日程表/Agenda

日期 Date	时间 Time	内容/Contents	主讲 Lecturer	主持 Host
6/27	12:00-20:00	报 到/ Registration （18:00－19:00 自助晚餐）	—	—
6/28	8:00-9:00	(27 日未报到者)会议报到 Registration	—	许秀香 Xu Xiuxiang
	9:00-9:15	**会议正式开始** 领导致辞 Opening address by Hou Hualiang from CATARC	侯华亮 Hou Hualiang	
	9:15-9:30	JASIC 方面致辞 Message by Ushio Ueno from JASIC	Ushio Ueno	
	9:30-10:00	中国汽车电子标准体系及电磁兼容标准化工作动态 Automotive electronics& EMC standardization of China	侯华亮 Hou Hualiang	
	10:00-11:00	车辆 EMC & ECE R10-03 整车与认证 R10(EMC) for vehicle and certification	Akihiko Nojima	
	11:00-11:20	茶歇 Coffee Break	—	
	11:20-11:50	汽车电磁兼容标准与电动车 Vehicle EMC Standard and E-Vehicle	刘新亮 Liu Xinliang	
	11:50-12:20	汽车抛负载试验脉冲特性及 TVS 管应用示例 Automotive load-dump test pulse characteristics and TVS diode applications	孙成明 Sun Chengming	
	12:20-13:30	自助午餐 Buffet Lunch	—	
	13:30-14:20	ECE R10-03 概要-电子电气部件 R10(EMC) for parts	Kazuo Sakakibara	侯华亮 Hou Hualiang
	14:20-14:50	电动汽车电磁兼容测试情况及整改建议 Electric vehicles – EMC testing and rectification	高明秋 Gao Mingqiu	
	14:50-15:10	茶歇 Coffee Break	—	
	15:10-15:40	电动汽车电磁兼容性-测试经验与标准化 Electromagnetic Compatibility of Electric Vehicles – Testing Experience and Standardization	Gernot Steinmair	
	15:40-16:10	GBT18655-2010 中有关技术内容的解析 Analysis on GB/T 18655-2010 (CISPR25: 2008)	崔强 Cui Qiang	
	16:10-17:00	提问解答和讨论 Q & A, Discussion		
	注：每位专家演讲结束后有不超过 10 分钟的代表提问解答时间。 Note: After each speech there may be a Q & A about 10 minutes.			

Vehicle EMC & ECE R10-03

1. Vehicle EMC
2. R10-03 international certification
3. ECE R10-03 technical requirements & testing
   - ＊Vehicle test
   - ＊Component test
4. Electrical vehicle certification and ECE-R10/04

Akihiko Nojima
Kazuo Sakakibara
JASIC EMC W/G

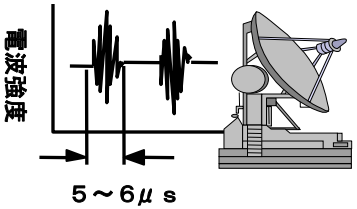
R10 Technical Requirements & Testing For Vehicle

[1] Vehicle Electro Magnetic Compatibility

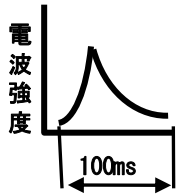
1.1 Immunity (Susceptibility for Strong Electro-magnetic Field)

◆Purpose

the ability of a vehicle to operate without degradation of performance in the strong electromagnetic disturbances which includes radio frequency from radio transmitters or broadcasting.



Aviation Radar



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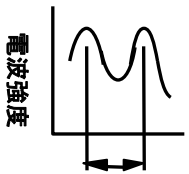
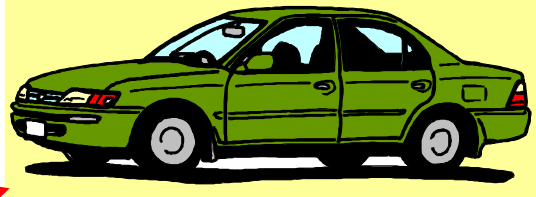
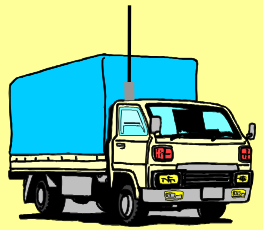
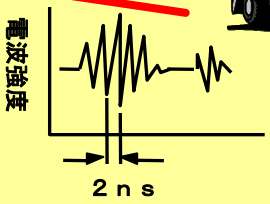


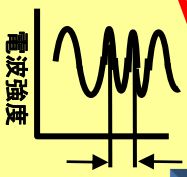
High Voltage Power cable

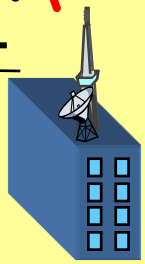






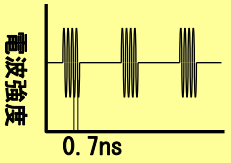
Amateur Radio





Broadcasting Tower

Cellular



ECE-R10

[1] Vehicle Electro Magnetic Compatibility

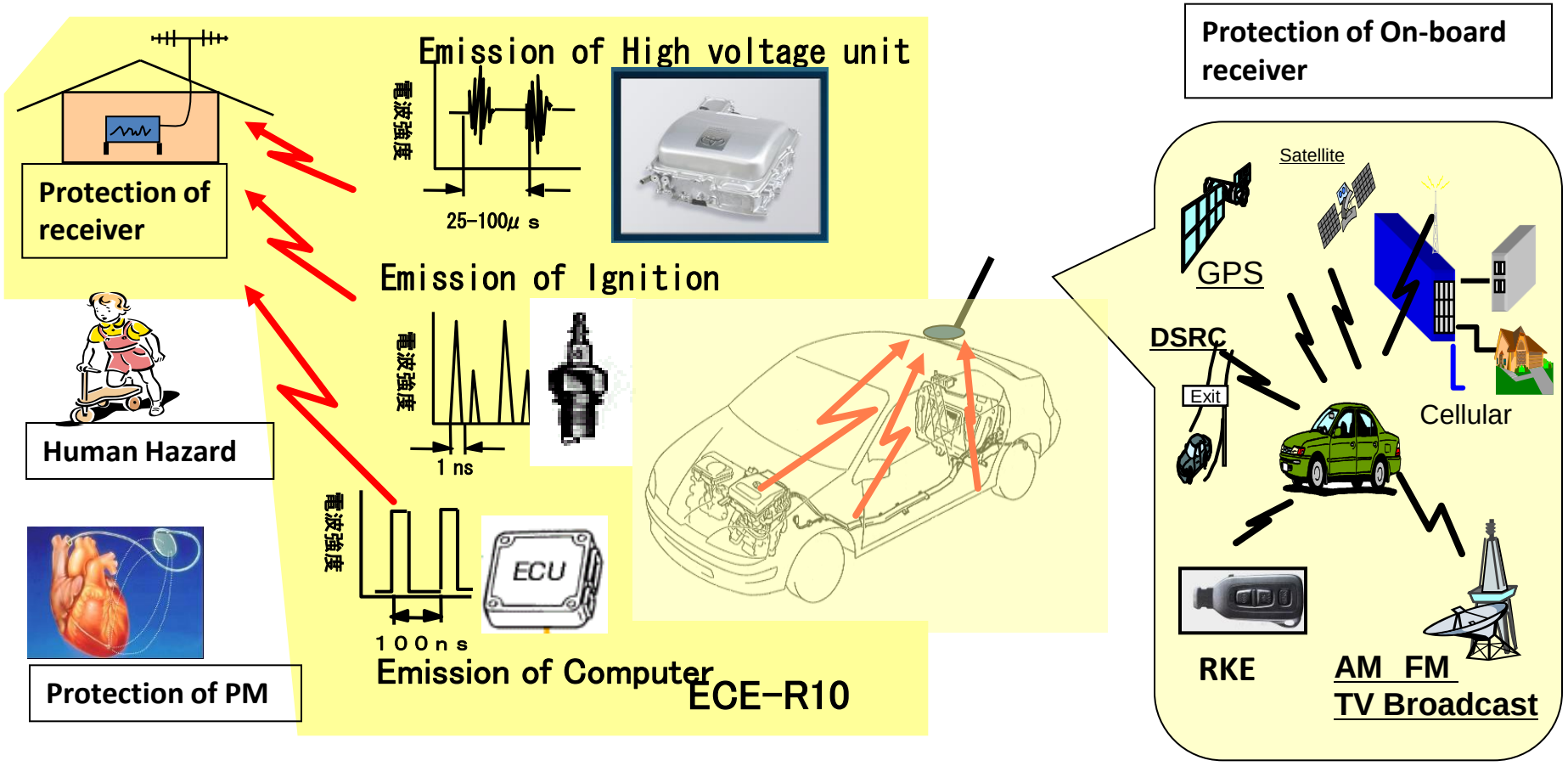
1.2 Electro-magnetic Emission

◆Purpose

Regulation : the protection of off-board receivers of residential and/or adjacent vehicles

Guideline for limiting exposure to electromagnetic field of Health, and Protection of Pace-Maker

Marketability : the protection of on-board receivers (FM radio, GPS, Cellular e.g.)



[2] ECE R10-03

ECE/TRANS/WP.29

World Forum for Harmonization of Vehicle Regulations

ECE R10-03

Harmonized EMC regulations based on uniform technical prescription of IEC & ISO

Referred as test standard

IEC

Emission test

CISPR 12&25

ISO

Immunity test

ISO11451/11452, 7637

IEC: International Electro Technical Commission

CISPR:

(Comite international Special des Perturbations Radioelectriques)

SC/D D sub committee : Vehicle

ISO: International Standard Organization

TC22 : Road Vehicle

SC3 : (Electrical and electronic equipment)

WG3 : (Electrical interferences)

[2] ECE R10-03

●: Applied ECE-R10 ○: Domestic regulation

Area	Contracting Parties	Emission	Immunity	
Europe	EU	●	●	EC directive applied the ECE regulation
	Russian	●	●	
North America	USA	SAE	SAE	
	Canada	○		
Asia/ Pacific	Japan	●	●	
	China	○		
	India	○	(○) 2013-	Equivalent R10
	Australia	○	○	Equivalent R10

[3] ECE R10-03

R10-03/04 for conventional vehicle and referred standards

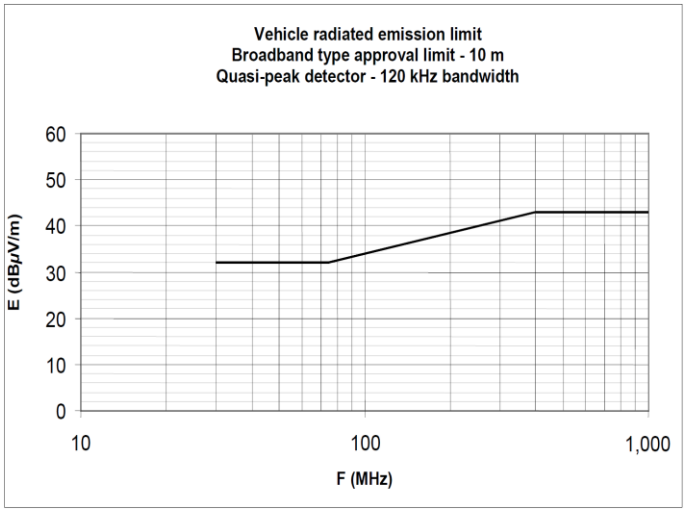
		Test item		CISPR/ISO	
Annex 4	Vehicle test	Vehicle: Broadband emission		CISPR12.5.1	2005
Annex 5		Vehicle: Narrowband emission		CISPR12.5.1	
Annex 6		Vehicle immunity	ALSE	ISO11451-2	
			BCI	ISO11451-4	
Annex 7	Electrical Sub-Assembly ESA test	Parts: Broadband emission		CISPR25.2	2004
Annex 8		Parts: Narrowband emission		CISPR25.2	2004
Annex 9		Parts: Immunity		ISO11452-1	2008
			ALSE	ISO11452-2 ed2	2004
			TEM	ISO11452-3 ed3	2001
			BCI	ISO11452-4 ed3	2009
			STRIP-LINE	ISO11452-5 ed2	2002
Annex 10		Parts: testing for immunity and emission of transients		ISO7637	2008

R10 utilize the definition of NB, BB so keep 12 5th

[3] ECE R10-03

Annex.4 Broadband emission test

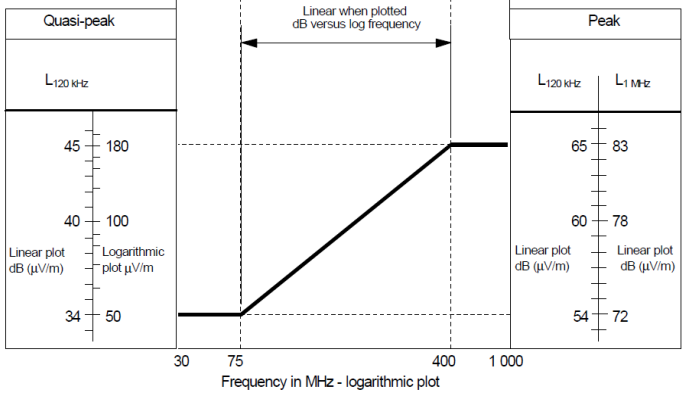
R10-03/04



CISPR12

Limit L_{bw} in dB (µV/m) as a function of bandwidth, detector and frequency f in MHz

L_{bw}	30-75 MHz	75-400 MHz	400-1000 MHz	Measurement type
$L_{120\ kHz}$	34	34 + 15,13 lg (f/75)	45	Quasi-peak
$L_{120\ kHz}$	54	54 + 15,13 lg (f/75)	65	Peak
$L_{1\ MHz}$	72	72 + 15,13 lg (f/75)	83	Peak



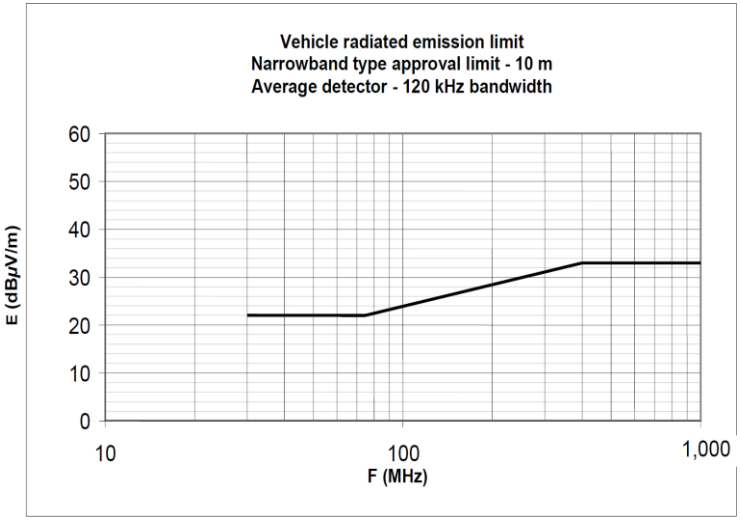
Test method ： Annex.4 Broadband emission test
Referred the CISPR12.5

Limit: equivalent, -2dB compare to the CISPR limit
for single sample test

[3] ECE R10-03

Annex.5 Narrowband emission test

R10-03/04



CISPR12

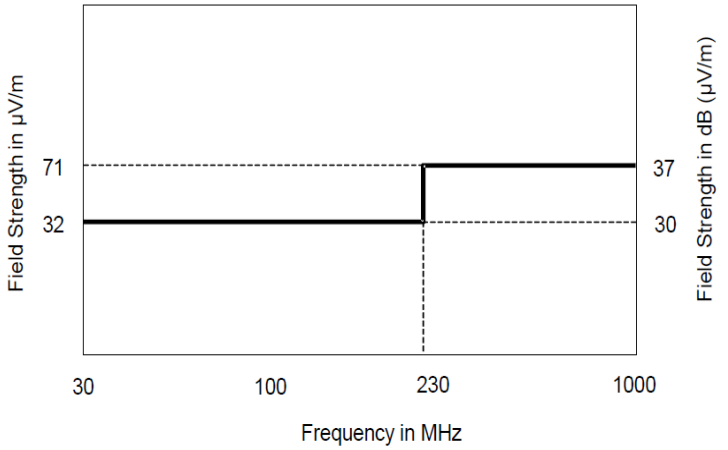


Figure 3 - Limits of disturbance (average detector) at 10 m antenna distance

Test method ： Annex.5 Narrowband emission test
Referred the CISPR12.5

Limit: -20dB compare to QP limit of Broadband.

[3] ECE R10-03

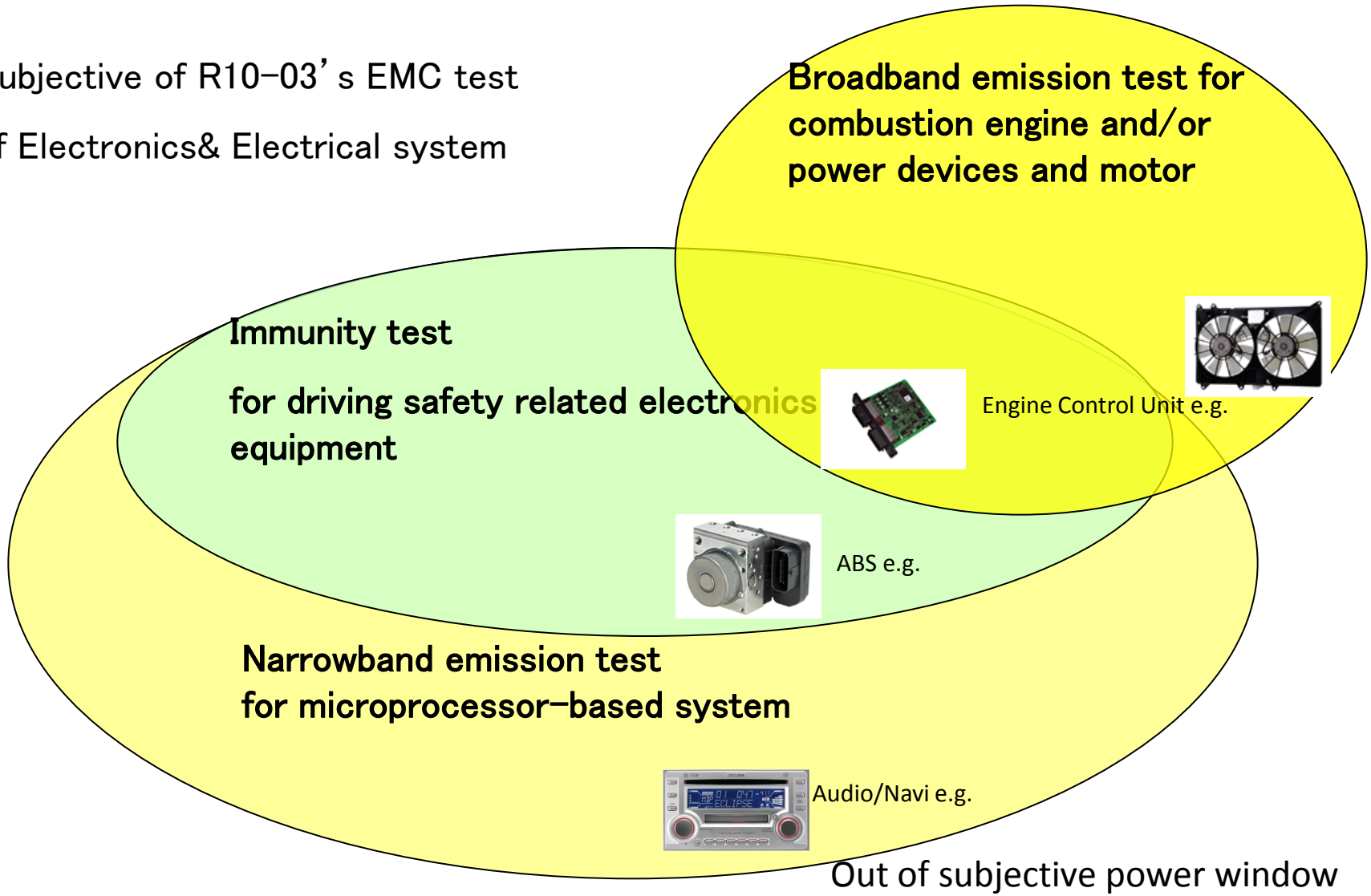
3.2 Vehicle Immunity test

	Test Standard	ISO Test condition		EU directives ECE-R10
Immunity (20MHz -2 GHz)	ISO 11451-2	Field Strength (V/m)	**Level 1: 25 Level 2 : 50 Level 3: 75 Level 4: 100**	30V/m (COP=24V/m)
		Polarization	**Horizontal & Vertical**	Vertical
		Modulation	**CW, AM & PM**	20MHz-800MHz AM 800MHz-2000MHz PM
		Vehicle condition	**TBD in test plan**	**"50 km/h cycle" vehicle test conditions** + **"Brake cycle" vehicle test conditions**

[3] ECE R10-03

Subjective of R10-03's EMC test

of Electronics& Electrical system



Out of subjective power window motor e.g.

[3] ECE R10-03

Subjective of immunity test

Definition in R10-03	Examples in JAMA with EU technical service
(a) Functions related to the direct control of the vehicle: (i) by degradation or change in: (ii) by affecting drivers position: (iii) by affecting driver's visibility:	Engine Control , Cruise Control, ABS,VSC,ECB,E-Parking Brake E-Power Steering, Lane keep assist Power Sheet control Wiper control, AFS (Adaptive Front lighting)
(b) Functions related to driver, passenger and other road user protection:	Air-Bag, Pre-Crash Safety
(c) Functions which when disturbed cause confusion to the driver or other road users: optical disturbances: incorrect operation acoustical disturbances: incorrect operation	Head-lamp leveling, Turn signal, Alarm
(d) Functions related to vehicle data bus functionality: by blocking data transmission on vehicle data bus-systems, which are used to transmit data, required to ensure the correct functioning of other immunity related functions.	Gateway to a,b&c system
(e) Functions which when disturbed affect vehicle statutory data:	Meter, speed limiter odometer

[3] ECE R10-03

Vehicle condition in immunity test

	R10 description	**Real operation in JAMA**
Vehicle speed	The engine shall normally turn the driving wheels at a steady speed of 50 km/h if there is no technical reason due to the vehicle to define a different condition For vehicles of categories L1 and L2 the steady speed shall normally be turned at 25 km/h.	M,N=50km/hr L=25km/hr as general test condition but 70km/hr or different speed are applied to confirm the HV or other immunity related function
CDM condition	The vehicle shall be on an appropriately loaded dynamometer or alternatively supported on insulated axle stands with minimum ground clearance if no dynamometer is available. Where appropriate, transmission shafts, belts or chains may be disconnected (e.g. trucks, two- and three wheel vehicles).	With CDM and Without CDM both test methods are applied in R10 vehicle test. In Brake circle test, speed signal simulator is applied to simulate wheel speed deviation signal in braking condition.

[3] ECE R10-03

Vehicle condition in immunity test

	R10 description	**Example of vehicle condition in JAMA's test plan**
Electrical system's condition	Dipped beams ON Front wiper ON maximum speed Direction indicator on driver's side ON Adjustable suspension in normal position Driver's seat and steering wheel in medium position Alarm unset Horn OFF Airbag and safety restraint systems operational with inhibited passenger airbag if this function exists Automatic doors closed Adjustable endurance brake lever in normal position	Set CCS. Front wiper manual on at High Direction indicator driver's side on. Set driver's seat and steering wheel at not end position. A sound apparatus is a silent state, i.e. Alarm unset, Horn OFF, Audio system OFF. Airbag operational with inhibited passenger airbag. If necessary, A/C off. Rear fog lamp off.

[3] ECE R10-03

Vehicle condition in immunity test in R10-03 Annex.6

"50 km/h cycle" vehicle test conditions	Failure criteria
Vehicle speed 50 km/h (respectively 25 km/h for L_1, L_2 vehicles) +/- 20 per cent (vehicle driving the rollers). If the vehicle is equipped with a cruise control system, it shall be operational.	Speed variation greater than +/- 10 per cent of the nominal speed. In case of automatic gearbox: change of gear ratio inducing a speed variation greater than +/- 10 per cent of the nominal speed.
Dipped beams ON (manual mode)	Lighting OFF
Front wiper ON (manual mode) maximum speed	Complete stop of front wiper
Direction indicator on driver's side ON	Frequency change (lower than 0.75 Hz or greater than 2.25 Hz). Duty cycle change (lower than 25 per cent or greater than 75 per cent).
Adjustable suspension in normal position	Unexpected significant variation
Driver's seat and steering wheel in medium position	Unexpected variation greater than 10 per cent of total range
Alarm unset	Unexpected activation of alarm
Horn OFF	Unexpected activation of horn
Airbag and safety restraint systems operational with inhibited passenger airbag if this function exists	Unexpected activation
Automatic doors closed	Unexpected opening
Adjustable endurance brake lever in normal position	Unexpected activation

[3] ECE R10-03

JAMA's experience

Function	・Check Item	・Monitor	・Criteria　Red is defined in Annex 6
Engine management (with Cruise control & Transmission control)	・Vehicle speed by the combination meter or chassis dynamometer revolution. ・Check engine lamp. ・CCS lamp.	・Monitor camera inside the vehicle or chassis dynamometer revolution.	・No remarkable speed deviation*1 between the condition of reference field strength and that of no field strength. *1: ex. 50±10km/h &control error. ・No check engine lamp turns on. ・No change of shift position.
EMPS system	・Steering and test vehicle movement. ・Warning light.	・Monitor camera inside & outside the vehicle.	・No movement of the steering. ・No warning light turns on. ・No unexpected test vehicle movement.
Airbag system	・Airbag warning lamp. ・Deployment of airbag.	・Monitor camera inside the vehicle.	・No airbag warning lamp turns on. ・No deployment of airbag.
DRL, Light control system, Fr controller, Rear fog lamp	・Headlamp ・Rear fog lamp. ・Horn.	・Monitor camera inside & outside the vehicle.	・No headlamp ・No rear fog lamp turns on ・No ring horn.

[3] ECE R10-03

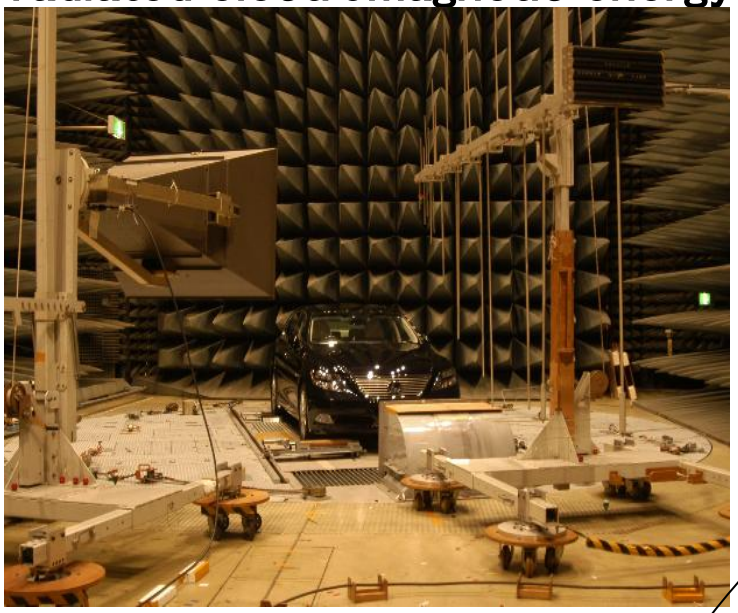
JAMA's experience

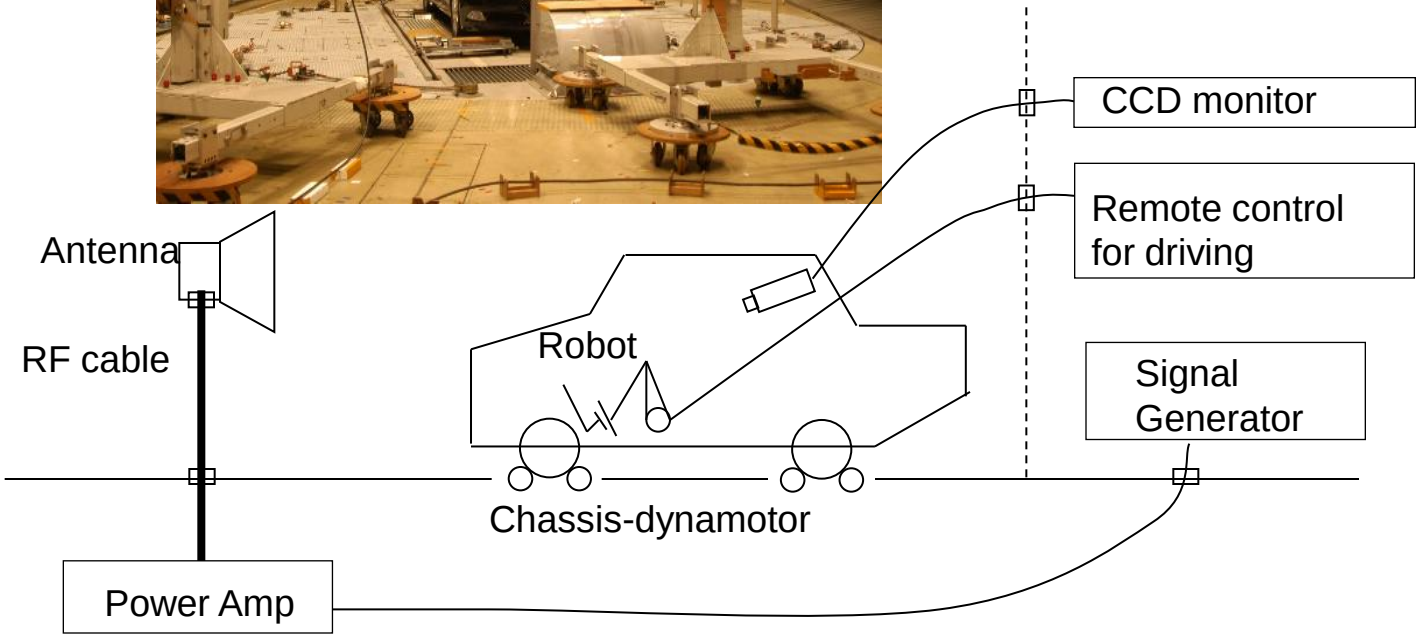
Function	・Check Item	・Monitor	・Requirement　Red is defined in Annex 6
Direction indicator	・The flashing frequency and rate of the turn signal light.	・Monitor camera inside & outside the vehicle.	・ No Turn signal light turn off or turn on continuously. ・ If there is remarkable difference of the flashing frequency and rate, which is checked by O/E converter. Directive: Frequency0.75~2.25Hz, Rate25~75%.
Adaptive front light system	・AFS, leveling performance of the headlamp beams.	・Monitor camera outside the vehicle.	・No remarkable movement of the headlamp beams.
Wiper control system	・Moving of front wiper arm.	・Monitor camera inside & outside the vehicle.	・No complete stop.
Seat position control system	・The position of the seat.	・Monitor camera inside the vehicle	・ No change of the position of the seat. Directive: Less than 10% of total range.
Power tilt & power telescopic	・The position of the tilt and telescopic steering.	・Monitor camera inside the vehicle.	・No change of the position of the tilt and telescopic steering.
Combination meter	・Meter illumination if optical meter type. ・Speed indication ・Odometer running distance	・Monitor camera inside the vehicle.	・No remarkable speed deviation*1 between the condition of reference field strength and that of no field strength. *1: ex. 50±10km/h &control error. ・No meter illumination turns off. ・No abnormal count up /down.

[3] ECE R10-03

3.2 Immunity test of vehicles

ISO11451-2：Vehicle test for electrical disturbances from narrowband radiated electromagnetic energy





On electric vehicles,
How to carry out
the EMC related certification

[4] EV/Plug-IN HV EMC certification in EU

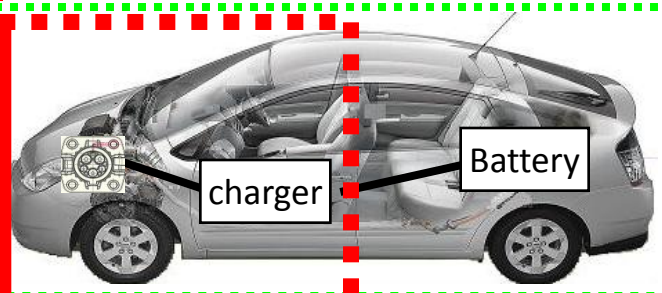
	emission		immunity	Charging related EMC	
	9kHz-30MHz	30M-1GHz		Charging cable	On-board system
China	GB/T 18387	GB 14023		??	??
EU		R10-03	R10-03	DOC for General EMC directives 2004/108/EC	
Japan		R10-03	R10-03	DOC of PSE**	

After R10-04

EU		R10-04	R10-04	DOC OF CE	R10-04
Japan		R10-04	R10-04	DOC of PSE**	R10-04

**PSE: Product Safety appliance & materials based on Electrical Appliance and Material Safety Law

Charging systems which connect the power line need to meet general EMC directives



[4] EV/Plug-IN HV EMC certification in EU

ECE R10-04 will be enforced in Oct 28 2011.

EMC directives
2004/108/EC

Vehicles are excluded from the EMC directive of 2004/108/EC.
The charging system's EMC assessment is required

Low Voltage Directives
2006/95/EC
Harmonized standard
IEC61851-21

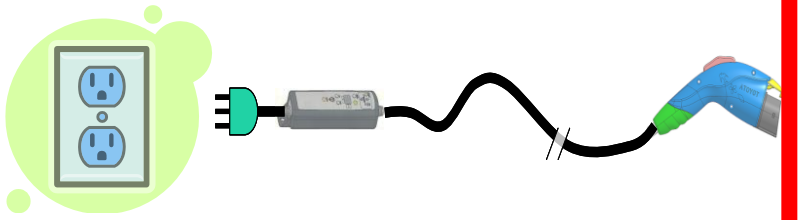
IEC61851-21 refers home Appliance harmonized EMC standard

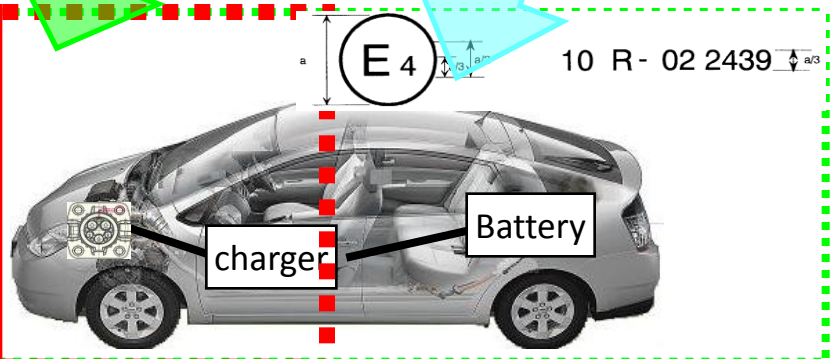
Vehicle EMC regulation
:ECE R10-03
refers to CISPR12, ISO11451

Add the Charging mode
→R10-04
CISPR12, ISO11451

The charging mode needs application of home appliance harmonized EMC standard

CE





[4] EV/Plug-IN HV EMC certification in Japan

Japan MLIT applied ECE R10-03 in the end of May 2011

Electrical Appliance and Material Safety Law

:Ministry of Economy, Trade and Industry

Harmonized standard
IEC61000's or JIS

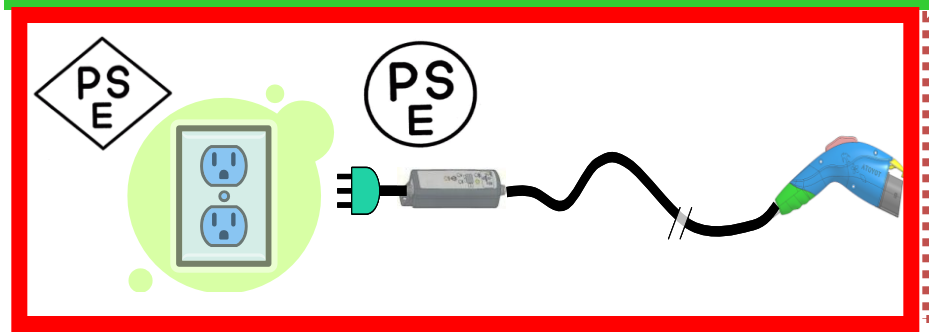
Safety Regulations for road vehicles refers

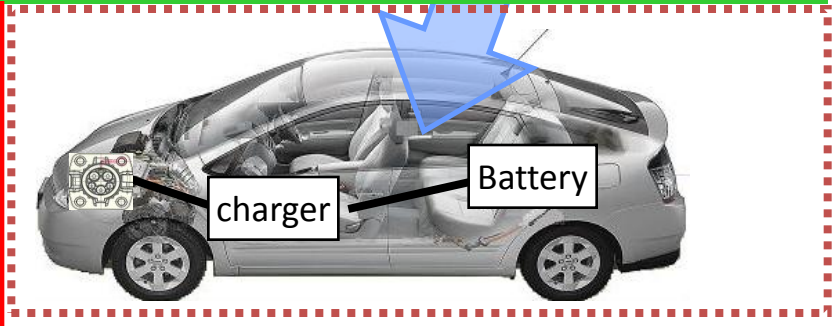
: Ministry of Land, Infrastructure, Transportation and Tourism

ECE R10-03

Add the Charging mode
→R10-04
CISPR12, ISO11451

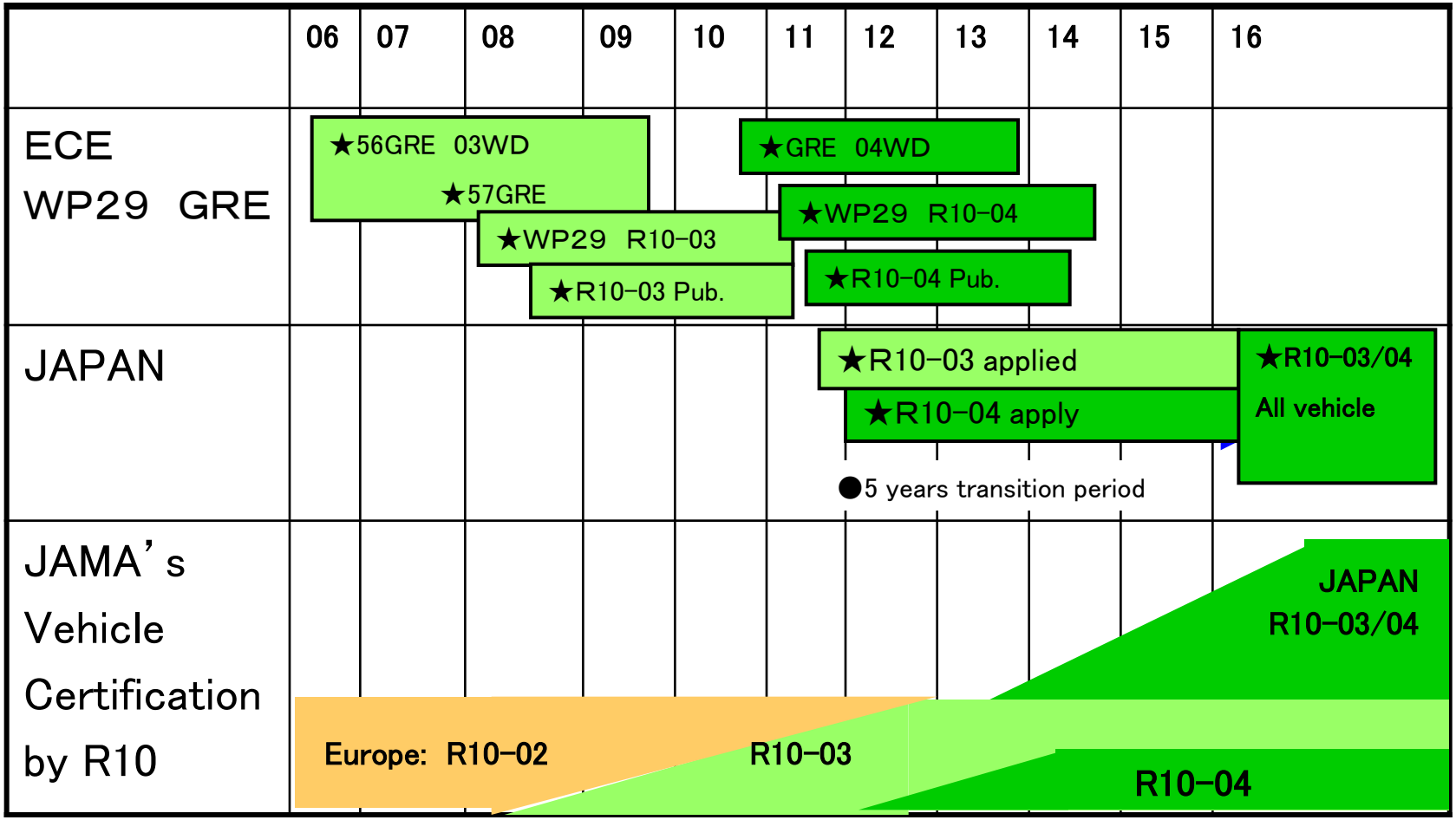
The charging mode needs application of home appliance harmonized EMC standard





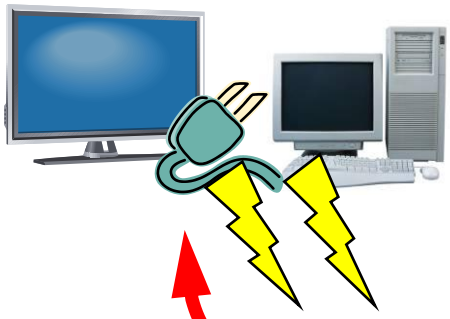
ECE R10-03/04

ECE R10-03 will change to 04 in Oct. 2011



[4] EV/Plug-IN HV EMC test standards

IEC61851-21



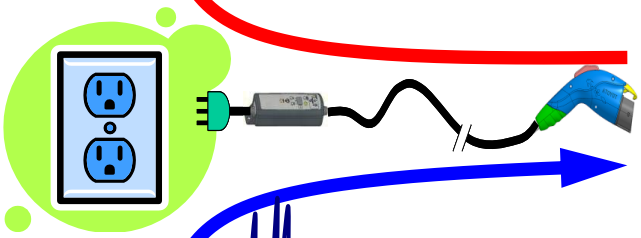
Emission（CISPR/IEC）: do not disturb other electronics systems

IEC61000-3-2 Harmonics current emission

**IEC61000-3-3 Voltage fluctuations on AC main*

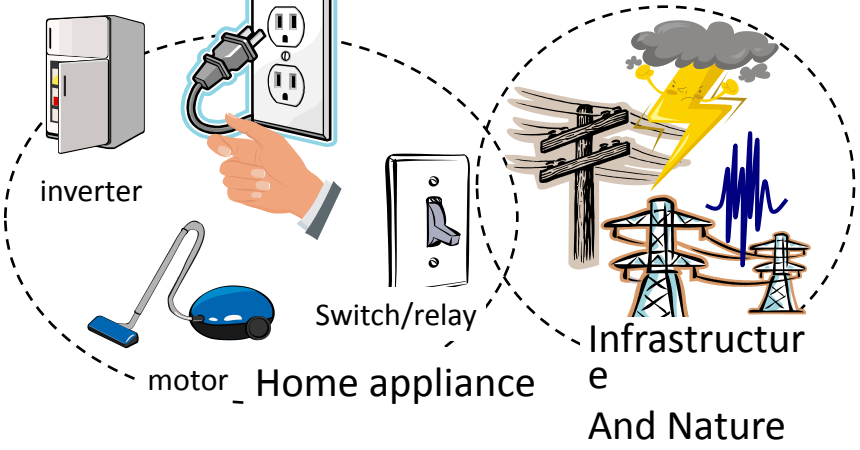
CISPR22 High Frequency Conducted disturbances

**CISPR22 Radiated emission→CISPR12 radiated emission*



Immunity（IEC）:

keep safer function from electrical noise or electromagnetic disturbances



IEC61000-4-2 ESD
IEC61000-4-3 Radiated Electromagnetic disturbances
IEC61000-4-4 Fast Transient Bursts
IEC61000-4-5 lightning Surges
**IEC61000-4-6 Conducted Electromagnetic disturbances*
IEC61000-4-11 voltage fluctuations
IEC61000-4-13 supply voltage harmonics

** No refers in IEC61851-21*

[4] EV/Plug-IN HV EMC test in R10 03/04

R10-03	
Annex4:	Vehicle: Broadband emission
Annex 5:	Vehicle: Narrowband emission
Annex 6:	Vehicle immunity
Annex 7:	Parts: Broadband emission
Annex 8:	Parts: Narrowband emission
Annex 9:	Parts: Immunity
Annex 10:	Parts: testing for immunity and emission of transients

R10-04	
	R10-03 + Charging mode emission
	R[illegible] + Charging mode Immunity
Annex.11.	Vehicle emission of harmonics generated on AC power lines
Annex.12.	Vehicle: emission of voltage changes, voltage fluctuations and flicker on AC power lines from vehicle
Annex.13.	Method's) of testing for emission of radiofrequency conducted disturbances on AC or DC power lines from vehicle
Annex.14.	Method's) of testing for emission of radiofrequency conducted disturbances on network and telecommunication access from vehicle
Annex.15.	Method's) of testing for immunity of vehicles to electrical fast transient / burst disturbances conducted along AC and DC power lines
Annex.16.	Method's) of testing for immunity of vehicles to surges conducted along AC and DC power lines"

Charging mode emission is applied in Broadband emission measurement for QP measurement

6 IEC test standards applied to charging system of EV as vehicle tests

Part level tests are being discussed.

