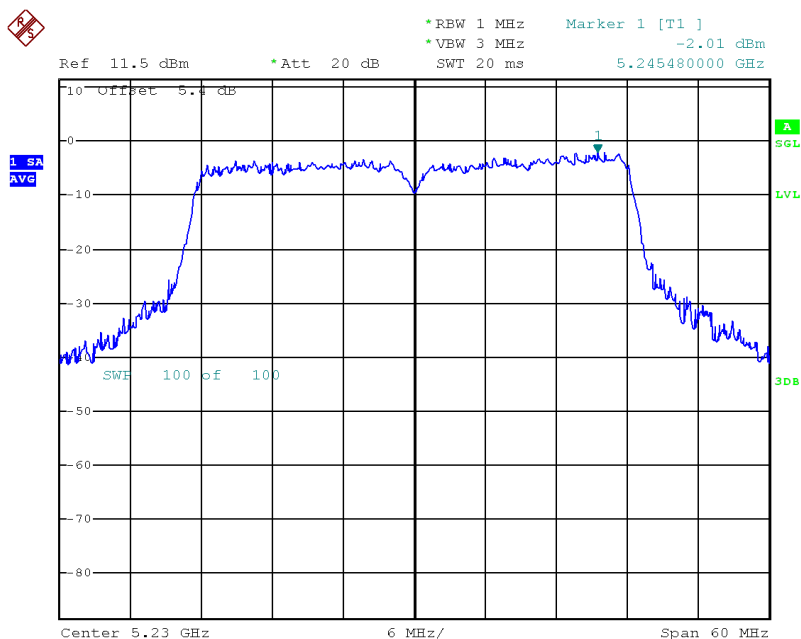


Channel 40 (5200 MHz)



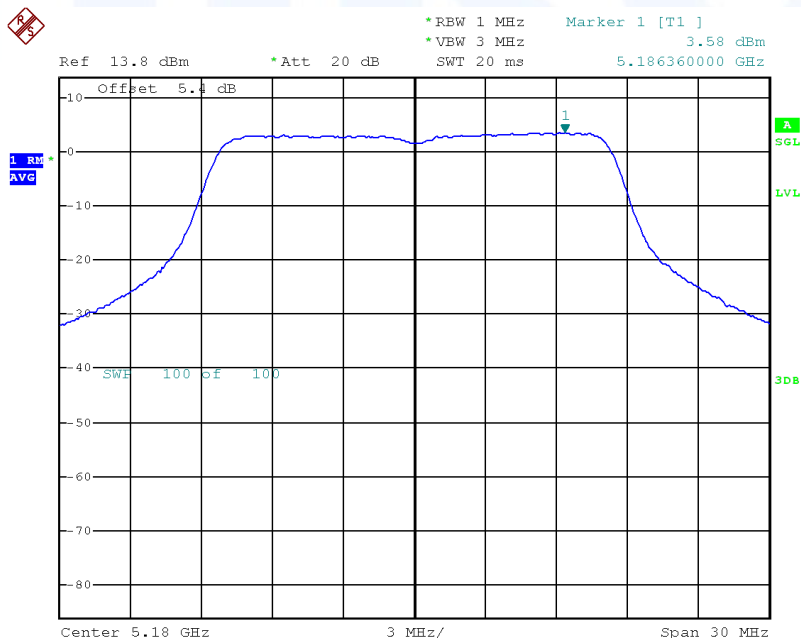
FCC-ID: LYHMPCIE1V1

Channel 44up (5230 MHz)



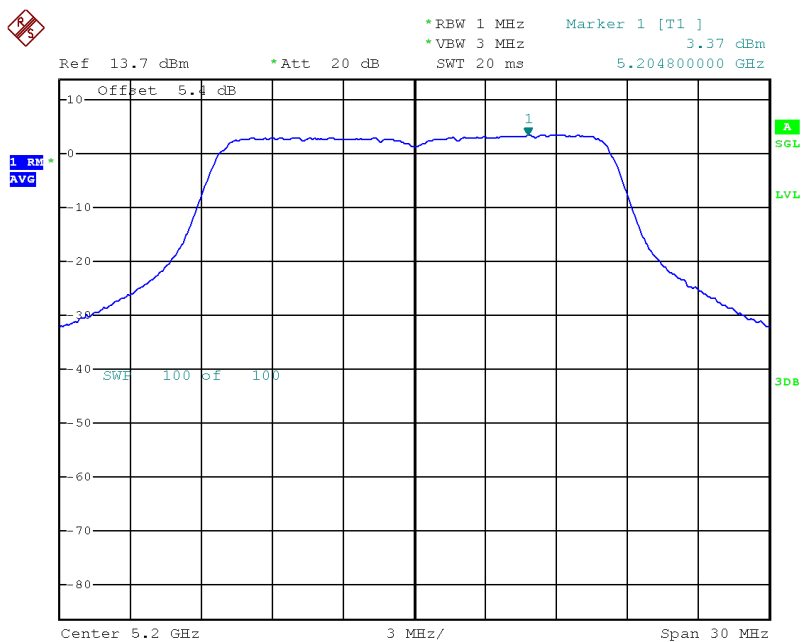
802.11a, Port1:

Channel 36 (5180 MHz)

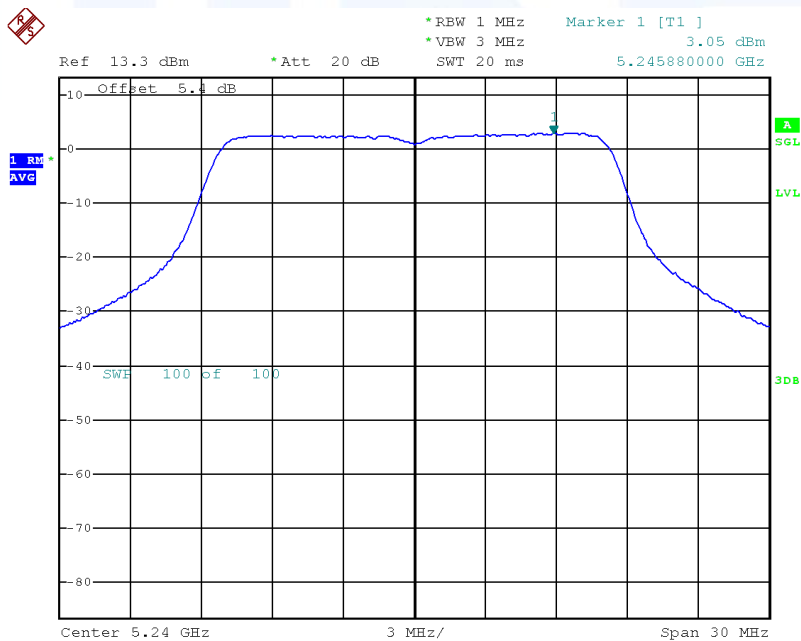


FCC-ID: LYHMPCIE1V1

Channel 40 (5200 MHz)



Channel 48 (5240 MHz)



FCC-ID: LYHMPCIE1V1

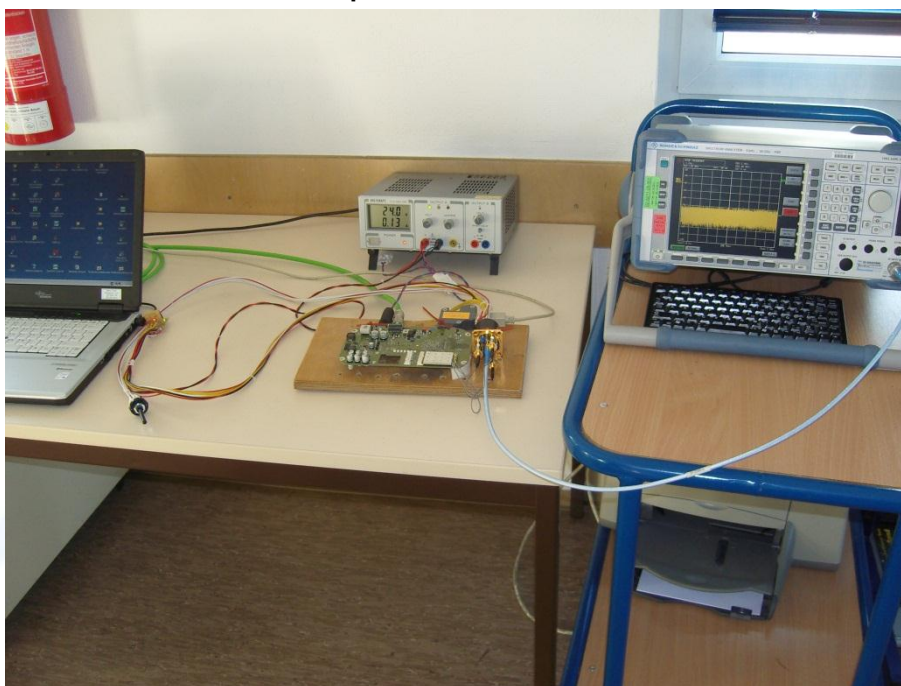
5.6 Peak excursion

For test instruments and accessories used see section 6 Part **MB**.

5.6.1 Description of the test location

Test location: AREA4

5.6.2 Photo documentation of the test set-up



5.6.3 Applicable standard

According to FCC Part 15E, Section 15.407(a)(6):

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured like before) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

5.6.4 Description of Measurement

The transmitter output is connected to the spectrum analyser. Using peak detector and "MAX HOLD" function for Trace 1 with 1 MHz RBW and 3 MHz VBW and Trace 2 with 1 MHz RBW and 300 kHz VBW both traces are recorded. The largest difference between Trace 1 and Trace 2 in any 1 MHz band is noted as maximum *Peak Excursion* value.

5.6.5 Test result

Note: In case of HT20 and HT40 is falling back into CDD-Modes the firmware will compensate automatically the array gain for this kind of correlating signals depending of used ports.

FCC-ID: LYHMPCIE1V1

Test conditions: HT20, MCS8, conducted				
Duty cycle: 100%	Test results			
Chain1	Power setting	PEX	PEX limit	Margin
		(dB)	(dB)	(dB)
CH36	P17	11.5	13	-1.5
CH40	P17	11.9	13	-1.1
CH48	P17	12.1	13	-0.9

Test conditions: HT20, MCS8, conducted				
Duty cycle: 100%	Test results			
Chain2	Power setting	PEX	PEX limit	Margin
		(dB)	(dB)	(dB)
CH36	P17	12.5	13	-0.5
CH40	P17	11.7	13	-1.3
CH48	P17	11.7	13	-1.3

Duty cycle: 100%	Test results			
Chain1	Power setting	PEX	PEX limit	Margin
		(dB)	(dB)	(dB)
CH36up	P17	12.9	13	-0.1
CH44up	P17	12.6	13	-0.4

Test conditions: HT40, MCS16, conducted				
Duty cycle: 100%	Test results			
Chain2	Power setting	PEX	PEX limit	Margin
		(dB)	(dB)	(dB)
CH36up	P17	11.9	13	-1.1
CH44up	P17	12.0	13	-1.0

Test conditions: HT40, MCS16, conducted				
Duty cycle: 100%	Test results			
Chain3	Power setting	PEX	PEX limit	Margin
		(dB)	(dB)	(dB)
CH36up	P17	11.9	13	-1.1
CH44up	P17	12.0	13	-1.0

Test conditions: Legacy, 6 Mbps, conducted				
Duty cycle: 100%	Test results			
Chain1	Power setting	PEX	PEX limit	Margin
		(dB)	(dB)	(dB)
CH36	P17	11.6	13	-1.4
CH40	P17	11.9	13	-1.1
CH48	P17	12.1	13	-0.9

The requirements are **FULFILLED**.

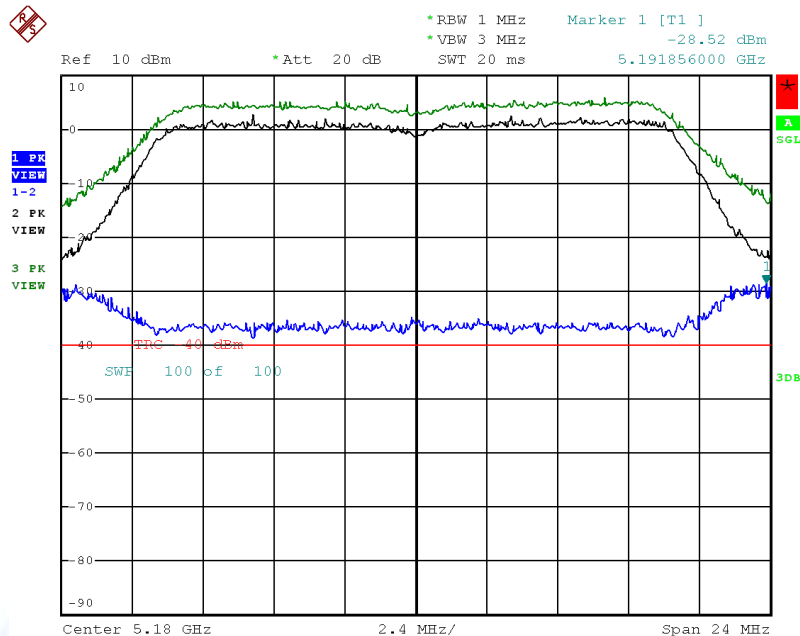
Remarks: For detailed test results please see the following test protocols. Only the worst case of the plots are listed.

FCC-ID: LYHMPCIE1V1

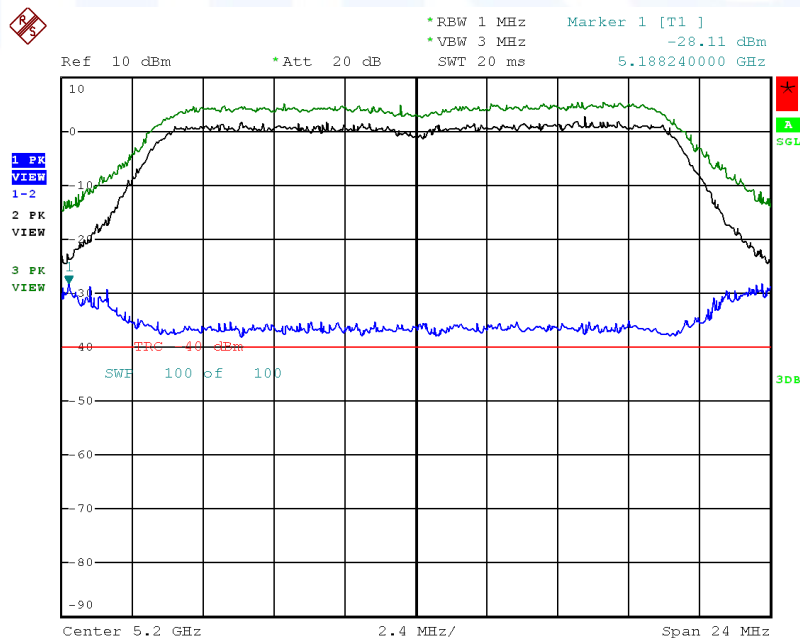
5.6.6 Peak excursion plots

5.6.6.1 HT20, Port1

Channel 36 (5180 MHz)

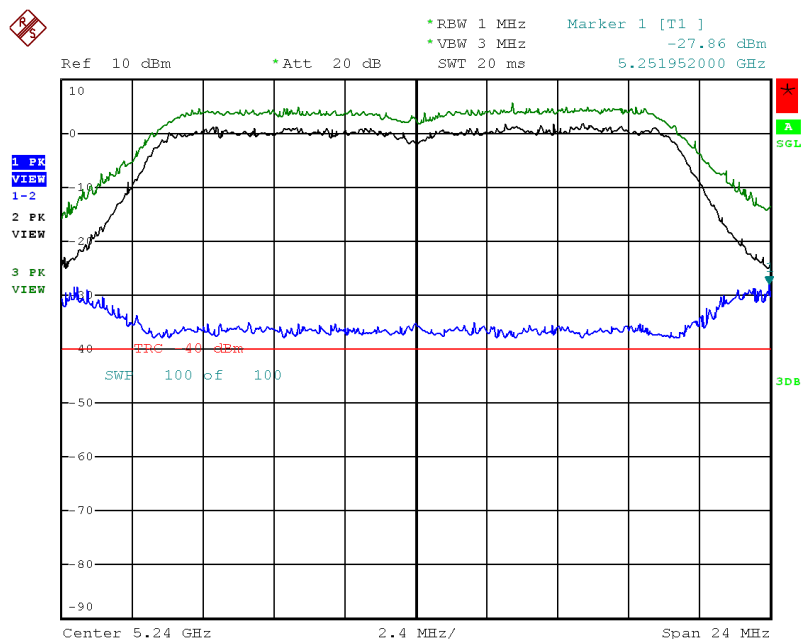


Channel 40 (5200 MHz)



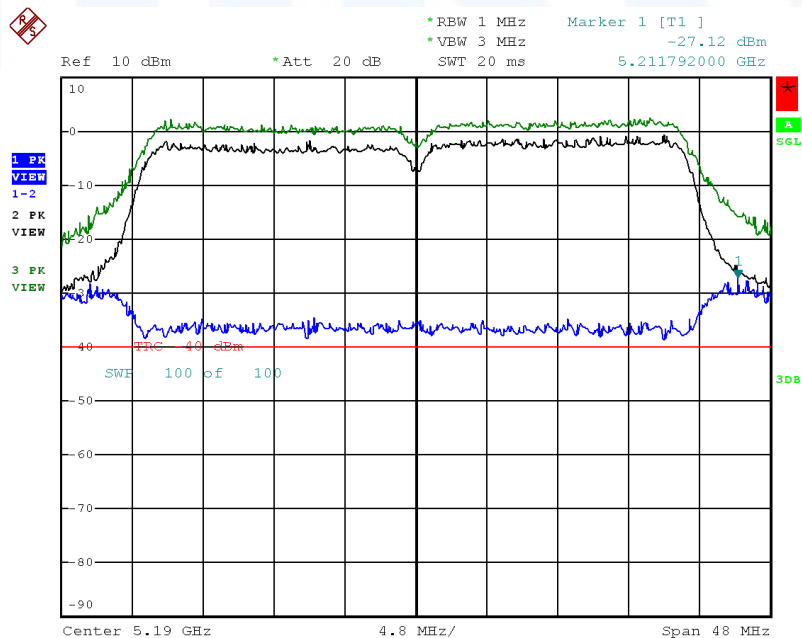
FCC-ID: LYHMPCIE1V1

Channel 48 (5240 MHz)



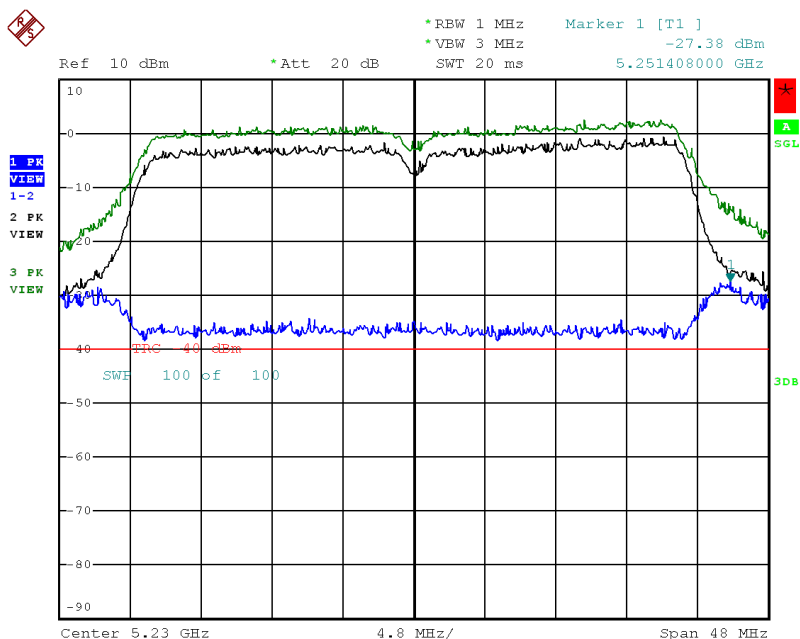
5.6.6.2 HT40, Port1

Channel 36up (5190 MHz)



