EMI	- TEST REPORT - FCC Part 15.249, RSS210 -
Type / Model Name	: <u>PR 30-HVSG A12 (02)</u>
Product Description	: Rotating Laser
Applicant	: Hilti AG
Address	: Feldkircherstrasse 100
	9494 SCHAAN, LIECHTENSTEIN
Manufacturer	: HILLOS GmbH
Address	: Prüssingstraße 41
	07745 JENA, GERMANY
Licence holder	: Hilti AG
Address	: Feldkircherstrasse 100
	9494 SCHAAN, LIECHTENSTEIN

Test Report No. : T43200-00-00WP	25. September 2017 Date of issue
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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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ATTACHMENT A as separate supplement



1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpar Part 15, Subpart A, Section 15.31	t A - General (September, 2016) 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, Subpar Part 15, Subpart C, Section 15.203	t C - Intentional Radiators (September, 2016) Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.249	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz
ANSI C63.4: 2014	Methods of Measurement of Radio-Noise Emissions from Low- Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
ANSI C95.1: 2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2013	Uncertainty in EMC measurement
CISPR 22: 2008 EN 55022: 2010	Information technology equipment



2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EuT – Detailed photos see attachment A

2.2 General Remarks

According to the customers modification a re-test of the EuT was performed to show further compliance. The EuT is tested and compliant according CFR 47, Part 15.249, FCC ID: SDL-PR3XR01 with the Test Report No. T33893-01-02HS, 2010-08-02 and RSS 210, IC ID: 5228A-PR3XR01 with the Test Report No. T33893-01-03HS, 2010-08-03 by **mikes testing partners GmbH**. The EuT is re-tested and compliant according CFR 47, Part 15.249, FCC ID: SDL - PR3XR02 and IC ID: 5228A – PR3XR02 within the Test Report No. T36776-01-01TK, 2013-07-05 by **mikes testing partners GmbH** and Test Report No. T39470-00-01TK, 2015-07-14 and T40621-00-01TK, 2016-08-01 by **CSA Group Bayern GmbH**.

The EuT is modified in the laser section and now uses a green laser beam instead of the red one. Also, the keyboard of the EuT has been modified. It has 2 LED's less than the previous version, and one key function is different.

This Test Report shows the further compliance with CFR 47, Part 15.249 by re-measurement of the most concerned tests to the RF part.

- field strength of fundamental
- out-of-band emission, radiated (30 MHz 18 GHz)

2.3 Equipment category

WPAN Zigbee device, portable equipment.

2.4 Short description of the equipment under test (EuT)

The EuT is a rotating laser alignment system and is equipped with an RF transceiver operating within the frequency range from 2.4 GHz up to 2.4835 GHz making available to the user to control the whole alignment system remotely. The RF section is not modified.

Number of tested samples	:	1
Serial number	:	233150028

2.5 Variants of the EuT

None



FCC ID: SDL – PR3XR02 IC: 52

IC: 5228A – PR3XR02

2.6 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan:

Channels	Frequency
1	2405
2	2440
3	2480

Note: the marked frequencies are determined for final testing.

2.7 Transmit operating modes

The EuT use GFSK and provide following data rate: 250 kbps (kbps = *kilobits per second*)

2.8 Antenna

The following antennas shall be used with the EuT:

Number	Characteristic	Model number	Plug	Frequency range (MHz)
1	F-type PCB-antenna	-	-	2400 -2483.5

Note: The EuT uses a PCB antenna. Due to the absence of an antenna connector no temporary antenna can be connected.

2.9 Power supply system utilised

Power supply voltage, Vnom:12 VDC Lithium accumulator batteryPower supply voltage (alternative):none

2.10 Peripheral devices and interface cables

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

-	Power supply battery	Model : B 12 / 2.6 Li-Ion
-	Radio remote control	Model : PRA 30G (02)
-		Model :



2.11 Determination of worst case conditions for final measurement

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.

2.11.1 Test jig

No test jig was used.

2.11.2 Test software

No special test software was used.



TEST RESULT SUMMARY 3

Operating in the 2400 MHz - 2483.5 MHz band:

FCC Rule Part RSS Rule Part		Description	Result
15.35(c)	RSS-Gen, 6.10	Pulsed operation	passed
15.203	RSS Gen, 8.3	Antenna requirement	not tested
15.204	RSS Gen, 8.2	External radio frequency power amplifiers	not tested
15.205(a)	RSS Gen, 8.1	Emissions in restricted bands	not tested
15.207(a) RSS Gen, 8.8		AC power line conducted emissions	not tested
15.215(c) -		EBW	not tested
- RSS-Gen, 6.6		OBW	not tested
15.249(a) RSS-210, B10(a)		Field strength of fundamental	passed
15.249(d)	RSS-210, B10(b)	Out-of-band emission, radiated	passed
-	RSS-Gen, 6.11	Transmitter frequency stability	not applicable

The mentioned RSS Rule Parts in the above table are related to: RSS Gen, Issue 4, November 2014 RSS 210, Issue 9, August 2016

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

: 28 August 2017

Testing concluded on

: 29 August 2017

Checked by:

Tested by:

Klaus Gegenfurtner Teamleader Radio

Willibald Probst Radio Team

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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 %

86-106 kPa

Atmospheric pressure:

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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%	± 2.5 x 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



4.1 Measurement protocol for FCC and ISED

4.1.1 Test methodology

The Open Area test site is a listed Open Site under the Canadian Test-Sites File-No: IC 3009A-1

The Anechoic chamber is a listed test site under the Canadian Test-Sites File-No:

IC 3009A-2

In compliance with RSS 247 testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.10 and applying the CISPR 22 limits.

