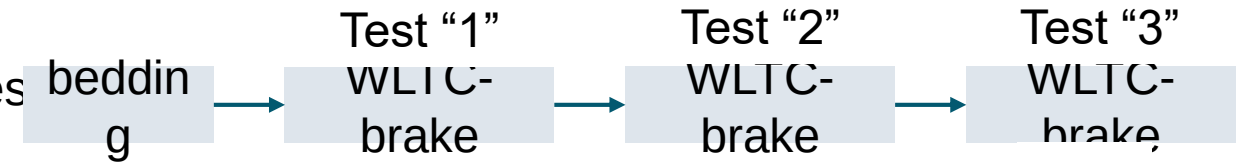
DIFFERENT BEDDING PROCEDURES (PMP TASK FORCE #3)

PMP TF3

TESTING METHODOLOGY AND SETUP

Question: Are there influences on the Temperature, PM_{10}, $PM_{2.5}$ & PN, depending on the two different running-in / bedding procedure?

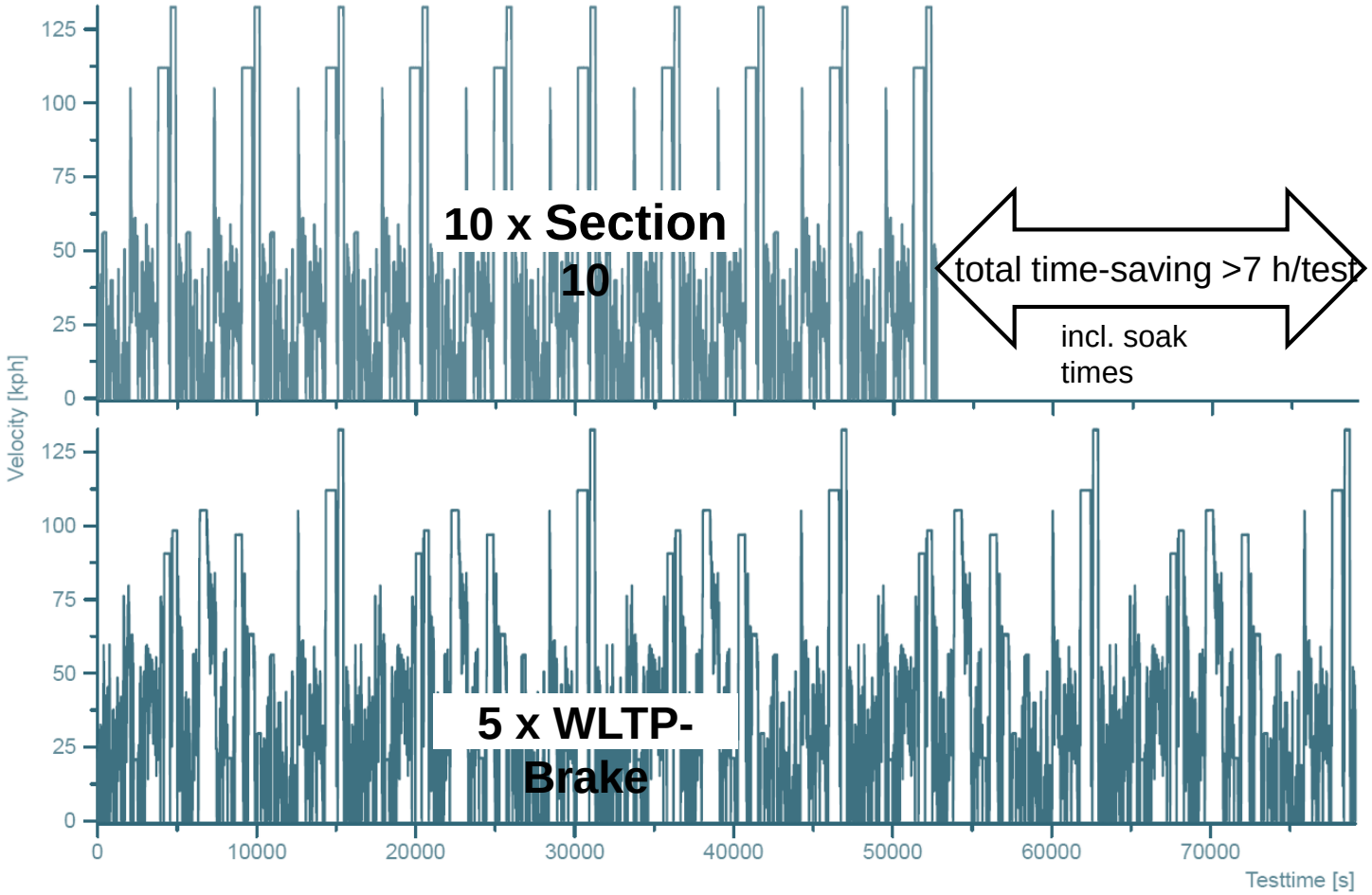
- All measurement are performed on the same brake dynos of each lab within the PMP TF#3 ILS (round-robin)
- Tested bedding procedures:
  - 5 x WLTC-brake
  - 10 x Section 10
- One test series



