UFIPOLNET Technical Interim Report

01-12-2005 to 31-03-2007
LIFE04 ENV/D/000054

UFIPOLNET
ultrafine particle size distributions in air pollution monitoring networks

Freistaat Sachsen

Saxon State Agency for Environment and Geology (LfUG)

LIFE Project Number

LIFE04 ENV/D/000054

TECHNICAL INTERIM REPORT

Covering the project activities from 01.12.2005 to 31.03.2007

Reporting Date

04-May-2007

LIFE PROJECT NAME

UFIPOLNET

Data Project	
Project location	Dresden / Germany
Project start date:	<01/12/2004>
Project end date:	<30/11/2007>; - Extension date
Total Project duration (in months)	<36> months; - Extension months
Total budget	€ 868 639
EC contribution:	€ 397 196
(%) of total costs	45.7%
(%) of eligible costs	46.3%

Data Beneficiary	
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1 CONTENTS

2 ABBREVIATIONS

CHMI	Czech Hydro Meteorological Institute (CHMI)
CS	Czech
DE	German
EN	English
GSF	National Research Centre for Environment and Health, Munich
IfT	Institute for Tropospheric Research
LfUG	Beneficiary: Landesamt für Umwelt und Geologie: Saxon State Agency for Environment and Geology
ITM	Department of Applied Environmental Science (ITM), University Stockholm
SV	Swedish
TOPAS	Technologie-orientierte Partikel-, Analysen- und Sensortechnik (TOPAS GmbH)
TSI	TSI GmbH, Aachen (Co financer)
UBG	LfUG Staatliche Umweltbetriebsgesellschaft (dependent on LfUG)
UFIPOLNET	Ultrafine particle size distributions in air pollution monitoring networks
VDI	Verein Deutscher Ingenieure

units

%	percent
°C	Grad Celsius
a	year
d	day
K	Kelvin
m	Meter
mg/m³	milligram per cubic meter
µg/m³	microgram per cubic meter
mm	millimetre
ng/m³	nanogram per cubic meter

3 EXECUTIVE SUMMARY

The two annual workshops in January 2005 and May 2006 as well as several internal meetings at the LfUG, with the assembly team, with TOPAS, IfT and other organisations (LfL, LANU, VOR and SAB) were organised. The project was visited by the monitoring team in July 2005 as well as May and November 2006.

Task Design (T2) was running all through 2005 and needed a 10 month extension. Therefore Task Implementation (T3) and Task Measuring (T4) will be shortened to 2 respectively 12 months in comparison to the plan of 5 (T3) and 18 (T4) months. Task 4 measurements started 12 months later than expected. Therefore, a 3 month project extension is needed to meet the objective of measuring one year at all 4 stations. A lot of work has been done by TOPAS and IFT with the help of TSI, which provided more than planned device parts. Instead of August 2005, finalisation of the first prototype was in June 2006. Technical problems occurred in the middle to the end of 2005 and were completely solved by the assembly team. The particle size distributions of ultrafine particle number concentrations were planned to be specified within a size range of approx. 12 - 500 nm. This objective has to be changed to about 20 – > 200 (800) nm because of technical problems. The four UFP 330 instruments had been checked at TOPAS, because not all of them produced the expected results in the calibration tests in August 2006 in Leipzig. Some special parts of the instrument were identified and exchanged during December. The results in January 2007 at IfT showed good correlations to the reference instrument. Therefore in February all instruments showed comparable results and were delivered to the users at the 4 different stations. A standardized sampling system was needed, which was not planned in the proposal. Management and Dissemination are running from the beginning until the end of the whole project life.

A dissemination plan for past and future events was created. A homepage with a shorter address: www.ufipolnet.eu is updated every month. A professional Flyer in English, German, Swedish and Czech was created in September 2006. The media informed the public about UFIPOLNET and ultrafine particles in January 2005 and February 2007 (including TV-broadcast) in Saxony as well as in Sweden (March 2007). Signboards were installed at the 4 measuring stations during February 2007.

Potential target groups were contacted personally, by newsletter, webpage or printed media in case of conference announcements. The VDI will publish “VDI 3867 Blatt 3 Mobilitätsspektrometer“ UFP 330 as an example. There is a positive presumption, that some routine measurement networks and health experts will buy the UFP 330. To measure number concentrations of particulate matter at different locations over a longer period will be one way of showing the reduction of number concentrations of particulates in European cities ac-cording to new directives aiming to reduce particulate mater. This can prove the effect of the TSAP (Thematic Strategy on Air Pollution, Sep-2005) on the particles, which have a negative health effect. It is planned to measure with the UFP 330 at all 4 stations for the next 5 years.

The next project meeting will be held on 31st May 2007 and discuss the first measuring results and further dissemination strategy. The task 2 was extended for more than 10 months. Therefore Task 3 and 4 have to be shortened. Because the measurements started in all stations in February, they will have results for the winter season. The project is now in time again for Dresden, because the aim to measure for 1 year during the project is still possible. The other 3 stations will run for 10 months during the project duration. Therefore, a two or even three month extension of the project duration is needed. Writing the final report will require extra time for finalization (max. 3 Month after project end).

First payments to partners were made based on subpayment requests. About 39% of the planned costs have been spent and some small budget modifications have been made, however, no substantial amendments are necessary. Due to the need for a better sampling system for receiving comparable results, money will be shifted between the cost categories to durable goods, without the need of a substantial amendment.

4 INTRODUCTION

One and a half years ago the Commission proposed a clean air strategy to protect human health and the environment (TSAP) (Reference: IP/05/1170 Date: 21/09/2005, IP/05/1170). Margot Wallström and Vice-President of the EC in charge of Institutional Relations and Communication Strategy and Stavros Dimas, Member of the EC in charge of Environment, participated in an experiment to measure the level of air pollution by particle matter on 15-09-2005 to underline the importance of this strategy. “American researchers recently investigated the potential health risks of ultrafine particles in rats. The results show that the nano-sized materials inhaled by rats follow a rapid and efficient pathway from the nasal cavity to several regions in the brain. Exposure also caused signs of inflammation and stress. The ultrafine particles used in the study are the same size as nano particles, which are controversial due to concern about their security to humans (DG ENV; Science for Environment Policy 14 September, 2006 Issue 34).”

A revision of the air quality directive is planned for 2013 by the European Commission, where they will discuss whether or not PM10 limits will be changed to other metrics, like PM2.5 or PM1 or numbers of ultrafine particles. In Germany, a broad discussion about particulate filters for cars is going on. According to a new regulation owners of Diesel-cars are encouraged by law in Germany to buy particulate filter systems.

This underlines the importance of the EU-project UFIPOLNET, which aims to make measurements of the amount of particulates in ambient air with routine measuring by an easier, cheaper and more reliable measuring network.

To measure number concentrations of particulate matter at different locations over a longer period will be one way of showing the reduction of number concentrations of particulates in European cities according to new directives aiming to reduce particulate mater.

The objective of the project is to demonstrate an applicable and affordable measuring device for ultrafine particles, that can be implemented all over Europe. The 4 prototypes will demonstrate that reliable and comparable data for various kinds of analysis can be provided by the device. To produce comparable data, the sampling system was standardised using a dryer unit and a critical orifice.

The new UFP 330 will cost about the same price as common PM2.5 sampler used in measuring networks all over the world. The cost effective and reliable instrument will therefore be ready for use in all measuring networks of Europe and in the World. It has more advantages, like low costs for maintenance and less costs for personnel because of its easy to use software and interfaces compared to other instruments measuring size distributions of particles. The UFP 330 will measure particles between 20 and above 200 nanometres in 6 size classes based on a technique using a diffusion charger and an electrometer. These classes are: >20 | >30 | >50 | >70 | >100 | >200 (<800) nanometre. Neither butanol nor radioactive source is needed; therefore neither waste nor emissions of Volatile organic compounds are made. There is also no danger of handling radioactive parts.

The practical experiences in the routine measuring networks will result in a user orientated handbook and a lot of small technical solutions. All future users will benefit from the practical knowledge implemented in the instrument and documented in the user’s handbook.

5 LIFE-PROJECT FRAMEWORK

The Project is divided in different Tasks (s. Fig 1). Task 1 (Management) and Task 6 (Dissemination) run throughout the duration of the whole project. Task 2 (Design), Task 3 (Implementation), Task 4 (Measuring Activities) and Task 5 (Evaluation) run sequentially with exception of Evaluation, which is partly running during Task 3 and Task 4.

