

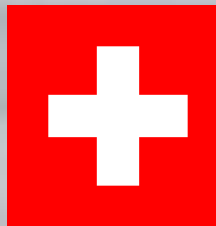
6. VERT – EMPA Dübendorf 20.March 2015

# VERT association's leading role in worldwide emission policy stimulation and harmonization

## *Activities 2014/15*

A.Mayer

M.Wyser, F.Legerer, J.Czerwinski, N.Heeb,  
P.Gehr, V.Hensel, J.J.Mooney



# Switzerland I

**Close Collaboration on Swiss Federal Level**  
*BAFU; SUVA; DEZA; METAS, EMPA*

## **SN 277206**

*VERT-Testing Procedure 1998  
formalized by SNR 277205 in 2006  
transferred to Swiss Standard SN 277206  
2013/14 updated upon request of VERT*

## **PN-Field Control**

*Introduced by VERT with NanoMet 2004  
tested in Santiago and Canadian mines  
formalized by METAS VAMV March 2014  
used synchronously upstream/downstream  
very successfully in VERT-China Pilot tests  
With NanoMet3 2014*

**INB** Interdisziplinärer Normenbereich  
Secteur interdisciplinaire de normalisation

Schweizer Norm  
Norme Suisse  
Norma Svizzera **SN**

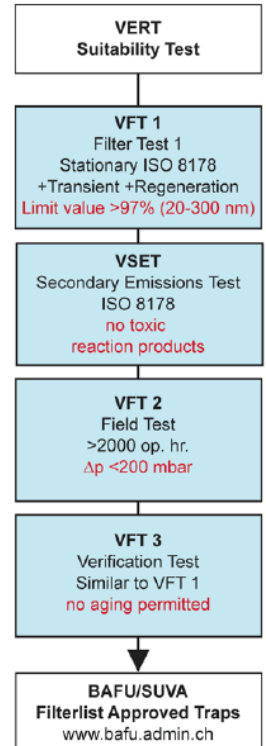
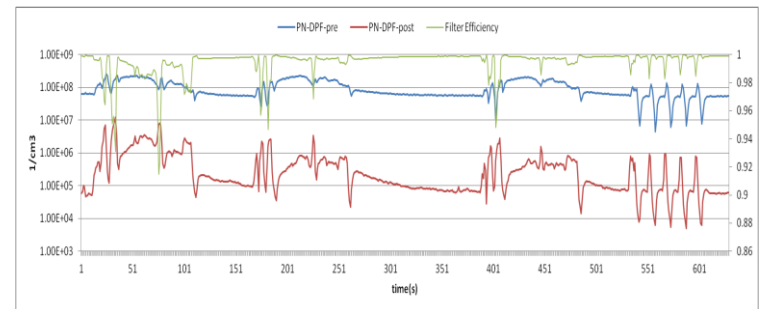
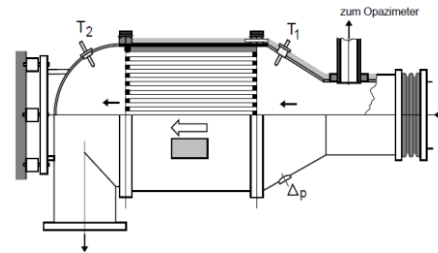
**SN 277206**

EINGETRAGENE NORM DER SCHWEIZERISCHEN NORMEN-VEREINIGUNG SNV NORME ENREGISTRÉE DE L'ASSOCIATION SUISSE DE NORMALISATION

Ersatz für / Remplace  
SNR 277205:2009

Ausgabe/Edition: 2011-02

Internal Combustion Engines – Exhaust Gas After-treatment – Particle Filter Systems –  
Testing Method



# Switzerland II

**Political Motions (D. Vischer, Green Party) → rejected by BR**

*four motions tabled in the Swiss Parliament*

- *Introduce PN-IGW (number count air quality limit)*
- *Retrofit of all HD and LD commercial vehicles*
- *Implement Class 1 Cancer Risk for Diesel PM*
- *Requirement of Alcylyate based Fuel for chainsaws etc.*

