The Motorcycle Industry in Europe
acem

IMMA
INTERNATIONAL MOTORCYCLE MANUFACTURERS' ASSOCIATION

IAI-Acustica
& TUG(FVT) study

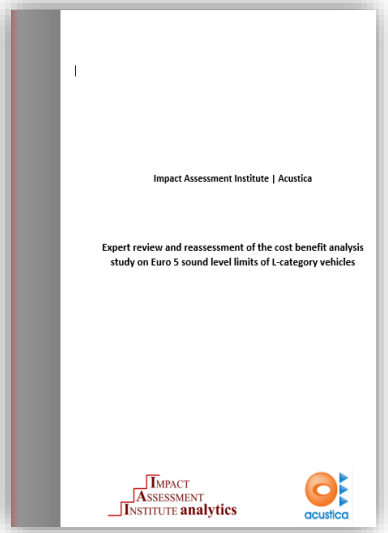
Expert review and reassessment of the cost benefit analysis study on Euro 5 sound level limits of L-category vehicles

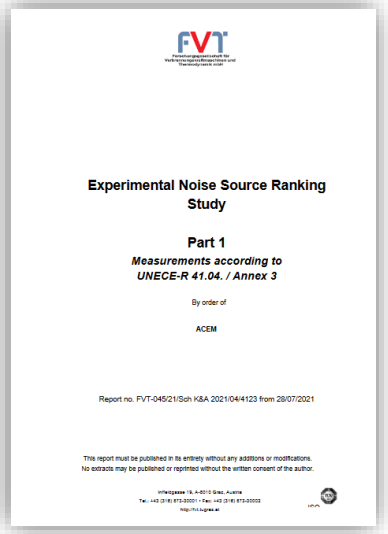
& Experimental Noise Source Ranking

07 February 2022

Introduction

- The *Impact Assessment Institute* and *Acustica* have carried out an expert review and reassessment of the 2017 cost benefit analysis study on Euro 5 sound level limits of L-category vehicles ("the CBA").
- In order to best support the CBA work, the *Forschungsgesellschaft für Verbrennungskraftmaschinen und Thermodynamik* (FVT) of Graz University of Technology (TU Graz) carried out an experimental *Noise Source Ranking* study (NSR) on 8 motorcycles.





- Documents
  - **IAI and Acustica - CBA study on Euro 5 sound limits for L-category vehicles [PDF]** = *TFVS-07-12*
  - **TU Graz - Experimental Noise Source Ranking [PDF]** = *TFVS-07-10*
  - **ACEM welcomes conclusions of the EC Cost Benefit Analysis scrutiny study performed by independent researchers [PDF]**

NSR – 8 VEHICLES

Table 1: Tested vehicle in alphabetic order

Vehicle	Capacity	Engine Type	Transmission	Power
BMW R 1250 GS	1254 cm³	Boxer 2-cyl. liquid cooled	6-speed manual	100 kW
Harley Davidson Street Bob	1,745 cm³	V 2-cyl. air-cooled	6-speed manual	64 kW
Honda Forza 125	124.9 cm³	1 cyl. liquid cooled	CVT	10.7 kW
Kawasaki Vulcan S	649 cm³	In-line 2-cyl. liquid cooled	6-speed manual	44.7 kW
KTM 390 Duke	373 cm³	1 cyl. liquid cooled	6-speed manual	32 kW
Piaggio Vespa 300GT	278 cm³	1 cyl. liquid cooled	CVT	15.5 kW
Triumph Street Triple	765 cm³	In-line 3 cyl. liquid cooled	6-speed manual	86.8 kW
Yamaha T-Max	562 cm³	In-line 2-cyl. liquid cooled	CVT	35 kW

as an example, results for this motorcycles are shown on next pages

NSR – 2 test tracks

Two different test tracks were used for the measurement, both certified according to [1] and situated in / around Graz:

- Test track AVL

Figure 1: AVL Test Facility Gratkorn

- Test track Magna

Figure 2: Magna Steyr – Test facility Graz

NSR example – TRIUMPH Street Triple R (3 cyl., 765cc)