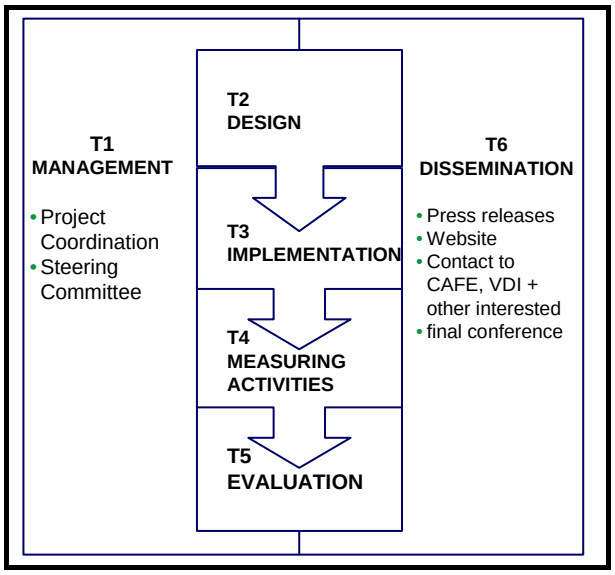


Fig. 1 *Organ gram of the Tasks in UFIPOLNET*

The partners of the project are divided in the user (demonstration) team (CHMU, IT; GSF and LfUG) and the assembly team (TOPAS, IfT with help of TSI). The assembly team builds the instrument and is responsible for the implementation at the measuring sites. The user team gives the user requirements to the assembly team during all phases of the project. They are responsible for the maintenance in cooperation with the assembly team.

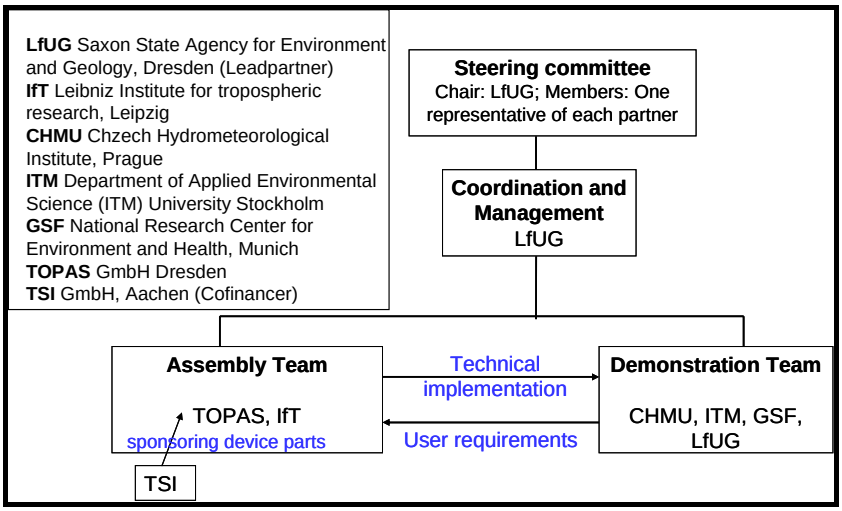


Fig. 2 *Organisation of partners*

In February implementation was completed in all stations. Measurements are already going on in Dresden (21-12-06) and are available in the database of the Saxon measuring network since 24-Jan-2007. First Evaluation results of comparing UFP 330 with the DMPS are promising.

A little modification according to sampling was necessary. It was decided during the beginning of the project to harmonise the sampling procedures using a dryer unit and a critical orifice. Therefore, more costs were necessary (about 5 - 8 k€) for each sampling stations. It was possible to shift the money from different cost categories to equipment, respectively at prototype costs, within the SAP-rules.

6 TECHNOLOGY

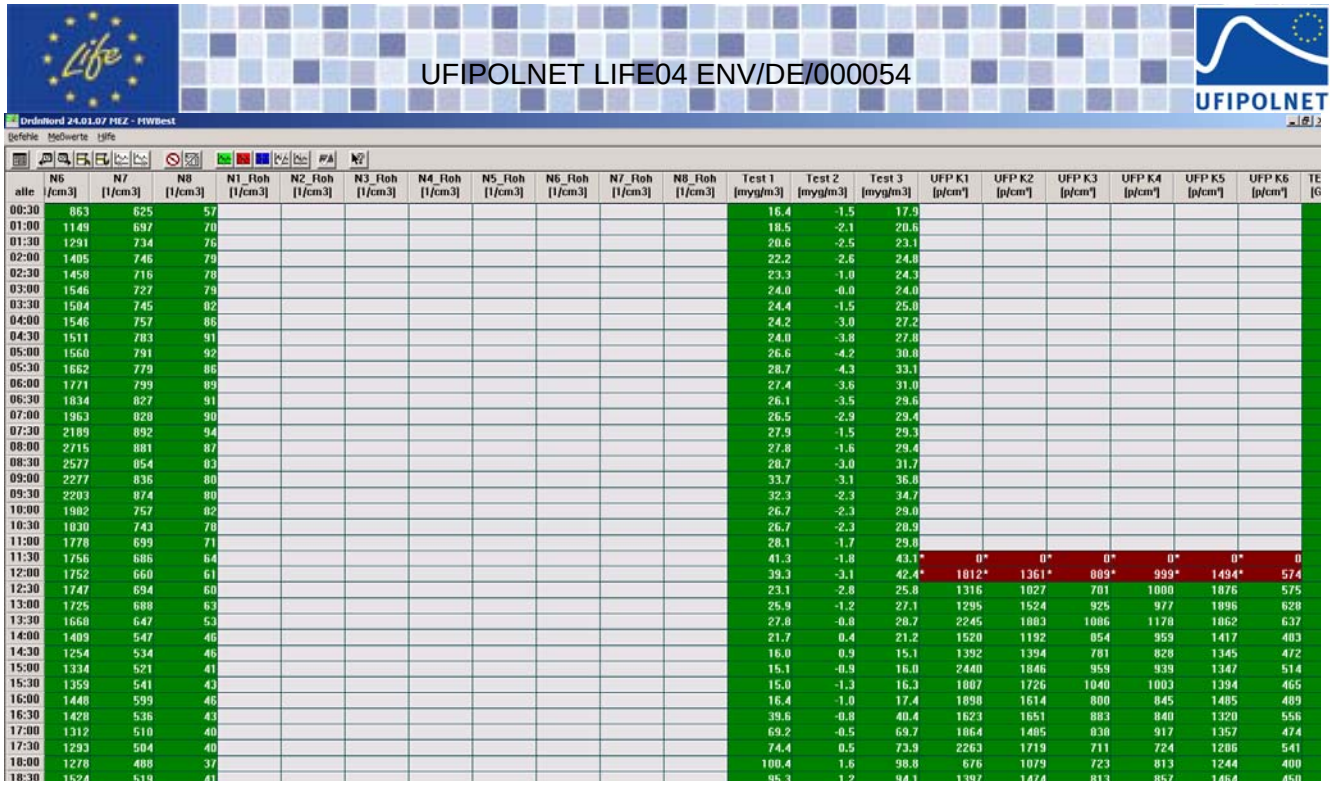
The UFP 330 is an electrical mobility spectrometer. It quantifies particles between 20 and 800 nanometres in 6 size classes by classification of the particles in an electric field after charging them using a diffusion charger. These classes are: >20 | >30 | >50 | >70 | >100 | >200 (<800) nanometer. Neither butanol nor radioactive source is needed. The particle sizes are calculated by an inversion program. One value for every size class every 10 minutes is produced. This is reduced to half-hour averages for the measuring networks.

Fig. 3 UFP 330 at the pilot station Dresden Schlesischer Platz working since 21.12.2006 (Photo: L. Hillemann).

The 4 Prototypes are implemented in 4 different measuring stations in Stockholm, Augsburg, Dresden and Prague. All data including measuring results and error as well as operation status are saved on the internal hard drive of an internal computer. The data will be transferred to a laptop at least every 4 weeks. The data will be evaluated by the user team and IfT.

The Data-interface is individual for each station. The solution for Dresden and Prague are based on the Bayern-Hessen protocol for Augsburg and Stockholm on IP-Protocols.

