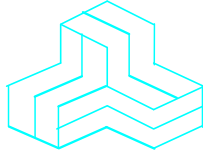


ENGINEERING TEST REPORT



ICT220 PCI V3
Model: ICT220-11T2371A
FCC ID: XKB-ICT220CLV3

Applicant:

Ingenico
9 Avenue de la Gare
Rovaltain TGV - Quartier de la gare
26958 VALENCE France

In Accordance With

Federal Communications Commission (FCC)
Part 15, Subpart C
Unlicensed Low Power Transmitter Operating in the Band 13.110-14.010 MHz

UltraTech's File No.: IVI-190Q_F15C225

This Test report is Issued under the Authority of
Tri M. Luu, BASc
Vice President of Engineering
UltraTech Engineering Labs Inc.

Date: July 04, 2013

Report Prepared by: Dharmajit Solanki

Tested by: Wei Wu

Issued Date: July 04, 2013

Test Dates: June 10 to 16, 2013

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

UltraTech

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NVLAP LAB CODE 200093-0



SL2-IN-E-1119R



Korea KCC-RRL
CA2049

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Part 15, Subpart C, Section 15.225 - Operation within the band 13.110 - 14.010 MHz.
Title:	Code of Federal Regulations (CFR), Title 47 Telecommunication, Part 15, Subpart C - Intentional Radiators
Purpose of Test:	Equipment Certification for Devices in Section 15.225 - Operation within the Band 13.110 - 14.010 MHz.
Test Procedures:	American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
Environmental Classification:	Commercial, industrial or business environment

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None

1.3. NORMATIVE REFERENCES

Publication	Year	Title
47 CFR Parts 0-19	2012	Code of Federal Regulations (CFR), Title 47 – Telecommunication
ANSI C63.4	2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
ANSI C63.10	2009	American National Standard for Testing Unlicensed Wireless Devices
CISPR 22 & EN 55022	2008-09, Edition 6.0 2006	Information Technology Equipment - Radio Disturbance Characteristics - Limits and Methods of Measurement
CISPR 16-1-1 +A1 +A2	2006 2006 2007	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus
CISPR 16-1-2 +A1 +A2	2003 2004 2006	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-2: Conducted disturbances

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT	
Name:	Ingenico
Address:	9 Avenue de la Gare Rovaltain TGV - Quartier de la gare 26958 VALENCE France
Contact Person:	Mr. Daniel Reboul Phone #: +33 4 75 84 21 95 Email Address: daniel.REBOUL@ingenico.com

MANUFACTURER	
Name:	Jabil Vietnam Co Ltd.
Address:	F02, Lot I4, Le Van Viet Street, Saigon Hitech Park, District 9, HCM CITY, VIETNAM
Contact Person:	Mr. Marc Delorme Phone #: +33 4 75 84 20 75 Email Address: marc.delorme@ingenico.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	Ingenico
Product Name:	ICT220 PCI V3
Model Name or Number:	ICT220-11T2371A
Serial Number:	Test sample
Type of Equipment:	Low Power Communication Device Transmitter
Input Power Supply Type:	AC adapter 8V DC, 3.0A (Max)
Primary User Functions of EUT:	Point of Sale credit/debit financial transactions

2.3. EUT’S TECHNICAL SPECIFICATIONS

Transmitter	
Equipment Type:	Portable
Intended Operating Environment:	Commercial & Industrial
Power Supply Requirement:	8V DC, 3.0A (Max)
Field Strength:	56.42 dBµV/m at 10 m
Operating Frequency Range:	13.56 MHz
RF Output Impedance:	50 Ω
20 dB Bandwidth:	2.4 kHz
Modulation Type:	ASK
Oscillator Frequencies:	18.432MHz
Antenna Connector Type:	Integral

Antenna Description (if more than one antenna, provide a list of all the antennas to be used with the device):	
Manufacturer:	Ingenico
Type:	Internal PCB - Inductive loop
Gain:	0 dBi
Frequency Range:	13.56 MHz

2.4. LIST OF EUT’S PORTS

Port Number	EUT’s Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	USB Host	1	USB Host	Non-shielded
2	USB Slave	1	USB Slave	Non-shielded
3	Ethernet	1	RJ-45	Non-shielded
4	Power	1	DC Plug	Non-shielded
5	RS232 Serial	1	RJ-12	Non-shielded
6	PSTN Dial	1	RJ-12	Non-shielded

2.5. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Magic Box
Brand name:	Ingenico
Model Name or Number:	--
Connected to EUT’s Port:	Multiple ports with caps

Ancillary Equipment # 2	
Description:	8V AC/DC Power Adapter
Brand name:	Ingenico
Model Name or Number:	PSM24W-080
Connected to EUT's Port:	Magic Box

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File #: IVI-190Q_F15C225
July 04, 2013

All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	22 to 24 °C
Humidity:	40 to 65%
Pressure:	101 to 102 kPa
Power Input Source:	AC adapter 8V DC, 3.0A(Max)

3.2. OPEPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TESTS

Operating Modes:	The EUT was configured for continuous transmission for the duration of testing.
Special Test Software:	N/A
Special Hardware Used:	N/A
Transmitter Test Antenna:	The EUT was tested with the antenna fitted in a manner typical of normal intended use as integral antenna equipment.

Transmitter Test Signals:	
Frequency:	13.56 MHz
Transmitter Wanted Output Test Signals:	
▪ RF Power Output (measured maximum output power):	56.42 dBµV/m at 10 m
▪ Normal Test Modulation:	ASK
▪ Modulating signal source:	Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Power Line Conducted Emissions were performed in UltraTech's shielded room, 24'(L) by 16'(W) by 8'(H).
- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2014-04-04.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Regulations	Test Requirements	Compliance (Yes/No)
15.203 & 15.204	The transmitter shall use a transmitting antenna that is an integral part of the device	Yes
15.215(c)	Emission Bandwidth	Yes
15.225(a) – (d)	Field Strength of Emissions Inside and Outside the Permitted Band 13.110 - 14.010 MHz	Yes
15.225(e)	Frequency Stability	Yes
15.107 & 15.207	Class B - Power Line Conducted Emissions	Yes

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

EXHIBIT 5. TEST DATA

5.1. EMISSION BANDWIDTH [§15.215(c)]

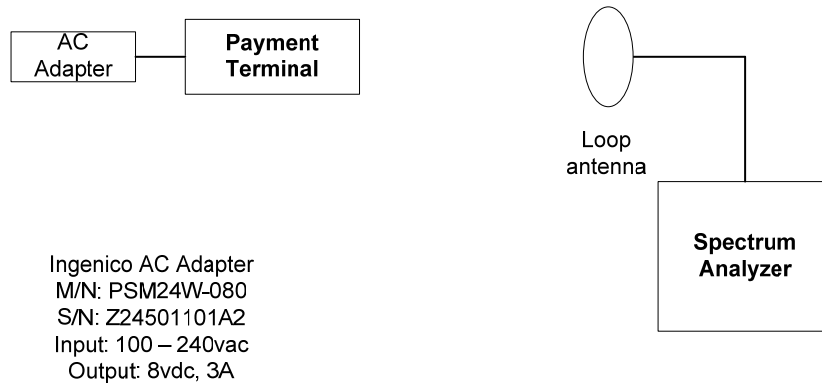
5.1.1. Limits

The 20dB bandwidth of the emission shall be contained within the band 13.110–14.010 MHz.

5.1.2. Method of Measurements

Refer to Ultratech Test Procedures, File # ULTR P001 and ANSI C63.4 for measurement methods

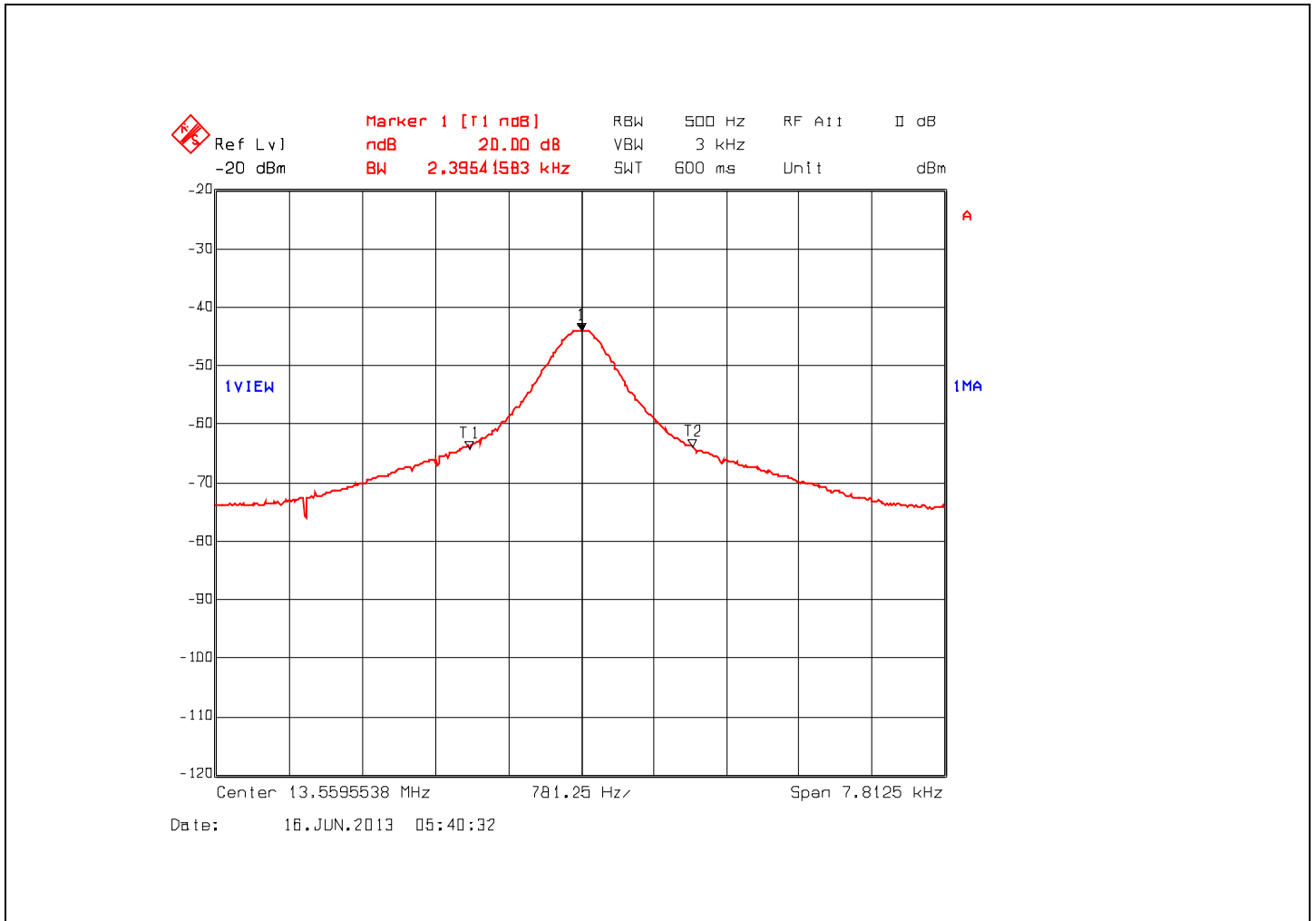
5.1.3. Test Setup Diagram



5.1.4. Test Data

Test Frequency @ 13.56 MHz	
Occupied Bandwidth (kHz)	
20 dB BW	99 % BW
2.395	4.18

Plot 5.1.4.1. 20 dB Emission Bandwidth, 13.56 MHz



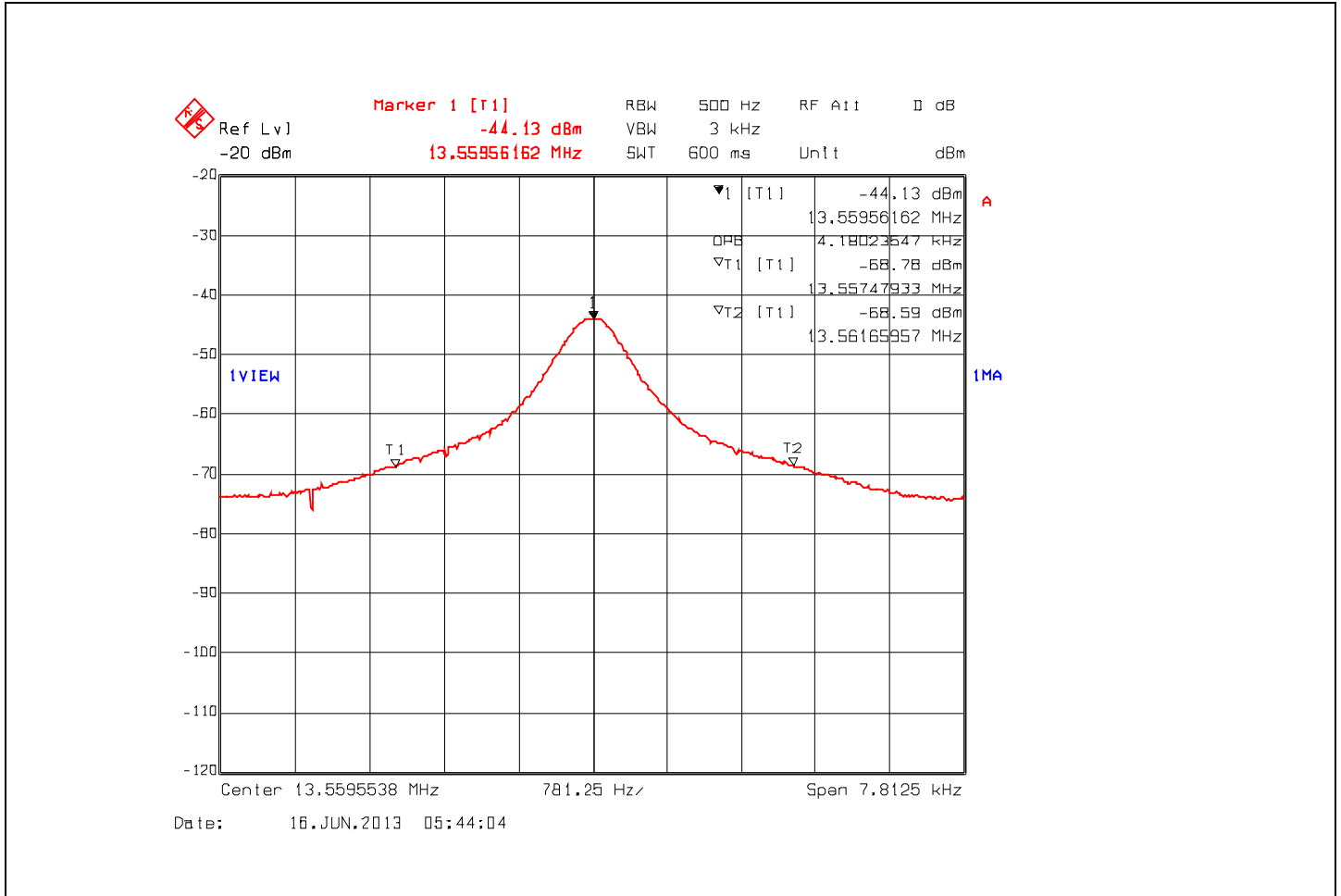
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Plot 5.1.4.2. 99% Occupied Bandwidth, 13.56 MHz



5.2. FIELD STRENGTH OF EMISSIONS WITHIN & OUTSIDE THE PERMITTED BAND 13.110-14.010 MHz [47 CFR 15.225 (a) to (d)]

5.2.1. Limits

- (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110 – 14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

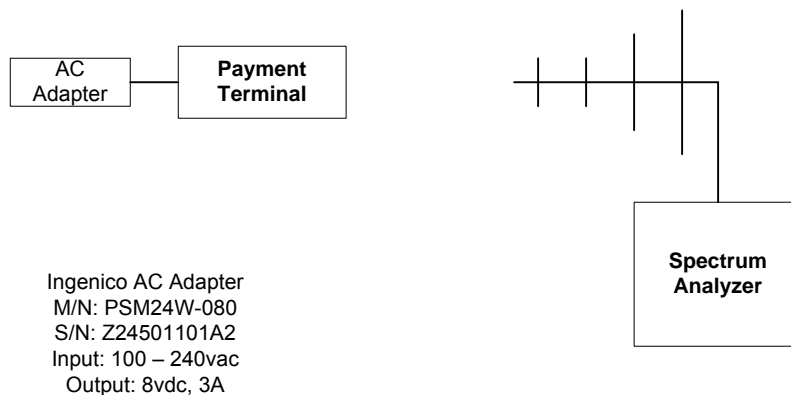
47 CFR 15.209(a) – Radiated Emission Limits; general requirements

Frequency (MHz)	Field Strength Limits (microvolts/m)	Distance (Meters)
0.009 - 0.490	2,400 / F (KHz)	300
0.490 - 1.705	24,000 / F (KHz)	30
1.705 - 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

5.2.2. Method of Measurements

Refer to Ultratech Test Procedures, File # ULTR P001 and ANSI C63.4 for measurement methods

5.2.3. Test Setup Diagram



5.2.4. Test Data

Remarks:

- Radiated spurious emissions measurements were performed at a measuring distance of 10 m (for frequencies below 30 MHz) and 3 m (for frequencies at or above 30 MHz), from 10 kHz – 10th harmonic of the fundamental or the range applicable to the digital device, whichever is the higher frequency range and all spurious emissions that are in excess of 20 dB below the specified limit shall be recorded.
- For frequencies below 30 MHz, the results measured at 10 m distance shall be extrapolated to the specified distance using an extrapolation factor of 40dB/decade for determining compliance.

5.2.4.1. Field Strength of Emissions within the Permitted Band at 10 m

Frequency (MHz)	Measured Field Strength @ 10 m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane	Field Strength Extrapolated Value @ 30M (dBµV/m)	§ 15.225 Field Strength Limits @ 30M (dBµV/m)	Margin (dB)
13.56	55.44	Peak	0°	36.4	84.0	< 40.0
13.56	56.42	Peak	90°	37.4	84.0	< 40.0

5.2.4.2. Field Strength of Emissions outside the Permitted Band below 30 MHz at 10 m

Frequency (MHz)	Measured Field Strength @ 10 m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	Field Strength Extrapolated Value (dBµV/m) @ 30M	§ 15.209 Field Strength Limits (dBµV/m) @ 30M	Margin (dB)
27.12	33.40	Peak	0°	14.3	29.5	- 15.2
27.12	42.70	Peak	90°	23.6	29.5	- 5.9

5.2.4.3. Field Strength of Emissions Outside the Permitted Band at or Above 30 MHz at 3 m

Frequency (MHz)	Measured Field Strength @ 3 m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	§ 15.209 Field Strength Limits (dBµV/m)	Margin (dB)
40.68	35.1	QP	V	40.0	-4.9
40.68	27.9	Peak	H	40.0	-12.1
54.24	30.3	Peak	V	40.0	-9.7
67.80	34.0	Peak	V	40.0	-6.0
67.80	27.6	Peak	H	40.0	-12.4
81.36	22.8	Peak	V	40.0	-17.2
94.92	29.6	Peak	V	43.5	-13.9
94.92	23.7	Peak	H	43.5	-19.8
108.48	24.2	Peak	V	43.5	-19.3
122.04	33.3	Peak	V	43.5	-10.2
122.04	24.7	Peak	H	43.5	-18.8
149.19	33.3	Peak	V	43.5	-10.2
149.19	28.5	Peak	H	43.5	-15.0
162.82	29.7	Peak	V	43.5	-13.8
162.82	28.6	Peak	H	43.5	-14.9

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Frequency (MHz)	Measured Field Strength @ 3 m (dBµV/m)	Detector Used (Peak/QP)	Antenna Plane (H/V)	§ 15.209 Field Strength Limits (dBµV/m)	Margin (dB)
176.28	30.7	Peak	V	43.5	-12.8
176.28	28.6	Peak	H	43.5	-14.9
193.39	35.8	Peak	V	43.5	-7.7
193.39	37.6	Peak	H	43.5	-6.1
203.36	28.3	Peak	V	43.5	-15.2
203.36	28.1	Peak	H	43.5	-15.4
216.98	31.4	Peak	V	46.0	-14.6
216.98	29.7	Peak	H	46.0	-16.3
230.61	35.3	Peak	V	46.0	-10.7
230.61	33.5	Peak	H	46.0	-12.5
233.81	32.1	Peak	V	46.0	-13.9
233.81	30.9	Peak	H	46.0	-15.1
244.07	33.7	Peak	V	46.0	-12.3
244.07	35.1	Peak	H	46.0	-10.9
314.58	31.0	Peak	V	46.0	-15.0
314.58	28.0	Peak	H	46.0	-18.0
346.79	30.6	Peak	V	46.0	-15.4
346.79	28.0	Peak	H	46.0	-18.0
483.97	30.1	Peak	V	46.0	-15.9
483.97	28.3	Peak	H	46.0	-17.7
677.08	25.3	Peak	V	46.0	-20.7
677.08	37.8	Peak	H	46.0	-8.2

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5.3. FREQUENCY STABILITY [47 CFR 15.225(e)]

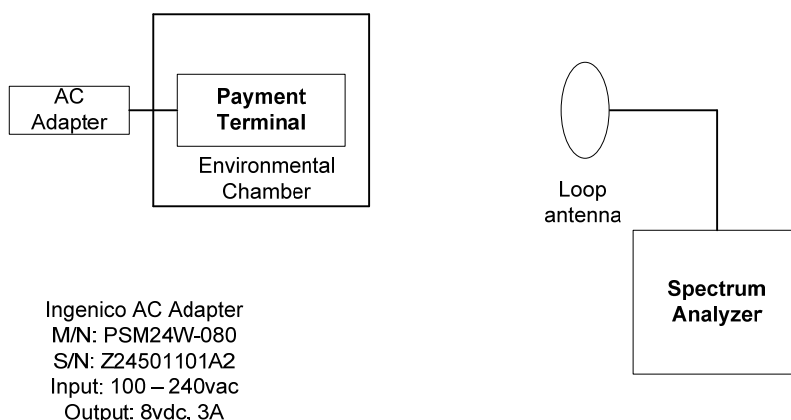
5.3.1. Limits

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.3.2. Method of Measurements

ANSI C63.4

5.3.3. Test Setup Diagram



5.3.4. Test Data

Center Frequency:	13.56 MHz
Frequency Tolerance Limit:	± 0.01% (±1356 Hz)
Max. Frequency Tolerance Measured:	± 39 Hz
Input Voltage Rating:	120V AC from AC adaptor

Ambient Temperature (°C)	Frequency Drift (Hz)		
	Supply Voltage (Nominal) 120 VAC	Supply Voltage (85% of Nominal) 102 VAC	Supply Voltage (115% of Nominal) 138 VAC
- 30	23	n/a	n/a
+ 20	0	-16	0
+ 50	39	n/a	n/a

5.4. POWER LINE CONDUCTED EMISSIONS [47 CFR 15.107(a) & 15.207]

5.4.1. Limits

The equipment shall meet the limits of the following table:

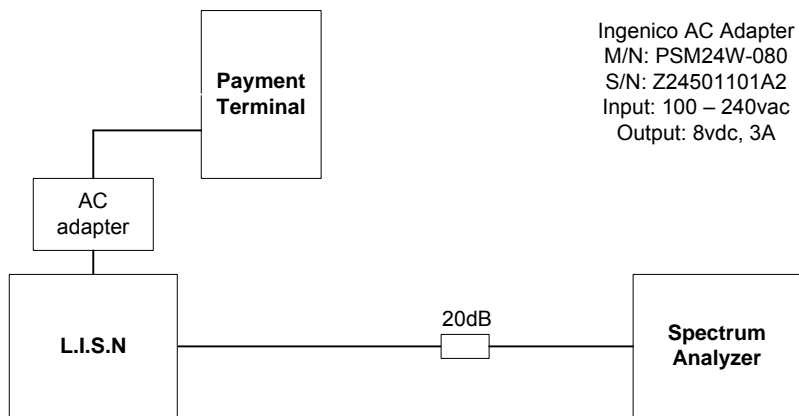
Frequency of emission (MHz)	Class B Conducted Limits (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

* Decreases linearly with logarithm of the frequency

5.4.2. Method of Measurements

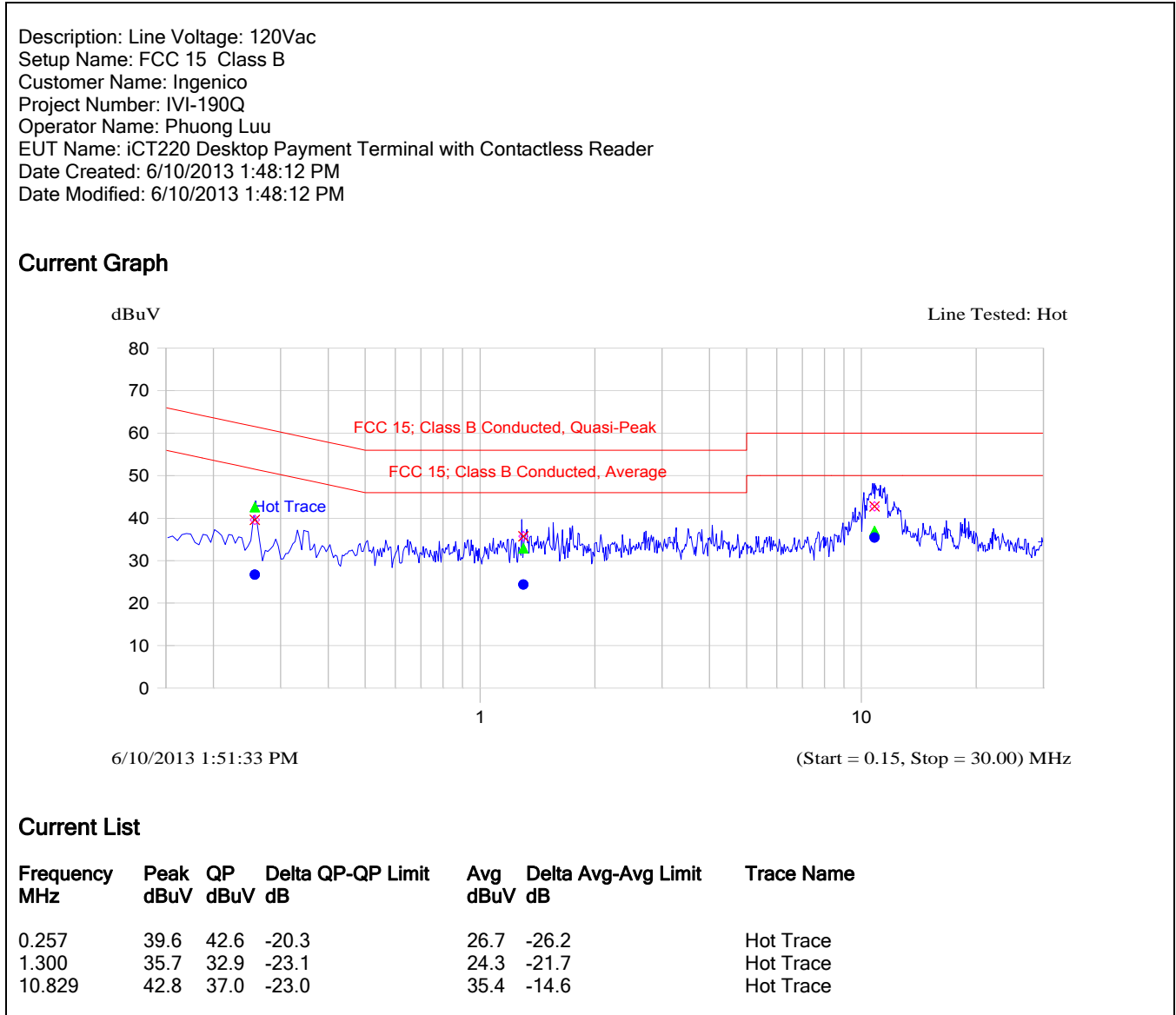
Refer to Ultratech Test Procedures, File # ULTR P001 and ANSI C63.4 for measurement methods

5.4.3. Test Setup Diagram



5.4.4. Test Data

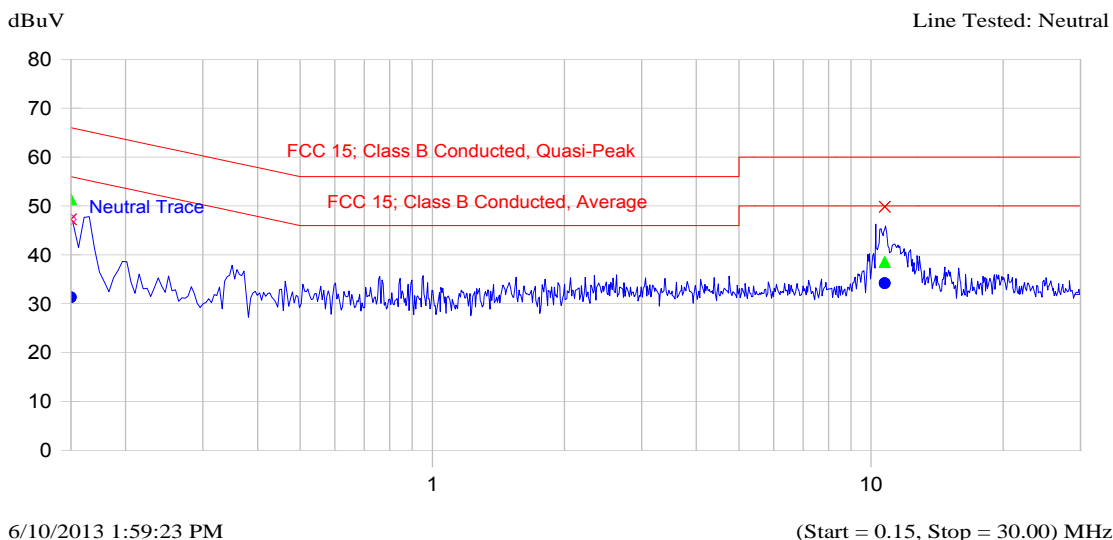
Plot 5.4.4.1. Power Line Conducted Emissions, Voltage: 120 VAC, Line Tested: Hot
 Configuration: EUT powered from AC Adaptor



Plot 5.4.4.2. Power Line Conducted Emissions, Voltage: 120 VAC, Line Tested: Neutral
 Configuration: EUT powered from AC Adaptor

Description: Line Voltage: 120Vac
 Setup Name: FCC 15 Class B
 Customer Name: Ingenico
 Project Number: IVI-190Q
 Operator Name: Phuong Luu
 EUT Name: iCT220 Desktop Payment Terminal with Contactless Reader
 Date Created: 6/10/2013 1:48:12 PM
 Date Modified: 6/10/2013 1:57:09 PM

Current Graph



Current List

Frequency MHz	Peak dBuV	QP dBuV	Delta QP-QP dB	Limit	Avg dBuV	Delta Avg-Avg dB	Limit	Trace Name
0.150	47.3	51.4	-14.6		31.3	-24.7		Neutral Trace
10.746	49.8	38.5	-21.5		34.2	-15.8		Neutral Trace

EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal Due Date
Loop Antenna	EMCO	6502	9104-2611	10KHz-30MHz	26 Aug 2013
Spectrum Analyzer	Rohde & Schwarz	FSEK30	100077	20 Hz – 40 GHz	02 Nov 2013
Environment Chamber	Envirotronics	SSH32C	11994847-S-11059	-60 to 177 degree C	16 Aug 2013
Spectrum Analyzer	HP	8593EM	3412A00103	9 kHz–26.5 GHz	06 Feb 2014
Attenuator	Pasternack	PE7010-20	-	DC–2 GHz	11 Jan 2014
LISN	EMCO	3825/2	8907-1531	0.01 -100 MHz	14 May 2014
EMI Receiver	Rohde & Schwarz	ESU40	100037	20Hz-40GHz	07 Mar 2014
Biconilog Antenna	EMCO	3142C	34792	26-3000MHz	12 Jun 2014
Preamplifier	AH System	PAM-0118	225	20 MHz – 18 GHz	25 Mar 2014
Horn Antenna	EMCO	3115	9701-5061	1-18GHz	18 Feb 2014

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EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

7.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

	Line Conducted Emission Measurement Uncertainty (150 kHz – 30 MHz):	Measured	Limit
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.57	± 1.8
U	Expanded uncertainty U: $U = 2u_c(y)$	± 3.14	± 3.6

7.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

	Radiated Emission Measurement Uncertainty @ 3m, Horizontal (30-1000 MHz):	Measured	Limit
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.15	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.30	± 5.2

	Radiated Emission Measurement Uncertainty @ 3m, Vertical (30-1000 MHz):	Measured	Limit
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 2.39	± 2.6
U	Expanded uncertainty U: $U = 2u_c(y)$	± 4.78	± 5.2

	Radiated Emission Measurement Uncertainty @ 3 m, Horizontal & Vertical (1 – 18 GHz):	Measured	Limit
u_c	Combined standard uncertainty: $u_c(y) = \sqrt{\sum_{i=1}^m u_i^2(y)}$	± 1.87	Under consideration
U	Expanded uncertainty U: $U = 2u_c(y)$	± 3.75	Under consideration