Loxone Electronics GmbH

TEST REPORT

SCOPE OF WORK
RADIO TESTING – LOXONE AIR CPU- MODUL

REPORT NUMBER
2233222KAU-007

ISSUE DATE

11-December-2018

PAGES
48

DOCUMENT CONTROL NUMBER
R_FCC 15-247_18-12

TYPE:	Loxone Air CPU- Modul
DESCRIPTION:	906-924 MHz Transceiver Modul with µ-Controller
EUT MAC-ID	50:4F:94:FF:FE:1C:60:00

All measurement results refer to the equipment which was tested

MANUFACTURER:	Loxone Electronics GmbH
CUSTOMER NAME:	Loxone Electronics GmbH
ADDRESS (CUSTOMER):	Smart Home 1 4154 Kollerschlag Austria
REPORT NO:	2233222KAU-007
TEST RESULT:	The equipment complies to 47 CFR Part 15, Subpart C, Intentional radiators, section 15.247 / RSS-210, Issue 9 and RSS-GEN, Issue 5 (Referring to the operating modes specified in this report).
TEST LABORATORY:	Intertek Deutschland GmbH Innovapark 20, 87600 Kaufbeuren Germany
FCC DESIGNATION NUMBER:	DE0014
FCC TEST FIRM REGISTRATION NUMBER.	359260
INDUSTRY CANADA REGISTRATION.	8882A-1; 8882A-2
TEST ENGINEER:	U. Gronert Senior Project Engineer
REVIEWER:	R. Dressler Technical Manager EMC/ Radio

Details about Accreditations/Acceptances

EMC / Radio National

DAkkS Deutsche Akkreditierungsstelle D-PL-12085-01-01	The Intertek Deutschland EMC-Lab is accredited by the Deutsche Akkreditierungsstelle GmbH (DAkkS) Registration Number (EMC general): **D-PL-12085-01-01** Registration Number (EMC Med): **D-PL-12085-01-03**

International

IECEE CB SCHEME	The Intertek Deutschland EMC-Lab is accepted to participate in the IECEE (IEC Conformity assessment for Electrotechnical Equipment and Components) CB-Scheme CB Test Laboratory: **TL118**
FCC Federal Communications Commission	The Intertek Deutschland EMC-Lab is listed at the Federal Communications Commission (FCC) Designation Number: **DE0014** Test Firm Registration Number: **359260**
Bundesnetzagentur BNetzA-CAB-16/21-10	The *Bundesnetzagentur* recognizes Intertek Deutschland GmbH as Conformity Assessment Body in the sector electromagnetic compatibility (EMC).
Industrie Canada Industry Canada Canada	The Intertek Deutschland EMC-Lab is listed at Industry Canada No.**8882A-1** (OATS) and **8882A-2** (3 m alternative test site)

Automotive

KBA Anerkennungsstelle Anerkannt unter KBA-P 00046-03	The Intertek Deutschland EMC-Lab is recognized as technical service of the Kraftfahrt-Bundesamt (KBA) Registration Number: **KBA-P 00046-03**

SECTION 1
CONTENTS

SECTION 2
MEASUREMENT AND TEST SPECIFICATION

47 CFR Part 15, Subpart C, Intentional radiators, section 15.207 and section 15.247 / RSS-210, Issue 9 and RSS-GEN, Issue 5

Test methods in:

ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices

No additions, deviations or exclusions have been made from standards and accreditation.

The test results detailed in this report apply only to the Loxone Air CPU- Modul with the test setup described. Any modification such as a change, addition to or inclusion of another device into this product will require an additional evaluation.
The support equipment listed as part of the emission tests is required to properly exercise and test the device under test.

SECTION 3
GENERAL INFORMATION

Possible test case verdicts:		
Test case does not apply to the test object:	N/A (Not Applicable)	
Test object does meet the requirement:	P (Pass)	
Test object does not meet the requirements:	F (Fail)	
Samples arrived:	2018-11-07	
Testing:	2018-11-08 to 2018-12-12	
Decimal separator:	☒ Point	☐ Comma
Environmental conditions during testing:	Temperature:	15 °C - 35 °C
	Humidity:	20 % - 60 %
	Atmospheric pressure:	900 mbar - 1000 mbar
	If explicitly required by a basic standard the measured climatic conditions are documented in the corresponding test section.	

Test sites:

Measurement Chamber	Type of chamber	IC Site filing #
ANECHOIC CHAMBER 1	Semi-anechoic 3 m	8882A-2

SECTION 4
SUMMARY OF TESTING

4.1 General annotation

The tests were performed in the order of the right column in the “Test Results – Overview” table.

Professional judgement:
All measurement results exclusively refer to the equipment type Loxone Air CPU- Modul which was tested.

4.2 Measurement uncertainty

For each test method, an uncertainty evaluation was carried out. The results of the evaluation can be provided upon request from Intertek Deutschland GmbH.

4.3 Document History

REVISION	DATE	REPORT	CHANGES	AUTHOR
Initial release	2018-12-11	2233222KAU-007	Initial issue	UGR

SECTION 5
TEST RESULTS – OVERVIEW

Requirements according FCC Part 15C

EMISSION	ACCORDING TO	VERDICT	DATE	NO
6dB bandwidth	FCC 15.247(a) (2)	P	2018-11-08 2018-11-09	1 4
Maximum conducted peak output Power	FCC 15.247(b) (3)	P	2018-11-08 2018-12-12	2 8
Out of band conducted emission	FCC 15.247(d)	P	2018-11-08/09	3
Out of band radiated emission	FCC 15.247(d) FCC 15.209	P	2018-11-10/11	6
Power spectral density conducted	FCC 15.247(e)	P	2018-11-09	5
Conducted emissions on the AC power line	FCC 15.207	P	2018-11-20	7

Requirements according RSS-Gen and RSS-210:

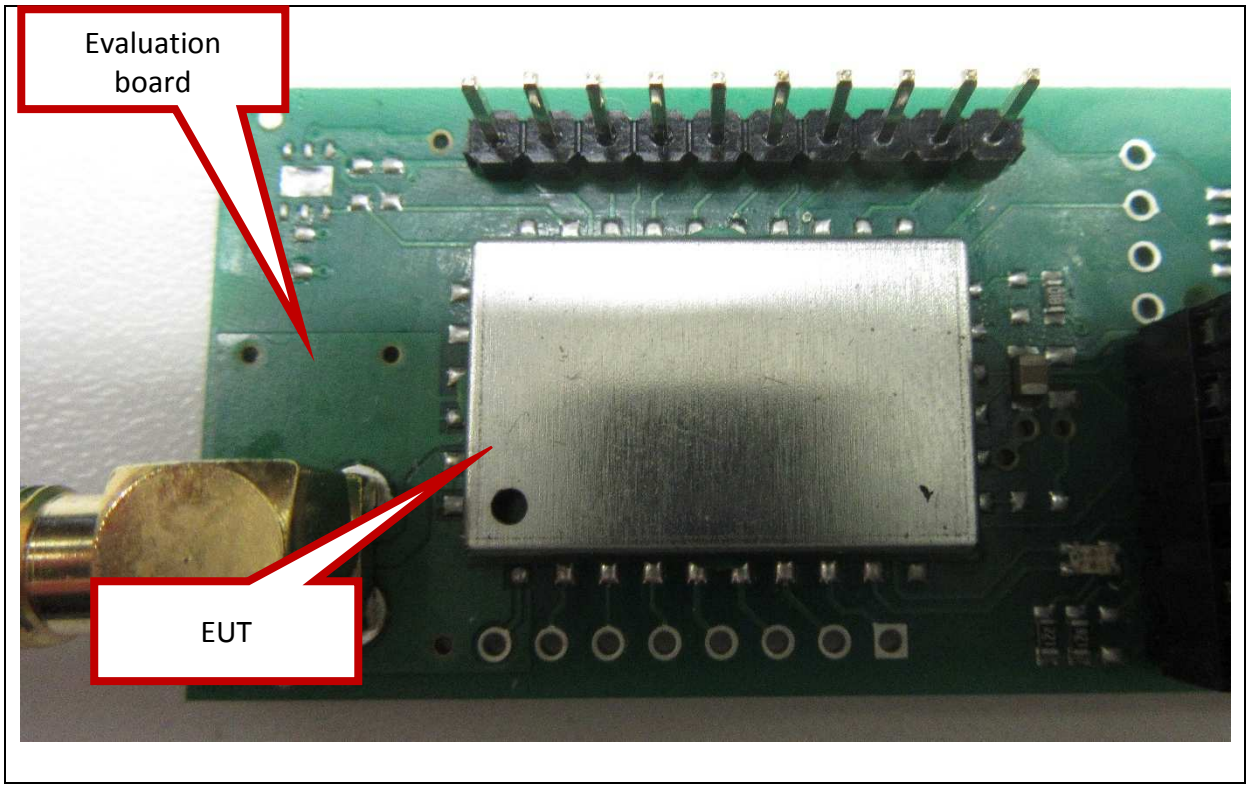
EMISSION	ACCORDING TO	VERDICT	DATE	NO
Occupied bandwidth	RSS-Gen Issue 4, section 6.6	P	2018-11-09	1
Maximum conducted peak output Power	RSS-210, Issue 9, section B10	P	2018-12-12-	4
Out of band radiated emission	RSS-210, Issue 9, section B10	P	2018-11-10/11	2
Conducted emissions on the AC power line	RSS-Gen 8.8	P	2018-11-20	3

SECTION 6
INFORMATION ABOUT THE EUT

6.1 Description of the EUT

☒ table-top EUT		☐ floor-standing EUT	
Dimensions:	Height:	Width:	Length:
	0.2 cm	1.4 cm	2.2 cm
Software version:			
Prototype or Product version:			
Description: The Saturn Transceiver Module is a sub-GHz module based on the Microchip AT86RF212B transceiver. The module is to be used in various Loxone Smart Home products.			
Transmitter frequency range:	906 to 924 MHz		
Frequency agile or hopping:	☐ Yes	☒ No	
Antenna:	☐ Internal antenna	☒ External antenna	
Antenna type	Rod antenna		
Antenna gain	2 dBi		
Antenna connector:	☐ None, internal antenna	☒ Yes, SMA	
Power rating:	-25 to 11 dBm (antenna port)		
Channal spacing	2 MHz		
Receiving only mode supported:	☒ Yes	☐ No	

6.2 Photo of EUT



6.3 Power interface

MODE	VOLTAGE (V)	FREQUENCY (Hz)	COMMENT
1	24	DC	

Power sources/associated test equipment

DEVICE	MANUFACTURER	TYPE	SN	ASSET NO.
4 quadrant amplifier	Spitzenberger & Spies	PAS 5000	826149/005	PM KF 2555
DC power supply	SIBO Electronics	6721	600104011706710016	PM KF 2938

6.4 Configuration mode

MODE	DESCRIPTION
1	Evaluation board supplied via 24 V / Radiated emission in the Semi-Anechoic chamber (measuring distance 3 m)
2	Device supplied via 24 V / antenna port connected to a spectrum analyzer
3	Device supplied via 3.3 V / antenna port connected to a spectrum analyzer
4	

6.5 Operation mode

MODE	DESCRIPTION
1	Transmitter active / continuous wave / transmitting power 11 dBm
2	Transmitter active / modulated continuous message/ transmitting power 11 dBm
3	Transmitter active / pseudo random test message/ transmitting power 11 dBm
4	Transmitter active / continuous wave / transmitting power -4 dBm

6.6 Peripheral devices used for testing

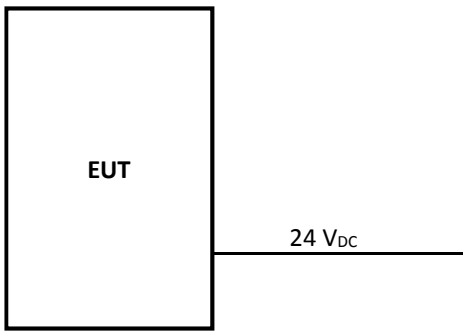
PRODUCT TYPE	MANUFACTURER/MODEL
DC power supply	SIBO Electronics / 6721
AC/DC adaptor	ATI / 48-24-500

6.7 Supply and interconnecting cables used for testing

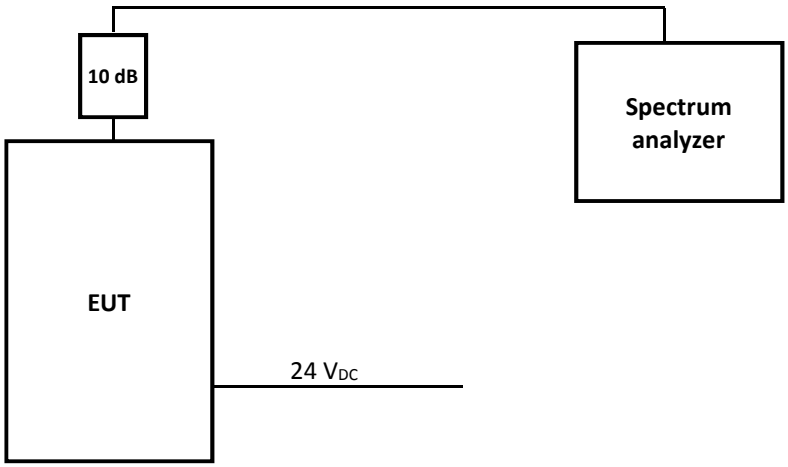
LINE	LENGTH (cm)	SHIELDING
DC cable	various	N