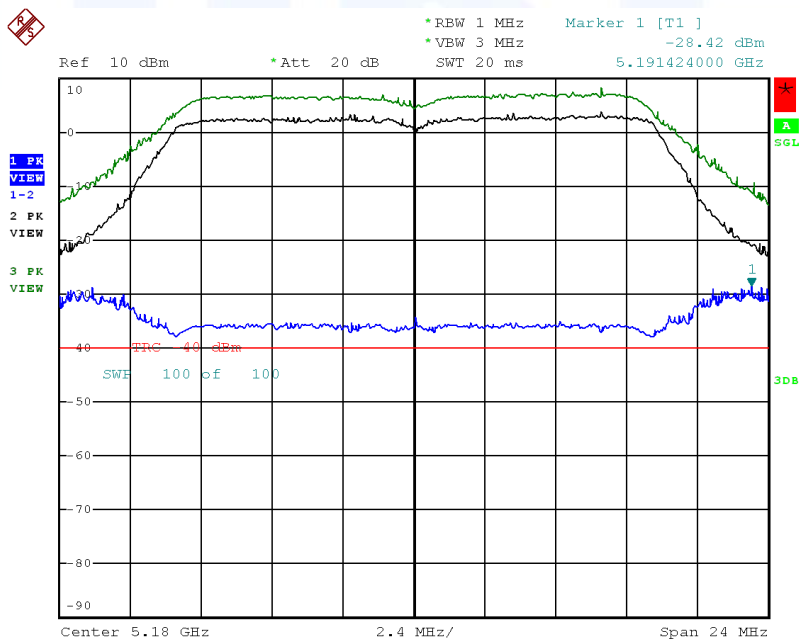
FCC-ID: LYHMPCIE1V1

Channel 44up (5230 MHz)



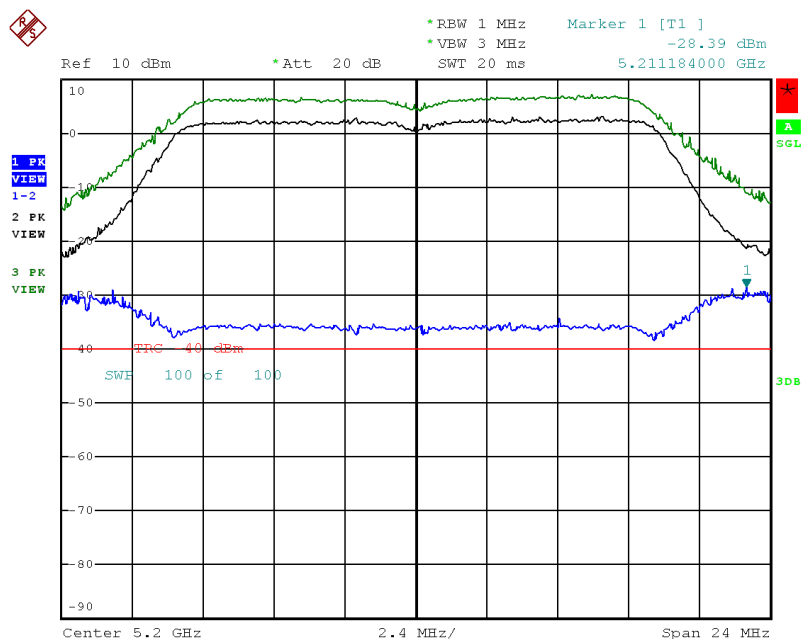
5.6.6.3 802.11a, Port1

Channel 36 (5180 MHz)

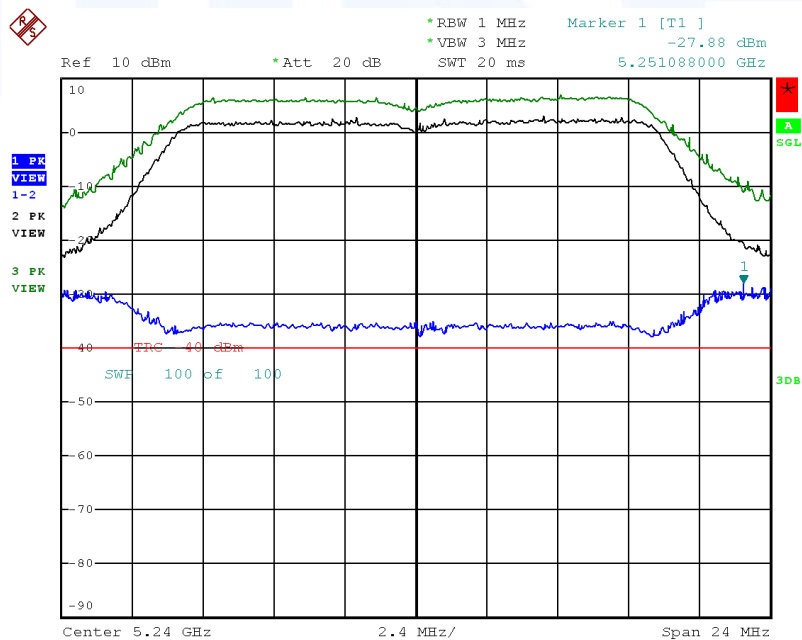


FCC-ID: LYHMPCIE1V1

Channel 40 (5200 MHz)



Channel 48 (5240 MHz)

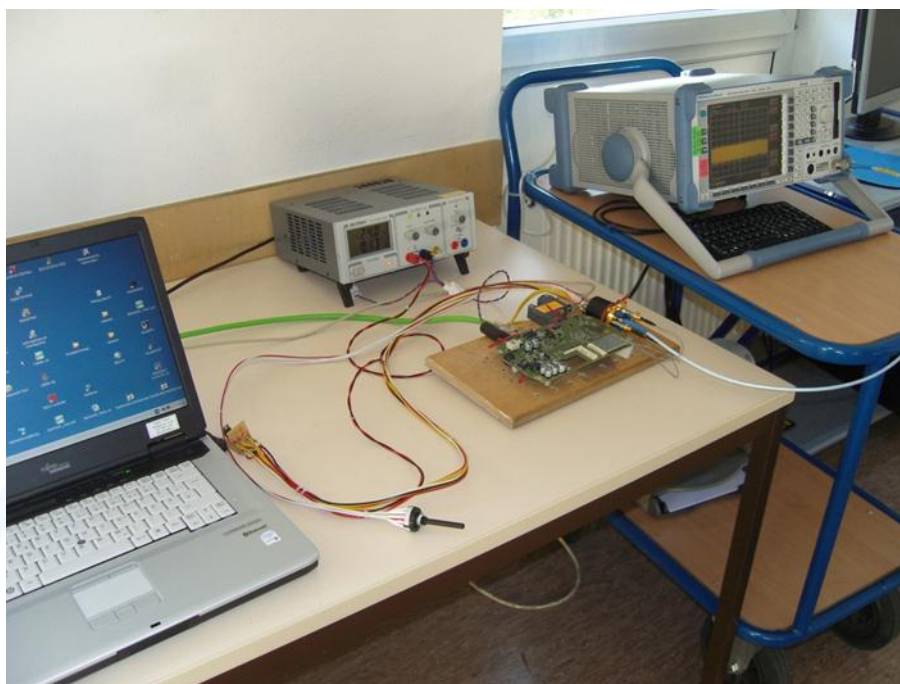


FCC-ID: LYHMPCIE1V1**5.7 Spurious emissions conducted**

For test instruments and accessories used see section 6 Part **SEC 3**.

5.7.1 Description of the test location

Test location: AREA4

5.7.2 Photo documentation of the test set-up**5.7.3 Applicable standard**

According to FCC Part 15E, Section 15.407(b):

Undesirable Emission Limits: Except as shown in Paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.

5.7.4 Description of Measurement

This measurement is done conducted scanning the frequencies from 1000 MHz to 40000 MHz according the guidelines 789033 D01, 25-10-2011.

Spectrum analyzer settings for peak values:

RBW: 1 MHz, VBW: 3 MHz, Sweep: Auto

FCC-ID: LYHMPCIE1V1
5.7.5 Test result
Frequency band: 5.15 GHz to 5.25 GHz
HT20:

Ant. group 1

PK-measurement							
Lowest frequency: CH36							
Test conditions: 2 TX, P17, MCS8							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5149.9	-34.6	6.0	-27.0	-1.6
5350	12000	1000	5460.7	-40.7	6.0	-27.0	-7.7
12000	20000	1000	16563.7	-50.3	6.0	-27.0	-17.3
20000	40000	1000	39986.4	-37.3	6.0	-27.0	-4.3
Measurement uncertainty				±3 dB			

PK-measurement							
Middle frequency: CH40							
Test conditions: 2 TX, P17, MCS8							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5144.4	-43.1	6.0	-27.0	-10.1
5350	12000	1000	5408.5	-40.7	6.0	-27.0	-7.7
12000	20000	1000	18148.3	-50.6	6.0	-27.0	-17.6
20000	40000	1000	39998.4	-37.4	6.0	-27.0	-4.4
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH48							
Test conditions: 2 TX, P17, MCS8							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	4999.4	-44.0	6.0	-27.0	-11.0
5350	12000	1000	5355.4	-42.1	6.0	-27.0	-9.1
12000	20000	1000	19687.6	-50.5	6.0	-27.0	-17.5
20000	40000	1000	39996.2	-36.8	6.0	-27.0	-3.8
Measurement uncertainty				±3 dB			

Ant. group 2

PK-measurement							
Lowest frequency: CH36							
Test conditions: 2 TX, P14, MCS8							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5148.0	-41.7	9.0	-27.0	-5.7
5350	12000	1000	5408.7	-42.9	9.0	-27.0	-6.9
12000	20000	1000	18065.1	-50.6	9.0	-27.0	-14.6
20000	40000	1000	39956.3	-37.5	9.0	-27.0	-1.5
Measurement uncertainty				±3 dB			

FCC-ID: LYHMPCIE1V1

PK-measurement							
Middle frequency: CH40							
Test conditions: 2 TX, P14, MCS8							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	4999.8	-44.5	9.0	-27.0	-8.5
5350	12000	1000	5410.1	-42.2	9.0	-27.0	-6.2
12000	20000	1000	19745.9	-50.6	9.0	-27.0	-14.6
20000	40000	1000	39984.6	-37.2	9.0	-27.0	-1.2
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH48							
Test conditions: 2 TX, P14, MCS8							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	4999.4	-47.8	9.0	-27.0	-11.8
5350	12000	1000	5359.8	-45.6	9.0	-27.0	-9.6
12000	20000	1000	18121.8	-50.1	9.0	-27.0	-14.1
20000	40000	1000	39972.5	-37.6	9.0	-27.0	-1.6
Measurement uncertainty				±3 dB			

Ant. group 3

PK-measurement							
Lowest frequency: CH36							
Test conditions: 2 TX, P8, MCS8							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5149.7	-46.9	14.2	-27.0	-5.7
5350	12000	1000	5352.4	-45.9	14.2	-27.0	-4.7
12000	20000	1000	19583.6	-50.4	14.2	-27.0	-9.2
20000	40000	1000	39999.0	-37.7	14.2	-27.0	3.5
Measurement uncertainty				±3 dB			

PK-measurement							
Middle frequency: CH40							
Test conditions: 2 TX, P8, MCS8							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	4999.2	-47.9	14.2	-27.0	-6.7
5350	12000	1000	5427.0	-45.2	14.2	-27.0	-4.0
12000	20000	1000	15656.3	-50.2	14.2	-27.0	-9.0
20000	40000	1000	39996.0	-37.1	14.2	-27.0	4.1
Measurement uncertainty				±3 dB			

FCC-ID: LYHMPCIE1V1

PK-measurement							
Highest frequency: CH48							
Test conditions: 2 TX, P8, MCS8							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	4999.4	-48.1	14.2	-27.0	-6.9
5350	12000	1000	5395.5	-46.0	14.2	-27.0	-4.8
12000	20000	1000	19745.1	-51.0	14.2	-27.0	-9.8
20000	40000	1000	39966.7	-36.8	14.2	-27.0	4.4
Measurement uncertainty				±3 dB			

Note: At 39 GHz the noise of the measurement system causes the exceeding the limit line with RBW=1 MHz. It does not result from emissions of the EUT. This is verified by a measurement, RBW=100 KHz, with 10 dB more dynamic.

HT40:

Ant. group 1

PK-measurement							
Lowest frequency: CH36up							
Test conditions: 3 TX, P17, MCS16							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5145.4	-34.3	6.0	-27.0	-1.3
5350	12000	1000	5437.2	-39.8	6.0	-27.0	-6.8
12000	20000	1000	17049.9	-48.2	6.0	-27.0	-15.2
20000	40000	1000	39989.6	-35.4	6.0	-27.0	-2.4
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH44up							
Test conditions: 3 TX, P17, MCS16							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5147.9	-47.6	6.0	-27.0	-14.6
5350	12000	1000	5384.5	-39.4	6.0	-27.0	-6.4
12000	20000	1000	18162.7	-48.6	6.0	-27.0	-15.6
20000	40000	1000	39965.5	-35.4	6.0	-27.0	-2.4
Measurement uncertainty				±3 dB			

FCC-ID: LYHMPCIE1V1

Ant. group 2

PK-measurement							
Lowest frequency: CH36up							
Test conditions: 3 TX, P14, MCS16							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5148.1	-36.5	9.0	-27.0	-0.5
5350	12000	1000	5359.2	-39.8	9.0	-27.0	-3.8
12000	20000	1000	19694.8	-48.6	9.0	-27.0	-12.6
20000	40000	1000	39998.6	-35.4	9.0	-27.0	0.6
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH44up							
Test conditions: 3 TX, P14, MCS16							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5148.0	-49.0	9.0	-27.0	-13.0
5350	12000	1000	5391.5	-40.6	9.0	-27.0	-4.6
12000	20000	1000	18159.5	-48.5	9.0	-27.0	-12.5
20000	40000	1000	39993.8	-35.0	9.0	-27.0	1.0
Measurement uncertainty				±3 dB			

Ant. group 3

PK-measurement							
Lowest frequency: CH36up							
Test conditions: 3 TX, P8, MCS16							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5149.9	-45.2	14.2	-27.0	-4.0
5350	12000	1000	5456.2	-43.8	14.2	-27.0	-2.6
12000	20000	1000	17933.1	-49.0	14.2	-27.0	-7.8
20000	40000	1000	39993.8	-35.4	14.2	-27.0	5.8
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH44up							
Test conditions: 3 TX, P8, MCS16							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	4999.4	-46.0	14.2	-27.0	-4.8
5350	12000	1000	5366.6	-44.0	14.2	-27.0	-2.8
12000	20000	1000	17105.4	-48.3	14.2	-27.0	-7.1
20000	40000	1000	39981.2	-36.1	14.2	-27.0	5.1
Measurement uncertainty				±3 dB			

Note: At 39 GHz the noise of the measurement system causes the exceeding the limit line with RBW=1 MHz. It does not result from emissions of the EUT. This is verified by a measurement, RBW=100 KHz, with 10 dB more dynamic.

FCC-ID: LYHMPCIE1V1

WLAN Standard 802.11a:

Ant. group 1

PK-measurement							
Lowest frequency: CH36							
Test conditions: 1 TX, P16, 6 Mbps							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5149.1	-34.2	6.0	-27.0	-1.2
5350	12000	1000	5467.4	-42.8	6.0	-27.0	-9.8
12000	20000	1000	18186.2	-53.8	6.0	-27.0	-20.8
20000	40000	1000	39986.2	-40.0	6.0	-27.0	-7.0
Measurement uncertainty				±3 dB			

PK-measurement							
Middle frequency: CH40							
Test conditions: 1 TX, P17, 6 Mbps							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5143.8	-46.6	6.0	-27.0	-13.6
5350	12000	1000	5457.9	-43.5	6.0	-27.0	-10.5
12000	20000	1000	19700.0	-53.5	6.0	-27.0	-20.5
20000	40000	1000	39948.3	-40.5	6.0	-27.0	-7.5
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH48							
Test conditions: 1 TX, P17, 6 Mbps							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5000.2	-47.4	6.0	-27.0	-14.4
5350	12000	1000	5366.0	-43.8	6.0	-27.0	-10.8
12000	20000	1000	19749.7	-53.2	6.0	-27.0	-20.2
20000	40000	1000	39994.8	-40.5	6.0	-27.0	-7.5
Measurement uncertainty				±3 dB			

Ant. group 2

PK-measurement							
Lowest frequency: CH36							
Test conditions: 1 TX, P14, 6 Mbps							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5148.9	-38.7	9.0	-27.0	-2.7
5350	12000	1000	5369.6	-44.0	9.0	-27.0	-8.0
12000	20000	1000	18158.5	-53.5	9.0	-27.0	-17.5
20000	40000	1000	39996.0	-40.5	9.0	-27.0	-4.5
Measurement uncertainty				±3 dB			

FCC-ID: LYHMPCIE1V1

PK-measurement							
Middle frequency: CH40							
Test conditions: 1 TX, P14, 6 Mbps							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	4999.4	-47.9	9.0	-27.0	-11.9
5350	12000	1000	5360.0	-44.2	9.0	-27.0	-8.2
12000	20000	1000	18728.9	-53.4	9.0	-27.0	-17.4
20000	40000	1000	39939.7	-40.7	9.0	-27.0	-4.7
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH48							
Test conditions: 1 TX, P14, 6 Mbps							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	4999.6	-48.5	9.0	-27.0	-12.5
5350	12000	1000	5384.5	-45.6	9.0	-27.0	-9.6
12000	20000	1000	18630.3	-53.7	9.0	-27.0	-17.7
20000	40000	1000	39994.6	-39.2	9.0	-27.0	-3.2
Measurement uncertainty				±3 dB			

Ant. group 3

PK-measurement							
Lowest frequency: CH36							
Test conditions: 1 TX, P8, 6 Mbps							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5149.4	-48.9	14.2	-27.0	-7.7
5350	12000	1000	5415.5	-49.3	14.2	-27.0	-8.1
12000	20000	1000	18120.0	-53.4	14.2	-27.0	-12.2
20000	40000	1000	39989.6	-40.8	14.2	-27.0	0.4
Measurement uncertainty				±3 dB			

PK-measurement							
Middle frequency: CH40							
Test conditions: 1 TX, P8, 6 Mbps							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	4999.6	-51.2	14.2	-27.0	-10.0
5350	12000	1000	5355.2	-48.7	14.2	-27.0	-7.5
12000	20000	1000	19720.4	-54.1	14.2	-27.0	-12.9
20000	40000	1000	39996.4	-39.6	14.2	-27.0	1.6
Measurement uncertainty				±3 dB			

FCC-ID: LYHMPCIE1V1

PK-measurement							
Highest frequency: CH48							
Test conditions: 1 TX, P8, 6 Mbps							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
1000	5150	1000	5000.0	-51.4	14.2	-27.0	-10.2
5350	12000	1000	5445.2	-48.4	14.2	-27.0	-7.2
12000	20000	1000	18203.2	-53.3	14.2	-27.0	-12.1
20000	40000	1000	39987.4	-38.9	14.2	-27.0	2.3
Measurement uncertainty				±3 dB			

Note: At 39 GHz the noise of the measurement system causes the exceeding the limit line with RBW=1 MHz. It does not result from emissions of the EUT. This is verified by a measurement, RBW=100 KHz, with 10 dB more dynamic.

