REPORT

issued by an Accredited Testing Laboratory

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2019-04-11	8P07436-F2	1 (162)

FCC ID: 2ADEFAT-DG2, ISED ID: 12460A-ATDG2

Airtame ApS
Att: Kendra Bannister
Kuglegårdsvej 17
1434 Copenhagen K
Danmark

Equipment Authorization measurements on U-NII-2 RLAN

FCC ID: 2ADEFAT-DG2
ISED ID: 12460A-ATDG2

Test object

Product name: Airtame 2
Product model of Airtame 2: AT-DG2
Product number: 18
HW Revision: Airtame_DG2_V7_RB
FVIN: cyw89342-dfs.clm_blob

RISE Research Institutes of Sweden AB
Electronics - EMC

Performed by	Examined by
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Ermin Pasalic	Monika Fuller

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DFS test for U-NII client devices without radar detection capability according to FCC 47 CFR part 15.407 (h) (2) /RSS-247 6.3 151

Summary

Standard	Compliant	Remarks
FCC 47 CFR Part 15 E 15.407 Operation within the bands 5250-5350 MHz and 5470-5725 MHz KDB 789033, D02 General U-NII Test Procedures New Rules v02r01, December 14, 2017	**Yes**	
ISED RSS-247 Issue 2, February 2017 / ISED RSS-Gen Issue 5 April 2018 Licence-Exempt Local Area Network (LE-LAN), RSS-247 Operation within the bands 5250-5350 MHz and 5470-5725 MHz	**Yes**	
15.407 (a) (2), Maximum conducted output power / RSS-247 6.2.2.1 (a) and (b), and 6.2.3.1 Maximum power and Maximum e.i.r.p	Yes	
15.407 (a) (2), Maximum power spectral density / RSS-247 6.2.2.1 (a) and 6.2.3.1, Maximum conducted spectral density	Yes	
15.407 (b) (2) and (3) Maximum emission outside of the frequency bands of operation / RSS-247 6.2.2.2 (a) and (b) and 6.2.3.2, Unwanted emission	Yes	
15.407 (b) (6) Unwanted emission below 1 GHz; according 15.209 / RSS-Gen 8.9 Transmitter emission	Yes	
15.407 (b) (7) Unwanted emission in the restricted bands / RSS-Gen 8.10 Restricted emission bands	Yes	
15.407 (b) (6) Conducted emission AC; according 15.207 / RSS-Gen 8.8 AC Power-line conducted emission	Yes	
15.407 (c) Automatic discontinue transmission/ RSS-247 6.4 (a) Automatic discontinue transmission	-	Note 1
15.407 (f) Radiation exposure; §1.1307 (b), §2.1091, §2.1093 / RSS-102 Radiofrequency (RF) exposure	Yes	Note 2
15.407 (g) Frequency stability / RSS-Gen 8.11 Frequency stability	Yes	
15.407 (h) Transmit Power Control (TPC) and Dynamic Frequency Selection (DFS) / RSS-247 6.3 Dynamic frequency selection	Yes	Note 3
15.407 (i) Security features/ RSS-247 6.4 (b) Security features	-	Note 1
Duty cycle measurements	N/A	Note 4
Band edge: f low U-NII-2A= 5250 MHz f high U-NII-2A = 5350 MHz f low U-NII-2C= 5470 MHz f high U-NII-2C = 5850 MHz	Yes	Note 5
26 dB Bandwidth	N/A	Note 6
99% Occupied bandwidth	N/A	Note 7

Note 1: See in separate document provided by client.

Note 2: See in the report annex, ”8P07436-F2 RF exposure”

Note 3: According 15.407 (h) (1) and RSS-247 6.2.3.1 TPC mechanism is not required for devices with e.i.r.p bellow 500mW (27dBm).
According RSS-247 6.2.2.1 (b) TPC mechanism is not required for devices with e.i.r.p bellow 500mW (27dBm) which are not installed in vehicles.

DFS functionality is not implemented in the device and it was tested only in the client without radar detection mode. The product cannot be used in either master mode or client mode with radar detection without compliance proof in those modes.

Note 4: There is not particular requirement, but information is needed for choosing applicable RF output power test method and for correction of data.

Note 5: This is part of the requirement for maximum emission outside of the frequency bands of operation.

Note 6: There is not particular requirement, but information is needed for configuration of instruments and for assessment if operating channel is inside allowed frequency band.

Note 7: There is not particular requirement, but information is needed for configuration of instruments and as alternative for assessment if operating channel is inside allowed frequency band.

Commission

The tests were performed to verify that the electromagnetic emission from the test object meets the requirements of FCC Part 15E and RSS-247 chapter 6.

Manufacturer representative

Airtame ApS
Att: Kendra Bannister
Kuglegårdsvej 17
1434 Copenhagen K
Denmark

Test object

The AT-DG2, 5 GHz RLAN provides wireless connection and transfer of huge amount of data including high definition video stream.
The device will be used as indoor client, (without radar detection function).
The test object could be configured in different ways. For these measurements devices were configured for test mode with duty cycle as high as possible. Duty cycle varied between 94.3% and 99.3% depending of mode, configuration, modulation and bandwidth. Samples used during tests:

- #8 (only for justification test for worst case positioning)
- #18

A special test software ‘mfg’-manufacturing cypress-chip firmware and a tool from cypress called ‘wl’ was used in the test objects to achieve test mode and high duty cycle transmission.
Device under test was configured by the python script on the separate PC.

Transceiver:	CYW89342CRFB4G
Antennas:	PCB printed antennas
Antenna gain	
Chain 1	2.5 dBi
Chain 2	6 dBi
Frequencies used during test:	5260 MHz 5270 MHz 5280 MHz 5290 MHz 5310 MHz 5320 MHz 5500 MHz 5510 MHz 5530 MHz 5550 MHz 5580 MHz 5610 MHz 5690 MHz 5710 MHz 5720 MHz
Output power, max, setting	17 dBm/p17, but maximum accepted setting can be seen in each subtest.
Frequency bandwidth:	20 MHz 40 MHz 80 MHz
Modulations:	Standards 802.11a, 802.11n and 802.11ac with modulations BPSK, QPSK, 16-QAM, 64-QAM and 256-QAM; MSC0 to MSC8
Max declared duty cycle in normal operation:	< 95%
Duty cycle during test:	See in the respective sub-tests
Supply voltage to AT-DG2:	5 V±2%, feeding from PSU (normal use) feeding from PoE adapter (test) Extreme voltage: ±15% of nominal voltage

During the test, the test object was powered by 5 V DC from PoE adapter. Power adapter was powered by 48 V DC from PoE injector which was powered by 120 V AC/60 Hz supply.
PoE injector and power adapter were used instead to power supply, PSU, to be able to control device under test to different modes, channels, power, BW and modulations.

Radiated tests:
During radiated tests only AT-DG2, PoE adapter and monitor were placed in the anechoic chamber. PoE injector, router and PC were outside the chamber.

Conducted tests:
Conducted emission was done by powering test device from PoE injector via PoE adapter.
PoE adapter was powered to the 120 V AC supply.

Environmental test with voltage variation was done with variation of 120 V AC for ±15%, instead for variation of 5 V DC due to practical reasons.

The test items were delivered to RISE 2018-09-03, 2018-09-17 and 2018-11-05.

Testing was carried by Ermin Pasalic and Markel Bertilsson at 2019-01-29 to 2019-04-11.

Operational test mode

The following were set in the EUT, if not otherwise stated.
Initial conducted power measurement and radiated spurious measurement were performed with maximum output power (setting 17 dBm/p17). During edge test it was needed to tune down output power to meet edge requirements. Se maximum acceptable power classes for different bandwidths to comply with edge requirement which consider also variation due to temperature.
Rest of the tests were done with power setting 9 dBm/p9.

In the table below you can find maximum acceptable power class to comply with all requirements:

Channel	Frequency (MHz)	Power class	Comment
Ch 52	5260	9 dBm/p9	Note 1
Ch 54	5270	9 dBm/p9	Note 1
Ch 56	5280	9 dBm/p9	Note 1
Ch 58	5290	9 dBm/p9	Max power for overall compliance
Ch 62	5310	9 dBm/p9	Max power for overall compliance
Ch 64	5320	9 dBm/p9	Max power for overall compliance
Ch 100	5500	6 dBm/p6	Max power for overall compliance
Ch 102	5510	4 dBm/p4	Max power for overall compliance
Ch 106	5530	5 dBm/p5	Max power for overall compliance
Ch 110	5550	5 dBm/p5	Note 1
Ch 116	5580	7 dBm/p7	Note 1
Ch 118	5590	5 dBm/p6	Note 1, Note 2
Ch 120	5600	7 dBm/p7	Note 1, Note 2
Ch 122	5610	6 dBm/p6	Note 1, Note 2
Ch 124	5620	7 dBm/p7	Note 1, Note 2
Ch 126	5630	5 dBm/p7	Note 1, Note 2
Ch 128	5640	7 dBm/p7	Note 1, Note 2
Ch 138	5690	13 dBm/p13	Max power for overall compliance
Ch 142	5710	13 dBm/p13	Max power for overall compliance
Ch 144	5720	13 dBm/p13	Max power for overall compliance

Note 1: Higher power classes might be allowed, (up to 13 dBm/p13 for FCC and up to 10 dBm/p10 for ISED), but additional edge test is needed.
Note 2: This channel is not allowed in Canada according RSS-247, 6.2.3

Tx power dBm: 18.7 dBm total in MIMO mode and 16.0 dBm per chain in SISO mode
Channel BW: 20 MHz / 40 MHz / 80 MHz

For duty cycle measurements results see: Duty cycle measurements.

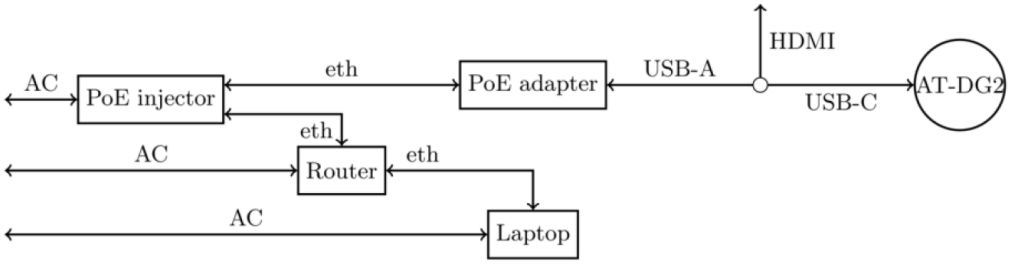
Justification measurements were performed of the different WiFi standards, different modulation and coding index – MCS and different antenna configuration. Justification were also performed of different placements of DUT and the worst case channel through different frequency bands. The presented results in the reports were judged to represent a worst case scenario based on the justification measurement.
The worst case according justification tests was 802.11ac, MCS0 and 20 MHz BW in MIMO mode.
Regarding placement of DUT, laying placement was the worst case.
The channel 52 showed highest emission levels in U-NII-2A band and channel 144 in U-NII-2C band.

Connected equipment during the test

According to ANSI C63.10.2013, clause 5.10.7

PoE injector, AXIS T8120 15W MDSPN 1P, model: 5026-001-01	Client equipment
PoE adapter, model: AT-PoE, FCC ID: 2ADEFTAT-PoE	Client equipment
Router, NetgearAC1900 Smart WiFi Router Model: R7000	Client equipment
HP Laptop Model: 14-bp092no, ProdID 2GG01EA#UUW	Client equipment
Lenovo ThinkVision LCD monitor, Type/Model A16270QP0	RISE equipment

Test setup - DUT with auxiliary equipment



DUT consists of AT-DG2 and PoE adapter.

Cabling during tests:

AT-DG2 port	Cable type	Termination / use
USB C	Aircord 0.2 m; branch USB C	Cable splitter (to PoE adapter via one branch with USB A connector and to the Monitor via second branch with HDMI connector)

PoE adapter	Cable type	Termination / use
USB-A	Aircord 0.85 m; branch USB A	Cable splitter (to AT-DG2 via one branch with USB C connector and to the Monitor via second branch with HDMI connector)
LAN (ethernet)	Cat 5, 1.0 m (conductive tests) Cat 5, 3.0 m (radiated tests)	PoE injector

Measurement equipment

Measurement equipment	RISE number	Calibration Due
Semi anechoic chamber, Edison	504114	2021-08
Test site Galvani	15:117	-
Computer Lenovo ThinkCentre	-	-
Software R&S EMC32, ver.9.15.00	503889	-
EMI test receiver R&S ESU 26	902210	2019-07
Signal Analyser R&S FSQ26	BX50694	2019-07
Signal Analyser R&S ESI40	503125	2019-07
Antenna Schaffner CBL 6143	504079	2021-08
Low Noise Amplifier Miteq	504160	2020-01
Step attenuator Narda743-60	BX41644	2019-11
Coaxial cable	BX50672	2019-10
Coaxial cable	504102	2020-03
Coaxial cable	504103	2020-03
Coaxial cable	504104	2020-03
Coaxial cable	900678	2019-05
Coaxial cable	504162	2020-01
120 V AC/60 Hz AC Power source HP 6813B	503091	2019-09
DC power supply TTI	502786	-
DC power supply HP E3632A	503170	-
Multimeter Fluke 83	501522	2019-06
Multimeter Fluke 85III	503418	2019-06
Temperature and humidity meter Testo 625	503498	2019-05
Test site Marconi	15:121	-
Software R&S WMS32, ver.10.40.10	-	-
Switching box with RF power meters R&S OSP120 with OSP-B157W8	BX60313	2020-07
Vector signal generator R&S SMBV100A	BX62243	2019-07
Coaxial cable	BX81424	2019-05
Coaxial cable	BX81436	2019-05
Coaxial cable	BX50685	2019-05
EMI test receiver R&S ESU 40	901385	2019-07
Antenna ETS-Lindgren 3115 Tesla	902175	2021-07
Standard gain horn, 18-26 GHz, 20240-20	503674	2021-01
Standard gain horn, 26-40 GHz, 22240-20	503674	2021-01
Low Noise Amplifier Miteq, 18-26.5 GHz	503285	2020-01
Low Noise Amplifier Miteq 18-40 GHz	503278	2018-12
Semi anechoic chamber, Tesla	503881	2019-12
Software R&S EMC32, ver.9.15.00	BX62351	-
Standard gain horn, 8-12.75 GHz	503939	-
Standard gain horn, 12.75-18 GHz	503900	-

Low Noise Amplifier Miteq	901545	2020-01
Huber Suhner antenna cable N-N	BX62218	2019-09
Coaxial cable	503697	2020-01
6 dB Dämpare	BX61530	2019-07
Coaxial cable	503508	2019-09
Coaxial cable	503509	2019-09
Coaxial cable	504206	2019-07
Temperature and humidity meter Testo 625	504188	2019-05
LISN Schwarzbeck NNLA 8120	BX70761	2020-04
LISN Schwarzbeck NNBL 8226-2	902060	2020-02
Limiter, EM-7600	BX42883	2019-09
Temperature scope	503360	2021-02
Temperature and humidity meter Testo 625	504203	2019-05
Temperature and humidity meter Testo 625, with wire sensor 2A	504117	2019-05
Coaxial cable	900226	2019-09
Coaxial cable	504035	2020-01
Coaxial cable	503274	2020-01

Test facility

The used semi-anechoic chambers are compliant with ANSI C63.4. ISED test laboratory company registration number 3482A.Test site registration numbers 3482A-1 (Tesla, RISE number 503881) and 3482A-2 (Edison, RISE number 504114).

References

Measurements were done according to relevant parts of the following standards:

ANSI 63.10-2013
eCFR 47, part 15 C
eCFR 47, part 15 E
KDB 447498 D01 General RF Exposure Guidance v06
KDB 789033 D02 General U-NII Test Procedures New Rules v02r01; Dec. 14, 2017
RSS-Gen, Issue 5, Apr. 2018
RSS-Gen, Issue 5, Amendment 1, March 2019
RSS-247, Issue 2, Feb. 2017
KDB 662911 D01 Multiple Transmitter Output v02r01, Oct 22, 2013
KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02, Apr 8, 2016
KDB 905462 D03 Client Without DFS New Rules v01r02, Aug 22, 2016

Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation ”SP-QD 10885”. The uncertainties are calculated with a coverage factor k=2 (95% level of confidence). The measurement uncertainties can be found in the table below:

Method	**Uncertainty**
Duty cycle	1.3 %
Maximum peak conducted power	1 dB
Restricted bands of operation:	
Radiated emission, 30 – 1000 MHz	4.8/5.6 dB (V/H-pol)
Radiated emission, 1 – 40 GHz	2.6 dB
Conducted 26 dBc	2 %
Power spectral density	1.3 dB
RF Safety	1 dB
99 % Occupied bandwidth	2.0 %
Band edge, restricted bands, radiated	4.8/5.6 dB (V/H-pol)
Band edge, 99 % OBW	2.0 %

Compliancy evaluation is based on a shared risk principle with respect to the measurement uncertainty.

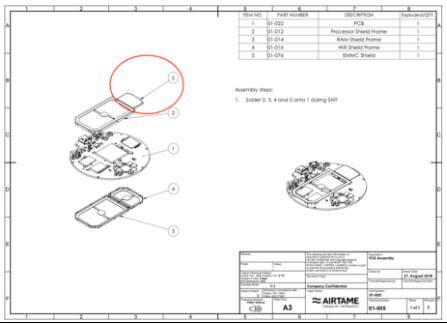
The test results in this report apply only to the particular Equipment Under Test (EUT) as declared in the report.

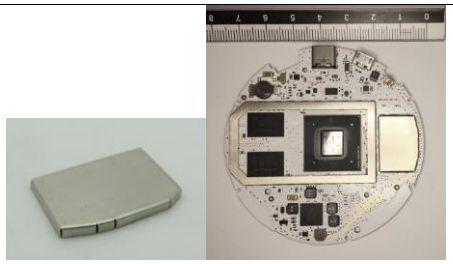
Modifications of the device

Some modifications of the test device were necessary to comply with requirements for Maximum emission outside of the frequency bands of operation, Unwanted emission below 1 GHz and for Conducted emission AC.

- EMMC shielding
  EMMC shielding was added over EMMC in order to improve emissions performance. See an image of this implantation below:

Aircord



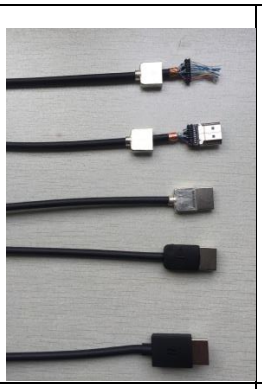


PCB Assembly showing shielding and position	01-076_EMMC Shield, mounted on PCB

  The device without EMMC shielding was used only at initial tests for judgement about worst case position. Our assessment is that implementation of the EMMC shielding could not negatively impact performances.

- Aircord
  The Aircord was modified with improved shielding. Copper tape was added to the splitter part of the cable, and the cable heads were modified to have

shielding added. A PCB was also custom-designed for the splitter to minimize emissions from high frequency HDMI signals. This will only improve performance in terms of emissions. See images of these implementations in production below:

			
USB-C	Splitter	HDMI	USB-Type A

Modified aircord was used for radiated emission tests below 1 GHz, conducted emission AC test, output power, PSD, EBW and OBW tests.
For all other tests, duty cycle, radiated emission test over 1 GHz and frequency stability test the original aircord, (without modifications), was used.
Our assessment is that implemented modifications on the aircord would not negatively impact performance.

- PoE injector
  PoE injector had to be replaced by different model due to experienced problem during radiated emission test below 1 GHz and conducted emission AC test.
  The model of the latest used power injector is AXIS T8120 15W MDSPN 1P, model: 5026-001-01.
  Initially used power injector was of model: GP-D480-050G.
  Our assessment is that using another model of power injector would not negatively impact performance.
  In addition, power injector is not supplied with the product.

- PoE to USB adapter
  During certification, Airtame supplied the latest revision of HW of the own product, the model: AT-PoE which is a PoE to USB adaptor. PoE Module Hardware Rev 1.3. The difference between this revision and earlier PoE to USB revisions is that additional filtering had been added (common mode choke).
  Our assessment is that implemented modifications on the PoE to USB adapter would not negatively impact performance.

Test participant:

Alvin Šipraga, Airtame, (partly present)

Test results

Duty cycle measurements

Date	Temperature	Humidity
2019-03-10	21 °C ± 3 °C	16 % ± 5 %

Test setup and procedure

The measurements were performed according to ANSI C63.10 clause 12.2 and the KDB 789033 D02 Dec. 14, 2017 II.B.2.b).

Conducted measurements were performed on units with the temporary antenna connectors, with transmission between 94.3% and 99.3% of duty cycle and with normal modulation.

