

FCC ID:U9A277IWLAN-V210

EMI - TEST REPORT

- FCC Part 15.407 -



| | | |
|--------------------------|-----------------------|------------------------------------|
| Test Report No. : | T34492-00-03HS | 22. December 2010 Date of issue |
|--------------------------|-----------------------|------------------------------------|

Type / Model Name : MobilePanel277IWLAN V2 / 277FIWLAN V2

Product Description : Mobile Human Machine Interface

Applicant : Siemens AG, I IA AS RD ST TT

Address : Werner-von-Siemens-Str. 50
92224 AMBERG, GERMANY

Manufacturer : Siemens AG, I IA AS

Address : Gleiwitzer Str. 555
90475 NUERNBERG, GERMANY

Licence holder : Siemens AG, I IA AS RD ST TT

Address : Werner-von-Siemens-Str. 50
92224 AMBERG, GERMANY

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



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

FCC ID:U9A277IWLAN-V210

Contents

| | | |
|----------|---|-----------|
| 1 | <u>TEST STANDARDS</u> | 3 |
| 2 | <u>SUMMARY</u> | 4 |
| 3 | <u>EQUIPMENT UNDER TEST</u> | 6 |
| 3.1 | Photo documentation of the EUT – Detailed photos see Attachment A | 6 |
| 3.2 | Power supply system utilised | 6 |
| 3.3 | Short description of the equipment under test (EUT) | 6 |
| 4 | <u>TEST ENVIRONMENT</u> | 7 |
| 4.1 | Address of the test laboratory | 7 |
| 4.2 | Environmental conditions | 7 |
| 4.3 | Statement of the measurement uncertainty | 7 |
| 4.4 | Measurement protocol for FCC | 7 |
| 4.5 | Determination of worst case measurement conditions | 9 |
| 5 | <u>TEST CONDITIONS AND RESULTS</u> | 10 |
| 5.1 | Conducted emissions | 10 |
| 5.2 | 26 dB emission bandwidth | 14 |
| 5.3 | Maximum conducted output power | 19 |
| 5.4 | Undesirable emissions | 21 |
| 5.5 | Peak power spectral density | 47 |
| 5.6 | Peak excursion | 51 |
| 5.7 | Maximum permissible exposure (MPE) | 56 |
| 5.8 | Antenna application - Detailed photos see attachment A | 58 |
| 5.9 | Receiver spurious emissions | 59 |
| 6 | <u>USED TEST EQUIPMENT AND ACCESSORIES</u> | 62 |

ATTACHMENT A, T34492

FCC ID:U9A277IWLAN-V210

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (October, 2009)

| | |
|-----------------------------------|---|
| 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 B - Unintentional Radiators (October, 2009)

| | |
|------------------------------------|--|
| Part 15, Subpart B, Section 15.107 | AC Line conducted emissions |
| Part 15, Subpart B, Section 15.109 | Radiated emissions, general requirements |

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October, 2009)

| | |
|------------------------------------|---|
| 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 |

FCC Rules and Regulations Part 15, Subpart E – Unlicensed National Information Infrastructure Devices (October, 2009)

| | |
|------------------------------------|---|
| 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 C95.1:1999 IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz

CISPR 16-4-2: 2003 Uncertainty in EMC measurement
CISPR 22: 2005 Information technology equipment

EN 55022: 2006

2 SUMMARY

GENERAL REMARKS:

The EUT consists of 1 WLAN Module and 1 Effective Range Module (Chirp 2.45 GHz) which measure the distance between Mobile Panel and accompanying Transponder. For the compliance of the ERM Module please refer to test report T34492-00-00AA by mikes-testingpartners gmbh.

The Mobile Panel 277F IWLAN offers the possibility of having the mobile safety functions of emergency stop available at any point of a machine or plant. The 277 IWLAN doesn't have the safety function. Both are electronically identical however the 277 IWLAN is not equipped with the relevant parts necessary for the safety function. All tests have been carried out with the fully equipped 277F IWLAN Mobile Panel. The EUT can be configured as client only. The EUT has no ad-hoc or peer-to-peer mode.

Available Features:

The WLAN miniPCI module is compatible with 802.11h technology. It is able to operate in the 5 GHz frequency band.

- 802.11h Mode 5.25 GHz – 5.35 GHz and 5.470 GHz – 5.725 GHz

The module uses DSSS or OFDM modulation and is capable to provide following data rates:

- 802.11h 54, 48, 36, 24, 18, 12, 9, 6 Mbps, auto-fallback

The EUT is equipped with 2 internal WLAN antennas (gain = 3 dBi at 2.4 GHz, 5 dBi at 5 GHz) and 1 dual port patch antenna (gain=2.6 / 2.7 dBic).

15 channels are provided in 802.11h mode:

| Channel | Frequency |
|---------|-----------|
| 52 | 5260 |
| 56 | 5280 |
| 60 | 5300 |
| 64 | 5320 |
| 100 | 5500 |
| 104 | 5520 |
| 108 | 5540 |
| 112 | 5560 |
| 116 | 5580 |
| 120 | 5600 |
| 124 | 5620 |
| 128 | 5640 |
| 132 | 5660 |
| 136 | 5680 |
| 140 | 5700 |

FCC ID:U9A277IWLAN-V210

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 : 22 November 2010

Testing concluded on : 29 November 2010

Checked by:

Tested by:

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

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

FCC ID:U9A277IWLAN-V210

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT – Detailed photos see Attachment A

3.2 Power supply system utilised

Power supply voltage : 7.2 VDC Battery
 Power supply voltage (alternative) : Input: 100-240 VAC, 50-60 Hz, Output: 12 VDC

3.3 Short description of the equipment under test (EUT)

The SIMATIC Mobile Panel 277 IWLAN / 277F IWLAN permits remote control to systems are controlled by more than one PLC. The HMI device communicates with the PLC via WLAN. The access to one of the system part is determined by a zone recognition function (ERM) of the HMI.

Number of tested samples: 1
 Serial number: 71

EUT operation mode:

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

- Data transmission (Client mode)

- Continuous transmit mode (conducted test mode only)

EUT configuration:

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

- AC/DC power supply _____ Model : MEAN WELL GS60A12
- _____ Model : _____
- _____ Model : _____

FCC ID:U9A277IWLAN-V210

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

mikes-testingpartners gmbh
Ohmstrasse 2-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

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

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

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

4.4 Measurement protocol for FCC

4.4.1 GENERAL INFORMATION

4.4.1.1 Test Methodology

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

In compliance with 47 CFR Part 15 Subpart A Section 15.38 testing for FCC compliance may be done following the ANSI C63.4-2003 procedures and using the CISPR 22 limits.

FCC ID:U9A277IWLAN-V210

4.4.1.2 Measurement Error

The data and results referenced in this document are true and accurate. The reader is cautioned that there is some measurement variability due to the tolerances of the test equipment that can contribute to a nominal product measurement uncertainty. The measurement uncertainty was calculated for all measurements listed in this test report according to NIS 81/5.1994 "The treatment of uncertainty in EMC measurements" and is documented in the mikes-testingpartners gmbh quality system according to DIN EN ISO/IEC 17025. Furthermore, component differences and manufacturing process variability of production units similar to that tested may result in additional product uncertainty. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests. The manufacturer has the sole responsibility of continued compliance of the device.

4.4.1.3 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 unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.2 DETAILS OF TEST PROCEDURES

4.4.2.1 General Standard Information

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 C63.4-2003 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

4.4.2.2 Radiated emission (electrical field 30 MHz - 1 GHz)

Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters and the EUT is rotated 360 degrees.

The final level in dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (dB). The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:

30 MHz – 1000 MHz: RBW: 120 kHz

Example:

| | | | | | | | | | |
|-----------|--------|---|--------|---|----------|---|-------------|---|-------|
| Frequency | Level | + | Factor | = | Level | - | CISPR Limit | = | Delta |
| (MHz) | (dBµV) | | (dB) | | (dBµV/m) | | (dBµV/m) | | (dB) |
| 719.0 | 75.0 | + | 32.6 | = | 107.6 | - | 110.0 | = | -2.4 |

FCC ID:U9A277IWLAN-V210

4.4.2.3 Radiated emission (electrical field 1 GHz - 40 GHz)

Radiated emissions from the EUT are measured in the frequency range 1 GHz up to the maximum frequency as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is following set out in ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to max peak detector function and a RBW = 1 MHz and VBW = 3 MHz for peak and 10 Hz for average measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty and are calculated at the specified test distance.

4.5 Determination of worst case measurement conditions

Measurements have been made in all three orthogonal axes and the settings of the EUT were changed to locate at which position and at what setting of the EUT produce the maximum of the emissions. Conducted measurements are performed using an access point (LAP) as a test jig. The EUT (WLAN module) is mounted in the AP and controlled via LAN by a Laptop. Radiated measurements are performed with normal configuration of the Mobile Panel (WLAN Module inside the MP).

Pre-scan has been performed to determine the worst-case mode from all possible combinations between available modulations and data rates. The maximum output power depends on used data rate.

The tests have been carried out in the following frequency bands: 5.25 - 5.35 GHz and 5.470 - 5.725 GHz.

As worst case the following data rate is used:

- **802.11h: 6 Mbits**

The EUT is controlled for conducted measurements by special test software enables continuous transmission during the tests with a duty cycle (x) of about x = 1.

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

| Technology | Available Channel | Tested Channel | Modulation | Modulation Type | Data Rate (Mbps) |
|------------|-------------------|------------------|------------|-----------------|------------------|
| 802.11h | 52 to 64 | 52, 56 and 64 | OFDM | BPSK | 6 |
| 802.11h | 100 to 140 | 100, 120 and 140 | OFDM | BPSK | 6 |

FCC ID:U9A277IWLAN-V210

5 TEST CONDITIONS AND RESULTS

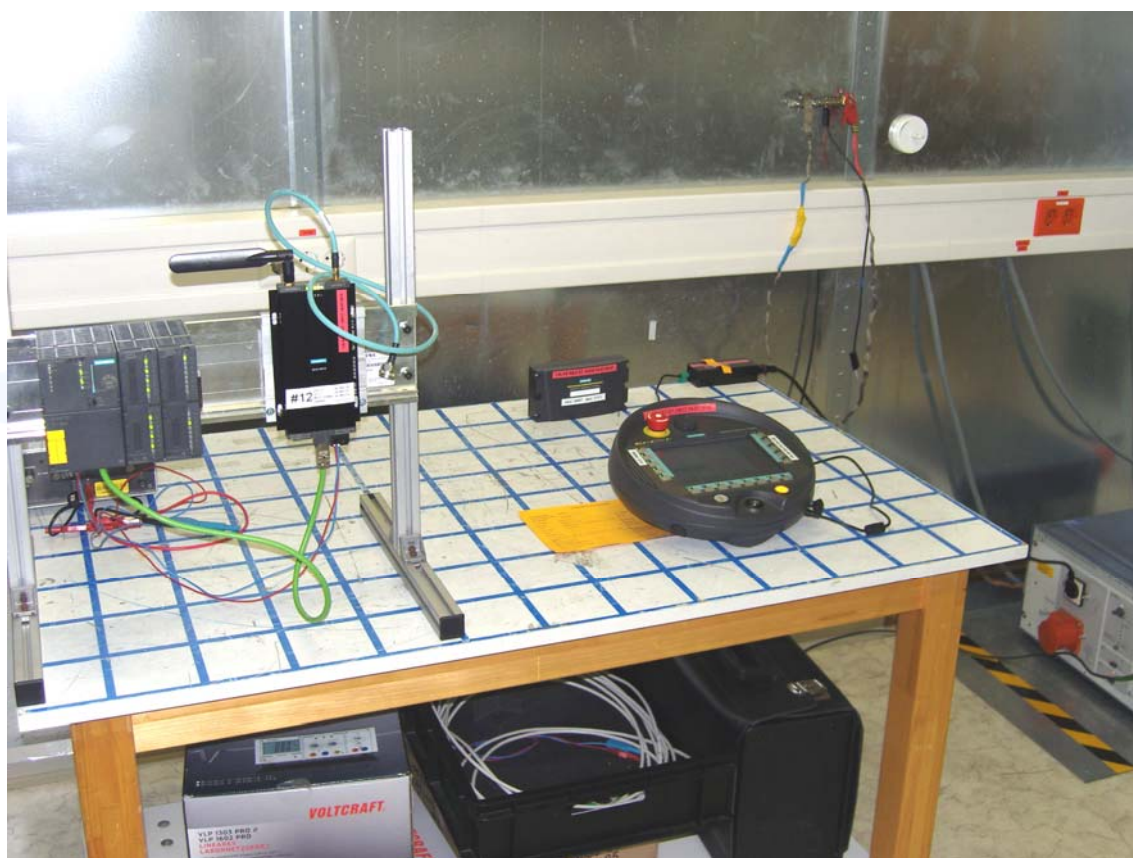
5.1 Conducted emissions

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 (dB μ V) | |
|-----------------------------|------------------------------|------------|
| | 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

FCC ID:U9A277IWLAN-V210**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 remeasured using a tuned receiver with quasi-peak and average detection and recorded.

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

$$\text{dB}\mu\text{V} = 20 \log \mu\text{V}$$

$$\mu\text{V} = 10^{(\text{dB}\mu\text{V}/20)}$$

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 9.2 dB at 26 MHz

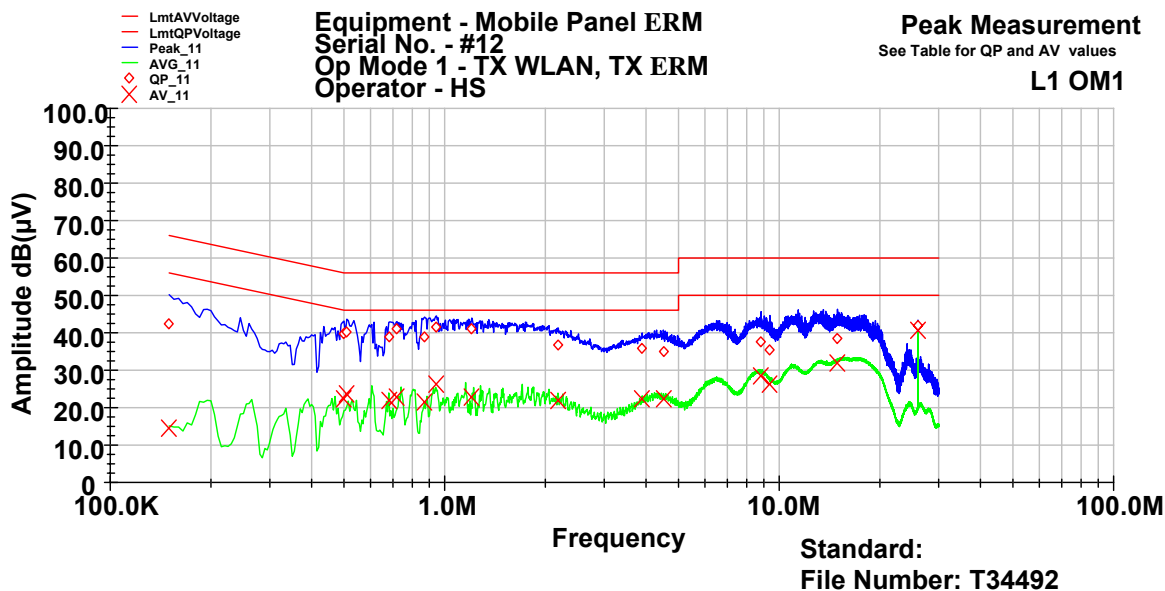
The requirements are **FULFILLED**.

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

FCC ID:U9A277IWLAN-V210

5.1.6 Test protocol

Test point: L1
 Operation mode: Data transmission (Client mode)
 Remarks:
 Result: passed

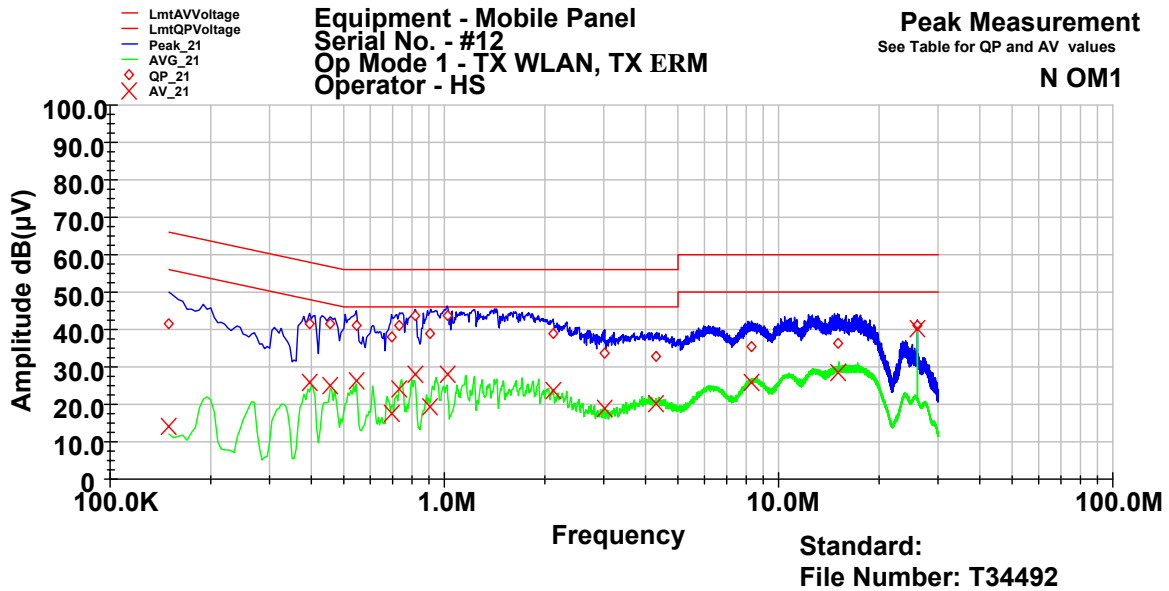


| Frequency MHz | QP Level dB(µV) | QP Delta dB | QP Limit dB | AV Level dB(µV) | AV Delta dB | AV Limit dB |
|---------------|-----------------|-------------|-------------|-----------------|-------------|-------------|
| 0.15 | 42.3 | -23.8 | 66.0 | 14.6 | -41.3 | 56.0 |
| 0.5 | 39.7 | -16.3 | 56.0 | 22.5 | -23.5 | 46.0 |
| 0.51 | 40.4 | -15.6 | 56.0 | 23.6 | -22.4 | 46.0 |
| 0.685 | 39.0 | -17.0 | 56.0 | 21.8 | -24.2 | 46.0 |
| 0.72 | 41.2 | -14.8 | 56.0 | 22.8 | -23.2 | 46.0 |
| 0.87 | 39.0 | -17.0 | 56.0 | 21.3 | -24.7 | 46.0 |
| 0.945 | 41.5 | -14.5 | 56.0 | 26.3 | -19.7 | 46.0 |
| 1.205 | 41.0 | -15.0 | 56.0 | 22.8 | -23.2 | 46.0 |
| 2.185 | 36.5 | -19.5 | 56.0 | 22.0 | -24.0 | 46.0 |
| 3.895 | 35.7 | -20.3 | 56.0 | 22.4 | -23.6 | 46.0 |
| 4.505 | 35.0 | -21.0 | 56.0 | 22.3 | -23.7 | 46.0 |
| 8.83 | 37.8 | -22.2 | 60.0 | 28.5 | -21.5 | 50.0 |
| 9.375 | 35.5 | -24.5 | 60.0 | 26.2 | -23.8 | 50.0 |
| 14.935 | 38.6 | -21.4 | 60.0 | 31.9 | -18.1 | 50.0 |
| 26 | 41.8 | -18.3 | 60.0 | 40.8 | -9.2 | 50.0 |

FCC ID:U9A277IWLAN-V210

Test point: N
 Operation mode: Data transmission (Client mode)
 Remarks:

Result: passed



| Frequency MHz | QP Level dB(µV) | QP Delta dB | QP Limit dB | AV Level dB(µV) | AV Delta dB | AV Limit dB |
|---------------|-----------------|-------------|-------------|-----------------|-------------|-------------|
| 0.15 | 41.5 | -24.5 | 66.0 | 14.2 | -41.8 | 56.0 |
| 0.395 | 41.7 | -16.3 | 58.0 | 25.9 | -22.0 | 48.0 |
| 0.455 | 41.4 | -15.4 | 56.8 | 24.8 | -22.0 | 46.8 |
| 0.545 | 41.2 | -14.8 | 56.0 | 26.2 | -19.8 | 46.0 |
| 0.695 | 37.9 | -18.1 | 56.0 | 17.5 | -28.5 | 46.0 |
| 0.735 | 41.1 | -14.9 | 56.0 | 24.0 | -22.0 | 46.0 |
| 0.82 | 43.6 | -12.4 | 56.0 | 28.2 | -17.8 | 46.0 |
| 0.91 | 38.8 | -17.2 | 56.0 | 19.1 | -26.9 | 46.0 |
| 1.02 | 43.9 | -12.1 | 56.0 | 28.2 | -17.8 | 46.0 |
| 2.115 | 38.7 | -17.3 | 56.0 | 23.9 | -22.1 | 46.0 |
| 3.015 | 33.5 | -22.5 | 56.0 | 18.7 | -27.3 | 46.0 |
| 4.315 | 32.9 | -23.1 | 56.0 | 20.4 | -25.6 | 46.0 |
| 8.295 | 35.5 | -24.5 | 60.0 | 25.8 | -24.2 | 50.0 |
| 15.02 | 36.4 | -23.6 | 60.0 | 28.5 | -21.5 | 50.0 |
| 26 | 41.2 | -18.8 | 60.0 | 40.2 | -9.8 | 50.0 |

FCC ID:U9A277IWLAN-V210

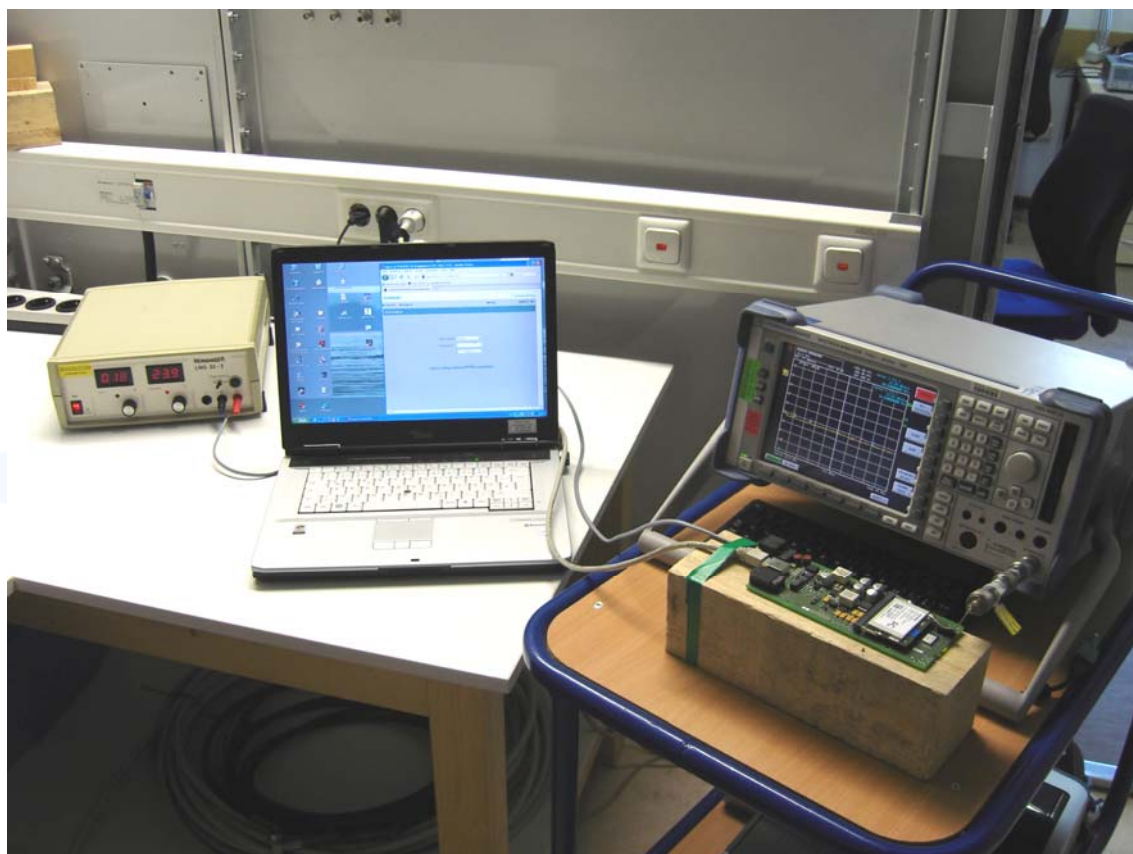
5.2 26 dB emission bandwidth

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

5.2.1 Description of the test location

Test location: AREA4

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15 Subpart 15.401 (i): The emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum of the modulated carrier.