**LRV 2014 Consultation → ongoing**

*VERT-Olten Group participates requesting*

- *Limits for stationary engines must be PN-based*
- *Cancer Risk for D-PM Class3 → Class 1*

**EKL Consultation → ongoing**

*VERT-Olten Group consulting and requesting*

- *Introduce PN-IGW (number count air quality limit)*
- *Cancer Risk for Diesel PM(PN) Class 3 → Class 1*

International Agency for Research on Cancer



PRESS RELEASE  
N° 213

12 June 2012

IARC: DIESEL ENGINE EXHAUST CARCINOGENIC

International Agency for Research on Cancer



PRESS RELEASE  
N° 213

12 June 2012

IARC: DIESEL ENGINE EXHAUST CARCINOGENIC

International Agency for Research on Cancer



PRESS RELEASE  
N° 213

12 June 2012

IARC: DIESEL ENGINE EXHAUST CARCINOGENIC

# Switzerland III

## *VERT-Public/Private-Partnership with Swiss SDC (DEZA)*

Test Results Nanjing / PN-Efficiency from Reports BIT

Vehicle	1 A34568 DINEX	2 A31695 DINEX	3 A32292 DINEX	4 A33377 DINEX	5 A33751 DINEX	6 A33694 Puritech	7 A33742 Puritech	8 A33753 Puritech	9 A33755 Puritech	10 A39358 Puritech
1 - Dyno	99.91	99.94	-	99.91	90.39	-	91.45	-	99.45	99.86
1 - Road	99.96	99.38	99.94	99.92	86.00	99.81	97.76	-	99.95	99.15
2 - Dyno	58.43	69.65	99.35	97.12	96.93	79.48	83.01	97.82	95.56	95.72
2 - Road	99.78	48.83	99.11	82.85	93.22	21.85	63.01	99.14	97.44	79.20

Measurement with 2 NanoMet3 in parallel  
 Measurement 1: August 2014 after 3-4 weeks of installation  
 Measurement 2: January 2015 after about 100'000 km of operation



### The Santiago de Chile Diesel Particle Filter Program for Buses of Public Urban Transport

Model Case for Cities of Emerging Countries and Success Story of the Swiss-Chilean Cooperation

Berne – Switzerland / Santiago de Chile – November 2011

## BCEMS

Black Carbon Emission Mobile Source  
with Chinese MEP – VECC and Beijing EPB

2014 two pilot tests Nanjing/Xiamen concluded,  
one in Beijing Construction still going one

## CALAC

Clean Air for Latin American Cities

- Santiago / Chile: 3500 retrofits + I/M PN
- Bogota / Colombia: regulation + first tender
- Mexico: cooperation starting

# European Union

## **NRMM – Nonroad Mobile Machines**

*VERT has participated in consultations from 2009/10 insisting on BAT and PN and required **offroad = onroad** → widely accepted  
New NRMM since 9/2014 in consultation;  
VERT participates in cooperation w. AK/Wien  
→ Lower limits, PN for all machines*



- **JRC - Emission Lab of EU-Commission**

*Close cooperation with BAFU+VERT*

*since 2004. Last (16.) meeting 30. Jan 2015*

*→ common research: GDI, SE, Metals, IGW*

- **REC – UN-ECE Retrofit Emission Control**

*VERT-proposal 2008 refused; VERT did not participate in the REC-process*

- **PN for Periodic HDV-Control: DPF-control by OBC not sustainable**

*→ New approach: investigate HDV-fleet for non-detected DPF failures*



Joint Research Centre (JRC)

Report on current emission performance



ie  
Institute for Energy



# US-EPA

## ***Transatlantic EPA Workshop on UFP 2/2015***

*organized by VERT, EPA and CARB*

*150 experts from Europe and USA*

*24 speakers, 8 from Europe, one EU-JRC  
discussed during 2 days at Triangle Park*

- How to measure UFP in exhaust gas  
and in ambient air for monitoring*
- Health effects and metric definitions*
- Limit values for emissions and ambient air*
- Averaged limits or exposure protection*

*Discussion will continue during ETH-NPC*

***First transatlantic event to evaluate harmonization US/EU  
of health related ultrafine PN-limits – emission and AQ-limits***

***One commercial reason: NRMM are no longer harmonized***



United States  
Environmental Protection  
Agency

Join us in Research Triangle Park: Save the Date!  
Workshop on Ultrafine Particles (UFP workshop)  
February 11-13, 2015



We will be bringing together international experts on emission, air quality, exposures, and health impacts of ultrafine particles to present and discuss the latest research and policy issues.

