



NOVEL WLTP CYCLE: PN RESULTS

HORIBA GmbH, AUDI AG

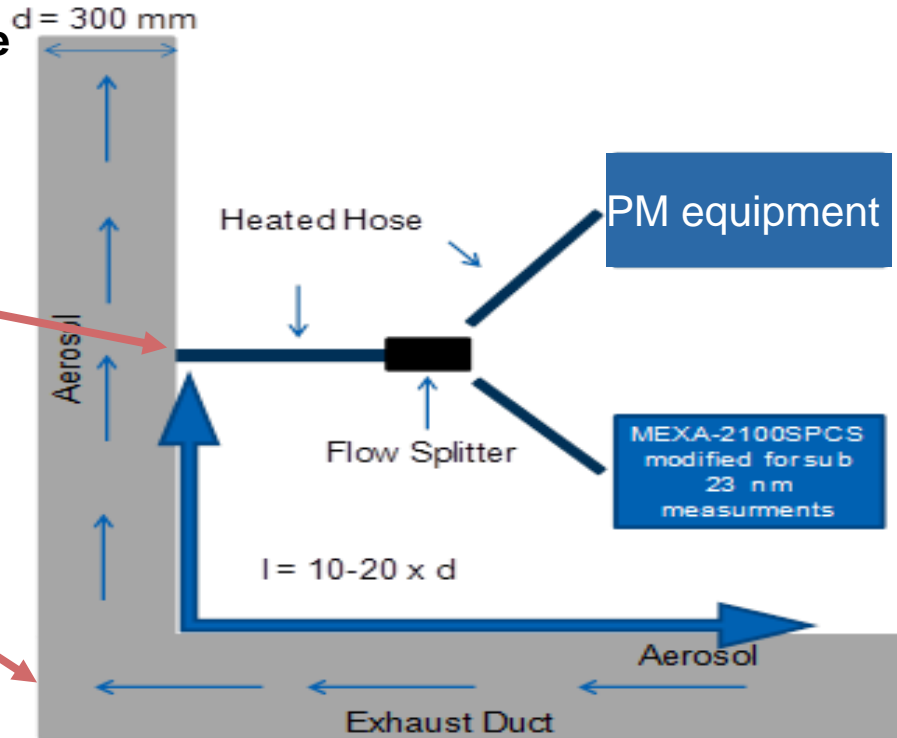
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Experimental set-up HORIBA-AUDI

