

EMI - TEST REPORT

- FCC Part 15.407, 5150-5250 MHz, outdoor -

Type / Model Name : Xirium Pro (NXP2TX)

Product Description : Digital Wireless Audio Network

Applicant : Neutrik AG

Address : Im alten Riet 143

9494 SCHAAN, LIECHTENSTEIN

Manufacturer : Neutrik AG

Address : Im alten Riet 143

9494 SCHAAN, LIECHTENSTEIN

Licence holder : Neutrik AG

Address : Im alten Riet 143

9494 SCHAAN, LIECHTENSTEIN

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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Test Report No. : T41996-02-00HS	05. September 2017 <small>Date of issue</small>
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Deutsche
Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

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.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September 2016)

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

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (September, 2016)

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 (December, 2016)

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 - 5.85 GHz
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ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
ETSI TR 100 028 V1.3.1: 2001-03	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the Measurement of Mobile Radio Equipment Characteristics—Part 1 and Part 2
KDB 789033 D02 v01r03	Guidance for compliance Testing of U-NII devices, August 22, 2016.

2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT – Detailed photos see ATTACHMENT A

2.2 General remarks:

The EUT is fully tested and approved under FCC Part 15.407, band 1 5150 to 5250 MHz indoor, and documented with the test report T41996-01-00HS by CSA Group Bayern GmbH.

This test report show the compliance for FCC Part 15.407, band 1 5150 to 5250 MHz outdoor. Therefore the additional power requirements for elevation are measured only.

2.3 Equipment category

WLAN - AP

2.4 Short description of the equipment under test (EUT)

The EUT is part of a digital wireless audio network. The product represents a TX base station. The audio stream is transmitted in the band 5180 MHz to 5240 MHz. The EUT is controlled via 2.4 GHz WLAN interface. The 2.4 GHz functionality is not part of this test report.

Number of tested samples: 1 TX
 Serial number: Host module 620007, TX module 515547
 Firmware version: 3.0

EUT configuration:

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

2.5 Variants of the EUT

There are no variants.

2.6 Operation frequency and channel plan

The operating frequency is 5150 MHz to 5250 MHz.

Channel plan:

WLAN Standard 802.11a:

Channel	Frequency (MHz)
36	5180
40	5200
44	5220
48	5240

Note: The marked frequencies are determined for final testing.

2.7 Transmit operating modes

The module use OFDM modulation and is capable to provide following data rates:

- 802.11a 24, 6 Mbps

2.8 Antenna

The following antennas shall be used with the EUT:

Number	Manufacturer Number	Characteristic	Model number	Connector	Frequency (GHz)	Gain 5 GHz	Cable loss (dB)	effective Gain 5 GHz (dBi)
1	ECO9-5500 Series	Omni	ECO9-5500-BLK-RN	N-male	5 GHz	9.0	0	9.0
2	ECO6-5500 Series	Omni	ECO6-5500-BLK-RN	N-male	5 GHz	6.0	0	6.0
3	WiFi Antenna 1399.17.0225	Omni	SOA-2456/360/1/0/V	N-male	5 GHz	2.0	0	2.0

2.9 Power supply system utilised

Power supply voltage, V_{nom} : 5 VDC Li-ion battery
 Power supply voltage (alternative) : Input: 100-240 V, 50-60 Hz, 1 ϕ Power supply,
 Output: +5 VDC (charging and operation)

2.10 Peripheral devices and interface cables

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

- _____ Model : _____
- _____ Model : _____

2.11 Determination of worst case conditions for final measurement

Measurements are made in all three orthogonal axes and the settings of the EUT are changed to locate at which position and at what setting of the EUT produce the maximum of the emissions.
 The tests are carried out in the following frequency band:

5150 - 5250 MHz

Preliminary tests are performed to find the worst-case mode from all possible combinations between available modulations and data rates. The maximum output power depends on used data rate.
 Following channels and test modes are selected for the final test as listed below:

WLAN	Available channel	Tested channels	Power setting	Modulation	Modulation type	Data rate
802.11a	36 to 48	36, 44, 48	Pmax	OFDM	BPSK	6 Mbps

- TX continuous mode, 802.11a

2.11.1 Test jig

No test jig is used.

