# FCC Part 15C Measurement and Test Report

# For

# ATID Co., Ltd.

(Gasan-dong, #1210 Byuksan/Kyungin Digitalvalley II),184,Gasandigital2-ro,

Geumcheon-gu, Seoul, Korea

FCC ID: VUJAT911N

FCC Rule(s): FCC Part 15.249

Product Description: WCDMA wireless data terminal

Tested Model: AT911N

**Report No.:** <u>STR15088054I-7</u>

**Tested Date:** <u>2015-08-05 to 2015-08-28</u>

**Issued Date:** <u>2015-08-28</u>

**Tested By:** Lebron Wang / Engineer

Reviewed By: <u>Lahm Peng / EMC Manager</u>

Approved & Authorized By: <u>Jandy so / PSQ Manager</u>

**Prepared By:** 

Shenzhen SEM.Test Technology Co., Ltd.

1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,

Lebron Wang Lahm peng Jumbyso

Bao'an District, Shenzhen, P.R.C. (518101)

Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

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# 1. GENERAL INFORMATION

# 1.1 Product Description for Equipment Under Test (EUT)

### **Client Information**

Applicant: ATID Co., Ltd.

Address of applicant: (Gasan-dong, #1210 Byuksan/Kyungin Digitalvalley II), 184,

Gasandigital2-ro, Geumcheon-gu, Seoul, Korea

Manufacturer: ATID Co., Ltd.

Address of manufacturer: (Gasan-dong, #1210 Byuksan/Kyungin Digitalvalley II), 184,

Gasandigital2-ro, Geumcheon-gu, Seoul, Korea

General Description of E	General Description of EUT				
Product Name:	WCDMA wireless data terminal				
Brand Name:	<b>A</b> tid				
Model No.:	AT911N				
Adding Model:	1				
Hardware Version:	AT911N MAIN PCB				
Software Version:	STD0110P4MXGC				
IMEI:	358625050875212				
Rated Voltage:	DC 3.7V Li-ion Battery				
Battery capacity:	Main Battery:2200mAh Gun Battery:4400mAh				
Dower Adenter:	PSAA10R-050				
Power Adaptor:	Input: AC 100-240V Output: DC 5V/2A				
Device Category:	Portable Device				
Note: The test data is gathered from a production sample provided by the manufacturer.					

Technical Characteristics of EUT				
Frequency Range:	920.625MHz-924.375MHz			
Max. Field Strength:	90.72 dBuV/m			
Modulation:	1			
Quantity of Channels:	16			
Channel Separation:	/			
Antenna Type:	Integral			
Antenna Gain:	1dBi			
Lowest Internal Frequency of EUT:	32.768kHz			

#### 1.2 Test Standards

The following report is prepared on behalf of the ATID Co., Ltd. in accordance with FCC Part 15, Subpart B, Subpart C, and section 15.107, 15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.107,15.203, 15.205, 15.207, 15.209 and 15.249 of the Federal Communication Commissions rules.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which results in lowering the emission, should be checked to ensure compliance has been maintained.

#### 1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices, and ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

#### 1.4 Test Facility

#### FCC – Registration No.: 934118

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

#### Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

#### **CNAS Registration No.: L4062**

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2<sup>nd</sup> Road, Bao'an District, Shenzhen, P.R.C (518101).

# 1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List					
Test Mode	Description	Remark			
TM1	Low Channel	920.625MHz			
TM2	Middle Channel	922.125MHz			
TM3	High Channel	924.375MHz			

EUT Cable List and Details							
Cable Description Length (m) Shielded/Unshielded With / Without Ferrit							
Adapter Cable	1.5	Unshielded	With Core				
USB Cable	1.0	Unshielded	Without Core				
USB Cable	1.5	Unshielded	With Core				

Special Cable List and Details							
Cable Description Length (m) Shielded/Unshielded With / Without Ferrite							
Earphone 1.2 Unshielded Without Core							

Auxiliary Equipment List and Details						
Description Manufacturer Model Serial Number						
Notebook	Lenovo	E10	LR-63C8R			

