

### FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS-210 ISSUE 8

**CERTIFICATION TEST REPORT** 

FOR

## APPLE WATCH MAGNETIC CHARGING CABLE FOR DISPLAY CASE

**MODEL NUMBER: A1667** 

**REPORT NUMBER: 14U19491-E1, REVISION B** 

FCC ID: BCGA1667 IC: 579C-A1667

**ISSUE DATE: FEBRUARY 23, 2015** 

Prepared for APPLE, INC. 1 INFINITE LOOP CUPERTINO, CA 95014, U.S.A.

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NVLAP LAB CODE 200065-0

### **Revision History**

Rev.	lssue Date	Revisions	Revised By
	02/12/2015	Initial Issue	M. Mekuria
A	02/19/2015	Address TCB questions	C. Pang
В	02/23/2015	Revised report to address TCB's question on Section 5.4	T. Chu

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<b>8.</b> 8 8 8 8	OCC RAD 3.1. 8.2.1 8.2.2 8.3.1 8.3.2 2.4. 8.4.1 8.4.2 8.4.1 8.4.2 9.1.1	SUPIED BANDWIDTH       1         IATED EMISSION TEST RESULTS       1         LIMITS AND PROCEDURE       1         TX FUNDAMENTAL FROM 0.15 TO 30 MHz       1         CONFIGURATION 1       1         CONFIGURATION 2       1         TX SPURIOUS EMISSIONS FROM 0.15 TO 30 MHz       1         CONFIGURATION 1       1         CONFIGURATION 2       1         TX SPURIOUS EMISSIONS FROM 0.15 TO 30 MHz       1         CONFIGURATION 1       1         CONFIGURATION 2       1         TX SPURIOUS EMISSION 30 TO 1000 MHz       1         CONFIGURATION 1       1         CONFIGURATION 1       1         CONFIGURATION 1       1         CONFIGURATION 1       2         MAINS LINE CONDUCTED EMISSIONS       2         CONFIGURATION 1       2	<b>11</b> <b>13</b> <i>14</i> <i>14</i> <i>15</i> <i>16</i> <i>17</i> <i>18</i> <i>18</i> <i>21</i> <b>27</b> <i>28</i>
<b>8.</b> 8 8 8 8	OCC RAD 3.1. 8.2.1 8.2.2 3.3 8.3.1 8.3.2 8.4.1 8.4.2 8.4.1 8.4.2 AC M	SUPIED BANDWIDTH1IATED EMISSION TEST RESULTS1LIMITS AND PROCEDURE1TX FUNDAMENTAL FROM 0.15 TO 30 MHz1CONFIGURATION 11CONFIGURATION 21TX SPURIOUS EMISSIONS FROM 0.15 TO 30 MHz1CONFIGURATION 11CONFIGURATION 21TX SPURIOUS EMISSION STO 1000 MHz1CONFIGURATION 11CONFIGURATION 21TX SPURIOUS EMISSION 30 TO 1000 MHz1CONFIGURATION 11CONFIGURATION 11CONFIGURATION 22MAINS LINE CONDUCTED EMISSIONS2CONFIGURATION 12	<b>11</b> <b>13</b> <i>14</i> <i>14</i> <i>15</i> <i>16</i> <i>17</i> <i>18</i> <i>18</i> <i>21</i> <b>27</b> <i>28</i>

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## 1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	APPLE, INC. 1 INFINITE LOOP CUPERTINO, CA 95014, U.S.A.		
EUT DESCRIPTION:	APPLE WATCH MAGNETIC CHARGING CABLE FOR DISPLAY CASE		
MODEL:	MODEL: A1667		
SERIAL NUMBER:	DLCNP05ZG86D (Single Charger)	DLCNP05ZG86D (Single Charger)	
DATE TESTED:	JANUARY 20 – 23 AND FEBRUARY 1	2, 2015	
	APPLICABLE STANDARDS		
ST	ANDARD	TEST RESULTS	
FCC PART	T 15 SUBPART C	Pass	
RSS-	210 Issue 8	Pass	

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL Verification Services Inc. By:

MENGISTU MEKURIA SENIOR ENGINEER UL VERIFICATION SERVICES INC. Tested By:

TONY WANG LAB ENGINEER UL VERIFICATION SERVICES INC.

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# 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2009, FCC CFR 47 Part 2, and FCC CFR 47 Part 15, RSS-GEN 4 and RSS-210 Issue 8 December 2010.

# 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street
Chamber A	Chamber D
Chamber B	Chamber E
Chamber C	Chamber F
	🛛 Chamber G
	Chamber H

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers A through H are covered under Industry Canada company address code 2324B with site numbers 2324B -1 through 2324B-8, respectively

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <u>http://ts.nist.gov/standards/scopes/2000650.htm</u>.

# 4. CALIBRATION AND UNCERTAINTY

# 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

# 4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB) 36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

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# 4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	± 3.52 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.94 dB
Radiated Disturbance, 1 to 6 GHz	± 3.86 dB
Radiated Disturbance, 6 to 18 GHz	± 4.23 dB
Radiated Disturbance, 18 to 26 GHz	± 5.30 dB
Radiated Disturbance, 26 to 40 GHz	± 5.23 dB

Uncertainty figures are valid to a confidence level of 95%.

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# 5. EQUIPMENT UNDER TEST

## 5.1. DESCRIPTION OF EUT

The EUT is a plastic magnetic charging cable, which includes an inductive charging coil and is used in the display case.

## 5.2. MAXIMUM OUTPUT POWER

The transmitter has maximum peak radiated electric field strength at 300m distance as follows:

Fundamental Frequency	Mode	E field (300m distance)	
(KHz)		(dBuV/m)	
326.5	Standby	-13.99	

## 5.3. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was v092.

# 5.4. WORST-CASE CONFIGURATION AND MODE

The EUT is a single frequency device with Plastic enclosure. The EUT was investigated at X, Y and Z orientations and the worst case orientation with support device. After the investigation the Y orientation is turned out to be the worst case. The final radiated tests conducted on using a plastic EUT as a standby and a plastic EUT with the support device as operational modes.

