

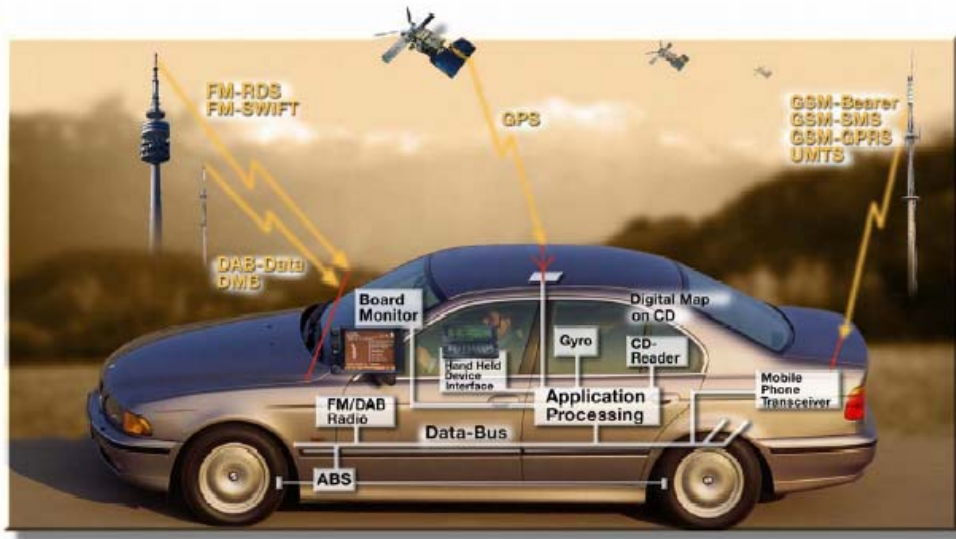


ISO7637

韦R:15919989397
深圳拓科锐科技有限公司

汽车EMC基本概念

- 为什么EMC对汽车如此重要？

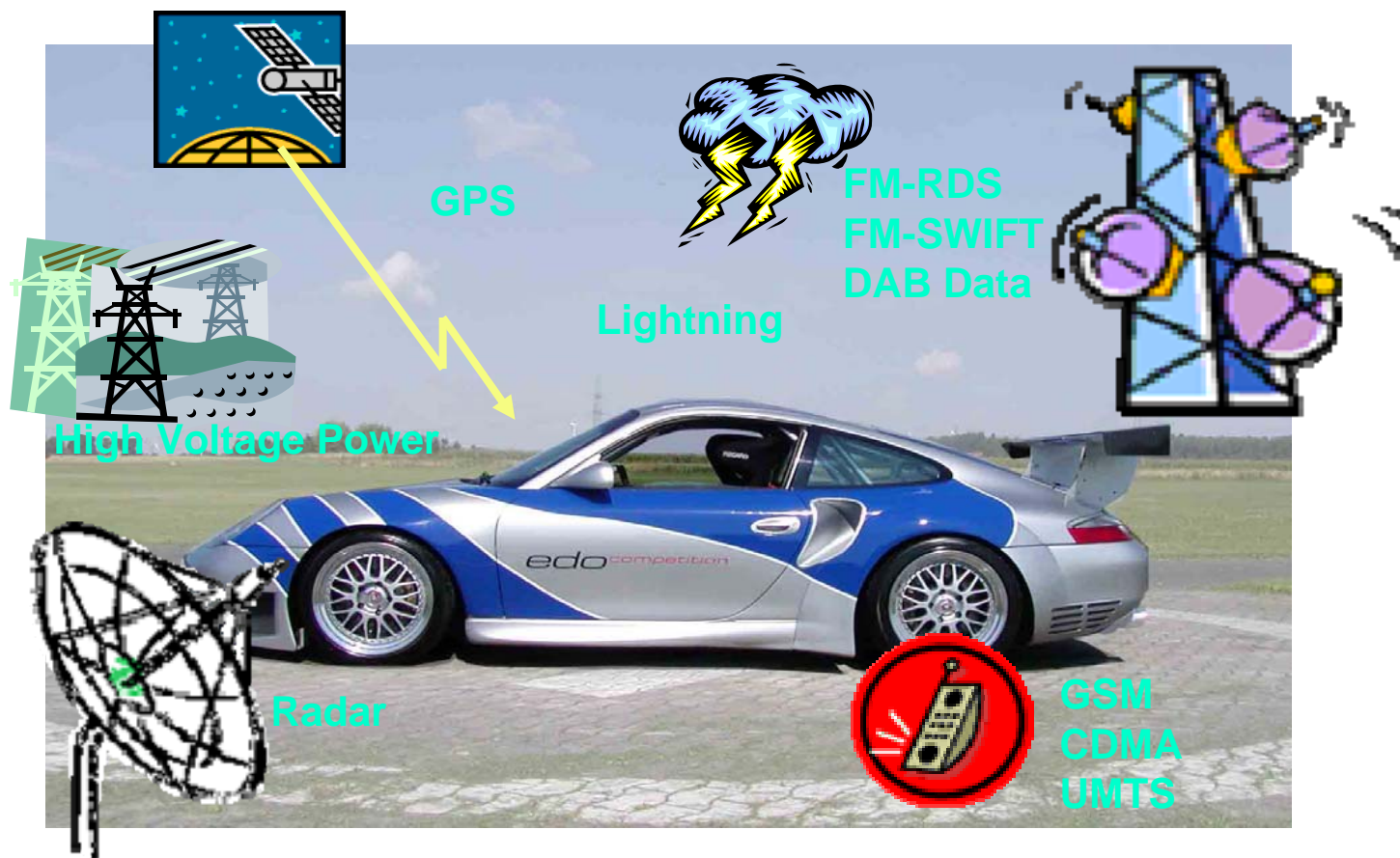


Yes !

- More than 30% of the cost of a car is now in Electronics (BMW)
- 90% of all innovations will be based on electronic systems (Daimler)

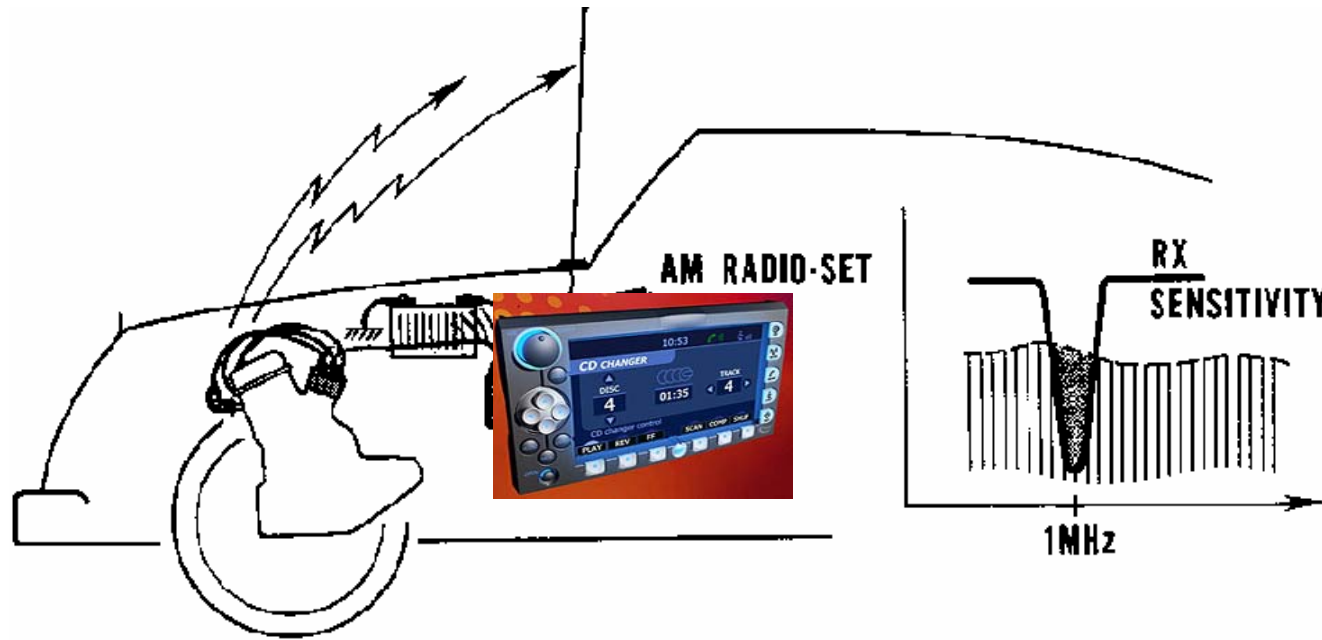
汽车EMC基本概念

- 为什么EMC对汽车如此重要？



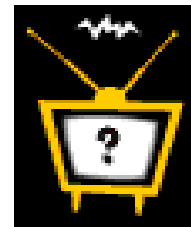
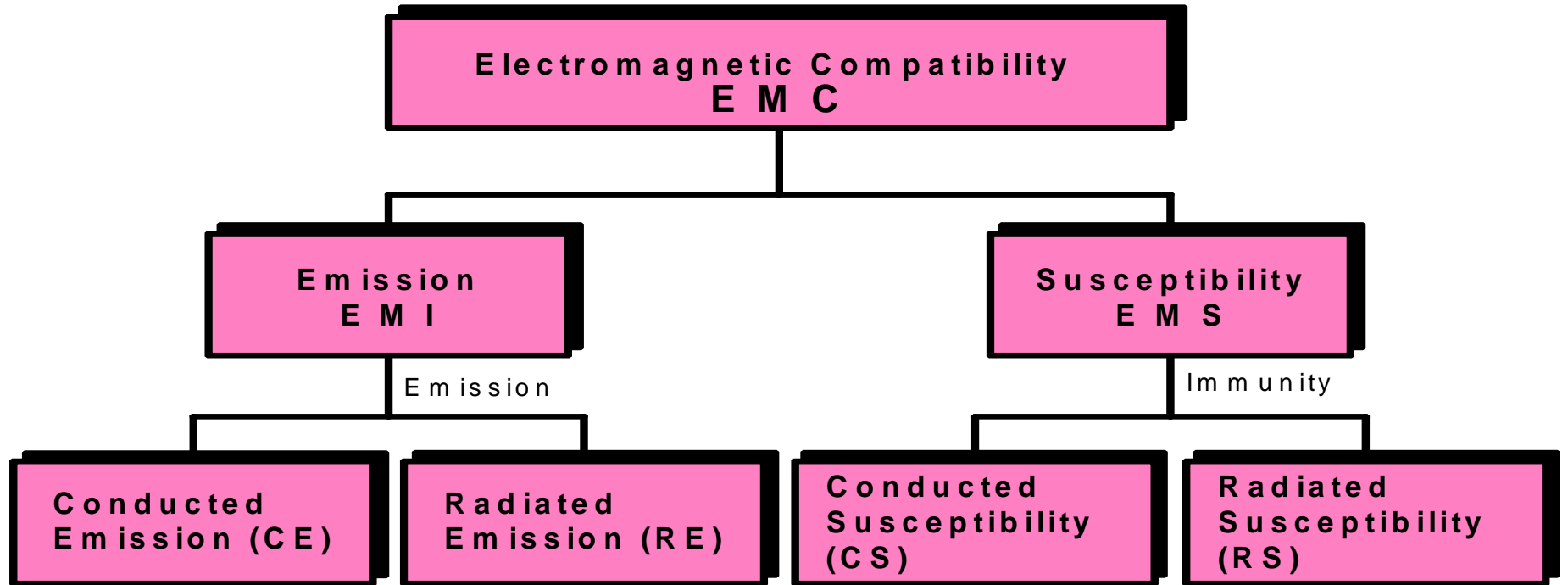
来自汽车外部的干扰