Limit according to FCC Part 15E, Section 15.407(b) for undesirable emissions outside of the operating range:

Operating Frequency range	Undesirable emission limit, EIRP
(MHz)	(dBm/MHz)
5150 - 5250	-27.0

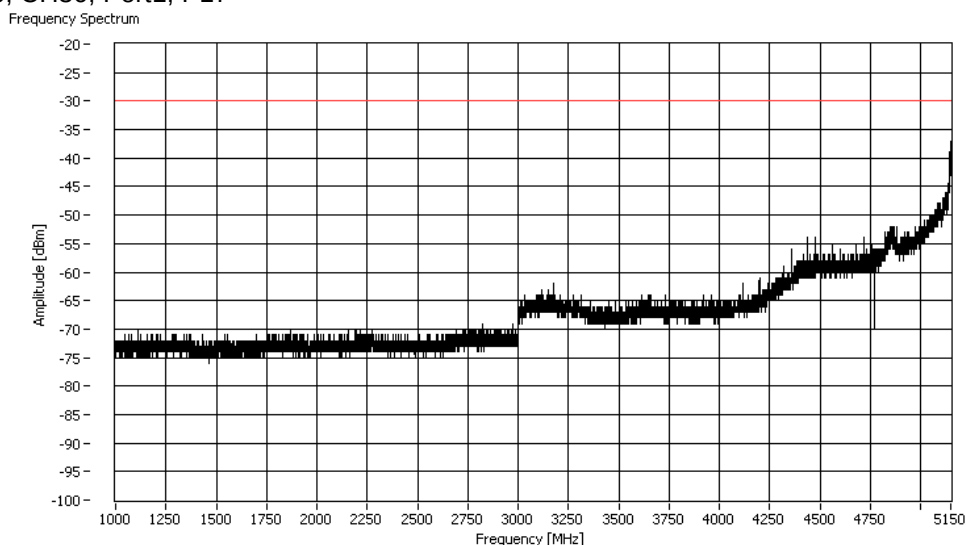
The requirements are **FULFILLED**.

Remarks: For detailed test results please see the following test protocols. Only the worst cases of the plots are listed.

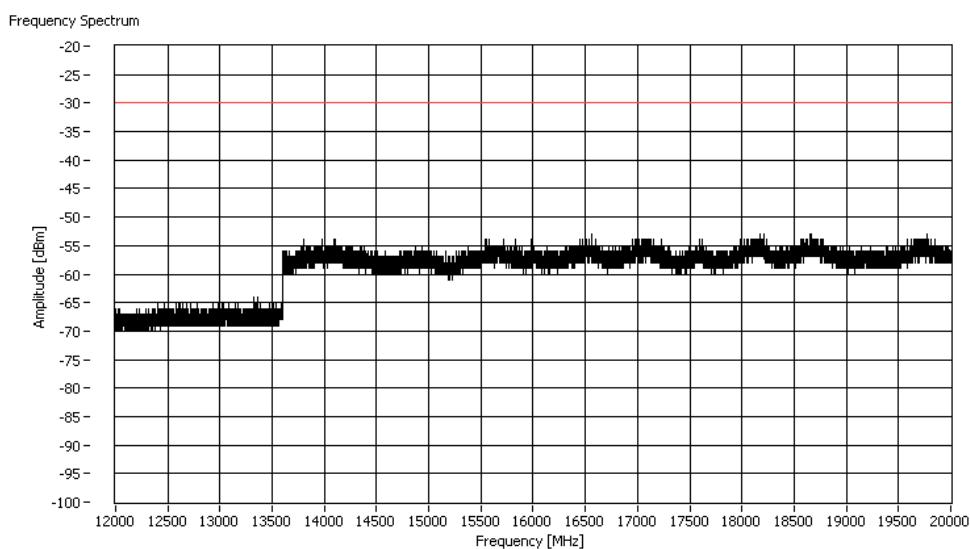
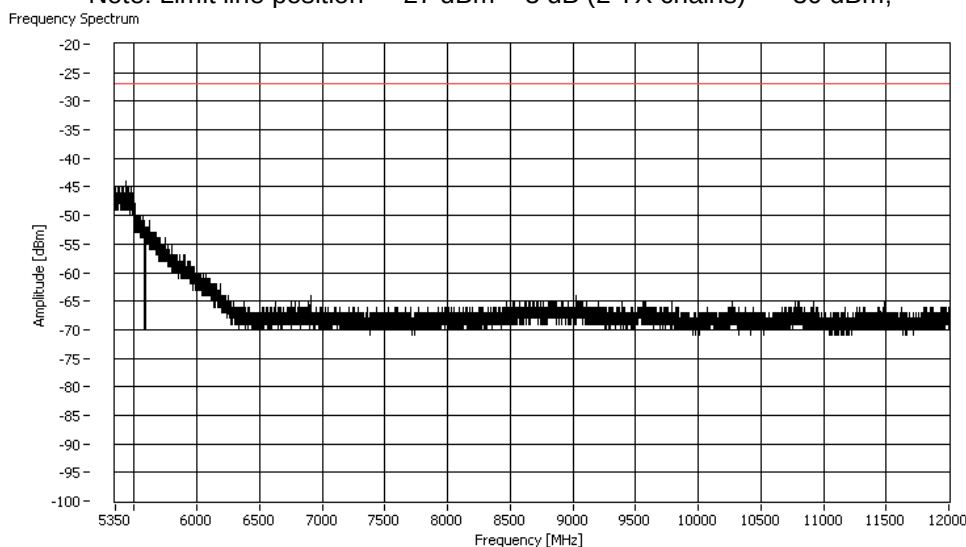
FCC-ID: LYHMPCIE1V1

5.7.6 Test protocols SEC

5.7.6.1 HT20, CH36, Port1, P17

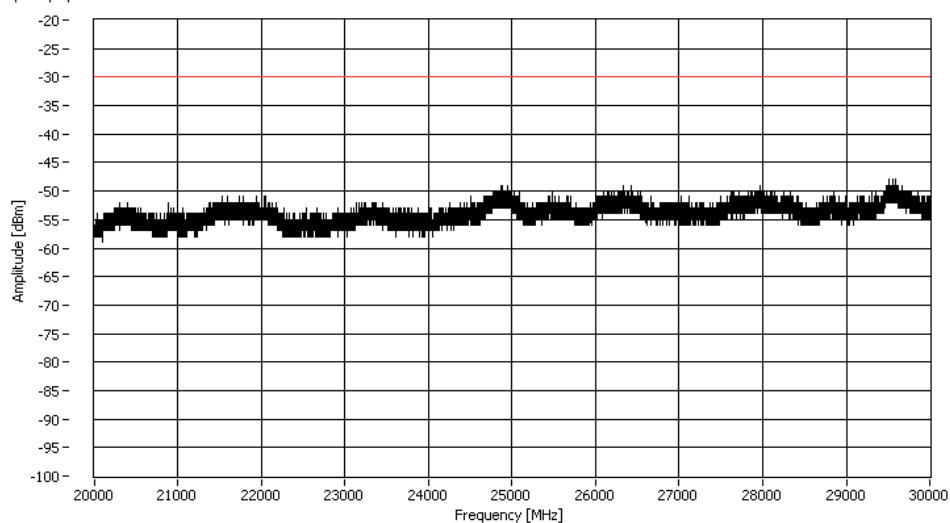


Note: Limit line position = $-27 \text{ dBm} - 3 \text{ dB (2 TX chains)} = -30 \text{ dBm}$;

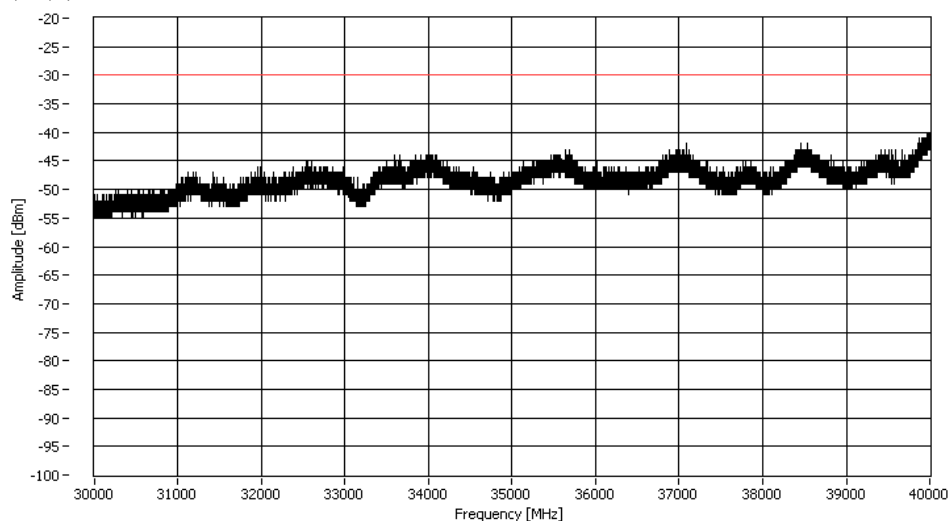


FCC-ID: LYHMPCIE1V1

Frequency Spectrum



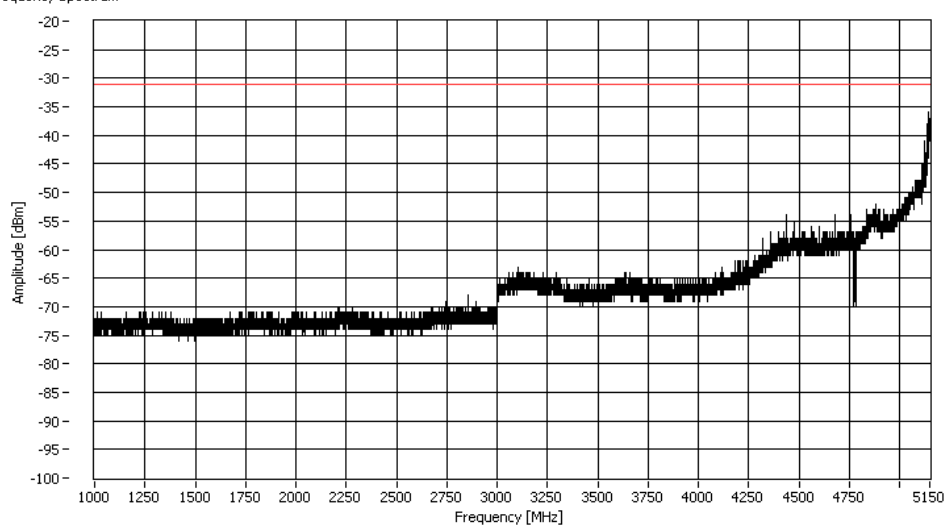
Frequency Spectrum



FCC-ID: LYHMPCIE1V1

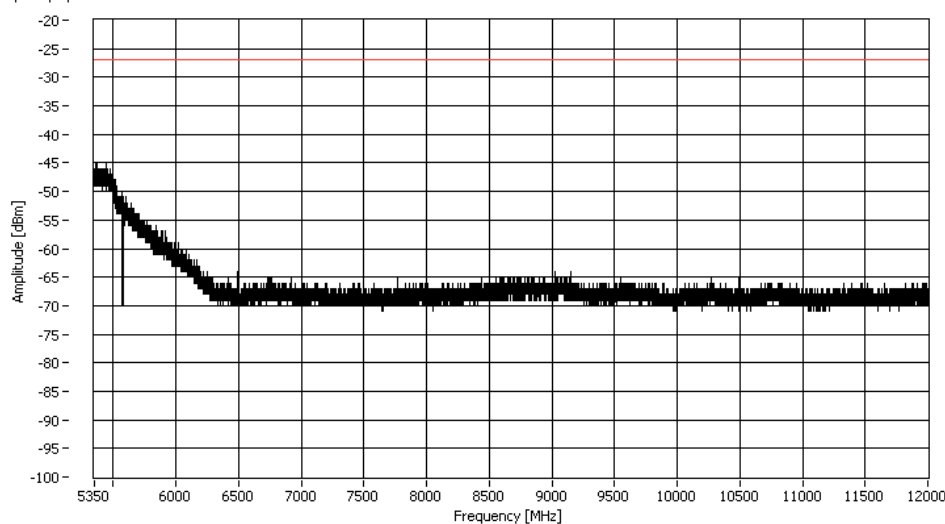
5.7.6.2 HT40, CH36up, Port1, P17

Frequency Spectrum

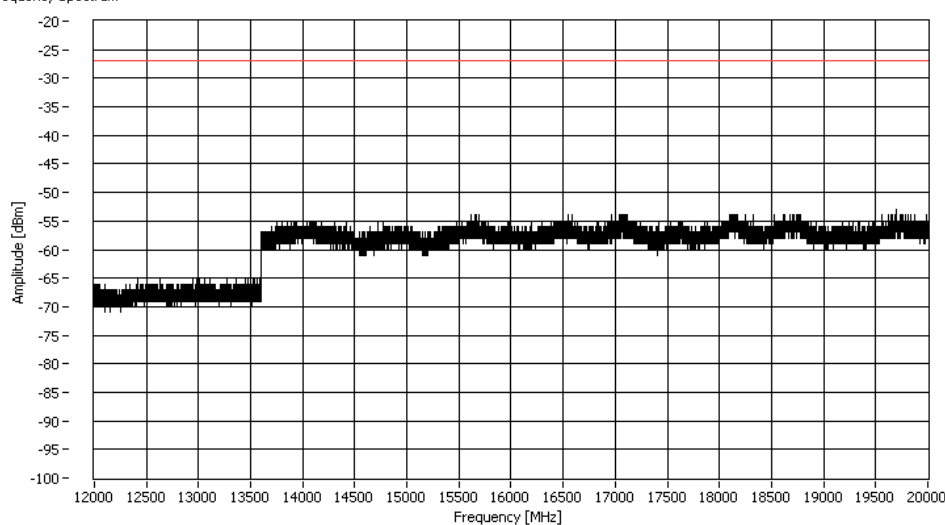


Note: Limit line position = $-27 \text{ dBm} - 4.8 \text{ dB}$ (3 TX chains) = -31.8 dBm ;