The follow 2 configurations were tested:

Configuration	Mode	Descriptions	
1	Standby	EUT Alone powered by AC/DC adapter	
2 Operating		EUT and Watch powered by AC/DC adapter	

AC power line conducted emissions were also investigated with the following configurations and EUT powered by AC/DC adapter was the worst-case scenario. All final tests conducted on configuration 1 and 2.

Configuration	Mode	Descriptions
1	Standby	EUT Alone powered by AC/DC adapter
2	Operating	EUT and Watch powered by AC/DC adapter
3	Standby	EUT Alone powered by laptop
4	Operating	EUT and Watch powered by laptop

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## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

Support Equipment List					
Description Manufacturer Model Serial Number FCC ID				FCC ID	
AC/DC adapter	Apple	A1385	D29236C3AFDHLHCT	N/A	
Watch	Apple	A1554	FG7NPOVLFY2H	BCG-E2871	
Watch	Apple	A1553	FG7NG0CVFY1P	BCG-E2870	

### I/O CABLES ( Configuration 1 and 2)

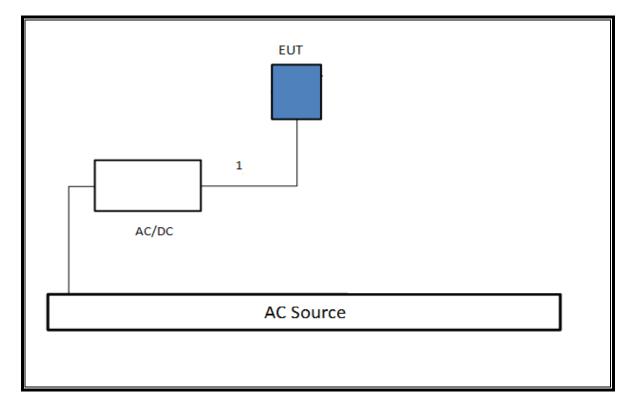
	I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks	
1	DC	1	USB	Un-shielded	0.3	N/A	

#### TEST SETUP

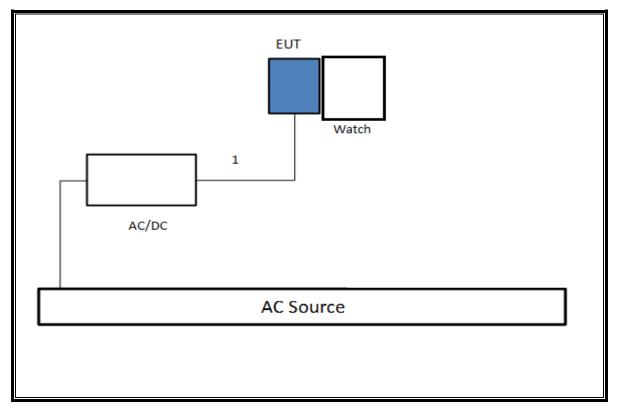
Please see the following configurations for the test setups. Both configurations indicate that the EUT is directly connected to an AC/DC adapter via USB cable.

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### **CONFIGURATION 1: STANDBY MODE**



#### **CONFIGURATION 2: OPERATING MODE**



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# 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Description	Manufacturer	Model	Asset	Cal Due
Antenna, Broadband Hybrid, 30MHz to 2000MHz	Sunol Sciences	JB3	A051314-2	06/05/15
Amplifier, 10KHz to 1GHz, 32dB	Sonoma	310N	325118	04/27/15
Spectrum Analyzer, PXA, 3Hz to 44GHz	Agilent	N9030A	MY53311010	05/17/15
Antenna, Loop, 30 MHz	ETS Lindgren	6502	F00366	10/04/15
Switch Driver	ACS	11713A	2508A04052	N/A
Antenna, Hybrid 30MHz to 2GHz	Sunol Sciences	JB3	T407	05/05/15
PXA Signal Analyzer 3Hz to 44GHz	Agilent	N9030A	T340	03/11/15
EMI Test Receiver	R & S	ESCI 7	T284	09/16/15
LISN, 10 kHz - 30 MHz	FCC	50/250-25-2	T24	01/17/16

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# 7. OCCUPIED BANDWIDTH

The emission bandwidth (xdB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.

When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately 3×RBW.

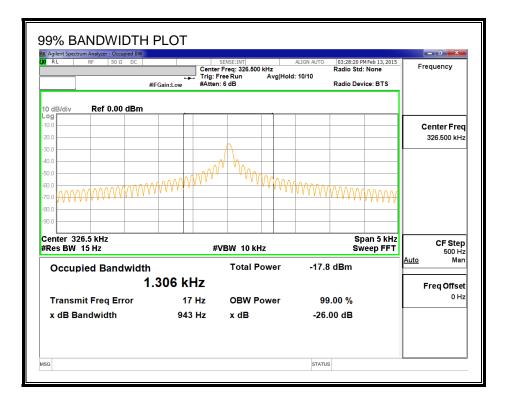
Note: Video averaging is not permitted.

A peak, or peak hold, may be used in place of the sampling detector as this may produce a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold may be necessary to determine the occupied bandwidth if the device is not transmitting continuously.

The trace data points are recovered and are directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded.

The difference between the two recorded frequencies is the 99% occupied bandwidth.

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# 8. RADIATED EMISSION TEST RESULTS

## 8.1. LIMITS AND PROCEDURE

#### **LIMITS**

FCC §15.209 (a) IC RSS-GEN, Section 8.9 and 8.10. IC RSS-GEN, Section 7 (Receiver)

Frequency	Field Strength	Measurement Distance				
(MHz)	(microvolts/meter)	(m)				
0.009–0.490	2400/F(kHz)	300				
0.490-1.705	24000/F(kHz)	30				
1.705–30.0	30	30				
30–88	100	3				
88 to 216	150	3				
216 to 960	200	3				
Above 960 MHz	500	3				
Note: The lower limit sha	Note: The lower limit shall apply at the transition frequency.					

