

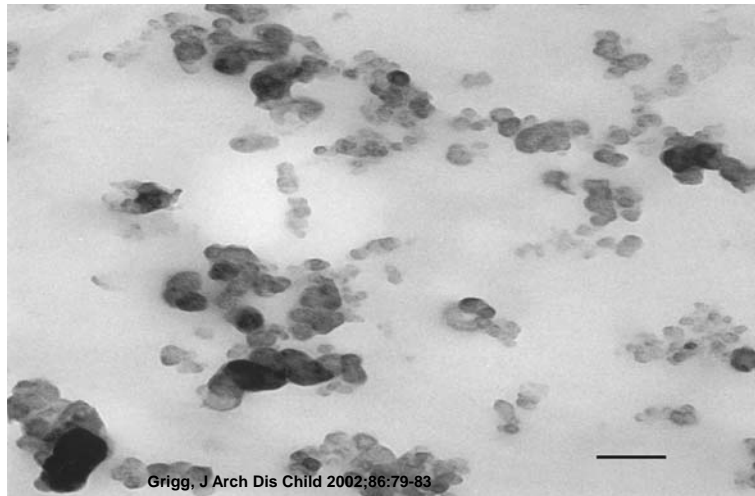


# Analys av Dieselavgaspartiklar/dieselryk i arbetsmiljö

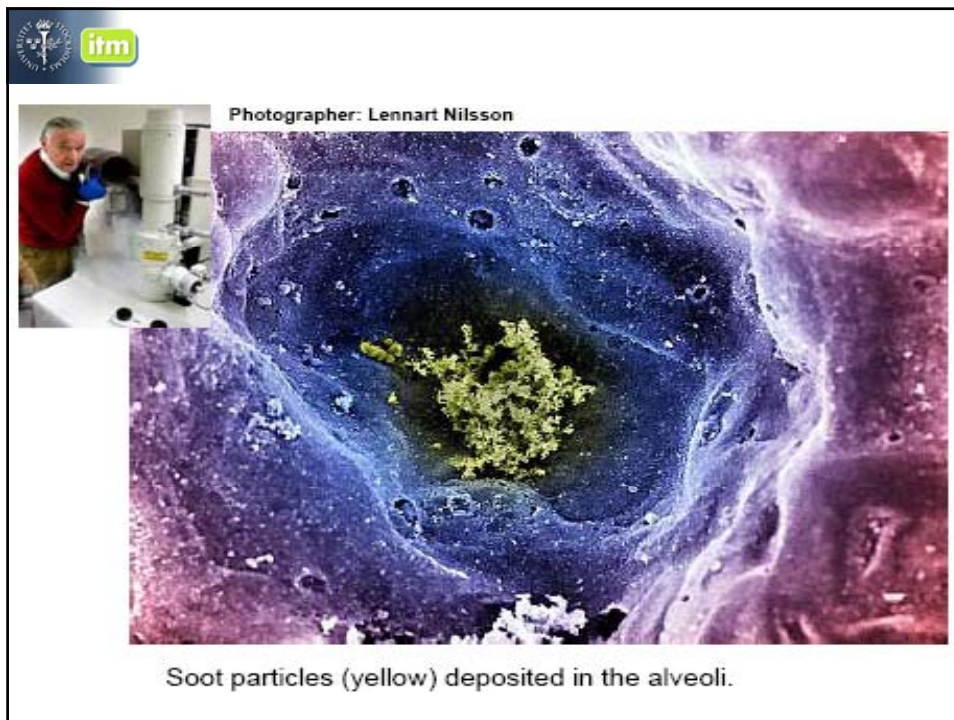
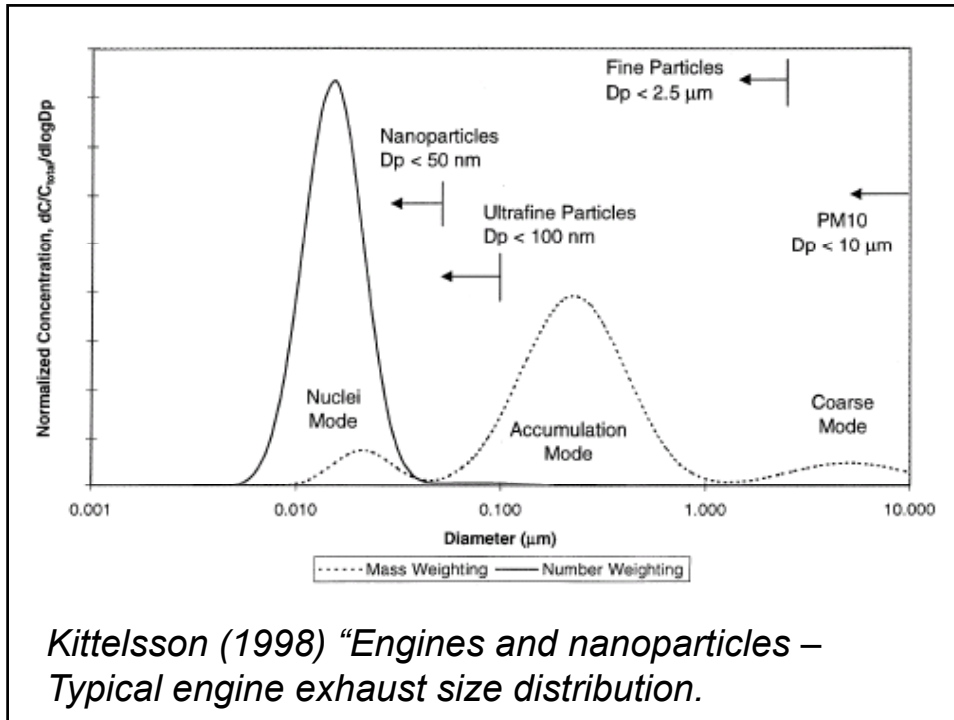
*Anna Wallén*  
*Stockholms Universitet*


