Proposal to amend the PBC reference for AEBS M1/N1
Proposal to adopt the Peak Braking Coefficient (PBC)

Two different PBC methods:

UN R152 refers in § 6.1.1.2 and 6.1.1.3 to 2 PBC demonstration methods:

- The American Society for Testing and Materials (ASTM) E1136 standard reference test tyre in accordance with ASTM Method E1337 90 or

- The k-test method specified in Appendix 2 to Annex 6 of Regulation No. 13-H (with vehicle with state of the art OEM production tires).

Conclusion for both methods: PBC needs to be adapted for today’s tyres

- Over the last decades tyres have reached a higher grip. So we ought to adopt to higher friction on average tyre-road-combinations. ASTM already recognises this progress, replacing the standard reference tyre E1136 with F2493.

- The ASTM E1337-90 determines a conversion factor, because tests with different tyres (e.g. E1136 or F2493) on the same track will result in different PBC values.

- Example - a of PBC 0.9 based on the E1136 can be converted to 1.017 with the F2493 tyre as follows:

  \[(0.9 \times 1.17) - 0.0360 = 1.017.\]  

  \[\Rightarrow 1.017 \text{ is the preferred PBC using the ASTM method}\]
Peak Braking Coefficient (PBC), determination with k-value method

\[ PBC = \mu = \frac{\text{max. Braking Force}}{\text{Nominal Load}} = \frac{9}{0.9 \times 9.81} \text{ m/s}^2 = 1.02 \]

Adhesion (PBC=Peak Braking Coefficient) is always the result of a tyre-road-combination.

With a PBC value of 1.02 it is possible to achieve a deceleration of 9 m/s\(^2\) during ABS control.

\[ \Rightarrow \text{1.02 is the preferred PBC using the k-value method.} \]
Proposal to adopt the Peak Braking Coefficient (PBC)

Justification:
Over the last years tyre/road friction parameters have improved and PBC values should be adapted accordingly.

Considering the ASTM method E1337-90 (12.4.2) and the UTAC measurements comparing both standard reference tyres on same tracks (AEBS-11-11) the PBC values should be as follows:

- \( \text{PBC} = 0.9 \) with “old“ ASTM standard reference tire E1136 (P195/75R14)
- \( \text{PBC} = 1.017 \) with “new“ ASTM standard reference tire F2493 (P225/60R16 97S)

For the k-test method with “vehicle under test“ production tires the PBC = 1.017 is also reasonable.
Proposal:

2.13. "Dry road" means a road with a nominal peak braking coefficient of 0.9 [as specified in par. xxx] or alternatively [that permits a mean fully developed deceleration of 9m/s²].

6.1.1.1. The road test surface shall have a consistent slope between level and 1 per cent and have a nominal peak braking coefficient (PBC) of

- 0.9 unless otherwise specified, when measured using the American Society for Testing and Materials (ASTM) of E1136 standard reference test tyre in accordance with ASTM Method E1337 90 at a speed of 40 mph
- 1.017 unless otherwise specified, when measured using either:
  - a) The American Society for Testing and Materials (ASTM) of F2493 standard reference test tyre in accordance with ASTM Method E1337 90 at a speed of 40 mph; or
  - b) The k-test method specified in Appendix 2 to Annex 6 of Regulation No. 13-H.