FCC ID: LYHMSN1V1 IC: 267AA-MSN1V1

EMI – TEST REPORT

- FCC Part 15.407 and RSS210 -

Test Report No. : T36325-00-13HS	08 April 2014 Date of issue

Type / Model Name : SCALANCE W700 / MSN

Product Description : Industrial WLAN access point

Applicant **:** Siemens AG, Industrial Automation Division

Address : Gleiwitzer Strasse 555

90475 NUERNBERG, GERMANY

Manufacturer **:** Siemens AG, Automation & Drives

Address : Oestliche Rheinbrueckenstrasse 50

76187 KARLSRUHE, GERMANY

Licence holder **:** Siemens AG, Automation & Drives

Address : Oestliche Rheinbrueckenstrasse 50

76187 KARLSRUHE, GERMANY

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

Deutsche Akkreditierungsstelle D-PL-12030-01-00

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September, 2013)

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, 2013)

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, 2013)

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.

ET Docket No. 03-122, FCC 06-96	Released June 30, 2006, Memorandum Opinion and Order concerning DFS
ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
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 EN 55022: 2006	Information technology equipment
KDB 789033 D01 v01r03	Guidelines for compliance testing of UNII-Devices – Part 15, Subpart E, April 08, 2013.
KDB 662911 D01 v02	Emission testing of transmitters with multiple outputs in the same band, 5/28/2013.

2 SUMMARY

2.1 Test result summary

WLAN devices using digital modulation:

Operating in the 5150 MHz - 5250 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS Gen, 7.2.4.	AC power line conducted emissions	passed
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)	RSS102, 2.5.2	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

2.2 General remarks

The EUT is a 2-Port WLAN-access point. The firmware does not support ad-hoc modes. The possibility to choose the channel for data transmission or power setting in relation to the used antenna with antenna cable makes a professional installation necessary. The AP is compatible with 802.11a, 802.11n Standard. It supports the 2.4 GHz and 5 GHz frequency band and supports no beam forming.

Variants of the EUT

Variant	Device-Name	WLAN-Interfaces	LAN connector	Antenna Ports	Order numbers
V01	MSN-W1-RJ-E2	1	RJ45	2	6GK5734-1FX00-xxxx
V02	MSN-W1-M12-E2	1	M12	2	6GK5774-1FY00-xxxx

Operation frequency and channel plan

Channel plan:

802.11a, HT20:

Channel	Frequency
36	5180
40	5200
44	5220
48	5240

HT40:

Channel	Frequency
36up	5190
44up	5230

Transmit operating modes

The module use OFDM modulation and is capable to provide following data rates:
- 802.11a 54, 48, 36, 24, 18, 12, 9, 6 Mbps
- 802.11n HT20, MCS 0 - 15
- 802.11n HT40, MCS 0 - 15

The module use OFDM modulation and is capable to provide following data rates:
- 802.11a 54, 48, 36, 24, 18, 12, 9, 6 Mbps
- 802.11n HT20, MCS 0 – 15
- 802.11n HT40, MCS 0 – 15

HT20

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 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

HT40

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 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

Symbol	Explanation
N_{SS}	Number of spatial streams
R	Coding rate
N_{BPSC}	Number of coded bits per single carrier (total across spatial streams)
$N_{BPSCS}(i_{SS})$	Number of coded bits per single carrier for each spatial stream, $i_{SS} = 1,...,N_{SS}$
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:

- Antenna gain group 1: Antennas 0 to 6 dBi
- Antenna gain group 2: Antennas 6 to 9 dBi
- Antenna gain group 3: Antennas 9 to 14 dBi

The following antennas shall be used with the EUT:

Number	Manufacturer Number	Characteristic	Model number	Connector	Frequency (GHz)	Gain 5GHz (dBi)	Cable loss (dB)	Effective gain 5 GHz (dBi)	Group
1	6GK5793-8DK00-0AA0	Directed	**ANT 793-8DK**	2x N-female	5 GHz	23	8.8	14.2	9-14 dBi
2	6GK5793-8DJ00-0AA0	Directed	**ANT 793-8D**	2x N-female	5 GHz	18	4.4	13.6	9-14 dBi
3	6GK5793-8DP00-0AA0	Directed	**ANT793-8DP**	N-female	5 GHz	13.5	0	13.5	9-14 dBi
4	6GK5795-6DC00-0AA0	Wide angle	**ANT 795-6DC**	N-female	2.4 + 5 GHz	9	0	9	6-9 dBi
5	6GK5793-6DG00-0AA0	Wide angle	**ANT793-6DG**	2x N-female	5 GHz	9	0	9	6-9 dBi
6	6GK5795-6MN10-0AA6	Omni	**ANT 795-6MN**	N-female	2.4 + 5 GHz	8	0	8	6-9 dBi
7	6GK5 793-4MN00-0AA6	Omni	**ANT 793-4MN**	N-female	5 GHz	6	0	6	0-6 dBi
8	6GK5795-4MD00-0AA3	Omni	**ANT795-4MD**	N-male	2.4 + 5 GHz	5	0	5	0-6 dBi
9	6GK5795-4MC00-0AA3	Omni	**ANT795-4MC**	N-male	2.4 + 5 GHz	5	0	5	0-6 dBi
10	6GK5795-4MA00-0AA3	Omni	**ANT 795-4MA**	R-SMA male	2.4 + 5 GHz	5	0	5	0-6 dBi
11	6GK5793-6MN00-0AA6	Omni	**ANT 793-6MN**	N-female	5 GHz	5	0	5	0-6 dBi
12	6XV1875-2D	Omni	**IWLAN Rcoax 1/2"**	N-female	5 GHz	0	0	0	0-6 dBi

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

2.3 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 : 7 November 2013

Testing concluded on : 28 February 2014

Checked by:

Eduard Stangl
I confirm the correctness and integrity of this document
2014.04.08 16:35:29 +02'00'

Eduard Stangl
Technical director

Tested by:

Hermann Smetana
I am the author of this document
2014.04.08 11:43:50 +02'00'

Hermann Smetana
Radio Team

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT – Detailed photos see attachment C

3.2 Power supply system utilised

Power supply voltage : 100 - 120 VAC
V_{nom}= 110 V
V_{min}= 100 V
V_{max}= 120 V

3.3 Short description of the equipment under test (EUT)

The EUT is a 2-Port WLAN-access point. The firmware does not support ad-hoc modes. The possibility to choose the channel for data transmission or power setting in relation to the used antenna with antenna cable makes a professional installation necessary. The AP is compatible with 802.11a/n Standard. It supports the 5 GHz frequency band and has no beam forming.

Number of tested samples: 1
Serial number: VPDN198359

EUT operation mode:

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

- WLAN transmission

- TX continuous mode

- RX continuous 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:

- LAN cable, 3m Model : CAT5
- Power supply cable, 1m Model : Self-made
- Model :

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
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. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor k = 2. The true value is located in the corresponding interval with a probability of 95 % The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern 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 and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

4.1 Measurement protocol for FCC and IC

4.1.1 General information

4.1.1.1 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 a listed Open Site under the Canadian Test-Sites File-No:

IC 3009A

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.

4.1.1.2 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.

4.1.1.3 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 and applying the CISPR 22 limits.

4.2 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 on cap rail test rack.
The tests are carried out in the following frequency bands:

5.15 - 5.25 GHz

Preliminary tests are 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. As worse case the HT20 mode (MCS0) and HT40 mode (MCS8) is used.
The EUT is controlled for several tests with special test software used for testing only where continuous signals are needed. For the tests a maximum duty cycle (x) is set.
Following channels and test modes were selected for the final test as listed below:

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)
802.11n, HT20	36 - 48	36, 40, 48	OFDM	BPSK	MCS0 (BW=20 MHz)
802.11n, HT40	36up – 44up	36up, 44up	OFDM	BPSK	MCS8 (BW=40 MHz)

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: Shielded Room S2

5.1.2 Photo documentation of the test set-up

5.1.3 Applicable standard

According to FCC Part 15C, Section 15.207(a):
Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

5.1.4 Description of Measurement

The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a line impedance stabilization network (LISN) with 50Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded.

To convert between dBμV and μV, the following conversions apply:

dBμV = 20 log μV

μV = 10^(dBμV/20)

5.1.5 Test result

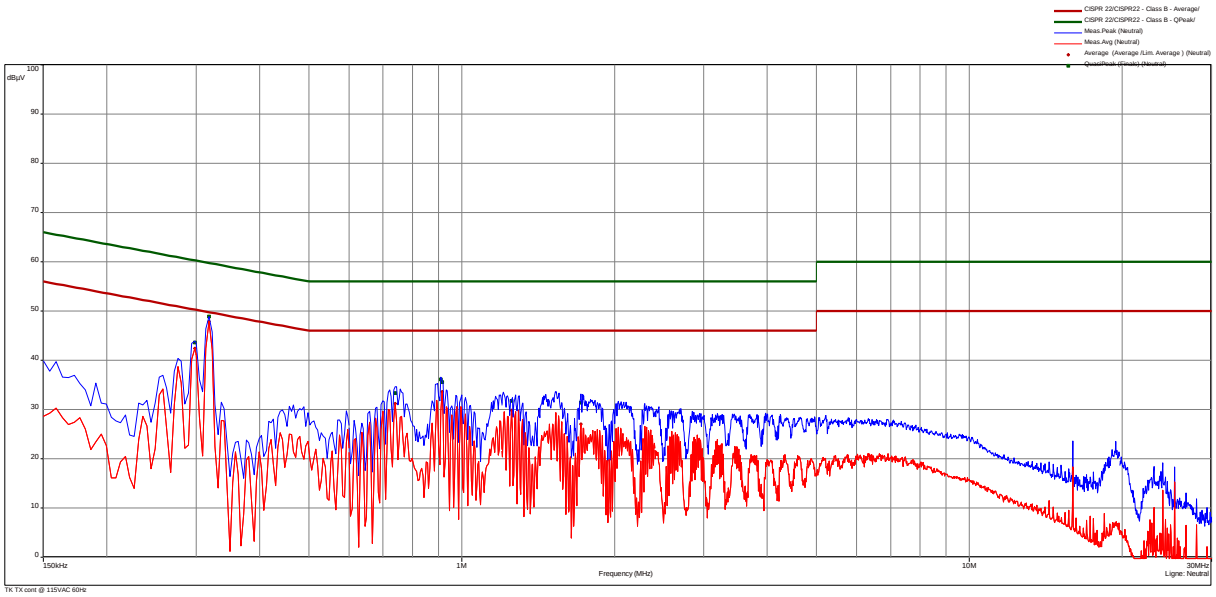
Frequency range:	0.15 MHz - 30 MHz
Min. limit margin	-1.5 dB at 0.318 MHz

The requirements are **FULFILLED.**

Remarks: For detailed test result please see following test protocols.

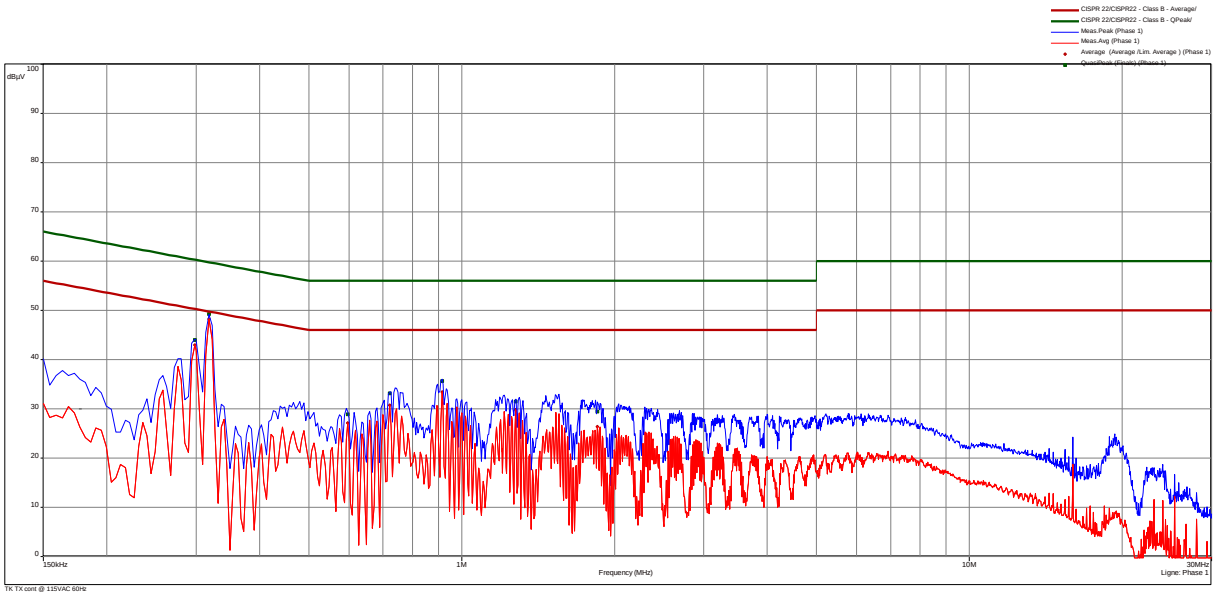
5.1.6 Test protocol

Test point N Result: passed
Operation mode: WLAN transmission
Remarks:



freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB	
0.299	1	43.7	-16.6	60.3	42.5	-7.8	50.3	Neutral
0.318	2	48.9	-10.9	59.8	47.8	-1.9	49.8	Neutral
0.740	3	33.3	-22.7	56.0	31.1	-14.9	46.0	Neutral
0.911	3	36.1	-19.9	56.0	30.1	-15.9	46.0	Neutral
0.915	3	35.6	-20.4	56.0	33.7	-12.3	46.0	Neutral
1.254	4	31.8	-24.3	56.0	29.7	-16.3	46.0	Neutral
1.718	4	31.4	-24.6	56.0	26.8	-19.2	46.0	Neutral

Test point L1 Result: passed
Operation mode: WLAN transmission
Remarks:



freq	SR	QP	margin	limit	AV	margin	limit	line
MHz		dB(µV)	dB	dB	dB(µV)	dB	dB	
0.299	9	44.0	-16.3	60.3	42.9	-7.4	50.3	Phase 1
0.318	10	49.2	-10.5	59.8	48.3	-1.5	49.8	Phase 1
0.597	10	28.9	-27.1	56.0	27.1	-18.9	46.0	Phase 1
0.722	11	33.2	-22.9	56.0	30.7	-15.3	46.0	Phase 1
0.915	11	35.7	-20.3	56.0	33.5	-12.5	46.0	Phase 1
1.277	12	31.5	-24.5	56.0	29.9	-16.2	46.0	Phase 1
1.853	12	29.5	-26.5	56.0	26.4	-19.6	46.0	Phase 1

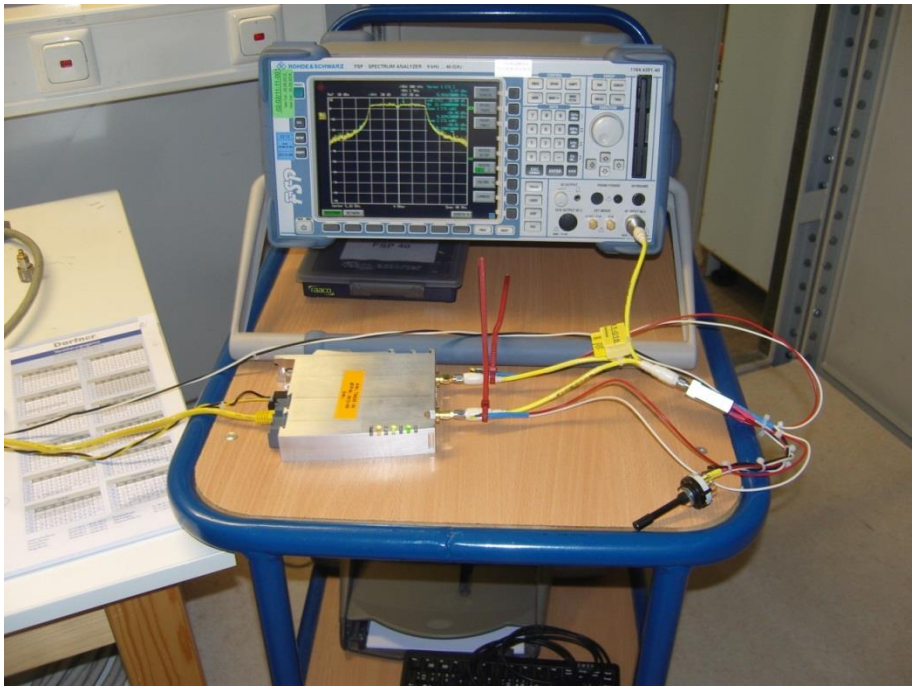
5.2 EBW and OBW

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

5.2.1 Description of the test location

Test location: AREA 4

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15E, Section 15.407(a)(1):
For the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz.

5.2.4 Description of Measurement

The bandwidth is measured conducted using a spectrum analyser and following the procedures according the OET 789033, item C. The spectrum analyser function “n-dB-down” is used to determine the bandwidth. For the OBW the analyser function “OBW” is used to determine the bandwidth. The procedures according the OET 789033, item D are followed in this case.

5.2.5 Test result

802.11a, Mbps 6, Port1:
Spectrum analyser settings: RBW: 300 kHz VBW: 1 MHz Detector: Peak

Channel	Centre frequency	26 dB bandwidth	99% OBW
	(MHz)	(MHz)	(MHz)
36	5180	21.69	17.12
40	5200	22.47	16.75
48	5240	21.72	17.03

HT20 mode, MCS0, Port1:
Spectrum analyser settings: RBW: 300 kHz VBW: 1 MHz Detector: Peak

Channel	Centre frequency	26 dB bandwidth	99% OBW
	(MHz)	(MHz)	(MHz)
36	5180	23.87	18.04
40	5200	22.25	17.98
48	5240	22.41	18.06

HT40 mode, MCS8, Port1:
Spectrum analyser settings: RBW: 1 MHz VBW: 3 MHz Detector: Peak

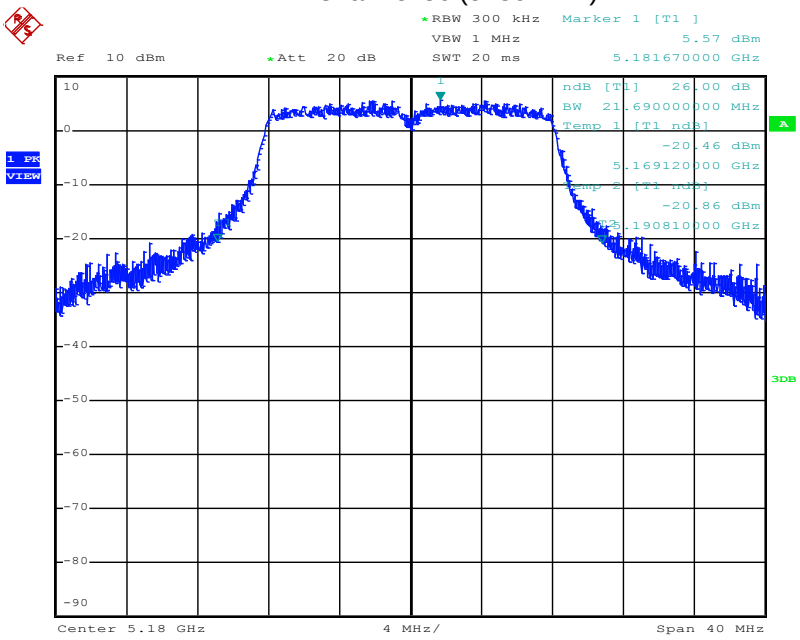
Channel	Centre frequency	26 dB bandwidth	99% OBW
	(MHz)	(MHz)	(MHz)
36up	5190	46.90	37.54
44up	5230	46.04	37.52

Remarks: For detailed test results please see the following test protocols. No limit is defined for EBW and OBW!

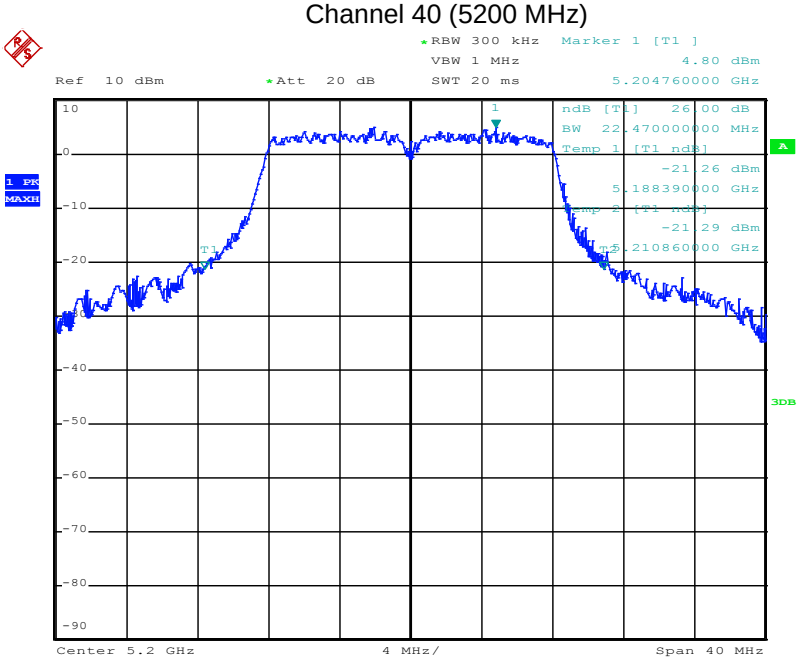
5.2.6 Test protocol EBW (26dB bandwidth measurement)

802.11a:

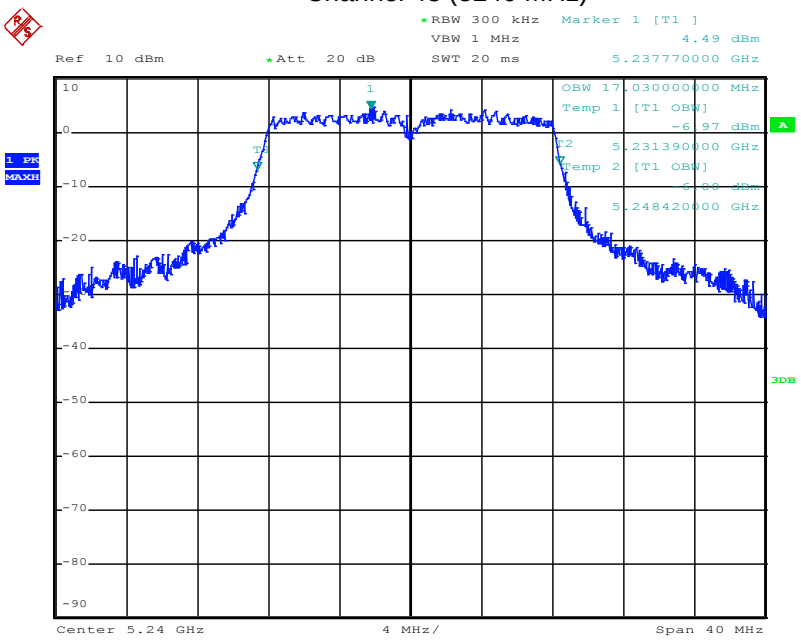
Channel 36 (5180 MHz)



Channel 40 (5200 MHz)

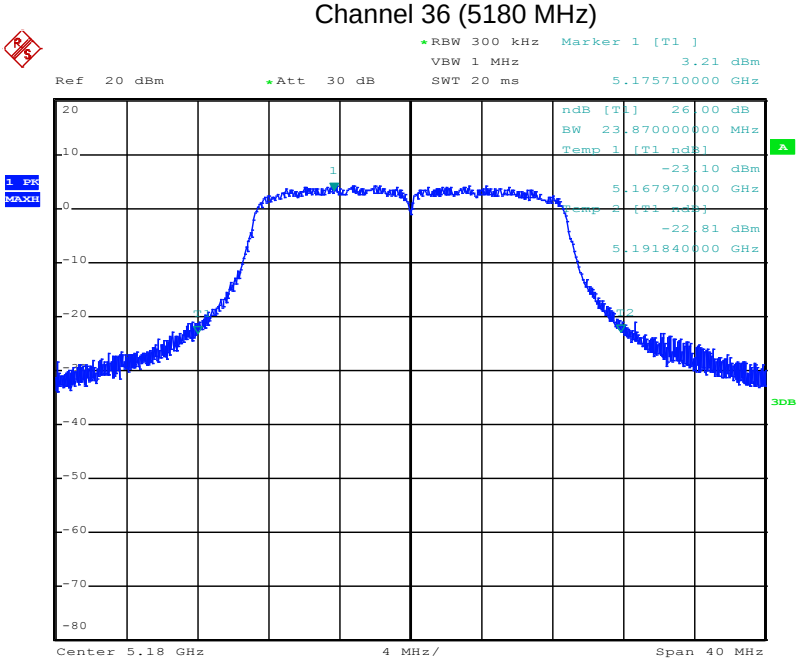


Channel 48 (5240 MHz)

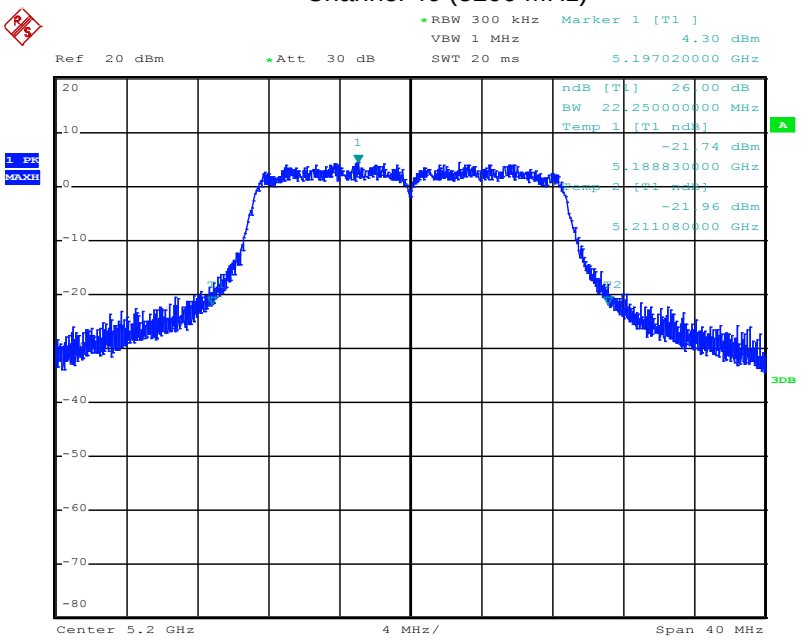


HT20:

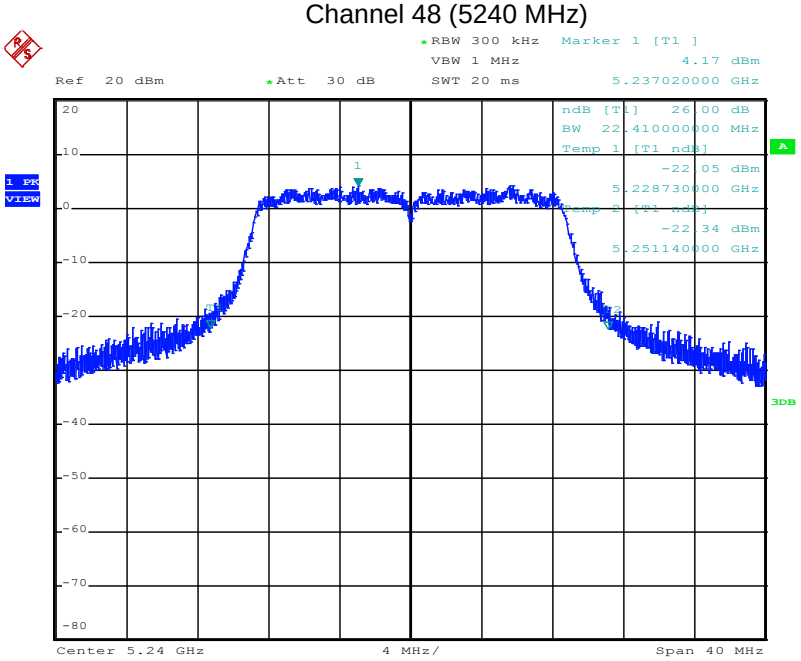
Channel 36 (5180 MHz)



Channel 40 (5200 MHz)

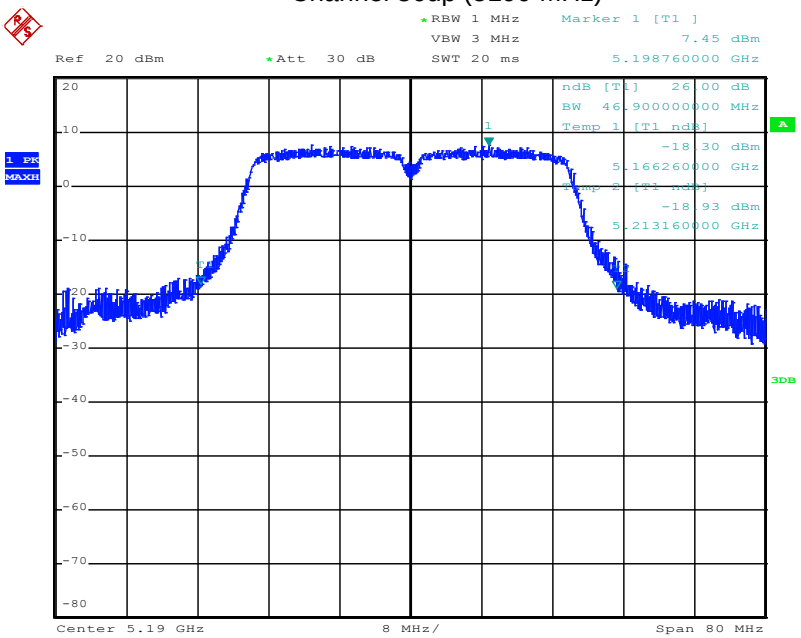


Channel 48 (5240 MHz)

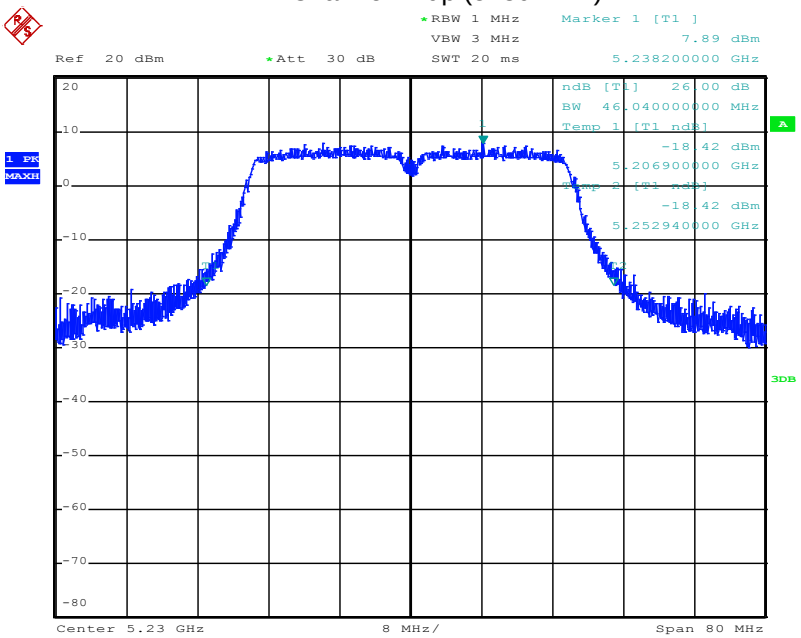


HT40:

Channel 36up (5190 MHz)



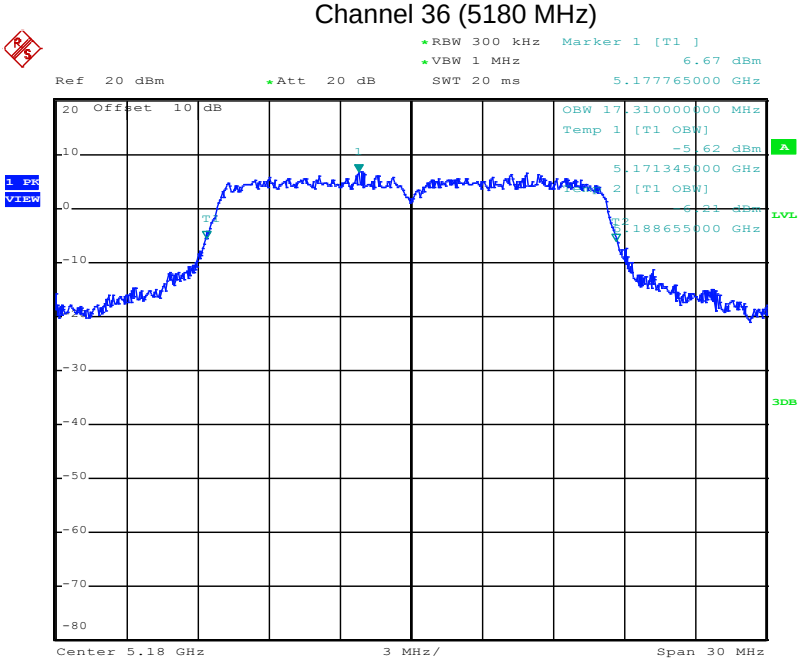
Channel 44up (5230 MHz)



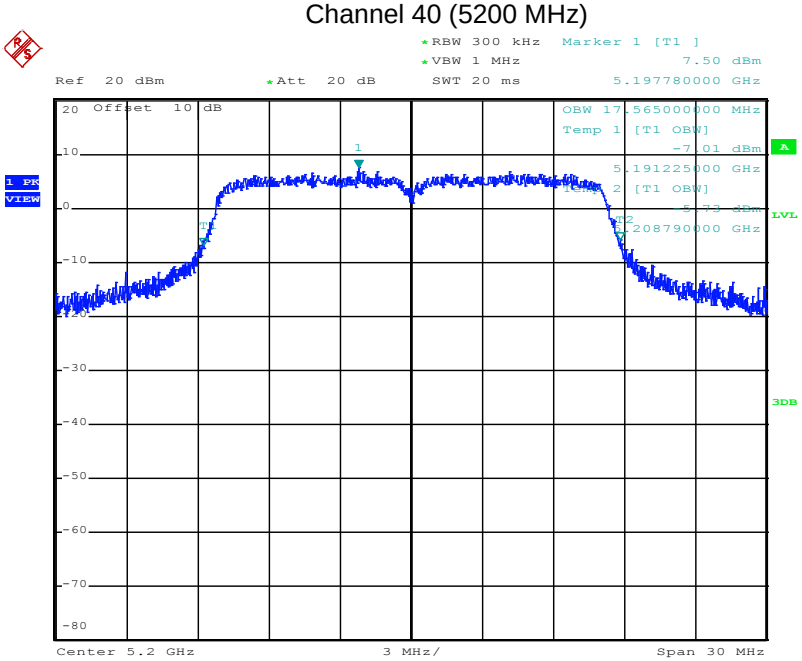
5.2.7 Test protocol OBW

802.11a:

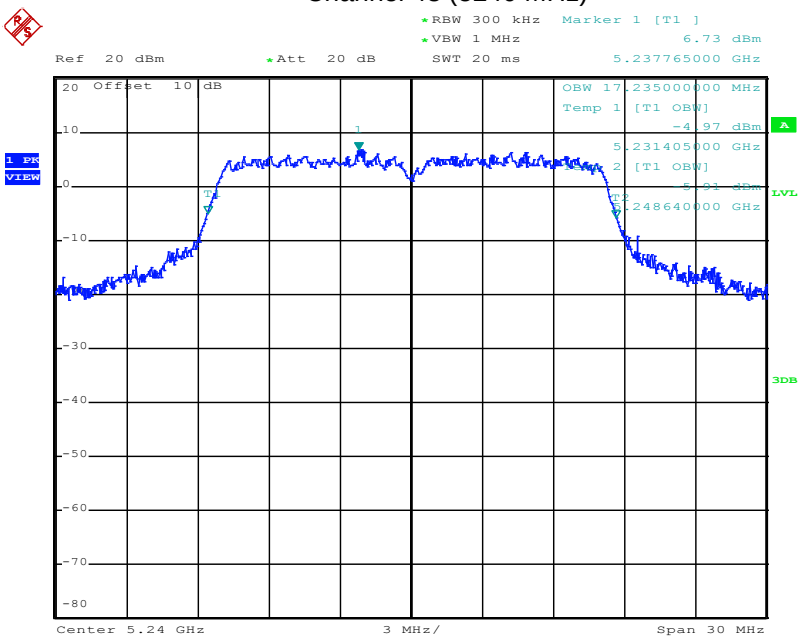
Channel 36 (5180 MHz)



Channel 40 (5200 MHz)

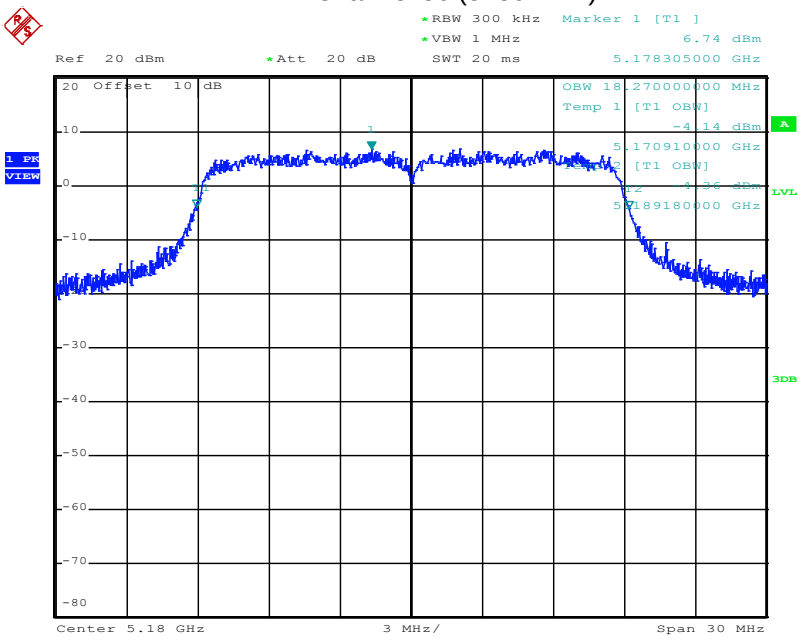


Channel 48 (5240 MHz)

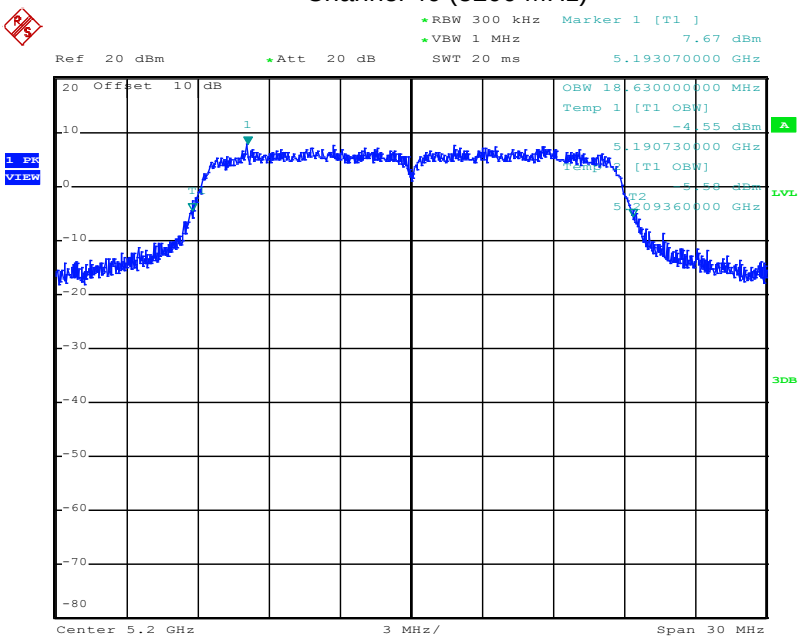


HT20:

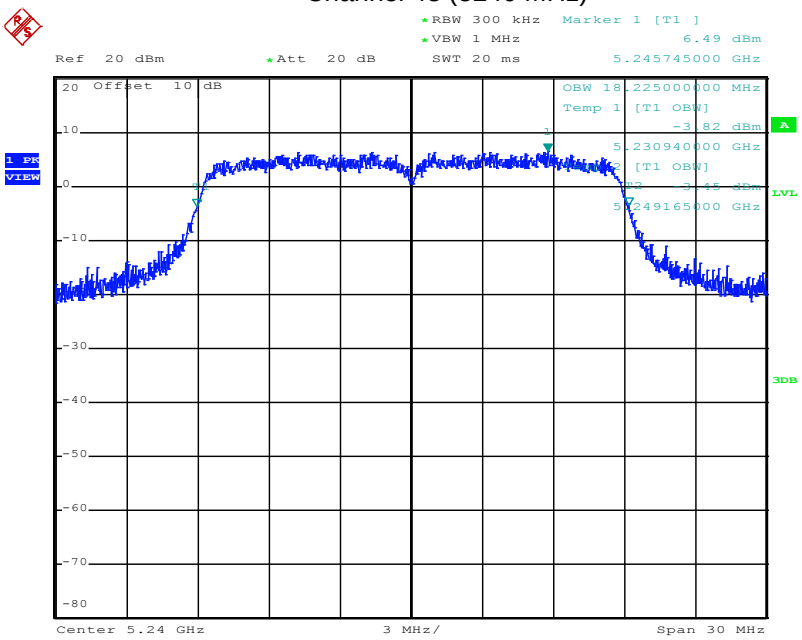
Channel 36 (5180 MHz)



Channel 40 (5200 MHz)

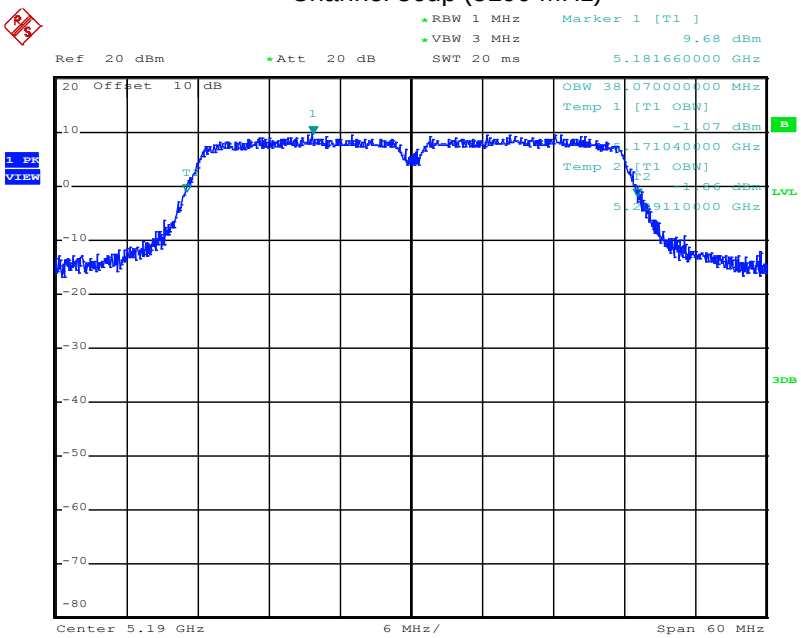


Channel 48 (5240 MHz)

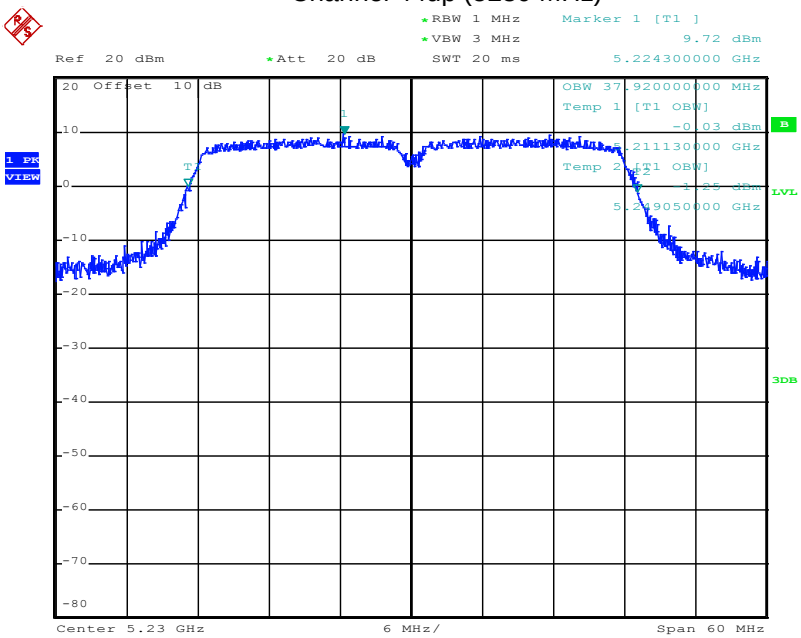


HT40:

Channel 36up (5190 MHz)



Channel 44up (5230 MHz)



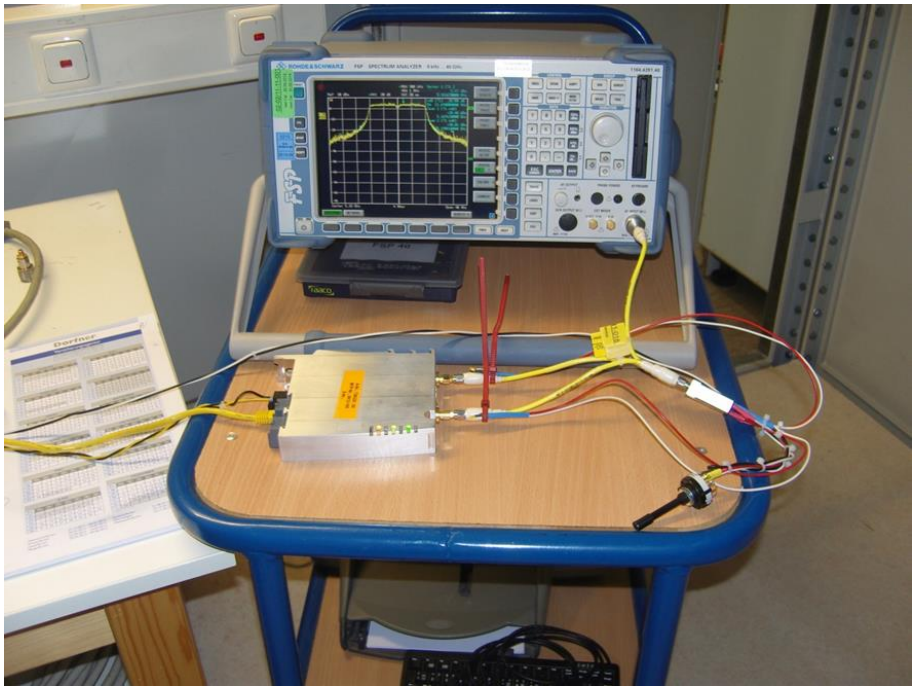
5.3 Maximum conducted output power

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

5.3.1 Description of the test location

Test location: AREA 4

5.3.2 Photo documentation of the test set-up



5.3.3 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 are 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.

5.3.4 Description of Measurement

The output power is measured conducted using a spectrum analyser. The EUT has no constant duty cycle and may be smaller than 98% therefore the procedure according the OET 789033, item E g) Method SA-3 Alternative is followed. The EUT is set while measuring in TX continuous mode with a maximum duty cycle. The total output power is summed over all antenna terminals of the multiple antenna system. The insertion loss of the measurement cable and switch is taken into account with a amplitude offset while measuring.

Determination of the min VBW:

Transmission duration			
Standard	min puls in TX continuous mode	1/T	min VBW
	(ms)	(Hz)	
801.11a	2.000	500	1 kHz
801.11n, HT20	1.850	541	1 kHz
801.11n, HT40	0.455	2198	3 kHz

Spectrum analyser settings:
Channel power measurement function, TX channel bandwidth equal to OBW;
RBW: 1 MHz, VBW: min VBW, Sweep time: auto, Detector: PK, Trace: max hold;

5.3.5 Test result

Test conditions:			
801.11a, Mbps 6:		Test results	
	A [P14]	A [P17]	A [P20]
Chain1	(dBm)	(dBm)	(dBm)
CH36	5.1	7.8	11.0
CH40	4.9	8.4	11.3
CH48	4.8	7.9	10.9

Test conditions:			
801.11a, Mbps 6:		Test results	
	A [P14]	A [P17]	A [P20]
Chain2	(dBm)	(dBm)	(dBm)
CH36	4.2	7.7	10.7
CH40	4.6	8.1	10.9
CH48	5.4	8.3	11.3

Calculating of the conducted power and EIRP:

CH36a	Test results							
	P set	Ant gain	A1 + A2	Limit	Margin	EIRP	Limit	Margin
Chain1 + 2		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P20	6.0	13.9	17.0	-3.1	19.9	23.0	-3.1
Ant_group2	P17	9.0	10.8	17.0	-6.2	19.8	23.0	-3.2
Ant_group3	P14	14.2	7.7	17.0	-9.3	21.9	23.0	-1.1

CH40a	Test results							
	P set	Ant gain	A1 + A2	Limit	Margin	EIRP	Limit	Margin
Chain1 + 2		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P20	6.0	14.1	17.0	-2.9	20.1	23.0	-2.9
Ant_group2	P17	9.0	11.0	17.0	-6.0	20.0	23.0	-3.0
Ant_group3	P14	14.2	7.9	17.0	-9.1	22.1	23.0	-0.9

CH48a	Test results							
	P set	Ant gain	A1 + A2	Limit	Margin	EIRP	Limit	Margin
Chain1 + 2		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P20	6.0	14.1	17.0	-2.9	20.1	23.0	-2.9
Ant_group2	P17	9.0	11.1	17.0	-5.9	20.1	23.0	-2.9
Ant_group3	P14	14.2	8.1	17.0	-8.9	22.3	23.0	-0.7

Test conditions:			
801.11n, HT20, MCS0:		Test results	
	A [P14]	A [P17]	A [P20]
Chain1	(dBm)	(dBm)	(dBm)
CH36	4.6	7.8	10.7
CH40	4.8	8.1	10.8
CH48	4.6	7.5	11.6

Test conditions:			
801.11n, HT20, MCS0:		Test results	
	A [P14]	A [P17]	A [P20]
Chain2	(dBm)	(dBm)	(dBm)
CH36	4.1	7.5	10.2
CH40	4.3	7.8	10.4
CH48	5.0	8.2	11.4

Calculating of the conducted power and EIRP:

CH36, HT20	Test results							
	P set	Ant gain	A1 + A2	Limit	Margin	EIRP	Limit	Margin
Chain1 + 2		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P20	6.0	13.5	17.0	-3.5	19.5	23.0	-3.5
Ant_group2	P17	9.0	10.7	17.0	-6.3	19.7	23.0	-3.3
Ant_group3	P14	14.2	7.4	17.0	-9.6	21.6	23.0	-1.4

CH40, HT20	Test results							
	P set	Ant gain	A1 + A2	Limit	Margin	EIRP	Limit	Margin
Chain1 + 2		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P20	6.0	13.6	17.0	-3.4	19.6	23.0	-3.4
Ant_group2	P17	9.0	10.8	17.0	-6.2	19.8	23.0	-3.2
Ant_group3	P14	14.2	7.5	17.0	-9.5	21.7	23.0	-1.3

CH48, HT20	Test results							
	P set	Ant gain	A1 + A2	Limit	Margin	EIRP	Limit	Margin
Chain1 + 2		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P20	6.0	14.5	17.0	-2.5	20.5	23.0	-2.5
Ant_group2	P17	9.0	10.9	17.0	-6.1	19.9	23.0	-3.1
Ant_group3	P14	14.2	7.8	17.0	-9.2	22.0	23.0	-1.0

Test conditions:			
801.11n, HT40, MCS8:		Test results	
	A [P14]	A [P17]	A [P20]
Chain1	(dBm)	(dBm)	(dBm)
CH36up	5.4	8.8	11.7
CH44up	5.4	8.7	11.4

Test conditions:			
801.11n, HT40, MCS8:		Test results	
	A [P14]	A [P17]	A [P20]
Chain2	(dBm)	(dBm)	(dBm)
CH36up	5.4	8.4	11.2
CH44up	5.8	9.1	11.8

Calculating of the conducted power and EIRP:

CH36up	Test results							
	P set	Ant gain	A1 + A2	Limit	Margin	EIRP	Limit	Margin
Chain1 + 2		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P20	6.0	14.5	17.0	-2.5	20.5	23.0	-2.5
Ant_group2	P17	9.0	11.6	17.0	-5.4	20.6	23.0	-2.4
Ant_group3	P14	14.2	8.4	17.0	-8.6	22.6	23.0	-0.4

CH44up	Test results							
	P set	Ant gain	A1 + A2	Limit	Margin	EIRP	Limit	Margin
Chain1 + 2		(dBi)	(dBm)	(dBm)	(dB)	(dBm)	(dBm)	(dB)
Ant_group1	P20	6.0	14.6	17.0	-2.4	20.6	23.0	-2.4
Ant_group2	P17	9.0	11.9	17.0	-5.1	20.9	23.0	-2.1
Ant_group3	P14	14.2	8.6	17.0	-8.4	22.8	23.0	-0.2

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

Frequency	Conducted power limit		
(GHz)		(dBm)	(dBm)
5.150 - 5.250	Legacy, 4 + 10 log B =	17.5	17.0
	HT20, 4 + 10 log B =	17.8	17.0
	HT40, 4 + 10 log B =	20.7	17.0

Note: The lower limit applies!

The requirements are **FULFILLED.**

Remarks: _____

_____

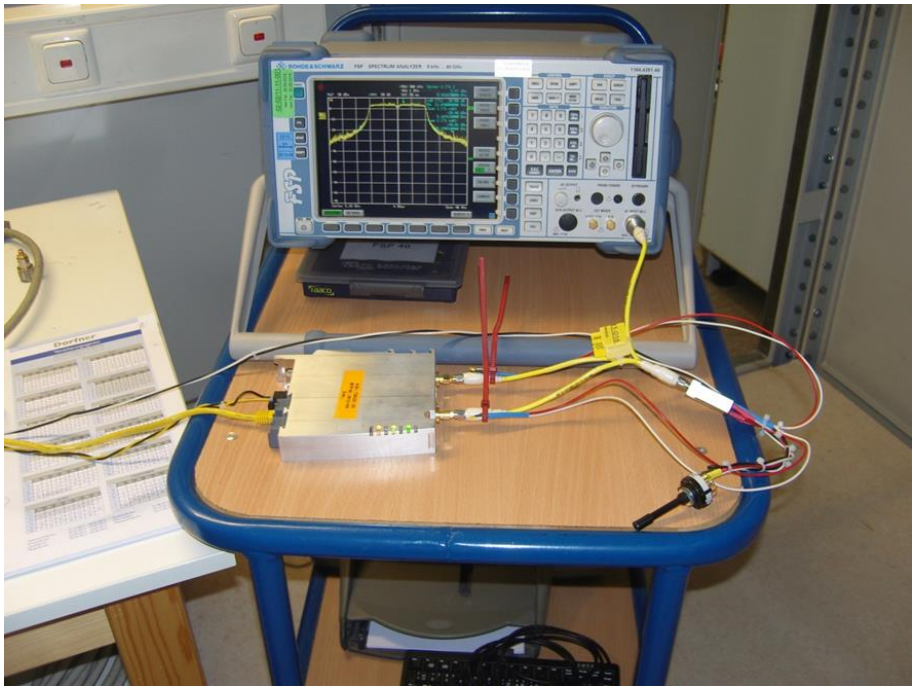
5.4 Peak power spectral density

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

5.4.1 Description of the test location

Test location: AREA 4

5.4.2 Photo documentation of the test set-up



5.4.3 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.

5.4.4 Description of Measurement

The bandwidth is measured conducted using a spectrum analyser and following the procedures according the OET 789033, item F. Since the method SA-3 alternative was used for channel power the spectrum analyser settings are the same as under item F)g). The marker function “Marker to max” is used to set at peak power spectral density. For this MIMO transmitter the antenna chain 1 and chain 2 is measured and summed in linear terms over all antenna terminals of the multiple antenna system. The insertion loss of the measurement cable and switch is taken into account with amplitude offset while measuring.

Spectrum analyser settings:
Channel power measurement function, TX channel bandwidth equal to OBW;
RBW: 1 MHz, VBW: min VBW, Sweep time: auto, Detector: PK, Trace: max hold;

5.4.5 Test result

Test conditions: 801.11a, Mbps 6, conducted						
	Test results					
Chain1 + 2	Power setting	D1	D2	D1 + D2	PPSD limit	Margin
		(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
CH36	P14	-5.9	-6.7	-3.3	4	-7.3
	P17	-3.1	-3.2	-0.1	4	-4.1
	P20	0.0	-0.2	2.9	4	-1.1
CH40	P14	-6.0	-6.3	-3.1	4	-7.1
	P17	-2.6	-2.8	0.3	4	-3.7
	P20	0.5	-0.1	3.2	4	-0.8
CH48	P14	-6.1	-5.5	-2.8	4	-6.8
	P17	-3.0	-2.4	0.3	4	-3.7
	P20	0.0	0.4	3.2	4	-0.8

Test conditions: HT20, MCS0, conducted						
	Test results					
Chain1 + 2	Power setting	D1	D2	D1 + D2	PPSD limit	Margin
		(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
CH36	P14	-6.5	-7.1	-3.8	4	-7.8
	P17	-3.5	-3.0	-0.2	4	-4.2
	P20	-0.5	-0.9	2.3	4	-1.7
CH40	P14	-6.2	-6.7	-3.4	4	-7.4
	P17	-3.2	-3.2	-0.2	4	-4.2
	P20	-0.4	-0.7	2.5	4	-1.5
CH48	P14	-6.6	-6.1	-3.3	4	-7.3
	P17	-3.7	-2.7	-0.2	4	-4.2
	P20	-0.5	0.3	2.9	4	-1.1

Test conditions: HT40, MCS8, conducted						
	Test results					
Chain1 + 2	Power setting	D1	D2	D1 + D2	PPSD limit	Margin
		(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
CH36up	P14	-8.9	-9.2	-6.0	4	-10.0
	P17	-5.4	-5.8	-2.6	4	-6.6
	P20	-2.5	-3.0	0.3	4	-3.7
CH44up	P14	-8.8	-8.5	-5.6	4	-9.6
	P17	-5.5	-5.2	-2.3	4	-6.3
	P20	-2.8	-2.6	0.3	4	-3.7

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

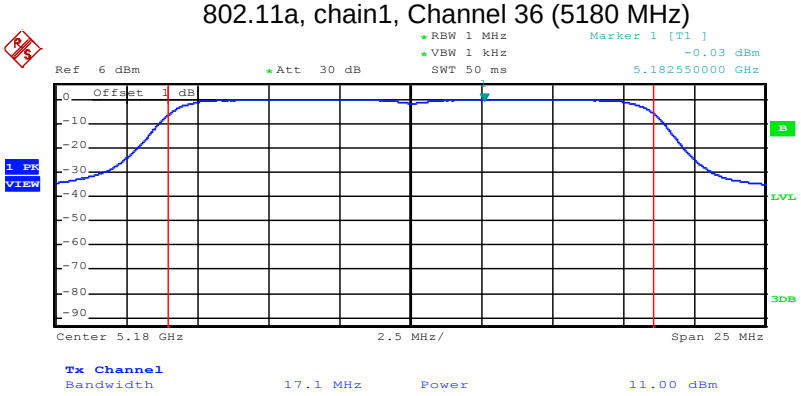
The requirements are **FULFILLED.**

Remarks: For detailed test results please refer to following test protocols. CH36 is listed only as representative channel.

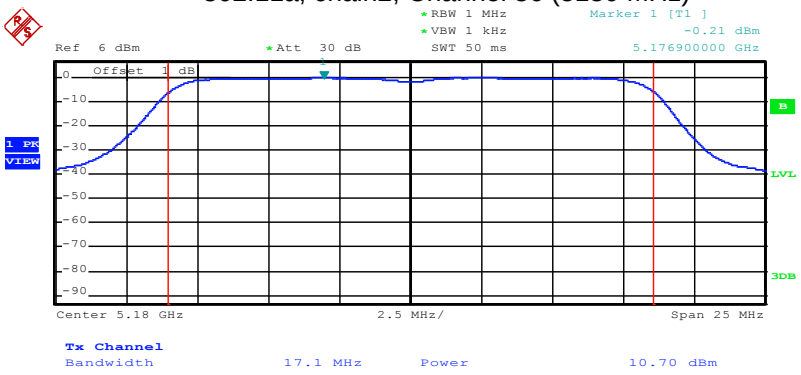
5.4.6 Peak Power spectral density plots

Power setting P20:

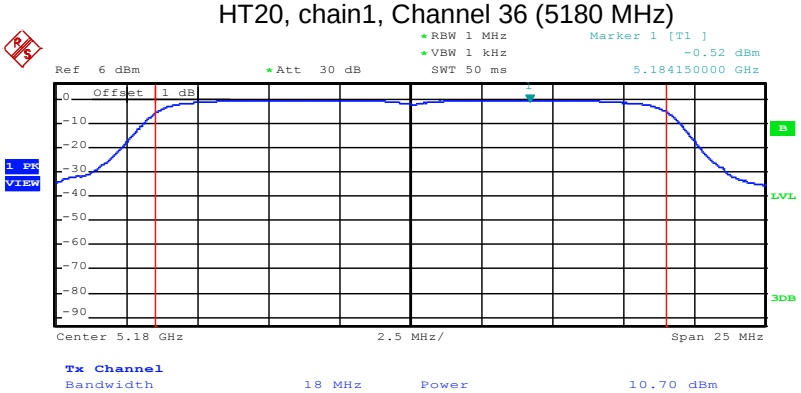
802.11a, chain1, Channel 36 (5180 MHz)



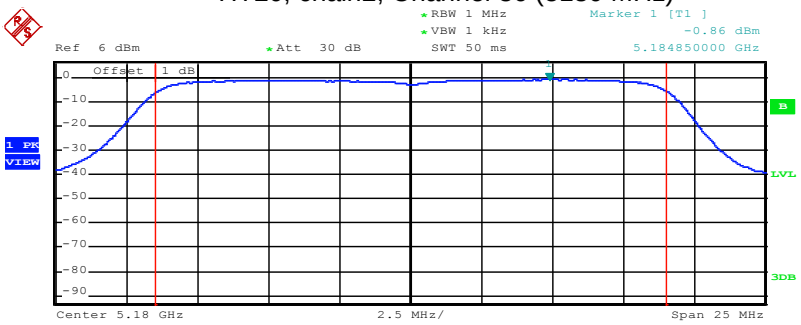
802.11a, chain2, Channel 36 (5180 MHz)



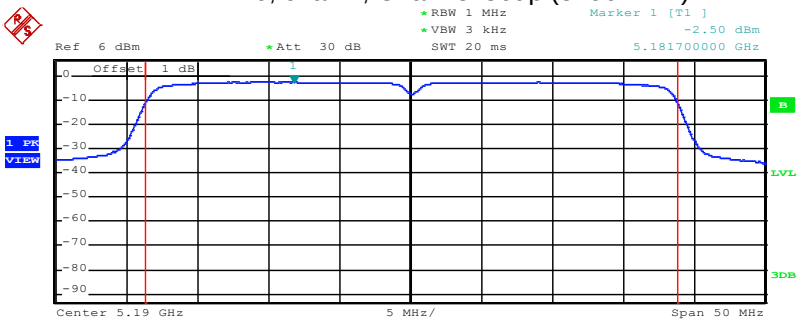
HT20, chain1, Channel 36 (5180 MHz)



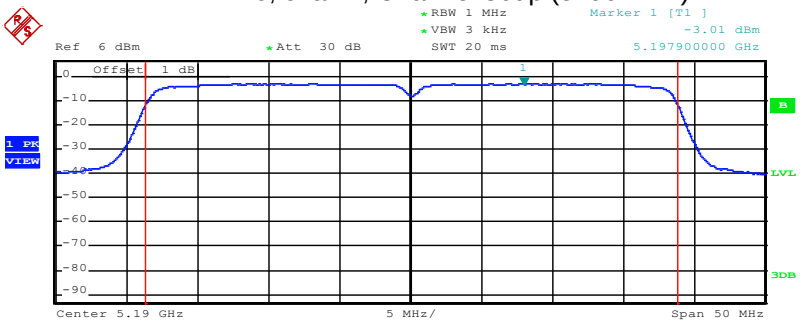
HT20, chain2, Channel 36 (5180 MHz)



HT40, chain1, Channel 36up (5190 MHz)



HT40, chain2, Channel 36up (5190 MHz)



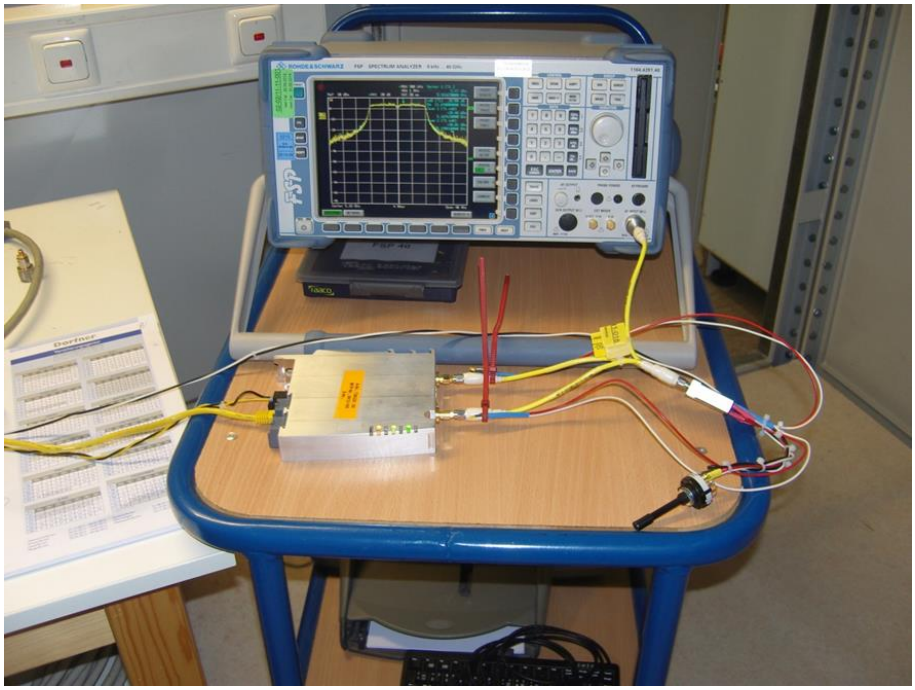
5.5 Peak excursion

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

5.5.1 Description of the test location

Test location: AREA 4

5.5.2 Photo documentation of the test set-up



5.5.3 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.

5.5.4 Description of Measurement

Peak excursion is measured using a spectrum analyser and following the procedures according the OET 789033, item G. The peak max spectrum is determined with the analyser setting mentioned below. The ratio between peak-max-hold spectrum and average spectrum is calculated and listed as PEX in the tables below.

Spectrum analyser settings:
RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto, Detector: PK, Trace: max hold;

5.5.5 Test result

Test conditions: 801.11a, Mbps 6, conducted						
	Test results					
Chain1	Power setting	PPSD	Level VBW=3 MHz	PEX	PEX limit	Margin
		(dBm)	(dBm)	(dB)	(dB)	(dB)
CH36	P20	0.0	9.4	9.4	13	-3.6
CH40	P20	0.5	9.8	9.3	13	-3.7
CH48	P20	0.0	9.2	9.2	13	-3.8

Test conditions: HT20, MCS0, conducted						
	Test results					
Chain1	Power setting	PPSD	Level VBW=3 MHz	PEX	PEX limit	Margin
		(dBm)	(dBm)	(dB)	(dB)	(dB)
CH36	P20	-0.5	10.1	10.6	13	-2.4
CH40	P20	-0.4	10.0	10.4	13	-2.6
CH48	P20	-0.5	9.7	10.2	13	-2.8

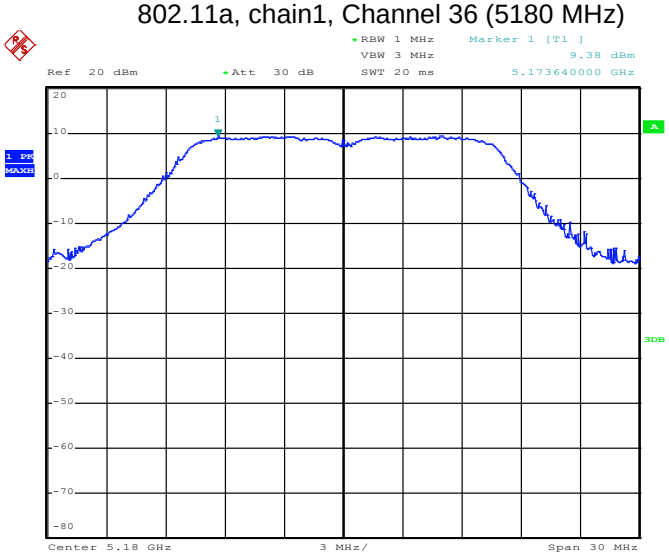
Test conditions: HT40, MCS16, conducted						
	Test results					
Chain1	Power setting	PPSD	Level VBW=3 MHz	PEX	PEX limit	Margin
		(dBm)	(dBm)	(dB)	(dB)	(dB)
CH36up	P20	-2.5	6.7	9.2	13	-3.8
CH44up	P20	-2.8	7.3	10.1	13	-2.9

The requirements are **FULFILLED.**

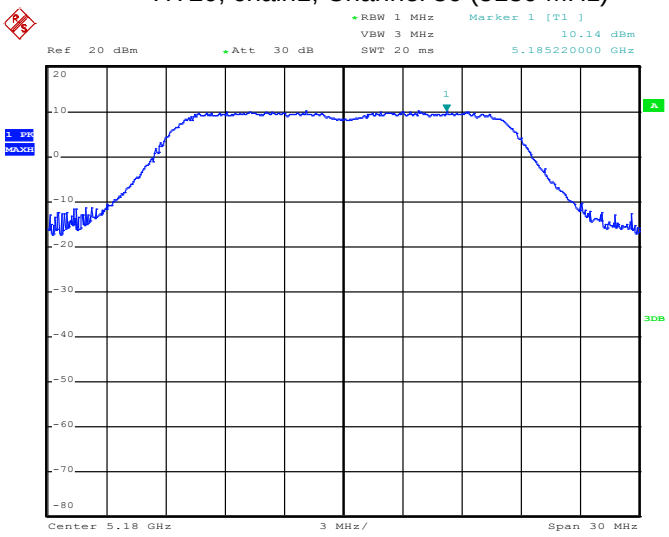
Remarks: For detailed test results please refer to following test protocols. CH36 is listed only as representative channel

5.5.6 Peak excursion plots

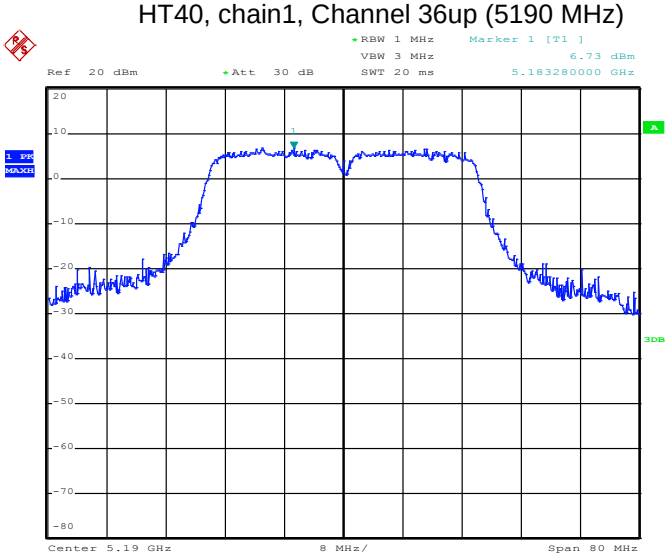
802.11a, chain1, Channel 36 (5180 MHz)



HT20, chain1, Channel 36 (5180 MHz)



HT40, chain1, Channel 36up (5190 MHz)



5.6 Undesirable emissions

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

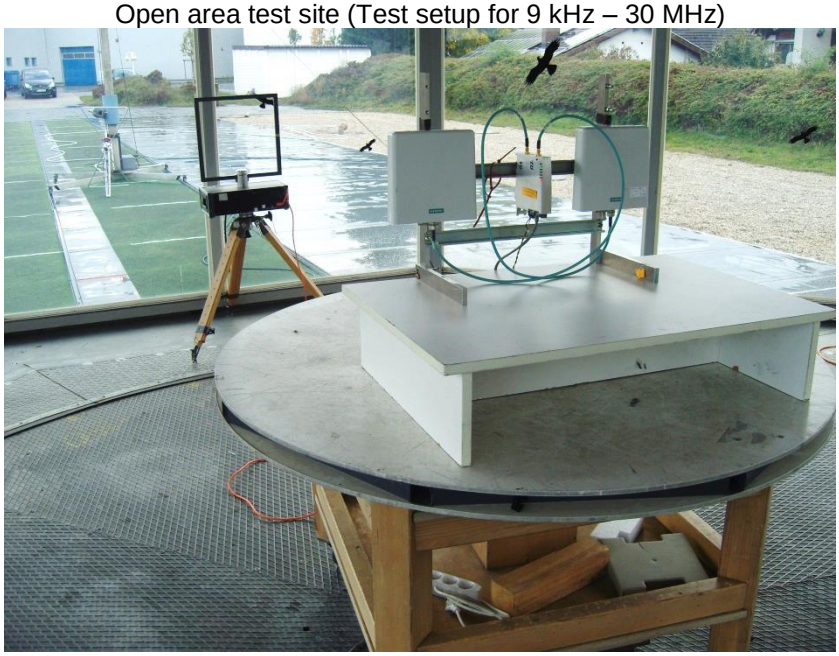
5.6.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 2

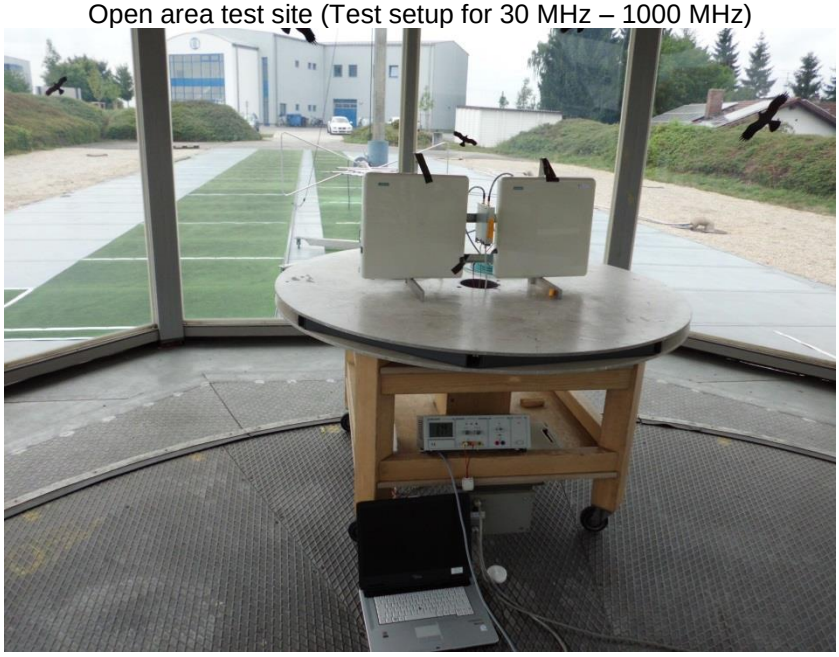
Test distance: 3 m

5.6.2 Photo documentation of the test set-up

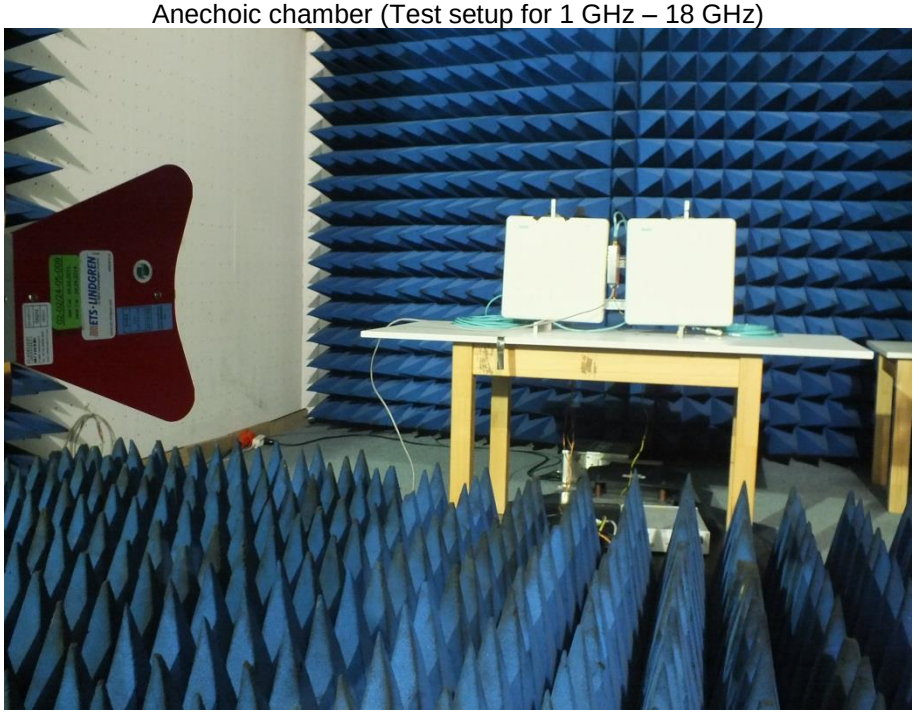
Open area test site (Test setup for 9 kHz – 30 MHz)



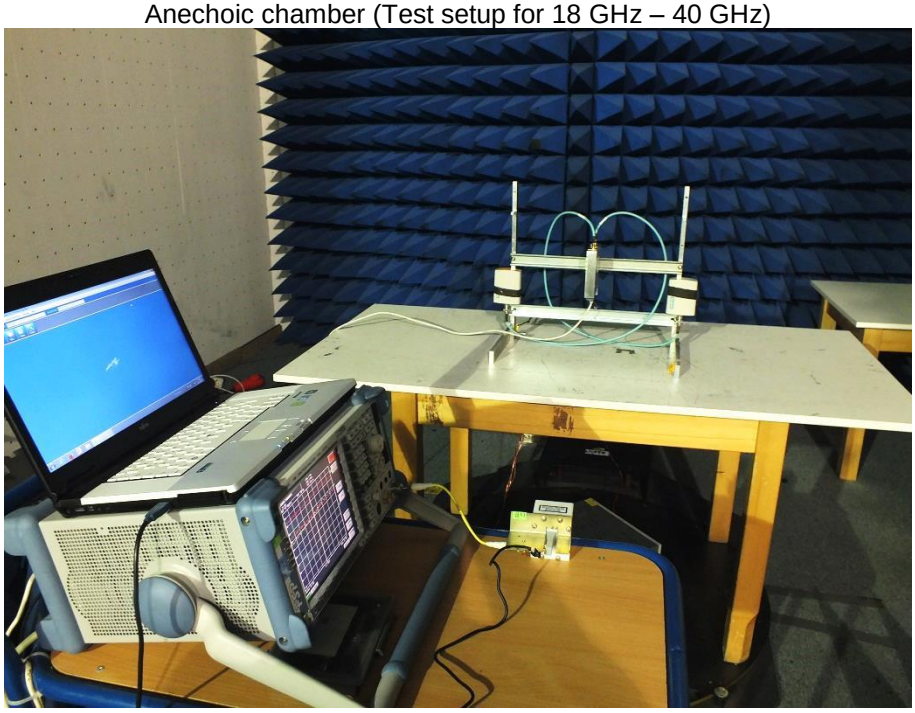
Open area test site (Test setup for 30 MHz – 1000 MHz)



Anechoic chamber (Test setup for 1 GHz – 18 GHz)



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



5.6.3 Applicable standard

According to FCC Part 15E, Section 15.407(b):
For transmitters operating in the defined bands shall not exceed the appropriate emission limit outside of the operating bands.
In addition, radiated emissions which fall in the restricted bands, as defined in Section15.205(a), must also comply with the radiated emission limit specified in Section15.209(a) (see Section15.205(c)).

