FCC /IC Test Report

FOR

Intel Corporation

Model Name: DZ110

Product Description: Smartphone with GSM/GPRS/EDGE, UMTS/HSPA+/LTE, Wi-Fi, BT, NFC and GPS Radios

FCC ID: O2Z-DZ110
IC ID: 1000W – DZ110

FCC Part 15B
ICES-003, issue 5

TEST REPORT #: EMC_INTEL-037-13001_15B_Rev1
DATE: 2014-06-04

ACCREDITED
TESTING LABORATORY
Certificate #2135.01

CTIA Authorized Test Lab
LAB CODE 20020328-00

FCC: Accredited

IC recognized # 3462B-1

***CETECOM* Inc.**
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1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Part 15B of the Code of Federal Regulations and ICES-003 Issue 5. No deviations were ascertained during the course of the tests performed.

Company	Description	Model #
Intel Corporation	Smartphone with GSM/GPRS/EDGE, UMTS/HSPA+/LTE, Wi-Fi, BT, NFC and GPS Radios	DZ110

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2014-06-04	Compliance	Franz Engert (Manager Compliance)	Digitally signed by Franz Engert DN: cn=Franz Engert, c=US, o=CETECOM, ou=Compliance, email=franz.engert@cetecom.com Date: 2014.07.02 20:09:58 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2014-06-04	Compliance	Danh Duy Le (EMC Engineer)	Digitally signed by Danh Le DN: cn=Danh Le, o=Cetecom, ou=Compliance, email=danh.le@cetecom.com, c=US Date: 2014.07.02 20:12:12 -07'00'

The test results of this test report relate exclusively to the test item specified in Section3.
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2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
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Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Test Lab Manager:	Franz Engert
Responsible Project Leader:	Danh Le

2.2 Identification of the Client

Applicant's Name:	Intel Corporation
Street Address:	2200 Mission College
City/Zip Code	Santa Clara, CA 94054
Country	USA
Contact Person:	Christine Ryan
Phone No.	+1 (408) 300-2167
e-mail:	Christine.m.ryan@intel.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as client.
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name / Model No:	DZ110
HW Revision :	PR2D.2
FCC-ID / IC-ID:	O2Z-DZ110 / 1000W-DZ110
Product Description:	Smartphone with GSM/GPRS/EDGE, UMTS/HSPA+/LTE, Wi-Fi, BT, NFC and GPS Radios
Power supply	AA lithium battery pack (dedicated) Voltage Range 3.6V-4.35V DC Nominal Voltage 3.8V DC
Antenna / highest declared gain:	Main cellular antenna internal monopole / 3.3dBi Secondary cellular antenna internal monopole / -3dBi Wi-Fi/BT/GPS internal monopole / 0dBi
operating temperature range	-10ºC to 55ºC
Prototype / Production unit	Prototype
Radios included in the device:	- Intel XMM 7160 Radio Module - GSM 850/900/1800/1900MHz - GPRS / EDGE Multi-slot class 33 operation - WCDMA / HSPA+ 850/900/1700/1900/2100 MHz - LTE 700/800/850/900/1700/1800/1900/2100/2600 - Wi-Fi, BT BDR, BT EDR, BT LE (BCM4339) 2.4 GHz band of operation and 5GHz band of operation - GPS 1575.42 MHz (BCM4752) - NFC NXP PN547 13.56 MHz

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	HW Revision	SW Version	Notes/Comments
1	INV133601723	PR2D.2	SB JB r43-main-weekly-973 (WW46)	Radiated
2	INV133601723	PR2D.2	SB JB r43-main-weekly-973 (WW46)	Conducted

3.3 Identification of Accessory equipment

STE #	Type	Manufacturer	Model	Serial Number
1	AC/DC Adapter	Solcomp	SC1402	12374000330319

3.4 Environmental Conditions during test:

The following environmental conditions were maintained during the course of testing:
Ambient Temperature: 20-25oC
Relative humidity: 40-60%

3.5 Dates of testing:

12/23/2013 – 01/02/2014

4 Subject of Investigation

Testing was performed on the DZ110 model to evaluate compliance against the applicable criteria specified in FCC CFR 47 Part 15 Subpart B and Industry Canada Standard ICES-003, issue 5

Radiated Emission tests are carried out to show that the EUT complies with FCC15.109 (a) radiated emissions limit for Class B device.

Conducted Emission tests are carried out to show that the EUT complies with FCC15.107 (a) conducted emissions limit for Class B device.

The EUT has been tested in airplane mode to ensure that cellular is not used. Wifi, Bluetooth and NFC were switched off. The game "Frozen Free Fall" was active with music playing on maximum level to stimulate microcontroller, display and audio circuitry.

5 Summary of Measurement Results

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§15.109	RX Spurious Emissions Radiated	Nominal	Digital Device	■	☐	☐	☐	Complies
§15.107(a)	Conducted Emissions <30MHz	Nominal	Digital Device	■	☐	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.

6 Radiated Emissions

§15.109, ICES-003, issue 5 sections 6.2: Radiated emission limits- Unintentional Radiators for a class B (residential) device:

Frequency of emission (MHz)	Field strength (µV/m) / (dB µV/m)
30–88	100 / 40
88–216	150 / 43.5
216–960	200 / 46
Above 960	500 / 54

6.1 Radiated Emissions Measurement Procedure

The radiated measurement is performed according to:
ANSI C63.4 (2009)
ANSI C63.10 (2009)

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 16 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9kHz to 30MHz, a Biconlog antenna is used from 30MHz to 1GHz, two different horn antennas are used to cover frequencies up to 40GHz.

Radiated Emissions Measurement Uncertainty: ±3dB

6.2 Sample Calculations for Radiated Measurements

6.2.1.1 Field Strength Measurements:

Measurements from the Spectrum Analyzer/ Receiver are used to calculate the Field Strength, taking into account the following parameters:

1. Measured reading in dBµV
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

FS (dBµV/m) = Measured Value on SA (dBµV)+ Cable Loss (dB)+ Antenna Factor (dB/m)
Eg:

Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

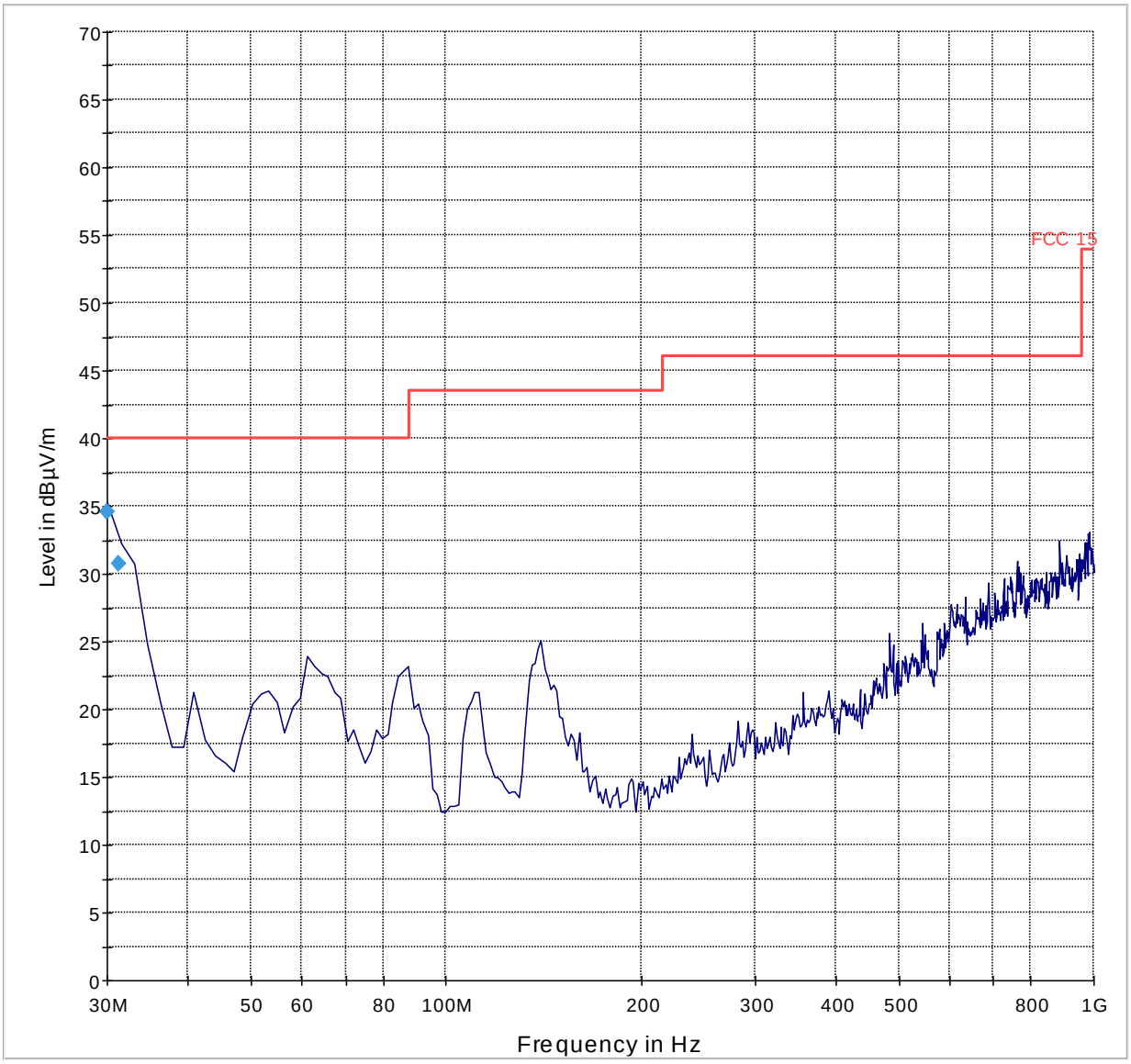
All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the above equation.

6.3 Testing Notes:

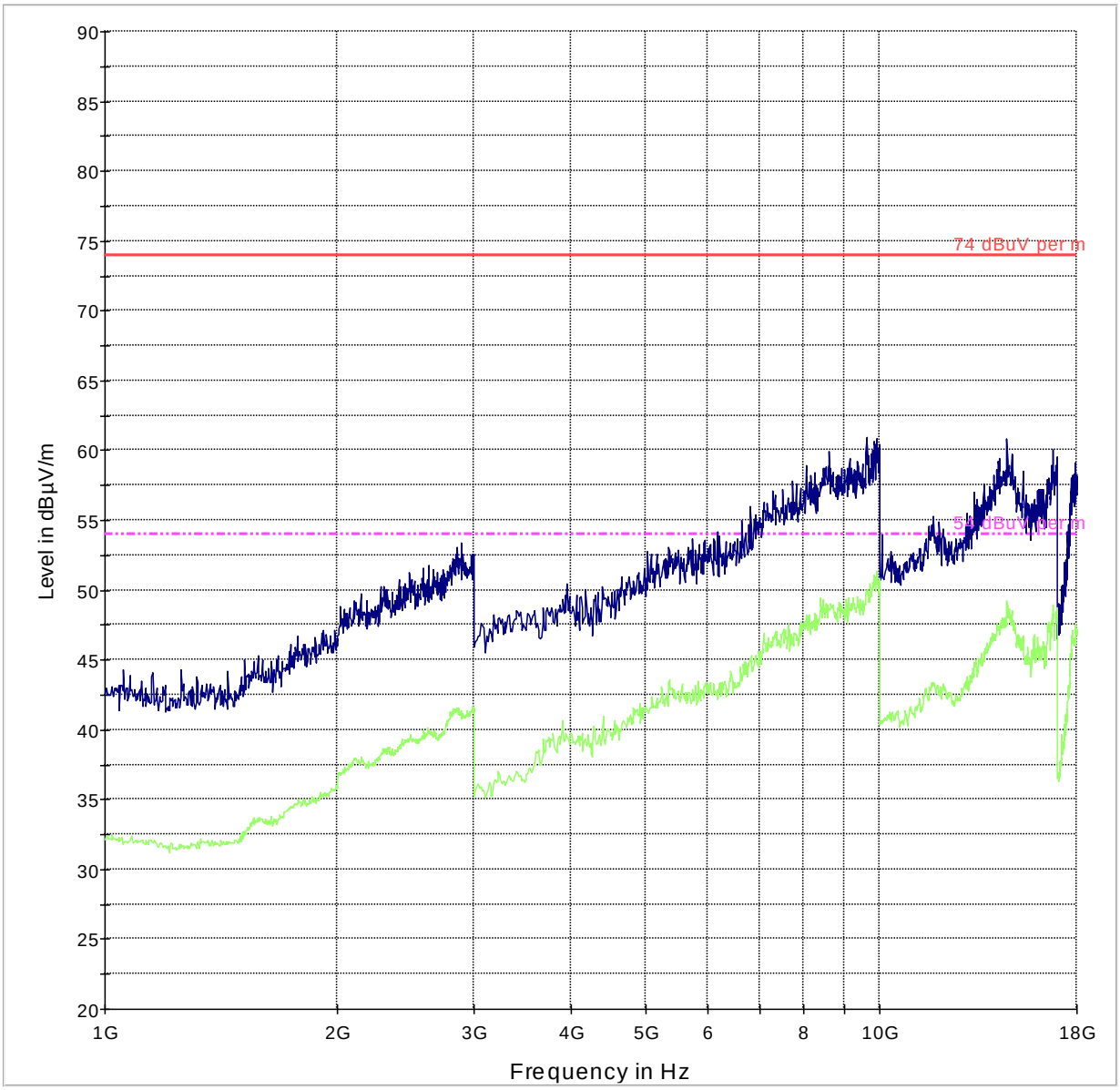
The relevant procedures of ANSI C63.4: 2009 have been followed.
All radiated test data in this report shows the worst case emissions for H/V measurement antenna polarizations and for all three orthogonal orientations of the EUT.

6.4 Results

Radiated Emissions: 30M- 1GHz



Radiated Emissions: 1 GHz- 18 GHz



7 AC Power Line Conducted Emissions

7.1 § 15.107 Conducted limits- Unintentional Radiators

(a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	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.

(b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms LISN. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	79	66
0.5–5	73	60

7.2 Measurement Procedure:

ANSI C63.4 (2009) Section 7.3.1: Measurements at a test site

Tabletop devices shall be placed on a nonconducting platform, of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane, when used, or wall of a screened room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground plane or on insulating material. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs. AC power-line adapters that are used with EUTs, such as notebook computers, should be placed as typically used (i.e., on the tabletop) if the adapter-to-EUT cord is too short to allow the power adapter to reach the floor. Each current-carrying conductor of the EUT power cord(s), except the ground (safety) conductor(s), shall be individually connected through a LISN to the input power source. All 50 Ω ports of the LISN shall be resistively terminated into 50 Ω loads when not connected to the measuring instrument. When the test configuration consists of multiple units (EUT and associated/peripheral equipment, or EUT consisting of multiple equipment) that have their own power cords, ac power-line conducted emissions measurements shall be performed with the ac power-line cord of the particular unit under test connected to one LISN that is connected to the measuring instrument. Those power cords for the units in the remainder of the configuration not under measurement shall be connected to a separate LISN or LISNs. This connection may be made using a multiple-receptacle device. Emissions from each current-carrying conductor of the EUT shall be individually measured. Where multiple portions of the EUT receive ac power from a common power strip, which is furnished by the manufacturer as part of the EUT, measurements need only be made on the current-carrying conductors of the common power strip. Adapters or extension cords connected between the EUT power cord plug and the LISN power receptacle shall be included in the LISN setup, such that the calibration of the combined adapter or extension cord with an adapter and the LISN meets the requirements of 5.2.3. If the EUT consists of a number of devices that have their own separate ac power connections, e.g., a floorstanding frame with independent power cords for each shelf, that are able to connect directly to the ac power network, each current-carrying conductor of one device is measured while the other devices are connected to a second (or more) LISN(s). All devices shall be separately measured. If the manufacturer provides a power strip to supply power to all of the devices making up the EUT, only the conductors in the common power cord to the power strip shall be measured.

If the EUT is normally operated with a ground (safety) connection, the EUT shall be connected to the ground at the LISN through a conductor provided in the lead from the ac power to the LISN.
The excess length of the power cord between the EUT and the LISN receptacle (or ac power receptacle where a LISN cannot be used), or an adapter or extension cord connected to and measured with the LISN, shall be folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length. If the EUT does not have a flexible power lead, the EUT shall be placed at a distance of 80 cm from the LISN (or power receptacle where a LISN cannot be used) and connected thereto by a power lead or appropriate connection no more than 1 m long. The measurement shall be made at the LISN end of this power lead or connection.

The LISN housing, measuring instrument case, reference ground plane, vertical conducting plane, if used, shall be bonded together.

ANSI C63.4 (2009) Section 7.3.3: Exploratory ac power-line conducted emission measurements

Exploratory measurements shall be used to identify the frequency of the emission that has the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable positions, and with a typical system equipment configuration and arrangement. For each mode of operation and for each ac power current-carrying conductor, cable manipulation may be performed within the range of likely configurations. For this measurement or series of measurements, the frequency spectrum of interest shall be monitored looking for the emission that has the highest amplitude relative to the limit. Once that emission is found for each current-carrying conductor of each power cord associated with the EUT (but not the cords associated with non-EUT equipment in the overall system), the one configuration and arrangement and mode of operation that produces the emission closest to the limit across all the measured conductors is recorded.

