

Proposal to supersedes
ECE/TRANS/WP.29/GRE/2025/03

This document is a revised proposal to amend ECE/TRANS/WP.29/GRE/2025/03 which is submitted to the ninety second session of the Working Party on Lighting and Light-Signalling (GRE). The proposed modifications to the current R10 text are marked in bold for new or strikethrough for deleted characters. The editorial correction to the formal document are marked highlighted in yellow.

I. Proposal

Paragraph 6.1.2., amend to read:

- "6.1.2. Before testing, the Technical Service ~~has to~~**shall** prepare a test plan in conjunction with the manufacturer, which contains at least mode of operation, stimulated function(s), monitored function(s), pass/fail criterion(criteria) and intended emissions.
- Depending on the intended operating conditions of the propulsion system, the test plan shall define the minimum number of steady state operating conditions of the vehicle, selectable by the driver or by the control system. The test conditions shall consider multiple propulsion system operating strategies which can be activated permanently by the driver or the vehicle control system and shall be based on documentation provided in Annexes 2A and 2B (e.g. risk analysis)."

Paragraph 6.7.1., amend to read:

- "6.7.1. Method of testing
- The emission of ESA representative of its type shall be tested by the method(s) according to ISO 7637-2:**2011** as described in Annex 10 for the levels given in Table 1.

Table 1
Maximum allowed pulse amplitude

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

Paragraph 7.1.2., amend to read:

- "7.1.2. Before testing the Technical Service ~~has to~~**shall** prepare a test plan in conjunction with the manufacturer, for the configuration "REESS charging mode coupled to the power grid" configuration which contains at least mode of operation, stimulated function(s), monitored function(s), pass/fail criterion (criteria) and intended emissions.
- Depending on the available charging modes of the REESS, the test plan shall define the minimum number of test conditions of the vehicle, selectable by the driver or by the control system and shall be based on documentation provided

in Annexes 2A and 2B (e.g. risk analysis). Refer to flow charts in Annexes where REESS charge mode is applicable."

Paragraph 7.17.1., amend to read:

- "7.17.1. Method of testing
The emission of ESA representative of its type shall be tested by the method(s) according to ISO 7637-2:2011, as described in Annex 10 for the levels given in Table 18.

Table 18

Maximum allowed pulse amplitude

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

"

Paragraph 7.18.2.1., Table 19a and Table 19b, amend to read:

- "7.18.2.1. The immunity to electromagnetic radiation of ESA representative of its type shall be tested by the method(s) as described in Annex 9:
- for the levels in over 90 per cent of the 20 to 6,000 MHz frequency band given in Table 19a.
 - for the minimum test Level over the whole 20 to 6,000 MHz frequency band given in Table 19b.

Table 19a

Test Level in over 90 per cent of the 20 to 6,000 MHz frequency band					
Frequency range	Stripline	TEM-cell	BCI	ALSE	Reverberation chamber
20 to 2,000 MHz	60 V/m	75 V/m	60 mA	30 V/m	21 V/m
2,000 to 6,000 MHz	Not applicable	Not applicable	Not applicable	10 V/m	7 V/m

Table 19b

Minimum Test Level over the whole 20 to 6,000 MHz frequency band					
Frequency range	Stripline	TEM-cell	BCI	ALSE	Reverberation chamber
20 to 2,000 MHz	50 V/m	62,5 V/m	50 mA	25 V/m	18 V/m
2,000 to 6,000 MHz	Not applicable	Not applicable	Not applicable	8 V/m	6 V/m

"

Paragraph 7.19.1., amend to read:

- "7.19.1 Method of testing
The immunity of ESA representative of its type shall be tested by the method(s) according to ISO 7637-2:2011, as described in Annex 10 with the test levels given in Table 20.

Table 20

Immunity of ESA

Test pulse number	Immunity test level		Test duration / Number of pulses	FPSC for systems ESA	
	12V system	24V system		Related to immunity related functions	Not related to immunity related functions
1	-75 V	-450V	500 pulses	III	III
2a	+37 V	+37 V	500 pulses	I	III
2b	+10 V	+ 20 V	10 pulses	II	III
3a	-112 V	-150 V	1 h	I	III

Test pulse number	Immunity test level		Test duration / Number of pulses	FPSC for systems ESA	
	12V system	24V system		Related to immunity related functions	Not related to immunity related functions
3b	+ 75 V	+150 V	1 h	I	III

"

Appendix I, amend to read:

"List of standards referred to in this Regulation

1. CISPR 12 "Vehicles', ~~motorboats~~ **boats, and internal combustion and spark-ignited engine- driven devices** - Radio disturbance characteristics - Limits and methods of measurement **for the protection of receivers except those installed in the vehicle/boat/device itself or in adjacent vehicles/boats/devices**", fifth eEdition 5.1 - 2001 and AMD1:2005.
2. CISPR 16-1-4 "Specifications for radio disturbance and immunity measuring apparatus and methods - Part 1-4: Radio disturbance and immunity measuring apparatus ~~apparatus~~ — Antennas and test sites for radiated disturbances measurements", fourth eEdition 4.2 - 2019, AMD1:2020 and AMD2:2023.
3. CISPR 25 "~~Limits and methods of measurement of~~ Radio disturbance characteristics for the protection of receivers used on board vehicles, **boats, and on devices - Limits and methods of measurement**", second eEdition 2.0 - 2002 and corrigendum 2004.
4. ISO 7637-1 "Road vehicles - Electrical disturbance from conduction and coupling - Part 1: Definitions and general ~~configurations~~ **considerations**", ~~Third~~ edition 2015.

ISO 7637-2 "Road vehicles - Electrical disturbance from conduction and coupling - Part 2: Electrical transient conduction along supply lines only ~~on vehicles with nominal 12 V or 24 V supply voltage~~", sSecond edition 2004.

ISO 7637-2 "Road vehicles - Electrical disturbance from conduction and coupling - Part 2: Electrical transient conduction along supply lines only", ~~Third~~ edition 2011.
5. ISO/IEC 17025 "General requirements for the competence of testing and calibration laboratories", ~~Third~~ edition 2017.
6. ISO 11451 "Road vehicles – **Vehicle test methods for e**Electrical disturbances ~~by~~ **from** narrowband radiated electromagnetic energy – ~~Vehicle test methods~~":
Part 1: General **principles** and ~~definitions~~ **terminology** (ISO 11451-1, ~~Fourth~~ edition 2015);
Part 2: Off-vehicle radiation sources (ISO 11451-2, ~~Fourth~~ edition 2015);
Part 4: ~~Bulk current injection (BCI)~~ **Harness excitation methods** (ISO 11451-4, fourth edition 2022).
7. ISO 11452 "Road vehicles - **Component test methods for e**Electrical disturbances ~~by~~ **from** narrowband radiated electromagnetic energy – ~~Component test methods~~":
Part 1: General **principles** and ~~definitions~~ **terminology** (ISO 11452-1, ~~Fourth~~ edition 2015);
Part 2: Absorber-lined **shielded enclosure-chamber** (ISO 11452-2, ~~Third~~ edition 2019);
Part 3: Transverse electromagnetic ~~mode~~ (TEM) cell (ISO 11452-3, ~~third~~ **Fourth** edition 202416);
Part 4: ~~Bulk current injection (BCI)~~ **Harness excitation methods** (ISO 11452-4, ~~Fifth~~ edition 2020);

Part 5: Stripline (ISO 11452-5, ~~s~~Second edition 2002);

Part 11: Reverberation chamber (ISO 11452-11, ~~f~~First edition 2010).

9. IEC 61000-3-2 "Electromagnetic Compatibility (EMC) - Part 3-2: **Limits** - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)", ~~e~~Edition 5.2 - 2018, AMD1:2020 and AMD2:2024.
10. IEC 61000-3-3 "Electromagnetic Compatibility (EMC) - Part 3-3:— Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage **supply** systems, for equipment with rated current ≤ 16 A per phase and not subjected to conditional connection", ~~e~~Edition 3.2 - 2013, AMD1:2017, AMD2:2021 and COR1:2022.
11. IEC 61000-3-11 "Electromagnetic Compatibility (EMC) - Part 3-11:— Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage **supply** systems - Equipment with rated current ≤ 75 A ~~per phase~~ and subjected to conditional connection", ~~e~~Edition 2.0 - 2017.
12. IEC 61000-3-12 "Electromagnetic Compatibility (EMC) - Part 3-12: **Limits** - Limits for harmonic currents ~~emissions~~ produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase", ~~e~~Edition **1.0 - 2004** ~~2.1 - 2011~~ and AMD1:2021.
13. IEC 61000-4-4 "Electromagnetic Compatibility (EMC) - Part 4-4:— Testing and measurement techniques - Electrical fast transients/burst immunity test", ~~e~~Edition 3.0 - 2012.
14. IEC 61000-4-5 "Electromagnetic Compatibility (EMC) - Part 4-5:— Testing and measurement techniques - Surge immunity test", ~~e~~Edition 3.1 - 2014 and AMD1:2017.
15. IEC 61000-6-3 "Electromagnetic Compatibility (EMC) - Part 6-3:— Generic standards - Emission standard for **equipment in** residential, ~~commercial and light industrial~~ environments", ~~e~~Edition 3.0 - 2020.
16. IEC 61000-6-4 "Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments", ~~e~~Edition 3.0 - 2018.
17. CISPR 16-2-1 "Specification for radio disturbances and immunity measuring apparatus and methods - Part 2-1:— Methods of measurement of disturbances and immunity - Conducted disturbances measurements", ~~e~~Edition 3.1 - 2014, AMD1:2017 and COR1:2020.
18. CISPR 16-1-2 "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-2: Radio disturbance and immunity measuring apparatus—~~Ancillary equipment~~— **Coupling devices for c**Conducted disturbances measurements", ~~e~~Edition 2.1 - 2014 and AMD1:2017.
19. IEC 61851-1 "Electric vehicle conductive charging system - Part 1: General requirements", ~~e~~Edition 3.0 - 2017.
20. IEC 61851-21-2 "Electric vehicle conductive charging system - Part 21-2: Electric vehicle requirements for conductive connection to an AC/DC supply - EMC requirements for off board electric vehicle charging systems", ~~e~~Edition 1.0 - 2018.
21. CISPR 32 "Electromagnetic compatibility of multimedia equipment - Emission requirements", ~~e~~Edition 2.1 - 2015 and AMD1:2019.
22. CISPR 16-1-1 "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus-", ~~e~~Edition ~~45.0~~ ~~2015~~ ~~59-09~~.

Appendix 8,

Paragraph 1., amend to read:

"1. Artificial networks (AN)

For an ESA powered by LV, a 5 μ H / 50 Ω AN as defined in Figure 1 shall be used.

The AN(s) shall be mounted directly on the ground plane. The grounding connection of the AN(s) shall be bonded to the ground plane.

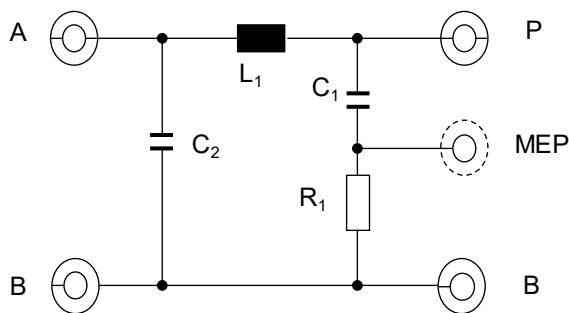
Measurement ports of AN(s) shall be terminated with a 50 Ω load.

The AN impedance Z_{PB} (tolerance $\pm 20\%$) in the measurement frequency range of 0,1 MHz to 100 MHz is shown in Figure 2. It is measured between the terminals P and B (of Figure 1) with a 50 Ω load on the measurement port with terminals A and B (of Figure 1) short circuited.

Figure 1, amend to read

"Figure 1

Example of 5 μ H AN schematic



LegendKey

$L_1 \div 5\ \mu\text{H}$

$C_1 \div 0,1\ \mu\text{F}$

$C_2 \div 1\ \mu\text{F}$ (default value)

$R_1 \div 1\ \text{k}\Omega$

A: Pport to power supply

P: Pport to ESA

B: Gground

MEP: M measuring Pport"

"

Paragraph 2., amend to read:

"2. High Voltage Artificial networks (HV-AN)

For an ESA powered by HV, a 5 μ H / 50 Ω HV-AN as defined in Figure 3 shall be used.

The HV-AN(s) shall be mounted directly on the ground plane. The grounding connection of the HV-AN(s) shall be bonded to the ground plane.

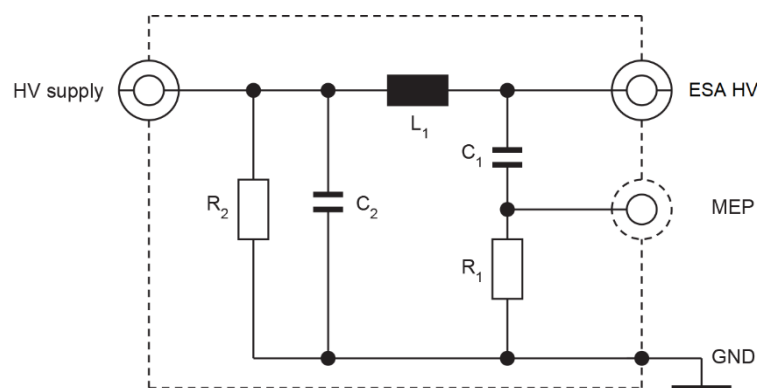
Measurement ports of HV-AN(s) shall be terminated with a 50 Ω load.

The HV-AN impedance Z_{PB} (tolerance $\pm 20\%$) in the measurement frequency range of 0,1 MHz to 100 MHz is shown in Figure 2. It is measured between the "Vehicle/ESA HV" and "GND" terminals (of Figure 3) with a 50 Ω load on the measurement port and with the "HV supply" and "GND" terminals short circuited."

Figure 3, amend to read:

"Figure 3

Example of 5 μ H / HV-AN schematic



LegendKey

$L_1 \div 5 \mu\text{H}$

$C_1 \div 0,1 \mu\text{F}$

$C_2 \div 0,1 \mu\text{F}$ (default value)

$R_1 \div 1 \text{ k}\Omega$

$R_2 \div 1 \text{ M}\Omega$ (discharging C_2 to $> 50 \text{ V}_{\text{dc}}$ within 60 s)

If unshielded HV-ANs are used in a single shielded box, then there shall be an inner shield between the HV-ANs as described in Figure 4."

HV supply: ~~H~~high ~~V~~voltage power supply

ESA HV: ~~H~~high ~~V~~voltage of ESA

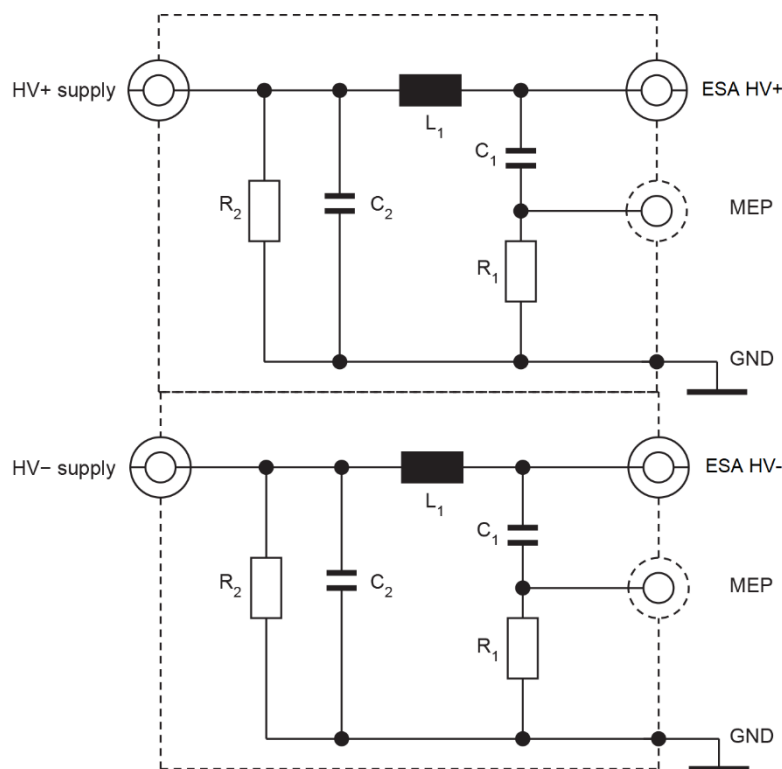
MEP: ~~M~~measuring ~~P~~port

GND: ~~G~~ground

Figure 4, amend to read:

"Figure 4

Example of 5 μH HV-AN combination in a single shielded box



LegendKey

$L_1 \div 5 \mu\text{H}$

$C_1 \div 0,1 \mu\text{F}$

$C_2 \div 0,1 \mu\text{F}$ (default value)

$R_1 \div 1 \text{ k}\Omega$

$R_2 \div 1 \text{ M}\Omega$ (discharging C_2 to $> 50 \text{ V}_{\text{dc}}$ within 60 s)"

HV supply: ~~H~~high ~~V~~voltage power supply (positive and negative)

ESA HV: ~~H~~high ~~V~~voltage of ESA (positive and negative)

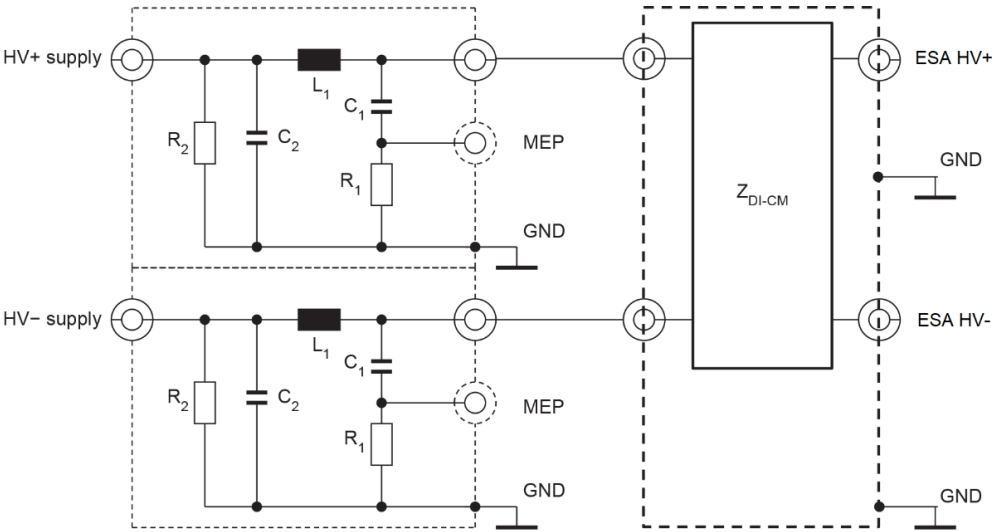
MEP: ~~M~~measuring ~~P~~port

GND: ~~G~~ground

Figure 5, amend to read:

"Figure 5

Impedance matching network attached between HV-ANs and ESA



LegendKey

$L_1 \div 5 \mu\text{H}$

$C_1 \div 0,1 \mu\text{F}$

$C_2 \div 0,1 \mu\text{F}$ (default value)

$R_1 \div 1 \text{ k}\Omega$

$R_2 \div 1 \text{ M}\Omega$ (discharging C_2 to $> 50 \text{ V}_{\text{dc}}$ within 60 s)

HV supply: ~~H~~high ~~V~~voltage power supply
(positive and negative)

ESA HV: ~~H~~high ~~V~~voltage of ESA (positive and
negative)

MEP: ~~M~~measuring ~~P~~port

GND: ~~G~~ground

$Z_{\text{DI-CM}}$: ~~D~~ifferential and common-mode impedance

"

Paragraph 3., amend to read:

"3. Direct Current charging Artificial Networks (DC-charging-AN)

For a vehicle/ESA in charging mode connected to a DC power supply, a $5 \mu\text{H} / 50 \Omega$ DC-charging-AN as defined in Figure 6 shall be used.