Figure 32: Triumph Street Triple R

Encapsulation variant: Fully encapsulated

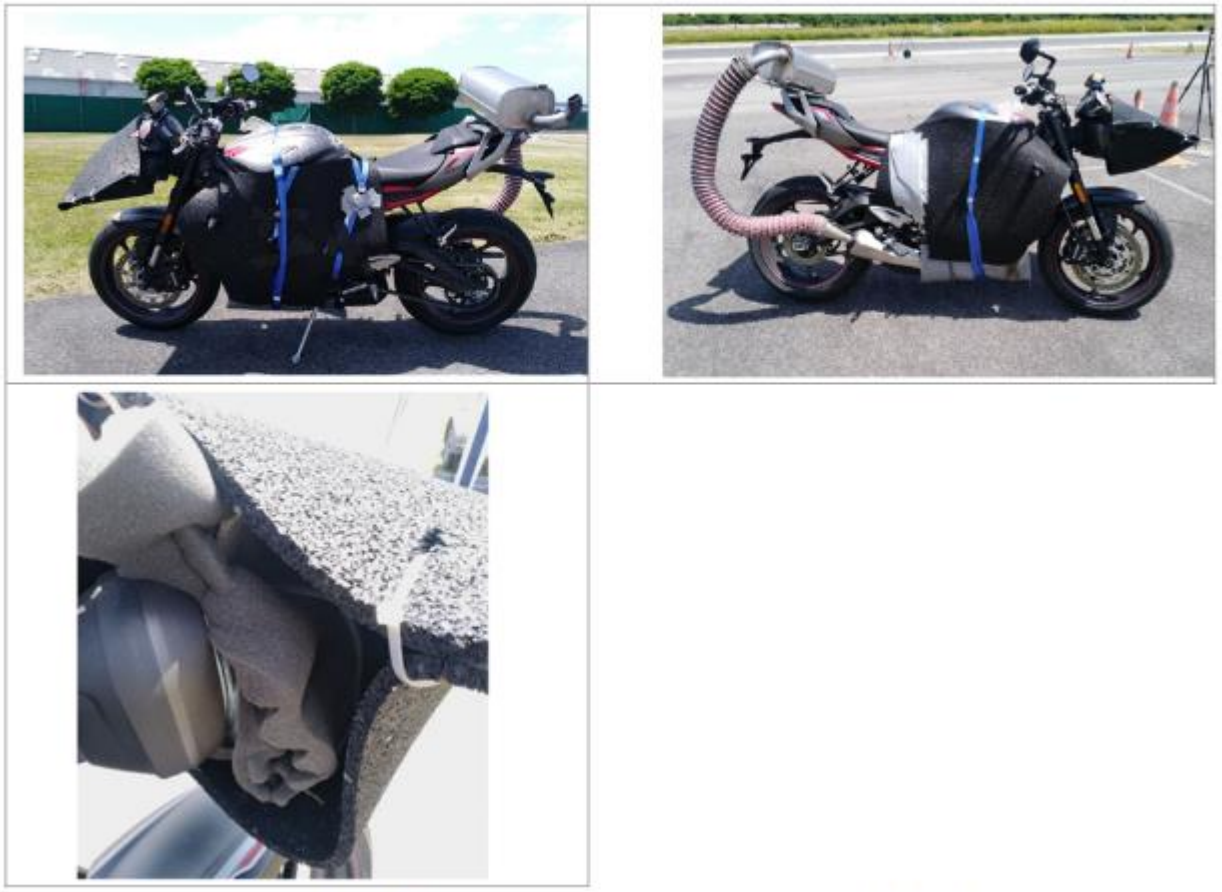


Figure 33: Fully encapsulated version Triumph Street Triple R

NSR example – TRIUMPH (3 cyl., 765cc)