In Dresden, the data is transferred online to a measuring network computer and from there to a central computer by modem. There, all data of 30 measuring stations are saved, validated and presented to the users of the data. Most of the data is made public via Internet. It is planned to publish results of UFP 330 on the website of the project every second month after evaluation.



alle	N6 /cm3]	N7 [1/cm3]	N8 [1/cm3]	N1_Roh [1/cm3]	N2_Roh [1/cm3]	N3_Roh [1/cm3]	N4_Roh [1/cm3]	N5_Roh [1/cm3]	N6_Roh [1/cm3]	N7_Roh [1/cm3]	N8_Roh [1/cm3]	Test 1 [myg/m3]	Test 2 [myg/m3]	Test 3 [myg/m3]	UFP K1 [p/cm³]	UFP K2 [p/cm³]	UFP K3 [p/cm³]	UFP K4 [p/cm³]	UFP K5 [p/cm³]	UFP K6 [p/cm³]
00:30	863	625	57									16.4	-1.5	17.9						
01:00	1149	697	70									18.5	-2.1	20.6						
01:30	1291	734	76									20.6	-2.5	23.1						
02:00	1405	746	79									22.2	-2.6	24.8						
02:30	1458	716	78									23.3	-1.0	24.3						
03:00	1546	727	79									24.0	-0.0	24.0						
03:30	1584	745	82									24.4	-1.5	25.8						
04:00	1546	757	86									24.2	-3.0	27.2						
04:30	1511	783	91									24.0	-3.8	27.8						
05:00	1560	791	92									26.6	-4.2	30.8						
05:30	1662	779	86									28.7	-4.3	33.1						
06:00	1771	799	89									27.4	-3.6	31.0						
06:30	1834	827	91									26.1	-3.5	29.6						
07:00	1963	828	90									26.5	-2.9	29.4						
07:30	2189	892	94									27.9	-1.5	29.3						
08:00	2715	881	87									27.8	-1.6	29.4						
08:30	2577	854	83									28.7	-3.0	31.7						
09:00	2277	836	80									33.7	-3.1	36.8						
09:30	2203	874	80									32.3	-2.3	34.7						
10:00	1902	757	82									26.7	-2.3	29.0						
10:30	1830	743	78									26.7	-2.3	28.9						
11:00	1778	699	71									28.1	-1.7	29.8						
11:30	1756	686	64									41.3	-1.8	43.1*	0*	0*	0*	0*	0*	0
12:00	1752	660	61									39.3	-3.1	42.4*	1012*	1361*	889*	999*	1494*	574
12:30	1747	694	60									23.1	-2.8	25.8	1316	1027	701	1000	1876	575
13:00	1725	688	63									25.9	-1.2	27.1	1295	1524	925	977	1896	628
13:30	1668	647	53									27.8	-0.8	28.7	2245	1883	1086	1178	1862	637
14:00	1409	547	46									21.7	0.4	21.2	1520	1192	854	959	1417	483
14:30	1254	534	46									16.0	0.9	15.1	1392	1394	781	828	1345	472
15:00	1334	521	41									15.1	-0.9	16.0	2440	1846	959	939	1347	514
15:30	1359	541	43									15.0	-1.3	16.3	1807	1726	1040	1003	1394	465
16:00	1448	599	46									16.4	-1.0	17.4	1898	1614	800	845	1485	489
16:30	1428	536	43									39.6	-0.8	40.4	1623	1651	883	840	1320	556
17:00	1312	510	40									69.2	-0.5	69.7	1864	1485	830	917	1357	474
17:30	1293	504	40									74.4	0.5	73.9	2263	1719	711	724	1206	541
18:00	1278	488	37									100.4	1.6	98.8	676	1079	723	813	1244	400
18:30	1524	519	41									95.3	1.2	94.1	1397	1474	813	857	1464	450

Fig. 4 Measurements UFP 330 implemented in the software ADVIS in the Saxony measuring network (Start 24-Jan-2007)

Measuring Principle

The operating principle of the UFP is based on diffusion charging of particles, followed by size segregation within a DMA and detection of the aerosol via a sensitive electrometer.

Charger: The charging device in the UFP is the "Corona-Jet" charger. Unipolar air ions from a corona needle-tip discharge are swept by clean air (1.0 L/min) through an orifice into a field-free mixing chamber of about 10 cc volume, forming a jet which collides with an opposing jet of the incoming aerosol (4.0 L/min). The turbulence of the two colliding jets improves the mixing of the aerosol with the unipolar ions, so that even within the residence time of about 0.25 seconds in the mixing chamber, most of the aerosol has reached its limiting charge state.

For aerosols charged by the corona-jet method, the mean charge per particle was found in detailed experiments to be accurately proportional to the particle's electrical-mobility diameter in the range from 10 nm to 1000 nm diameter. Thus, aside from size-dependent losses, the net current in the electrometer is proportional to the sum of the diameters of all particles per unit volume. Actual performance deviates from this ideal, due to size-dependent losses in the particles transmitted from the charger to the electrometer.

DMA: The charged aerosol passes into the main part of the Differential Mobility Analyzer (DMA). The DMA contains two concentric metal cylinders. The polydisperse aerosol and sheath air are introduced at the top of the Classifier and flow down the annular space between the cylinders. The aerosol surrounds the inner core of sheath air, and both flows pass down the annulus with no mixing of the two laminar streams. The inner cylinder, the collector rod, is maintained at a controlled negative voltage, while the outer cylinder is electrically grounded. This creates an electric field between the two cylinders.

The electric field causes positively charged particles to be attracted through the sheath air to the negatively charged collector rod. Particles are precipitated along the length of the collector rod. The location of the precipitating particles depends on the particle electrical mobility, the Classifier flow rates, and the Classifier geometry. Particles with a high electrical mobility are precipitated along the upper portion of the rod; particles with a low electrical mobility are collected on the lower

portion of the rod.
Particles within a narrow range of electrical mobility exit with the monodisperse air flow through a small slit located at the bottom of the collector rod. These particles are transferred to a particle sensor to determine the particle concentration. The remaining particles are removed from the Classifier via the excess air flow.

Electrometer: After leaving DMA, the aerosol enters a faraday cage where the particles, and their charge, are collected on particle filter. The filter is conductive, and is electrically connected to the input of a sensitive electrometer amplifier. The electrometer's critical circuits are contained in a small enclosure placed near one end of the filter to minimize input capacitance and to maintain mechanical stiffness of the leads and thus avoid micro phonics. The filter may be replaced provided proper precautions are taken to prevent electrostatic-discharge damage to the sensitive electrometer circuit.

The sampling systems

The sampling system consists of a pre-impactor and a dryer. Conductive and non corrosive tubing material such as stainless-steel that is weather- and sunlight-resistant is used.

Dryer: Atmospheric aerosols may change their size and physical properties if ambient conditions vary such as temperature and relative humidity. Low volatile compounds may evaporate with increasing temperature. On the other hand particle size may increase with increasing relative humidity due to hygroscopic growth. Thus, the measured particle number size distribution depends strongly on the relative humidity within ambient air but also in the instrument. In humid environments with high ambient temperatures and high dew points, the water may even condense when entering the air conditioned measurement container leading to an increase in particle diameter. To avoid these problems, the usage of a membrane dryer within the aerosol sampling is recommended. The method is based on water vapour diffusion through a membrane (Nafion) into a dry air flow. This instrument does not need any regular maintenance, but it does require initial buying costs.

Inlet: The sampling head (PM10) removes larger particles to avoid contamination of the instrument. The pre – impactor (PM1 inlet, standard flow 1m³/h or 16.7 lpm) is needed in order to sample with highest velocities and laminar flow. The flow scheme of the instrument is documented in the users manual.

Data Collecting and Processing

A measurement cycle can be divided into the two parts:
a) Raw data collection from the electrometer; b) Data inversion through mathematical routines Raw data is taken from the electrometer and stored in a local database, containing the system parameters like sheath flow and sheath temperature. The second part, the inversion program, takes the stored values and calculates the result. Therefore, the inversion algorithm can be changed afterwards without influence to the data collection.

Instrument Design

The instrument is placed in a 19“Rack, 710 mm height and 410 mm depth and its weight is about 30 kg. The instrument needs a direct environment of 10 - 40°C and 0 – 90% relative humidity, which are mostly the conditions inside a measurement container. A sampling volume of 5 litres per minute is required. An internal PC and a Front panel display (240×128 pixel) Touch screen LCD are included. Output ports are Serial (user programmable), Ethernet and USB.

