

FCC ID: XYN2761

IC ID: 8748A-2761

EMI - TEST REPORT

- FCC Part 15.249, RSS210 -

Test Report No. : T36953-00-00HS

26. July 2013

Date of issue

Type / Model Name : 2761**Product Description** : Remote control**Applicant** : ruwido austria gmbh

Address : Koestendorfer Str. 8

5202 NEUMARKT, AUSTRIA

Manufacturer : ruwido austria gmbh

Address : Koestendorfer Str. 8

5202 NEUMARKT, AUSTRIA

Licence holder : ruwido austria gmbh

Address : Koestendorfer Str. 8

5202 NEUMARKT, AUSTRIA

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.

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Attachment A see separate supplement

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 Information technology equipment
EN 55022: 2006

2 SUMMARY

2.1 GENERAL REMARKS:

The EUT is a 2.4 GHz – transceiver chip MCP24J40 for low power data transmission supporting 3 channels in the 2.4 GHz band. Due to integrated antenna all measurements are performed radiated.

Variants of the EUT

There are no variants.

Antennas

The following integrated antenna is used with the EUT:

- Inverted F antenna (PCB)

The antennas cannot be dispatched by the user.

Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel	Frequency (MHz)
1	2425
2	2450
3	2475

Transmit operating modes

The EUT use OQPSK and provide following data rate:

250 kbps

(kbps = *kilobits per second*)

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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	passed
15.203	RSS Gen, 7.1.2	Antenna requirement	passed
15.204	RSS Gen, 7.1.1	External radio frequency power amplifiers	passed
15.205(a)	RSS-Gen, 7.2.2	Emissions in restricted bands	passed
15.207(a)	RSS Gen, 7.2.4	AC power line conducted emissions	passed
15.215(c)		EBW	passed
	RSS-Gen, 4.6.1	OBW	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 applicable

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

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 : 28 June 2013

Testing concluded on : 08 July 2013

Checked by:

Tested by:

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

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

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3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT – Please see attachment A

3.2 Power supply system utilised

Power supply voltage : 3 VDC (2 * AAA batteries)

3.3 Short description of the equipment under test (EUT)

The EUT is a wireless remote control operating in the 2.4 GHz band.

Number of tested samples: 1
Serial number: No serial number

EUT operation mode:

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

- TX continuous mode

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 : - _____

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 are made in all three orthogonal axes. The EUT has only one setting. The EUT is changed to locate at which position of the EUT produce the maximum of the emissions. For the further measurement the EUT is set in X position.

The EUT is used for measurement with special test software which enables a TX continuous mode at every CH. The duty cycle (x) is 100% for the test mode. The real application shows a duty cycle up to 7%.

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 driven.

5.2 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 2

Test 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.

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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 setup 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

5.2.3 Test result

Frequency (MHz)	Level PK dB(μ V/m)	Limit PK dB(μ V/m)	Margin PK (dB)	Level AV dB(μ V/m)	Limit AV dB(μ V/m)	Margin AV (dB)
2425	92.3	114.0	-21.7	-	94.0	-
2450	93.5	114.0	-20.5	-	94.0	-
2475	92.5	114.0	-21.5	-	94.0	-

Note: No average measurement is done; the peak measurement is below the AV-limit.

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

Frequency (MHz)	Field strength of fundamental	
	(mV/m)	dB(μ V/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 field strength shall not exceed the maximum permitted average limit by more than 20 dB.

The requirements are **FULFILLED**.

Remarks:

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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 1
Test location: Anechoic chamber 2
Test distance: 3 m

5.3.2 Photo documentation of the test set-up

Test setup 9 kHz – 30 MHz:



Test setup 30 MHz – 1000 MHz:



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Test setup 1 GHz – 18 GHz:



Test setup 18 GHz – 25 GHz:



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 C63.4, 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

Average values were measured with spectrum analyser by taking the following settings:

RBW: 1 MHz, VBW: 10 Hz, Detector: PK, Sweep: Auto, Trace mode: max hold;

5.3.1 Test result $f < 30$ MHz

Note: Due to the extremely low power and the small dimensions of the EUT it is not able to have emissions in the frequency range 9 kHz to 30 MHz.

5.3.2 Test result $f < 1$ GHz

Note: In the frequency range 30 MHz to 1000 MHz no emission could be detected.

