

ETSI EN 301 489-1 V1.8.1: 2008-04
ETSI EN 301 489-5 V1.3.1: 2002-08
TEST REPORT

For

Vehicle Radio

Model Number: 5188, 588, TWR MR-150U (400-490MHz)

Trade Name: N/A

Report No.: QZAGC013080602E1

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Prepared For

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1. GENERAL INFORMATION

Applicant	Qixiang Electron Science & Technology Co., Ltd. Qixiang Building, Tangxi Industrial Zone, Luojiang District, Quanzhou 362011, Fujian Province, China
Equipment Under Test	Vehicle Radio
Trade Name	--
Model	5188, 588, TWR MR-150U (400-490MHz)
Date of Test	Jun.12 to Jun.22, 2008

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
ETSI EN 301 489-1 V1.8.1: 2008	Compliance
ETSI EN 301 489-5 V1.3.1: 2002	

The above equipment was tested by Shenzhen Attestation of Global Compliance Science & Technology Co., Ltd. for compliance with the requirements set forth in ETSI EN 301 489-5. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Prepared By: Tony Tian
Tony Tian Jun.22, 2008

Checked By: Randy He
Randy He Jun.22, 2008

Authorized By: King Zhang
King Zhang Jun.22, 2008

2. EUT DESCRIPTION

Product	Vehicle Radio
Trade Name	--
Model Number	5188, 588, TWR MR-150U (400-490MHz)
Difference between Models	Same PCB Layout, Parts list, difference with it's external appearance
Operation Frequency	400 MHz-490MHz
Operation Mode	Push-to-Talk
Channel Separation	25.0 KHz, 12.5KHz
Output Power	40 W, 10W, 5W
Model Difference	N/A
Power Supply	DC 13.8 V

Note: for more details, refer to the user's manual of the EUT.

3. TEST METHODOLOGY

All tests were performed in accordance with the procedure documented in ETSI EN 301 489-1 V1.8.1 (2008-04) as referenced in ETSI EN 301 489-5 V1.3.1 (2002-08).

3.1 UNIT OF MEASUREMENT

Measurements of radiated interference are reported in terms of dB(uV/m) at a specified distance. The indicated readings on the Spectrum analyzers were converted to dB (uV/m) by use of appropriate conversion factors. Measurements of conducted interference are reported in terms of dB(uV).

The field strength is calculated by adding the Antenna Factor and Cable Factors and subtracting the Amplifier Gain from the measured reading. The following is a sample calculation:

$$FS = RA + AF + CF - AG$$

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4dB/m and a Cable Factor of 1.1dB are added. The Amplifier Gain of 29 dB is subtracted, giving field strength of 32 dBuV/m. The 32-dBuV/m values was mathematically converted to its corresponding level in uV/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dBuV/m}$$

Note: Level in uV/m = Common Antilogarithm $[(32 \text{ dBuV/m})/20] = 39.8 \text{ uV/m}$

3.2 ANTENNA

The calibrated antennas used to sample the radiated field strength are mounted on a non-conductive, motorized antenna mast 3 meters from the leading edge of the turntable.

3.3 DECISION OF TEST MODE

Mode 1

Transmitting Operation

Mode 2

Receiving Operation

4. INSTRUMENT AND CALIBRATION

MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

1-2/F, Dachong Keji Building, No.28 of Tonggu Road, Nanshan District,
World Standardization Certification & Testing Co., Ltd.

FCC Registration Number: 989301

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

6. SETUP OF EQUIPMENT UNDER TEST

6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

6.2 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	FCC ID	Series No.	Data Cable	Power Cord
1.	--	--	--	--	--	--	--

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

6.3 TEST SETUP

The equipment under test was configured and operated in a manner of normal operation. EUT tended to maximize its emission characteristics in a typical application for conducted and radiated emission measurement. The RF module plus ancillary (stand alone unit) was evaluated as per table 2 of clause 7.1 of ETSI EN 301 489-1.

Software Used During the Test	
Operating System	--
File Name	--
Program Sequence	--
RF Management Software	--

Remark: During the test, no modification is made to the EUT to comply with Class B limit levels.

7. ETSI EN 301 489-1/-5 REQUIREMENTS (NO APPLICABLE)

7.1 RADIATED EMISSION

LIMIT

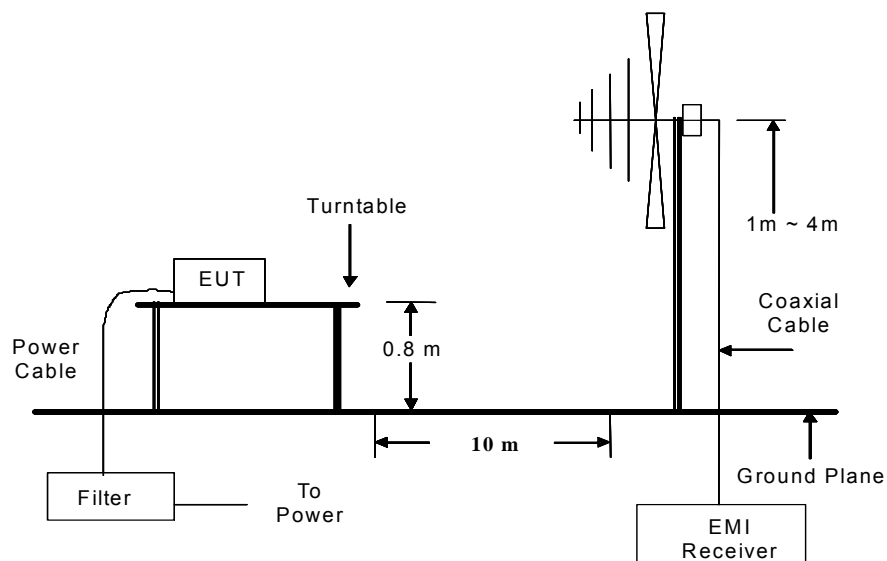
Please refer to ETSI EN 301 489-1 Clause 8.2.3, Table 4 and EN 55022 Clause 6, Table 6, Class A

MEASUREMENT EQUIPMENT USED

Radiated Emission Test Site # 4				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Attenuator	--	--	--	2009-04-16
EMI Test Receiver	R&S	ESCS30	100343	2009-04-16
AMPLIFIER	HP	HP8447E	2945A02715	2009-04-16
ANTENNA	Sunol Sciences Corp.	JB3	A021907	2009-04-16

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST CONFIGURATION



TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 8.2.3 and EN 55022 Clause 6 for the measurement methods.

TEST RESULTS

N/A

7.2 AC MAINS LINE CONDUCTED EMISSION (NO APPLICABLE)

LIMIT

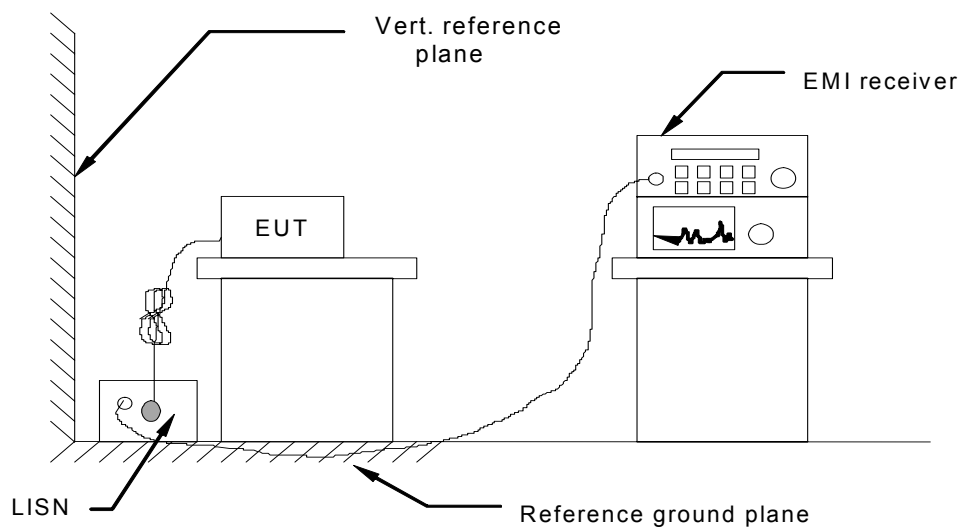
Please refer to ETSI EN 301 489-1 Clause 8.4.3, Table 8 and EN 55022 Clause 5, Table 2, Class A

MEASUREMENT EQUIPMENT USED

Conducted Emission Test Site # 3				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EMI Test Receiver	HP	8546A/85460A	3625A00349 3448A00325	2009-04-16
LISN	AFJ	LS16	16010222119	2009-04-16

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST CONFIGURATION



TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 8.4.3 and EN 55022 Clause 5 for the measurement methods.

TEST RESULTS

N/A

7.3 AC MAINS HARMONIC CURRENT EMISSION (NO APPLICABLE)

LIMIT

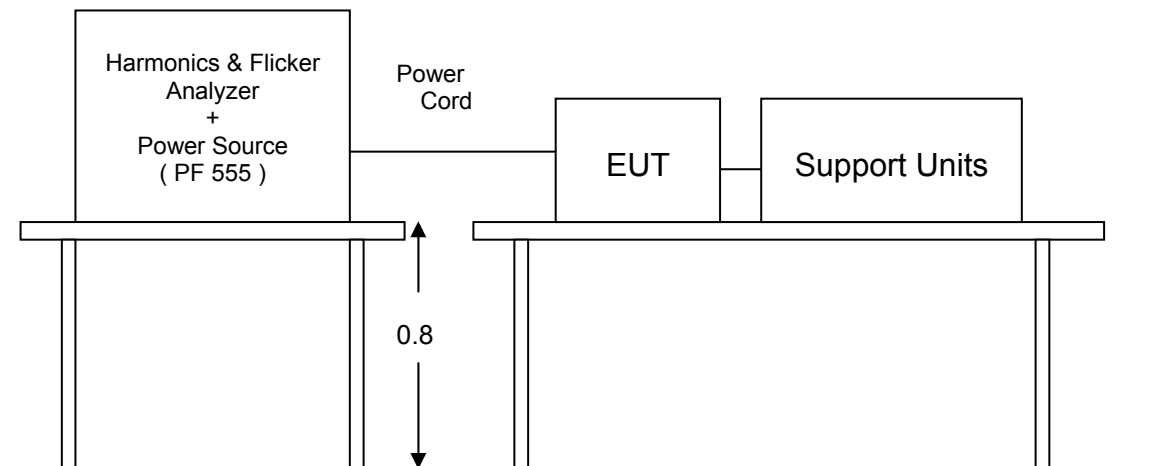
Please refer to EN 61000-3-2

MEASUREMENT EQUIPMENT USED

AC MAINS HARMONIC CURRENT EMISSIONS (EN 61000-3-2)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonic Emission Flicker	California Instruments	500LIX-400-CTX	--	2009-04-16

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST CONFIGURATION



Ambient Condition of the Test Site			
Temperature	24°C	EUT AC Voltage Rating	AC 230 V/50 Hz
Humidity	50%	EUT DC Voltage Rating	N/A
Pressure	990 mbar	Ground Bond Resistance	0.2 Ohm
Tested by	Tony		

TEST PROCEDURE

Please refer to EN 61000-3-2 for the measurement methods.

TEST RESULTS

N/A

7.4 AC MAINS VOLTAGE FLUCTUATION AND FLICKER (NO APPLICABLE)

LIMIT

Please refer to EN 61000-3-3

MEASUREMENT EQUIPMENT USED

AC MAINS FLICKER (EN 61000-3-3)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Harmonic Emission Flicker	California Instruments	500LIX-400-CTX	--	2009-04-16

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST CONFIGURATION

(Same as the configuration of the AC MAINS HARMONIC CURRENT EMISSIONS TEST)

Ambient Condition of the Test Site			
Temperature	24°C	EUT AC Voltage Rating	AC 230 V/50 Hz
Humidity	50%	EUT DC Voltage Rating	N/A
Pressure	990 mbar	Ground Bond Resistance	0.2 Ohm
Tested by	Tony		

TEST PROCEDURE

Please refer to EN 61000-3-3 for the measurement methods.

TEST RESULTS

N/A

7.5 ELECTROSTATIC DISCHARGE

LIMIT

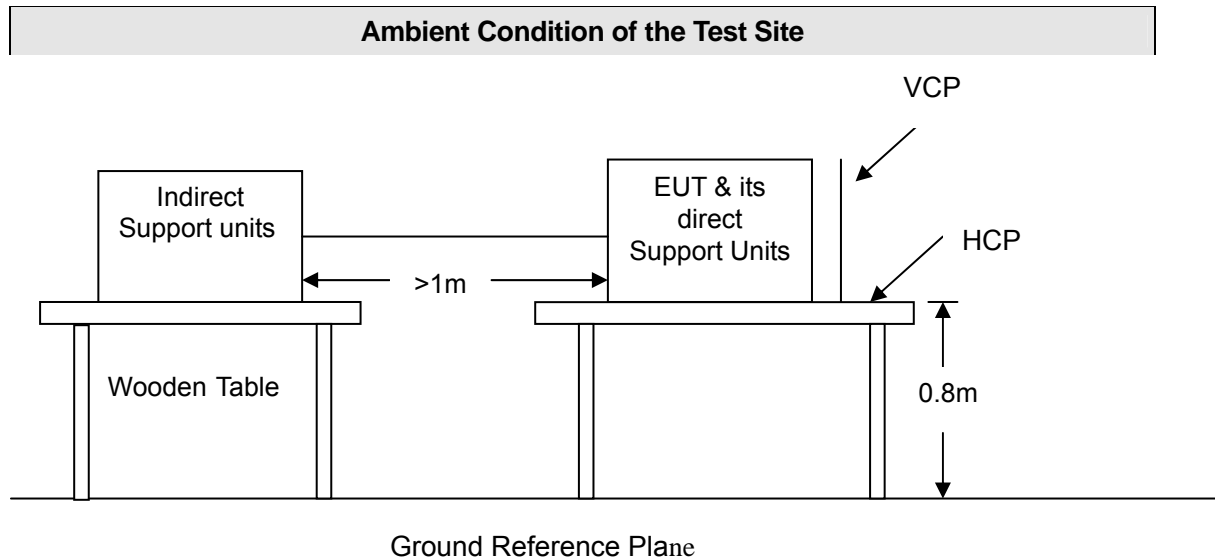
Please refer to EN 61000-4-2

MEASUREMENT EQUIPMENT USED

ESD test (61000-4-2)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
ESD 2000	EMC PARTNER	ESD2000	182	2008-07-26

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



Temperature	26°C	EUT AC Voltage Rating	AC 230V/50Hz
Humidity	52%RH	EUT DC Voltage Rating	DC 7.4V
Pressure	990 mbar	Ground Bond Resistance	0.2 Ω
Tested by	Tony		

TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.3.2 and EN 61000-4-2 for the measurement methods.

TEST RESULTS

The EUT(Two-way Radio) can function as both transmitter and receiver, so the evaluation of the TT and TR to ESD has undergone by the following means: Two Pieces of EUT are used, one for suffering from ESD and the other one for supporting communication and providing judgments for assessor. Both Operating and Standby mode (Receiving Mode) have been tested

Passed and Judged by performance of both TT and TR

TT: At the conclusion of each exposure the EUT operates with no user noticeable loss of the communication link and at the conclusion of the total test comprising the series of individual exposures the EUT operates as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link has been maintained during the test. The standby mode is the receiving mode.

TR: At the conclusion of each exposure the EUT operates with no user noticeable loss of the communication link. At the conclusion of the total test comprising the series of individual exposures the EUT shall operates as intended with no loss of user control functions or stored data, as declared by the manufacturer, and the communication link has been maintained during the test.

Description of the Electrostatic Discharges (ESD)

☒ **Operating & Standby Mode**

Amount of Discharges	Voltage	Coupling	Result (Pass/Fail)
Mini 20 / Point	±2KV, ±4kV	Contact Discharge	Pass
Mini 20 / Point	±2KV, ±4kV, ±8kV	Air Discharge	Pass
Mini 20 / Point	±2KV, ±4kV	Indirect Discharge HCP	Pass
Mini 20 / Point	±2KV, ±4kV	Indirect Discharge VCP	Pass

Note: For tested points to EUT, refer to the attached pages. Be aware that the Blue mark is for contact discharge, and the red mark is for air discharge.

PERFORMANCE CRITERIA	
Criteria requested	<input type="checkbox"/> A / <input checked="" type="checkbox"/> B / <input type="checkbox"/> C
Criteria meet	<input type="checkbox"/> A / <input checked="" type="checkbox"/> B / <input type="checkbox"/> C

7.6 RF ELECTROMAGNETIC FIELD

LIMIT

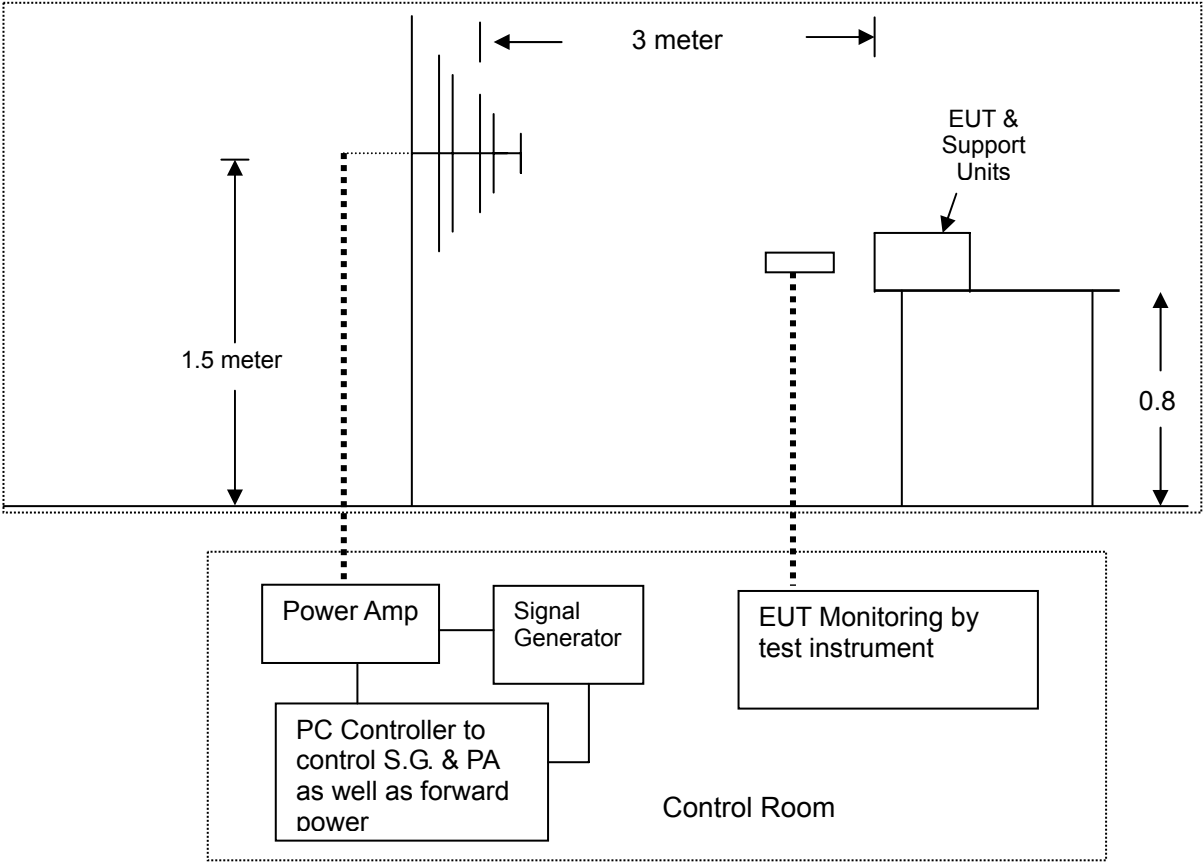
Please refer to EN 61000-4-3

MEASUREMENT EQUIPMENT USED

Radiated Electromagnetic Field immunity Measurement (61000-4-3)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Generator	IFA	2023B	202477/229	2009-04-16
Power Amplifier	AR	150W1000	322276	2009-04-16
Dual Directional Coupler	AR	25S1G4A	321119	2009-04-16

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



Ambient Condition of the Test Site			
Temperature	24°C	EUT AC Voltage Rating	AC 230V/50Hz
Humidity	51%RH	EUT DC Voltage Rating	DC 7.4V
Pressure	990 mbar	Ground Bond Resistance	0.2 Ω
Tested by	Tony		

TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.2.2, ETSI EN 301 489-5 Clause 7.2.2 and EN 61000-4-3 for the measurement methods.

TEST RESULTS

During the assessment of CT and CR, the audio quality was monitored by an distortion analyzer located outside the test environment. An audio generator has been used to provide necessary modulation for CT test and for CR evaluation; an RF Generator has been used to provide source.

☒ Result of Final Tests (Operating Mode & Standby Mode)

Freq. Range (MHz)	Field	Modulation	Polarity	Worst Position	Audio Distortion	Mode	Result (Pass/Fail)
1400-2700	3V/m	Yes	H / V	Front	7%	CT Operating	PASS
80-1000	3V/m	Yes	H / V	Front	10%		PASS
1400-2700	3V/m	Yes	H / V	Front	8%	CR Receiving	PASS
80-1000	3V/m	Yes	H / V	Front	14%		PASS

PERFORMANCE CRITERIA	
Criteria requested	<input checked="" type="checkbox"/> A / <input type="checkbox"/> B / <input type="checkbox"/> C
Criteria meet	<input checked="" type="checkbox"/> A / <input type="checkbox"/> B / <input type="checkbox"/> C

7.7 TRANSIENTS AND SURGES IN VEHICULAR ENVIRONMENT

LIMIT

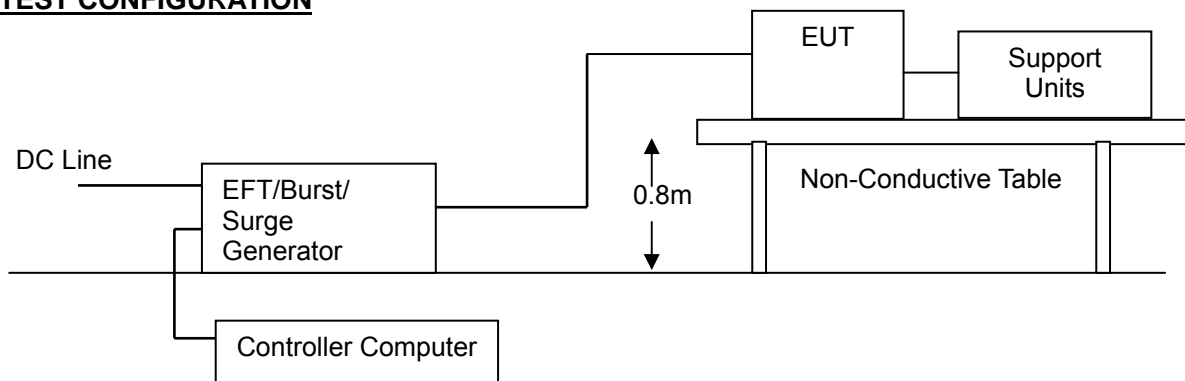
Please refer to ISO 7637-2 [14]

MEASUREMENT EQUIPMENT USED

AC MAINS FAST TRANSIENTS - COMMON MODE (EN 61000-4-4)				
Name of Equipment	Manufacturer	Model	Serial Number	Cal. Due
Ultra Compact Simulator	EM TEST	UCS500M6	0500-19	2009-04-16
Coupling Clamp	EM TEST	HFK	1501-14	N.C.R.

Remark: Each piece of equipment is scheduled for calibration once a year.

TEST CONFIGURATION



Ambient Condition of the Test Site			
Temperature	24 °C	EUT AC Voltage Rating	N/A
Humidity	50%	EUT DC Voltage Rating	DC 13.6V
Pressure	988 mbar	Ground Bond Resistance	0.2 Ω
Tested by	Tony		

TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.6.2 and ISO7637-2[14] for the measurement methods.

TEST CONDITIONS & TEST RESULT

☒ **Results of Final Tests (Transmitting Mode)**

Pulse Type	Level	Criteria	Result (Pass / Fail)
<input checked="" type="checkbox"/> 3a	Level III	CT/TT	Pass
<input checked="" type="checkbox"/> 3b	Level III	CT/TT	Pass
<input checked="" type="checkbox"/> 4	Level III	TT	Pass
<input checked="" type="checkbox"/> 1	Level III	TT	Pass
<input checked="" type="checkbox"/> 2a	Level III	TT	Pass
<input checked="" type="checkbox"/> 2b	Level III	TT	Pass

☒ **Results of Final Tests (Standby (Receiving) Mode)**

Pulse Type	Level	Criteria	Result (Pass / Fail)
<input checked="" type="checkbox"/> 3a	Level III	CR/TR	Pass
<input checked="" type="checkbox"/> 3b	Level III	CR/TR	Pass
<input checked="" type="checkbox"/> 4	Level III	TR	Pass
<input checked="" type="checkbox"/> 1	Level III	TR	Pass
<input checked="" type="checkbox"/> 2a	Level III	TR	Pass
<input checked="" type="checkbox"/> 2b	Level III	TR	Pass

7.8 DC MAINS RF – COMMON MODE

LIMIT

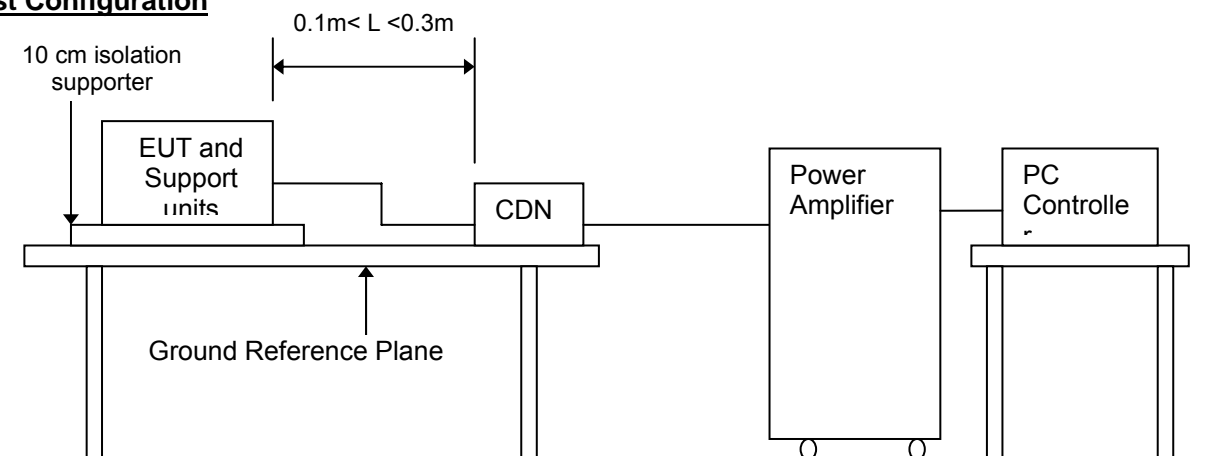
Please refer to EN 61000-4-6

MEASUREMENT EQUIPMENT USED

AC MAINS RF COMMON MODE (EN 61000-4-6)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Signal Generator	IFA	2023B	202301/878	2009-04-16
Amplifier	AR	75A250A	302276	2009-04-16
Dual Directional Coupler	AR	DC2600A	302389	2009-04-16
CDN	EM TEST	CDN M1/32A	0201-01	2009-04-16

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



Ambient Condition of the Test Site			
Temperature	25°C	EUT AC Voltage Rating	N/A
Humidity	52%RH	EUT DC Voltage Rating	DC 13.8 V
Pressure	990 mbar	Ground Bond Resistance	0.2 Ω
Tested by	Tony		

TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.5.2, ETSI EN 301 489-3 Clause 7.2.2 and EN 61000-4-6 for the measurement methods.

TEST RESULTS

Test conditions

☒ **Results of Final Tests (Transmitting Mode)**

Frequency Range: 0.15MHz~80MHz

Frequency Step: 1% of fundamental

Dwell time: 3 Sec.

☒ **80% A.M., 400 Hz Sine wave (Field Strength: 3 V)**

☒ **Coupling type:** ☒ **CDN** / ☐ **RF Current Probe**

Range (MHz)	Field	Modulation	Result (Pass/Fail)
0.15-80	3V	Yes	Pass

PERFORMANCE CRITERIA	
Criteria requested	CT
Criteria meet	CT pass by working as intended, no loss of function
Audio Distortion	6%

☒ **Results of Final Tests (Standby(Receiving) Mode)**

Frequency Range: 0.15MHz~80MHz

Frequency Step: 1% of fundamental

Dwell time: 3 Sec.

☒ **80% A.M., 400 Hz Sine wave (Field Strength: 3 V)**

☒ **Coupling type:** ☒ **CDN** / ☐ **RF Current Probe**

Range (MHz)	Field	Modulation	Result (Pass/Fail)
0.15-80	3V	Yes	Pass

PERFORMANCE CRITERIA	
Criteria requested	CR
Criteria meet	CR pass by working as intended, no loss of function
Audio Distortion	7%

7.9 VOLTAGE DIPS AND INTERRUPTION (NO APPLICABLE)

LIMIT

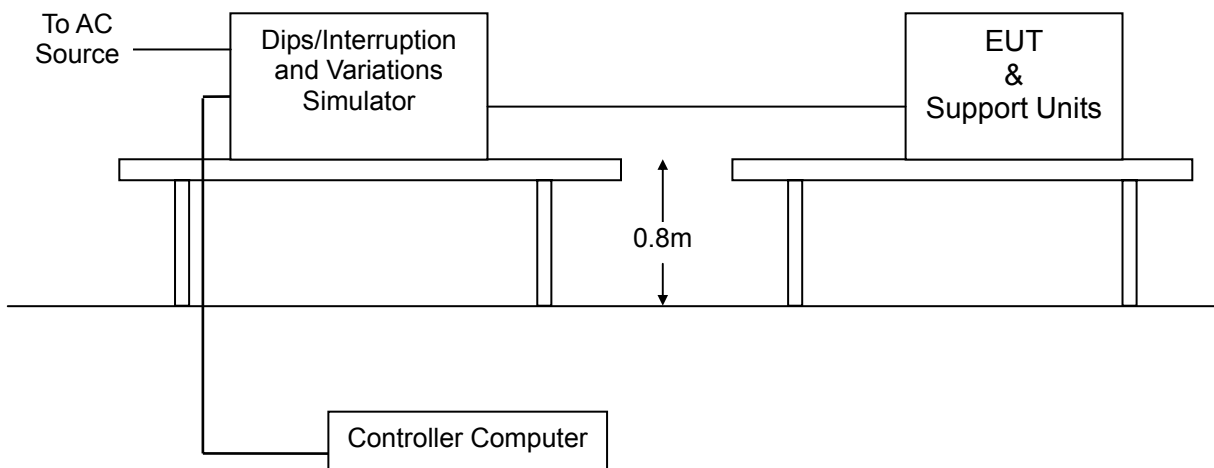
Please refer to EN 61000-4-11

MEASUREMENT EQUIPMENT USED

VOLTAGE DIPS AND INTERRUPTIONS (EN 61000-4-11)				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Purified Power Source	CI	HFS500	0500-10	2008-07-26

Remark: Each piece of equipment is scheduled for calibration once a year.

Test Configuration



Ambient Condition of the Test Site			
Temperature	24°C	EUT AC Voltage Rating	AC 230V/50Hz
Humidity	51%RH	EUT DC Voltage Rating	N/A
Pressure	990 mbar	Ground Bond Resistance	0.2 Ω
Tested by	Tony		

TEST PROCEDURE

Please refer to ETSI EN 301 489-1 Clause 9.7.2 and EN 61000-4-11 for the measurement methods.

TEST RESULTS (NO APPLICABLE)

Test conditions

Interruption at phase angles of 0, 45, 90, 135, 180, 225, 270 and 315 degree in a 10 sec-interval.

Dips / Interruption	Reduction (%)	Duration (Cycle)
Voltage Dips	100	0.5
Voltage Dips	100	1
Voltage Dips	100	250
Voltage Interruption	30	25

Note: The duration with a sequence of three dips/interruptions with a minimum interval of 10 s between each test event.

☐ **Results of Final Tests (Operating Mode)**

☐ *Voltage Dips*

Test Level (% UT)	Reduction (%)	Duration (Cycle)	Observation	Criterion
70	30	25	Normal	A

☐ *Voltage Interruption*

Test Level (% UT)	Reduction (%)	Duration (Cycle)	Observation	Criterion
0	100	0.5	Normal	A
0	100	1	Normal	A
0	100	250	Normal	C

☐ **Results of Final Tests (Standby Mode)**

☐ *Voltage Dips*

Test Level (% UT)	Reduction (%)	Duration (Cycle)	Observation	Criterion
70	30	25	Normal	A

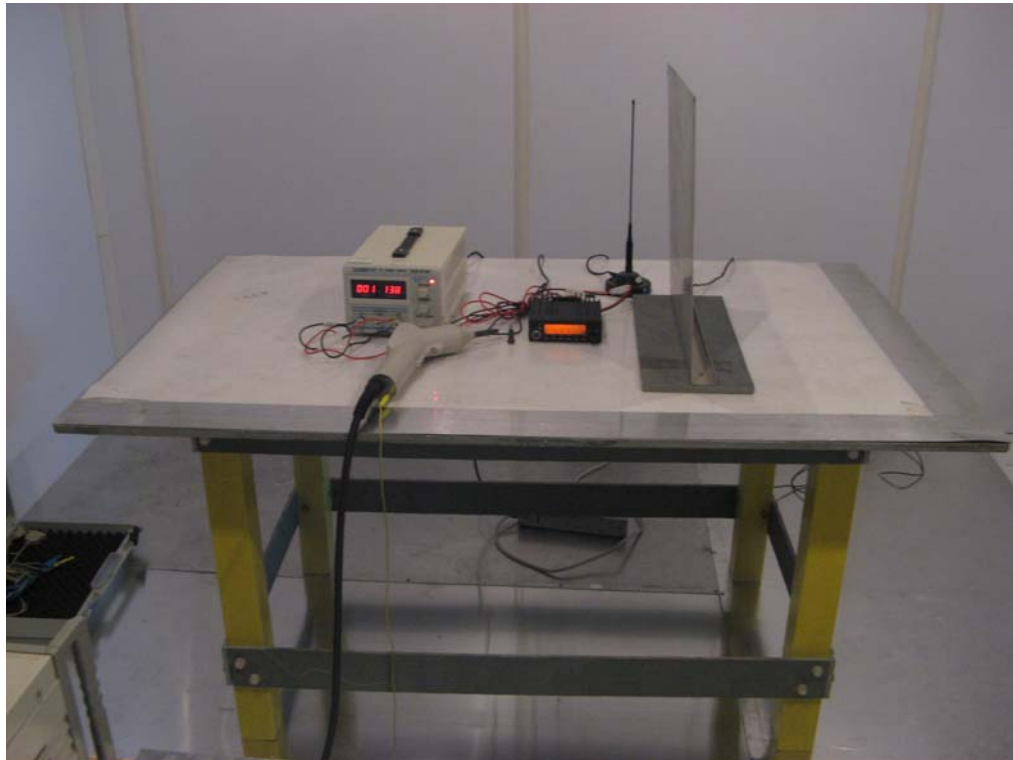
☐ *Voltage Interruption*

Test Level (% UT)	Reduction (%)	Duration (Cycle)	Observation	Criterion
0	100	0.5	Normal	A
0	100	1	Normal	A
0	100	250	Normal	C

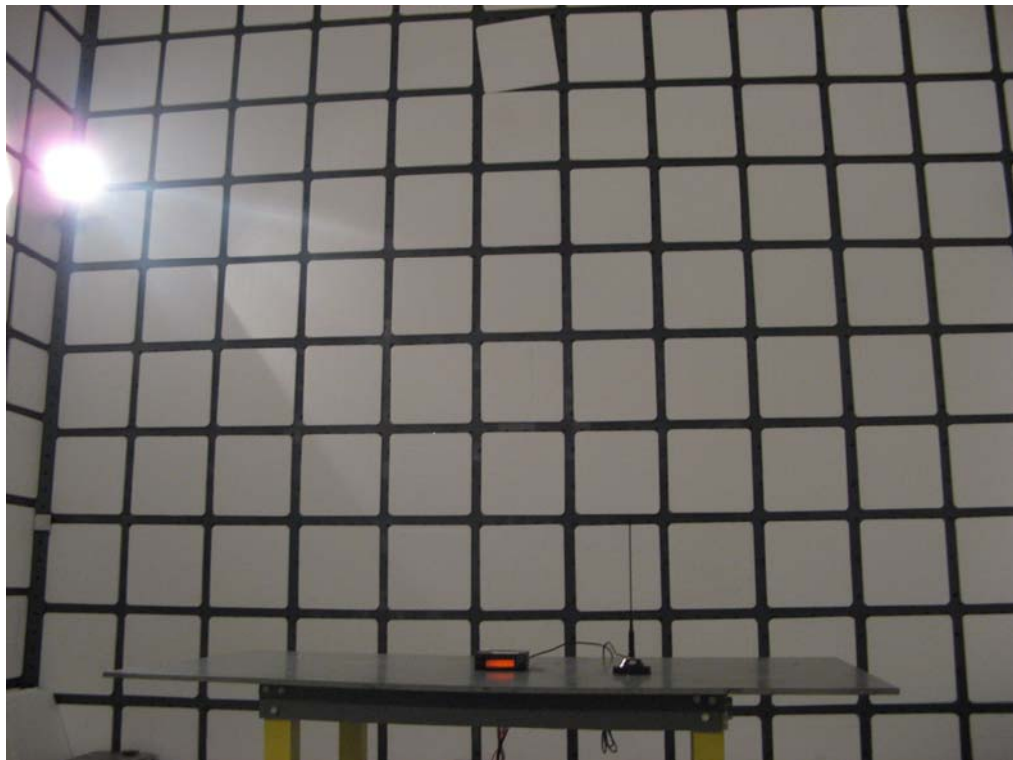
APPENDIX 1

PHOTOGRAPHS OF TEST SETUP

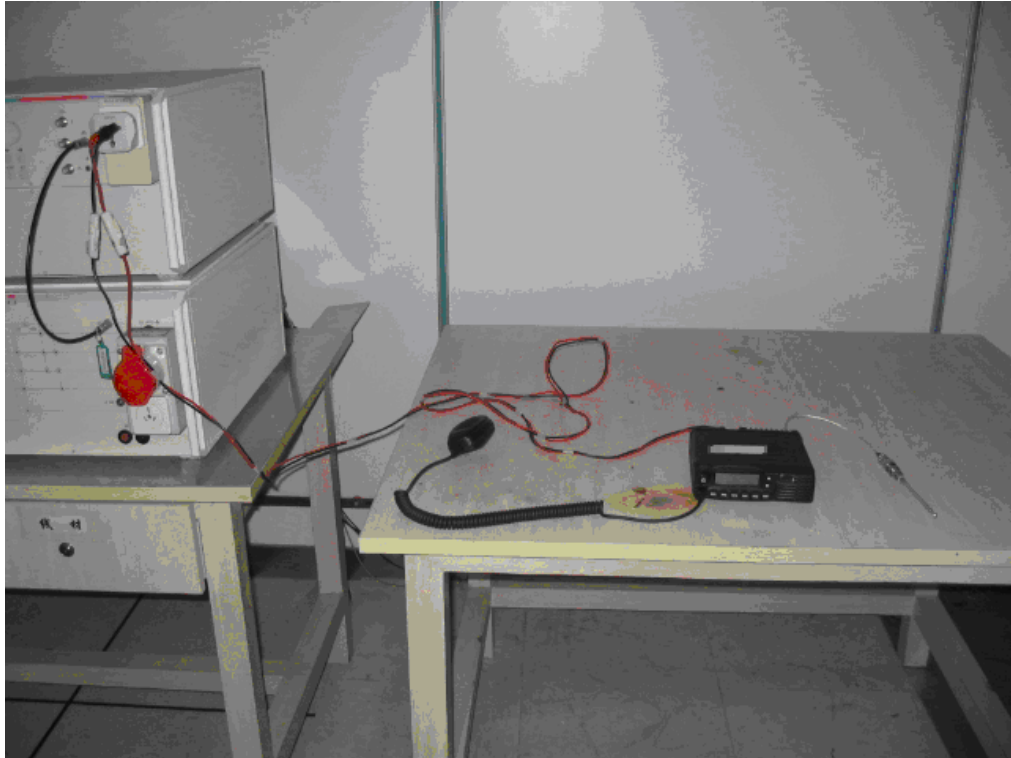
ELECTROSTATIC DISCHARGE TEST SETUP



RF ELECTROMAGNETIC FIELD TEST SETUP



EFT AND SURGE (ISO 7637 TEST)



APPENDIX 2

PHOTOGRPHS OF EUT

TOP VIEW OF SAMPLE



BOTTOM VIEW OF SAMPLE



LEFT VIEW OF SAMPLE



RIGHT VIEW OF SAMPLE



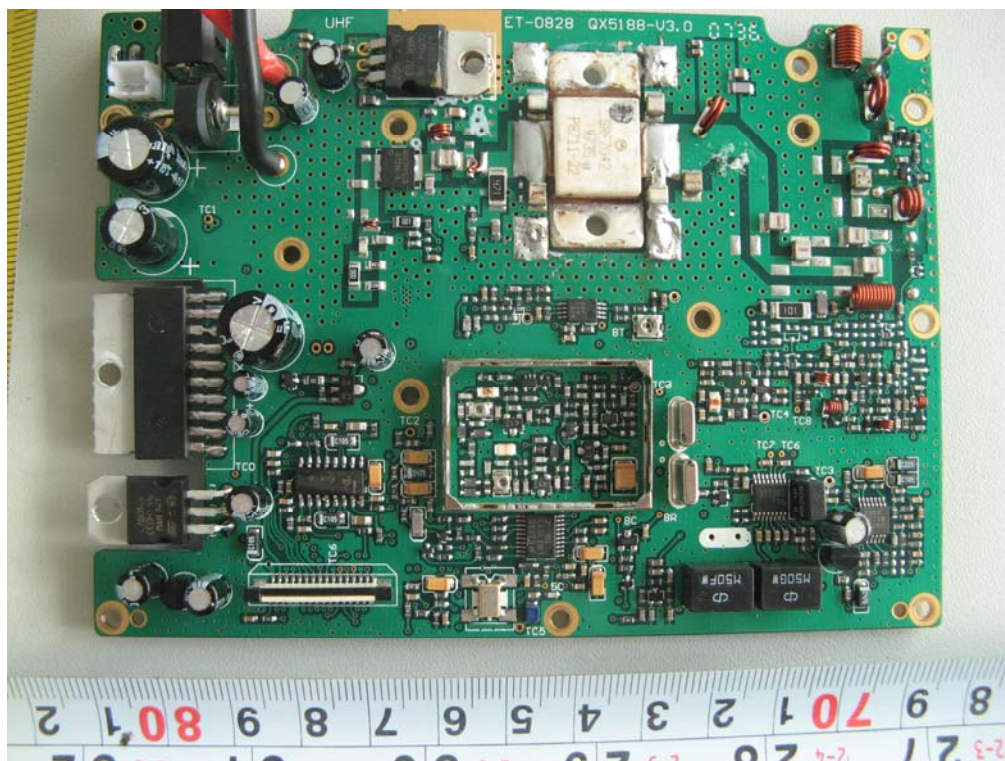
FRONT VIEW OF SAMPLE



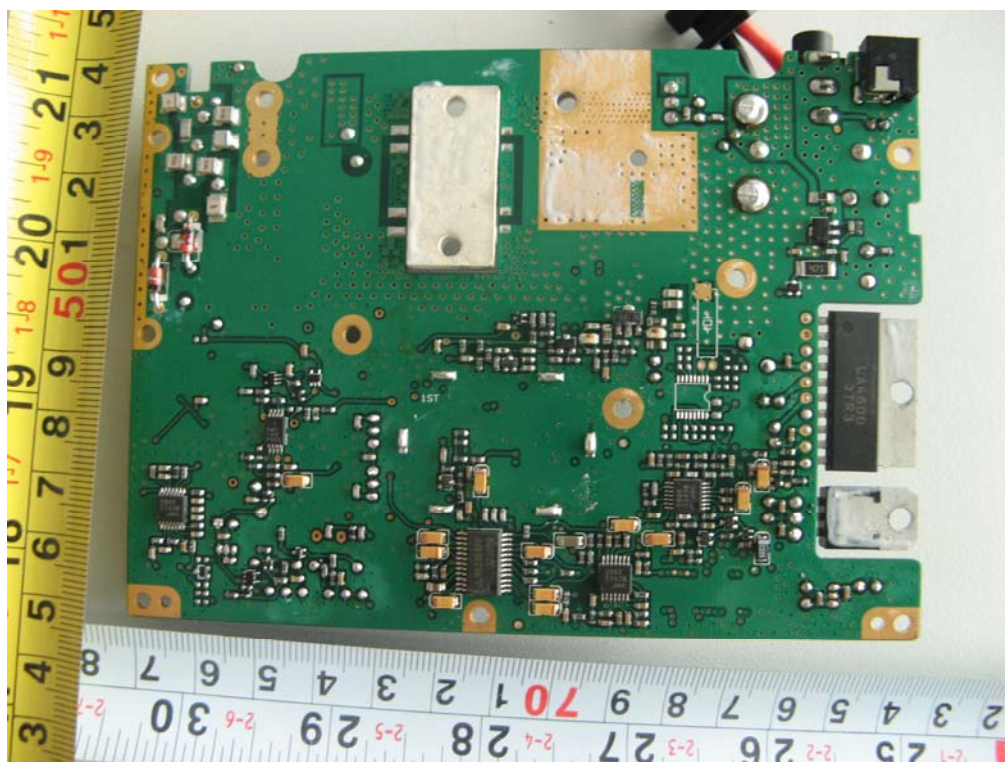
BACK VIEW OF SAMPLE



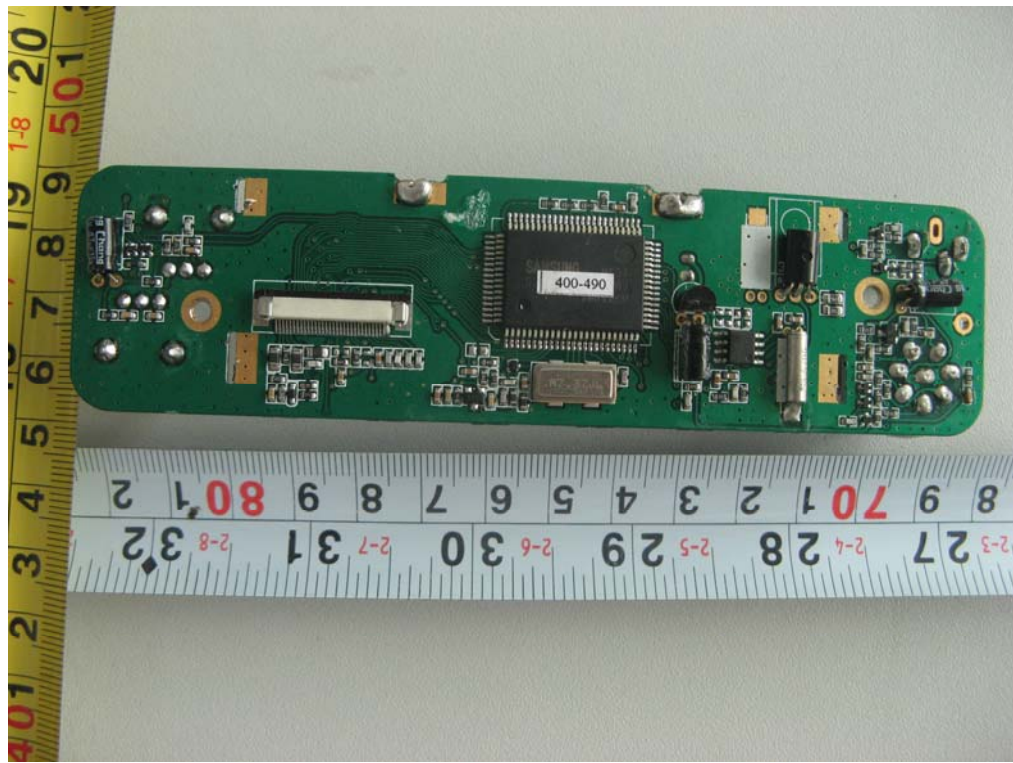
INTERNAL VIEW OF SAMPLE -1



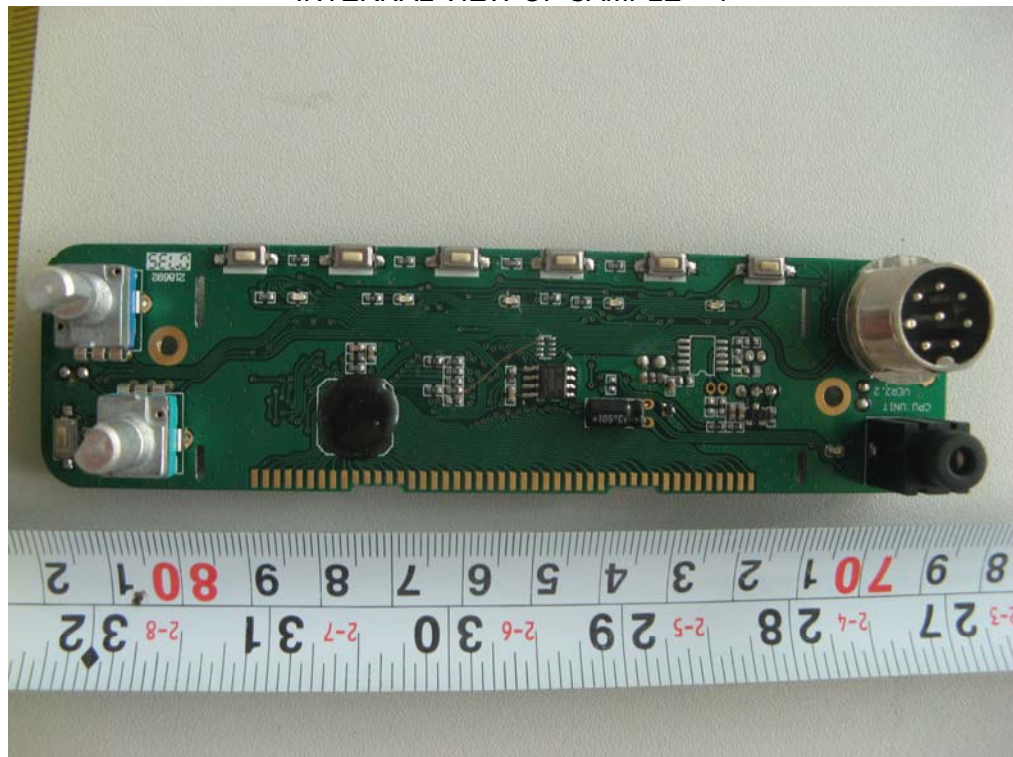
INTERNAL VIEW OF SAMPLE -2



INTERNAL VIEW OF SAMPLE – 3



INTERNAL VIEW OF SAMPLE – 4



----END OF REPORT----