Please join us in the EPA Auditorium, 109 T. W. Alexander Drive, Research Triangle Park, North Carolina USA

For more information please contact Richard Baldauf at the U.S. EPA [Baldauf.richard@epa.gov](mailto:Baldauf.richard@epa.gov) or visit the webpage at <https://www.eventbrite.com/e/us-epa-workshop-on-ultrafine-particles-tickets-13583846651>

# California ARB



**SAVE THE DATE**  
April 30 – May 2, 2006

Join health researchers, government policy-makers, engine manufacturers, emission control manufacturers, and technology experts in lively and informative discussions of what needs to be done to reduce this currently-unregulated air pollutant.

**ULTRAFINE PARTICLES**  
The Science, Technology, and Policy Issues

**Moved by:**  
SCAQMD South Coast Air Quality Management District

**Sponsors to Date Include:**

- California Air Resources Board
- Cal. Natural Gas Vehicle Partnership
- Cleco Energy
- The Health Effects Institute
- International Truck and Engine Corp.
- John Deere Power Systems
- Johnson Matthey, PLC
- U.S. Dept. of Water and Power
- Port of Los Angeles
- Southern California Edison
- Southern California Gas Company
- Toyota
- U.S. Environmental Protection Agency
- Wegport Innovations, Inc.
- Westburn CALSTART
- American Honda
- Chrysler/Dodge
- Cleco Advanced Emission Controls

Wilshire Grand Hotel  
930 Wilshire Blvd.  
Los Angeles, CA 90017

California Environmental Protection Agency  
 **Air Resources Board**



**Course on Ultrafine Diesel Particles  
and Retrofit Technologies for Diesel Engines**

Nov 12 -14, 2008

South Coast Air Quality Management District  
21865 Copley Drive, Diamond Bar, CA 91765

**CARB Diesel-Consulting Group 1998 - 2004**

*Participation BAFU/VERT, A.Mayer, Lemaire, A.Friedrich*

*Development of ARB retrofit regulation*

**SCAQMD common workshop on UFP**

*May 2006; many VERT-speakers*

**CARB-Construction Showcase 2008**

*Organized by VERT-CARB-SCAQM-Mooney*

*Start of construction machine retrofit in California*

**CARB and SCAQMD**

*Periodic experience exchange*

*Meetings during ETH-NPC*

**2015: Ayala / CARB board opens ETH-NPC**

# Germany I

## Berlin - Construction Machines

*How to further improve air quality in the Berlin LEZ ? VERT initiated a 2 day event on construction machine DPF retrofit for the Senat of Berlin in May 2013 after successful pilot testing with TÜV Süd. This resulted in regulations for DPF retrofit of construction machines in all city projects from Jan.2014*

*Implementation requires detailed guidance. Aurigna received the mandate for individual technical consulting and guidance, performed workshops and elaborated the “Leitfaden on best practice” based on VERT –principles of best available technology.*

### Ziel: Saubere Luft auf Baustellen

Erster Workshop zum Thema Partikelfilter an Baumaschinen in Berlin – TÜV Hessen nimmt Messungen als unabhängige Stelle vor



berlinbaut

LebensBäume

Senatsverwaltung  
für Stadtentwicklung  
und Umwelt

berlin Berlin





# Germany II

Ausgabe: Oktober 2008

Technische Regeln für Gefahrstoffe	Abgase von Dieselmotoren	TRGS 554
--	--------------------------	----------