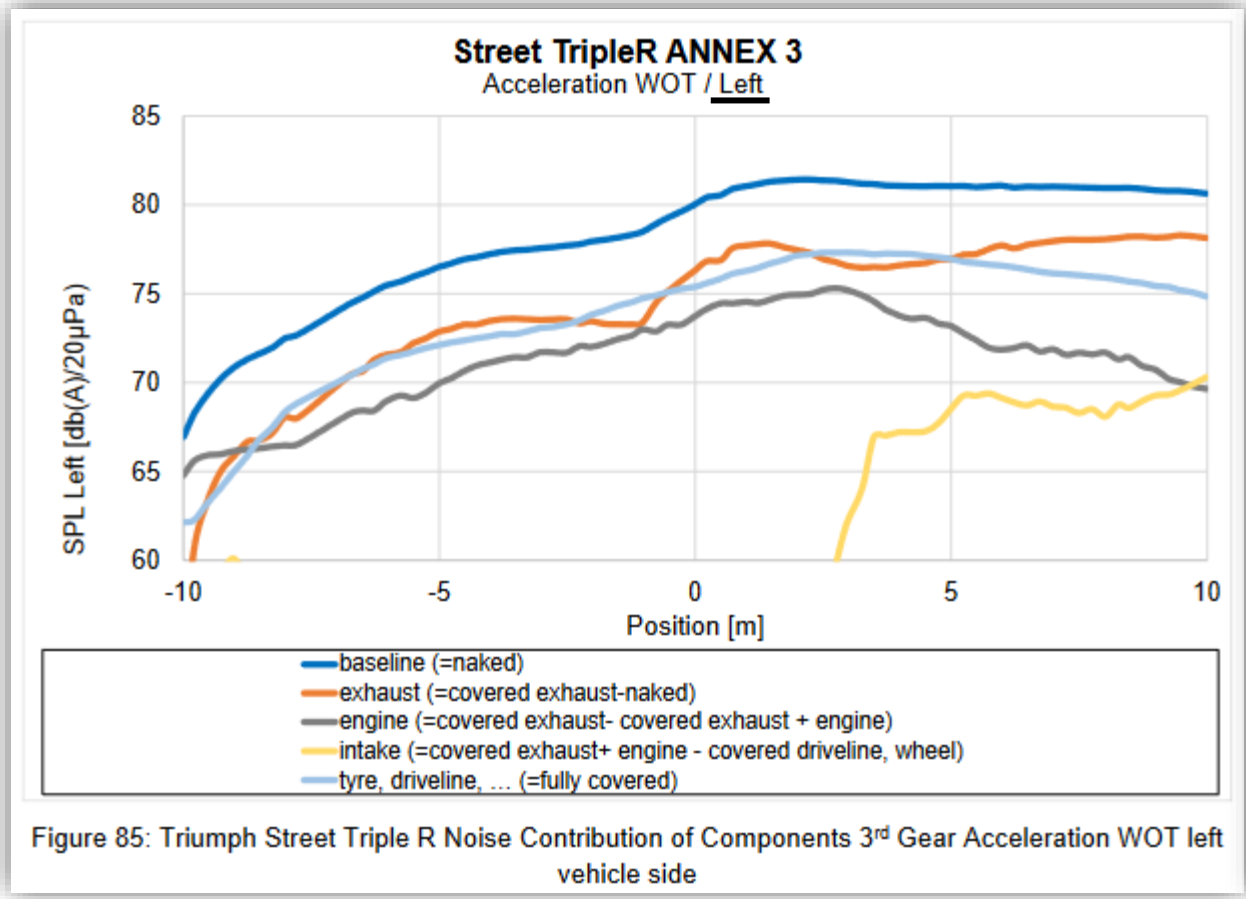


Figure 85: Triumph Street Triple R Noise Contribution of Components 3rd Gear Acceleration WOT left vehicle side