7 PROGRESS RESULTS

7.1 General

As you can see from fig. 10 Management and Dissemination are running from the beginning until the end of the whole project life. Task Design (T2) was running all threw 2005 and needed a 10 month extension (s. fig. 10). Therefore Task Implementation (T3) and Task Measuring (T4) will be shortened to 2 respectively 12 months in comparison to the plan of 5 (T3) and 18 (T4) months.

7.2 Task 1 Coordination activities (Management)

The project manager created and updated the **project time plan**. The project manager helped the finance coordinator respectively its predecessor in producing individual **finance plans for the partner contracts** and to write the **financial guidelines UFIPOLNET**. A **dissemination plan** (past and future events) has been made.

The **Beneficiary employed the project manager** from January 2005 with 80 % and from Mai 2005 with 100% of a full time position. The **finance coordinator was employed** in June 2005 for 16 h per week until Dec 2005. From Jan 2006 until Nov 2007 it will be 12 h. In **May 2006 the Engineer was employed** as planned for 20h per week.

Project meetings with partners:

- 3-day kick off meeting in January 2005; 2-day **2nd annual meeting** from 16- 17-May-2006.
- **Assembly team** (TOPAS, IfT and co financer TSI) **meeting** with minutes: at the European Aerosol Conference (30.08.2005), 06-12-2005 and 20-03-2006. The **assembly team** also organised telephone conferences. The assembly team had a lot of contacts via email and telephone with each other. During the International Aerosol Conference in St. Paul/USA a meeting took place on the 13-Sep-2006. Telephone conference on the 27-10-2005 (with minutes) and during spring.
- Meetings with **TOPAS** and UBG (9-03-2006) to visit the measuring container in Dresden and in spring with TOPAS, regarding financial guidelines.
- The project manager organised and documented **meetings with IfT** (30-06-2005) and **with TOPAS** (25-05-2005) and 14-12-2005 with TOPAS regarding financial guidelines.

The project manager organised, with the help of the partner IfT and TOPAS, the **visit of the project** by **PARTICIP** (Mr. Reisenberger) on the 20-5-2005, 17-05-2006 and Nov-2006.

Project meetings inside the beneficiary organisation (**LfUG, UBG**):

- 5 half days meetings: 14.12.2004; 26.7.2005; 03.08.2005, 11.8.2005 (without minutes), 25.08.2005, 29.11.2005.
- Coordination meeting LfUG and UBG 15.11.2005 presenting up-to-date news on UFIPOLNET and to prepare the employment of the engineer at the UBG. Project manager organised and documented a meeting on 20.12.2005 regarding the Engineer at the UBG.
- A half day for the half time meeting with LfUG/UBG/LfL: 5-Jul-2006, 10 participants (financial organisation, dissemination, technical status quo)

- press officer: half day meeting 1-Aug-2006; 20-Sep-2006

- Financial manager + Sub department 13: half day meeting 1-Feb-2006 regarding financial management (together with consultant); half day meeting 15-03-2006 same topic

- Sub department 14: half day meeting 23-3-06 regarding dissemination: Logo, leaflet, Layman report, notice boards

- UBG: 22-03-2006; half day meeting 9-May-2006 regarding tasks of the engineer at UBG

Project meetings with other organisations (**LfL, SAB, LANU, VOR, TMGS**):

- LANU (Landesstiftung für Natur und Umwelt): Half day meeting at the Blockhaus, Dresden as a possible location for final conference on 14-Jul-2006

- VOR, advertising agency: Half day meetings at VOR on the 9-May-2006, half day meeting on 19-May-2006.

- SAB (Sächsische Aufbaubank): Half day meeting at the SAB, Dresden city as a possible location for the final conference on 15-Aug-2006

- LfL (Landesanstalt für Landwirtschaft): First half day meeting with auditor of the project on 12-Sep-2006

- TMGS (Tourismus Marketing Gesellschaft): March 2007.

The updated **contract** for the **rooms** + **catering** for the final conference at the SAB (Oct-2007) were signed in January 2007.

The project manager created and updated the **project time plan**. The project manager helped the finance coordinator to write the **financial guidelines UFIPOLNET**. A **dissemination plan** (past and future events) has been made.

The project coordinator updated the **address file (see Attachments)**, **dissemination** plan, distribution list with postal address, with email address (>600). The **numbers of internet hits** are counted and documented since August 2005.

The financial plan has been made and sub plans attached to the partner contracts. The financial plan will be updated continuously.

Representatives of the beneficiary:

- **The finance coordinator:** Coordinates the Sub-Payment-Requests by partners and checks the invoices and other financial papers.
- **Sub department 14** helped to produce the **leaflets, sign boards** and to **organise** the **final conference**.
- The **press department** has launched press releases in January 2005 and February 2007. They plan to do this also in October 2007.
- The **president of LfUG** attended the press meeting in February 2007 and the final conference in October 2007.
- The desk officer in **sub department 22** is responsible for particle measurements in Saxony attended different meetings, like the 1st and 2nd annual meeting and the assembly team meetings.

Following **reports have been delivered** since the start of the project to the commission:

- Documentation of the kick off workshop (5 - 7-Jan-2005) incl. CD-ROM
- Short minutes including pictures during the visit of PARTICIP (20-07-2005)
- Financial Guidelines UFIPOLNET (Ver. 12-Oct-2005)
- Documentation of the 2nd annual workshop (16 - 17-May-2006) incl. CD-ROM
- Progress report 1 (7-Mar 2006) (including partner contracts)
- Progress report 2 (29-Sep 2006)

Partner:

Last partner contracts have been signed in 2006.

The beneficiary, TOPAS, IfT and ITM provided a declaration from the relevant national authorities that he must pay and may not recover the VAT for the assets and services required for the project. GSF and CHMU will have to send this declaration for 2005 and 2006 to the beneficiary.

An extension of the project duration is needed to keep the measuring phase for all measuring stations at the aim of one year, especially at the partner stations Augsburg, Prague and Stockholm.

7.3 Task 2 Designing and planning, assembly and calibration of the prototype

This is the main task in the beginning of the project. A lot of work has been done from TOPAS and IFT with the help of TSI providing more than planned device parts.

Objectives according to the proposal	Outcome
Definition of user requirements	O.K., see attachment to progress report 2.
Planning of the prototype	O.K., a **Report with blue prints** and pictures of the designed prototype is in a draft version of the pre version of the users' manual attached to progress report 2. The well documented users' manual will be available from TOAPS at the end of the project in middle 2007. All changes and experiences of the user will be taken into account.
Assembly of first prototype + Assembly of the other three protoypes	**O.K.;** TOPAS assembled last 3 of 4 UFI 330 in July 2006. Interfaces are ready end of 2007.
Calibration of first prototype	**O.K., first measurements in comparison to other DMPS** with promising results (May 2006). These measurements are documented in the pre version of the users' manual.
Tests and calibration of the other 3 prototypes	**O.K.** They have been tested during August - September 2006 and Jan 2007 by IfT. A **test report** of the 4 devices will be presented by IfT at the 3rd annual meeting in **May 2007** and is attached to this report.
Delivery of the prototypes	**OK: Dec- 2006** Dresden + **other 3 in February** by TOPAS/IfT, after checking the devices because of deviations between them

Technical problems occurred in middle to end of 2005 and were be solved by the assembly team with success. This problems caused a temporarily delay of about 10 months inside Task 2 Designing

which. The delay will be compensated by a shorter respectively parallel working Task 3 Implementation and shorter Task 4 Measuring Activities. The aim of the project to measure at least one year during the project duration is still realisable for measuring station in Dresden. Extension of 3 months of project duration is needed to fulfil this aim for all measuring stations.

After the results of tests with ambient aerosol August/September 2006 at IfT/UfZ-Eisenbahnstr. (s. Fig 5a,b), not all individual instruments produced the expected results (s. Task 5). The assembly team found that one part of the devices was not working well. These parts have been identified and were exchanged in the beginning of 2007. After these parts were exchanged, further tests were done. These comparisons showed good results between the 4 prototypes and the reference instrument (DMPS) in January 2007 (s. Task 5).

In Dresden, special monthly evaluations and checks will be performed to monitor the parts causing the past problems as well as to determine the necessary time for filter changing. Particle number concentration is tested in parallel with a CPC respectively distinct particle diameter samples are tested in parallel with a SMPS.