5.2.4 Description of Measurement

The bandwidth was measured at an amplitude level reduced from the reference level by a specified ratio of -26 dB. The reference level is the level of the highest amplitude signal observed from the transmitter fundamental frequency

Spectrum analyzer settings: RBW = 300 kHz, VBW = 1 MHz, Detector: Peak

FCC ID:U9A277IWLAN-V210**5.2.5 Test result**

| Channel number | Fundamental frequency (MHz) | 26 dB Bandwidth (MHz) |
|----------------|-----------------------------|-----------------------|
| 52 | 5260 | 38.1 |
| 56 | 5280 | 38.3 |
| 64 | 5320 | 25.7 |
| 100 | 5500 | 28.7 |
| 120 | 5600 | 37.1 |
| 140 | 5700 | 32.6 |

Remarks: For detailed test result please refer to following test protocols.

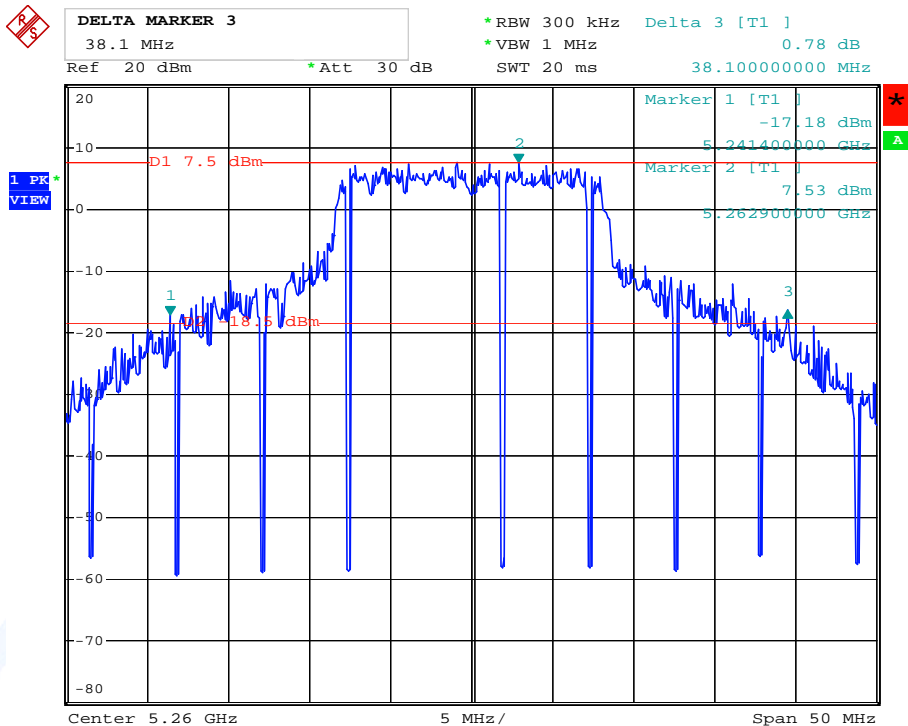
mikes

FCC ID:U9A277IWLAN-V210

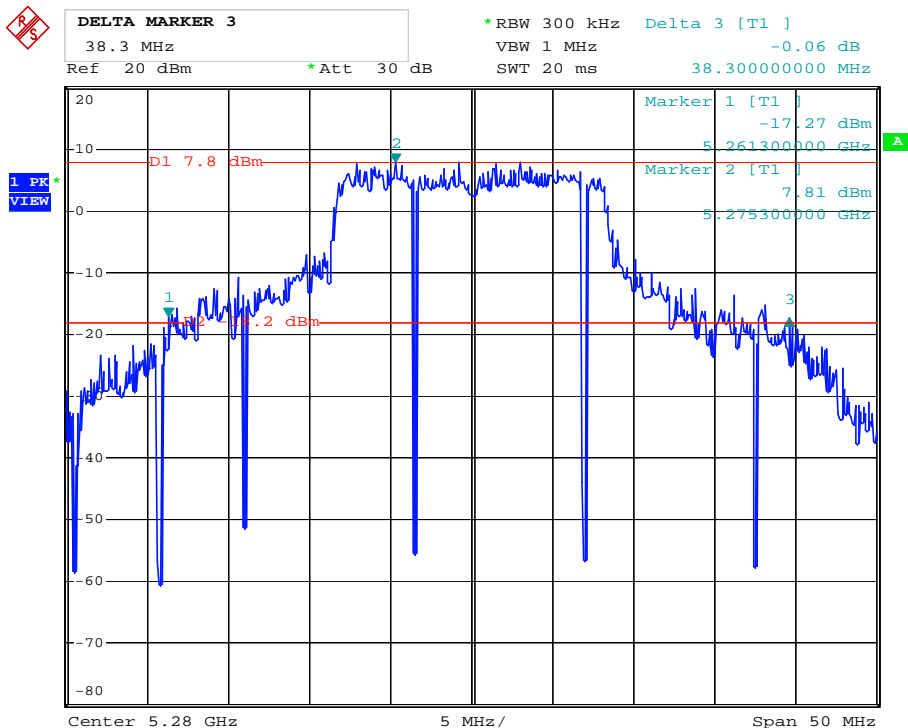
5.2.6 Test protocol

26dB bandwidth measurement plots

802.11h, Channel 52 (5260 MHz)

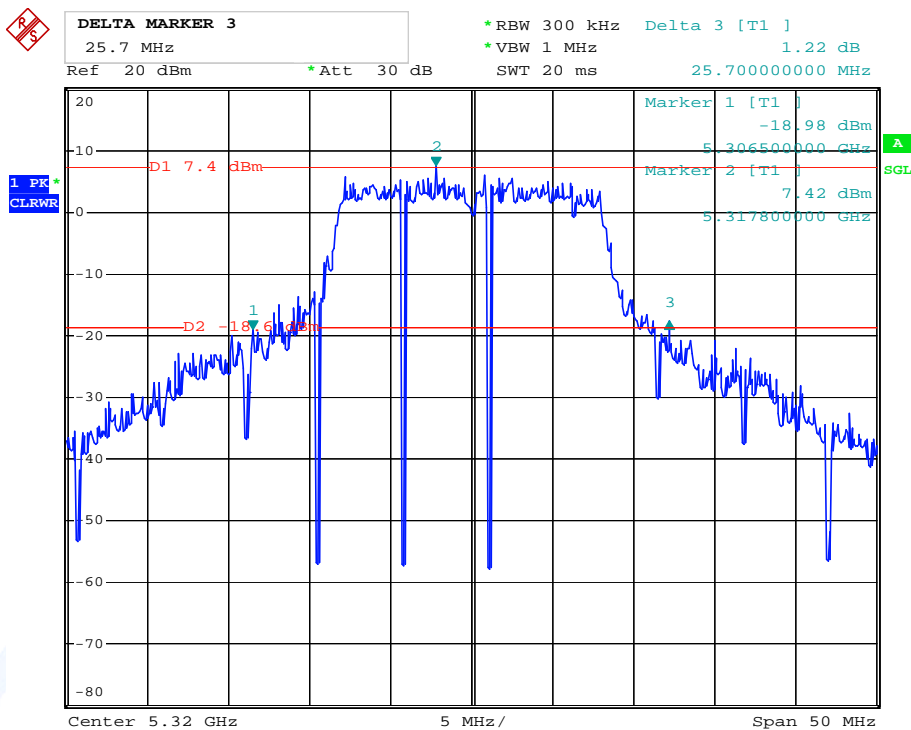


802.11h, Channel 56 (5280 MHz)

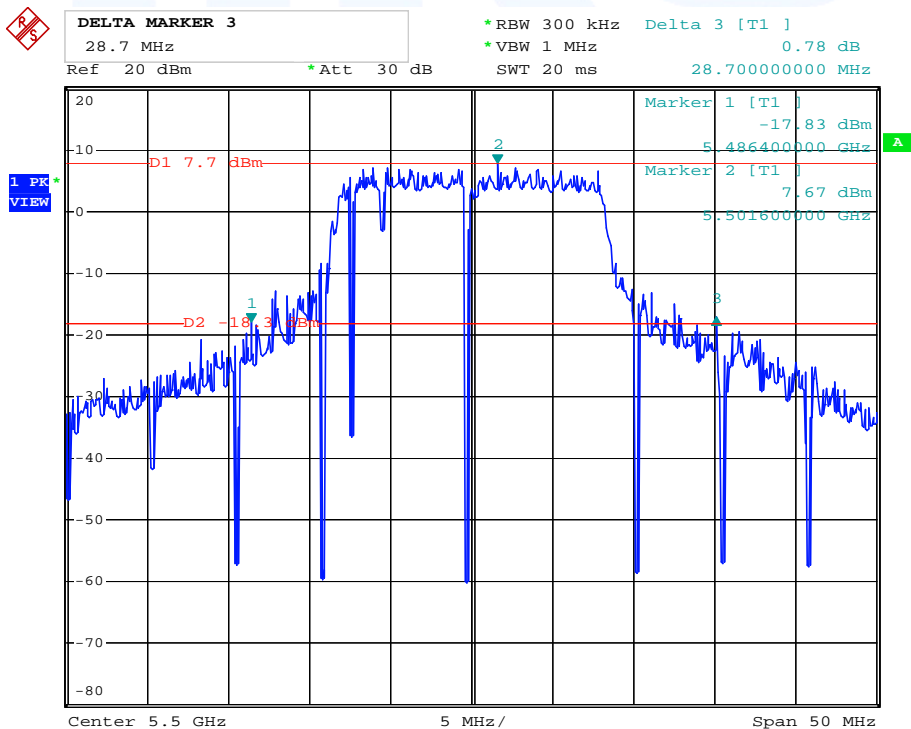


FCC ID:U9A277IWLAN-V210

802.11h, Channel 64 (5320 MHz)

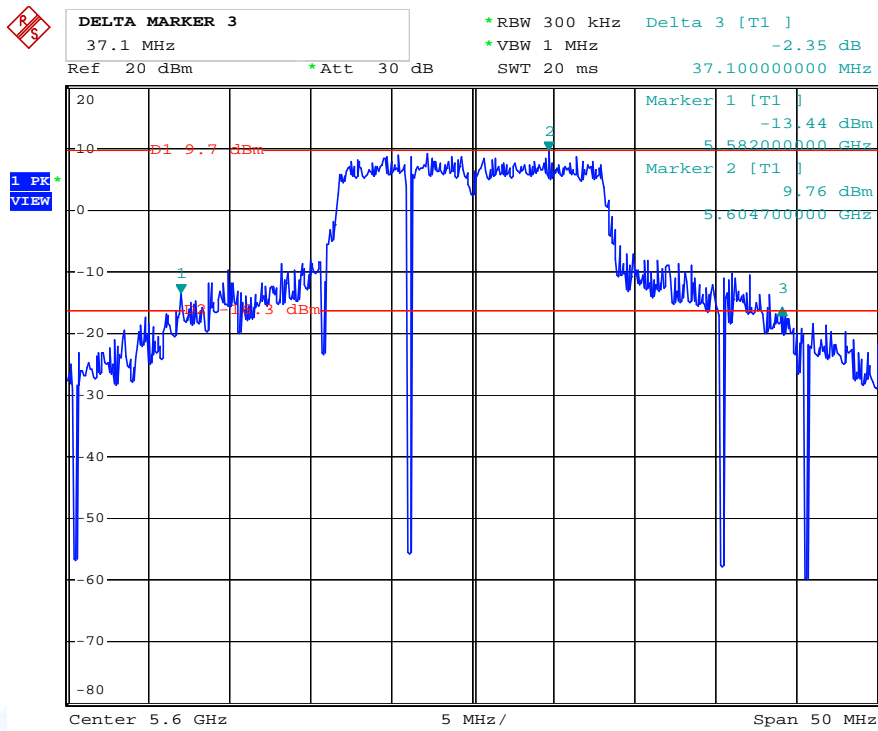


802.11h, Channel 100 (5500 MHz)

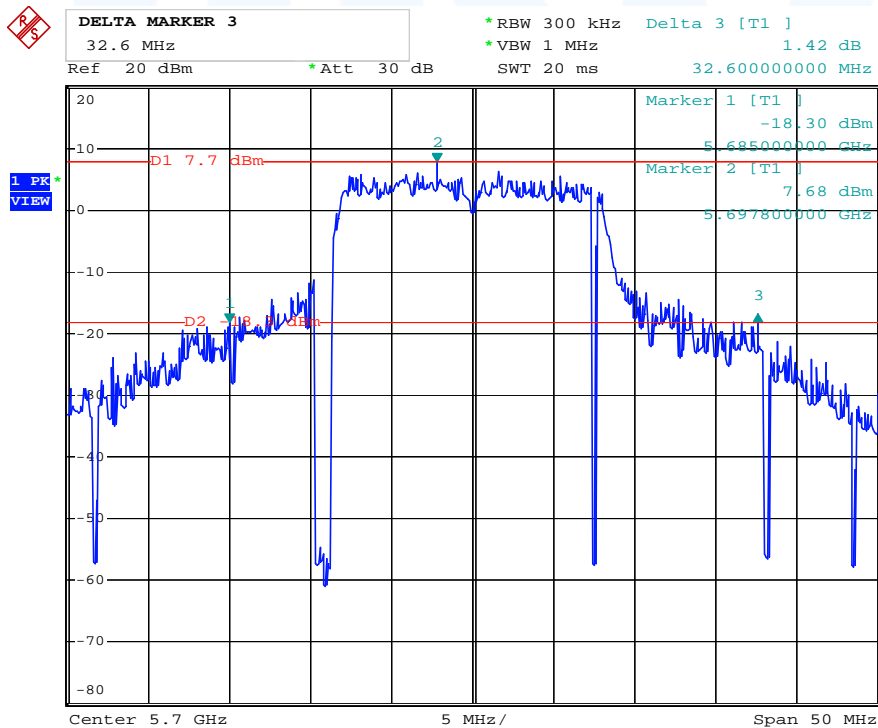


FCC ID:U9A277IWLAN-V210

802.11h, Channel 120 (5600 MHz)



802.11h, Channel 140 (5700 MHz)

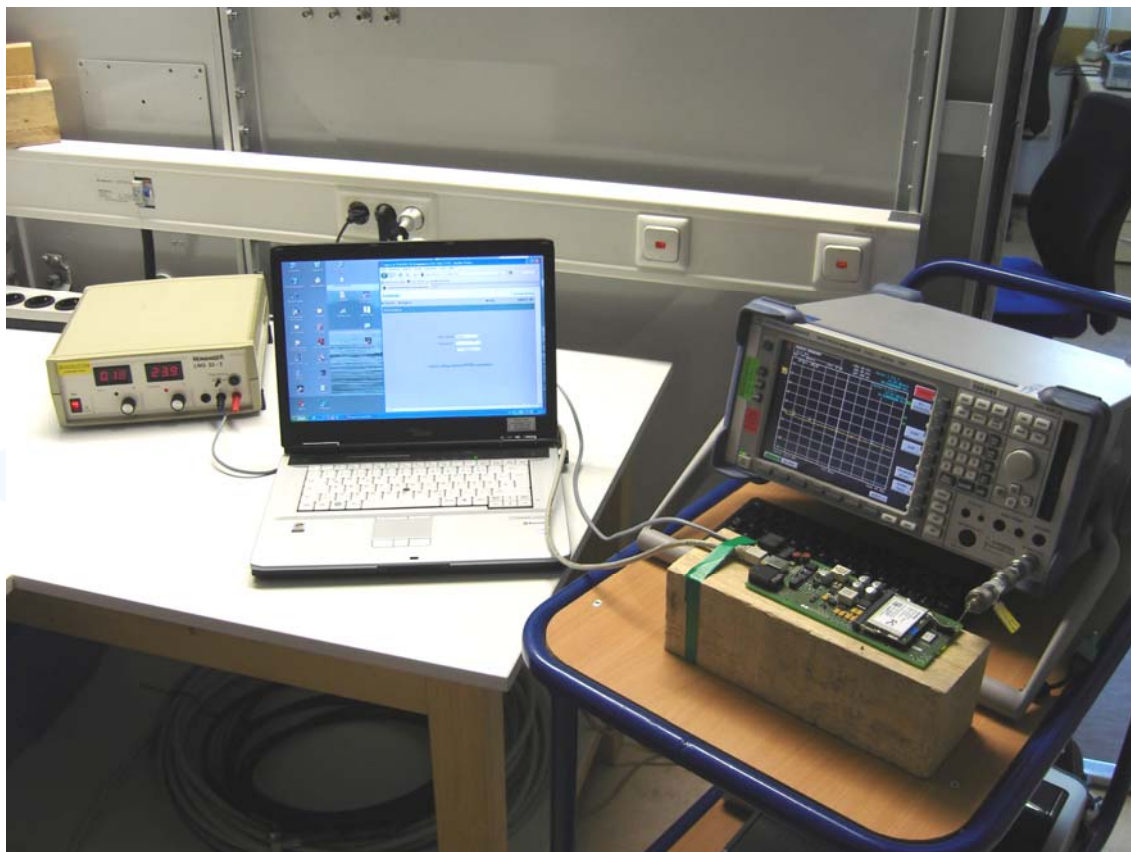


FCC ID:U9A277IWLAN-V210**5.3 Maximum conducted output power**

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

5.3.1 Description of the test location

Test location: AREA4

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

According to FCC Part 15 Subpart 15.401 (n): The total transmits power delivered to all antennas and antenna elements averaged across all symbols in the signalling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. The applicable power limits are defined in Part 15.407 (a).

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.

FCC ID:U9A277IWLAN-V210

5.3.4 Description of measurement

The transmitter output was connected to the spectrum analyzer through an attenuator. The center frequency of the spectrum analyzer is set to the fundamental frequency using RBW = 1 MHz and VBW = 300 kHz. The span of the spectrum analyser should be larger than the Emission Band Width (EBW). To get the total power of the occupied bandwidth the function "Channel Power Measurement" of the analyzer is used. The channel bandwidth is set to 20 MHz. With AV detector and Power Mode "Max Hold" the result is the summed maximum output power.

5.3.5 Test result

| Channel | f (MHz) | SW settings (dBm) | Power conducted (dBm) | Antenna gain (dBi) | EIRP (dBm) | EIRP limit (dBm) | Delta (dB) |
|---------|------------|-------------------------|-----------------------------|--------------------------|---------------|------------------------|---------------|
| 52 | 5260 | 20.0 | 15.8 | 5.0 | 20.8 | 30.0 | -9.2 |
| 56 | 5280 | 20.0 | 15.8 | 5.0 | 20.8 | 30.0 | -9.2 |
| 64 | 5320 | 20.0 | 13.9 | 5.0 | 18.9 | 30.0 | -11.1 |
| 100 | 5500 | 20.0 | 15.4 | 5.0 | 20.4 | 30.0 | -9.6 |
| 120 | 5600 | 20.0 | 17.7 | 5.0 | 21.3 | 30.0 | -8.7 |
| 140 | 5700 | 20.0 | 14.3 | 5.0 | 22.7 | 30.0 | -7.3 |

Note: The calculated EIRP includes the maximum gain of the applicable antenna.

Peak Power Limit according to FCC Subpart 15.407(a):

| Frequency (MHz) | Conducted power limit (dBm) | EIRP limit (dBm) |
|--------------------|--------------------------------------|--------------------------------------|
| 5250 - 5350 | 24.0 or $11 + (10 \log_{10} B_{Ch})$ | 30.0 or $17 + (10 \log_{10} B_{Ch})$ |
| 5470 - 5725 | 24.0 or $11 + (10 \log_{10} B_{Ch})$ | 30.0 or $17 + (10 \log_{10} B_{Ch})$ |

The requirements are **FULFILLED**.

Remarks: This test has been performed conducted at antenna cable on WLAN module.

