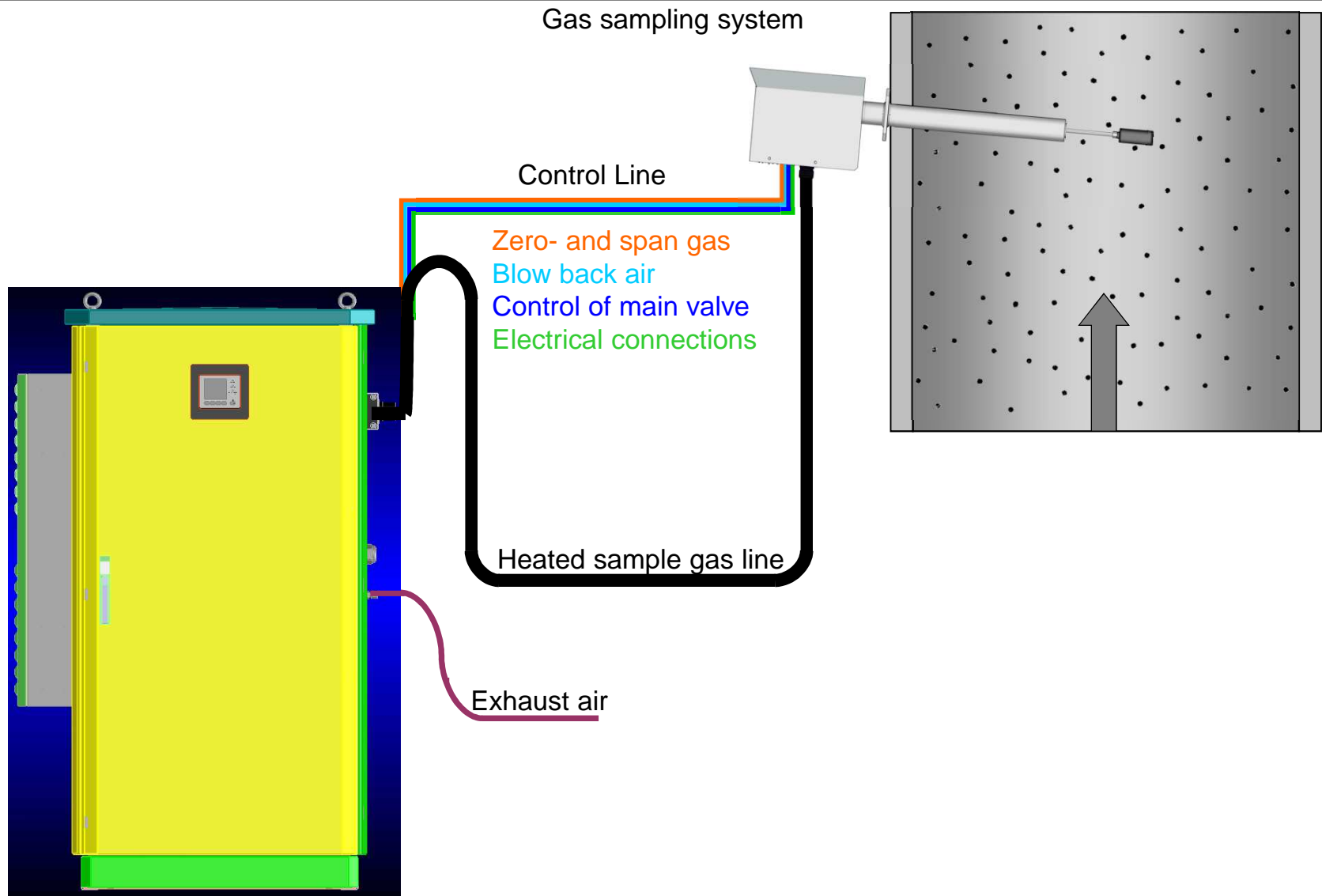


Mercury Monitoring: CEM and Process Control