# 1.6 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal Date	Due Date
Spectrum Analyzer	Agilent	E4407B	MY41440400	2015-06-17	2016-06-16
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2015-06-17	2016-06-16
EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2015-06-17	2016-06-16
Amplifier	Agilent	8447F	3113A06717	2015-06-17	2016-06-16
Amplifier	C&D	PAP-1G18	2002	2015-06-17	2016-06-16
Broadband Antenna	Schwarz beck	VULB9163	9163-333	2015-06-17	2016-06-16
Horn Antenna	ETS	3117	00086197	2015-06-17	2016-06-16
Horn Antenna	ETS	3116B	00088203	2015-06-17	2016-06-16
Loop Antenna	Schwarz beck	FMZB 1516	9773	2015-06-17	2016-06-16
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2015-06-17	2016-06-16
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2015-06-17	2016-06-16
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2015-06-17	2016-06-16

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# 2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§15.203	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§15.207(a)	Conducted Emission	Compliant
§15.209(a)(f)	Radiated Spurious Emissions	Compliant
§15.249(a)	Field Strength of Emissions	Compliant
§15.249(d)	Out of Band Emission	Compliant
§15.215 (c)	Emission Bandwidth	Compliant

# 3. Antenna Requirements

# 3.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

## 3.2 Test Result

This product has an integral antenna, fulfill the requirement of this section.

### 4. Radiated Emissions

# 4.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is +5.10 dB.

## 4.2 Standard Applicable

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental Frequency	Field strength of fundamental	Field strength of Harmonics
	(milli-volts/meter)	(micro-volts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

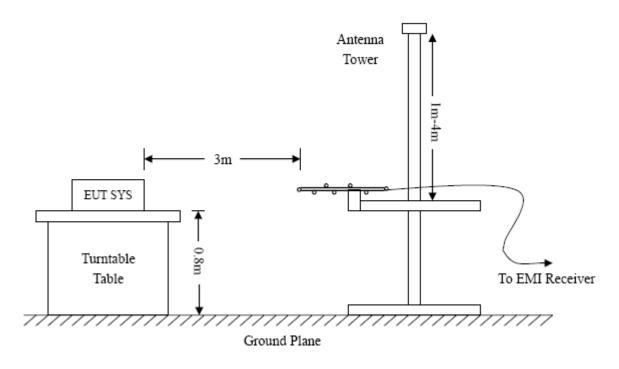
(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

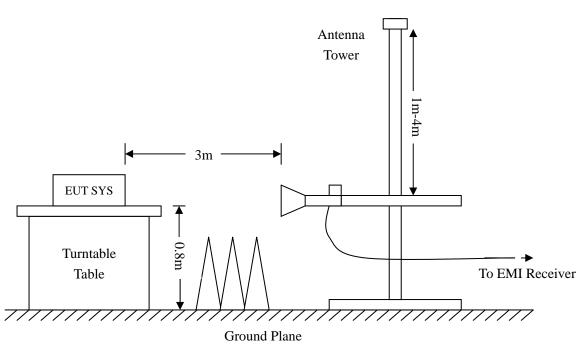
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

#### **4.3 Test Procedure**

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.205 15.249(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.





Frequency:9kHz-30MHz

RBW=10KHz,

VBW = 30KHz

Sweep time= Auto

Trace = max hold

Detector function = peak

Frequency:30MHz-1GHz

RBW=120KHz,

VBW=300KHz

Sweep time= Auto

Trace = max hold

Detector function = peak, QP

Frequency: Above 1GHz

RBW=1MHz,

VBW=3MHz(Peak), 10Hz(AV)

Sweep time= Auto

Trace = max hold

Detector function = peak, AV

# 4.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of  $-6dB\mu V$  means the emission is  $6dB\mu V$  below the maximum limit. The equation for margin calculation is as follows:

#### **4.5 Environmental Conditions**

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

### 4.6 Summary of Test Results/Plots

According to the data below, the FCC Part 15.205, 15.209 and 15.249 standards, and had the worst margin of:

-1.75 dB at 350.4768 in the Horizontal polarization, Low Channel of Antenna 1, 9 kHz to 25 GHz, 3Meters

