DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29 507 456

ENSAYOS Nº 51/LE147

Test report No:

NIE: 59015RRF.002A2

Test report

USA FCC Part 15.249, 15.209
CANADA RSS-210, RSS-Gen

Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz.

(*) Identification of item tested	ZONING SYSTEM
(*) Trademark	AIRZONE
(*) Model and /or type reference	AZxxxMZZONR
Other identification of the product	FCC ID: SVS-007-ZMR IC: 24685-007ZMR
(*) Features	See technical sheet.
Applicant	CORPORACIÓN EMPRESARIAL ALTRA S.L. C/ Marie Curie, 21. 29590. Málaga. Spain.
Test method requested, standard	USA FCC Part 15.249 10-1-17 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, 5725 - 5875 MHz, and 24.0 – 24.25 GHz. USA FCC Part 15.209 10-1-17 Edition: Radiated emission limits; general requirements. CANADA RSS-210 Issue 9 (August 2016). CANADA RSS-Gen Issue 5 (April 2018). ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Approved by (name / position & signature)	Rafael López EMC Consumer & RF Lab. Manager RAFAEL LÓPEZ MARTÍN 2020.01.21 16:02:49 +01'00'
Date of issue	2020-01-21
Report template No	FDT08_22 (*) "Data provided by the client"

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Competences and guarantees

DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory with appropriate scope of accreditation that include testing performed in this test report

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification S.A.U. has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification S.A.U. guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA Testing and Certification S.A.U. at the time of performance of the test.

DEKRA Testing and Certification S.A.U. is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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General Conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA Testing and Certification S.A.U.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Testing and Certification S.A.U. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

Data provided by the client

The sample consist of a zoning system model AZxxxMZZONR.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

Sample M/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
59015/005	Zoning system	AZxxxMZZONR	---	2018-11-13
59015/012	Antenna			2018-11-13

Auxiliary element used with the sample M/01:

Control Nº	Description	Model	Serial Nº	Date of reception
59015/003	Control board	AZXXXXCENTRAL	000B1C3A	2018-11-13

Sample M/01 has undergone the following test(s): All RADIATED test indicated in Appendix A for channel 915.20 MHz

Sample M/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
59015/011	Zoning system	AZxxxMZZONR	---	2018-11-13
59015/012	Antenna			2018-11-13

Auxiliary element used with the sample M/02:

Control Nº	Description	Model	Serial Nº	Date of reception
59015/003	Control board	AZXXXXCENTRAL	000B1C3A	2018-11-13

Sample M/02 has undergone the following test(s): All RADIATED test indicated in Appendix A for channel 917.20 MHz

Sample M/03 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
59015/005	Zoning system	AZxxxMZZONR	---	2018-11-13

Auxiliary element used with the sample M/03:

Control Nº	Description	Model	Serial Nº	Date of reception
59015/003	Control board	AZXXXXCENTRAL	000B1C3A	2018-11-13

Sample M/03 has undergone the following test(s): All CONDUCTED test indicated in Appendix A for channel 915.20 MHz

Sample M/04 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
59015/011	Zoning system	AZxxxMZZONR	---	2018-11-13

Auxiliary element used with the sample M/04:

Control Nº	Description	Model	Serial Nº	Date of reception
59015/003	Control board	AZXXXXCENTRAL	000B1C3A	2018-11-13

Sample M/04 has undergone the following test(s): All RADIATED test indicated in Appendix A for channel 917.20 MHz

Test sample description

Ports…… :	Port name and description	Cable		
		Specified length [m]	Attached during test	Shielded
	Motorized element	< 1	☒	☐
	Probe	3	☐	☒
	Airzone Connection Bus	100	☒	☒
	Presence contact	10	☐	☒
	Windows contact	10	☐	☒
Supplementary information to the ports…… :	Not provided data			

Rated power supply .....:	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 12Vdc.					
	☐	DC:					

Rated Power .....:	0.6W
Clock frequencies .....:	6MHz
Other parameters.....:	Not provided data
Software version .....:	7.0.7
Hardware version.....:	1.0
Dimensions in cm (W x H x D)....:	59 x 44.5 x 17mm.

Mounting position.....:	☐	Table top equipment	
	☒	Wall/Ceiling mounted equipment	
	☐	Floor standing equipment	
	☐	Hand-held equipment	
	☐	Other: Vehicular environment equipment	
Modules/parts .....:	Module/parts of test item	Type	Manufacturer
	Wireless zone module	AZxxxMZZONR	AIRZONE
Accessories (not part of the test item) .....:	Description	Type	Manufacturer
	Wireless thermostat and user interface Think	AZXXXXTHINKRX	AIRZONE
	Control Board	AZXXXXCENTRAL	AIRZONE
	Wired zone module	AZXXXXMZZONC	AIRZONE
	Wired thermostat and user interface Blueface	AZXXXXBLUEFACECX	AIRZONE
Documents as provided by the applicant.....:	Description	File name	Issue date
	Technical datasheet Wireless zone module	FZAZxxxDAMPERZMR_MUL	16/06/2018
	Technical datasheet GSM Antenna	GSM-ANT402	-
	Technical datasheet Control Board	FTAZxxxRxxxx_A4_MUL	16/06/2018

Copy of marking plate:

Identification of the client

ALTRA CORPORACIÓN EMPRESARIAL
C/ Marie Curie, 21. 29590. Málaga. Spain.