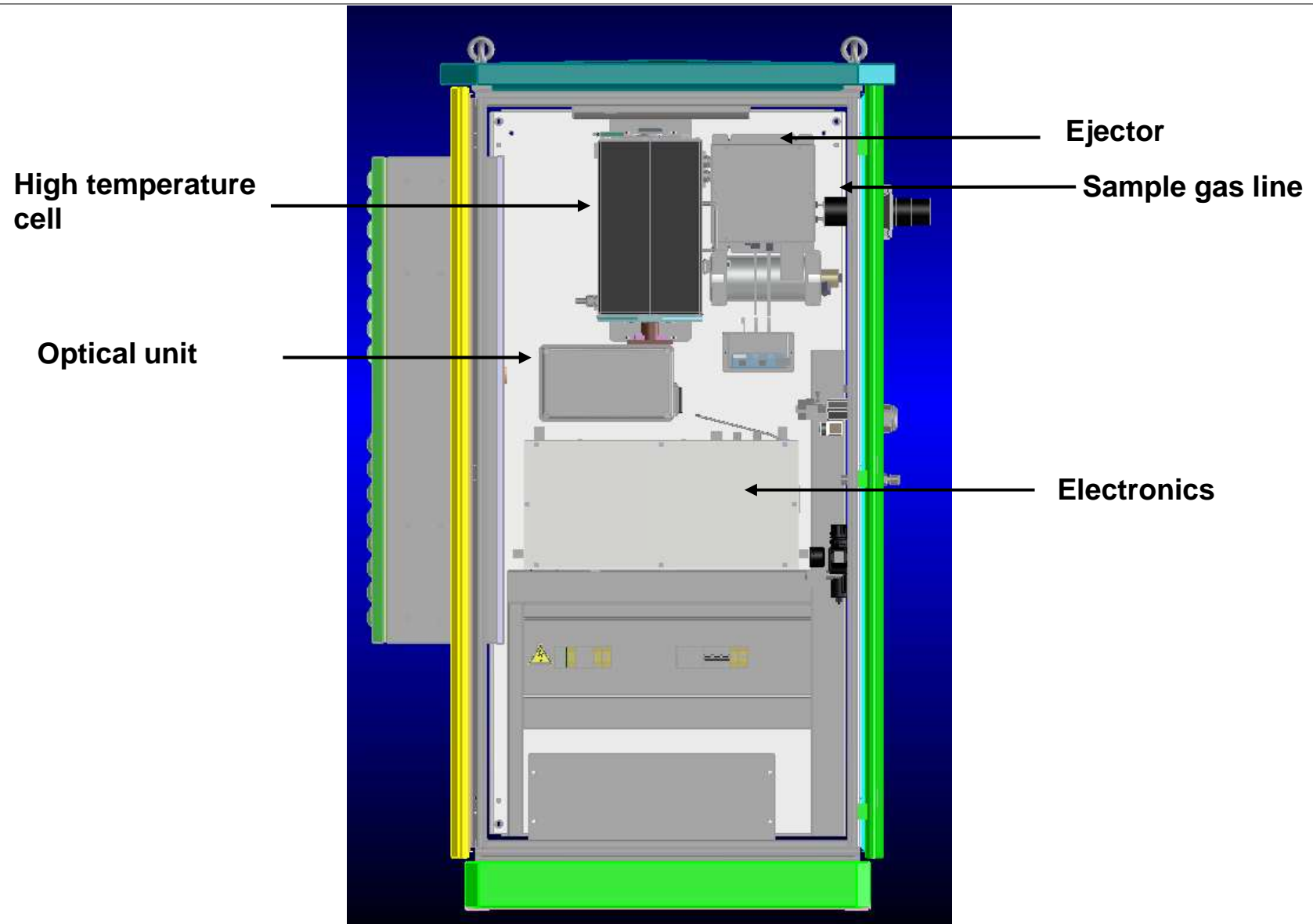
McIlvaine Hot Topic Hour: Mercury Measurement and Control, Part 2

