



The European Sensor Systems Cluster (ESSC)

European Sensor Systems Cluster - *ESSC*

Vision, Objectives, Strategies, Priorities and Challenges of EU Cluster

Cluster launched at Preparatory Workshop on 27 November 2014 in Brussels
sponsored and observed by EC DG Research and Innovation

ESSC Steering Committee Meeting

Concert Hall, 8 September 2015 - Session Time: 8:30 - 10:00

Freiburg/Germany, 6 - 9 September 2015

Vision, Objectives, History and Position Paper

Michele Penza - Chairman of the ESSC

michele.penza@enea.it

ENEA, Materials Technologies, Brindisi - Italy



ESSC SC AGENDA

EUROSENSORS
XXIX 2015
Germany
Freiburg

September 6-9, 2015

Tuesday - 8 September 2015, 8.30 - 10.00

ESSC Steering Committee

Tuesday - 8 September 2015, 8.30 - 10.00

Location: Konferenz 8

Session Chairs: *Dr. Michele Penza*, Chairman of ESSC, ENEA, Italy

Prof. Andreas Schuetze, Steering Committee Member, Saarland University, Germany

8.30 - 8.40

Welcome Address

Dr. Michele Penza, Chairman of ESSC, ENEA, Italy

8.40 - 8.50

Vision, Objectives and Position Paper

Dr. Michele Penza, Chairman of ESSC, ENEA, Italy

8.50 - 9.00

Governance and Membership

Dr. Rudolf Frycek, Coach of ESSC, Amires, Switzerland

9.00 - 9.15

Key Notes from ESSC Steering Committee Members

9.15 - 10.00

Open Discussion:

- Planning of Future ESSC Events (2015-2016)
- Relations with Other Bodies/Associations
- Contributions from FP7/H2020 Project Coordinators

10.00

Conclusions



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ESSC SESSION AGENDA

EUROSENSORS
XXIX 2015
Germany
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September 6-9, 2015

Wednesday - 9 September 2015, 14.00 - 16.00

European Sensor Systems Cluster (ESSC) Session

Wednesday - 9 September 2015, 14.00 - 16.00

Location: Runder Saal

Session Chairs: *Dr. Michele Penza*, Chairman of ESSC, ENEA, Italy

Prof. Andreas Schuetze, Steering Committee Member, Saarland University, Germany

14.00 - 14.05 Welcome Address

Dr. Michele Penza, Chairman of ESSC, ENEA, Italy

14.05 - 14.25 Sensor Systems and the H2020 Research and Innovation Programme - Clustering as a Mean to Increase Impact: The Case-Study ESSC

Dr. Hans-Hartmann Pedersen, EC Research Programme Officer

14.25 - 14.35 Vision, Objectives and Position Paper of ESSC

Dr. Michele Penza, Chairman of ESSC, ENEA, Italy

14.35 - 14.45 Governance and Membership of ESSC

Dr. Rudolf Frycek, Coach of ESSC, Amires, Switzerland

14.45 - 15.00 Towards the Roadmap of ESSC

Prof. Andreas Schuetze, Steering Committee Member, Saarland University, Germany

15.00 - 15.10 Key Notes from ESSC Steering Committee Members

15.10 - 16.00 Open Discussion:

Inputs from Representatives of the Bodies, Associations, Societies, FP7-H2020 Projects



The European Sensor Systems Cluster (ESSC)

