



## EMC TEST REPORT

**Product** : Car LCD monitor  
**Trade mark** : N/A  
**Model/Type reference** : LM-070C2, LM-070A, LM-070B, LM-070C, LM-070D, LM-070E, LM-070F, LM-070G, LM-070H, LM-070M, LM-735, LM-745, LM-750, LM-755, LM-756, LM-780, LM-090  
**Serial Number** : N/A  
**Ratings** : DC 12V & DC 24V  
**Report Number** : EED32H000326  
**Date** : Apr. 17, 2015  
**Regulations** : See below

Test Standards	Results
<input checked="" type="checkbox"/> EN 50498: 2010	PASS

Prepared for:

**LINTECH ENTERPRISES LIMITED**  
**No.9 2nd Street, xinshi, Changping Town, Dongguan**  
**City, Guangdong, China**

Prepared by:

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Approved by: Louisa Lu

Date: Apr. 17, 2015

Louisa Lu  
Lab supervisor

Check No.: 1727857619



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*(Note: N/A means not applicable)*

## 1. GENERAL INFORMATION

**Applicant:** LINTECH ENTERPRISES LIMITED  
 No.9 2nd Street, xinshi, Changping Town, Dongguan City, Guangdong, China

**Manufacturer:** LINTECH ENTERPRISES LIMITED  
 No.9 2nd Street, xinshi, Changping Town, Dongguan City, Guangdong, China

**EMC Directive:** 2004/108/EC

**Product:** Car LCD monitor

**Trade mark:** N/A

**Model/Type reference:** LM-070A, LM-070B, LM-070C, LM-070C2, LM-070D, LM-070E, LM-070F, LM-070G, LM-070H, LM-070M, LM-735, LM-745, LM-750, LM-755, LM-756, LM-780, LM-090

**Serial Number:** N/A

**Report Number:** EED32H000326

**Sample Received Date:** Jan. 26, 2015

**Sample tested Date:** Jan. 26, 2015 to Feb. 02, 2015

All test data come from the report of No. EED32H000128.

## 2. TEST SUMMARY

The Product has been tested according to the following specifications:

Test Item (Test method is refer to 2004/104/EC directive)	Test Result
Broadband Radiated Disturbances and Narrowband Radiated Disturbance	Pass
Conducted Transient Disturbances	Pass
Conducted Transient Immunity	Pass

## 3. TEST UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Value (dB)
Radiated disturbance (30MHz to 1GHz)	4.9

## 4. PRODUCT INFORMATION AND TEST SETUP

### 4.1 PRODUCT INFORMATION

**Ratings:** DC 12V & DC 24V

**Model difference:** All models are identical except the model number, appearance and size. The test model is LM-070C2 and the test results are applicable to the others.

### 4.2 TEST SETUP CONFIGURATION

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

### 4.3 SUPPORT EQUIPMENT

No.	Device Type	Brand	Model	Series No.	Data Cable	Power Cord
1.	Car camera	LINTECH	LC-018A	---	Shielding 1m	Detachable
2.	Car camera	LINTECH	LC-010G	---	Shielding 1m	Detachable

**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.

## 5. FACILITIES AND ACCREDITATIONS

### 5.1 TEST FACILITY

All test facilities used to collect the test data are located at Hongwei Industrial Zone, 70 Area, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4, CISPR 16-1-1 and other equivalent standards.

### 5.2 TEST EQUIPMENT LIST

**Instrumentation:** The following list contains equipments used at CTI for testing.

The calibrations of the measuring instruments, including any accessories that may effect such calibration, are checked frequently to assure their accuracy. Adjustments are made and correction factors applied in accordance with instructions contained in the manual for the measuring instrument.

**Equipment used during the tests:**

<b>3M Semi-anechoic Chamber (2)-Broadband Radiated Disturbances and Narrowband Radiated Disturbance</b>				
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Due Date</b>
3M Chamber & Accessory Equipment	TDK	SAC-3	---	06/01/2016
Receiver	R&S	ESCI	100435	07/08/2015
LISN	schwarzbeck	NNBM8125	81251547	07/08/2015
LISN	schwarzbeck	NNBM8125	81251546	07/08/2015
Log.-per. Antenna	SCHWARZBECK	VUSLP 9111B	9111B-088	03/19/2015
Biconical Antenna	SCHWARZBECK	VHBB 9124 + BBA 9106	9124-587	03/19/2015

<b>Conducted Transient Disturbances Test</b>				
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Due Date</b>
ISO7637 Test System	TESEQ	NSG5500/5600	104	03/18/2015

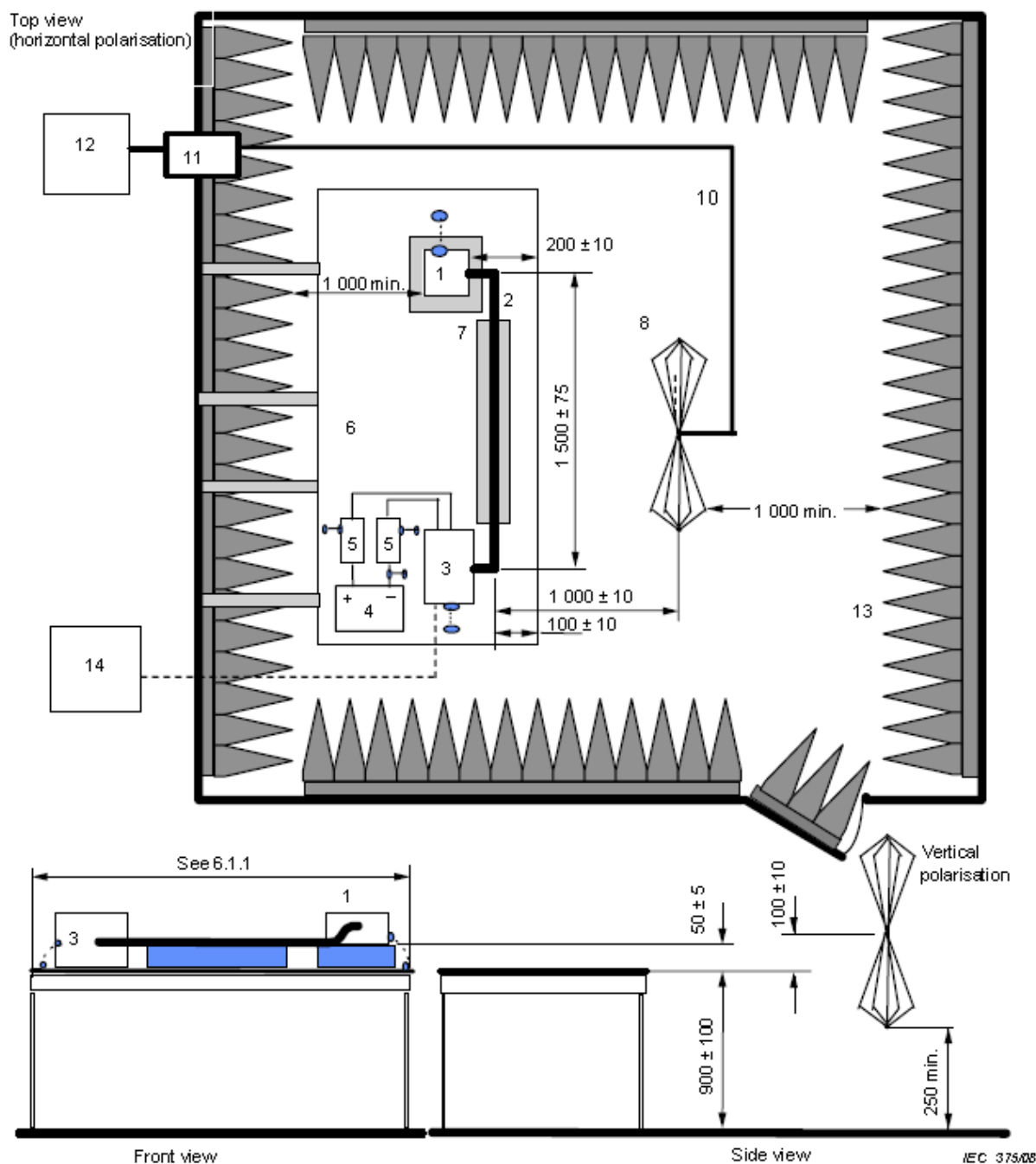
<b>Conducted Transient Immunity Test</b>				
<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial No.</b>	<b>Due Date</b>
ISO7637 Test System	TESEQ	NSG5500/5600	W124	03/18/2015

**5.3 LABORATORY ACCREDITATIONS AND LISTINGS**

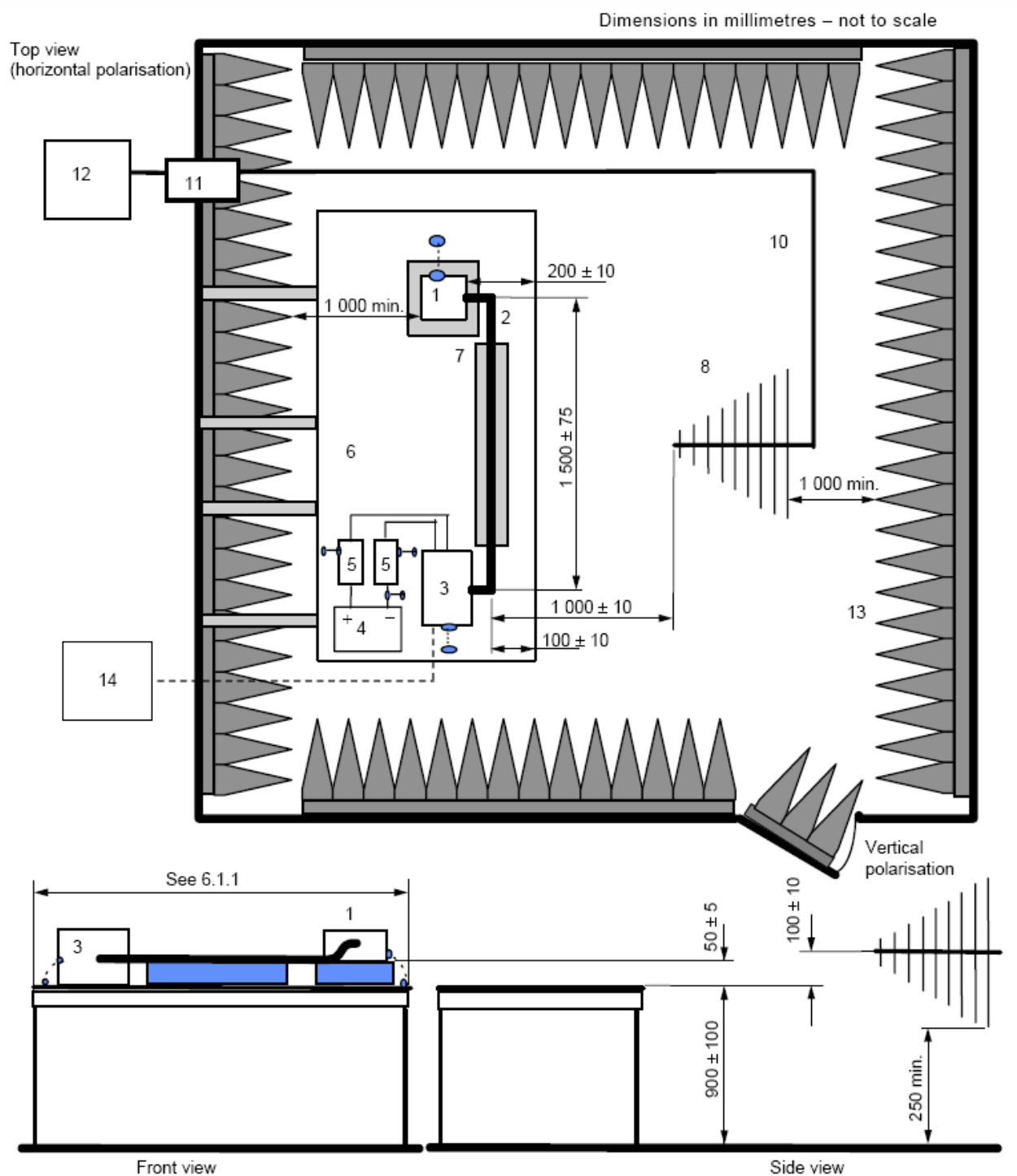
The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.







- |   |   |    |  |
|---|---|----|--|
| 1 | EUT (grounded locally if required in test plan)                       | 8  | Biconical antenna  |
| 2 | Test harness  |    |  |
| 3 | Load simulator (placement and ground connection according to 6.4.2.5) | 10 | High-quality coaxial cable e.g. double-shielded (50 $\Omega$ ) |
| 4 | Power supply (location optional)                                      | 11 | Bulkhead connector   |
| 5 | Artificial network (AN)   | 12 | Measuring instrument   |
| 6 | Ground plane (bonded to shielded enclosure)                           | 13 | RF absorber material   |
| 7 | Low relative permittivity support ( $\epsilon_r \leq 1,4$ )           | 14 | Stimulation and monitoring system                              |



IEC 376/08

# Key

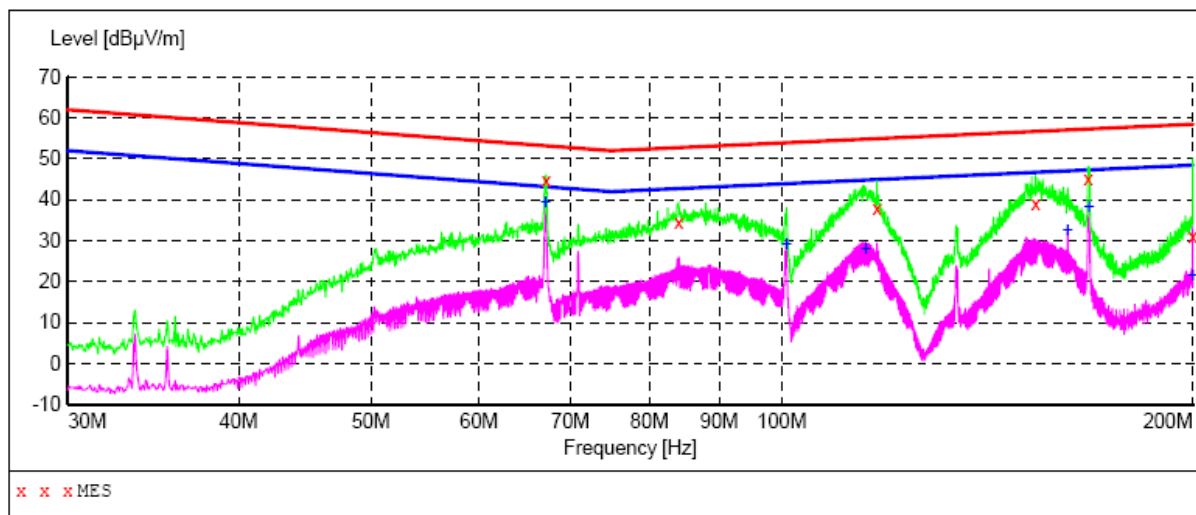
- |   |   |
|---|---|
| 1 EUT (grounded locally if required in test plan)                       | 8 Log-periodic antenna                                    |
| 2 Test harness  |   |
| 3 Load simulator (placement and ground connection according to 6.4.2.5) | 10 High-quality coaxial cable e.g. double-shielded (50 Ω) |
| 4 Power supply (location optional)                                      | 11 Bulkhead connector                                     |
| 5 Artificial network (AN)   | 12 Measuring instrument                                   |
| 6 Ground plane (bonded to shielded enclosure)                           | 13 RF absorber material                                   |
| 7 Low relative permittivity support ( $\epsilon_r \leq 1,4$ )           | 14 Stimulation and monitoring system                      |



## 6.4 TEST RESULT

**Product** : Car LCD monitor  
**Power** : DC 12V  
**Frequency** : 30MHz-200MHz

**Model/Type reference** : LM-070C2  
**Mode** : Normal

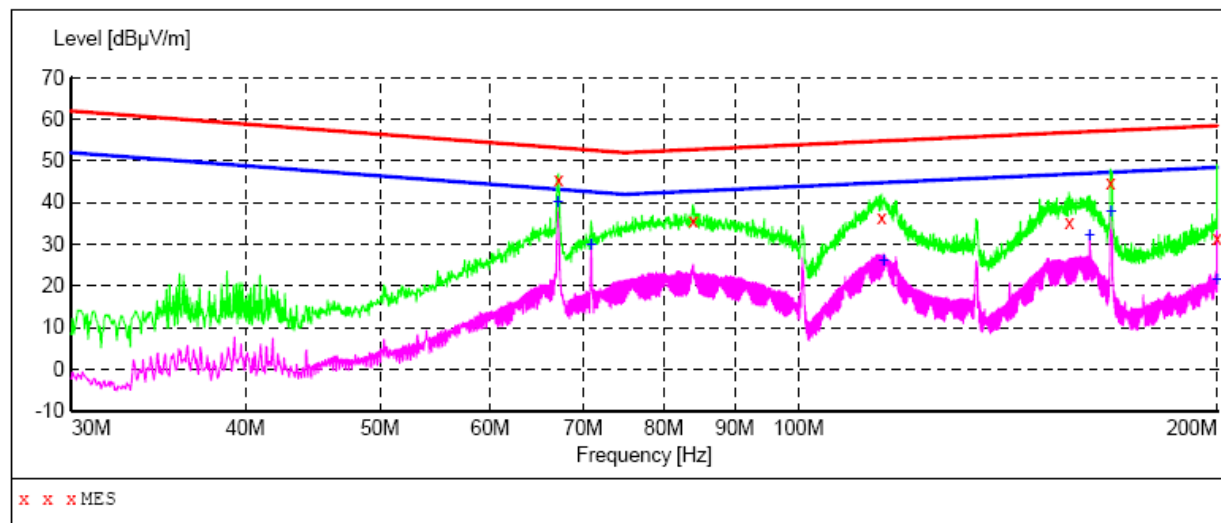


### MEASUREMENT RESULT:

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
67.200000	44.80	-22.1	53.2	8.4	QP	100.0	0.00	HORIZONTAL
84.060000	34.60	-22.2	52.7	18.1	QP	100.0	0.00	HORIZONTAL
117.420000	38.10	-20.5	54.9	16.8	QP	100.0	0.00	HORIZONTAL
153.420000	39.10	-18.2	56.7	17.6	QP	100.0	0.00	HORIZONTAL
167.700000	45.20	-17.5	57.3	12.1	QP	100.0	0.00	HORIZONTAL
200.000000	31.20	-15.5	58.4	27.2	QP	100.0	0.00	HORIZONTAL

### MEASUREMENT RESULT:

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
67.140000	39.50	-22.1	43.2	3.7	AV	100.0	0.00	HORIZONTAL
100.800000	29.20	-21.6	43.9	14.7	AV	100.0	0.00	HORIZONTAL
115.200000	28.10	-20.7	44.8	16.7	AV	100.0	0.00	HORIZONTAL
162.000000	32.70	-17.7	47.1	14.4	AV	100.0	0.00	HORIZONTAL
167.880000	38.20	-17.4	47.3	9.1	AV	100.0	0.00	HORIZONTAL
200.000000	21.60	-15.5	48.4	26.8	AV	100.0	0.00	HORIZONTAL



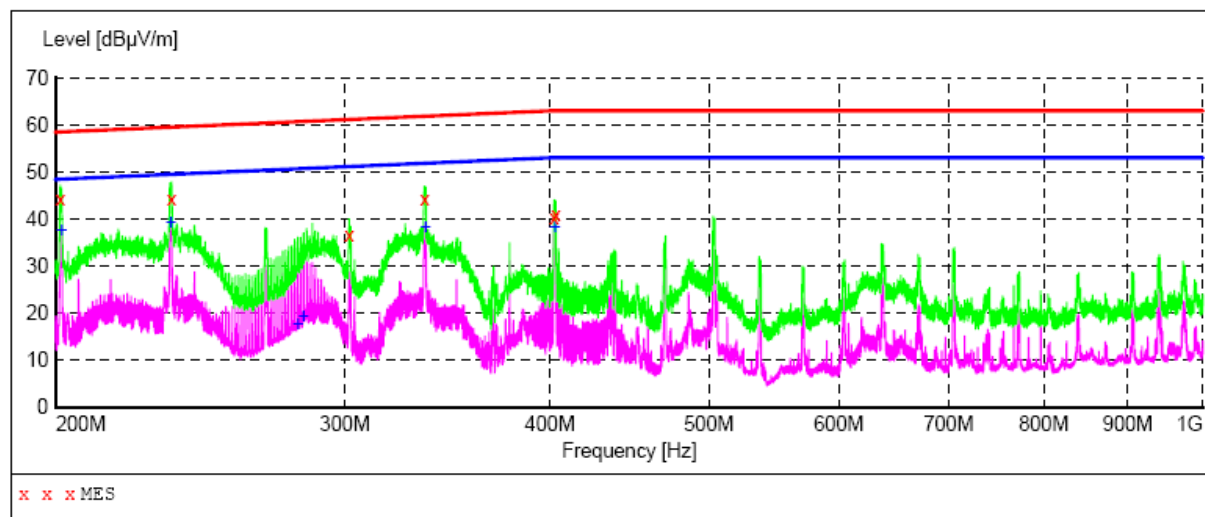
**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
67.200000	45.60	-22.1	53.2	7.6	QP	100.0	0.00	VERTICAL
84.000000	35.60	-22.2	52.7	17.1	QP	100.0	0.00	VERTICAL
114.780000	36.50	-20.7	54.8	18.3	QP	100.0	0.00	VERTICAL
156.540000	35.10	-18.1	56.8	21.7	QP	100.0	0.00	VERTICAL
167.700000	44.90	-17.5	57.3	12.4	QP	100.0	0.00	VERTICAL
200.000000	31.40	-15.5	58.4	27.0	QP	100.0	0.00	VERTICAL

**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
67.140000	40.30	-22.1	43.2	2.9	AV	100.0	0.00	VERTICAL
70.920000	29.80	-22.3	42.6	12.8	AV	100.0	0.00	VERTICAL
115.140000	26.00	-20.7	44.8	18.8	AV	100.0	0.00	VERTICAL
162.000000	32.20	-17.7	47.1	14.9	AV	100.0	0.00	VERTICAL
167.760000	38.10	-17.4	47.3	9.2	AV	100.0	0.00	VERTICAL
200.000000	21.70	-15.5	48.4	26.7	AV	100.0	0.00	VERTICAL

**Product** : Car LCD monitor      **Model/Type reference** : LM-070C2  
**Power** : DC 12V      **Mode** : Normal  
**Frequency** : 200MHz-1000MHz

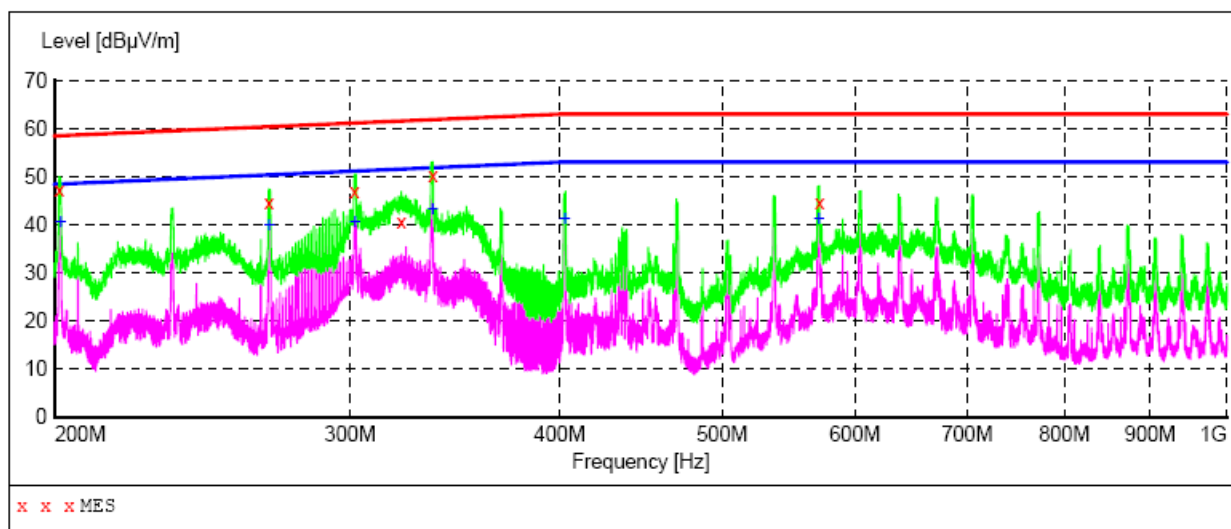


**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
201.260000	44.30	-16.3	58.5	14.2	QP	100.0	0.00	HORIZONTAL
235.280000	44.40	-15.9	59.5	15.1	QP	100.0	0.00	HORIZONTAL
301.880000	36.50	-13.6	61.2	24.7	QP	100.0	0.00	HORIZONTAL
335.420000	44.10	-13.0	61.8	17.7	QP	100.0	0.00	HORIZONTAL
402.440000	40.20	-11.9	63.0	22.8	QP	100.0	0.00	HORIZONTAL
403.340000	40.80	-11.9	63.0	22.2	QP	100.0	0.00	HORIZONTAL

**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
201.620000	37.70	-16.3	48.5	10.8	AV	100.0	0.00	HORIZONTAL
235.040000	39.20	-15.9	49.5	10.3	AV	100.0	0.00	HORIZONTAL
280.880000	17.80	-14.4	50.7	32.9	AV	100.0	0.00	HORIZONTAL
283.220000	19.30	-14.3	50.7	31.4	AV	100.0	0.00	HORIZONTAL
335.900000	38.20	-13.0	51.9	13.7	AV	100.0	0.00	HORIZONTAL
403.100000	38.30	-11.9	53.0	14.7	AV	100.0	0.00	HORIZONTAL



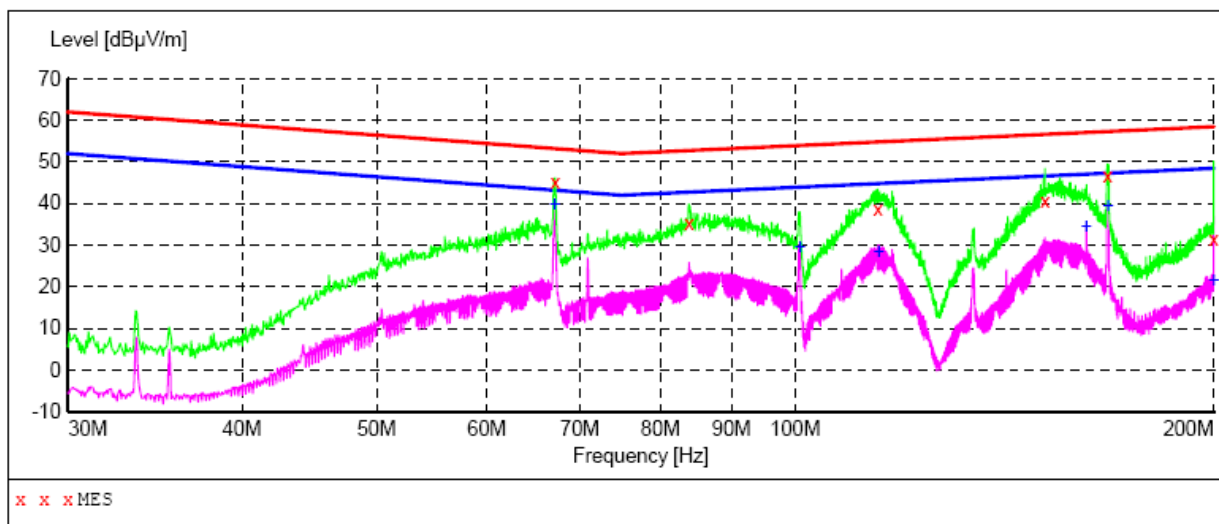
**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
201.260000	47.40	-16.3	58.5	11.1	QP	100.0	0.00	VERTICAL
268.340000	44.70	-14.9	60.4	15.7	QP	100.0	0.00	VERTICAL
301.880000	46.90	-13.6	61.2	14.3	QP	100.0	0.00	VERTICAL
321.920000	40.70	-13.2	61.6	20.9	QP	100.0	0.00	VERTICAL
336.080000	50.10	-13.0	61.9	11.8	QP	100.0	0.00	VERTICAL
571.460000	44.70	-9.4	63.0	18.3	QP	100.0	0.00	VERTICAL

**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
201.620000	40.70	-16.3	48.5	7.8	AV	100.0	0.00	VERTICAL
268.520000	40.00	-14.9	50.4	10.4	AV	100.0	0.00	VERTICAL
302.120000	40.50	-13.6	51.2	10.7	AV	100.0	0.00	VERTICAL
335.900000	43.40	-13.0	51.9	8.5	AV	100.0	0.00	VERTICAL
403.100000	41.30	-11.9	53.0	11.7	AV	100.0	0.00	VERTICAL
571.160000	41.30	-9.4	53.0	11.7	AV	100.0	0.00	VERTICAL

**Product** : Car LCD monitor      **Model/Type reference** : LM-070C2  
**Power** : DC 24V      **Mode** : Normal  
**Frequency** : 30MHz-200MHz



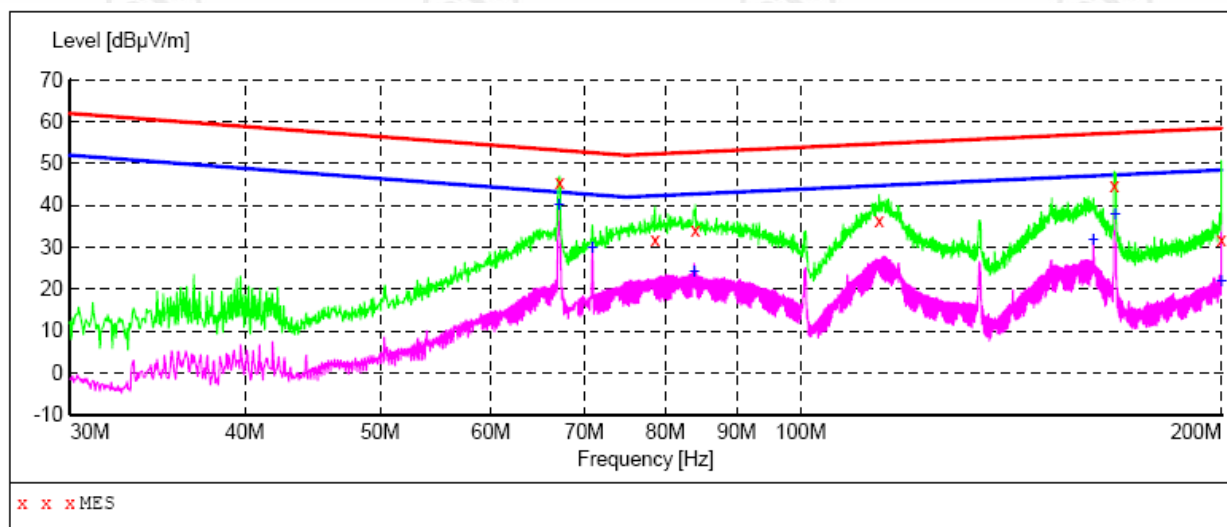
**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
67.200000	45.00	-22.1	53.2	8.2	QP	100.0	0.00	HORIZONTAL
83.880000	35.40	-22.2	52.7	17.3	QP	100.0	0.00	HORIZONTAL
114.660000	38.60	-20.7	54.8	16.2	QP	100.0	0.00	HORIZONTAL
151.260000	40.60	-18.4	56.6	16.0	QP	100.0	0.00	HORIZONTAL
167.760000	46.60	-17.4	57.3	10.7	QP	100.0	0.00	HORIZONTAL
200.000000	31.30	-15.5	58.4	27.1	QP	100.0	0.00	HORIZONTAL

**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
67.140000	39.70	-22.1	43.2	3.5	AV	100.0	0.00	HORIZONTAL
100.800000	29.50	-21.6	43.9	14.4	AV	100.0	0.00	HORIZONTAL
114.840000	28.30	-20.7	44.8	16.5	AV	100.0	0.00	HORIZONTAL
162.000000	34.40	-17.7	47.1	12.7	AV	100.0	0.00	HORIZONTAL
167.880000	39.40	-17.4	47.3	7.9	AV	100.0	0.00	HORIZONTAL
200.000000	21.70	-15.5	48.4	26.7	AV	100.0	0.00	HORIZONTAL





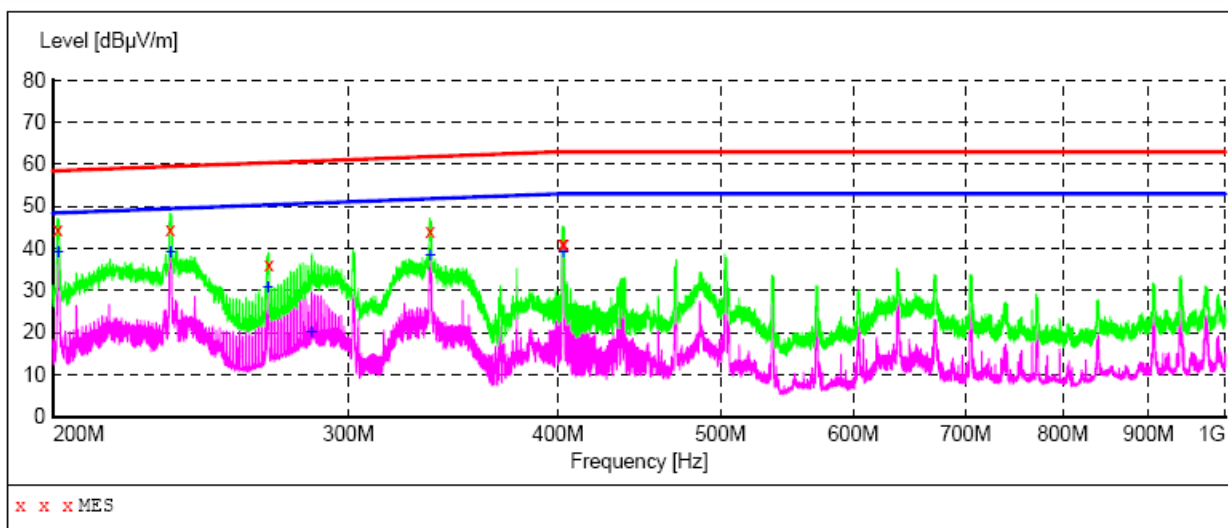
**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
67.200000	45.60	-22.1	53.2	7.6	QP	100.0	0.00	VERTICAL
78.660000	31.70	-22.3	52.3	20.6	QP	100.0	0.00	VERTICAL
84.060000	34.30	-22.2	52.7	18.4	QP	100.0	0.00	VERTICAL
113.820000	36.40	-20.8	54.7	18.3	QP	100.0	0.00	VERTICAL
167.700000	44.90	-17.5	57.3	12.4	QP	100.0	0.00	VERTICAL
200.000000	31.80	-15.5	58.4	26.6	QP	100.0	0.00	VERTICAL

**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
67.140000	40.30	-22.1	43.2	2.9	AV	100.0	0.00	VERTICAL
70.920000	29.90	-22.3	42.6	12.7	AV	100.0	0.00	VERTICAL
83.880000	24.30	-22.2	42.7	18.4	AV	100.0	0.00	VERTICAL
162.000000	31.80	-17.7	47.1	15.3	AV	100.0	0.00	VERTICAL
167.880000	38.00	-17.4	47.3	9.3	AV	100.0	0.00	VERTICAL
200.000000	21.80	-15.5	48.4	26.6	AV	100.0	0.00	VERTICAL

**Product** : Car LCD monitor      **Model/Type reference** : LM-070C2  
**Power** : DC 24V      **Mode** : Normal  
**Frequency** : 200MHz-1000MHz

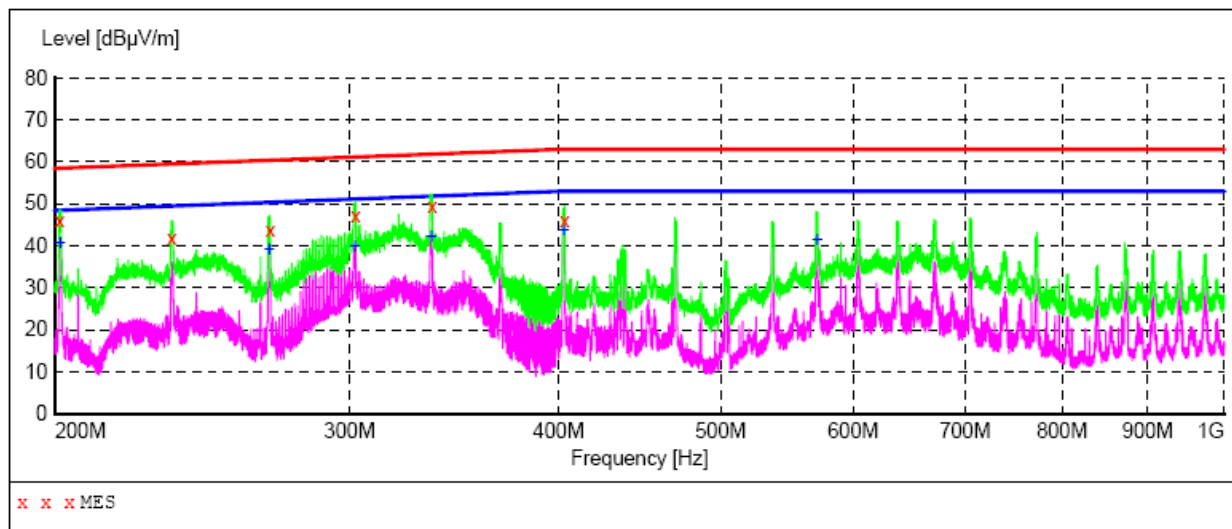


**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
201.260000	44.60	-16.3	58.5	13.9	QP	100.0	0.00	HORIZONTAL
234.800000	44.60	-15.9	59.5	14.9	QP	100.0	0.00	HORIZONTAL
268.880000	36.00	-14.9	60.4	24.4	QP	100.0	0.00	HORIZONTAL
335.420000	44.10	-13.0	61.8	17.7	QP	100.0	0.00	HORIZONTAL
402.440000	41.10	-11.9	63.0	21.9	QP	100.0	0.00	HORIZONTAL
403.340000	41.00	-11.9	63.0	22.0	QP	100.0	0.00	HORIZONTAL

**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
201.440000	39.30	-16.3	48.5	9.2	AV	100.0	0.00	HORIZONTAL
235.040000	39.30	-15.9	49.5	10.2	AV	100.0	0.00	HORIZONTAL
268.640000	30.70	-14.9	50.4	19.7	AV	100.0	0.00	HORIZONTAL
285.320000	20.30	-14.2	50.8	30.5	AV	100.0	0.00	HORIZONTAL
335.600000	38.40	-13.0	51.8	13.4	AV	100.0	0.00	HORIZONTAL
403.100000	39.10	-11.9	53.0	13.9	AV	100.0	0.00	HORIZONTAL



**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
201.260000	45.90	-16.3	58.5	12.6	QP	100.0	0.00	VERTICAL
234.800000	41.90	-15.9	59.5	17.6	QP	100.0	0.00	VERTICAL
268.880000	43.90	-14.9	60.4	16.5	QP	100.0	0.00	VERTICAL
302.480000	47.00	-13.6	61.2	14.2	QP	100.0	0.00	VERTICAL
336.080000	49.40	-13.0	61.9	12.5	QP	100.0	0.00	VERTICAL
403.340000	46.10	-11.9	63.0	16.9	QP	100.0	0.00	VERTICAL

**MEASUREMENT RESULT:**

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
201.440000	40.60	-16.3	48.5	7.9	AV	100.0	0.00	VERTICAL
268.640000	39.20	-14.9	50.4	11.2	AV	100.0	0.00	VERTICAL
302.240000	39.90	-13.6	51.2	11.3	AV	100.0	0.00	VERTICAL
335.780000	42.40	-13.0	51.8	9.4	AV	100.0	0.00	VERTICAL
403.100000	43.70	-11.9	53.0	9.3	AV	100.0	0.00	VERTICAL
571.160000	41.40	-9.4	53.0	11.6	AV	100.0	0.00	VERTICAL

## 7. CONDUCTED TRANSIENT DISTURBANCES

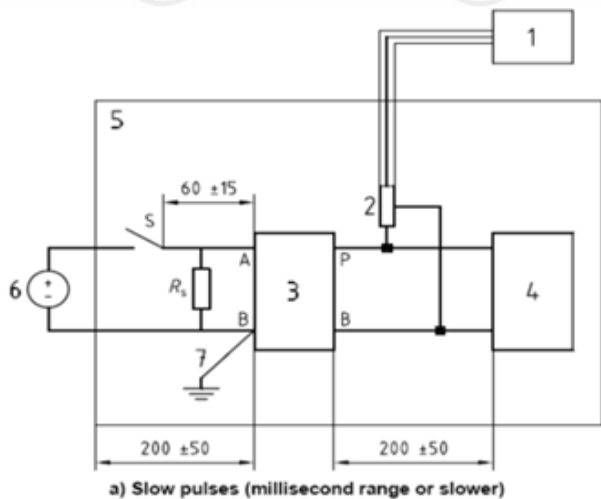
### 7.1 TEST CONDITION

Operation mode	: Normal
Test voltage	: DC 12V & DC 24V
Test Condition	: Temp: 24.3℃ Related Humidity: 49% Air pressure: 101.0Kpa
Model/Type reference	: LM-070C2

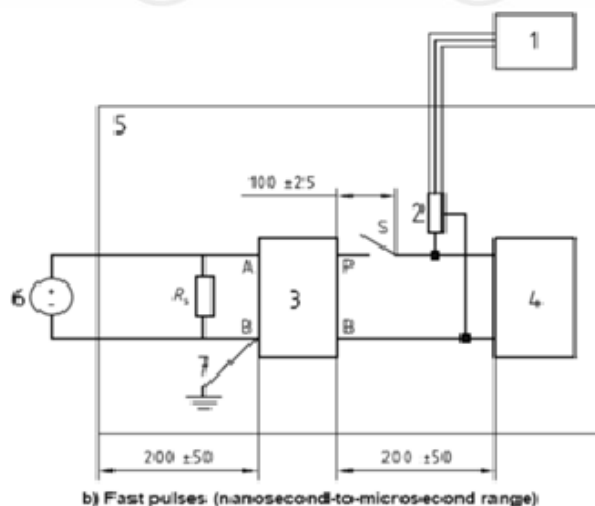
### 7.2 LIMITS

Polarity of pulse amplitude	Maximum allowed pulse amplitude for	
	Vehicles with 12V systems	Vehicles with 24V systems
Positive	+75	+150
Negative	-100	-450

### 7.3 BLOCK DIAGRAM OF TEST SETUP



a) Slow pulses (millisecond range or slower)



b) Fast pulses: (nanosecond-to-microsecond range)

#### Key

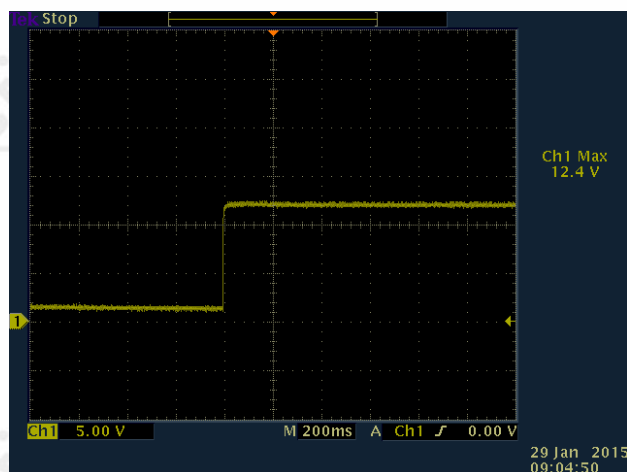
- 1 oscilloscope or equivalent
- 2 voltage probe
- 3 artificial network
- 4 DUT (source of transient)

- 5 ground plane
- 6 power supply
- 7 Ground connection; length < 100 mm

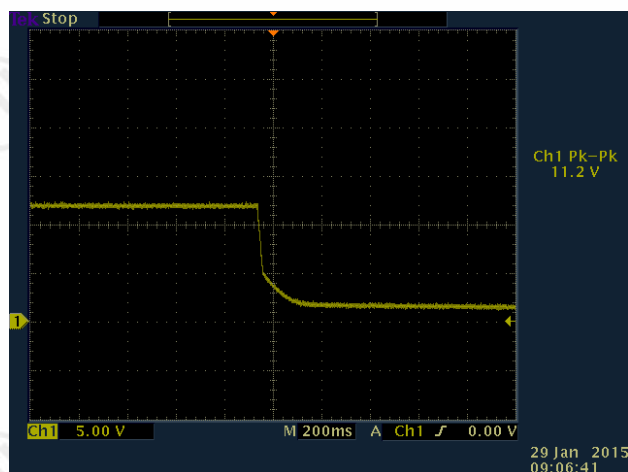
## 7.4 TEST RESULT

### Input DC 12V (Fast pulse)

Positive amplitude



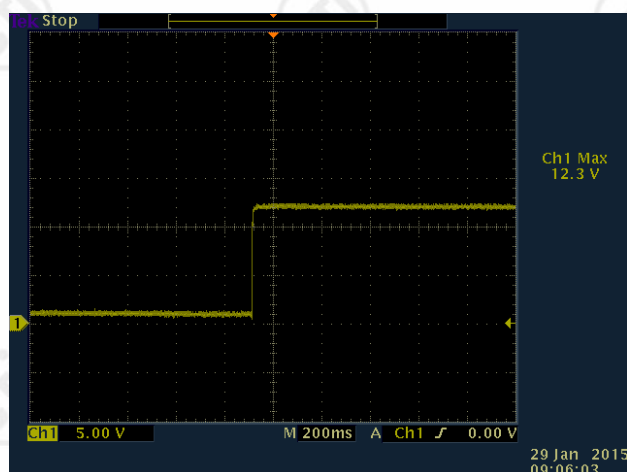
Negative amplitude



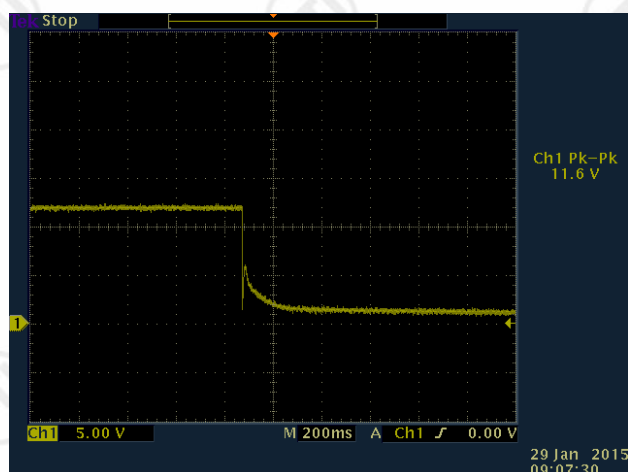
Polarity of pulse amplitude	Maximum allowed pulse amplitude	Maximum level	result
Positive	+75V	+12.4V	Pass
Negative	-100V	-11.2V	Pass

### Input DC 12V (Slow pulse)

Positive amplitude



Negative amplitude

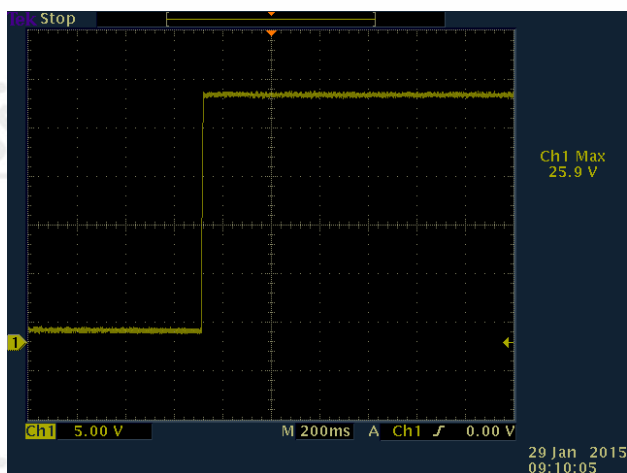


Polarity of pulse amplitude	Maximum allowed pulse amplitude	Maximum level	result
Positive	+75V	+12.3V	Pass
Negative	-100V	-11.6V	Pass

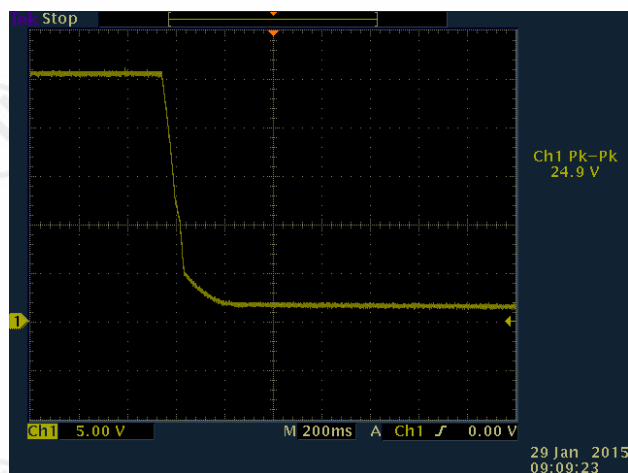


### Input DC 24V (Fast pulse)

Positive amplitude



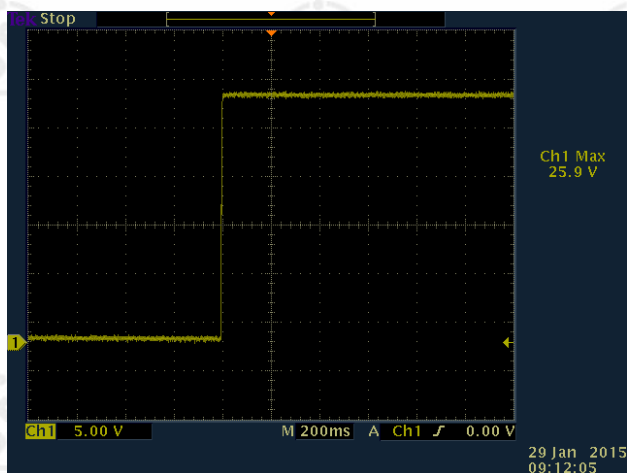
Negative amplitude



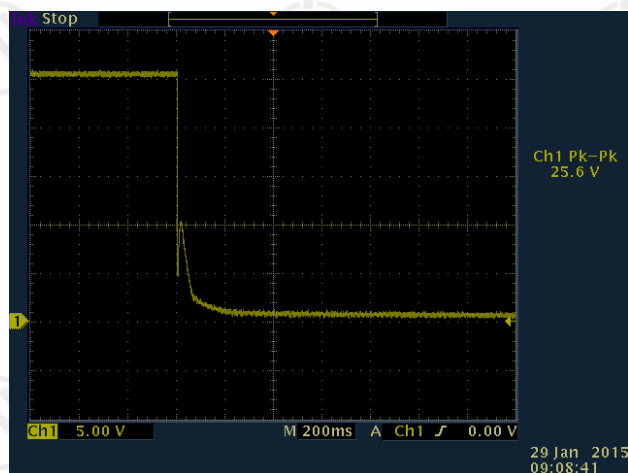
Polarity of pulse amplitude	Maximum allowed pulse amplitude	Maximum level	result
Positive	+150V	+25.9V	Pass
negative	-450V	-24.9V	Pass

### Input DC 24V (Slow pulse)

Positive amplitude



Negative amplitude



Polarity of pulse amplitude	Maximum allowed pulse amplitude	Maximum level	result
Positive	+150V	+25.9V	Pass
negative	-450V	-25.6V	Pass

## 8. CONDUCTED TRANSIENT IMMUNITY

### 8.1 TEST CONDITION

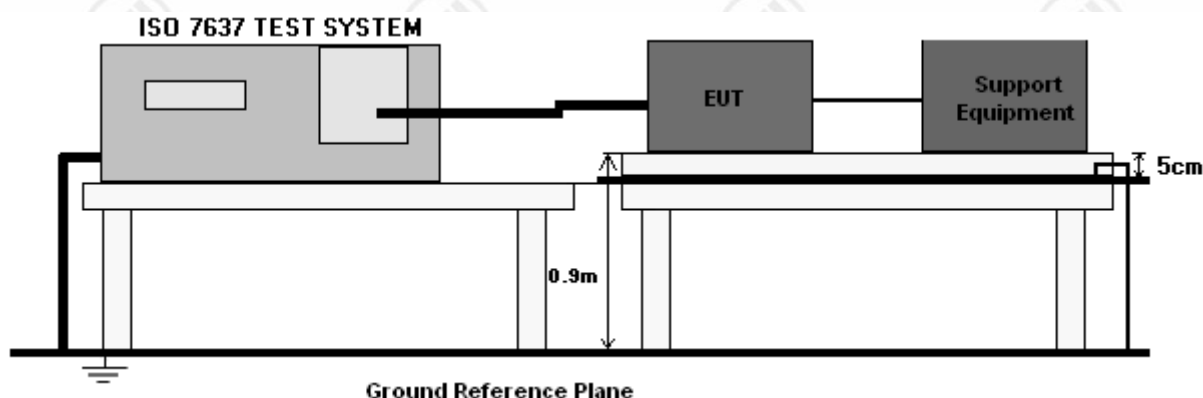
Operation mode	: Normal
Test voltage	: DC 12V & DC 24V
Test Condition	: Temp: 24.3℃ Related Humidity: 49% Air pressure: 101.0Kpa
Model/Type reference	: LM-070C2

### 8.2 TEST LEVELS AND FUNCTIONAL STATUS

Test pulse number	Immunity test level	Functional status
1	III	D
2a	III	D
2b	III	D
3a/3b	III	D
4	III	D

Functional status D is where one or more functions of the ESA do not perform as designed during and after exposure and do not return to normal operation until exposure is removed and the ESA is reset by simple "operator/use" action.

### 8.3 BLOCK DIAGRAM OF TEST SETUP



#### 8.4 CLASSIFICATION OF FUNCTIONAL STATUS

**Class A:** all functions of a device/system perform as designed during and after exposure to disturbance.

**Class B:** all functions of a device/system perform as designed during exposure. However, one or more of them can go beyond specified tolerance. All functions return automatically to within normal limits after exposure is removed. Memory functions shall remain class A.

**Class C:** one or more functions of a device/system do not perform as designed during exposure but return automatically to normal operation after operation after exposure is removed.

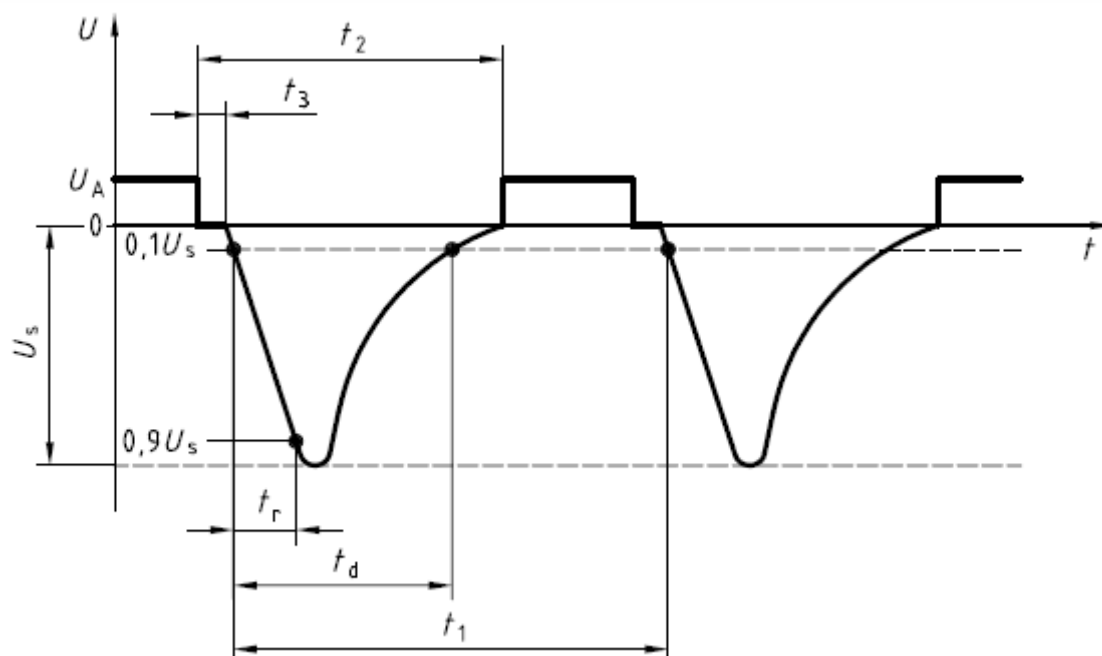
**Class D:** one or more functions of a device/system do not perform as designed during exposure and do not return to normal operation until exposure is removed and the device/system is reset by simple operator/use action.

**Class E:** one or more functions of a device/system do not perform as designed during and after exposure and can not be returned proper operation without repairing or replacing the device/system.

NOTE The word “function” in this context refers only to the function performed by the electronic system.

## 8.5 TEST PULSE AND PARAMETERS

### 8.5.1 TEST PULSE 1

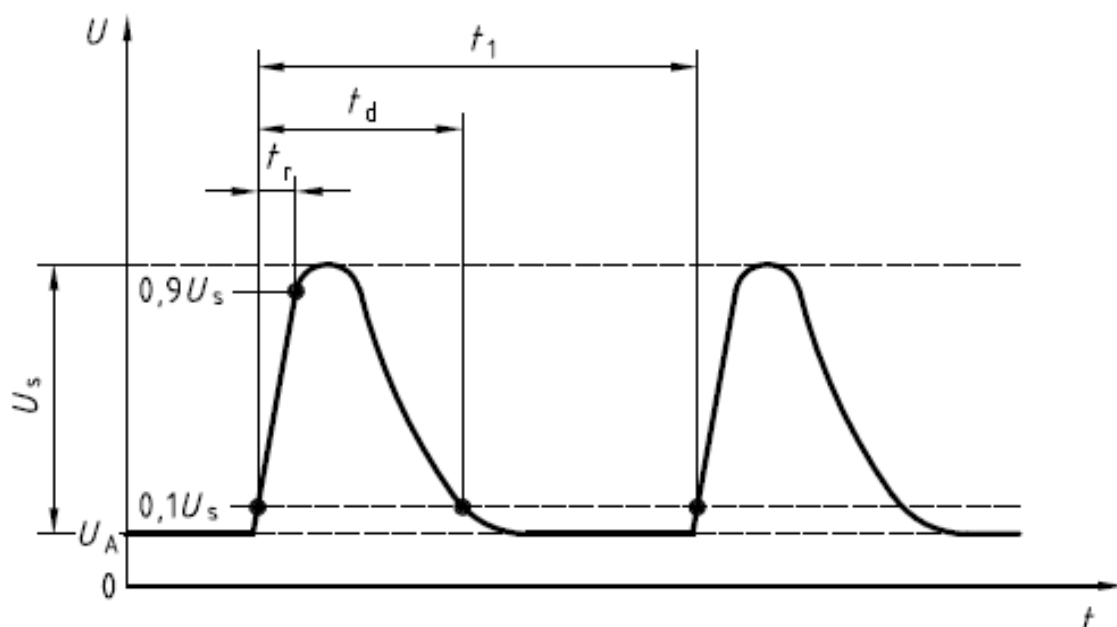


Parameter	12 V system	24 V system
$U_s$	-75 V to -100 V	-450 V to -600 V
$R_i$	10 $\Omega$	50 $\Omega$
$t_d$	2 ms	1 ms
$t_r$	$1_{-05}^0 \mu s$	$3_{-1,5}^0 \mu s$
$t_1^a$	0,5 s to 5 s	
$t_2$	200 ms	
$t_3^b$	< 100 $\mu s$	

<sup>a</sup>  $t_1$  shall be chosen such that the DUT is correctly initialized before the application of the next pulse.

<sup>b</sup>  $t_3$  is the smallest possible time necessary between the disconnection of the supply source and the application of the pulse.

## 8.5.2 TEST PULSE 2A

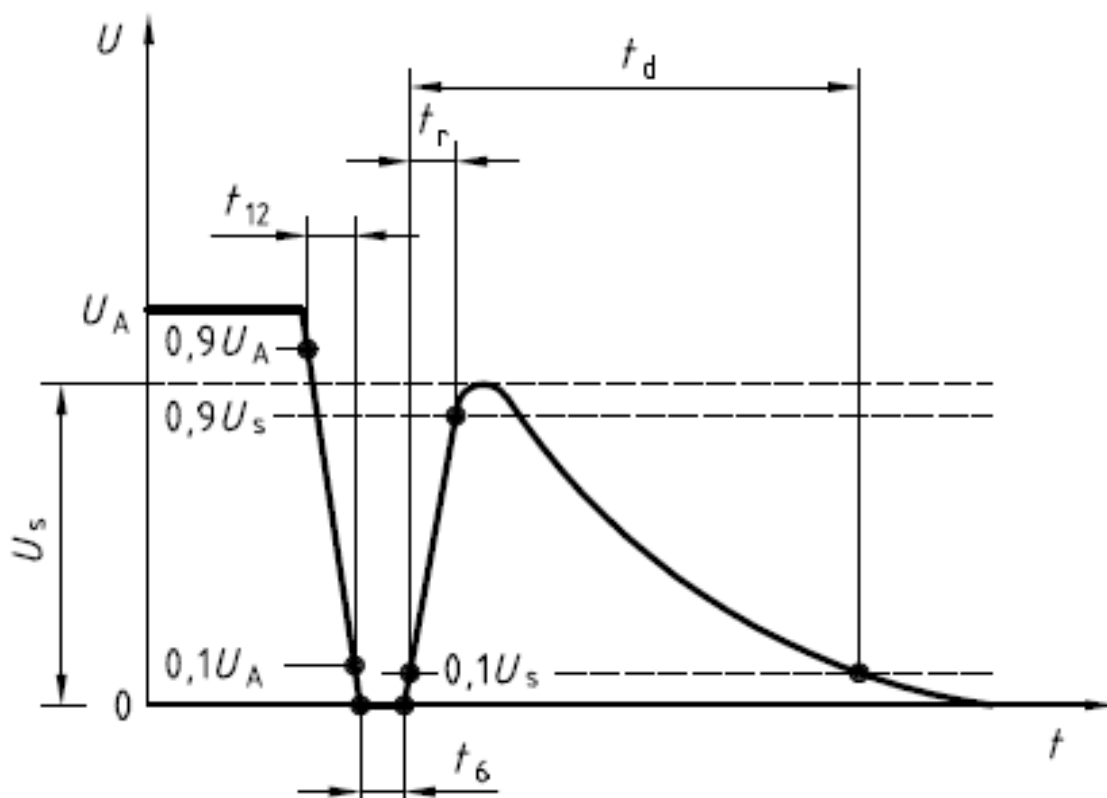


Parameter	12 V system	24 V system
$U_s$	+ 37 V to + 50 V	
$R_i$	$2 \Omega$	
$t_d$	0,05 ms	
$t_r$	$\left( \begin{smallmatrix} 1 & 0 \\ & -0,5 \end{smallmatrix} \right) \mu s$	
$t_1^a$	0,2 s to 5 s	

<sup>a</sup> The repetition time  $t_1$  can be short, depending on the switching. The use of a short repetition time reduces the test time.

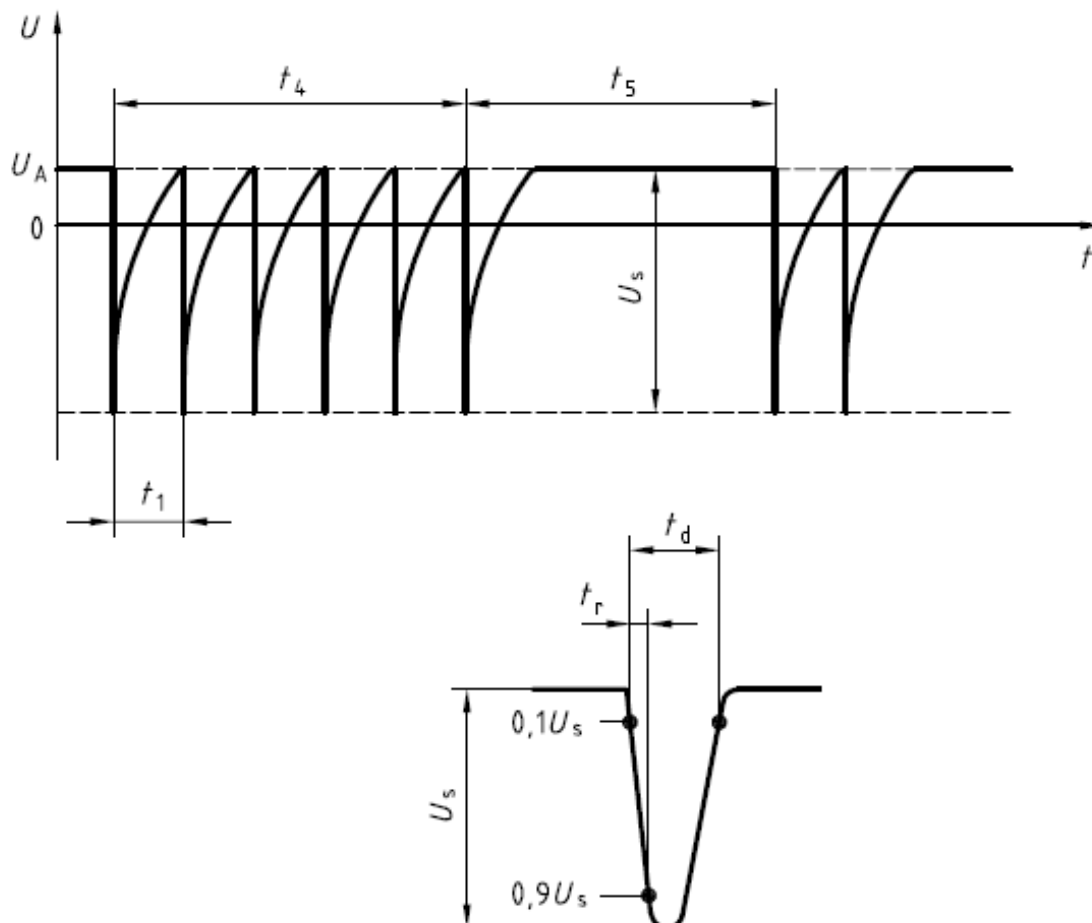


### 8.5.3 TEST PULSE 2B



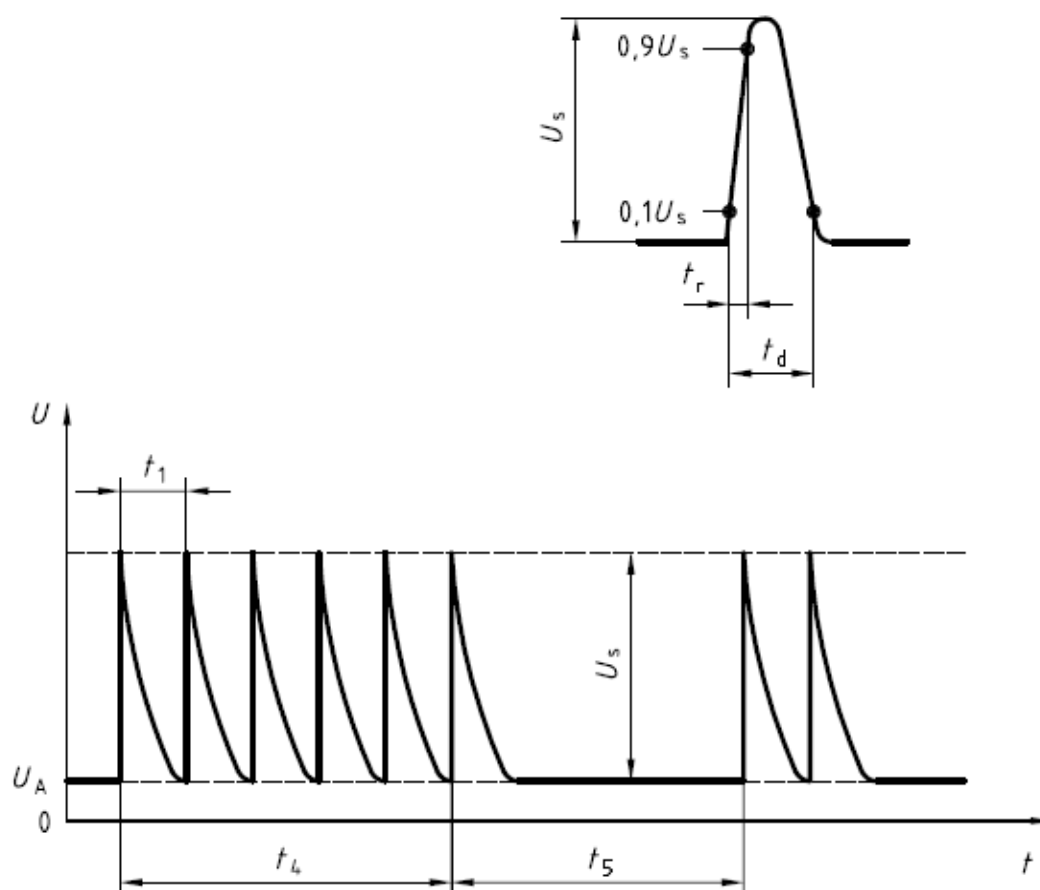
Parameter	12 V system	24 V system
$U_s$	10 V	20 V
$R_i$	0 $\Omega$ to 0,05 $\Omega$	
$t_d$	0,2 s to 2 s	
$t_{12}$	1 ms $\pm$ 0,5 ms	
$t_r$	1 ms $\pm$ 0,5 ms	
$t_6$	1 ms $\pm$ 0,5 ms	

### 8.5.4 TEST PULSE 3A



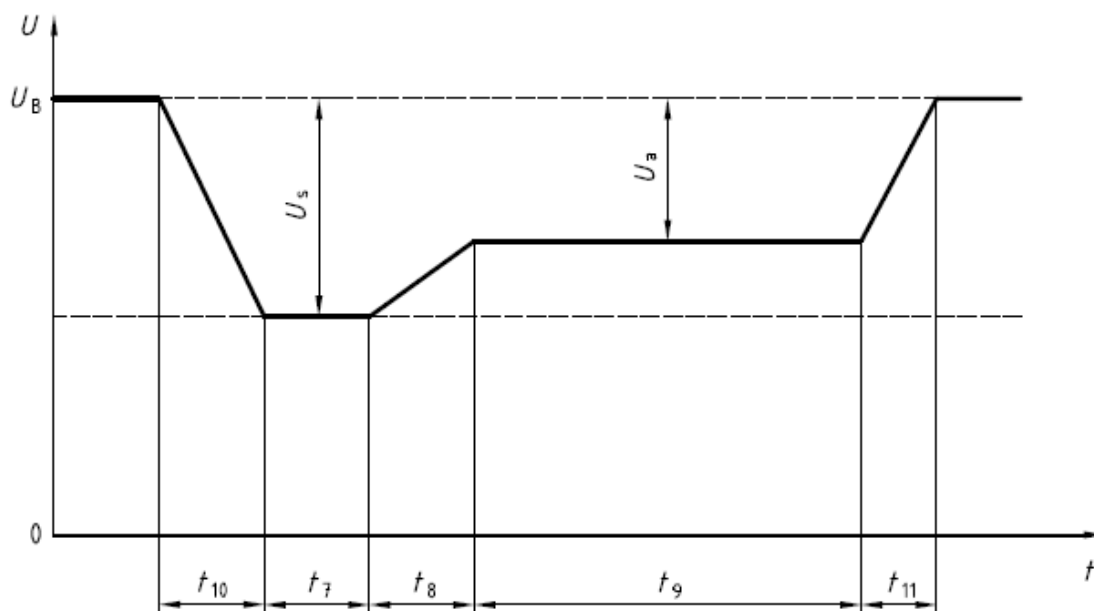
Parameter	12 V system	24 V system
$U_s$	- 112 V to - 150 V	- 150 V to - 200 V
$R_i$	50 $\Omega$	
$t_d$	$(0,1^{+0,1}_0)$ $\mu s$	
$t_r$	5 ns $\pm$ 1,5 ns	
$t_1$	100 $\mu s$	
$t_4$	10 ms	
$t_5$	90 ms	

### 8.5.5 TEST PULSE 3B



Parameter	12 V system	24 V system
$U_s$	+ 75 V to + 100 V	+ 150 V to + 200 V
$R_i$	50 $\Omega$	
$t_d$	$(0,1^{+0,1}_0) \mu s$	
$t_r$	5 ns $\pm$ 1,5 ns	
$t_1$	100 $\mu s$	
$t_4$	10 ms	
$t_5$	90 ms	

## 8.5.6 TEST PULSE 4



Parameter	12 V system	24 V system
$U_s$	- 6 V to - 7 V	- 12 V to - 16 V
$U_a$	- 2,5 V to - 6 V with $ U_a  \leq  U_s $	- 5 V to - 12 V with $ U_a  \leq  U_s $
$R_i$	0 $\Omega$ to 0,02 $\Omega$	
$t_7$	15 ms to 40 ms <sup>a</sup>	50 ms to 100 ms <sup>a</sup>
$t_8$	$\leq 50$ ms	
$t_9$	0,5 s to 20 s <sup>a</sup>	
$t_{10}$	5 ms	10 ms
$t_{11}$	5 ms to 100 ms <sup>b</sup>	10 ms to 100 ms <sup>c</sup>

<sup>a</sup> The value used should be agreed between the vehicle manufacturer and the equipment supplier to suit the proposed application.

<sup>b</sup>  $t_{11} = 5$  ms is typical of the case when engine starts at the end of the cranking period, while  $t_{11} = 100$  ms is typical of the case when the engine does not start.

<sup>c</sup>  $t_{11} = 10$  ms is typical of the case when engine starts at the end of the cranking period, while  $t_{11} = 100$  ms is typical of the case when the engine does not start.

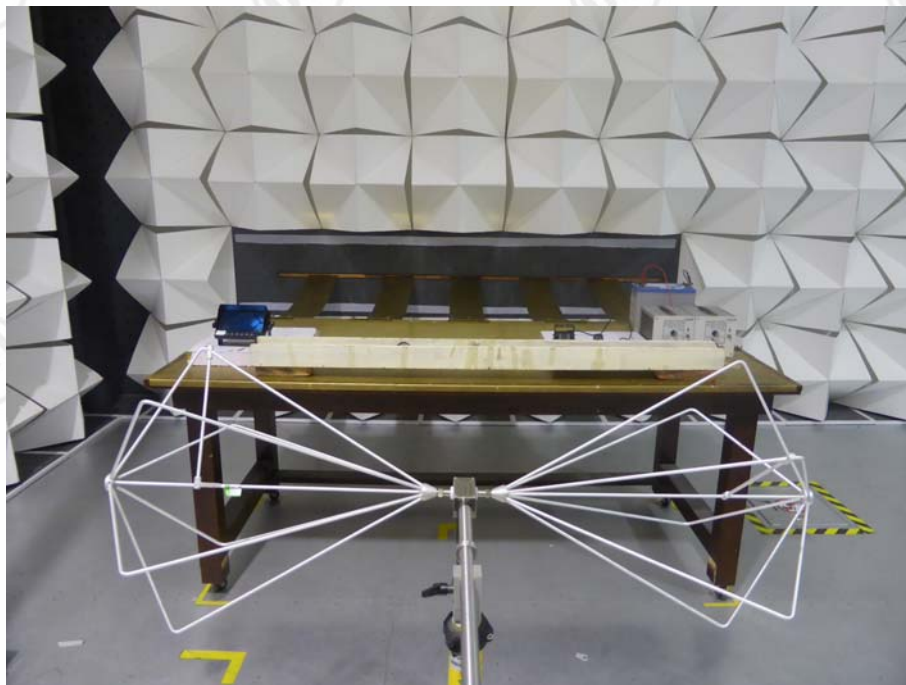
## 8.6 TEST RESULTS

Test Pulse	Test Voltage		Required Level	Test Level	Test Result
	12V system	24V system			
1	-75V	-450V	D	C <sup>1</sup>	Pass
2a	+37V	+37V	D	A	Pass
2b	+10V	+20V	D	C <sup>1</sup>	Pass
3a	-112V	-150V	D	A	Pass
3b	+75V	+150V	D	A	Pass
4	-6V	/	D	C <sup>1</sup>	Pass
4	/	-12V	D	A	Pass

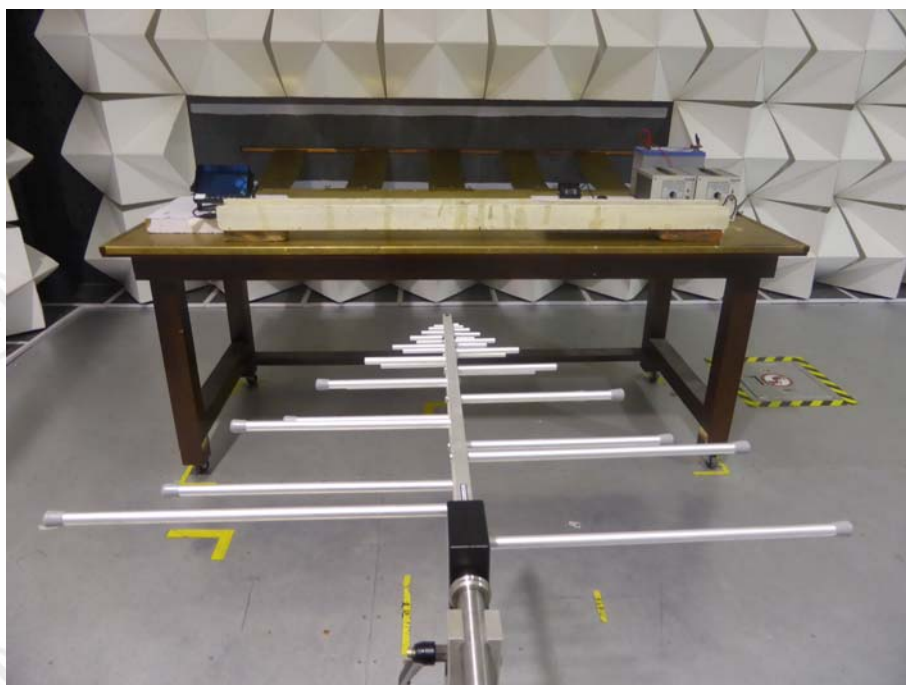
Remarks: 1. During test, the power indicator light is put out and it will recover normally automatically after test.



## APPENDIX 1 PHOTOGRAPHS OF TEST SETUP



**BROADBAND AND NARROWBAND RADIATED DISTURBANCES TEST SETUP  
(30MHz-200MHz)**



**BROADBAND AND NARROWBAND RADIATED DISTURBANCES TEST SETUP  
(200MHz-1000MHz)**



**CONDUCTED TRANSIENT DISTURBANCES TEST SETUP**



**CONDUCTED TRANSIENT IMMUNITY TEST SETUP**

## APPENDIX 2 PHOTOGRAPHS OF PRODUCT



View of Product-1



View of Product-2





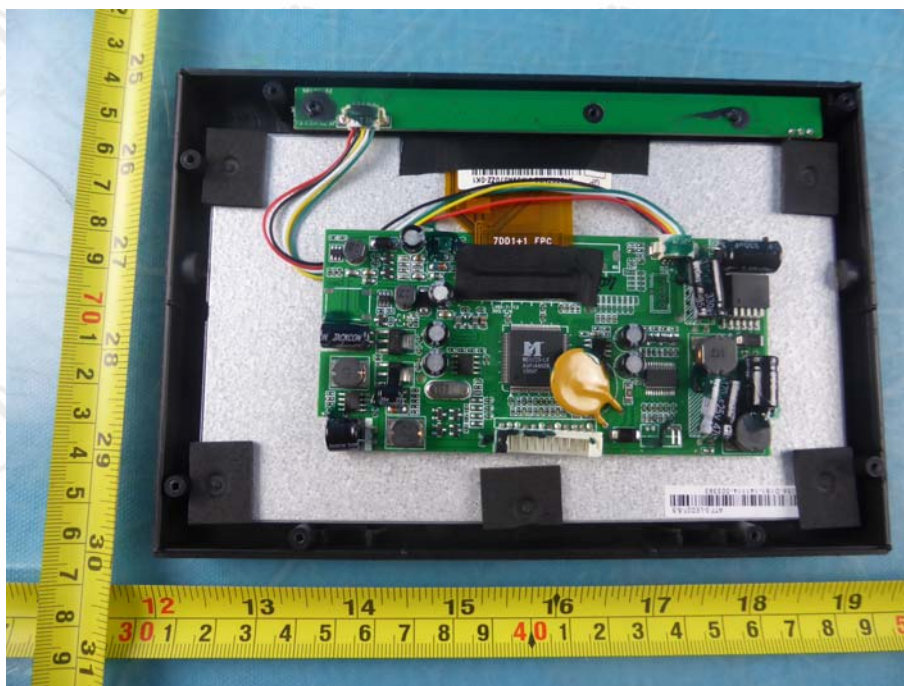
View of Product-3



View of Product-4

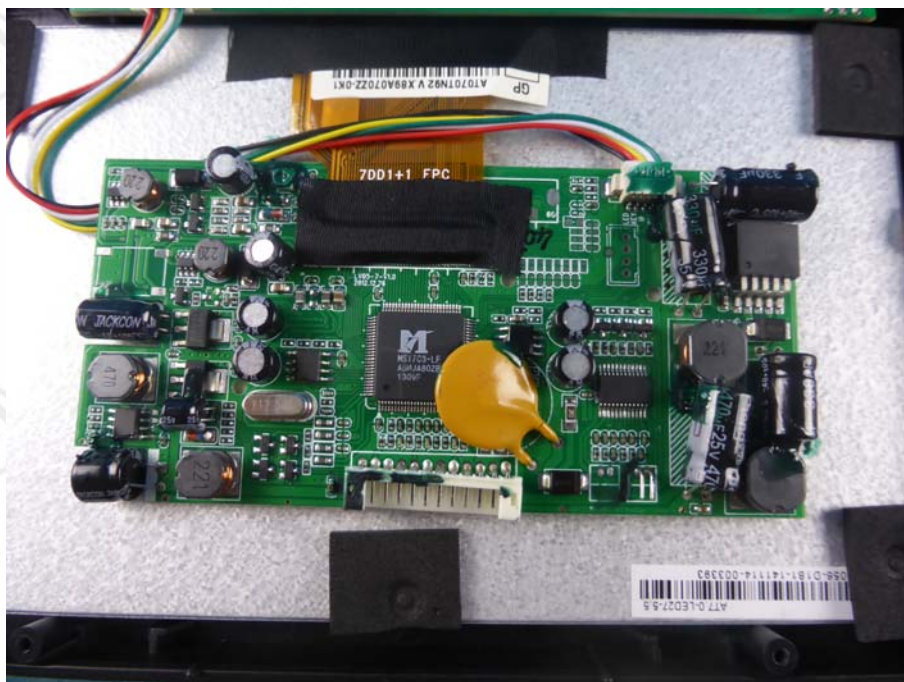


View of Product-5



View of Product-6





View of Product-7

\*\*\* End of Report \*\*\*

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