Test set-up photos during the tests can be found in the report annex, "8P07436 - F2 photos"

Measurement equipment	RISE number
Test site Marconi	15:121
Software R&S WMS32, ver.10.40.10	-
Signal Analyser R&S FSQ26	BX50694
Switching box with RF power meters R&S OSP120 with OSP-B157W8	BX60313
Coaxial cable	BX81424
Coaxial cable	BX81436
Coaxial cable	BX50685
120 V AC/60 Hz AC Power source HP 6813B	503 091
Multimeter Fluke 85 III	503 418
Temperature and humidity meter Testo 625	503 498

SISO 2, (chain 2 – 6 dBi antenna gain)		802.11.ac/MCS0			
T_{nom} 20°C, V_{nom} 120 V AC					
f [MHz]	BW [MHz]	Pulse period [ms]	Pulse width [ms]	Duty Cycle [%]	Correction [dB]
5260	20	1.36	1.34	98.5	0.06
5270	40	0.68	0.66	97.1	0.13
5280	20	1.36	1.34	98.5	0.06
5290	80	0.35	0.33	94.3	0.26
5310	40	0.69	0.67	97.1	0.13
5320	20	1.36	1.34	98.5	0.06
5500	20	1.36	1.35	99.3	0.03
5510	40	0.68	0.66	97.1	0.13
5530	80	0.35	0.33	94.3	0.26
5550	40	0.68	0.66	97.1	0.13
5580	20	1.36	1.34	98.5	0.06
5610	80	0.35	0.33	94.3	0.26
5690	80	0.35	0.33	94.3	0.26
5710	40	0.69	0.67	97.1	0.13
5720	20	1.36	1.35	99.3	0.03

Results

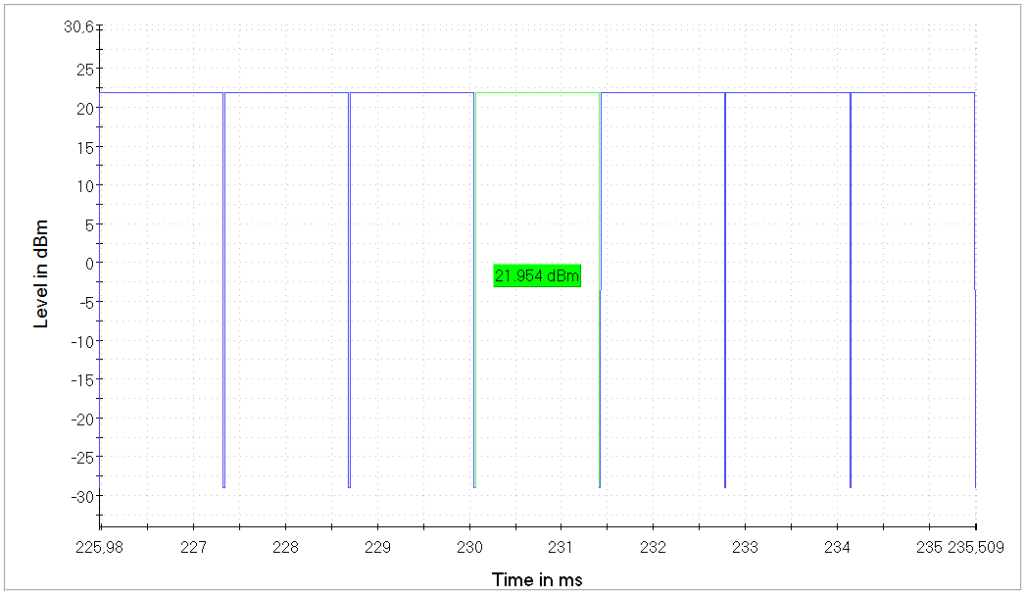
The duty cycle measurements can be found in the diagrams below:

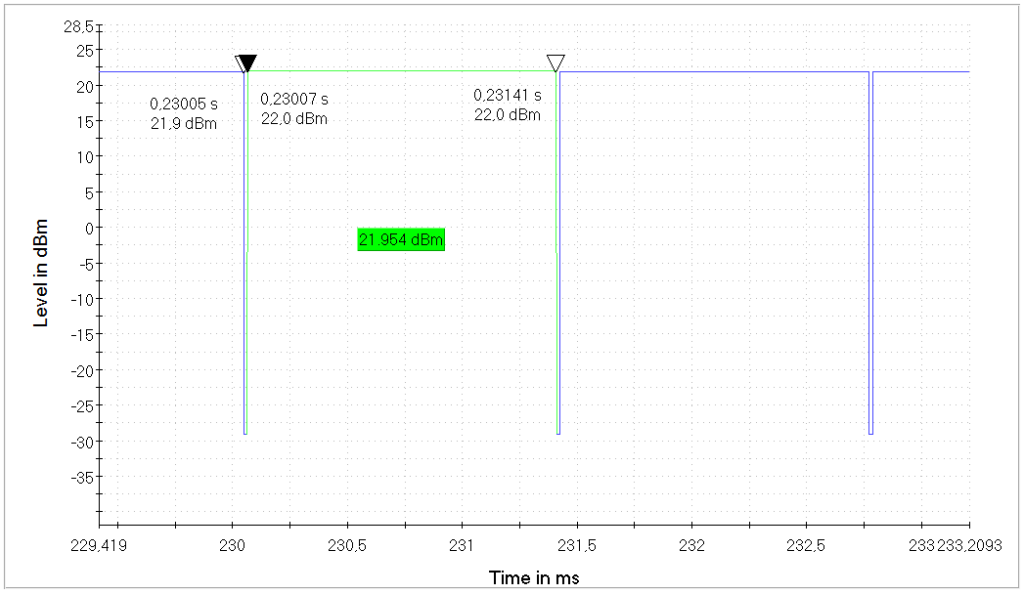
Diagram 1:	5260 MHz, 20 MHz BW, SISO2
Diagram 2:	5270 MHz, 40 MHz BW, SISO2
Diagram 3:	5280 MHz, 20 MHz BW, SISO2
Diagram 4:	5290 MHz, 80 MHz BW, SISO2
Diagram 5:	5310 MHz, 40 MHz BW, SISO2
Diagram 6:	5320 MHz, 20 MHz BW, SISO2
Diagram 7:	5500 MHz, 20 MHz BW, SISO2
Diagram 8:	5510 MHz, 40 MHz BW, SISO2
Diagram 9:	5530 MHz, 80 MHz BW, SISO2
Diagram 10:	5550 MHz, 40 MHz BW, SISO2
Diagram 11:	5580 MHz, 20 MHz BW, SISO2
Diagram 12:	5610 MHz, 80 MHz BW, SISO2
Diagram 13:	5690 MHz, 80 MHz BW, SISO2
Diagram 14:	5710 MHz, 40 MHz BW, SISO2
Diagram 15:	5720 MHz, 20 MHz BW, SISO2