5.3.3 Test result $f > 1$ GHz

Channel 1

Frequency (MHz)	Level PK dB(μ V/m)	Level AV dB(μ V/m)	Limit PK dB(μ V/m)	Margin PK (dB)	Limit AV dB(μ V/m)	Margin AV (dB)
1936	47.8	-	74.0	-26.2	54.0	-
3844	47.0	-	74.0	-27.0	54.0	-
7275	62.7	52.3	74.0	-11.3	54.0	-1.7
11824	50.0	-	74.0	-24.0	54.0	-
12120	52.6	-	74.0	-21.4	54.0	-
24791	53.6	-	74.0	-20.4	54.0	-

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Channel 2

Frequency (MHz)	Level PK dB(μV/m)	Level AV dB(μV/m)	Limit PK dB(μV/m)	Margin PK (dB)	Limit AV dB(μV/m)	Margin AV (dB)
1990	48.0	-	74.0	-26.0	54.0	-
3856	46.8	-	74.0	-27.2	54.0	-
4896	49.0	-	74.0	-25.0	54.0	-
7344	59.6	51.4	74.0	-14.4	54.0	-2.6
17844	52.3	-	74.0	-21.7	54.0	-
24753	53.9	-	74.0	-20.1	54.0	-

Channel 3

Frequency (MHz)	Level PK dB(μV/m)	Level AV dB(μV/m)	Limit PK dB(μV/m)	Margin PK (dB)	Limit AV dB(μV/m)	Margin AV (dB)
1996	46.4	-	74.0	-27.6	54.0	-
3868	46.6	-	74.0	-27.4	54.0	-
4944	45.6	-	74.0	-28.4	54.0	-
7424	58.4	48.6	74.0	-15.6	54.0	-5.4
12372	52.0	-	74.0	-22.0	54.0	-
24910	54.3	41.2	74.0	-19.7	54.0	-12.8

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
2400 - 2483.5	500	54
5725 - 5875	500	54
24000 - 24250	2500	68

The requirements are **FULFILLED**.

Remarks: The measurement was performed up to the 10th harmonic (25000 MHz). For detailed test result please refer to following test protocols. Only the worst case plots are listed.

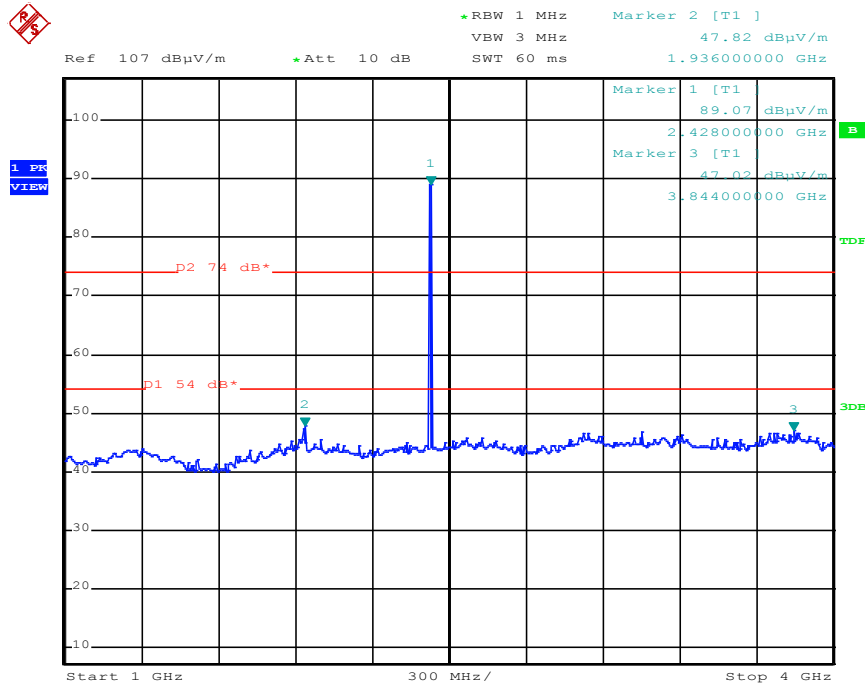
FCC ID: XYN2761

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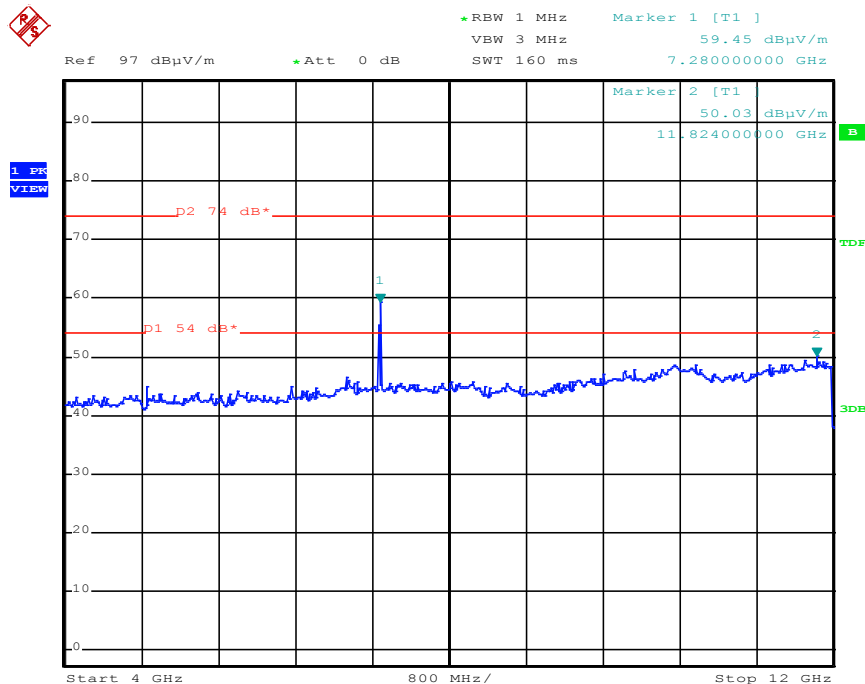
5.3.4 Test protocols