6.8 Block diagram of the test setup

Test set up radiated measurement



Test set up conducted measurement



SECTION 7
CONFORMANCE REQUIREMENTS

7.1 6dB bandwidth

NORMATIVE REFERENCES			RESULT
Limits according to:	**FCC 15.247(a) (2)** **RSS-Gen Issue 4, section 6.6**		**P**
Methods of measurement according to:	**ANSI C63.10, section 6.8** **RSS-Gen Issue 4, section 6.6**		
Equipment mode	Power interface	1	
	EUT configuration mode	2	
	Operation mode	2	

Limits

Limit:	>500 kHz

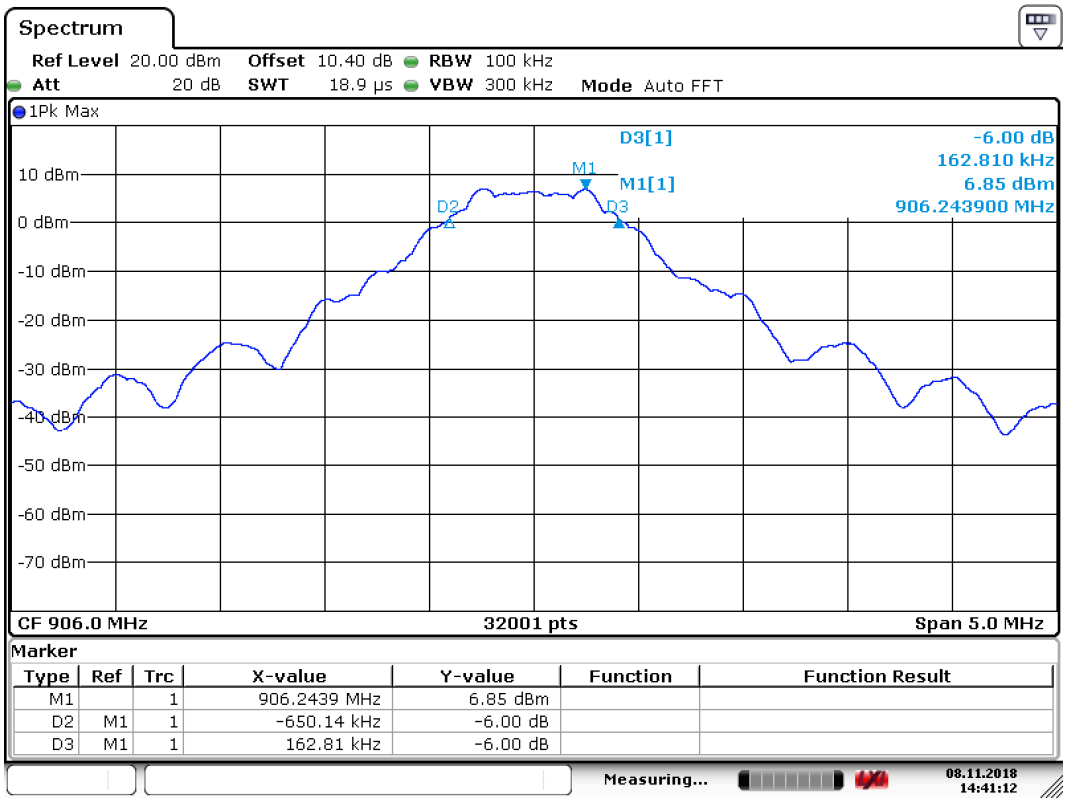
Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Spectrum analyser	Rohde & Schwarz	FSV40	837356/012	PM KF 2783	2018-09 (1 year)

Measurement results – 6dB bandwidth:

Channel	TX frequency (MHz)	6dB bandwidth (kHz)	Limit (kHz)	OBW 99% (kHz)
1	906	812.96	>500	1408.5
5	914	798.88	>500	1325.6
10	924	800,60	>500	1296.5

6dB bandwidth:



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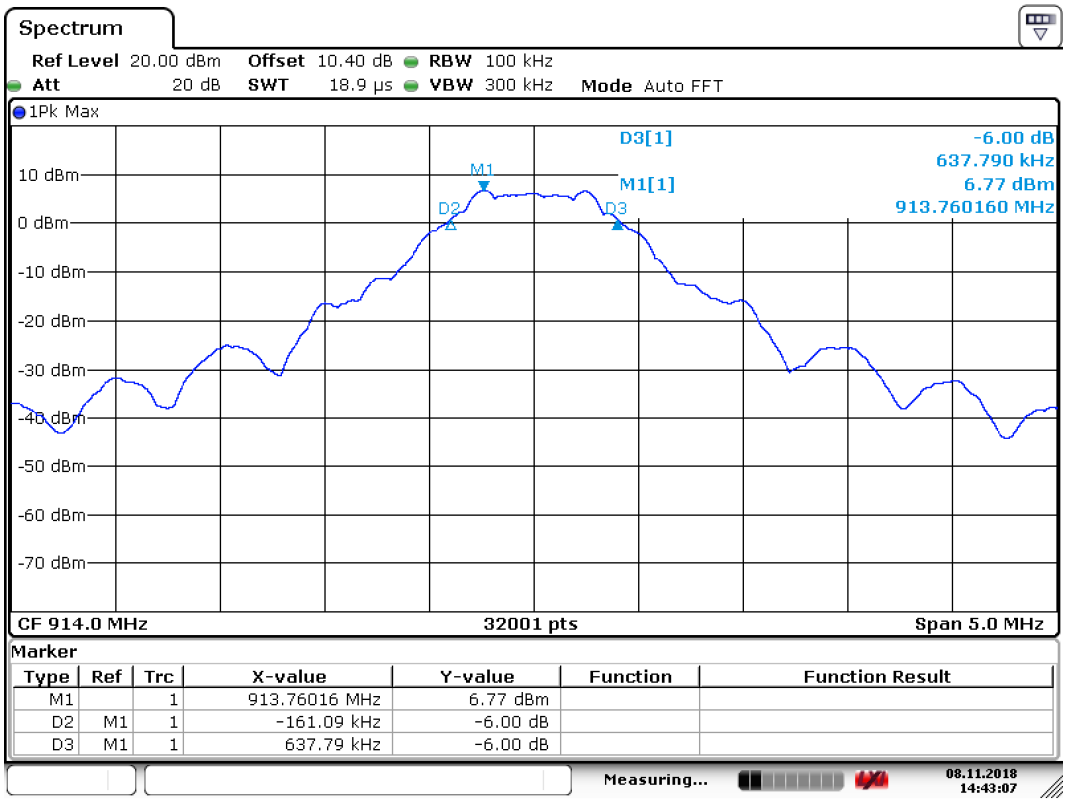

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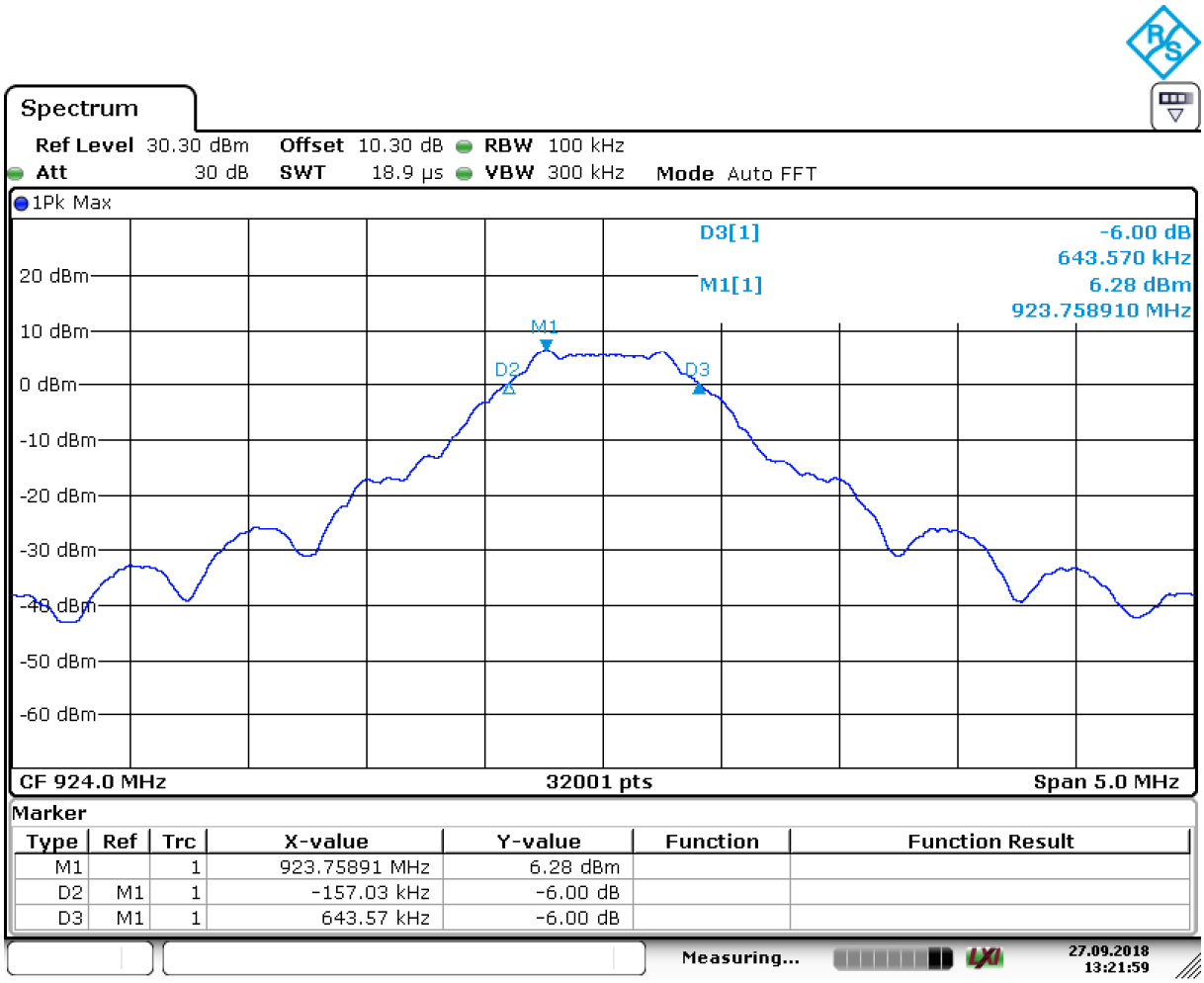

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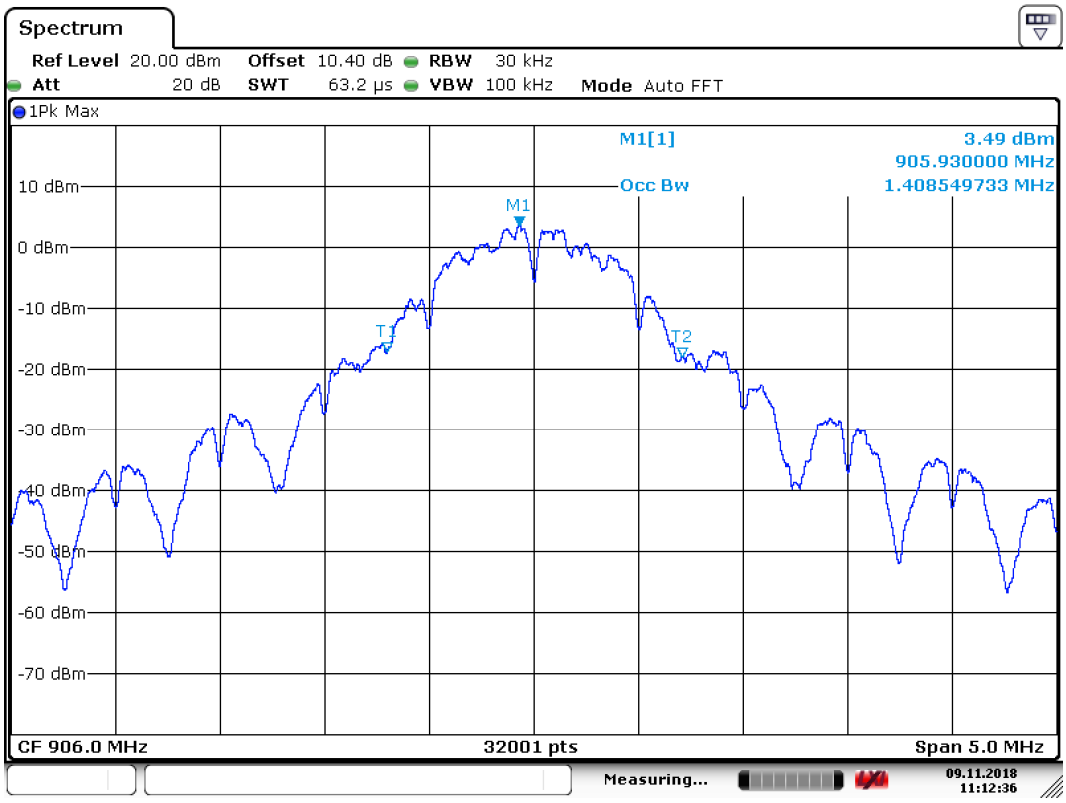
OBW 99%:



