# JRC replies to ETRTO (TFVS-18-05) and OICA (TFVS-19-02)

TFVS 19th session
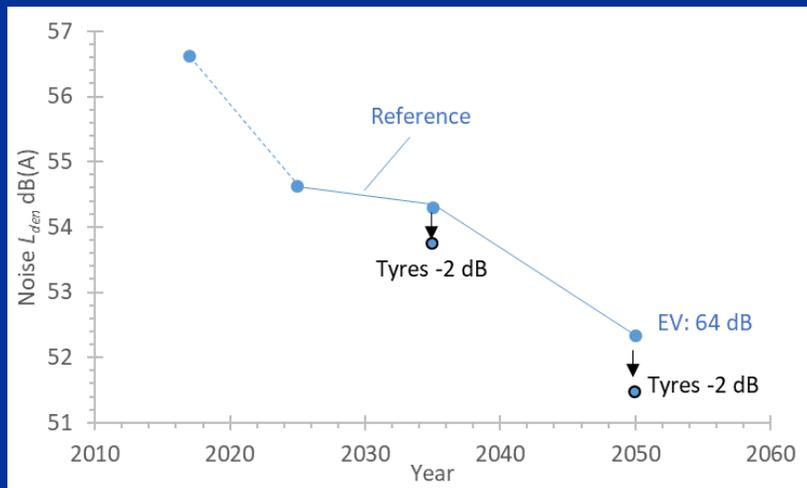
9 Feb 2026

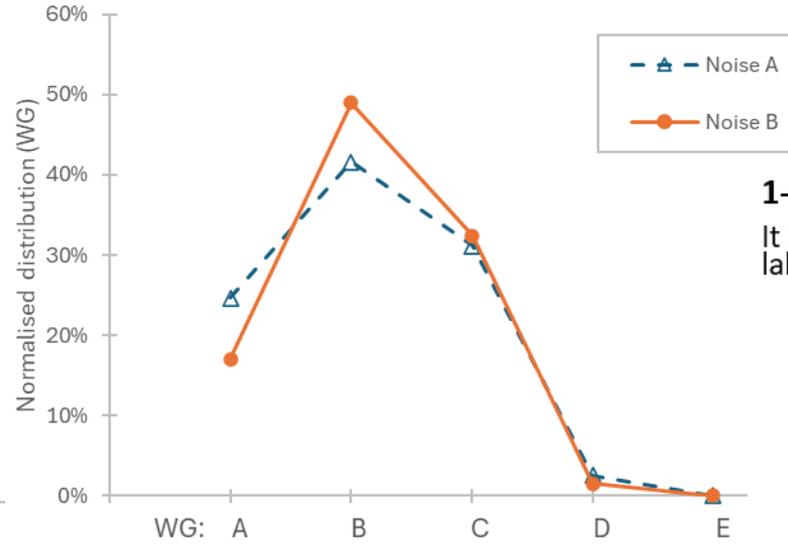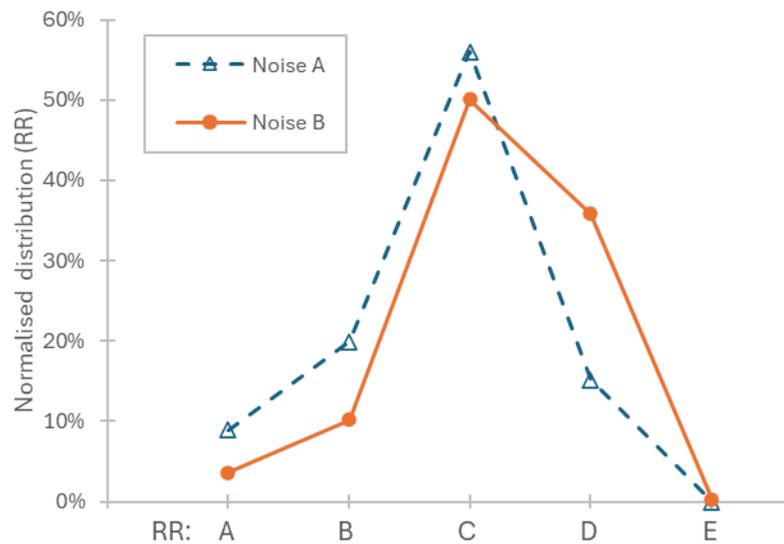| dB | END (2017) | 2017 | 2025 | 2035 | 2050 |
|---|---|---|---|---|---|
| <50 | 18% | 19% | 19% | 19% | 58% |
| 50-54 | 37% | 39% | 39% | 39% | 1% |
| 55-59 | 18% | 19% | 19% | 19% | 28% |
| 60-64 | 14% | 10% | 22% | 22% | 13% |
| 65-69 | 9% | 13% | 0% | 0% | 0% |
| 70-74 | 3% | 1% | 1% | 1% | 1% |
| >75 | 0% | 0% | 0% | 0% | 0% |
| average | | 56.6 | 54.6 | 54.3 | 52.3 |

# JRC replies to ETRTO (TFVS-18-05)

TFVS 19th session

9 Feb 2026

# ETRTO comments and JRC replies



1- **Supporting data not enough robust**

It is not robust / not correct to compare Noise levels with RR or WG labels :

- RR or WG labels (A, B, C, D) are discrete sets, no indications are available to know if a given tyre is low or high in the label → impossible to draw "tendencies"
- Only a multivariate regression analysis can properly reflect performance compromise
- Moreover, the study does not consider the inherent uncertainty in noise measurements

LEON-T analysed specific tyre sizes and not only all the <u>EPREL</u> data together. A tyre can be high or low in the label, but still a class A tyre is better than a class B

Another comparison: How different are WG and RR between A and B noise tyres?
For eleven C1, five C2 and five C3 tyre sizes, and separately Normal and 3PMSF tyres:
- RR was better for A noise tyres (see left example distribution shifted to left)

For the most populated class (typically C) the impact on WG was also checked:
- In most cases WG was better for A noise tyres (see right example distribution shifted to left)

Note: number of tyres in classes A and B are 1 to 9 in terms of EPREL inputs

# ETRTO comments and JRC replies

The TyreReviews study was evaluated independently for EACH set of data, thus the uncertainty is not >2 dB

Analysis of tyrereviews.com data also did not show any negative impact of noise reduction on other parameters.

