

# MEASUREMENT REPORT

## FCC PART 15.225 / NFC 13.56MHz

**FCC ID:** HD5-CT40PL0N  
**APPLICANT:** Honeywell International Inc  
Honeywell Safety and Productivity Solutions

**Application Type:** Certification  
**Product:** Mobile Computer  
**Model No.:** CT40P-L0N  
**Brand Name:** Honeywell  
**FCC Classification:** Part 15 Low Power Communication Device Transmitter (DXX)  
**FCC Rule Part(s):** Part 15 Subpart C (Section 15.225)  
**Test Procedure(s):** ANSI C63.10-2013  
**Test Date:** July 07 ~ 27, 2020

Reviewed By:

*Jame Yuan*  
( Jame Yuan )

Approved By:

*Robin Wu*  
( Robin Wu )



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

## Revision History

Report No.	Version	Description	Issue Date	Note
2006RSU069-U7	Rev. 01	Initial Report	07-27-2020	Valid

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## General Information

<b>Applicant:</b>	Honeywell International Inc Honeywell Safety and Productivity Solutions
<b>Applicant Address:</b>	9680 Old Bailes Rd, Fort Mill, SC 29707, USA
<b>Manufacturer:</b>	Honeywell International Inc Honeywell Safety and Productivity Solutions
<b>Manufacturer Address:</b>	9680 Old Bailes Rd, Fort Mill, SC 29707, USA
<b>Test Site:</b>	MRT Technology (Suzhou) Co., Ltd
<b>Test Site Address:</b>	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China

## Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is an FCC registered (MRT Designation No. CN1166) test facility with the site description report on file and has met all the requirements specified in ANSI C63.4-2014.
- MRT facility is an IC registered (MRT Reg. No.11384A-1) test laboratory with the site description on file at Industry Canada.
- MRT facility is a VCCI registered (R-20025, G-20034, C-20020, T-20020) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LACert. No.3628.01) in EMC, Telecommunications, Radio and SAR testing.



## 1. INTRODUCTION

### 1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

### 1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The measurement facility compliant with the test site requirements specified in ANSI C63.4-2014.



## 2. PRODUCT INFORMATION

### 2.1. Equipment Description

Product Name	Mobile Computer
Model No.	CT40P-L0N
Serial No.	S/N: 20132B48D4 (Radiated Sample)
Hardware Version	V2.0
Software Version	OS.03.001
Qualcomm Chipset	
Wi-Fi Specification	802.11a/b/g/n/ac
Bluetooth Version	v5.0 dual mode
Antenna Delivery	2*TX + 2*RX
Nordic Chipset	
Bluetooth Version	v5.1 single mode, LE only
NXP Chipset	
NFC Working Frequency	13.56MHz
Accessories	
USB Adapter	Model No.: ADS-12B-06 05010E Input Power: 100 - 240V ~ 50/60Hz, Max. 0.3A Output Power: 5VDC 2.0A
Rechargeable Li-ion Battery	Model No.: CT50-BTSC Capacitance: 4020mAh/15.5Wh Rated Voltage: 3.85V

### 2.2. Product Specification Subjective to this Report

Frequency Range	13.56MHz
Channel Number	1
Type of modulation	ASK
Antenna Type	Loop Antenna

Note: For other features of this EUT, test report will be issued separately.

### 2.3. Test Mode

Test Mode
Mode 1: Transmit by NFC

## 2.4. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

## 2.5. Labeling Requirements

Per 2.1074 & 15.19; Docket 95-19

The label shall be permanently affixed at a conspicuous location on the device; instruction manual or pamphlet supplied to the user and be readily visible to the purchaser at the time of purchase.

However, when the device is so small wherein placement of the label with specified statement is not practical, only the FCC ID must be displayed on the device per Section 15.19(a)(5). Please see attachment for FCC ID label and label location.

## 2.6. Test Environment Condition

Ambient Temperature	15°C~35°C
Relative Humidity	20%RH ~75%RH

### **3. DESCRIPTION OF TEST**

#### **3.1. Evaluation Procedure**

The measurement procedure described in the document titled “American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices” (ANSI C63.10-2013) was used in the measurement.

#### **3.2. AC Line Conducted Emissions**

The line-conducted facility is located inside an 8'x4'x4' shielded enclosure. A 1m x 2m wooden table 80cm high is placed 40cm away from the vertical wall and 80cm away from the sidewall of the shielded room. Two 10kHz-30MHz, 50Ω/50uH Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room floor. Power to the LISNs is filtered by external high-current high-insertion loss power line filters. These filters attenuate ambient signal noise from entering the measurement lines. These filters are also bonded to the shielded enclosure.

The EUT is powered from one LISN and the support equipment is powered from the second LISN. All interconnecting cables more than 1 meter were shortened to a 1 meter length by non-inductive bundling (serpentine fashion) and draped over the back edge of the test table. All cables were at least 40cm above the horizontal reference ground-plane. Power cables for support equipment were routed down to the second LISN while ensuring that that cables were not draped over the second LISN.

Sufficient time for the 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 receiver and exploratory measurements were made to determine the frequencies producing the maximum emission from the EUT. The receiver was scanned from 150kHz to 30MHz. The detector function was set to peak mode for exploratory measurements while the bandwidth of the analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was also maximized by varying: power lines, the mode of operation or data exchange speed, or support equipment whichever determined the worst-case emission. Once the worst case emissions have been identified, the one EUT cable configuration/arrangement and mode of operation that produced these emissions are used for final measurements on the same test site. The analyzer is set to CISPR quasi-peak and average detectors with a 9kHz resolution bandwidth for final measurements.

