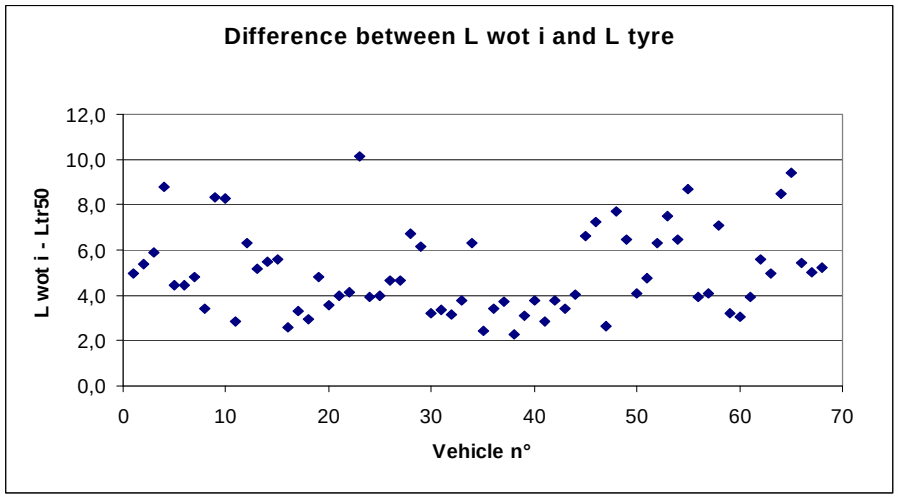
ASEP GRB 08

Tyre influence in vehicle noise

Tyre noise contribution and influence

Large variations between tyre noise and L wot i : from 2 dB to 10 dB

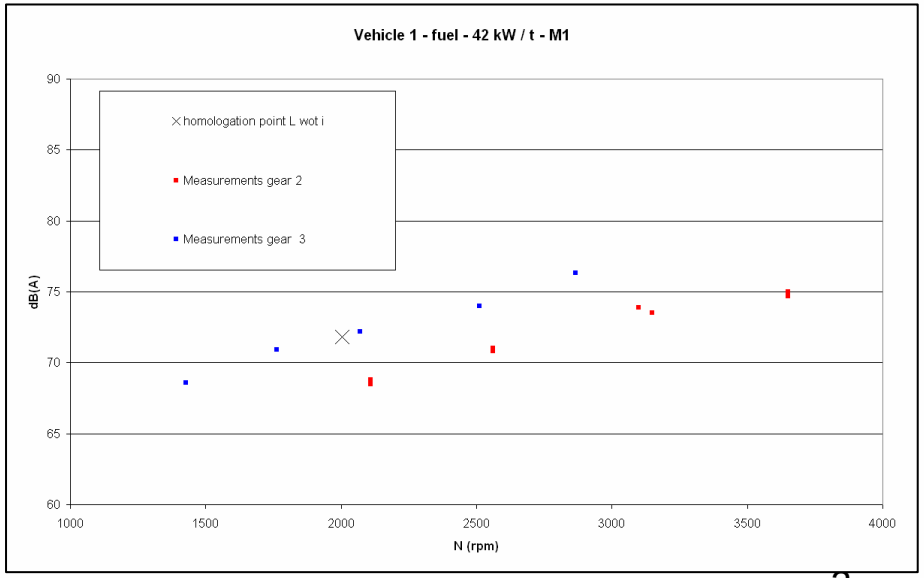


ACEA Data base

This difference depends of vehicle design :

- engine,
- tyre
- gear ratios

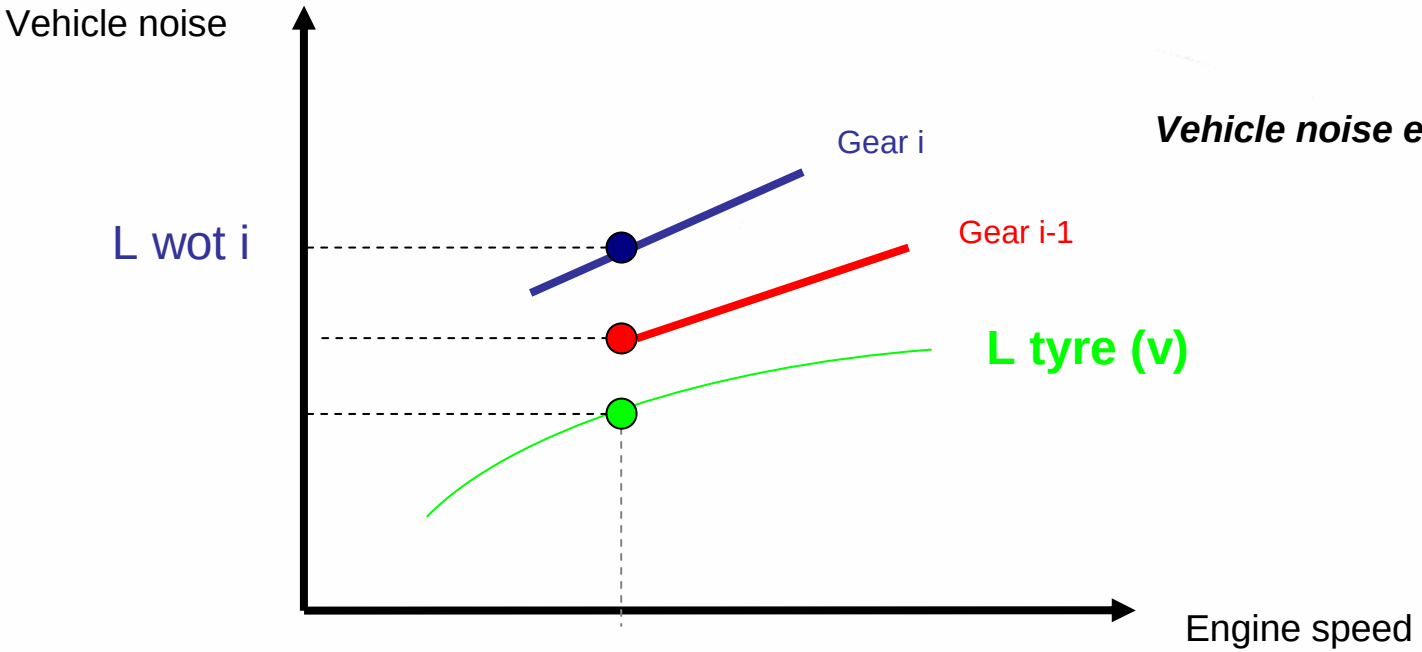
This influence introduce a gap between vehicle noise in gear i and vehicle noise in gear i-1 or i-n



This influence may be important

Simulation using F/D model

To evaluate this influence, vehicle noise behaviour is studying
by using the simple and realistic vehicle noise model
Using by F/D proposal



F/D Model :

L vehicle (N, v) = L engine (N) « + » L tyre (v)
L tyre = L_tyre (v ref)+ a*log (v/v ref)
L engine = L engine (N ref) + b (N – N ref)

Simulation 1

High difference of gear ratios
High tyre noise slope

Vehicle simulated :
Gear i-n : 15 kph/1000 rpm
Gear i : 30 kph/1000 rpm

L wot i = 74 dB(A)

Tyre :
L tyre 50 kph = 72 dB(A) or 64 dB(A)
a = 40

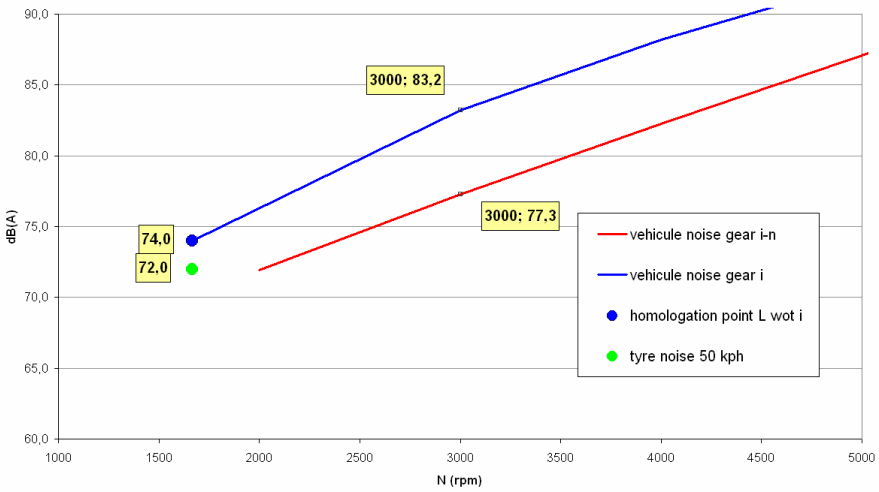
Engine :
b = 5 dB/1000rpm

At 3000 rpm :

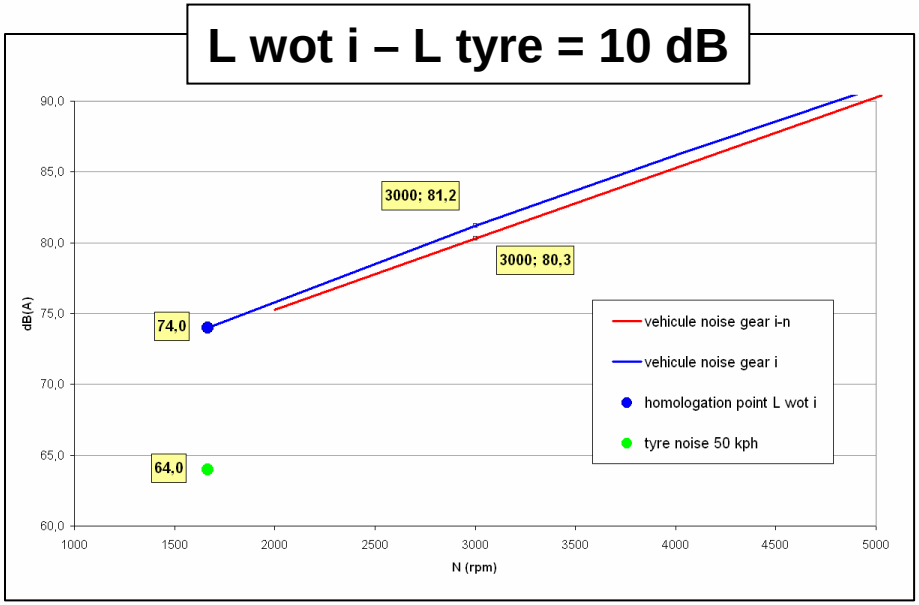
L wot i – L tyre = 3 dB :
L veh gear i – L veh Gear i-n = 5,9 dB

L wot i – L tyre = 10 dB :
L veh gear i – L veh Gear i-n = 0,9 dB

L wot i – L tyre = 2 dB



L wot i – L tyre = 10 dB



Simulation 2

Low difference of gear ratios
Low tyre noise slpoe

Vehicle simulated :
Gear i-n : 15 kph/1000 rpm
Gear i : 20 kph/1000 rpm

L wot i = 74 dB(A)

Tyre :
L tyre 50 kph = 72 dB(A) or 64 dB(A)
a = 32

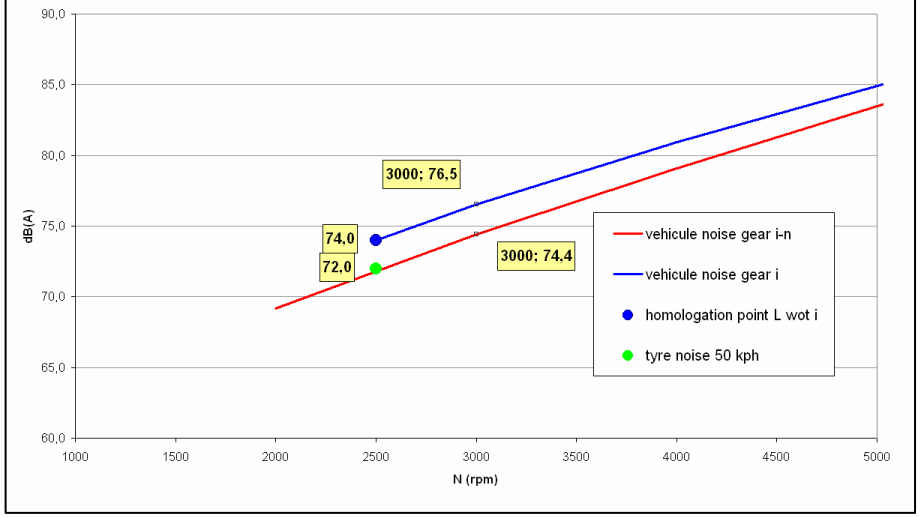
Engine :
b = 5 dB/1000rpm

At 3000 rpm :

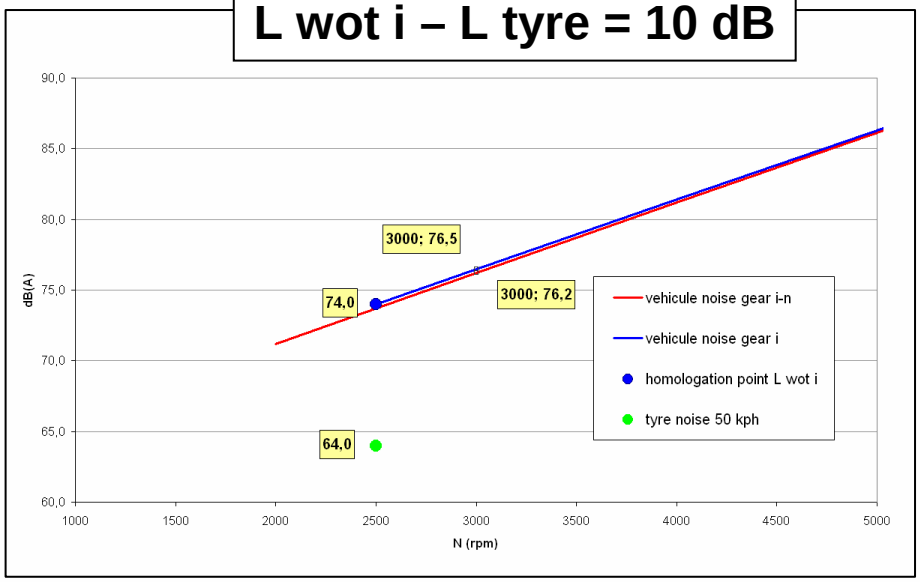
L wot i – L tyre = 3 dB :
L veh gear i – L veh Gear i-n = 2,1 dB

L wot i – L tyre = 10 dB :
L veh gear i – L veh Gear i-n = 0,3 dB

L wot i – L tyre = 2 dB



L wot i – L tyre = 10 dB



Conclusions

➢Gap between vehicle noise in gear i and gear i –n can go up to 5 dB depending to vehicle design.

➢To take account of the influence of tyre noise in vehicle noise, different approaches have been tested :

- Using combination with speed or engine speed and acceleration or gear ratios
  → Relation between tyre influence and acceleration or gear ratios depends of each vehicle design.

- Using tyre noise influence as F/D proposal

➢Two alternatives can be chosen :

- Using Tyre noise into the model
  → More precise approache to take into account this gap

- Not using Tyre noise into the model
  → Give a larger tolerance for vehicle which have high tyre noise or low engine noise