



FCC LISTED, REGISTRATION  
NUMBER: 720267

Informe de ensayo nº:  
Test report No:

IC LISTED REGISTRATION  
NUMBER IC 4621A-2

**NIE: 51934RRF.001**

## 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.

<b>Identificación del objeto ensayado.....</b> Identification of item tested	Smart Sensor
<b>Marca .....</b> Trade	Imr / AIUT
<b>Modelo y/o referencia tipo .....</b> Model and /or type reference	ALEVEL 0275
<b>Other identification of the product .....</b>	FCC ID: 2AKQSALE0275 IC: 22378-ALEVEL0275
<b>Final HW version .....</b>	v.3
<b>Final SW version .....</b>	v.1
<b>Características .....</b> Features	Not provided data
<b>Fabricante .....</b> Manufacturer	AIUT SP. Z O.O. ul. Wyczółkowskiego 113, 44-109 Gliwice, Poland.
<b>Método de ensayo solicitado, norma.....</b> 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.
<b>Resultado.....</b> Summary	IN COMPLIANCE
<b>Aprobado por (nombre / cargo y firma) .....</b> Approved by (name / position & signature)	A. Llamas RF Lab. Manager
<b>Fecha de realización .....</b> Date of issue	2017-02-13
<b>Formato de informe No. ....</b> 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 conjunction 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.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
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 N°	Description	Model	Serial N°	Date of reception
51934/013	Smart Sensor	ALEVEL 0275	01487059	2016-12-28

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 N°	Description	Model	Serial N°	Date of reception
51934/009	Smart Sensor ( RF conducted sample)	ALEVEL 0275	01647041	2016-12-19

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

All conducted tests indicated in appendix A.

## Test sample description

The test sample consists of a Smart Sensor designed to remote wireless indicate the liquid gas level in tank equipped with float level gauge. Additionally, it is possible to visually read the gas level on its built-in mechanical level indicator. The device ALEVEL 0275 comprises one printed circuit board with electronic circuitry, an integrated antenna and primary battery, all housed in a polycarbonate enclosure.

## Identification of the client

AIUT SP. Z O.O.

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

## Testing period

The performed test started on 2016-01-27 and finished on the same day.

The tests have been performed at AT4 wireless.

## Environmental conditions

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

<b>Temperature</b>	Min. = 15 °C Max. = 35 °C
<b>Relative humidity</b>	Min. = 20 % Max. = 75 %
<b>Shielding effectiveness</b>	> 100 dB
<b>Electric insulation</b>	> 10 kΩ
<b>Reference resistance to earth</b>	< 1 Ω

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

<b>Temperature</b>	Min. = 15 °C Max. = 35 °C
<b>Relative humidity</b>	Min. = 20 % Max. = 75 %
<b>Air pressure</b>	Min. = 860 mbar Max. = 1060 mbar
<b>Shielding effectiveness</b>	> 100 dB
<b>Electric insulation</b>	> 10 kΩ
<b>Reference resistance to earth</b>	< 1 Ω
<b>Normal site attenuation (NSA)</b>	< ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz)
<b>Field homogeneity</b>	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:

<b>Temperature</b>	Min. = 15 °C Max. = 35 °C
<b>Relative humidity</b>	Min. = 20 % Max. = 75 %
<b>Air pressure</b>	Min. = 860 mbar Max. = 1060 mbar
<b>Shielding effectiveness</b>	> 100 dB
<b>Electric insulation</b>	> 10 kΩ
<b>Reference resistance to earth</b>	< 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
10.	RF pre-amplifier 18-40 GHz BONN ELEKTRONIK BLMA 1840-1M	2015/12	2017/12

## Testing verdicts

<b>Not applicable</b> .....	N/A
<b>Pass</b> .....	P
<b>Fail</b> .....	F
<b>Not measured</b> .....	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):

$V_{\text{nominal}} = 3.0\text{Vdc}$

Type of power supply = DC voltage from internal primary Li-MnO<sub>2</sub> 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

