

Prüfbericht-Nr.: Test Report No.:	50050477 003	Auftrags-Nr.: Order No.:	164058674	Seite 1 von 16 Page 1 of 16
Kunden-Referenz-Nr.: Client Reference No.:	N/A	Auftragsdatum: Order date:	22.03.2016	
Auftraggeber: Client:	Lenovo (Beijing) Limited, No. 6, Chuang Ye Road, Shangdi Information Industry Base, Haidian District, Beijing 100085, P.R. China			
Prüfgegenstand: Test item:	ThinkVision X24 Pro Wireless Charging Stand			
Bezeichnung / Typ-Nr.: Identification / Type No.:	HH-1601			
Auftrags-Inhalt: Order content:	FCC approval			
Prüfgrundlage: Test specification:	CFR47 FCC Part 18: Subpart C Section 18.305 CFR47 FCC Part 18: Subpart C Section 18.307			
Wareneingangsdatum: Date of receipt:	05.05.2016			
Prüfmuster-Nr.: Test sample No.:	A000355351-002, A000355351-003			
Prüfzeitraum: Testing period:	10.05.2016 - 15.07.2016			
Ort der Prüfung: Place of testing:	Accurate Technology Co., Ltd.			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
Refer to photo document				
geprüft von / tested by:		kontrolliert von / reviewed by:		
28.07.2016 Sam Lin / Assistant Manager		28.07.2016 Winnie Hou / Technical Certifier		
Datum Date	Name / Stellung Name / Position	Unterschrift Signature	Datum Date	Name / Stellung Name / Position
Sonstiges / Other: This report is for 8CC equipment class. FCC ID: A5MHH1601				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

Prüfbericht - Nr.: 50050477 003
Test Report No.

Seite 2 von 16
Page 2 of 16

TEST SUMMARY

5.1.1 RADIATED EMISSIONS

RESULT: Pass

5.1.2 CONDUCTED EMISSIONS

RESULT: Pass

CONTENTS

1.	GENERAL REMARKS	4
1.1	COMPLEMENTARY MATERIALS	4
2.	TEST SITES	4
2.1	TEST FACILITIES	4
2.2	LIST OF TEST AND MEASUREMENT INSTRUMENTS.....	5
2.3	TRACEABILITY	6
2.4	CALIBRATION	6
2.5	MEASUREMENT UNCERTAINTY.....	6
2.6	LOCATION OF ORIGINAL DATA.....	6
2.7	STATUS OF FACILITY USED FOR TESTING.....	6
3.	GENERAL PRODUCT INFORMATION	7
3.1	PRODUCT FUNCTION AND INTENDED USE.....	7
3.2	RATINGS AND SYSTEM DETAILS	7
3.3	INDEPENDENT OPERATION MODES	8
3.4	NOISE GENERATING AND NOISE SUPPRESSING PARTS	8
3.5	SUBMITTED DOCUMENTS	8
4.	TEST SET-UP AND OPERATION MODES	9
4.1	PRINCIPLE OF CONFIGURATION SELECTION.....	9
4.2	TEST OPERATION AND TEST SOFTWARE	9
4.3	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	9
4.4	COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE.....	9
4.5	TEST SETUP DIAGRAM	10
5.	TEST RESULTS	12
5.1	TEST REQUIREMENT & TEST SUITES - PART 18.....	12
5.1.1	<i>Radiated emissions.....</i>	<i>12</i>
5.1.2	<i>Conducted emissions.....</i>	<i>13</i>
6.	PHOTOGRAPHS OF THE TEST SET-UP	14
7.	LIST OF TABLES	16
8.	LIST OF PHOTOGRAPHS	16

1. General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Test Results

2. Test Sites

2.1 Test Facilities

Accurate Technology Co., Ltd.

(FCC Registration No.: 752051 & IC Registration Number: 5077A-2)

F1, Bldg A, Changyuan New Material Port, Keyuan Rd., Science & Industry Park,
Nanshan District, Shenzhen, 518057, P.R. China

The tests at the test site have been conducted under the supervision of a TÜV engineer.

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Kind of Equipment	Manufacturer	Type	S/N	Calibrated until
Conducted emissions				
Test Receiver	R & S	ESCS30	100307	Jan.9, 2017
L.I.S.N.	Schwarzbeck	NLSK8126	8126431	Jan.9, 2017
Pulse Limiter	R & S	ESH3-Z2	100815	Jan.9, 2017
50ΩCoaxial Switch	Anritsu Corp	MP59B	6200283933	Jan.9, 2017
Radiated emissions				
Spectrum Analyzer	R & S	FSV40	101495	Jan.9, 2017
Test Receiver	R & S	ESCS30	100307	Jan.9, 2017
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan.14, 2017
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan.14, 2017
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan.14, 2017
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan.14, 2017
RF Switching Unit+PreAMP	Compliance Direction	RSU-M2	38322	Jan.9, 2017
Pre-Amplifier	R & S	CBLU11835 40-01	3791	Jan.9, 2017
50 Coaxial Switch	Anritsu Corp	MP59B	6200506474	Jan.9, 2017
RF Coaxial Cable	SUHNER	N-3m	No.8	Jan.9, 2017
RF Coaxial Cable	RESENBERGER	N-3.5m	No.9	Jan.9, 2017
RF Coaxial Cable	SUHNER	N-6m	No.10	Jan.9, 2017
RF Coaxial Cable	RESENBERGER	N-12m	No.11	Jan.9, 2017
RF Coaxial Cable	RESENBERGER	N-0.5m	No.12	Jan.9, 2017

2.3 Traceability

All measurement equipment calibrations are traceable to NIST or where calibration is performed outside the United States, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table,

Items		Extended Uncertainty
CE	Disturbance Voltage (dBuV)	U=1.94dB, k=2, σ =95%
RE (9kHz-30MHz)	Field strength (dBuV/m)	U=3.08dB, k=2, σ =95%
RE (30-1000MHz)	Field strength (dBuV/m)	U=4.42dB, k=2, σ =95%
RE (above 1000MHz)	Field strength (dBuV/m)	U=4.06dB, k=2, σ =95%

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The Accurate Technology Co., Ltd. facility located at F1, Bldg A, Changyuan New Material Port, Keyuan Rd., Science & Industry Park, Nanshan District, Shenzhen, 518057, P.R. China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3. General Product Information

3.1 Product Function and Intended Use

The EUT is wireless charging stand which is only can be used for the specified display by connected with Type C connector. And the product also can be used as a transmitter of wireless charger. The product also contains Mini DP connector and USB 3.0 port.

It supports Bluetooth Low Energy and A4WP technology.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

Technical Specification	Value
Kind of Equipment:	ThinkVision X24 Pro Wireless Charging Stand
Type Designation:	HH-1601
FCC ID:	A5MHH1601
IC:	5903G-HH1601
Type of Equipment:	Consumer equipment
Equipment Class:	8CC
Operating Voltage:	DC 20V via AC/DC Adapter
Operating Temperature Range:	0°C to 35°C

Table 3: Marketed AC/DC adapter

Description	Manufacturer	Model	S/N	Rating
AC/DC adapter	Lenovo	ADLX90NCC3A	11S45N0249Z1 ZX1B58T89X	Input: AC 100-240V, 50/60Hz, 1.2A MAX. Output: DC 20V, 4.5A

3.3 Independent Operation Modes

The basic operation modes are:

- A. A4WP wireless charging
 - 1. Charging
 - i. Minimum load
 - ii. Medium load
 - iii. Maximum load
- B. Bluetooth Low Energy operating
 - 1. Transmitting
 - i. Low channel
 - ii. Middle channel
 - iii. High channel
 - 2. Receiving
 - i. Low channel
 - ii. Middle channel
 - iii. High channel
- C. USB 3.0 connect to PC with data transferring
- D. Mini Display port connect to PC with data transferring
- E. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit Diagram.

3.5 Submitted Documents

- Bill of Material	- Circuit Diagram
- PCB Layout	- Instruction Manual
- Photo Document	- Rating Label

4. Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5.

4.3 Special Accessories and Auxiliary Equipment

Table 4: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	S/N
Notebook PC	Lenovo	ThinkPad X240	SL10F31638
Mobile Phone	Apple	MG4J2 CH/A	F17NTK2QG5MV
Printer	HP	HP LaserJet 1015	CNFG030424
Display	LENOVO	ThinkVision X24 Pro	--

Table 5: List of Accessories and Cables

Interface(s) / Port (s)	Max. cable length, Shielding	Cable classification
USB port	Shielded, 170cm	USB cable
Mini-Display port	Shielded, 170cm	Mini-Display cable

4.4 Countermeasures to achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Constructional Data Form or the Technical Construction File. No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test below 1 GHz

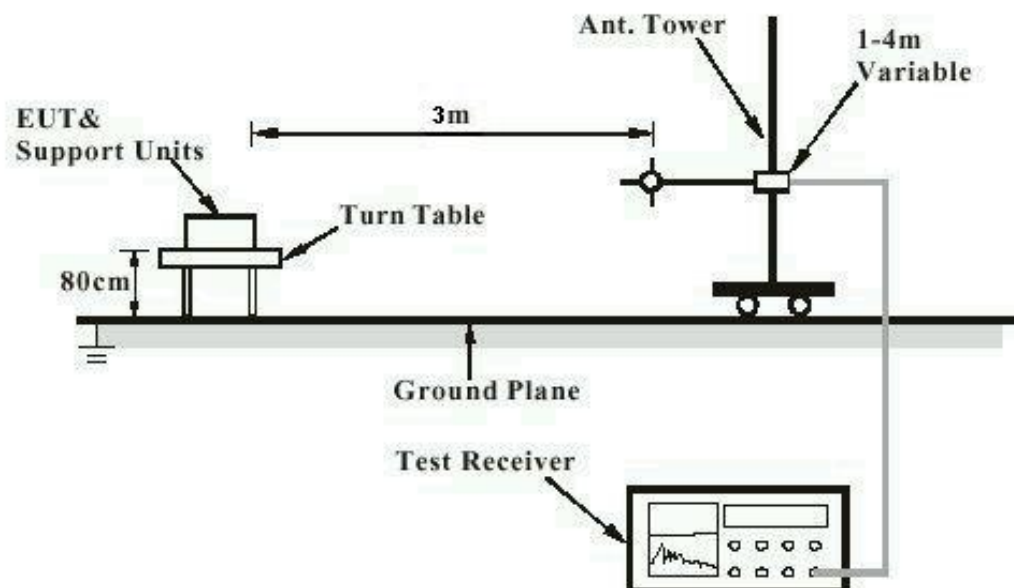


Diagram of Measurement Configuration for Radiation Test above 1 GHz

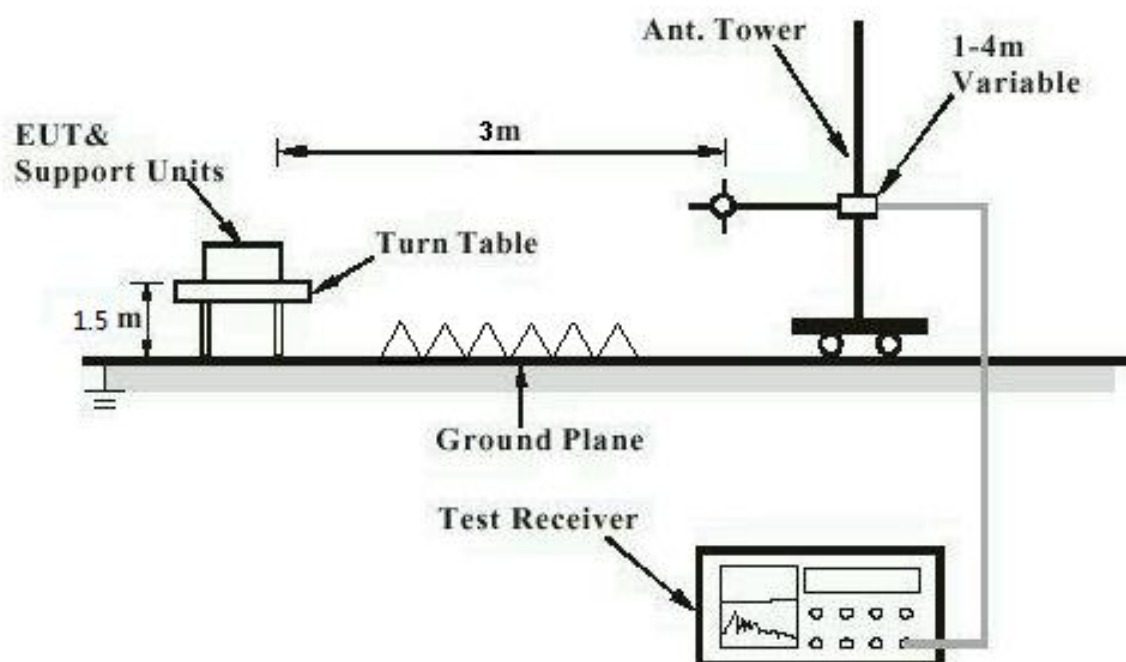
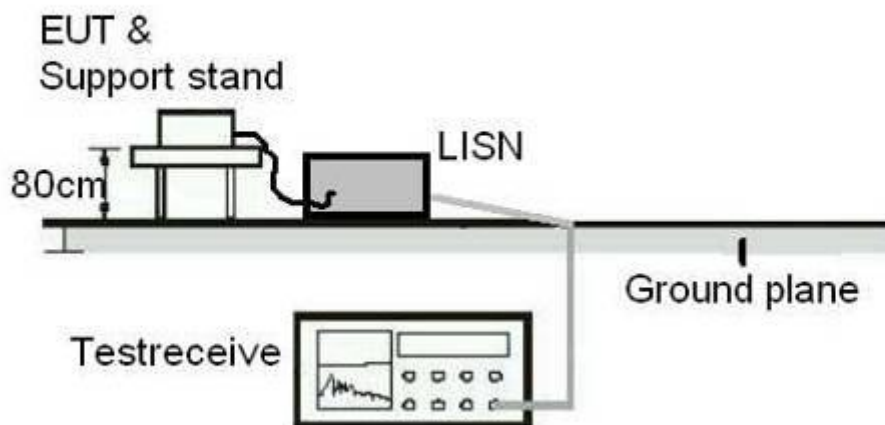


Diagram of Measurement Equipment Configuration for Conduction Measurement

5. Test Results

5.1 Test Requirement & Test Suites - Part 18

5.1.1 Radiated emissions

RESULT:**Pass**

Date of testing	:	2016-07-09 to 2016-07-15
Test standard	:	FCC Part 18.305
Basic standard	:	ANSI C63.4: 2014
Frequency range	:	9 kHz - 30 MHz, 30 – 400MHz
Limits	:	FCC Part 18.305 (b)
Kind of test site	:	3m Semi-Anechoic Chamber

Test Setup

Input Voltage	:	DC 20V via AC/DC Adapter
Operation Mode	:	A+C+D
Ambient temperature	:	23°C
Relative humidity	:	50%
Atmospheric pressure	:	101.0 kPa

The EUT supports A4WP wireless charging technology and operates at 6.78 MHz fundamental ISM frequency as the charging energy transfer. According to theory of operation and exemption condition that described in FCC Part 18, ISM equipment operating on a frequency specified in FCC Part 18.301 is permitted unlimited radiated energy in the band specified for the frequency.

Refer to attached Appendix A for details.

5.1.2 Conducted emissions

RESULT:**Pass**

Date of testing	:	2016-07-09 to 2016-07-15
Test standard	:	FCC Part 18.307
Basic standard	:	ANSI C63.4: 2014
Frequency range	:	0.009MHz – 30MHz
Limits	:	FCC Part 18.307(a)
Kind of test site	:	Shield Room

Test Setup

Input Voltage	:	DC 20V via AC/DC Adapter
Operation Mode	:	A+C+D
Ambient temperature	:	23°C
Relative humidity	:	50%
Atmospheric pressure	:	101.0 kPa

The EUT supports A4WP wireless charging technology and operates at 6.78 MHz fundamental ISM frequency as the charging energy transfer. According to theory of operation and exemption condition that described in FCC Part 18, ISM equipment operating on a frequency specified in FCC Part 18.301 is permitted unlimited radiated energy in the band specified for the frequency.

Refer to attached Appendix A for details.

7. List of Tables

Table 1: List of Test and Measurement Equipment	5
Table 2: Technical Specification of EUT	7
Table 3: Marketed AC/DC adapter	7
Table 4: List of Accessories and Auxiliary Equipment	9
Table 5: List of Accessories and Cables	9

8. List of Photographs

Photograph 1: Set-up for Radiated Emissions (9kHz-30GHz)	14
Photograph 2: Set-up for Radiated Emissions (30MHz-400MHz).....	14
Photograph 3: Set-up for Conducted emissions.....	15

Appendix A

Test Results

APPENDIX A.1: RADIATED EMISSIONS 2

APPENDIX A.2: CONDUCTED EMISSIONS..... 7

Appendix A.1: Radiated Emissions

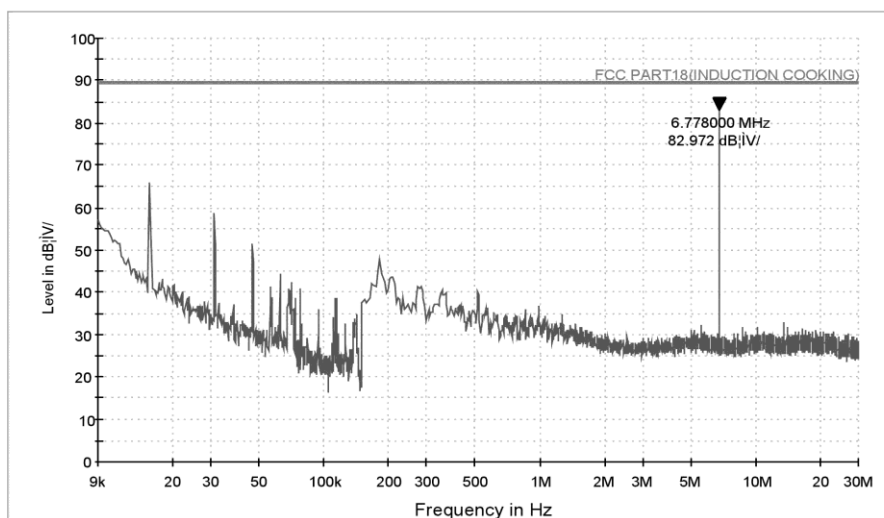
ACCURATE TECHNOLOGY CO.,LTD

RADIATED EMISSION

Common Information

Test Description: EMC32 Standard Report Setup
Operating Conditions:
Operator Name:

FCC PART18(INDUCTION COOKING)9K-30MHz



Protocol

Test Start: 2016-7-11 8:38:04
Test Stop: 2016-7-11 8:40:29

EUT Information

EUT Name:	ThinkVision X24 Pro Wireless Charging Stand M/N:HH-1601
Manufacturer:	Lenovo
Operation Mode:	A.1
Operator	LGWADE
Power :	AC 120V/60Hz
Antenna Polarization:	X
Comment:	

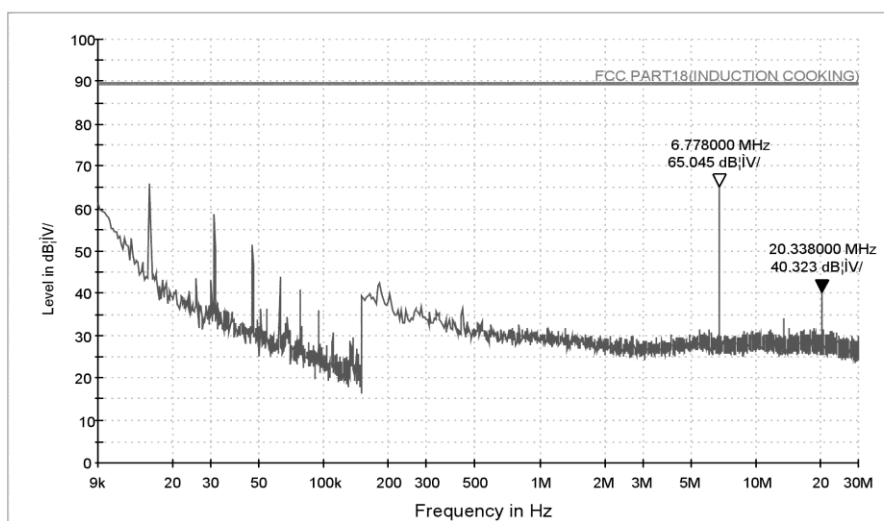
ACCURATE TECHNOLOGY CO.,LTD

RADIATED EMISSION

Common Information

Test Description: EMC32 Standard Report Setup
Operating Conditions:
Operator Name:

FCC PART18(INDUCTION COOKING)9K-30MHz



Protocol

Test Start: 2016-7-11 8:44:04
Test Stop: 2016-7-11 8:46:29

EUT Information

EUT Name:	ThinkVision X24 Pro Wireless Charging Stand M/N:HH-1601
Manufacturer:	Lenovo
Operation Mode:	A.1
Operator	LGWADE
Power :	AC 120V/60Hz
Antenna Polarization:	Y
Comment:	

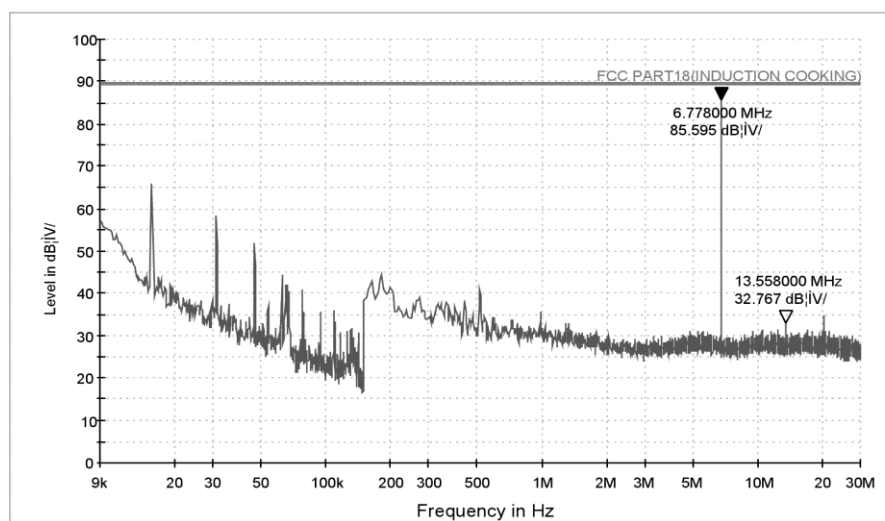
ACCURATE TECHNOLOGY CO.,LTD

RADIATED EMISSION

Common Information

Test Description: EMC32 Standard Report Setup
Operating Conditions:
Operator Name:

FCC PART18(INDUCTION COOKING)9K-30MHz



Protocol

Test Start: 2016-7-11 8:48:38
Test Stop: 2016-7-11 8:51:03

EUT Information

EUT Name:	ThinkVision X24 Pro Wireless Charging Stand M/N:HH-1601
Manufacturer:	Lenovo
Operation Mode:	A.1
Operator	LGWADE
Power :	AC 120V/60Hz
Antenna Polarization:	Z
Comment:	



ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LGWADE #2517

Standard: FCC PART18

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: ThinkVision X24 Pro Wireless Charging Stand

Mode: A.1

Model: HH-1601

Manufacturer: Lenovo

Polarization: Horizontal

Power Source: AC 120V/60Hz

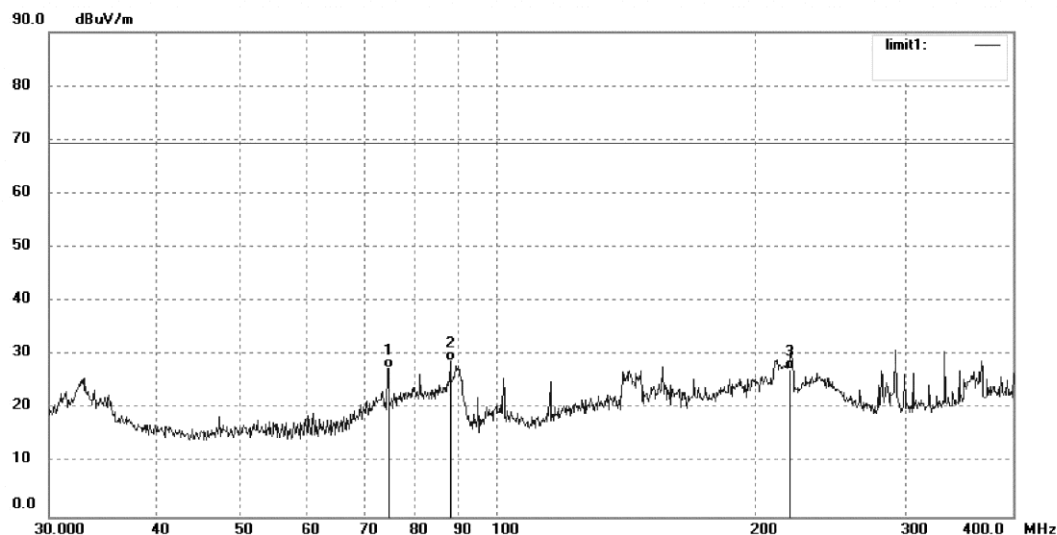
Date: 16/07/09/

Time:

Engineer Signature: LGWADE

Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	74.6620	44.29	-16.71	27.58	69.50	-41.92	QP			
2	88.1243	44.17	-15.19	28.98	69.50	-40.52	QP			
3	219.8867	39.12	-11.71	27.41	69.50	-42.09	QP			

**ACCURATE TECHNOLOGY CO., LTD.**
 F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
 Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGWADE #2518

Standard: FCC PART18

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: ThinkVision X24 Pro Wireless Charging Stand

Mode: A.1

Model: HH-1601

Manufacturer: Lenovo

Polarization: Vertical

Power Source: AC 120V/60Hz

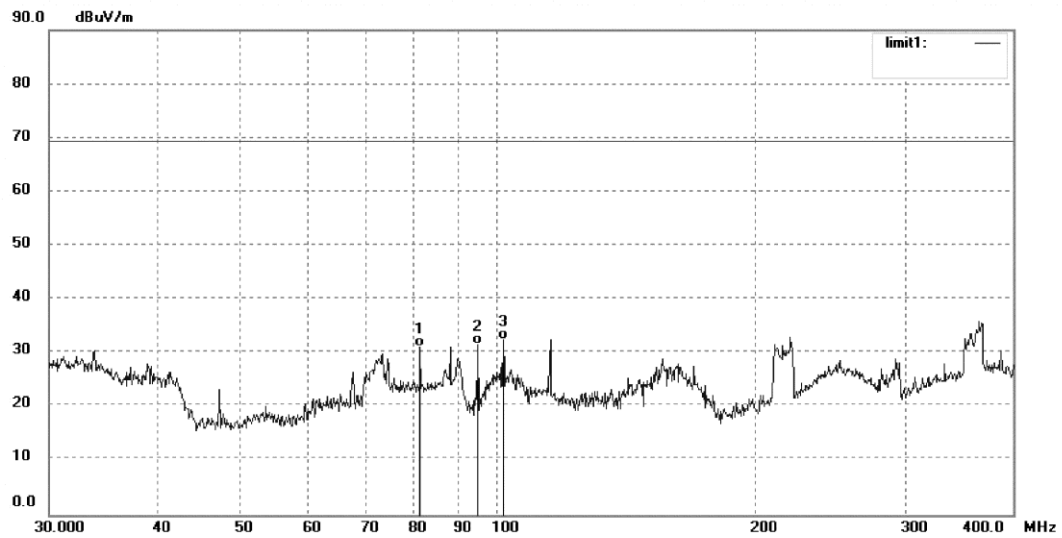
Date: 16/07/09/

Time:

Engineer Signature: LGWADE

Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	81.3247	47.36	-16.21	31.15	69.50	-38.35	QP			
2	94.9990	46.45	-14.82	31.63	69.50	-37.87	QP			
3	101.6172	45.94	-13.38	32.56	69.50	-36.94	QP			

Appendix A.2: Conducted Emissions

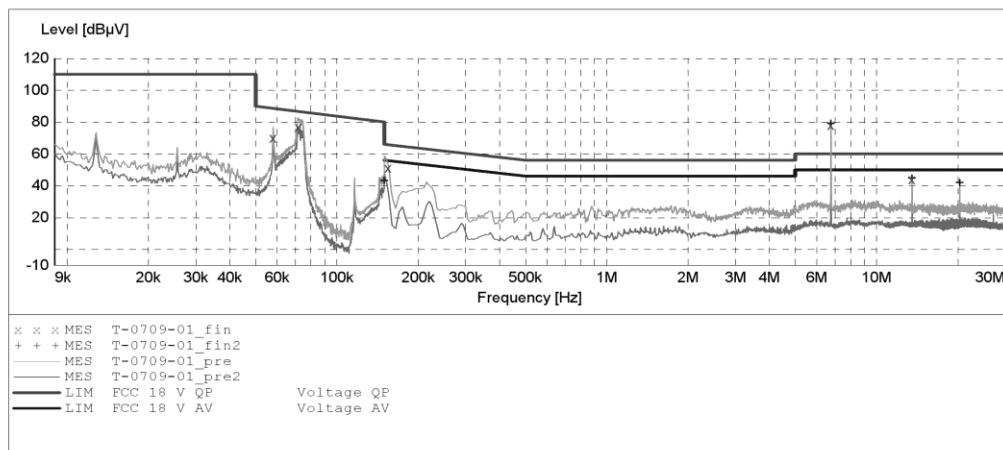
ACCURATE TECHNOLOGY CO., LTD

CONDUCTED EMISSION STANDARD FCC PART 18

EUT: ThinkVision X24 Pro Wireless Charging Stand M/N:HH-1601
 Manufacturer: Lenovo
 Operating Condition: A.1
 Test Site: 1# Shielding Room
 Operator: LGWADE
 Test Specification: L 120V/60Hz
 Comment: Mains Port
 Start of Test: 7/9/2016 /

SCAN TABLE: "V 9K-30MHz fin"

Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak Average	1.0 s	200 Hz	NSLK8126 2008
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak Average	1.0 s	9 kHz	NSLK8126 2008



MEASUREMENT RESULT: "T-0709-01_fin"

7/9/2016

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.058000	69.90	10.3	89	18.7	QP	L1	GND
0.072000	76.80	10.4	87	9.9	QP	L1	GND
0.155000	51.00	10.5	66	14.7	QP	L1	GND
6.780000	77.90	11.2	60	-17.9	QP	L1	GND
13.555000	44.00	11.3	60	16.0	QP	L1	GND

MEASUREMENT RESULT: "T-0709-01_fin2"

7/9/2016

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	42.90	10.5	56	13.1	AV	L1	GND
6.780000	78.90	11.2	50	-28.9	AV	L1	GND
13.555000	44.60	11.3	50	5.4	AV	L1	GND
20.335000	41.80	11.4	50	8.2	AV	L1	GND

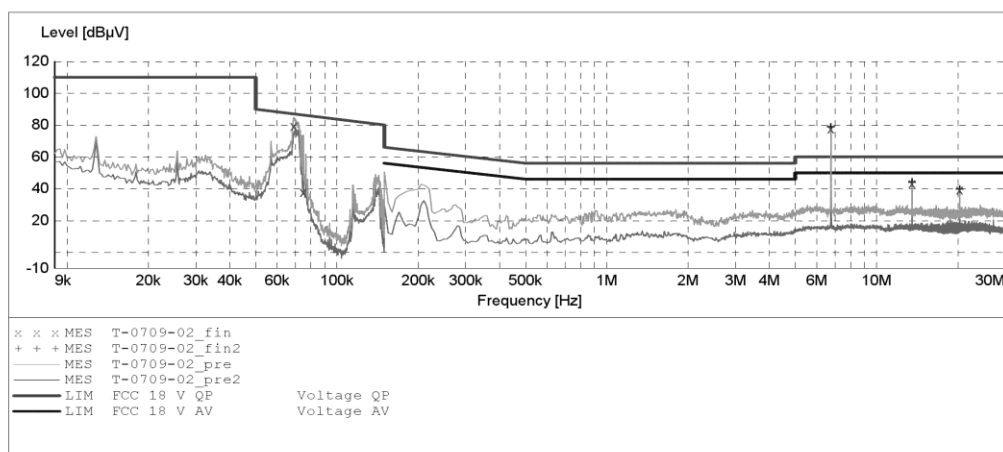
ACCURATE TECHNOLOGY CO., LTD

CONDUCTED EMISSION STANDARD FCC PART 18

EUT: ThinkVision X24 Pro Wireless Charging Stand M/N:HH-1601
 Manufacturer: Lenovo
 Operating Condition: A.1
 Test Site: 1# Shielding Room
 Operator: LGWADE
 Test Specification: N 120V/60Hz
 Comment: Mains Port
 Start of Test: 7/9/2016 /

SCAN TABLE: "V 9K-30MHz fin"

Short Description: _SUB_STD VTERM2 1.70
 Start Stop Step Detector Meas. IF Transducer
 Frequency Frequency Width Time Bandw.
 9.0 kHz 150.0 kHz 100.0 Hz QuasiPeak 1.0 s 200 Hz NSLK8126 2008
 Average
 150.0 kHz 30.0 MHz 5.0 kHz QuasiPeak 1.0 s 9 kHz NSLK8126 2008
 Average



MEASUREMENT RESULT: "T-0709-02_fin"

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
0.069200	79.30	10.3	87	7.7	QP	N	GND
0.075200	37.60	10.4	86	48.7	QP	N	GND
6.780000	77.70	11.2	60	-17.7	QP	N	GND
13.555000	43.30	11.3	60	16.7	QP	N	GND
20.335000	39.20	11.4	60	20.8	QP	N	GND

MEASUREMENT RESULT: "T-0709-02_fin2"

Frequency MHz	Level dBuV	Transd dB	Limit dBuV	Margin dB	Detector	Line	PE
6.780000	78.50	11.2	50	-28.5	AV	N	GND
13.555000	43.80	11.3	50	6.2	AV	N	GND
20.335000	39.50	11.4	50	10.5	AV	N	GND