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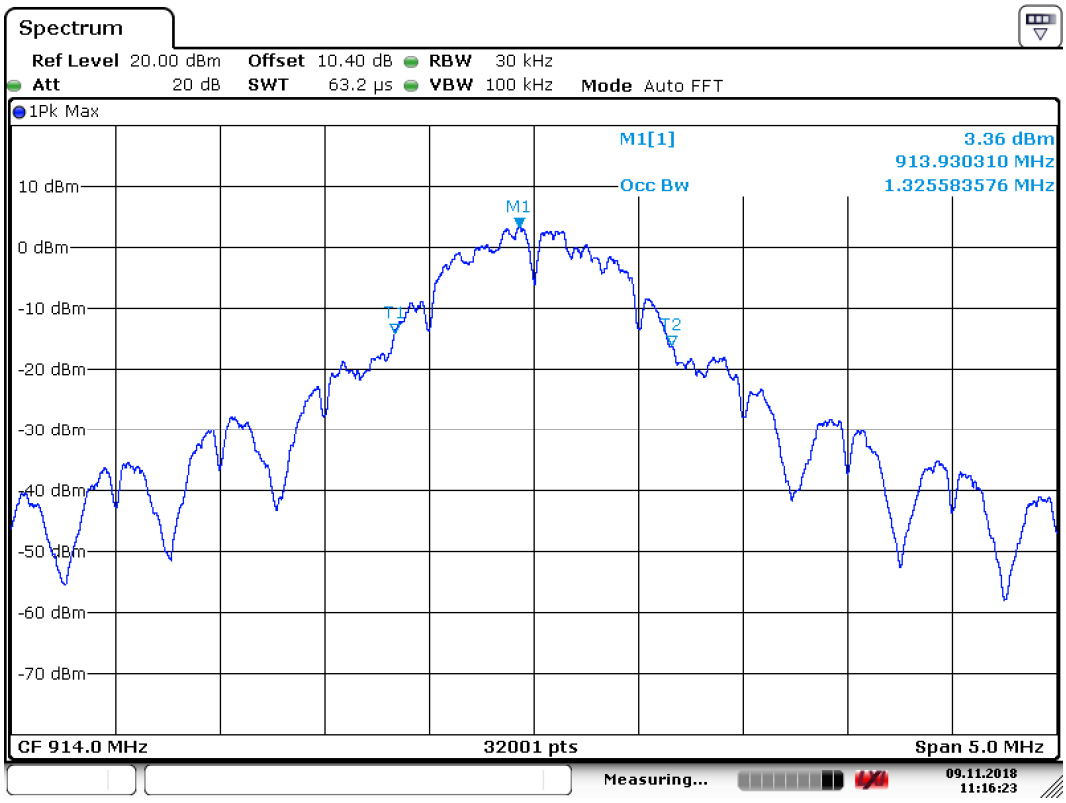

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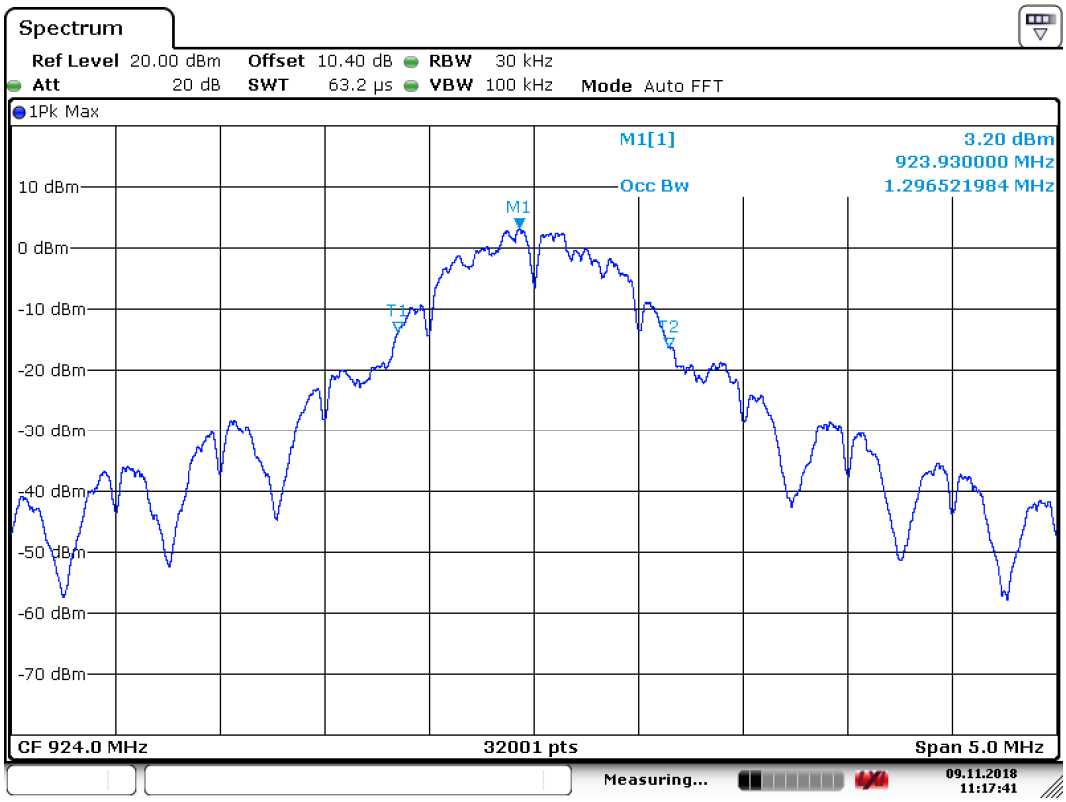

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7.2 Maximum conducted peak output Power

NORMATIVE REFERENCES			RESULT
Limits according to:	**FCC 15.247(b) (3)** **RSS-210, Issue 9, section B10**		**P**
Methods of measurement according to:	**ANSI C63.10:2013, Clause 11.9** **RSS-Gen Issue 4, section 6.11**		
Equipment mode	Power interface	1	
	EUT configuration mode	2	
	Operation mode	1 and 4	

Limits

Limit:	**FCC 15.247(b) (3)** TX power conducted: 30 dBm	**RSS-210, Issue 9, section B10** field strength of fundamental

Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Spectrum analyser	Rohde & Schwarz	FSV40	837356/012	PM KF 2783	2018-09 (1 year)

Measurement results FCC requirements – Maximum conducted peak output Power:

Channel	TX frequency (MHz)	Peak power conducted (dBm)	Limit (dBm)
1	906	8.94	30
5	914	8.71	30
10	924	8.41	30

Measurement results RSS-210 – Maximum conducted peak output Power:

To fulfill the requirements the TX power of the RF module is set to -4 dBm

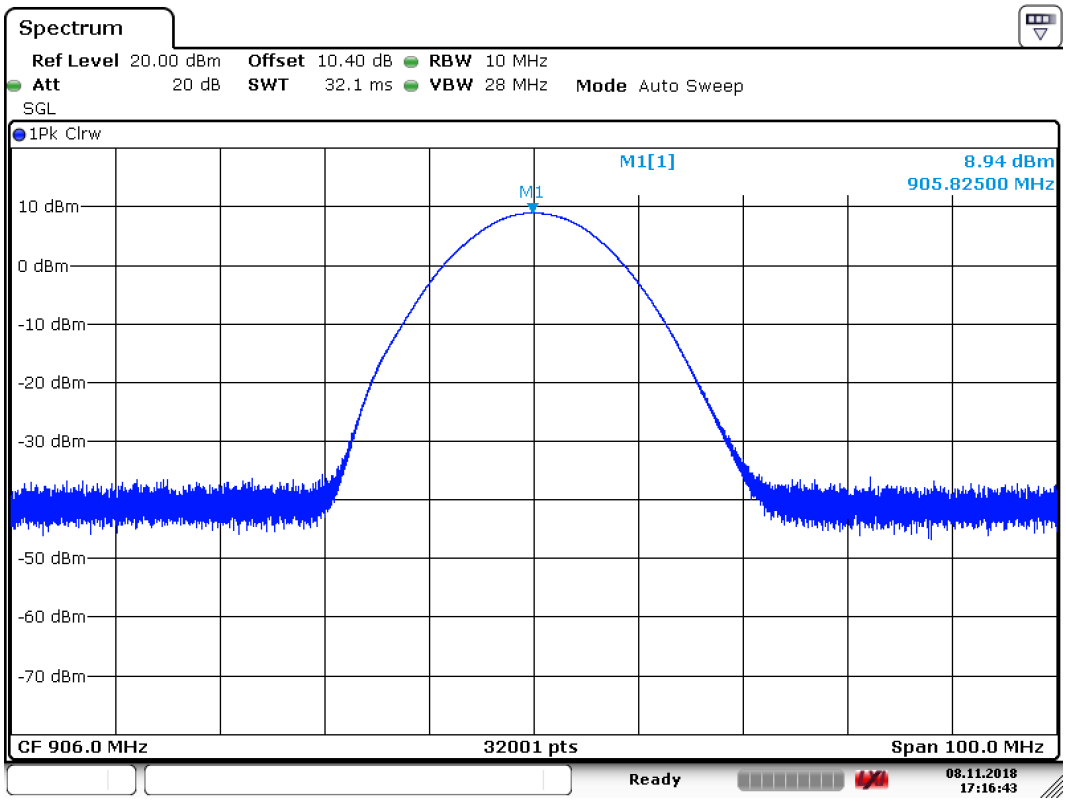
Channel	TX frequency (MHz)	Peak power conducted (mW)	Antenna gain	field strength of fundamental * (mV)	Limit (mV)
1	906	0.24	1.6	35.5	50
5	914	0.23	1.6	34.8	50
10	924	0.22	1.6	33.9	50

*The value was calculated:

$$Fs = \sqrt{TP \cdot 30 \cdot G} / D$$

Fs: Field strength (V/m) TP: Transmitting power conducted (W)
G: Antenna gain isotropic D: Distance (m)

Maximum conducted peak output Power / setting 11 dBm:



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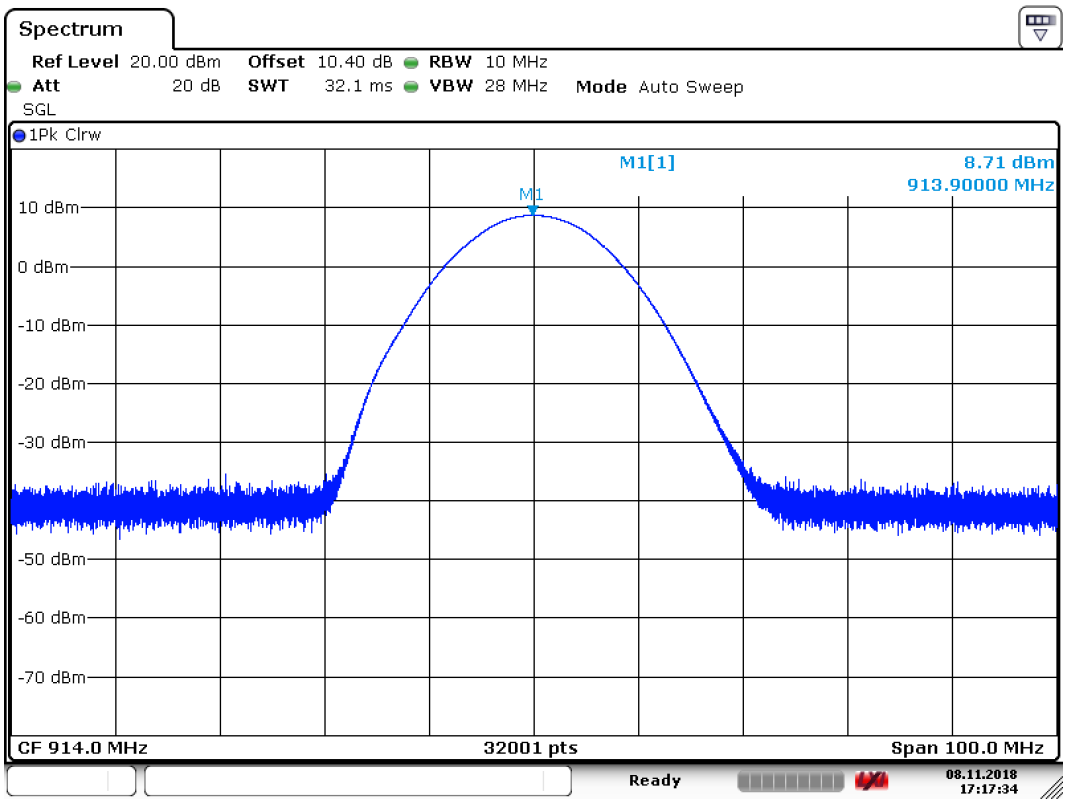

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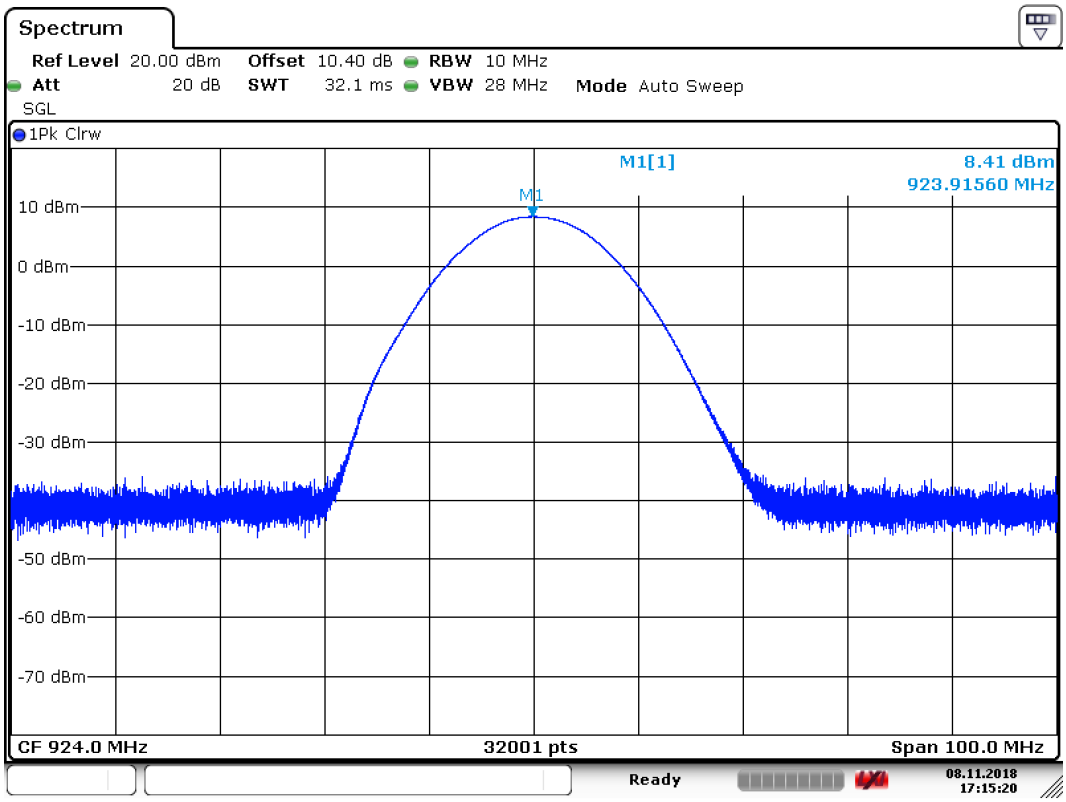