5.6.4 Description of Measurement

Undesirable emissions are measured using a spectrum analyser and following the procedures according the OET 789033, item H. If the emission level of the EUT in peak mode complies with the 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. Up from 8 GHz a HP filter is used.

Spectrum analyser settings for peak values:
RBW: 1 MHz, VBW: 3 MHz, Detector: max. peak, Sweep: Auto, Trace mode: max hold;
Spectrum analyser settings for average values:
RBW: 1 MHz VBW: 3 MHz Detector: RMS, Sweep: Auto, Trace mode: max hold;

5.6.5 Test result radiated emissions

5.6.5.1 0.009 - 30 MHz:

In the frequency range 9 kHz to 30 MHz no emission could be detected!

5.6.5.2 Gain group 1

802.11a:

Lowest frequency: **5180 MHz**						
Test conditions: 2 TX , P20, 6 Mbps					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-48.0	-27.0	-21.0
1000	5150	1000	5097	-35.3	-27.0	-8.3
5250	13000	1000	6860	-36.6	-27.0	-9.6
13000	18000	1000	16565	-39.1	-27.0	-12.1
18000	40000	1000	33887	-35.1	-27.0	-8.1
Measurement uncertainty			±6 dB			

Middle frequency: **5200 MHz**						
Test conditions: 2 TX , P20, 6 Mbps					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-48.0	-27.0	-21.0
1000	5150	1000	5117	-35.8	-27.0	-8.8
5250	13000	1000	7200	-36.0	-27.0	-9.0
13000	18000	1000	16526	-38.9	-27.0	-11.9
18000	40000	1000	33913	-34.8	-27.0	-7.8
Measurement uncertainty			±6 dB			

Highest frequency: **5240 MHz**						
Test conditions: 2 TX , P20, 6 Mbps					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-48.0	-27.0	-21.0
1000	5150	1000	5072	-37.6	-27.0	-10.6
5250	13000	1000	5250	-34.6	-27.0	-7.6
13000	18000	1000	16523	-38.9	-27.0	-11.9
18000	40000	1000	33898	-35.9	-27.0	-8.9
Measurement uncertainty			±6 dB			

Note: The value at the band edge 5250 MHz is determined by integration method set out in OET 789033, item H3)d)ii) band-power measurement.

802.11n, HT20:

Lowest frequency: **5180 MHz**						
Test conditions: 2 TX , P20, MCS0					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-48.0	-27.0	-21.0
1000	5150	1000	5102	-34.6	-27.0	-7.6
5250	13000	1000	7491	-36.8	-27.0	-9.8
13000	18000	1000	16480	-37.4	-27.0	-10.4
18000	40000	1000	39982	-33.1	-27.0	-6.1
Measurement uncertainty			±6 dB			

Middle frequency: **5200 MHz**						
Test conditions: 2 TX , P20, MCS0					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-48.0	-27.0	-21.0
1000	5150	1000	5116	-34.8	-27.0	-7.8
5250	13000	1000	6906	-36.8	-27.0	-9.8
13000	18000	1000	16525	-38.2	-27.0	-11.2
18000	40000	1000	39971	-33.3	-27.0	-6.3
Measurement uncertainty			±6 dB			

Highest frequency: **5240 MHz**						
Test conditions: 2 TX , P20, MCS0					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-48.0	-27.0	-21.0
1000	5150	1000	5042	-38.1	-27.0	-11.1
5250	13000	1000	5250	-31.8	-27.0	-4.8
13000	18000	1000	17042	-37.9	-27.0	-10.9
18000	40000	1000	39992	-32.7	-27.0	-5.7
Measurement uncertainty			±6 dB			

Note: The value at the band edge 5250 MHz is determined by integration method set out in OET 789033, item H3)d)ii) band-power measurement.

802.11n, HT40:

Lowest frequency: **5190 MHz**						
Test conditions: 2 TX , P20, MCS8					EIRP	
			Test results			
Start frequ.	Stop frequ.	RBW	Maximum emission observed		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-48.0	-27.0	-21.0
1000	5150	1000	5147	-33.9	-27.0	-6.9
5250	13000	1000	6745	-36.2	-27.0	-9.2
13000	18000	1000	16501	-38.9	-27.0	-11.9
18000	40000	1000	39720	-32.7	-27.0	-5.7
Measurement uncertainty			±6 dB			

Highest frequency: **5210 MHz**						
Test conditions: 2 TX , P20, MCS8					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-48.0	-27.0	-21.0
1000	5150	1000	5138	-35.4	-27.0	-8.4
5250	13000	1000	5250	-37.8	-27.0	-10.8
13000	18000	1000	17059	-39.7	-27.0	-12.7
18000	40000	1000	39750	-32.9	-27.0	-5.9
Measurement uncertainty			±6 dB			

Note: The value at the band edge 5250 MHz is determined by integration method set out in OET 789033, item H3)d)ii) band-power measurement.

5.6.5.3 Gain group 2

802.11a:

Lowest frequency: **5180 MHz**						
Test conditions: 2 TX , P17, 6 Mbps					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-44.0	-27.0	-17.0
1000	5150	1000	5096	-35.0	-27.0	-8.0
5250	13000	1000	5400	-35.0	-27.0	-8.0
13000	18000	1000	16499	-39.2	-27.0	-12.2
18000	40000	1000	39998	-33.1	-27.0	-6.1
Measurement uncertainty			±6 dB			

Middle frequency: **5200 MHz**						
Test conditions: 2 TX , P17, 6 Mbps					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-44.0	-27.0	-17.0
1000	5150	1000	5118	-34.0	-27.0	-7.0
5250	13000	1000	5357	-35.4	-27.0	-8.4
13000	18000	1000	16513	-38.6	-27.0	-11.6
18000	40000	1000	39874	-33.3	-27.0	-6.3
Measurement uncertainty			±6 dB			

Highest frequency: **5240 MHz**						
Test conditions: 2 TX , P17, 6 Mbps					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-44.0	-27.0	-17.0
1000	5150	1000	5031	-37.2	-27.0	-10.2
5250	13000	1000	5250	-33.0	-27.0	-6.0
13000	18000	1000	17000	-38.9	-27.0	-11.9
18000	40000	1000	39987	-32.7	-27.0	-5.7
Measurement uncertainty			±6 dB			

Note: The value at the band edge 5250 MHz is determined by integration method set out in OET 789033, item H3)d)ii) band-power measurement.

802.11n, HT20:

Lowest frequency: **5180 MHz**						
Test conditions: 2 TX , P17, MCS0					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-44.0	-27.0	-17.0
1000	5150	1000	5096	-34.5	-27.0	-7.5
5250	13000	1000	5443	-35.1	-27.0	-8.1
13000	18000	1000	17155	-38.3	-27.0	-11.3
18000	40000	1000	33972	-34.4	-27.0	-7.4
Measurement uncertainty			±6 dB			

Middle frequency: **5200 MHz**						
Test conditions: 2 TX , P17, MCS0					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-44.0	-27.0	-17.0
1000	5150	1000	5113	-34.5	-27.0	-7.5
5250	13000	1000	5388	-36.0	-27.0	-9.0
13000	18000	1000	16555	-38.8	-27.0	-11.8
18000	40000	1000	33964	-35.6	-27.0	-8.6
Measurement uncertainty			±6 dB			

Highest frequency: **5240 MHz**						
Test conditions: 2 TX , P17, MCS0					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-44.0	-27.0	-17.0
1000	5150	1000	5048	-37.1	-27.0	-10.1
5250	13000	1000	5250	-32.9	-27.0	-5.9
13000	18000	1000	16481	-39.1	-27.0	-12.1
18000	40000	1000	33989	-33.7	-27.0	-6.7
Measurement uncertainty			±6 dB			

802.11n, HT40:

Lowest frequency: **5190 MHz**						
Test conditions: 2 TX , P17, MCS8					EIRP	
			Test results			
Start frequ.	Stop frequ.	RBW	Maximum emission observed		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-44.0	-27.0	-17.0
1000	5150	1000	5146	-31.3	-27.0	-4.3
5250	13000	1000	5358	-35.3	-27.0	-8.3
13000	18000	1000	16550	-39.1	-27.0	-12.1
18000	40000	1000	33994	-33.5	-27.0	-6.5
Measurement uncertainty			±6 dB			

Highest frequency: **5210 MHz**						
Test conditions: 2 TX , P17, MCS8					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-44.0	-27.0	-17.0
1000	5150	1000	5146	-35.8	-27.0	-8.8
5250	13000	1000	5250	-29.7	-27.0	-2.7
13000	18000	1000	16559	-38.6	-27.0	-11.6
18000	40000	1000	33981	-33.2	-27.0	-6.2
Measurement uncertainty			±6 dB			

Note: The value at the band edge 5250 MHz is determined by integration method set out in OET 789033, item H3)d)ii) band-power measurement.

5.6.5.4 Gain group 3

802.11a:

Lowest frequency: **5180 MHz**						
Test conditions: 2 TX , P14, 6 Mbps					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-41.0	-27.0	-14.0
1000	5150	1000	5097	-35.3	-27.0	-8.3
5250	13000	1000	6860	-36.6	-27.0	-9.6
13000	18000	1000	16565	-39.1	-27.0	-12.1
18000	40000	1000	38488	-32.3	-27.0	-5.3
Measurement uncertainty			±6 dB			

Middle frequency: **5200 MHz**						
Test conditions: 2 TX , P14, 6 Mbps					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-41.0	-27.0	-14.0
1000	5150	1000	5117	-35.8	-27.0	-8.8
5250	13000	1000	7200	-35.7	-27.0	-8.7
13000	18000	1000	16526	-38.9	-27.0	-11.9
18000	40000	1000	38512	-33.9	-27.0	-6.9
Measurement uncertainty			±6 dB			

Highest frequency: **5240 MHz**						
Test conditions: 2 TX , P14, 6 Mbps					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-41.0	-27.0	-14.0
1000	5150	1000	5072	-37.6	-27.0	-10.6
5250	13000	1000	5250	-30.0	-27.0	-3.0
13000	18000	1000	16523	-38.9	-27.0	-11.9
18000	40000	1000	38326	-33.4	-27.0	-6.4
Measurement uncertainty			±6 dB			

Note: The value at the band edge 5250 MHz is determined by integration method set out in OET 789033, item H3)d)ii) band-power measurement.

802.11n, HT20:

Lowest frequency: **5180 MHz**						
Test conditions: 2 TX , P14, MCS0					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-41.0	-27.0	-14.0
1000	5150	1000	5102	-34.6	-27.0	-7.6
5250	13000	1000	7491	-36.8	-27.0	-9.8
13000	18000	1000	16480	-37.4	-27.0	-10.4
18000	40000	1000	39978	-32.7	-27.0	-5.7
Measurement uncertainty			±6 dB			

Middle frequency: **5200 MHz**						
Test conditions: 2 TX , P14, MCS0					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-41.0	-27.0	-14.0
1000	5150	1000	5116	-34.8	-27.0	-7.8
5250	13000	1000	6906	-36.8	-27.0	-9.8
13000	18000	1000	16525	-38.2	-27.0	-11.2
18000	40000	1000	39963	-33.1	-27.0	-6.1
Measurement uncertainty			±6 dB			

Highest frequency: **5240 MHz**						
Test conditions: 2 TX , P14, MCS0					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-41.0	-27.0	-14.0
1000	5150	1000	5042	-38.1	-27.0	-11.1
5250	13000	1000	5250	-27.4	-27.0	-0.4
13000	18000	1000	17042	-37.9	-27.0	-10.9
18000	40000	1000	39978	-32.3	-27.0	-5.3
Measurement uncertainty			±6 dB			

Note: The value at the band edge 5250 MHz is determined by integration method set out in OET 789033, item H3)d)ii) band-power measurement.

802.11n, HT40:

Lowest frequency: **5190 MHz**						
Test conditions: 2 TX , P14, MCS8					EIRP	
			Test results			
Start frequ.	Stop frequ.	RBW	Maximum emission observed		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-41.0	-27.0	-14.0
1000	5150	1000	5147	-33.9	-27.0	-6.9
5250	13000	1000	6745	-36.2	-27.0	-9.2
13000	18000	1000	16501	-38.9	-27.0	-11.9
18000	40000	1000	39952	-32.9	-27.0	-5.9
Measurement uncertainty			±6 dB			

Highest frequency: **5210 MHz**						
Test conditions: 2 TX , P14, MCS8					EIRP	
			Test results			
Start	Stop	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm/MHz)	(dBm/MHz)	(dB)
30	1000	120	900	-41.0	-27.0	-14.0
1000	5150	1000	5138	-35.4	-27.0	-8.4
5250	13000	1000	5250	-31.7	-27.0	-4.7
13000	18000	1000	17059	-39.7	-27.0	-12.7
18000	40000	1000	39967	-32.6	-27.0	-5.6
Measurement uncertainty			±6 dB			

Note: The value at the band edge 5250 MHz is determined by integration method set out in OET 789033, item H3)d)ii) band-power measurement.

Limit according to FCC Part 15E, Section 15.407(b) for undesirable emissions:

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

5.6.6 Test result radiated emissions in restricted bands

5.6.6.1 Gain group 1

802.11a:

Lowest frequency: **5180 MHz**						
Test conditions: 2 TX , P20, 6 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5097	59.9	74.0	-14.1
5250	13000	1000	7250	58.4	74.0	-15.6
13000	18000	1000	16565	56.1	74.0	-17.9
18000	40000	1000	33887	60.1	74.0	-13.9
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5096	53.0	54.0	-1.0
7250	7750	1000	7250	51.3	54.0	-2.7
Measurement uncertainty			±6 dB			

Middle frequency: **5200 MHz**						
Test conditions: 2 TX , P20, 6 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5127	56.8	74.0	-17.2
5250	13000	1000	7320	58.5	74.0	-15.5
13000	18000	1000	16526	56.3	74.0	-17.7
18000	40000	1000	33913	60.4	74.0	-13.6
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5126	50.2	54.0	-3.8
7250	7750	1000	7320	50.1	54.0	-3.9
Measurement uncertainty			±6 dB			

Highest frequency: **5240 MHz**						
Test conditions: 2 TX , P20, 6 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	4893	56.1	74.0	-17.9
5250	13000	1000	7305	58.1	74.0	-15.9
13000	18000	1000	16523	56.3	74.0	-17.7
18000	40000	1000	33898	59.3	74.0	-14.7
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	4907	48.5	54.0	-5.5
7250	7750	1000	7305	51.9	54.0	-2.1
Measurement uncertainty			±6 dB			

HT20:

Lowest frequency: **5180 MHz**						
Test conditions: 2 TX , P20, MCS0						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5147	62.8	74.0	-11.2
5250	13000	1000	7422	56.7	74.0	-17.3
13000	18000	1000	16480	57.8	74.0	-16.2
18000	40000	1000	39982	62.1	74.0	-11.9
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5149	46.9	54.0	-7.1
7250	7750	1000	7422	51.3	54.0	-2.7
Measurement uncertainty			±6 dB			

Middle frequency: **5200 MHz**						
Test conditions: 2 TX , P20, MCS0						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5118	57.6	74.0	-16.4
5250	13000	1000	7750	58.4	74.0	-15.6
13000	18000	1000	16525	57.0	74.0	-17.0
18000	40000	1000	39971	61.9	74.0	-12.1
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5118	50.2	54.0	-3.8
7250	7750	1000	7750	50.2	54.0	-3.8
Measurement uncertainty			±6 dB			

Highest frequency: **5240 MHz**						
Test conditions: 2 TX , P20, MCS0						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5042	57.1	74.0	-16.9
5250	13000	1000	7710	58.1	74.0	-15.9
13000	18000	1000	17042	57.3	74.0	-16.7
18000	40000	1000	39992	62.5	74.0	-11.5
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5042	49.3	54.0	-4.7
7250	7750	1000	7710	52.4	54.0	-1.6
Measurement uncertainty			±6 dB			

HT40:

Lowest frequency: **5190 MHz**						
Test conditions: 2 TX , P20, MCS8						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5148	69.7	74.0	-4.3
5250	13000	1000	7725	58.6	74.0	-15.4
13000	18000	1000	16501	56.3	74.0	-17.7
18000	40000	1000	39720	62.5	74.0	-11.5
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5148	53.9	54.0	-0.1
7250	7750	1000	7725	50.3	54.0	-3.7
Measurement uncertainty			±6 dB			

Highest frequency: **5210 MHz**						
Test conditions: 2 TX , P20, MCS8						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5138	59.8	74.0	-14.2
5250	13000	1000	7270	56.8	74.0	-17.2
13000	18000	1000	17059	55.5	74.0	-18.5
18000	40000	1000	39750	62.3	74.0	-11.7
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5138	49.1	54.0	-4.9
7250	7750	1000	7270	52.4	54.0	-1.6
Measurement uncertainty			±6 dB			

5.6.6.2 Gain group 2

802.11a:

Lowest frequency: **5180 MHz**						
Test conditions: 2 TX , P17, 6 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5096	60.2	74.0	-13.8
5250	13000	1000	5400	60.2	74.0	-13.8
13000	18000	1000	16499	56.0	74.0	-18.0
18000	40000	1000	39998	62.1	74.0	-11.9
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5105	53.2	54.0	-0.8
5350	5460	1000	5400	49.3	54.0	-4.7
Measurement uncertainty			±6 dB			

Middle frequency: **5200 MHz**						
Test conditions: 2 TX , P17, 6 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5118	61.2	74.0	-12.8
5250	13000	1000	5357	59.8	74.0	-14.2
13000	18000	1000	16513	56.6	74.0	-17.4
18000	40000	1000	39874	61.9	74.0	-12.1
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5123	53.7	54.0	-0.3
5350	5460	1000	5399	53.6	54.0	-0.4
Measurement uncertainty			±6 dB			

Highest frequency: **5240 MHz**						
Test conditions: 2 TX , P17, 6 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5031	58.0	74.0	-16.0
5250	13000	1000	5364	60.1	74.0	-13.9
13000	18000	1000	17000	56.3	74.0	-17.7
18000	40000	1000	39987	62.5	74.0	-11.5
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5040	50.9	54.0	-3.1
5350	5460	1000	5364	52.6	54.0	-1.4
Measurement uncertainty			±6 dB			

HT20:

Lowest frequency: **5180 MHz**						
Test conditions: 2 TX , P17, MCS0						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5096	60.7	74.0	-13.3
5250	13000	1000	5443	60.1	74.0	-13.9
13000	18000	1000	17155	56.9	74.0	-17.1
18000	40000	1000	33972	60.8	74.0	-13.2
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5094	53.8	54.0	-0.2
5350	5460	1000	5479	53.3	54.0	-0.7
Measurement uncertainty			±6 dB			

Middle frequency: **5200 MHz**						
Test conditions: 2 TX , P17, MCS0						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5113	60.7	74.0	-13.3
5250	13000	1000	5388	59.2	74.0	-14.8
13000	18000	1000	16555	56.4	74.0	-17.6
18000	40000	1000	33964	59.6	74.0	-14.4
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5115	53.8	54.0	-0.2
5350	5460	1000	5388	49.6	54.0	-4.4
Measurement uncertainty			±6 dB			

Highest frequency: **5240 MHz**						
Test conditions: 2 TX , P17, MCS0						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5048	58.1	74.0	-15.9
5250	13000	1000	5400	60.9	74.0	-13.1
13000	18000	1000	16481	56.1	74.0	-17.9
18000	40000	1000	33989	61.5	74.0	-12.5
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5048	50.6	54.0	-3.4
5350	5460	1000	5400	48.9	54.0	-5.1
Measurement uncertainty			±6 dB			

HT40:

Lowest frequency: **5190 MHz**						
Test conditions: 2 TX , P17, MCS8						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5146	63.9	74.0	-10.1
5250	13000	1000	5358	59.9	74.0	-14.1
13000	18000	1000	16550	56.1	74.0	-17.9
18000	40000	1000	33994	61.7	74.0	-12.3
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5150	51.2	54.0	-2.8
5350	5460	1000	5358	52.1	54.0	-1.9
Measurement uncertainty			±6 dB			

Highest frequency: **5210 MHz**						
Test conditions: 2 TX , P17, MCS8						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5146	59.4	74.0	-14.6
5250	13000	1000	5360	60.7	74.0	-13.3
13000	18000	1000	16559	56.6	74.0	-17.4
18000	40000	1000	33981	62.0	74.0	-12.0
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5137	52.1	54.0	-1.9
5350	5460	1000	5360	51.8	54.0	-2.2
Measurement uncertainty			±6 dB			

5.6.6.3 Gain group 3

802.11a:

Lowest frequency: **5180 MHz**						
Test conditions: 2 TX , P14, 6 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5097	59.9	74.0	-14.1
5250	13000	1000	7295	58.6	74.0	-15.4
13000	18000	1000	16565	56.1	74.0	-17.9
18000	40000	1000	38488	62.9	74.0	-11.1
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5096	53.0	54.0	-1.0
7250	7750	1000	7295	51.1	54.0	-2.9
Measurement uncertainty			±6 dB			

Middle frequency: **5200 MHz**						
Test conditions: 2 TX , P14, 6 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5117	59.4	74.0	-14.6
5250	13000	1000	7273	59.5	74.0	-14.5
13000	18000	1000	16526	56.3	74.0	-17.7
18000	40000	1000	38512	61.3	74.0	-12.7
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5121	53.6	54.0	-0.4
7250	7750	1000	7273	51.2	54.0	-2.8
Measurement uncertainty			±6 dB			

Highest frequency: **5240 MHz**						
Test conditions: 2 TX , P14, 6 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5072	57.6	74.0	-16.4
5250	13000	1000	7680	59.1	74.0	-14.9
13000	18000	1000	16523	56.3	74.0	-17.7
18000	40000	1000	38326	61.8	74.0	-12.2
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5087	50.0	54.0	-4.0
7250	7750	1000	7680	50.9	54.0	-3.1
Measurement uncertainty			±6 dB			

HT20:

Lowest frequency: **5180 MHz**						
Test conditions: 2 TX , P14, MCS0						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5102	60.6	74.0	-13.4
5250	13000	1000	7491	58.4	74.0	-15.6
13000	18000	1000	16480	57.8	74.0	-16.2
18000	40000	1000	39978	62.5	74.0	-11.5
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5104	53.8	54.0	-0.2
7250	7750	1000	7491	50.1	54.0	-3.9
Measurement uncertainty			±6 dB			

Middle frequency: **5200 MHz**						
Test conditions: 2 TX , P14, MCS0						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5116	60.4	74.0	-13.6
5250	13000	1000	7460	58.4	74.0	-15.6
13000	18000	1000	16525	57.0	74.0	-17.0
18000	40000	1000	39963	62.1	74.0	-11.9
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5115	53.1	54.0	-0.9
7250	7750	1000	7460	50.1	54.0	-3.9
Measurement uncertainty			±6 dB			

Highest frequency: **5240 MHz**						
Test conditions: 2 TX , P14, MCS0						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5042	57.1	74.0	-16.9
5250	13000	1000	7310	58.5	74.0	-15.5
13000	18000	1000	17042	57.3	74.0	-16.7
18000	40000	1000	39978	62.9	74.0	-11.1
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5064	49.6	54.0	-4.4
7250	7750	1000	7310	50.3	54.0	-3.7
Measurement uncertainty			±6 dB			

HT40:

Lowest frequency: **5190 MHz**						
Test conditions: 2 TX , P14, MCS8						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5147	61.3	74.0	-12.7
5250	13000	1000	7453	59.0	74.0	-15.0
13000	18000	1000	16501	56.3	74.0	-17.7
18000	40000	1000	39952	62.3	74.0	-11.7
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5150	51.4	54.0	-2.6
7250	7750	1000	7453	51.3	54.0	-2.7
Measurement uncertainty			±6 dB			

Highest frequency: **5210 MHz**						
Test conditions: 2 TX , P14, MCS8						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	5150	1000	5138	59.8	74.0	-14.2
5250	13000	1000	7621	58.7	74.0	-15.3
13000	18000	1000	17059	55.5	74.0	-18.5
18000	40000	1000	39967	62.6	74.0	-11.4
Measurement uncertainty			±6 dB			

AV-Mesurement			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
4500	5150	1000	5145	50.9	54.0	-3.1
7250	7750	1000	7621	51.7	54.0	-2.3
Measurement uncertainty			±6 dB			

Radiated limits according to FCC Part 15C, Section 15.209(a):

Frequency	Field strength of spurious emissions		Measurement distance
(MHz)	(µV/m)	dB(µV/m)	(metres)
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

FCC Part 15C, Section 15.205, restricted bands of operation:

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.**

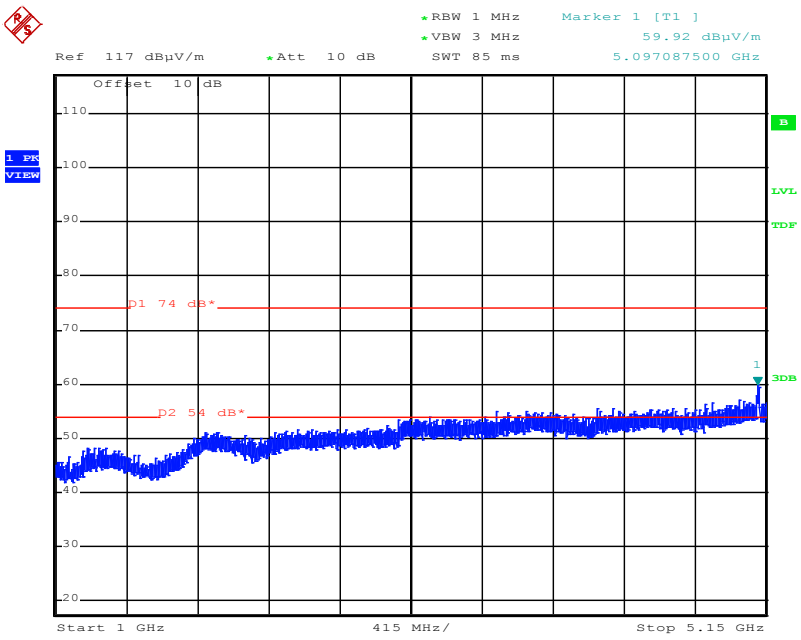
Remarks: The measurement is performed from 9 kHz up to 40 GHz. For detailed test results please see the following test protocols. CH36 is listed only as representative channel.

5.6.7 Test protocols undesirable emission

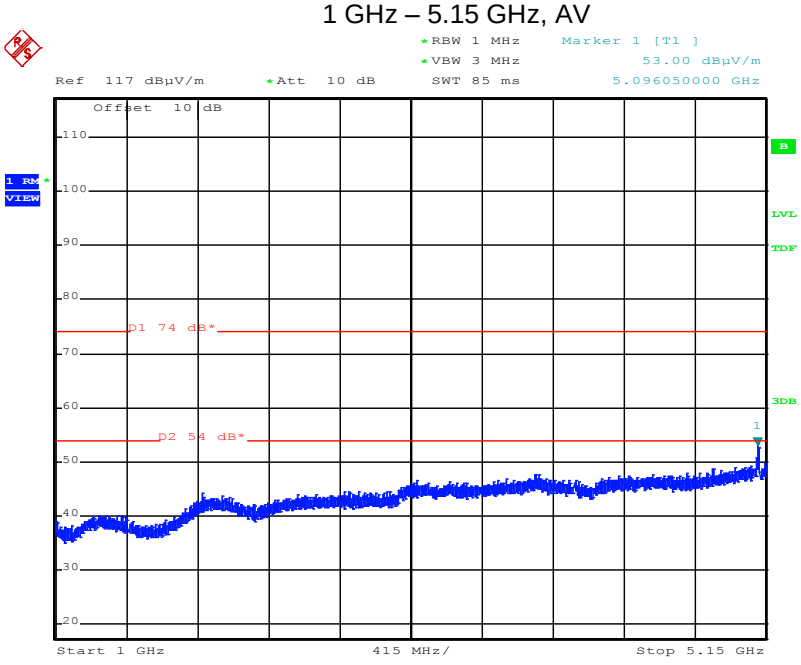
5.6.7.1 Gain group 1 (6 dBi)

802.11a, Channel 36 (5180 MHz)

