CMA Testing and Certification Laboratories
廠商會檢定中心

Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

Application No. : LT047751(2)

Applicant : Skylink Technologies
17 Sheard Avenue, Brampton
Ontario, L6Y 1J3, Canada

Sample Description : One(1) item of submitted sample stated to be:

Sample Description	Model No.
Residential garage door opener	ATOMS, AT-600, AT-603, AT-803, AT-800

Radio Frequency : 433MHz Transmitter; 318MHz Receiver
Rating : AC 120 V
No. of submitted sample : Two (2) piece (s)
Sample registration No. : RT051650-002

Date Received : 17 Nov 2015.

Test Period : 17 Nov 2015 to 25 Nov 2015.

Test Requested : FCC 47CFR Part 15 Certification.
Industry Canada Interference Causing Equipment Standard RSS-210.

Test Method : 47 CFR Part 15 (10-1-15 Edition)
ANSI C63.10 – 2013
RSS-210 Issue 8
RSS-GEN Issue 4

Test Result : See attached sheet(s) from page 2 to 36.

Conclusion : The submitted sample was found to comply with requirement of FCC 47CFR Part 15 Subpart C and Industry Canada RSS-210 Issue 8.

The Test Report AT0075656(7) issued on 27 Nov 2015 which found to comply with requirement of FCC Part 15 B Declaration of Conformity and Industry Canada RSS-210 Issue 8.

For and on behalf of
CMA Industrial Development Foundation Limited

Authorized Signature : _____

Mr. WONG Lap-pong, Andrew
Manager
Electrical Division

FCC ID: MY5ATOMS
IC: 3133B-ATOMS

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Remark : All five models are the same in circuitry and components; and therefore model ATOMS was chosen to be the representative of the test sample. The difference between the tested model and the declared model(s) is/are the Model no.

For and on behalf of
CMA Industrial Development Foundation Limited

Authorized Signature : _____

Mr. WONG Lap-pong, Andrew
Manager
Electrical Division

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1 General Information

1.1 General Description

The equipment under test (EUT) is a transceiver for garage door opener. It operates at 433MHz for transmission and 318MHz for receiver. The oscillation of radio control is generated by a 13.565 MHz crystal for RF transmitter and 9.909 MHz crystal for RF receiver. The EUT is powered by AC120V.

The garage door opener uses radio frequency modulation receiver, carrier frequency is 318MHz. It has the wall button or wall console or remote transmitter to activate the unit. Each device has unique ID code. Therefore the garage door opener will not respond to peripherals devices from other system. When receive the proper signal, the garage door opener will activate the motor to move the properly balanced residential garage door.

The garage door opener consist the following major functional portion, namely digital contrail portion, radio frequency receiver, IR sensing, power supply portion. The digital portion is controlled by a micro-controller unit which continuously monitors the system status, transform the signal to activate the motor, interfaces with the operator through the remote or wall console.

The antenna terminal is permanently attached in EUT and the radio output power is unable to adjust.

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The brief circuit description is listed as follows:

For main board:

-U1, U13, Q19, D22, D24, RV4	and its associated circuit act as voltage regulator
-Q6_B1, Q11-Q12, D11, D16, D21, D23	and its associated circuit act as battery charge control
-U3_M, Y2	and its associated circuit act as MCU
-U5-B, D1	and its associated circuit act as power detection
-U7	and its associated circuit act as EEPROM
-U10, D8-D10	and its associated circuit act as analog switch
-U12-A, U12-B, M2, Q5, Q9-Q10, Q13, Q15, D15, D18, D19	and its associated circuit act as Motor and control
-LED1	and its associated circuit act as segment display
-BUZZER1, Q2	and its associated circuit act as buzzer
-B1, B2	and its associated circuit act as ac to dc rectifier
-U11, D12-D14, LED_F1-LED_F24	and its associated circuit act as LED Light, power and control
-U2, U9, Q4, Q16	and its associated circuit act as hall sensor
-U5-A, U14D-G, Q1, Q3, Q8, RV1, RV2, D4-D5	and its associated circuit act as safety sensor

For the part of TX:

-U2, Y1, ANT1	and its associated circuit act as TX module

For the part of RX:

-U3, YF1, ANT	and its associated circuit act as RX module

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1.2 Location of the test site

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.4 – 2009. A Semi-Anechoic Chamber Testing Site is set up for investigation and located at:

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
Fo Tan, Shatin,
New Territories,
Hong Kong.

Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.4 – 2009. A shielded room is located at :

Ground Floor, Yan Hing Centre,
9 – 13 Wong Chuk Yeung Street,
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FCC Registration Number: 552221
IC Assigned Code: 4093A-2

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1.3 List of measuring equipment

Equipment	Manufacturer	Model No.	Serial No.	Calibration Due Date
EMI Test Receiver	Rohde & Schwarz	ESCI	100152	28 Sep 2016
Spectrum Analyze	Rohde & Schwarz	FSV 40	100964	03 Feb 2016
Broadband Antenna	Schaffner	CBL6112B	2718	20 Feb 2016
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-531	25 Nov 2016
Broadband Pre-Amplifier	Schwarzbeck	BBV 9718	9718-119	25 Nov 2016
Loop Antenna	EMCO	6502	00056620	28 Dec 2015
Artificial Main Network	Rohde & Schwarz	ENV216	101232	22 Oct 2016
Coaxial Cable	Schaffner	RG213/U	N/A	18 May 2016
Coaxial Cable	Suhner	RG214/U	N/A	18 May 2016
Coaxial Cable	HUBER+SUHNER	84225426	MY24201/4	24 Nov 2016

1.4 Measurement Uncertainty

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a level of confidence of approximately 95%.

Radiated emissions

Frequency	Uncertainty (U_{lab})
30MHz ~ 200MHz (Horizontal)	4.66dB
30MHz ~ 200MHz (Vertical)	4.67dB
200MHz ~1000MHz (Horizontal)	4.68dB
200MHz ~1000MHz (Vertical)	4.67dB

Conducted emissions

Frequency	Uncertainty (U_{lab})
150kHz ~ 30MHz	2.63dB

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2 Description of the radiated emission test

2.1 Test Summary

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Radiated emission	15.231(b)	RSS-210 Issue 8 Annex A1.1 Table A & Clause 2.2	Comply
Assigned bandwidth (20dB bandwidth)	15.231(c)	-	Comply
Occupied bandwidth >0.25% of the centre frequency	-	RSS-210 Issue 8 Annex A1.1.3	Comply
Power line conducted emission	15.207	RSS-Gen Issue 4 Clause 7.2.4	Comply
Transmission time after manual activation	15.231(a)	RSS-210 Issue Annex A1.1.1	Comply

2.2 Test Procedure

Radiated emissions measurements are investigated and taken pursuant to the procedures of ANSI C63.10 – 2013.