Fig. 5a, b *Photos of the 4 prototypes UFP 330 Sep-2006 at the common IfT/ UfZ (Helmholtz Zentrum für Umweltforschung – UfZ) calibration test laboratory in the Eisenbahnstr. in Leipzig situated in a flat. High polluted ambient air of a street canyon was measured.* *(Photo: TOPAS)*

7.4 Task 3 Implementation at the test sites / training for the participants

Task 3 started in June 2006, not in January 2006, as it was planned in the beginning. First, theoretical subjects were discussed during the annual workshop in May 2006.

The assembly team recommended a sampling system including an inlet and a dryer (see attached documents for details: Suggestion inlet and necessary main components). The parts for sampling have been mainly bought by the user group as it was discussed at the 2nd annual meeting.

The descriptions of the 4 measuring stations were made by the user team (see attachment), air quality parameter were compared (see. Fig. 6 a, b) and presented at the second annual workshop in Leipzig (May 2006).

Objectives according to the proposal	Outcome
1st Prototype installed in Dresden	26-06 – 09-07-2006 First test runs in the measuring station for two weeks.
Documentation of training sessions (Workshop May 2006):	June 2006
Interface communication in Dresden	Test in middle Sep together with CHMU
Delivery of 3 prototypes to user group after test at IfT	December Dresden; Augsburg, Stockholm, Prag February
Installation prototype 3 locations + **on site training** at the locations LfUG station: **October** **GSF** station: **End of October 2006** **CHMU** station: **Middle of November 2006** **IITM** station: **End of November 2006**	December Dresden; Augsburg, Stockholm, Prag February
First **test runs Dresden + structured data**	11-2006 / 12-2006, first data in Measuring network Dresden 01/2007
First test runs **Augsburg, Prague, Stockholm + structured data**	2-2006
Interface communication of Augsburg	02-2007
Interface communication of Prague	02-2007
Interface communication of Stockholm	02-2007

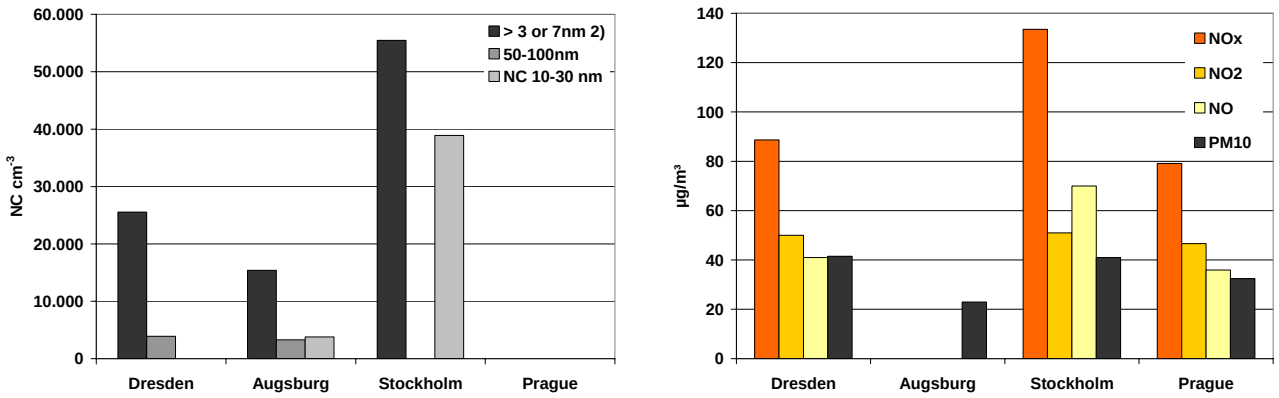


Fig. 6 a, b *Comparison of annual averages of particle numbers of different particle diameters of other installed measuring devices at the measuring stations; NOx, NO2, NO and PM10.*

7.5 Task 4 Measuring activities and demonstration

Task 4 started partly in October and again after a brake in December 2006 in Dresden (s. Fig 10), not in June as it was planned in the beginning of the project. The other measuring stations started to work in February 2007.

Objectives according to the proposal	Outcome
End of first test runs (February until March 2007)	All stations delivered reasonable data on first glance. Discussion of results in May at project workshop.

7.6 Task 5 Evaluation

Task 5 has been already started in August, not in September 2006, by running 4 devices in parallel at the IfT at a place with high traffic load and high concentrations of ultrafine particles (Leipzig, Eisenbahnstr.) (s. Fig 5a,b) not all individual instruments produced the expected results. The second comparison took place in January 2007 at the same place. The Status Evaluation Prototypes Report by IfT, January 2007 report says: “As a result of the comparison measurements, IfT is very convinced by the measurement accuracy and recommends installation of systems at four test sites. Now, experiences with long term measurements concerning quality stability are required. Thus, during February 2007 the instruments will be installed at the individual sites including setup of inlet and drying systems.” (see attachment for details)

Objectives according to the proposal	Outcome
See Task 3: comparison to reference instrument in August 2006 + Jan 2007	January 2007 gave good results. See text for details

7.7 Task 6 Dissemination

See for details: 8 Dissemination.

A dissemination report and plan for past and future events was created. A homepage in German and English is updated every month. A logo and notice boards were created together by all partners and an advertising agency. A leaflet in English and German was created in September 2005. Additional leaflets were printed in English, German, Czech and Swedish in the middle of 2006. The homepage address was shortened to: www.ufipolnet.eu. Several oral presentations of the project were held. 3 press releases in Dresden respectively Stockholm were sent and several press organs published the results as well as 2 TV-Broadcasts (Saxony (MDR) in German and Sweden (TV2) in Swedish). (see attachment for summaries and web pages for detailed feedback)

8 DISSEMINATION ACTIVITIES AND DELIVERABLES

Deliverables / Event	Lang.	Date	Audience	Contribution from
Homepage http://www.umwelt.sachsen.de/lfug/luft-laerm-klima_ufipolnet.html; changed address, links to other projects/institutions, English; Newsletter	DE, EN	17-01-2005; 16-09-2005; 3-Feb-2006	scientists, network-managers, public in general interested in fine particles	LfUG
Homepage www.ufipolnet.eu changed address, links to other projects/institutions, English; Newsletter	DE, EN	4-Aug-2006	scientists, network-managers, public in general interested in fine particles	LfUG
Flyer (Leaflets) in the languages of all partners: - German, English done (800 first circulation); - Czech and Swedish planned until end of 2006	DE, EN	Sep-2005	scientists, network-managers, public in general interested in fine particles + general public	LfUG
Flyer (Leaflets) in the languages of all partners: - English (5000 second circulation); - New professional Leaflet circulation 3000 De 1500 S, 1500 Cz	DE, EN, Cz, S	Aug-2006; Sep 2006	scientists, network-managers, public in general interested in fine particles + general public	LfUG
Leaflets at congress/event: - 500 "In motion visions for urban mobility and clean air" in London; - 20 copies Kick-off LIFE Projects in 2005; - 200 leaflets "PM 10 - Challenge or fait ?" in Graz; - 10 VDI AG Partikelmessungen	EN	15-16-Sep2005; 26-27-Oct-2005; 17-18-Nov2005; 30-09-2005	Air Quality Experts and authorities and media; VDI Working group Particle counting	EU Commission / Mr. Kaschl; Astrale GEIE - Particip GmbH Mr. Reisenberger; LfUG in cooperation with LIFE 04 project KAPA GS; LfUG/Dr. Löschau
Leaflets at congress/event: - 500 EN "International Air Conference" in St. Paul USA, 1600 participants; - 100 – 300 EN to all partners;	EN/DE	11-15-Sep-2006 Aug-2006	Air Quality Experts; scientists, network-managers Members of partner organisations	LfUG in cooperation with TOPAS LfUG in coop. partners
- 100 GdCh meeting in Halle/Germany 4-6-Oct-2006		Okt. 2006	Chemist	LfUG
- 20 Workshop “Ultrafeinstaub” UBA, IfT, Leipzig		March 2007	German scientists, network experts	LfUG in coop. partners
- 30 “Die Einrichtung von Umweltzonen in den Städten”, Dortmund		March 2007	Local + regional Authorities	LfUG
- 300 KAPA GS, Klagenfurt, Austria (28 - 30-Mar-2007		March 2007	authorities, politicians, NGOs, scientists, network managers	LfUG in Coop. with KAPA GS