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

4.1.2.1 General Standard information

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.

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

Description of measurement

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 C63.10.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 metres 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 metres and the EuT is rotated 360 degrees.

The final level in $dB\mu V/m$ is calculated by taking the reading from the EMI receiver (Level $dB\mu V$) 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 Delta	Level	+	Factor	=	Level -	CISPR Limit	=
(MHz) 719.0	(dBµV) 75.0	+	(dB) 32.6	=	(dBµV/m) 107.6 -	(dBµV/m) 110.0	(dB) = -2.4



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

Description of measurement

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, 1.5 metre 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 C63.10. 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 analyzer set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak 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.



5 TEST CONDITIONS AND RESULTS

5.1 AC power line conducted emissions

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

5.1.1 Description of the test location

Test location: NONE

Remarks: Not applicable, the EuT is battery powered and has no externally connectable cables.



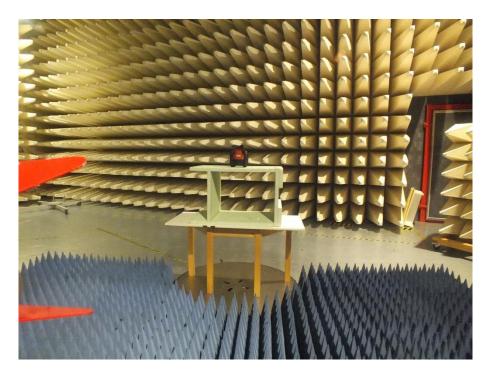
Field strength of fundamental

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

5.2.1 Description of the test location

Test location:Anechoic chamber 1Test distance:3 m

5.2.2 Photo documentation of the test set-up



5.2.1 Applicable standard

According to FCC Part 15C, Section 15.249(a):

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the effective limits.

5.2.2 Description of Measurement

The radiated emission of the fundamental wave from the EuT is measured using a spectrum analyser and appropriate linear polarized antennas. The set up of the EuT and the measurement procedure is in accordance to ANSI C63.10, Item 6.5. The EuT is measured in TX continuous mode unmodulated under normal conditions.

Analyser settings: Peak measurement: RBW: 1 MHz AV measurement: RBW: 1 MHz

VBW: 1 MHz VBW: 10 Hz Detector: Detector:

ctor: Max peak ctor: Max peak



FCC ID: SDL – PR3XR02 IC: 5228

IC: 5228A – PR3XR02

5.2.3 Test result

Frequency	Reading level PK	Bandwidth	Correction factor	Corrected level PK	Limit PK	Duty cycle correction factor K _E	Corrected level AV	Limit AV
(MHz)	(dBµV)	(kHz)	(dB)	dB(µV/m)	dB(µV/m)	(dB)	dB(µV/m)	dB(µV/m)
2405	114.8	1000	-14.6	100.2	114	-30.8	69.4	94
2440	114.6	1000	-14.4	100.2	114	-30.8	69.4	94
2480	112.8	1000	-14.0	98.8	114	-30.8	68.0	94
Measurement uncertainty					±2.34 dB			

Note: The correction factor includes cable loss and antenna factor.

Average-Limit according to FCC Part 15C, Section 15.249(a):

Frequency	Field strength of	f fundamental
(MHz)	(mV/m)	dB(µV/m)
902 - 928	50	94
2400 - 2483.5	50	94
5725-5875	50	94
24000 - 24250	250	108

Peak-Limit according to FCC Part 15C, Section 15.249(e):

However the peak fieldstrength shall not exceed the maximum permitted average limit by more than 20 dB.

The requirements are FULFILLED.

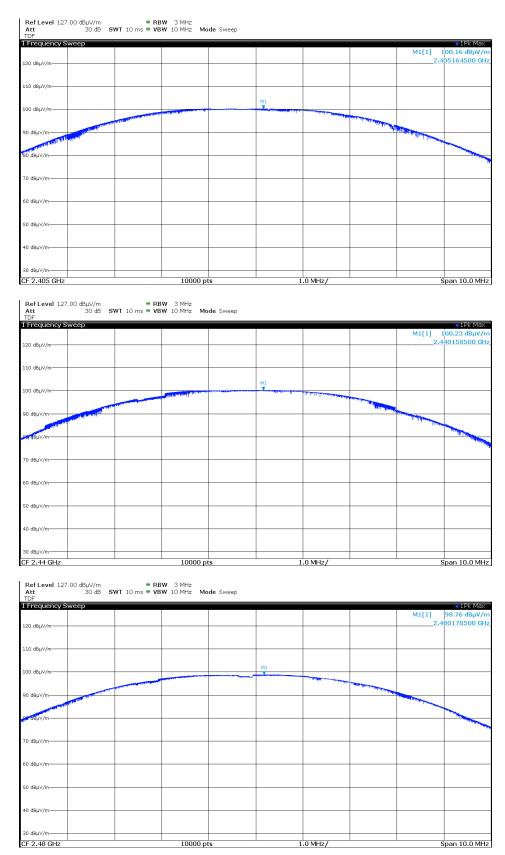
Remarks:



FCC ID: SDL – PR3XR02

IC: 5228A – PR3XR02

5.2.4 Test protocols



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5.3 Out-of-band emission, radiated

For test instruments and accessories used see section 6 Part SER1, SER 2, SER 3.