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2019-12-18
Date (finish)	2019-06-12

Document history

Report number	Date	Description
59015RRF.002	2019-09-27	First release
59015RRF.002A1	2019-11-20	First modification: Modification of Occupied Bandwidth measurement on page 14. This modification test report cancels and replaces the test report 59015RRF.002
59015RRF.002A2	2020-01-21	Second modification: Typo correction on result table of page 16. This modification test report cancels and replaces the test report 59015RRF.002A1

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 35 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Ignacio Cabra, Francisco José Alcaide y José Gabriel Pendón.

Used instrumentation:

Conducted Measurements:

		Last Calibration	Due Calibration
1.	Signal and Spectrum Analyzer ROHDE AND SCHWARZ FSV40	2017/07	2019/07
2.	Spectrum analyser Agilent PSA E4440A	2017/10	2019/10
3.	DC power supply R&S NGPE 40/40	2018/02	2021/02

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber ETS LINDGREN FACT3 200 STP	N.A.	N.A.
2.	EMI Test Receiver R&S ESU26	2018/02	2020/02
3.	EMI Test Receiver 7 GHz ROHDE AND SCHWARZ ESR7	2017/08	2019/08
4.	RF pre-amplifier 30 MHz-6 GHz Bonn Elektronik BLNA 0360-01N	2018/07	2019/07
5.	Biconical/Log Antenna 30MHz - 6GHz ETS LINDGREN 3142E	2017/04	2020/04
6.	Spectrum analyser Rohde & Schwarz FSV40	2018/02	2020/02
7.	RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-3A	2019/04	2020/04
8.	Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2018/01	2021/01

Testing verdicts

Not applicable:	N/A
Pass:	P
Fail:	F
Not measured:	N/M

Summary

FCC PART 15 PARAGRAPH / RSS-210			
Requirement – Test case		**Verdict**	**Remark**
Section 15.249 Subclause (a) / RSS-210 B.10. (a)	Field strength of fundamental and harmonic emissions	P	
Section 15.249 Subclause (d) / RSS-210 B.10. (b)	Emissions radiated outside of the specific frequency bands	P	
Supplementary information and remarks: None.			

Appendix A: Test results.

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TEST CONDITIONS

POWER SUPPLY (V):

V nonimal:	12 Vdc
Type of power supply:	Power supply from the Mains.

ANTENNA:

Type of antenna:	Monopole SMA
Maximum Declared Gain:	2 dBi

TEST FREQUENCIES:

Lowest Channel:	915.2 MHz
Highest Channel:	917.2 MHz

The sample was used to configure the EUT to continuously transmit at a specified output power in all channels.

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is connected to the spectrum analyser using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.

RADIATED MEASUREMENTS

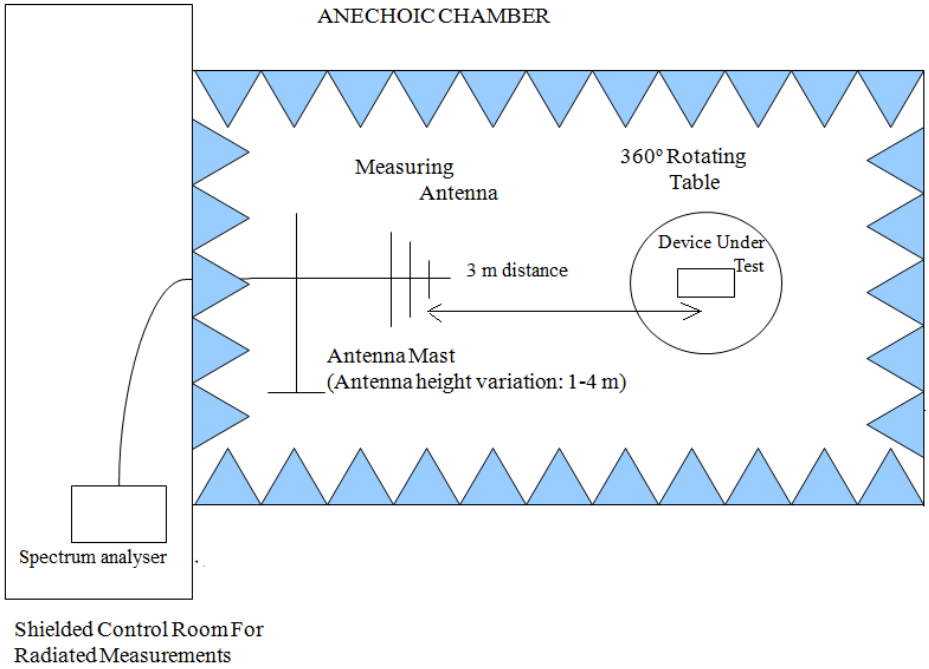
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-26 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