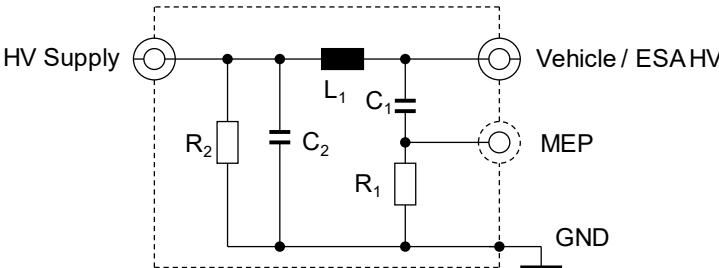
Measurement ports of DC-charging-AN(s) shall be terminated with 50Ω loads.

The DC-charging-AN impedance $Z_{\text{PB-PB}}$ (tolerance $\pm 20 \%$) in the measurement frequency range of 0,1 MHz to 100 MHz is shown in Figure 7. It is measured between the terminals "Vehicle/ESA HV" and "GND" (of Figure 6) with a 50Ω load on the measurement port and with terminals "HV Supply" and "GND" (of Figure 6) short circuited."

Figure 6, amend to read:

"Figure 6

Example of $5 \mu\text{H}$ DC-charging-AN schematic



LegendKey

$L_1 \div 5 \mu\text{H}$

$C_1 \div 0,1 \mu\text{F}$

HV supply: ~~H~~high ~~V~~voltage power supply
~~V~~vehicle / ESA HV: ~~H~~high
~~V~~voltage ~~V~~vehicle or ESA

$C_2 \div 1 \mu\text{F}$ (default value, if another value is used, it ~~has to~~ shall be justified)
 $R_1 \div 1 \text{ k}\Omega$
 $R_2 \div 1 \text{ M}\Omega$ (discharging C_2 to $> 50 \text{ V}_{\text{dc}}$ within 60 s)"

MEP: ~~M~~measuring ~~P~~port
GND: ~~G~~ground

Paragraph 5.1., amend to read:

"5.1. Signal/Control port with symmetric lines

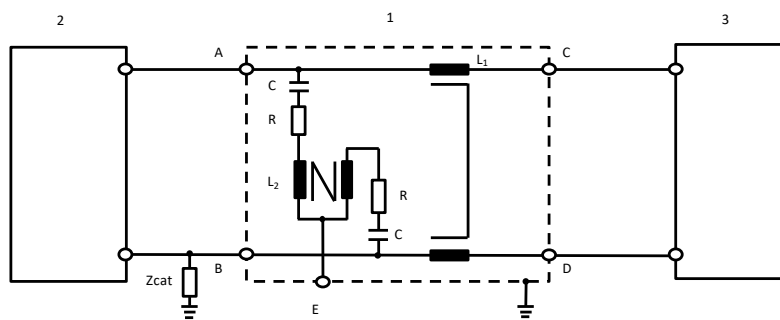
An asymmetric artificial network (AAN) to be connected between the vehicle and the charging station or any auxiliary equipment (AE) used to simulate communication is defined in CISPR 16-1-2 Annex E clause E.2 (T network circuit) (see example in Figure 8).

The AAN has a common mode impedance of 150Ω . The impedance Z_{cat} adjusts the symmetry of the cabling and attached periphery typically expressed as longitudinal conversion loss (LCL). The value of LCL should be predetermined by measurements or be defined by the manufacturer of the charging station/charging harness. The selected value for LCL and its origin shall be stated in the test report."

Figure 8, amend to read:

"Figure 8

Example of an AAN for Signal/Control port with symmetric lines (e.g. CAN)



LegendKey:

1: AAN

2: ~~V~~vehicle

3: ~~C~~charging station

$L_1 \div 2 \times 38 \text{ mH}$

$L_2 \div 2 \times 38 \text{ mH}$

$R \div 200 \Omega$

$C \div 4,7 \mu\text{F}$

$Z_{\text{cat}} \div$ ~~S~~symmetric adjustment impedance

A: ~~S~~symmetrical line 1 (in vehicle)

B: ~~S~~symmetrical line 2 (in vehicle)

C: ~~S~~symmetrical line 1 (charging station side)

D: ~~S~~symmetrical line 2 (charging station side)

E: ~~M~~measuring ~~P~~port with 50Ω load"

Paragraph 5.2., amend to read [remark: "/" between DC-charging-AN and HV-AN]:

"5.2. Wired network port with PLC on power lines

If an original charging station can be used for the test, an AAN and/or AMN/DC-charging-AN might not be required for PLC communication.

If the presence of the AMN/DC-charging-AN prevents proper PLC communication with the original charging station or if the PLC communication needs to be simulated by means of a piece of auxiliary equipment (e.g. a PLC modem) instead of the original charging station, it is necessary to add an AAN between the AE (e.g. the PLC modem) and the AMN/DC-charging-AN output (vehicle side), as shown in Figure 9.

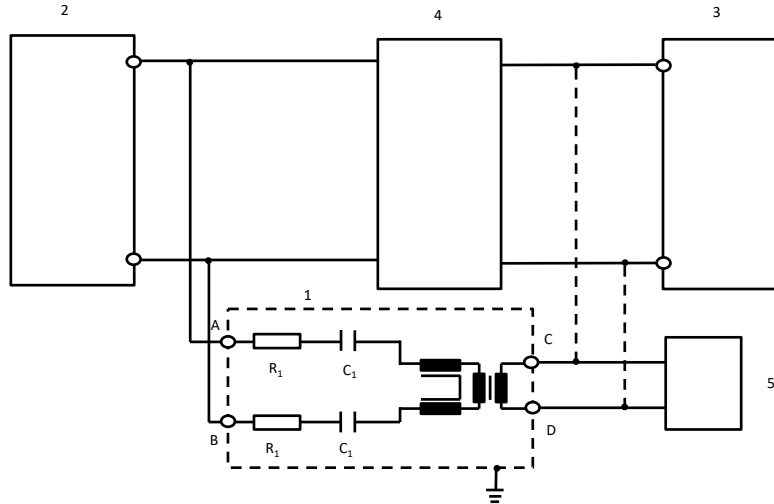
The circuit in Figure 9 provides a common mode termination by the AMN / DC-charging-AN / HV-AN. In order to minimize emission from the PLC modem of the vehicle, an attenuator is located between the powerline and the PLC modem at the AE side in the circuit for emission tests. This attenuator consists of two resistors in combination with the

input/output impedance of the PLC modem. The value of the resistors depends on the design impedance of the PLC modems and the allowed attenuation for the PLC system."

Figure 9, amend to read:

"Figure 9

Example of AAN with Signal/Control port with PLC on AC or DC power lines



LegendKey:

1: AAN

2: Vvehicle

3: Charging station / Ppower supply

4: HV-AN or AMN or DC-charging-AN

5: AE

R1: 2,5 kΩ"

C1: 4,7 nF

A: PLC on AC or DC power line (vehicle side)

B: PLC on AC or DC power line (vehicle side)

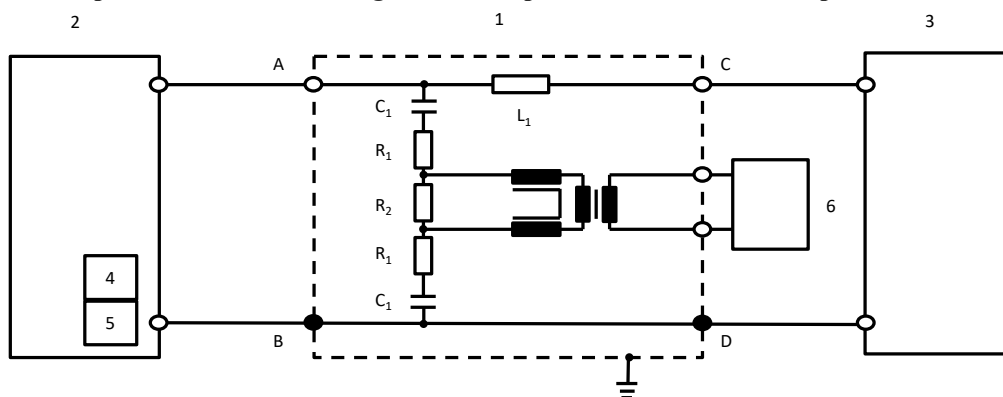
C: PLC line (charging station or AE side)

D: PLC line (charging station or AE side)

Figure 10, amend to read:

"Figure 10

Example of AAN circuit for Signal/Control port with PLC on control pilot



LegendKey:

1: AAN

2: Vvehicle

3: Charging station

4: Control pilot (in vehicle)

5: PLC (in vehicle)

6: AE

R1: 39 Ω

R2: 270 Ω

C1: 2,2 nF

L1: 100 μH

A: Control pilot line (vehicle side)

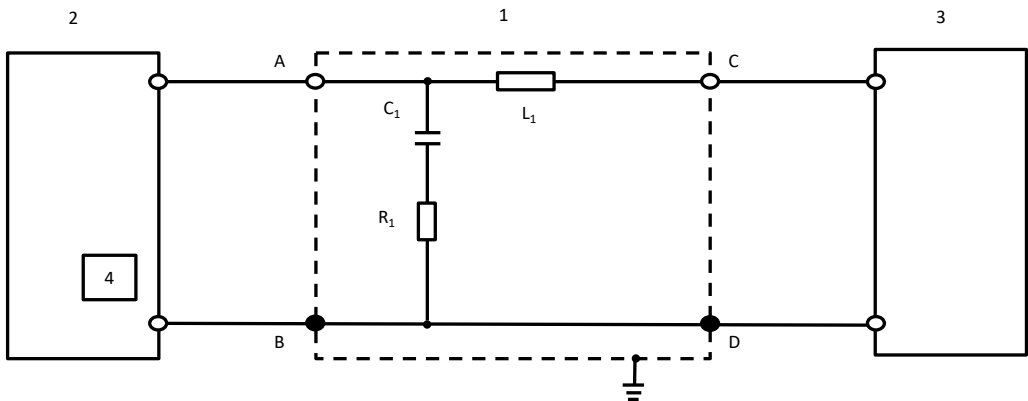
B/D: Protective earth

C: Control pilot line (charging station side)"

Figure 11, amend to read:

"Figure 11

Example of AAN circuit for pilot line



LegendKey:

1÷ AAN

2÷ Vehicle

3÷ Charging station

4÷ Control pilot (in vehicle)

$R_1 \div 150 \Omega$

$C_1 \div 1,1 \text{ nF}$

$L_1 \div 100 \mu\text{H}$

A÷ Control pilot line (vehicle side)

B/D÷ Protective earth

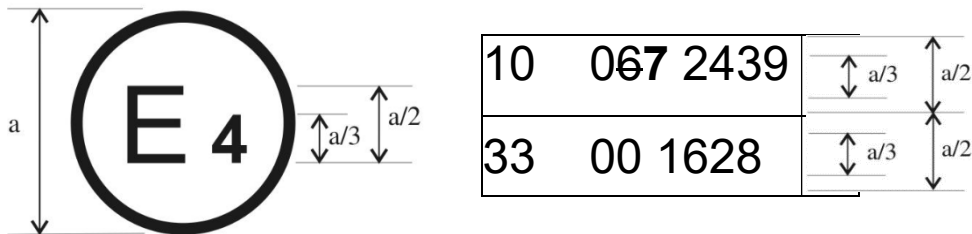
C÷ Control pilot line (charging station side)

"

Annex 1, amend to read:

"Model B

(See paragraph 5.2. of this Regulation)



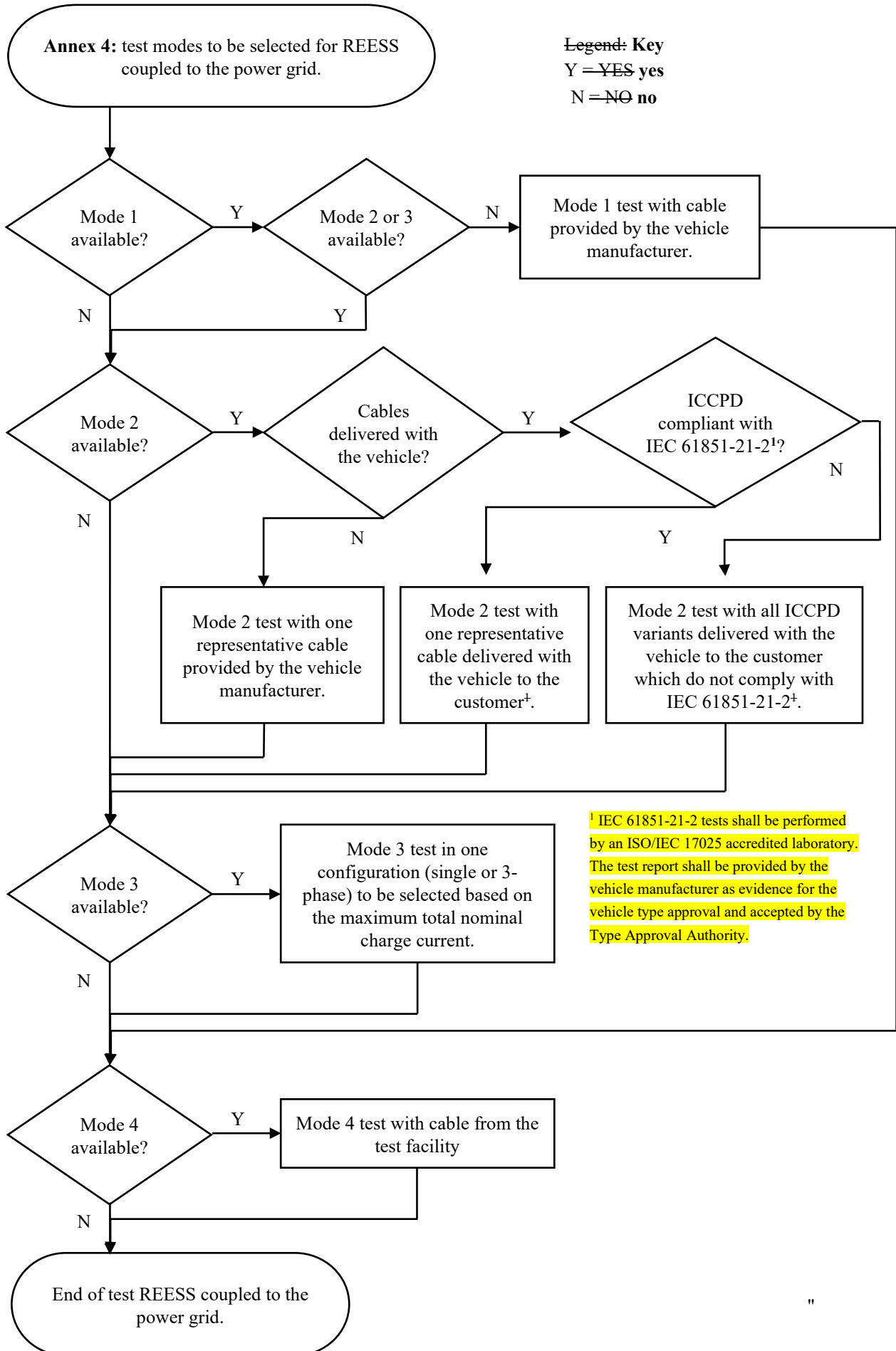
$a = 6 \text{ mm min}$

The above approval mark affixed to a vehicle or ESA shows that the vehicle type concerned has, with regard to electromagnetic compatibility, been approved in the Netherlands (E 4) pursuant to Regulations Nos. 10 and 33. The approval numbers indicate that, at the date when the respective approvals were given, Regulation No. 10 included the 067 series of amendments and Regulation No. 33 was still in its original form."

Annex 4,

Paragraph 2.2., Figure 1, amend to read:

"Charging mode configuration for Annex 4



Paragraphs 4.3., amend to read:

"4.3. The measurements shall be performed with a spectrum analyser or a scanning receiver. The parameters to be used are defined in Table 1 and Table 2.

Spectrum analysers and FFT-based instruments, that meet the requirements of CISPR 16-1-1, may be used for conformity measurements. FFT-based measuring instruments shall continuously record and evaluate the signal during the measurement time. If using FFT-based instruments, the minimum measurement time shall be 1 s per analysis frequency band (in real-time mode) of the FFT instrument.

