

TEST REPORT For FCC

Test Report No. : 2011050056
Date of Issue : May 23, 2011
FCC ID : ZK9STM-8800
Model/Type No. : STM-8800
Kind of Product : Industrial PDA
Rule Part(s) : §24(E), §22(H), , §15(C), §2
TX Frequency Range : 824.2 - 848.8 MHz(GSM850)/1850.2 - 1909.8 MHz(PCS1900)
RX Frequency Range : 869.2 - 893.8 MHz(GSM850)/1930.2 - 1989.8 MHz(PCS1900)
Applicant : Woongjin Holdings Co., Ltd.
Applicant Address : 3F. Kukdong Bldg., Chungmuro 3-ga, Jung-gu, Seoul, Korea
Manufacturer : Woongjin Holdings Co., Ltd.
Manufacturer Address : 3F. Kukdong Bldg., Chungmuro 3-ga, Jung-gu, Seoul, Korea
Contact Person : Hyong-Ju Kim / Principal Research Engineer
Telephone : +82-2-2075-9370
Received Date : November 27, 2010
Test period : Start : April 11, 2011 End : April 29, 2011
Test Results : ☒ In Compliance ☐ Not in Compliance

The test results presented in this report relate only to the object tested.

Tested by

Y. T. Lee

Young-taek, Lee
Test Engineer
Date: May 23, 2011

Reviewed by

Y. J. Park

Young-Joon, Park
Technical Manager
Date: May 23, 2011



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REPORT REVISION HISTORY

Date	Revision	Revision
May 23, 2011	Issued (2011050056)	Revision 2.0
May 31, 2011	Correction	Revision 2.1

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1.0 General Product Description

Trade name : Industrial PDA
Model name : STM-8800
Serial number : Prototype
EUT condition : Pre-production, not damaged
GSM / GPRS : Sierra Wireless, Inc.
Module : FCC ID: N7NQ2687
Antenna type : GSM850 / PCS1900 ANTENNA
Gain: -2.1 dBi for GSM850, Gain: -0.9 dBi for PCS1900 (Max)
RF output power : GSM850 30.4 dBm ERP / PCS1900 28.4 dBm EIRP
Modulation : GMSK
Power Source : Rechargeable Li-ion Battery Pack 3.7 Vdc/1900 mAh

1.1 Tested Frequency

Frequency	Channel	GSM850	Channel	PCS1900
Low frequency (MHz)	128	824.2	512	1850.2
Middle frequency (MHz)	190	836.6	661	1880.0
High frequency (MHz)	251	848.8	810	1909.8

1.2 Test Conditions

Operating Mode	Description
GSM850	A communication link is established between the EUT and CMU200. The EUT is operated at its maximum rated output power: 33 dBm (power class 4 = power control level 5)
PCS1900	A communication link is established between the EUT and CMU200. The EUT is operated at its maximum rated output power: 30 dBm (power class 1 = power control level 0)
Print	Continuous printing mode connected via USB cable between the EUT and Notebook



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1.3 Model Differences

Not applicable

1.4 Device Modifications

The following modifications were necessary for compliance:

Not applicable

1.5 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.	FCC ID or DoC
AC ADAPTER	NingBo ISO Electronics Co., Ltd.	KPA-045E	-	-
Cradle	Woongjin System & Technology Co, Ltd.	-	-	-
Personal Computer	Samsung Electronics Co., Ltd.	DB-A150	ZMSI96BSB0012 5F	DoC
LCD Monitor	VS17	Lite-ON Technology Corp.	CNN5130QMC	DoC
Keyboard(PS/2)	Samsung Electro-Mechanics Co., Ltd.	SEM-DT35	33008101	DoC
Mouse(USB)	Microsoft Corporation	Optical Mouse USB/PS2 Compatible	69657-492-4974533-40420	DoC





1.6 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

1.7 Test Facility

The measurement facility is located at 386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea.

