

EMC - TEST REPORT

Report Number : **612861818901-2** Date of Issue: Sep. 07, 2018

Model : K200, K202, K402, K404, K600, K602, K604, K606
: K800, K802, K804, K806, K808

Product Type : Radio remote control transmitter

Applicant : SHUN HU Technology Co., Ltd.

Address : No. 21, Zhonggong Rd., Xihu Township,
: Changhua Country 514, Taiwan

Manufacturer : SHUN HU Technology Co., Ltd.

Address : No. 21, Zhonggong Rd., Xihu Township,
: Changhua Country 514, Taiwan

Test Result : ☒ **Positive** ☐ **Negative**

Total pages including Appendices : 35

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1. Report Version

Revision	Release Date	History/Memo.
1.0	Sep. 07, 2018	Initial Release

2. General Information

The product is a Radio remote control transmitter.

2.1 Notes

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2018-08-01
Date

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Signature

Approved by
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2018-08-15
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Signature

2.2 Testing Laboratory

Test Laboratory: MRT Technology Co.,

Test Site: No.38, Fuxing Second Rd., Guishan Dist., Taoyuan City 333,
Taiwan (R.O.C.)

2.3 Details of Applicant

Client: SHUN HU Technology Co., Ltd.

Address: No. 21, Zhonggong Rd., Xihu Township, Changhua Country 514, Taiwan

Product Description: Radio remote control transmitter

Submitted Model No.: K200, K202, K402, K404, K600, K602, K604, K606,
K800, K802, K804, K806, K808

2.4 Application Details

Revision	1.0	
Date of receipt of order	Jun 25, 2018	
Date of receipt of test item	Jun 28, 2018	
Date of test	July 1, 2018	

2.5 Applied Standard

EN 301 489-1 V 2.1.1
EN 301 489-3 V 2.1.1

2.6 Test Summary

Summary of Results				
Test Items	Test Mode	Performance Class & Required Performance Criteria	Result	Site
<u>Radiated Emissions</u> <input checked="" type="checkbox"/> Enclosure Port	TM1	CLASS B	Pass	Site 1
<u>Conducted Emissions</u> <input type="checkbox"/> DC Power Port <input type="checkbox"/> AC Power Port <input type="checkbox"/> Telecom. Ports	NA	NA	NA	Site1
<u>Current harmonics emissions</u> <input type="checkbox"/> AC Power Port	NA	NA	NA	Site1
<u>Voltage fluctuations and flickers</u> <input type="checkbox"/> AC Power Port	NA	NA	NA	Site1
<u>Immunity To Radiated Electromagnetic Fields</u> <input checked="" type="checkbox"/> Enclosure Port	TM1	CT/CR	Pass	Site1
<u>Immunity To Electrostatic Discharge</u> <input checked="" type="checkbox"/> Enclosure Port	TM1	TT/TR	Pass	Site1
<u>Immunity To Electrical Fast Transient Bursts</u> <input type="checkbox"/> AC Power Port <input type="checkbox"/> DC Power Port <input type="checkbox"/> Telecom. Ports	NA	TT/TR	NA	Site1
<u>Immunity To Surges</u> <input type="checkbox"/> AC Power Port <input type="checkbox"/> DC Power Port <input type="checkbox"/> Telecom. Port	NA	TT/TR	NA	Site1
<u>Immunity To Continuous Conducted Interference</u> <input type="checkbox"/> AC Power Port <input type="checkbox"/> DC Power Port <input type="checkbox"/> Telecom. Ports	NA	CT/CR	NA	Site1
<u>Immunity To Voltage dips and Short Interruption</u> <input type="checkbox"/> AC Power Port	NA	TT/TR	NA	Site1
Note: 1, Measurement taken is within the measurement uncertainty of measurement system. 2, <input checked="" type="checkbox"/> The item has been tested; <input type="checkbox"/> The item has not been tested.				

Test Mode: TM1 See 4.1 for definition

2.7 Performance Criteria

Clause 6 of EN301 489-1	
Criteria	Performance Criteria
CT/CR	During and after the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the apparatus is used as intended.
TT/TR	After the test, the apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the apparatus is used as intended.

Remark: The EUT has met the requirements of Performance Criterion defined were in accordance with Product standards.

3. EUT Information

3.1 EUT Description

Description:	Radio remote control transmitter
Model(s):	K200, K202, K402, K404, K600, K602, K604, K606, K800, K802, K804, K806, K808
Hardware edition	N/A
PCB hardware version	N/A
Software version	N/A
Antenna Deliver	1*TX
Battery Rated Voltage	3.0 Vdc

Remark: The above EUT's information is declared by manufacturer. Please refer to the specifications or user's manual for more detailed description

3.2 EUT Appearance





4. System Configuration during EMC Test

4.1 Test Configurations

The applicant has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was in this test report and defined as:

Test Sample: AMP30	
Test Mode1 (TM1)	433 MHz Link

According to the preliminary test for Radiated Emission at these three test modes, it was found test Mode 1 was the worst. These three test modes were taken as the representative condition for testing and its data are recorded in this test report.

4.2 Test Mode

See 4.1

4.3 Configurations of Test System



5. Electromagnetic Interference (EMI)

5.1 Radiated Disturbance 30MHz to 6000MHz

5.1.1 Test Procedure

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4. The test distance was 3m for 30 ~ 1GHz.

The test site full-anechoic chamber has met the requirement of VSWR tolerance 6dB according to the standards: CISPR 16-1-4. The test distance was 3m for 1GHz ~ 6GHz.

The set-up and test methods were according to EN 55032 a preliminary scan and a final scan of the emissions were made from 30 MHz to 1GHz by using test script of software; the emissions were measured using Quasi-Peak Detector (30MHz~1GHz) and AV/PK Detector (above 1GHz).

The maximal emission value was acquired by adjusting the antenna height, polarization and turntable azimuth in accordance with the software setup. Normally, the height range of antenna was 1m to 4m, the azimuth range of turntable was 0° to 360°, The receive antenna has two polarizations V and H.