Table 1
Spectrum analyser parameters

Frequency range MHz	Peak detector		Quasi-peak detector		Average detector	
	RBW at -3 dB	Minimum scan time	RBW at -6 dB	Minimum scan time	RBW at -3 dB	Minimum scan time
30 to 1,000	100/120 kHz	100 ms/MHz	120 kHz	20 s/MHz	100/120 kHz	100 ms/MHz

Note: If a spectrum analyser is used for peak measurements, the video bandwidth shall be at least three times the resolution bandwidth (RBW).

Table 2
Scanning receiver parameters

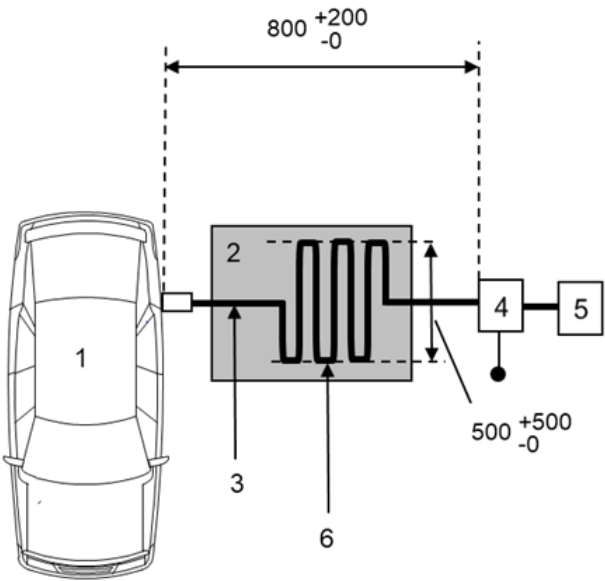
Frequency range MHz	Peak detector			Quasi-peak detector			Average detector		
	BW at -6 dB	Maximum step size ^a	Minimum dwell time	BW at -6 dB	Maximum step size ^a	Minimum dwell time	BW at -6 dB	Step size ^a	Minimum dwell time
30 to 1,000	120 kHz	50 60 kHz	5 ms	120 kHz	50 60 kHz	1 s	120 kHz	50 kHz	5 ms

^a For purely broadband disturbances, the maximum frequency step size may be increased up to a value not greater than the bandwidth value."

Annex 4 – Appendix 1,

Figure 3b, Key 5, NOTE, amend to read:

"Figure 3b



Key

1 vehicle under test

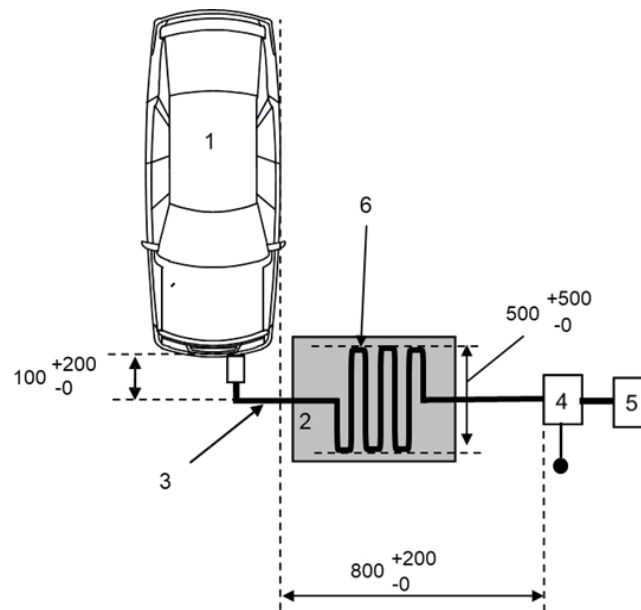
- 2 insulating support
- 3 charging cable (including EVSE for charging mode 2)
- 4 artificial mains network(s) grounded
- 5 power mains socket (~~see 7.3.2.2~~)
- 6 extraneous length Z-folded

NOTE: The cable between the AC mains and the AMN ~~need~~may not be aligned in the same direction as the cable between the AMN and the EV.

Example of test setup for vehicle with socket located front / rear of vehicle (charging mode 1 or 2, AC powered, without communication)."

Figure 3d, Key 5, NOTE, amend to read:

"Figure 3d



Key

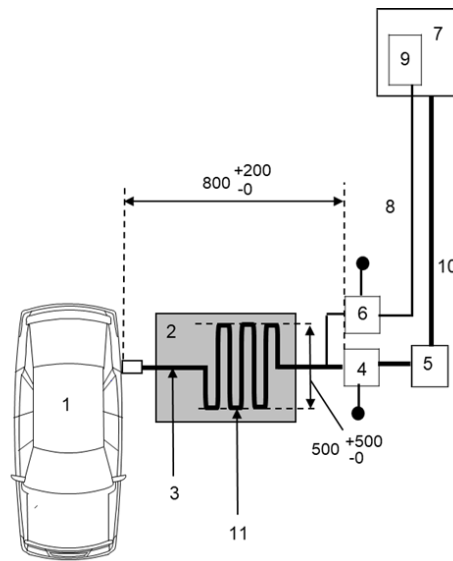
- 1 vehicle under test
- 2 insulating support
- 3 charging cable (including EVSE for charging mode 2)
- 4 artificial mains network(s) grounded
- 5 power mains socket (~~see 7.3.2.2~~)
- 6 extraneous length Z-folded

NOTE: The cable between the AC mains and the AMN ~~need~~may not be aligned in the same direction as the cable between the AMN and the EV.

Example of test setup for vehicle with socket located on vehicle side (charging mode 3 or mode 4, with communication)"

Figure 3f, Key 5, NOTE, amend to read:

"Figure 3f



Key

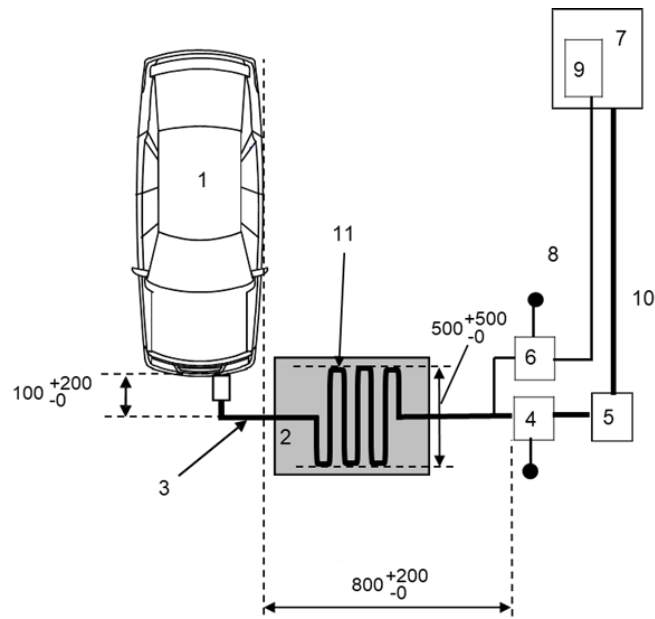
- 1 vehicle under test
- 2 insulating support
- 3 charging harness with communication lines
- 4 AMN(s) or DC-charging-AN(s), grounded
- 5 power mains / supply socket (optional, see 7.3.3.2)
- 6 AAN(s), grounded (optional, not represented in the front view)
- 7 charging station (can be emulated)
- 8 communication lines
- 9 communication module
- 10 power cable
- 11 extraneous length Z-folded

NOTE: The cable between the AC/DC mains/supply and the AMN/DC-charging-AN ~~need~~**may** not be aligned in **the** same direction as the cable between the AMN/DC-charging-AN and the EV.

Example of test setup for vehicle with socket located front / rear of vehicle (charging mode 3 or mode 4, with communication) "

Annex 4 – Appendix 1, Figure 3h, Key 5 and 11, NOTE, amend to read:

"Figure 3h



Key

- 1 vehicle under test
- 2 insulating support
- 3 charging harness with communication lines
- 4 AMN(s) or DC-charging-AN(s), grounded
- 5 power mains / supply socket (optional, see 7.3.3.2)
- 6 AAN(s), grounded (optional, not represented in the front view)
- 7 charging station (can be emulated)
- 8 communication lines
- 9 communication module
- 10 power cable
- 11 extraneous length Z-folded
- ±

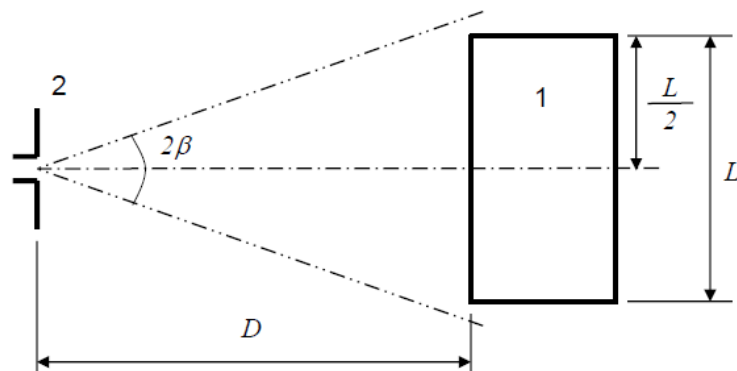
NOTE: The cable between the AC/DC mains/supply and the AMN/DC-charging-AN need may not be aligned in the same direction as the cable between the AMN/DC-charging-AN and the EV."

Figure 4, amend to read:

"Antenna position

Figure 4

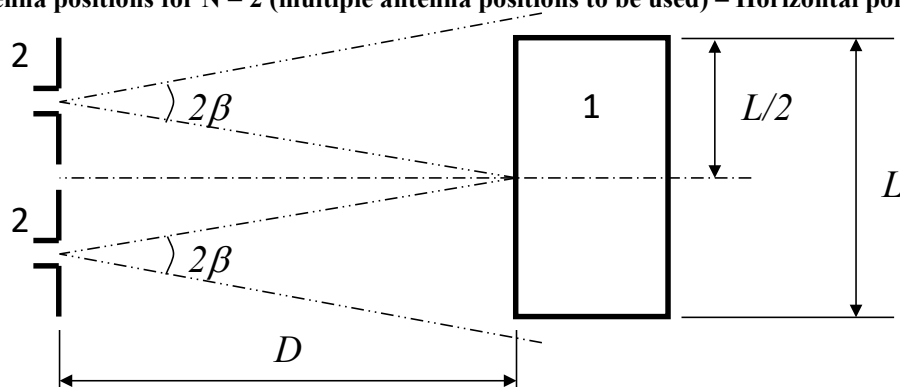
Antenna position for N = 1 (one antenna position to be used) – Horizontal polarization shown



1: ~~V~~vehicle under test;
2: ~~A~~antenna"

Figure 5, amend to read:

"Figure 5
Antenna positions for N = 2 (multiple antenna positions to be used) – Horizontal polarization shown



LegendKey:

1: ~~V~~vehicle under test;
2: ~~A~~antenna (two positions)-"

Annex 5,

Paragraph 1.2., amend to read:

"1.2. Test method
This test is intended to measure the narrowband electromagnetic emissions that may emanate from microprocessor-based systems or other narrowband source.
If not otherwise stated in this annex the test shall be performed according to CISPR 12 ~~or CISPR 25~~."

Paragraph 4.3., amend to read:

"4.3. The measurements shall be performed with a spectrum analyser or a scanning receiver. The parameters to be used are defined in Table 1 and Table 2.
Spectrum analysers and FFT-based instruments, that meet the requirements of CISPR 16-1-1, may be used for conformity measurements. FFT-based measuring instruments shall continuously record and evaluate the signal during the measurement time. If using FFT-based instruments, the minimum measurement time shall be 1 s per analysis frequency band (in real-time mode) of the FFT instrument.

Table 1
Spectrum analyser parameters

Frequency range MHz	Peak detector		Average detector	
	RBW at -3 dB	Minimum scan time	RBW at -3 dB	Minimum scan time
30 to 1,000	100/120 kHz	100 ms/MHz	100/120 kHz	100 ms/MHz

Note: If a spectrum analyser is used for peak measurements, the video bandwidth shall be at least three times the resolution bandwidth (RBW).

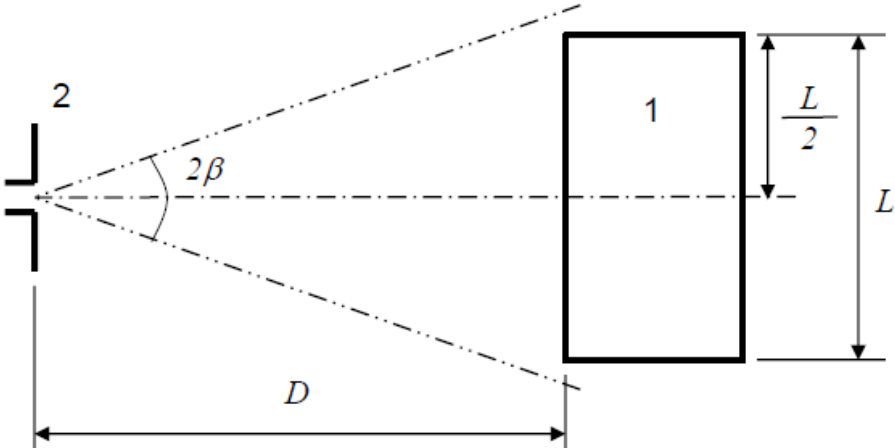
Table 2
Scanning receiver parameters

Frequency range MHz	Peak detector			Average detector		
	BW at -6 dB	Maximum step size	Minimum dwell time	BW at -6 dB	Maximum step size	Minimum dwell time
30 to 1,000	120 kHz	5060 kHz	5 ms	120 kHz	5060 kHz	5 ms

"

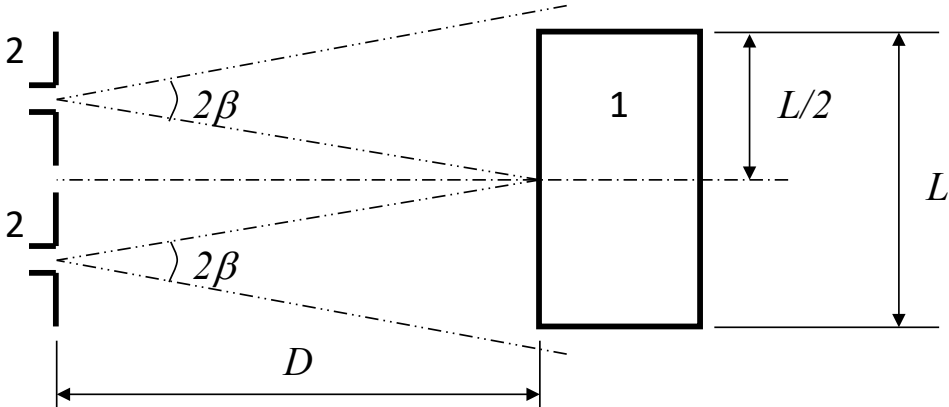
Annex 5, Appendix 1,
Figure 1, amend to read:
"Figure 1

Antenna position for N = 1 (one antenna position to be used) –
Horizontal polarization shown



LegendKey:
1: vehicle under test
2: Antenna"

Figure 2, amend to read:
"Figure 2
Antenna positions for N = 2 (multiple antenna positions to be used) –
Horizontal polarization shown



LegendKey
1: vehicle under test
2: Antenna (two positions)"

Annex 6,

Paragraph 1.3., amend to read:

"1.3. Alternative test methods

The test may be alternatively performed in an outdoor test site for all vehicles (including "large vehicles"). The test facility shall comply with (national) legal requirements regarding the emission of electromagnetic fields. The test shall be performed according to ISO 11451-2 in an OTS:

- with front irradiation for vehicle not considered as "large vehicles". **Rear irradiation is specified in paragraph 5.1.3.**

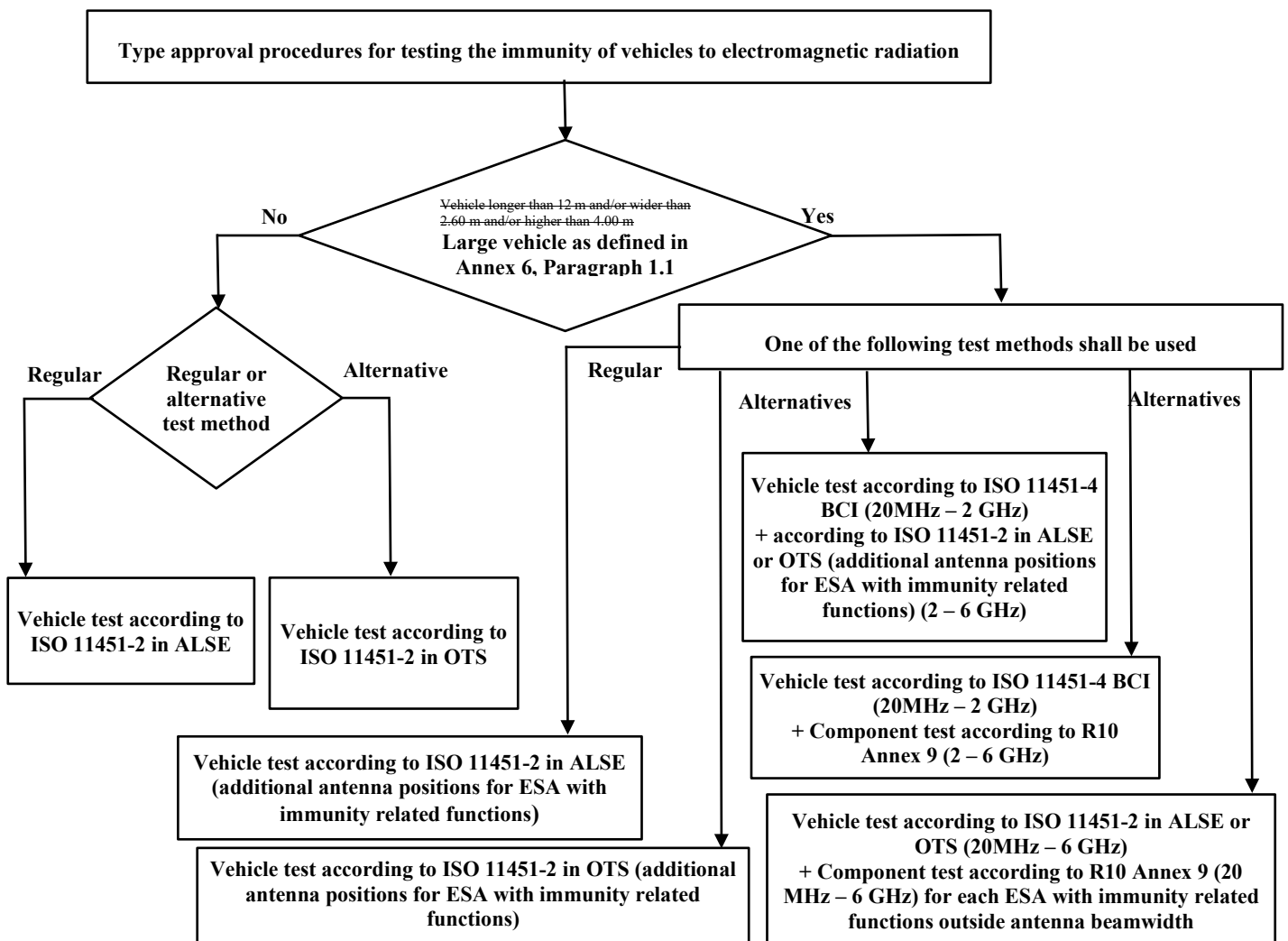
- with front irradiation and with additional antenna positions for "large vehicles". Additional antenna position(s) shall be chosen by the manufacturer in conjunction with the Type Approval Authority after considering the distribution of electronic systems with immunity related functions and the layout of any wiring harness. Tests shall be performed with levels defined in paragraph 6.4.2.1. of this Regulation. **For REESS charging mode, only the electronic systems and wiring harnesses required for charging mode shall be considered for antenna positions.**

..."