2.11.2 Test software

The test software for the EUT provides the special test mode TX continuous mode, modulated, after switch on. The switch "XROC" is used for switch the channels 36, 44, 48. No other settings are available.

3 TEST RESULT SUMMARY

UNII device using the operating band 5150 MHz - 5250 MHz:

FCC Rule Part	RSS Rule Part	Description	Result
15.407(b)(6)	-	AC power line conducted emissions	Not tested
15.407(a)(5)	-	EBW 26 dB	Not tested
15.407(a)(1)	-	Emission at elevation angle higher 30° from horizon	passed
15.407(a)(1)	-	Maximum PSD	Not tested
15.407(b)(1)	-	Undesirable emissions	Not tested
15.407(b)(7)	-	Emissions in restricted bands	Not tested
15.407(a)	-	Antenna requirement	Not tested
15.407(g)	-	Frequency stability	Not tested

3.1 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 : 31 August 2017

Testing concluded on : 31 August 2017

Checked by:

Tested by:

Eduard Stangl
Technical Director

Hermann Smetana
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

**CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY**

4.2 Environmental conditions

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

Temperature: 15-35 °C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Measurement Type	Range	Confidence Level	Calculated Uncertainty
AC power line conducted emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
EBW and OBW	2400 MHz to 3000 MHz	95%	$\pm 2.5 \times 10^{-7}$
Maximum peak conducted output power	2400 MHz to 3000 MHz	95%	± 0.62 dB
Power spectral density	2400 MHz to 3000 MHz	95%	± 0.62 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB
Conducted Spurious Emissions	10000 MHz to 40000 MHz	95%	± 3.47 dB
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	± 3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 3.71 dB
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	± 2.34 dB
Field strength of the fundamental	100 kHz to 100 MHz	95%	± 3.53 dB

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 set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

4.4.1.2 Justification

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

4.4.1.3 Details of test procedures

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.10 - "American national standard of procedures for compliance testing of unlicensed wireless devices". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.10 and applying the CISPR 22 limits.

5 TEST CONDITIONS AND RESULTS

5.1 Measurement of emission at elevation angle higher 30° from horizon

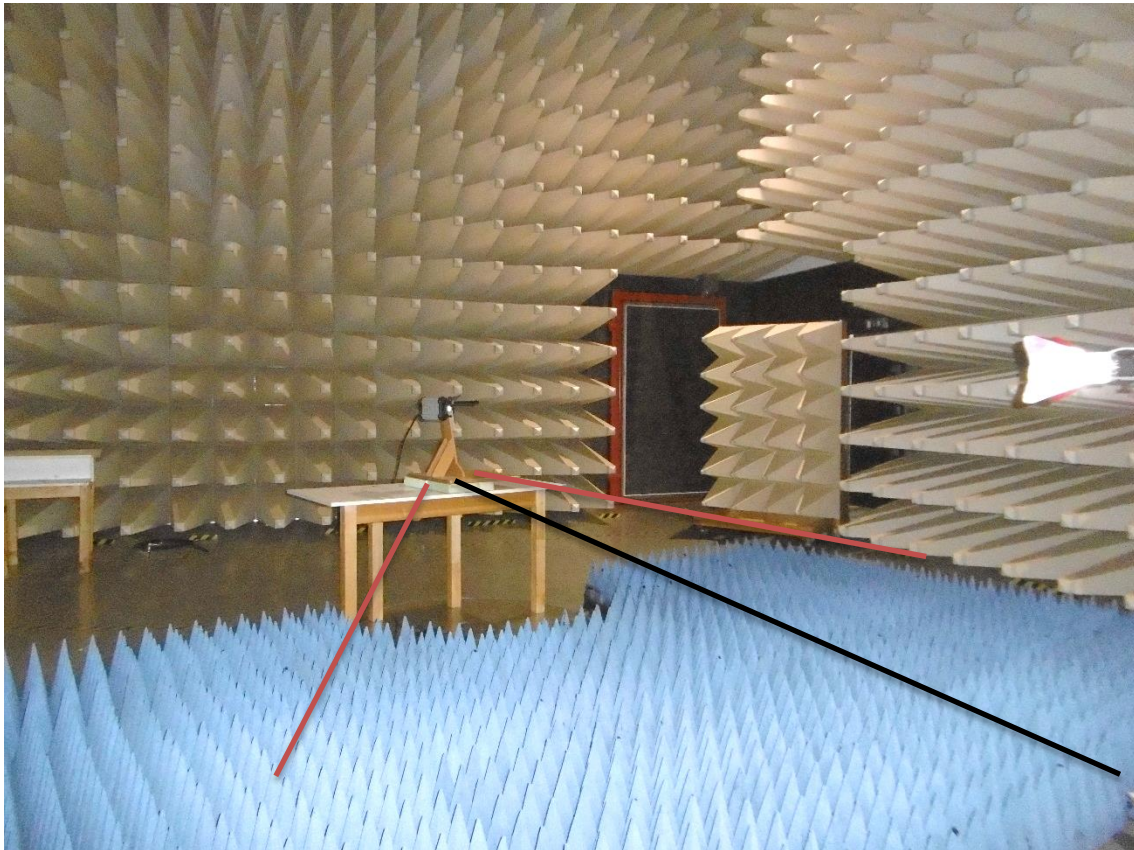
For test instruments and accessories used see section 6 Part CPR 3.

