



Nemko Korea Co., Ltd.

155 & 159, Osan-Ro, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 449-852 KOREA, REPUBLIC OF
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FCC EVALUATION REPORT FOR CERTIFICATION

Applicant :

Samsung Electronics Co., Ltd.
129, Samsung-ro, Yeongtong-gu, Suwon-si,
Gyeonggi-do, 443-742 Korea, Republic of
Attn : Mr. Minhyeong Cho

Dates of Issue : June 11, 2015
Test Report No. : NK-15-E-0328
Test Site : Nemko Korea Co., Ltd.
EMC site, Korea

FCC ID

A3LCYLHDE01A

Trade Mark

SAMSUNG

Contact Person

Samsung Electronics Co., Ltd.
129, Samsung-ro, Yeongtong-gu, Suwon-si,
Gyeonggi-do, 443-742 Korea, Republic of
Mr. Minhyeong Cho
Telephone No. : + 82 31 277 2688

Applied Standard : FCC Part 15 Subpart B & Part 2, ICES-003
Classification : FCC Class B Device
EUT Type : ZigBee/Z-wave Dongle

The device bearing the brand name and model specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2009.

The test results of this report are deemed satisfactory evidence of compliance with Industry Canada Interference-causing Equipment Standard ICES-003.

I attest to the accuracy of data and all measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Jun 11, 2015

Tested By : Youngwoo Cho
Engineer

June 11, 2015

Reviewed By : Changsoo Choi
Technical Manager

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SCOPE

Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission under FCC part 15.

Responsible Party :	Samsung Electronics Co., Ltd.
Contact Person :	Mr. Minhyeong Cho Tel No.: + 82 31 277 2688
Manufacturer :	Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 443-742 Korea, Republic of

- FCC ID : A3LCYLHDE01A
- Model : CY-LHDE01A
- EUT Type: ZigBee/Z-wave Dongle
- Trade Mark: SAMSUNG
- Electric Rating: d.c. 5 V
- Test Voltage: a.c. 120 V, 60 Hz (Host Unit)
- I/O Port: USB x 1 EA
- Classification: FCC Class B Device
- Applied Standard: FCC Part 15 Subpart B & Part 2, ICES-003
- Test Procedure(s): ANSI C63.4 (2009)
- Dates of Test: June 02, 2015 to June 09, 2015
- Place of Tests: Nemko Korea Co., Ltd. EMC Site
- Test Report No.: NK-15-E-0328

INTRODUCTION

The measurement procedure described in 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 (ANSI C63.4-2009) was used in determining radiated and conducted emissions emanating from **Samsung Electronics Co., Ltd.**

FCC ID : **A3LCYLHDE01A, ZigBee/Z-wave Dongle.**

These measurement tests were conducted at **Nemko Korea Co., Ltd. EMC Laboratory.**

The site address is 155 & 159, Osan-Ro, Mohyeon-Myeon, Cheoin-Gu, Yongin-Si, Gyeonggi-Do 449-852 KOREA, REPUBLIC OF

The area of Nemko Korea Corporation Ltd. EMC Test Site is located in a mountain area at 80 kilometers (48 miles) southeast and Incheon International Airport (Incheon Airport), 30 kilometers (18 miles) south-southeast from central Seoul.

It is located in the valley surrounded by mountains in all directions where ambient radio signal conditions are quiet and a favorable area to measure the radio frequency interference on open field test site for the computing and ISM devices manufactures.

The detailed description of the measurement facility was found to be in compliance with the requirements of §2.948 according to FCC Part 2.



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Fig. 1. The map above shows the Seoul in Korea vicinity area.
The map also shows Nemko Korea Corporation Ltd. EMC Lab and Incheon Airport.

TEST CONDITIONS & EUT INFORMATION

Operating During Test

The EUT was tested after connecting to a LED TV and controlled through the Zig system provided by the manufacturer.