CH1:

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



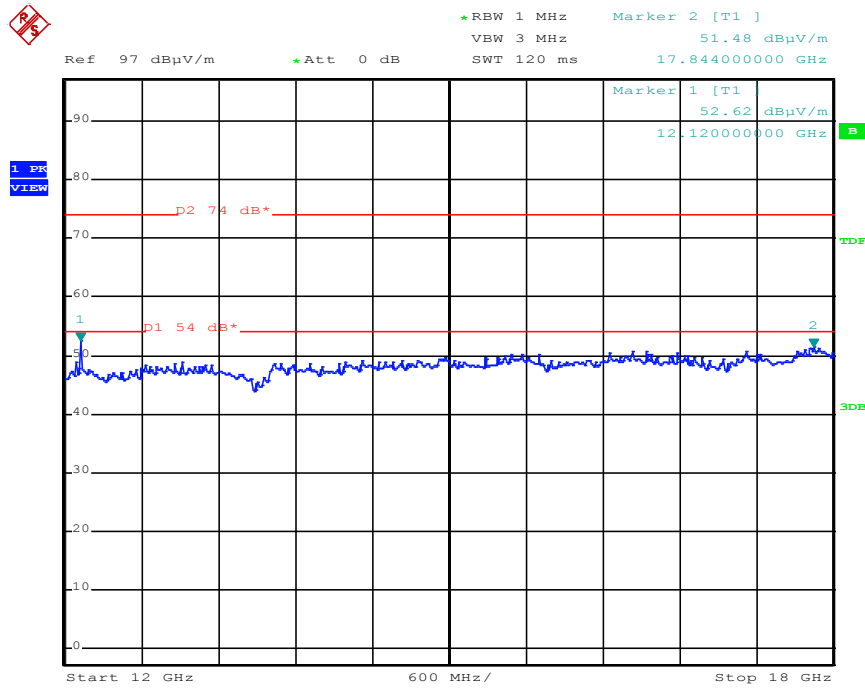
Spurious emissions from 4 to 12 GHz



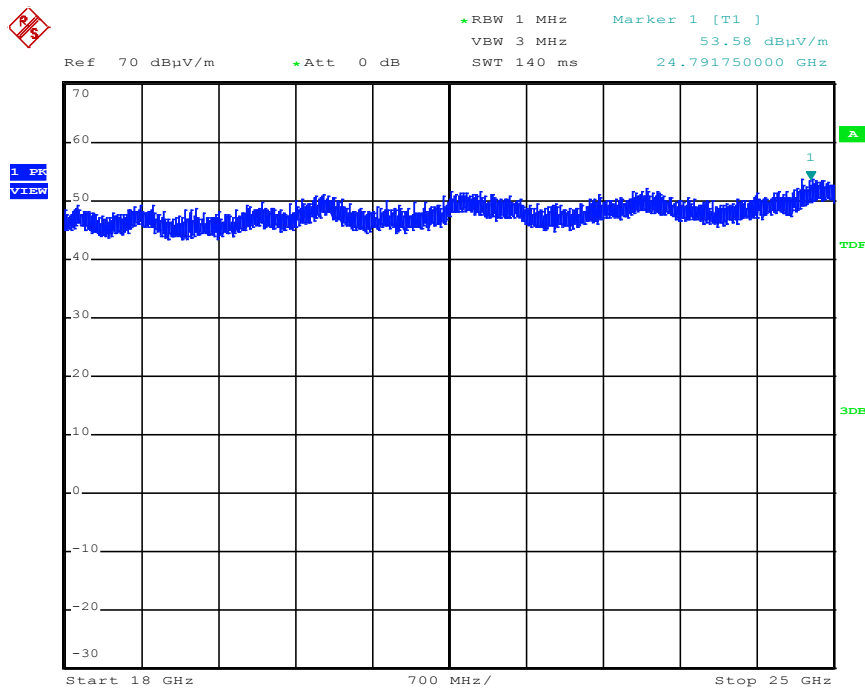
FCC ID: XYN2761

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Spurious emissions from 12 to 18 GHz