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

# Plot of Radiated Emissions Test Data (30MHz to 1GHz)

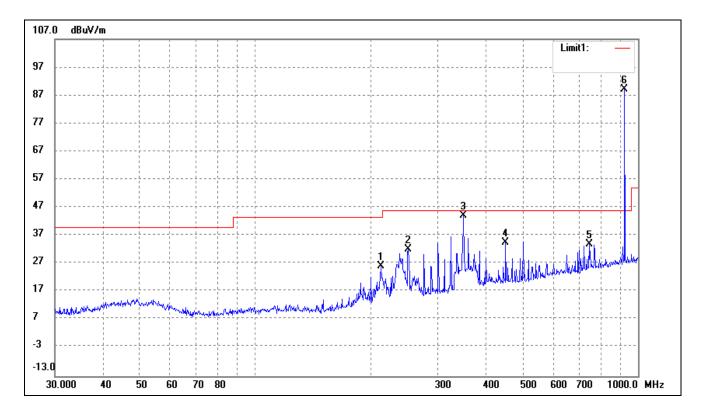
EUT: WCDMA wireless data terminal

Tested Model: AT911N

Operating Condition: Transmitting Low Channel (920.625MHz)

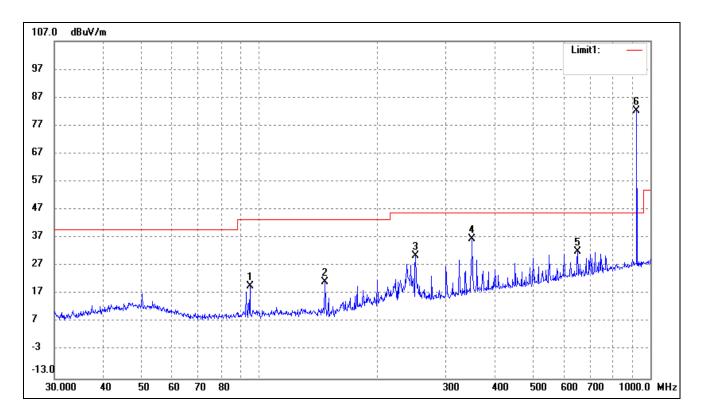
Comment: DC 3.7V

Test Specification: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	213.0151	33.87	-7.67	26.20	43.50	-17.30	264	100	peak
2	251.1804	38.41	-6.14	32.27	46.00	-13.73	113	100	peak
3	350.4768	47.36	-3.11	44.25	46.00	-1.75	287	100	peak
4	451.1350	36.21	-1.57	34.64	46.00	-11.36	185	100	peak
5	744.8661	30.09	3.75	33.84	46.00	-12.16	178	100	peak
6	920.6250	83.50	5.79	89.29	94.00	-4.71	168	100	Fundamental

Test Specification: Vertical

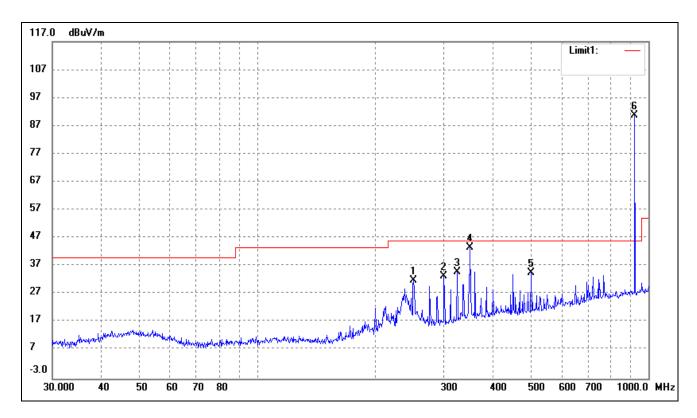


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	94.7601	31.37	-11.63	19.74	43.50	-23.76	264	100	peak
2	147.4036	32.49	-11.00	21.49	43.50	-22.01	113	100	peak
3	251.1804	36.72	-6.14	30.58	46.00	-15.42	287	100	peak
4	350.4768	39.74	-3.11	36.63	46.00	-9.37	185	100	peak
5	651.9417	29.84	2.27	32.11	46.00	-13.89	178	100	peak
6	920.6250	76.53	5.79	82.32	94.00	-11.68	168	100	Fundamental

Operating Condition: Transmitting Middle Channel (922.125MHz)

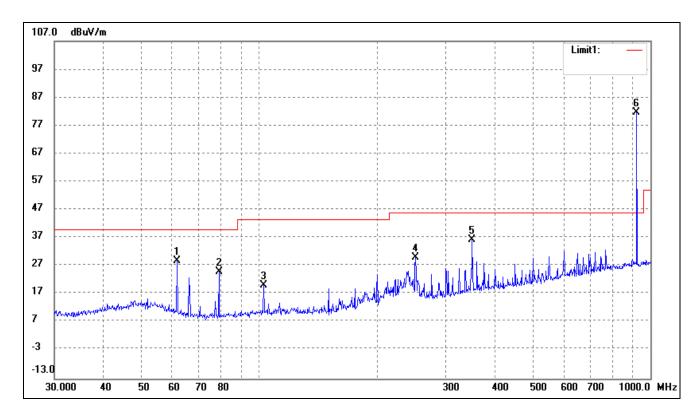
Comment: DC 3.7V

Test Specification: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degr	Height	Remark
							ee		
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	251.1804	37.98	-6.14	31.84	46.00	-14.16	162	100	peak
2	300.3673	38.48	-4.98	33.50	46.00	-12.50	200	100	peak
3	324.4561	39.28	-4.24	35.04	46.00	-10.96	158	100	peak
4	350.4768	46.76	-3.11	43.65	46.00	-2.35	127	100	peak
5	501.1790	35.19	-0.60	34.59	46.00	-11.41	169	100	peak
6	922.1250	84.93	5.79	90.72	94.00	-3.28	85	100	Fundamental

Test Specification: Vertical

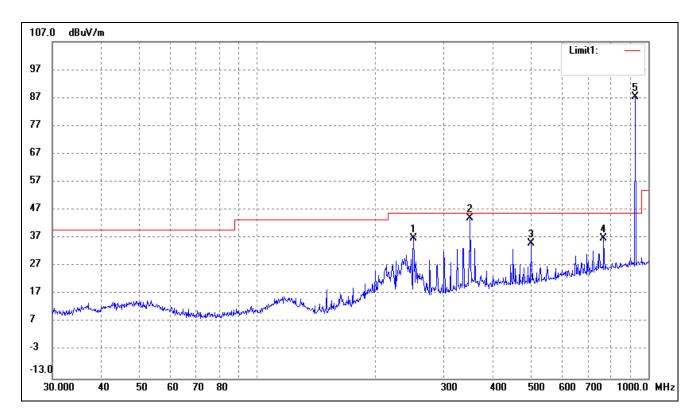


No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	61.7781	39.79	-10.82	28.97	40.00	-11.03	240	100	peak
2	78.9652	37.29	-12.30	24.99	40.00	-15.01	187	100	peak
3	102.7192	31.23	-11.01	20.22	43.50	-23.28	220	100	peak
4	251.1804	36.33	-6.14	30.19	46.00	-15.81	198	100	peak
5	350.4768	39.40	-3.11	36.29	46.00	-9.71	125	100	peak
6	922.1250	75.92	5.79	81.71	94.00	-12.29	145	100	Fundamental

Operating Condition: Transmitting High Channel (924.375MHz)

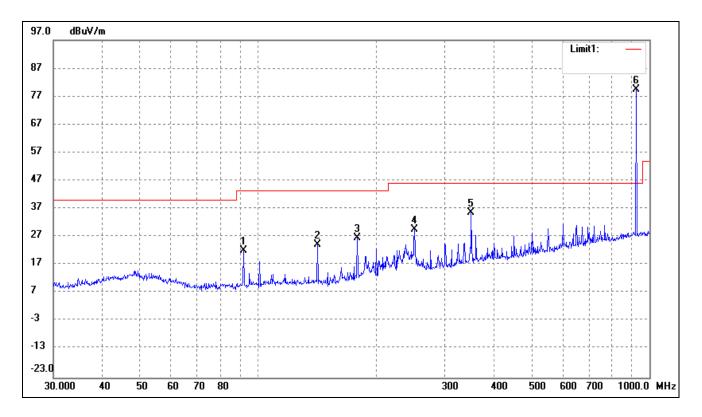
Comment: DC 3.7V

Test Specification: Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	251.1804	43.03	-6.14	36.89	46.00	-9.11	162	100	peak
2	350.4768	47.34	-3.11	44.23	46.00	-1.77	200	100	peak
3	501.1790	35.68	-0.60	35.08	46.00	-10.92	147	100	peak
4	768.7482	32.83	4.06	36.89	46.00	-9.11	158	100	peak
5	924.3750	81.62	5.80	87.42	94.00	-6.58	169	100	Fundamental

Test Specification: Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	(•)	(cm)	
1	91.8163	34.04	-11.86	22.18	43.50	-21.32	240	100	peak
2	141.8262	35.05	-10.91	24.14	43.50	-19.36	187	100	peak
3	179.3864	35.90	-9.31	26.59	43.50	-16.91	220	100	peak
4	251.1804	35.79	-6.14	29.65	46.00	-16.35	148	100	peak
5	350.4768	38.71	-3.11	35.60	46.00	-10.40	152	100	peak
6	924.3750	73.73	5.80	79.53	94.00	-14.47	168	100	Fundamental

### Spurious Emissions Above 1GHz

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector			
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V				
Low Channel-920.625MHz										
1841.25	34.17	10.27	44.44	74.00	-29.56	Н	PK			
1841.25	20.77	10.27	31.04	54.00	-22.96	Н	AV			
1841.25	36.05	10.27	46.32	74.00	-27.68	V	PK			
1841.25	25.33	10.27	35.60	54.00	-18.40	V	AV			
	Middle Channel-922.125MHz									
1644.25	34.85	10.28	45.13	74.00	-28.87	Н	PK			
1644.25	19.33	10.28	29.61	54.00	-24.39	Н	AV			
1644.25	34.85	10.28	45.13	74.00	-28.87	V	PK			
1644.25	20.21	10.28	30.49	54.00	-23.51	V	AV			
			High Channel	-924.375MHz						
1848.75	33.81	10.29	44.10	74.00	-29.90	Н	PK			
1848.75	20.90	10.29	31.19	54.00	-22.81	Н	AV			
1848.75	36.00	10.29	46.29	74.00	-27.71	V	PK			
1848.75	22.38	10.29	32.67	54.00	-21.33	V	AV			

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 3<sup>th</sup> Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured. The measurements greater than 20dB below the limit from 9kHz to 30MHz..

# 5. Out of Band Emissions

# **5.1 Standard Applicable**

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

#### **5.2 Test Procedure**

As the radiation test, set the Lowest and Highest Transmitting Channel, observed the outside band of 2400MHz to 2483.5MHz, than mark the higher-level emission for comparing with the FCC rules.

### **5.3 Environmental Conditions**

Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	1012 mbar

# **5.4 Summary of Test Results/Plots**

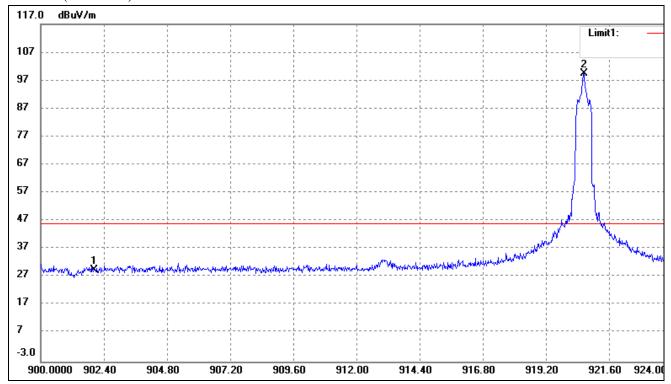
Togt made	Frequency	Limit	Result	
Test mode	MHz	dBuV / dBc		
Lowest	902.00	<46 dBuV	Pass	
Lowest	928.00	<46 dBuV	Pass	

The edge emissions are below the FCC 15.209 Limits or complies with the 15.249 requirements.

Please refer to the test plots as below.

