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World Forum for Harmonization of Vehicle Regulations

197th session
Geneva, 11–14 November 2025
Item 4.8.1 of the provisional agenda
1958 Agreement:
Consideration of draft amendments to existing UN Regulations submitted by GRE

Proposal for Supplement 1 to the 07 series of amendments to UN Regulation No. 10 (Electromagnetic Compatibility)

Submitted by the Working Party on Lighting and Light-Signalling*

The text reproduced below was adopted by the Working Party on Lighting and Light-Signalling (GRE) at its ninety-second session (ECE/TRANS/WP.29/GRE/92, para. 26). It is based on ECE/TRANS/WP.29/GRE/2025/3 as amended by GRE-92-24. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee (AC.1) for consideration at their November 2025 sessions.

* In accordance with the programme of work of the Inland Transport Committee for 2025 as outlined in proposed programme budget for 2025 (A/79/6 (Sect. 20), table 20.6), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

Paragraph 6.1.2., first line, replace “has to” with “shall”.

Paragraph 6.7.1., ISO reference, amend to read “ISO 7637-2:2011”.

Paragraph 7.1.2., first line, replace “has to” with “shall”.

Paragraph 7.17.1., ISO reference, amend to read “ISO 7637-2:2011”.

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

"7.18.2.1. …

Table 19a

	Test Level in over 90 per cent of the 20 to 6,000 MHz frequency band	
Frequency range	*BCI*	*ALSE*
20 to 2,000 MHz	60 mA	30 V/m
2,000 to 6,000 MHz	Not applicable	10 V/m

Table 19b

	Minimum Test Level over the whole 20 to 6,000 MHz frequency band	
Frequency range	*BCI*	*ALSE*
20 to 2,000 MHz	50 mA	25 V/m
2,000 to 6,000 MHz	Not applicable	8 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 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
3b	+ 75 V	+150 V	1 h	I	III

"

Appendix 1, amend to read:

"**List of standards referred to in this Regulation**

1. CISPR 12 "Vehicles,boats, and internal combustion 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", Edition 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, antennas and test sites for radiated disturbances measurements", Edition 4.2 - 2019, AMD1:2020 and AMD2:2023.

3. CISPR 25 "Radio disturbance characteristics for the protection of receivers used on board vehicles, boats, and on devices - Limits and methods of measurement", Edition 2.0 - 2002 and corrigendum 2004.

4. ISO 7637-1 "Road vehicles - Electrical disturbance from conduction and coupling - Part 1: Definitions and general considerations", Third edition 2015.

   ISO 7637-2 "Road vehicles - Electrical disturbance from conduction and coupling - Part 2: Electrical transient conduction along supply lines only", Second 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 electrical disturbances from narrowband radiated electromagnetic energy":

   Part 1: General principles and terminology (ISO 11451-1, Fourth edition 2015);

   Part 2: Off-vehicle radiation sources (ISO 11451-2, Fourth edition 2015);

   Part 4: Harness excitation methods (ISO 11451-4, fourth edition 2022).

7. ISO 11452 "Road vehicles - Component test methods for electrical disturbances from narrowband radiated electromagnetic energy":

   Part 1: General principles and terminology (ISO 11452-1, Fourth edition 2015);

   Part 2: Absorber-lined shielded enclosure (ISO 11452-2, Third edition 2019);

   Part 3: Transverse electromagnetic (TEM) cell (ISO 11452-3, Fourth edition 2024);

   Part 4: Harness excitation methods (ISO 11452-4, Fifth edition 2020);

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

   Part 11: Reverberation chamber (ISO 11452-11, 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)", 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 subject to conditional connection", 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 and subject to conditional connection", Edition 2.0 - 2017.

12. IEC 61000-3-12 "Electromagnetic Compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current > 16 A and ≤ 75 A per phase", Edition 1.0 - 2004.

13. IEC 61000-4-4 "Electromagnetic Compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transients/burst immunity test", Edition 3.0 - 2012.

14. IEC 61000-4-5 "Electromagnetic Compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test", 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 environments", Edition 3.0 - 2020.

16. IEC 61000-6-4 “Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments”, Edition 3.0 - 2018.

17. CISPR 16-2-1 "Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-1:– Methods of measurement of disturbances and immunity - Conducted disturbances measurements", 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, coupling devices for conducted disturbance measurements", Edition 2.1 - 2014 and AMD1:2017.

19. IEC 61851-1 "Electric vehicle conductive charging system - Part 1: General requirements", 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", Edition 1.0 - 2018.

21. CISPR 32 "Electromagnetic compatibility of multimedia equipment - Emission requirements”, Edition 2.1 - 2015 and AMD1:2019.

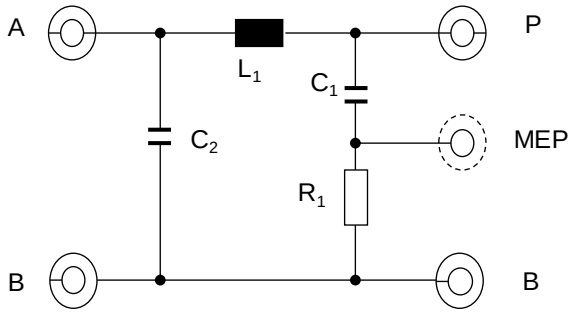
22. CISPR 16-1-1 “Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus", Edition 5.0: 2019.

"

Appendix 8,

Paragraph 1., for “ZPB” read “Z_{PB}”.

Figure 1, amend to read
"Figure 1
Example of 5 µH AN schematic



Key

L_1 5 µH	A port to power supply
C_1 0,1 µF	P port to ESA
C_2 1 µF (default value)	B ground
R_1 1 kΩ	MEP measuring port”

"

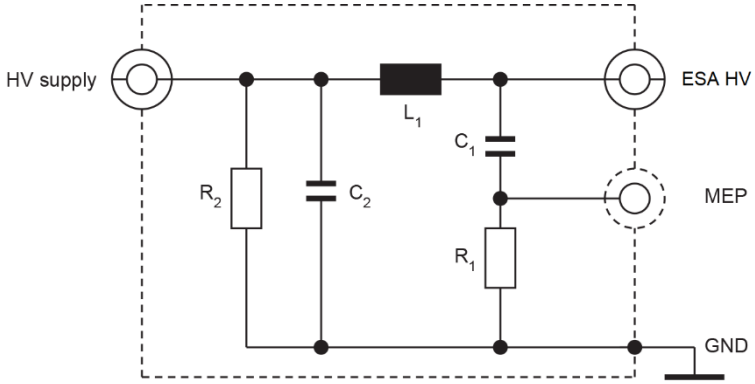
Paragraph 2., fourth indent, amend to read:

" …

The HV-AN impedance Z_{PB} (tolerance ± 20 %) in the measurement frequency range of 0,1 MHz to 100 MHz is shown in Figure 2. It is measured between the “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 µH / HV-AN schematic



Key

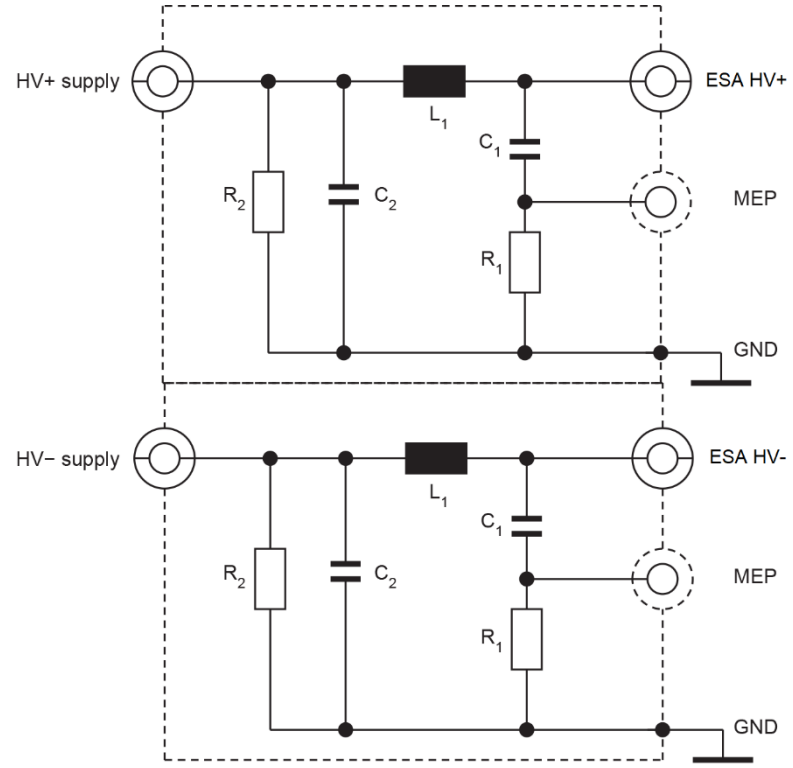
L_1 5 µH	HV supply high voltage power supply
C_1 0,1 µF	ESA HV high voltage of ESA
C_2 0,1 µF (default value)	MEP measuring port
R_1 1 kΩ	GND ground

R_2 1 MΩ (discharging C_2 to > 50 V_{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."

Figure 4, amend to read:

"Figure 4
Example of 5 µH HV-AN combination in a single shielded box



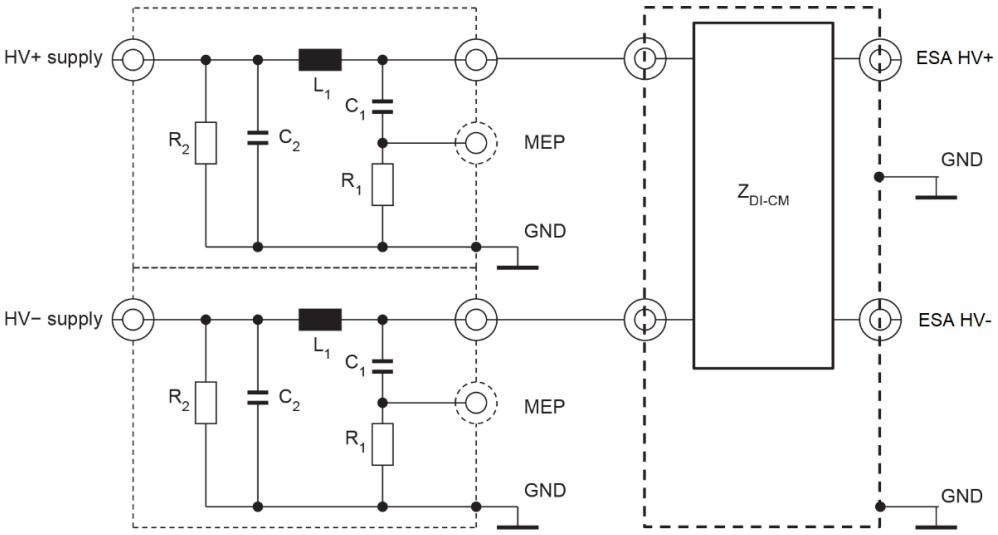
Key

L_1 5 µH	HV supply high voltage power supply (positive and negative)
C_1 0,1 µF	ESA HV high voltage of ESA (positive and negative)
C_2 0,1 µF (default value)	MEP measuring port
R_1 1 kΩ	GND ground
R_2 1 MΩ (discharging C_2 to > 50 V_{dc} within 60 s)"	

Figure 5, amend to read:

"Figure 5

Impedance matching network attached between HV-ANs and ESA



Key

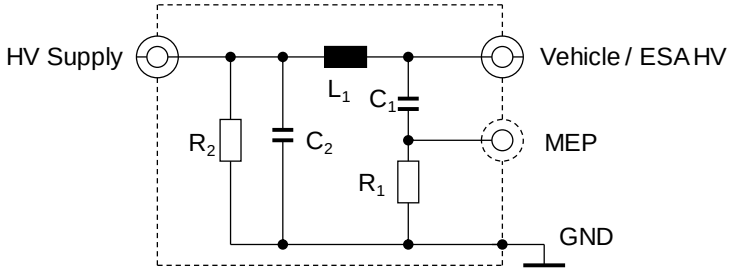
L_1 5 µH	HV supply high voltage power supply (positive and negative)
C_1 0,1 µF	ESA HV high voltage of ESA (positive and negative)
C_2 0,1 µF (default value)	MEP measuring port

R_1 1 kΩ — GND ground
R_2 1 MΩ (discharging C_2 to > 50 V_{dc} within 60 s) — Z_{DI-CM} differential and common-mode impedance"

Paragraph 3., third indent, for "ZPB" read "Z_{PB}".