汽车EMC基本概念



汽车内部的干扰

EMC 分类



↑
ISO7637

汽车EMC标准

国际

欧洲

美国

日本

厂家

- ISO11451
- ISO11452
- CISPR12
- CISPR25
- ISO7637
- ISO 10605

2004/104/CE

SAEJ551

SAEJ1113

JASO D001

BMW3097

VW TL

B21 7090



汽车EMC标准概览

	Audi		Mercedes
	Bentley		Nissan
	BMW		Porsche
	Bugatti		PSA
	Chrysler		PSA
	Fiat		Renault
	Ford/ Jaguar		Seat / Skoda
	Ford/ Jaguar		Seat / Skoda
	GM / Opel		Smart
	GM / Opel		Rolls-Royce
	IECO		Volvo
	Lamborghini		VW

ISO7637

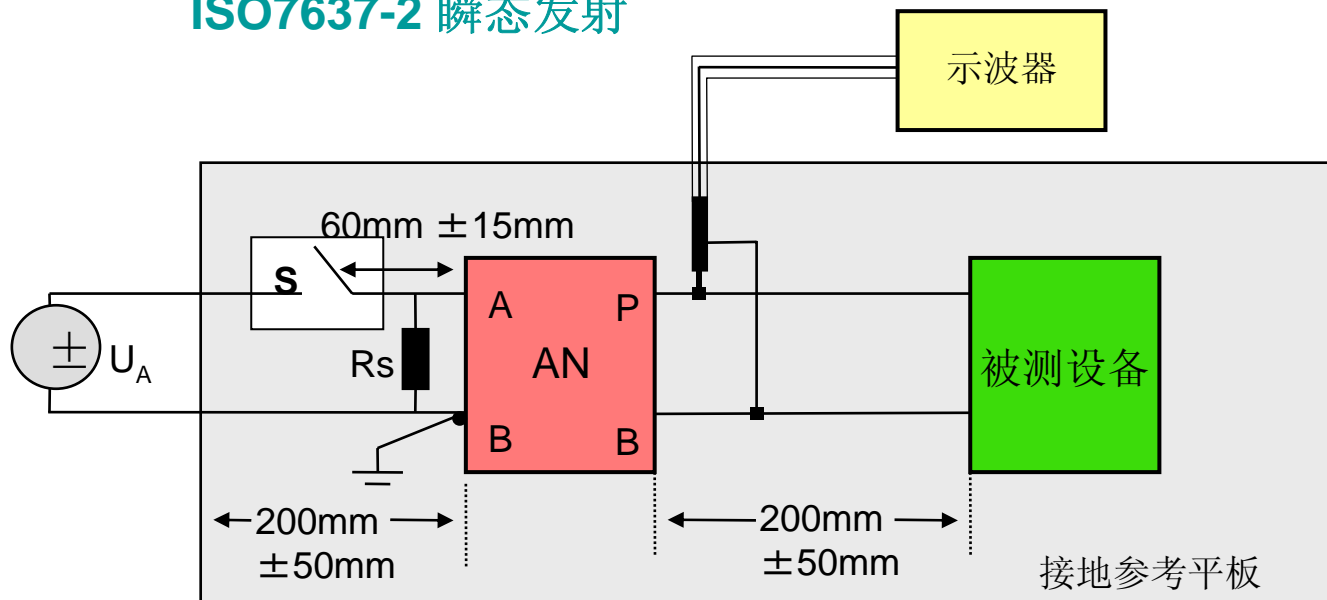
ISO7637-2:Electrical transient conduction along supply lines only

GB21437.2:沿电源线的电瞬态传导

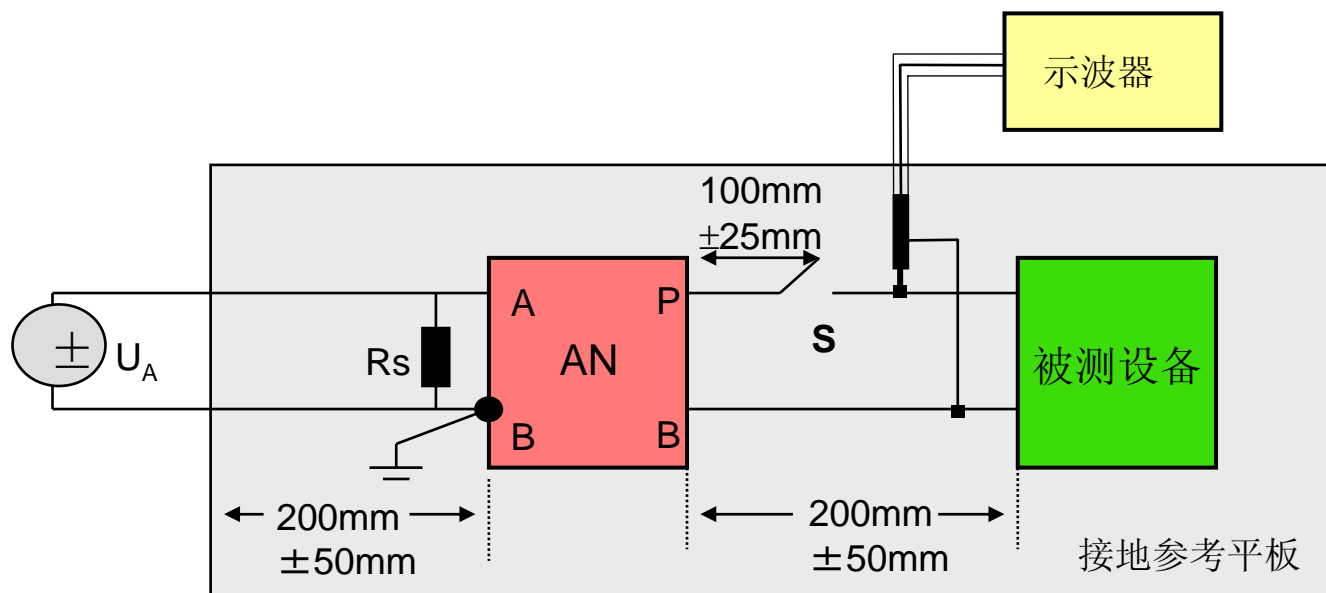
ISO7637-3: Electrical transient transmission by capacitive and conductive coupling via lines other than supply lines