The CHARACTERIZATION Cluster: *3 Sub-Clusters*

KICK-OFF WORKSHOP - Brussels, Covent Garden, 27 November 2014

European Commission - DG Research & Innovation

Directorate Key Enabling Technologies

Unit Advanced Materials and Nanotechnologies

SENSORS

**Characterization
for Model Validation**

**Characterization
Tools
(Materials,
Metrology)**



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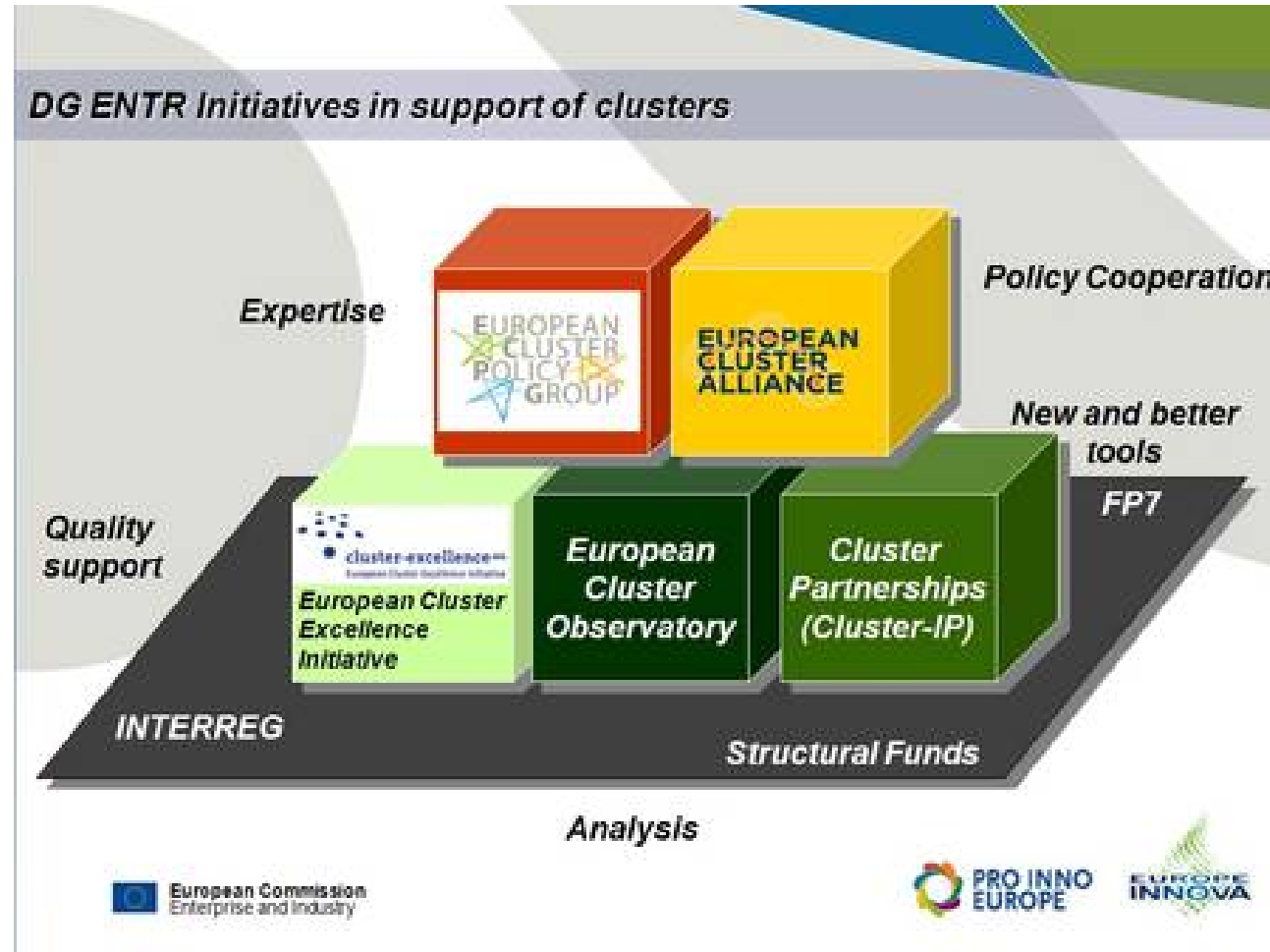
Cluster ESSC Identity



Outline

- **The European Sensor Systems Cluster (ESSC):**
 - ✓ *Objectives, Vision, History, Position Paper*
- **Future Plans and Challenges: *Expected Impact***
- **Concluding Remarks & Further Steps ESSC**

CONTEXT POLICY OF THE EU CLUSTERS



EC Report on **Innovation Clusters in Europe:**
A statistical analysis and overview of current policy support
by DG Enterprise and Industry

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The EU CLUSTERS: *EC Expectations*