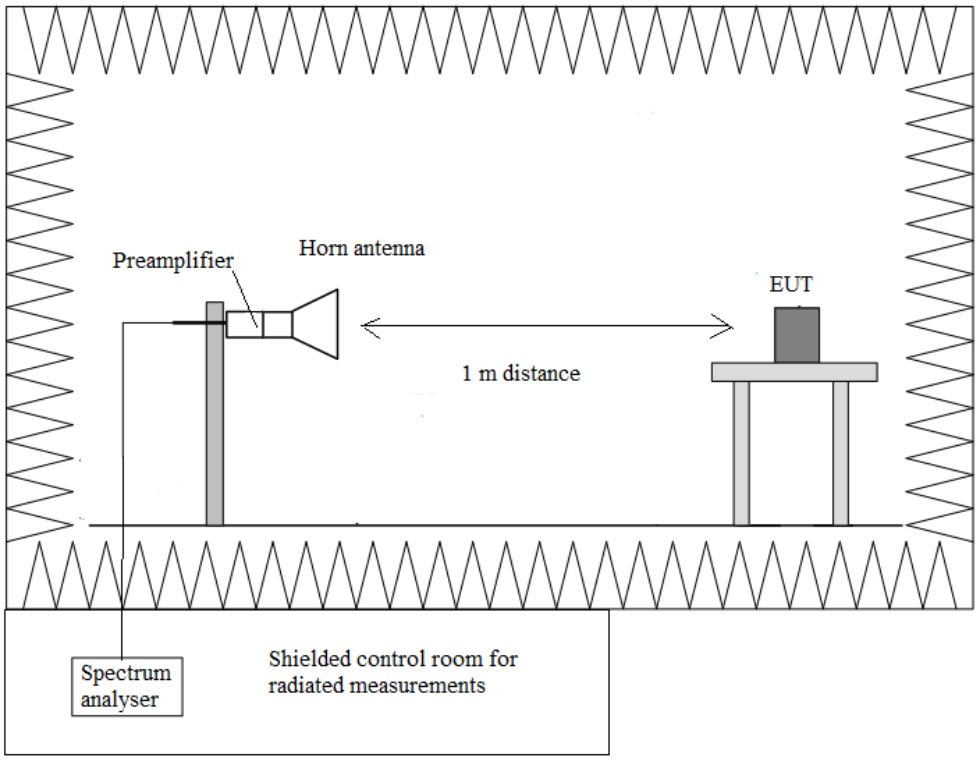
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

Radiated measurements setup f < 1 GHz:



Radiated measurements setup f > 1 GHz:

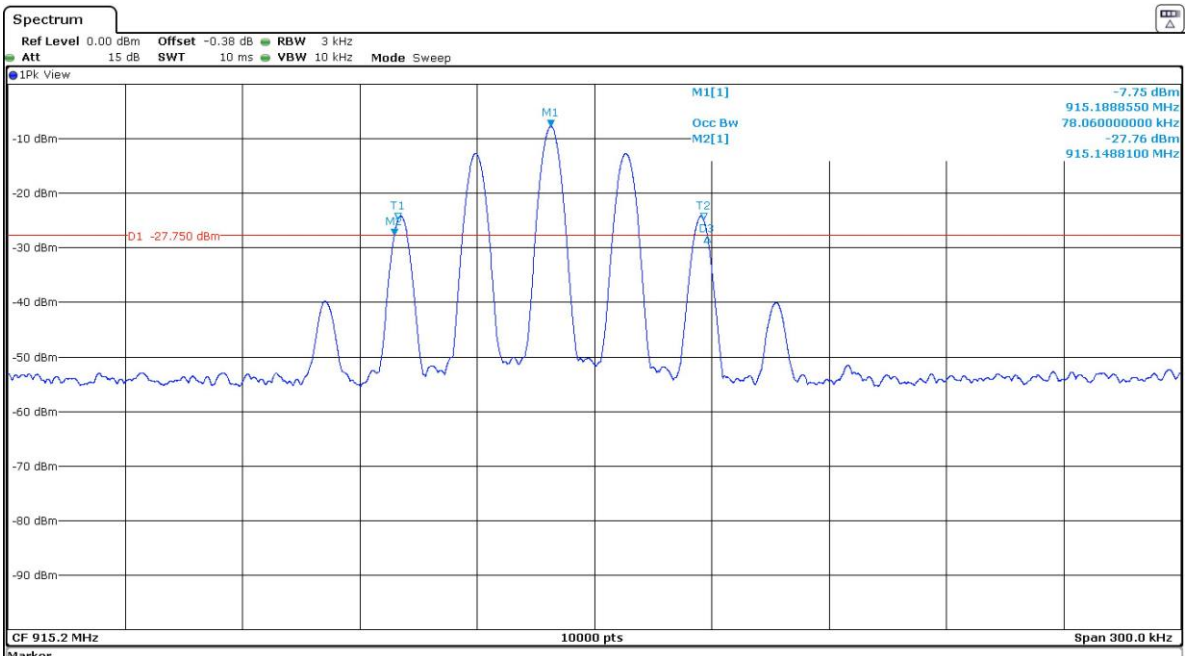


Occupied Bandwidth

RESULTS:

	Low Channel 915.20 MHz	High Channel 917.20 MHz
99% Bandwidth (kHz)	78.060	78.060
-20 dBc Bandwidth (kHz)	80.100	80.291
Measurement Uncertainty (kHz)	<±5.00	

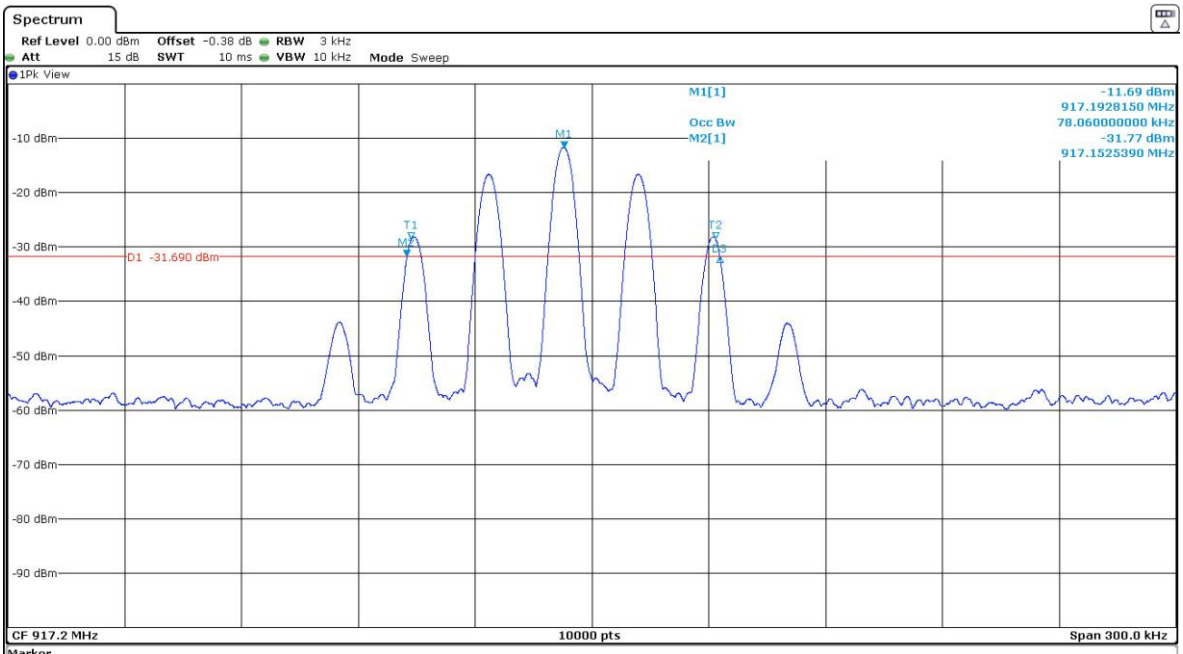
- Low Channel:



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	915.188855 MHz	-7.75 dBm		
T1		1	915.149825 MHz	-24.77 dBm	Occ Bw	78.06 kHz
T2		1	915.227885 MHz	-24.81 dBm		
M2		1	915.14881 MHz	-27.76 dBm		
D3	M2	1	80.1 kHz	-0.09 dB		

- High Channel:



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	917.192815 MHz	-11.69 dBm		
T1		1	917.153695 MHz	-28.56 dBm	Occ Bw	78.06 kHz
T2		1	917.231755 MHz	-28.53 dBm		
M2		1	917.152539 MHz	-31.77 dBm		
D3	M2	1	80.291 kHz	-0.01 dB		

Section 15.249 Subclause (a) / RSS-210 B.10. (a) Field strength of fundamental and harmonics emissions

SPECIFICATION:

The field strength of emissions from intentional radiators shall comply with the following

Fundamental frequency (MHz)	Field strength of fundamental (mV/m)	Field strength (dBµV/m)	Measurement distance (m)
902 - 928	50	93.98	3
2400 – 2483.5	50	93.98	3
5725 - 5875	50	93.98	3
24000-24250	250	107.96	3