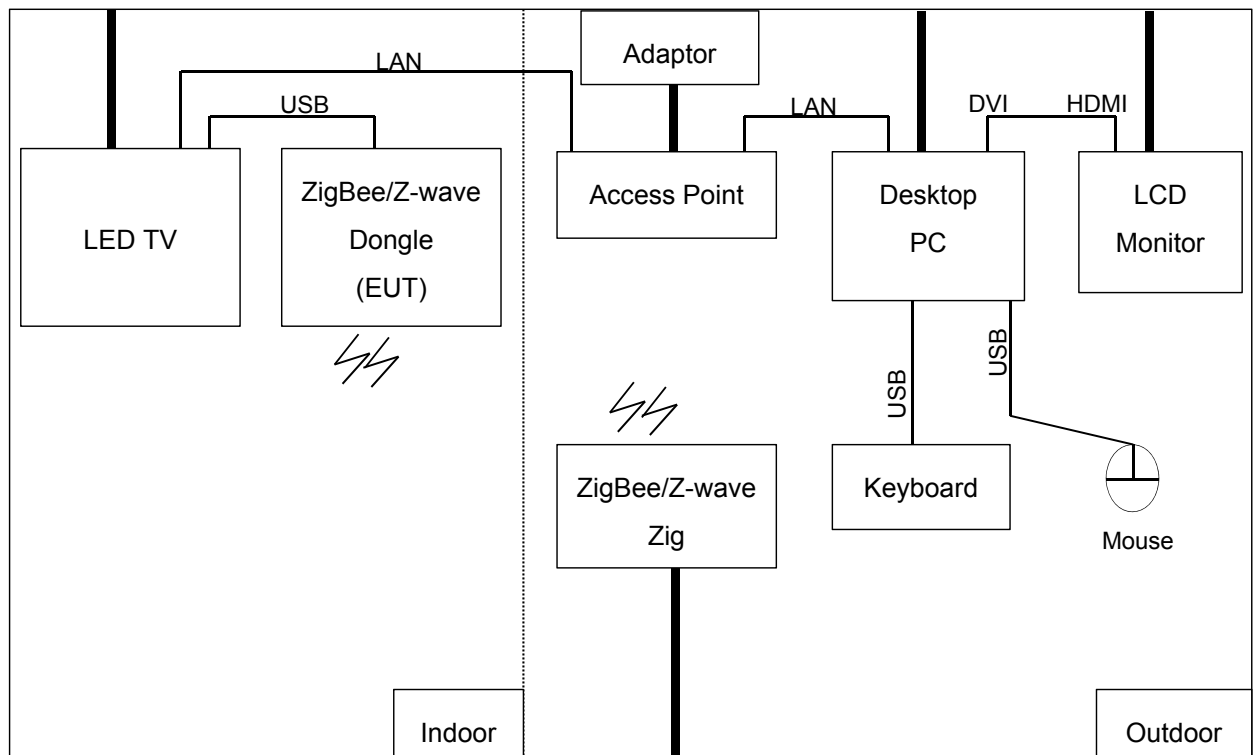
Support Equipment

ZigBee/Z-wave Dongle (EUT)	Samsung Electronics Co., Ltd. FCC ID : A3LCYLHDE01A 0.4 m shielded USB cable	FCC Verification S/N : N/A
LED TV	N/A Model : HG48ND690DFXZA 1.7 m unshielded power cable 4.8 m unshielded LAN cable	S/N : 1B2XX33BG100007V
ZigBee & Z-wave Zig	N/A Model : N/A 1.7 m unshielded power cable	S/N : N/A
LCD Monitor	Samsung Electronics Co., Ltd. Model : HG22na470 1.7 m unshielded power cable	S/N : Z5GY3CPF400008W
Desktop PC	Samsung Electronics Co., Ltd. Model : DB-P400 1.6 m unshielded power cable 0.8 m unshielded LAN cable	S/N : HFEV97AB500115H
Keyboard	MONTEREY INTERNATIONAL CORP. Model : K6723 1.8 m shielded USB cable	S/N : CN13BA5903224AGP53F2A807
Mouse	PRIMAX ELECTRONICS Model : MOARUO 1.7 m shielded USB cable	S/N : 20-1AR03S504
Access Point	N/A Model : N604R PLUS	S/N : N/A
Adaptor	SHENZHEN KUANTEN LIMITED Model : SSA021F090050KODM 1.7 m unshielded power cable	S/N : 1452

EUT Information

Frequency Range	ZigBee : 2400 – 2483.5 MHz
	Z-wave : 908.42 MHz, 908.40 MHz, 916.00 MHz
Clock(s)	Z-wave SoC (X-tal : 32 MHz), ZigBee Single-Chip (X-tal : 24 MHz),
	USB HUB (X-tal : 12 MHz)
Port	USB Port x 1 EA

Setup Drawing



SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specification:

Name of Test	Paragraph No.	Result	Remark
Conducted Emission	15.107(a)	Complies	
Radiated Emission	15.109(g)	Complies	Below 1 GHz
Radiated Emission	15.109(a)	N/A	Above 1 GHz

RECOMMENDATION/CONCLUSION

The data collected shows that the **Samsung Electronics Co., Ltd.**

FCC ID : A3LCYLHDE01A, ZigBee/Z-wave Dongle.

The highest emission observed was at **18.24 MHz** for conducted emissions with a AV margin of **7.8 dB**, at **242.62 MHz** for radiated emissions with a QP margin of **4.0 dB**.

SAMPLE CALCULATION

$$\text{dB } \mu\text{V} = 20 \log_{10} (\mu\text{V}/\text{m})$$

$$\mu\text{V} = 10^{(\text{dB } \mu\text{V}/20)}$$

EX.

@165.0 MHz

Class B limit = 30.0 dB $\mu\text{V}/\text{m}$

Reading = 38.2 dB μV (calibrated level)

Antenna factor + Cable Loss + Amplifier Gain = -12.9 dB

Total = 25.30 dB $\mu\text{V}/\text{m}$

Margin = 30.0 – 25.30 = 4.70

4.70 dB below the limit

DESCRIPTION OF TESTS

Conducted Emissions

The Line conducted emission test facility is located inside a 4 x 7 x 2.5 m shielded enclosure.

It is manufactured by EM engineering. The shielding effectiveness of the shielded room is in accordance with MIL-STD-285 or NSA 65-6.

A 1 m x 1.5 m wooden table 0.8 m height is placed 0.4 m away from the vertical wall and 0.5 m away from the side of wall of the shielded room Rohde & Schwarz (ENV216) and Rohde & Schwarz (ESH2-Z5) of the 50 ohm / 50 uH Line Impedance Stabilization Network(LISN) are bonded to the shielded room.