- 1. Increase the Impact of Research funded under the NMBP Programme**
(*Nanotechnologies, Advanced Materials, Biotechnology, Advanced Manufacturing and Processing*)
 - ✓ *Scientifically*
 - ✓ *Technically*
 - ✓ *Commercially*
- 2. Facilitate Networking and help projects to benefit from Synergies**
- 3. Obtain better Advice for future Policy and Call Preparations**
(*Roadmaps, Inputs for Call Topics, long-term Research Goals*)
- 4. Improve Impact, Exploitation and Knowledge Management**
- 5. Raise Visibility of Public Funded Research activities and their Impact**



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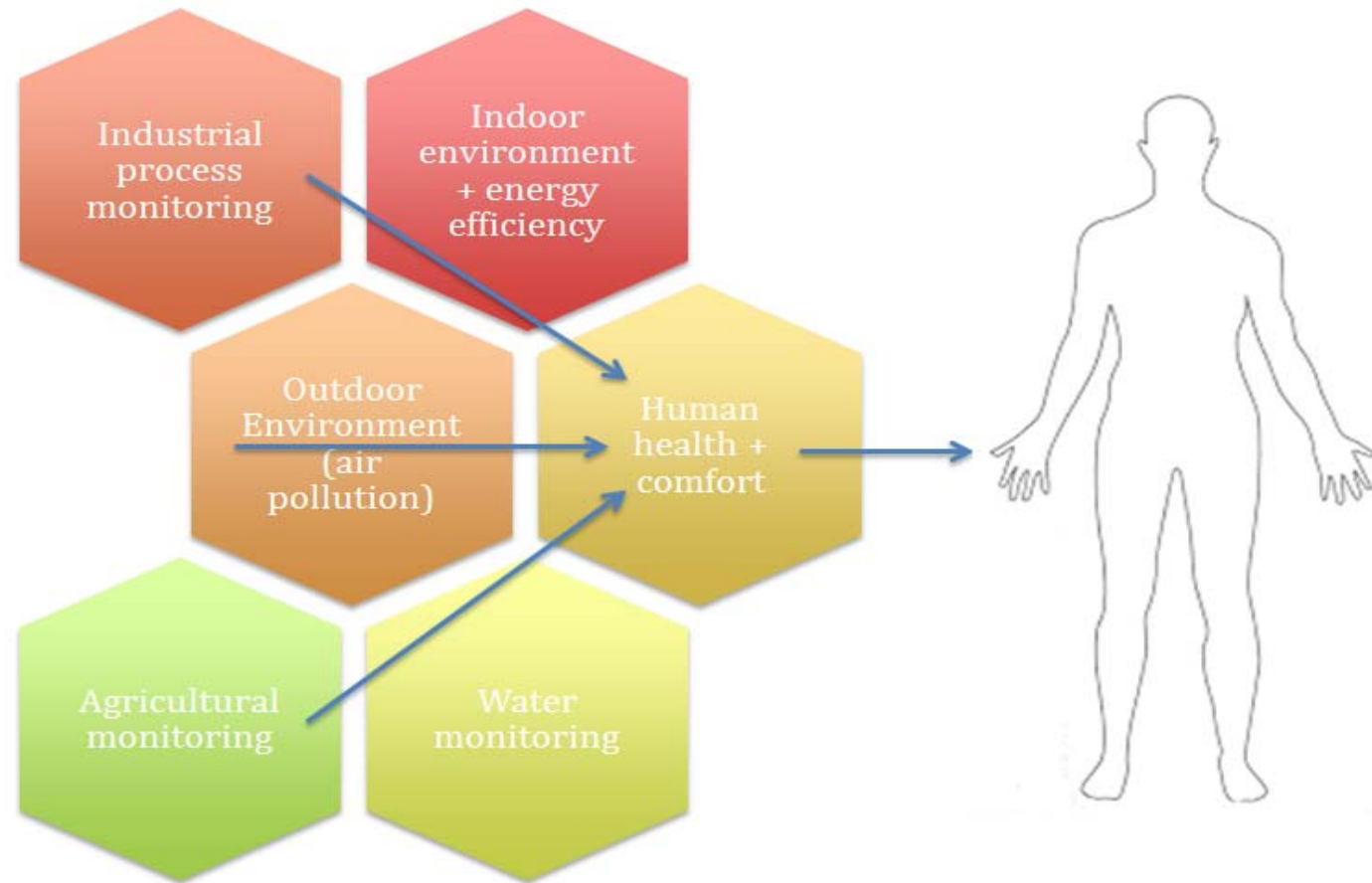
VISION OF ESSC (1/2)

