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FCC LISTED, REGISTRATION NUMBER: 720267

IC LISTED REGISTRATION NUMBER IC 4621A-2

Nº 51/LE147

Informe de ensayo nº:
Test report No:

NIE: 51934RRF.002

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, 5725 - 5875 MHz, and 24.0 – 24.25 GHz.

Identificación del objeto ensayado Identification of item tested	Mobile Data Gateway
Marca Trade	imr / AIUT
Modelo y/o referencia tipo Model and /or type reference	OKO 5875
Other identification of the product	FCC ID: 2AKQSOKO5875 IC: 22378-OKO5875
Final HW version	3
Final SW version	C1
Características Features	Not provided data
Fabricante Manufacturer	AIUT SP. Z O.O. ul. Wyczólkowskiego 113, 44-109 Gliwice, Poland.
Método de ensayo solicitado, norma Test method requested, standard	USA FCC Part 15.249 10-1-15 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 10-1-15 Edition: Radiated emission limits; general requirements. CANADA RSS-210 Issue 9 (August 2016). CANADA RSS-Gen Issue 4 (November 2014). ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Resultado Summary	IN COMPLIANCE
Aprobado por (nombre / cargo y firma) Approved by (name / position & signature)	A. Llamas RF Lab. Manager Firmado digitalmente por ALEJANDRO LLAMAS RODRIGUEZ Fecha: 2017.03.03 13:00:34 +01'00'
Fecha de realización Date of issue	2017-03-03
Formato de informe No. Report template No	FDT08_18

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Competences and guarantees

AT4 wireless 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.

AT4 wireless is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjuction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

AT4 wireless is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: IC 4621A-2.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless 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 AT4 wireless at the time of performance of the test.

AT4 wireless 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.
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4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the AT4 wireless internal document PODT000.

Usage of samples

Samples undergoing test have been selected by: **the client**

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
51934/018	Mobile Data Gateway	OKO 5875	01000002	2017-01-11
51934/024	Battery	ABAT M020	12345678	2017-01-11
51934/030	Antenna	2JW0124	---	2017-01-11

1. Sample S/01 has undergone following test(s).

   All radiated tests indicated in appendix A.

Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
51934/016	Mobile Data Gateway	OKO 5875	01000001	2017-01-11
51934/024	Battery	ABAT M020	12345678	2017-01-11

1. Sample S/02 has undergone following test(s).

   All conducted tests indicated in appendix A.

Test sample description

The product OKO 5875, a compact, battery-powered mobile data gateway, is an essential element of IMR Tank Monitoring System that has been designed, developed and manufacturer by AIUT. OKO 5875 receives via radio measurements from assigned smart level sensors ALEVEL 0275 installed on propane tanks. With configured frequency OKO 5875 collects the tank level/volume data and retransmits the current stock information, archive measurement and the status of the device via cellular network to acquisition server. OKO 5875 can be mounted next or directly on propane tank. The deice OKO 5875 comprises two printed circuit board with electronic circuitry, and integrated antenna (for link with ALEVEL 0275), a SMA connector for external mobile antenna and primary battery, all housed in a polycarbonate enclosure.

Identification of the client

AIUT SP. Z O.O.

ul. Wyczólkowskiego 113, 44-109 Gliwice, Poland.

Testing period

The performed test started on 2017-01-31 and finished on 2017-02-06.

The tests have been performed at AT4 wireless.

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 %
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

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
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
Field homogeneity	More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).

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. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar
Shielding effectiveness	> 100 dB
Electric insulation	> 10 kΩ
Reference resistance to earth	< 1 Ω

Remarks and comments

1: Used instrumentation:

Conducted Measurements

		Last Cal. date	Cal. due date
1.	Spectrum analyser Agilent PSA E4440A	2015/10	2017/10
2.	DC power supply R&S NGPE 40/40	2014/11	2017/11

Radiated Measurements

		Last Cal. date	Cal. due date
1.	Semianechoic Absorber Lined Chamber ETS FACT3 200STP	N.A.	N.A.
2.	BiconicalLog antenna ETS LINDGREN 3142E	2014/03	2017/03
3.	Multi Device Controller EMCO 2090	N.A.	N.A.
4.	Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D	2016/11	2019/11
5.	Broadband Horn antenna 18-40 GHz SCHWARZBECK BBHA 9170	2014/03	2017/03
6.	EMI Test Receiver R&S ESU 40	2016/03	2018/03
7.	Spectrum analyser Rohde & Schwarz FSW50	2015/12	2017/12
8.	RF pre-amplifier 10 MHz-6 GHz SCHWARZBECK BBV9743	2016/04	2017/04
9.	RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-1M	2016/02	2018/02