5.3.1 Description of the test location

Test location:OATS 1Test location:Anechoic chamber 1

Test distance:

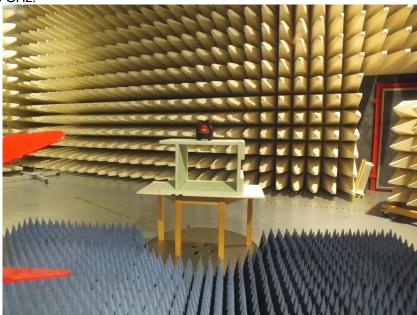
3 m

5.3.2 Photo documentation of the test set-up

Test setup 30 MHz – 1000 MHz:



Test setup 1 GHz – 18 GHz:



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5.3.3 Applicable standard

According to FCC Part 15C, Section 15.249 (d):

Emission radiated outside of the specified frequency bands, except harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated limit in FCC Part 15C, Section 15.209, whichever is the lesser attenuation.

5.3.4 Description of Measurement

The radiated emissions from the EuT are measured in the frequency range of 9 kHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. The setup of the EuT and the measurement procedure is in accordance to ANSI C63.10, Item 6.3. In the frequency range above 1 GHz a spectrum analyser is used with appropriate linear polarized antennas. If the emission level in peak mode complies with the average limit testing is stopped and peak values will be reported, otherwise, the emission is measured in average mode again and reported. The EuT is measured in TX continuous mode unmodulated under normal conditions.

According to section 2.2 of the present document the measurements in the frequency ranges from 9 kHz to 30 MHz and 18 GHz to 25 GHz were not performed because within these frequency ranges no emmisions could be detected within former tests.

Instrument settings:

inten entrenn oortunger		
30 MHz – 1000 MHz:	RBW:	120 kHz
1000 MHz – 25 GHz	RBW:	1 MHz

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
63.70	1.5	8.9	14.5	13.6	16.0	22.5	40.0	-17.5
79.72	2.3	3.9	11.2	10.9	13.5	14.8	40.0	-25.2
111.60	5.2	2.2	10.9	11.7	16.1	13.9	43.5	-27.4
216.02	3.4	6.8	12.1	12.6	15.5	19.4	46.0	-26.6

5.3.5 Test result f 30 - 1000 MHz



5.3.6 Test result f 1 GHz – 18 GHz

Channel 1

Test condition	ns:							
active comm	unication				Test r	results		
Start requency (MHz)	Stop frequency (MHz)	RBW (kHz)	Maximum (MHz)	emission (dBµV/m)	AV Limit (dBµV/m)	Duty cycle correction (dB)	Margin (dB)	Detector
1000	2400	1000	2400	67.5	54.0	-30.8	-17.3	PK
2483.5	4000	1000	3974	41.7	54.0	0.0	-12.3	PK
4000	6000	1000	4810	49.3	54.0	0.0	-4.7	PK
6000	12000	1000	11961	48.5	54.0	0.0	-5.5	PK
12000	18000	1000	16709	52.0	54.0	0.0	-2.0	PK
	Measuremer	t uncertainty				±6 dB		

Channel 2

Test condition	าร:									
active comm	unication				Test results					
Start requency (MHz)	Stop frequency (MHz)	RBW (kHz)			AV Limit (dBµV/m)	Duty cycle correction (dB)	Margin (dB)	Detector		
1000	2400	1000	2398	45.0	54.0	0.0	-9.0	PK		
2483.5	4000	1000	2494	43.3	54.0	0.0	-10.7	PK		
4000	6000	1000	4879	49.1	54.0	0.0	-4.9	PK		
6000	12000	1000	11953	49.0	54.0	0.0	-5.0	PK		
12000	18000	1000	17956	52.5	54.0	0.0	-1.5	PK		
	Measuremen	nt uncertainty				±6 dB				

Channel 3

Test condition	าร:									
active comm	unication				Test results					
Start requency (MHz)	Stop frequency (MHz)	RBW (kHz)	Maximum (MHz)	emission (dBµV/m)	AV Limit (dBµV/m)	Duty cycle correction (dB)	Margin (dB)	Detector		
1000	2400	1000	2053	40.3	54.0	0.0	-13.7	PK		
2483.5	4000	1000	2484	59.4	54.0	-30.8	-25.5	PK		
4000	6000	1000	4959	47.2	54.0	0.0	-6.8	PK		
6000	12000	1000	11947	49.1	54.0	0.0	-4.9	PK		
12000	18000	1000	17965	52.0	54.0	0.0	-2.0	PK		
	Measuremer	nt uncertainty				±6 dB				



Limit according to FCC Part 15C, Section 15.209:

Frequency (MHz)	15.209 Limits (µV/m)	Measurement distance (m)
0.0090.49	2400/f(kHz)	300
0.49 – 1.705	24000/f(kHz)	30
1.705 – 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Average limit according to FCC Part 15C, Section 15.249(a):

Fundamental frequency	Field strength of	of harmonics		
(MHz)	(µV/m)	dB(µV/m)		
902 - 928	500	54		
2400 - 2483.5	500	54		
5725 - 5875	500	54		
24000 - 24250	2500	68		

The requirements are **FULFILLED**.