**1- Supporting data not enough robust**

For the "Consumers testing data" using a TyreReviews study, the values are not comparable.

Indeed, in the same dimensional box, there can be several test campaigns at different locations, different atmospheric conditions etc.

Reminder: the dispersion of the test measurement is > 2dB, mainly due to track & atmospheric influent parameters.

ADAC summer tyres 205/55

For the same size tyres: Simple linear model with RR and WG gave positive coefficients (higher noise, higher RR or WG  letter)

Using ADAC *measured* data gave similar results.

In both case the modelled noise values to the measured ones had very low R2 indicating that WG and RR cannot explain the noise.

No indication that lower noise tyres worsen WG or RR for the specific set of 50 tyres

UTAC study (see next slide)

# JRC vs UTAC methodology

For the specific study the JRC methodology (multi-linear regression) gives the same conclusions, even though the analysis is different
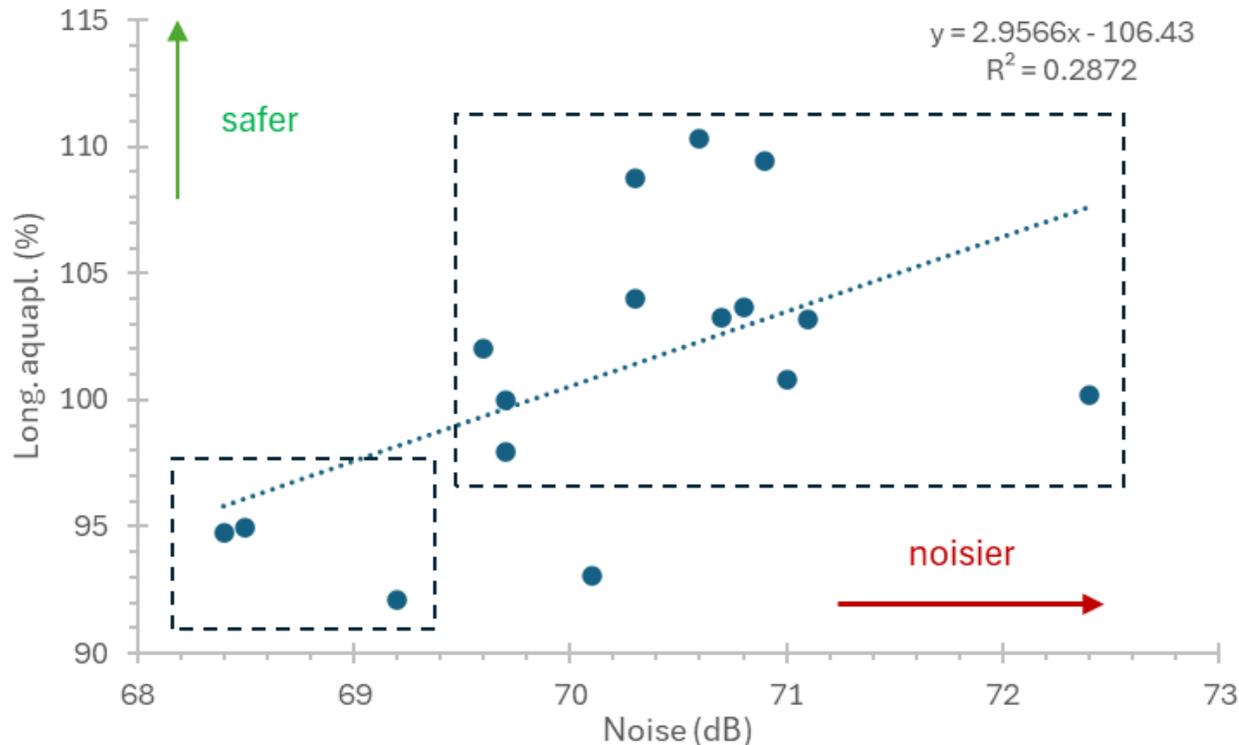
### 4.1.1.2 The 3 best tyres for Noise performances

Among the 16 different tyre references, we focused on the quietest tyres.
The graduation of the Figure 4.1-2 is the following:
- 0: defined by the worst tyre of the sample.
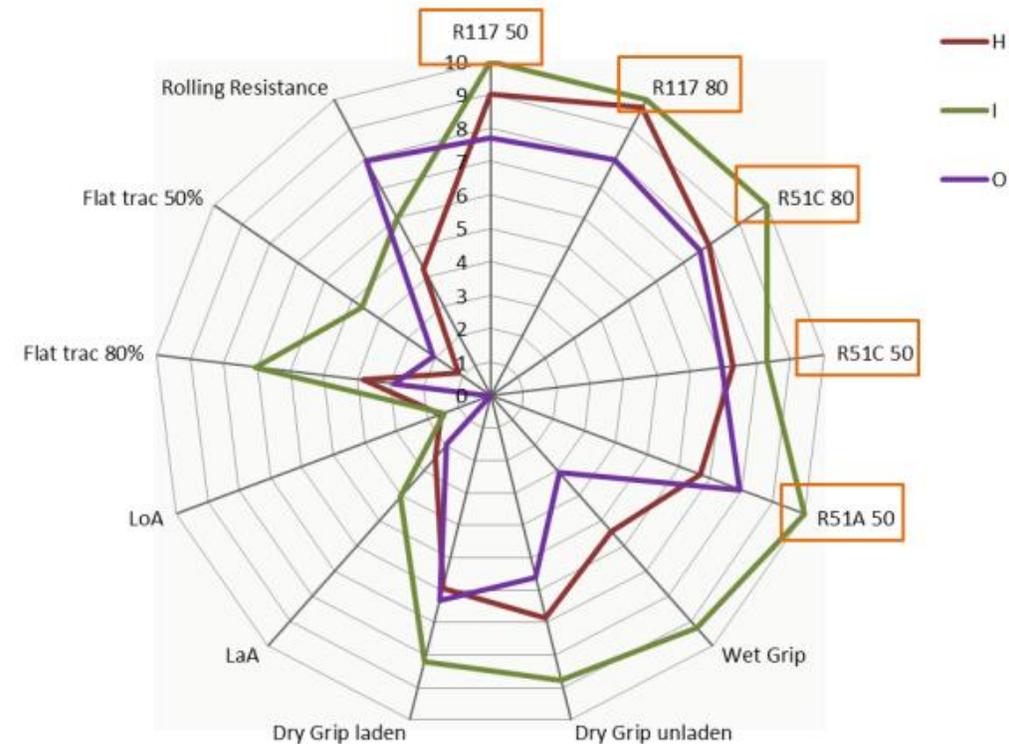- 10: defined by the best tyre of the sample.