GB21437.3: 除电源线外的导线通过容性和感性耦合的电瞬态发射

ISO7637-2 瞬态发射



- ms- Pulse
- $S \Rightarrow$ 开关
- AN : 人工电源网络

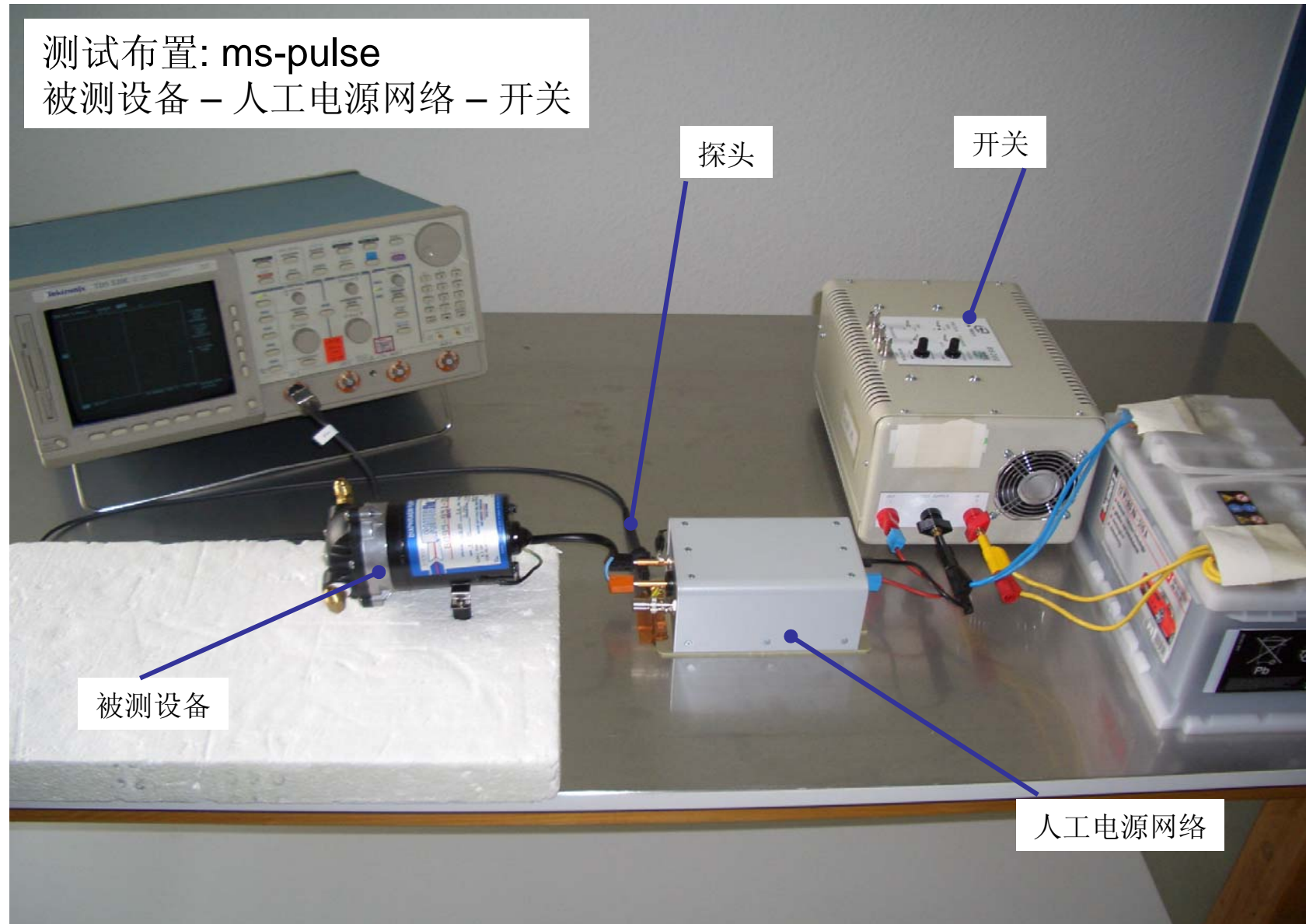


- $\mu\text{s}/\text{ns}$ - Pulse
- $S \Rightarrow$ 开关
- AN : 人工电源网络

ISO7637-2 瞬态发射: ms pulse

测试布置: ms-pulse

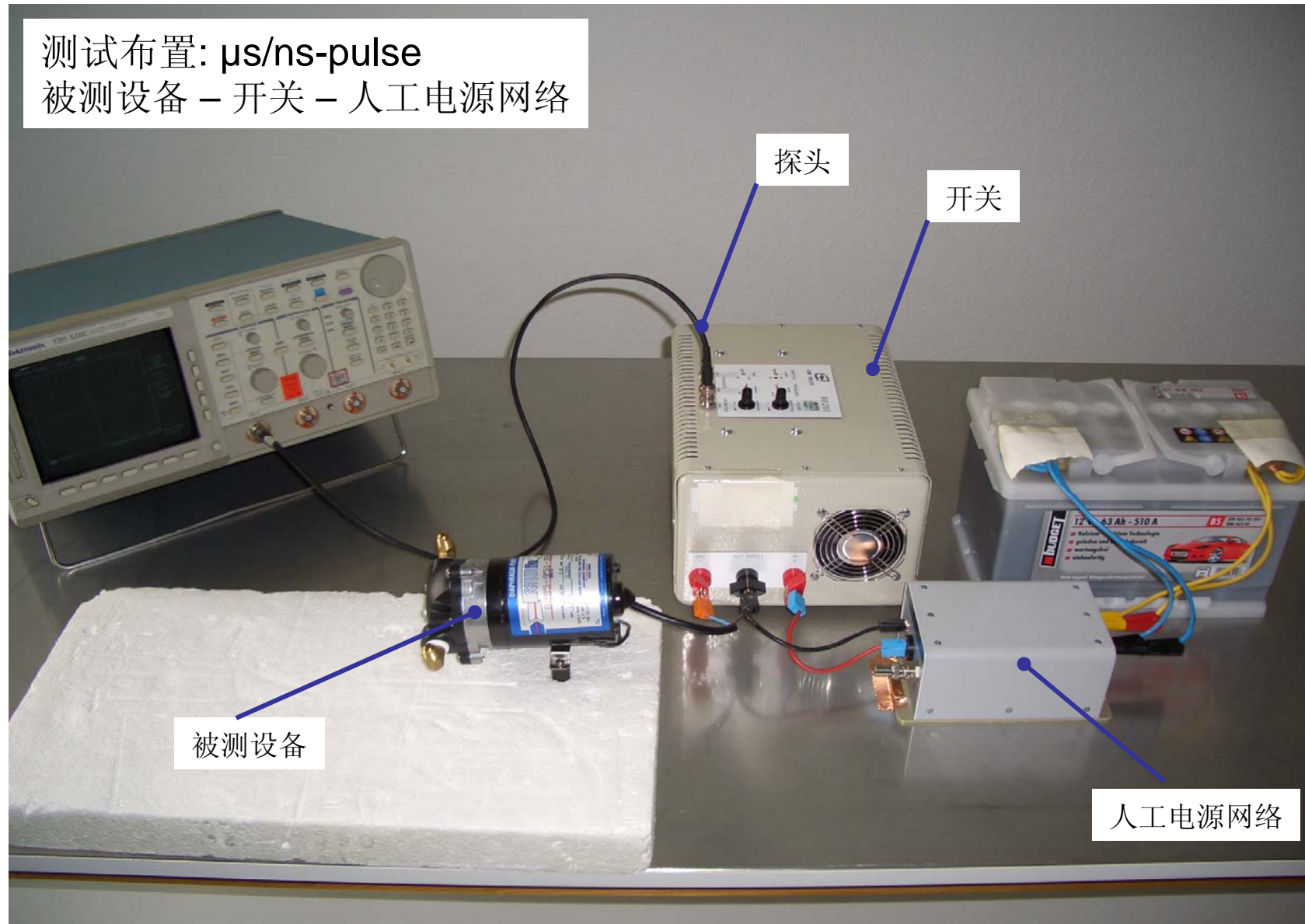
被测设备 - 人工电源网络 - 开关



ISO7637-2 瞬态发射: $\mu\text{s}/\text{ns}$ pulse

测试布置: $\mu\text{s}/\text{ns}$ -pulse

被测设备 - 开关 - 人工电源网络



典型的瞬态脉冲波形

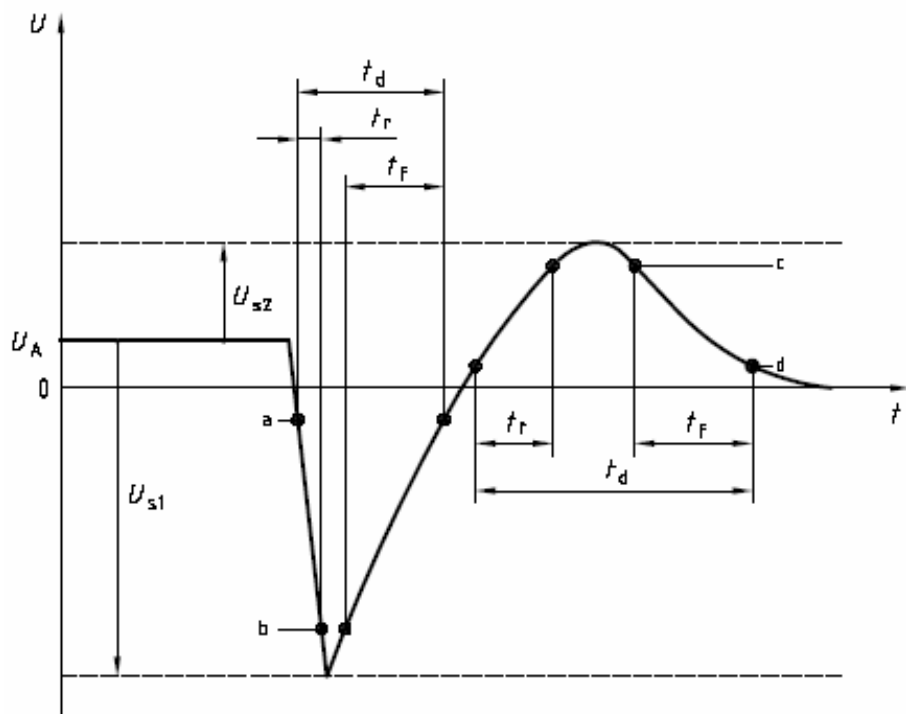


Figure C.1 — Single transient waveform

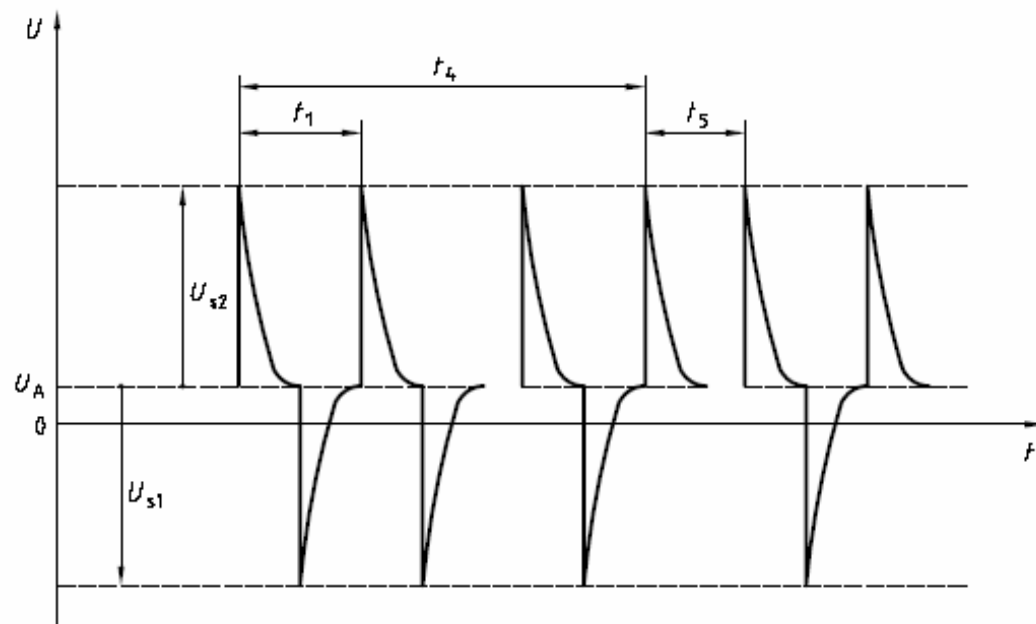


Figure C.2 — Burst transient waveform

瞬态发射的限制值

Table C.2 — 12V设备的限制值

Pulse amplitude (U_S)	Suggested limit for U_S for severity level				
	V ^a	IV	III	II	I
Positive	—	+ 100 V	+ 75 V	+ 50 V	+ 25 V
Negative	—	- 150 V	- 100 V	- 50 V	- 25 V

^a Values to be determined by vehicle manufacturer and equipment supplier.

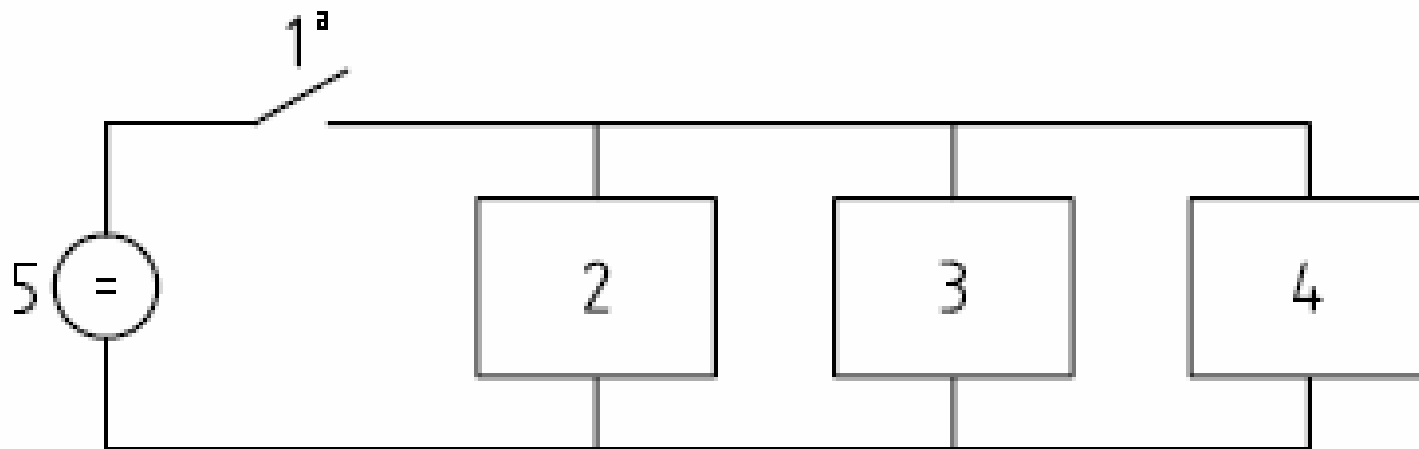
Table C.3 — 24V设备的限制值

Pulse amplitude (U_S)	Suggested limit for U_S for severity level				
	V ^a	IV	III	II	I
Positive	—	+ 200 V	+ 150 V	+ 100 V	+ 50 V
Negative	—	- 600 V	- 450 V	- 300 V	- 150 V

^a Values to be determined by vehicle manufacturer and equipment supplier.