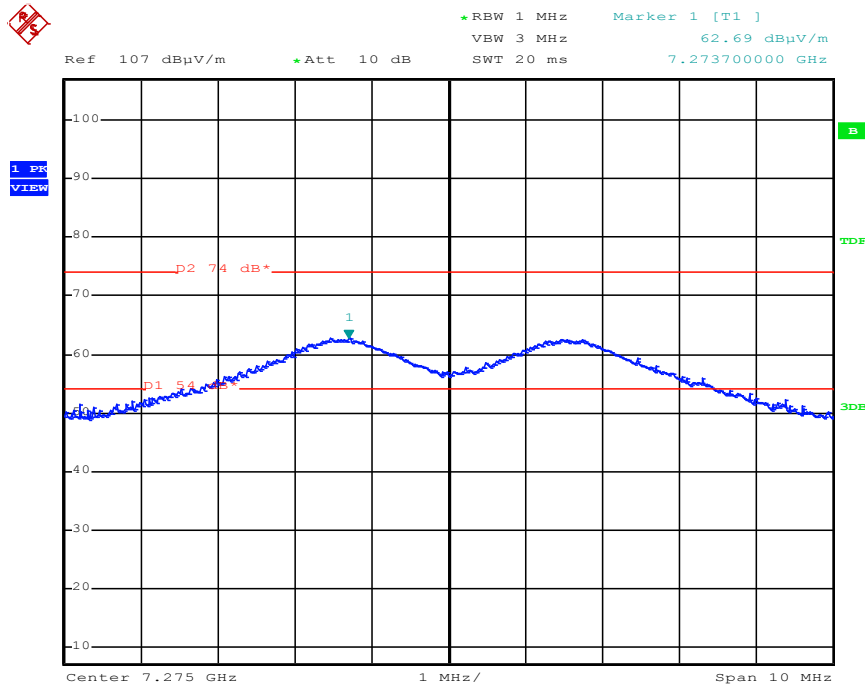
Spurious emissions from 18 to 25 GHz



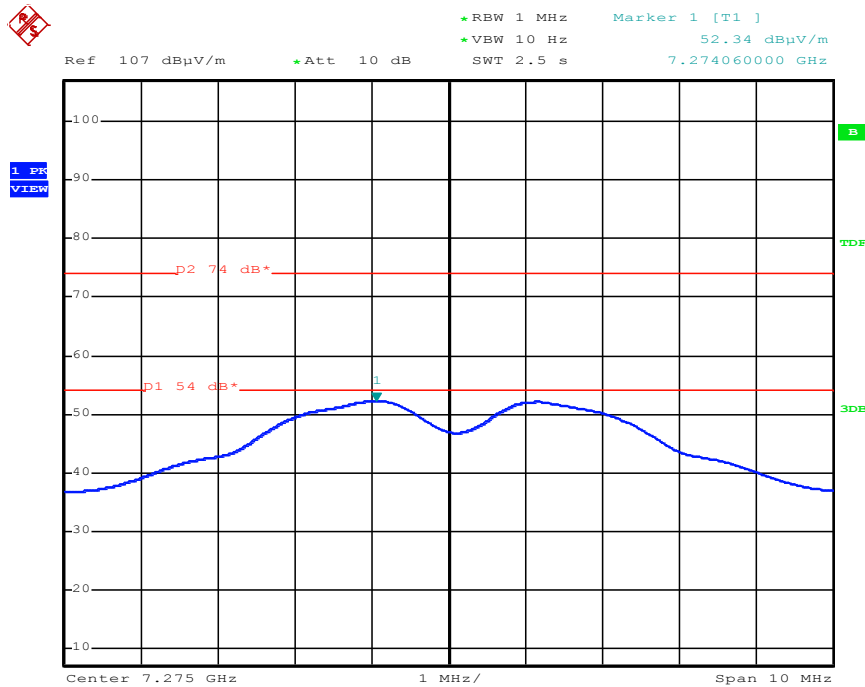
FCC ID: XYN2761

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Peak measurement emission 7275 MHz



AV measurement emission 7275 MHz

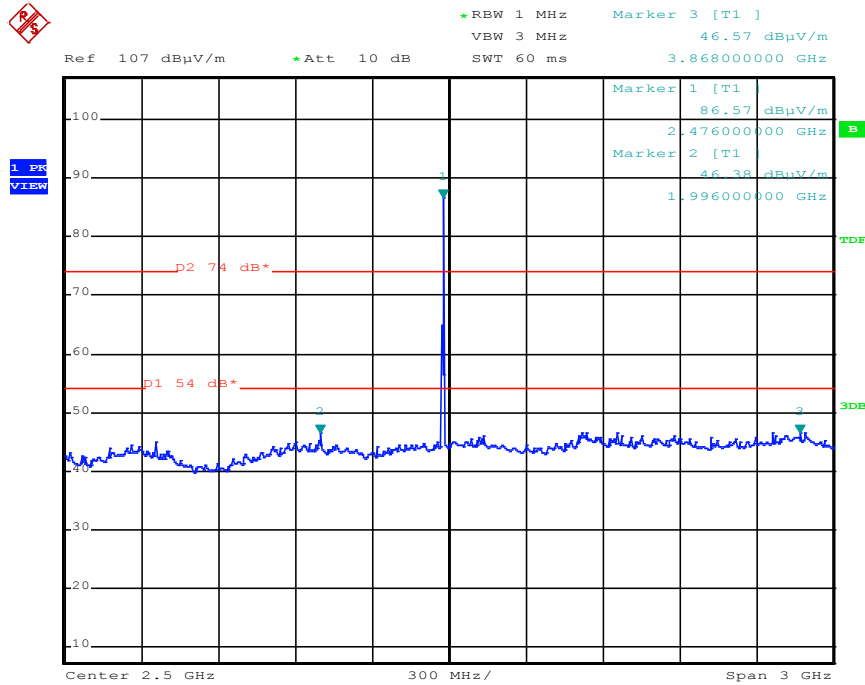


FCC ID: XYN2761

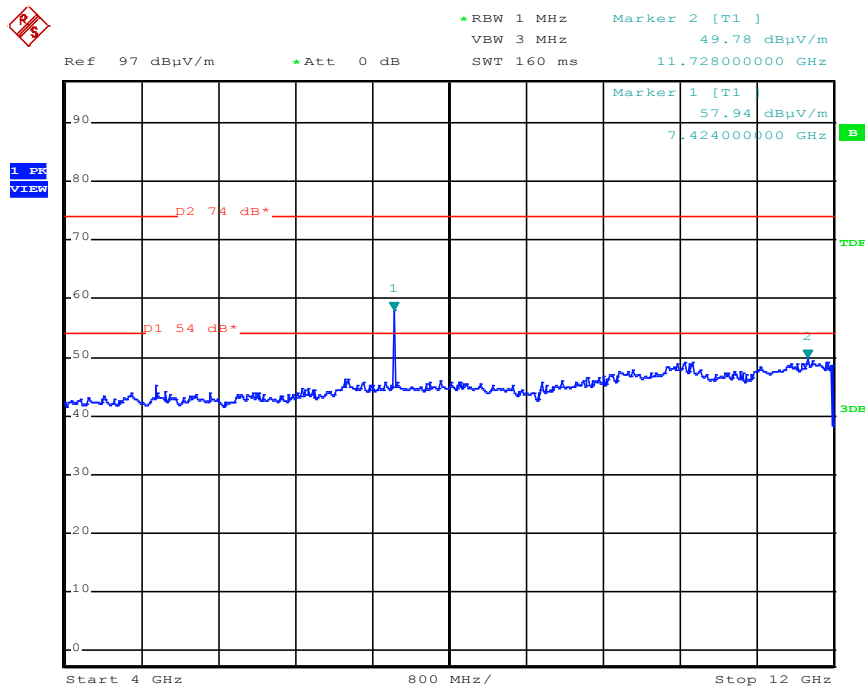
IC ID: 8748A-2761

CH3:

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



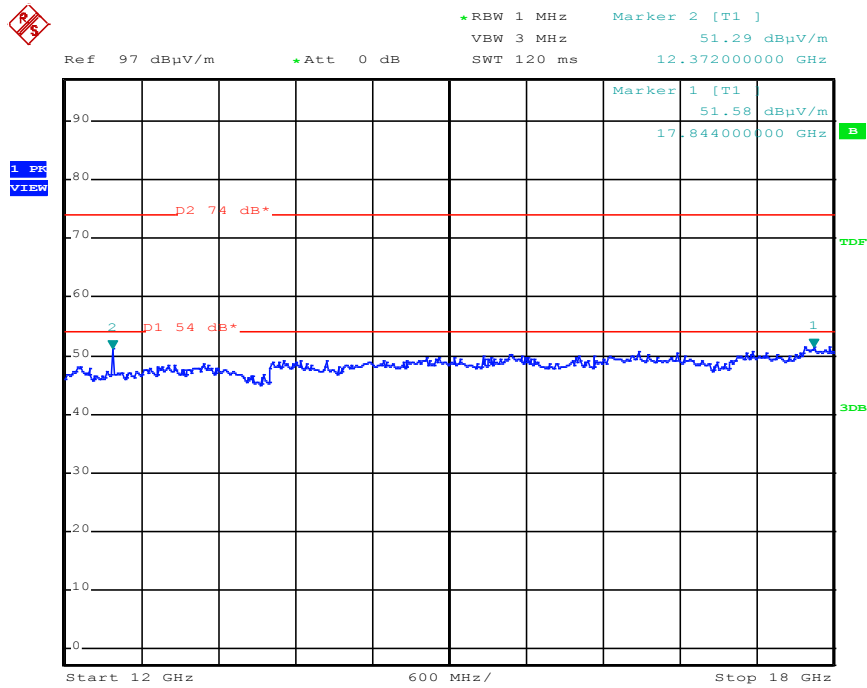
Spurious emissions from 4 to 12 GHz



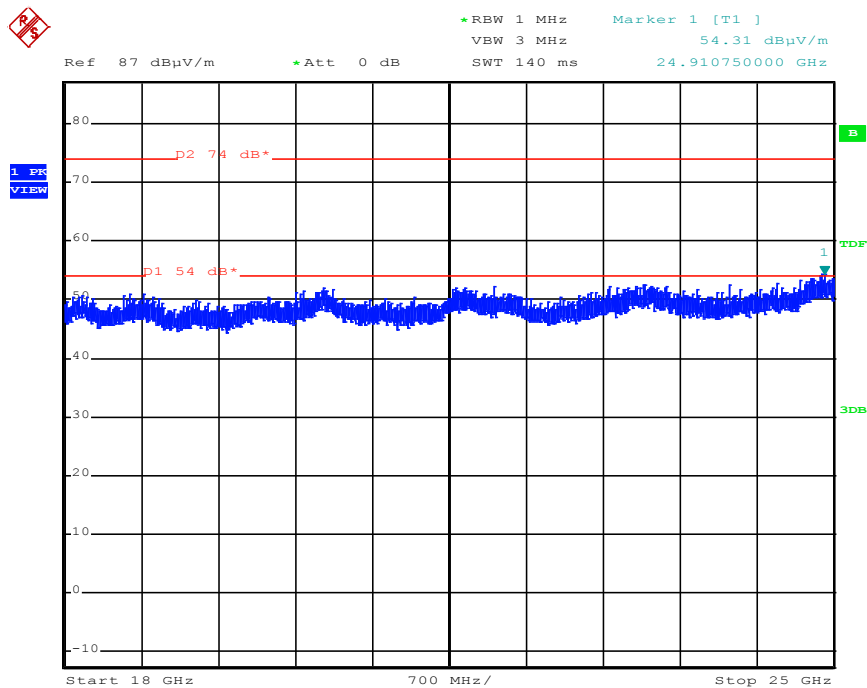
FCC ID: XYN2761

IC ID: 8748A-2761

Spurious emissions from 12 to 18 GHz



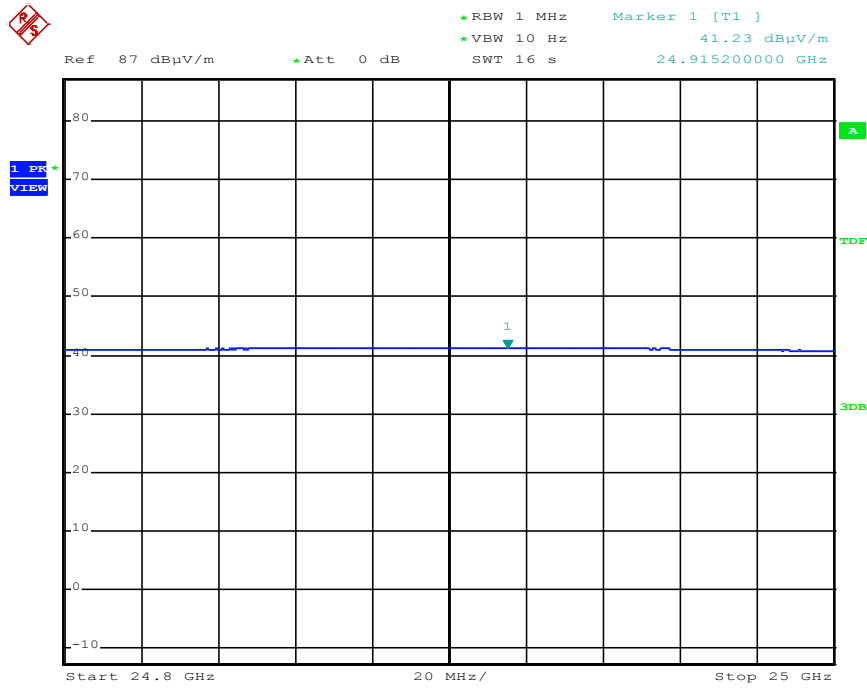
Spurious emissions from 18 to 25 GHz



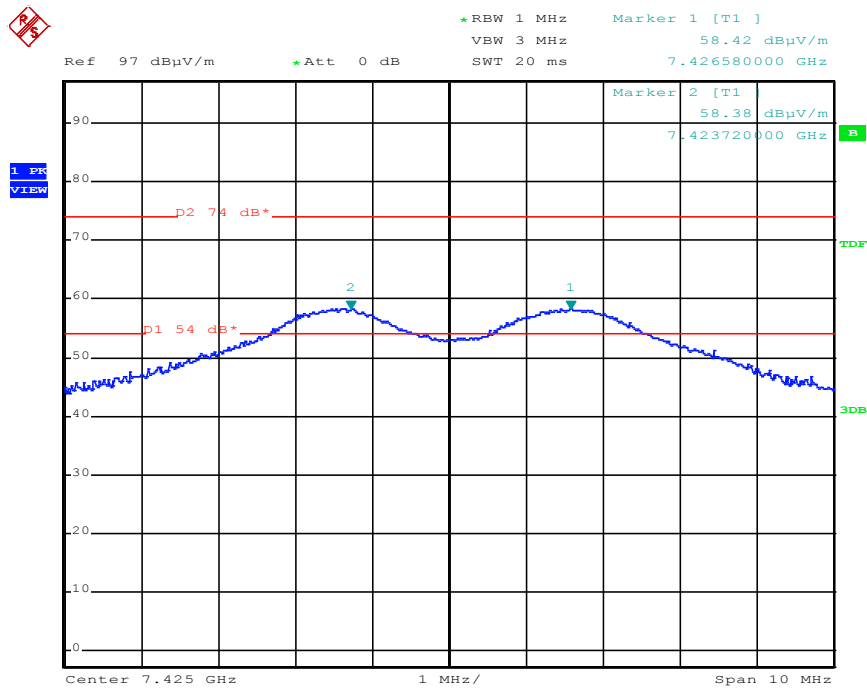
FCC ID: XYN2761

IC ID: 8748A-2761

AV measurement emission 24910 MHz



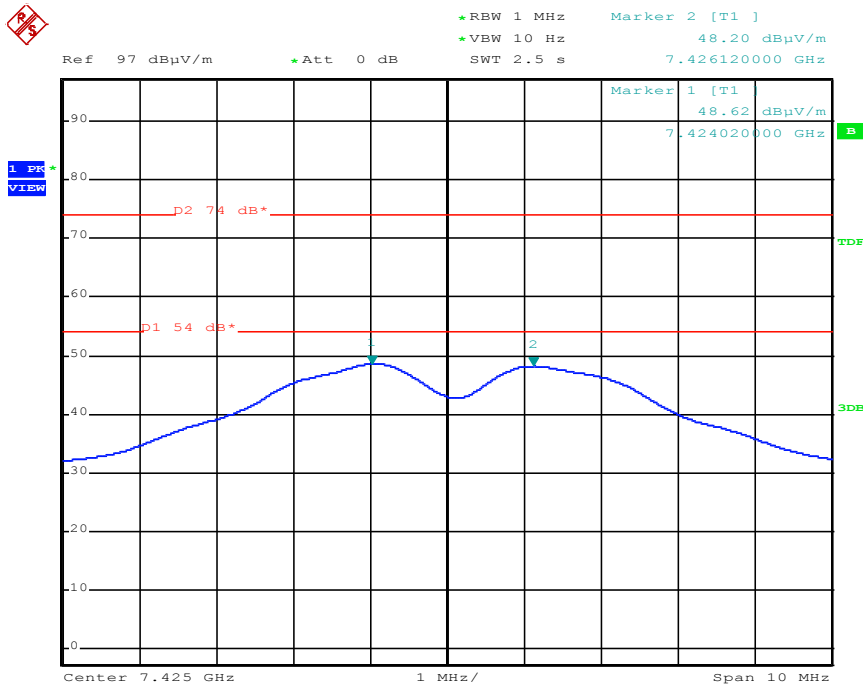
Peak measurement emission 7425 MHz



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AV measurement emission 7425 MHz



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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: Anechoic chamber 2
Test distance: 3 m

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 (99%). The x-dB-down (OBW) function of the analyser is used. The measurement is performed with normal modulation in TX continuous mode.

Spectrum analyser settings:

RBW: 100 kHz, VBW: 300 kHz, Span: 10 MHz, Trace mode: max. hold, Detector: max. peak;

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5.4.5 Test result

EBW:

Operating frequency band (MHz)	20 dB Bandwidth (MHz)
$f_{\text{low}} > 2400$	$f_{\text{low}} = 2423.620$
$f_{\text{high}} < 2483.5$	$f_{\text{high}} = 2476.440$
EBW	52.820
80% bandwidth of the permitted band	66.800

OBW:

Centre f (MHz)	99% bandwidth f_1	99% bandwidth f_2	Measured OBW (MHz)
2425.020	2423.700	2426.340	2.640
2450.000	2448.660	2451.340	2.680
2475.000	2473.660	2476.340	2.680

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.

The OBW99 is measured for RSS only.