An extension cord was used to connect to a single LISN which powered by EUT. The extension cord was calibrated with LISN, the impedance and insertion loss are compliance with the requirements as stated in ANSI C63.10-2013 at Clause 4.3.

### 3.3. Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. For measurements above 1GHz absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1GHz, the absorbers are removed. A MF Model 210SS turntable is used for radiated measurement. It is a continuously rotatable, remote controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm high PVC support structure is placed on top of the turntable.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33(b)(1) depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 0.8 meter high, 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, if applicable, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions. According to 3dB Beam-Width of horn antenna, the horn antenna should be always directed to the EUT when rising height.

## 4. ANTENNA REQUIREMENTS

### **Excerpt from §15.203 of the FCC Rules/Regulations:**

“An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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.”

- The antenna of the **Tablet** is **permanently attached**.
- There are no provisions for connection to an external antenna.

### **Conclusion:**

The unit complies with the requirement of §15.203.

## 5. TEST EQUIPMENT CALIBRATION DATE

### Conducted Emissions - SR2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR3	MRTSUE06185	1 year	2021/01/18
Two-Line V-Network	R&S	ENV 216	MRTSUE06002	1 year	2021/06/11
Two-Line V-Network	R&S	ENV 216	MRTSUE06003	1 year	2021/06/11
Thermohygrometer	Testo	608-H1	MRTSUE06404	1 year	2020/08/08
Shielding Room	MIX-BEP	Chamber-SR2	MRTSUE06215	N/A	N/A

### Radiated Emissions - AC1

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2020/08/01
PXA Signal Analyzer	Keysight	9030B	MRTSUE06395	1 year	2020/09/03
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2020/11/13
Bilog Period Antenna	Schwarzbeck	VULB 9168	MRTSUE06172	1 year	2021/04/03
Broad Band Horn Antenna	Schwarzbeck	BBHA 9120D	MRTSUE06023	1 year	2020/10/13
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2020/12/29
Microwave System Amplifier	Agilent	83017A	MRTSUE06076	1 year	2020/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Thermohygrometer	Testo	608-H1	MRTSUE06403	1 year	2020/08/08
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2021/04/30

### Radiated Emission - AC2

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Keysight	N9038A	MRTSUE06125	1 year	2020/08/01
Loop Antenna	Schwarzbeck	FMZB 1519	MRTSUE06025	1 year	2020/11/13
Bilog Period Antenna	Schwarzbeck	VULB 9162	MRTSUE06022	1 year	2020/10/13
Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06171	1 year	2020/10/27
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	MRTSUE06024	1 year	2020/12/29
Broadband Coaxial Preamplifier	Schwarzbeck	BBV 9718	MRTSUE06176	1 year	2020/11/15
Preamplifier	Schwarzbeck	BBV 9721	MRTSUE06121	1 year	2021/06/11
Temperature/Humidity Meter	Minggao	ETH529	MRTSUE06170	1 year	2020/12/15
Anechoic Chamber	RIKEN	Chamber-AC2	MRTSUE06213	1 year	2021/04/30

## Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
EXA Signal Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2021/04/14
EXA Signal Analyzer	Keysight	N9010B	MRTSUE06452	1 year	2020/07/11
Signal Analyzer	R&S	FSV40	MRTSUE06218	1 year	2021/04/14
Power Meter	Agilent	U2021XA	MRTSUE06030	1 year	2020/11/17
USB wideband power sensor	Keysight	U2021XA	MRTSUE06446	1 year	2021/06/11
USB wideband power sensor	Keysight	U2021XA	MRTSUE06447	1 year	2021/06/11
Bluetooth Test Set	Anritsu	MT8852B-042	MRTSUE06389	1 year	2021/06/11
Audio Analyzer	Agilent	U8903B	MRTSUE06143	1 year	2021/06/11
Modulation Analyzer	HP	8901A	MRTSUE06098	1 year	2020/10/10
Wideband Radio Communication Tester	R&S	CMW 500	MRTSUE06243	1 year	2020/11/07
DC Power Supply	GWINSTEK	DPS-3303C	MRTSUE06064	N/A	N/A
Attenuator	MVE	6dB	MRTSUE06534	1 year	2020/12/12
Attenuator	MVE	10dB	MRTSUE06543	1 year	2020/12/12
Temperature & Humidity Chamber	BAOYT	BYH-150CL	MRTSUE06051	1 year	2020/11/07
Thermohygrometer	testo	608-H1	MRTSUE06401	1 year	2020/08/08

Software	Version	Function
EMI Software	V3	EMI Test Software

## 6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k = 2$ .

AC Conducted Emission Measurement
Measurement Uncertainty for a Level of Confidence of 95% ( $U=2U_{c(y)}$ ): 9kHz~150kHz: 3.74dB 150kHz~30MHz: 3.44dB
Radiated Disturbance
Measurement Uncertainty for a Level of Confidence of 95% ( $U=2U_{c(y)}$ ): Horizontal: 30MHz~300MHz: 5.04dB 300MHz~1GHz: 4.95dB 1GHz~40GHz: 6.40dB Vertical: 30MHz~300MHz: 5.24dB 300MHz~1GHz: 6.03dB 1GHz~40GHz: 6.40dB
Spurious Emissions, Conducted
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_{c(y)}$ ): 0.78dB
Output Power
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_{c(y)}$ ): 1.13dB
Occupied Bandwidth
Measuring Uncertainty for a Level of Confidence of 95% ( $U=2U_{c(y)}$ ): 0.28%