The EUT is powered from the Rohde & Schwarz (ENV216) LISN and the support equipment is powered from the Rohde & Schwarz (ESH2-Z5) LISN.

Power to the LISN s are filtered by high-current high insertion loss power line filters.

The purpose of filter is to attenuate ambient signal interference and this filter is also bonded to shielded enclosure. All electrical cables are shielded by tinned copper zipper tubing with inner diameter of 1 / 2 ”.

If d.c. power device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the LISNs,

All interconnecting cables more than 1 m were shortened by non-inductive bundling (serpentine fashion) to a 1 m length.

Sufficient time for EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT. The spectrum was scanned from 150 kHz to 30 MHz with 20 ms sweep time.

The frequency producing the maximum level was re-examined using the EMI test receiver. (Rohde & Schwarz ESCI).

The detector functions were set to Quasi-peak mode & average mode.

The bandwidth of receiver was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission.

Each emission was maximized by; switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux a.c. outlet, if applicable; whichever determined the worst case emission.

Each EME reported was calibrated using the R&S signal generator.

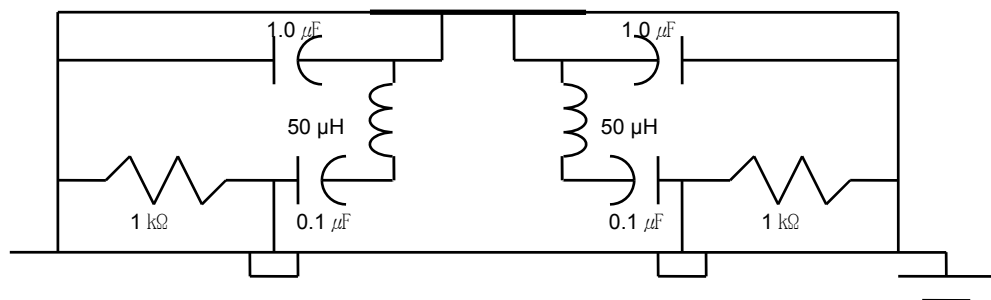


Fig. 2. LISN Schematic Diagram

DESCRIPTION OF TESTS

Radiated Emissions

Measurement were made indoors at 10 m using antenna, signal conditioning unit and EMI test receiver to determine the frequency producing the maximum EME.

Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The Technology configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna was note for each frequency found.

The test receiver was scanned from 30 MHz to 1 000 MHz using TRILOG Broadband Test Antenna (Schwarzbeck, VULB 9163).

The test equipment was placed on a wooden table.

Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

Each frequency found during scan measurements was reexamined and investigated using EMI test receiver. (ESU 40)

The detector function were set to Quasi-peak and peak mode and the bandwidth of the receiver were set to 120 kHz and 1 MHz depending on the frequency or type of signal.

The EUT support equipment and interconnecting cables were re configured to the setup producing the maximum emission for the frequency and were placed on top of a 0.8 m high non- metallic 1.0 m x 1.5 m table.

The EUT, support equipment and interconnecting cables were re-arranged and manipulated to maximize each EME emission.

The turn table containing the Technology was rotated; the antenna height was varied 1 to 4 meter and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by : switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and of support equipment, and powering the monitor from the floor mounted outlet box and computer aux a.c. outlet, if applicable; whichever determined the worst case emission.

Each EME reported was calibrated using the R/S signal generator.