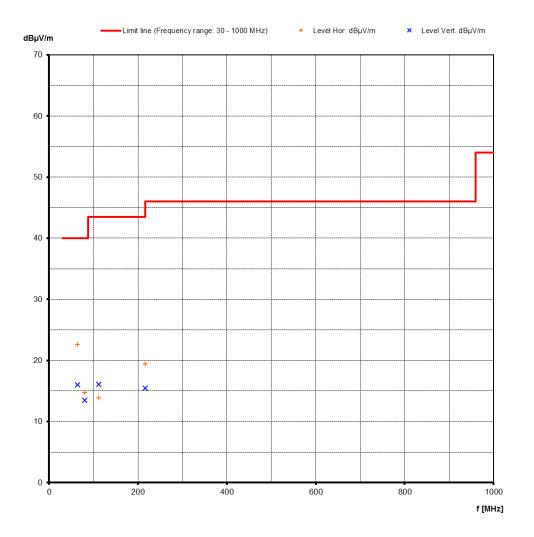
Remarks: For detailed test results please refer the following test protocols.



FCC ID: SDL – PR3XR02

IC: 5228A – PR3XR02

5.3.7 Test protocols





Channel 1, 2405 MHz

0 dBµV/m								M1[1]	 1Pk Ma 67.52 dBµV,
									2.399750 G
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dBµV/m									
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Marker Table Type Ref M1	Trc 1 2	X-Value 2.39975 GH	z 67	Y-Value .52 dBµV∕n	1	Function		Function Re	esult
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4835 GHz Marker Peak L No 1 Marker Table	X-Value 3.974090 Gi	Hz X-Value .974093 GI	41.669 dB	¥-Value .67 dBμV/n		Function		Function Re	esult
4835 GHz Marker Peak L No 1 Marker Table Fype Ref M1 Ref Level 97.00 Att	X-Value 3.974090 Gl Trc 1 3 0 dB _µ V//m 0 dB SW	Hz X-Value .974093 GI	41.669 dB	µV/m Y-Value .67 dBµV∕n		Function		Function Re	esult
4835 GHz Marker Peak L No 1 Marker Table Fype Ref M1 Ref Level 97.00 Frequency Sw	X-Value 3.974090 Gl Trc 1 3 0 dB _µ V//m 0 dB SW	Hz X-Value .974093 GI	41.669 dB Hz 41 W 1 MHz	µV/m Y-Value .67 dBµV∕n		Function			● 1Pk Ma
4835 GHz Aarker Peak L No 1 Marker Table (rope Ref M1 Ref Level 97.00 Att Frequency Sw	X-Value 3.974090 Gl Trc 1 3 0 dB _µ V//m 0 dB SW	Hz X-Value .974093 GI	41.669 dB Hz 41 W 1 MHz	µV/m Y-Value .67 dBµV∕n		Function			● 1Pk Ma 49.30 dBµV
4835 GHz Marker Peak L No 1 Marker Table Fype Ref M1 Ref Level 97.00 Aktevel 97.00 Mt dBµV/m	X-Value 3.974090 Gl Trc 1 3 0 dB _µ V//m 0 dB SW	Hz X-Value .974093 GI	41.669 dB Hz 41 W 1 MHz	µV/m Y-Value .67 dBµV∕n		Function			● 1Pk Ma 49.30 dBµV
4835 GHz Aarker Peak L Aarker Table I	X-Value 3.974090 Gl Trc 1 3 0 dB _µ V//m 0 dB SW	Hz X-Value .974093 GI	41.669 dB Hz 41 W 1 MHz	µV/m Y-Value .67 dBµV∕n		Function			● 1Pk Ma 49.30 dBµV
4835 GHz Harker Peak L No 1 Marker Table ype Ype Ref Level 97.00 Harker Table Ymax Buy/m dBuy/m dBuy/m	X-Value 3.974090 Gl Trc 1 3 0 dB _µ V//m 0 dB SW	Hz X-Value .974093 GI	41.669 dB Hz 41 W 1 MHz	µV/m Y-Value .67 dBµV∕n		Function			● 1Pk Ma 49.30 dBµV
4835 GHz Marker Peak L Marker Peak L No 1 Arker Table (ype) (ype) Ref Level 97.00 Xt reduency Sw d8µV/m d8µV/m d8µV/m d8µV/m ype	X-Value 3.974090 Gl Trc 1 3 0 dB _µ V//m 0 dB SW	Hz .974093 GI ● RB /T 32 ms ● VB	41.669 dB Hz 41 W 1 MHz	µV/m Y-Value .67 dBµV∕n		Function			● 1Pk Ma 49.30 dBµV
4835 GHz Marker Peak L Marker Peak L No 1 Arker Table (ype) (ype) Ref Level 97.00 Xt reduency Sw d8µV/m d8µV/m d8µV/m d8µV/m ype	X-Value 3.974090 Gi 1 3 0 dBµV/m 0 dB SW CCP	Hz .974093 GI ● RB /T 32 ms ● VB	41.669 dB Hz 41 W 1 MHz	µV/m Y-Value .67 dBµV∕n		Function			● 1Pk Ma 49.30 dBµV
4835 GHz Marker Peak L Marker Table T 1 Marker Table Frequence Ref Level 97.00 Att DF GBµV/m dBµV/m dBµV/m	X-Value 3.974090 Gi 1 3 0 dBµV/m 0 dB SW CCP	Hz .974093 GI ● RB /T 32 ms ● VB	41.669 dB Hz 41 W 1 MHz	µV/m Y-Value .67 dBµV∕n				M1[1]	1Рk Ма 49.30 dBµV 4.809750 с
4835 GHz Marker Peak L No 1 Marker Table Frequence Ref Level 97.00 Att Sef Level 97.00 Att BµV/m dBµV/m dBµV/m dBµV/m	X-Value 3.974090 Gi 1 3 0 dBµV/m 0 dB SW CCP	Hz .974093 GI ● RB /T 32 ms ● VB	41.669 dB Hz 41 W 1 MHz	µV/m Y-Value .67 dBµV∕n				M1[1]	1Рk Ма 49.30 dBµV 4.809750 с
4835 GHz Marker Peak L No 1 Marker Table Type Ref M1 Ref Level 97.00 Att Frequency Sw dBµV/m dBµV/m dBµV/m dBµV/m dBµV/m dBµV/m dBµV/m dBµV/m	X-Value 3.974090 Gi 1 3 0 dBµV/m 0 dB SW CCP	Hz .974093 GI ● RB /T 32 ms ● VB	41.669 dB Hz 41 W 1 MHz	µV/m Y-Value .67 dBµV∕n				M1[1]	1Pk Ma 49.30 dBµV, 4.809750 G
.4835 GHz Marker Peak L No 1 Marker Table Type Ref M1 Ref Level 97.00 dBµV/m	X-Value 3.974090 Gi 1 3 0 dBµV/m 0 dB SW CCP	Hz .974093 GI ● RB /T 32 ms ● VB	41.669 dB Hz 41 W 1 MHz	µV/m Y-Value .67 dBµV∕n				M1[1]	1Pk Ma 49.30 dBµV, 4.809750 G
.4835 GHz Marker Peak L No 1 Marker Table Type Ref M1 Ref Level 97.00 Att DF Trequency Swith dBµV/m	X-Value 3.974090 Gi 1 3 0 dBµV/m 0 dB SW CCP	Hz .974093 GI ● RB /T 32 ms ● VB	41.669 dB Hz 41 W 1 MHz	µV/m Y-Value .67 dBµV∕n				M1[1]	1Рk Ма 49.30 dBµV 4.809750 с
4835 GHz Vlarker Peak L Vlarker Peak L No 1 Marker Table Type Ref M1 Ref Level 97.00 Att Fequency Sw dBµV/m	X-Value 3.974090 Gi 1 3 0 dBµV/m 0 dB SW CCP	Hz .974093 GI ● RB /T 32 ms ● VB	41.669 dBy	V-Value .67 dBµV/n e Auto Sweep				M1[1]	0 1Pk Ma 49.30 dBrV 4.809750 C
4835 GHz Marker Peak L No 1 Marker Table Type Ref M1 Ref Level 97.00 dBµV/m dBµV/m </td <td>X-Value 3.974090 Gl Trc 1 3 0 dBµV/m 0 dB SW CCP </td> <td>H2 .974093 GI /T 32 ms ● VB d8μV/m</td> <td>41.669 dBy</td> <td>Y-Value .67 dBµV/n e Auto Sweep</td> <td></td> <td>0.0 MHz/</td> <td></td> <td>M1[1]</td> <td>1Pk Ma 49.30 dBµV 4.809750 C</td>	X-Value 3.974090 Gl Trc 1 3 0 dBµV/m 0 dB SW CCP 	H2 .974093 GI /T 32 ms ● VB d8μV/m	41.669 dBy	Y-Value .67 dBµV/n e Auto Sweep		0.0 MHz/		M1[1]	1Pk Ma 49.30 dBµV 4.809750 C
4835 GHz Marker Peak L Marker Peak L Marker Table I Aarker Table I Marker Table I Aarker Table I I I I I I I I I I I I I I I I I I I <td>X-Value 3.974090 Gl Trc 1 3 0 dBµV/m 0 dB SW CCp H2 54.000 H2 54.000</td> <td>H2 .974093 GI .974093 GI .97400 GI .974000 GI .974000 GI .974000 GI .97400000 .9740000000 .97400000000000</td> <td>41.669 dBy</td> <td>Y-Value S7 dBµV/n e Auto Sweep characteristics charac</td> <td></td> <td></td> <td>e GHz</td> <td>M1[1]</td> <td>1Pk Ma 49.30 dBµV 4.809750 C</td>	X-Value 3.974090 Gl Trc 1 3 0 dBµV/m 0 dB SW CCp H2 54.000 H2 54.000	H2 .974093 GI .974093 GI .97400 GI .974000 GI .974000 GI .974000 GI .97400000 .9740000000 .97400000000000	41.669 dBy	Y-Value S7 dBµV/n e Auto Sweep characteristics charac			e GHz	M1[1]	1Pk Ma 49.30 dBµV 4.809750 C