- The **European Sensor System Cluster (ESSC)** will identify the technical or non-technical challenges of (bio)chemical sensing and highlight opportunities resulting from **nanotechnology**, **microsystems integration**, **advanced data evaluation**, their **manufacturing**, **commercialization** and **systemic integration**.
- **ESSC** will mobilize a *pan-European network*, ready to advise, assist and execute the national or international measures leading to **strengthened position of European Research and Innovation** in the field **(bio)chemical sensing** (e.g. analysis, measures proposition, evaluation, reviews).

VISION OF ESSC (2/2)

ESSC Key Areas:

- Environmental Sustainability
- Energy Efficiency
- Health Monitoring
- Comfort
- Industrial Applications



OBJECTIVES OF ESSC

The ESSC is committed to execute objectives, which are defined as follows:

1. Maximize the **cooperation between projects** (avoid duplicating work and improve efficiency)
2. Identify **common interests in on-going research and development** (e.g. open calls, training)
3. Provide a **forum** for discussion, problem solving and analytical planning R&D activities in Europe
4. Establish the **EU-wide meeting platform** for researchers and mainly for involved industries and end-users
5. **Remove commercialization barriers** to ensure the EU leadership in Sensor Technologies
6. **Integrate inputs** and Recommendations from other existing clusters or groups
7. Promote the **connection with external bodies** (EC-RTD, Connect, standardization and regulatory bodies, journals and scientific boards, advisory boards)
8. Disseminate the **sensor-related issues/findings** to informed public (e.g. stimulate awareness for the invisible environmental problems and support *citizen science*)



TECHNOLOGICAL CHALLENGES OF ESSC (1/5)

Preliminary List:

*(to be completed and prioritized in the further **Roadmap** activities)*

- **Indoor Sensing**
- **Environmental Sensing**
- **Biosensors**
- **Chemo/bio Sensors for Liquids**
- **Modelling and Simulation**
- **Analytical Tools and Metrology**
- **Standardization and Regulation**
- **Business Models and Spin-offs**



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TECHNOLOGICAL CHALLENGES OF ESSC (2/5)

- **Improved 3S of **sensor materials** and More 3S:**
 - ❑ Sensitivity, Selectivity, Stability
 - ❑ Response/Recovery Time, Repeatability, Resolution
- **Miniaturization and integration:**
 - ✓ Low-powered Sensors
 - ✓ Chemical Filters
 - ✓ Catalysts
 - ✓ Pre-concentrators
 - ✓ Low-cost Modules
 - ✓ Sub-systems
- **Integration to systems:**
 - Energy Consumption/Harvesting
 - Data acquisition and Filtering
 - Data Fusion
 - User Interaction

TECHNOLOGICAL CHALLENGES OF ESSC (3/5)

The particular challenges are identified, where R&D efforts should be invested:

- **Indoor Sensing**

- Cross-sensitivity with *specific gases (fatty acids)*
- Accurate VOC quantification
- Long term exposure quantification
- Stability and life expectancy
- Miniaturization, low consumption, controlling and data processing
- Integration to air treatment systems and HVAC (incl. occupancy)
- Human machine interface for comfort

- **Environmental Sensing**

- Scalable sensing models for building Sensor Networks to track key air/water quality parameters
- Sensors complementary to existing tools (larger devices)
- Integration to *mobile devices*
- Low cost, wireless sensors to form *networks (e.g. sensing cities)*
- Targeted *information to habitants* and mitigation
- *Nanoparticle detection* for dust and aerosols

TECHNOLOGICAL CHALLENGES OF ESSC (4/5)

The particular challenges are identified, where R&D efforts should be invested:

- **Biosensors**

- Disposables vs. *continuous/automatic* monitoring
- High throughput
- *Regulatory framework* not fully adapted to personalization
- Towards *point of care* diagnostics, incl. Telemonitoring
- Data integrate-ability in *health system*

- **Chemo/bio Sensors for Liquids**

- High potential, *but low progress*
- *Multiparametric approach should be investigated*

- **Modeling and Simulation**

- *Multi-physics model*: analyte flow, material layer, transduction, data processing, integration

