

Exposure to exhaust components at border control stations



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Vse pravice so pridržane. Gradiva ni dovoljeno razmnoževati in razpošiljati v kakršnikoli obliki brez predhodnega pisnega dovoljenja avtorja in Ministrstva za delo, družino, socialne zadeve in enake možnosti. Citiranje je v skladu z Zakonom o avtorskih in sorodnih pravicah, dovoljeno z navedbo podatkov o viru.

Border control

- **cars, lorries, buses, minivans, motorcycles**
- **petrol and diesel engines**
- **investigation focused on diesel engines**

- **police officers**
- **checking cars and people**

Exhaust components of diesel engines

main components

- **diesel particulate matter (DPM)**
(measured as elemental carbon – EC)
- **nitrogen oxide NO₂**
- **nitric oxide NO**
- **carbon monoxide CO**
- **(inhalable and respirable particle fraction)**

OELs of exhaust components

component	Slovenia [mg/m ³]	Germany [mg/m ³]	European Union [mg/m ³]
DPM	0.05	0.05	0.05*
NO₂	0.96	0.95	0.96
NO	2.5	2.5	2.5
CO	23	35	23

* from 21th February 2023 according to:

Directive (EU) 2019/130 of the European Parliament and of the Council of 16 January 2019 amending Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work

Workplace measurements

- **at 4 border control stations
(outdoor or partially encased)**
- **2004 and 2018**
- **personal air sampling and stationary sampling**
- **DPM: sampled as respirable fraction,
determined coulometric as EC**
- **NO, NO₂, CO: direct reading instrument
(electrochemical sensors)**

Sampling

DPM as respirable particle fraction



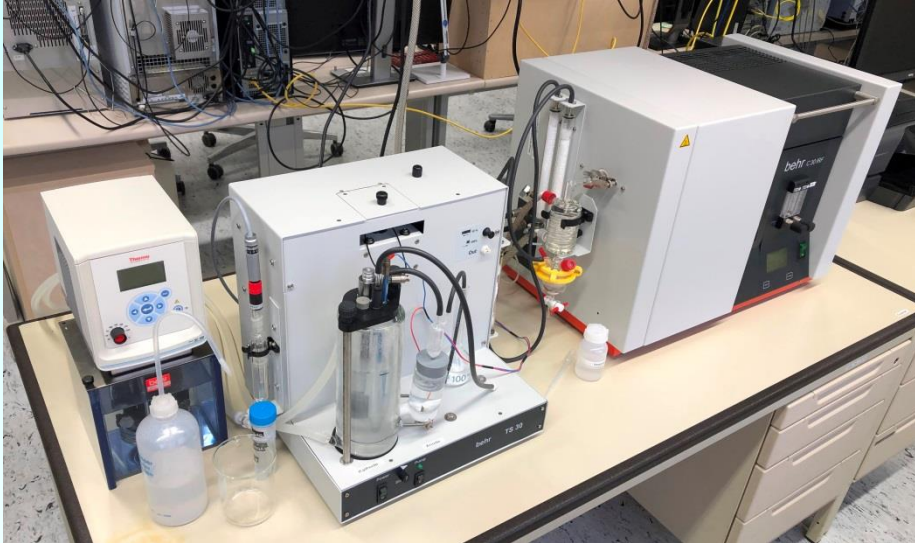
Direct reading instrument:
CO, NO, NO2



Inhalable particle fraction



Analytical determination



**Coulometric determination of DPM
(EN 14530 (2004) Determination of diesel
particulate matter - General requirements)
Method description: see MAK Collection
[https://onlinelibrary.wiley.com/doi/10.1002/
/3527600418.am0diespyre0010a](https://onlinelibrary.wiley.com/doi/10.1002/3527600418.am0diespyre0010a)**



**Gravimetric determination of
inhalable and respirable particles**

Results for 2004 (1 station)

Diesel particulate matter (lorries)

sampling (3-4 hours)	no. of mea- surements	DPM [$\mu\text{g}/\text{m}^3$]
personal	6	1.1 – 2.9
stationary (worst case)	6	14 – 45

Cars

CO < 2.5 mg/m³

NO₂ < 0.1 mg/m³

Benzene < 0,05 mg/m³

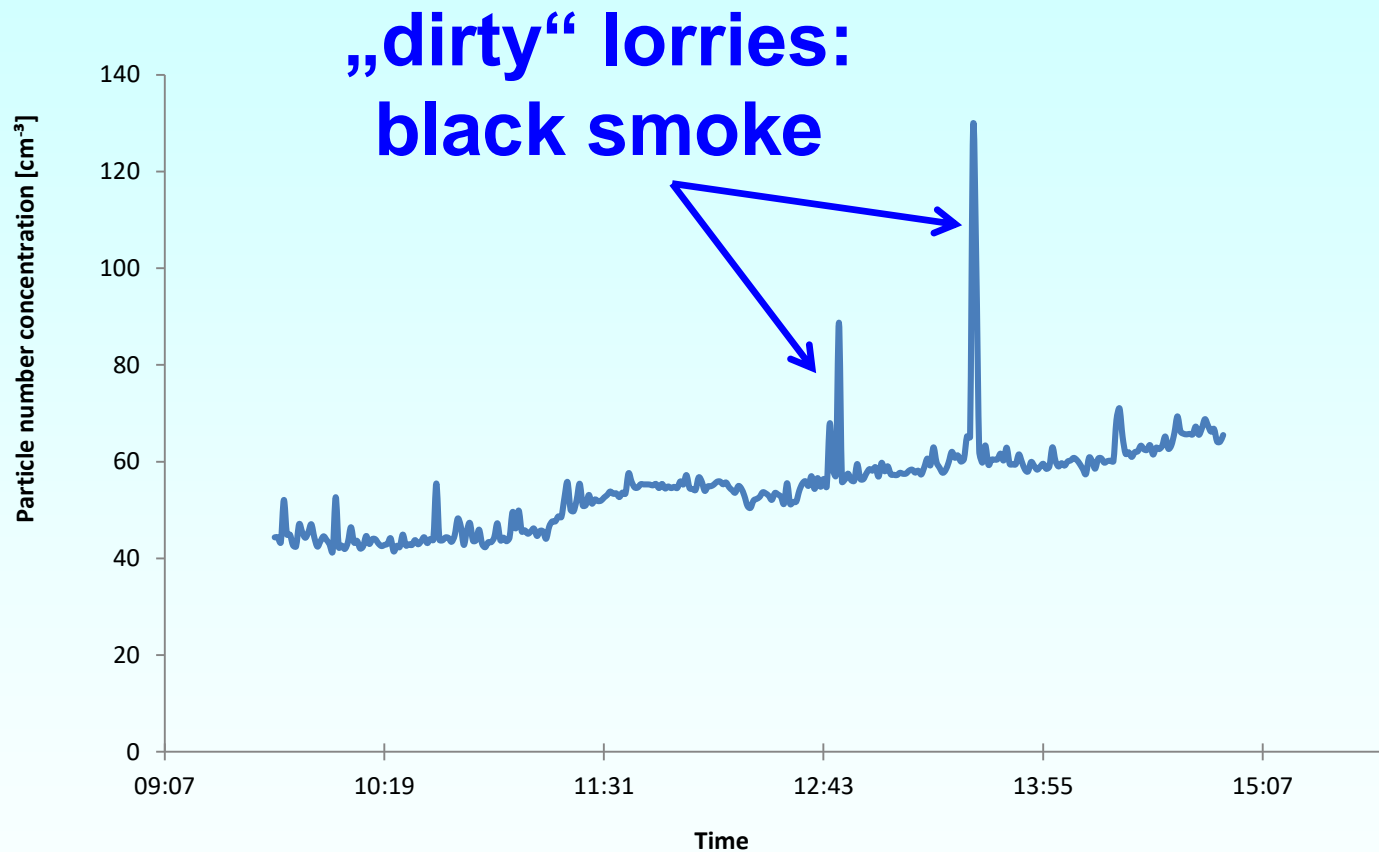
Results for 2018 (3 stations)

Cars and lorries

sampling (2-5 hours)	no. of mea- surements	DPM [$\mu\text{g}/\text{m}^3$]
personal	11	2.3 – 7.3
stationary	11	1.4 – 4.6

**CO, NO, NO₂ , respirable particles
< limit of quantification**

Measurement of ultrafine particles



Conclusion

- **all OELs are adhered to**
- **exposure to diesel particulate matter decreased from 2004 to 2018**
- **dirty and old cars can cause higher exposure**
- **the engine should be switched-off during control**

Outlook

**2019 additional measurements at one border control station
(worst case: weekend at the end of holidays)**

Thank you for your attention
Zahvaljujem se vam za pozornost