Paragraph 1.4., amend to read:

"1.4 Applicability of test methods:

Figure 1



Paragraph 2.1.1.2., amend to read:

" ...

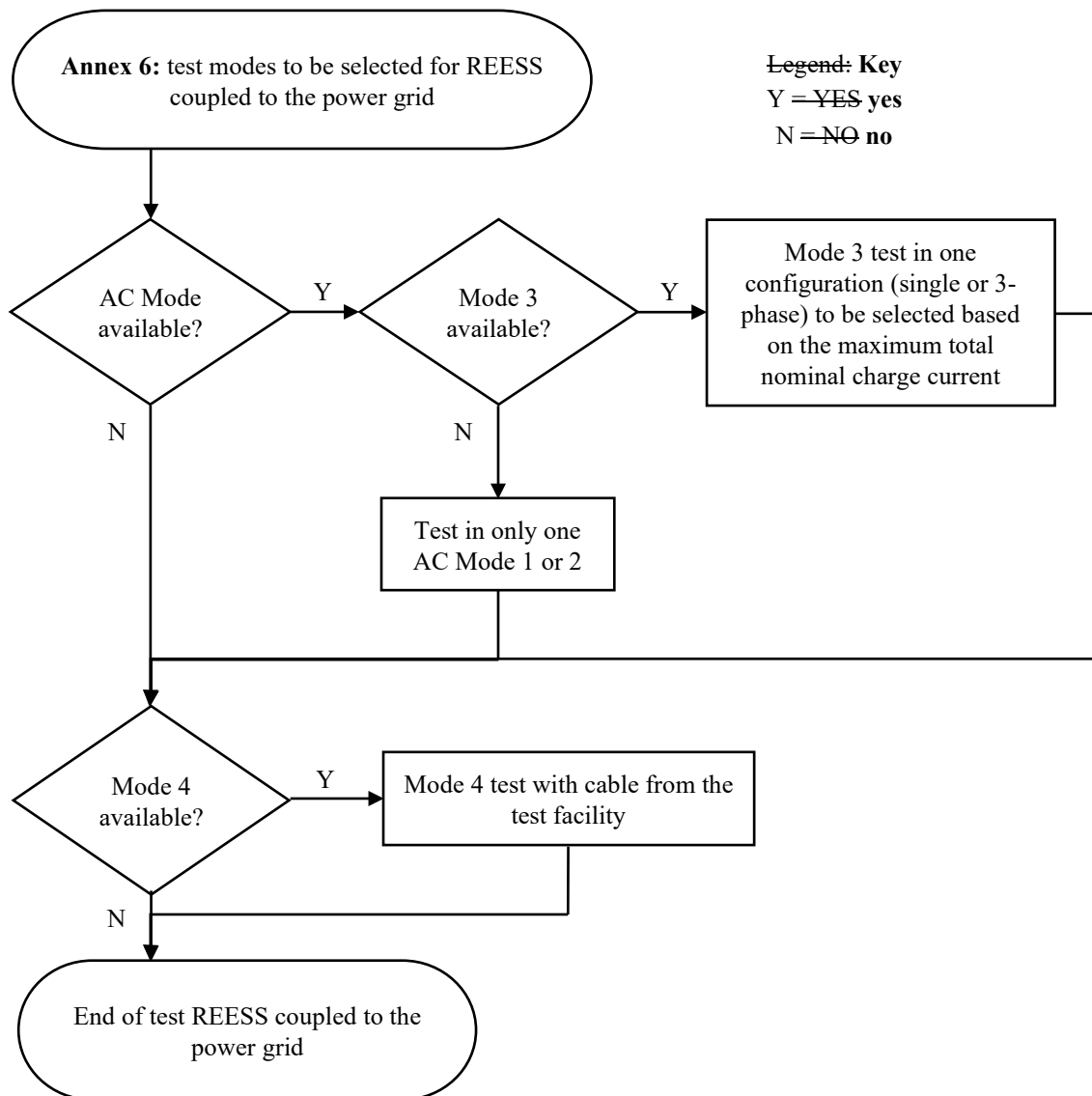
<i>"Brake mode" vehicle test conditions</i>	<i>Failure criteria</i>
Vehicle in a state that allows the braking system to operate normally, parking brake released, vehicle speed 0 km/h. Brake pedal depressed to activate the brake function and the stop lights without any dynamic cycle.	Stop lights inactivated during mode Brake warning light ON with loss of brake function.
Day running light (DRL) ON	DRL inactivated during mode
ADS shall be operational ⁽¹⁾	ADS failure situation ADS does not remain in a failure safe mode or expected failure operational mode
⁽¹⁾ : ADS are turned on by the driver but some or all ADS functions may revert to a mode where system is monitoring sensors but is not actively 'driving' the vehicle due to plausibility issues caused by the EMC laboratory environment.	

... "

Annex 6, Paragraph 2.2.1.1., Figure 2, amend to read:

"Figure 2

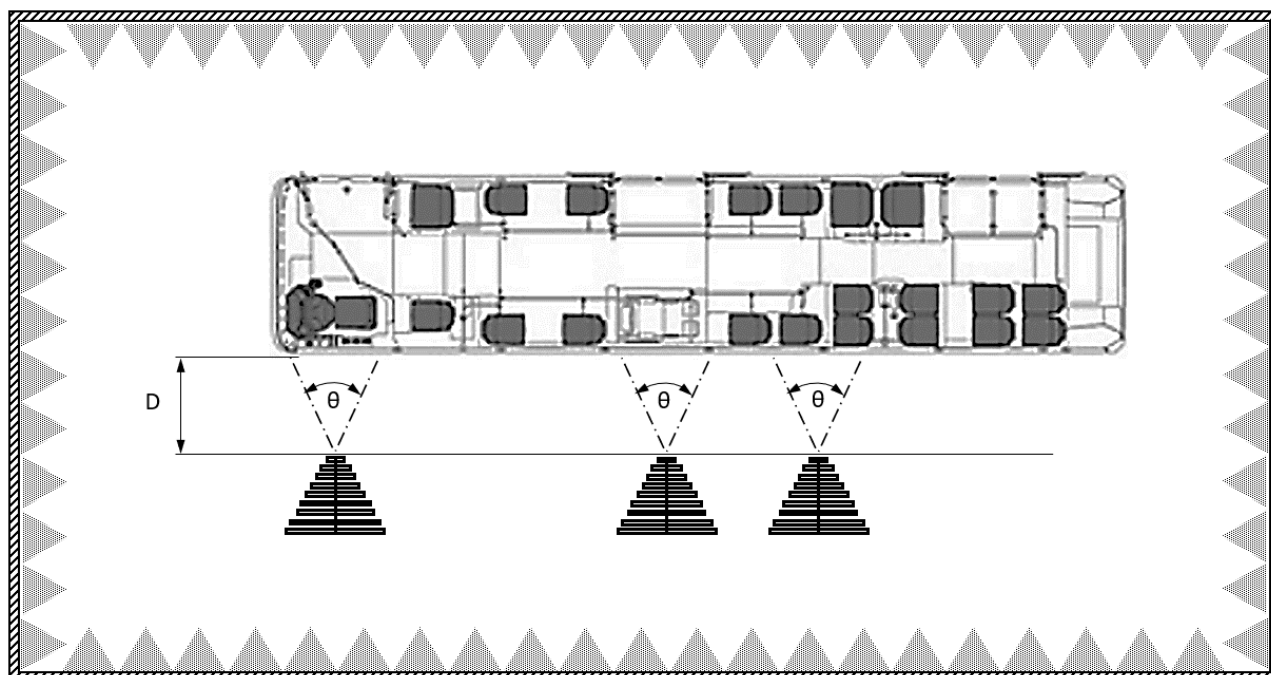
Charging mode configuration for Annex 6



"

Annex 6, Appendix 1, Figure 4., amend to read:

"Figure 4 - Example of a selection of antenna placements for lateral illumination of a large vehicle



Key

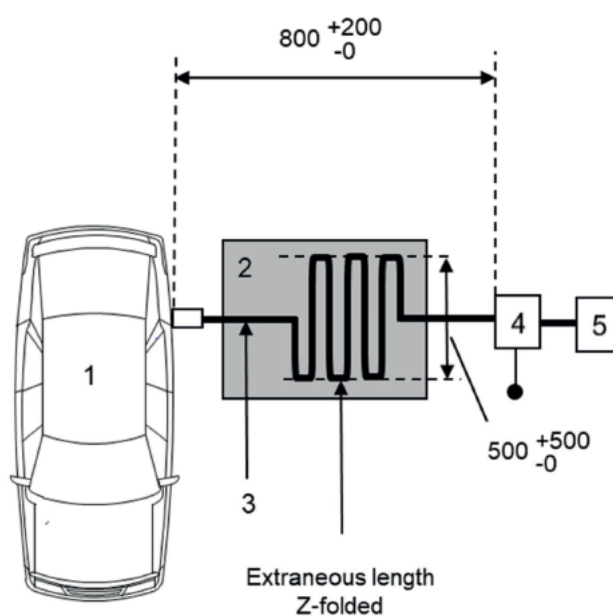
$\theta \div 3$ dB antenna beamwidth

D: the distance between the tip or phase centre of the antenna and the nearest part of the vehicle body without considering small extruding elements (such as side mirrors or fenders)

"

Annex 6, Appendix 1, Figure 5b, amend to read:

"Figure 5b



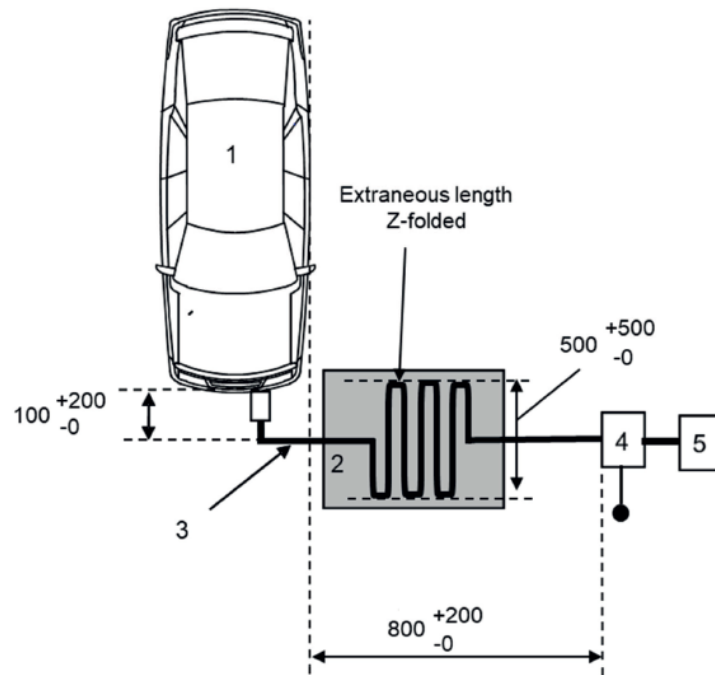
LegendKey:

- 1 ~~V~~vehicle under test
- 2 ~~I~~nsulating support
- 3 ~~C~~harging harness (including EVSE for charging mode 2)
- 4 AMN(s) or DC-charging-AN(s) grounded
- 5 ~~P~~power mains socket

NOTE: The cable between the AC mains and the AMN ~~need~~**may** not be aligned in the same direction as the cable between the AMN and the EV."

Annex 6, Appendix 1, Figure 5d, amend to read:

"Figure 5d



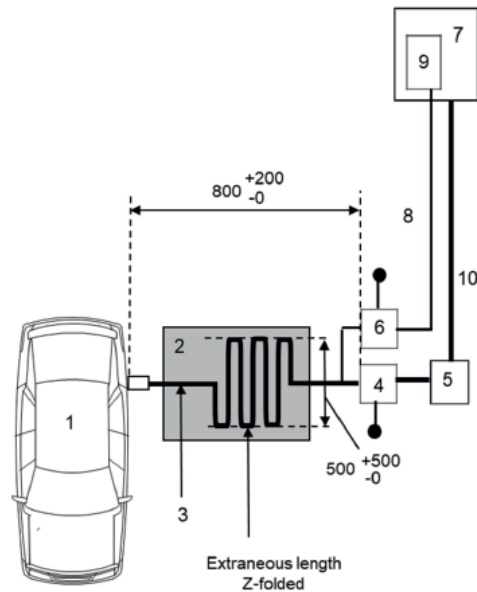
LegendKey:

- 1 ~~V~~vehicle under test
- 2 ~~I~~nsulating support
- 3 ~~C~~harging harness (including EVSE for charging mode 2)
- 4 AMN(s) or DC-charging-AN(s) grounded
- 5 ~~P~~power mains socket

NOTE : The cable between the AC mains and the AMN ~~need~~**may** not be aligned in the same direction as the cable between the AMN and the EV."

Annex 6, Appendix 1, Figure 5f, amend to read:

"Figure 5f



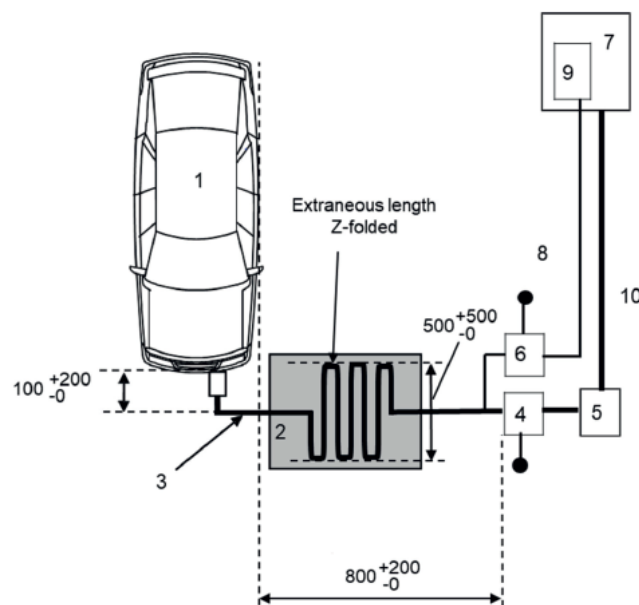
LegendKey:

- 1 vehicle under test
- 2 insulating support
- 3 charging harness with local/private communication lines
- 4 AMN(s) or DC-charging-AN(s) grounded
- 5 power mains socket
- 6 AAN(s) grounded (optional)
- 7 charging station
- 8 communication lines
- 9 communication module
- 10 power cable

NOTE: The cable between the AC/DC mains/supply and the AMN/DC-charging-AN ~~need~~ may not be aligned in the same direction as the cable between the AMN/DC-charging-AN and the EV."

Annex 6 – Appendix 1, Figure 5h, amend to read:

"Figure 5h



Key

- 1 vehicle under test

- 2 insulating support
- 3 charging harness with communication lines
- 4 AMN(s) or DC-charging-AN(s), grounded
- 5 power mains / supply socket (optional, ~~see 7.3.3.2~~)
- 6 AAN(s) grounded (optional, not represented in the front view)
- 7 charging station (can be emulated)
- 8 communication lines
- 9 communication module
- 10 power cable

NOTE: The cable between the AC/DC mains/supply and the AMN/DC-charging-AN ~~need~~**may** not be aligned in the same direction as the cable between the AMN/DC-charging-AN and the EV."

Annex 7, Paragraph 4.3., amend to read:

"4.3. The measurements shall be performed with a spectrum analyser or a scanning receiver. The parameters to be used are defined in Table 1 and Table 2.

Spectrum analysers and FFT-based instruments, that meet the requirements of CISPR 16-1-1, may be used for conformity measurements. FFT-based measuring instruments shall continuously record and evaluate the signal during the measurement time. If using FFT-based instruments, the minimum measurement time shall be 1 s per analysis frequency band (in real-time mode) of the FFT instrument.

Table 1
Spectrum analyser parameters

Frequency range MHz	Peak detector		Quasi-peak detector		Average detector	
	RBW at -3 dB	Minimum scan time	RBW at -6 dB	Minimum scan time	RBW at -3 dB	Minimum scan time
30 to 1,000	100/120 kHz	100 ms/MHz	120 kHz	20 s/MHz	100/120 kHz	100 ms/MHz

Note: If a spectrum analyser is used for peak measurements, the video bandwidth shall be at least three times the resolution bandwidth (RBW)."