1.8 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3 & 10 meter Open Area Test Sites and one conducted site to perform FCC Part 15/18 measurements.	 805871
JAPAN	VCCI	10 meter Open Area Test Site and one conducted site.	 R-948, C-986 T-1843
KOREA	KCC	EMI (10 meter Open Area Test Site and two conducted sites) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and interruptions)	 No. 51, KR0025
International	KOLAS	EMC	



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2.0 Summary of tests

	Parameter	Limit	Test Condition	Status (note1)
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I. FCC Part Section(s)

GSM 850/1900 Terminal equipment is certified by FCC(FCC ID: N7NQ2687)
Refer to the test report of FCC ID: N7NQ2687

II. Additional items

22.913	Transmitter Carrier Output Power and Effective Radiated Power	-	Conducted	C
24.232	Transmitter Carrier Output Power and Equivalent Isotropic Radiated Power	-	Conducted	C
15.209	Field Strength of Harmonics	15.209(a)	Radiated	C
15.207	AC Conducted Emissions	15.207(a)	Line Conducted	C

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

The sample was tested according to the following specification:
ANSI C63.4-2003



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2.1 Transmitter Conducted Output Power and Effective Radiated Power(ERP)

FCC Part

FCC Part 22.913(a)

Test Method Used

As detailed in ANSI TIA-603-C-2004 Section 2.2.17.2

Test Results

Test mode : GSM 850

Frequency (MHz)	Channel No.	Conducted RF Output Power(dBm)	Antenna Gain(dBi)	Calculated ERP(dBm)
824.2	128	32.5	-2.1	30.4
836.6	190	32.4	-2.1	30.3
848.8	251	32.2	-2.1	30.1

2.2 Transmitter Conducted Output Power and Equivalent Isotropic Radiated Power(EIRP)

FCC Part

FCC Part 24.232

Test Method Used

As detailed in ANSI TIA-603-C-2004 Section 2.2.17.2

Test Results

Test mode : PCS 1900

Frequency (MHz)	Channel No.	Conducted RF Output Power(dBm)	Antenna Gain(dBi)	Calculated EIRP(dBm)
1850.2	512	29.2	-0.9	28.3
1880.0	661	29.2	-0.9	28.3
1909.8	810	29.3	-0.9	28.4

2.3 Field Strength of Emissions

Test Date

April 25, 2011

Test Location

☒ Testing was performed at a test distance of 3 meter Open Area Test Site

Test Procedures

The height of the measuring antenna was varied between 1 to 4 m and the table was rotated a full revolution in order to obtain maximum values of the electric field intensity. The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

The spectrum analyzer is set to:

Center frequency = the worst channel

Frequency Range = 30 MHz ~ 10th harmonic.

RBW = 120 kHz (30MHz ~ 1 GHz)

VBW ≥ RBW

= 1 MHz (1 GHz ~ 10th harmonic)

Span = 100 MHz

Detector function = Quasi-peak

Trace = max hold

Sweep = auto

Limit

- 15.209(a)

Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m
30-88	100**	40
88-216	150**	43.5
216-960	200**	46
Above 960	500	54

** Except as provided in 15.209(g).fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72MHz, 76-88MHz, 174-216MHz, 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g.15.231 and 15.241.



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Test Results

EUT	INDUSTRIAL PDA	Test Mode	GSM850, With Cradle
Model	STM-8800	Frequency Range	30-1000 MHz
Channel	Channel 251 (Worst Case)	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
47.06	34.3	5.7	Quasi-peak

Test Data

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
				Antenna	Cable	Amp. Gain			
47.06	55.7	V	1.0	9.7	0.3	31.4	40.0	34.3	5.7
241.06	55.6	H	4.0	9.4	1.9	31.3	46.0	35.6	10.4
308.97	54.7	H	4.0	11.7	2.5	31.3	46.0	37.6	8.4
325.97	50.0	V	1.8	12.2	2.6	31.3	46.0	33.5	12.5
393.89	48.4	V	2.0	13.7	2.8	31.3	46.0	33.6	12.4
716.35	42.7	H	2.0	18.8	4.0	31.3	46.0	34.2	11.8

H : Horizontal, V : Vertical

Result = Reading + Antenna + Cable - Amp.Gain



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Test Results

EUT	INDUSTRIAL PDA	Test Mode	PCS1900, With Cradle
Model	STM-8800	Frequency Range	30-1000 MHz
Channel	Channel 661 (Worst Case)	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
47.01	33.9	6.1	Quasi-Peak