Figure 6, amend to read:

"Figure 6
Example of 5 µH DC-charging-AN schematic

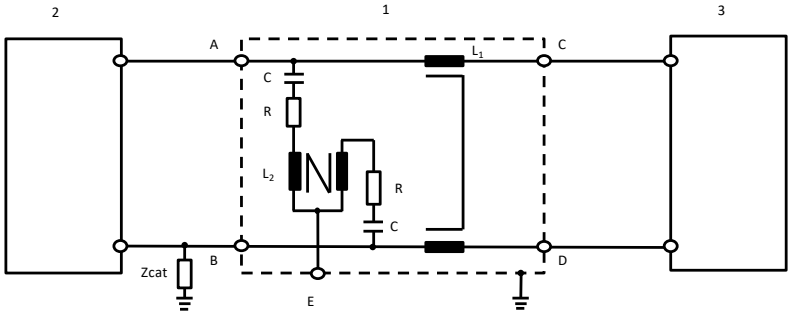


Key
L_1 5 µH — HV supply high voltage power supply
C_1 0,1 µF — vehicle / ESA HV high voltage vehicle or ESA
C_2 1 µF (default value, if another value is used, it shall be justified) — MEP measuring port
R_1 1 kΩ — GND ground
R_2 1 MΩ (discharging C_2 to > 50 V_{dc} within 60 s)"

Paragraph 5.1., second indent, for "Zcat**"** read "Z_{cat}**".**

Figure 8, amend to read:

"Figure 8
Example of an AAN for Signal/Control port with symmetric lines (e.g. CAN)



Key
1 AAN
2 vehicle — Z_{cat} symmetric adjustment impedance
3 charging station — A symmetrical line 1 (in vehicle)
L_1 2 x 38 mH — B symmetrical line 2 (in vehicle)
L_2 2 x 38 mH — C symmetrical line 1 (charging station side)
R 200 Ω — D symmetrical line 2 (charging station side)
C 4,7 µF — E measuring port with 50 Ω load"

Paragraph 5.2., third indent, amend to read:

"

…

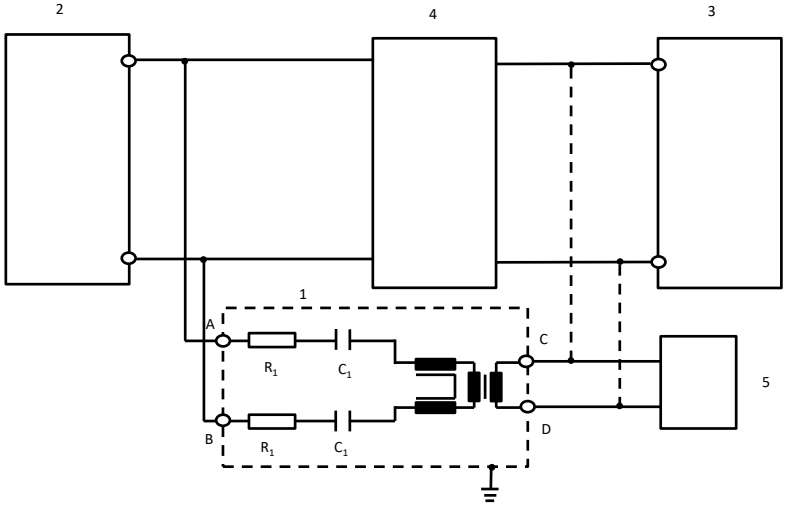
The circuit in Figure 9 provides a common mode termination by the AMN / DC-charging-AN / HV-AN. In order to minimize emission from the PLC modem of the vehicle, an attenuator is located between the powerline and the PLC modem at the AE side in the circuit for emission tests. This attenuator consists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



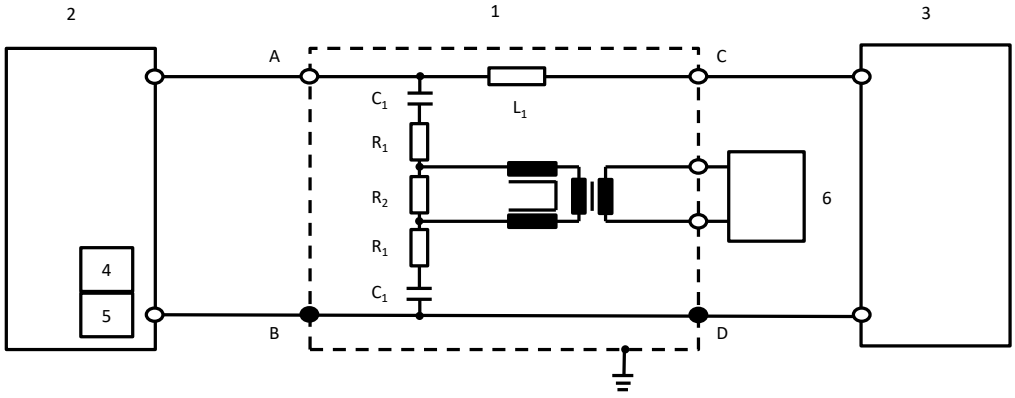
Key

1 AAN
2 vehicle
3 charging station / power supply
4 HV-AN or AMN or DC-charging-AN
5 AE
R_1 2,5 kΩ"
C_1 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

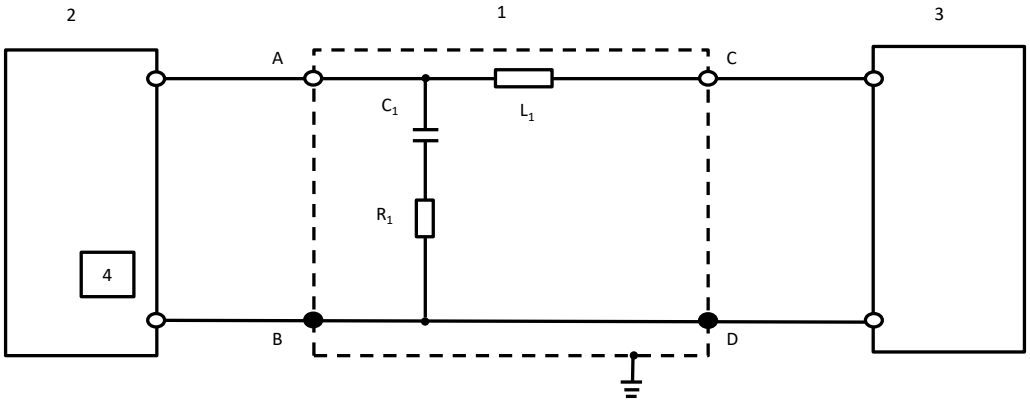


Key

1 AAN
2 vehicle
3 charging station
4 control pilot (in vehicle)
5 PLC (in vehicle)
6 AE
R_1 39 Ω
R_2 270 Ω
C_1 2,2 nF
$L_1$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



Key

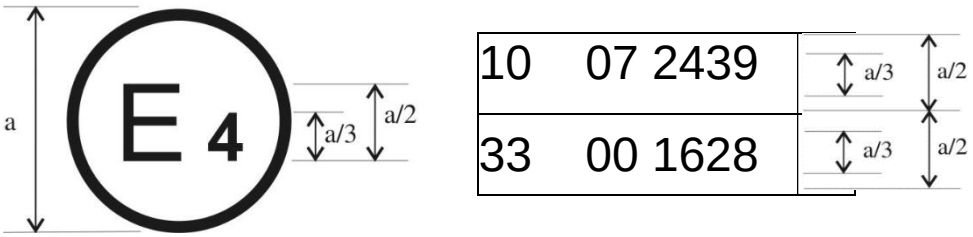
1 AAN	C_1 1,1 nF
2 Vehicle	L_1 100 µH
3 Charging station	A Control pilot line (vehicle side)
4 Control pilot (in vehicle)	B/D Protective earth
R_1 150 Ω	C Control pilot line (charging station side)

"

Annex 1, amend to read:

"Model B

(See paragraph 5.2. of this Regulation)



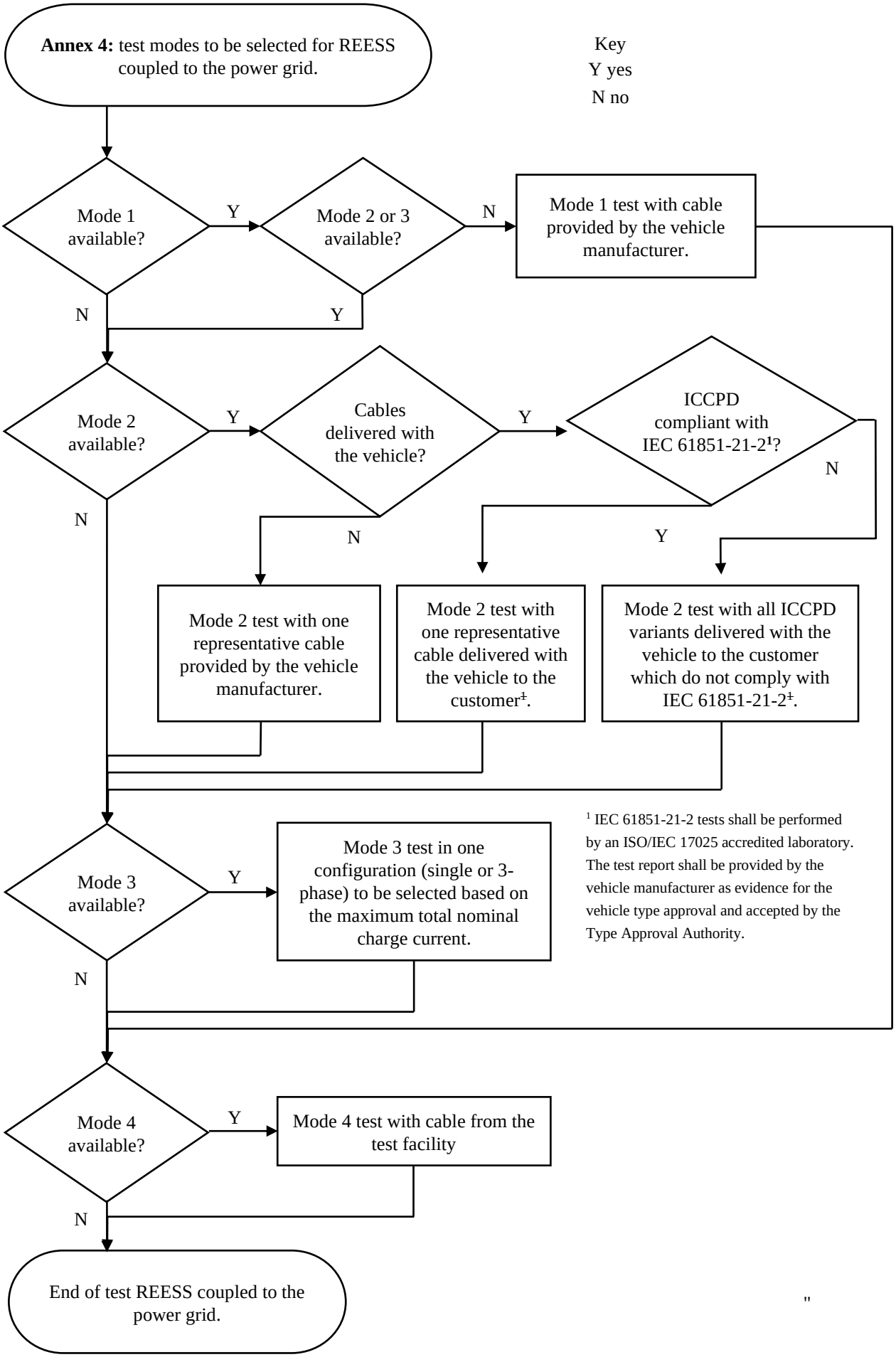
a = 6 mm min

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 UN Regulations Nos. 10 and 33. The approval numbers indicate that, at the date when the respective approvals were given, UN Regulation No. 10 included the 07 series of amendments and UN 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**



[1] IEC 61851-21-2 tests shall be performed by an ISO/IEC 17025 accredited laboratory. The test report shall be provided by the vehicle manufacturer as evidence for the vehicle type approval and accepted by the Type Approval Authority.