Testing verdicts

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

FCC PART 15 PARAGRAPH / RSS-210		**VERDICT**			
		NA	**P**	**F**	**NM**
FCC 15.249 Subclause (a) / RSS-210 B.10. (a)	Field strength of fundamental and harmonics emissions		P		
FCC 15.249 Subclause (d) / RSS-210 B.10. (b)	Emissions radiated outside of the specific frequency bands		P		

Appendix A – Test result "Proprietary radio"

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TEST CONDITIONS

Power supply (V):

$V_{nominal}$ = 3.3Vdc

Type of power supply = DC voltage from external battery.

Type of antenna = Integral antenna (quarter-wave whip).

Declared Gain for antenna (maximum) = <0 dBi

TEST FREQUENCIES:

Lowest channel: 902.025 MHz

Middle channel: 915.025 MHz

Highest channel: 927.975 MHz

CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is directly connected to the spectrum analyzer.

RADIATED MEASUREMENTS

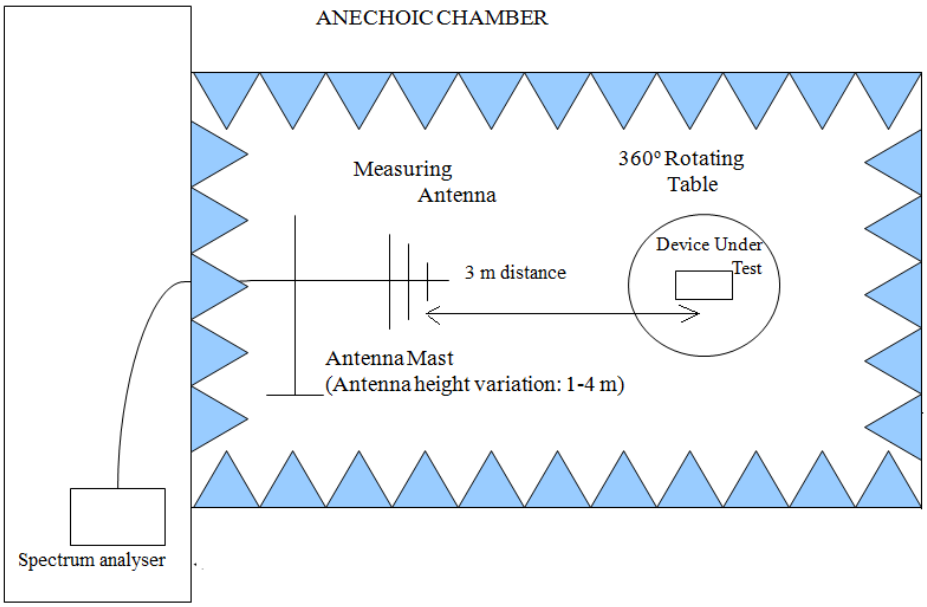
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-10 GHz (1 GHz-18 GHz Double ridge horn antenna).

For radiated emissions in the range 1 GHz-10 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.

