

European Network on New Sensing Technologies for Air Pollution Control and
Environmental Sustainability - *EuNetAir*

COST Action TD1105

1st TRAINING SCHOOL of COST Action TD1105

Environmental Technologies and Air-Quality Monitoring

*UNIVERSITAT de BARCELONA (UB), MIND-IN2UB - Department of Electronics
in cooperation with CSIC-IDAEA, Barcelona*

Barcelona, 13 - 15 June 2013

Action Start date: 16/05/2012 - Action End date: 15/05/2016



UNIVERSITAT DE BARCELONA

Albert Romano-Rodriguez, *Action Training Schools Coordinator*
Universitat de Barcelona, Barcelona, SPAIN



Michele Penza, *Chair of COST Action TD1105*
ENEA, Brindisi, ITALY



Outline



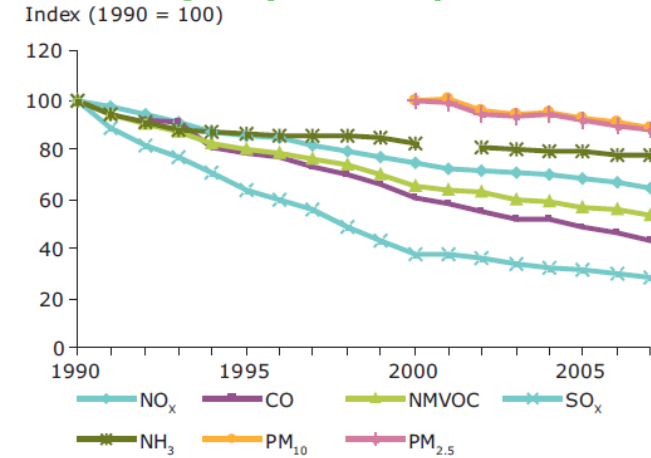
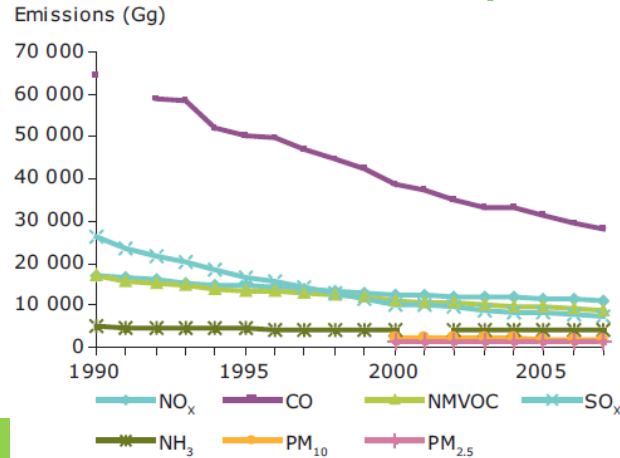
- **Background / Problem Statement:**
 - ✓ *Scientific context*
 - ✓ *Challenges addressed by the Action*
- **MoU Action's Objectives: *Main and Secondary***
- **Action Research Directions:**
 - ✓ *Methodology and Innovation*
- **Working Groups**
- **Future Plans and Challenges: *Expected Impact***
- **Concluding Remarks**

Scientific context: Air Quality Control (1/2)



Figure ES1 EU-27 emission trends in absolute (Gg) and relative terms for NO_x , CO, NMVOCs, SO_x and NH_3 between 1990 and 2007 (index year 1990 = 100), and for PM_{10} and $\text{PM}_{2.5}$ between 2000–2007 (index year 2000 = 100)

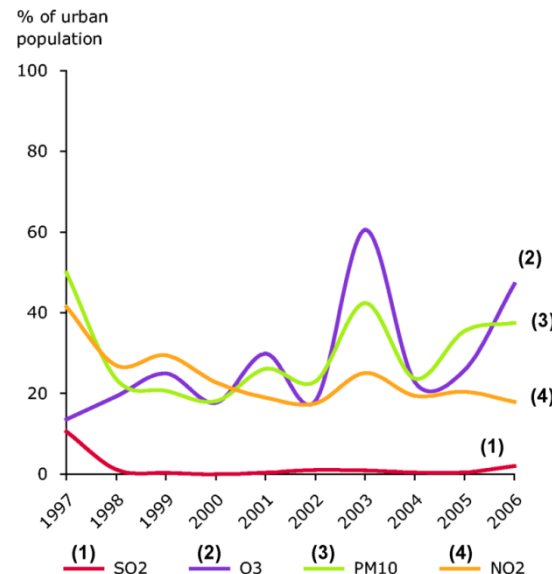
European Environment Agency, EEA Report 8/2009



Some Environmental Emergencies:

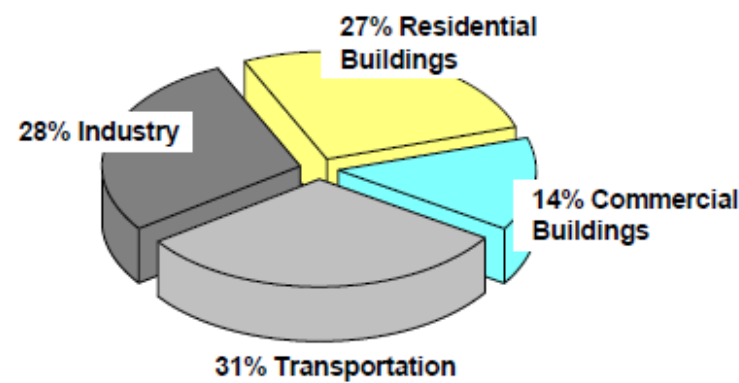
1930 - Meuse Valley (Belgium)
 1952 - Great London Smog (UK)
 1954 - Los Angeles (USA)
 1984 - Bhopal (India)
 2005 - Teheran (Iran)
 2006 - Hong Kong (China)
 2008 - Shanghai, Peking (China)
 2012 - Taranto (Italy)

AMBIENT AIR QUALITY
EU DIRECTIVE 2008/50/EC and Daughters



Pollutant	Limit Level
NO_x	100, 200 ppb
CO	8 ppm
SO_2	130, 190 ppb
O_3	$120 \mu\text{g}/\text{m}^3$
PM_{10}	$50 \mu\text{g}/\text{m}^3$
BTEX	$6 \mu\text{g}/\text{m}^3$
PAH (BaP)	$1 \text{ ng}/\text{m}^3$
$\text{PM}_{2.5}$	-

Scientific context: Indoor/Outdoor Energy Efficiency (2/2)



Primary energy consumption in the EU¹

¹ O. Seppanen,

11th Conference on Indoor Air Quality
2008, Copenhagen, Denmark

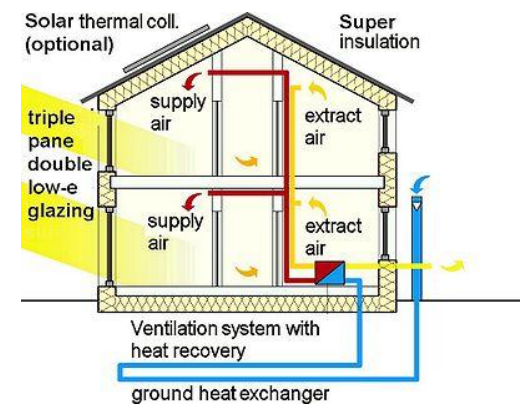
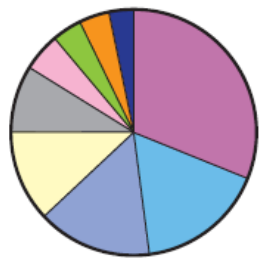
41% Primary Energy consumed in Buildings:

- 2/3 in Residential Buildings
- 1/3 in Commercial Buildings

Energy Performance of Buildings EU Directive
EPBD 2010/31/EC

Figure 2 – Total Energy Consumption by End Use
Adapted from E Source, 2006

- Ventilation 4%
- Refrigeration 3%
- Space Heating 31%
- Water Heating 17%
- Cooling 15%
- Lighting 12%
- Other 9%
- Cooking 5%
- Office Equipment 4%



Source: Environmental Protection Agency's National Action Plan for Energy Efficiency Sector Collaborative on Energy Efficiency Hotel Energy Use Profile

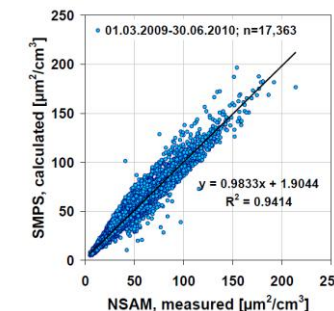
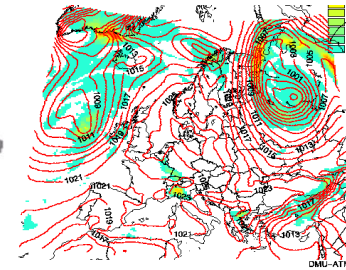
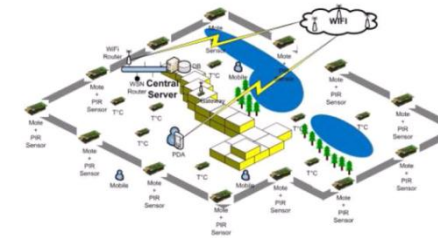
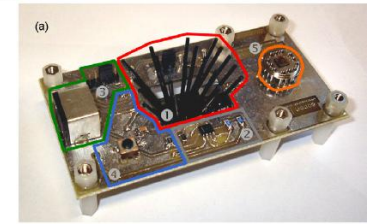
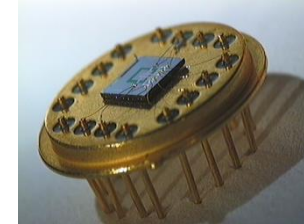
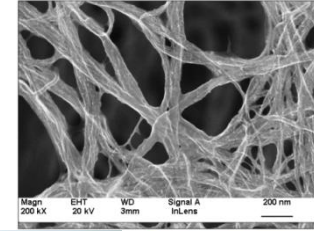
IAQ by WORLD HEALTH ORGANIZATION