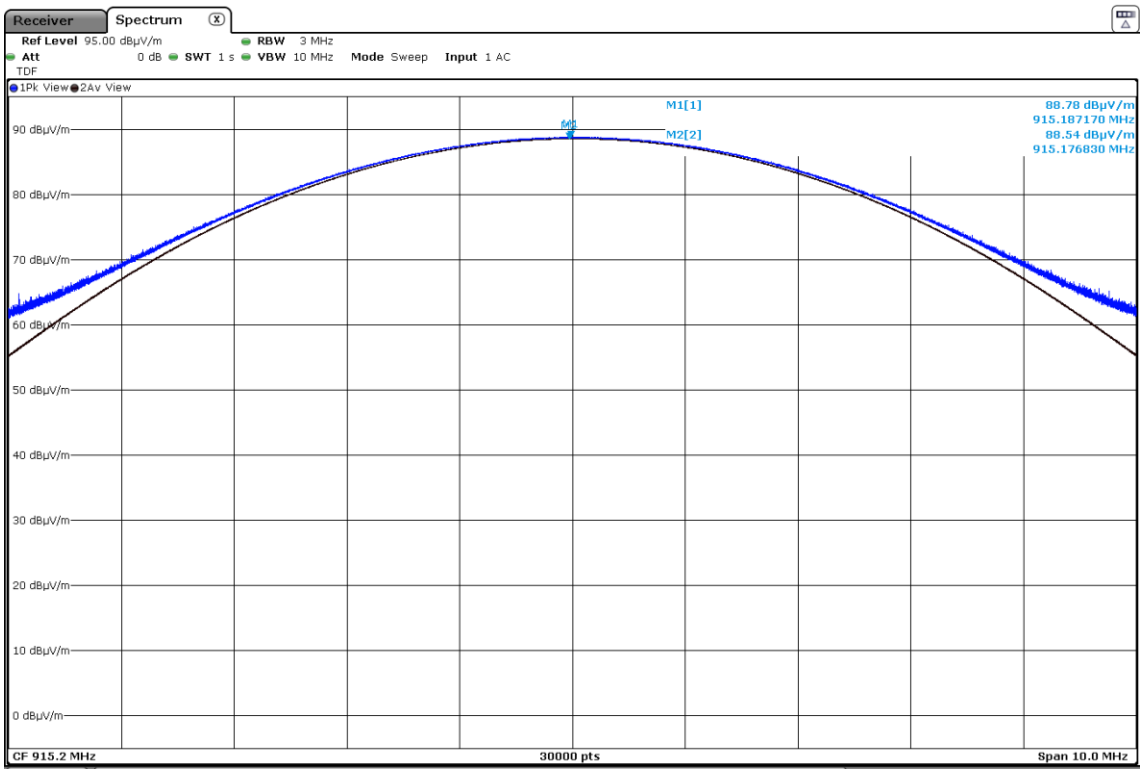
For frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

RESULTS:

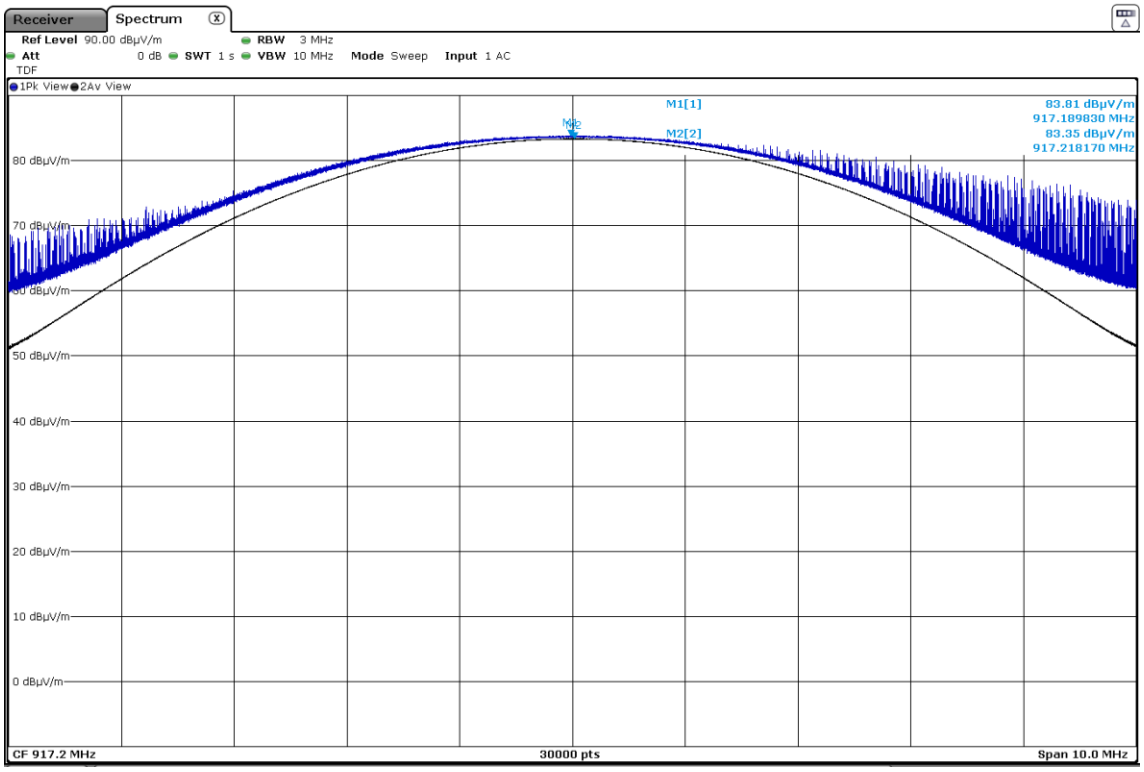
	Low Channel 915.20 MHz	High Channel 917.20 MHz
Peak Field Strength (dBµV/m)	88.78	83.81
Average Field Strength (dBµV/m)	88.54	83.35
Measurement Uncertainty (dB)	<±3.05	

Verdict: PASS

- Low Channel:



- High Channel:



Section 15.249 Subclause (d) / RSS-210 B.10. (b) Emissions radiated outside of the specific frequency bands

SPECIFICATION:

The field strength of harmonics from intentional radiators shall comply with the following

Fundamental frequency (MHz)	Field strength of harmonics (µV/m)	Field strength of harmonics (dBµV/m)	Measurement distance (m)
902 - 928	500	54	3
2400 – 2483.5	500	54	3
5725 - 5875	500	54	3
24000-24250	2500	67.96	3

Emissions radiated outside of the specific frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of fundamental or to the general radiated emission limits specified in section 15.209:

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

Whichever is the lesser attenuation.

RESULTS:

The situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

All tests were performed in a semi-anechoic chamber at a distance of 3 m for the frequency range 30 MHz-1000 MHz and at distance of 1m for the frequency range 1 GHz-10 GHz.

The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

Frequency range 30 MHz - 1 GHz.

- Low Channel (915.2 MHz):

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
811.19	Quasi-Peak	34.60	H	<±3.70
863.214	Quasi-Peak	35.10	H	<±3.70
967.198	Quasi-Peak	38.80	V	<±3.70

- High Channel (917.2 MHz):

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
920.072	Quasi-Peak	36.32	V	<±3.70

Frequency range 1 - 10 GHz.

The results in the next tables show the maximum measured levels in the 1-10 GHz range.

Spurious signals with peak levels above the average limit (54 dBµV/m at 3 m) are measured with average detector for checking compliance with the average limit.

- Low Channel (915.2 MHz):

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
1.83025 (*)	Peak	57.70	V	<±3.70
	Average	57.25		<±3.70
2.74555	Peak	42.93	H	<±3.70
3.66055	Peak	49.47	H	<±3.70
4.57615	Peak	41.66	H	<±3.70
5.40145	Peak	42.44	H	<±3.70
5.49085	Peak	53.35	H	<±3.70
5.70325	Peak	49.22	H	<±3.70

(*): This spurious frequency is outside the restricted bands as defined in §15.205(a). The measured maximum carrier level at 3 m was 87.52 dBµV/m (Peak) so the spurious level is more than 20 dB below the carrier level.

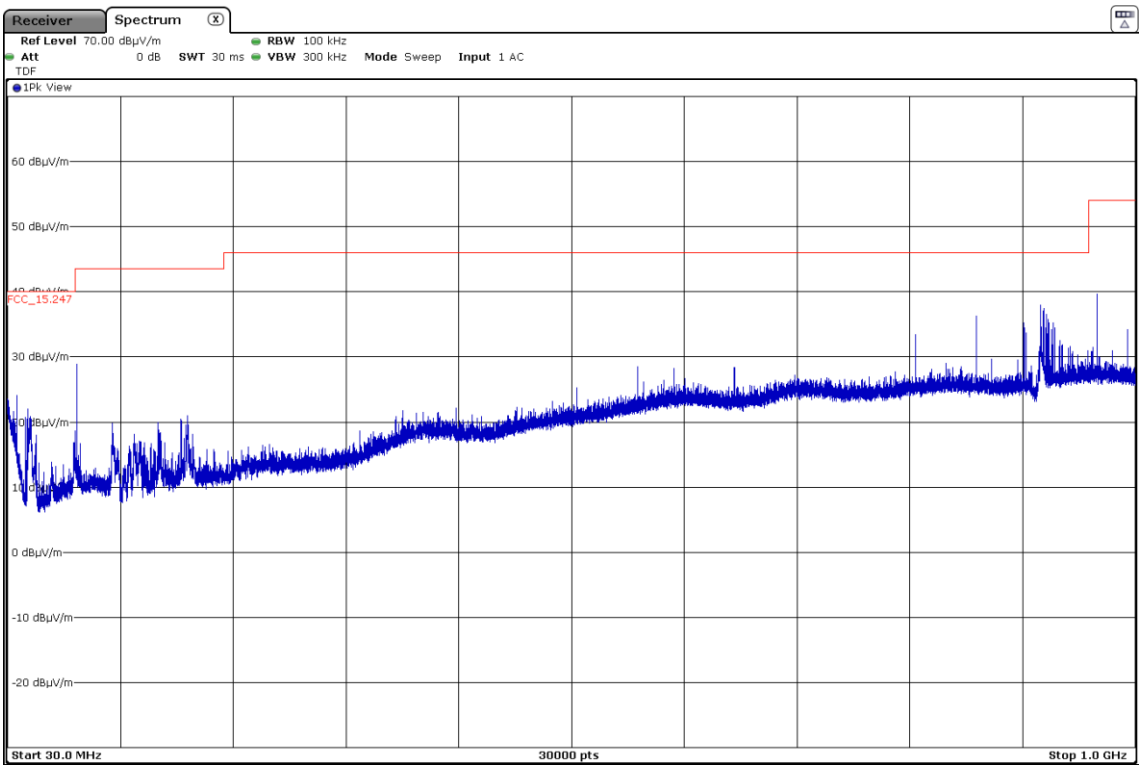
- High Channel (917.2 MHz):