Range 4 dB

Figure 4.1-2 : The 3 best tyres for Noise

We can notice that these 3 tyres are good on Rolling Sound but they have poor aquaplaning scores.

# ETRTO comments and JRC replies

**2- Technical infeasibility of – 2 dB without trade-off**

- Design constraints: Further reduction requires major changes that compromise safety and other performances. All ETRTO and ACEA studies (GRBP 70-25, GRBP 75-18, ...) confirmed a trade-off between noise and safety. However, the LEON-T study reports that "a reasonably small (2 dB) reduction in pneumatic tyre noise is feasible without compromising safety, rolling resistance and other parameters.

- "-2 dB" is a huge reduction of noise. 90% of the SKUs on the market in C1 are graded B for noise, so between LV-2 and LV.

- For recall, relevant progress has already been made over the last 15 years by the tyre industry to reduce the rolling noise by up to 5dB.

The LEON-T report did not claim that A class tyres should further decrease. It did not assess further reductions of the lowest noise tyres. The conclusions are based only on market tyres analysis without any extrapolation. The conclusion was that tyres on the high noise end could reach class A without compromising other parameters (except cost). The reductions were on average on the order of **1.0** to **1.5 dB** (half range).

Rough estimations are 60-90% of tyres would be affected (right part of the noise distribution)

# ETRTO comments and JRC replies

There is a short chapter in the LEON-T report discussing the conclusions of the Task Force Measurement Uncertainties subgroup

This is the reason that a value of 2 dB was selected for the analysis as it is a value that can detect improvements

From conclusions how 2 dB reduction could be achieved:

*A reasonably small (1-2 dB) reduction of pneumatic tyre noise is feasible (**from methodology and removing high emitting tyres**) without compromising safety, rolling resistance and other parameters.*

## 3- Measurement uncertainty not addressed
- The measurement uncertainty is > 2 dB for a proposed -2 dB target
- Risk of undetectable gains

| | Uncertainty categories | Systematic or Random | Standard Uncertainty [dB] 95% confidence interval | Description |
|---|---|---|---|---|
| 1 | Test Repeatability (day by day) | Random | ± 0.6 [b] | Result variability once tyres, track, acquisition system, vehicle and modus operandi are the same (Day and driver might be different) |
| 1.1 | Test Repeatability (run to run) | Random | ± 0.3 [b] | Result variability for consecutive test once tyres, track, acquisition system, vehicle and modus operandi are the same |
| 1.2 | Track Humidity | Random | Unknown | Definition of "dry" is quite vague Humidity may affect more R51 Drive-by than R117 |
| 1.3 | Speed effect | Random | ± 0.13 | Minimum requirement for sensor accuracy in R117 is +- 1km/h- tyre noise vs speed sensitivity= 0.2 dB/km/h PtoP =0.2 dB* 2km/h=0.4 dB (± 0.13) |
| 1.4 | Temperature influence (after temperature correction) | Random | ± 0.3 [b] | Despite temperature correction a residual error remains ( Formula not fully correct). Only applicable for C1/C2 tyres |
| 2 | Temperature influence (without temperature correction) | Systematic | ± 0.6 | The systematic error is removed in Reg.117 (except for C3) but not in Reg.51 Reg. 117 allows following temperature ranges: air 5>, <40 surface temperature >5,<50 Estimated peak to peak by Reg.117 formula =1.8 dB (± 0.6 dB) |
| 3 | Track to Track | Systematic | ± 1.8 [a] | Estimated by VDA round robin test results |
| 4 | Tyre to tyre | Random | ± 0.5 [b] | Uncertainty due to production variability (Different plants, different period…..) Excluding ageing effect |
| 5 | Sound meter-to sound meter | Random | ± 0.4 [a] | Measurement system shall meet class 1 requirements |
| 6 | Vehicle influence | Systematic / Random | ± 1.0 [b] | Possibility to use different vehicles. Uncertainty takes into consideration differences on: Wheel adjustment, Suspension, Tyre load and inflation, Body-road clearance, shadowing and reflecting properties, Rim, Transmission noise, Bearings, Brake noise (brakes not completely released), Body shape - aerodynamic noise around the vehicle body and extra equipment |
| | Total Uncertainty C1/C2 tyres | | ± 2.2 dB | Combined standard uncertainty $U = \sqrt{(u_1{}^2 + u_3{}^2 + u_4{}^2 + u_5{}^2 + u_6{}^2)}$ |
| | Total Uncertainty C3 tyres | | ± 2.3 dB | Combined standard uncertainty $U = \sqrt{(u_1{}^2 + u_2{}^2 + u_3{}^2 + u_4{}^2 + u_5{}^2 + u_6{}^2)}$ |

# ETRTO comments and JRC replies

JRC does not disagree with the ETRTO statements 2 and 3

Regarding 1, JRC does not have the expertise to judge if current tyres are the best that can be achieved. The LEON-T analysis showed a benefit of going towards class A noise tyres.

However a cost benefit analysis can clarify the cost effectiveness. For example (from the LEON-T report):

- How the type approval noise values translate on real roads noise (or bad roads, with stones etc)

- How other sources contribute to noise

- How other solutions can mitigate the problem

**1- Acknowledge physical and technical limitations**
- Tyre noise already highly optimized
- Further reductions would compromise safety and other perform

**2- Implement a new accurate methodology**
- Reduction of the uncertainty of the test method
- Creation of the GOIE

**3- Adopt a systemic and balanced approach**
(insights from TFVS-13-03 _ FOEN)
- Combine efforts on tyres, road surfaces, vehicles and speed
- Consider infrastructure in the noise reduction strategy
- Promote shared, locally adapted solutions

NEW: It should also be modelled for the future fleet when low becomes too low and then there is a need for AVAS for too quiet tyres, e.g. in zones with max speed of 30 km/h

# Summary of replies

The LEON-T analysis was robust enough to conclude that high emitting tyres can be reduced to the lower edge of market tyres without compromising the other parameters

JRC believes that the following conclusion is correct: A reasonably small (1-2 dB) reduction of pneumatic tyre noise is feasible (from methodology and removing high emitting tyres) without compromising safety, rolling resistance and other parameters

> No statement was made for improvements of A class tyres

> JRC acknowledges that the feasible reductions demonstrated are on the order of 1.0-1.5 dB still close to the measurement uncertainty

The measurement uncertainty was discussed and the selection of a "round" number of -2 dB for the model was based also on this fact

> JRC agrees on further work to reduce measurement uncertainty

The model also demonstrated that electrification of the fleet can deliver by far the most noise reductions.

> JRC agrees that other solutions should be further explored, especially in terms of cost-effectiveness, but it was not part of LEON-T.

# JRC replies to OICA (TFVS-19-02)

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# On the inconsistencies

Page 6-7 presents the regulations on tyres and powertrain. The sentence is at the introduction where it mentions that tyre can be a significant contributor to vehicle sound.

Page 14 calculates the contribution of tyre during the type approval test of the powertrain (which is calculated <5%)

Our model describes the contribution of the tyres and the powertrain, where below 50 km/h the powertrain is the main contributor, while above 50 km/s are the tyres

<u>We do not see any inconsistency in our statements</u>.

> Inconsistencies in the elaboration could lead to wrong conclusions for further work:

- Contribution of tyre noise to the whole vehicle sound is claimed to be "significant" / "one of the main contributors to the total vehicle sound emission" (pp.6-7) - at the same time it is displayed as neglectable (p.14, Table 10)

- Several previous studies show, that tyre noise is the main contributor to the whole vehicle sound especially for cruising condition (e.g. Heinz Steven 2012 for German EPA (UBA): impact of new R51.03)
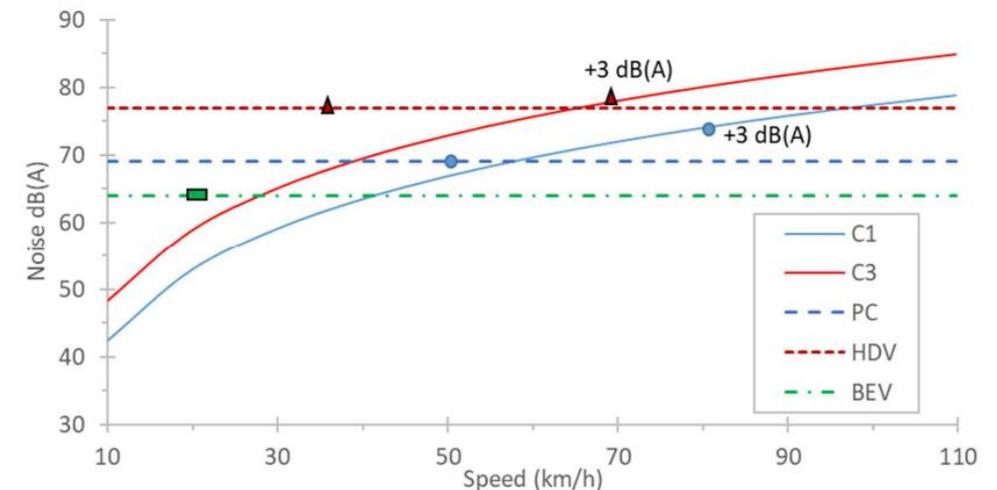


Figure 8 : Noise of tyres (C1 and C3) and propulsion engines (of PC and HDV or BEV) as used in the model. Symbols indicate the speed of the type approval tests for the tyres and propulsion engines PCs (circles), HDVs (triangles) and electric vehicles (square)

# On the methodological risks

Although our model is a simplified approach, comparing our data with CNOSSOS and ACEA study we do not see significant differences, other those described in the report.

The advantage is that our formula could include type approval values and model their future impact.
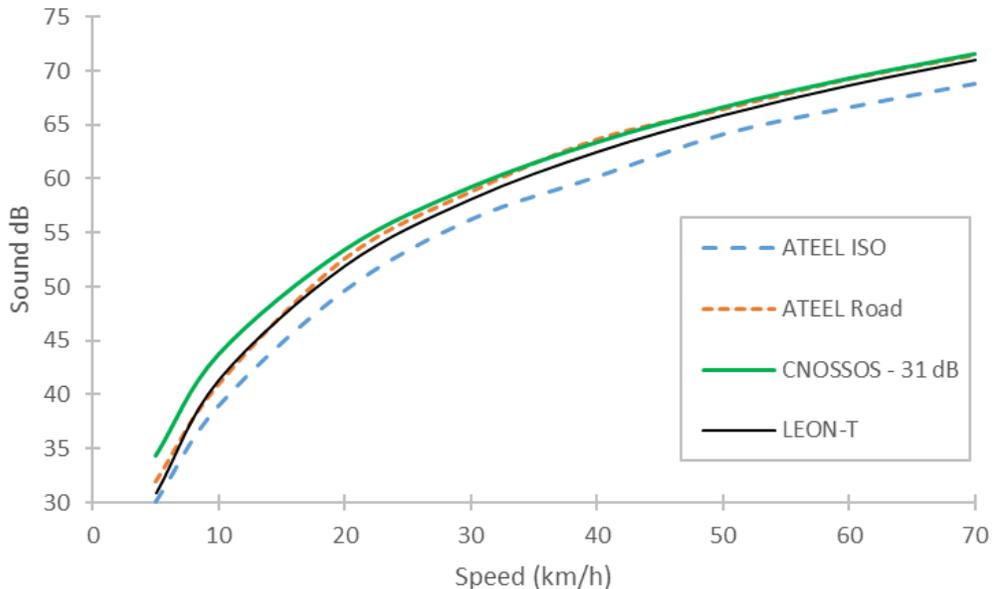
> Methodological risks of tyre noise extrapolation influence the results (pp. 13–14)

- Tyre noise levels were extrapolated from 70–90 km/h to 50 km/h, but it is unclear whether the tyres matched those used in the UN-R 51/03 vehicle tests, or whether powertrain noise was excluded.
- Given the known risks of extrapolation error, direct measurement at 50 km/h – as required by UN-R 51/03 Supplement 7 – is recommended for accuracy.

> Further influences like the torque effect of tyres have not been integrated in the calculation

$$L_{w,R,m}(v) = TA_R + 3 + 35 \log (v/v_{TA,R})$$

Note: In the Leon-T deliverable 6.3 we have carried out such measurements Chapter 6 (Table 10)



Legend:
- ATEEL ISO
- ATEEL Road
- CNOSSOS - 31 dB
- LEON-T

(x-axis: Speed (km/h), y-axis: Sound dB)

# Tyre models

Details for the previous slide

ATEEL (2022) and CNOSSOS (2012)

$$L_{WR,i,m} = A_{R,i,m} + B_{R,i,m} \times \lg\left(\frac{v_m}{v_{ref}}\right) + \Delta L_{WR,i,m}(v_m) \qquad \text{(III-5)}$$
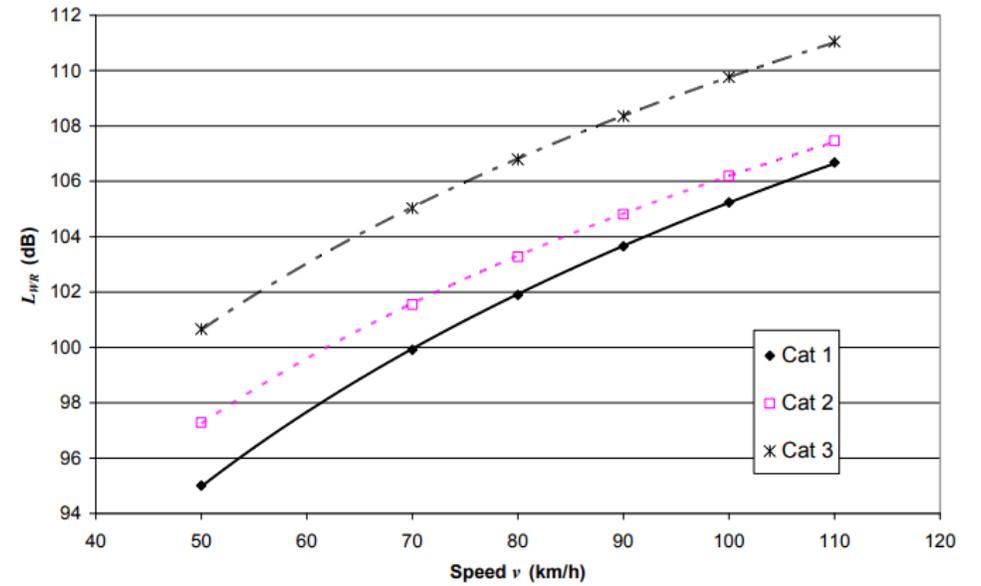


**Figure III.2:** *Rolling sound power levels in dB for the first three categories of vehicles in reference conditions*
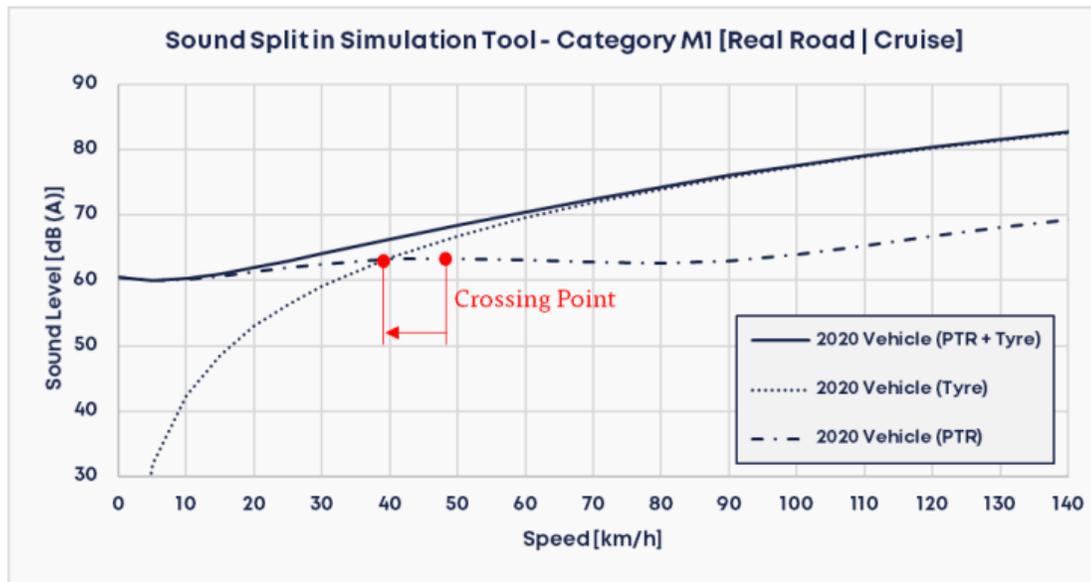


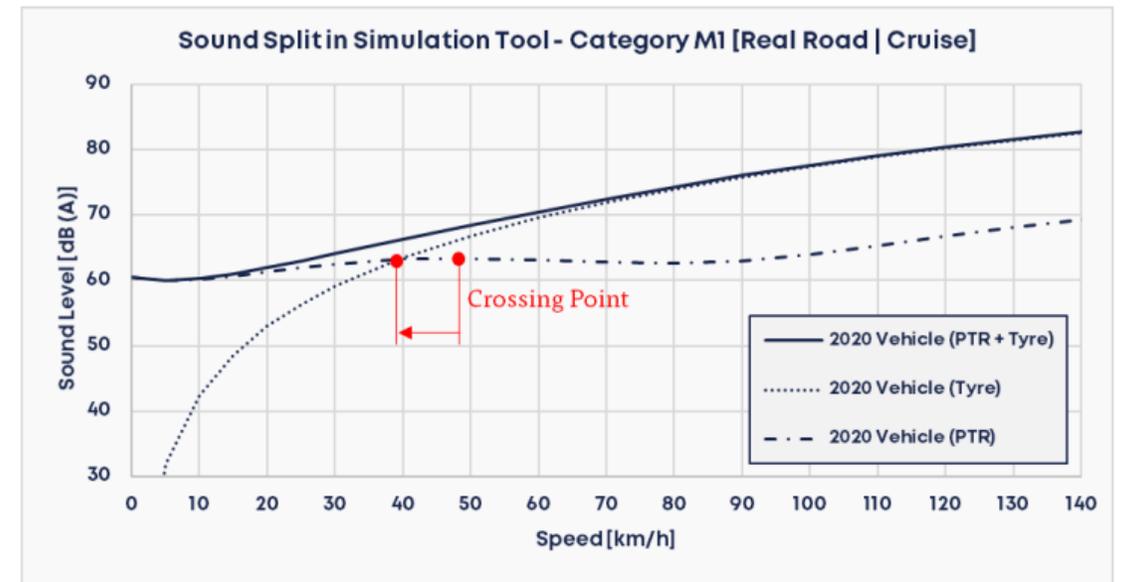Figure 4-3: Sound split in calculation tool - Category M1 (Real road | Cruise condition)



Figure 4-3: Sound split in calculation tool - Category M1 (Real road | Cruise condition)

# Sound of electric vehicles

In the model we actually assumed the <u>MINIMUM</u> sound that we measured from BEV and found in the ACEA study (see next slide for details).

The propulsion noise is assumed unrealistically high (for BEVs 64 dB(A) constant is almost the max. sound allowed today by UN-R 138) and in contradiction to the LEON-T recommendations
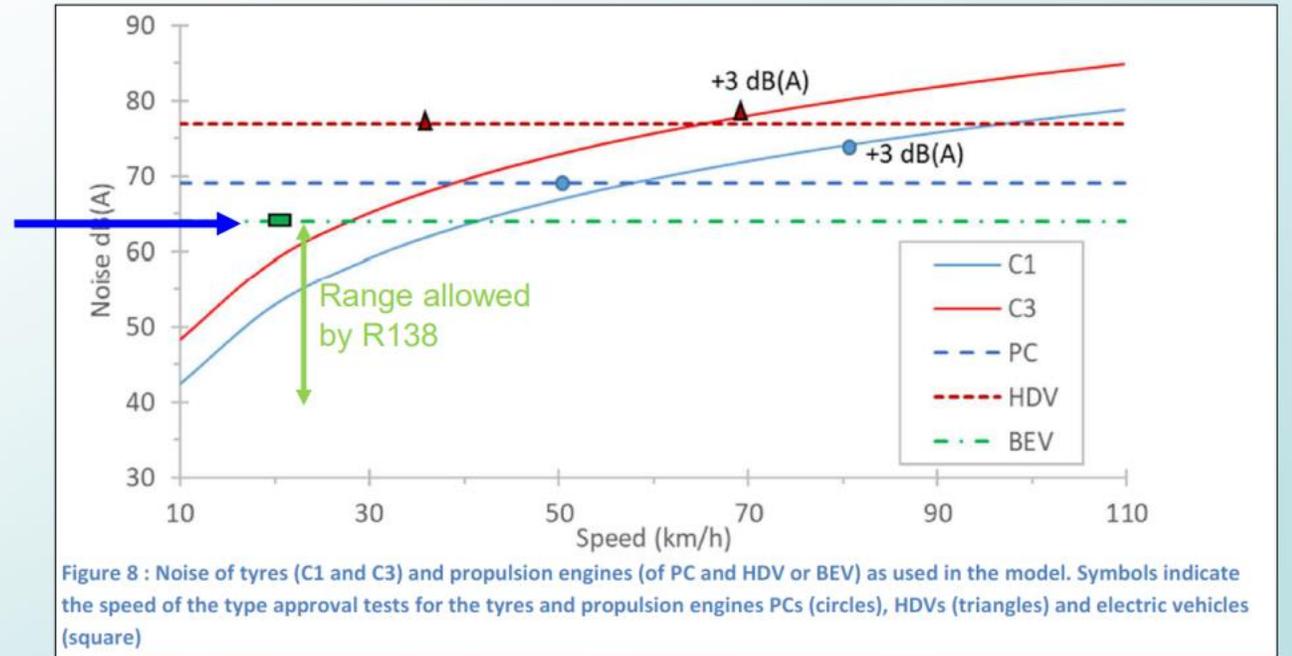


Figure 8 : Noise of tyres (C1 and C3) and propulsion engines (of PC and HDV or BEV) as used in the model. Symbols indicate the speed of the type approval tests for the tyres and propulsion engines PCs (circles), HDVs (triangles) and electric vehicles (square)

LEON-T report (WP D6.3 - Evaluation of future new policies on noise emissions), p.31

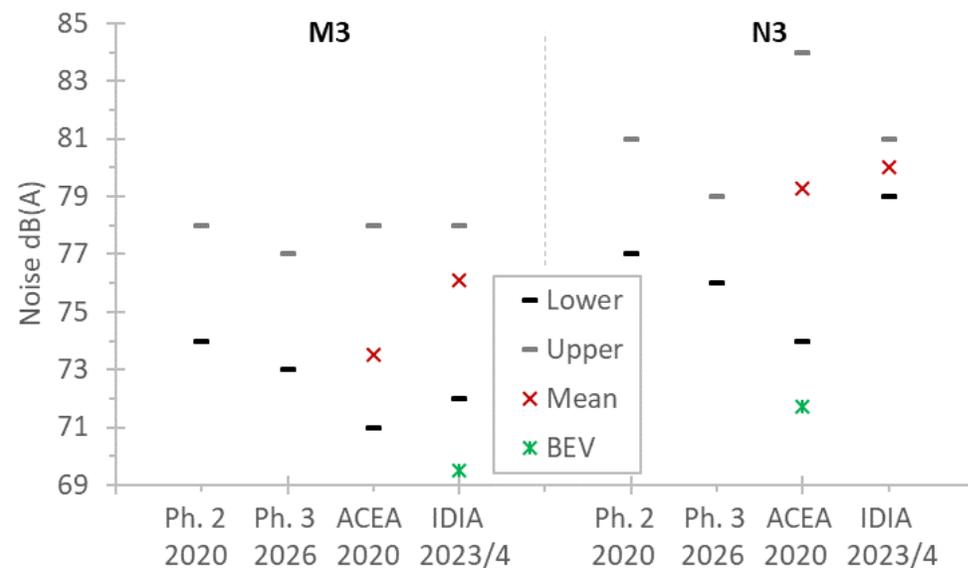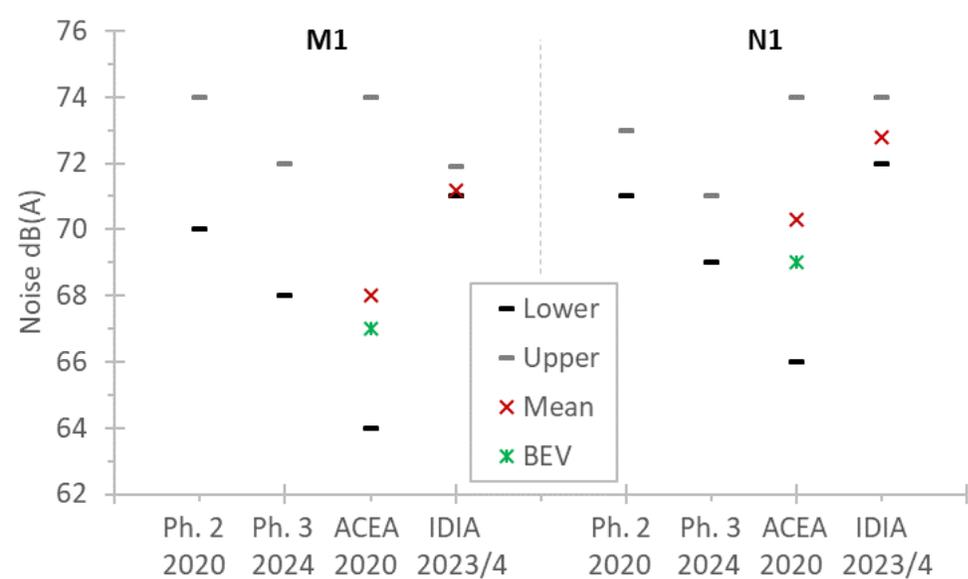Table 7 : Summary of UN R51 test results at IDIADA (2023-2024).

| Category | # | Propulsion type | Pass-by dB(A) |
|---|---|---|---|
| M1 | 5 | ICE | 71.2 (71.0-71.9) |
| M1 | 16 | PEV | 66.0 (64.0-68.0) |
| N1 | 4 | ICE | 72.8 (72.0-74.0) |
| N2 | 4 | ICE | 73.5 (73.0-74.0) |
| N2 | 2 | PEV | 72.0 (70.0-74.0) |
| N3 | 4 | ICE | 80.0 (79.0-81.0) |
| M3 | 20 | ICE | 76.1 (72.0-78.0) |
| M3 | 6 | BEV | 69.5 (64.0-77.0) |
| M3 | 1 | FCEV | 67.0 |

Table 8 : Overview of ACEA 2020 test results.

| Category | # | Propulsion type | Pass-by dB(A) |
|---|---|---|---|
| M1 ($L_{urban}$) | 1655 (all) | ICE | 68 (64-74) |
| M1 ($L_{urban}$) | 14 | HEV | 68 (64-71) |
| M1 ($L_{urban}$) | 27 | BEV | 67 (64-69) |
| M2 ($L_{urban}$) | 23 | ICE | 71.3 (69-75) |
| M3 ($L_{urban}$) | 42 (+2 BEV) | ICE | 73.5 (71-78) |
| N1 | 156 | ICE | 70.3 (66-74) |
| N1 | 3 | BEV | 69 (67-71) |
| N2 | 74 (+2 BEV around 69) | ICE | 72.4 (67-78) |
| N3 | 119 (+2 HEV around 79) | ICE | 79.3 (74-84) |
| N3 | 6 | BEV | 71.7 (69-76) |

$$L_{urban} = L_{wot} - k_p * (L_{wot} - L_{crs}),$$

$$k_p = 1 - (a_{urban} / a_{wot}),$$

$$a_{urban} = 0.63 * \log10(PMR)-0.09$$

Data from Leon-T deliverable 6.3

# Comparison of models

We could not find the model curves of the OICA graph in the cited presentation. The graph we found shows levels >75 dB, even higher than the LEON-T curves.