 

**Diesel particles sampled from an exhaust pipe examined by electron microscopy. Single carbonaceous ultrafine particles and aggregates of ultrafine particles are present (scale bar 100 nm).**




Grigg, J Arch Dis Child 2002;86:79-83






**SOT**  
**≠**  
**EC**  
**≠**  
**BC**




**DPM trolig carcinogen (IARC, EPA)**

- **lungcancer**  
 Garshick, E., et al., *Lung cancer and vehicle exhaust in trucking industry workers*. Environmental Health Perspectives, 2008;  
 Garshick, E., et al., *Lung Cancer in Railroad Workers Exposed to Diesel Exhaust*, Environmental Health Perspectives, 2004. **112**(15): p. 1539-1543.  
 Stayner, L., et al., *Predicted lung cancer risk among miners exposed to diesel exhaust particles*. American Journal of Industrial Medicine, 1998.
- **urinblåsecancer**  
 Boffetta, P. and D.T. Silverman, *A meta-analysis of bladder cancer and diesel exhaust exposure*. Epidemiology, 2001.
- **coloncancer**  
 Goldberg, M.S., et al., *A case-control study of the relationship between the risk of colon cancer in men and exposures to occupational agents*. American Journal of Industrial Medicine, 2001.



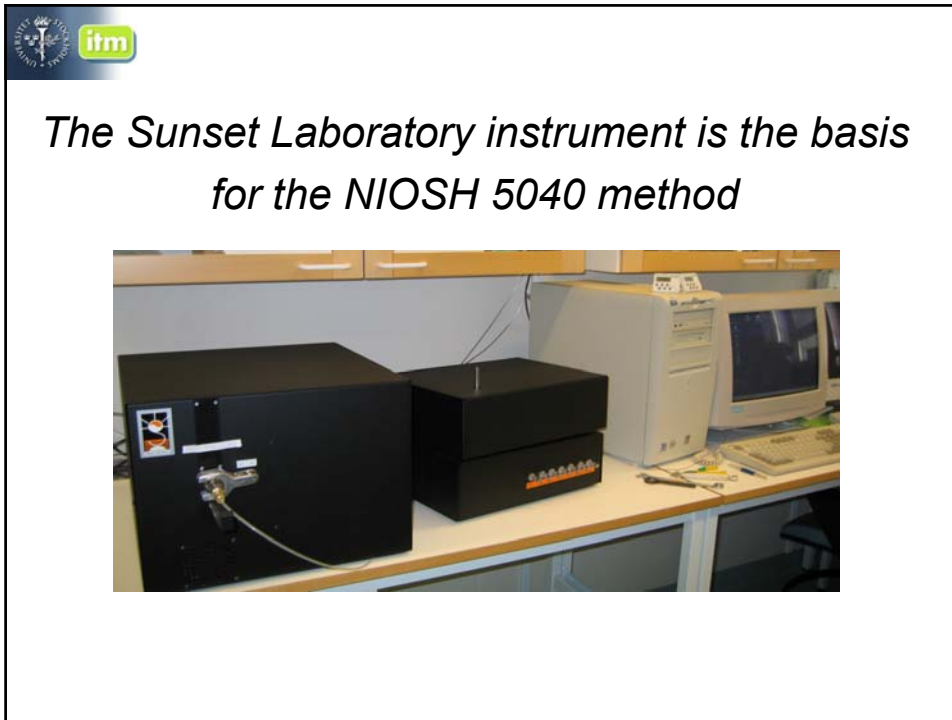
## Dieselavgaspartiklar

- **Ökar risken för CVDs**  
 Laden, F., et al., *Cause-Specific Mortality in the Unionized U.S. Trucking Industry*. Environmental Health Perspectives, 2007.  
 Lundbäck, M., *Cardiovascular effects of exposure to diesel exhaust - mechanistic and interventional studies*, avhandling, Umeå, 2009
- **Förstärker eller orsakar astma**  
 Ris, C., *U.S. EPA Health Assessment for Diesel Engine Exhaust: A Review*. Inhalation Toxicology, 2007  
 Pandya, R.J., et al., *Diesel Exhaust and Asthma: Hypothesis and Molecular Mechanisms of Action*. Environmental Health Perspectives, 2002.
- **KOL, emfysem mm**
- **Hjärnan – koncentrationssvårigheter?**

