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ABSTRACT FORM

Name of Author: Dr. Manon Delisle……
Co-Authors……
Organization: Swiss Agency for the Environment, Forests and Landscape……..
Mailing address: ……
Phone / Fax 0041 31 323 15 05 / 0041 31 324 01 37
E-mail manon.delisle@buwal.admin.ch …

Title: New emission limit philosophy based on total number of solid particles in the size range 20-300 nm

Abstract: (max 200 words)

Studies published in recent years have shown that increased exposure to ultrafine particles (<0.1 µm) leads to impaired lung function in adults having asthma and increases the risk of heart attacks and premature death. The finer the particles, the greater the likelihood of inflammatory processes arising. Diesel cars contribute significantly to the emission of ultrafine particles. In consultation with the Swiss Federal Roads Office, the Swiss Agency for the Environment, Forests and Landscape has therefore decided that for reasons of public health, not only the mass, but also the number, of ultrafine solid particles emitted by combustion motors in the range of interest (20-300 nm) should be measured and controlled, and that appropriate action is needed to reduce them.

This paper presents the results of the current deliberations at the Swiss Agency for the Environment, Forests and Landscape concerning the introduction of a new emission limit value to reduce the risk to public health arising from diesel cars. The emphasis is on lowering the EURO 4 mass limit and supplementing it with a number limit. Diesel cars would only be able to comply with this where fitted with efficient particle filters.

Short CV

Dr. Manon Delisle is Head of the Transport Section of the Air Pollution Control and Non-Ionising Radiation Division of the SAEFL. She is concerned primarily with PM10 emission from road traffic and with measures to reduce it.

Return by Email latest 30th of June 2003
ttm.a.mayer@bluewin.ch

New Emission Limit Philosophy

based on the total number of solid particles

in the size range 20-300 nm

Paper by
Dr. Manon Delisle

Head of Traffic Section in the SAEFL

Contents

1. Effects on health
2. Reduction potential of particle filters
3. New emission limit philosophy
4. Implementation and future perspectives

New Emission Limit Philosophy

1.
Health consequences of ultrafine particles

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- Origin of inflammatory processes
- Functional impairment of the lung
- Increased risk of heart attack
- Systemic effects in the whole body via the blood
- Carcinogenic effects
- Increase in sudden deaths

New Emission Limit Philosophy

Conclusion 1

For health reasons it is important

- to measure
- to control
- to reduce

ultrafine solid particles

Current standpoint of the Swiss Agency for the Environment, Forests and Landscape (SAEFL) and the Federal Roads Office (FEDRO), March 2002

2.

Reduction potential of particle filters

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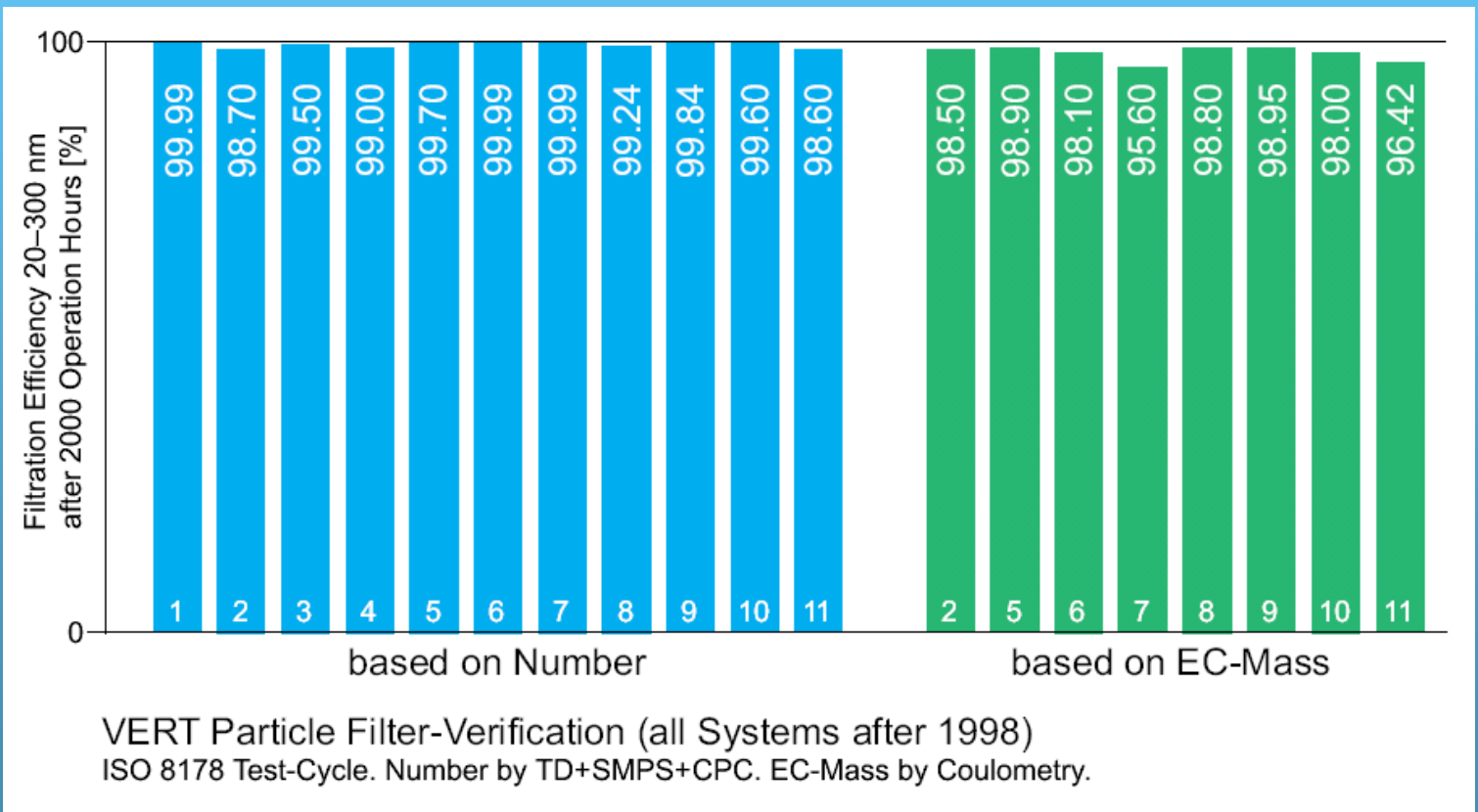
Reduction potential of particle filters



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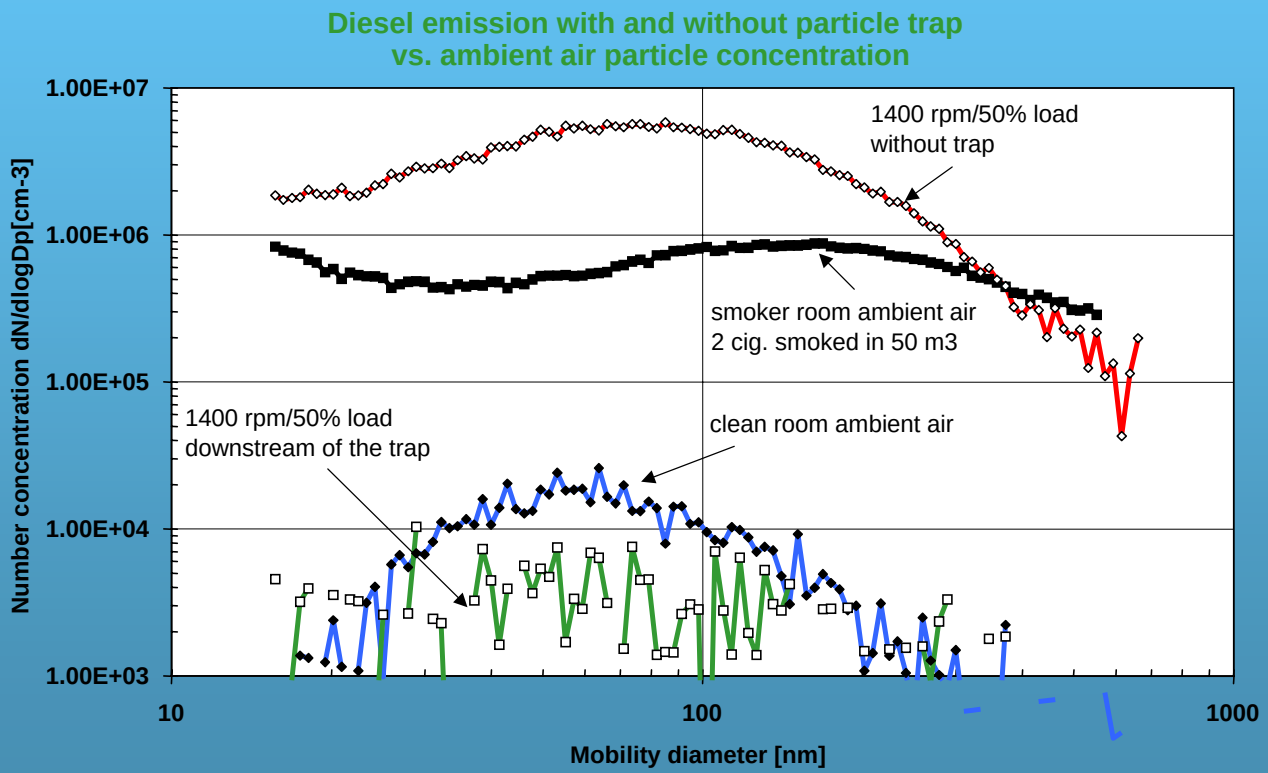
Reduction potential of particle filters
Particle number



Comparison of diesel emissions measured at Biel TC on Liebherr 110 kW TDI Diesel with HJS-CRT filter, 1999

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Good particle filters

- are state-of-the-art
- reduce > 98 % of the mass
  > 99 % of the number

as shown by the VERT effectiveness tests

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Progress in EURO particle emission standards

Diesel cars:

EURO 3	(since 2001)	0.050 g/km
EURO 4	(effective 2006)	0.025 g/km
EURO 5		does not yet exist

Heavy motor vehicles:

EURO 3	(since 2001)	0.10 g/kWh
EURO 4	(effective 2006)	0.02 g/kWh
EURO 5	(effective 2009)	0.02 g/kWh

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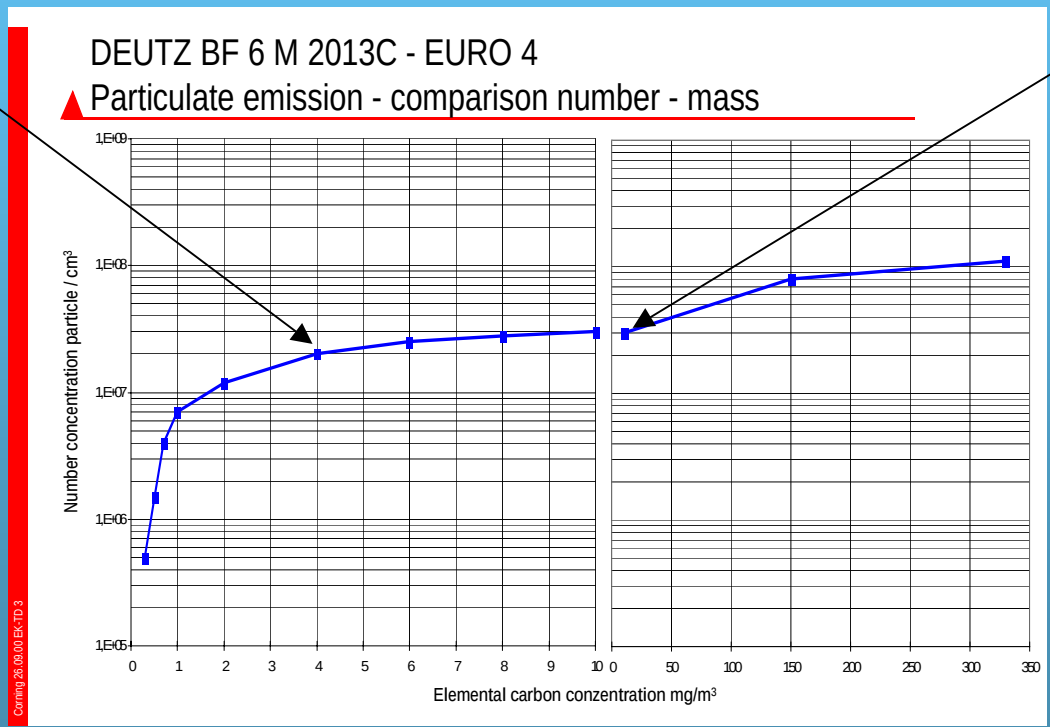
Forecast for 2005
Redesign of motor in place of particle filter

EURO 4

EURO 3



Conclusion 2

The EURO emission limits do not fully exploit the technical reduction potential of particle filters in respect of:

- quality (ultrafine particles)
- quantity (reduction potential > 98%)

3.

New philosophy for particle emission limits

Current considerations of the SAEFL

- The emission of ultrafine particles must be minimised for health reasons
- Particle filters are the best available technic for reducing their number and mass
- The measure of the mass of particles has to be completed through the measure of the number.
- Highly sensitive instruments are available that measure the number of particles with the necessary precision.

New Emission Limit Philosophy

New SAEFL philosophy for particle emission limits

Mass
Tightening of present emission limit for particle mass.

Number
Laying down of new particle emission limit based on the reduction potential of available particle filters.

Standpoint of "Automobil Revue"

Quotations from AR no. 31, July 2003, p. 15

The editorial board of the "Automobil Revue" vigorously supports efforts aimed at reducing as far as possible the emission of particles in diesel exhaust.

If provisions describing the number, size distribution and surface properties of diesel particles would be of assistance in clarifying the present situation, a corresponding amendment to the exhaust gas regulations would be welcomed.

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Knowledge gained from the ECE-GRPE particle measurement programme (PMP)

- Limitation of number and mass
- Size range 20-300 nm
- Assessment of solid particles alone
- Limit value should be based on the performance capabilities of modern particle filters
- Higly sensitive measuring equipment with the necessary precision is available

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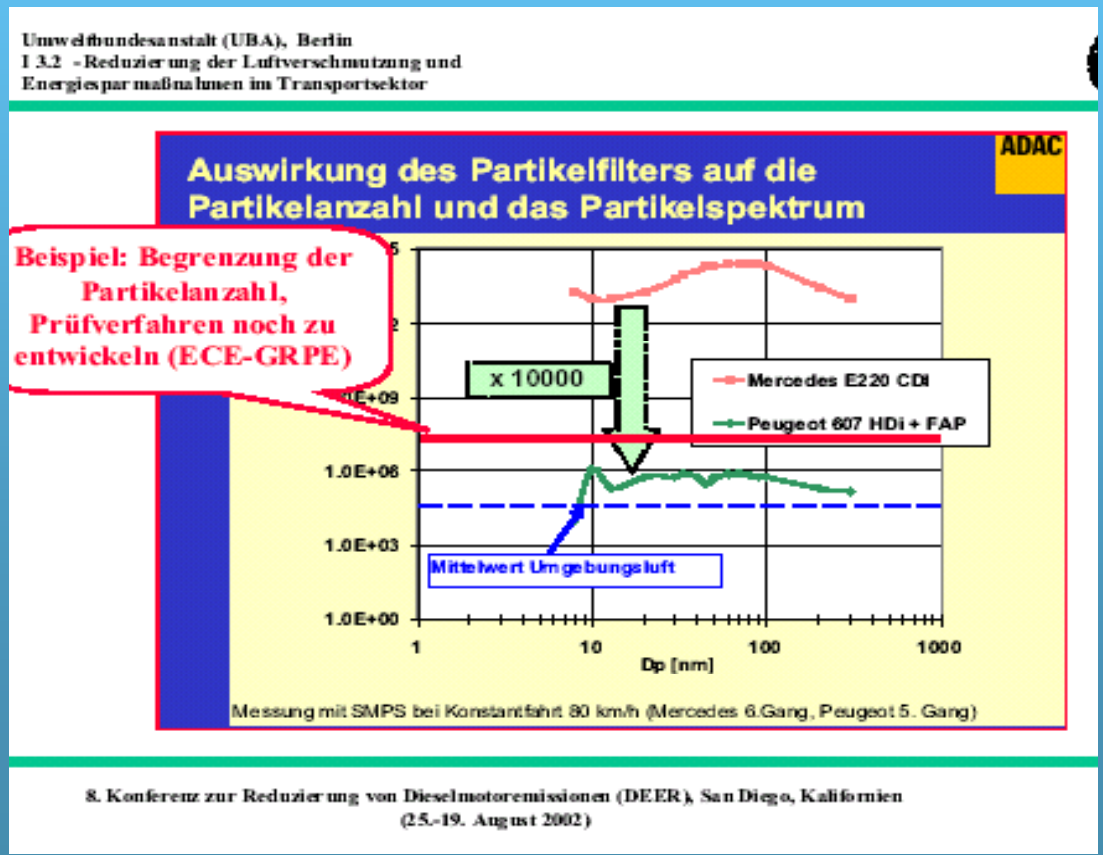
Current considerations of the German Federal Agency for the Environment



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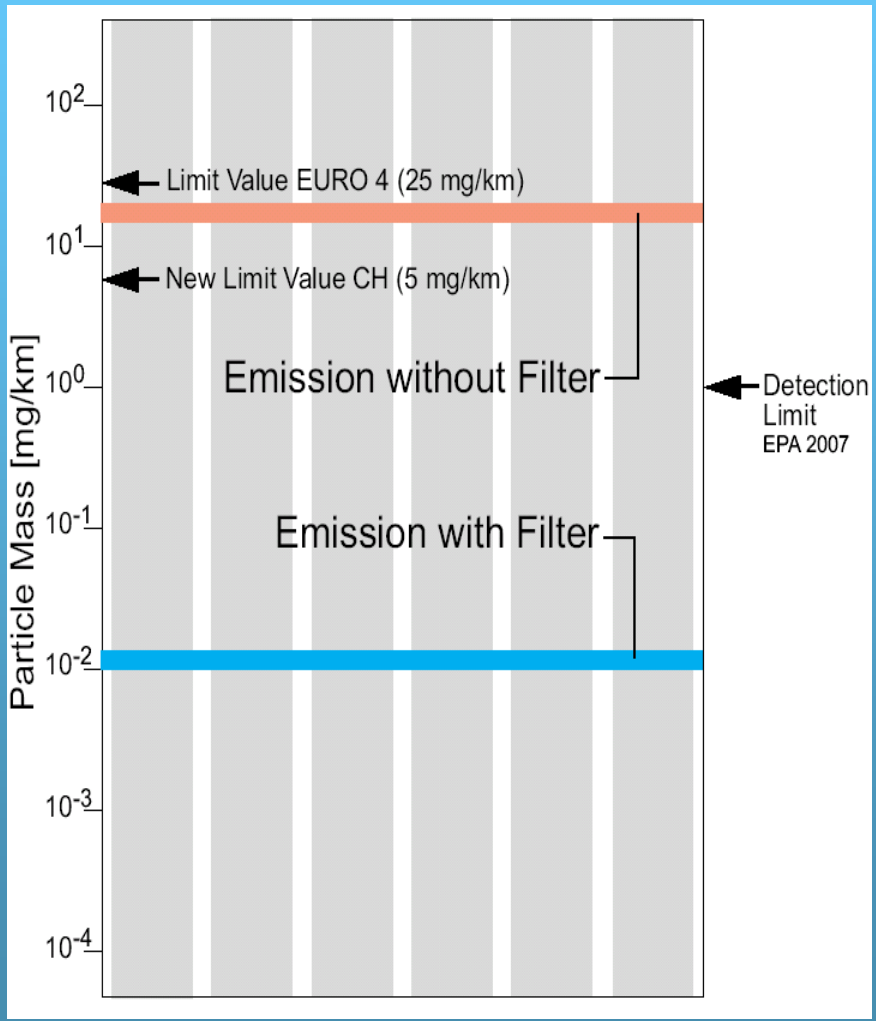

Mass

Health-related emission limit for diesel cars

EURO 4	25 mg/km
EURO 4 with PF	< 0,5 mg/km
Detection limit	1 mg/km
New emission limit	5 mg/km

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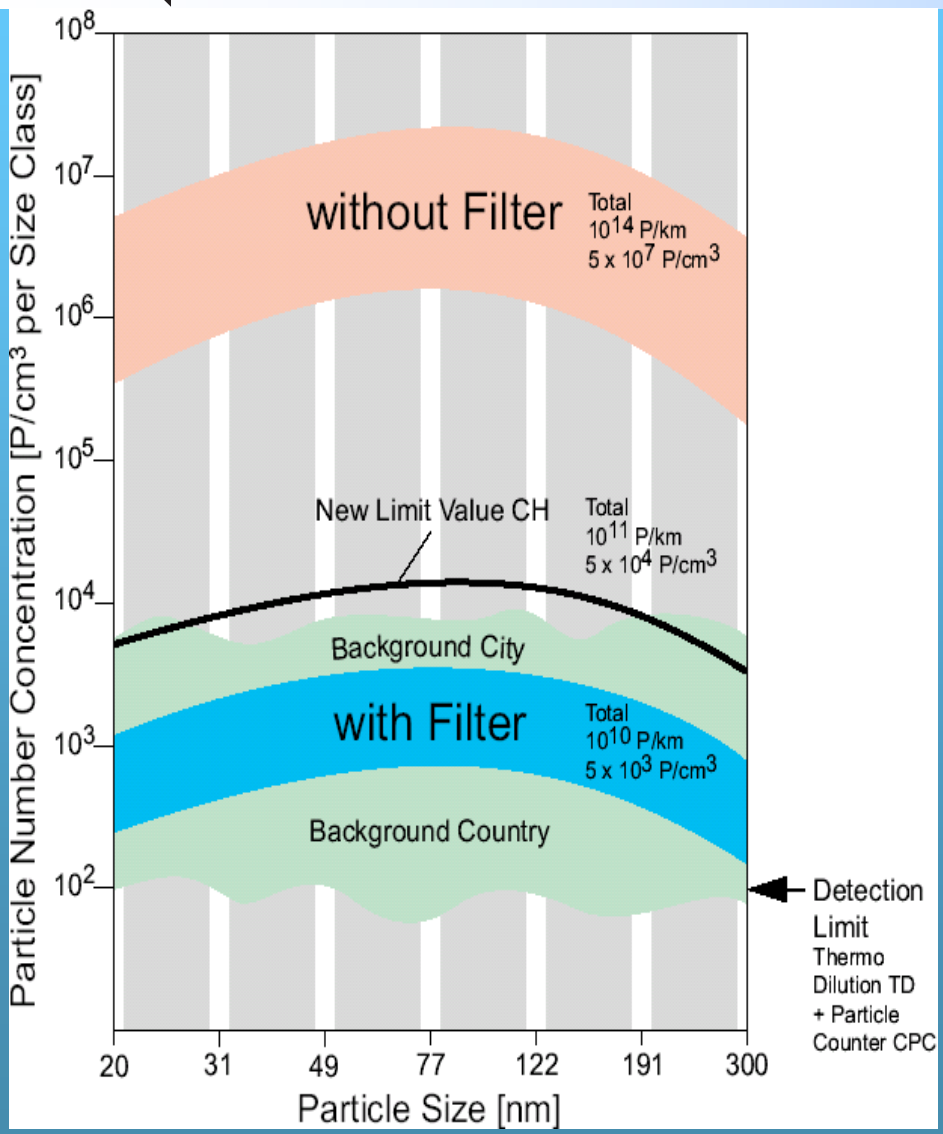

Number

Health-related emission limit for diesel cars (total, particle 20-300 nm)

Without filter	10^{14} P/km
With filter	< 10^{10} P/km
Detection limit	10^{8} P/km
New emission limit	10^{11} P/km

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4.
Implementation and future perspectives

Implementation in Switzerland

Building sites

Obligatory fitting of particle filters to:

- large machines at big building sites
- all machines at underground building sites

Busses

About 500 busses fitted with particle filters are now on the roads.

Future objectives in Switzerland

Diesel cars

Opportunities to promote the introduction of diesel cars complying with the new emission limit:

- Obligation for all new diesel cars
- Import duty compensation scheme
- Combination of the above

=> All the above measures require a new emission limit and suitable measurement procedure.

Future objectives in Switzerland

Heavy motor vehicles

The Federal Council will hold negotiations with the EU concerning updating of the distance-dependent heavy vehicle tax (LSVA).

Objective: Lorries fitted with a particle filter should be assigned to the lowest LSVA category from 2005 onwards.

=> Here too, a new emission limit and suitable measurement procedure are required.

New Emission Limit Philosophy

International objectives

- Development of a particle counter in the GRPE PMP programme
- Definition of a health-risk-related number and mass emission limits in GRPE
- Adoption of these emission limits in EURO standards

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New Emission Limit Philosophy

Many thanks for your attention