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Interactive comment on "Aerosol and NO_X emission factors and submicron particle number size distributions in two road tunnels with different traffic regimes" *by* D. Imhof et al.

Anonymous Referee #2

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The paper describes aerosol and NO_x measurements carried out in two road tunnels in the UK and Austria. The paper is well written and structured and is full of high quality data. It represents a valuable contribution to understanding the source characteristics of road transport emissions. The paper should be published after some revision. The authors should consider the following comments:

1.) page 5142, 1. par.: In Figure 6 the authors try to identify two regimes: low soot surface and increasing volatile emissions increase the number of nucleation particles. At high soot surface area the volatile material would condense onto the soot surface,

resulting in decreasing nucleation particle number. Although I think that in principle this is a valid assumption, it is not backed by data. For example, at Kingsway for data points $> 5\times$109 nm^2 cm^{-3} there is no indication of a downward trend. Perhaps the ventilation time/residence time of the 2 tunnels is different, and/or the emission characteristics (ratio volatile material / soot particles) are different resulting in more condensation and less nucleation in the Plabutsch tunnel.

2.) Page 5143, line 9–10: in general passenger diesel cars have a much larger [PM]/NO_x ratio than heavy duty diesel vehicles, so this cannot explain the higher NO_x observations. Perhaps some high polluting gasoline vehicles caused the observation?

3.) Table 3, page 5147–8: There is no good explanation why the PM1 emission factor for LDV and HDV is 3 x time larger at the Plabutsch tunnel. Also, could the authors consider a separation into Gasoline and Diesel emission factors?

4.) Page 5149, and table 3: In the paper the authors correctly distinguish among nucleation particles and soot particles. On the other hand, N0.1, N0.3, and N0.7 give a combination of the two. Why did the authors not try to fit two lognormal curves in order to deconvolute nucleation and soot mode. Even if the nucleation mode is strongly dependent on the ambient conditions and presence of soot surface, this approach should reveal robust real world soot number emission factors.

5.) References: page 5140 line 10: The volatility of traffic related particles has been studied in depth by the Leipzig group. You may want to give credit to Wehner et al 'Volatility of aerosol particles measured next a highway' J. Aerosol Sci. 32.1 S117-8 (2001) and Wehner et al., Atmos. Environ. 38, 6081–6090 (2004).

6.) References: Page 5149: there is a large variety of number emission data in the literature, for example see: Maricq et al., Aerosol Science Technol. 33, 239–260 (2000); Maricq et al., EST 36, 276–282 (2002); EST 36, 283–289 (2002); ACEA programme on the emission of fine particles from passenger cars [2], ACEA 2002; Maricq et al., EST 33, 2007–2015; Vogt et al., EST 37, 4070–4076 (2003); Zervas et al., SAE 2004-

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Interactive comment on Atmos. Chem. Phys. Discuss., 5, 5127, 2005.