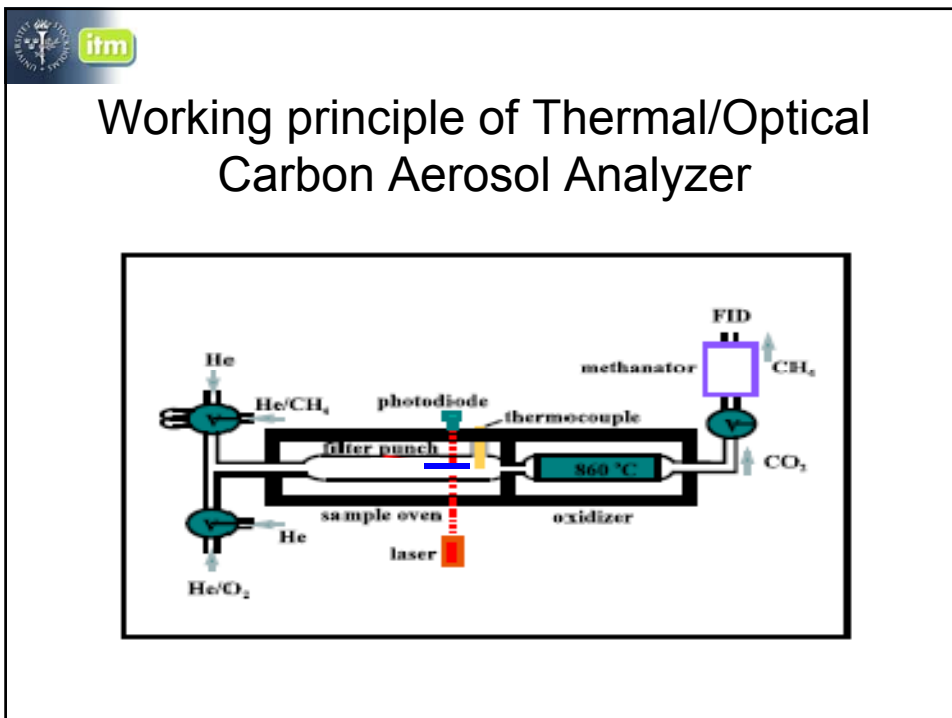


## Analys av dieselryk som elementärt kol EC

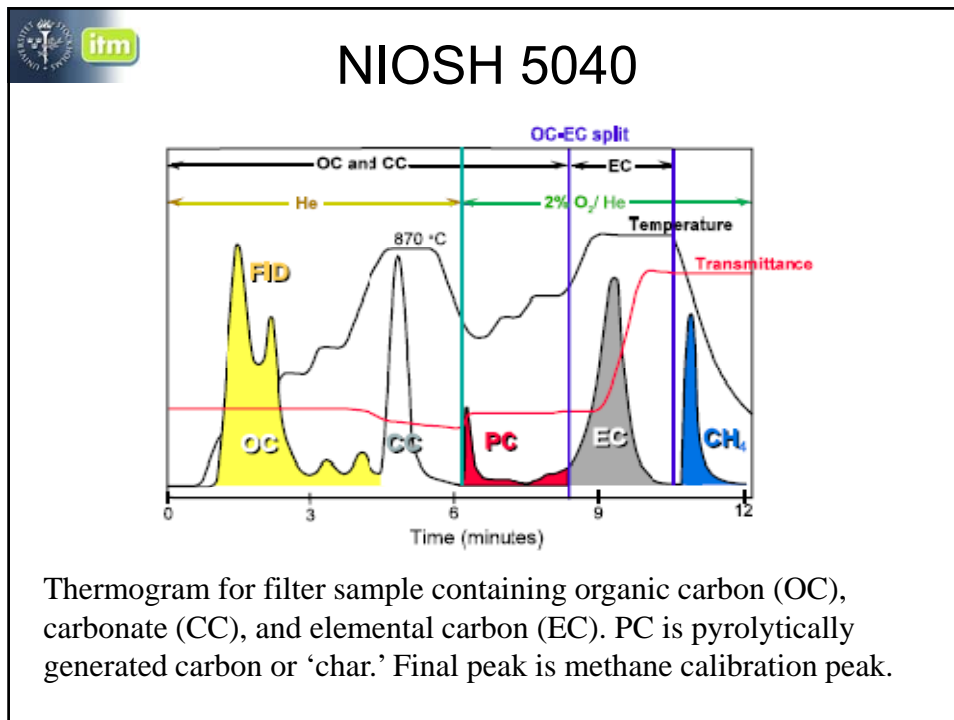
- Bestämd mängd beror på vald analysmetod
- Skillnader mellan analysmetoder beror även på dieselkvalitet, körsätt och motorernas ålder
- På ITM utgår vi från det instrument och den metod som specificeras i NIOSH #5040 som mäter icke-volatilt ”organic carbon” (OC) och ”elemental carbon” (EC)
- Metoden finns på:  
<http://www.cdc.gov/niosh/nmam/pdfs/5040.pdf>



*The Sunset Laboratory instrument is the basis  
for the NIOSH 5040 method*




Working principle of Thermal/Optical  
Carbon Aerosol Analyzer




**Temperatur/tid NIOSH 5040**  
OBS! ej skrivet i standardmetoden

He		He/Ox	
Time (s)	Temp (°C)	Time (s)	Temp (°C)
60	310	45	550
60	475	45	625
60	615	45	700
90	870	45	775
		45	850
		120	890