**RESULTS** 

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# 8.2. TX FUNDAMENTAL FROM 0.15 TO 30 MHz

### 8.2.1. CONFIGURATION 1

FCC Par	. 10, 00	opuit	540		0 mete	Distance	incusurement.	At Chamber-0	0				
Company													
Project #:			14U19										
EUT Confi		#:	Model										
Mode of o	peration:		Standb	,									
Tester:			C. Xior	•									
Date:			1/21/20	)15									
Frequency	PK	QP	AV	AF	Distance	Distance	PK Corrected	AV Corrected	PK Limit	AV Limit	PK Margin	AV Margin	Notes
(MHz)         (dBu/V)         (dBu/V) <th(dbu th="" v)<=""> <th(dbu th="" v)<=""> <th(db< td=""></th(db<></th(dbu></th(dbu>													
-		)n:											
0.3265	55.467		42.83	10.54	3	-80.00	-13.99	-26.63	37.33	17.33	-51.3	-44.0	
Loop Anter		Off:											
0.3265	52.309		39.93	10.54	3	-80.00	-17.15	-29.53	37.33	17.33	-54.5	-46.9	
and	mission lin above 100	nits are l	based or	n measu				tor except for the fre easurements emplo			'	-490 kHz	
P.K. = Peak     Below 150kHz => RBW=VBW=200 or 300Hz       A.F. = Antenna factor     Above 150kHz => RBW=VBW=9 or 10kHz (Average => VBW=10Hz)													

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### 8.2.2. CONFIGURATION 2

<u>A1554</u>

EUT Configuration #:       Model A1667 + Supporting Devices         Mode of operation:       Operating         Sester:       C. Xiong         Date:       1/21/2015	Company:													
Notes       Operating         ester:       C. Xiong         pate:       1/21/2015         Frequency       PK       QP       AV       AF       Distance       Distance       PK Corrected       AV Corrected       PK Limit       AV Limit       PK Margin       Notes         (MHz)       (dBu/V)       (dBu/V)       (dBu/V)       (dBu/V)       (dBu/V)       (dB)       Notes         oop Antenna Face On:	Project #:			14U19	491									
Pester:         C. Xiong 1/21/2015           Frequency         PK         OP         AV         AF         Distance         Distance         PK Corrected         AV Corrected         PK Limit         AV Limit         PK Margin         AV Margin         Notes           (MHz)         (dBuV)         (dBuV)         (dBuV)         (dBuV)         (dBuV)         (dBuV/m)         (dB				Model	A1667	+ Supportin	ng Devices							
Date:         1/21/2015           Frequency         PK         QP         AV         AF         Distance         Distance         PK Corrected         AV Corrected         PK Limit         AV Limit         PK Margin         AV margin         Notes           (MHz)         (dBu/V)         (dBu/V)         (dBu/V)         (dBu/V)         (dBu/V)         (dBu/V)         (dBu/V)         (dB)         Notes           oop Antenna Face On:         0.3265         45.207         38.99         10.54         3         -80.00         -24.25         -30.47         37.33         17.33         -61.6         -47.8         0.3265         43.546         35.2         10.54         3         -80.00         -25.91         -34.25         37.33         17.33         -63.2         -51.6           No more emissions were found up to 30MHz         0.00 - 25.91         -34.25         37.33         17.33         -63.2         -51.6		peration												
Frequency         PK         OP         AV         AF         Distance         Distance         PK Corrected         AV Corrected         PK Limit         PK Margin         AV Margin         Notes           (MHz)         (dBuV)         (dB	Tester:				0									
(MHz)         (dBuV)         (dBuV)         (dBuV)         (dBuV)         (dBuV)         (dBuV)         (dBuV)         (dB)         (dB)           oop Antenna Face On:         0.3265         45.207         38.99         10.54         3         -80.00         -24.25         -30.47         37.33         17.33         -61.6         -47.8           oop Antenna Face Off:         0.3265         43.546         35.2         10.54         3         -80.00         -25.91         -34.25         37.33         17.33         -63.2         -51.6           0.3265         43.546         35.2         10.54         3         -80.00         -25.91         -34.25         37.33         17.33         -63.2         -51.6	Date:			1/21/20	)15									
oop Antenna Face On:         0.3265         45.207         38.99         10.54         3         -80.00         -24.25         -30.47         37.33         17.33         -61.6         -47.8           oop Antenna Face Off:         0.3265         43.546         35.2         10.54         3         -80.00         -24.25         -30.47         37.33         17.33         -61.6         -47.8           0.3265         43.546         35.2         10.54         3         -80.00         -25.91         -34.25         37.33         17.33         -63.2         -51.6	Frequency	PK	QP	AV	AF	Distance	Distance	PK Corrected	AV Corrected	PK Limit	AV Limit	PK Margin	AV Margin	Notes
0.3265         45.207         38.99         10.54         3         -80.00         -24.25         -30.47         37.33         17.33         -61.6         -47.8           oop Antenna Face Off:	(			(dBuV)	dB/m	(m)	Correction (dB)	Reading (dBuV/m)	Reading (dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	
oop Artenna Face Off:         org         org <thorg< th="">         org         <thorg< th=""></thorg<></thorg<>			On:	<u> </u>										
0.3265         43.546         35.2         10.54         3         -80.00         -25.91         -34.25         37.33         17.33         -63.2         -51.6           No more emissions were found up to 30MHz         Image: Source of the second	0.0200			38.99	10.54	3	-80.00	-24.25	-30.47	37.33	17.33	-61.6	-47.8	
No more emissions were found up to 30MHz <u>lote:</u> The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz			Off:			<u> </u>								
<u>lote:</u> The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz	0.3265	43.546		35.2	10.54	3	-80.00	-25.91	-34.25	37.33	17.33	-63.2	-51.6	
	0.3265 * No more er <u>Note:</u> The e	43.546 missions mission li	were four mits are t	nd up to based or	30MHz n measu	urements en	nploying a CISPF	R quasi-peak detec	or except for the fre	equency ba	ands 9–90	kHz, 110-		
	P.K. = Peak													
	Q.P. = Quas		eadings											
0.P. = Quasi Peak Readings Below 150kHz => RBW=VBW=200 or 300Hz		na factor			Above 1	50kHz -> PB1	N-VBW-9 or 10kl	Hz (Average => VBW	-10Hz)					