Indoor Air		Typical Substances		Cure
Contamination Source	Emission Source	VOCs	Others	
• Human Being	• Breath	Acetone, Ethanol, Isoprene		demand controlled ventilation
		CO ₂		
	• Skin Respiration & Transpiration	Humidity		
		Nonanal, Decanal, α-Pinene		
	• Flatus	Humidity		
		Methane, Hydrogen		
		Limonene, Eucalyptol		
	• Cosmetics	Alcohols, Esters, Limonene		
		Unburnt Hydrocarbons		
		CO		
		CO ₂		
• Building Material • Furniture • Office Equipment • Consumer Products	• Combustion (Engines, Appliances, Tobacco Smoke)	Humidity		permanent 5-10% ventilation
	• Paints, Adhesives, Solvents, Carpets	Formaldehyde, Alkanes, Alcohols, Aldehydes, Ketones, Siloxanes		
		Toluene, Xylene, Decane		
	• PVC			
	• Printers, Copiers, Computers	Benzene, Styrene, Phenole		

Table 1 – Typical Indoor Air Contaminants (VOCs and others)

Challenges addressed by Action TD1105 (1/1)

- **Nanomaterials for AQC sensors**
- **Low-cost Gas Sensors**
- **Low-power Sensor-Systems**
- **Wireless Technology (*Environmental Sensors Network*)**
- **Air Quality Modelling**
- **Environmental Measurements**
- **Standards and Protocols**



Action's Objectives (1/3)

MoU Main Objectives of COST Action TD1105:

- To establish a *Pan-European multidisciplinary R&D platform* on new sensing paradigm for Air Quality Control (AQC) contributing to sustainable development, green-economy and social welfare.
- To create *collaborative research teams* in the ERA on the new sensing technologies for AQC in an integrated approach to avoid fragmentation of the research efforts.
- To train *Early Stage Researchers (ESRs)* and new young scientists in the field for supporting competitiveness of European industry by qualified human potential.
- To promote *gender balance* and involvement of ESRs in AQC.
- To disseminate *R&D results on AQC* towards *industry community* and policy makers as well as general public and high schools.

Action's Objectives (2/3)

MoU Secondary Objectives of COST Action TD1105:

- To provide a *platform between scientists* in the field of materials, nanotechnology and sensor-systems and other scientists such as environmental protection engineers, public agencies managers, stakeholders, decision-makers, aiming to improve best practices in AQC and explore the potential role of new generation of low-cost sensing devices.
- To investigate *sensing mechanisms* of functional nano-materials for gas measurement and identification of the best available nano-materials, providing concepts and harmonising pre-standardised methods; based on available datasets from partners.
- To assess *degradation rates and lifetime* of sensor elements in defined environmental conditions and evaluate interactions of sensitive materials with outdoor/indoor pollutants; based on datasets from ongoing and historical field deployments of low-cost sensors.
- To investigate *the best available technology* for sensor deployment, communication, power supply and data storage, analysis and display.

Action's Objectives (3/3)

MoU Secondary Objectives of COST Action TD1105:

- To monitor real-world environmental conditions with *experimental campaigns* to assess composition of *indoor air* (buildings: house and office) and *outdoor air* (urban areas and industrial sites) and to investigate how such data can be utilised in air pollution modelling.
- To approach *standardisation of methods* for air quality measurements, e.g. harmonisation of test procedures, chemical analysers, post processing, protocols, etc..
- To disseminate *knowledge* on functional materials and sensor-systems for AQC; to aid better focusing of Europe's resources by coordinated efforts in AQC and environmental sustainability to strengthen Europe's competitiveness and scientific excellence improving capacity building and networking to tackle global challenges in a big market in the mid-long term.

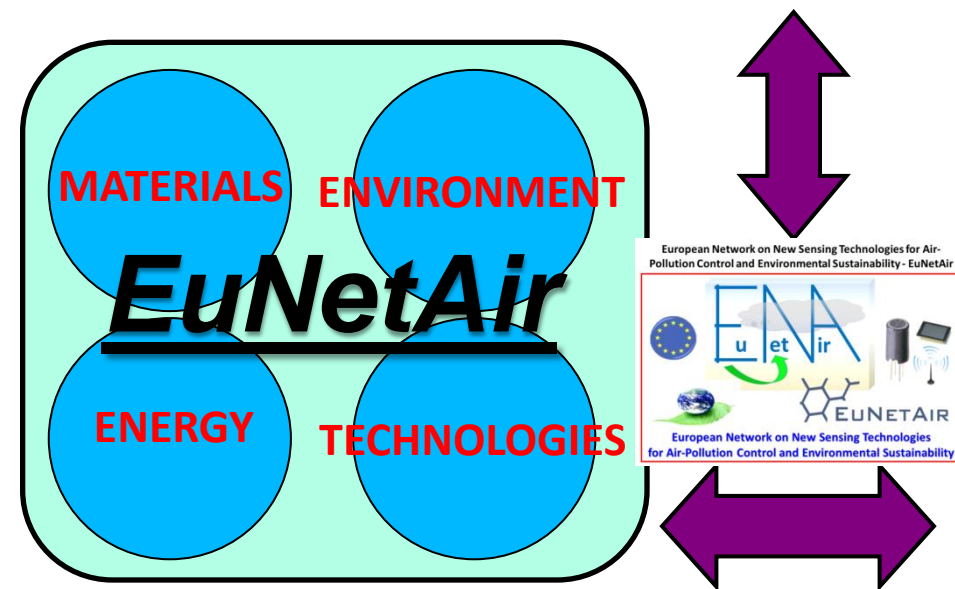
COST Action EuNetAir: Some National Research Projects



COST Action EuNetAir: **INNOVATION** (1/2)

Complementarity with other COST Actions:

- ES0602 Chemical Weather Forecasting and Information Systems
- MP0701 Composites with Novel Functional and Structural Properties by Nanoscale Materials
- MP0901 Designing Novel Materials for Nanodevices: From Theory to Practice
- TU0902 Integrated Assessment Technologies to Support the Sustainable Development of Urban Areas



RELATED FP6-FP7 PROJECTS:

- NANOS4, NMP
- S3, EU-RUSSIA COOPERATION
- ORAMA, NMP
- NANO2HYBRIDS, NMP
- AIRMONTECH, ENV
- AQUILA, ENV
- OFFICAIR, ENV
- CITI-SENSE, ENV
- GOSPEL, Network of Excellence in Artificial Olfaction
- FLEXSMELL, PEOPLE Marie-Curie Action

INNOVATION of ACTION:

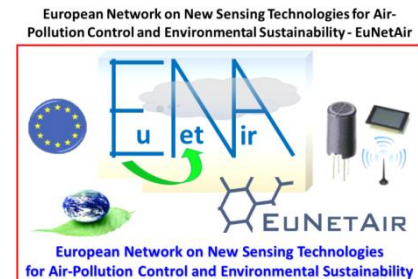
Integrated approach on AQC for environmental sustainability by cooperative networking of multidisciplinary research on nanomaterials, gas sensing technologies, wireless sensor technologies and networks, environmental measurements, ambient intelligence, air quality modelling, chemical weather forecasting, harmonisation of measurements, protocols, methods, standards and procedures for commercialisation of low-cost AQC sensors.

Action Research Directions: *Innovation* (2/2)

Innovation Highlights of COST Action TD1105 *EuNetAir*:

The Working Program includes multidisciplinary Research at integrated approach and trans-domain multi-scale level:

- Nanomaterials for low-cost AQC sensors
- Improved gas sensor systems and low-power sensing microdevices
- Wireless sensor networks and distributed intelligence
- Air-quality modelling and chemical weather forecasting
- New protocols, standards and methods for AQC sensors
- Harmonisation of environmental measurements
- Guidelines for AQC systems and transducers
- Environmental sustainability and energy efficiency



Action TD1105 *EuNetAir*: Working Groups (1/5)



WG1:
**Sensor Materials
&
Nanotechnologies**

WG2:
**Sensors, Devices
& Systems for AQC**

**INTERDISCIPLINARY
SPECIAL INTEREST GROUPS**

WG4:
**Protocols &
Standardisation
Methods**

WG3:
**Env. Measurements
&
Air Pollution Modelling**

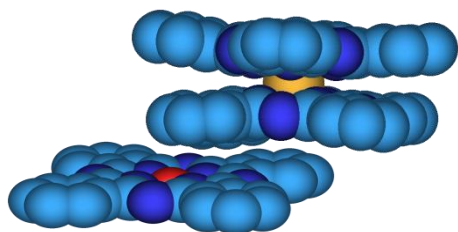
MANAGEMENT COMMITTEE:

CORE-GROUP & STEERING COMMITTEE

- *Editorial Board*
- *Dissemination*
- *Training Schools*
- *Gender Balance*
- *Early Stage Researchers (ESR)*
- *Short-Term Scientific Mission (STSM)*
- *Intellectual Property Rights (IPR)*
- *Local Organizing Committee (LOC)*

- **SIG 1: Network of Spin-offs**
- **SIG 2: Smart Sensors for Urban Air Monitoring in Cities**
- **SIG 3: Guidelines for Best Coupling Air Pollutant-Transducer**
- **SIG 4: Expert comments for the Revision of the Air Quality EU Directive**

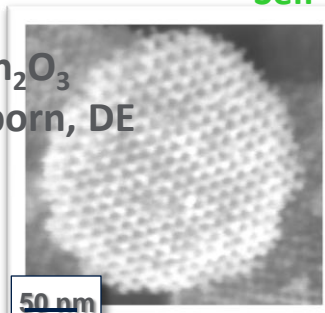
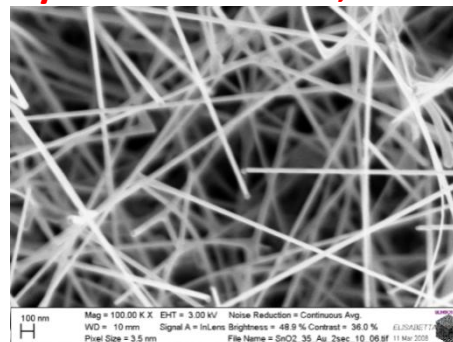
- **Sub-Working Group 1.1:**
Metal oxides nanostructures for AQC gas sensors.
- **Sub-Working Group 1.2:**
Carbon nanomaterials for AQC gas sensors.
- **Sub-Working Group 1.3:**
Emerging sensor materials (organic/inorganic, hybrid, nanocomposites, polymers, functional, etc.).