Spurious frequency (GHz)	Detector	Emission Level (dBµV/m)	Polarization	Measurement Uncertainty (dB)
3.66865	Peak	44.86	H	<±3.70
5.34115	Peak	42.88	V	<±3.70
5.50285	Peak	51.49	H	<±3.70

Verdict: PASS

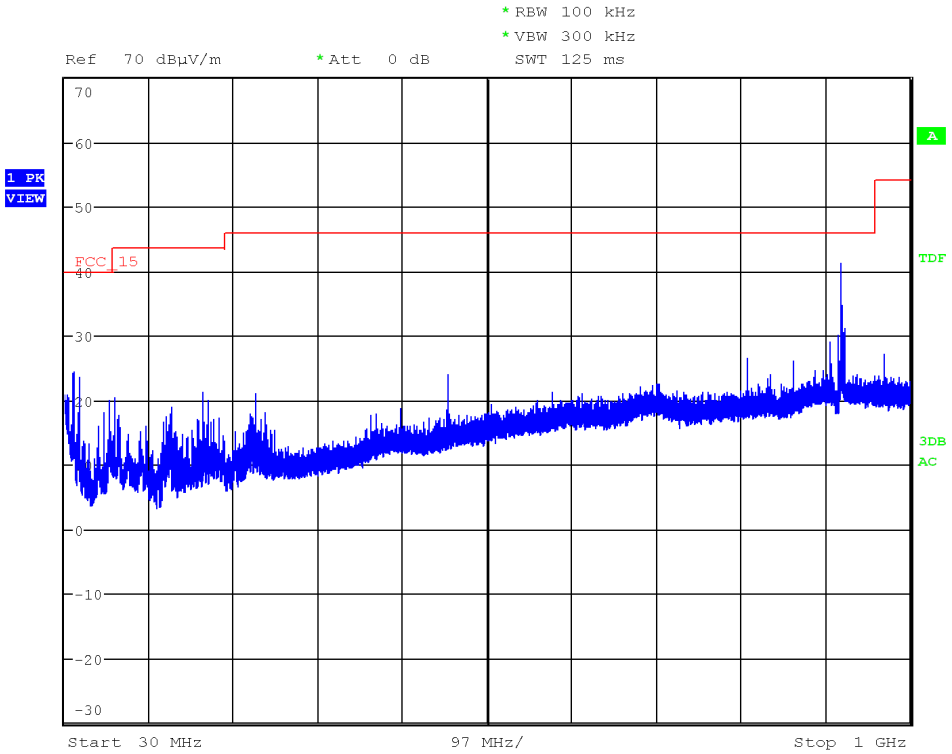
FREQUENCY RANGE 30 MHz - 1 GHz

- Low Channel:



Note: The carrier was attenuated using a Notch filter.