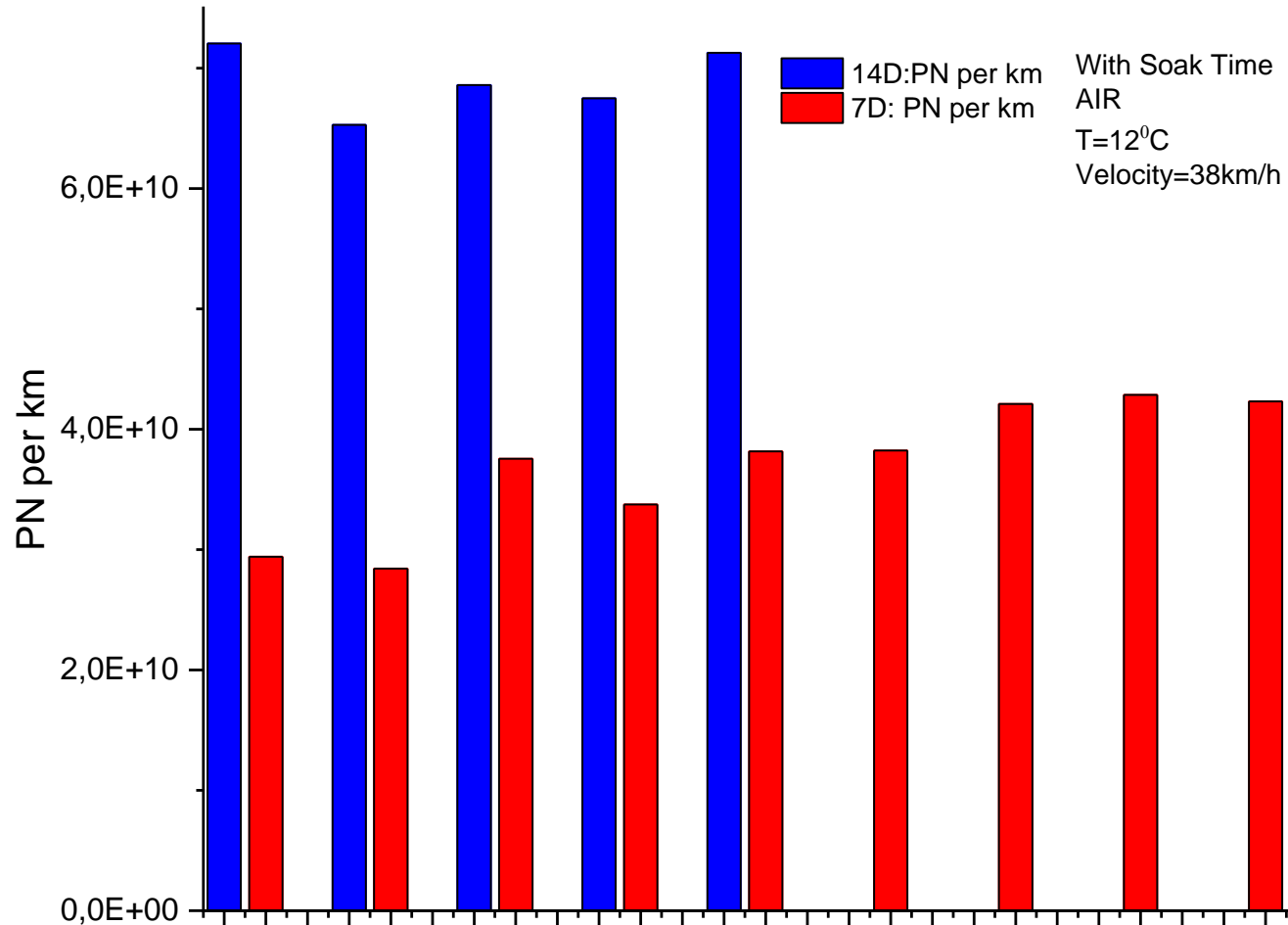
- 17" 2 piston frame-design caliper, low steel (ECE) brake pads (AUDI A8) For WLTP class3
- Ford Focus Pads for novel cycle
- 2 sampling points
 - 14D
 - 7D