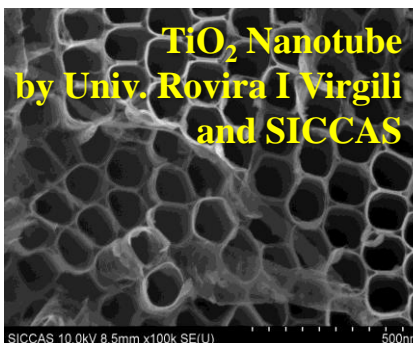
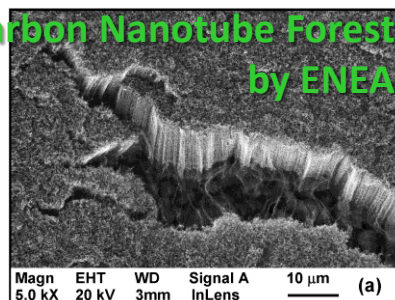
New molecular materials of polymer-macrocycles as transducers for polluting gas sensing by University of Bourgogne

Mesoporous In₂O₃
by Univ. of Paderborn, DE

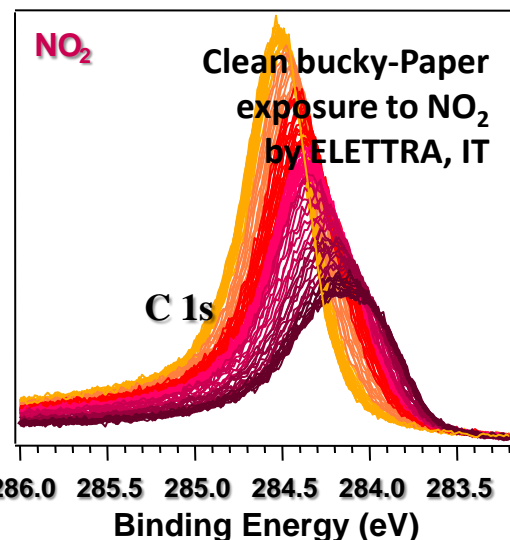
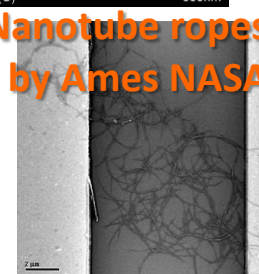
Metal oxide (SnO₂)
Nanowires nets
by Univ. of Brescia, IT



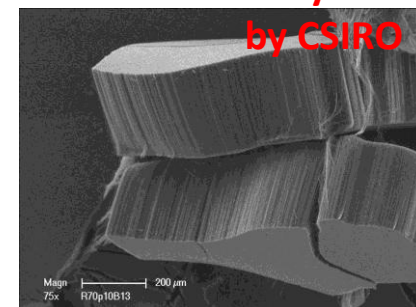
Carbon Nanotube Forest
by ENEA



Carbon Nanotube ropes
by Ames NASA



Carbon Nanotube yarns
by CSIRO

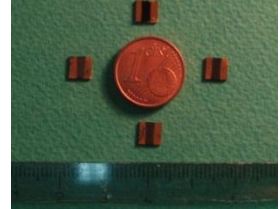


TD1105 *EuNetAir* **WG2**: Sensors, Devices and Systems for AQC (3/5)

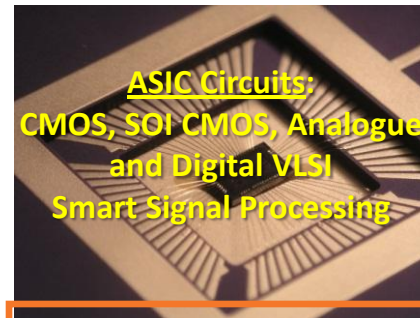
WG2 Chair: Prof. Andreas Schuetze, Saarland University, Germany

IT PATENT ENEA

Carbon Nanotube Gas Sensors

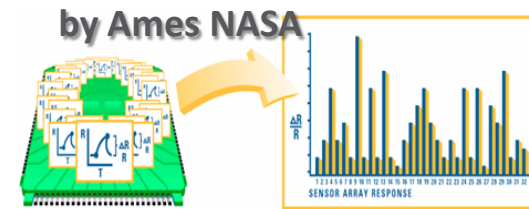


EnviroWatch mote by Newcastle University



ASIC Circuits:
CMOS, SOI CMOS, Analogue
and Digital VLSI
Smart Signal Processing

Warwick University in collaboration with
Cambridge University, EPFL, PennState.

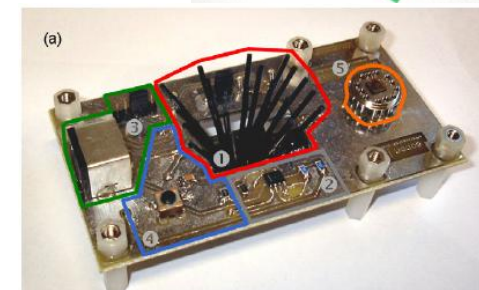


Using pattern matching algorithms, the data is
converted into a unique response pattern

A versatile platform for the efficient development of
gas detection systems based on automatic device
adaptation by University of Saarland.

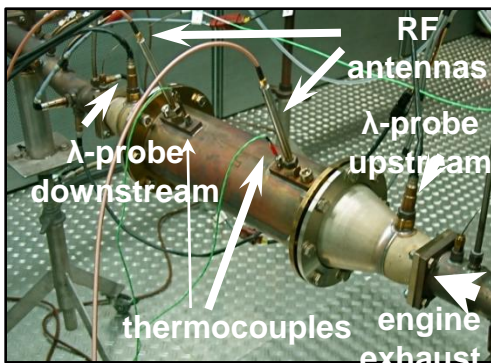


Low-ppb sensitivity for NO₂
GaN-based sensor concept



Autonomous Gas Sensor System
by Univ. of Barcelona

- **Sub-Working Group 2.1:**
Gas sensors and new transducers.
- **Sub-Working Group 2.2:**
Portable gas sensor-systems.
- **Sub-Working Group 2.3:**
Wireless technology and AQC
sensors network.
- **Sub-Working Group 2.4:**
Intelligence algorithms and
distributed computing for
networked AQC gas sensors.



Direct status measurement of
automotive catalysts by
radio-frequency technique by
University of Bayreuth, DE.

ERATION IN SCIENCE AND TECHNOLOGY

Sub-Working Group 3.1:

Environmental measurements at laboratory and in field air-quality stations.

Sub-Working Group 3.2:

Air-quality modelling and chemical weather forecasting.

Sub-Working Group 3.3:

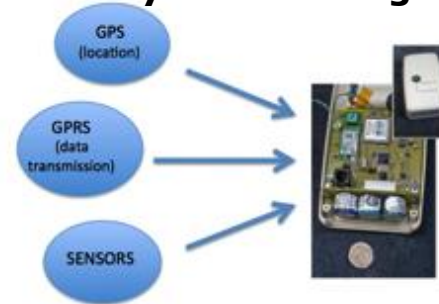
Harmonisation of environmental measurements.

by Aristotle University, EL

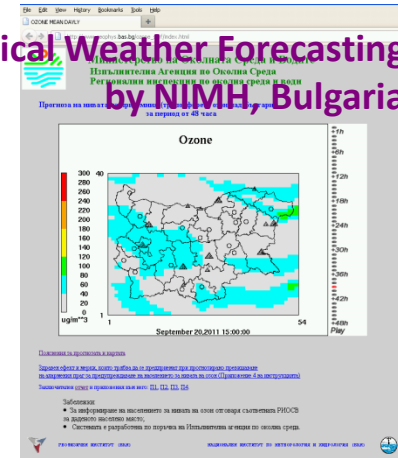


AirMerge system for Chemical Weather Models

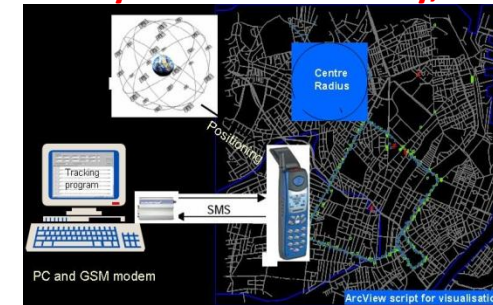
Mobile and static sensor network configurations by University of Cambridge.



Chemical Weather Forecasting by NIMH, Bulgaria



AQ Modeling: Tracking routes by Aarhus University, DK



Environmental measurements of PM and air pollution by CSIC, ES

AQ monitoring station by ARPA-PUGLIA, IT

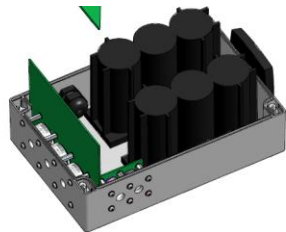
AQ monitoring station by Aarhus University, DK

AQ monitoring station by Lithuanian EPA

TD1105 *EuNetAir* **WG4**: Protocols and Standardisation Methods (5/5)

WG4 Chair: Prof. Ingrid Bryntse, SenseAir AB, Sweden

- **Sub-Working Group 4.1**:
Protocols, standards and methods for AQC by analyzers/instruments (no-sensors) technologies.
- **Sub-Working Group 4.2**:
Protocols, standards and methods for AQC by sensors (no-analyzers) technologies.
- **Sub-Working Group 4.3**:
Benchmarking of new products and market of commercial AQC sensors.

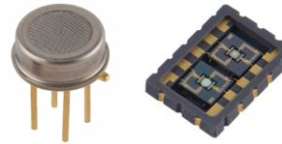


Battery-Powered Sensors by Alphasense Ltd, UK

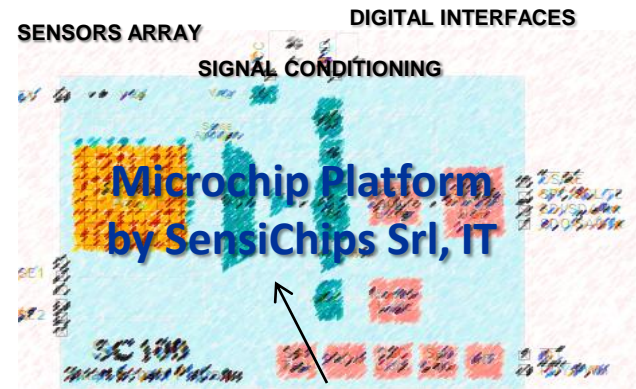
European Directive 2008/50/EC: Ambient Air Quality
EU standard EN 13725/2003: Dynamic Olfactometry

Protocols and Standardised Methods for Gas Sensors
Guidelines of Best Transducers applied to specific gases

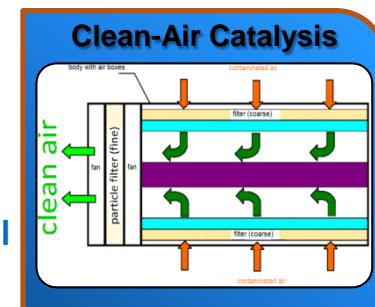
Dynamic olfactometry EN13725
by Univ. of Liege, Odometric SA,
Univ. of Bari, Lenviros srl.