A non-conductive turntable with dimensions of 1.5m x 0.4m x 0.8m (L x W x H) placed above the reference ground plane. The equipment under test (EUT) was placed at 0.8m height for below 1GHz measurement and 1.5m height for above 1GHz measurement. The test distance is 3m between EUT and receiving antenna. A broadband antenna mounting on the mast received the signal strength. The turntable was rotated to maximize the emission level. The antenna was moving along the mast from 1m up to 4m until no more higher value was found. Both horizontal and vertical polarization of the antenna were placed and investigated. Additional absorbing material will be placed between the EUT and receiving antenna for above 1GHz measurement.

For below 30MHz, a loop antenna with its vertical plane is placed 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1 m above the ground.

The device was rotated through three orthogonal axes to determine which attitude and configuration produce the highest emission during measurement.

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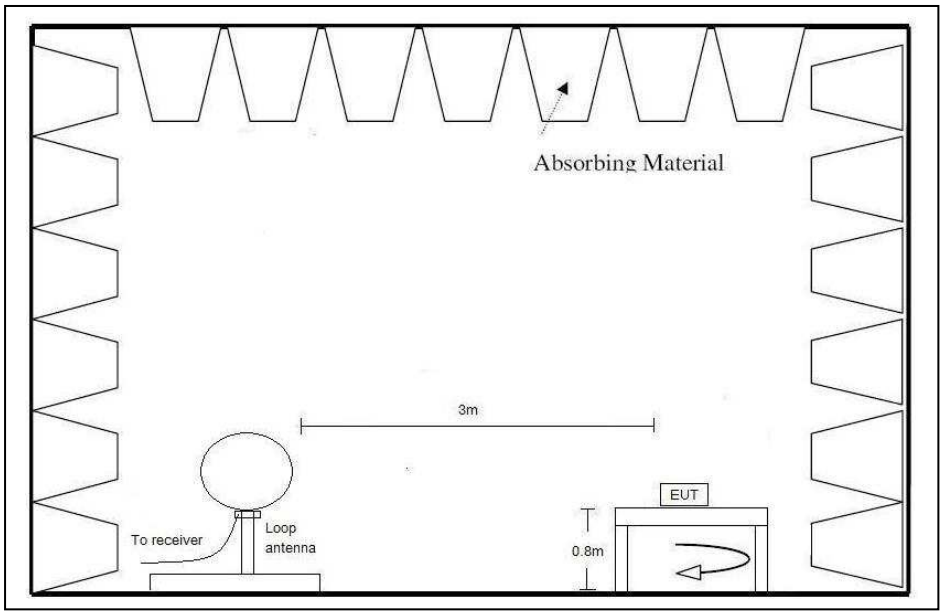
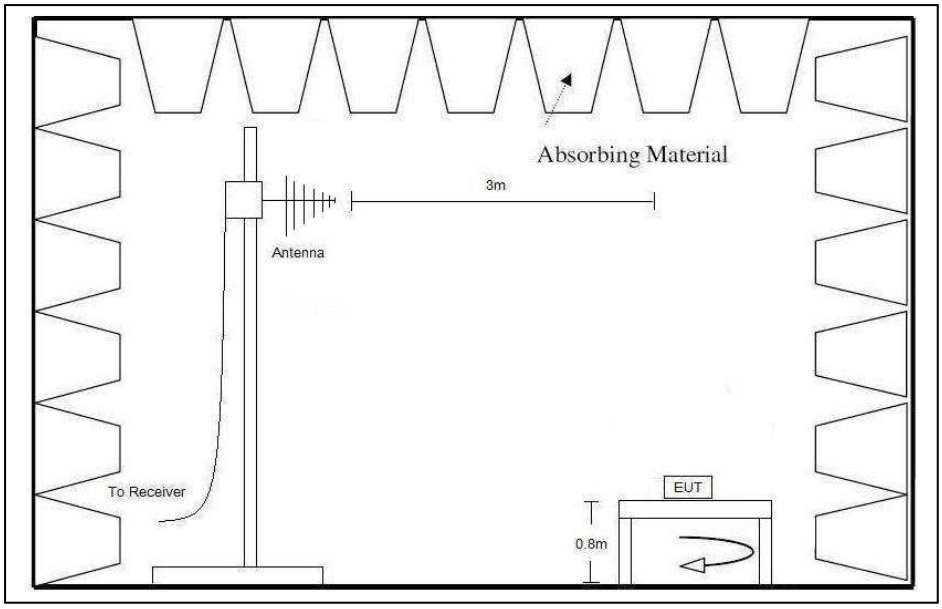
2.3 Test Setup



Below 30MHz



30MHz – 1GHz

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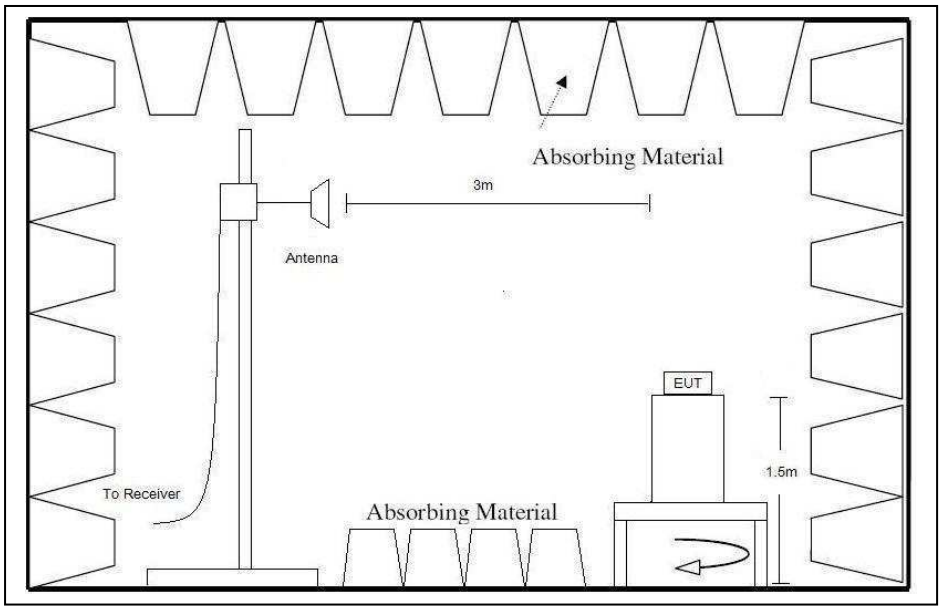
2.3 Test Setup



Above 1GHz

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2.4 Test Result

Peak Detector data was measured unless otherwise stated.

The radiated emissions are measured from 9kHz to 4.4GHz (the tenth harmonics)

"#" means emissions appearing within the restricted bands shall follow the requirement of 47 CFR Part 15 section 15.205 and RSS-GEN section 8.10.