# Lowest Bandedge

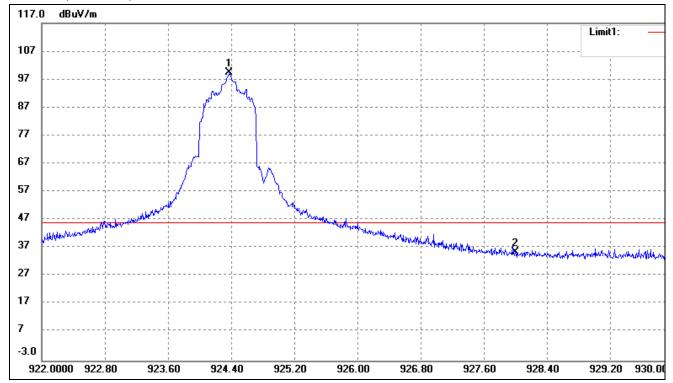
# Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	902.0000	23.84	5.66	29.50	46.00	-16.50	Peak Detector
2	920.6400	93.77	5.77	99.54	/	/	Fundamental

# Highest Bandedge

Vertical (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	924.3760	93.73	5.79	99.52	/	1	Fundamental
2	928.0000	29.74	5.81	35.55	46.00	-10.45	Peak Detector

## 6. Emission Bandwidth

## 6.1 Standard Applicable

According to 15.215 (c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

#### **6.2 Test Procedure**

According to the ANSI 63.4-2014, the emission bandwidth test method as follows.

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Set span = 1MHz, centered on a transmitting channel

RBW ≥1% 20dB Bandwidth, VBW ≥RBW

Sweep = auto

Detector function = peak

Trace = max hold

All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down and 99% bandwidth of the emission.

#### **6.3 Environmental Conditions**

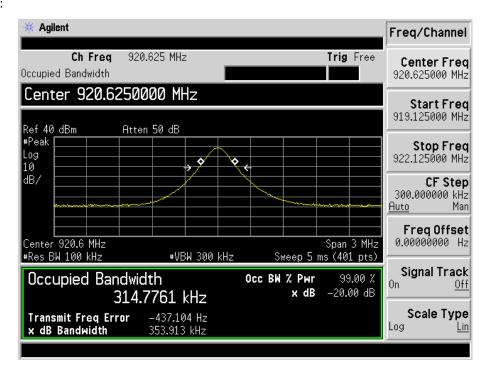
Temperature:	25 °C		
Relative Humidity:	53%		
ATM Pressure:	1018 mbar		

## 6.4 Summary of Test Results/Plots

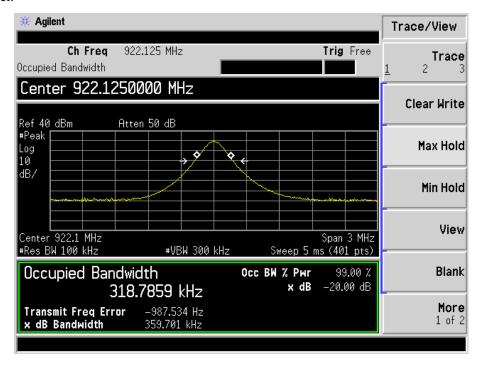
Channel	Frequency	20dB Bandwidth	99% Bandwidth
Channel	MHz	kHz	kHz
Low Channel	920.625	353.913	314.7761
Middle Channel	922.125	359.701	318.7859
High Channel	924.375	359.395	318.9337

# Please refer to the following test plots

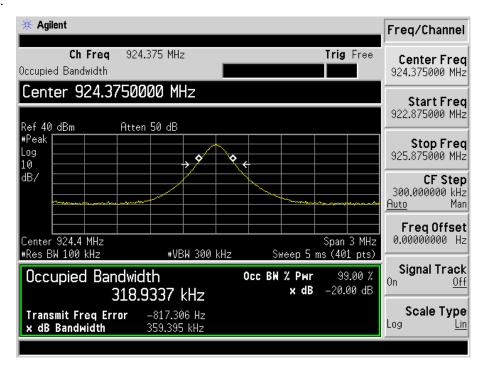
#### Low Channel:



#### Middle Channel:



#### High Channel:



# 7. Conducted Emissions

# 7.1 Measurement Uncertainty

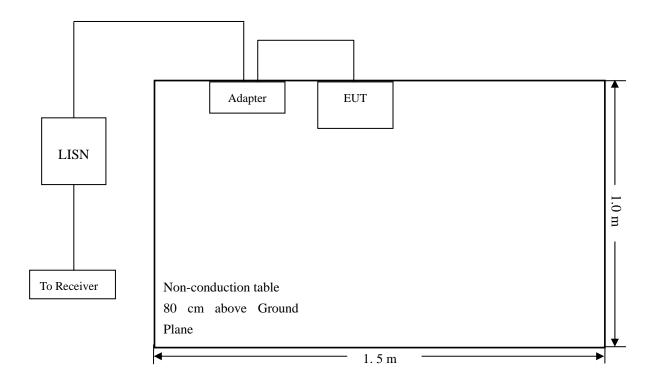
Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is  $\pm$  2.88 dB.

### 7.2 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

# 7.3 Basic Test Setup Block Diagram



#### 7.4 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

# 7.5 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency	150 kHz
Stop Frequency	30 MHz
Sweep Speed	Auto
IF Bandwidth	10 kHz
Quasi-Peak Adapter Bandwidth	9 kHz
Ouasi-Peak Adapter Mode	Normal

# 7.6 Summary of Test Results/Plots

According to the data in section 7.7, the EUT <u>complied with the FCC Part 15.207</u> Conducted margin for this device, with the *worst* margin reading of:

-2.19 dB at 0.4420 MHz in the Neutral mode, Peak detector, 0.15-30MHz

### 7.7 Conducted Emissions Test Data

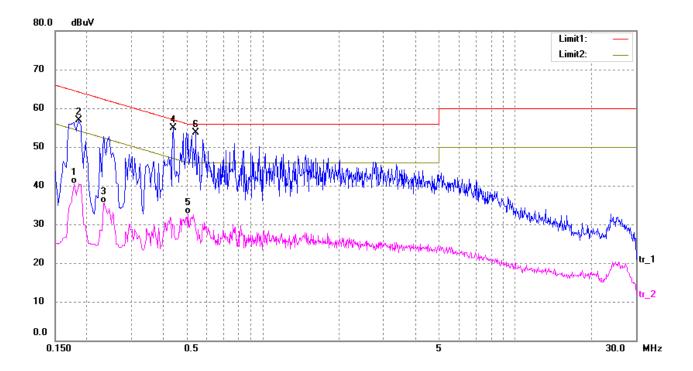
### **Plot of Conducted Emissions Test Data**

EUT: WCDMA wireless data terminal

Tested Model: AT911N
Operating Condition: Transmitting

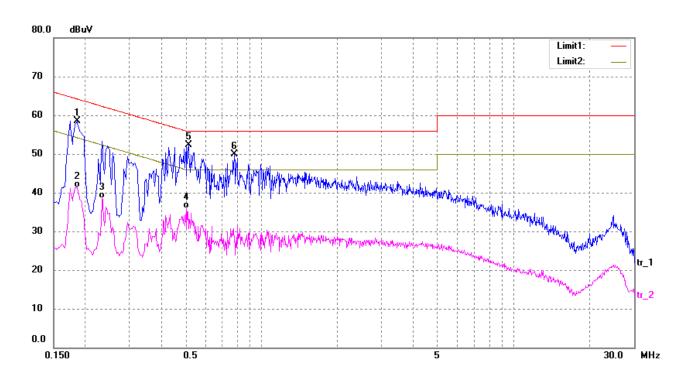
Comment: AC 120V/60Hz; Adapter DC 5V/2A

Test Specification: Neutral



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1	0.1780	28.03	12.50	40.53	54.58	-14.05	AVG
2	0.1860	44.47	12.50	56.97	64.21	-7.24	peak
3	0.2340	23.06	12.50	35.56	52.31	-16.75	AVG
4	0.4420	42.33	12.50	54.83	57.02	-2.19	peak
5	0.5060	20.15	12.51	32.66	46.00	-13.34	AVG
6	0.5420	41.23	12.54	53.77	56.00	-2.23	peak

Test Specification: Line



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1	0.1860	45.91	12.50	58.41	64.21	-5.80	peak
2	0.1860	28.89	12.50	41.39	54.21	-12.82	AVG
3	0.2340	25.94	12.50	38.44	52.31	-13.87	AVG
4	0.5020	23.46	12.50	35.96	46.00	-10.04	AVG
5	0.5140	39.79	12.51	52.30	56.00	-3.70	peak
6	0.7820	37.07	12.78	49.85	56.00	-6.15	peak

\*\*\*\*\* END OF REPORT \*\*\*\*\*