- **Industrial Process Monitoring**

- Better control of processes by increasing the number chemical parameters to be determined continuously (*robust sensors needed*)

TECHNOLOGICAL CHALLENGES OF ESSC (5/5)

The particular challenges are identified, where R&D efforts should be invested:

- **Analytical Tools and Metrology**
 - Validation
 - Joint-exercises *sensors-versus-analyzers* in real scenario measurements
 - Measurement protocols for benchmarking
- **Standardization and Regulation**
 - Standards and data protocols for Data Benchmarking (open access)
 - Validation and standardization of measurement procedures
 - Advanced study of VOC impact on health/productivity
 - Harmonization/Regulation/Public information of measured sites/households
 - Regulation/Public info on industrial products - e.g., real time styrene monitoring
- **Business Models and Spin-offs**
 - Total cost of ownership vs. savings in comfort environment
 - Food quality monitoring and price adaptation (realtime S/D)
 - Health system rewarding for early testing and monitoring

GOVERNANCE: Steering Committee of ESSC (1/2)

- **Chairman of ESSC:** Michele Penza, ENEA, Italy
- **Coach of ESSC:** Rudolf Frycek, Amires, Switzerland
- **EC Observer:** Hans Hartmann Pedersen (*EC Officer*), DG R&I, Belgium

Environmental Sensors

- D. Diamond

Indoor Air Quality

- A. Schütze (O. Martimort)

Health Monitoring and Comfort Sensors

- P. Galvin (A. Prina Mello)

Monitoring of Industrial Processes

- T. Mayr

Sensor Integration and Commercialization

- O. Martimort

Dissemination and Outreach

- T. Simmons (AMA), Eurice

GOVERNANCE OF ESSC (2/2)

- **Chairman of ESSC:** Michele Penza, ENEA, Italy - michele.penza@enea.it
- **Coach of ESSC:** Rudolf Frycek, Amires, Switzerland - frycek@amires.eu
- **EC Observer:** Hans Hartmann Pedersen (EC Officer)
hans-hartmann.pedersen@ec.europa.eu

Application WG	Leader	Institution	Email
Environmental Sensors	D. Diamond	Dublin City Uni	dermot.diamond@dcu.ie
Indoor Air Quality	A. Schütze	Saarland Univ.	schuetze@lmt.uni-saarland.de
Health Monitoring and Comfort Sensors	P. Galvin	Tyndall	paul.galvin@tyndall.ie
Monitoring of Industrial Processes	T. Mayr	TU Graz	torsten.mayr@tugraz.at
Sensor System Integration and Commercialization	O. Martimort	Nanosense	martimort@nano-sense.com
Dissemination and Outreach	T. Simmons	AMA Sensorik	simmons@ama-sensorik.de

PARTNERS supporting ESSC



Italian National Agency for New Technologies,
Energy and Sustainable Economic Development



UNIVERSITÄT
DES
SAARLANDES



DUBLIN CITY
UNIVERSITY



Brandenburgische
Technische Universität
Cottbus - Senftenberg



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FP7/H2020 PROJECTS & Actions supporting ESSC

 **cost**
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY



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ESSC Cluster Planning

1.

Preparation,
1° Cluster Meeting

- Establish interest with projects
- Analyse results and prepare workshop
- 1° Cluster Meeting

2.

Define Objectives
and Scope

- Scope, Targets and Action Plan definition
- Organisation and Management
- Sub-Cluster Working Groups & Your role !

3.

Working Groups
Activities - Phase 1

- Vision and **Scope Paper** completed
- Targets detailed
- Kick-off and 1° Open Cluster Meeting (ENF2015)

4.