Table 2
Scanning receiver parameters

Frequency range MHz	Peak detector			Quasi-peak detector			Average detector		
	BW at -6 dB	Maximum step size ^a	Minimum dwell time	BW at -6 dB	Maximum step size ^a	Minimum dwell time	BW at -6 dB	Step size ^a	Minimum dwell time
30 to 1,000	120 kHz	50 60 kHz	5 ms	120 kHz	50 60 kHz	1 s	120 kHz	50 kHz	5 ms

^a For purely broadband disturbances, the maximum frequency step size may be increased up to a value not greater than the bandwidth value.

Note: For emissions generated by brush commutator motors without an electronic control unit, the maximum step size may be increased up to five times the bandwidth."

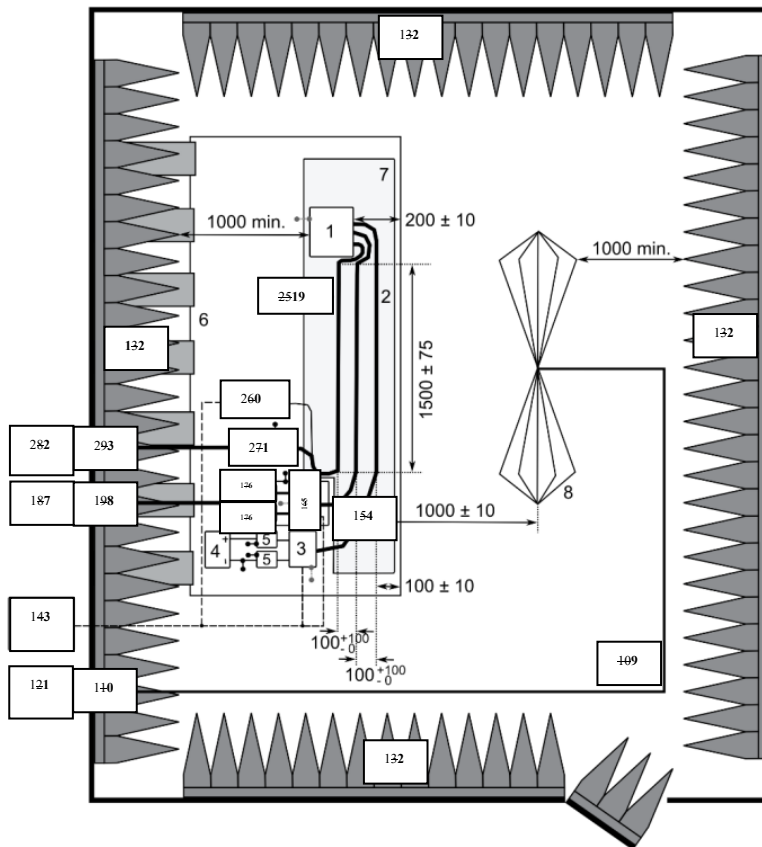
Annex 7, Appendix 1, Figure 2, amend to read:

"Figure 2

Test configuration for ESAs involved in "REESS charging mode coupled to the power grid" (example for biconical antenna)

Dimensions in millimetres

Top view (horizontal polarization)



LegendKey:

- | | |
|---|---|
| 1 ESA (grounded locally if required in test plan) | 132 RF absorber material |
| 2 LV Test harness | 143 Sstimulation and monitoring system |
| 3 LV Load simulator (placement and ground connection according to CISPR 25 paragraph 6.4.2.5) | 154 HV harness |
| 4 Ppower supply (location optional) | 165 HV load simulator |
| 5 LV Artificial network (AN) | 176 HV AN |
| 6 Gground plane (bonded to shielded enclosure) | 187 HV power supply |
| 7 Hlow relative permittivity support ($\epsilon_r \leq 1.4$) | 198 HV feed-through |
| 8 Bbiconical antenna | 2519 AC/DC charger harness |
| 499 HbHigh-quality coaxial cable e.g. double-shielded (50 Ω) | 260 AC/DC load simulator (e.g. Programmable Logic Controller (PLC)) |
| 140 Bbulkhead connector | 271 AMN(s) or DC-charging-AN(s) |
| 121 Mmeasuring instrument | 282 AC/DC power supply |
| | 293 AC/DC feed-through" |

Annex 8, Paragraph 4.3., amend to read:

"4.3. The measurements shall be performed with a spectrum analyser or a scanning receiver. The parameters to be used are defined in Tables 1 and 2.

Spectrum analysers and FFT-based instruments, that meet the requirements of CISPR 16-1-1, may be used for conformity measurements. FFT-based measuring instruments shall continuously record and evaluate the signal during the measurement time. If using FFT-based instruments, the minimum measurement time shall be 1 s per analysis frequency band (in real-time mode) of the FFT instrument.

Table 1
Spectrum analyser parameters

Frequency range MHz	Peak detector		Average detector	
	RBW at -3 dB	Minimum scan time	RBW at -3 dB	Minimum scan time
30 to 1,000	100/120 kHz	100 ms/MHz	100/120 kHz	100 ms/MHz

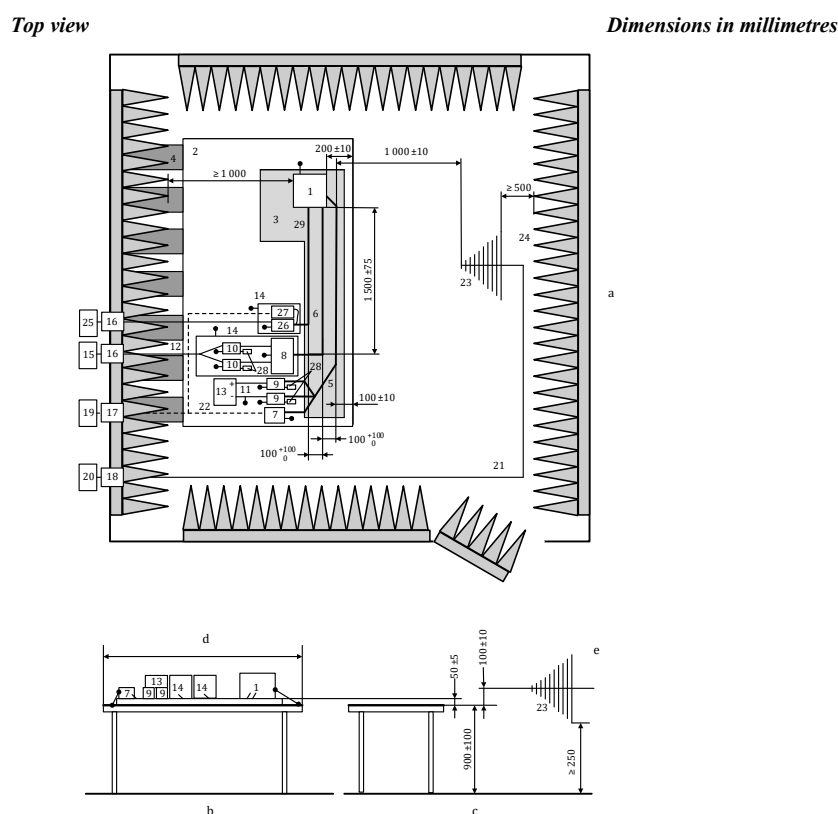
Note: If a spectrum analyser is used for peak measurements, the video band width shall be at least three times the resolution band width (RBW)

Table 2
Scanning receiver parameters

Frequency range MHz	Peak detector			Average detector		
	<i>BW at -6 dB</i>	<i>Maximum Sstep size</i>	<i>Minimum dwell time</i>	<i>BW at -6 dB</i>	<i>Maximum Sstep size</i>	<i>Minimum dwell time</i>
30 to 1,000	120 kHz	50 60 kHz	5 ms	120 kHz	50 60 kHz	5 ms

Annex 9, Appendix 23, Figure 1, amend to read:

"Figure 1
Example of test set-up for log-periodic antenna



KeyLegend:

- | | | | |
|---|--|----|--|
| 1 | ESA (grounded locally if required in test plan) | 16 | power line filter |
| 2 | ground plane | 17 | fibre optic feed through |
| 3 | low relative permittivity support ($\epsilon_r \leq 1.4$); thickness 50 mm | 18 | bulk head connector |
| 4 | ground straps | 19 | stimulating and monitoring system |
| 5 | LV harness | 20 | RF signal generator and amplifier |
| 6 | HV lines (HV+, HV-) | 21 | high quality coaxial cable e.g. double shielded (50 Ω) |
| 7 | LV load simulator | 22 | optical fibre |

- | | | | |
|----|--|----|----------------------------|
| 8 | impedance matching network (optional) | 23 | log-periodic antenna |
| 9 | LV AN | 24 | RF absorber material |
| 10 | HV AN | 25 | AC power mains |
| 11 | LV supply lines | 26 | AMN for AC power mains |
| 12 | HV supply lines | 27 | AC charging load simulator |
| 13 | LV power supply 12 V / 24 V / 48 V (placed on the bench) | 28 | 50 Ω load |
| 14 | additional shielded box (optional) | 29 | AC lines |
| 15 | HV power supply (should be shielded if placed inside ALSE) | | |

"

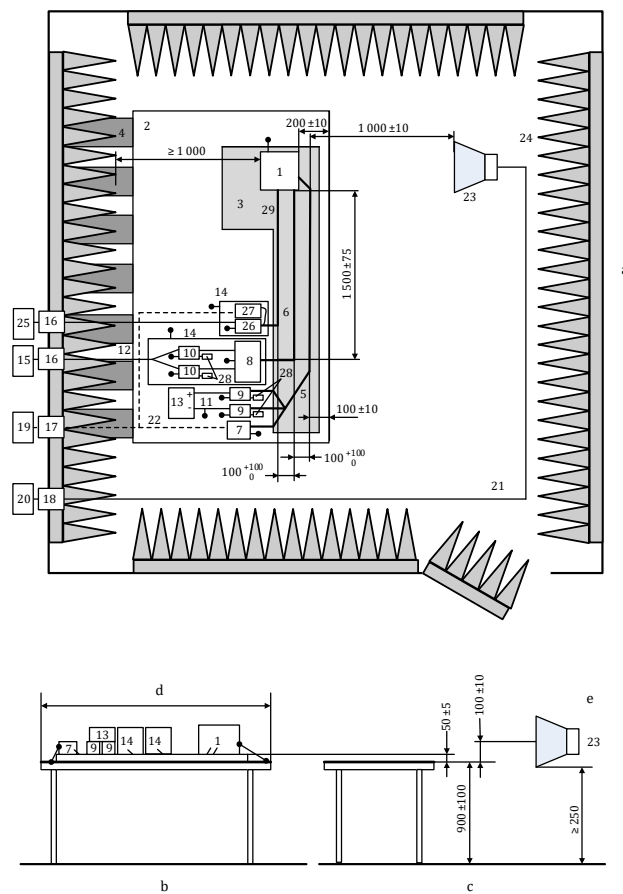
Annex 9, Appendix 23, Figure 2, amend to read:

"Figure 2

Example of test set-up for horn antenna

Top view

Dimensions in millimetres



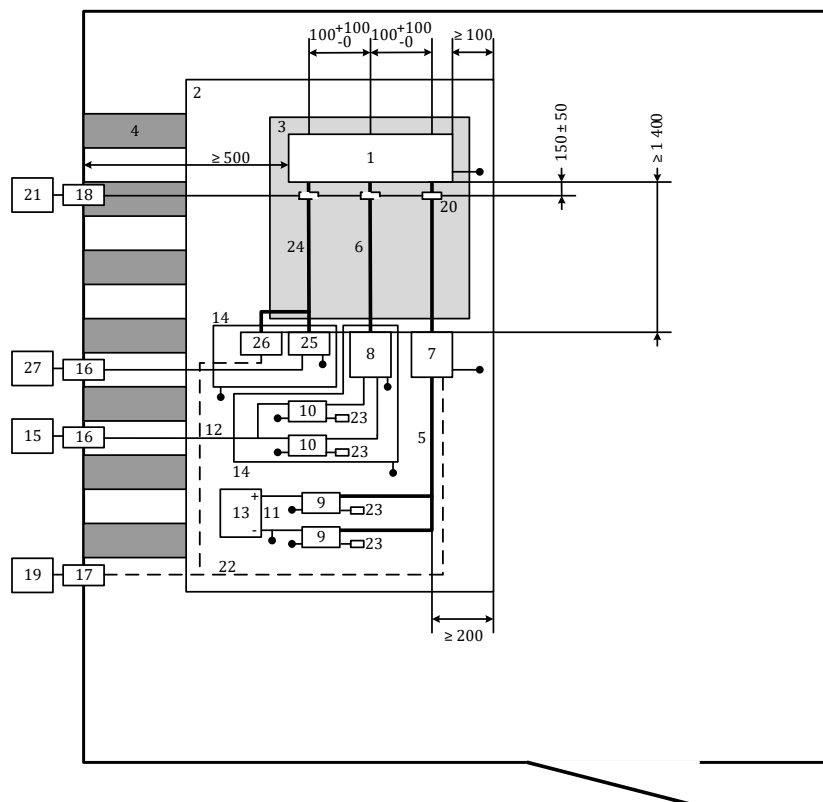
KeyLegend:

- | | | | |
|----|--|----|--|
| 1 | ESA (grounded locally if required in test plan) | 16 | power line filter |
| 2 | ground plane | 17 | fibre optic feed through |
| 3 | low relative permittivity support ($\epsilon_r \leq 1.4$); thickness 50 mm | 18 | bulk head connector |
| 4 | ground straps | 19 | stimulating and monitoring system |
| 5 | LV harness | 20 | RF signal generator and amplifier |
| 6 | HV lines (HV+, HV-) | 21 | high quality coaxial cable e.g. double shielded (50 Ω) |
| 7 | LV load simulator | 22 | optical fibre |
| 8 | impedance matching network (optional) | 23 | horn antenna |
| 9 | LV AN | 24 | RF absorber material |
| 10 | HV AN | 25 | AC power mains |
| 11 | LV supply lines | 26 | AMN for AC power mains |
| 12 | HV supply lines | 27 | AC charging load simulator |
| 13 | LV power supply 12 V / 24 V / 48 V (placed on the bench) | 28 | 50 Ω load |
| 14 | additional shielded box (optional) | 29 | AC lines |
| 15 | HV power supply (should be shielded if placed inside ALSE) | | |

Annex 9, Appendix 34, Figure 1, amend to read:

"Figure 1

Example of test set-up for substitution method - Injection on LV (or HV or AC) lines for ESAs with shielded power supply systems and inverter/charger device (dimensions in millimetres)



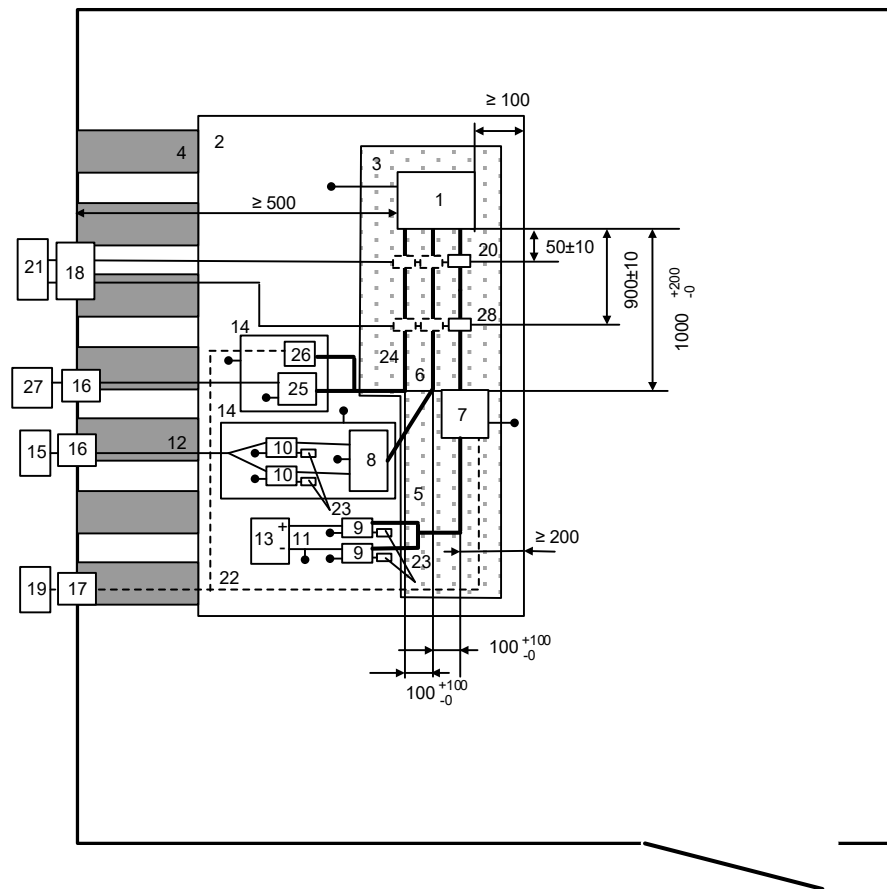
KeyLegend:

- | | | | |
|----|--|----|--|
| 1 | ESA | 14 | additional shielded box |
| 2 | ground plane | 15 | HV power supply (should be shielded if placed inside ALSE) |
| 3 | low relative permittivity support ($\epsilon_r \leq 1,4$); thickness 50 mm | 16 | power line filter |
| 4 | ground straps | 17 | fibre optic feed through |
| 5 | LV harness | 18 | bulk head connector |
| 6 | HV lines (HV+, HV-) | 19 | stimulating and monitoring system |
| 7 | LV load simulator | 20 | injection probe |
| 8 | impedance matching network (optional) (see ISO 11452-1) | 21 | high frequency equipment (generator and amplifier) |
| 9 | LV AN | 22 | optical fibre |
| 10 | HV AN | 23 | 50 Ω load |
| 11 | LV supply lines | 24 | AC lines |
| 12 | HV supply lines | 25 | AMN for AC power mains |
| 13 | LV power supply 12 V / 24 V / 48 V (should be placed on the bench) | 26 | AC charging load simulator |
| | | 27 | AC power mains |

Annex 9, Appendix 34, Figure 2, amend to read:

"Figure 2

Example of test set-up for closed loop method - Injection on LV (or HV or AC) lines for ESAs with shielded power supply systems and inverter/charger device (dimensions in millimetres)



KeyLegend:

- | | | | |
|----|--|----|---|
| 1 | ESA | 15 | HV power supply (should be shielded if placed inside ALSE) |
| 2 | ground plane | 16 | power line filter |
| 3 | low relative permittivity support ($\epsilon_r \leq 1,4$); thickness 50 mm | 17 | fibre optic feed through |
| 4 | ground straps | 18 | bulk head connector |
| 5 | LV harness | 19 | stimulating and monitoring system |
| 6 | HV lines (HV+, HV-) | 20 | measuring probe |
| 7 | LV load simulator | 21 | high frequency equipment (generator, amplifier and spectrum analyser) |
| 8 | impedance matching network (optional) (see ISO 11452-1) | 22 | optical fibre |
| 9 | LV AN | 23 | 50 Ω load |
| 10 | HV AN | 24 | AC lines |
| 11 | LV supply lines | 25 | AMN for AC power mains |
| 12 | HV supply lines | 26 | AC charging load simulator |
| 13 | LV power supply 12 V / 24 V / 48 V (should be placed on the bench) | 27 | AC power mains |
| 14 | additional shielded box | 28 | injection probe |

Annex 10, paragraphs 2. And 3., amend to read:

"2. Immunity against transient disturbances conducted along 12/24 V supply lines.