Newsletter: UFIPOLNETnews No. 1-12	EN	27-Sep-2005 03-02-2006; 29-03-2006; 28-04-2006; 21-06-2006; Every month: 08-2006 – 03-2007	About 500 – 600 experts and authorities, other persons	LfUG
Oral + Poster presentation GdCh meeting in Halle/Germany 4-6-Oct-2006	DE/EN	4- 6-Oct-2006	Scientists/Chemists	LfUG
Press release: - Germany Kick-off (3 articles in newspapers, 2 online articles, 2 press agencies)	DE	23-Jan-2005	general public, local authorities, local politicians	LFUG
- Germany begins measurements (5 articles in newspapers, 3 online articles, 1 press agency, 1 TV)	DE	7-Feb-2007		LfUG
- Sweden begins measurements (2 online articles, 1 TV broadcast SV2)	SV	5-Mar-2007		ITM
kick off meeting minutes with next actions to follow + Documentation CD_ROM + Booklet	EN	5-7-Jan-2005	LfUG officials, employee of partners	partners

Indicators

Description	Outcome
Use of the **homepage: Number of hits**	200 – 2000 per month (s. below for details)
Published releases: Number of published **press releases**	1 in 2005; 2 in 2007
Brochures available in the languages of all project partners	Leaflets: 1 German, 1 English , 1 Swedish, 1 Czech
Newsletter	1 in 2005, 9 in 2006, 3 in 2007
Participation at final conference Number of participants	(planned: about 150)
Layman report	Planned in 2007: about 5,000 – 10,000

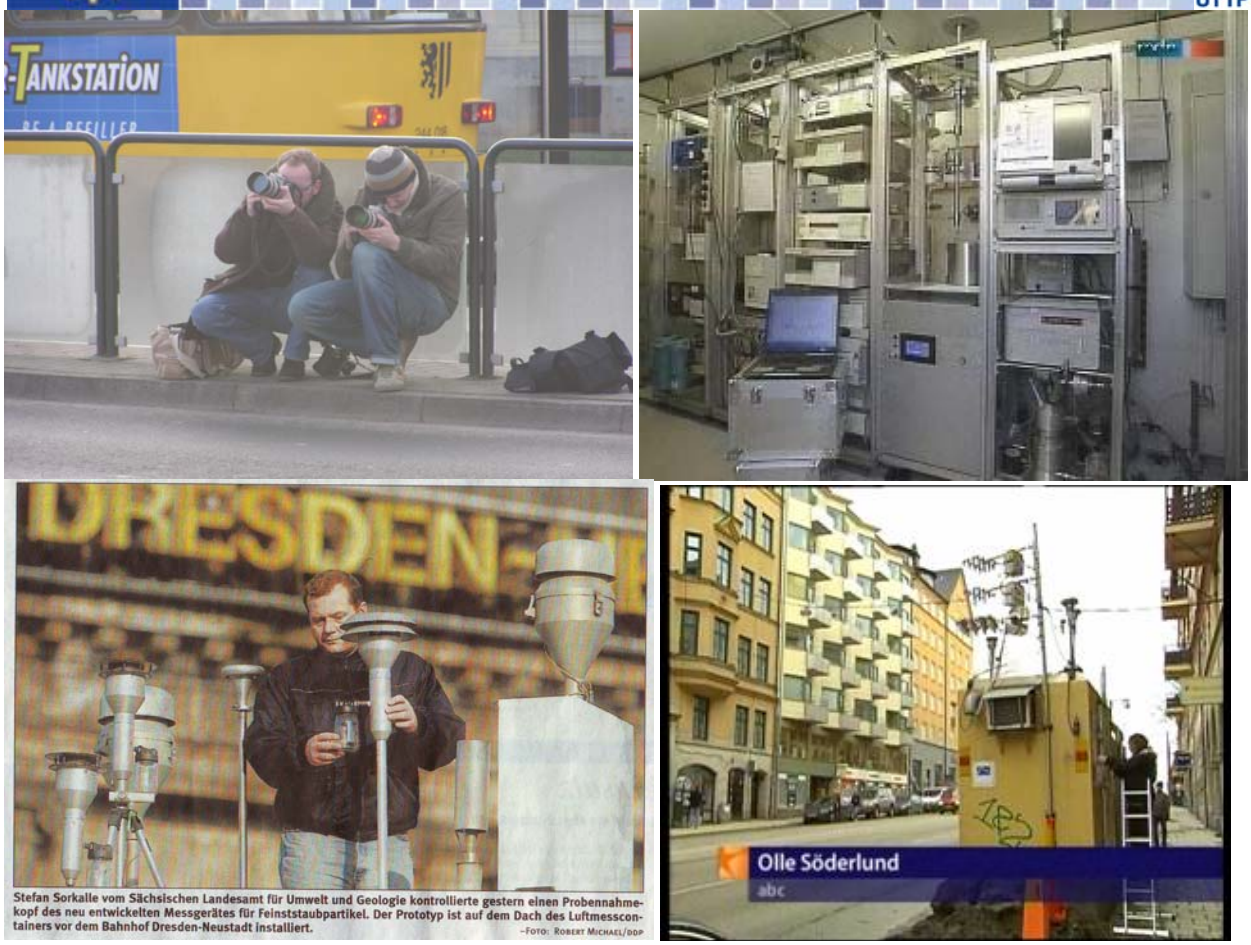


Fig. 7 Press event on 7-Feb-2007 in Dresden: Photographers at work *(photo: H. Gerwig);* picture from TV-broadcast on same day by MDR *(editor: F. Wend)* and in newspaper (*Freie Presse, page 3, 8.2.2007);* Press event Mar-2007 in Stockholm: picture from TV-broadcast *(TV2 20-Mar-2007, ABC-editor: O. Söderlund)*.

Planned deliverables as stated in the proposal under Task 6 Dissemination

Deliverables / Event	Lang.	Date	Audience	Contribution from
Oral + Poster presentation	DE/EN			
EAC Salzburg (9- 14-Sep -2007)	EN	Sep-2007	Scientists	IfT, all partners
Press release: - Germany: Final Conference + panel discussion	DE	Sep-2007	general public, local authorities, local politicians	LfUG
Leaflets at meetings, conferences				
100 MTK 42 (Messtechnisches Kolloqium) in Germany	DE	May-2006	network-managers	LfUG in Coop. with LANU NRW
500 EAC Salzburg, Austria (9- 14-Sep-2007)	DE/EN /CZ/SV	Sep-2007	Scientists, authorities	LfUG, TOPAS
Layman report Brochure (5 - 10,000 cp) with short information about project results and background	DE, EN, (SV, CS)	Oct-2007	general public	LfUG
Scientific papers: preparation begins after 6 months of measurements	DE, EN	End 2007	scientists	IfT, all partners
Report with recommendations for the expert groups	DE	Nov-2007	scientists, network-managers	LfUG, all Partners
Report of the final Congress	EN	Oct-2007	scientists, network-managers	LfUG, all Partners

Fig. 8 *Info plates and running instruments at all 4 stations Feb-2007: Stockholm (up, left), Augsburg (up, right), Prague (down, left), and Dresden (down, right) (Photos: ITM, GSF, CHMU, IfT, LfUG).*

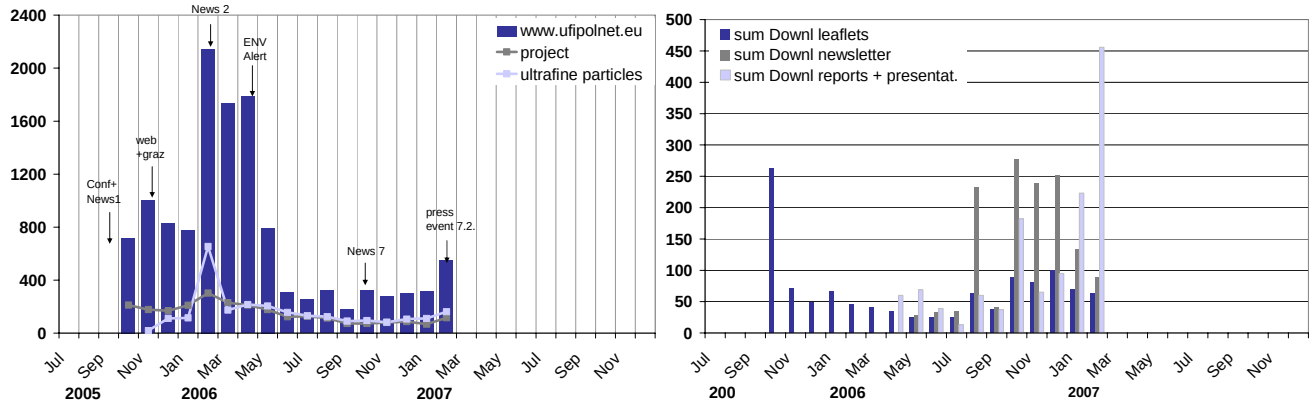


Fig. 9 *a: Number of hits UFIPOLNET homepage Jul-2005 – Dez-2006*
b: number of downloads of leaflets and UFIPOLNETnews