## Jämförelse mellan 3 metoder som analyserar EC i Europa

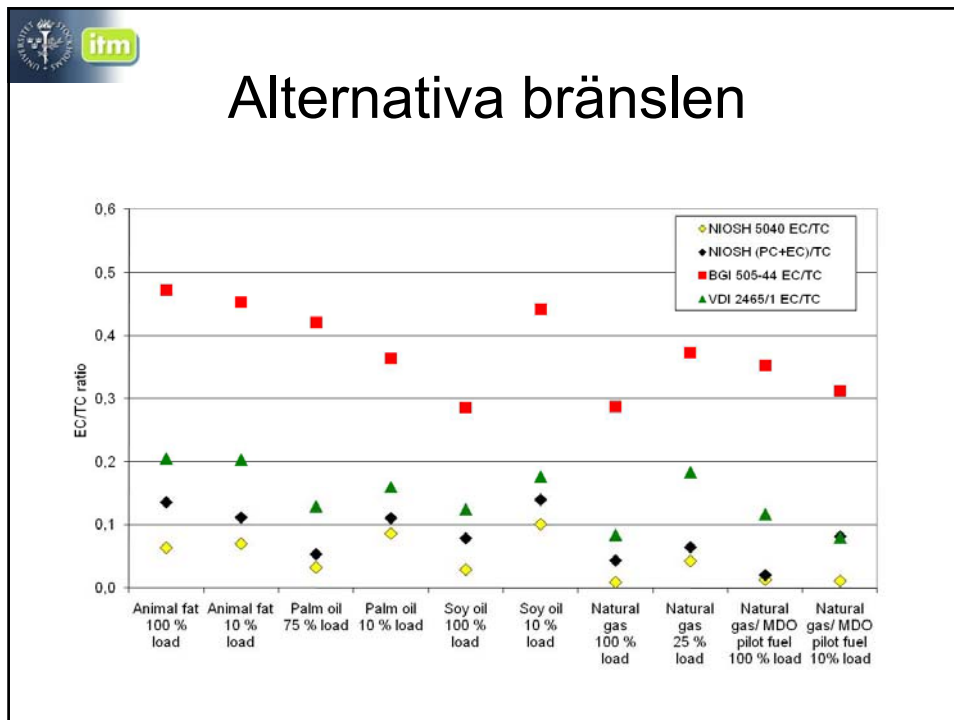
- Provtagning av motorer /bränslen
- BGI 505-44, used in occupational environments
- VDI 2465/1 for ambient air measurements
- NIOSH 5040 for occupational environment and ambient air measurements



**Summary of comparability of results from diesel exhaust samples with different methods of analysis.**

↓ = Analysis shows more than 10 % lower values than the NIOSH 5040 method  
 ↑ = Analysis shows more than 10 % higher values than the NIOSH 5040 method

NIOSH vs	BGI			VDI			Pyrolytic carbon in NIOSH analysis
	EC	TC	EC/TC	EC	TC	EC/TC	
Passenger Cars	↓	↓	↓	↓	↓	↑	No
Light-duty Vehicle	↑		↑	↓		↓	No
Heavy-duty Vehicle							No
Heavy-duty Vehicle + EGR	↑			↓		↓	No
Non-road Engine	↓		↓				Yes
Marine Engine	↓	↑	↓	↓	↑	↓	Yes



itm

## Gränsvärden för dieseldavgaser

- I Sverige NO<sub>2</sub> : 1 ppm
- ACGIH 1995: TLV150 µg EC/m<sup>3</sup> för PM1
- ACGIH 1999: TLV 50 µg EC/m<sup>3</sup> för PM?
- ACGIH 2001: TLV 20 µg EC/m<sup>3</sup> för PM?


Det senaste baserat enbart på EC som ansågs vara den bästa markören för DPM

- Tyskland: inget gränsvärde – bästa möjliga teknik ska användas

 **Personburen BC-mätare baserad på optisk analys -  $\mu$ -aethalometer**


- Realtidsmätning av exponering för EC/BC
- Primär målgrupp: underjordsarbetare  
(där ventilationen är betydligt sämre och halterna är högre)