### <u>A1553</u>

	rt B & C	•	3 Mete	r Distance	Measurement	t At Chamber-	G				
Company: Project #: EUT Configuration #: Mode of operation: Tester: Date:	14U19 Model Opera T. Chu 2/12/2	A1667 ting	+ Supportir	g Devices							
Frequency PK QF	AV	AF	Distance	Distance	PK Corrected	AV Corrected	PK Limit	AV Limit	PK Margin	AV Margin	Notes
(MHz)         (dBu/V)         (dB)         (dB)           Loop Antenna Face On:											
0.3265 45.529 39.66 10.54 3 -80.00 -23.93 -29.79 37.33 17.33 -61.3 -47.1											
oop Antenna Face Off:											
0.3265 43.207	35.44	10.54	3	-80.00	-26.25	-34.01	37.33	17.33	-63.6	-51.3	
No more emissions were <u>Note:</u> The emission limits a and above 10000M P.K. = Peak Q.P. = Quasi Peak Readin	re based o nz. Radiate	n measi ed emiss	ion limits in		ds are based on me	tor except for the fre easurements emplo				–490 kHz	

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## 8.3. TX SPURIOUS EMISSIONS FROM 0.15 TO 30 MHz

### 8.3.1. CONFIGURATION 1

Company													
Project #:			14U19										
EUT confi			Model A										
Mode of o	peration		Standb										
Tester:			C. Xior	•									
Date:			1/21/20	015									
Frequency	PK	QP	AV	AF	Distance	Distance	PK Corrected	AV Corrected	PK Limit	Δ\/ Limit	PK Marain	AV Margin	Notes
(MHz)	(dBu/V)	(dBu/V)	(dBuV)	dB/m	(m)	Correction (dB)	Reading (dBuV/m)	Reading (dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	Holes
Loop Anter	na Face	On:								````			
0.653	45.764	40.601	-	10.53	3	-40.00	11.13	-	31.31	-	-20.2	-	
0.9795	39.266			10.6	3	-40.00	4.38	-	27.78	-	-23.4	-	
Loop Anter													
0.653	42.408		-	10.53	3	-40.00	7.73	-	31.31	-	-23.6	-	
0.9795	35.534	30.495	-	10.6	3	-40.00	1.09	-	27.78	-	-26.7	-	
No more e lote: The e and P.K. = Peak	missions mission li above 10	were four mits are l 000Mhz.	based or Radiate	30MHz n measu d emiss	irements en ion limits in	nploying a CISPF these three banc	R quasi-peak detec Is are based on me	- tor except for the fre assurements emplo	equency ba		kHz, 110-	- -490 kHz	
Q.P. = Quasi Peak Readings     Below 150kHz => RBW=VBW=200 or 300Hz       A.F. = Antenna factor     Above 150kHz => RBW=VBW=9 or 10kHz (Average => VBW=10Hz)       Rev. 060314     Rev. 060314													

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### 8.3.2. CONFIGURATION 2

<u>A1554</u>

ompany: roject #: UT config lode of op ester: pate:	guration		14U19 Model A Operat T Wang 1/22/20	A1667 + ing	Supporting I	Devices							
Frequency	PK	QP	AV	AF	Distance	Distance	PK Corrected	AV Corrected				AV Margin	Notes
(MHz)	(dBu/V)	(dBu/V)	(dBuV)	dB/m	(m)	Correction (dB)	Reading (dBuV/m)	Reading (dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	
oop Anten													
0.921	32.91	27.81	-	10.58	3	-40.00	-1.61	-	28.32	-	-29.9	-	
2.06	25.81	20.69		10.6	3	-40.00	-8.71	-	29.54	-	-38.3	-	
oop Anten													
0.929	34.06	28.95	-	10.59	3	-40.00	-0.46	-	28.24	-	-28.7	-	
1.778	28.21	23.11	-	10.6	3	-40.00	-6.29	-	29.54	-	-35.8	-	
	mission lii above 100 si Peak Re	mits are I 000Mhz.	based or Radiate	n measu d emiss Below 1	ion limits in 50kHz => RB	W=VBW=200 or 3	ls are based on me	tor except for the fre easurements emplo =10Hz)				-490 kHz	

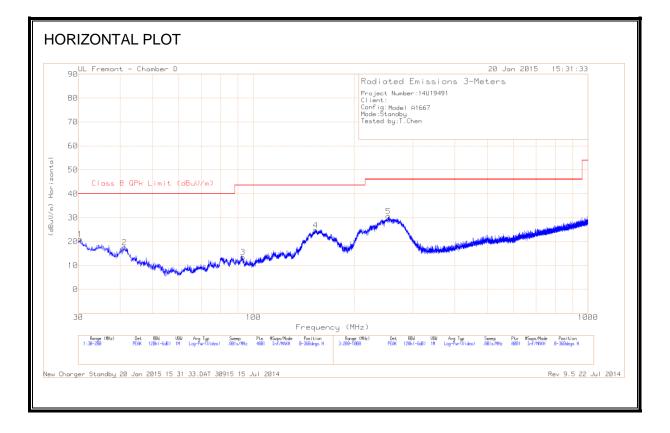
### <u>A1553</u>

Company: Project #:							At Chamber-	-				
UT configuration Node of operation Tester: Date:		14U19 Model Operat T. Chu 2/12/20	A1667 ting	+ Supportir	ng Devices							
Frequency PK	QP	AV	AF	Distance	Distance	PK Corrected	AV Corrected	PK Limit	AV Limit	PK Margin	AV Margin	Notes
(MHz) (dBu/V)		(dBuV)	dB/m	(m)	Correction (dB)	Reading (dBuV/m)	Reading (dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	
oop Antenna Face	On:											
0.896 31.643		-	10.58	3	-40.00	-2.40	-	28.56	-	-31.0	-	
	12.321		10.64	3	-40.00	-17.03	-	29.54	-	-46.6	-	
oop Antenna Face	Off:											
0.986 31.121	26.178	-	10.6	3	-40.00	-3.22	-	27.73	-	-31.0	-	
6.02 15.418	11.64	-	10.7	3	-40.00	-17.66	-	29.54	-	-47.2	-	
	imits are l 000Mhz. eadings	based or Radiate	n measu d emiss Below 1	ion limits in 50kHz => RB	these three band	is are based on me	tor except for the fre easurements emplo				–490 kHz	

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## 8.4. TX SPURIOUS EMISSION 30 TO 1000 MHz