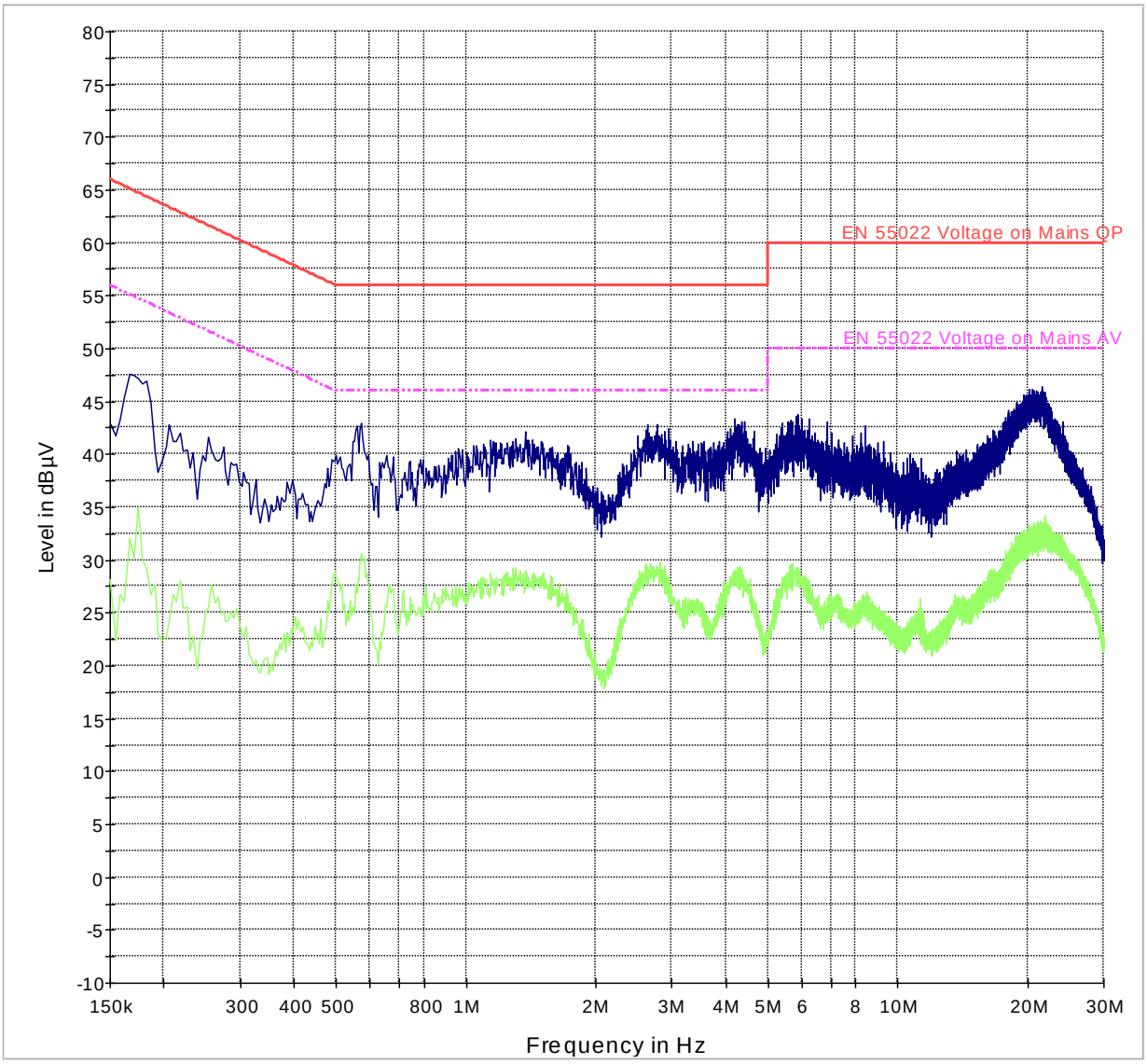
ANSI C63.4 (2009) Section 7.3.4: Final ac power-line conducted emission measurements

Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that produced the emission with the highest amplitude relative to the limit is selected for the final measurement. If the EUT is relocated from an exploratory test site to a final test site, the highest emissions shall be remaximized at the final test location before final ac power-line conducted emission measurements are performed. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment in the system) is then performed for the full frequency range for which the EUT is being tested for compliance without additional variation of the EUT arrangement, cable positions, or EUT mode of operation. If the EUT consists of equipment units that have their own separate ac power connections (e.g., a floor-standing frame with independent power cords for each shelf that are able to connect directly to the ac power network), then each current-carrying conductor of one unit is measured while the other units are connected to a second (or more) LISN(s). All units shall be measured separately. If the manufacturer provides a power strip to supply all the units making up the EUT, only the conductors in the power cord of the power strip shall be measured.

Conducted Emissions Measurement Uncertainty: ±3dB

7.3 Results:

Plots below show the worst case representation of emissions into LINE and NEUTRAL.

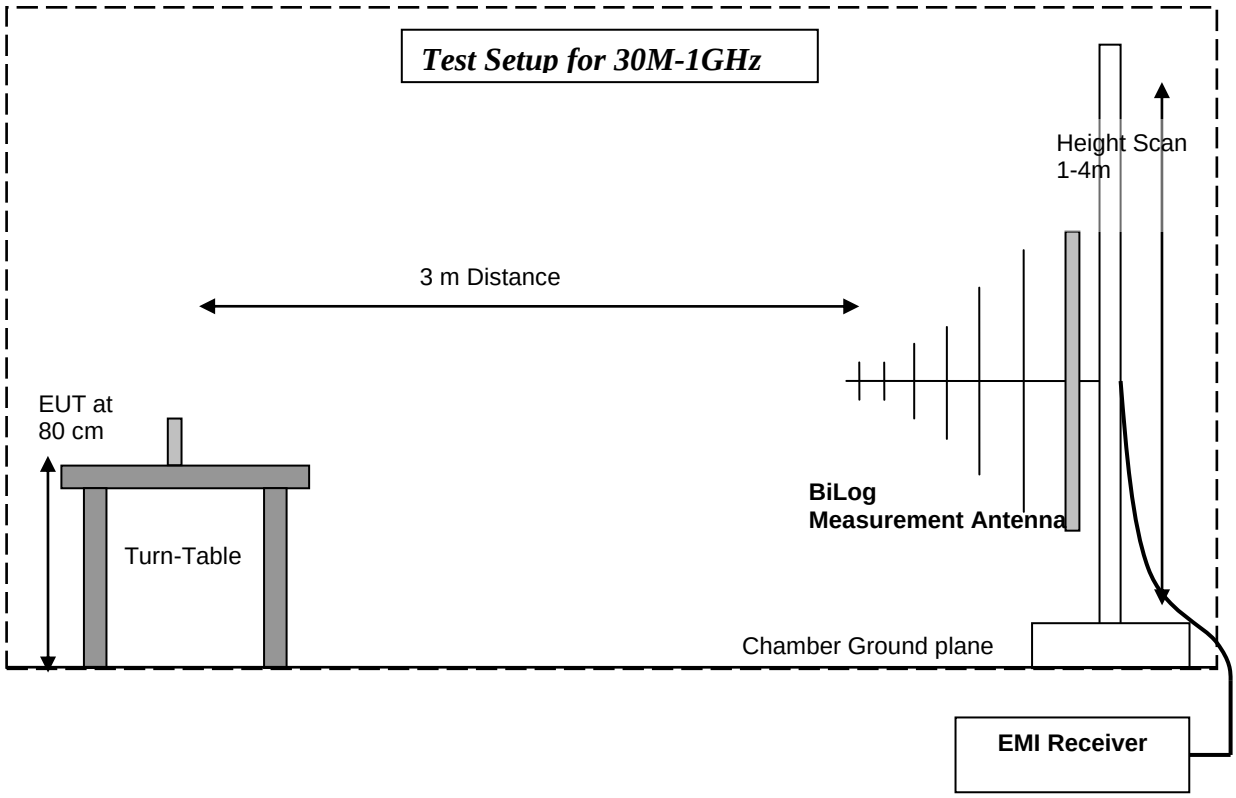


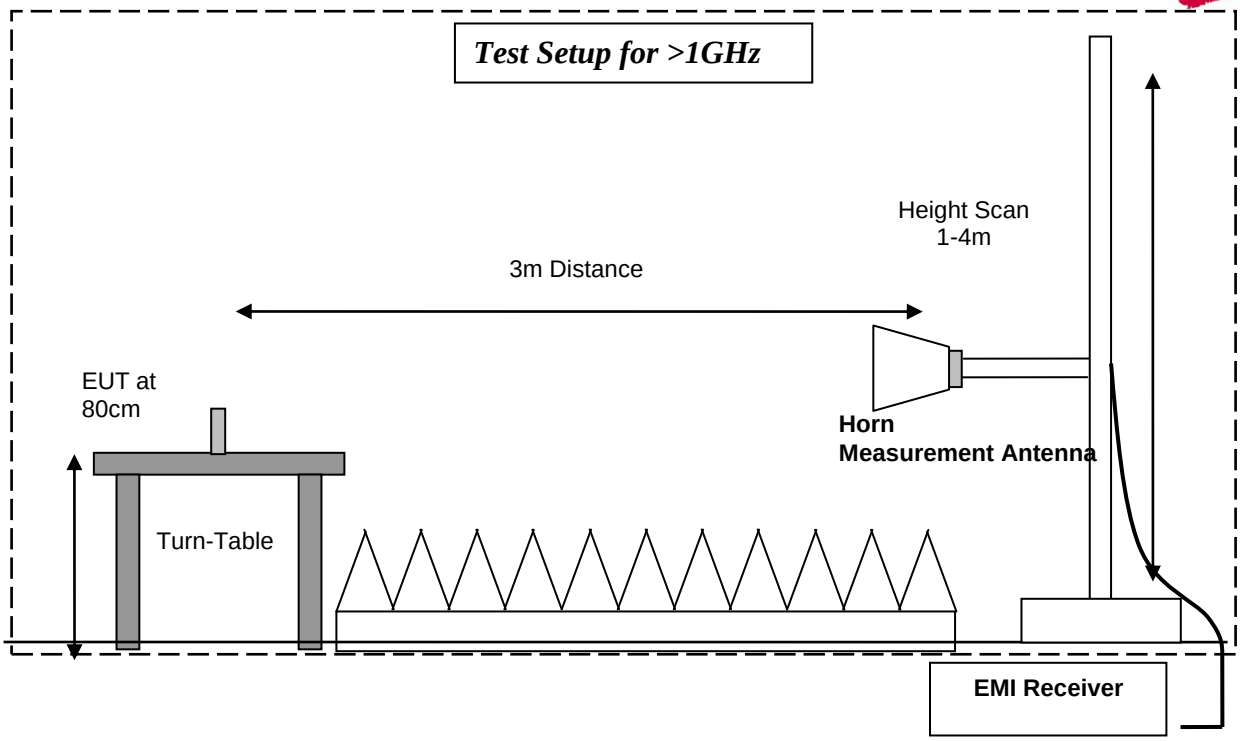
EN 55022 Voltage on Mains QP
EN 55022 Voltage on Mains AV
Preview Result 1-PK+
Preview Result 2-AVG

8 Test Equipment and ancillaries used for tests

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Calibration Date
Turn table	EMCO	2075	N/A	N/A	N/A
Relay Switch Unit	Rohde&Schwarz	RSU	338964/001	N/A	N/A
Antenna Mast	EMCO	2075	N/A	N/A	N/A
Pre-Amplifier	Miteq	JS40010260	340125	N/A	N/A
Binconilog Antenna	EMCO	3141	0005-1186	3 years	4/5/2012
Digital Radio Comm.	R&S	CMU 200# 4	110229	2 Years	6/15/2013
Digital Radio Comm.	R&S	CMU 200 #1	101821	2 Years	6/17/2013
Digital Radio Comm.	R&S	CMU 200 #2	109879	2 Years	6/15/2013
Digital Radio Comm.	R&S	CMU 200 #3	110759	2 Years	6/15/2013
EMI Receiver	R&S	ESU40	100251	2 Years	9/13/2013