Test Data

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor			Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
				Antenna	Cable	Amp. Gain			
47.01	55.3	V	1.0	9.7	0.3	31.4	40.0	33.9	6.1
241.03	55.7	H	4.0	9.4	1.9	31.3	46.0	35.7	10.3
308.96	53.9	H	4.0	11.7	2.5	31.3	46.0	36.8	9.2
325.91	49.8	V	1.8	12.2	2.6	31.3	46.0	33.3	12.7
393.88	47.6	V	2.0	13.7	2.8	31.3	46.0	32.8	13.2
716.41	42.6	H	2.0	18.8	4.0	31.3	46.0	34.1	11.9

H : Horizontal, V : Vertical

Result = Reading + Antenna + Cable - Amp.Gain

Test Results(GSM850)

EUT	INDUSTRIAL PDA	Test Mode	With Cradle(Worst Case)
Model	STM-8800	Frequency Range	1-10GHz
Channel	Channel 128	Detector function	Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
1469.00	46.8	7.2	Average

Test Data – GPRS

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor			Limits [dBuV/m] AV / Peak	Result [dBuV/m] AV / Peak	Margin [dB] AV / Peak
				Antenna	Amp. Gain	Cable			
1649.00	50.4 68.8	V	1.1	25.4	35.6	6.6	54.0 74.0	46.8 65.2	7.2 8.8



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Test Results(GSM850)

EUT	INDUSTRIAL PDA	Test Mode	With Cradle(Worst Case)
Model	STM-8800	Frequency Range	1-10GHz
Channel	Channel 190	Detector function	Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
1673.00	48.3	5.7	Average

Test Data – GPRS

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor			Limits [dBuV/m] AV / Peak	Result [dBuV/m] AV / Peak	Margin [dB] AV / Peak	
				Antenna	Amp. Gain	Cable				
1673.00	51.9 70.9	V	1.0	25.4	35.6	6.6	54.0 74.0	48.3 67.3	5.7 6.7	
2510.00	33.9 53.1	V	1.0	28.5	35.4	8.1	54.0 74.0	35.1 54.3	18.9 19.7	



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Test Results(GSM850)

EUT	INDUSTRIAL PDA	Test Mode	Battery(Worst Case)
Model	STM-8800	Frequency Range	1-10GHz
Channel	Channel 251	Detector function	Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
1698.00	49.8	4.2	Average

Test Data – GPRS

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor			Limits [dBuV/m] AV / Peak	Result [dBuV/m] AV / Peak	Margin [dB] AV / Peak
				Antenna	Amp. Gain	Cable			
1698.00	53.4 72.4	V	1.0	25.4	35.6	6.6	54.0 74.0	49.8 68.8	4.2 5.2

Test Results(PCS1900)

EUT	INDUSTRIAL PDA	Test Mode	With Cradle(Worst Case)
Model	STM-8800	Frequency Range	1-20GHz
Channel	Channel 512	Detector function	Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
3700.00	47.2	6.8	Average

Test Data – GPRS

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Height [m]	Correction Factor			Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
					Antenna	Amp. Gain	Cable						
3700.00	41.3	59.5	V	1.5	31.2	35.3	10.0	54.0	74.0	47.2	65.4	6.8	8.6
5550.00	25.8	44.8	V	1.5	35.1	34.7	12.7	54.0	74.0	38.9	57.9	15.1	16.1



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Test Results(PCS1900)

EUT	INDUSTRIAL PDA	Test Mode	With Cradle(Worst Case)
Model	STM-8800	Frequency Range	1-20GHz
Channel	Channel 661	Detector function	Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
3760.00	67.3	6.7	Peak

Test Data – GPRS

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Height [m]	Correction Factor			Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
					Antenna	Amp. Gain	Cable						
3760.00	41.3	61.4	V	1.5	31.2	35.3	10.0	54.0	74.0	47.2	67.3	6.8	6.7
5640.00	26.3	45.0	V	1.5	35.1	34.7	12.7	54.0	74.0	39.4	58.1	14.6	15.9



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Test Results(PCS1900)

EUT	INDUSTRIAL PDA	Test Mode	With Cradle(Worst Case)
Model	STM-8800	Frequency Range	1-20GHz
Channel	Channel 810	Detector function	Peak