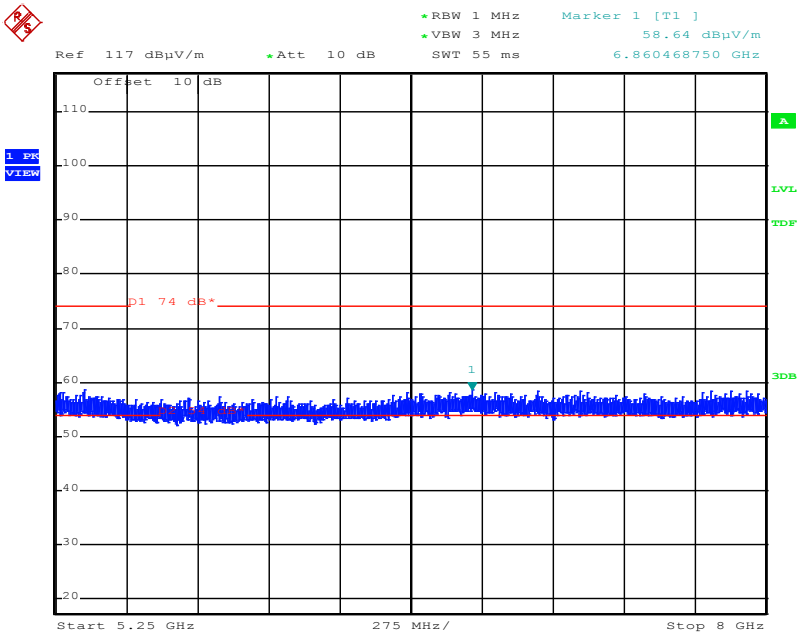
1 GHz – 5.15 GHz



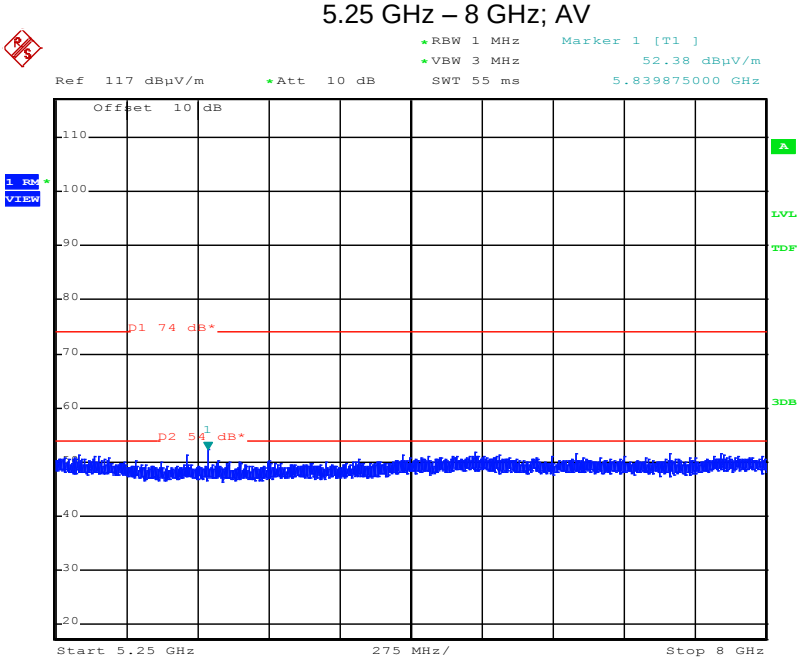
1 GHz – 5.15 GHz, AV



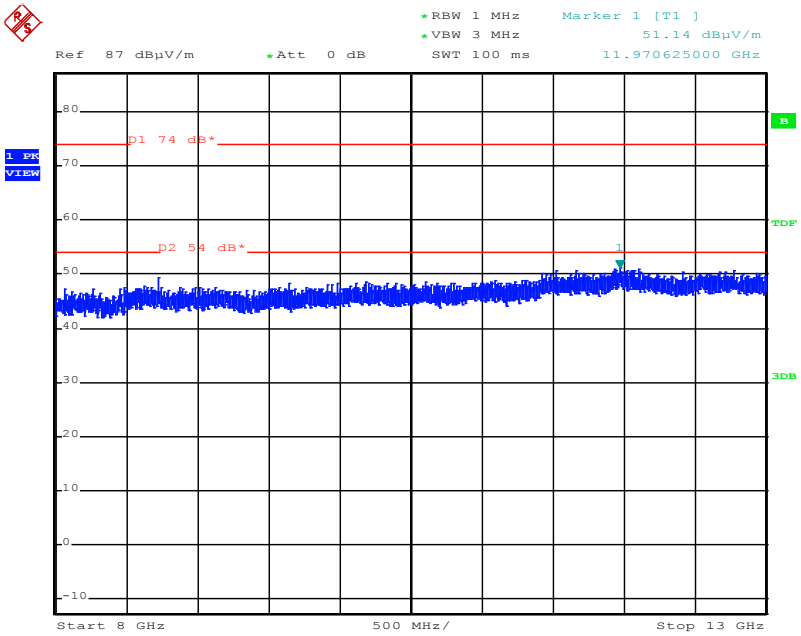
5.25 GHz – 8 GHz



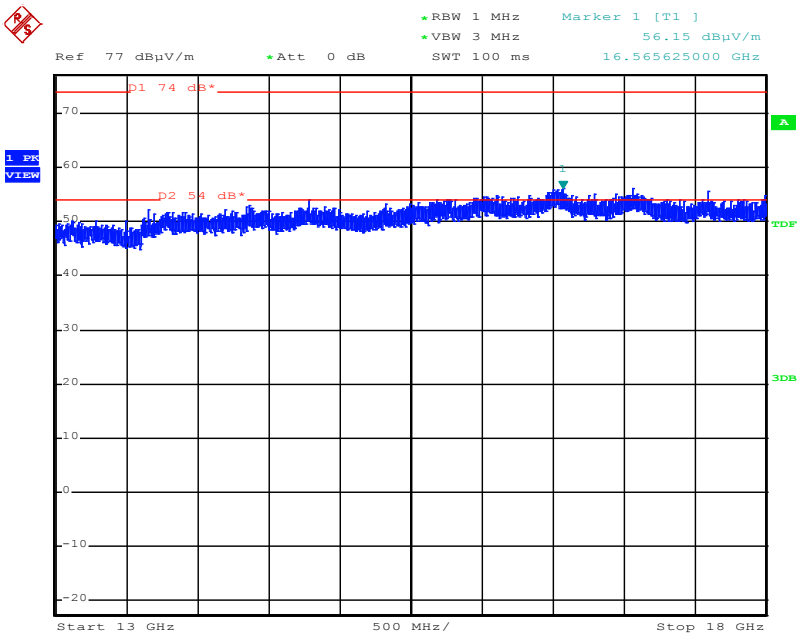
5.25 GHz – 8 GHz; AV



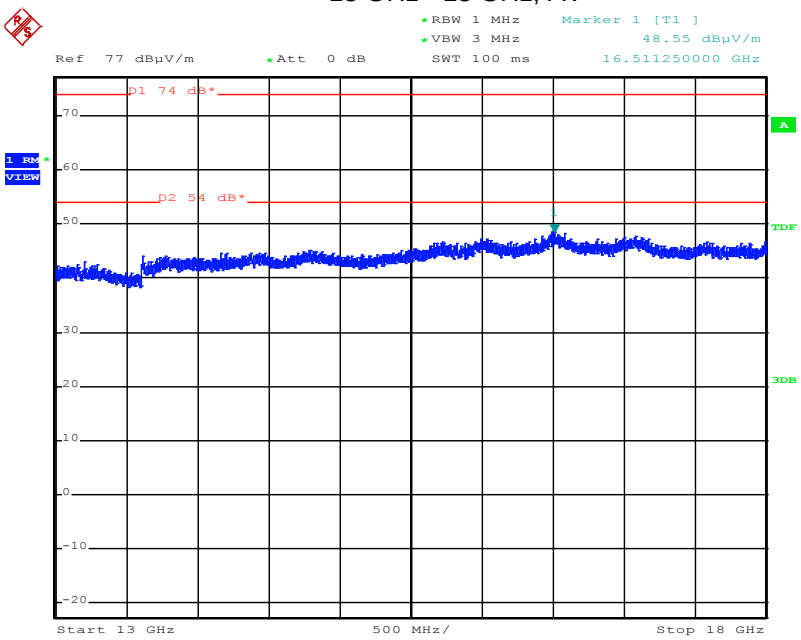
8 GHz – 13 GHz



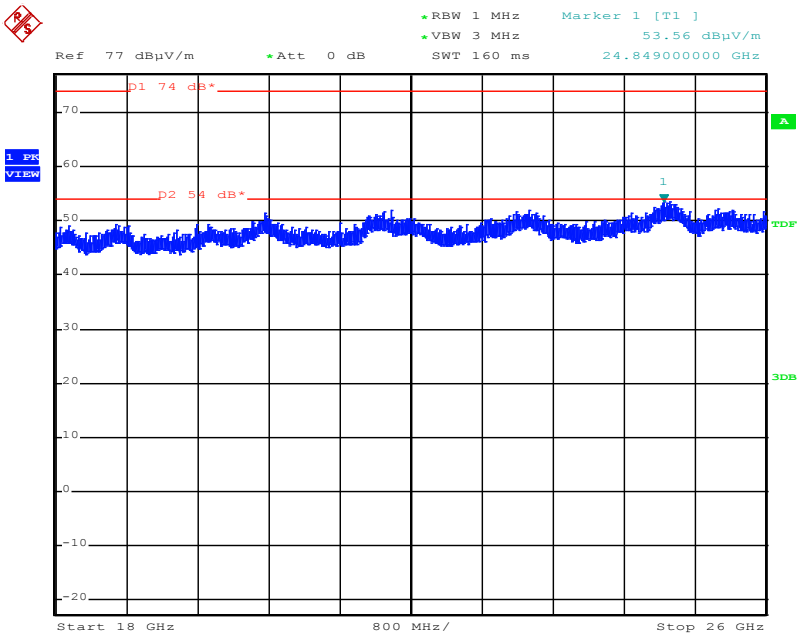
13 GHz - 18 GHz



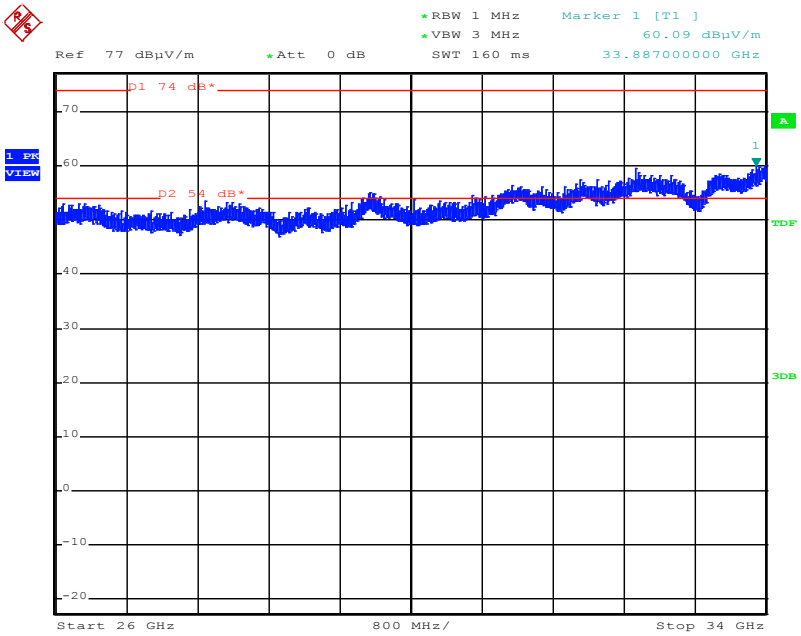
13 GHz - 18 GHz, AV



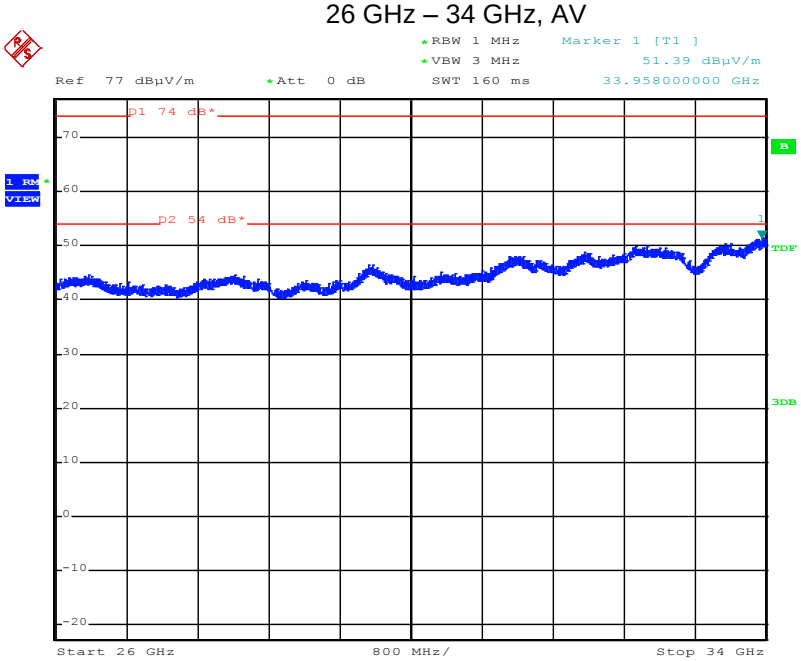
18 GHz – 26 GHz



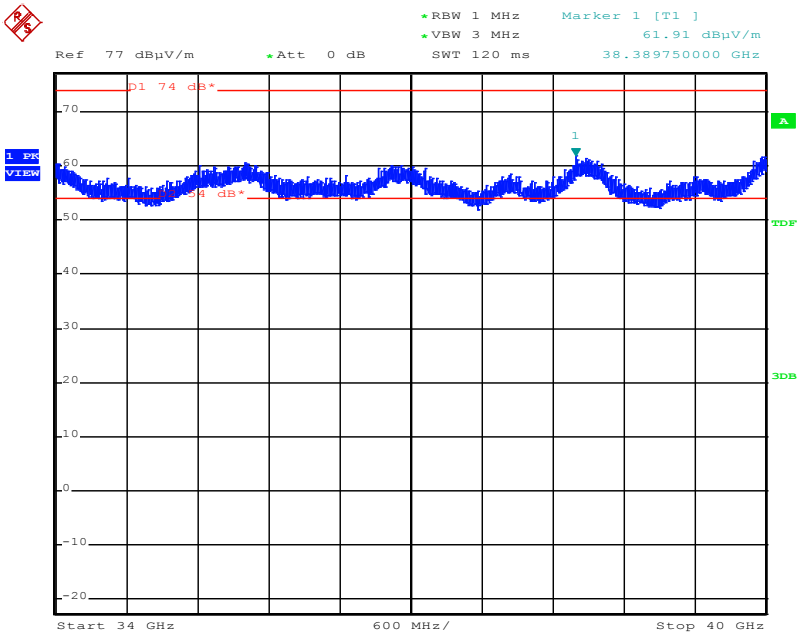
26 GHz – 34 GHz



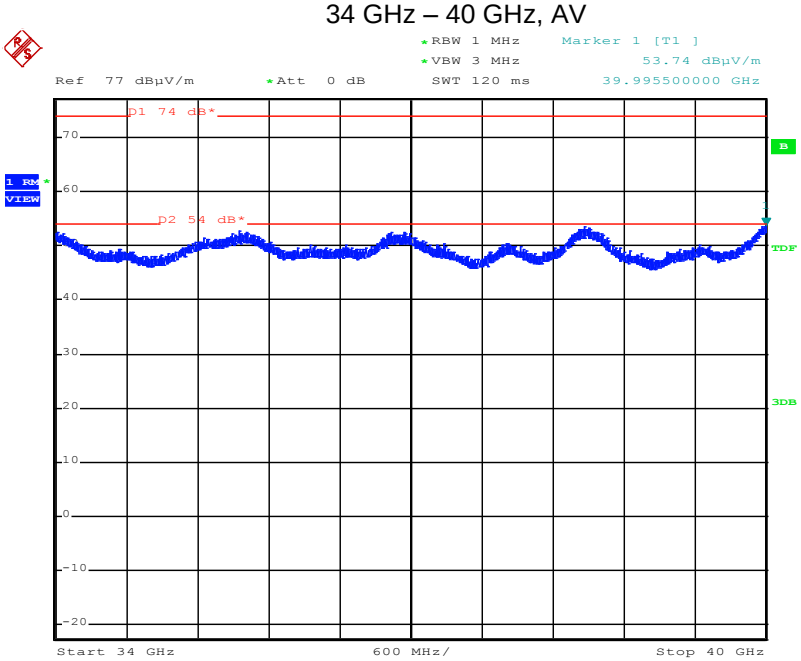
26 GHz – 34 GHz, AV



34 GHz – 40 GHz

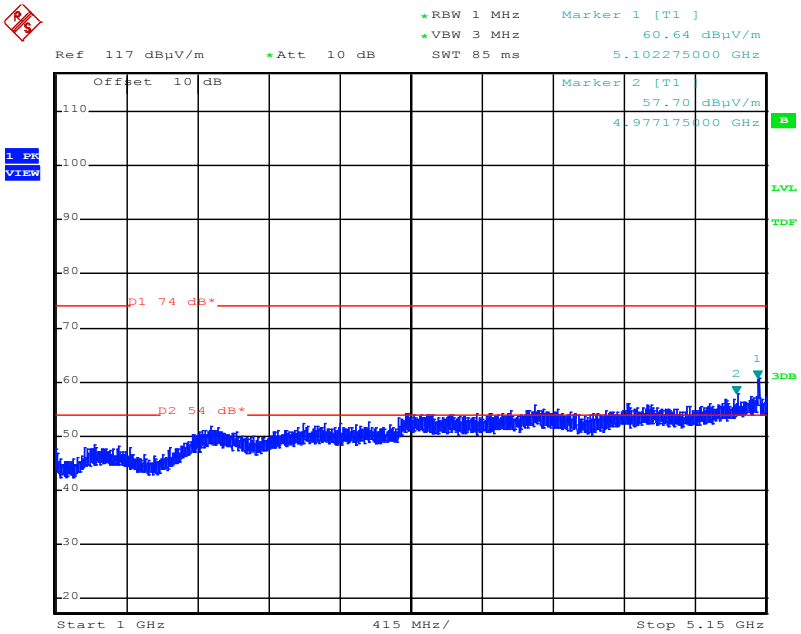


34 GHz – 40 GHz, AV

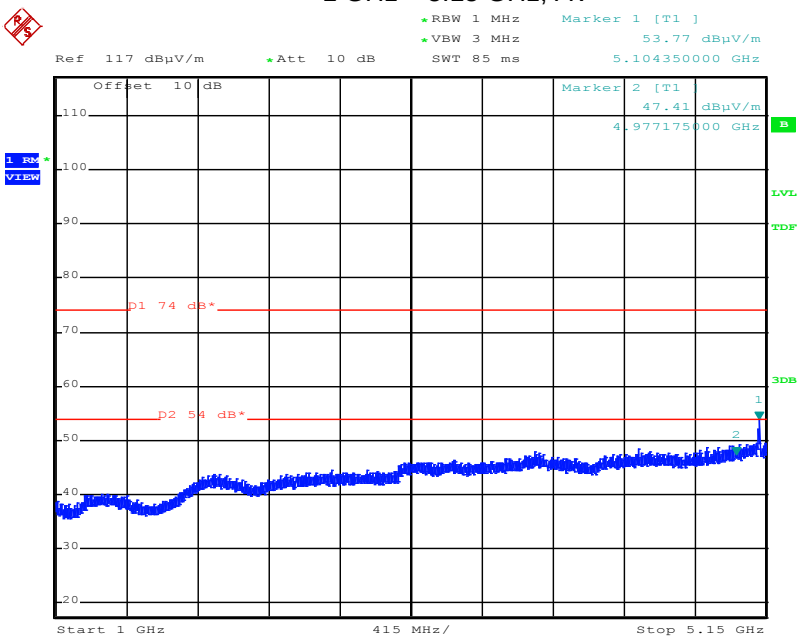


802.11n, HT20, Channel 36 (5180 MHz)

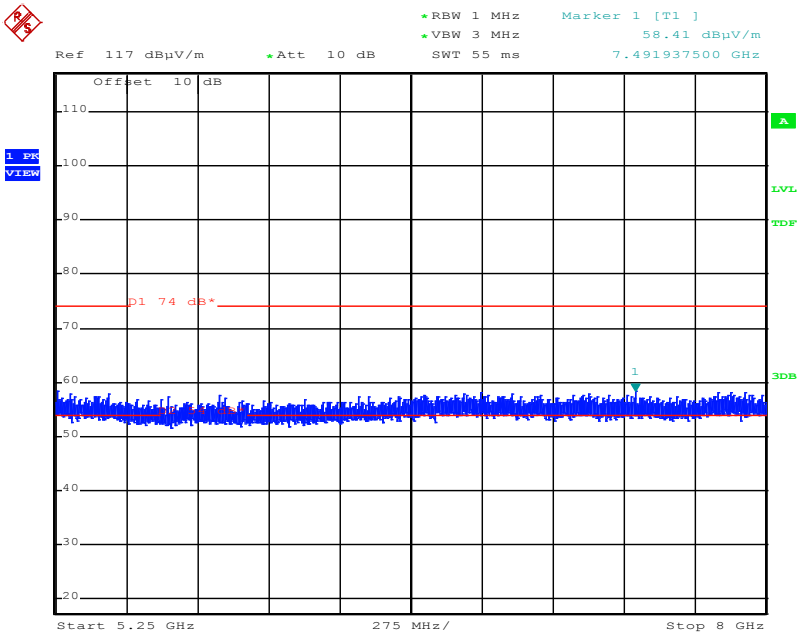
1 GHz – 5.15 GHz



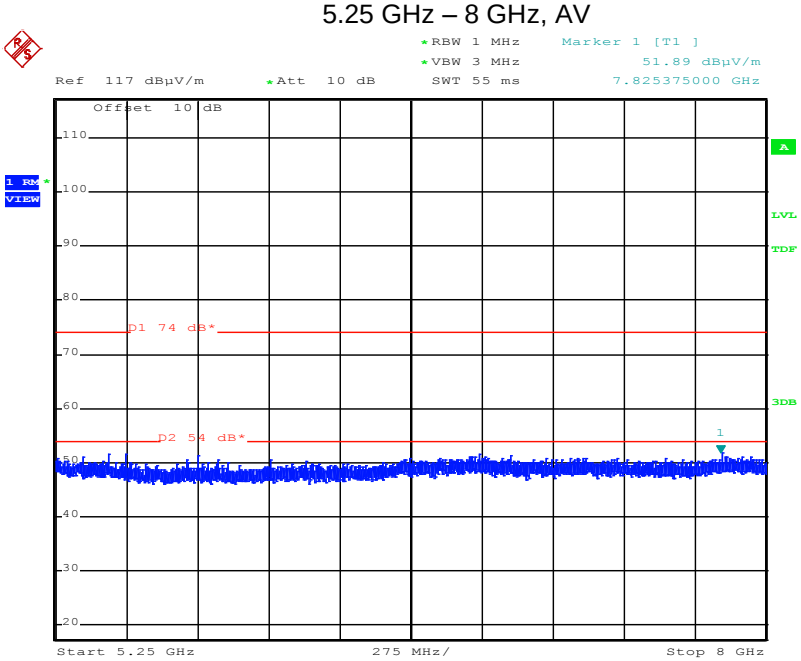
1 GHz – 5.15 GHz, AV



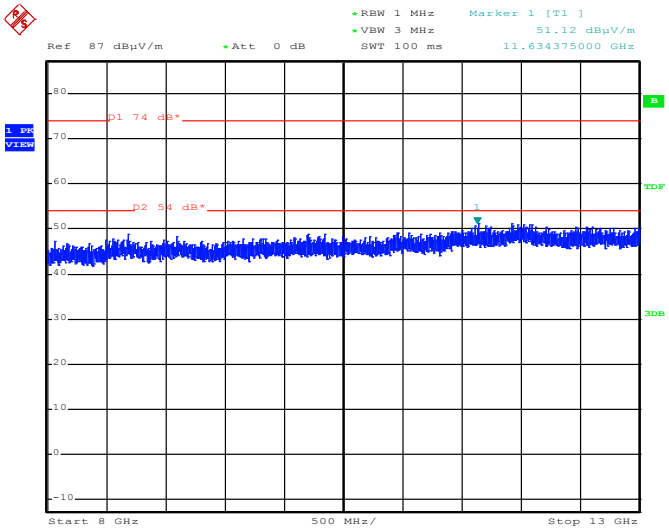
5.25 GHz – 8 GHz



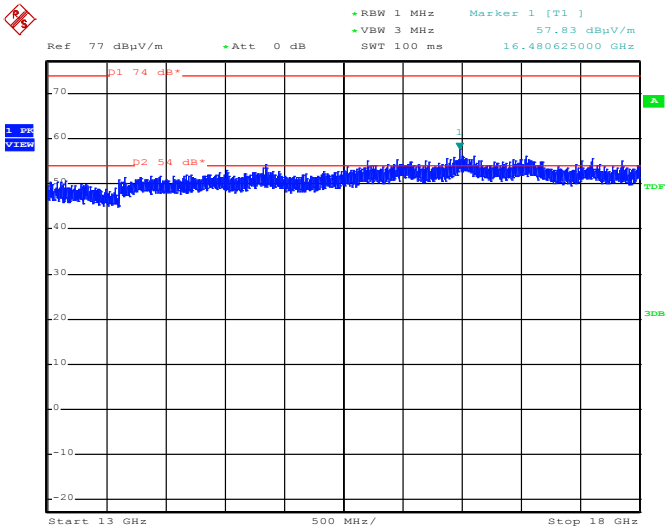
5.25 GHz – 8 GHz, AV



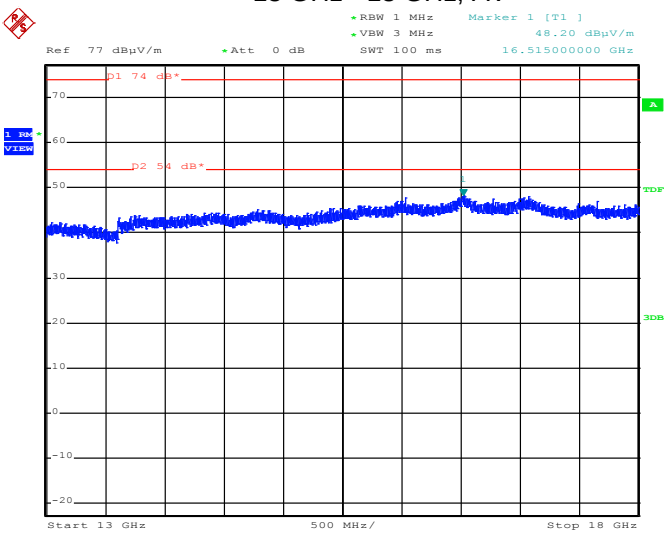
8 GHz – 13 GHz



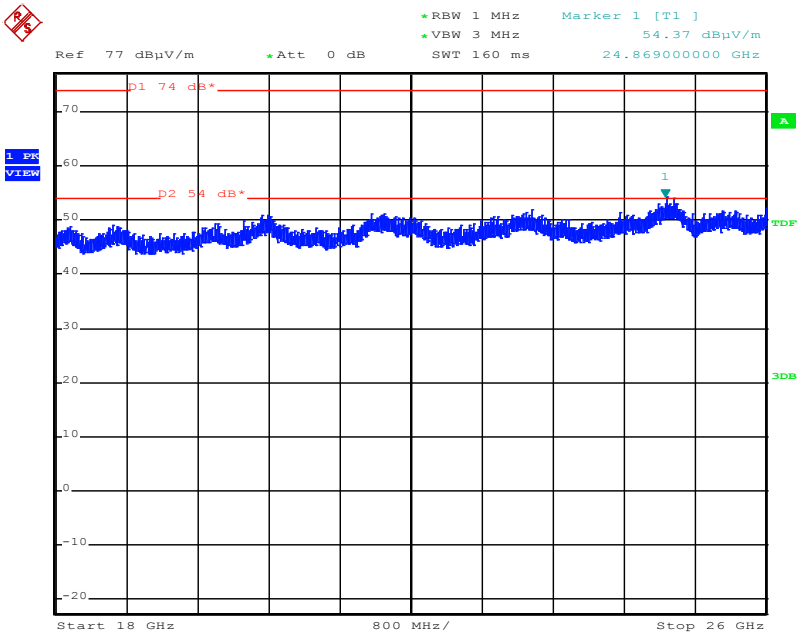
13 GHz - 18 GHz



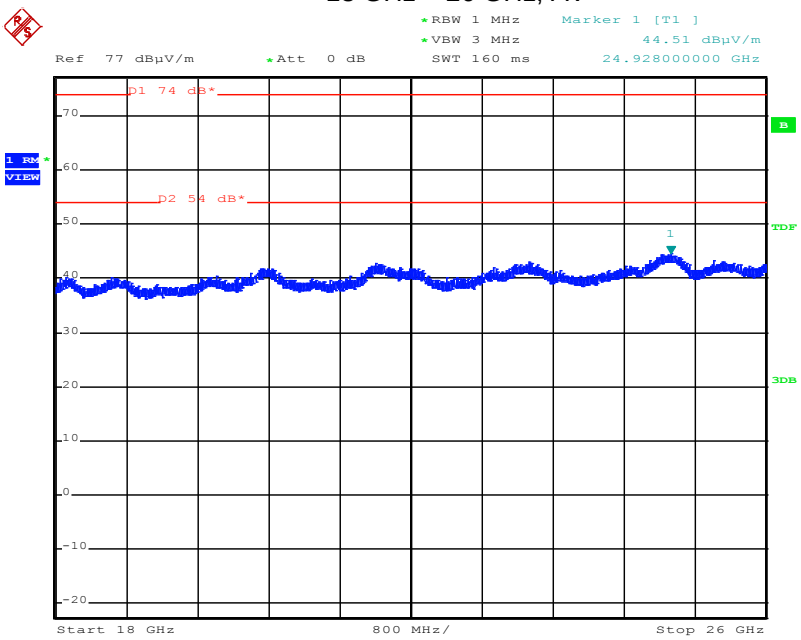
13 GHz - 18 GHz, AV



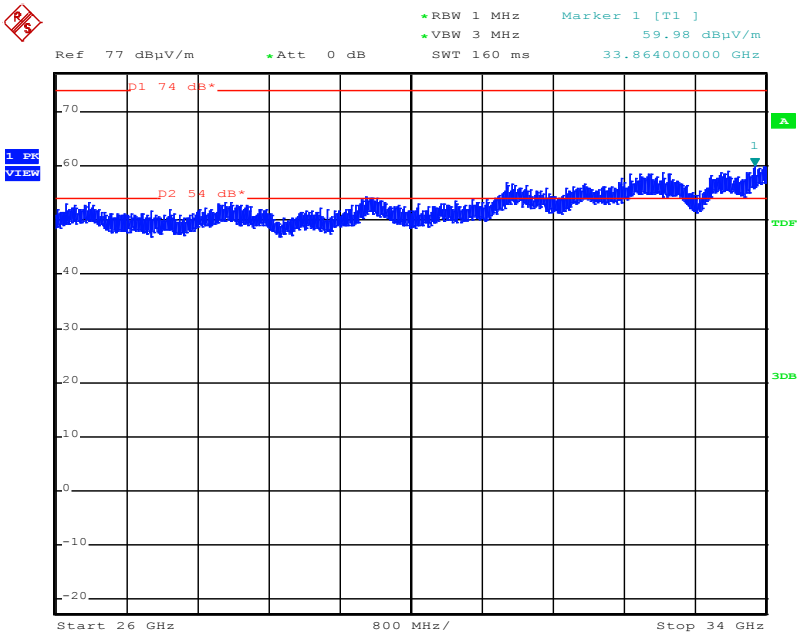
18 GHz – 26 GHz



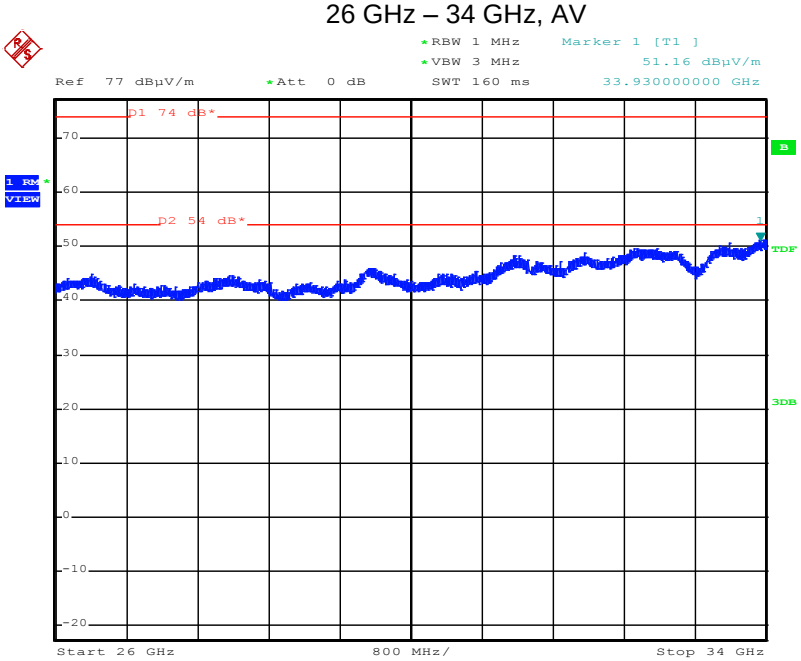
18 GHz – 26 GHz, AV



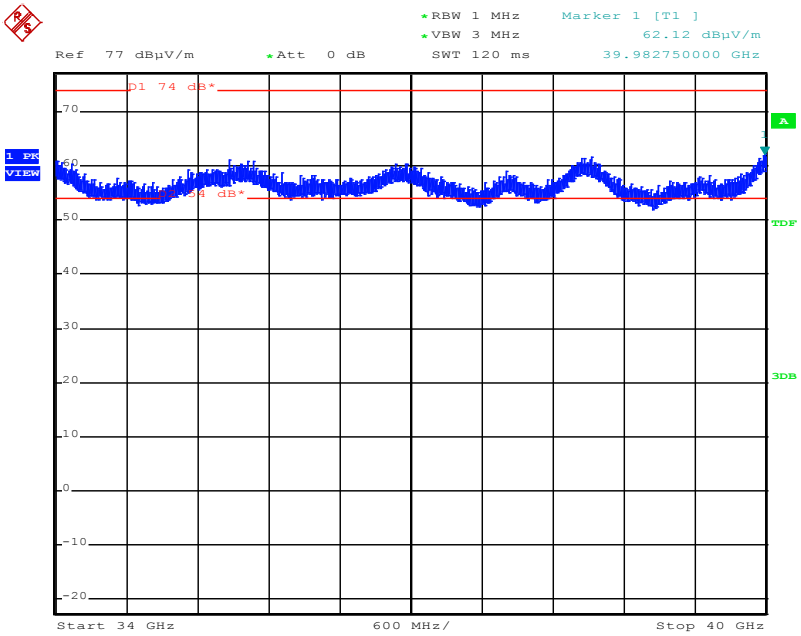
26 GHz – 34 GHz



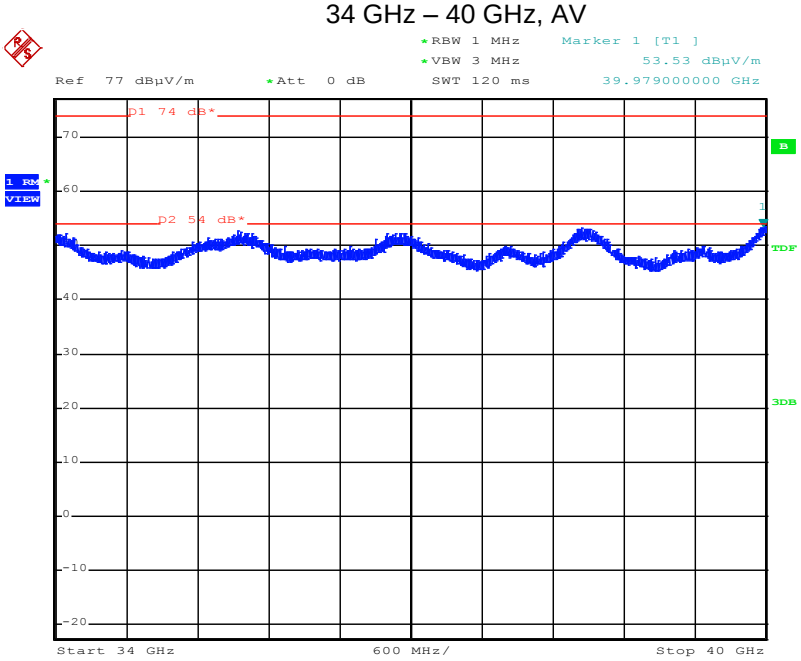
26 GHz – 34 GHz, AV



34 GHz – 40 GHz

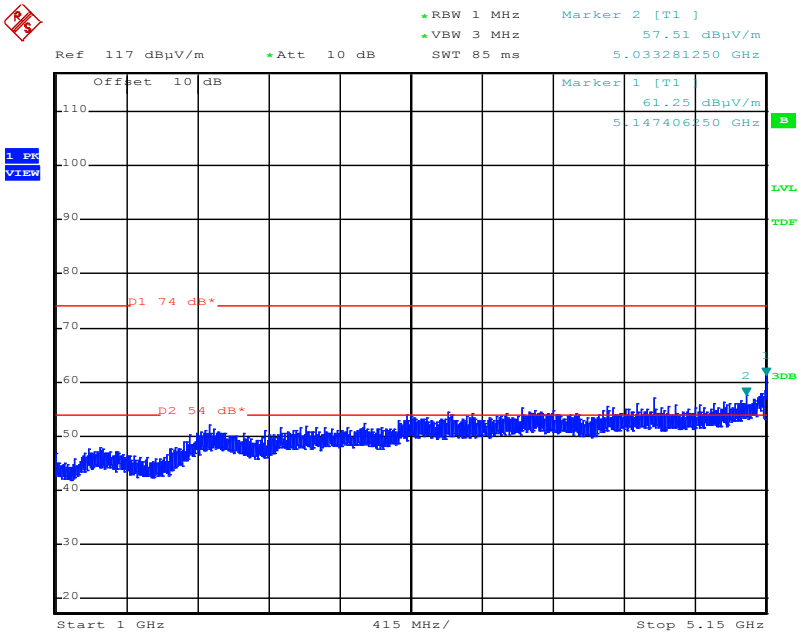


34 GHz – 40 GHz, AV

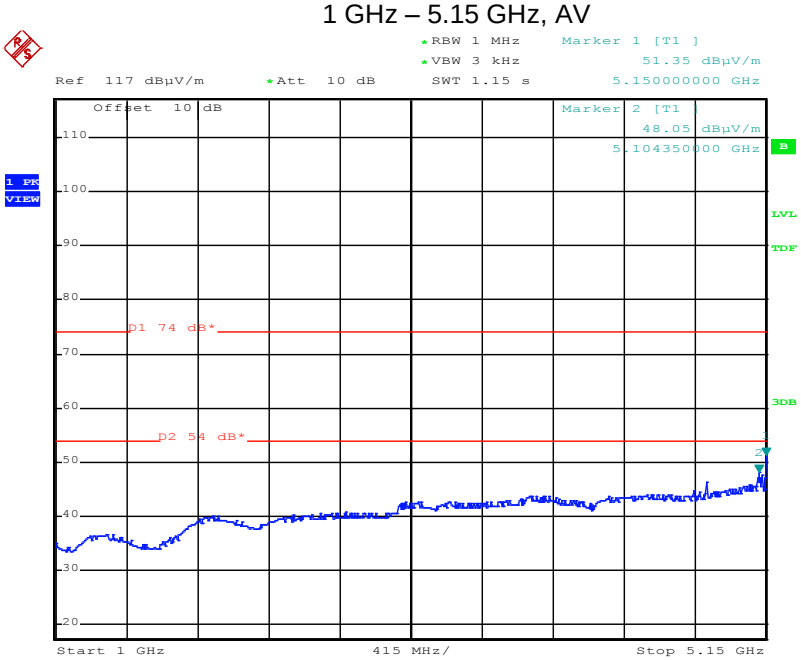


HT40, Channel 36up (5190 MHz)