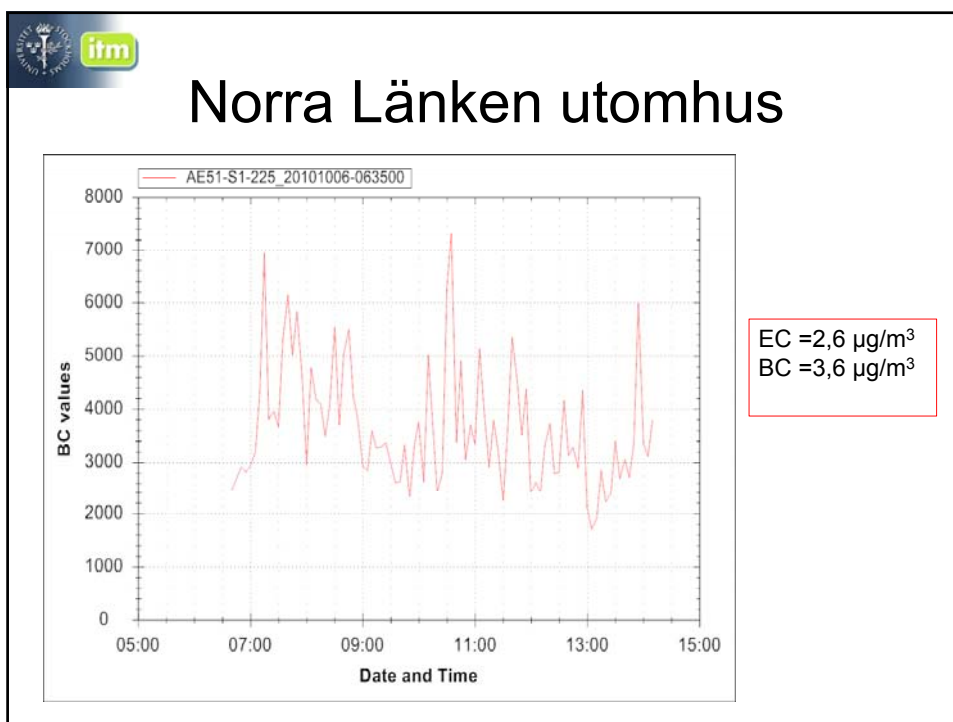


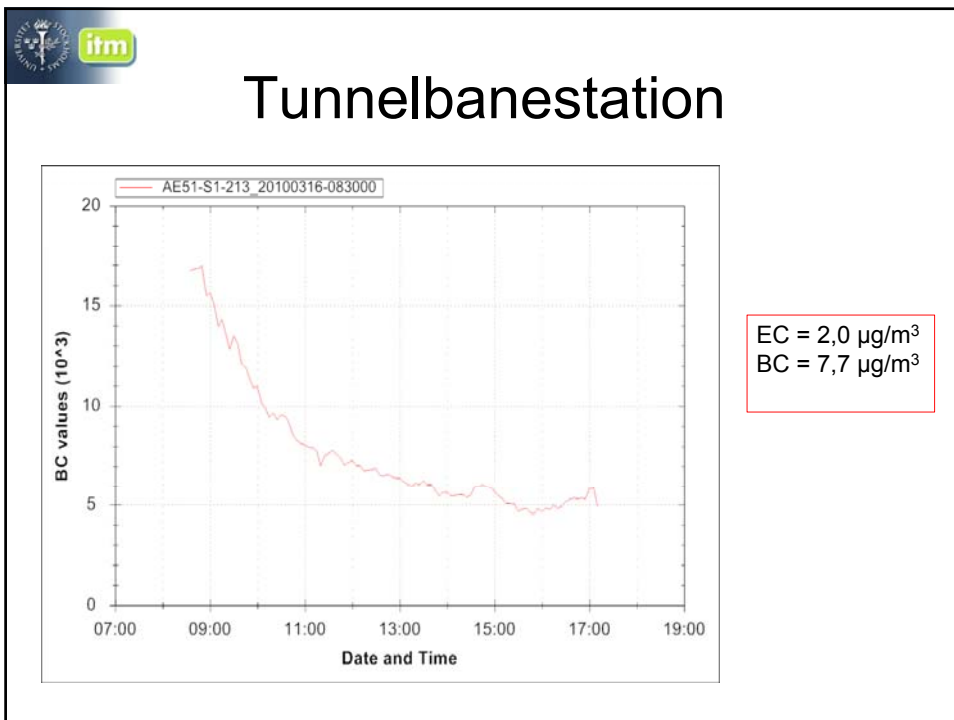
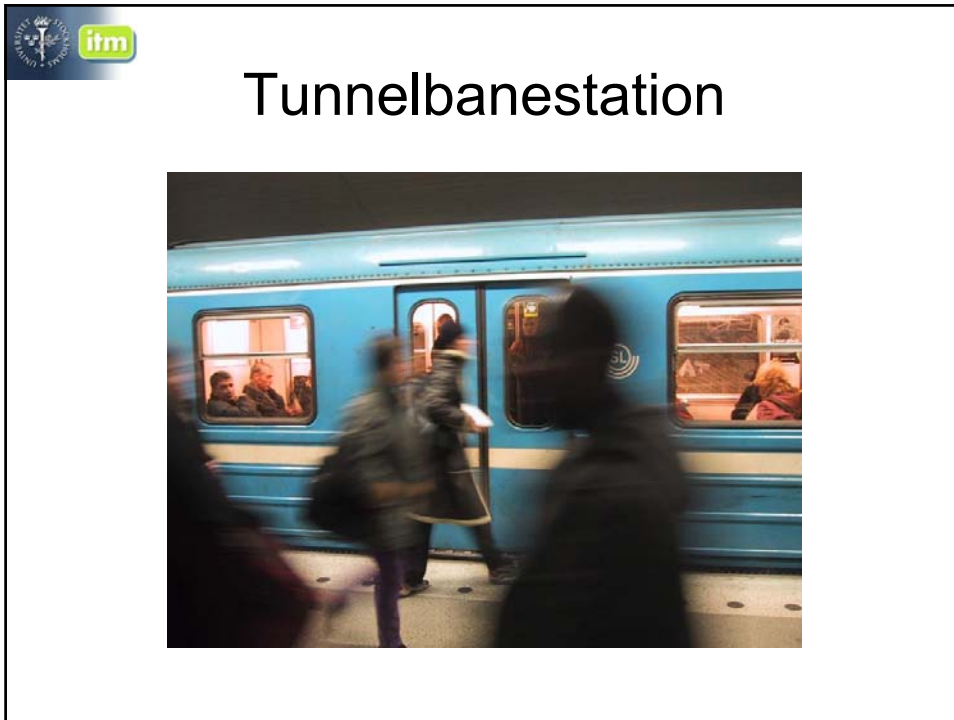
 Model AE51 microAeth  
[www.mageescientific.com](http://www.mageescientific.com)