5.1.2 Test Setup

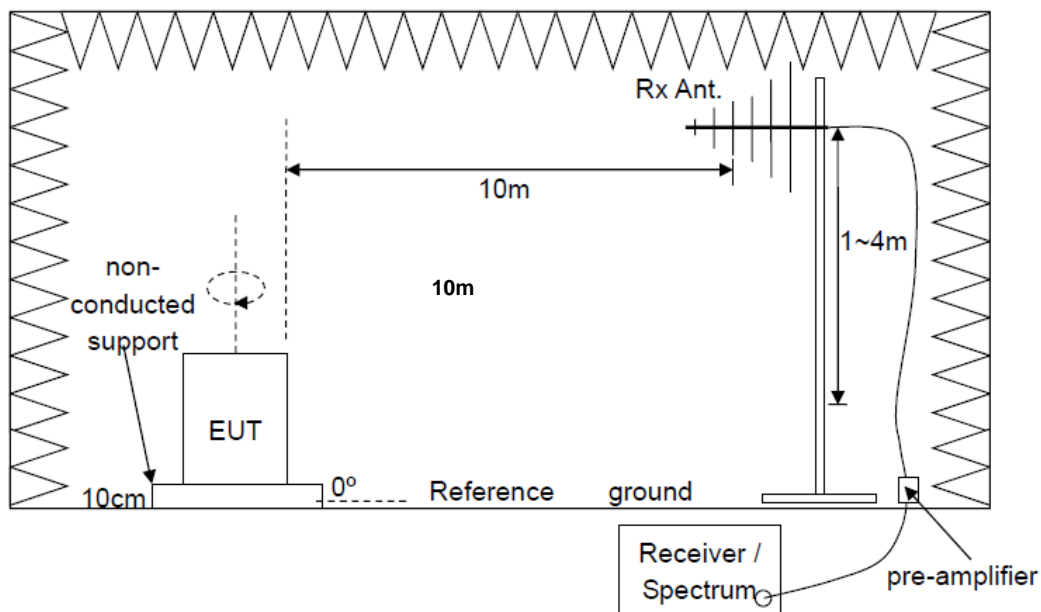


Figure 1. Test set-up of radiated disturbance(30MHz-1GHz)

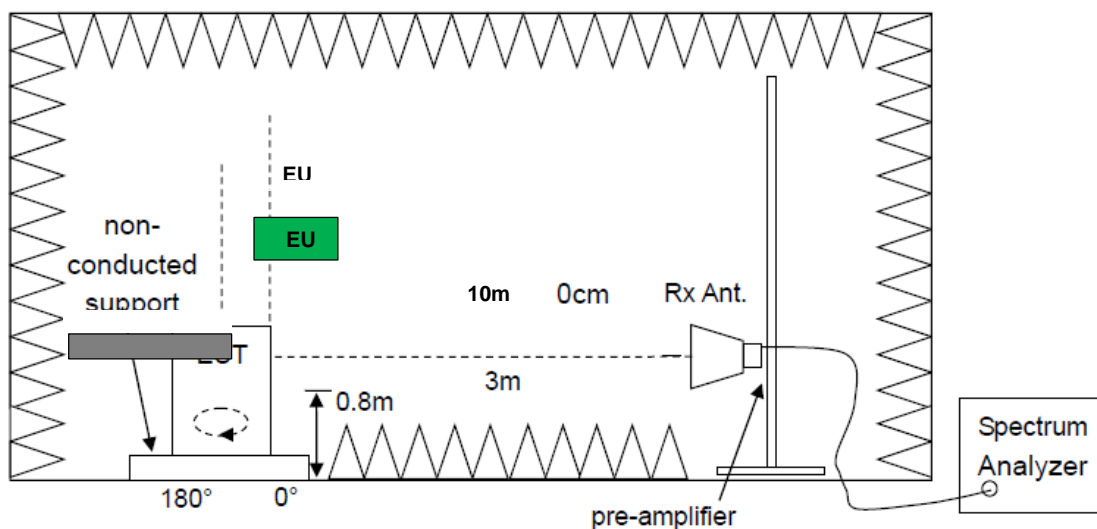


Figure 2. Test set-up of radiated disturbance (above 1GHz)

5.1.3 Test Results

The EUT has met the requirements for Radiated Emission of enclosure port.
The test data see section 9.1 of this report.

Test Limits			
Frequency (MHz)	Distance (m)	QP (dBuV/m)	
30 - 230	10	30	
230 - 1000	10	37	
Frequency (GHz)	Distance (m)	Average (dBuV/m)	Peak (dBuV/m)
1-3	3	50	70
3-6	3	54	74

Test environment condition:

Performed Item	Item	Required	Actual
Radiated Emission	Ambient temperature	15°C ~ 35°C	24°C
	Relative humidity	25% ~ 75%	67%
	Atmospheric pressure	86 kPa ~ 106kPa	99kPa

5.2 Conducted Disturbance 0.15 MHz to 30MHz On AC Port

5.2.1 Test Procedure

The EUT was configured as described in section 4 for this test. The mains cable of the EUT being measured shall be connected to LISN, The LISN shall be placed 0.8m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

All telecommunication and signal ports must be correctly terminated using either appropriate associated equipment or a representative termination during the measurement of the conducted disturbances at the mains.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1m.

The setup of Conducted Disturbance for telecommunication port was according to Annex C of EN 55022/CISPR 22.

5.2.2 Test Setup

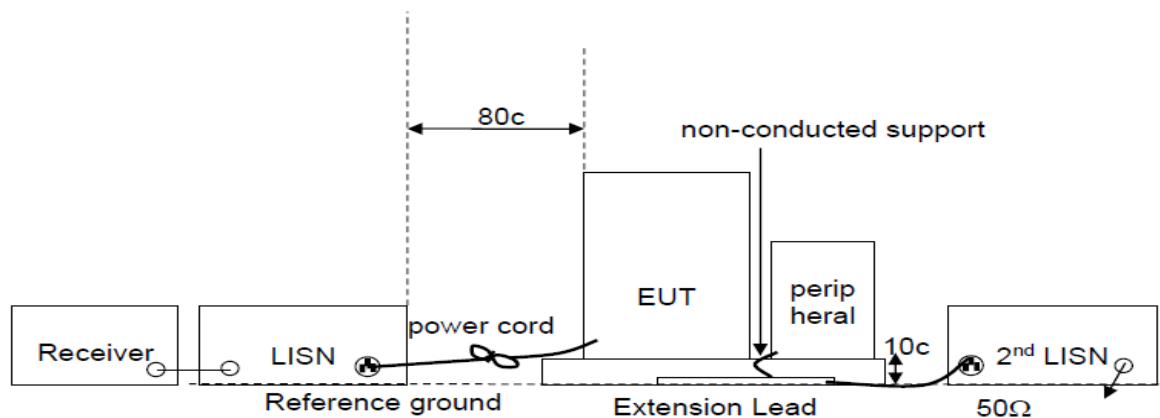


Figure 3. Test set-up of conducted disturbance for power port

5.2.3 Test Results

The EUT Power by Battery, so do not need to test Conducted Emission.

