

20IND06 PROMETH2O

# Introduction of partners

capabilities, capacities, competences

**Project kick-off meeting**

Online, hosted by INRIM

**14<sup>th</sup> of June 2021**

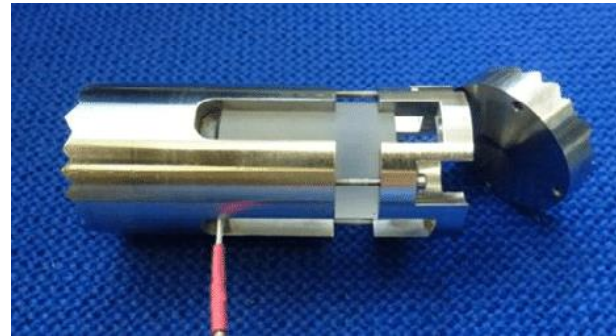
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no.	Participant Type	Short Name	Organisation legal full name	Country
1	Internal Funded Partner	INRIM	Istituto Nazionale di Ricerca Metrologica	Italy
2	Internal Funded Partner	CEM	Centro Español de Metrología	Spain
3	Internal Funded Partner	CETIAT	Centre Technique des Industries Aérauliques et Thermiques	France
4	Internal Funded Partner	CMI	Cesky Metrologický Institut	Czech Republic
5	Internal Funded Partner	CNAM	Conservatoire national des arts et métiers	France
6	Internal Funded Partner	INTA	Instituto Nacional de Técnica Aeroespacial Esteban Terradas	Spain
7	Internal Funded Partner	PTB	Physikalisch-Technische Bundesanstalt	Germany
8	Internal Funded Partner	TUBITAK	Türkiye Bilimsel ve Teknolojik Arastırma Kurumu	Turkey
9	Internal Funded Partner	UL	Univerza v Ljubljani	Slovenia
10	Internal Funded Partner	VSL	VSL B.V.	Netherlands
11	Internal Funded Partner	VTT	Teknologian tutkimuskeskus VTT Oy	Finland
12	External Funded Partner	DTU	Danmarks Tekniske Universitet	Denmark
13	External Funded Partner	Nippon Gases	Nippon Gases Industrial S.r.l.	Italy
14	External Funded Partner	Qrometric	Qrometric Ltd	United Kingdom
15	External Funded Partner	SUN	Università degli studi della Campania Luigi Vanvitelli	Italy
16	External Funded Partner	UNICAS	Università degli Studi di Cassino e del Lazio Meridionale	Italy
17	External Funded Partner	UVa	Universidad De Valladolid	Spain
18	Unfunded Partner	MBW	MBW Calibration AG	Switzerland
19	Unfunded Partner	Vaisala	Vaisala Oyj	Finland



- Temperature and Humidity: primary standards

- ITS-90 realization
- Boltzmann & the new K
- Radiation thermometry
- Humidity standards



- Thermo-physical quantities

- Spectral emissivity & radiative heat flux
- Speed of sound, density & heat capacity
- Water vapor pressure & viscosity

- Temperature, Humidity and Moisture: applied research
  - Industrial thermometry
  - Applied thermodynamics for meteo & climate
  - Acoustic, dielectric & WGM thermometry
  - Moisture in materials



## INRIM-01. Dew/frost-point PHG

- Temperature range: -20 °C to + 95 °C
- $U(T) = 0.04$  °C to 0.08 °C
- Pressure: 1000 hPa – 1200 hPa
- Flow-rate: 0.5 l/min to 4.0 l/min



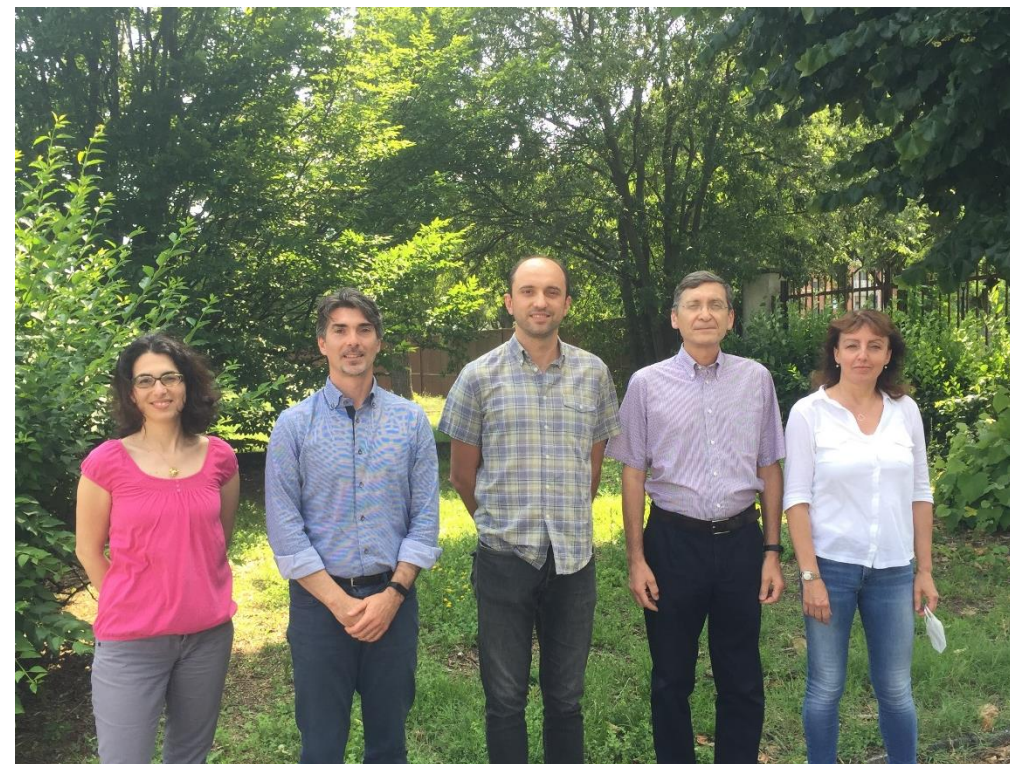
## INRIM-02. Frost point PHG

- Temperature range: -85 °C to 0 °C
- $U(T) = 0.08$  °C to 0.04 °C
- Pressure: 1000 hPa – 1300 hPa
- Flow-rate: 0.5 l/min to 2.5 l/min





