



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

Metrology for traceable protocols for elemental and oxidised mercury concentrations

Iris de Krom

ICMGP 2022 – 25-29 July 2022 – Virtual

On demand poster presentation

Introduction



SI-traceability for mercury measurement results

- Primary reference materials
 - Elemental mercury in air
- SI-traceable calibration methods
 - Elemental mercury concentrations
 - Oxidised mercury concentrations



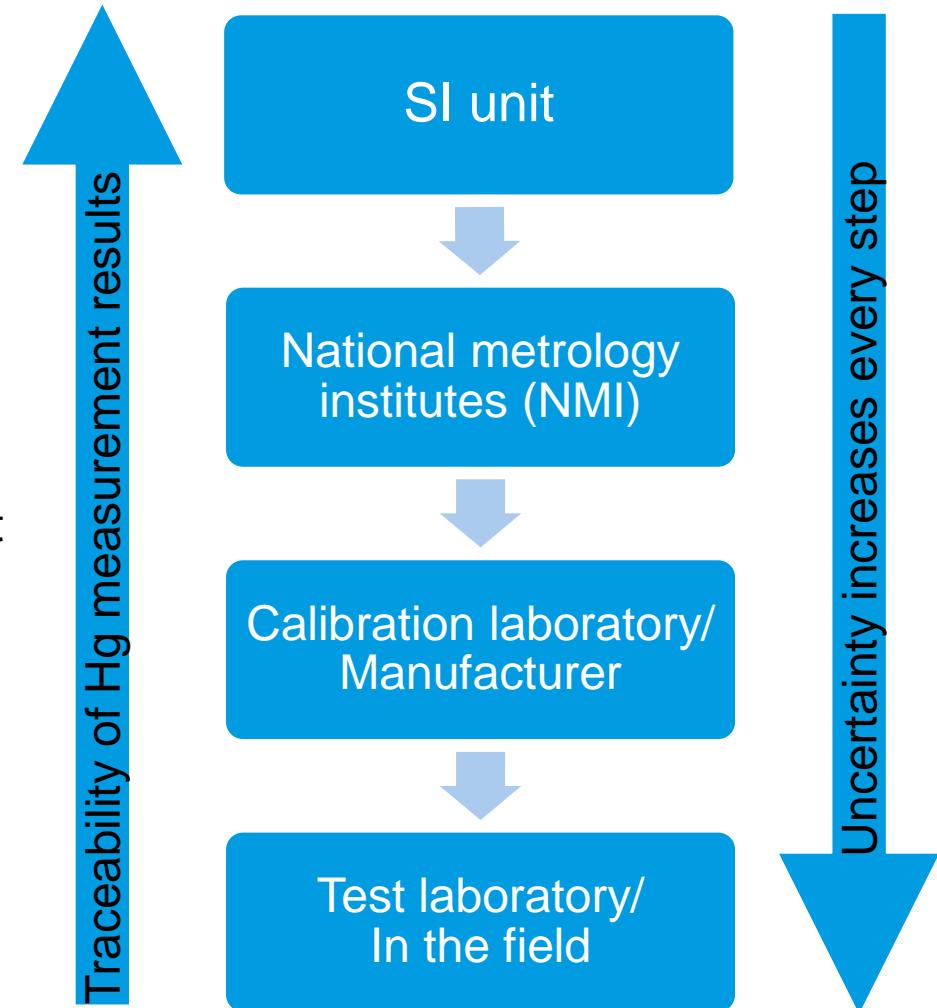


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SI-traceability for mercury measurement results

- Unbroken chain of calibrations from primary standards to industry and monitoring programmes
- Standardised procedures
 - SI traceability for mercury measurement results
 - Documentary standards (ISO/EN)



19NRM03 SI-Hg

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✓ Development and validation of a SI-traceable calibration protocol for **elemental mercury** gas generators

✓ Development and validation of a SI-traceable calibration protocol for **oxidised mercury** gas generators

✓ Performance evaluation of mercury gas generators on the market



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Elemental mercury

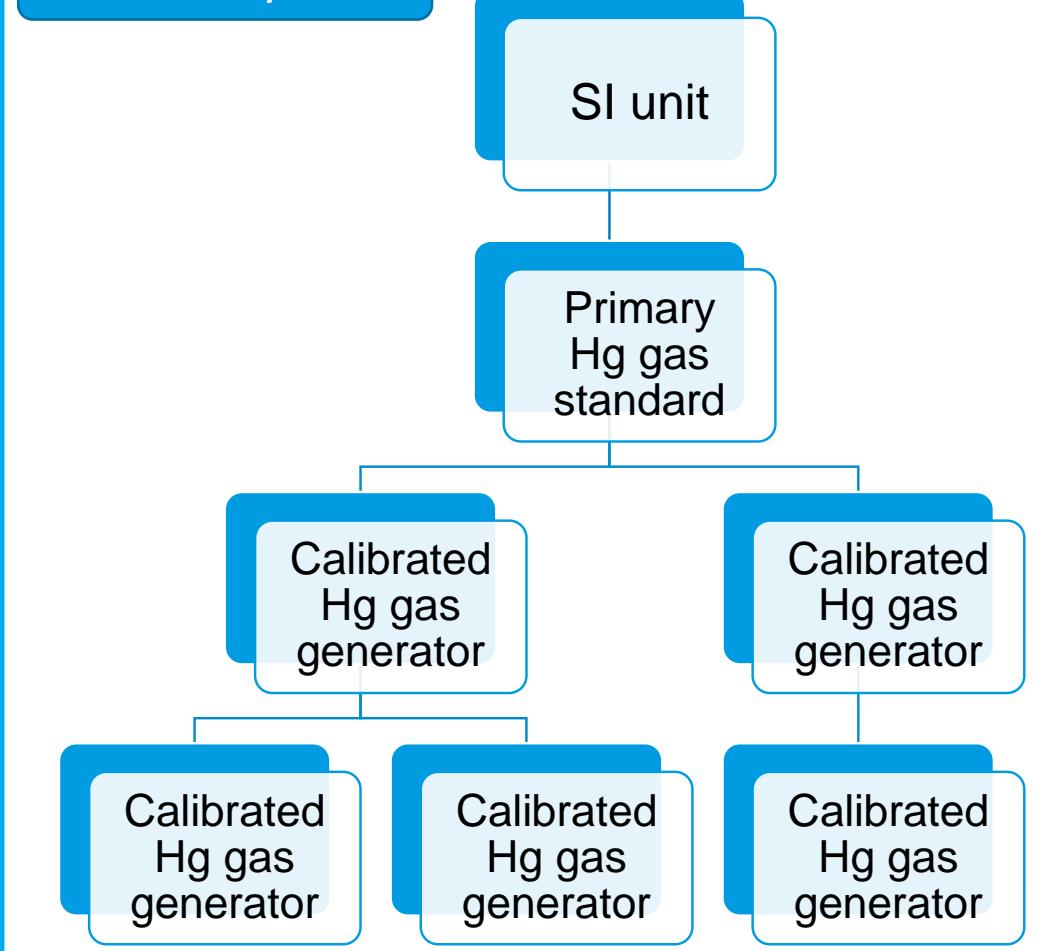
Calibration protocol

1. Calibration of the output of a mercury gas generator by comparison with a reference standard
2. Calculating the uncertainty of the mercury concentration

Validation

Special session 27 July 2022 14:00
Metrological traceability for mercury analysis and speciation

Traceability chain





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Oxidised mercury

State of the art dual analysers and gas generators

Essential characteristics

- Thermal converter efficiency
- Species selectivity
- Transport efficiency

Set-up 1

ID ICP-MS

&

Dual
analytical
system



Set-up 2

- ^{197}Hg radiotracer
- Cold plasma gas generator

conversion
 $\text{Hg}^0 \rightarrow \text{Hg}^{\text{II}}$



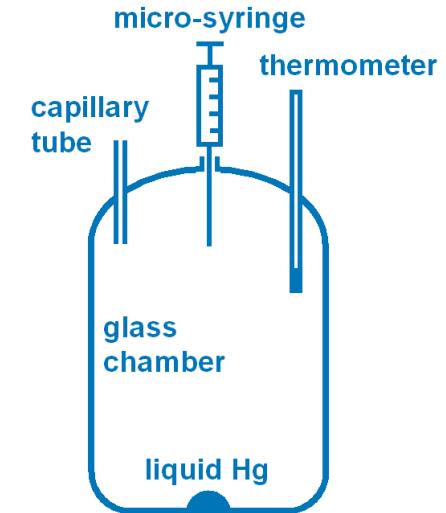
Results

Special session 27 July 2022 14:00
Metrological traceability for mercury analysis and speciation



Gas generators used in the field

- Saturation gas generators (ISO 6145-9)
 - Manually with syringe injection (bell-jar)
 - Automatically
- Mercury amount fraction in cylinders (ISO 6142-1)
- Continuous injection (ISO 6145-4)
 - Based on vaporization of a mercury chloride solution





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Conclusion

- SI-traceable calibration protocols for mercury gas generators used in the field
- SI-traceable mercury measurement results for emission sources and monitoring programmes

Next steps

- Performance evaluation of mercury gas generators on the market ([2022/2023](#))
- Validated protocols for the calibration of mercury gas generators ([2023](#))
- Services for calibration of mercury equipment ([2023](#))
- Protocols converted into a written documentary standard ([2025](#))



Acknowledgement

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