Dan Kietzer: SICK Process Automation

Mercury CEM – Technology Advancements



Mercury CEM – Technology Advancements

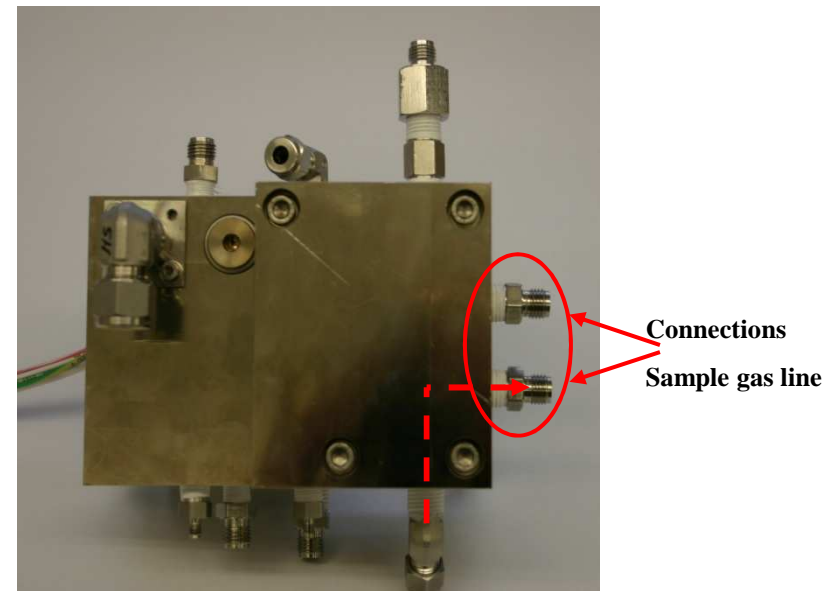


: Ejector

- Instrument air: 2500 l/h
- Flow rate: 300 l/h
- Flow rate sampling cell: 60 l/h

: Sample gas line

- 2 integrated tubes
 - Supply of sample gas
 - Supply of span gas (HgCl₂)
- Recommended length: < 150 ‘

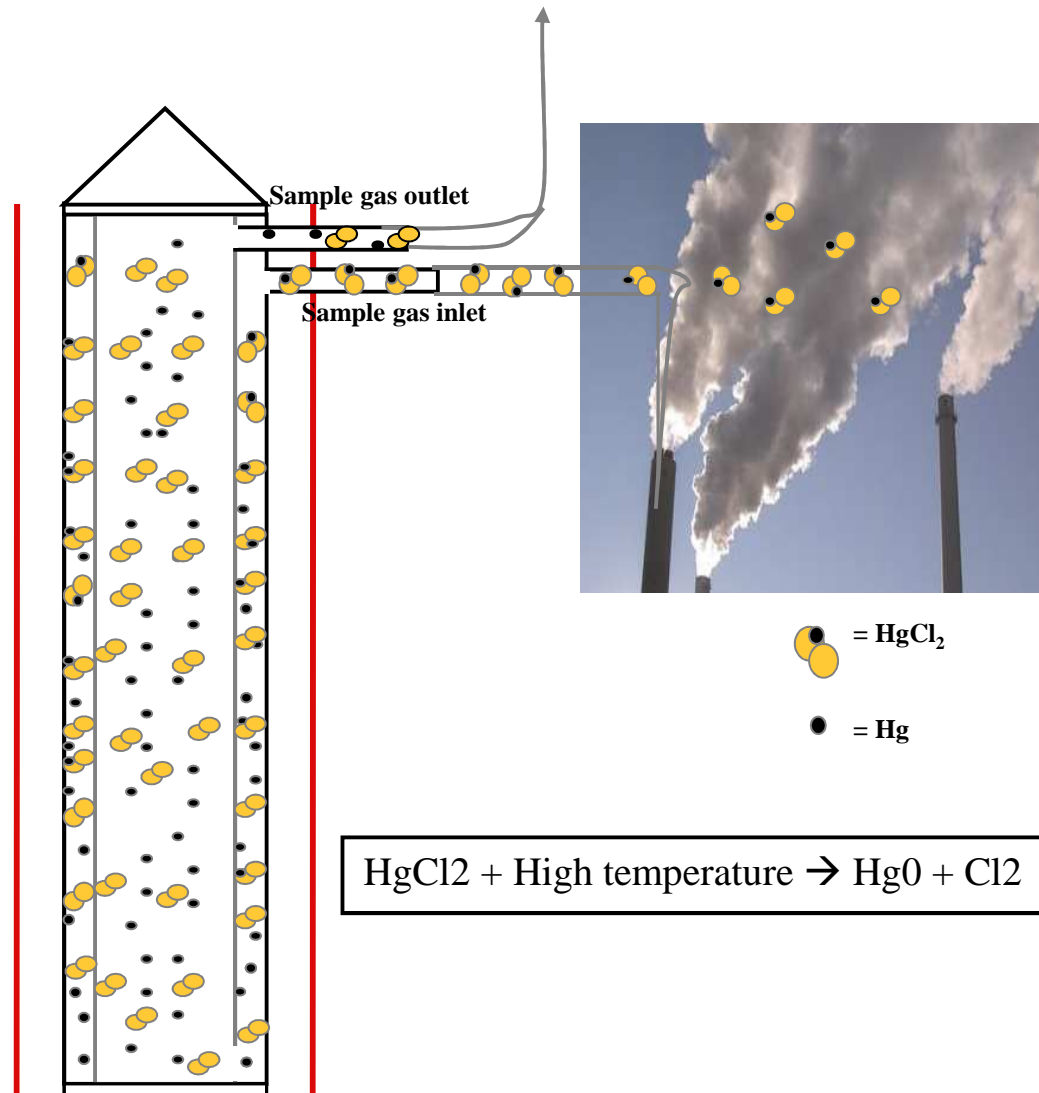


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: High temperature conversion

