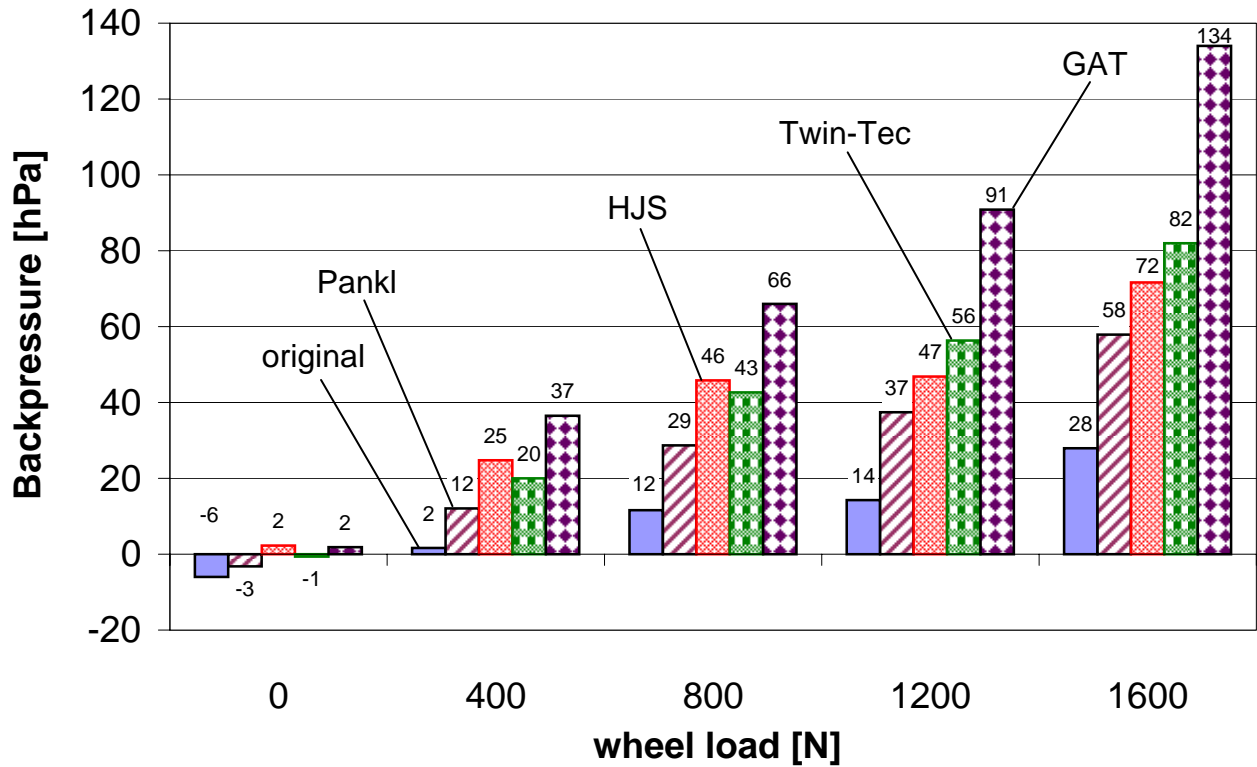


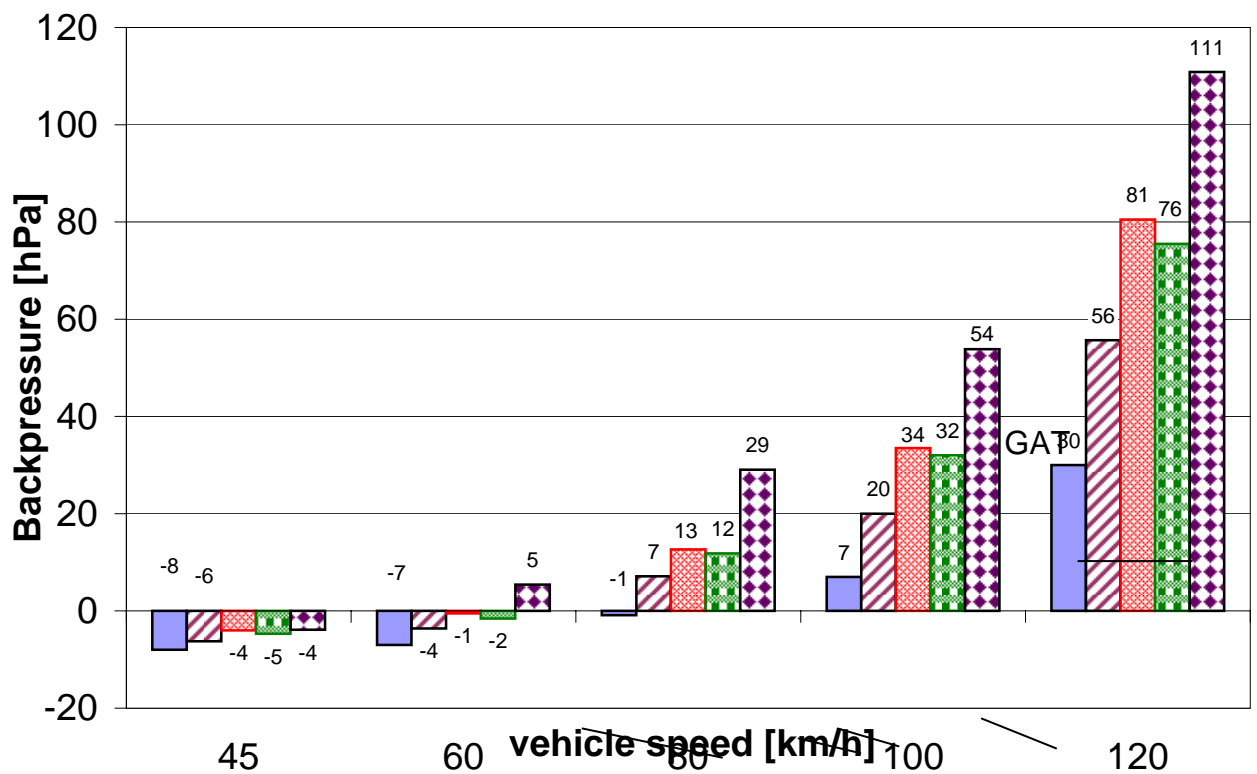
# Backpressure w/o & with PMS

VW Passat 1.9 TDI; low sulfur diesel

Load steps : original / PMS



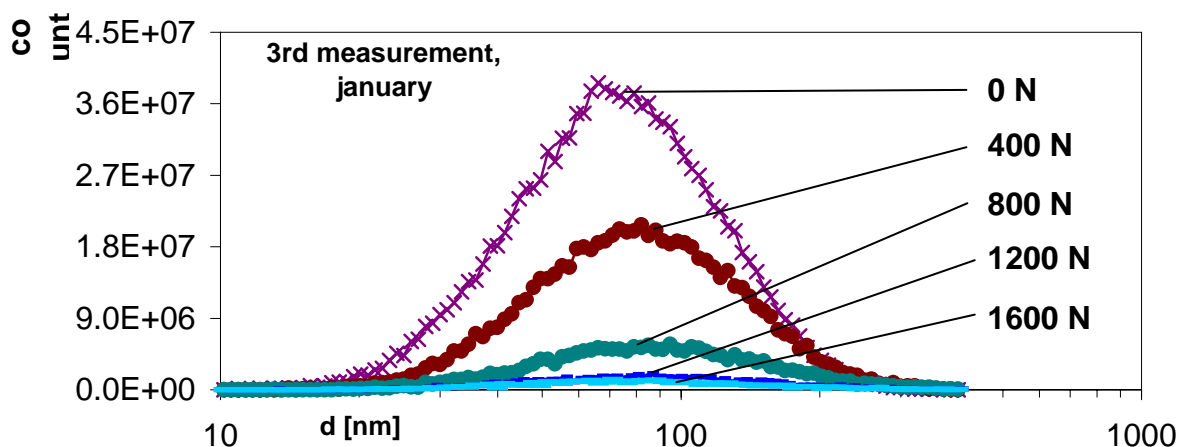
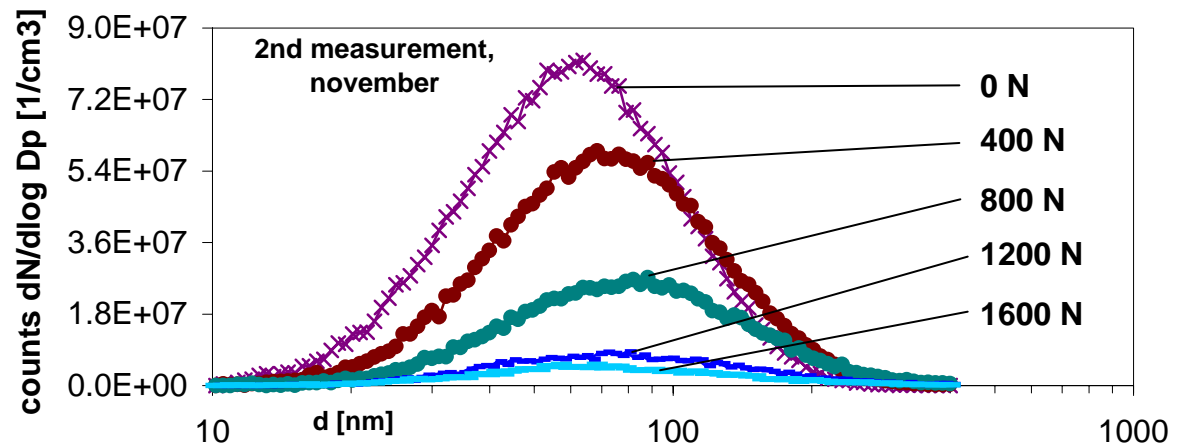
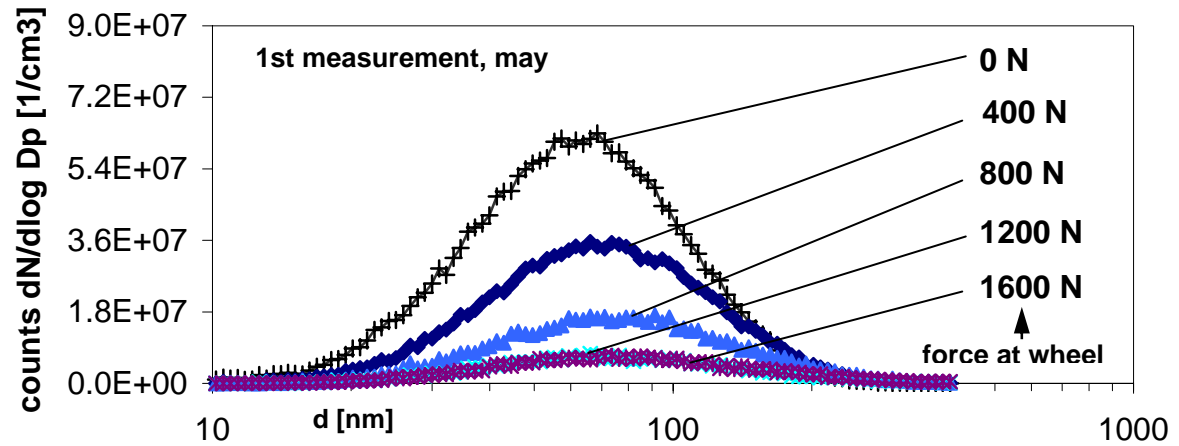
Speed variations : original / PMS



# SMPS PSD spectra and masse of the nanoparticle at 85 km/h with engine warm and engine load variations, origin status.

Measured in may 06, november 06 and in january 07; VW Passat 1.9 TDI; low sulfur diesel.

SMPS PSD - spectra (SP1)



SP4

Configuration	1st meas.	2nd meas.	3rd meas.
	SMPS [10-400 nm]	SMPS [10-400 nm]	SMPS [10-400 nm]
0 N	3.574E+07	4.671E+07	2.046E+07
400 N	2.108E+07	3.489E+07	1.129E+07
800 N	1.056E+07	1.653E+07	3.258E+06
1200 N	4.446E+06	5.125E+06	1.084E+06
1600 N	4.483E+06	3.119E+06	6.703E+05

Configuration	1st meas.	2nd meas.	3rd meas.
	PM [g/km]	PM [g/km]	PM [g/km]
0 N	0.0074	0.0053	0.0070
400 N	0.0189	0.0175	0.0187
800 N	0.0383	0.0307	0.0311
1200 N	0.0461	0.0256	0.0272
1600 N	0.0545	0.0244	0.0258

# NanoMet : nanoparticle at 85 km/h with engine warm and engine load variations, origin status.

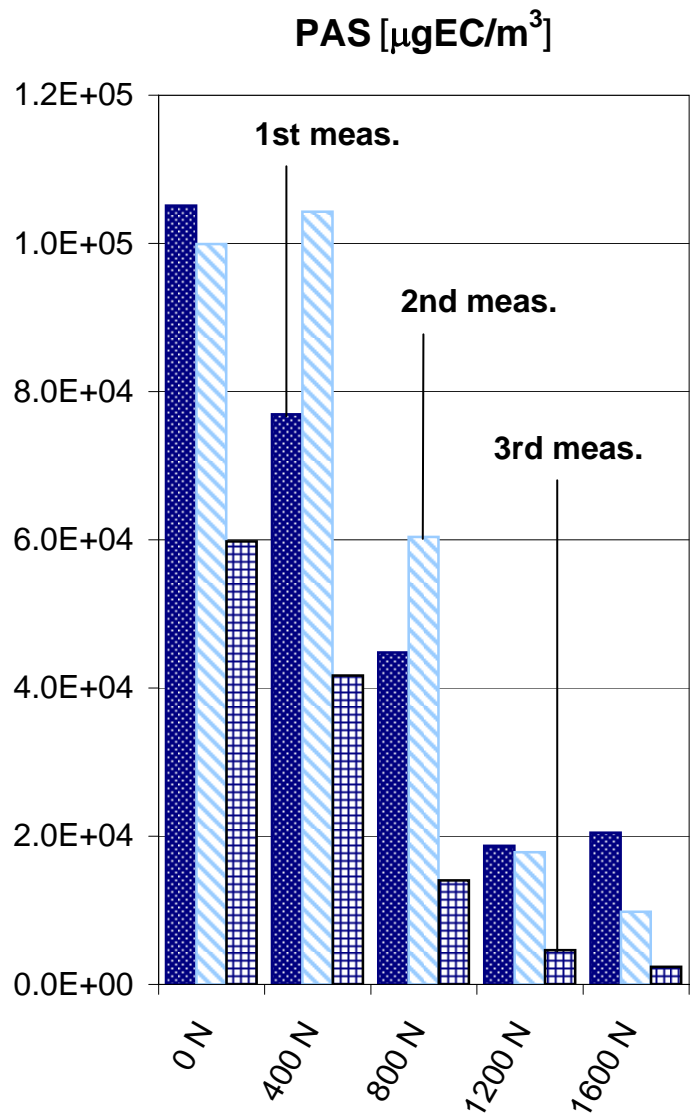
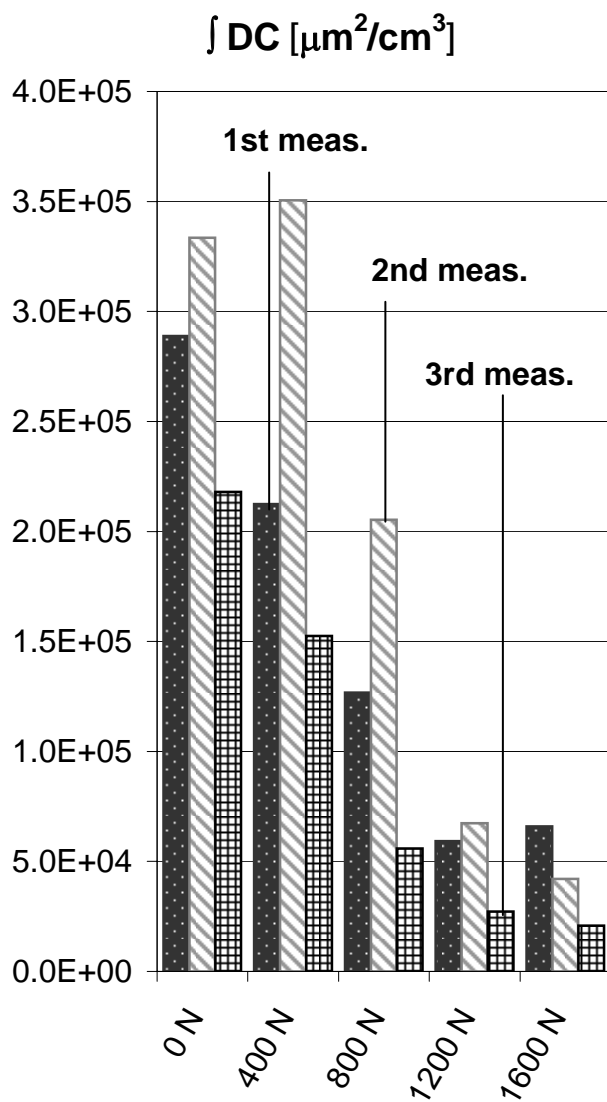
Measured in may 06, november 06 and january 07; VW Passat 1.9 TDI; low sulfur diesel

Driving cycle : 85 km/h const.

**SP1**

Configuration	1st meas.		2nd meas.		3rd meas.	
	∫ DC *)	∫ PAS *)	∫ DC *)	∫ PAS *)	∫ DC *)	∫ PAS *)
	[ $\mu\text{m}^2/\text{cm}^3$ ]	[ $\mu\text{gEC}/\text{m}^3$ ]	[ $\mu\text{m}^2/\text{cm}^3$ ]	[ $\mu\text{gEC}/\text{m}^3$ ]	[ $\mu\text{m}^2/\text{cm}^3$ ]	[ $\mu\text{gEC}/\text{m}^3$ ]
0 N	288881	105098	333549	99917	217979	59795
400 N	212401	76953	350474	104267	152530	41687
800 N	126780	44778	205267	60408	55841	14060
1200 N	59223	18689	67417	17828	27143	4621
1600 N	65968	20492	42082	9801	20827	2377

\*) ... integral average value of 7.5 min.



## NOx emissions by constant speed 85 km/h with different wheel loads, origin status (w/o PMS)

6th gear; n=1710 rpm; low sulfur diesel; hot NOx-measurement.

### 1st measurement, may

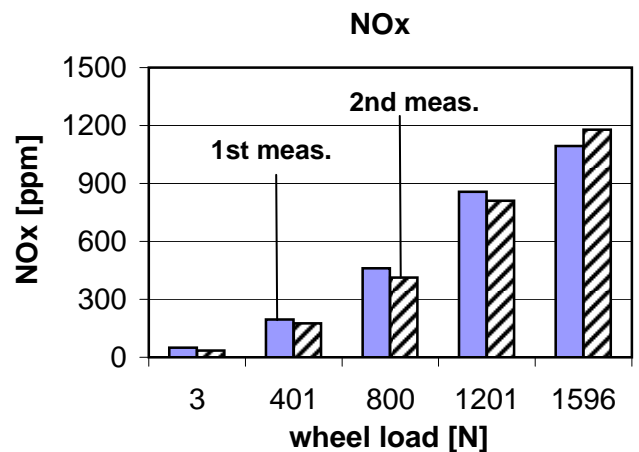
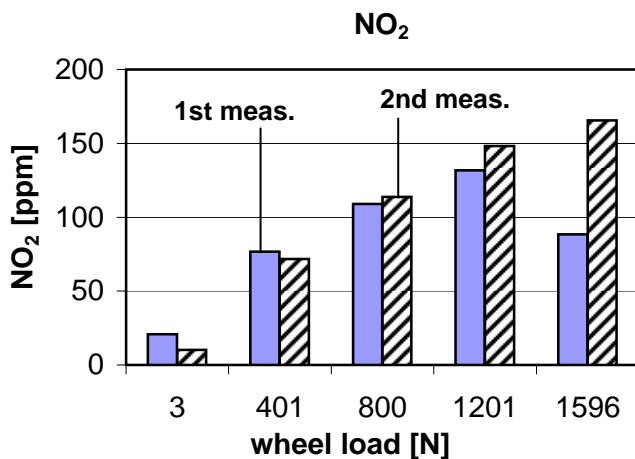
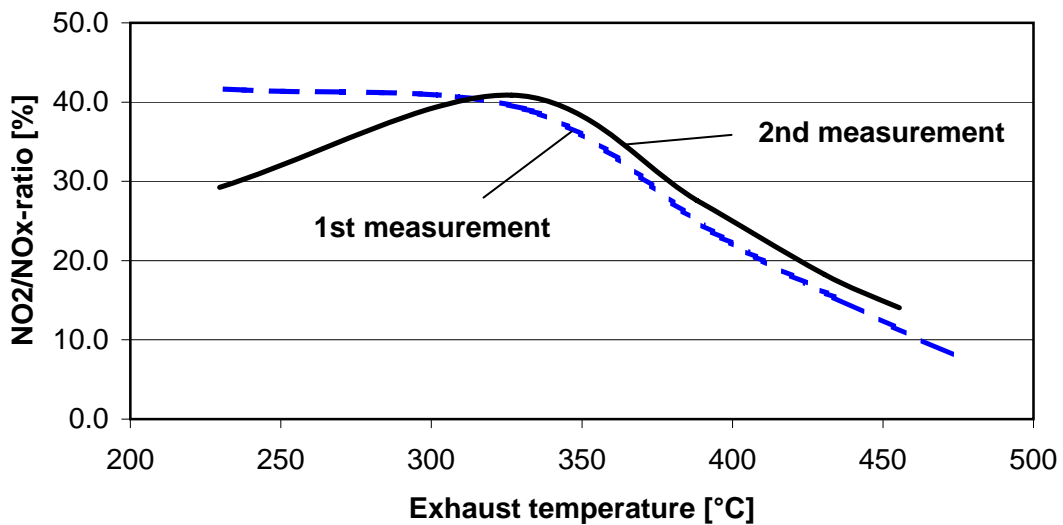
Fwheel	V	T b. SP1	T a. SP2	NO <sub>2</sub> SP1	NOx SP1	NO <sub>2</sub> /NOx-ratio
[N]	[km/h]	[°C]	[°C]	[ppm]	[ppm]	[%]
3	84.6	231.6	193.3	20.7	49.7	41.6
398	84.5	330.9	289.8	76.8	196.1	39.2
798	84.3	393.4	351.5	108.9	461.0	23.6
1196	84.1	433.8	397.2	131.8	856.8	15.4
1597	83.8	473.1	441.0	88.4	1094.0	8.1

### 2nd measurement, november

Fwheel	V	T b. SP1	T a. SP2	NO <sub>2</sub> SP1	NOx SP1	NO <sub>2</sub> /NOx-ratio
[N]	[km/h]	[°C]	[°C]	[ppm]	[ppm]	[%]
3	85.3	229.7	186.1	10.2	35.0	29.3
401	85.2	326.6	281.5	71.6	175.3	40.9
800	84.9	388.3	342.9	113.7	412.3	27.6
1201	84.7	430.5	390.4	148.1	810.5	18.3
1596	84.5	455.5	419.7	165.6	1177.7	14.1

3rd measurement - no NOx analysis

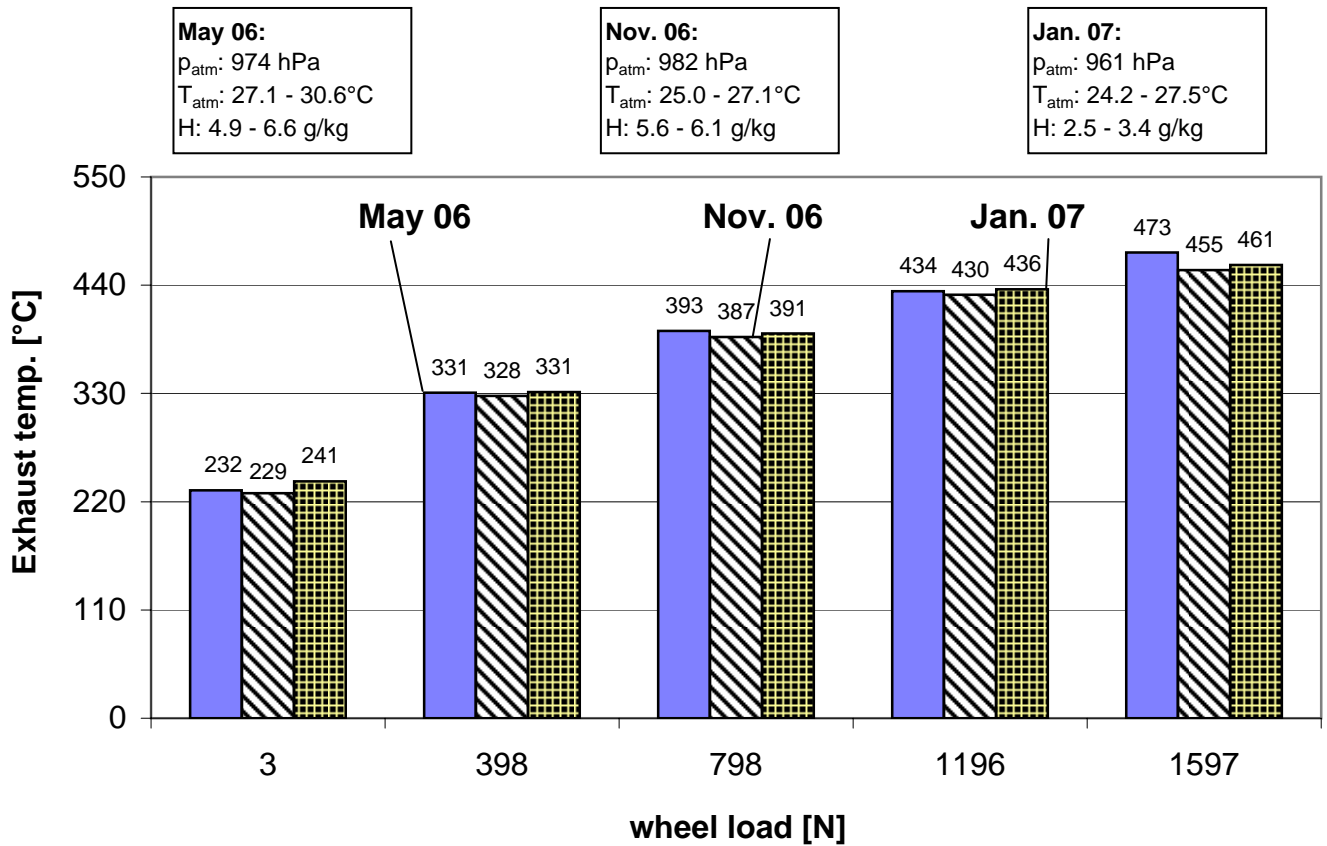
### NO<sub>2</sub>/NOx-ratio



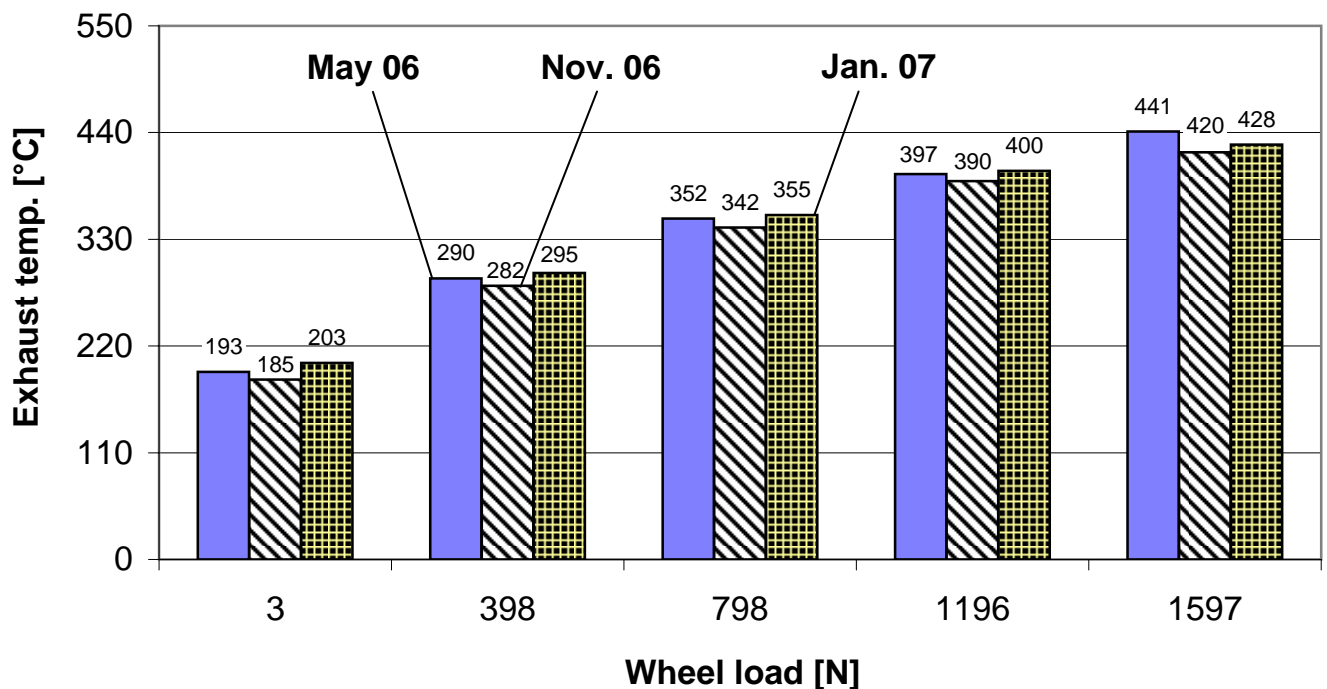
## Temperatures measured at SP 1 and SP 2, origin status.

Measured in may 06, november 06 and january 07; VW Passat 1.9 TDI; low sulfur diesel.

### Load steps, SP 1



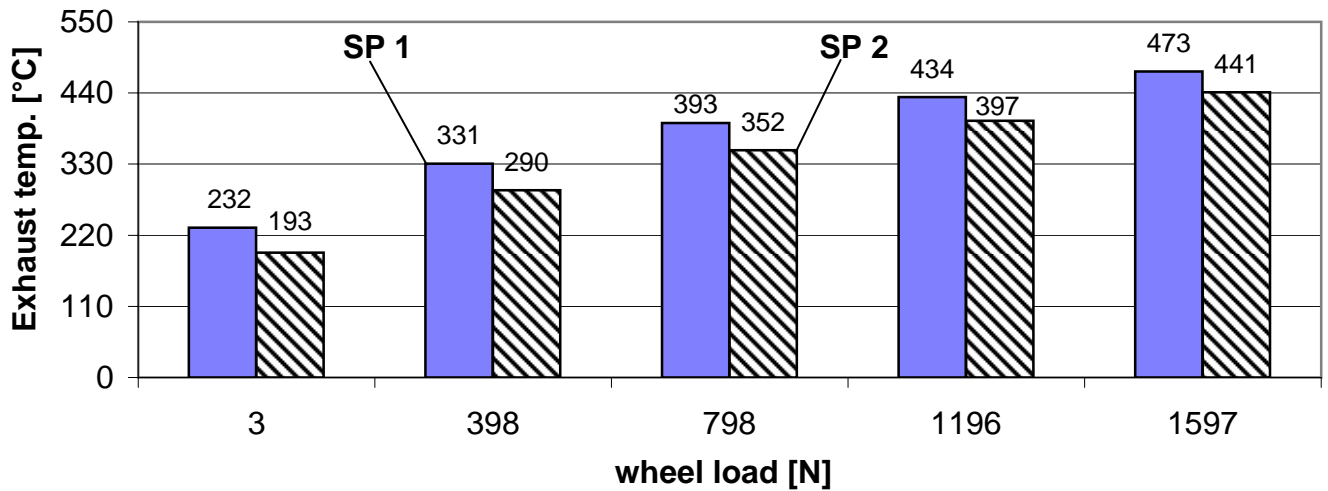
### Load steps, SP 2



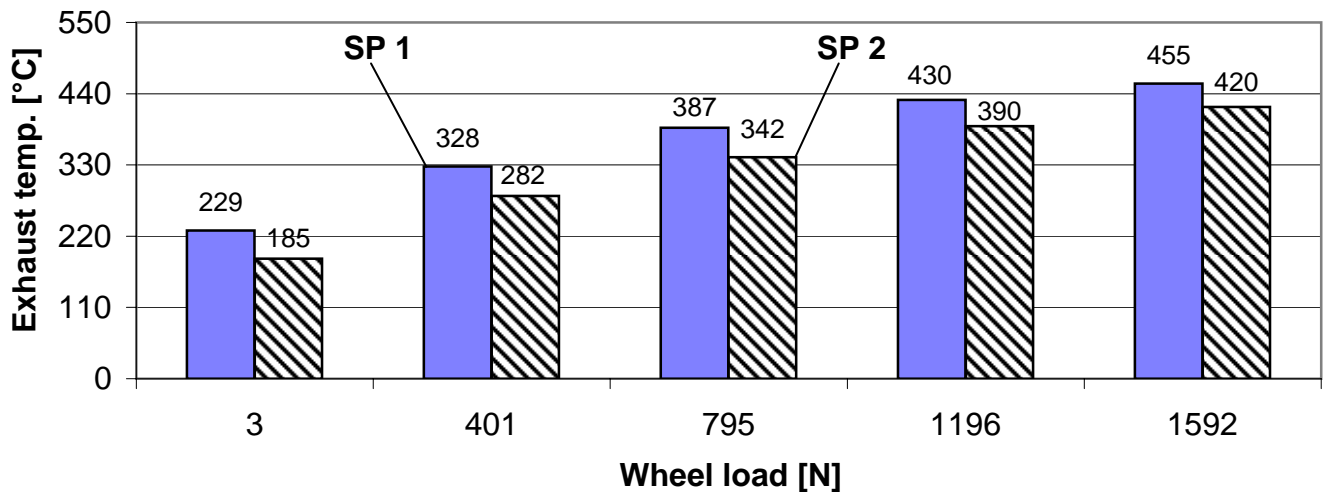
## Temperatures measured at SP 1 and SP 2, origin status.

Measured in may, november 2006 and january 2007; VW Passat 1.9 TDI; low sulfur diesel

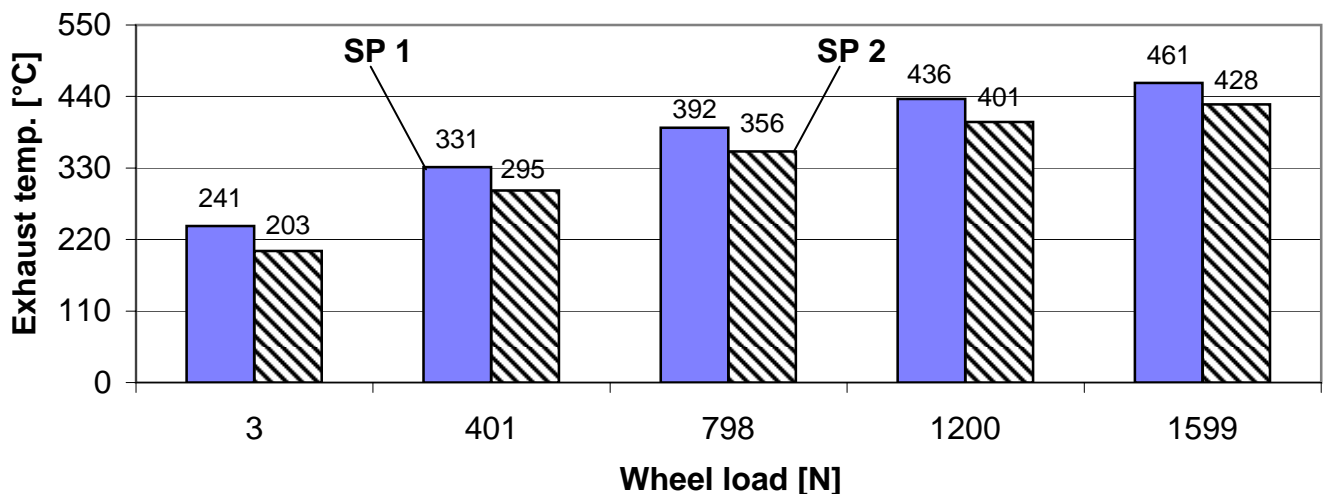
### Load steps, may 2006



### Load steps, nov. 2006



### Load steps, jan. 2007



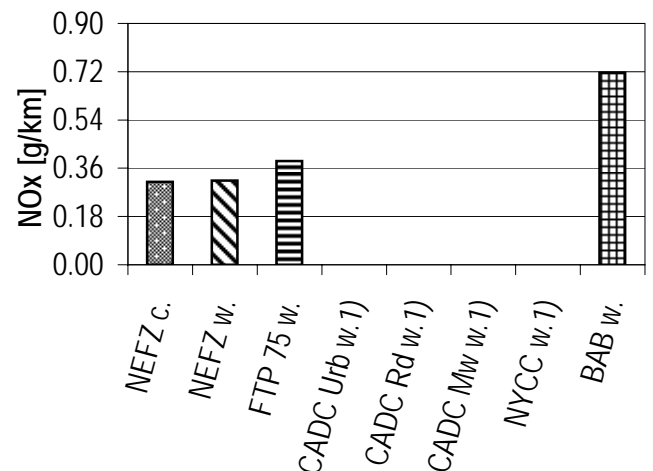
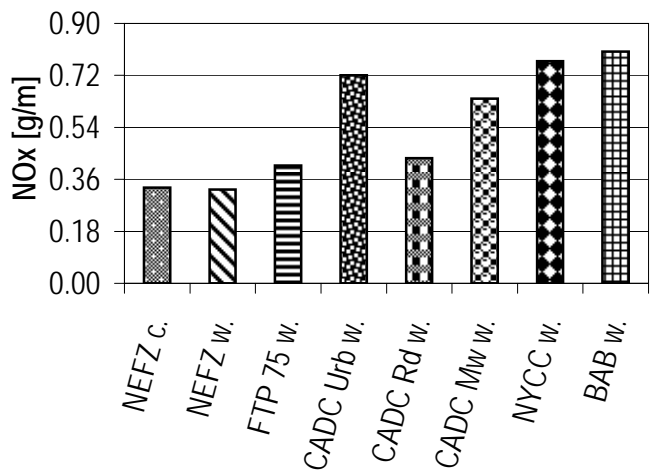
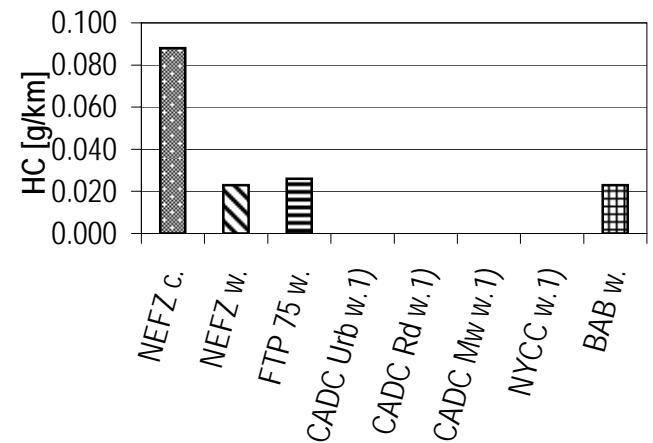
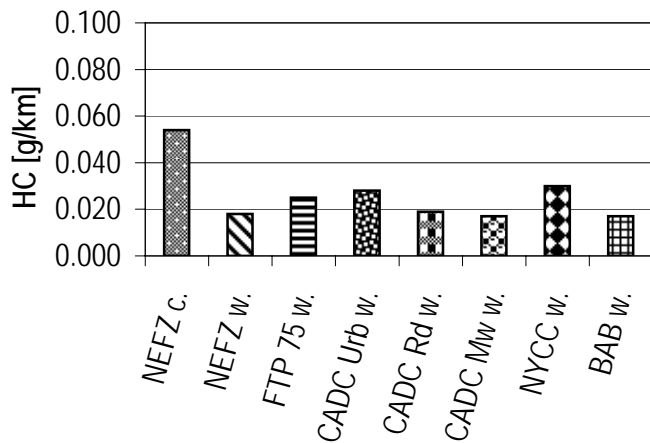
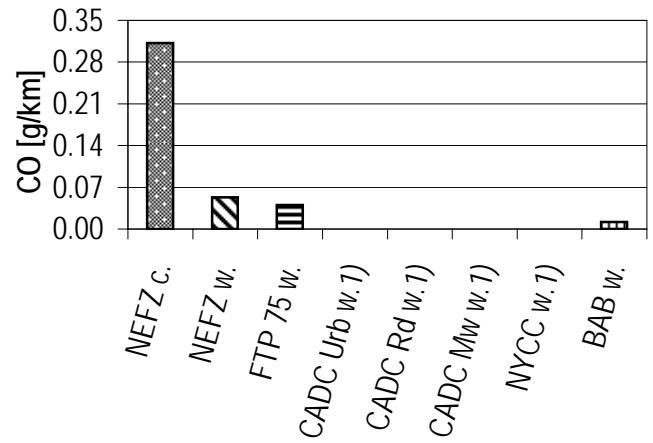
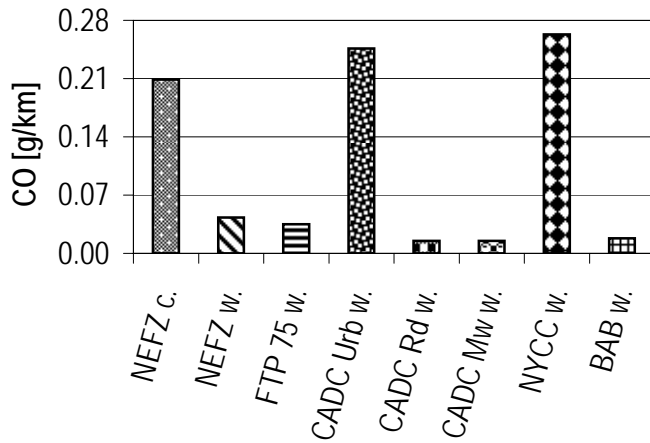
## Comparison of limited emissions during different driving cycles, origin status.

w/o PMS; VW Passat 1.9 TDI; low sulfur diesel

**SP4**

**1st measurement, may**

**2nd measurement, nov.**



c... with cold start

w... with engine warm

1)... not measured

TPN... Total Particle Number [particle/km]

3rd measurement no driving cycles

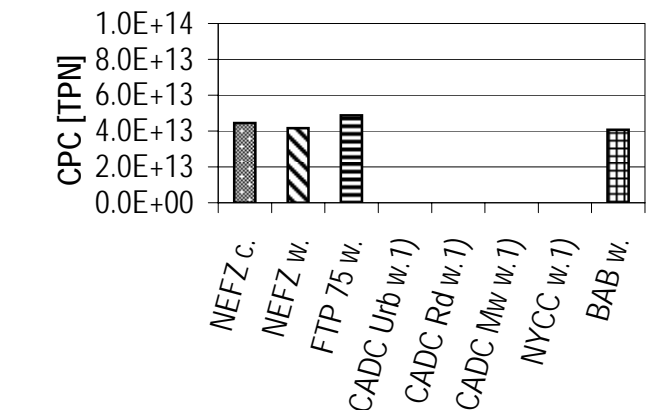
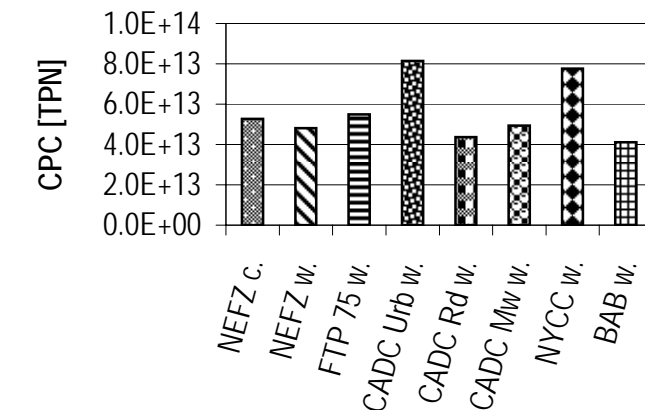
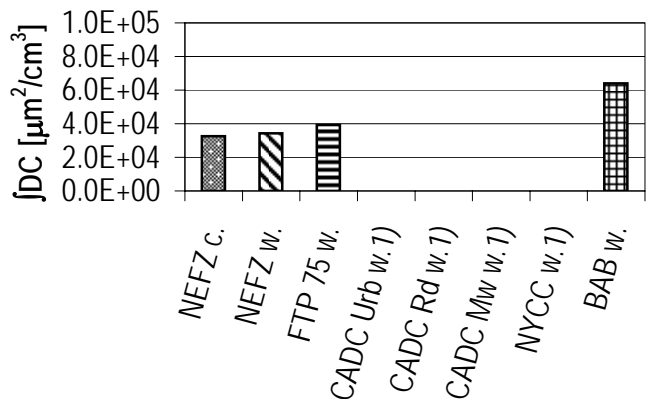
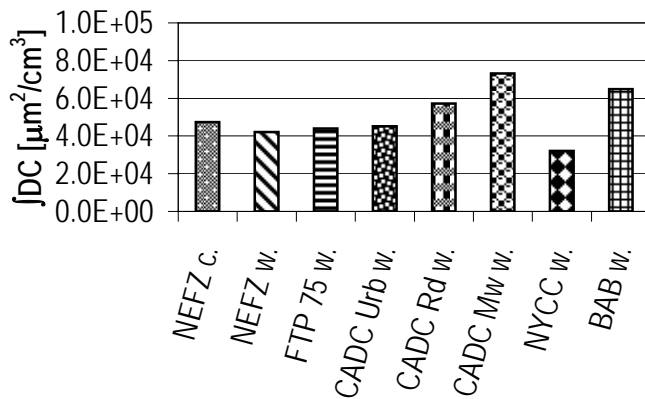
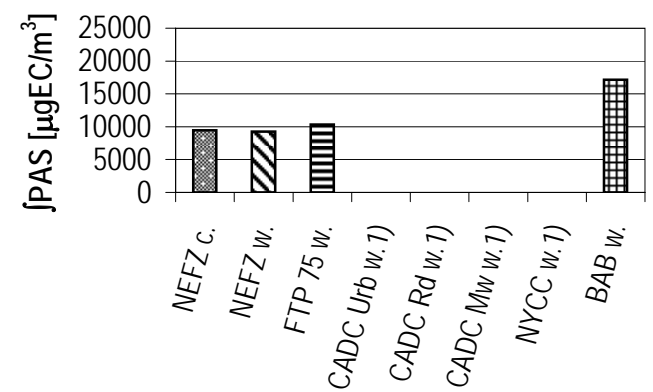
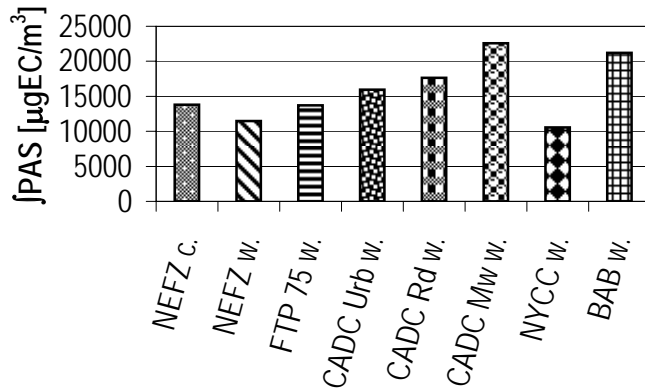
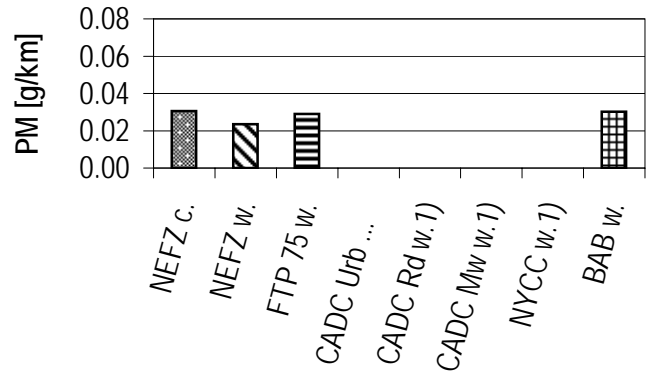
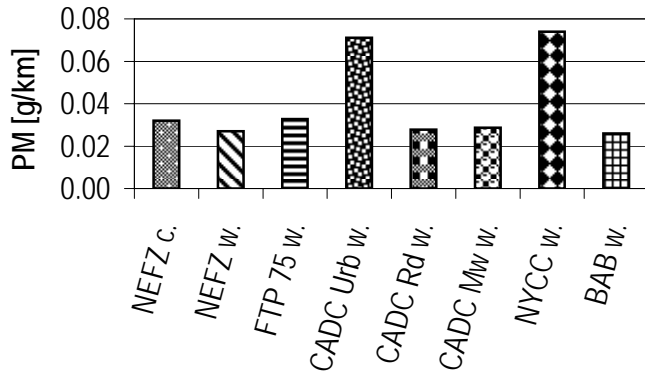
# Comparison of limited and unlimited emissions during different driving cycles, origin status.

w/o PMS; VW Passat 1.9 TDI; low sulfur diesel

**SP4**

**1st measurement, may**

**2nd measurement, nov.**



TPN... Total Particle Number [particle/km]

3rd measurement no driving cycles

## Comparison of limited and unlimited emissions during different driving cycles, origin status.

w/o PMS; VW Passat 1.9 TDI; low sulfur diesel

### 1st measurement, may

Configuration	CO	HC	NOx	PM	∫ DC *)	CPC	∫ PAS *)
	[g/km]	[g/km]	[g/km]	[g/km]	[ $\mu\text{m}^2/\text{cm}^3$ ]	[TPN]	[ $\mu\text{gEC}/\text{m}^3$ ]
NEFZ c.	0.209	0.054	0.331	0.032	47354	5.27E+13	13813
NEFZ w.	0.043	0.018	0.325	0.027	42166	4.81E+13	11477
FTP 75 w.	0.035	0.025	0.408	0.033	43890	5.49E+13	13698
CADC Urb w.	0.246	0.028	0.720	0.071	45126	8.15E+13	15951
CADC Rd w.	0.015	0.019	0.433	0.028	57285	4.36E+13	17664
CADC Mw w.	0.015	0.017	0.639	0.029	73202	4.94E+13	22575
NYCC w.	0.263	0.030	0.769	0.074	32007	7.77E+13	10559
BAB w.	0.018	0.017	0.803	0.026	64864	4.11E+13	21192

\*) ... integral average value

### 2nd measurement, nov.

Configuration	CO	HC	NOx	PM	∫ DC *)	CPC	∫ PAS *)
	[g/km]	[g/km]	[g/km]	[g/km]	[ $\mu\text{m}^2/\text{cm}^3$ ]	[TPN]	[ $\mu\text{gEC}/\text{m}^3$ ]
NEFZ c.	0.312	0.088	0.309	0.031	32619	4.45E+13	9466
NEFZ w.	0.053	0.023	0.314	0.024	34222	4.15E+13	9259
FTP 75 w.	0.040	0.026	0.387	0.029	39191	4.88E+13	10324
CADC Urb w.	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CADC Rd w.	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CADC Mw w.	n/a	n/a	n/a	n/a	n/a	n/a	n/a
NYCC w.	n/a	n/a	n/a	n/a	n/a	n/a	n/a
BAB w.	0.012	0.023	0.716	0.030	63939	4.07E+13	17156

\*) ... integral average value

# PM filtration efficiencies calculated with 3 different results of original status.

VW Passat 1.9 TDI; low sulfur diesel.

## Load steps

## SP4

### Pankl-PMS

	PMAG [%]		
	1st meas.	2nd meas.	3rd meas.
0 N	28.38	0.00	24.29
400 N	28.57	22.86	27.81
800 N	45.17	31.60	32.48
1200 N	57.92	24.22	28.68
1600 N	42.75	-27.87	-20.93

### TWIN-TEC-PMS

	PMAG [%]		
	1st meas.	2nd meas.	3rd meas.
0 N	22.97	-7.55	18.57
400 N	20.63	14.29	19.79
800 N	51.17	39.09	39.87
1200 N	67.46	41.41	44.85
1600 N	44.77	-23.36	-16.67

### HJS-PMS

	PMAG [%]		
	1st meas.	2nd meas.	3rd meas.
0 N	39.19	15.09	35.71
400 N	56.08	52.57	55.61
800 N	74.41	68.08	68.49
1200 N	73.75	52.73	55.51
1600 N	51.19	-9.02	-3.10

### GAT-PMS

	PMAG [%]		
	1st meas.	2nd meas.	3rd meas.
0 N	6.76	-30.19	1.43
400 N	25.40	19.43	24.60
800 N	54.31	43.00	43.73
1200 N	61.61	30.86	34.93
1600 N	50.83	-9.84	-3.88

## NEDC

### Pankl-PMS

Driving cycle	PMAG [%]	
	1st meas.	2nd meas.
NEFZ C.	31.25	28.10
NEFZ W.	33.33	23.73

no 3rd repetition

### Twin-Tec-PMS

Driving cycle	PMAG [%]	
	1st meas.	2nd meas.
NEFZ C.	41.97	39.31
NEFZ W.	37.91	28.97

### HJS-PMS

Driving cycle	PMAG [%]	
	1st meas.	2nd meas.
NEFZ C.	55.65	53.62
NEFZ W.	59.76	53.96

### GAT-PMS

Driving cycle	PMAG [%]	
	1st meas.	2nd meas.
NEFZ C.	38.13	35.29
NEFZ W.	26.40	15.80

# Fuel consumption changes calculated with 3 different results of original status.

VW Passat 1.9 TDI; low sulfur diesel; load steps.

## w/o PMS

F <sub>wheel</sub>	consumption [l/100 km]		
	1st meas.	2nd meas.	3rd meas.
0 N	2.27	2.06	2.35
400 N	4.93	4.58	4.90
800 N	7.32	6.92	7.25
1200 N	9.92	9.38	9.80
1600 N	12.34	11.92	12.36

## Panki-PMS

Δ consumption [%]			
1st meas.	2nd meas.	3rd meas.	
-0.44	-10.68	2.98	
2.43	-5.02	1.84	
1.91	-3.76	0.97	
1.92	-3.73	0.71	
-0.65	-4.19	-0.49	

## TWIN-TEC-PMS

Δ consumption [%]			
1st meas.	2nd meas.	3rd meas.	
-4.41	-15.05	-0.85	
0.81	-6.77	0.20	
1.23	-4.48	0.28	
1.31	-4.37	0.10	
-5.59	-9.31	-5.42	

## HJS-PMS

Δ consumption [%]			
1st meas.	2nd meas.	3rd meas.	
-2.64	-13.11	0.85	
3.65	-3.71	3.06	
3.55	-2.02	2.62	
1.41	-4.26	0.20	
-2.67	-6.29	-2.51	

## GAT-PMS

Δ consumption [%]			
1st meas.	2nd meas.	3rd meas.	
0.88	-9.22	4.26	
1.42	-6.11	0.82	
-0.14	-5.92	-1.10	
0.71	-5.01	-0.51	
-3.08	-6.71	-2.91	

(all PMS1); (+)... Δ consumption reduction; (-)... Δ consumption increase

## CVS dilution factors and average tunnel temperature by engine load variations

Origin and all PMS; VW Passat 1.9 TDI; low sulfur diesel

Configuration: wheel load = 0N

	Origin	Pankl	HJS 1	HJS 2	TWIN-TEC 1	TWIN-TEC 2	GAT 1	GAT 2	Average
Dil. Factor [-]	23.6	23.9	23.1	25.5	22.8	25.4	24.0	24.1	24.0
Tunnel temp. [°K]	303.2	301.3	302.1	300.5	301.1	*)	301.7	301.6	301.7

Configuration: wheel load = 400N

	Origin	Pankl	HJS 1	HJS 2	TWIN-TEC 1	TWIN-TEC 2	GAT 1	GAT 2	Average
Dil. Factor [-]	11.5	11.9	11.8	12.0	11.5	11.8	11.6	11.7	11.7
Tunnel temp. [°K]	309.5	307.1	308.8	307.0	309.6	306.6	307.8	*)	308.1

Configuration: wheel load = 800N

	Origin	Pankl	HJS 1	HJS 2	TWIN-TEC 1	TWIN-TEC 2	GAT 1	GAT 2	Average
Dil. Factor [-]	7.8	8.1	8.1	8.1	7.9	8.0	7.8	7.9	8.0
Tunnel temp. [°K]	320.3	315.1	319.5	312.8	321.4	315.3	318.8	294.1	317.6

Configuration: wheel load = 1200N

	Origin	Pankl	HJS 1	HJS 2	TWIN-TEC 1	TWIN-TEC 2	GAT 1	GAT 2	Average
Dil. Factor [-]	8.9	9.3	8.9	9.2	8.9	9.0	8.9	9.0	9.0
Tunnel temp. [°K]	324.6	319.1	316.8	*)	326.0	319.3	323.3	323.1	321.5

Configuration: wheel load = 1600N

	Origin	Pankl	HJS 1	HJS 2	TWIN-TEC 1	TWIN-TEC 2	GAT 1	GAT 2	Average
Dil. Factor [-]	7.1	7.2	6.8	7.2	6.6	7.1	6.9	7.0	7.0
Tunnel temp. [°K]	336.8	330.5	326.1	335.8	328.8	*)	334.2	335.4	332.0

\*)... no value available

**Max permitted tunnel  
temperature: 325°K**  
according to the directive 70/220/CEE