### 8.4.1. CONFIGURATION 1



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### DATA

Marker	Frequenc y (MHz)	Meter Reading (dBuV)	Det	Hybrid	Amp/Cbl (dB)	Correcte d Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	30.34	27.98	PK	23.9	-30.9	20.98	40	-19.02	0-360	99	Н
2	41.305	32.05	PK	16.3	-30.8	17.55	40	-22.45	0-360	301	Н
3	93.1125	32.29	PK	11.3	-30.1	13.49	43.52	-30.03	0-360	201	Н
4	153.4625	38.91	PK	15.5	-29.6	24.81	43.52	-18.71	0-360	301	Н
5	253.6	44.41	PK	15	-28.8	30.61	46.02	-15.41	0-360	100	Н
6	32.635	35.27	PK	22.3	-30.9	26.67	40	-13.33	0-360	100	V
7	36.545	37.36	PK	19.6	-30.9	26.06	40	-13.94	0-360	100	V
8	41.2625	38.05	PK	16.3	-30.8	23.55	40	-16.45	0-360	100	V
9	146.195	36.03	PK	16	-29.7	22.33	43.52	-21.19	0-360	100	V
10	241.6	42.74	PK	14.4	-28.9	28.24	46.02	-17.78	0-360	100	V

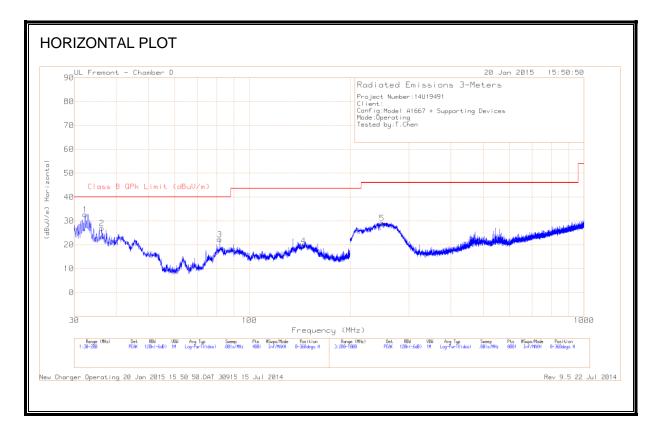
PK - Peak detector

FCC Part 15 Subpart B Class B 30-1000MHz.TST 30915 15 Jul 2014 Rev 9.5 22 Jul 2014

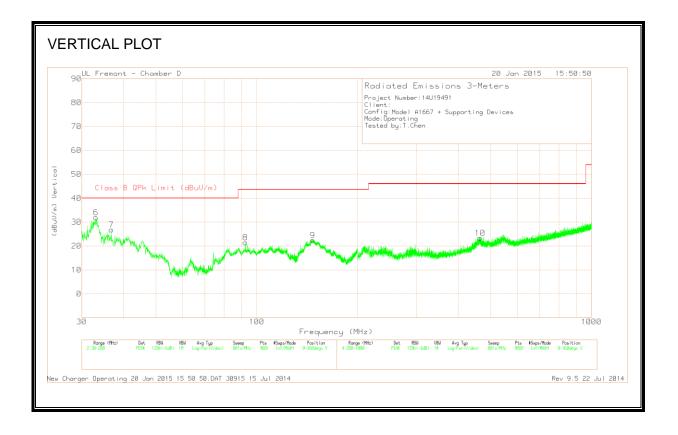
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### 8.4.2. CONFIGURATION 2

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### <u>DATA</u>

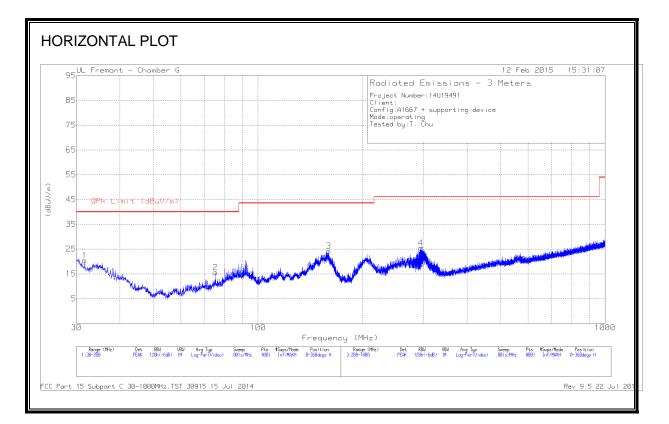
Marker	Frequenc y (MHz)	Meter Reading (dBuV)	Det	Hybrid	Amp/Cbl (dB)	Correcte d Reading (dBuV/m)	Class B QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	32.3375	41.04	PK	22.5	-30.9	32.64	40	-7.36	0-360	103	Н
2	36.2475	37.99	PK	19.8	-30.9	26.89	40	-13.11	0-360	103	Н
3	81.6375	42.11	PK	10.3	-30.2	22.21	40	-17.79	0-360	103	Н
4	145.3025	33.33	PK	16	-29.7	19.63	43.52	-23.89	0-360	103	Н
5	249	43.14	PK	14.8	-28.9	29.04	46.02	-16.98	0-360	100	Н
6	33.1025	41.03	PK	21.9	-30.9	32.03	40	-7.97	0-360	100	V
7	36.8	38.32	PK	19.4	-30.9	26.82	40	-13.18	0-360	100	V
8	92.6025	40.58	PK	11.1	-30.2	21.48	43.52	-22.04	0-360	100	V
9	147.045	36.1	PK	15.9	-29.6	22.4	43.52	-21.12	0-360	100	V
10	464.5	30.89	PK	20.1	-27.6	23.39	46.02	-22.63	0-360	100	V