H13
Filter

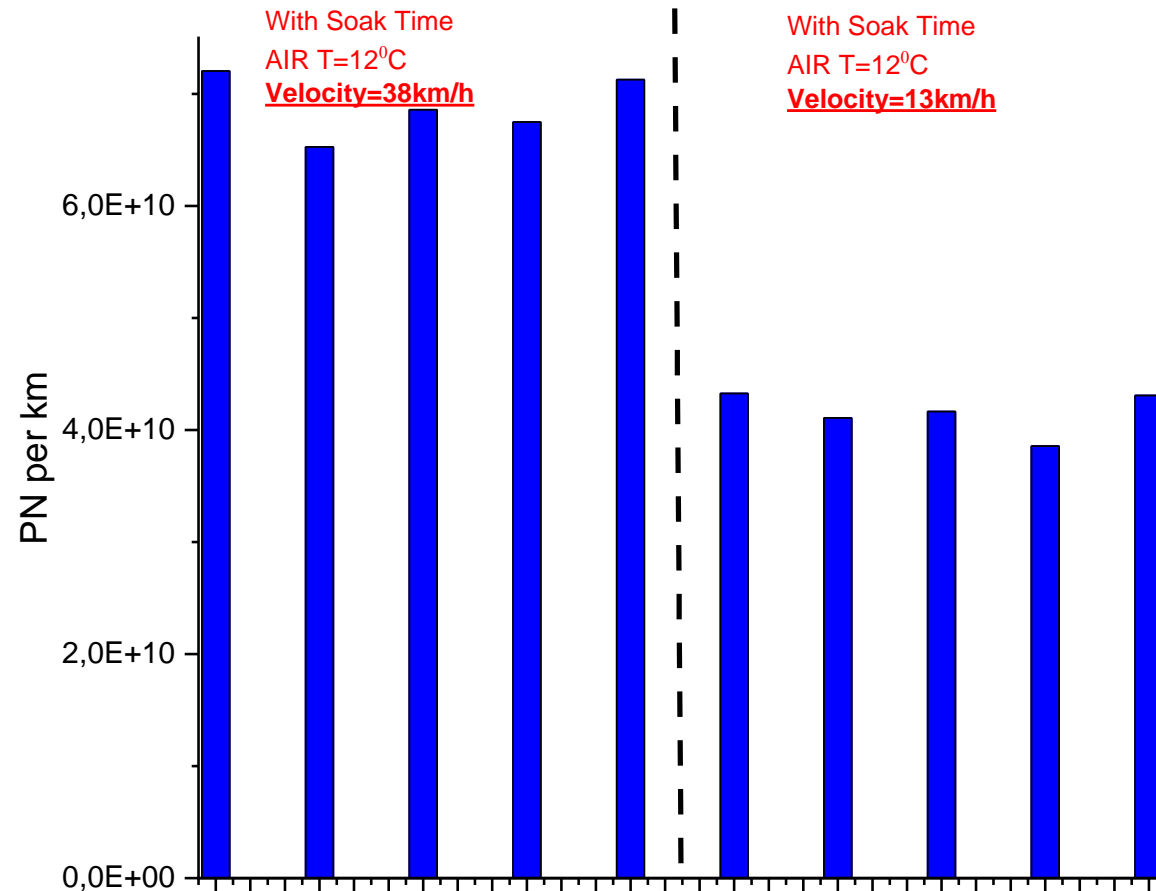


Novel cycle: Influence of sampling point



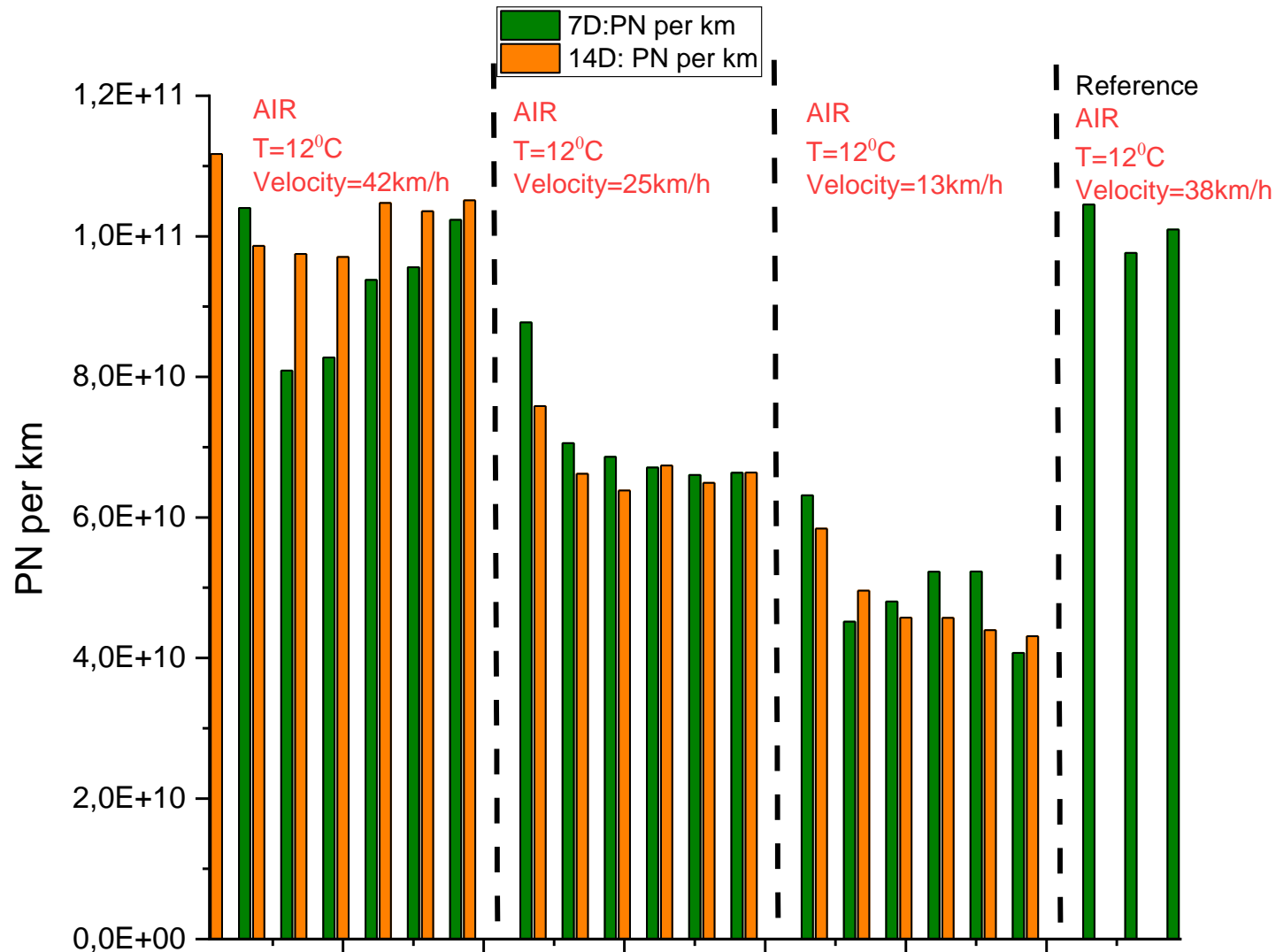
- *Emission will be stabilized after at least 5 cycles*
- *High emission level was observed for sampling point as defined in exhaust legislation*
- *Problems with homogenous probe mixture is assumed for sampling point at 7 D*