Frequency Spectrum

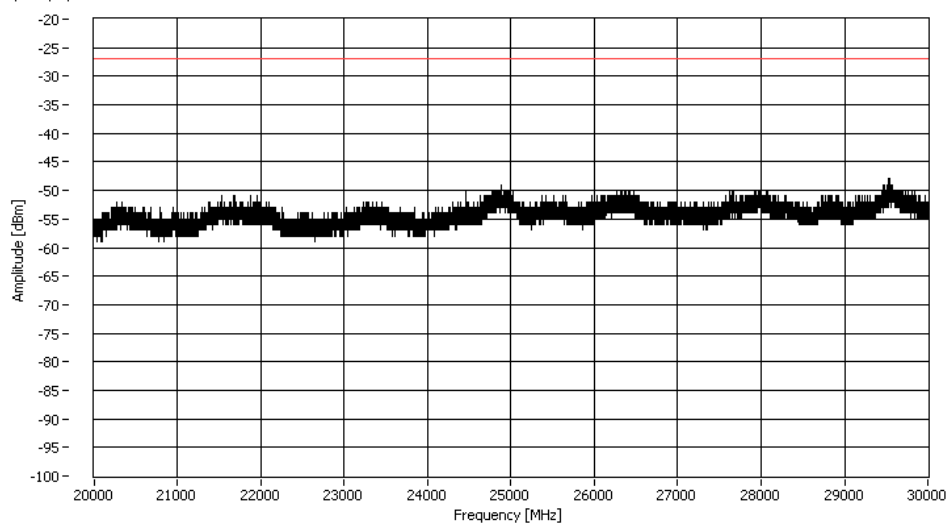


Frequency Spectrum

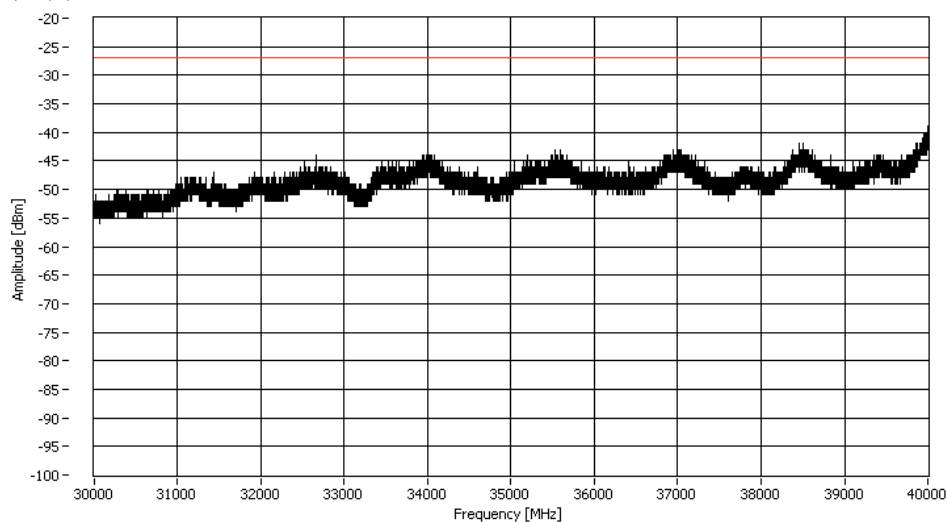


FCC-ID: LYHMPCIE1V1

Frequency Spectrum

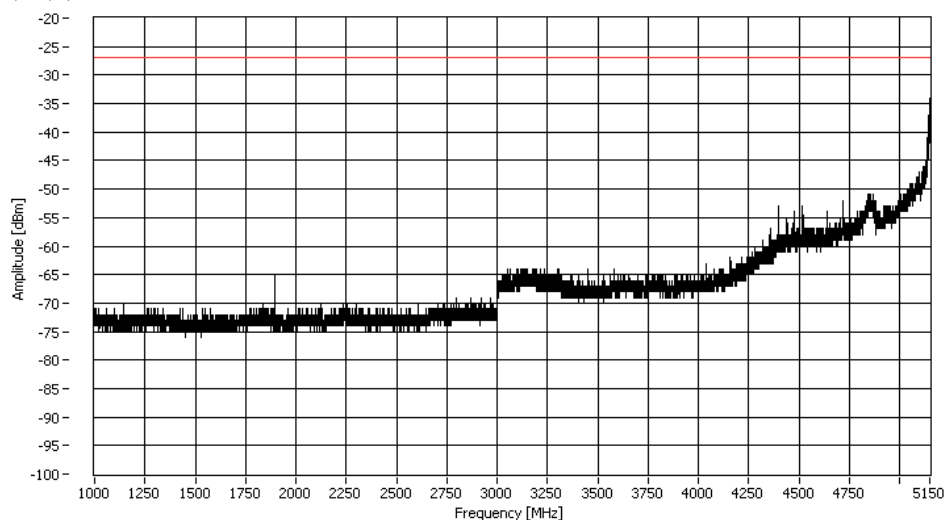


Frequency Spectrum



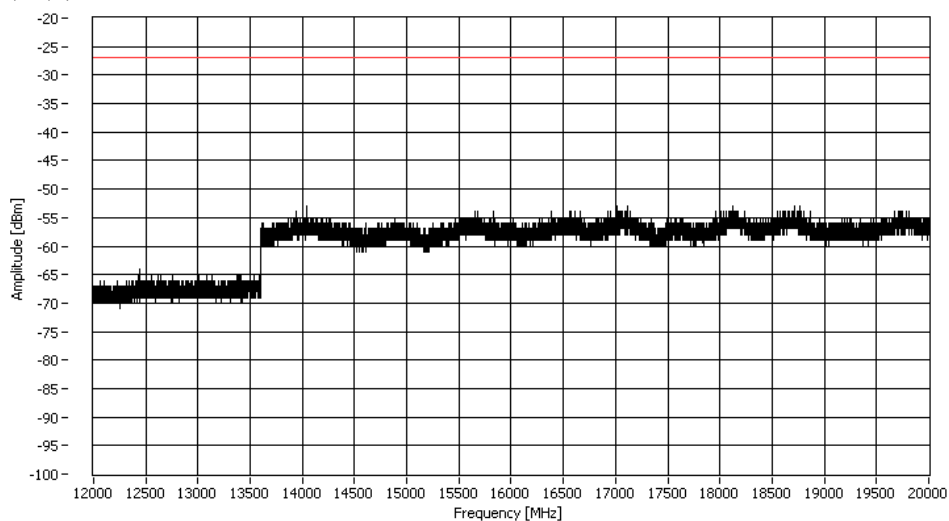
5.7.6.3 802.11a, CH36, Port1, P16

Frequency Spectrum

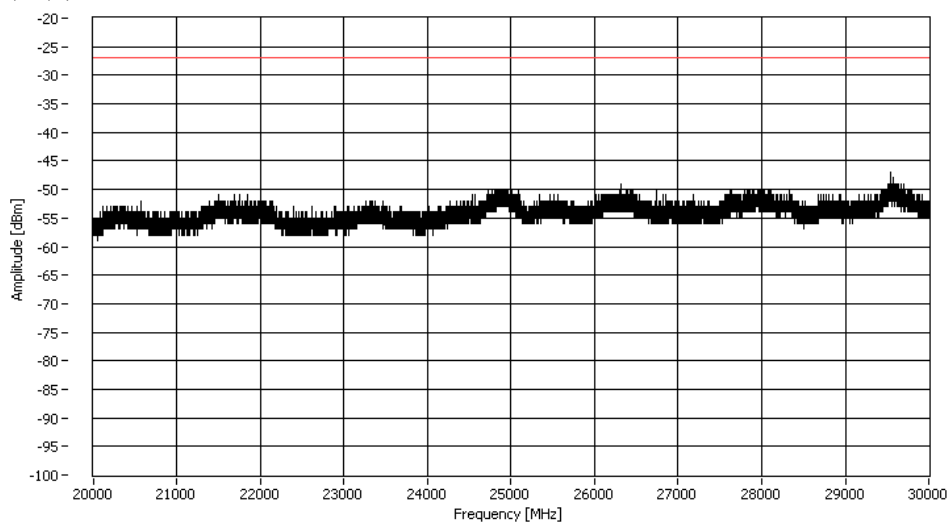


FCC-ID: LYHMPCIE1V1

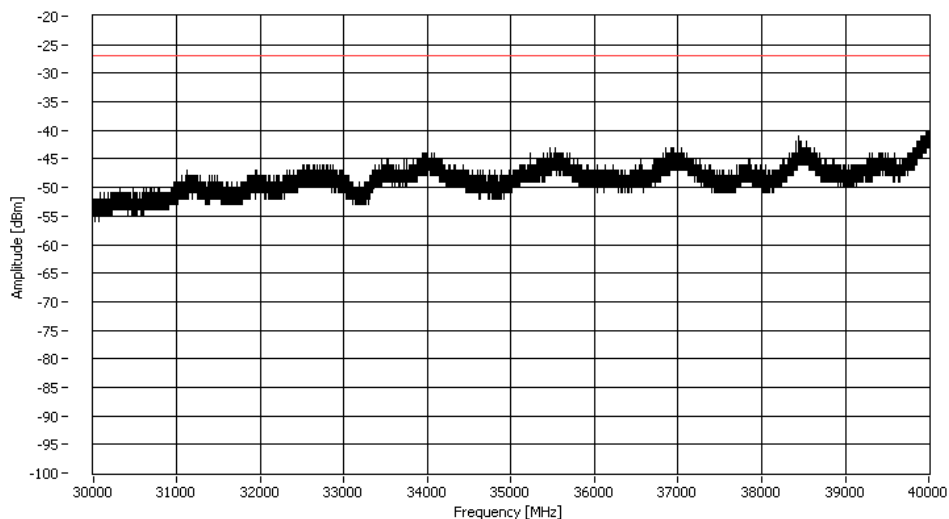
Frequency Spectrum



Frequency Spectrum

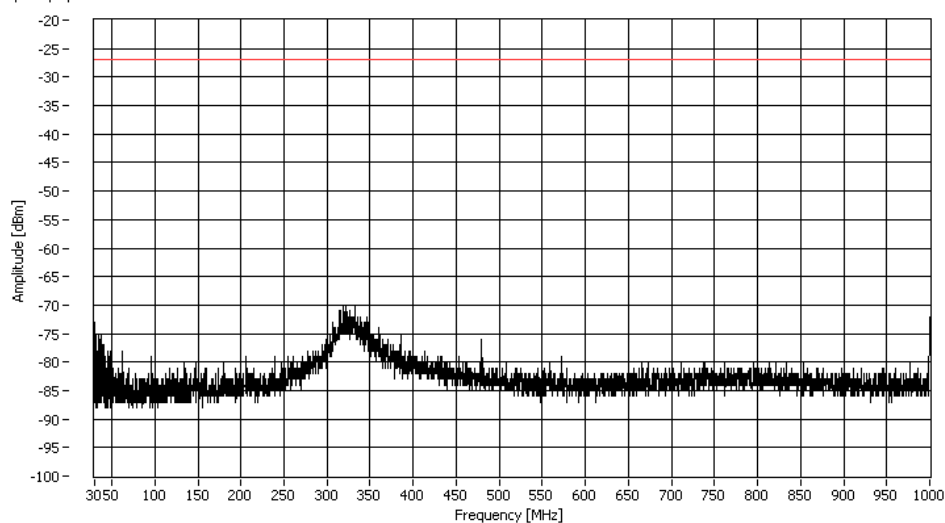


Frequency Spectrum

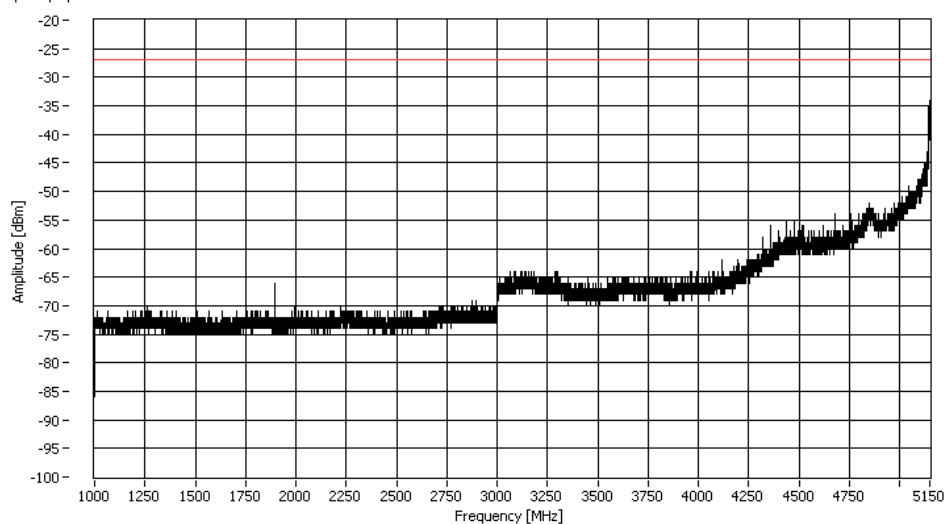


FCC-ID: LYHMPCIE1V1

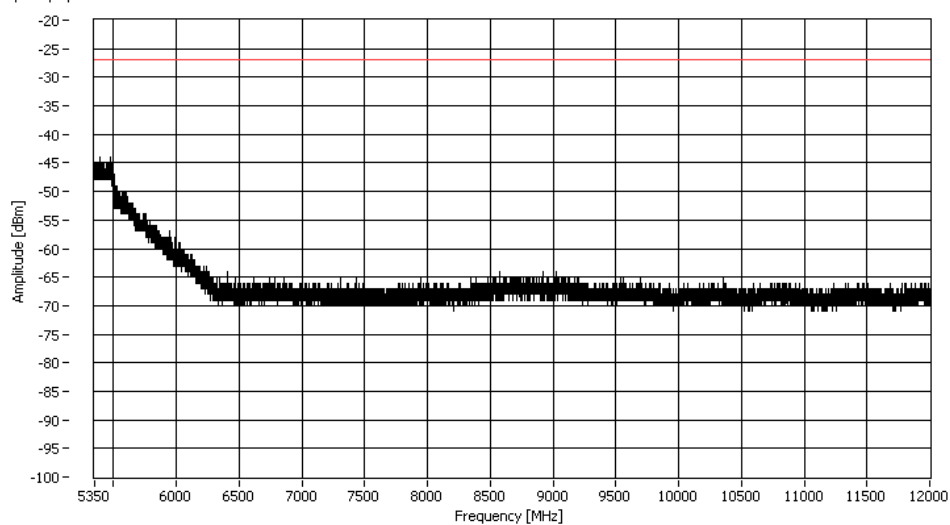
Frequency Spectrum



Frequency Spectrum

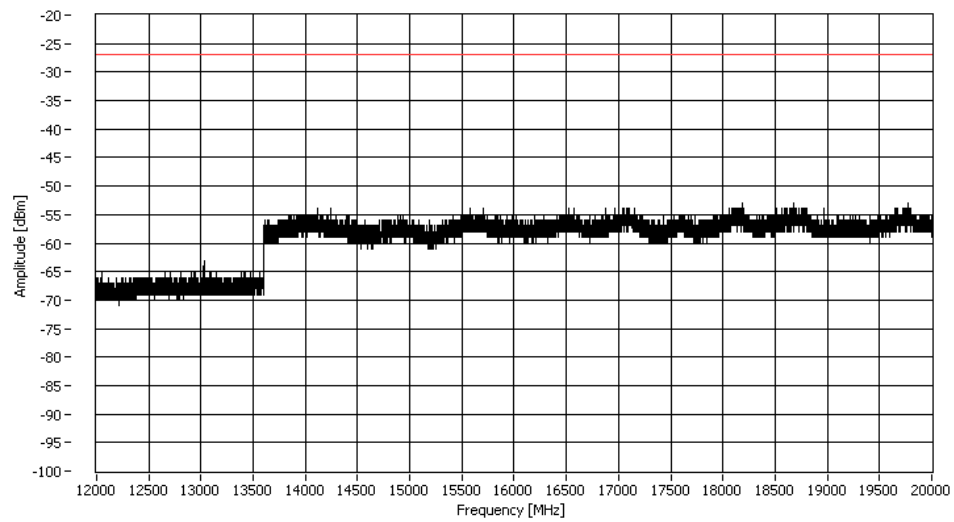


Frequency Spectrum

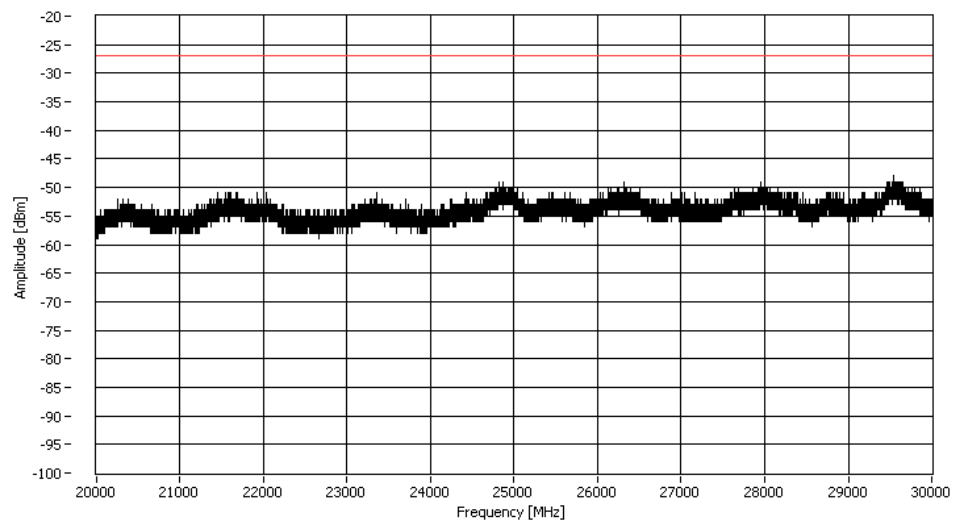


FCC-ID: LYHMPCIE1V1

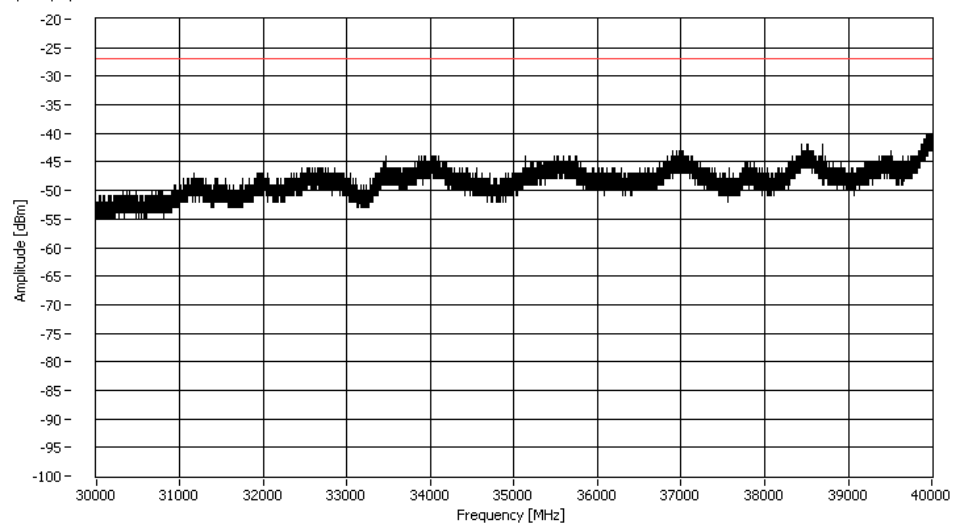
Frequency Spectrum



Frequency Spectrum



Frequency Spectrum



FCC-ID: LYHMPCIE1V1

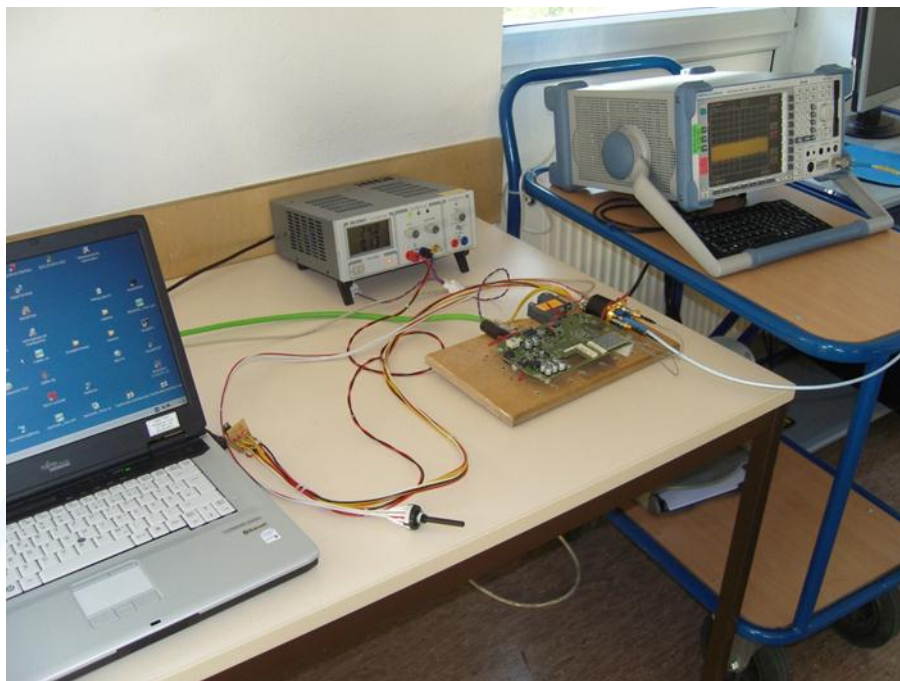
5.8 Spurious emissions conducted, in restricted bands

For test instruments and accessories used see section 6 Part **SEC 1**, **SEC 2** and **SEC 3**.

5.8.1 Description of the test location

Test location: AREA4

5.8.2 Photo documentation of the test set-up



5.8.3 Applicable standard

According to FCC Part 15, Section 15.407(b)(6):

Undesirable Emission Limits: Except as shown in Paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209.

5.8.4 Description of Measurement

The spurious emissions below 1 GHz and emissions falling in the restricted bands greater 1 GHz are measured conducted using a spectrum analyser in a test setup following the procedures set out in OET 789033 D01 for UNII-Devices. The conducted limit in EIRP is converted according OET 789033 D01, Item G) 1) d) ii) to the absolute radiated limit. The cable loss is taken into account. For this MIMO transmitter the antenna output chain 1 is measured and the chain 2 and chain 3 is taken into account with the formula according OET 662911, $10 \log(N)$, where N is the number of outputs. The measurement is performed at normal test conditions in modulated TX continuous mode. The observed spurious emissions falling into restricted bands are measured again under the provisions of Section 15.209(a).

Spectrum analyser settings:

$9 \text{ kHz} < f < 150 \text{ kHz}$:	RBW: 300 Hz,	VBW: 1 kHz,	Detector: Max peak,	Trace Mode: Max hold
$150 \text{ kHz} < f < 30 \text{ MHz}$:	RBW: 10 kHz,	VBW: 30 kHz,	Detector: Max peak,	Trace Mode: Max hold
$30 \text{ MHz} < f < 1000 \text{ MHz}$:	RBW: 100 kHz,	VBW: 300 kHz,	Detector: Max peak,	Trace Mode: Max hold
$f > 1000 \text{ MHz}$:	RBW: 1 MHz,	VBW: 3 MHz,	Detector: Max peak,	Trace Mode: Max hold

FCC-ID: LYHMPCIE1V1

5.8.5 Test result

G_{out} is the assumed antenna gain out of operating band

G_{in} is the in-band antenna gain of operating band

CDD-Modes: In case of HT20 and HT40 is falling back into CDD-Modes, the data stream out of the ports will be time jittered this is the reason why the harmonics and spurious emissions in the band edges are considered completely uncorrelated.