Remarks

We have tested three mode (X, Y, Z). The worst mode (X axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
3820.00	44.6	9.4	Average

Test Data – GPRS

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Height [m]	Correction Factor			Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
					Antenna	Amp. Gain	Cable						
3820.00	38.7	57.9	V	1.5	31.2	35.3	10.0	54.0	74.0	44.6	63.8	9.4	10.2
5729.00	22.7	40.6	V	1.5	35.1	34.7	12.7	54.0	74.0	35.8	53.7	18.2	20.3



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2.4 AC Conducted Emissions

Test Date

April 25, 2011

Test Location

Shielded Room

Frequency Range of Measurement

150 kHz to 30 MHz

Instrument Settings

IF Band Width: 9 kHz

Test Procedures

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.

Amplitude measurements were performed with a quasi-peak detector and an average detector.

Measurement Data: Complies

Limit

- 15.207(a)

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56*	56 to 46*
0.5 ~ 5	56	46
5 ~ 30	60	50

* Decreases with the logarithm of the frequency.

Test Results

Model	STM-8800	Test Mode	GSM850 mode
Channel	251	Detector function	Quasi-Peak / Average

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
0.546	42.4	3.6	Average

Test Data

[HOT]

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.150000	48.1	1000.0	9.000	On	L1	10.1	17.9	66.0
0.249000	43.9	1000.0	9.000	On	L1	10.1	17.9	61.8
0.460500	44.9	1000.0	9.000	On	L1	10.2	11.8	56.7
0.514500	47.5	1000.0	9.000	On	L1	10.2	8.5	56.0
0.541500	49.5	1000.0	9.000	On	L1	10.1	6.5	56.0
0.789000	39.5	1000.0	9.000	On	L1	10.0	16.5	56.0
0.892500	41.8	1000.0	9.000	On	L1	10.0	14.2	56.0
1.365000	39.6	1000.0	9.000	On	L1	9.9	16.4	56.0
1.954500	37.8	1000.0	9.000	On	L1	9.9	18.2	56.0
1.977000	38.0	1000.0	9.000	On	L1	9.9	18.0	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.343500	34.3	1000.0	9.000	On	L1	10.1	14.8	49.1
0.546000	42.4	1000.0	9.000	On	L1	10.1	3.6	46.0
0.550500	42.0	1000.0	9.000	On	L1	10.1	4.0	46.0
0.843000	33.5	1000.0	9.000	On	L1	10.0	12.5	46.0
0.870000	32.7	1000.0	9.000	On	L1	10.0	13.3	46.0
1.333500	31.0	1000.0	9.000	On	L1	9.9	15.0	46.0
1.923000	30.9	1000.0	9.000	On	L1	9.9	15.1	46.0
1.981500	31.3	1000.0	9.000	On	L1	9.9	14.7	46.0
2.467500	30.2	1000.0	9.000	On	L1	9.9	15.8	46.0
3.075000	29.8	1000.0	9.000	On	L1	9.8	16.2	46.0

[NEUTRAL]

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.501000	39.6	1000.0	9.000	On	N	10.2	16.4	56.0
0.505500	41.5	1000.0	9.000	On	N	10.2	14.5	56.0
0.789000	38.3	1000.0	9.000	On	N	10.0	17.7	56.0
0.807000	38.5	1000.0	9.000	On	N	10.0	17.5	56.0
1.266000	35.9	1000.0	9.000	On	N	9.9	20.1	56.0
1.509000	38.3	1000.0	9.000	On	N	9.9	17.7	56.0
1.576500	37.9	1000.0	9.000	On	N	9.9	18.1	56.0
2.040000	37.7	1000.0	9.000	On	N	9.9	18.3	56.0
2.742000	36.1	1000.0	9.000	On	N	9.9	19.9	56.0
3.228000	36.3	1000.0	9.000	On	N	9.9	19.7	56.0

