NanoScale 2026

14th Seminar on Quantitative Microscopy (QM) and

10th Seminar on Nanoscale Calibration Standards and Methods

Dimensional and related measurements in the micro- and nanometre range

NPL, TEDDINGTON, ENGLAND
OCTOBER 20TH ~ 22ND, 2026

Organized by



HELMHOLTZ FONDS e.V.

EURAMET
Nanometrology Group
@ TC Length

PTB

NPL
National Physical Laboratory

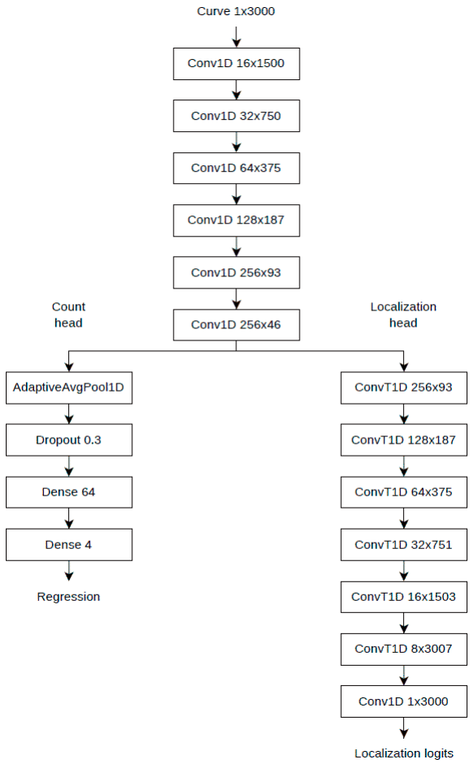


Fig. 3 A depiction of the architecture of our NN prototype. This iteration has two heads, one for the local localisation of the areas of interest and the other for the global prediction of the number of puncture events.

Back to the Table of Contents

Metrological characterisation of soft AFM cantilevers combining experimental dynamic calibration and numerical modelling

1) L. Ribotta*, A. Schiavi, A. Facello, A. Giura, L. Giorio, B. Torre, M. Marini, A. Prato
2) L. Fabbiano

1) Istituto Nazionale di Ricerca Metrologica (INRiM), Strada delle Cacce 91, 10135, Turin, Italy
2) Politecnico di Bari, Via Amendola 126/B, 70126, Bari, Italy

** Corresponding author:* l.ribotta@inrim.it

Keywords: AFM, cantilever, micro-Laser Doppler Velocimetry, Finite Element Method, uncertainty

Accurate characterisation of soft AFM cantilevers is essential for reliable force and displacement measurements at the nanoscale, particularly in biomedical applications involving very low forces.

In this work, an integrated methodology based on micro-Laser Doppler Velocimetry, analytical beam models and Finite Element Method simulations is presented. The effective spring constants are determined from the cantilever resonant behaviour and compared with predictions based on Euler–Bernoulli and Saint-Venant theories. Numerical simulations are used to investigate modal frequencies, stress distributions and sensitivity to dimensional variations. Measurement and modelling uncertainties are evaluated through detailed uncertainty budgets.

The proposed approach provides a consistent framework for improving cantilever calibration and may support the development of harmonised calibration procedures for quantitative, high-sensitivity AFM measurements.

Back to the Table of Contents