Test Limit of AC Power Port

Frequency range	150kHz ~ 30MHz	
Frequency	Voltage limits	
	QP	AV
0.15MHz~0.5MHz	66-56 dB μ V	56-46 dB μ V
0.5MHz-5MHz	56 dB μ V	46 dB μ V
5MHz~30MHz	60 dB μ V	50 dB μ V

5.3 Conducted Disturbance on Telecommunication Port 0.15 MHz to 30MHz

5.3.1 Test Procedure

The EUT was configured as described in section 4 for this test. Assessment of common mode (asymmetric mode) current or voltage disturbances at telecommunication ports for attachment of unscreened balanced pairs shall be performed with the telecommunication port connected by a cable to an ISN; thus the ISN shall define the common mode termination impedance seen by the telecommunication port during the disturbance measurements. The ISN shall allow normal operation of the EUT, and to this end shall be interposed in the signal cable between the EUT and any auxiliary/associated equipment (AE) or load required to exercise the EUT.

The set-up and test methods were according to EN 55032

5.3.2 Test Results

The EUT Power by Battery, so do not need to test Conducted Emission.

Test Limit of Telecommunication Port

Frequency range	150kHz~ 30MHz	
Classification	Class B	
Limit(Class B)	Voltage limits	
	QP	AV
0.15MHz~0.5MHz	84~74 dB μ V	74~64 dB μ V
0.5MHz~30MHz	74 dB μ V	64 dB μ V

5.4 Current Harmonics Emissions

5.4.1 Test Procedure

The EUT is to be powered from a clean (low distortion) 230V 50Hz AC Power Port source. The EUT was configured as described in section 4 for this test. The set-up and test methods were according to EN 61000-3-2/IEC 61000-3-2.

5.4.2 Test Setup

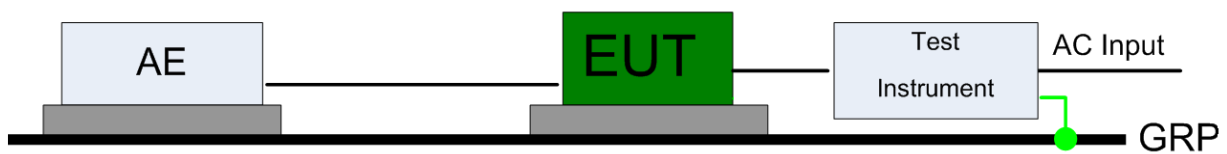


Figure 4. Test set-up of current harmonics emission test

5.4.3 Test Results

The EUT Power by Battery, so do not need to test Harmonic Current Emissions.

5.5 Voltage Fluctuations (Flicker)

5.5.1 Test Procedure

The EUT is to be powered from a clean (low distortion) 230V 50Hz AC Power Port source. The EUT was configured as described in section 4 for this test. The formal test ran 10mins and over a 2 hour period. The values of Pst, d(t), dmax and dc is measured. Power's source impedance is $0.4+j0.25\Omega$. The set-up and test methods were according to EN 61000-3-3/IEC 61000-3-3.

5.5.2 Test Setup

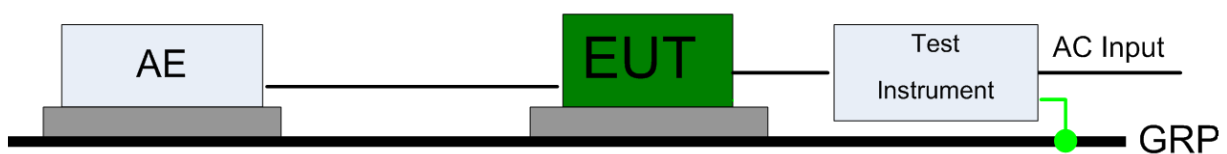


Figure 5. Test set-up of voltage fluctuations test

5.5.3 Test Results

The EUT Power by Battery, so do not need to test Voltage Fluctuations and Flicker.

6. Electromagnetic Susceptibility (EMS)

6.1 Immunity to Electrostatic Discharge

6.1.1 Test Procedure

The EUT was configured as described in section 4 for this test. The set-up and test methods were according to IEC 61000-4-2.