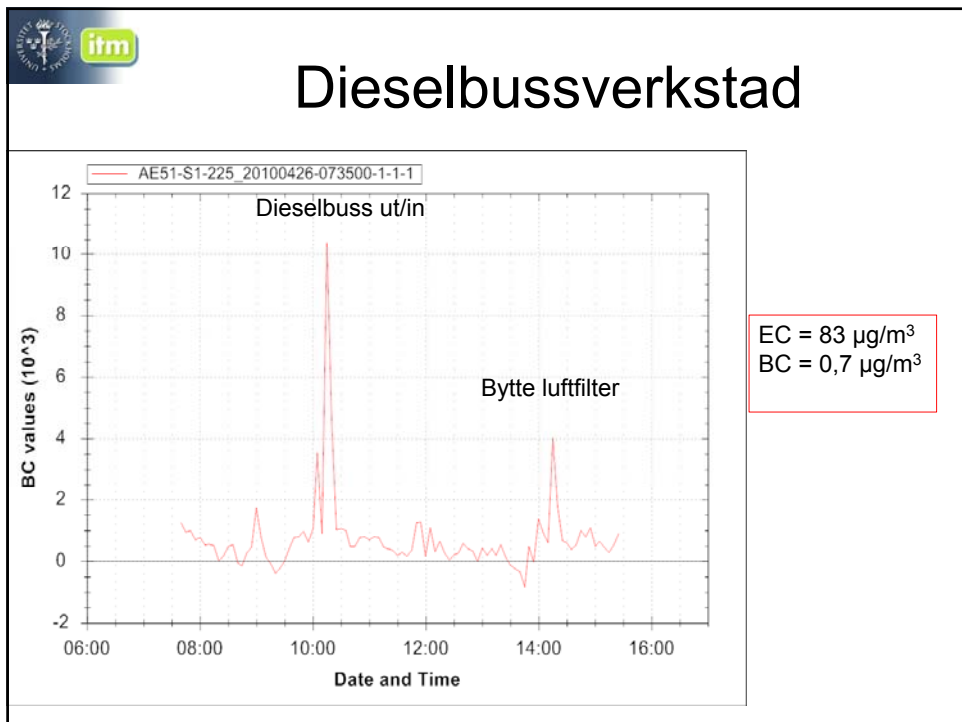
**Measurement Principle**  
Real-time sample collection and analysis of Aerosol Black Carbon mass concentration in air using the Aethalometer optical absorption method.

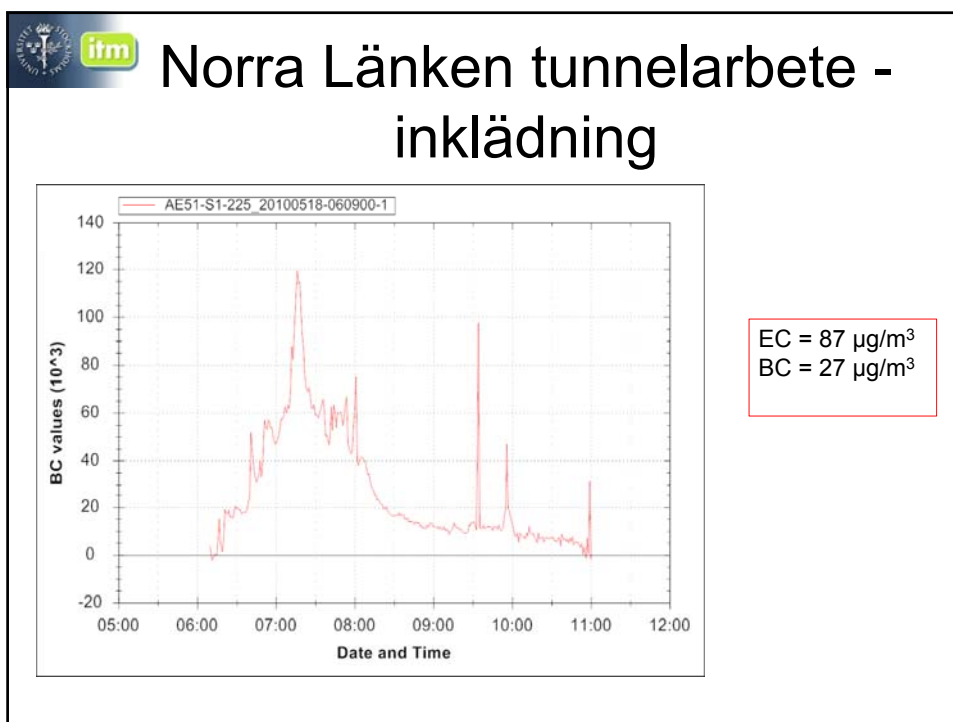
**Measurement Precision**  
 $\pm 0.100 \mu\text{g BC/m}^3$ , 1 min avg., 150 mL/min flow rate

