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## **Publishable JRP Summary Report for JRP ENV02 PartEmission Emerging requirements for measuring pollutants from automotive exhaust emissions**

### **Political Background**

The Sixth Community Environment Action Programme adopted by Decision No 1600/2002/EC of the European Parliament and of the Council of 22 July 2002 establishes the need to reduce pollution to levels which minimise harmful effects on human health, paying particular attention to vulnerable members of the population and to the environment as a whole. European Community legislation have established appropriate standards for ambient air quality for the protection of human health and susceptible individuals in particular, as well as for national emission ceilings. Following its communication of 4. May 2001, which established the 'Clean Air For Europe (CAFE) programme', the Commission adopted another communication on 21. September 2005 entitled 'Thematic strategy for air pollution'. One of the conclusions of that thematic strategy is that further reductions in emissions from the transport sector (air, maritime and land transport), from households and from the energy, agricultural and industrial sectors are needed to achieve EU air quality objectives. This project aims to provide the underpinning metrology research to better understand, measure and therefore control automotive exhaust emissions. The need for this JRP is demonstrated in different ways for different parts of the work. It addresses three main constituent of exhaust emissions where measurement infrastructure is lacking: Soot particles, Platinum Group Elements (PGE) and Mercury.

### **Introduction**

Numerous epidemiological studies show the effect of increased ambient pollution. Therefore measurement air quality networks have been installed and a European Directive requires the monitoring of air pollution. Improvement in the quality of life for European citizens cannot be achieved by observing ambient air alone. It is also important to be able to identify, to quantify and finally to regulate the emission of distinct sources relevant for ambient air quality. For this reason it is essential to establish a metrological basis for the measurement of certain critical pollutants.

Automotive vehicles are a major source of environmental pollution i.e. particularly the primary atmospheric contaminants, such as CO, NO<sub>x</sub>, SO<sub>x</sub> and hydrocarbons. Petrol combustion also causes pollution with a number of inorganic elements, such as mercury (Hg), which is naturally occurring in fossil fuels while Platinum Group Elements (PGE) can be present from catalytic converters, and sub-micron particles are present in exhausts from the combustion of Diesel fuel. In order to assess the risks from these additional pollutants and introduce appropriate regulation, the capability of practical and traceable measurements is required.

### **Soot particles**

The JRP will establish a sound metrological base for particle emissions in exhaust gases of diesel vehicles in Europe. This includes establishment of a particle number concentration standard for soot particles with the aim of providing calibration services for end users and industry, in particular for the calibration of measuring instruments for the type approval of Euro 5 and Euro 6 diesel vehicles such as light vans and passenger cars.

Furthermore a sound background will be developed for metrological validation of novel instrument types measuring the soot particle concentrations in exhaust gases from diesel vehicles and their capability to be used for the regulatory periodic emission control of vehicles.

### **Platinum Group Elements (PGE)**

The release of PGE into the environment is damaging in terms of public health, ecological and economic interests. In order to assess the risks reliable, accurate and comparable data on the release rates of PGE from automotive catalysers are needed. The outcome of this JRP will allow to assess the PGE content to be determined not only in terms of PGE mass per total emitted mass, but also in terms of PGE mass emitted per driven distance.

Producing a reference procedure fulfilling the requirements of a primary method of measurement can only be performed by combining all validated single steps and setting up a complete uncertainty budget. As no

Certified Reference Materials (CRM) are available this will be challenging, especially with regard to the achieving uncertainties. Additionally, a comparison with a similar analytical procedure will be performed. The whole analytical procedure will be validated by combining all validated single steps and setting up a complete uncertainty budget.

### Mercury

Recent annual global mercury emissions from all sources, natural and anthropogenic (human-generated), are highly uncertain, and have been estimated at about 4800 tons per year up to 8300 tons per year. The WP will join American expertise in this field with European metrological expertise, building a global metrological framework for the determination of mercury in various environmental compartments.

In addition, current mercury vapour calibration procedures, use mercury vapour sources with very high concentrations, which are not suited for accurate calibration of the low mass concentration levels found in exhaust emissions and in ambient air. Therefore, the project will also produce SI traceable mercury vapour sources at much lower concentration levels than those previously achieved. Additionally, exemplarily traceable measurements of mercury vapour in exhaust emissions and ambient air will be delivered.

### General impact

Being driven by a series of important legislation, environmental and health needs the project team is convinced that this JRP will have a significant impact on society. This WP aims to facilitate the dissemination of the project results and to stimulate contacts with manufacturers (of e.g. cars, measurement instruments, reference materials, catalysers). Whilst the partners obligate to publish peer-reviewed papers, publish trade-journal articles and make conference presentations in order to disseminate scientific excellence from the project, the key impacts are the capabilities and methodologies that will be implemented by or on-behalf of the Stakeholder Community.

The main activities in this WP concern the scientific output of the project, the exploitation of the project deliverables, and the wide dissemination of knowledge and project results to relevant parties in Europe.

### Support of this JRP

The JRP is supported by different governmental, research and industrial organisations, manufacturers (of e.g. cars, measurement instruments, reference materials) and users (e.g. exhaust inspectors). And the Partners are always looking for more supporters. Please feel free to contact the Coordinator of this JRP.

A Kick-Off-Workshop is planned on June 6<sup>th</sup> and 7<sup>th</sup>, 2011. Please have a look to the JRP website for further information.

### Report Status: PU Public

JRP start date and duration:

1. June 2011, 36 months

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<http://www.ptb.de/emrp/PartEmission.html>

JRP-Partners:

JRP-Partner 1 PTB, Germany

JRP-Partner 6 JRC, EC

JRP-Partner 2 BAM, Germany

JRP-Partner 7 LNE, France

JRP-Partner 3 DFM, Denmark

JRP-Partner 8 MIKES, Finland

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JRP-Partner 5 IJS, Slovenia

JRP-Partner 10 VSL, The Netherlands

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