"

Paragraphs 4.3., tables 1 and 2, amend to read:

"4.3. …

Table 1
Spectrum analyser parameters

Frequency range MHz	*Peak detector*		*Quasi-peak detector*	
	RBW at -3 dB	*Minimum scan time*	*RBW at -6 dB*	*Minimum scan time*
30 to 1,000	100/120 kHz	100 ms/MHz	120 kHz	20 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*		
	BW at -6 dB	*Maximum step size* [a]	*Minimum dwell time*	*BW at -6 dB*	*Maximum step size* [a]	*Minimum dwell time*
30 to 1,000	120 kHz	60 kHz	5 ms	120 kHz	60 kHz	1 s

[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 and 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
6 extraneous length Z-folded

NOTE: The cable between the AC mains and the AMN 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 and 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
6 extraneous length Z-folded

NOTE: The cable between the AC mains and the AMN 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 and 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)
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 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) "

Figure 3h, Key and NOTE, amend to read:

"**Figure 3h**

…

Key

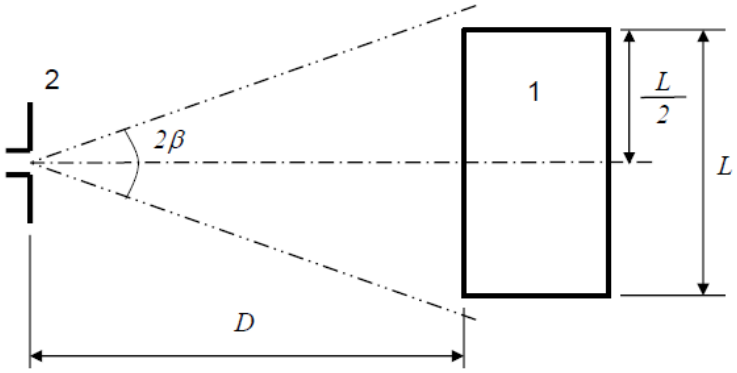
1 vehicle under test
2 insulating support
3 charging harness with communication lines
4 AMN(s) or DC-charging-AN(s), grounded
5 power mains / supply socket (optional)
6 AAN(s), grounded (optional, not represented in the front view)
7 charging station (can be emulated)
8 communication lines
9 communication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

NOTE: The cable between the AC/DC mains/supply and the AMN/DC-charging-AN 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:

"Figure 4

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

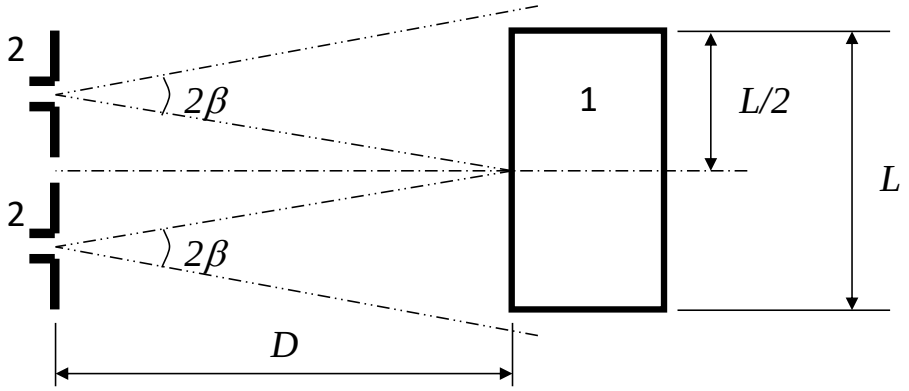


Key
1 vehicle under test
2 antenna"

Figure 5, amend to read:

"Figure 5

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



Key
1vehicle under test
2 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."

Paragraph 4.3., table 2, amend to read:

"4.3. …

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 ~~S~~step size*	*Minimum dwell time*
30 to 1,000	120 kHz	60 kHz	5 ms	120 kHz	60 kHz	5 ms

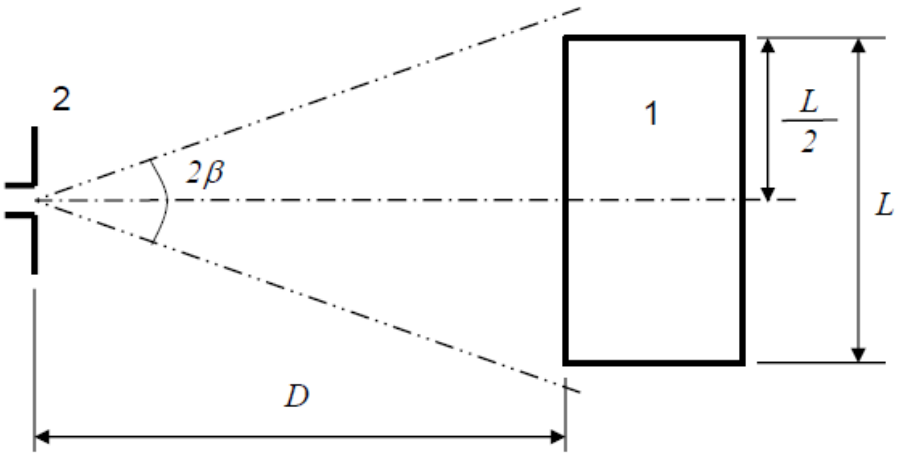
"

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

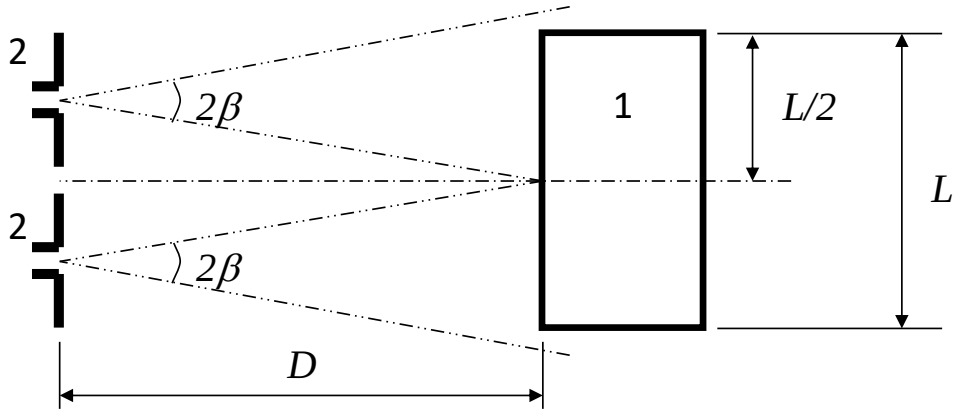


Key
1 vehicle under test
2 antenna"

Figure 2, amend to read:

"Figure 2

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



Key

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.

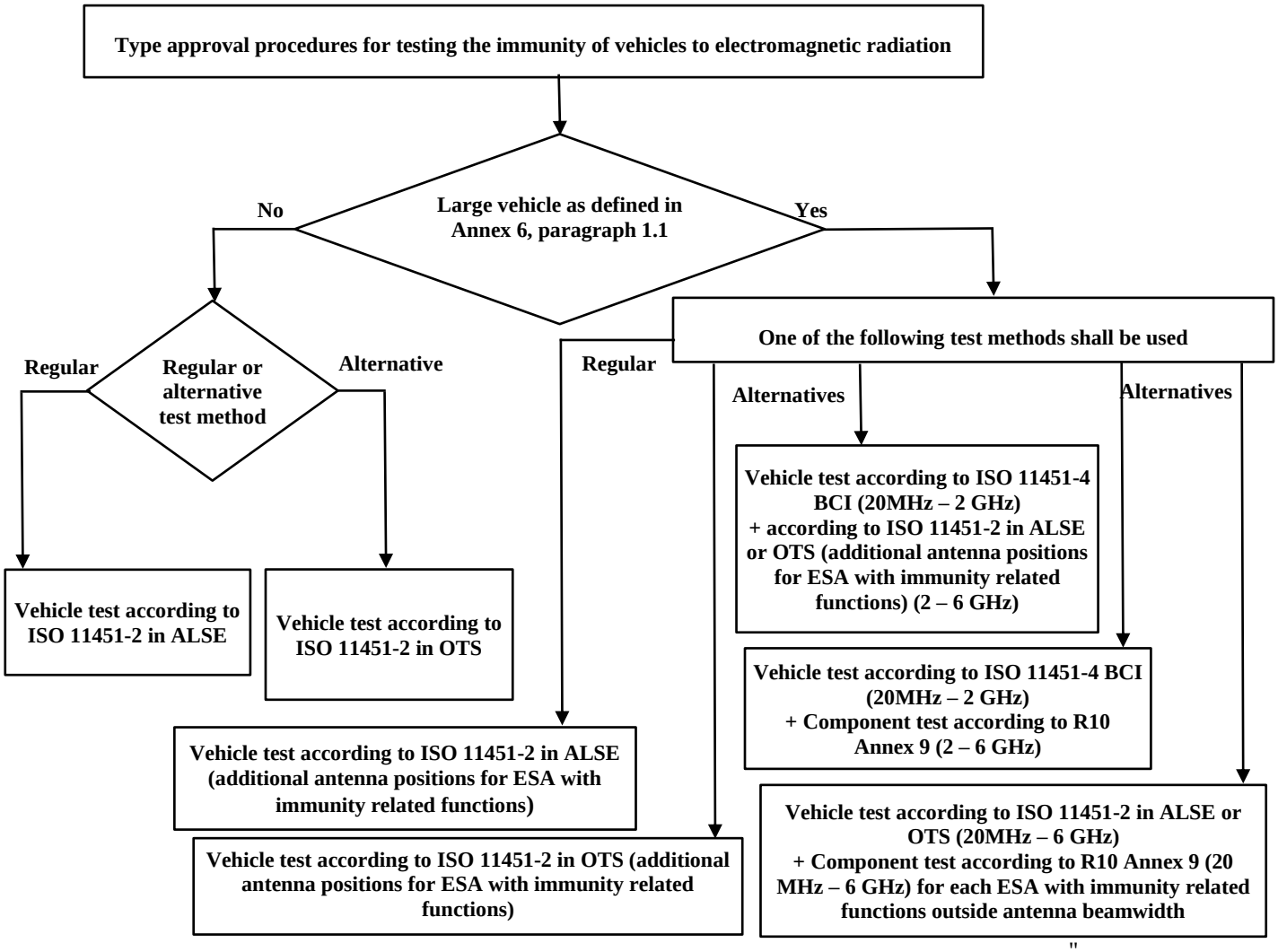
• with front irradiation and with additional antenna positions for “large vehicles”. Additional antenna position(s) shall be chosen by the manufacturer in conjunction with the Type Approval Authority after considering the distribution of electronic systems with immunity related functions and the layout 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:

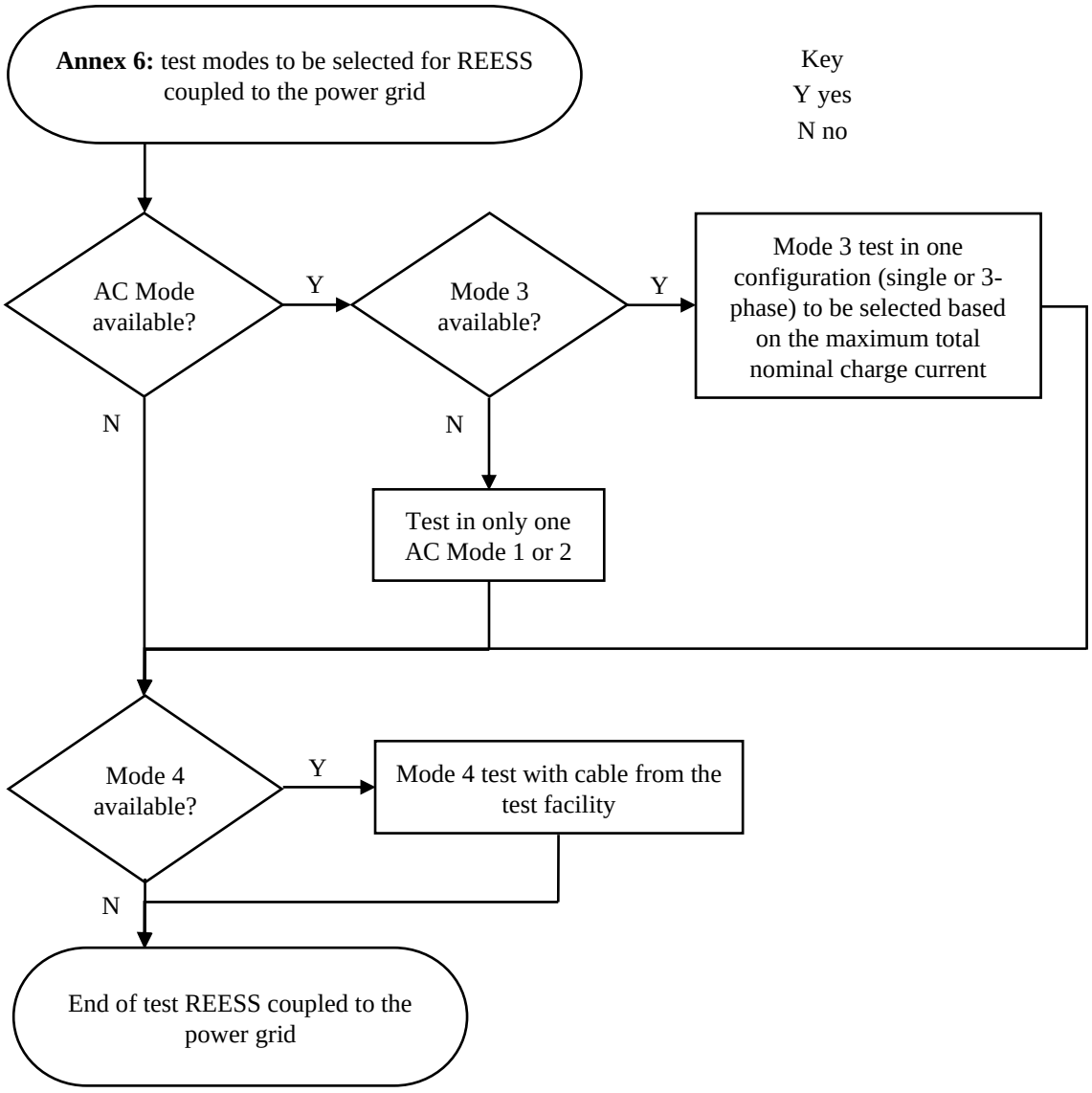
"…

"Brake mode" vehicle test conditions	*Failure criteria*
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 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:

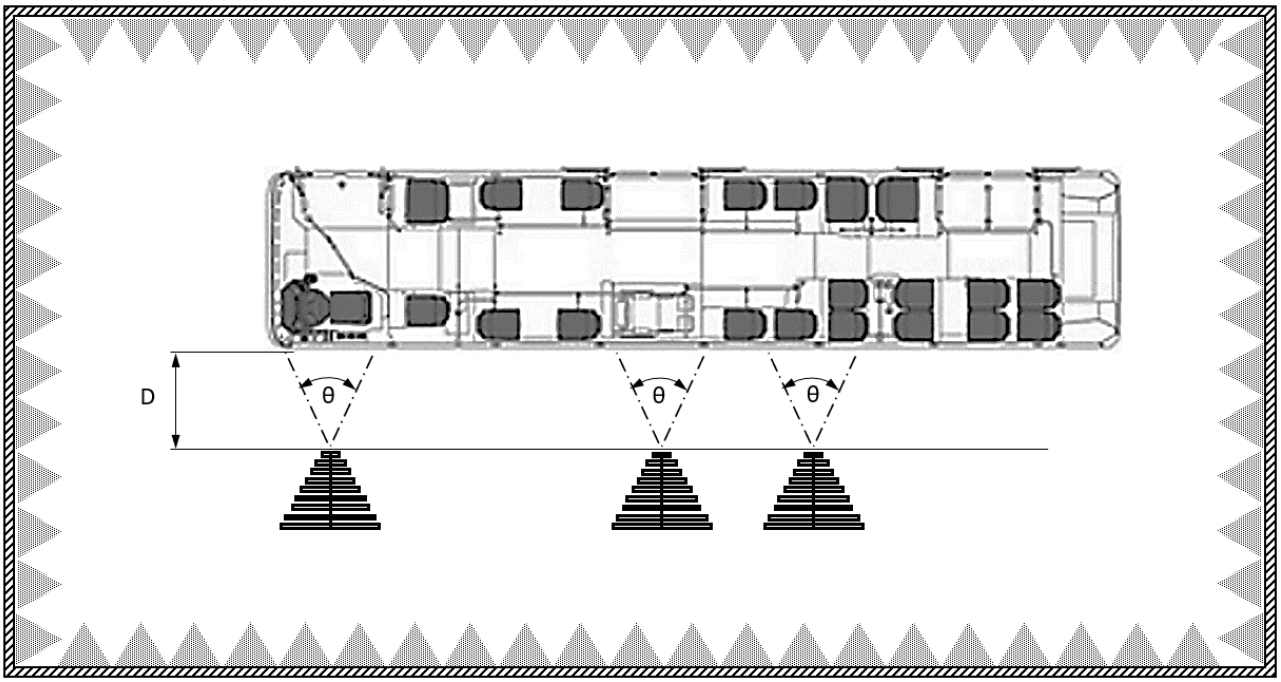
"Figure 2
Charging mode configuration for Annex 6



"

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

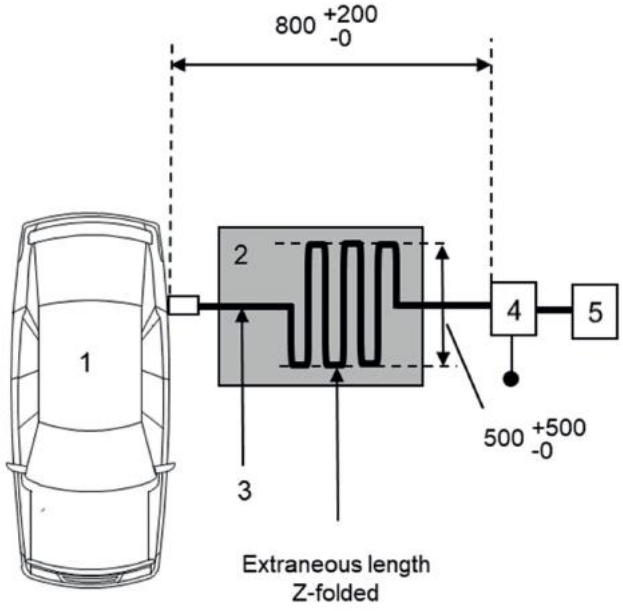


Key
θ 3 dB antenna beamwidth
D the distance between the tip or phase centre of the antenna and the nearest part of the vehicle body without considering small extruding elements (such as side mirrors or fenders)"

Annex 6, Appendix 1,

Figure 5b, amend to read:

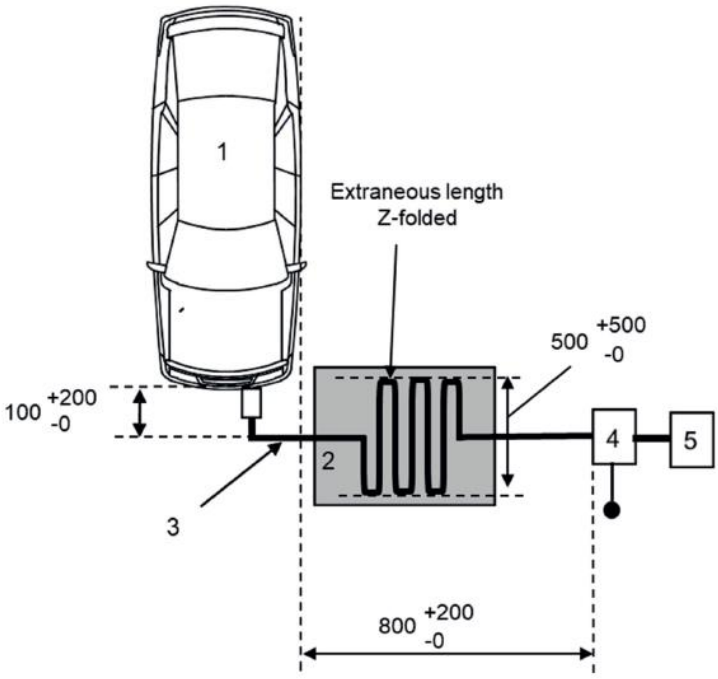
"Figure 5b



Key
1 vehicle under test
2 insulating support
3 charging harness (including EVSE for charging mode 2)
4 AMN(s) or DC-charging-AN(s) grounded
5 power mains socket
NOTE: The cable between the AC mains and the AMN may not be aligned in the same direction as the cable between the AMN and the EV."

Figure 5d, amend to read:

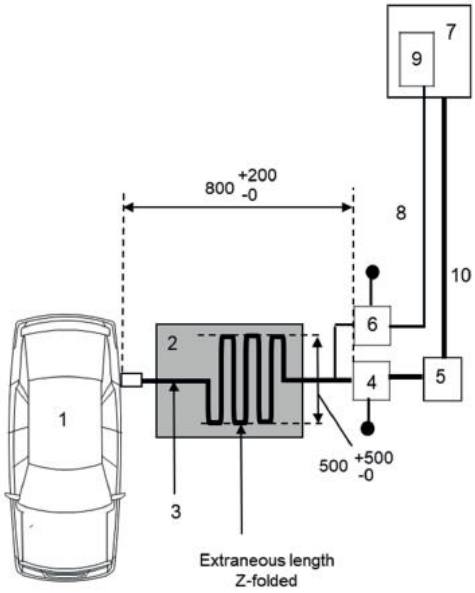
"Figure 5d



Key
1 vehicle under test
2 insulating support
3 charging harness (including EVSE for charging mode 2)
4 AMN(s) or DC-charging-AN(s) grounded
5 power mains socket
NOTE: The cable between the AC mains and the AMN may not be aligned in the same direction as the cable between the AMN and the EV."

Figure 5f, amend to read:

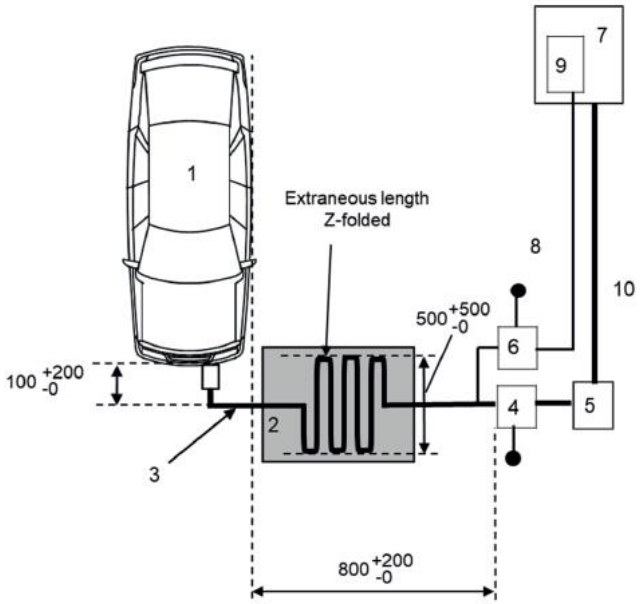
"Figure 5f



Key
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 may not be aligned in the same direction as the cable between the AMN/DC-charging-AN and the EV."

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)

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 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., tables 1 and 2, amend to read:

"4.3. ...

Table 1
Spectrum analyser parameters

Frequency range MHz	*Peak detector*		*Quasi-peak detector*	
	RBW at -3 dB	*Minimum scan time*	*RBW at -6 dB*	*Minimum scan time*
30 to 1,000	100/120 kHz	100 ms/MHz	120 kHz	20 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*		
	BW at -6 dB	*Maximum step size* [a]	*Minimum dwell time*	*BW at -6 dB*	*Maximum step size* [a]	*Minimum dwell time*
30 to 1,000	120 kHz	60 kHz	5 ms	120 kHz	60 kHz	1 s

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

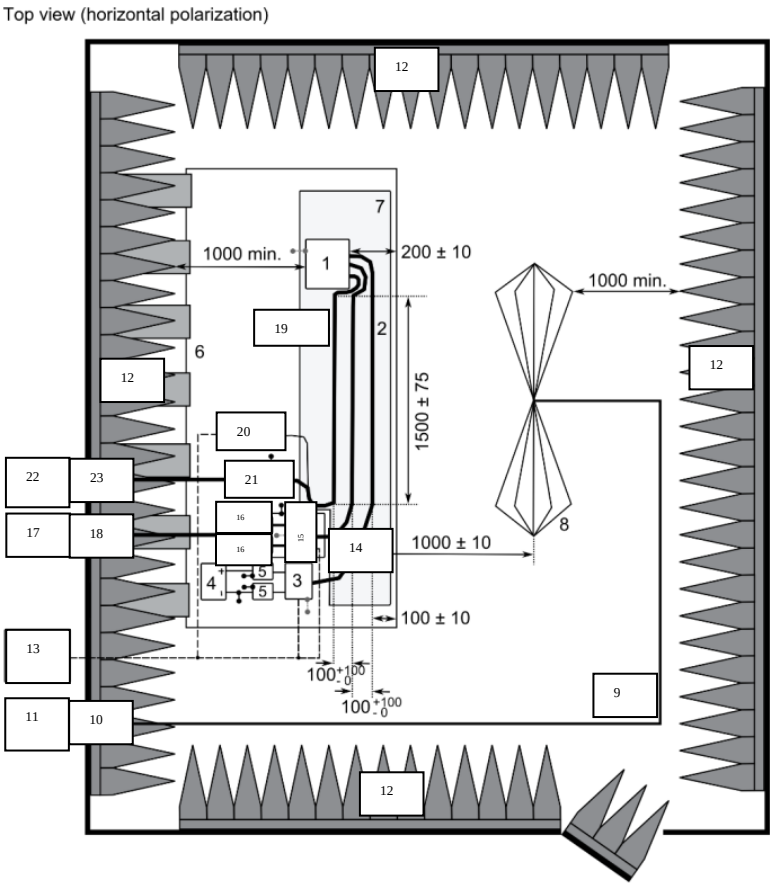
Note: For emissions generated by brush commutator motors without an electronic control unit, the maximum step size may be increased up to five times the bandwidth."

