

Report No.: KSCR220500069902

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# TEST REPORT

**Application No.:** KSCR2205000699AT **FCC ID:** SVN-ARK30T-W2

**Applicant:** ZHEJIANG DAHUA VISION TECHNOLOGY CO.,LTD.

Address of Applicant: No.1199, Bin'an Road, Binjiang District, Hangzhou, P.R. China

Manufacturer: ZHEJIANG DAHUA VISION TECHNOLOGY CO.,LTD.

Address of Manufacturer: No.1199, Bin'an Road, Binjiang District, Hangzhou, P.R. China

**Equipment Under Test (EUT):** 

**EUT Name:** Wireless Keypad

Model No.: ARK30T-W2;DH-ARK30T-W2;DHI-ARK30T-W2\*

Please refer to section 2 of this report which indicates which model was

actually tested and which were electrically identical.

Standard(s): 47 CFR Part 15, Subpart C 15.225

**Date of Receipt:** 2022-05-11

**Date of Test:** 2022-08-22 to 2022-08-22

**Date of Issue:** 2022-08-23

Test Result: Pass\*

Eric Lin Laboratory Manager

Fra Lin



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<sup>\*</sup> In the configuration tested, the EUT complied with the standards specified above.



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	Revision Record					
Version	Chapter	Date	Modifier	Remark		
01		2022-08-23		Original		

Authorized for issue by:		
	Tommie Tang	
	Tommie_Tang/Project Engineer	
	Eric fri	
	Eric Lin /Reviewer	-



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## 2 Test Summary

Radio Spectrum Technical Requirement				
Item Standard Method Requirement		Requirement	Result	
Antenna Requirement	47 CFR Part 15, Subpart C 15.225	N/A	47 CFR Part 15, Subpart C 15.203	Pass

Radio Spectrum Matter Part					
Item	Standard	Method	Requirement	Result	
20dB Bandwidth		ANSI C63.10 (2013) Section 6.9	47 CFR Part 15, Subpart C 15.215	Pass	
Emission Mask		ANSI C63.10 (2013) Section 6.4	47 CFR Part 15, Subpart C 15.225(a)&(b)&(C)	Pass	
Frequency tolerance	47 CFR Part 15, Subpart C 15.225	ANSI C63.10 (2013) Section 6.8	47 CFR Part 15, Subpart C 15.225(e)	Pass	
Radiated Emissions (30MHz-1GHz)		ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15, Subpart C 15.225(d) & 15.209	Pass	
Radiated Emissions (9kHz-30MHz)		ANSI C63.10 (2013) Section 6.4&6.5	47 CFR Part 15, Subpart C 15.225(d) & 15.209	Pass	

Note: There are series models mentioned in this report, and they are the identical in electrical and electronic characters. Only the model ARK30T-W2 was tested since their differences were the model number and appearance.



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### 4 General Information

#### 4.1 Details of E.U.T.

Power supply:	DC 1.5V by battery*4
Operation Frequency:	13.56MHz
Number of Channels:	1
Modulation Type:	ASK
Antenna Type:	Loop Antenna

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.		
The EUT has been tested as an independent unit.					

4.3 Measurement Uncertainty

No.	Item	Measurement Uncertainty
1	Radio Frequency	8.4 x 10 <sup>-8</sup>
2	Timeout	2s
3	Occupied Bandwidth	3%
4	DE Dedicted Dever	5.2dB (Below 1GHz)
4	RF Radiated Power	5.9dB (Above 1GHz)
		4.2dB (Below 30MHz)
_	Radiated Spurious Emission Test	4.5dB (30MHz-1GHz)
5		5.1dB (1GHz-18GHz)
		5.4dB (Above 18GHz)
6	Temperature Test	1°C
7	Humidity Test	3%
8	Supply Voltages	1.5%
9	Time	3%

Note: The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



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#### 4.4 Test Location

All tests were performed at:

Compliance Certification Services (Kunshan) Inc.

