

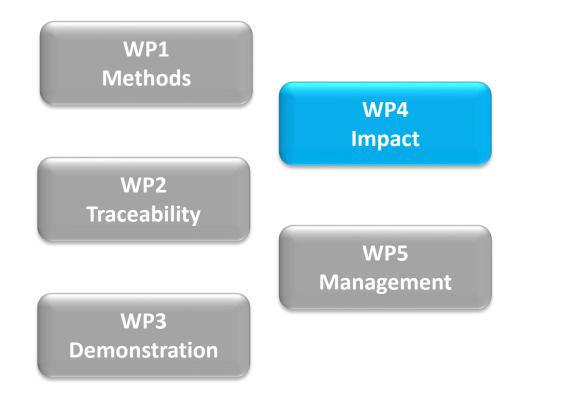
# 20IND06 PROMETH20 Metrology for trace water in ultra-pure process gases

Project Progress Meeting at M9 Online, hosted by INRIM Wednesday 9 March 2022





### **Involved partners in WP4**









MBW	calibra 	tion
	UVa	

#### **PROMETH2O M9 Meeting**



- A4.1.1 set up, host and maintain the project website (CETIAT, all partners) M36
  - The website will have a public and restricted area and it will be set up within 3 months from the start of the project and will be updated at least every 9 months (M3, M12, M21, M30, M36)
    - Requests
      - high resolution/quality pictures, drawings, schematics
      - check/review your description : <u>https://www.prometh2o.eu/en/our-partners</u>
    - Implementation (in progress)
      - link with cloud storage GARRbox
      - flow chart of the project
    - Statistics



- A4.1.1 set up, host and maintain the project website (CETIAT, all partners) M36
  - The website will have a public and restricted area and it will be set up within 3 months from the start of the project and will be updated at least every 9 months (M3, M12, M21, M30, M36)
    - Requests
      - high resolution/quality pictures, drawings, schematics

— check/review your description :	PROMETH2O (outil GA4)	oct-21	nov-21	déc-21	2121
	Sessions Prometh2O	6	4	4	14
<ul> <li>Implementation (in progress)</li> </ul>	Utilisateurs Prometh2O	6	2	2	10
	Pages vues Prometh2O	16	3	6	25
<ul> <li>link with cloud storage GARRbo</li> </ul>	durée d'engagement moyenne (min) Prometh20	0:21	0:05	00:28	00:18
	taux d'engagement Frometrizo	83%	25%	100%	69,33%
<ul> <li>flow chart of the project</li> </ul>	nouveaux visiteurs Prometh2O	100%	100%	100%	100,00%
now chart of the project		<u> </u>		,	<b>ר</b> ו
A Ctatistics	PROMETH2O (outil GA4)	janv.22	févr-22	2022	J
<ul> <li>Statistics</li> </ul>	Sessions Prometh20	20	19	39	]
	Utilisateurs Prometh2O	11	14	25	] '
	Pages vues Prometh2O	42	35	77	] \
	durée d'engagement moyen par session (min)	00:28	00:39	00:33	
PRO	taux d'engagement Prometh2O	55%	63%	59,00%	6
	nouveaux visiteurs Prometh2O	91%	86%	88,50%	



## Task 4.1: Knowledge transfer

A4.1.1 set up, host and maintain the project website (CETIAT, all partners) – M36

All files

Shared with y

Shared with ot
Shared by link

Q Tags

Deleted files

- A protected cloud storage for the exchange of information and documents has been already set up by INRIM and will be maintained for the lifetime of the project
  - https://gbox.garr.it/

	♣ ≥ 20IND06 PROMETH20 ≥ +					
	Name A			Size	Modified	
iu	01-Contact List	<pre>r.cuccaro@</pre>		31 KB	a month ago	
hers	02-Negotilation with MSU	<pre><creare@< pre=""></creare@<></pre>	***	2.4 MB	9 months ago	
	03-Meetings	<pre>cuccaro@</pre>		48.4 MB	9 months ago	
	04-Deliverables (Material and outcomes for all WPs)	< r.cuccaro@		0 KB	10 months ago	
	05-Reporting (Progress and periodical reporting to EURAMET)	<pre>cuccaro@</pre>		726 KB	12 days ago	
	O6-Website (Material for the Website, Logos, Images, Blog entries)	<pre><!-- r.cuccaro@</pre--></pre>		76.3 MB	9 months ago	
	07-Publications	< r.cuccaro@	***	0 KB	10 months ago	
	08-Data sets	<pre>cuccaro@</pre>		0 KB	10 months ago	
	09-General information (contact details and other information)	<pre>r.cuccaro@</pre>		0 KB	10 months ago	
	10-Steering Board	<pre>r.cuccaro@</pre>		13 KB	12 days ago	
	11-Material for presentations	<pre>r.cuccaro@</pre>		0 KB	10 months ago	
	2-Contract documents	< r.cuccaro@	***	4.1 MB	12 days ago	
	3-Archive	<pre>r.cuccaro@</pre>		7.2 MB	9 months ago	
	14-Template	<pre><!-- r.cuccaro@</th--><th></th><th>147 KB</th><th>9 months ago</th><th></th></pre>		147 KB	9 months ago	



- A4.1.2 set up a stakeholder's Steering Board (SB) (INRIM, all partners) M6, M36
  - The SB will be established within 6 months from the start of the project (M6)
  - The aim of SB is to clarify the needs, to feed these into the different activities (e.g. A1.3.1, A2.3.2 and A3.1.1) and to keep the project aligned with the needs to maximise impact
  - SB members will be regularly invited to attend the public part of the project meetings



### 20IND06 - PROMETH2O Steering Board members

MET	Name	Person to be contacted	Alternate	Email
	International Organisations			
▪ H₂O —	CIPM CCT WG-Hu	Stephanie Bell	Chairperson	Stephanie.Bell@npl.co.uk
	IAPWS	Karsten Meier	Jan Hruby	<u>meierk@hsu-hh.de</u>
	JCS	Olaf Hellmuth		<u>olaf@tropos.de</u>
A4.1.2 set up a	KRISS	Byung II Choi		<u>cbi@kriss.re.kr</u>
	NMIJ	Hisashi Abe		<u>abe.h@aist.go.jp</u>
M6, M36	ISO/TC 158 WG3	Adriaan van der Veen		avdveen@vsl.nl
10, 10,50	CIPM CCQM GAWG	Paul Brewer (NPL)		paul.brewer@npl.co.uk
— The SB will be	UNI CIG	Paola Comotti		<u>paola.comotti@mi.camcom.it</u>
- The SD will be	ACCREDIA	Rosalba Mugno		<u>r.mugno@accredia.it</u>
The sime of CC	)			
<ul> <li>The aim of SE</li> </ul>		Person to be contacted	Alternate	Email
(ρσ Δ131 /	Instrument Manufacturers Ball Wave			
_		Yusuke Tsukahara		tsukahara@ballwave.jp
maximise imp	Meeco	Rutger Oudwater		roudwater@meeco.com
		Graham Leggett		graham.leggett@licor.com
<ul> <li>– SB members</li> </ul>	Baker Hughes	Gerard McKeogh		gerard.mckeogh@bakerhughes.com
Se members		Richard Gee		Richard.Gee@processsensing.com
meetings	EffecTech Ltd.	Paul Holland		paul.holland@effectech.co.uk
	Name	Person to be contacted	Alternate	Email
	Gas Providers			
	Air Liquide	Jean-Luc Blanc		jean-luc.blanc@airliquide.com
	Air Liquide	Antonio Carreira		antonio.carreira@airliquide.com
	BOC	Kevin D. Cleaver		Kevin.Cleaver@boc.com
	SOL	Riccardo Nava		<u>r.nava@sol.it</u>
	SIAD	Pierluigi Bissolotti		ricerca@siad.it
	SAPIO	Pierluigi Radaelli	- <i></i> -:	lpmr@sapio.it
	FHa	Laura Abadía Albás	Guillermo Figueroa	labadia@hidrogenoaragon.org



INRIM, CETIAT, INTA, PTB, and VTT will disseminate

to CIPM CCT WG-Hu the outputs of the project from WP1 to contribute on the consultations for the protocol

INRIM,

INTA,

CETIAT,

• A4.1.3 dissemination to key standards bodies CIPM CCT WG-Hu CCT and committees (INRIM. all partners) N126

ees (INRIM, all partners) – M36				PTB, VTT	for CIPM inter-comparison. This WG-Hu holds meetings in conjunction with CC <sup>-</sup>		
Standards Committee / Technical Committee / Working Group	Partners involved	Likely area of impact / activities undertaken by partners related to standard / committee	CIPM CCQM GAWG	PTB	plenary, in general every 3 years. PTB will disseminate to CIPM CCQM GAWG the outputs of the project from WP1 and WP2 to contribute on the consultations for the protocol for CIPM CCT inter-comparison and liaise with such committee This WG holds meetings generally once per year.		
ISO/TC 158 WG3	VSL, CEM	VSL and CEM will disseminate to ISO/TC 158/WG3 the outputs of the project in order to update ISO 19229: 2019 'Gas analysis - Purity analysis and the treatment of purity data' with the project results that are metrological traceable. This ISO group holds meetings twice per year.	IAPWS WG TPWS	INRIM, PTB, VTT	INRIM, PTB, and VTT will disseminate to IAPWS WG TPWS the outputs of the project from WP2 to contribute on the consultation on non-ideal humid gas mixtures and water vapour enhancement data and correlation. This WG holds meetings generally once per year.		
SEMI, Gases Global Technical Committee.	CETIAT	CETIAT will liaise with SEMI, Gases Global Technical Committee to disseminate the outputs of the project from WP2 and contribute to a future update of SEMI F112-0613 - Test Method for Determination of Moisture Dry-Down Characteristics of Surface-Mounted and Conventional Gas Delivery Systems by Cavity Ring Down Spectroscopy (CRDS)	JCS	INRIM, PTB, VTT	INRIM, PTB, and VTT will disseminate to JCS the outputs of the project from WP2 to contribute on the consultation on non-ideal humid gas mixtures and water vapour enhancement data and correlation equations. This JCS group holds meetings once per year.		
		This SEMI, group holds meetings once per year.	EURAMET TC-T	INRIM, CETIAT.	INRIM, CETIAT, INTA, PTB, and VTT will disseminate to EURAMET TC-T the outputs of the project from WP1		
DIN NA 062- 05-73 AA	РТВ	PTB will disseminate to the DIN NA 062-05-73 AA committee the outputs of the project from WP2 to contribute to the discussion on gas supplier industry. This DIN group holds meetings twice per year.		INTA, PTB, VTT	and WP2 to inform the metrology community. The EURAMET TC-T holds meetings once per year.		
PROMETH20 M9 Meeting		EURAMET TC-MC SCGA	РТВ	PTB will disseminate WP1 and WP2 output to EURAMET SCGA and will liaise with this gas metrology committee. The EURAMET TC-T holds meetings once per year.			



- A4.1.4 ≥ 20 presentations (oral and poster) in national or international conferences (CETIAT, all partners) M36
  - The target international conferences are:
    - International Metrology Congress (CIM) 2023, International Measurement Confederation (IMEKO) World Congress 2023, World Gas Conference (GAS) 2022, Symposium on Temperature and Thermal Measurements in Industry and Science (TEMPMEKO) 2023, International Temperature Symposium (ITS) 2023, European Conference on Thermophysical Properties (ECTP) 2023, Symposium on Thermophysical Properties (STP) 2024, International Association for the Properties of Water and Steam (IAPWS) Annual Meeting
  - The target national conferences and media are:
    - Electronic Journal e-medida, Spanish Congress of Metrology, Tutto Misure, Revue Mesures



- A4.1.4 ≥ 20 presentations (oral and poster) in national or international conferences (CETIAT, all partners) M36
  - The target international conferences are:
    - World Gas Conference (GAS) 2022
      - 1 article submitted
    - Other(s) ?
  - The target national conferences and media are:
    - Any ?



- A4.1.5 ≥ 8 peer-reviewed open access publications to scientific journals (CETIAT, all partners) – M36
  - Typical content:
    - i) ultra-trace water vapour standards, ii) methods and procedures developed to improve the ultratrace water vapour measurements with their corresponding uncertainty budgets, iii) results on the enhancement factor in real gas matrices and saturation vapour curves
  - The authors will clearly acknowledge the financial support provided through the EMPIR
    - This project (EMPIR 20IND06 PROMETH2O) has received funding from the EMPIR programme cofinanced by the Participating States and from the European Union's Horizon 2020 research and innovation programme
  - The authors will ensure that the following meta data is submitted and included for each paper
    - Funder name: European Metrology Programme for Innovation and Research, Funder ID: 10.13039/100014132, Grant number: EMPIR 20IND06 PROMETH20



- A4.1.5 ≥ 8 peer-reviewed open access publications to scientific journals (CETIAT, all partners) – M36
  - Berg, R. F., Chiodo, N., and Georgin, E.: Silicone tube humidity generator, Atmos. Meas. Tech., 15, 819–832, https://doi.org/10.5194/amt-15-819-2022, 2022
  - Other(s) ?



- A4.1.6 ≥ 4 e-newsletters (CETIAT, all partners) M9, M18, M27, M36
   SB + website
- A4.1.6 information package (**CETIAT**, all partners) **M36** 
  - Provide materials to facilitate project presentations and to promote consistency on what is shared
- A4.1.6 social media account (CETIAT, all partners) M36
  - Linkedin and research gate



- A4.1.6 ≥ 4 e-newsletters (CETIAT, all partners) M9, M18, M27, M36
  - SB + website
    - Please send to <u>eric.georgin@cetiat.fr</u> your inputs : pictures, small texts (typ. half page), events...
- A4.1.6 information package (CETIAT, all partners) M36
  - Provide materials to facilitate project presentations and to promote consistency on what is shared
    - Template
    - GARRbox : folders n° 11, 14



## Task 4.1: Knowledge transfer

- A4.1.6 social media account (CETIAT, all partners) M36
- A Home Questions Jobs Search for researchers, publications, and more Q Linkedin and research gate Project Updates (0 new) 0 PROMETH20 Metrology for trace water in ultra-pure process Recommendations .... Essayez Premium gases Followers Q Rechercher des posts dans ce groupe gratuitement Accuei Réseau Emplois Messagerie Notifications Vous Produits 🔻 E. Georgin Reads 🛈 Goal: PROMETH2O is a research project in metrology, funded by the European Metrology Programme for Innovation and Research (EMPIR). Trace water is the single largest matrix contaminant in ultra-high purity (UHP) process gases (e.g. Ar, N2 and H2) and its presence 1 membre affects the process yield in UHP gas applications. Even though the manufacturing of UHP gases PROMETH<sub>2</sub>O serves many key technology areas, such as high-value semiconductor manufacturing, the trace water measurements are still lacking metrological traceability in the relevant ranges and matrix gases. The project will fill the knowledge gap regarding the metrological traceability - by developing traceable and improved measurement methods at challenging amount fractions between 5 ppm and 5 ppb for use in the production of pure process gases - and will demonstrate Eric Georgin Propriétaire its applicability in the gas industry. Groupe créé : mars 2022 Inviter des relations The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR participating States. 1 ... Posts en attente 0 Hide details Tous les voir Demandes d'adhésion 0 PROMETH2O - Metrology for trace water in Add update Statistiques Overview Project log References ultra-pure process gases À propos du groupe Gérer le groupe PROMETH2O is a research project in 👬 Groupe répertorié Introduction metrology, funded by the European  $\sim$ Modifier le groupe Introduce your project to your audience to tell them what your research is about Metrology Programme for Innovation and Research (EMPIR). Trace water is the single largest matrix contaminant in ultra-high Mettez toutes les chances du côté de votre groupe Récent  $\sim$ purity (UHP) process gases (e.g. Ar, N2 and ... Goal PROMETH2O - Metrology for tr... PROMETH2O is a research project in HIT: Metrology for Humidity at... 1 suggestion metrology, funded by the European Tout voir iii OpenFOAM Metrology Programme for Innovation and Research (EMPIR), Trace water is the single # actualitsanalyses largest matrix contaminant in ultra-high × Partagez ce post avec votre réseau purity (UHP) process gases (e.g. Ar, N2 and iii METefnet  $(\mathcal{O})$ Add hypothesis Faites circuler l'information pour faire connaître votre Administrateur H2) and its presenc... Tell your audience what you groupe aux personnes présentes sur LinkedIn ou non expect to find out. Edit Eric Georgin réussie des informations de X Partager ce groupe Vous Propriétaire



- A4.2.1 training course on site and workshop (Nippon Gases, all partners) M34
  - The course will be targeted to industry and will consist of one-day training session
  - The course will be provided with special focus on measurements of trace water in ultra-pure gas production and on-site process humidity sensors calibration
  - The course will use data/instruments/methods resulting from A1.2.6 and A3.2.2
  - The workshop
    - The targeted number of attendees is at least 40 for online mode, 20 in presence.