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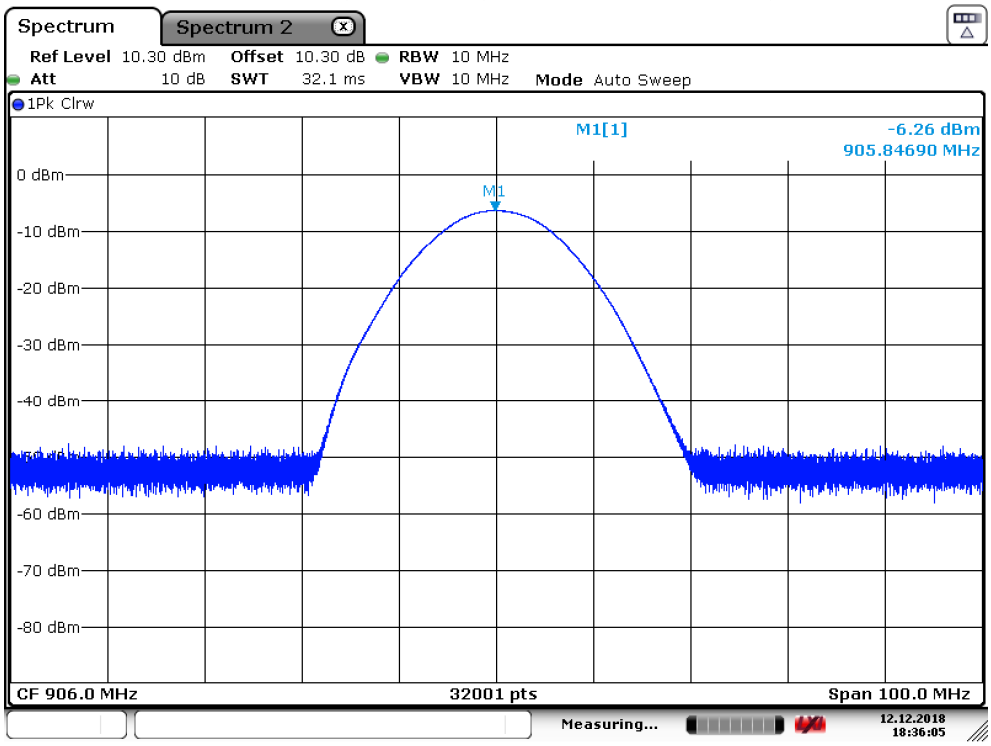
Maximum conducted peak output Power / setting -4 dBm:



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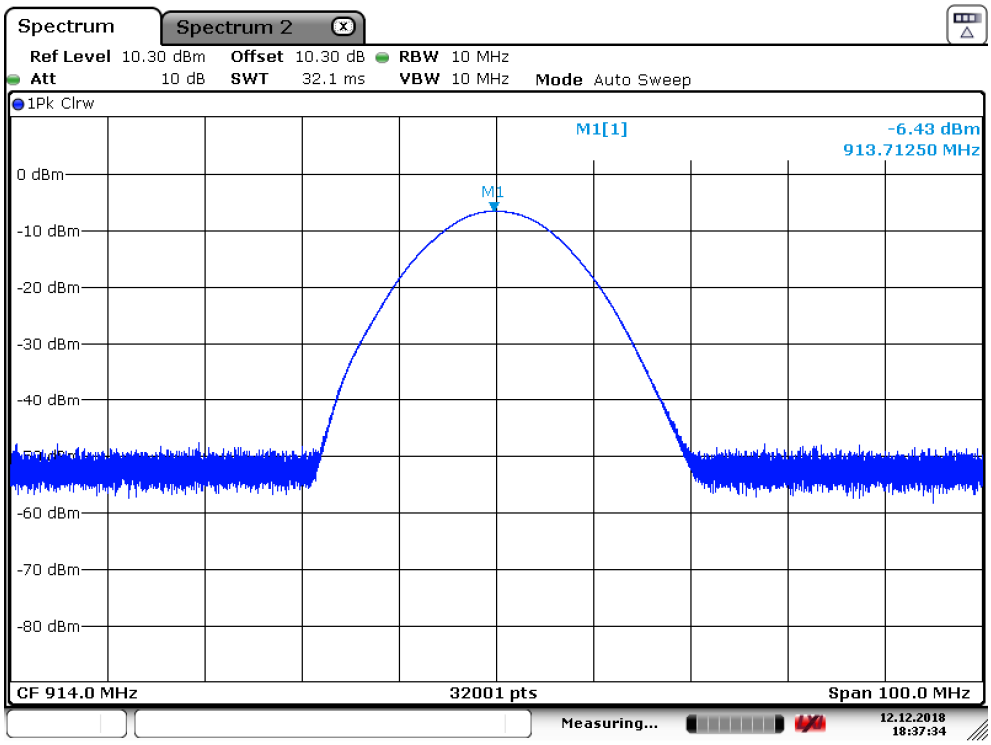

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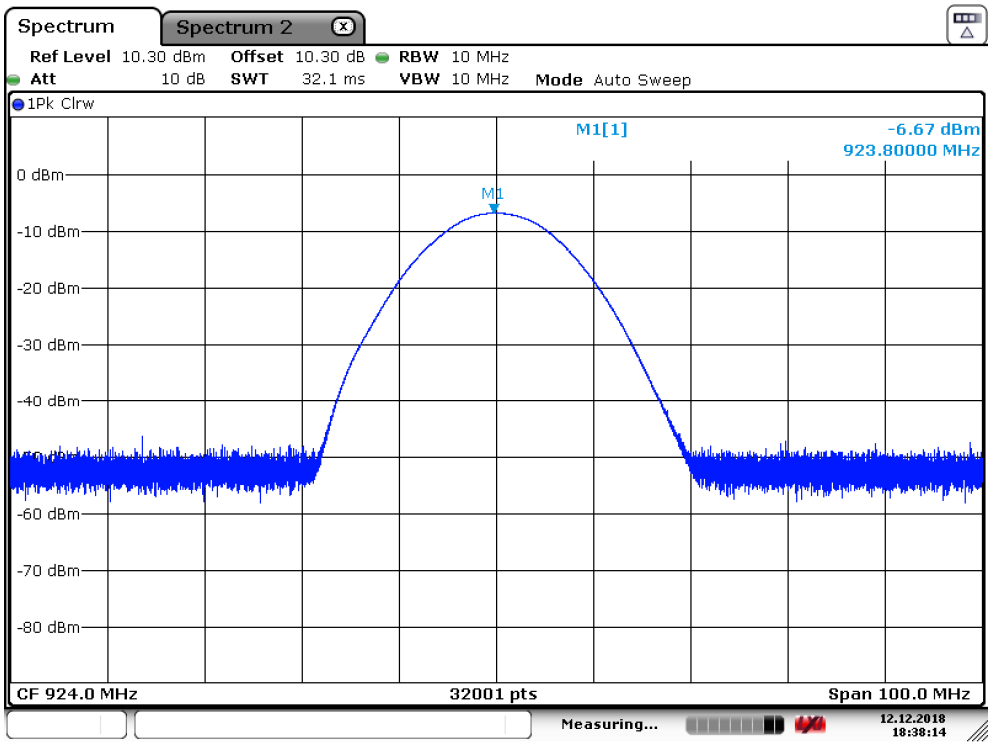

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7.3 Out of band conducted emission

NORMATIVE REFERENCES			RESULT
Limits according to:	**FCC §15.247 (d)** **RSS-210, Issue 9, section B10**		**P**
Methods of measurement according to:	**ANSI C63.10:2013, Clause 11.11** **RSS-Gen Issue 4, section 6.13**		
Equipment mode	Power interface	1	
	EUT configuration mode	2	
	Operation mode	1	

Limits

Limit:	-20 dB

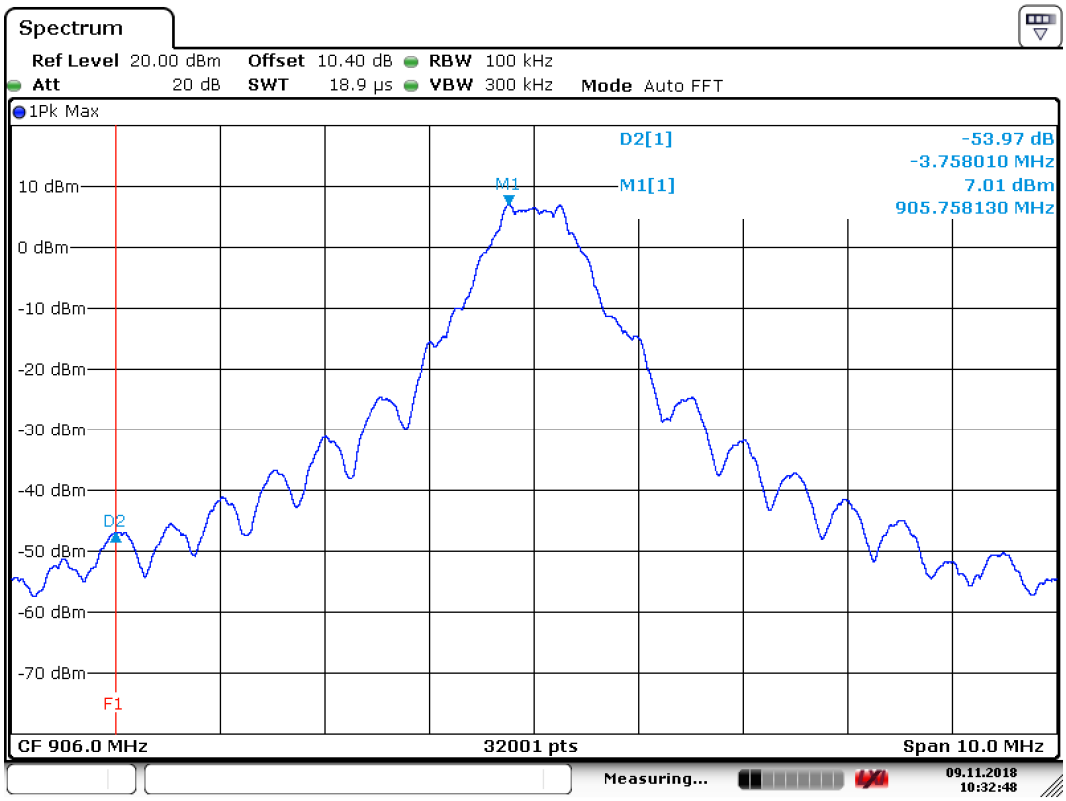
Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Spectrum analyser	Rohde & Schwarz	FSV40	837356/012	PM KF 2783	2018-09 (1 year)

Measurement results – Out of band conducted emission:

Channel	TX frequency (MHz)	Band edge conducted emission below carrier (dB)	Out of band conducted emission below carrier other frequencies (dB)	Limit (dB)
1	906	<-40	<-40	-20
5	914	-	<-40	-20
10	924	<-40	<-40	-20

Out of band conducted emission band edge:



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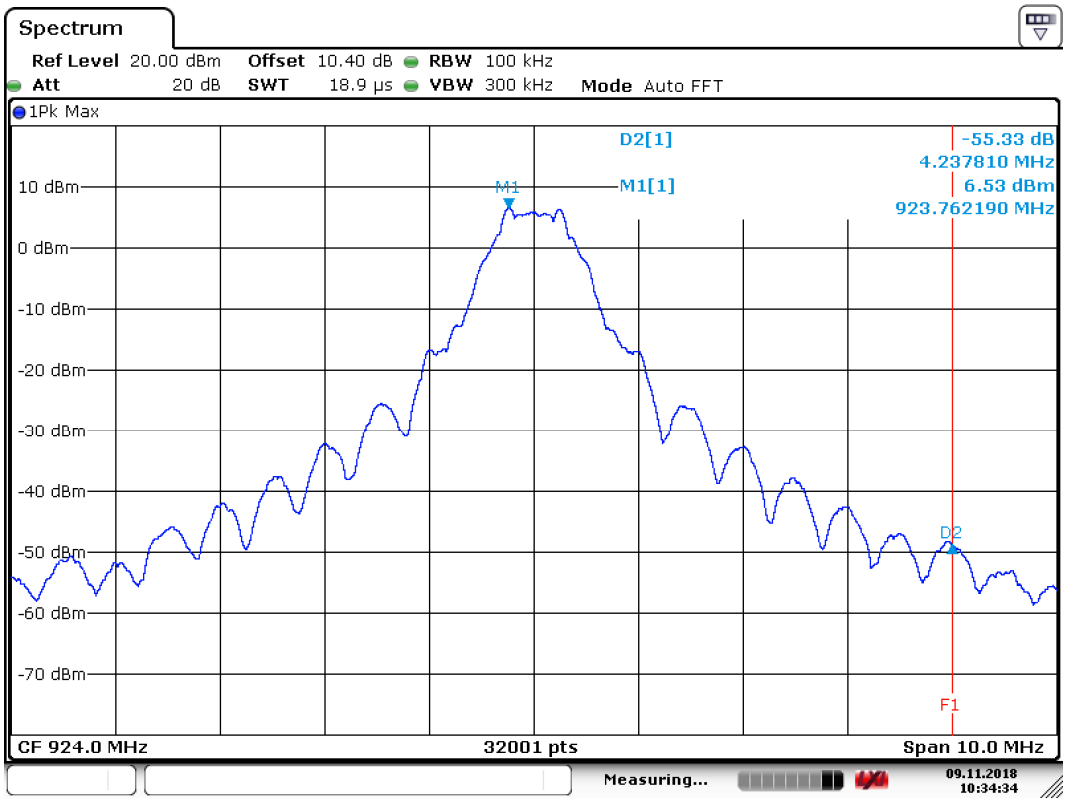