Note that the model uses values in the 30-70 km/h range (assumed average urban speeds), so differences at low speeds are irrelevant.
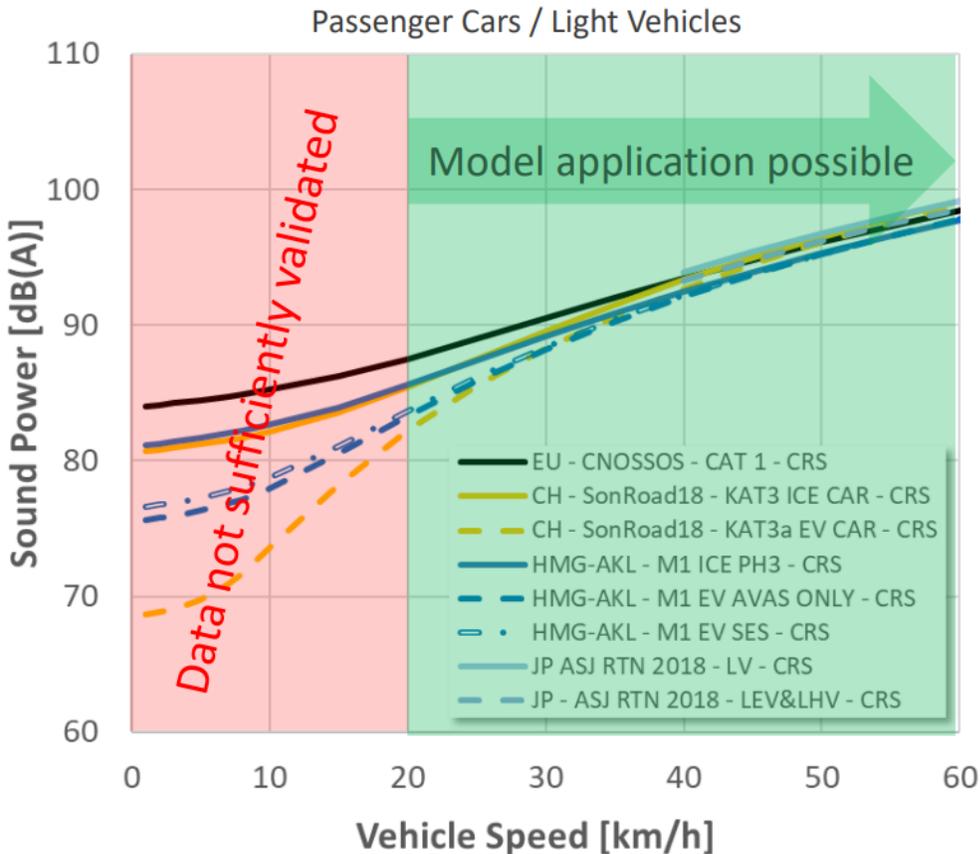


> Existing Studies (VENOLIVA, PHENOMENA, LEON-T, etc.) use different approaches

> All models differ from CNOSSOS by individual modifications

> The Sound Model of LEON-T should not be used without comparison to existing road traffic noise models for GRBP work (esp. GRBP-81-28)
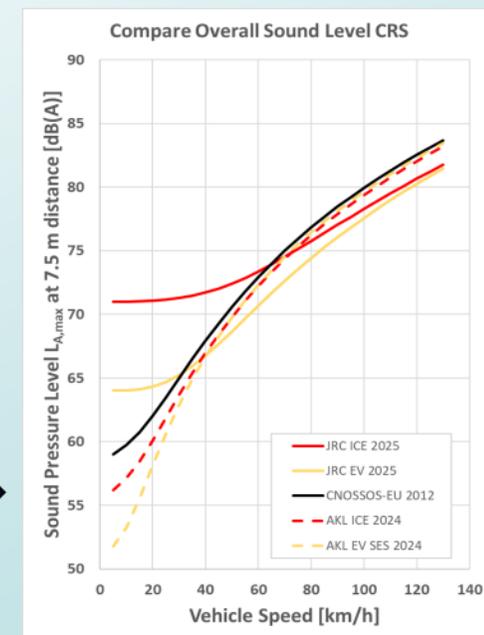
# Summary of replies

We believe that the methodology and the assumptions behind are reliable, keeping in mind the simplified model which has type approval values as input. The results so far do not seem to be different to other models, under the same assumptions.

The model did not assume any noise reduction of electric vehicles, but only replacement of ICEs with electric vehicles (which had a fixed 64 dB sound).

JRC is happy to further clarify any topics or support in any discussions.

JRC agrees that safety should not be compromised.

➢ The results of work package D6.3 of the LEON-T project should not be used for further GRBP work without a detailed review of methodology and model assumptions.

➢ OICA is happy to support further legislation and to assist in solving common problems with practical approaches (e.g. ASEP for BEVs).

➢ A reduction of noise limit values must not happen at the cost of safety – as mentioned by the ACEA Tyre Performance Study (GRBP-75-18/19) and ETRTO Recommendations (TFVS-18-05).

# Thank you

# LEON-T study conclusions (model)

The cost-benefit analysis showed that noise reduction by fleet electrification results in huge benefits. Tyre rolling noise reduction (and other measures not examined) can further enhance the result.

Ranking of tyres (and propulsion engines) on type approval surfaces and on real road surfaces might not be the same

Impact of mitigation measures such as lower average speed, porous roads, greening, or fitting buildings with high insulating windows was not assessed in this study

In non-urban areas, the average speed is high and the dominant noise source is the tyre, thus fleet electrification will not have a big impact.

Contribution of other sources needs to be assessed (e.g. 2-wheelers), especially as vehicles (tyres and propulsion engines) become less noisy.

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