5.1.1 Description of the test location

Test location: Anechoic chamber 1
Test distance: 3 m

5.1.2 Photo documentation of the test set-up

Elevation 90°



5.1.3 Applicable standard

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

For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

5.1.4 Description of Measurement

The maximum conducted output power is measured using a spectrum analyser with the function “integrated band power measurement” following the procedure set out in KDB 789033 D02, item E b) Method SA-1, IF power trigger is used for DC < 98%. The EUT is set in TX continuous mode while measuring. The resulting values are listed in the following tables.

Spectrum analyser settings:

RBW: 20 MHz, VBW: 80 MHz, Detector: RMS (power averaging), Number of sweep points: 501,
Sweep time: 60 s;

The measurement of the elevation angle above 30° to 90° is measured according KDB 789033 D02, item H 1b: The EUT is set at turntable shifted 90° that the horizontal position is converted to azimuth angle. The turn table is moved 360° within 55 s. The use of 501 sweep points' results in a resolution 0.78 °/measurement point. The trace is used for displaying the pattern around the EUT. The maximum emission level is calculated to EIRP and compared with the limit.

Note: The pattern is displayed using a diagram of 360°.

0° means horizontal,

30° means 30° elevation,

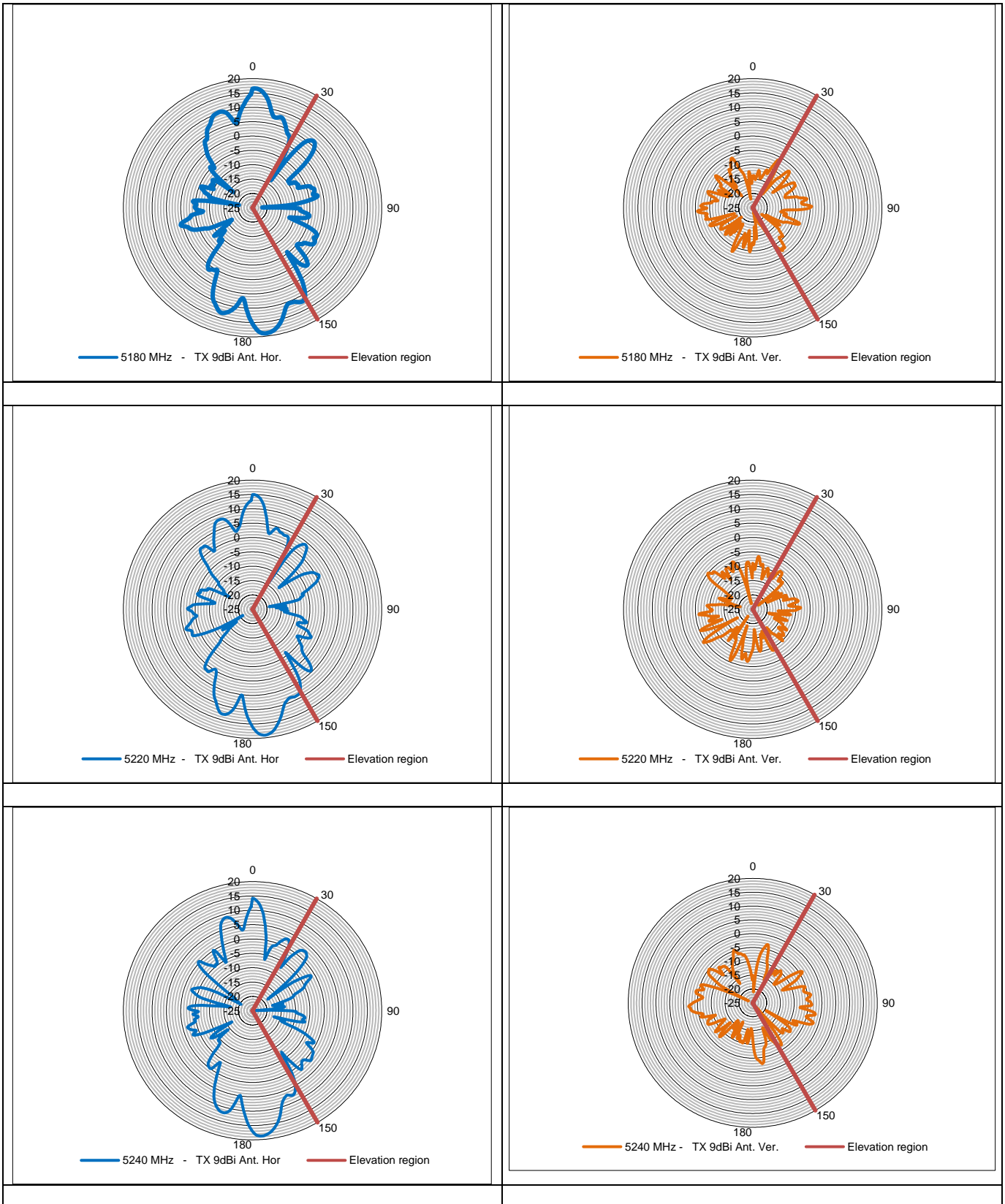
90° is vertical,

150° means 30° elevation higher than the horizon,

The range 30° to 150° is the focus of the rule.

5.1.5 Test result

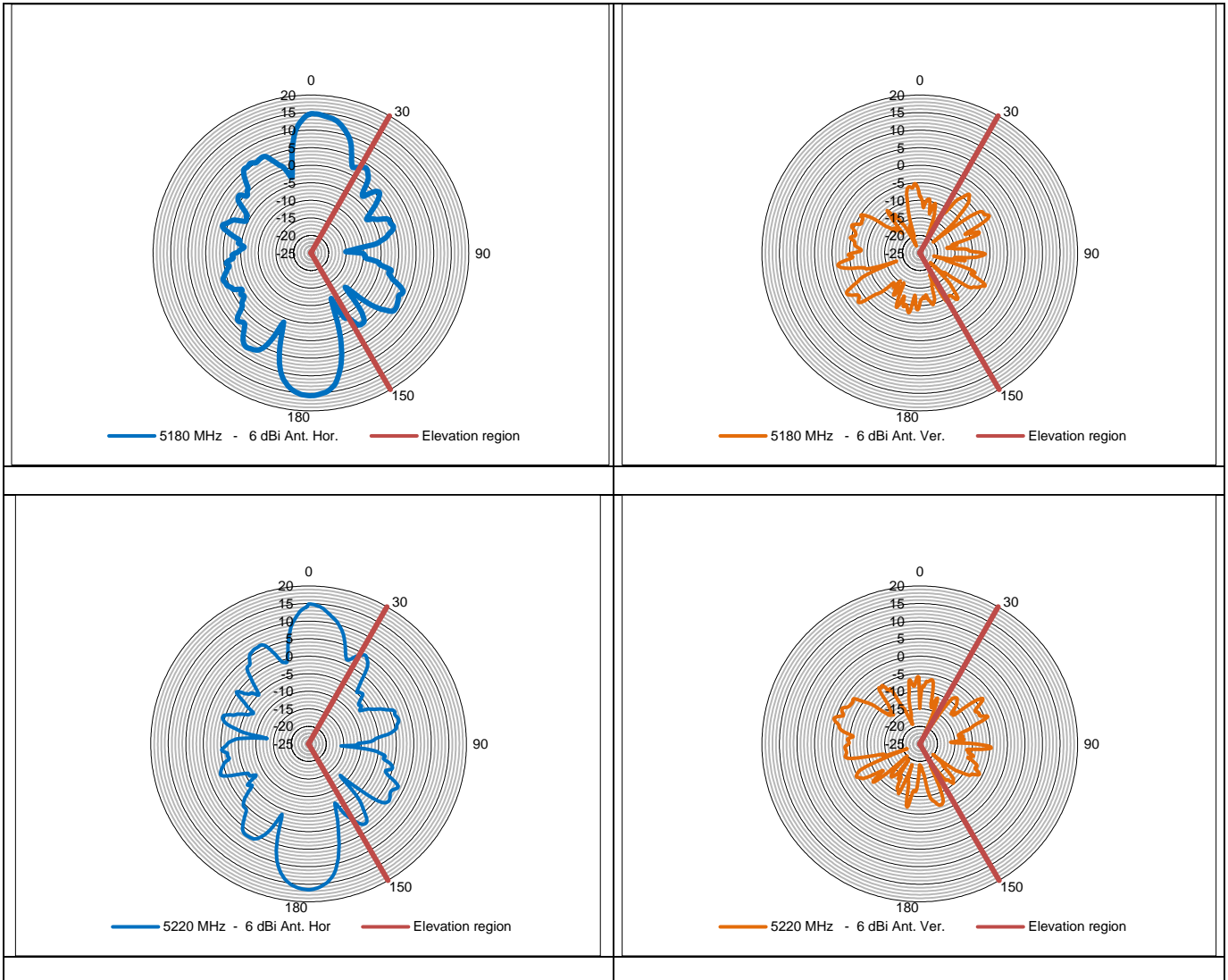
9 dBi antenna:

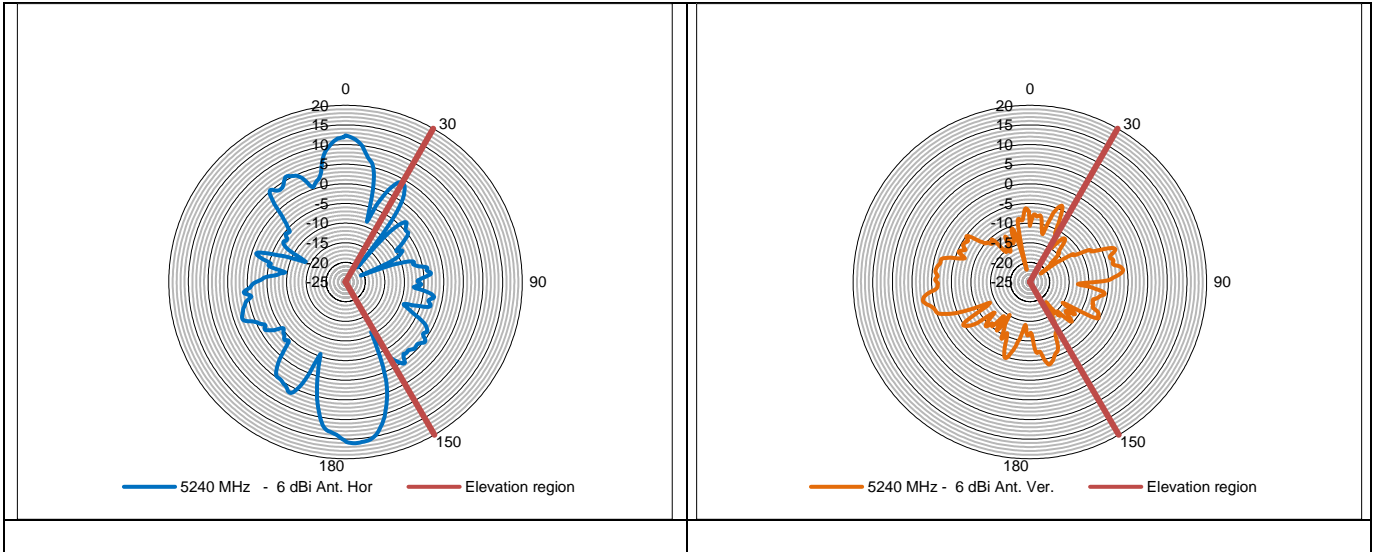


FCC ID: 2ABA7XPT

Channel	Receiving antenna position	Elevation angle (°)	Maximum Power (dBm)	Maximum Power (mW)	Limit (mW)
36	hor	149.80	11.26	13.4	125
36	ver	88.63	-4.45	0.4	125
44	hor	149.80	8.47	7.0	125
44	ver	87.84	-8.31	0.1	125
48	hor	149.80	5.42	3.5	125
48	ver	108.24	-1.89	0.6	125

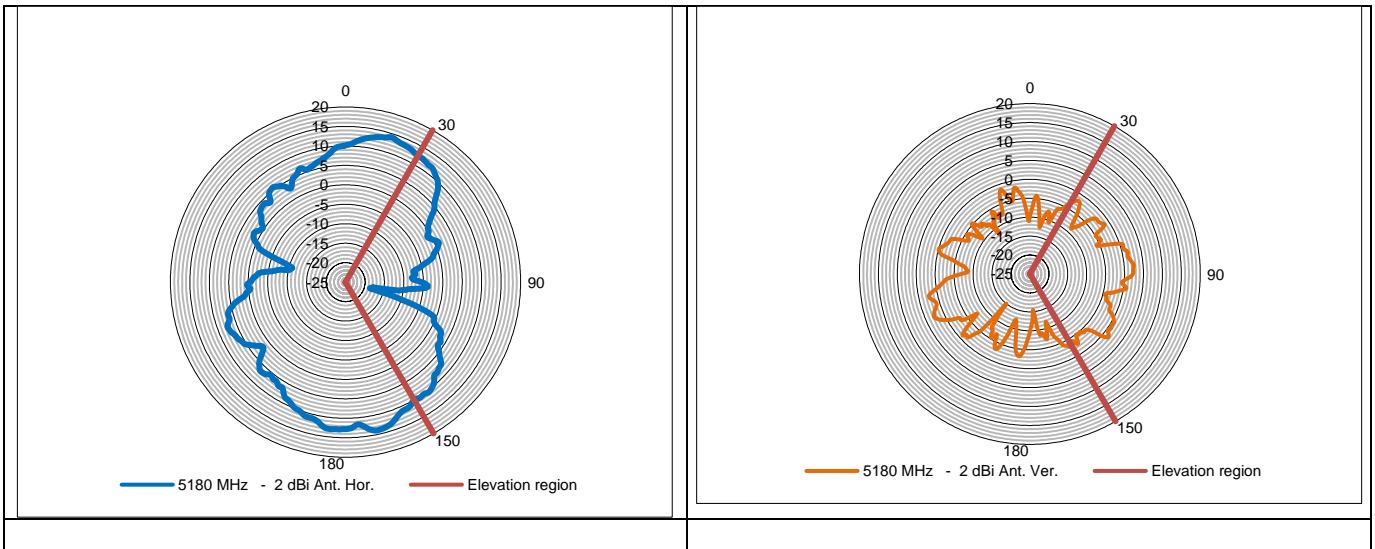
6 dBi antenna:

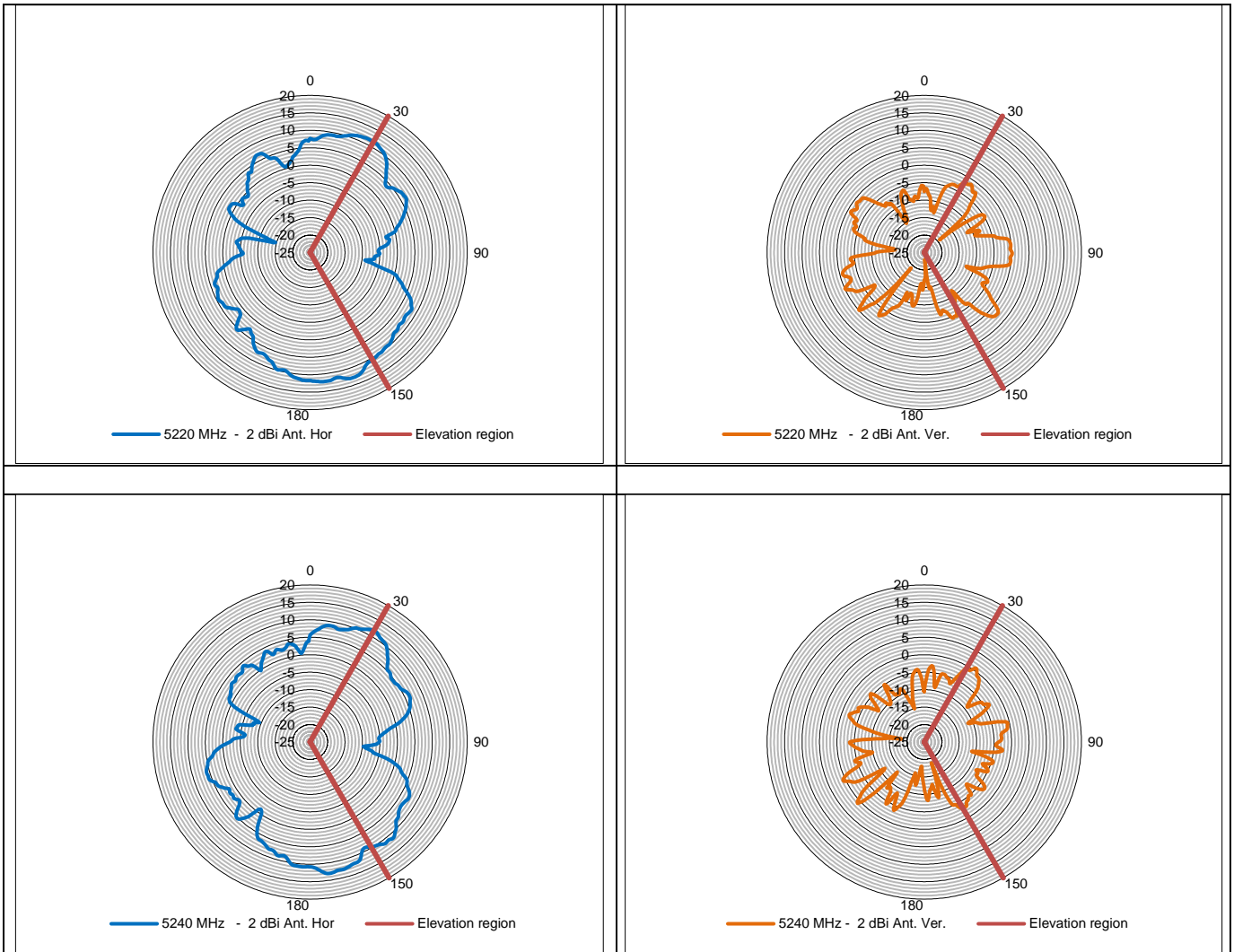




Channel	Receiving antenna position	Elevation angle (°)	Maximum Power (dBm)	Maximum Power (mW)	Limit (mW)
36	hor	32.94	3.91	2.5	125
36	ver	61.96	-2.55	0.6	125
44	hor	32.94	4.98	3.1	125
44	ver	54.12	-2.89	0.5	125
48	hor	30.59	4.04	2.5	125
48	ver	83.14	-1.10	0.8	125

2 dBi antenna:





Channel	Receiving antenna position	Elevation angle (°)	Maximum Power (dBm)	Maximum Power (mW)	Limit (mW)
36	hor	31.37	12.43	17.5	125
36	ver	85.49	2.53	1.8	125
44	hor	30.59	11.58	14.4	125
44	ver	130.20	2.37	1.7	125
48	hor	30.59	11.86	15.3	125
48	ver	35.29	0.84	1.2	125

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

The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).

The requirements are **FULFILLED**.

Remarks:

6 USED TEST EQUIPMENT AND ACCESSORIES

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

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPR 3	AFS5-12001800-18-10P-6	02-02/17-06-002				
	AFS4-01000400-10-10P-4	02-02/17-13-002				
	AMF-4F-04001200-15-10P	02-02/17-13-003				
	BBHA 9120 E 251	02-02/24-05-006	19/04/2017	19/04/2016	23/06/2017	23/12/2016
	WBH2-18NHG	02-02/24-08-002	19/04/2017	19/04/2016	23/06/2017	23/12/2016
	Sucoflex N-2000-SMA	02-02/50-05-075				
	SF104/11N/11N/1500MM	02-02/50-13-015				
	SF104/11SMA/11N/1500MM	02-02/50-13-016				
	SF104/11SMA/11N/1500MM	02-02/50-13-017				