Measurement of noise from electrical vehicles and internal combustion engine vehicles under urban driving conditions

Oslo the 12th of June
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Agenda

- Background
- Details of the measurements
- The results
  - Steady speed
  - Engine braking
  - Acceleration
- Conclusions
Background

Litterature survey found that...

...... there is a potential for noise reduction by replacement of Internal Combustion Engine (ICE) vehicles with Electric Vehicles (EV).

...... more knowledge is needed about the tires used on electric passenger cars.

...... measurements of different driving situations should be carried out.
Background

Noise from an average modern ICE passenger car

![Graph showing noise levels vs. speed]

- **Total noise**
- **Tyre/road noise**
- **Propulsion noise**

*Graph legend*
# Measurements

<table>
<thead>
<tr>
<th>Citroën Berlingo EV</th>
<th>Citroën Berlingo ICE</th>
<th>Nissan Leaf EV</th>
<th>VW Golf Variant ICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>71 dB</td>
<td>69 dB</td>
<td>70 dB</td>
<td>70 dB</td>
</tr>
</tbody>
</table>
Measurements

Temperature 16.6 °C.
Normalized to 20 °C correction -0.05 dB/°C.

2-3 years old soft asphalt
Measurements

Controlled pass by (CPB) was used to investigate the 3 different driving pattern: Constant speed, engine braking and accelerating.
Measurements

• Constant speed:
  • 10, 20, 30, 40, 50 and 60 km/h

• Deceleration (Constant speed → Engine breaking):
  • 20, 30, 40, 50 and 60 km/h

• Acceleration:
  • 10 → 30 km/h
  • 10 → 50 km/h
  • 20 → 40 km/h
  • 20 → 60 km/h
  • 30 → 50 km/h
  • 40 → 60 km/h
Results

The Berlingos noise levels at constant speed

**EV**
- Total noise
- Tyre/road noise
- Propulsion noise

**ICE**
- Total noise
- Tyre/road noise
- Propulsion noise
Results

The Berlingos frequency spectra at constant speed

- Berlingo ICE 9 km/h
- Berlingo ICE 61 km/h
- Berlingo EV 10 km/h
- Berlingo EV 59 km/h
Results

The Nissan Leaf and VW Golf Variant noise levels at constant speed

![Graph showing CPB noise level vs. speed for Nissan Leaf and VW Golf Variant at constant speed](graph.png)
Results

The Nissan Leaf and VW Golf Variant frequency spectra at constant speed

[Graph showing frequency spectra for Nissan Leaf and VW Golf Variant at different speeds]
Results

The Berlingos noise levels at deceleration by engine braking.
Results

The Berlingos frequency spectra at deceleration by engine braking

[Graph showing frequency spectra for Berlingo ICE 14 km/h, Berlingo ICE 61 km/h, Berlingo EV 13 km/h, and Berlingo EV 57 km/h.]
Results

The Nissan Leaf and VW Golf Variant noise levels at deceleration by engine braking

![Graph showing noise level vs speed for Nissan Leaf and VW Golf Variant](image)
Results

The Nissan Leaf and VW Golf Variant frequency spectra at deceleration by engine braking
Results

The Berlingos noise levels at acceleration of various degree

![Graph showing CPB noise level vs. Acceleration for Berlingo EV and Berlingo ICE]
The Nissan Leaf and VW Golf Variant noise levels at acceleration of various degree.
Results
Conclusions

Constant speed

- EVs are 4-5 dB less noisy than similar ICEs at low speed.
- At about 30 km/h the difference in emitted noise is not significant.

Deceleration by engine braking

- EVs are 2-4 dB less noisy than ICEs at low speed.
- At higher speed the difference decrease as the tire/road noise is getting dominant.

Overall conclusion

EVs will have the potential to reduce the traffic noise in carparks and on streets where vehicles travel with speeds under 30 km/h.
Thank you for your attention !!!

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