Frequency range 5150 – 5250 MHz:

HT20:

Ant. group 1

PK-measurement							
Lowest frequency: CH36							
Test conditions: 2 TX, P17, MCS8							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5150	60.6	6.0	74.0	-7.4
5350	5460	1000	5352	54.0	6.0	74.0	-14.0
7250	7750	1000	7615	31.8	6.0	74.0	-36.2
Measurement uncertainty				±3 dB			

AV-measurement							
Lowest frequency: CH36							
Test conditions: 2 TX, P17				Test results			
f	E	RBW	G_{in}	G_{out}	E	AV Limit	Margin
(MHz)	(dB μ V/m)	(kHz)	(dBi)	(dBi)	(dB μ V/m)	(dB μ V/m)	(dB)
5150.0	46.7	1000	6.0	6.0	52.7	54.0	-1.3
5359.4	41.7	1000	6.0	6.0	47.7	54.0	-6.3
Measurement uncertainty				± 3 dB			

PK-measurement							
Middle frequency: CH40							
Test conditions: 2 TX, P17, MCS8							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5144	52.1	6.0	74.0	-15.9
5350	5460	1000	5408	54.5	6.0	74.0	-13.5
7250	7750	1000	7281	33.0	6.0	74.0	-35.0
Measurement uncertainty				±3 dB			

AV-measurement							
Middle frequency: CH40							
Test conditions: 2 TX, P17				Test results			
f	A	RBW	G_{in}	G_{out}	E	AV Limit	Margin
(MHz)	(dB μ V/m)	(kHz)	(dBi)	(dBi)	(dB μ V/m)	(dB μ V/m)	(dB)
5150.0	40.9	1000	6.0	6.0	46.9	54.0	-7.1
5360.1	42.6	1000	6.0	6.0	48.6	54.0	-5.4
Measurement uncertainty				± 3 dB			

FCC-ID: LYHMPCIE1V1

PK-measurement							
Highest frequency: CH48							
Test conditions: 2 TX, P17, MCS8							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	4999	51.2	6.0	74.0	-16.8
5350	5460	1000	5355	53.1	6.0	74.0	-14.9
7250	7750	1000	7616	32.3	6.0	74.0	-35.7
Measurement uncertainty				±3 dB			

AV-measurement							
Highest frequency: CH48							
Test conditions: 2 TX, P17				Test results			
<i>f</i>	<i>A</i>	RBW	<i>G</i> _{in}	<i>G</i> _{out}	<i>E</i>	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	39.2	1000	6.0	6.0	45.2	54.0	-8.8
5374.4	41.6	1000	6.0	6.0	47.6	54.0	-6.4
Measurement uncertainty				±3 dB			

Ant. group 2

PK-measurement							
Lowest frequency: CH36							
Test conditions: 2 TX, P14, MCS8							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5148	53.5	9.0	74.0	-11.5
5350	5460	1000	5409	52.3	9.0	74.0	-12.7
7250	7750	1000	7460	32.8	9.0	74.0	-32.2
Measurement uncertainty				±3 dB			

AV-measurement							
Lowest frequency: CH36							
Test conditions: 2 TX, P14				Test results			
<i>f</i>	<i>A</i>	RBW	<i>G</i> _{in}	<i>G</i> _{out}	<i>E</i>	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	43.6	1000	9.0	9.0	52.6	54.0	-1.4
5374.4	40.9	1000	9.0	9.0	49.9	54.0	-4.1
Measurement uncertainty				±3 dB			

PK-measurement							
Middle frequency: CH40							
Test conditions: 2 TX, P14, MCS8							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5000	50.7	9.0	74.0	-14.3
5350	5460	1000	5410	53.0	9.0	74.0	-12.0
7250	7750	1000	7490	31.5	9.0	74.0	-33.5
Measurement uncertainty				±3 dB			

FCC-ID: LYHMPCIE1V1

AV-measurement							
Middle frequency: CH40							
Test conditions: 2 TX, P14				Test results			
<i>f</i>	A	RBW	G _{in}	G _{out}	E	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	38.2	1000	9.0	9.0	47.2	54.0	-6.8
5366.2	40.8	1000	9.0	9.0	49.8	54.0	-4.2
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH48							
Test conditions: 2 TX, P14, MCS8							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	4999	47.4	9.0	74.0	-17.6
5350	5460	1000	5360	49.6	9.0	74.0	-15.4
7250	7750	1000	7307	31.8	9.0	74.0	-33.2
Measurement uncertainty				±3 dB			

AV-measurement							
Highest frequency: CH48							
Test conditions: 2 TX, P14				Test results			
<i>f</i>	A	RBW	G _{in}	G _{out}	E	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	37.1	1000	9.0	9.0	46.1	54.0	-7.9
5374.4	38.1	1000	9.0	9.0	47.1	54.0	-6.9
Measurement uncertainty				±3 dB			

Ant. group 3

PK-measurement							
Lowest frequency: CH36							
Test conditions: 2 TX, P8, MCS8							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5150	48.3	14.2	74.0	-11.5
5350	5460	1000	5352	49.3	14.2	74.0	-10.5
7250	7750	1000	7412	31.8	14.2	74.0	-28.0
Measurement uncertainty				±3 dB			

AV-measurement							
Lowest frequency: CH36							
Test conditions: 2 TX, P8				Test results			
<i>f</i>	A	RBW	G _{in}	G _{out}	E	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	38.8	1000	14.2	14.2	53.0	54.0	-1.0
5374.2	37.7	1000	14.2	14.2	51.9	54.0	-2.1
Measurement uncertainty				±3 dB			

FCC-ID: LYHMPCIE1V1

PK-measurement							
Middle frequency: CH40							
Test conditions: 2 TX, P8, MCS8							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	4999	47.3	14.2	74.0	-12.5
5350	5460	1000	5427	50.0	14.2	74.0	-9.8
7250	7750	1000	7471	32.5	14.2	74.0	-27.3
Measurement uncertainty				±3 dB			

AV-measurement							
Middle frequency: CH40							
Test conditions: 2 TX, P8				Test results			
<i>f</i>	<i>A</i>	RBW	<i>G</i> _{in}	<i>G</i> _{out}	<i>E</i>	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	36.1	1000	14.2	14.2	50.3	54.0	-3.7
5366.9	37.7	1000	14.2	14.2	51.9	54.0	-2.1
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH48							
Test conditions: 2 TX, P8, MCS8							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	4999	47.1	14.2	74.0	-12.7
5350	5460	1000	5396	49.2	14.2	74.0	-10.6
7250	7750	1000	7736	31.8	14.2	74.0	-28.0
Measurement uncertainty				±3 dB			

AV-measurement							
Highest frequency: CH48							
Test conditions: 2 TX, P8				Test results			
<i>f</i>	<i>A</i>	RBW	<i>G</i> _{in}	<i>G</i> _{out}	<i>E</i>	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	35.2	1000	14.2	14.2	49.4	54.0	-4.6
5384.7	37.9	1000	14.2	14.2	52.1	54.0	-1.9
Measurement uncertainty				±3 dB			

FCC-ID: LYHMPCIE1V1
HT40:

Ant. group 1

PK-measurement							
Lowest frequency: CH36up							
Test conditions: 3 TX, P17, MCS16							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5146	63.4	6.0	74.0	-4.6
5350	5460	1000	5437	55.4	6.0	74.0	-12.6
7250	7750	1000	7269	34.2	6.0	74.0	-33.8
Measurement uncertainty				±3 dB			

AV-measurement							
Lowest frequency: CH36up							
Test conditions: 3 TX, P16				Test results			
<i>f</i>	<i>E</i>	RBW	<i>G</i> _{in}	<i>G</i> _{out}	<i>E</i>	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	47.8	1000	6.0	6.0	53.8	54.0	-0.2
5374.4	41.7	1000	6.0	6.0	47.7	54.0	-6.3
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH44up							
Test conditions: 3 TX, P17, MCS16							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5148	63.7	6.0	74.0	-4.3
5350	5460	1000	5385	55.8	6.0	74.0	-12.2
7250	7750	1000	7570	34.4	6.0	74.0	-33.6
Measurement uncertainty				±3 dB			

AV-measurement							
Highest frequency: CH44up							
Test conditions: 3 TX, P17				Test results			
<i>f</i>	<i>A</i>	RBW	<i>G</i> _{in}	<i>G</i> _{out}	<i>E</i>	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	40.0	1000	6.0	6.0	46.0	54.0	-8.0
5374.4	42.2	1000	6.0	6.0	48.2	54.0	-5.8
Measurement uncertainty				±3 dB			

FCC-ID: LYHMPCIE1V1

Ant. group 2

PK-measurement							
Lowest frequency: CH36up							
Test conditions: 3 TX, P14, MCS16							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5149	59.5	9.0	74.0	-5.5
5350	5460	1000	5359	55.4	9.0	74.0	-9.6
7250	7750	1000	7674	34.0	9.0	74.0	-31.0
Measurement uncertainty				±3 dB			

AV-measurement							
Lowest frequency: CH36up							
Test conditions: 3 TX, P14				Test results			
<i>f</i>	<i>A</i>	RBW	<i>G</i> _{in}	<i>G</i> _{out}	<i>E</i>	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	44.8	1000	9.0	9.0	53.8	54.0	-0.2
5374.4	41.6	1000	9.0	9.0	50.6	54.0	-3.4
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH44up							
Test conditions: 3 TX, P14, MCS16							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5148	60.3	9.0	74.0	-4.7
5350	5460	1000	5392	54.6	9.0	74.0	-10.4
7250	7750	1000	7276	33.9	9.0	74.0	-31.1
Measurement uncertainty				±3 dB			

AV-measurement							
Highest frequency: CH44up							
Test conditions: 3 TX, P14				Test results			
<i>f</i>	<i>A</i>	RBW	<i>G</i> _{in}	<i>G</i> _{out}	<i>E</i>	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	37.8	1000	9.0	9.0	46.8	54.0	-7.2
5374.4	39.3	1000	9.0	9.0	48.3	54.0	-5.7
Measurement uncertainty				±3 dB			

Ant. group 3

PK-measurement							
Lowest frequency: CH36up							
Test conditions: 3 TX, P8, MCS16							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5150	50.0	14.2	74.0	-9.8
5350	5460	1000	5456	51.4	14.2	74.0	-8.4
7250	7750	1000	7642	33.4	14.2	74.0	-26.4
Measurement uncertainty				±3 dB			

FCC-ID: LYHMPCIE1V1

AV-measurement							
Lowest frequency: CH36up							
Test conditions: 3 TX, P8				Test results			
f	A	RBW	G_{in}	G_{out}	E	AV Limit	Margin
(MHz)	(dB μ V/m)	(kHz)	(dBi)	(dBi)	(dB μ V/m)	(dB μ V/m)	(dB)
5150.0	39.4	1000	14.2	14.2	53.6	54.0	-0.4
5374.4	38.5	1000	14.2	14.2	52.7	54.0	-1.3
Measurement uncertainty				± 3 dB			

PK-measurement							
Highest frequency: CH44up							
Test conditions: 3 TX, P8, MCS16							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	4999	49.2	14.2	74.0	-10.6
5350	5460	1000	5367	51.2	14.2	74.0	-8.6
7250	7750	1000	7277	33.4	14.2	74.0	-26.4
Measurement uncertainty				±3 dB			

AV-measurement							
Highest frequency: CH44up							
Test conditions: 3 TX, P8				Test results			
f	A	RBW	G_{in}	G_{out}	E	AV Limit	Margin
(MHz)	(dB μ V/m)	(kHz)	(dBi)	(dBi)	(dB μ V/m)	(dB μ V/m)	(dB)
5150.0	36.5	1000	14.2	14.2	50.7	54.0	-3.3
5397.7	38.4	1000	14.2	14.2	52.6	54.0	-1.4
Measurement uncertainty				± 3 dB			

802.11a:

Ant. group 1

PK-measurement							
Lowest frequency: CH36							
Test conditions: 1 TX, P16, 6 Mbps							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5149	61.0	6.0	74.0	-7.0
5350	5460	1000	5397	52.2	6.0	74.0	-15.8
7250	7750	1000	7615	29.0	6.0	74.0	-39.0
Measurement uncertainty				±3 dB			

AV-measurement							
Lowest frequency: CH36							
Test conditions: 1 TX, P16				Test results			
f	E	RBW	G_{in}	G_{out}	E	AV Limit	Margin
(MHz)	(dB μ V/m)	(kHz)	(dBi)	(dBi)	(dB μ V/m)	(dB μ V/m)	(dB)
5150.0	45.0	1000	6.0	6.0	51.0	54.0	-3.0
5374.4	40.0	1000	6.0	6.0	46.0	54.0	-8.0
Measurement uncertainty				± 3 dB			

FCC-ID: LYHMPCIE1V1

PK-measurement							
Middle frequency: CH40							
Test conditions: 1 TX, P17, 6 Mbps							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5144	48.6	6.0	74.0	-19.4
5350	5460	1000	5458	51.7	6.0	74.0	-16.3
7250	7750	1000	7304	29.2	6.0	74.0	-38.8
Measurement uncertainty				±3 dB			

AV-measurement							
Middle frequency: CH40							
Test conditions: 1 TX, P17				Test results			
<i>f</i>	<i>A</i>	RBW	<i>G</i> _{in}	<i>G</i> _{out}	<i>E</i>	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	38.3	1000	6.0	6.0	44.3	54.0	-9.7
5374.4	39.5	1000	6.0	6.0	45.5	54.0	-8.5
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH48							
Test conditions: 1 TX, P17, 6 Mbps							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5000	47.8	6.0	74.0	-20.2
5350	5460	1000	5366	51.4	6.0	74.0	-16.6
7250	7750	1000	7289	29.1	6.0	74.0	-38.9
Measurement uncertainty				±3 dB			

AV-measurement							
Highest frequency: CH48							
Test conditions: 1 TX, P17				Test results			
<i>f</i>	<i>A</i>	RBW	<i>G</i> _{in}	<i>G</i> _{out}	<i>E</i>	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	36.9	1000	6.0	6.0	42.9	54.0	-11.1
5360.7	39.7	1000	6.0	6.0	45.7	54.0	-8.3
Measurement uncertainty				±3 dB			

Ant. group 2

PK-measurement							
Lowest frequency: CH36							
Test conditions: 1 TX, P14, 6 Mbps							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5149	56.5	9.0	74.0	-8.5
5350	5460	1000	5370	51.2	9.0	74.0	-13.8
7250	7750	1000	7310	29.4	9.0	74.0	-35.6
Measurement uncertainty				±3 dB			

FCC-ID: LYHMPCIE1V1

AV-measurement							
Lowest frequency: CH36							
Test conditions: 1 TX, P14				Test results			
f	A	RBW	G_{in}	G_{out}	E	AV Limit	Margin
(MHz)	(dB μ V/m)	(kHz)	(dBi)	(dBi)	(dB μ V/m)	(dB μ V/m)	(dB)
5150.0	42.3	1000	9.0	9.0	51.3	54.0	-2.7
5374.4	39.4	1000	9.0	9.0	48.4	54.0	-5.6
Measurement uncertainty				± 3 dB			

PK-measurement							
Middle frequency: CH40							
Test conditions: 1 TX, P14, 6 Mbps							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	4999	47.3	9.0	74.0	-17.7
5350	5460	1000	5360	51.0	9.0	74.0	-14.0
7250	7750	1000	7601	29.0	9.0	74.0	-36.0
Measurement uncertainty				±3 dB			

AV-measurement							
Middle frequency: CH40							
Test conditions: 1 TX, P14				Test results			
f	A	RBW	G_{in}	G_{out}	E	AV Limit	Margin
(MHz)	(dB μ V/m)	(kHz)	(dBi)	(dBi)	(dB μ V/m)	(dB μ V/m)	(dB)
5150.0	37.5	1000	9.0	9.0	46.5	54.0	-7.5
5380.8	39.4	1000	9.0	9.0	48.4	54.0	-5.6
Measurement uncertainty				± 3 dB			

PK-measurement							
Highest frequency: CH48							
Test conditions: 1 TX, P14, 6 Mbps							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5000	46.7	9.0	74.0	-18.3
5350	5460	1000	5385	49.6	9.0	74.0	-15.4
7250	7750	1000	7736	28.7	9.0	74.0	-36.3
Measurement uncertainty				±3 dB			

AV-measurement							
Highest frequency: CH48							
Test conditions: 1 TX, P14				Test results			
f	A	RBW	G_{in}	G_{out}	E	AV Limit	Margin
(MHz)	(dB μ V/m)	(kHz)	(dBi)	(dBi)	(dB μ V/m)	(dB μ V/m)	(dB)
5150.0	35.9	1000	9.0	9.0	44.9	54.0	-9.1
5373.3	38.6	1000	9.0	9.0	47.6	54.0	-6.4
Measurement uncertainty				± 3 dB			

FCC-ID: LYHMPCIE1V1

Ant. group 3

PK-measurement							
Lowest frequency: CH36							
Test conditions: 1 TX, P8, 6 Mbps							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5149	46.3	14.2	74.0	-13.5
5350	5460	1000	5415	45.9	14.2	74.0	-13.9
7250	7750	1000	7699	28.9	14.2	74.0	-30.9
Measurement uncertainty				±3 dB			

AV-measurement							
Lowest frequency: CH36							
Test conditions: 1 TX, P8				Test results			
<i>f</i>	<i>A</i>	RBW	<i>G</i> _{in}	<i>G</i> _{out}	<i>E</i>	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	37.1	1000	14.2	14.2	51.3	54.0	-2.7
5383.8	35.2	1000	14.2	14.2	49.4	54.0	-4.6
Measurement uncertainty				±3 dB			

PK-measurement							
Middle frequency: CH40							
Test conditions: 1 TX, P8, 6 Mbps							
Chain1			Test results				
Start f	Stop f	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5000	44.0	14.2	74.0	-15.8
5350	5460	1000	5355	46.5	14.2	74.0	-13.3
7250	7750	1000	7424	28.9	14.2	74.0	-30.9
Measurement uncertainty				±3 dB			

AV-measurement							
Middle frequency: CH40							
Test conditions: 1 TX, P8				Test results			
<i>f</i>	<i>A</i>	RBW	<i>G</i> _{in}	<i>G</i> _{out}	<i>E</i>	AV Limit	Margin
(MHz)	(dBμV/m)	(kHz)	(dBi)	(dBi)	(dBμV/m)	(dBμV/m)	(dB)
5150.0	33.4	1000	14.2	14.2	47.6	54.0	-6.4
5374.4	35.5	1000	14.2	14.2	49.7	54.0	-4.3
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH48							
Test conditions: 1 TX, P8, 6 Mbps							
Chain1			Test results				
Start <i>f</i>	Stop <i>f</i>	RBW	Maximum emission		G _{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBi)	(dBμV/m)	(dB)
4500	5150	1000	5000	43.8	14.2	74.0	-16.0
5350	5460	1000	5445	46.8	14.2	74.0	-13.0
7250	7750	1000	7425	29.1	14.2	74.0	-30.7
Measurement uncertainty				±3 dB			

FCC-ID: LYHMPCIE1V1

AV-measurement							
Highest frequency: CH48							
Test conditions: 1 TX, P8				Test results			
f	A	RBW	G_{in}	G_{out}	E	AV Limit	Margin
(MHz)	(dB μ V/m)	(kHz)	(dBi)	(dBi)	(dB μ V/m)	(dB μ V/m)	(dB)
5150.0	32.8	1000	14.2	14.2	47.0	54.0	-7.0
5373.3	35.5	1000	14.2	14.2	49.7	54.0	-4.3
Measurement uncertainty				± 3 dB			

Limit according to FCC Part 15, Section 15.407(d):

Attenuation below the general limits specified in Section 15.209(a) is not required.

Calculation formula for a distance 3 m:

$$E \text{ (dB(mV/m))} = \text{EIRP (dBm)} + 95.2;$$

E: Field strength;

Frequency	General limit radiated	PK limit	AV limit
(MHz)	(mV/m)	(dB μ V/m)	(dB μ V/m)
Above 960	500	74.0	54.0

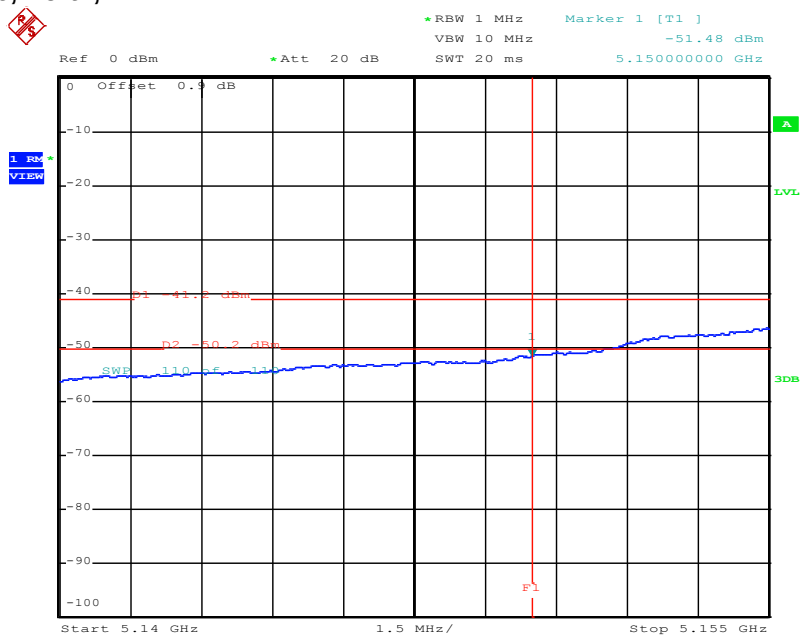
The requirements are **FULFILLED**.

