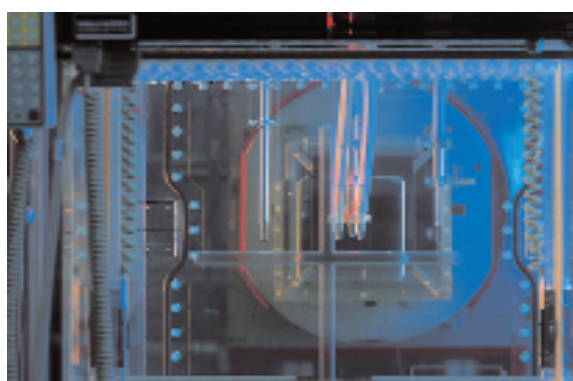


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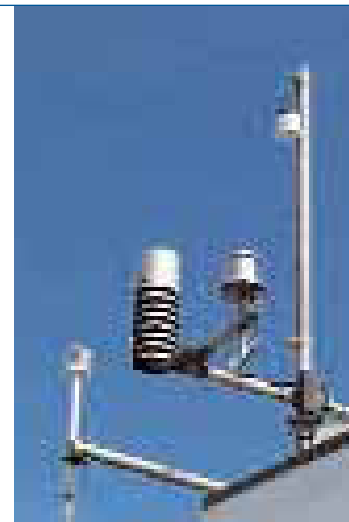
Primärdosimetrie hoch energetischer Photonenstrahlung

Geschwindigkeitsüberwachung
mit direkter Datenübertragung

Staatsbesuch aus China im METAS

METAS a participé à
la Nuit de la Science 2004

Primary Standard Optimised with METAS Software



The ozone primary standard is successfully operational since 2004 with a new METAS software. This software enables numerous hardware optimisations to improve accuracy and repeatability.

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DIETER W. ZICKERT

In 1993, METAS set a European première by starting the operation of a Standard Reference Photometer (SRP) as ozone primary standard. The manufacturer NIST (National Institute of Standards and Technology) has since sold around 30 machines world-wide as standards for ozone-immission measurements. These are still being made to order and are pure laboratory instruments.

The operational software offered was written in the programming language C (Borland). Today's standard PC systems no longer support the necessary relating hard- and software resources (ISA-Bus/DOS). For this reason, the NIST software has been translated into Visual-Basic. Thus results, for example, are no longer stored in ASCII, but in Excel files. Furthermore the new software is mainly functionally designed for the comparison of the SRP's amongst themselves i. e. during international comparisons.

The instruments themselves were modified accordingly by NIST and in particular obsolete electronic components were replaced by more suitable ones. This hardware update was performed in 2002 for both METAS standards by the manufacturer.



1: METAS ozone laboratory: In the measurement cubicle, ozone reference instruments are calibrated using the primary standard (right). In the foreground the controls for the primary standard and the measurement facility automation.

METAS is involved in further development

Constructive joint co-operation for the necessary development of the software and the instruments themselves is delayed considerably due to the manufacturer's lack of personnel resources. The Bureau International des Poids et Mesures (BIPM) in Paris now owns several machines, performs international comparisons and is currently establishing fundamentals in the field of optics. A commercial hardware update,

however, is not intended by the BIPM in the near future. The engagement of METAS however is to encourage all future development of the ozone standards.

In Switzerland, the ozone primary standard is used mainly for the routine calibration of the transfer standards owned by the cantons' laboratories. This cannot be performed efficiently enough using the original NIST software. Possible add-on capabilities of the SRP, such as the measurement of

pressure and temperature in both measuring cells, are not possible without access to the software resources (NIST) and the necessary support.

The new software

For these reasons, METAS has decided to acquire its own future-orientated software, which not only rationalises the use of the primary standard in Switzerland, but also enables the further technical development of the hardware.