- **Frost point temperature: -99 °C to -20 °C**
- $U(T=-95\text{ °C}) = 0.05\text{ °C}$
- $P$ : 200 hPa to 1100 hPa
- $x_w$ : 15 nmol/mol to 0.005 mol/mol





**DIVISION**  
„Chemical Physics and  
Explosion Protection“



**DEPARTMENT**  
“Analytical Chemistry of the **Gas Phase**”  
> 4 WG and around 35 Co-workers



**Humidity and  
Thermal State  
Behaviour**

- **National H2O-scale**
- **H2O preparation**
  - Thermodynamic
  - Coulometric
  - Permeation
- **H2O analytics**
  - Thermodynamic
  - Spectroscopic
  - ppb to 80 vol%
  - airborne hygrometers
- **Breath alcohol scale**
- **Grain humidity**



**Spectrometric  
Gas Analysis**

- **Traceable molecular/laser spectroscopy**
  - TDLAS/CRDS/ICOS/PAS
  - TDL-Engine diagnostics
  - Airborne TDLAS
  - 1D/2D/3D TDLAS
- **TDL transfer standards**
- **HR-FT-Spectroscopy**
  - spectral reference data:  
LBL+Xsect / UV to MIR



**Aerosols  
and  
Particles**

- Development of  
**Primary aerosol std**
- **Preparative:**  
Reference Aerosol Generation +  
characterization
- **Analytical:**  
Traceable aerosol diagnostics
  - Opacity
  - mass density
  - particle size and
  - particle size distribution article
  - **number density**



**Transport  
Emissions  
+ Services**

- **Emission diagnostics**
  - vehicle type approval
  - vehicle PTI / AU
- **PTI – monitor  
conformity assessment**
- **PN calibration service**
- **RDE-PEMS performance**  
**PN, NO, NO2, CO, CO2**

**3** Chemical Physics  
and  
Explosion Protection



**3.4** Analytical Chemistry  
of the Gas Phase

Volker Ebert (head)



Humidity and  
Thermal State  
Behaviour

R. Deschermeier (head)

## — Capabilities in 3.41 —

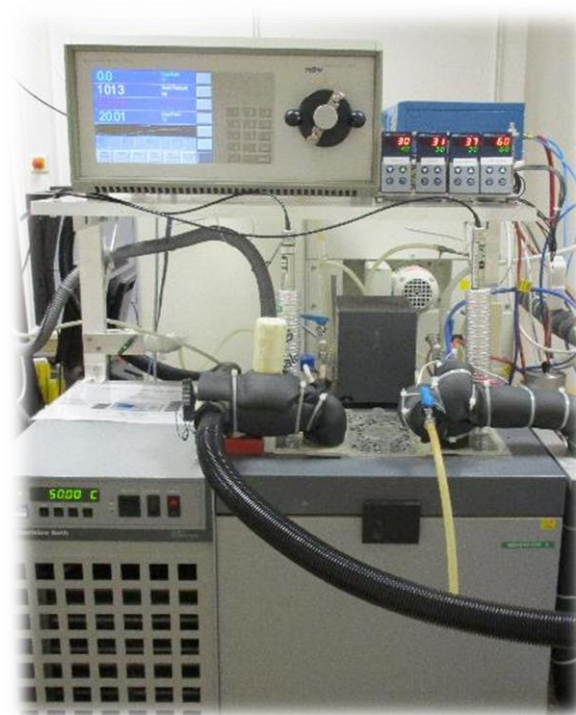
### Humidity standards

- Primary generators: absolute/relative humidity  
→ thermodynamic + coulometric (Trace H<sub>2</sub>O)
- Secondary principles  
→ thermodynamic, permeation, optical
- Dissemination of humidity scale
- Calibration services for hygrometers
- R&D humidity: preparative + analytical

### Legal metrology

- Breath alcohol concentration
- Grain moisture

Primary H<sub>2</sub>O standard





**3** Chemical Physics  
and  
Explosion Protection



**3.4** Analytical Chemistry  
of the Gas Phase

Volker Ebert (head)



 **3.42** Spectrometric  
Gas Analysis

V. Ebert (head)

## — Capabilities in 3.42 —

### Laser spectroscopy

- Direct traceable laser absorption spectroscopy (TDLAS/QCLAS/ TILSAM)
- Cavity-enhanced techniques (CRDS/CEAS)
- Field TDLAS (ground based, balloon, airplanes) + industrial process spectrometer
- Optical isotope ratio spectroscopy (OIRS) also for H<sub>2</sub>O (triple isotope laser hygrometer)

### FTIR-based spectrometry

- Two Bruker IFS 125HR (Super High.-res. FT 0.009 cm<sup>-1</sup>, UV/VIS/NIR/IR)  
→ spectral line data measurement facility  
→ complex gas analysis
- Bruker VERTEX 80 FTS





## AMP Group – Atoms, Molecules & Precision measurements