No.10 Weiye Rd, Innovation park, Eco&Tec, Development Zone, Kunshan City, Jiangsu, China.

Tel: +86 512 5735 5888 Fax: +86 512 5737 0818

No tests were sub-contracted.

Note:

- 1. SGS is not responsible for wrong test results due to incorrect information (e.g., max. internal working frequency, antenna gain, cable loss, etc) is provided by the applicant. (If applicable).
- 2. SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (If applicable).

#### 4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

#### • CNAS (No. CNAS L4354)

CNAS has accredited Compliance Certification Services (Kunshan) Inc. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

#### A2LA (Certificate No. 2541.01)

Compliance Certification Services (Kunshan) Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). Certificate No. 2541.01.

#### • FCC (Designation Number: CN1172)

Compliance Certification Services (Kunshan) Inc. has been recognized as an accredited testing laboratory.

Designation Number: CN1172.

• ISED (CAB identifier: CN0072)

Compliance Certification Services (Kunshan) Inc. has been recognized by Innovation, Science and

Economic Development Canada (ISED) as an accredited testing laboratory.

Company Number: 2324E
• VCCI (Member No.: 1938)

The 3m and 10m Semi-anechoic chamber and Shielded Room of Compliance Certification Services (Kunshan) Inc. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-20134, R-11600, C-11707, T-11499, G-10216 respectively.

#### 4.6 Deviation from Standards

None

#### 4.7 Abnormalities from Standard Conditions

None



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# 5 Equipment List

Item	Equipment	Manufacturer	Model	Inventory No	Cal Date	Cal. Due Date
RF Ra	RF Radiated Test					
1	Spectrum Analyzer	R&S	FSV40	KUS1806E003	10/11/2021	10/10/2022
3	Signal Generator	Agilent	E8257C	KS301066	10/18/2021	10/17/2022
4	Loop Antenna	COM-POWER	AL-130R	KUS1806E001	04/13/2021	04/12/2023
5	Bilog Antenna	TESEQ	CBL 6112D	KUS1806E005	06/29/2021	06/28/2023
6	Amplifier(30MHz~18GHz)	PANSHAN TECHNOLOGY	LNA:1~18G	KSEM010-1	01/22/2022	01/21/2023
7	RE Test Cable	REBES MICROWAVE	1	CZ301097	11/14/2021	11/13/2022
8	Temperature & Humidity Recorder	Renke Control	RS-WS-N01-6J	KSEM024-4	01/04/2022	31/03/2023
9	Software	Faratronic	EZ_EMC-v 3A1	1	N/A	N/A



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## 6 Radio Spectrum Technical Requirement

#### 6.1 Antenna Requirement

#### 6.1.1 Test Requirement:

47 CFR Part 15, Subpart C 15.203

#### 6.1.2 Conclusion

15.203 requirement:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

#### **EUT Antenna:**

The antenna is Loop antenna and no consideration of replacement.

Antenna location: Refer to Internal photos



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## 7 Radio Spectrum Matter Test Results

#### 7.1 20dB Bandwidth

Test Requirement 47 CFR Part 15, Subpart C 15.215 Test Method: ANSI C63.10 (2013) Section 6.9

Measurement Distance: 3m

#### 7.1.1 E.U.T. Operation

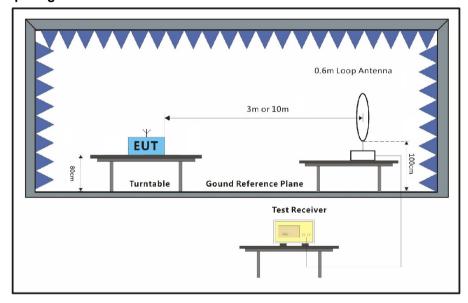
Operating Environment:

Temperature: 25.5 °C Humidity: 53.3 % RH Atmospheric Pressure: 1010 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT in transmitting mode

#### 7.1.3 Test Setup Diagram



#### 7.1.4 Measurement Procedure and Data

The detailed test data see: Appendix B for KSCR220500069902



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#### 7.2 Emission Mask

Test Requirement 47 CFR Part 15, Subpart C 15.225(a)&(b)&(C)

Test Method: ANSI C63.10 (2013) Section 6.4

Measurement Distance: 3m

Limit:

(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.

#### **Below 30MHz**

The limit at 30m test distance is below:

$$FS_{\text{limit}} = FS_{\text{max}} - 40 \log \left( \frac{d_{\text{limit}}}{d_{\text{measure}}} \right)$$

where

 $FS_{\text{limit}}$  is the calculation of field strength at the limit distance, expressed in dB $\mu$ V/m

FS<sub>max</sub> is the measured field strength, expressed in dBμV/m  $d_{\text{measure}}$  is the distance of the measurement point from the EUT is the reference distance or the distance of the  $\lambda/2\pi$  point

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 84dBuV/m at 30 meters.

#### 7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C Humidity: 53.3 % RH Atmospheric Pressure: 1010 mbar

7.2.2 Test Mode Description

7.2.2 TOST IV	7.2.2 Test mode bescription				
Pre-scan / Final test	Mode Code	Description			
Final test	01	TX mode Keep the EUT in transmitting mode			



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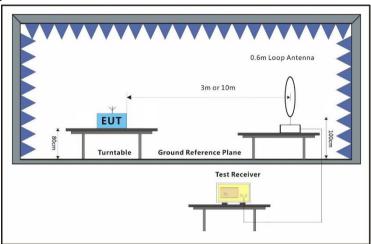
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#### 7.2.3 Test Setup Diagram



#### 7.2.4 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.

The detailed test data see: Appendix B for KSCR220500069902



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#### 7.3 Frequency tolerance

Test Requirement 47 CFR Part 15, Subpart C 15.225(e)
Test Method: ANSI C63.10 (2013) Section 6.8

Measurement Distance: 3m

Limit:

±0.01

#### 7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C Humidity: 53.1 % RH Atmospheric Pressure: 1010 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT in transmitting mode

#### 7.3.3 Test Setup Diagram

#### 7.3.4 Measurement Procedure and Data

The EUT was placed in an environmental test chamber and powered such that control element received normal voltage and the transmitter provided maximum RF output.

The detailed test data see: Appendix B for KSCR220500069902



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#### 7.4 Radiated Emissions (30MHz-1GHz)

Test Requirement 47 CFR Part 15, Subpart C 15.225(d) & 15.209

Test Method: ANSI C63.10 (2013) Section 6.4&6.5

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength(microvolts/meter)	Measurement distance(meters)
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

#### 7.4.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C Humidity: 53.3 % RH Atmospheric Pressure: 1010 mbar

#### 7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT in transmitting mode



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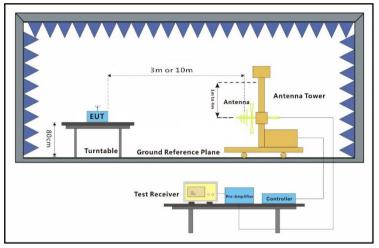
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#### 7.4.3 Test Setup Diagram



#### 7.4.4 Measurement Procedure and Data

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground for below 1GHz at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. g. The radiation measurements are performed in X, Y, Z axis positioning. And found the X axis positioning which it is worse case, only the test worst case mode is recorded in the report. Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

The detailed test data see: Appendix B for KSCR220500069902



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#### 7.5 Radiated Emissions (9kHz-30MHz)

47 CFR Part 15, Subpart C 15.225(d) & 15.209 Test Requirement

ANSI C63.10 (2013) Section 6.4&6.5 Test Method:

Measurement Distance: 3m

Limit:

Frequency(MHz)	Field strength (microvolts/meter)	Limit (dBuV/m)	Detector	Measurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	-	300
0.490-1.705	24000/F(kHz)	-	-	30
1.705-30	30	-	-	30

#### Below 30MHz

If field strength is measured at only a single point, then that point shall be at the radial from the EUT that produces the maximum emission at the frequency being measured, as described in 5.4. If that point is closer to the EUT than  $\lambda/2\pi$  and the limit distance is greater than  $\lambda/2\pi$ , the measurement shall be extrapolated to the limit distance by conservatively presuming that the field strength decreases at a 40 dB/decade of distance rate to the  $\lambda/2\pi$  distance, and at a 20 dB/decade of distance rate beyond  $\lambda/2\pi$ . This shall be accomplished using Equation (2):

$$FS_{(10m)} = FS_{(30/300m)} + 40log\{d_{(near field)}/d_{(10m)}\} + 20log\{d_{(30/300m)}/d_{(near field)}\}$$
(2)

If the single point measured is at a distance greater than  $\lambda/2\pi$ , then extrapolation to the limit distance shall be calculated using Equation (3):

$$FS_{(10m)} = FS_{(30/300m)} + 20log\{d_{(30/300m)}/d_{(10m)}\}$$
(3)

If both the single point and the limit distance are equal to or closer to the EUT than  $\lambda/2\pi$ , then extrapolation to the limit distance shall be calculated using Equation (4):

$$FS_{(10m)} = FS_{(30/300m)} + 40log\{d_{(30/300m)}/d_{(10m)}\}$$
(4)

Remark:

 $d_{near field} = 47.77 / f_{MHz}$ 

where f<sub>MHz</sub> is the frequency of the emission being measured in MHz.

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#### Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor - Preamplifier Factor



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$$FS_{\text{limit}} = FS_{\text{max}} - 40 \log \left( \frac{d_{\text{limit}}}{d_{\text{measure}}} \right)$$

where

 $FS_{limit}$  is the calculation of field strength at the limit distance, expressed in dB $\mu$ V/m

FS<sub>max</sub> is the measured field strength, expressed in dBμV/m is the distance of the measurement point from the EUT  $d_{\text{limit}}$  is the reference distance or the distance of the  $\lambda/2\pi$  point

r

#### 7.5.1 E.U.T. Operation

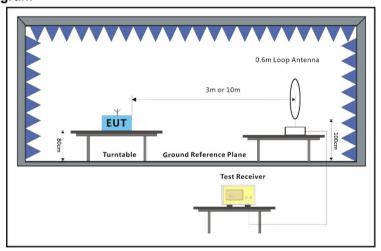
Operating Environment:

Temperature: 25.5 °C Humidity: 53.2 % RH Atmospheric Pressure: 1010 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	TX mode_Keep the EUT in transmitting mode

#### 7.5.3 Test Setup Diagram





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#### 7.5.4 Measurement Procedure and Data

For testing performed with the loop antenna, the center of the loop was positioned 1 m above the ground and positioned with its plane vertical at the specified distance from the EUT. During testing the loop was rotated about its vertical axis for maximum response at each azimuth and also investigated with the loop positioned in the horizontal plane. Only the worst position of vertical was shown in the report.

The detailed test data see: Appendix B for KSCR220500069902



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## 8 Test Setup Photo

Refer to Appendix - Test Setup Photo for KSCR2205000699AT

## 9 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for KSCR2205000699AT



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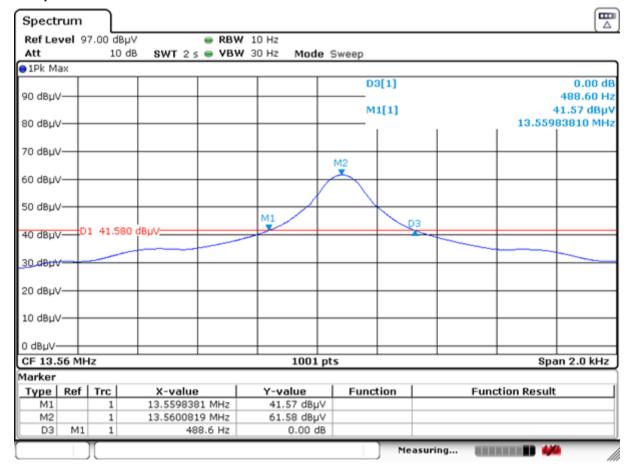
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#### Appendix B for KSCR220500069902

#### 1. 20dB Bandwidth

20dB bandwidth (kHz)	F <sub>L</sub> (MHz)	F <sub>H</sub> (MHz)	Limit(MHz)	Result
0.4886	13.5598381	13.5603267	13.110 – 14.010	Pass

#### Test plot as follows:





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#### 2. Frequency tolerance

Nominal Operation Frequency: 13.56MHz

Test Co	nditions	Test Result	Deviation	Limit	Decell
Temp (°C)	Volt (V DC)	(MHz)	(kHz)	(kHz)	Result
T <sub>nom</sub> (-20)	V <sub>nom</sub> (1.5)	13.55995	-0.05		Pass
T <sub>nom</sub> (-10)	V <sub>nom</sub> (1.5)	13.55998	-0.02		Pass
T <sub>nom</sub> (0)	V <sub>nom</sub> (1.5)	13.56004	0.04		Pass
T <sub>nom</sub> (10)	V <sub>nom</sub> (1.5)	13.56008	0.08		Pass
T <sub>nom</sub> (20)	V <sub>nom</sub> (1.5)	13.56000	0.00	±0.01%	Pass
T <sub>nom</sub> (30)	V <sub>nom</sub> (1.5)	13.56022	0.22	(1.3560kHz)	Pass
T <sub>nom</sub> (40)	V <sub>nom</sub> (1.5)	13.56017	0.17		Pass
T <sub>nom</sub> (50)	V <sub>nom</sub> (1.5)	13.56033	0.33		Pass
T <sub>nom</sub> (20)	V <sub>min</sub> (1.35)	13.56011	0.11		Pass
	V <sub>max</sub> (1.65)	13.56020	0.20		Pass

Note: Deviation (kHz) = (Test Result-13.56MHz)\*1000



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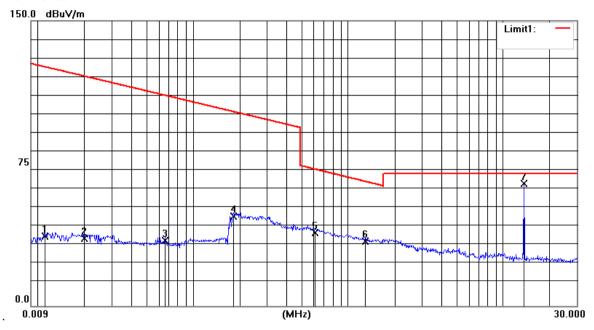


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### 3. Radiated Emissions(9kHz-30MHz)

#### Horizontal



Item	Freq.	Read Level	Correct Factor	Result Level@ 3m	Result Level@S PEC	Limit Line@SP EC	Over Limit	Detector
(Mark)	(MHz)	(dBµV)	(dB/m)	(dBuV/m )	(dBuV/m)	(dBuV/m)	(dB)	
1	0.0111	20.63	15.90	36.53	-43.47	46.70	-90.17	QP
2	0.0200	20.06	15.44	35.50	-44.50	41.58	-86.08	QP
3	0.0660	19.78	14.49	34.27	-45.73	31.21	-76.94	QP
4	0.1814	32.66	14.45	47.11	-32.89	22.43	-55.32	QP
5	0.6075	23.92	14.49	38.41	-1.59	31.93	-33.52	QP
6	1.2960	19.49	14.55	34.04	-5.960	25.35	-31.31	QP
7	13.5600	50.87	13.27	64.14	24.14	84.00	-59.86	PeaK



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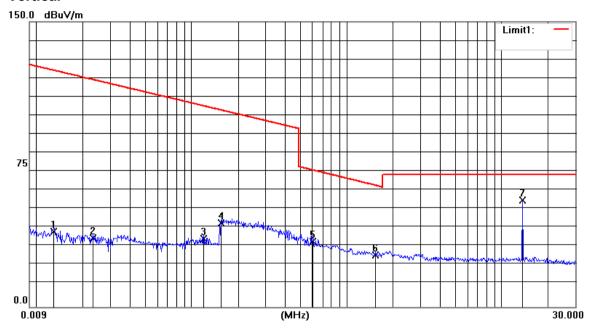
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#### Vertical



Item	Freq.	Read Level	Correct Factor	Result Level@3 m	Result Level@SP EC	Limit Line@SP EC	Over Limit	Detector
(Mark)	(MHz)	(dBµV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	0.0130	39.72	15.80	39.72	-40.28	45.33	-83.71	QP
2	0.0230	36.33	15.28	36.33	-43.67	40.37	-85.57	QP
3	0.1190	35.99	14.47	35.99	-44.01	26.09	-79.37	QP
4	0.1540	43.92	14.45	43.92	-36.08	23.95	-59.02	QP
5	0.6040	34.42	14.49	34.42	-5.58	31.98	-32.84	QP
6	1.5355	27.34	14.57	27.34	-12.66	23.88	-42.16	QP
7	13.5600	55.97	13.27	55.97	15.97	84.00	-68.03	PeaK

Remark: 'SPEC' means the specified measurement distance, for frequency between 0.009MHz to 0.490MHz is 300 meters, 0.490MHz to 1.705MHz is 30 meters, 1.705MHz to 30MHz is 30 meters.



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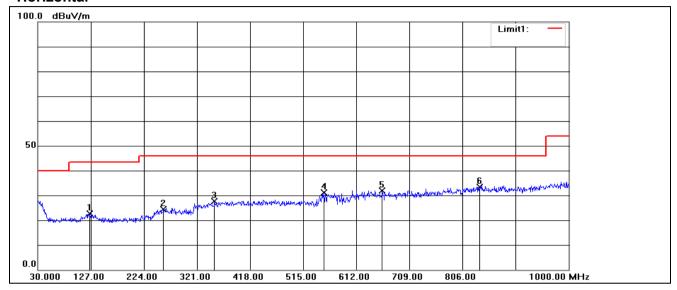


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#### 4. Below 1GHz

#### Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	125.0600	3.08	19.46	22.54	43.50	-20.96	QP
2	259.8900	3.55	20.90	24.45	46.00	-21.55	QP
3	353.0100	5.71	21.96	27.67	46.00	-18.33	QP
4	552.8300	3.84	27.27	31.11	46.00	-14.89	QP
5	659.5300	4.48	27.28	31.76	46.00	-14.24	QP
6	837.0400	31.31	2.16	33.47	46.00	-12.53	QP



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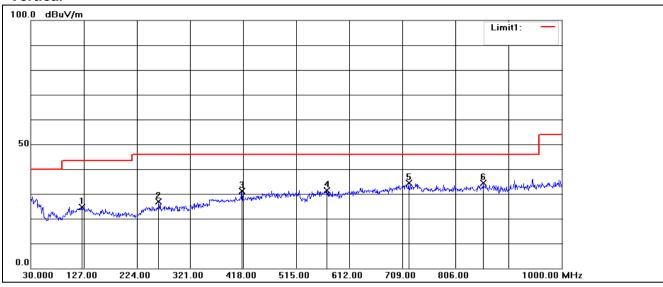
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#### Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	123.1200	5.34	19.41	24.75	43.50	-18.75	QP
2	263.7700	5.81	21.02	26.83	46.00	-19.17	QP
3	416.0600	7.18	24.01	31.19	46.00	-14.81	QP
4	571.2600	4.32	27.15	31.47	46.00	-14.53	QP
5	720.6400	31.85	2.43	34.28	46.00	-11.72	QP
6	857.4100	32.08	2.18	34.26	46.00	-11.74	QP

- End of the Report -



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