Horn Antenna	EMCO	3115	35114	3 years	3/6/2012
Horn Antenna	EMCO	3116	70497	3 years	3/2/2012
LISN	R&S	ESH3-Z5	836679/003	2 Years	6/18/2013
LISN	R&S	ESH3-Z6	836154/011	2 Years	6/16/2013
LISN	FCC	FCC-LISN-50-25-2-08	70497	2 Years	7/12/2012
Log Periodic Antenna	ETS Lindgren	3149	1186	3 years	8/23/2011
Loop Antenna	ETS Lindgren	6512	49838	3 years	8/1/2011
Thermometer Humidity	Dickson	TM320	5280063	1 Year	4/15/2013
Thermometer Humidity	Dickson	TM325	5285354	2 Years	4/15/2013
Spectrum Analyzer	R&S	FSU 26	100189	2 Years	6/1/2013
Signal Generator	R&S	SMP04	100151	2 Years	6/17/2013

9 Test Setup Diagrams




Test Setup for >1GHz
Height Scan
1-4m
3m Distance
EUT at
80cm
Horn
Measurement Antenna
Turn-Table
EMI Receiver

10 Revision History

Date	Report Name	Changes to report	Report prepared by
2014-06-04	EMC_INTEL-039-14001_15B_Rev1	First Version	F. Engert