Working Groups
Activities - Phase 2

- Present **ROADMAP (INPUTS WELCOMED)**
- Events & Workshops
- Specific Networking



1. Q3-4, 2014

2. Q1, 2015

3. Q2-3, 2015

4. Q3-4, 2015



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Short History of ESSC Dissemination

- **Preparatory Workshop** at Bruxelles, Belgium, 27 November 2014
- **COST Action EuNetAir Workshop**, Riga, Latvia, 26-27 March 2015
- **EMRS-2015**, Board of Delegates, ESSC Dissemination, 14 May 2015
- **ESSC Kick-off Meeting**, inside AMA Conference 2015 at SENSOR+TEST Fair, Nuremberg, Germany, 19 May 2015
- **COST Action EuNetAir 4^o Scientific Meeting** in Linköping 3-5 June 2015
- ESSC Invited Talks at **EuroNanoForum 2015**, Riga, Latvia, 10-12 June 2015
- ESSC Session at **EUROSENSORS 2015**, Freiburg, Germany, 6-9 Sept. 2015



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FUNDING of ESSC

- **No specific funding yet**
- Use resources within *running EU projects*
- Use resources of your environment (e.g. associations, institutions)
- Continue **defining which specific funding** is urgently in need and use Cluster to build **critical mass and to communicate it**

IIINTERLINK & NETWORKING of ESSC ???



EUROSENSORS



**INTERNATIONAL MEETING
ON CHEMICAL SENSORS**



**EuroNanoForum
2015**

TRANSDUCERS



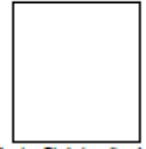
**INTERNATIONAL SOCIETY FOR
OLFACTION AND CHEMICAL SENSING**



The European Sensor Systems Cluster (ESSC)

FREE REGISTRATION at ESSC webpages

www.cluster-essc.eu



Member Photo is optional

The European Sensor Systems Cluster (ESSC) Affiliation Form

ESSC Affiliation Information Form for New Participants, New Working Group Members and New Stakeholders

Personal Details	
1. Surname	
2. First name(s)	
3. Gender	
4. Email	
5. Institute/company	
6. Address (Street)	
7. Postal address (PO Box)	
8. Telephone	
9. Fax	
10. Mobile	

The Individual Form should be sent to the Chairman of the ESSC: Michele Perzo, BNEA, Brindisi, Italy - Email: michele.perzo@enes.it

Other Contacts:

- Coach of the ESSC: Dr. Rudolf Fryczek, AMRES, Neuchâtel, Switzerland - Email: fryczek@amres.eu
- EC Officer and ESSC Observer: Dr. Hans Hartmann Pedersen, DG RSI Programme Officer, Brussels, Belgium
Email: hans-hartmann.pedersen@ec.europa.eu

Background related to the ESSC (research activities, institute/company profile in relation to the EU Sensor Systems Cluster)
(Max 10 lines)

Personal S&T Activities and Team Activities related to the ESSC
(Max 10 lines)

Planned contribution to the European Sensor Systems Cluster (ESSC)
(Max 10 lines)

Involved Member of (please, sign one box or not more than two):

SC	<input type="checkbox"/>	Steering Committee
WG1	<input type="checkbox"/>	Environmental Sensors
WG2	<input type="checkbox"/>	Indoor Air Quality Sensors
WG3	<input type="checkbox"/>	Health Monitoring and Comfort Sensors
WG4	<input type="checkbox"/>	Monitoring of Industrial Processes
WG5	<input type="checkbox"/>	Sensor-Systems Integration and Commercialization
WG6	<input type="checkbox"/>	Dissemination and Outreach
OTHER	<input type="checkbox"/>	

Remarks and Comments
(Max 10 lines)

[Registration online](#)



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ESSC CONTACT PERSONS:

- **Chairman of the ESSC: Dr. Michele Penza (ENEA, Brindisi, Italy)**
- michele.penza@enea.it
- **Coach of the ESSC: Dr. Rudolf Frycek (Amires, Neuchatel, Switzerland)** - frycek@amires.eu
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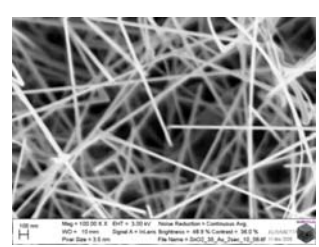
REGISTRATION AS ESSC MEMBER at:
www.cluster-essc.eu

European Commission - DG Research & Innovation
Directorate Key Enabling Technologies
Unit Advanced Materials and Nanotechnologies