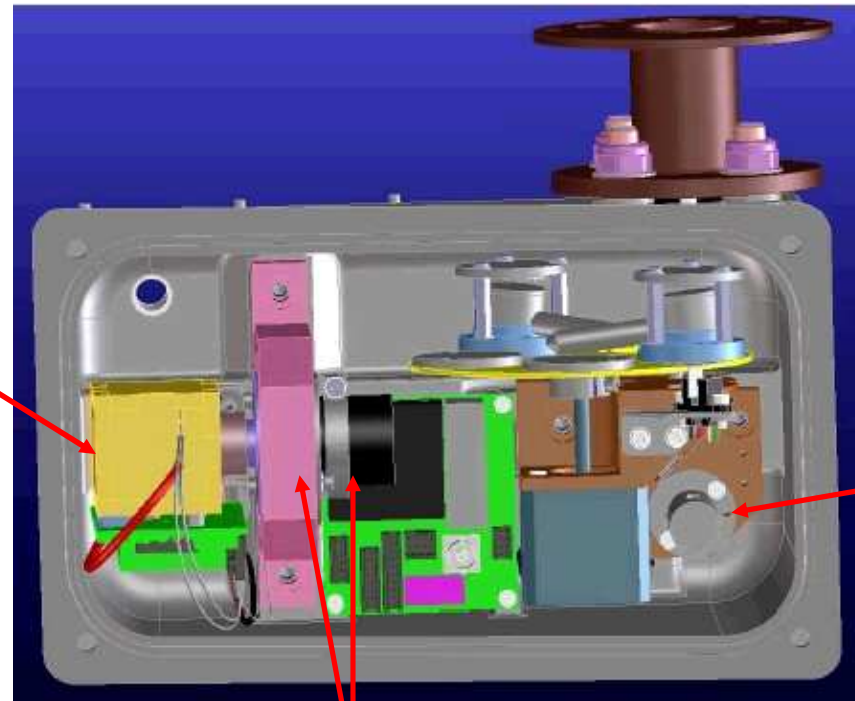
- Heated quartz cell (1000 °C)
- Double walled