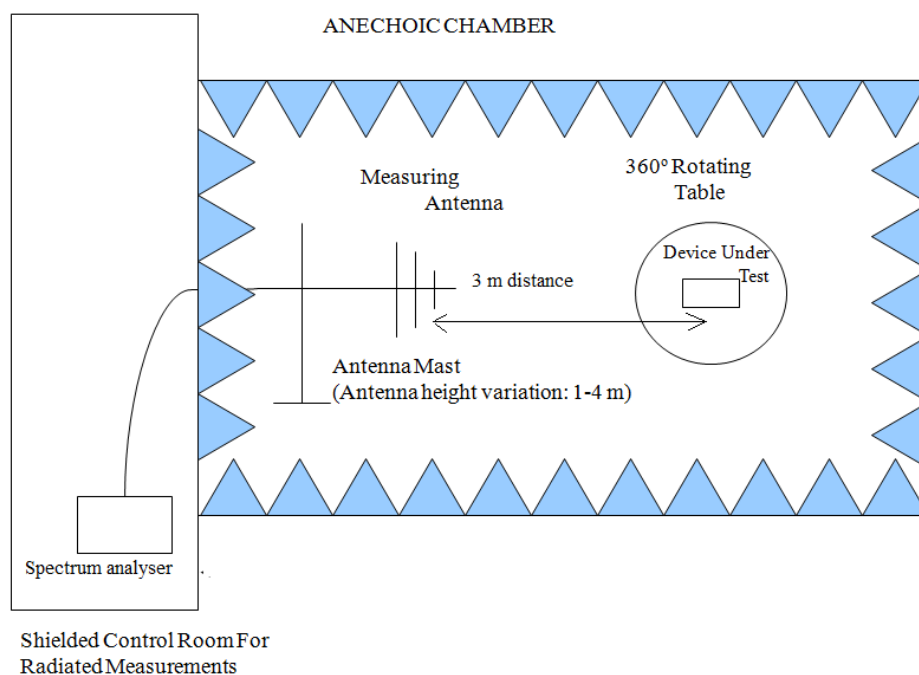
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-25 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-25 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.

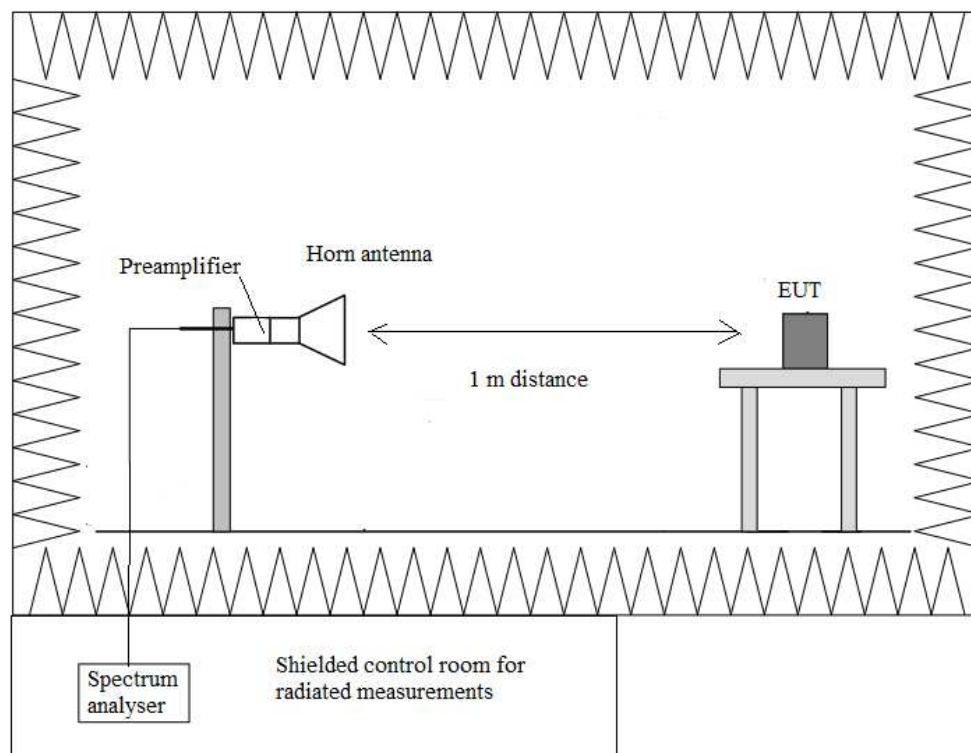
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