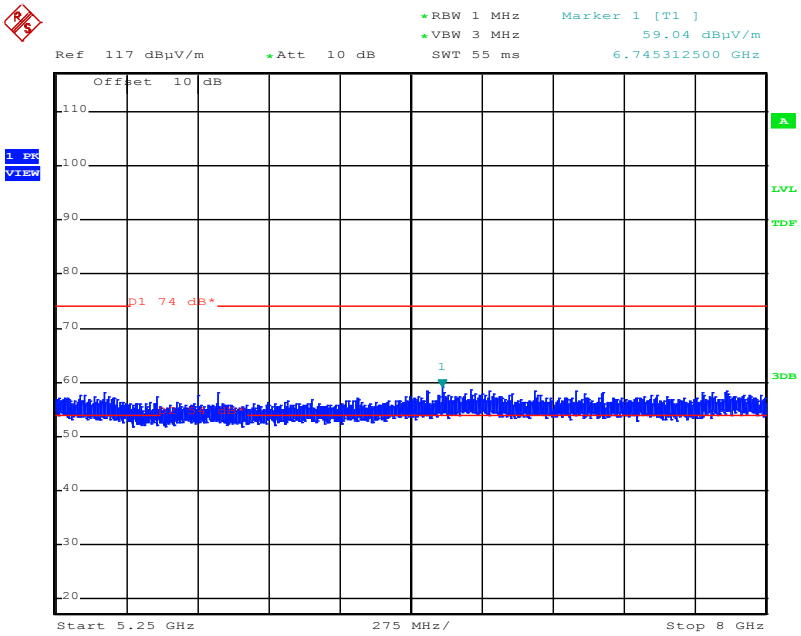
1 GHz – 5.15 GHz



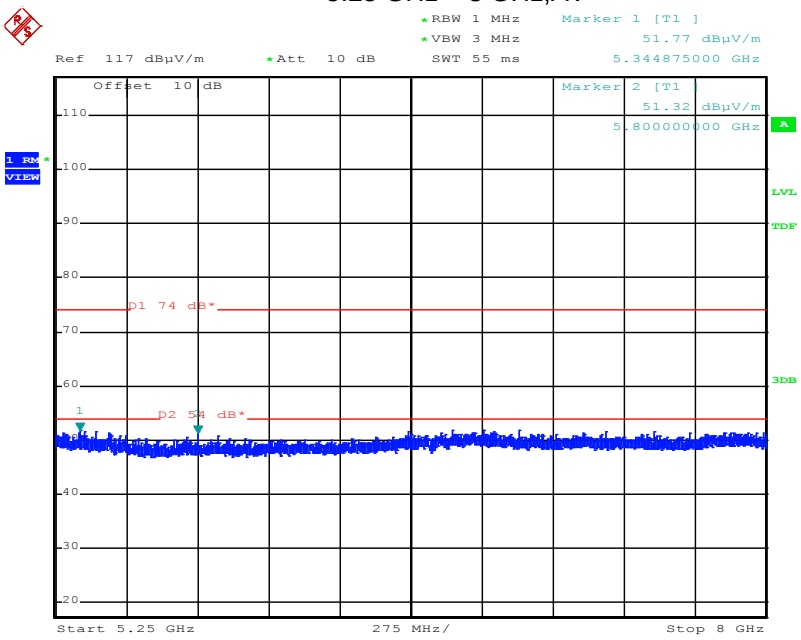
1 GHz – 5.15 GHz, AV



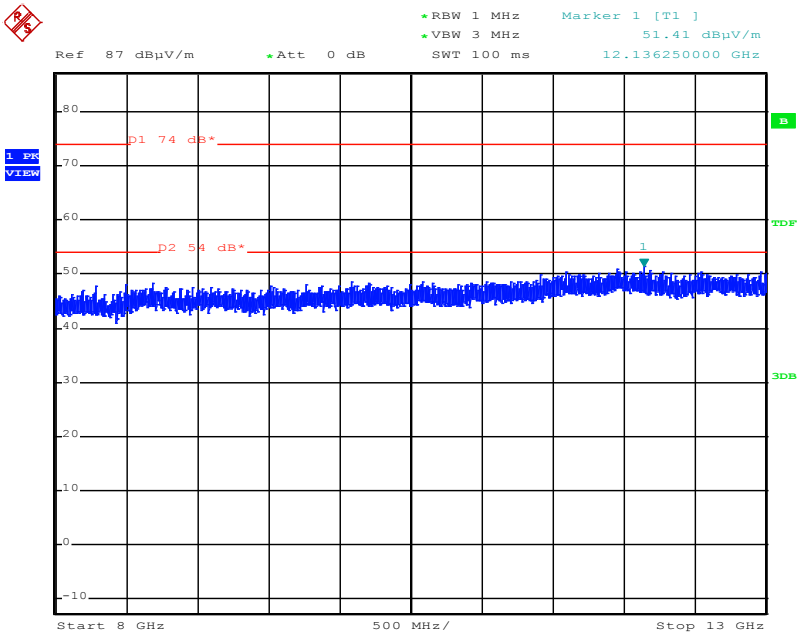
5.25 GHz – 8 GHz



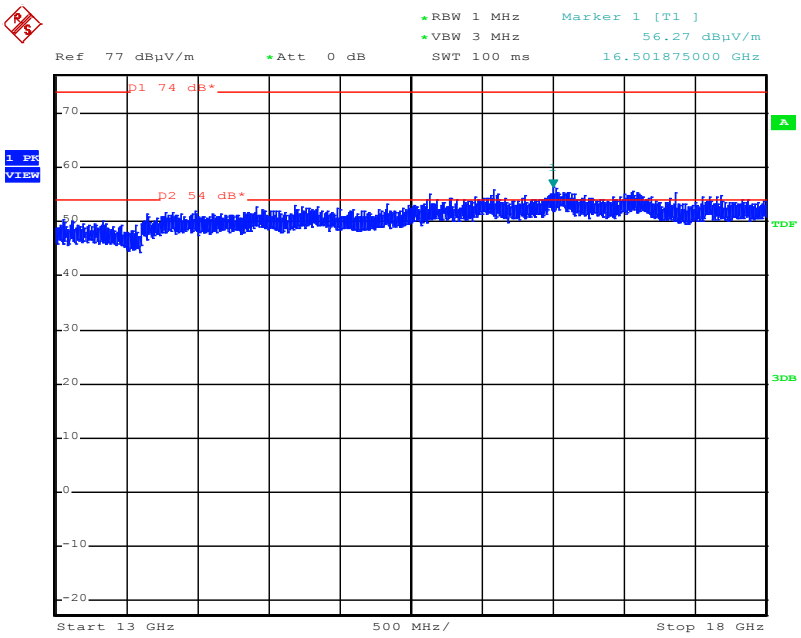
5.25 GHz – 8 GHz;AV



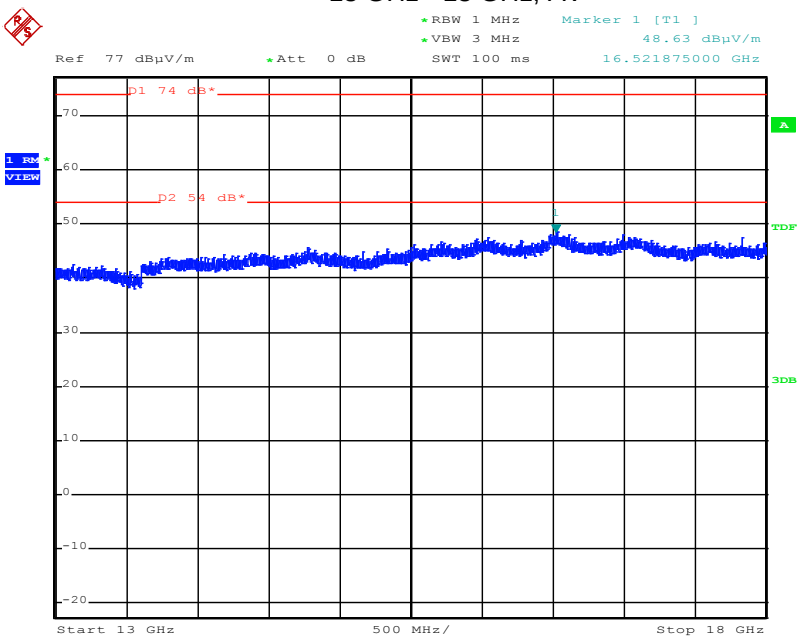
8 GHz – 13 GHz



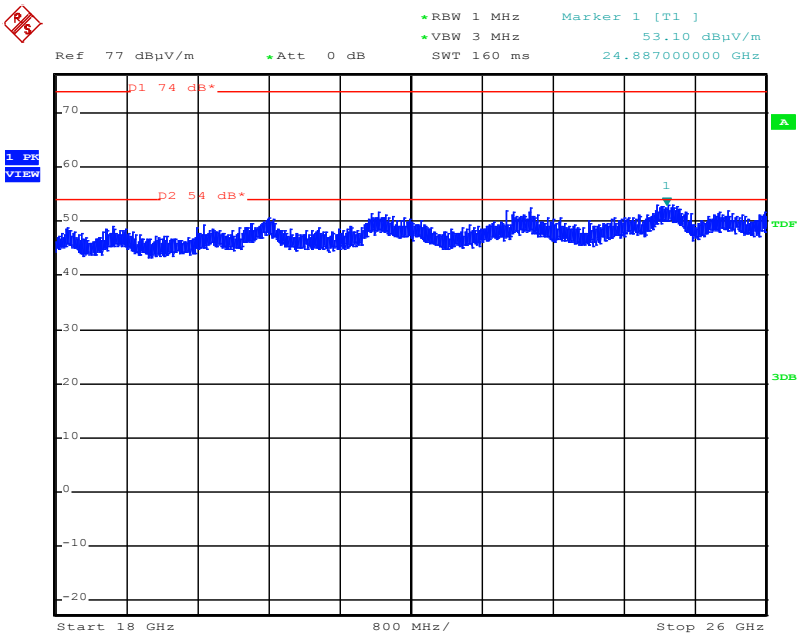
13 GHz - 18 GHz



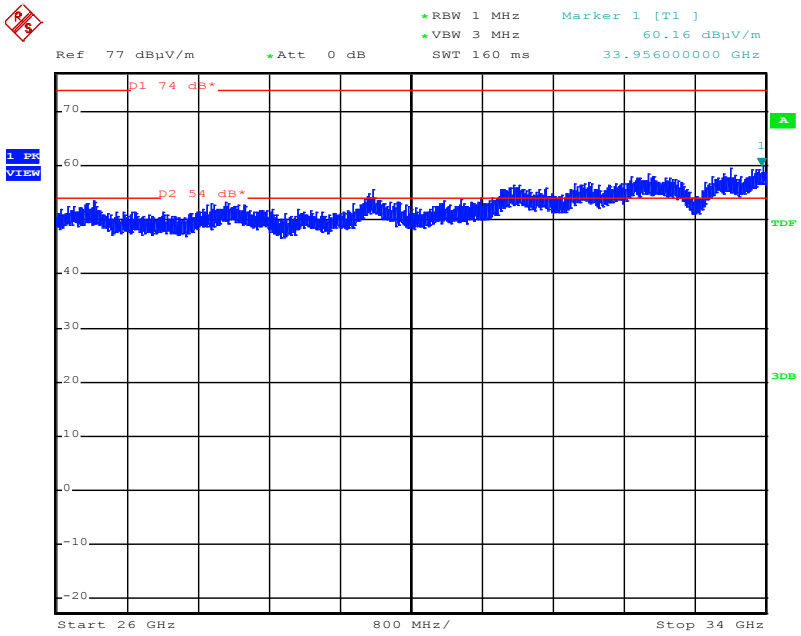
13 GHz - 18 GHz, AV



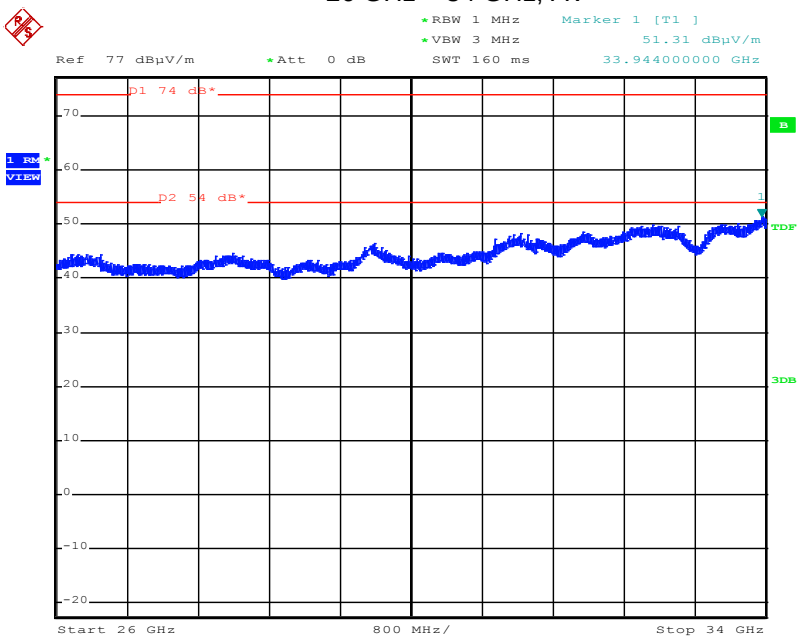
18 GHz – 26 GHz



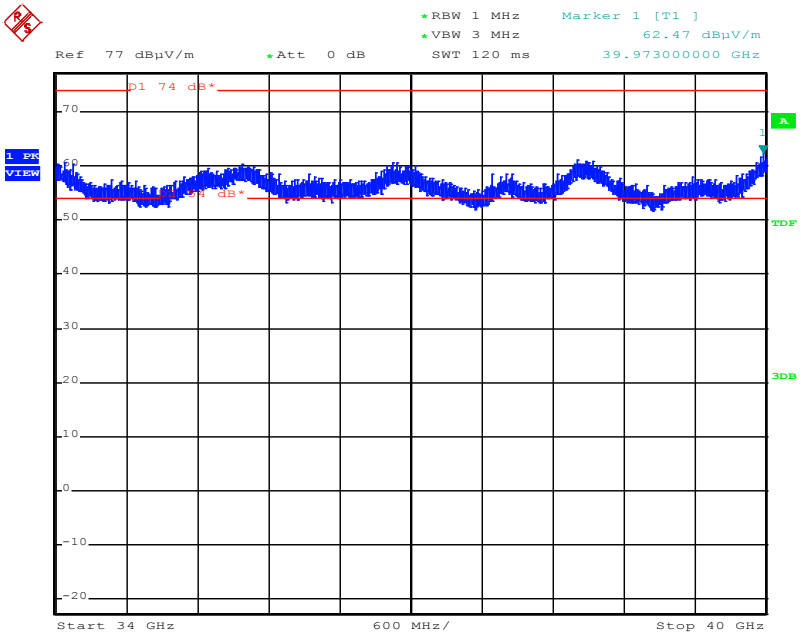
26 GHz – 34 GHz



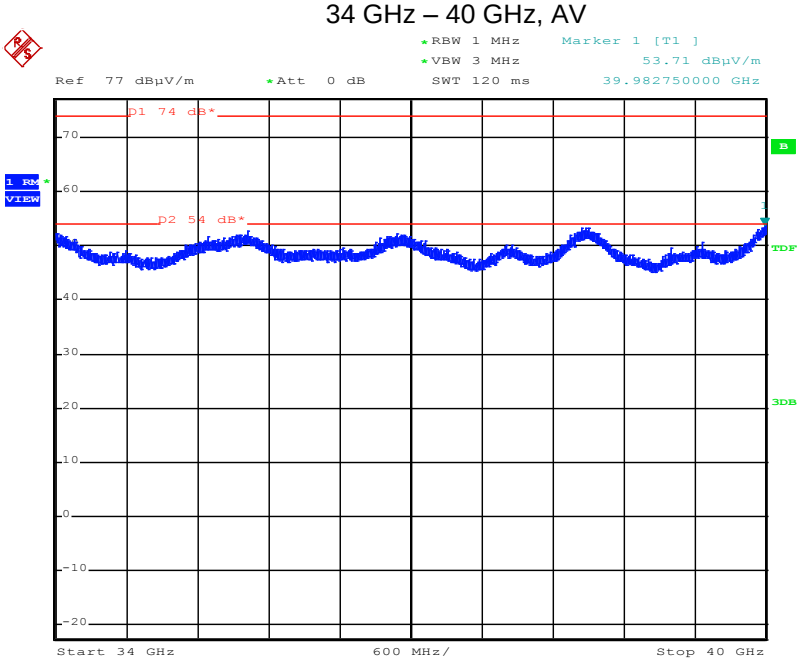
26 GHz – 34 GHz, AV



34 GHz – 40 GHz



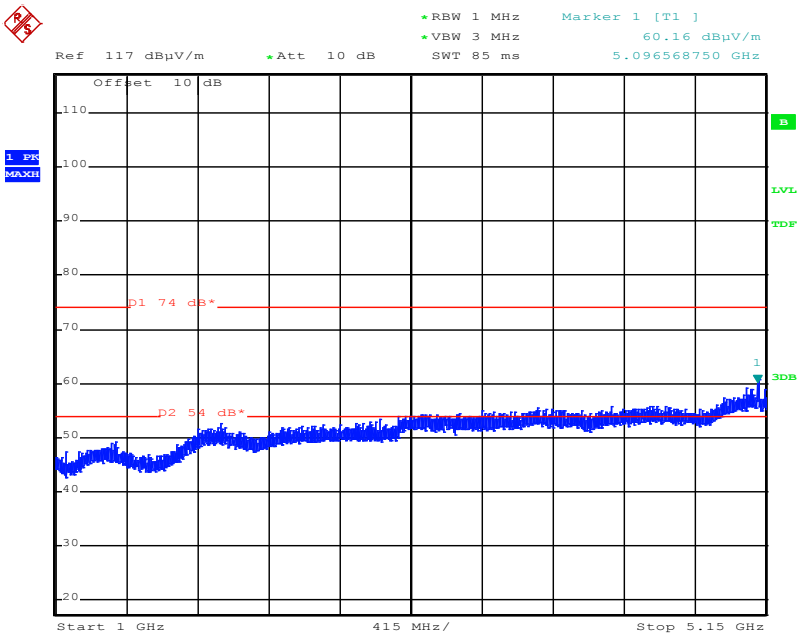
34 GHz – 40 GHz, AV



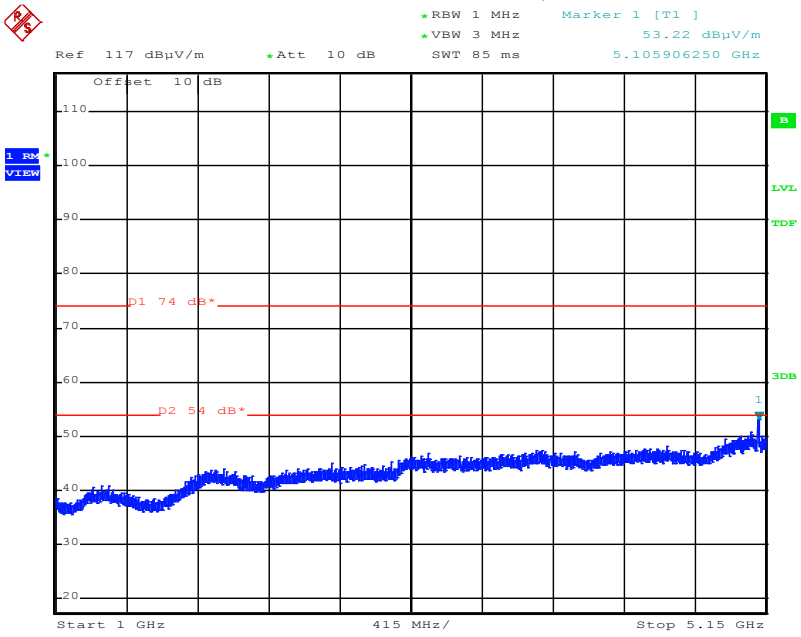
5.6.7.2 Gain group 2 (9 dBi)

802.11a, Channel 36 (5180 MHz)

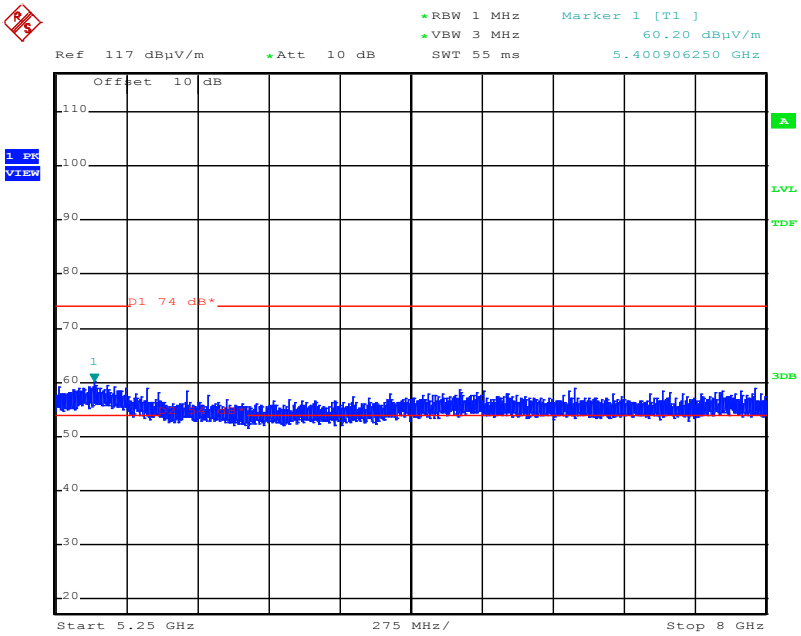
1 GHz – 5.15 GHz



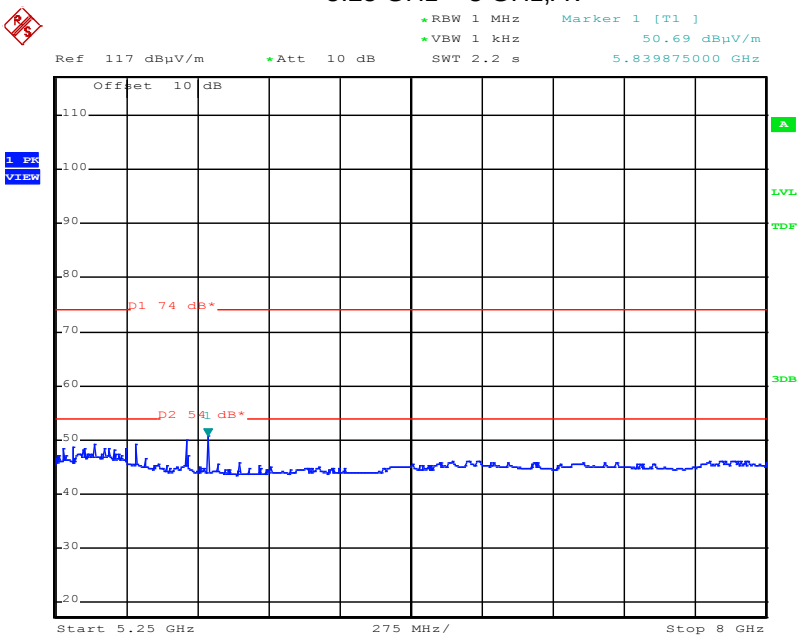
1 GHz – 5.15 GHz, AV



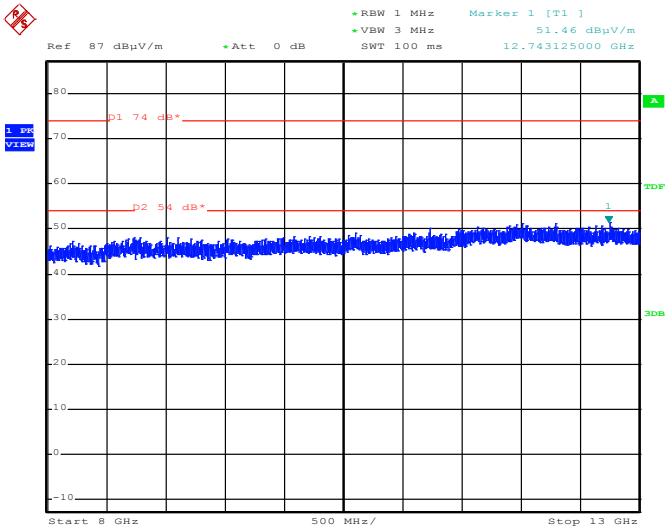
5.25 GHz – 8 GHz



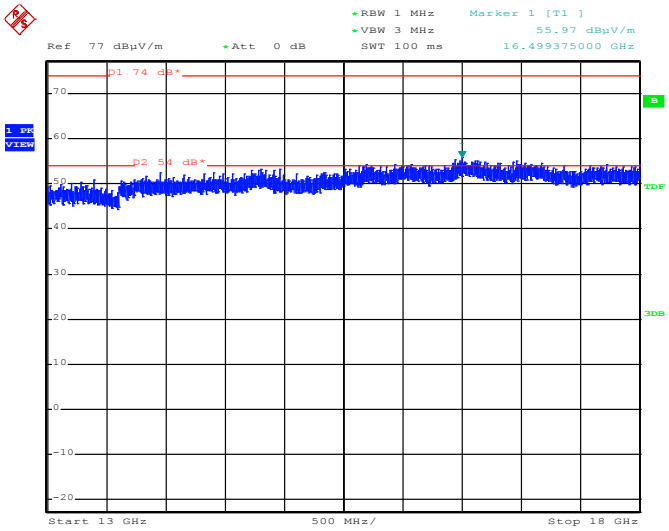
5.25 GHz – 8 GHz;AV



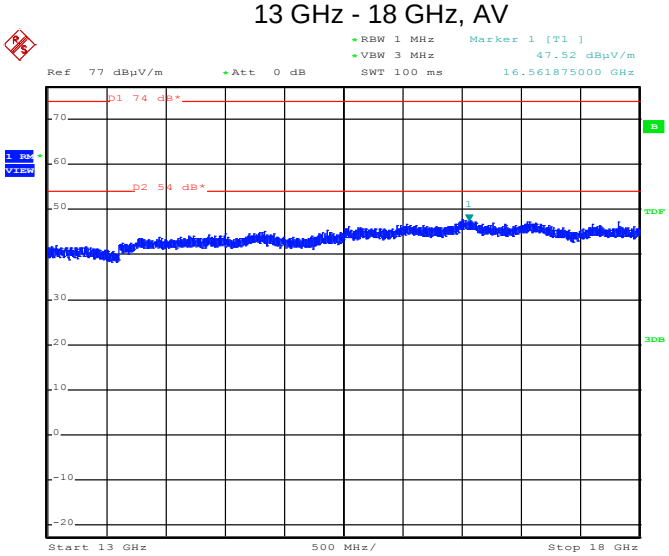
8 GHz – 13 GHz



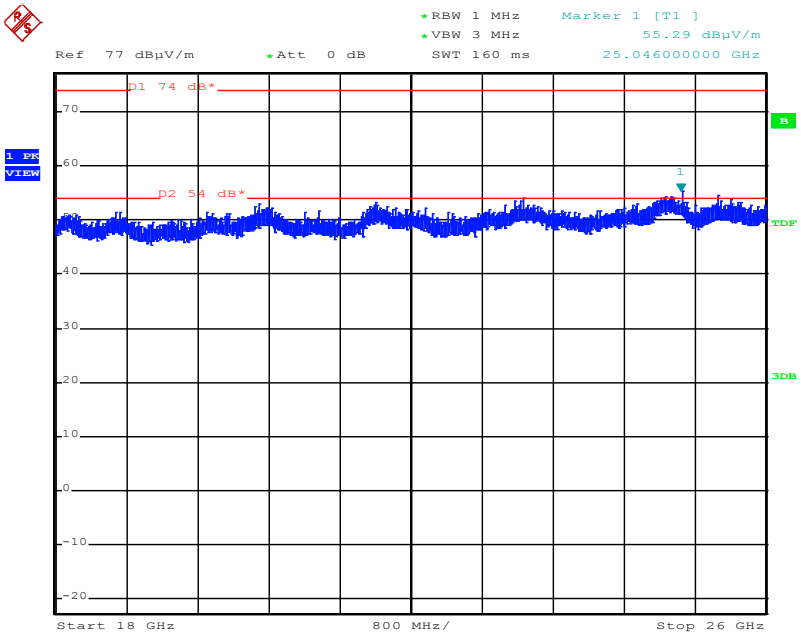
13 GHz - 18 GHz



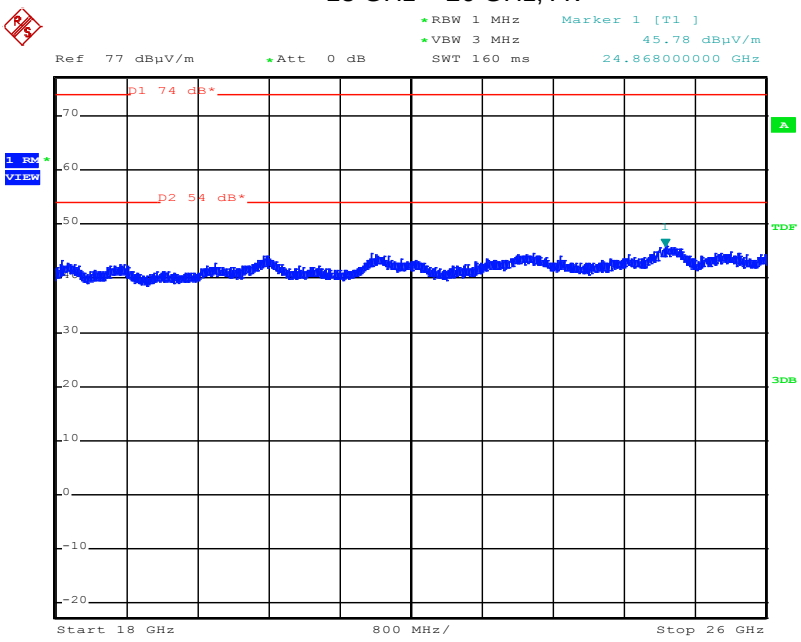
13 GHz - 18 GHz, AV



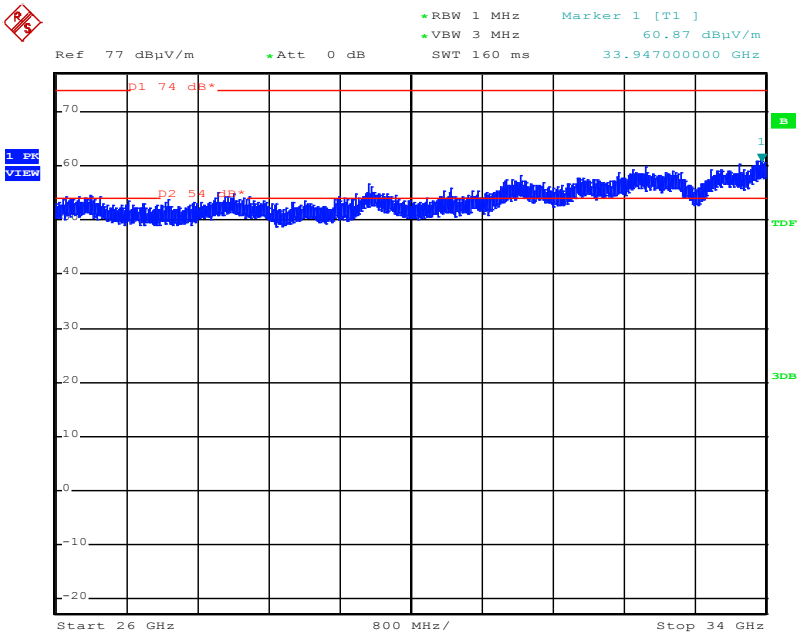
18 GHz – 26 GHz



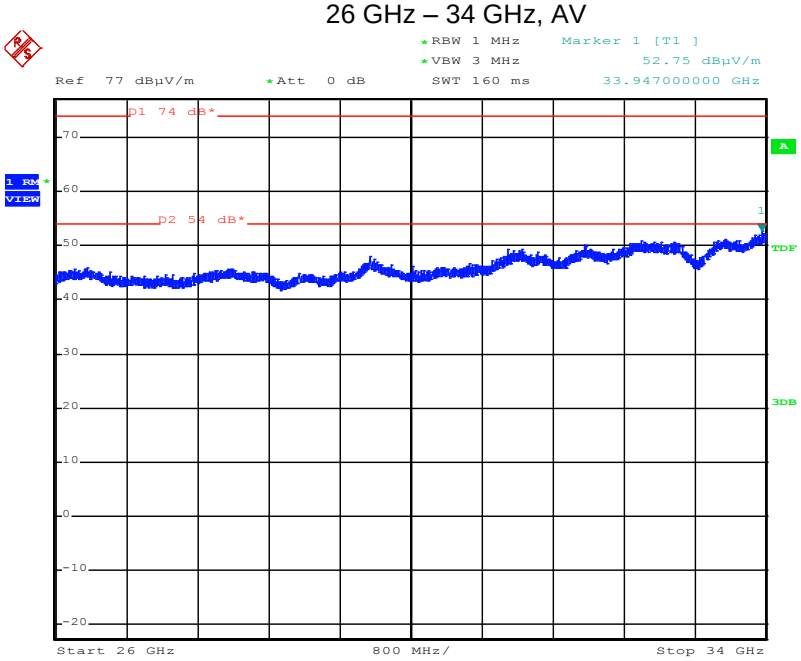
18 GHz – 26 GHz, AV



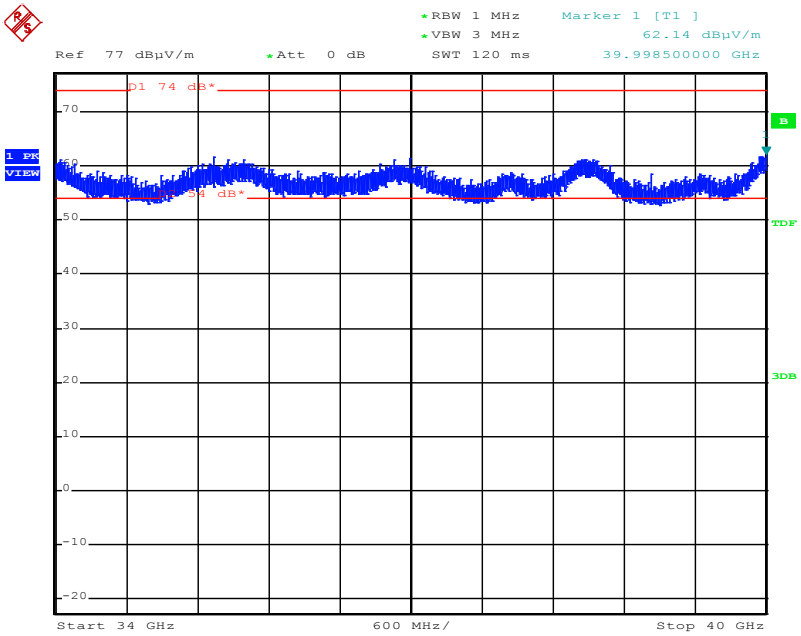
26 GHz – 34 GHz



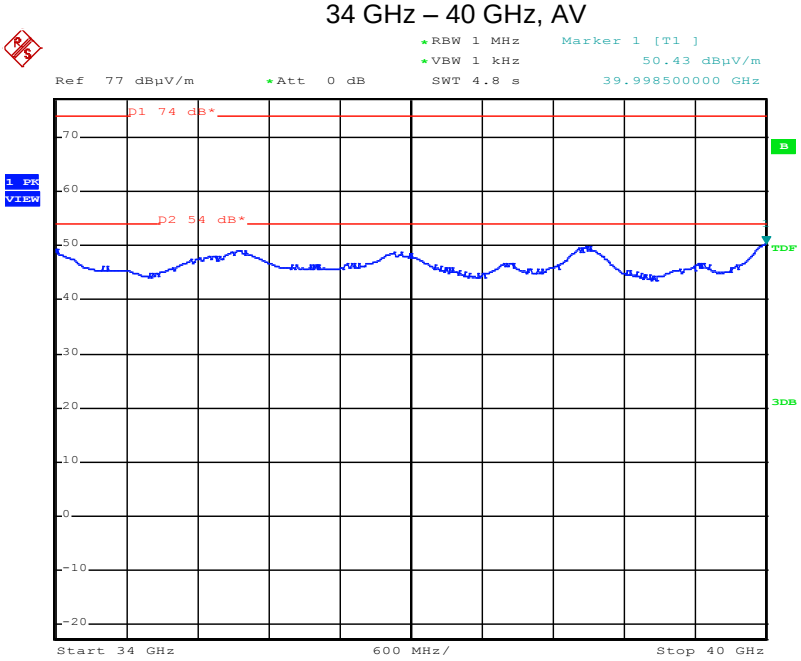
26 GHz – 34 GHz, AV



34 GHz – 40 GHz

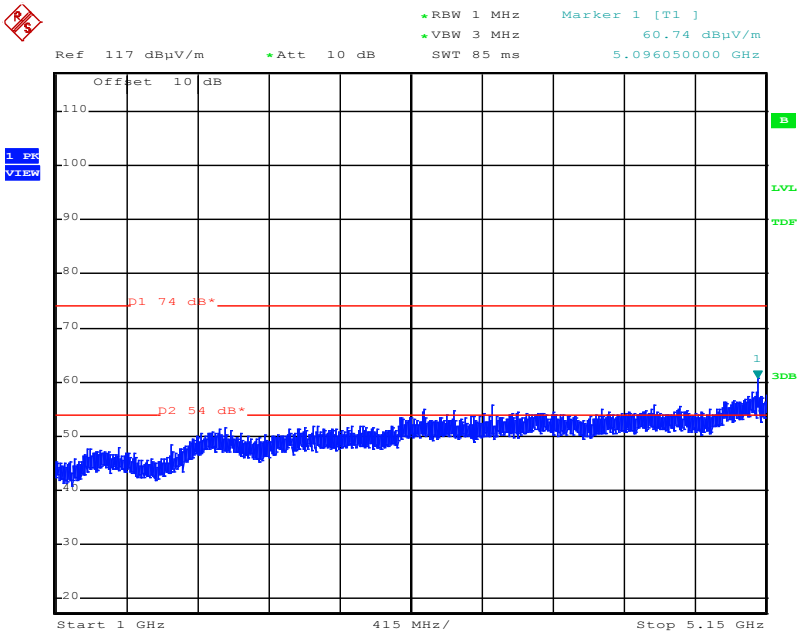


34 GHz – 40 GHz, AV

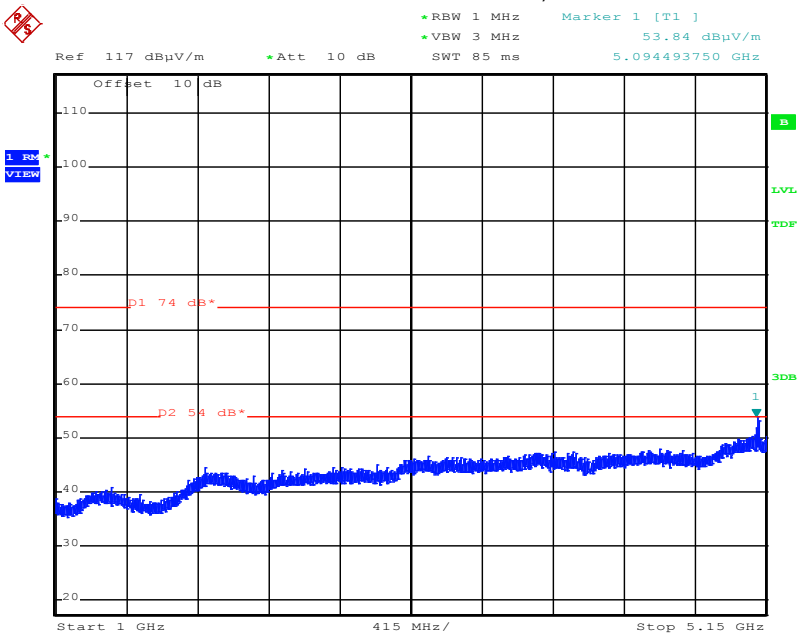


802.11n, HT20, Channel 36 (5180 MHz)