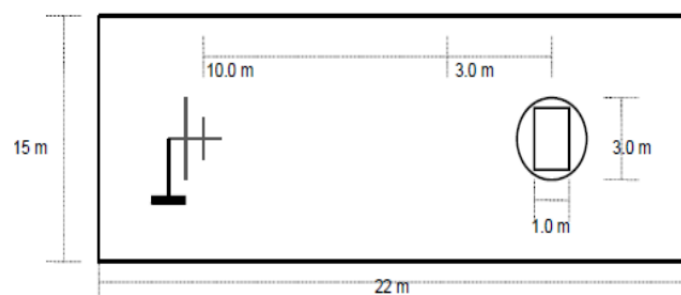


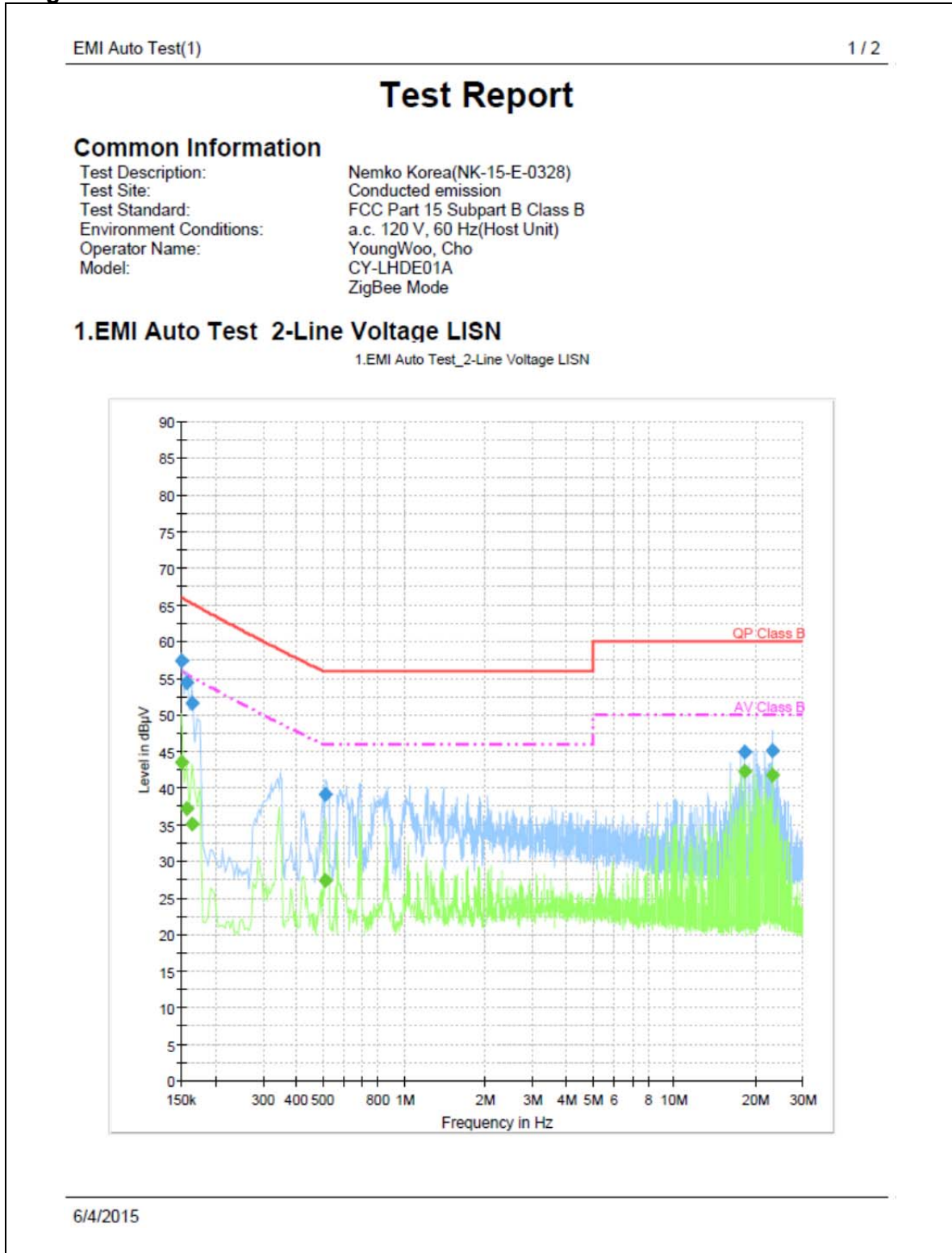
Fig. 3. Dimensions of 10 semi anechoic chamber