## Radiated measurements setup $f < 1$ GHz



## Radiated measurements setup $f > 1$ GHz



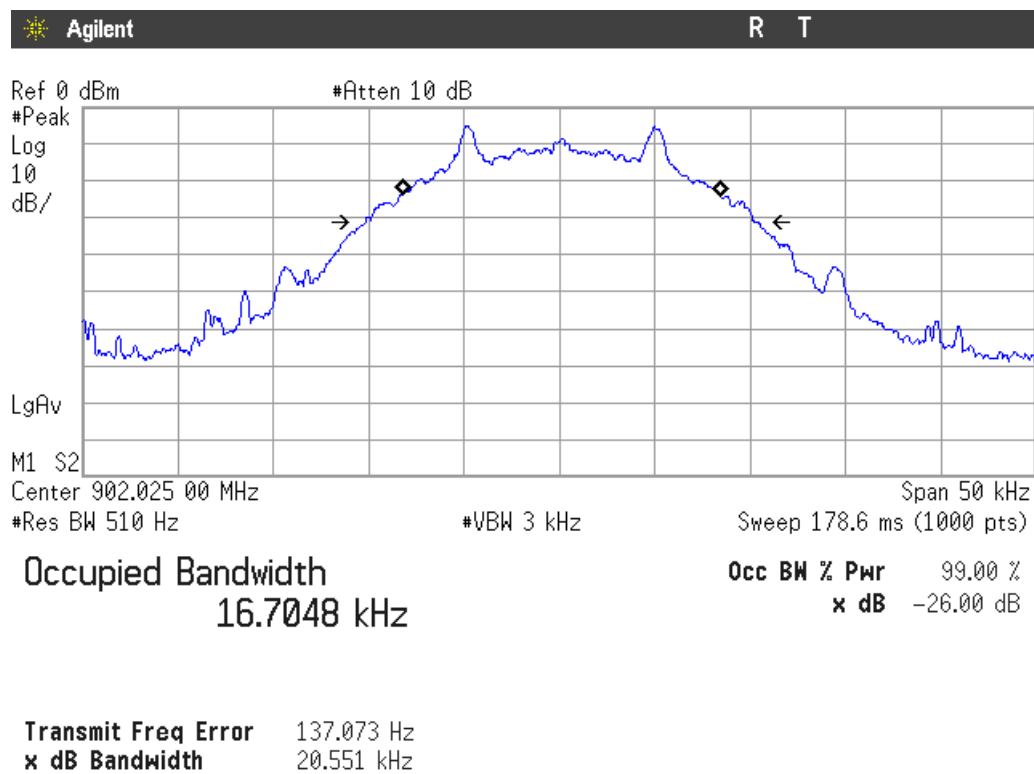
## Occupied Bandwidth

### RESULTS

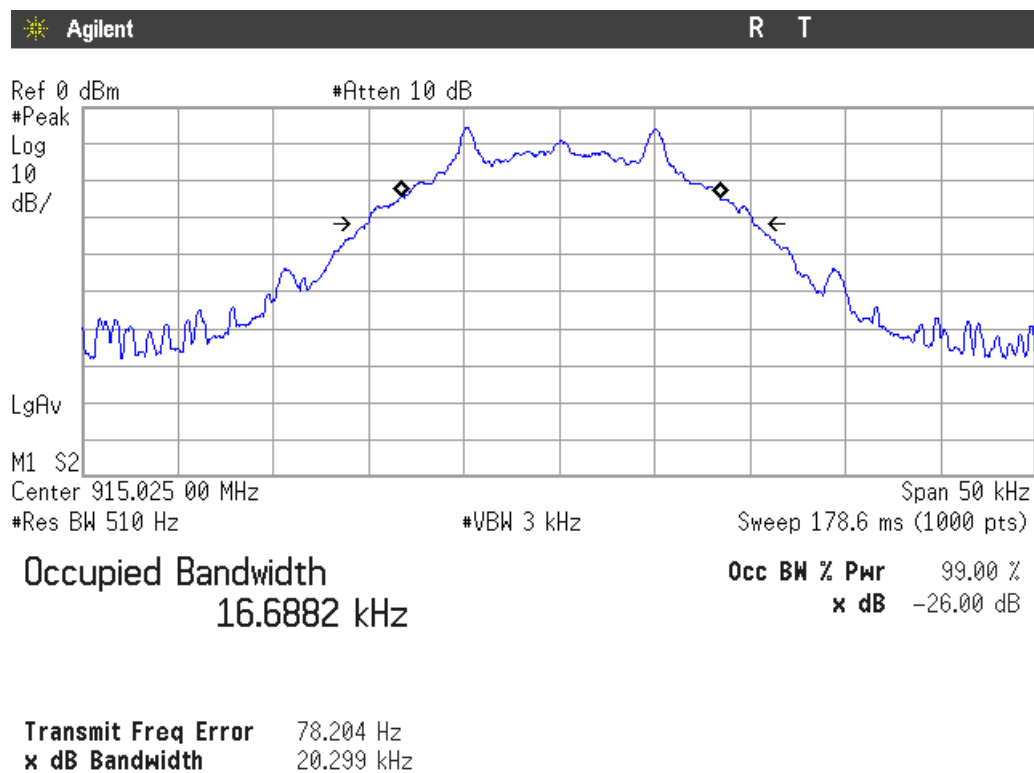
(see next plots).

	Lowest frequency 902.025 MHz	Middle frequency 915.025 MHz	Highest frequency 927.975 MHz