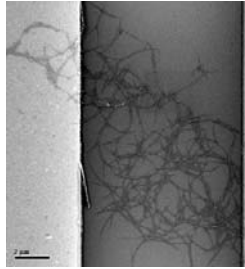


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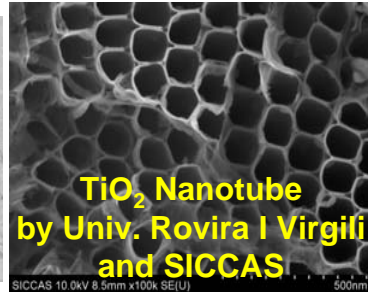
Selected Examples of Gas Sensors and Sensor Systems



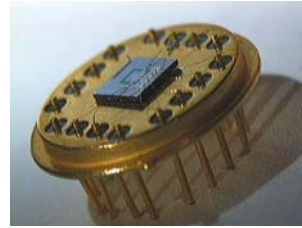
Metal oxide (SnO₂) Nanowires nets by Univ. of Brescia



Carbon Nanotubes by Ames NASA



TiO₂ Nanotube by Univ. Rovira I Virgili and SICCAS



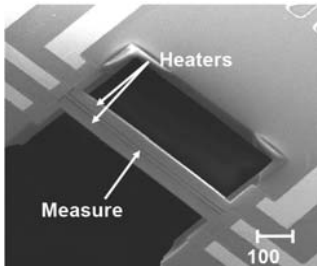
GasFET by EPFL, CH



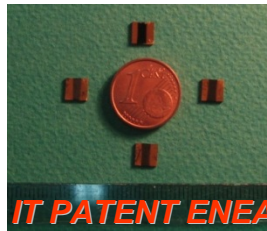
UNITEC srl, ETL3000 multi-component outdoor air quality monitor



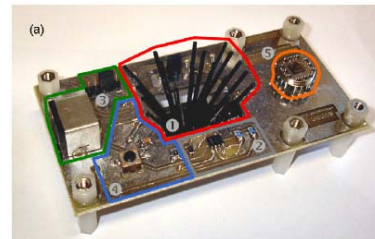
AEROQUAL, AQM 60 Air Quality Sensors Station



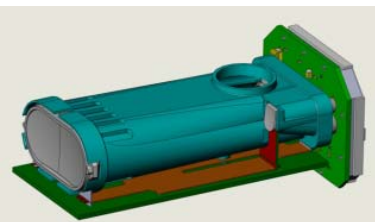
Cantilever Sensor by DTU, DK



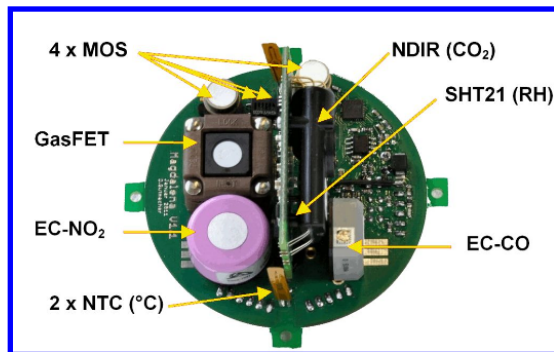
Carbon Nanotube Gas Sensors IT PATENT ENEA



Autonomous Gas Sensor System by IREC and Univ. of Barcelona

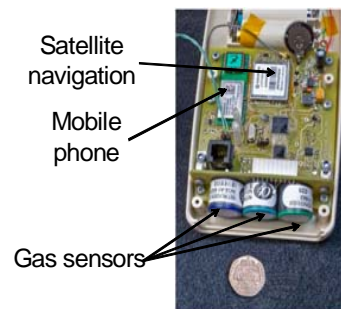


SenseAir SA, Low-Cost NDIR Sensor Platform for sub-ppm Gas Detection



Research Platform for Fire Gas Detection by Siemens AG

Sensor units components



400 gm (incl. batteries)



Simple operation!