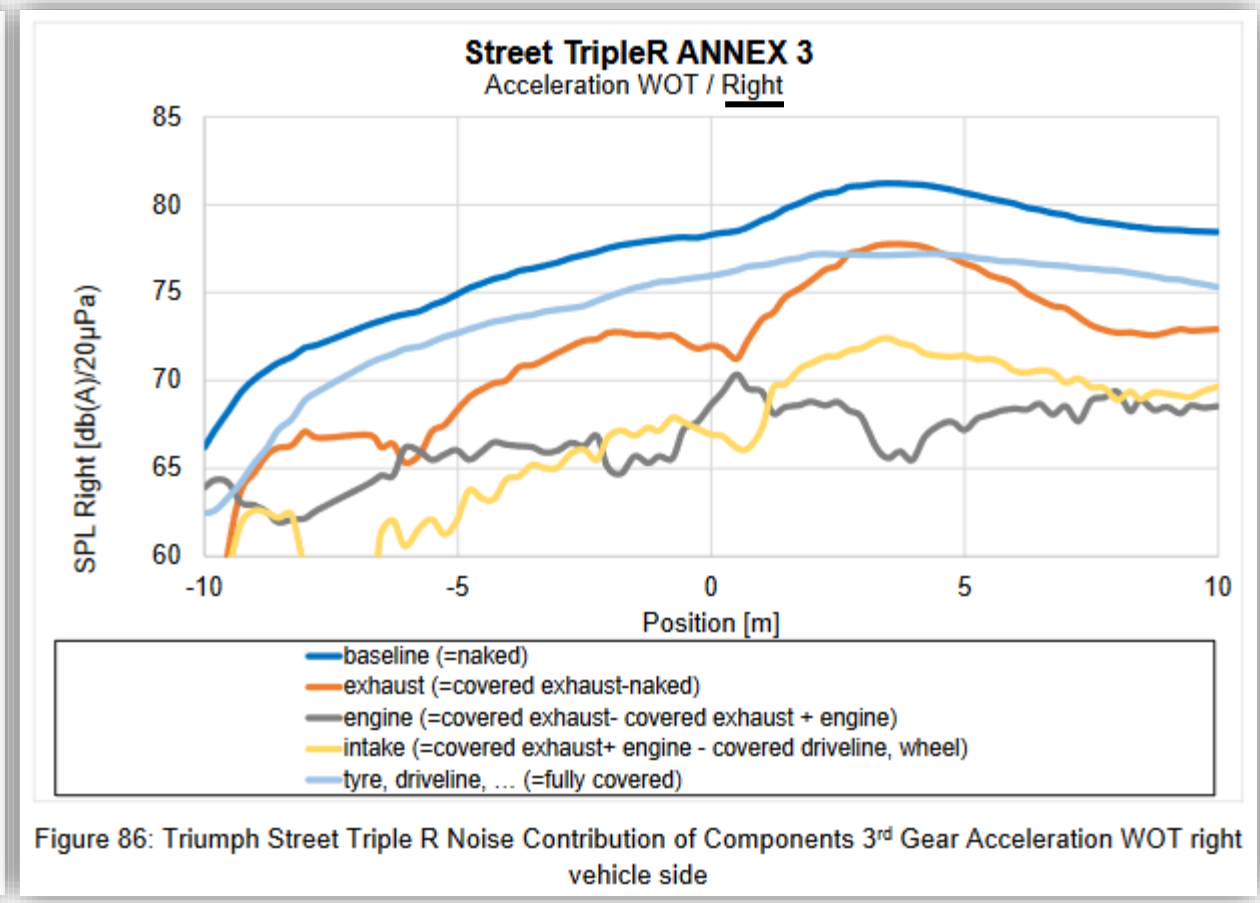


Figure 86: Triumph Street Triple R Noise Contribution of Components 3rd Gear Acceleration WOT right vehicle side

NSR example – TRIUMPH (3 cyl., 765cc)