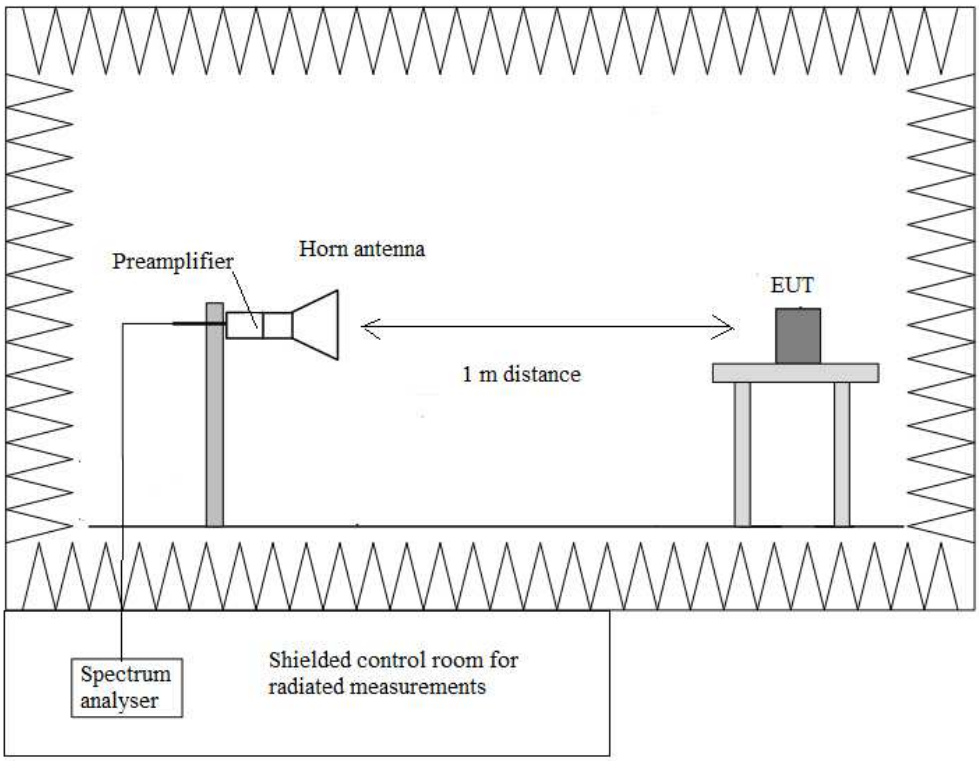
Measurements were made in both horizontal and vertical planes of polarization.

