

# TEST REPORT

On the basis of the referenced test report(s), the sample(s) of the below product has been found to comply with the relevant harmonized standard(s) to the directive(s) listed on this verification at the time the tests were carried out.

**Applicant Name & Address** : CBQ Auto and Leisure (Aust) Pty Ltd  
Building 9, 83 Burnside Road, Stapylton QLD 4207 Australia

**Manufacturer Name & Address** :



**Product Name** : LED LIGHT BAR

**Model No.** : HKLB-HPR-50S

**Variants** : See the report for details.

**Trade mark** : /

**Electrical Rating** : DC12.0/24.0V

**Relevant Standard(s) / Specification(s) / Directive(s)** : **UN/ECE REGULATION 10R06**  
Uniform provisions concerning the approval of vehicles with regard to electromagnetic compatibility

**Report Number(s)** : SQT2311090

**Test Result** : Pass

**Conclusion** : In the configuration tested, the DUT complied with the standards specified above.

*Prepared and Checked By:*



Mark Qin  
Project Engineer

*Approved by:*



Zane Zhang  
Technical Supervisor



2023-11-30  
Issued Date



## Statement

1. The report is invalid without "special stamp for inspection and testing".
2. Failure to affix "special seal for inspection and testing" to the copy report is invalid, and some copies are invalid.
3. The report is invalid without the signature and seal of the person preparing, reviewing and approving it.
4. The report is invalid if altered.
5. If there is any objection concerning the report, please inform us within 15 days from the date of receiving the report.
6. This test is only responsible for incoming samples, and the report is only valid for this test.

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## 1. Description of version

Report No.	Version No.	Issue Date	Description	Approved
SQT2311090	V0	2023-11-30	Original	Valid

## 2. Test summary

Emission		
Test item	Test Method	Result
Broadband radiated disturbances	ECE R10.06 Annex 7	PASS
Narrowband radiated disturbances	ECE R10.06 Annex 8	PASS
Conducted transient disturbances emission	ECE R10.06 Annex 10 ISO 7637-2	PASS
Immunity		
Test item	Test Method	Result
Bulk Current Injection	ECE R10.06 Annex 9 ISO 11452-4	PASS
Radiated Immunity	ECE R10.06 Annex 9 ISO 11452-2	PASS
Transient Conducted Immunity	ECE R10.06 Annex 10 ISO 7637-2	PASS
<p>Remark:</p> <p>The symbol “N/A” in above table means <u>N</u>ot <u>A</u>pplicable.</p> <p>When determining the test results, measurement uncertainty of tests has been considered.</p> <p>This test covers all possible operating modes of the device, only the worst data are list in report. The worst data is the nearest standard limit which were recorded in this report.</p>		

## 3. Measurement uncertainty

The reported uncertainty of measurement  $y \pm U$ , where expended uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95 %.

Test item	Frequency	Expanded Uncertainty ( $U_{Lab}$ )
Broadband radiated disturbances	30MHz to 1000 MHz	$\pm 4.6$ dB
Narrowband radiated disturbances	30MHz to 1000 MHz	$\pm 4.6$ dB
Conducted transient disturbances emission	/	$\pm 4.1$ V



## 4. LABORATORY MEASUREMENTS

### 4.1. Configuration Information

Product name	LED LIGHT BAR	
Category	Component	
Model No.	HKLB-HPR-50S	
Software version/ Hardware version	N/A	
Quantity of sample	1pcs	
Date Received	2023-11-20	
Date Test Conducted	2023-11-20~2023-11-25	
Sample No.	1#	Q2311110-001
Operating Mode	MO# 1	Lighting
Test Voltage	DC13.5/27.0V	
Tested Setup	Remotely grounded/ <del>Locally grounded</del>	
Electronic oscillator with frequency greater than 9 kHz	YES	
Noise floor of the measurement system shall be at least 6 dB lower than the applicable limits	YES	
Test Laboratory	Guangzhou Shuntai Quality Technical Service Co., Ltd. Room 206A, 2F, 4# Plant, No.63 Punan Road, Huangpu District, Guangzhou, China, 510760	

**Note:** The above DUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

### 4.2. Worse Case Description

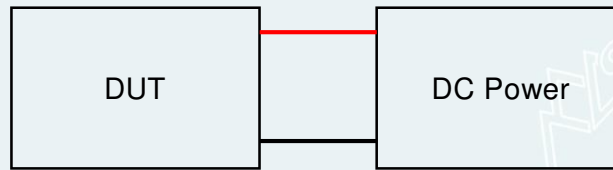
Model No.: HKLB-HPR-50S

Variants: HKLB-HPR-10S、HKLB-HPR-20S、HKLB-HPR-30S、HKLB-HPR-40S

Above variants have the same PCB layout, electronic circuit design and the same component list for each PCB, the differences among them are model name and appearance.

Model HKLB-HPR-50S is selected as typical model to perform testing and the worst case.

#### 4.3. Block diagram of DUT configuration



#### 4.4. Support Equipment

No.	Device Type	Brand	Model	Specification	Note
1.	/	/	/	/	/

#### 4.5. Explanation of test method deviation

The test method deviates from the standard method: **yes/no**

If yes, please explain in details: ---



## 5. TEST ITEM AND RESULTS

### 5.1. Broadband radiated disturbances/ Narrowband disturbances

#### 5.1.1 Test Limits

Frequency range F/MHz	Limits broadband radiated Quasi peak(dB $\mu$ V/m)	Limits narrowband radiated Average (dB $\mu$ V/m)
30 to 75	62 – 52 <sup>a</sup>	52 – 42 <sup>a</sup>
75 to 400	52 – 63 <sup>b</sup>	42 – 53 <sup>b</sup>
400 to 1 000	63	53

a Decreasing linearly with the log of the frequency.  
b Increasing linearly with the log of the frequency.

#### 5.1.2 Used Test Equipment

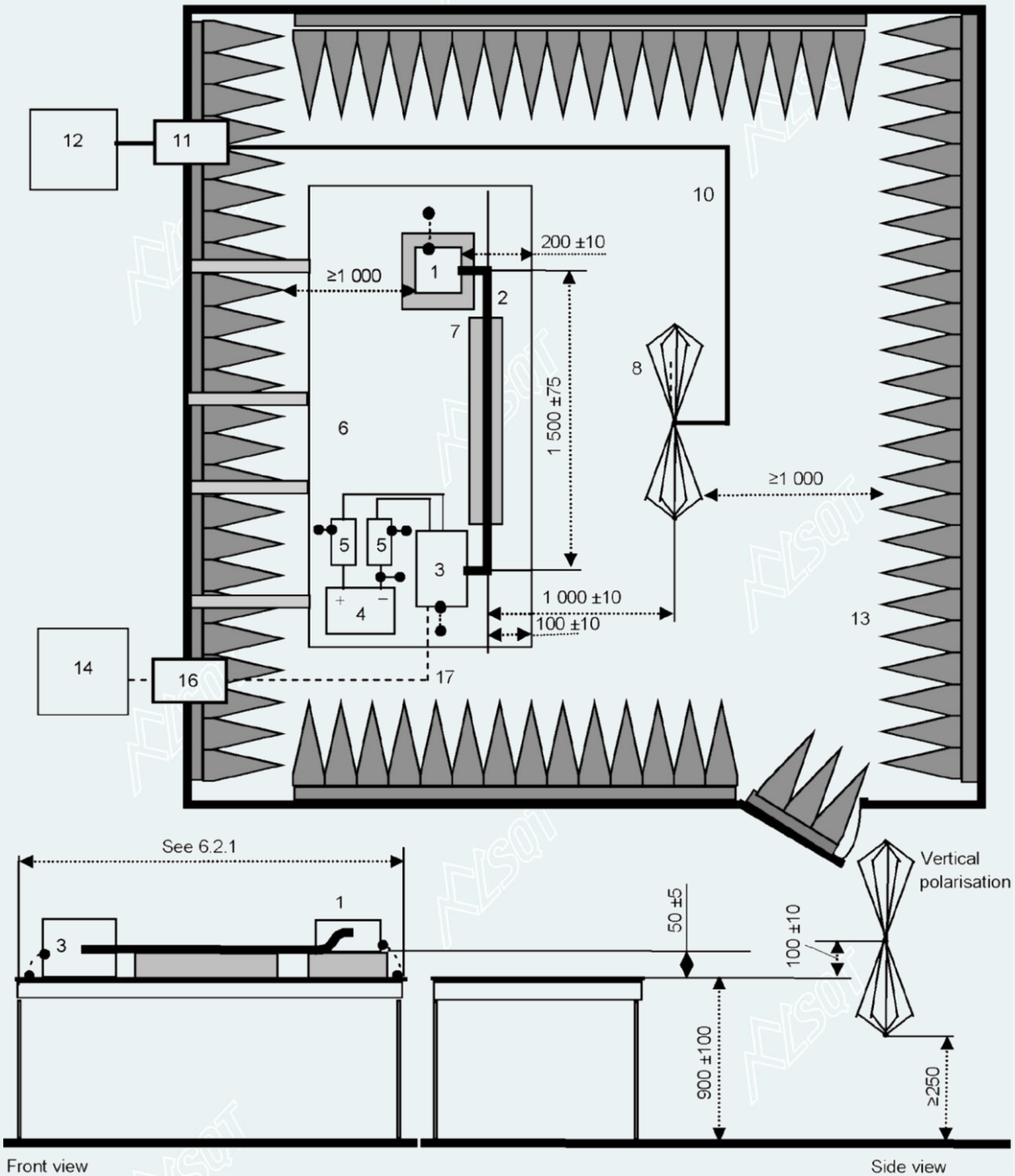
Equipment	Equipment S/N	Manufacturer	Model No.	Calibration Due
ALSE ROOM	GZST/YQ-EMC-01	C.R.T	SQT-ALSE-1#	2025-07-21
EMI receiver	GZST/YQ-EMC-26	R&S	ESCI7	2024-06-29
L.I.S.N.	GZST/YQ-EMC-130	SCHWARZBECK	NNHV 8124-200	2024-08-28
L.I.S.N.	GZST/YQ-EMC-131	SCHWARZBECK	NNHV 8124-200	2024-08-28
Biconical antenna	GZST/YQ-EMC-126	SCHWARZBECK	VHBB9124	2025-07-05
Log-periodic antenna	GZST/YQ-EMC-127	SCHWARZBECK	VULP9118B	2024-08-26
Test software	GZST/SOFT-10	Tonsend	Ts+	/

#### 5.1.3 Test Setup and Procedure

The ground plane minimum thickness of 0.5mm was situated at a height of 0.9m above the test facility floor on a non-metallic table. The ESA and its wiring harness was supported  $50 \pm 5$ mm above a wooden or non-metallic table and placed along the support with keeping 100mm distance from the edge. The length of wiring harness was  $1500 \pm 75$ mm to the artificial network (AN). Power supply was applied to the ESA via a  $5\mu\text{H}/50\Omega$  AN which was electrically bonded to the ground plane.

The measurement distance between the DUT harness and the emissions antenna was 1m.

Top view (horizontal polarisation)

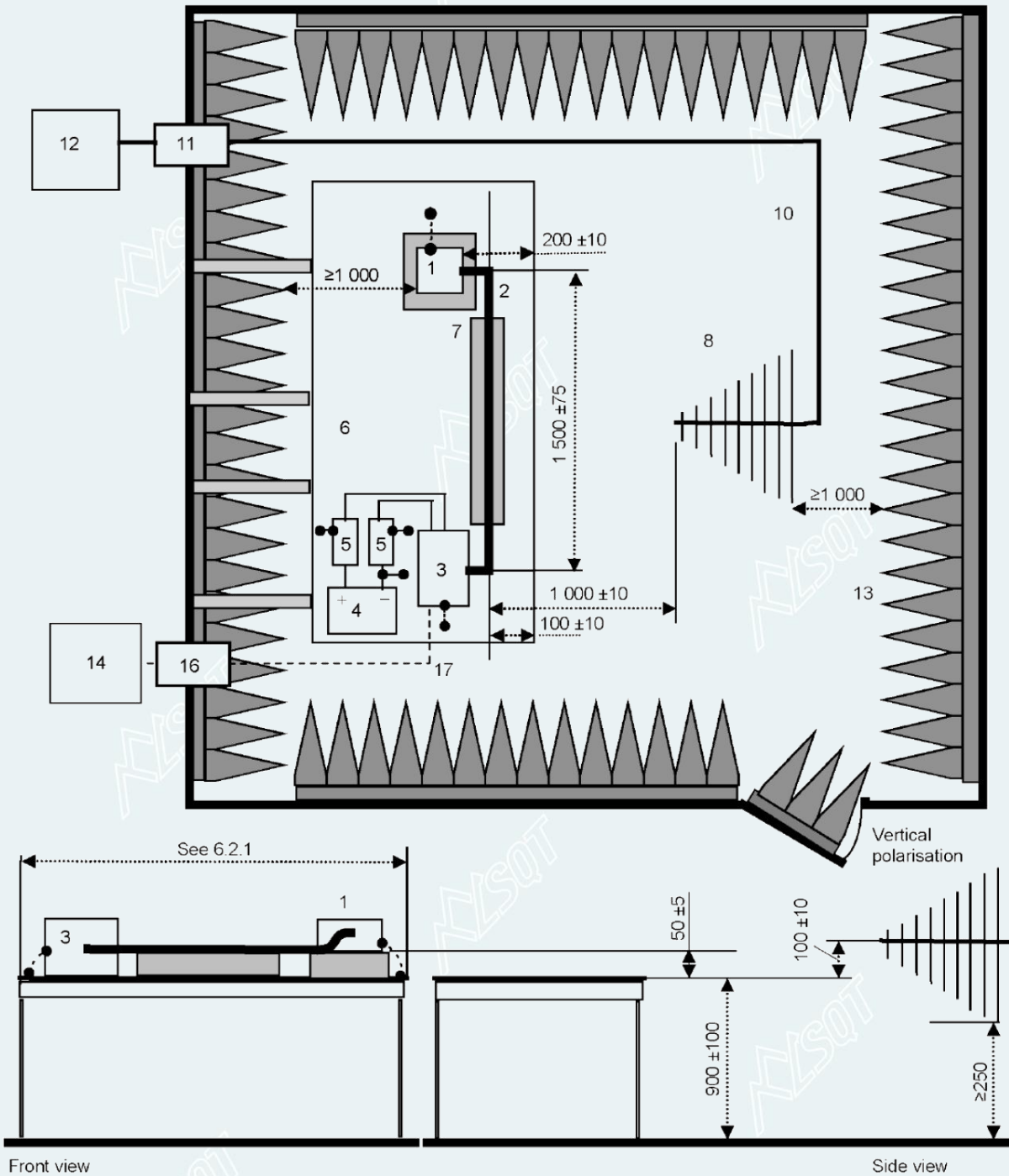


Biconical antenna

Key:

- 1 DUT (grounded locally if required in test plan)
- 2 Test harness
- 3 Load
- 4 Power
- 5 LISN
- 8 Biconical antenna (no part of the antenna closer than 700 mm to the wiring harness or DUT)

Top view (horizontal polarisation)



Log-periodic antenna

Key:

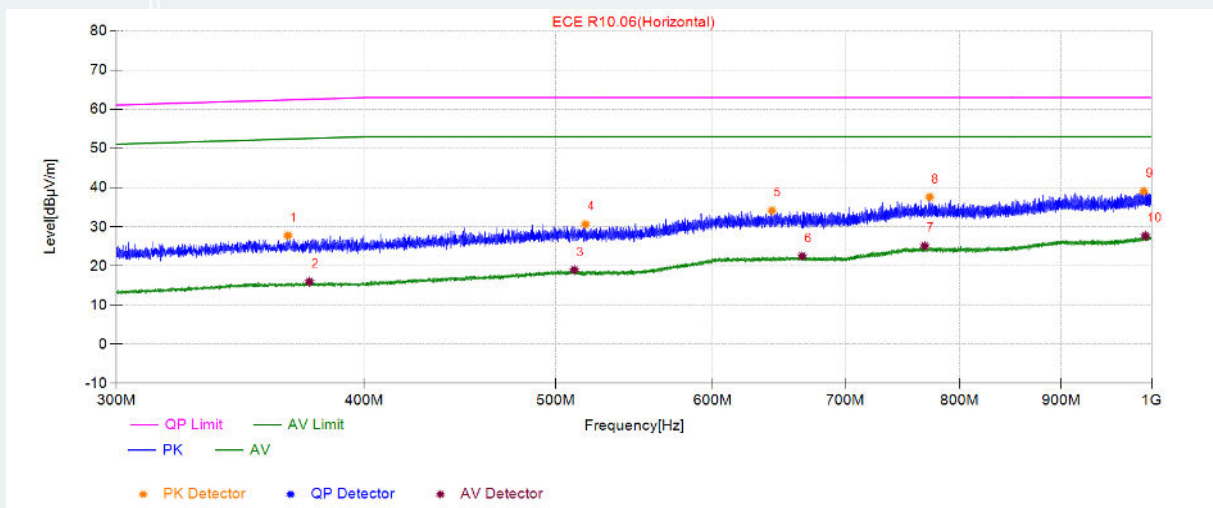
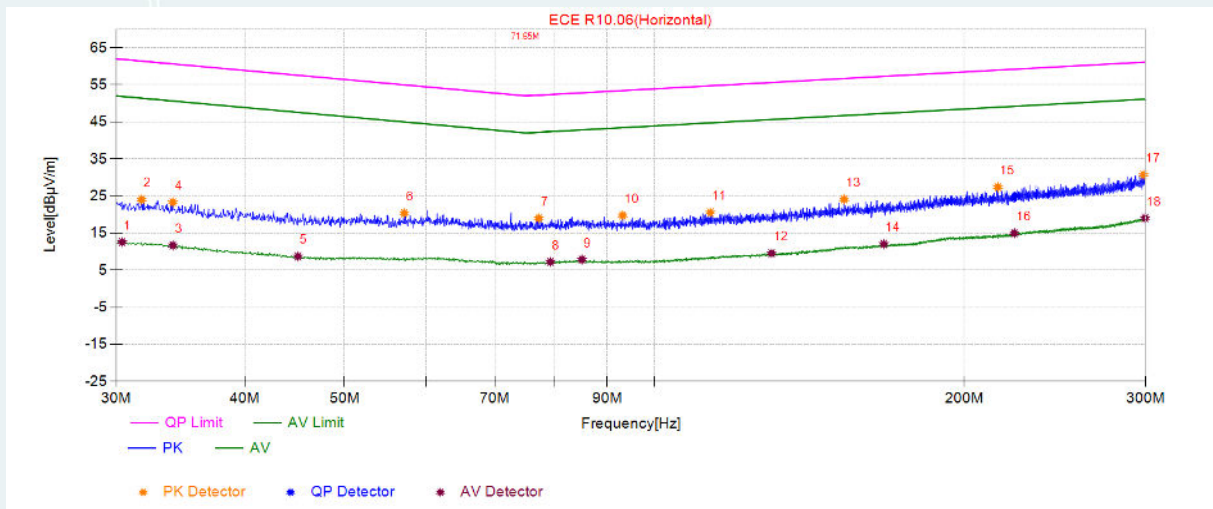
- 1 DUT (grounded locally if required in test plan)
- 2 Test harness
- 3 Load
- 4 Power
- 5 LISN
- 8 Log-periodic antenna

5.1.4 Test Results

**Horizontal Polarisation**

30MHz to 1GHz

Sample NO.:	1#	Test Mode:	MO#1
Tested Voltage:	DC 13.5V	Environmental conditions:	23.6°C/46.7%RH
Results Conclusion:	Correct	Note:	/



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
Frequency: 30~300MHz							
1	30.400	-2.16	14.74	12.58	51.86	39.28	AV
2	31.750	9.66	14.37	24.03	61.38	37.35	QP
3	34.050	-2.05	13.73	11.68	50.61	38.93	AV
4	34.050	9.57	13.73	23.30	60.61	37.31	QP
5	45.050	-2.01	10.71	8.70	47.56	38.86	AV
6	57.150	9.97	10.41	20.38	54.97	34.59	QP
7	77.200	9.53	9.47	19.00	52.19	33.19	QP
8	79.250	-2.37	9.60	7.23	42.36	35.13	AV
9	85.050	-2.14	9.97	7.83	42.82	34.99	AV
10	93.150	9.89	9.87	19.76	53.42	33.66	QP
11	113.350	9.56	10.97	20.53	54.71	34.18	QP
12	130.000	-2.18	11.72	9.54	45.61	36.07	AV
13	152.900	11.21	12.90	24.11	56.68	32.57	QP
14	167.100	-1.48	13.52	12.04	47.27	35.23	AV
15	215.700	11.10	16.29	27.39	58.94	31.55	QP
16	223.800	-1.73	16.70	14.97	49.18	34.21	AV
17	298.850	10.18	20.52	30.70	61.08	30.38	QP
18	299.800	-1.57	20.59	19.02	51.11	32.09	AV
Frequency: 300~1000MHz							
1	366.300	10.00	17.76	27.76	62.42	34.66	QP
2	375.550	-1.83	17.78	15.95	52.59	36.64	AV
3	511.050	-1.54	20.51	18.97	53.00	34.03	AV
4	517.650	10.12	20.49	30.61	63.00	32.39	QP
5	643.000	11.59	22.54	34.13	63.00	28.87	QP
6	666.100	0.03	22.50	22.53	53.00	30.47	AV
7	768.000	0.75	24.36	25.11	53.00	27.89	AV
8	772.500	13.28	24.33	37.61	63.00	25.39	QP
9	990.850	12.91	26.17	39.08	63.00	23.92	QP
10	992.750	1.48	26.20	27.68	53.00	25.32	AV

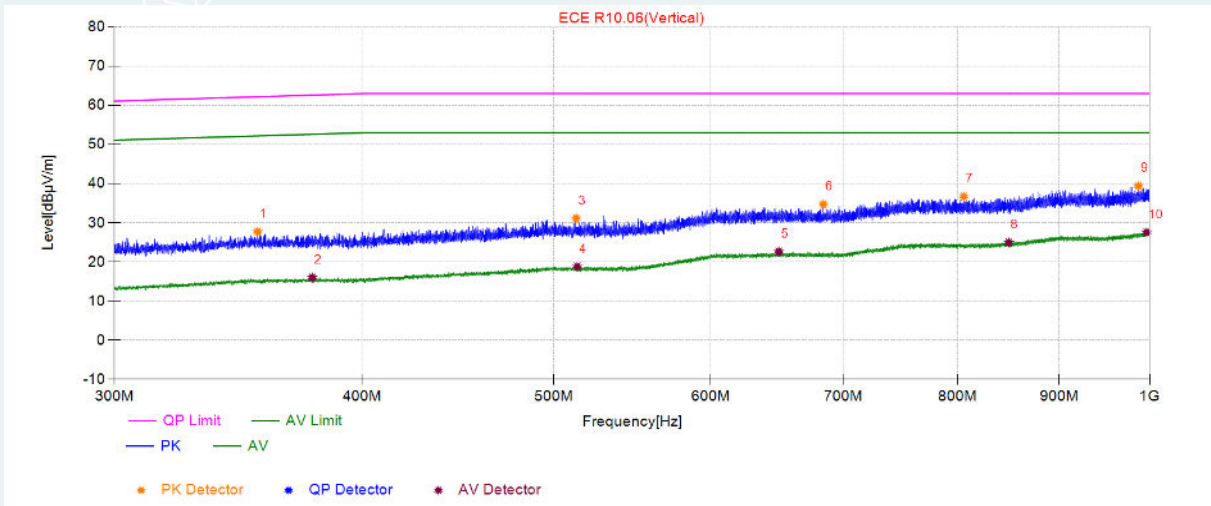
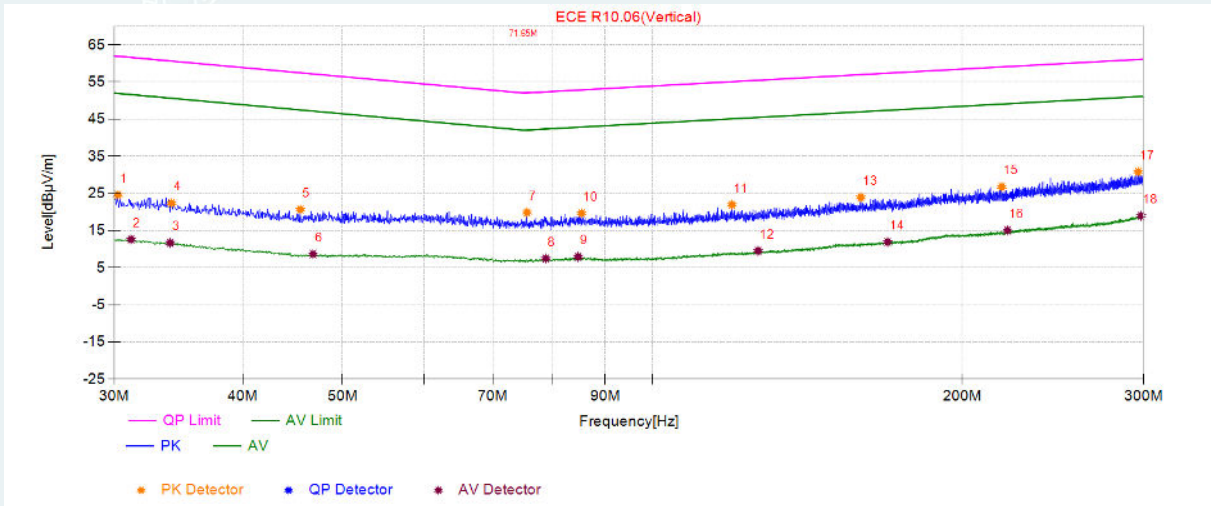
\*Level= Reading+Correct\_F



**Vertical Polarisation**

30MHz to 1GHz

Sample NO.:	1#	Test Mode:	MO#1
Tested Voltage:	DC 13.5V	Environmental conditions:	23.6°C/46.7%RH
Results Conclusion:	Correct	Note:	/



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
Frequency: 30~300MHz							
1	30.250	9.81	14.78	24.59	61.91	37.32	QP
2	31.150	-1.92	14.53	12.61	51.59	38.98	AV
3	34.000	-2.06	13.74	11.68	50.63	38.95	AV
4	34.100	8.68	13.71	22.39	60.60	38.21	QP
5	45.500	9.96	10.69	20.65	57.45	36.80	QP
6	46.800	-2.00	10.65	8.65	47.14	38.49	AV
7	75.550	10.48	9.37	19.85	52.05	32.20	QP
8	78.800	-2.13	9.57	7.44	42.32	34.88	AV
9	84.700	-2.04	9.96	7.92	42.80	34.88	AV
10	85.350	9.69	9.96	19.65	52.85	33.20	QP
11	119.500	10.56	11.36	21.92	55.06	33.14	QP
12	126.700	-2.06	11.58	9.52	45.44	35.92	AV
13	159.450	10.82	13.10	23.92	56.96	33.04	QP
14	169.300	-1.71	13.61	11.90	47.35	35.45	AV
15	218.550	10.35	16.41	26.76	59.03	32.27	QP
16	221.350	-1.49	16.55	15.06	49.11	34.05	AV
17	296.550	10.49	20.33	30.82	61.03	30.21	QP
18	298.500	-1.56	20.49	18.93	51.08	32.15	AV
Frequency: 300~1000MHz							
1	354.400	9.98	17.74	27.72	62.20	34.48	QP
2	377.700	-1.80	17.79	15.99	52.62	36.63	AV
3	513.300	10.62	20.50	31.12	63.00	31.88	QP
4	513.950	-1.69	20.50	18.81	53.00	34.19	AV
5	649.700	0.08	22.53	22.61	53.00	30.39	AV
6	684.200	12.23	22.47	34.70	63.00	28.30	QP
7	805.650	12.53	24.15	36.68	63.00	26.32	QP
8	848.950	0.70	24.29	24.99	53.00	28.01	AV
9	987.050	13.32	26.10	39.42	63.00	23.58	QP
10	996.500	1.31	26.27	27.58	53.00	25.42	AV

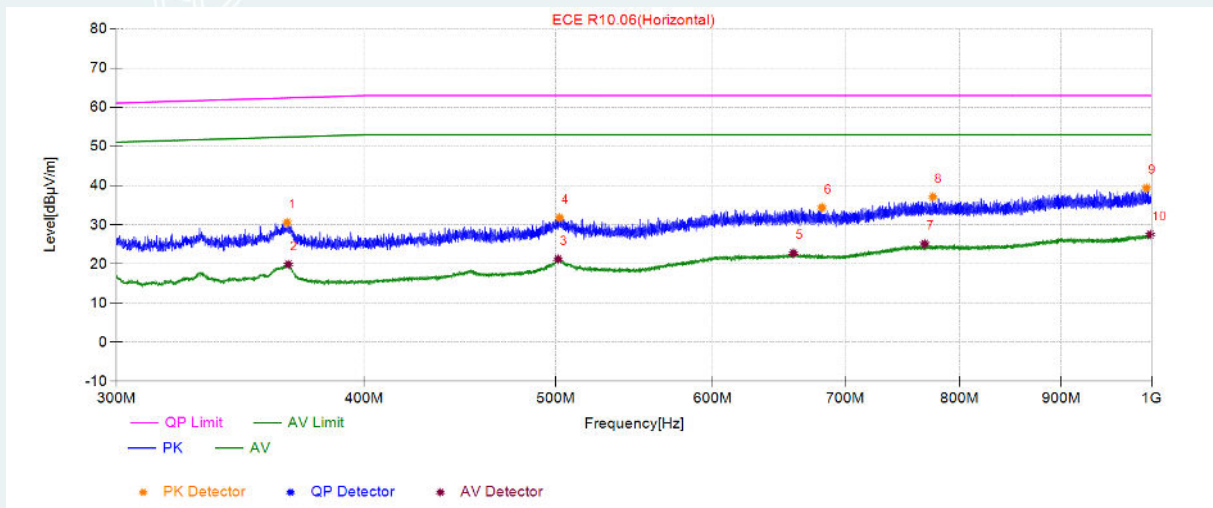
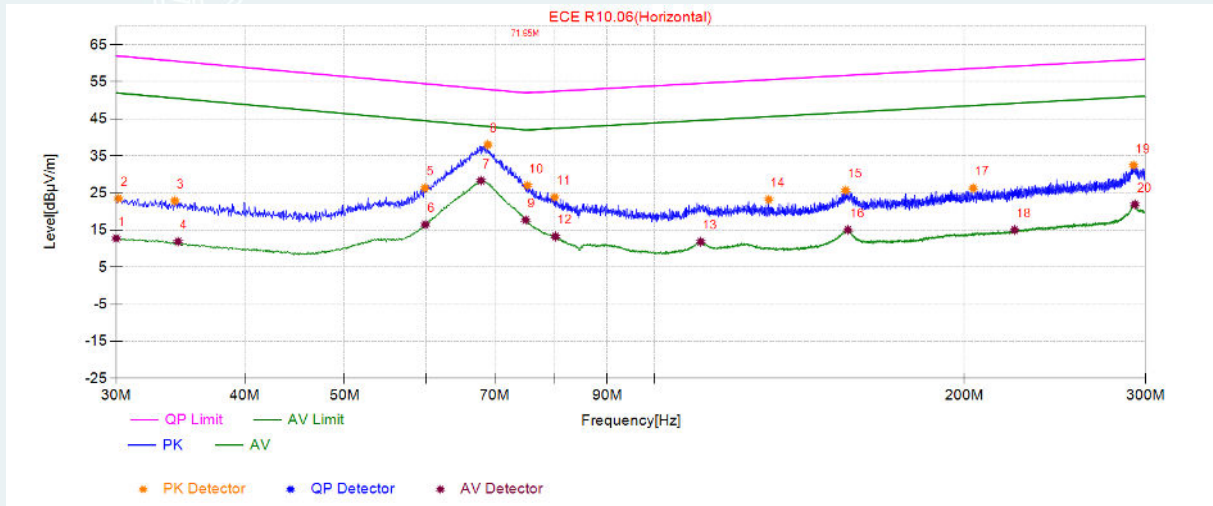
\*Level= Reading+Correct\_F



**Horizontal Polarisation**

30MHz to 1GHz

Sample NO.:	1#	Test Mode:	MO#1
Tested Voltage:	DC 27.0V	Environmental conditions:	23.6°C/46.7%RH
Results Conclusion:	Correct	Note:	/



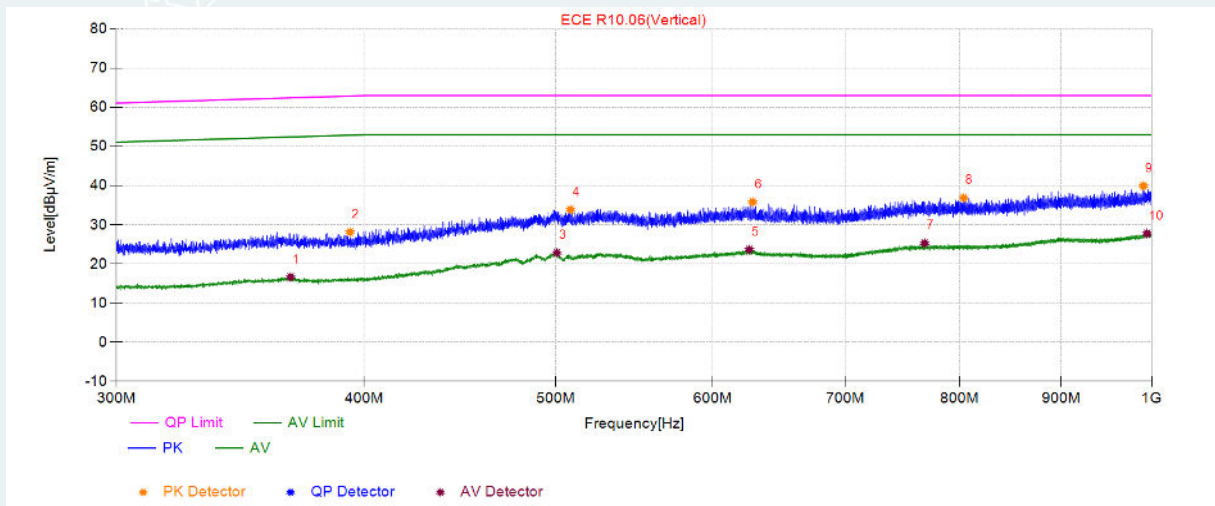
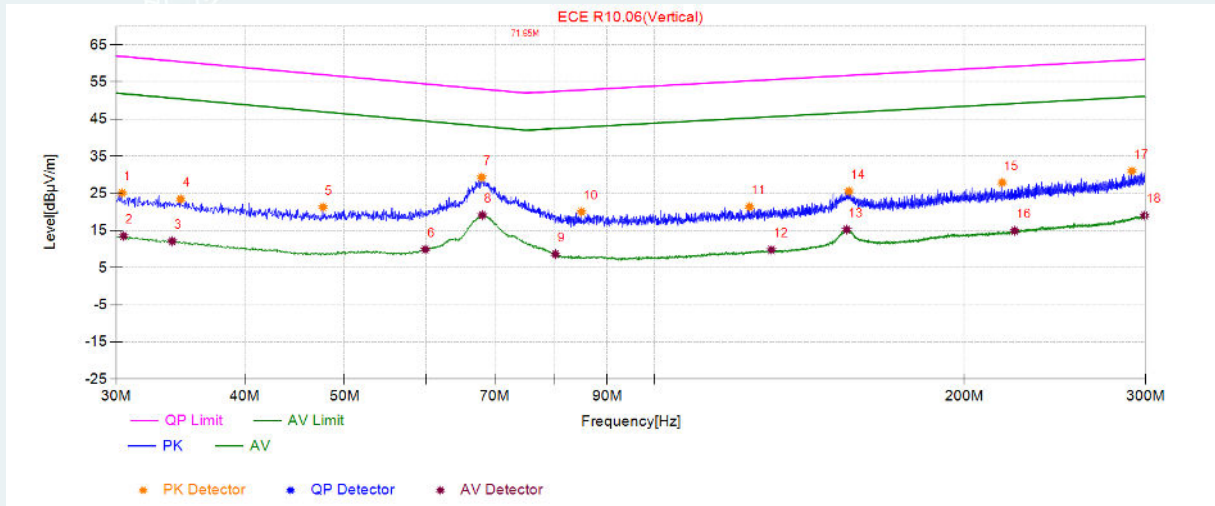
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
Frequency: 30~300MHz							
1	30.000	-2.09	14.85	12.76	52.00	39.24	AV
2	30.150	8.70	14.81	23.51	61.95	38.44	QP
3	34.200	9.17	13.69	22.86	60.57	37.71	QP
4	34.450	-1.74	13.62	11.88	50.49	38.61	AV
5	59.850	15.84	10.48	26.32	54.47	28.15	QP
6	59.900	5.98	10.48	16.46	44.46	28.00	AV
7	67.850	18.65	9.68	28.33	43.10	14.77	AV
8	68.900	28.42	9.60	38.02	52.93	14.91	QP
9	75.000	8.39	9.34	17.73	42.00	24.27	AV
10	75.300	17.68	9.35	27.03	52.03	25.00	QP
11	80.000	14.21	9.65	23.86	52.42	28.56	QP
12	80.150	3.60	9.66	13.26	42.43	29.17	AV
13	110.950	1.01	10.82	11.83	44.57	32.74	AV
14	129.200	11.53	11.69	23.22	55.57	32.35	QP
15	153.400	12.76	12.93	25.69	56.70	31.01	QP
16	154.200	2.11	12.96	15.07	46.74	31.67	AV
17	204.100	10.67	15.62	26.29	58.58	32.29	QP
18	223.900	-1.68	16.71	15.03	49.19	34.16	AV
19	292.200	12.51	19.97	32.48	60.94	28.46	QP
20	293.100	1.85	20.05	21.90	50.96	29.06	AV
Frequency: 300~1000MHz							
1	365.900	12.81	17.76	30.57	62.41	31.84	QP
2	366.450	2.14	17.76	19.90	52.42	32.52	AV
3	501.500	0.71	20.54	21.25	53.00	31.75	AV
4	502.350	11.23	20.54	31.77	63.00	31.23	QP
5	659.300	0.25	22.51	22.76	53.00	30.24	AV
6	681.550	11.91	22.48	34.39	63.00	28.61	QP
7	768.000	0.77	24.36	25.13	53.00	27.87	AV
8	775.450	12.86	24.31	37.17	63.00	25.83	QP
9	994.100	13.17	26.23	39.40	63.00	23.60	QP
10	998.350	1.24	26.30	27.54	53.00	25.46	AV

\*Level= Reading+Correct\_F

**Vertical Polarisation**

30MHz to 1GHz

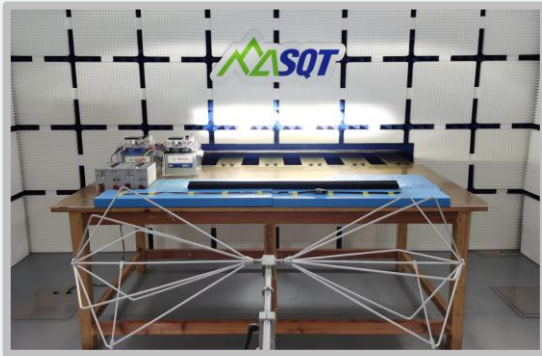
Sample NO.:	1#	Test Mode:	MO#1
Tested Voltage:	DC 27.0V	Environmental conditions:	23.6°C/46.7%RH
Results Conclusion:	Correct	Note:	/



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.
Frequency: 30~300MHz							
1	30.400	10.39	14.74	25.13	61.86	36.73	QP
2	30.500	-1.20	14.71	13.51	51.82	38.31	AV
3	34.000	-1.62	13.74	12.12	50.63	38.51	AV
4	34.650	9.88	13.56	23.44	60.42	36.98	QP
5	47.650	10.66	10.62	21.28	56.95	35.67	QP
6	59.900	-0.57	10.48	9.91	44.46	34.55	AV
7	67.950	19.62	9.68	29.30	53.08	23.78	QP
8	68.050	9.46	9.67	19.13	43.06	23.93	AV
9	80.150	-1.01	9.66	8.65	42.43	33.78	AV
10	84.950	10.08	9.97	20.05	52.82	32.77	QP
11	123.750	9.91	11.48	21.39	55.29	33.90	QP
12	129.950	-1.94	11.72	9.78	45.61	35.83	AV
13	153.800	2.29	12.94	15.23	46.72	31.49	AV
14	154.550	12.59	12.98	25.57	56.75	31.18	QP
15	217.800	11.53	16.37	27.90	59.01	31.11	QP
16	223.950	-1.79	16.71	14.92	49.19	34.27	AV
17	291.150	11.11	19.89	31.00	60.91	29.91	QP
18	299.450	-1.52	20.57	19.05	51.10	32.05	AV
Frequency: 300~1000MHz							
1	367.400	-1.13	17.77	16.64	52.44	35.80	AV
2	393.700	10.31	17.83	28.14	62.90	34.76	QP
3	500.750	2.30	20.55	22.85	53.00	30.15	AV
4	508.800	13.35	20.52	33.87	63.00	29.13	QP
5	626.300	1.09	22.56	23.65	53.00	29.35	AV
6	628.800	13.28	22.56	35.84	63.00	27.16	QP
7	768.000	0.94	24.36	25.30	53.00	27.70	AV
8	803.650	12.73	24.14	36.87	63.00	26.13	QP
9	990.450	13.78	26.16	39.94	63.00	23.06	QP
10	994.700	1.51	26.24	27.75	53.00	25.25	AV

\*Level= Reading+Correct\_F

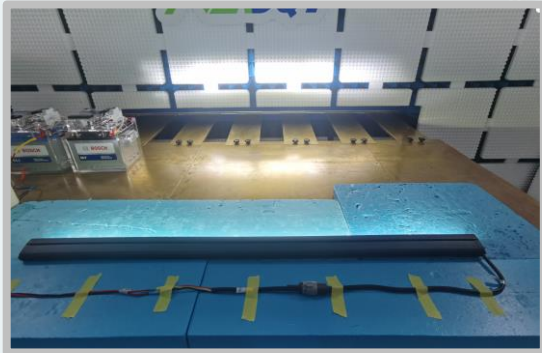
### 5.1.5 Test Photos



Biconical antenna



Log-periodic antenna



Particulars



## 5.2. Conducted transient disturbances

### 5.2.1 Test Limits

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

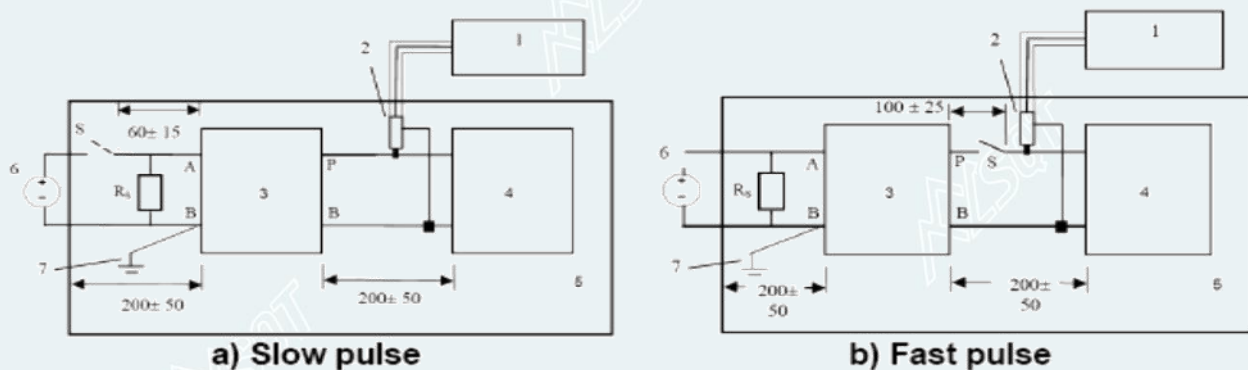
### 5.2.2 Used Test Equipment

Equipment	Equipment S/N	Manufacturer	Model No.	Calibration Due
Supply Voltage Change Simulator	GZST/YQ-EMC-10	3C-TEST	APS40C15	2024-06-29
Electronic Switch	GZST/YQ-EMC-24	SQT	ESS3030A	2024-06-29
L.I.S.N.	GZST/YQ-EMC-33	Lunar EM	AN-100A	2024-06-29
Digital phosphor oscilloscope	GZST/YQ-EMC-89	Tektronix	MDO3052	2024-02-09

### 5.2.3 Test Setup and Procedure

The test was set-up to the requirements of ISO 7637-2, Electrical transient conduction along supply lines only.

For conducted emission, all wiring connections between artificial network, switch, and the DUT shall 50mm + 10mm above the metal ground plane. The DUT shall be placed on a non-conductive material 50mm + 10mm above the ground plane. The artificial network shall be kept 200mm ± 50mm with the edge of the ground plane and DUT.

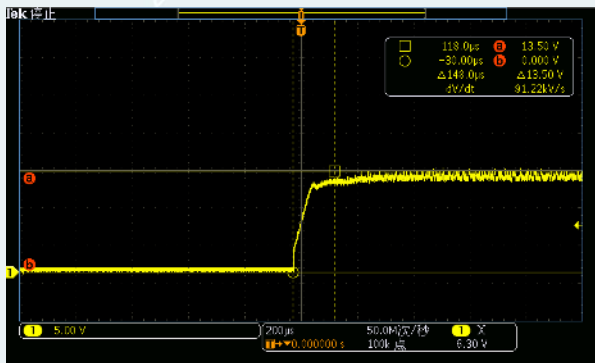


**Note:**

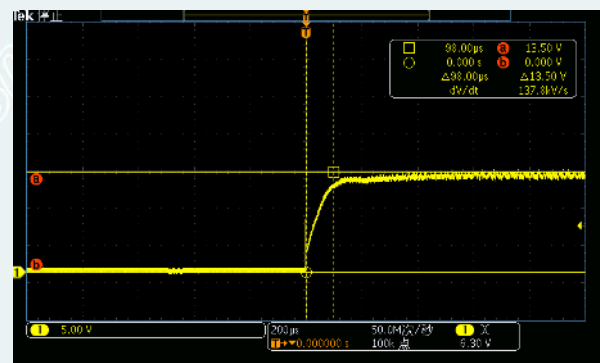
- |                              |                                      |
|------------------------------|--------------------------------------|
| 1 oscilloscope or equivalent | 5 ground plane                       |
| 2 voltage probe              | 6 power supply                       |
| 3 artificial network         | 7 Ground connection; length < 100 mm |
| 4 DUT (source of transient)  |                                      |

5.2.4 Test Results

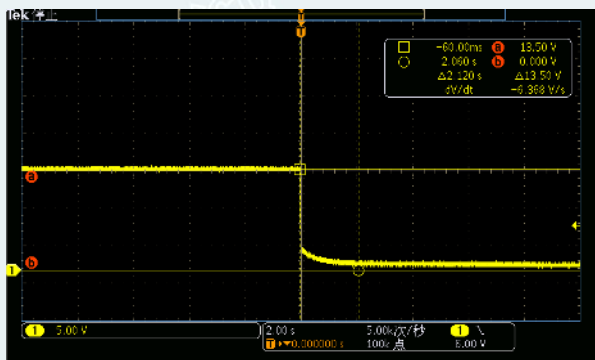
Sample NO.:	1#	Test Mode:	MO#1
Tested Voltage:	DC 13.5V	Environmental conditions:	24.1°C/45.8%RH
Results Conclusion:	Correct	Note:	/
Slow Pulse	Results	Fast Pulse	Results
OFF-->ON	+0V	OFF-->ON	+0V
ON-->OFF	-13.5V	ON-->OFF	-13.5V



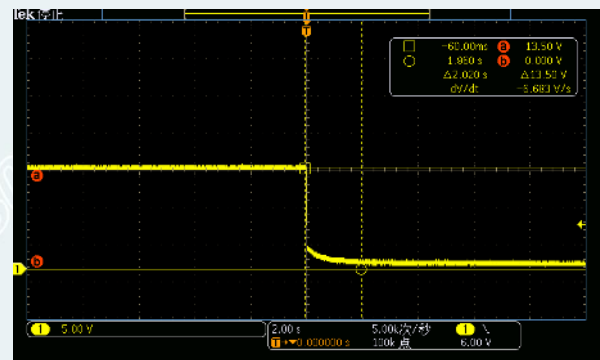
Slow Pulse: OFF-->ON Data Graph



Fast Pulse: OFF-->ON Data Graph



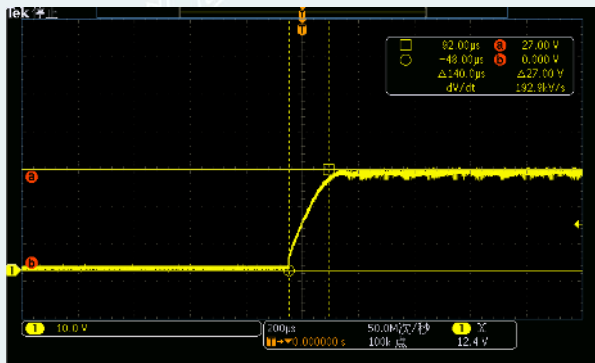
Slow Pulse: ON-->OFF Data Graph



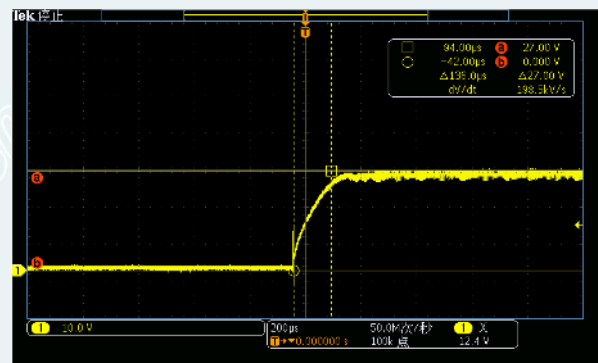
Fast Pulse: ON-->OFF Data Graph



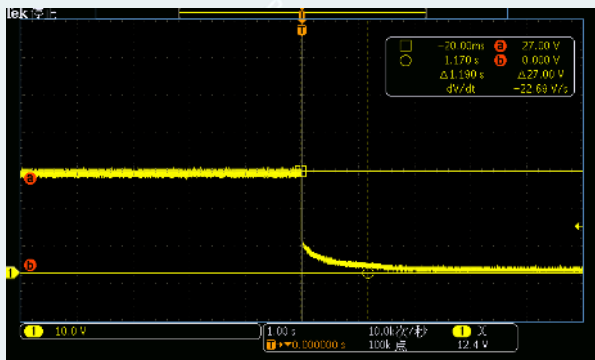
Sample NO.:	1#	Test Mode:	MO#1
Tested Voltage:	DC 27.0V	Environmental conditions:	24.1°C/45.8%RH
Results Conclusion:	Correct	Note:	/
Slow Pulse	Results	Fast Pulse	Results
OFF-->ON	+0V	OFF-->ON	+0V
ON-->OFF	-27.0V	ON-->OFF	-27.0V



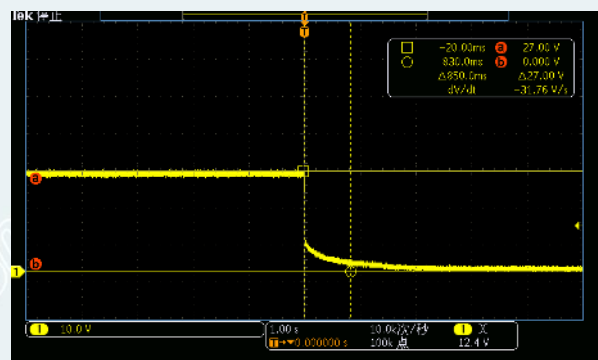
Slow Pulse: OFF-->ON Data Graph



Fast Pulse: OFF-->ON Data Graph

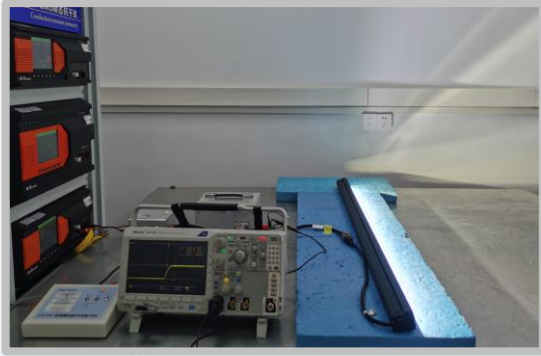


Slow Pulse: ON-->OFF Data Graph

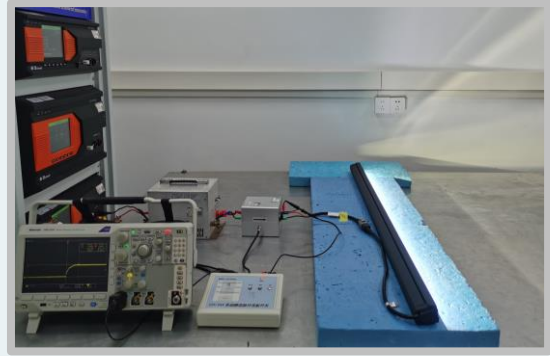


Fast Pulse: ON-->OFF Data Graph

### 5.2.5 Test Photos



Slow Pulse



Fast Pulse

### 5.3. Bulk Current Injection

#### 5.3.1 Test Required

Measurements shall be made in the 20MHz to 400MHz frequency range with steps according to ECE Regulation 10.06;

Test signal modulation: AM, with 1kHz modulation and 80% modulation depth in the 20-400MHz frequency range;

In case for the BCI (Bulk Current Injection) = 60mA;

BCI test method with substitution method and injection probe positioned at 150 mm distance to the ESA.

#### 5.3.2 Used Test Equipment

Equipment	Equipment S/N	Manufacturer	Model No.	Calibration Due
Anechoic chamber	GZST/YQ-EMC-02	A.M.T	SQT-ALSE-2#	2025-07-21
L.I.S.N.	GZST/YQ-EMC-32	Lunar EM	AN-100A	2024-06-29
L.I.S.N.	GZST/YQ-EMC-34	Lunar EM	AN-100A	2024-06-29
Amplifier	GZST/YQ-EMC-122	Vectawave	VBA400-110	2025-07-05
Signal generator	GZST/YQ-EMC-117	Agilent	N5181A	2024-06-29
Power meter	GZST/YQ-EMC-118	Keysight	E4419B	2024-06-29
Avg Power Sensor	GZST/YQ-EMC-119	Keysight	E9304A	2024-06-29
Avg Power Sensor	GZST/YQ-EMC-120	Keysight	E9304A	2024-06-29
Directional Coupler	GZST/YQ-EMC-121	SHX	DDTO-9K/1G-40-300	2024-06-29
Current Injection Clamp	GZST/YQ-EMC-81	FCC	F-120-8F	2024-08-28
Oscilloscope	GZST/YQ-EMC-89	Tektronix	MDO3052	2024-02-09
Testing software	GZST/SOFT-13	JSDENKI	JSDEMC	/

#### 5.3.3 Test Setup and Procedure

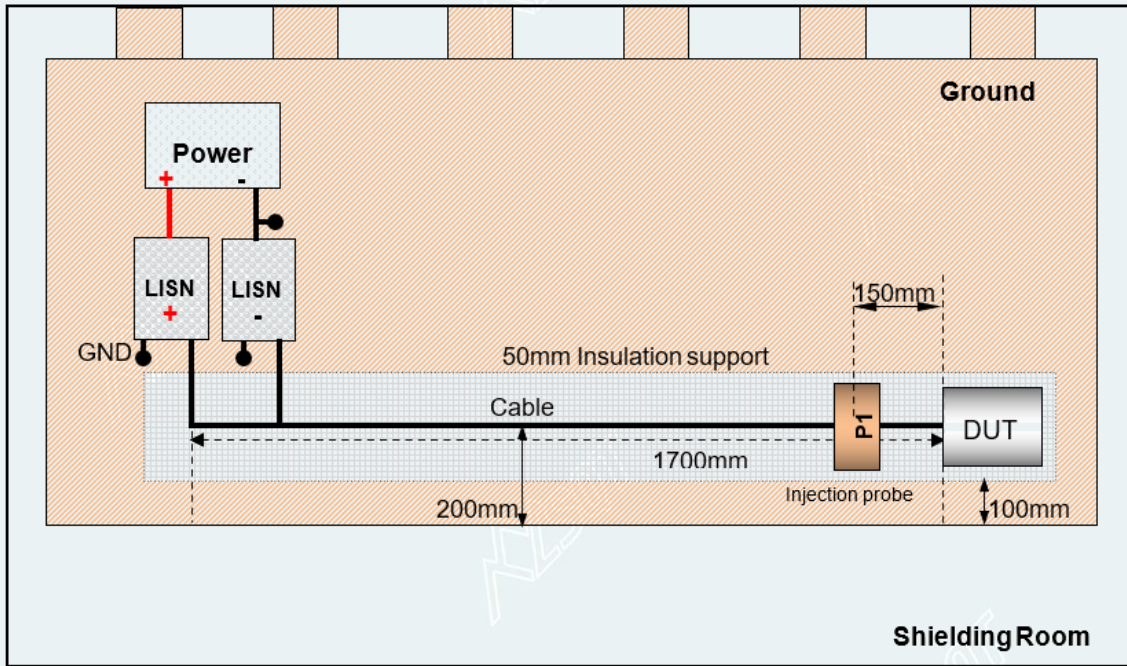
The DUT shall be placed on a non-conductive, low relative permittivity (dielectric constant) material ( $\epsilon_r \leq 1.4$ ), at  $(50 \pm 5)$  mm above the metallic surface of the table.

The case of the DUT shall not be grounded to the metallic surface of the table unless it is grounded in the actual vehicle.

The face of the DUT shall be located at least 100 mm from the edge of the ground plane.

There should be a distance at least 500 mm between the DUT and any metal part such as the walls of the shielded room, with the exception of the ground plane on which the DUT is placed.

Power supply is assumed to be negative ground. If the DUT utilizes a positive ground then the test set-ups shown in the figures need to be adapted accordingly. Power shall be applied to the DUT via  $5 \mu\text{H}/50 \Omega$  AN (see Annex C for artificial network schematic). Requirements vary depending on the intended DUT installation in the vehicle.



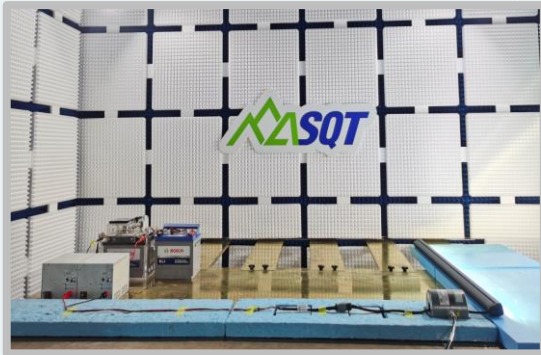
### 5.3.4 Test Results

Sample NO.	1#		Test Mode	MO#1
Tested Voltage	DC 13.5V		Environmental conditions	23.9°C/46.1%RH
Results Conclusion	Correct		Note	/
Frequency (MHz)	Level (mA)	Modulation	Injection place	Status
20-400	60	AM (1kHz,80%)	150mm	A

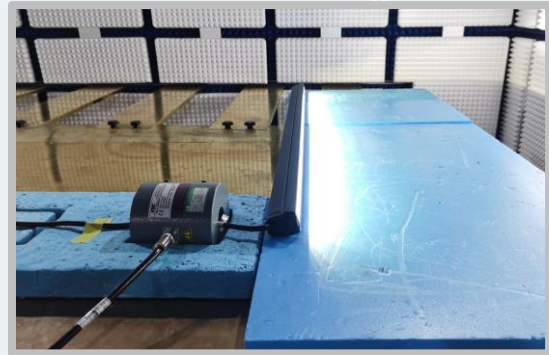
Sample NO.	1#		Test Mode	MO#1
Tested Voltage	DC 27.0V		Environmental conditions	23.9°C/46.1%
Results Conclusion	Correct		Note	/
Frequency (MHz)	Level (mA)	Modulation	Injection place	Status
20-400	60	AM (1kHz,80%)	150mm	A



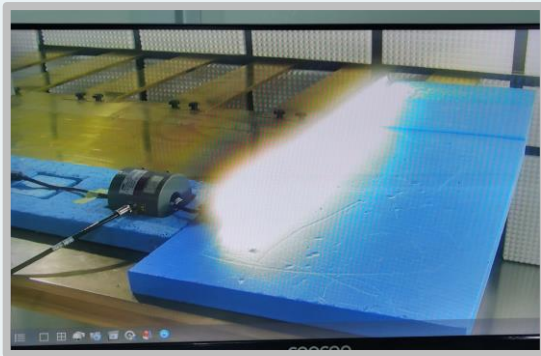
### 5.3.5 Test Photos



Overall photo



Particulars



Security photo

## 5.4. Radiated Immunity

### 5.4.1 Test Required

Measurements shall be made in the 400MHz to 2000MHz frequency range with steps according to ECE Regulation 10.06.

Test signal modulation:

AM, with 1kHz modulation and 80% modulation depth in the 400-800MHz frequency range.

PM,  $t=577\mu\text{s}$ , period  $4600\mu\text{s}$  in the 800-2000MHz frequency range.

In case for the Free field testing method  $=30$  volts/m.

The test shall be performed with vertical polarization.

### 5.4.2 Used Test Equipment

Equipment	Equipment S/N	Manufacturer	Model No.	Calibration Due
Semianechoic chamber	GZST/YQ-EMC-01	C.R.T	SQT-ALSE-1#	2025-07-21
L.I.S.N.	GZST/YQ-EMC-130	SCHWARZBECK	NNHV 8124-200	2024-08-28
L.I.S.N.	GZST/YQ-EMC-131	SCHWARZBECK	NNHV 8124-200	2024-08-28
Amplifier	GZST/YQ-EMC-58	MICOTOP	MPA-1000-6000-200	2025-08-30
Signal generator	GZST/YQ-EMC-59	R&S	SMB100A	2024-08-28
Power meter	GZST/YQ-EMC-60	Keysight	E4419B	2024-08-28
Avg Power Sensor	GZST/YQ-EMC-61	Keysight	E9304A	2024-08-28
Avg Power Sensor	GZST/YQ-EMC-30	Keysight	E9304A	2024-08-28
Amplifier	GZST/YQ-EMC-74	MICOTOP	MPA-80-1000-1000	2025-08-30
Log-periodic Antenna	GZST/YQ-EMC-62	SCHWARZBECK	STLP 9128 E	/
Horn Antenna	GZST/YQ-EMC-63	SCHWARZBECK	BBHA 9120 J	/
Manual RF switch	GZST/YQ-EMC-65	JSTOYO	JSDSW-M-B502	/
Field strength probe	GZST/YQ-EMC-64	Narda	EP602	2024-08-31
Testing software	GZST/SOFT-10	Tonsend	Ts+	/

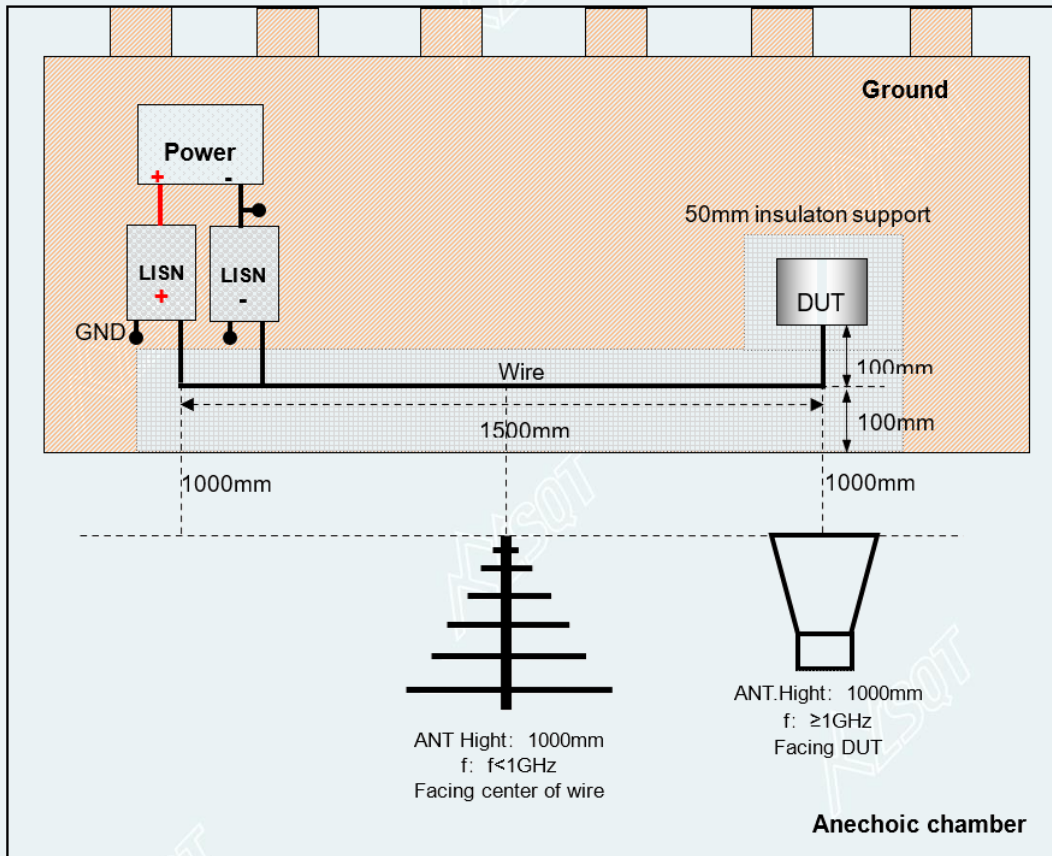
### 5.4.3 Test Setup and Procedure

The DUT shall be placed on a non-conductive, low relative permittivity (dielectric constant) material ( $\epsilon_r \leq 1.4$ ), at  $(50 \pm 5)$  mm above the metallic surface of the table.

The case of the DUT shall not be grounded to the metallic surface of the table unless it is grounded in the actual vehicle.

The face of the DUT shall be located at least 100 mm from the edge of the ground plane.

Power supply is assumed to be negative ground. If the DUT utilizes a positive ground then the test set-ups shown in the figures need to be adapted accordingly. Power shall be applied to the DUT via  $5\mu\text{H}/50\Omega$  AN (see Annex C for artificial network schematic). Requirements vary depending on the intended DUT installation in the vehicle.



### 5.4.4 Test Results

Sample NO.	1#		Test Mode	MO#1	
Tested Voltage	DC 13.5V		Environmental conditions	24.3°C/46.3%RH	
Results Conclusion	Correct		Note	/	
Frequency (MHz)	Level (V/m)	Modulation	Polarity	Accept Status	Test Status
400-800	30	AM (1kHz,80%)	V	A	A
800-1000	30	PM	V	A	A
1000-2000	30	PM	V	A	A



Sample NO.	1#		Test Mode	MO#1	
Tested Voltage	DC 27.0V		Environmental conditions	24.3°C/46.3%	
Results Conclusion	Correct		Note	/	
Frequency (MHz)	Level (V/m)	Modulation	Polarity	Accept Status	Test Status
400-800	30	AM (1kHz,80%)	V	A	A
800-1000	30	PM	V	A	A
1000-2000	30	PM	V	A	A

#### 5.4.5 Test Photos



Log-periodic Antenna



Horn Antenna

## 5.5. Conducted transient immunity

### 5.5.1 Test Limits

Pulse	Immunity level	Vehicles with 12V systems	Vehicles with 24V systems	Performance criteria
1	III	-75V	-450 V	C
2a	III	+37 V	+37 V	A
2b	III	+10 V	+20 V	C
3a	III	-112 V	-150 V	A
3b	III	+75V	+150V	A
4	III	-6 V	-12 V	B/C

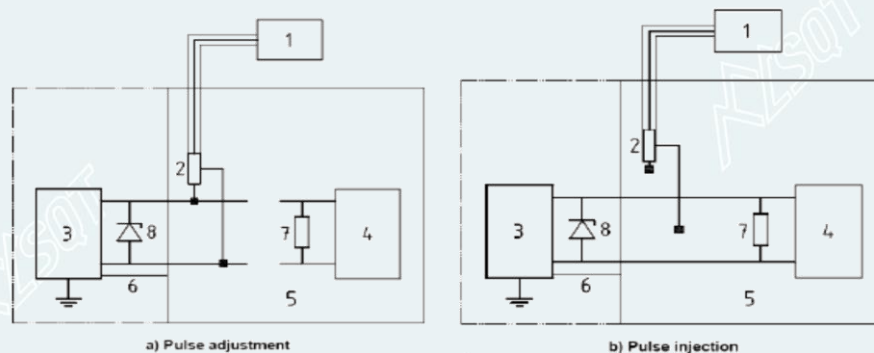
### 5.5.2 Used Test Equipment

Equipment	Equipment S/N	Manufacturer	Model No.	Calibration Due
Supply Voltage Change Simulator	GZST/YQ-EMC-10	3C-TEST	APS40C15	2024-06-29
Load dump wave simulator	GZST/YQ-EMC-11	3C-TEST	LDS200N30	2024-06-29
Transient pulse disturbance simulator	GZST/YQ-EMC-12	3C-TEST	TIS700	2024-06-29
Testing software	GZST/SOFT-05	3C-TEST	2.3.3.0	/

### 5.5.3 Test Setup and Procedure

For transient immunity, the supply lines between the terminals of the test pulse generator and the DUT shall be laid out in a straight parallel line at a height of 50mm + 10mm above the ground plane and shall have a length of  $0.5\text{m} \pm 0.1\text{m}$ .

The measurements were made to the requirements of EN 50498 for an ESA, section 7.4, Specifications concerning the immunity to transient disturbances conducted along supply lines. The test was set-up to the requirements of ISO 7637-2:2004 Electrical transient conduction along supply lines only.



**Note:**

1. oscilloscope or equivalent
2. voltage probe
3. test pulse generator with internal power supply resistance  $R_i$
4. DUT
5. ground plane
6. Ground connection (maximum length for test pulse 3: 100 mm)
7. optional resistor ( $R_v$ )<sup>a</sup>
8. optional diode bridge<sup>b</sup>

**Performance Criteria:**

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

**Class B:** all functions of a device/system perform as designed during exposure; however, one or more of them may go beyond the 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 or system do not perform as designed during exposure but return automatically to normal operation after exposure is removed.

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

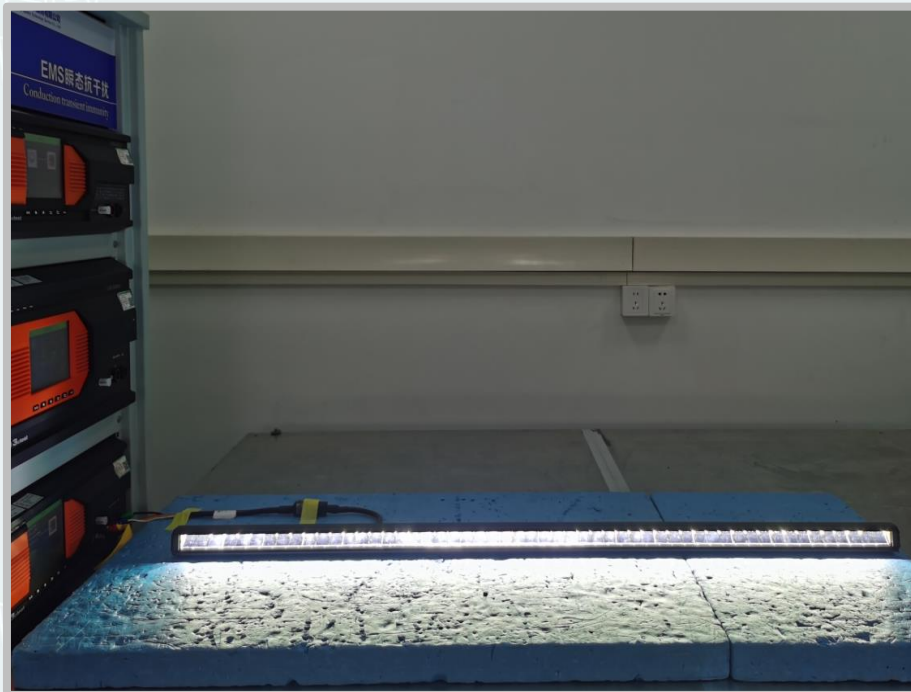
**Class E:** one or more functions of a device or system do not perform as designed during and after exposure and cannot be returned to proper operation without repairing or replacing the device or system.

**5.5.4 Test Results**

Sample NO.:	1#	Test Mode:	MO#1
Tested Voltage:	DC 13.5V	Environmental conditions:	24.2°C/45.9%RH
Results Conclusion:	Correct	Note:	Power Port
Test Pulses	12V System	Pulse duration repetition time	Results
1	-75V	Ri=10Ω, td=2ms, tr=1μs, t1=1s, t2=200ms, t3<100μs	C
2a	+37 V	Ri=2Ω, td=0.05ms, tr=1μs, t1=5s	A
2b	+10 V	Ri=0Ω, td=1s, t12=1ms, tr=1ms, t6=1ms	C
3a	-112 V	Ri=50Ω, td=0.1μs, tf=5ns, t1=100μs, t4=10ms, t5=90ms	A
3b	+75 V	Ri=50Ω, td=0.1μs, tr=5ns, t1=100μs, t4=10ms, t5=90ms	A
4	-6 V	Va=-2.5V, Ri=0Ω, t8<50ms, t9=10s, t10=5ms, t11=5ms to100ms	C

Sample NO.:	1#	Test Mode:	MO#1
Tested Voltage:	DC 27.0V	Environmental conditions:	24.2°C/45.9%RH
Results Conclusion:	Correct	Note:	Power Port
Test Pulses	24V System	Pulse duration repetition time	Results
1	-450 V	Ri=50Ω, td=1ms, tr=3μs, t1=1s, t2=200ms, t3<100μs	C
2a	+37 V	Ri=2Ω, td=0.05ms, tr=1μs, t1=5s	A
2b	+20 V	Ri=0Ω, td=1s, t12=1ms, tr=1ms, t6=1ms	C
3a	-150 V	Ri=50Ω, td=0.1μs, tf=5ns, t1=100μs, t4=10ms, t5=90ms	A
3b	+150 V	Ri=50Ω, td=0.1μs, tr=5ns, t1=100μs, t4=10ms, t5=90ms	A
4	-12 V	Va=-12V, Ri=0Ω, t8<50ms, t9=10s, t10=10ms, t11=10ms to 100ms	B

### 5.5.5 Test Photos



Overall photo



## 6. Photographs of DUT



DUT photo1



DUT photo2

\*\*\*\*\*End of Page\*\*\*\*\*