99% bandwidth (kHz)	16.704	16.688	16.569
-26 dBc bandwidth (kHz)	20.551	20.299	20.328
Measurement uncertainty (kHz)	<±0.08		

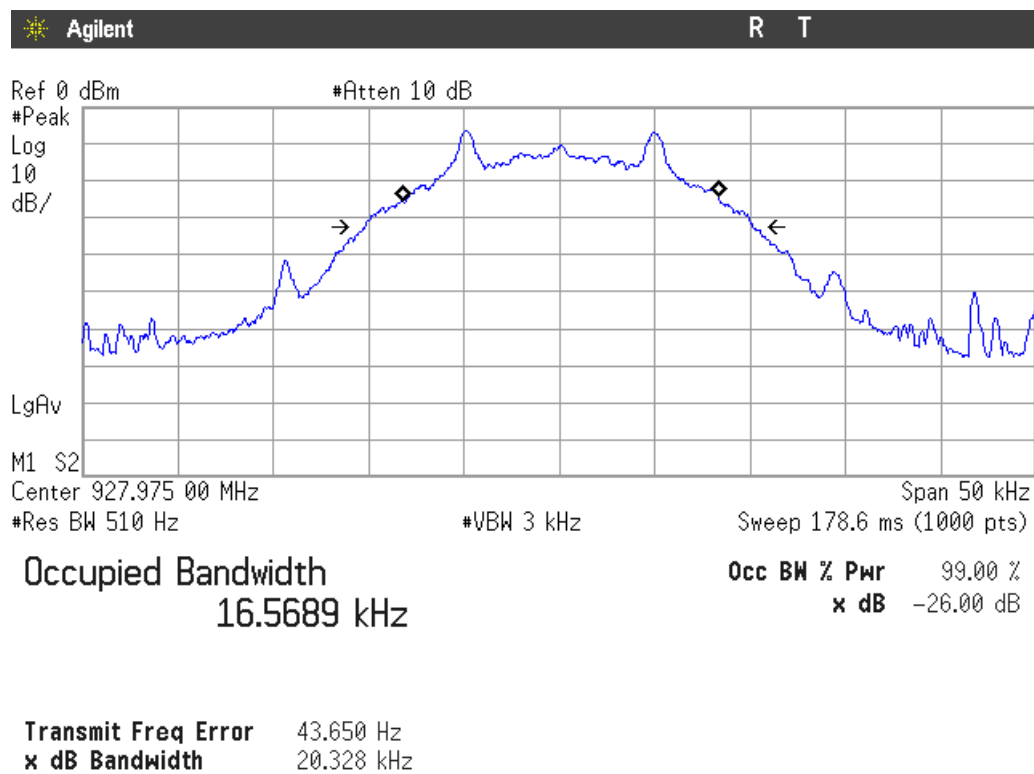
## Lowest Channel



## 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 (dB $\mu$ V/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.