Novel cycle: Influence of air flow



- *Emission decreases as air velocity/air flow rate decreases*
- *No coagulation problems is expected by theory*
- *What's about dilution?*

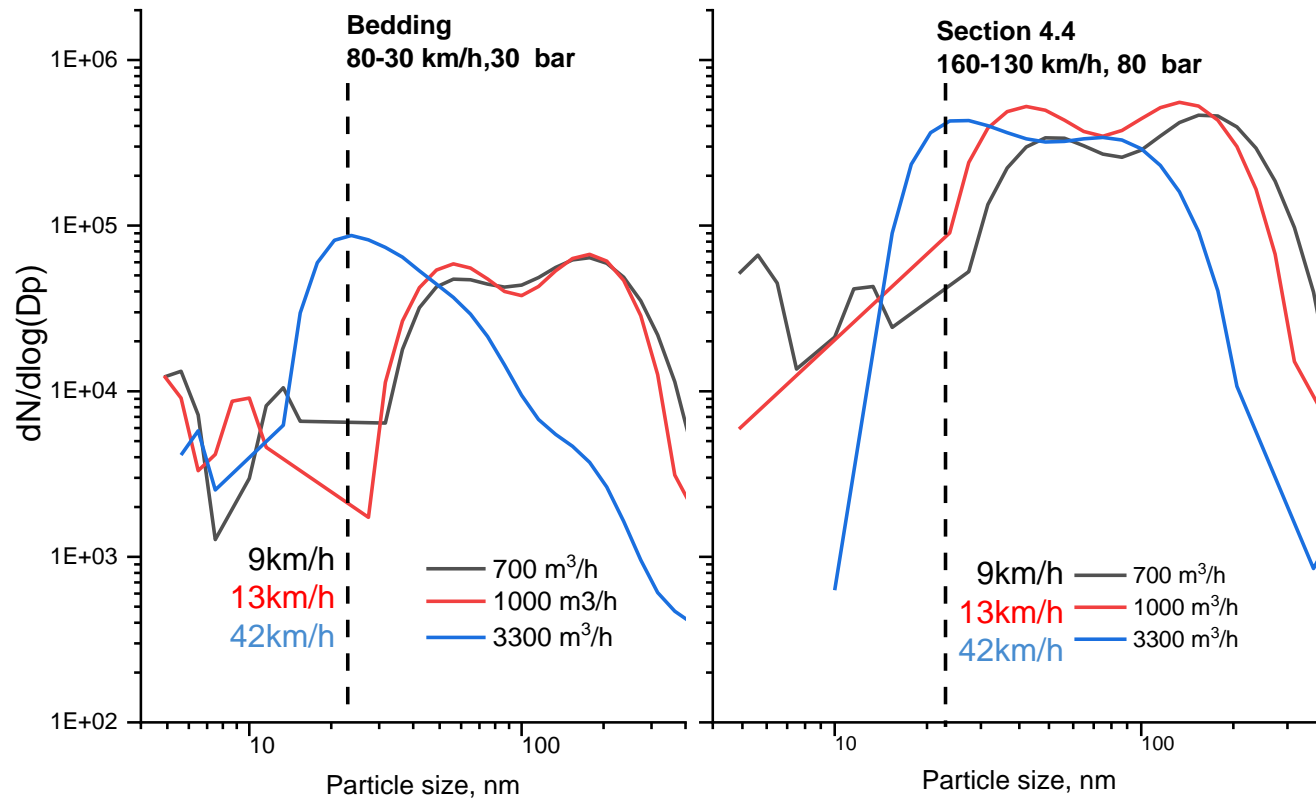
WLTP class 3 cycle: Influence of sampling point and air flow