UNIVERSITY OF CAMBRIDGE

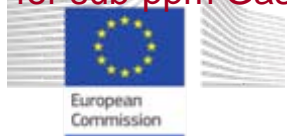
Lisbon 13-14 November 2009

message



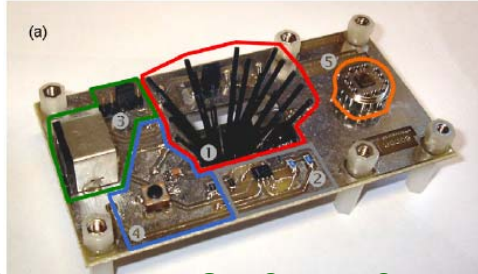
Octocopter - the first platform by Max Planck Institute for Biogeochemistry, Jena, Germany tested a measurement sensor package for air quality

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EuNetAir INNOVATION on AIR QUALITY MONITORING

23 cm



Autonomous Gas Sensor System
by IREC and Univ. of Barcelona

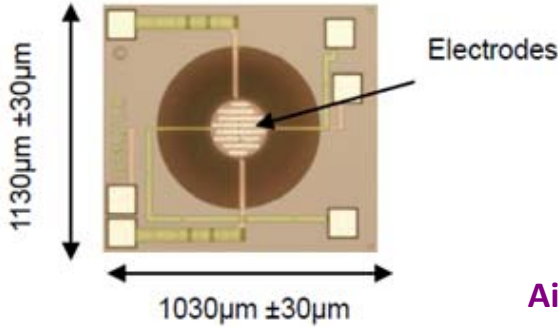
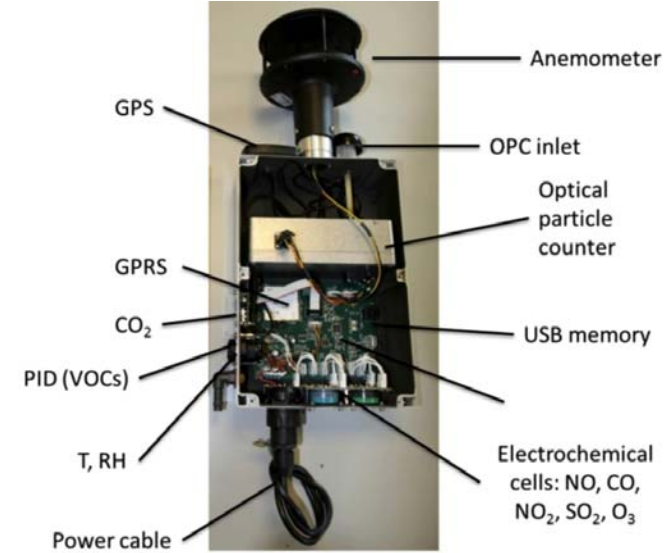


AIRBOX Sensor System
by ENEA, Italy

30 cm



AQC Gas Sensor
by CCS, UK



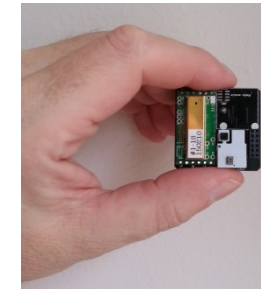
Miniaturized CMOS Sensor
by CCMOS Sensors Ltd and Warwick University



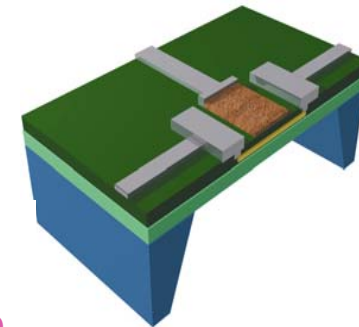
Air Quality Bike (Aeroflex) for Mobile AQ Measurements
by VITO, Belgium



Smoke Detector
SIEMENS, Germany



E5000 IAQ Probe/Controller,
NanoSense, France



SGX-Sensortech MOX Gas Sensors for Automotive AQ Measurements
by SGX-Sensortech, Switzerland



NDIR Gas Sensors (CO₂)
by SenseAir, Sweden



A low-cost modular sensor platform combining IR spectrometry and MOX gas sensors for IAQ monitoring (CO₂, VOC) and medical applications
by 3S GmbH and Saarland University, Germany

The European sensor systems Cluster



FUTURE STEPS ESSC

- Planning of Future Events (2015 - 2016)
- Relations with Other Bodies/Associations
- Contributions from FP7/H2020 Projects
- Finalization of ESSC Roadmap
- Free ESSC Membership (*on-line Registration live !*)



ACKNOWLEDGEMENTS

Freiburg, Germany, 6- 9 September 2015



THANK YOU VERY MUCH FOR YOUR KIND ATTENTION!



EuroNanoForum
2015



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