ECE R10-04 test annex and their test standard

R10-04		Test standard
Annex.11	Method of testing for emission of transients of harmonics generated on AC power lines from vehicle	IEC61000-3-2(edition3.2-2009) IEC61000-3-12(edition1.0-2004)
Annex.12	Method of testing for emission of voltage changes, voltage fluctuations and flicker on AC power lines from vehicle	IEC61000-3-3(edition2.0-2008) IEC61000-3-11(edition1.0-2000)
Annex.13	Method of testing for emission of radiofrequency conducted disturbances on AC or DC power lines from vehicle	CISPR 16-2-1:(edition2.0-2008) IEC61000-6-3(edition2.0-2006)
Annex.14	Method of testing for emission of radiofrequency conducted disturbances on network and telecommunication access from vehicle	CISPR 22:(edition6.0-2008) IEC61000-6-3(edition2.0-2006)
Annex.15	Method of testing for immunity of vehicles to electrical fast transient / burst disturbances conducted along AC and DC power lines	IEC 61000-4-4(edition 2.0-2004)
Annex.16	Method of testing for immunity of vehicles to surges conducted along AC and DC power lines	IEC 61000-4-5(edition 2.0-2005)

Annex4: Broadband emission

QP limit

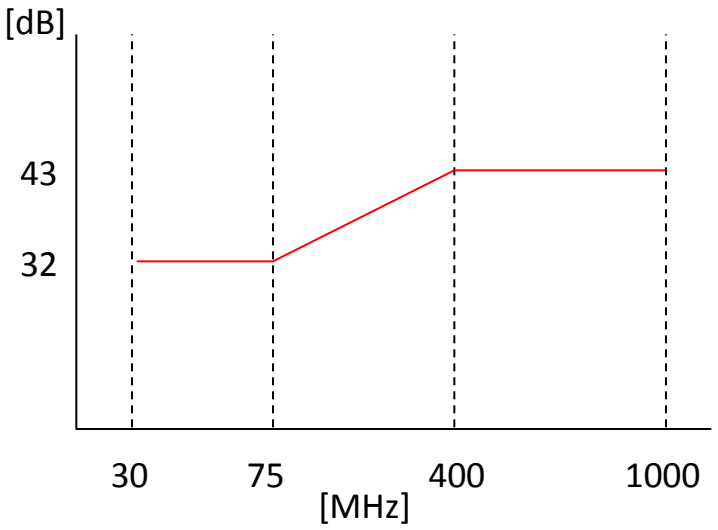
(Peak limit = QP limit + 20dB)

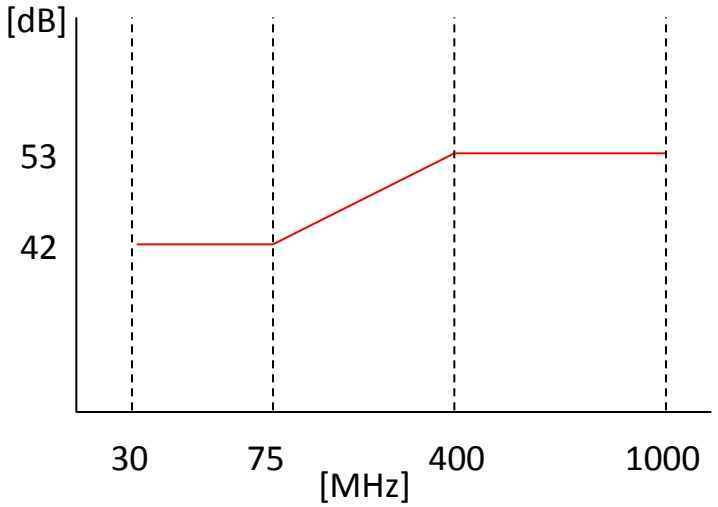
a）10±0.2m

- **30~75MHz：32dBμV/m**
- **75～400MHz：32～43dBμV/m**
- **400～1000MHz：43dBμV/m**

b）3±0.05m

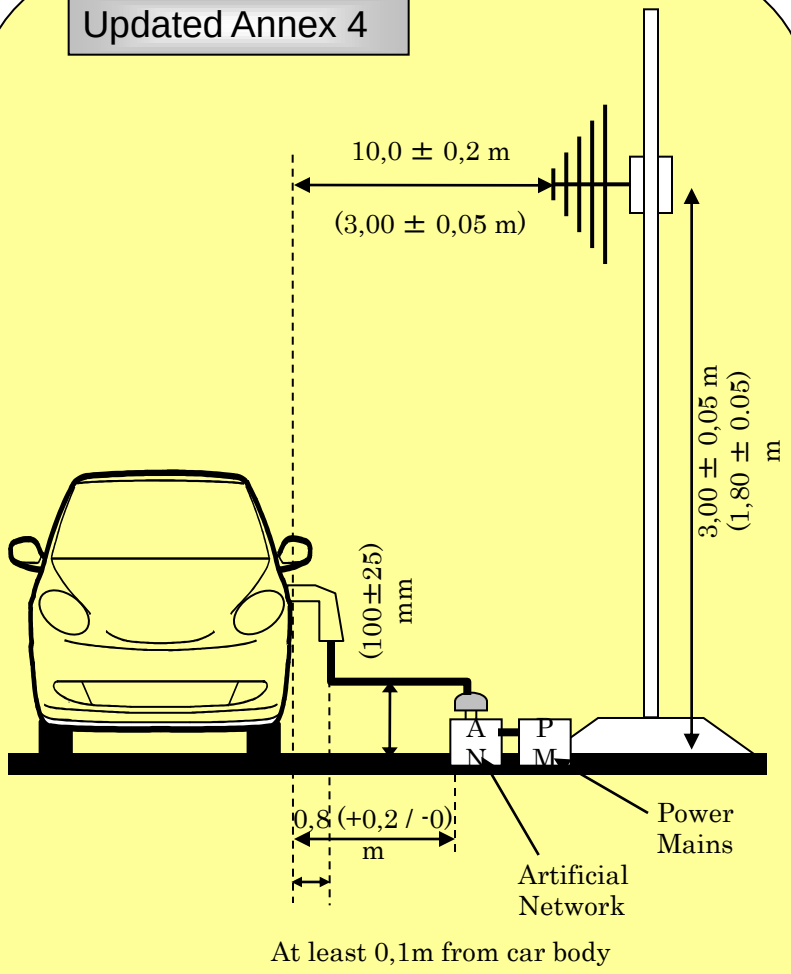
- **30~75MHz：42dBμV/m**
- **75～400MHz：42～53dBμV/m**
- **400～1000MHz：53dBμV/m**

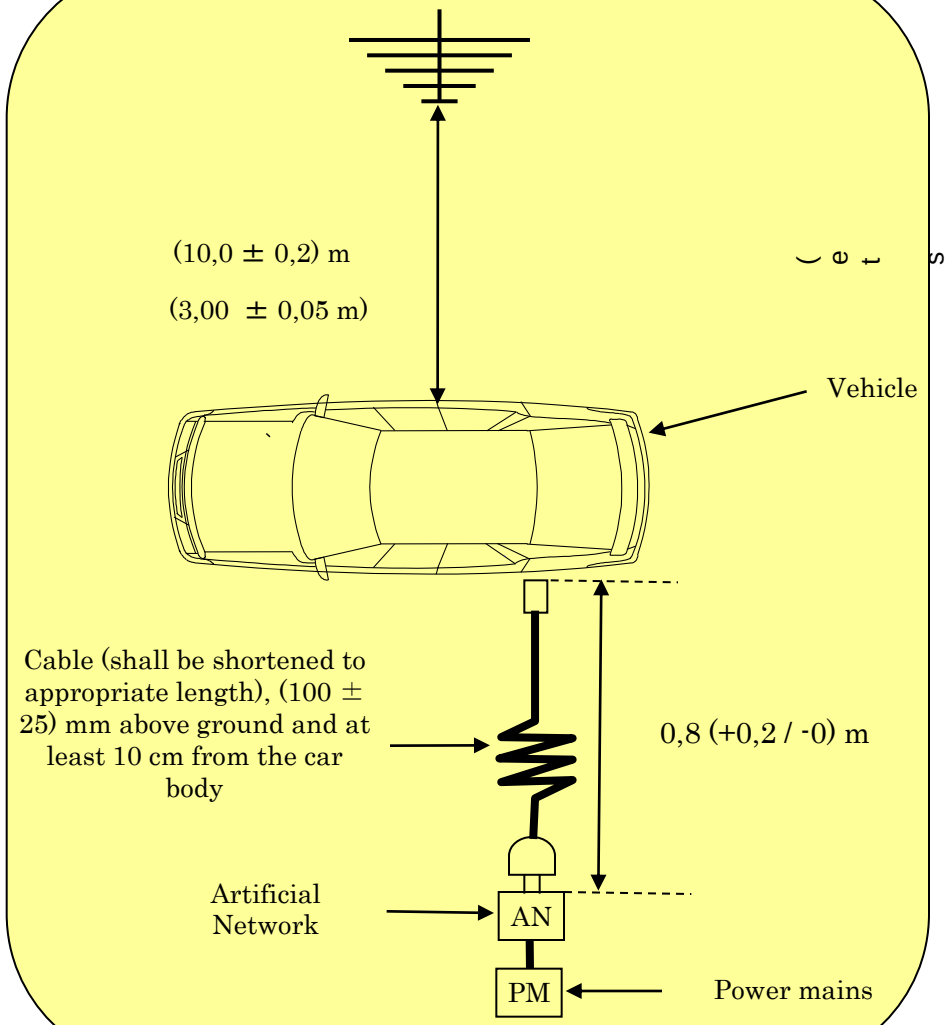




Annex4: Broadband emission

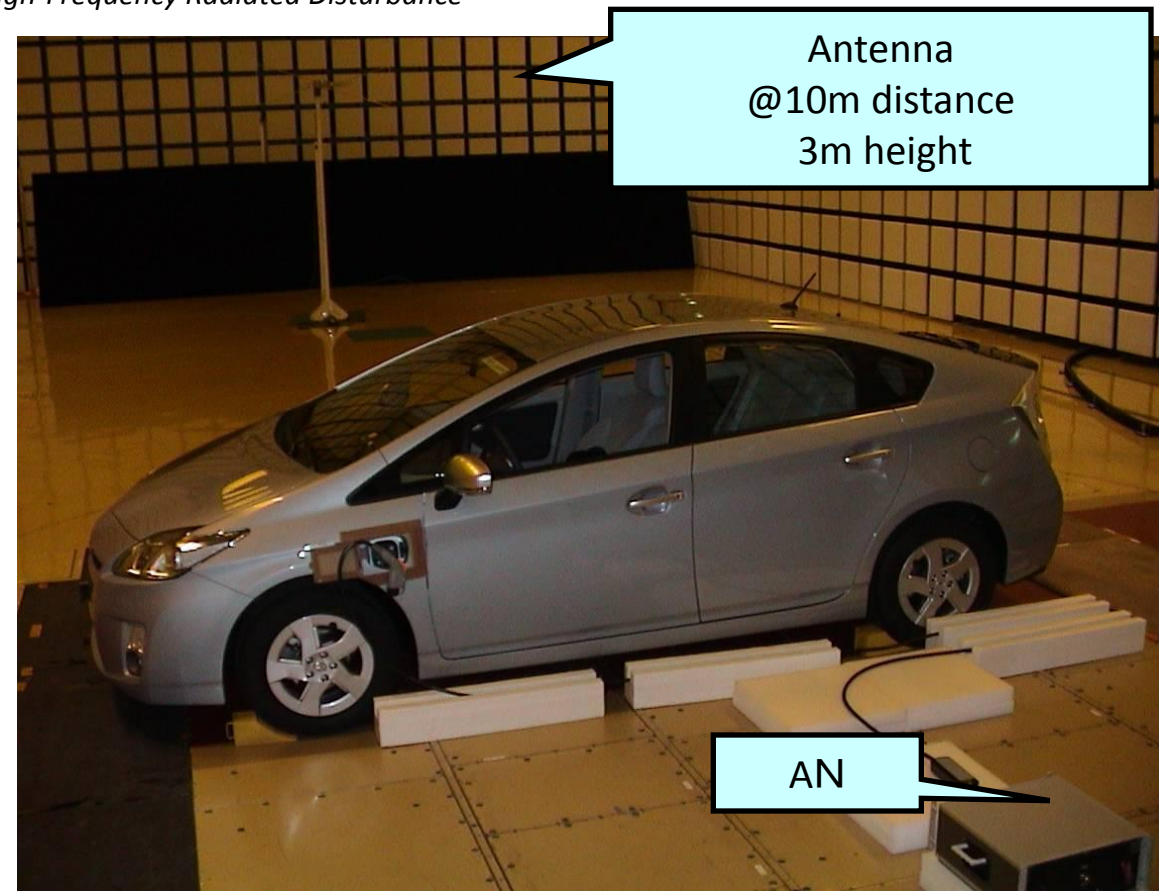
Updated Annex 4

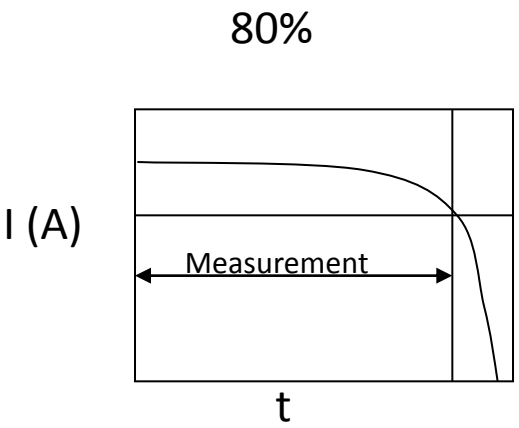




Annex4: Broadband emission

High-Frequency Radiated Disturbance





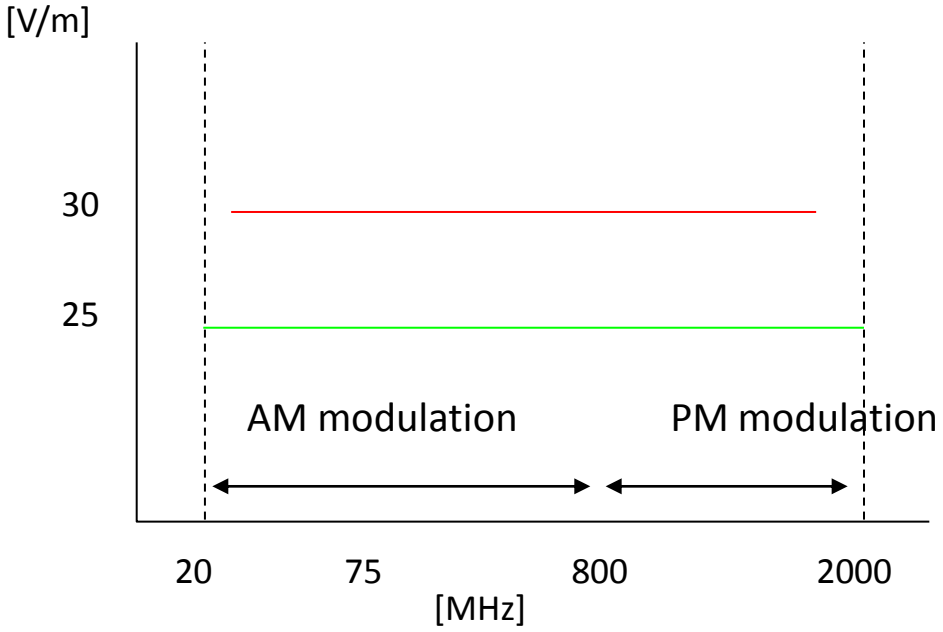
"This vehicle shall be in battery charging mode at rated power until the AC or DC current reached at least 80 per cent of its initial value. "

Generally, in the beginning of the charging to the battery, current will be maximum. Charging current will decrease in case of full charged. Measurement should not done in the full charging battery.

Annex6:Method of testing vehicle immunity

- **20～2000MHz 30V/m rms　defined in ISO11451 peak conservation (differ from IEC immunity test definition)**

The field strength shall be 30 volts/m rms (root mean squared) in over 90 per cent of the 20 to 2,000 MHz frequency band and a minimum of 25 volts/m rms over the whole 20 to 2,000 MHz frequency band.



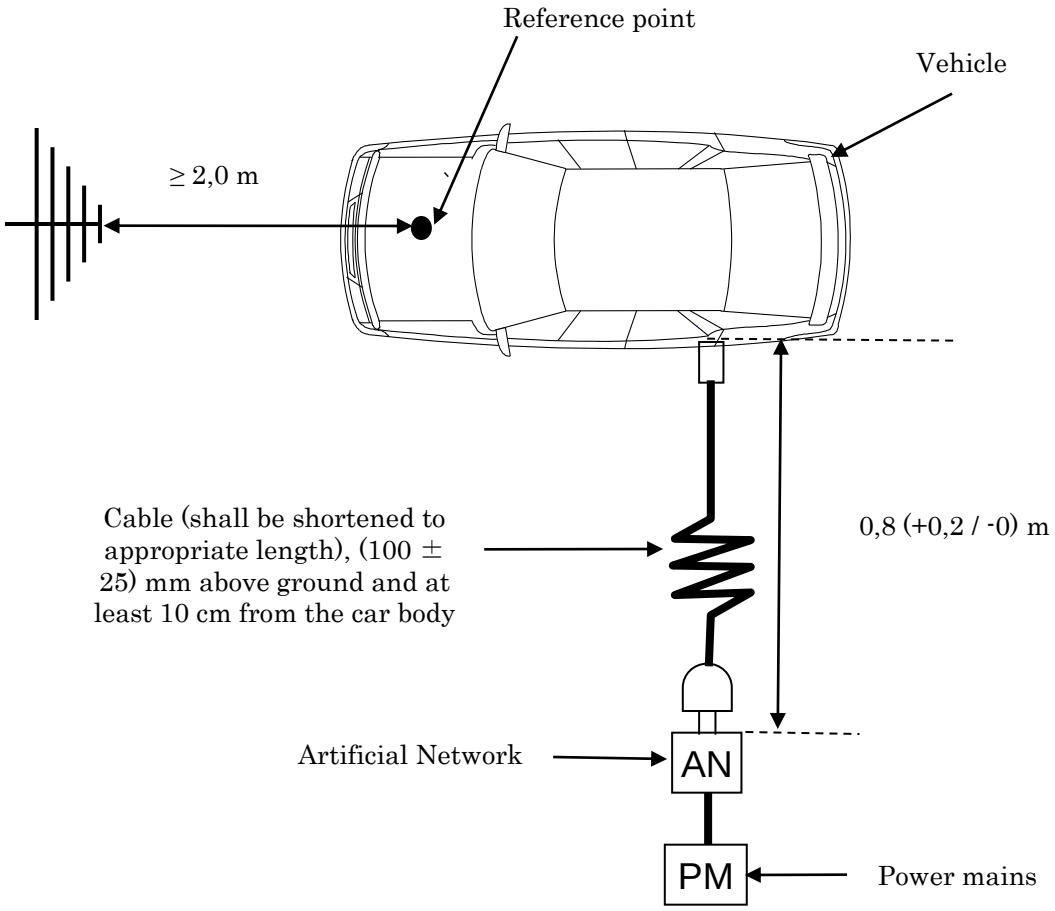
Annex6:Method of testing vehicle immunity

Updated Annex 6

"Figure 4

Vehicle in configuration "RESS in charging mode coupled to the power grid"

(e t s u p p o r t)



Annex6:Method of testing vehicle immunity

“The vehicle shall be immobilized, engine OFF and in charging mode.”

"RESS in charging mode" vehicle test conditions	Failure criteria
The RESS shall be in charging mode. The RESS state of charge shall be agreed in between the manufacturer and the Technical Service.	Vehicle sets in motion

Annex11 Method of Testing for Emission of Harmonics generated on AC power lines from vehicle

▪Maximum allowed harmonics (input current > 16 A and ≤ 75 A per phase) for equipment other than balanced three-phase equipment ：IEC61000-3-2(edition3.2-2009）

Harmonic number n	*Maximum authorized harmonic current A*
Odd harmonics	
3	2.3
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
$15 \le n \le 39$	0.15x15/n
Even harmonics	
2	1.08
4	0.43
6	0.30
$8 \le n \le 40$	0.23x8/n

Table 4

Maximum allowed harmonics (input current > 16 A and ≤ 75 A per phase) for equipment other than balanced three-phase equipment

Minimum R_{sce}	*Acceptable individual harmonic current* I_n/I_1 *%*						*Maximum current harmonic ratio %*	
	I_3	I_5	I_7	I_9	I_{11}	I_{13}	THD	PWHD
33	21.6	10.7	7.2	3.8	3.1	2	23	23
66	24	13	8	5	4	3	26	26
120	27	15	10	6	5	4	30	30
250	35	20	13	9	8	6	40	40
≥ 350	41	24	15	12	10	8	47	47

Relative values of even harmonics lower or equal to 12 shall be lower than 16/n %. Even harmonics greater than 12 are taken into account in the THD and PWHD the same way than odd harmonics.

Linear interpolation between successive values of R_{sce} is authorized.

Annex11 Method of Testing for Emission of Harmonics generated on AC power lines from vehicle

Table 5

Maximum allowed harmonics (input current > 16 A and ≤ 75 A per phase) for balanced three-phase equipment

Minimum R_{sce}	*Acceptable individual harmonic current I_n/I_1 %*				*Maximum current harmonic ratio %*	
	I_5	I_7	I_{11}	I_{13}	THD	PWHD
33	10.7	7.2	3.1	2	13	22
66	14	9	5	3	16	25
120	19	12	7	4	22	28
250	31	20	12	7	37	38
≥ 350	40	25	15	10	48	46

Relative values of even harmonics lower or equal to 12 shall be lower than 16/n %. Even harmonics greater than 12 are taken into account in the THD and PWHD the same way than odd harmonics.
Linear interpolation between successive values of R_{sce} is authorized.

Table 6

Maximum allowed harmonics (input current > 16 A and ≤ 75 A per phase) for balanced three-phase equipment under specific conditions

Minimum R_{sce}	*Acceptable individual harmonic current I_n/I_1 %*				*Maximum current harmonic ratio %*	
	I_5	I_7	I_{11}	I_{13}	THD	PWHD
33	10.7	7.2	3.1	2	13	22
≥ 120	40	25	15	10	48	46

Relative values of even harmonics lower or equal to 12 shall be lower than 16/n %. Even harmonics greater than 12 are taken into account in the THD and PWHD the same way than odd harmonics

Balanced 3 phase has no emission in 3rd, 6th , 9th harmonics

Because of those 3rd harmonics will be cancelled in Δ circuit.

Annex11 Method of Testing for Emission of Harmonics generated on AC power lines from vehicle

New Annex 11

Annex 11 - Appendix 1

Figure 1: Vehicle in configuration "RESS charging mode coupled to the power grid" - Single phase charger test set-up

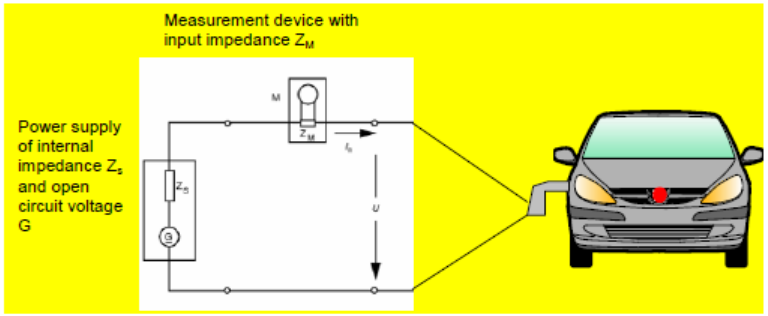
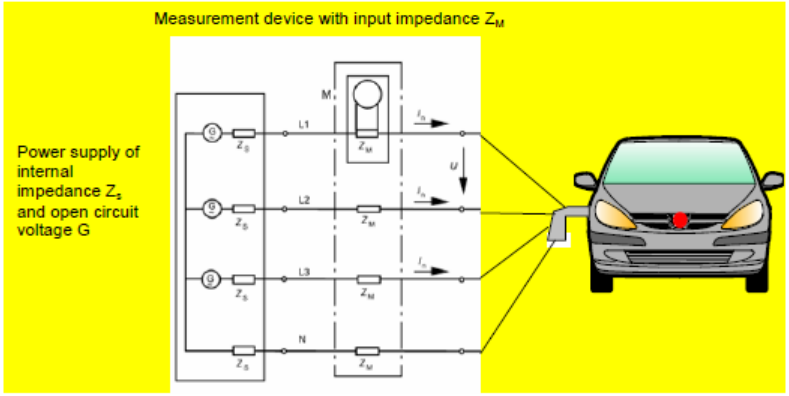
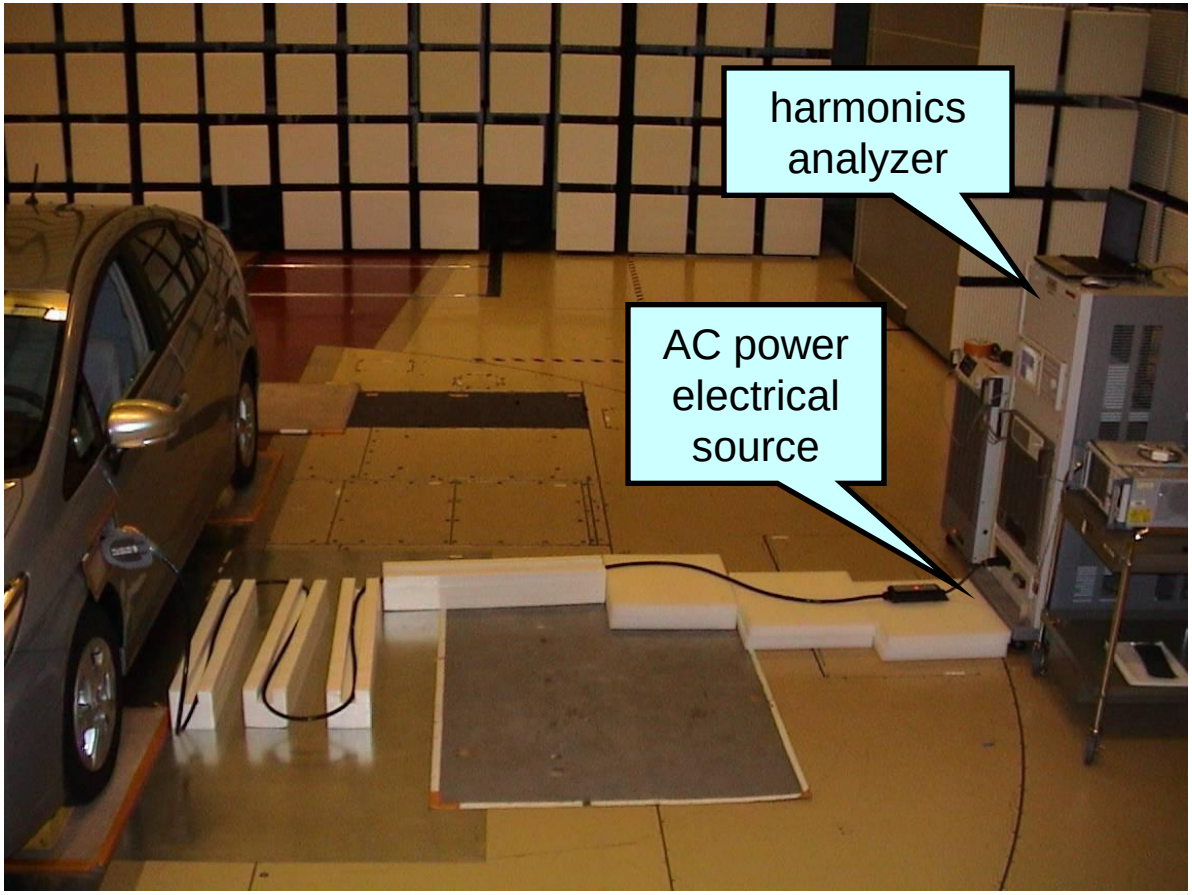


Figure 2: Vehicle in configuration "RESS charging mode coupled to the power grid" - Three-phase charger test set-up

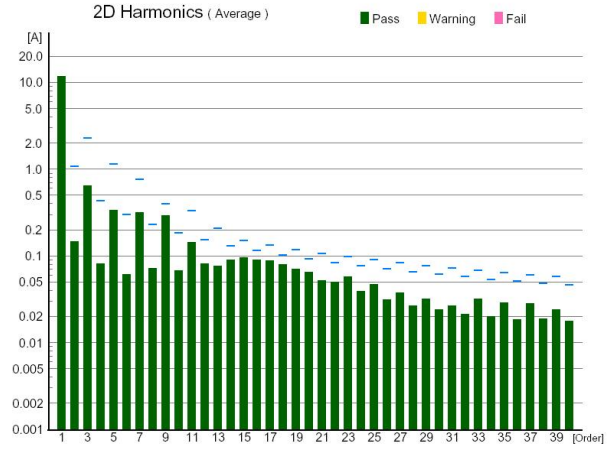


Annex11 Method of Testing for Emission of Harmonics generated on AC power lines from vehicle

Low Frequency Conducted Disturbances (Harmonics)



Limit Levels	≪Odd harmonics≫ N=3: 2.30 [A] N=5: 1.14 [A] N=7: 0.77 [A] N=9: 0.40 [A] N=11: 0.33 [A] N=13: 0.21 [A] N=15 to 39: 0.15×15／N [A] ≪Even harmonics ≫ N=2: 1.08 [A] N=4: 0.43 [A] N=6: 0.30 [A] N=8 to 40: 0.23×8／N [A]



Annex12 Method of testing for emission of voltage changes, voltage fluctuations and flicker on AC power lines from vehicle

Maximum allowed voltage changes, voltage fluctuations and flicker (rated current ≤ 16 A per phase and not subjected to conditional connection)

IEC61000-3-3 (edition2.0-2008)

Table 7

・・・LIMIT：IEC61000-3-3 Clause 5

IEC61000-3-3 Clause 5

Pst	<1．0
Plt	<0．65
d(t) More than 3.3%	<500msec
dc	<3,3%
dmax a) Without additional condition ex.: refrigerator b) e.g.: automatic washer c) e.g.：hair dryers	<4% <6% <7%

Maximum allowed voltage changes, voltage fluctuations and flicker (rated current > 16 A and ≤ 75 A per phase and subjected to conditional connection)

IEC 61000-3-11 (edition 1.0 – 2000)

Table 8

・・・Limit：IEC61000-3-11 Clause 5

IEC61000-3-11 clause 5

Pst	<1．0
Plt	<0．65
d(t) More than 3.3%	<500msec
dc	<3．3%
dmax a) Without additional condition ex.: refrigerator b) e.g.: automatic washer c) e.g.：hair dryers	<4% <6% <7%

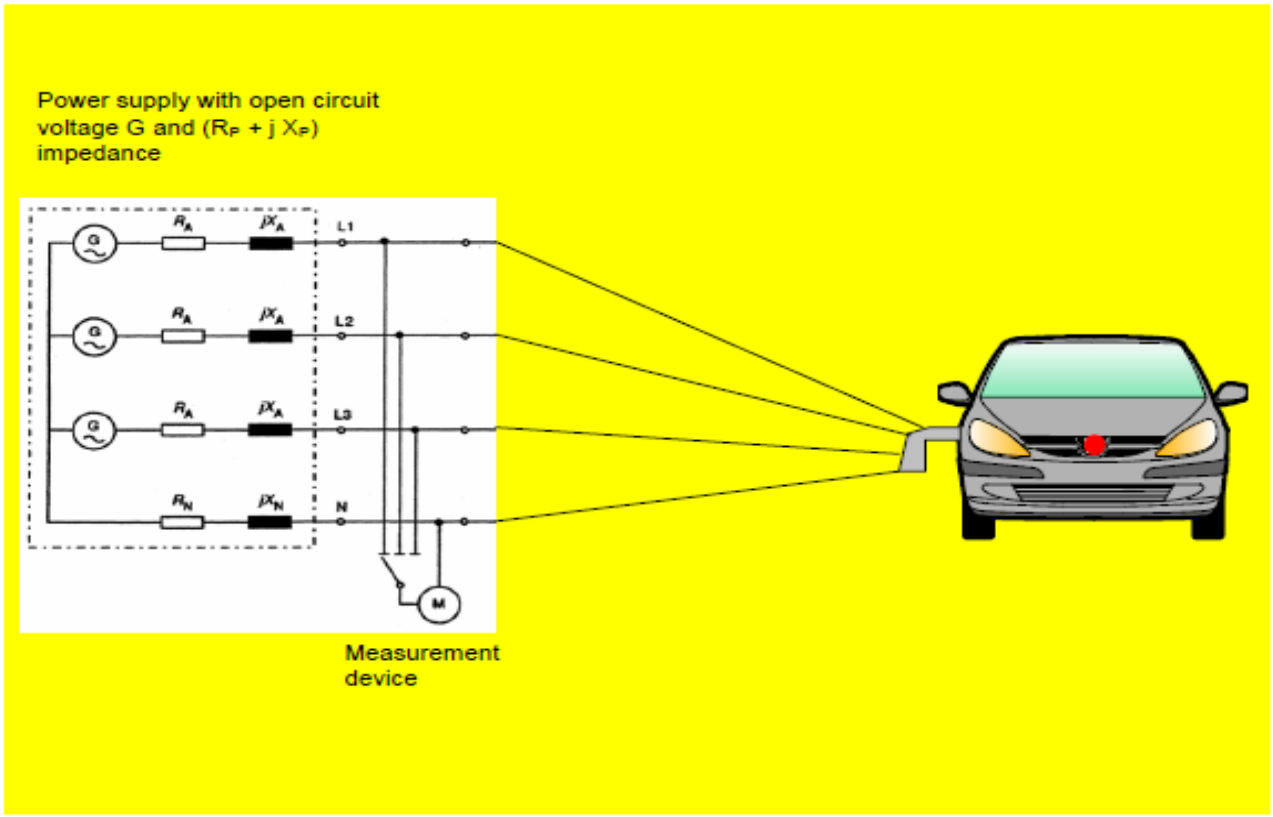
Annex12 Method of testing for emission of voltage changes, voltage fluctuations and flicker on AC power lines from vehicle

New Annex 12

Annex 12 – Appendix 1

Figure 1

Vehicle in configuration "RESS charging mode coupled to the power grid"



Annex13: Method of Testing for Emission of Radiofrequency conducted disturbances on AC or DC power lines from vehicle

Class B: Residential Area requirement

Table 9

Maximum allowed radiofrequency conducted disturbances on AC power lines

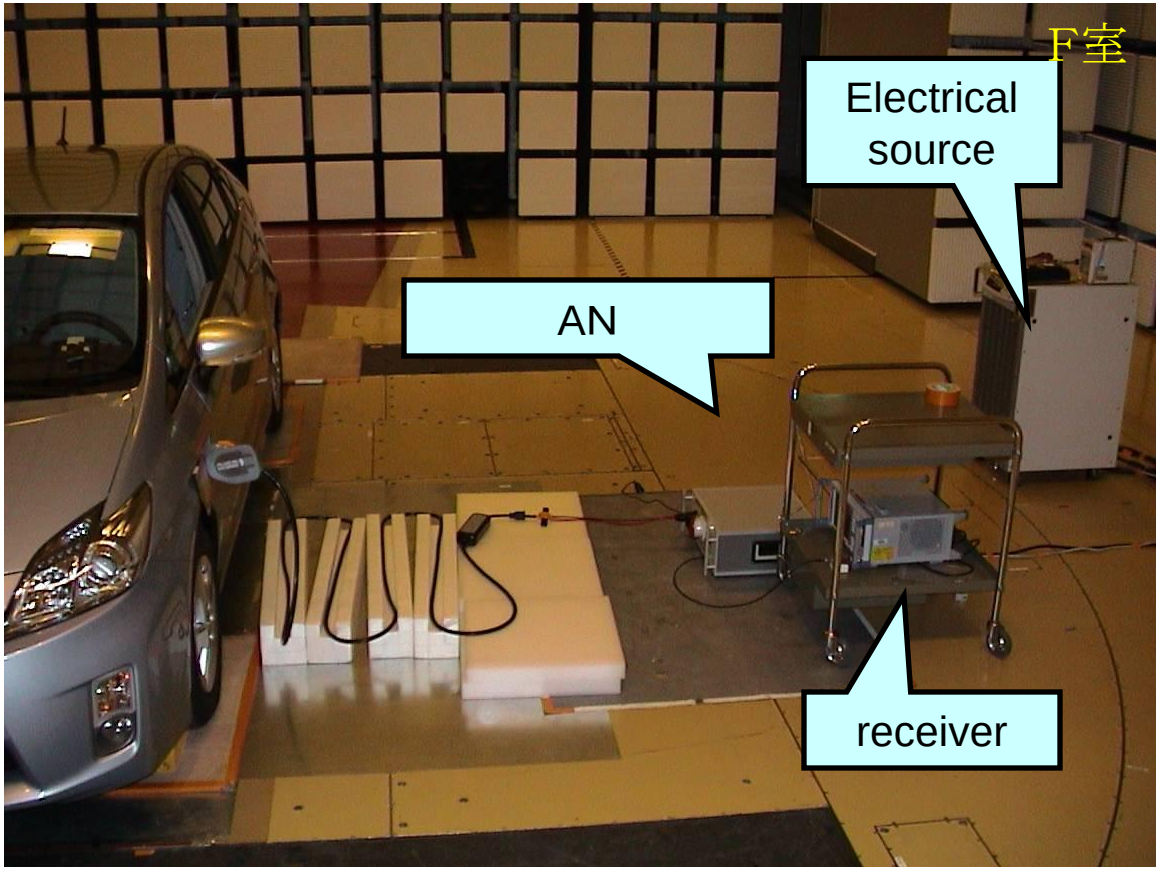
Frequency (MHz)	*Limits and detector*
0.15 to 0.5	66 to 56 dBμV (quasi-peak) 56 to 46 dBμV (average) (linearly decreasing with logarithm of frequency)
0.5 to 5	56 dBμV (quasi-peak) 46 dBμV (average)
5 to 30	60 dBμV (quasi-peak) 50 dBμV (average)

Table 10

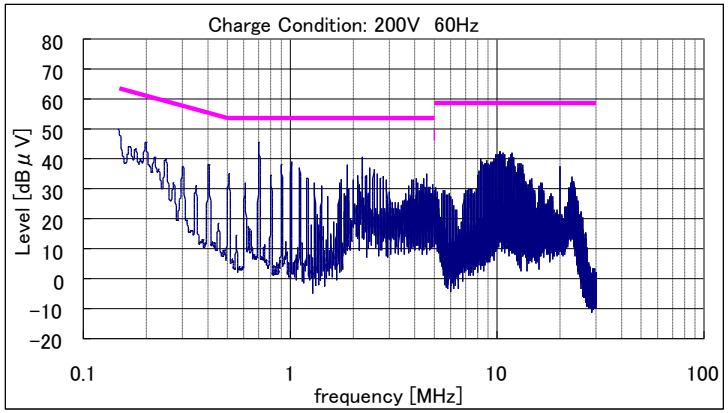
Maximum allowed radiofrequency conducted disturbances on DC power lines

Frequency (MHz)	*Limits and detector*
0.15 to 0.5	79 dBμV (quasi-peak) 66 dBμV (average)
0.5 to 30	73 dBμV (quasi-peak) 60 dBμV (average)

Annex13: Method of Testing for Emission of Radiofrequency conducted disturbances on AC or DC power lines from vehicle



Frequency (MHz)	Quasi-Peak dB(μV)	Average dB(μV)
0.15 to 0.50	66 Decreases linearly with log of freq. To 56	56 Decreases linearly with log of freq. To 46
0.50 to 5	56	46
5 to 30	60	50



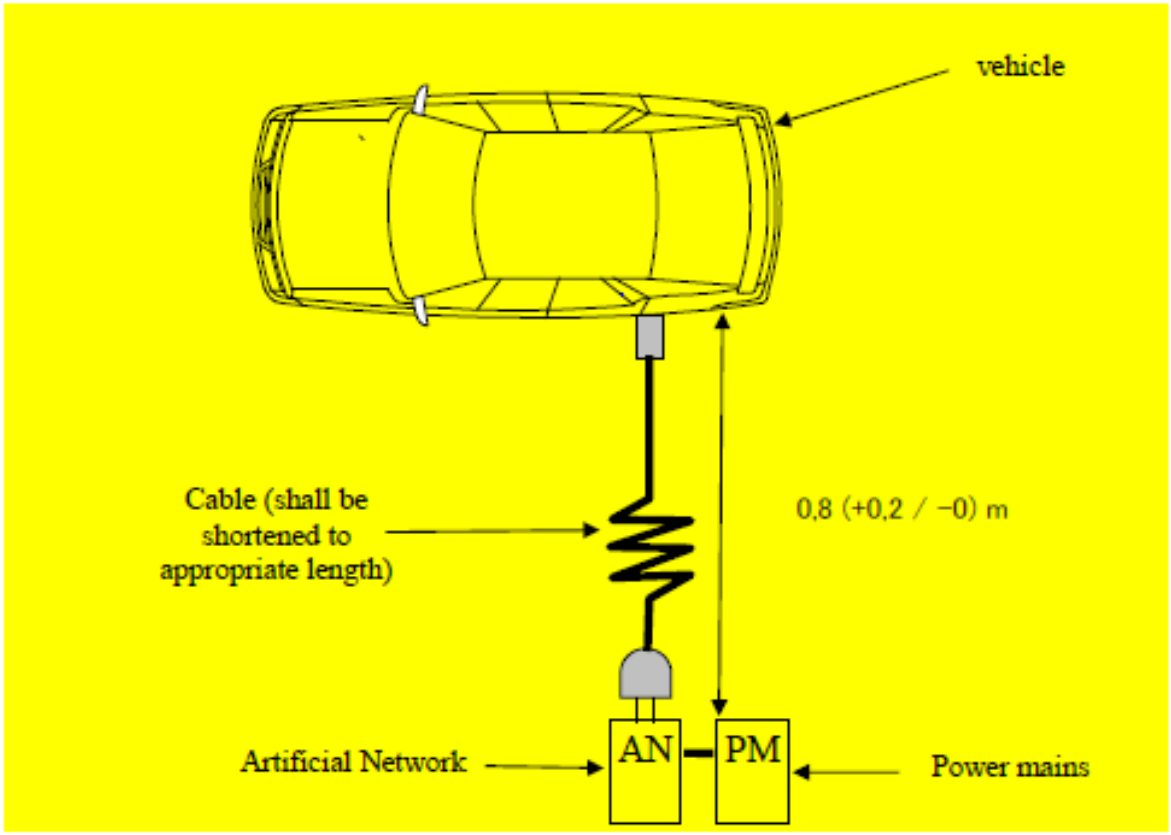
Annex13: Method of Testing for Emission of Radiofrequency conducted disturbances on AC or DC power lines from vehicle

New Annex 13

Annex 13 – Appendix 1

Figure 1

Vehicle in configuration "RESS charging mode coupled to the power grid"



Annex14 Method of Testing for Emission of Radiofrequency conducted disturbances on Network and Telecommunication access from Vehicle

Maximum allowed radiofrequency conducted disturbances on network and telecommunication access

Frequency (MHz)	*Limits and detector*	
0.15 to 0.5	84 to 74 dBμV (quasi-peak) 74 to 64 dBμV (average) (linearly decreasing with logarithm of frequency)	40 to 30 dBμA (quasi-peak) 30 to 20 dBμA (average) (linearly decreasing with logarithm of frequency)
0.5 to 30	74 dBμV (quasi-peak) 64 dBμV (average)	30 dBμA (quasi-peak) 20 dBμA (average)

150Ω Conversion from Voltage to current

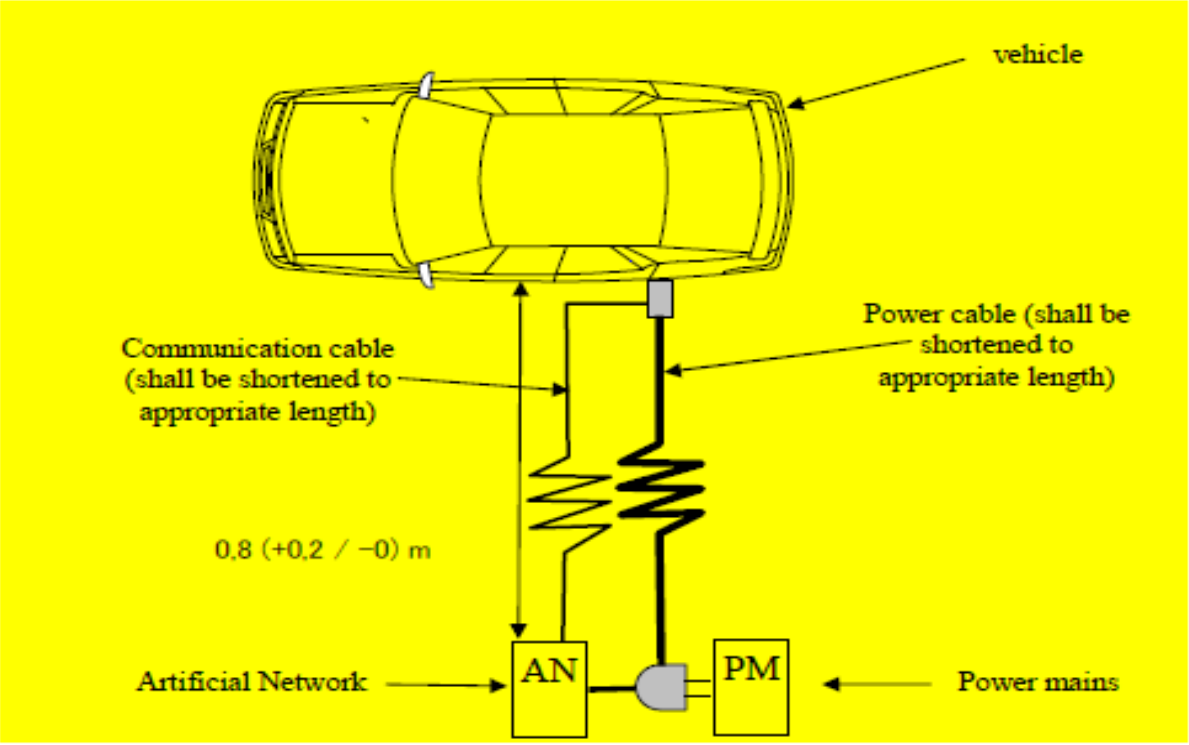
Annex14 Method of Testing for Emission of Radiofrequency conducted disturbances on Network and Telecommunication access from Vehicle

New Annex 14

Annex 14 – Appendix 1

Figure 1

Vehicle in configuration "RESS charging mode coupled to the power grid"



Annex15 Method of testing for immunity of vehicles to electrical fast transient / burst disturbances conducted along AC and DC power lines

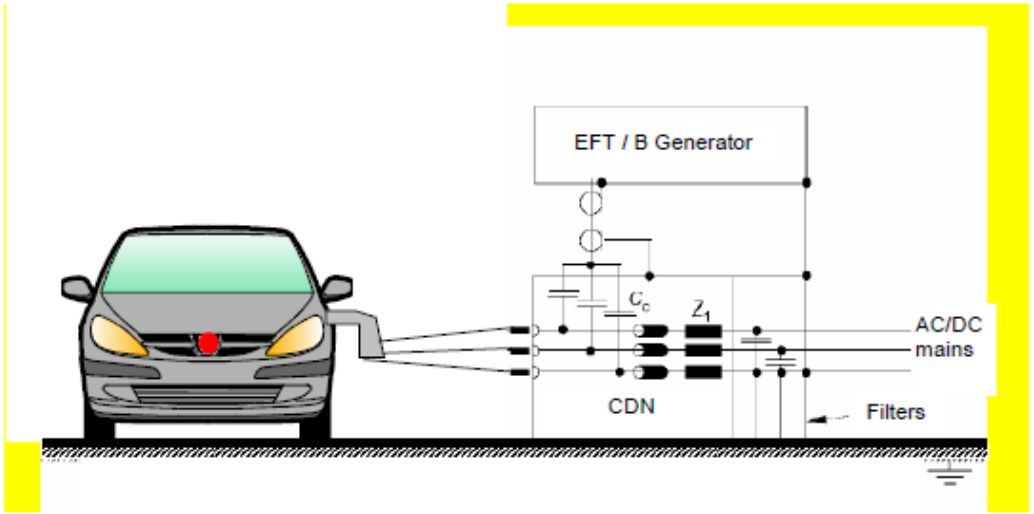
The immunity test levels, for AC or DC power lines, shall be : ± 2 kV test voltage in open circuit, with a rise time (Tr) of 5 ns, and a hold time (Th) of 50 ns and a repetition rate of 5 kHz for at least 1 minute.

New Annex 15

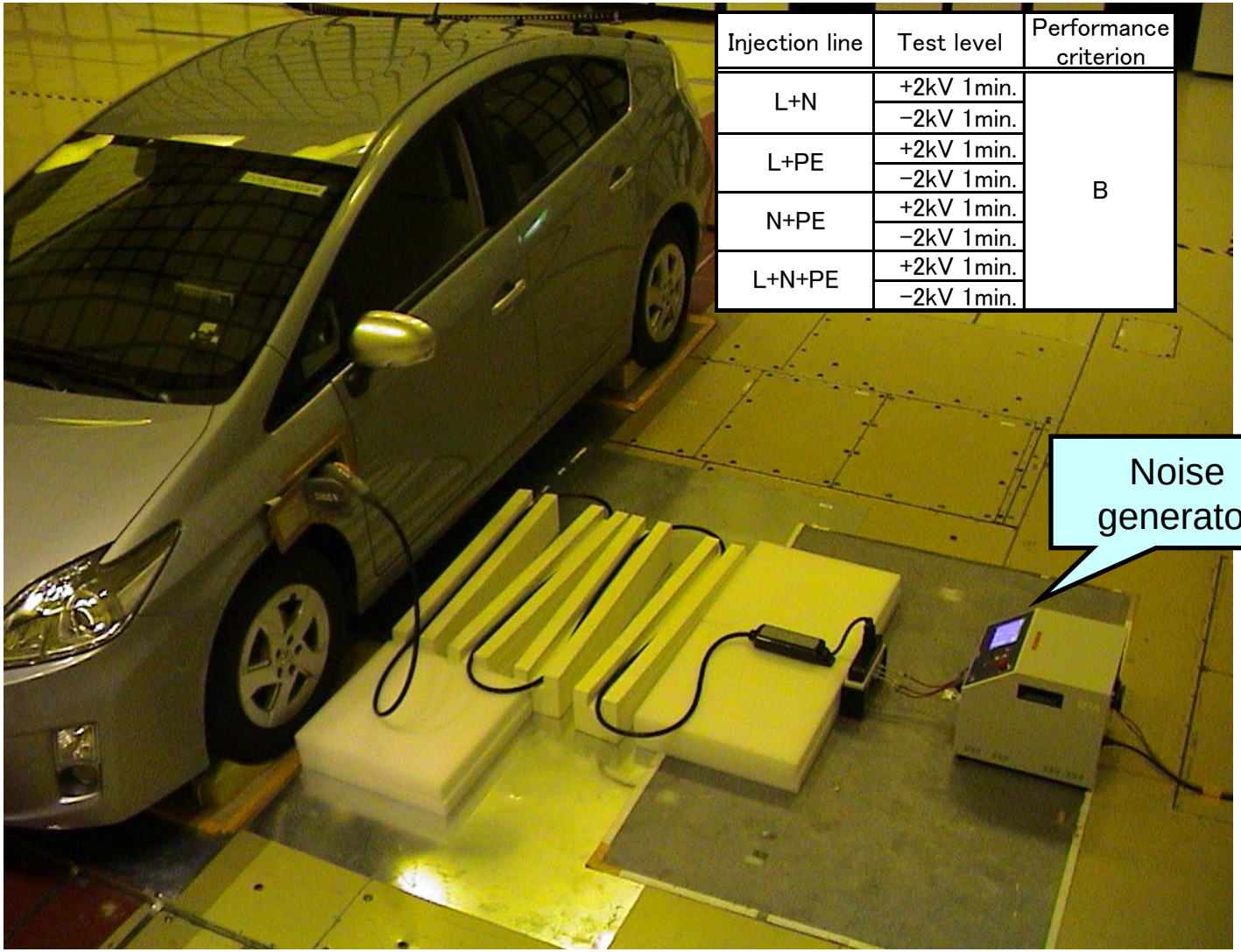
Annex 15 – Appendix 1

Figure 1

Vehicle in configuration "RESS charging mode" coupled to the power grid coupling on AC/DC power lines



Annex15 Method of testing for immunity of vehicles to electrical fast transient / burst disturbances conducted along AC and DC power lines



Injection line	Test level	Performance criterion
L+N	+2kV 1min.	B
	−2kV 1min.	
L+PE	+2kV 1min.	
	−2kV 1min.	
N+PE	+2kV 1min.	
	−2kV 1min.	
L+N+PE	+2kV 1min.	
	−2kV 1min.	

Annex16 Method of testing for immunity of vehicles to surges conducted along AC and DC power lines

(a) for AC power lines: ± 2 kV test voltage in open circuit between line and earth and ± 1 kV between lines, with a rise time (Tr) of 1,2 µs, and a hold time (Th) of 50 µs.

Each surge shall be applied 5 times at 1 minute delay for each of following phases: 0, 90, 180 and 270 ° ,

(b) for D… …en line and earth … and a hold time … …ute delay.