- *No big difference for sampling point*
- *Emission decreases as air velocity/air flow rate decreases*
- *No coagulation problems is expected by theory*
- *What's about dilution?*

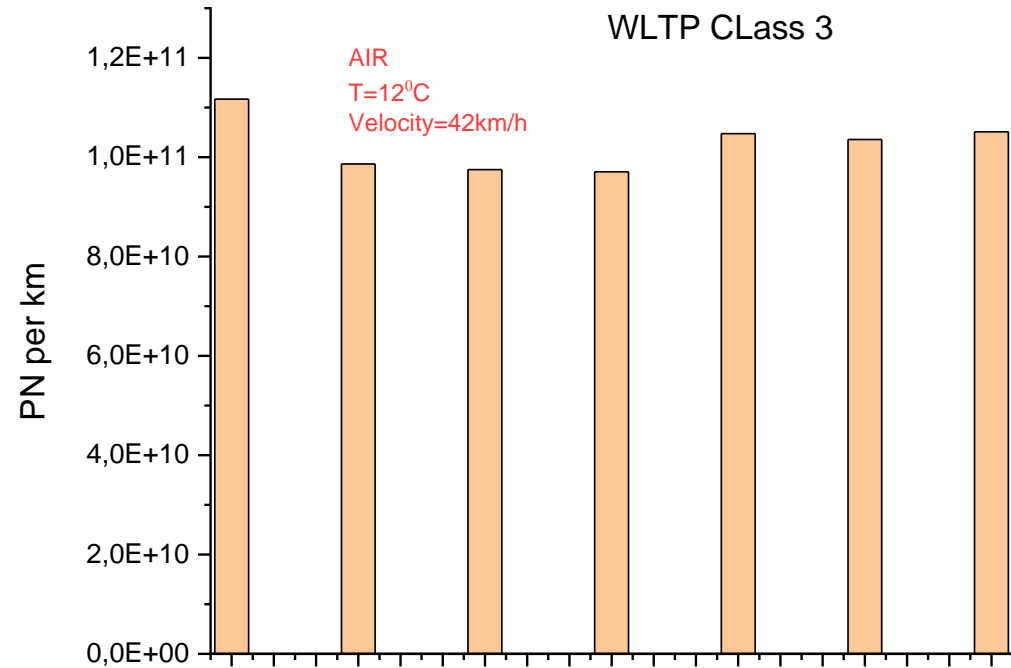
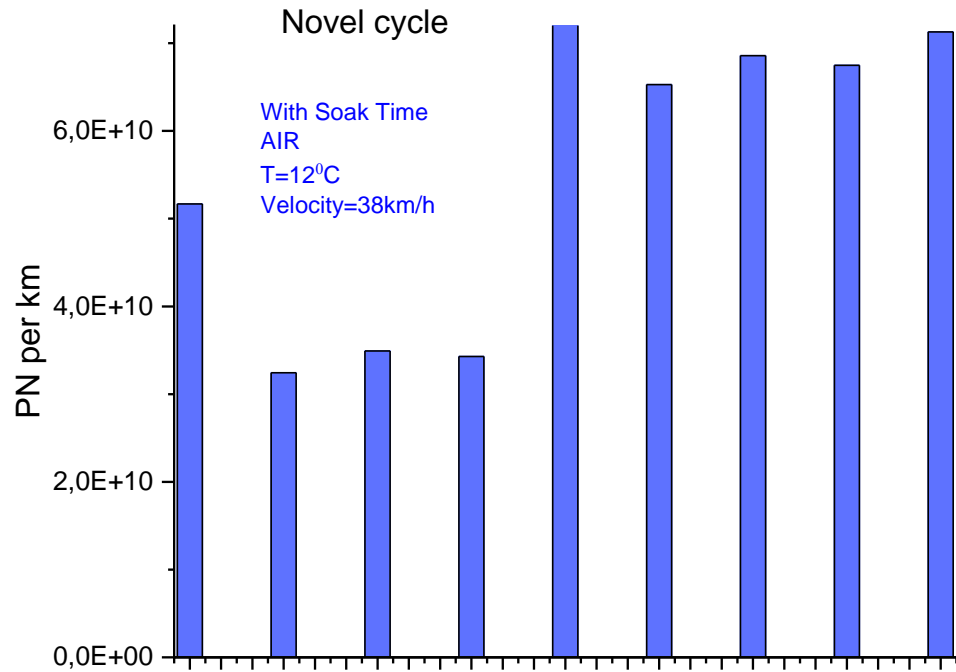
AK master: Influence of air flow

AK-Mater results



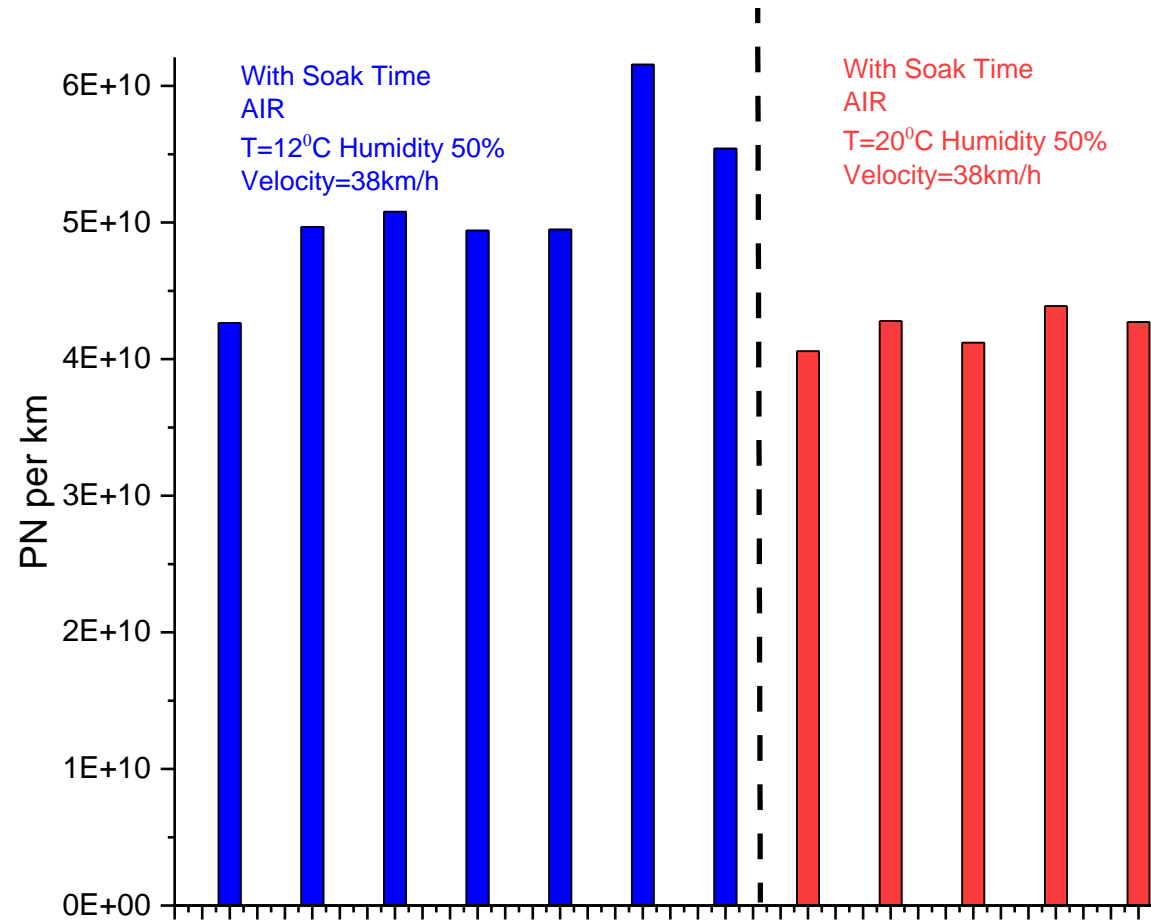
- *Emission decreases as air velocity/air flow rate decreases*
- *Coagulation problems is observed even if theory does not predict*
- *What's about dilution?*