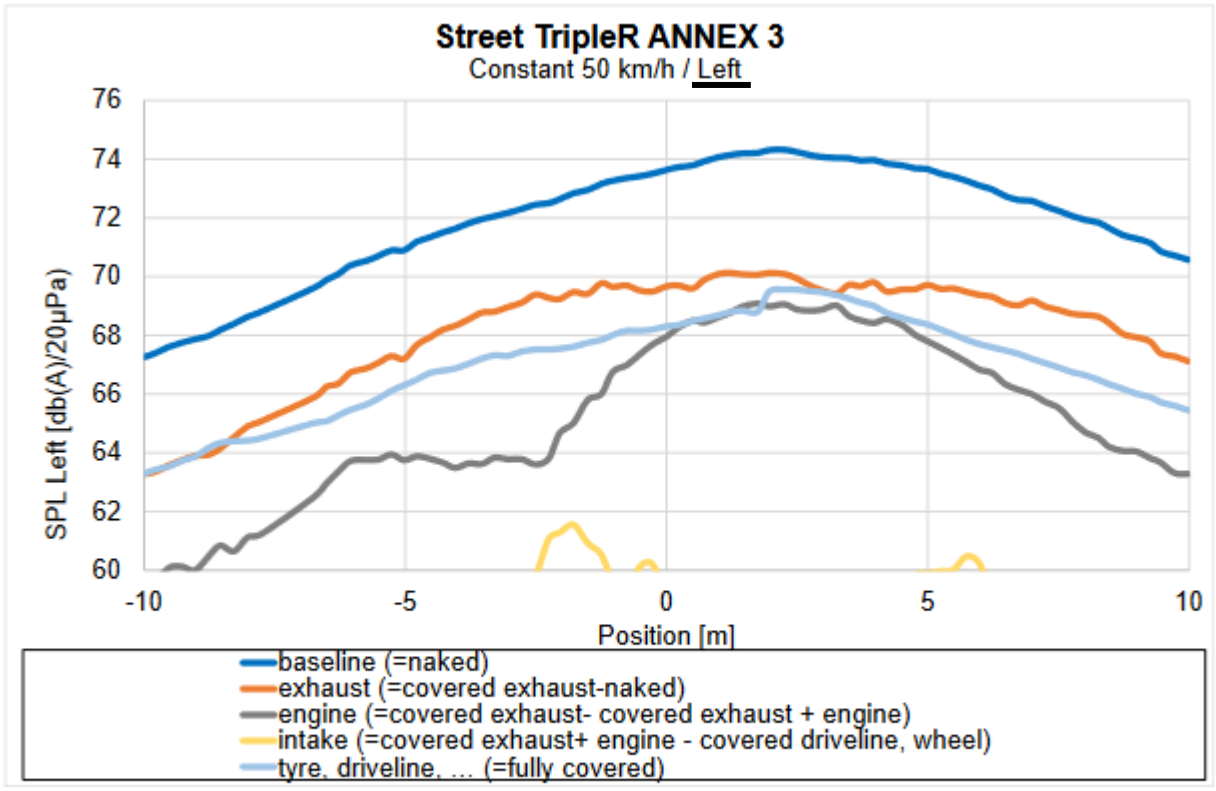


Figure 87: Triumph Street Triple R Noise Contribution of Components 3rd Gear Constant Speed 50 km/h left vehicle side