High temperature
1000 °C



MERCEM300Z – Design: optical unit

Hg – light source



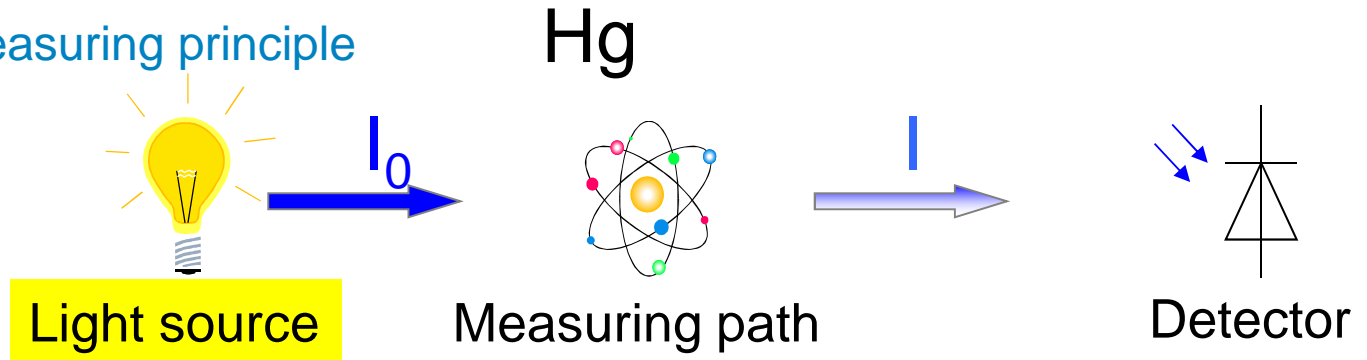
Detector

PEM and
polarizer

Mercury CEM – Technology Advancements

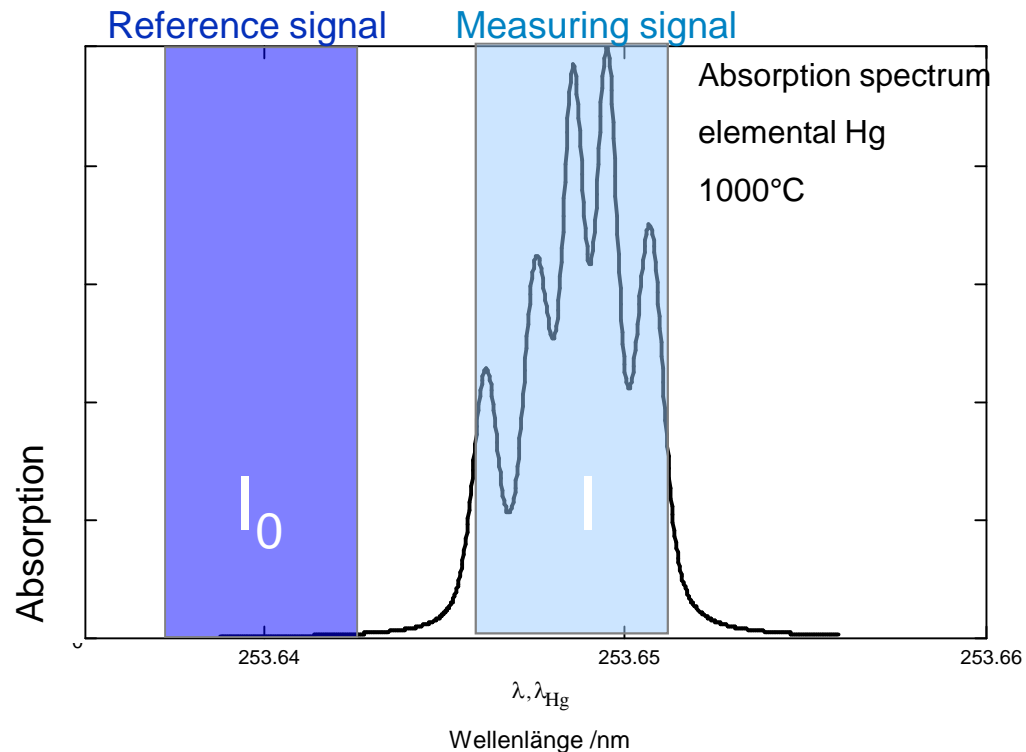
MERCEM300Z – Measuring principle

How to determine the concentration?