Novel versus WLTC cycle



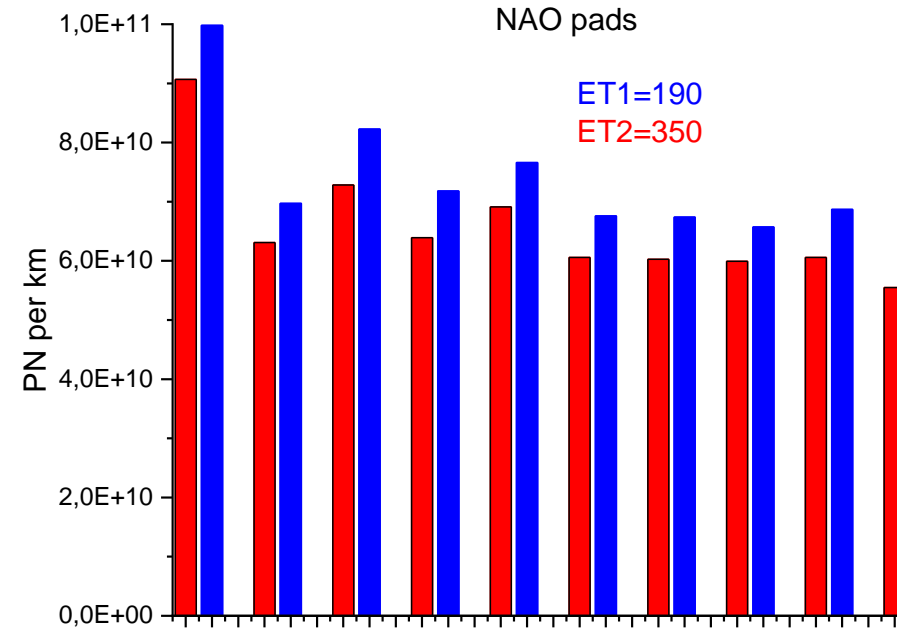
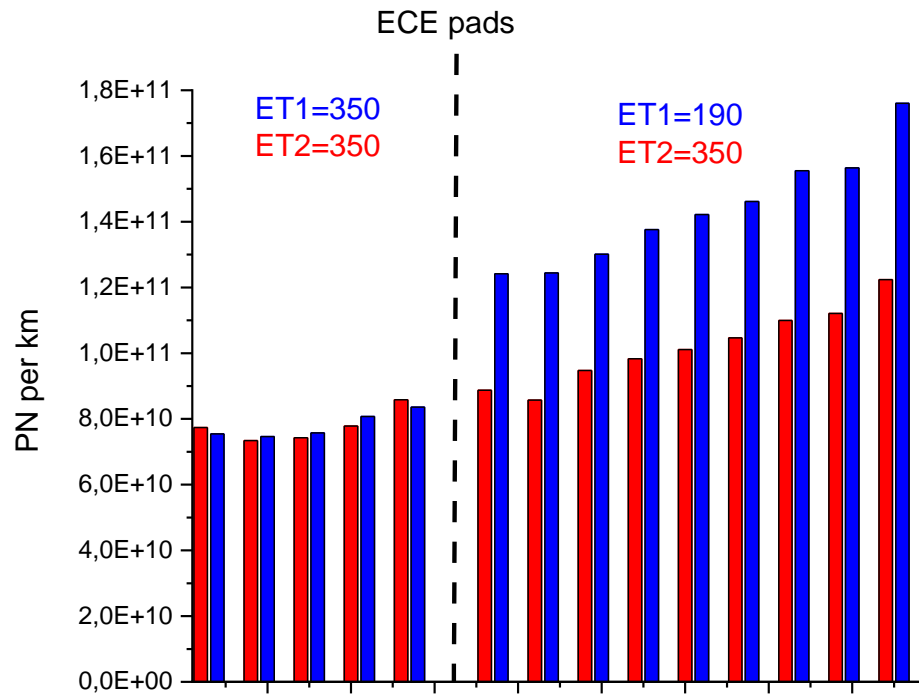
- *Emission will be stabilized after at least 5 cycles for Novel cycle*
- *Lower emission level for novel cycle is observed*

Novel cycle: Influence of air temperature



- *Emission decreases as air temperature increases*
- *Difference estimated to be 20%*

Influence of Volatile Content: WLTP class 3



- *Effect of volatile content are observed*
- *For different materials volatile contents differs strongly*

Finding's

- ❑ Brake pads would be stabilized only after 8-10 cycles
- ❑ PN depends on air flow/air speed as well as air temperature
- ❑ Coagulation of particles is observed with reduction of airflow/air speed
- ❑ Effect of volatile content is observed
- ❑ Homogeneous mixture of aerosol has more influence to PN and PM than geometry of set-up

Outlook

- ❑ Effect of airflow/ air speed has to be taken to account in respect to sufficient probe dilution
- ❑ Different brake partners has to be tested in order to clarify dependences of PM and PN on test parameters
- ❑ Presence of volatile content has to be take to account by definition of PN instrumentation

Omoshiro-okashiku
Joy and Fun

おもしろい
おかし

眞峰



Thank you

Cảm ơn

감사합니다

ありがとうございました

Dziękuję

धन्यवाद

Grazie

Merci

谢谢

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நன்றி

Gracias

Obrigado

Σας ευχαριστούμε

Děkuji

Teşekkürler

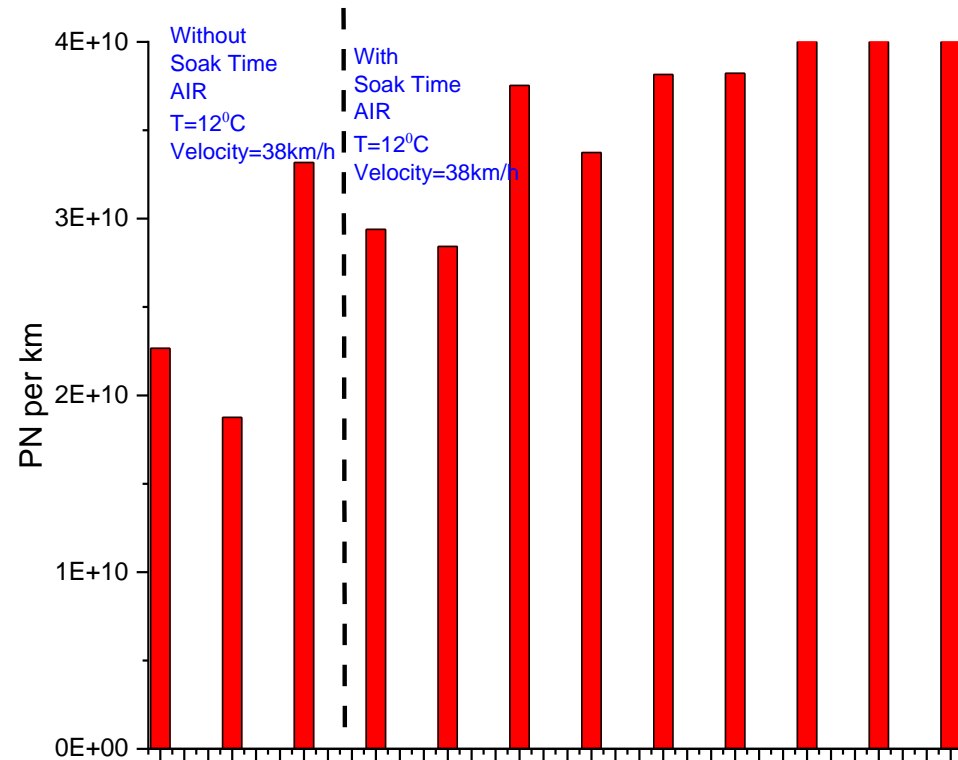
شكرا

Tack ska ni ha

Danke

Большое спасибо

Novel cycle: Influence of Soak time



- *Emission was not really stabilized for measurements without soak time*
- *No big difference in emission assumed for cycles with and without soak time*