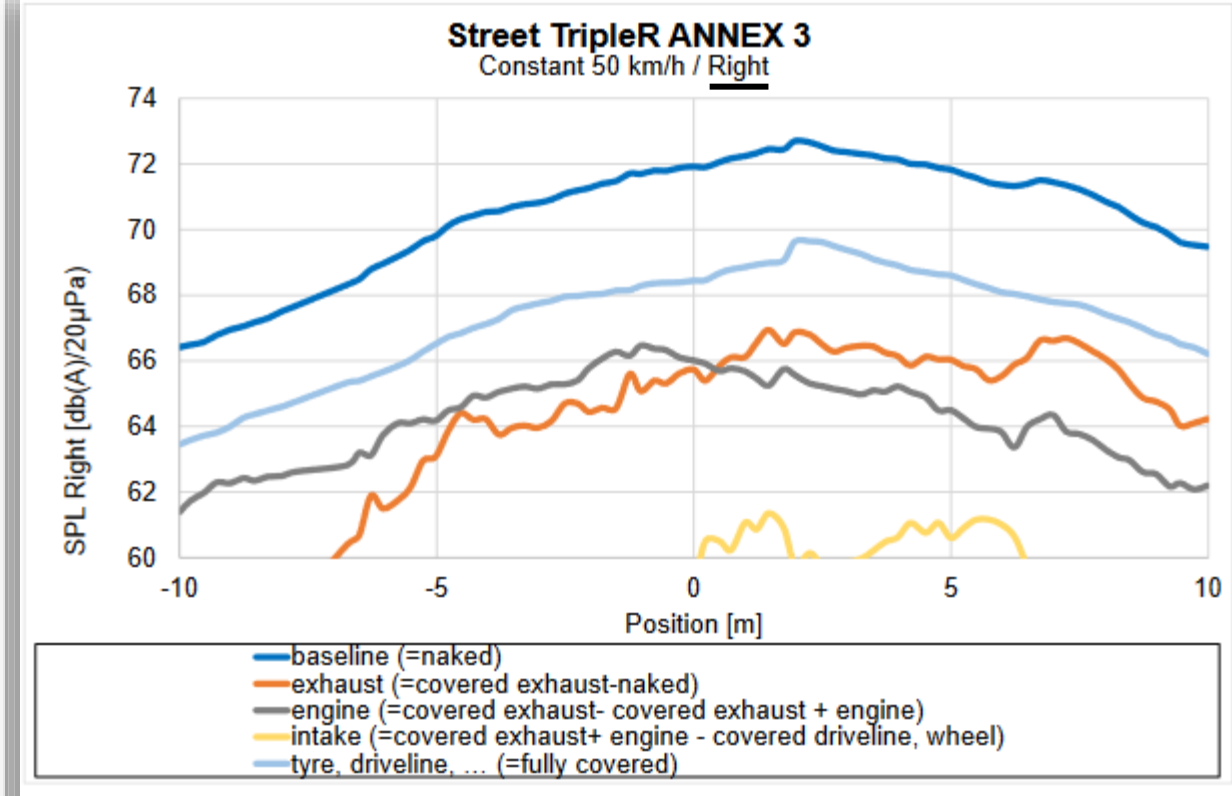


Figure 88: Triumph Street Triple R Noise Contribution of Components 3rd Gear Constant Speed 50 km/h right vehicle side

NSR example – TRIUMPH (3 cyl., 765cc)