FCC ID:U9A277IWLAN-V210

5.4 Undesirable emissions

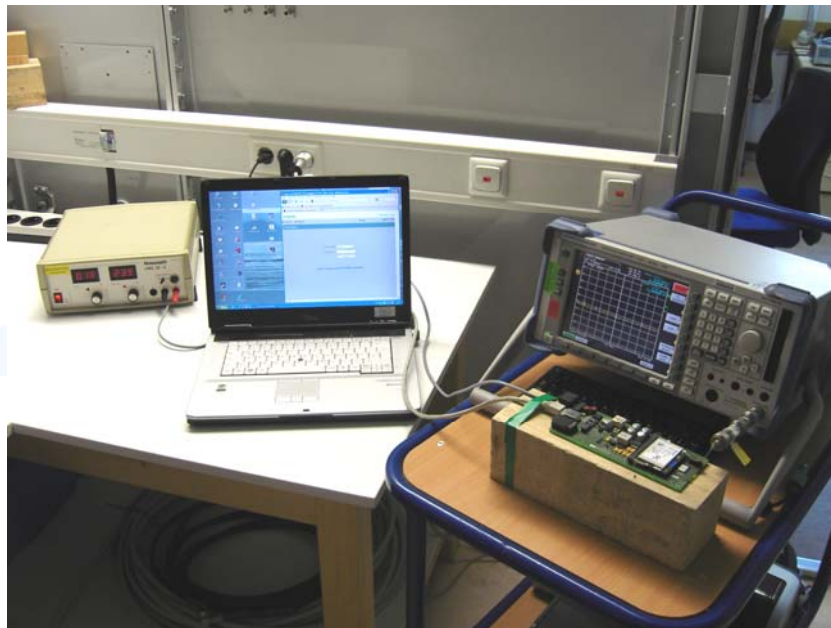
For test instruments and accessories used see section 6 Part **SEC 1-3, SER 1, SER 2 and SER 3.**

5.4.1 Description of the test location

Test location: AREA 4
Test location: OATS1
Anechoic Chamber A2
Test distance: 3 metres

5.4.2 Photo documentation of the test set-up

Conducted measurements



Open area test site (9 kHz – 30 MHz)

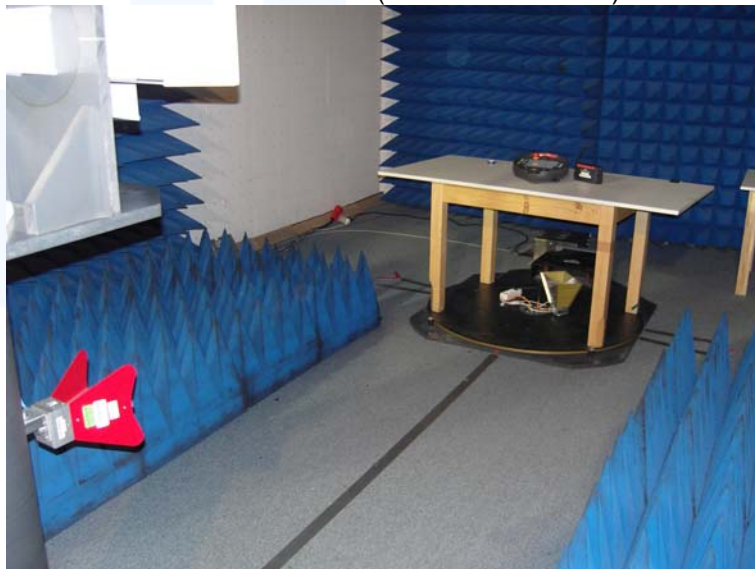


FCC ID:U9A277IWLAN-V210

Open area test site (30 MHz – 1000 MHz)



Anechoic chamber (960 MHz – 18 GHz)

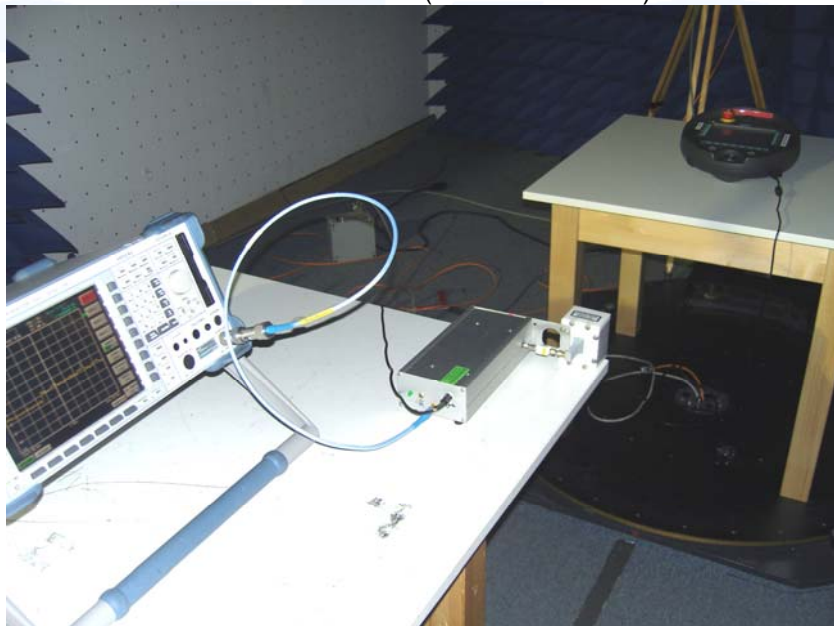


FCC ID:U9A277IWLAN-V210

Anechoic chamber (18 GHz – 30 GHz)



Anechoic chamber (30 GHz – 40 GHz)



FCC ID:U9A277IWLAN-V210

5.4.3 Applicable standard

According to FCC Part 15 Subpart 15.407 (b):

- (2) For transmitters operating in the 5.25 - 5.35 GHz band:
All emissions outside of the 5.15 - 5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25 - 5.35 GHz band that generate emissions in the 5.15 - 5.25 GHz band must meet all applicable technical requirements for operation in the 5.15 - 5.25 GHz or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15 - 5.25 GHz band.
- (3) For transmitters operating in the 5.47 - 5.725 GHz band:
All emissions outside of the 5.47 - 5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limit specified in §15.209(a) (see §15.205(c)).

5.4.4 Description of measurement

Spurious emissions from the EUT are measured with the procedure set out under ANSI C63.4-2003. According to Part 15.407 (b) (5) the emission measurements have been performed using a minimum RBW of 1 MHz.

Spectrum analyzer settings:

Peak values: RBW: 1 MHz, VBW: 3 MHz, Sweep: Auto;
Average values: RBW: 1 MHz, VBW: 10 Hz, Sweep: Auto;

5.4.5 Test result

5.4.5.1 Conducted spurious emissions

Frequency band: 5.25 GHz to 5.35 GHz

| Channel 52 (5260 MHz) | | | | Channel 64 (5320 MHz) | | | |
|-----------------------|------------------|----------------|------------|-----------------------|------------------|----------------|------------|
| Frequency (MHz) | Peak Power (dBm) | AV-Limit (dBm) | Delta (dB) | Frequency (MHz) | Peak Power (dBm) | AV-Limit (dBm) | Delta (dB) |
| 9 - 150 kHz | <-60 | -27 | > -20 | 9 - 150 kHz | <-60 | -27 | > -20 |
| 150 kHz - 30 | <-60 | -27 | > -20 | 150 kHz - 30 | <-60 | -27 | > -20 |
| 30 - 1000 | <-60 | -27 | > -20 | 30 - 1000 | <-60 | -27 | > -20 |
| 1 - 5.15 GHz | <-47 | -27 | > -20 | 1 - 5.15 GHz | -46.2 | -27 | -19.8 |
| 5.15 - 5.25 GHz | 0.2 | 10 | -9.8 | 5.15 - 5.25 GHz | <-10 | 10 | > -20 |
| 5.35 - 40 GHz | -36.6 | -27 | -9.6 | 5.35 - 40 GHz | -32.9 | -27 | -5.9 |

Frequency band: 5.47 GHz to 5.725 GHz

| Channel 100 (5500 MHz) | | | | Channel 140 (5700 MHz) | | | |
|------------------------|------------------|----------------|------------|------------------------|------------------|----------------|------------|
| Frequency (MHz) | Peak power (dBm) | AV-Limit (dBm) | Delta (dB) | Frequency (MHz) | Peak power (dBm) | AV-Limit (dBm) | Delta (dB) |
| 9 - 150 kHz | <-60 | -27 | > -20 | 9 - 150 kHz | <-60 | -27 | > -20 |
| 150 kHz - 30 | <-60 | -27 | > -20 | 150 kHz - 30 | <-60 | -27 | > -20 |
| 30 - 1000 | <-60 | -27 | > -20 | 30 - 1000 | <-60 | -27 | > -20 |
| 1 - 5.47 GHz | -25.6 | -27 | 1.4 | 1 - 5.47 GHz | -47.3 | -27 | > -20 |
| 5.725 - 40 GHz | -42.8 | -27 | -15.8 | 5.725 - 40 GHz | -23.2 | -27 | 3.8 |

Note: All spurious emissions falling in restricted bands have been measured radiated.

FCC ID:U9A277IWLAN-V210

Re-measurement AV:

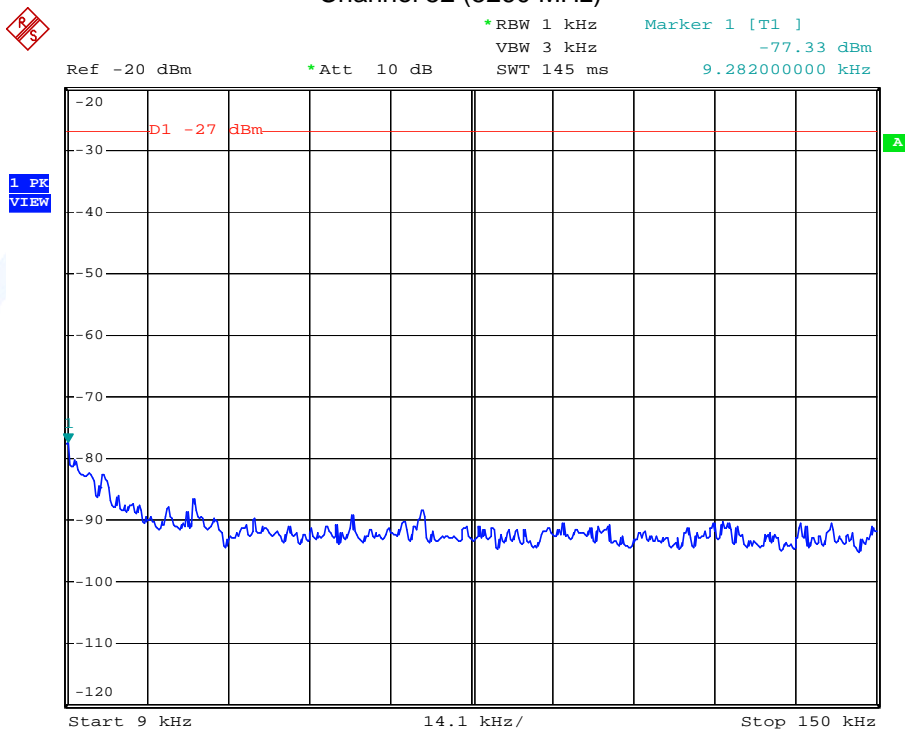
| Channel 100 (5500 MHz) | | | | Channel 140 (5700 MHz) | | | |
|------------------------|----------------|----------------|------------|------------------------|----------------|----------------|------------|
| Frequency (MHz) | AV Power (dBm) | AV-Limit (dBm) | Delta (dB) | Frequency (MHz) | AV Power (dBm) | AV-Limit (dBm) | Delta (dB) |
| 5469 | -44.7 | -27 | -17.7 | 5725 | -40.2 | -27 | -13.2 |

For detailed test results please see to test plots below.

5.4.5.2 Test plots spurious emissions, conducted:

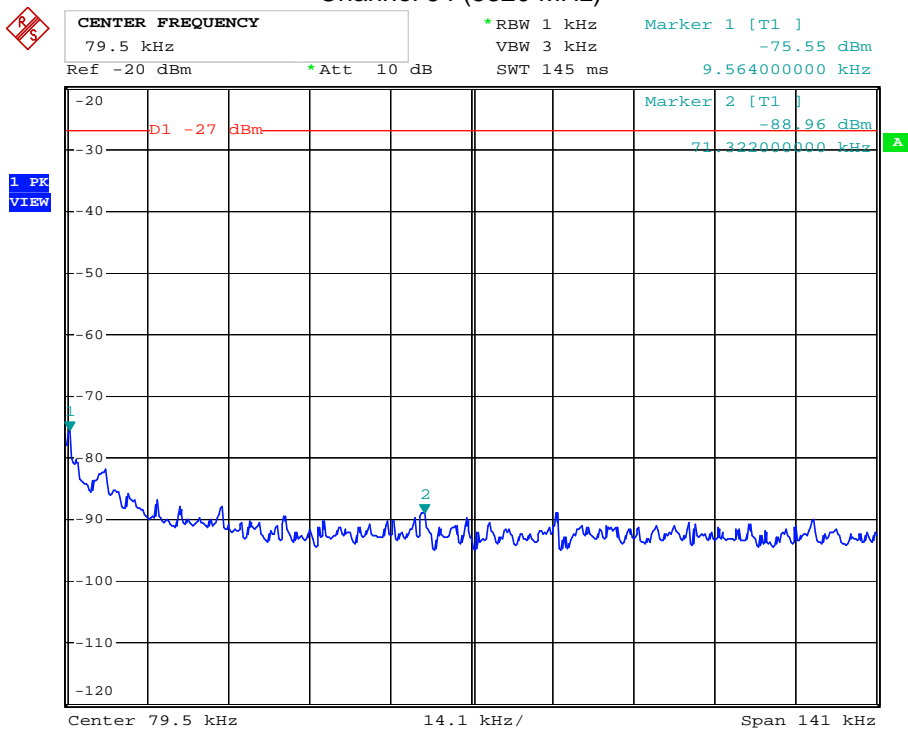
Spurious emissions from 9 kHz to 150 kHz

Channel 52 (5260 MHz)

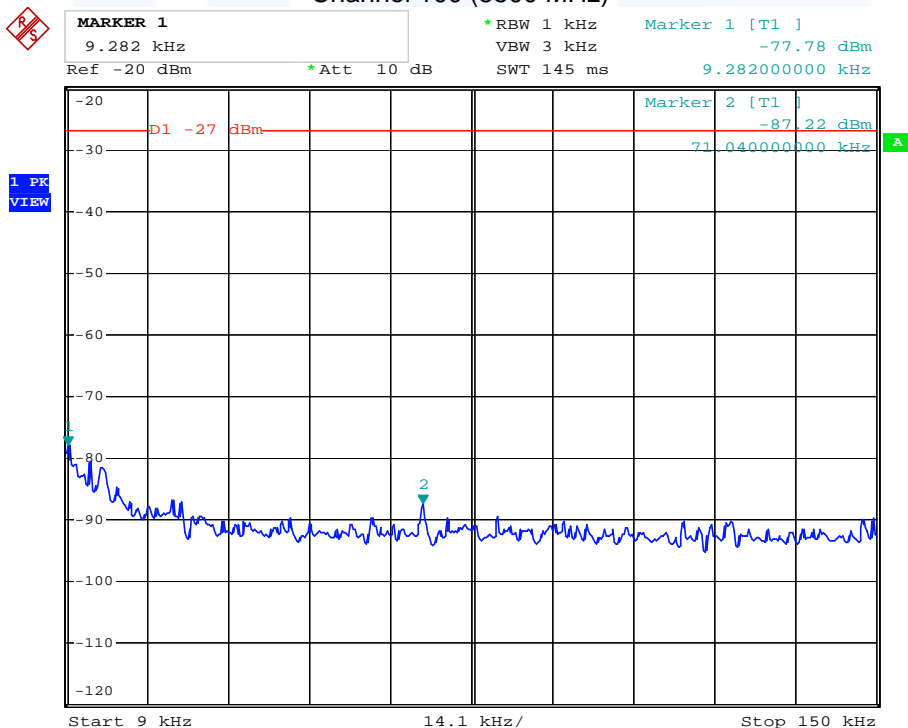


FCC ID:U9A277IWLAN-V210

Channel 64 (5320 MHz)

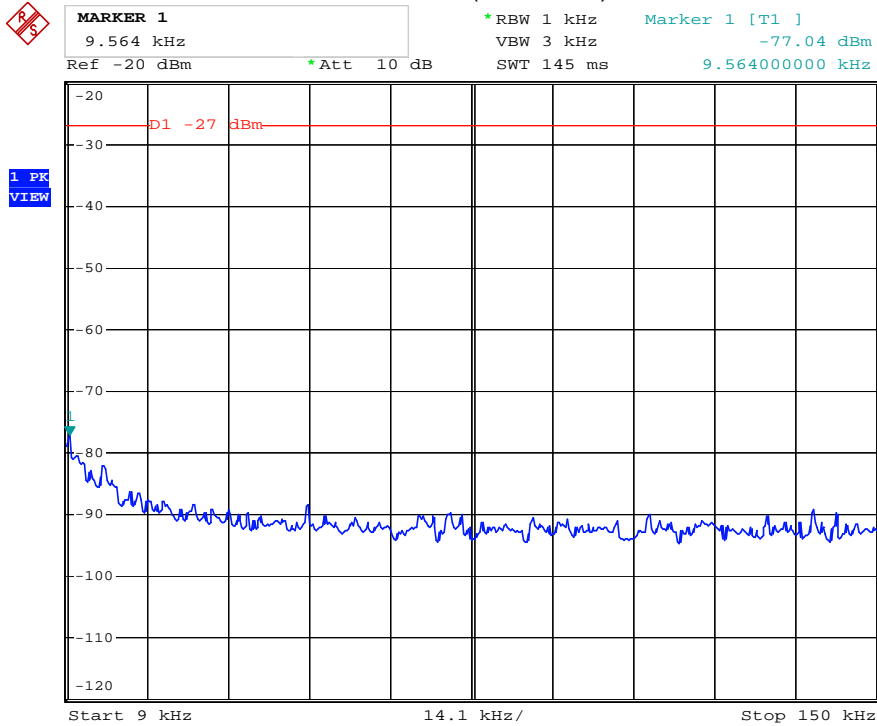


Channel 100 (5500 MHz)



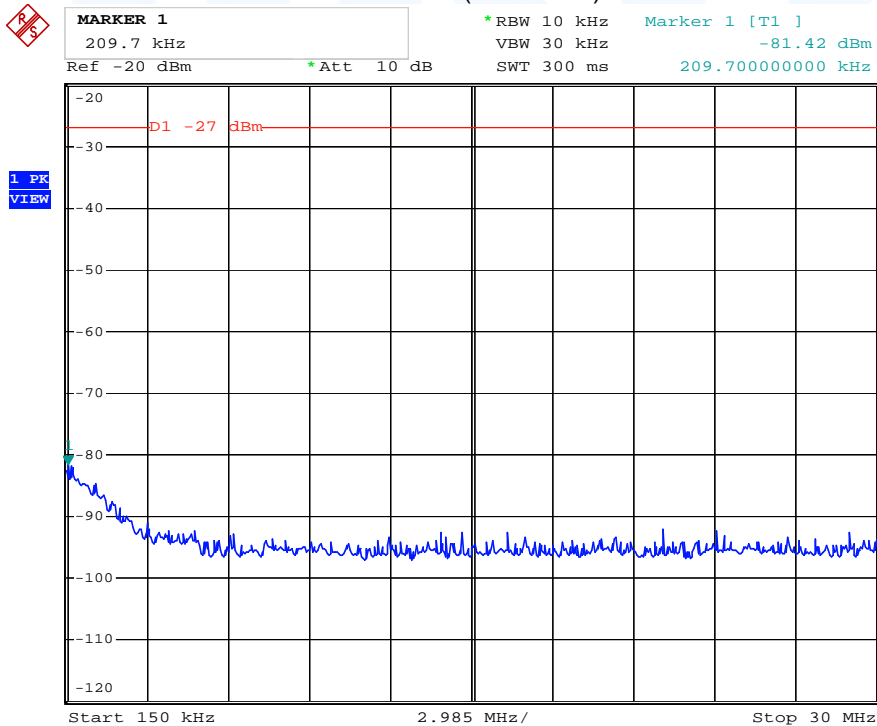
FCC ID:U9A277IWLAN-V210

Channel 140 (5700 MHz)



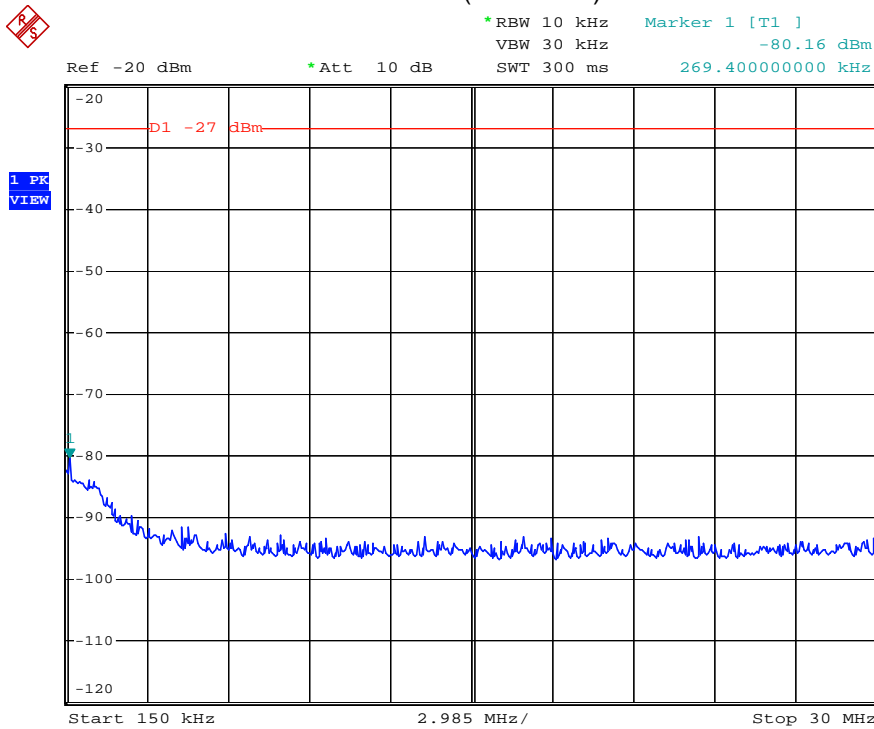
Spurious emissions from 150 kHz to 30 MHz

Channel 52 (5260 MHz)