- A4.2.1 training course on site and workshop (Nippon Gases, all partners) M34
  - Not started yet





- A4.2.2 Final workshop and final project meeting (CETIAT, all partners) M36
  - The workshop
    - The workshop will be addressed to technicians/engineers/researchers of NMIs, gas and instrument makers, accredited laboratories, and the industry.
    - It will present the results achieved by the project, such as instrument development (A1.2.6 and A3.2.2), trace water standards (A2.1.6) and software tool(s) (A2.3.3)
    - It will allow time for discussion of the results
    - The targeted number of attendees is at least 40 for online mode, 20 in presence.



- A4.2.2 Final workshop and final project meeting (CETIAT, all partners) M36
  - Not started yet



- A4.3.1 Communication and exploitation plan (CETIAT, all partners) –
   M2, M9, M18, M27, M36
  - The focus points of this exploitation plan will be to detail how the project will ensure dissemination of the project activities and take up of the technology and measurement infrastructure developed in the project
    - exploitation\_plan\_v0.docx



- A4.3.2 New primary and reference standards and calibration and measurement capabilities (CETIAT, INRIM, VTT, PTB, CEM, UL, CMI) – M36
  - Range of generators based on mixed-flow principle extended below -80 °C at pressures up to 1 MPa and with N<sub>2</sub> and air (CETIAT)
  - Range of generators based on saturation down to -105 °C and pressures up to 1 MPa in N<sub>2</sub>, Ar (INRIM) and air (VTT)
  - Coulometric generator for water vapour amount fraction between 5 ppb and 5 ppm at 0.1 MPa in N<sub>2</sub> and Ar (PTB)
  - Certified reference gas materials ( $N_2$ , Ar and  $H_2$ ) with trace water vapour (CEM)
  - Saturation-based generator extended below -80 °C at pressures up to 1 MPa operating with  $N_2$  and Ar (CMI, UL)



- A4.3.2 New primary and reference standards and calibration and measurement capabilities (CETIAT, INRIM, VTT, PTB, CEM, UL, CMI) – M36
  - No input available yet



- A4.3.3 New primary and reference standards and calibration and measurement capabilities (CETIAT, INRIM, VTT, PTB, VSL) – M36
  - calibration services for hygrometers down to -100 °C in N2, Ar or air
  - resulting from A2.1.1, A2.1.3, A2.1.5 and A2.2.2 after the project completion.



- A4.3.3 New primary and reference standards and calibration and measurement capabilities (**CETIAT**, INRIM, VTT, PTB, VSL) **M36** 
  - No input available yet



- A4.3.4 Exploitation of closed-loop trace water calibrator (Qrometric) M36
  - Qrometric will exploit the portable, closed-loop, trace water calibrator from A3.2.5 down to -90 °C frost point in N or air
- A4.3.5 Analysis of trace water vapour in N<sub>2</sub>, Ar, and H<sub>2</sub> (CEM) M36
  - CEM will exploit the improved analysis of trace water vapour in N2, Ar, and H2 from A2.2.3



- A4.3.4 Exploitation of closed-loop trace water calibrator (Qrometric) M36
  - Qrometric will exploit the portable, closed-loop, trace water calibrator from A3.2.5 down to -90 °C frost point in N<sub>2</sub> or air
    - No input available yet
- A4.3.5 Analysis of trace water vapour in N<sub>2</sub>, Ar, and H<sub>2</sub> (CEM) M36
  - CEM will exploit the improved analysis of trace water vapour in N2, Ar, and H2 from A2.2.3
    - No input available yet



# Thank you for your attention



The EMPIR initiative is co-funded by the European Union's Horizon 2020 research and innovation programme and the EMPIR Participating States