Supplementary Information for

Nanomechanical control of an optical antenna

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Three topics are addressed in this supplementary information section. First, the determination of the antenna feedgap is discussed. Second, details for the DDA calculation are given. Finally, darkfield spectra in short antenna direction are given.

1. Gold bowtie nanoantenna feedgap

The antenna feedgap size is not uniquely defined due to the tilted edges in the gap. Therefore, the separation of the two antenna arms is arbitrarily determined at 10 % of the total height of the nanotriangle.

2. Discrete Dipole approximation (DDA) calculations

The calculations are performed with a dipole density of 0.65 dipoles/nm^3 (150000 dipoles/nanoantenna). Triangular prism and truncated tetrahedron shapes for the antenna arms are used for the DDA calculation. The bulk dielectric function for gold has been taken from Johnson and Christy (*S1*).

3. Measured and calculated darkfield scattering spectra in short antenna axis direction

Dark field scattering spectra of the gold nanoantenna with excitation and detection in *short* axis direction are depicted in figure S1. The long wavelength resonance position remains

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constant at 720 nm with decreasing gap, while the strength of both resonances gradually decreases.

Figure S2 shows the calculated backscattering spectra of a gold bowtie nanoantenna with different gap sizes assuming vertical (**a**) and tilted sidewalls (**b**) for excitation and detection polarizations set in direction of the *short* antenna axis. The trends observed in the measured scattering spectra (Fig. S1) are confirmed by the DDA calculation for a nanoantenna with tilted sidewalls.
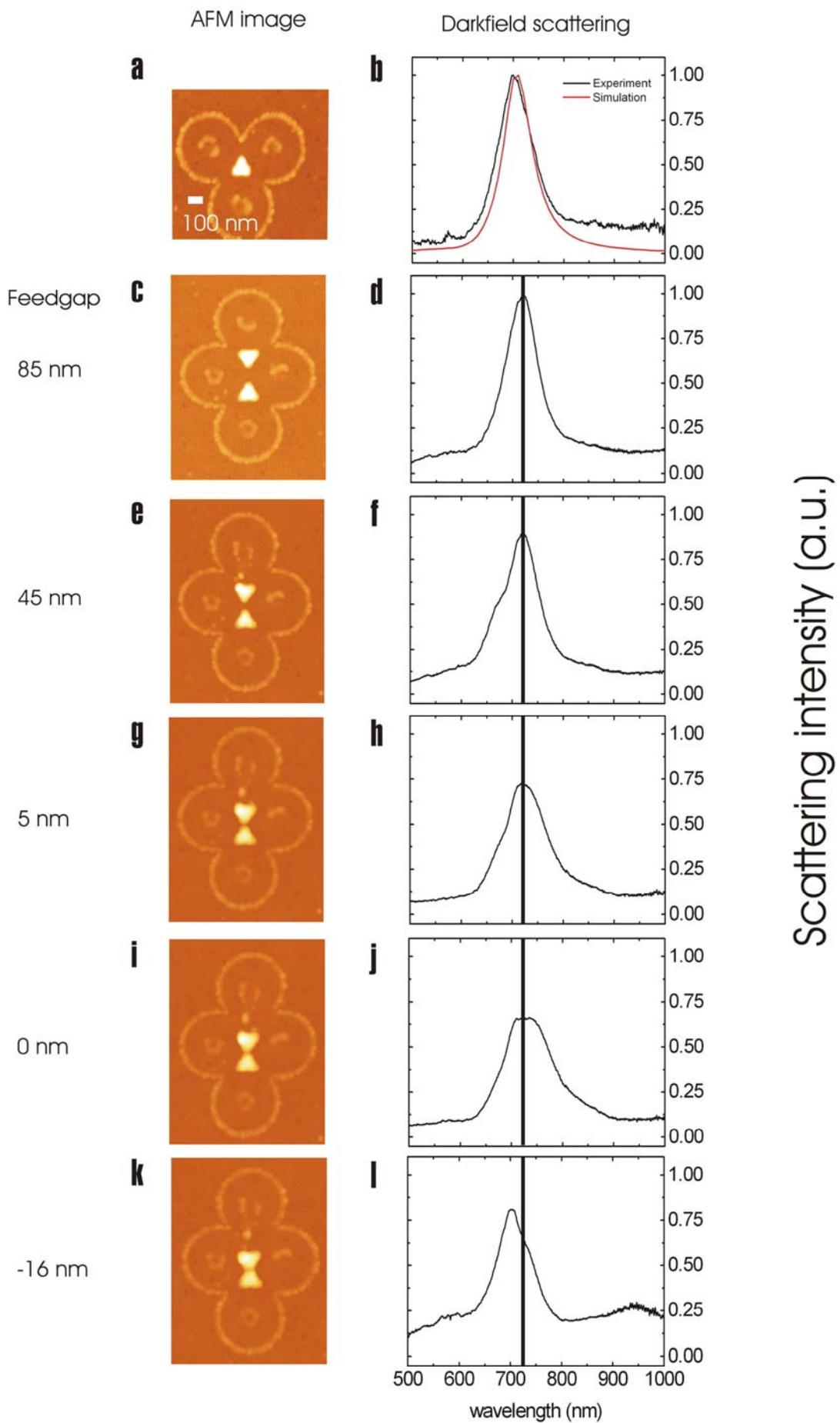
AFM image   Darkfield scattering

a

100 nm

b

Experiment
Simulation

Feedgap

85 nm

c

d

45 nm

e

f

5 nm

g

h

0 nm

i

j

-16 nm

k

l

Scattering intensity (a.u.)

500 600 700 800 900 1000
wavelength (nm)

Fig. S1

3

Figure S1   Atomic force microscope images (left) and dark field scattering spectra (right) of a single gold nanotriangle (**a** and **b**) and a single gold bowtie optical nanoantenna with feedgap sizes ranging from 85 to -16 nm (**c** to **l**). In the scattering spectra the optical excitation and detection is polarized along the *short* antenna axis.
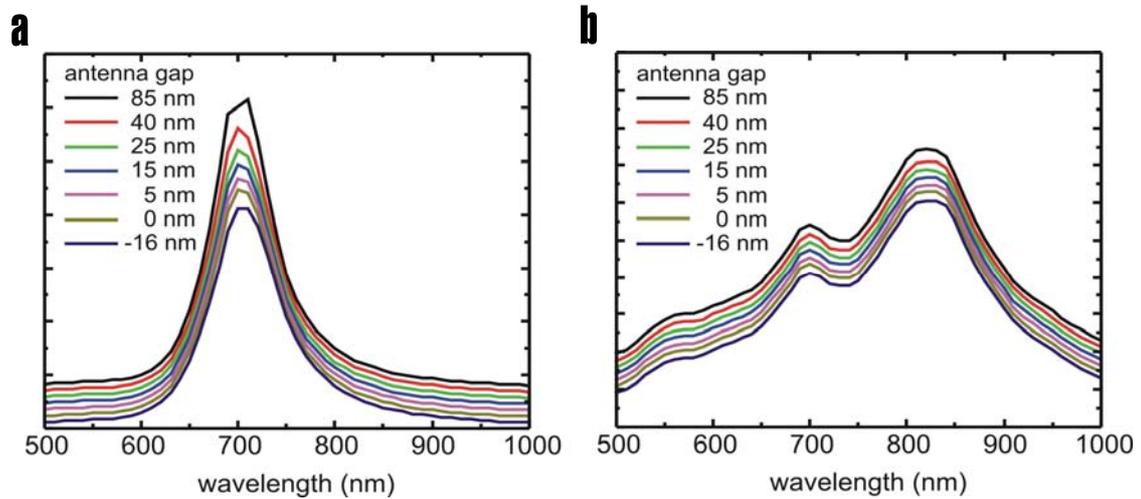
Figure S2   Calculated backscattering spectra of a gold bowtie nanoantenna with different gap sizes assuming vertical (**a**) and tilted sidewalls (**b**). Same parameters as in figure 3 have been used in the calculation. The excitation and detection polarizations are set in direction of the *short* antenna axis.

References

S1.   Johnson, P. B., and Christy, R. W. Optical constants of the noble metals. *Phys. Rev. B* **6**, 4370 (1972).