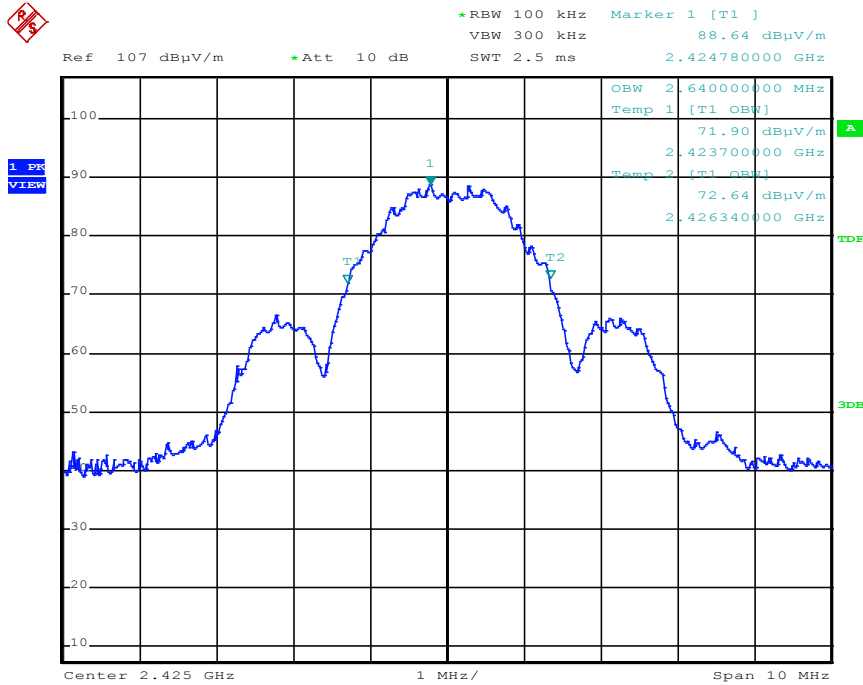
FCC ID: XYN2761

IC ID: 8748A-2761

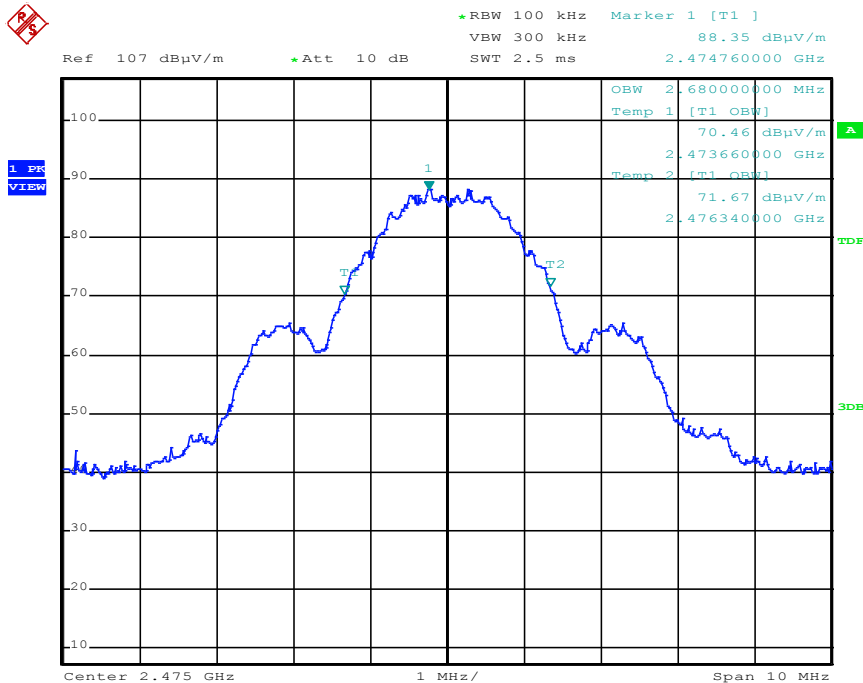
5.4.6 Test protocols

OBW 99%

CH1:



CH3:



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5.5 Correction for pulse operation (duty cycle)

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

5.5.1 Description of the test location

Test location: NONE

Remarks: Not applicable, the AV value is measured.

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.

5.6.2 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.

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	FSP 30	02-02/11-05-001	18/10/2013	18/10/2012		
	AMF-4F-04001200-15-10P	02-02/17-05-004				
	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	FSP 30	02-02/11-05-001	18/10/2013	18/10/2012		
	AMF-4F-04001200-15-10P	02-02/17-05-004				
	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				
SER 1	FMZB 1516	01-02/24-01-018	14/02/2014	14/02/2013		
	FSP 30	02-02/11-05-001	18/10/2013	18/10/2012		
	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	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	FSP 30	02-02/11-05-001	18/10/2013	18/10/2012		
	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		
	R1 _ 18 - 40 GHz	02-02/30-09-002	08/01/2014	08/01/2013		
	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				