Effect of variants for an Lurban ASEP approach

As requested by the GRB Chairman

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Basic assumptions in analysis as stated by the GRB chairman

- **ASEP Methods**
  - Chair-ASEP = slope method doc 2011-02 annex 10 par 3
  - KBA-ASEP = KBA method doc 2011-02 annex 10 par 4
  - Lurban-ASEP = accel method doc 2011-02 annex 10 par 6
  - NL ASEP = doc 2011-08

- **KBA always applicable** (independent of choice for Lurban/ASEP or Chair/ASEP)

- **Acceleration boundaries**
  - Annex 3: $3 \text{ m/s}^2$
  - ASEP: $5 \text{ m/s}^2$
Huge amount of data
How to clarify in a simple presentation?
If necessary: Formulas

\[
L_{WOT,ASEP} \leq \frac{3 - k_{p,ASEP} \times L_{crs} + L_{urban} + 0.15 \times (v_{BB,ASEP} - 50)}{1 - k_{p,ASEP}}
\]

- All factors influencing L\textsubscript{wot,ASEP} are multiplied by a factor \(1/(1-k_{p,ASEP})\)
- For the example vehicle this factor has a value of 3
- This means
  - The margin of 3 dB on L\textsubscript{urban} translates into a margin of 9 dB on L\textsubscript{wot}
Huge amount of data
How to clarify in a simple presentation?

Strategy for this presentation
• No formulas
• One example vehicle
• Three variants of Lurban-ASEP
• For every variant
  – One graph with the principle
  – One graph with the data
The example vehicle

Blue dots are measured noise levels
The example vehicle

Why this example?
Reason 1: sound emission
- Not very linear
- Jump of 10 dB
- Estimated $L_{\text{max,nrated}} = 110$ dB
vehicle 200-49
PMR 159 kW/t
assumed limit A3: 73

Why this example?
• Sound emission
  – Not very linear
  – Jump of 10 dB
  – Lmax,nrated circa 110 dB
• Annex 3 on the edge
  – R51.02: -0.9 dB
  – R51.03 +0.7 dB
• Fulfills KBA
• Acceleration < 4 m/s²

• Sound emission not everywhere as could be expected from the Annex 3 result
vehicle 200-49
PMR 159 kW/t

The vehicle fails both NL ASEP and Chair ASEP at various engine speeds.

NL ASEP and Chair ASEP differ less than 3 dB
How do the Lurban-ASEP variants perform?
Variant 1 of Lurban-ASEP
Variant 1 for Lurban ASEP

3 dB margin on Lurban

Margin on Lwot in 2nd gear = Margin on Lurban multiplied by a factor 3
vehicle 200-49
PMR 159 kW/t

Variant 1 Lurban ASEP: 3 dB margin on Lurban
The vehicle never fails Lurban-ASEP

Limit of Lurban-ASEP is up to 10 dB higher than chair-ASEP and up to 15 dB higher than NL ASEP
Variant 2 of Lurban-ASEP
Variant 2 for Lurban ASEP

3 dB margin on Lwot

- margin independent of acceleration
vehicle 200-49
PMR 159 kW/t

Variant 2 Lurban ASEP:
3 dB margin on Lwot instead of Lurban

The vehicle is a boarder case for Lurban-ASEP

Lurban-ASEP is 0-6 dB more liberal than chair-ASEP and NL ASEP
Variant 3 of Lurban-ASEP
Variant 3 for Lurban ASEP

- Check Lurban-ASEP against Annex3 limit
- with 0 dB margin on Limit
Variant 3 for Lurban ASEP
Example: different Annex 3 result

No effect on ASEP limit
ASEP limit only depends on Annex 3 limit, not the Annex 3 result
vehicle 200-49
PMR 159 kW/t

Variant 3 Lurban ASEP:
Check with A3 limit
0 dB margin on A3 limit

The vehicle fails Lurban-ASEP

Lurban-ASEP limit is comparable to chair-ASEP and NL ASEP
Discussion

- Chair-ASEP rejects this vehicle
- Lurban ASEP
  - Variant 1 vehicle passes
  - Variant 2 boarder case
  - Variant 3 rejected