Test engineer: Markel Bertilsson and Ermin Pasalic

Complies?	N/A

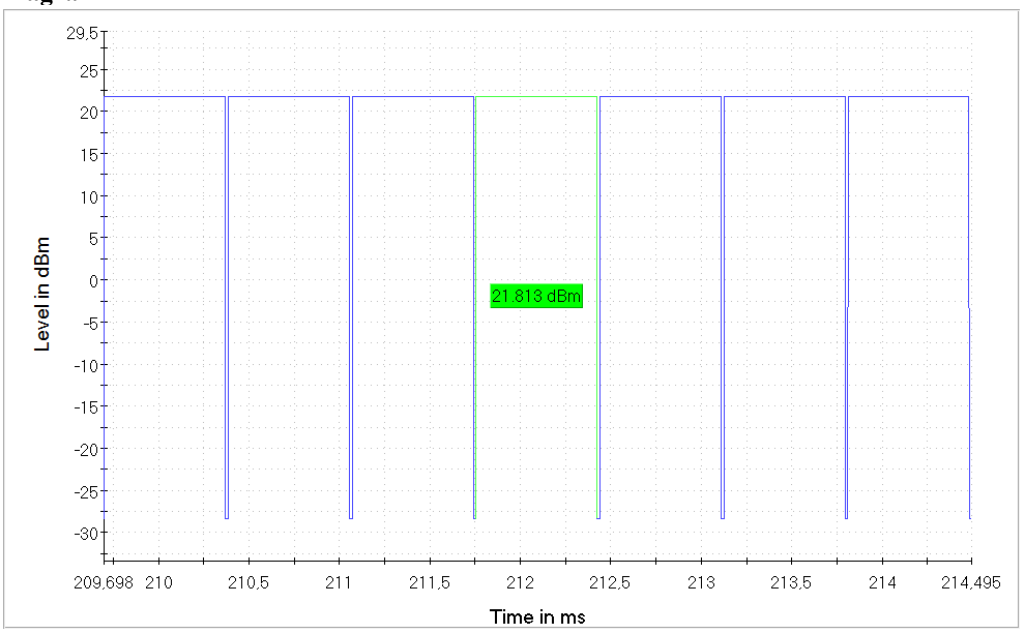
Diagram 1

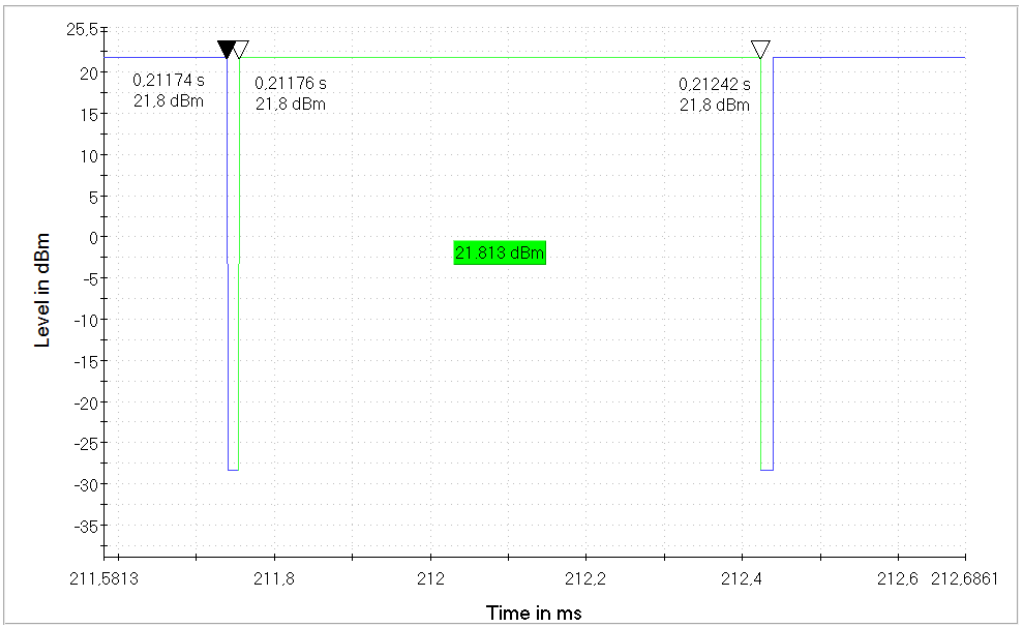




DUT operating at 5260 MHz and 20 MHz BW, SISO2; Duty cycle

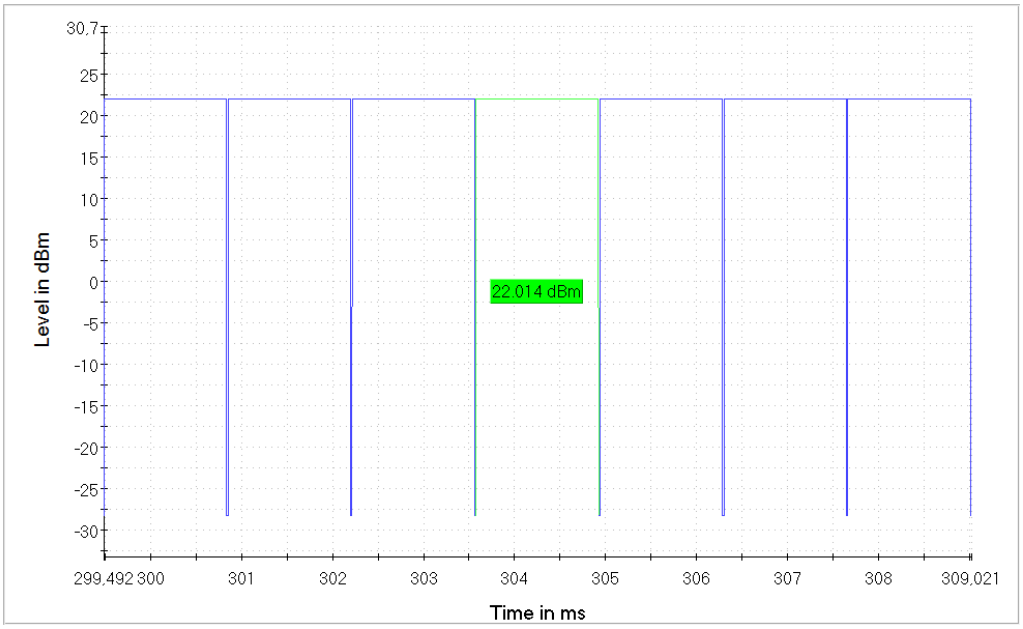
Diagram 2

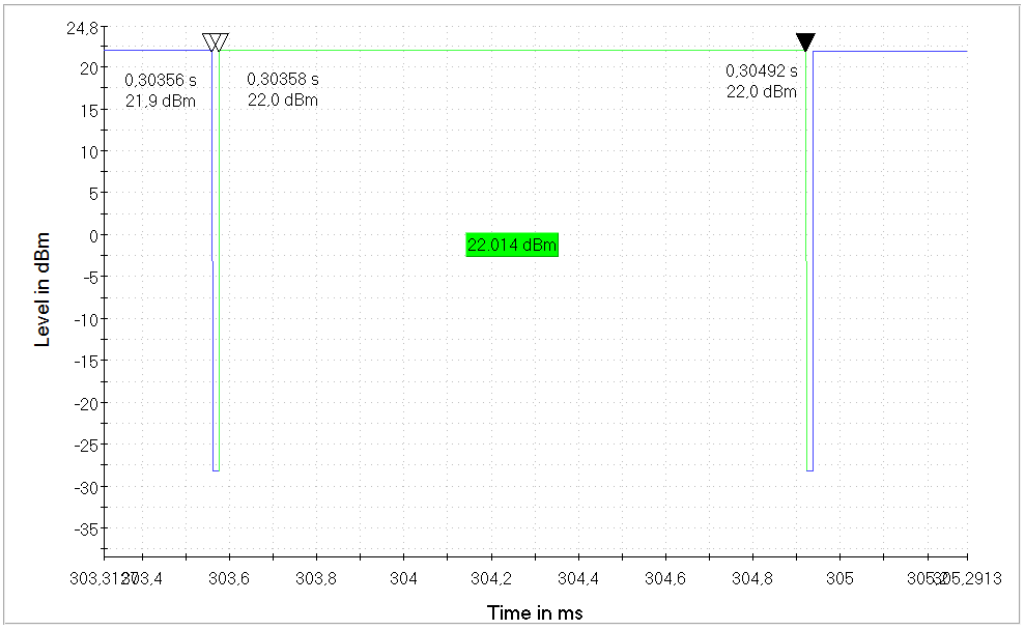




DUT operating at 5270 MHz and 40 MHz BW, SISO2; Duty cycle

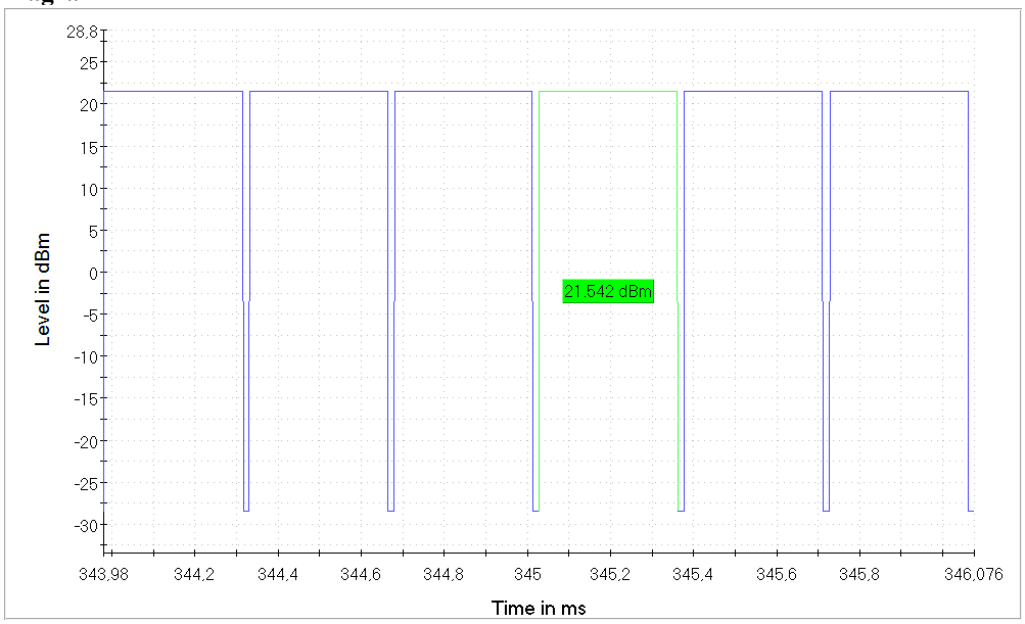
Diagram 3

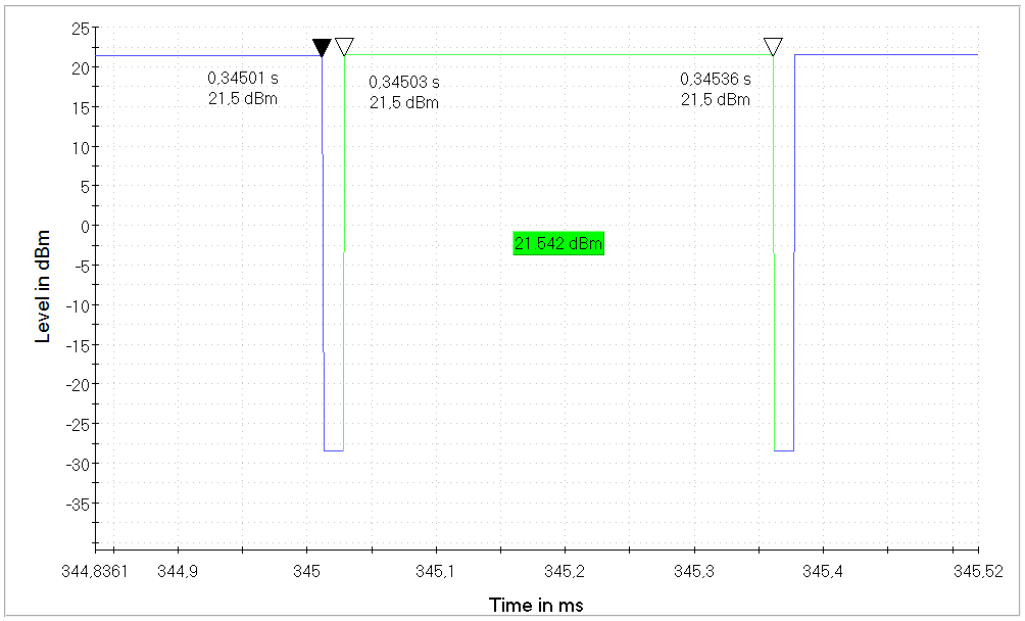




DUT operating at 5280 MHz and 20 MHz BW, SISO2; Duty cycle

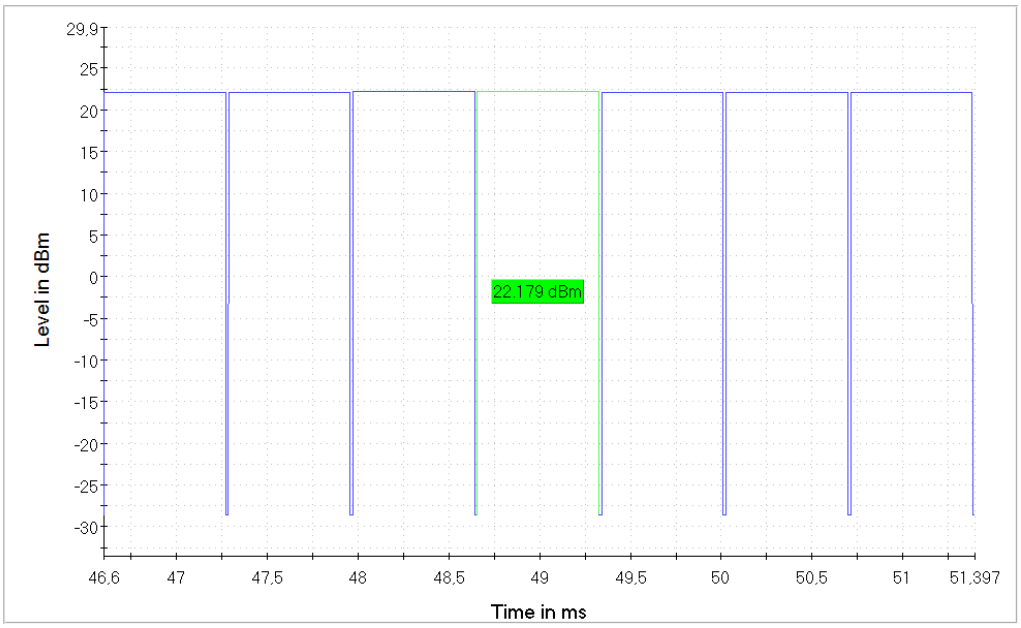
Diagram 4

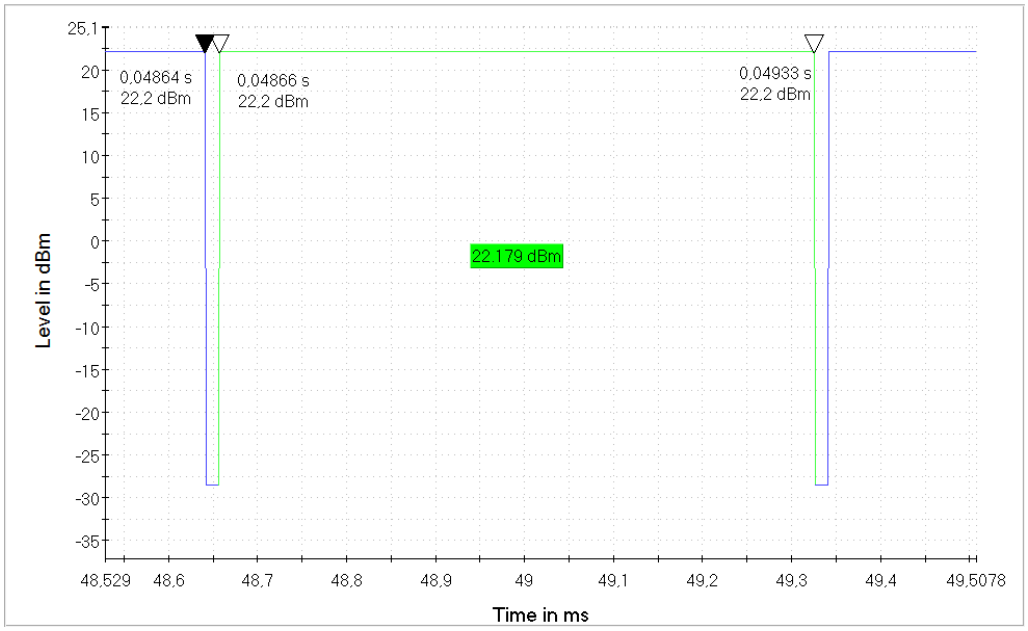




DUT operating at 5290 MHz and 80 MHz BW, SISO2; Duty cycle

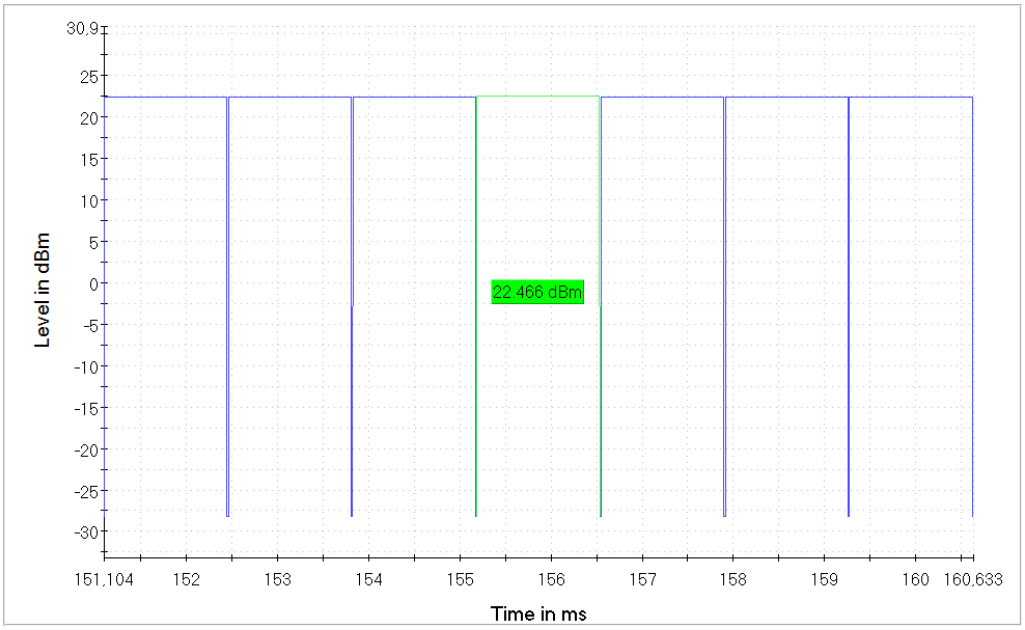
Diagram 5

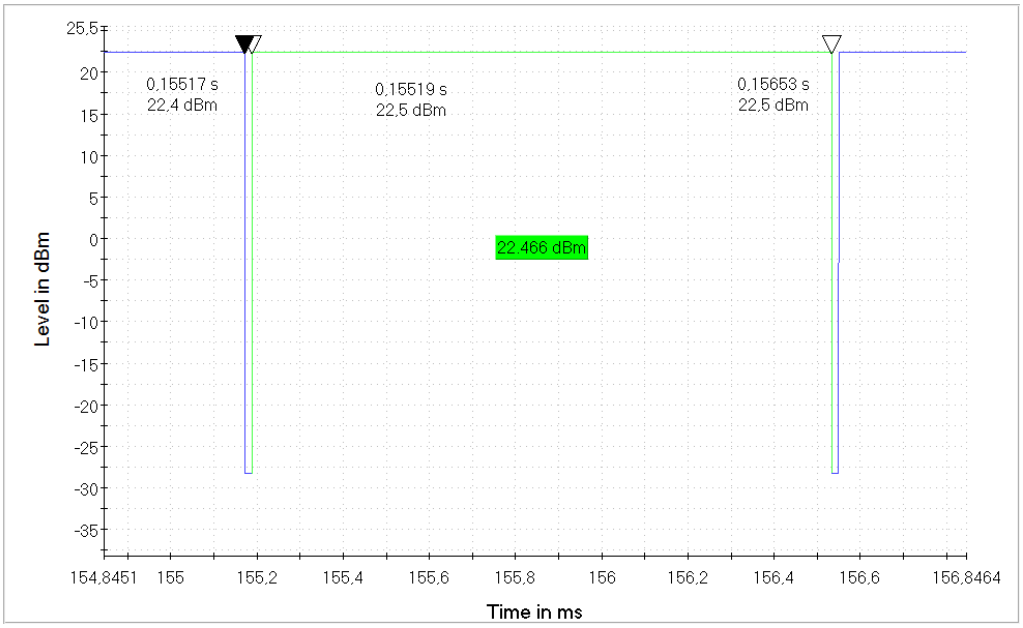




DUT operating at 5310 MHz and 40 MHz BW, SISO2; Duty cycle

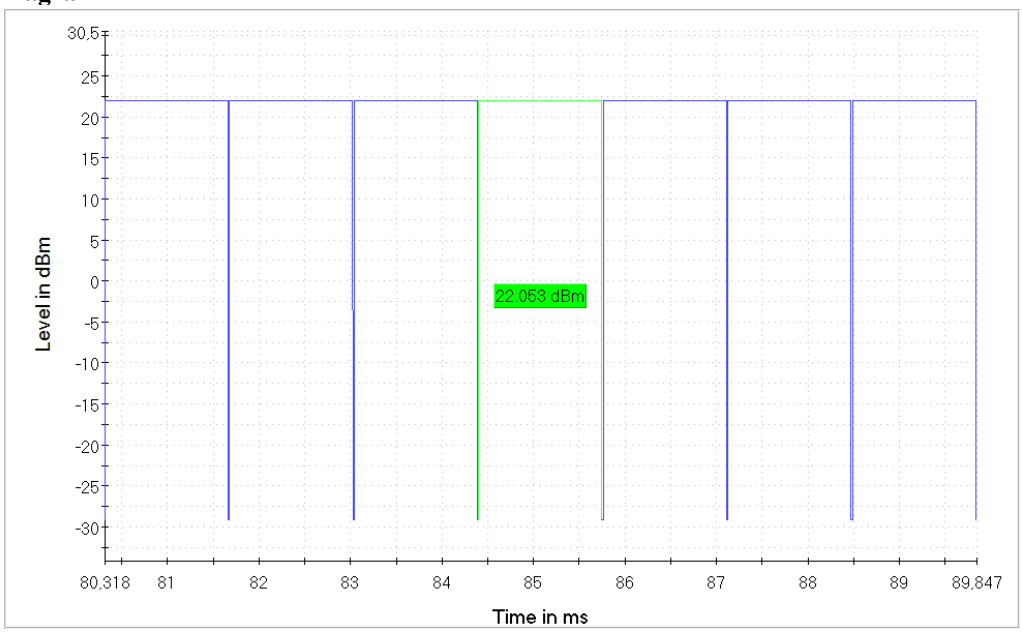
Diagram 6

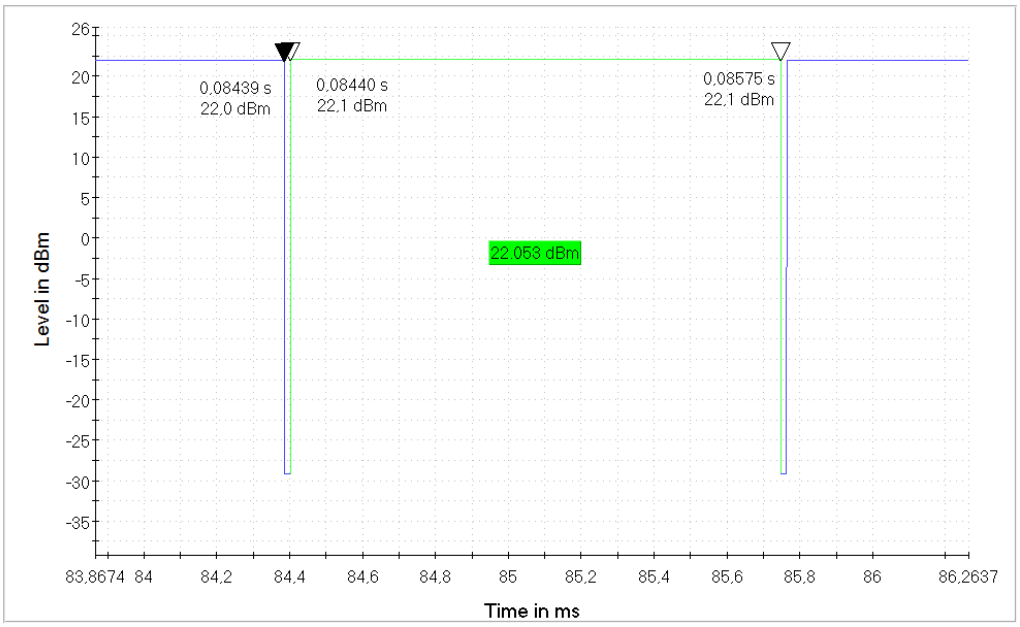




DUT operating at 5320 MHz and 20 MHz BW, SISO2; Duty cycle

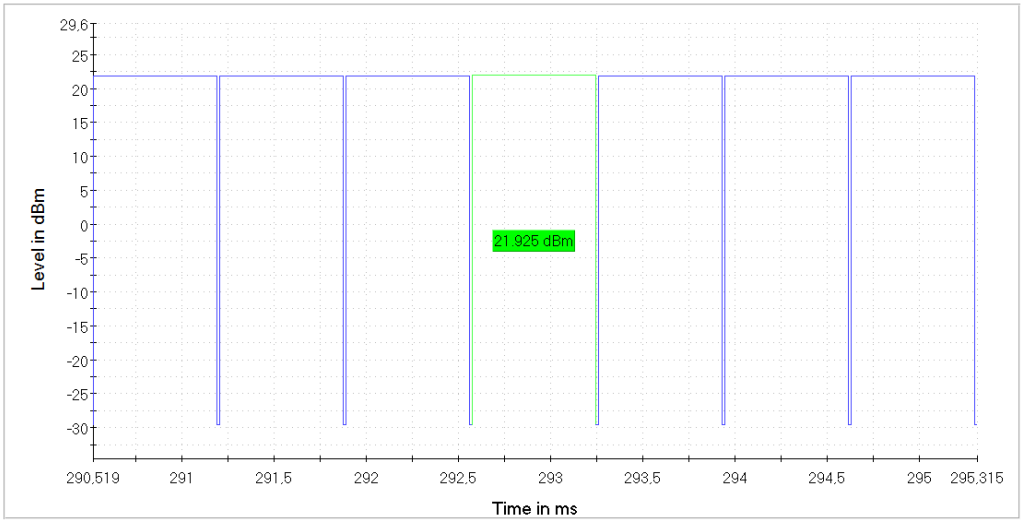
Diagram 7

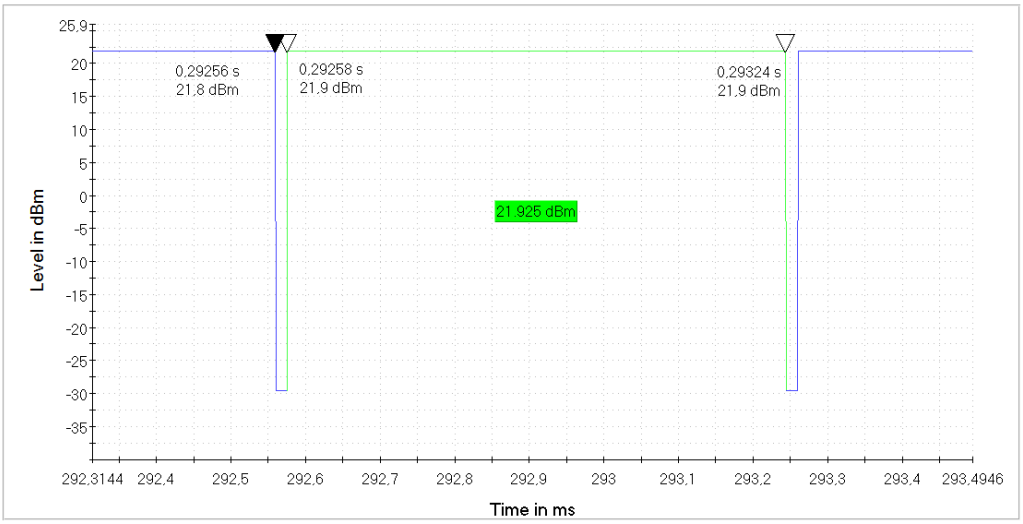




DUT operating at 5500 MHz and 20 MHz BW, SISO2; Duty cycle

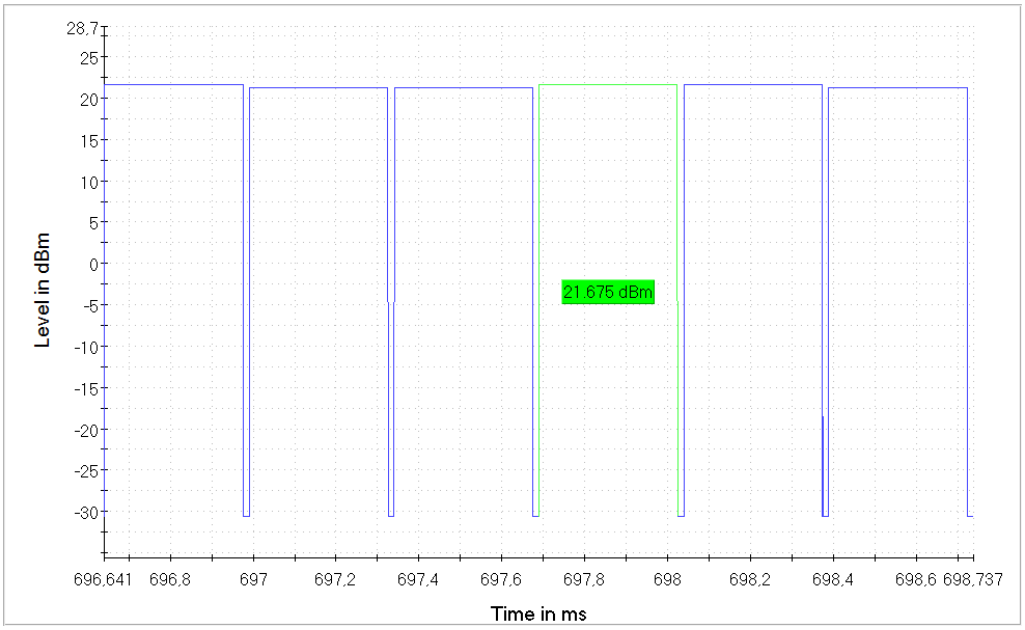
Diagram 8

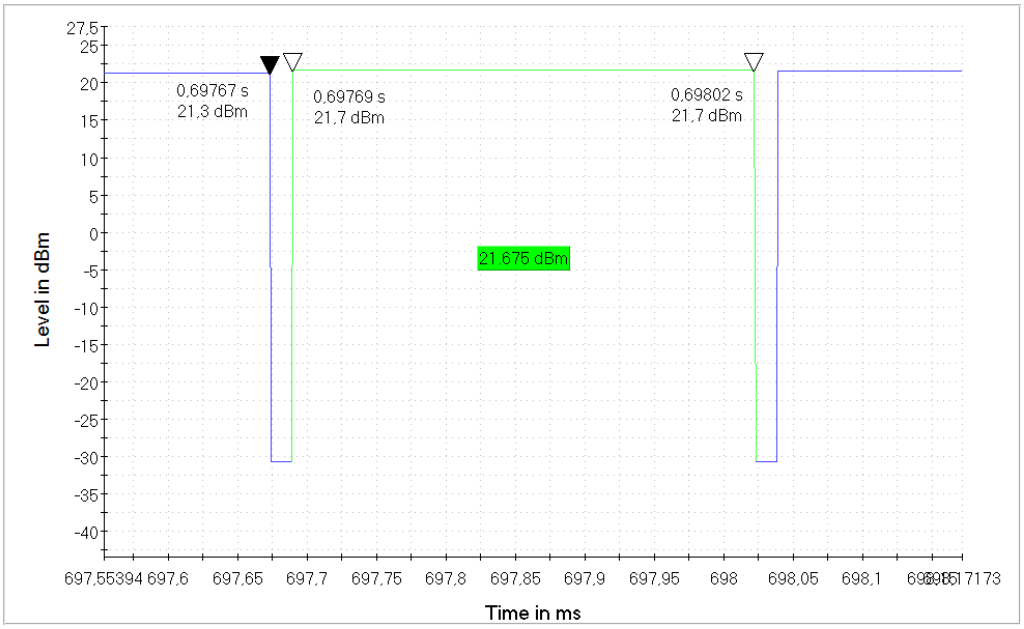




DUT operating at 5510 MHz and 40 MHz BW, SISO2; Duty cycle

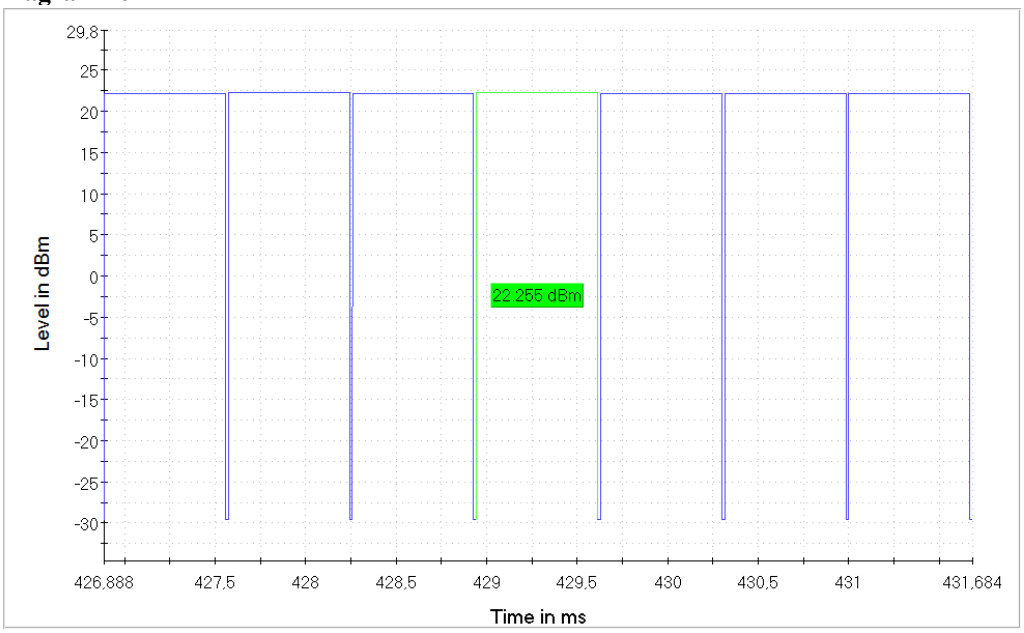
Diagram 9

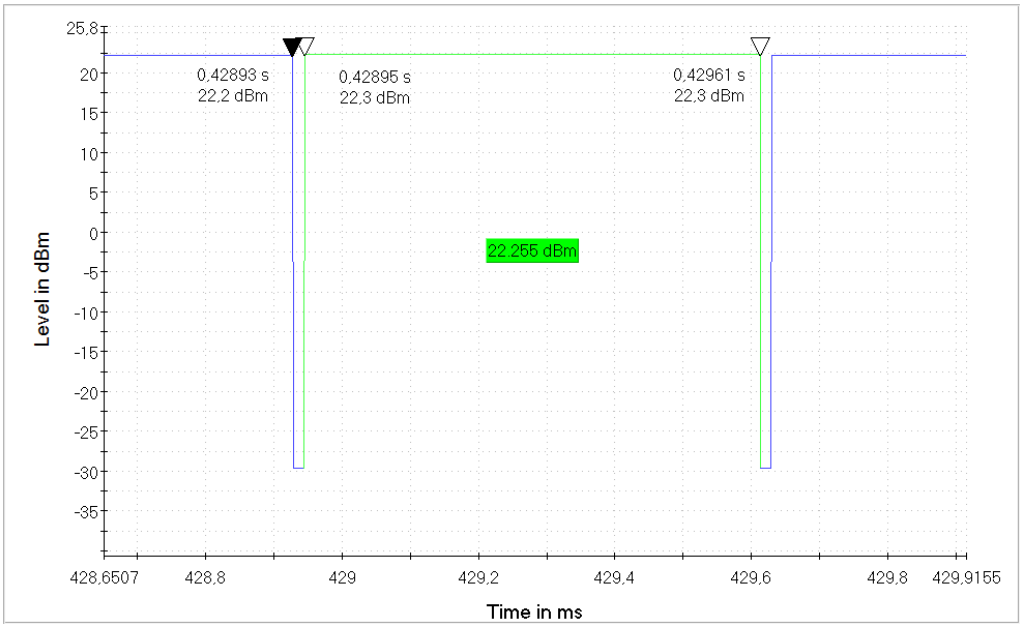