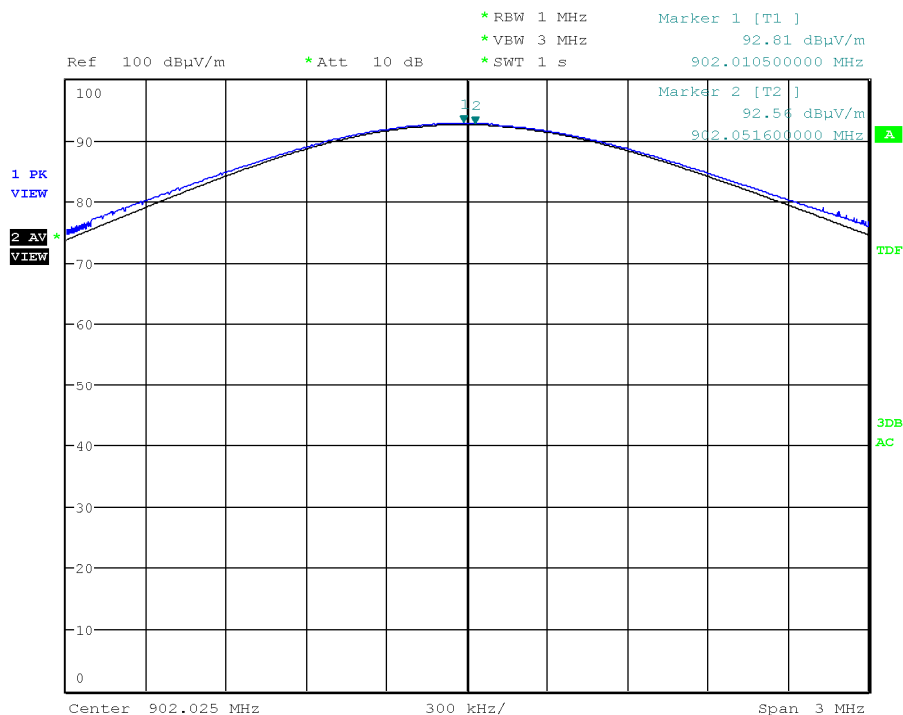
### RESULTS

	Lowest frequency 902.025 MHz	Middle frequency 915.025 MHz	Highest frequency 927.975 MHz
Field strength (dB $\mu$ V/m) average	92.56	92.39	92.24
Field strength (dB $\mu$ V/m) peak	92.81	92.71	92.59
Measurement uncertainty (dB)	< $\pm$ 3.88		