TEST DATA

Conducted Emissions

FCC ID : A3LCYLHDE01A

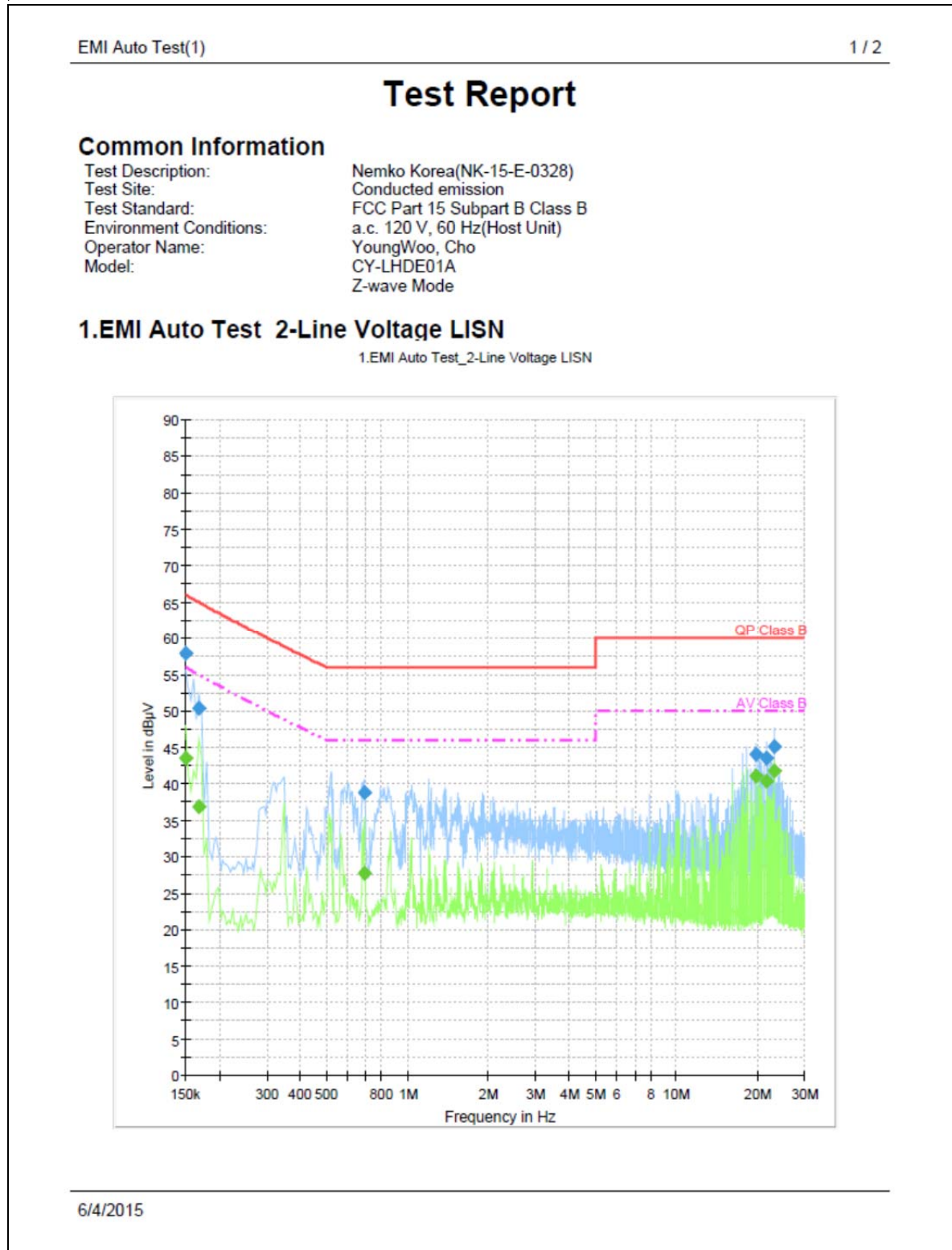
► ZigBee mode



EMI Auto Test(1)								2 / 2
Final Result 1								
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	57.5	15000.0	On	L1	9.8	8.5	66.0	
0.157462	54.4	15000.0	On	L1	9.9	11.1	65.6	
0.164925	51.7	15000.0	On	N	10.0	13.5	65.2	
0.511931	39.2	15000.0	On	N	10.0	16.8	56.0	
18.242831	44.9	15000.0	On	N	10.0	15.1	60.0	
23.130769	45.1	15000.0	On	L1	10.1	14.9	60.0	
Final Result 2								
Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	43.5	15000.0	On	L1	9.8	12.5	56.0	
0.157462	37.1	15000.0	On	L1	9.9	18.4	55.6	
0.164925	35.1	15000.0	On	N	10.0	20.0	55.1	
0.511931	27.3	15000.0	On	N	10.0	18.7	46.0	
18.242831	42.2	15000.0	On	N	10.0	7.8	50.0	
23.130769	41.8	15000.0	On	L1	10.1	8.2	50.0	
6/4/2015								

Table 1. Line Conducted Emissions Tabulated Data

► Z-wave mode



EMI Auto Test(1)

2 / 2

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	57.9	15000.0	On	N	9.7	8.1	66.0	
0.168656	50.3	15000.0	On	L1	10.1	14.6	65.0	
0.691031	38.7	15000.0	On	N	9.9	17.3	56.0	
19.709212	44.0	15000.0	On	N	10.0	16.0	60.0	
21.664388	43.5	15000.0	On	L1	10.1	16.5	60.0	
23.130769	45.1	15000.0	On	L1	10.1	14.9	60.0	

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	43.6	15000.0	On	N	9.7	12.4	56.0	
0.168656	36.8	15000.0	On	L1	10.1	18.1	54.9	
0.691031	27.7	15000.0	On	N	9.9	18.3	46.0	
19.709212	41.0	15000.0	On	N	10.0	9.0	50.0	
21.664388	40.4	15000.0	On	L1	10.1	9.6	50.0	
23.130769	41.7	15000.0	On	L1	10.1	8.3	50.0	

6/4/2015

Table 2. Line Conducted Emissions Tabulated Data

NOTES:

1. Measurements using Quasi-peak mode & average mode.
2. All modes of operation were investigated and the worst -case emission are reported. See attached Plots.
3. LINE : L1 = Line , N = Neutral
4. The limit for Class B device is on the FCC Part section 15.107(a).