**Packaged Sensors
by SGX-Sensortech, CH**



New precision multi-parametric analytical tool

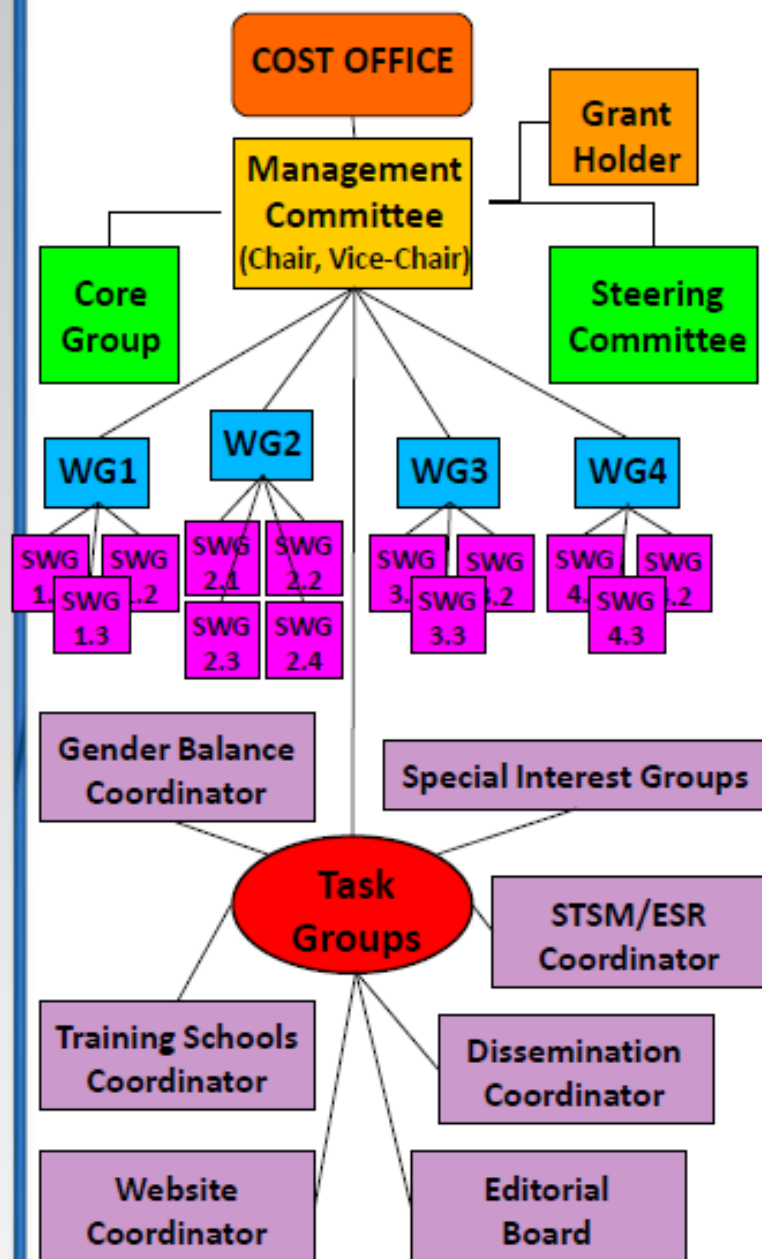


Becker Gruppe, DE



**CO₂ IR sensor for alarm
System by SenseAir AB, Sweden**

COST Action EuNetAir: COORDINATION AND ORGANIZATION



MANAGEMENT COMMITTEE

2 Representatives of participating Countries

Steering Committee:

- ✓ Action Monitoring
- ✓ Milestones settings
- ✓ Prepare MC meetings
- ✓ Management of IPR issues

Core Group:

- ✓ Prepare Documents for MC
- ✓ Prepare MC meetings
- ✓ Executive tasks in Action

- Meet every 6 months
- S&T exchange
- Cooperation
- Researcher mobility (STSM)
- Budget management
- Report to COST Office
- Organize Workshops/Conferences
- Organize Training Schools
- Promote Gender Balance
- Action Results Dissemination
- Evaluation plans

CORE GROUP

Action Chair
Action Vice Chair
Secretary

WGs Coordinator

- Organize WG meetings
- Coordination
- Monitoring
- Promote joint-activities
- Report to MC and SG

STSM/ESR Coordinator

- STSM/ESR agenda
- Training agenda

Gender Coordinator

- Gender agenda
- Care for gender balance

Dissemination Coordinator

- Dissemination activities
- Action Website
- Local Organizing Committee

NETWORKING

- Special Interest Groups (SIGs)
- Network of spin-offs
- International Experts
- Keynote Speakers

COST Action TD1105 ROADMAP (2012-2016)

YEAR	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1	<u>M</u> : Kick-Off Meeting. MC Meeting 1. <u>D</u> : MC setup and Action Workplan established	<u>M</u> : Editorial Board for Leaflet, Brochure, Newsletter. Action website setup. <u>D</u> : Definition of WGs and WGs Workplans	<u>M</u> : MC Meeting 2. WGs Meeting 1. <u>D</u> : Scientific activities, ESR/STSM program, Dissemination	<u>M</u> : Workshop 1. Training School 1. State-of-Art on AQC. <u>D</u> : Evaluation and Activity Report. Scientific strategies
2	<u>M</u> : MC Meeting 3. WGs Meeting 2. Update Action website. <u>D</u> : Scientific activities. Liason with EU Programs	<u>M</u> : Editorial Board meeting. ESR/STSM. <u>D</u> : Dissemination. Newsletter. Reporting	<u>M</u> : MC Meeting 4. WGs Meeting 3. Workshop 2. Training School 2. <u>D</u> : S&T strategies	<u>M</u> : International Conference 1. Edit. Board. ESR/STSM. <u>D</u> : Dissemination. Reporting
3	<u>M</u> : MC Meeting 5. WGs Meeting 4. <u>D</u> : Dissemination. Strategies & Activities	<u>M</u> : Edit. Board: State-of-art AQC. ESR/STSM <u>D</u> : Dissemination. Strategies. Reporting	<u>M</u> : MC Meeting 6. WGs Meeting 5. Workshop 3. Training School 3. <u>D</u> : S&T strategies	<u>M</u> : Edit. Board: Newsletter. ESR/STSM <u>D</u> : Dissemination. Reporting
4	<u>M</u> : MC Meeting 7. WGs Meeting 6. <u>D</u> : S&T strategies. Link to EU programs, Industry	<u>M</u> : Workshop 4. Training School 4. <u>D</u> : Dissemination. ESR/STSM. S&T strategic activity.	<u>M</u> : WGs Meeting 7. <u>D</u> : S&T strategies and activities. ESR/STSM. Dissemination	<u>M</u> : International Conference 2. MC Meeting 8. <u>D</u> : Final Evaluation. Reporting

M: Milestones D: Deliverables

First Period TD1105 WORKPLAN (1 July 2012 - 30 June 2013)

YEAR 1	MILESTONES	DELIVERABLES
Year 1 from 07/2012 to 06/2013	<u>Quarter 1: July 2012 - September 2012</u> Kick-off Meeting. MC setup. Action Workplan established. MC Meeting 1.	<u>Quarter 1: July 2012 - September 2012</u> MC setup Action Workplan established.
	<u>Quarter 2: October 2012 - December 2012</u> Action website setup. Start-up of Editorial Board for Leaflet, Brochure, Newsletter.	<u>Quarter 2: October 2012 - December 2012</u> Definition of WGs and WGs Workplans. <i>Newsletter: Issue 1. Leaflet/Brochure: Release 1.</i>
	<u>Quarter 3: January 2013 - March 2013</u> MC Meeting 2. WGs Meeting 1. Scientific activities.	<u>Quarter 3: January 2013 - March 2013</u> Publication of the List of EuNetAir Action R&D <i>Infrastructures</i> and main <i>Facilities</i> . Scientific Activities. ESR/STSM Report and Dissemination.
	<u>Quarter 4: April 2013 - June 2013</u> Scientific strategies: State-of-art on AQC. Training School organization. Workshop organization.	<u>Quarter 4: April 2013 - June 2013</u> Action website fully operational with publication of <i>Curricula</i> of partners. <i>Newsletter: Issue 2.</i> <i>State-of-Art on AQC tech: Release 1.</i> <i>Training School 1. Workshop 1. Annual Report.</i>