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Ref Level 80 Att		● RB VT 24 ms ● VB	WI1MHz WI3MHz Mode	e Sweep					
TDF									
1 Frequency S	weep								1Pk Max
75 dBuV/m								M1[1]	52.00 dBµV/m
75 UBµV/m-	H2 74.000	I dBµV/m							16.709250 GHz
70 dBµV/m									
65 dBµ∀/m									
60 dBµV/m									
00 000000									
55 dBµV/m	H1 54.000 dBµV/m						<u> </u>		2
50 dBuV/m							Hakalı		
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dimension (10) up and	and the second second second second	Street in the second	and the second						
40 dBµV/m									
or In 114									
35 dBµV/m									
30 dBµ∀/m									
25 dBµV/m									
12.0 GHz			12000 pt	s	6	00.0 MHz/			18.0 GHz
2 Marker Peak	< List								
No	X-Valu		Y-Va		No	X-Valu		Y-Va	
1	16.709250	GHz	51.997 dE	3µV/m	2	17.932750	GHz	51.953 di	3μV/m
3 Marker Tabl	e								
Type Ref	Trc	X-Value 6.70925 GH	7 52	Y-Value .00 dBuV/m		Function		Function R	esult

Channel 2, 2440 MHz

DF Frequency Swe	ер								 1Pk Ma
) dBµ∀/m								M1[1	2.398250 G
) dBµV/m									2.398230 0
	——H2 74.000 dBµV/m								
) dBµV/m									
) dBµV/m									
I dBµ∀/m-	54.000 dBµ∀/m								
dBµV/m						. atter as protocilitation	ganter alter produces and age		day address and MM
dBµV/m	han the second second second provided and	ware and the same to	erenderhanserrader	ergestylereseterstation	a fire for the contraction of the second			**********	Party of the second second
dBµV/m									
dBµV/m									
BµV/m									
0 GHz 1arker Peak Lis			2800 pt	5	14	0.0 MHz/			2.4 G
1 larker Table ype Ref	2.398250 GHz	alue 25 GHz	45.005 dE	9µV/m Y-Value . 01 dBµV/ 1	 	Function		Function F	Result
Marker Table Type Ref M1 ef Level 97.00 d tt	2.398250 GHz Trc X-v 1 2.398	• RBW 1 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function		Function F	Result
1 Marker Table Type Ref M1 ef Level 97.00 d H	2.398250 GHz Trc X-v 1 2.3983 JBµV/m 0 dB SWT 6 ms	• RBW 1 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function	1		• 1Pk Ma
1 Aarker Table Type Ref M1 ef Level 97.00 d tt F Tequency Swee	2.398250 GHz Trc X-v 1 2.3983 JBµV/m 0 dB SWT 6 ms	• RBW 1 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function			● 1Pk Ma
1 Marker Table Yope Ref M1 ef Level 97.00 d tt F requency Swe dBµV/m	2.398250 GHz Trc X-v 1 2.3983 JBµV/m 0 dB SWT 6 ms	• RBW 1 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function			● 1Pk Ма
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2.398250 GHz Trc X-v 1 2.3983 JBµV/m 0 dB SWT 6 ms	• RBW 1 M • VBW 3 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function			● 1Pk Ma
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2.398250 GHz Trc 2.398 Trc 2.398 The second	• RBW 1 M • VBW 3 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function			● 1Pk Ma
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2.398250 GHz Trc 2.398 Trc 2.398 The second	• RBW 1 M • VBW 3 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function			● 1Pk Ma
1 Marker Table Type Ref M1 ef Level 97.00 c tt F Tequency Swee d8µV/m d8µV/m d8µV/m d8µV/m	2.398250 GHz Trc 2.398 Trc 2.398 The second	• RBW 1 M • VBW 3 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function			● 1Pk Ма
1 Aarker Table ype Ref M1 ef Level 97.00 o tt F requency Swe d8µV/m d8µV/m d8µV/m d8µV/m	2.398250 GHz Trc 2.398 Trc 2.398 The second	• RBW 1 M • VBW 3 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function			● 1Pk Ma
1 Aarker Table Type Ref M1 ef Level 97.00 c tt t F requency Swee d8µV/m d8	2.398250 GHz Trc 2.398 Trc 2.398 The second	• RBW 1 M • VBW 3 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function			● 1Pk Ма
1 Aarker Table Type Ref M1 ef Level 97.00 c tt t F requency Swee d8µV/m d8	2.398250 GHz Trc 2.398 Trc 2.398 The second	• RBW 1 M • VBW 3 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function			● 1Pk Ма
	2.398250 GHz Trc 2.398 Trc 2.398 The second	• RBW 1 M • VBW 3 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function			Result 1Pk Me 19k Me 2.494242 G 2.494242 G 4.444242 G 4.44424 G 4.44444 G 4.444444 G 4.4444444 G 4.444444 G 4.444444 G
1 Aarker Table Fype Ref M1 ef Level 97.00 o tt F F Gequency Swe dBµV/m	2.398250 GHz Trc 2.398 Trc 2.398 The second	• RBW 1 M • VBW 3 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function			● 1Pk Ма
1 Aarker Table Fype Ref M1 ef Level 97.00 c tt t j F FEGUENCY SWE d8µV/m	2.398250 GHz Trc 2.398 Trc 2.398 The second	• RBW 1 M • VBW 3 M	45 . 1Hz	Y-Value .01 dBµV∕ı		Function			● 1Pk Ма

