

FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

# EMI - TEST REPORT

- FCC Part 15.249, RSS210 -

**Test Report No. :** T36940-00-00TK

27. August 2013

Date of issue

**Type / Model Name** : PRA30**Product Description** : Radio remote control for Laser detector**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 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.

# Contents

<b>1</b>	<b><u>TEST STANDARDS</u></b>	<b>3</b>
<b>2</b>	<b><u>SUMMARY</u></b>	<b>4</b>
2.1	GENERAL REMARKS:	4
2.2	Test result summary	4
2.3	FINAL ASSESSMENT:	5
<b>3</b>	<b><u>EQUIPMENT UNDER TEST</u></b>	<b>6</b>
3.1	Photo documentation of the EUT	6
3.2	Power supply system utilised	9
3.3	Short description of the equipment under test (EUT)	9
<b>4</b>	<b><u>TEST ENVIRONMENT</u></b>	<b>10</b>
4.1	Address of the test laboratory	10
4.2	Environmental conditions	10
4.3	Statement of the measurement uncertainty	10
4.4	Measurement protocol for FCC and IC	11
4.5	Determination of worst case measurement conditions	11
<b>5</b>	<b><u>TEST CONDITIONS AND RESULTS</u></b>	<b>12</b>
5.1	Field strength of fundamental	12
5.2	Spurious emissions radiated	14
5.3	Correction for pulse operation (duty cycle)	27
5.4	Occupied Bandwidth	30
5.5	Antenna application	33
<b>6</b>	<b><u>USED TEST EQUIPMENT AND ACCESSORIES</u></b>	<b>34</b>

## 1 TEST STANDARDS

The tests were performed according to following standards:

### **FCC Rules and Regulations Part 15, Subpart A - General (September, 2012)**

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, 2012)**

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.249	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz
ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C95.1:2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2003	Uncertainty in EMC measurement
CISPR 22: 2005 EN 55022: 2006	Information technology equipment

## 2 SUMMARY

### 2.1 GENERAL REMARKS:

The EUT is equipped with a RF transceiver operating within the free 2.4 GHz ISM band that enables the user to control the whole alignment system remote. The EUT is modified to use one of three fixed frequencies with a LBT mechanism to use the free frequency which isn't occupied.

#### Update testing

The EUT is tested and compliant according CFR 47, Part 15.249, FCC ID: SDL-PR3XR01 with the Test Report No. T33893-01-07HS, 2010-08-03 and RSS 210, IC ID: 5228A-PR3XR01 with the Test Report No. T33893-01-08HS, 2010-08-03 by **mikes testing partners GmbH**.

The EUT has only got a re-configuration of the transmission frequency. All other devices are in position and value the same.

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.

The following tests are selected for re-measurement:

- Equivalent isotropic radiated power
- Transmitter spurious emissions

#### Variants of the EUT

During the tests one EUT worked with the fixed frequency of 2405 MHz, the second EUT worked with 2440 MHz and the third worked with 2480 MHz. The fourth sample was tested in live mode to test the frequency selection function and to measure duty cycle to calculate a correction factor.

### 2.2 Test result summary

Operating in the 2400 MHz – 2483.5 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.35(c)	RSS-Gen, 4.5	Pulsed operation	not tested
15.203	RSS Gen, 7.1.2	Antenna requirement	not tested
15.204	RSS Gen, 7.1.1	External radio frequency power amplifiers	not tested
15.205(a)	RSS-Gen, 7.2.2	Emissions in restricted bands	not tested
15.207(a)	RSS Gen, 7.2.4	AC power line conducted emissions	not tested
15.215(c)	RSS-Gen, 4.6.1	Occupied Bandwidth	passed
15.249(a)	RSS-210, A2.9(a)	Field strength of fundamental	passed
15.249(d)	RSS Gen, 7.2.5	Out-of-band emission, radiated	passed
	RSS-Gen, 7.2.6	Transmitter frequency stability	not tested

The mentioned RSS Rule Parts in the above table are related to:

RSS Gen, Issue 3, December 2010

RSS 210, Issue 8, December 2010

RSS 102, Issue 4, March 2010

FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

## 2.3 FINAL ASSESSMENT:

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 06 May 2013

Testing concluded on : 09 August 2013

Checked by:

Tested by:

---

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

---

Tobias Kammerer  
Radio Expert

FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

### 3 EQUIPMENT UNDER TEST

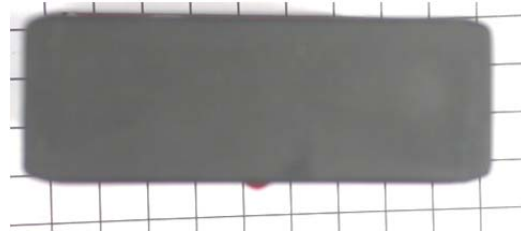
#### 3.1 Photo documentation of the EUT

External view:

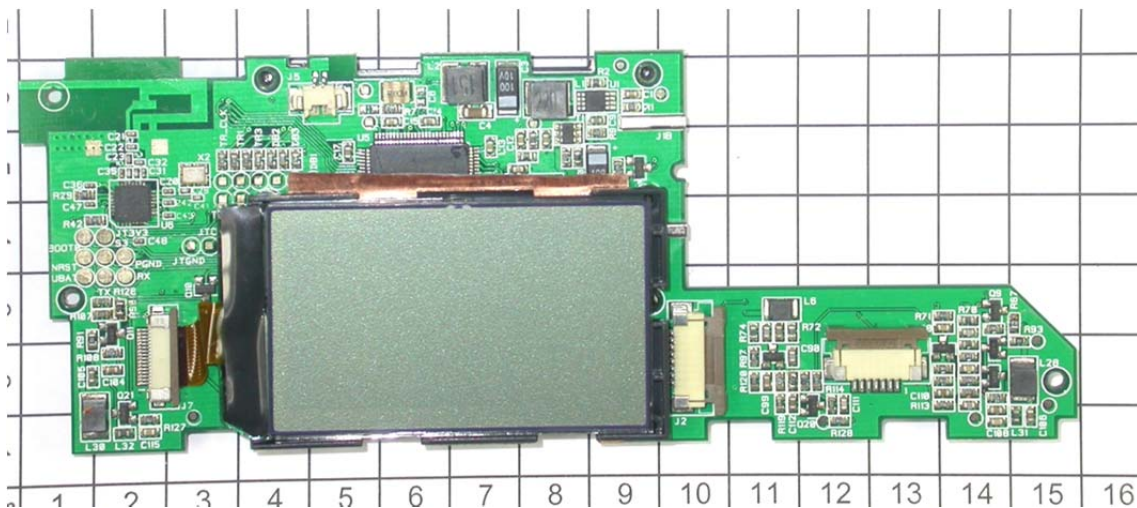
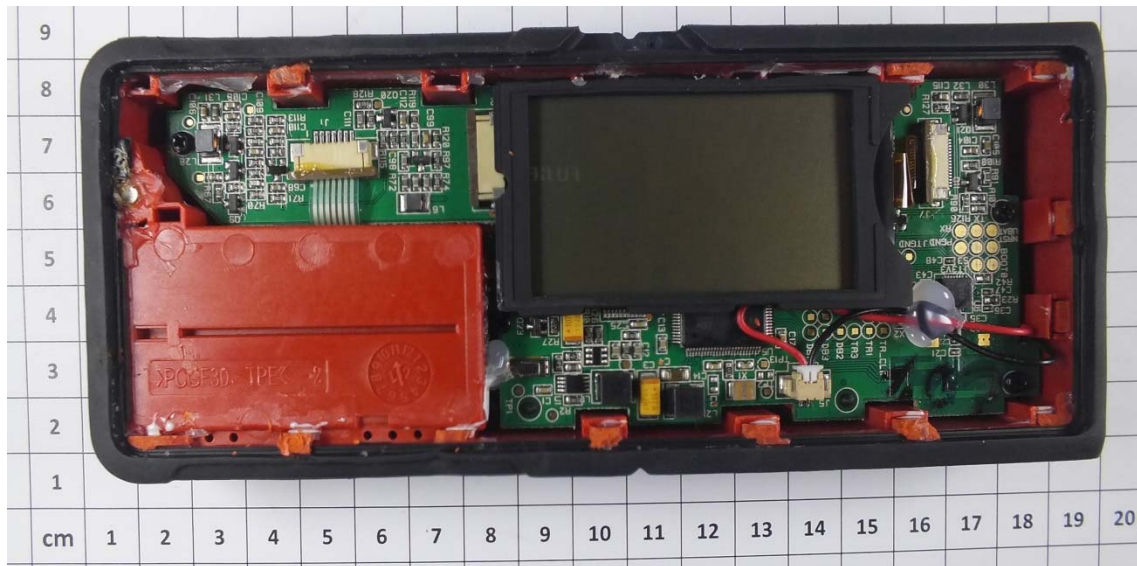