ISO7637-2抗扰度波形介绍

ISO 7637-2:2004 - Pulse 1



1 引擎开关

2 感性负载

3 负载 R_s

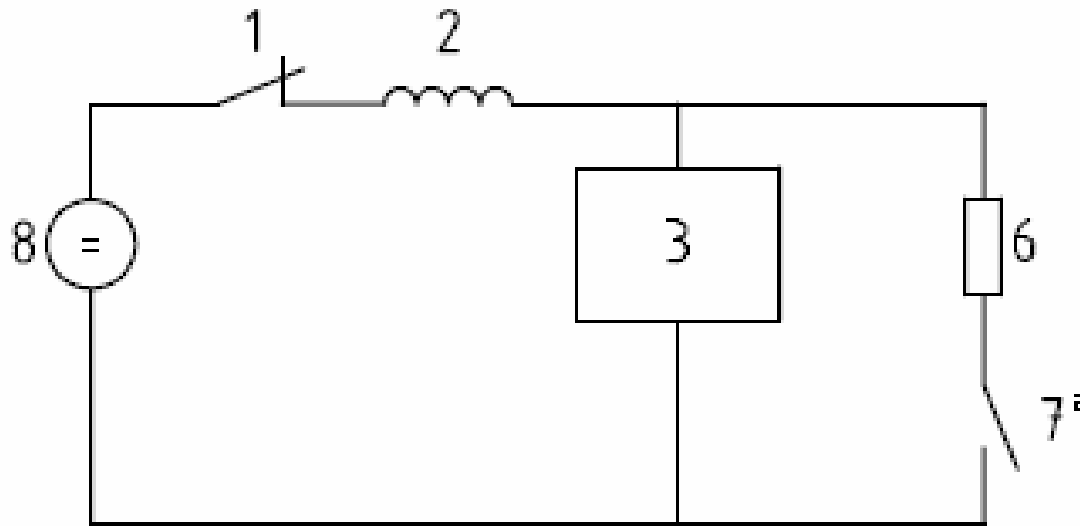
4 被测设备

5 电源

此测试模拟由于电源从感性负载断开产生的干扰；应用于车内与感性负载并联的被测设备。

ISO7637-2抗扰度波形介绍

ISO 7637-2:2004 - Pulse 2a



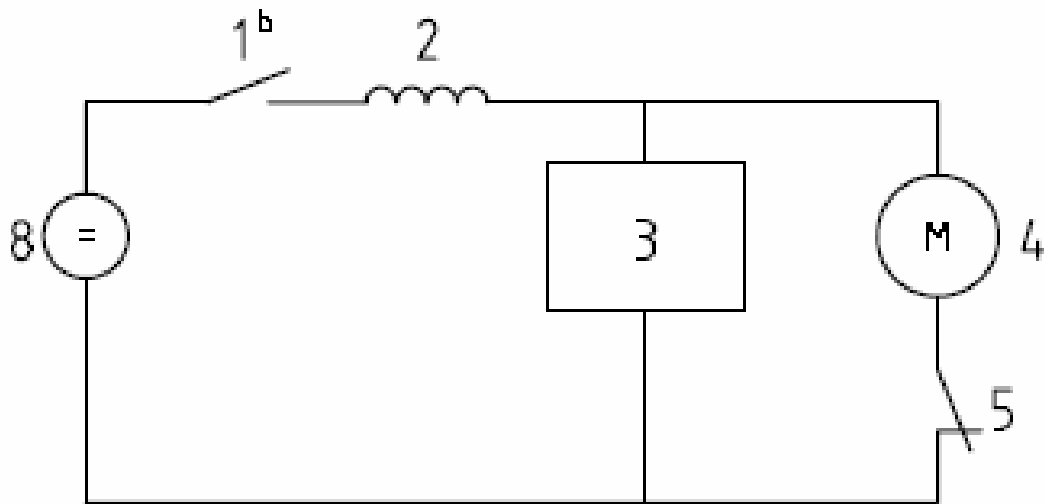
- | | |
|--------|----------|
| 1 引擎开关 | 2 线束(电感) |
| 3 被测设备 | 6 负载 |
| 7 负载开关 | 8 电源 |

当引擎开关（1）处于闭合状态时，负载开关（7）断开就会产生脉冲2a

脉冲2a模拟与被测设备并联的设备突然断电所产生的干扰

ISO7637-2抗扰度波形介绍

ISO 7637-2:2004 - Pulse 2b



1 引擎开关

2 线束(电感)

3 被测设备

4 直流电机

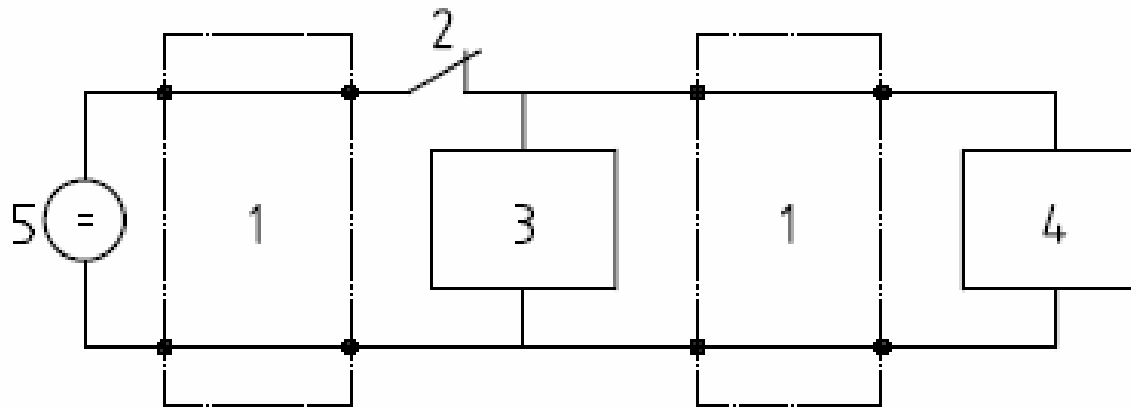
8 电源

当电机运转时，引擎开关（1）突然断开就会产生脉冲2b

Pulse 2b 模拟引擎关闭后直流电机充当发电机而产生的干扰。

ISO7637-2抗扰度波形介绍

ISO 7637-2:2004 - Pulse 3a /3b

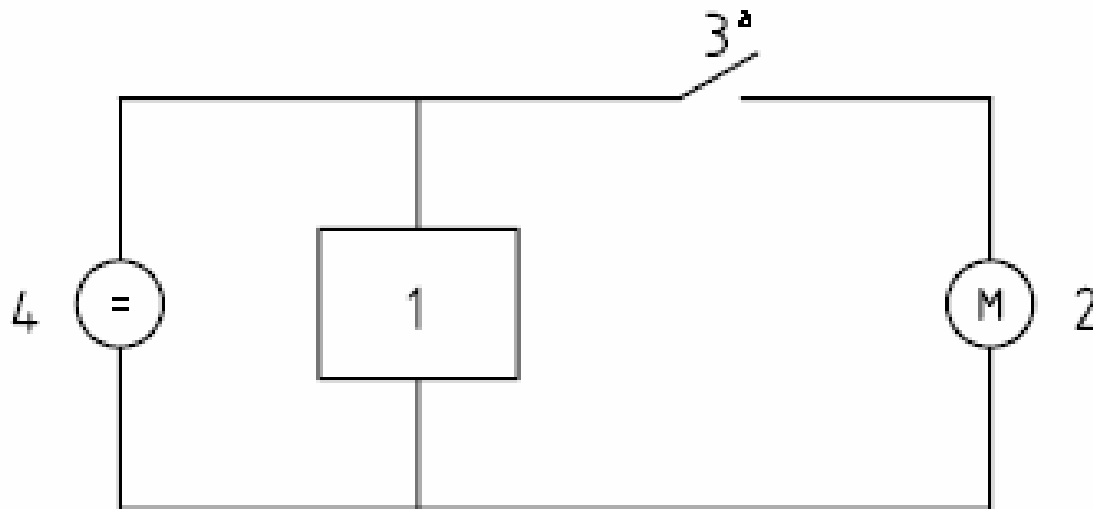


- 1 有分布电感和分布电容的线束
- 2 开关
- 3 被测设备
- 4 感性负载
- 5 电源

脉冲3a/3b模拟机械开关工作时产生的干扰。此干扰受到线束的分布电容和分布电感的影响。

ISO7637-2抗扰度波形介绍

ISO 7637-2:2004 - Puls 4



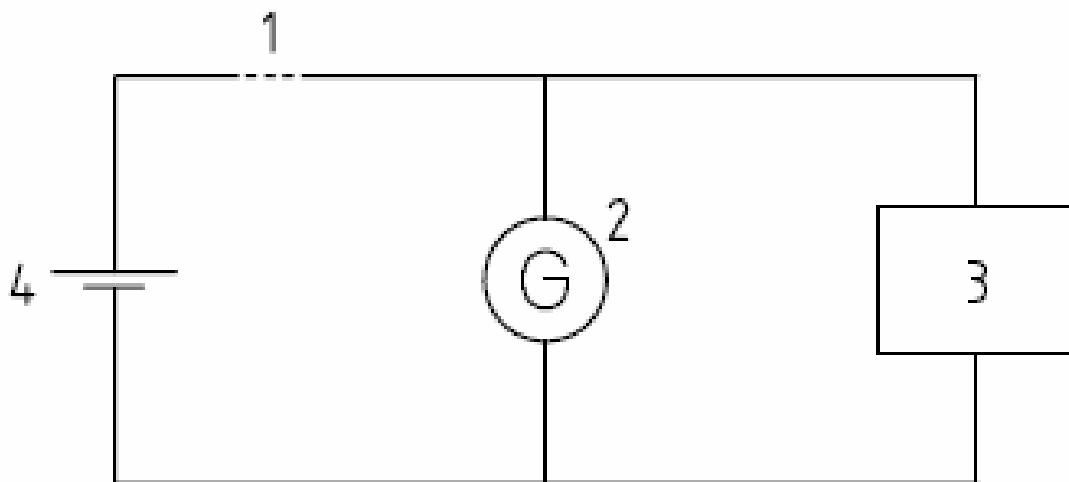
- | | |
|--------|--------|
| 1 被测设备 | 2 启动马达 |
| 3 开关 | 4 电源 |