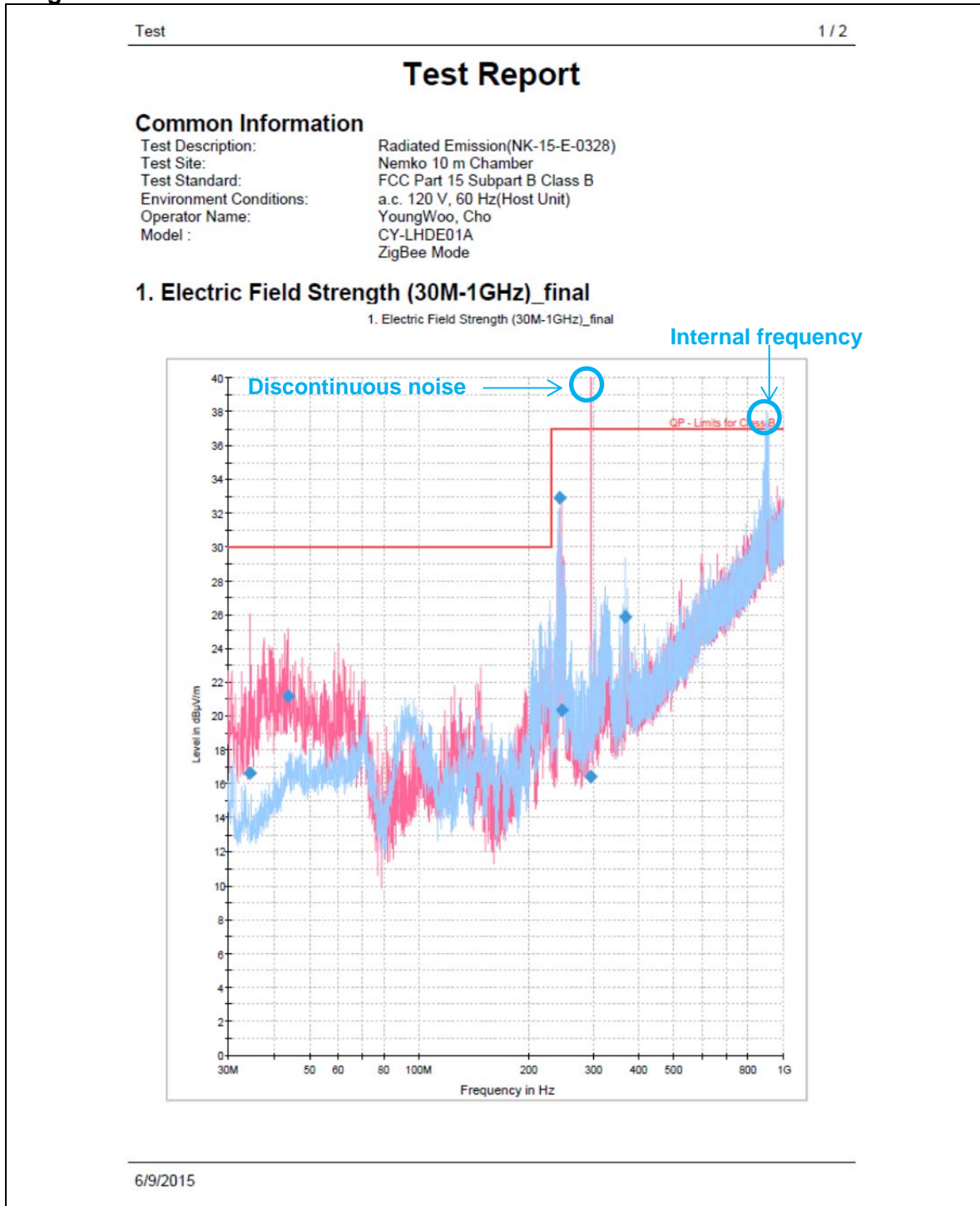
Tested by : **Youngwoo Cho**

TEST DATA

Radiated Emissions (Below 1 GHz)

FCC ID : A3LCYLHDE01A

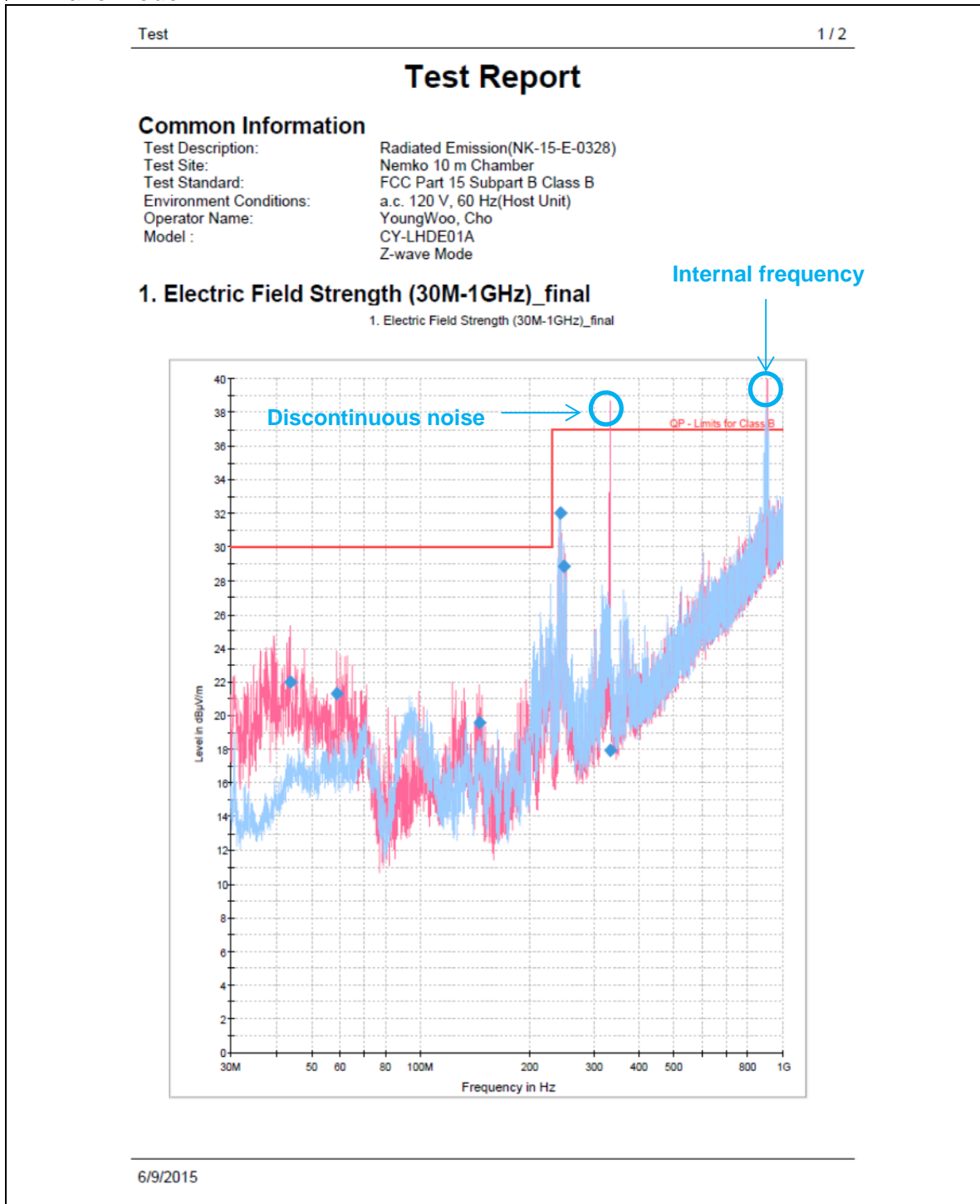
► ZigBee mode



Test	2 / 2							
Final Result 1								
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)
34.365000	16.7	15000.0	120.000	100.0	V	58.0	-24.9	13.3
43.822500	21.1	15000.0	120.000	100.0	V	338.0	-22.7	8.9
242.624000	33.0	15000.0	120.000	230.0	H	15.0	-21.7	4.0
246.601000	20.3	15000.0	120.000	400.0	V	98.0	-21.4	16.7
297.186500	16.4	15000.0	120.000	100.0	V	151.0	-19.5	20.6
369.839500	25.8	15000.0	120.000	187.0	H	206.0	-16.9	11.2
(continuation of the "Final Result 1" table from column 9 ...)								
Frequency (MHz)	Limit (dBµV/m)	Comment						
34.365000	30.0							
43.822500	30.0							
242.624000	37.0							
246.601000	37.0							
297.186500	37.0							
369.839500	37.0							
6/9/2015								

Table 3. Radiated Measurements at 10 meters

► Z-wave mode



Test	2 / 2							
Final Result 1								
Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)
43.774000	22.0	15000.0	120.000	100.0	V	94.0	-22.7	8.0
58.712000	21.3	15000.0	120.000	130.0	V	83.0	-23.3	8.7
145.236000	19.6	15000.0	120.000	130.0	V	344.0	-27.3	10.4
242.672500	32.0	15000.0	120.000	270.0	H	10.0	-21.7	5.0
249.753500	28.8	15000.0	120.000	270.0	H	15.0	-21.1	8.2
333.319000	17.9	15000.0	120.000	100.0	V	255.0	-18.2	19.1
(continuation of the "Final Result 1" table from column 9 ...)								
Frequency (MHz)	Limit (dBµV/m)	Comment						
43.774000	30.0							
58.712000	30.0							
145.236000	30.0							
242.672500	37.0							
249.753500	37.0							
333.319000	37.0							
6/9/2015								

Table 4. Radiated Measurements at 10 meters

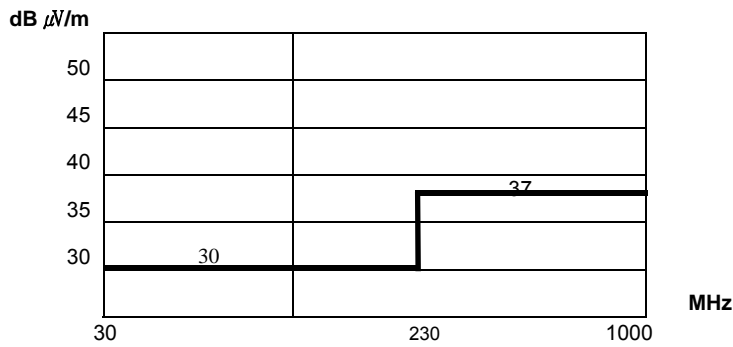


Fig. 4. Limits at 10 meters

NOTES:

1. All modes were measured and the worst-case emission was reported.
2. Below 1 GHz, the radiated limits are shown on Figure 5.
3. CISPR 22 limit will be applied for radiated emission test

NOTES:

1. *Pol. H = Horizontal V = Vertical
2. **Corr. = Antenna Factor + Cable Loss + Amplifier.
3. Measurements using Quasi-peak mode below 1 GHz.
4. The limit for Class B device is on the FCC Part section 15.109(g).



Tested by : **Youngwoo Cho**

ACCURACY OF MEASUREMENT

The Measurement Uncertainties stated were calculated in accordance with the requirements of measurement uncertainty contained in CISPR 16-4-2 with the confidence level of 95 %

1. Conducted Uncertainty Calculation

Source of Uncertainty	X_i	Uncertainty of X_i		Coverage factor k	$u(X_i)$ (dB)	C_i	$C_i u(X_i)$ (dB)
		Value (dB)	Probability Distribution				
Measurement System Repeatability	R_s	0.07	normal 1	1.00	0.07	1	0.07
Receiver reading	R_i	± 0.02	normal 2	2.00	0.01	1	0.01
Attenuation AMN-Receiver	L_c	± 0.10	rectangular	$\sqrt{3}$	0.06	1	0.06
AMN Voltage division factor	L_{AMN}	± 0.09	normal 2	2.00	0.05	1	0.05
Sine wave voltage	dV_{SW}	± 0.17	normal 2	2.00	0.09	1	0.09
Pulse amplitude response	dV_{PA}	± 0.92	normal 2	2.00	0.50	1	0.50
Pulse repetition rate response	dV_{PR}	± 0.35	normal 2	2.00	0.18	1	0.18
Noise floor proximity	dV_{NF}	± 0.00	rectangular	$\sqrt{3}$	0.00	1	0.00
AMN Impedance	dZ	± 2.00	normal 2	2.00	1.00	1	1.00
Mismatch	M	+ 0.80 - 0.89	U-Shaped	$\sqrt{3}$	0.60	1	0.60
Remark	Using 50 Ω / 50 uH AMN						
Combined Standard Uncertainty	Normal			$u_c = 1.29$ dB			
Expanded Uncertainty U	Normal ($k = 2$)			$U = 2.6$ dB (CL is 95 %)			

2. Radiation Uncertainty Calculation (Below 1 GHz)

Source of Uncertainty	X_i	Uncertainty of X_i		Coverage factor k	$u(X_i)$ (dB)	C_i	$C_i u(X_i)$ (dB)
		Value (dB)	Probability Distribution				
Measurement System Repeatability	RS	0.34	normal 1	1.00	0.11	1	0.34
Receiver reading	Ri	± 0.02	normal 2	2.00	0.01	1	0.01
Sine wave voltage	dVsw	± 0.17	normal 2	2.00	0.09	1	0.09
Pulse amplitude response	dVpa	± 0.92	normal 2	2.00	0.46	1	0.46
Pulse repetition rate response	dVpr	± 0.35	normal 2	2.00	0.18	1	0.18
Noise floor proximity	dVnf	± 0.50	normal 2	2.00	0.25	1	0.25
Antenna Factor Calibration	A_F	± 2.00	rectangular	$\sqrt{3}$	1.15	1	1.15
Cable Loss	C_L	± 1.00	normal 2	2.00	0.50	1	0.50
Antenna Directivity	A_D	± 0.00	rectangular	$\sqrt{3}$	0.00	1	0.00
Antenna Factor Height Dependence	A_H	± 2.00	rectangular	$\sqrt{3}$	1.15	1	1.15
Antenna Phase Centre Variation	A_P	± 0.20	rectangular	$\sqrt{3}$	0.12	1	0.12
Antenna Factor Frequency Interpolation	A_i	± 0.25	rectangular	$\sqrt{3}$	0.14	1	0.14
Site Imperfections	S_i	± 4.00	triangular	$\sqrt{6}$	1.63	1	1.63
Measurement Distance Variation	D_V	± 0.60	rectangular	$\sqrt{3}$	0.35	1	0.35
Antenna Balance	D_{bal}	± 0.90	rectangular	$\sqrt{3}$	0.52	1	0.52
Cross Polarization	D_{Cross}	± 0.00	rectangular	$\sqrt{3}$	0.00	1	0.00
Mismatch	M	+ 0.98 - 1.11	U-Shaped	$\sqrt{2}$	0.74	1	0.74
EUT Volume Diameter	V_d	0.33	normal 1	1.00	0.33	1	0.11
Combined Standard Uncertainty	Normal			$uc = 2.66$ dB			
Expanded Uncertainty U	Normal ($k = 2$)			5.3 dB (CL is 95 %)			


LIST OF TEST EQUIPMENT

No.	Instrument	Manufacturer	Model	Serial No.	Due to Calibration	Calibration Interval
1	EMI Test Receiver	R&S	ESCI	101041	Apr. 01 2016	1 year
2	Software	R&S	EMC32	Version 8.53.0	-	-
3	TWO-LINE V-NETWORK	R&S	ENV216	101156	Apr. 01 2016	1 year
4	Artificial Mains Network	R&S	ESH2-Z5	100273	Apr. 01 2016	1 year
5	EMI Test Receiver	R&S	ESU 40	100202	Apr. 01 2016	1 year
6	Software	R&S	EMC32	Version 8.53.0	-	-
7	TRILOG Broadband Test Antenna	SCHWARZBECK	VULB 9163	9163-454	Feb. 11 2016	2 year
8	ATTENUATOR	FAIRVIEW	SA3N5W-06	N/A	Apr. 01 2016	1 year
9	Controller	innco systems GmbH	CO2000-G	CO2000/562/ 23890210/L	N/A	N/A
10	Open Switch and Control Unit	R&S	OSP-120	100015	N/A	N/A
11	Antenna Mast (Left)	innco systems GmbH	MA4000-EP	N/A	N/A	N/A
12	Turn Table	innco systems GmbH	DT3000-3T	N/A	N/A	N/A
13	Signal Conditioning Unit	R&S	SCU 01	10030	Apr. 01 2016	1 year

APPENDIX A – SAMPLE LABEL

Labeling Requirements

The sample label shown shall be *permanently affixed* at a conspicuous location on the device and be readily visible to the user at the time of purchase.

ZigBee / Z-wave Dongle	
MODEL : CY-LHDE01A	
P/N : BN59-01238A	
FCC ID : A3LCYLHDE01A	
IC : 649E-CYLHDE01A	
CAN ICES-3 (B)/NMB-3(B)	
Power Source : 5V 	Ver. : 01
Samsung Electronics	WSCOZ100A00
Made in Korea	ZABD81001 YYMMDD

- Label Location of EUT



APPENDIX D – BLOCK DIAGRAM

APPENDIX E – USER'S MANUAL

APPENDIX F – SCHEMATIC DIAGRAM