Remarks: For detailed test results please see the following test protocols. Only the worst cases of the plots are listed.

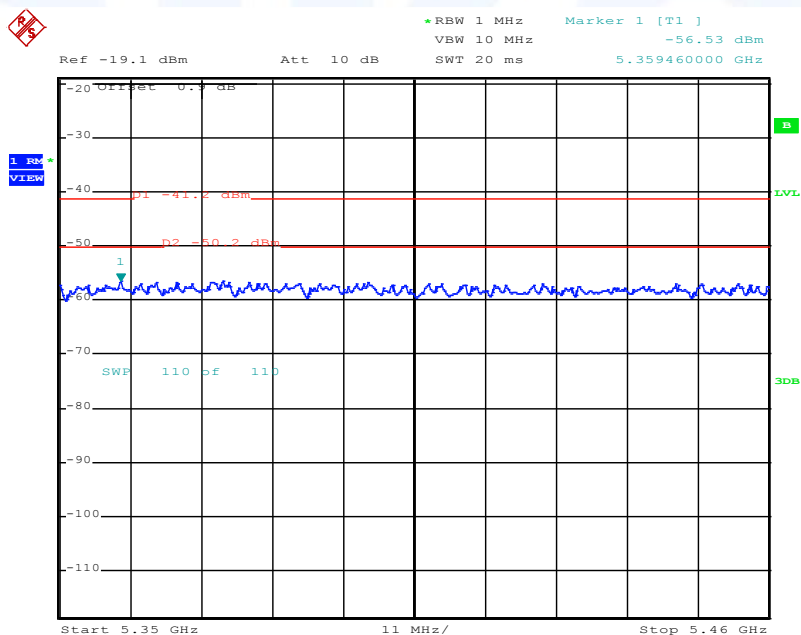
FCC-ID: LYHMPCIE1V1

5.8.6 Test protocols SEC in restricted bands, AV measurements

5.8.6.1 HT20, CH36, Port1, P17

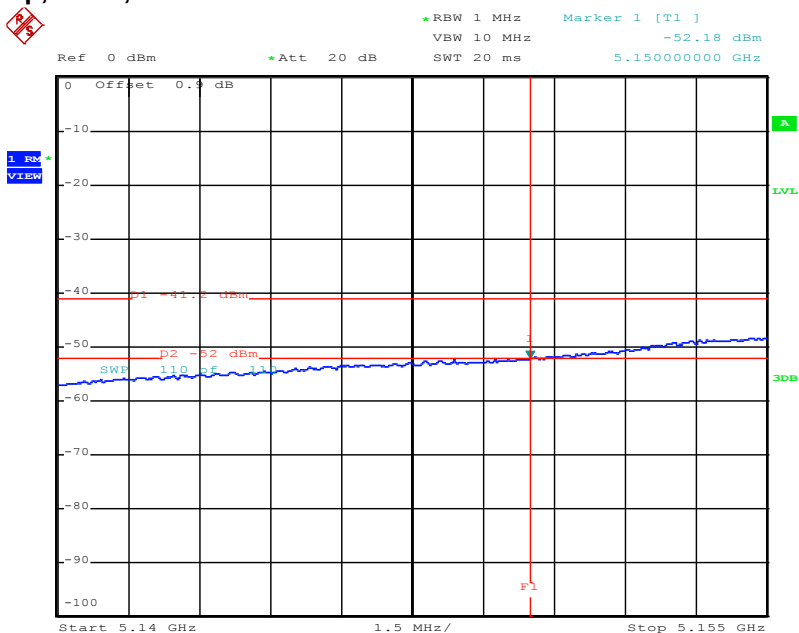


Note: Limit line position -50.2 dBm = -41.2 dBm (general limit) - 3 dB (2 TX chains) – 6 dBi (max. gain);

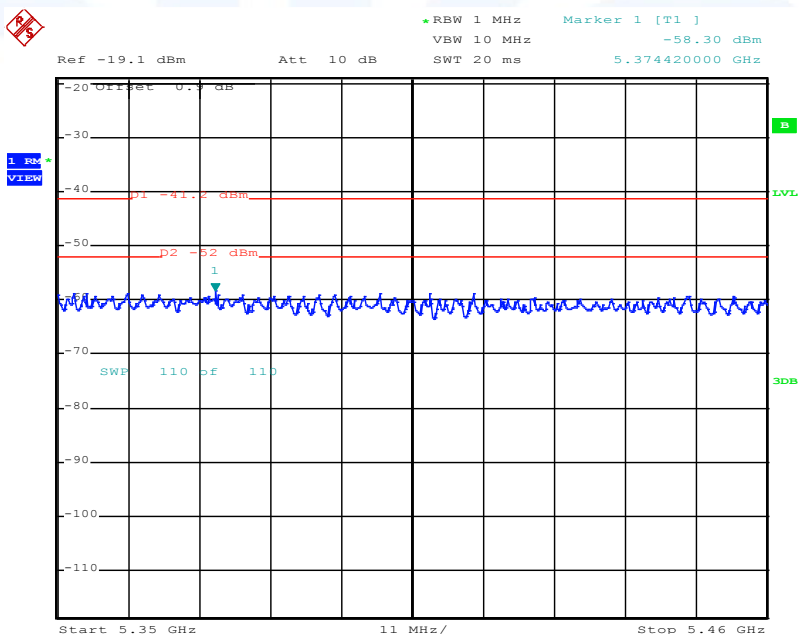


FCC-ID: LYHMPCIE1V1

5.8.6.1 HT40, CH36up, Port1, P16

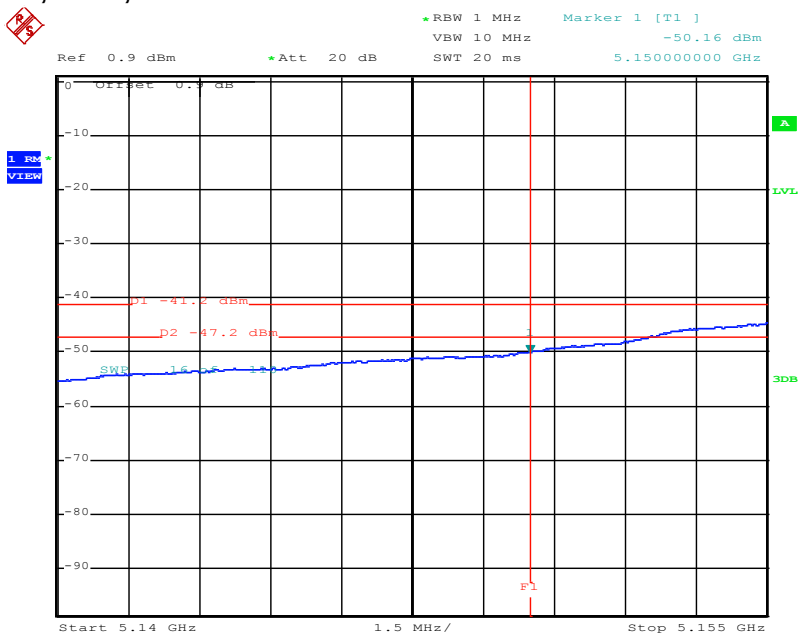


Note: Limit line position -52 dBm = -41.2 dBm (general limit) – 4.8 dB (3 TX chains) – 6 dBi (max. gain);

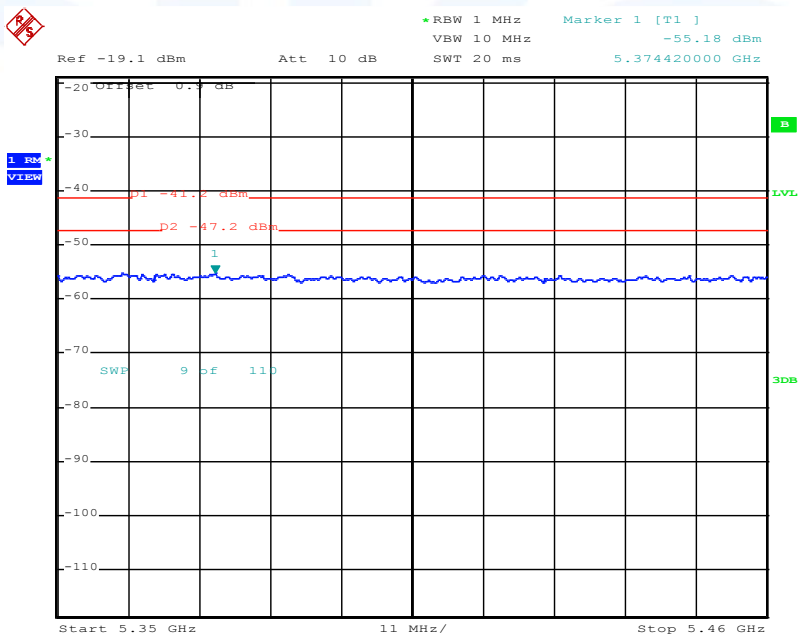


FCC-ID: LYHMPCIE1V1

5.8.6.2 802.11a, CH36; Port1, P16



Note: Limit line position -47.2 dBm = -41.2 dBm (general limit) – 6 dBi (max. gain);



FCC-ID: LYHMPCIE1V1

5.9 Spurious emissions radiated (cabinet radiation)

For test instruments and accessories used see section 6 Part **SER 1**, **SER 2**, **SER 3**.

5.9.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 2
Test distance: 3 m

5.9.2 Photo documentation of the test set-up

Open area test site (Test setup for 9 kHz – 30 MHz)



Open area test site (Test setup for 30 MHz – 300 MHz)

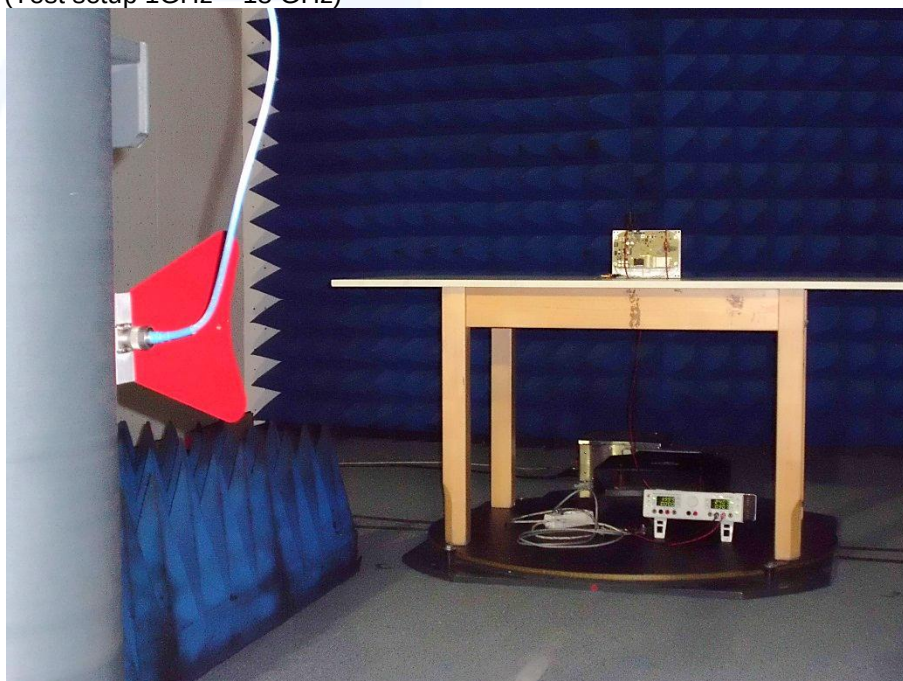


FCC-ID: LYHMPCIE1V1

Open area test site (Test setup for 300 MHz – 1000 MHz)

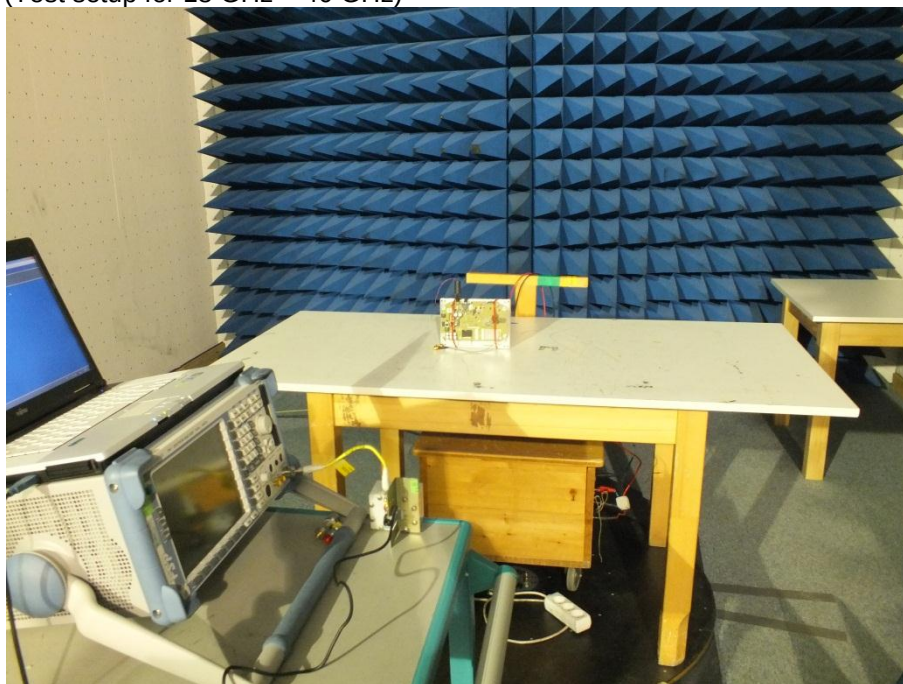


Anechoic chamber (Test setup 1GHz – 18 GHz)



FCC-ID: LYHMPCIE1V1

Anechoic chamber (Test setup for 18 GHz – 40 GHz)



5.9.3 Applicable standard

According to FCC Part 15, Section 15.407(b):

5.9.4 Description of Measurement

The radiated power of the spurious emission from the EUT cabinet is measured with terminated antenna connector in a test setup following the procedures set out in KDB 789033 D01. If the emission level of the EUT in peak mode complies with the general average limit then testing will be stopped and peak values of the EUT will be reported, otherwise the emission will be measured in average mode again and reported.

EMI receiver settings: $f < 1$ GHz:

9 kHz < f < 150 kHz:	RBW: 200 Hz;
150 kHz < f < 30 MHz:	RBW: 9 kHz;
30 MHz < f < 1000 MHz:	RBW: 120 kHz;

Spectrum analyser settings $f > 1$ GHz:

RBW: 1 MHz,	VBW: 3 MHz,	Detector: Max peak,	Trace: Max hold,	Sweep: Auto;
-------------	-------------	---------------------	------------------	--------------

5.9.5 Test result

9 kHz < f < 1000 MHz:

For all kinds of modulation no emission could be detected within 20 dB to the limit.

FCC-ID: LYHMPCIE1V1
1000 MHz < f < 40000 MHz:

HT20, Port1 + Port2

Lowest frequency: 5180 MHz						
Highest power setting : P17					EIRP	
			Test results			
Start frequ.	Stop frequ.	RBW	Maximum emission		Limit	Margin
1000	4000	1000	1996.0	50.4	74.0	-23.6
4000	5150	1000	-	< 44	74.0	< -30
5350	12000	1000	10368.0	50.8	74.0	-23.2
12000	18000	1000	16164.0	53.6	74.0	-20.4
18000	40000	1000	-	< 50	74.0	< -24
Measurement uncertainty			±6 dB			

Middle frequency: 5200 MHz						
Highest power setting : P17					EIRP	
			Test results			
Start frequ.	Stop frequ.	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	4000	1000	1996.0	50.0	74.0	-24.0
4000	5150	1000	-	< 46	74.0	< -28
5350	12000	1000	10400.0	53.3	74.0	-20.7
12000	18000	1000	16920.0	53.7	74.0	-20.3
18000	40000	1000	-	< 50	74.0	< -24
Measurement uncertainty			±6 dB			

Highest frequency: 5240 MHz						
Highest power setting : P17					EIRP	
			Test results			
Start frequ.	Stop frequ.	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	4000	1000	2002.0	50.1	74.0	-23.9
4000	5150	1000	-	< 46	74.0	< -28
5350	12000	1000	10480.0	51.4	74.0	-22.6
12000	18000	1000	17328.0	53.7	74.0	-20.3
18000	40000	1000	-	< 50	74.0	< -24
Measurement uncertainty			±6 dB			

HT40, Port1 + Port2 + Port3:

Lowest frequency: 5190 MHz						
Highest power setting : P17					EIRP	
			Test results			
Start frequ.	Stop frequ.	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	4000	1000	2002.0	50.3	74.0	-23.7
4000	5150	1000	-	< 46	74.0	< -28
5350	12000	1000	-	< 50	74.0	< -24
12000	18000	1000	16812.0	53.5	74.0	-20.5
18000	40000	1000	-	< 50	74.0	< -24
Measurement uncertainty			±6 dB			

FCC-ID: LYHMPCIE1V1

Highest frequency: 5210 MHz						
Highest power setting : P17					EIRP	
			Test results			
Start frequ.	Stop frequ.	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	4000	1000	2002.0	49.8	74.0	-24.2
4000	5150	1000	-	< 46	74.0	< -28
5350	12000	1000	10464.0	54.9	74.0	-19.1
12000	18000	1000	15060.0	53.8	74.0	-20.2
18000	40000	1000	-	< 50	74.0	< -24
Measurement uncertainty			±6 dB			

Highest power setting : P17					EIRP	
AV-Mesurement			Test results			
Start frequ.	Stop frequ.	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
5350	12000	1000	10464.0	44.2	54.0	-9.8
Measurement uncertainty			±6 dB			

802.11a, Port1:

Lowest frequency: 5180 MHz						
Highest power setting : P17					EIRP	
			Test results			
Start frequ.	Stop frequ.	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBμV/m)	(dBμV/m)	(dB)
1000	4000	1000	1996.0	49.1	74.0	-24.9
4000	5150	1000	-	< 44	74.0	< -30
5350	12000	1000	10368.0	53.9	74.0	-20.1
12000	18000	1000	16680.0	54.0	74.0	-20.0
18000	40000	1000	-	< 50	74.0	< -24
Measurement uncertainty			±6 dB			

Middle frequency: 5200 MHz						
Highest power setting : P17					EIRP	
			Test results			
Start frequ.	Stop frequ.	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	4000	1000	1996.0	48.8	74.0	-25.2
4000	5150	1000	-	< 46	74.0	< -28
5350	12000	1000	10400.0	51.0	74.0	-23.0
12000	18000	1000	17844.0	53.9	74.0	-20.1
18000	40000	1000	-	< 50	74.0	< -24
Measurement uncertainty			±6 dB			

FCC-ID: LYHMPCIE1V1

Highest frequency: 5240 MHz						
Highest power setting : P17					EIRP	
			Test results			
Start frequ.	Stop frequ.	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	4000	1000	2002.0	49.7	74.0	-24.3
4000	5150	1000	-	< 46	74.0	< -28
5350	12000	1000	10480.0	51.4	74.0	-22.6
12000	18000	1000	-	< 50	74.0	< -24
18000	40000	1000	-	< 50	74.0	< -24
Measurement uncertainty			±6 dB			

Radiated limits according to FCC Part 15 Section 15.209(a) for spurious emissions which fall in restricted bands:

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	(µV/m)	dB(µV/m)	
0.009-0.490	2400/F (kHz)		300
0.490-1.705	24000/F (kHz)		30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	Above 38.6

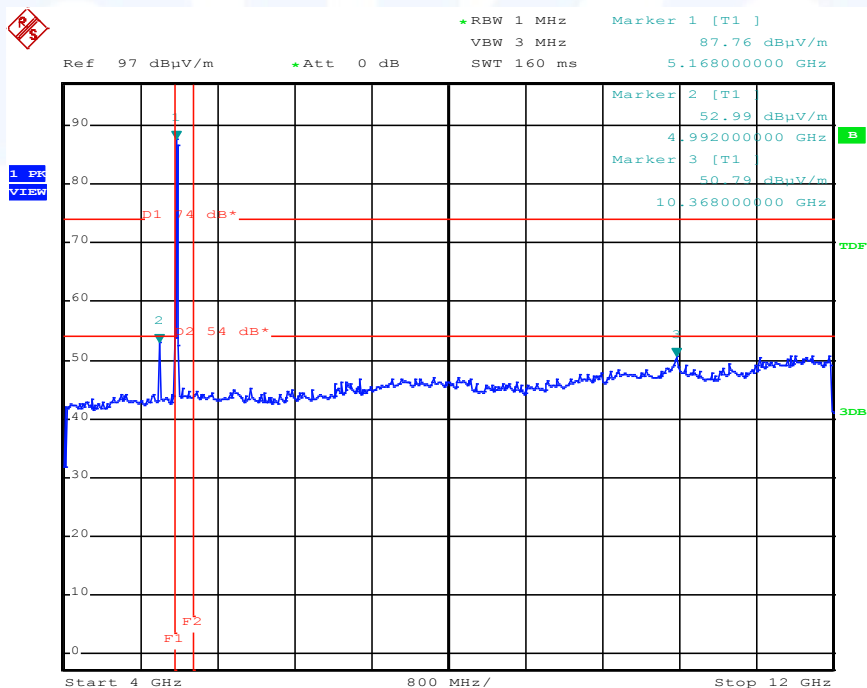
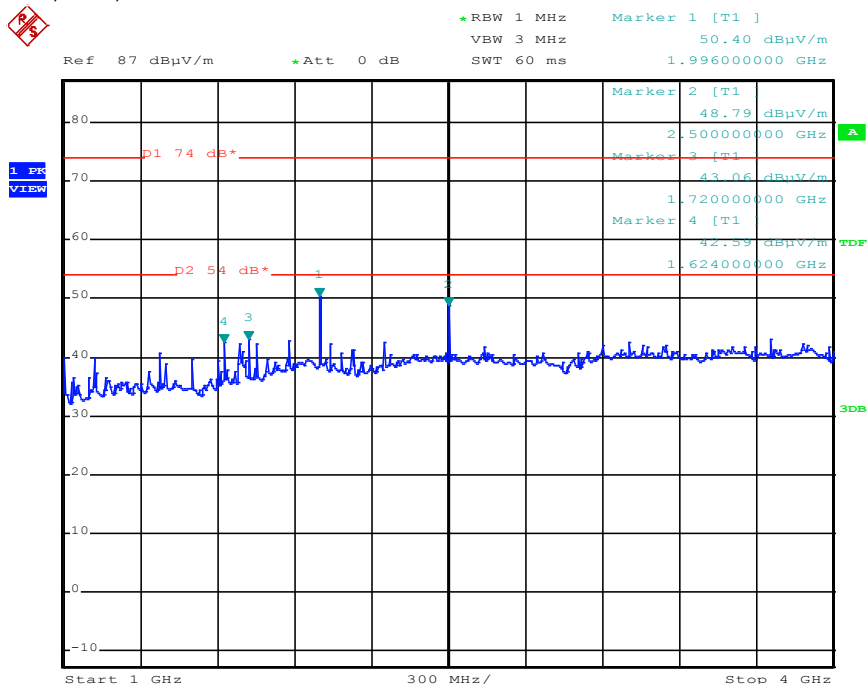
The requirements are **FULFILLED**.

Remarks: All emissions are more than 20 dB below the specified limit needs not to be reported. For detailed test results please see the following test protocols. Only the worst cases of the plots are listed.

FCC-ID: LYHMPCIE1V1

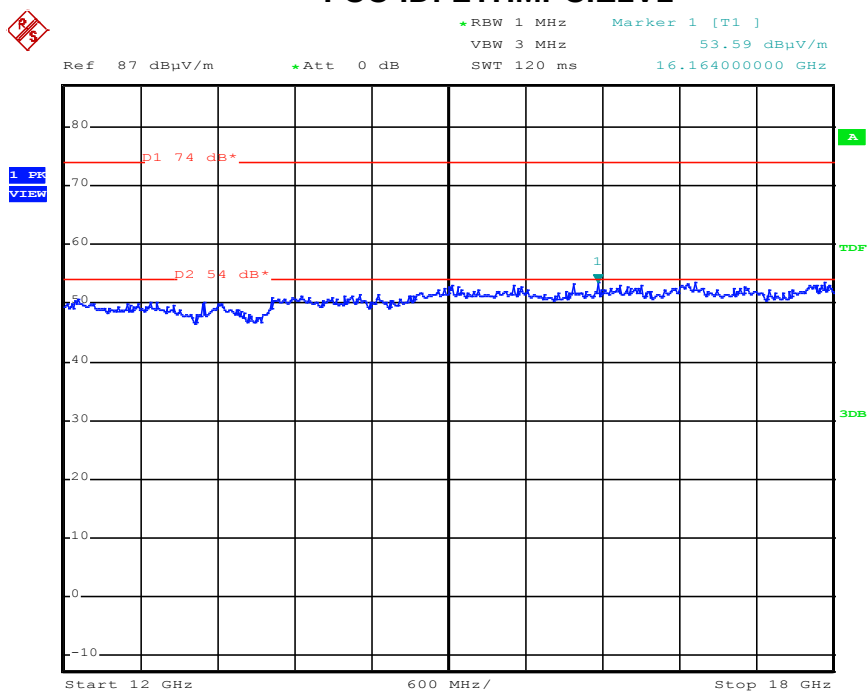
5.9.6 Test protocols SER cabinet radiation

HT20, Port1 + Port2, P17, CH36:

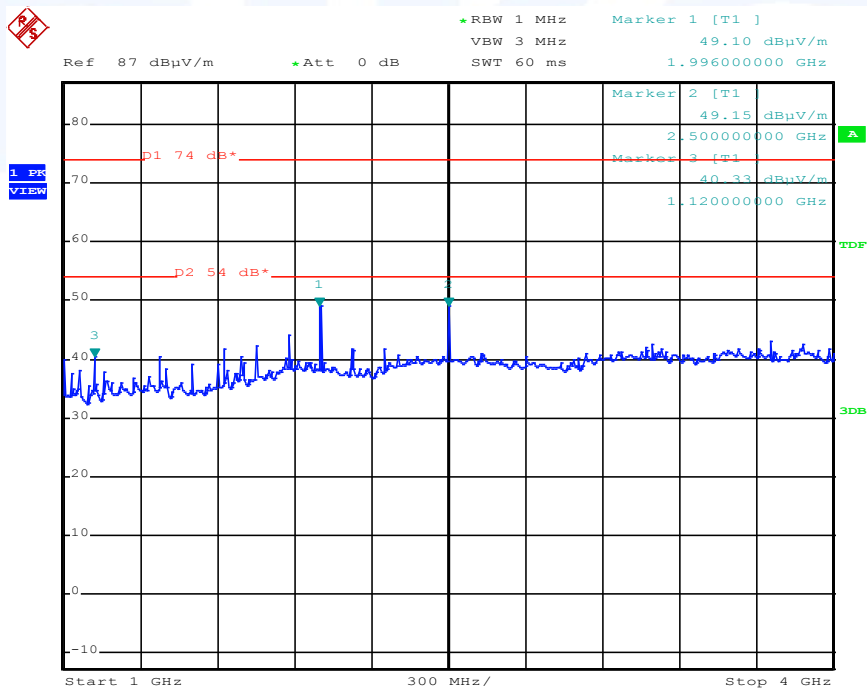


Note: The emission at 4992 MHz is identified as emission from C-plug interface and will not taken into account for EUT conformity discussion.

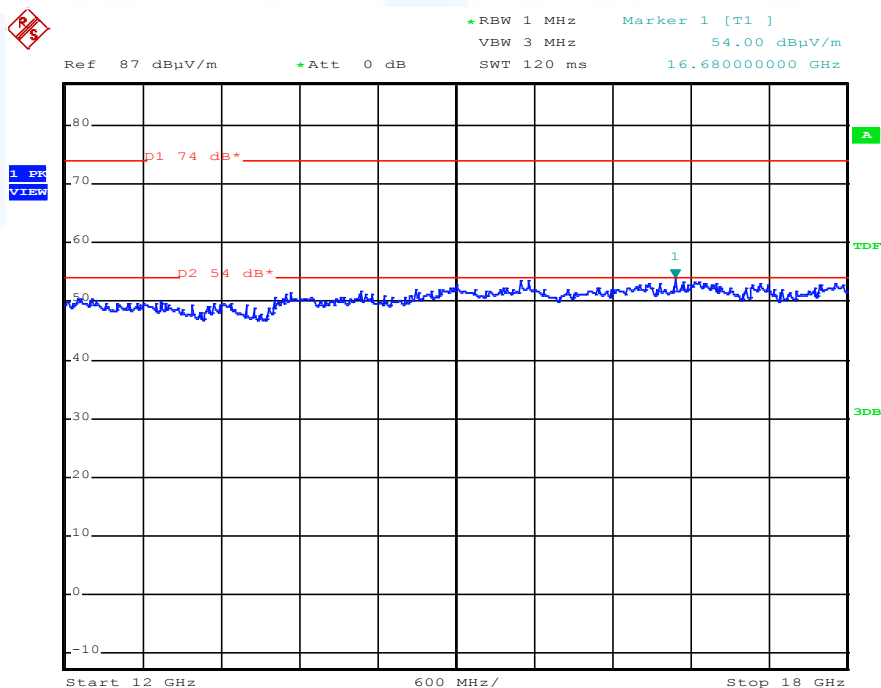
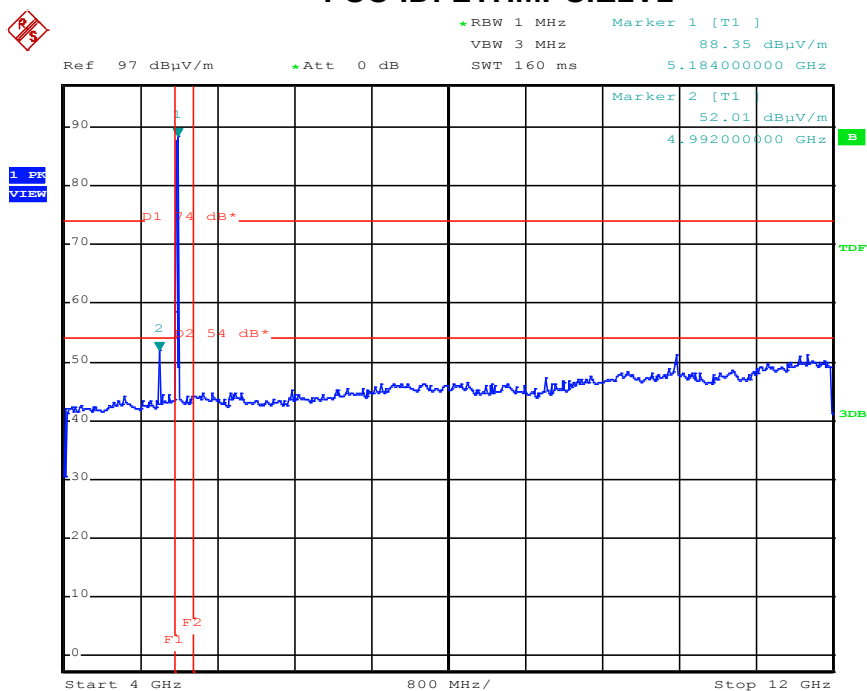
FCC-ID: LYHMPCIE1V1



802.11a, Port1, P17, CH36:

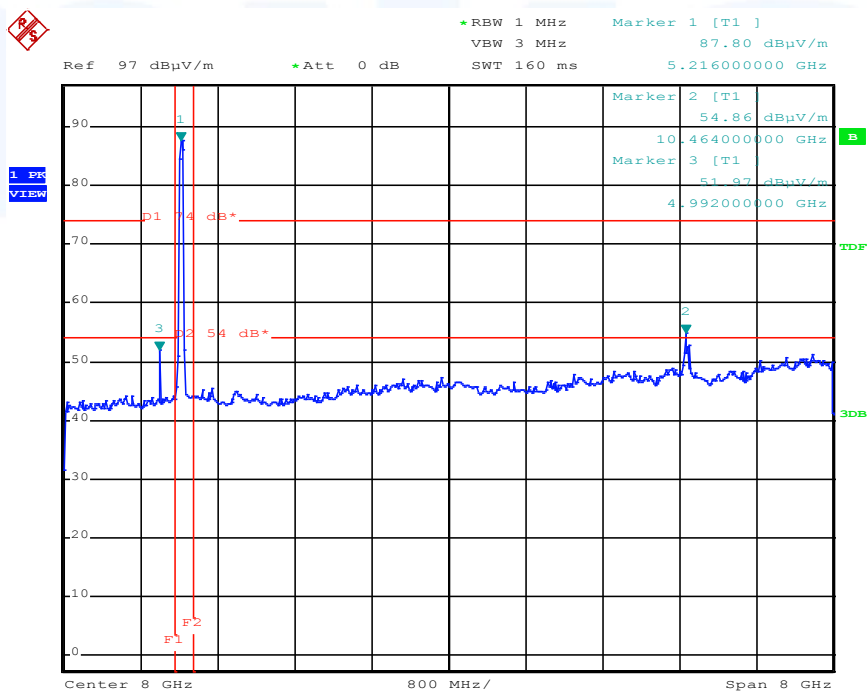
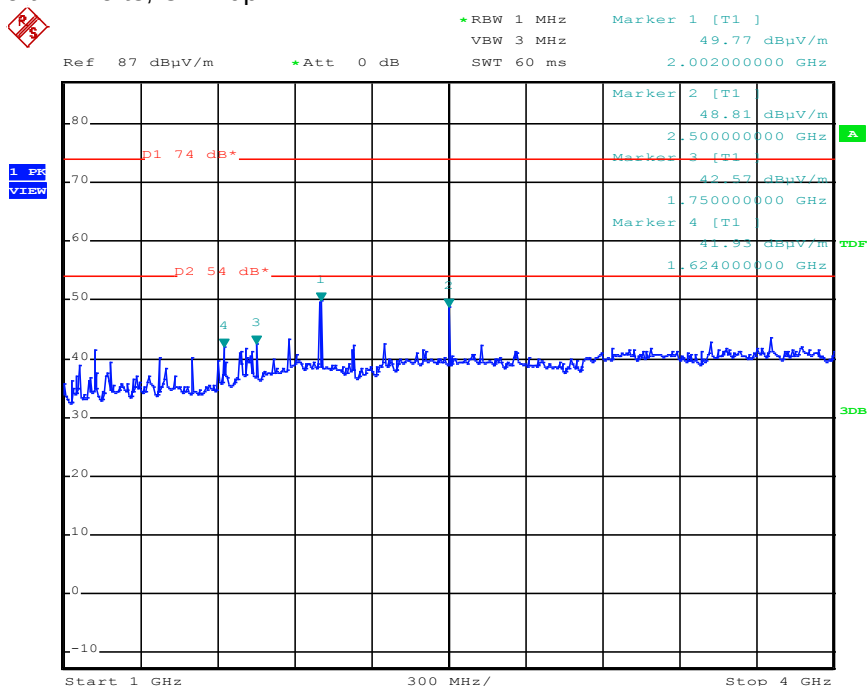


FCC-ID: LYHMPCIE1V1

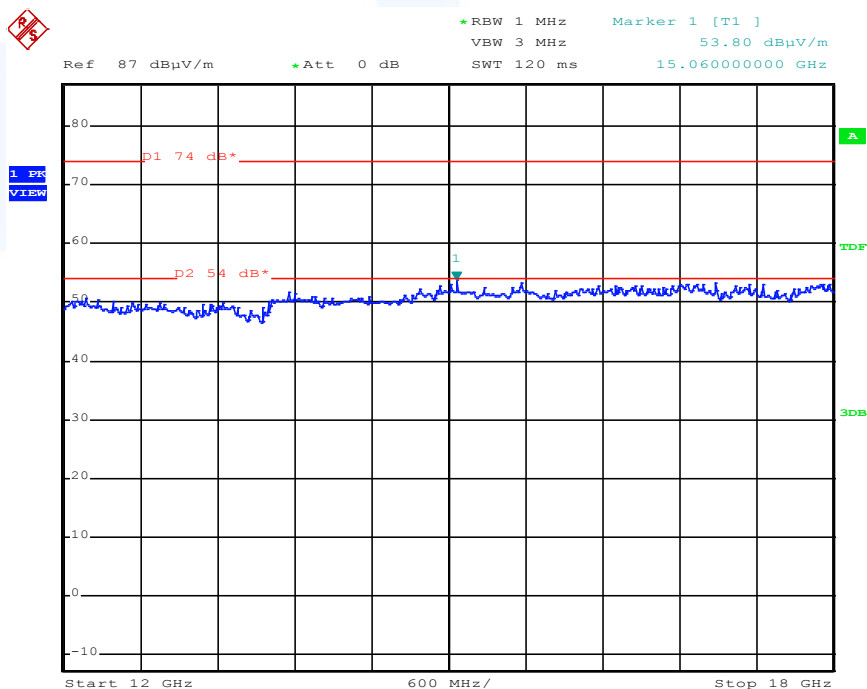
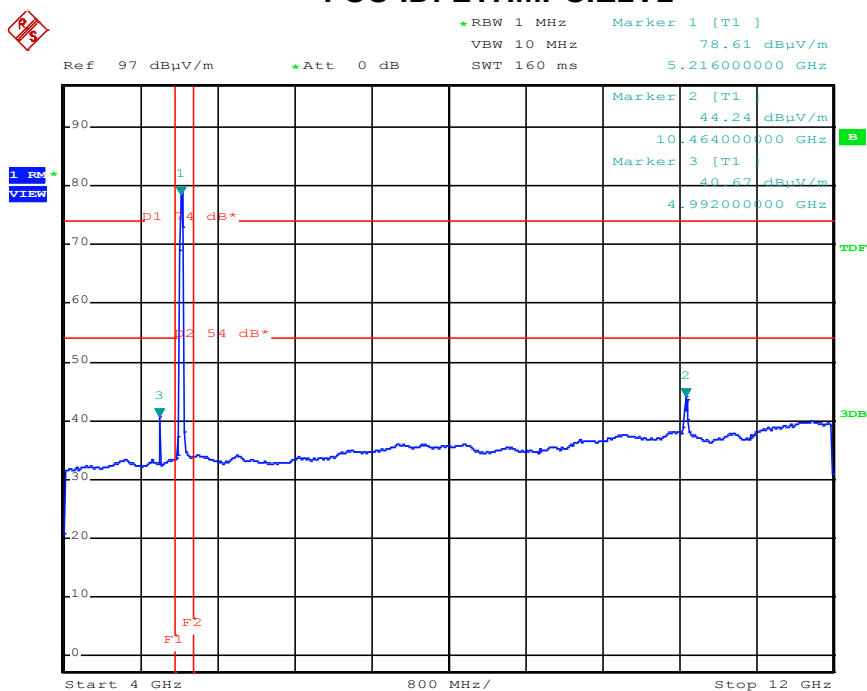


