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

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





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.





Noise from an average modern ICE passenger car









Citroën Berlingo EV	Citroën Berlingo ICE	Nissan Leaf EV	VW Golf Variant ICE
Michelin Agiglis 51 195/70 R15C	Michelin Energy Saver 195/65 R15 G1	Michelin Energy Saver 205/55 R16	Michelin Energy Saver 205/55 R16
71 dB	69 dB	70 dB	70 dB





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



2-3 years old soft asphalt





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







- Constant speed:
 - · 10, 20, 30, 40, 50 and 60 km/h
- Deceleration (Constant speed \rightarrow Engine breaking):
 - · 20, 30, 40, 50 and 60 km/h
- Acceleration:
 - * $10 \rightarrow 30 \text{ km/h}$
 - * $10 \rightarrow 50 \text{ km/h}$
 - * $20 \rightarrow 40 \text{ km/h}$
 - * $20 \rightarrow 60 \text{ km/h}$
 - * 30 ightarrow 50 km/h
 - $40 \rightarrow 60 \text{ km/h}$







The Berlingos frequency spectra at constant speed







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



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







The Berlingos noise levels at deceleration byzengine braking







The Berlingos frequency spectra at deceleration by engine braking







The Nissan Leaf and VW Golf Variant noise levels at deceleration by engine braking 75



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







The Berlingos noise levels at acceleration of various degree







The Nissan Leaf and VW Golf Variant noise levels at acceleration of various degree









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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