

7.4.3. EQ/MC 03: MEASUREMENT OF RADIO FREQUENCY CONDUCTED NOISES ON THE POWER SUPPLY INPUTS

7.4.3.1. Reference document

This test procedure is based on the CISPR 25 publication, except as regards the extension in low frequency to 100 kHz.

7.4.3.2. Purpose of the test

This test is intended to evaluate the radio frequency disturbances emitted by conduction, by the DUT and its power supply wiring.

The wires concerned by the test are the following:

- All the power supply + wires for the DUT taken as a whole in the case of local grounding.
- On all the power supply + wires taken as a whole then grounding in the case of offset grounding from the DUT

7.4.3.3. Conditions for application of the test

This test is applied to the equipment in which at least one of the following conditions is fulfilled:

- The equipment contains a frequency oscillator greater than 9kHz
- The equipment contains an electric motor.
- The equipment is supplied in power by a PWM
- The equipment contains one or several transistors (example : LED lights)

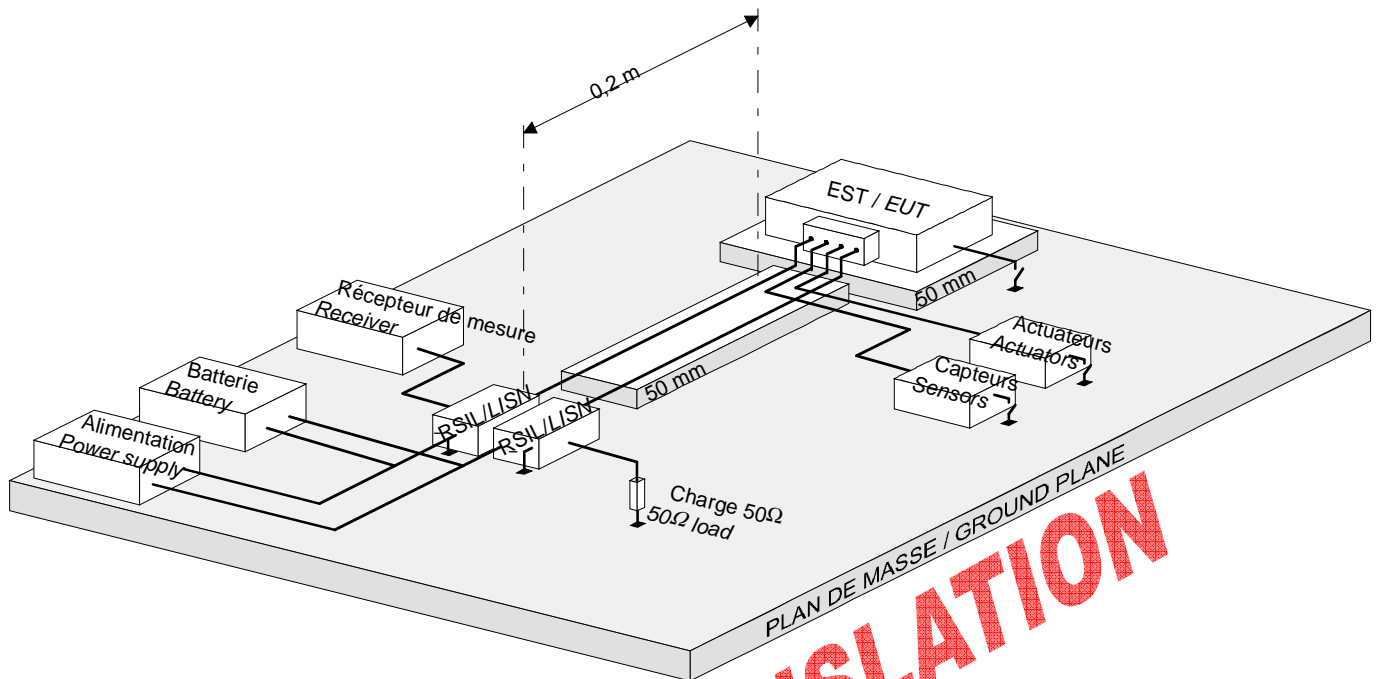
应用条件

This test is not directly applied on the possible high voltage power supply lines ("200V"). The measurement conditions specific to this network are specified in the EQ/MC_HV_01 test.

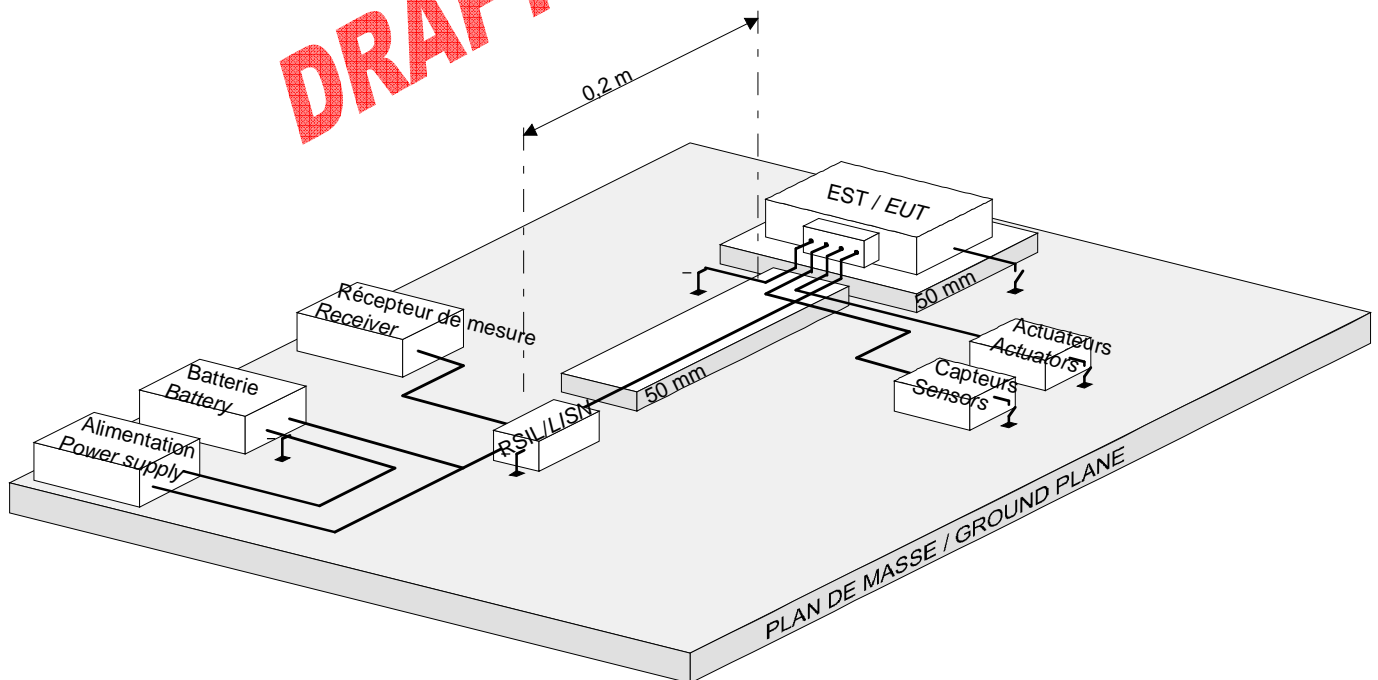
7.4.3.4. Test means

- Power supply and battery.
- Devices necessary for the verification of the proper operation of the DUT.
- DUT environment, real (sensors, actuators) or simulated.
- Insulating support of 50mm thickness.
- LSIN compliant with the CISPR 25 publication (2 LSIN for a DUT with offset grounding), and/or 2 high voltage LSIN (with a shielding connected to the shielding of the high voltage lines) depending upon the power supply type of the DUT.
- 50 Ω load
- Receiver or spectrum analyzer and possibly preselector
- Shielded chamber.

7.4.3.5. Assembly



DUT remotely connected to the ground



DUT locally connected to the ground

7.4.3.6. Procedure

Preparation:

Preferably, a wiring harness of maximum length of 2000 mm should be used (possibly, the real wiring harness can be used). The test wiring harness is placed on an insulating support of 50 mm thickness. The length of the 12V power supply wires should be 200^{+200}_0 mm.

The potential high voltage power supply cables ("200V") will be connected to high voltage LSIN (with a shielding connected to the shielding of high voltage lines), through a length of 1000^{+300}_0 mm. These cables will be placed on an insulating support of 50 mm thickness.

The other wires should be plated directly on the ground plane at a minimum distance of 200 mm from the power supply wires

The DUT is placed on an insulating support of 50 mm thickness. It is connected to the ground plane in conformity with its real installation on vehicle, and no other grounding connection is authorized.

In the case of use of several LSIN, the measurement device is successively connected on each LSIN. The non connected LSIN(s) are loaded by 50Ω.

Calibration:

This test does not require any specific calibration.

Parameters of the measuring device:

The following detectors are used:

- peak detector for the evaluation of the levels in relation to the "peak" limit,
- average value detector for the evaluation of the levels in relation to the "average value" limit,
- quasi peak detector can be used (if required) in the 150 kHz – 300 kHz, 530 kHz – 2 MHz and 76-108 MHz bands, for the evaluation of levels in relation to the "quasi-peak" limit.

Note: to reduce the scanning time it is possible to carry out the measurements with a peak detector only. If the measured value is less than the "average value" limit, then the result is accepted.

The values of the bandwidth and scanning times are the following:

- For the spectrum analyzers:

Service / Frequency band (MHz)		Peak detector		Quasi peak detector		Average value detector	
		Band width at -3 dB	Scanning time	Band width at -6 dB	Scanning time	Band width at -3 dB	Scanning time
ADML system	0.1 – 0.15	100Hz	100s/MHz	Not applicable	Not applicable	Not applicable	Not applicable
AM radio and mobile services	0.15 - 30	9/10 kHz	10 s / MHz	9 kHz	200 s / MHz	9/10 kHz	10 s / MHz
FM radio	76 - 108	100/120 kHz	100 ms / MHz	120 kHz	20 s / MHz	100/120 kHz	100 ms / MHz

- For the receivers:

Service / Frequency band (MHz)		Peak detector			Quasi peak detector			Average value detector		
		Band width at -6 dB	step	Holding time	Band width at -6 dB	step	Holding time	Band width at -6 dB	step	Holding time
ADML system	0.1 – 0.15	200Hz	100Hz	500ms	does not apply	does not apply	does not apply	does not apply	does not apply	does not apply
AM radio and mobile services	0.15 - 30	9 kHz	5 kHz	50 ms	9 kHz	5 kHz	1 s	9 kHz	5 kHz	50 ms
FM radio	76 - 108	120 kHz	50 kHz	5 ms	120 kHz	50 kHz	1 s	120 kHz	/ 50 kHz	5 ms

Note: for the transmissions generated by the brush motors that do not have any electronic control unit, the maximum frequency step can be increased up to 5 times the bandwidth.

Note: A surveyor based on a Fourier transformation method can be used for the transmission measurements. It should sample and evaluate the signal continuously during the measurement time. The minimum measurement time as well as the timing considerations are defined in the CISPR 16-2-3 and 3.1 (chapters 6.6.2 and 6.6.6).

Test:

Run the DUT for a minimal period of 10 minutes. Carry out the measurements, with peak detection (quasi-peak) and with average value detection at the LSIN terminals.

Test report:

The test report should, among other things, include the following elements:

- Assembly used: wiring harness, DUT environment.
- The operating procedures of the DUT likely to have an impact on the test result (consumption, PWM cyclic ratio...)
- Curve per measurement with: F, V_{avg} , V_{peak} , $V_{quasi-peak}$ (if requested), peak limits, average value and possibly quasi-peak (voltages in dBuV)
- Table of overruns with: F (in MHz with 3 digits after the comma), V_{avg} , V_{peak} , $V_{quasi-peak}$, deviation/peak limit and deviation/ average value limit or possibly deviation /quasi-peak limit (voltage in dBuV, deviation in dB). In the case of continuous overruns (broad band noise) on a frequency band, only the maximum overrun is required.

In addition to the test report, all the F data (in MHz with 3 digits after the comma), V_{avg} , V_{peak} or $V_{quasi-peak}$, average value, peak and possibly quasi-peak limits (voltages in dBuV), wire(s) measured should be provided in digital form in an Excel table in this order.

7.4.3.7. Requirements

The values measured at the LSIN terminals, in peak detection and in average value detection should not exceed the following values (the two peak and average value requirements should be satisfied):

Services and frequencies (MHz)		Peak limit detector "permanent" noises		Peak limit detector "short duration" noises (1)		Average value limit detector	
		Class	Limit in dBuV	Class	Limit in dBuV	Class	Limit in dBuV
ADML system (4)	0.10 – 0.15	–	80	–	–	–	–
LW (2)	0.15 – 0.30	4	80 67 (quasi peak) (3)	3	86 73 (quasi peak) (3)	4	60
MW (2)	0.53 – 1.8	3	70 57 (quasi peak) (3)	2	76 63 (quasi peak) (3)	3	50
SW (2)	5.9 – 6.2	3	65	2	71	3	45
CB	26 - 28	3	56	2	62	3	36
VHF	30 - 54	2	62	1	68	2	42
VHF	68 – 87	4	44	3	50	4	24
FM (2)	76 - 108	4	44 31 (quasi peak) (3)	3	50 37 (quasi peak) (3)	4	24

(1) Unless otherwise specified, the "short duration" qualification corresponds to the equipment whose use is less than a minute (examples such as window-lift noise, windscreen washer pump; examples of constant noises: wind screen wiper, GMV...).

(2) In the case of equipments located close to the receiving or AM and/or FM screen printed antenna (rear window, quarter panel, top of the windscreen...), these levels should get their severity increased by 10 db in the considered frequency bands. This case is to be specified in the TNS/TS or the EMC test plan.

(3) The given levels with quasi-peak detector are applicable on specific request (example: PWM signals...)

(4) The limit in the 100-150kHz band is not applicable to equipments which are localized under the hood.

(5) The measurements lower than 30MHz should be carried out on the entire band at 0.1 – 30MHz, even if no limit is applied in certain sub-bands.

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