## 7. TEST RESULT

### 7.1. Summary

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
15.225 (a), (b), (c)	In-Band Emission	15.848uV/m @ 30m 13.553 ~ 13.567 MHz 334uV/m @ 30m 13.410 ~ 13.553 MHz 13.567 ~ 13.710 MHz 106uV/m @ 30m 13.110 ~ 13.410 MHz 13.710 ~ 14.010 MHz		Pass	Section 7.2
15.225(d)	Out-Band Emission	Emissions outside of the specified band (13.110~14.010 MHz) must meet the radiated limits detailed in 15.209	Radiated	Pass	Section 7.3
2.1049	20dB Bandwidth 99% Bandwidth	N/A		Pass	Section 7.4
15.225(e)	Frequency Stability Tolerance	$\pm 0.01\%$ of operating frequency		Pass	Section 7.5
15.207	AC Conducted Emissions 150kHz - 30MHz	< FCC 15.207 limits	Line Conducted	Pass	Section 7.6

**Notes:**

- 1) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.

## 7.2. In-band Emission

### 7.2.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.225		
Frequency (MHz)	Distance (m)	Level (uV/m)
13.553 ~13.567	30	15,848
13.410 ~13.553 13.567 ~13.710	30	334
13.110 ~13.410 13.710 ~14.010	30	106

Note 1: The lower limit shall apply at the transition frequency.  
Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.  
Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m)

### 7.2.2. Test Procedure Used

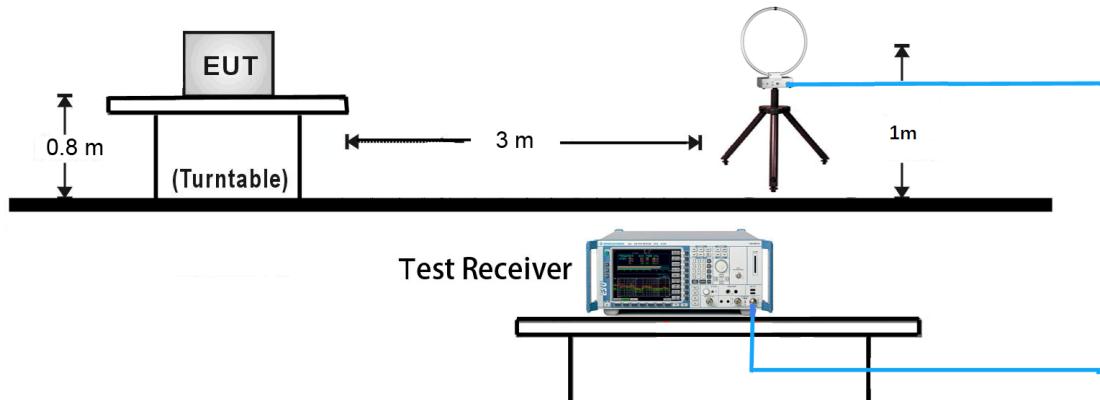
ANSI C63.10-2013 - Section 6.4.7

### 7.2.3. Test Setting

1. RBW = 9kHz
2. VBW = 3 \* RBW
3. Detector = Peak
4. Trace mode = Max hold
5. Sweep = Auto couple
6. Allow the trace to stabilize

#### 7.2.4. Test Setup

9kHz ~ 30MHz Test Setup:



### 7.2.5. Test Result

Test Engineer	Antony Yang	Test Date	2020/07/15
Test Mode	Mode1	Test Site	AC1

Frequency	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (@3m) (dBuV/m)	Margin [dB]
<b>Face On</b>					
13.14	7.97	20.51	28.48	80.51	-52.03
13.50	7.32	20.62	27.94	90.47	-62.53
13.56	33.06	20.63	53.69	123.99	-70.30
13.70	7.85	20.67	28.52	90.47	-61.95
13.98	7.32	20.72	28.04	80.51	-52.47
<b>Face Off</b>					
13.16	7.33	20.52	27.85	80.51	-52.66
13.50	6.14	20.62	26.76	90.47	-63.71
13.56	28.03	20.63	48.66	123.99	-75.33
13.60	8.38	20.64	29.02	90.47	-61.45
13.89	7.23	20.71	27.94	80.51	-52.57

Note 1: All measurements were performed using a loop antenna. The antenna was positioned in two orthogonal (face on and face off) and the position with the highest emission level was recorded.

Note 2: Measurements were tested at 3m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear extrapolation factor (40 dB/decade) as specified in &15.31(f)(2).

Extrapolation Factor =  $20 * \log(30/3)^2 = 40$  dB

Note 3: All measurements were recorded using an EMI test receiver employing a peak detector.