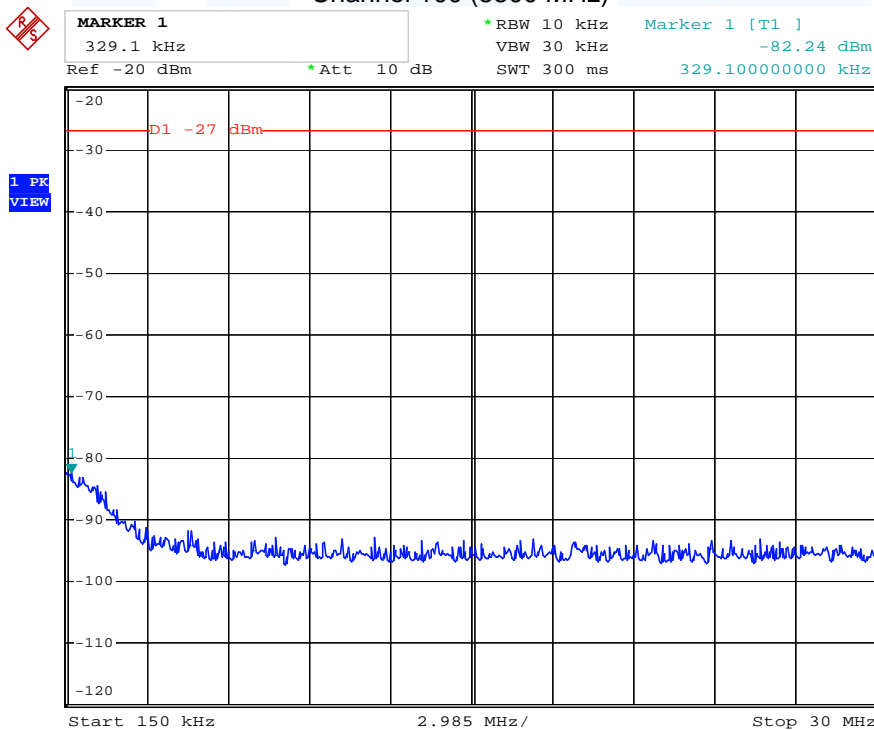


FCC ID:U9A277IWLAN-V210

Channel 64 (5320 MHz)

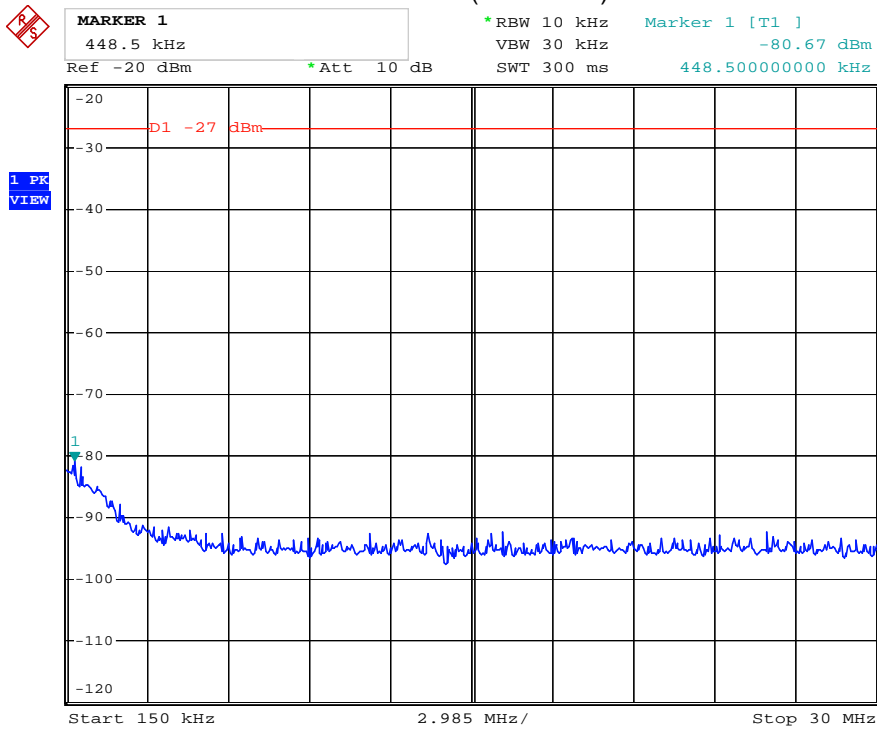


Channel 100 (5500 MHz)



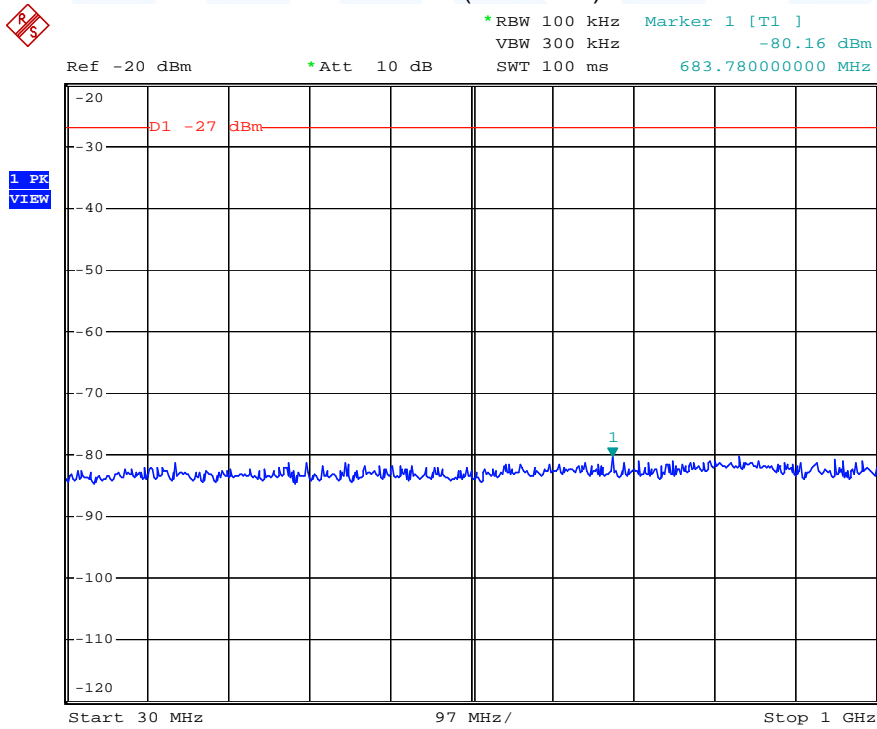
FCC ID:U9A277IWLAN-V210

Channel 140 (5700 MHz)



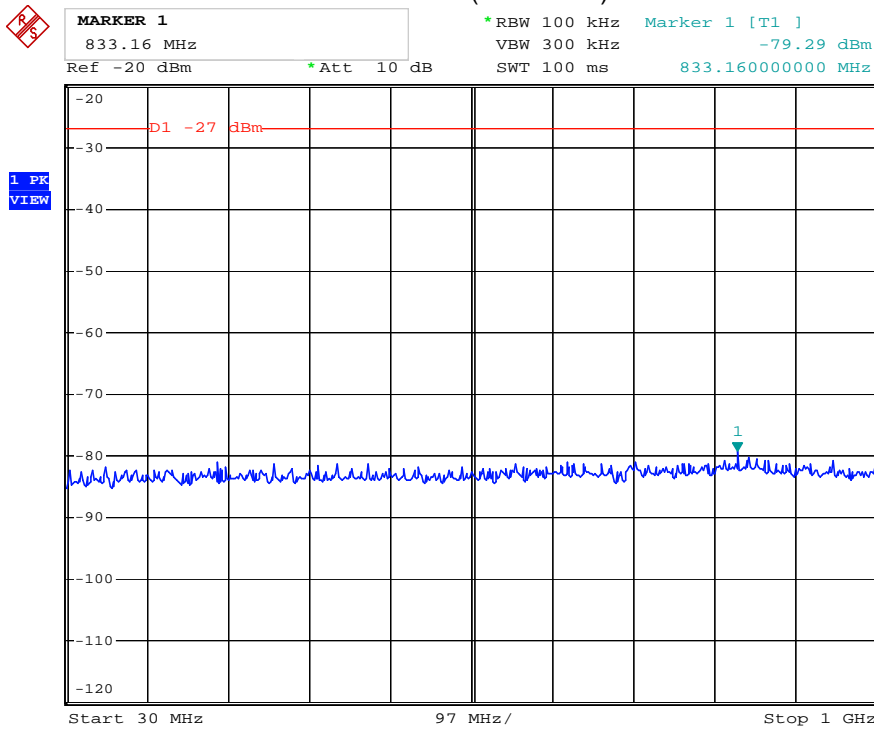
Spurious emissions from 30 MHz to 1000 MHz

Channel 52 (5260 MHz)



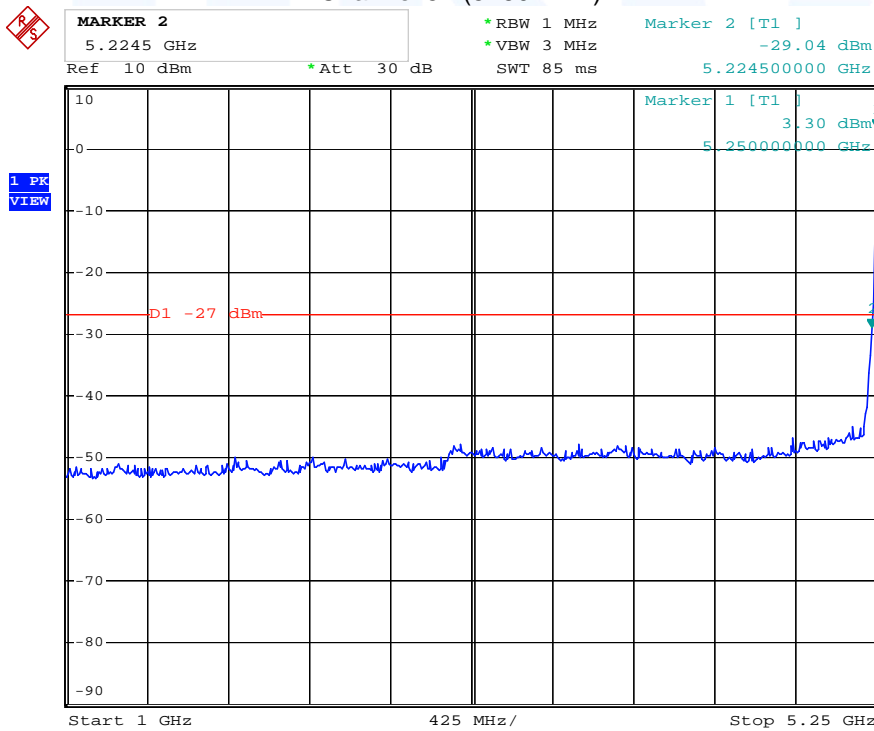
FCC ID:U9A277IWLAN-V210

Channel 140 (5700 MHz)



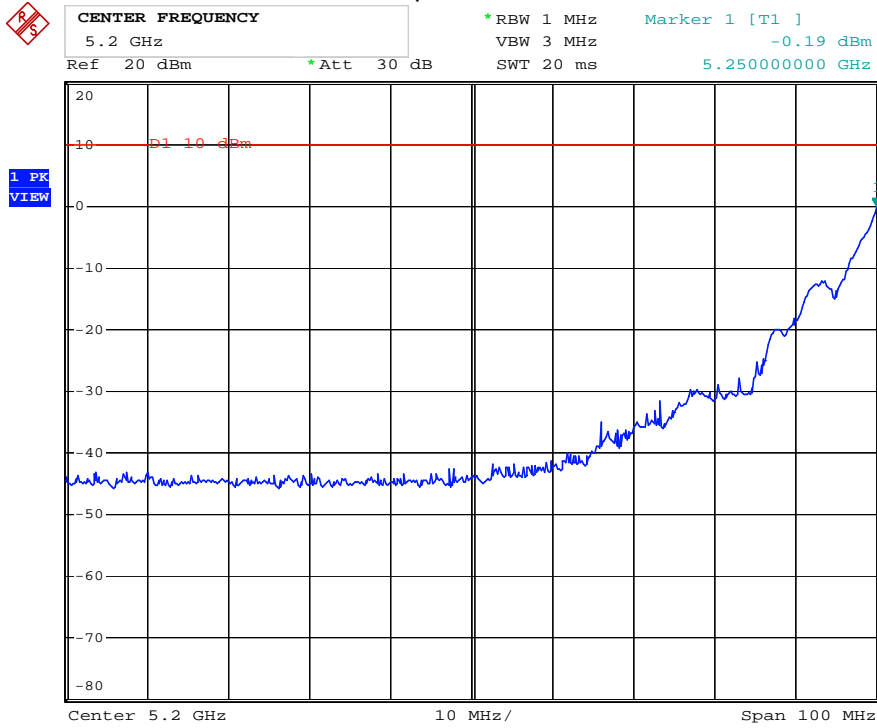
Spurious emissions from 1 GHz to 5.25 GHz

Channel 52 (5260 MHz)

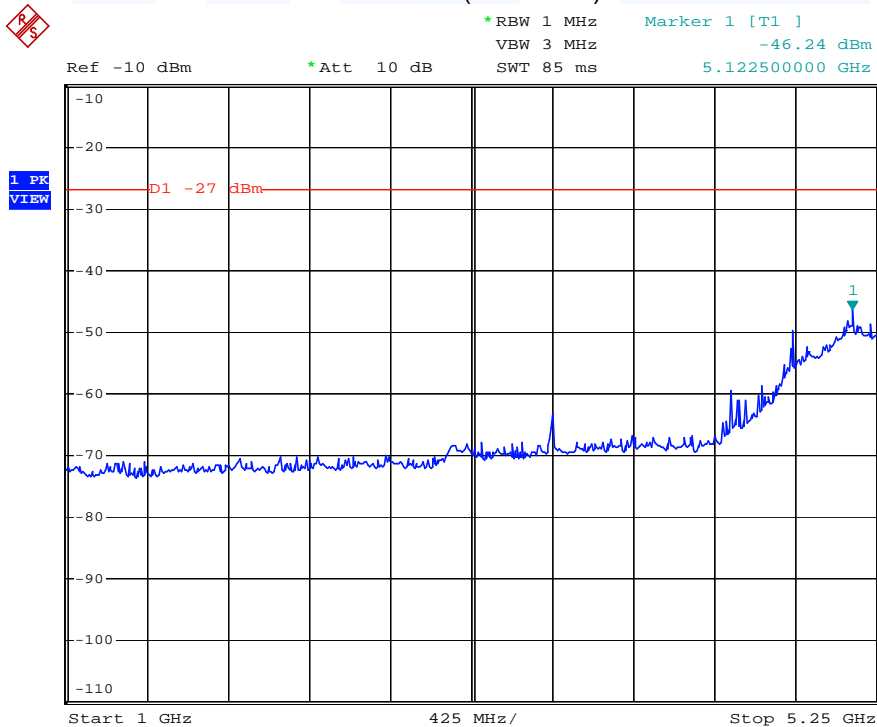


FCC ID:U9A277IWLAN-V210

Re-measurement with the requirements of band 5150 – 5250 MHz

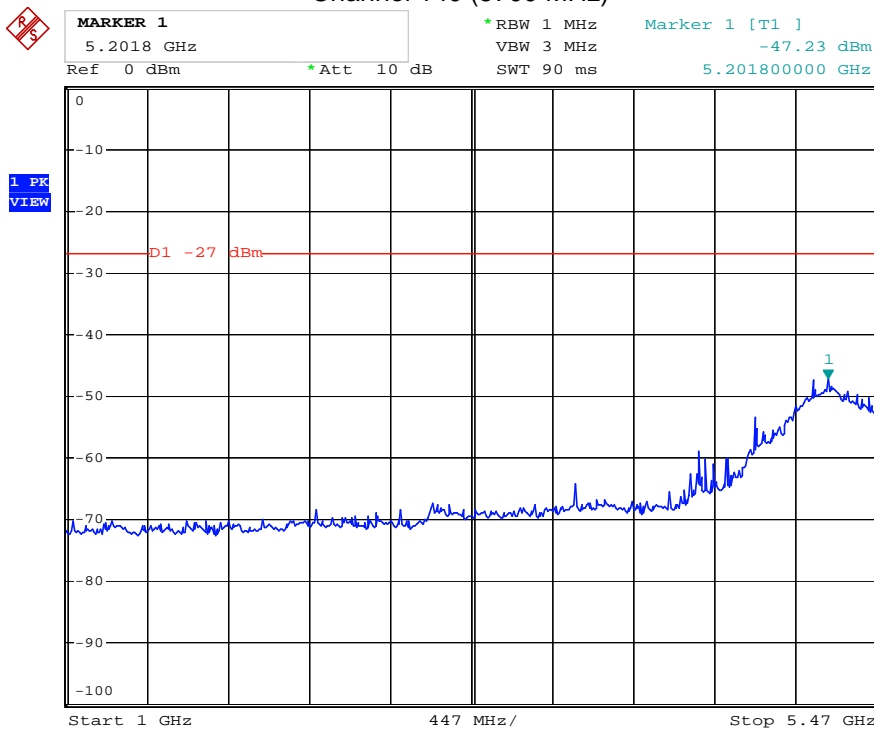


Channel 64 (5320 MHz)



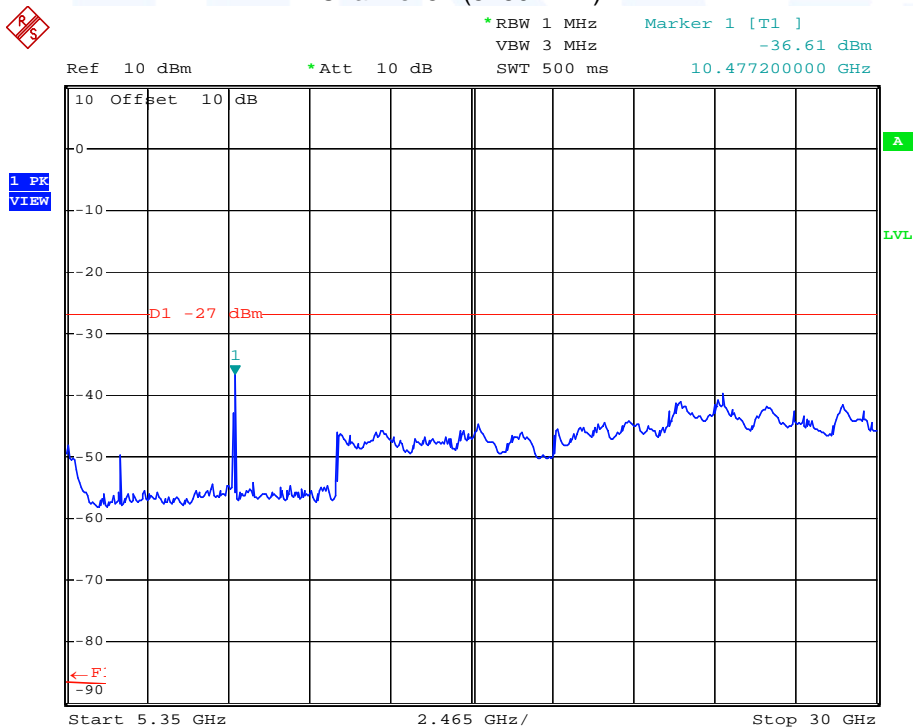
FCC ID:U9A277IWLAN-V210

Channel 140 (5700 MHz)



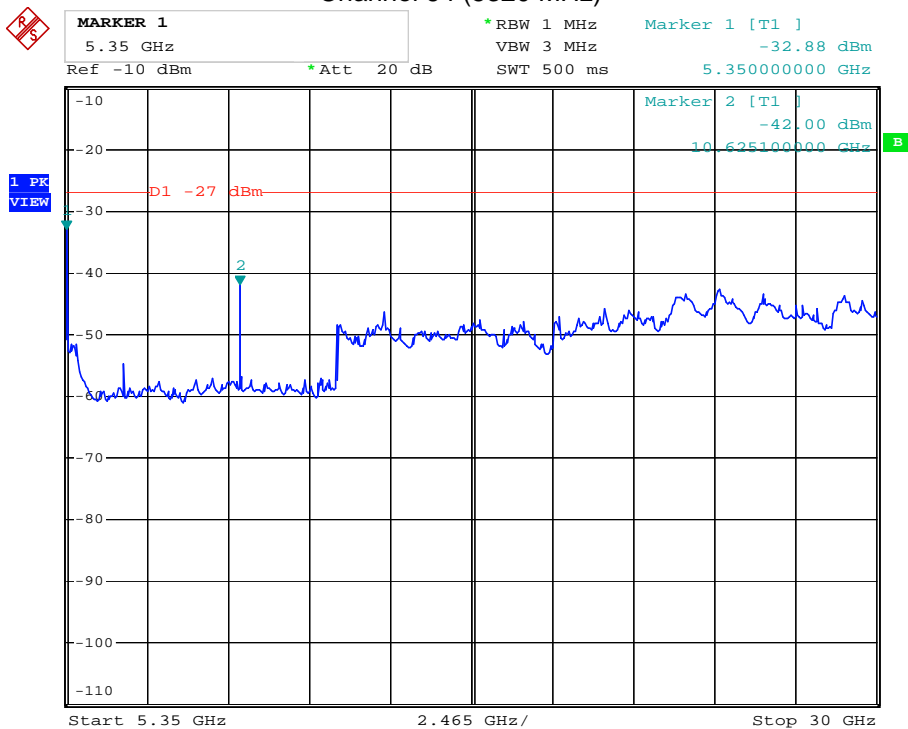
Spurious emissions from 5.35 GHz to 30 GHz

Channel 52 (5260 MHz)