Radiated measurements setup f < 1 GHz



Shielded Control Room For Radiated Measurements

Radiated measurements setup f > 1 GHz



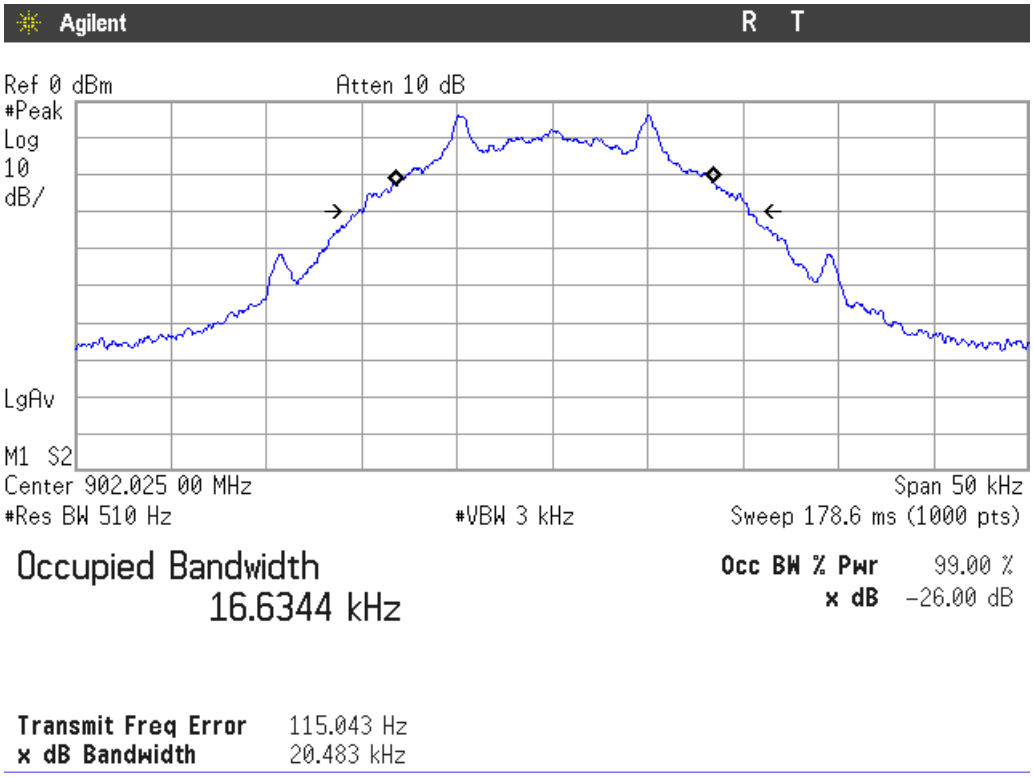
Occupied Bandwidth

RESULTS

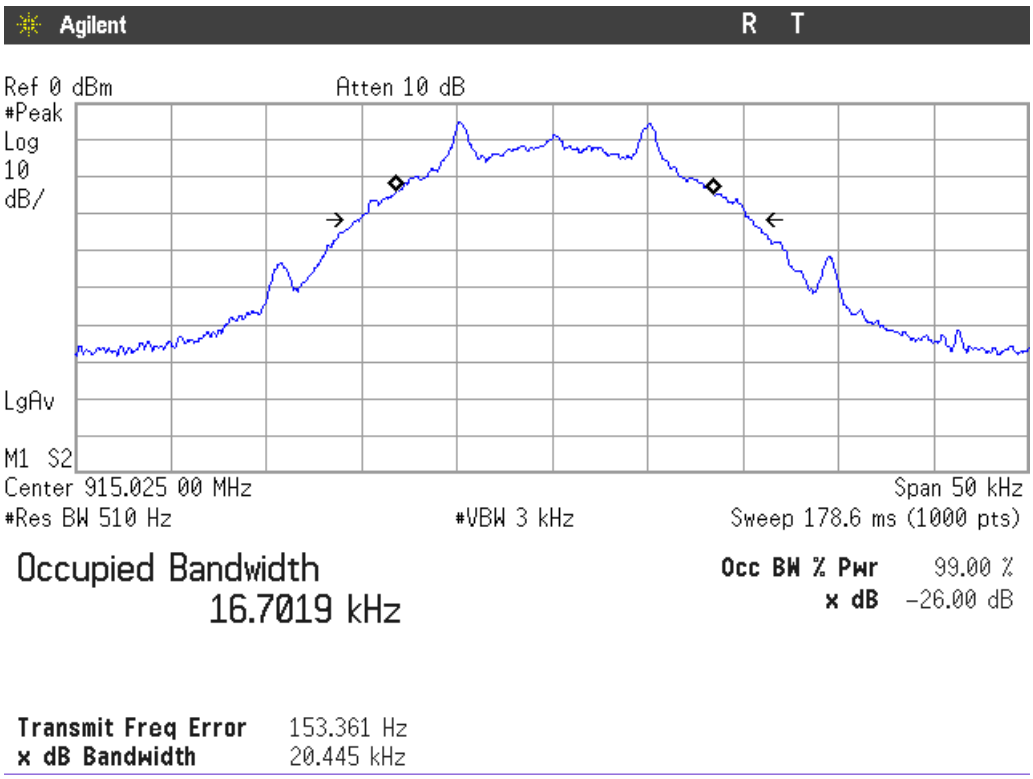
(see next plots).

	Lowest frequency 902.025 MHz	Middle frequency 915.025 MHz	Highest frequency 927.975 MHz
99% bandwidth (kHz)	16.634	16.702	16.776
-26 dBc bandwidth (kHz)	20.483	20.445	20.553
Measurement uncertainty (kHz)	<±0.08		