- Test Matrix:
  7 labs announced participation,
  3 Labs delivered data
  only Lab L measuring brake 1a, 1b, 2 & 3

		Brake ID (-)			
		1a	1b	2	3
AB: 10x Section 10	LabB	3			
	LabL	3	3	3	6
	LabN				3
STD: 5x WLTP-Brake	LabB	6	3	3	3
	LabL	3	3	7	9
	LabN	3	3		3

INVESTIGATED BEDDING CYCLES



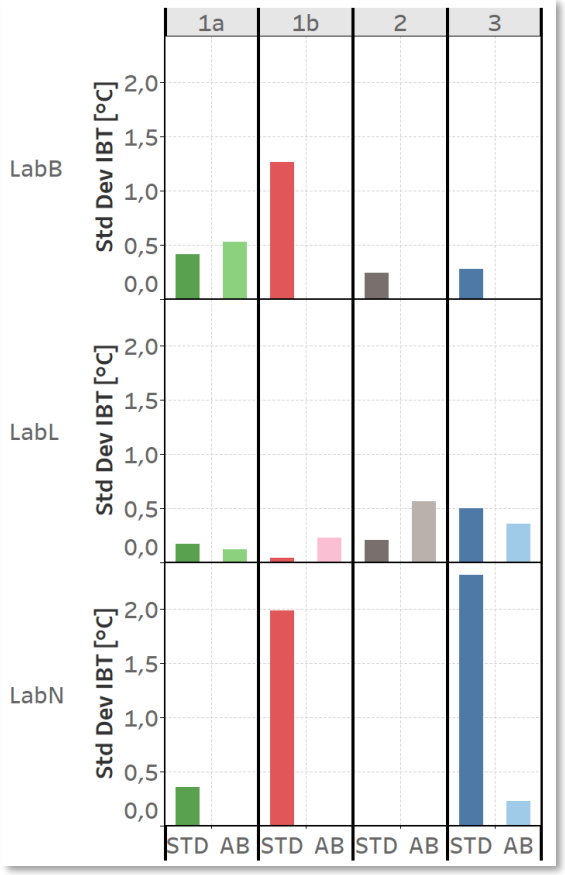
	Duration* [h]	Number of stops [-]	Braking power [Wh]
10 x Section 10	14.63	1140	113.38
5 x WLTP-Brake	21.98	4545	168.89
Delta	**7.35**	**3405**	**55.51**

*w/o soak times

IBT (INITIAL BRAKE TEMPERATURE)

Temperature Data

Standard Deviation



No significant influence on initial temperature can be observed, if sufficient measurement data are available

First measurement of brake 3 @ lab N with higher T => higher Std. Dev.

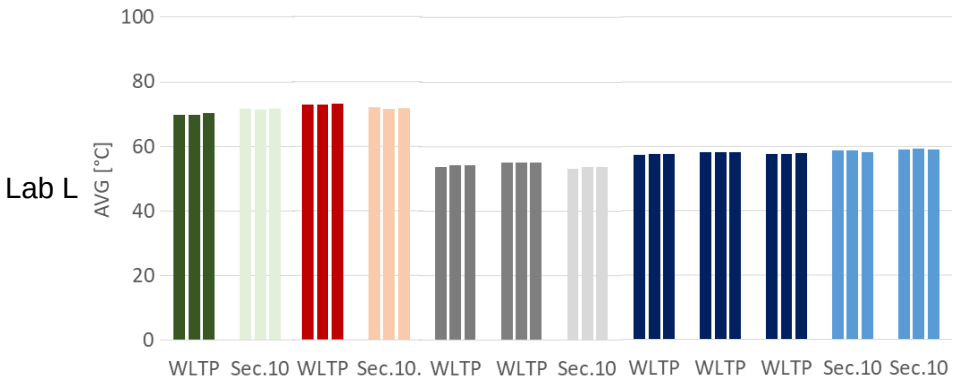
Lab B: Brake 1a

Lab L: all Brakes

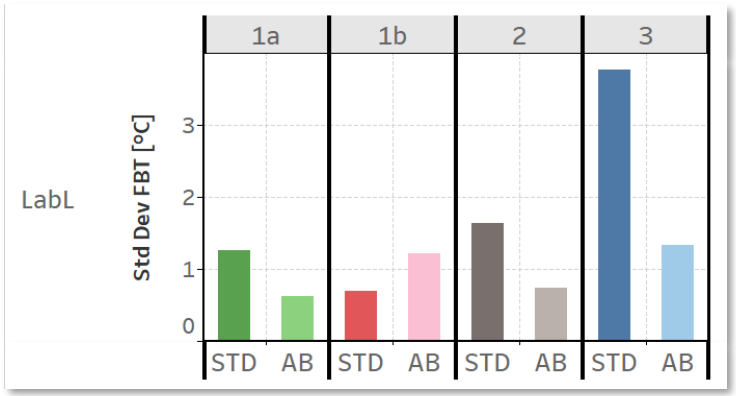
Lab N: Brake 3

AVG (AVERAGE BRAKE TEMPERATURE)

