ECE R 10.05
Specifics of ESA

EMC Type Approval of
Vehicles and Electronic Sub-Assemblies
Who am I?

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Topics

- Development
- REESS and non REESS
- Is ECE R 10.05 required or not (Coverage)
  - E-mark, CE, other Directives
  - ESA with built in RF module
- Focus on ESA
  - Immunity vs non immunity related functions
  - Aftermarket equipment
  - Surprise topic
  - Procedures
  - Test coverage (different methods)
  - Finally – requirements after testing for obtaining E-mark, and placing a product on the market
Development

In just 50 years, we have gone

From:
Development

To:
Before we start
REESS and non REESS

What are REESS

[Images of electric vehicles and charging stations]
REESS and non REESS

WIRELESS TESLA CHARGING
ECE R 10.05 - required or not?

- ECE R 10.05
- CE
- Other Directives for “vehicles”
- ESA with built in RF module
ECE R 10.05 - required or not?

Electrical/electronic sub assembly (ESA) classification

ESAs intended for fitment in vehicles?
- Yes
  - Passive ESA or system (e.g., spark plugs, cables, passive antenna)?
    - Yes
      - Not concerned
      - No marking
      - No type approval
    - No
      - Use restricted by technical means to immobilized vehicle
        - Yes
          - Provides a coupling system for charging the REESS?
            - Yes
              - Connected permanently or temporarily to the vehicle wiring harness?
                - Yes
                  - Connected via an interface type approved to this Regulation as amended?
                    - Yes
                      - No application of Regulation No. 10
                    - No
                      - No application of Regulation No. 10
                - No
                  - No application of Regulation No. 10
        - No
          - No application of Regulation No. 10

ESAs not intended for fitment in vehicles:
- No
  - Application of Regulation No. 10

SIQ
Special case
In case of an ESA is (part of) a light source, the applicant shall:

(a) Specify the approval number according to Regulation No. 37, Regulation No. 99 or Regulation No. 128, granted to this ESA;

or

(b) Provide a test report by a Technical Service designated by the Type Approval Authority, stating that this ESA is not mechanically interchangeable with any light source according to Regulation No. 37, Regulation No. 99 or Regulation No. 128.

In case of an ESA is (part of) a light source and if the documentation as specified left is missing, approval of this ESA according to Regulation No. 10 shall not be granted.
immunity related (E-mark)
What are im. rel. functions non-immunity related (CE mark)
How to approach
What about aftermarket equipment?
And if they have a wireless module or CAN?
Immunity related functions

HOW TO KNOW?
Some of the functions considered are:

– Degradation or change in: e.g. engine, gear, brake, suspension, active steering, speed limitation devices;
– Affecting drivers position: e.g. seat or steering wheel positioning;
– Affecting driver's visibility: e.g. dipped beam, windscreen wiper.

Functions related to driver, passenger and other road user protection
– E.g. airbag and safety restraint systems.

Functions which, when disturbed, cause confusion to the driver or other road users:
– Optical disturbances: incorrect operation of e.g. direction indicators, stop lamps, end outline marker lamps, rear position lamp, light bars for emergency system, wrong information from warning indicators, lamps or displays related to functions in subparagraphs (a) or (b) which might be observed in the direct view of the driver;
– Acoustical disturbances: incorrect operation of e.g. anti-theft alarm, horn.

Functions related to vehicle data bus functionality:
– Blocking data transmission on vehicle data bus-systems, which are used to transmit data, required to ensure the correct functioning of other immunity related functions

Functions which when disturbed affect vehicle statutory data: e.g. tachograph, odometer.

Function related to charging mode when coupled to the power grid:
– For vehicle test: by leading to unexpected vehicle motion;
– For ESA test: by leading to an incorrect charging condition (e.g. over-current, over-voltage).
Immunity related functions
Aftermarket equipment

Two options:

- Immunity related
  ECE R 10.05 and homologation is required
  different functions

- Non-immunity related
  ECE R 10.05 and homologation are **NOT** required
  EN 50498 required
  different functions
ESA – Type approval

Two options:

1. ESA to be fitted either to any vehicle type (component approval)
2. to a specific vehicle type or types requested by the ESA manufacturer (separate technical unit approval).
DIFFERENT FUNCTIONS
The Connected Highway

ESA with built in RF module
The Connected Highway

ESA with built in RF module

Compliance:
- E-mark
- RED (CE mark)
RED – definitions

• The RED is applicable to the combination of the non-radio product and the radio equipment, if the radio equipment is:
  – incorporated into the non-radio product; and
  – permanently affixed to the non-radio product.

• If the radio equipment is incorporated in a fixed and permanently way in the non-radio product at the moment of its placing on the market, as specified above, this product is deemed to be a single product.

Combined Equipment

• Non-radio products which function with radio equipment
Additional Directive(s)

Additional Directive(s)

Essential requirements

- **Art. 3.1(a):** Health and Safety requirements as LVD, **but with no lower voltage limit**
- **Art. 3.1(b):** EMC requirements as EMCD
- **Art. 3.2:** effective and efficient use of radio spectrum to avoid harmful interference
EMC testing - Combined Equipment

Standard EN 303 446-1 only applies if:

- applicable non-radio EMC standard
- applicable radio EMC standard

is stated in normative references.

• Informative references

ETSI EG 203 367: "Guide to the application of harmonised standards covering articles 3.1b and 3.2 of the Directive 2014/53/EU (RED) to multi-radio and combined radio and non-radio equipment".
The Connected Highway

And if one of the components does not work due to disturbances?
Let’s do some testing

- **EMISSION:**
  - Conducted emission
  - Transient emission
  - Radiated emission
  - Harmonics and current test
  - Flicker and voltage fluctuations

- **IMMUNITY:**
  - Radiated immunity
  - EFT
  - Surge
  - Surges and transients
Procedures

Conducted emission:
- Conducted emission - REESS
- Transient emission - NON-REES
Procedures

- Transient emission - NON-REES
Procedures

Radiated emission:
- Both
Procedures

Harmonics and current test – REESS
Flicker and voltage fluctuation test – REESS
Procedures

Radiated immunity:
- REESS
- NON-REES
- Possible methods:
  (a) Absorber chamber test according to ISO 11452-2;
  (b) TEM cell testing according to ISO 11452-3;
  (c) Bulk current injection testing according to ISO 11452-4;
  (d) Stripline testing according to ISO 11452-5;
  (e) 800 mm stripline.

- Are they aligned?
Procedures

Absorber chamber test

Test configuration for ESA's involved in "REESS charging mode coupled to the power grid". The test shall be performed according to ISO 11452-2.
Procedures

Burst:
- REESS

Cable shall be z-folded if longer than 1m, 100 ± 25 mm above ground and at least 100mm from the car body.
Procedures

Transient immunity:

Test Setup

ECE R10 (Revision 5, 2012-03) : Pulse 1
- \( V_s: \) 450 V
- \( t_1: \) 0.5 s
- \( t_2: \) 200 ms
- \( t_r: \) 3 us
- \( t_d: \) 1000 us
- \( R_t: \) 50 Ohm
- Coupling: Battery
- Events: 5000
- Test duration: 00:41:40 h

Test Setup

ECE R10 (Revision 5, 2012-03) : Pulse 2a
- \( V_s: \) +37 V
- \( t_1: \) 0.2 s
- \( t_d: \) 50 us
- \( R_t: \) 2 Ohm
- Coupling: Battery
- Events: 5000
- Test duration: 00:16:40 h

Test Setup

ECE R10 (Revision 5, 2012-03) : Pulse 2b
- \( V_s: \) 20.0 V
- \( t_1: \) 1.0 s
- \( t_d: \) 200 ms
- \( t_r: \) 1 ms
- \( R_t: \) 0.05 Ohm
- \( t_2: \) 1 ms
- Events: 5
- Test duration: 00:00:14 h

Test Setup

ECE R10 (Revision 5, 2012-03) : Pulse 3a
- \( V_s: \) -150 V
- \( f_1: \) 10 kHz
- \( t_4: \) 10 ms
- \( t_5: \) 90 ms
- \( t_r: \) 5 ns
- \( t_d: \) 150 ns
- \( R_t: \) 50 Ohm
- Coupling: Battery
- Test duration: 1 h

Test Setup

ECE R10 (Revision 5, 2012-03) : Pulse 3b
- \( V_s: \) +150 V
- \( f_1: \) 10 kHz
- \( t_4: \) 10 ms
- \( t_5: \) 90 ms
- \( t_r: \) 5 ns
- \( t_d: \) 150 ns
- \( R_t: \) 50 Ohm
- Coupling: Battery
- Test duration: 1 h

Test Setup

ECE R10 (Revision 5, 2012-03) : Pulse 4
- \( V_{a1}: \) -12.0 V
- \( V_{a2}: \) -5.0 V
- \( t_1: \) 1.0 s
- \( t_6: \) 10 ms
- \( t_7: \) 50 ms
- \( t_8: \) 50 ms
- \( t_9: \) 0.5 s
- \( t_{11}: \) 10 ms
- Events: 5
- Test duration: 00:00:10 h
Procedures test coverage

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

Figure 1
Vehicle in configuration "REESS charging mode coupled to the power grid" – Coupling between lines for DC or AC (single phase) power lines

Figure 2
Vehicle in configuration "REESS charging mode coupled to the power grid" – Coupling between each line and earth for DC or AC (single phase) power lines

Surges:
- REESS
Procedure for obtaining E-mark in Slovenia

Required documents for E-mark procedure:
• Electrical schematics
• PCB layouts
• BOM
• User manual
• Signed application form (E26 Application)
• Picture of device with visible label
• Label with visible placement of E26 mark and place for the number of homologation
• ISO 9001
• Out print of national company registry (proof of company existence)
• PASS test report
And if it is also RED applicable?

Technical Documentation

• Description of the apparatus,
• General Arrangement drawing,
• List of standards applied,
• Wiring and circuit diagrams,
• Records of risk assessments and assessments to standards,
• Datasheets for critical sub-assemblies,
• Part list (BoM),
• Copies of any markings and labels,
• Copy of instructions (user, maintenance, installation),
• Test reports and certificates,
• Quality control & commissioning procedures,
• EU - Declaration of Conformity.
After Compliance - Product Labelling

Manufacturer’s Trade Name/Mark:
Full Postal Address:
Web Address: (recommended but not mandatory)

Importer’s Label; Trade Name/Mark:
Full Postal Address:

Product Name/Type:
Batch/Serial Number:

Other Directives may require further data
Where can you go with this
Thank you