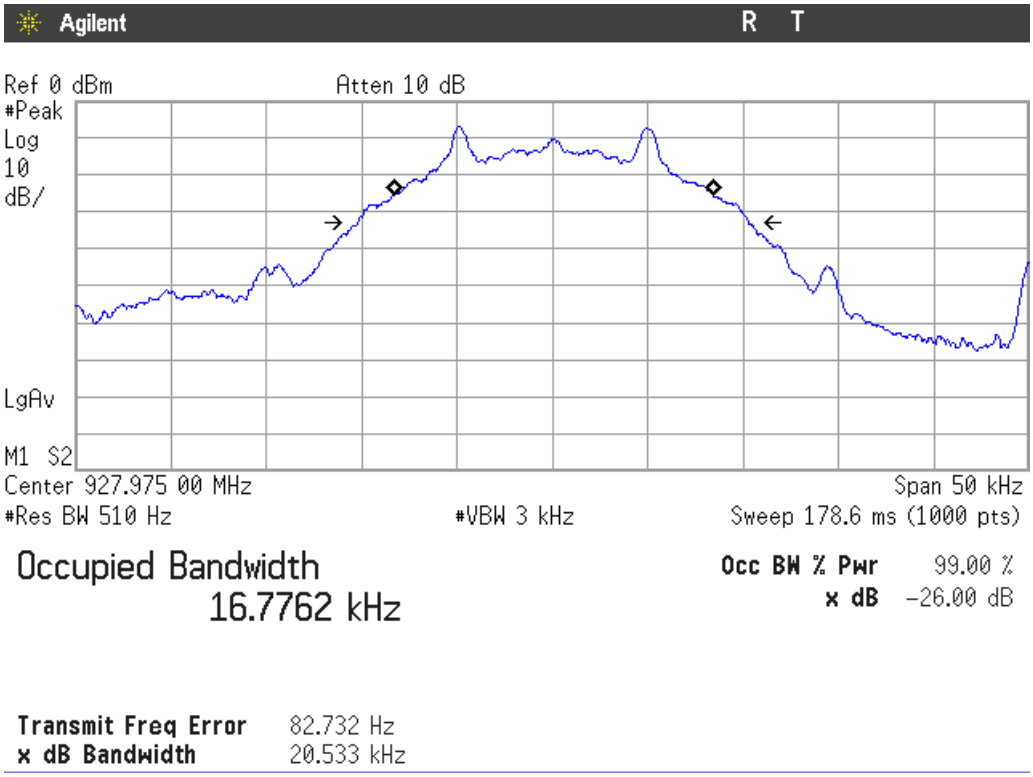
Lowest Channel



Middle Channel



Highest channel



Section 15.249 Subclause (a) / RSS-210 B.10. (a) Field strength of Fundamental

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.

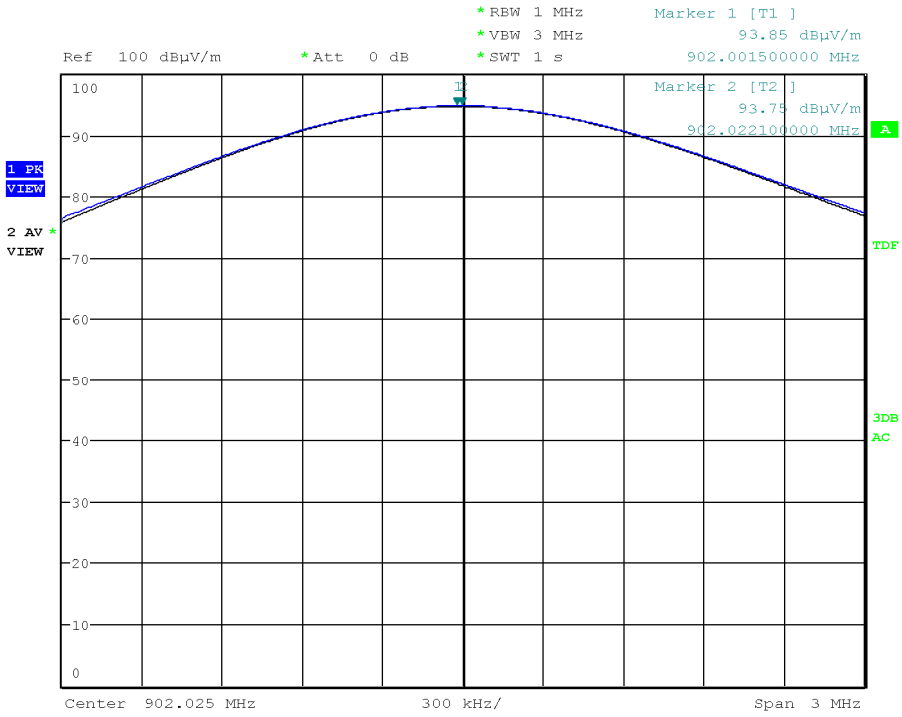
RESULTS

	Lowest frequency 902.025 MHz	Middle frequency 915.025 MHz	Highest frequency 927.975 MHz
Field strength (dBµV/m) average	93.75	93.63	93.95
Field strength (dBµV/m) peak	93.85	93.73	94.05
Measurement uncertainty (dB)	<±3.88		