COST Action: EuNetAir PARTICIPANTS



	BE - Belgium	VITO, Université de Liège, Odometric S.A.
	BG - Bulgaria	National Institute of Meteorology and Hydrology - BAS; Institute of Electronics - BAS
	CH - Switzerland	Ecole Polytechnique Fédérale de Lausanne; e2v Microsensors S.A.; EnvEve S.A.; EMPA
	CZ - Czech Republic	Academy of Sciences of the Czech Republic
	DE - Germany	Institute of Energy and Environmental Technology; Saarland University; MPI for Biogeochemistry Univ. of Bayreuth; Univ. of Paderborn; Univ. Applied Sci. Ostwestfalen-Lippe; UST; Alfred Becker; 3S
	DK - Denmark	Aarhus University; Technical University of Denmark - DTU
	EL - Greece	Aristotle University; FORTH; Athena/ISI; University of Piraeus
	ES - Spain	Catalonia Institute for Energy Research - IREC; Spanish National Research Council - CSIC; University Rovira i Virgili; University of Barcelona, Worldsensing S.L.
	FI - Finland	University of Oulu; University of Helsinki; Tampere University of Technology
	FR - France	University of Bourgogne; University Blaise Pascal; Ecole des Mines de Douai; CEA-CNRS; ETHERA
	HU - Hungary	Hungarian Meteorological Service
	IS - Iceland	Agricultural University of Iceland
	IE - Ireland	Trinity College Dublin
	IL - Israel	AirBase Systems
	IT - Italy	ENEA; ELETTRA; Univ. of Bari; Univ. of Brescia; Univ. of Trieste; Lenviros; Sensichips, ARPA-Puglia
	LV - Latvia	University of Latvia
	NL - Netherlands	IMEC - Holst Centre; ECN
	NO - Norway	NILU - Norwegian Institute for Air Research
	PL - Poland	Silesian University of Technology; Warsaw University of Life Science
	PT - Portugal	Univ of Coimbra; Instit. of Environment & Development; National Health Institute; Univ of Lisbon
	RO - Romania	National R&D Institute for Nonferrous and Rare Metals; SC IPA SA - Research & Development
	SE - Sweden	Linköping University; Chalmers University of Technology; SenSiC AB; SenseAir AB
	SI - Slovenia	University of Ljubljana; Aerosol d.o.o.
	UK - United Kingdom	Imperial College London; Newcastle University; University of Manchester; Cambridge; University of Warwick; University of Edinburgh; Cambridge CMOS Sensors; Alphasense
	TR - Turkey	GEBZE Institute of Technology; Middle East Technical University of Ankara
		 MK - Republic of Macedonia Ministry of Environment and Physical Planning
		 RS- Serbia Institute of Public Health of Belgrade

COST Action TD1105 *EuNetAir*: 27 COST Countries (Parties) have already signed Memorandum of Understanding (MoU)

PARTIES

**already accepted
MoU: 27 Countries**

**Belgium, Bulgaria,
Czech Republic,
Denmark, Finland,
France, Germany,
Greece, Hungary,
Iceland, Ireland,
Israel, Italy, Latvia,
The Former
Yugoslav Republic
of Macedonia,
Netherlands,
Norway, Poland,
Portugal, Romania,
Serbia, Slovenia,
Spain, Sweden,
Switzerland, Turkey,
United Kingdom.**



COST Action TD1105 *EuNetAir*:

5 Non-COST Countries and 7 Non-COST Institutions

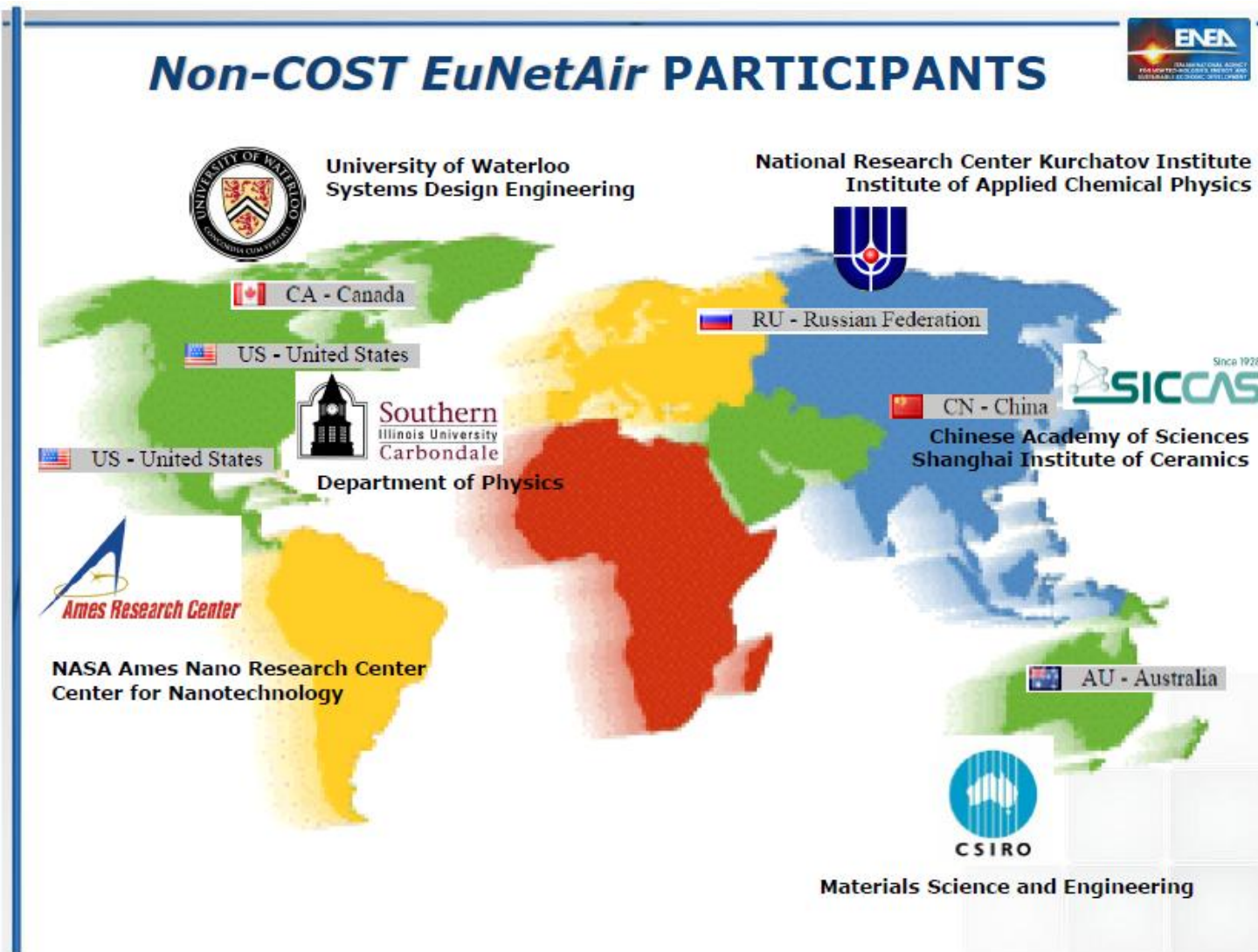
Non-COST Countries:

Australia, Canada,
China, Russia, USA

Non-COST Institutions:

CSIRO (Australia*);
University of Waterloo
(Canada); Chinese Academy
of Sciences, Shanghai
Institute of Ceramics
(China); National Research
Center Kurchatov Institute
(Russia); Southern Illinois
University Carbondale,
NASA Ames Research
Center (USA).

* *Reciprocal Agreement
Country.*



COST Action EuNetAir: List of Experts

150 EXPERTS from 27 COST Countries
and 5 Non-COST Countries

BE - Belgium

Prof. Anne-Claude ROMAIN
Dr. Jan THEUNIS
Dr. Julien DELVA

BG - Bulgaria

Dr. Dimiter SYRAKOV
Dr. Ivan NEDKOV

CH - Switzerland

Dr. Danick BRIAND
Dr. Marco BRINI
Dr. Christine ALEPEE
Dr. Nicolas MOSER
Dr. Christoph HUEGLIN

CZ - Czech Republic

Dr. Vera KURKOVA
Dr. Roman NERUDA
Dr. Zdenek ZELINGER

DE - Germany

Dr. Thomas A. J. KULHUSCH
Dr. Ulrich QUASS
Prof. Andreas SCHUETZE
Dr. Tilman SAUERWALD
Prof. Ralf MOOS
Dr. Daniela SCHONAUER-KAMIN
Dr. Thorsten WAGNER
Dr. Olaf KIESEWETTER
Dr. Thorsten CONRAD
Dr. Thomas BECKER
Prof. Wrenger Burkhard
Dr. Jost Valentin Lavric

DK - Denmark

Prof. Ole HERTEL
Dr. Lise Lotte SORENSEN
Prof. Anja BOISEN
Dr. Silvan SCHMID

EL - Greece

Prof. Kostas KARATZAS
Prof. George KIRIAKIDIS
Dr. Christos KOULAMAS
Prof. George PAPADOPOULOS
Prof. Tatiana TAMBOURATZIS

ES - Spain

Prof. Juan Ramon MORANTE
Dr. Francisco HERNANDEZ
Dr. Xavier QUEROL
Dr. Mar VIANA

Prof. Eduard LLOBET

Dr. Radu IONESCU
Prof. Albert ROMANO
Dr. Juan Daniel PRADES
Dr. Jordi LLOSA

FI - Finland

Prof. Heli JANTUNEN
Prof. Jyrki LAPPALAINEN
Dr. Jari JUUTI
Prof. Kaarle HAMERI
Prof. Jorma KESKINEN

FR - France

Prof. Marcel BOUVET
Prof. Jerome BRUNET
Prof. Alain PAULY
Dr. Jean SUISSE
Dr. Amadou NDYAE
Dr. Thu-Hoa THIRAN-THI
Dr. Philippe KARPE
Prof. Jerome ROSSIGNOL
Prof. Nadine LOCOGE

HU - Hungary

Dr. Zita FERENCZI
Dr. Krisztina LABANCZ

IS - Iceland

Dr. Arngrimur THORLACIUS

IE - Ireland

Dr. Francesco PILLA

IL - Israel

Dr. Liad ORTAR

IT - Italy

Dr. Michele PENZA
Dr. Marco ALVISI
Dr. Saverio DE VITO
Dr. Andrea GOLDONI
Dr. Magda BRATTOLI
Dr. Annamaria DEMARINIS
Dr. Gianluigi DE GENNARO
Dr. Luigi BARBIERI
Prof. Giorgio ASSENNATO
Dr. Roberto SIMMARANO
Prof. Giorgio SBERVEGLIERI

LV - Latvia

Prof. Iveta STEINBERGA

MK - Rep. of Macedonia

Dr. Igor ATANASOV
Dr. Ljupcho GROZDANOSVKI
Dr. Sywert BRONGERSMA
Dr. Ernie WEIJERS

PL - Poland

Dr. Monika KWOKA
Prof. Stanislaw GAWRONSKI
Prof. Jacek SZUBER

PT - Portugal

Prof. Bernadete RIBEIRO
Prof. Carlos BORREGO
Dr. Joao Paulo TEIXEIRA
Prof. Cristina MAGUAS
Dr. Miguel COUTINHO
Dr. Ana Margarida COSTA

SE - Sweden

Prof. Anita LLOYD SPETZ
Dr. Marina VOINOVA
Dr. Mike ANDERSSON
Dr. Donatella PUGLISI
Dr. Ulf THOLE
Prof. Ingrid BRYNTSE