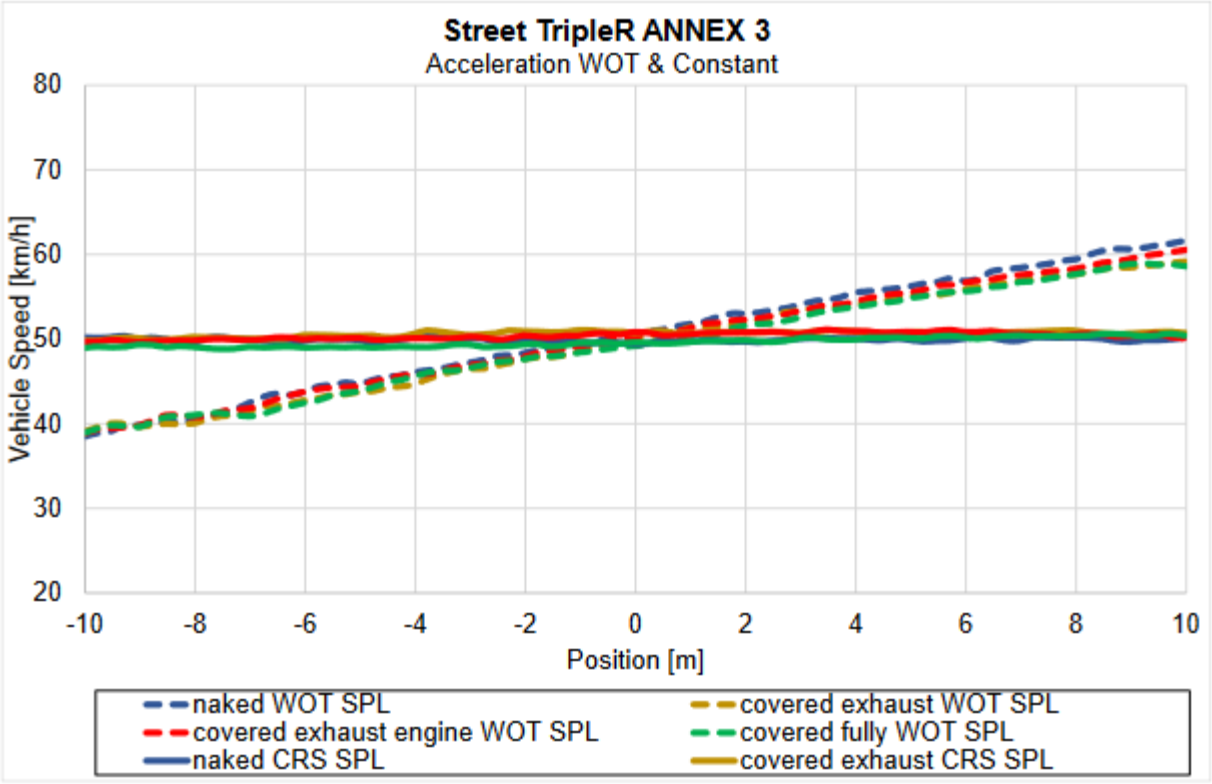


Figure 83: Triumph Street Triple R Vehicle Speed for Acceleration WOT & Constant Speed / Comparison noise damping variants

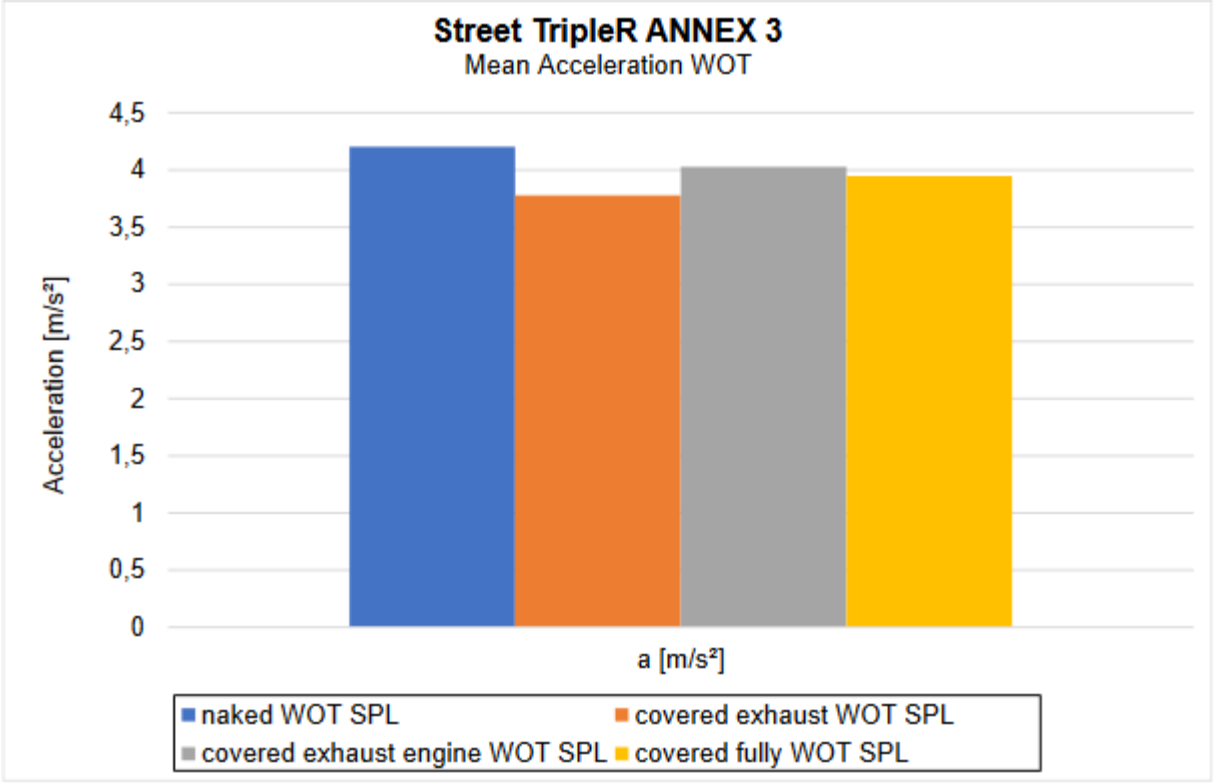


Figure 84: Triumph Street Triple R Acceleration WOT / Comparison noise damping variants

NSR example – TRIUMPH (3 cyl., 765cc)