DUT operating at 5530 MHz and 80 MHz BW, SISO2; Duty cycle

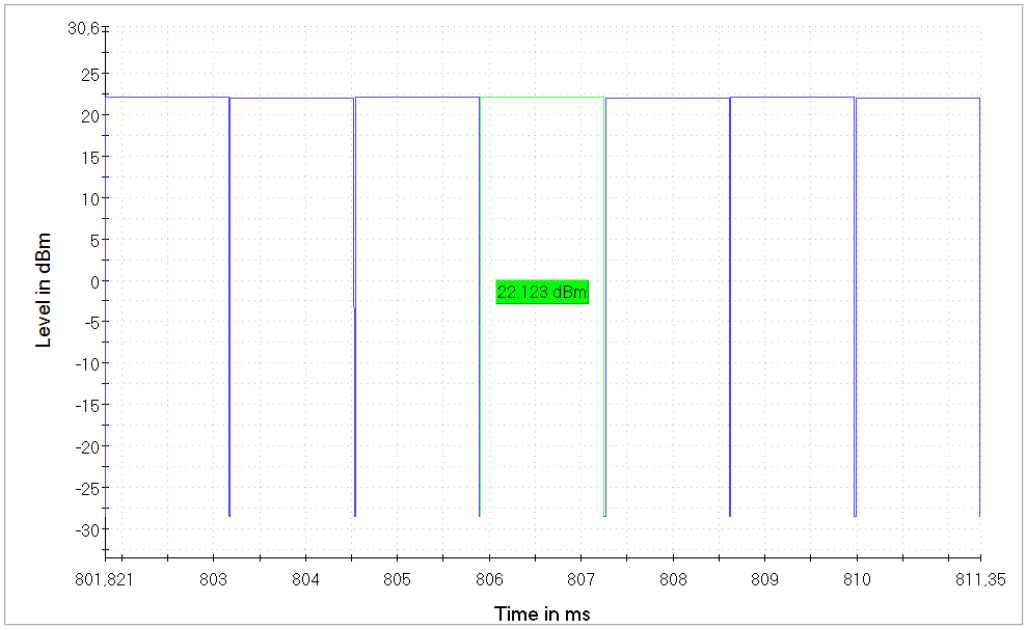
Diagram 10

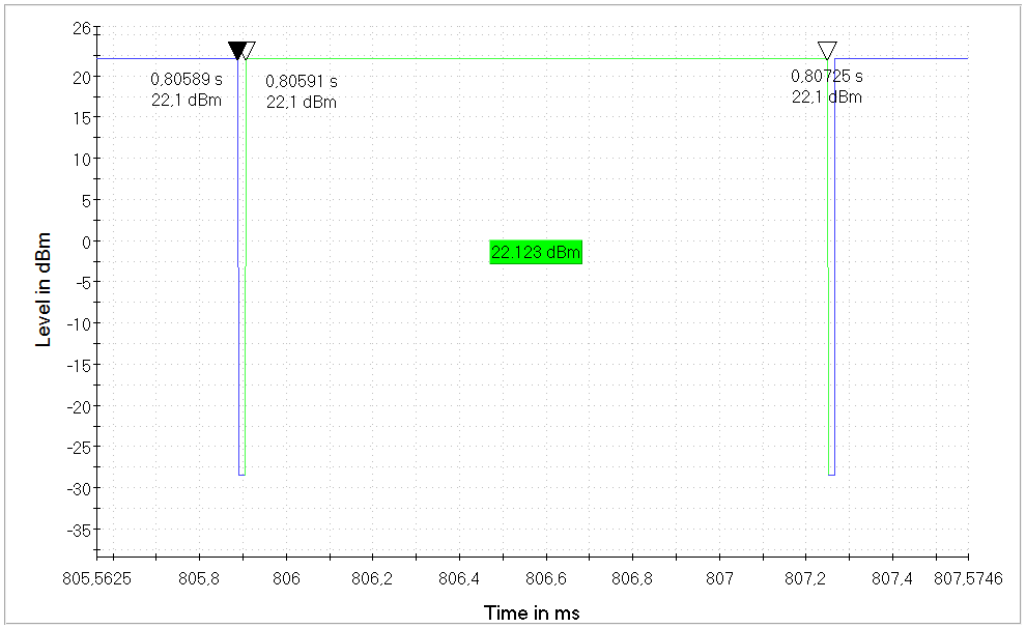




DUT operating at 5550 MHz and 40 MHz BW, SISO2; Duty cycle

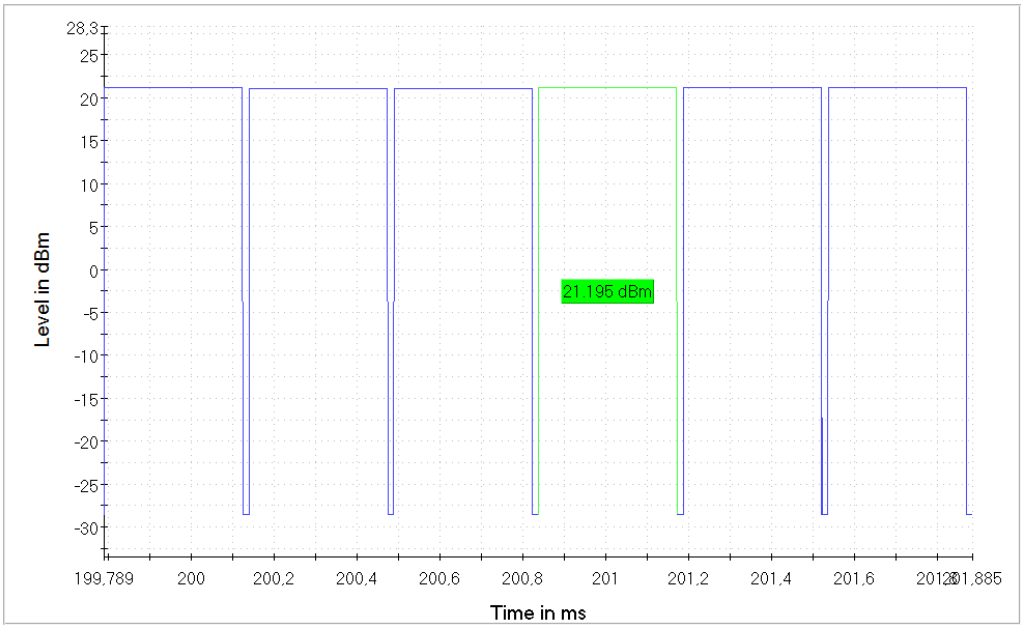
Diagram 11

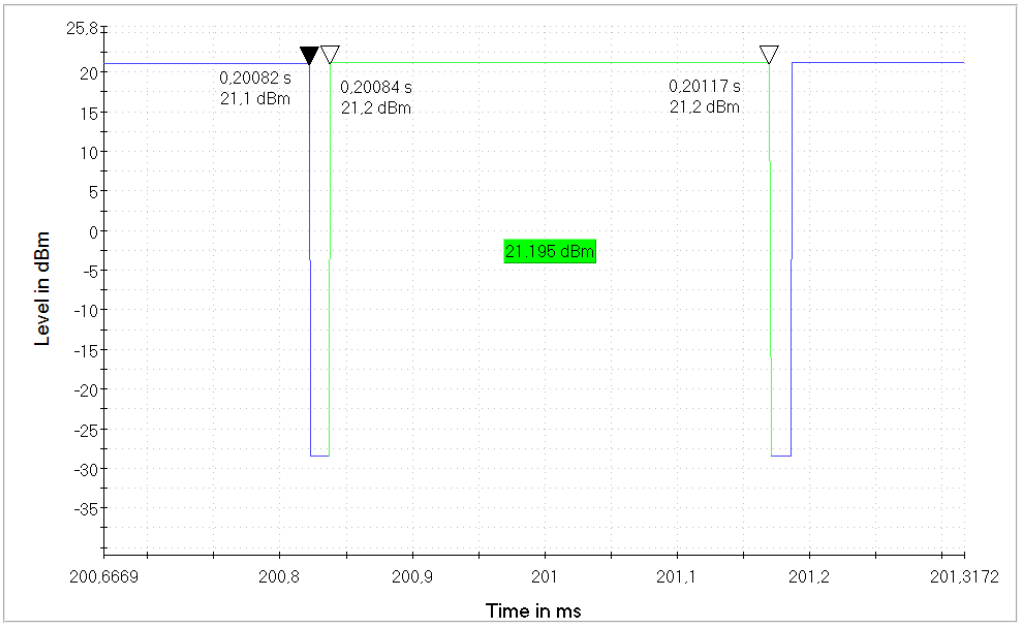




DUT operating at 5580 MHz and 20 MHz BW, SISO2; Duty cycle

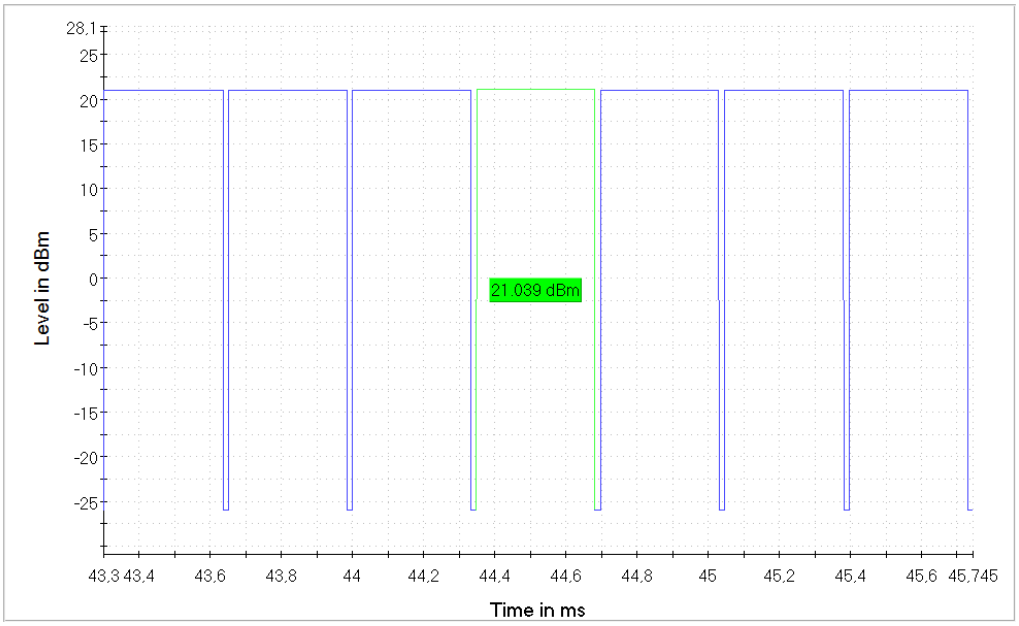
Diagram 12

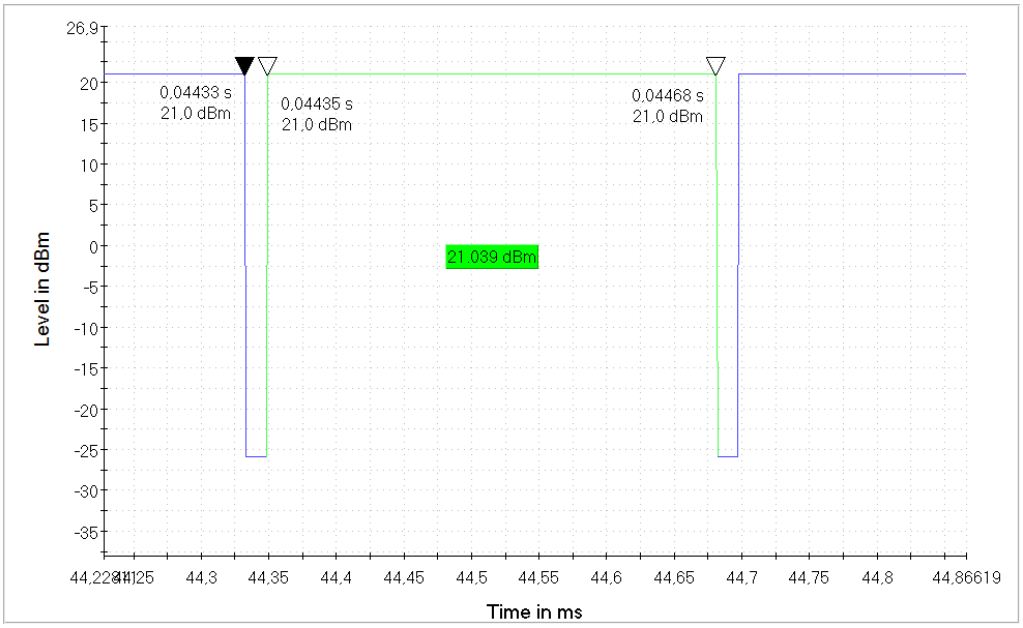




DUT operating at 5610 MHz and 80 MHz BW, SISO2; Duty cycle

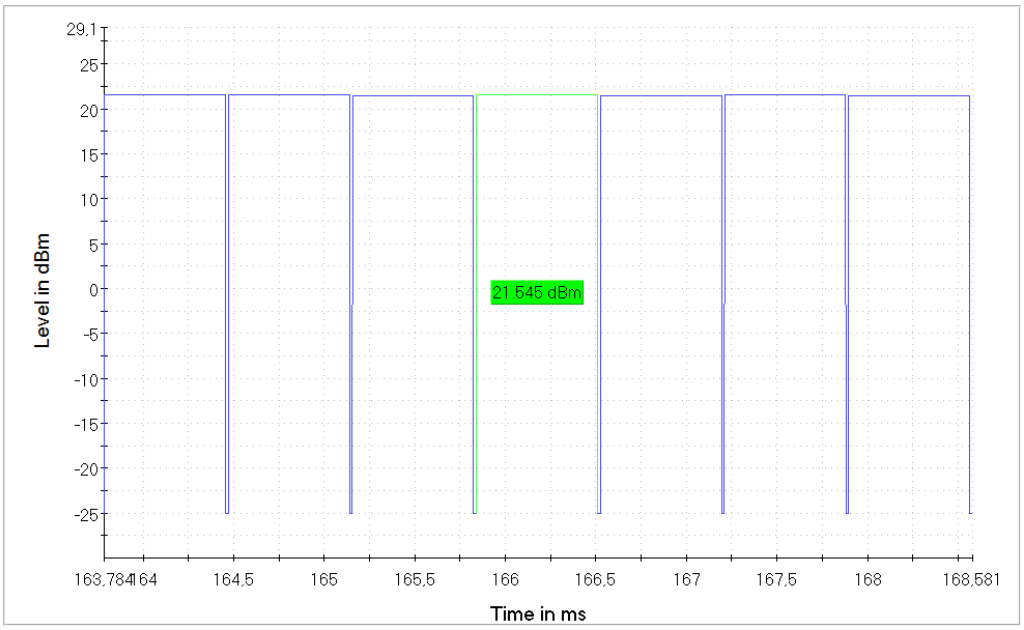
Diagram 13

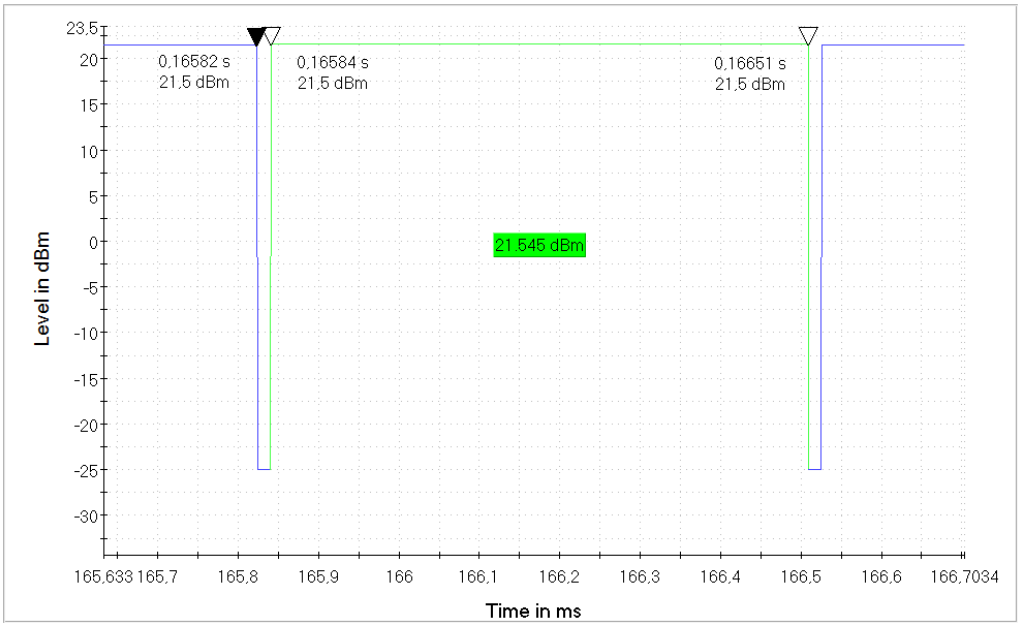




DUT operating at 5690 MHz and 80 MHz BW, SISO2; Duty cycle

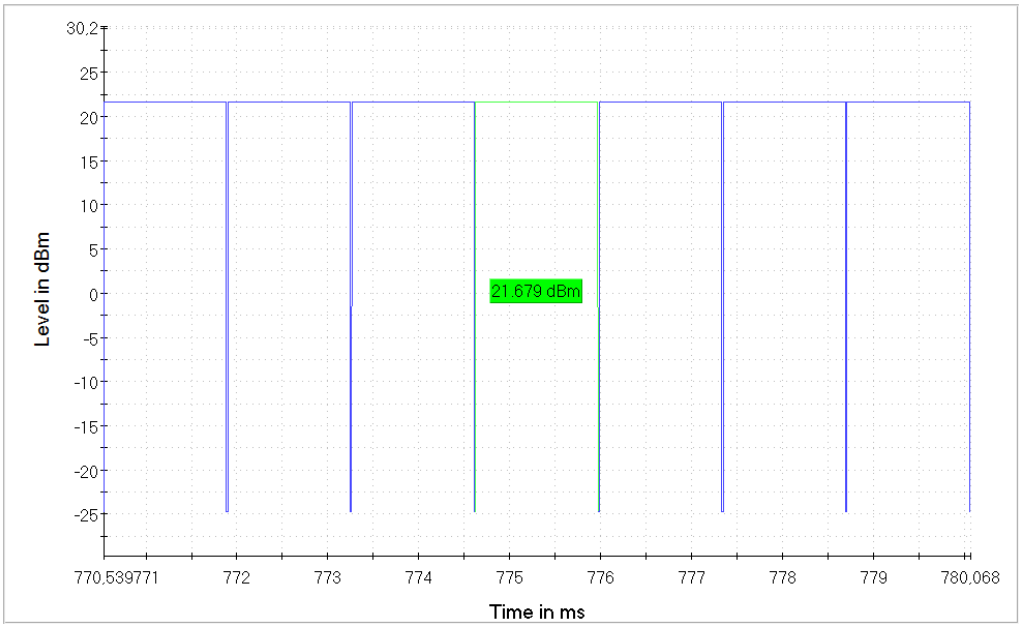
Diagram 14

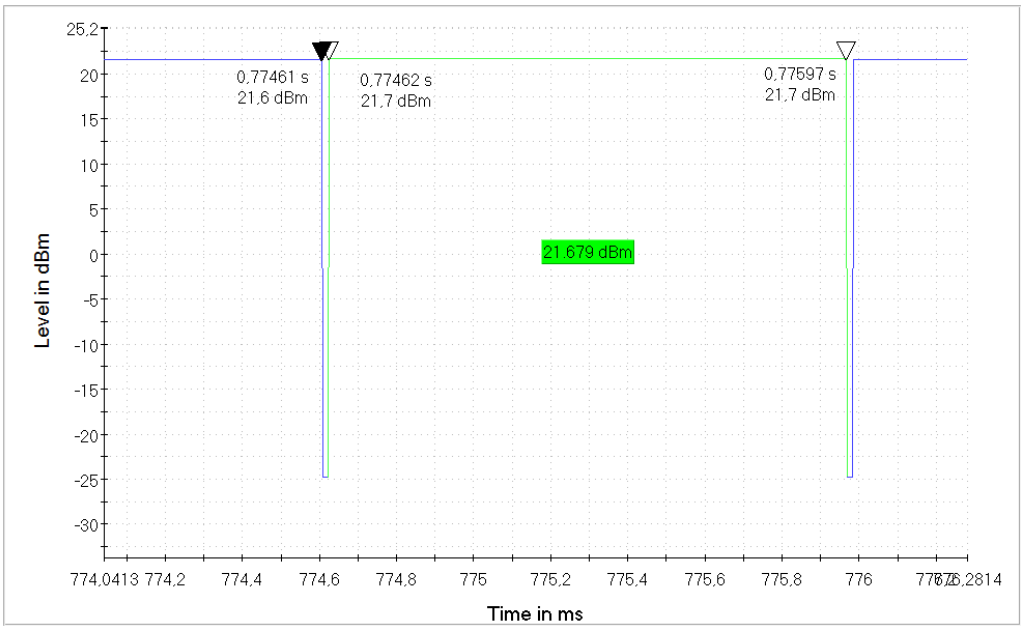




DUT operating at 5710 MHz and 40 MHz BW, SISO2; Duty cycle

Diagram 15





DUT operating at 5720 MHz and 20 MHz BW, SISO2; Duty cycle

Maximum conducted output power/e.i.r.p. measurements according to FCC 47 CFR part 15.407 (a) (2) /RSS-247 6.2.2.1 and 6.2.3.1

Date	Temperature	Humidity
2019-01-30	22 °C ± 3 °C	19 % ± 5 %
2019-01-31	24 °C ± 3 °C	18 % ± 5 %
2019-02-01	24 °C ± 3 °C	16 % ± 5 %

Test setup and procedure

The measurements were performed according to ANSI C63.10 clause 12.3 and KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Dec. 14, 2017 II.E.3.b. Additionally, test in MIMO operating mode was done according KDB 662911 D01 Multiple Transmitter Output v02r01.E.1.