Apply the test pulses 1, 2a, 2b, 3a and 3b according to the International Standard ISO 7637-2:**2011** to the supply lines as well as to other connections of ESAs which may be operationally connected to supply lines.

Apply the test pulses 4 according to the International Standard ISO 7637-2:**2004** to the supply lines as well as to other connections of ESAs which may be operationally connected to supply lines.

ESAs that are exclusively reserved for mounting on electric vehicles (vehicles without 12V/24V starter motor) are not subject to pulse 4.

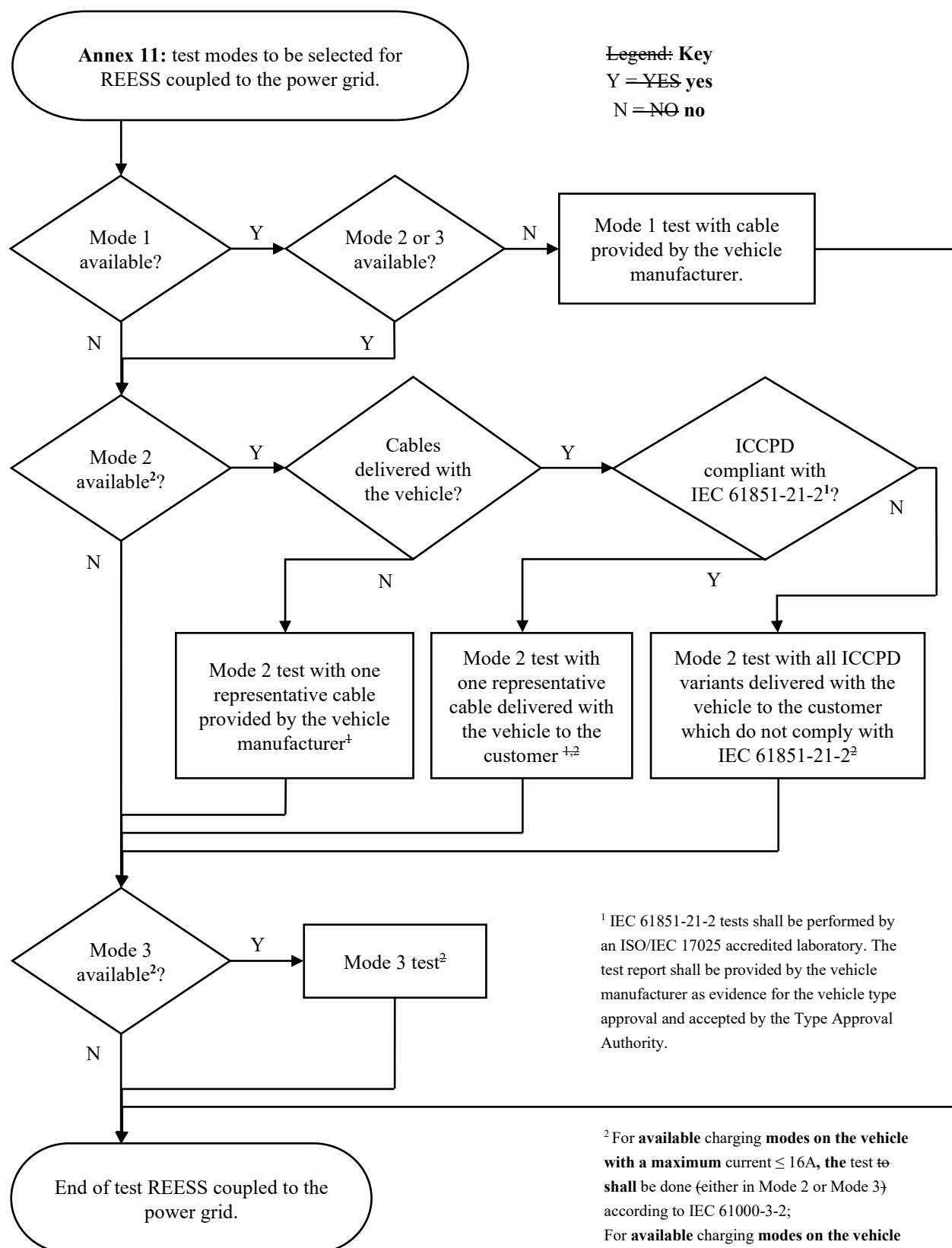
3. Emission of transient conducted disturbances generated by ESAs on 12/24 V supply lines.

Measurement according to the International Standard ISO 7637-2:**2011** on supply lines as well as to other connections of ESAs which may be operationally connected to supply lines. "

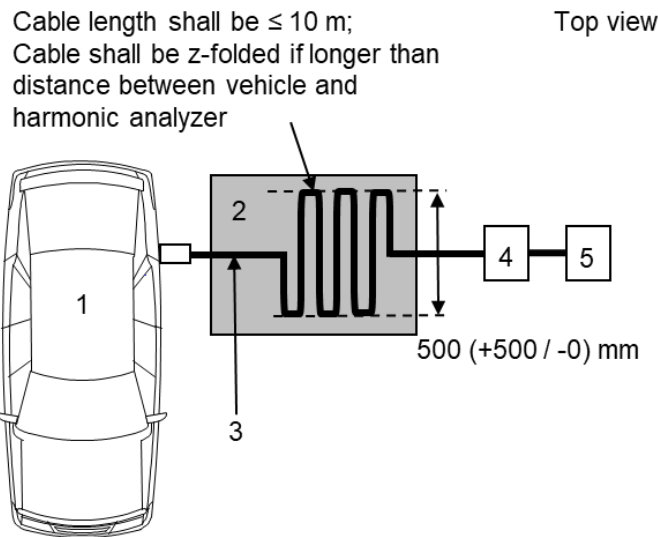
Annex 11, Paragraph 2.1., Figure 1, amend to read:

"Figure 1

Charging mode configuration for Annex 11



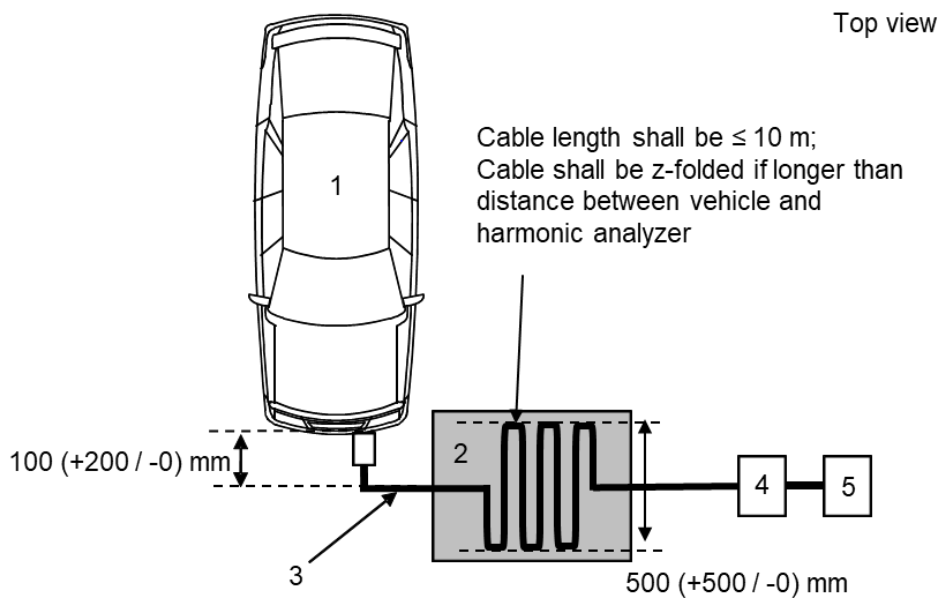
Annex 11, Appendix 1, Figure 1b, amend to read:
 "Figure 1b



LegendKey:
 1 vehicle under test
 2 insulating support
 3 charging harness
 4 harmonic analyzer
 5 power supply"

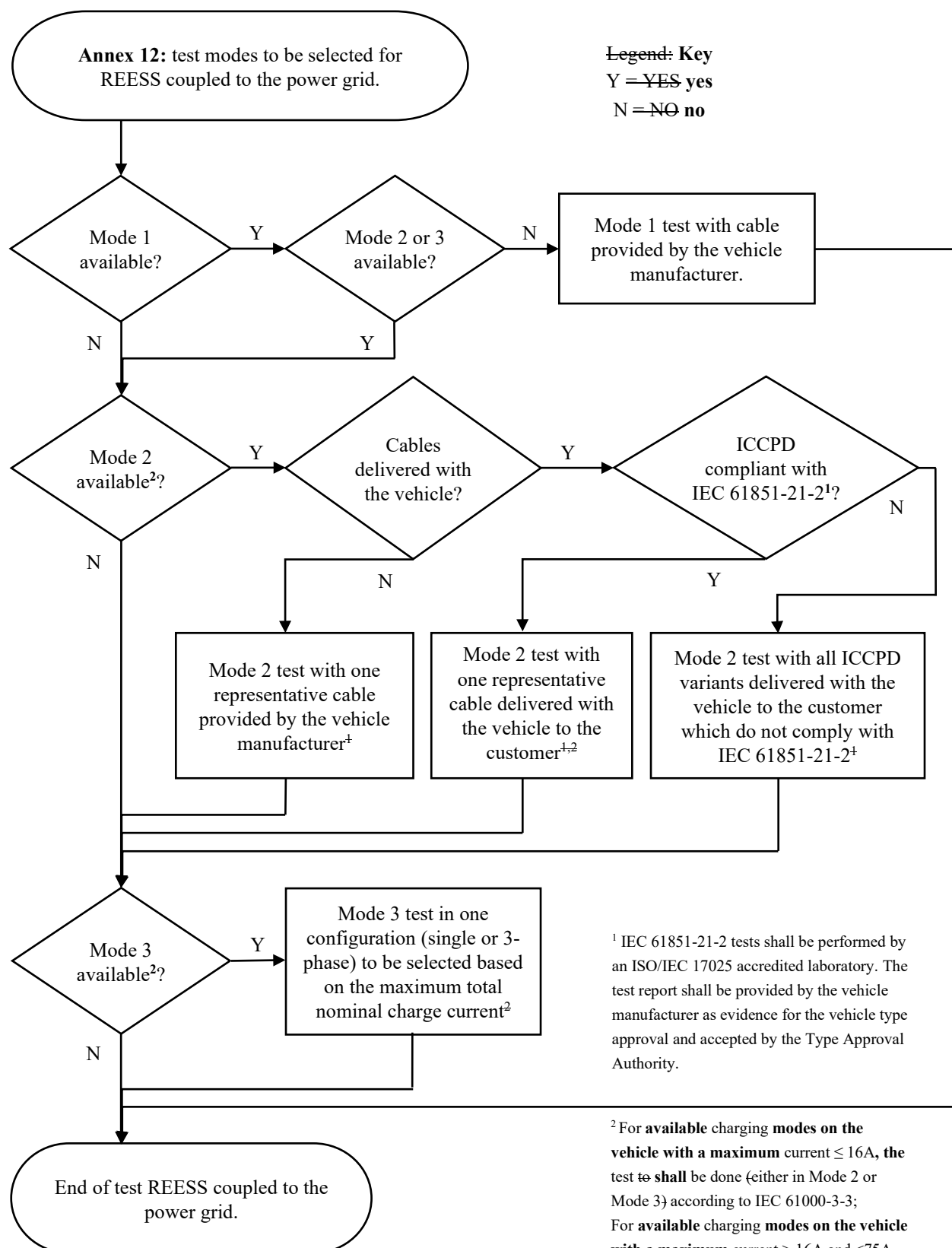
Annex 11, Appendix 1, Figure 1d, amend to read:

"Figure 1d



LegendKey:
 1 vehicle under test
 2 insulating support
 3 charging harness
 4 harmonic analyzer
 5 power supply"

"Figure 1
Charging mode configuration for Annex 12

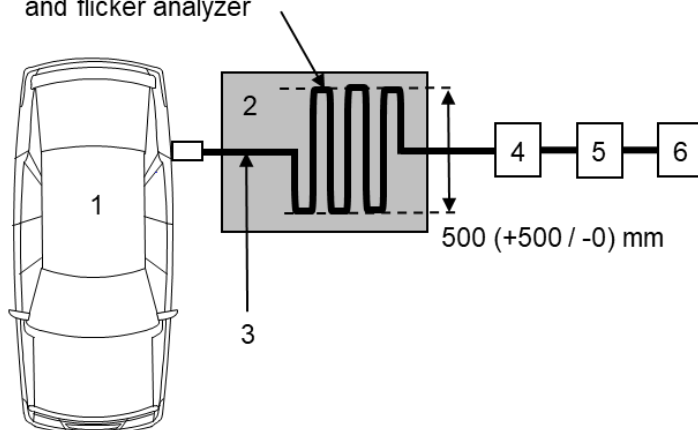


Annex 12, Appendix 1, Figure 1b, amend to read:

"Figure 1b

Cable length shall be ≤ 10 m;
Cable shall be z-folded if longer
than distance between vehicle
and flicker analyzer

Top view



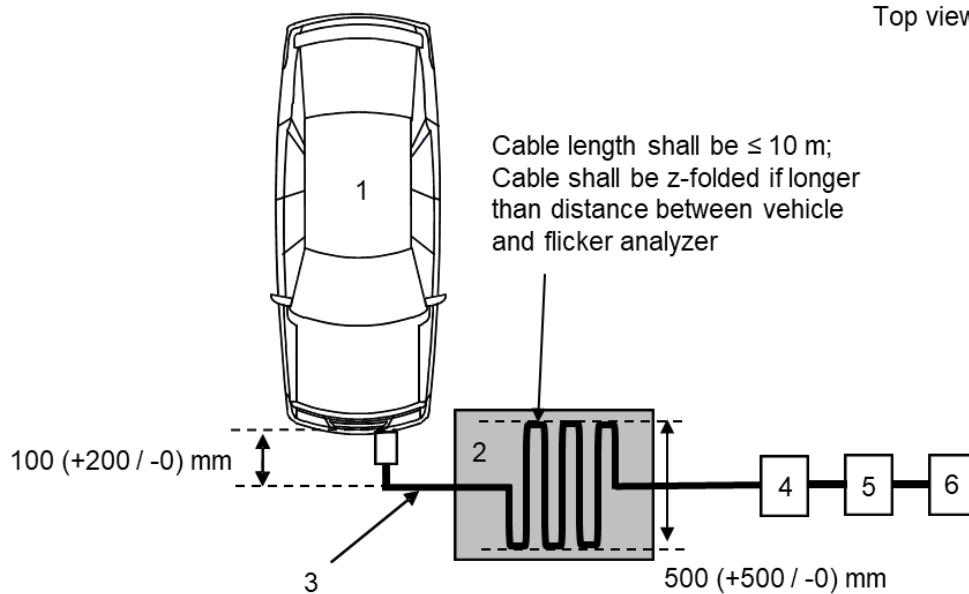
LegendKey:

- 1 vehicle under test
- 2 insulating support
- 3 charging harness
- 4 flicker analyzer
- 5 impedance simulator
- 6 power supply"

Annex 12, Appendix 1, Figure 1d, amend to read:

"Figure 1d

Top view



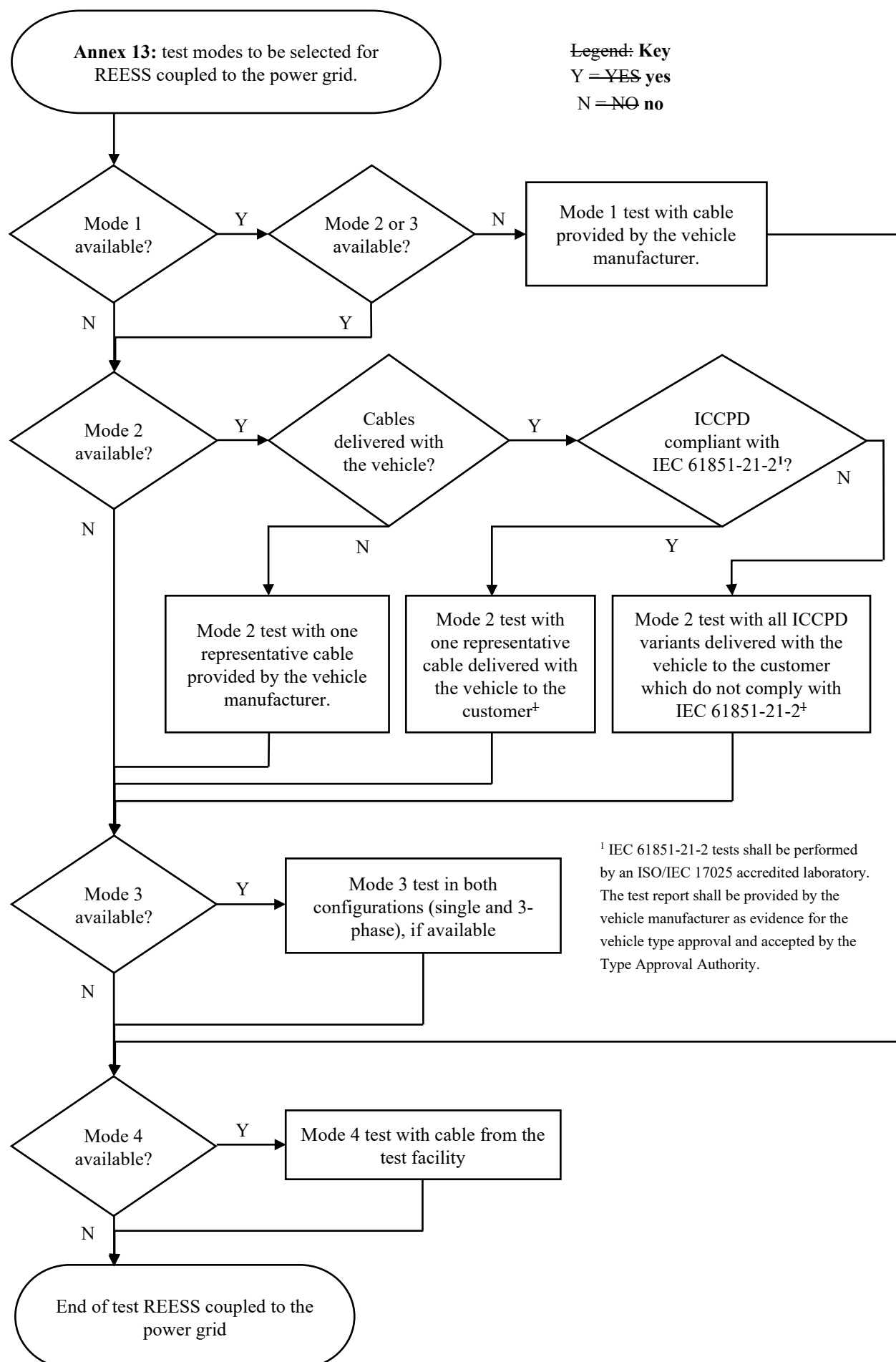
LegendKey:

- 1 vehicle under test
- 2 insulating support
- 3 charging harness
- 4 flicker analyzer
- 5 impedance simulator
- 6 power supply"

Annex 13, Paragraph 2.1., Figure 1, amend to read:

"Figure 1

Charging mode configuration for Annex 13



1

"3.5.