Triumph Street Triple R Overall Results UNECE-R 41.04. / Annex 3

Table 62: Measurement result Triumph Street Triple R UNECE-R 41.04. / Annex 3 Original Setup without noise damping measures

Street TripleR ANNEX 3								
Lurban	**Lwot,rep**	**Lcrs,rep**	**a urban [m/s²]**	**a wot,ref [m/s²]**	**kp**	**k**	**Calc. Type**	**PMR**
76,7	80,4	73,3	2,04	4,23	0,52	0	R41 rev3	331

Table 63: Measurement result Triumph Street Triple R UNECE-R 41.04. / Annex 3 (Original Setup without noise damping measures)

Street TripleR ANNEX 3				
	L [dB(A)]	**Lmax L [dB(A)]**	**Lmax R [dB(A)]**	**a [m/s²]**
Acceleration WOT	80,4	80,4	80,3	4,20
Constant 50 km/h	73,3	73,3	71,7	0,01

Scrutiny CBA study by the IAI & ACUSTICA, with reference to NSR test
Key learnings (1)

- 'Due to the **many inconsistencies** in the figures applied in the CBA and the **absence of sources or derivation** of many of the input data and results, **the results for benefits and costs presented in the EC CBA are subject to a high level of uncertainty**.
- By reviewing the assumptions, data and calculations, we **generated alternative benefits, costs** and therefore benefit/cost (B/C) ratios for a 2 dB reduction in the noise limits of L-category vehicles and 25% illegal exhausts.
- Our results rely on the veracity of the following assumptions and simplifications, detailed in the text of this report:
  - The impact of fractional dB changes in sound pressure levels can be interpolated between the whole number dB increments in the dose-response relationships.
  - The UK dose-response relationship is currently the most robust available.
  - The reconstructed flow rates generated from various sources are representative.
  - The compliance costs provided by the OEMs with the most representative profile can be used to generalise costs for the whole analysis.

Scrutiny CBA study by the IAI & ACUSTICA, with reference to NSR test
Key learnings (2)

- Overall, our reassessment of the benefits and costs leads to a **B/C ratio of 0.82 based on the above assumptions**, **compared to 2.18 in the CBA**. Due to the absence of sufficient relevant data in the appropriate form and level of detail, in particular on flow rates and compliance costs, this result is subject to high uncertainty. It is a best estimate that serves as an orientation for assessment of the impacts, subject to the clearly stated assumptions. The B/C ratio is sensitive to those assumptions. Taking into account all the potential scenarios and delta analysis detailed in the benefit and cost chapters 3 and 5, a range of B/C ratios an order of magnitude higher or lower than the primary estimate above could result. This result emphasises the **high level of uncertainty** inherent in the benefit/cost calculations.
- **NSR testing results confirm the challenging technical interventions required to meet a 2 dB limit reduction** and qualitatively support the substantial R&D and manufacturing costs underlying the cost estimates. Robust and accurate cost estimates are however difficult to achieve because of the many systems requiring intervention and are different for different L-category vehicle types.
- Cost data are insufficient to generate equivalent benefit/cost ratios for a 5 dB limit reduction. NSR results indicate that **a 5 dB limit reduction would likely be infeasible for smaller motorcycles and very challenging or potentially infeasible for larger motorcycles.'**

Industry takes - Overall

- Industry
  - welcomes the conclusions of this independent scrutiny study as it demonstrates that a **2dB limit reduction** would be technically and economically **very challenging** for manufacturers.
  - trusts that this thorough work will once and for all put aside any ambition to **reduce limits by 5dB**, a scenario that is **simply unrealistic**.
  - looks forward to the conclusion of the work currently underway by Applus IDIADA and ACASA for the European Commission, to support the European Commission on the Impact Assessment of its future proposal for new sound level limits.
  - calls on all GRBP & TF-VS stakeholders, the EU Member States and the European Commission to review the IAI/Acustica and TU Graz reports, and on the European Commission, Applus IDIADA and ACASA, to duly consider their content and findings in order to avoid any shortcomings in the current policy-making preparatory phases that would lead to ill-advised policy recommendations.

Thank you for your attention!

Any questions?