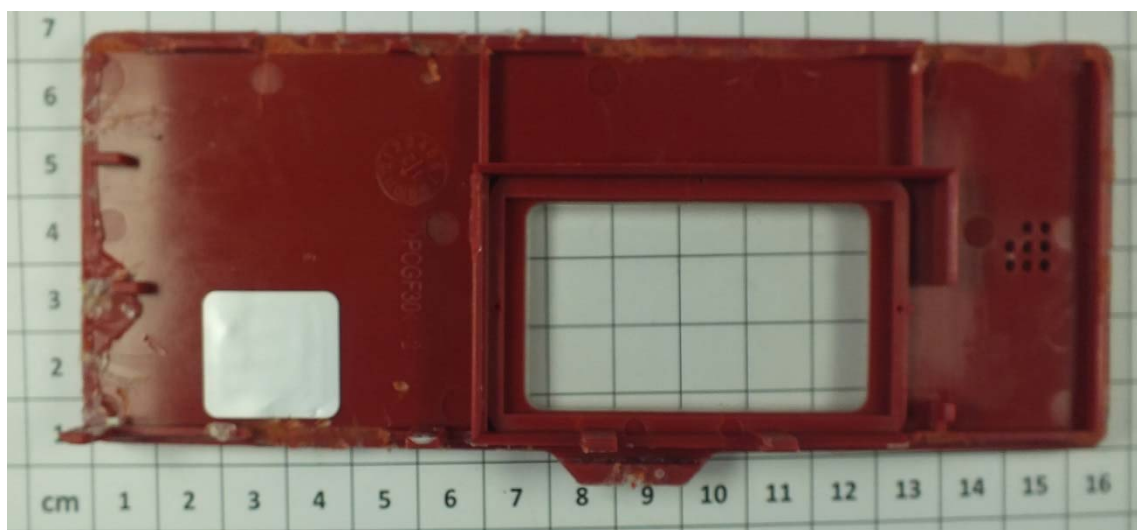
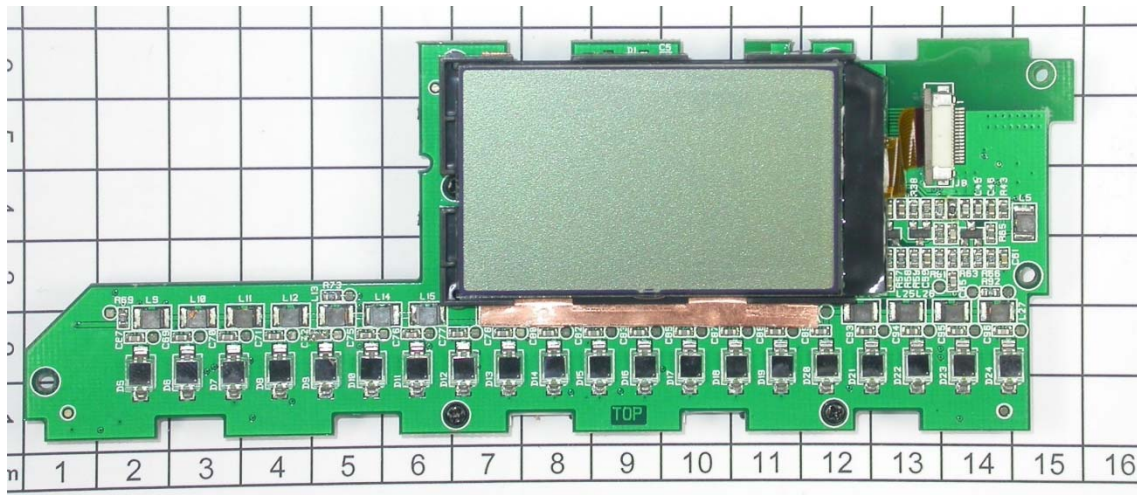
FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02



Internal view:



FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02





### 3.2 Power supply system utilised

Power supply voltage : 3.0 VDC Lithium ion battery

### 3.3 Short description of the equipment under test (EUT)

The EUT is radio remote controller for a levelling and alignment instrument based on laser marking. The laser draws a horizontal line at a wall which can be supported by a rotating laser. You are able to get so all four walls marked in one procedure. The height can be checked in a simple way on all walls relative to a reference point. The function of the EUT can be controlled by this radio remote controller operating normally at 2.405 GHz. Additionally a LBT mechanism is installed to select one frequency which isn't occupied of two alternative frequencies (2440 MHz and 2480 MHz).

Number of tested samples: 1 pc for TX continuous at 2405 MHz  
 1 pc for TX continuous at 2440 MHz  
 1 pc for TX continuous at 2480 MHz  
 1 pc for TX in normal work mode with automatic frequency selection  
 Serial number: All tested samples are pre-production samples

#### EUT operation mode:

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

- TX continuous mode (fixed frequency samples)

- TX mode (sample with automatic frequency selection)

-

#### EUT configuration:

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

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

- _____	Model : _____
- _____	Model : _____
- _____	Model : _____
- _____	Model : _____

## 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 processes may result in additional deviation. 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 EUT.

## 4.4 Measurement protocol for FCC and IC

### 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.

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

### **IC 3009A-1**

In compliance with RSS 210 testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

#### 4.4.1.2 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.

#### 4.4.1.3 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 C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

## 4.5 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. For the further measurement the EUT is set in X position. The stated RF power is not adjustable. The lowest generated frequency is 9 kHz.

## 5 TEST CONDITIONS AND RESULTS

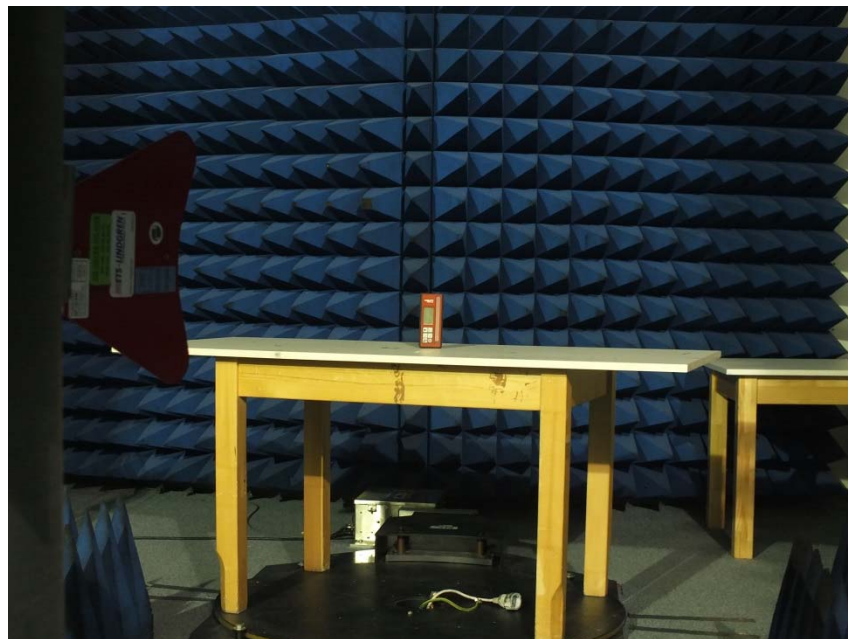
### 5.1 Field strength of fundamental

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

#### 5.1.1 Description of the test location

Test location: Anechoic chamber 2  
Test distance: 3 m

#### 5.1.2 Photo documentation of the test set-up



#### 5.1.1 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.

#### 5.1.2 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 C63.4, Item 8.3. The EUT is measured in TX continuous mode unmodulated under normal conditions.