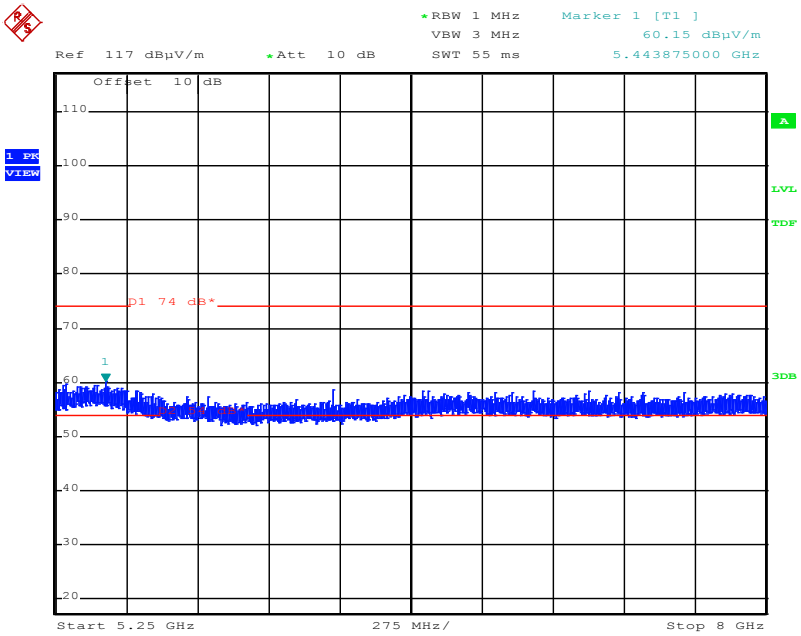
1 GHz – 5.15 GHz



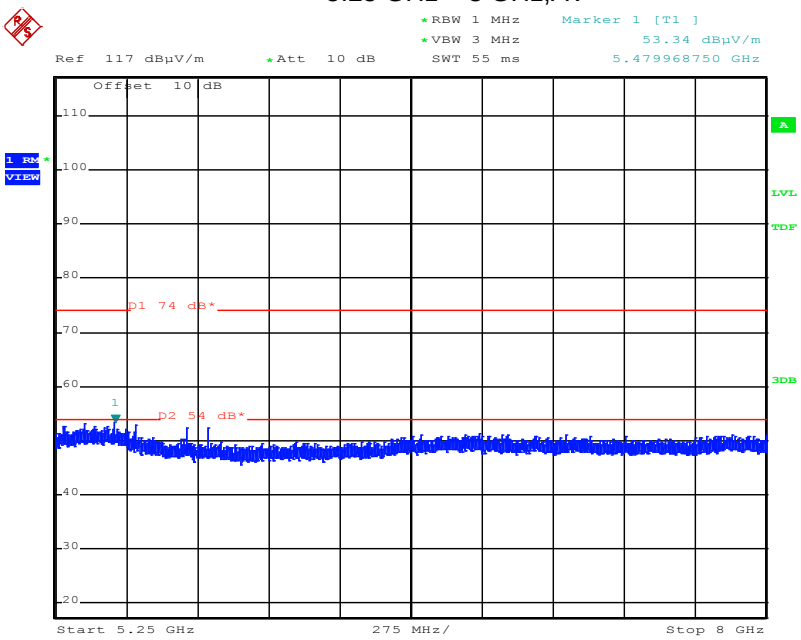
1 GHz – 5.15 GHz, AV



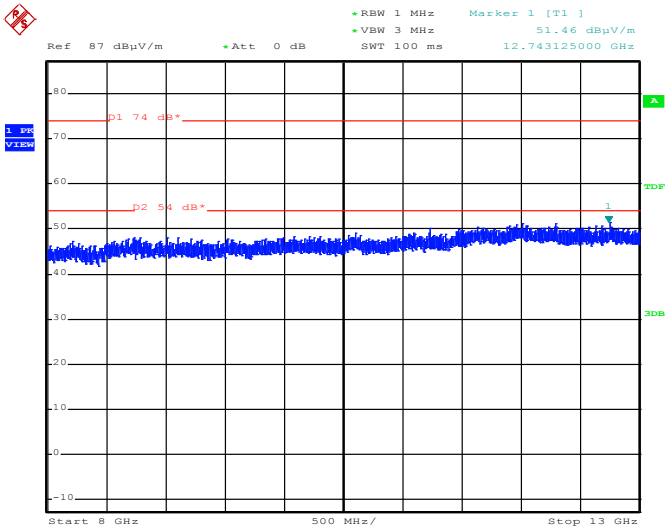
5.25 GHz – 8 GHz



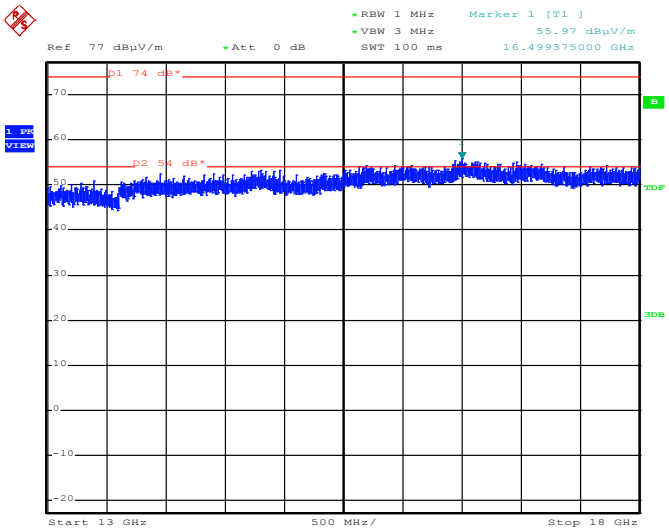
5.25 GHz – 8 GHz;AV



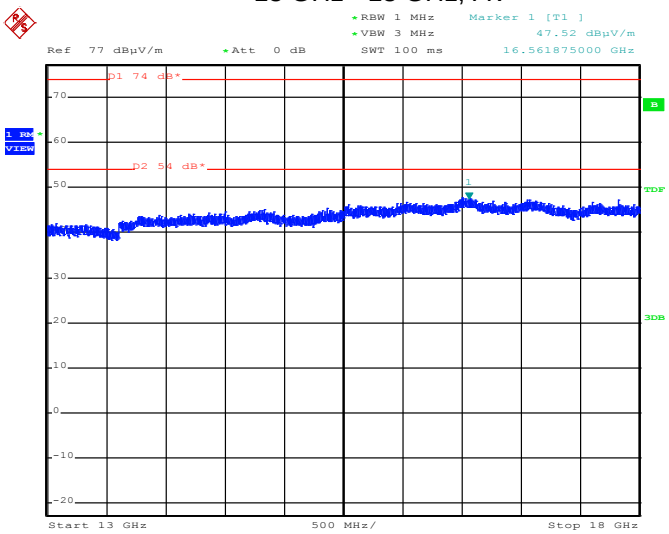
8 GHz – 13 GHz



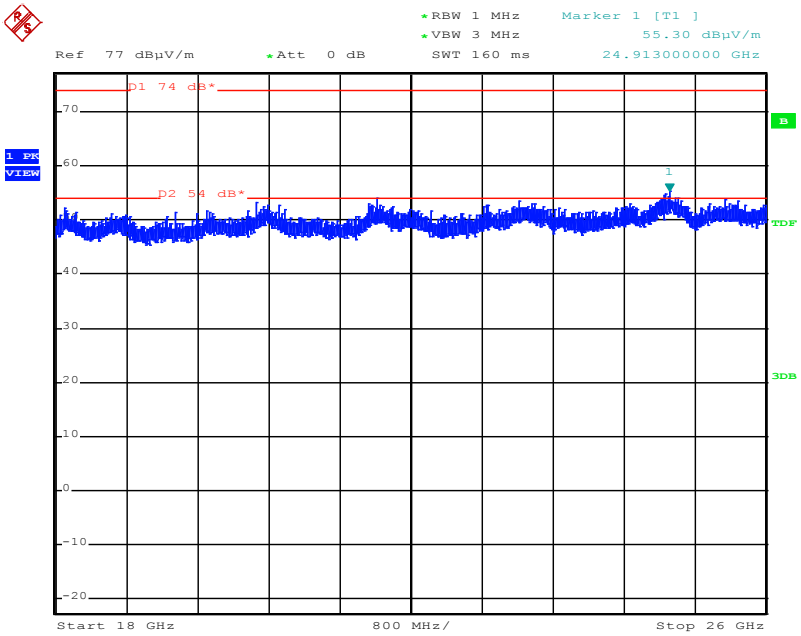
13 GHz - 18 GHz



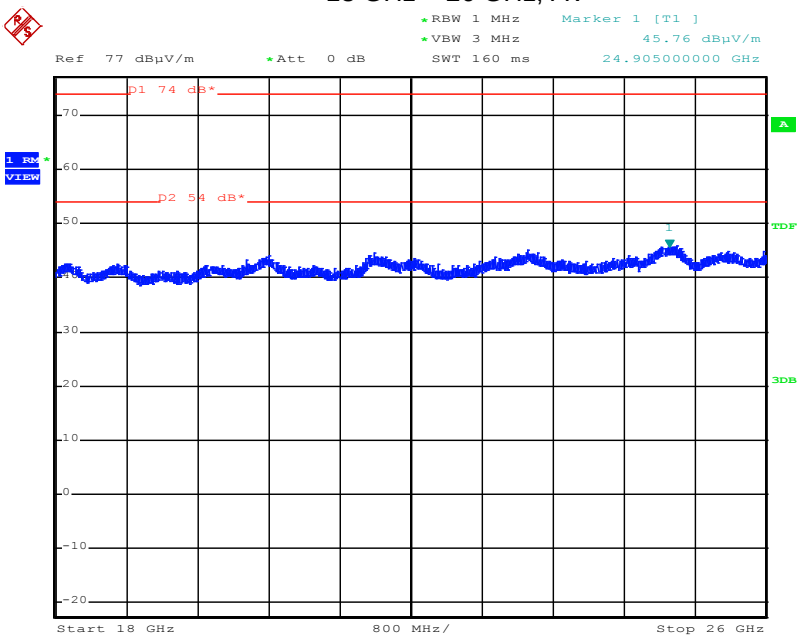
13 GHz - 18 GHz, AV



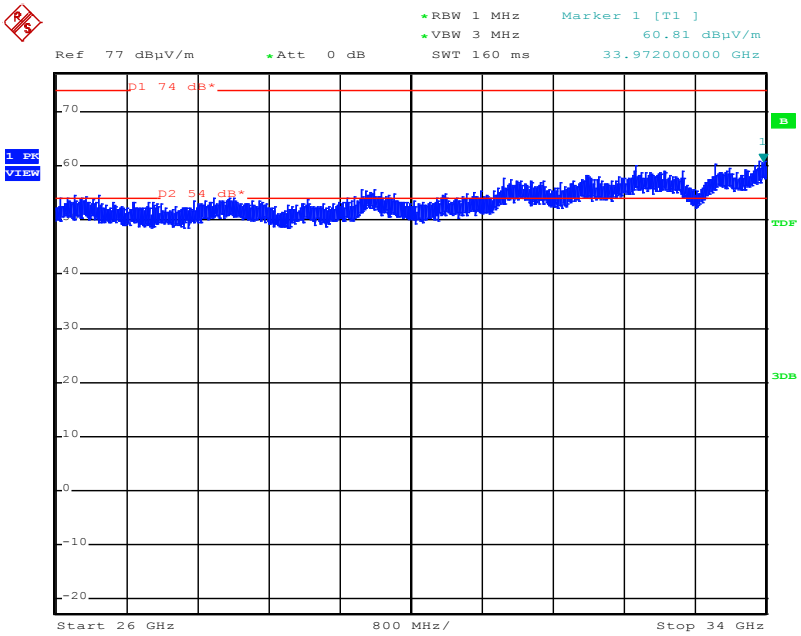
18 GHz – 26 GHz



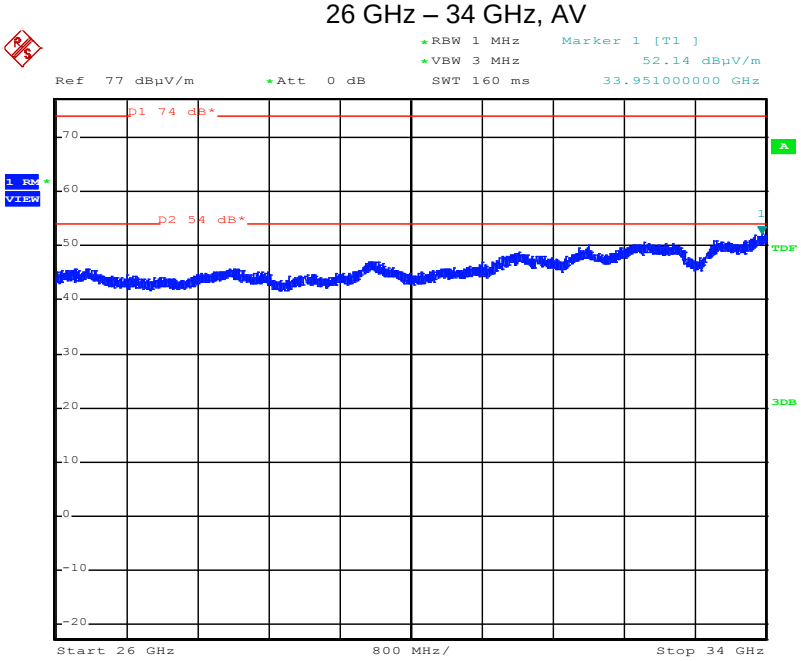
18 GHz – 26 GHz, AV



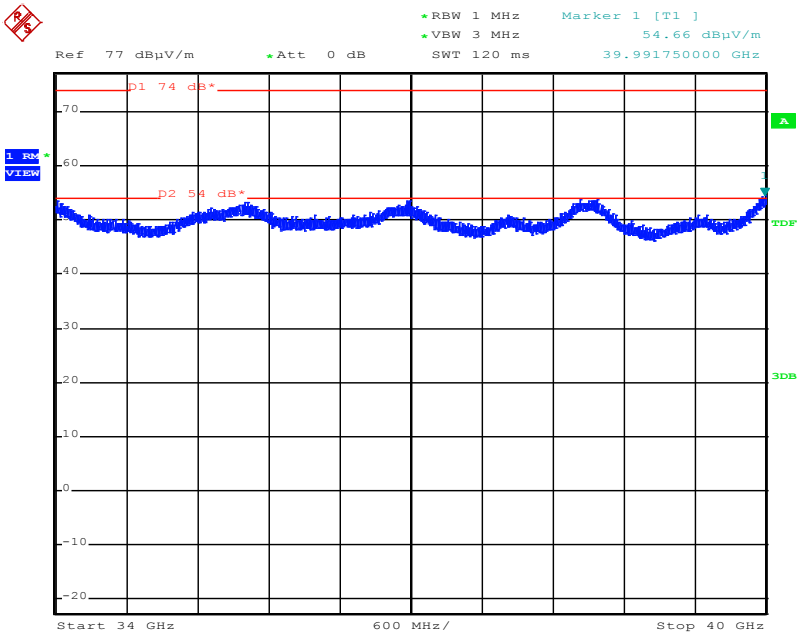
26 GHz – 34 GHz



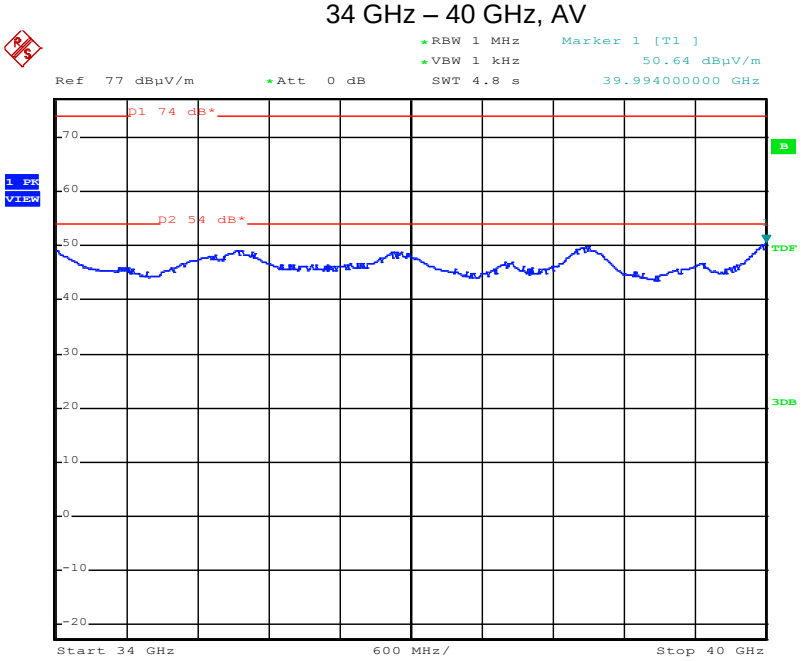
26 GHz – 34 GHz, AV



34 GHz – 40 GHz

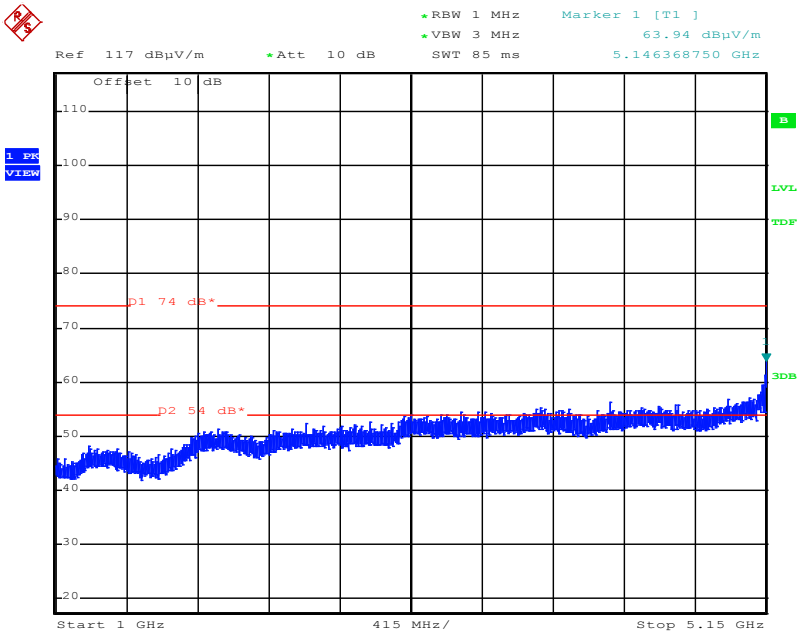


34 GHz – 40 GHz, AV

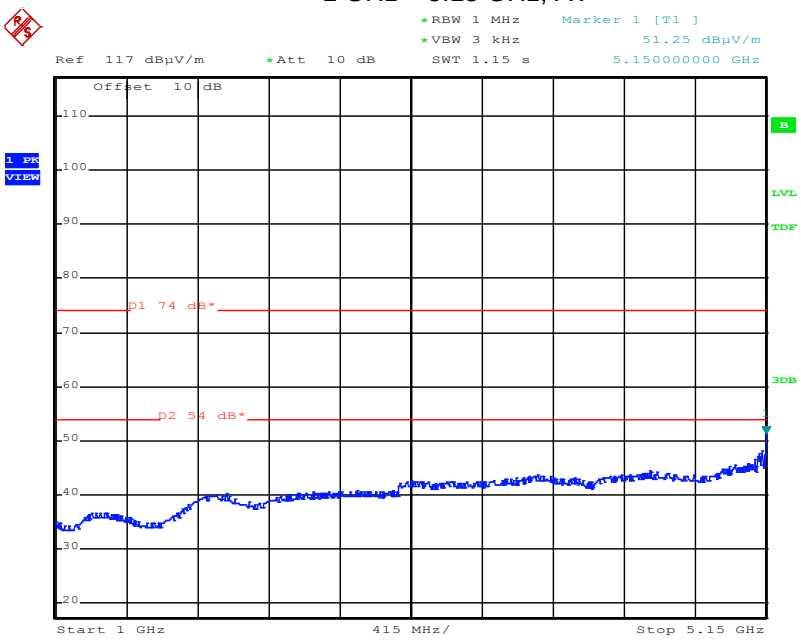


HT40, Channel 36up (5190 MHz)

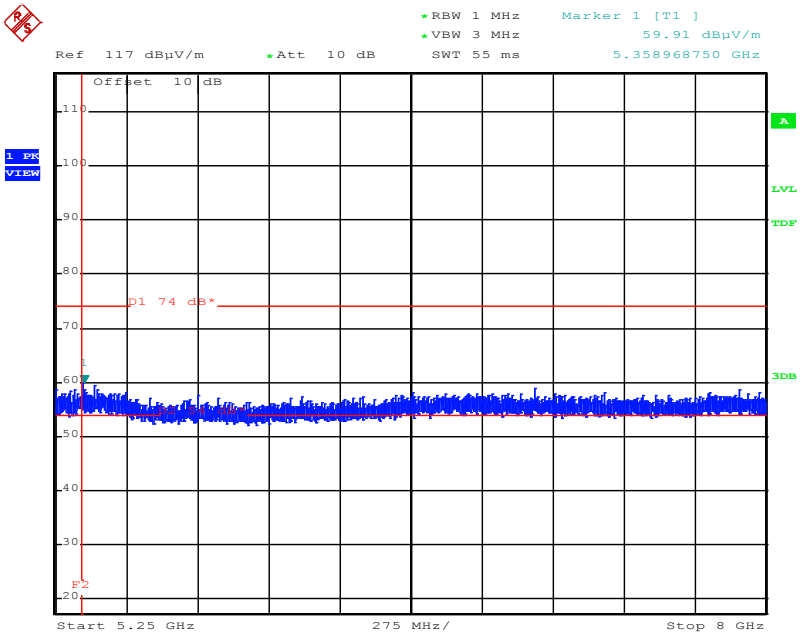
1 GHz – 5.15 GHz



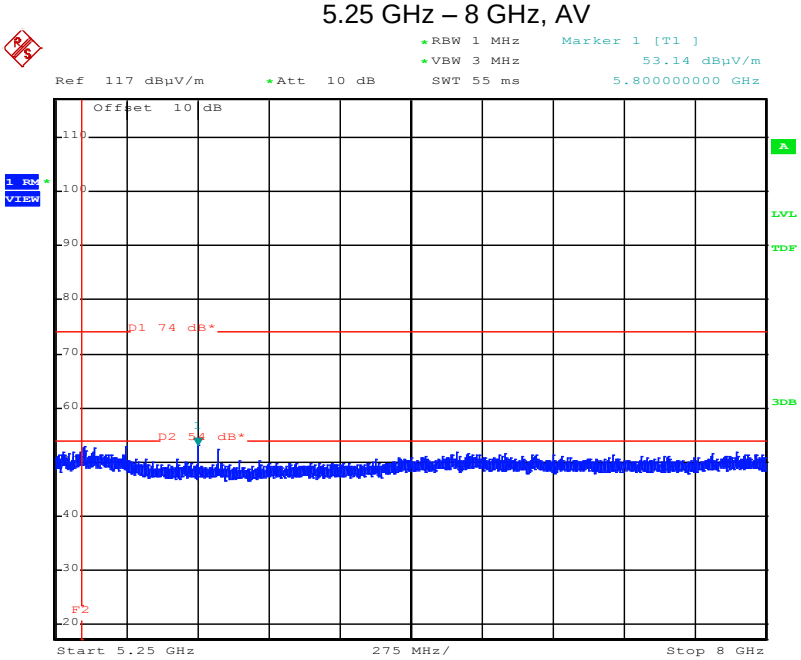
1 GHz – 5.15 GHz, AV



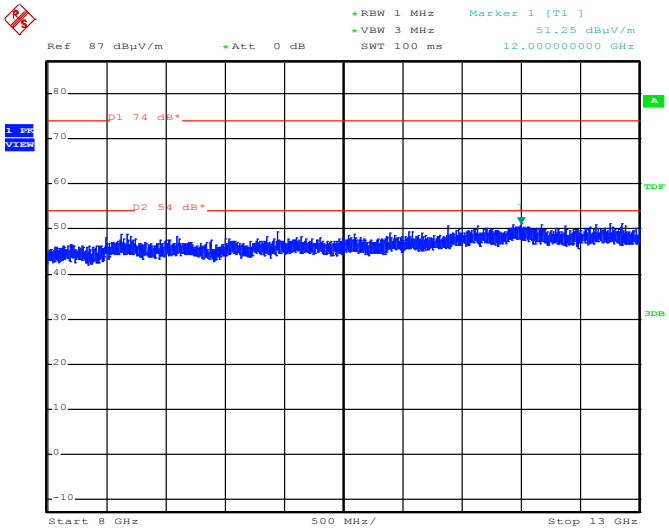
5.25 GHz – 8 GHz



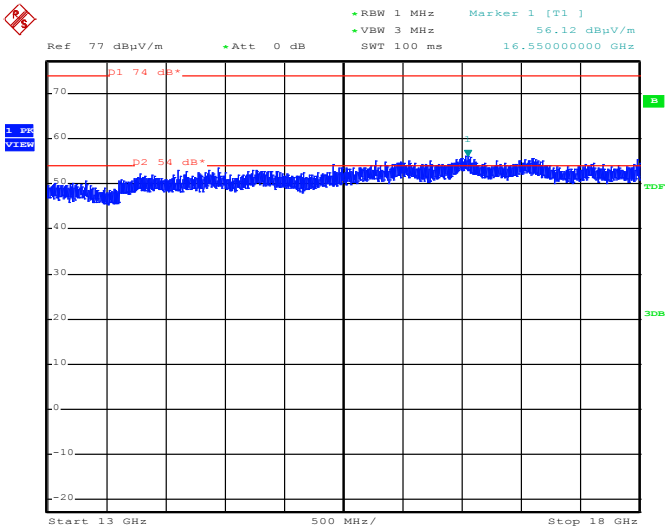
5.25 GHz – 8 GHz, AV



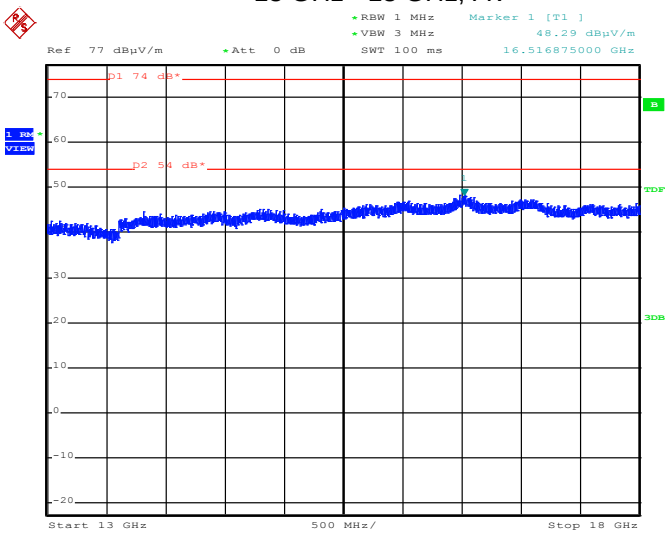
8 GHz – 13 GHz



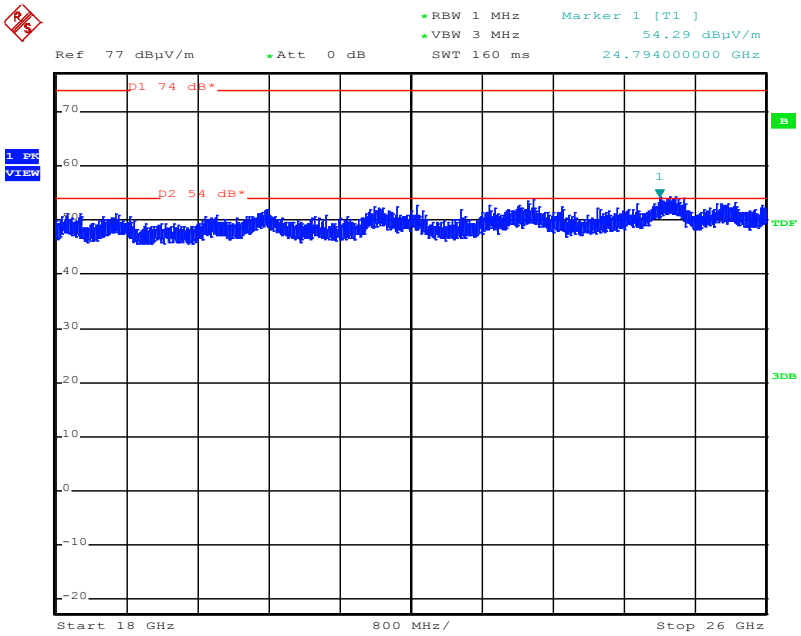
13 GHz - 18 GHz



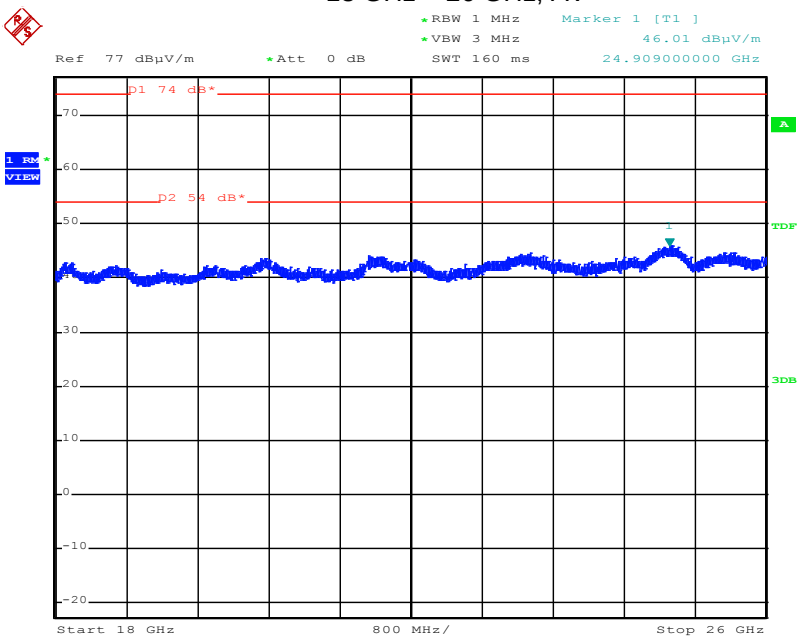
13 GHz - 18 GHz, AV



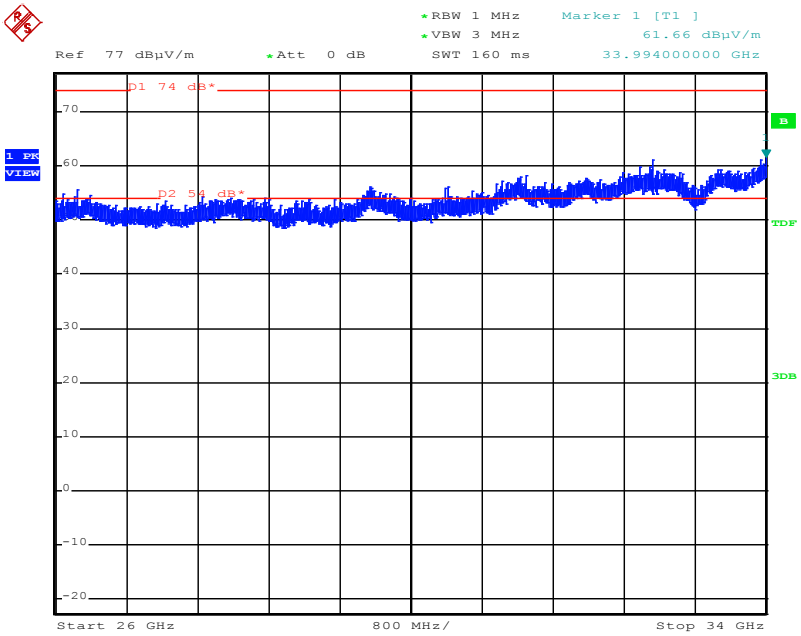
18 GHz – 26 GHz



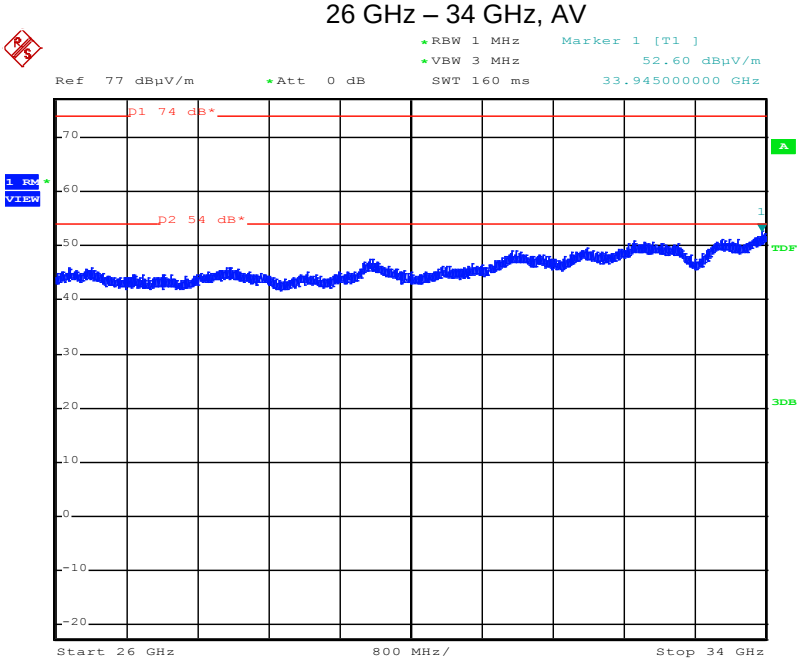
18 GHz – 26 GHz, AV



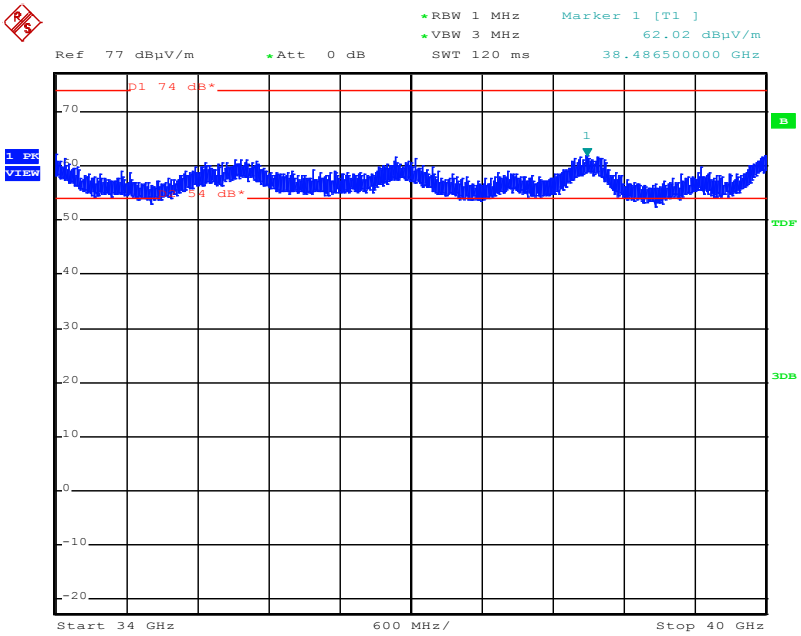
26 GHz – 34 GHz



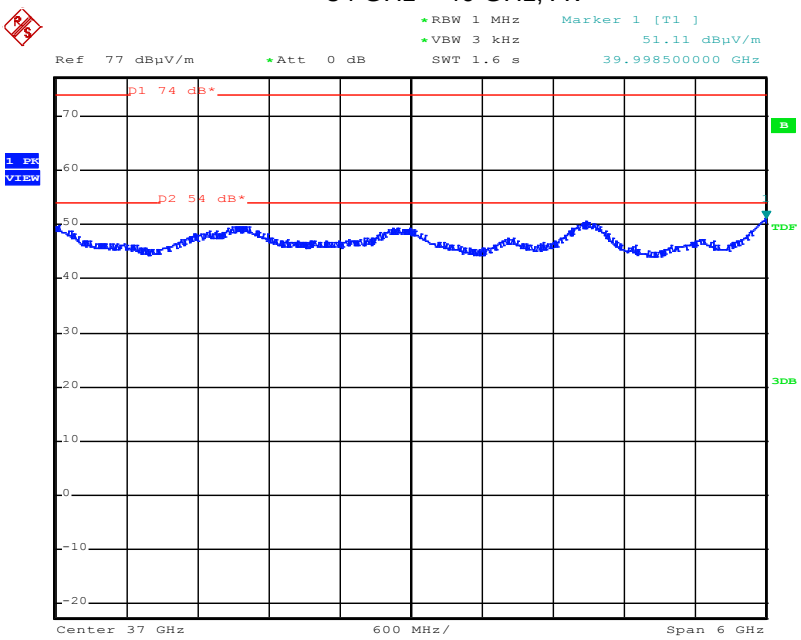
26 GHz – 34 GHz, AV



34 GHz – 40 GHz



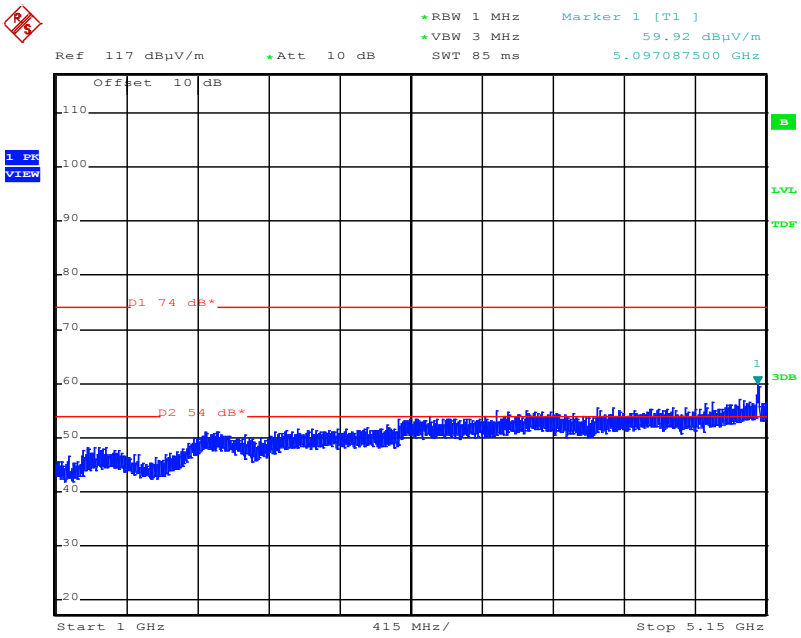
34 GHz – 40 GHz, AV



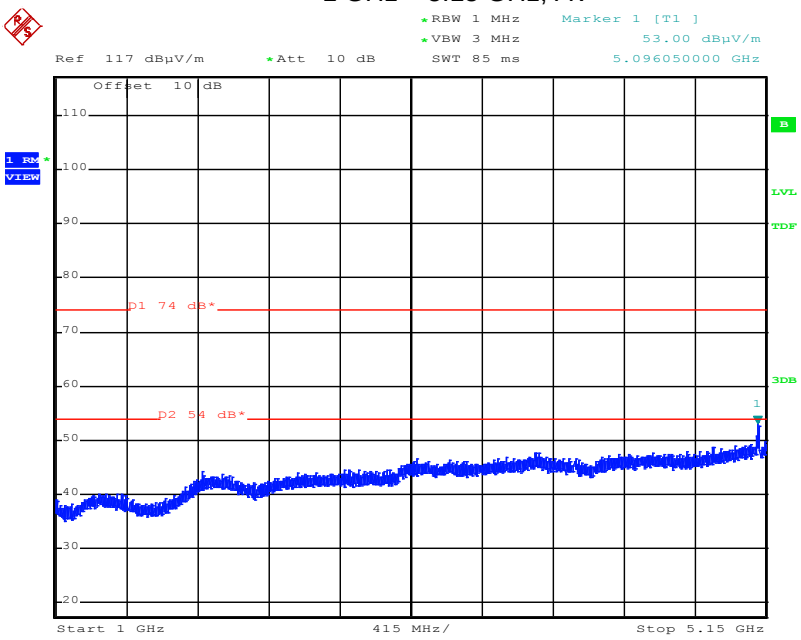
5.6.7.3 Gain group 3 (14 dBi)

802.11a, Channel 36 (5180 MHz)

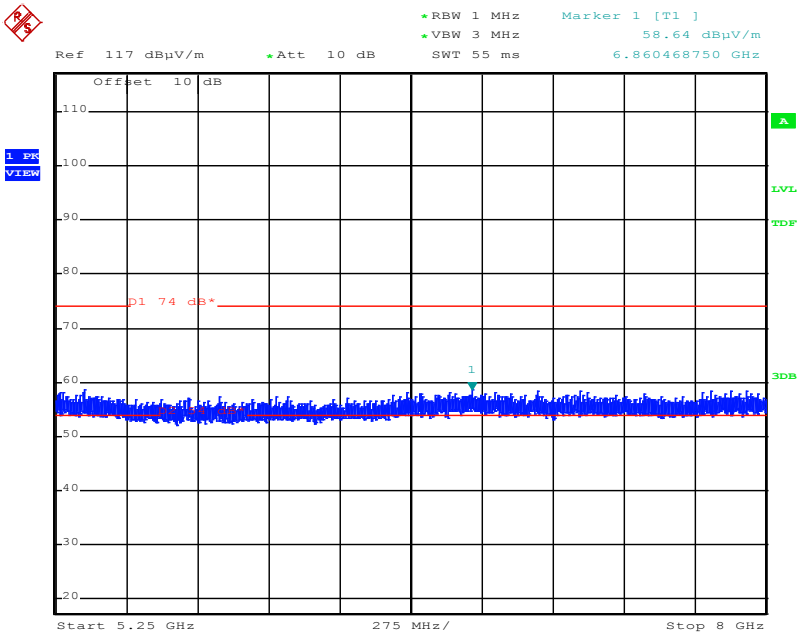
1 GHz – 5.15 GHz



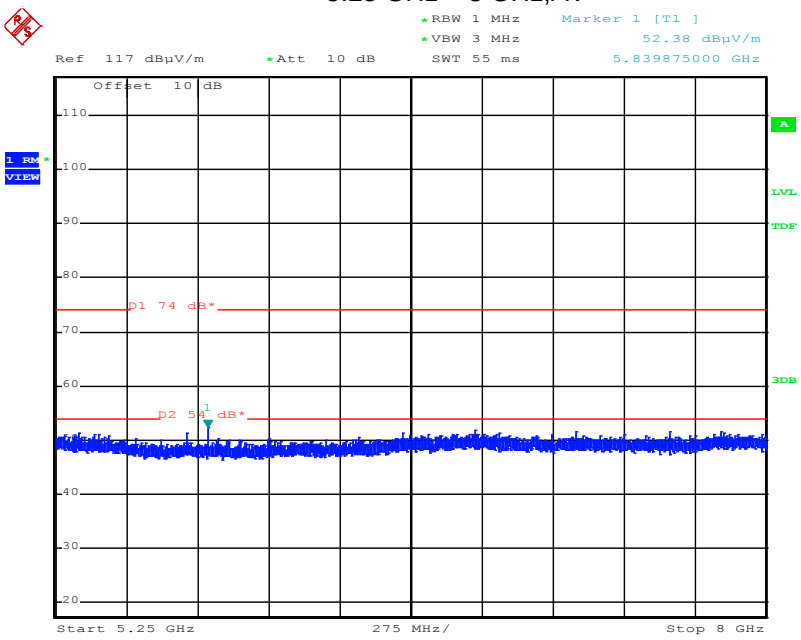
1 GHz – 5.15 GHz, AV



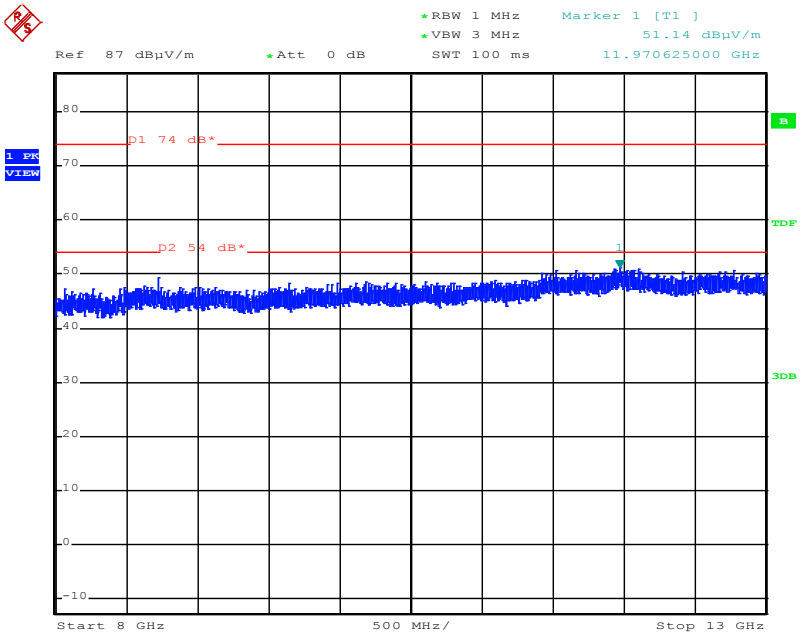
5.25 GHz – 8 GHz



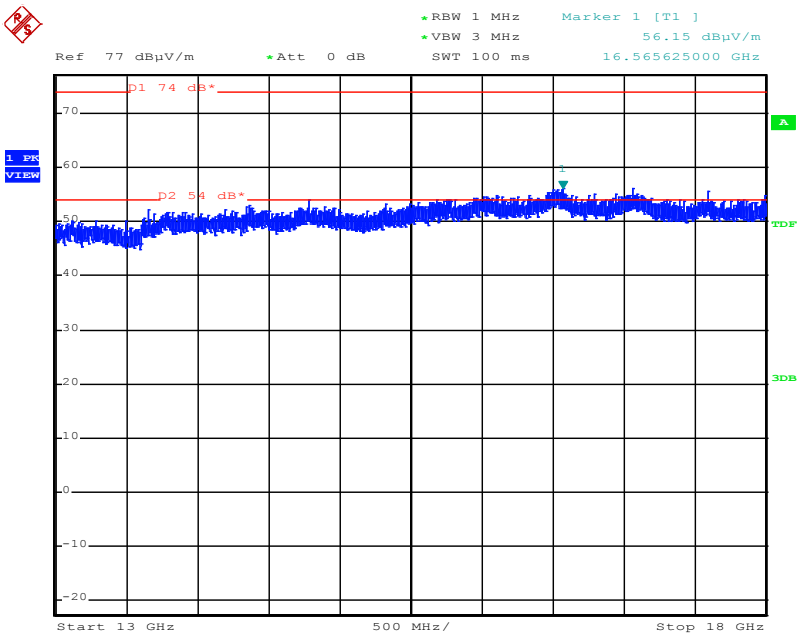
5.25 GHz – 8 GHz;AV



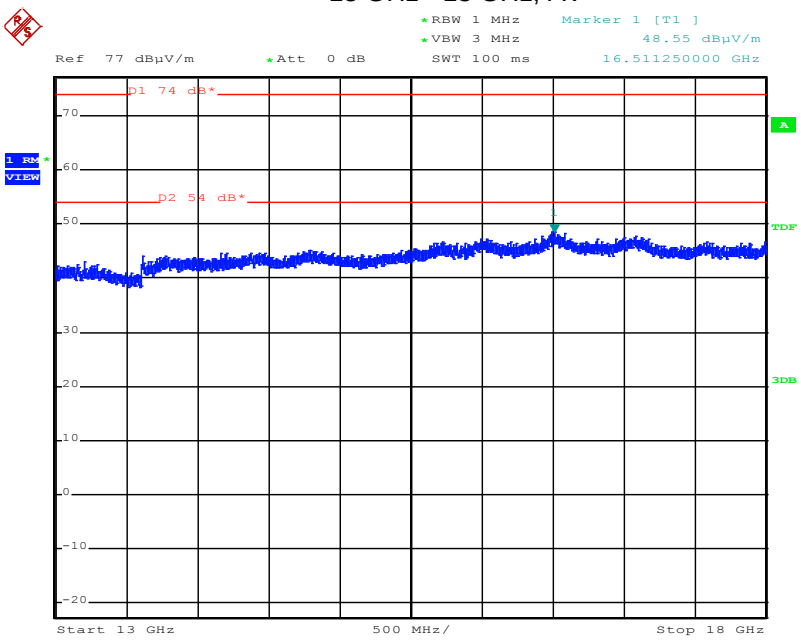
8 GHz – 13 GHz



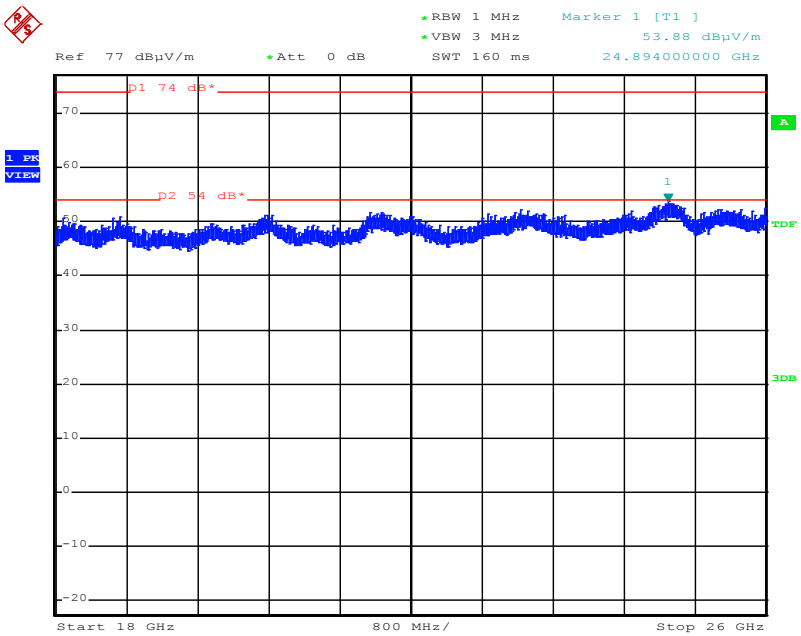
13 GHz - 18 GHz



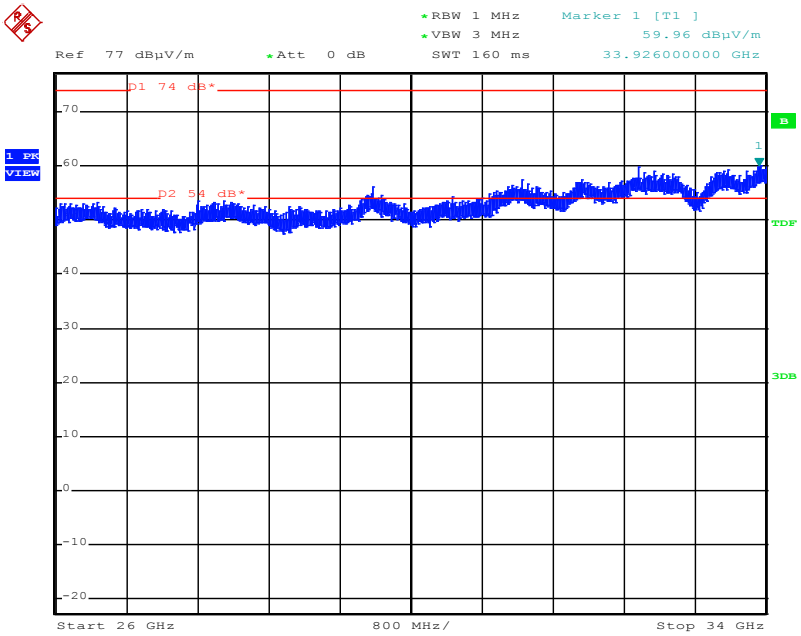
13 GHz - 18 GHz, AV



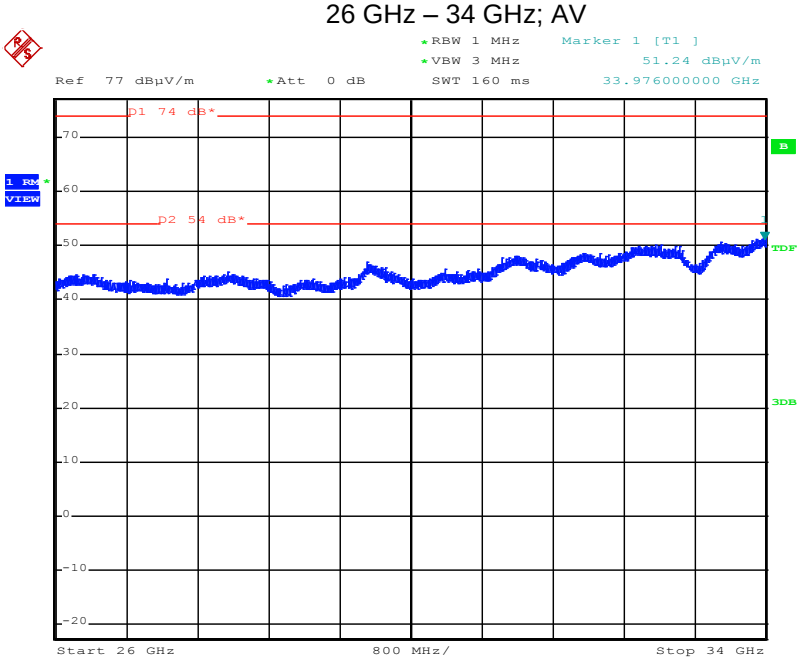
18 GHz – 26 GHz



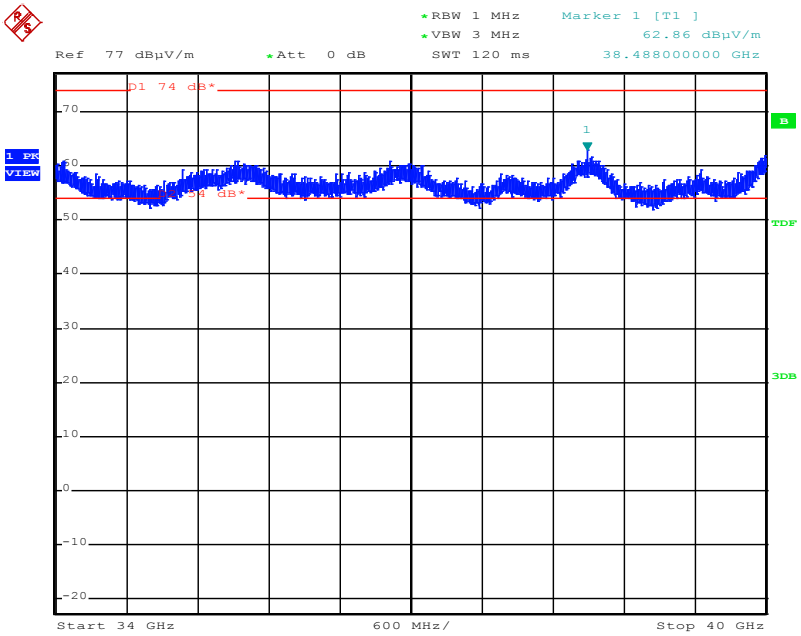
26 GHz – 34 GHz



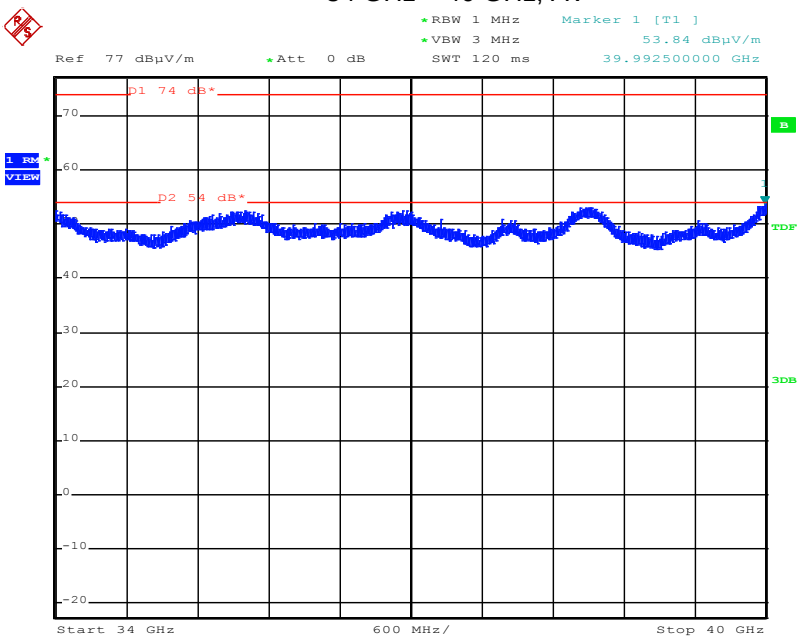
26 GHz – 34 GHz; AV



34 GHz – 40 GHz

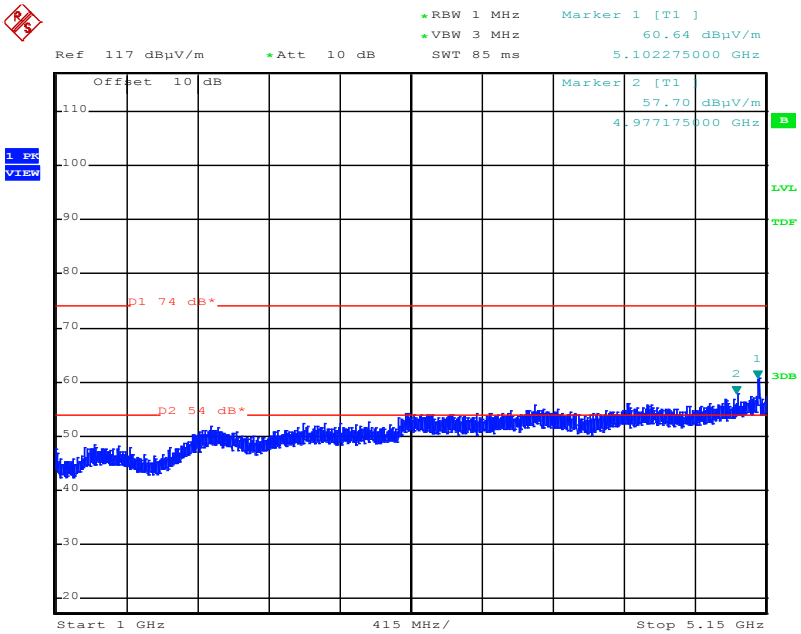


34 GHz – 40 GHz, AV

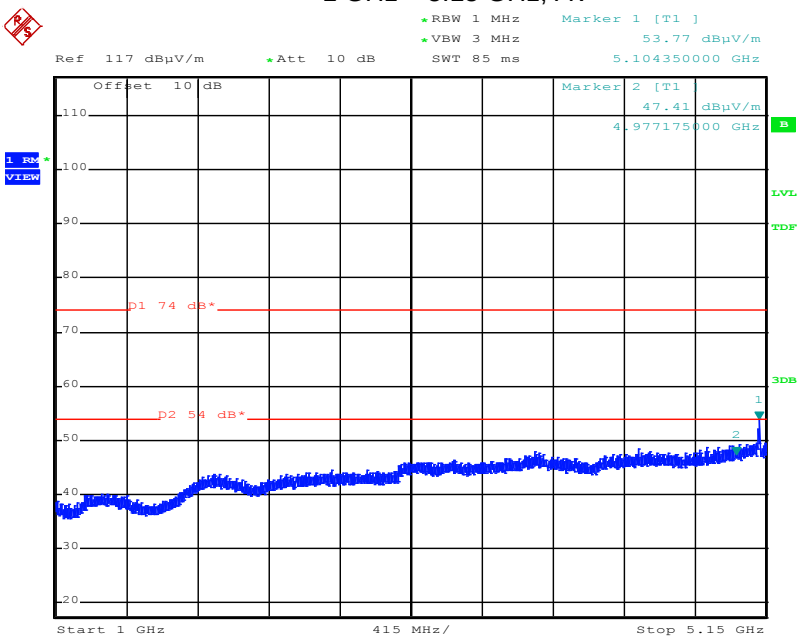


802.11n, HT20, Channel 36 (5180 MHz)

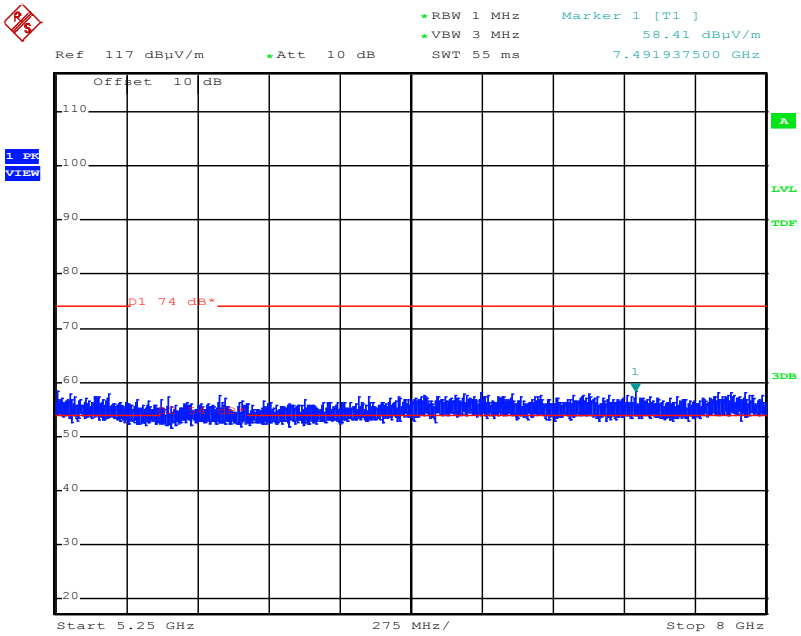
1 GHz – 5.15 GHz



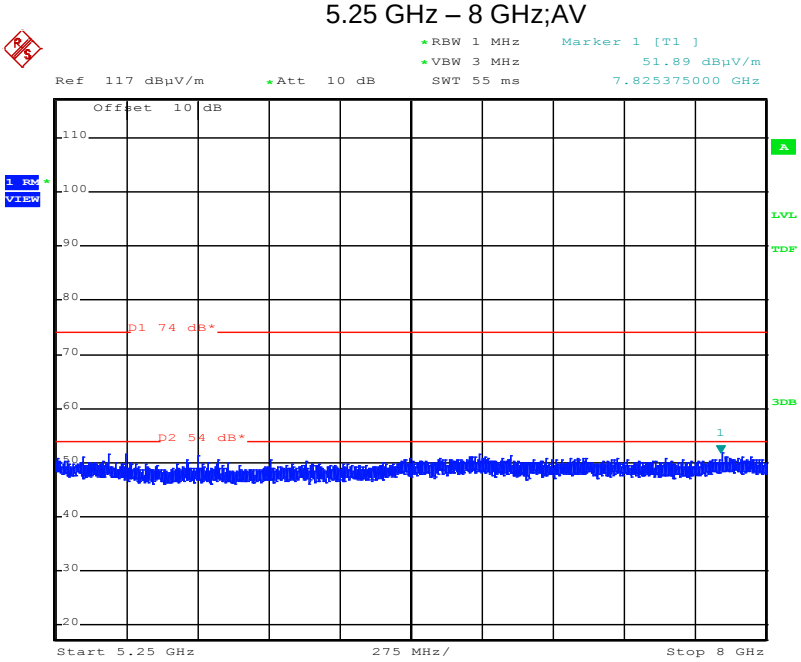
1 GHz – 5.15 GHz, AV



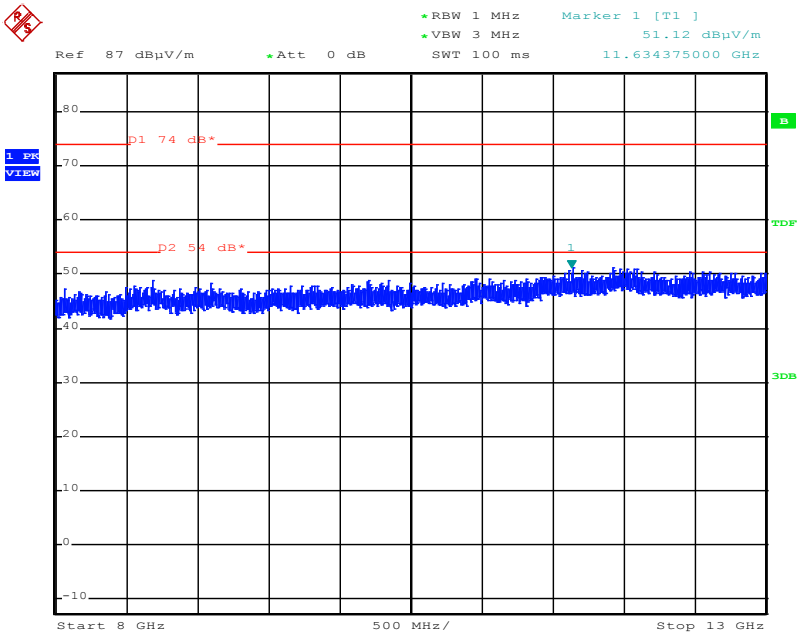
5.25 GHz – 8 GHz



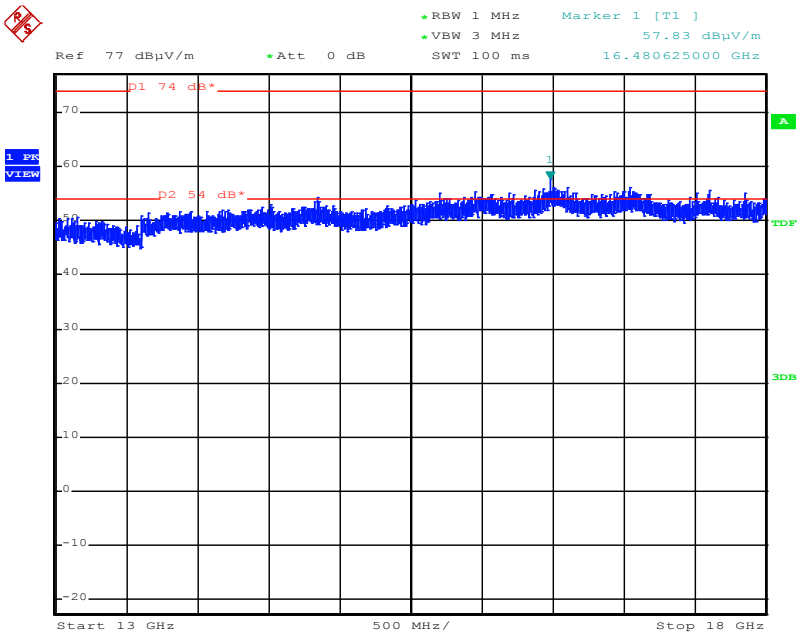
5.25 GHz – 8 GHz;AV



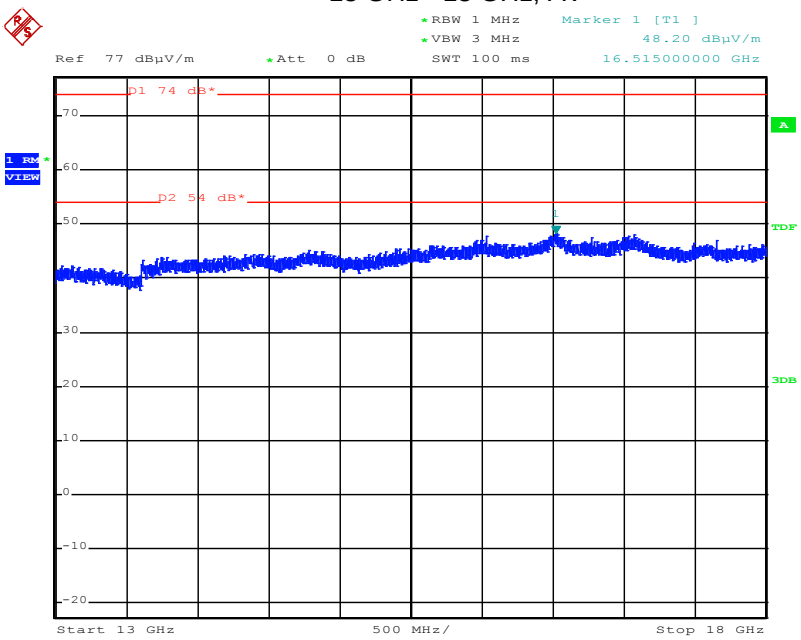
8 GHz – 13 GHz



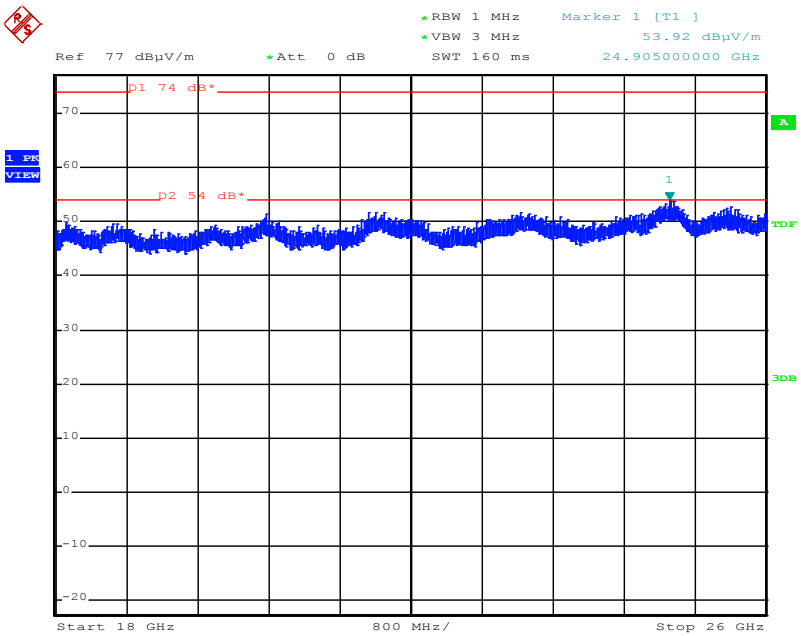
13 GHz - 18 GHz



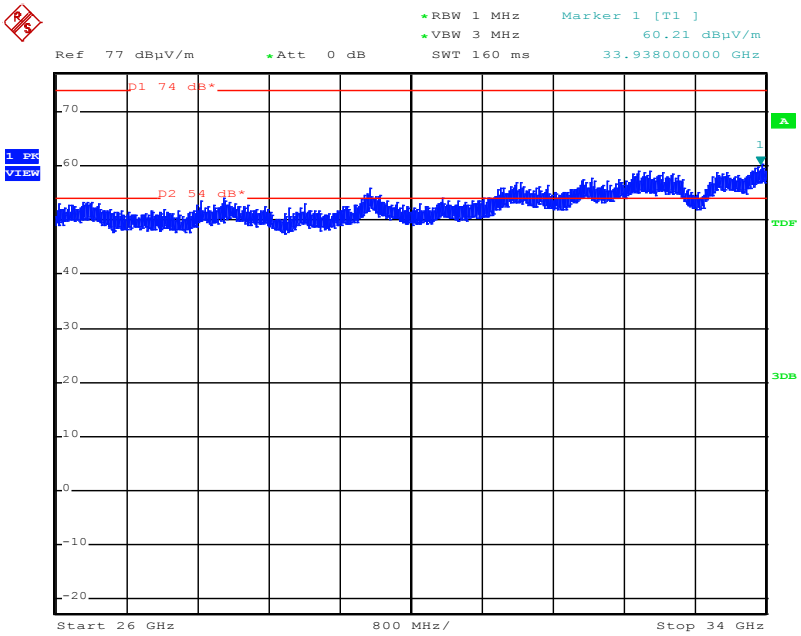
13 GHz - 18 GHz, AV



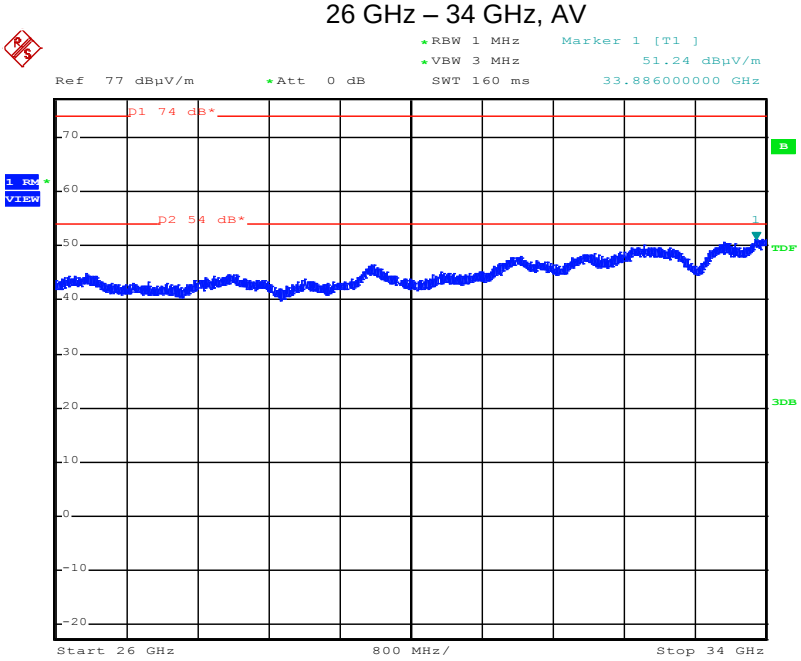
18 GHz – 26 GHz



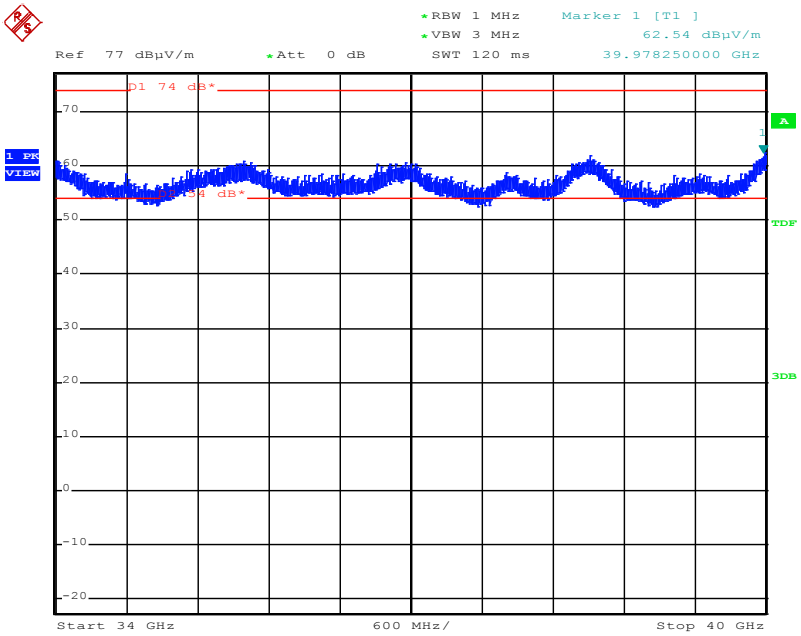
26 GHz – 34 GHz



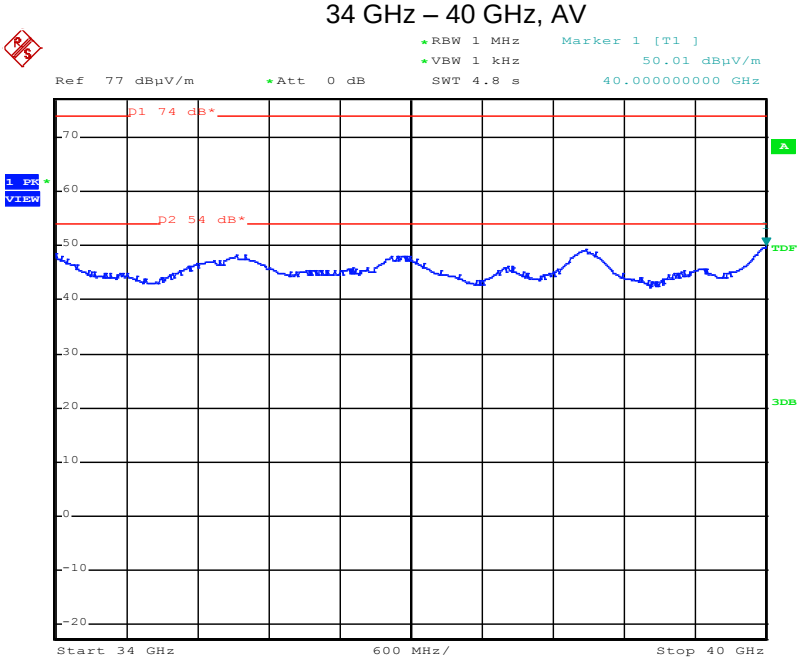
26 GHz – 34 GHz, AV



34 GHz – 40 GHz

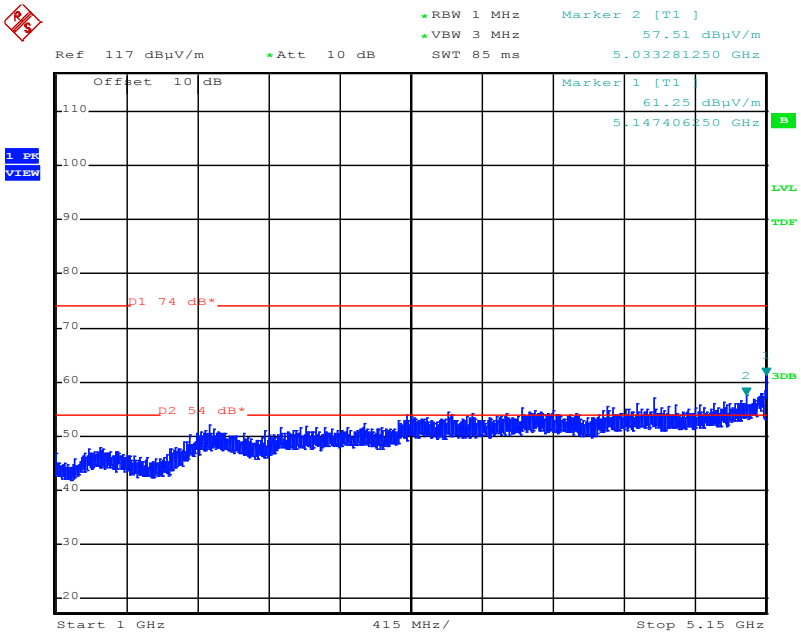


34 GHz – 40 GHz, AV

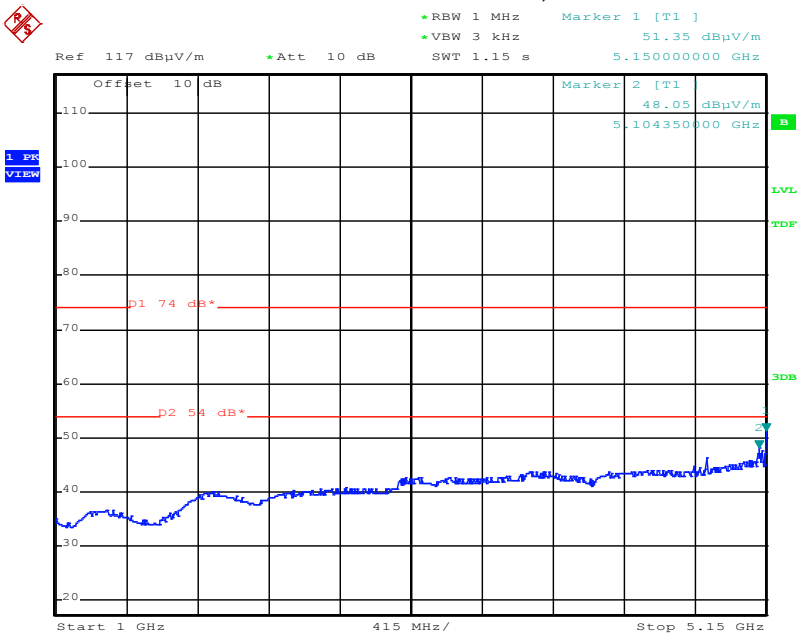


HT40, Channel 36up (5190 MHz)

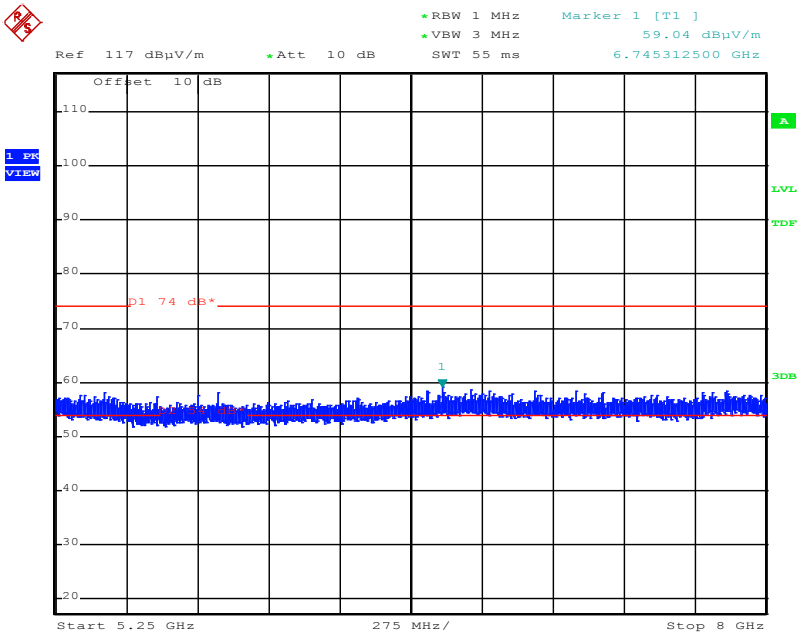
1 GHz – 5.15 GHz



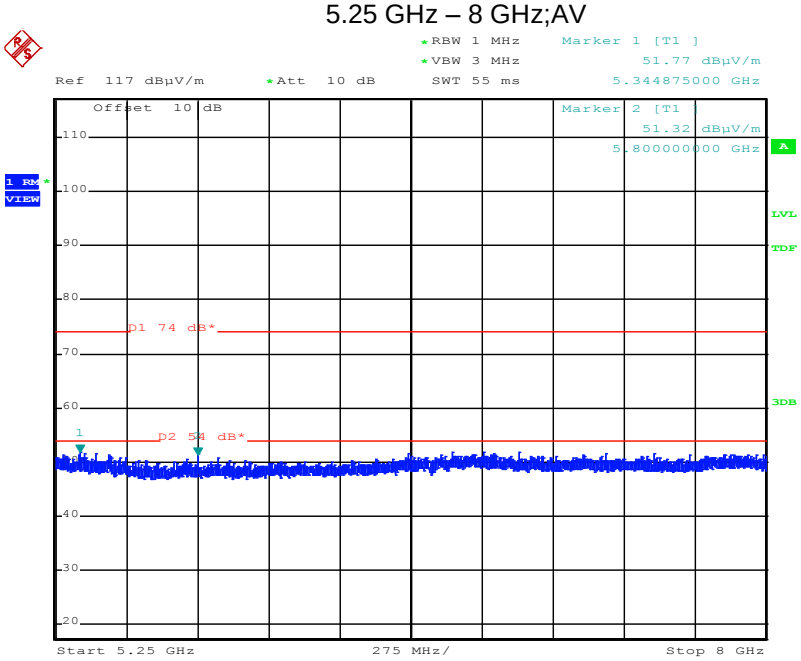
1 GHz – 5.15 GHz, AV



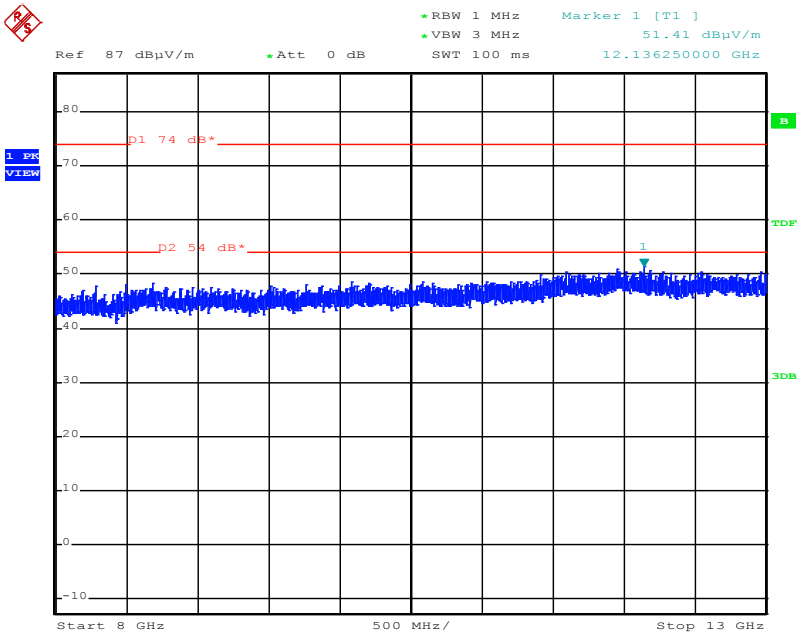
5.25 GHz – 8 GHz



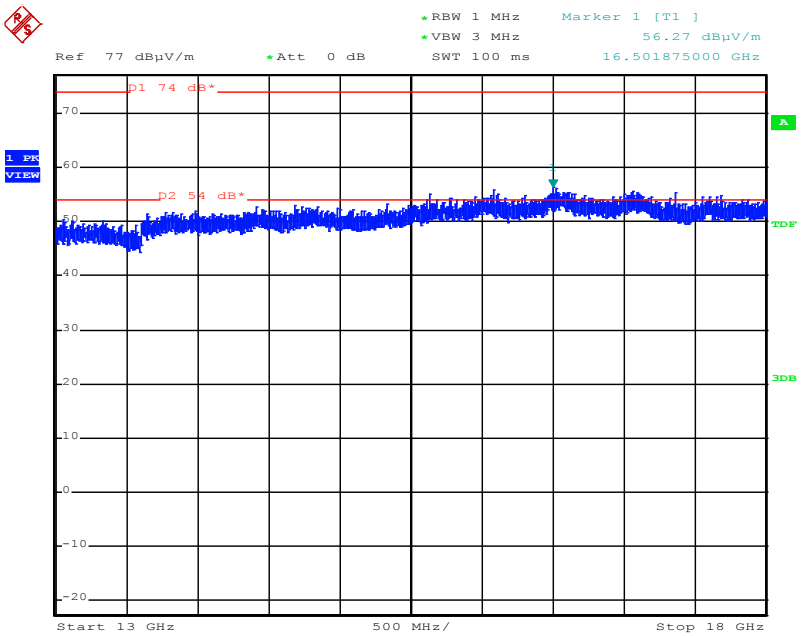
5.25 GHz – 8 GHz;AV



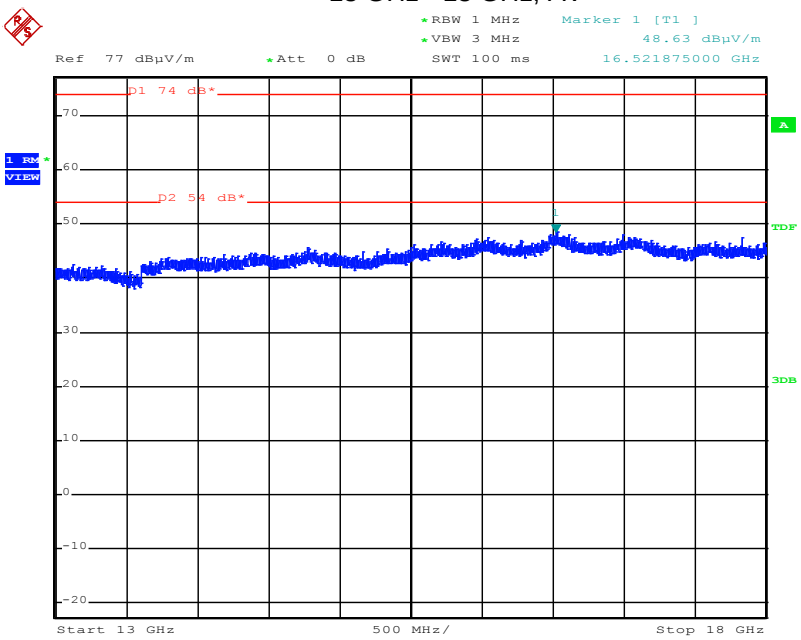
8 GHz – 13 GHz



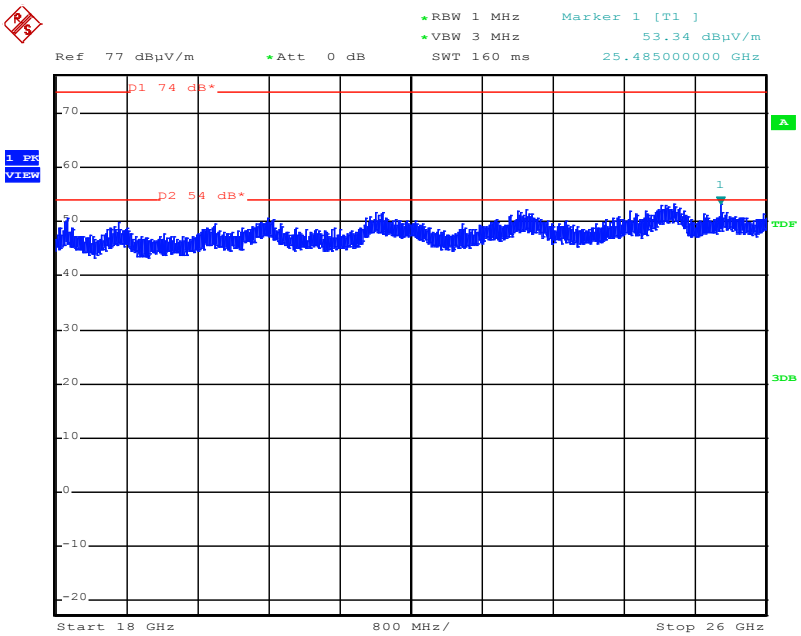
13 GHz - 18 GHz



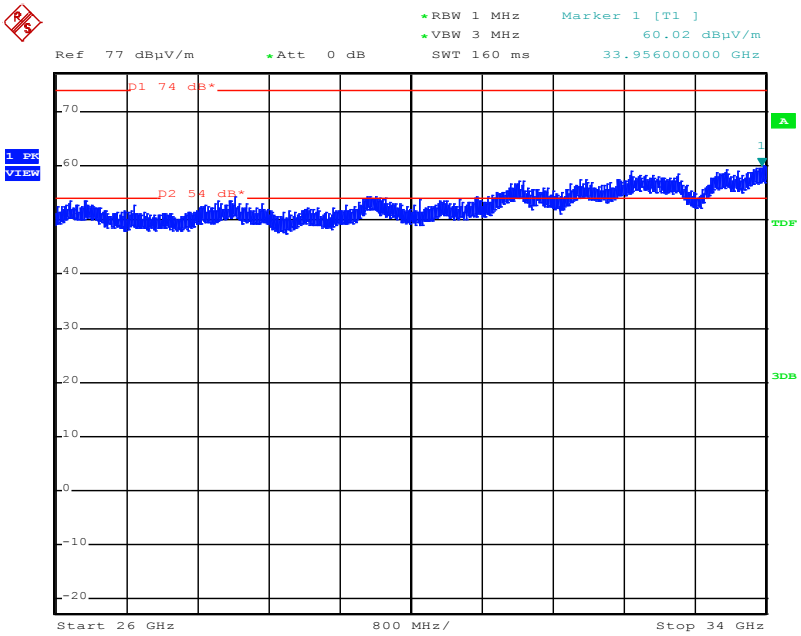
13 GHz - 18 GHz, AV



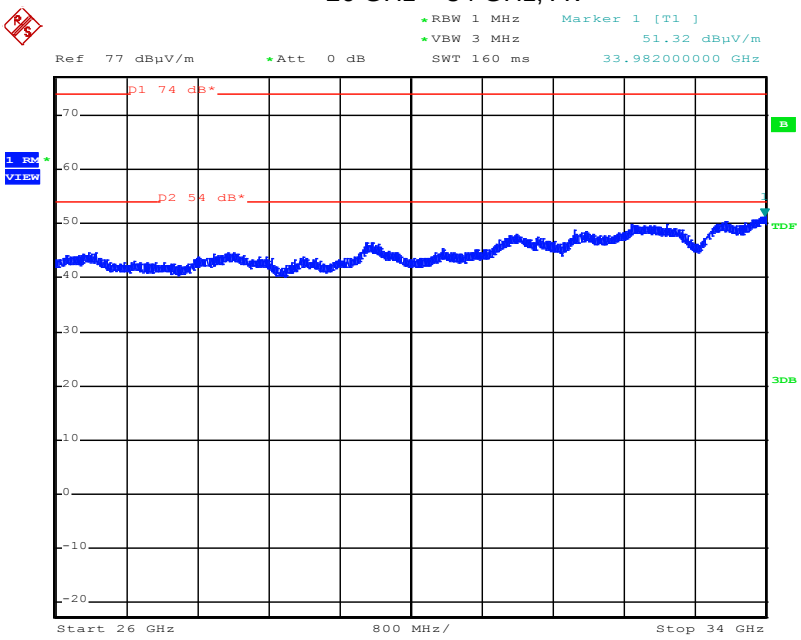
18 GHz – 26 GHz



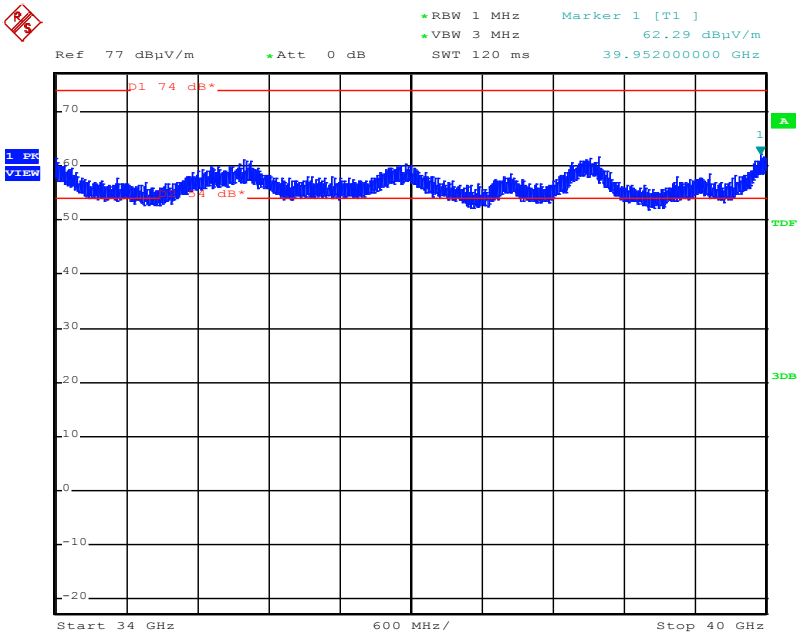
26 GHz – 34 GHz



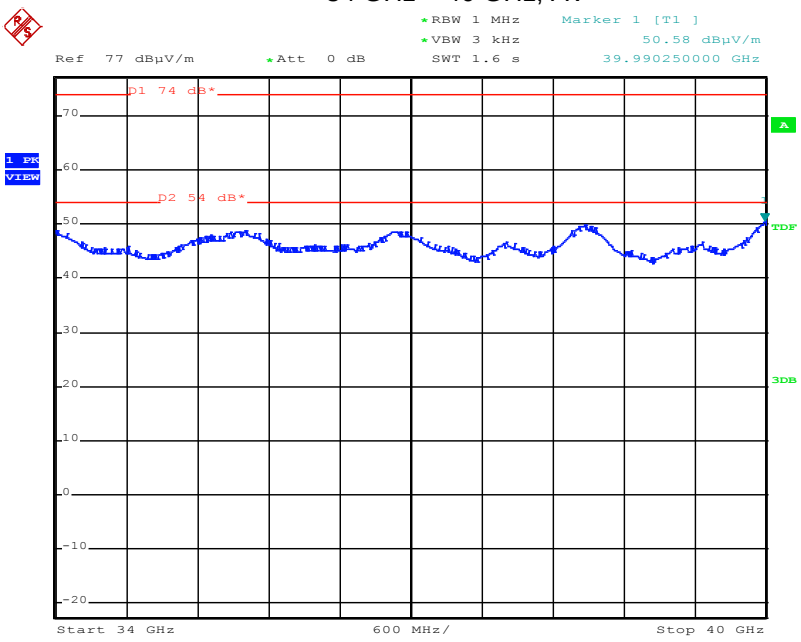
26 GHz – 34 GHz, AV



34 GHz – 40 GHz



34 GHz – 40 GHz, AV



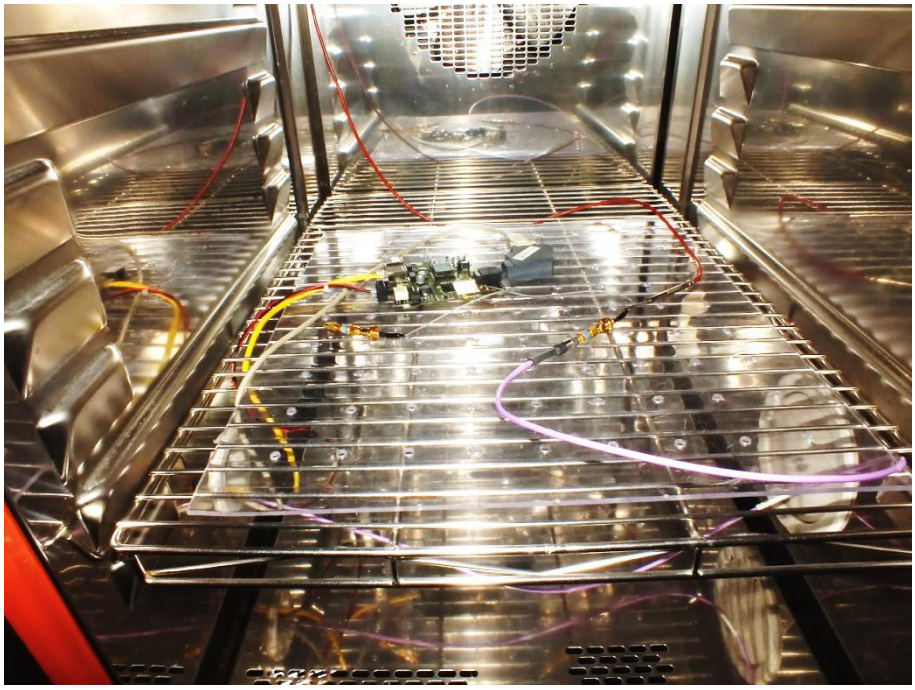
5.7 Frequency stability

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

5.7.1 Description of the test location

Test location: AREA4

5.7.2 Photo documentation of the test setup



5.7.3 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.

5.7.4 Description of Measurement

This test is 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 100 VAC to 120 VAC at normal temperature
2. Extreme temperature from -40˚C to 60 ˚C at nominal voltage.

5.7.5 Test result

Frequency band 5150 – 5250 MHz:
802.11a, chain1

Test conditions		Test result			
		Frequency (MHz)			
T (-40°C)	V_{nom}	f_l	5171.762	f_h	5248.342
T (-30°C)	V_{nom}	f_l	5171.751	f_h	5248.362
T (-20°C)	V_{nom}	f_l	5171.740	f_h	5248.378
T (-10°C)	V_{nom}	f_l	5171.733	f_h	5248.395
T (0°C)	V_{nom}	f_l	5171.724	f_h	5248.410
T(10°C)	V_{nom}	f_l	5171.690	f_h	5248.420
T_{nom}(20°C)	V_{max}	f_l	5171.680	f_h	5248.420
	V_{min}	f_l	5171.680	f_h	5248.420
T (30°C)	V_{nom}	f_l	5171.700	f_h	5248.445
T (40°C)	V_{nom}	f_l	5171.730	f_h	5248.473
T (50°C)	V_{nom}	f_l	5171.750	f_h	5248.490
T (60°C)	V_{nom}	f_l	5171.778	f_h	5248.501
Measurement uncertainty		±1500 Hz			

Occupied spectrum envelope:
Measured frequency nearest at the lowest band edge: f_l = 5171.680 MHz
Measured frequency nearest at the highest band edge: f_h = 5248.501 MHz

802.11n, HT20, chain1

Test conditions		Test result			
		Frequency (MHz)			
T (-40°C)	V_{nom}	f_l	5171.170	f_h	5249.102
T (-30°C)	V_{nom}	f_l	5171.162	f_h	5249.086
T (-20°C)	V_{nom}	f_l	5171.153	f_h	5249.066
T (-10°C)	V_{nom}	f_l	5171.139	f_h	5249.052
T (0°C)	V_{nom}	f_l	5171.127	f_h	5249.039
T(10°C)	V_{nom}	f_l	5171.122	f_h	5249.025
T_{nom}(20°C)	V_{max}	f_l	5171.120	f_h	5249.020
	V_{min}	f_l	5171.120	f_h	5249.020
T (30°C)	V_{nom}	f_l	5171.145	f_h	5249.042
T (40°C)	V_{nom}	f_l	5171.163	f_h	5249.066
T (50°C)	V_{nom}	f_l	5171.186	f_h	5249.088
T (60°C)	V_{nom}	f_l	5171.202	f_h	5249.108
Measurement uncertainty		±1500 Hz			

Occupied spectrum envelope:
Measured frequency nearest at the lowest band edge: f_l = 5171.120 MHz
Measured frequency nearest at the highest band edge: f_h = 5249.108 MHz

802.11n, HT40, chain1

Test conditions		Test result			
		Frequency (MHz)			
T (-40°C)	V_{nom}	f_l	5171.944	f_h	5248.769
T (-30°C)	V_{nom}	f_l	5171.930	f_h	5248.756
T (-20°C)	V_{nom}	f_l	5171.921	f_h	5248.743
T (-10°C)	V_{nom}	f_l	5171.907	f_h	5248.721
T (0°C)	V_{nom}	f_l	5171.898	f_h	5248.712
T(10°C)	V_{nom}	f_l	5171.891	f_h	5248.706
T_{nom}(20°C)	V_{max}	f_l	5171.880	f_h	5248.700
	V_{min}	f_l	5171.880	f_h	5248.700
T (30°C)	V_{nom}	f_l	5171.899	f_h	5248.709
T (40°C)	V_{nom}	f_l	5171.923	f_h	5248.733
T (50°C)	V_{nom}	f_l	5171.937	f_h	5248.751
T (60°C)	V_{nom}	f_l	5171.968	f_h	5248.772
Measurement uncertainty		±1500 Hz			

Occupied spectrum envelope:
Measured frequency nearest at the lowest band edge: f_l = 5171.880 MHz
Measured frequency nearest at the highest band edge: f_h = 5248.772 MHz

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: _____

_____

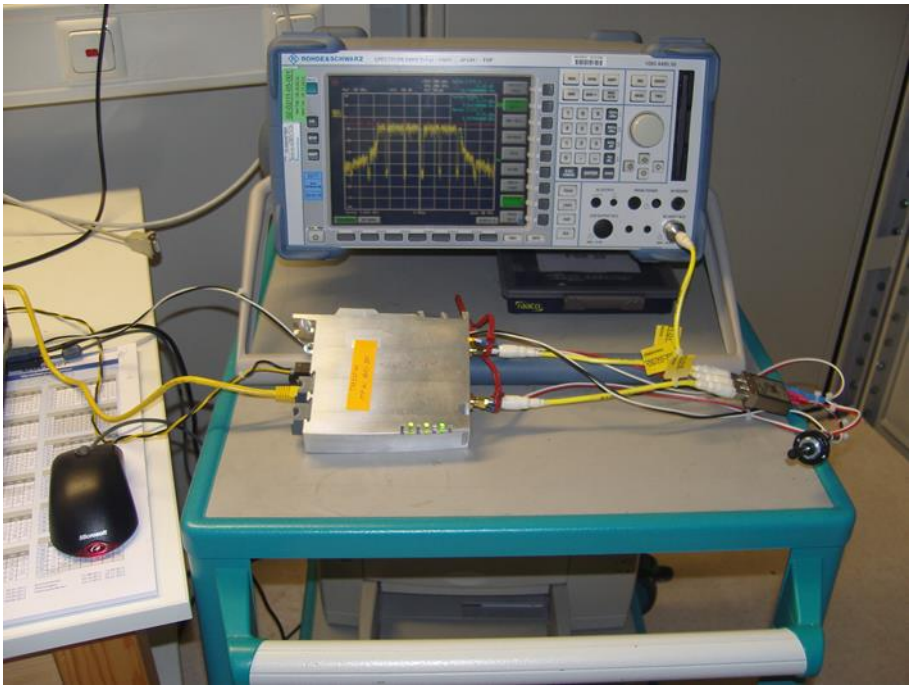
5.8 CDD functionality

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

5.8.1 Description of the test location

Test location: AREA 4

5.8.2 Photo documentation of the test set-up



5.8.3 Applicable standard

According to FCC KDB 662911 D01, accounting for directional and array gain.

5.8.4 Description of Measurement

5.8.5 Test result

Array gain:
The only correlated signal is sent in legacy mode. The spurious emission measurement is made radiated. Therefore it is accounted for the array gain.

Directional gain:
The directional gain calculation for in-band measurements:
If any transmit signals are correlated with each other,

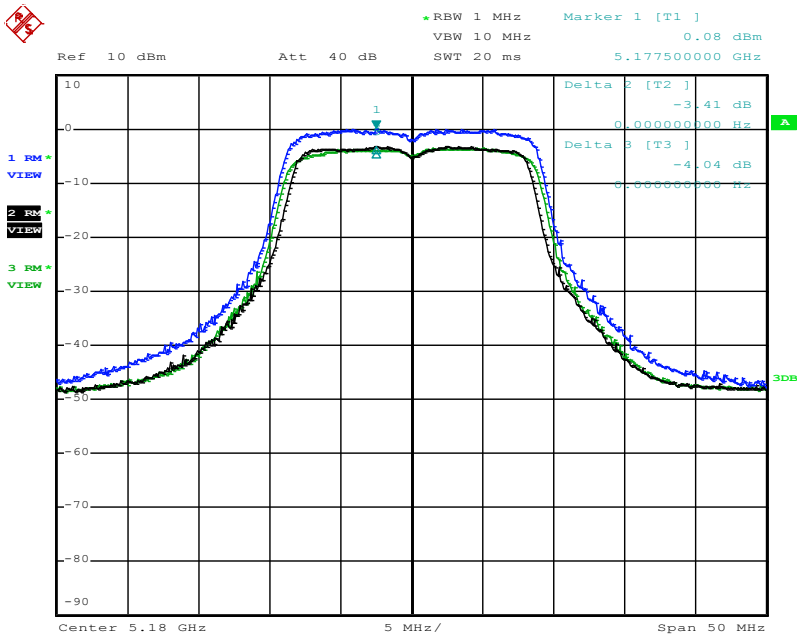
Directional gain = G_{ANT} + 10 log (N_{ANT}) dBi;

If all transmit signals are completely uncorrelated with each other,

Directional gain = G_{ANT}

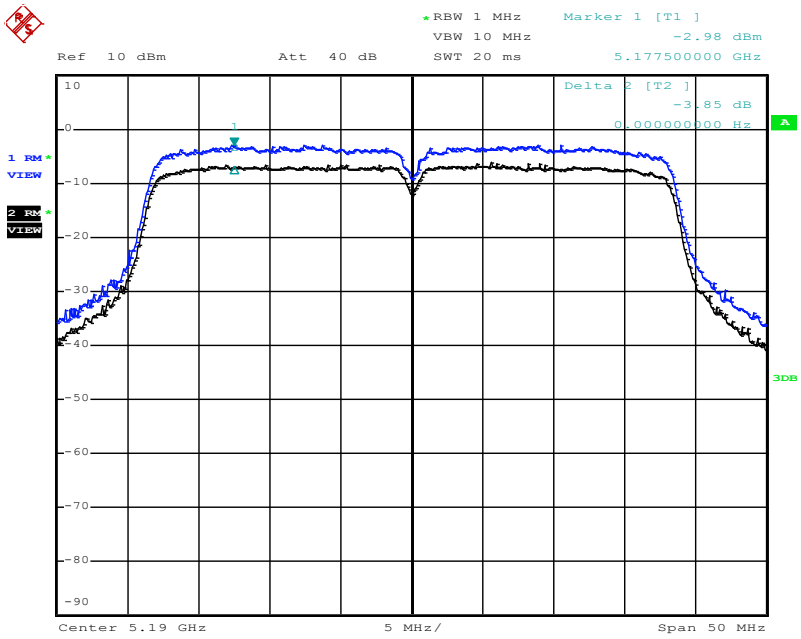
The directional gain appears when the transmission rate fall back from dual stream transmission to one stream or legacy mode. In this case the EUT reduce the output power 3 dB in order to be at the same as before.

802.11n, HT20, MCS15 to MCS7 or to 6 Mbps (P14)
CH36



Trace1 (blue) MCS15;
Trace2 (black) 6 Mbps;
Trace3 (green) MCS7;

802.11n, HT40, MCS15 to MCS7 (P14)
CH36up



Trace1 (blue) MCS15;
Trace2 (black) MCS7;

The requirements are **FULFILLED.**

Remarks:

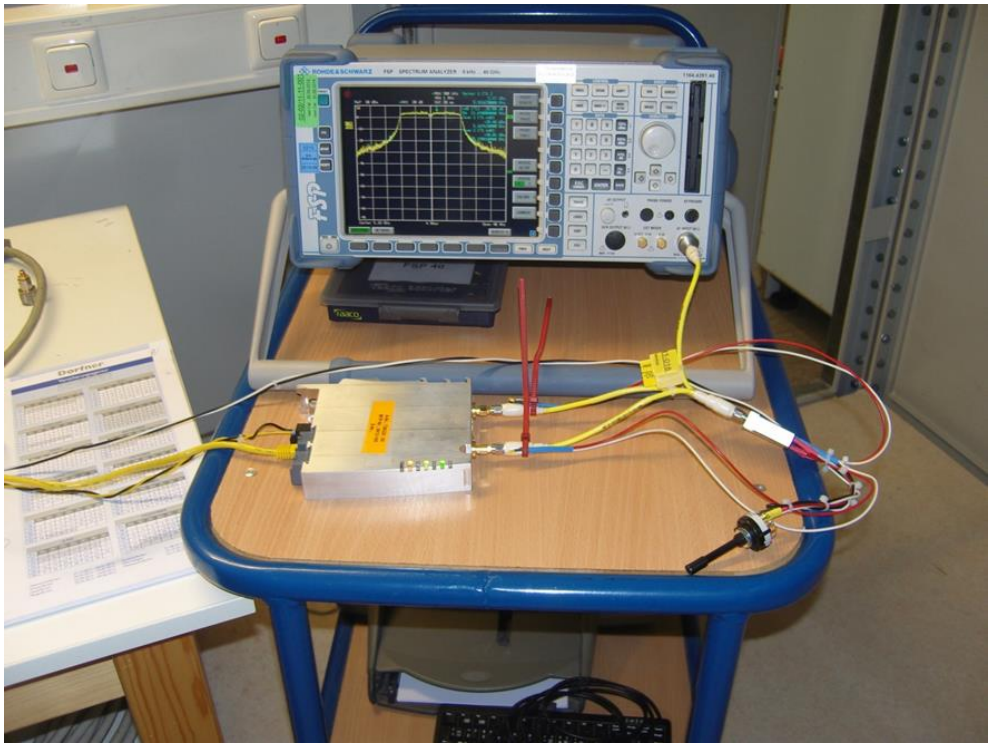
5.9 Maximum permissible exposure (MPE)

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

5.9.1 Description of the test location

Test location: AREA4

5.9.2 Photo documentation of the test set-up



5.9.3 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 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”.

5.9.4 Description of Measurement

The maximum total power input to the antenna has been measured 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/cm^2
P_{out} = output power to antenna in mW
G = gain of antenna (linear scale)
r = distance between antenna and observation point (cm)

5.9.5 Test result

For fixed equipment the distance r = 20 cm

Gain group 1

Channel No.	Power setting	A1+A2 (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm^2)	Limit S_{eq} (mW/cm^2)
36	P20	13.9	6.0	24.34	3.98	0.0969	0.0193	1.0
40	P20	14.1	6.0	25.79	3.98	0.1027	0.0204	1.0
48	P20	14.1	6.0	25.79	3.98	0.1027	0.0204	1.0

Channel No.	Power setting	A1+A2 (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm^2)	Limit S_{eq} (mW/cm^2)
36	P20	13.5	6.0	22.22	3.98	0.0885	0.0176	1.0
40	P20	13.6	6.0	22.99	3.98	0.0915	0.0182	1.0
48	P20	14.5	6.0	28.26	3.98	0.1125	0.0224	1.0

Channel No.	Power setting	A1+A2 (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm^2)	Limit S_{eq} (mW/cm^2)
36up	P20	14.5	6.0	27.97	3.98	0.1114	0.0222	1.0
44up	P20	14.6	6.0	28.94	3.98	0.1152	0.0229	1.0

Gain group 2

Channel No.	Power setting	A1+A2 (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm^2)	Limit S_{eq} (mW/cm^2)
36	P17	10.8	9.0	11.91	7.94	0.0946	0.0188	1.0
40	P17	11.0	9.0	12.48	7.94	0.0991	0.0197	1.0
48	P17	11.1	9.0	12.93	7.94	0.1027	0.0204	1.0

Channel No.	Power setting	A1+A2 (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm^2)	Limit S_{eq} (mW/cm^2)
36	P17	10.7	9.0	11.65	7.94	0.0925	0.0184	1.0
40	P17	10.8	9.0	12.05	7.94	0.0957	0.0190	1.0
48	P17	10.9	9.0	12.23	7.94	0.0971	0.0193	1.0

Channel No.	Power setting	A1+A2 (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm^2)	Limit S_{eq} (mW/cm^2)
36up	P17	11.6	9.0	14.50	7.94	0.1152	0.0229	1.0
44up	P17	11.9	9.0	15.54	7.94	0.1234	0.0246	1.0

Gain group 3

Channel No.	Power setting	A1+A2 (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm^2)	Limit S_{eq} (mW/cm^2)
36	P14	7.7	14.2	5.87	26.30	0.1543	0.0307	1.0
40	P14	7.9	14.2	6.12	26.30	0.1610	0.0320	1.0
48	P14	8.1	14.2	6.49	26.30	0.1706	0.0339	1.0

Channel No.	Power setting	A1+A2 (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm^2)	Limit S_{eq} (mW/cm^2)
36	P14	7.4	14.2	5.45	26.30	0.1435	0.0285	1.0
40	P14	7.5	14.2	5.58	26.30	0.1467	0.0292	1.0
48	P14	7.8	14.2	6.05	26.30	0.1590	0.0316	1.0

Channel No.	Power setting	A1+A2 (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm^2)	Limit S_{eq} (mW/cm^2)
36up	P14	8.4	14.2	6.93	26.30	0.1824	0.0363	1.0
44up	P14	8.6	14.2	7.27	26.30	0.1912	0.0380	1.0

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 report 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).

5.10 Co-location and Co-transmission

Applicable standard:
OET Bulletin 65, Edition 97-01, Section 2: Multiple-transmitter sites and complex environments

The MPE limits of FCC vary with frequency. Therefore, in mixed or broadband RF fields where several sources and frequencies are involved, the fraction of the recommended limit (in terms of power density or square of the electric or magnetic field strength) incurred within each frequency interval should be determined, and the sum of all fractional contributions should not exceed 1.0, or 100 % in terms of percentage.

There is no co-location issue the EUT provides with 2 TX streams simultaneously and use MIMO technique which is taken always into consideration.

The requirements are **FULFILLED.**

Remarks: _____

_____

5.11 Antenna application

5.11.1 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.

5.11.2 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.

5.11.3 Defacto EIRP-Limit:

For the output power reduction of the used antennas see the following table. The limit is calculated as using following formula, Pout = 30 – (Gx – 6);

Ant. group 3 antennas with max 9 to 14 dBi gain:

Antenna	Gx	Cond. limit	max. G	A [P8]	Limit P_{out}	Reduction	P set
	(dBi)	(dBm)	(dBi)	(dBm)	(dBm)	(dB)	5 GHz
ANT793-8DK	14.2	23.0	6.0	8.6	14.8	-6.2	P14
ANT793-8DJ	13.6	23.0	6.0	8.6	15.4	-6.8	P14

Ant. group 2 antennas with max 6 to 9 dBi gain:

Antenna	Gx	Cond. limit	max. G	A [P14]	Limit P_{out}	Reduction	P set
	(dBi)	(dBm)	(dBi)	(dBm)	(dBm)	(dB)	5 GHz
ANT793-6DT	9.0	23.0	6.0	11.6	20.0	-8.4	P17
ANT793-6DG	9.0	23.0	6.0	11.6	20.0	-8.4	P17
ANT795-6DC	9.0	23.0	6.0	11.6	20.0	-8.4	P17
ANT795-6MN	8.0	23.0	6.0	11.6	21.0	-9.4	P17
ANT795-6MT	7.0	23.0	6.0	11.6	22.0	-10.4	P17

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

Antenna	Gx	Cond. limit	max. G	A [P17]	Limit P_{out}	Reduction	P set
	(dBi)	(dBm)	(dBi)	(dBm)	(dBm)	(dB)	5 GHz
ANT793-4MN	6.0	23.0	6.0	14.6	23.0	-8.4	P20
ANT793-6MN	5.0	23.0	6.0	14.6	24.0	-9.4	P20
ANT795-4MC	5.0	23.0	6.0	14.6	24.0	-9.4	P20
ANT795-4MD	5.0	23.0	6.0	14.6	24.0	-9.4	P20
ANT795-4MA	5.0	23.0	6.0	14.6	24.0	-9.4	P20
A5E002280427-06	5.0	23.0	6.0	14.6	24.0	-9.4	P20
Rcoax 5G	0.0	23.0	6.0	14.6	29.0	-14.4	P20

Remarks: No power reduction results using the listed antennas in combination with the mentioned power setting.

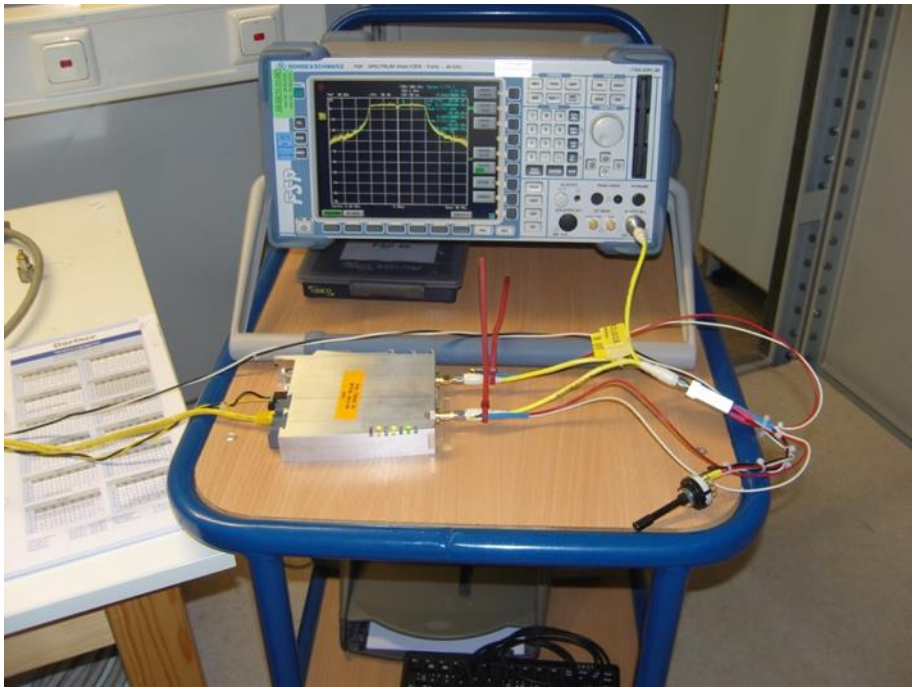
5.12 Band requirement 5150 – 5250 MHz

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

5.12.1 Description of the test location

Test location: AREA4

5.12.2 Photo documentation of the test setup



5.12.3 Applicable standard

According to FCC Part 15, Subpart C, Section 15.215 (c):
Devices must be designed to ensure that the 20 dB bandwidth of the emission is fully contained within the frequency band designated.

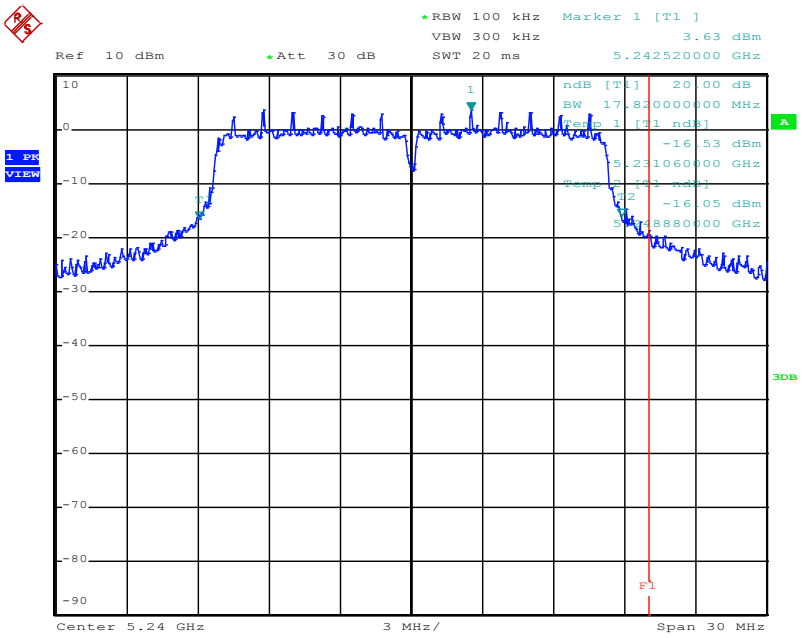
5.12.4 Description of Measurement

The spectrum analyser function “n-dB-down” is used to determine the 20 dB EBW.

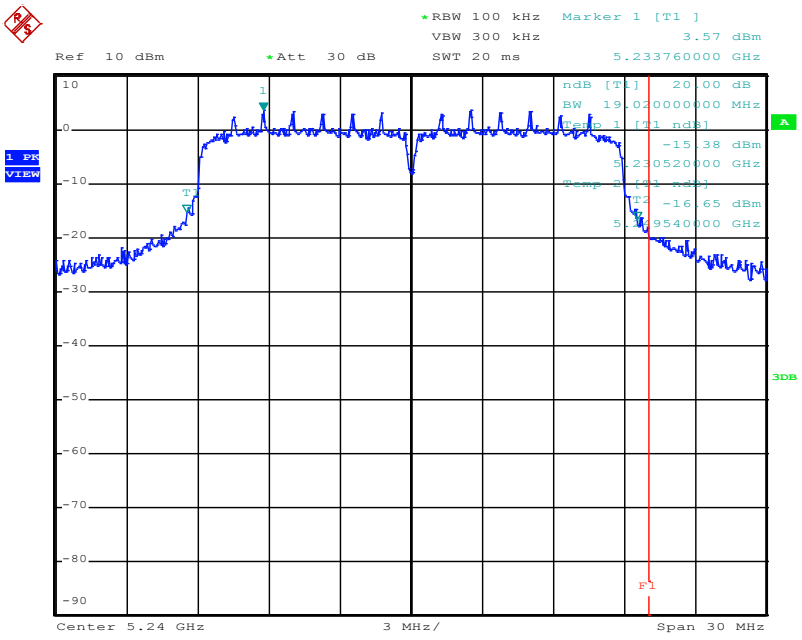
Spectrum analyser settings:
RBW: 100 kHz, VBW: 300 kHz, Sweep: Auto, Detector: max peak, Trace mode: max hold;

5.12.5 Test result

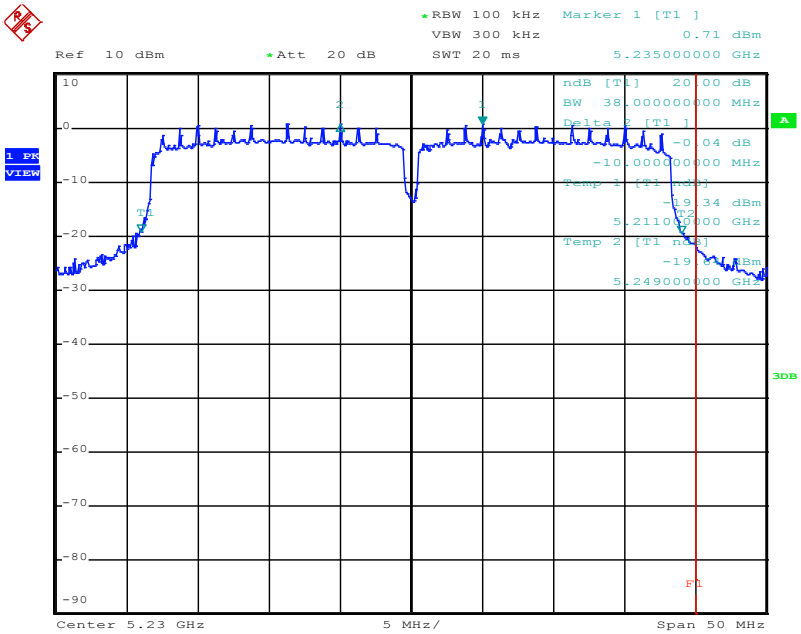
802.11a, P20, 6 Mbps, Port1:



802.11n, HT20, P20, MCS0, Port1:



802.11n, HT40, P20, MCS8, Port1:



According to FCC Part 15, Subpart C, Section 15.215 (c):
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed.

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

The requirements are **FULFILLED.**

Remarks: _____

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.
A 4	ESHS 30	02-02/03-05-002	16/07/2014	16/07/2013		
	ESH 2 - Z 5	02-02/20-05-004	18/10/2014	18/10/2013		
	KEMA 801	02-02/22-05-016				
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155	05/04/2014	05/04/2013		
	SP 103 /3.5-60	02-02/50-05-182				
CPC 3	FSP 40	02-02/11-11-001	30/09/2014	30/09/2013		
	HM8143	02-02/50-10-016				
	KMS102-0,2 m	02-02/50-11-016				
	KMS102-0,2 m	02-02/50-11-017				
	KMS102-0,2 m	02-02/50-11-018				
MB	FSP 40	02-02/11-11-001	30/09/2014	30/09/2013		
	WK-340/40	02-02/45-05-001	31/05/2014	31/05/2013		
	HM8143	02-02/50-10-016				
	KMS102-0,2 m	02-02/50-11-016				
	KMS102-0,2 m	02-02/50-11-017				
	KMS102-0,2 m	02-02/50-11-018				
SER 1	FMZB 1516	01-02/24-01-018	14/02/2014	14/02/2013		
	ESCI	02-02/03-05-005	03/12/2014	03/12/2013		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
	VLP-1602 PRO	02-02/50-10-015				
SER 2	ESVS 30	02-02/03-05-006	28/06/2014	28/06/2013		
	VULB 9168	02-02/24-05-005	11/04/2014	11/04/2013		
	S10162-B	02-02/50-05-031				
	NW-2000-NB	02-02/50-05-113				
	VLP-1602 PRO	02-02/50-10-015				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
SER 3	FSP 40	02-02/11-11-001	30/09/2014	30/09/2013		
	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	04/04/2014	04/04/2013		
	R1 _ 18 - 40 GHz	02-02/30-09-002			08/01/2015	08/01/2014
	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				
	VLP-1602 PRO	02-02/50-10-015				