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



Key

1 ESA (grounded locally if required in test plan)
2 LV Test harness
3 LV Load simulator (placement and ground connection according to CISPR 25 paragraph 6.4.2.5)
4 power supply (location optional)
5 LV Artificial network (AN)
6 ground plane (bonded to shielded enclosure)
7 low relative permittivity support ($\varepsilon r \leq 1.4$)
8 biconical antenna
9 high-quality coaxial cable e.g. double-shielded (50 Ω)
10 bulkhead connector
11 measuring instrument
12 RF absorber material
13 stimulation and monitoring system
14 HV harness
15 HV load simulator
16 HV AN
17 HV power supply
18 HV feed-through
19 AC/DC charger harness
20 AC/DC load simulator (e.g Programmable Logic Controller (PLC))
21 AMN(s) or DC-charging-AN(s)
22 AC/DC power supply
23 AC/DC feed-through"

Annex 8, paragraph 4.3., table 2, amend to read:

"4.3. …

Table 2

Scanning receiver parameters

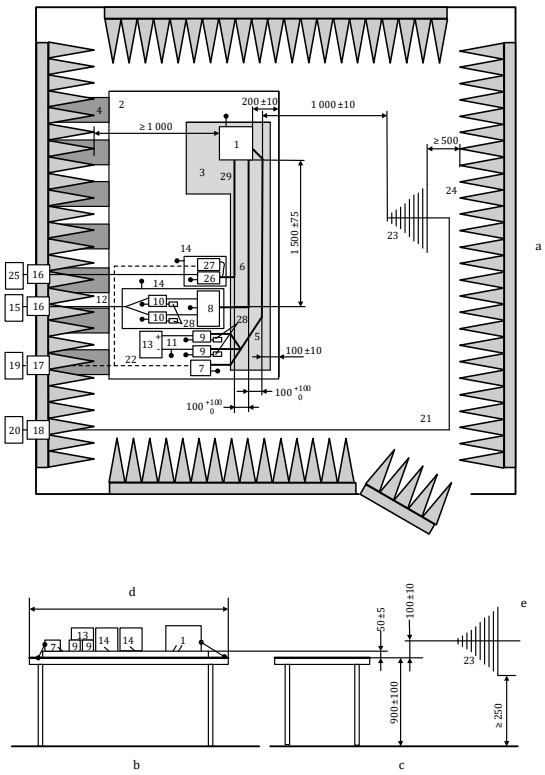
	Peak detector			*Average detector*		
Frequency range MHz	*BW at -6 dB*	*Maximum step size*	*Minimum dwell time*	*BW at -6 dB*	*Maximum step size*	*Minimum dwell time*
30 to 1,000	120 kHz	60 kHz	5 ms	120 kHz	60 kHz	5 ms

"

Annex 9, Appendix 2, Figure 1, amend to read:

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

Top view ***Dimensions in millimetres***



Key

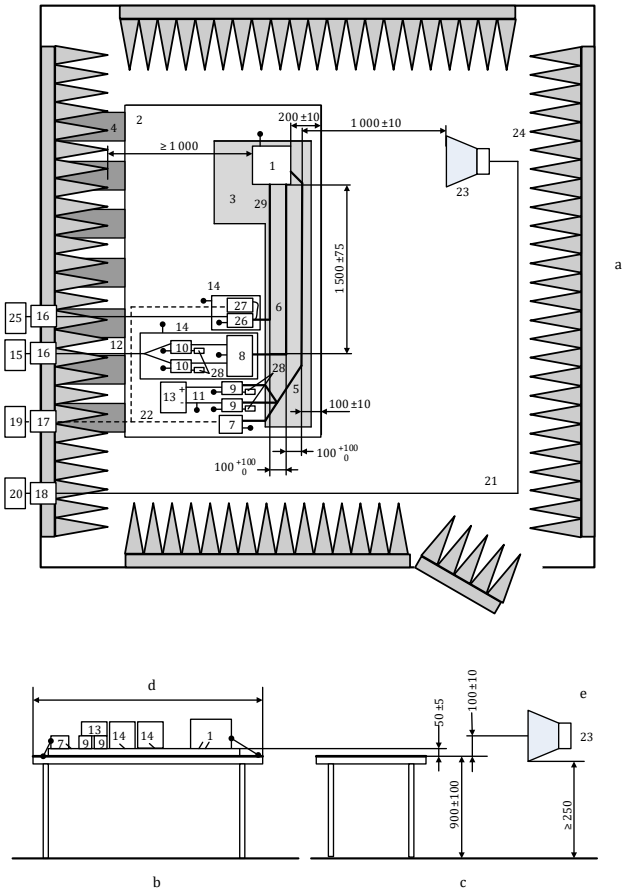
1	ESA (grounded locally if required in test plan)
2	ground plane
3	low relative permittivity support ($\varepsilon_r \leq 1.4$); thickness 50 mm
4	ground straps
5	LV harness
6	HV lines (HV+, HV-)
7	LV load simulator
8	impedance matching network (optional)
9	LV AN
10	HV AN
11	LV supply lines
12	HV supply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

"

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

"Figure 2
Example of test set-up for horn antenna

Top view ***Dimensions in millimetres***



Key

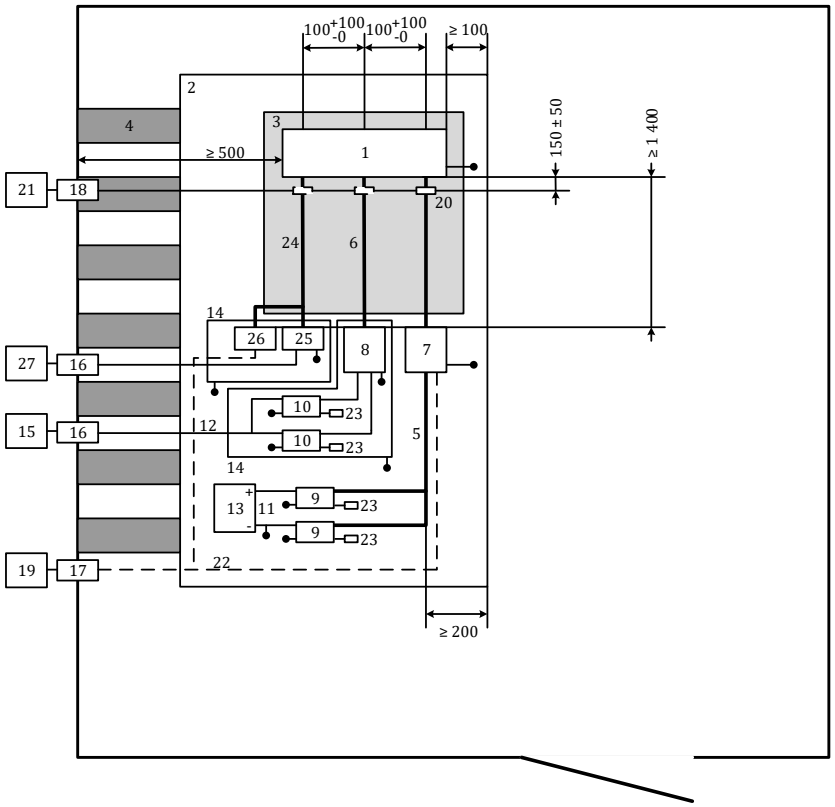
1	ESA (grounded locally if required in test plan)
2	ground plane
3	low relative permittivity support ($\varepsilon_r \leq 1.4$); thickness 50 mm
4	ground straps
5	LV harness
6	HV lines (HV+, HV-)
7	LV load simulator
8	impedance matching network (optional)
9	LV AN
10	HV AN
11	LV supply lines
12	HV supply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

"

Annex 9, Appendix 3, 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)



Key

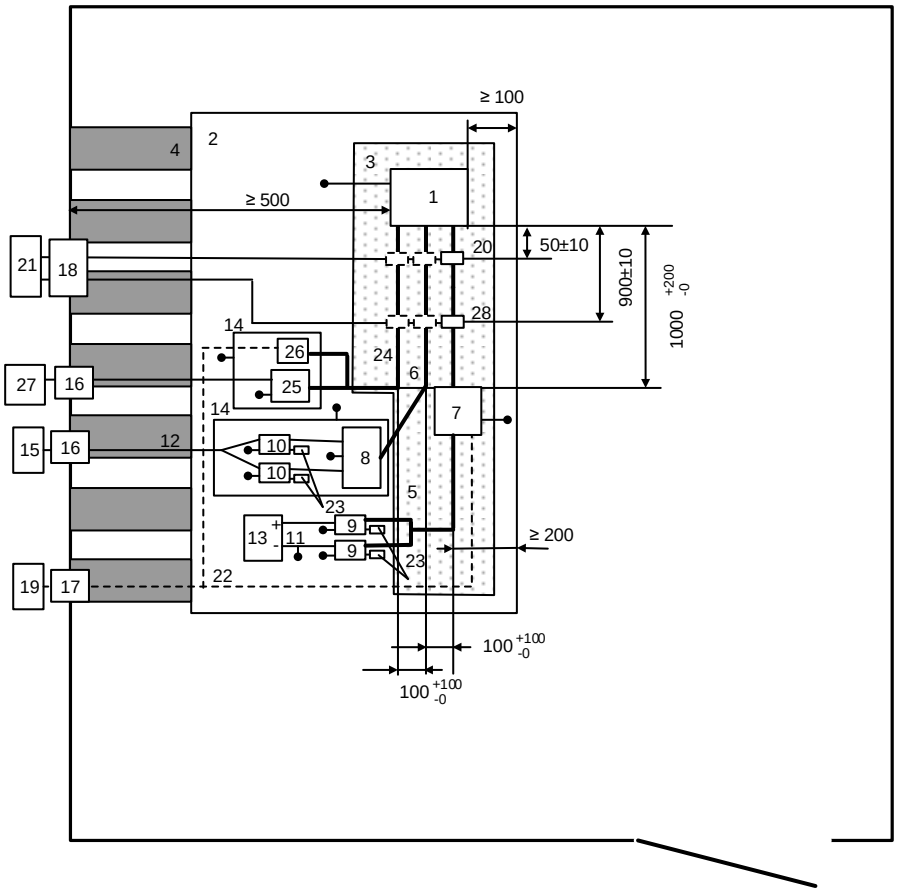
1 ESA
2 ground plane
3 low relative permittivity support (εr ≤ 1,4); thickness 50 mm
4 ground straps
5 LV harness
6 HV lines (HV+, HV-)
7 LV load simulator
8 impedance matching network (optional) (see ISO 11452-1)
9 LV AN
10 HV AN
11 LV supply lines
12 HV supply lines
13 LV power supply 12 V / 24 V /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

"

Annex 9, Appendix 3, 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)



Key

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 (εr ≤ 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.

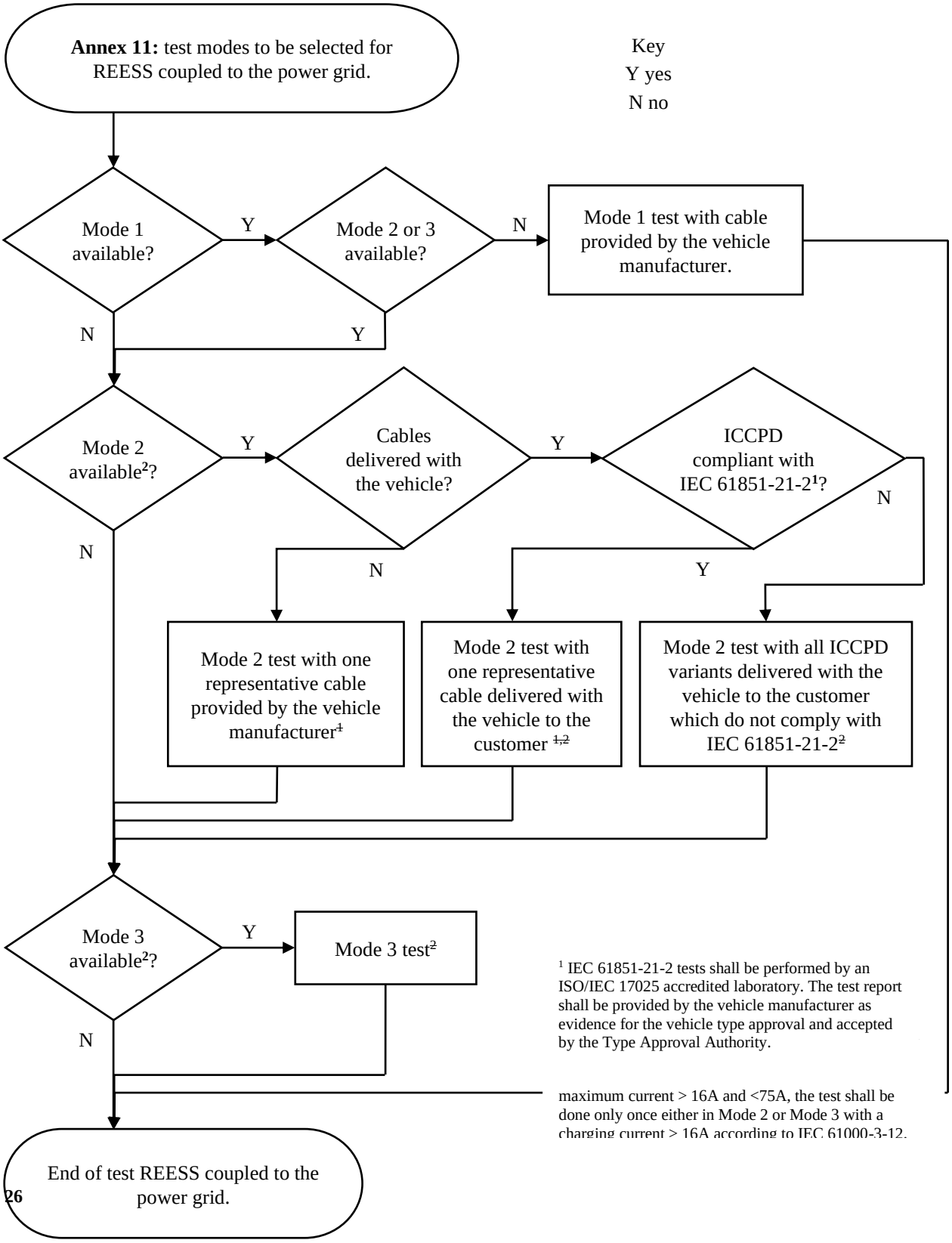
ESAs that are exclusively reserved for mounting on electric vehicles (vehicles without 12V/24V starter motor) are not subject to pulse 4.

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

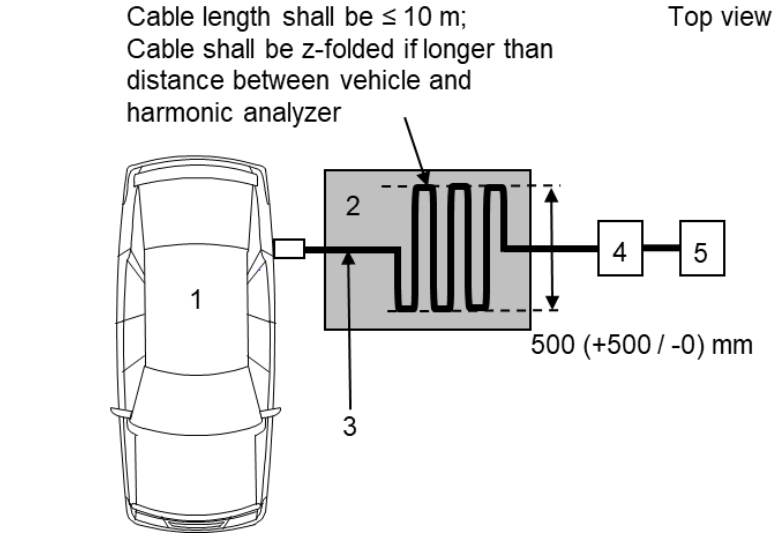


"

Annex 11, Appendix 1,

Figure 1b, amend to read:

"Figure 1b

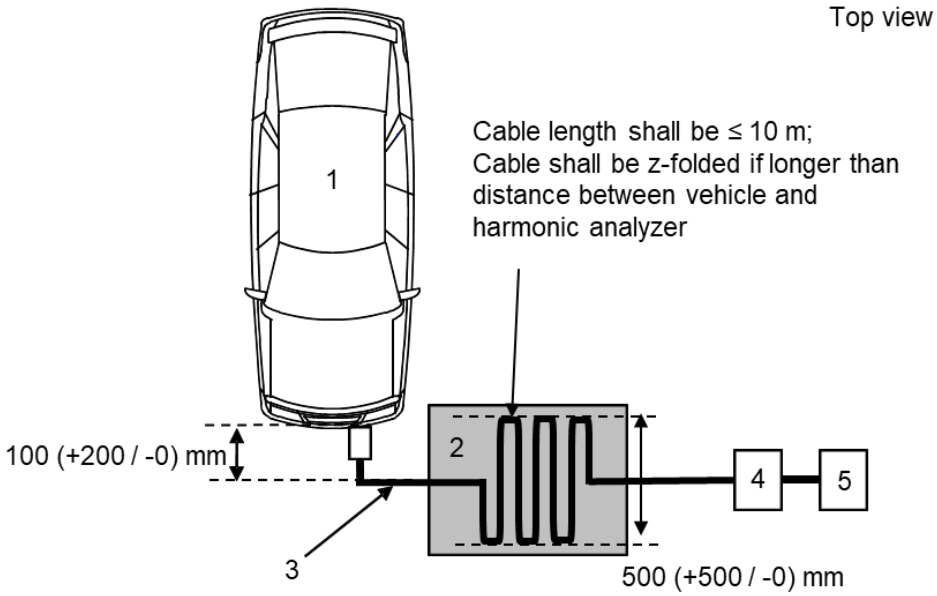


Key
1 vehicle under test
2 insulating support
3 charging harness
4 harmonic analyzer
5 power supply"

Annex 11, Appendix 1,

Figure 1d, amend to read:

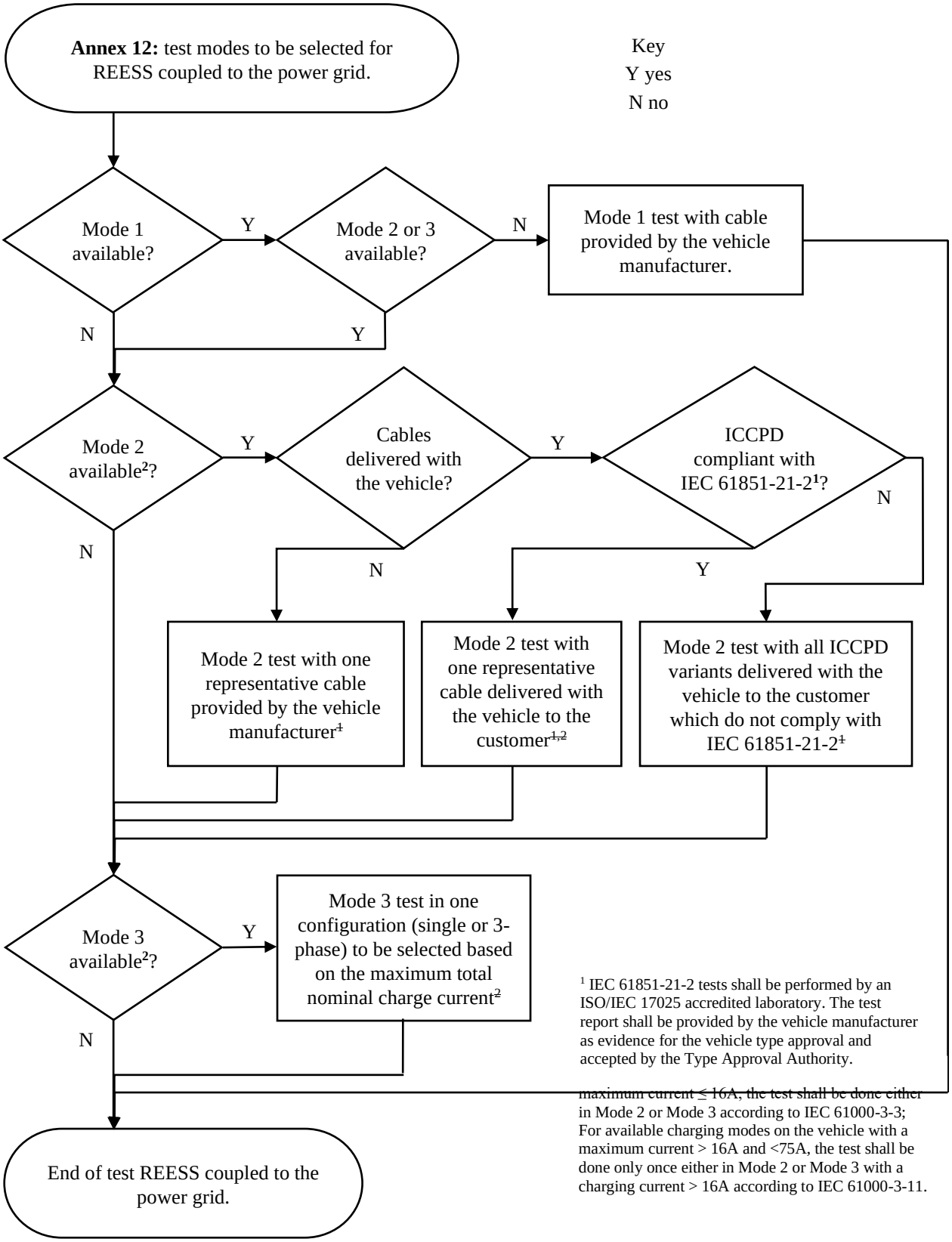
"Figure 1d



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

Annex 12, paragraph 2.1., Figure 1

"Figure 1
Charging mode configuration for Annex 12



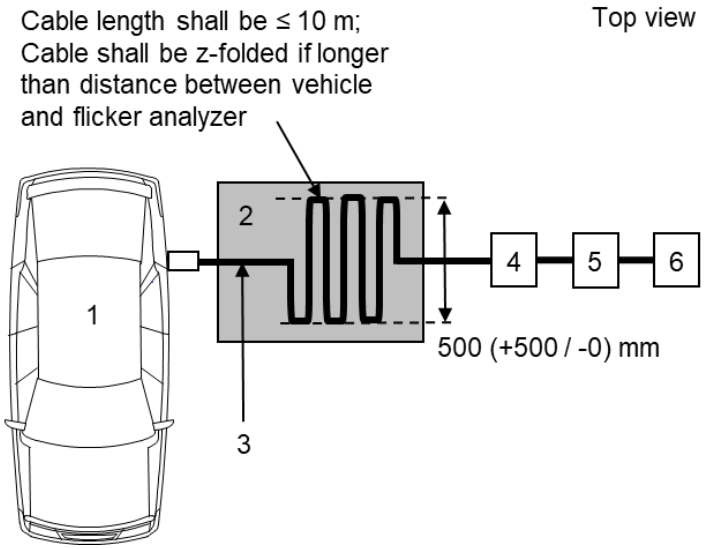
[1] IEC 61851-21-2 tests shall be performed by an ISO/IEC 17025 accredited laboratory. The test report shall be provided by the vehicle manufacturer as evidence for the vehicle type approval and accepted by the Type Approval Authority.

~~maximum current ≤ 16A, the test shall be done either~~ in Mode 2 or Mode 3 according to IEC 61000-3-3;
For available charging modes on the vehicle with a maximum current > 16A and <75A, the test shall be done only once either in Mode 2 or Mode 3 with a charging current > 16A according to IEC 61000-3-11.

"

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

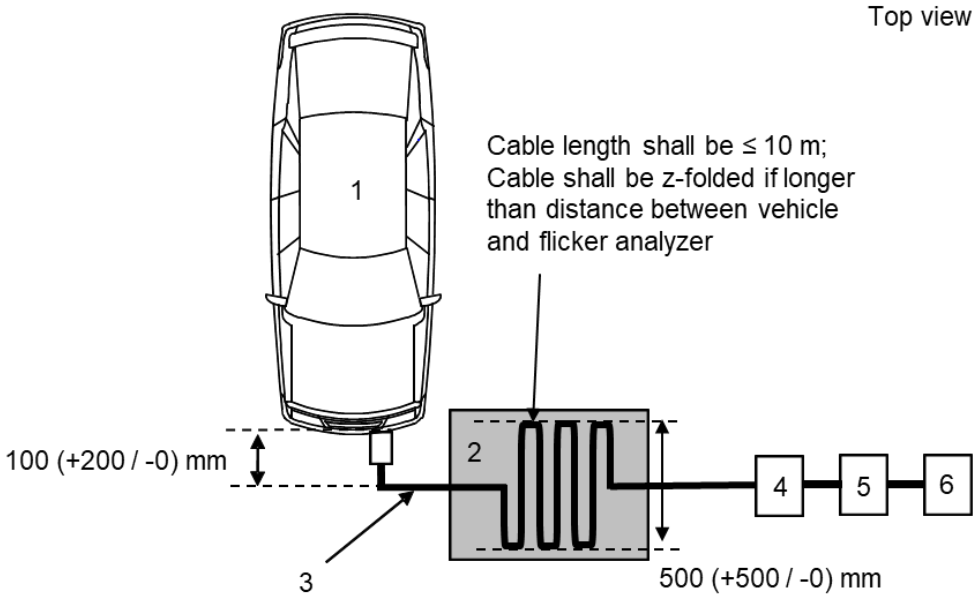
"Figure 1b



Key
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:

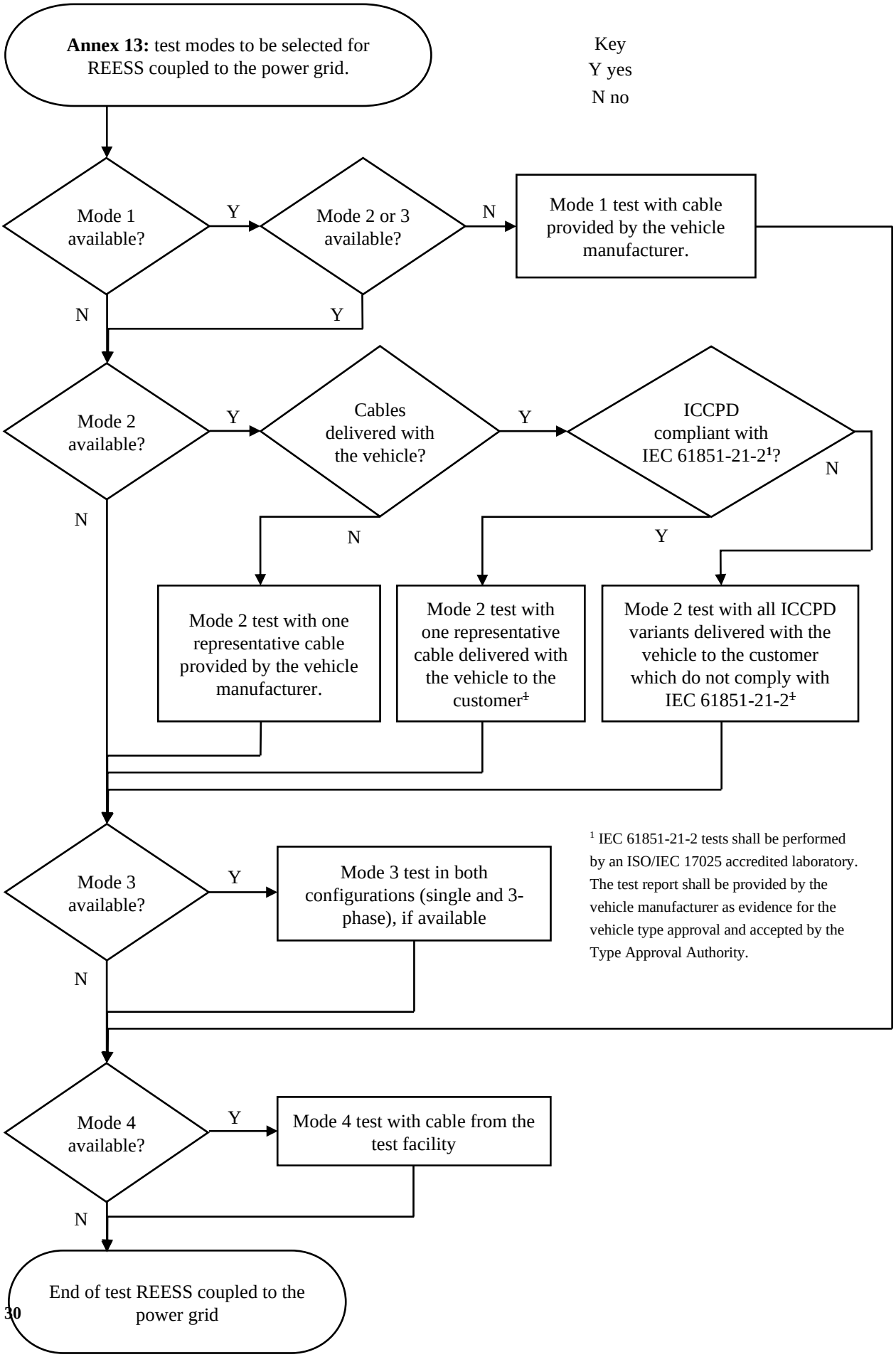
"Figure 1d



Key
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



"

Annex 13, paragraph 3.5., table 2, amend to read:

"3.5. …

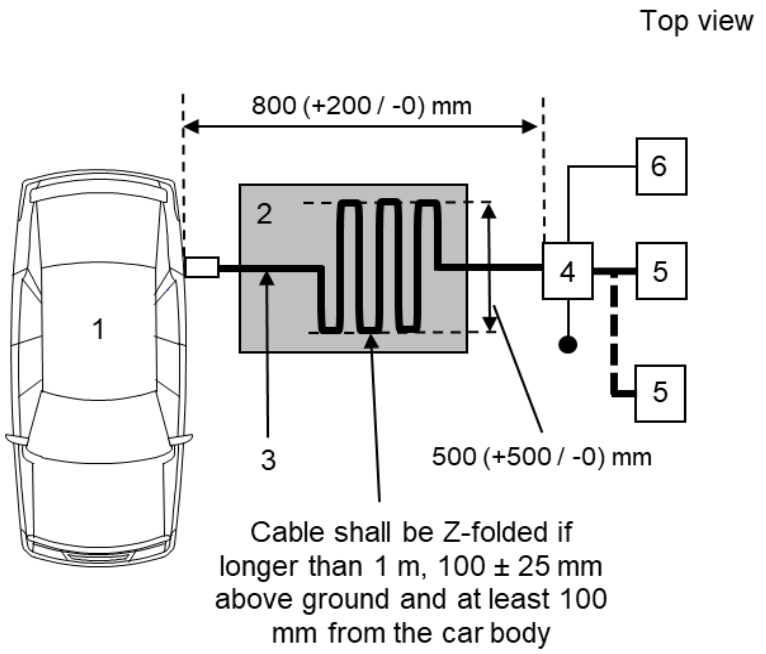
Table 2
Scanning receiver parameters

Frequency range MHz	*Peak detector*			*Quasi-peak detector*			*Average detector*		
	BW at -6 dB	*Maximum step size*	*Minimum dwell time*	*BW at -6 dB*	*Maximum step size*	*Minimum dwell time*	*BW at -6 dB*	*Maximum step 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 13, Appendix 1, Figure 1b, amend to read:

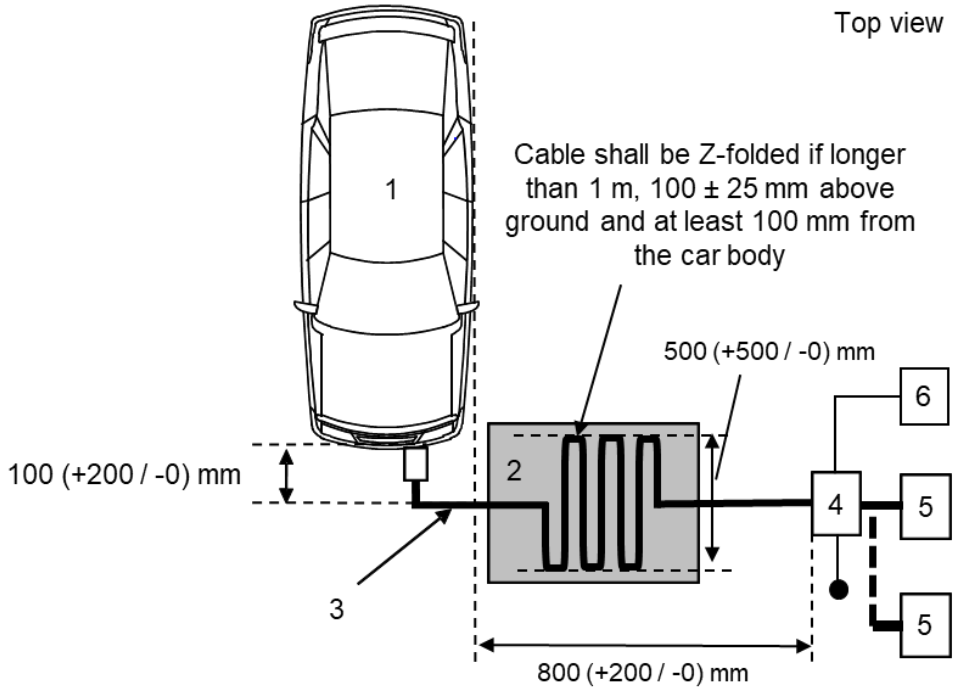
"Figure1b



Key
1 vehicle under test
2 insulating support
3 charging harness
4 AMN(s) or DC-charging-AN(s) grounded
5 power mains socket
6 measuring receiver"

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

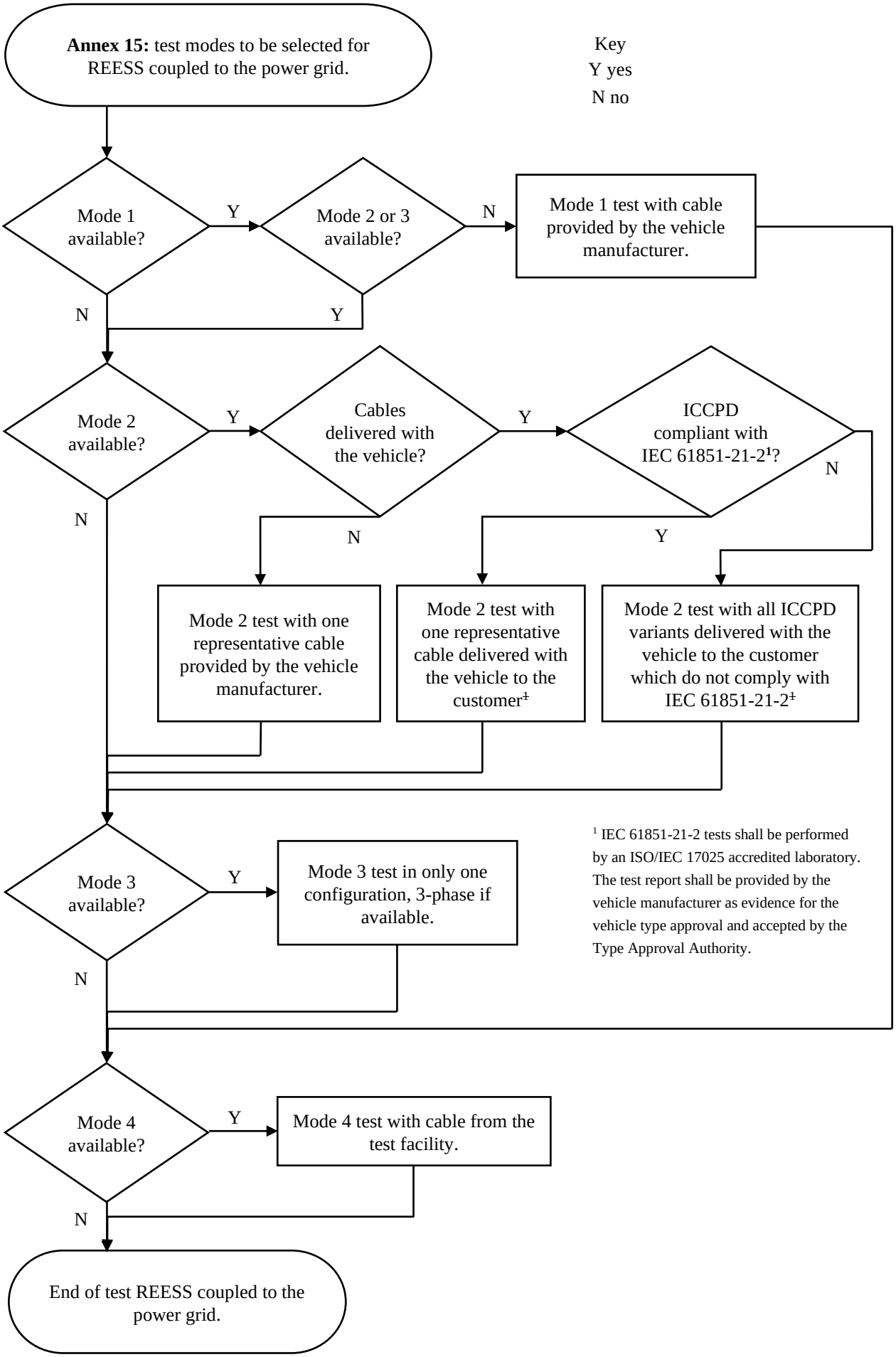
"Figure 1d



Key
1 vehicle under test
2 insulating support
3 charging harness
4 AMN(s) or DC-charging-AN(s) grounded
5 power mains socket
6 measuring receiver"

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

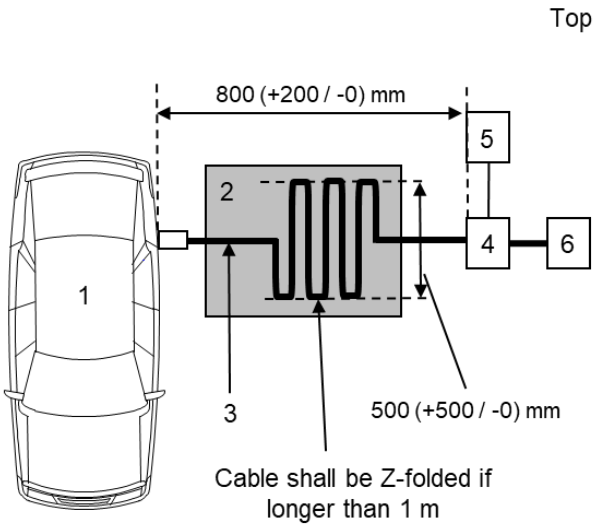
"Figure 1
Charging mode configuration for Annex 15



[1] IEC 61851-21-2 tests shall be performed by an ISO/IEC 17025 accredited laboratory. The test report shall be provided by the vehicle manufacturer as evidence for the vehicle type approval and accepted by the Type Approval Authority.

"

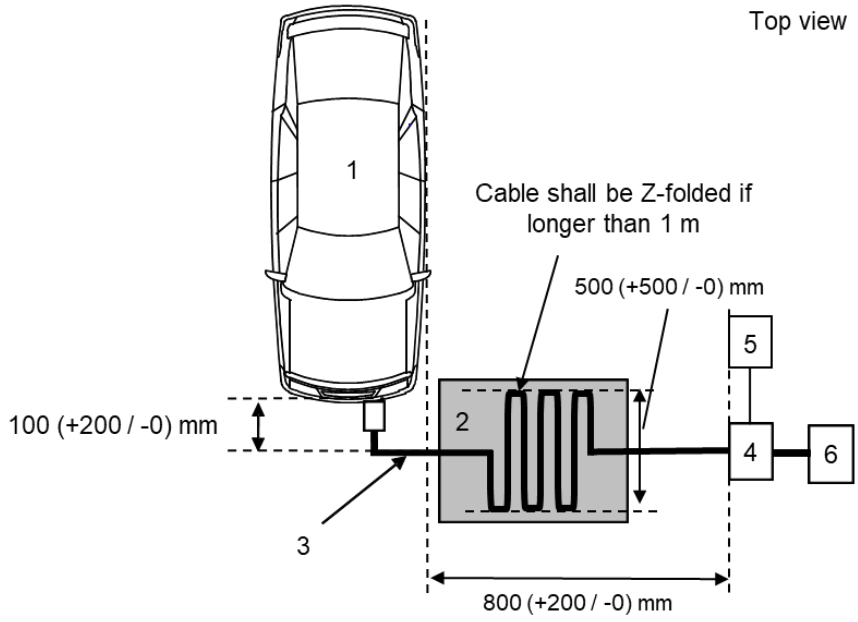
Annex 15, Appendix 1, Figure 1b, amend to read:
"Figure 1b



Key
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:

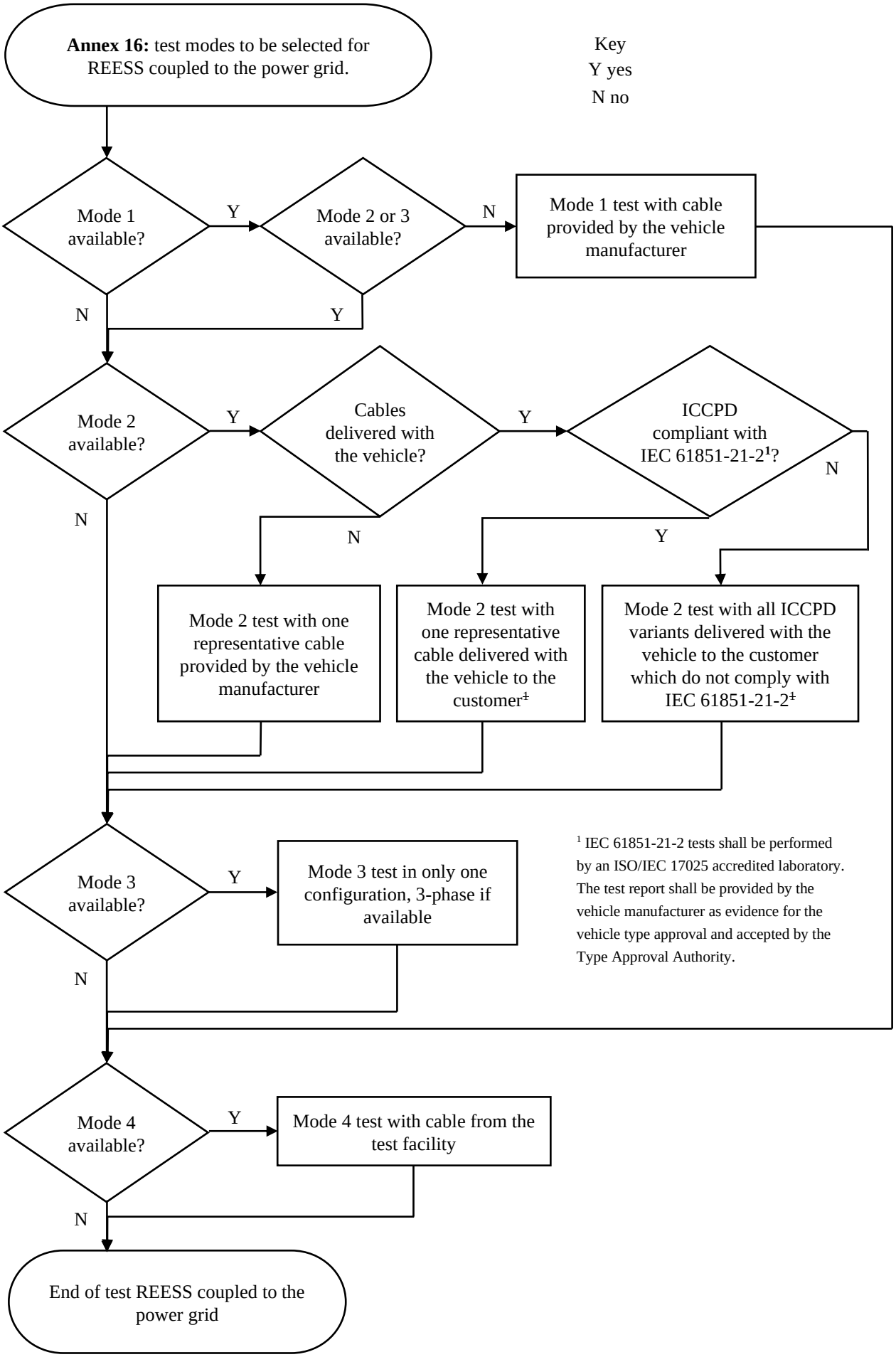
"Figure 1d



Key
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:

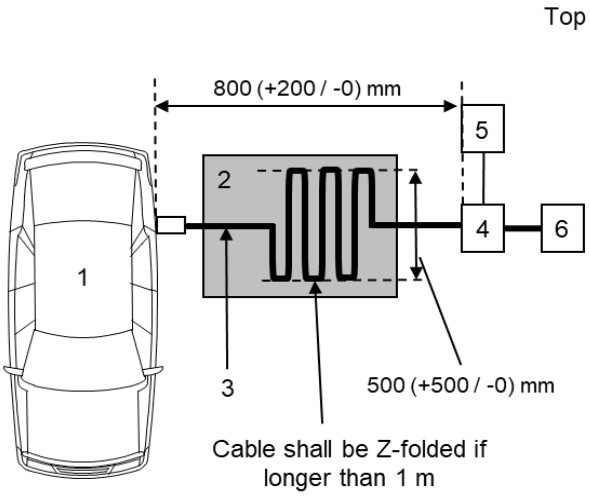
"Figure 1
Charging mode configuration for Annex 16



[1] IEC 61851-21-2 tests shall be performed by an ISO/IEC 17025 accredited laboratory. The test report shall be provided by the vehicle manufacturer as evidence for the vehicle type approval and accepted by the Type Approval Authority.

"

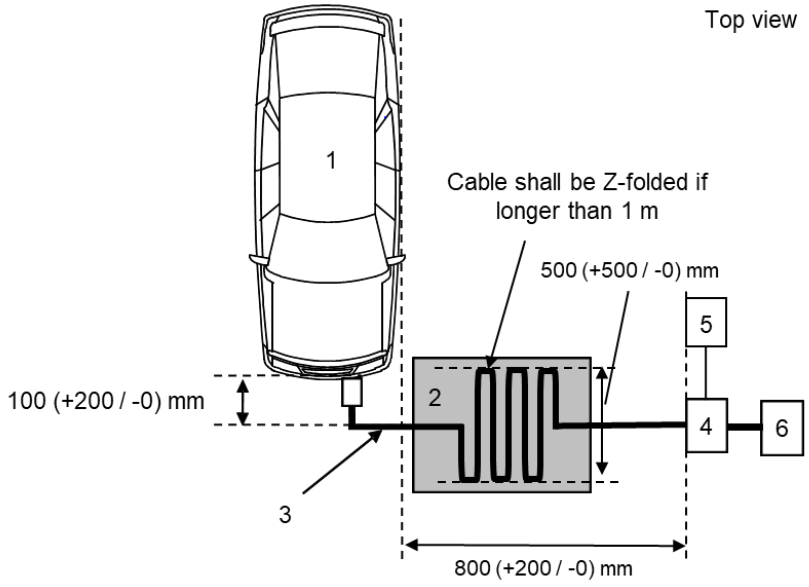
Annex 16, Appendix 1, Figure 1b, amend to read:
"Figure 1b



Key
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



Key
1 vehicle under test
2 insulating support
3 charging harness
4 CDN
5 surge generator
6 power supply"

Annex 19, paragraph 3.4., table 2, amend to read:

"3.4. …

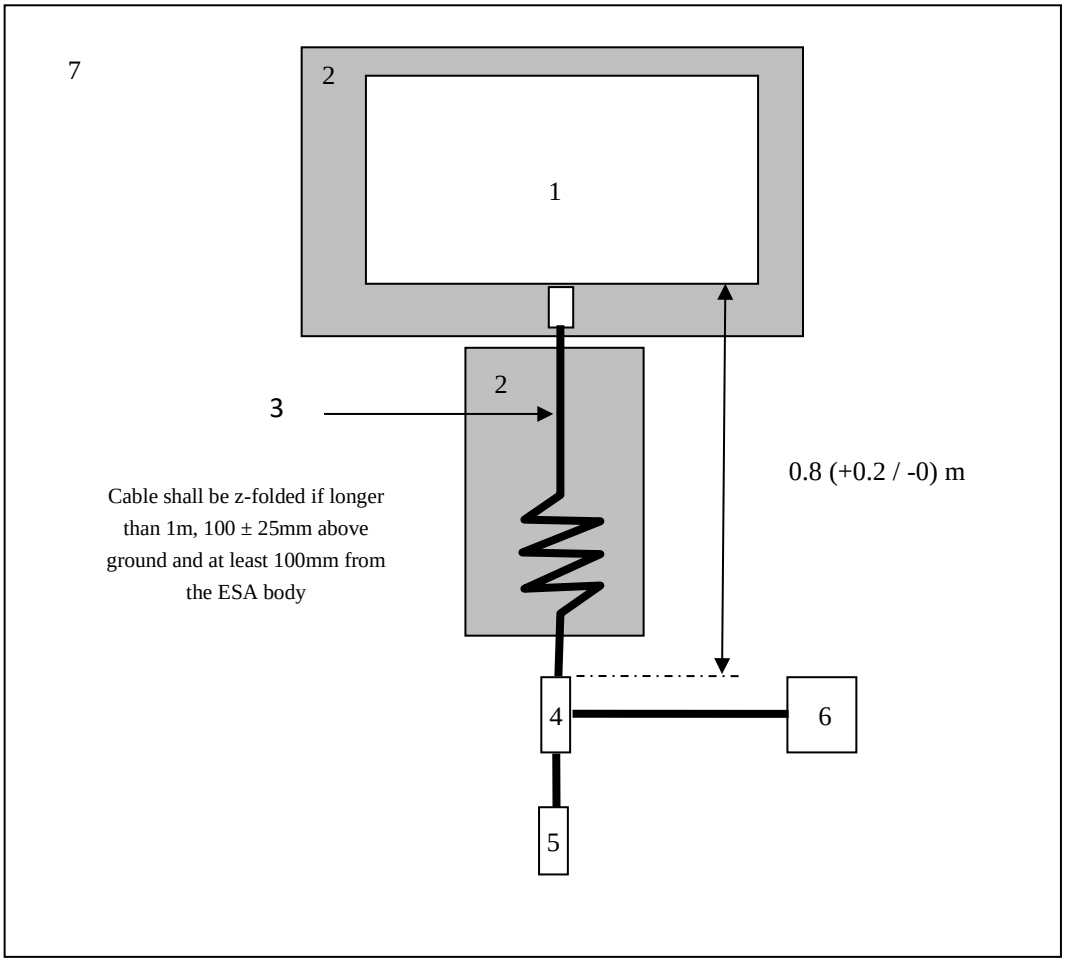
Table 2
Scanning receiver parameters

Frequency range MHz	*Peak detector*			*Quasi-peak detector*			*Average detector*		
	BW at -6 dB	*Maximum step size*	*Minimum dwell time*	*BW at -6 dB*	*Maximum step size*	*Minimum dwell time*	*BW at -6 dB*	*Maximum step 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)



Key
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 461000-4-5. Test shall be performed only at the severity levels given in 7.16.2.1."