Use of the homepage is monitored via the number of hits since October 2005. Between 200 and 2000 hits per month were monitored. The announcement of the website by leaflet at conferences in September and November 2005, UFIPOLNETnews 2 in February and ENV Policy in March 2006 showed a positive effect on the number of hits. The UFIPOLNETnews2 had a significant advertising effect for the sub-page, where ultrafine particles are described. UFIPOLNETNews 7 were sent around to more than 500 email addresses but without attachment – only a link. This could be the reason for doubling hits from September to October. The advertising effect of the press conference in February 2007 doubled the homepage hits from January. The interest in the press-webpage was roughly the same in February as for the project itself because of a direct link from the top-page of LfUG to that page.

In October, the sum of all downloaded newsletters increased by a factor of 5 and the sum of leaflets doubled. The presentation of UFIPOLNET presented at the TU-Dresden in Nov-2006 was very popular (362 downloads in Feb-2007) which led the sum of downloads and presentations to rise from December 2006 to February 2007.

Deliverables not mentioned in UFIPOLNET proposal

Deliverables / Event	Lang.	Date	Audience	Contribution from
HTML and PDF-File in Database	EN	End of 2004	Internet user, in LIFE-Programme interested people	EU COM
PDF-File introducing LIFE 04 Projects	EN	End of 2004	LIFE-Programme interested people	EU COM
Bullet board messages: EU-project INTEGAIRE ; Werkstatt Feinstaub	EN, DE	27-9-2005	readers of websites: scientists, network-managers, public in general	Sergio Ferreira; LfUG
short description on website + weblink from: Feinstaub-Werkstatt Berlin; NANOSAFE 2; ITM; GSF	DE, EN	17-10-2005; 18-11-2005; 30-11-2005	scientists, network-managers, public in general interested in fine particles	Berlin authorities; EU FRP6 Project NANOSAFE2; partner ITM and GSF
announcing UFIPOLNET: 88th Meeting of LAI-Unterausschuss "Luft/Überwachung", Minutes; European Aersol Conference contact to Mr. Jacob (CAFE)	DE	22 until 23-Feb-2005;	Air Quality Experts of federal and national authorities; CAFE	Ministry of Environment Saxony; LfUG (Gerwig)
oral presentations: 1 hour during a professional training: " UFIPOLNET – ein transnationales EU-Projekt"	DE	31-1-2006;	10 co-workers at Saxon authorities;	LfUG (Gerwig)
VDI AG Partikelmessungen		14 15-Feb-06	Members of VDI AG	LfUG (Gerwig)
Workshop Immissionsschutz		10-Nov-06	10 co-workers at Saxon ministry for Environment	LfUG (Gerwig)
EU-Projekt misst Ultrafeinstaubpartikel an Verkehrsschwerpunkt in Dresden (1,5 h incl. discussion)		29-Nov-2006	Kolloquium Inst. f. Verkehrsplanung und Straßenverkehr	LfUG (Gerwig)

9 EVALUATION AND CONCLUSIONS

The process of Task Management and Dissemination were completed. Task 2 needed more time, than expected (10 months), therefore Task 3 implementation was shortened and Task 4 measurements started 12 months later than expected. Consequently, only 1 station would measure during a 1 year period as stated in the proposal during planned project duration. Therefore, a 3 month project extension is needed. Task 5 evaluation started earlier than planned to aid Task 2 designing.

The problems encountered where of technical reasons and were solved. The partnerships show good developments regarding dissemination activities as well as the cooperation in technical questions between assembly and user team. Almost all partners were able to attend all of the annual meetings. There was an added value when the user perspective influenced the planning of building the new instrument as well as during the deciding process, that a standardized sampling system was needed, which was not planned in the proposal.

The technical application looks good and the aim of the task to develop and to test an instrument in routine measuring networks will be fulfilled. The results of different instruments are similarly reproducible. The limiting factors for the application at places with less number of particles in a city background (Augsburg) will be evaluated.

The commercial application in terms of economic feasibility shows potential. The first interested persons asked for the price of the UFP 330 and the possibilities to buy it. The price will be comparable to a common PM2.5 sampler used in routine monitoring networks. The publications at the European Aerosol Conference will help to underline the good quality of the UFP 330 with respect to data quality at a reasonable price.

Potential target groups were contacted personally and by newsletter, webpage or printed media in case of conference announcements. The VDI will publish in VDI 3867 Blatt 3 (Mobilitätsspektrometer) UFP 330 as an example. Members of the CAFÉ working group were met at different conferences and are invited to the final conference in October 2007. Other interested groups like health experts are contacted by newsletter and are invited to the final conference.

The project-objectives were almost all reached or evenly balanced in such areas as dissemination activities. The exceptions from this are: The range of particle sizes to be measured had to be reduced from minimum limit 12 to 20 nm. The upper limit of 500 nm will be met. The objective to measure during one year will be at least met in Dresden and if the extension time of 3 months will be accepted, also at the other 3 stations.

Environmental benefits will be no butanol use and therefore, no volatile organic compounds or radioactive source compared to common particle size classifier. The instrument will lead to the possibility to monitor ultrafine particles in routine measuring networks with only basic understanding of the subject by the persons working with it. There is a positive presumption, that some routine measurement networks and health experts will buy the UFP 330.

A cost-benefit analysis of a potential user of the new instrument will show that a user friendly and adequately tested device for measuring network container will be more reasonable, than only comparable devices with a couple of disadvantages.

The results of the measurements at the 4 stations are applicable to a lot of other European measuring places from northern Europe to middle Europe. A user will have very low barriers to use the new instrument. There are also potentials to measure at other environments, like in traffic tunnels, perhaps at working places with high loads of natural or anthropogenic particles. The limiting factor will probably be caused by lower particle numbers below 1000 cm^{-3}. The monitoring of the size distributions of high number of particles in environments equal or less humid as in ambient air will be possible as well.

The project has an innovative aspect on international level, because the instrument is one of the first to be put easily into a routine measuring container including proven connections to the peripherals up to the central database at the 4 measuring places.

The dissemination activities showed the impact on relevant groups. Leaflets in all languages of partners are available; therefore every one of partner organisation is able to present the project at internal and external meetings. A couple of presentation have and will reach important groups and possible future users. The general public was already reached by press and TV-broadcastings in Saxony and Sweden. Every press release had a good impact, mostly in a local to regional area, and also sometimes on a national level. Because of the invitations and announcement for the final conference, the professional interested groups will be reached in a broad way. The webpage gives information to the general public as well as to the scientists or practical users or authorities. The monitoring of the page hits showed the impact of newsletter, conference presentations and press activities.

There is also job creation potential if there is a high demand of the UFP 330. There are possibly a couple of thousand routine air measuring stations in Europe which could use this instrument, but it is not yet known how many other applications beside high traffic roads are possible.

A revision of the AIR QUALITY FRAMEWORK DIRECTIVE (96/62/EC) is planned for 2013 by the European Commission. It will be discussed if PM_{10} limits will be changed to other metrics, like PM2.5 or PM1 or perhaps numbers of ultrafine particles. There is still a discussion about a limit value for measuring ultrafine particles in the exhaust of cars in an EU-directive.

To measure number concentrations of particulate matter at different locations over a longer period will be one way of showing the reduction of number concentrations of particulates in European cities according to new directives aiming to reduce particulate mater. This can prove the effect of the TSAP (Thematic Strategy on Air Pollution, Sep-2005) on the particles, which have a negative health effect. The EU-project UFIPOLNET aims to show, that measurements of number of particulates in ambient air with a routine measuring container can be easy, cheap and reliable to fulfil the possible new limit value for different particle number concentrations in a new EU-directive.

