



Physikalisch-Technische Bundesanstalt
Braunschweig and Berlin
National Metrology Institute

Status of

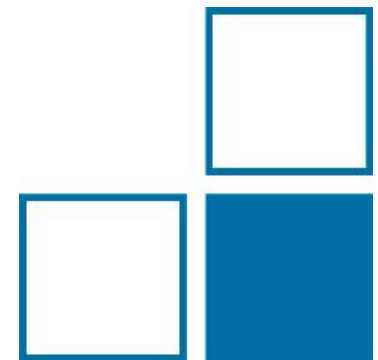
Germany-wide intercomparison of state approved test centers for water meters - concept, planning and evaluation strategy

22nd International EMATEM-Summer School

22. - 24. September 2026

Kloster Haydau

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Dr. Enrico Frahm, PTB - Germany



Presentation outline

Introduction to the planned comparison

Description of the transfer setup

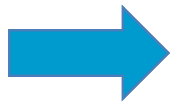
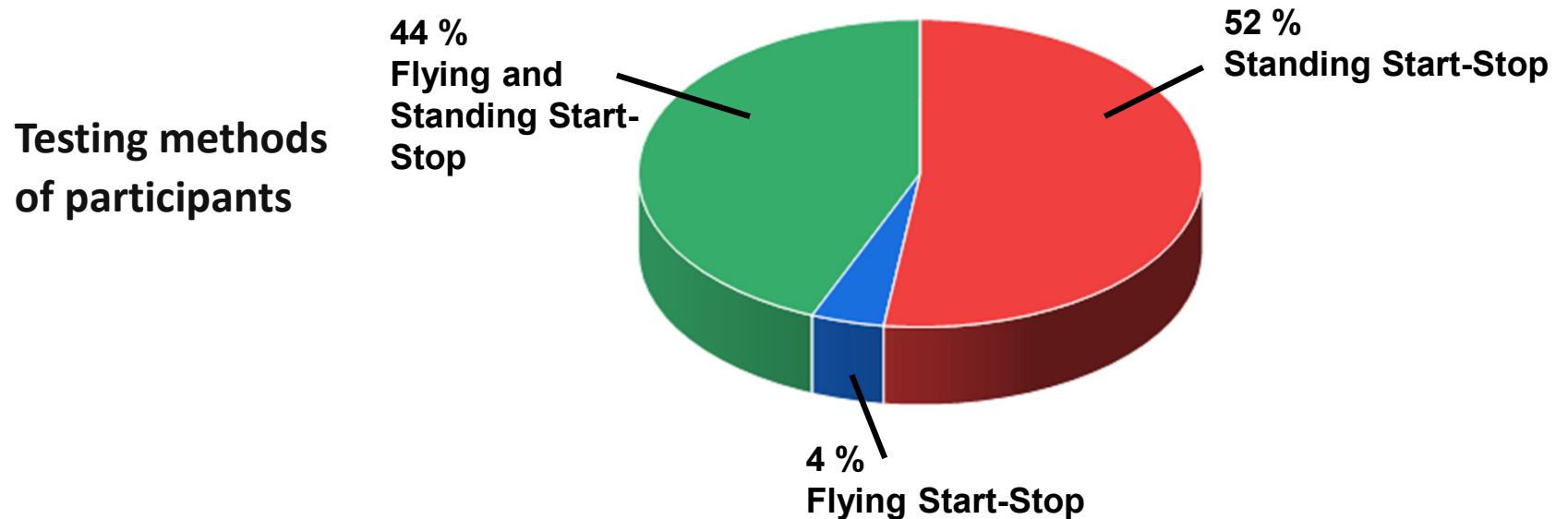
Calibration program

Goal and Participants

- **Participants:** 40 Flow Calibration Authorities and State-approved Testing Laboratories
- Reference Laboratory: PTB (Braunschweig, FB 1.5)
- Under Support from: DVGW
- **Goal:** Infrastructure improvements and direct traceability to the PTB as national standard
- **Flow range:** 25 l/h ... 4000 l/h
- **2 Transfer setup:**
 - (1) Electromagnetic flowmeter 25 l/h ... 500 l/h
 - (2) Electromagnetic flowmeter 750 l/h ... 4000 l/h

=> On the initiative of PTB

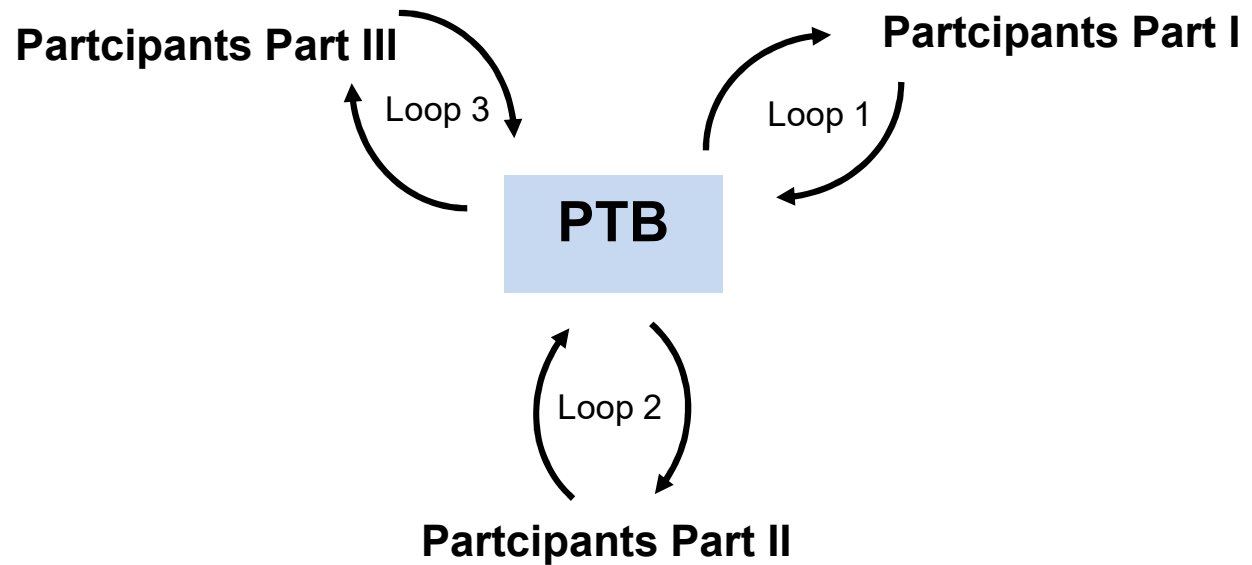
Calibration Methods of the Participants



Standing Start-Stop = predominant method

A significant portion can also test meters with the Flying Start-Stop method

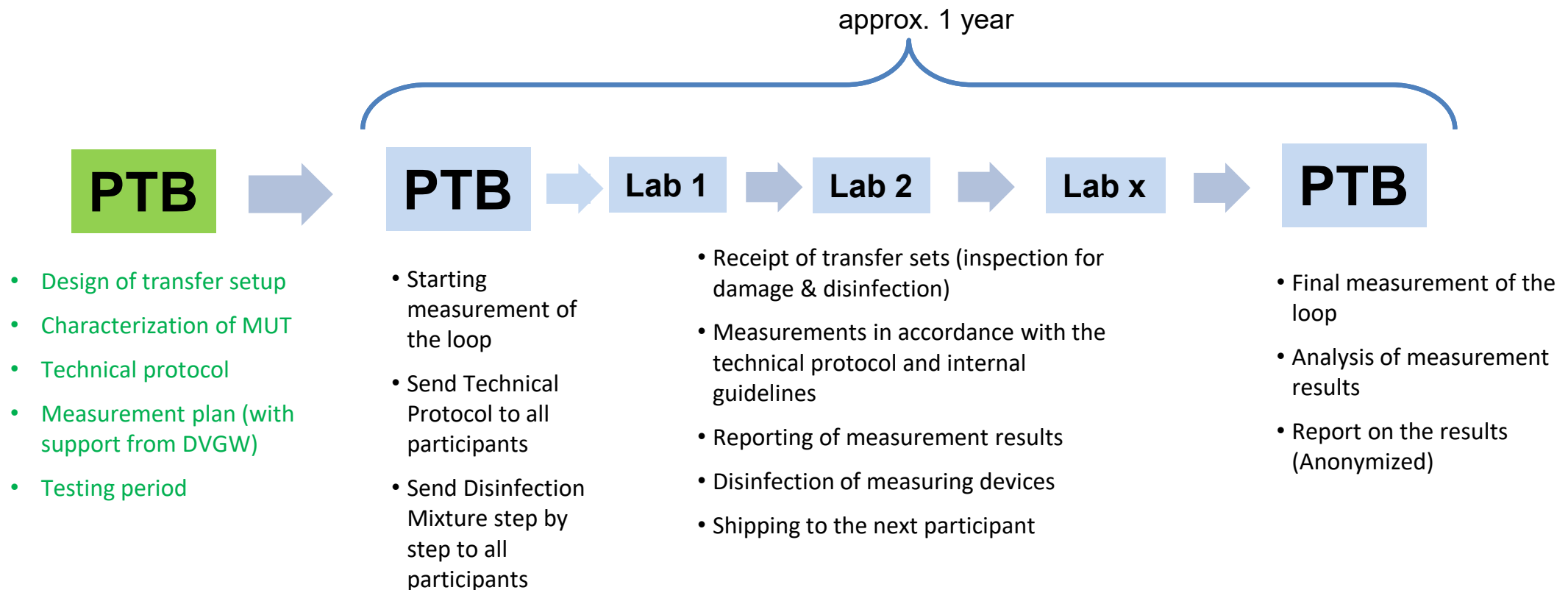
Comparison Procedure and Time Line



Planned start of Loop 1: 10/2026

Planned end of Loop 3: 10/2029

Comparison Procedure – Example for one Loop



Transport and Shipment

- Transportation is the responsibility of the shipping laboratory



Delivered on a pallet in one transportation box
120 cm x 80 cm x 100 cm, 165 kg

Including:



Setup 1



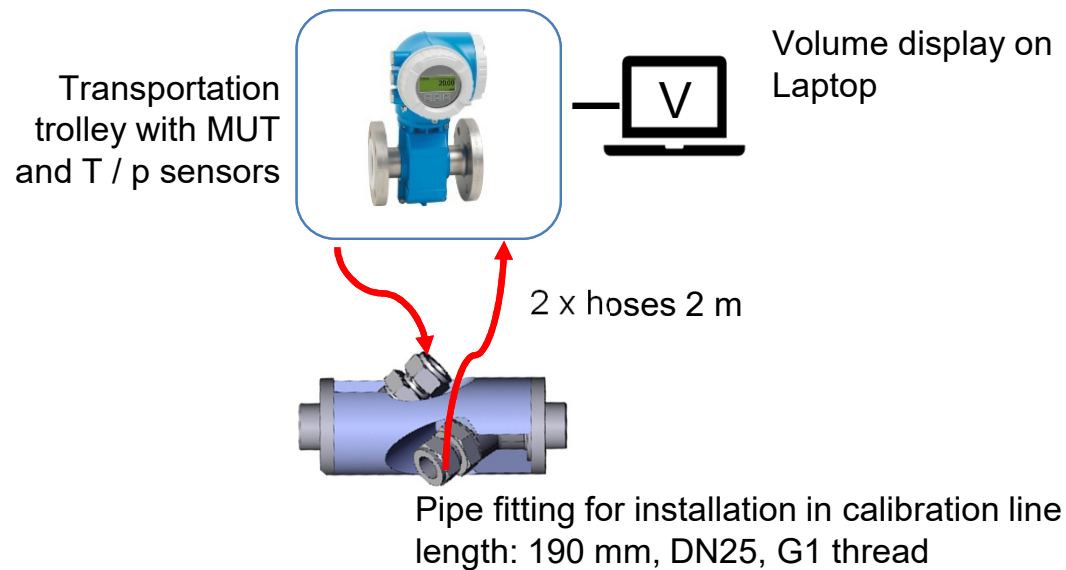
Setup 2

including:

- Laptop
- 2 pipe fittings
- 4 hoses
- Manual pump
- Canister

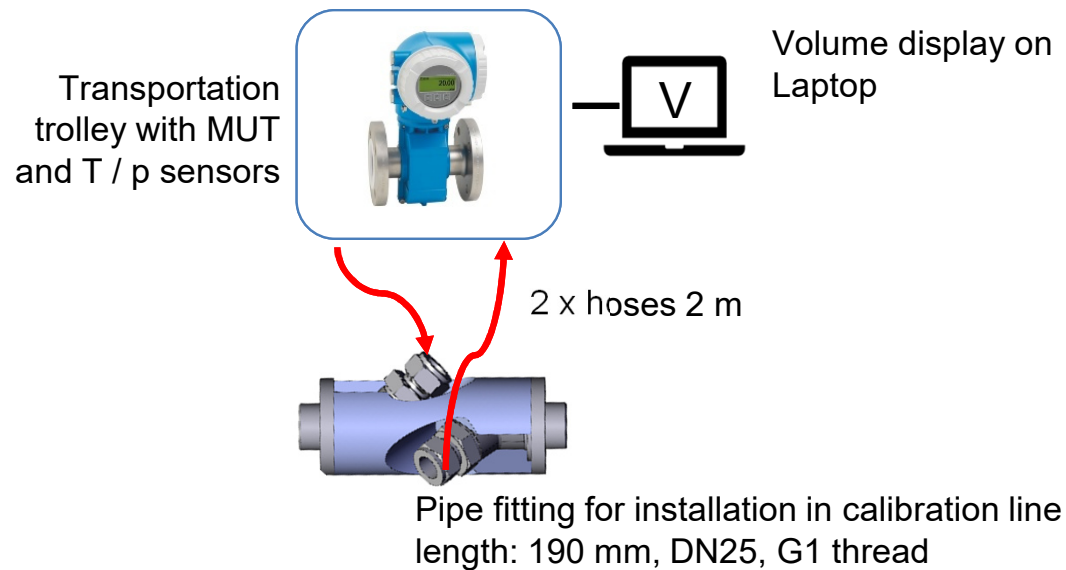
Setup 1

- Endress + Hauser Promag H300, DN04
- Flow range: up to 500 l/h
- 2 fluid temperature and line pressure sensors



Setup 2

- Krohne Optiflux 5300, DN15
- Flow range: 750 l/h ... 4000 l/h
- 2 fluid temperature and line pressure sensors



Installation in Calibration Line

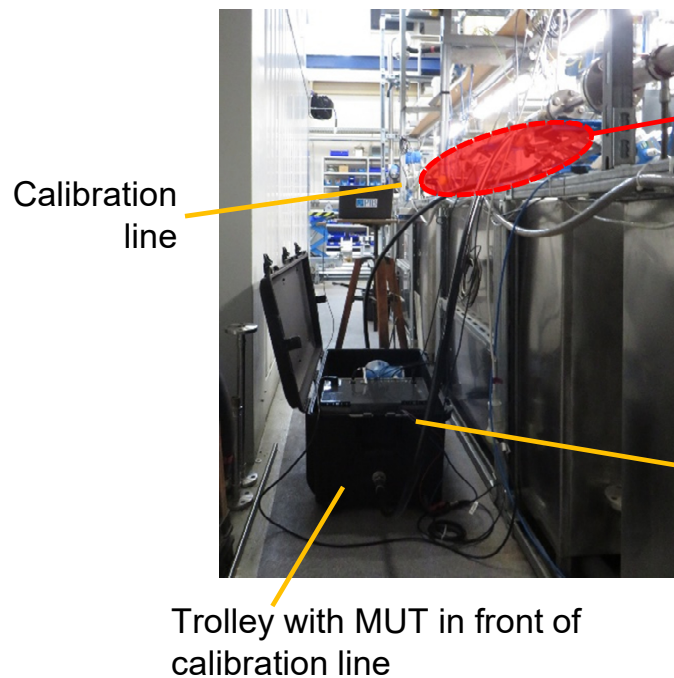
- Installation of transfer meter => **not** in calibration line
- „Indirect“ installation via a pipe fitting
- Pipe fitting is equal to a water meter (dimensions / flanges)
- Connection via hoses (length 2 m)
- Elimination of air at pipe fitting = highest point

Detail of calibration line

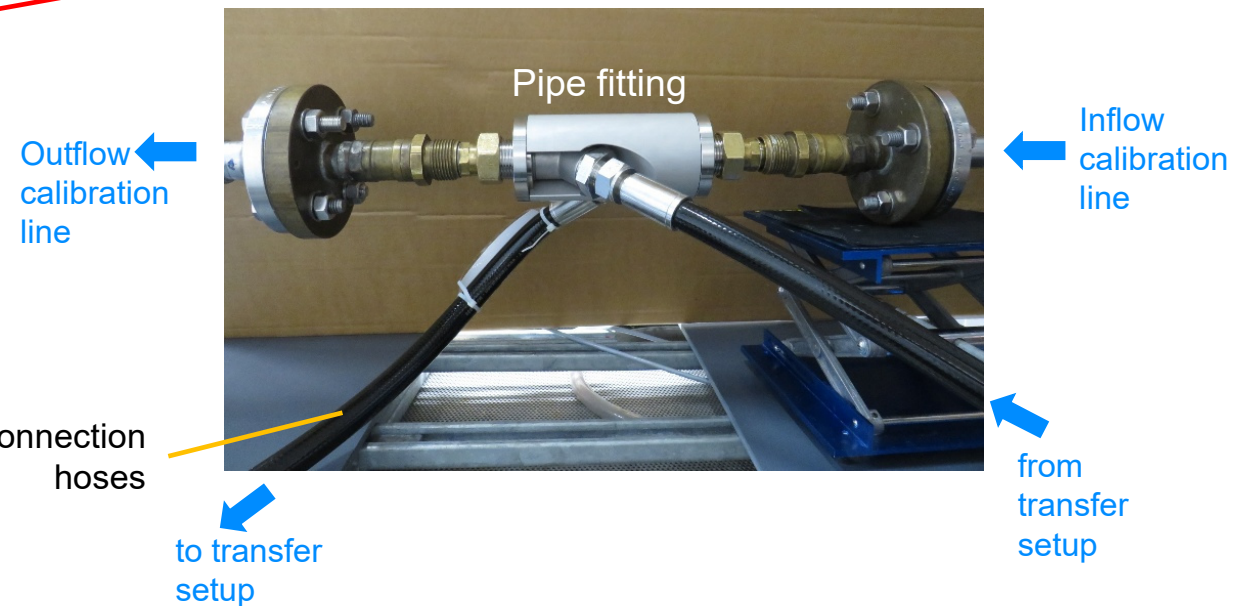


Installation in Calibration Line

Calibration line at PTB



Detail of calibration line



Calibration Procedure

- According to Technical Protocol
 - ...and internal specification for a measurement
- => standard testing of a water meter

Technical Protocol	Lab internal procedure
Installation of transfer meter	Measurement time
Maximum ranges of fluid and ambient conditions	Measurement volume
Flow set points	...
Number of repeated measurements	

specified

not specified

Flow set points
25 l/h
80 l/h
160 l/h
1330 l/h
2500 l/h
3125 l/h
4000 l/h

Fluid:

temperature $20\text{ °C} \pm 5\text{ °C}$
pressure max. 8 bar (g)

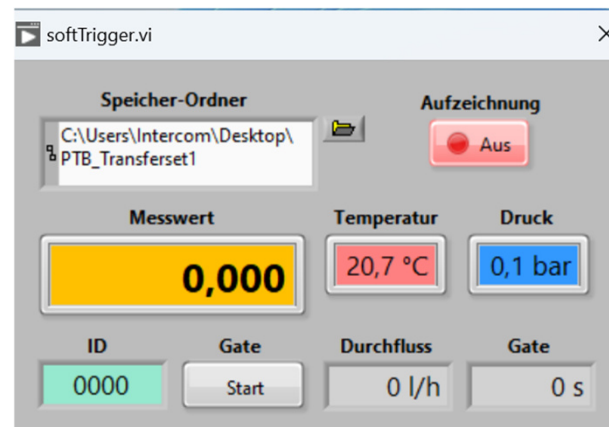
Ambient conditions:

temperature $20\text{ °C} \pm 5\text{ °C}$
humidity $55\% \pm 25\%$
pressure $96\text{ kPa} \pm 10\text{ kPa}$

Data logging

- Data recording via laptop
- Transfer standard output: frequency, active, fixed pulse value
- Counted impulses => display on laptop screen
- Additional data logging of fluid temperature and line pressure at in- and outlet of the setup

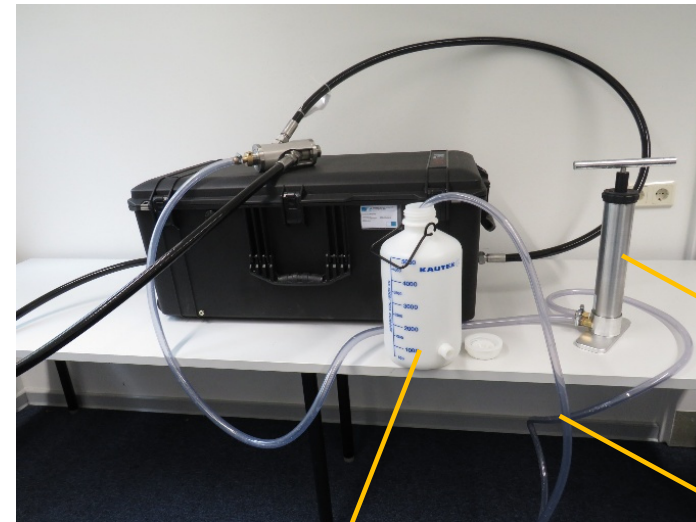
Example of
laptop screen



Cleaning of the Setup

- Cleaning of the setup before and after measurement
- Using provided equipment
- For cleaning: mix of water and BAXERO®

Cleaning equipment



Manual
pump

Connection
hoses

Storage reservoir with
cleaning fluid

Summary and Outline

- Successful test run at Berliner Wasserbetriebe
- Start of first loop in October 2026
- All measurement slots already scheduled
- Analysis based on measurement and standard deviations, E_N value



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