SI - Slovenia

Rahela ZABKAR
Grisa MOCNIK
Branko STER

RS - Serbia

Anka CVETKOVIC

UK - United Kingdom

Prof. Julian GARDNER
Prof. Roderic JONES
Prof. Krishna PERSAUD
Prof. John POLAK
Dr. Robin NORTH
Dr. Jeff NEASHAM
Dr. Fabio GALATIOTO
Prof. Florin UDREA
Dr. John SAFFELL
Prof. John LEE

NO - Norway

Dr. Nuria Castell-BALAGUER
Dr. Philippe SCHNEIDER

RO - Romania

Dr. Roxana Mioara PITICESCU
Dr. Marcel IONICA
Dr. Cristina RUSTI
Dr. Radu Adrian IONICA

TR - Turkey

Prof. Zafer Ziya OZTURK
Prof. Mehmet Fatih DANISMAN

AU - Australia

* Dr. Phil MARTIN
(* Reciprocal Agreement)

CA - Canada

Prof. John YEOW

CN - China

Dr. Yongxiang LI
Dr. Zhifu LIU

RU - Russian Federation

Dr. Alexey VASILIEV

US - United States

Prof. Andrei KOLMAKOV
Dr. Meyya MEYAPPAN

Country

MC Members (48): *Male (73%) - Female (27%)*

Belgium	Dr Jan THEUNIS; Dr Anne-Claude ROMAIN
Bulgaria	Dr Dimiter SYRAKOV; Dr Ivan NEDKOV
Czech Republic	Dr. Vera KURKOVA
Denmark	Prof. Ole HERTEL
Finland	Prof. Kaarle HAMERI; Prof. Jyrki LAPPALAINEN
France	Prof. Marcel BOUVET; Prof. Jerome BRUNET
Germany	Prof. Andreas SCHUETZE; Dr Thorsten CONRAD
Greece	Prof. George PAPADOPOULOS; Prof. Kostas KARATZAS
Hungary	Ms Krisztina LABANCZ; Dr Zita FERENCZI
Iceland	Dr Arngrimur THORLACIUS
Ireland	Dr. Francesco PILLA
Israel	Dr. Liad ORTAR
Italy	Dr Michele PENZA; Prof. G. SBERVEGLIERI; Dr. G. DE GENNARO
Latvia	Dr Iveta STEINBERGA
Macedonia Rep.	Dr. Igor ATASANOV; Dr. Ljupcho GROZDANOVSKI
Netherlands	Dr Sywert BRONGERSMA; Dr. Ernie WEIJERS
Norway	Dr Nuria CASTELL BALAGUER; Dr. Philipp SCHENEIDER
Poland	Dr Monika KWOKA; Prof. Janislaw GAWRONSKI
Portugal	Prof. Bernadete RIBEIRO; Prof. Carlos BORREGO
Romania	Dr Marcel IONICA; Dr Roxana Mioara PITICESCU
Serbia	Dr. Anka CVETKOVIC
Slovenia	Dr Grisa MOCNIK; Dr Rahela ZABKAR
Spain	Prof. Juan Ramon MORANTE; Prof. Eduard LLOBET VALERO
Sweden	Prof. Anita LLOYD SPETZ; Prof. Ingrid BRYNTSE
Switzerland	Dr Danick BRIAND; Dr. Nicolas MOSER
United Kingdom	Dr John SAFFELL; Prof. Roderic JONES
Turkey	Prof. Zafer ZIYA OZTURK; Prof. Mehmet Fatih DANISMAN

MC Chair: Michele Penza, ENEA, IT

MC Vice Chair: Anita Lloyd Spetz, Linkoping University, SE

Grant Holder: University of Bari, IT

Kick-off Meeting at Brussels on 16 May 2012

Country

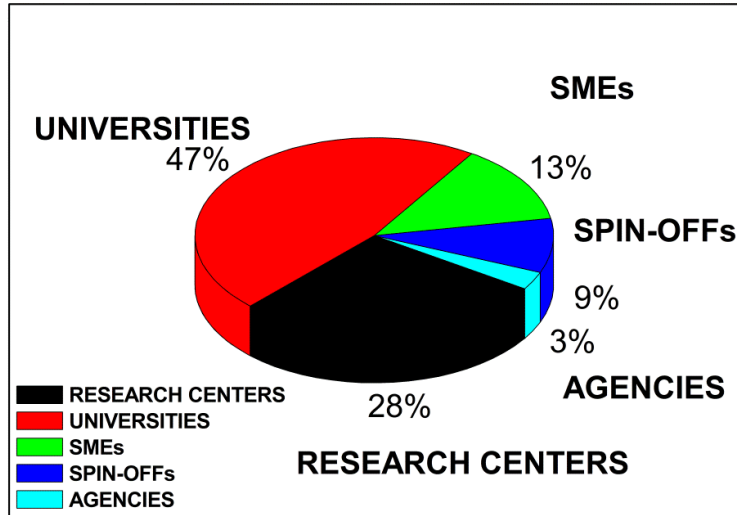
MC Substitutes (26)

Belgium	Dr Julien DELVA
Czech Republic	Dr. Roman NERUDA
Denmark	Dr. Lise Lotte SORENSEN
Finland	Prof. Jarmo PESKINEN
France	Dr Jean SOISSE Prof. Alain PAULY
Germany	Dr. Daniela SCHONAUER-KAMIN Dr. Thomas KUHLBUSCH
Greece	Prof. George KIRIKIADIS Dr. Roberto SIMMARANO
Italy	Dr. Marco ALVISI Dr. Saverio DE VITO
Poland	Prof. Jacek SZUBER
Portugal	Dr. Joao Paulo TEIXEIRA
Romania	Dr. Cristina RUSTI Dr. Marcel Adrian IONICA
Slovenia	Prof. Andrej DOBNIKAR
Spain	Prof. Albert ROMANO-RODRIGUEZ Dr. Jordi LLOSA
Sweden	Dr Ulf THOLE Dr. Marina VOINOVA
Switzerland	Dr Christoph HUEGLIN
UK	Prof. Julian GARDNER Dr Robin NORTH Prof. Florin UDREA

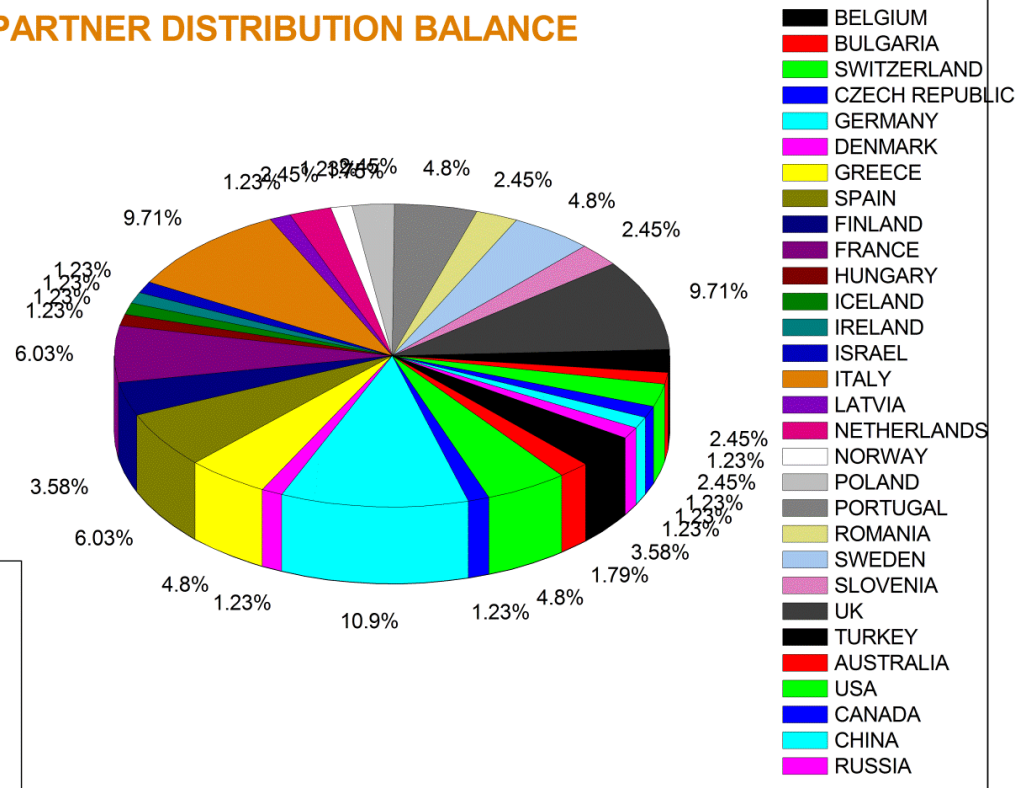
MANAGEMENT COMMITTEE

COST Action TD1105 *EuNetAir*: STATISTICS

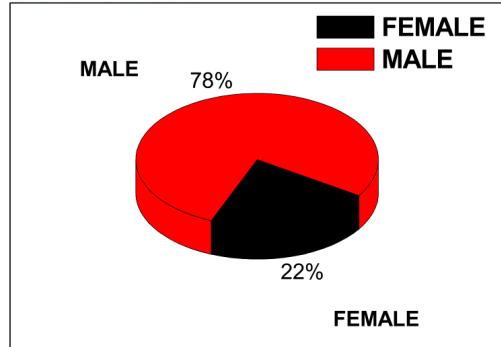
PARTNERSHIP



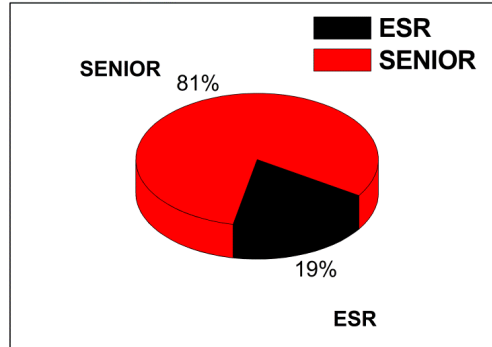
COUNTRY PARTNER DISTRIBUTION BALANCE



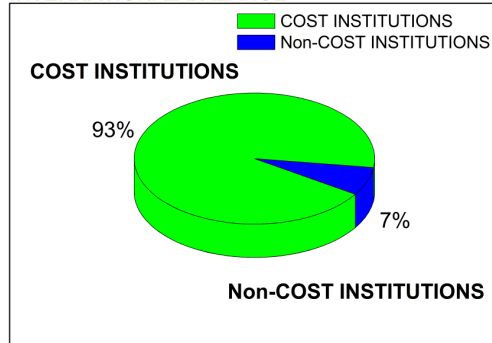
GENDER BALANCE



ESR BALANCE



INTERNATIONAL BALANCE



PARTIES: 27
Action Coordinating Partner: IT (ENEA)
Grant Holder: IT (University of Bari)