Die Technischen Regeln für Gefahrstoffe (TRGS) geben den Stand der Technik, Arbeitsmedizin und Arbeitshygiene sowie sonstige gesicherte wissenschaftliche Erkenntnisse für Tätigkeiten mit Gefahrstoffen, einschließlich deren Einstufung und Kennzeichnung, wieder. Sie werden vom

Ausschuss für Gefahrstoffe (AGS)



## TRGS 554

*2002 VERT participated in the first elaboration requiring DPF*

*2008 VERT participated in the second edition*

*2014 VERT again member of the Group to prepare the third edition*

**DECHEMA** German Ass.for chem.Engineering.

*2006 formed a group of experts on UFP with research and policy represented to become a relevant partner for the government, influential on political decisions.*

*VERT was member from the day of foundation*

*2014 important findings have been published*

*and internationally presented – also at the US-EPA*

# Megacities Projects

***LOS ANGELES***

***PARIS***

***LONDON***

***SANTIAGO → Euro III + F***

***BOGOTÁ → Retrofit***

***BEIJING, NANJING, XIAMEN***

***TEHRAN → Euro III + F***

***MEXICO***

# DPF on Euro III at high Sulfur Fuel

**Retrofit in-use vehicles is not sufficient**

**to clean the air in Megacities**

**Five more tools are needed:**

- **First fit of all new HDV**

*Iran is the first country to require*

*BAT-DPF for all HDV in 2015*

- **Technical BAT update by OEM**

*Retrofit Kits shall become mandatory*

- **High sulphur fuel compatibility**

*VERT demonstrated up to 7000 ppm*

- **Filters for LDV**

*VERT-demonstrated within GDI -Project*

- **Clean Lubricants**

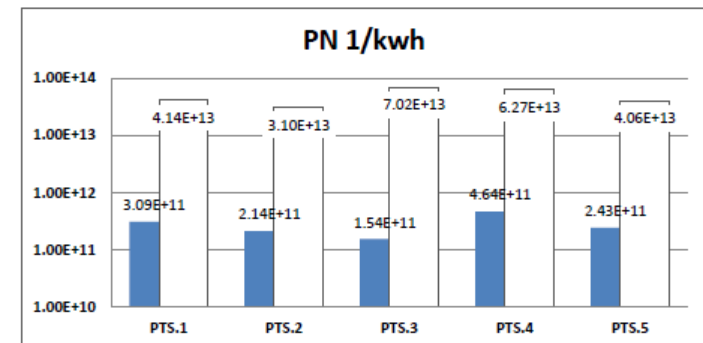
*VERT-demonstrated within the HaMaNet*

## National legislation for new and used vehicles Iran legislation to protect the environment<sup>4</sup>

from April 2014

	Activity	Executor	Supervisor	Time plan
1	<b>Fuel</b>			
1-2	Distributing Euro 4 fuel and diesel having maximum sulfur content of 40 ppm, in Tabriz (Jul. 23, 2014) in Esfahan and Shiraz (Sep. 23, 2014) , in Ahvaz and Mashhad (Nov. 23, 2014)	Ministry of Oil	Department of Environment	*
1-3	Standardization of fuel, at least in metropolises, according to Euro 4 and Euro 5 standards, and standardization of fuel in power plants based on Supreme Council of Department of Environment's act.	Ministry of Oil	Department of Environment	36 months
2	<b>Moving vehicle</b>			
2-1	Replacing public city vehicles' catalyst.	Homeland Ministry(via municipality)	Department of Environment	6 months
2-3	Using particulate filters for diesel heavy-duty vehicles	Homeland Ministry(For urbane public vehicles via municipality) -Ministry of Roads and Transportation	Department of Environment	24 months
4	<b>New vehicles</b>			
4-1	Diesel vehicle registration is complete, stipulating that the soot filter is used.	Traffic Police of Iran	Department of Environment	Mar. 21, 2015