The product LabVIEW® of National Instruments was chosen as development platform. The graphic programming language LabVIEW is experiencing a steadily increasing application in laboratories. Particular consideration in this choice was paid to the necessary in-house and external support.

The solution realised, designated OzoneLab, uses the hardware interface of the new NIST software (PCI cards). Therefore no adjustments to the SRP are necessary. The software structure still permits future development/modification of the SRP, whereby the reverse compatibility is guaranteed.

The Swiss company Iset GmbH was commissioned to design OzoneLab on the operating system NT (W2K, XP possible) with LabVIEW 6.1. The data base employed is MSDE of Microsoft.

OzoneLab provides the following advantages:

- The modular programming enables easy adjustment of software in the case of later hardware changes.
- All original NIST software functions are integrated in OzoneLab.
- The controlling of the ozone generators is simplified (direct input in units of ppb ozone)
- The use of a data base offers more advantages: All settings and results of each measurement are definitely stored and can be viewed at any time, or previous settings can be reused for further measurements.
- OzoneLab thus fulfils the requirements of the METAS quality management system.

Optimisation of the primary standard

The electronic control system is to be replaced during an initial phase in 2004. The most essential elements, the temperature and pressure measurements, are to be redesigned. At least one calibrated sensor in each of the two measurement cells is necessary to establish the correct measurement values. OzoneLab is already pre-programmed for the introduction of the new components and for the subse-

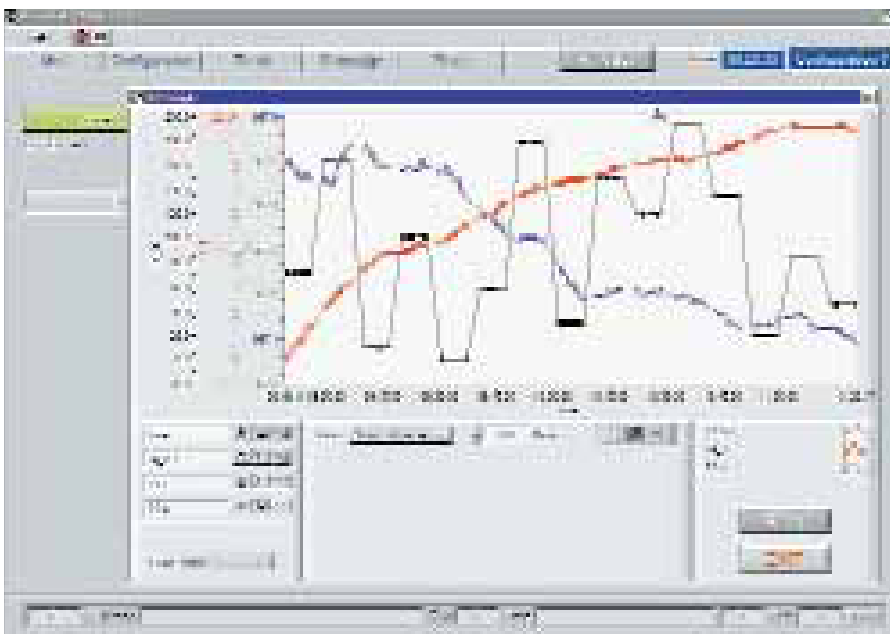
quent calculations. With the replacement of the control system, METAS is planning the following things:

- Measurement and individual compensation of pressure in each of both measuring cells.
- Measurement and individual compensation of temperature in each of both measuring cells.
- The installation of stable measuring instruments for pressure and temperature that can be calibrated and therefore no longer require repeated adjustments prior to each measurement.
- Greater flexibility in the choice of flush and measurement times by freely selectable intervals, hence optimisation of the measurement processes.
- Installation of mass flow controllers for gas flow regulation.
- Safety programme to prevent defects caused by handling errors.

The modular and flexible design of OzoneLab allows further development of soft- and hardware to increase reproducibility and accuracy of the standard instruments.

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2: Diagram of the new software showing typical measurement procedure.