Final Result 2

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.348000	27.9	1000.0	9.000	On	N	10.1	21.1	49.0
0.546000	35.9	1000.0	9.000	On	N	10.2	10.1	46.0
0.546000	35.4	1000.0	9.000	On	N	10.2	10.6	46.0
0.843000	27.9	1000.0	9.000	On	N	10.0	18.1	46.0
0.847500	27.7	1000.0	9.000	On	N	10.0	18.3	46.0
1.414500	27.2	1000.0	9.000	On	N	9.9	18.8	46.0
1.981500	26.8	1000.0	9.000	On	N	9.9	19.2	46.0
1.990500	26.0	1000.0	9.000	On	N	9.9	20.0	46.0
2.607000	25.5	1000.0	9.000	On	N	9.9	20.5	46.0
3.133500	24.0	1000.0	9.000	On	N	9.9	22.0	46.0



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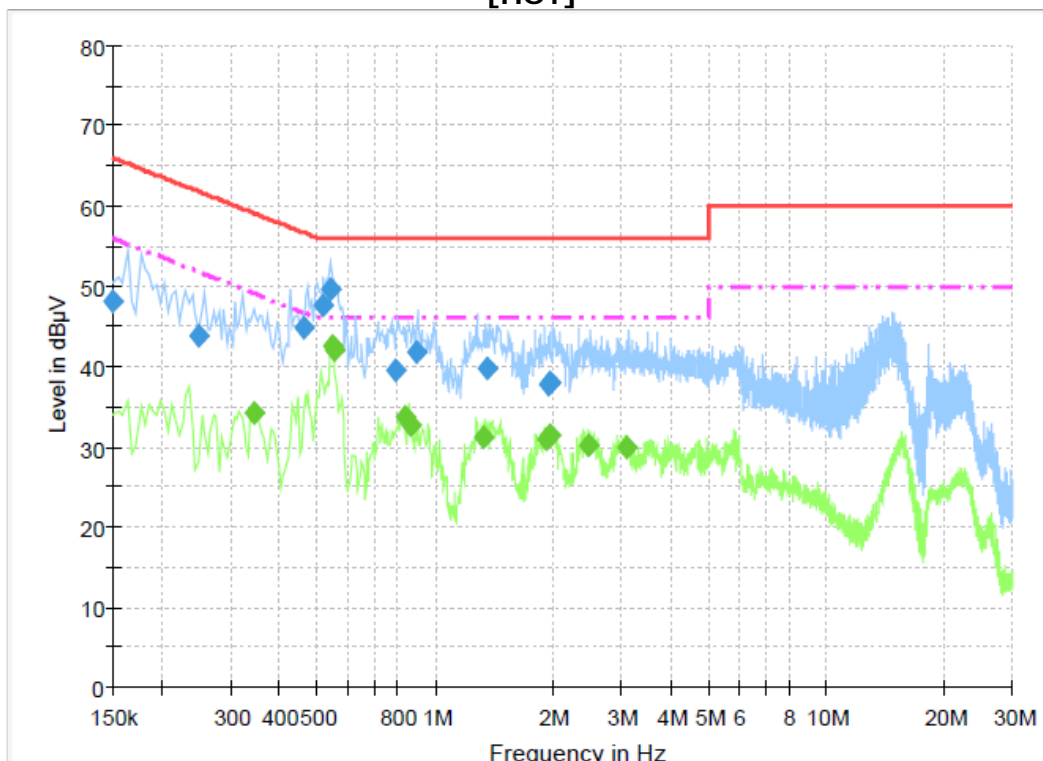
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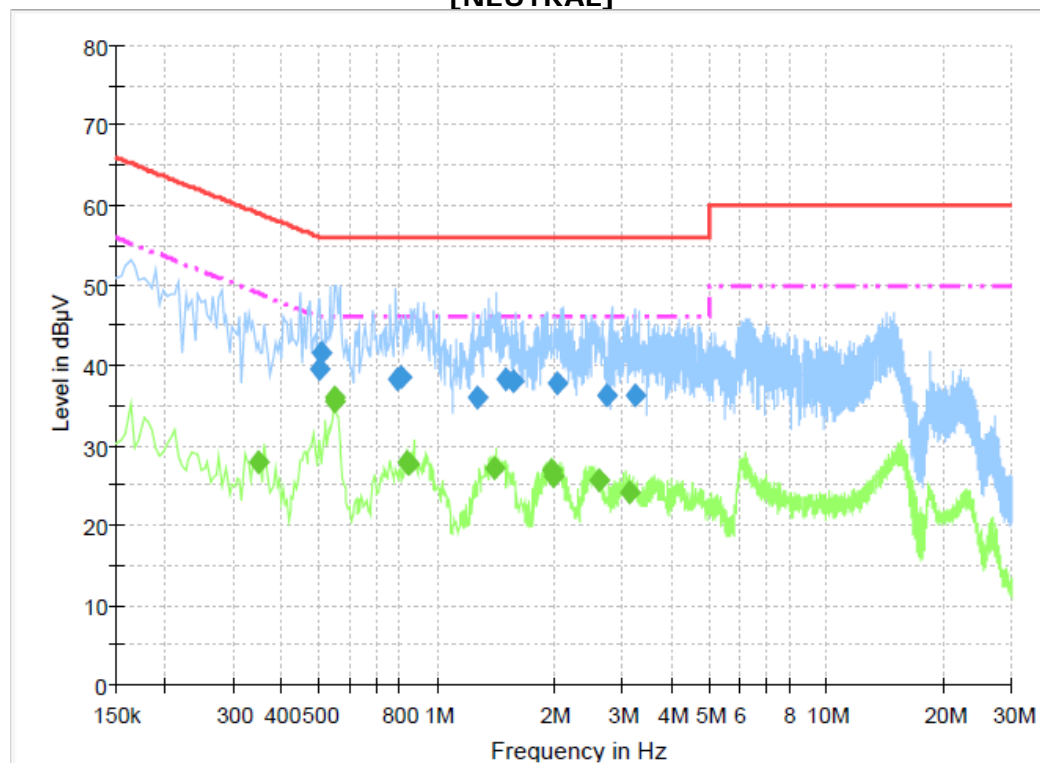
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APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
1	Signal Analyzer	Agilent	N9020A	MY48011598	2011-11-12
2	Spectrum Analyzer	Rohde & Schwarz	FSP-30	100994	2011-11-12
3	EMI Test Receiver	Rohde & Schwarz	ESVS30	826638/008	2011-07-12
4	ULTRA Broadband Antenna	Rohde & Schwarz	HL562	361324/014	2011-11-18
5	LOOP ANTENNA	EMCO	6502	9107-2652	2012-10-29
6	Attenuator	HP	8498A	1801A06913	2011-11-15