FCC-ID: LYHMPCIE1V1

HT40, Port1 + Port2 + Port3, CH44up:



FCC-ID: LYHMPDIE1V1

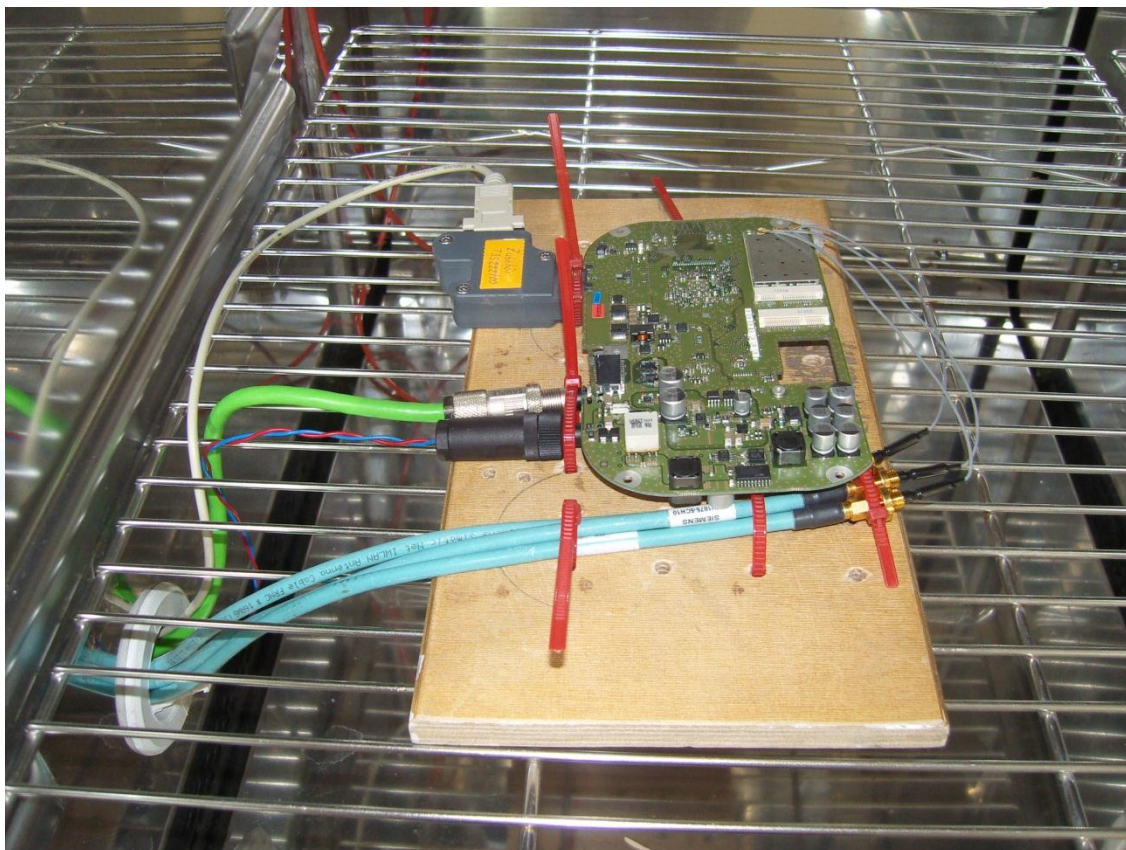


FCC-ID: LYHMPCIE1V1**5.10 Frequency stability**

For test instruments and accessories used see section 6 Part MB.

5.10.1 Description of the test location

Test location: AREA4

5.10.2 Photo documentation of the test setup**5.10.3 Applicable standard**

According to FCC Part 15, Subpart E, Section 15.407 (g):

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

5.10.4 Description of Measurement

This test has been performed over variations in temperature and voltage. The lowest and the highest channel in the operating frequency bands are measured at the 20 dB bandwidth under following conditions:

1. Supply voltage from 19.2 VDC to 28.8 VDC at normal temperature
2. Extreme temperature from -40°C to 60°C at nominal voltage.

FCC-ID: LYHMPCIE1V1

5.10.5 Test result

Frequency band 5150 – 5250 MHz:

Worsed case HT20 mode, P20, MCS8:

Test conditions		Test result			
		Frequency (MHz)			
T (-40°C)	V _{nom}	f_l	5170.800	f_h	5249.120
T (-30°C)	V _{nom}	f_l	5170.720	f_h	5248.960
T (-20°C)	V _{nom}	f_l	5170.880	f_h	5249.120
T (-10°C)	V _{nom}	f_l	5170.960	f_h	5249.040
T (0°C)	V _{nom}	f_l	5170.720	f_h	5249.280
T (10°C)	V _{nom}	f_l	5170.800	f_h	5249.280
T _{nom} (20°C)	V _{max}	f_l	5170.640	f_h	5249.280
	V _{min}	f_l	5170.800	f_h	5249.200
T (30°C)	V _{nom}	f_l	5170.560	f_h	5249.200
T (40°C)	V _{nom}	f_l	5170.560	f_h	5249.200
T (50°C)	V _{nom}	f_l	5170.640	f_h	5249.040
T (60°C)	V _{nom}	f_l	5170.640	f_h	5249.200
Measurement uncertainty		±1500 Hz			

Occupied spectrum envelope:

Measured frequency nearest at the lowest band edge:

Measured frequency nearest at the highest band edge:

$$f_l = 5170.560 \text{ MHz}$$

$$f_h = 5249.280 \text{ MHz}$$

Worsed case HT40 mode, P20, MCS16:

		Test result			
		Frequency (MHz)			
T (-40°C)	V _{nom}	f_l	5171.280	f_h	5248.980
T (-30°C)	V _{nom}	f_l	5171.280	f_h	5248.960
T (-20°C)	V _{nom}	f_l	5171.400	f_h	5248.840
T (-10°C)	V _{nom}	f_l	5171.400	f_h	5248.720
T (0°C)	V _{nom}	f_l	5171.400	f_h	5248.720
T (10°C)	V _{nom}	f_l	5171.400	f_h	5248.840
T _{nom} (20°C)	V _{max}	f_l	5171.280	f_h	5248.720
	V _{min}	f_l	5171.400	f_h	5248.600
T (30°C)	V _{nom}	f_l	5171.280	f_h	5248.720
T (40°C)	V _{nom}	f_l	5171.280	f_h	5248.720
T (50°C)	V _{nom}	f_l	5171.280	f_h	5248.600
T (60°C)	V _{nom}	f_l	5171.280	f_h	5248.600
Measurement uncertainty		±1500 Hz			

Occupied spectrum envelope:

Measured frequency nearest at the lowest band edge:

Measured frequency nearest at the highest band edge:

$$f_l = 5171.280 \text{ MHz}$$

$$f_h = 5248.980 \text{ MHz}$$

FCC-ID: LYHMPCIE1V1

According to FCC Part 15, Subpart E, Section 15.407 (g):

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

Operating frequency range limit	
(MHz)	(MHz)
5150	5250

The requirements are **FULFILLED**.

Remarks:

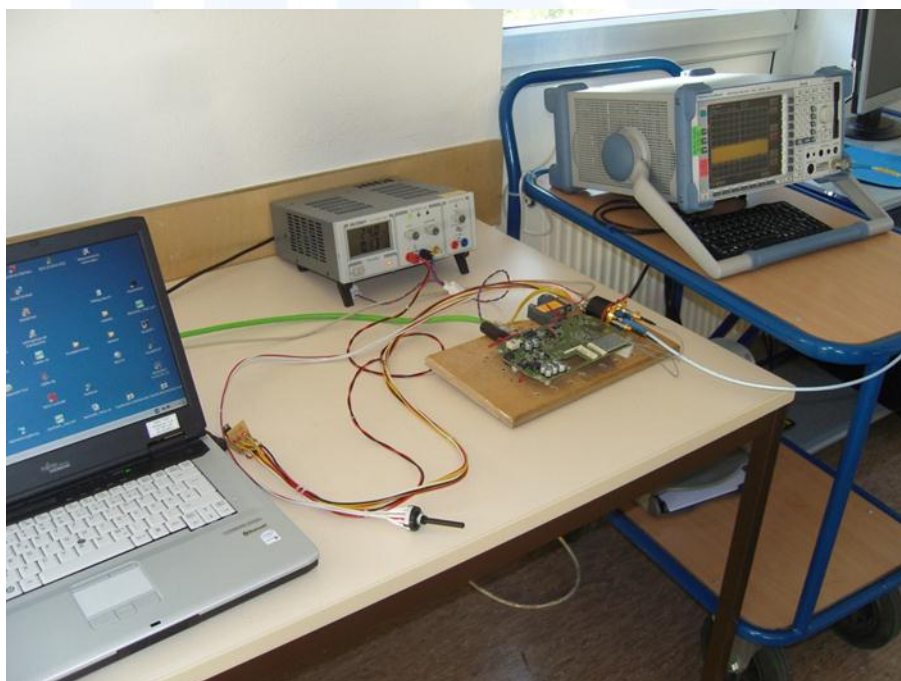
5.11 Maximum permissible exposure (MPE)

For test instruments and accessories used see section 6 Part **CPC 3**.

5.11.1 Description of the test location

Test location: AREA4

5.11.2 Photo documentation of the test set-up



FCC-ID: LYHMPCIE1V1

5.11.3 Applicable standard

According to FCC Part 15, Section 15.407(f):

U-NII devices are subject to the radio frequency radiation exposure requirements specified in Section 1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. The test methods used comply with ANSI/IEEE C95.1-2005, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz".

5.11.4 Description of Measurement

The maximum total power input to the antenna has been measured and conducted as described in clause 5.3 of this document. Through the Friis transmission formula, which is a far field assumption and the known maximum gain of the antenna, the maximum MPE at a defined distance away from the product, can be calculated.

Friis transmission formula:

$$P_d = \frac{P_{out} * G}{4 * \pi * r^2}$$

where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna (linear scale)

r = distance between antenna and observation point (cm)

For fixed equipment the distance $r = 20$ cm;

5.11.5 Test result

WLAN Standard 802.11n, HT20, 2 TX chains, highest power level:

Channel	Power setting	A1+A2	Antgain	A	G	P	S	Limit S _{eq}
No.		(dBm)	(dBi)	(mW)	linear	(W)	(mW/cm ²)	(mW/cm ²)
36	P17	15.5	6.0	35.53	3.98	0.1414	0.0281	1.0
40	P17	15.6	6.0	36.39	3.98	0.1449	0.0288	1.0
48	P17	15.1	6.0	32.31	3.98	0.1286	0.0256	1.0

WLAN Standard 802.11n, HT40, 3 TX chains, highest power level:

Channel	Power setting	A1+A2+A3	Antgain	A	G	P	S	Limit S _{eq}
No.		(dBm)	(dBi)	(mW)	linear	(W)	(mW/cm ²)	(mW/cm ²)
36up	P17	16.0	6.0	40.09	3.98	0.1596	0.0318	1.0
44up	P17	16.1	6.0	41.09	3.98	0.1636	0.0325	1.0

WLAN Standard 802.11a, Legacy, 1 TX chain, highest power level:

Channel	Power setting	A	Antgain	A	G	P	S	Limit S _{eq}
No.		(dBm)	(dBi)	(mW)	linear	(W)	(mW/cm ²)	(mW/cm ²)
36	P17	14.7	6.0	29.58	3.98	0.1178	0.0234	1.0
40	P17	14.9	6.0	30.90	3.98	0.1230	0.0245	1.0
48	P17	14.7	6.0	29.65	3.98	0.1180	0.0235	1.0

FCC-ID: LYHMPCIE1V1

Limits for maximum permissible exposure (MPE):

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(B) Limits for General Population / Uncontrolled Exposure				
0.3 – 3.0	614	1.63	100	30
3.0 – 30	824/f	2.19/f	180/ f ²	30
30 - 300	27.5	0.073	0.2	30
300-1500	---	---	f/1500	30
1500-100000	---	---	1.0	30

f = Frequency (MHz)

The requirements are **FULFILLED**.

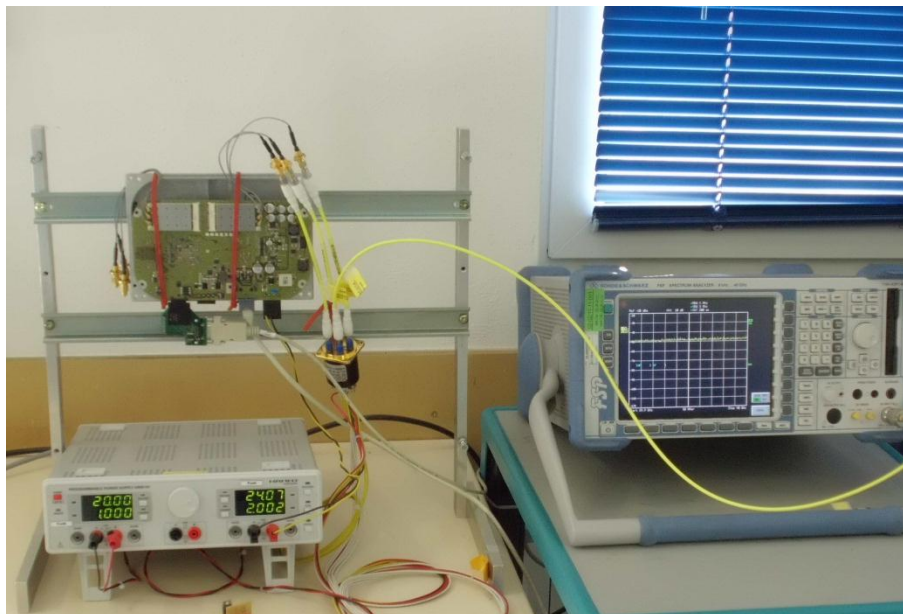
Remarks: This test shows the compliance with the limits for maximum permissible exposure (MPE)
specified in FCC 1.1310 and the criteria to evaluate the environmental impact of human exposure
to radio-frequency (RF) radiation as specified in FCC 1.1307(b).

FCC-ID: LYHMPCIE1V1

5.12 Co-location and Co-transmission

Applicable standard:

OET Bulletin 65, Edition 97-01, Section 2: Multiple-transmitter sites and Complex Environments



It may be that 2 WLAN-modules are implemented in one unit. This has been tested under this section. There is no co-location issue. The firmware of the unit splits the transmission time that one module can only transmit at a time. The MIMO Antenna technology has been tested and used for the determination of the worst case.

Remarks:

FCC-ID: LYHMPCIE1V1

5.13 Antenna application

5.13.1 Applicable standard

According to FCC Part 15C, Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT use the listed antennas for MIMO technique. The equipment connector is subject to the end product.

5.13.2 Antenna requirements

According to FCC Part 15E, Section 15.407(a):

The conducted output power limit specified in paragraph (a) of 15.407 is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from intentional radiator shall be reduced below the stated values in paragraph (a)(1), (a)(2) and (a)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds the effective value.

For the output power reduction of the used antennas see the following table. The limit is calculated as using following formula, $P_{out} = 30 - (G_x - 6)$;

Ant. group 3 antennas with max 10 to 14 dBi gain:

Antenna	G _x (dBi)	Cond. limit (dBm)	max. G (dBi)	A [P8] (dBm)	Limit P _{out} (dBm)	Reduction (dB)	P set 5 GHz
ANT793-8DK	14.2	23.0	6.0	6.8	14.8	-8.0	P8
ANT793-8DJ	13.6	23.0	6.0	6.8	15.4	-8.6	P8

Ant. group 2 antennas with max 7 to 9 dBi gain:

Antenna	G _x (dBi)	Cond. limit (dBm)	max. G (dBi)	A [P14] (dBm)	Limit P _{out} (dBm)	Reduction (dB)	P set 5 GHz
ANT793-6DT	9.0	23.0	6.0	12.9	20.0	-7.1	P14
ANT793-6DG	9.0	23.0	6.0	12.9	20.0	-7.1	P14
ANT795-6DC	9.0	23.0	6.0	12.9	20.0	-7.1	P14
ANT795-6MN	8.0	23.0	6.0	12.9	21.0	-8.1	P14
ANT795-6MT	7.0	23.0	6.0	12.9	22.0	-9.1	P14

Ant. group 1 antennas with max 0 to 6 dBi gain:

Antenna	G _x (dBi)	Cond. limit (dBm)	max. G (dBi)	A [P17] (dBm)	Limit P _{out} (dBm)	Reduction (dB)	P set 5 GHz
ANT793-4MN	6.0	23.0	6.0	16.1	23.0	-6.9	P17
ANT793-6MN	5.0	23.0	6.0	16.1	24.0	-7.9	P17
ANT795-4MC	5.0	23.0	6.0	16.1	24.0	-7.9	P17
ANT795-4MD	5.0	23.0	6.0	16.1	24.0	-7.9	P17
ANT795-4MA	5.0	23.0	6.0	16.1	24.0	-7.9	P17
A5E002280427-06	5.0	23.0	6.0	16.1	24.0	-7.9	P17
Rcoax 5G	0.0	23.0	6.0	16.1	29.0	-12.9	P17

Remarks: No power reduction results with the listed antennas.

FCC-ID: LYHMPCIE1V1
6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPC 3	NRVS	02-02/07-05-005				
	NRV-Z1	02-02/07-05-017	18/11/2013	18/11/2010	04/01/2013	04/01/2012
	VLP-1602 PRO	02-02/50-10-015				
DC	FSP 40	02-02/11-11-001	02/09/2012	02/09/2011		
	VLP-1602 PRO	02-02/50-10-015				
	KMS102-1m	02-02/50-11-014				
	KMS102-0,2m	02-02/50-11-016				
	KMS102-0,2m	02-02/50-11-017				
	KMS102-0,2m	02-02/50-11-018				
	DC-40GHz - D/C9914	02-02/50-12-010				
MB	FSP 40	02-02/11-11-001	02/09/2012	02/09/2011		
	WK-340/40	02-02/45-05-001	31/05/2013	31/05/2011	22/06/2012	22/12/2011
	VLP-1602 PRO	02-02/50-10-015				
	KMS102-1m	02-02/50-11-014				
	KMS102-0,2m	02-02/50-11-016				
	KMS102-0,2m	02-02/50-11-017				
	KMS102-0,2m	02-02/50-11-018				
	DC-40GHz - D/C9914	02-02/50-12-010				
SEC 1-3	FSP 40	02-02/11-11-001	02/09/2012	02/09/2011		
	VLP-1602 PRO	02-02/50-10-015				
	KMS102-1m	02-02/50-11-014				
	KMS102-0,2m	02-02/50-11-016				
	KMS102-0,2m	02-02/50-11-017				
	KMS102-0,2m	02-02/50-11-018				
	DC-40GHz - D/C9914	02-02/50-12-010				
SER 1	FMZB 1516	01-02/24-01-018	16/02/2013	16/02/2012		
	ESCI	02-02/03-05-005	21/11/2012	21/11/2011		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 2	ESVS 30	02-02/03-05-006	20/06/2012	20/06/2011		
	BBA 9106 / VHA 9103	02-02/24-05-002	08/09/2012	08/03/2012		
	UHALP 9108 A	02-02/24-05-004	23/09/2014	23/09/2011	23/03/2012	23/09/2011
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 3	FSP 40	02-02/11-11-001	02/09/2012	02/09/2011		
	AFS4-01000400-10-10P-4	02-02/17-05-003				
	AMF-4F-04001200-15-10P	02-02/17-05-004				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	3117	02-02/24-05-009	16/02/2013	16/02/2012		
	R1 _ 18 - 40 GHz	02-02/30-09-002	19/12/2012	19/12/2011		
	Sucoflex N-1000-SMA	02-02/50-05-072				
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				