COST ACTION TD1105 DISSEMINATION EVENTS



IMCS 2012

The 14th International Meeting on Chemical Sensors
May 20 - 23, 2012, Nürnberg/Nuremberg



Special Session: Chemical Sensors and New Technologies for Air-Pollution Control

COST Action TD1105 EuNetAir

European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability

IMCS 2012 - The 14th International Meeting on Chemical Sensors, May 20-23, 2012 - Nuremberg, Germany



SGS 2012

VIII International Workshop on
Semiconductor Gas Sensors

September 11 - 15, 2012, Cracow, Poland



3th Intelligent Systems for Quality of Life information
Services Workshop (ISQL 2012)

8th AIAI Conference, September 27- 30, 2012,
Halkidiki, Greece



TCM 2012

The 4th International Symposium on Transparent
Conductive Materials
October 21- 26, 2012, Hersonissos, Crete, Greece



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST ACTION TD1105 MEETINGS 2012-13 (Year 1)



COST ACTION TD1105 *EuNetAir*

Kick-off Meeting of Action Management Committee
COST Office, 16 May 2012, Brussels (BE)

COST ACTION TD1105 *EuNetAir*

**First Meeting and 2nd Management Committee and
Working Groups**
ENEA Headquarters, 4-6 December 2012, Rome (IT)

COST ACTION TD1105 *EuNetAir*

WG3-WG4 Meeting joined to AirMonTech project
Fraunhofer Inhaus Zentrum, 4-6 March 2013,
Duisburg (DE)

COST ACTION TD1105 *EuNetAir*

**Third Meeting of Action Management Committee (21 June 2013),
Action Workshop (20 June 13) - Training School (13-15 June 2013)**
Transducers-2013, 16-20 June 2013, Barcelona (ES)

Expected Impact by Action TD1105



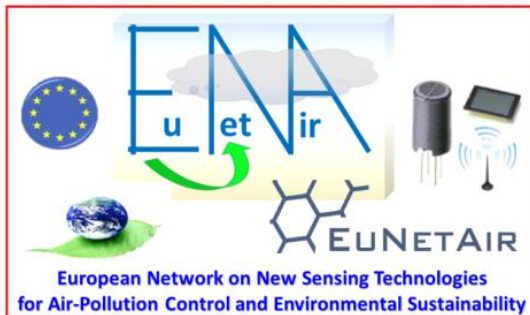
- **European Leadership on AQC Science & Technology**
- **Development of Green-Economy**
- **Support to Sustainable Development**
- **Support to Monitoring System of Clean Air for Europe**
- **Fostering Research & Innovation on New Sensing Technologies for Environmental Monitoring**

CONCLUSIONS

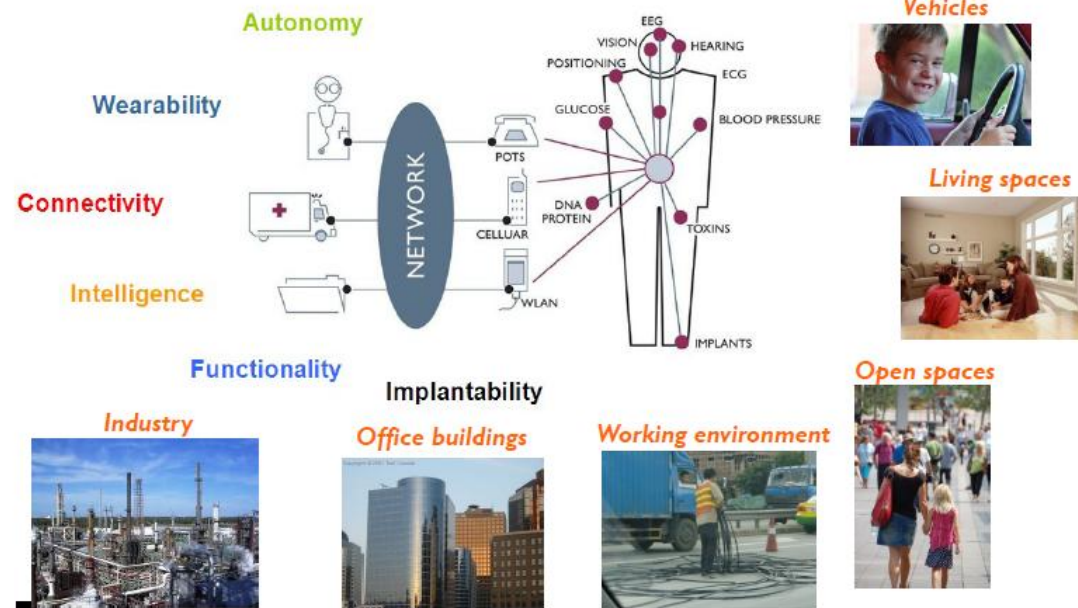
COST Action TD1105 *EuNetAir* is proposed to solve problems in the area of:

- Air Quality Control
- Environmental Sustainability
- Indoor/Outdoor Energy Efficiency
- Climate Change Monitoring
- Health Effects of Air-Pollution

European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability - EuNetAir



From *Body Area Network* to *Personal Area Network*



ACKNOWLEDGEMENTS

***KICK-OFF MEETING of Action TD1105
at Brussels on 16 May 2012***

TD1105 MANAGEMENT COMMITTEE



Link of COST Action TD1105 EuNetAir:

MC Chair:

Dr. Michele Penza, ENEA, IT
michele.penza@enea.it

MC Vice Chair:

Prof. Anita Lloyd Spetz
Linköping University, SE
spetz@ifm.liu.se

Grant Holder:

University of Bari, IT
gianluigi.degennaro@uniba.it

Scientific Secretary:

Dr. Annamaria Demarinis Loiotile
annamaria.demarinis@uniba.it

Science Officer:

Dr. Deniz Karaca
deniz.karaca@cost.eu

**Administrative
Officer:**

Dr. Kent Hung
kent.hung@cost.eu

Rapporteur ESSEM:

Prof. Kostantinos Kourtidis (GR)
kourtidi@env.duth.gr

Rapporteur MPNS:

Prof. Joaquim Manuel Vieira (PT)
jvieira@cv.ua.pt

Rapporteur CMST:

Prof. Antonio Lagana (IT)
lagana05@gmail.com

UPDATING AND BREAKING NEWS from Action TD1105

COST Action TD1105 - EuNetAir

European Network on New Sensing Technologies for
Air-Pollution Control and Environmental Sustainability - EuNetAir

Action website:

www.cost.eunetair.it

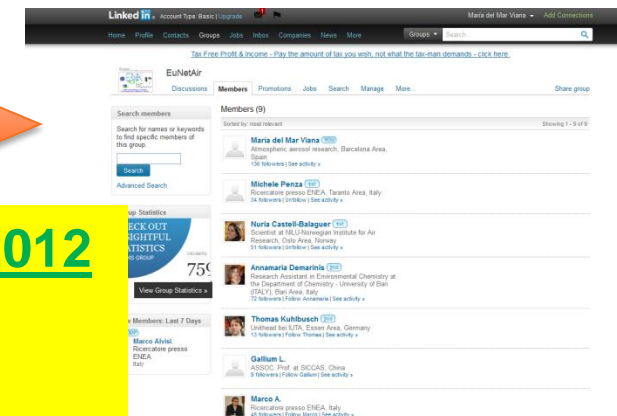
hosted by ENEA

Dr. Marco Alvisi, Webmaster Coordinator

Sebastiano Dipinto, Valerio Pfister, Gianfranco Zingarelli, Webmaster Team

Social Scientific ESRs Network (SSEN) by LinkedIn

Moderator(s): Mar Viana, Mariacruz Minguillon



CALL for Short Exchange Visits launched on 20 Nov. 2012
(STSM - Short Term Scientific Mission)

Dr. Jan Theunis, STSM Coordinator EuNetAir



EUROPEAN COOPERATION
IN SCIENCE AND TECHNOLOGY



European Network on New Sensing Technologies
for Air-Pollution Control and Environmental Sustainability

EuNetAir Newsletter

COST Action TD1105 Iss. 1/Dec 2012

Opening Editorial

Issue 1: published on Dec. 2012 ✓

Issue 2: published on June 2013

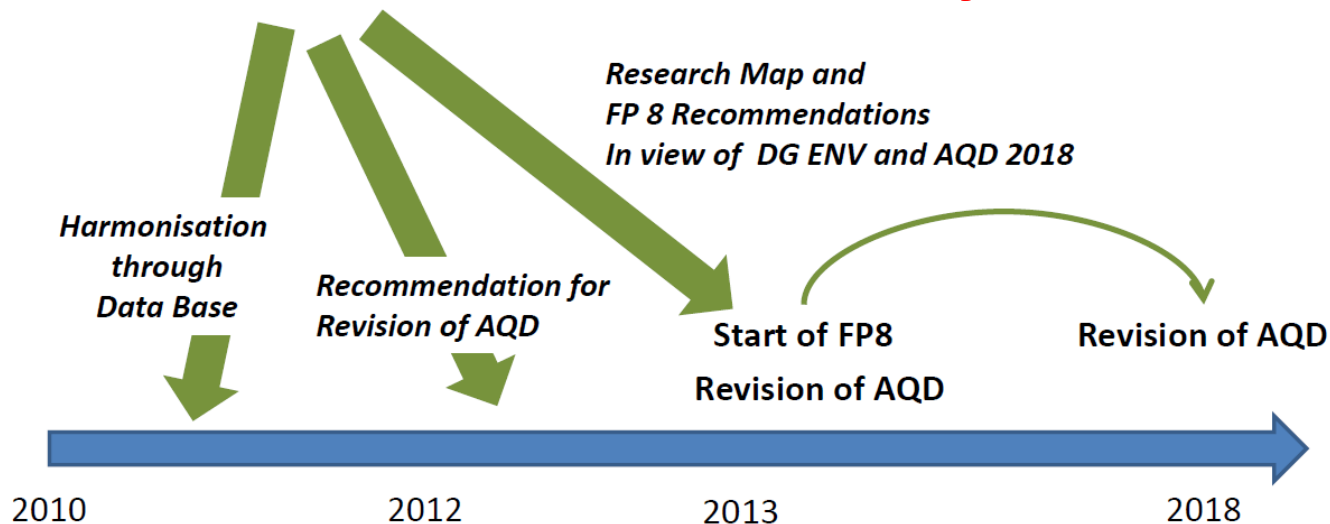
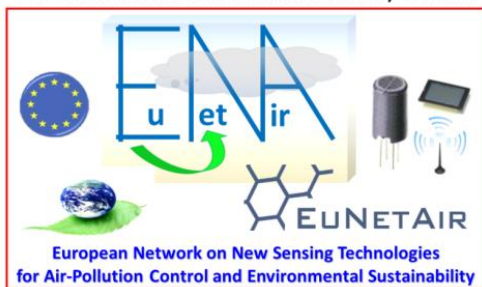
Prof. Ralf Moos, Editor-in-Chief