The frequencies from fundamental up to tenth harmonics were investigated, and emissions more 20dB below limit were not reported. Thus, those highest emissions were presented in next pages.

It was found that the EUT meet the FCC and RSS requirement.

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2.5 Radiated Emission Measurement Data

Radiated emission

Environmental conditions:

Parameter	Recorded value	
Ambient temperature:	26	° C
Relative humidity:	66	%

Frequency (MHz)	Polarity (H/V)	Reading at 3m (dBμV)	Antenna Factor and Cable Loss (dB/m)	Field Strength at 3m (dBμV/m)	Limit at 3m (dBμV/m)	Margin (dB)	Detector Type
433.924	H	62.1	21.6	83.7	100.8	-17.1	Peak
867.861	H	22.1	24.3	46.4	80.8	-34.4	Peak
#1301.819	H	49.2	-7.6	41.6	74.0	-32.4	Peak
1735.718	H	51.1	-7.7	43.4	80.8	-37.4	Peak
2169.513	H	45.8	-6.5	39.3	80.8	-41.5	Peak
2603.464	H	55.1	-4.2	50.9	80.8	-29.9	Peak
3037.674	H	53.0	-2.8	50.2	80.8	-30.6	Peak
3471.611	H	51.2	-2.8	48.4	80.8	-32.4	Peak
#3905.998	V	54.0	-1.7	52.3	74.0	-21.7	Peak
#4339.542	H	46.6	-0.6	46.0	74.0	-28.0	Peak

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2.5 Radiated Emission Measurement Data

Radiated emission

Environmental conditions:

Parameter	Recorded value	
Ambient temperature:	26	° C
Relative humidity:	66	%

Frequency (MHz)	Polarity (H/V)	Peak Reading at 3m (dBµVm)	Average Factor (dB)	Average Value at 3m (dBµV/m)	Limit at 3m (dBµV/m)	Margin (dB)
433.924	H	83.7	-3.5	80.2	80.8	-0.60
867.861	H	46.4	-3.5	42.9	60.8	-17.9
#1301.819	H	41.6	-3.5	38.1	54.0	-15.9
1735.718	H	43.4	-3.5	39.9	60.8	-20.9
2169.513	H	39.3	-3.5	35.8	60.8	-25.0
2603.464	H	50.9	-3.5	47.4	60.8	-13.4
3037.674	H	50.2	-3.5	46.7	60.8	-14.1
3471.611	H	48.4	-3.5	44.9	60.8	-15.9
#3905.998	V	52.3	-3.5	48.8	54.0	-5.20
#4339.542	H	46.0	-3.5	42.5	54.0	-11.5

Remark: According to FCC Part15 C clause 15.231 (b) and (or) RSS-210 Issued 8 Annex 1, the EUT shall demonstrate the compliance with the limits on the field strength of emissions based on the average value of the measured emissions. The equation with a sample calculation as follow: Average value = Peak value + 20 Log_{10} (Duty cycle), where the Duty cycle is calculated from following section 5.2.

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3 Description of the Line-conducted Test

3.1 Test Procedure

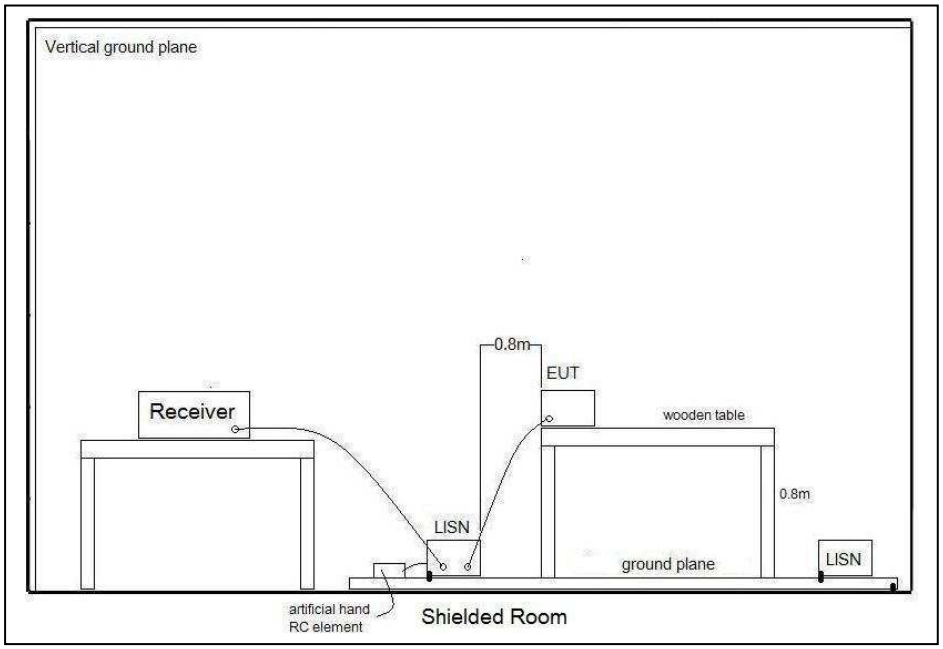
Conducted emissions measurements are investigated and also taken pursuant to the procedures of ANSI C63.10 – 2013. The EUT was setup as described in the procedures, and both lines were measured.

3.2 Test Result

The EUT has been tested in Transmission mode without LED Light operation.

PASS - It was found that the EUT met the FCC and RSS requirement.

3.3 Test Setup



3.4 Graph and Table of Conducted Emission Measurement Data

The test data and graphs had shown in Appendices A9.

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4 Photograph

4.1 Photographs of the Test Setup for Radiated Emission and Conducted Emission

The test setup photos had shown in Appendices A1 and A2.

4.2 Photographs of the External and Internal Configurations of the EUT

The photos of external and internal configurations had shown in Appendices A3 and A4.

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5 Supplementary document

The following document were submitted by applicant, and for electronic filing, the document are saved with the following filenames:

Document	Filename
ID Label/Location	LabelSmp.pdf
Block Diagram	BlkDia.pdf
Schematic Diagram	Schem.pdf
Users Manual	UserMan.pdf
Operational Description	OpDes.pdf

5.1 Bandwidth

An Appendices A6 is shown the fundamental emission is confined in the specified band. It also shows that the 20dB bandwidth met the 15.231(c) requirement.

An Appendices A6 is shown the fundamental emission is confined in the specified band. The 20dB bandwidth is 525.67kHz and 99% bandwidth is 408.53kHz. The bandwidth requirement is 0.25% of 433MHz = 1.083MHz .

5.2 Duty cycle

Base on the EUT characteristic, the duty cycle may be difference for the different receiver; therefore the worst case duty cycle is used for the average factor calculation.