当启动电机工作时产生脉冲4

脉冲4 模拟由于启动电机工作而引起的电压降低。

ISO7637-2抗扰度波形介绍

ISO 7637-2:2004 - Pulse 5a



1 损坏的连接

2 交流发电机

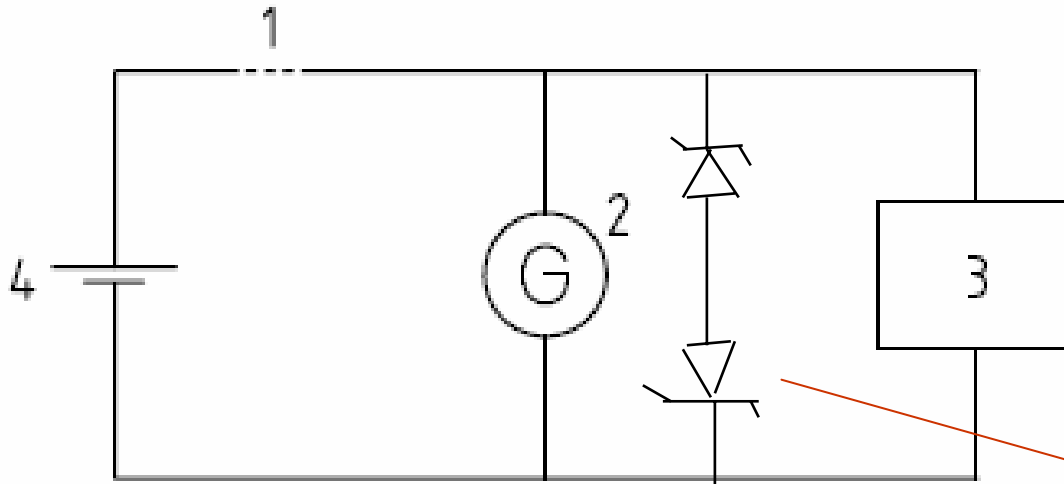
3 被测设备

4 电瓶

脉冲5a模拟交流发电机正在给空的电瓶充电时，电瓶断开产生的干扰。

ISO7637-2抗扰度波形介绍

ISO 7637-2:2004 - Pulse 5b

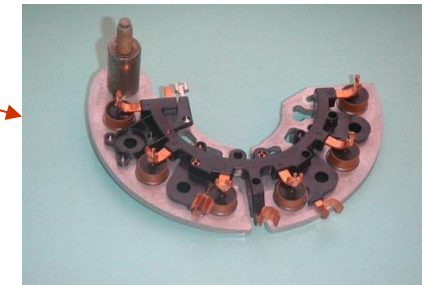


1 损坏的连接

2 交流发电机

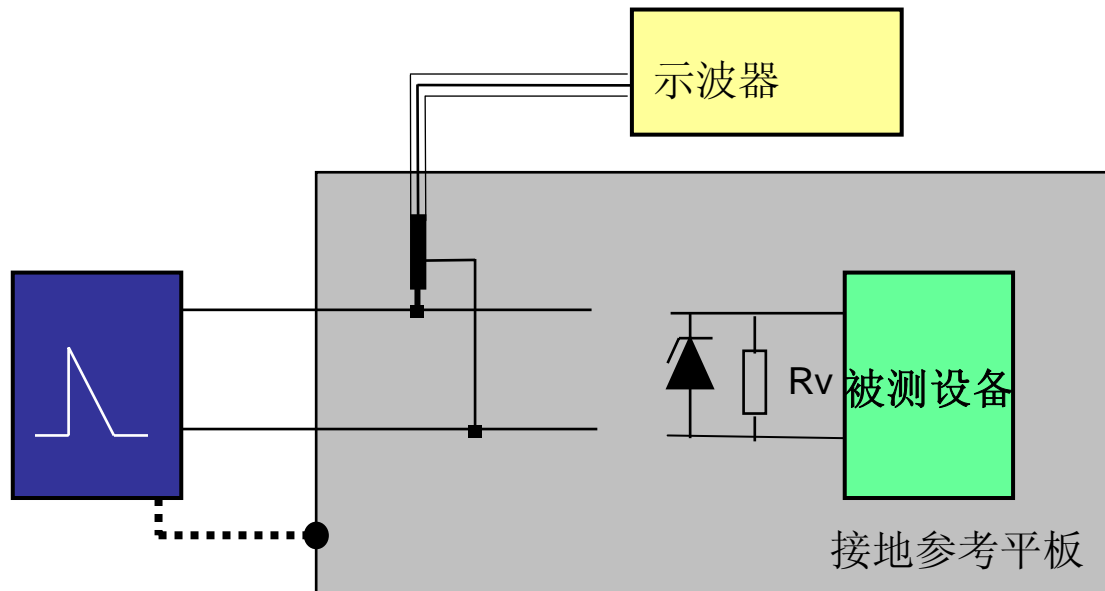
3 被测设备

4 电瓶

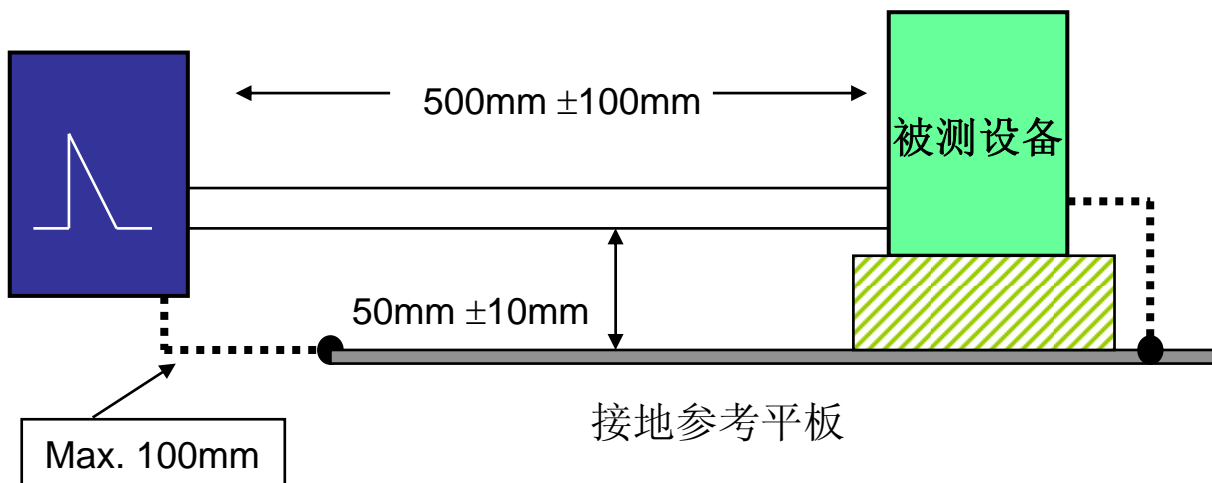


脉冲5b模拟交流发电机正在给空的电瓶充电时，电瓶断开产生的干扰。当车内交流发电机的输出端带有钳位二极管时则产生脉冲5b。

ISO7637-2抗扰度测试布置

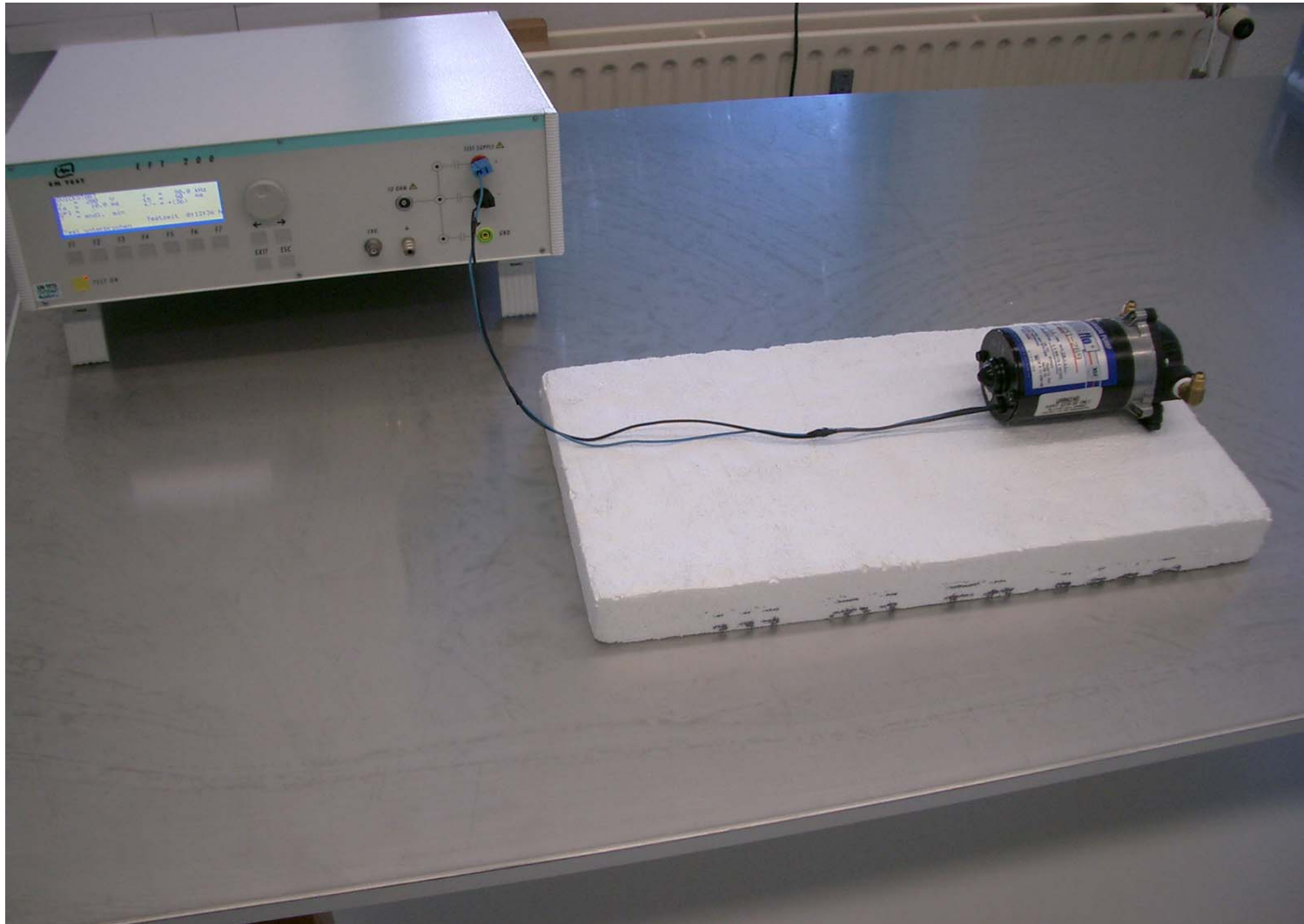


校验:
直接在发生器的输出端进行



测试:
- 测试过程中不连接示波器
- 汽车厂家标准可能会有不同的测试布置要求

ISO7637-2抗扰度测试布置



- 电缆长度 **50cm**
- 被测设备 和线束在接地参考平板 上方**50mm**

ISO 7637-3:2007的变化

主要变化:

1. 新的耦合方式

- Capacitive Coupling Clamp
- Direct Capacitive Coupling
- Inductive Coupling Clamp

CCC

DCC

ICC

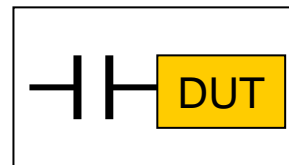
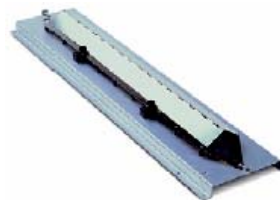
2. 与耦合方式对应的脉冲指标

3. 采用基于ISO7637-2的脉冲发生器进行测试 发生器的校验基于ISO7637-2附录D

耦合方式对应的脉冲

Pulse specification

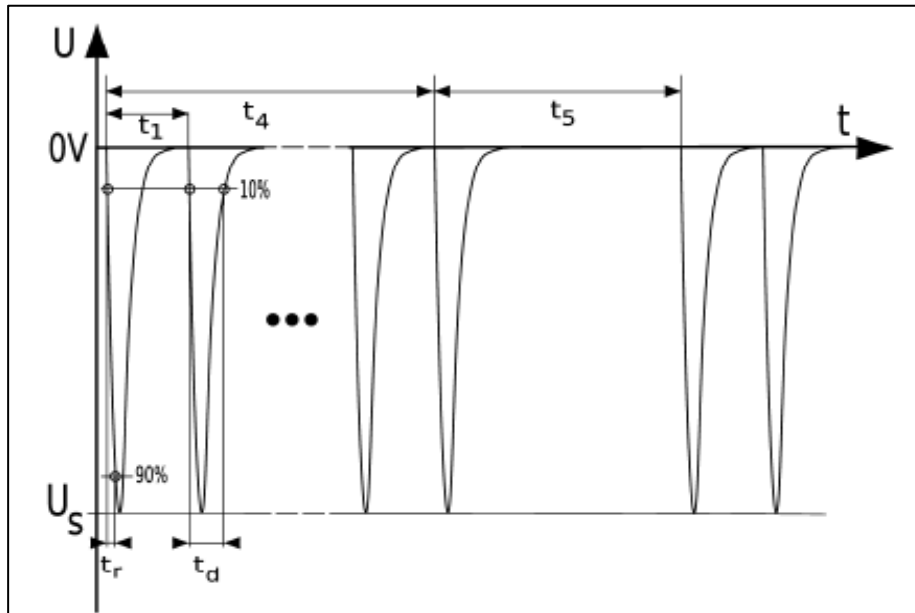
Pulse	CCC	DCC	ICC
Slow (Pulse 2a of ISO 7637-2)	Not applicable	Applicable	Applicable
Fast (Pulse 3a/3b of ISO 7637-2)	Applicable	Applicable	Not applicable