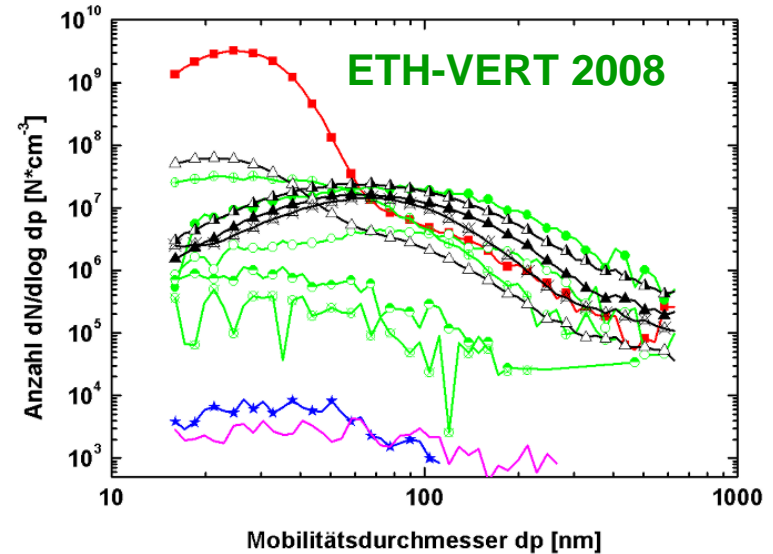
OM 457; Fuel-Sulfur 7000 ppm, VERT--DPF



# DPF on Petrol Engines PFI and GDI

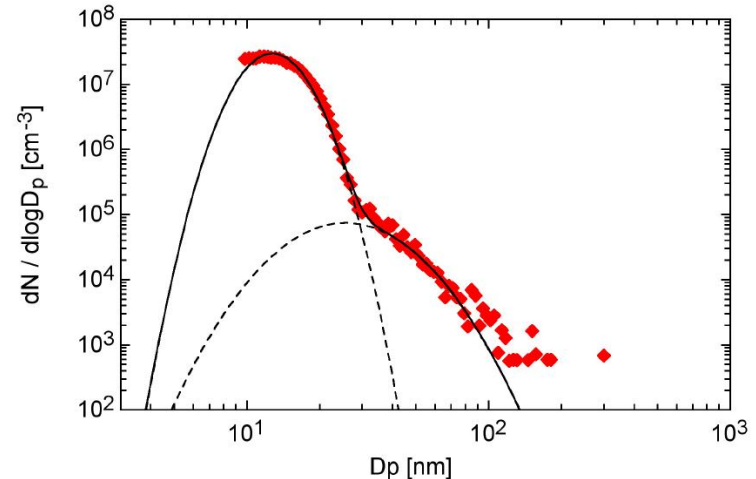
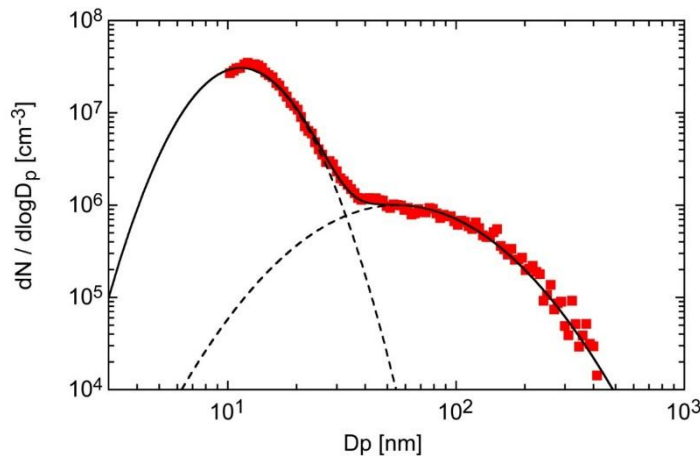
## Filter for Petrol engines

- Required for PFI and GDI
- Particles are smaller than Diesel
- More metal oxide particles
- Filter = the 3W-catalyst substrate
- Regeneration demonstrated



VERT presented to EU/Brussels and US-EPA/Washington

Which one is Diesel Exhaust ?