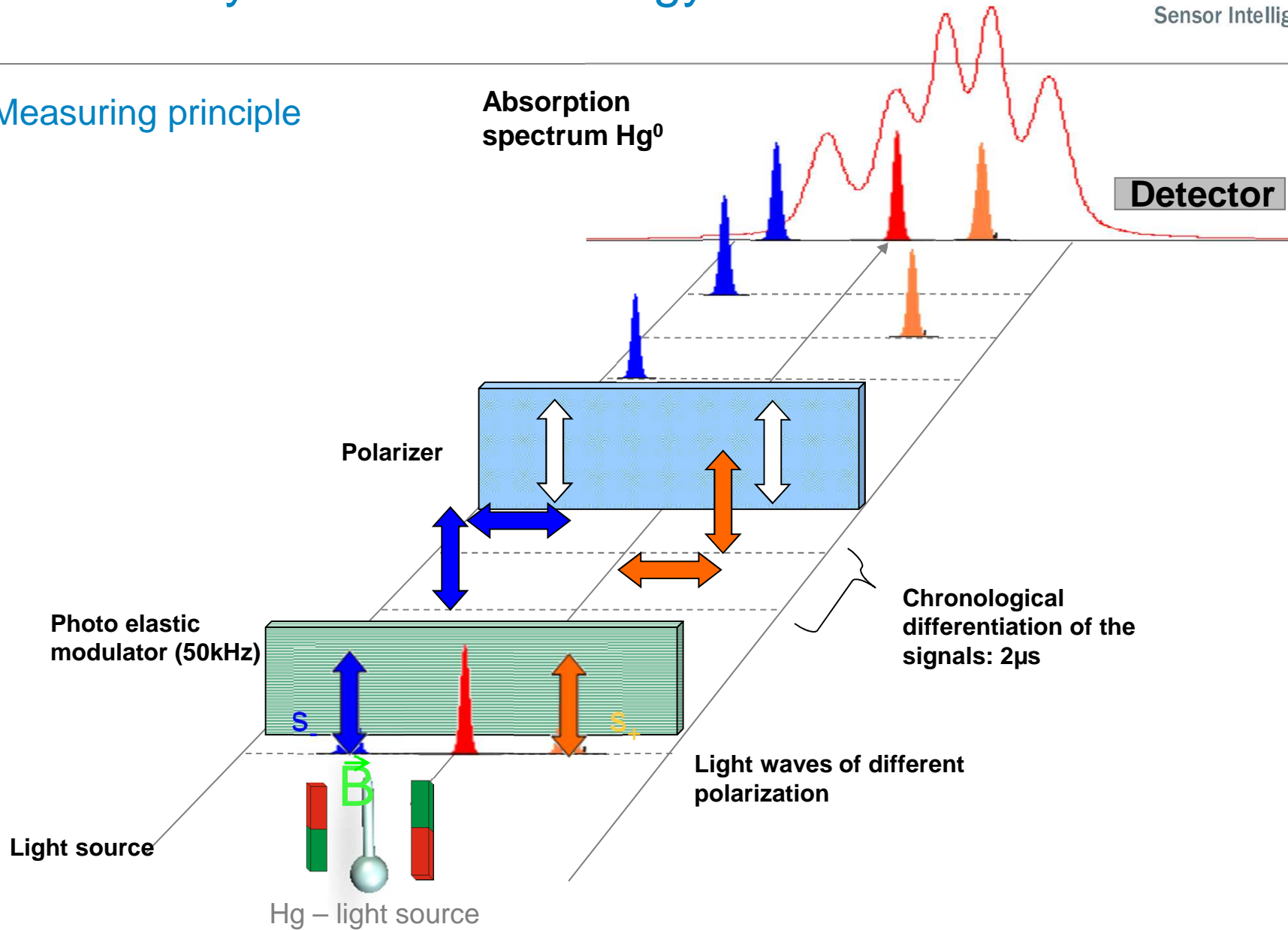
$$\text{Conc} \sim I_0 / I$$

Atomic absorption spectroscopy



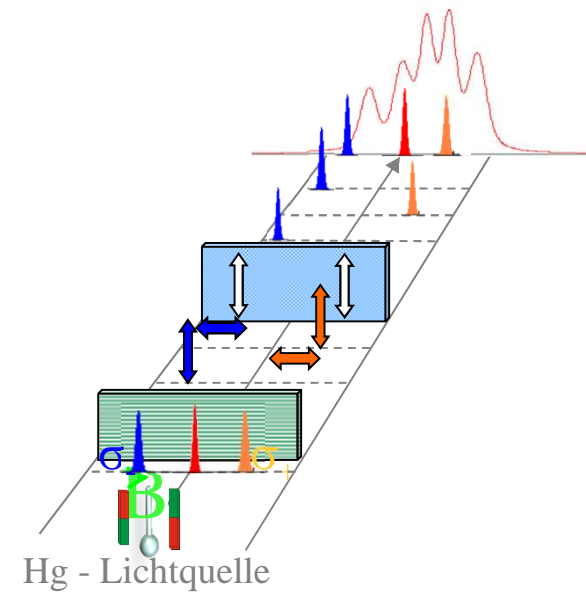
Mercury CEM – Technology Advancements

Measuring principle



: Advantages of Zeeman - AAS

- Continuous measuring method
- No moving parts
 - No mechanical wear
 - Long-term stability
(Maintenance cycle of light source: ≥ 1 year)
- Automatic drift correction for
 - Light source modifications
 - Contamination of optical surfaces
- Identical influence of cross sensitivity components on measuring and reference signal
 - Best possible cross sensitivity correction