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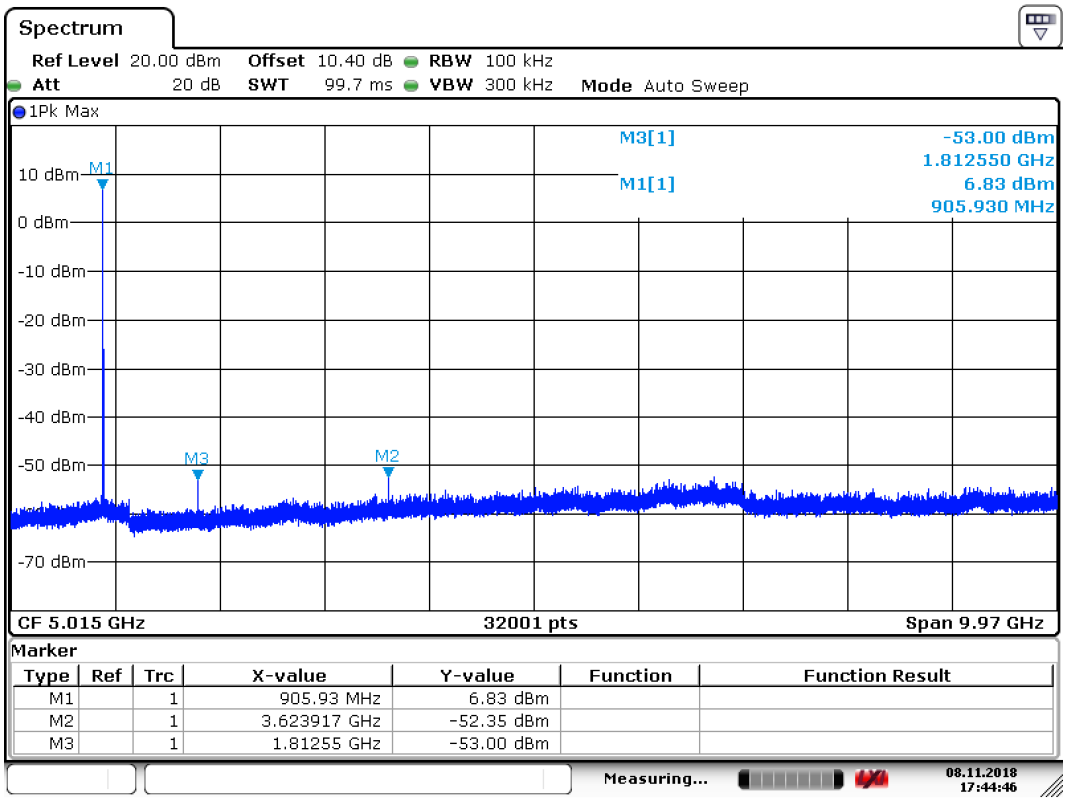
Out of band conducted emission other frequencies:



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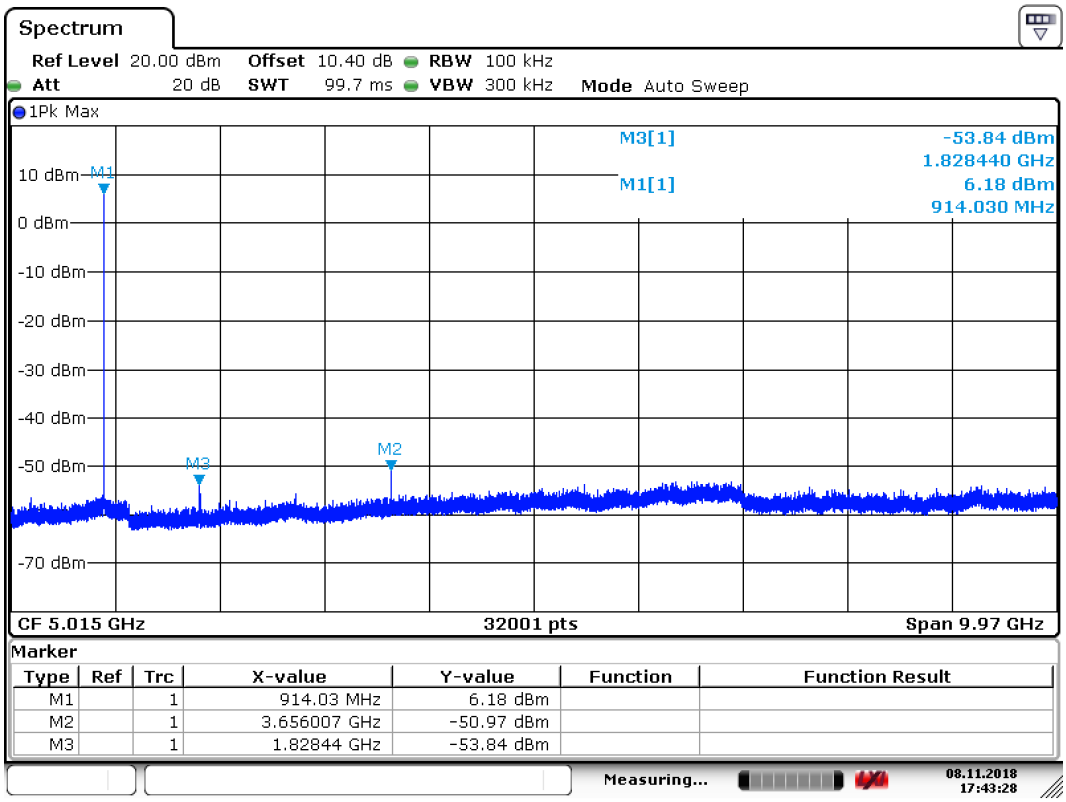

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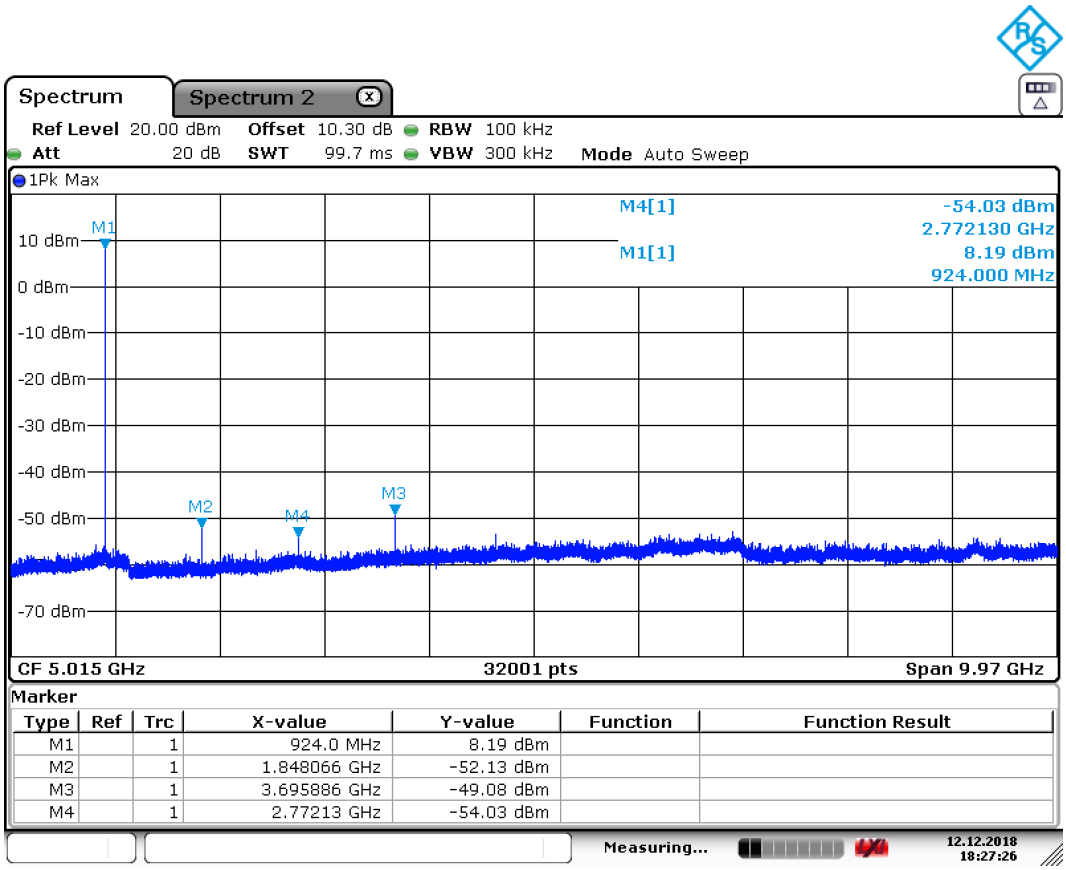


Date: 8.NOV.2018 17:38:44

7.4 Power spectral density conducted

NORMATIVE REFERENCES			RESULT
Limits according to:	**FCC 15.247(e)**		**P**
Methods of measurement according to:	**ANSI C63.10:2013, Clause 11.9**		
Equipment mode	Power interface	1	
	EUT configuration mode	2	
	Operation mode	2	

Limits

Limit:	8 dBm

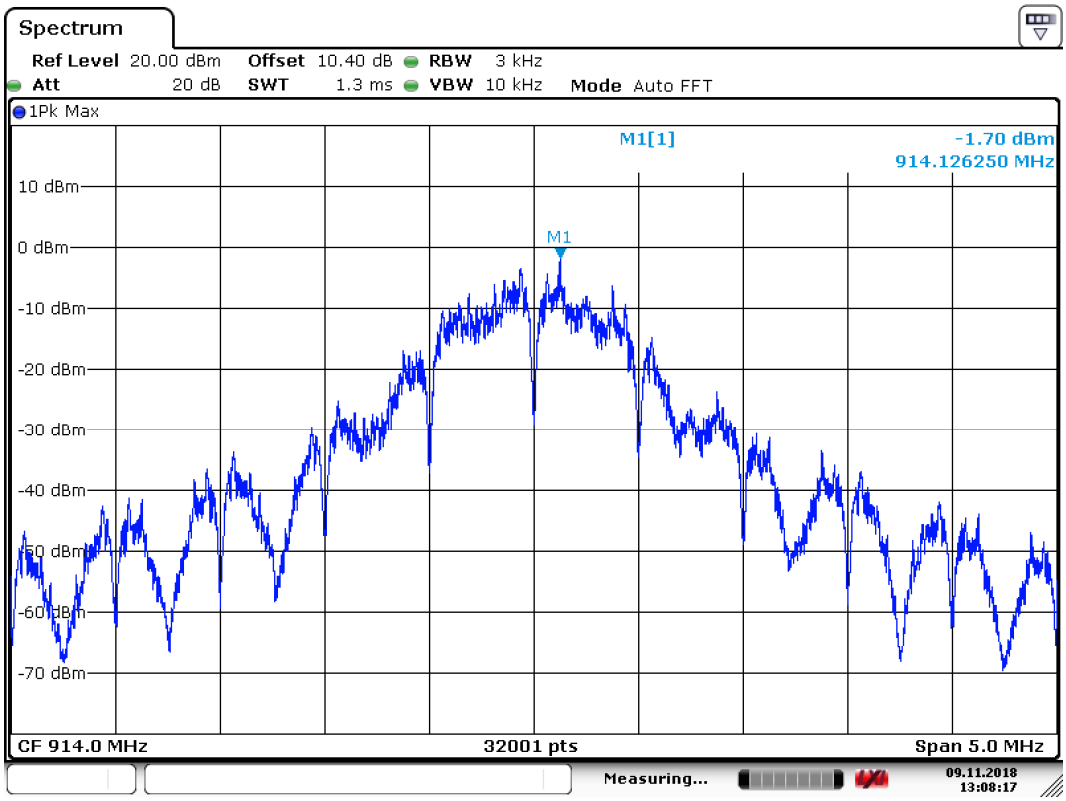
Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Spectrum analyser	Rohde & Schwarz	FSV40	837356/012	PM KF 2783	2018-09 (1 year)

Measurement results – 6dB bandwidth:

Channel	TX frequency (MHz)	Power spectral density (dBm)	Limit (dBm)
1	906	-1.70	8
5	914	-1,53	8
10	924	-1.91	8

Power spectral density conducted:



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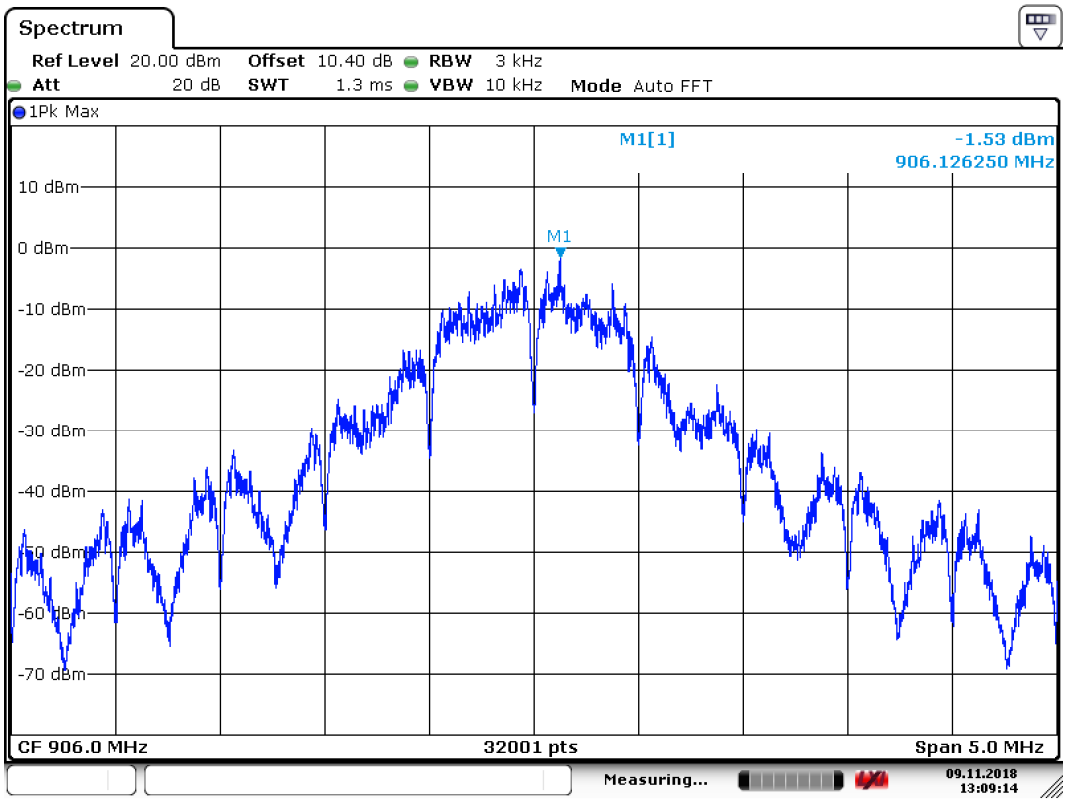

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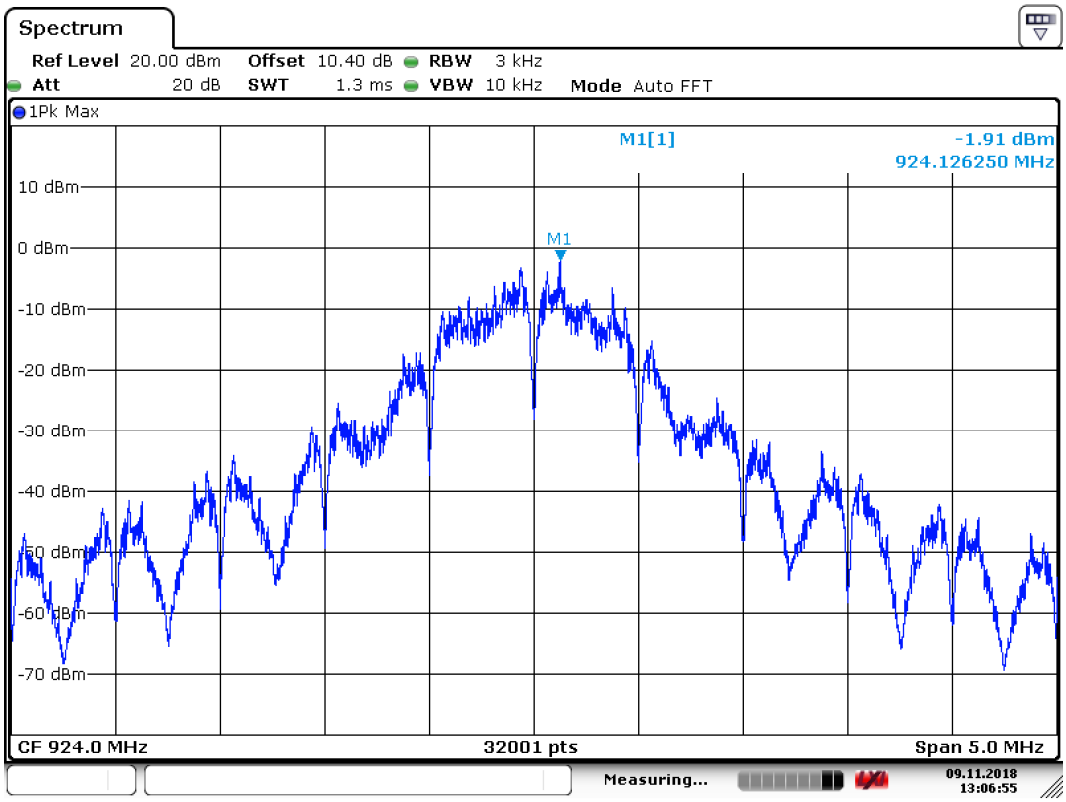

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7.5 Radiated emissions 30 MHz to 10 GHz

NORMATIVE REFERENCES			**RESULT**
Limits according to:	**FCC §15.247 (d), §15.209 RSS-210, Issue 9, section B10**		**P**
Methods of measurement according to:	**ANSI C63.10, section 6.3, 6.5 RSS-Gen 6.13, 8.9**		
Equipment mode	Power interface	1	
	EUT configuration mode	1	
	Operation mode	1	
Test requirements	Frequency range	30 MHz - 10 GHz	

Limits

Frequency (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
30 – 88	100	40.0	3
88 – 216	150	43.5	3
216 – 960	200	46.0	3
Above 960	500	54.0	3

Test setup details

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector in the frequency range below 1 GHz and average detector in the frequency range above 1 GHz. In this frequency range the peak detector limit is 20 dB above the average limit.

Test equipment

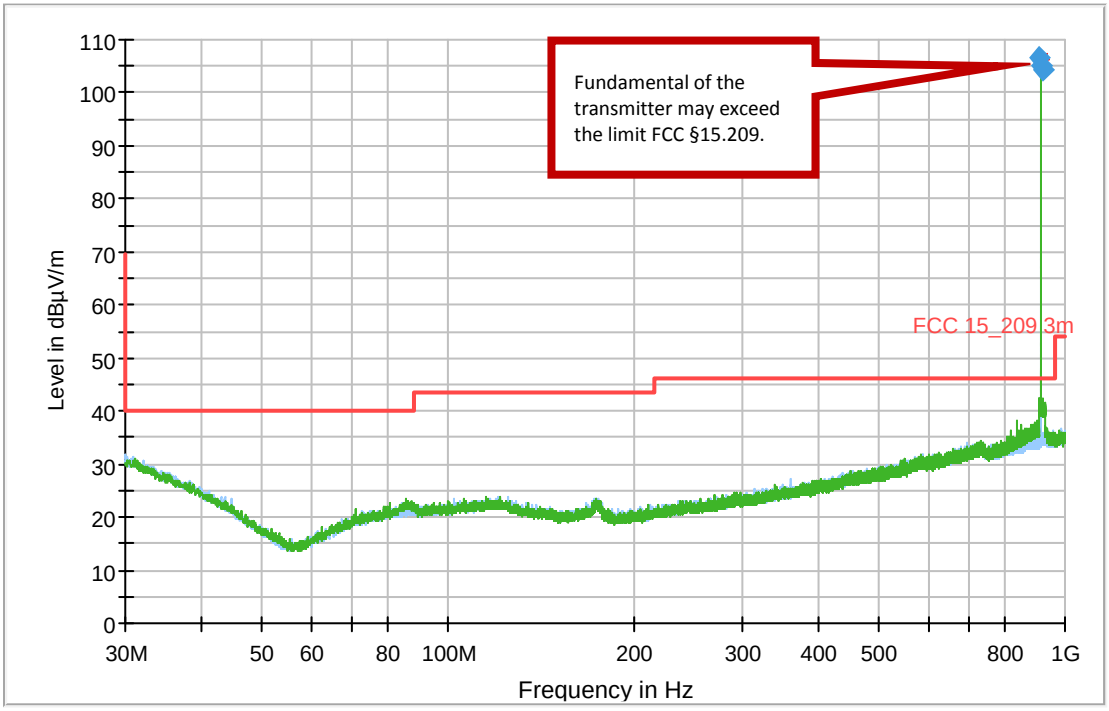
DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Semi-Anechoic chamber	Siepel	REF W460SLB	-	PM KF 1150-01	2016-12 (3 years)
Turntable	Inn-Co	-	-	PM KF 2949-04	-
Tower	Inn-Co	MA4484-XPET	-	PM KF 2949-03	-
Controller	Inn-Co	CO 3000	4970815	PM KF 2949	-
Receiver 9 kHz- 7 GHz	Rohde & Schwarz	ESR7	101757	PM KF 3371	2018-04 (1 year)
Antenna 30 MHz - 3GHz	Rohde & Schwarz	HL 562	100354	PM KF 1123	2018-03 (2 years)
RF-cable	Rohde & Schwarz	HFU2-Z5	11673862	PM KF 1646	2018-01 (1 year)
RF-cable Kabel Micro-Coax UTIFLEX	Rosenberger	LA3-020-5500	010-1788635	PM-KF-3187	2018-06 (1 years)
RF-cable Kabel Micro-Coax UTIFLEX	Rosenberger	LA2-001-7200	010-1786350	PM-KF-3188	2018-03 (1 years)
RF-cable Kabel Micro-Coax UTIFLEX	Rosenberger	LA2-001-7200	010-1787517	PM-KF-3189	2018-06 (1 years)
Spectrum analyzer	Rohde & Schwarz	FSV40	837356/012	PM KF 2783	2018-09 (1 year)
Horn antenna 1 - 18 GHz	Rohde & Schwarz	HF906	100331	PM KF 1047a	2017-05 (2 years)
Horn antenna preamp. 0.7 - 18 GHz	Minicircuit	ZVA-183-S+	76609	PM KF 2866	2018-10 (2 years)
Test software	Rohde & Schwarz	EMC 32 V.10.01.00	-	PM KF 2983-2	-

Measurement results – Radiated emissions EUT in transmit mode:

Radiated Emissions Test Report

Common Information

EUT:	Loxone Air CPU- Modul
Test Verdict:	Pass
Test Description:	FCC part 15.247
Operating Conditions:	TX, 914 MHz, 11 dBm
Operator Name:	UGR
Project Number:	33222
Date	05.12.2018
Comment:	Antenna connected



Preview Result 1H-PK+ [Preview Result 1H.Result:2]
Preview Result 1V-PK+ [Preview Result 1V.Result:2]
FCC 15_209 3m [..\EMI radiated\FCC Part 15C\]
MaxPeak-PK+ [Critical_Freqs.Result:4]
Final_Result QPK [Final_Result.Result:4]

Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
906.000000	106.67	46.02	-60.65	1000.0	120.000	100.0	V	44.0	23.4
914.010000	105.25	46.02	-59.23	1000.0	120.000	103.0	V	44.0	23.6
924.000000	104.26	46.02	-58.24	1000.0	120.000	103.0	V	44.0	24.0

(continuation of the "Final_Result" table from column 16 ...)

Frequency (MHz)	Comment
906.000000	Fundamental of transmitter
914.010000	Fundamental of transmitter
924.000000	Fundamental of transmitter

EMI Auto Test Template: EN-RE-R17-AN08

Hardware Setup: EN-RE-R12-AN08
Measurement Type: Open-Area-Test-Site
Frequency Range: 30 MHz - 1 GHz
Graphics Level Range: 0 dBµV/m - 80 dBµV/m

Preview Measurements:
- Antenna height: 0 - 0 cm , Step Size = 0 cm , Positioning Speed = 8
- Turntable position: 0 - 352 deg , Step Size = 22 deg , Positioning Speed = 8
- Graphics Display: Show separate traces for horizontal and vertical polarization
- Scan Test Template: EN-RE-R12-AN08_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 7]					
30 MHz - 1 GHz	30 kHz	PK+	120 kHz	0,01 s	20 dB
1 GHz - 3 GHz	250 kHz	PK+	1 MHz	0,1 s	20 dB

Frequency Zoom:
- Zoom Scan Template: EN-RE-R12-AN08_ZOOM

Adjustment:
- Antenna height: Range = 300 cm , Measuring Speed = 3
- Turntable position: Range = 45 deg , Measuring Speed = 3
- Template for Single Meas.: EN-RE-R12-AN08_MAX

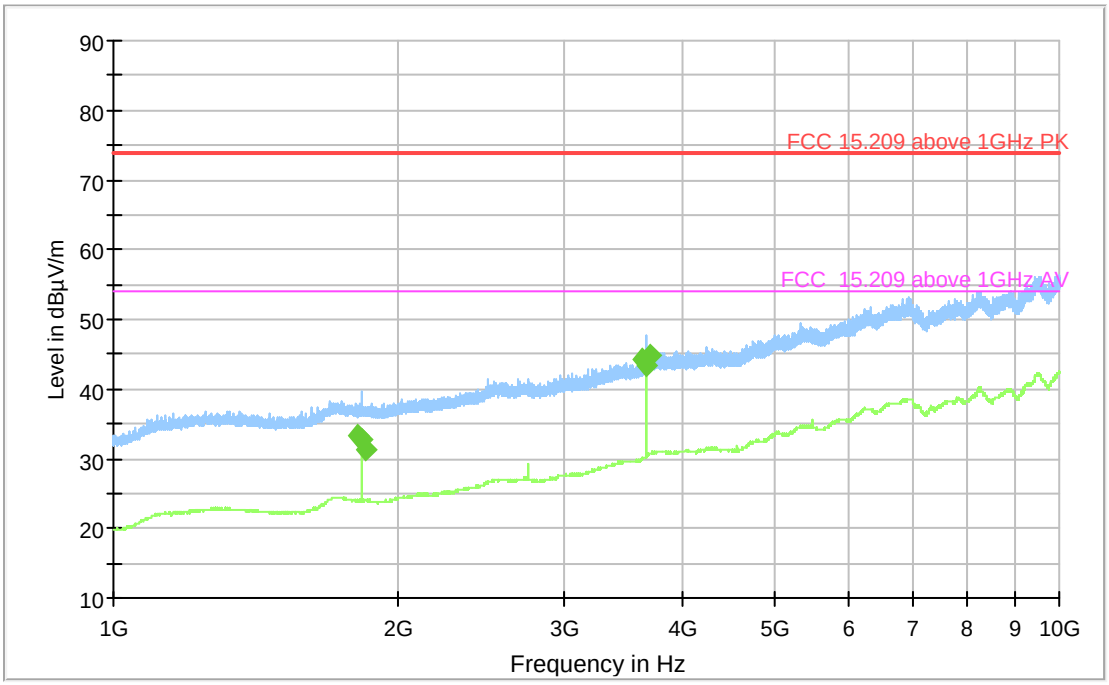
Final Measurements:
- Template for Single Meas.: EN-RE-R12-AN08_FIN

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 7]					
30 MHz - 1 GHz	40 kHz	QPK	120 kHz	1 s	20 dB
1 GHz - 3 GHz	40 kHz	QPK	1 MHz	1 s	20 dB

Radiated Emissions Test Report

Common Information

EUT:	Loxone Air CPU- Modul
Test Verdict:	Pass
Test Description:	FCC part 15.247
Operating Conditions:	TX, 914 MHz, 11 dBm
Operator Name:	UGR
Project Number:	33222
Date	11.11.2018
Comment:	



Preview Result 2-AVG [Preview Result 2.Result:2]
Preview Result 1-PK+ [Preview Result 1.Result:1]
FCC 15.209 above 1GHz PK [..\EMI radiated\FCC Part 15C\]
FCC 15.209 above 1GHz AV [..\EMI radiated\FCC Part 15C\]
Final_Result PK+ [Final_Result.Result:4]
Final_Result AVG [Final_Result.Result:5]

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
1812.000000	---	33.23	54.00	20.77	1000.0	1000.000	195.0	H	195.0
1828.000000	---	32.76	54.00	21.24	1000.0	1000.000	195.0	H	202.0
1848.000000	---	31.15	54.00	22.85	1000.0	1000.000	184.0	H	214.0
3624.000000	---	44.23	54.00	9.77	1000.0	1000.000	195.0	H	17.0
3656.000000	---	43.40	54.00	10.60	1000.0	1000.000	200.0	H	17.0
3696.000000	---	44.70	54.00	9.30	1000.0	1000.000	200.0	H	50.0

EMI Auto Test Template: zF-RE-R15-PAMXX-AN20

Hardware Setup: zF-RE-R15-PAMXX-AN20
Measurement Type: Open-Area-Test-Site
Frequency Range: 1 GHz - 10 GHz
Graphics Level Range: 10 dBµV/m - 90 dBµV/m

Preview Measurements:
- Antenna height: 100 - 355 cm , Step Size = 85 cm , Positioning Speed = 8
- Polarization: H + V
- Turntable position: 0 - 352 deg , Step Size = 22 deg , Positioning Speed = 8
- Sweep Test Template: zF-RE-R15-PAMXX_AN20_PRE

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [FSV 40]					
1 GHz - 18 GHz	531,25 kHz	PK+ ; AVG	1 MHz	150 s	0 dB

Frequency Zoom:
- Zoom Sweep Template: zF-RE-R15-PAMXX_AN20_MAX

Adjustment:
- Antenna height: Range = 90 cm , Measuring Speed = 3
- Turntable position: Range = 30 deg , Measuring Speed = 3
- Template for Single Meas.: zF-RE-R15-PAMXX-AN20_ADJ

Final Measurements:
- Template for Single Meas.: zF-RE-R15-PAMXX-AN20_FIN

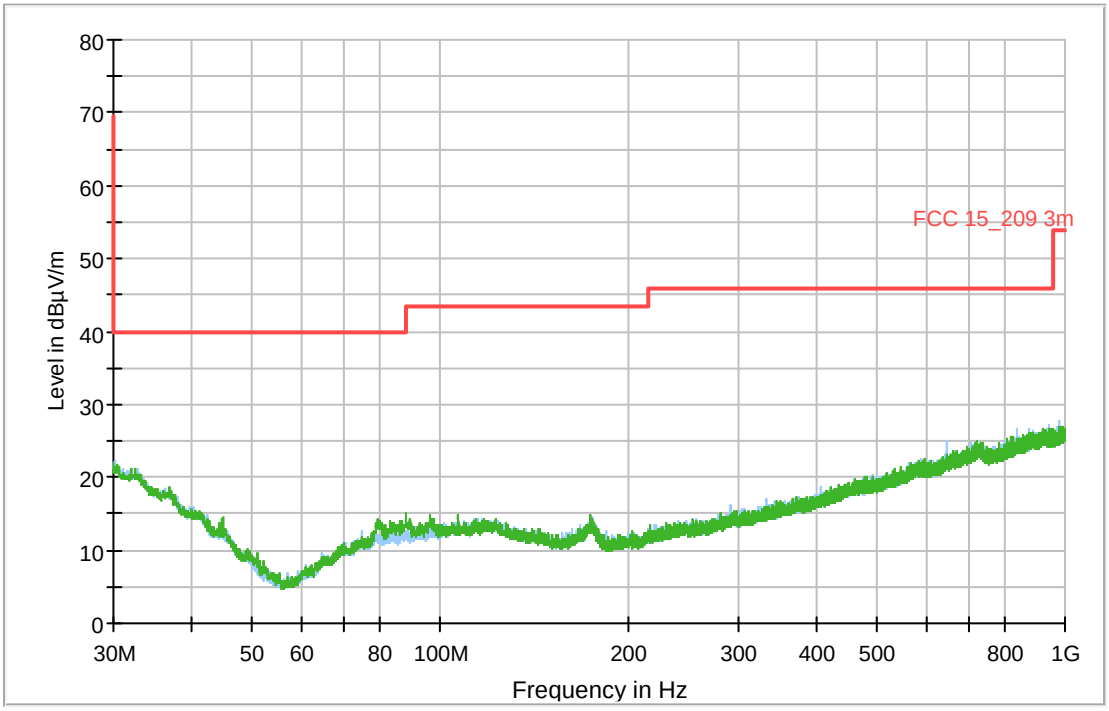
Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [FSV 40]					
1 GHz - 18 GHz	100 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Measurement results – Radiated emissions EUT in receive mode:

Radiated Emissions Test Report

Common Information

EUT:	Loxone Air CPU- Modul
Test Verdict:	Pass
Test Description:	FCC part 15.247
Operating Conditions:	RX, 914 MHz
Operator Name:	UGR
Project Number:	33222
Date	10.11.2018
Comment:	



Preview Result 1H-PK+ [Preview Result 1H.Result:2]
Preview Result 1V-PK+ [Preview Result 1V.Result:2]
Critical_Freqs PK+ [Critical_Freqs.Result:4]
FCC 15_209 3m [..\EMI radiated\FCC Part 15C\]
Final_Result QPK [Final_Result.Result:4]

EMI Auto Test Template: EN-RE-R17-AN08

Hardware Setup: EN-RE-R12-AN08
Measurement Type: Open-Area-Test-Site
Frequency Range: 30 MHz - 1 GHz
Graphics Level Range: 0 dBµV/m - 80 dBµV/m

Preview Measurements:
- Antenna height: 0 - 0 cm , Step Size = 0 cm , Positioning Speed = 8
- Turntable position: 0 - 352 deg , Step Size = 22 deg , Positioning Speed = 8
- Graphics Display: Show separate traces for horizontal and vertical polarization
- Scan Test Template: EN-RE-R12-AN08_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 7]					
30 MHz - 1 GHz	30 kHz	PK+	120 kHz	0,15 s	20 dB
1 GHz - 3 GHz	250 kHz	PK+	1 MHz	0,1 s	20 dB

Frequency Zoom:
- Zoom Scan Template: EN-RE-R12-AN08_ZOOM

Adjustment:
- Antenna height: Range = 300 cm , Measuring Speed = 3
- Turntable position: Range = 45 deg , Measuring Speed = 3
- Template for Single Meas.: EN-RE-R12-AN08_MAX

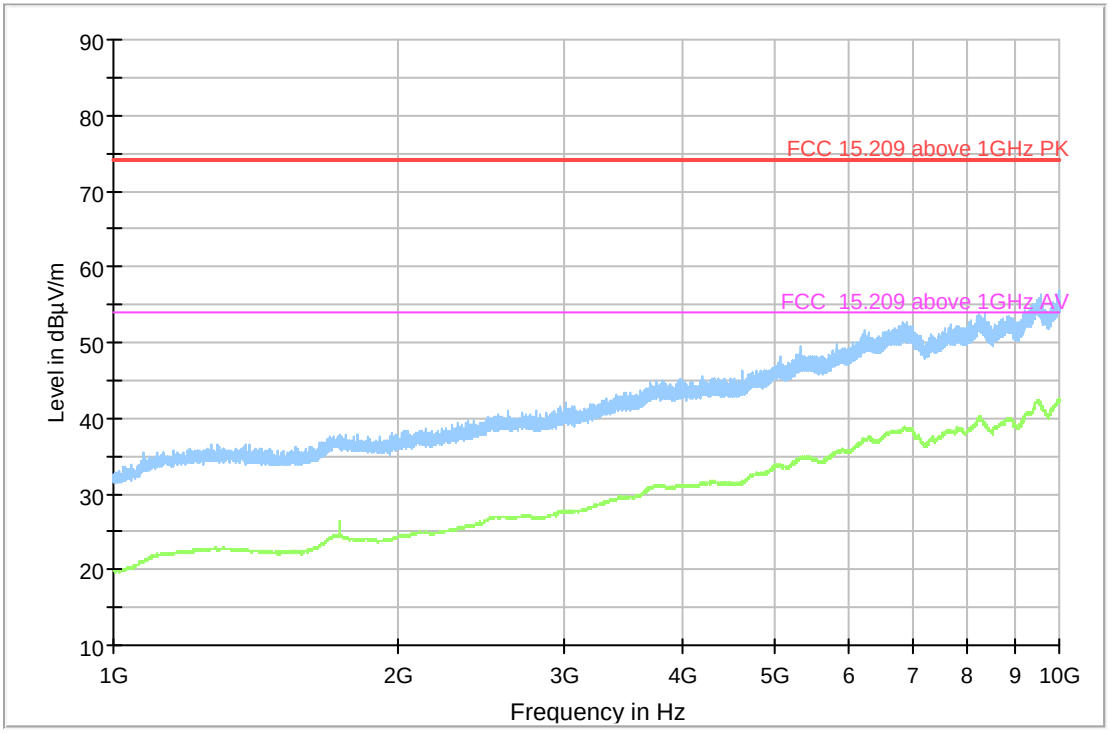
Final Measurements:
- Template for Single Meas.: EN-RE-R12-AN08_FIN

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 7]					
30 MHz - 1 GHz	40 kHz	QPK	120 kHz	1 s	20 dB
1 GHz - 3 GHz	40 kHz	QPK	1 MHz	1 s	20 dB

Radiated Emissions Test Report

Common Information

EUT:	Loxone Air CPU- Modul
Test Verdict:	Pass
Test Description:	FCC part 15.247
Operating Conditions:	RX, 914 MHz
Operator Name:	UGR
Project Number:	33222
Date	11.11.2018
Comment:	



Preview Result 2-AVG [Preview Result 2.Result:2]
Preview Result 1-PK+ [Preview Result 1.Result:1]
FCC 15.209 above 1GHz PK [..\EMI radiated\FCC Part 15C\]
FCC 15.209 above 1GHz AV [..\EMI radiated\FCC Part 15C\]

EMI Auto Test Template: zF-RE-R15-PAMXX-AN20

Hardware Setup: zF-RE-R15-PAMXX-AN20
Measurement Type: Open-Area-Test-Site
Frequency Range: 1 GHz - 10 GHz
Graphics Level Range: 10 dBµV/m - 90 dBµV/m

Preview Measurements:
- Antenna height: 100 - 355 cm , Step Size = 85 cm , Positioning Speed = 8
- Polarization: H + V
- Turntable position: 0 - 352 deg , Step Size = 22 deg , Positioning Speed = 8
- Sweep Test Template: zF-RE-R15-PAMXX_AN20_PRE

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
Receiver: [FSV 40]					
1 GHz - 18 GHz	531,25 kHz	PK+ ; AVG	1 MHz	50 s	0 dB

Frequency Zoom:
- Zoom Sweep Template: zF-RE-R15-PAMXX_AN20_MAX

Adjustment:
- Antenna height: Range = 90 cm , Measuring Speed = 3
- Turntable position: Range = 30 deg , Measuring Speed = 3
- Template for Single Meas.: zF-RE-R15-PAMXX-AN20_ADJ

Final Measurements:
- Template for Single Meas.: zF-RE-R15-PAMXX-AN20_FIN

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [FSV 40]					
1 GHz - 18 GHz	100 kHz	PK+ ; AVG	1 MHz	1 s	0 dB

Anechoic chamber

Test procedure

The test site is an anechoic chamber suitable for radiated emission measurements in the frequency range of 30 MHz – 18 GHz (40 GHz). It includes automatic antenna mast of height 4 m and turntable of radius 2 m. It enables both manual and fully automatic measurements. To find the highest level of radiation

- the height of the antenna is scanned in range 1m to 4 m with antenna in horizontal and vertical polarization;
- the turntable is rotated in range from 0° to 360°.

The system was configured for testing in a typical worst case fashion (as a customer may use it). All interface cables were moved to determine the position which resulted in the highest emission levels.

Correction factors

The field strength is calculated by adding the antenna factor and cable attenuation.
The calculations are performed automatically by the measurement software EMC 32.
As example consider the following input values and result:

FREQUENCY (MHZ)	RECEIVER READING U (dBµV)	ANTENNA FACTOR AF (dB/m)	CABLE ATTENUATION A (dB)	CORRECTION ANTENNA + CABLE (dB)	RADIATED FIELD STRENGTH E (dBµV/m)
30.0	20	20.6	0.8	21.4	41.4

E = U + AF + A

7.6 Conducted emissions

NORMATIVE REFERENCES			RESULT
Limits according to:	**FCC §15.207** **RSS-Gen 8.8**		**P**
Methods of measurement according to:	**ANSI C63.4**		
Equipment mode	Power interface	1	
	EUT configuration mode	1	
	Operation mode	1	
Test requirements	Frequency range	150 kHz - 30 MHz	

Test equipment

DESCRIPTION	MANUFACTURER	TYPE	SN	ASSET NO.	CALIBRATION
Shielded cabin	ETS LINDGREN	RFSD 100	3598	PM KF 2955-2	-
Receiver 9 kHz - 30 MHz	Rohde & Schwarz	ESHS10	837356/012	PM KF 0134	2018-08 (2 years)
Pulse Limiter 10 dB 9 kHz - 200 MHz	Schwarzbeck	VTSD 9561-F N	9561-F N242	PM KF 3059	2018-02 (1 year)
Receiver 9 kHz - 7 GHz	Rohde & Schwarz	ESR7	101757	PM KF 3371	2018-04 (1 year)
V-Artificial mains-network, 2 Line	Rohde & Schwarz	ESH3-Z5	838576/016	PM KF 0141	2017-02 (2 years)
V-Artificial mains-network, 2 Line	Rohde & Schwarz	ESH3-Z5	863367/018	PM KF 0142	2017-10 (2 years)
V-Artificial mains-network, 4/2 Line	Schwarzbeck	NSLK8126	8126230	PM KF 0136	2017-11 (2 years)
V-Artificial mains-network, 4 line	Schwarzbeck	NNLK 8121	8121332	PM KF 3023	2017-04 (2 years)
RF-Cable	Schwarzbeck	AK 9513	95956	PM-KF-2056	2018-10 (2 years)
RF-Cable	Schwarzbeck	RG 58 C/U	-	PM-KF-1103	2018-07 (2 years)
Test software	Rohde & Schwarz	EMC 32 V.8.54	-	PM KF 2983	-

Comment
In the following diagram, the N and L line are merged.

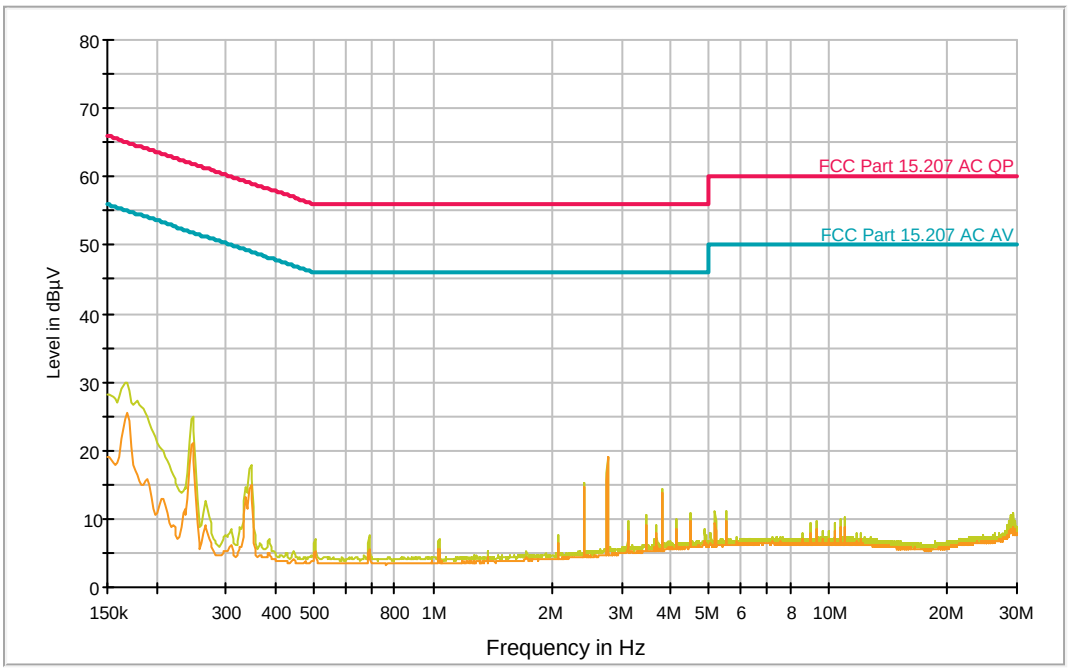
Measurement results – Conducted emissions:

Intertek Test Report

Common Information

EUT:	Loxone Air CPU- Modul
Project No.:	33222
Test description:	Conducted Emissions
Test standard:	FCC Part 15.207
Tested port:	Mains
Test verdict:	Passed
Operating conditions:	Transmitter aktiv 914 MHz, AC/DC adaptor 48-24-500, 120 V, 60 Hz
Operator name:	UGR
Date of testing:	20.11.2018

EN-CE-R32-LN01



FCC Part 15.207 AC QP [..\EMI conducted\FCC Part 15 Subpart C\]
FCC Part 15.207 AC AV [..\EMI conducted\FCC Part 15 Subpart C\]
Preview Result 1-QPK [Preview Result 1.Result:1]
Preview Result 2-CAV [Preview Result 2.Result:2]

EMI Auto Test Template: EN-CE-R32-LN01

Hardware Setup: EN-CE-R32-LN01
Measurement Type: 2 Line LISN
Frequency Range: 150 kHz - 30 MHz
Graphics Level Range: 0 dBµV - 80 dBµV

Preview Measurements:
Scan Test Template: EN-CE-R32-LN01_PRE

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
9 kHz - 150 kHz	50 Hz	QPK; CAV	200 Hz	1 s	20 dB
150 kHz - 30 MHz	2.25 kHz	QPK; CAV	9 kHz	1 s	0 dB

Receiver: [ESR 7]

Data Reduction:
Limit Line #1: FCC Part 15.207 AC QP
Limit Line #2: FCC Part 15.207 AC AV
Peak Search: 6 dB , Maximum Results: 10
Subrange Maxima: 10 Subranges , Maxima per Subrange: 1
Acceptance Offset: -10 dB
Maximum Number of Results: 20
After Data Reduction: Interactive data reduction

Report Settings:
Report Template: Standard Report_EMC KF_Conducted Emission

SECTION 8
Product labelling

FCC, Part 15 C, Certification

Information to the user:

For a **Class A** digital device or peripheral, the instructions furnished the user shall include the following or similar statement, **placed in a prominent location in the text of the manual**:

NOTE: This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of these equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

For a **Class B** digital device or peripheral, the instructions furnished the user shall include the following or similar statement, **placed in a prominent location in the text of the manual**:

NOTE: This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/ TV technician for help

Systems incorporating several digital devices:

For systems incorporating several digital devices, the statement mentioned above needs to be contained only in the instruction manual for the main control unit.

Manual is provided in a form other than paper:

In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

Label on the device:

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(Where a device is constructed in two or more sections connected by wires and marketed together, the statement of this section is required to be affixed only on the main control unit.)

Small devices:

When the device is so small or for such use that it is not practicable to place the statement specified under paragraph “Label on the device” of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed.

ISED, Certification

Labelling Requirements

The manufacturer, importer or distributor shall meet the labelling requirements set out in this section for every unit:

1. prior to marketing in Canada, for products manufactured in Canada
2. prior to importation into Canada, for imported products

For information regarding the e-labelling option, see Notice 2014–DRS1003. The label for the certified product represents the manufacturer's or importer's compliance with Innovation, Science and Economic Development Canada's regulatory requirements.

Labelling of Certified Products

It should be noted that the Product Marketing Name (PMN), Hardware Version Identification Number (HVIN), Firmware Version Identification Number (FVIN) and Host Marketing Name (HMN) are commonly used terms, and are defined in Section 10 of this document.

Every unit of certified product for marketing and use in Canada shall be identified as per these requirements:

- The HVIN and ISED certification number shall be permanently indicated on the exterior of the product or displayed electronically according to e-labelling requirements:
  - the HVIN and ISED certification number are permitted to be placed on a label, which shall be permanently affixed to the product
  - the ISED certification number shall be preceded by "IC:"
  - the HVIN is permitted to be listed or placed with or without any prefix (HVIN:, Model#, M/N:, P/N:, etc.)
  - the HVIN and ISED certification number are not required to be adjacent to each other
- The PMN must be displayed electronically (e-labelling), or indicated on the exterior of the product or product packaging or product literature, which shall be available with the product or online.
- The PMN, HVIN and ISED certification number are permitted to be etched, engraved, stamped, printed on the product, or permanently affixed to a permanently attached part of the product.
- The PMN, HVIN and ISED certification number indicated/displayed (e-labelling) on any product on the Canadian market must be listed in the REL.
- When the FVIN is the only differentiation between different product versions (PMN and HVIN remain identical) listed in the REL within a family certification, the FVIN shall be displayed electronically or stored electronically and be easily retrievable.
- In all cases, the PMN, FVIN, HVIN and ISED certification number text shall be clearly legible.

Note: The ISED certification number, HVIN, applicable PMN and FVIN are not required to be adjacent to each other.

The certification number is made up of a Company Number (CN), assigned by Innovation, Science and Economic Development Canada's Certification and Engineering Bureau, followed by the Unique Product Number (UPN) assigned by the applicant. The certification number format is:

IC: XXXXXX-YYYYYYYYYY

where:

- The letters "IC:" indicate that this is an Innovation, Science and Economic Development Canada certification number, but they are not part of the certification number. XXXXXX-YYYYYYYYYY is the ISED certification number.
- XXXXXX is the CN assigned by Innovation, Sciences et Développement économique Canada. Newly assigned CNs will be made up of five numeric characters (e.g. "20001") whereas existing CNs may consist of up to five numeric characters followed by an alphabetic character (e.g. "21A" or "15589J").
- YYYYYYYYYY is the Unique Product Number (UPN) assigned by the applicant, made up of a maximum of 11 alphanumeric characters.
- The CN and UPN are limited to capital alphabetic characters (A-Z) and numerals (0-9) only. The use of punctuation marks or other symbols, including "wildcard" characters, is not permitted.
- The HVIN may contain punctuation marks or symbols but they shall not represent any indeterminate ("wildcard") characters.

Example 1: A company has been assigned a CN of "21A" and wishes to use a UPN of "WILAN3" for one of its products. The full Innovation, Science and Economic Development Canada certification number of this product would thus be: IC: 21A-WILAN3.

Example 2: A company has been assigned a CN of "20001" and wishes to use a UPN of "WILAN3" for one of its products. The full Innovation, Science and Economic Development Canada certification number of this product would thus be: IC: 20001-WILAN3.

Example 3: In a scenario where the HVIN is 47XP-820K/A21XX or ISED certification number is IC: 21A-WILANXX, a manufacturer wishes to use the characters "XX" as wildcards to indicate that these two characters are not fixed, but represent a range of characters decided by the manufacturer. This practice is not permitted. However, this same sequence of symbols can be used as a valid HVIN if it identifies a single product version.

If the dimensions of the product are extremely small or if it is not practical to place the label or marking on the product and electronic labelling has not been implemented, the label shall be, upon agreement with Innovation, Science and Economic Development Canada prior to certification application, placed in a prominent location in the user manual supplied with the product. The user manual may be in an electronic format and must be readily available.

Module and Host Product Labelling Requirements

Any product for which Modular Approval (MA) or Limited Modular Approval (LMA) is being sought shall meet the above labelling requirements (Section 3.1).

The Host Marketing Name (HMN) must be displayed (according to e-labelling requirements) or indicated at any location on the exterior of the host product or product packaging or product literature, which shall be available with the host product or online.

The host product shall be properly labelled to identify the modules within the host product.

The Innovation, Science and Economic Development Canada certification label of a module shall be clearly visible at all times when installed in the host product; otherwise, the host

product must be labelled to display the Innovation, Science and Economic Development Canada certification number for the module, preceded by the word "Contains" or similar wording expressing the same meaning, as follows:

Contains IC: XXXXXX-YYYYYYYYYYY

where XXXXXX-YYYYYYYYYYY is the module's certification number.

The applicant for a certified module shall provide with each certified module to the user, either a host label, such as described above, or an explanation and instructions to the user as to the host product labelling requirements.

End of test report