# Public Health Protection

## World Medical Association

October 2014 the WMA

unanimously adopted a very strong statement to avoid carcinogenic particle emissions from Diesels

This was prepared

and edited by VERT – Dr.Legerer

## Exposure Paradigm

At EPA conference Feb. 2015

VERT strongly promoted small scale **exposure protection** Instead of large scale nationwide averaging - accepted in official protocol as VERT already did 2014 with BAFU and EKL

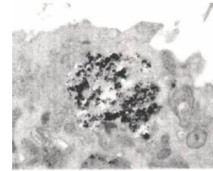
AQ-Limits and Monitoring must be Solid PN based

World Medical Association's Concern Regarding Effects of Ultrafine Particles

### WMA Statement on the Prevention of Air Pollution due to Vehicle Emissions

Dr. Heinz Fuchsig<sup>1</sup>, Dr. Reiner Brettenthaler<sup>2</sup>, Manfred Neuberger<sup>3</sup>

1. Austrian Workers' Compensation Board, 2. World Medical Association, 3. Professor emeritus, Medical University Vienna



Diesel Soot in Alveoli of a three month old child (Bunn, Thorax 56:932, 2001)



At the 65<sup>th</sup> General Assembly of the World Medical Association (WMA) in Durban, SA (10-11-2014), there has been unanimously adopted the resolution:

#### "WMA Statement on the Prevention of Air Pollution due to Vehicle Emissions".

The World Medical Association (WMA) as the Confederation of National Medical Associations which are the legal representations of the medical profession in their respective countries regards it as important mission to serve humanity by endeavouring to improve public health. The WMA represents some 10 million physicians all over the world, its secretariat is in Geneva-Ferney close to WHO. The yearly General Assembly is the highest ranking body of decision, the statement, a resolution indeed, calling member organisations to request specific action of their respective governments as below:

1. Introduce Best available technology (BAT) standards for all new diesel vehicles (both, on-road and off-road)
2. Incentivise retrofitting with BAT filters for all in-use engines
3. Monitor and limit the concentration of nanosize soot particles in urban air.
4. Conduct epidemiological studies detecting and differentiating the health effects of ultrafine particles.
5. Build professional and public awareness of the importance of diesel soot and the existing methods of eliminating particles.
6. Contribute to developing strategies to protect people from soot particles in aircraft passenger cabins, trains, homes and the general environment. These strategies should include plans to develop and increase use of public transportation.

# High Level Networking

***VERT is not keen for broad publicity***

*but it works on high policy decision level*

*by Technical expertise*

*Interdisciplinary research*

*BAT technology development*

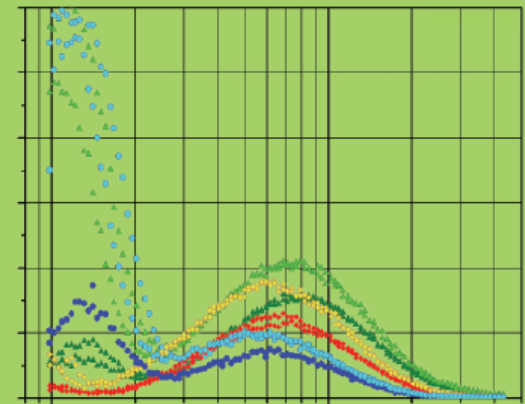
*Normalization and quality control*

- *ETH-Nanoparticle Conference*
- *VERT-Forum*
- *Government workshops in China, Iran, Israel, Chile, Colombia, USA, EU*
- *Swiss LRV 2014 Consultation*
- *Swiss EKL Consultation*

Invitation and call for papers to the

19<sup>th</sup> ETH-Conference on  
Combustion Generated  
Nanoparticles

Focus Event:  
Air Quality in Megacities



June 28<sup>th</sup> – July 1<sup>st</sup>, 2015  
ETH Zurich, Switzerland  
[www.nanoparticles.ethz.ch](http://www.nanoparticles.ethz.ch)



*La sabiduría no es exclusiva de los grandes, famosos y valerosos caballeros andantes como Vuestra Merced –*

*nosotros, los mozos de campo y pleza también conocen el desafío y el camino exitoso, incluso mejor.*

*Sancho Panza de la Mancha  
Pensamientos 1608*