0,180 phase used to be switch timing

90, 270 will be maximum voltage timing

And 270 timing surge cause
Polarity change – to + will be caused

So, these phases are critical point

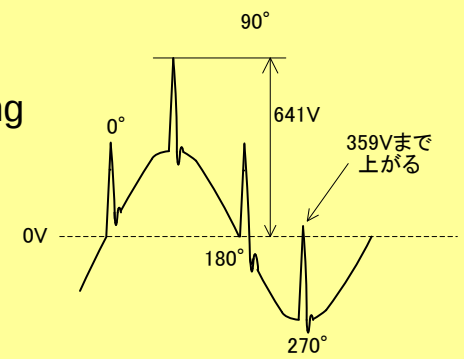


図.1 AC100Vラインに+0.5kVのサージを印加した場合

Annex16 Method of testing for immunity of vehicles to surges conducted along AC and DC power lines

New Annex 16

Annex 16 – Appendix 1

Figure 1

Vehicle in configuration "RESS charging mode coupled to the power grid" - Coupling between lines for DC or AC (single phase) power lines

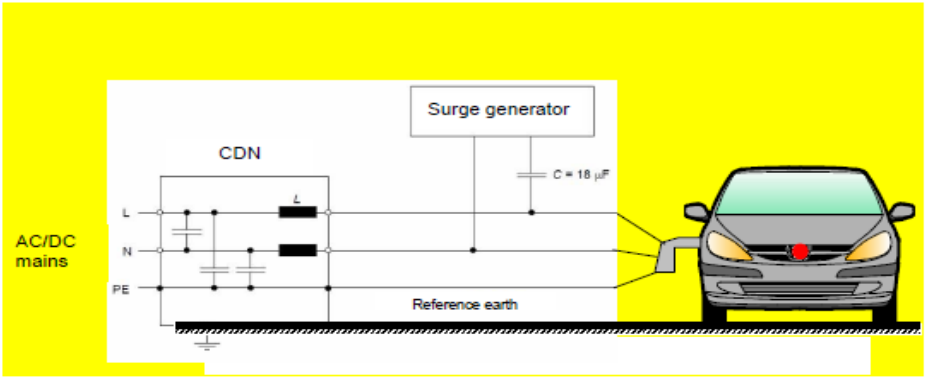


Figure 2

Vehicle in configuration "RESS charging mode coupled to the power grid" - Coupling between each line and earth for DC or AC (single phase) power lines

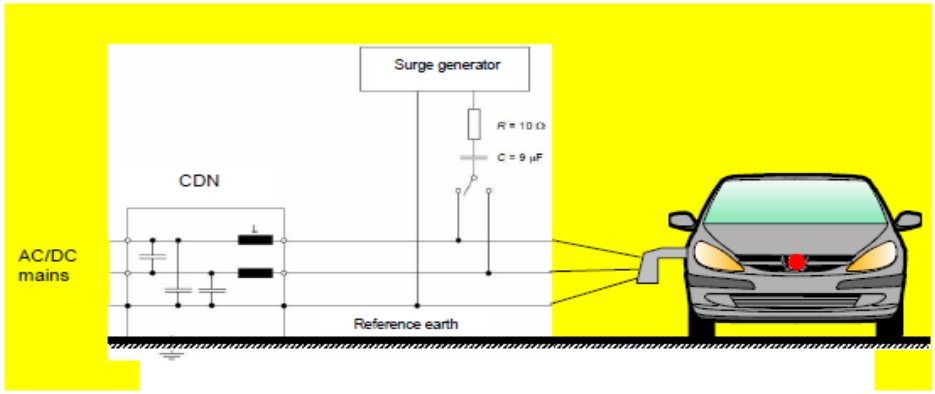


Figure 3

Vehicle in configuration "RESS charging mode coupled to the power grid" - Coupling between lines for AC (three phases) power lines

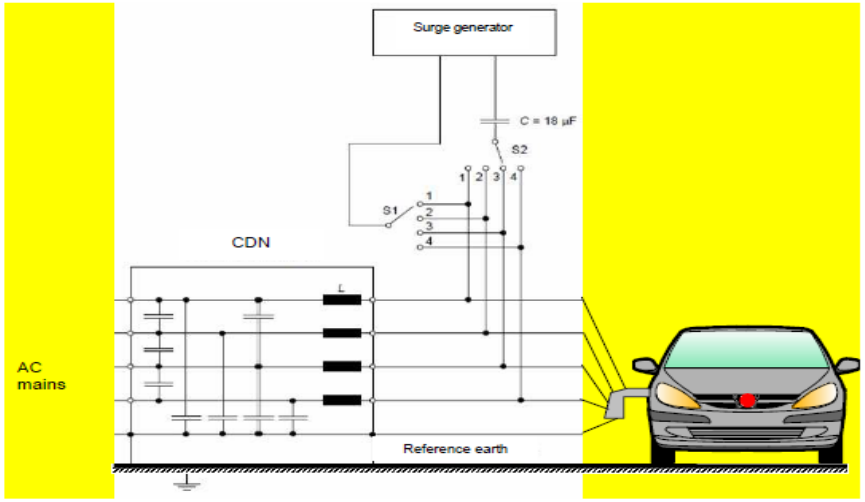
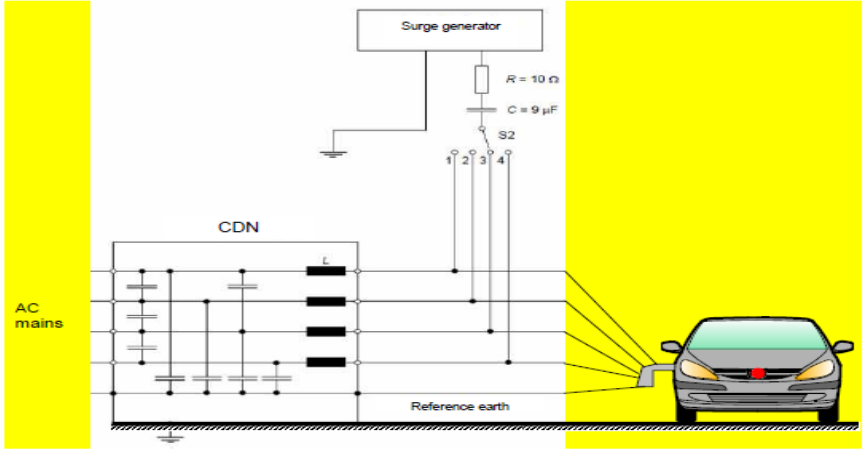
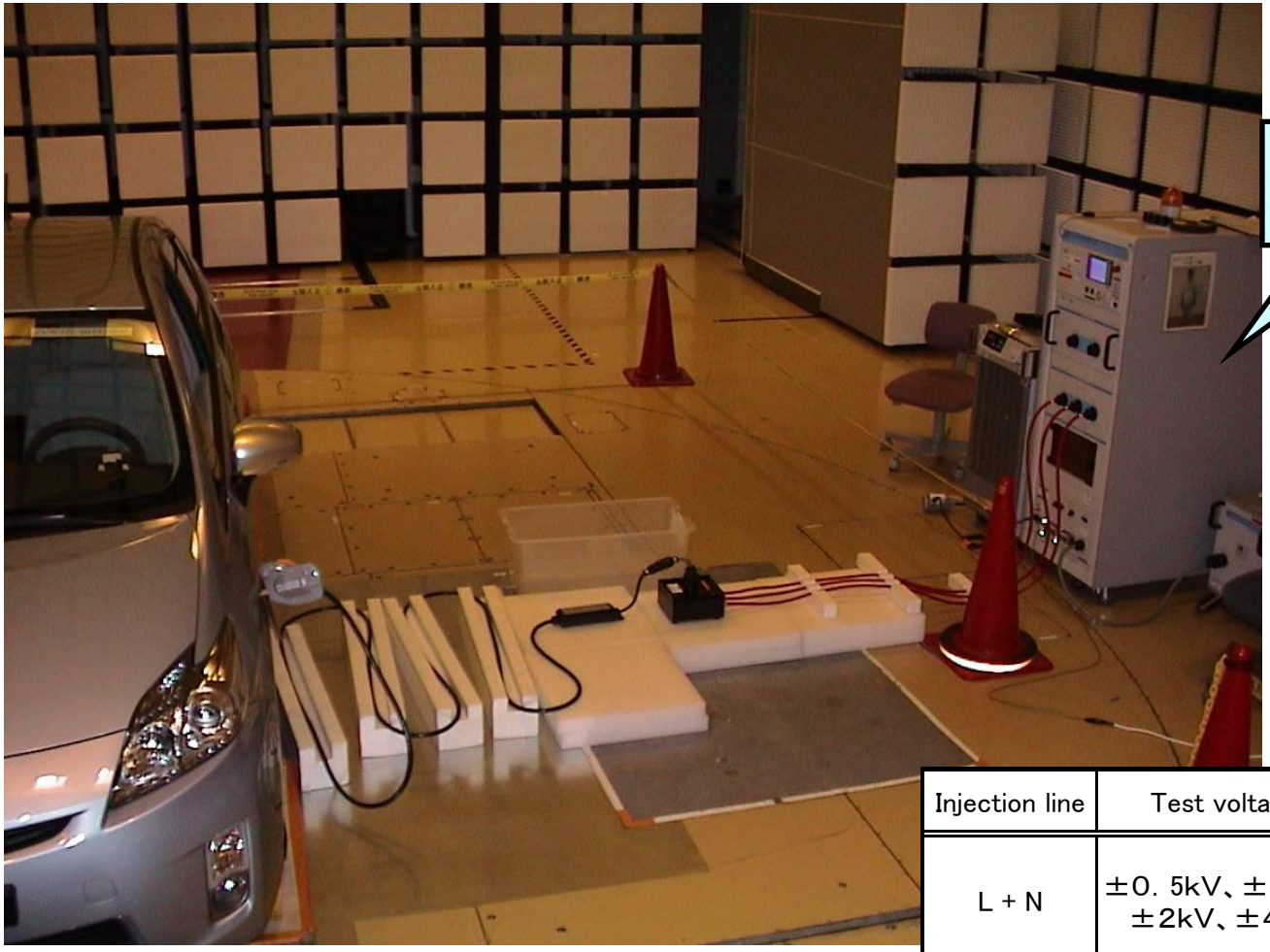


Figure 4

Vehicle in configuration "RESS charging mode coupled to the power grid" - Coupling between each line and earth for AC (three phases) power lines



Annex16 Method of testing for immunity of vehicles to surges conducted along AC and DC power lines



Injection line	Test voltage	Phase shifting	Performance criterion
L + N	±0. 5kV、±1kV、±2kV、±4kV	0°	C
		90°	
		180°	
		270°	
L/N + PE	±0. 5kV、±1kV、±2kV	0°	
		90°	
		180°	
		270°	

Compare the EMC test level between home appliance and vehicle

	Radiated Emission	Conductive emission	Harmonics emission
Vehicle	CISPR12	NA	NA
	Equivalent	New	New
Home appliance	CISPR22	CISPR22 LISN **150kHz ～30MHz**	IEC61000-3-2 50/60Hz 2～40N Harmonics

Compare the EMC test level between home appliance and vehicle

Immunity test

	EMI (radiate)	Electrical Noise
Vehicle	ISO11452-2,3 **75～25V/m** **20MHz～2GHz**	ISO 7637 200V ns～ms
	Vehicle test is higher level	New & more severe
Home appliance	IEC 61000-4-3 3V～10V/m 80MHz～1GHz	**IEC 61000-4-5,4-6** **Fast Transient Burst 2kV、5ns** **Lightning surge** **2kV、50μs**

Emission: Conductive noise and Immunity : Conductive surge

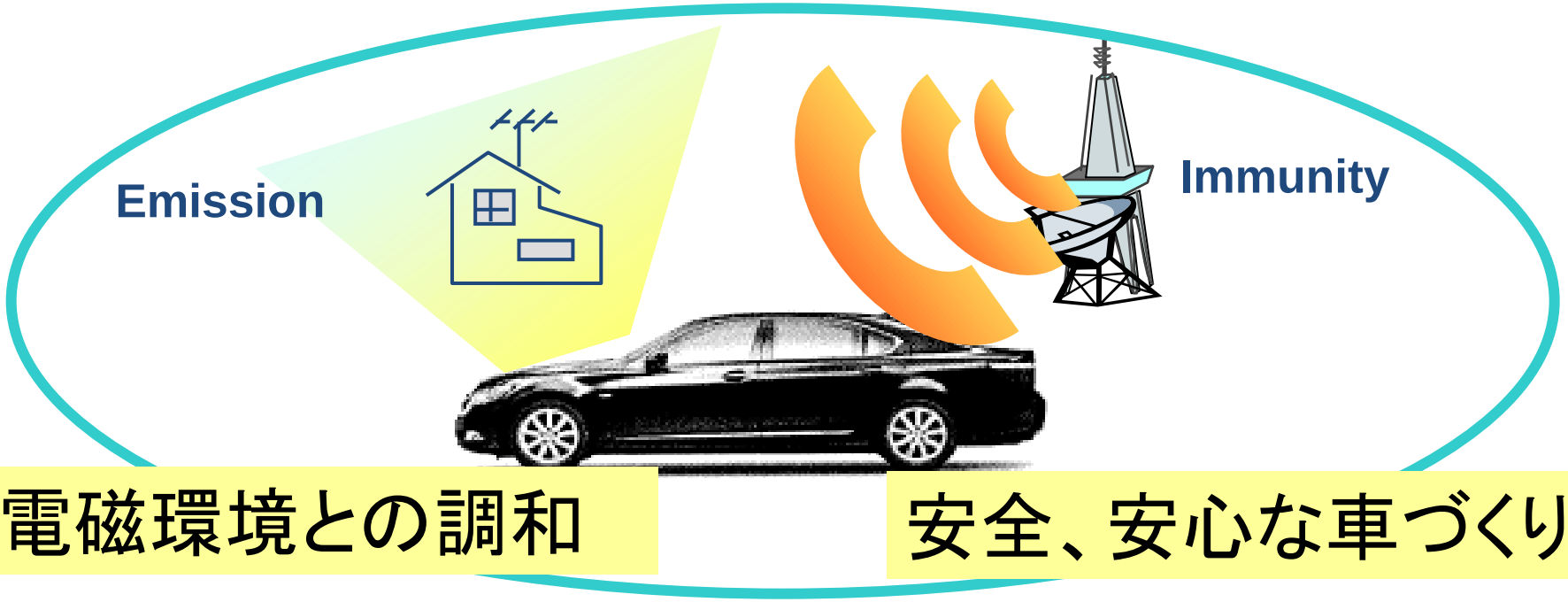
will be technical and facility issues.

Conclusion

R10-04 requirement seems a necessary and sufficient requirement for Plug-In EV & HV vehicle's EMC.

R10-04 requirement has new technical and facility issues of vehicle manufacture.

With adequate transition period, R10-04 will be a global Certification test method as a harmonized International mutual certification.



電磁環境との調和

安全、安心な車づくり

謝謝　:ご聴講有難う御座いました。

车辆 EMC & ECE R10-03

1. 车辆EMC
2. R10-03 国际认证
3. ECE R10-03 技术要求与测试
   - *车辆测试
   - *零部件测试
4. 电动车辆认证与ECE-R10/04

Akihiko Nojima
Kazuo Sakakibara
JASIC EMC W/G

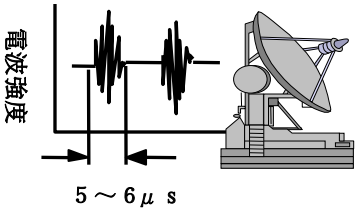
R10 技术要求与测试
--整车

[1] 车辆电磁兼容

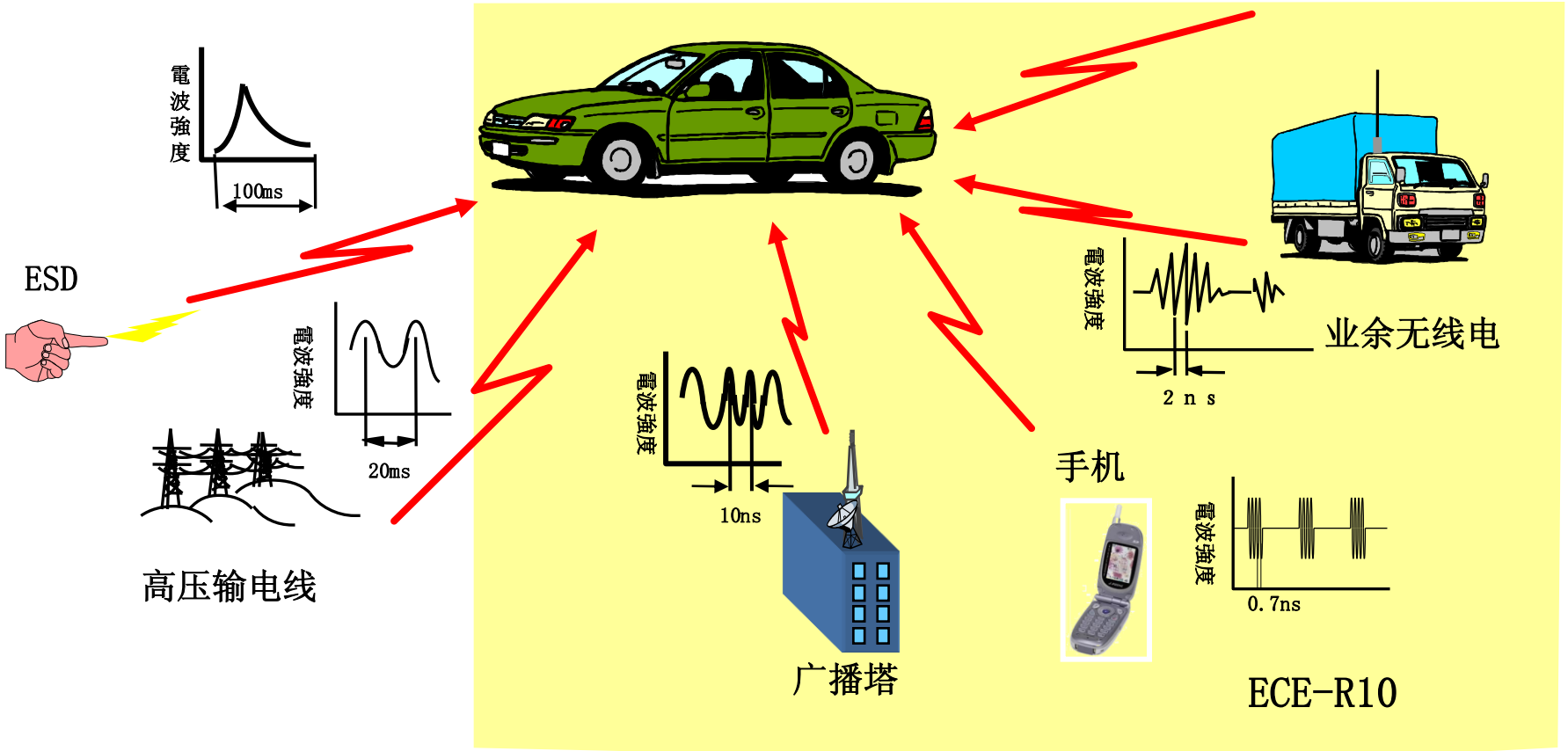
1.1 抗扰度（对强电磁场的敏感度）

◆目的

车辆在强电磁骚扰作用下正常运行的能力，电磁骚扰包括无线电发射机和广播信号等产生的射频信号。



航空雷达



[1] 车辆电磁兼容

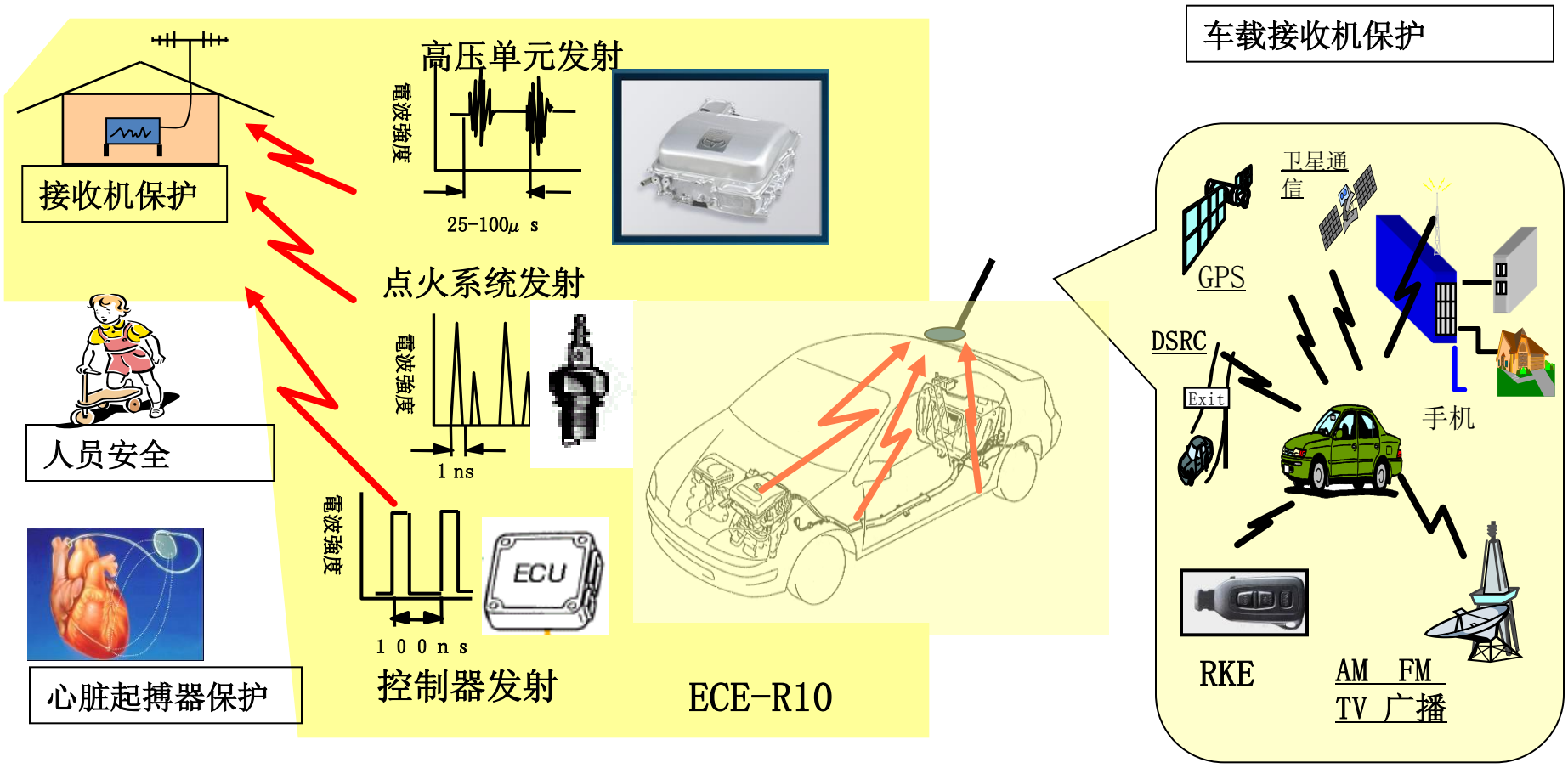
1.2 电磁发射

◆目的

法规：保护居民区的车外接收机和附近的车辆

曝露于电磁场限制导则：保护人员健康以及心脏起搏器等

市场价值：保护车载接收机 （例如，FM 收音机，GPS，手机）



[2] ECE R10-03

ECE/TRANS/WP.29
关于车辆法规一致性的国际论坛

ＥＣＥ　Ｒ１０-０３

通过IEC & ISO技术规定来统一 EMC 法规

参考标准

发射试验
CISPR 12&25

抗扰度试验
ＩＳＯ11451/11452, 7637

IEC: 国际电工委员会
CISPR:(国际无线电干扰委员会)
SC/D　D 分会 ： 车辆

ISO: 国际标准化组织
TC22：道路车辆
SC3：（电子电气设备）
WG3：（电气干扰）

[2] ECE R10-03

●：适用 ECE-R10　○：国内法规

区域	缔约方	发射	抗扰度	
欧洲	欧盟	●	●	EC指令应用ECE 法规
	俄罗斯	●	●	
北美洲	USA	SAE	SAE	
	加拿大	○		
亚洲/太平洋地区	日本	●	●	
	中国	○		
	印度	○	（○）2013-	等同 R10
	澳大利亚	○	○	等同 R10

[3] ECE R10-03

R10-03/04 传统车辆参考标准

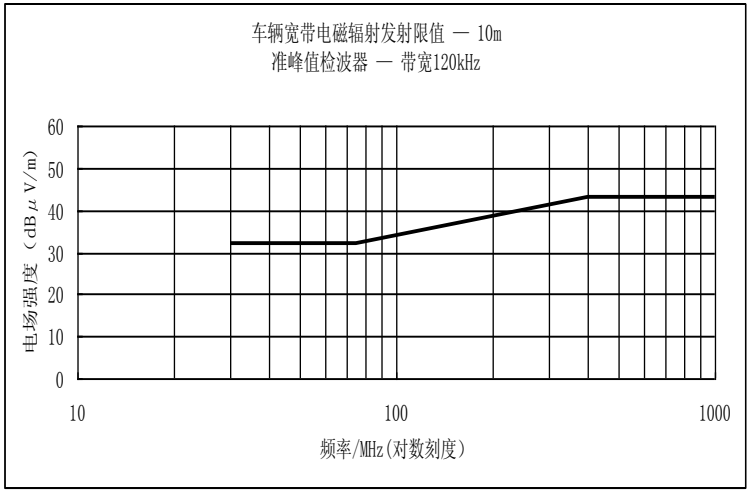
R10 利用了宽带和窄带的定义，所以保留了CISPR 12 版本5th

		测试项目		CISPR/ISO	
附件 4	车辆测试	车辆：宽带发射		CISPR12.5.1	2005
附件 5		车辆：窄带发射		CISPR12.5.1	2005
附件 6		车辆 抗扰度	ALSE	ISO11451-2 ed.3	2005
			BCI	ISO11451-4 ed.1	1995
附件 7	ESA 测试	零部件： 宽带发射		CISPR25.2	2004
附件 8		零部件： 窄带发射		CISPR25.2	2004
附件 9		零部件：抗扰度		ISO11452-1	2008
			ALSE	ISO11452-2 ed2	2004
			TEM	ISO11452-3 ed3	2001
			BCI	ISO11452-4 ed3	2009
			带状线	ISO11452-5 ed2	2002
附件 10		零部件：瞬态抗扰度和发射		ISO7637	2008

［3］ ECE R10-03

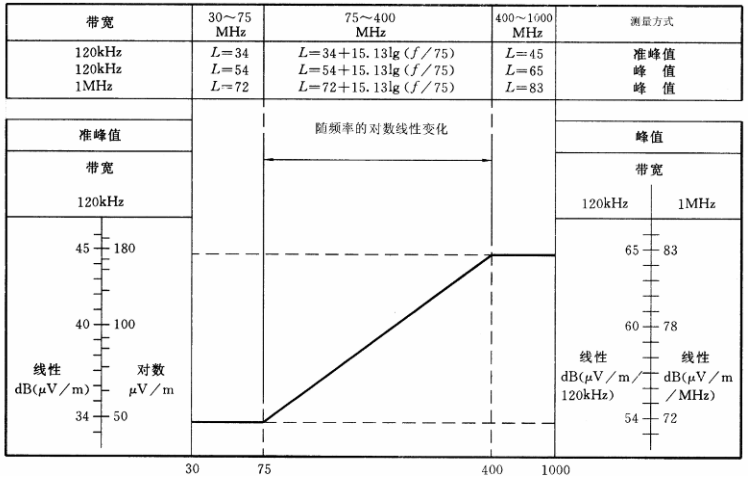
附件.4 宽带发射测试

R10-03/04



CISPR12

限值L_{bw}［dB(μV/m)］——对应带宽、检波器和频率的f(MHz) 函数



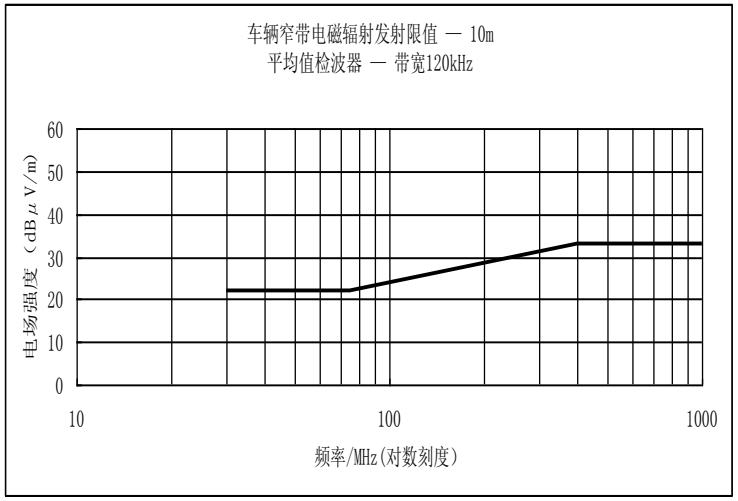
频率，MHz（对数刻度）

试验方法 ： 附件.4 宽带发射测试
参考 CISPR12 第5版

限值: 等于单个样品CISPR限值 -2dB

附件.5 窄带发射测试

R10-03/04



CISPR12

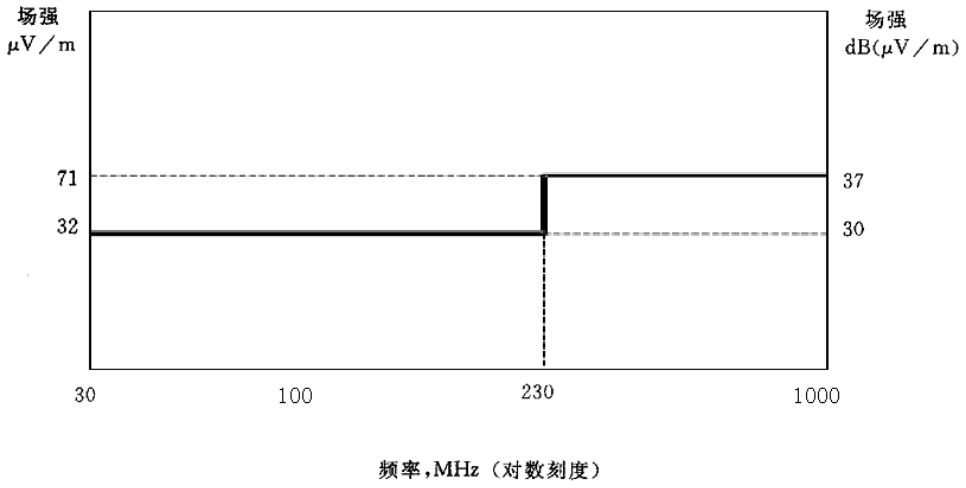


图3 天线距离为10m的骚扰限值（平均值检波器

测试方法 ： 附件.5 窄带发射测试
参考 CISPR12第5版

限值： 宽带QP限值-20dB.

3.2 车辆抗扰度测试

	参考标准	ISO 测试条件		EU 指令 ECE-R10
抗扰度 (20MHz - 2 GHz)	ISO 11451-2	电场强度 (V/m)	等级 1： 25 等级 2 ： 50 等级 3： 75 等级 4： 100	30V/m (最小25V/m)
		极化	水平和垂直极化	垂直极化
		调制	CW, AM & PM	20MHz -800MHz AM 800MHz-2000MHz PM
		车辆运行条件	制定测试计划时讨论	“50 km/h 工作循环”车辆 运行条件 + “制动工作循环” 车辆运行条件

［3］ ECE R10-03

电子电气系统EMC测试

宽带发射测试

内燃机、功率装置和电机

出于主观判断，如电动车窗电机

抗扰度测试

和驾驶安全相关的电子装置

例如，发动机控制单元

例如，ABS

窄带发射测试
微处理器系统

例如，收音机、导航

[3] ECE R10-03

抗扰度测试

R10-03中定义	JAMA EU 技术服务机构应用示例
(a)车辆直接控制相关的功能: (i) 发动机、传动装置、制动器、悬挂、主动转向系统、限速装置等设备性能降低或改变；： (ii) 影响驾驶员的位置: (iii) 影响驾驶员的视野:	发动机控制、巡航定速控制, ABS（防抱死系统）,VSC（车身稳定控制系统）,ECB（电动刹车系统）,电子驻车制动 电动转向,车道保持辅助系统 电源控制 雨刮控制, AFS（自适应前照灯）
(b)保护驾驶员、乘客和其它道路使用者相关的功能：	安全气囊，碰撞预防安全系统
(c) 受到骚扰时，引起驾驶员或其它道路使用者混乱相关的功能	大灯调节器，转向信号灯，警报器
(d)车辆数据总线性能相关的功能: 妨碍车辆数据总线系统的数据传输。车辆数据总线系统用于传输数据，需要确保其他抗扰度相关功能正常。	a,b&c 系统的网关设备
(e) 受到骚扰时，影响车辆法常规数据相关的功能:	仪表,限速器里程表

［3］ ECE R10-03

抗扰度测试时车辆运行状态

	R10 描述	JAMA实际操作
车辆速度	如果没有技术原因造成条件改变，发动机应正常工作，驱动轮速度稳定在50 km/h L1 和 L2类车辆速度稳定在25 km/h.	基本运行状态为M,N=50km/h，L=25km/h， 进行混合动力车辆试验或其他抗扰度相关功能测试时使用70km/h 或不同的速度。
CDM（底盘测功机） 条件	车辆应放置在合适的加载测功机上，如果没有测功机，可以使用绝缘轴支撑物支起车辆，和地面间隙尽量小。这时，传动轴、传动带或传动链可以断开（例如，卡车，两轮和三轮车）	有CDM和无CDM的测试方法都应用R10车辆测试。在制动工作循环测试时，模拟制动状态下轮速变化信号采用速度信号模拟器。

抗扰度测试时车辆运行状态

	R10 描述	JAMA实际操作
电子电气系统运行状态	近光灯 ON 前雨刮 ON 最大速度 驾驶员侧方向灯 ON 可调节悬挂处于正常位置 驾驶员座位和方向盘处于中间位置 报警器关闭 喇叭关闭 安全气囊和安全约束系统运行，不考虑乘客安全气囊。 自动门关闭 制动系统的自动调整臂处于正常位置	设置巡航控制系统. 前雨刮设置到“高”档 驾驶员侧方向灯打开. 驾驶员座位和方向盘不处于极端位置。. 声音设备处于静音状态, 即，报警器关闭、喇叭关闭、收音机关闭。 安全气囊运行，不考虑乘客安全气囊。 如果需要, A/C 关闭. 后雾灯关闭.

［3］ ECE R10-03

抗扰度测试时车辆运行状态 R10-03 附件.6

车辆测试条件（50km/h工作循环）	失效判定准则
车速50 km/h ± 20% （L1类和L2类车速25 km/h ± 20% ）（车辆驱动转鼓）。如果车辆装备有巡航控制系统，该系统应运行。	速度变化大于正常速度的 ± 10 % 。如果使用自动变速箱：传动比改变引起的速度变化大于正常速度的 ± 10 % 。
近光灯打开（手动模式）	灯熄灭
前雨刮开到最大速度（手动模式）	前雨刮完全停止
驾驶员侧的方向指示灯打开	频率改变（低于0,75 Hz或高于2,25 Hz） 工作周期改变（低于25 %或高于75 %）
可调节悬挂处于正常位置	显著意外变化
驾驶员座位和方向盘处于中间位置	意外变化大于总范围的10 %
报警器关闭	报警器意外激活
喇叭关闭	喇叭意外激活
安全气囊和安全约束系统运行，不考虑乘客安全气囊。	意外激活
自动门关闭	意外打开
制动系统的自动调整臂处于正常位置	意外激活

车辆测试条件（制动工作循环）	失效判定准则
在确定制动工作循环试验计划中，必须包括制动踏板的操作（除非因技术原因不能这么做），不必包括防抱死制动系统的作用。	在制动工作循环中，制动灯不亮 制动功能丧失，制动故障报警灯亮 意外激活

［3］ ECE R10-03

JAMA的 经验

功能	·检查项目	·监测手段	·要求
发动机管理(巡航控制和传动控制)	·使用组合仪表或底盘测功机转速来检查车辆速度 ·检查发动机灯. ·检查CCS灯.	·车辆内安装监视器或使用底盘测功机转速监测	·在无骚扰和有骚扰情况下没有显著的速度偏离*1. *1：不超过 50±10km/h 以及控制错误. ·检查发动机警示灯没有点亮 ·档位没有改变
EMPS电子辅助动力转向系统	·转向和车辆移动 ·报警灯.	·车内外安装监视器	·转向没有动作. ·报警灯没有点亮. ·车辆没有意外移动
安全气囊系统	·安全气囊报警灯 ·安全气囊展开	·车内安装监视器	·安全气囊报警灯没有点亮 ·安全气囊没有展开.
DRL白天行驶灯，灯控制系统 Fr控制器，后雾灯	· 前大灯 · 后雾灯. · 喇叭.	·车内外安装监视器	·前大灯没有点亮 ·后雾灯没有点亮 ·喇叭没有激活.

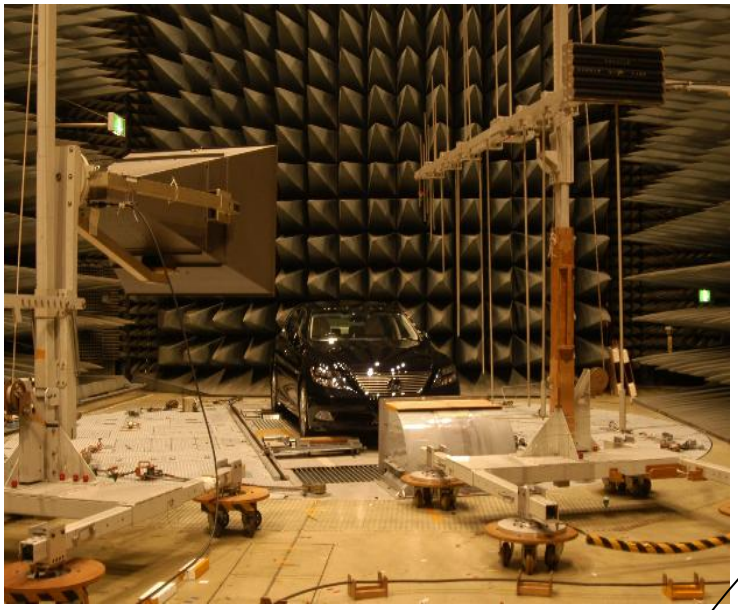
［3］ ECE R10-03

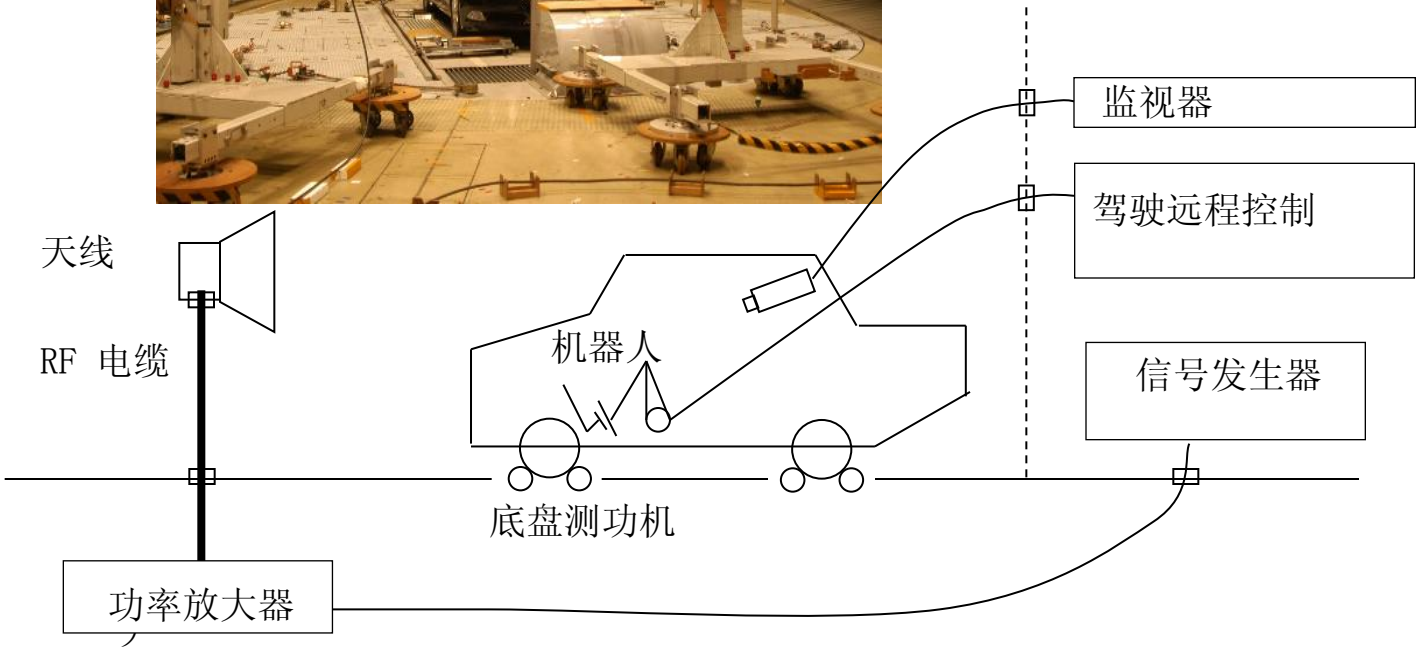
JAMA的 经验

功能	·检查项目	·监测	·要求
方向灯	·方向灯的闪烁速度及频率	·车内外安装监视器	·方向灯没有连续处于熄灭状态或点亮状态。 ·方向灯闪烁频率和速度的显著变化，使用O/E 变换器检查。. 指令:频率0.75~2.25Hz，速度25~75%.
自适应前照灯系统	·即AFS,检查前大灯光束的情况.	·车外安装监视器	·前大灯光束没有明显的移动。.
雨刮控制系统	·前雨刮臂的移动	·车内外安装监视器	·没有停止.
座椅位置控制系统	·座椅的位置.	·车内安装监视器	·座椅的位置没有改变 指令：小于总范围的 10%
电动天窗和电动伸缩方向盘	电动天窗和电动伸缩方向盘位置 .	·车内安装监视器	·电动天窗和电动伸缩，方向盘位置不变。.
组合仪表	·如果是光仪表类型检查仪表照明. ·速度指示 ·里程表指示	·车内安装监视器	·在无骚扰和有骚扰情况下没有显著的速度偏离*1. *1：不超过 50±10km/h 以及控制错误. *仪表指示灯没有熄灭.没有不正常的计数终止或倒计数。

3.2车辆抗扰度测试

ISO11451-2：窄带辐射电磁能引发的电骚扰的车辆测试





电动车如何进行EMC相关认证

［4］ 欧盟关于电动车/插入式混合动力车的EMC认证

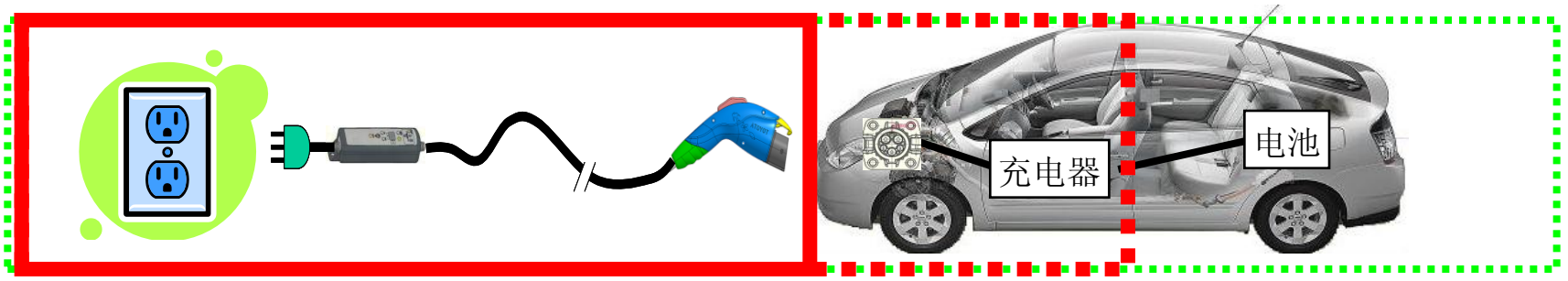
	发射		抗扰度	充电相关 EMC	
	9kHz-30MHz	30M-1GHz		充电电缆	车载系统
中国	GB/T 18387	GB 14023		??	??
欧盟		R10-03	R10-03	对基本EMC指令 2004/108/EC的符合自我声明	
日本		R10-03	R10-03	对 PSE**符合自我声明	

R10-04发布后

欧盟		R10-04	R10-04	CE符合自我声明	R10-04
日本		R10-04	R10-04	PSE**符合自我声明	R10-04

**PSE：产品安全用品和材料，电气用品和材料安全法

连接电源线的充电系统需要满足基本的EMC指令



ECE R10-04 将于2011.10.28强制执行.

EMC 指令2004/108/EC

低压指令2006/95/EC
协调标准
IEC61851-21

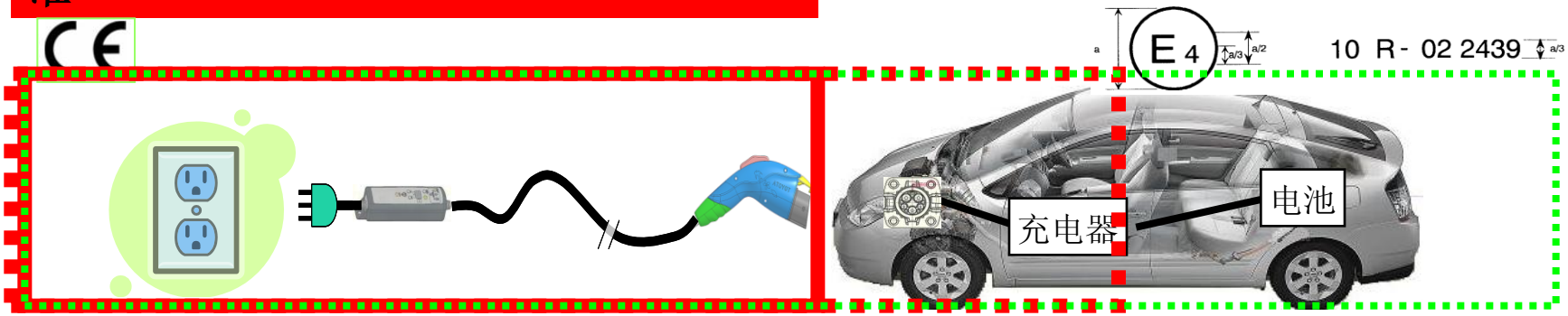
车辆 EMC 法规
：ECE R10-03
参考 CISPR12, ISO11451

车辆不在EMC指令2004/108/EC的范围内.
需要对充电系统进行EMC评价。

IEC61851-21 参考家用器具的相关EMC标准

增加了充电模式
→R10-04
CISPR12, ISO11451

充电模式需要应用家用器具的相关EMC标准



日本 MLIT在2011年5月底应用 ECE R10-03

电气用具和材料安全法

:经济、商业和工业部门

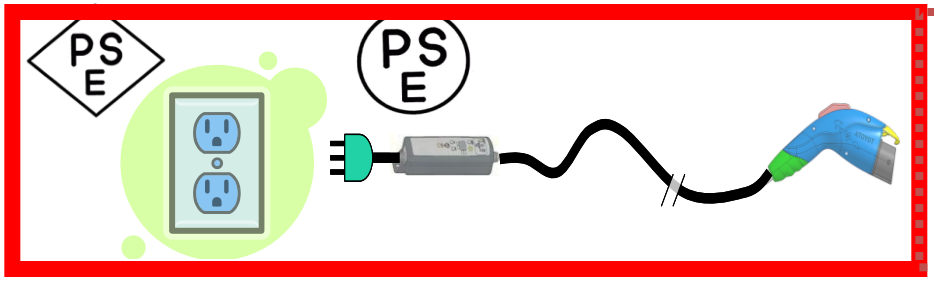
协调标准
IEC61000系列或 JIS

道路车辆安全法规

：国土、基建、运输和旅游相关部门
ECE R10-03

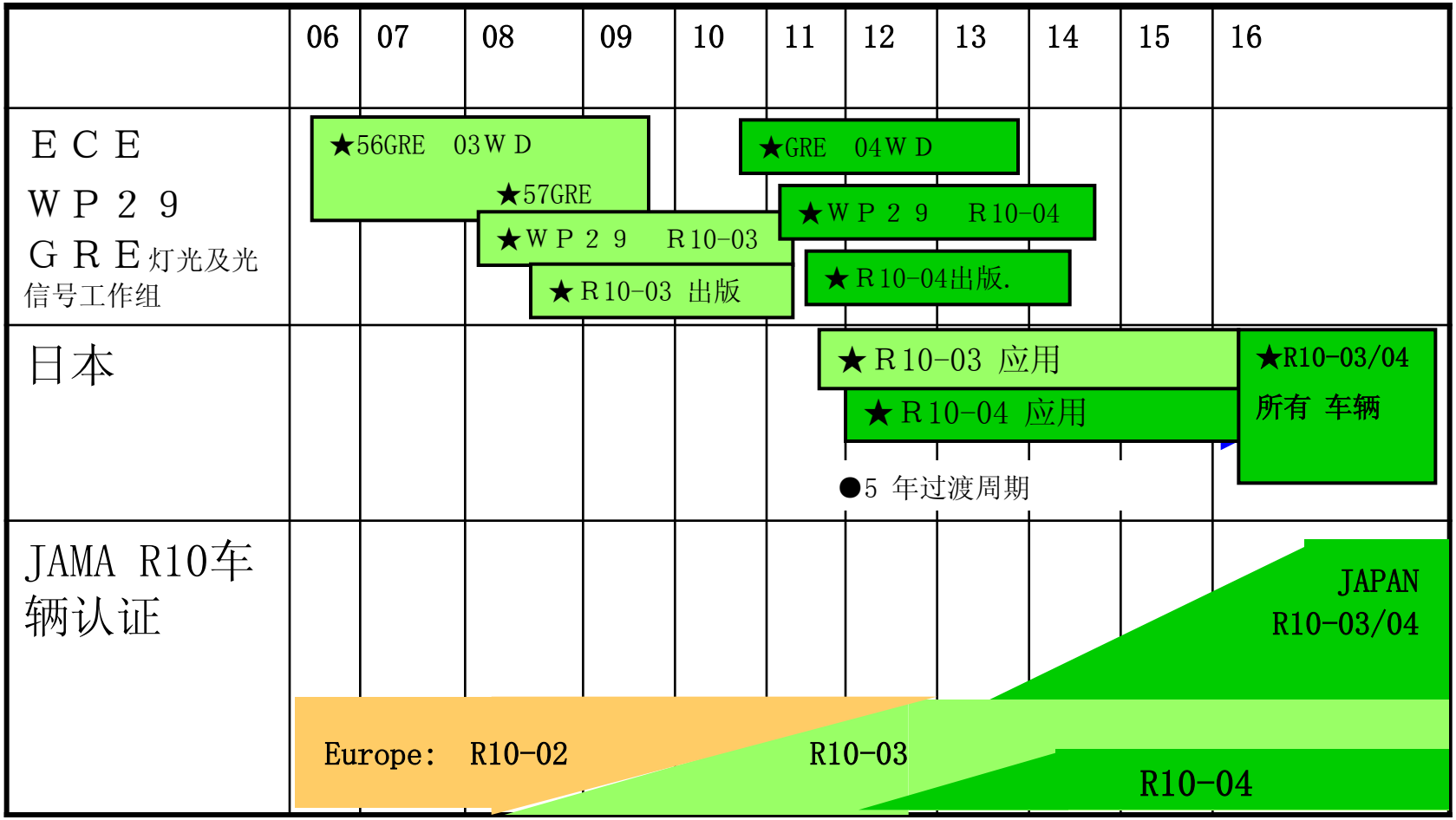
增加了充电模式
→R10-04
CISPR12, ISO11451

充电模式需要应用家用器具的相关EMC标准



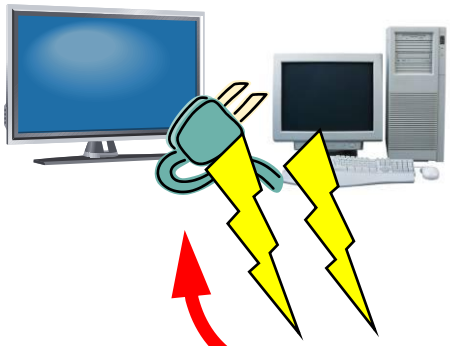
ECE R10-03/04

2011年10月ECE R10-03 转变为 04



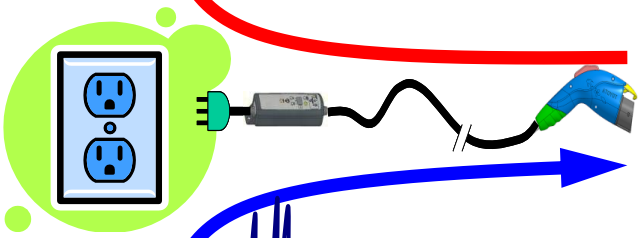
［4］ 电动车/插入式混合动力车的EMC测试标准

IEC61851-21



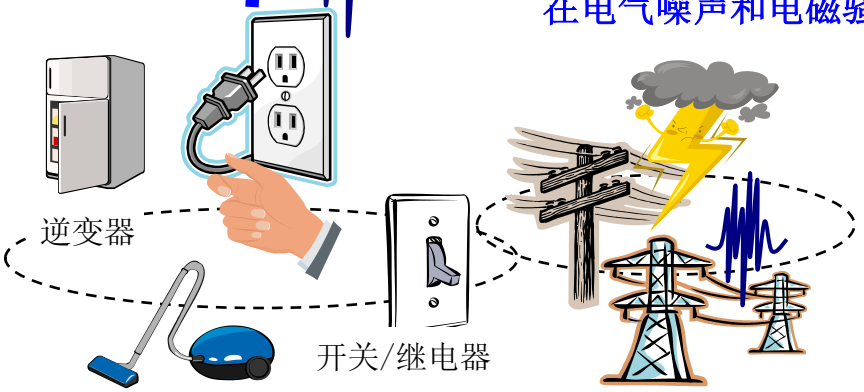
发射（CISPR/IEC）：不能骚扰其他电子系统

IEC61000-3-2 谐波电流 发射
IEC61000-3-3 AC电源电压波动
CISPR22 高频传导骚扰
CISPR22 辐射发射→CISPR12 辐射发射



抗扰度（IEC）：

在电气噪声和电磁骚扰影响下保持比较安全的功能状况



IEC61000-4-2 ESD静电放电
IEC61000-4-3 辐射电磁骚扰
IEC61000-4-4 快脉冲群
IEC61000-4-5 雷电浪涌
IEC61000-4-6 传导电磁骚扰
IEC61000-4-11 电压波动
IEC61000-4-13 电源电压谐波

** 没有参考 IEC61851-21*

家用器具　　基础设施和自然界噪声

［4］ R10 03/04中的电动车/插入式混合动力车的EMC测试

R10-03	
附件4:	车辆宽带发射
附件 5:	车辆窄带发射
附件 6:	车辆抗扰度
附件 7:	零部件宽带发射
附件 8:	零部件窄带发射
附件 9:	零部件抗扰度
附件10:	零部件瞬态抗扰度和瞬态发射

充电模式发射应用宽带发射QP方式测量

R10-04	
	R10-03 + 充电模式发射
	R10-03 + 充电模式抗扰度
附件. 11.	车辆AC电源线的谐波发射
附件. 12.	车辆AC电源线的电压变化、波动、闪烁发射
附件. 13.	车辆AC或DC电源线的射频传导骚扰发射测试方法
附件. 14.	车辆上网络和通讯端口上的射频传导骚扰发射测试方法
附件. 15.	沿AC和DC电源线上的电快速瞬态脉冲群骚扰的车辆抗扰度测试方法
附件. 16.	沿AC和DC电源线上浪涌的车辆抗扰度测试方法

电动车的充电系统车辆测试应用了 6 个 IEC 试验标准

零部件级的试验还在讨论中.

ECE R10-04 的附件及测试参考标准

R10-04		测试标准
附件.11	车辆AC电源线的谐波发射测量方法	IEC61000-3-2(edition3.2-2009) IEC61000-3-12(edition1.0-2004)
附件.12	车辆AC电源线的电压变化、波动、闪烁发射测量方法	IEC61000-3-3(edition2.0-2008) IEC61000-3-11(edition1.0-2000)
附件.13	车辆AC或DC电源线的射频传导骚扰发射测试方法	CISPR 16-2-1:(edition2.0-2008) IEC61000-6-3(edition2.0-2006)
附件.14	车辆上网络和通讯端口上的射频传导骚扰发射测试方法	CISPR 22:(edition6.0-2008) IEC61000-6-3(edition2.0-2006)
附件.15	沿AC和DC电源线上的电快速瞬态脉冲群骚扰的车辆抗扰度测试方法	IEC 61000-4-4(edition 2.0-2004)
附件.16	沿AC和DC电源线上浪涌的车辆抗扰度测试方法	IEC 61000-4-5(edition 2.0-2005)

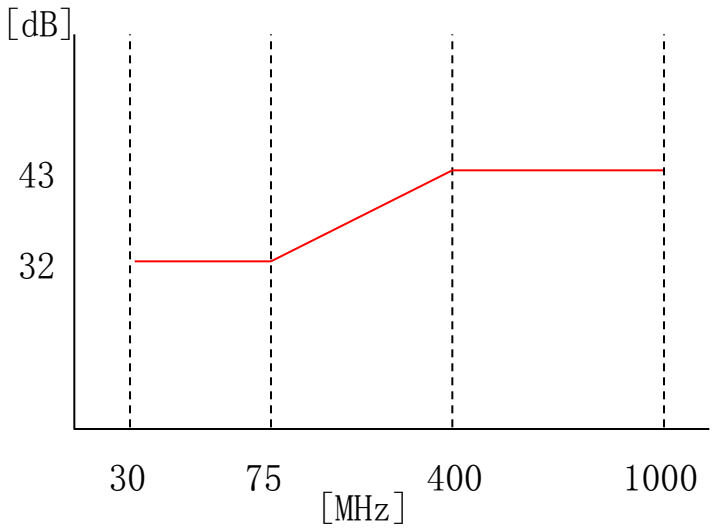
附件4：宽带发射

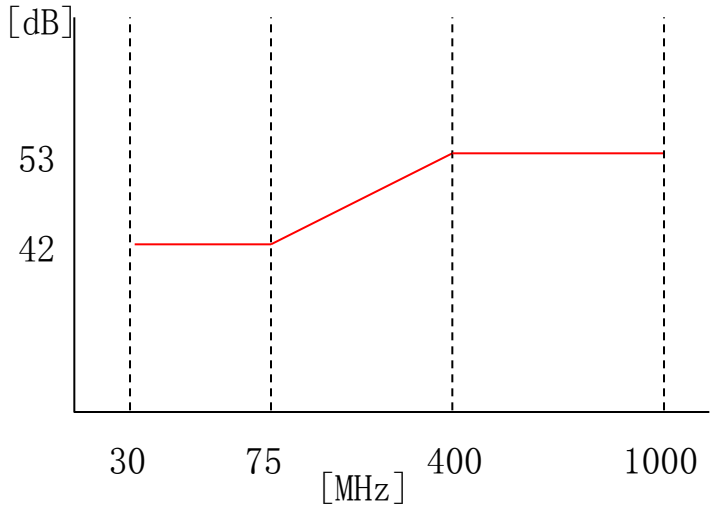
QP　限值

(Peak 限值 = QP 限值 + 20dB)

a）10±0.2m
- 30~75MHz：32dBμV/m
- 75～400MHz：32～43dBμV/m
- 400～1000MHz：43dBμV/m

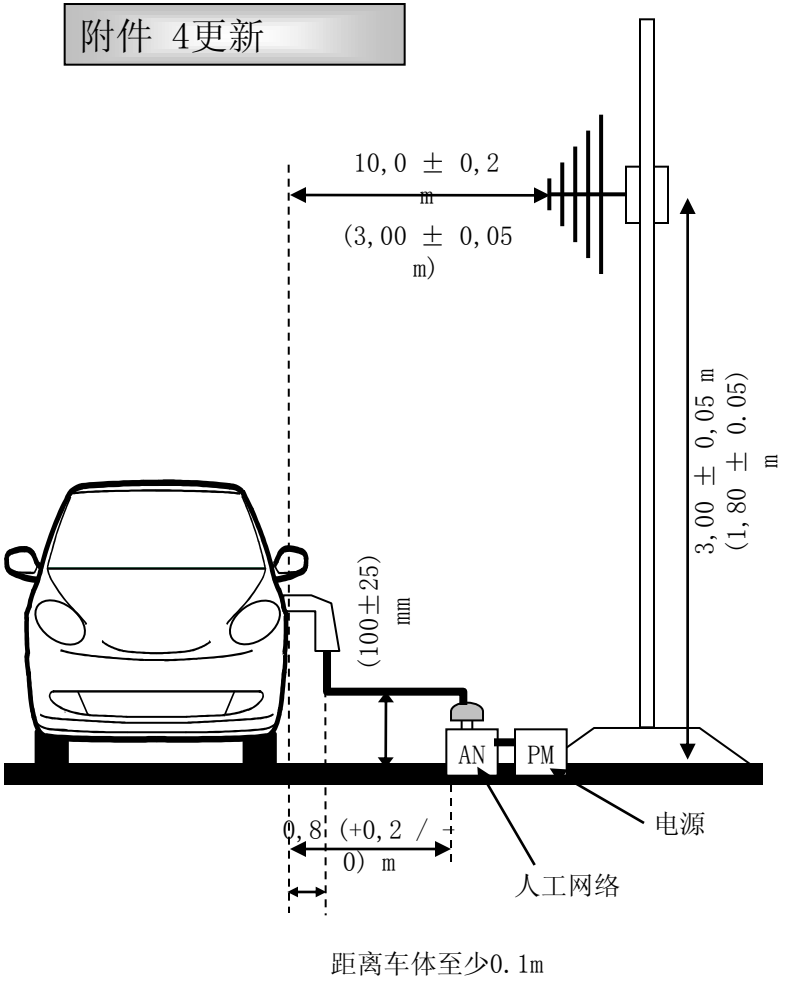
b）3±0.05m
- 30~75MHz：42dBμV/m
- 75～400MHz：42～53dBμV/m
- 400～1000MHz：53dBμV/m

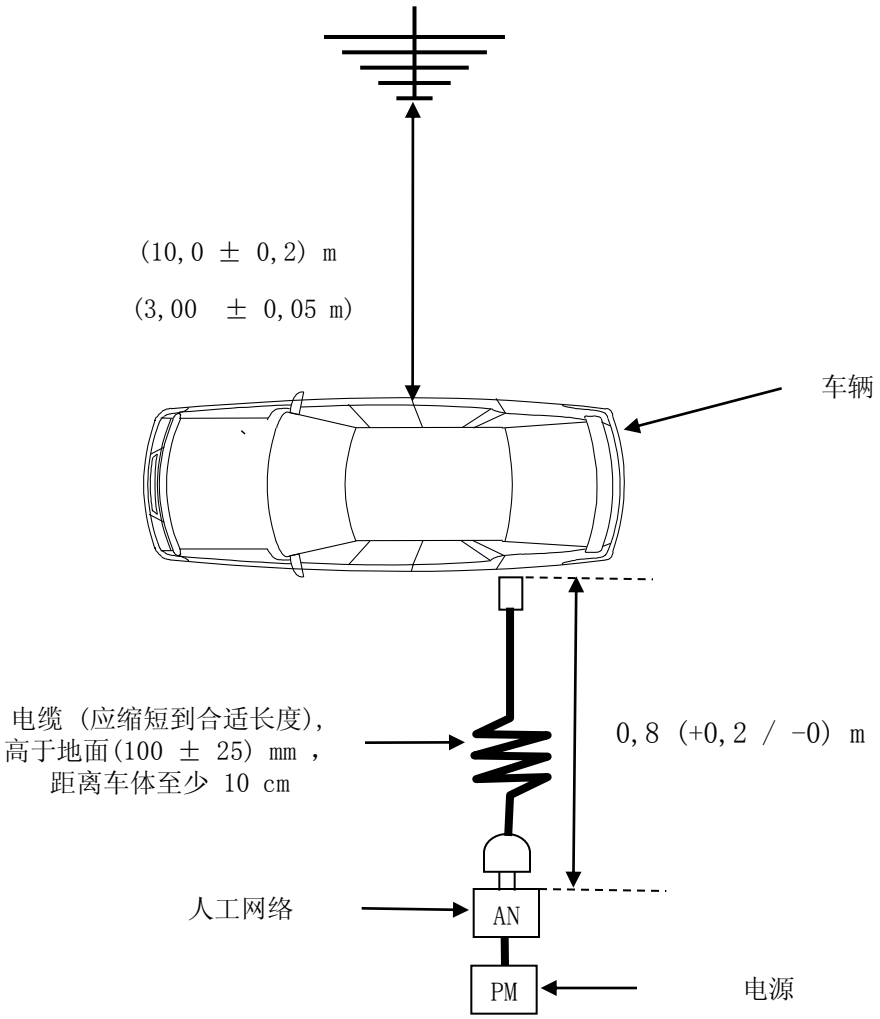




附件4：宽带发射

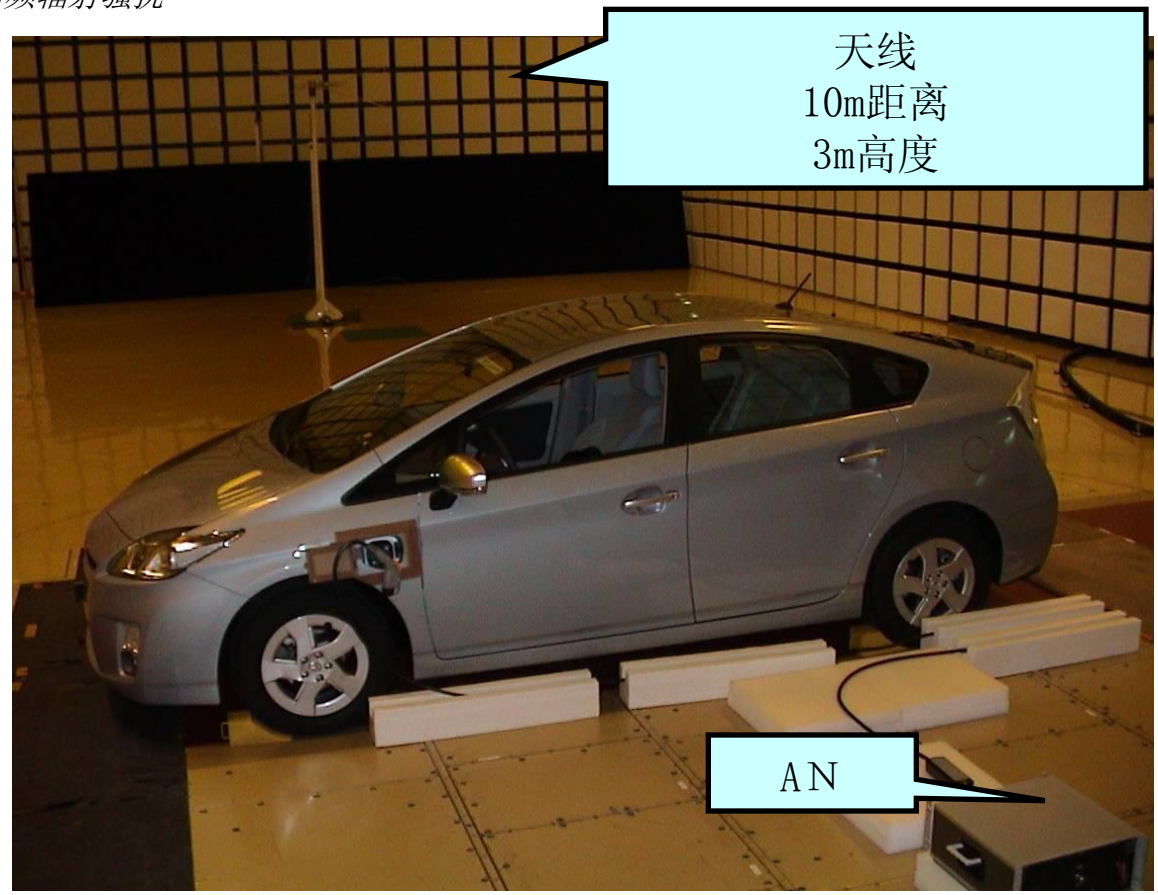
附件 4更新

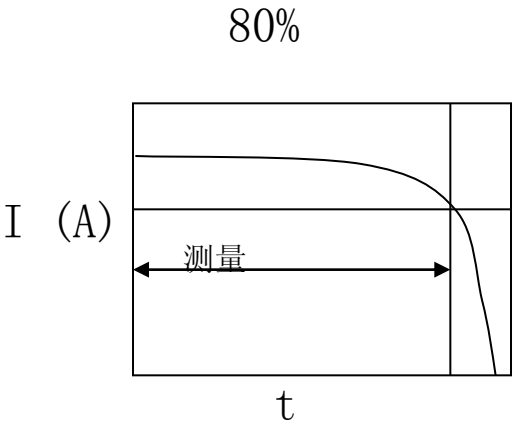




附件4：宽带发射

高频辐射骚扰





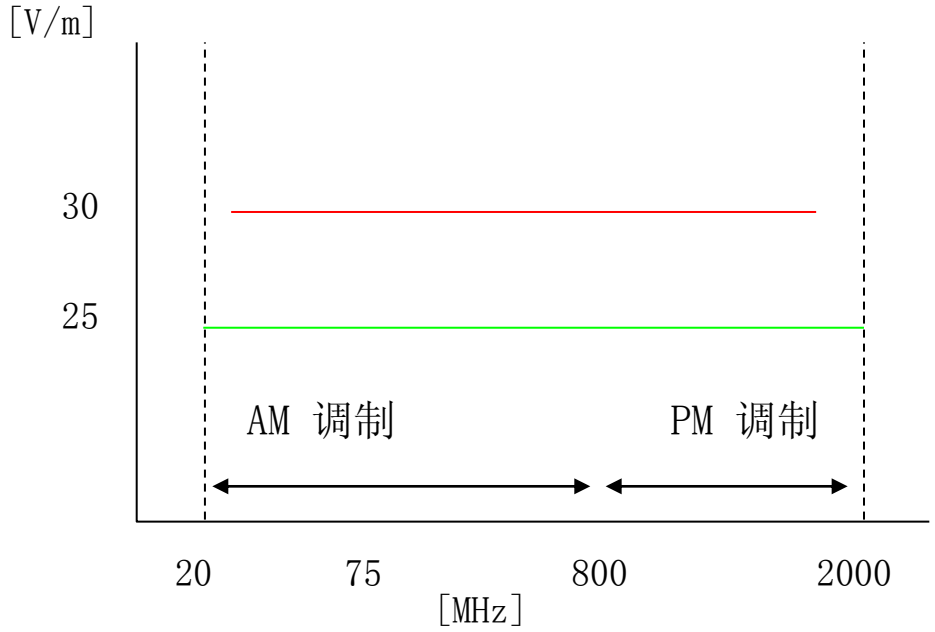
“车辆应处于充电模式，以标称功率充电直到AC或DC电流达到起始值的80%。 “

一般说来，电池充电开始时电流最大，充满时电流降低。不要对已经充满电的电池进行电流测量。

附件6:车辆抗扰度测量方法

·20～2000MHz 30V/m rms 按照 ISO11451规定峰值恒定（和IEC 抗扰度测试规定不同）

20 MHz～2000 MHz的90％频段内场强应为 30 volts/m rms（方均根值）；
在20 MHz～2000 MHz全频段内，场强应不低于25 V/m rms

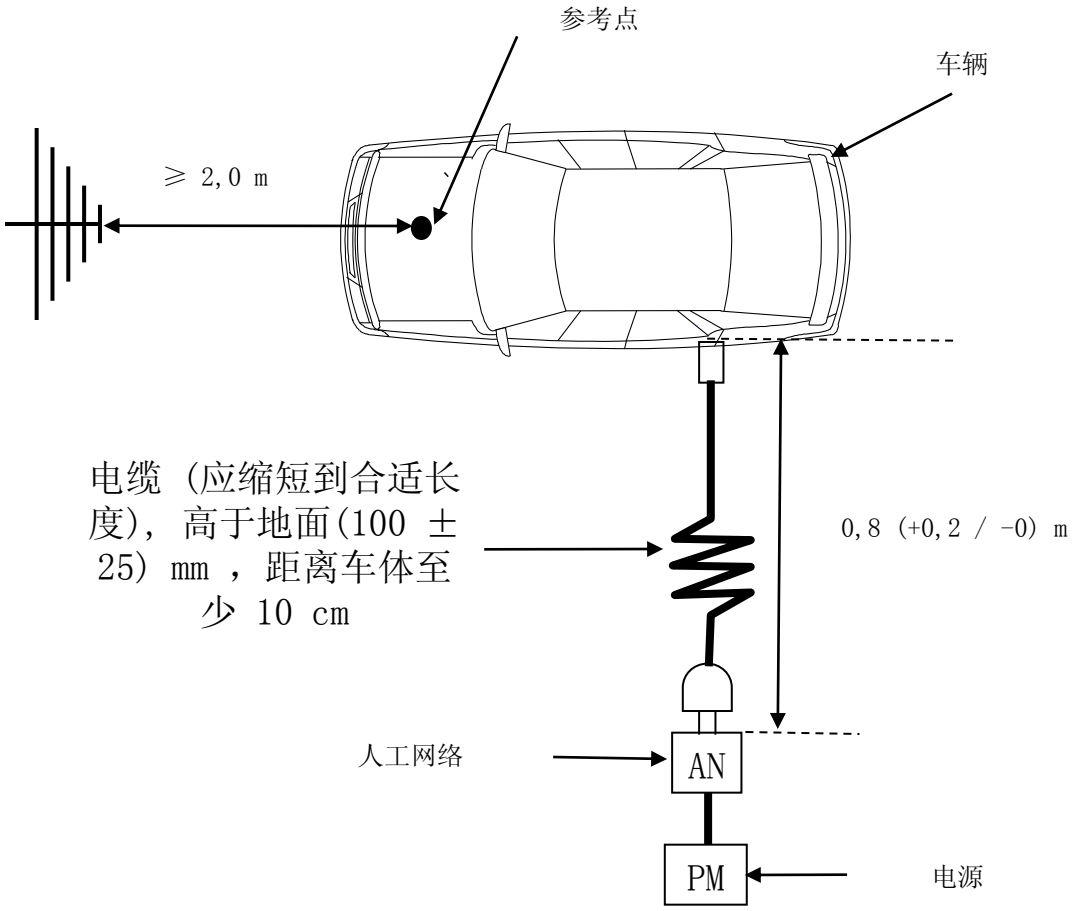


附件6:车辆抗扰度测量方法

附件 6更新

“图 4

车辆“RESS 在充电模式下耦合到电网“配置



附件6:车辆抗扰度测量方法

“车辆不运转,发动机 OFF并处于充电状态

“RESS 在充电模式下” 车辆测试运行状态	实效判定准则
RESS 处于充电模式. RESS 充电状态应由制造商和技术服务部门商定。	车辆有动作

附件11 车辆AC电源线的谐波发射测量方法

・表3
输入电流≤ 16 A时，根据IEC61000-3-2（3.2-2009版）中的规定，每相的最大允许谐波

谐波数n	认可的最大谐波电流A
奇次谐波	
3	2.3
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15≤n≤39	0.15x15/n
偶次谐波	
2	1.08
4	0.43
6	0.30
8≤n≤40	0.23x8/n

表4
输入电流>16A且≤75A时，非平衡三相设备每相的最大允许谐波

最小 R_{sce}	可接受的单个谐波电流 I_n / I_1%						最大电流谐波比%	
	I3	I5	I7	I9	I11	I13	THD	PWHD
33	21.6	10.7	7.2	3.8	3.1	2	23	23
66	24	13	8	5	4	3	26	26
120	27	15	10	6	5	4	30	30
250	35	20	13	9	8	6	40	40
≥350	41	24	15	12	10	8	47	47

小于或等于12的偶次谐波的相对值会低于16/n%。高于12的偶次谐波采用与奇次谐波相同的方式来考虑THD和PWHD。序列值 R_{sce} 之间进行线性插值是许可的。

附件11 车辆AC电源线的谐波发射测量方法

表 5
平衡三相设备的最大允许谐波（输入电流>16A且≤75A每相）

最小 R_{sce}	可接受的单个谐波电流 I_n/I_1%				最大电流谐波比%	
	I_5	I_7	I_{11}	I_{13}	THD	PWHD
33	10.7	7.2	3.1	2	13	22
66	14	9	5	3	16	25
120	19	12	7	4	22	28
250	31	20	12	7	37	38
≥350	40	25	15	10	48	46
HD小于或等于12的偶次谐波的相对值会低于16/n%。高于12的偶次谐波采用与奇次谐波相同的方式来考虑THD和PW。序列值 R_{sce} 之间进行线性插值是许可的。						

表 6
特殊条件下的平衡三相设备的最大允许谐波（输入电流>16A且≤75A每相）

最小 R_{sce}	可接受的单个谐波电流 I_n/I_1%				最大电流谐波比%	
	I_5	I_7	I_{11}	I_{13}	THD	PWHD
33	10.7	7.2	3.1	2	13	22
≥120	40	25	15	10	48	46
小于或等于12的偶次谐波的相对值会低于16/n%。高于12的偶次谐波采用与奇次谐波相同的方式来考虑THD和PWHD。						

由于Δ电路中没有3rd谐波，平衡三相没有 3rd，6th ，9th 谐波发射

附件11 车辆AC电源线的谐波发射测量方法

新附件 11

附件11-附录1

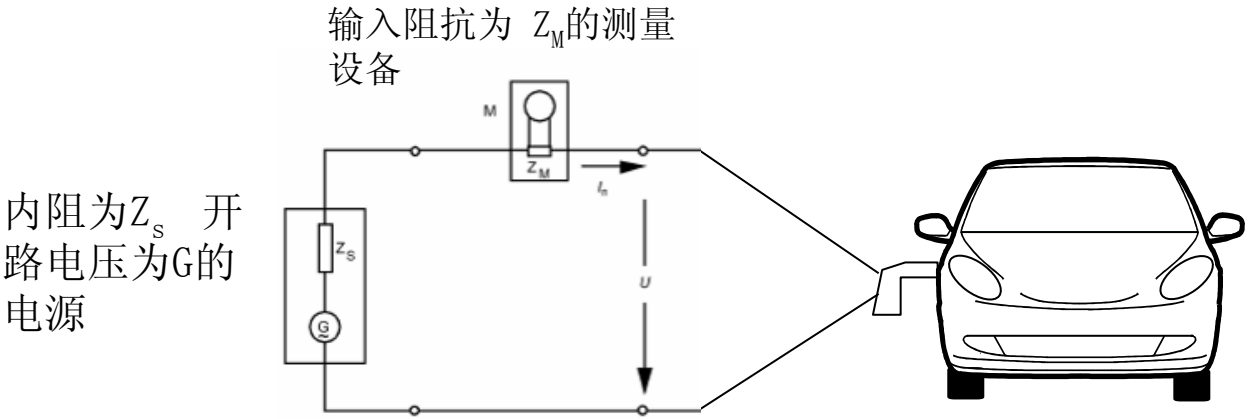


图1 汽车处于“RESS充电模式时对电网的耦合”状态，单相充电时的试验布置

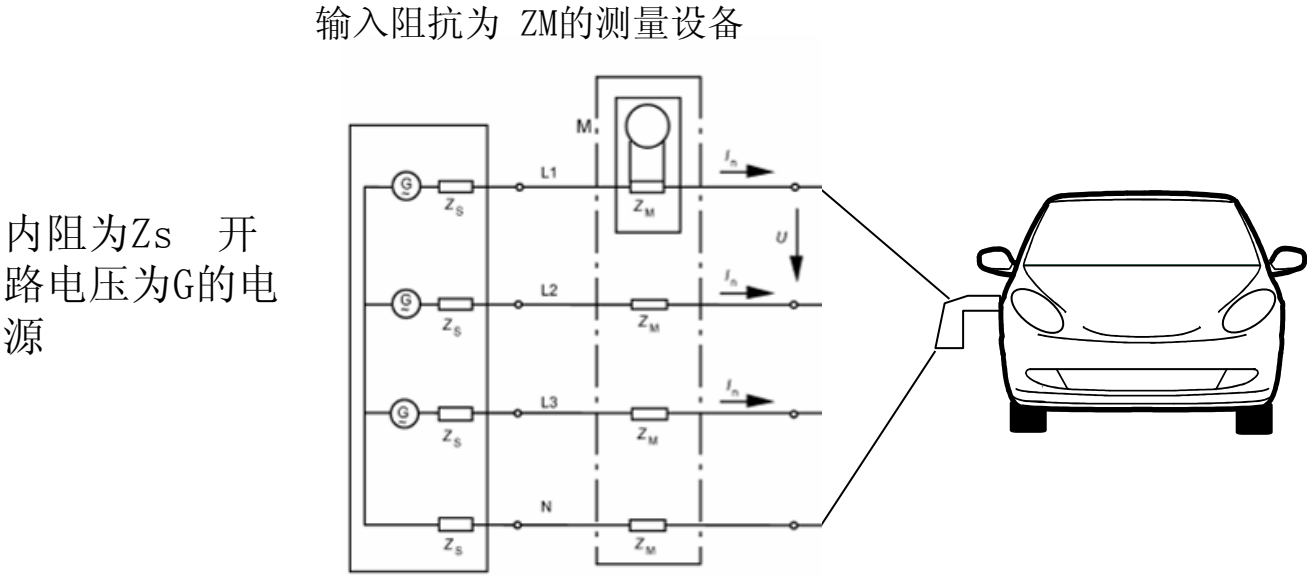
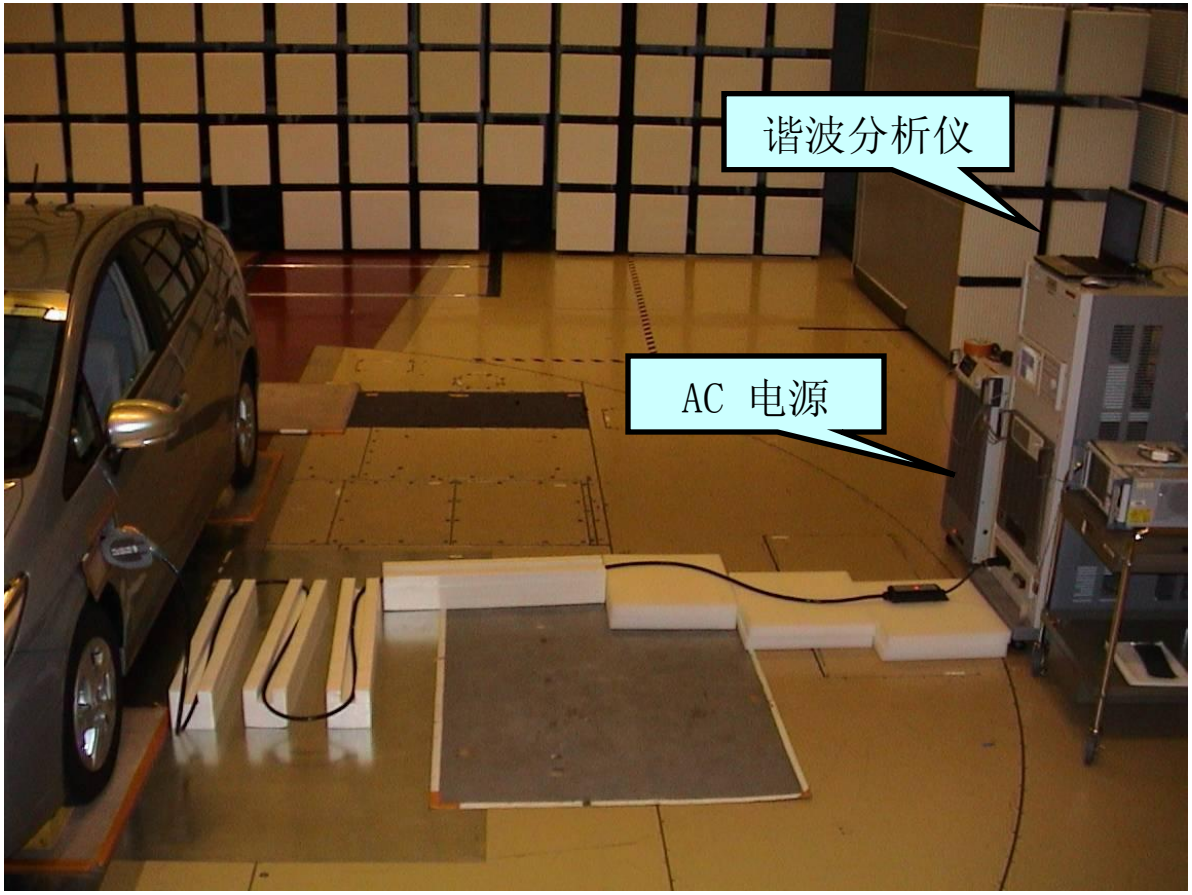


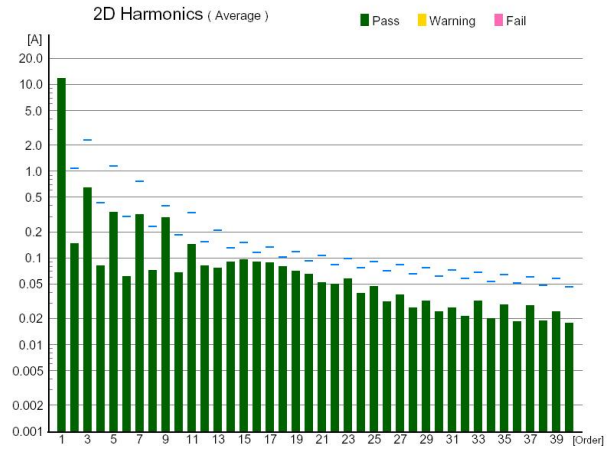
图2 汽车处于“RESS充电模式时对电网的耦合”状态，三相充电时的试验布置

附件11车辆AC电源线的谐波发射测量方法

低频传导骚扰（谐波）



Limit Levels	≪Odd harmonics≫ N=3: 2.30 [A] N=5: 1.14 [A] N=7: 0.77 [A] N=9: 0.40 [A] N=11: 0.33 [A] N=13: 0.21 [A] N=15 to 39: 0.15×15／N [A] ≪Even harmonics ≫ N=2: 1.08 [A] N=4: 0.43 [A] N=6: 0.30 [A] N=8 to 40: 0.23×8／N [A]



附件12　车辆AC电源线的电压变化、波动、闪烁发射测量方法

最大允许电压变化、电压波动和闪烁（额定电流≤16A每相且不受特殊连接的情况））

IEC61000-3-3 (edition2.0-2008)

表 7

・・・限值：IEC61000-3-3　5条

IEC61000-3-3　5条

Pst	＜1．0
Plt	＜0．65
d（t） 大于 3.3%	＜500msec
dc	<3,3%
dmax a）没有附加条件 除了电冰箱 b）例如自动洗衣机 c）例如，吹风机	＜4％ ＜6％ ＜7％

最大允许电压变化、电压波动和闪烁（额定电流>16A而≤75A每相且受特殊连接的情况）

IEC 61000-3-11 (edition 1.0 - 2000)

表 8

・・・限值：IEC61000-3-11　5条

IEC61000-3-11　5条

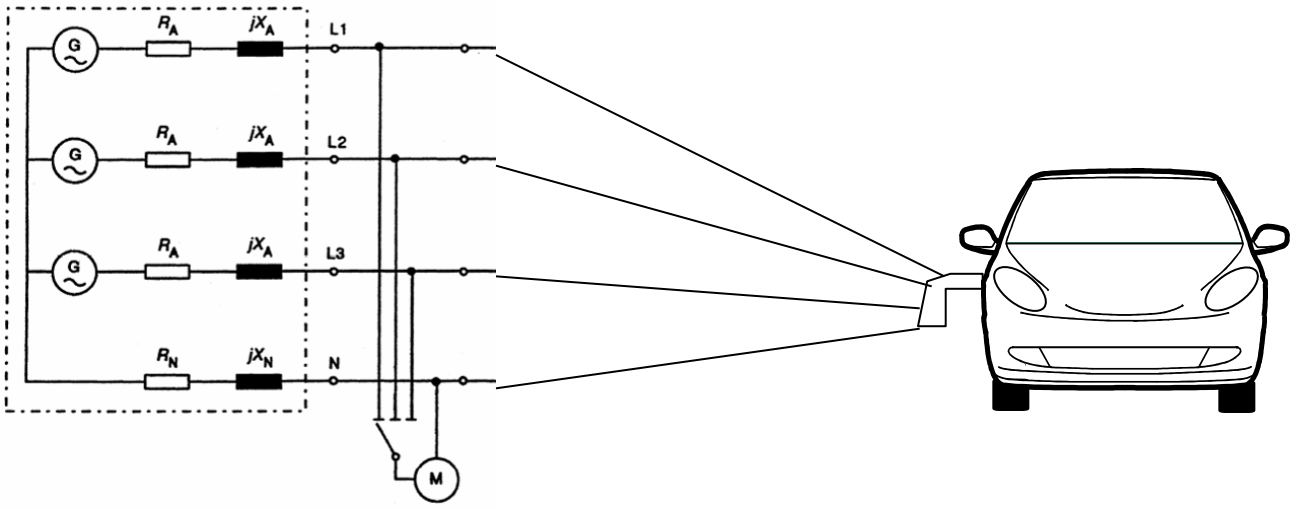
Pst	＜1．0
Plt	＜0．65
d（t） 大于 3.3%	＜500msec
dc	＜3．3％
dmax a）没有附加条件 除了电冰箱 b）例如自动洗衣机 c）例如，吹风机	＜4％ ＜6％ ＜7％

附件12　车辆AC电源线的电压变化、波动、闪烁发射测量方法

新附件 12

附件12-附录1

开路电压 G ，阻抗为
(R_P + j X_P) 的电源



测量设备

图1 汽车处于“RESS充电模式时对电网的耦合”状态

附件13：车辆AC或DC电源线的射频传导骚扰发射测试方法

Class B：居民区要求

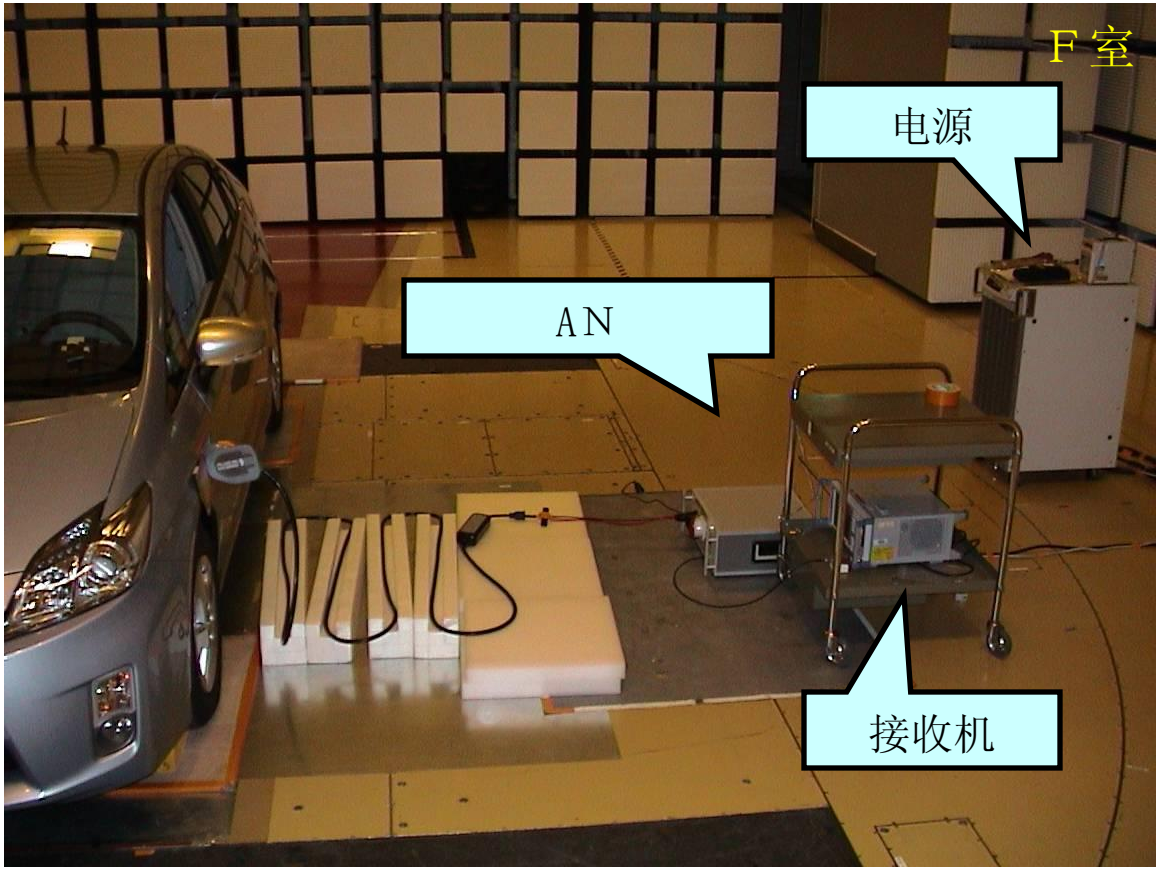
表 9
AC电源线上最大允许的射频传导干扰

频率（MHz）	*限值和检波器*
0.15 to 0.5	66 ～ 56 dBμV（准峰值） 56 ～ 46 dBμV（平均值） （随着频率的对数呈线性递减 ）
0.5 to 5	56 dBμV（准峰值）46 dBμV（平均值）
5 to 30	60 dBμV（准峰值）50 dBμV（平均值）

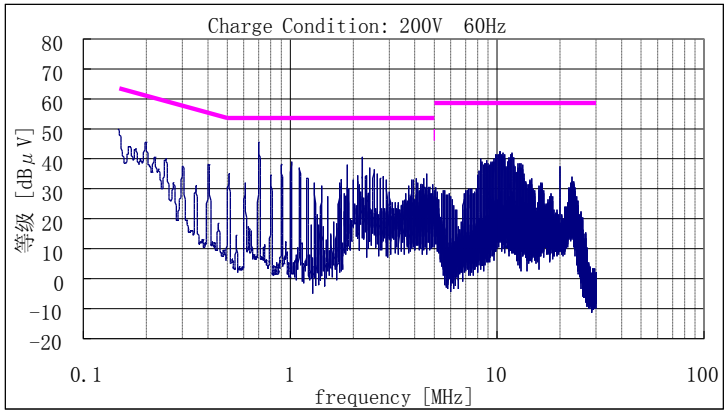
表 10
DC电源线上最大允许的射频传导干扰

频率(MHz)	*限值和检波器*
0.15 to 0.5	79 dBμV（准峰值） 66 dBμV（平均值）
0.5 to 30	73 dBμV（准峰值） 60 dBμV（平均值）

附件13：车辆AC或DC电源线的射频传导骚扰发射测试方法



Frequency (MHz)	Quasi-Peak dB(μV)	Average dB(μV)
0.15 to 0.50	66 Decreases linearly with log of freq. To 56	56 Decreases linearly with log of freq. To 46
0.50 to 5	56	46
5 to 30	60	50



附件13：车辆AC或DC电源线的射频传导骚扰发射测试方法

新附件 13

附件13-附录1

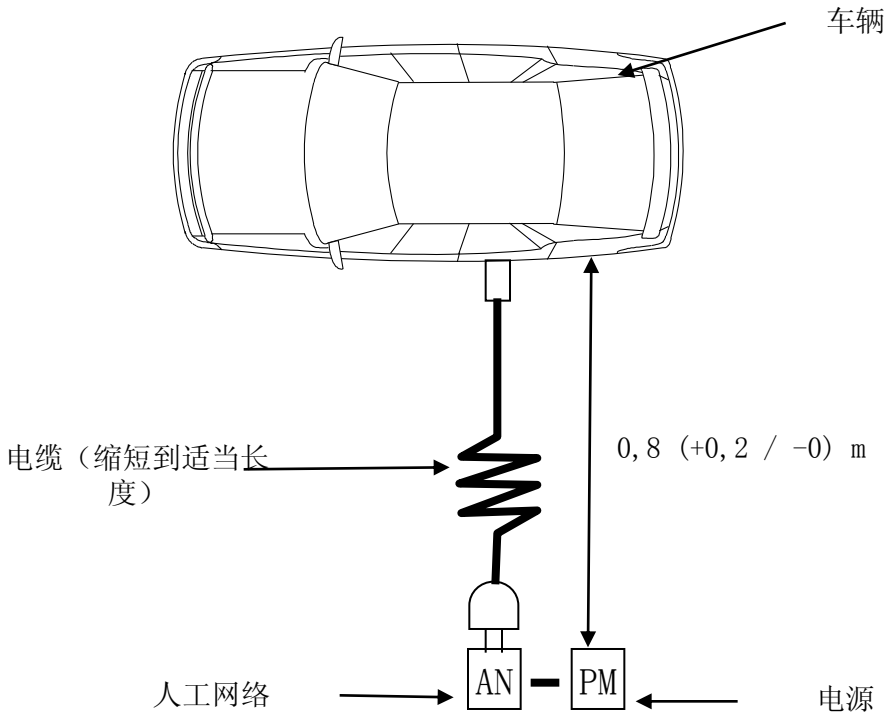


图1 汽车处于“RESS充电模式时对电网的耦合”状态

附件14　车辆上网络和通讯端口上的射频传导骚扰发射测试方法

网络和通信端口的最大允许传导干扰

频率(MHz)	限值和检波器	
0.15到0.5	84 到74dBμV（准峰值） 74到64 dBμV（平均值） （随着频率的对数线性递减）	40到30 dBμA（准峰值） 30到20 dBμA（平均值） （随着频率的对数线性递减）
0.5到30	74 dBμV（准峰值） 64 dBμV（平均值）	30 dBμV（准峰值） 20dBμV（平均值）

电压电流转化电阻为150Ω

附件14　车辆上网络和通讯端口上的射频传导骚扰发射测试方法

New 附件 14

附件14-附录1

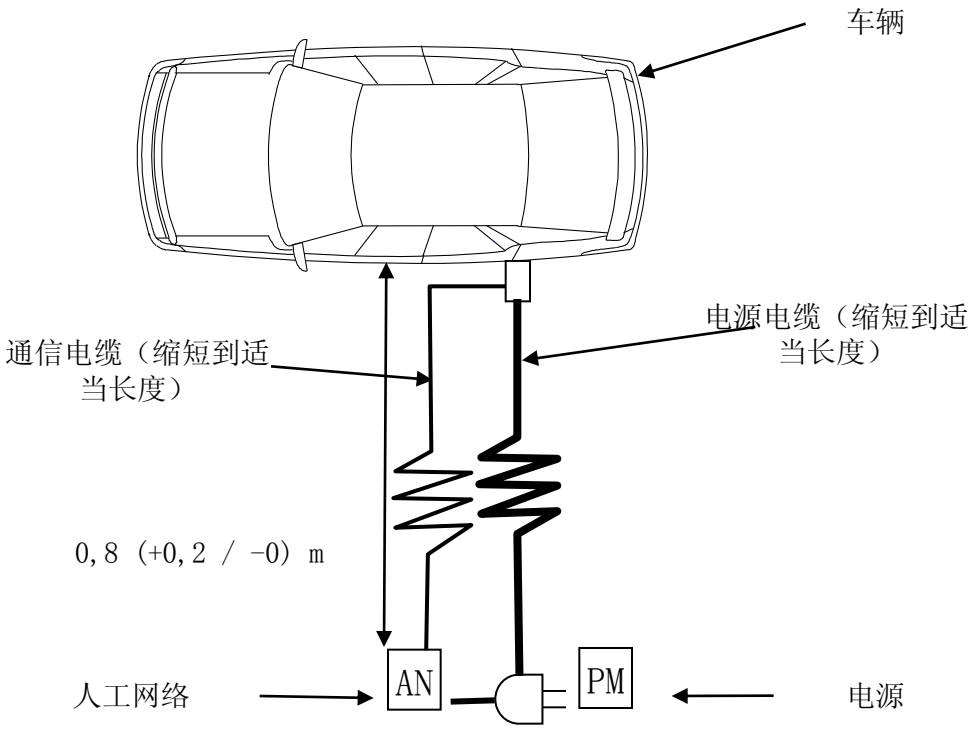


图1 汽车处于“RESS充电模式时对电网的耦合”状态

附件15　沿AC和DC电源线上的电快速瞬态脉冲群骚扰的车辆抗扰度测试方法

对AC或DC电源线的抗扰度等级应是：开路测试电压± 2 kV， 5ns的上升时间，50ns的保持时间，5kHz的频率，最少1min测试时间。

新附件 15

附件15-附录1

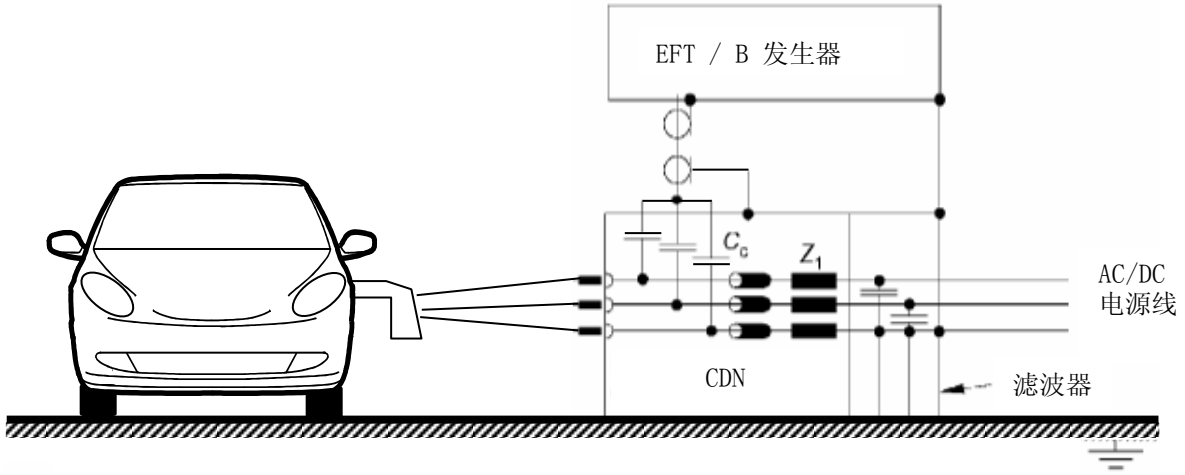
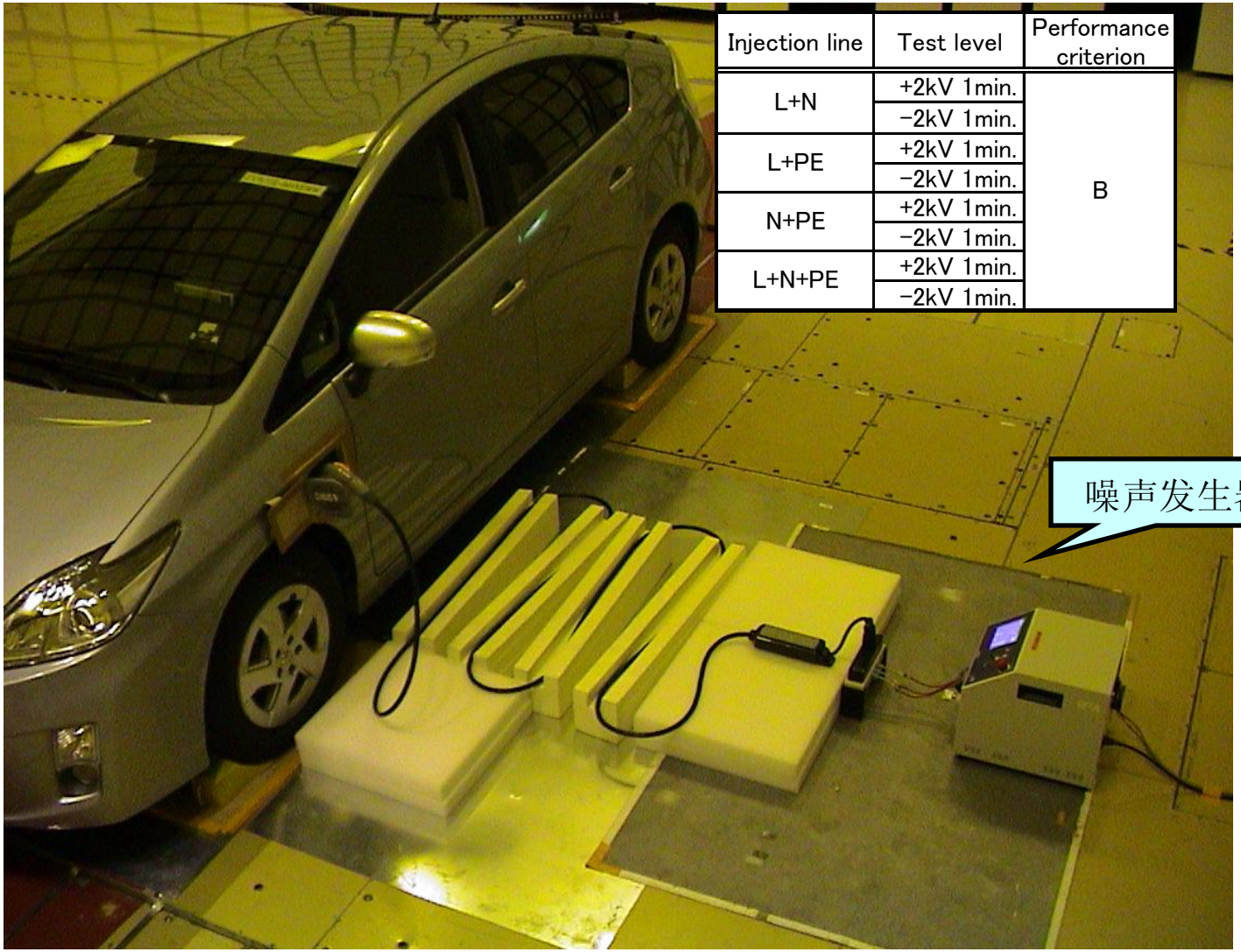


图1 汽车处于“RESS充电模式”时对电网的AC/DC电源线的干扰

附件15　沿AC和DC电源线上的电快速瞬态脉冲群骚扰的车辆抗扰度测试方法



Injection line	Test level	Performance criterion
L+N	+2kV 1min.	B
	−2kV 1min.	
L+PE	+2kV 1min.	
	−2kV 1min.	
N+PE	+2kV 1min.	
	−2kV 1min.	
L+N+PE	+2kV 1min.	
	−2kV 1min.	

附件16 沿AC和DC电源线上浪涌的车辆抗扰度测试方法

（a）对于AC电源线：线与地之间的开路测试电压±2kV，线间电压±1kV，上升时间1.2us，保持时间50us。

每个浪涌应以1min的间隔作用5次，分别在0，90，180，270度四个相位

0,180　相位用于开关时间

90, 270 相位为最大电压时间

270相位时是浪涌极性由 - 转变 +

因此，这些相位是关键点

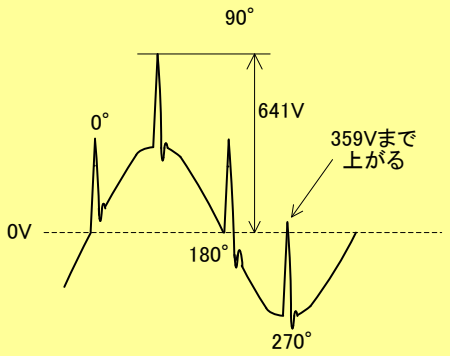


図.1　AC100Vラインに+0.5kVのサージを印加した場合

（b）对于DC电源线：线与地之间的开路测试电压±0.5kV，线间电压±0.5kV，且上升时间1.2us，保持时间50us。每个浪涌以1min的间隔作用5次。

附件16 沿AC和DC电源线上浪涌的车辆抗扰度测试方法

新附件 16

附件16-附录1

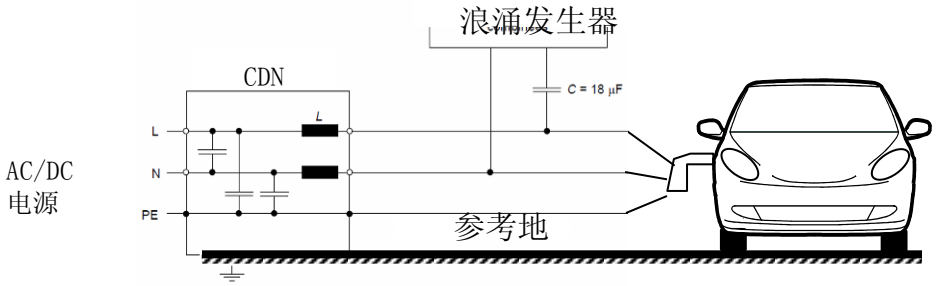


图1 汽车处于“RESS充电模式时对电网的耦合”，DC/AC电源线之间（单相）施加耦合

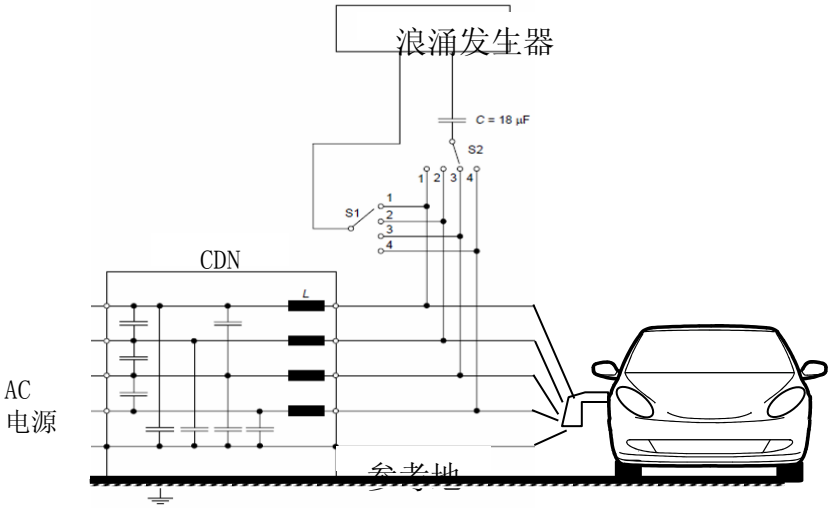


图3汽车处于“RESS充电模式时对电网的耦合”，AC电源线之间（三相）施加耦合

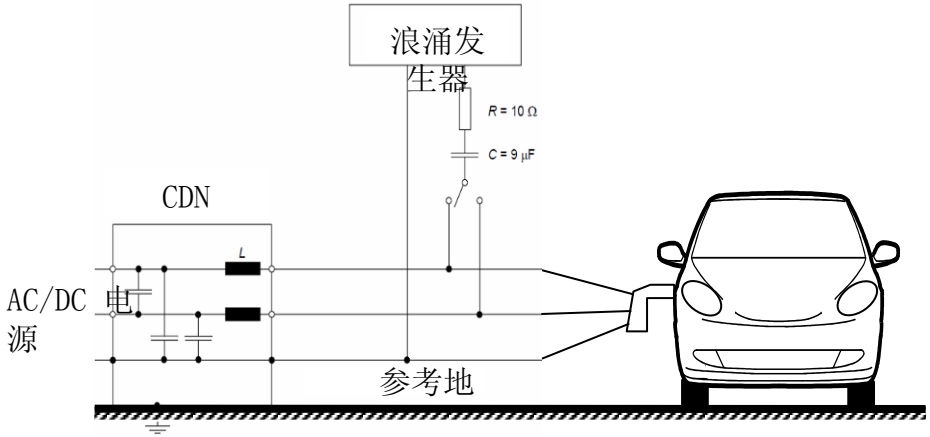


图2 汽车处于“RESS充电模式时对电网的耦合”，DC/AC每根电源线与地线之间（单相）施加耦合

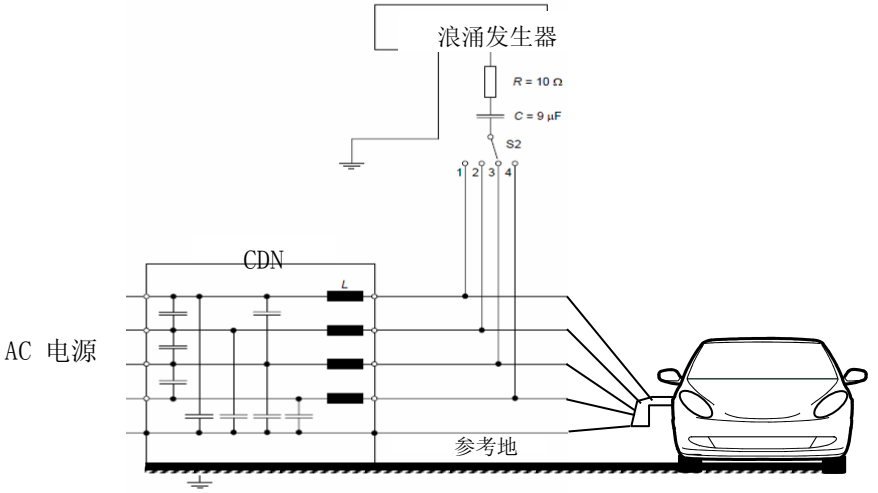
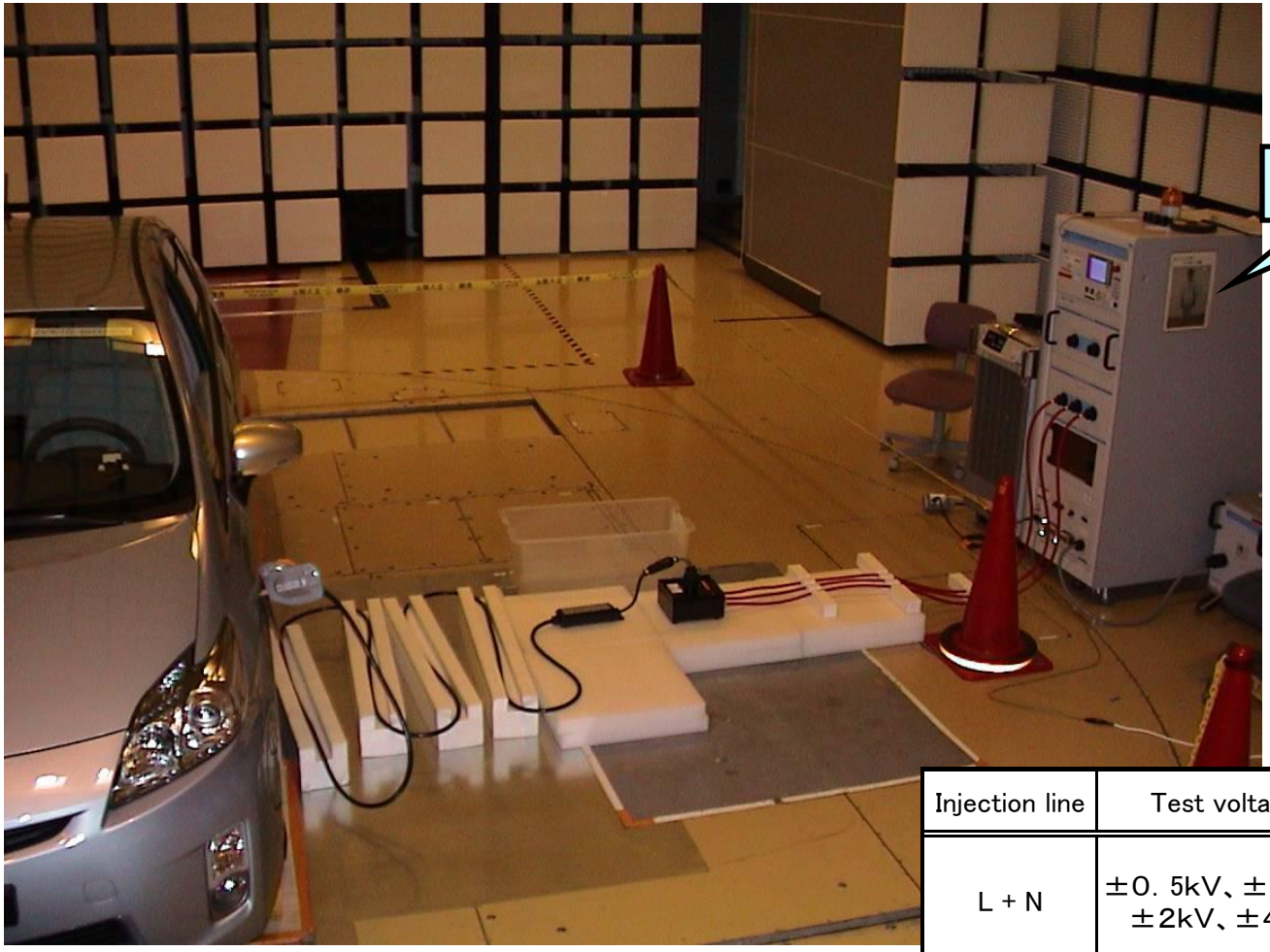


图4 汽车处于“RESS充电模式时对电网的耦合”，每根AC电源线与地线之间（三相）施加耦合

附件16 沿AC和DC电源线上浪涌的车辆抗扰度测试方法



Injection line	Test voltage	Phase shifting	Performance criterion
L + N	±0. 5kV、±1kV、±2kV、±4kV	0°	C
		90°	
		180°	
		270°	
L/N + PE	±0. 5kV、±1kV、±2kV	0°	
		90°	
		180°	
		270°	

家用器具和车辆的EMC测试等级比较

	辐射 发射	传导 发射	谐波 发射
车辆	CISPR12	NA	NA
	等效	新规定	新规定
家用器具	CISPR22	CISPR22 LISN 150 kHz ～30MHz	IEC61000-3-2 50/60Hz 2～40N 谐波

家用器具和车辆的EMC测试等级比较

	EMI （辐射）	电气噪声
车辆	ISO11452-2,3 75～25V/m 20MH z ～2GHz	ISO 7637 200V ns～ms
	车辆测试等级较高	新规定并且更严格
家用器具	IEC 61000-4-3 3V～10V/m 80MHz～1GHz	IEC 61000-4-5,4-6 快脉冲群 2kV、5ns 雷电浪涌 2kV、50μs

发射：传导噪声　　抗扰度 ： 传导浪涌

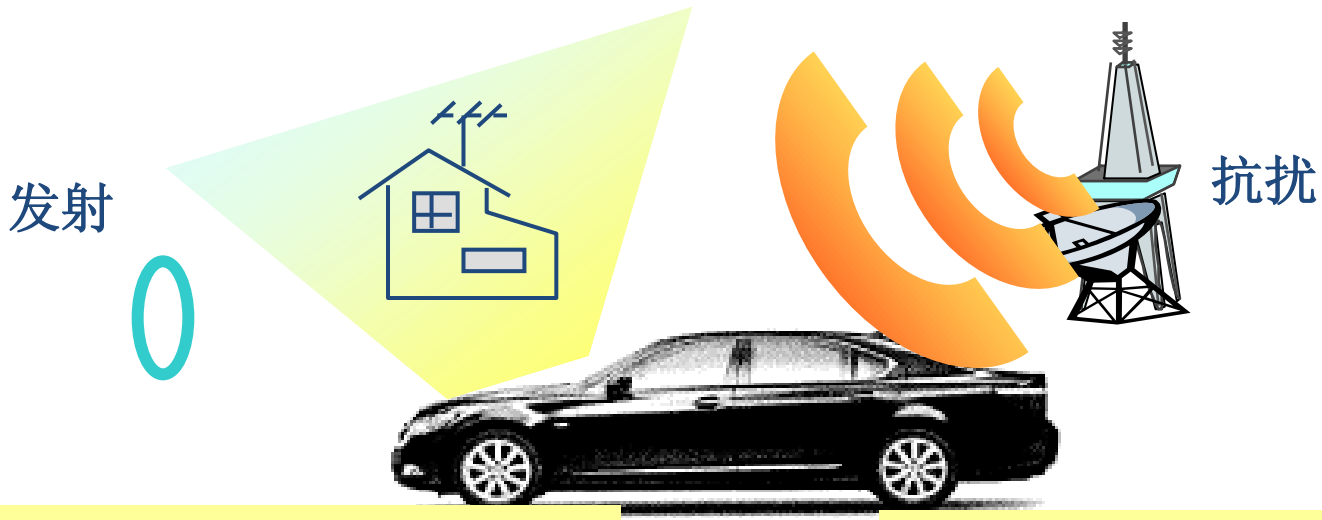
注意技术上和设备上的问题.

结论

对于电动车/插入式混合动力车的EMC测试，R10-04 要求似乎是必要并且足够的。

车辆制造商为了满足R10-04要求需要解决技术上和设施上的问题。

过渡期足够长，R10-04作为国际通用认证，成为全球性认证测试方法。



电磁环境兼容

安全性

謝謝

Outline of UN/ECE Regulation ECE R10-03

-Electric/Electronic Sub-Assemblies-

1. What is EMC regulation ?
2. Outline of type approval according to ECE R10-03
3. ESA specifications required by ECE R10-03
   - 3-1 Broadband emission
   - 3-2 Narrowband emission
   - 3-3 Radiated immunity
   - 3-4 Conducted emission
   - 3-5 Conducted immunity
4. Example of test plan for type approval

1. What is EMC regulation?

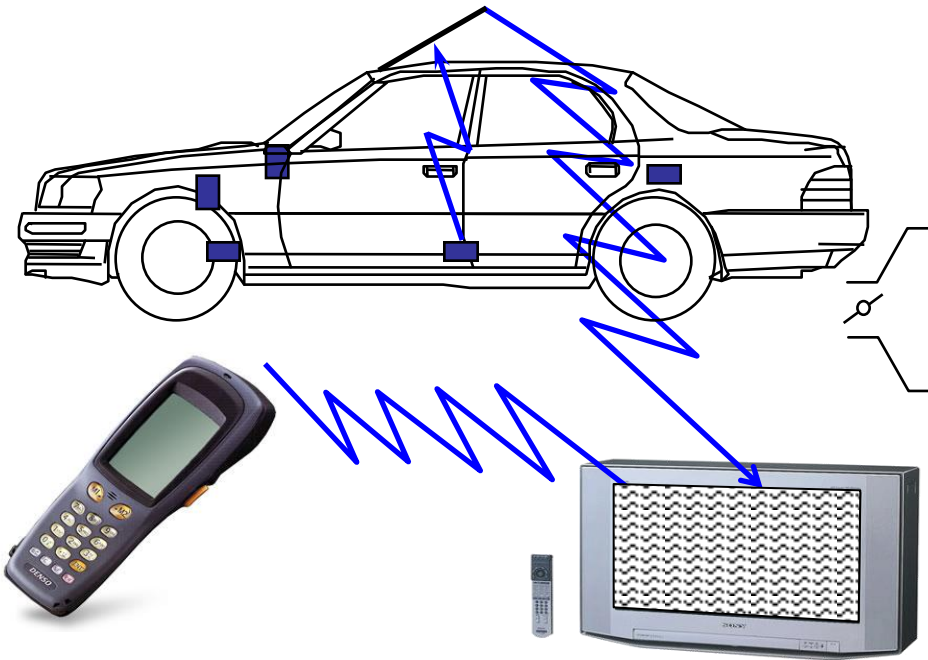
EMC: Electro Magnetic Compatibility

1) Emission (Device does not generate electromagnetic waves)
   EMI: (Electro Magnetic Interference)
2) Immunity (Ability to operate without degradation of performance)
   EMS: (Electro Magnetic Susceptibility)

→EMC regulation covers the listed above

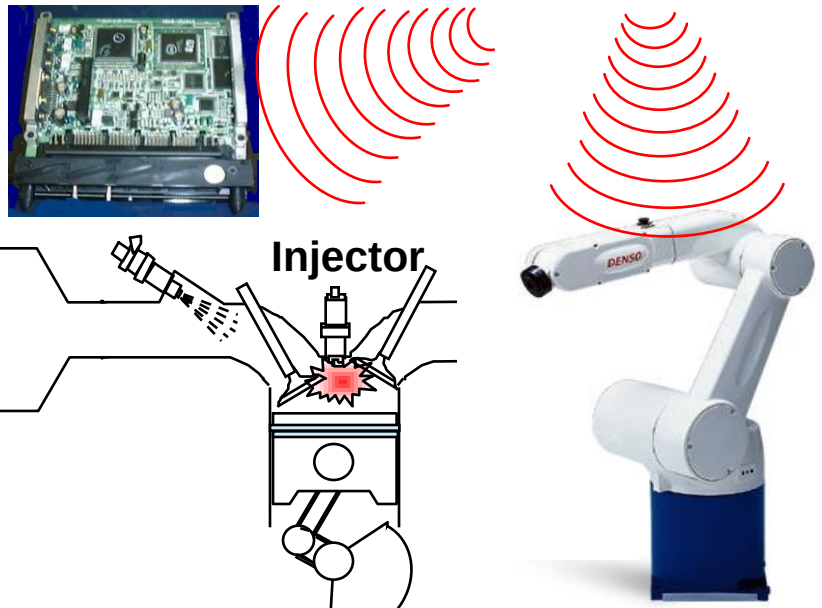
■Emission

e.g. A television has noisy image by vehicle electromagnetic noises.

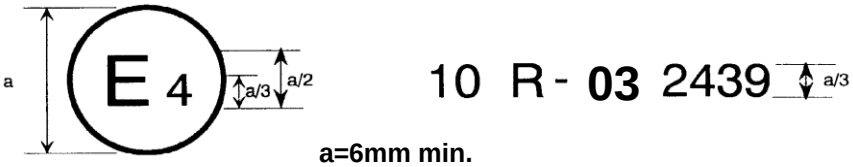


■Immunity

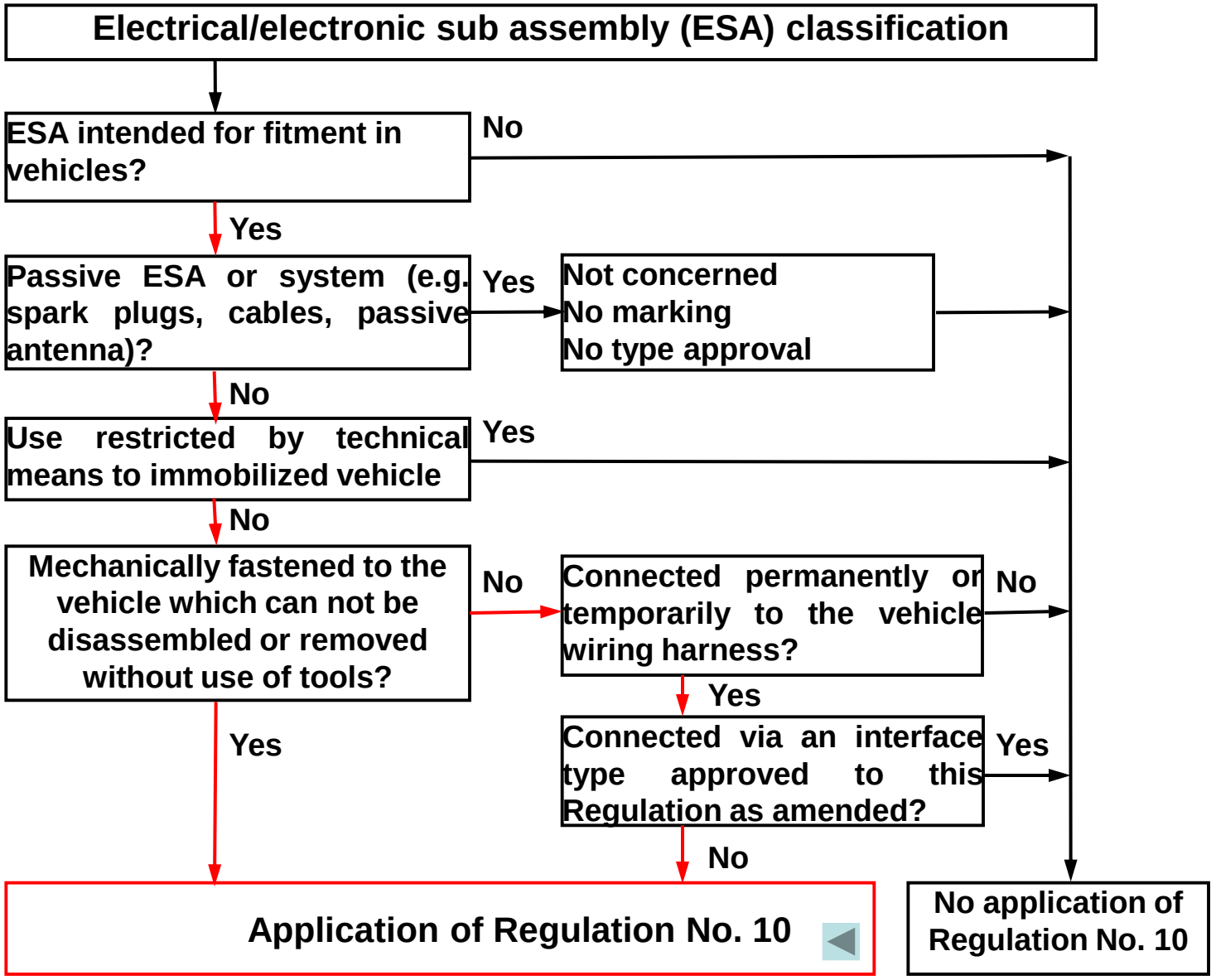
e.g. Engine ECU does not work by extraneous electromagnetic noises.



2. Outline of type approval according to ECE R10-03

Items	Details
Applicability to ESA*	See next page ▶ *Electrical/electronic sub-assembly
Definition of ESA Type (para.2.10)	Essentially same-function ESA (Component or STU, separate technical unit)
Type Approval procedure	1) Discussion * with technical service and testing site, preparation of test sample and application document. 2) Type approval test *Applicable ESA, test condition, criteria 3) Application 4) Certification
Marking (para.5.2.2)	An approval mark shall be affixed to every ESA. e.g. ECE R10-03  a=6mm min.
Modifications of approved ESA (para.11)	Any modification of the ESA shall be notified to the administrative department and further tests may be required.
Aftermarket ESA (para.3.2.9)	ESA related to immunity related functions: Type approved. ESA not related immunity related functions: Manufacturer shall issue a declaration specifying that ESA comply to the requirements. ▶

1) Applicability to ESA (para. 3.2.1)



2) Remarks of type approval

- For applicants -

✓Basically ESA are type-approved as components fitted into vehicle type, i.e. ESA are included vehicle type approval.

✓Merits of ESA type approval

1) ESA are not originally equipped into vehicle.(e.g. dealer option parts)

2) Test of ESA fitted into vehicle is difficult and/or heavier testing burden.

- For technical service and test site -

- ✓ Technical judgment about applicable ESA type, test conditions, criteria because of lots of variation of functions and configurations of ESA
- ✓ Calibration of measuring equipment and maintenance of accuracy
- ✓ Training of technician

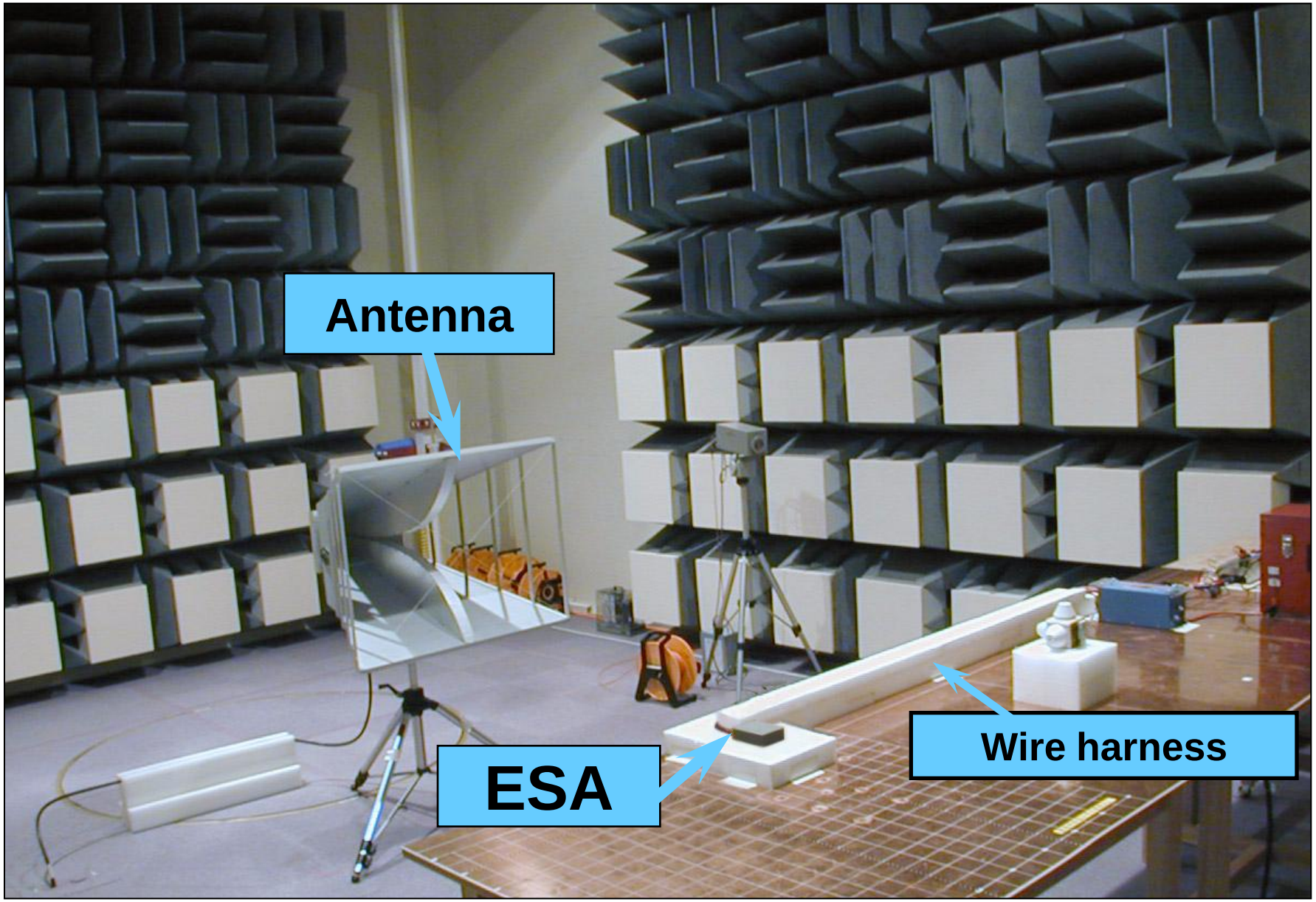
Appropriate application of type approval is recommended.

3. ESA specifications required by ECE R10-03

※ECER10-04:Other than RESS (Rechargeable Energy Storage System) charging mode couple to the power grid.

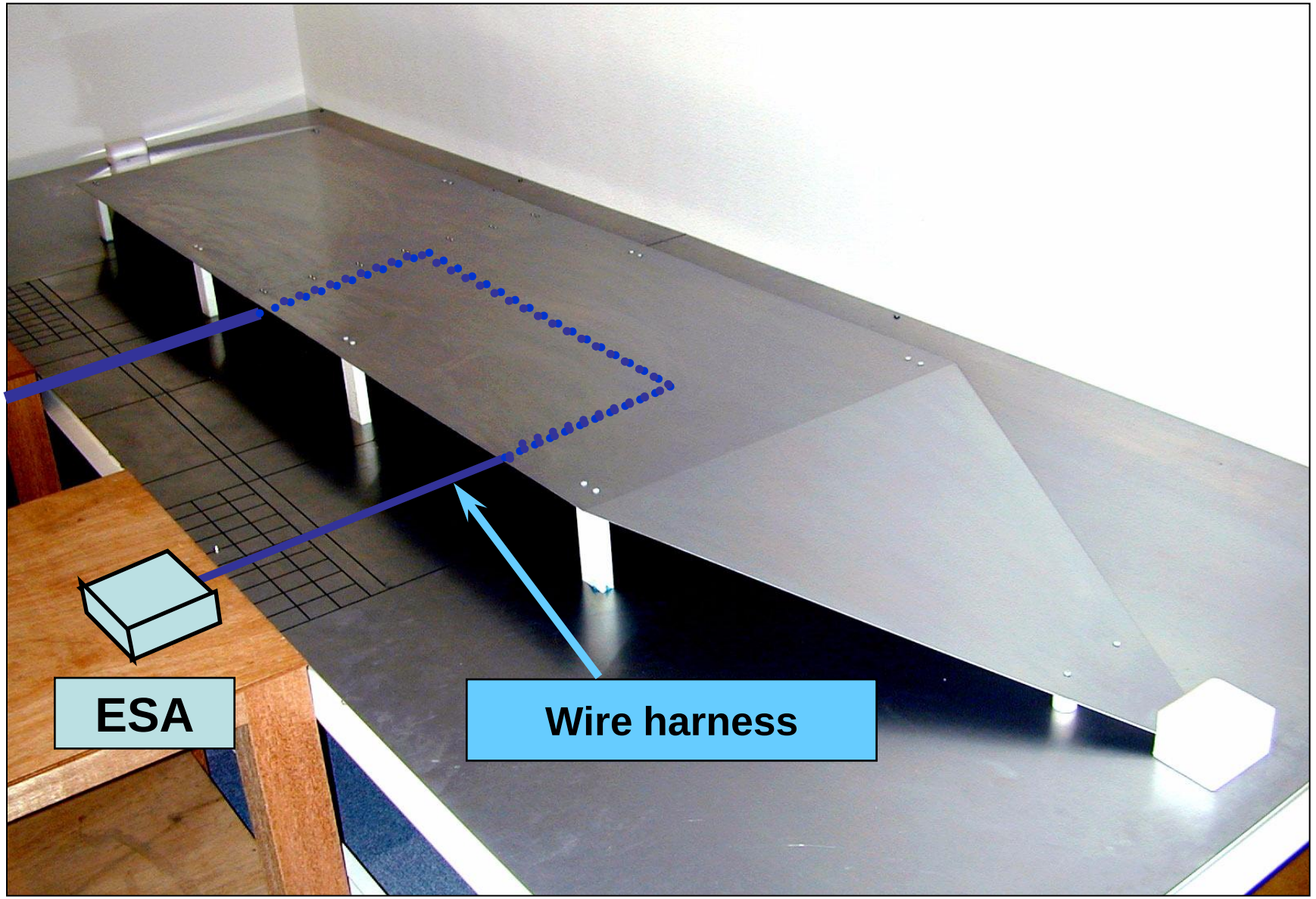
<table>
<tr><th colspan="3">Items</th><th>Applied ESA</th><th>Specifications</th></tr>
<tr><td rowspan="3">Radiated</td><td rowspan="2">Emission</td><td>Broadband
(para. 6.5)</td><td>ESA having broadband noise
(e.g. ignition system or electric motor)</td><td>Approval limit: Appendix 6
Method of testing: Annex 7</td></tr>
<tr><td>Narrowband
(para. 6.6)</td><td>ESA include an electronic oscillator with an operating frequency greater than 9 kHz (e.g. ECU)</td><td>Approval limit: Appendix 7
Method of testing: Annex 8</td></tr>
<tr><td colspan="2">Immunity
(para. 6.7)</td><td>ESA having immunity related functions</td><td>Approval limit: No degradation of performance
150mm strip line:60V/m rms(ISO11452-5 2nd, 2002)
800mm strip line: 15V/m rms(ISO11452-5 2nd, 2002)
TEM cell: 75V/m rms(ISO11452-3 2nd, 2001)
BCI: 60mArms(ISO11452-4 3rd, ,2005, corr.1, 2009)
Free Field: 30V/m rms(ISO11452-2, 2nd ,2004)
Method of testing: Annex 9</td></tr>
<tr><td rowspan="2">Conducted</td><td colspan="2">Emission
(para. 6.9)</td><td>ESA that are switched, contain switches or include inductive loads.</td><td>Approval limit:
<table><tr><td></td><td colspan="2">Maximum allowed pulse amplitude for</td></tr><tr><td>Polarity of pulse amplitude</td><td>Vehicle with 12V system</td><td>Vehicle with 24V system</td></tr><tr><td>Positive</td><td>+75</td><td>+150</td></tr><tr><td>Negative</td><td>-10</td><td>-450</td></tr></table>Method of testing: Annex 10</td></tr>
<tr><td colspan="2">Immunity
(para. 6.8)</td><td>All ESA</td><td>Approval limit: para. 6.8.1, Table 1
Method of testing: Annex 10</td></tr>
</table>

Immunity: Free field

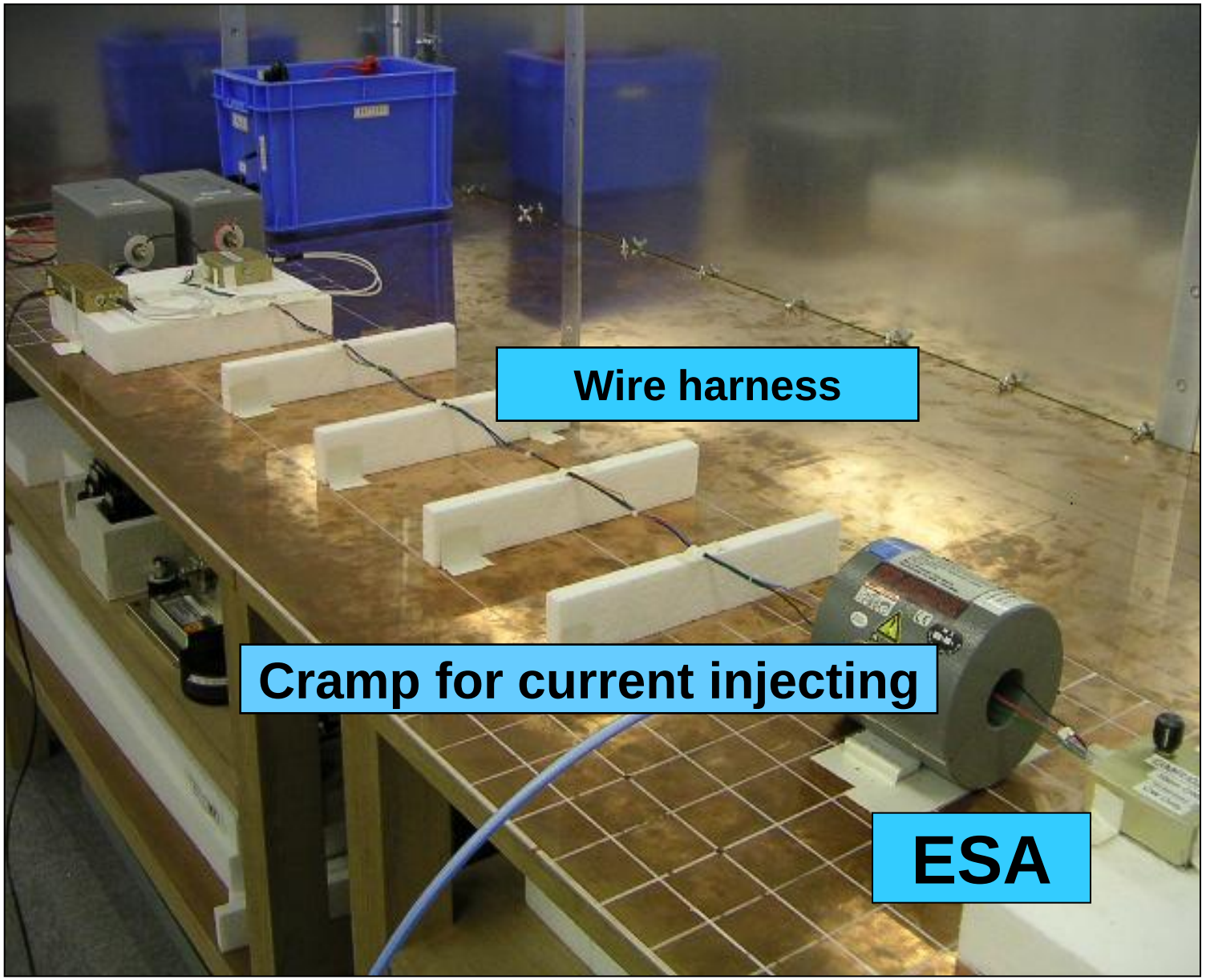


Immunity: TEM cell in a shielded chamber

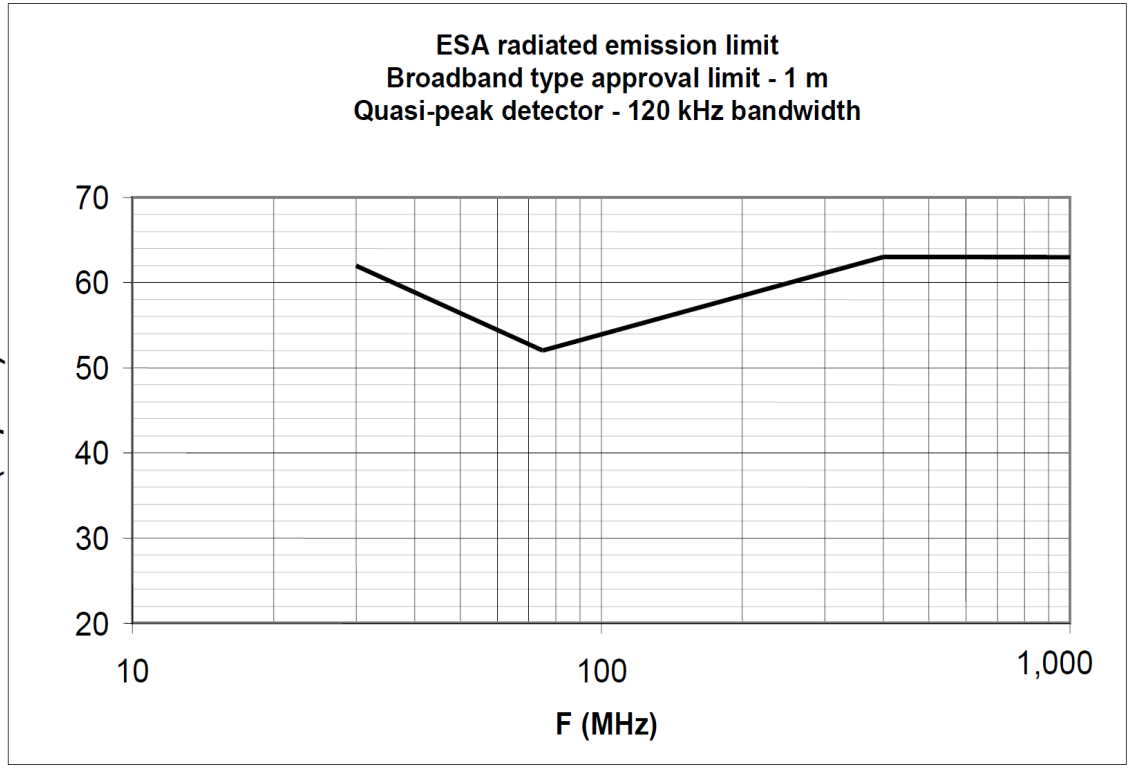
Immunity: 150mm Strip line in an anechoic chamber



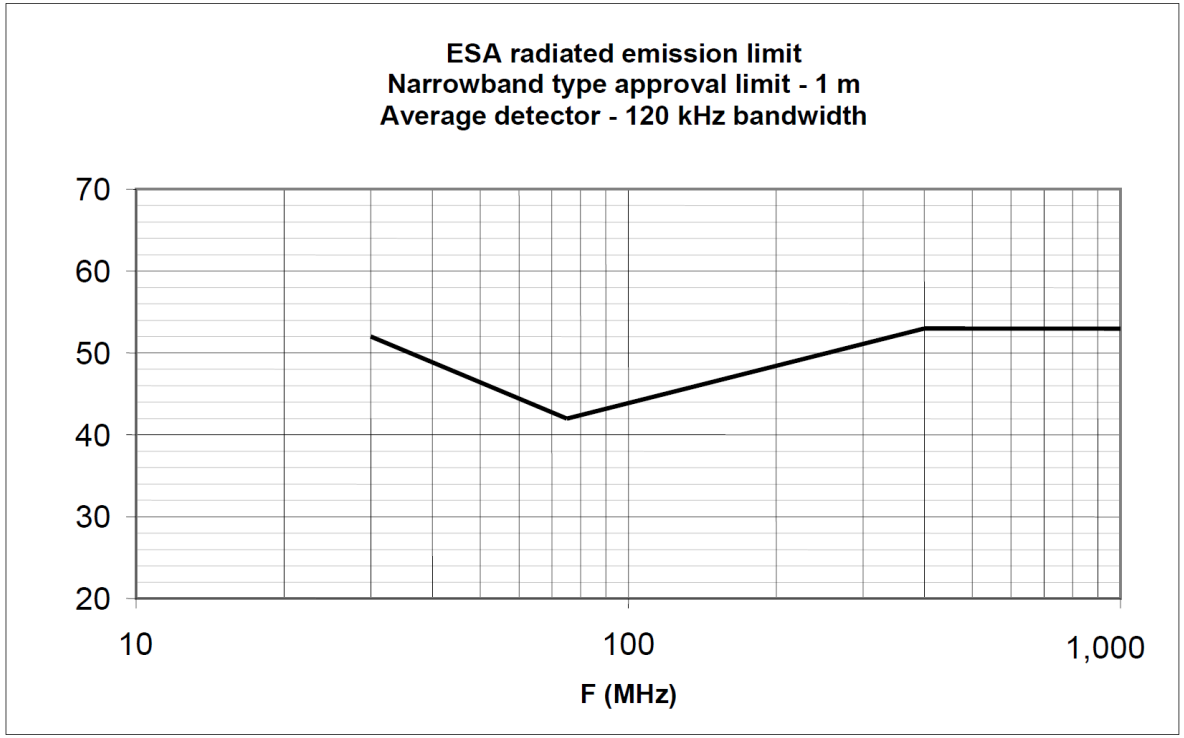
Immunity: BCI in a shielded chamber



3-1 Broadband emission（para. 6.5，ANNEX 7）

	Specifications
Applicable ESA	ESA(e.g. ignition system or electric motor etc.)
Frequency	30 MHz – 1GHz
Mode	Normal operation mode (continuous mode), preferably in maximum load
Measuring method	CISPR 25 2nd Ed., 2002 and Corr.2004
Approval limits (Appendix 6)	

3-2 Narrowband emission（para. 6.6, ANNEX8）

	Specifications
Applicable ESA	ESA include an electronic oscillator with an operating frequency greater than 9 kHz (e.g. ECU)
Frequency	30 MHz – 1GHz
Mode	Normal operation mode
Measuring method	CISPR 25 2nd Ed., 2002 and Corr.2004
Approval limits (Appendix 7)	

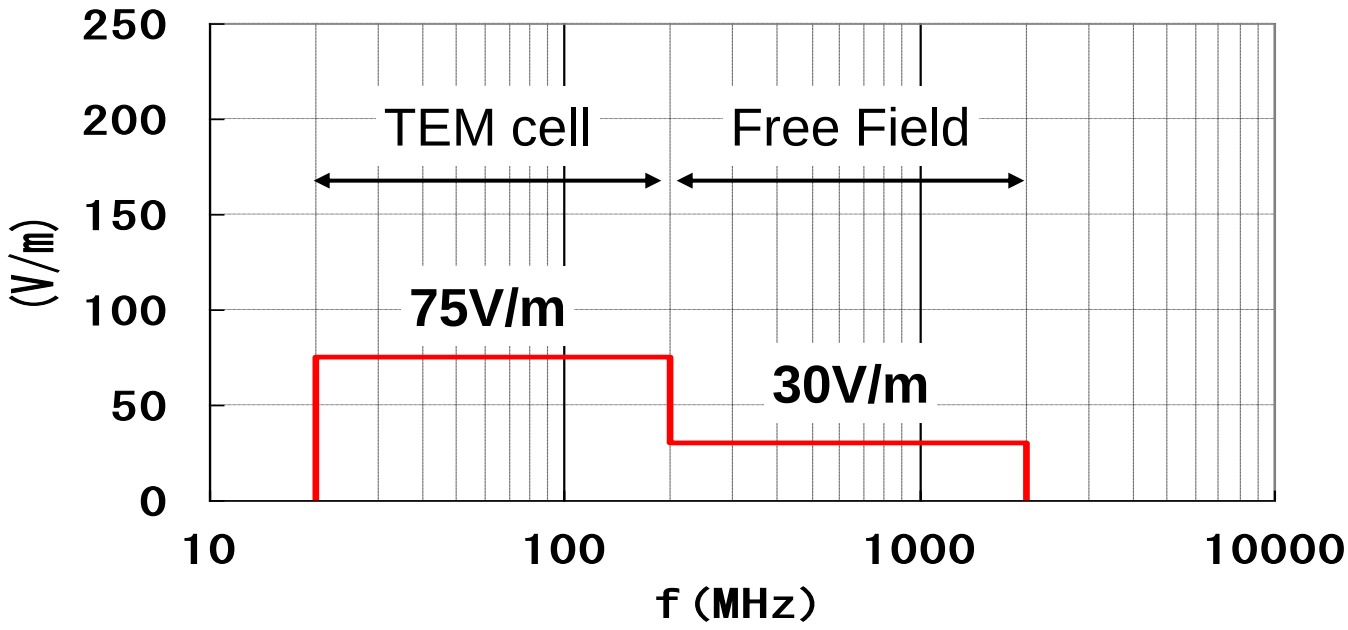
3-3 Radiated immunity（para6.7., ANNEX9）

1) Applicable ESA having immunity related functions

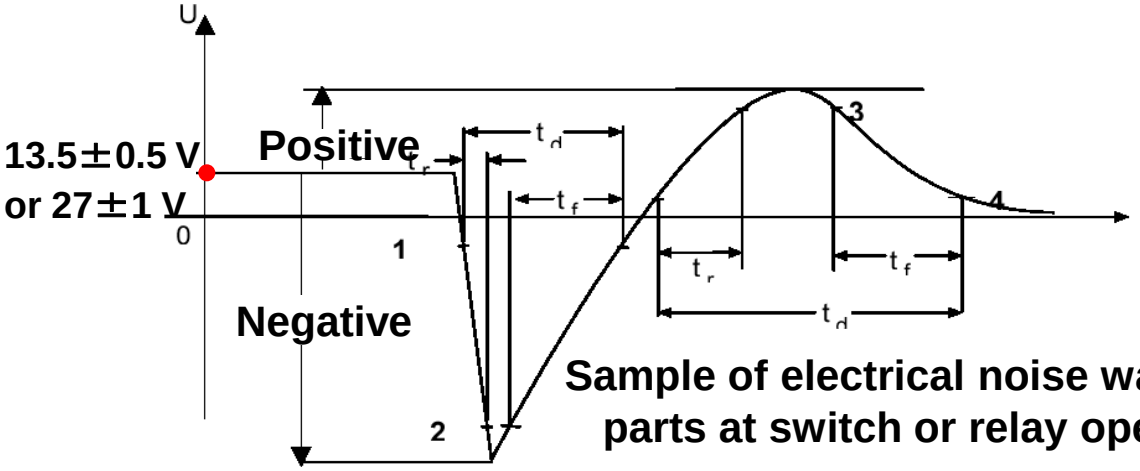
(para. 2.12)

1) Functions related to the direct control of the vehicle
   - by degradation or change in motion: e.g. E/G, brake
   - by affecting drivers position: e.g. seat or steering wheel positioning
   - by affecting driver's visibility: e.g. dipped beam, windscreen wiper
2) Functions related to driver, passenger and other road user protection: airbag, safety restraint system
3) Functions which when disturbed cause confusion to the driver or other road users: lamp, horn
4) Functions related to vehicle data bus functionality
5) Functions which when disturbed affect vehicle statutory data: tachograph, odometer

2) Electrical field strength (e.g. combination of TEM cell and Free field)

	Specifications	
Applicable ESA	ESA having the functions related to immunity	
Frequency	TEM cell(20 MHz – 200MHz)	Free Field(200 MHz - 2 GHz)
Modulation	AM(Amplitude)	200 MHz – 800 MHz : AM 800 MHz – 2 GHz : PM(Pulse)
Measuring method	ISO 11452-3 3rd, 2001	ISO 11452-2nd ,2004 Vertical polarization
Electrical field strength		

3-4 Conducted emission（para.6.9, ANNEX10）

<table>
<tr><th></th><th>Specifications</th></tr>
<tr><td>Applicable ESA</td><td>ESA that are switched, contain switches or include inductive loads</td></tr>
<tr><td>Measuring method</td><td>ISO7637-2 2nd Ed., 2004 and Amd 1:2008</td></tr>
<tr><td>Approval limits</td><td>
<table>
<tr><td></td><td colspan="2">Maximum allowed pulse amplitude for</td></tr>
<tr><td>Polarity of pulse amplitude</td><td>Vehicle with 12V system</td><td>Vehicle with 24V system</td></tr>
<tr><td>Positive</td><td>+75</td><td>+150</td></tr>
<tr><td>Negative</td><td>-10</td><td>-450</td></tr>
</table>


Sample of electrical noise wave from parts at switch or relay operation
</td></tr>
</table>

3-5 Conducted immunity（para.6.8, ANNEX10）

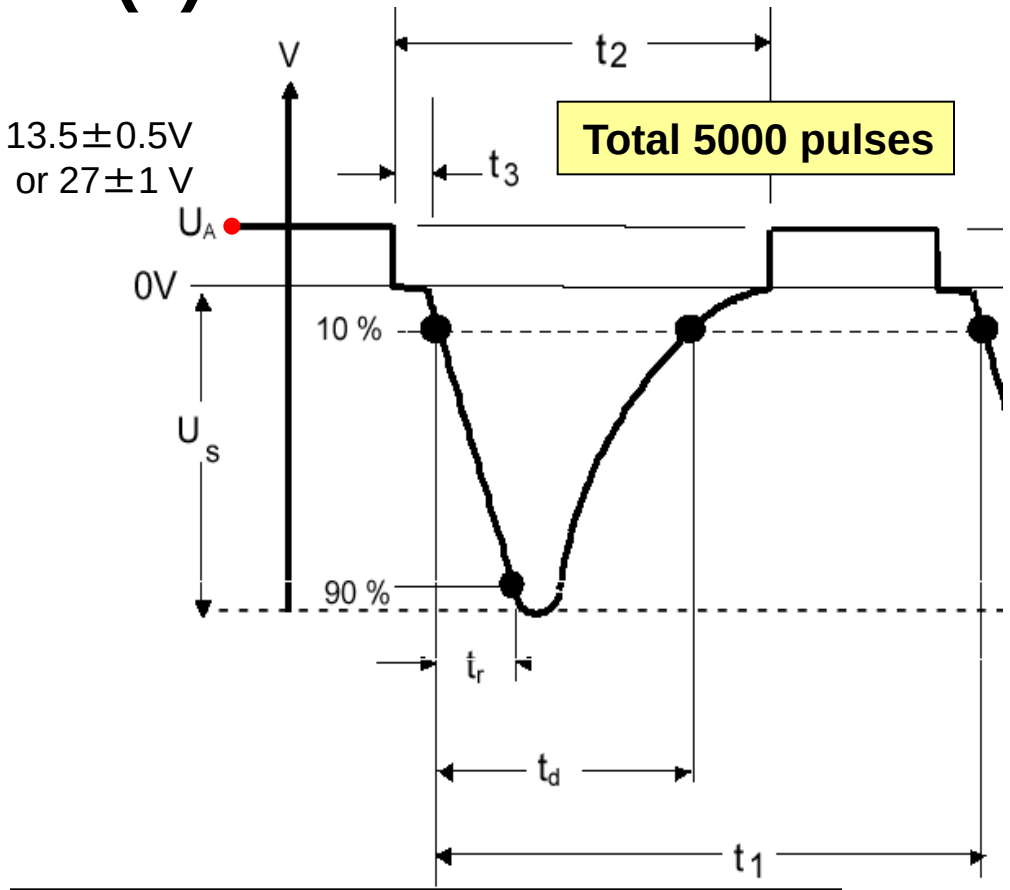
	Specifications
Applicable ESA	All ESA
Measuring method	ISO7637-2 2nd Ed., 2004 and Amd 1:2008
Approval limits (Appendix 6)	Comply with specified criteria against the following pulses

Pulse No.	test level	Functional status for systems:	
		Immunity related	Others
1	III	C	D
2a, 2b	III	B,C	D
3a, 3b	III	A	D
4	III	C(B)	D

＜Classification of functional status＞

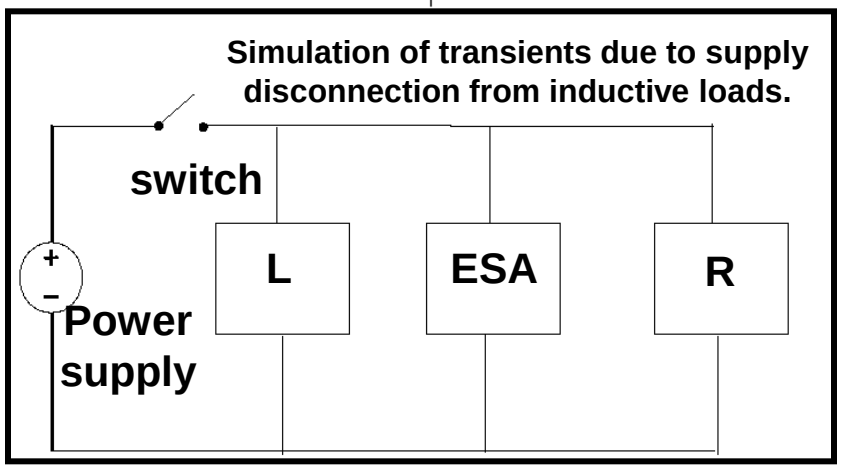
Class	Required conditions
A	All functions of device/system perform as designed during and after exposure to disturbance.
B	All functions of a device/system perform as designed during exposure. However, one or more of them can go beyond specified tolerance. All functions return automatically to within normal limits after exposure is removed. Memory function shall remain class A.
C	One or more functions of a device/system do not perform as designed during exposure but return automatically to normal operation after exposure is removed.
D	One or more functions of a device/system do not perform as designed during and after exposure and do not return to normal operation until exposure is removed and the device/system is reset by simple “operator/use” action.
E	One or more functions of a device/system do not perform as designed during and after exposure and cannot be returned to proper operation without repairing or replacing the device/system.

3-5(1) Pulse 1



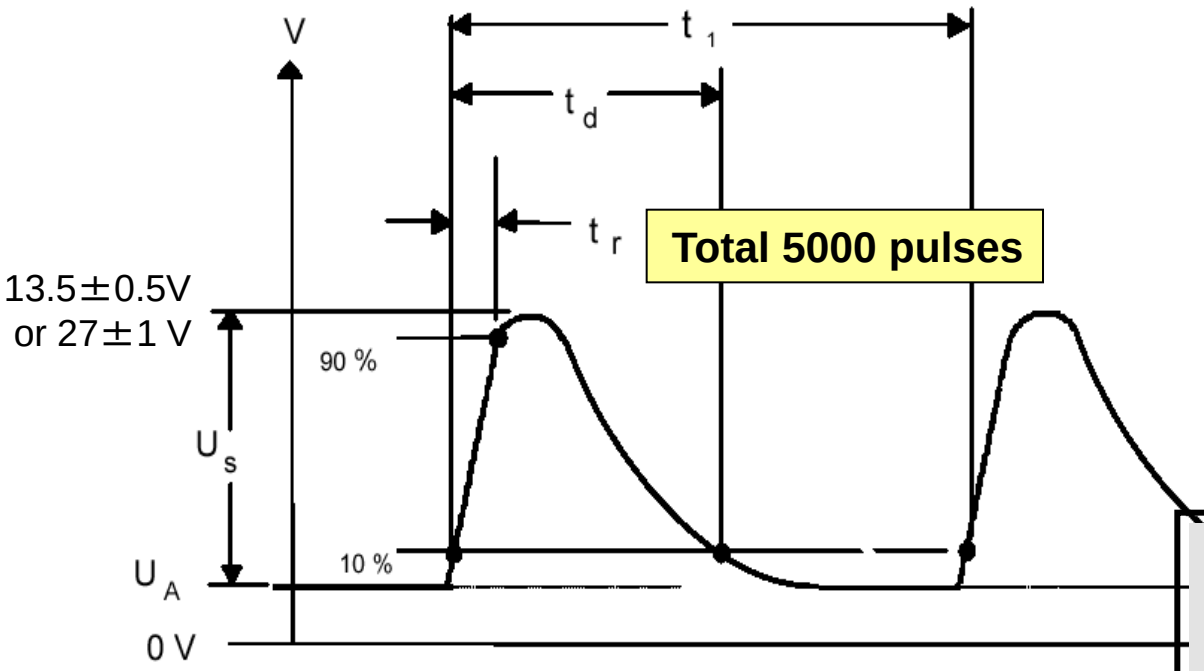
Parameters	12V system	24V system
Us	-75V to -100V	-450V to -600V
Ri	10 ohms	50 ohms
td	2ms	1ms
tr	(1 +0/-0.5)us	(3 +0/-1.5)us
t1 *	0.5 s to 5s	
t2	200ms	
t3 *	<100us	

***t1,t2:See para. 5.6.1 table 3 ISO7637-2 2nd Ed., 2004**



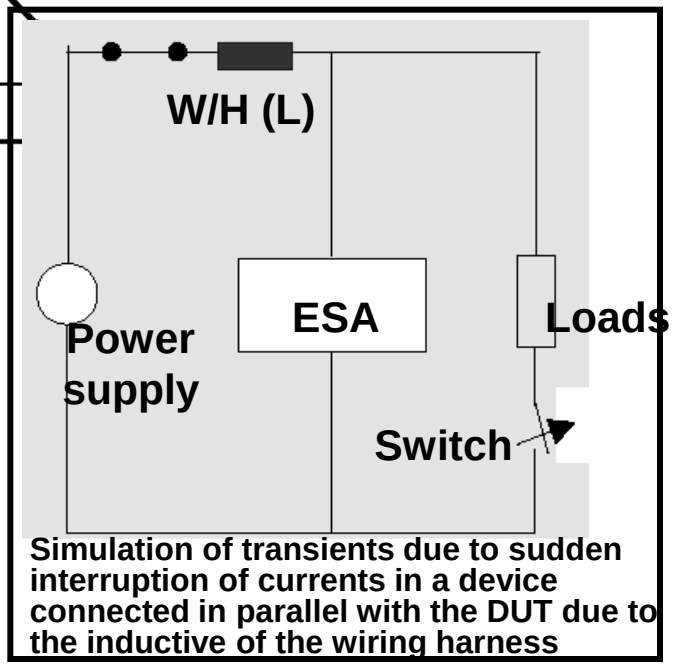
Criteria	
Immunity related ESA	Others
C	D

3-5(2) Pulse 2a



Criteria	
Immunity related ESA	Others
B	D

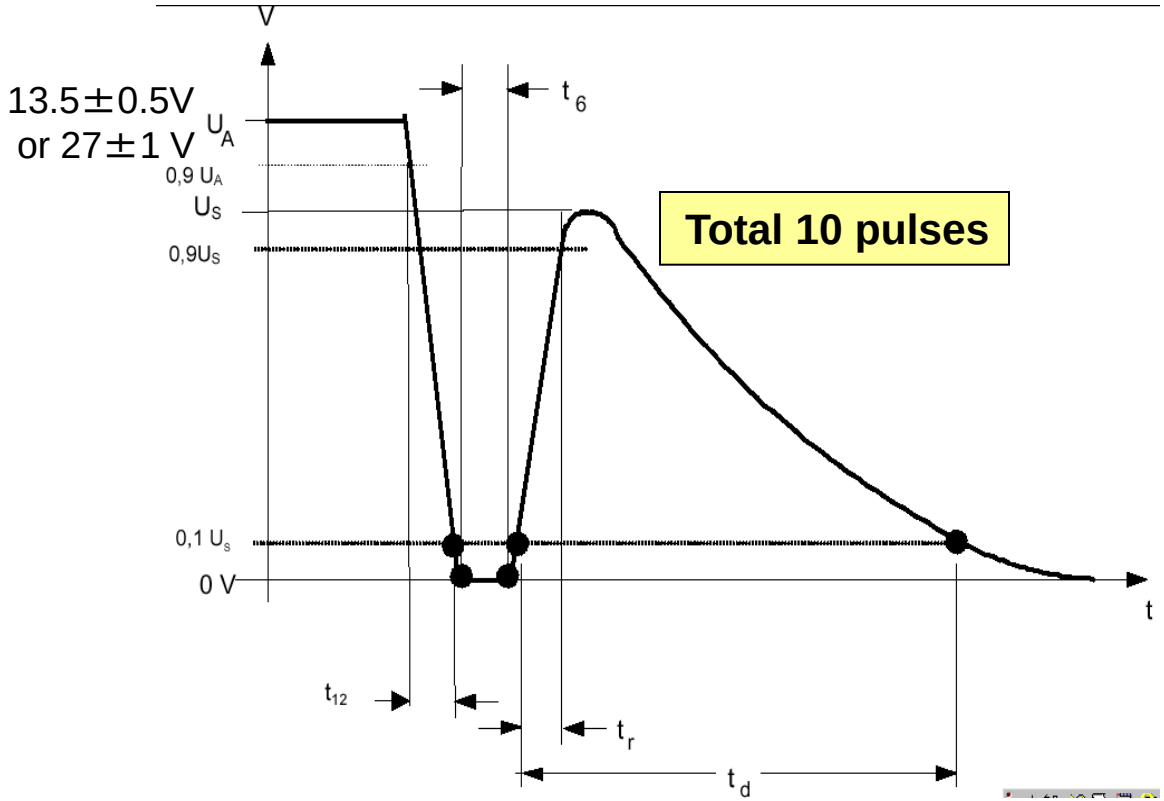
Parameters	12V system	24V system
Us	+37V to +50V	
Ri	2 ohms	
td	0.05ms	
tr	(10 +0/-0.5)us	
t1 *	0.2 s to 5s	



Simulation of transients due to sudden interruption of currents in a device connected in parallel with the DUT due to the inductive of the wiring harness

*** t1:See para. 5.6.2 table 4**
ISO7637-2 2nd Ed., 2004

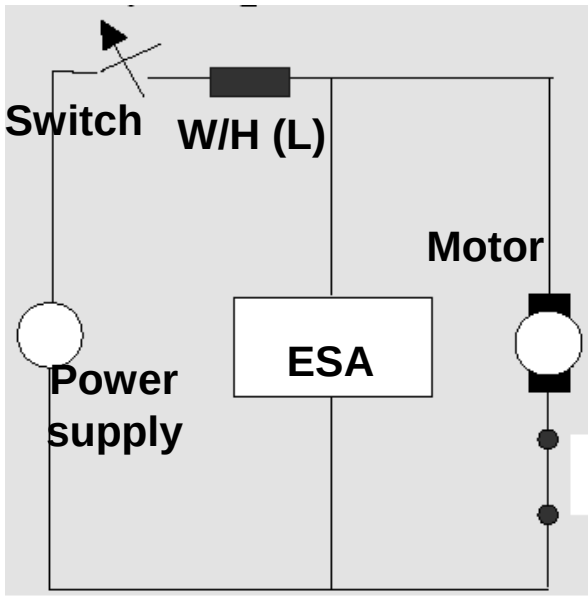
3-5(3) Pulse 2b



Total 10 pulses

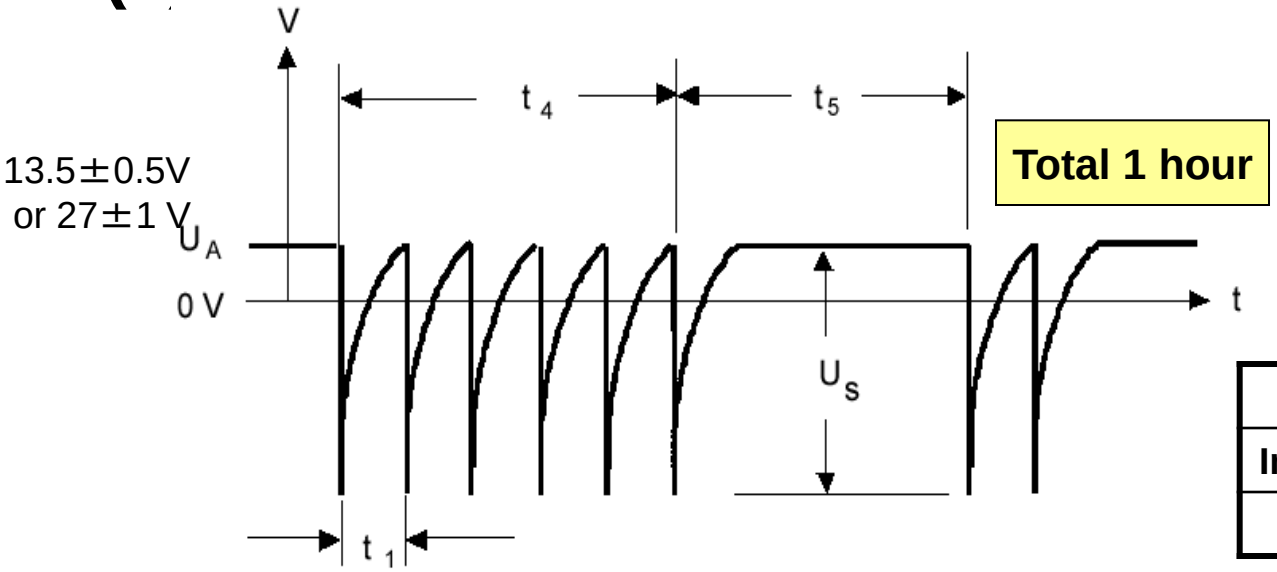
Criteria	
Immunity related ESA	Others
C	D

Parameters	12V system	24V system
Us	10V	20V
Ri	0 to 0.05 ohms	
td	0.2 s to 2s	
t12	1ms +/- 0.5ms	
tr	1ms +/- 0.5ms	
t6	1ms +/- 0.5ms	



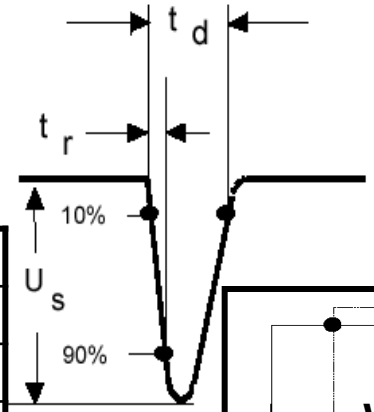
Simulation of transients from DC motor acting as generators after the ignition off

3-5(4) Pulse 3a

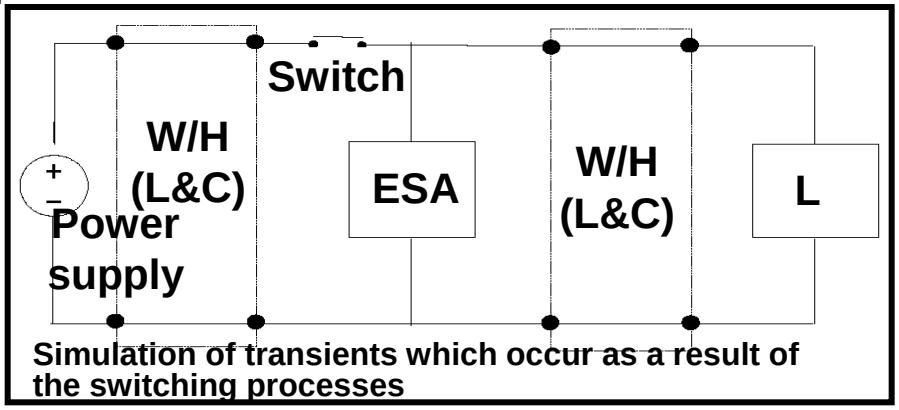


Total 1 hour

Criteria	
Immunity related ESA	Others
A	D

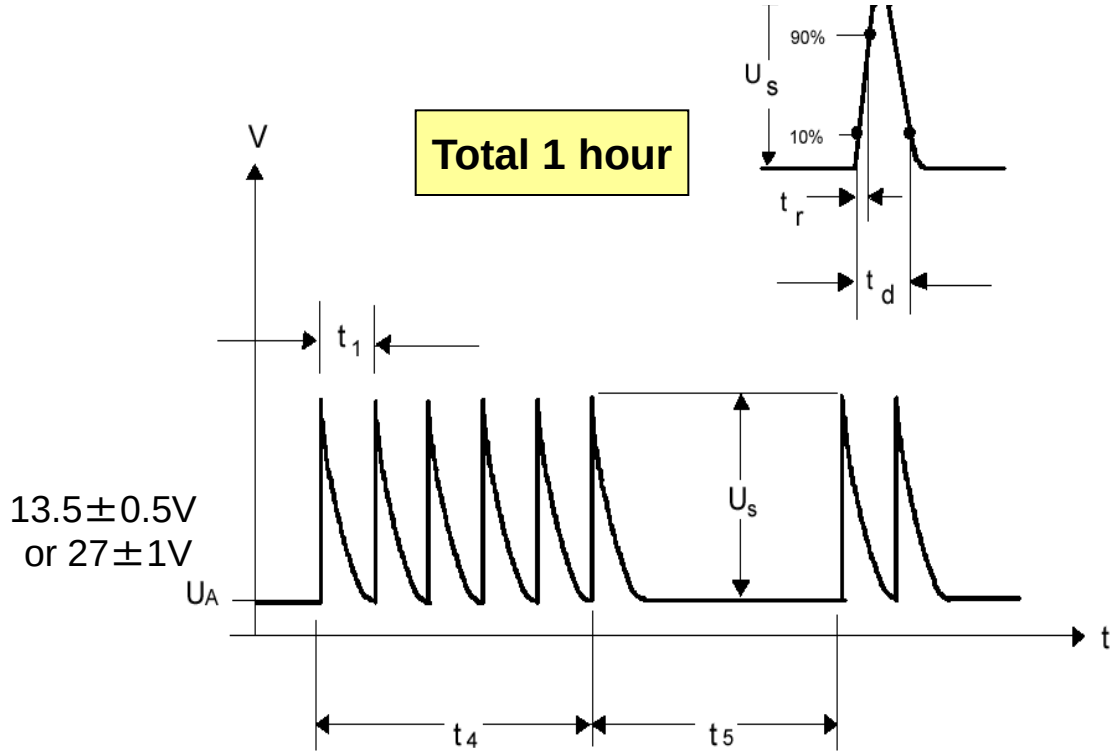


Parameters	12V system	24V system
Us	-112V to -150V	-150V to -200V
Ri	50 ohms	
td	(0.1 +0.1/-0)us	
tr	5ns +/- 1.5ns	
t1	100us	
t4	10ms	
t5	90ms	

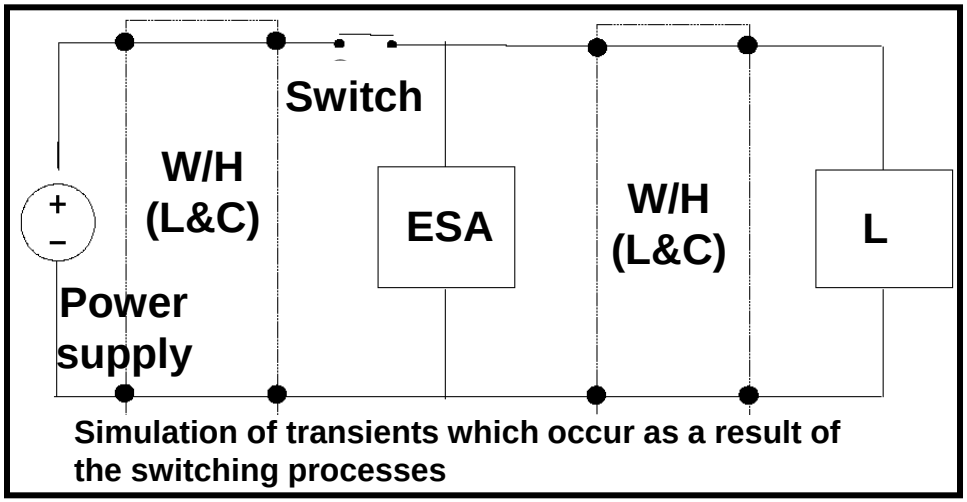


Simulation of transients which occur as a result of the switching processes

3-5(5) Pulse 3b



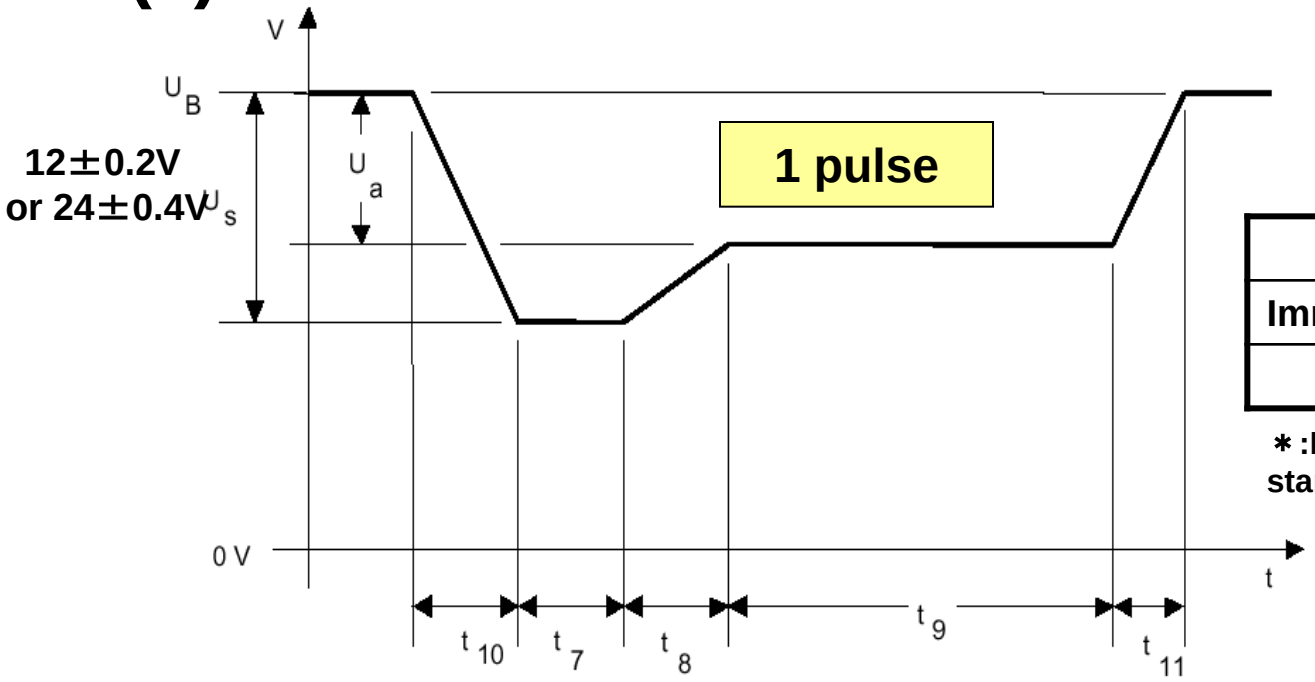
Criteria	
Immunity related ESA	Others
A	D



Simulation of transients which occur as a result of the switching processes

Parameters	12V system	24V system
Us	+75V to +100V	+150V to +200V
Ri	50 ohms	
td	(0.1 +0.1/-0)us	
tr	5ns +/- 1.5ns	
t1	100us	
t4	10ms	
t5	90ms	

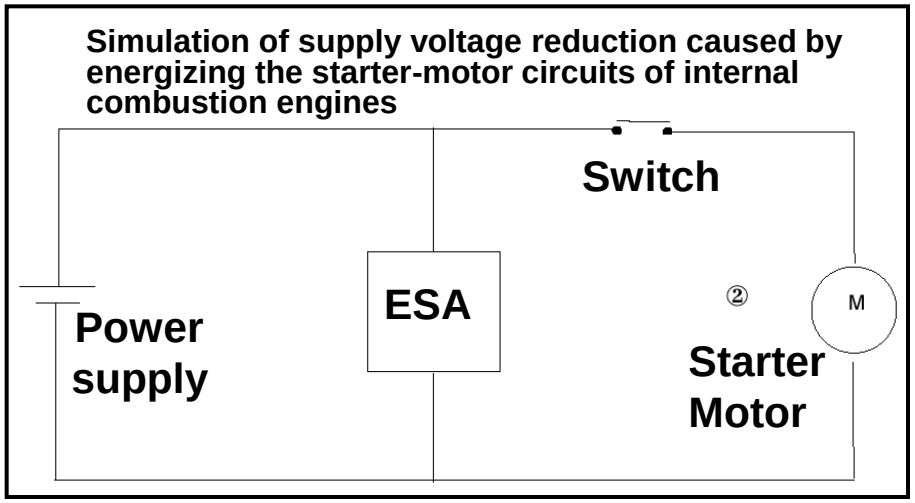
3-5(6) Pulse 4



Criteria	
Immunity related ESA	Others
C(*)	D

∗ :B for ESA operating when engine is started

•t7, t11:See para. 5.6.4 table 8
•ISO7637-2 2nd Ed., 2004



Parameters	12V system	24V system
Us	-6V to -7V	-12V to -16V
Ua	-2.5 V to -6V with |Ua|≤|Us|	-5 V to -12V with |Ua| ≤ |Us|
Ri	0 to 0.02 ohms	
t7	15ms to 40ms *	50ms to 100ms *
t8	≤ 50ms	
t9	0.5s to 20s	
t10	5ms	10ms
T11	5ms to 100ms *	10ms to 100ms *

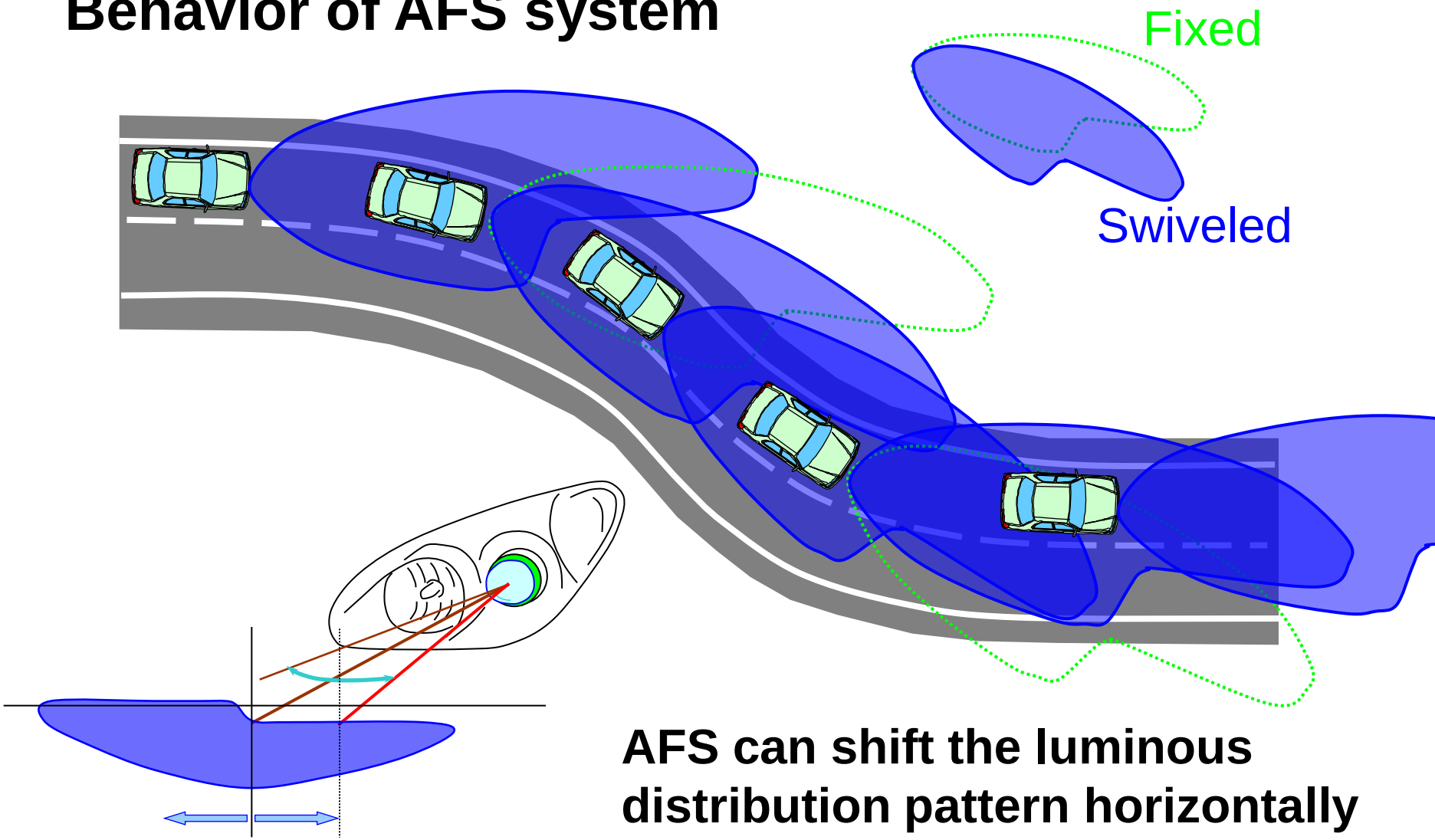
4. Example of test plan for type approval

Pass/fail criteria and test condition for ECE R10-03

Example of AFS (Adaptive Front-Lighting System)
AFS is a head light system having a function orientating a light axis to steering direction to improve nighttime Visibility.

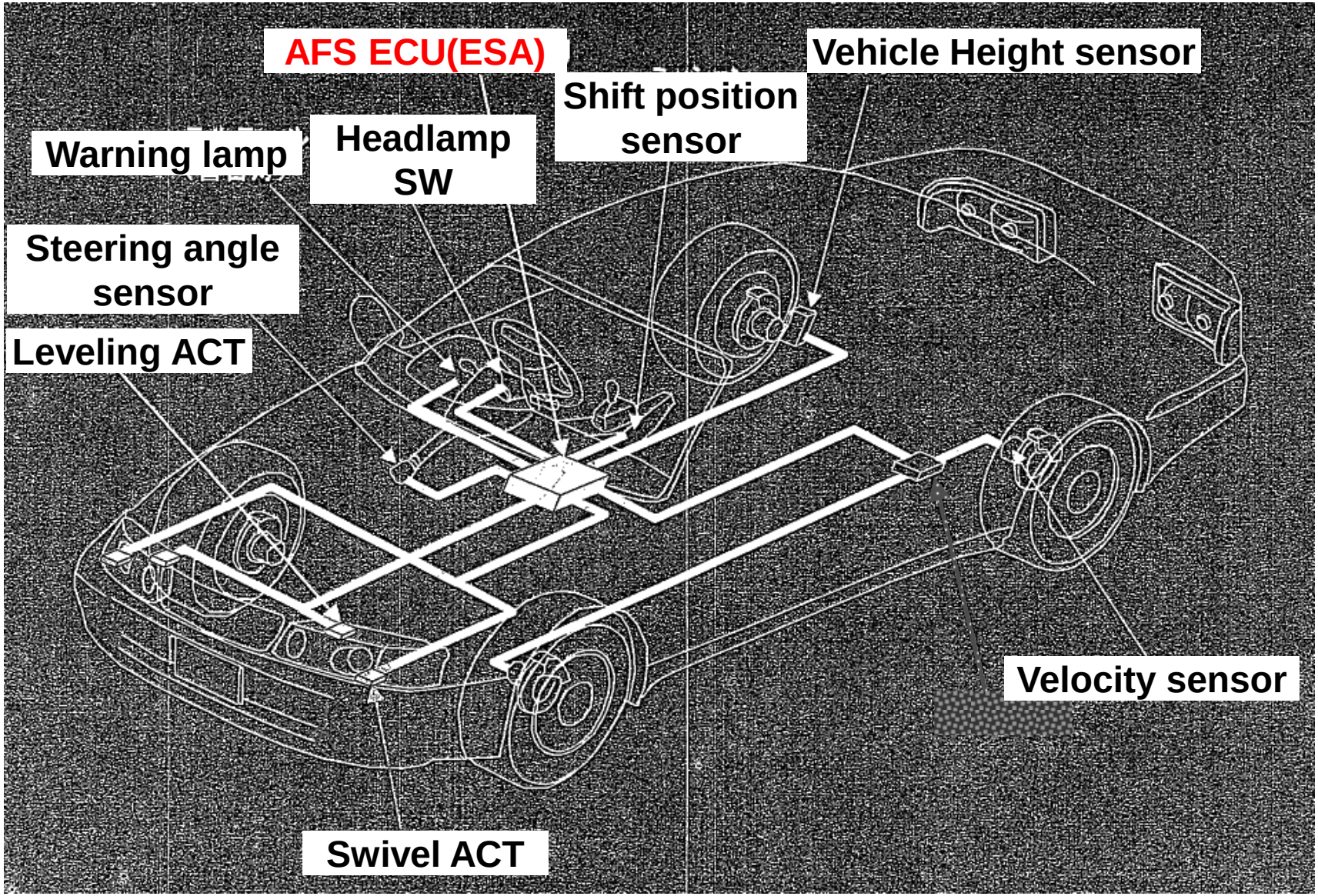
Note: Only example, different from real system and testing condition.

Behavior of AFS system



AFS can shift the luminous distribution pattern horizontally by swiveling low beam.

Example of the system configuration



Note: Only example, different from real system.

Criteria for test plans

Applicable ESA	**AFS ECU only. Other sensors are not applicable for approval**

	Test items	Reasons
Applicable test and reasons	N/A: Radiated broadband emission	No noise source
	Radiated narrowband emission	More than 9kHz oscillator
	Radiated Immunity	Effect on driving
	Conducted Immunity	All ESA
	N/A :Conducted emission	No switches and/or inductive loads
Criteria	Radiated narrowband emission	Annex 8
	Radiated Immunity	•No degradation during the test •No affect on data bus communication
	Conducted Immunity	•No degradation during the test •No affect on data bus communication

Note: Only example, different from real testing condition.

1. Pass/fail criteria

No degradation during the test
No affect on data bus communication

(1)Warning on LCD of PC does not light.

Warning lights in the following condition:

-The signals to ESA actuators by communication are fail.

-The warning lamp-on signal by communication is fail.

-The CAN-communication signals are fail.

(2) The values which are monitoring actuators is not changed.(tolerance: +/-5 steps)

The values are changed when ESA actuators are actuated.

No degradation during the test

2. ESA conditions and test items

Mode Name	Details	Applied Test Name
Idling	**IG: ON** **Engine speed:Idling** **Vehicle speed:0 km/h** **Horizontal tilt angle in a longitudinal direction=0 degree** **Steering angle:0 degree**	**Radiated narrowband emission**
50 km/h	**IG: ON** **Vehicle speed:50km/h** **Horizontal tilt angle in a longitudinal direction=0 degree** **Steering angle:0 degree**	**Radiated and conducted Immunity**

Note: Only example, different from real testing condition.

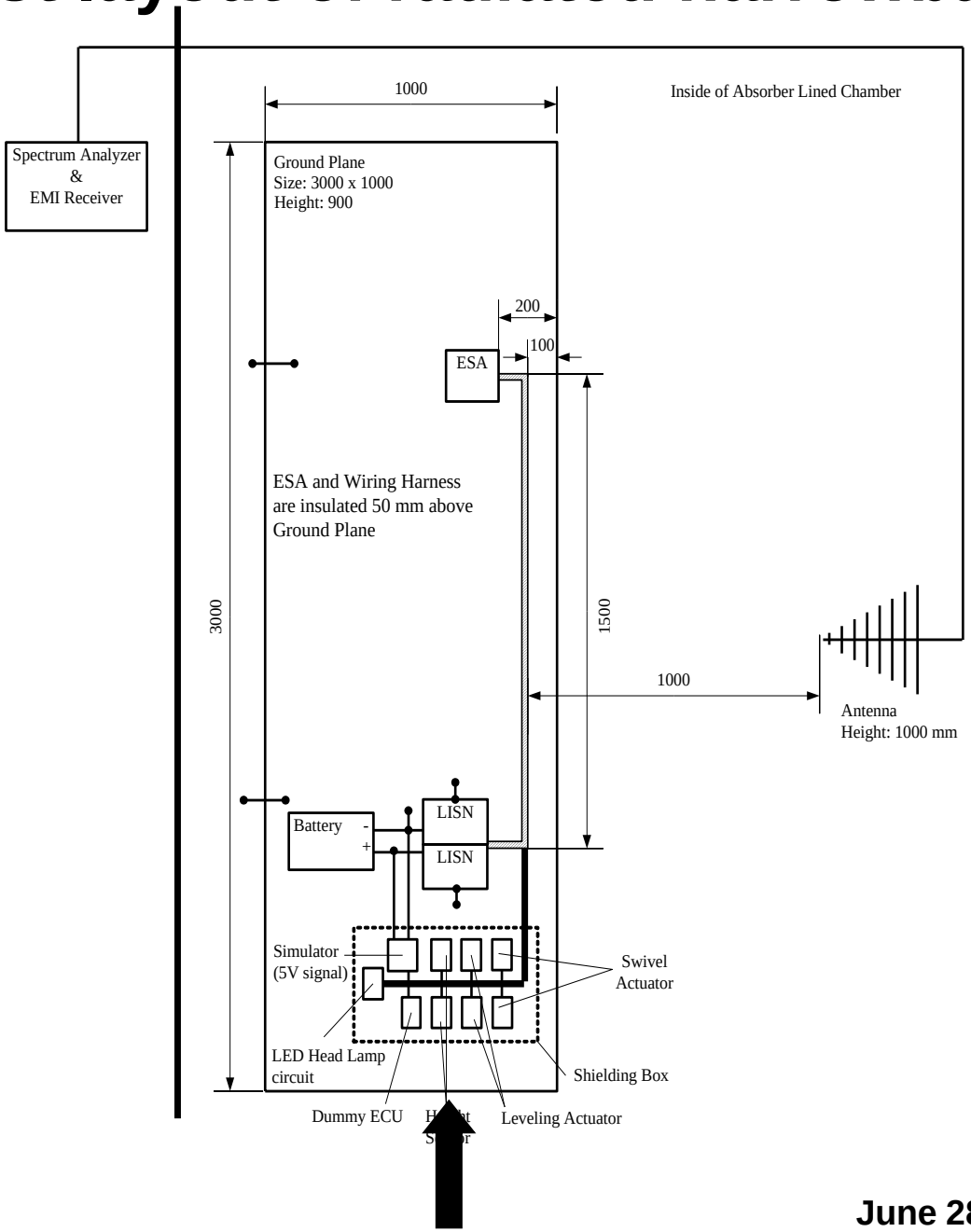
3. Test condition

(1) Radiated narrowband emission

Test condition Parameter and pass/fail criteria (limit)	Remarks
Frequency range: 30MHz-1000MHz Measurement frequency: 13 points * 30-50, 50-75, 75-100, 100-130, 130-165, 165-200, 200-250, 250-320, 320-400, 400-520, 520-660, 660-820, 820-1000MHz Limit: 30MHz - 75MHz：62-52dBuV/m, 75MHz - 400MHz：52-63dBuV/m, 400MHz - 1000MHz：63dBuV/m	*:Manufacturer provides data for the whole frequency band from a test laboratory accredited to the applicable parts of ISO 17025 and recognized by the Approval Authority. (ANNEX 8, para.4.3)

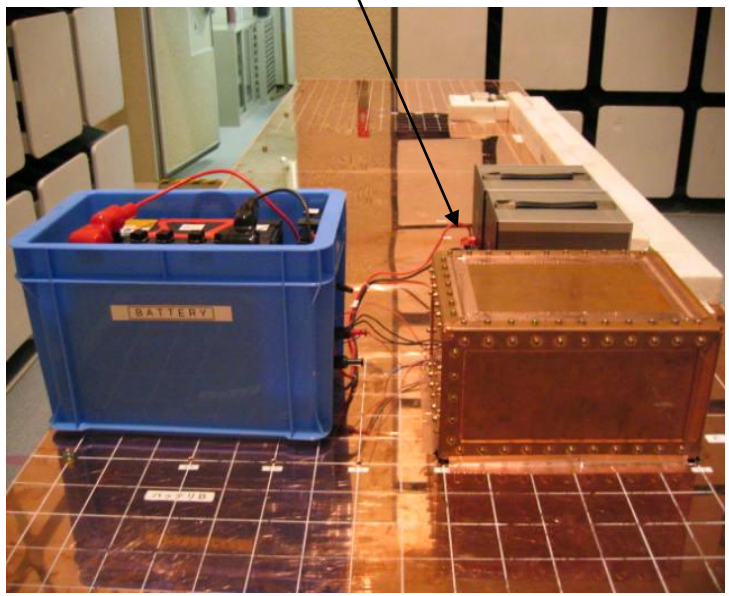
Note: Only example, different from real testing condition.

Test layout of radiated narrowband emission



Note: Only example, different from real testing condition.

Conductive case preventing unintended noise



(2) Radiated immunity

Test condition		Pass/fail criteria	Remarks
Test items	Parameter		
TEM cell	Frequency range: 20MHz – 200MHz Limit: 75V/m, Modulation: AM Measurement frequency: 7 points 27, 45, 65, 90, 120, 150, 190MHz Dwell time: More than 2s	(1), (2)	Same as the remarks of (1) Radiated narrowband emission (ANNEX 9, para.3.2)

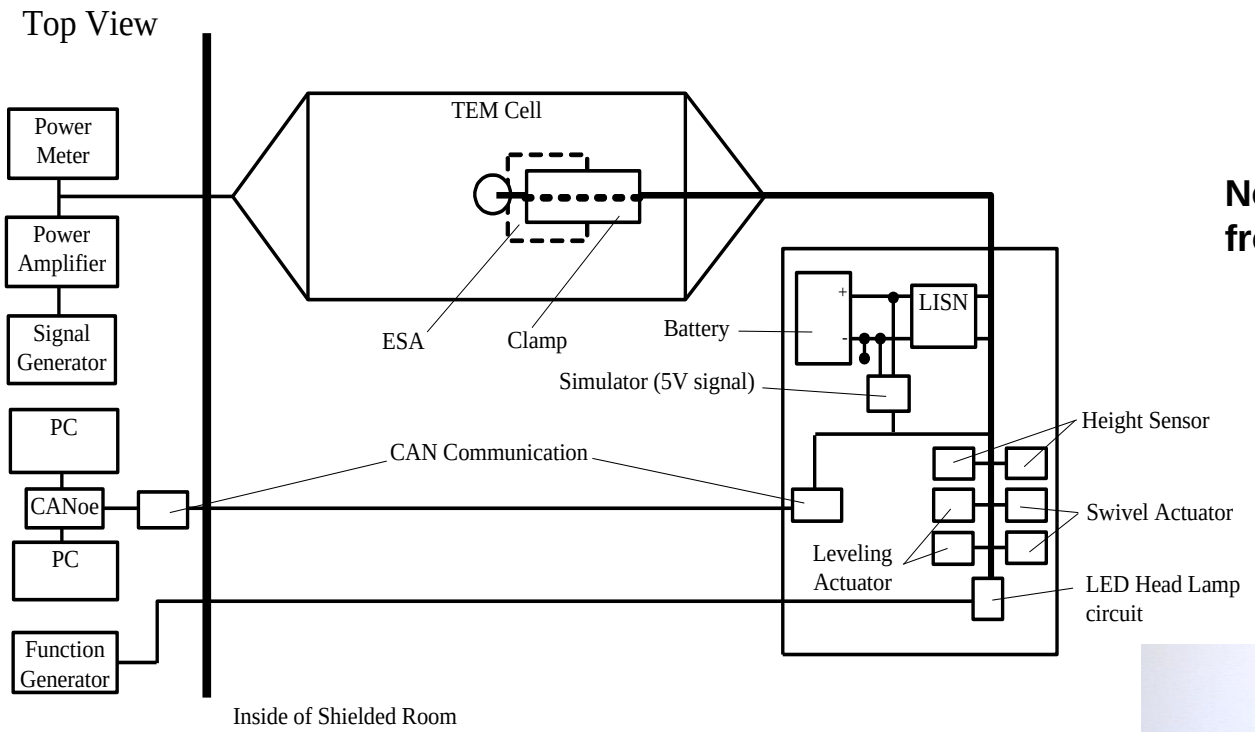
*: Functional status is measured based on the pass/fail criteria (1) and (2).

Test condition		Pass/fail criteria	Remarks
Test items	Parameter		
Free Field	Frequency range & modulation: 200MHz – 800MHz: AM 800MHz – 2GHz: Pulse Antenna Position: 200Hz – 1GHz:in line with center of harness 1GHz – 2GHz:in line with DUT Limit：30V/m, Measurement frequency: 9 points 230, 280, 380, 450, 600, 750, 900, 1300,1800MHz Dwell time: More than 2s	(1), (2)	Same as the remarks of (1) Radiated narrowband emission (ANNEX 9, para.3.2)

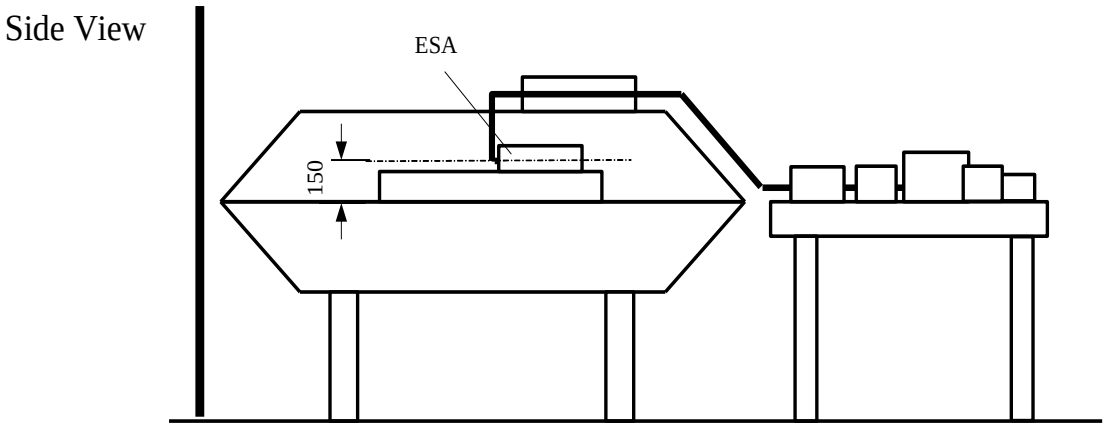
*: Functional status is measured based on the pass/fail criteria (1) and (2).

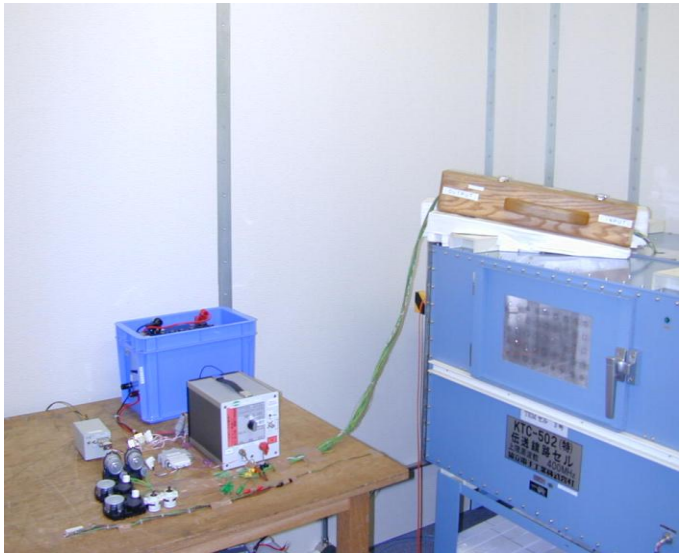
Note: Only example, different from real testing condition.

Test layout of TEM cell immunity in a shielded chamber

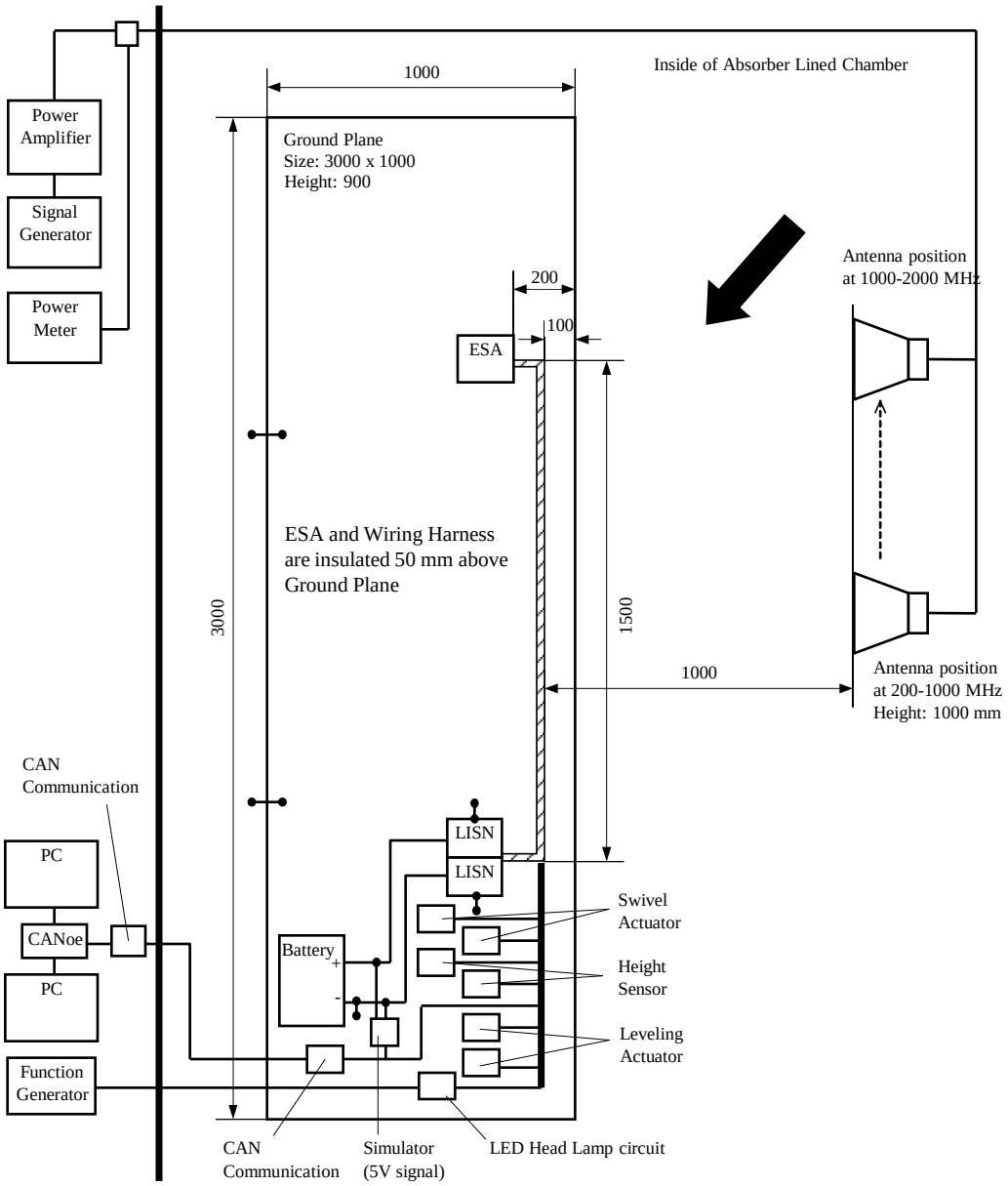


Note: Only example, different from real testing condition.

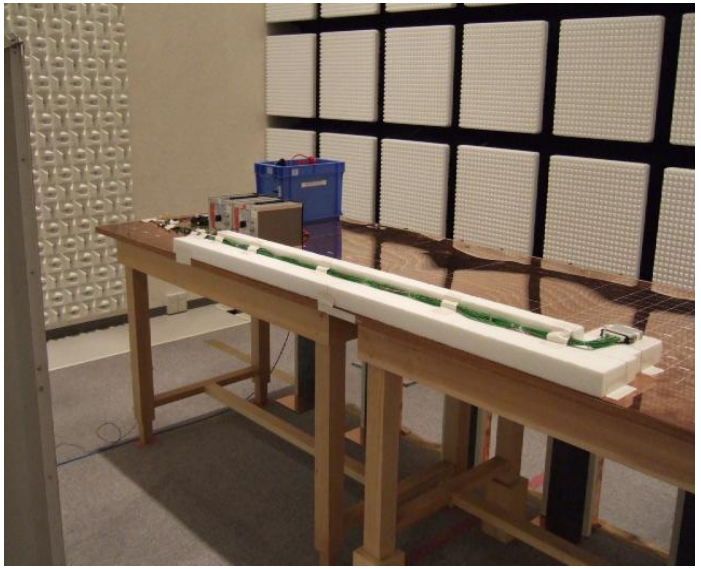




Test layout of radiated immunity



Note: Only example, different from real testing condition.



(3) Conducted immunity (1/2)

	Test condition	Functional status (*) (Pass/fail criteria)
Pulse	Parameter ( ):Standard Value	
Pulse 1 (Level III)	Us=-100(-75)V, Ri=10ohms, td=2ms, tr<1us+0/-0.5us t1=0.5 ~ 5s->0.5s, t2=200ms, t3<100us Pulse cycle time=5000 pulses	C
Pulse 2a (Level III)	Us=50(37)V, Ri=2ohms, td=0.05s, tr=10us+0/-0.5us, t1=0.2s to 5s -> 0.2s, Pulse cycle time=5000 pulses	B
Pulse 2b (Level III)	Us=10V, Ri= 0 to 0.05ohms → 0 ohms, td=0.2s to 2s -> 0.2s, t12=1 ms+/-0.5ms, tr =1ms+/-0.5ms, t6=1ms+/-0.5ms, Pulse cycle time=10 pulses	C

*: Functional status is measured based on the pass/fail criteria (1) and (2).

Note: Only example, different from real testing condition.

(3) Conducted immunity (2/2)

	Test condition	Functional status (*) (Pass/fail criteria)
Pulse	Parameter ( ):Standard Value	
Pulse 3a (Level III)	Us=-150(-112)V, Ri=50ohms, td=0.1 +0.1/-0us, tr<5ns+/-1.5ns t1=100us, t4=10ms, t5<90ms Test time=1hour	A
Pulse 3b (Level III)	Us=100(75)V, Ri=50ohms, td=0.1us+0.1/+0, tr<5ns+/-1.5ns t1=100us, t4=10ms, t5<90ms Test time=1hour	A
Pulse 4 (Level III)	Ub=12V, Us=-7(-6)V, Ua=-2.5 ~ -6V [|Va|≤|Vs|]->-6V Ri=0-0.02ohms, t7=15 ~ 40ms->40ms t8≤50ms, t10<5ms, t9=0.5 ~ 20s->20s t11=5 ~ 100ms→100ms, Test pulse=1pulse	C

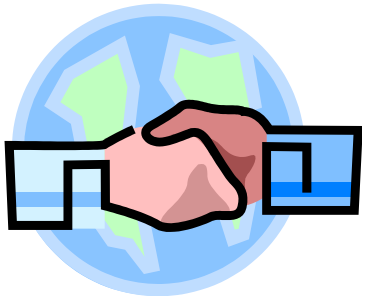
***: Functional status is measured based on the pass/fail criteria (1) and (2).**

Note: Only example, different from real testing condition.

Summary of ECE R10-03
-Electric/Electronic Sub-Assemblies-

- ✓ECE R10-03 is a global regulation under 1958 agreement, consisted of RE, RI, CE and CI. (CE & CI are for only ESA)
- ✓Specified ESA are only applicable.
- ✓ESA type is defined as ESA having essentially same-function.
- ✓Basically ESA are type-approved as components fitted into vehicle type.
  Appropriate application of type approval is recommended.
- ✓A test plan is important before testing.

Thank you for your attention.



UN/ECE 法规
ECE R10-03概要
-电子电气部件-

1. 什么是EMC法规 ？
2. ECE R10-03的型式认证概要
3. ECE R10-03中ESA的详细说明
    - 3-1 宽带发射
    - 3-2 窄带发射
    - 3-3 辐射抗扰度
    - 3-4 传导发射
    - 3-5 传导抗扰度
4. 型式认证试验计划案例

1. 什么是EMC法规?

EMC（ Electro Magnetic Compatibility）：电磁兼容

1）发射（装置不产生*较强*电磁波）

EMI（Electro Magnetic Interference）：电磁干扰

2)抗扰度（能够正常运行，不导致性能降级）

EMS（Electro Magnetic Susceptibility）：电磁敏感度

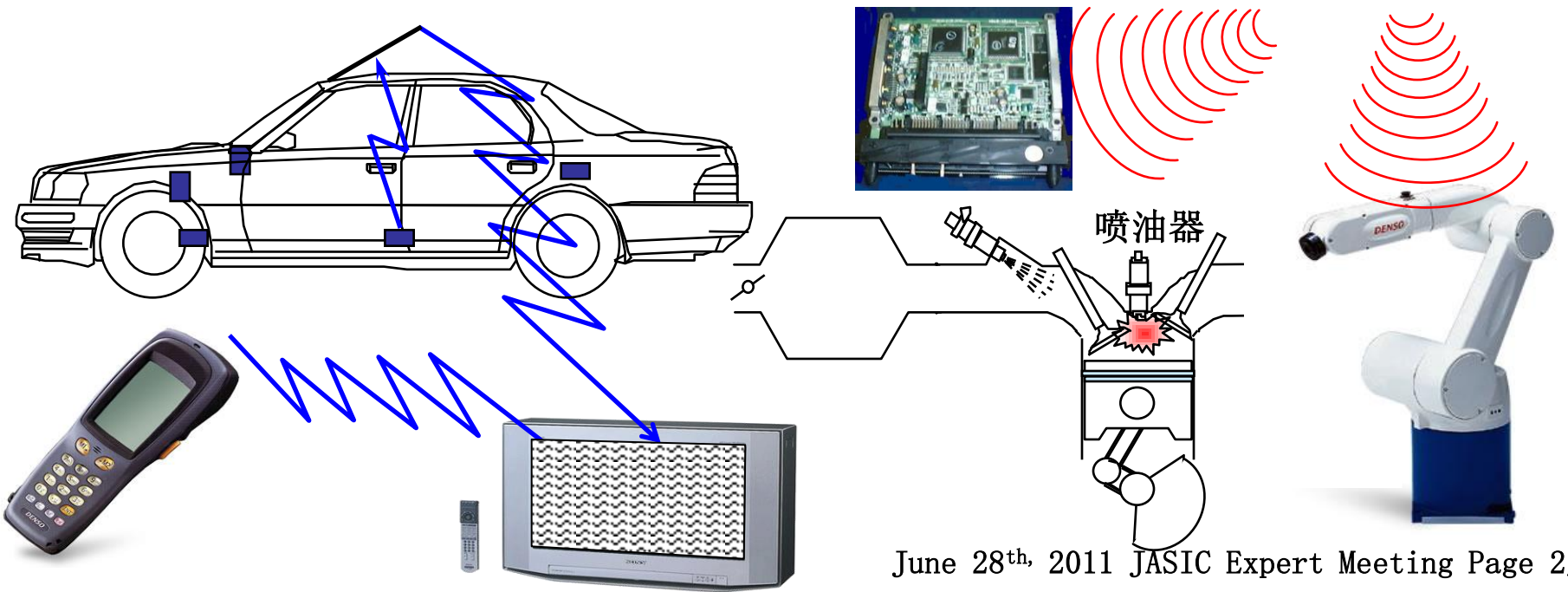
→EMC 法规包含以上所列内容

■发射

例如，电视机因车辆发出的电磁噪声而图像模糊.

■抗扰度

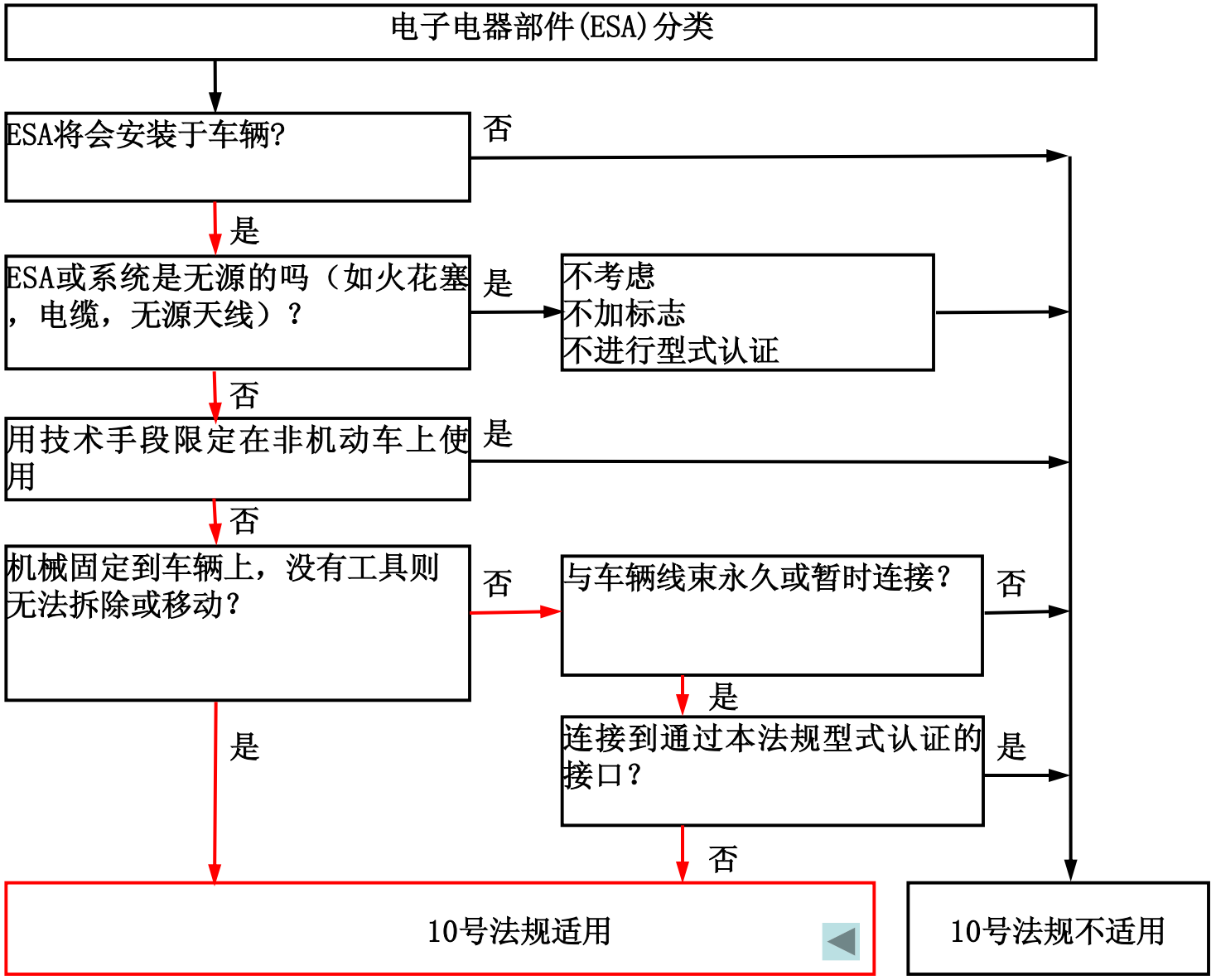
例如，发动机ECU因外部电磁噪声停止工作.



2. ECE R10-03型式认证概要

项目	详细说明
对ESA*的适用性	见下一页 ▶ *电子电气部件
ESA型式定义（见2.10）	ESA功能基本相同 （零部件或独立技术单元）
型式认证流程	1） 与技术服务和测试部门讨论*，准备试验样品和申请表（*适用的ESA，试验条件，判定准则）。 2） 型式认证测试 3） 申请 4） 认证
标志（见5.2.2）	每个ESA都要贴上认证标志 a=6mm 最小 例如，ECE R10-03 
已认证ESA的更改（见11）	ESA的任何更改都应通知管理部门，可能需要进一步的试验。
售后市场的ESA（见3.2.9）	与“抗扰度相关功能”有关的ESA：型式认证 与“抗扰度相关功能”无关的ESA：生产商应发布声明ESA满足法规要求。

1）ESA 适用性(见 3.2.1)



2）型式认证要点

——对于申请单位，应注意

✓ESA 是作为安装于整车的零部件来进行型式认证的，即，整车型式认证包括ESA认证。

✓ESA 型式认证的价值

1）最初目的不是装备于整车的ESA(例如，经销商选配件)认证；

2）ESA固定于整车时，进行测试非常困难且/或加重测试的负担。

——对于技术服务部门和检测机构，应注意

- ✓ ESA功能和结构各不相同，ESA型式适用性、试验条件、判定准则需要技术评价
- ✓ 测量仪器的校准和测试精度的维护
- ✓ 技术人员的培训

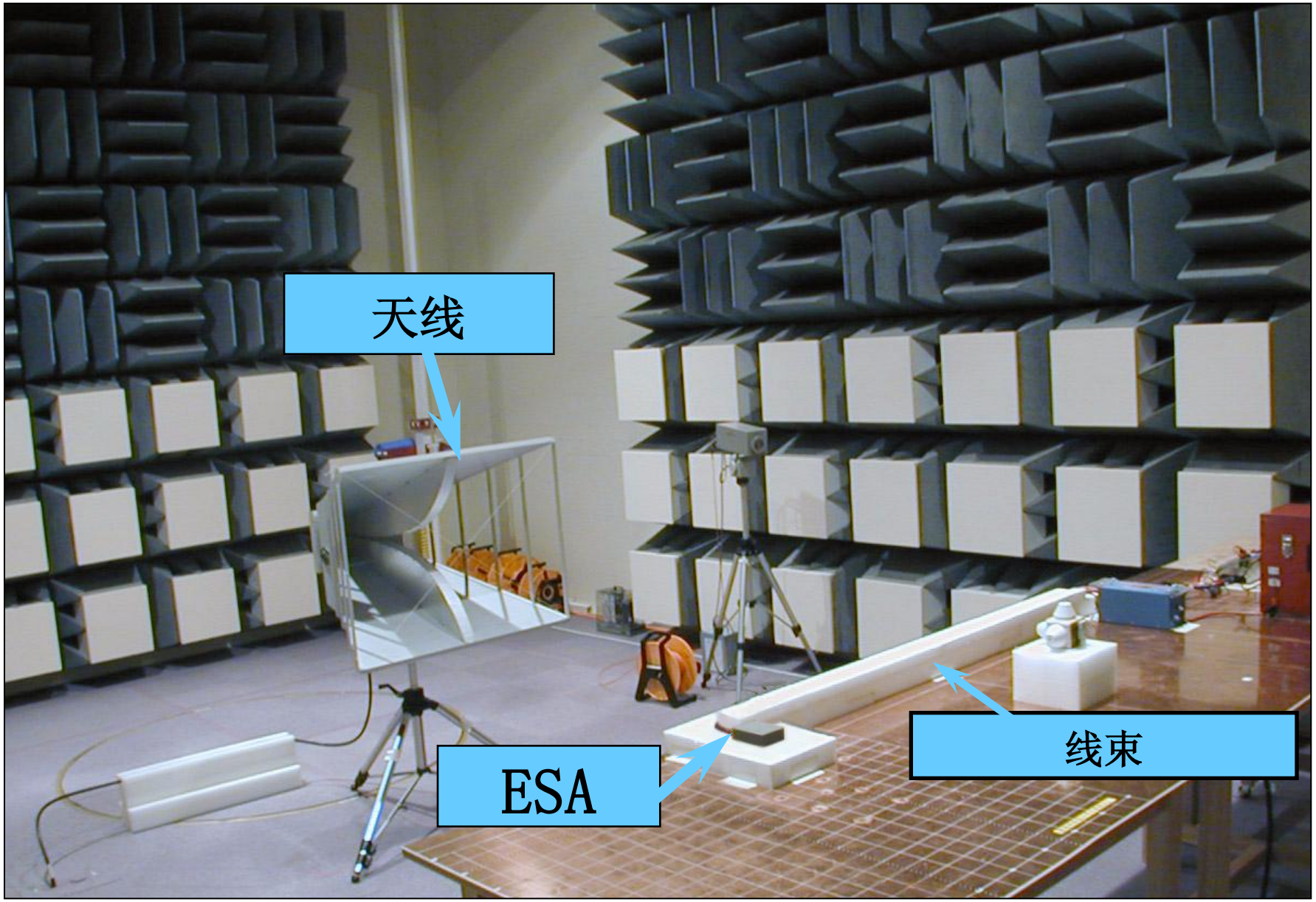
建议合理运用型式认证.

3. ESA 规范要求

※ECER10-04:不包括 RESS（可充电的能量存储系统)充电模式向电网的耦合测量

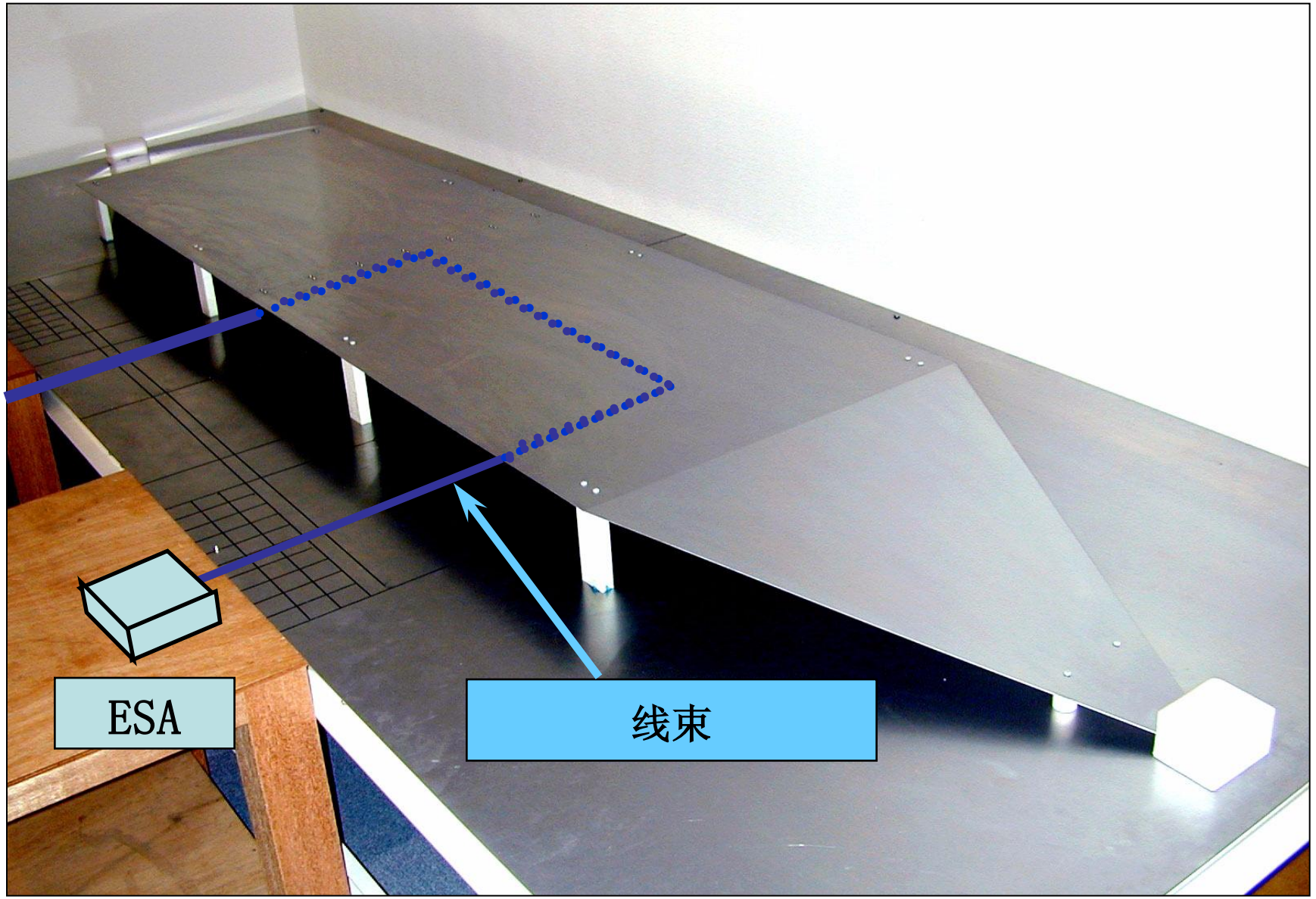
<table>
<tr><th colspan="3">项目</th><th>适用 ESA</th><th>规范要求</th></tr>
<tr><td rowspan="3">辐射</td><td rowspan="2">发射</td><td>宽带
（见 6.5）</td><td>ESA具有宽带噪声
（例如，点火系统或电动机）</td><td>限值：附录6
试验方法：附件 7</td></tr>
<tr><td>窄带
（见 6.6）</td><td>ESA 包含一个工作频率大于9kHz的电子晶振（例如，ECU）</td><td>限值：附录7
试验方法：附件 8</td></tr>
<tr><td colspan="2">抗扰度
（见 6.7）</td><td>ESA 具有抗扰度相关功能</td><td>限值：无性能降级
150mm 带状线:60V/m rms(ISO11452-5 2nd, 2002)
800mm 带状线：15V/m rms(ISO11452-5 2nd, 2002)
TEM小室：75V/m rms(ISO11452-3 2nd, 2001)
BCI：60mArms(ISO11452-4 3rd, ,2005, c或r.1, 2009)
自由场：30V/m rms(ISO11452-2, 2nd ,2004)
试验方法：附件 9</td></tr>
<tr><td rowspan="2">传导</td><td colspan="2">发射
（见 6.9）</td><td>可开关，包含开关负载或感性负载的ESA</td><td>限值：
<table><tr><td></td><td colspan="2">最大允许脉冲幅度</td></tr><tr><td>脉冲极性</td><td>12V电系车辆</td><td>24V电系车辆</td></tr><tr><td>正</td><td>+75</td><td>+150</td></tr><tr><td>负</td><td>-10</td><td>-450</td></tr></table>试验方法：附件 10</td></tr>
<tr><td colspan="2">抗扰度
（见 6.8）</td><td>所有ESA</td><td>限值：见 6.8.1，表 1
试验方法：附件 10</td></tr>
</table>

抗扰度：自由场

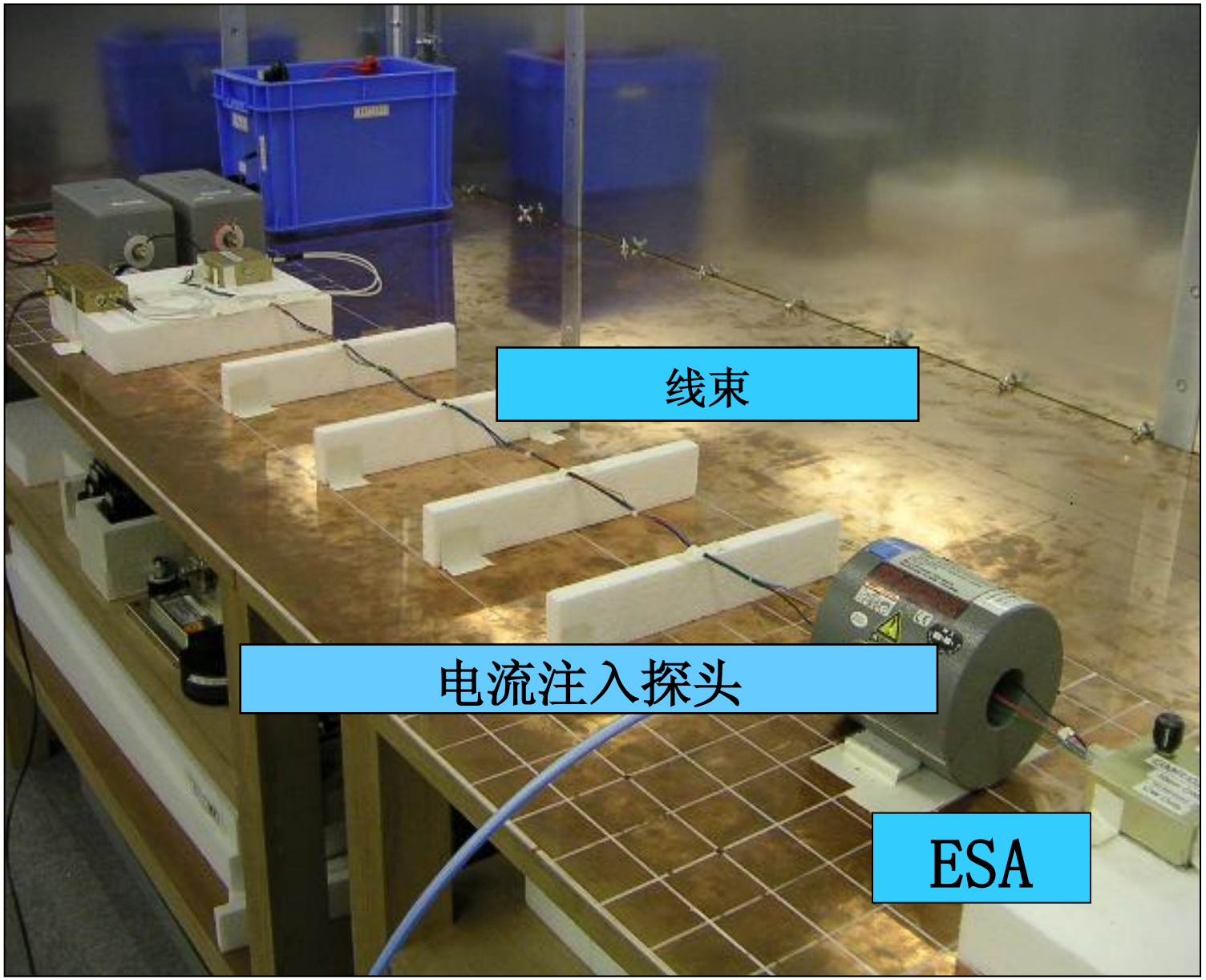


抗扰度：TEM小室——屏蔽室内

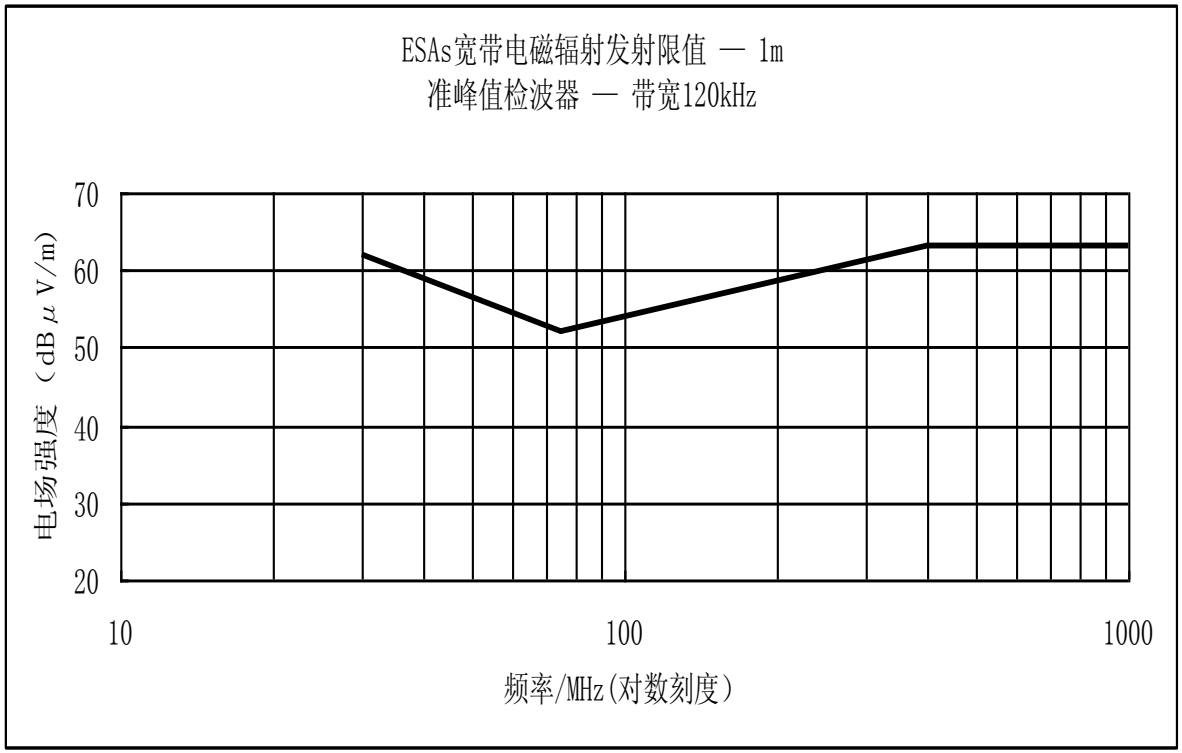
抗扰度：150mm 带状线——屏蔽室内



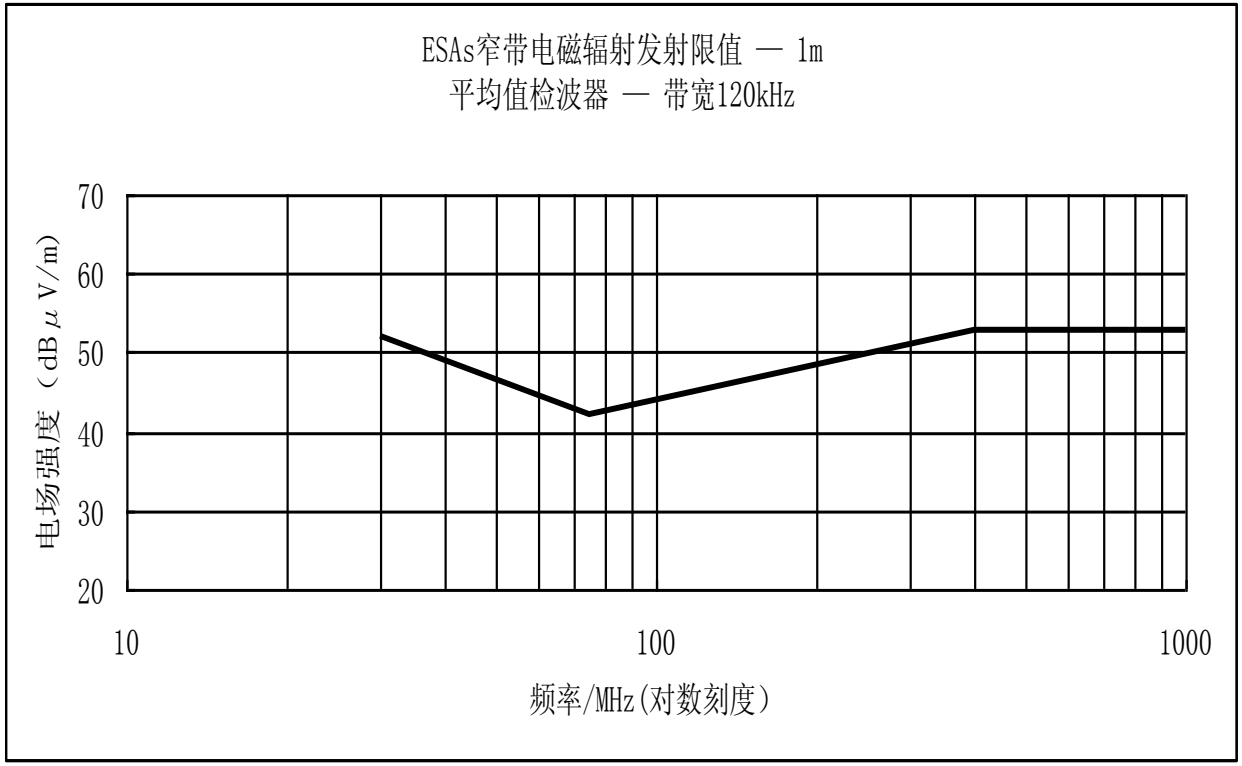
抗扰度：BCI ——屏蔽室内



3-1 宽带发射（见 6.5，附件 7）

	规范要求
适用 ESA	ESA(例如，点火系统或电动机等)
频率	30 MHz - 1GHz
模式	正常工作模式(连续工作)，最好在最大载荷时测量
测试方法	CISPR 25 2nd Ed.，2002 and C或r.2004
限值 (附录6)	

3-2 窄带发射（见 6.6, 附件8）

	规范要求
适用 ESA	ESA 包含工作频率大于9kHz的电子晶振 (例如，ECU)
频率	30 MHz - 1GHz
模式	正常工作模式
测试方法	CISPR 25 2nd Ed., 2002 and C或r.2004
限值 (附录7)	

3-3 辐射发射（见6.7.， 附件9）

1） 适用 ESA 具有抗扰度相关功能

（见 2.12）

1)车辆直接控制相关的功能：

- 动力性降级或改变：例如，发动机，变速箱， 制动系统
- 影响驾驶员位置：例如，座位或方向盘定位
- 影响驾驶员视野：例如，近光灯,风挡雨刮

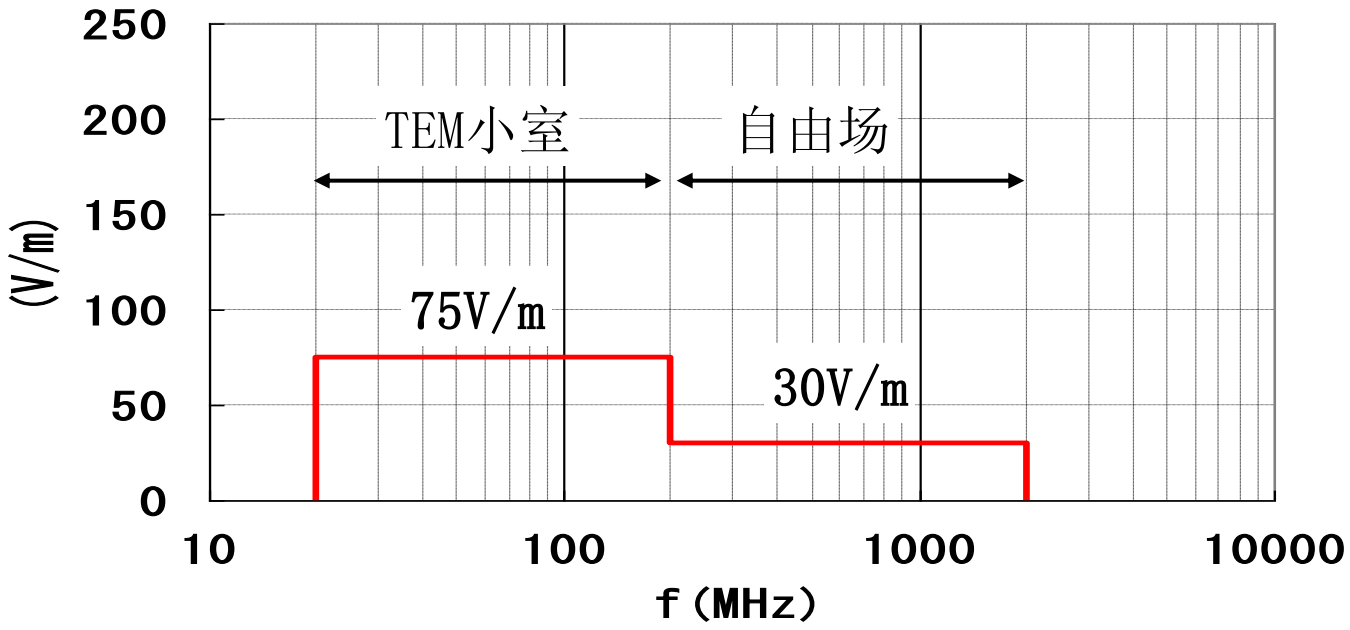
2） 与驾驶员、乘客和其他行人安全防护相关功能：安全气囊,安全约束系统

3)受到骚扰时，引起驾驶员或其它行人陷入混乱的功能： 灯,喇叭

4） 车辆数据总线性能相关的功能

5)受到骚扰时，影响车辆法定数据的功能：转速表，里程表

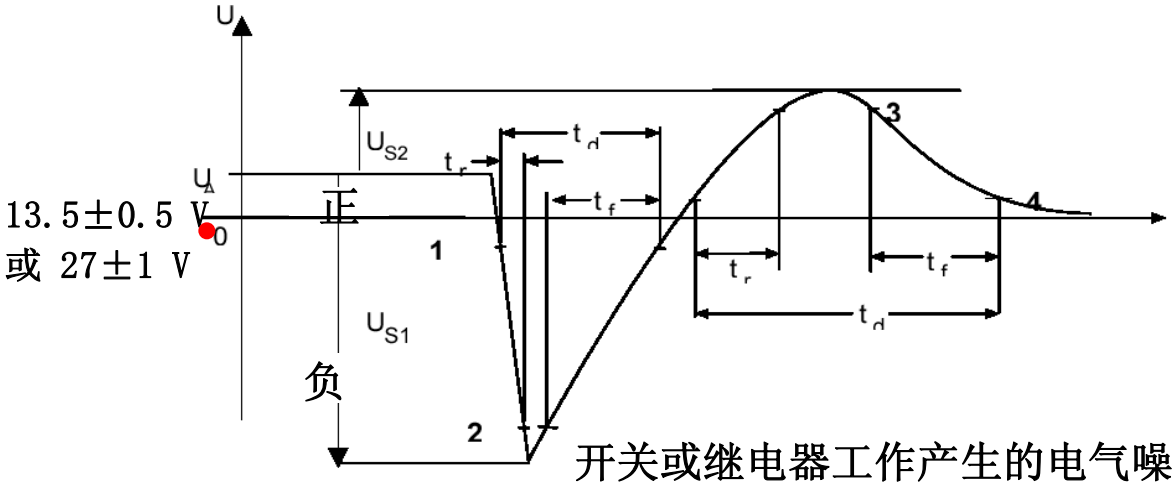
2) 电场强度(例如，TEM 小室与自由场的组合)

	规格要求	
适用 ESA	ESA具有与抗扰度相关的功能	
频率	TEM小室(20 MHz - 200MHz)	自由场(200 MHz - 2 GHz)
调制	AM(调幅)	200 MHz - 800 MHz : AM 800 MHz - 2 GHz : PM(脉冲)
测试方法	ISO 11452-3 3rd, 2001	ISO 11452-2nd ,2004 垂直极化
电场强度		

3-4 传导发射（见6.9，附件10）

	规格要求
适用 ESA	可开关，包含开关负载或感性负载的ESA
测试方法	ISO7637-2 2nd Ed., 2004 and Amd 1:2008
限值	

	脉冲最大允许幅值	
脉冲幅值的极性	12 V电系的车辆	24V电系的车辆
正	+75	+150
负	-10	-450



开关或继电器工作产生的电气噪声波形

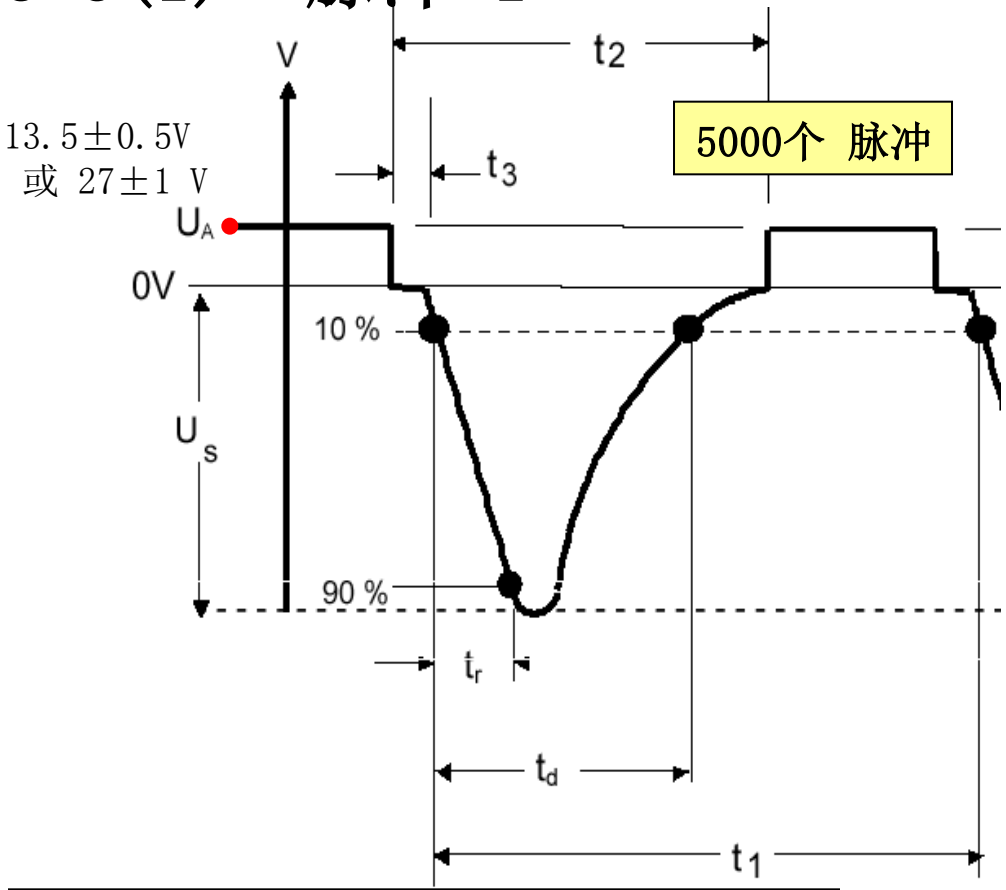
3-5 传导抗扰度（见6.8，附件10）

<table>
<tr><th></th><th>规格要求</th></tr>
<tr><td>适用的ESA</td><td>所有 ESA</td></tr>
<tr><td>试验方法</td><td>ISO7637-2 2nd Ed.， 2004 and Amd 1:2008</td></tr>
<tr><td>限值(附录6)</td><td>在下列脉冲影响下功能状态要求
<table>
<tr><th rowspan="2">脉冲形式.</th><th rowspan="2">试验等级</th><th colspan="2">系统的功能状态:</th></tr>
<tr><th>抗扰度相关功能</th><th>其他功能</th></tr>
<tr><td>1</td><td>III</td><td>C</td><td>D</td></tr>
<tr><td>2a，2b</td><td>III</td><td>B,C</td><td>D</td></tr>
<tr><td>3a，3b</td><td>III</td><td>A</td><td>D</td></tr>
<tr><td>4</td><td>III</td><td>C(B)</td><td>D</td></tr>
</table></td></tr>
</table>

＜功能执行状态分类＞

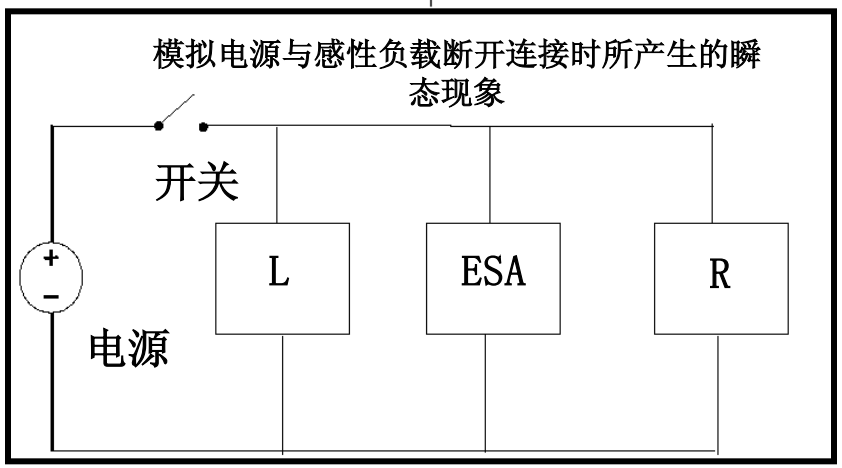
分类	说明
A	装置或系统在施加骚扰期间和之后，能执行其预先设计的所有功能。
B	装置或系统在施加骚扰期间，能执行其预先设计的所有功能；然而，可以有一项或多项指标超出规定的偏差。所有功能在停止施加骚扰之后，自动恢复到正常工作范围内。存储功能应维持A类水平。
C	装置或系统在施加骚扰期间，不执行其预先设计的一项或多项功能，但在停止施加骚扰之后能自动恢复到正常操作状态。
D	装置或系统在施加骚扰期间，不执行其预先设计的一项或多项功能，直到停止施加骚扰之后，并通过简单的“操作或使用”复位动作，才能自动恢复到正常操作状态。
E	装置或系统在施加骚扰期间和之后，不执行其预先设计的一项或多项功能，且如果不修理或不替换装置或系统，则不能恢复其正常操作。

3-5(1)　脉冲 1



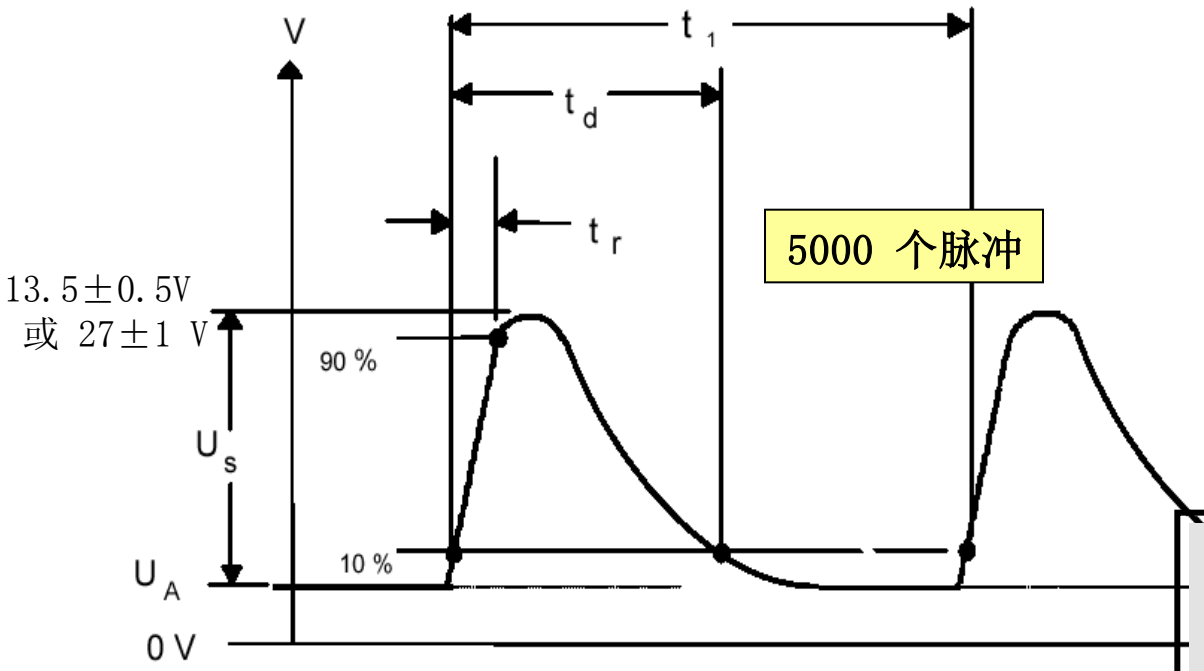
参数	12V 系统	24V 系统
Us	-75V ～ -100V	-450V ～ -600V
Ri	10 ohms	50 ohms
td	2ms	1ms
tr	(1 +0/-0.5)us	(3 +0/-1.5)us
t1 *	0.5 s ～ 5s	
t2	200ms	
t3 *	<100us	

*t1,t2:见 5.6.1 表 3 ISO7637-2 2nd Ed., 2004

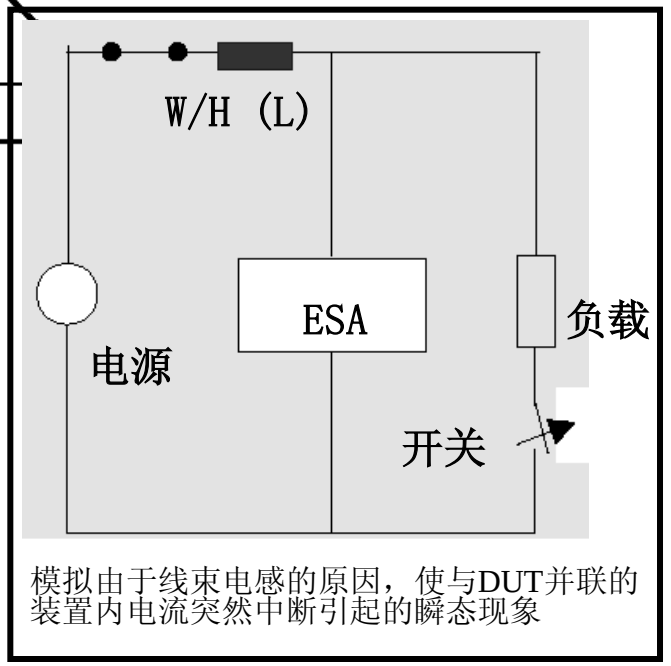


判定准则	
抗扰度功能相关 ESA	其他
C	D

3-5(2) 脉冲 2a



判定准则	
抗扰度功能相关ESA	其他
B	D



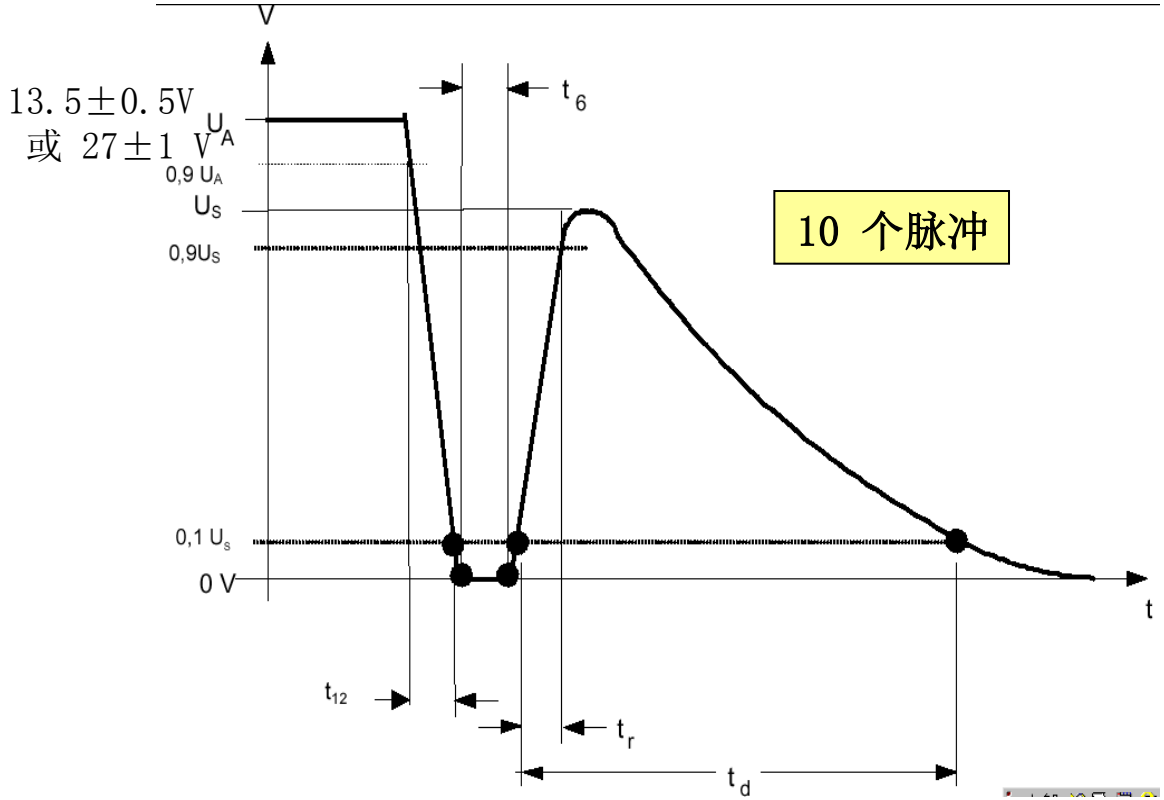
模拟由于线束电感的原因，使与DUT并联的装置内电流突然中断引起的瞬态现象

参数	12V 系统	24V 系统
Us	+37V ～ +50V	
Ri	2 ohms	
td	0.05ms	
tr	(10 +0/-0.5)us	
t1 *	0.2 s ～ 5s	

* t1:见 5.6.2 表 4

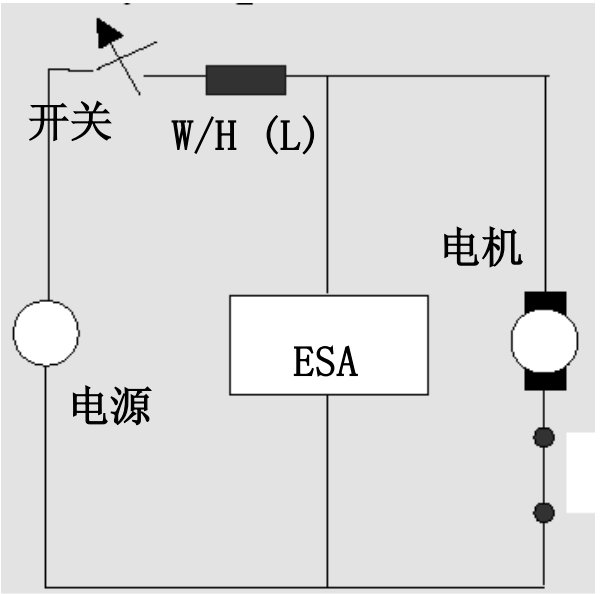
ISO7637-2 2nd Ed., 2004

3-5(3) 脉冲 2b



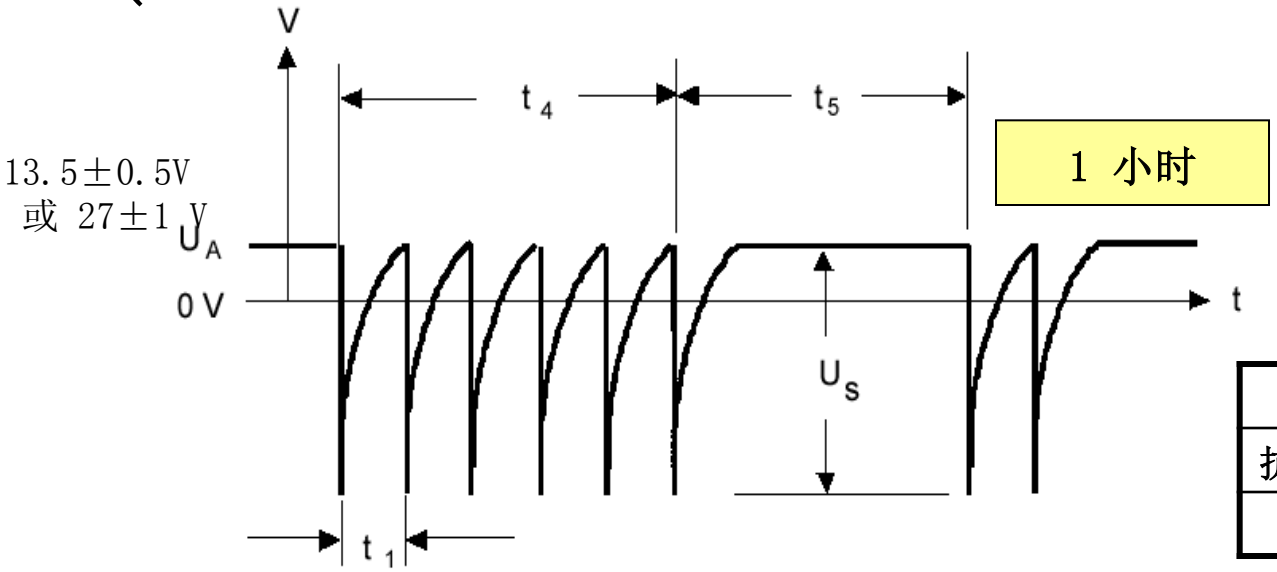
判定准则	
抗扰度功能相关 ESA	其他
C	D

参数	12V 系统	24V 系统
Us	10V	20V
Ri	0 ～ 0.05 ohms	
td	0.2 s ～ 2s	
t12	1ms +/- 0.5ms	
tr	1ms +/- 0.5ms	
t6	1ms +/- 0.5ms	

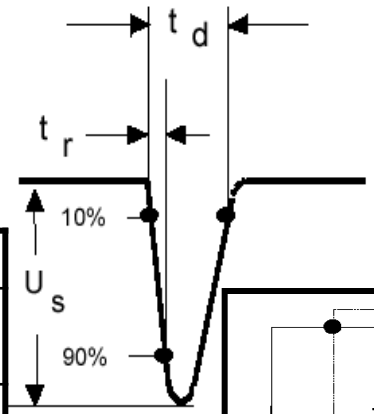


模拟直流电机充当发电机，点火开关断开时的瞬态现象

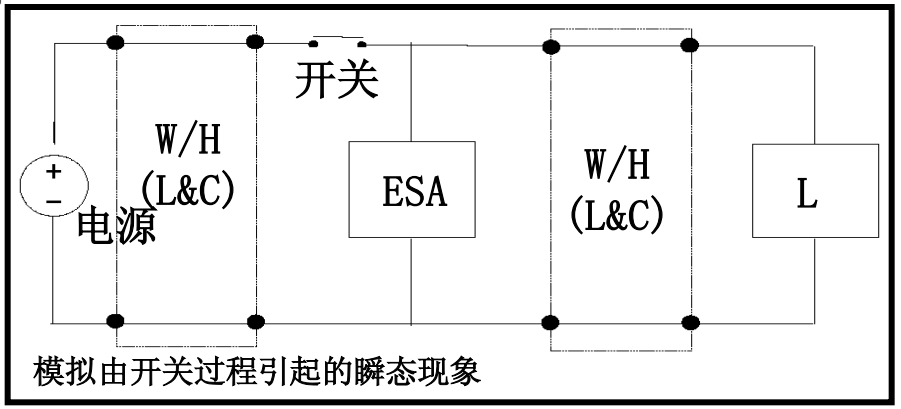
3-5(4) 脉冲 3a



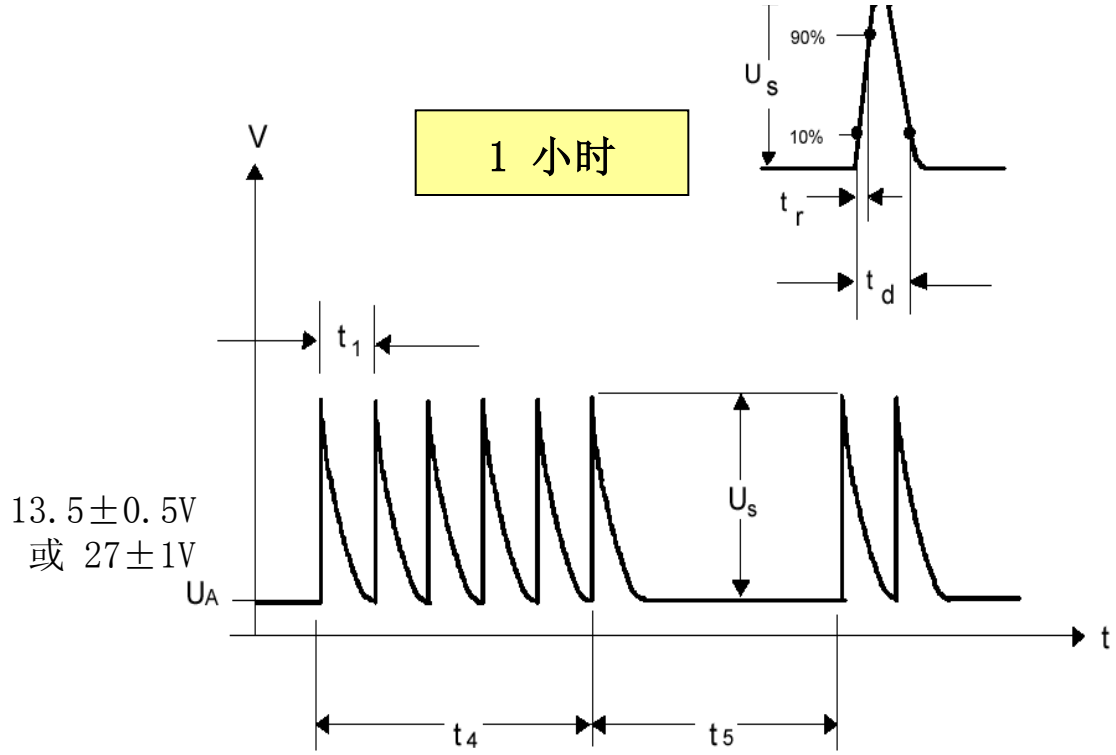
判定准则	
抗扰度功能相关ESA	其他
A	D



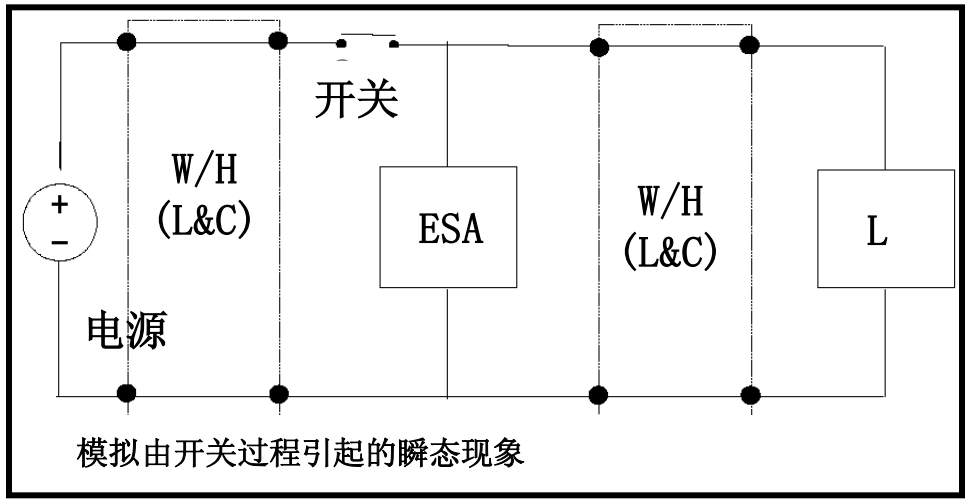
参数	12V 系统	24V 系统
Us	-112V ～ -150V	-150V ～ -200V
Ri	50 ohms	
td	(0.1 +0.1/-0)us	
tr	5ns +/- 1.5ns	
t1	100us	
t4	10ms	
t5	90ms	



3-5(5) 脉冲 3b

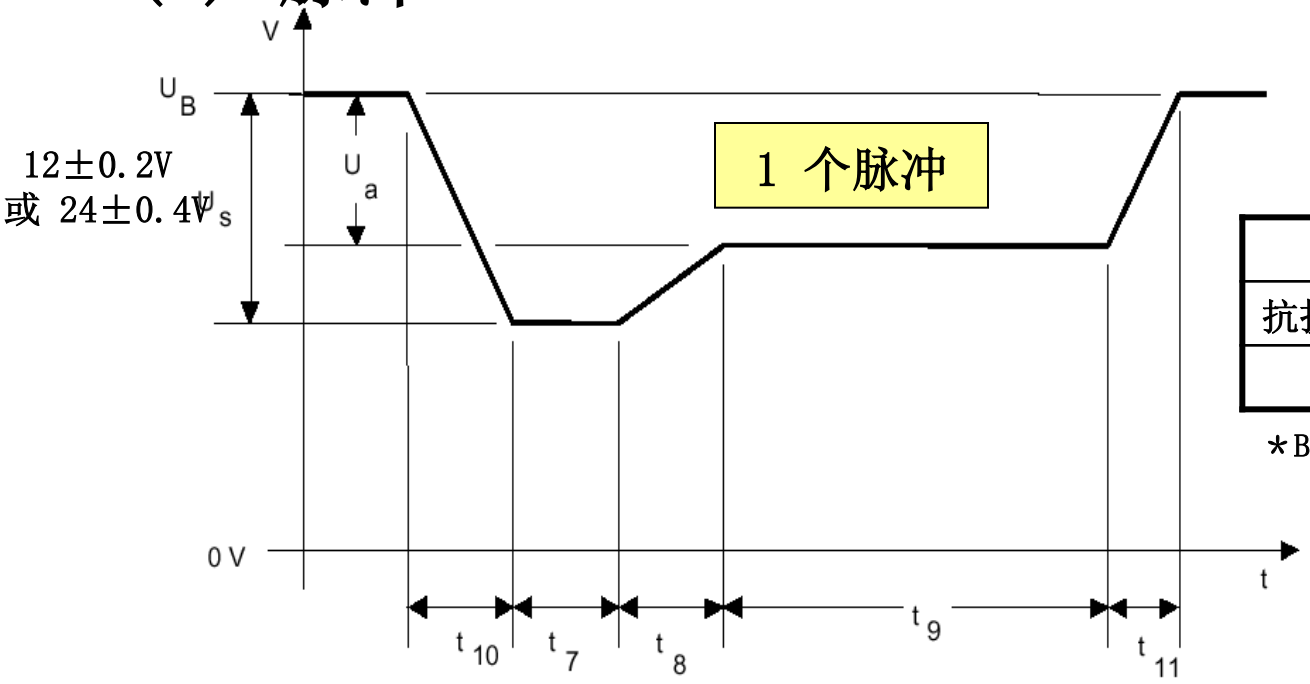


判定准则	
抗扰度功能相关 ESA	其他
A	D



参数	12V 系统	24V 系统
Us	+75V ～ +100V	+150V ～ +200V
Ri	50 ohms	
td	(0.1 +0.1/-0)us	
tr	5ns +/- 1.5ns	
t1	100us	
t4	10ms	
t5	90ms	

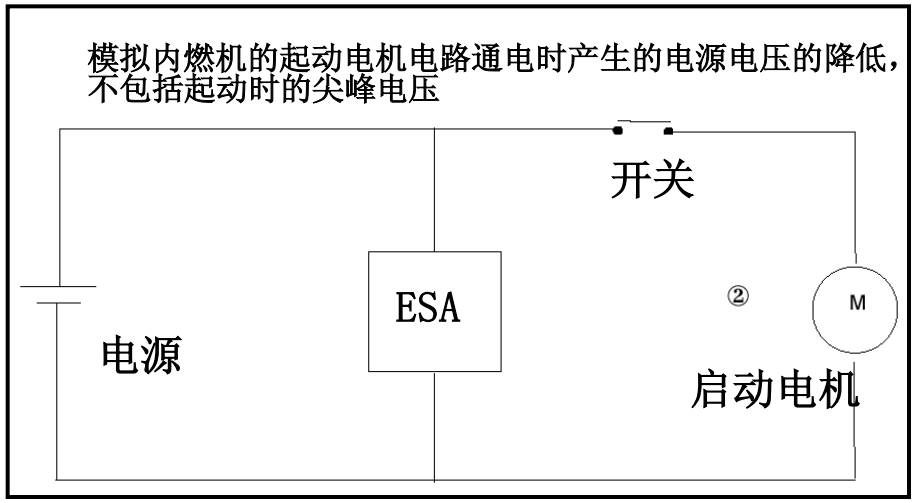
3-5(6) 脉冲 4



判定准则	
抗扰度功能相关 ESA	其他
C(*)	D

*B：发动机启动阶段必须运行的ESA

•t7, t11: 见 5.6.4 表 8
•ISO7637-2 2nd Ed., 2004



参数	12V 系统	24V 系统
Us	-6V ～ -7V	-12V ～ -16V
Ua	-2.5 V ～ -6V with |Ua|≤|Us|	-5 V ～ -12V with |Ua| ≤ |Us|
Ri	0 ～ 0.02 ohms	
t7	15ms ～ 40ms *	50ms ～ 100ms *
t8	≤ 50ms	
t9	0.5s ～ 20s	
t10	5ms	10ms
T11	5ms ～ 100ms *	10ms ～ 100ms *

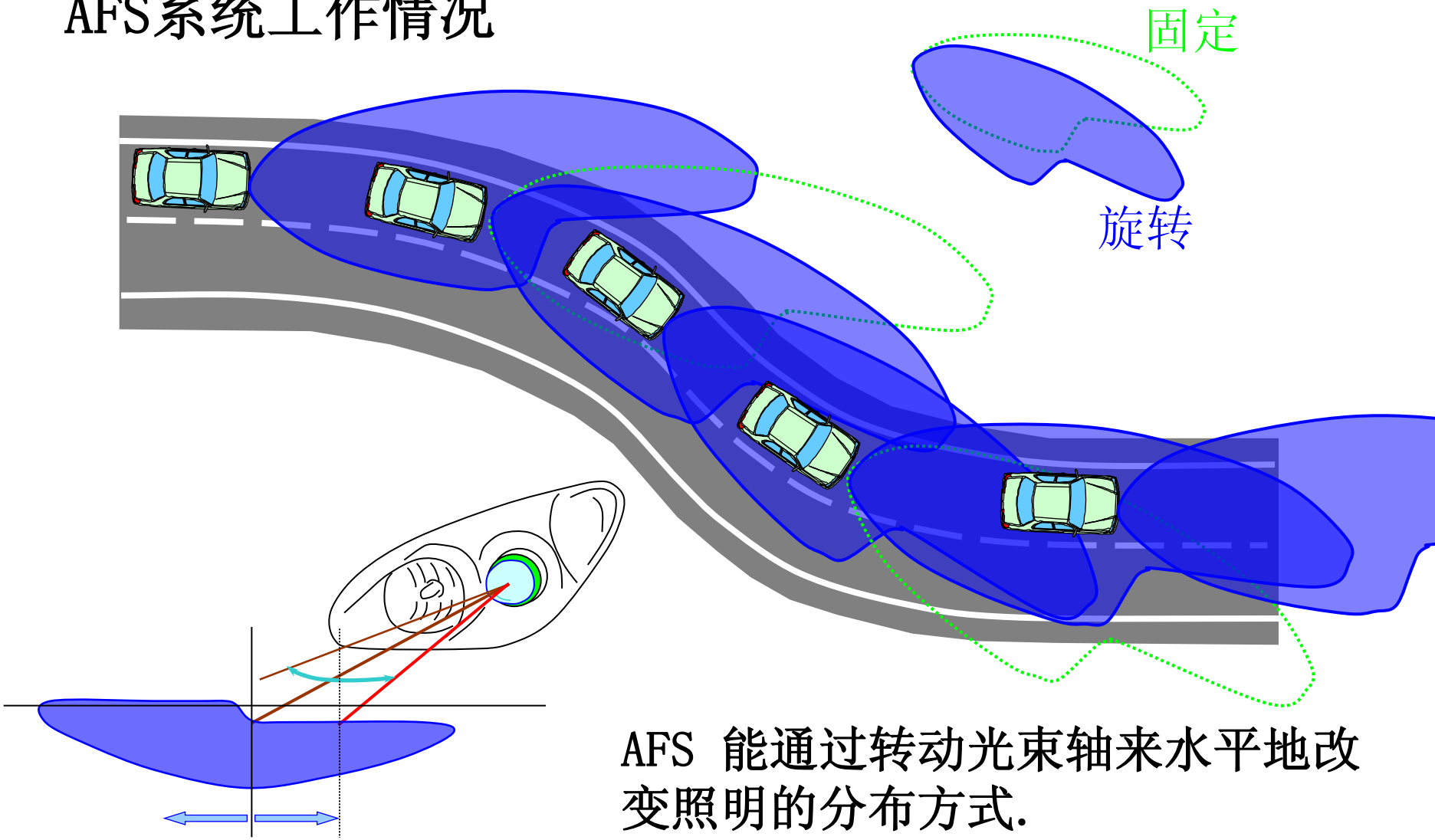
4. 型式认证试验计划案例

ECE R10-03
合格/不合格判定准则及试验条件

AFS (自适应前照灯系统)案例
AFS 具有调整前照灯轴线与转向装置保持一致的功能，以改善夜间行车视野。

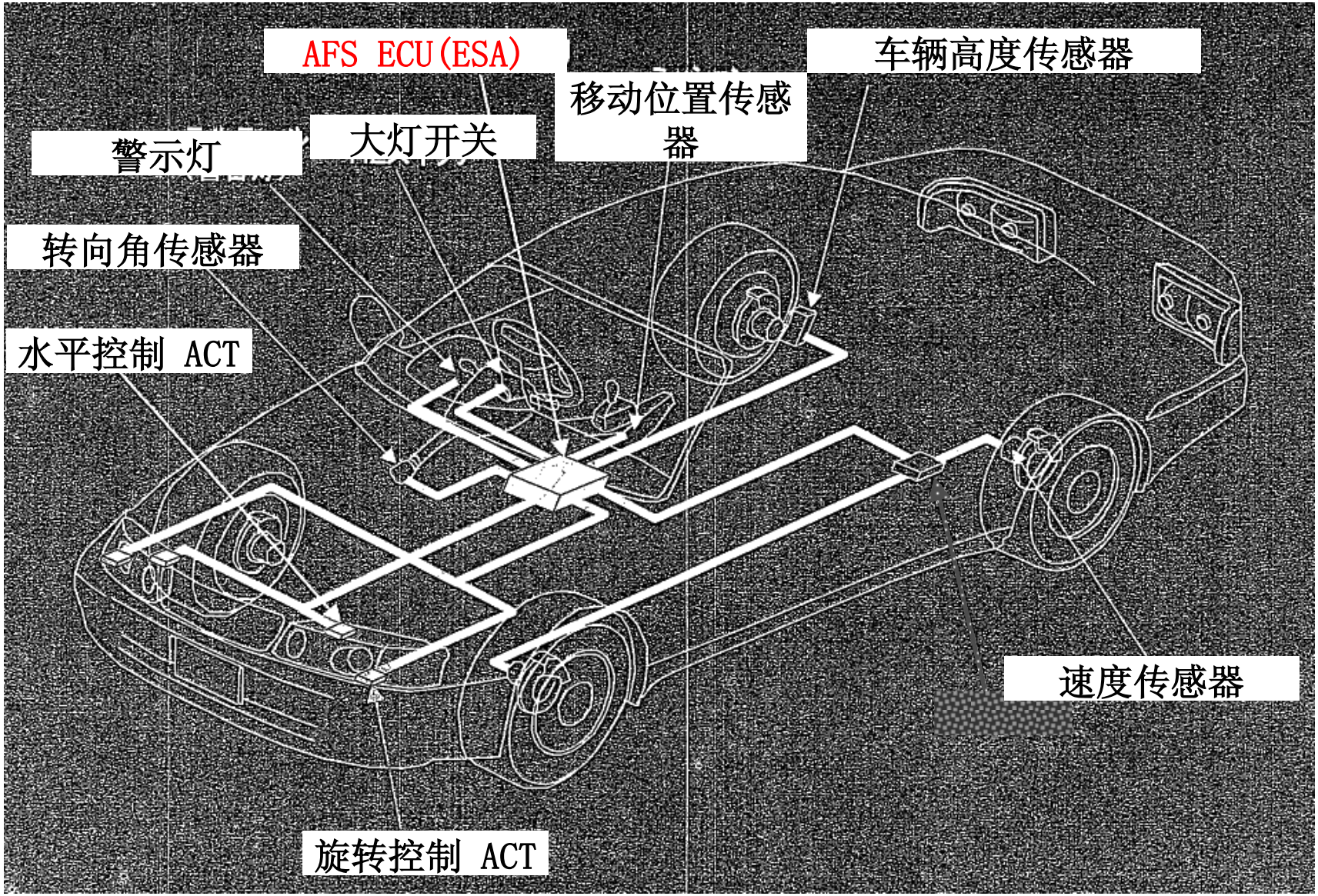
注：仅仅作为案例，不同于真实系统和试验条件.

AFS系统工作情况



AFS 能通过转动光束轴来水平地改变照明的分布方式.

系统配置示例



注：仅为示例，与实际系统不同.

试验计划及判定准则

适用的ESA	仅适用于AFS ECU. 其他传感器不适用。

	试验项目	原因
适用的试验和原因	N/A: 宽带辐射发射	无噪声源
	窄带辐射发射	高于9kHz的晶振
	辐射抗扰性	影响驾驶
	传导抗扰性	所有ESA
	N/A :传导发射	没有开关负载且/或感性负载
判定准则	窄带辐射发射	附件 8
	辐射抗扰性	•试验中无降级现象 •对数据总线通信无影响
	传导抗扰性	•试验中无降级现象 •对数据总线通信无影响

注：仅为示例，与实际系统不同.

.

1. 合格/不合格判定准则

(1) PC的液晶屏上警告灯不亮.

警告灯在以下条件发亮:

-到ESA激励器的信号通信出错.

-警告灯亮灯信号通信出错.

-CAN通信信号出错.

(2) 监控执行器的数值无变化（允差+/-5步进）

该数值在ESA 执行器被激活时变化。

•试验中无降级现象
•对数据总线通信无影响

•试验中无降级现象

2. ESA 运行条件和测试项目

模式	详细说明	适用测试项目
怠速	IG: ON 发动机转速:怠速 车速:0 km/h 纵向的水平倾斜角=0 度 转向角:0 度	窄带辐射发射
50 km/h	IG: ON 车速:50km/h 纵向的水平倾斜角=0 degree 转向角:0 degree	辐射和传导抗扰性

注：仅为示例，与实际系统不同.

.

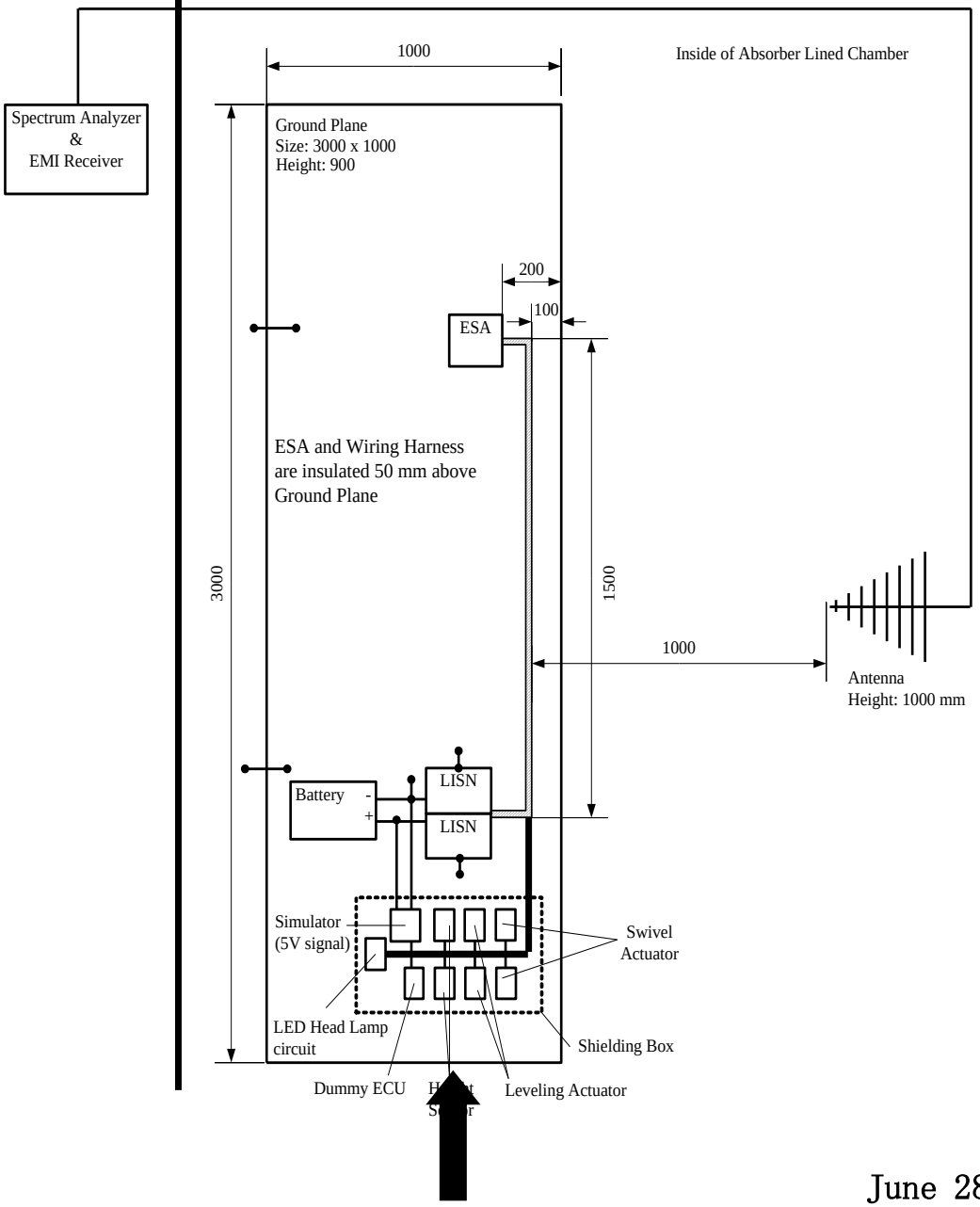
3. 试验条件

(1) 窄带辐射发射

试验条件 参数与合格/不合格判定准则（限值）	备注
频率范围：30MHz-1000MHz 测量频率：13 points * 30-50, 50-75, 75-100, 100-130, 130-165, 165-200, 200-250, 250-320, 320-400, 400-520, 520-660, 660-820, 820-1000MHz 限值： 30MHz - 75MHz：62-52dBuV/m, 75MHz - 400MHz：52-63dBuV/m, 400MHz - 1000MHz：63dBuV/m	*:制造商应提供试验室测得的整个频段数据，该试验室应得到ISO 17025适用部分的认可以及认证权威部门的认可. （附件 8，见4.3）

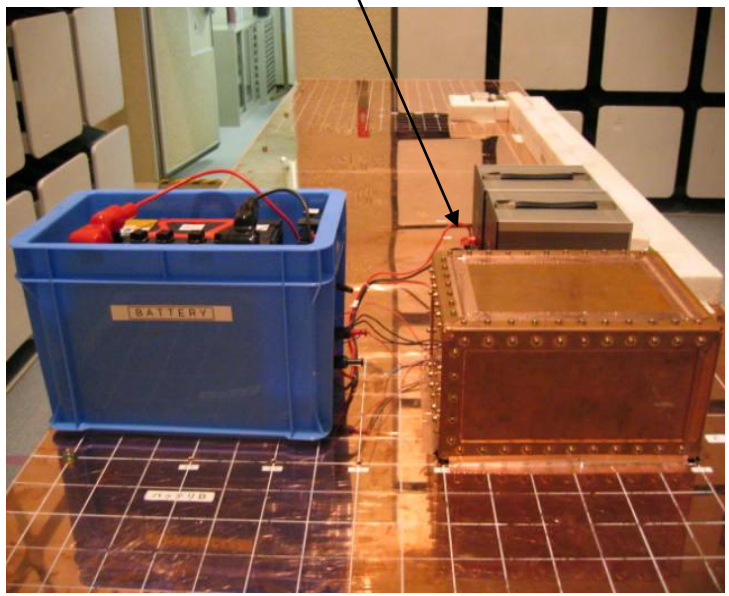
注：仅为示例，与实际系统不同.

窄带辐射发射的试验布置



注：仅为示例，与实际系统不同.

导电壳体以避免不期望噪声。



(2) 辐射抗扰性

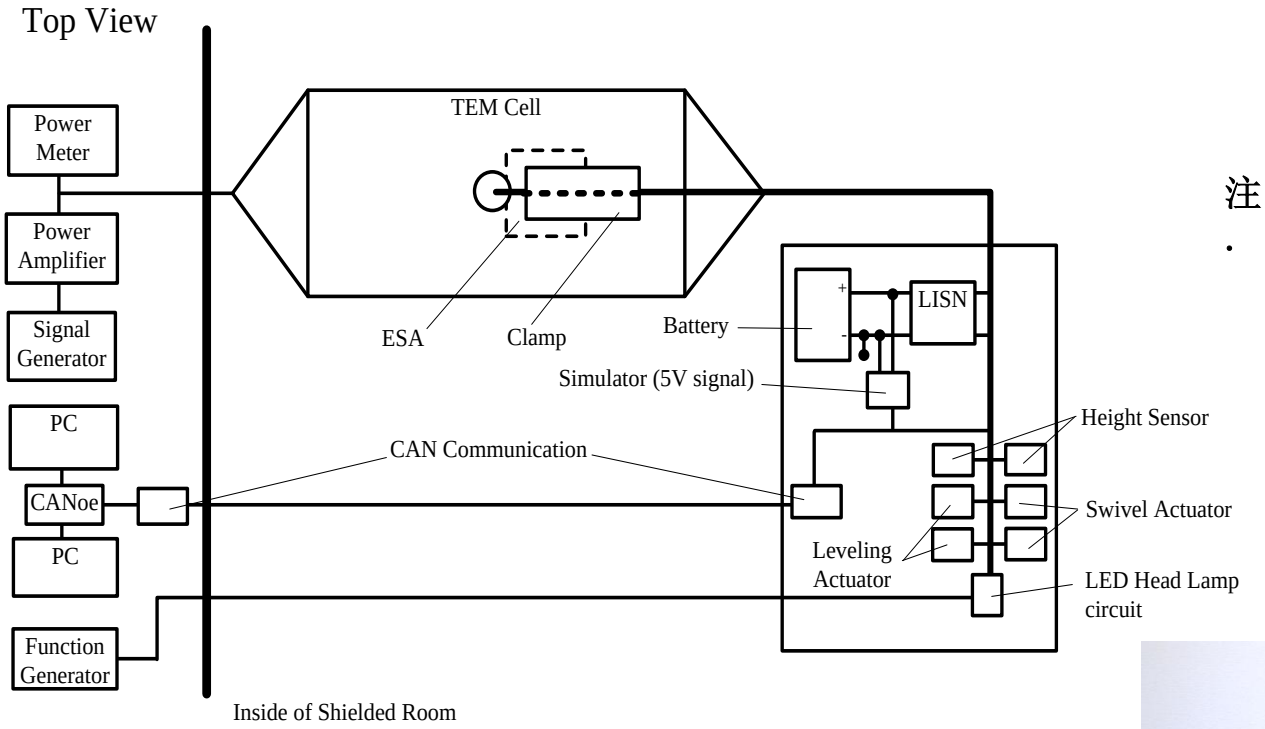
试验条件		合格/不合格判定准则	备注
试验项目	参数		
TEM小室	频率范围: 20MHz - 200MHz 限值: 75V/m, 调制: AM 测试频点: 7 点 27, 45, 65, 90, 120, 150, 190MHz 驻留时间: 大于 2s	(1), (2)	参见（1）窄带辐射发射的备注（附件 9, 见3.2)

*:功能状态的测量基于合格/不合格判定准则 (1) 和 (2).

试验条件		合格/不合格判定准则	备注
试验项目	参数		
自由场	频率范围& 调制: 200MHz - 800MHz: AM 800MHz - 2GHz: 脉冲 天线 位置: 200Hz - 1GHz:正对线束中心 1GHz - 2GHz:正对 DUT 限值：30V/m, 测试频点: 9 点 230, 280, 380, 450, 600, 750, 900, 1300,1800MHz 驻留时间: 大于 2s	(1), (2)	参见（1）窄带辐射发射的备注（附件 9, 见3.2)

注：仅为示例，与实际系统不同.

在屏蔽室的TEM小室抗扰度试验布置



注：仅为示例，与实际系统不同.

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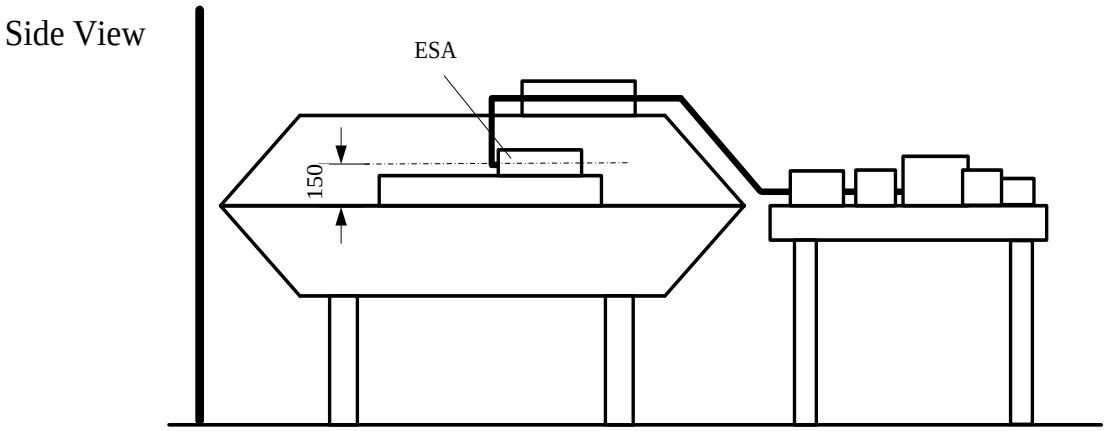
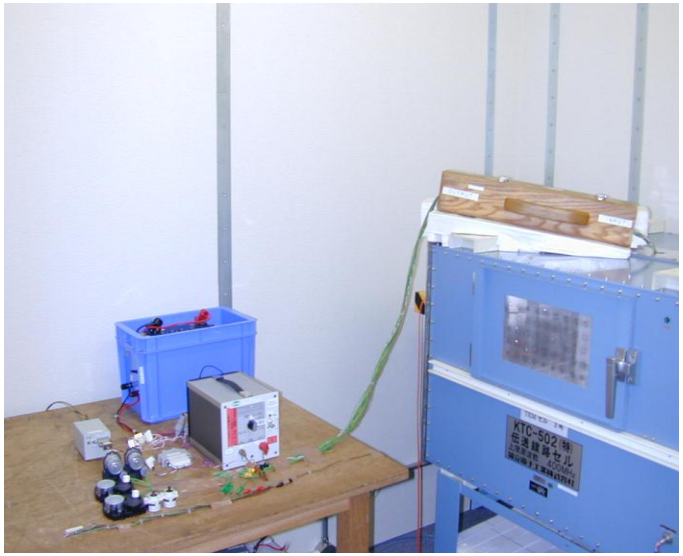
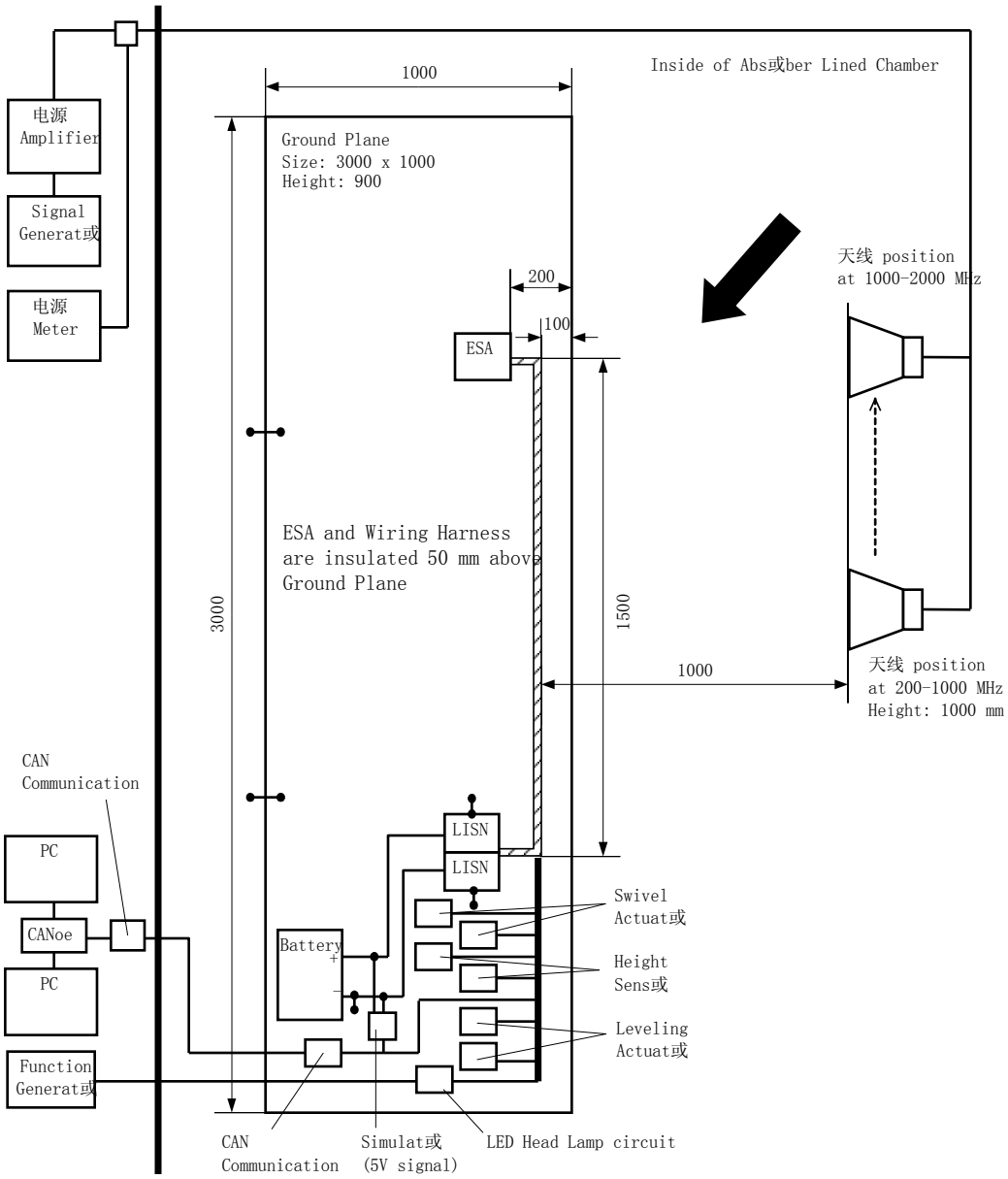
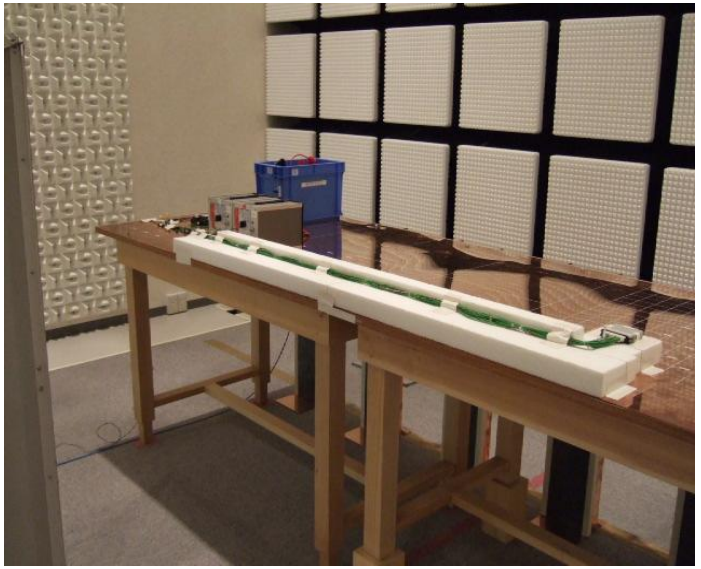




辐射抗扰度的试验布置



注：仅为示例，与实际系统不同.



(3) 传导抗扰度(1/2)

	试验条件	功能状态 (*) (合格/不合格 判定准则)
脉冲	参数 ( ):标准设定值	
脉冲 1 (等级 III)	Us=-100(-75)V, Ri=10ohms, td=2ms, tr<1us+0/-0.5us t1=0.5 ~ 5s->0.5s, t2=200ms, t3<100us 脉冲个数=5000个 脉冲	C
脉冲 2a (等级 III)	Us=50(37)V, Ri=2ohms, td=0.05s, tr=10us+0/-0.5us, t1=0.2s ～ 5s -> 0.2s, 脉冲个数=5000个 脉冲	B
脉冲 2b (等级 III)	Us=10V, Ri= 0 ～ 0.05ohms → 0 ohms, td=0.2s ～ 2s -> 0.2s, t12=1 ms+/-0.5ms, tr =1ms+/-0.5ms, t6=1ms+/-0.5ms, 脉冲个数=10个 脉冲	C

*:功能状态的测量基于合格/不合格判定准则 (1) 和 (2).

注：仅为示例，与实际系统不同.

(3) 传导抗扰度(2/2)

	试验条件	功能状态 (*) (合格/不合格 判定准则)
脉冲	参数 ( ):标准设定值	
脉冲 3a (等级 III)	Us=-150(-112)V, Ri=50ohms, td=0.1 +0.1/-0us, tr<5ns+/-1.5ns t1=100us, t4=10ms, t5<90ms 试验时间=1小时	A
脉冲 3b (等级 III)	Us=100(75)V, Ri=50ohms, td=0.1us+0.1/+0, tr<5ns+/-1.5ns t1=100us, t4=10ms, t5<90ms 试验时间=1小时	A
脉冲 4 (等级 III)	Ub=12V, Us=-7(-6)V, Ua=-2.5 ~ -6V [|Va|≤|Vs|]->-6V Ri=0-0.02ohms, t7=15 ~ 40ms->40ms t8≤50ms, t10<5ms, t9=0.5 ~ 20s->20s t11=5 ~ 100ms→100ms, 脉冲个数=1个脉冲	C

*: 功能状态的测量基于合格/不合格判定准则 (1) 和 (2).

注：仅为示例，与实际系统不同.

ECE R10-03概要
-电子电器组件-

✓ECE R10-03 是一个在1958协议下的全球性的法规，
包括RE, RI, CE and CI. (CE & CI 仅针对 ESA)

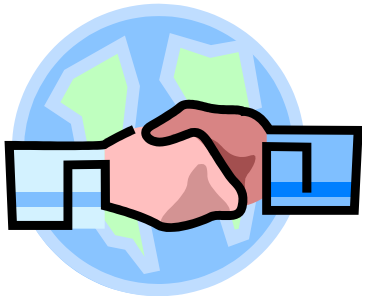
✓只有指定的ESA适用.

✓ESA型式根据ESA是否在本质上具有相同功能来定义.

✓基本上ESA是作为安装于整车的零部件进行型式认证的.
建议合理运用型式认证试验.

✓试验之前制定试验计划非常重要。

谢谢.



Minutes of the 26th Asia Expert Meeting in China

1. Date: Wednesday, 28 June 2011, 9:00-17:00

2. Place: Rosedale Hotel & Suites Beijing, Beijing

3. Organizer: China Automotive Technology & Research Center (CATARC)

Attendees from China: About 130 in total, including Mr. Halley Hou (CATARC), Mr. Jia Yi (Japanese-Chinese interpreter, Toyota Motor Technical Center China), Mr. Feng Qin (Japanese-Chinese interpreter, Denso China Investment), Dr. Gernot Steinmair (BMW group), and Mr. Liu Xinliang (VW Shanghai).

4. Attendees from JASIC: Four people, comprised of Mr. Akihiko Nojima (Toyota), presenter of R10 (legal requirements, test methods, approval methods), Mr. Kazuo Sakakibara (Denso), presenter of R10 (legal requirements, test methods for parts), Mr. Ushio Ueno (speech, JASIC), and Mr. Yoshiaki Nanbu (Secretariat).

5. Outline of Meeting

Representing the organizer, Mr. Hou, Deputy Director of CATARAC gave an opening address. Mr. Ueno, Director of Research Division, JASIC, delivered a keynote speech. Presentations on electromagnetic compatibility of vehicle, system, and parts (R10) by JASIC, CATARC, inspection bodies, and local industries and Q&A sessions followed, answering questions of Chinese attendees. Active discussion was held in a friendly atmosphere. Simultaneous translation between Chinese and English helped the meeting go on smoothly despite the volume of speeches, presentations, and discussion.

Presentation by JASIC

1. R10 (EMC: Electromagnetic Compatibility) for Vehicle – Presentation by Mr. Nojima from Toyota

After presenting the outline of the regulation, Mr. Nojima explained the details of technical requirements, test requirements, and vehicle certification, including the difference between the former and new versions. The attendees deepened their

understanding on the details of certification of vehicle under the EMC regulation to be reflected in future. The presentation was followed by a Q&A session and lively exchange of views.

・Major Q&A (including those in the pre-meeting with CATARC of the previous day) were as follows:

Q1: Is the requirement of 30V/m in page 10 mandatory?
A1: Basically, yes. But it is 24V/m, lighter by 20% at a random sampling of COP.

Q2: For the polarization test in page 10, the requirement is vertical polarization only?
A2: Yes. The vertical polarization is the severest evaluation and the results are stable.

Q3: What do “AM” and “PM” mean?
A3: They mean amplitude modulation and pulse modulation, respectively.

Q4: In page 11, if both the ABS and audio system have microcomputers, should we test both of them?
A4: That’s right. If there’re ABS and engine control, it will be as follows:

	ABS (Computer +Actuator)	EFI+Fan control, Ignition, Cooling fan, Fuel control
NB	✔	✔
Immunity	✔	✔
BB	-	✔

Q5: Can I understand that, except for those listed in this handout, we don’t need to do any immunity test?
A5: That’s right. It’s not necessary for R10-03. There’s no damage to safety. Although CAN does the test, it’s not necessary if there’s not this interface.

Q6: Why are audio parts exported to Europe subject to the immunity test?
A6: If there aren’t any problems with safety, they don’t need to have any immunity test.

Q7: To get an E mark for a radio, we don’t have to do the immunity test, right?
A7: It's written “don’t disturb driver’s safety". So the influence on the acoustics is

outside the scope of R10. However, initially, UK was of a different opinion and parts exported to UK were treated differently, but the certification bodies outside UK all treated such parts as outside the scope of R10, and eventually E marks are exempted with audio immunity test. For its part, the EU expressly designates malfunctioning alarms as factors that disturb the driver's safety.

Q8: To get an E mark, do we have to pass the test of a certification body?
A8: That's right.

Q9: Why do the power supply cables snake their way?
A9: Because resistance changes less and is more stable that way. That's how they are often used in IEC and other standards. Be careful, because they'll coil up if you try to wind them up. Only, what you see in the photos are AC cables. For DC, it hasn't been decided yet. For DC charge, the major source of noise is on the infrastructure charger side. The vehicle side is simply a battery and doesn't give any emission.

Q10: The purpose of the immunity regulation is the safety of the vehicle itself. Why should we test it also in charging conditions?
A10: You're right. So, the only criterion is whether or not the vehicle doesn't start moving. Only, the regulation is under examination right now, and they'll add the requirement of not overcharging.

Q11: Are there any existing standards on outer charge?
A11: Yes. There are some in IEC. But the draft is still under discussion.

Q12: In page 29, what does "80 percent" mean?
A12: A power supply system has a current monitor. If you see it, you'll know the operating current. Generally, the largest volume of current flows when you start charging the battery. When it's fully charged, the current goes down. That's how the current generally behaves and what you see in page 29 shows that. In other words, that's about the same meaning as saying "You can test it, if the battery's not fully charged."

Q13: How should power lines be designed?
A13: You need to take measures against power surge and conductive noise. To prevent conductive noise, you need to use so-called LC filters and π side filters. Against power

surge, especially for the lightening surge test, you need to add voltage clamp elements such as varistor. But there's nothing special about it, they are what you usually do for any home electric appliance.

Q14: What's actually pulse modulation like?
A14: It's specified in ISO 11451/2. On and off is indicated by the presence or absence of continuous waves.

Q15: Are the limits on emissions from electric vehicles imposed by the related standards (GP14023 and CISPR12) the same as those on conventional vehicles?
A15: Yes, given the purpose of GP14023 and CISPR12, there's no difference in limit values. The same values should be applied.

2. R10 (EMC: Electromagnetic Compatibility) for Parts – Presentation by Mr. Sakakibara from Denso

After presenting the outline of the regulation, Mr. Sakakibara explained the details of parts certification, technical requirements, and test requirements. He explained certification test programs taking example of AFS. The presentation and discussion that followed deepened the understanding of the attendees on the details of certification of parts and systems under the EMC regulation to be reflected in future.

・Major Q&A (including those in the pre-meeting with CATARC of the previous day) were as follows:

Q1: Are switches subject to the regulation?
A1: No, if they're mechanical ones without their own power supply, because they don't make continuous noise, although there might be some momentary noise. If they're electronic, for example of display type, yes, they are subject to the regulation.

Q2: In page 29, why is the power supply connected to the simulator and actuator sides?
A2: It's to match the system configuration in the test to that of the actual vehicle.

Q3: Are the motors of AFS actuators out of the scope?
A3: Yes, for this lecture, they are out of scope.

Q4: Why?
A4: The applicants target only this. If you want to get the certification of your country, you need to make clear how far you cover. You can get certification also for systems.

Q5: How's the scope of application determined?
A5: The automaker determines the parts concerned (scope) and tells that to the parts manufacturers. There have to be rules.

Q6: How do you know which test item you have to do and which test item you don't as immunity test? There must be easy ones and difficult ones, aren't there?
A6: There are a lot of test items, but the regulations make no limitation. You can choose anything you like.

Q7: Actually, we're arguing about which ones we should choose.
A7: If you pass one test, that's OK. The regulation doesn't say "you have to do more than one test" anywhere. There are a variety of parts and systems. You can't say with absolute certainty you should choose something.

Q8: Can I understand that I don't need to test my part in all of the three directions X, Y, and Z?
A8: That's right. The regulation doesn't give any specification. One direction's enough.

Q9: I think we need more than 30V/m of electric field intensity for the free field test for immunity. Don't you think so?
A9: This is a global regulation, so, if you think it should be revised, you can show your data and propose a discussion at WP.29.

Q10: How's calibration done in the tests?
A10: Calibration's done periodically. You need to write a test procedure and make the tests well reproducible.

Q11: Why aren't there many measuring frequency points for radiated emission and immunity?
A11: As written in the note, test laboratory is accredited to the applicable parts of ISO 17025 and recognized by the approval authority.


汽车电磁兼容标准法规技术研讨会
Seminar on Automotive Electromagnetic Compatibility Standardization and Regulations
2011年6月28日，北京
June 28th, Beijing