Analyser settings:

Peak measurement: RBW: 1 MHz

VBW: 3 MHz

Detector: Max peak

AV measurement: RBW: 1 MHz

VBW: 10 Hz

Detector: Max peak



FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

### 5.1.3 Test result

Frequency (MHz)	Level PK (dBμV)	Duty Cycle Correction (dB)	Level AV (dBμV)*	Corrected level PK dB(μV/m)	Limit AV dB(μV/m)	Delta (dB)
2405	89.4	-36.6	-	52.8	94	-41.2
2440	96.8	-36.6	-	60.2	94	-33.8
2480	92.9	-36.6	-	56.3	94	-37.7

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

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

Frequency (MHz)	Field strength of fundamental	
	(mV/m)	dB(μV/m)
902 - 928	50	94
<b>2400 - 2483.5</b>	<b>50</b>	<b>94</b>
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:

---



---

## 5.2 Spurious emissions radiated

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

### 5.2.1 Description of the test location

Test location: OATS 1  
Test location: Anechoic chamber 2

Test distance: 3 m

### 5.2.2 Photo documentation of the test set-up

Test setup 9 kHz – 30 MHz:

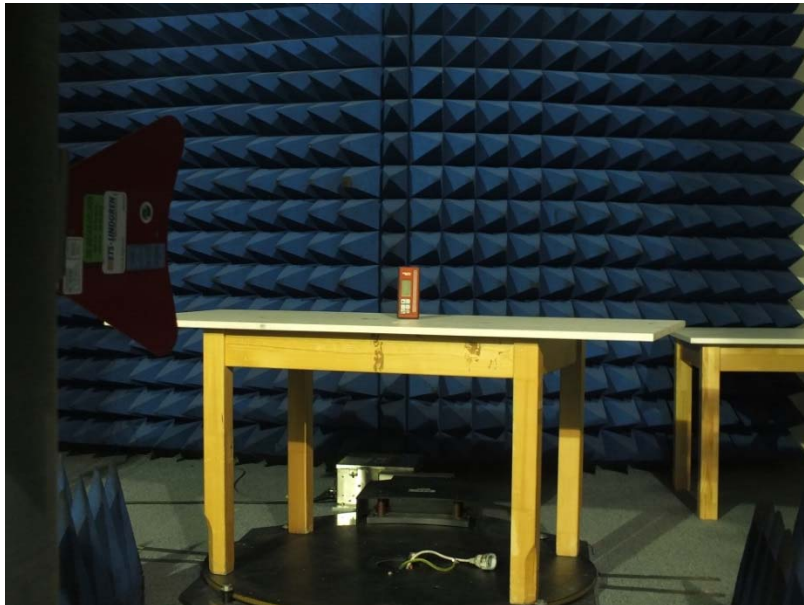


Test setup 30 MHz – 1000 MHz:



FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

Test setup 1 GHz – 18 GHz:



### 5.2.3 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.

### 5.2.4 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 C63.4, Item 8.3. 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.

Instrument settings:

9 kHz – 150 kHz	RBW:	200 Hz
150 kHz - 30 MHz	RBW:	9 kHz
30 MHz – 1000 MHz:	RBW:	120 kHz
1000 MHz – 25 GHz	RBW:	1 MHz

#### 5.2.1 Test result $f < 30$ MHz

Note: In the frequency range from 9 kHz to 30 MHz no emission could be detected.

#### 5.2.2 Test result $f < 1$ GHz

Transmission frequency 2440 MHz

Frequency (MHz)	Reading level QP (dB $\mu$ V)	Reading level AV (dB $\mu$ V)	Bandwidth (kHz)	Correction factor (dB/m)	Corrected level QP dB( $\mu$ V/m)	Corrected level AV dB( $\mu$ V/m)	Limit dB( $\mu$ V/m)	Delta (dB)
42.96	16.4	13.4	120		29.8	-	40.0	-10.2
43.14	16.7	14.6	120		31.2	-	40.0	-8.8
57.78	16.6	13.8	120		30.3	-	40.0	-9.7
66.54	16.5	14.1	120		30.5	-	40.0	-9.5
66.78	16.6	13.2	120		29.7	-	40.0	-10.3
132.36	17.5	13.3	120		30.7	-	43.5	-12.8
136.44	17.1	12.7	120		29.7		43.5	-13.8
206.24	17.1	11.3	120		28.3		43.5	-15.2
256.76	17.4	14.2	120		31.6		46.0	-14.4
272.48	17.9	15.0	120		32.8		46.0	-13.2
467.96	19.0	20.9	120		39.8		46.0	-6.2

Note: The correction factor includes cable loss and antenna factor. There were no different results for the transmission frequencies 2405 MHz and 2480 MHz.



**FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02**
**5.2.3 Test result  $f > 1$  GHz**

Transmission frequency 2405 MHz

Frequency (MHz)	Level PK (dB $\mu$ V)	Duty Cycle Correction (dB)	Level AV (dB $\mu$ V)*	Correction factor (dB/m)	Corrected level PK dB( $\mu$ V/m)	Corrected level AV dB( $\mu$ V/m)	Limit PK dB( $\mu$ V/m)	Limit AV dB( $\mu$ V/m)	Delta (dB)
2350.0	45.5	-36.6	-	3.8	12.7	-	74	-	-61.3
3802.0	43.8	-36.6	-	3.4	10.6	-	74	-	-63.4
4808.0	50.1	-36.6	-	3.0	16.6	-	74	-	-57.4
7216.0	54.6	-36.6	-	6.3	24.3	-	74	-	-49.7
9616.0	41.4	-36.6	-	9.2	14.0	-	74	-	-60.0
12024.0	48.8	-36.6	-	1.6	13.8	-	74	-	-60.2

Transmission frequency 2440 MHz

Frequency (MHz)	Level PK (dB $\mu$ V)	Duty Cycle Correction (dB)	Level AV (dB $\mu$ V)*	Correction factor (dB/m)	Corrected level PK dB( $\mu$ V/m)	Corrected level AV dB( $\mu$ V/m)	Limit PK dB( $\mu$ V/m)	Limit AV dB( $\mu$ V/m)	Delta (dB)
2383.8	41.5	-36.6	-	3.9	8.8	-	74	-	-65.2
3172.0	43.6	-36.6	-	3.0	10.0	-	74	-	-64.0
4880.0	51.4	-36.6	-	3.2	18.0	-	74	-	-56.0
7320.0	53.5	-36.6	-	6.2	23.1	-	74	-	-50.9
9760.0	44.6	-36.6	-	9.6	17.7	-	74	-	-56.3
12192.0	46.8	-36.6	-	1.5	11.7	-	74	-	-62.3

Transmission frequency 2480 MHz

Frequency (MHz)	Level PK (dB $\mu$ V)	Duty Cycle Correction (dB)	Level AV (dB $\mu$ V)*	Correction factor (dB/m)	Corrected level PK dB( $\mu$ V/m)	Corrected level AV dB( $\mu$ V/m)	Limit PK dB( $\mu$ V/m)	Limit AV dB( $\mu$ V/m)	Delta (dB)
2383.8	41.8	-36.6	-	3.9	9.2	-	74	-	-64.8
3316.0	44.1	-36.6	-	3.4	10.8	-	74	-	-63.2
4960.0	48.3	-36.6	-	3.6	15.3	-	74	-	-58.7
7440.0	52.9	-36.6	-	6.4	22.6	-	74	-	-51.4
9920.0	43.0	-36.6	-	9.4	15.8	-	74	-	-58.2
16608.0	46.1	-36.6	-	5.5	15.0	-	74	-	-59.0

**FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02**

Limit according to FCC Part 15C, Section 15.209:

Frequency (MHz)	15.209 Limits (μV/m)	Measurement distance (m)
0.009 - -0.49	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 (MHz)	Field strength of harmonics	
	(μV/m)	dB(μV/m)
902 - 928	500	54
<b>2400 - 2483.5</b>	500	54
5725 - 5875	500	54
24000 - 24250	2500	68

The requirements are **FULFILLED**.