PK - Peak detector

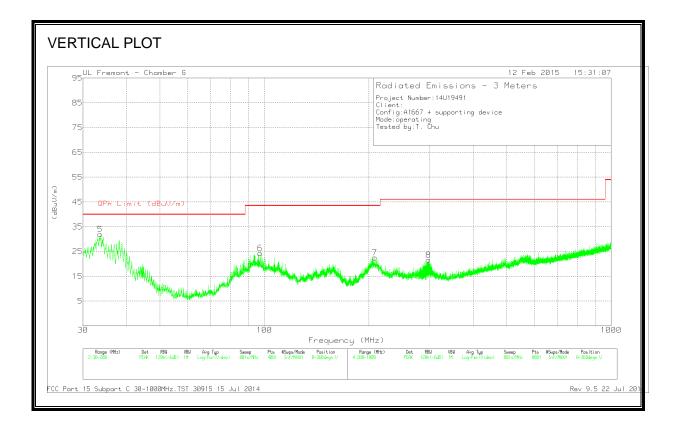
FCC Part 15 Subpart B Class B 30-1000MHz.TST 30915 15 Jul 2014 Rev 9.5 22 Jul 2014

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### <u>A1553</u>



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### <u>DATA</u>

Marker	Frequenc y (MHz)	Meter Reading (dBuV)	Det	Hybrid	Amp/Cbl (dB)	Correcte d Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	31.6575	28.67	PK	23	-31.3	20.37	40	-19.63	0-360	301	Н
2	75.475	35.63	PK	10.8	-30.8	15.63	40	-24.37	0-360	201	Н
3	159.71	38.98	PK	15.2	-30	24.18	43.52	-19.34	0-360	201	Н
4	294.2	38.19	PK	16.4	-29.1	25.49	46.02	-20.53	0-360	100	Н
5	33.6125	41.62	PK	21.6	-31.3	31.92	40	-8.08	0-360	100	V
6	97.235	42.88	PK	12.1	-30.6	24.38	43.52	-19.14	0-360	100	V
7	208.3	37.5	PK	14.7	-29.7	22.5	43.52	-21.02	0-360	100	V
8	297.4	34.22	PK	16.4	-29.1	21.52	46.02	-24.5	0-360	100	V

PK - Peak detector

FCC Part 15 Subpart C 30-1000MHz.TST 30915 15 Jul 2014 Rev 9.5 22 Jul 2014

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# 9. AC MAINS LINE CONDUCTED EMISSIONS

### LIMITS

§15.207 (a)

IC RSS-GEN, Section 8.8

Frequency of emission	Conducte	d Limit (dBµV)
(MHz)	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50
* Decreases with the logarithm	of the frequency.	

### TEST PROCEDURE

ANSI C63.4-2009

### **RESULTS**

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### 9.1.1. CONFIGURATION 1

#### WORST EMISSIONS

Line-	·L1	.15 -	30MHz
_		-	

Trace	e Markers									
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.3255	47.62	PK	.5	0	48.12	59.6	-11.48	-	-
2	.3255	34.58	Av	.5	0	35.08	-	-	49.6	-14.52
3	.654	34.86	PK	.3	0	35.16	56	-20.84	-	-
4	.654	15.07	Av	.3	0	15.37	-	-	46	-30.63
5	1.149	28.79	PK	.2	0	28.99	56	-27.01	-	-
6	1.149	15.88	Av	.2	0	16.08	-	-	46	-29.92
7	19.266	21.44	PK	.3	.2	21.94	60	-38.06	-	-
8	19.266	13.67	Av	.3	.2	14.17	-	-	50	-35.83

### Line-L2 .15 - 30MHz

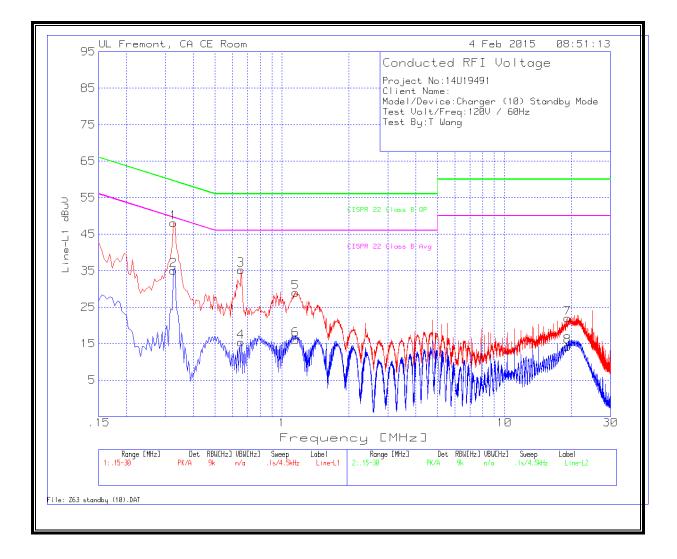
Trace Markers										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
9	.33	46.9	PK	.5	0	47.4	59.5	-12.1	-	-
10	.33	36.04	Av	.5	0	36.54	-	-	49.5	-12.96
11	.6585	32.17	PK	.3	0	32.47	56	-23.53	-	-
12	.6585	13.88	Av	.3	0	14.18	-	-	46	-31.82
17	1.1895	36.97	PK	.3	.1	37.37	56	-18.63	-	-
18	1.1895	22.49	Av	.3	.1	22.89	-	-	46	-23.11
13	1.194	29.01	PK	.3	.1	29.41	56	-26.59	-	-
14	1.194	16.54	Av	.3	.1	16.94	-	-	46	-29.06
15	14.2395	21.57	PK	.2	.2	21.97	60	-38.03	-	-
16	14.2395	14.45	Av	.2	.2	14.85	-	-	50	-35.15
19	19.59	28.84	PK	.3	.2	29.34	60	-30.66	-	-
20	19.59	19.67	Av	.3	.2	20.17	-	-	50	-29.83

PK - Peak detector

Av - average detection

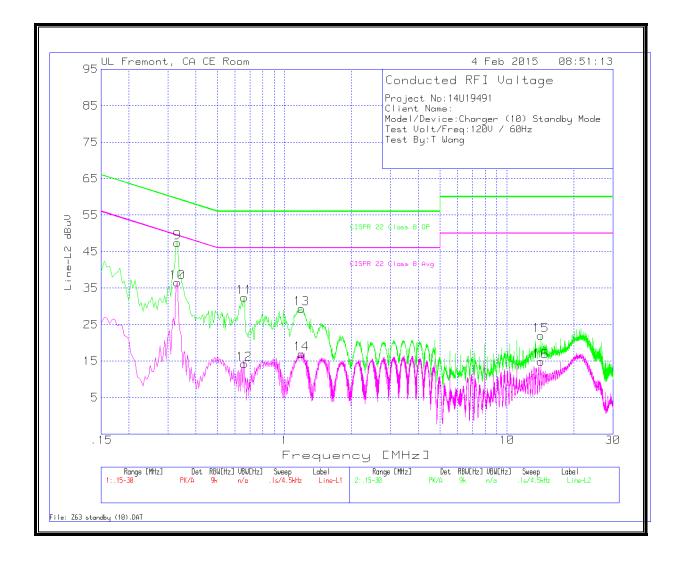
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### LINE 1 RESULTS



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### LINE 2 RESULTS



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### 9.1.2. CONFIGURATION 2

### <u>A1554</u>

#### WORST EMISSIONS

#### Line-L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.15	52.48	PK	1.4	0	53.88	66	-12.12	-	
2	.15	29.96	Av	1.4	0 0	31.36	-	-	56	-24.64
3	.33	48.28	PK	.5	0	48.78	59.5	-10.72	-	-
4	.33	36.95	Av	.5	0	37.45	-	-	49.5	-12.05
5	.924	37.6	PK	.3	0	37.9	56	-18.1	-	-
6	.924	26.83	Av	.3	0	27.13	-	-	46	-18.87
7	1.2525	37.59	PK	.2	0	37.79	56	-18.21	-	-
8	1.2525	24.42	Av	.2	0	24.62	-	-	46	-21.38
9	5.8785	29.92	PK	.2	.1	30.22	60	-29.78	-	-
10	5.8785	20.44	Av	.2	.1	20.74	-	-	50	-29.26

### Line-L2 .15 - 30MHz

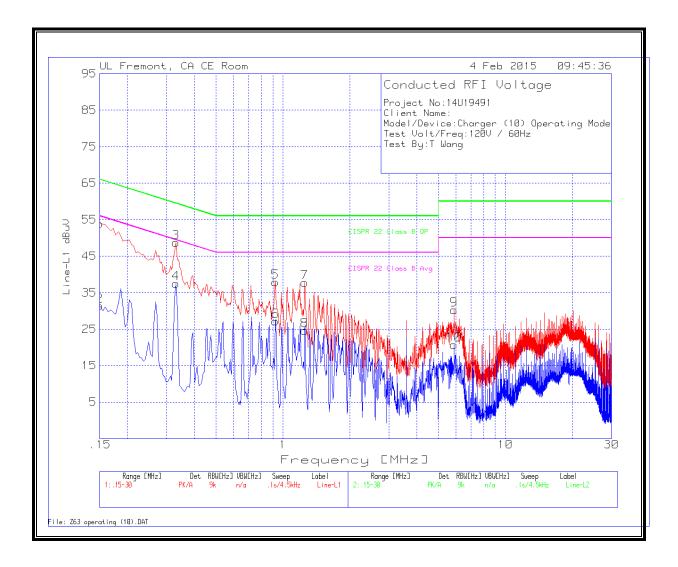
Marker	Frequency	Meter	Det	T24 IL L2	LC Cables	Corrected	CISPR 22	Margin to	CISPR 22	Margin to
	(MHz)	Reading (dBuV)		(dB)	2&3 (dB)	Reading dBuV	Class B QP	Limit (dB)	Class B Avg	Limit (dB)
11	.15	52.59	PK	1.5	0	54.09	66	-11.91	-	-
12	.15	28.79	Av	1.5	0	30.29	-	-	56	-25.71
13	.33	47.83	PK	.5	0	48.33	59.5	-11.17	-	-
14	.33	36.37	Av	.5	0	36.87	-	-	49.5	-12.63
15	.591	38.19	PK	.3	0	38.49	56	-17.51	-	-
16	.591	18.24	Av	.3	0	18.54	-	-	46	-27.46
17	1.1895	36.97	PK	.3	.1	37.37	56	-18.63	-	-
18	1.1895	22.49	Av	.3	.1	22.89	-	-	46	-23.11
19	19.59	28.84	PK	.3	.2	29.34	60	-30.66	-	-
20	19.59	19.67	Av	.3	.2	20.17	-	-	50	-29.83

PK - Peak detector

Av - average detection

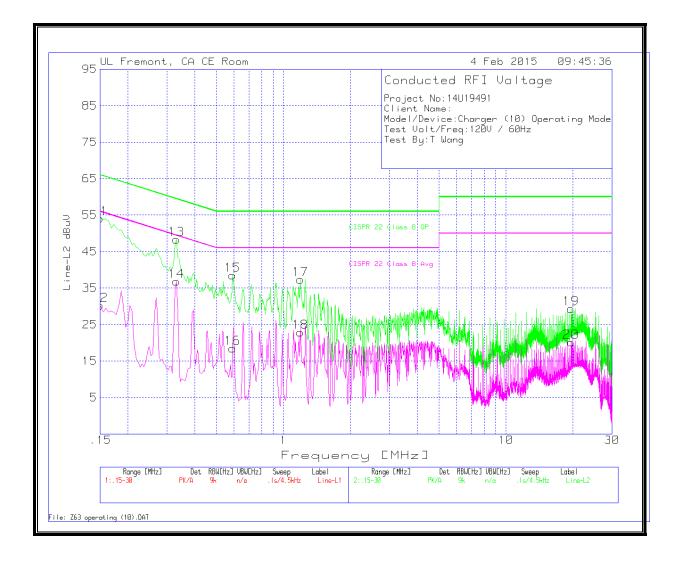
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### LINE 1 RESULTS



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### LINE 2 RESULTS



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#### <u>A1553</u>

#### WORST EMISSIONS

Line-L1 .15 - 30MHz

#### **Trace Markers**

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L1 (dB)	LC Cables 1&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
1	.159	40.17	РК	1.3	0	41.47	65.5	-24.03	-	-
2	.159	5.19	Av	1.3	0	6.49	-	-	55.5	-49.01
3	.249	37.65	РК	.7	0	38.35	61.8	-23.45		-
4	.249	4.96	Av	.7	0	5.66		-	51.8	-46.14
5	.798	36.23	РК	.3	0	36.53	56	-19.47	-	-
6	.798	9.37	Av	.3	0	9.67	-	-	46	-36.33

Line-L2 .15 - 30MHz

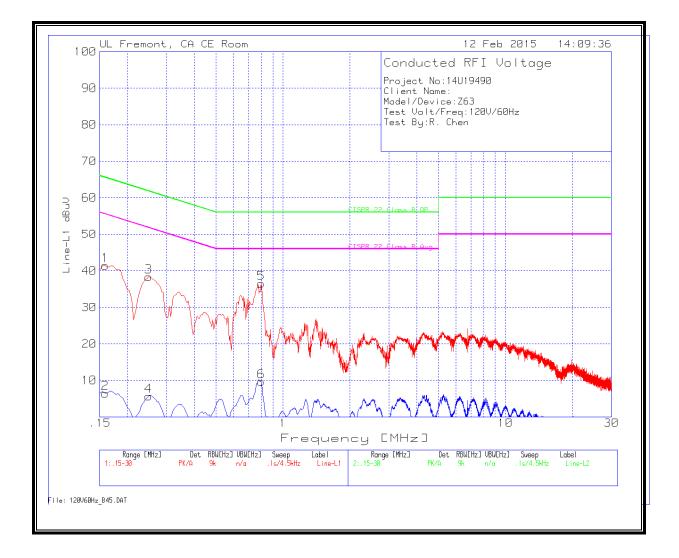
#### **Trace Markers**

Frequency (MHz)	Meter Reading (dBuV)	Det	T24 IL L2 (dB)	LC Cables 2&3 (dB)	Corrected Reading dBuV	CISPR 22 Class B QP	Margin to Limit (dB)	CISPR 22 Class B Avg	Margin to Limit (dB)
.1635	40.35	РК	1.3	0	41.65	65.3	-23.65	-	-
.1635	7.22	Av	1.3	0	8.52	-	-	55.3	-46.78
.2445	37.19	РК	.8	0	37.99	61.9	-23.91	-	-
.2445	6.83	Av	.8	0	7.63	-	-	51.9	-44.27
.78	36.39	РК	.3	0	36.69	56	-19.31	-	-
.78	14.32	Av	.3	0	14.62	-	-	46	-31.38
	(MHz) .1635 .1635 .2445 .2445 .78	(MHz)         Reading (dBuV)           .1635         40.35           .1635         7.22           .2445         37.19           .2445         6.83           .78         36.39	(MHz)         Reading (dBuV)           .1635         40.35         PK           .1635         7.22         Av           .2445         37.19         PK           .2445         6.83         Av           .78         36.39         PK	Reading (dBuV)         (dB)           .1635         40.35         PK         1.3           .1635         7.22         Av         1.3           .2445         37.19         PK         .8           .2445         6.83         Av         .8           .78         36.39         PK         .3	(MHz)         Reading (dBuV)         (dB)         2&3         (dB)           .1635         40.35         PK         1.3         0           .1635         7.22         Av         1.3         0           .2445         37.19         PK         .8         0           .2445         6.83         Av         .8         0           .78         36.39         PK         .3         0	(MHz)         Reading (dBuV)         (dB)         2&3 (dB)         Reading dBuV           .1635         40.35         PK         1.3         0         41.65           .1635         7.22         Av         1.3         0         8.52           .2445         37.19         PK         .8         0         37.99           .2445         6.83         Av         .8         0         7.63           .78         36.39         PK         .3         0         36.69	(MHz)         Reading (dBuV)         (dB)         2&3 (dB)         Reading dBuV         Class B QP           .1635         40.35         PK         1.3         0         41.65         65.3           .1635         7.22         Av         1.3         0         8.52         -           .2445         37.19         PK         .8         0         37.99         61.9           .2445         6.83         Av         .8         0         7.63         -           .78         36.39         PK         .3         0         36.69         56	(MHz)         Reading (dBvV)         (dB)         2&3 (dB)         Reading dBuV         Class B QP         Limit (dB)           .1635         40.35         PK         1.3         0         41.65         65.3         -23.65           .1635         7.22         Av         1.3         0         8.52         -         -           .2445         37.19         PK         .8         0         37.99         61.9         -23.91           .2445         6.83         Av         .8         0         7.63         -         -           .78         36.39         PK         .3         0         36.69         56         -19.31	(MHz)         Reading (dBuV)         (dB)         2&3 (dB)         Reading dBuV         Class B QP         Limit (dB)         Class B Avg           .1635         40.35         PK         1.3         0         41.65         65.3         -23.65         -           .1635         7.22         Av         1.3         0         8.52         -         -         55.3           .2445         37.19         PK         .8         0         37.99         61.9         -23.91         -           .2445         6.83         Av         .8         0         7.63         -         -         51.9           .78         36.39         PK         .3         0         36.69         56         -19.31         -

PK - Peak detector

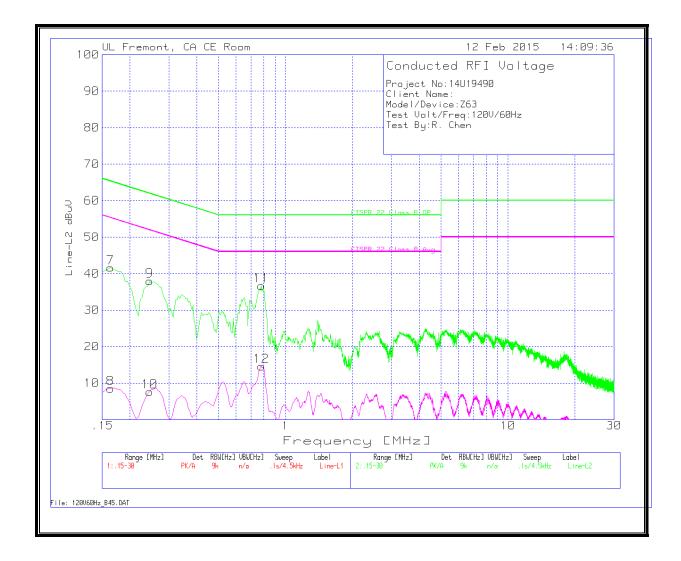
Av - average detection

#### LINE 1 RESULTS



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### LINE 2 RESULTS



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