Spectrum analysers and FFT-based instruments, that meet the requirements of CISPR 16-1-1, may be used for conformity measurements. FFT-based measuring instruments shall continuously record and evaluate the signal during the measurement time. If using FFT-based instruments, the minimum measurement time shall be 1 s per analysis frequency band (in real-time mode) of the FFT instrument.

Table 1

Frequency range MHz	Peak detector		Quasi-peak detector		Average detector	
	RBW at -3 dB	Minimum scan time	RBW at -6 dB	Minimum scan time	RBW at -3 dB	Minimum scan time
0.15 to 30	9/10 kHz	10 s/MHz	9 kHz	200 s/MHz	9/10 kHz	10 s/MHz

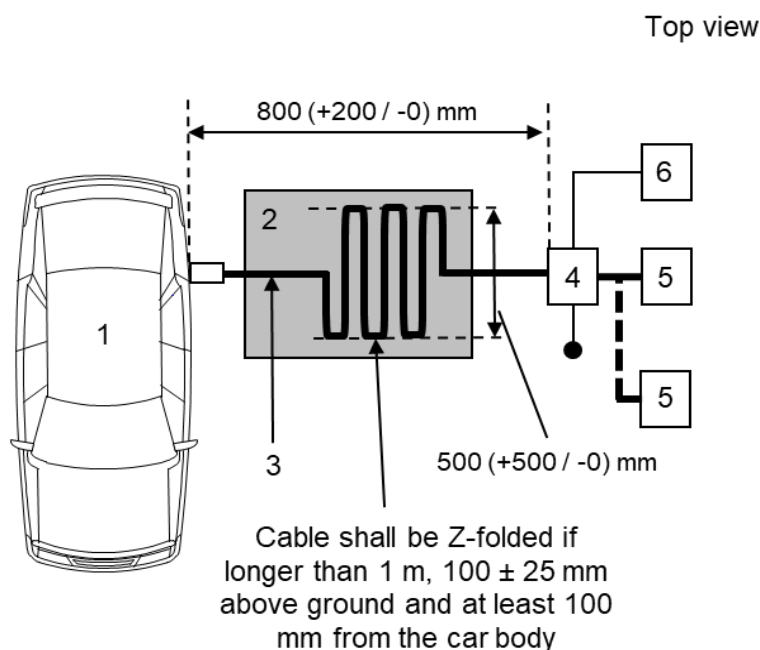
Note: If a spectrum analyser is used for peak measurements, the video bandwidth shall be at least three times the resolution bandwidth (RBW)."

Table 2

Frequency range MHz	Peak detector			Quasi-peak detector			Average detector		
	<i>BW at -6 dB</i>	<i>Maximu m Step size</i>	<i>Minimu m dwell time</i>	<i>BW at -6 dB</i>	<i>Maximu m Step size</i>	<i>Minimu m dwell time</i>	<i>BW at -6 dB</i>	<i>Maximu m Step size</i>	<i>Minimum dwell time</i>
0.15 to 30	9 kHz	5 kHz	50 ms	9 kHz	5 kHz	1 s	9 kHz	5 kHz	50 ms

1

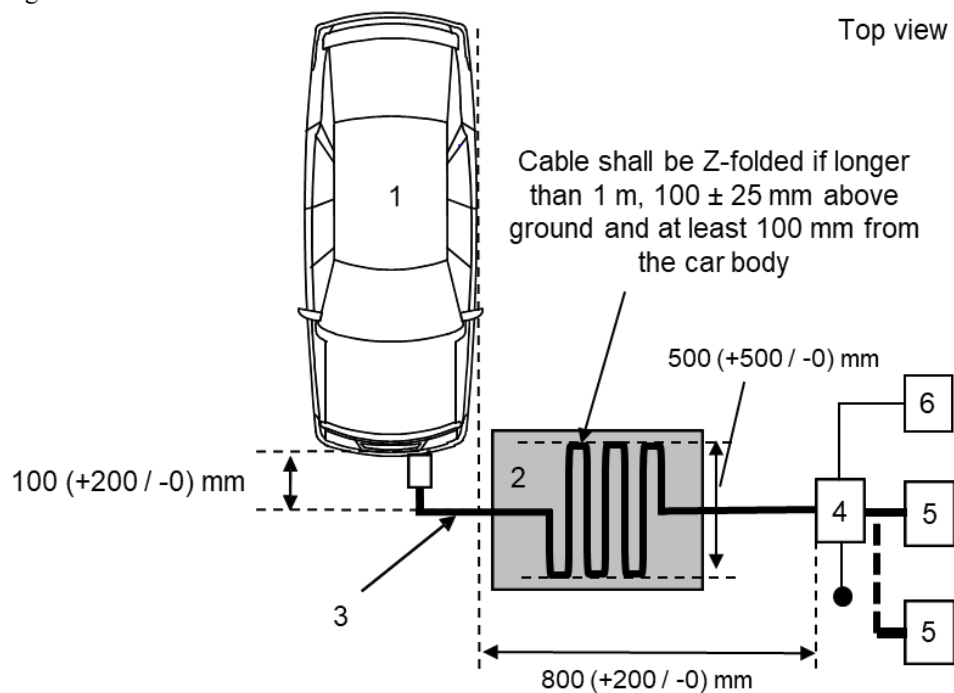
"Figure1b



LegendKey:

- 1 ~~V~~vehicle under test
- 2 ~~I~~nsulating support
- 3 ~~C~~harging harness
- 4 AMN(s) or DC-charging-AN(s) grounded
- 5 ~~P~~power mains socket
- 6 ~~M~~measuring receiver"

Annex 13, Appendix 1, Figure 1d, amend to read:
"Figure 1d



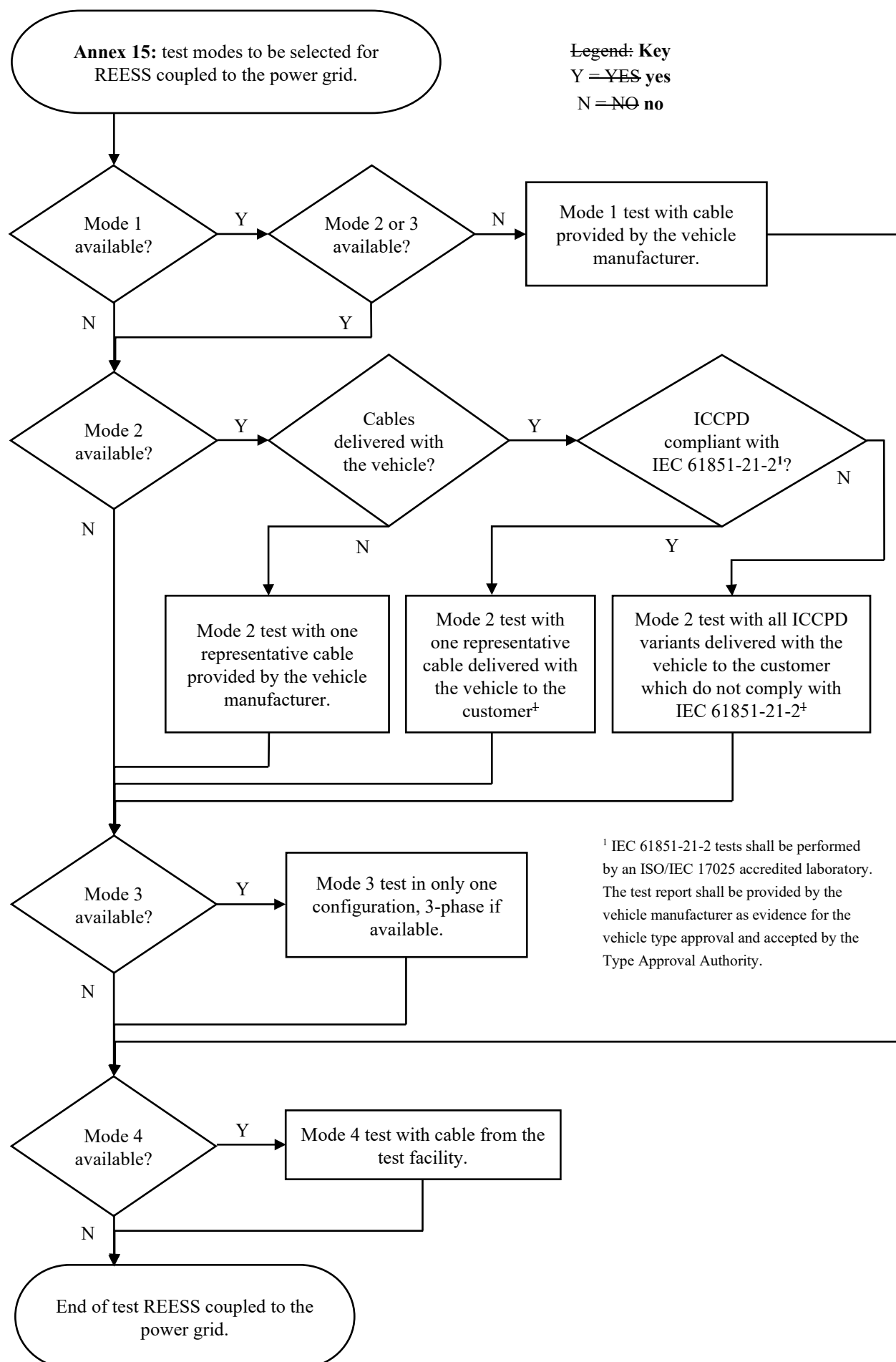
LegendKey:

- 1 ~~V~~vehicle under test
- 2 ~~I~~nsulating support
- 3 ~~C~~harging harness
- 4 AMN(s) or DC-charging-AN(s) grounded
- 5 ~~P~~power mains socket
- 6 ~~M~~measuring receiver"

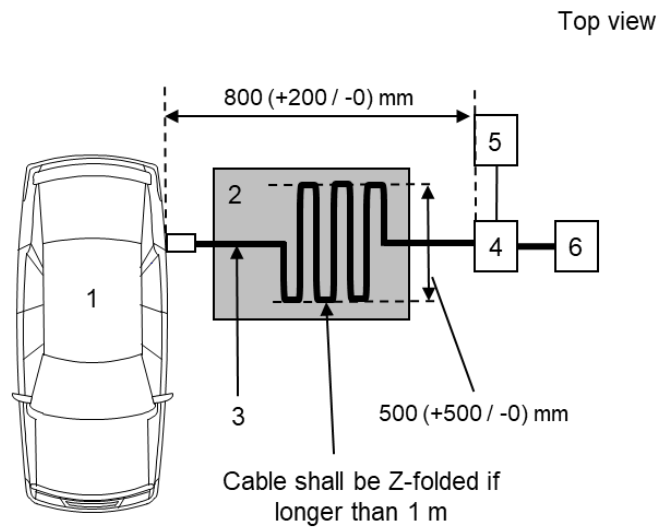
Annex 15, Paragraph 2., Figure 1, amend to read:

"Figure 1

Charging mode configuration for Annex 15

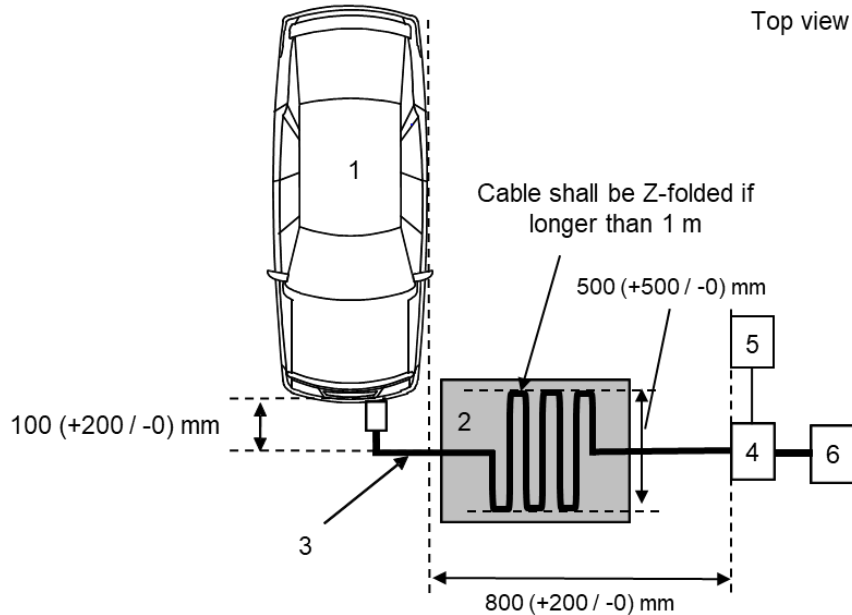


Annex 15, Appendix 1, Figure 1b, amend to read:
 "Figure 1b



LegendKey:
 1 Vehicle under test
 2 Insulating support
 3 Charging harness
 4 CDN
 5 Fast Transients / Burst generator
 6 Power supply"

Annex 15, Appendix 1, Figure 1d, amend to read:
 "Figure 1d

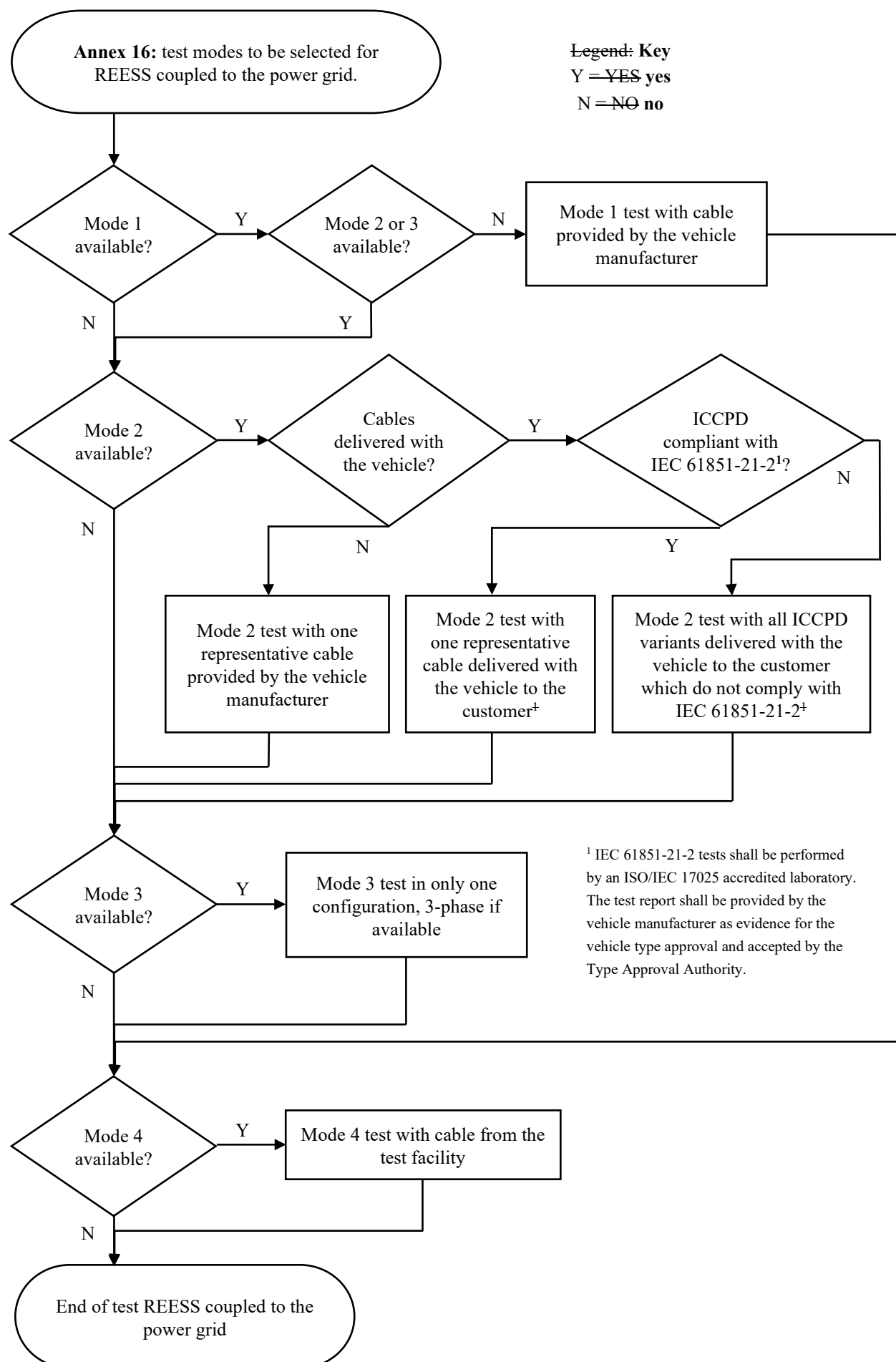


LegendKey:
 1 Vehicle under test
 2 Insulating support
 3 Charging harness
 4 CDN
 5 Fast Transients / Burst generator
 6 Power supply"