6.1.2 Test Set up

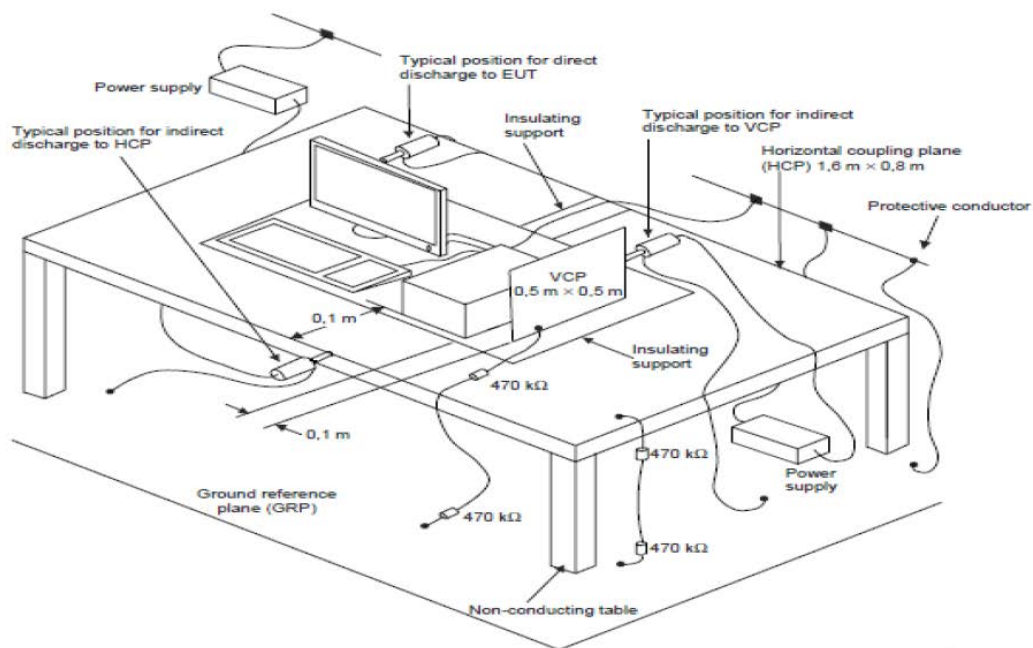


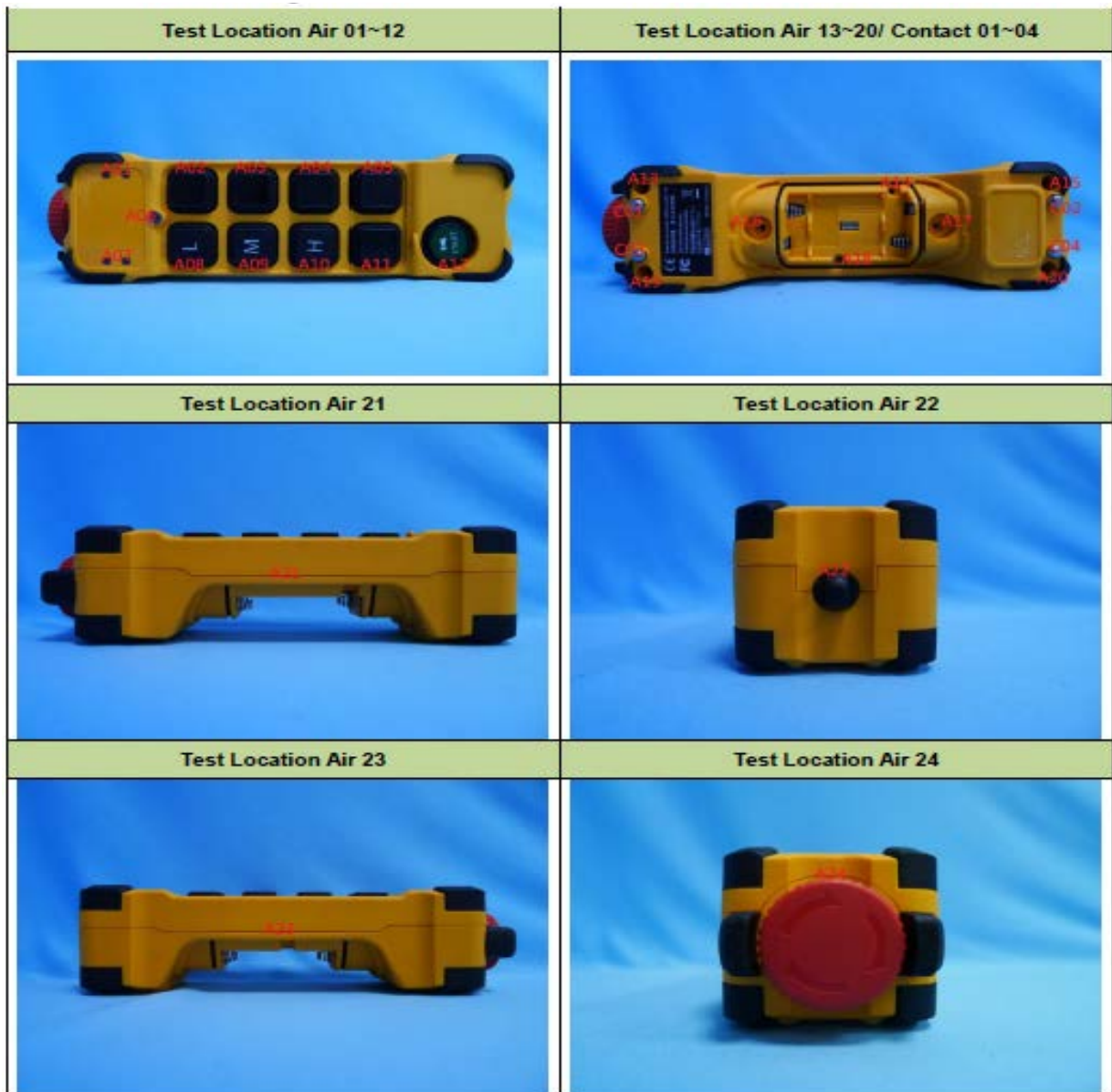
Figure 6. Test set-up of electrostatic discharge

6.1.3 Test Results

Test was performed on EUT with normal operation.
Details of the points tested were presented in below:

Test Results					
Test Points	Specification Level				Conclusion
	±2kV,±4kV Contact Discharges		±2kV,±4kV, ±8kV Air Discharges		
	Positive	Negative	Positive	Negative	
Indirect Contact					
Indirect Contact, HCP (left, right, front, rear)	✓	✓	N/A	N/A	Pass
Indirect Contact, VCP (left, right, front, rear)	✓	✓	N/A	N/A	Pass
Direct Contact/ Air Contact					
See below	✓	✓	N/A	N/A	Pass
See below	N/A	N/A	✓	✓	Pass

✓ Normal operation condition specified by manufacturer during test



Test environment condition:

Performed Item	Item	Required	Actual
Immunity to Electrostatic Discharge	Ambient temperature	15°C ~ 35°C	24°C
	Relative humidity	30% ~ 60%	46%
	Atmospheric pressure	86 kPa ~ 106kPa	101kPa

6.2 Radio Frequency Electromagnetic Field

6.2.1 Test Procedure

The EUT was configured as described in section 4 for this test. The set-up and test methods were according to IEC 61000-4-3. All sides of the EUT (front, rear, left and right) were tested by antenna with vertical and horizontal polarization.

6.2.2 Test Setup

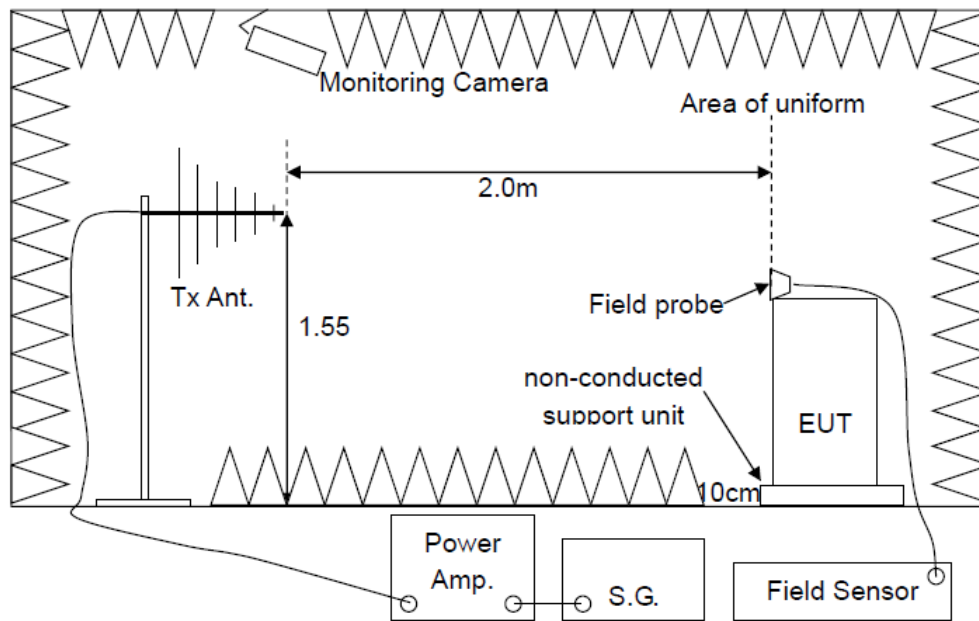


Figure 7. Test set-up of Immunity to Radiated Electric Fields

6.2.3 Test Results

Test was performed on EUT with normal operation. Test data were presented in below:

Test Results of Radiated Electric Fields	
Test side of EUT	Front, Rear, Left, Right
Criterion	CT&CR
Frequency range & Test Level	80MHz –1400MHz test level: 3 V/m(Unmodulated, rms) 1400MHz –6000MHz test level: 3 V/m(Unmodulated, rms)
Modulation	80% AM, 1kHz
carrier centre frequency	434 MHz
Conclusion	Pass (Criteria: A)

Test environment condition:

Performed Item	Item	Required	Actual
Immunity to Radiated Electric Fields	Ambient temperature	15°C ~ 35°C	25°C
	Relative humidity	25% ~ 75%	66%
	Atmospheric pressure	86 kPa ~ 106kPa	99kPa

6.3 Immunity to Electrical Fast Transient Bursts

6.3.1 Test Procedure

The EUT was configured as described in section 4 for this test. A series of Fast Transient Bursts meeting the specification were applied for a period of 120 seconds. The Transient Bursts were applied for both Positive and Negative Burst Trains to Power Port. The set-up and test methods were according to IEC 61000-4-4.

6.3.2 Test Setup

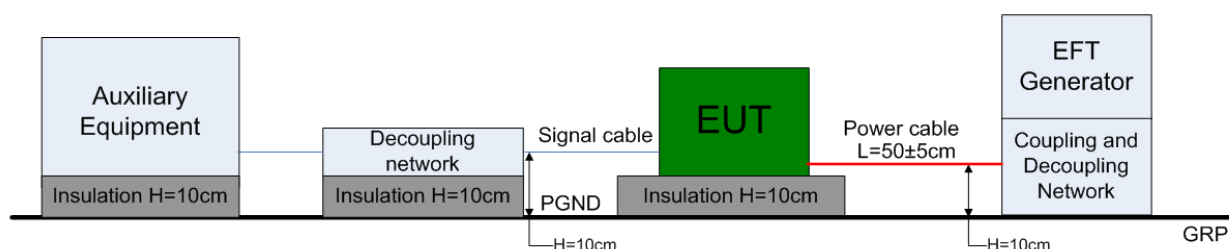


Figure 8. Test set-up of immunity to electrical fast transient bursts

6.3.3 Test Results

The EUT Power by Battery, so do not need to test Electrical Fast Transients.

Test data were presented in below:

Test Results of Electrical Fast Transient Bursts			
Ports	Measuring condition Couple mode	Description	Conclusion
AC Power Port	Level: $\pm 1.0\text{kV}$, Tr/Th: 5/50ns, 5kHz Interval: 120 seconds	N/A	N/A
Telecommunication Port	Level: $\pm 1.0\text{kV}$, Tr/Th: 5/50ns, 100kHz Interval: 120 seconds	N/A	N/A

6.4 Immunity to Surges

6.4.1 Test Procedure

The EUT was configured as described in section 4 for this test. A series of High Energy Surges were applied to Power Port. The set-up and test methods were according to IEC 61000-4-5.

6.4.2 Test Setup

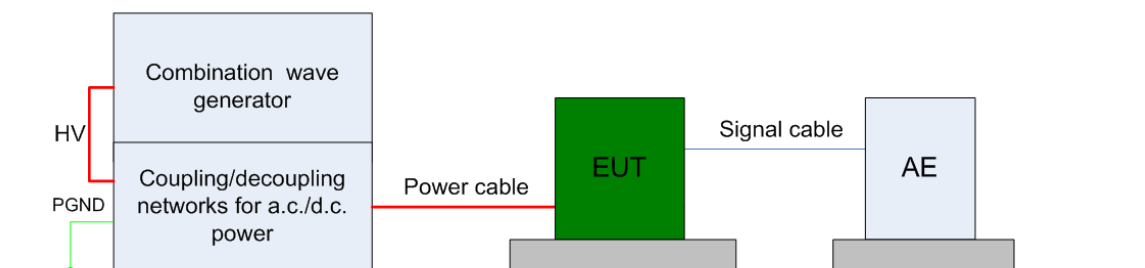


Figure 9. Test set-up of immunity to surge

6.4.3 Test Results

The EUT Power by Battery, so do not need to test Surge.

Test data were presented in below:

Test Results of Surges			
Ports	Measuring condition	Description	Conclusion
AC Power Port	Line to Line: L-N Level: $\pm 1.0\text{kV}$, Tr/Th: $1.2/50\mu\text{s}$ Interval: 60 seconds Phase: Sync	N/A	N/A
Signal Port	Level: $\pm 1.0\text{kV}$, Tr/Th: $1.2/50\mu\text{s}$ Interval: 60 seconds	N/A	N/A

6.5 Immunity to Continuous Conducted Interference 0.15MHz to 80MHz

6.5.1 Test Procedure

The EUT was configured as described in section 4 for this test. The applied level was Amplitude Modulated by a 1 kHz sinusoidal signal to a modulation depth of 80%. The set-up and test methods were according to IEC 61000-4-6.

6.5.2 Test Setup

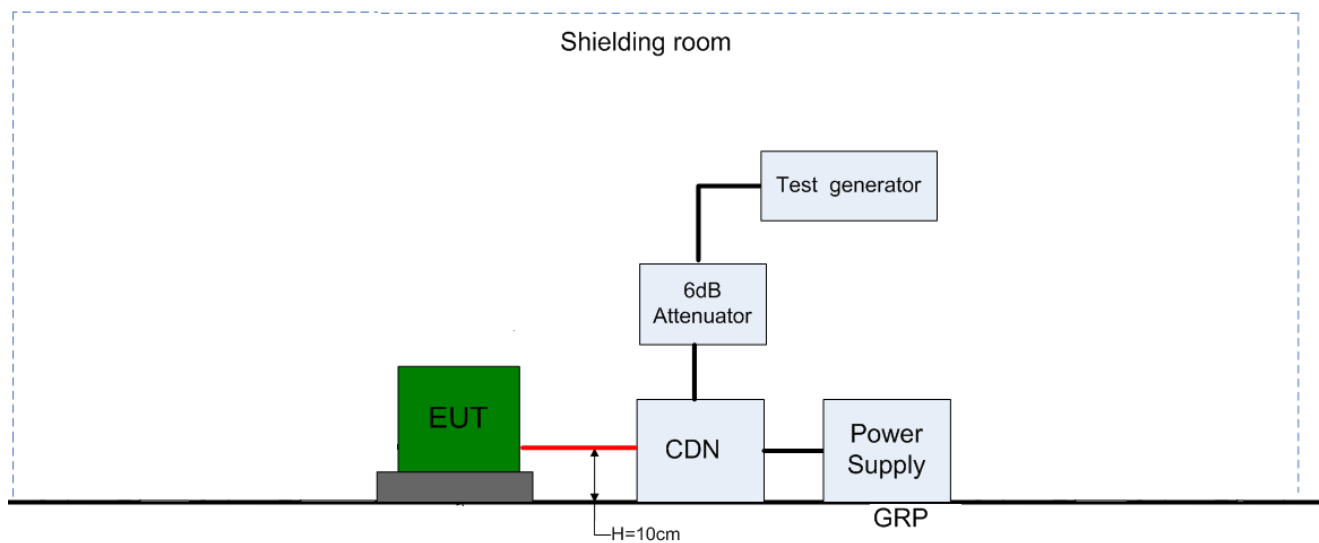


Figure 10. Test set-up of immunity to continuous conducted interference

6.5.3 Test Results

The EUT Power by Battery, so do not need to test Radio-Frequency Continuous Conducted.

Test data were presented in below:

Test Results of Continuous Conducted Interference				
Ports	Measuring condition	Inject method	Description	Conclusion
AC Power Port	Frequency range: 0.15 MHz to 80 MHz Induced voltage :3 V (rms) Special frequency point: 0.2MHz;1.0MHz;7.1MHz;13.56 MHz;21.0MHz;27.12MHz; 40.68MHz ($\pm 1\%$)	CDN M2	N/A	N/A
Signal port	Frequency range: 0.15 MHz to 80 MHz Induced voltage :3 V (rms) Special frequency point: 0.2MHz;1.0MHz;7.1MHz; 13.56MHz;21.0MHz; 27.12MHz;40.68MHz ($\pm 1\%$)	Clamp	N/A	N/A

6.6 Immunity to Voltage Dips and Short Interruption of AC Power Port

6.6.1 Test Procedure

The EUT was configured as described in section 4 for this test. The set-up and test methods were according to IEC 61000-4-11.

6.6.2 Test Setup

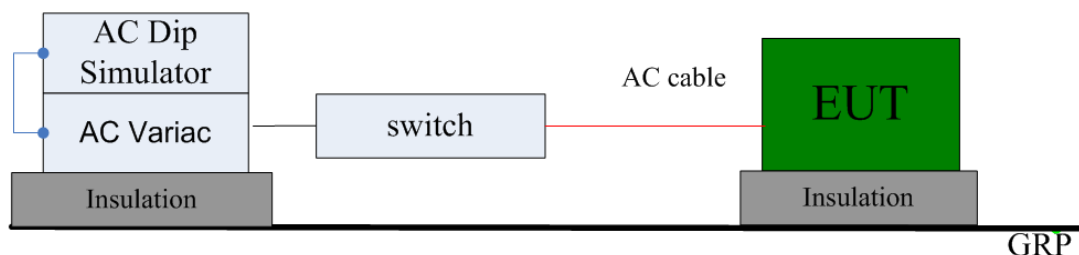


Figure 11. Test set-up of Voltage Dips and Short Interruption of AC Power Port

6.6.3 Test Results

In the case where the equipment is fitted with or connected to a battery back-up, the performance criteria for transient phenomena shall apply. In the case where the equipment is powered solely from the AC mains supply (without the use of a parallel battery back-up) volatile user data may have been lost and if applicable the communication link need not to be maintained and lost functions should be recoverable by user or operator; no unintentional responses shall occur at the end of the test.

The EUT Power by Battery, so do not need to test Voltage Dips and interruptions.

Test data were presented in below:

Test Results of Voltage Dips and Short Interruption				
Ports	Measuring condition	Performance Criterion	Description	Conclusion
AC Power Port	Voltage dip: 70 % residual voltage for 25 cycles (at 50 Hz)	TT&TR	N/A	N/A
	Voltage dip: 0 % residual voltage for 0,5 cycle	TT&TR	N/A	N/A
	Voltage dip: 0 % residual voltage for 1 cycle	TT&TR	N/A	N/A
	Voltage interruption: 0 % residual voltage for 250 cycles (at 50 Hz)	TT&TR	N/A	N/A

7. Main Test Instruments

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Date
Broadband TRILOG Antenna	Schwarzbeck	VULB 9162	MRTTWA00001	1 year	2019/5/22
Broadband Horn antenna	Schwarzbeck	BBHA 9120D	MRTTWA00003	1 year	2019/4/24
Broadband Preamplifier	Schwarzbeck	BBV 9718	MRTTWA00005	1 year	2019/4/23
Signal Analyzer	R&S	FSV40	MRTTWA00007	1 year	2019/3/20
EMI Test Receiver	R&S	ESR3	MRTTWA00009	1 year	2019/3/19

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cal. Date
ESD Simulator	TESEQ	NSG 435	MRTTWA00049	1 year	2018/11/21

Instrument	Manufacturer	Type No.	Asset No.	Cali. Interval	Cali. Due Date
Signal Generator	Agilent	E4438C	MRTSUE06081	1 year	2018/12/06
EPM Series Power Meter	Agilent	E4418B	MRTSUE06204	1 year	2019/07/04
Power Sensor	Agilent	E9301H	MRTSUE06205	1 year	2019/07/04
Power Amplifier	AR	150W1000M 1	MRTSUE06146	N/A	N/A
Power Amplifier	rflight	NTWPAS-10 25100	MRTSUE06364	N/A	N/A
Power Amplifier	rflight	NTWPAS-25 60100	MRTSUE06363	N/A	N/A
High-Gain Horn Antenna	AR	ATH800M5G A	MRTSUE06144	N/A	N/A
Log-Periodic Antenna	AR	ATR80M6G	MRTSUE06145	N/A	N/A
Digital Thermometer & Hygrometer	Minggao	ETH529	MRTSUE06170	1 year	2018/12/12
Anechoic Chamber	RIKEN	Chamber-AC 2	MRTSUE06213	1 year	2019/04/30

8. System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Items	Extended Uncertainty
RE (3m chamber)	U=4.32dB (30MHz~6GHz)
CE	U=2.40dB

9. Graph and Data of Emission Test

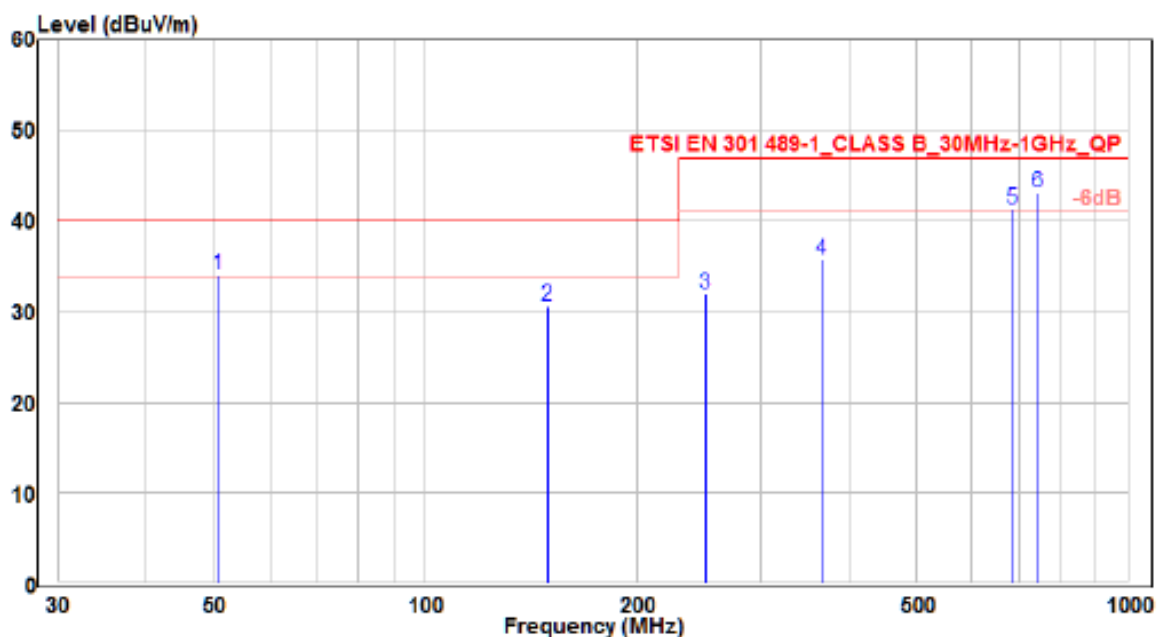
9.1 Radiated Disturbance (30 MHz – 1 GHz)

EUT Model: K200, K202, K402, K404, K600,
K602, K604, K606, K800, K802,
K804, K806, K808

Test Mode: Mode 1

Test Mode: Normal Operation

Polarization: Vertical



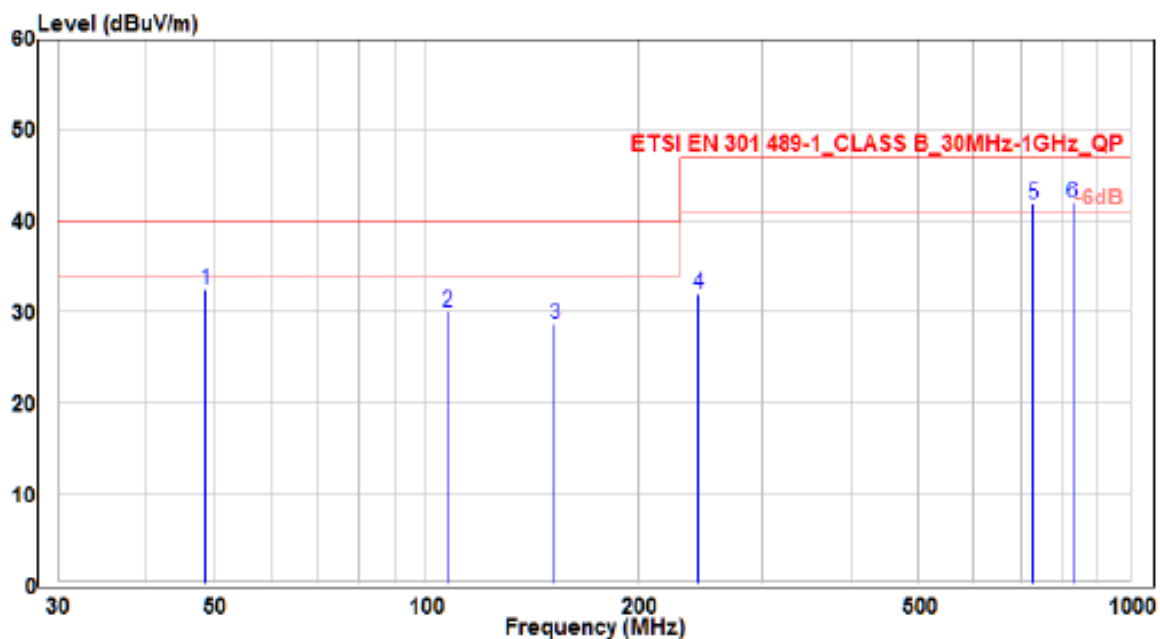
No	Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Height (cm)	Angle (deg)	Remark (QP/PK/AV)
1	50.794	12.46	21.71	34.17	-5.83	40	100	220	QP
2	148.946	14.97	15.67	30.64	-9.36	40	150	240	QP
3	250.038	11.63	20.34	31.97	-15.03	47	110	390	QP
4	366.772	12.23	23.54	35.77	-11.23	47	100	40	QP
5	685.174	12.43	28.98	41.41	-5.59	47	100	-20	QP
6	* 744.253	13.31	29.83	43.14	-3.86	47	125	340	QP

EUT Model: K200, K202, K402, K404, K600,
K602, K604, K606, K800, K802,
K804, K806, K808

Test Mode: Mode 1

Test Mode: Normal Operation

Polarization: Horizontal



No	Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Height (cm)	Angle (deg)	Remark (QP/PK/AV)
1	48.491	10.6	21.81	32.41	-7.59	40	100	30	QP
2	107.085	10.85	19.2	30.05	-9.95	40	100	290	QP
3	152.463	12.93	15.79	28.72	-11.28	40	120	380	QP
4	243.673	11.98	20.07	32.05	-14.95	47	130	-40	QP
5	729.703	12.23	29.63	41.86	-5.14	47	100	50	QP
6	* 830.008	11.15	30.89	42.04	-4.96	47	100	270	QP

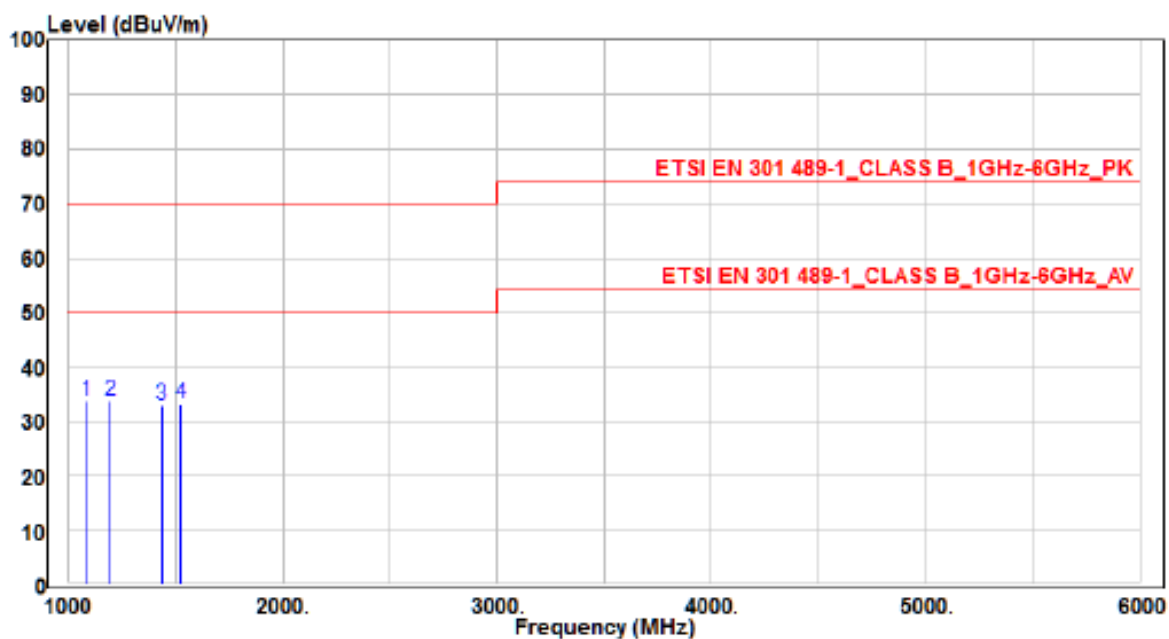
Radiated Disturbance (1 GHz – 6 GHz)

EUT Model: K200, K202, K402, K404, K600,
K602, K604, K606, K800, K802,
K804, K806, K808

Test Mode: Mode 1

Test Mode: Normal Operation

Polarization: Vertical



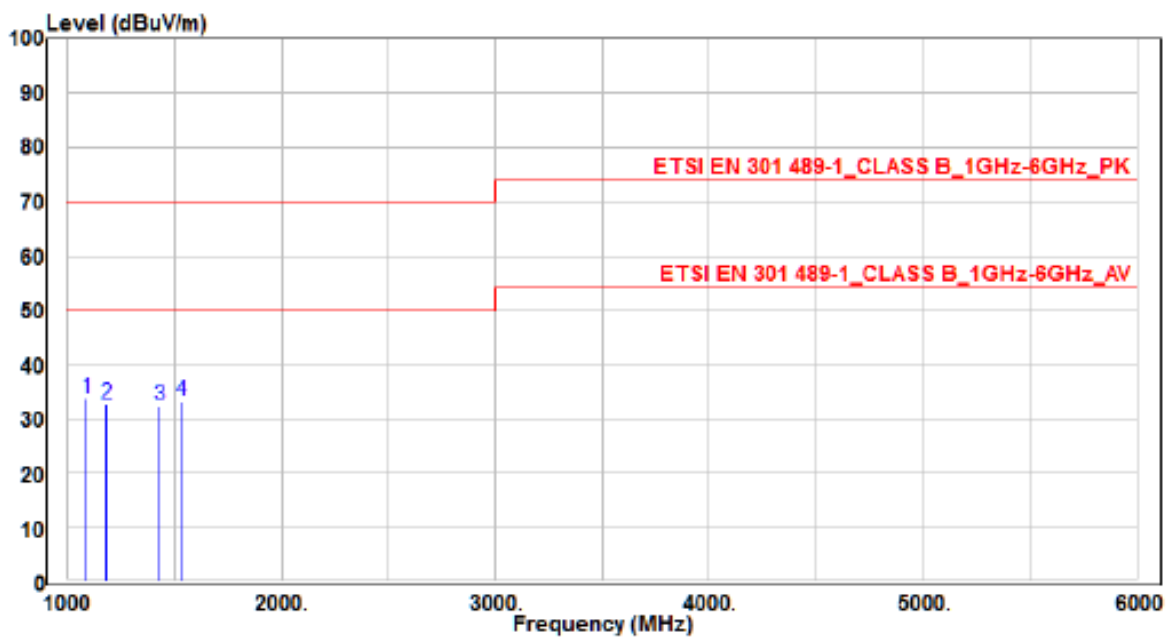
No	Frequency (MHz)	Reading (dBUV)	C.F (dB)	Measurement (dBUV/m)	Margin (dB)	Limit (dBUV/m)	Height (cm)	Angle (deg)	Remark (QP/PK/AV)
1	1084.76	41.18	-7.44	33.74	-36.26	70	100	400	Peak
2	* 1193.51	40.8	-6.91	33.89	-36.11	70	100	400	Peak
3	1435.38	38.67	-5.74	32.93	-37.07	70	100	400	Peak
4	1522.41	38.71	-5.36	33.35	-36.65	70	100	400	Peak

EUT Model: K200, K202, K402, K404, K600,
K602, K604, K606, K800, K802,
K804, K806, K808

Test Mode: Mode 1

Test Mode: Normal Operation

Polarization: Horizontal



No		Frequency (MHz)	Reading (dBuV)	C.F (dB)	Measurement (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Height (cm)	Angle (deg)	Remark (QP/PK/AV)
1	*	1089.61	41.18	-7.42	33.76	-36.24	70	100	400	Peak
2		1179.92	39.63	-6.98	32.65	-37.35	70	100	400	Peak
3		1431.31	38.14	-5.76	32.38	-37.62	70	100	400	Peak
4		1532.09	38.65	-5.33	33.32	-36.68	70	100	400	Peak

10. Setup Photographs of EUT

10.1 Radiated Disturbance Emissions (30MHz - 1GHz)



10.2 Radiated Disturbance Emissions (above 1GHz)



10.3 Immunity to Electrostatic Discharge



10.4 Radio Frequency Electromagnetic Field

