Functional noise specifications for purchasing green low noise vehicles

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DISSEMINATION WORKSHOP

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CityHush

Objectives

- ✓ Develop functional noise specifications for purchasing green low noise vehicles
  - ✓ Environmentally friendly regarding noise?
- ✓ Develop noise criteria for vehicles to enter Q-zones
  - ✓ Free access to Q-zones?

Green vehicles in city areas

- ✓Passenger cars (hybrid/pure electric)
- ✓Light trucks (hybrid)
- ✓Garbage trucks (hybrid)
- ✓Busses (hybrid)
- ✓Motorcycles (electric)

The work process

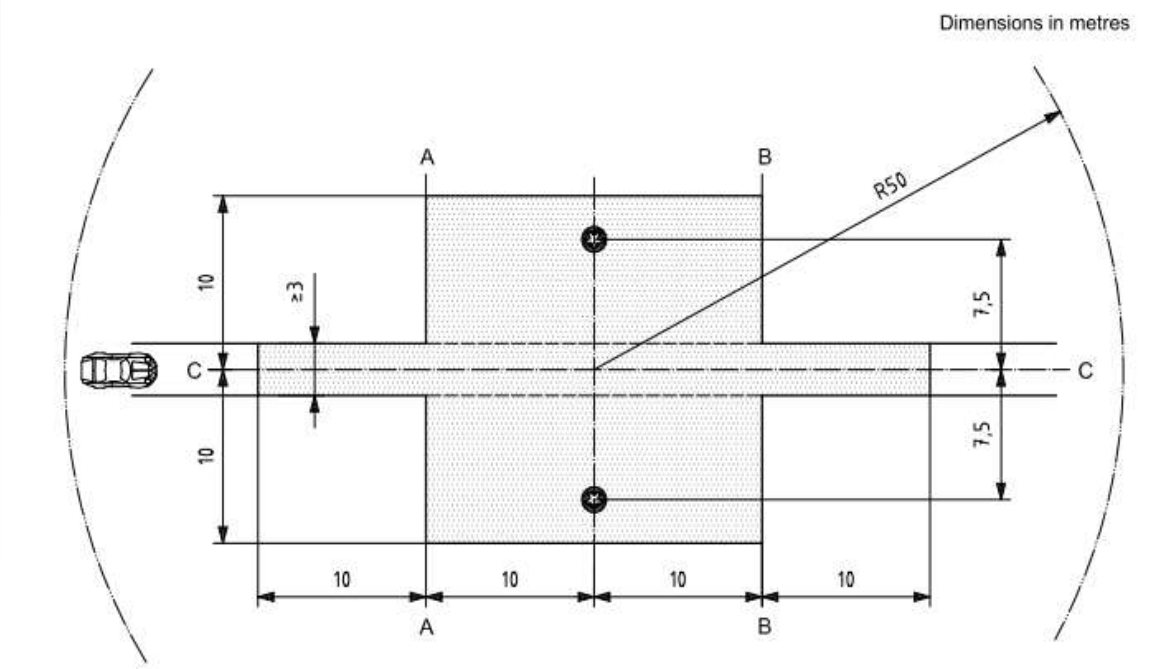
- ✓ Studies regarding proper testing methods for electric and hybrid passenger cars
- ✓ Sound measurements on new hybrid and electric cars
- ✓ Collection of noise emission data on conventional passenger cars
- ✓ Development of noise classification
- ✓ Proposal on a suitable noise limit for a passenger car to be considered as a quiet vehicle “acoustically green”

Testing methods for exerior noise type approval in Europe

- ECE Regulation 51, method A
  - Based on ISO 362:1998
  - Measure the highest noise levels produced during full acceleration (wot) from 50 km/h
  - Poor correlation to normal urban driving conditions today
- ECE Regulation 51, method B
  - Based on ISO 362:2007
  - Estimates partial throttle operations at 50 km/h
    L_{urban} - weighted average of wot-test and crs-test
  - More in line with normal urban driving

Measurement program based on method B

- ✓ ISO 362-1:2007 extended program
  - ✓ Constant speed test (crs) at 15, 20, 25, 30, 40 and 50 km/h
  - ✓ Full acceleration test (wot) from 20, 30 and 50 km/h



Tested passenger cars

- ✓ Hybrid car
  - ✓ Toyota Prius
- ✓ Pure electric car
  - ✓ Mitsubishi iMiev
  - ✓ Fiat 500 EVadapt
  - ✓ Fiat 500 Liion
  - ✓ Peugeot iOn
  - ✓ Citroen C-Zero

Toyota Prius:

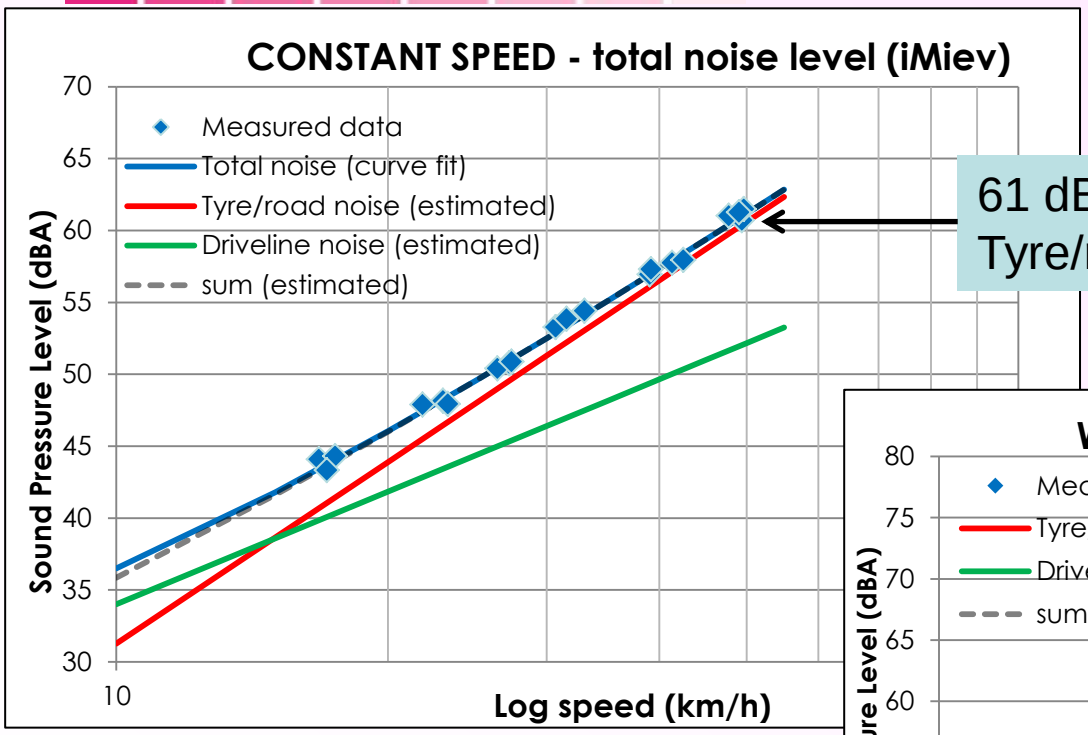
Mitsubishi iMiEV:

Fiat 500 EVadapt:

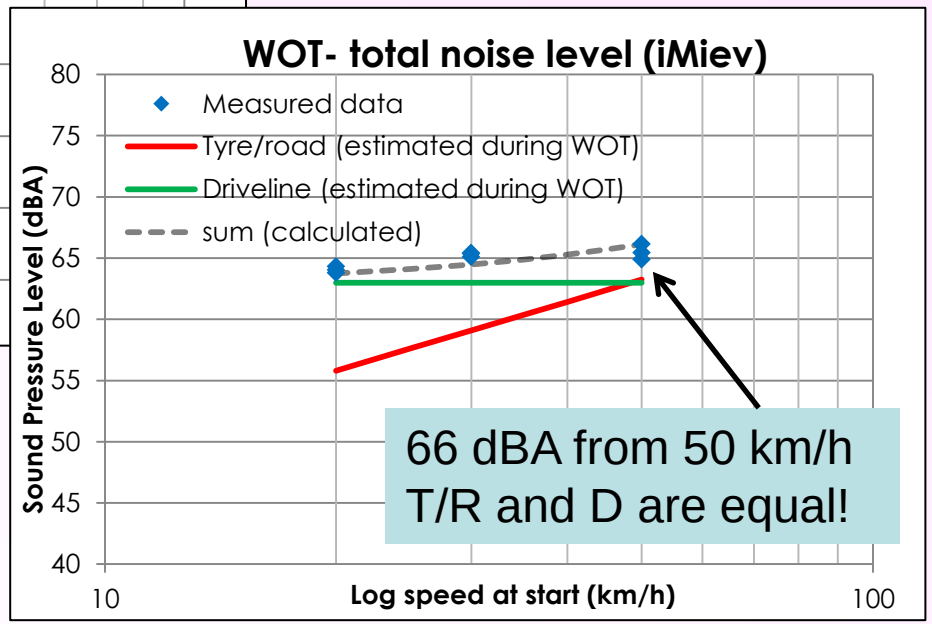
Peugeot iOn:

Citroen C-Zero:

Mitsubishi iMiEV (pure electric)



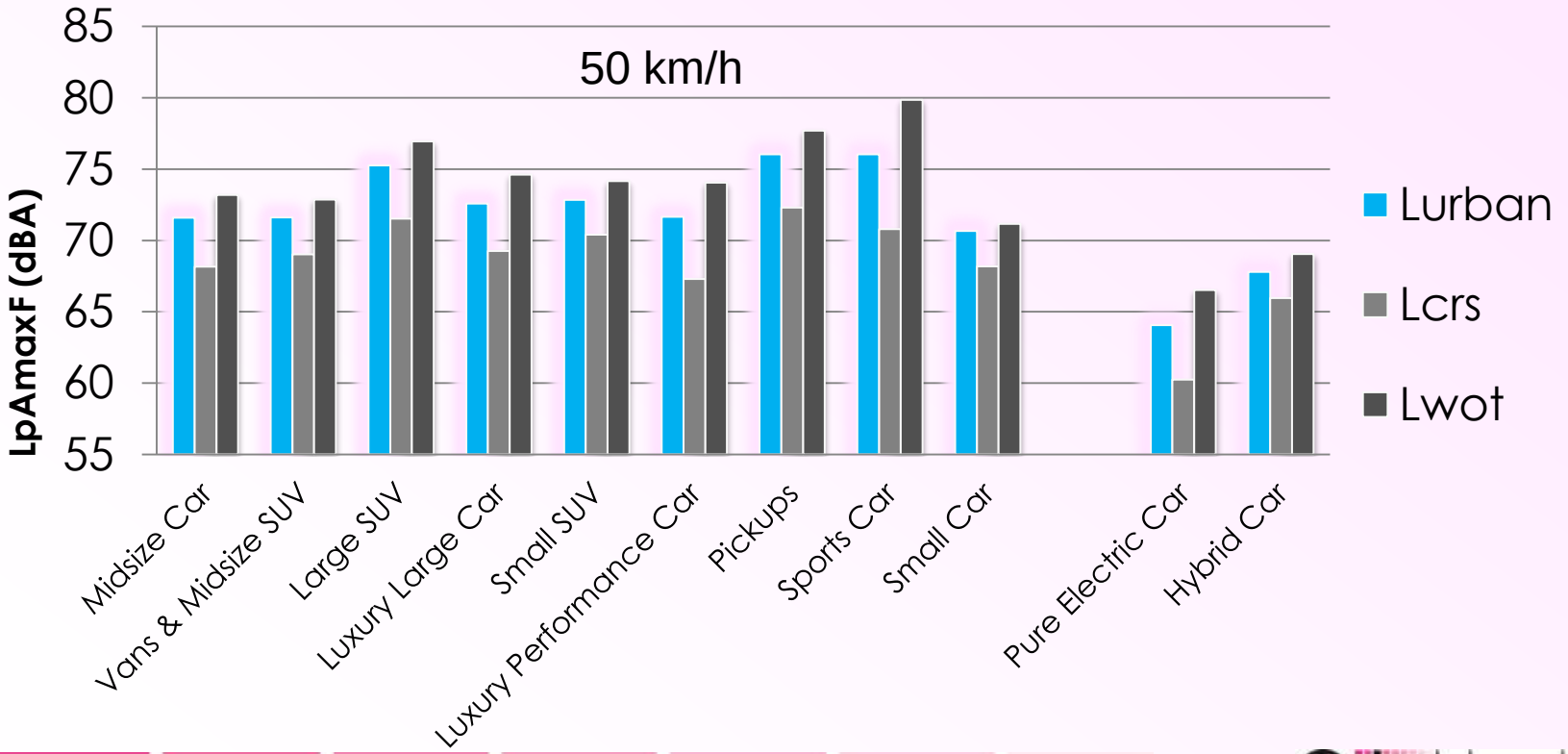
61 dBA @ 50 km/h
Tyre/road noise is dominating



66 dBA from 50 km/h
T/R and D are equal!

Hybrid and electric cars vs. conventional cars

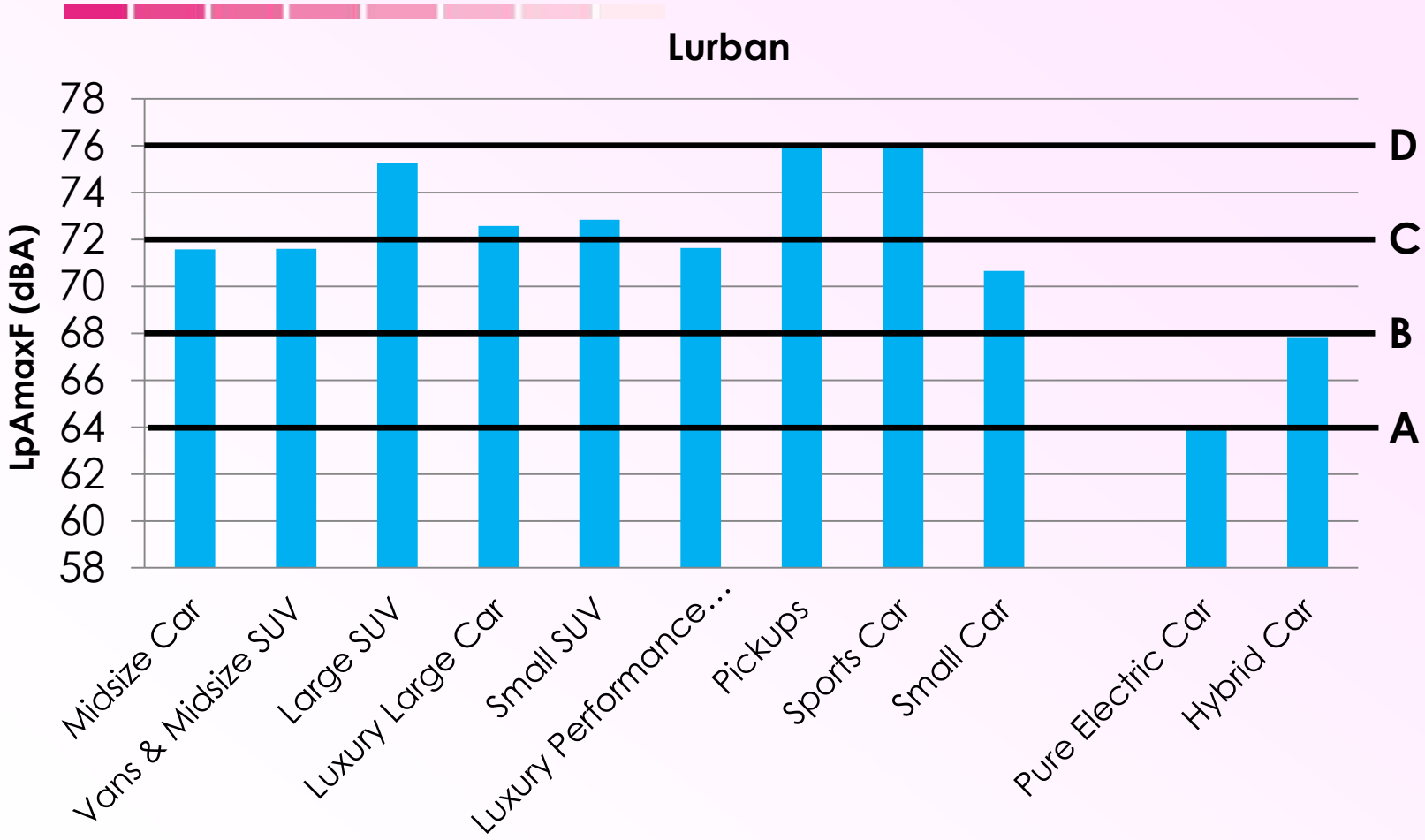
- ✓ 5-10 dB lower noise levels at 50 km/h
- ✓ Higher noise reduction < 50 km/h (quiet driveline)
- ✓ Lower noise reduction > 50 km/h (dominating tyre/road noise)



Exterior noise clasification

Noise class	Noise limit ISO 362:2007 (L_{urban})	Environmentally friendly regarding noise	Typical passenger car types
A	< 64 dBA	YES	Pure electric cars
B	64 - 68 dBA	YES	Hybrid cars
C	68 - 72 dBA	NO	Normal passenger cars
D	72 - 76 dBA	NO	Large passenger cars
E	> 76 dBA	NO	Sport cars and pickups

Exterior noise clasification



Conclusions

- ✓ Type approval according to ECE R51 method B (ISO 362:2007)
- ✓ Full acceleration test from 20 or 30 km/h instead of 50 km/h for electric passenger cars with weak engines (low PMR)
- ✓ A passenger car that are considered "acoustically green" should fulfil $\mathbf{L_{urban} < 68\ dBA}$ (i.e. noise class A or B)
- ✓ Similar noise limits should be developed for other vehicle categories as well (busses, light trucks, garbage trucks etc)

Thank you for your attention