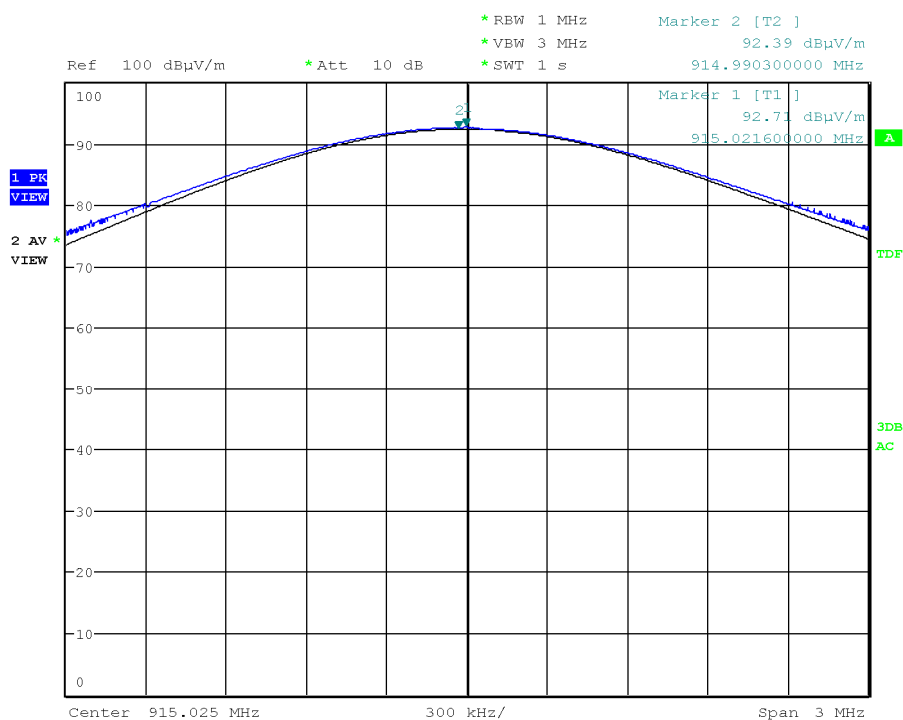
Verdict: PASS

## FIELD STRENGTH

### Lowest Channel

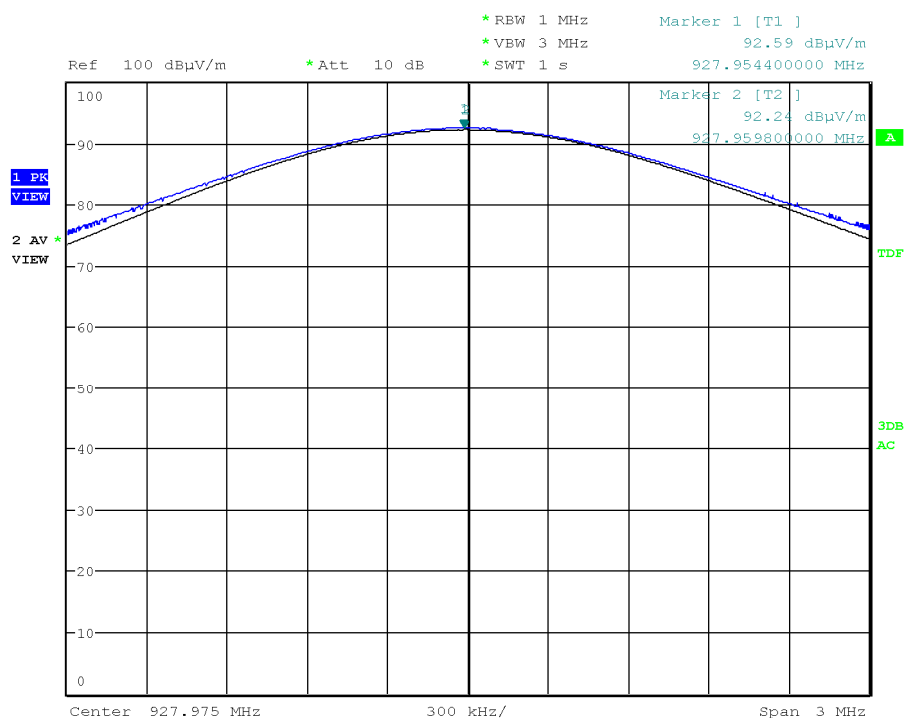


### Middle Channel





## 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 ( $\mu\text{V/m}$ )	Field strength of harmonics ( $\text{dB}\mu\text{V/m}$ )	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 ( $\mu\text{V/m}$ )	Field strength ( $\text{dB}\mu\text{V/m}$ )	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 360° 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-25 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.

All peaks are more than 20 dB below the limit.