۲-Value 43.29 dBµV/m

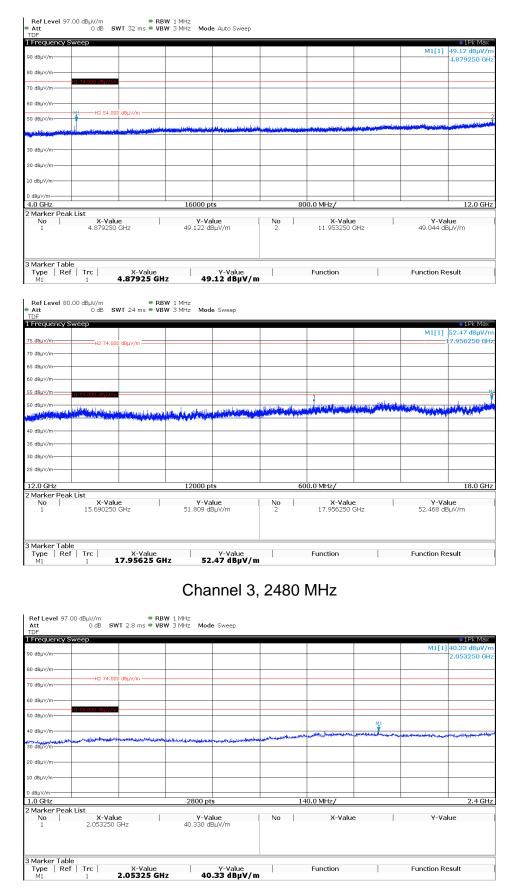
X-Value 2.494242 GHz Function

3 Marker Table Type | Ref | Trc | M1 1

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Function Result





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								M1[1]	• 1Pk Ma) 59.35 dBµV/
00 dBµV/m									2.483626 G
0 dBµV/m									
0 dBµ∨/m	H2 74.000	dBuV/m							
0 dBµV/m	12 74.000	appvym							
1 0 dBµV/m									
O _g dByµV/m───	H1 54.000 dBµV/m								
AMAAND	nil Mindler (n. 1921), de Mindleff (1772)	instantia da cia industria	et a seller to a seller a della			and a sticket provide that the			dan diki wanifa ta sinta
0 dвµY/m									
0 dBµ∀/m									
0 dBµV/m			6000 pt	is is	1	.51.65 MHz/			4.0 Gł
Marker Peak	List X-Value	<u> </u>	Y-Val		No	X-Value		Y-Value	
1 2	2.483630 G 2.490200 G	Hz	59.345 dE 53.430 dE	uV/m	3 4	2.510920 GH 2.535190 GH	1z	45.343 dBµ\ 46.470 dBµ\	v/m
Marker Table Type Ref	Trc	X-Value .483626 G	Hz 59	Y-Value .35 dBµV/	m	Function		Function R	esult
Ref Level 97.	.00 dBµV/m	= RI	BW 1 MHz						
Att IDF Frequency S		VT 32 ms 🗢 VI	3W 3 MHz Mod	e Auto Sweep		_			● 1Pk Ma
0 dBµV/m								M1[1]	49.07 dBµV/ 11.946750 G
0 dBµV/m									
0 dBµ∀/m	H1 74.000 dBµV/m -								
0 dBµV/m									
	H2 54.000	dBµV/m							
0 dBµ∀/m		La La Milanda (Milanda da Milanda	te and the second second	معسين باجاذ	and the second second	ومستخدما ويروقنا والملوم	فاعقبه المراجع	and the state of the	
0 dBµV/m									
0 dBµV/m									
0 dBµV/m									
dBµV/m			16000						10.00
1.0 GHz Marker Peak	List		16000 p	ts		800.0 MHz/			12.0 G
No 1	X-Value 4.959250 (e GHz	Y-V a 47.211 d	alue ΒμV/m	2 2	X-Valu 11.946750	GHz	Y-Va 49.073 di	lue 3μV/m
Marker Table Type Ref M1	Trc	X-Value 1.94675 G	Hz 49	Y-Value .07 dBµV/	 m	Function		Function R	esult
Ref Level 80.	.00 dBµV/m	• RI	BW 1 MHz						
Att IDF Frequency S		VI 24 ms - VI	3W 3 MHz Mod	e sweep				MILLI	• 1Pk Ma
5 dBµV/m	H2 74.000	dBµV/m						M1[1]	51.97 dBµV/ 17.965250 G
0 dBµ∀/m									
5 dBµV/m									
0 dBµV/m					+	-			
5 dBµV/m	H1 54.000 dBµV/m -				+				
0 dBµY/m	وتندروه والماريد والتلاطعتين	والعامي معرفين المراجع	متر فالألف ورق وقلام	Lader of the later of the	وحائبة فحالتهم التبلي		in the second state		
A number of the second s	and the second	and the second	and the second secon	and south and the second					
0 dBµV/m									
5 dBµV/m									
о авµ∨/м									
			10000			(00.0.M/) /			
0.0.0			12000 p	ts	(600.0 MHz/			18.0 G
12.0 GHz Marker Peak	List		Y-Va						

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5.4 EBW and OBW

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

5.4.1 Description of the test location

Test location: NONE

Remarks: Not tested, because the RF section was not modified.



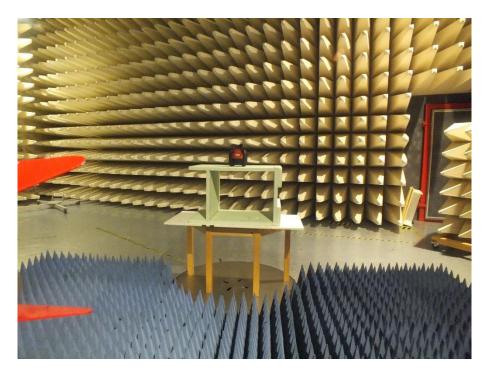
5.5 Correction for pulse operation (duty cycle)

For test instruments and accessories used see section 6 Part CPR1.

5.5.1 Description of the test location

Test location:Anechoic chamber 1Test distance:3 m

5.5.2 Photo documentation of the test set-up



5.5.3 Applicable standard

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

When the radiated emission limits are expressed in terms of average value and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete puls train, including blanking intervals, as long as the pulse train does not exceed 0.1s. In cases where the puls train exceeds 0.1s, the measured field strength shall be determined from the average absolute voltage during a 0.1s interval during which the field strength is at its maximum. The exact method of calculating the average field strength shall be submitted.

5.5.4 Description of Measurement

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

 $KE = 20 \log \left((t_{iw}/T_w) * (t_{iB}/T_B) \right)$

KE: pulse operation correction factor

- *tiw* pulse duration for one complete pulse track
- *tiB* pulse duration for one pulse
- T_W a period of the pulse track
- *T_B* a period of one pulse

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FCC ID: SDL – PR3XR02 IC: 5228

IC: 5228A – PR3XR02

5.5.5 Test result

t _{iw}	T _w	t _{iB}	Τ _Β	K _E
(ms)	(ms)	(ms)	(ms)	(dB)
100	100	2.86	100	

Remarks: The pulse train (*Tw*) exceeds 100 ms, therefore the duty cycle have been calculated by averaging

the sum of the pulse widths over the 100 ms width with the highest average value.

For detailed results, please see the test protocol below.



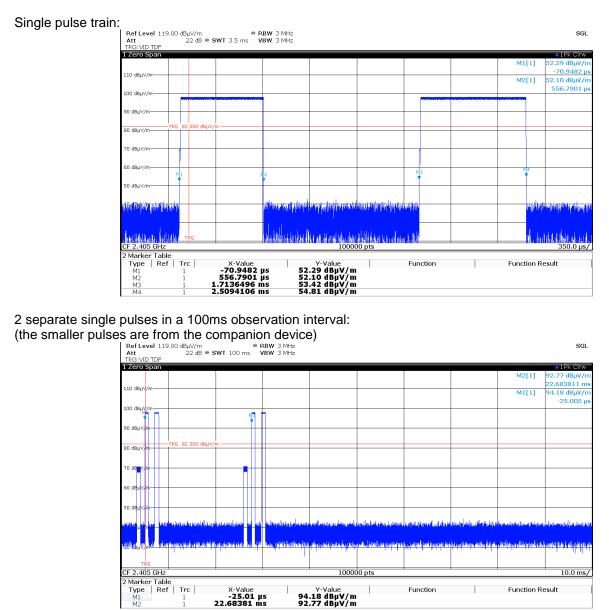
FCC ID: SDL – PR3XR02

IC: 5228A – PR3XR02

5.5.6 Test protocol

Correction for Pulse Operation (Duty Cycle)

FCC Part 15A, Section 15.35(c)

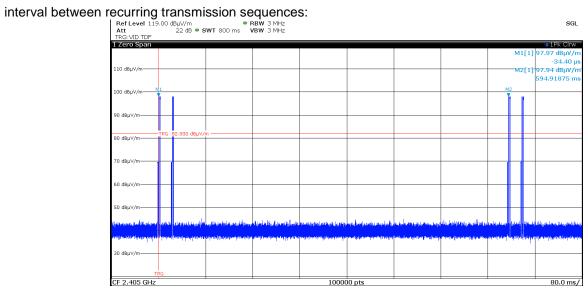




FCC ID: SDL – PR3XR02

IC: 5228A - PR3XR02







5.6 Antenna application

5.6.1 Applicable standard

According to FCC Part 15C, Section 15.203(a):

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.

Remarks: Not applicable, because the RF section was not modified.



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	FSW43 AFS5-12001800-18-10P-6 AFS4-01000400-10-10P-4 AMF-4F-04001200-15-10P	02-02/11-15-001 02-02/17-06-002 02-02/17-13-002 02-02/17-13-003	07/04/2018	07/04/2017		
	3117 02-02/24-05-009 Sucoflex N-2000-SMA SF104/11N/11N/1500MM	10/05/2018 02-02/50-05-075 02-02/50-13-015	10/05/2017			
SER 2	ESVS 30 VULB 9168 NW-2000-NB KK-EF393/U-16N-21N20 m KK-SD_7/8-2X21N-33,0M	02-02/03-05-006 02-02/24-05-005 02-02/50-05-113 02-02/50-12-018 02-02/50-15-028	03/07/2018 12/04/2018	03/07/2017 12/04/2017	12/10/2017	12/04/2017
SER 3	FSW43 AFS5-12001800-18-10P-6 AFS4-01000400-10-10P-4 AMF-4F-04001200-15-10P	02-02/11-15-001 02-02/17-06-002 02-02/17-13-002 02-02/17-13-003	07/04/2018	07/04/2017		
	3117 02-02/24-05-009 Sucoflex N-2000-SMA WHK 3.0/18G-10EF SF104/11N/11N/1500MM	10/05/2018 02-02/50-05-075 02-02/50-05-180 02-02/50-13-015	10/05/2017			