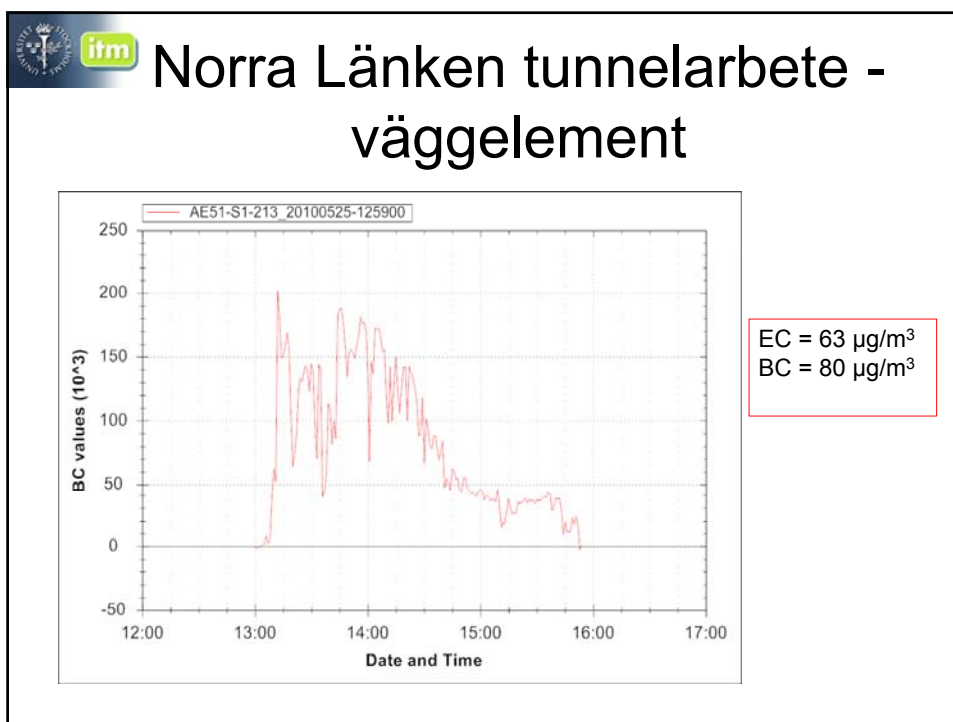






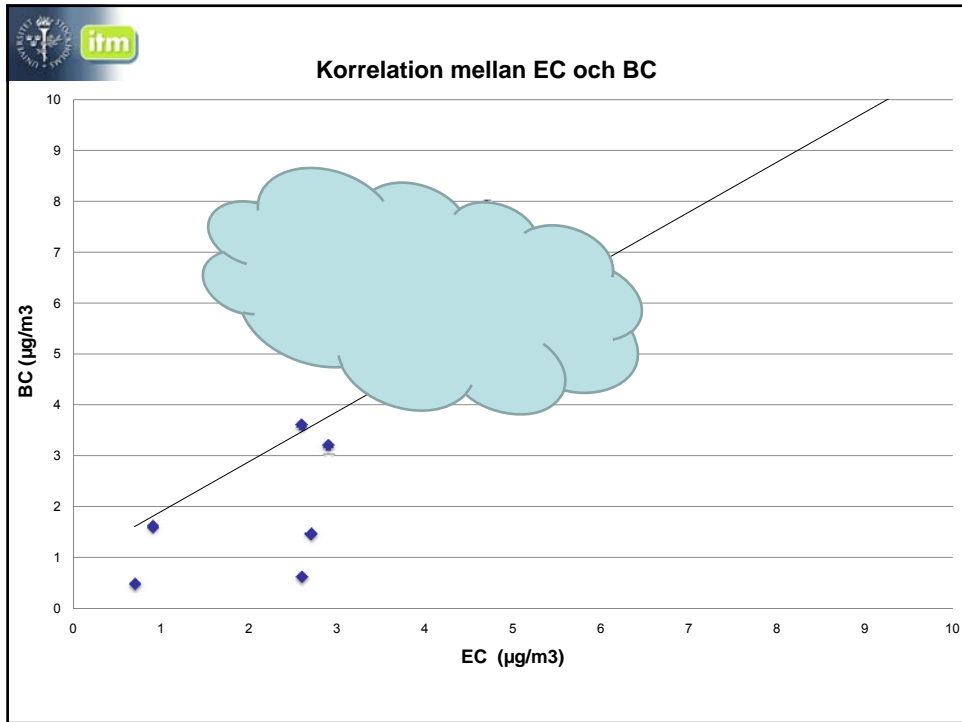
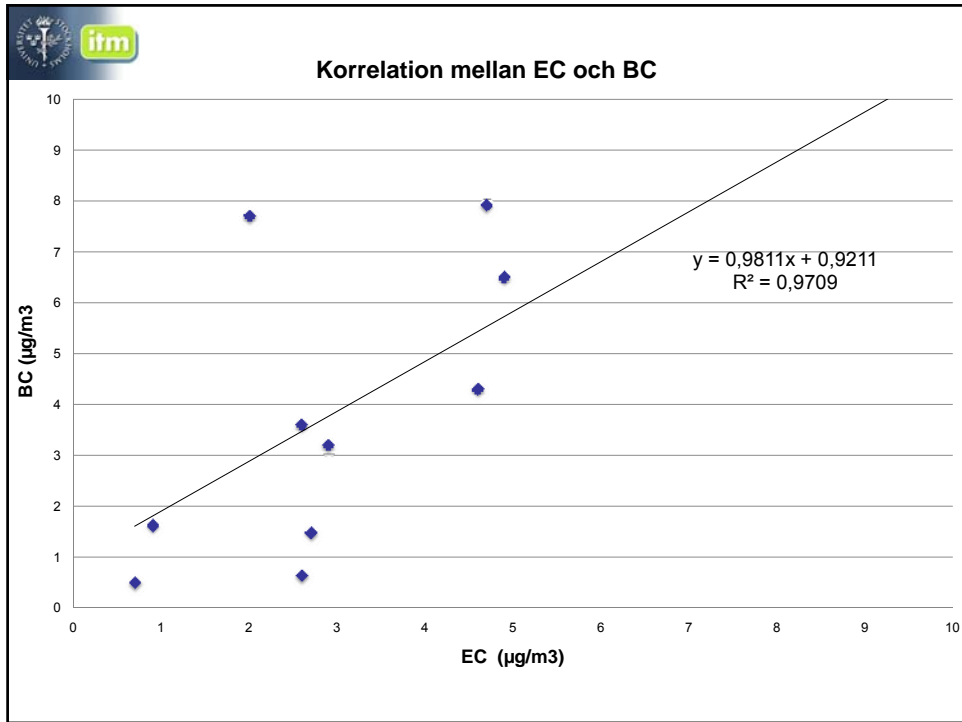