### 7.3. Out-band Emission

#### 7.3.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Distance (m)	Level (uV/m)
0.009 - 0.490	300	2400/F (kHz)
0.490 - 1.705	30	2400/F (kHz)
1.705 - 30	30	30
30 - 88	3	100
88 - 216	3	150
216 - 960	3	200
Above 960	3	500

Note 1: The lower limit shall apply at the transition frequency.  
Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.  
Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m)

#### 7.3.2. Test Procedure Used

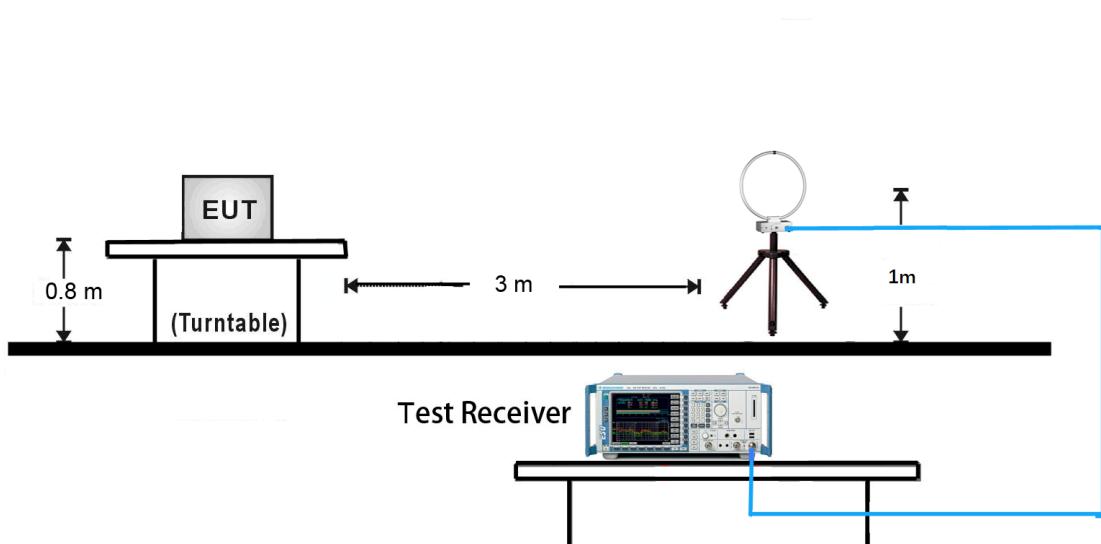
ANSI C63.10-2013 - Section 6.5.4

#### 7.3.3. Test Setting

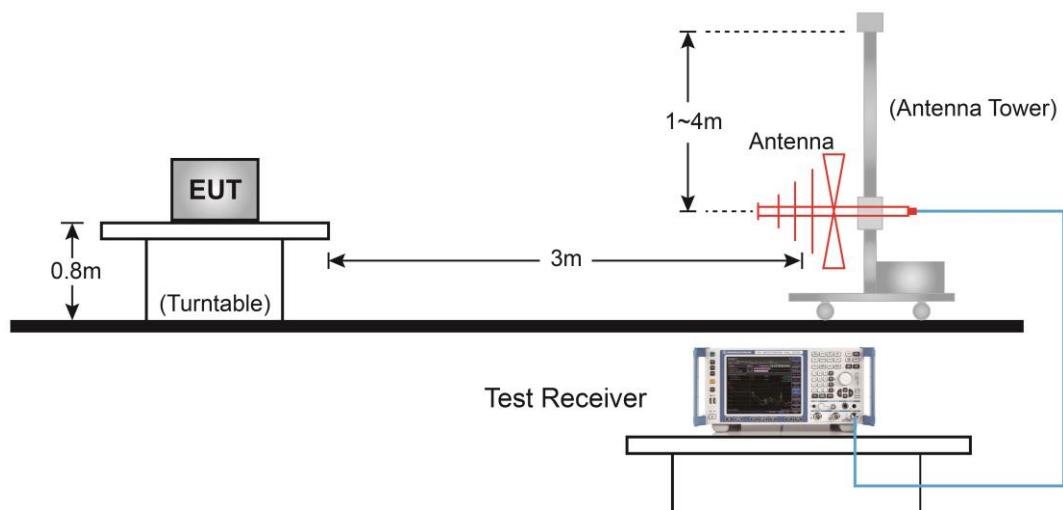
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 9kHz for emission below 30MHz and 100kHz for emission between 30MHz and 1GHz
3. VBW = 3 \* RBW
4. Detector = Peak
5. Trace mode = Max hold
6. Sweep = Auto couple
7. Allow the trace to stabilize

### 7.3.4. Test Setup

#### 9kHz ~ 30MHz Test Setup:



#### 30MHz ~ 1GHz Test Setup:



### 7.3.5. Test Result

Test Engineer	Antony Yang	Test Date	2020/07/23
Test Mode	Mode 1	Test Site	AC1

Out-Band Emission Below 30MHz						
Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
Face On						
27.12	6.54	20.35	26.89	69.54	-42.65	QP
Face Off						
27.12	8.18	20.35	28.53	69.54	-41.01	QP

Out-Band Emission Above 30MHz							
Polarization	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	48.9	3.5	14.5	18.0	40.0	-22.0	QP
H	149.8	3.6	14.4	18.0	43.5	-25.5	QP
H	371.9	3.6	16.6	20.2	46.0	-25.8	QP
H	429.2	3.3	18.2	21.5	46.0	-24.5	QP
H	641.1	3.6	22.6	26.2	46.0	-19.8	QP
H	768.7	4.8	24.7	29.5	46.0	-16.5	QP
V	45.5	2.5	14.5	17.0	40.0	-23.0	QP
V	98.9	7.3	9.4	16.8	43.5	-26.7	QP
V	158.0	3.1	14.6	17.7	43.5	-25.8	QP
V	428.7	3.9	18.1	22.0	46.0	-24.0	QP
V	641.6	4.2	22.6	26.8	46.0	-19.2	QP
V	871.5	4.9	25.4	30.3	46.0	-15.7	QP

Note1: Below 30MHz measurement was performed using a loop antenna. The antenna was positioned in two orthogonal (face on and face off) and the position with the highest emission level was recorded.

Note2: Measurements were tested at 3m and the data was extrapolated to the specified measurement distance of 30m using the square of an inverse linear extrapolation factor (40 dB/decade) as specified in &15.31(f)(2).

Extrapolation Factor =  $40 * \log^{(30/3)} = 40$  dB

Note3: All measurements were recorded using an EMI test receiver employing a peak detector.

## 7.4. Occupied Bandwidth

### 7.4.1. Test Limit

The occupied bandwidth is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequency.

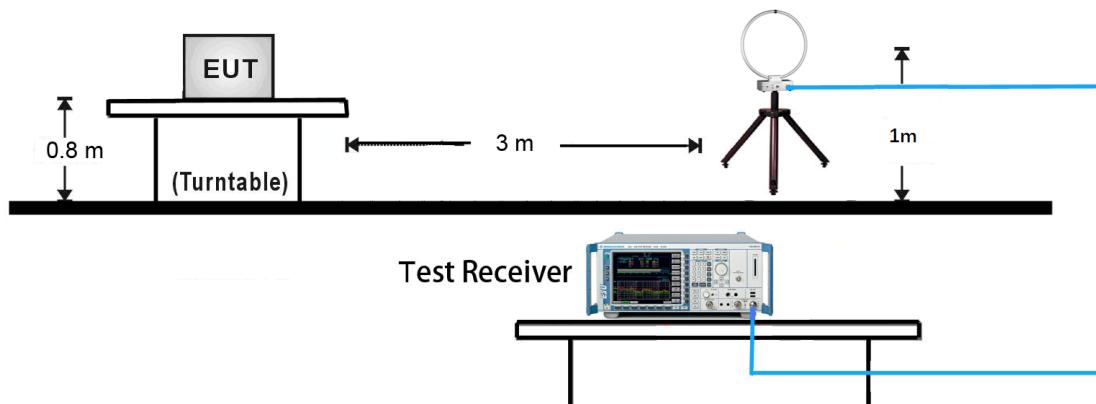
### 7.4.2. Test Procedure Used

ANSI C63.10-2013 - Section 6.9.3

### 7.4.3. Test Setting

1. Spectrum analyzer frequency is set to the nominal EUT channel center frequency.
2. Set RBW  $\geq 1\%$  to 5% of the OBW
3. VBW = Approximately three times RBW
4. Reference level set to keep signal from exceeding maximum input mixer level for linear operation
5. Detector = Peak
6. Trace mode = Max hold
7. Sweep = Auto couple
8. Allow the trace to stabilize
9. Using 99% power bandwidth function of the instrument and report the measured bandwidth

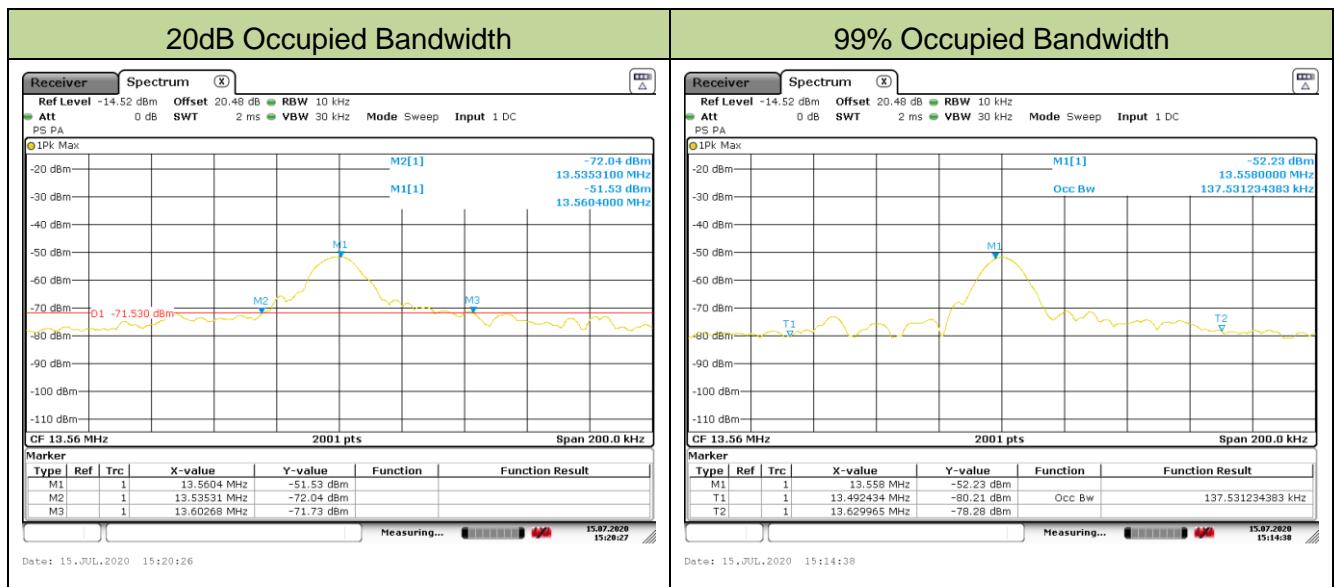
### 7.4.4. Test Setup



#### 7.4.5. Test Result

Test Engineer	Antony Yang	Test Date	2020/07/15
Test Mode	Mode1	Test Site	AC2

Frequency (MHz)	20dB Occupied Bandwidth (kHz)	99% Occupied Bandwidth (kHz)
13.56	67.37	137.53



## 7.5. Frequency Tolerance

### 7.5.1. Test Limit

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency.

### 7.5.2. Test Procedure Used

ANSI C63.10-2013 - Section 6.8

### 7.5.3. Test Setting

#### **Frequency Stability Under Temperature Variations:**

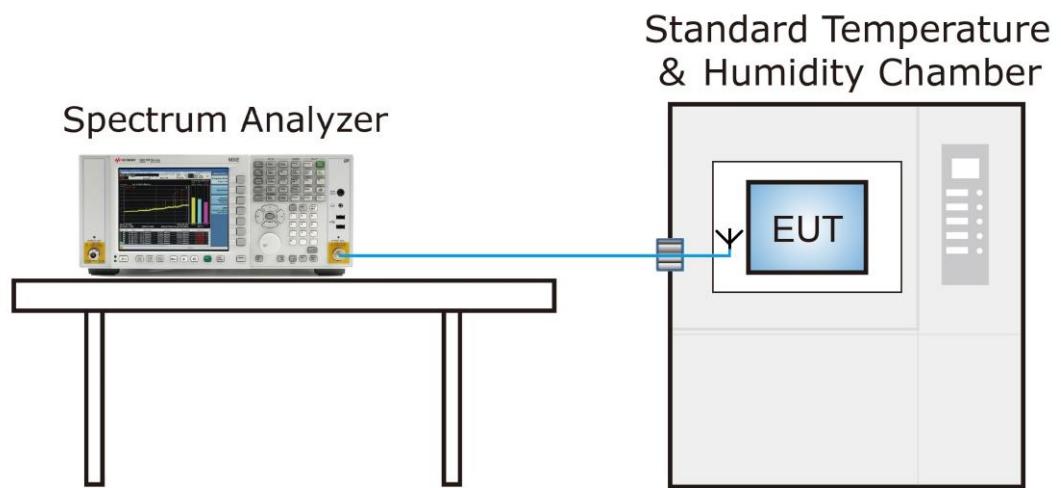
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to highest. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C decreased per stage until the lowest temperature reached.

#### **Frequency Stability Under Voltage Variations:**

Set chamber temperature to 20°C. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.

Reduce the input voltage to specify extreme voltage variation ( $\pm 15\%$ ) and endpoint, record the maximum frequency change.

#### 7.5.4. Test Setup



### 7.5.5. Test Result

Test Engineer	Antony Yang	Test Date	2020/07/15
Test Mode	Mode1	Test Site	AC1

Operating Frequency: 13.56MHz					
Reference Voltage: 3.85Vdc					
Deviation Limit: +/- 0.01% = 1356Hz					
Voltage (%)	Power Battery	Temp (°C)	Freq. (Hz)	Freq. Dev. (Hz)	Deviation (%)
100%	3.85	-20	13,560,025	25	0.000184
		-10	13,560,098	98	0.000723
		0	13,560,030	30	0.000221
		+10	13,559,935	-65	-0.000479
		+20 (Ref)	13,560,034	34	0.000251
		+30	13,559,992	-8	-0.000059
		+40	13,559,946	-54	-0.000398
		+50	13,560,082	82	0.000605
Battery Upper	4.30	+ 20	13,559,895	-105	-0.000774
Battery Endpoint	3.50	+ 20	13,559,967	-33	-0.000243

Note 1: Frequency Tolerance (ppm) = {[Measured Frequency (MHz) - Declared Frequency (MHz)] / Declared Frequency (MHz)} \*10<sup>6</sup>.

Note 2: Battery upper voltage is 4.30Vdc, battery endpoint voltage is 3.50Vdc, which are declared by the manufacturer.