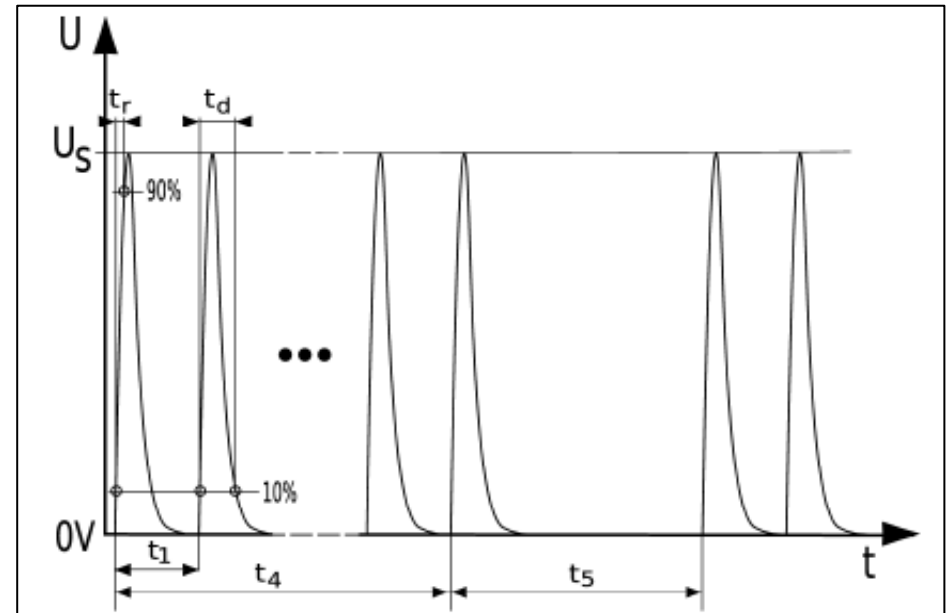
ISO 7637-3:2007 – 快脉冲

- ISO 7637-3:2007快脉冲的定义
- 采用 pulse3a/3b
- fast a 用于(CCC 和 DCC):

fast b 用于 (CCC 和DCC):



Parameters	12 V System	24 V System	42 V System
U_s in V	See table B.1	See table B.2	See table B.3
t_r in ns	5	5	5
t_d in μ s	0,1	0,1	0,1
t_1 in μ s	100	100	100
t_4 in ms	10	10	10
t_5 in ms	90	90	90
R_i in Ω	50	50	50

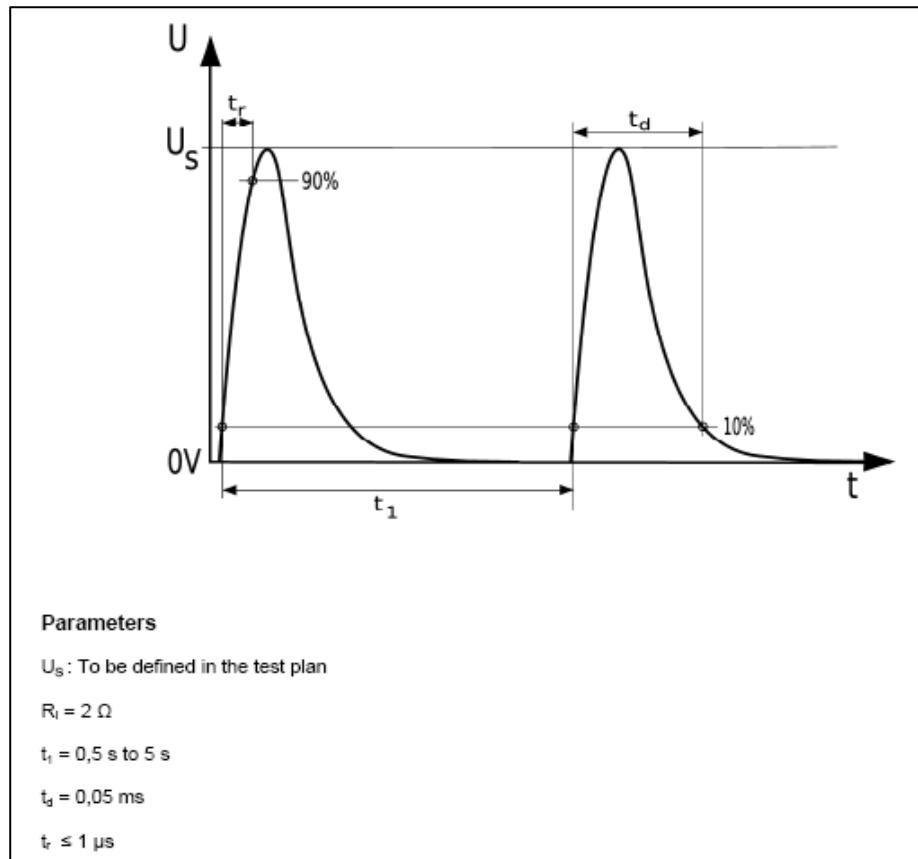


Parameters	12 V System	24 V System	42 V System
U_s in V	See table B.1	See table B.2	See table B.3
t_r in ns	5	5	5
t_d in μ s	0,1	0,1	0,1
t_1 in μ s	100	100	100
t_4 in ms	10	10	10
t_5 in ms	90	90	90
R_i in Ω	50	50	50

[2]

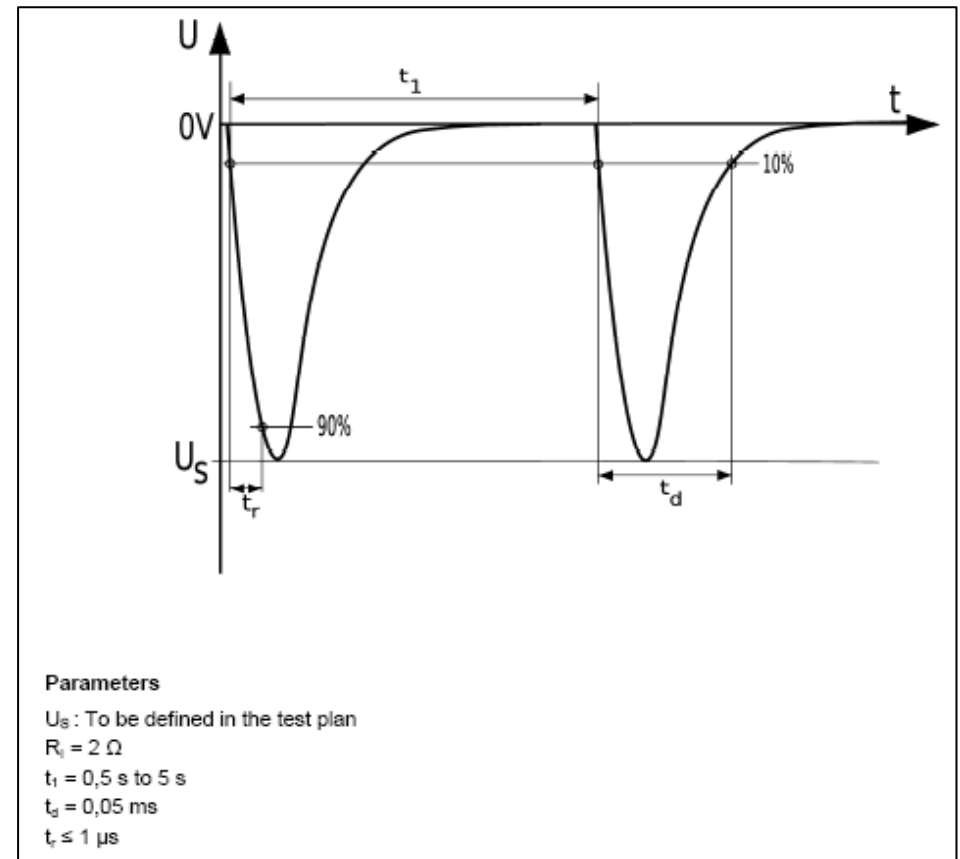
ISO 7637-3:2007 – 慢脉冲

- ISO 7637-3:2007定义的慢脉冲
- 采用 pulse2a
- slow +用于(DCC 和 ICC):



[2]

- slow –用于 (DCC 和 ICC):



Capacitive Coupling Clamp

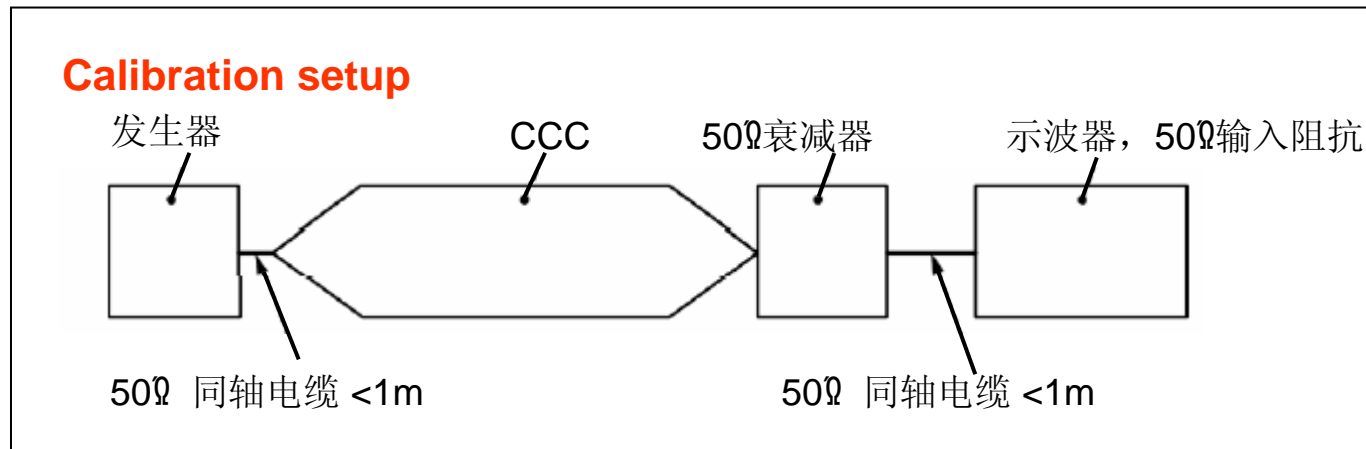
CCC

脉冲校验 CCC:

基于 ISO 7627-2, 但是直接在耦合钳输出端进行

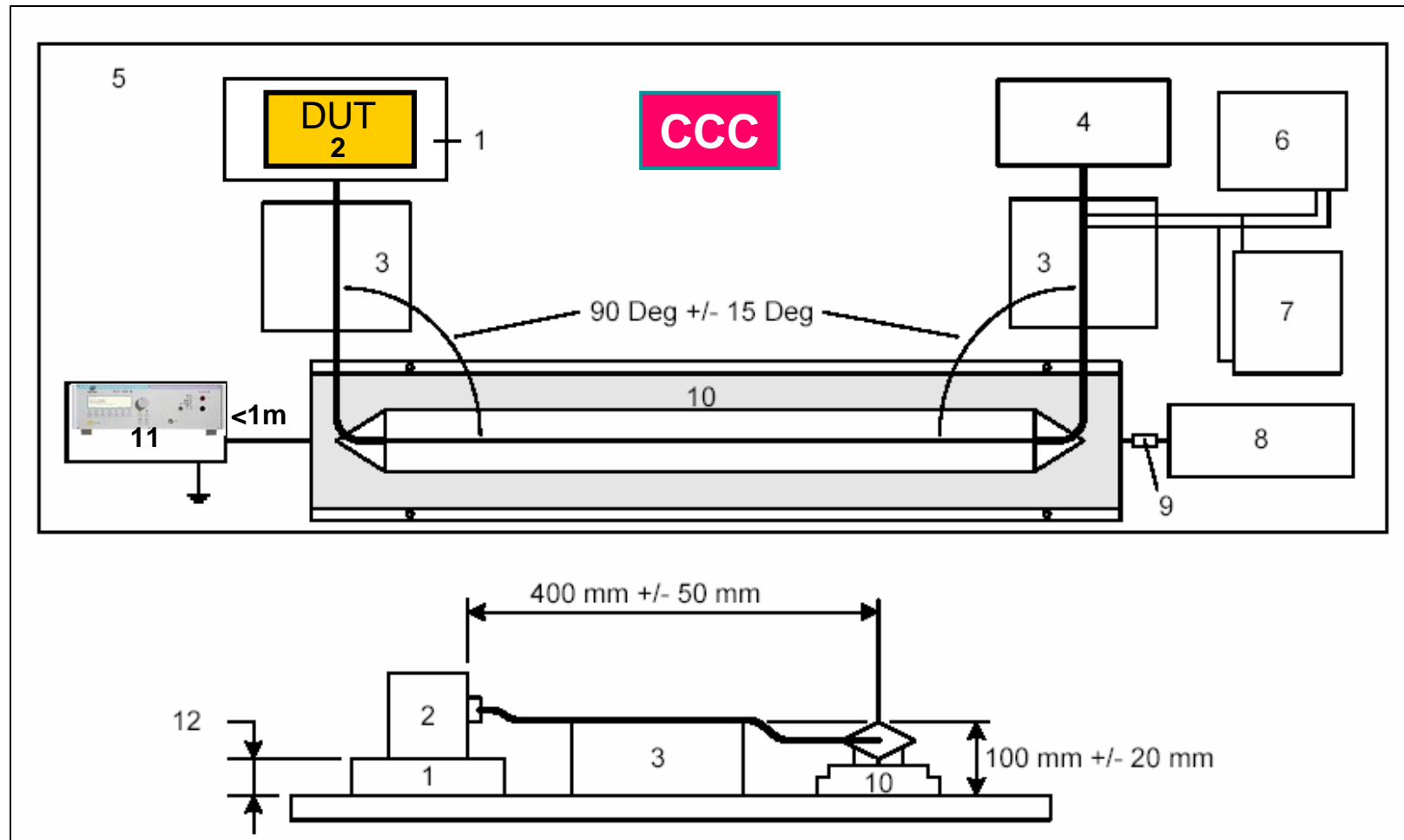
校验

- 带50Ω 负载



Capacitive Coupling Clamp

CCC

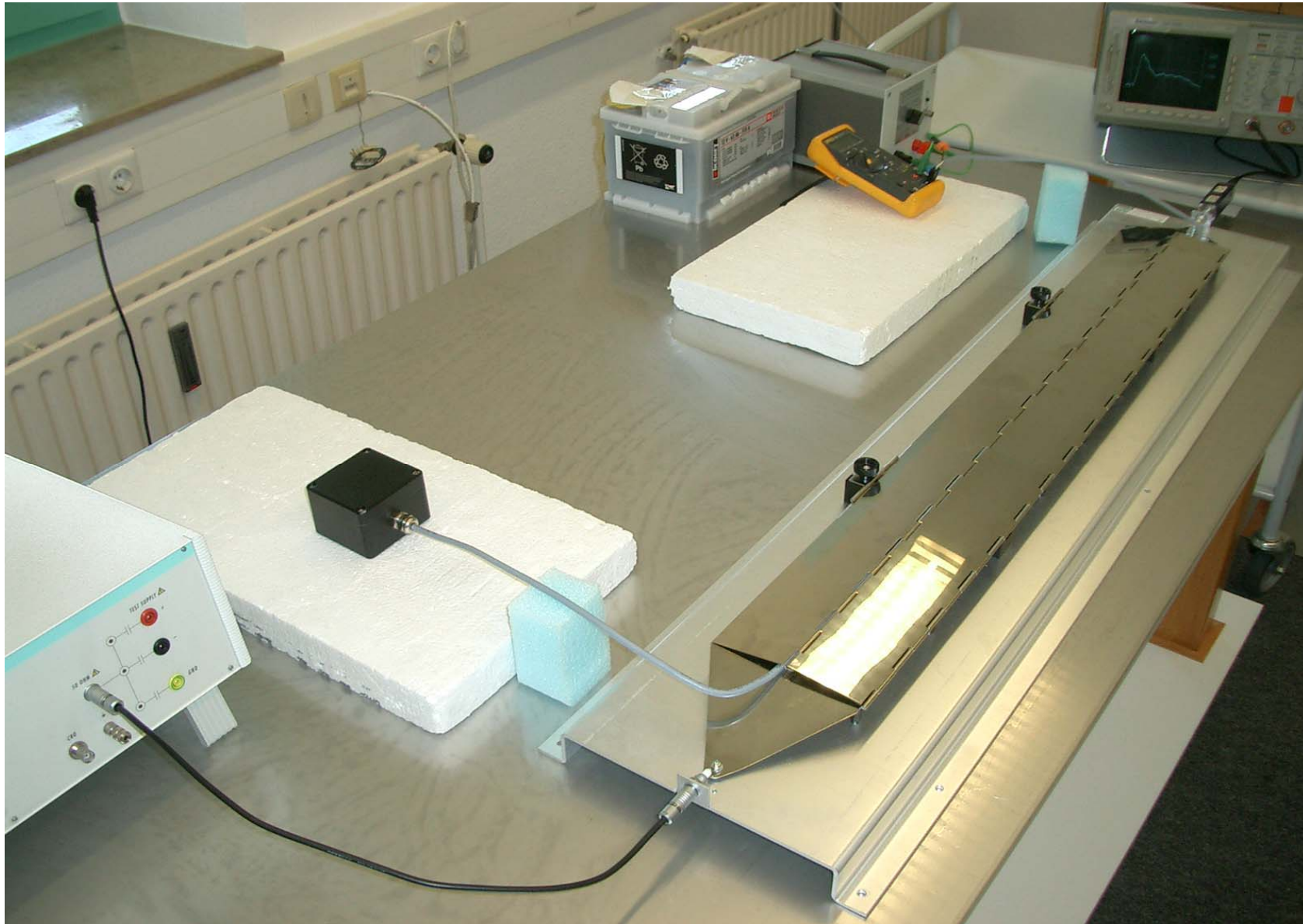


- 1 被测设备绝缘垫
- 2 被测设备
- 3 线束绝缘垫
- 4 附件

- 5 接地参考平板
- 6 直流电源
- 7 电瓶
- 8 示波器

- 9 50 Ohm 衰减器
- 10 容性耦合夹
- 11 脉冲发生器

Capacitive Coupling Clamp CCC



Direct Capacitive Coupling

DCC

耦合电容 C

测试脉冲

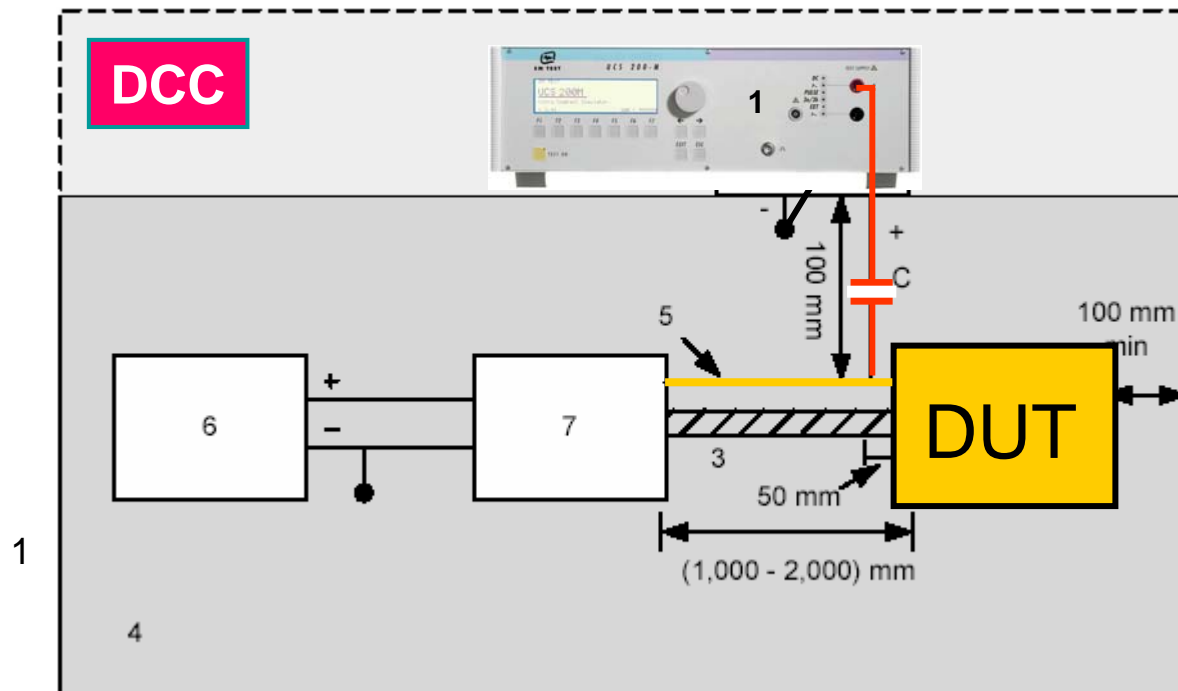
Fast transient (3a/b)

Slow transient (2a)

耦合电容

100pF

0.1 μ F



1 脉冲发生器

2 被测设备

3 线束

4 接地参考平板

5 被测I/O线

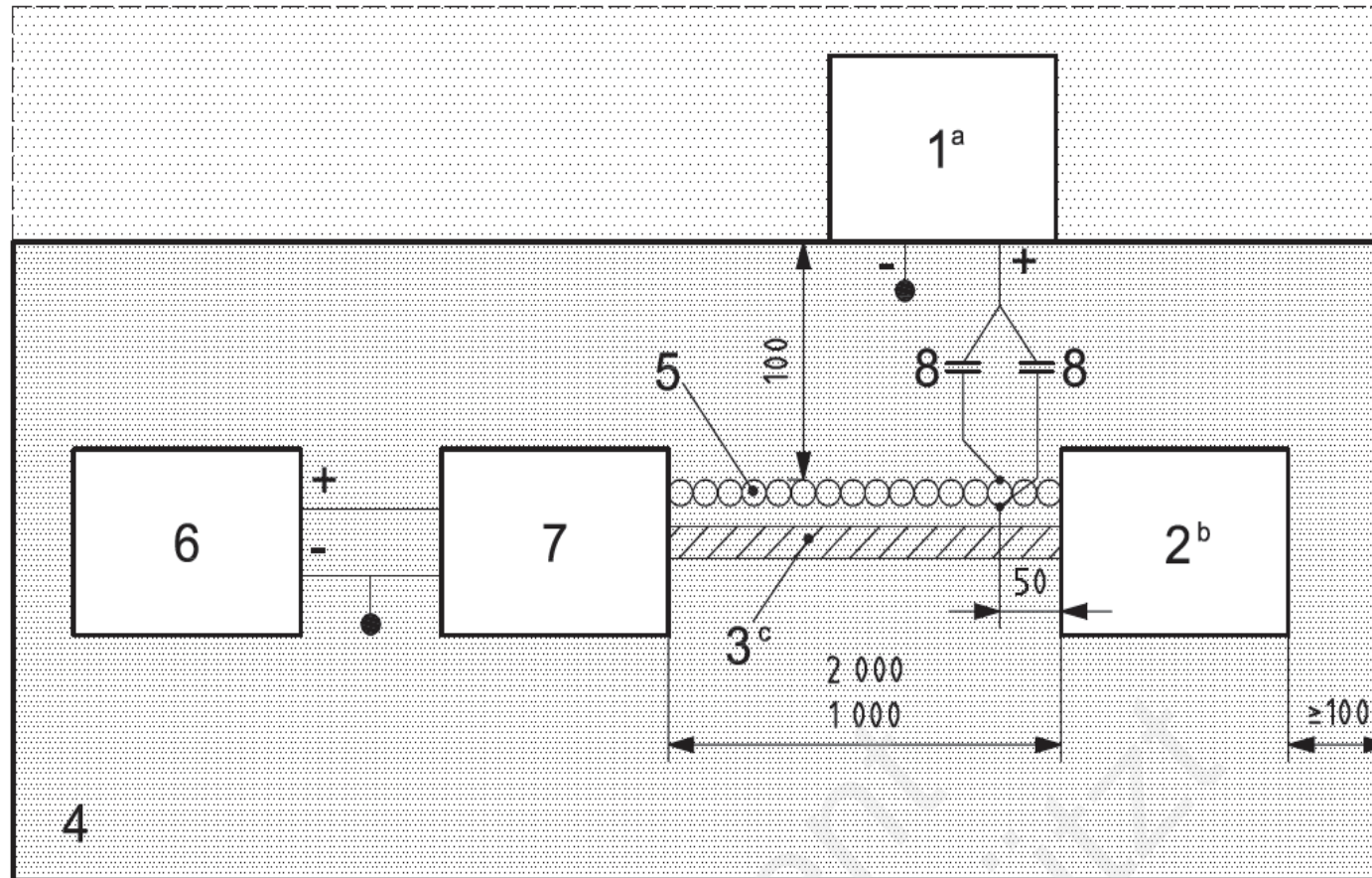
6 直流电源

7 辅助设备

C 耦合电容

Direct Capacitive Coupling DCC

CAN Bus总线的特殊测试布置



- 1 脉冲发生器
- 2 被测设备
- 3 线束
- 4 接地参考平板
- 5 被测I/O线
- 6 直流电源
- 7 被测设备激励装置
- 8 耦合电容

耦合电容 C

Fast transient

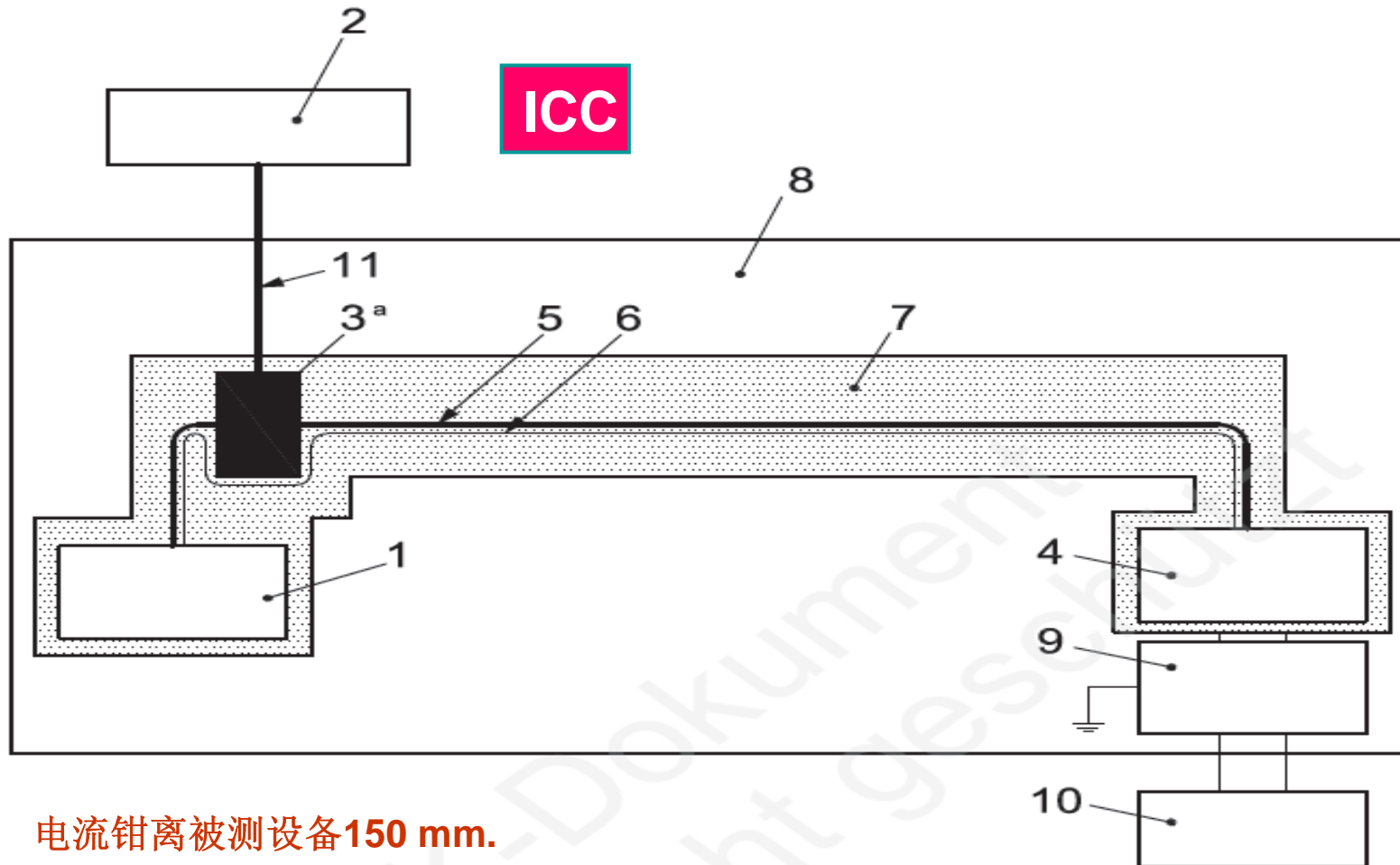
100pF

Slow transient

470pF

Inductive Coupling Clamp

ICC



电流钳离被测设备**150 mm**。

- 1 被测设备
- 2 脉冲发生器
- 3 电流钳
- 4 辅助设备
- 5 线束 (长度 ≤ 2 m)
- 6 地线
- 7 绝缘垫 [(50 \pm 10) mm]
- 8 接地参考平板
- 9 电瓶
- 10 直流电源
- 11 50Ω 同轴电缆

Inductive Coupling Clamp

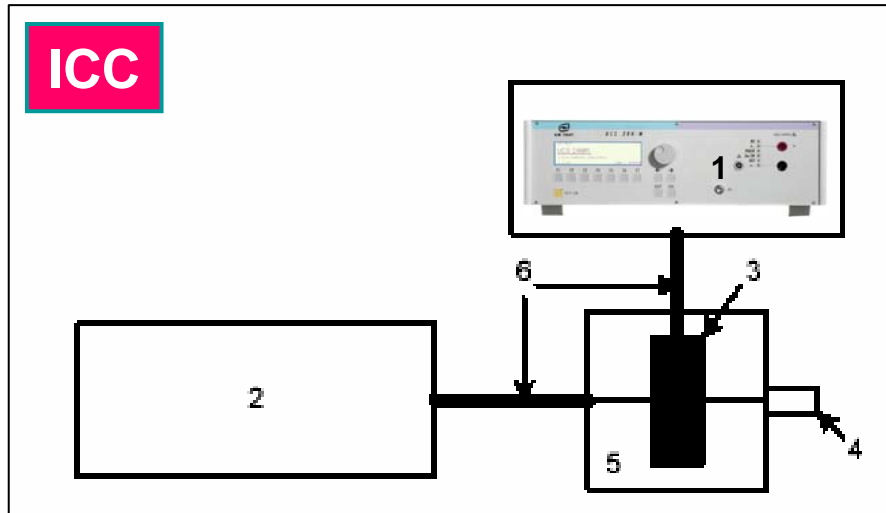
ICC



重要信息!
地线不在电流钳内

Inductive Coupling Clamp

ICC



- | | |
|------------|---------|
| 1 脉冲发生器 | 5 校准夹具 |
| 2 示波器, 1MΩ | 6 50Ω电缆 |
| 4 短路环 | |



校准夹具

校验:

- 注入钳与ISO 11452-4 BCI测试中使用的一样
- 用ISO7637-2的Pulse 2a进行测试. !!! 正极和负极!!!
- 在开路状态下用校准夹具校验脉冲
- $tr \leq 1.2\mu s$
- $Td = 7\mu s \pm 30\%$
- 必须调整脉冲发生器以达到规定的测试等级

ICC测试等级 (附录 B)

Table B.1 — Recommended test severity levels for a 12 V electrical system

Test pulse ^a	Selected test level ^b	Test levels U_s ^c				Test time min
		V				
		I min.	II	III	IV max.	
Fast a (DCC and CCC)		- 10	- 20	- 40	- 60	10
Fast b (DCC and CCC)		+ 10	+ 20	+ 30	+ 40	10
DCC slow +		+ 8	+15	+ 23	+ 30	5
DCC slow -		- 8	- 15	- 23	- 30	5
ICC slow +		+ 3	+ 4	+ 5	+ 6	5
ICC slow -		- 3	- 4	- 5	- 6	5

^a Test pulses as in 4.3.
^b Values agreed to between vehicle manufacturer and supplier.
^c The amplitudes in the table are the values of U_s , as defined for each test pulse in 4.3. U_s is referenced at the output of the CCC for the CCC method, or at the output of the open circuit generator for the DCC method.

Table B.2 — Recommended test severity levels for a 24 V electrical system

Test pulse ^a	Selected test level ^b	Test levels U_s ^c				Test time min
		V				
		I min.	II	III	IV max.	
Fast a (DCC and CCC)		- 14	- 28	- 56	- 80	10
Fast b (DCC and CCC)		+ 14	+ 28	+ 56	+ 80	10
DCC slow +		+ 15	+25	+ 35	+ 45	5
DCC slow -		- 15	- 25	- 35	- 45	5
ICC slow +		+ 4	+ 6	+ 8	+ 10	5
ICC slow -		- 4	- 6	- 8	- 10	5

^a Test pulses as in 4.3.
^b Values agreed to between vehicle manufacturer and supplier.
^c The amplitudes in the table are the values of U_s , as defined for each test pulse in 4.3. U_s is referenced at the output of the CCC for the CCC method, or at the output of the open circuit generator for the DCC method.

Thank you for your attention!
谢谢大家!