-
- : Response time** **130 sec w/ 100 ft sample line lengths**

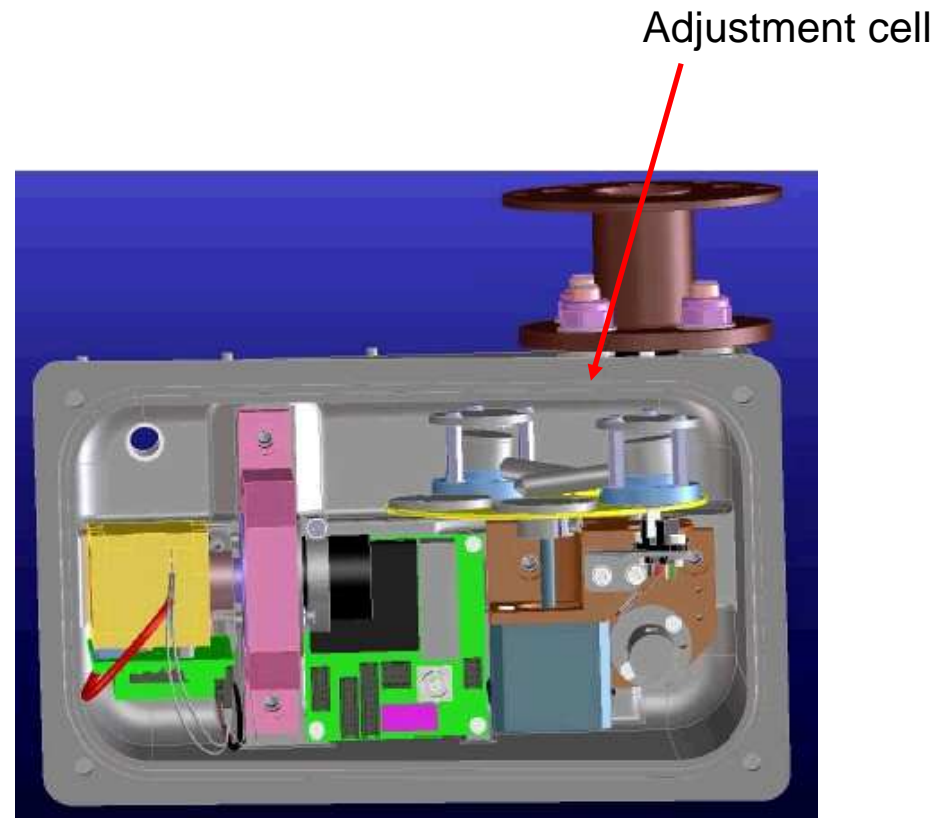
 - : Linearity** **within ± 1.5 % of full scale (10 μ g)**
 - :**

 - : Lower detectable limit:** **0.045 ug/m³**

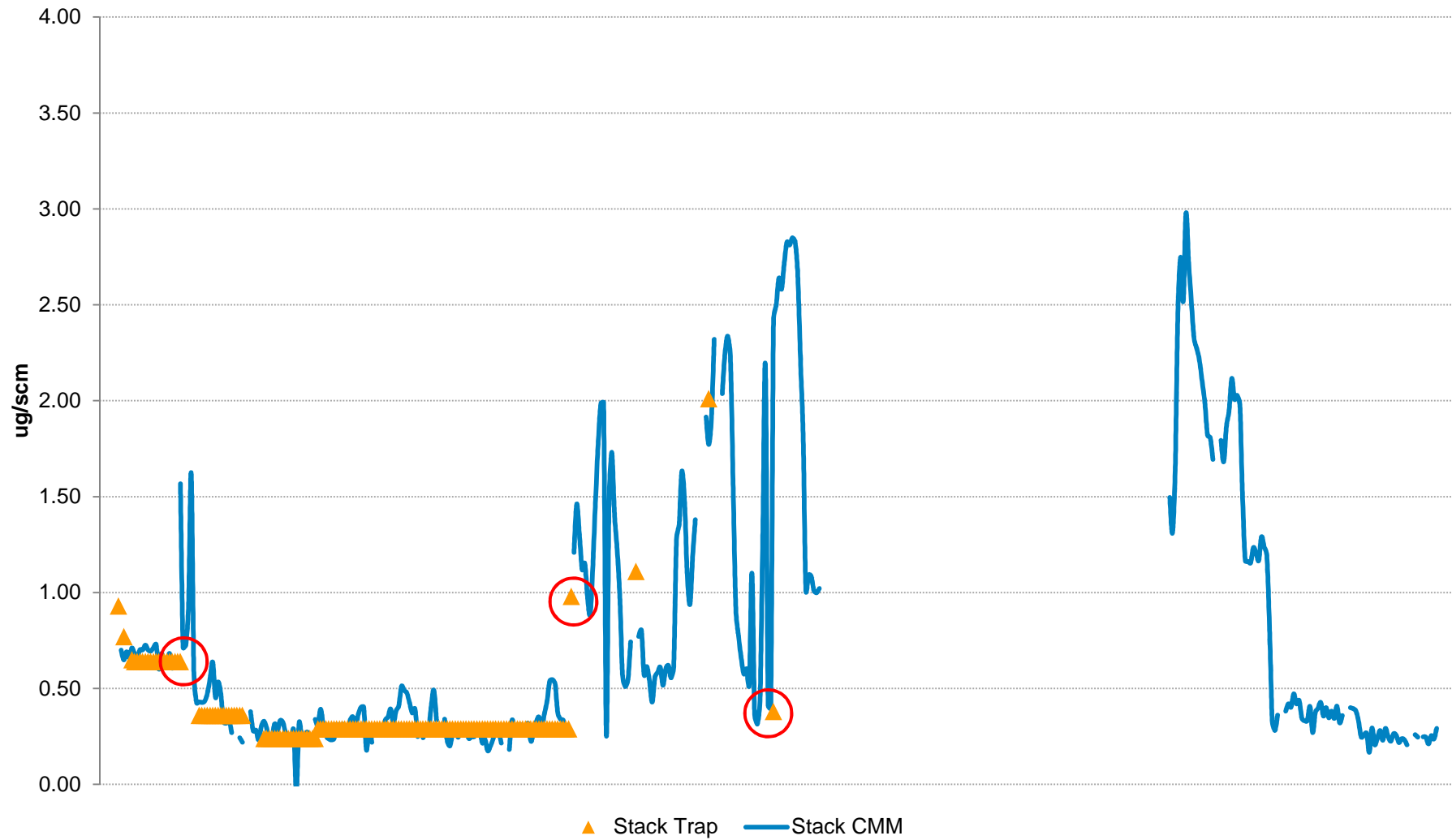
 - : Reproducibility:** **0.2% of full scale (10 μ g)**