Conducted measurements were performed on units with the temporary antenna connectors, with transmission between 94.3% and 99.3% of duty cycle and with normal modulation.

Test set-up photos during the tests can be found in the report annex, "8P07436 - F2 photos"

Measurement equipment	RISE number
Test site Marconi	15:121
Computer Lenovo ThinkCentre	-
Software R&S WMS32, ver.10.40.10	-
Switching box with RF power meters R&S OSP120 with OSP-B157W8	BX60313
Coaxial cable	BX81424
Coaxial cable	BX81436
Coaxial cable	BX50685
Temperature and humidity meter Testo 625	504 117
120 V AC/60 Hz AC Power source HP 6813B	503 091
Multimeter Fluke 85 III	503 418
Temperature and humidity meter Testo 625	503 498

Results

Conducted output power as function of voltage variation

MIMO			802.11ac			
T_{nom} 20°C MSC0	Max conducted output power and e.i.r.p. (RMS detector – gated power meter)					
	f = 5260 MHz BW = 20 MHz 13 dBm/p13		f = 5280 MHz BW = 20 MHz 13 dBm/p13		f = 5320 MHz BW = 20 MHz 9 dBm/p9	
	Power	e.i.r.p.	Power	e.i.r.p.	Power	e.i.r.p.
$V_{85\% nom}$ 102 V AC	18.5	23.3	18.2	23.0	15.1	19.9
V_{nom} 120 V AC	18.7	23.5	18.2	23.0	15.1	19.8
$V_{115\% nom}$ 138 V AC	18.6	23.4	18.1	22.9	15.3	20.1

MIMO			802.11ac			
T_{nom} 20°C MSC0	Max conducted output power and e.i.r.p. (RMS detector – gated power meter)					
	f = 5270 MHz BW = 40 MHz 13 dBm/p13		f = 5310 MHz BW = 40 MHz 9 dBm/p9		f = 5290 MHz BW = 80 MHz 9 dBm/p9	
	Power	e.i.r.p.	Power	e.i.r.p.	Power	e.i.r.p.
$V_{85\% nom}$ 102 V AC	18.2	23.0	14.9	19.7	14.4	19.2
V_{nom} 120 V AC	18.2	23.0	15.1	19.9	14.4	19.2
$V_{115\% nom}$ 138 V AC	18.1	22.9	15.0	19.8	14.4	19.2

SISO 2, (chain 2 – 6 dBi antenna gain)			802.11ac			
T_{nom} 20°C MSC0	Max conducted output power and e.i.r.p. (RMS detector – gated power meter)					
	f = 5260 MHz BW = 20 MHz 13 dBm/p13		f = 5280 MHz BW = 20 MHz 13 dBm/p13		f = 5320 MHz BW = 20 MHz 9 dBm/p9	
	Power	e.i.r.p.	Power	e.i.r.p.	Power	e.i.r.p.
$V_{85\% nom}$ 102 V AC	15.7	21.7	15.6	21.6	12.7	18.7
V_{nom} 120 V AC	15.9	21.9	15.6	21.6	12.5	18.5
$V_{115\% nom}$ 138 V AC	15.9	21.9	15.5	21.5	12.8	18.8

SISO 2, (chain 2 – 6 dBi antenna gain)			802.11ac			
T_{nom} 20°C MSC0	Max conducted output power and e.i.r.p. (RMS detector – gated power meter)					
	f = 5270 MHz BW = 40 MHz 13 dBm/p13		f = 5310 MHz BW = 40 MHz 9 dBm/p9		f = 5290 MHz BW = 80 MHz 9 dBm/p9	
	Power	e.i.r.p.	Power	e.i.r.p.	Power	e.i.r.p.
$V_{85\% nom}$ 102 V AC	15.5	21.5	12.5	18.5	11.8	17.8
V_{nom} 120 V AC	15.7	21.7	12.6	18.6	11.8	17.8
$V_{115\% nom}$ 138 V AC	15.5	21.5	12.6	18.6	12.0	18.0

MIMO			802.11ac			
T_{nom} 20°C MSC0	Max conducted output power and e.i.r.p. (RMS detector – gated power meter)					
	f = 5500 MHz BW = 20 MHz 9 dBm/p9		f = 5580 MHz BW = 20 MHz 13 dBm/p13		f = 5720 MHz BW = 20 MHz 13 dBm/p13	
	Power	e.i.r.p.	Power	e.i.r.p.	Power	e.i.r.p.
$V_{85\% nom}$ 102 V AC	14.9	19.7	18.1	22.9	18.0	22.7
V_{nom} 120 V AC	14.9	19.7	18.2	23.0	18.2	22.9
$V_{115\% nom}$ 138 V AC	14.8	19.7	18.2	23.0	18.1	22.7

MIMO			802.11ac			
T_{nom} 20°C MSC0	Max conducted output power and e.i.r.p. (RMS detector – gated power meter)					
	f = 5510 MHz BW = 40 MHz 9 dBm/p9		f = 5550 MHz BW = 40 MHz 13 dBm/p13		f = 5710 MHz BW = 40 MHz 13 dBm/p13	
	Power	e.i.r.p.	Power	e.i.r.p.	Power	e.i.r.p.
$V_{85\% nom}$ 102 V AC	14.6	19.4	18.3	23.0	18.7	23.4
V_{nom} 120 V AC	14.7	19.5	18.4	23.1	18.0	22.6
$V_{115\% nom}$ 138 V AC	14.5	19.3	18.4	23.1	18.0	22.6

MIMO			802.11ac			
T_{nom} 20°C MSC0	Max conducted output power and e.i.r.p. (RMS detector – gated power meter)					
	f = 5530 MHz BW = 80 MHz 9 dBm/p9		f = 5610 MHz BW = 80 MHz 13 dBm/p13		f = 5690 MHz BW = 80 MHz 13 dBm/p13	
	Power	e.i.r.p.	Power	e.i.r.p.	Power	e.i.r.p.
$V_{85\% nom}$ 102 V AC	14.5	19.4	17.6	22.4	17.5	22.2
V_{nom} 120 V AC	14.5	19.4	17.6	22.4	17.5	22.2
$V_{115\% nom}$ 138 V AC	14.4	19.2	17.7	22.4	17.5	22.2

SISO 2, (chain 2 – 6 dBi antenna gain)			802.11ac			
T_{nom} 20°C MSC0	Max conducted output power and e.i.r.p. (RMS detector – gated power meter)					
	f = 5500 MHz BW = 20 MHz 9 dBm/p9		f = 5580 MHz BW = 20 MHz 13 dBm/p13		f = 5720 MHz BW = 20 MHz 13 dBm/p13	
	Power	e.i.r.p.	Power	e.i.r.p.	Power	e.i.r.p.
$V_{85\% nom}$ 102 V AC	12.4	18.4	15.8	21.8	15.6	21.6
V_{nom} 120 V AC	12.4	18.4	15.9	21.9	15.6	21.6
$V_{115\% nom}$ 138 V AC	12.6	18.6	15.8	21.8	15.5	21.5

SISO 2, (chain 2 – 6 dBi antenna gain)			802.11ac			
T_{nom} 20°C MSC0	Max conducted output power and e.i.r.p. (RMS detector – gated power meter)					
	f = 5510 MHz BW = 40 MHz 9 dBm/p9		f = 5550 MHz BW = 40 MHz 13 dBm/p13		f = 5710 MHz BW = 40 MHz 13 dBm/p13	
	Power	e.i.r.p.	Power	e.i.r.p.	Power	e.i.r.p.
$V_{85\% nom}$ 102 V AC	12.2	18.2	16.1	22.1	15.5	21.5
V_{nom} 120 V AC	12.3	18.3	16.0	22.0	15.5	21.5
$V_{115\% nom}$ 138 V AC	12.3	18.3	16.1	22.1	15.5	21.5

SISO 2, (chain 2 – 6 dBi antenna gain)			802.11ac			
T_{nom} 20°C MSC0	Max conducted output power and e.i.r.p. (RMS detector – gated power meter)					
	f = 5530 MHz BW = 80 MHz 9 dBm/p9		f = 5610 MHz BW = 80 MHz 13 dBm/p13		f = 5690 MHz BW = 80 MHz 13 dBm/p13	
	Power	e.i.r.p.	Power	e.i.r.p.	Power	e.i.r.p.
$V_{85\%\ nom}$ 102 V AC	11.9	17.9	15.2	21.2	15.0	21.0
V_{nom} 120 V AC	12.0	18.0	15.1	21.1	14.9	20.9
$V_{115\%\ nom}$ 138 V AC	12.1	18.1	15.1	21.1	15.0	21.0

Note : According 47CFR 15.31(e), for intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage.

Summarized limits for maximum conducted output power according FCC 47 CFR part 15.407 and RSS-247 are presented in tables below:

Pout Limit 1 [mW]	Pout Limit 1 [dBm]
250	24

NBW [MHz]	26dB EBW [MHz] Acc. FCC	Pout FCC Limit 2 [dBm]	OBW [MHz] Acc. RSS	Pout RSS Limit 2 [dBm]
20	32.6	26.1	18	23.6
40	61.7	28.9	36,5	26.6
80	119.1	31.8	75,9	29.8

The lower one between Limit 1 and Limit 2 shall be applied for compliance for each particular case.

Limit for maximum e.i.r.p. is 6 dB higher than limit for output power.

Limits

According to 47CFR 15.407(a)(2), for devices operating in the band 5.25-5.35 GHz and 5.47-5.725 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lower of 250 mW or 11 dBm + 10logB, where B is 26 dB emission bandwidth in MHz, provided the maximum antenna gain does not exceed 6 dBi.

According to RSS-247 6.2.2.1 and 6.2.3.1 maximum e.i.r.p. all devices except OEM devices installed in vehicles shall comply with following:

a) Conducted output power shall not exceed 250 mW or 11 + 10log10(B), dBm whichever is less. B is 99% emission bandwidth in MHz.
b) e.i.r.p shall not exceed 1W or 17 + 10log10(B), dBm whichever is less. B is 99% emission bandwidth in MHz.

Test engineers: Ermin Pasalic, Markel Bertilsson

Complies?	Yes

Maximum power spectral density measurements according to FCC 47 CFR part 15.407 (a) (2) / RSS-247 6.2.2.1 and 6.2.3.1

Date	Temperature	Humidity
2019-01-30	22 °C ± 3 °C	19 % ± 5 %
2019-01-31	24 °C ± 3 °C	18 % ± 5 %

Test setup and procedure

The measurements were performed according to ANSI C63.10 clause 12.5 and KDB 789033 D02 General UNII Test Procedures New Rules v02r01 Dec. 14, 2017 II.F.1 (II.E.2.f; SA-3).
Additionally, test in MIMO operating mode was done according KDB 662911 D01 Multiple Transmitter Output v02r01.E.2.a.

The conducted measurements were performed on units with the temporal antenna connectors, with transmission between 94.3% and 99.3% of duty cycle and with normal modulation.
The test was performed with RMS detector. Total power in the burst was measured with triggered power meter.

Test set-up photos during the tests can be found in the report annex, "8P07436 - F2 photos"

Measurement equipment	RISE number
Test site Marconi	15:121
Computer Lenovo ThinkCentre	-
Software R&S WMS32, ver.10.40.10	-
Spectrum analyser R&S FSQ 26	BX50694
Switching box with RF power meters R&S OSP120 with OSP-B157W8	BX60313
Coaxial cable	BX81424
Coaxial cable	BX81436
Coaxial cable	BX50685
Temperature and humidity meter Testo 625	504 117
120 V AC/60 Hz AC Power source HP 6813B	503 091
Multimeter Fluke 85 III	503 418
Temperature and humidity meter Testo 625	503 498

Results

Power spectral density as function of voltage variation

MIMO			802.11ac			
T_{nom} 20°C MSC0	Max power spectral density, PSD and Max e.i.r.p power spectral density, (SA-3)					
	f = 5260 MHz BW = 20 MHz 13 dBm/p13		f = 5280 MHz BW = 20 MHz 13 dBm/p13		f = 5320 MHz BW = 20 MHz 9 dBm/p9	
	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD
$V_{85\% nom}$ 102 V AC	7.4	12.2	7.0	11.8	4.4	9.2
V_{nom} 120 V AC	7.5	12.3	7.0	11.8	4.4	9.2
$V_{115\% nom}$ 138 V AC	7.5	12.3	7.0	11.8	4.4	9.2

MIMO			802.11ac			
T_{nom} 20°C MSC0	Max power spectral density, PSD and Max e.i.r.p power spectral density, (SA-3)					
	f = 5270 MHz BW = 40 MHz 13 dBm/p13		f = 5310 MHz BW = 40 MHz 9 dBm/p9		f = 5290 MHz BW = 80 MHz 9 dBm/p9	
	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD
$V_{85\% nom}$ 102 V AC	4.3	9.1	1.3	6.1	-2.6	2.2
V_{nom} 120 V AC	4.3	9.1	1.6	6.4	-2.5	2.3
$V_{115\% nom}$ 138 V AC	4.3	9.1	1.3	6.1	-2.4	2.4

MIMO, ISED measurements done due to different requirements in RSS-247			802.11ac	
T_{nom} 20°C MSC0	Max power spectral density, PSD and Max e.i.r.p power spectral density, (SA-3)			
	f = 5260 MHz BW = 20 MHz 10 dBm/p10		f = 5280 MHz BW = 20 MHz 10 dBm/p10	
	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD
$V_{85\% nom}$ 102 V AC	4.4	9.2	3.9	8.7
V_{nom} 120 V AC	4.6	9.4	4.1	8.9
$V_{115\% nom}$ 138 V AC	4.4	9.1	3.9	8.7

SISO 2, (chain 2 – 6 dBi antenna gain)			802.11ac			
T_{nom} 20°C MSC0	Max power spectral density, PSD and Max e.i.r.p power spectral density, (SA-3)					
	f = 5260 MHz BW = 20 MHz 13 dBm/p13		f = 5280 MHz BW = 20 MHz 13 dBm/p13		f = 5320 MHz BW = 20 MHz 9 dBm/p9	
	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD
$V_{85\% nom}$ 102 V AC	4.60	10.60	4.66	10.66	1.95	7.95
V_{nom} 120 V AC	4.88	10.88	4.68	10.68	1.87	7.87
$V_{115\% nom}$ 138 V AC	4.79	10.79	4.65	10.65	1.96	7.96

SISO 2, (chain 2 – 6 dBi antenna gain)			802.11ac			
T_{nom} 20°C MSC0	Max power spectral density, PSD and Max e.i.r.p power spectral density, (SA-3)					
	f = 5270 MHz BW = 40 MHz 13 dBm/p13		f = 5310 MHz BW = 40 MHz 9 dBm/p9		f = 5290 MHz BW = 80 MHz 9 dBm/p9	
	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD
$V_{85\% nom}$ 102 V AC	1.64	7.64	-0.97	5.03	-5.07	0.93
V_{nom} 120 V AC	1.75	7.75	-1.16	4.84	-5.13	0.87
$V_{115\% nom}$ 138 V AC	1.64	7.64	-0.86	5.14	-4.90	1.10

SISO 2, (chain 2 – 6 dBi antenna gain) ISED measurements done due to different requirements in RSS-247			802.11ac	
T_{nom} 20°C MSC0	Max power spectral density, PSD and Max e.i.r.p power spectral density, (SA-3)			
	f = 5260 MHz BW = 20 MHz 10 dBm/p10		f = 5280 MHz BW = 20 MHz 10 dBm/p10	
	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD
$V_{85\% nom}$ 102 V AC	1.4	7.4	1.4	7.4
V_{nom} 120 V AC	1.4	7.4	1.4	7.4
$V_{115\% nom}$ 138 V AC	1.5	7.5	1.4	7.4

MIMO			802.11ac			
T_{nom} 20°C MSC0	Max power spectral density, PSD and Max e.i.r.p power spectral density, (SA-3)					
	f = 5500 MHz BW = 20 MHz 9 dBm/p9		f = 5580 MHz BW = 20 MHz 13 dBm/p13		f = 5720 MHz BW = 20 MHz 13 dBm/p13	
	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD
$V_{85\%\ nom}$ 102 V AC	3.3	8.1	7.3	12.1	6.4	11.1
V_{nom} 120 V AC	3.2	8.0	7.4	12.2	6.5	11.2
$V_{115\%\ nom}$ 138 V AC	3.4	8.3	7.3	12.1	6.4	11.0

MIMO			802.11ac			
T_{nom} 20°C MSC0	Max power spectral density, PSD and Max e.i.r.p power spectral density, (SA-3)					
	f = 5510 MHz BW = 40 MHz 9 dBm/p9		f = 5550 MHz BW = 40 MHz 13 dBm/p13		f = 5710 MHz BW = 40 MHz 13 dBm/p13	
	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD
$V_{85\%\ nom}$ 102 V AC	0.2	5.0	4.8	9.5	4.3	9.0
V_{nom} 120 V AC	0.3	5.1	4.8	9.5	3.9	8.5
$V_{115\%\ nom}$ 138 V AC	0.3	5.1	4.8	9.5	3.7	8.3

MIMO			802.11ac			
T_{nom} 20°C MSC0	Max power spectral density, PSD and Max e.i.r.p power spectral density, (SA-3)					
	f = 5530 MHz BW = 80 MHz 9 dBm/p9		f = 5610 MHz BW = 80 MHz 13 dBm/p13		f = 5690 MHz BW = 80 MHz 13 dBm/p13	
	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD
$V_{85\%\ nom}$ 102 V AC	-2.5	2.4	1.2	6.0	0.6	5.3
V_{nom} 120 V AC	-2.2	2.7	1.4	6.2	0.8	5.5
$V_{115\%\ nom}$ 138 V AC	-2.3	2.5	1.2	5.9	0.7	5.4

SISO 2, (chain 2 – 6 dBi antenna gain)	802.11ac					
T_{nom} 20°C MSC0	Max power spectral density, PSD and Max e.i.r.p power spectral density, (SA-3)					
	f = 5500 MHz BW = 20 MHz 9 dBm/p9		f = 5580 MHz BW = 20 MHz 13 dBm/p13		f = 5720 MHz BW = 20 MHz 13 dBm/p13	
	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD
$V_{85\%\,nom}$ 102 V AC	1.04	7.04	4.73	10.73	3.81	9.81
V_{nom} 120 V AC	0.77	6.77	4.80	10.80	3.75	9.75
$V_{115\%\,nom}$ 138 V AC	0.86	6.86	4.81	10.81	3.80	9.80

SISO 2, (chain 2 – 6 dBi antenna gain)	802.11ac					
T_{nom} 20°C MSC0	Max power spectral density, PSD and Max e.i.r.p power spectral density, (SA-3)					
	f = 5510 MHz BW = 40 MHz 9 dBm/p9		f = 5550 MHz BW = 40 MHz 13 dBm/p13		f = 5710 MHz BW = 40 MHz 13 dBm/p13	
	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD
$V_{85\%\,nom}$ 102 V AC	-2.01	3.99	2.32	8.32	1.09	7.09
V_{nom} 120 V AC	-2.11	3.89	2.21	8.21	1.16	7.16
$V_{115\%\,nom}$ 138 V AC	-2.03	3.97	2.29	8.29	1.09	7.09

SISO 2, (chain 2 – 6 dBi antenna gain)	802.11ac					
T_{nom} 20°C MSC0	Max power spectral density, PSD and Max e.i.r.p power spectral density, (SA-3)					
	f = 5530 MHz BW = 80 MHz 9 dBm/p9		f = 5610 MHz BW = 80 MHz 13 dBm/p13		f = 5690 MHz BW = 80 MHz 13 dBm/p13	
	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD	PSD	e.i.r.p. PSD
$V_{85\%\,nom}$ 102 V AC	-4.74	1.26	-1.31	4.69	-1.87	4.13
V_{nom} 120 V AC	-4.97	1.03	-1.29	4.71	-1.99	4.01
$V_{115\%\,nom}$ 138 V AC	-4.94	1.06	-1.30	4.70	-1.97	4.03

Note: No corrections of power spectral density, PSD, for duty cycle were done in upper tables because PSD measured by spectrum analyser is normalized to the power measured in the burst by OSP-B157W8 which is not impacted by duty cycle.
The measurements with RMS detector can be found in the diagrams below:

Diagram 1:	5260 MHz 20 MHz BW MIMO MSC0, Power spectral density
Diagram 2:	5280 MHz 20 MHz BW MIMO MSC0, Power spectral density
Diagram 3:	5320 MHz 20 MHz BW MIMO MSC0, Power spectral density
Diagram 4:	5270 MHz 40 MHz BW MIMO MSC0, Power spectral density
Diagram 5:	5310 MHz 40 MHz BW MIMO MSC0, Power spectral density
Diagram 6:	5290 MHz 80 MHz BW MIMO MSC0, Power spectral density
Diagram 7:	5260 MHz 20 MHz BW MIMO MSC0, Power spectral density, ISED
Diagram 8:	5280 MHz 20 MHz BW MIMO MSC0, Power spectral density, ISED
Diagram 9:	5260 MHz 20 MHz BW SISO 2 MSC0, Power spectral density
Diagram 10:	5280 MHz 20 MHz BW SISO 2 MSC0, Power spectral density
Diagram 11:	5320 MHz 20 MHz BW SISO 2 MSC0, Power spectral density
Diagram 12:	5270 MHz 40 MHz BW SISO 2 MSC0, Power spectral density
Diagram 13:	5310 MHz 40 MHz BW SISO 2 MSC0, Power spectral density
Diagram 14:	5290 MHz 80 MHz BW SISO 2 MSC0, Power spectral density
Diagram 15:	5260 MHz 20 MHz BW SISO 2 MSC0, Power spectral density, ISED
Diagram 16:	5280 MHz 20 MHz BW SISO 2 MSC0, Power spectral density, ISED

Diagram 17:	5500 MHz 20 MHz BW MIMO MSC0, Power spectral density
Diagram 18:	5580 MHz 20 MHz BW MIMO MSC0, Power spectral density
Diagram 19:	5720 MHz 20 MHz BW MIMO MSC0, Power spectral density
Diagram 20:	5510 MHz 40 MHz BW MIMO MSC0, Power spectral density
Diagram 21:	5550 MHz 40 MHz BW MIMO MSC0, Power spectral density
Diagram 22:	5710 MHz 40 MHz BW MIMO MSC0, Power spectral density
Diagram 23:	5530 MHz 80 MHz BW MIMO MSC0, Power spectral density
Diagram 24:	5610 MHz 80 MHz BW MIMO MSC0, Power spectral density
Diagram 25:	5690 MHz 80 MHz BW MIMO MSC0, Power spectral density
Diagram 26:	5500 MHz 20 MHz BW SISO 2 MSC0, Power spectral density
Diagram 27:	5580 MHz 20 MHz BW SISO 2 MSC0, Power spectral density
Diagram 28:	5720 MHz 20 MHz BW SISO 2 MSC0, Power spectral density
Diagram 29:	5510 MHz 40 MHz BW SISO 2 MSC0, Power spectral density
Diagram 30:	5550 MHz 40 MHz BW SISO 2 MSC0, Power spectral density
Diagram 31:	5710 MHz 40 MHz BW SISO 2 MSC0, Power spectral density
Diagram 32:	5530 MHz 80 MHz BW SISO 2 MSC0, Power spectral density
Diagram 33:	5610 MHz 80 MHz BW SISO 2 MSC0, Power spectral density
Diagram 34:	5690 MHz 80 MHz BW SISO 2 MSC0, Power spectral density

Note: the results in the diagrams are not corrected for duty cycle.

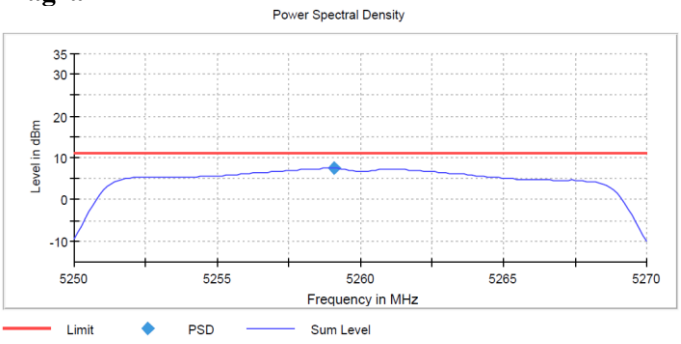
Limits

According to 47CFR 15.407(a)(2), for devices operating in the band 5.25-5.35 GHz and 5.47-5.725, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band, provided that max antenna gain is 6 dBi.
According to RSS-247 6.2.2.1. and 6.2.3.1 for devices operating in the band 5.25-5.35 GHz and 5.47-5.825 GHz, spectral density shall not exceed 11 dBm, (e.i.r.p. spectral density shall not exceed 17 dBm), in any 1 MHz band.

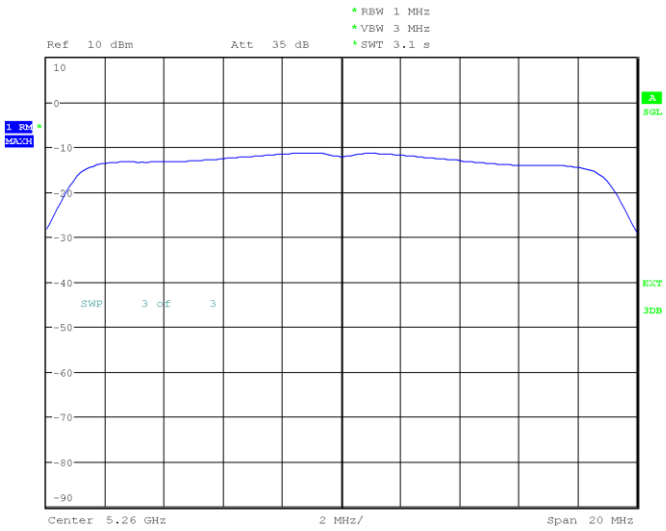
Test engineers: Markel Bertilsson and Ermin Pasalic

Complies?	Yes

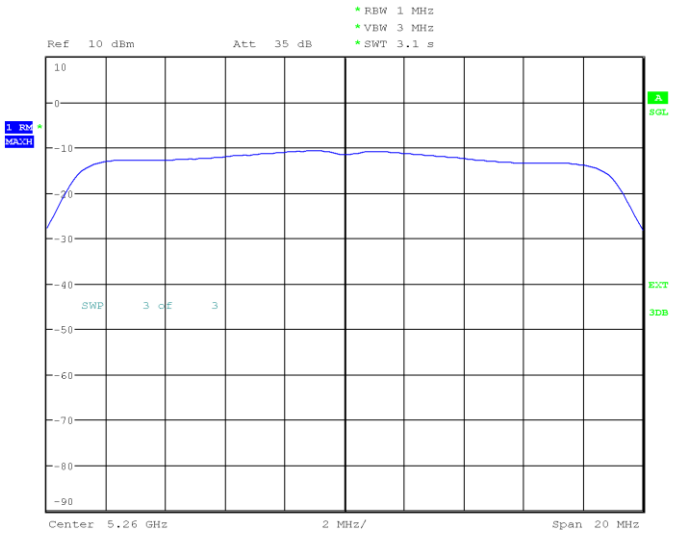
Diagram 1



PSD – total



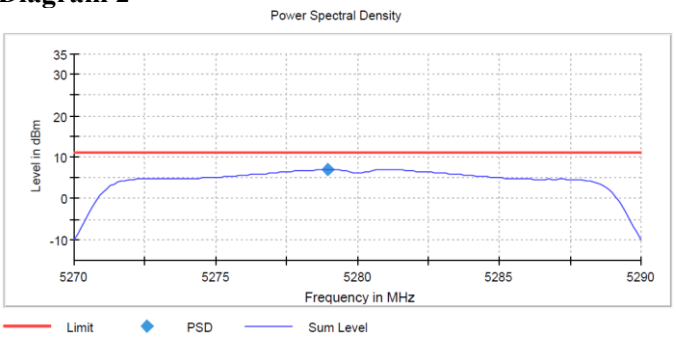
PSD – chain 1, 2.5 dBi antenna gain



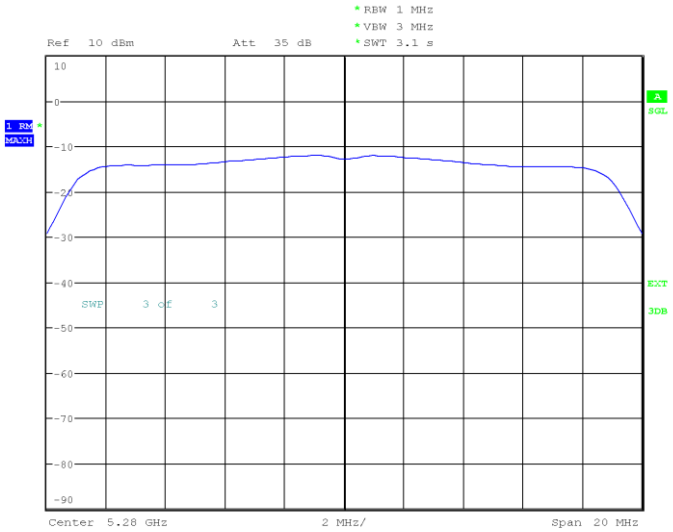
PSD – chain 2, 6 dBi antenna gain
DUT operating at 5260 MHz 20 MHz BW MIMO MSC0, 13 dBm/p13

Power spectral density

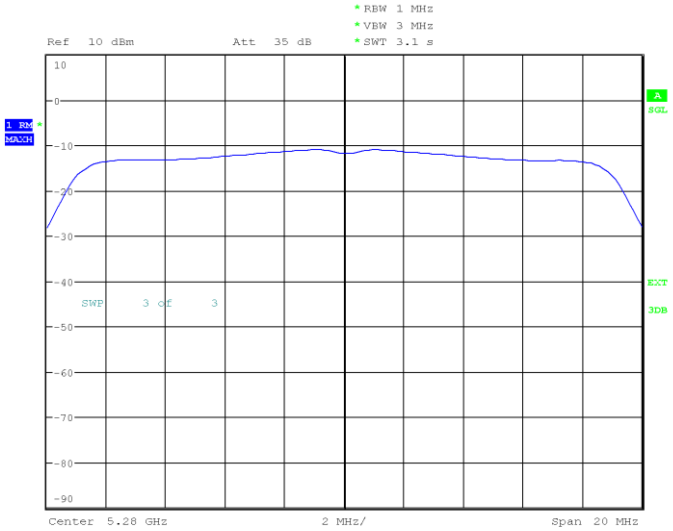
Diagram 2



PSD – total

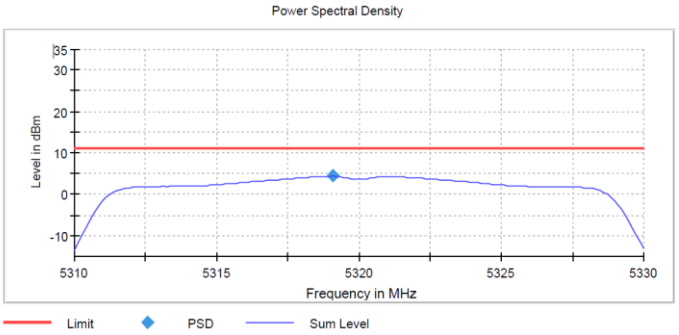


PSD – chain 1, 2.5 dBi antenna gain

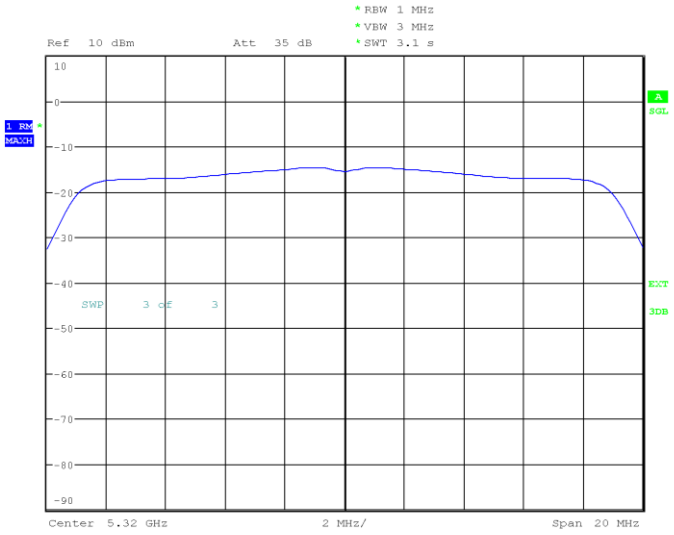


PSD – chain 2, 6 dBi antenna gain
DUT operating at 5280 MHz 20 MHz BW MIMO MSC0, 13 dBm/p13
Power spectral density

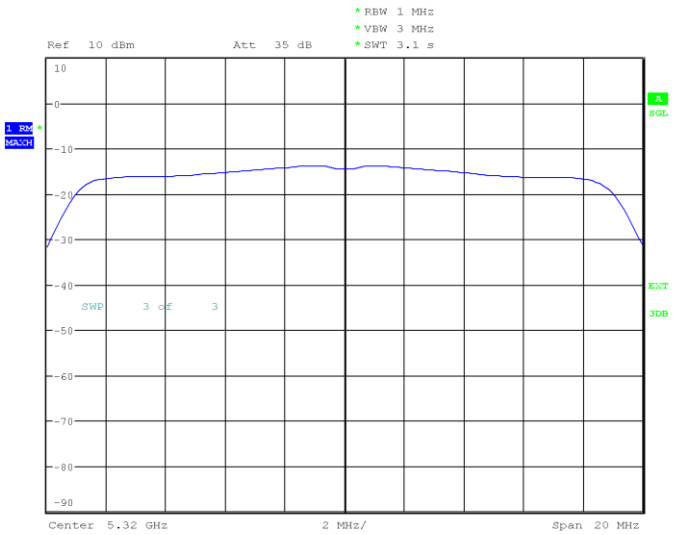
Diagram 3



PSD – total

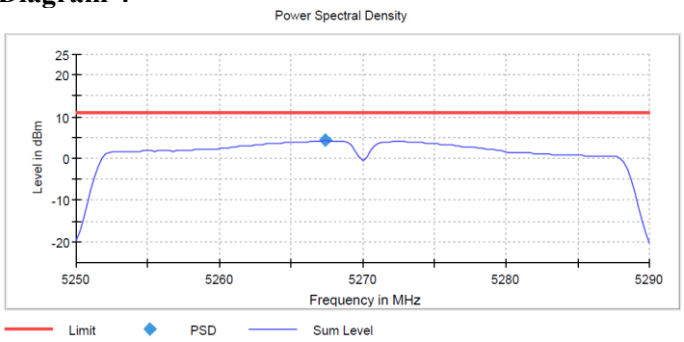


PSD – chain 1, 2.5 dBi antenna gain

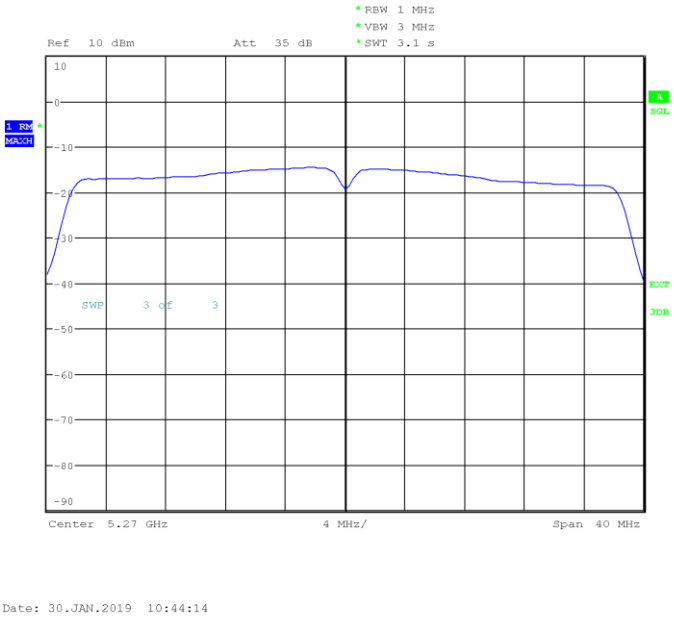


PSD – chain 2, 6 dBi antenna gain
DUT operating at 5320 MHz 20 MHz BW MIMO MSC0, 9 dBm/p9
Power spectral density

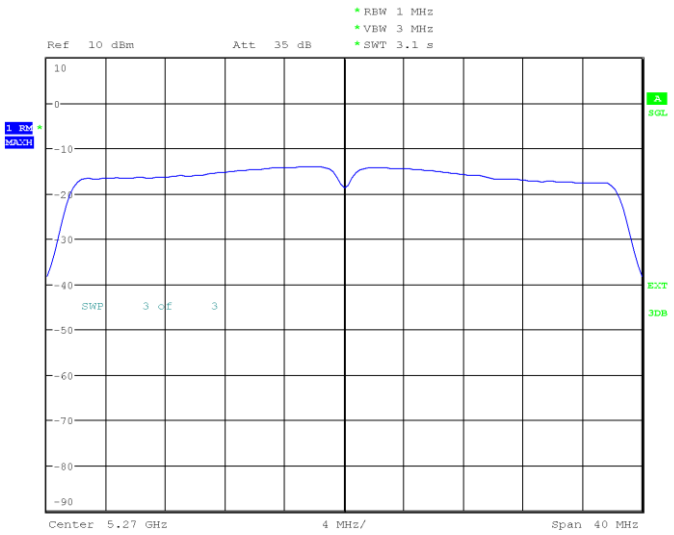
Diagram 4



PSD – total

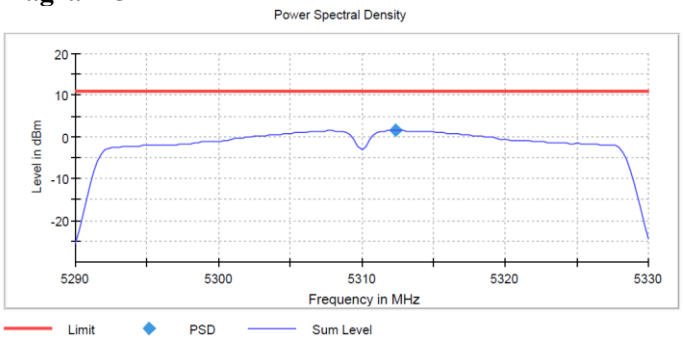


PSD – chain 1, 2.5 dBi antenna gain

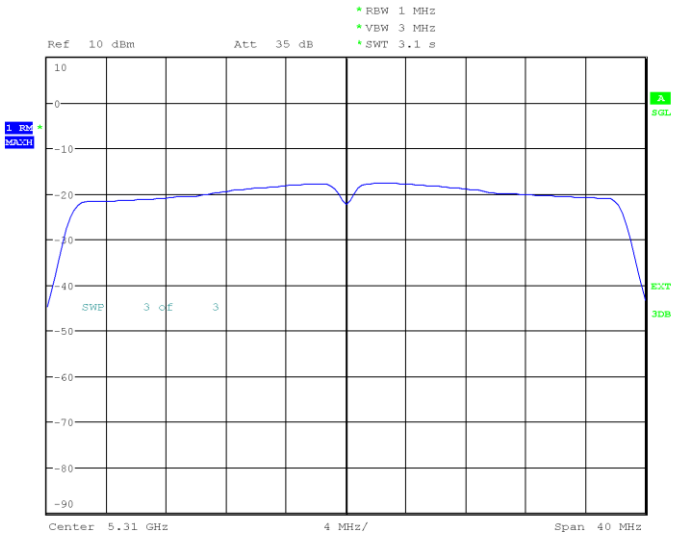


PSD – chain 2, 6 dBi antenna gain
DUT operating at 5270 MHz 40 MHz BW MIMO MSC0, 13 dBm/p13
Power spectral density

Diagram 5



PSD – total



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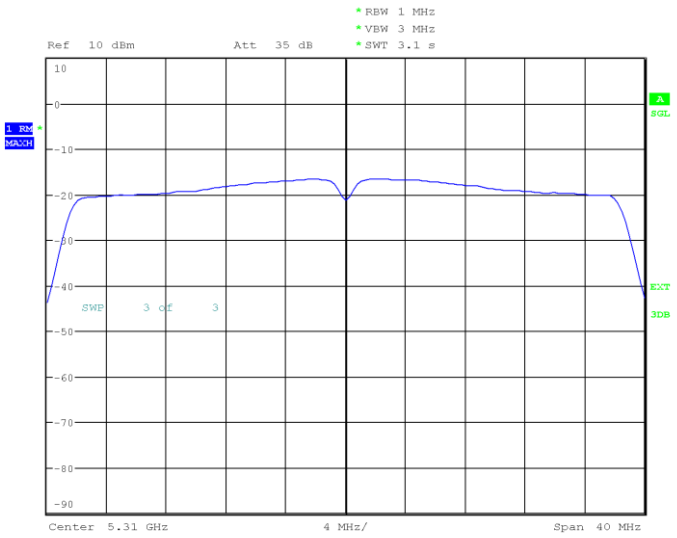
PSD – chain 1, 2.5 dBi antenna gain



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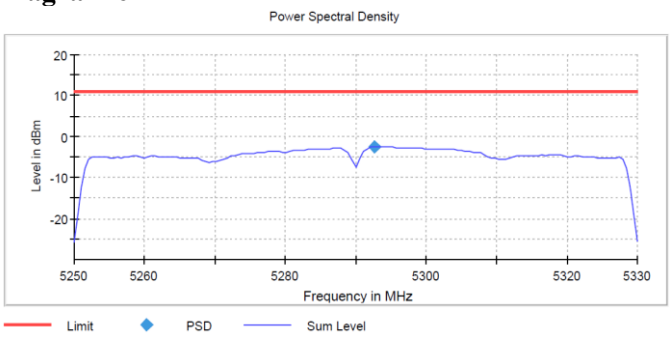
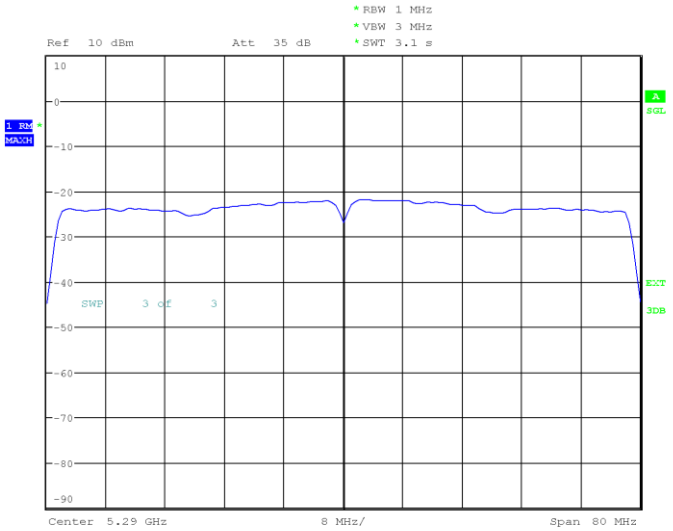
PSD – chain 2, 6 dBi antenna gain
DUT operating at 5310 MHz 40 MHz BW MIMO MSC0, 9 dBm/p9
Power spectral density

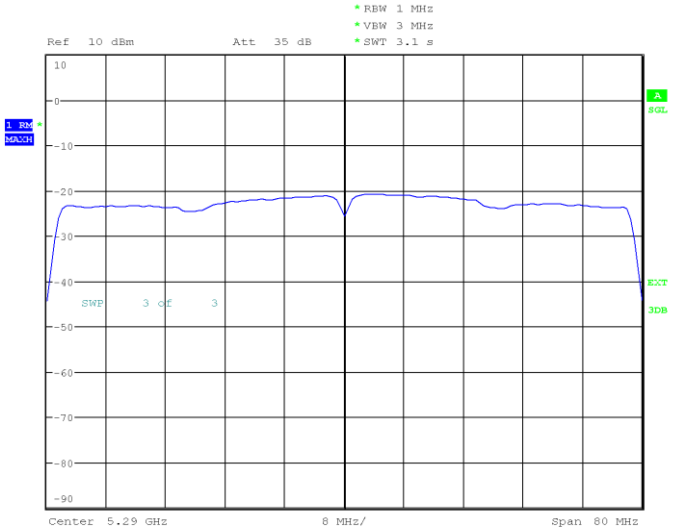
Diagram 6



PSD – total

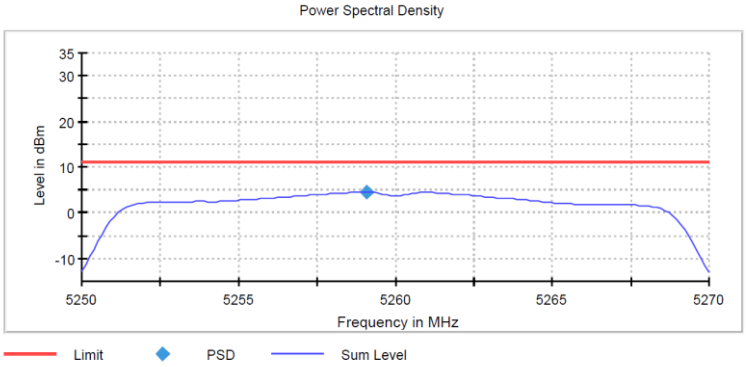


PSD – chain 1, 2.5 dBi antenna gain

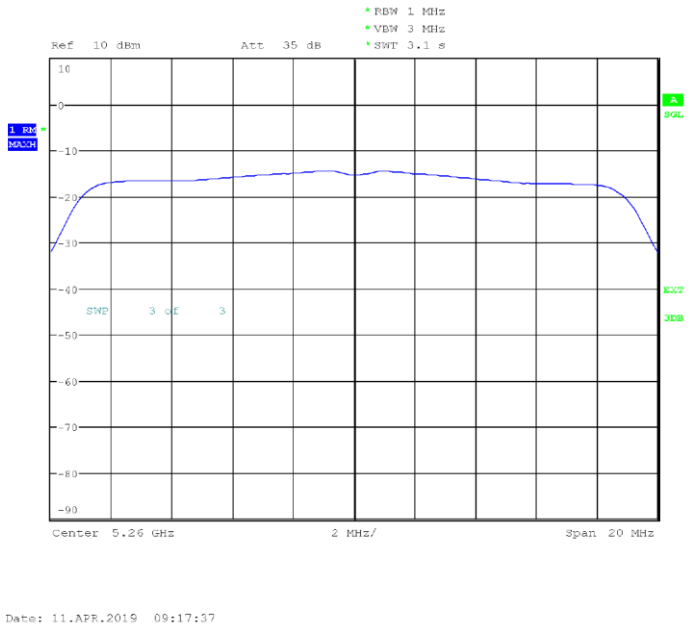


PSD – chain 2, 6 dBi antenna gain
DUT operating at 5290 MHz 80 MHz BW MIMO MSC0, 9 dBm/p9
Power spectral density

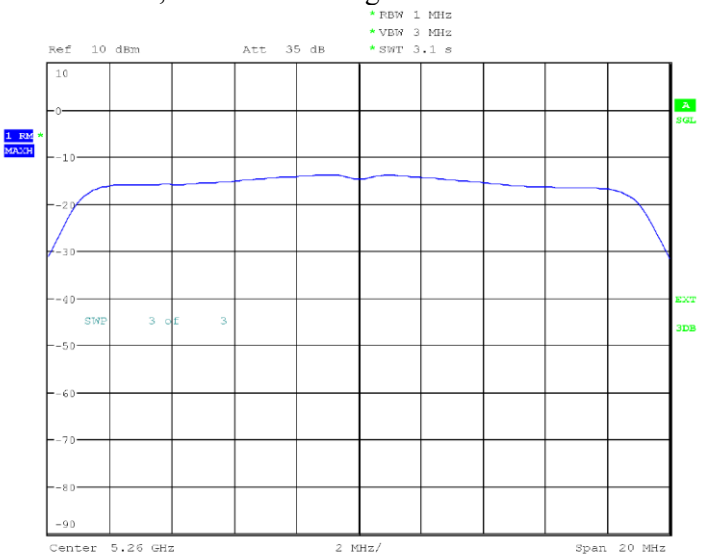
Diagram 7



PSD – total

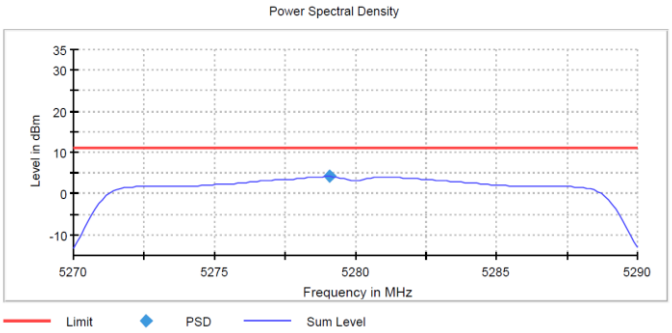


PSD – chain 1, 2.5 dBi antenna gain

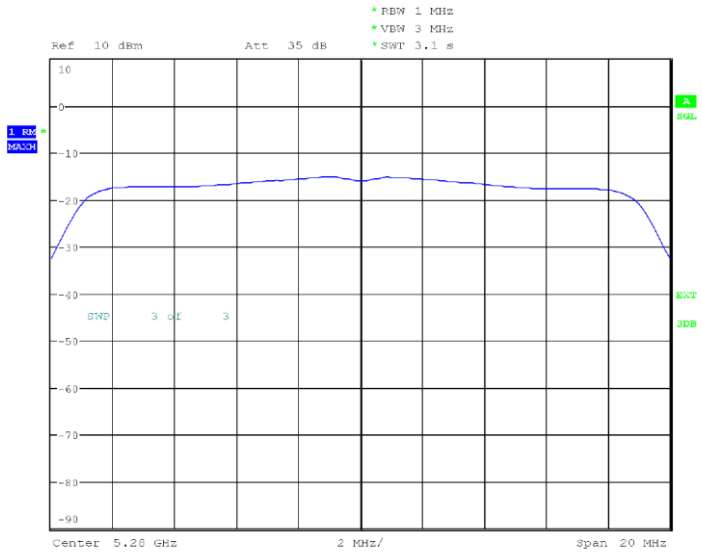


PSD – chain 2, 6 dBi antenna gain
DUT operating at 5260 MHz 20 MHz BW MIMO MSC0, 10 dBm/p10
Power spectral density

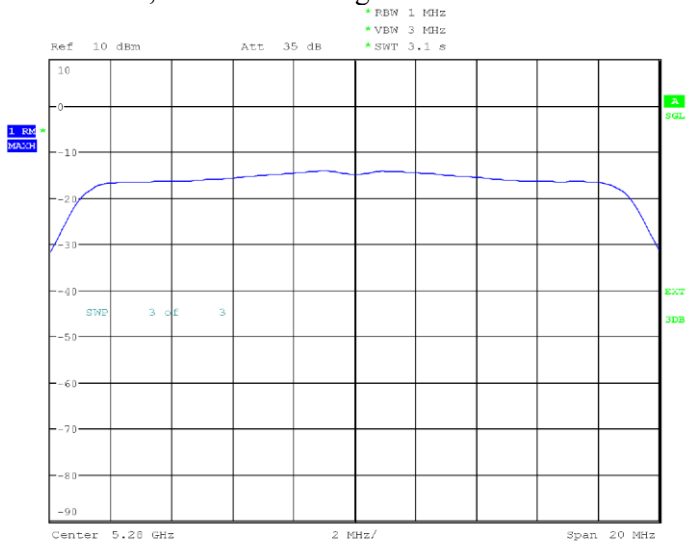
Diagram 8



PSD – total

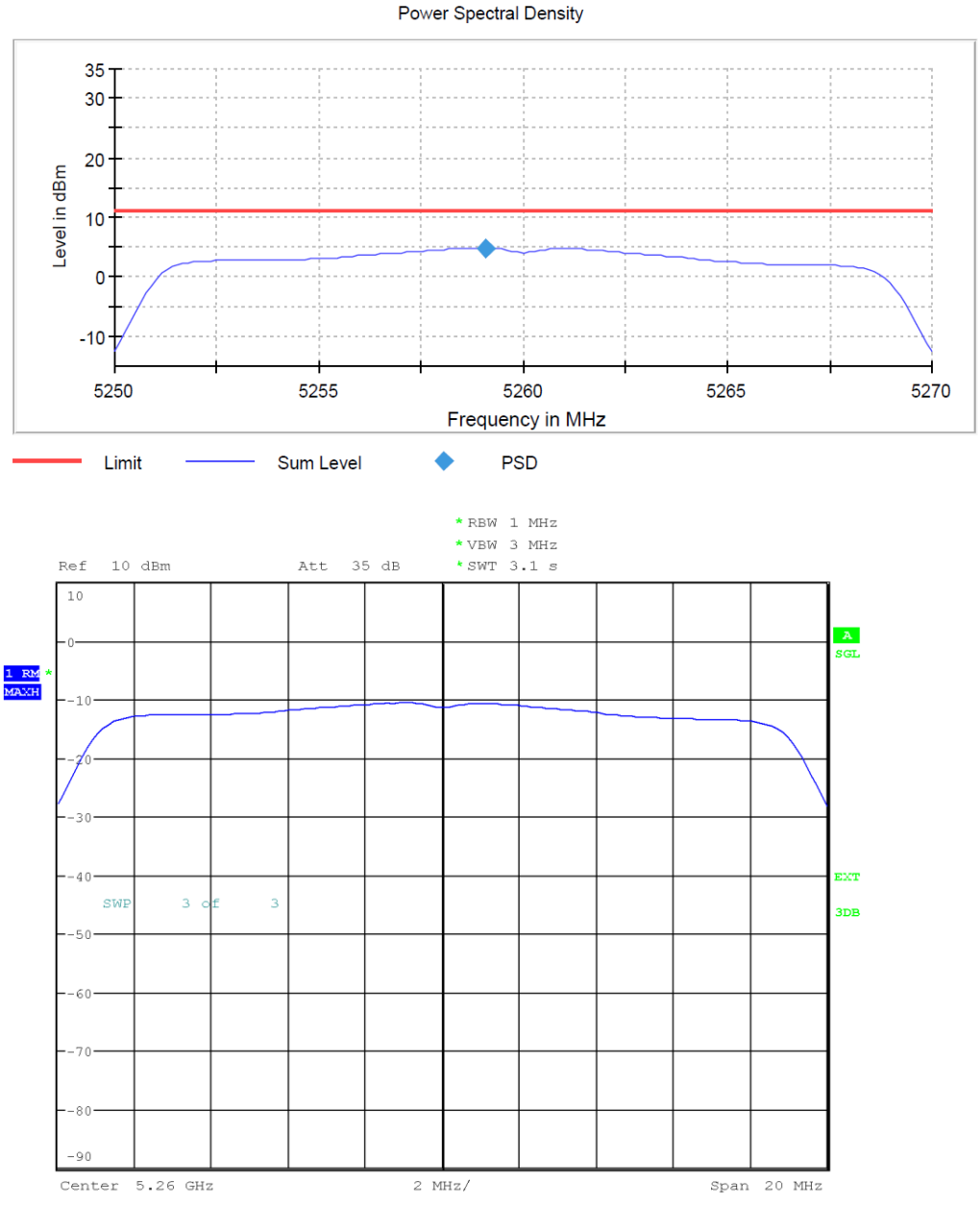


PSD – chain 1, 2.5 dBi antenna gain



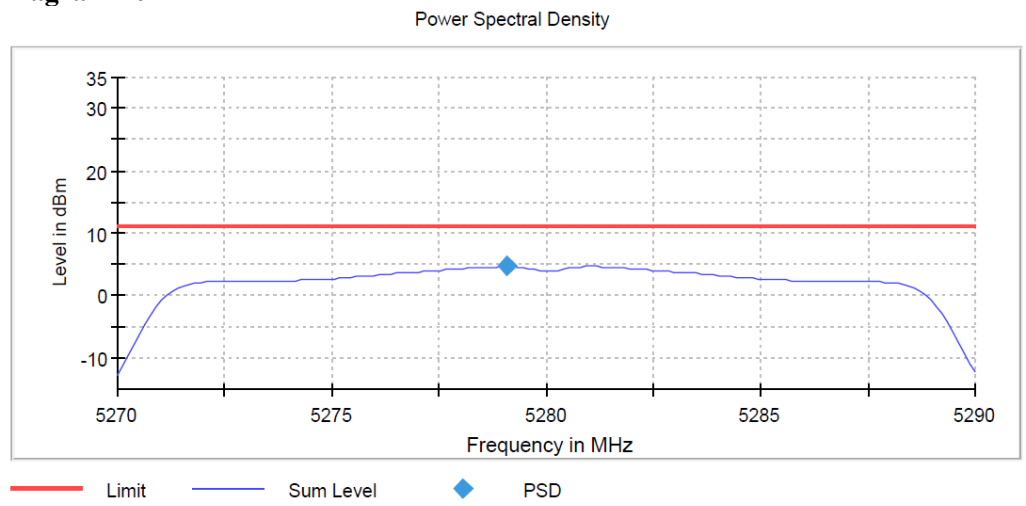
PSD – chain 2, 6 dBi antenna gain
DUT operating at 5280 MHz 20 MHz BW MIMO MSC0, 10 dBm/p10
Power spectral density

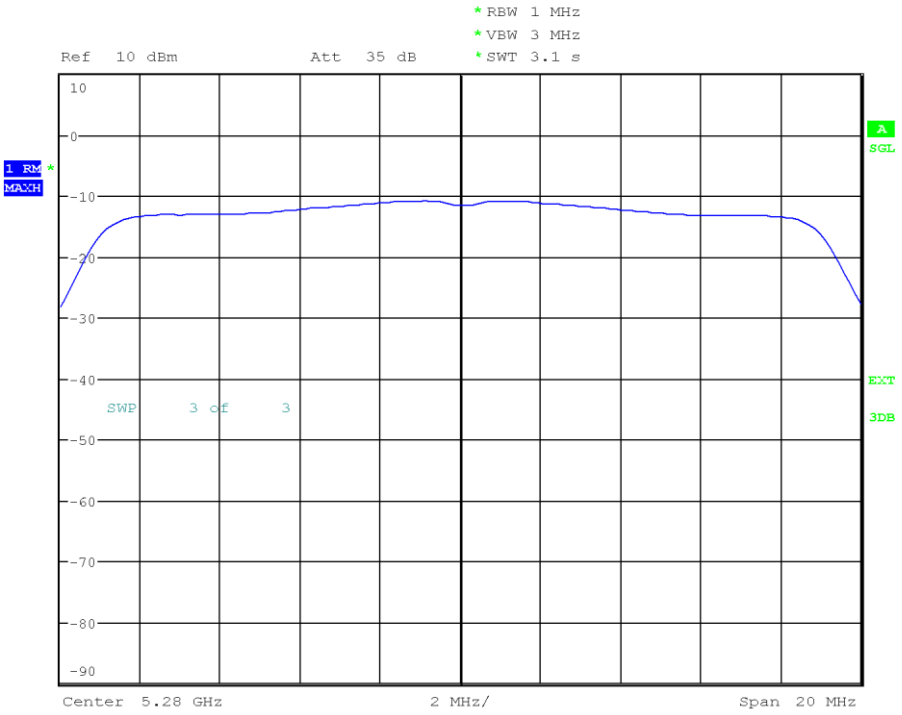
Diagram 9



DUT operating at 5260 MHz 20 MHz BW MSC0 SISO 2, 6 dBi antenna gain, 13 dBm/p13
Power spectral density

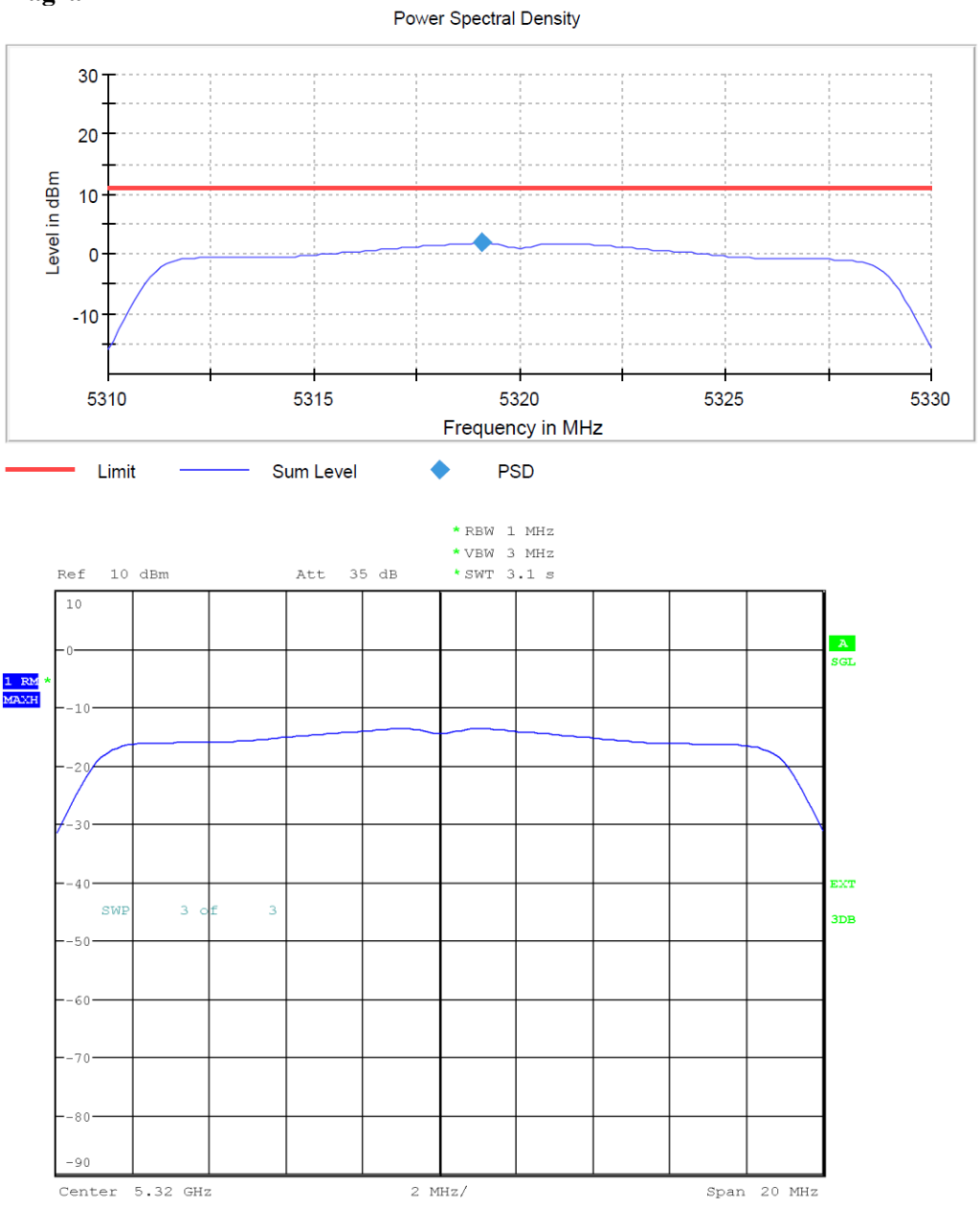
Diagram 10





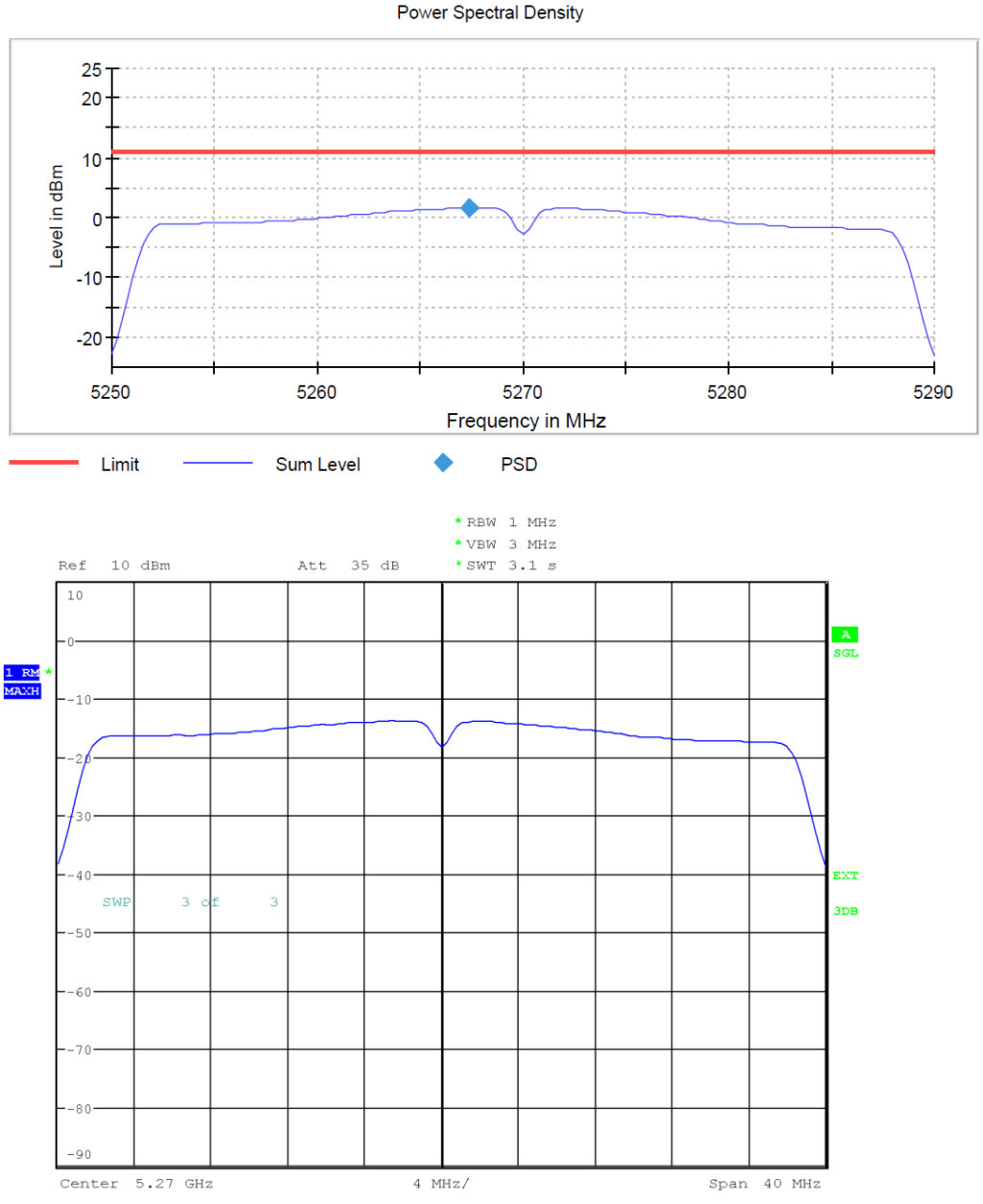
DUT operating at 5280 MHz 20 MHz BW MSC0 SISO 2, 6 dBi antenna gain, 13 dBm/p13
Power spectral density

Diagram 11



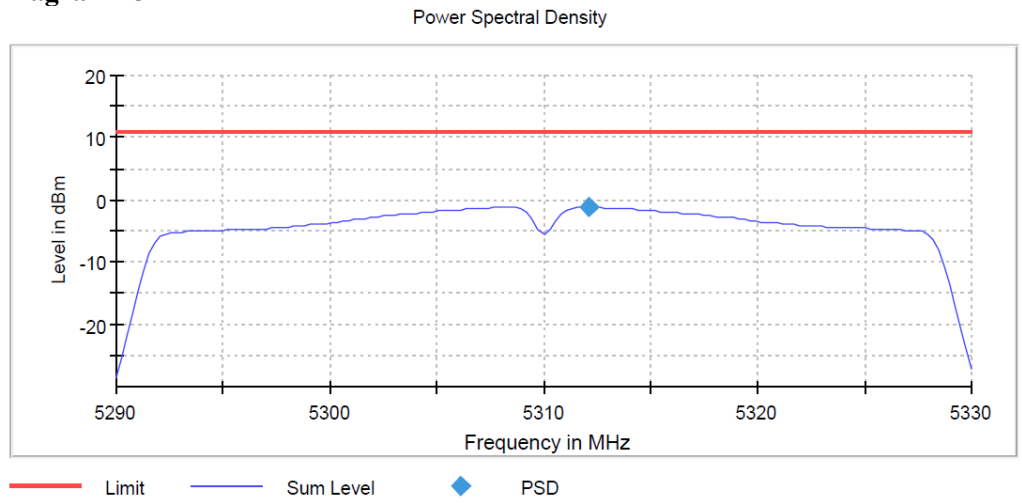
DUT operating at 5320 MHz 20 MHz BW MSC0 SISO 2, 6 dBi antenna gain, 9 dBm/p9
Power spectral density

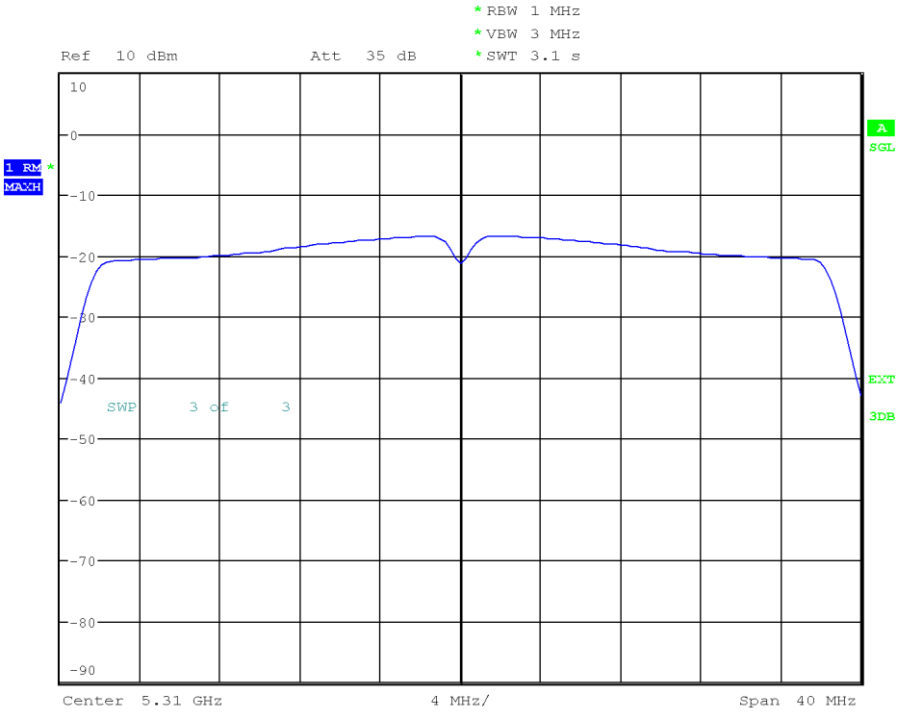
Diagram 12



DUT operating at 5270 MHz 40 MHz BW MSC0 SISO 2, 6 dBi antenna gain, 13 dBm/p13
Power spectral density

Diagram 13

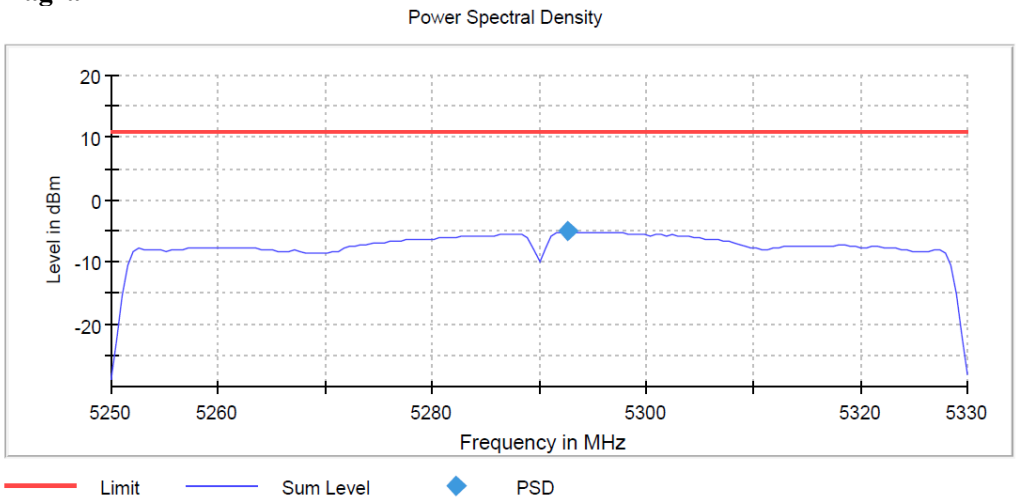


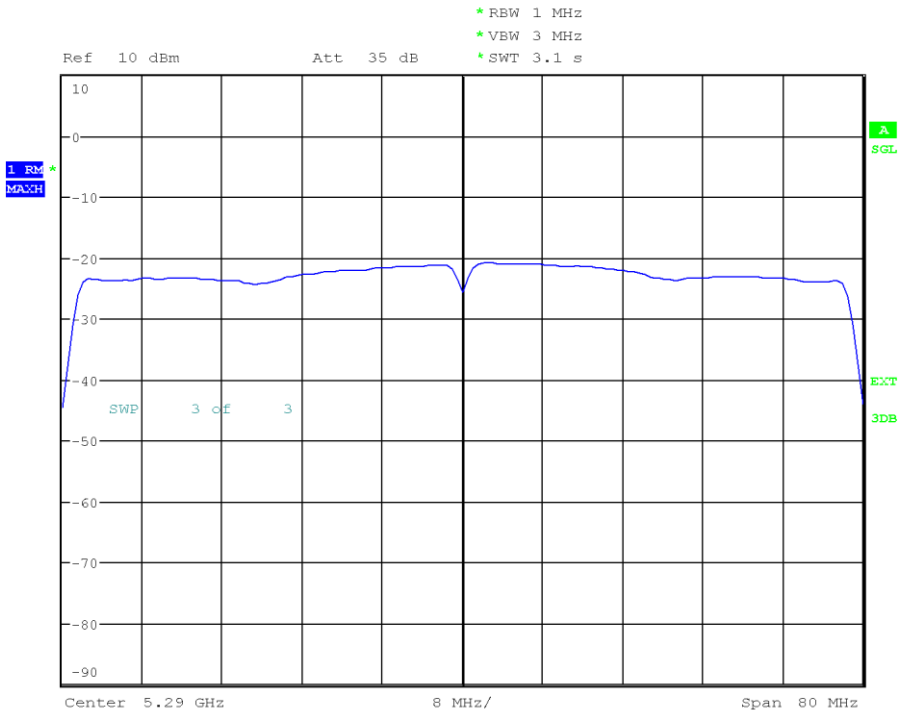


Date: 31.JAN.2019 13:16:05

DUT operating at 5310 MHz 40 MHz BW MSC0 SISO 2, 6 dBi antenna gain, 9 dBm/p9
Power spectral density

Diagram 14

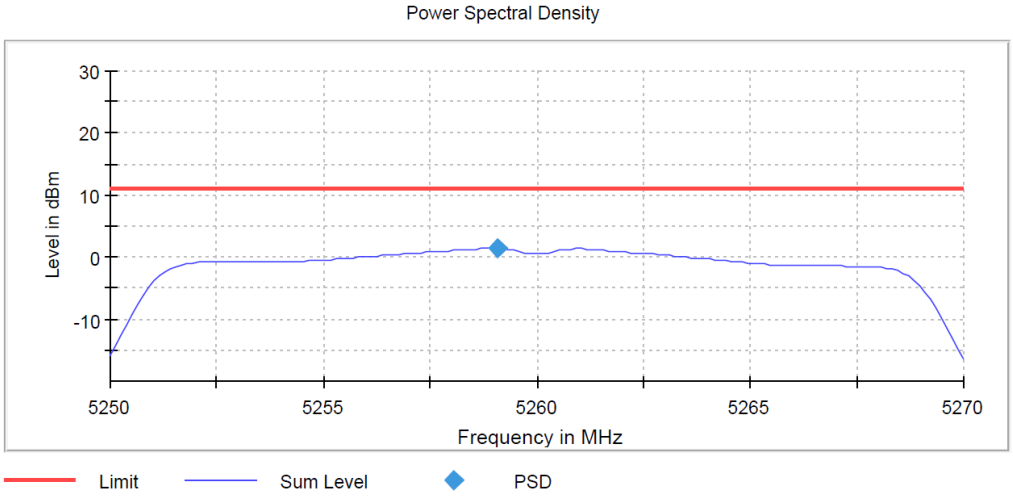


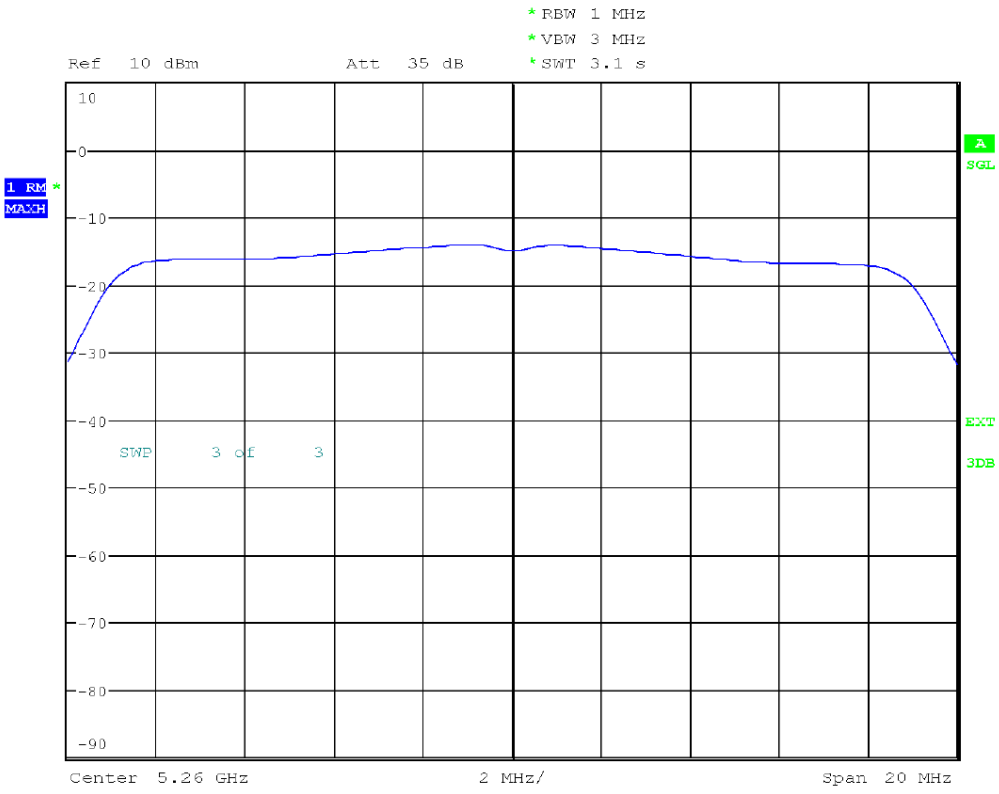


Date: 31.JAN.2019 13:19:26

DUT operating at 5290 MHz 80 MHz BW MSC0 SISO 2, 6 dBi antenna gain, 9 dBm/p9
Power spectral density

Diagram 15

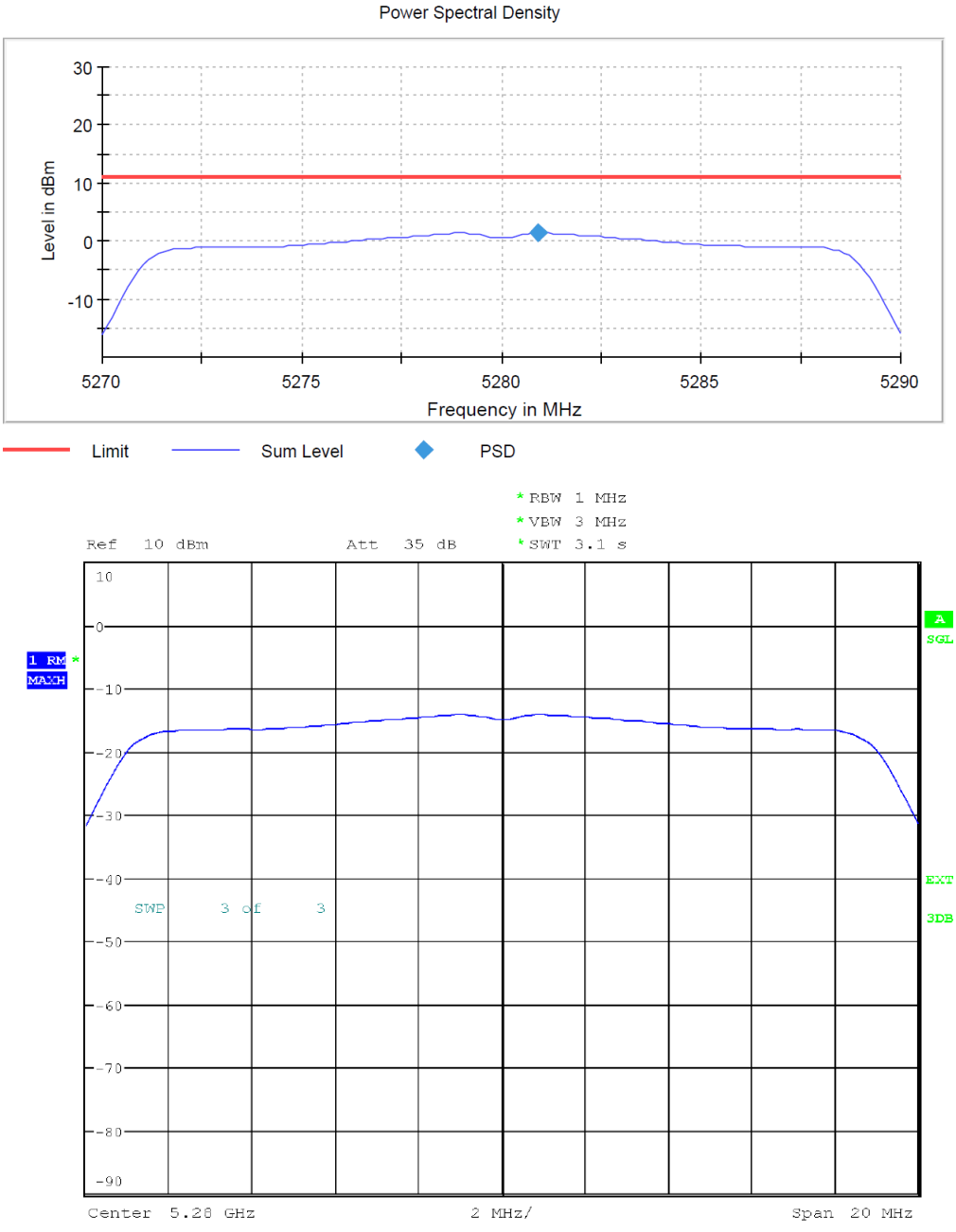




Date: 11.APR.2019 10:28:13

DUT operating at 5260 MHz 20 MHz BW MSC0 SISO 2, 6 dBi antenna gain, 10 dBm/p10
Power spectral density

Diagram 16



DUT operating at 5280 MHz 20 MHz BW MSC0 SISO 2, 6 dBi antenna gain, 10 dBm/p10
Power spectral density