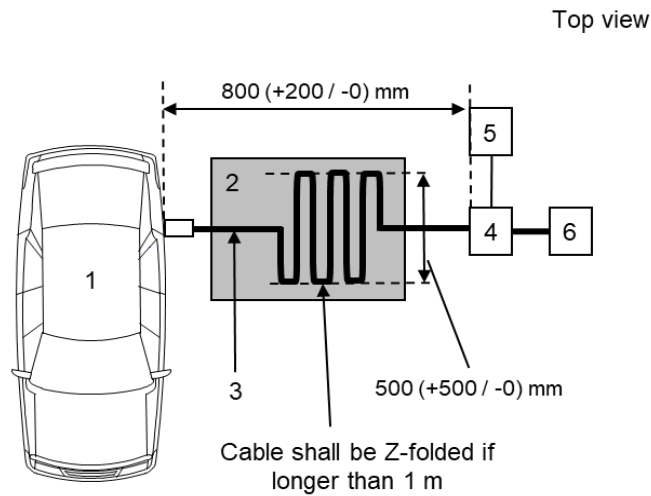
Annex 16, Paragraph 2., Figure 1, amend to read:

"Figure 1

Charging mode configuration for Annex 16

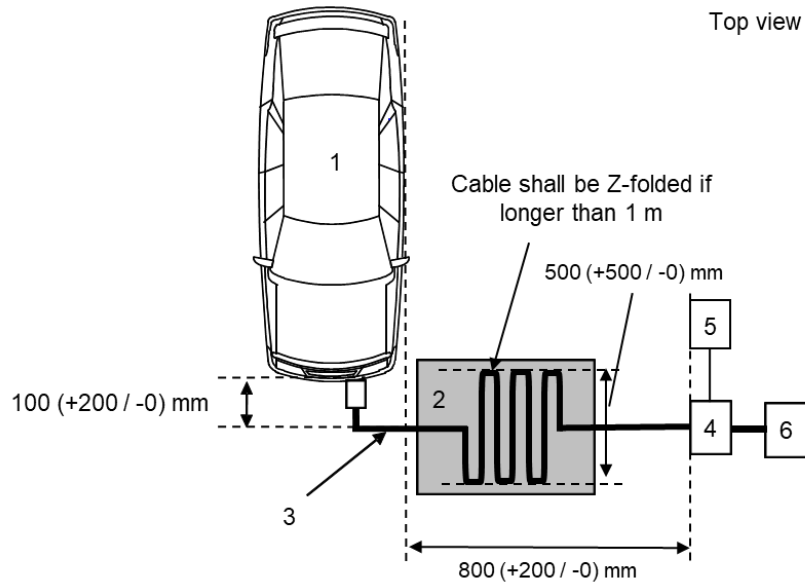


Annex 16, Appendix 1, Figure 1b, amend to read:
 "Figure 1b



- LegendKey:**
- 1 Vehicle under test
 - 2 Insulating support
 - 3 Charging harness
 - 4 CDN
 - 5 Surge generator
 - 6 Power supply

Annex 16, Appendix 1, Figure 1d, amend to read:
 "Figure 1d



- LegendKey:**
- 1 Vehicle under test
 - 2 Insulating support
 - 3 Charging harness
 - 4 CDN
 - 5 Surge generator
 - 6 Power supply

Annex 19, Paragraph 3.4., amend to read:

"3.4. The measurements shall be performed with a spectrum analyser or a scanning receiver. The parameters to be used are defined in Table 1 and Table 2.

Spectrum analysers and FFT-based instruments, that meet the requirements of CISPR 16-1-1, may be used for conformity measurements. FFT-based measuring instruments shall continuously record and evaluate the signal during the measurement time. If using FFT-based instruments, the minimum measurement time shall be 1 s per analysis frequency band (in real-time mode) of the FFT instrument.

Table 1
Spectrum analyser parameters

Frequency range MHz	Peak detector		Quasi-peak detector		Average detector	
	RBW at -3 dB	Minimum scan time	RBW at -6 dB	Minimum scan time	RBW at -3 dB	Minimum scan time
0.15 to 30	9/10 kHz	10 s/MHz	9 kHz	200 s/MHz	9/10 kHz	10 s/MHz

Note: If a spectrum analyser is used for peak measurements, the video bandwidth shall be at least three times the resolution bandwidth (RBW).

Table 2
Scanning receiver parameters

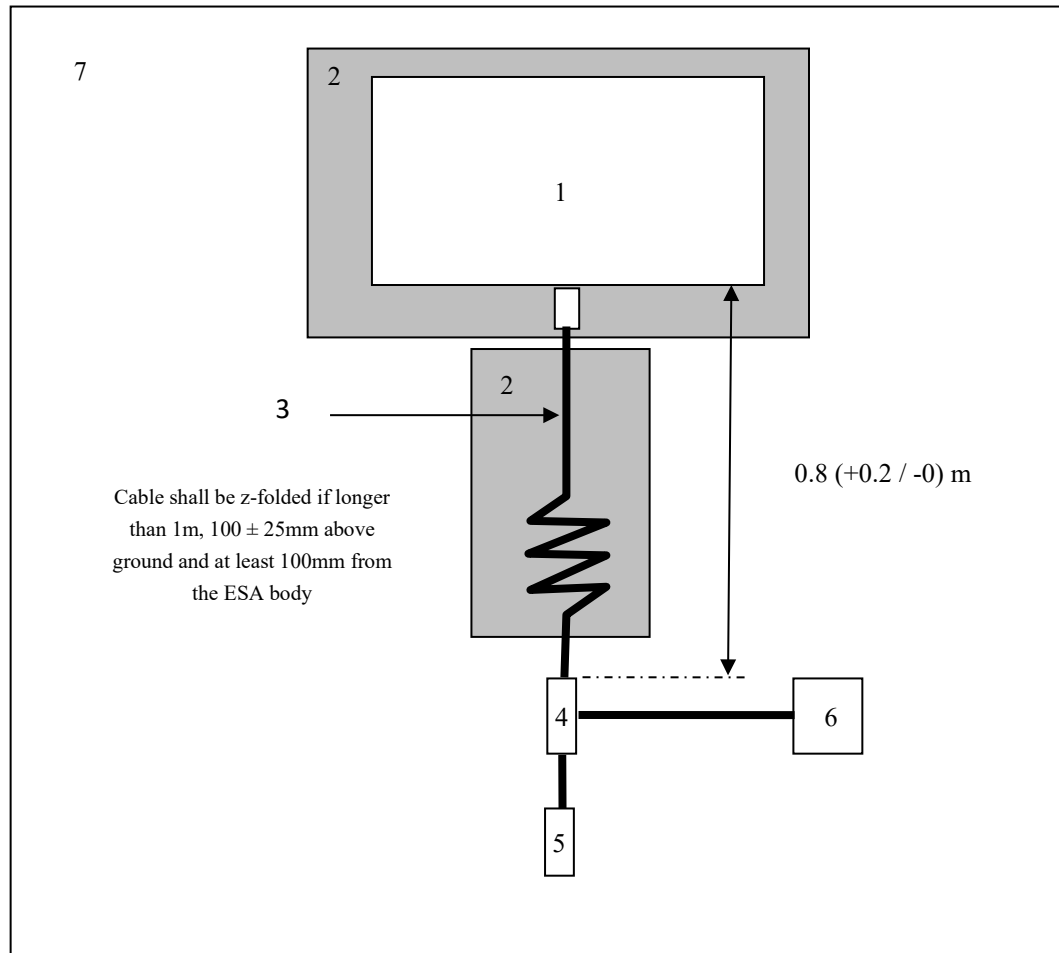
Frequency range MHz	Peak detector			Quasi-peak detector			Average detector		
	BW at -6 dB	Maximu m Sstep size	Minimu m dwell time	BW at -6 dB	Maximu m Sstep size	Minimu m dwell time	BW at -6 dB	Maximu m Sstep size	Minimum dwell time
0.15 to 30	9 kHz	5 kHz	50 ms	9 kHz	5 kHz	1 s	9 kHz	5 kHz	50 ms

"

Annex 19, Appendix 1, Figure 1, amend to read:

"Figure 1

ESA in configuration "REESS charging mode coupled to the power grid" (floor-standing equipment)



LegendKey:

- 1 ESA under test
- 2 Insulating support
- 3 Charging harness
- 4 AMN(s) or DC-charging-AN(s) grounded
- 5 Power mains socket
- 6 Measuring receiver
- 7 Ground plane"

Annex 22, Paragraph 5.1.1., amend to read:

"5.1.1. Test shall be conducted in accordance with IEC 61000-4-5. Test shall be performed only at the severity levels given in 7.16.2.1."

II. Justification

1. The proposed modifications to the current text of the UN Regulation are marked in bold for new or strikethrough for deleted characters in comparison to ECE/TRANS/WP.29/2024/90 and E/ECE/324/Add.9/Rev.6 - E/ECE/TRANS/505/Add.9/Rev.6. Each change is justified in this section.

2. In formal regulatory language, 'shall' is more appropriate than 'have to', because it avoids any ambiguity. While 'have to' can technically express a necessity, it is less precise in legal contexts, and 'shall' should be used for mandatory obligations. In paragraphs 7.9.2.1. and 7.16.2.1., 'has to' was changed to 'shall'. Therefore, in paragraphs 6.1.2. and 7.1.2., 'has to' should be revised to 'shall' as well.

Reference to ISO 7637-2 in paragraphs 6.7.1., 7.17.1., 7.19.1. and in Annex 10.

3. Appendix 1 references two versions of ISO 7637-2. The references in the main body and Annex 10 shall clearly reference the required version of the standard. Therefore, each reference should be extended with the year of publication. All references in the main body and Annex 10 were aligned in the same way. Paragraph 6.9.1. was changed but omitted to make the same change in other paragraphs of the document. If this change is not made, the users of the Regulation will not know which version to use. This is an essential change.

4. UN Regulation No. 10 currently distinguishes the following types of electrical/electronic sub-assembly:

- ESA “other than [in] rechargeable energy storage system (REESS) charging mode coupled to the power grid” in paragraphs 6.5. to 6.9.
- ESA “in the configuration REESS charging mode coupled to the power grid” in paragraphs 7.10 to 7.19.

As per Annex 9, paragraph 1.2.1., ESA “in the configuration REESS charging mode coupled to the power grid” shall only be tested acc. to ISO 11452-2 (Absorber Lined Shielded Enclosure- ALSE) and ISO 11452-4 (Bulk Current Injection - BCI). Therefore, listing the transversal electromagnetic (TEM) cell, strip line and reverb chamber methods in Tables 19a and 19b of paragraph 7.18.2.1. is wrong or misleading, while Tables 2a and 2b in paragraph 6.8.2.1. shall of course remain unchanged. For ESA “other than in REESS charging mode coupled to the power grid” Annex 9, paragraph 1.2.1. does not provide any restrictions.

5. In specification 6.9.1., Table 3a and 3b, ‘system’ was changed to ‘ESA’, but this change was not applied to 7.19.1. Therefore, in 7.19.1. Table 20 ‘system’ should be revised to ‘ESA’.

Appendix 1

6. As part of the evolution of EMC standards, not only the Edition changes (including any additional amendment or corrigendum), but also the title may be modified. As this has been the case for several standards, their titles should be updated accordingly. The indication of the Edition of a standard should be in line with its issuing organization:

- Item 7: update of ISO 11452-3 to Fourth Edition 2024: the new Edition corrects only a mistake in a formula.
- Item 12: the reference to IEC 61000-3-12 was updated without revising 7.3., 7.1.1., Annex 11 and Annex 17. The test method and evaluation of test results have changed significantly and are not consistent with the present wording of the 07 series of amendments. The update of the standard will be considered after thorough revision of the concerned paragraphs (later supplement or new series of amendments).
- Item 22: the modification of Appendix 1, update of International Special Committee on Radio Interference (CISPR) standard 6-1-1, was included in an earlier draft and not taken over in the draft phase of the latest documents. This basic standard defines the requirements of measuring apparatus which should be state-of-the art. Referencing the latest publication of this standard reduces the effort for laboratories and simplifies

the calibration process of apparatus which could also be applied for other regulations and standards than UN Regulation No. 10.

7. In diagrams or figures, Revision 6 of UN Regulation No. 10 and the preliminary changes for Revision 7 currently use both “legend” and “key” to provide further information. Additionally, the numbers in the keys of some diagrams are occasionally followed by a colon (“:”) and an explanation starting with a capital letter. For the sake of formal consistency, the keys of figures should be homogeneously aligned. Typically, e.g. in international standards, the term “key” is used. In addition to that, the numbers in the enumeration are in chronological order, not followed by a colon (“:”) and completed with an explanation starting with a lower case.

8. According to paragraphs 1., 2., and 3. of Appendix 8, the impedance of artificial network is labelled as ZPB and should be corrected to ZPB.

9. According to paragraph 2. of Appendix 8, a High Voltage Artificial Network (HV-AN) is only applied to ESA, so the "Vehicle" has been removed from Figure 3. Therefore, the term "Vehicle" should also be deleted from the main text.

10. Figure 11 of Appendix 8, paragraph 5.4., has been adopted from CISPR 25:2021 (Edition 5). The value of C1 should be corrected to 1,1 nF in order to avoid deviating setups in standardization and type-approval.

11. In Annex 1, the approval mark for Model A has been updated to version 07. Model B also required an update to version 07.

Flowcharts on charging modes

12. The footnotes should be moved to the decision boxes, to improve readability of the flow charts for applying the Regulation. Footnote 1 is only applicable for the references to IEC 61851-21-1. Footnote 2 indicates that a decision must be made between modes 2 and 3. The above concerns:

- Annex 4, Figure 1
- Annex 11, Figure 1
- Annex 12, Figure 1
- Annex 13, Figure 1
- Annex 15, Figure 1
- Annex 16, Figure 1

13. A fixed step size requirement of exactly 50 kHz is not in line with CISPR 16-2-3. This basic standard defines the radiated disturbance measurement method, which includes a frequency step size of 50 % of the resolution bandwidth used or less. For this reason, in the latest draft of CISPR 12 Edition 7 (Committee Draft for Vote (CDV) positive vote in 2024) it was agreed to require a maximum step size of 60 kHz. OICA members have received feedback from a manufacturer of EMI measuring receivers that a fixed step size requirement of exactly 50 kHz cannot be fulfilled in Fast Fourier Transform (FFT) mode with all kinds and brands of FFT based measuring receivers. Affected receivers are using a frequency step size of 50 % of the resolution bandwidth or less, i.e. 60 kHz for a resolution bandwidth of 120 kHz as required in Regulation No. 10 or 30 kHz in the high dynamic mode with improved level accuracy. Furthermore, such receivers do not allow the adjustment of the step size by the user. OICA members propose to align Regulation No. 10 requirements with the requirements in CISPR 16-2-3, which is equal to the latest CISPR 12 draft. Otherwise, the latest included FFT mode is not applicable with the majority of the commercially available FFT based measuring receivers. Annex 4 and Annex 7 shall be applied to measure the broadband emission from vehicle and ESA. Therefore, only Peak and Quasi-Peak detector shall be applied. The average detector can be suppressed in Table 1 and Table 2 for consistency.

14. Annex 4, Figures 3b, 3d, 3f, 3h, Key 5 contains a wrong reference: 7.3.3.2. is not existing in Regulation No. 10. This is a purely editorial error, due to copy & paste from draft ISO 11451-2.
15. Annex 4, Figure 3h, Key 11: purely editorial error forced by late changes.
16. In Annex 5, the method for measuring emission levels in the frequency modulation (FM) band at the vehicle antenna has been removed. Therefore, CISPR 25 which is the reference standard for that test method should consequently be removed from Annex 5 as well.
17. For the “Regular test method” in Annex 6, paragraph 1.2., both a specification of rear irradiation and REESS charging mode have been added. These specifications are missing for the “Alternative test methods” in Annex 6, paragraph 1.3. and should be added as well.
18. In Annex 6, paragraph 1.4., applicable vehicle immunity test methods are provided in a flowchart. Since the definition of a "Large vehicle" is already given in the main text, it should be sufficient to simply refer to "Large vehicle" with the according reference in the flowchart.
19. In Annex 6, paragraph 2.1.1.2. includes a table outlining the basic vehicle conditions. The Advanced Driving System (ADS) is listed under the "50 km/h mode" and "Brake mode" vehicle test conditions. However, the failure criteria for ADS, as revised in informal document GRE-90-19, have not been applied to the "Brake mode" vehicle test conditions.
20. In Annex 11, Footnote 2 of Figure 1 includes a reference standard. However, the standard number following 'IEC' has not been specified. Therefore, it needs to be clearly stated as 'IEC 61000-3-12.'. Additionally, the charging current is already given to be > 16A and < 75A. A repetition of the charging current > 16A is therefore not necessary before referencing the IEC standard 61000-3-12.
21. In Annex 12, Figure 1, Footnote 2, the charging current is already given to be > 16A and < 75A. A repetition of the charging current > 16A is therefore not necessary before referencing the IEC standard 61000-3-11.
22. Annex 22 addresses surges conducted along alternate current (AC) and direct current (DC) power lines for ESAs. Therefore, the reference standard should be updated to IEC 61000-4-5. The erroneously cited standard IEC 61000-4-4 addresses fast transients/bursts.
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