Dr. Daniela Schonauer-Kamin, Editorial Board Manager

NOLOGY

Timeline of Air-Pollution EU Policy

European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability - EuNetAir



2013: Year of Air
declared by European Environment Agency and EC

EU Thematic Strategy on Air Pollution

<http://ec.europa.eu/environment/air/quality/index.htm>

**Consultation by EC DG ENV from
Citizens and Experts**

Deadline for Consultation: March 04, 2013

Winner of 'Imaginair' youth prize



1st INTERNATIONAL WORKSHOP of COST Action TD1105

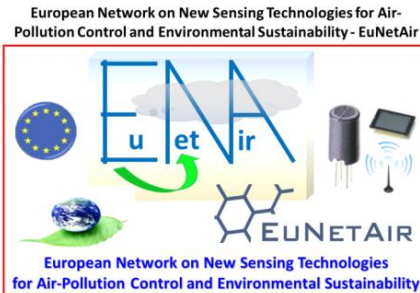
New Sensing Technologies and Transducers for Air-Quality Monitoring

Barcelona, 20 June 2013

FIRST INTERNATIONAL WORKSHOP on New Sensing Technologies and Transducers for Air-Quality Monitoring

Barcelona, 20 June 2013

Barcelona International Convention Centre (CCIB)
Plaça de Willy Brandt, 11-14, E- 08019 Barcelona, Spain



AGENDA

20 June 2013 - Thursday	
16:00 - 20:00	REGISTRATION to COST Action Satellite WORKSHOP
16:30 - 18:30	COST Action Session 1
18:30 - 19:00	<i>Break</i>
18:30 - 19:00	COST Action Poster Session
19:00 - 20:00	COST Action Session 2
20:00 - 20:10	<i>Workshop Adjourns and Farewell</i>

COST Action TD1105 EuNetAir

**OPEN SATELLITE WORKSHOP to
Transducers 2013 - Eurosensors XXVII**

The 17th International Conference
on Solid-State Sensors,
Actuators and Microsystems



**The 17th International Conference
on Solid-State Sensors,
Actuators and Microsystems
June 16-20, 2013, Barcelona, Spain**

COST Action TD1105: 3rd MC Meeting at IREC on 21 June 2013

COST Action TD1105

European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability - EuNetAir

3rd MANAGEMENT COMMITTEE MEETING

Invited Talks and Management Committee

Barcelona, 21 June 2013

IREC, Institut de Recerca en Energia de Catalunya

Address: Jardins de les Dones de Negre, 1, 2nd floor

08930 Sant Adrià de Besòs - Barcelona (Spain)



MEETING AGENDA

AGENDA	
9:00 - 14:00	REGISTRATION
9:30 - 10:00	WELCOME ADDRESS
	Juan Ramon Morante, IREC Representative, Barcelona, Spain General Chair of Transducers 2013 - Eurosensors XXVII
	Michele Penza, Action Chair, ENEA, Brindisi, Italy
10:00 - 11:00	INVITED TALKS
10:00 - 10:30	Invited Talk 1: Automotive Air Quality Sensors Nicolas Moser, MC Member and WG4 Vice-Chair, SGX-Sensortech, Corcelles, Switzerland
10:30 - 11:00	Invited Talk 2: Challenges for a New Air Quality Directive: The Role of Monitoring and Modelling Techniques Carlos Borrego, MC Member, Institute of Environment and Development, Aveiro, Portugal
11:00 - 11:30	Coffee-Break
11:30 - 13:30	3 rd MANAGEMENT COMMITTEE MEETING
13:30 - 14:30	Light Lunch offered by Action meeting organization
14:30	Meeting Closing



1ST TRAINING SCHOOL OF COST ACTION TD1105

Green Week 2013
satellite event



Training school on Environmental Technologies and Air-Quality Monitoring

13-15 June 2013

08:30 - 18:30

Barcelona

Spain



European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability - EuNetAir



European Network on New Sensing Technologies
for Air-Pollution Control and Environmental Sustainability

ec.europa.eu/environment/greenweek

Training school on Environmental
Technologies and Air-Quality Monitoring

Green Week 2013
satellite event



ORGANIZED BY

Universitat de Barcelona (UB)

MIND-IN2UB Department of Electronics

In collaboration with

Institute of Environmental Assessment and Water Research (IDAEA-CSIC)

Within the framework of

COST Action TD1105 European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability (EuNetAir)

VENUE

Universitat de Barcelona (UB)

Faculty of Physics

C/ Martí i Franquès, 1, 08028 Barcelona, Spain



MORE INFORMATION

- Michele Penza, MC Chair/Proposer of COST Action TD1105 EuNetAir
ENEA, Brindisi, Italy. michele.penza@enea.it
- Albert Romano-Rodríguez, Coordinator of Action Training School Committee
U. Barcelona, Barcelona, Spain. aromano@el.ub.es

Statistics

Received Trainees Applications: 39. Participating Trainees: 36. Assigned Trainees Grants: 20

Involved Trainers: 14

COST Countries involved from Action partnership: 15

Training School Programme Committee

Albert Romano-Rodríguez, U. Barcelona, Spain
Juan Daniel Prades, U. Barcelona, Spain
Mar Viana, CSIC-IDAEA, Spain
María Cruz Mingüillón, CSIC-IDAEA, Spain
Eduard Llobet, U. Rovira i Virgili, Spain
Annamaria Demarinis Loiotile, U. Bari, Italy
Michele Penza, ENEA, Italy

Training School Action Committee

Albert Romano-Rodríguez, U. Barcelona, Spain
Juan Daniel Prades, U. Barcelona, Spain
Mar Viana, CSIC-IDAEA, Spain
María Cruz Mingüillón, CSIC-IDAEA, Spain
George Kiriakidis, FORTH, Greece
Philippe Schneider, NILU, Norway
Monika Kwoka, Silesian U. Technology, Poland
Rahela Zabkar, U. Ljubljana, Slovenia
Francisco Hernandez-Ramirez, IREC, Spain
Zafer Ziya Ozturk, Gebze Institute of Technology, Turkey
Julian Gardner, U. Warwick, United Kingdom



In collaboration with the



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



1ST TRAINING SCHOOL OF COST ACTION TD1105

Green Week 2013
satellite event



Training school on Environmental Technologies and Air-Quality Monitoring

13-15 June 2013

Barcelona

08:30 - 18:30

Spain

Training school on Environmental
Technologies and Air-Quality Monitoring

Green Week 2013
satellite event



PROGRAMME

13 June 2013 Thursday

08:30-17:00 REGISTRATION

09:00-09:45 Welcome Address

A. Romano-Rodríguez (U. Barcelona, Spain)

ACTIVE MATERIALS FOR SENSOR FABRICATION

09:45-11:00 Metal Oxides

J.R. Morante (IREC and U. Barcelona, Spain)

11:00-11:30 Break

11:30-13:00 Carbon-based materials

E. Llobet (U. Rovira i Virgili, Spain)

13:00-15:00 Lunch

SENSORS AND TRANSDUCERS - PART 1

15:00-17:30 Conductometric Sensors, Capacitive Sensors and Other Sensing Platforms

F. Hernández-Ramírez (IREC and U. Barcelona, Spain)
D. Ceballos, J. Prades and A. Romano-Rodríguez (U. Barcelona, Spain)

14 June 2013 Friday

SENSORS AND TRANSDUCERS - PART 2

09:30-11:00 Optical Detection Methods

J. Wöllenstein (U. Freiburg and Fraunhofer Gesellschaft, Germany)

11:00-11:30 Break

11:30-13:00 Sensors for indoor air quality and health

T. Tran-Thi (CEA-Saclay, France)

13:00-15:00 Lunch

15:00-16:00 Electrochemical Sensors

J. Wöllenstein (U. Freiburg and Fraunhofer Gesellschaft, Germany)

16:00-16:30 Break

SMART SENSING TECHNOLOGIES AND ALGORITHMS

16:30-17:30 Signal Processing

A. Pardo (U. Barcelona, Spain)

17:30-18:30 Computational Intelligence for Smart Sensors and Sensor Network

S. De Vito (ENEA, Italy)

20:30 School dinner (place to be announced)

15 June 2013 Saturday

ENVIRONMENTAL MONITORING

09:30-10:30 Overview of environmental measurements

M. Viana (CSIC, Spain)

10:30-11:30 Black carbon measurements

G. Mocnik (Aerosol doo, Slovenia)

11:30-12:00 Break and walk to the air quality monitoring station

12:00-13:00 Visit to the air quality monitoring station at CSIC

M. Viana and M.C. Minguillón (CSIC, Spain)

13:00-15:00 Lunch

15:00-15:30 Gas sensors: Principle of Operations and Sensor Parameters

M. Penza (ENEA, Italy)

15:30-18:00 Presentation of own research activities by trainees

18:00-18:30 Certificate of Attendance Ceremony and Farewell

THANK YOU VERY MUCH FOR YOUR KIND ATTENTION!

European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability - EuNetAir



European Network on New Sensing Technologies for Air-Pollution Control and Environmental Sustainability

ec.europa.eu/environment/greenweek



In collaboration with the



EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY