

# **TC for Metrology in Length: EURAMET project #1239 Measurement of surface roughness by AFM**

**Coordinator:**

**Ludger Koenders (until 2019), retired**

**Thorsten Dziomba (from 2020 on), PTB, WG 5.14**

**Presenter: H. Bosse, TC-L Contact Person, PTB, Germany**

**17<sup>th</sup> TC-L “hybrid” meeting**

**VTT MIKES, Espoo, Finland**

**09-10 Oct. 2023**



# EURAMET Project No 1239

## Measurement of surface roughness by AFM



### Coordinator:

**Ludger Koenders (retired), Thorsten Dziomba**

Surface Metrology / Roughness Measuring Methods

Physikalisch-Technische Bundesanstalt

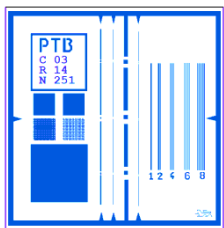
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***Instruments: Only atomic force microscopes (AFM)***

### ***Samples:***

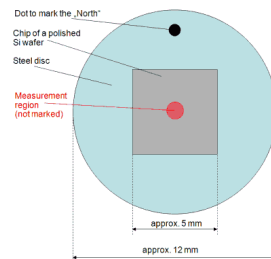
**#1**



nom. 1000 nm

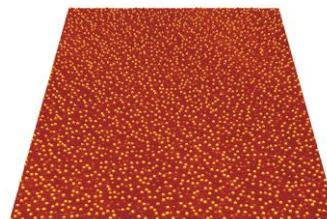
**step height standard**

**#2**



**polished Si wafer**

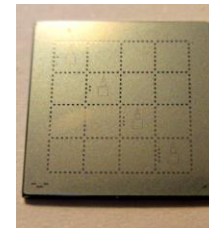
**#3**



„smaller nanodots“

**Ge-Si nanodot samples**

**#4**



**Simetrics RnS  
Lapped Si chip**

**#5**



**Simetrics RS-N  
resolution standard**

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Status:  
Sep. 2023

- Originally agreed and scheduled for 2014/2015, but several participants requested postponement back then
- Relunched in June 2018, with reduced measurement effort and tight conditions: one month per institute only, institute to be skipped if not ready
- **Relaunch successful, 2018/2019 without major delays, no change in circulation: 9 European NMIs** have measured within the agreed timeslots, 1 NMI had to withdraw from measurements (lack of time)
- **control measurement at PTB in late 2019:**
  - polished Si chip got heavily contaminated during circulation, might impede comparability
  - but all other samples still quite clean + stable so that results can be compared well
- NIST measurements were planned, but had to be postponed repeatedly due to pandemic, finally cancelled due to aging/contamination of samples
- **Analysis: Two-fold in parallel to identify possible bias by operator**
  - 1) **central analysis by pilot lab** – all participating European NMIs have submitted raw data, partly delayed due to pandemic, **already largely analysed**
  - 2) **analysis by participants** – most reports submitted, but some still pending or not complete
- **Outlook:**
  - Draft A** delayed due to pandemic + originally planned NIST measurements
  - Work on draft A to be resumed in late 2023 / 2024



Length