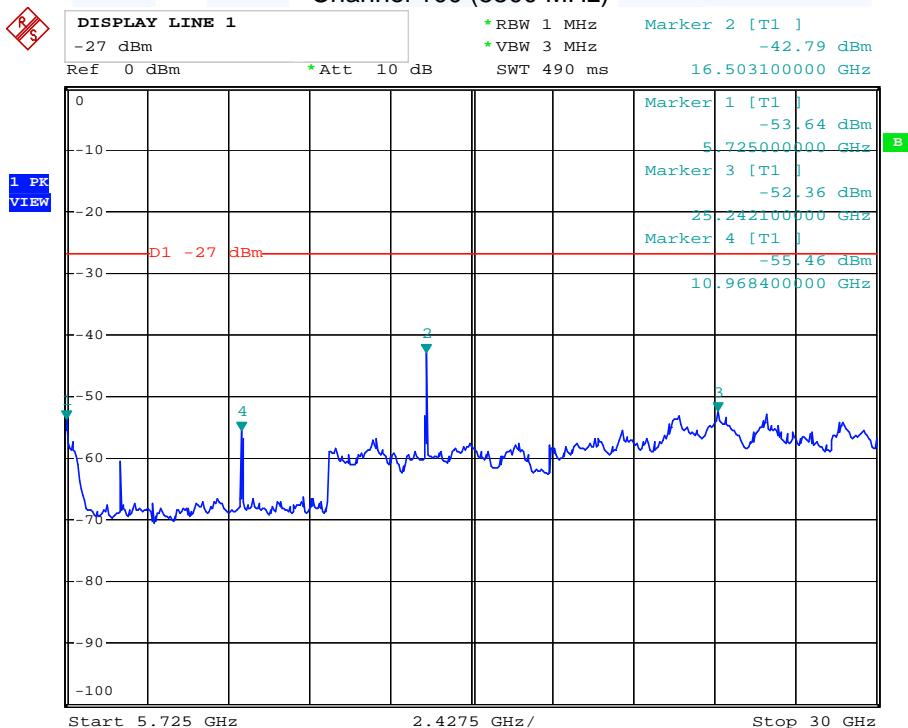
FCC ID:U9A277IWLAN-V210

Channel 64 (5320 MHz)



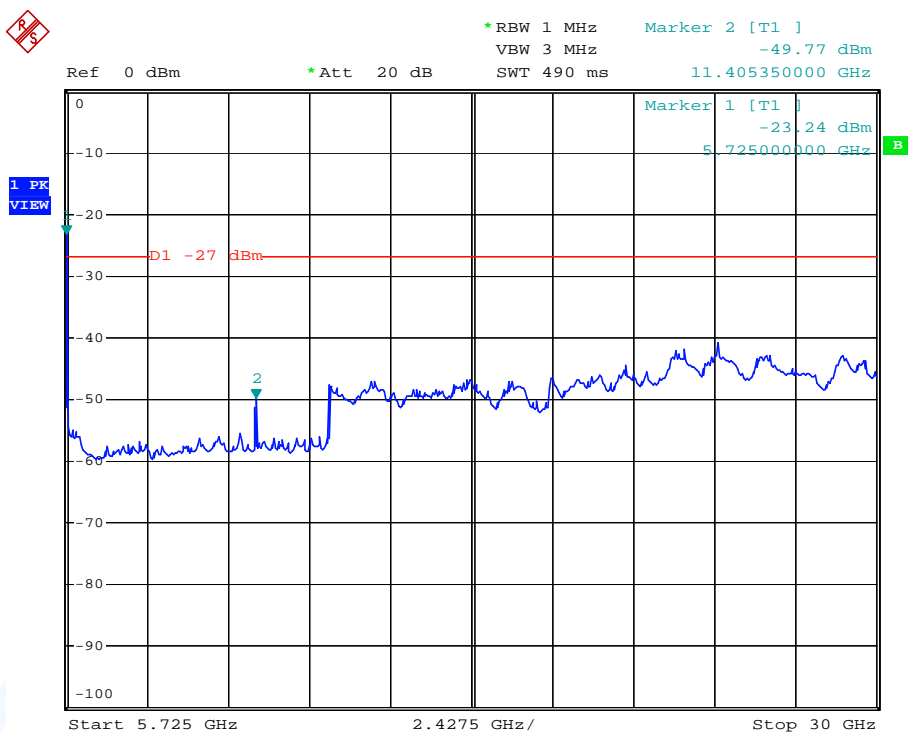
Spurious emissions from 5.725 GHz to 30 GHz

Channel 100 (5500 MHz)

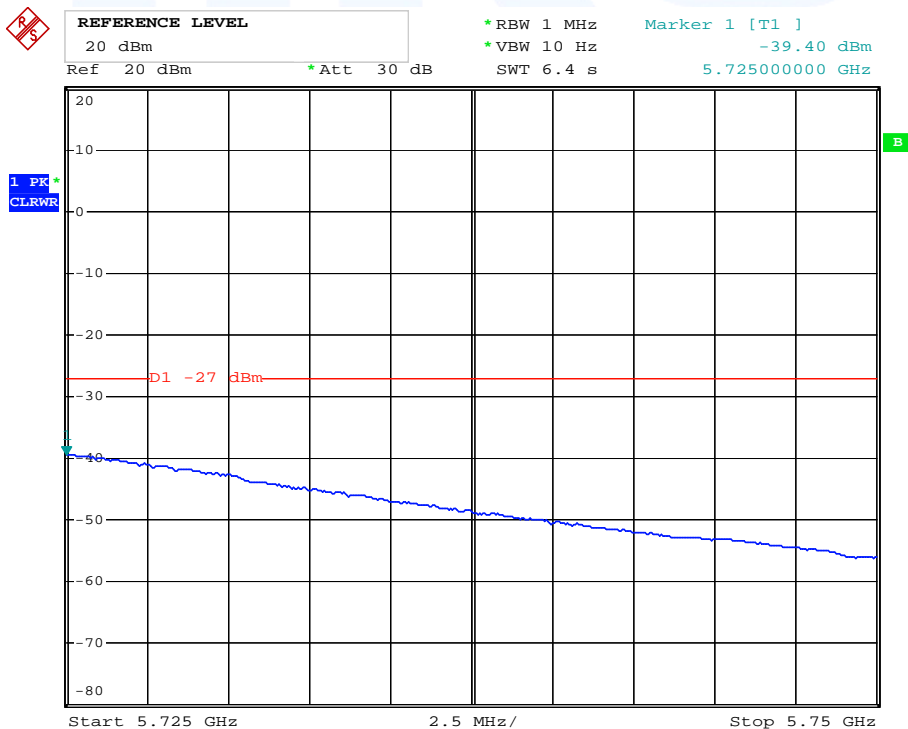


FCC ID:U9A277IWLAN-V210

Channel 140 (5700 MHz)



Re-measurement AV



FCC ID:U9A277IWLAN-V210

5.4.5.3 Radiated emissions and harmonics in restricted bands

Channel 52 (5260 MHz)

Nearest restricted band: 4500 to 5150 MHz and band 10.6 to 12.7 GHz

| Frequency (MHz) | Detector | Analyzer reading | | Correction (dB) | Result | | Limit (dBμV/m) | Delta (dB) |
|-----------------|----------|------------------|---------------|-----------------|--------------|---------------|----------------|------------|
| | | hor (dBμV/m) | vert (dBμV/m) | | hor (dBμV/m) | vert (dBμV/m) | | |
| 4875 | Pk | --- | --- | --- | 54.4 | 57.2 | 74 | -16.8 |
| | AV | --- | --- | --- | --- | 50.4 | 54 | -3.6 |
| 10516 | Pk | --- | --- | --- | 55.6 | 61.5 | 74 | -12.5 |
| | AV | --- | --- | --- | --- | 35.3 | 54 | -18.7 |

Channel 64 (5320 MHz)

Nearest restricted band: 5350 to 5460 MHz and band 10.6 to 12.7 GHz

| Frequency (MHz) | Detector | Analyzer reading | | Correction (dB) | Result | | Limit (dBμV/m) | Delta (dB) |
|-----------------|----------|------------------|---------------|-----------------|--------------|---------------|----------------|------------|
| | | hor (dBμV/m) | vert (dBμV/m) | | hor (dBμV/m) | vert (dBμV/m) | | |
| 5353 | Pk | --- | --- | --- | 54.6 | 57.3 | 74 | -16.7 |
| | AV | --- | --- | --- | --- | 30.1 | 54 | -23.9 |
| 10641 | Pk | --- | --- | --- | 54.6 | 57.1 | 74 | -16.9 |
| | AV | --- | --- | --- | --- | 33.9 | 54 | -20.1 |

Channel 100 (5500 MHz)

Nearest restricted band: 5350 to 5460 MHz

| Frequency (MHz) | Detector | Analyzer reading | | Correction (dB) | Result | | Limit (dBμV/m) | Delta (dB) |
|-----------------|----------|------------------|---------------|-----------------|--------------|---------------|----------------|------------|
| | | hor (dBμV/m) | vert (dBμV/m) | | hor (dBμV/m) | vert (dBμV/m) | | |
| 5459 | Pk | --- | --- | --- | --- | 60.5 | 74 | -13.5 |
| | AV | --- | --- | --- | --- | 29.6 | 54 | -24.4 |

Remark: No radiated harmonics in restricted band 10.6 to 12.7 GHz could be measured.

Channel 120 (5500 MHz)

Restricted band: 10.6 to 12.7 GHz

| Frequency (MHz) | Detector | Analyzer reading | | Correction (dB) | Result | | Limit (dBμV/m) | Delta (dB) |
|-----------------|----------|------------------|---------------|-----------------|--------------|---------------|----------------|------------|
| | | hor (dBμV/m) | vert (dBμV/m) | | hor (dBμV/m) | vert (dBμV/m) | | |
| 11200 | Pk | --- | --- | --- | --- | 57.1 | 74 | -16.9 |
| | AV | --- | --- | --- | --- | 34.7 | 54 | -19.3 |

Channel 140 (5700 MHz)

Nearest restricted band: 5350 to 5460 MHz and band 10.6 to 12.7 GHz

| Frequency (MHz) | Detector | Analyzer reading | | Correction (dB) | Result | | Limit (dBμV/m) | Delta (dB) |
|-----------------|----------|------------------|---------------|-----------------|--------------|---------------|----------------|------------|
| | | hor (dBμV/m) | vert (dBμV/m) | | hor (dBμV/m) | vert (dBμV/m) | | |
| 5350-5460 | Pk | --- | --- | --- | <54 | <54 | 74 | <-20.0 |
| | AV | --- | --- | --- | --- | --- | 54 | --- |
| 11407 | Pk | --- | --- | --- | --- | 57.8 | 74 | -16.2 |
| | AV | --- | --- | --- | --- | 35.2 | 54 | -18.8 |

FCC ID:U9A277IWLAN-V210

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

| Frequency (MHz) | Field strength of spurious emissions | | Measurement distance (m) |
|-----------------|--------------------------------------|------------------------|--------------------------|
| | ($\mu\text{V/m}$) | dB ($\mu\text{V/m}$) | |
| 0,009-0,490 | 2400/F(kHz) | | 300 |
| 0,490-1,705 | 24000/F(kHz) | | 30 |
| 1,705-30 | 30 | 29,5 | 30 |
| 30-88 | 100 | 40 | 3 |
| 88-216 | 150 | 43.5 | 3 |
| 216-960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

Restricted bands of operation, FCC Part 15.205:

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

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

The requirements are **FULFILLED**.

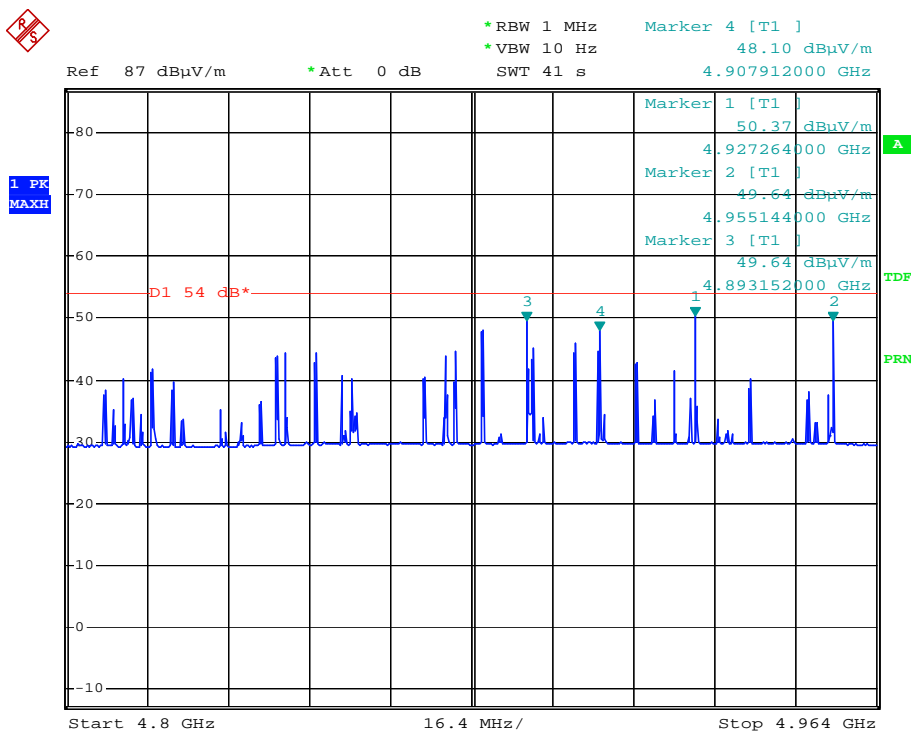
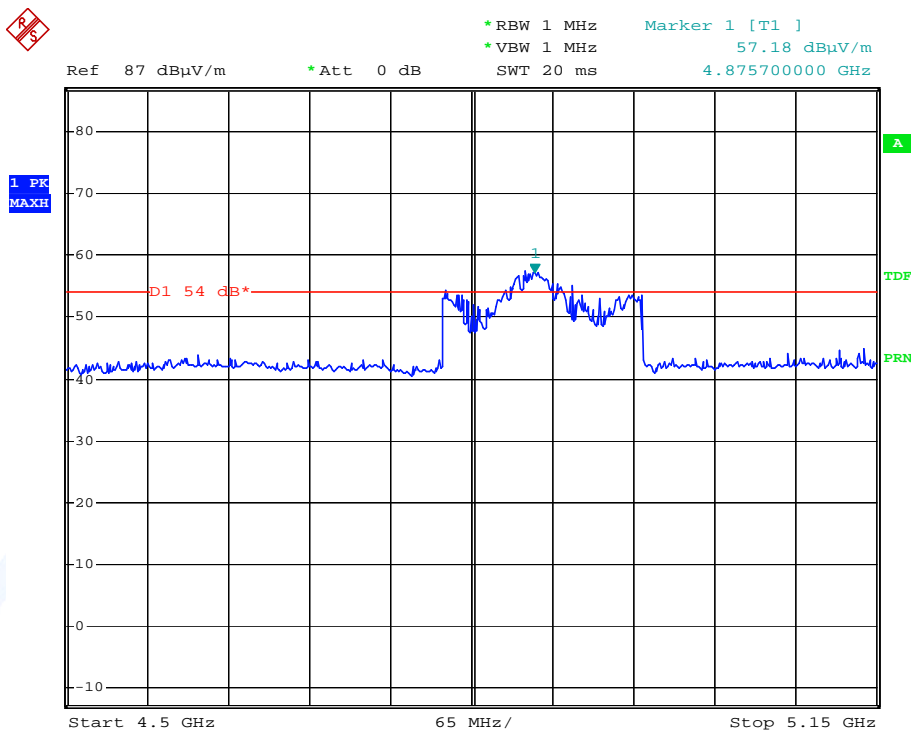
Remarks: The measurement was performed up to 40 GHz. All radiated peak emissions from 9 kHz to 1000 MHz were below the limits of part 15.209. For detailed test results please see to following test protocols.

FCC ID:U9A277IWLAN-V210

5.4.5.4 Test protocols spurious emissions, radiated:

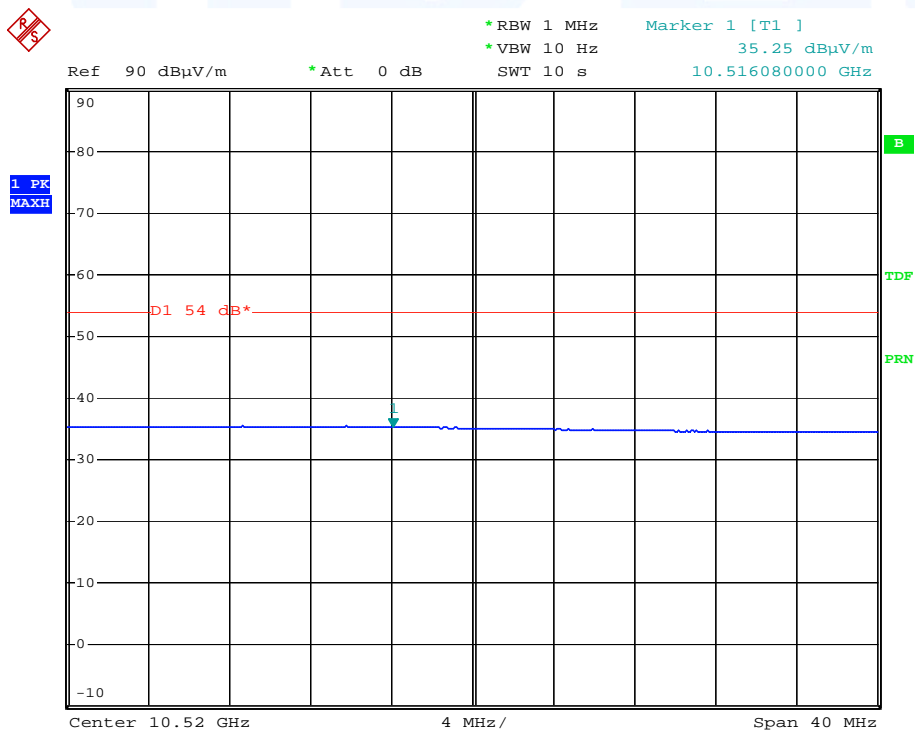
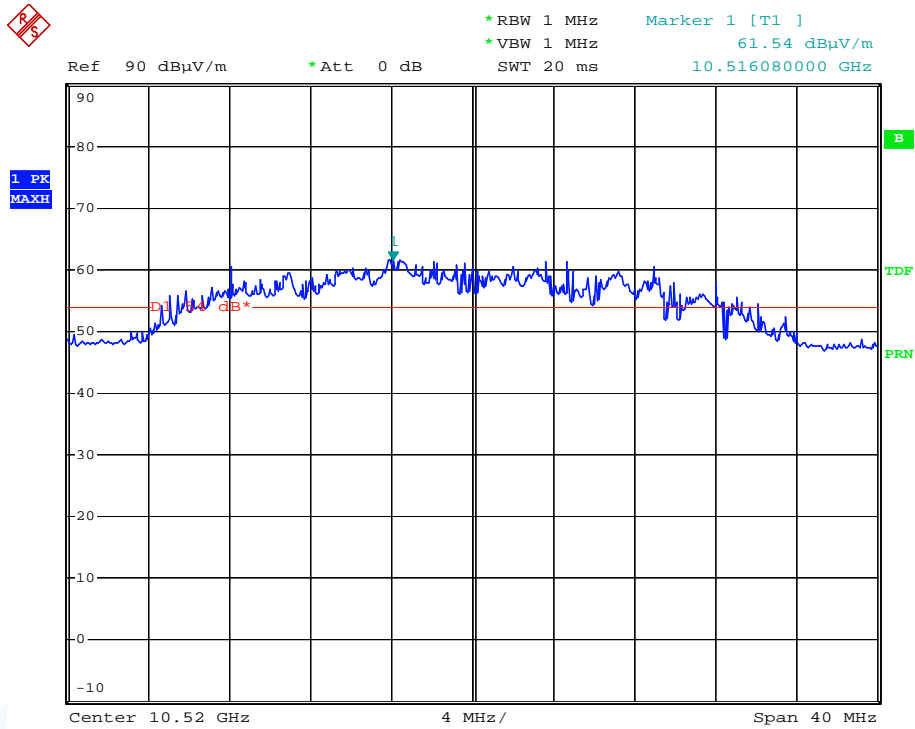
Carrier frequency at channel 52 (5260 MHz)

Peak and AV plot has been taken to show the restricted band emission levels near the lower authorized band edge.
(Restricted band from 4500 to 5150 MHz)



FCC ID:U9A277IWLAN-V210

Pk and AV Value of harmonics in restricted band from 10.6 – 12.7 GHz.

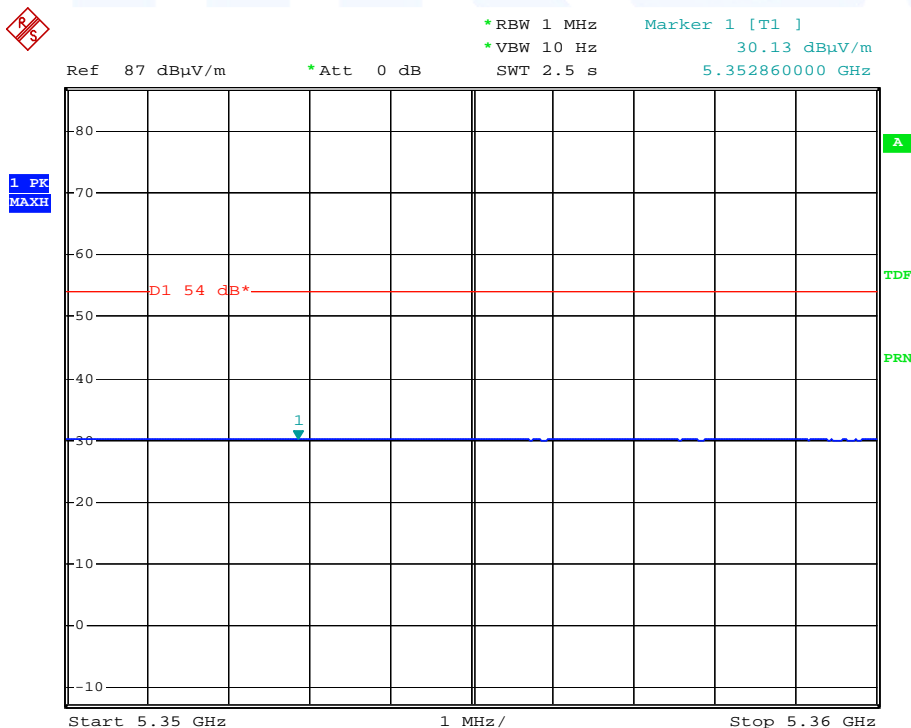
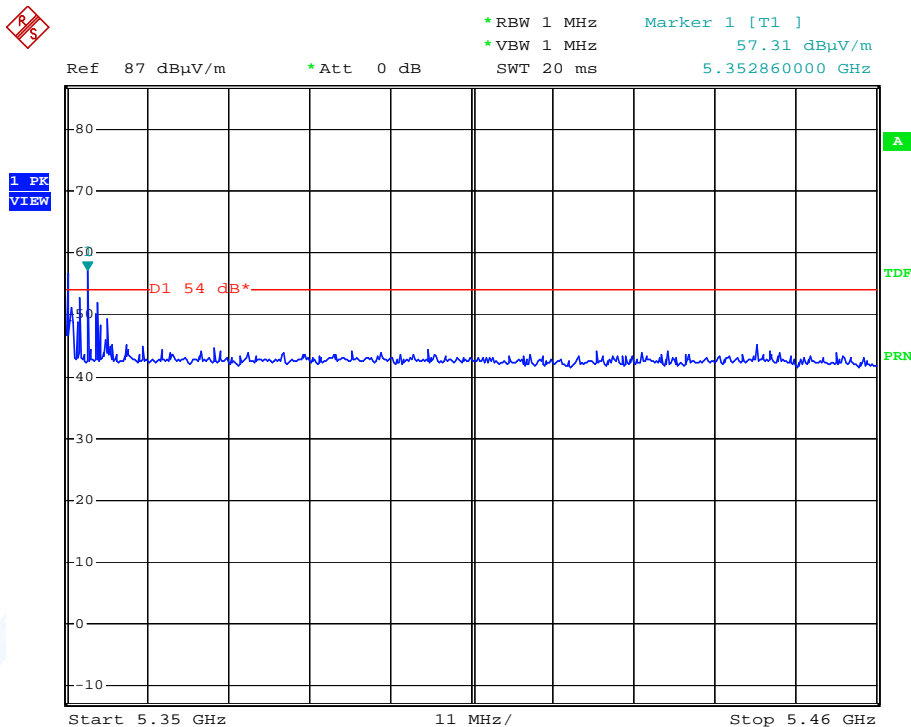


Remark: No harmonics in restricted band from 15.35 – 16.2 GHz.

FCC ID:U9A277IWLAN-V210

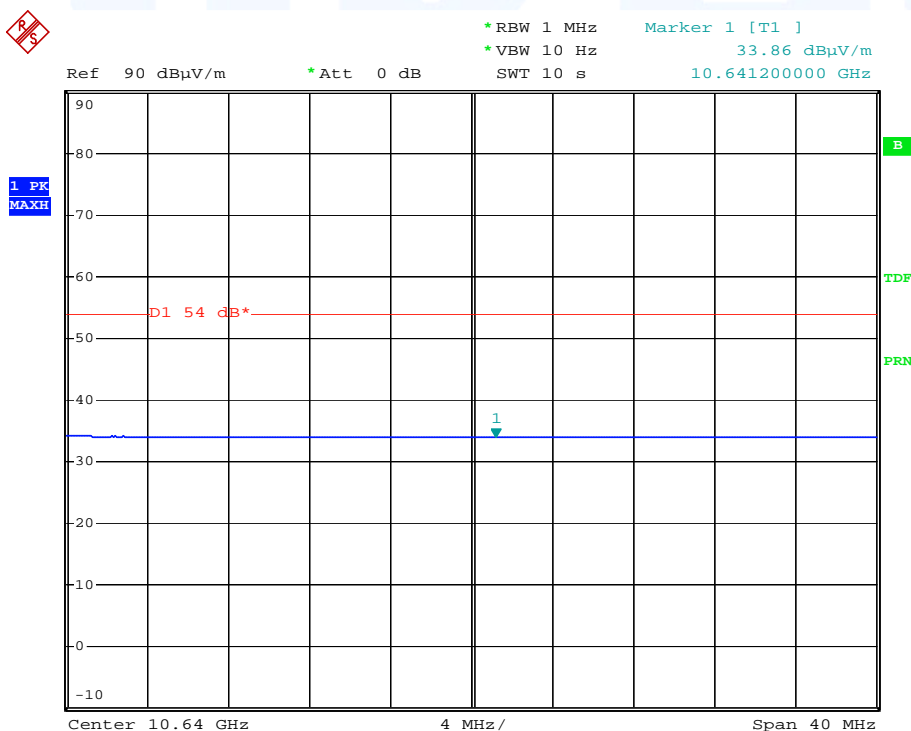
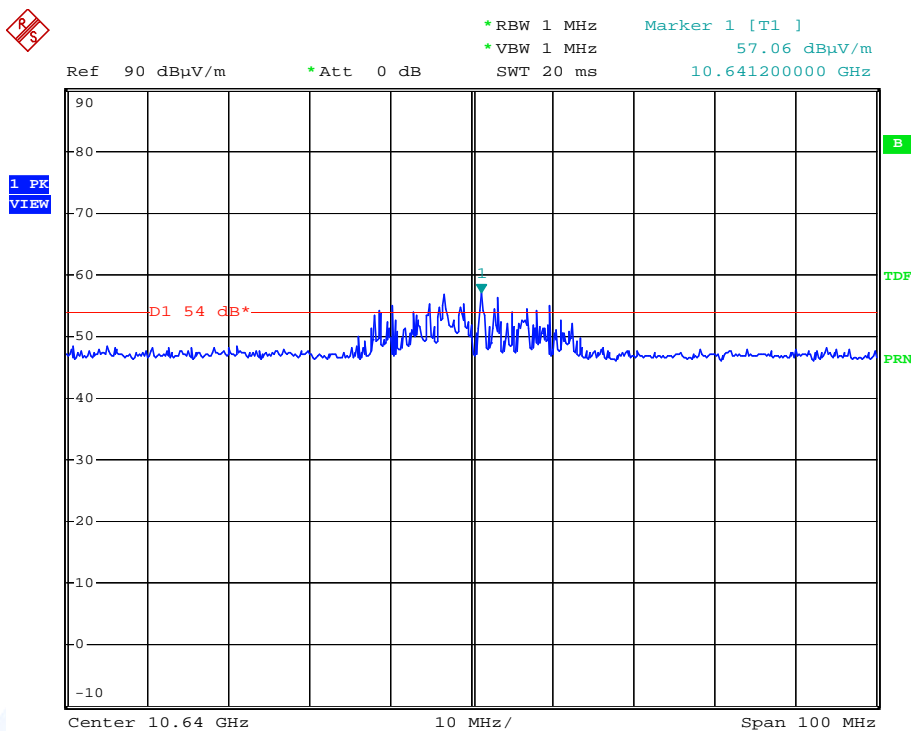
Carrier frequency at channel 64 (5320 MHz)

Peak and AV plot has been taken to show the restricted band emission levels near the upper authorized band edge.
(Restricted band from 5350 to 5460 MHz)



FCC ID:U9A277IWLAN-V210

Pk and AV Value of harmonics in restricted band from 10.6 – 12.7 GHz.

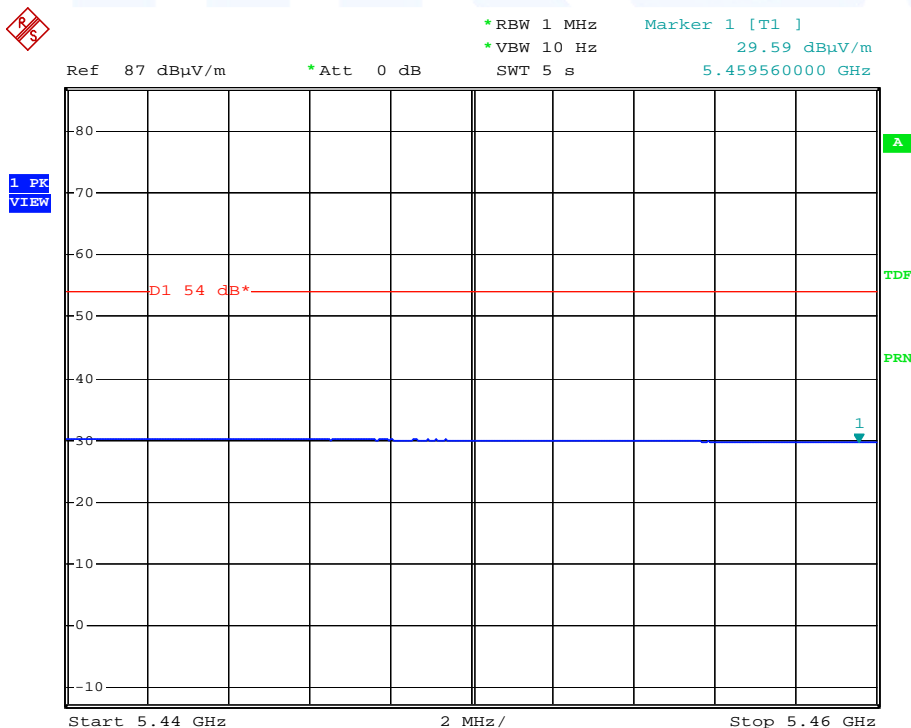
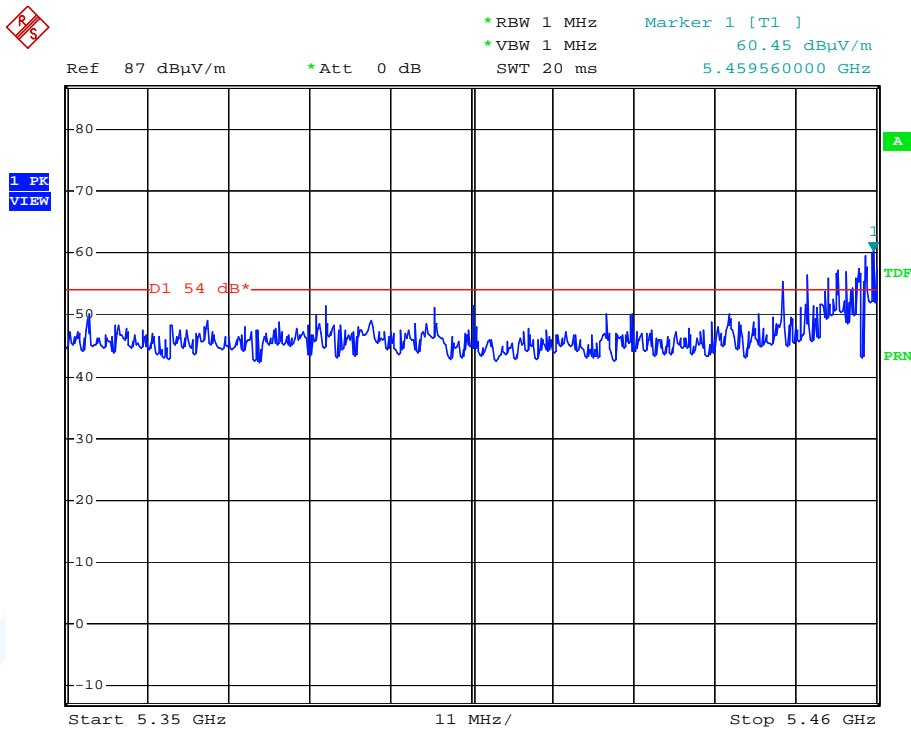


Remark: No harmonics in restricted band from 15.35 – 16.2 GHz.

FCC ID:U9A277IWLAN-V210

Carrier frequency at channel 100 (5500 MHz)

Peak plot has been taken to show the restricted band emission levels near the lower authorised band edge.
(Restricted band from 5350 to 5460 MHz)

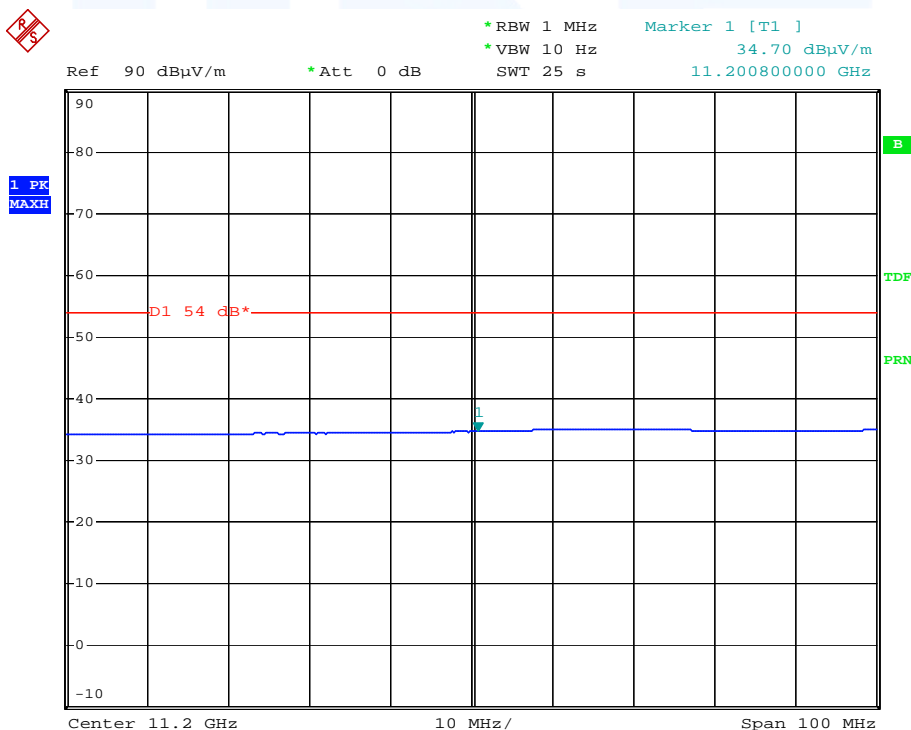
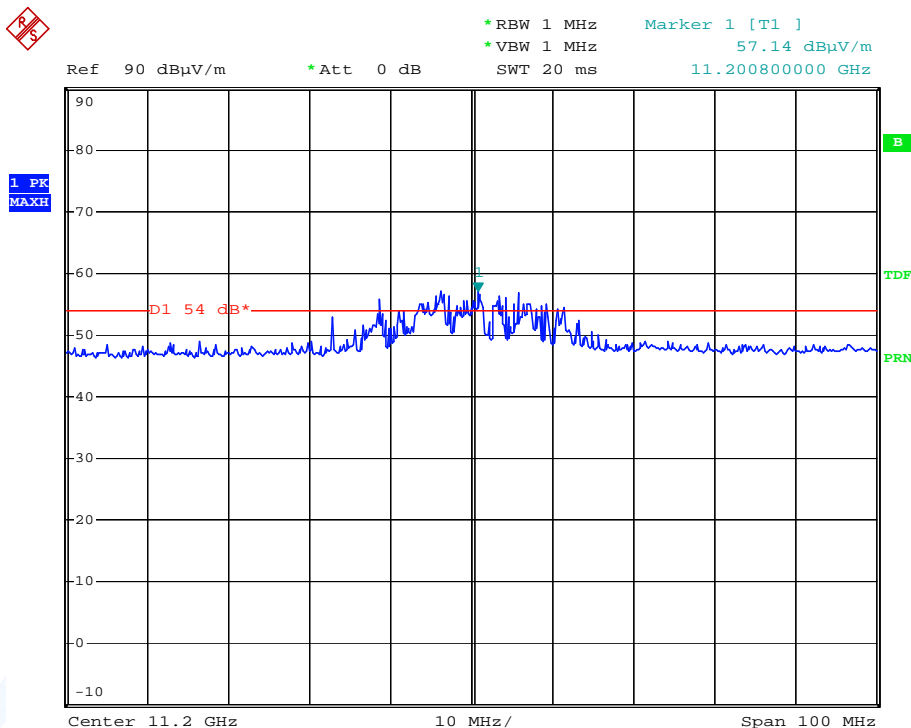


Remark: No harmonics in restricted band from 10.6 – 12.7 GHz.

FCC ID:U9A277IWLAN-V210

Carrier frequency at channel 120 (5600 MHz)

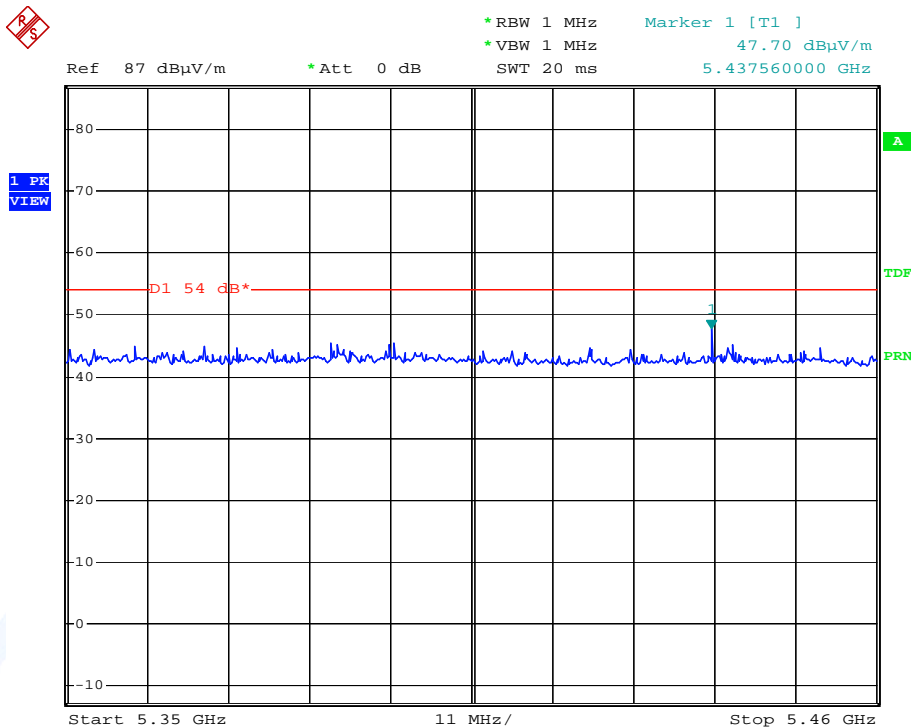
Pk and AV Value of harmonics in restricted band from 10.6 – 12.7 GHz.



FCC ID:U9A277IWLAN-V210

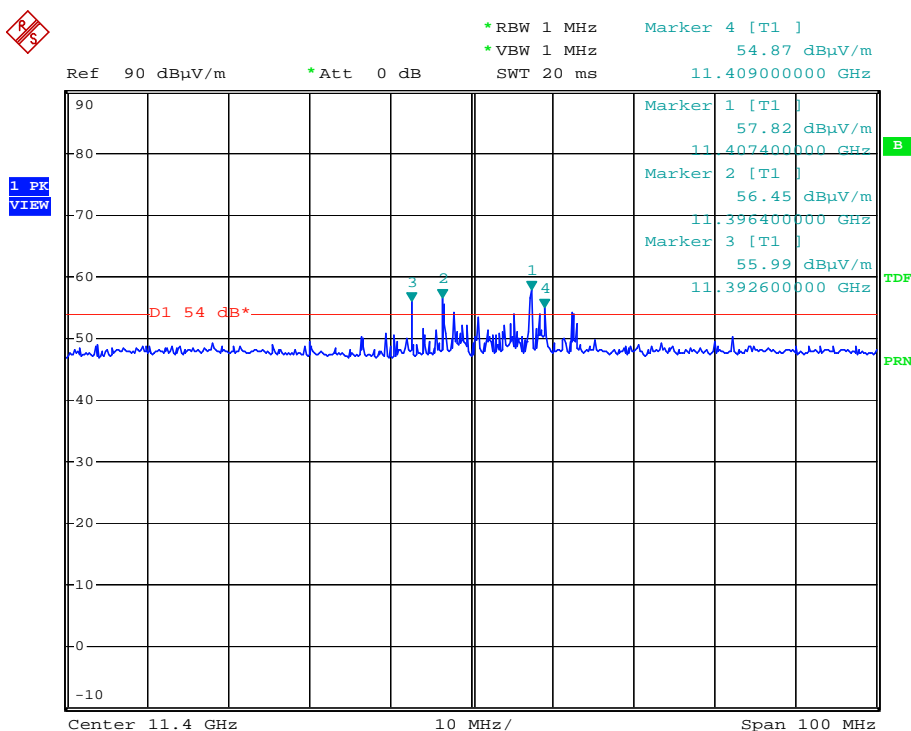
Carrier frequency at channel 140 (5700 MHz)

Peak plot has been taken to show the restricted band emission levels near the lower authorized band edge.
(Restricted band from 5350 to 5460 MHz)



Remark: Pk Value is below average limit.

Pk and AV Value of harmonics in restricted band from 10.6 – 12.7 GHz.



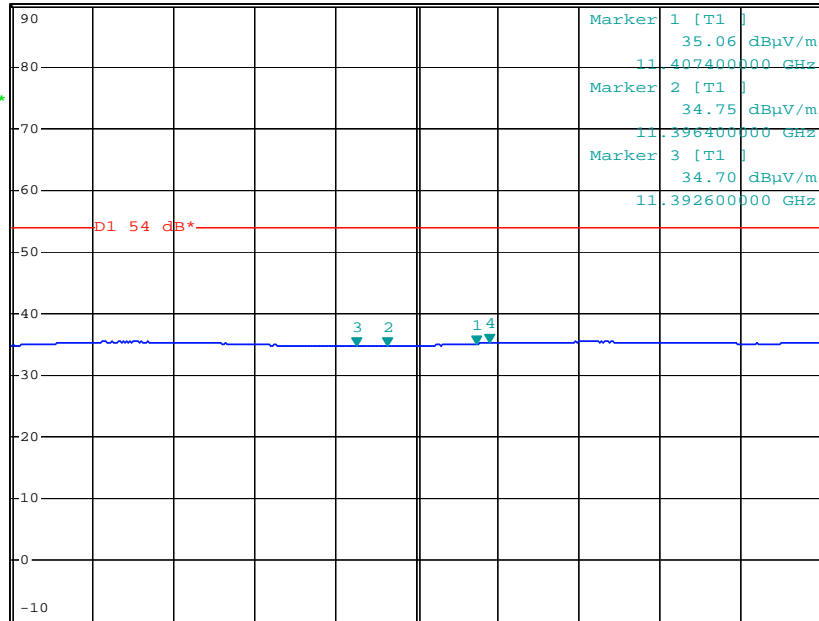
FCC ID:U9A277IWLAN-V210



*RBW 1 MHz Marker 4 [T1]
*VBW 10 Hz 35.18 dBuV/m
SWT 25 s 11.409000000 GHz

Ref 90 dBuV/m *Att 0 dB

1 PK
VIEW



Center 11.4 GHz 10 MHz/ Span 100 MHz

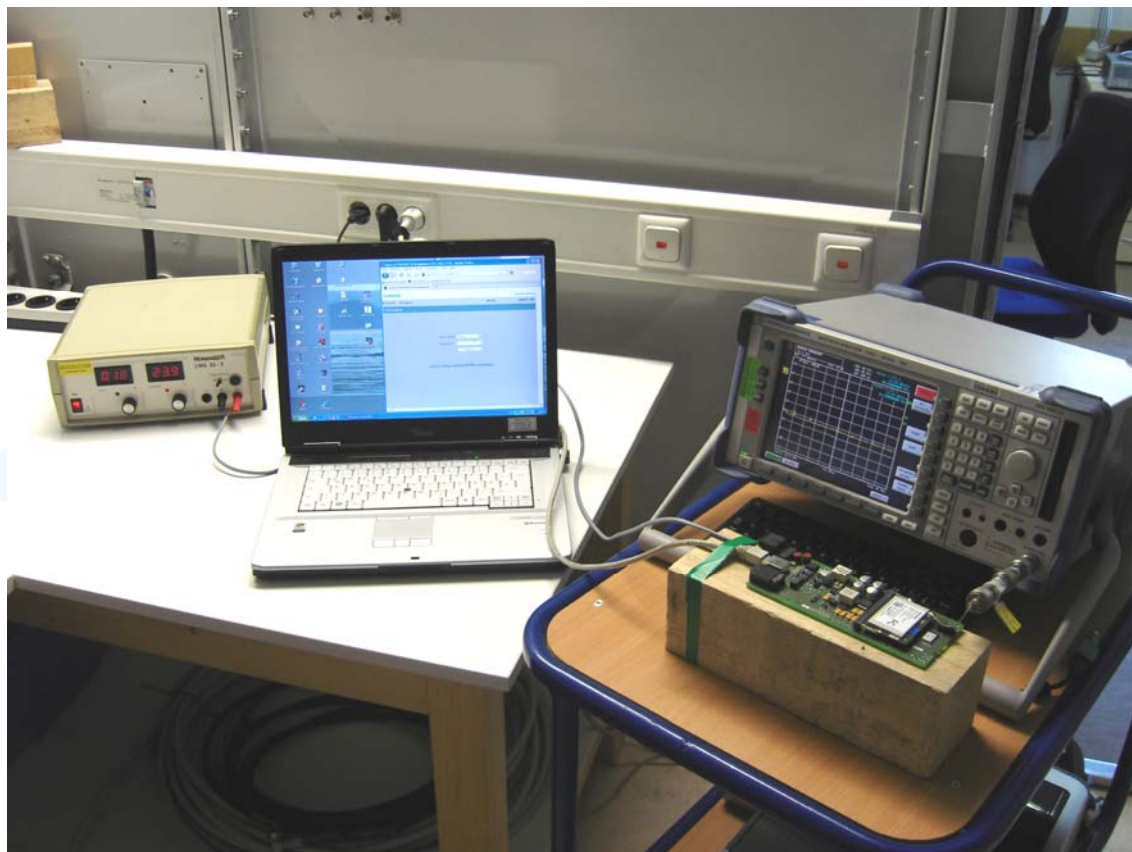
mikes

FCC ID:U9A277IWLAN-V210**5.5 Peak power spectral density**

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 15 Subpart 15.407 (a):

For the 5.25 – 5.35 GHz and 5.47 – 5.725 GHz bands, the maximum conducted peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.5.4 Description of measurement

The EUT was connected to the spectrum analyzer with a suitable attenuator. The peak power spectral density was measured using the analyzer function of measuring the band power/Hz and the same settings like the power measuring. The result is calculated by addition a correction factor 60 dB ($10 \log 1 \text{ MHz/Hz}$) to the readings.

Spectrum analyser settings:

RBW: 1 MHz, VBW: 3 MHz, Sweep: auto, Detector function: AV

FCC ID:U9A277IWLAN-V210

5.5.5 Test result

| Channel | Frequency (MHz) | Reading (dBm/Hz) | Correction to 1 MHz (dB) | PSD (dBm/MHz) | Limit (dBm) |
|---------|-----------------|------------------|---------------------------|---------------|-------------|
| 52 | 5260 | -56.9 | 60 | 3.1 | 11 |
| 56 | 5280 | -56.7 | 60 | 3.3 | 11 |
| 64 | 5320 | -58.8 | 60 | 1.2 | 11 |
| 100 | 5500 | -57.5 | 60 | 2.5 | 11 |
| 120 | 5600 | -55.3 | 60 | 4.7 | 11 |
| 140 | 5700 | -58.6 | 60 | 1.4 | 11 |

PSD Limit according to FCC Subpart 15.407(a)(2):

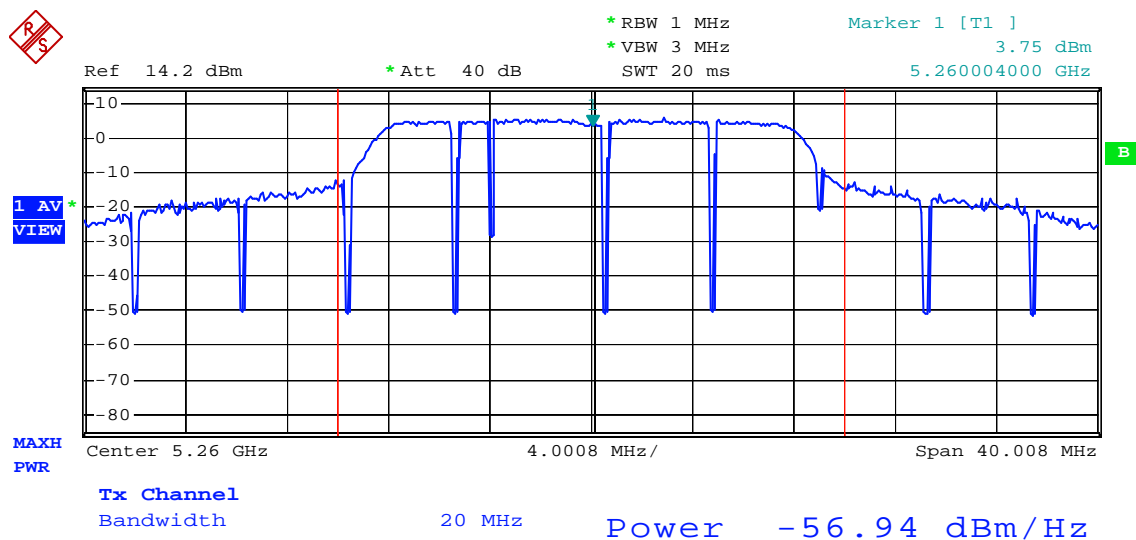
For the 5.25 – 5.35 GHz and 5.47 – 5.725 GHz bands, the maximum conducted peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The requirements are **FULFILLED**.

Remarks: For detailed test results please refer to following test protocols.

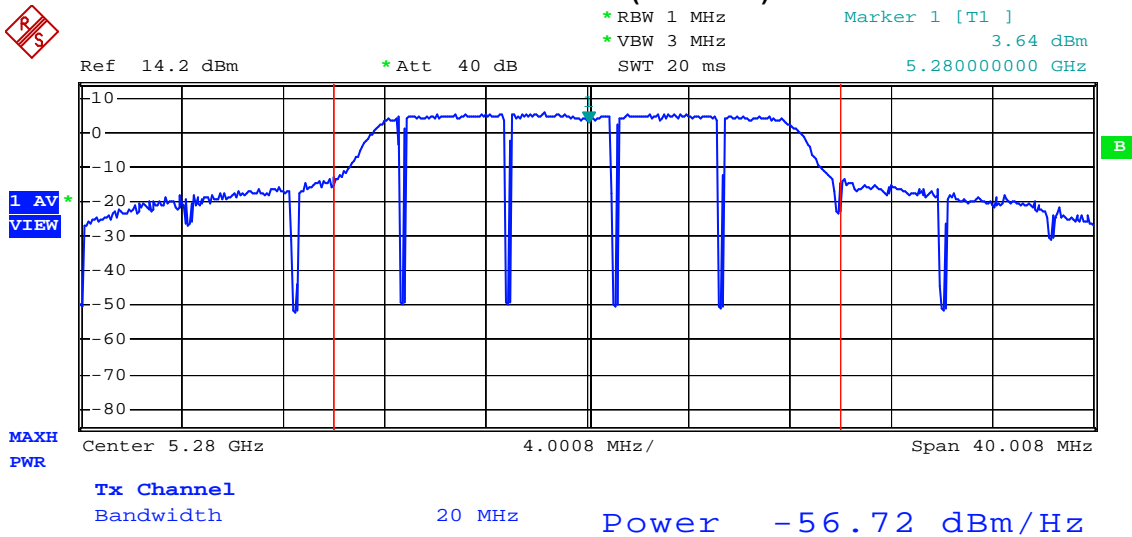
5.5.6 Peak power spectral density plots

802.11h Channel 52 (5260 MHz)

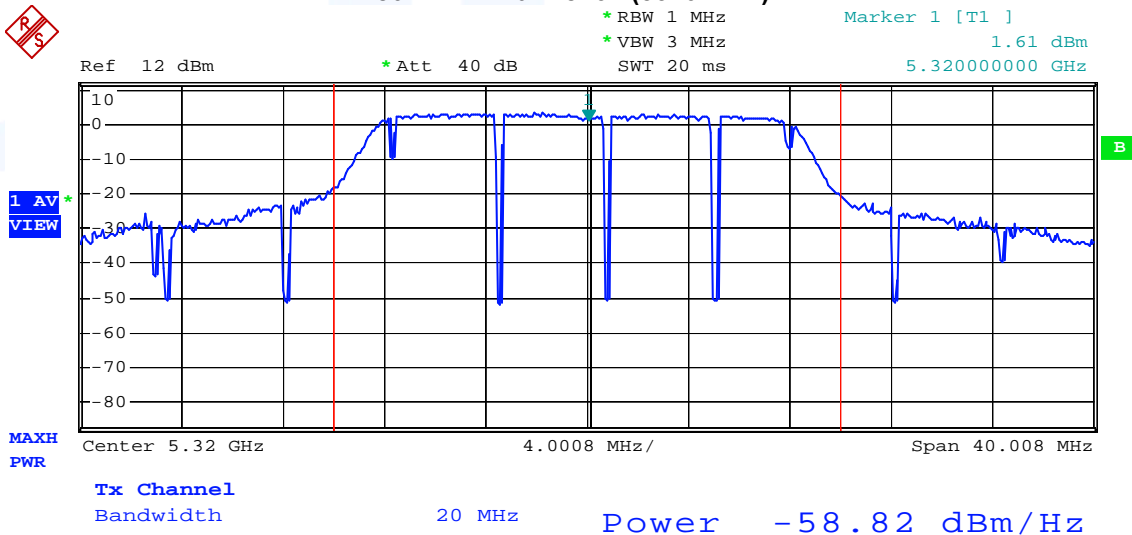


FCC ID:U9A277IWLAN-V210

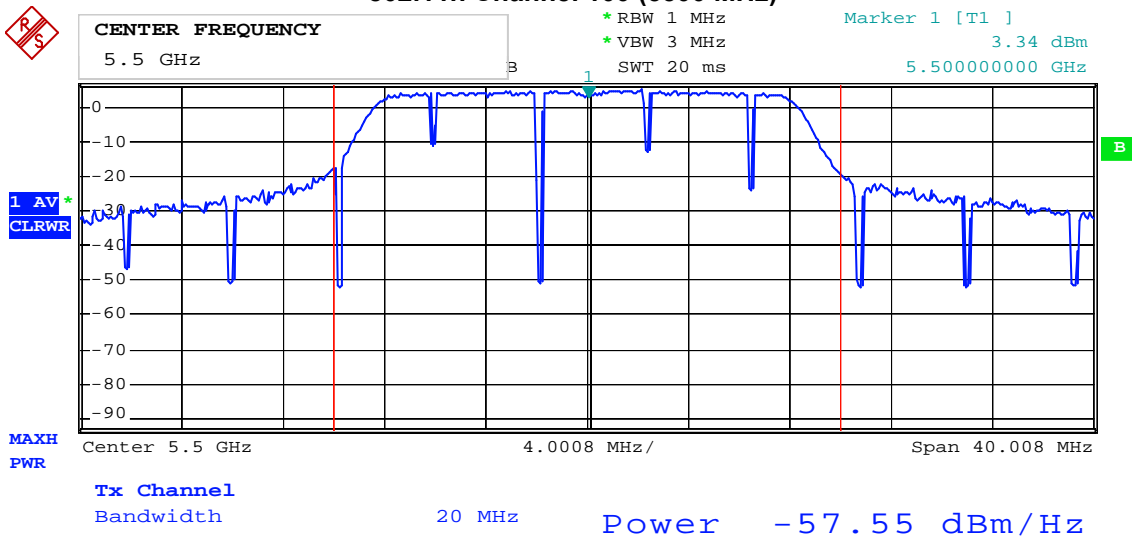
802.11h Channel 56 (5280 MHz)



802.11h Channel 64 (5320 MHz)

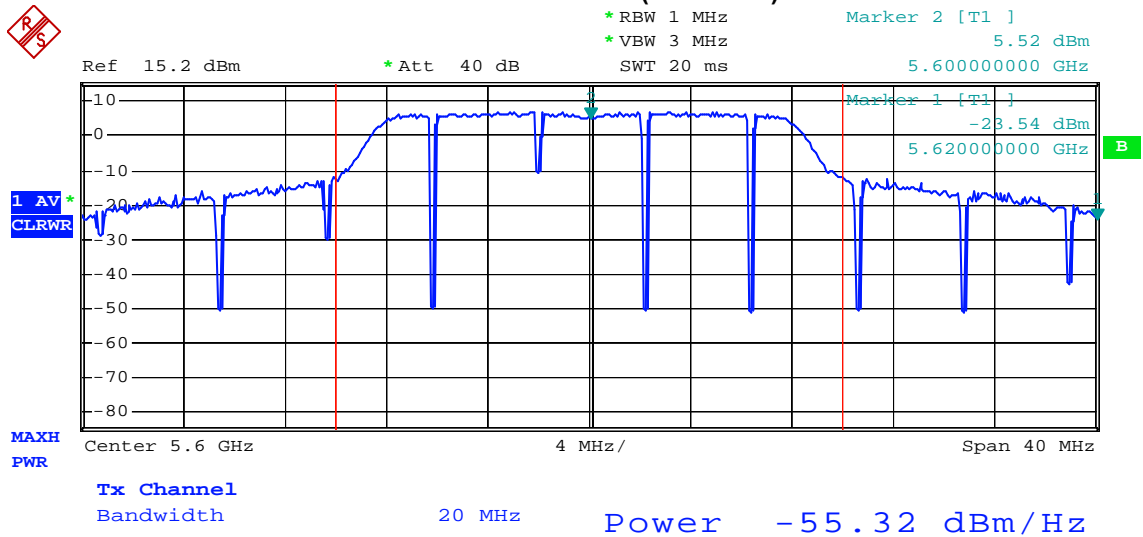


802.11h Channel 100 (5500 MHz)

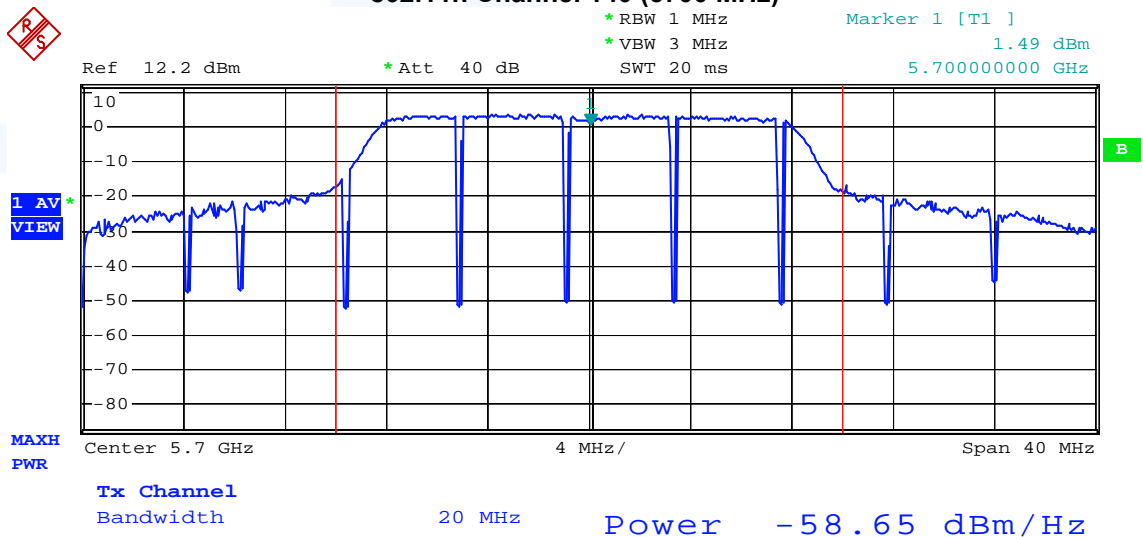


FCC ID:U9A277IWLAN-V210

802.11h Channel 120 (5600 MHz)



802.11h Channel 140 (5700 MHz)

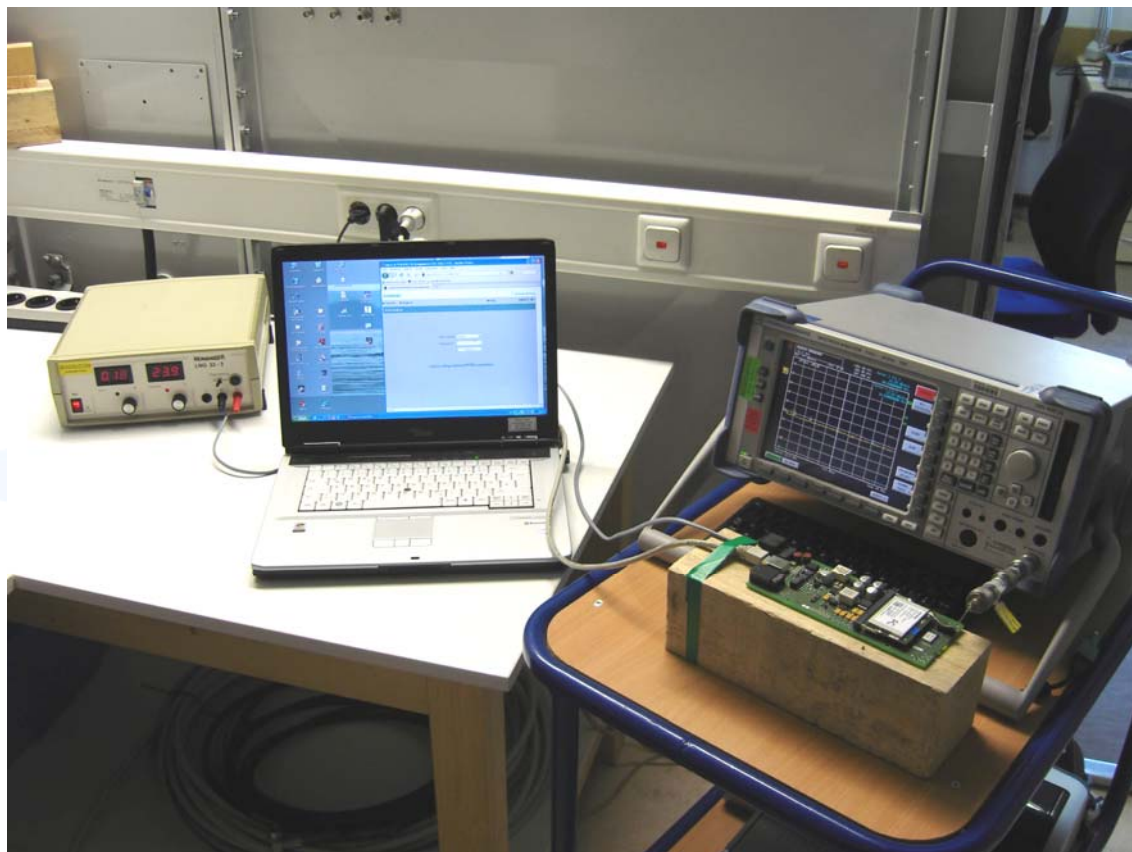


FCC ID:U9A277IWLAN-V210**5.6 Peak excursion**

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

5.6.1 Description of the test location

Test location: AREA4

5.6.2 Photo documentation of the test set-up**5.6.3 Applicable standard**

According to FCC Part 15 Subpart 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 as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

5.6.4 Description of Measurement

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

FCC ID:U9A277IWLAN-V210

5.6.5 Test result

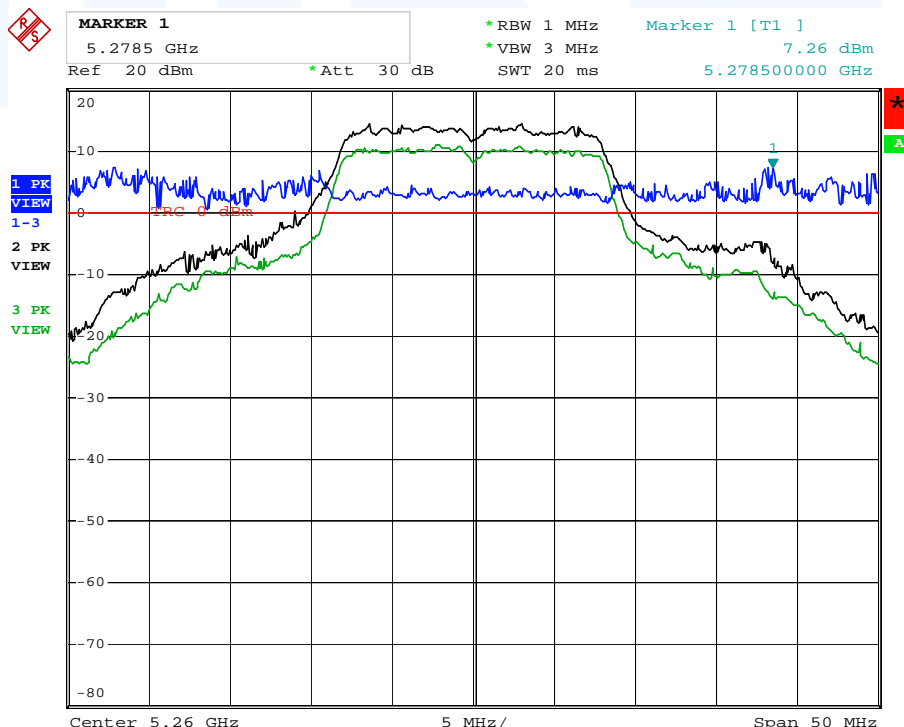
| Channel | Frequency (MHz) | Peak power excursion (dBm) | Peak to average limit (dBm) | Delta (dB) |
|---------|-----------------|----------------------------|-----------------------------|------------|
| 52 | 5260 | 7.3 | 13 | -5.7 |
| 56 | 5280 | 9.0 | 13 | -4.0 |
| 64 | 5320 | 8.9 | 13 | -4.1 |
| 100 | 5500 | 9.8 | 13 | -3.2 |
| 120 | 5600 | 12.5 | 13 | -0.5 |
| 140 | 5700 | 8.7 | 13 | -4.3 |

The requirements are **FULFILLED**.