 - : Availability tested over 6 months:** **97.5%**

- ⋮ Integrated adjustment cell
 - Generation of a defined, long-term stable Hg- signal
→ (patented) adjustment cell
 - Automatic drift correction
 - Optical adjustment



Mercury Concentration



Mercury CEM – Technology Advancements

Description	Reference	wl ^[1]	Q ^[1]	H ^[1]	γ ^[2]	γ ^[3]
Visual inspection						
Check measured values for plausibility, also in the control room, if required		X	X	X		
Check whether status signals are pending or whether messages are or were active	Menu 3 "Diagnosis"	X	X	X		
Check lines, hoses and connections, exhaust gas line free of bends		X	X	X		

Instrument air conditioning						
Check for oil and water			X	X		
Check filter elements, replace if necessary (Part Nos.: 5315577 & 5315578)			X	X		
Check condensate line, clean if necessary			X	X		
Check filter housing, clean if necessary			X	X		
Check instrument air pressure			X	X		
Check status LEDs of air drier (option)	→ p. 74, Fig. 55		X	X		

Gas sampling system (heated fine filter unit)						
Visual inspection	Refer to Operating Instructions		X	X		
Check internal fine filter, replace every 12 months (possibly more often, depending on the application, Part No.: 2039002)					X	
Check for damage to sample gas line			X	X		
Clean sample gas sampling (inside / outside)					X	

System cabinet						
Visual inspection	Refer to Operating Instructions		X	X		
Clean air conditioner (blow out outer fins)			X	X		
Replace test gas generator solution (option)	→ p. 79, § 6.2.12.6			X		
Replace test gas generator hoses (option)					X	

MERC300Z						
Replace ejector pump spare parts set (Part No.: 2060701)					X	
Replace ejector block spare parts set (Part No.: 2060733)						X
Replace thermoelement of oven (Part No.: 2060249)					X	
Check sample gas flow (150 - 450 l/h)	Refer to menu "Measuring Screen"		X	X		
Replace lamp spare parts set (Part No.: 2060110)					X	
Replace lamp subassembly (Part No.: 2060244)						X
Replace O-ring of optic housing (Part No.: 5324455)						X
Test signal transfer						X
Carry out scaling ^[4]	→ p. 160, § 14.6					

- ⋮ Maintenance Interval Performance
 - Weekly and Quarterly Maintenance
 - Visual inspections
 - Six (6) Month Maintenance
 - Visual Inspections
 - Clean Air Conditioner
 - Replace Gas Generator Solution
 - Yearly Maintenance
 - Visual Inspections
 - Check/replace probe filter
 - Replace thermocouple in oven
 - Replace lamp
- ⋮ Maintenance Estimates
 - < 10 hrs / month
 - < \$6000 / year in hardware

: Thank you for your attention.