7	EPM Series Power Meter	HP	E4418A	GB38272734	2011-11-12
8	Power Sensor	HP	8487A	3318A03524	2011-07-12
9	Audio Analyzer	HP	8903B	2747A03432	2011-11-12
10	ESG-D Series Signal Generator	Agilent	E4432B	US40054094	2011-11-12
11	SYNTHESIZED SWEEPER	HP	8341B	2819A01563	2011-11-12
12	Modulation Analyzer	HP	8901B	3438A05228	2011-11-16
13	Attenuator	HP	8494A	3308A33351	2011-11-15
14	Temp&Humi Chamber	Kunpoong	JT-TH-556-1	9QE5-002	2012-11-14
15	DC POWER SUPPLY	Agilent	E3632A	MY40011638	2011-11-12
16	EMC Analyzer	Agilent	E7405A	MY45110859	2012-02-11
17	Horn Antenna	ETS-Lindgren	3115	00078894	2013-03-22
18	Horn Antenna	ETS-Lindgren	3115	00078895	2013-03-22
19	Dipole Antenna	SCHWARZBECK	VHA 9103	VHA91032557	2011-09-18
20	Dipole Antenna	SCHWARZBECK	UHA 9105	UHA91052417	2011-09-18
21	OPT H64 AMPLIFIER	HP	8447F	3113A06814	2012-03-31
22	PREAMPLIFIER	Agilent	8449B	3008A02307	2011-11-16
23	Radio Communication Tester	Rohde & Schwarz	CMU200	106765	2012-02-09
24	LISN	Rohde & Schwarz	ESH3-Z5	100207	2011-11-15
25	LISN	Rohde & Schwarz	ENV216	101151	2012-03-09
26	DC POWER SUPPLY	Agilent	E3632A	MY40011638	2011-11-12
27	EMI Test Receiver	Rohde & Schwarz	ESCI3	100032	2012-02-09