Remarks: For detailed test results please refer to following test protocols.

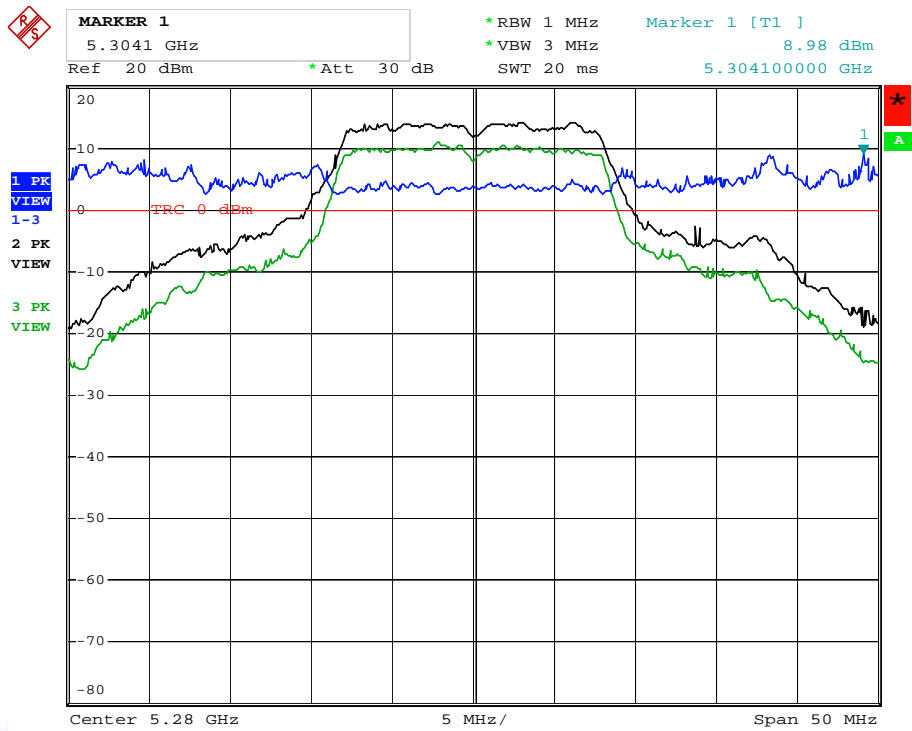
5.6.6 Test protocols Peak excursion

Channel 52 (5260 MHz)

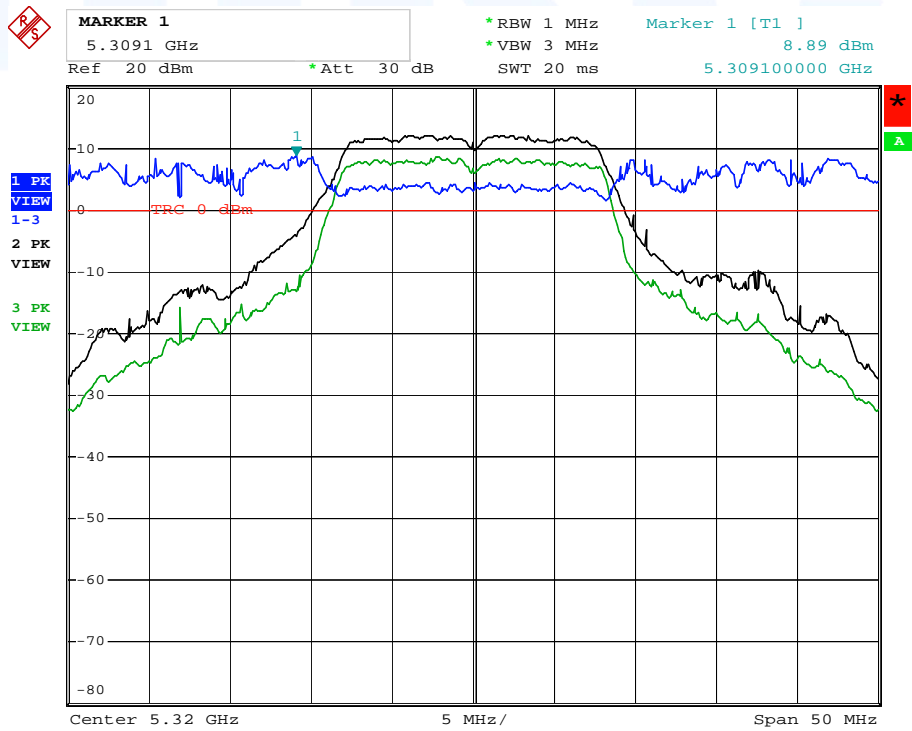


FCC ID:U9A277IWLAN-V210

Channel 56 (5280 MHz)

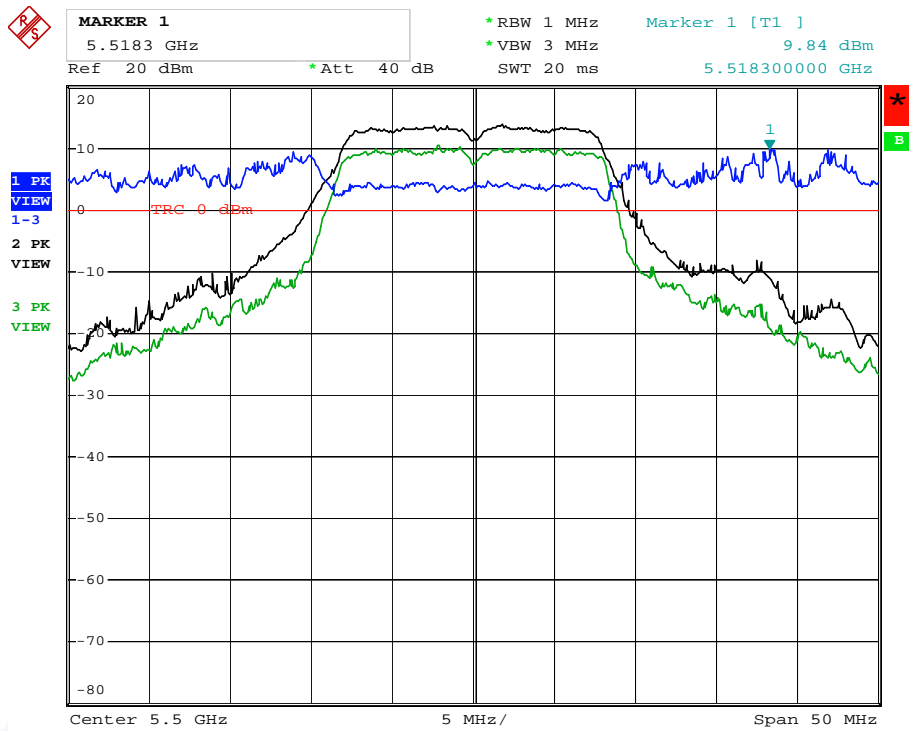


Channel 64 (5320 MHz)

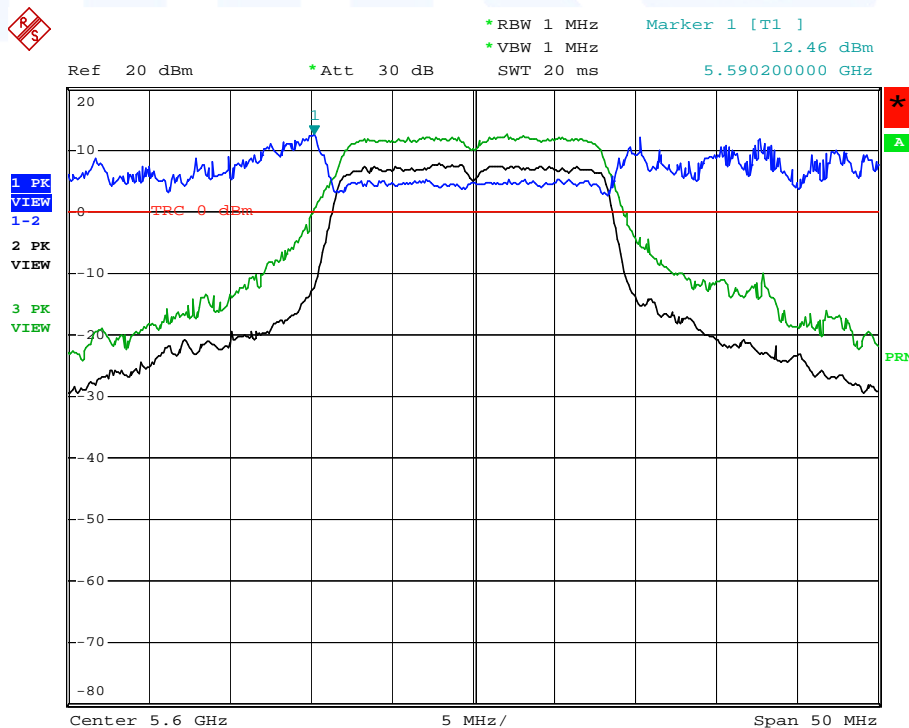


FCC ID:U9A277IWLAN-V210

802.11h Channel 100 (5500 MHz)

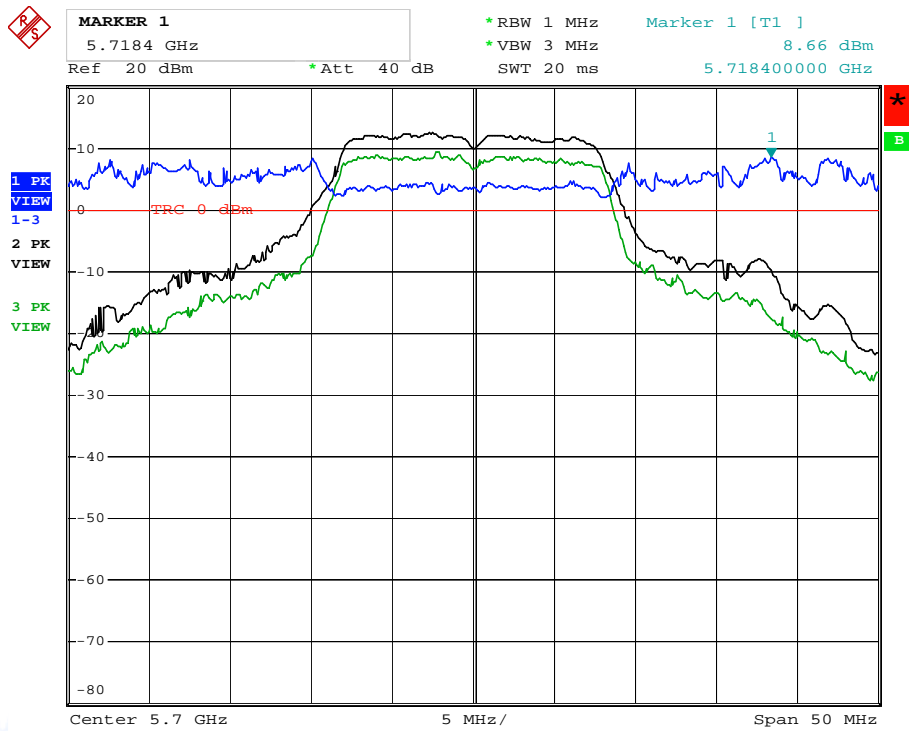


802.11h Channel 120 (5600 MHz)



FCC ID:U9A277IWLAN-V210

802.11h Channel 140 (5700 MHz)



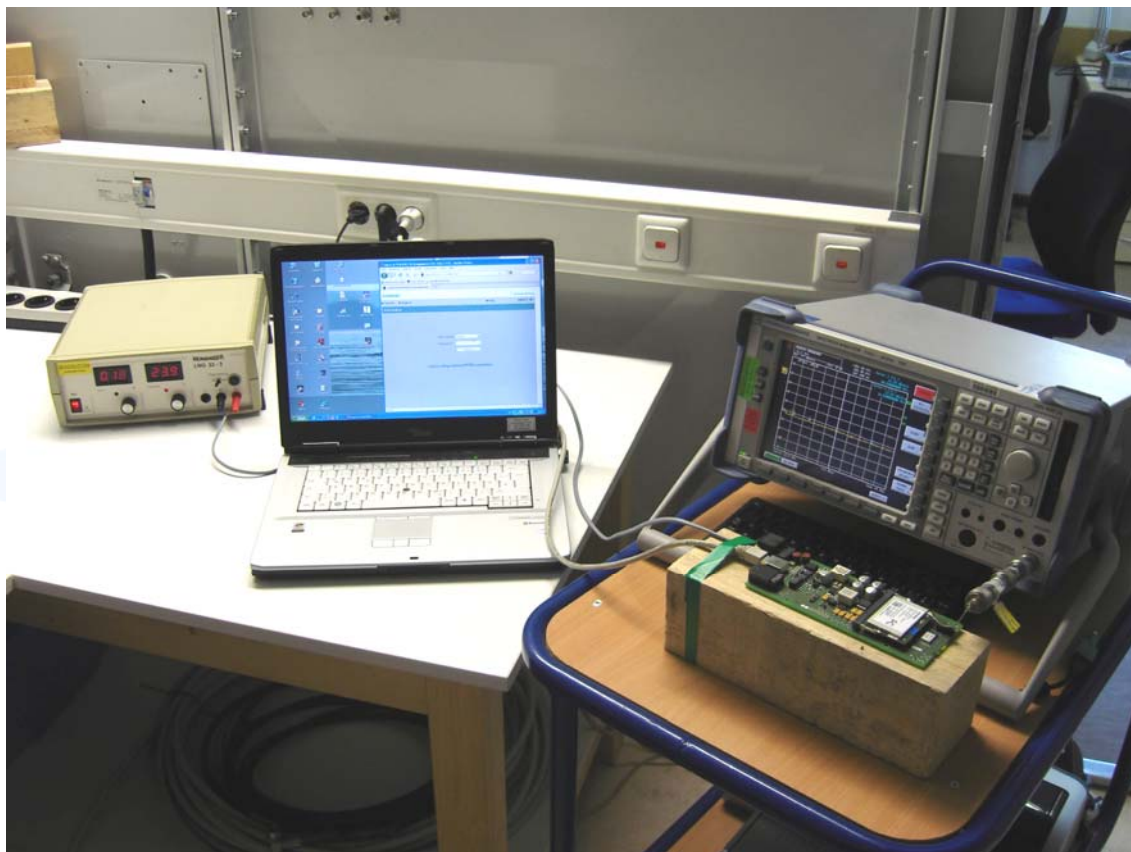
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FCC ID:U9A277IWLAN-V210**5.7 Maximum permissible exposure (MPE)**

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 set-up**5.7.3 Applicable standard**

According to FCC Part 15 Subpart 15.407 (f): U-NII devices are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307 (b), 2.1091 and 2.1093 of this chapter, as appropriate.

The test methods used comply with ANSI/IEEE C95.1-1992, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz". 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).

FCC ID:U9A277IWLAN-V210

5.7.4 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.

$$\text{Friis transmission formula: } P_d = \frac{P_{out} * G}{4 * \pi * r^2}$$

where:

- P_d = power density in mW/cm²
- P_{out} = output power to antenna in mW
- G = gain of antenna (linear scale)
- r = distance between antenna and observation point (cm)

5.7.5 Test result

| Channel No. | Frequency (MHz) | Max power output to Antenna | | Antenna gain (dBi) | Power density (mW/cm ²) | Limit of power density (mW/cm ²) |
|-------------|-----------------|-----------------------------|------|--------------------|-------------------------------------|--|
| | | (dBm) | (mW) | | | |
| 52 | 5260 | 15.8 | 38.0 | 5 | 0.024 | 1.0 |
| 56 | 5280 | 15.8 | 38.0 | 5 | 0.024 | 1.0 |
| 64 | 5320 | 13.9 | 24.5 | 5 | 0.015 | 1.0 |
| 100 | 5500 | 15.4 | 34.7 | 5 | 0.022 | 1.0 |
| 120 | 5600 | 17.7 | 58.9 | 5 | 0.037 | 1.0 |
| 140 | 5700 | 14.3 | 26.9 | 5 | 0.017 | 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:

FCC ID:U9A277IWLAN-V210

5.7.6 Compliance regarding Co-location and Co-transmission

Applicable standard: ANSI/IEEE C95.1-1999, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", Clause 4.1.1. e):

For mixed or broadband fields at a number of frequencies for which there are different values of the MPE, the fraction of the MPE (in terms of E, H, or power density (S)) occurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity (1.0, or 100 % in terms of percentage).

- | | |
|-----------------------------------|---|
| 1. MPE of WLAN-Module: | $P_d = 0.037 \text{ mW/cm}^2$ Limit: 1 mW/cm^2 Fraction of MPE: 3.7% |
| 2. MPE of Effective Range Module: | $P_d = 0.00006 \text{ mW/cm}^2$ Limit: 1 mW/cm^2 Fraction of MPE: 0.006 % |

The requirements are **FULFILLED**.

Remarks: For the test result of Effective Range Module please refer to Test Report T33234-03-00AA
(mikes-testingpartners gmbh).

5.8 Antenna application - Detailed photos see attachment A

5.8.1 Applicable standard

According to FCC Part 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.

5.8.2 Result

The EUT is equipped with 3 integrated antennas (2 for WLAN, 1 for ERM) and have no external antenna connectors, which meets the requirement of FCC Part 15.203 and 15.204.

The requirements are **FULFILLED**.

Remarks: _____

FCC ID:U9A277IWLAN-V210

5.9 Receiver spurious emissions

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

5.9.1 Description of the test location

Test location: OATS1
Anechoic Chamber A2

Test distance: 3 metres

5.9.2 Photo documentation of the test set-up

Open area test site



Anechoic chamber (960 MHz – 18 GHz)



FCC ID:U9A277IWLAN-V210

Anechoic chamber (18 GHz – 30 GHz)



5.9.3 Applicable standard

According to FCC Part 15 Subpart 15.109:
Field strength of radiated emissions from unintentional radiator.

5.9.4 Description of Measurement

Radiated Spurious emissions from the EUT are measured with the procedure mentioned under item 4.4.3 and 4.4.4.

Spectrum analyser settings $f > 960$ MHz:

Peak measurement: RBW: 1 MHz, VBW: 1 MHz, Sweep: Auto
AV measurement: RBW: 1 MHz, VBW: 10 Hz, Sweep: Auto

5.9.5 Test result

| Frequency (MHz) | Detector | Analyzer reading | | Correction (dB) | Result | | Limit (dB μ V/m) | Delta (dB) |
|--------------------|----------|-----------------------|------------------------|--------------------|-----------------------|------------------------|-------------------------|---------------|
| | | hor (dB μ V/m) | vert (dB μ V/m) | | hor (dB μ V/m) | vert (dB μ V/m) | | |
| 30 - 960 | QP | | | | <30 | <30 | --- | --- |
| 960 - 28500 | Pk | | | | <54 | <54 | 74 | --- |
| | AV | --- | --- | | --- | --- | 54 | --- |

FCC ID:U9A277IWLAN-V210

Limit according to FCC Subpart 15.109(a)

| Frequency of emission (MHz) | Field strength Limits ($\mu\text{V/m}$) | Field strength Limits ($\text{dB}\mu\text{V/m}$) |
|-----------------------------|---|--|
| 0,009-0,490 | 2400/F(kHz) | |
| 0,490-1,705 | 24000/F(kHz) | |
| 1,705-30 | 30 | |
| 30-88 | 100 | 40 |
| 88-216 | 150 | 44 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

The requirements are **FULFILLED**.

Remarks: The measurement was performed up to the 5th harmonic.

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FCC ID:U9A277IWLAN-V210

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used, in addition to the test accessories, are calibrated and verified regularly.

| Test ID | Model Type | Equipment No. | Next Calib. | Last Calib. | Next Verif. | Last Verif. |
|---------|------------------------|-----------------|-------------|-------------|-------------|-------------|
| A 4 | ESHS 30 | 02-02/03-05-002 | 18/06/2011 | 18/06/2010 | | |
| | ESH 2 - Z 5 | 02-02/20-05-004 | 13/03/2011 | 13/03/2008 | 11/12/2010 | 11/06/2010 |
| | EMV D 30000/PAS | 02-02/30-05-006 | | | | |
| | 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 | 07/04/2011 | 07/10/2010 | | |
| CPC 3 | FSP 30 | 02-02/11-05-001 | 04/05/2011 | 04/05/2010 | | |
| | LNG32-3 | 02-02/50-07-035 | | | | |
| MB | FSP 30 | 02-02/11-05-001 | 04/05/2011 | 04/05/2010 | | |
| | LNG32-3 | 02-02/50-07-035 | | | | |
| SEC 1-3 | FSP 30 | 02-02/11-05-001 | 04/05/2011 | 04/05/2010 | | |
| | LNG32-3 | 02-02/50-07-035 | | | | |
| SER 1 | FMZB 1516 | 01-02/24-01-018 | 15/02/2011 | 15/02/2010 | | |
| | ESCI | 02-02/03-05-005 | 19/11/2011 | 19/11/2010 | | |
| | S10162-B | 02-02/50-05-031 | | | | |
| | KK-EF393-21N-16 | 02-02/50-05-033 | | | | |
| | NW-2000-NB | 02-02/50-05-113 | | | | |
| SER 2 | ESVS 30 | 02-02/03-05-006 | 11/06/2011 | 11/06/2010 | | |
| | VULB 9168 | 02-02/24-05-005 | 06/05/2011 | 06/05/2008 | 16/03/2011 | 16/09/2010 |
| | S10162-B | 02-02/50-05-031 | | | | |
| | KK-EF393-21N-16 | 02-02/50-05-033 | | | | |
| | NW-2000-NB | 02-02/50-05-113 | | | | |
| SER 3 | FSP 30 | 02-02/11-05-001 | 04/05/2011 | 04/05/2010 | | |
| | AFS4-01000400-10-10P-4 | 02-02/17-05-003 | | | | |
| | AMF-4F-04001200-15-10P | 02-02/17-05-004 | | | | |
| | AFS5-12001800-18-10P-6 | 02-02/17-06-002 | | | | |
| | 3117 | 02-02/24-05-009 | 10/02/2011 | 10/02/2010 | | |
| | R2 _ 30 - 40 GHz | 02-02/30-09-001 | 22/02/2011 | 22/02/2010 | | |
| | R1 _ 18 - 30 GHz | 02-02/30-09-002 | 17/02/2011 | 17/02/2010 | | |
| | 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 | | | | |
| | H26G40G1 | 02-02/50-10-011 | | | | |