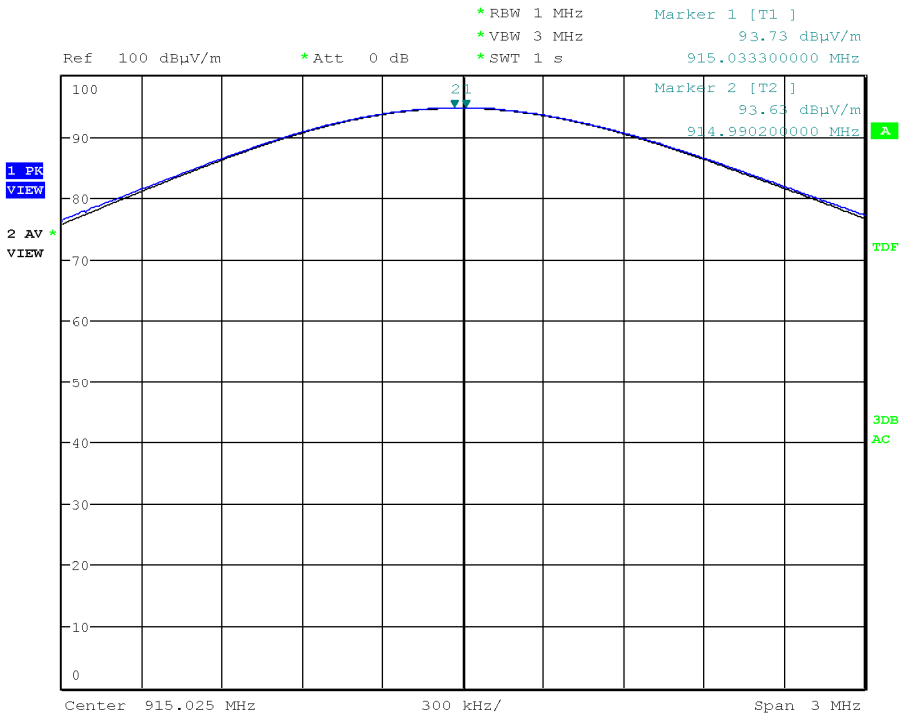
Verdict: PASS

FIELD STRENGTH

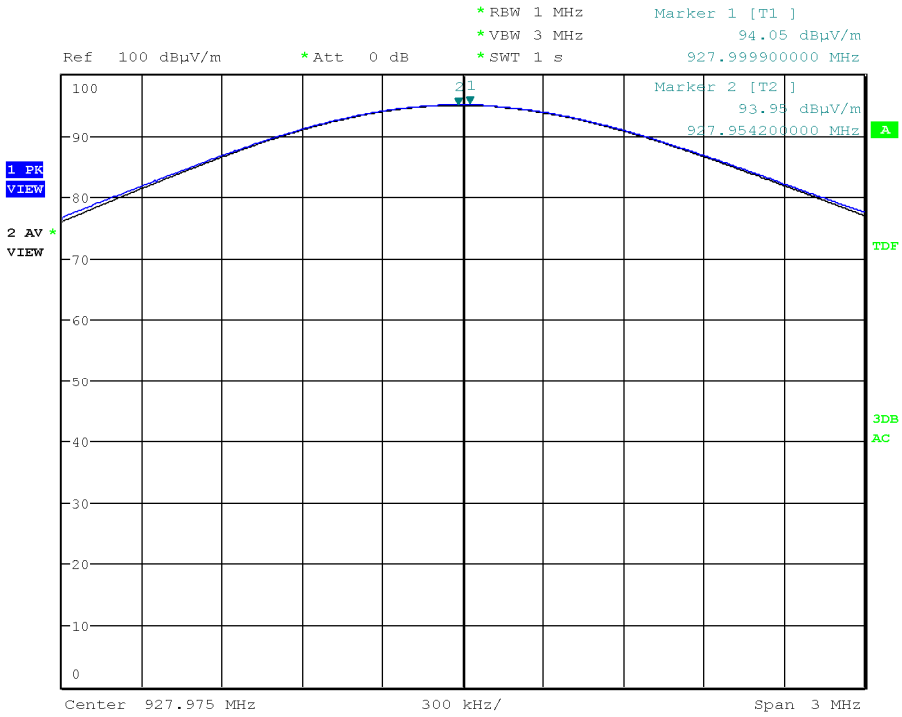
Lowest Channel



Middle Channel



Highest Channel



Section 15.249 Subclause (a) and (d) / RSS-210 B.10 (b) Emissions limitations radiated (Transmitter)

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-1000 MHz.