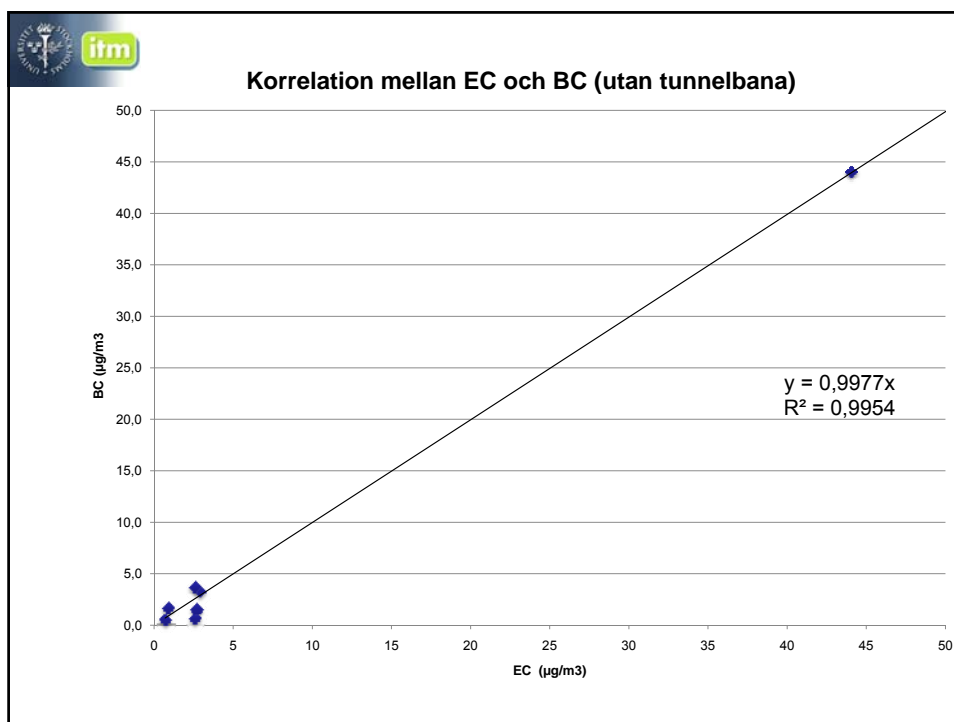




itm		RESULTAT EC-BC mätningar		
	Datum	Tid (tim)	respirabelt EC ( $\mu\text{g}/\text{m}^3$ )	BC ( $\mu\text{g}/\text{m}^3$ )
tunnelbana stat 1 9-15	100114	6	4,7	7,9
tunnelbana stat 1 15-18	100114	3	4,9	6,5
tunnelbana stat 2	100316	9	2,0	7,7
tunnelbana stat 3	100317	9	4,6	4,3
Bussverkstad pers 1	100426	7	0,7	0,5
Bussverkstad pers 2	100426	7	83	0,7
Bussverkstad pers 3	100427	7	2,6	0,6
Bussverkstad pers 4	100427	7	2,7	1,5
Bussverkstad stat 1	100429	23	0,9	1,6
N L ute pers 1	101006	7	2,9	3,2
N L ute stat 1	101006	7	2,6	3,6
N L tunnel pers 1 pass 1	100518	5	87	27
N L tunnel pers 1 pass 2	100518	5	66	0,0
N L tunnel pers 2 pass 1	100518	4	92	5,5
N L tunnel pers 2 pass 2	100518	4	63	-
N L tunnel pers 3 pass 1	100525	3	63	80
N L tunnel pers 3 pass 2	100525	3	44	44
N L tunnel pers 4 pass 1	100525	3	76	-
N L tunnel pers 4 pass 2	100525	3	27	-

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N L tunnel pers 2 pass 1	100518	4	92	5,5
N L tunnel pers 2 pass 2	100518	4	63	-
N L tunnel pers 3 pass 1	100525	3	63	80
N L tunnel pers 3 pass 2	100525	3	44	44
N L tunnel pers 4 pass 1	100525	3	76	-
N L tunnel pers 4 pass 2	100525	3	27	-





Tack för er uppmärksamhet!