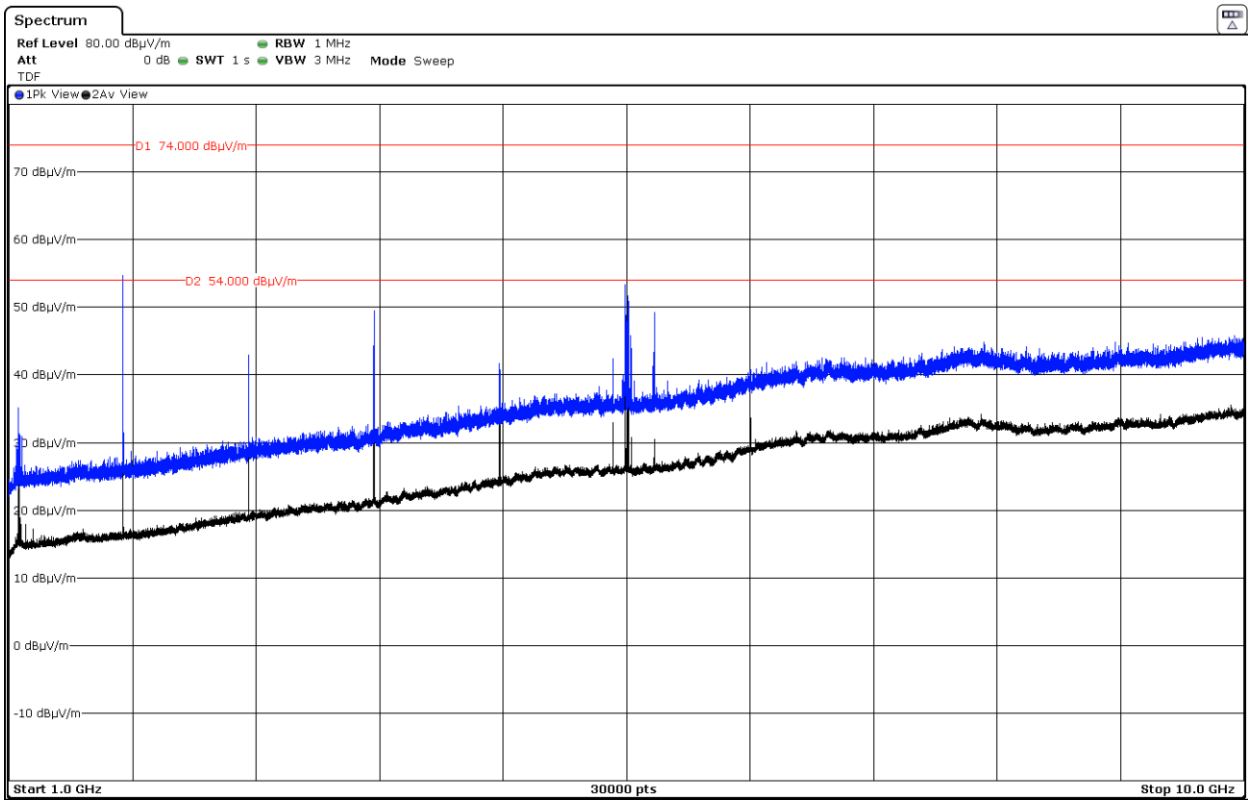
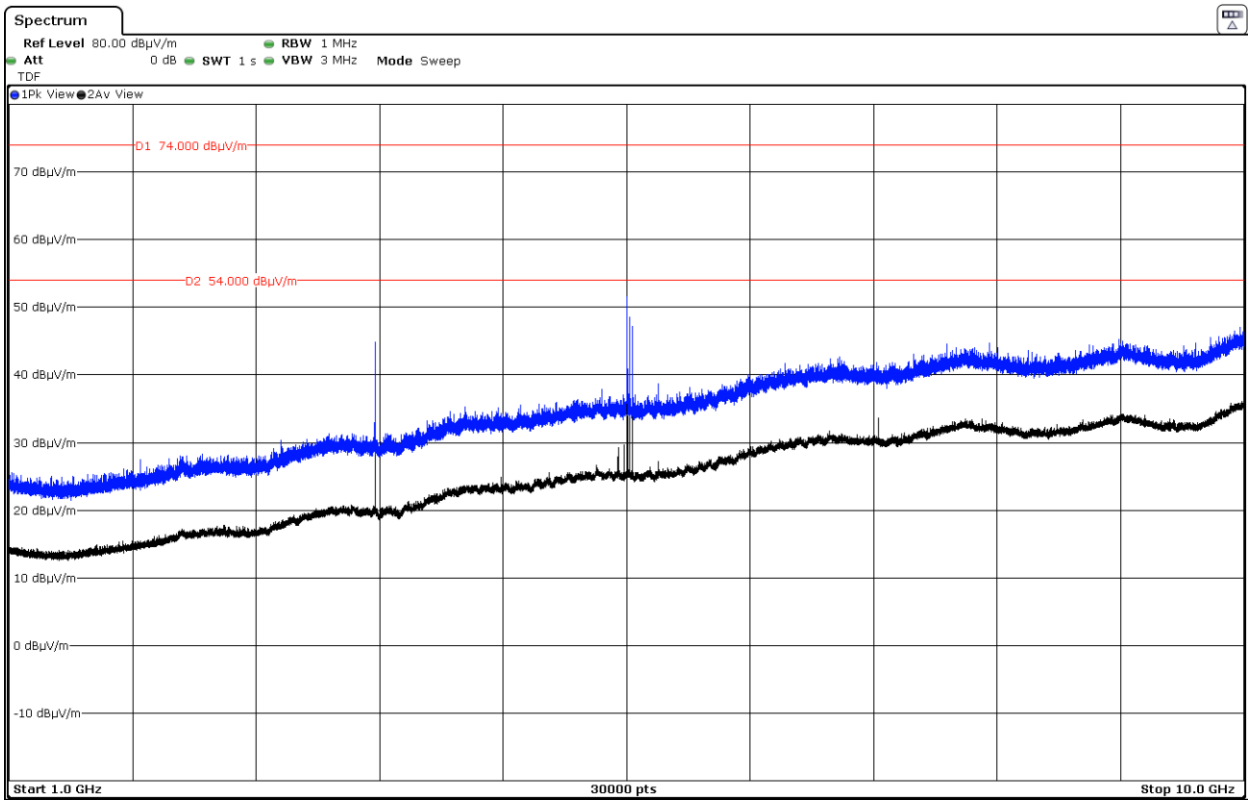
- High Channel:



Note: The carrier was attenuated using a Notch filter.

FREQUENCY RANGE 1 - 10 GHz

- Low Channel:



- High Channel: