

# attoAFM I for High Resolution Imaging of Quantum Dots & Rings

The attoAFM is an ultra-compact atomic force microscope designed for low temperature applications. The force detection scheme for the attoAFM systems is based on an all fiber low-coherence interferometer. Monitoring the intensity of the interference fringes allows to determine the absolute value of the cantilever deflection. The precision of this measurement technique is better than  $160 \text{ fm}/\text{Hz}^{1/2}$ .

During the scan in contact mode, the cantilever is bent proportionally to the sample surface topography and the interaction forces. The fiber based optical interferometer measures the deflection of the cantilever, thus providing a topographic or force image. As an XY scanner moves the sample, the fiber based optical interferometer measures the vertical deflection indicating the local sample height.

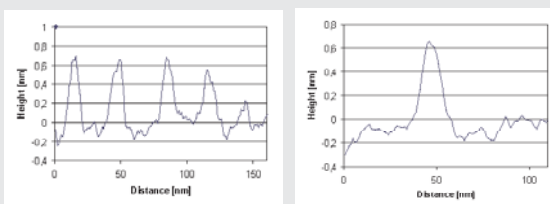
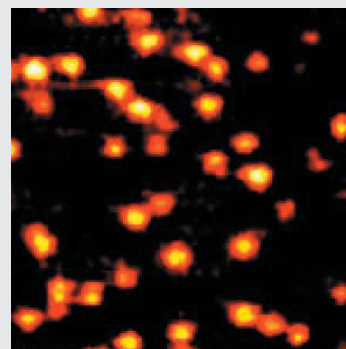
The image shown in Figure 1 shows quantum dots of 16-20 nm in diameter and a height of  $0.8 \pm 0.1 \text{ nm}$  recorded in contact mode under ambient conditions. Below the image, the corresponding line scans are depicted.

Furthermore, quantum rings were imaged in contact mode under ambient conditions (Figure 2). Although the height of the rings was less than 0.4 nm and the diameter of the complete ring only 20 nm, the ring structure could clearly be resolved. The corresponding line scans are shown in the graphs below the image.

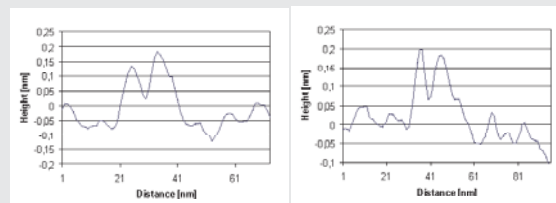
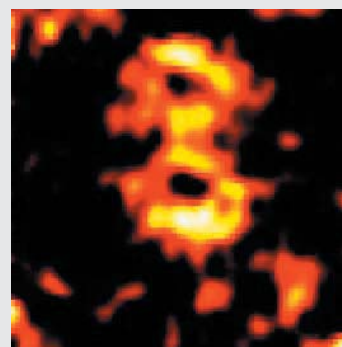
Despite imaging in contact mode under ambient conditions, a resolution of 0.1 nm in z and 2-3 nm in x-y could be obtained!



The attoAFM I.



**Fig. 1:** AFM contact mode image of quantum dots. Scan range  $160 \times 160 \text{ nm}$ , diam. ca. 20 nm, height ca. 0.8 nm. Sample provided by P.M. Koenraad, TU Eindhoven.



**Fig. 2:** AFM contact mode image of quantum rings. Scan range  $60 \times 60 \text{ nm}$ , diam. ca. 20 nm, height  $< 0.4 \text{ nm}$ ! Sample provided by P.M. Koenraad, TU Eindhoven.

## RELATED PRODUCTS

attoAFM I	highly stable and compact atomic force microscope
ANPxyz100/LT	high precision, piezo electric, inertial positioner for big loads
ANSxy100	high precision piezoelectric scanner
ANC150/3	electronic controller
ANC200	electronic scan controller
attoSCAN	data acquisition software
attoVIEW	data viewing software