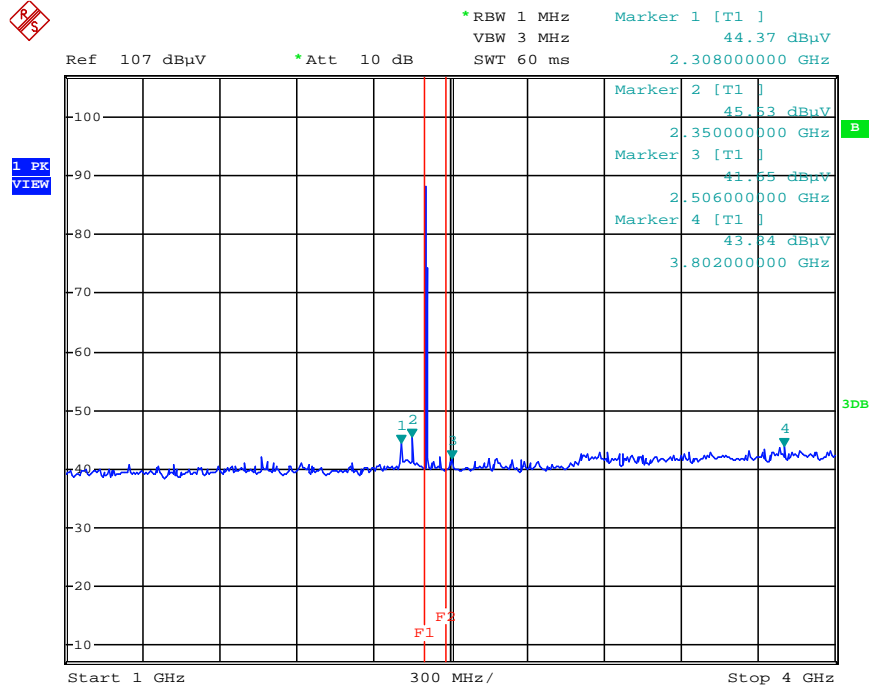
**Remarks:** The measurement was performed up to the 10<sup>th</sup> harmonic (25000 MHz). In the ranges of 9 kHz – 30 MHz and 18 GHz – 25 GHz no emission could have been detected. For detailed test results please refer the following test protocols.

FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

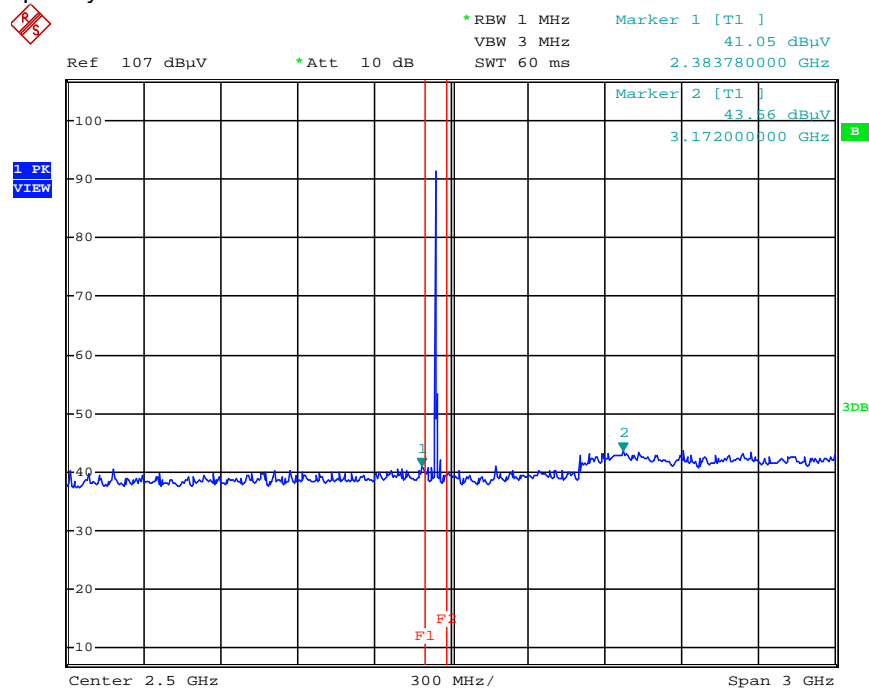
## 5.2.4 Test protocols

Spurious emissions from 1 to 4 GHz  
(incl. Fundamental carrier)

Transmission frequency 2405 MHz

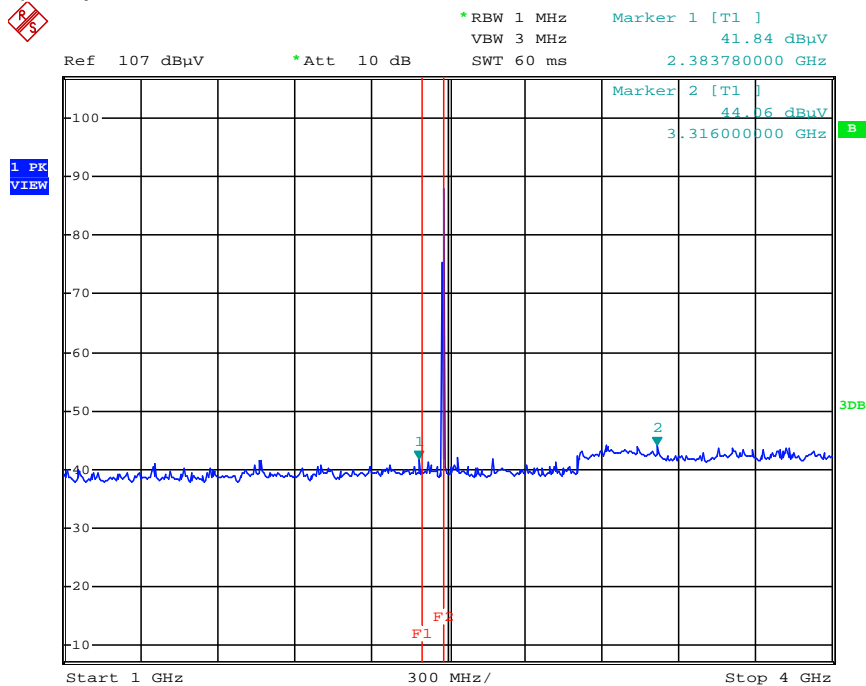


Transmission frequency 2440 MHz



FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

Transmission frequency 2480 MHz

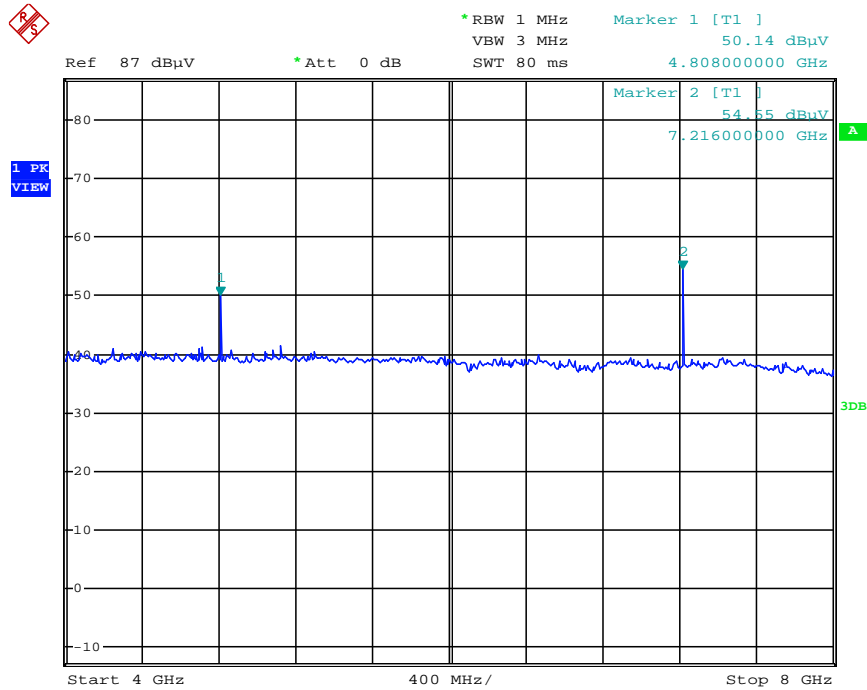




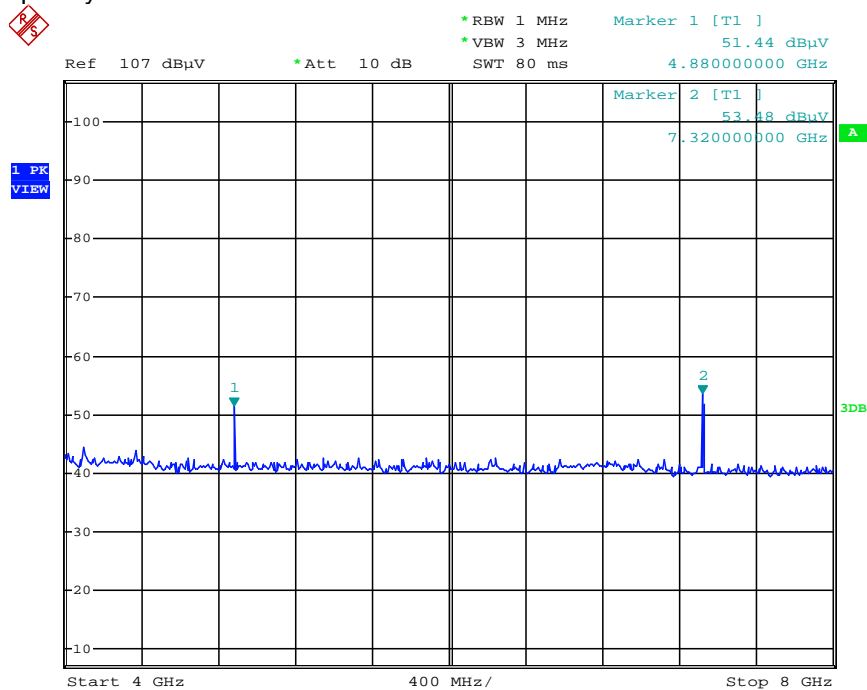
FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

### Spurious emissions from 4 to 8 GHz

Transmission frequency 2405 MHz

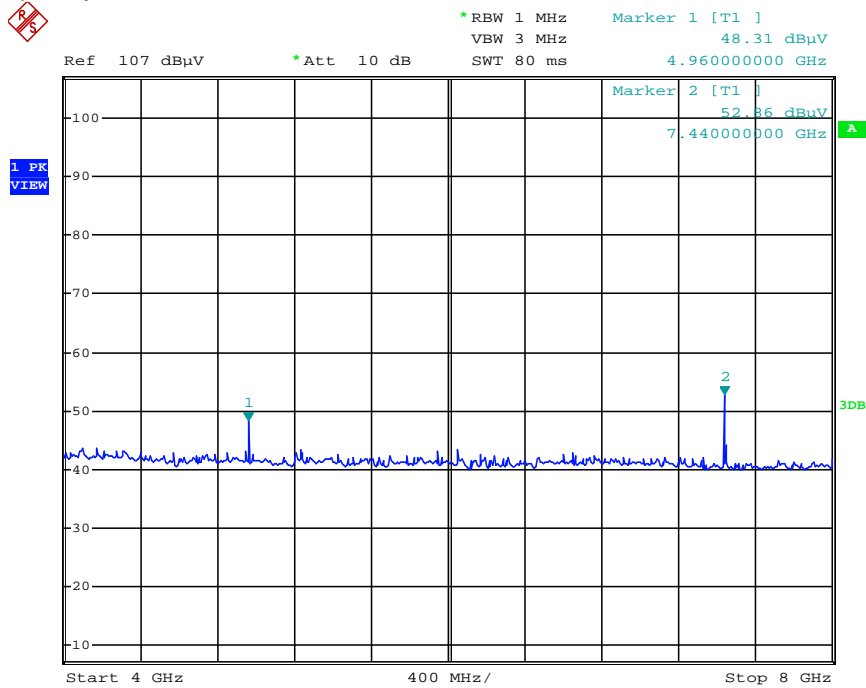


Transmission frequency 2440 MHz



FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

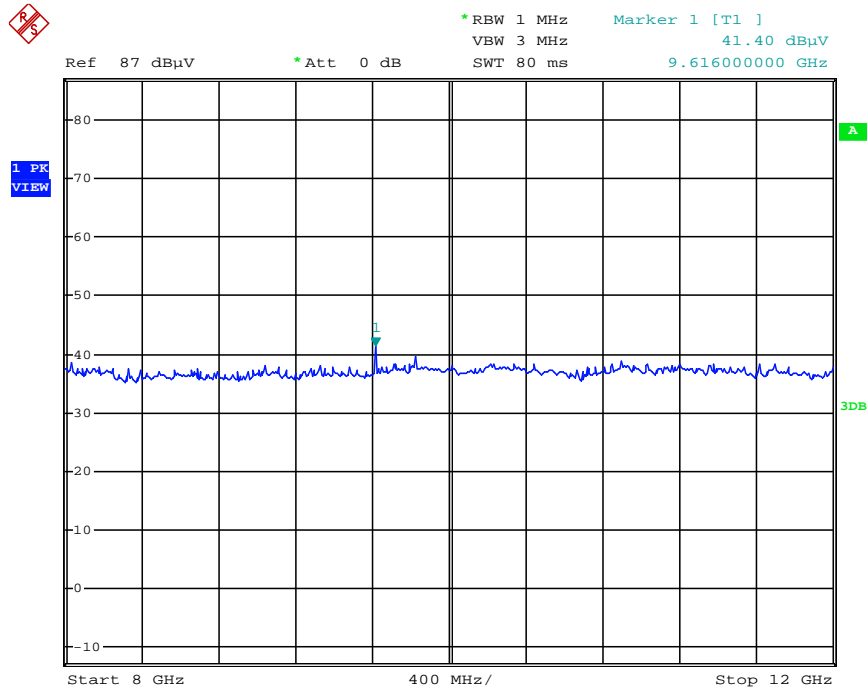
Transmission frequency 2480 MHz



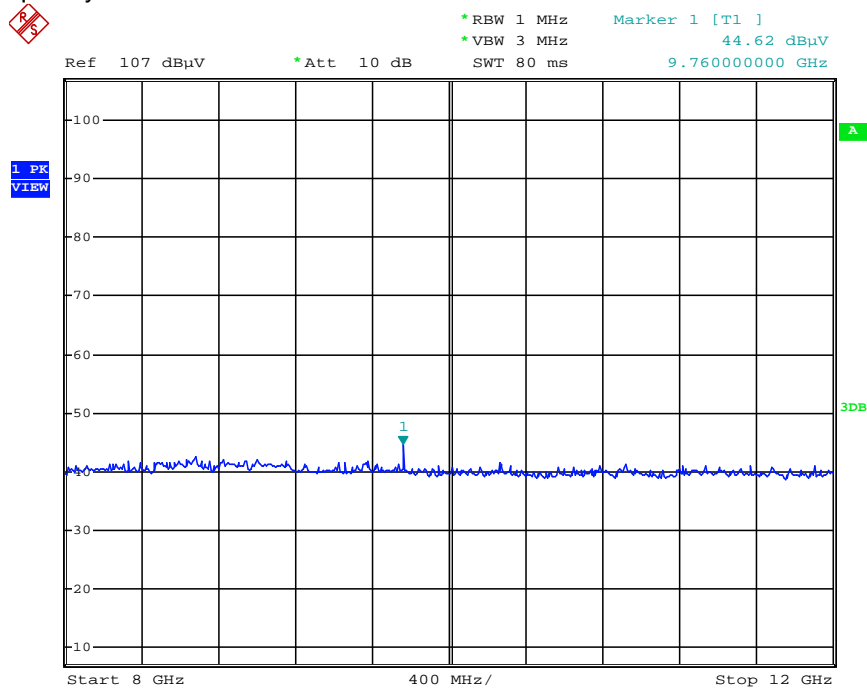
FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

Spurious emissions from 8 to 12 GHz

Transmission frequency 2405 MHz

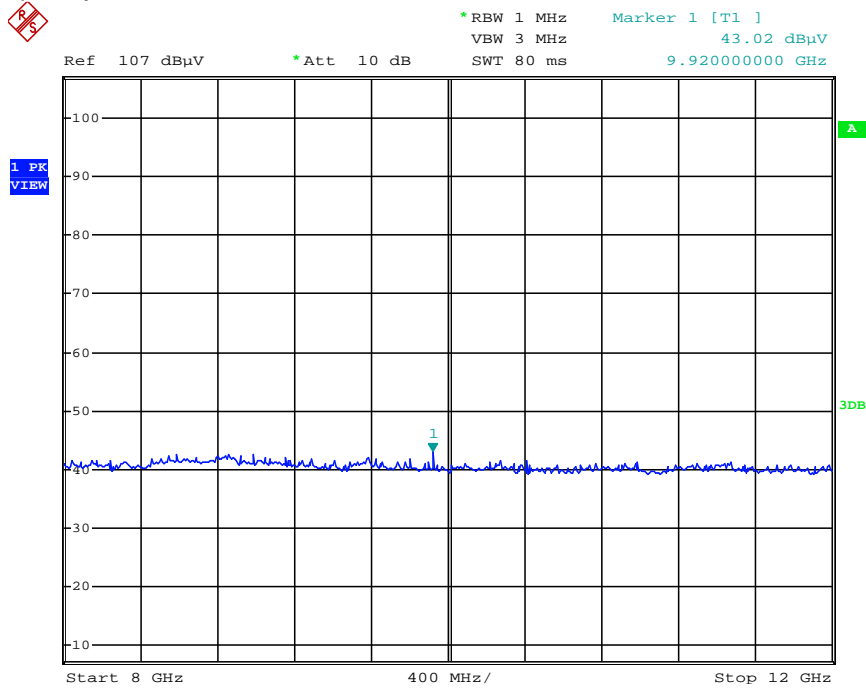


Transmission frequency 2440 MHz



FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

Transmission frequency 2480 MHz

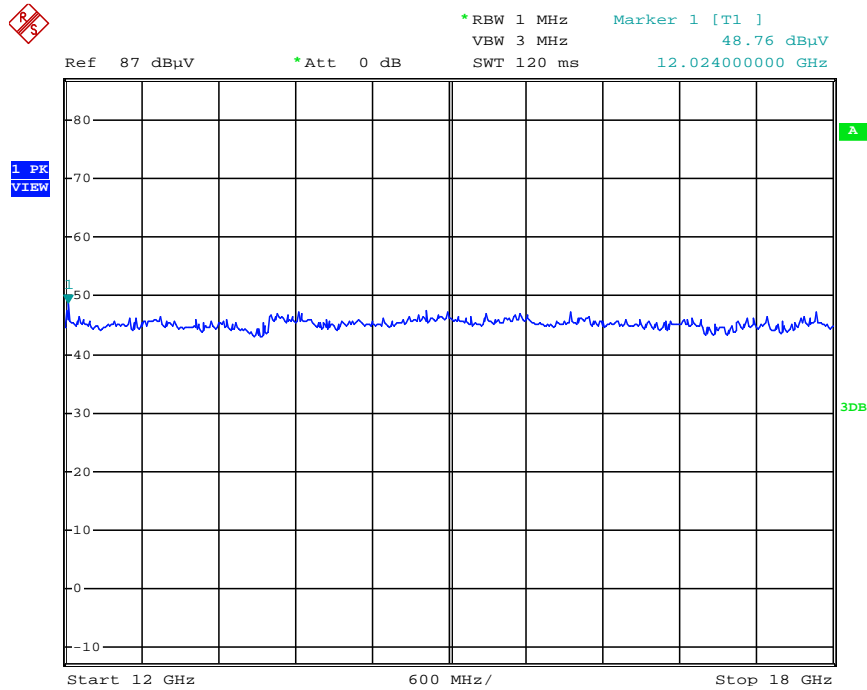




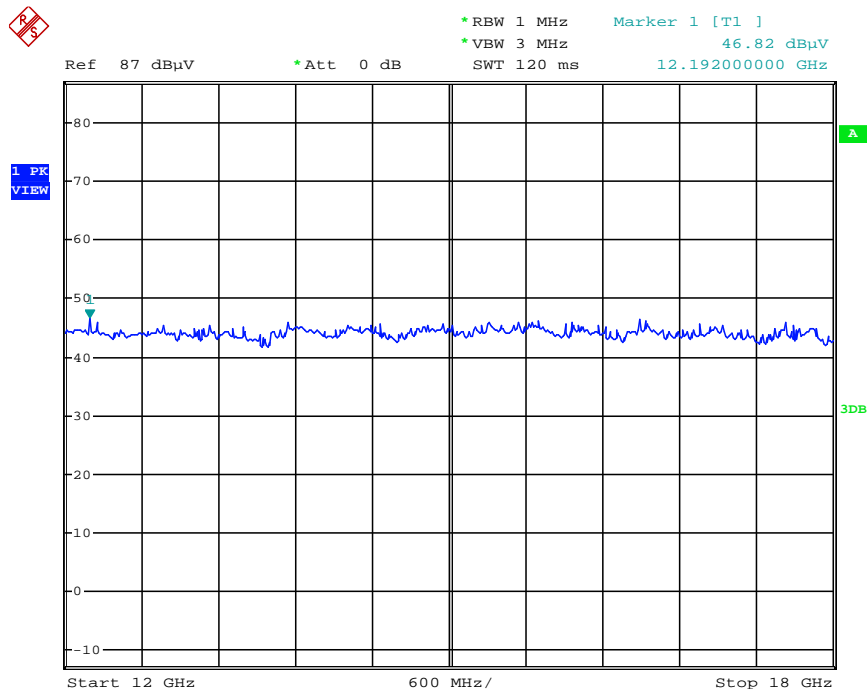
FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

Spurious emissions from 12 to 18 GHz

Transmission frequency 2405 MHz

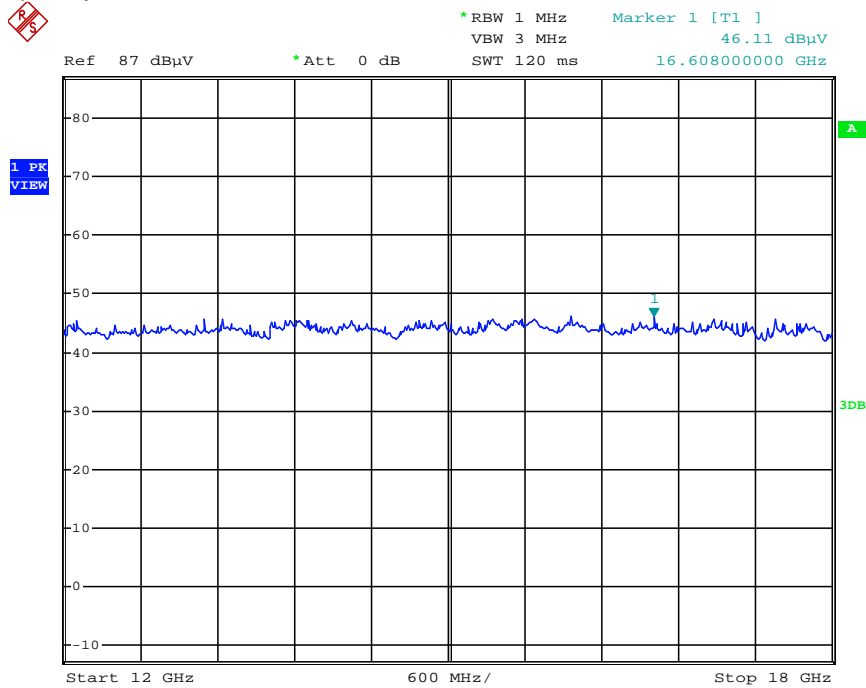


Transmission frequency 2440 MHz



FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

Transmission frequency 2480 MHz



Remarks:

---



---

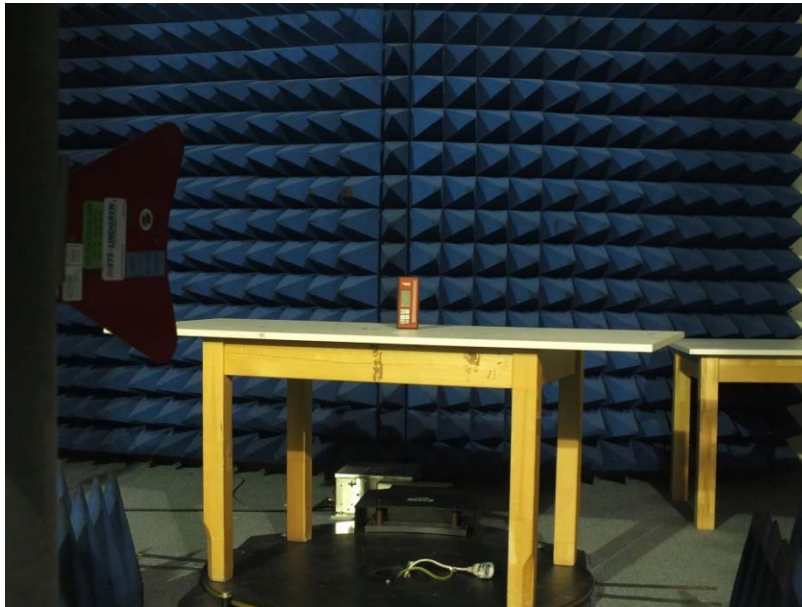
### 5.3 Correction for pulse operation (duty cycle)

For test instruments and accessories used see section 6 Part CPR3.

#### 5.3.1 Description of the test location

Test location: Anechoic chamber 2

#### 5.3.2 Photo documentation of the test set-up



#### 5.3.3 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.

FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

### 5.3.4 Description of Measurement

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

$$KE = 20 \log (t_{iw}/T_w)$$

$KE$ : pulse operation correction factor  
 $T_w$ : pulse duration for one complete pulse track  
 $t_{iw}$ : pulse duration for one pulse

### 5.3.5 Test result

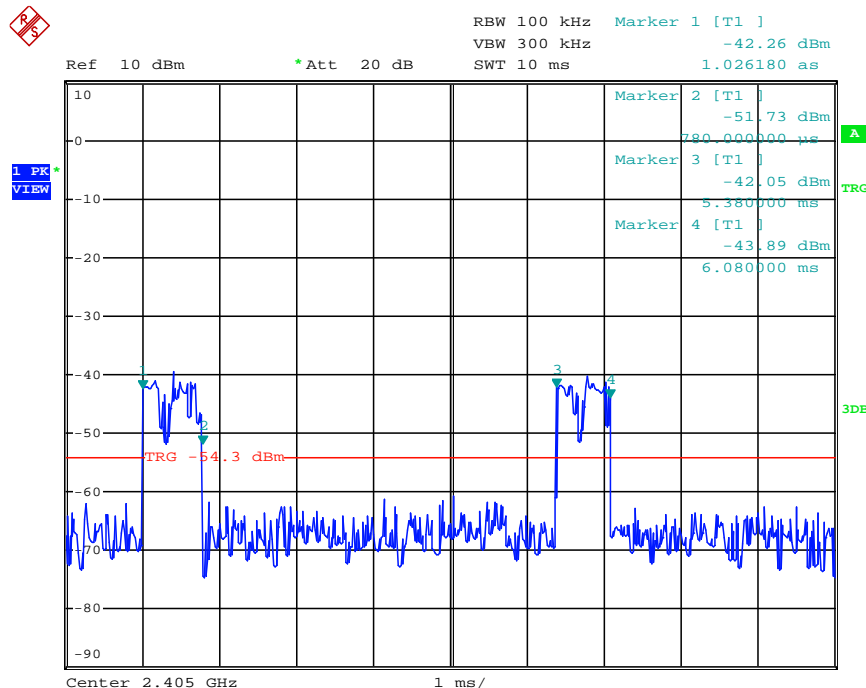
$t_{iw}$ (ms)	$T_w$ (ms)	$KE$ (dB)
1.48	100	-36.6

**Remarks:** The pulse train ( $T_w$ ) 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.

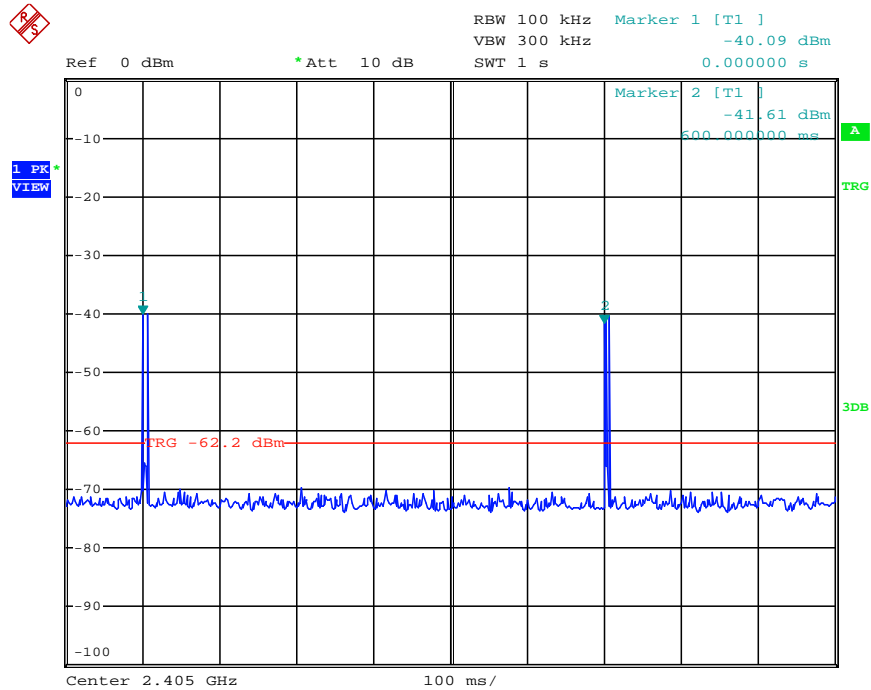
For detailed results, see the test protocol below.

### 5.3.6 Test protocol

#### Correction for Pulse Operation (Duty Cycle) FCC Part 15A, Section 15.35(c)



FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02



FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

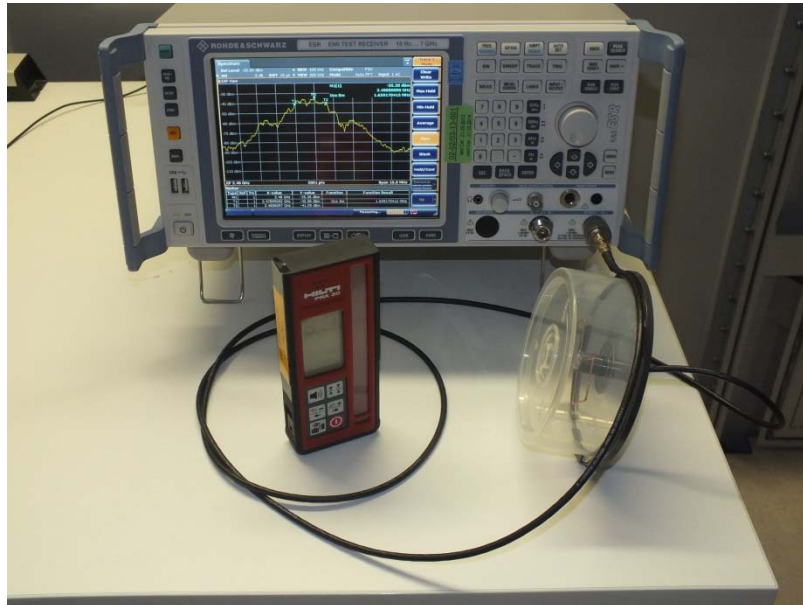
## 5.4 Occupied Bandwidth

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

### 5.4.1 Description of the test location

Test location: AREA4

### 5.4.2 Photo documentation of the test set-up



### 5.4.3 Applicable standard

According to FCC Part 15, Section 15.215(c):

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Section 15.217 through Section 15.257, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated.

### 5.4.4 Description of Measurement

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio of -20 dB. The reference level is the level of the highest signal amplitude observed from the transmitter at the fundamental frequency. Alternative is the x-dB-down function of the analyser used. The EBW is then directly shown in the marker display. The measurement is performed with normal modulation and a transfer rate means the worst case. To fulfil the regulations of the RSS 210, Issue 8 the Occupied Bandwidth was measured.

Spectrum analyser settings:

RBW:	100 kHz	VBW:	300 kHz	Span:	10 MHz
Sweep time:	auto	Detector:	Maximum Peak		



FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

#### 5.4.5 Test result

Channel (No.)	Channel BW (MHz)	Centre $f$ (MHz)	99% bandwidth $f_1$	99% bandwidth $f_2$	Measured OBW (MHz)
1	5	2404.735130	2403.2759	2406.1944	2.918540
2	5	2439.702650	2438.2759	2441.1294	2.853580
3	5	2479.680160	2478.2159	2481.1444	2.928540

80% bandwidth of the permitted band:

4.0 MHz

Limit according to FCC Part 15C, Section 15.215(c):

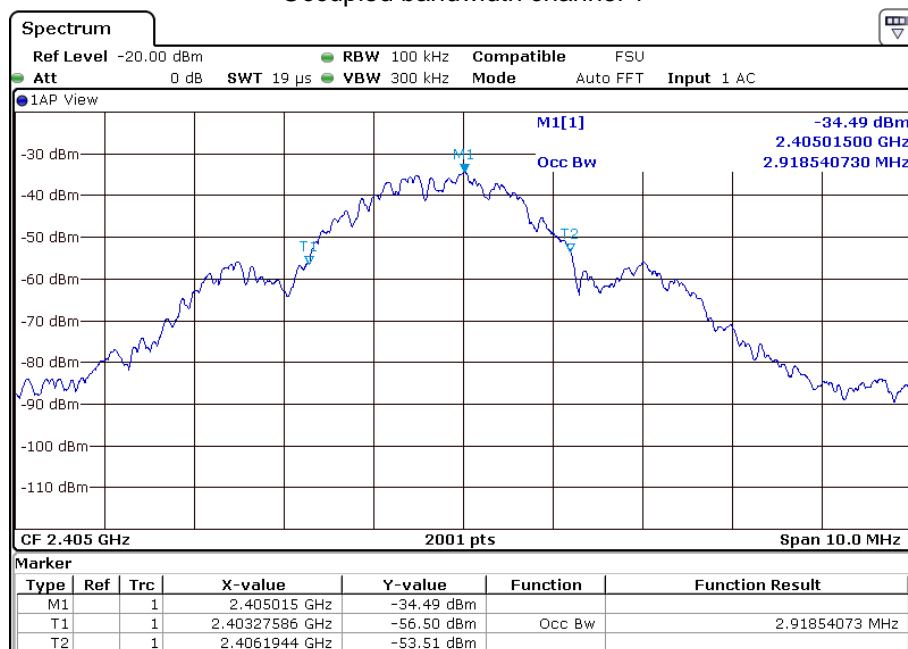
If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

The requirements are **FULFILLED**.

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

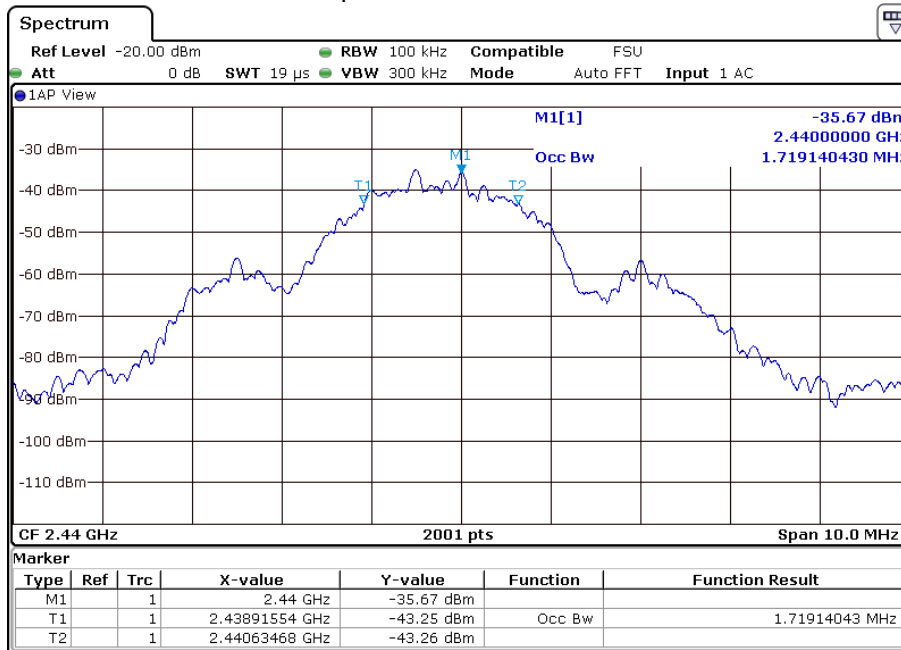
#### 5.4.6 Test protocols

Occupied bandwidth channel 1

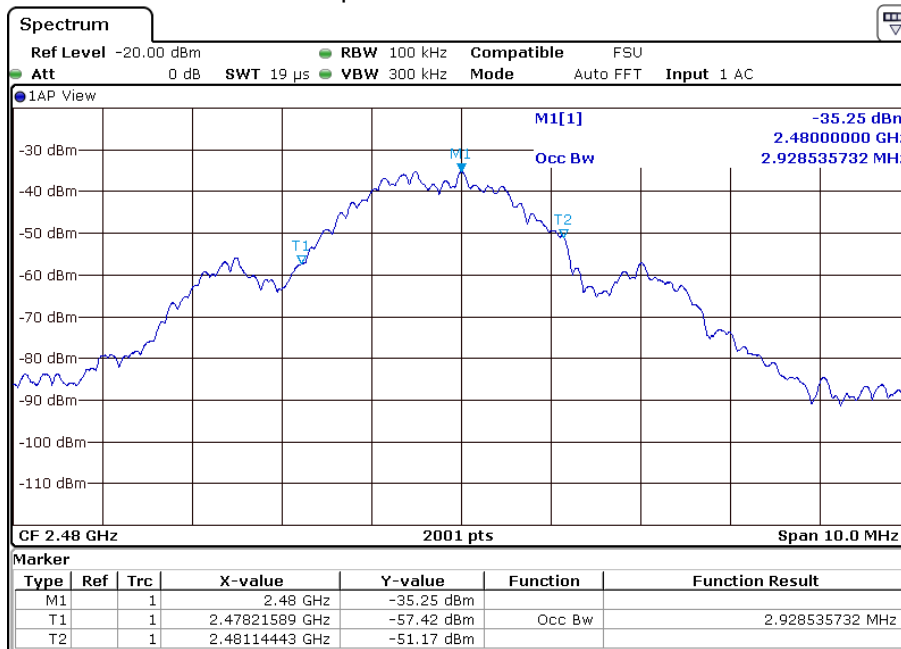


FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02

### Occupied bandwidth channel 2



### Occupied bandwidth channel 3



## 5.5 Antenna application

### 5.5.1 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.

### 5.5.2 Result

The EUT use an integrated PCB antenna. No other antenna than that furnished by the responsible party or external power amplifier can be applied by a customer.

The antenna of the EUT meets the requirement of FCC Part 15C, Section 15.203 and 15.204.

**FCC ID: SDL - PRA3XR02 IC ID: 5228A - PRA3XR02**

## **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	AMF-4F-04001200-15-10P	02-02/17-05-004				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	3117	02-02/24-05-009	04/04/2014	04/04/2013		
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				
MB	ESR7	02-02/03-13-001	21/05/2014	21/05/2013		
SER 1	FMZB 1516	01-02/24-01-018			14/02/2014	14/02/2013
	ESCI	02-02/03-05-005	03/12/2013	03/12/2012		
SER 2	ESVS 30	02-02/03-05-006	28/06/2014	28/06/2013		
	VULB 9168	02-02/24-05-005	11/04/2014	11/04/2013	11/10/2013	11/04/2013
	S10162-B	02-02/50-05-031				
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
SER 3	AMF-4F-04001200-15-10P	02-02/17-05-004				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	3117	02-02/24-05-009	04/04/2014	04/04/2013		
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				