It is planned to measure with the UFP 330 at all 4 stations for the next 5 years. In the next months it will be determined whether or not the normal conditions and the permanent run of the instrument will not alter its qualities. The project will go on as it was planned, as all partners are motivated. There is a delay in subpayment request delivery with only one partner of the user team, however, in the technical sense, he is performing his tasks well.

10 PLANNED PROJECT PROGRESS

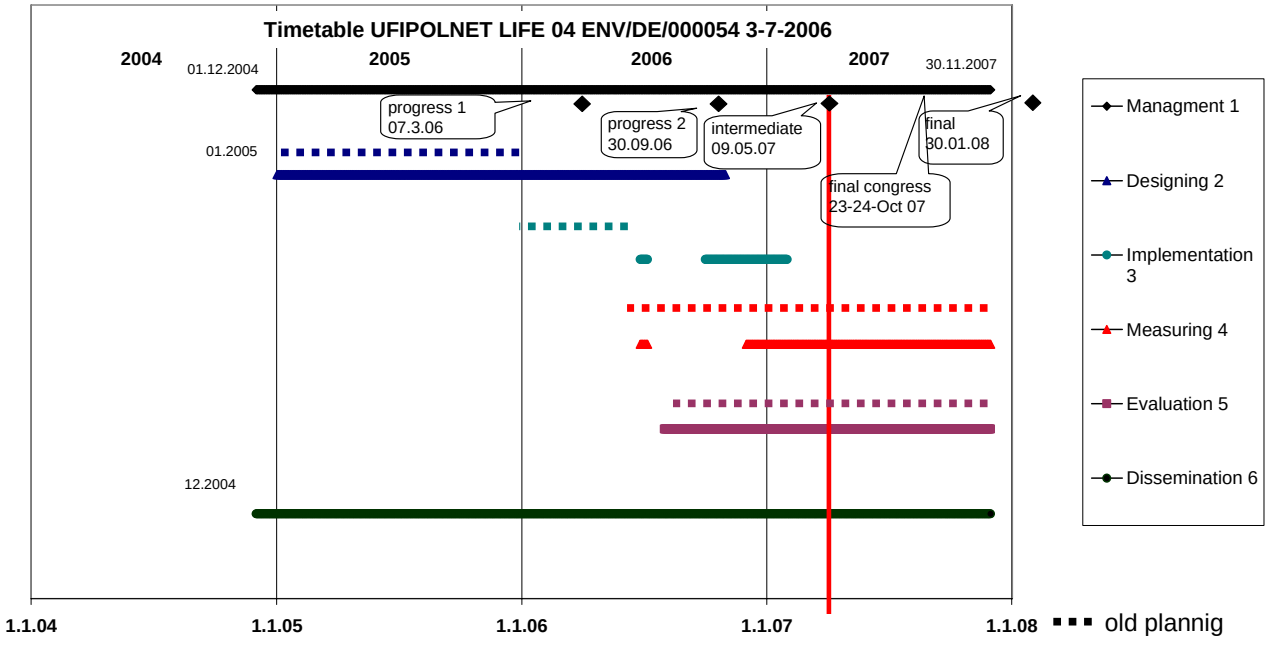


Fig. 10 *Progress and planned activities*

Task 1 Management

The 3rd workshop on 31-May-2007 in Leipzig and the 4th workshop 22-Oct-2007 just before the final conference from 23-24-Oct-2007 in Dresden at the SAB (Sächsische Aufbaubank) are planned.

The preparation of the final report will begin in October 2007. Last modifications are planned to end in December after all partners have sent the sub payment requests and copies of the invoices in time. The auditor of the LfUG will check the finance report of the interim report prior to official posting in January 2008. All these dates would change to plus 3 months if a project extension is allowed.

Milestone:

- On May 2007, the 3rd annual workshop will be held at the IfT-Leipzig with all partners, including the user team. First measurements and results of the project as well as practical operating procedures will be discussed there.
- 4th workshop 22-Oct-2007 in Dresden at the SAB (Sächsische Aufbaubank). Organisational topics and discussion of results.
- Final conference from 23-24-Oct-2007 in Dresden at the SAB (Sächsische Aufbaubank)
- Final report in January 2008 (or April 2008 in case of extension)

Task 2 Designing

- First version of users manual: May 2007 to 3rd workshop (one technical description + 2 page practical description of operation / “SOP”).
- Final version of users manual incl. SOPs: Oct-2007 to final conference

Task 3 Implementation (None, already done)

Task 4 Measuring

Since 15-1-2007 the UFP 330 is measuring with all sampling inlets and dryer. Since 24-Jan-2007 data is transferred to the central measuring computer in Radebeul-Wahnsdorf and Dresden-Klotzsche.

Since February 2007 all instruments are running at the stations.

- 05/07 Documentation of first structured data since: Dec 2006 (Dresden); since March at Augsburg, Stockholm and Prague
- - 11/07 or Feb/08 until Project end: **Maintenance** of the device at the partner locations
- 05/07 **Documentation** of **first structured data -> presentation at 31st may** meeting (Augsburg, Dresden, Stockholm. Prague?)
- 05/07 **End** of **first test runs**
- 05/07-end project: Complete **Database** with **datasets from 4 locations**
- 05/07-end project: **Validation protocol** of the log-book-reports **every 2 months**
- 10/07 Report with the **presentation of the data +** Report about **Stability** of delivering of reliable data (Availability 80%)
- 10/07 Report with **improvements of the device and the methods**
- 10/07 Continued **improvement** of the **device and the methods** to help **improve user handbook**
- 01/08 Dresden, 04/08 other stations: Begin of regular measurement activities: **After 1 year test**

Task 5 Evaluation

- 05/07: Documentation of test of 4 prototypes in Leipzig Aug -2006 by IfT.
- 05/07 How to make first evaluations with UFP 330: Hints to user group from IfT (given in words by IfT at stations; will be written down in the Users Manual)
- 05/07 Documentation of **test of 4 prototypes Aug-06**
- 05/07 How to make **first evaluations** with UFP 330: Hints to user group
- 05-10/07 **Comparison** of the data **with** the data from **reference instruments** (Dresden, Augsburg, Stockholm) -> for final conference
- 10/07 **Evaluation Report** on evaluation **procedures** / **Data quality**
- 10/07 Evaluation Report on **user friendliness**
- 10/07 Evaluation Report on **technical issues** of UFP 330

Task 6 Dissemination

- 05/07 Layman report will be prepared as a first version
- 05/07: UFIPOLNETNews 13 will report about the interim report.
- 10/07 Press release: Evening for public + conference
- 10/07 22-Oct-2007 an evening panel discussion with experts from science, monitoring networks, and local/federal authorities for the general public in Dresden.
- 11/07 Abstract report of final conference
- 11/07 Report with recommendations for the expert groups about measuring Ultrafine particles
- 12/07 Scientific Article

Milestone:

- 09/07: Layman report printed and partly distributed in Germany
- 10/ 07 Final conference from 23-24-Oct-2007 in Dresden at Sächsische Aufbaubank.

11 COMMENTS ON FINANCIAL REPORT

This chapter is not included in the WEB-Version of this report.PROJECT COSTS INCURRED

12 APPENDICES

Technical:

- **Status Evaluation Prototypes by IfT, January 2007 (WORD)**
- **List of operating and error states of UFP 330 (Excel)**
- **Component list of particle size classes to the measuring network Dresden (Excel)**

Dissemination:

- **Press map 31-Jan-2006 in Dresden for a press background talk: "Sperrvermerk"; Thesenpapier; Oral presentation, summary of former LfUG-project about size segregated particles, leaflet in German*, leaflet for air measuring stations Saxony*, 4 photos of event**
- **Press release 7-2-2007 in Dresden and press echo for photo-date at the measuring container: Invitation, Photos*, TV-spot (* and some pictures), press articles (* partly), radio-broadcasts***
- **Press release 5-3-2007 in Stockholm and press echo: TV-spot (* partly pictures + short description), press articles***
- **Poster at Final Conference LIFE Project KAPAGS March 2007**
- **UFIPOLNETnews No. 10**
- **"LIFE-Projects in Germany" by DG ENV: UFIPOLNET as one example**
- **Press article in GIT 12-2006 "Umweltbelastung durch Feinstaub" (DE)**

(* = only on CD-ROM)

13 Imprint

UFIPOLNET TECHNICAL INTERIM REPORT 5 / 2007

Cover picture:
UFP 330 in Dresden, Schlesischer Platz. Jan 2007
Photos: L. Hilemann

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