The duty cycle is simply the on-time divided by the period:

Time duration of one cycle = 200ms

Effective period of one cycle = (4ms + 2ms + 1333µs + 667µs) x 1 +
(667µs + 1333µs) x 32 +
(1333µs + 667µs) x 32
= 136ms

Duty Cycle = 136 ÷ 200
= 0.667

Therefore, the average correction factor is found by $\underline{20 \log_{10}} 0.667 = -3.5$dB

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5.3 Transmission time

Duration of each transmission =2.66s

The duration of the transmission is less than 5s after the transmission is activated by remote controller. An Appendices A8 is shown the EUT to comply with FCC part 15, section 15.231(a)(1) and RSS-210, Annex 1, section A1.1.1.

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6 Appendices

A1.	Photos of the set-up of Radiated Emissions	3	page(s)
A2.	Photos of the set-up of Conducted Emissions	2	page(s)
A3.	Photos of External Configurations	2	page(s)
A4.	Photos of Internal Configurations	4	page(s)
A5.	ID Label/Location	2	page(s)
A6.	Bandwidth Plot	1	page(s)
A7.	Average Factor	1	page(s)
A8.	Transmission time	1	page(s)
A9.	Conducted Emission Measurement Data	2	page(s)

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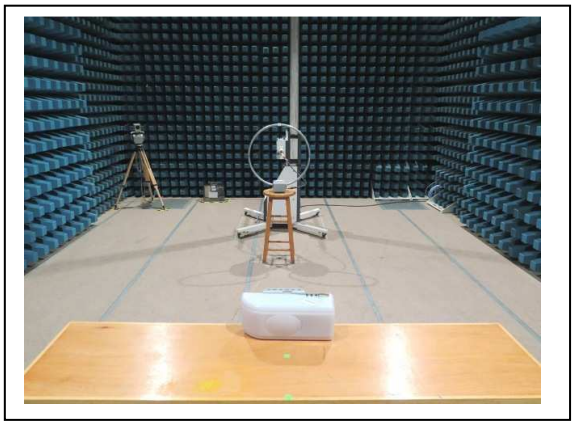
A1. Photos of the set-up of Radiated Emissions



(Front view, 9kHz – 30MHz)

(Back view, 9kHz – 30MHz)

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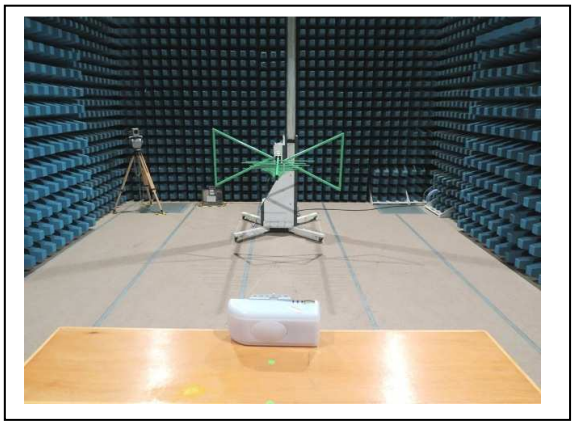
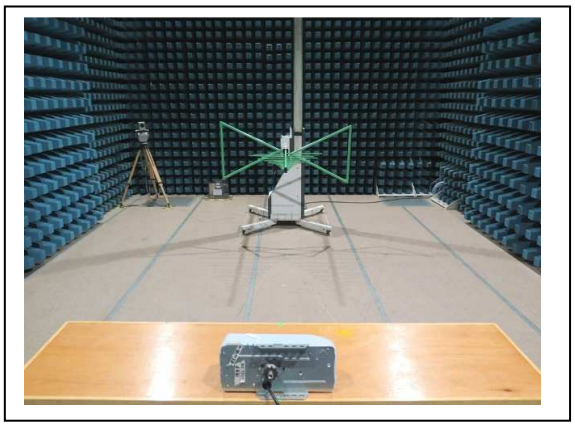
Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

A1. Photos of the set-up of Radiated Emissions



(Front view, 30MHz – 1GHz)



(Back view, 30MHz – 1GHz)

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Test Report

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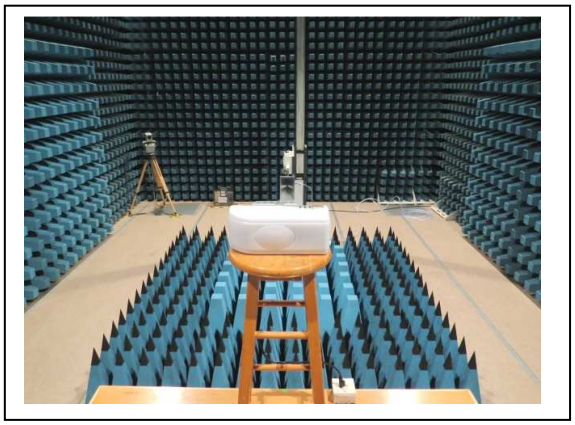
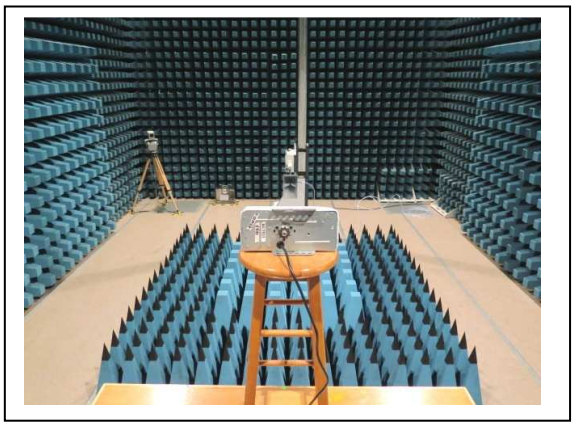
A1. Photos of the set-up of Radiated Emissions



(Front view, 1GHz – 4.4GHz)



(Back view, 1GHz – 4.4GHz)

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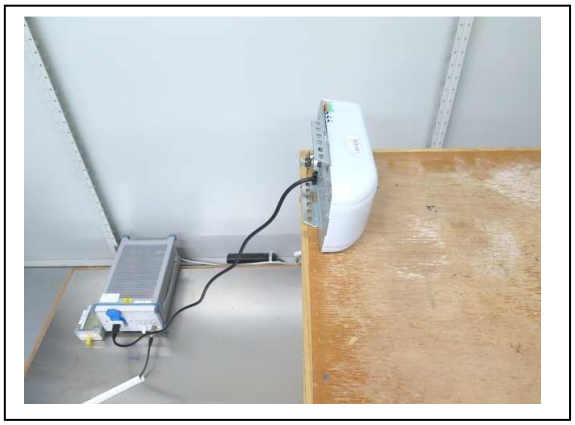
Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

A2. Photos of the set-up of Conducted Emissions



(Front view)

(Back view)

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Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

A2. Photos of the set-up of Conducted Emissions

(Side view)

