

# **Alternative Approach to UN R13 Type-IIA for Battery Electric Vehicles**

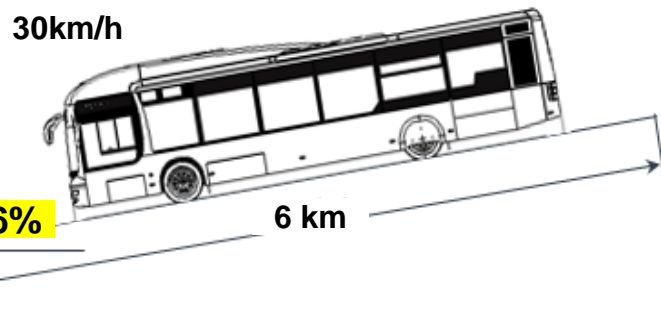
OICA – CLEPA  
GRVA-01 - September 2018

# Technical background

## UN R13 - Type-II and IIA tests

### Type-II

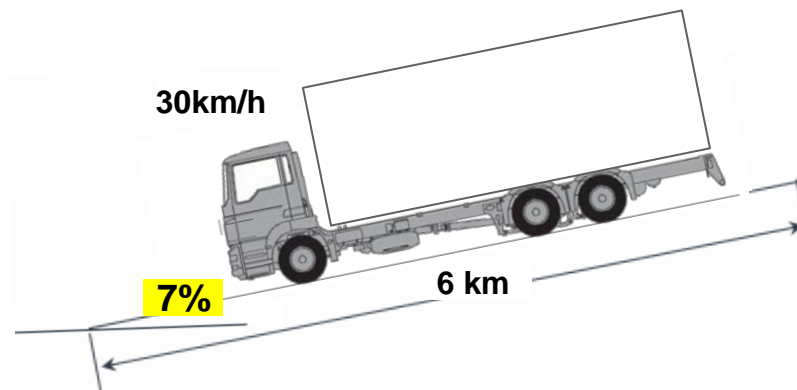
#### Downhill Behaviour Test



- **Scope**
  - M3 and N3
  - Except vehicles submitted to Type-IIA
- **Service brake:** no restriction
- **Pass criteria:** Hot-stop performance after Type-II
  - N3:  $3.3 \text{ m/s}^2$
  - M3:  $3.75 \text{ m/s}^2$

### Type-IIA

#### Endurance Braking Performance Test



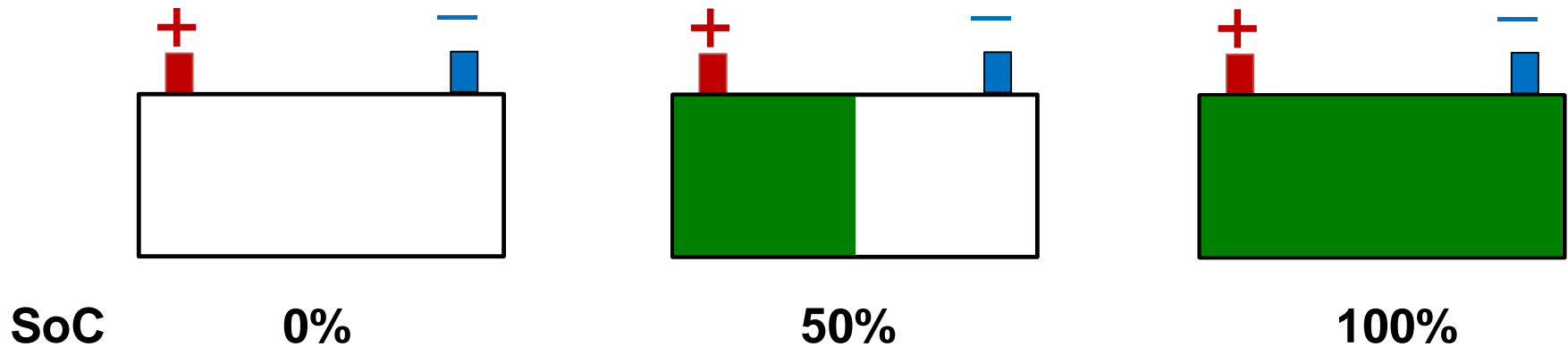
- **Scope**
  - M3 class II, III & B
  - N3 ADR and/or authorized to tow cat. O4
- **Service brake: prohibited**
- **Pass criteria:** Average speed of 30km/h (+/- 5 km/h)

# Technical background

UN R13 – Definition of SoC \*

\* *State of charge*

2.21.4. “Electrical state of charge” means the instantaneous **ratio of electric quantity of energy stored in the traction battery** relative to the maximum quantity of electric energy which could be stored in this battery;



# Technical background

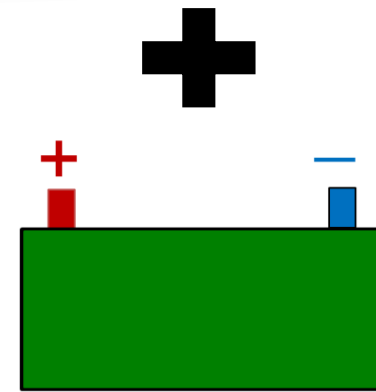
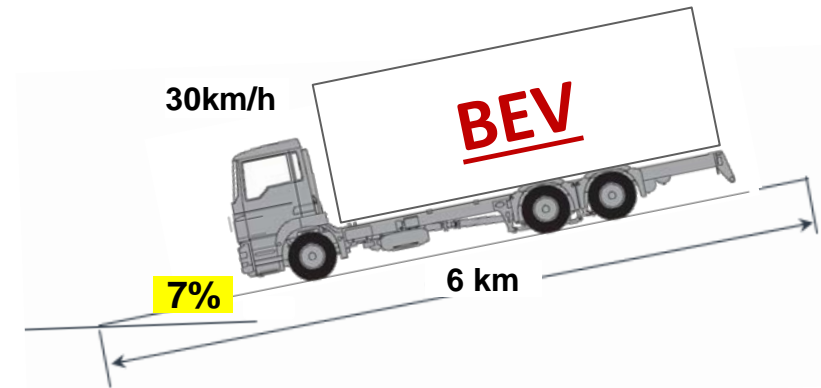
## Description of the issue

### General:

UN R13 Type-IIA test is not adapted to Battery Electric vehicles (BEV) technology.

### Technical issue:

- Technical Services requires Type-IIA to be conducted with a **fully charged** traction battery (i.e. the worst case).
  - In these conditions:
    - The kinetic energy of the vehicle cannot be converted and stored in the traction battery,
    - No endurance braking is available.
    - **Type-IIA cannot be passed** without complex technical solutions highly impacting weight, packaging and cost, e.g. resistors and high-temp cooling system, extra batteries.
- **Such solutions kill the economical interest of BEV technology.**



100%



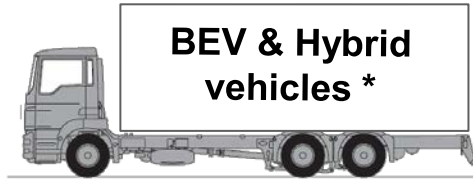
Type-IIA *not feasible*

An alternative approach is needed for BEVs

# Alternative to Type IIA

## Principles

No change for vehicles not equipped with an ERB system



\* M3 class II, III & B + N3 ADR and/or authorized to tow cat. O4, equipped with an ERB system of cat A or B

Current way

Type-IIA

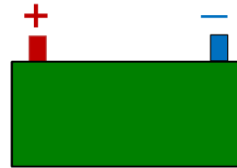


100%

30 +/-5km/h

Alternative approach

Type-II



100%

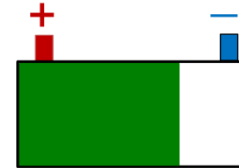
hot-stop requirements:

N3 = 3.3 m/s<sup>2</sup>

M3 = 3.75m/s<sup>2</sup>

+

Type-IIA



<100%

30 +/-5km/h

Brake estimator

Warn the driver if performance is below Type-II hot-stop requirements:

N3 = 3.3 m/s<sup>2</sup>

M3 = 3.75m/s<sup>2</sup>