Temperature Data



Standard Deviation



Lab L: all Brakes

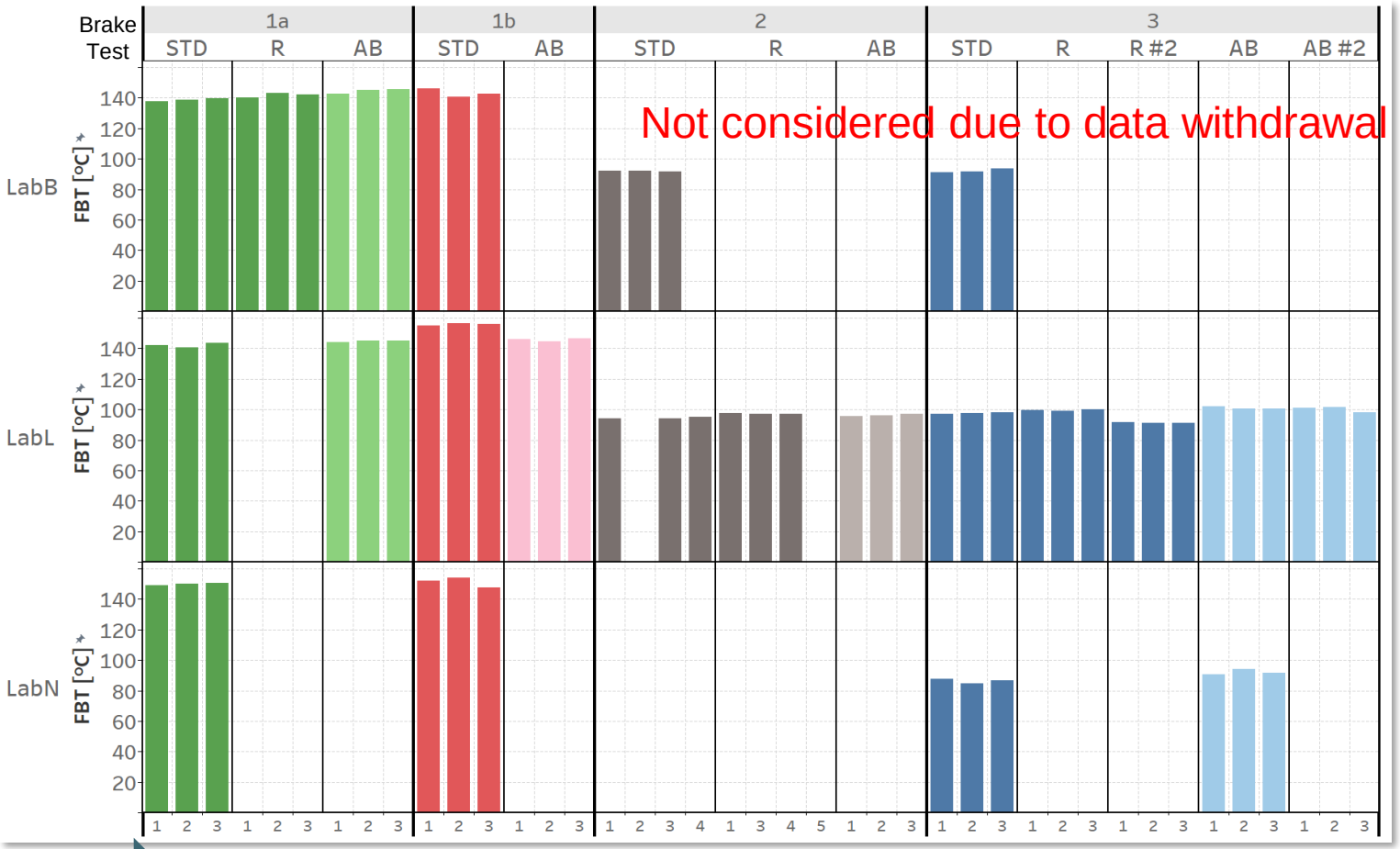
Lab B & N data not available at the moment.

Will be provided later .

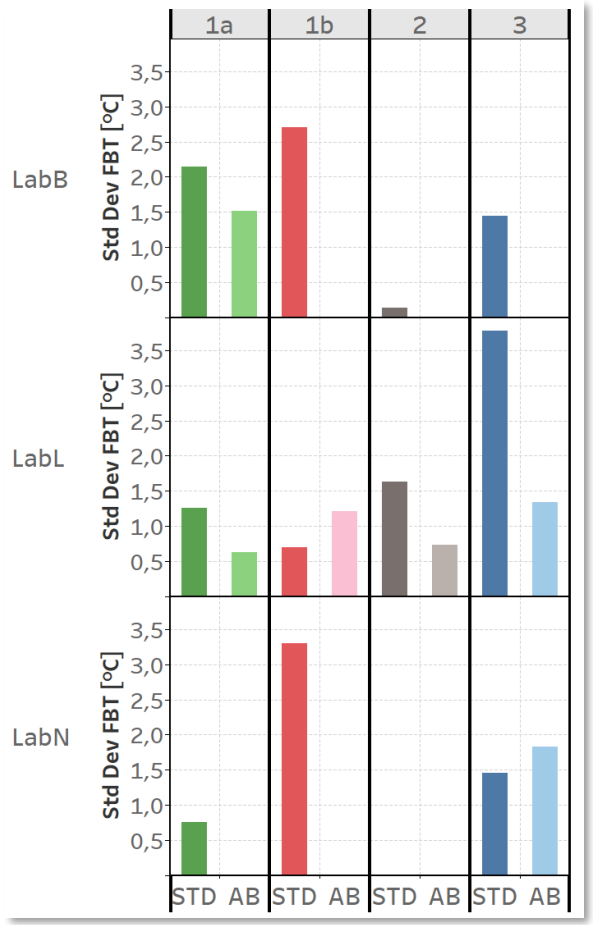
No Significant influence on average temperature can be observed at Lab L

FBT (FINAL BRAKE TEMPERATURE)

Temperature Data



Standard Deviation



At Lab L: 3. series of tests on the blue brake with WTLP bedding shows lower temperature.

Leading to an increased standard deviation.

However, no significant influence on final temperature due to bedding procedure can be observed.

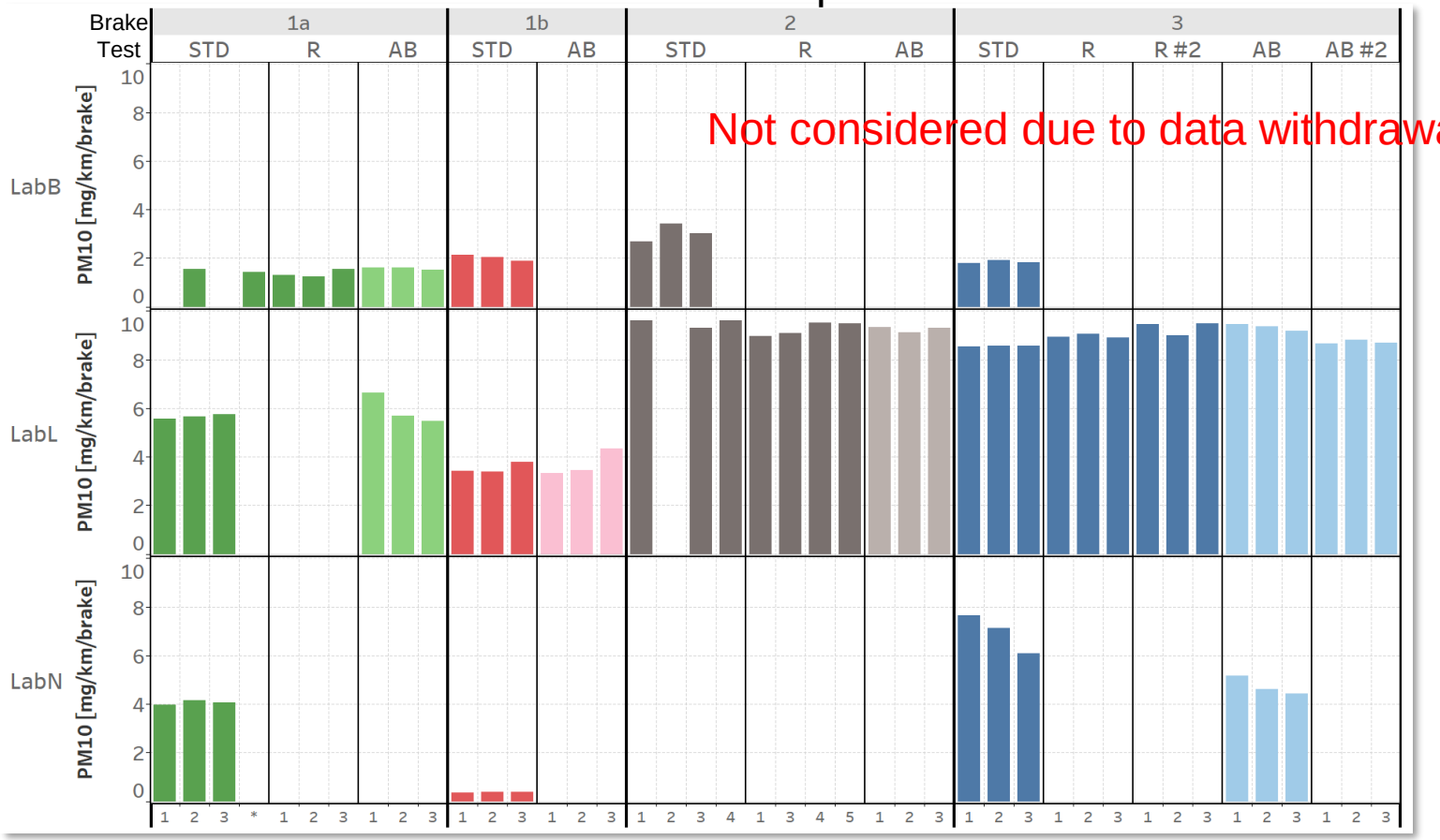
Lab B: Brake 1a

Lab L: all Brakes

Lab N: Brake 3

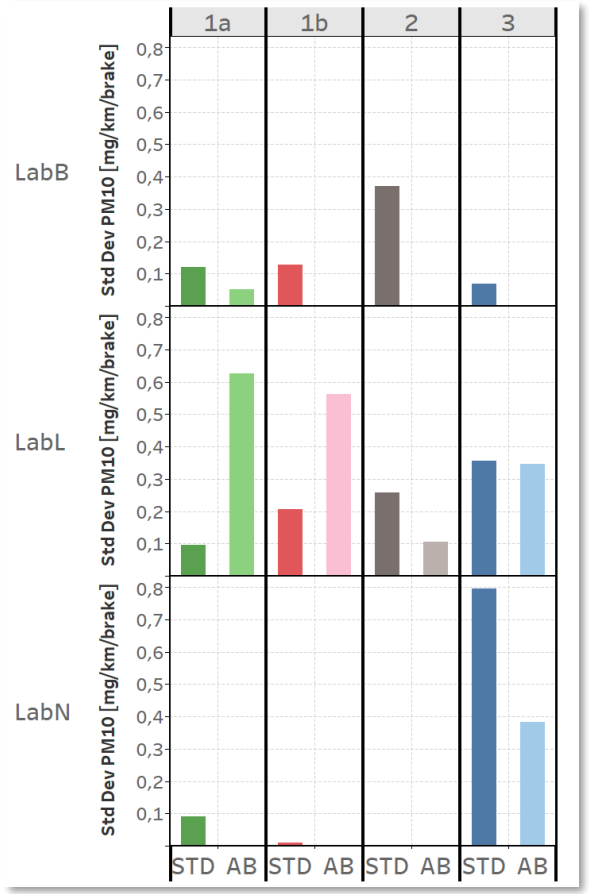
PM_{10}

Emission Data per Brake



Not considered due to data withdrawal

Standard Deviation



Considering the standard deviation especially @ Lab L:

- Higher deviations for green and red for AB, for grey for standard and for blue no difference

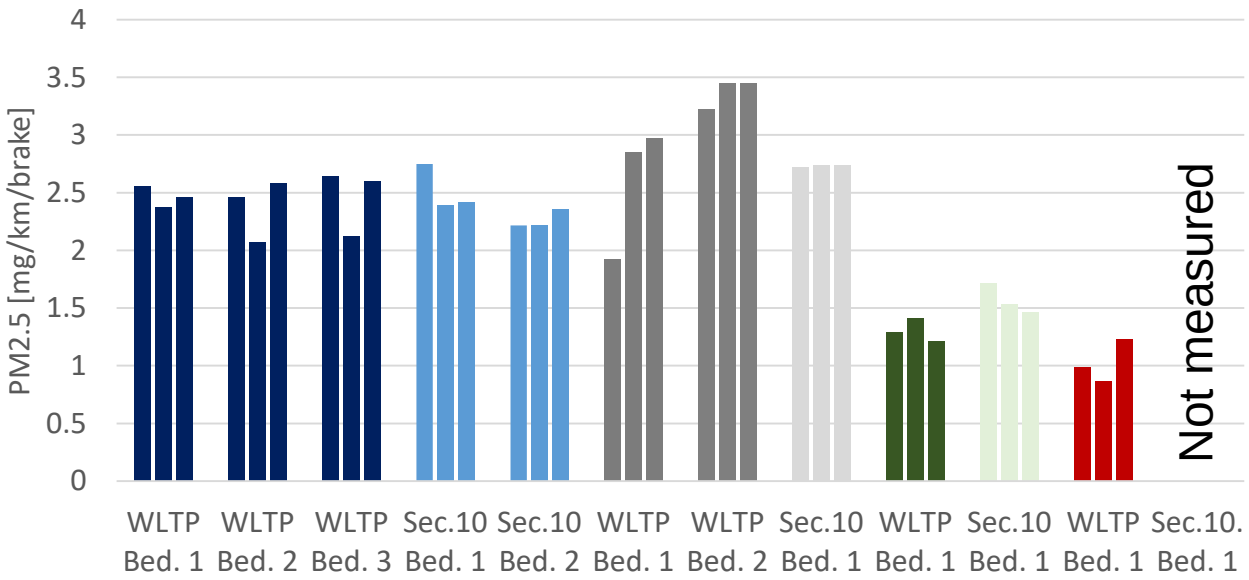
However, no significant influence on PM_{10} due to bedding procedure can be observed.

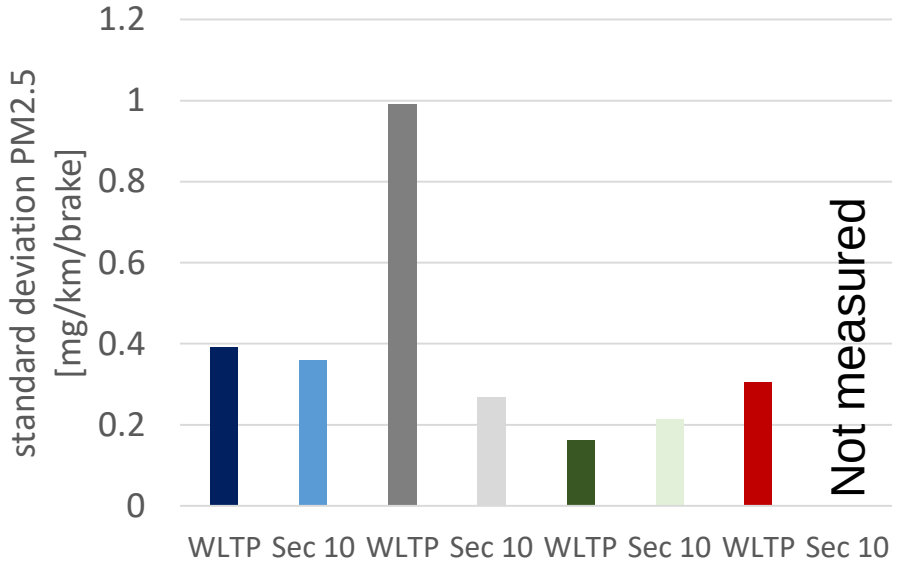
Lab B: Brake 1a

Lab L: all Brakes

Lab N: Brake 3

$PM_{2.5}$





Considering the standard deviation:

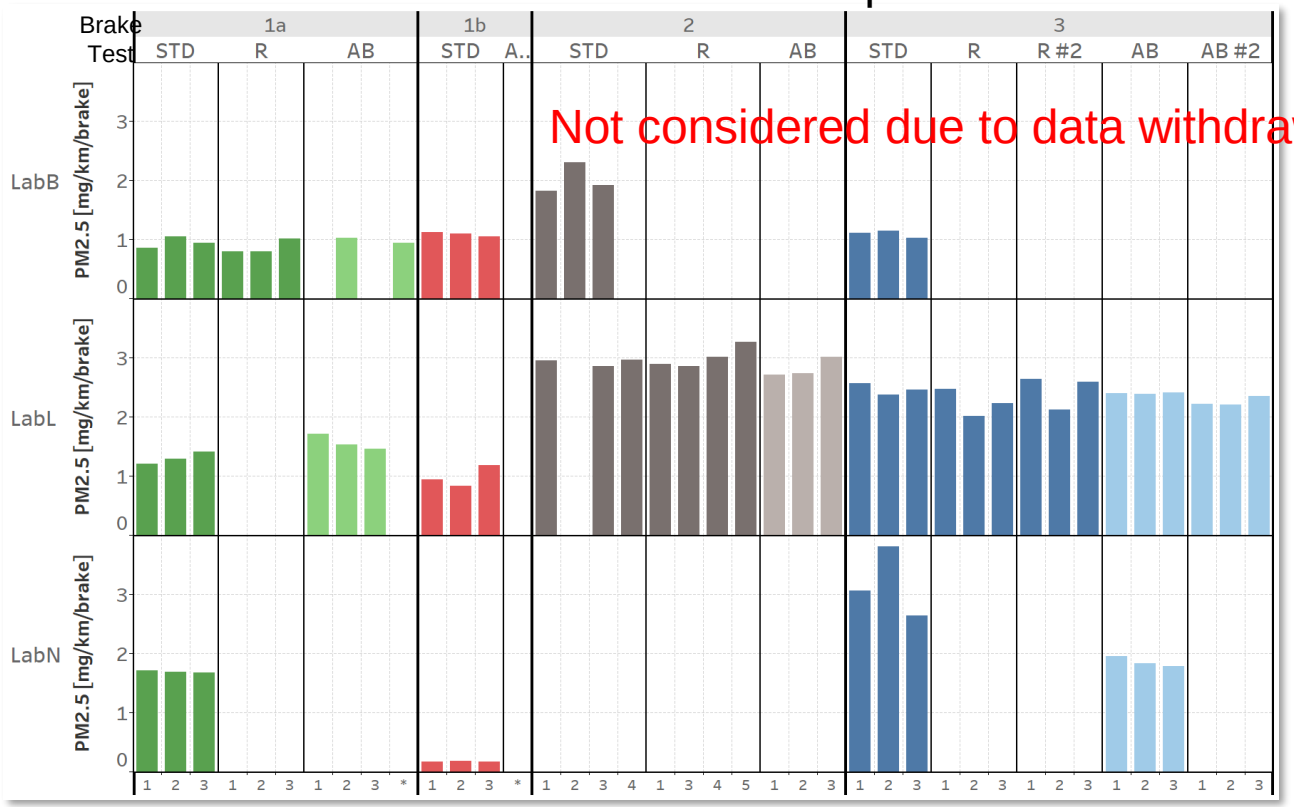
- For blue and grey: section 10 bedding seems to be (slightly) beneficial
- For green: WLTP-brake bedding seems to be beneficial

However, no significant influence on $PM_{2.5}$ due to bedding procedure can be observed.

Total mass on the filter is <0,5mg
The differences are ~0,01mg

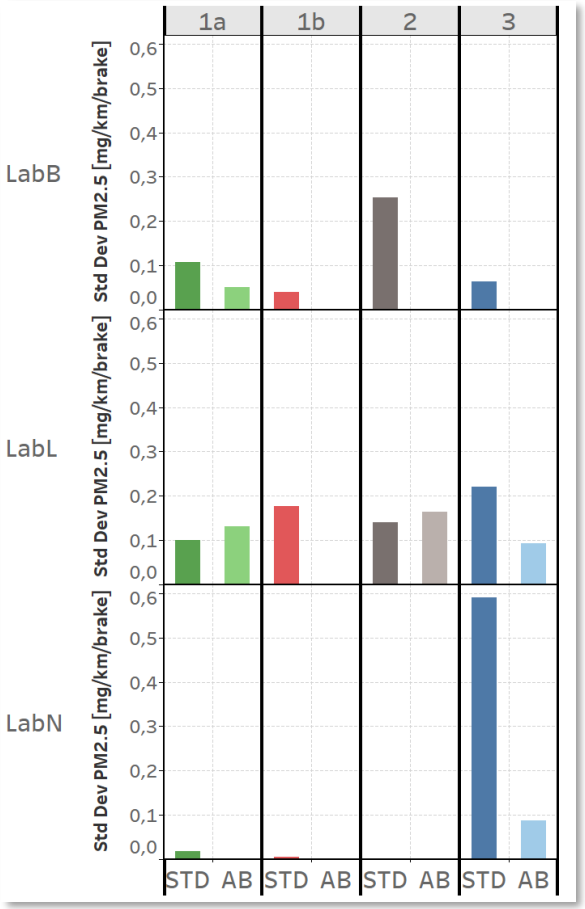
$PM_{2.5}$

Emission Data per Brake



Not considered due to data withdrawal

Standard Deviation



Considering the standard deviation:

- For blue and grey: section 10 bedding seems to be (slightly) beneficial
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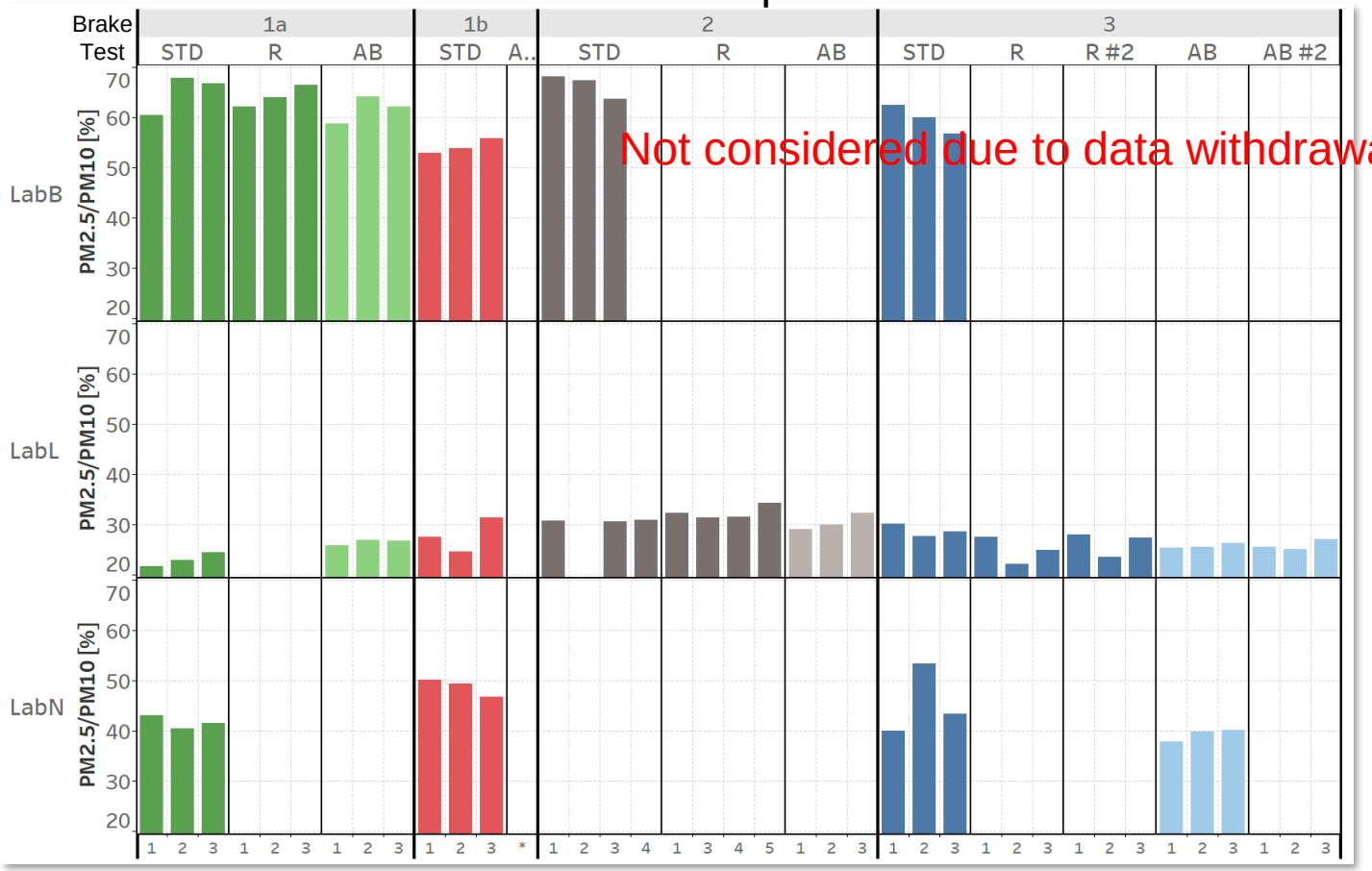
However, no significant influence on $PM_{2.5}$ due to bedding procedure can be observed.

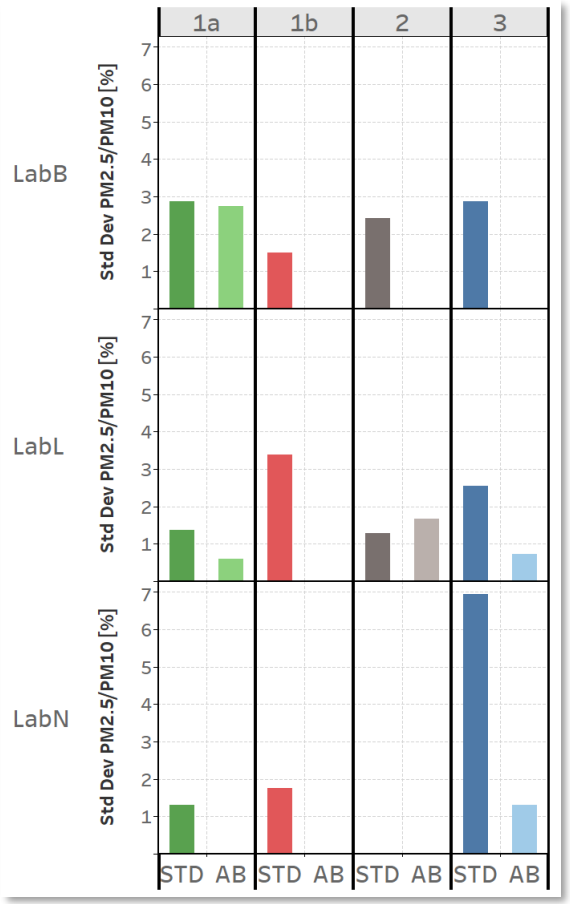
Total mass on the filter is <0,5mg
The differences are ~0,01mg

PM_{10} / $PM_{2.5}$

Emission Data per Brake



Standard Deviation



Lab B: Brake 1a

Lab L: all Brakes

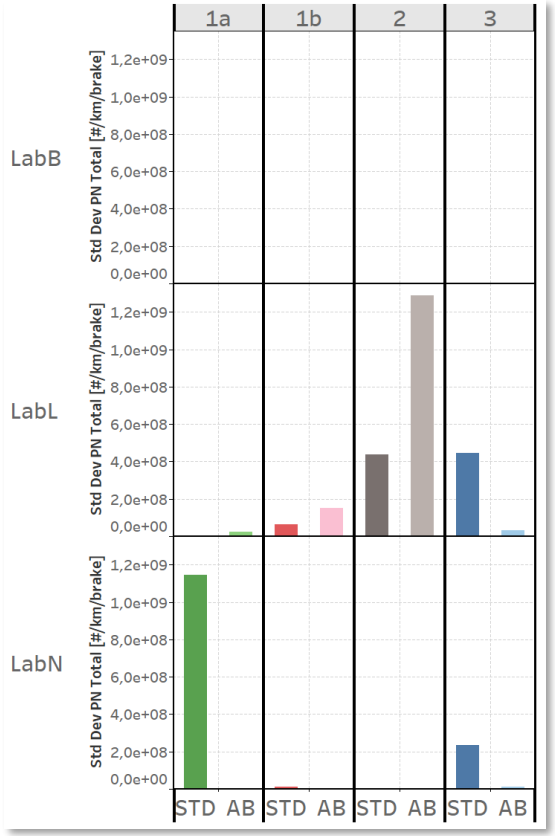
Lab N: Brake 3

Bedding procedure does not seem to be the dominating source for the variation

PN

Emission Data per brake

Standard Deviation



Apart from blue, WLTP bedding seems to be beneficial regarding the std. deviation. However, standard deviation for these test seems to be very low.

No significant influence on PN due to bedding procedure can be observed.

Lab B: Brake 1a

Lab L: all Brakes

Lab N: Brake 3

SUMMARY AND CONCLUSION

- Both bedding procedures (5 x WLTP-brake and 10 x section 10) have been investigated
- The results show no significant influence:
  - Neither on temperatures
  - Nor on emissions

- However, there has been no examination of different flows or variation of other tests parameters

- At this point in time the differences are considered to be within the expected repeatability of the overall tests/procedure
- The overall bedding procedure duration can be reduced by more than 7 h per test

⇒ PMP has to decide how to proceed with the implementation of the method or additional experiments

⇒ How many emission tests should be conducted after the bedding?