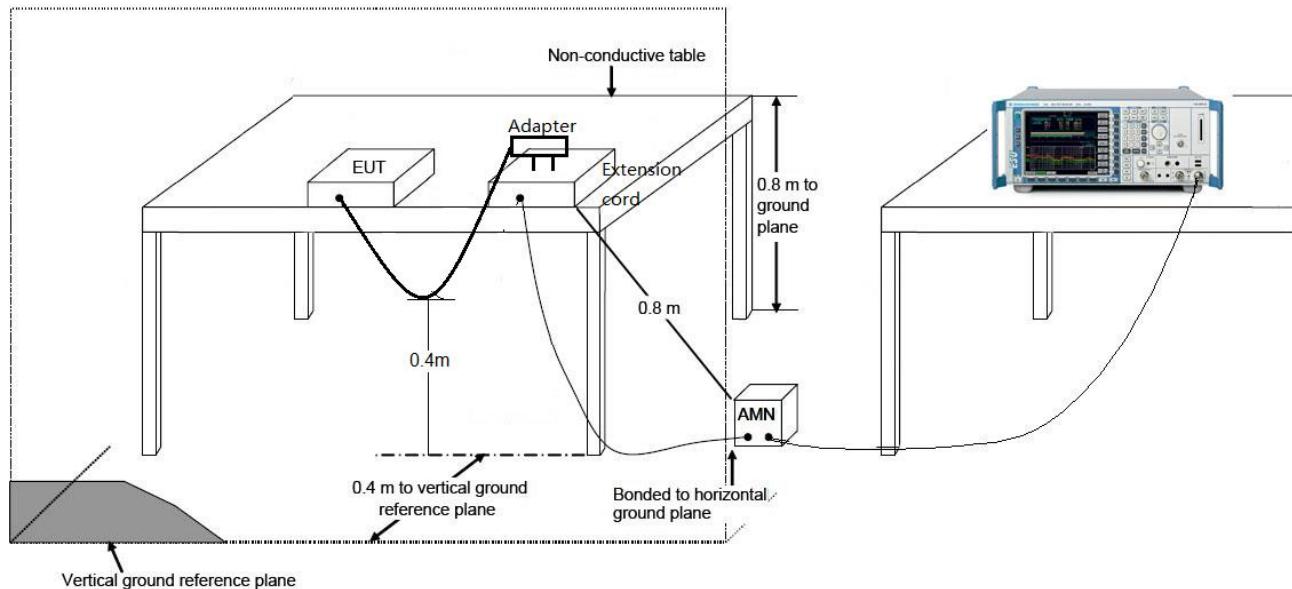
## 7.6. AC Conducted Emissions Measurement

### 7.6.1. Test Limit

FCC Part 15 Subpart C Paragraph 15.207		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

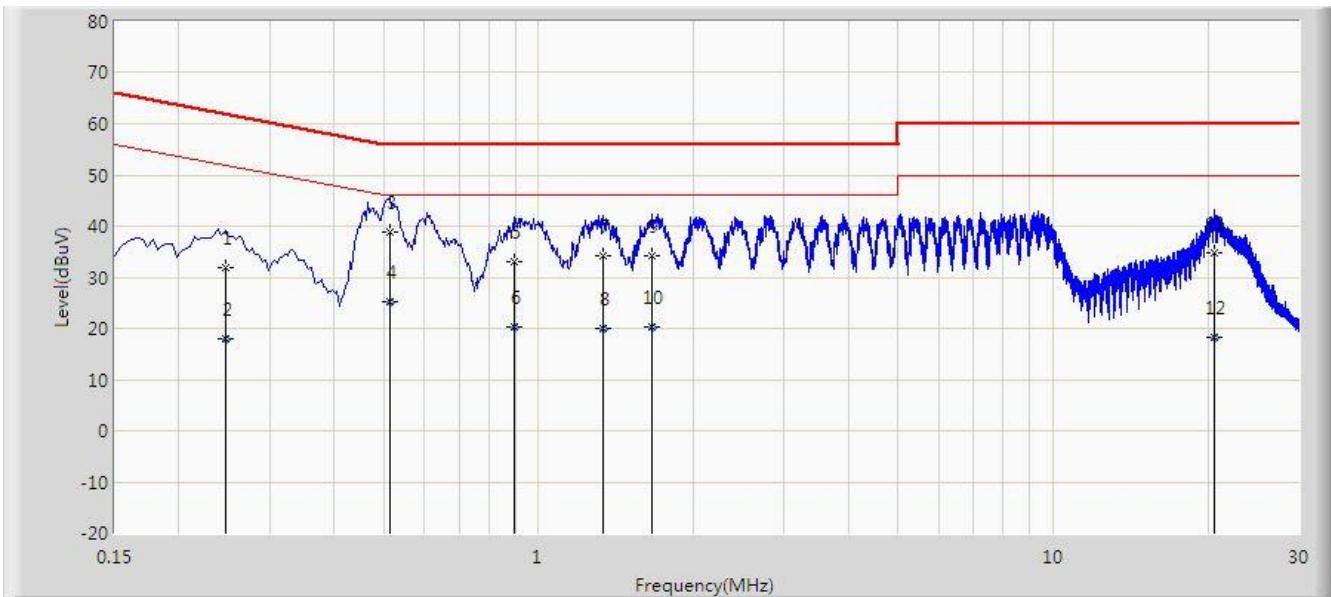
Note 1: The lower limit shall apply at the transition frequencies.  
Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.5MHz.

### 7.6.2. Test Setup



### 7.6.3. Test Result

Site: SR2	Time: 2020/07/23 - 18:03
Limit: FCC_Part15.207_CE_AC Power	Engineer: Hyde Yu
Probe: ENV216_101683_Filter On	Polarity: Line
EUT: Mobile Computer	Power: AC 120V/60Hz
Test Mode 1	

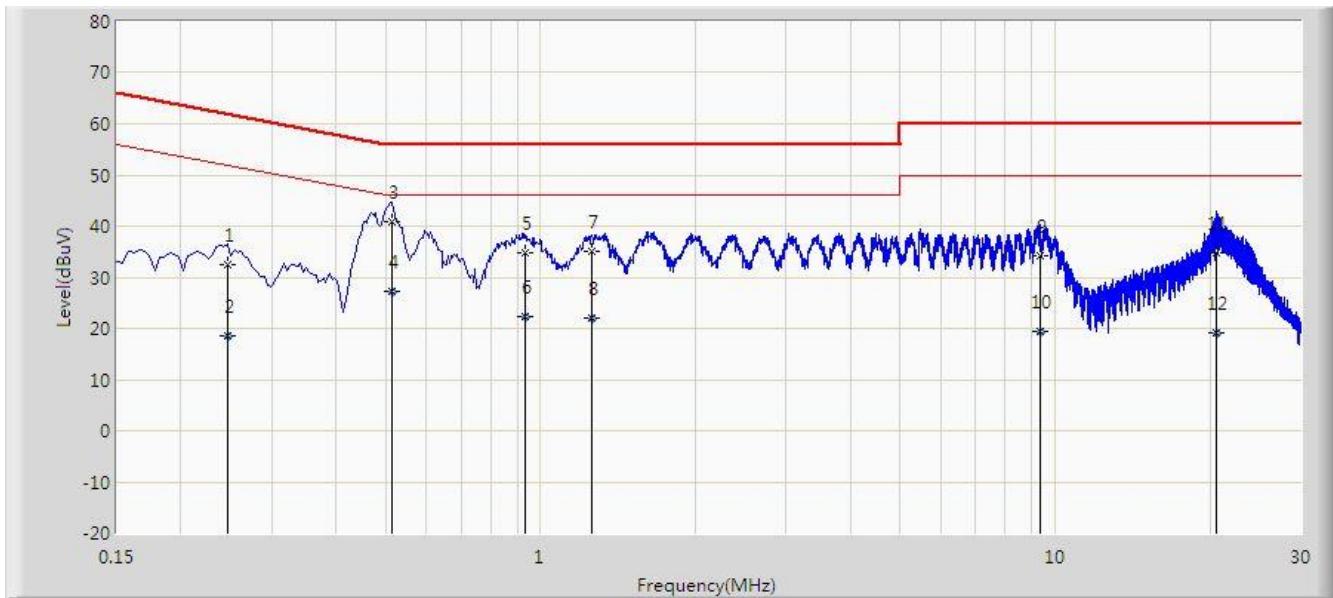


No	Flag	Mark	Frequency (MHz)	Measure Level (dB $\mu$ V)	Reading Level (dB $\mu$ V)	Margin (dB)	Limit (dB $\mu$ V)	Factor	Type
1			0.246	31.777	22.113	-30.114	61.891	9.664	QP
2			0.246	17.870	8.206	-34.021	51.891	9.664	AV
3		*	0.514	38.822	29.082	-17.178	56.000	9.739	QP
4			0.514	25.178	15.438	-20.822	46.000	9.739	AV
5			0.898	33.046	23.238	-22.954	56.000	9.808	QP
6			0.898	20.264	10.456	-25.736	46.000	9.808	AV
7			1.338	34.100	24.230	-21.900	56.000	9.870	QP
8			1.338	19.870	10.000	-26.130	46.000	9.870	AV
9			1.658	34.194	24.339	-21.806	56.000	9.855	QP
10			1.658	20.150	10.294	-25.850	46.000	9.855	AV
11			20.581	34.881	24.545	-25.119	60.000	10.336	QP
12			20.581	18.117	7.780	-31.883	50.000	10.336	AV

Note: Measure Level (dB $\mu$ V) = Reading Level (dB $\mu$ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

Site: SR2	Time: 2020/07/23 - 18:22
Limit: FCC_Part15.207_CE_AC Power	Engineer: Hyde Yu
Probe: ENV216_101683_Filter On	Polarity: Neutral
EUT: Mobile Computer	Power: AC 120V/60Hz
Test Mode 1	



No	Flag	Mark	Frequency (MHz)	Measure Level (dB $\mu$ V)	Reading Level (dB $\mu$ V)	Margin (dB)	Limit (dB $\mu$ V)	Factor	Type
1			0.246	32.361	22.728	-29.530	61.891	9.632	QP
2			0.246	18.517	8.885	-33.374	51.891	9.632	AV
3	*		0.514	40.910	31.250	-15.090	56.000	9.659	QP
4			0.514	27.264	17.604	-18.736	46.000	9.659	AV
5			0.934	34.899	25.225	-21.101	56.000	9.675	QP
6			0.934	22.204	12.529	-23.796	46.000	9.675	AV
7			1.258	34.931	25.191	-21.069	56.000	9.740	QP
8			1.258	22.029	12.289	-23.971	46.000	9.740	AV
9			9.370	34.093	23.835	-25.907	60.000	10.259	QP
10			9.370	19.320	9.061	-30.680	50.000	10.259	AV
11			20.538	34.667	24.344	-25.333	60.000	10.322	QP
12			20.538	19.095	8.772	-30.905	50.000	10.322	AV

Note: Measure Level (dB $\mu$ V) = Reading Level (dB $\mu$ V) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB).

## 8. CONCLUSION

The data collected relate only the item(s) tested and show that the device is in compliance with Part 15C of the FCC Rules.

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The End

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## Appendix A - Test Setup Photograph

Refer to "2006RSU069-UT" file.

## Appendix B - EUT Photograph

Refer to "2006RSU069-UE" file.