### 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)
3.60805	V	Peak	39.51	<±4.87
		Average	36.83	<±4.87

#### 2. CHANNEL: MIDDLE (915.025 MHz).

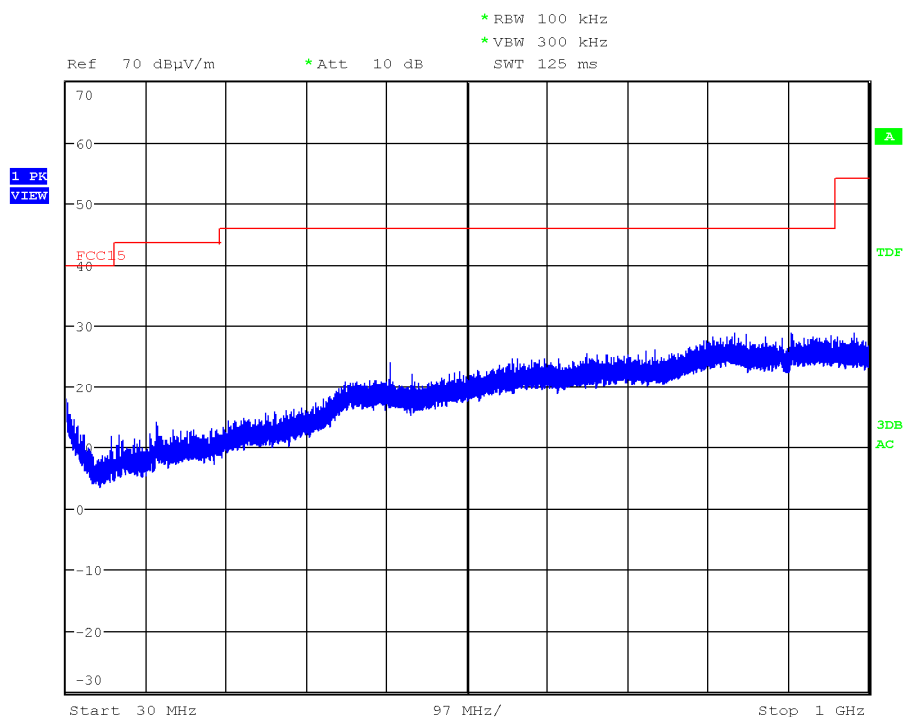
Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
3.65995	V	Peak	39.93	<±4.87
		Average	37.27	<±4.87

#### 3. CHANNEL: HIGHEST (927.975 MHz).

Spurious frequency (GHz)	Polarization	Detector	Emission Level (dBμV/m)	Measurement Uncertainty (dB)
3.71185	H	Peak	40.1	<±4.87
		Average	39.79	<±4.87

Verdict: PASS

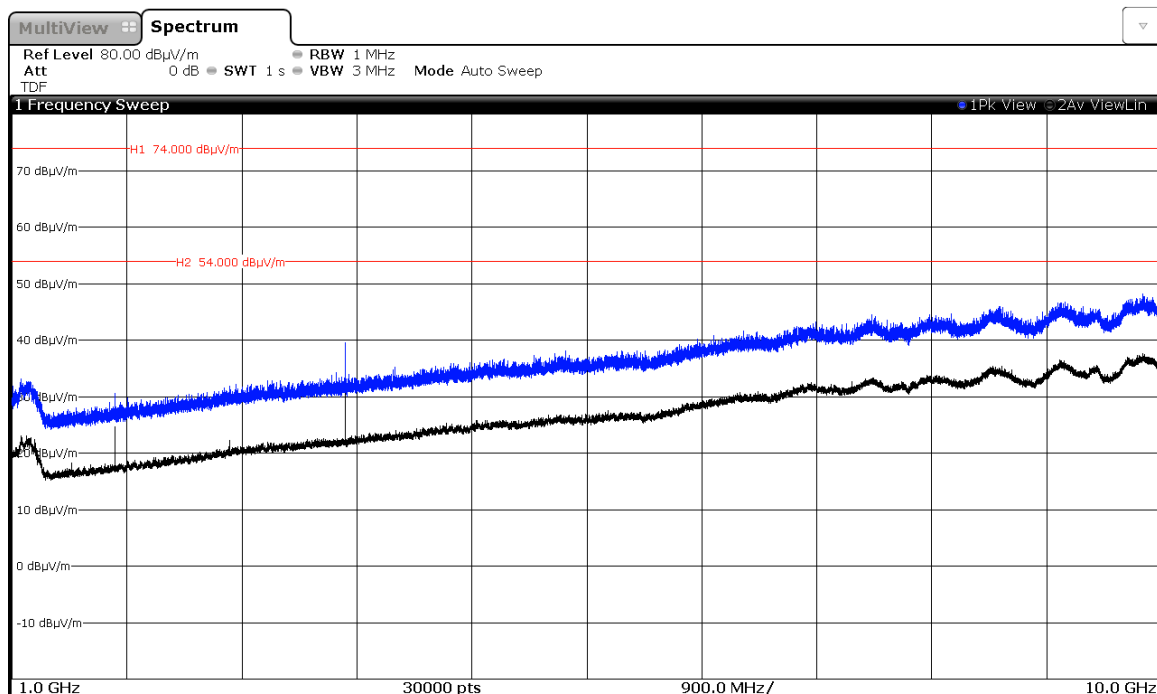
FREQUENCY RANGE 30 MHz-1000 MHz.



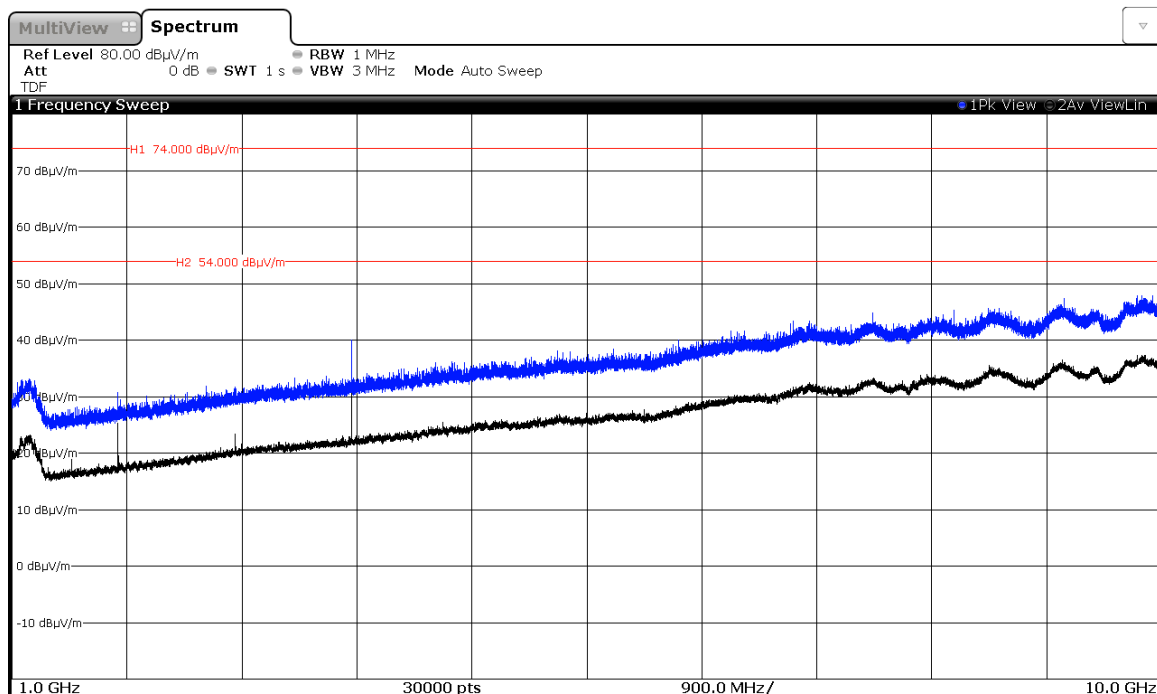
(This plot is valid for all three channels).

FREQUENCY RANGE 1 GHz to 10 GHz.

**CHANNEL: Lowest (902.025MHz).**



**CHANNEL: Middle (915.025 MHz).**



**CHANNEL: Highest (927.975 MHz).**