The result does not depend on the operating channel.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
268.5876	V	Quasi-Peak	25.15	± 3.88
398.8910	V	Quasi-Peak	26.65	± 3.88
710.0346	V	Quasi-Peak	28.04	± 3.88

Frequency range 1 GHz-10 GHz

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

1. CHANNEL: LOWEST (902.025 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
3.60835	V	Peak	45.16	<±4.87
		Average	43.81	<±4.87

2. CHANNEL: MIDDLE (915.025 MHz).

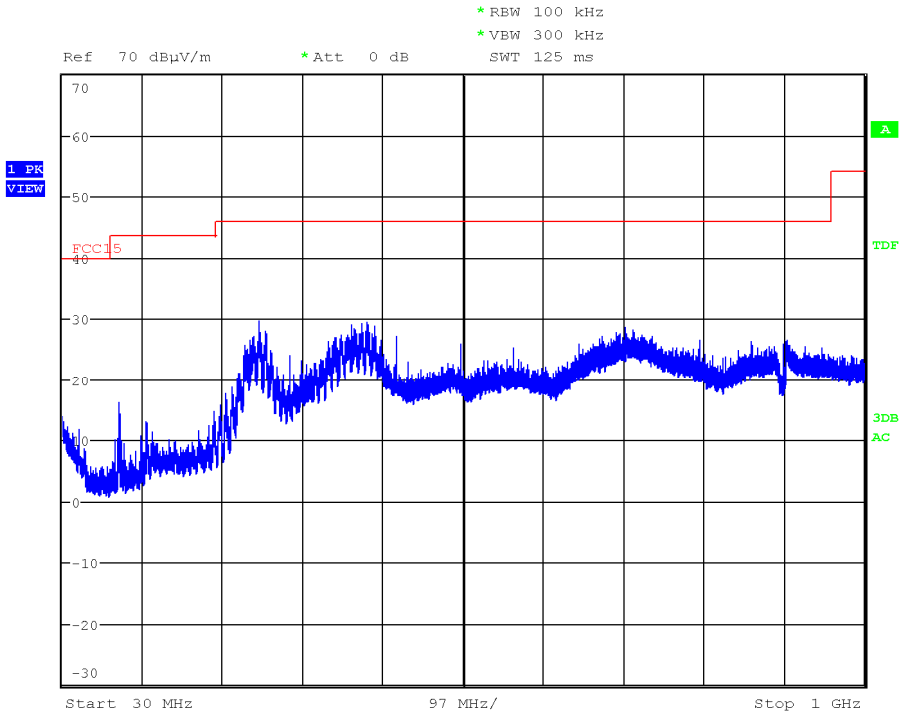
Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
3.65995	V	Peak	45.15	<±4.87
		Average	43.61	<±4.87

3. CHANNEL: HIGHEST (927.975 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
3.71185	H	Peak	43.48	<±4.87
		Average	41.82	<±4.87

Verdict: PASS

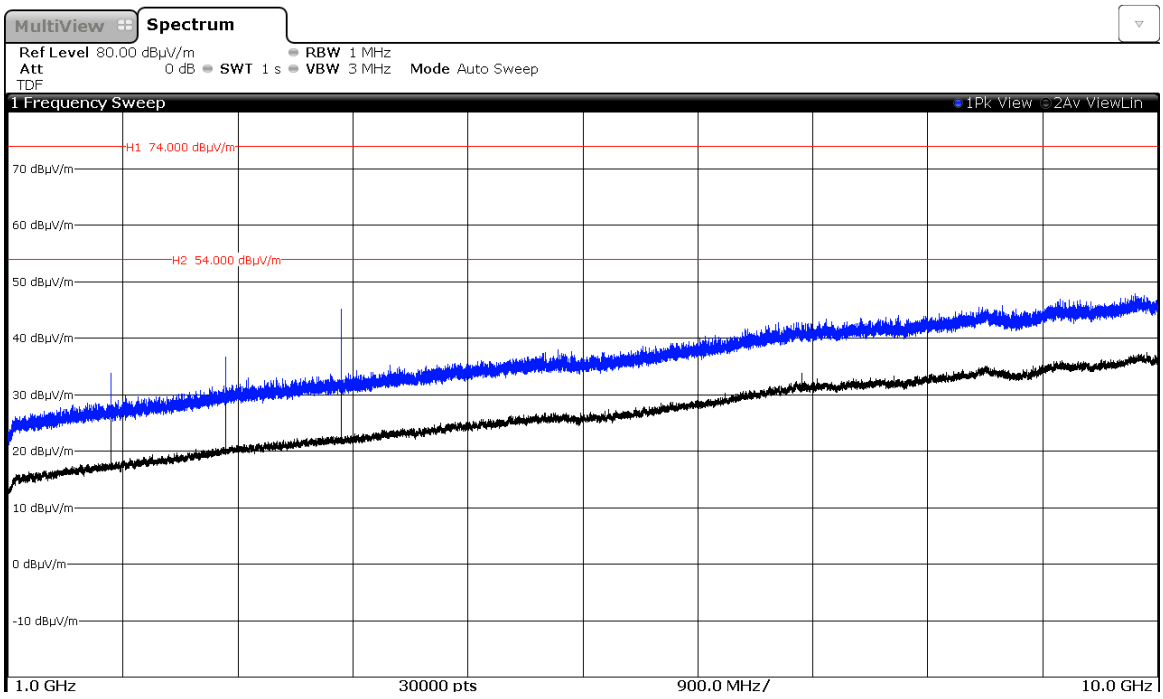
FREQUENCY RANGE 30 MHz-1000 MHz.



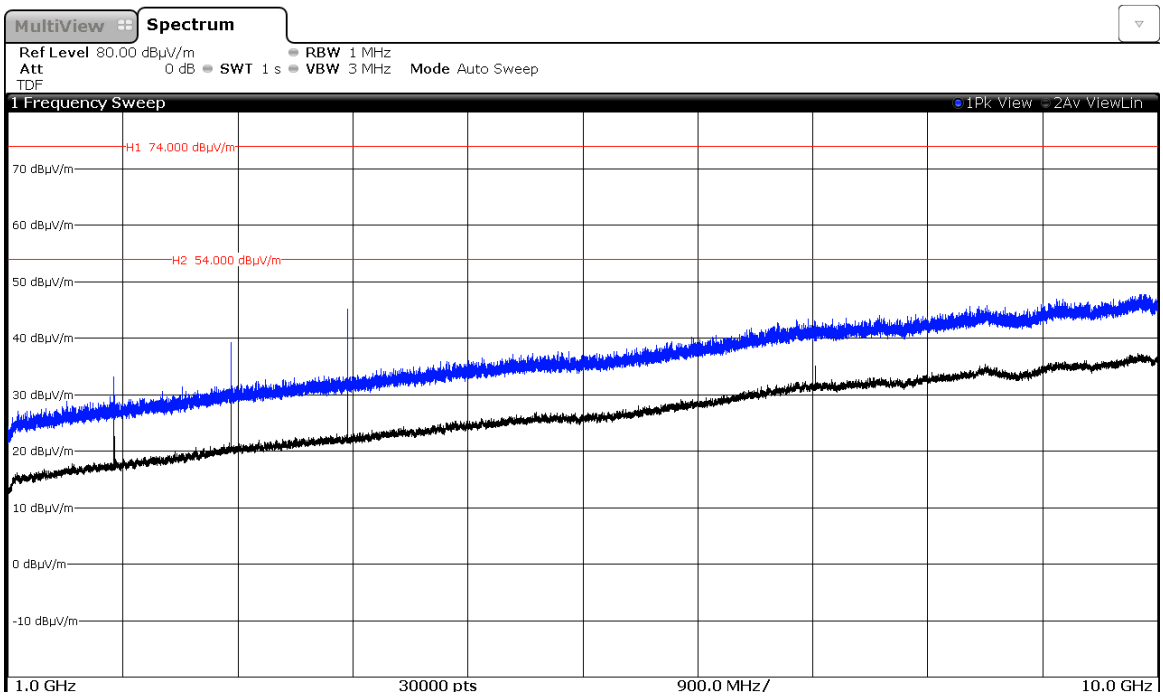
(This plot is valid for all three channels).

FREQUENCY RANGE 1 GHz to 10 GHz.

CHANNEL: Lowest (902.025MHz).



CHANNEL: Middle (915.025 MHz).



CHANNEL: Highest (927.975 MHz).