

## ***Interactive comment on “A miniature Portable Emissions Measurement System (PEMS) for real-driving monitoring of motorcycles” by Michal Vojtisek-Lom et al.***

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The manuscript is fit for AMT but is quite long and at times reads a little bit like a report rather than an easy to read manuscript. Some parts discuss observations rather than having a focus on measurement techniques, the interesting part of lab vs on road PEMS for motorcycles gets a little bit too much in the background and could stand out more.

\*\* We thank the reviewer for the comments. We tried to address all of them (replies are marked with "\*\*\*\*" as the application does not allow text formatting. \*\*

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I have mainly minor comments below and suggest may be refocusing the manuscript by putting some of the technical tables that convey only information but no results in the SI (you are starting results with table 4). I would also put some of the figures in SI such as the road trips (Figs 3 and 9). This will help shorten the manuscript and make it more readable.

Details Please tighten experimental section as some things are repetitive (e.g. twice the size cut of your TSI CPC).

\*\* The experimental section has been shortened by moving Fig. 2. Fig. 3 and Table 2 to the SI file, and by shortening the text describing particulate matter measurements (page 5 lines from 3 to 13 of the original manuscript). The remaining part of the experimental section is, in our opinion, relevant to the results presented. \*\*

Formulas page 7 and 8 appear in a poor resolution.

\*\* All equations in the manuscript have been rewritten. \*\*

Figure 5: data in bright green is hardly visible except in a few places

\*\* We have improved Figure 5 for better readability. \*\*

Figure 7: This figure should be substantially improved. Please homogenize the panels. Do not use frames for the panels. Please align the axis between panels, make sure the legend and the axis units do not overlay etc... Also please use subscripts on chemical formulas. Please add error bars to his figure, indicating measurement uncertainties, or at least indicate them on one point.

\*\* The Figure has been improved as suggested. \*\*

\*\* The estimate of the measurement uncertainty information has been added to the text at page 11 line 22 of the new version: "The estimated measurement uncertainty for the laboratory measurement (bag data) of NO<sub>x</sub> is 10% at 80 mg/km and 5% at the 150 mg/km emission level, of HC is 10% at 50 mg/km and 5% at 200 mg/km, and

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of CO and CO<sub>2</sub> is 3% for all emission levels. This uncertainty is shown in Figure 6 as a separate arrow rather than being added to each point. The largest components of uncertainty for the Mini-PEMS are the engine volumetric efficiency (affecting the exhaust flow calculations), the uncertainty of HC and PM measurements due to the limitations of the approach chosen (unheated sampling train, surrogate measurements for PM), and the uncertainty associated with dynamic events (rapid changes in both exhaust flow and pollutant concentrations). These non-controllable uncertainties were estimated ex post to be overall in the range from 10% up to 20% (see MAPD, mean absolute percentage differences, in Table 4 and Table 6). The known uncertainty of gaseous component measurements at steady-state, above the detection limit, is 3-5%, and the combined uncertainty of engine rpm and intake manifold pressure and temperature is 1-2%. We estimated this known uncertainty to be about 5% for all measurements.” \*\*

Figure 8: same as figure 7 with attention to detail and quality. Please put legends in similar spots, align axis, get rid of frames, add error bars,...

\*\* The Figure has been revised. The estimated uncertainty of laboratory measurement was added as a separate arrow to reflect its overall estimate, rather than calculation specific to each point. \*\*

Figure 10: please add units to axis rather than in the title. Also this bright neon green is not well visible. Again error bars should be provided, this is an analytical journal

\*\* The Figure was improved as suggested. \*\*

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