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Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

A3. Photos of External Configurations

External Configuration 1

External Configuration 2

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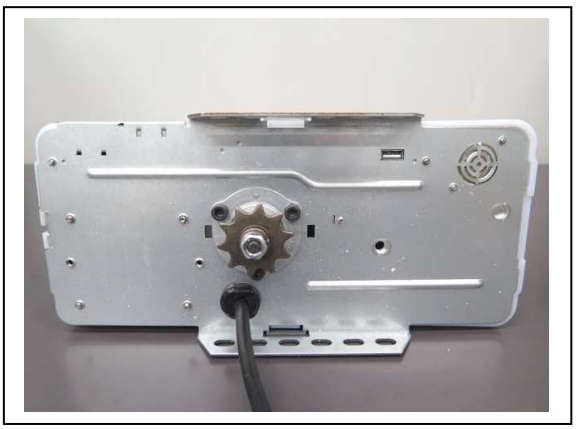
Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

A3. Photos of External Configurations

External Configuration 3



External Configuration 4

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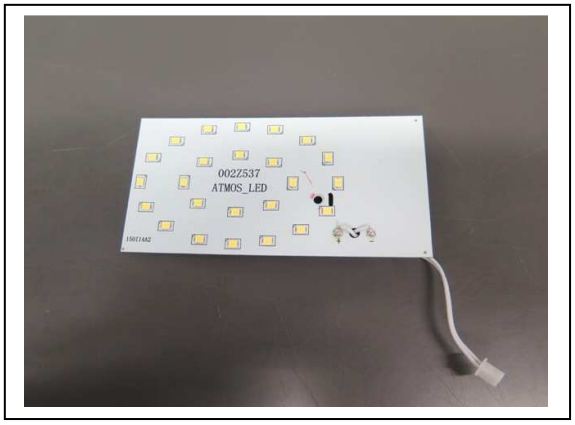
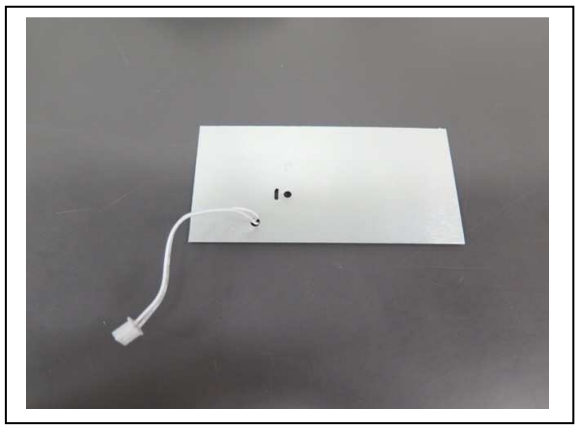
Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

A4. Photos of Internal Configurations



Internal Configuration 1 (LED light)



Internal Configuration 2 (LED light)

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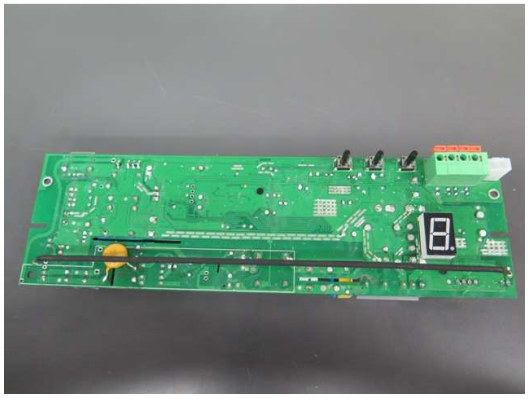
Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

A4. Photos of Internal Configurations

Internal Configuration 3 (Main board)



Internal Configuration 4 (Main board)

A4. Photos of Internal Configurations

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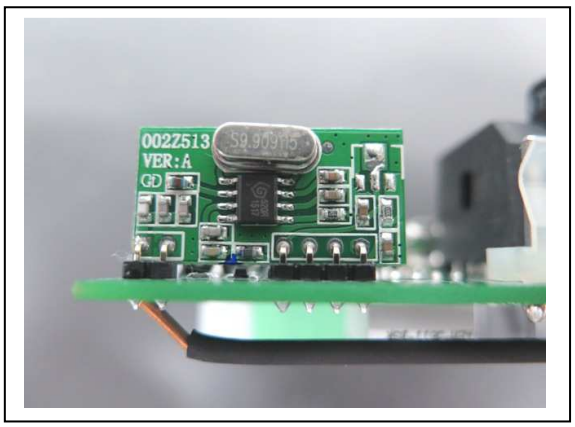
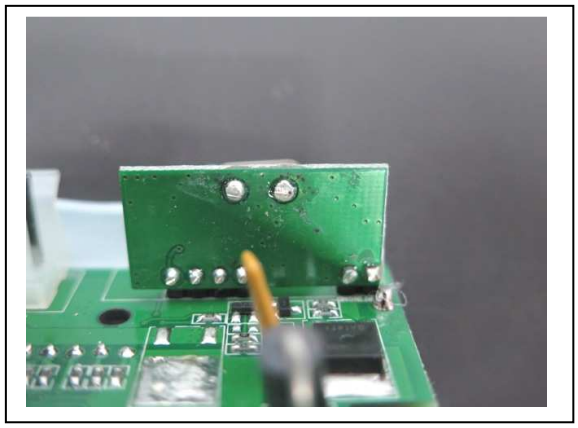


Internal Configuration 5 (Receiver module)



Internal Configuration 6 (Receiver module)

A4. Photos of Internal Configurations

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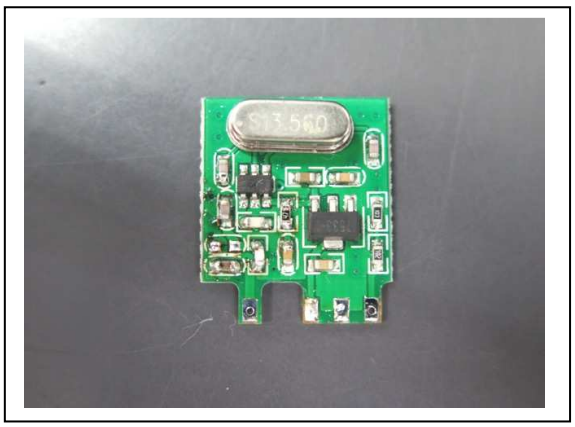

Internal Configuration 7 (Transmitter module)

Internal Configuration 8 (Transmitter module)

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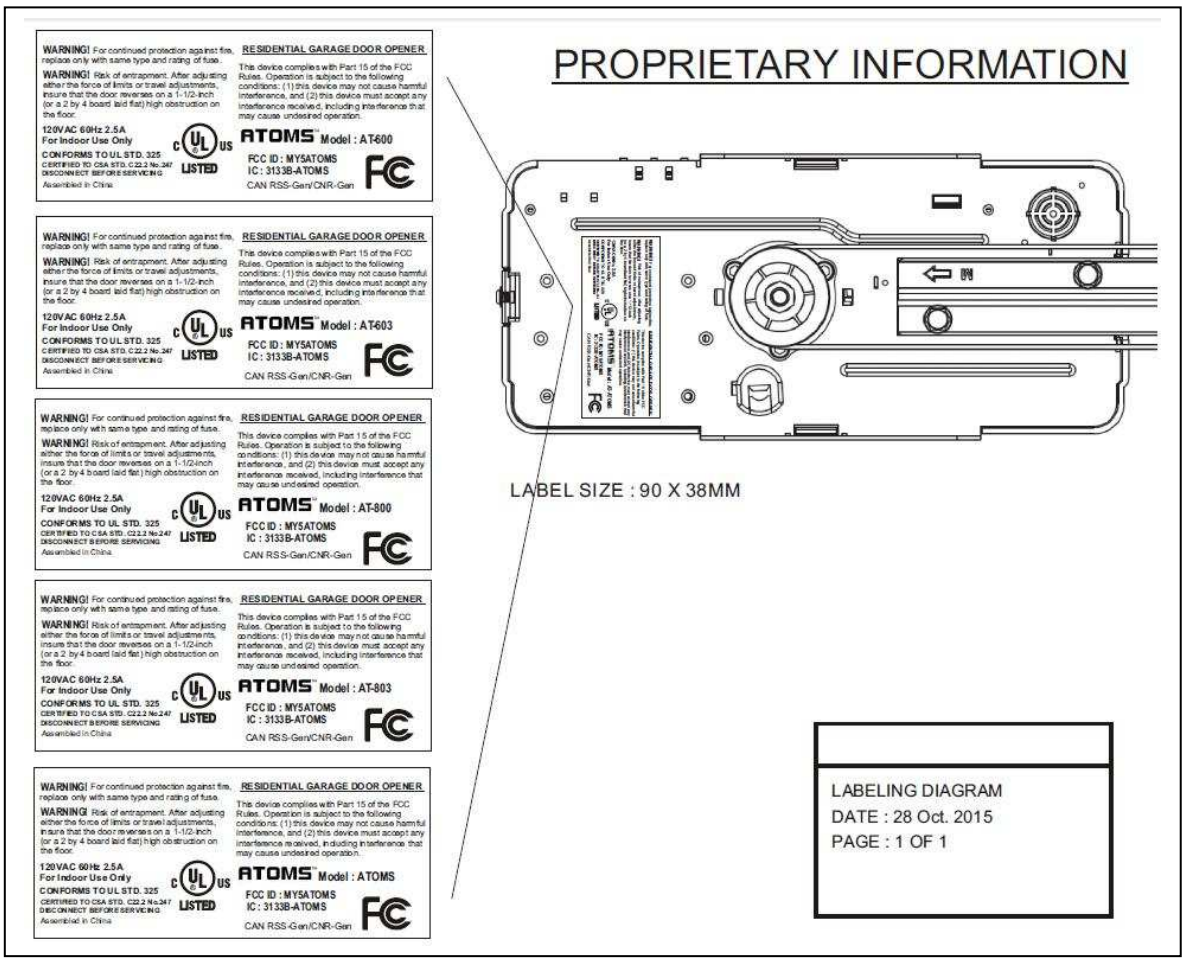
Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

A5. ID Label / Location



ID Label 1

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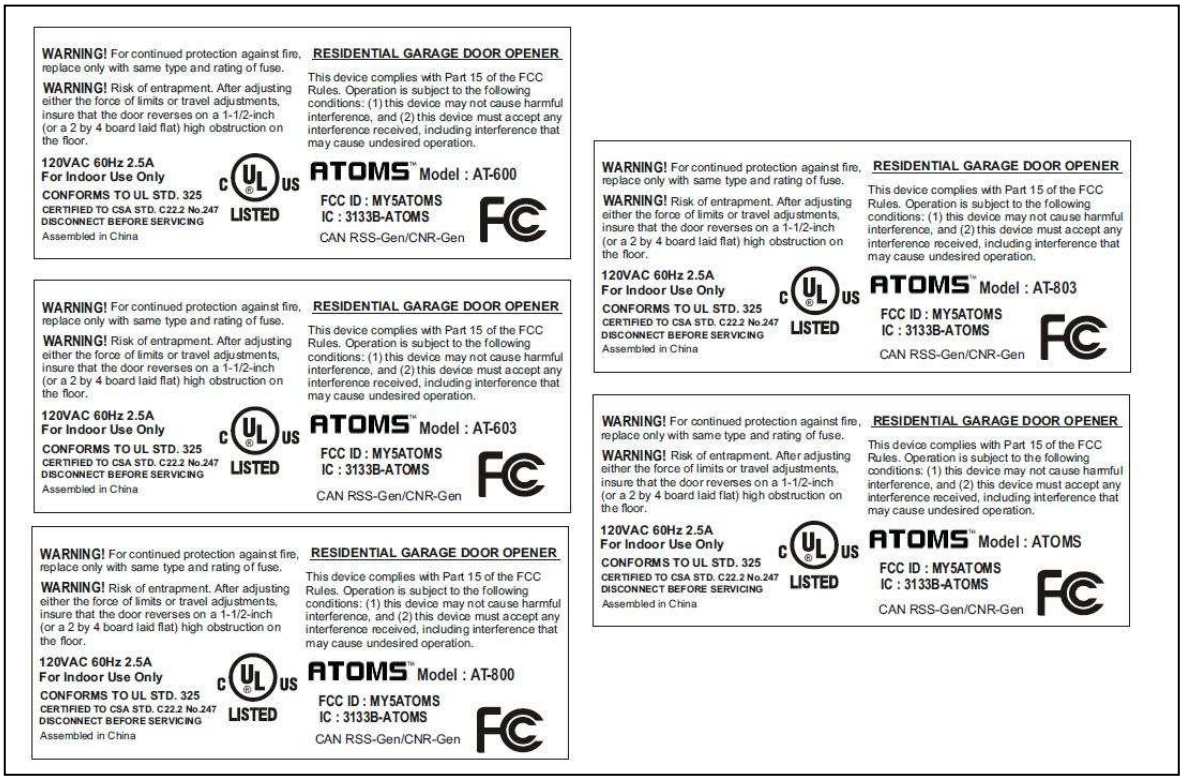
Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

A5. ID Label / Location



ID Label 2

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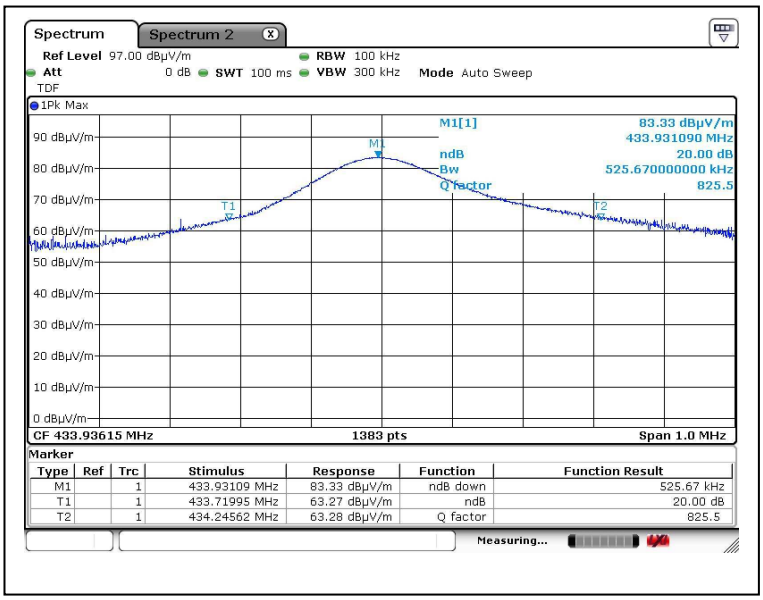
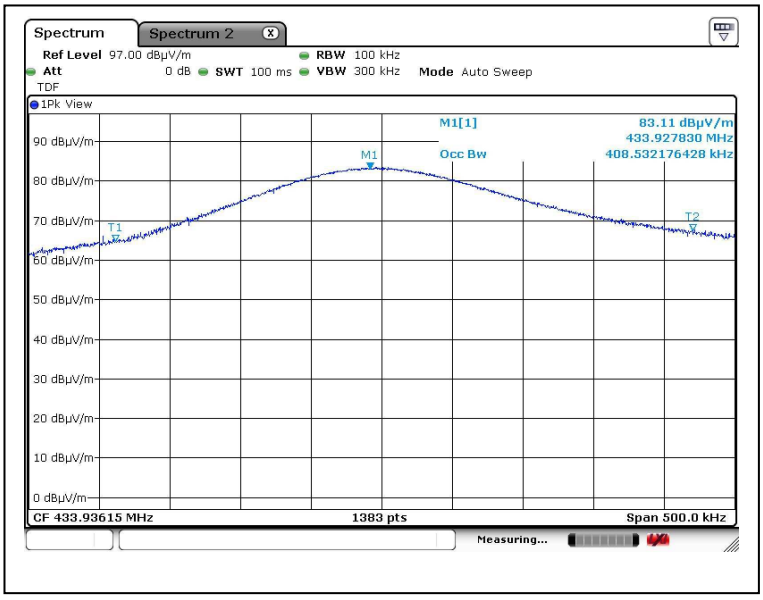
Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

A6. Bandwidth Plot



20dB bandwidth



99% occupied bandwidth

FCC ID: MY5ATOMS
IC: 3133B-ATOMS

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Test Report

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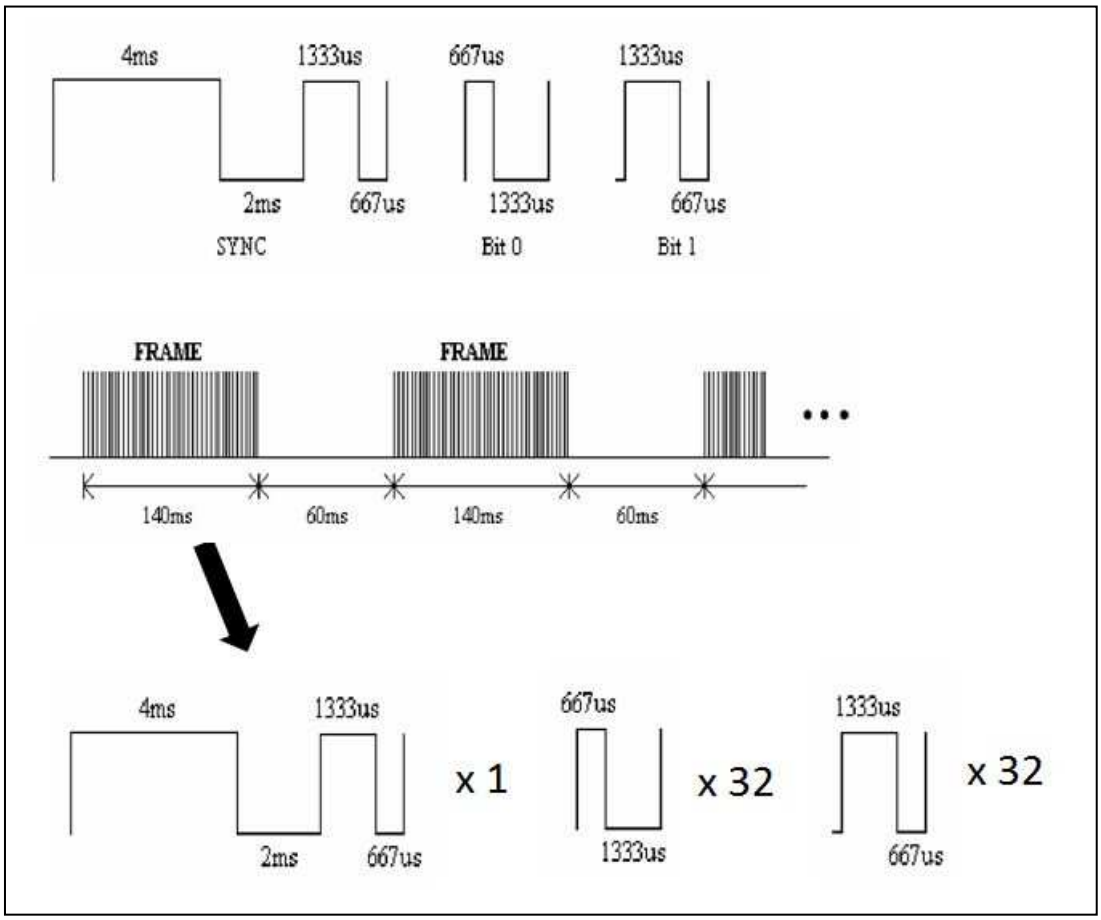
A7. Duty Cycle



Duty Cycle

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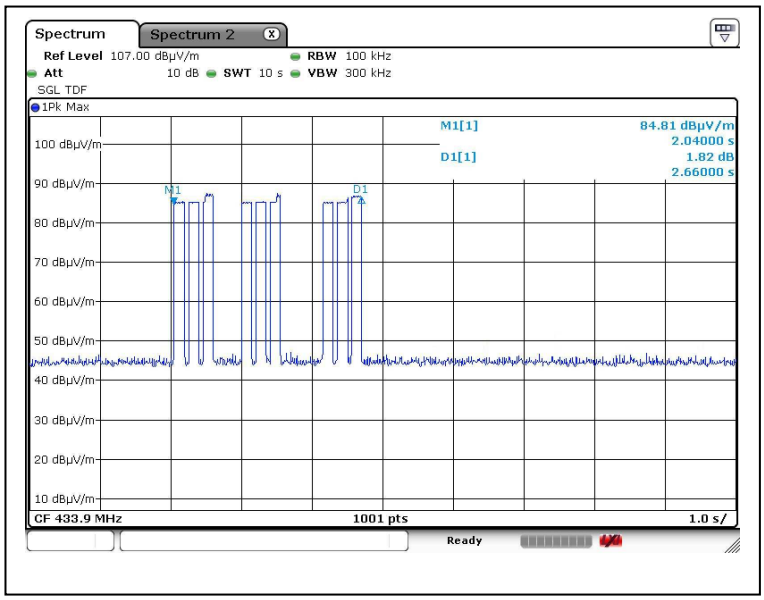
Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

A8. Transmission time



Transmission time 1

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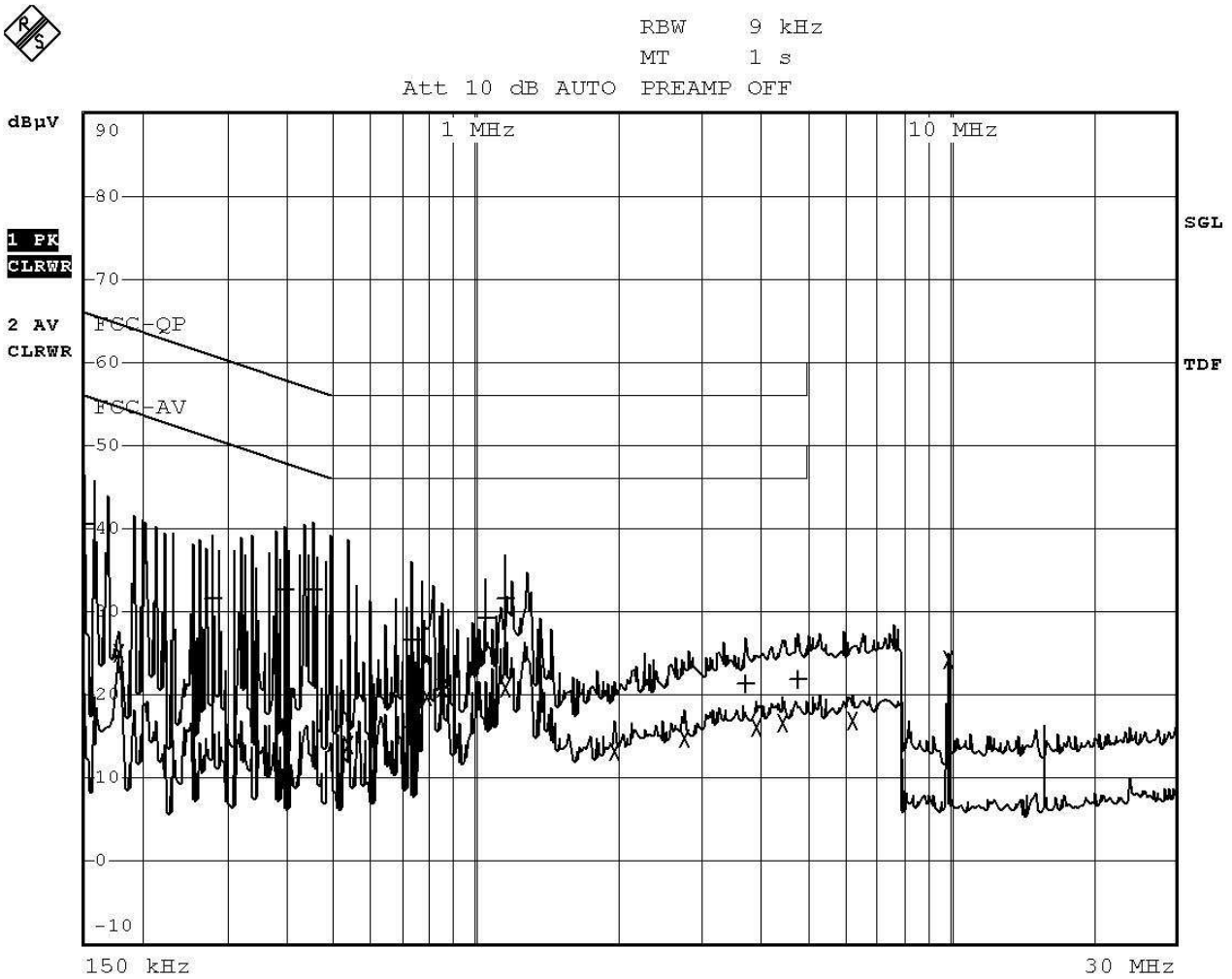
Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

A9. Conducted Emission Measurement Date



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Test Report

Report No. : AT0075124 (8) Date : 27 Nov 2015

A9. Conducted Emission Measurement Date

EDIT PEAK LIST (Final Measurement Results)				
Trace1:	FCC-QP			
Trace2:	FCC-AV			
Trace3:	---			
TRACE		FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Quasi Peak	150 kHz	40.48 N gnd	-25.51
2	Average	177 kHz	25.03 L1 gnd	-29.59
1	Quasi Peak	280.5 kHz	31.55 L1 gnd	-29.24
1	Quasi Peak	397.5 kHz	32.60 L1 gnd	-25.30
1	Quasi Peak	456 kHz	32.54 L1 gnd	-24.22
2	Average	536 kHz	14.12 N gnd	-31.87
1	Quasi Peak	734 kHz	26.66 L1 gnd	-29.33
2	Average	783.5 kHz	19.88 L1 gnd	-26.11
2	Average	846.5 kHz	20.92 L1 gnd	-25.07
1	Quasi Peak	1.0535 MHz	29.34 N gnd	-26.65
1	Quasi Peak	1.157 MHz	31.52 L1 gnd	-24.47
2	Average	1.157 MHz	20.80 N gnd	-25.19
2	Average	1.958 MHz	13.13 N gnd	-32.86
2	Average	2.759 MHz	14.83 N gnd	-31.16
1	Quasi Peak	3.7085 MHz	21.36 N gnd	-34.64
2	Average	3.8975 MHz	16.15 N gnd	-29.84
2	Average	4.4555 MHz	16.53 L1 gnd	-29.47
1	Quasi Peak	4.802 MHz	21.76 N gnd	-34.23
2	Average	6.26 MHz	16.94 N gnd	-33.05
2	Average	9.9095 MHz	24.29 L1 gnd	-25.70

****** End of Report ******

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