Additional Online Material

A Background Radiation. Leaky waveguide modes are non-radiative modes in an ideal case where no rough surfaces as well as no internal defects in the layers are present. For the experimental case these conditions are naturally not reachable, so that the leaky mode field is elastically scattered due to these imperfections. This additional signal has to be determined in order to understand its possible contribution to the correlation functions obtained.

To quantitatively describe this background radiation, the waveguide modes were excited respectively and the combined background signal was measured at the back of the prism using a photo-diode as described elsewhere[11]. We found this part of the radiation to be less than 1% compared to the incident intensity.

This background radiation is elastic light which interferes with the light scattered by the particle in the evanescent field enhancing this signal by heterodyne detection. Another effect of this background is, it acts as a secondary "laser beam" into each angle it is emitted. Therefore particle in these secondary "laser beams" will scatter this light as well leading to a broad distribution of relaxation times in this secondary correlation. We have shown in ref 11 that it is possible to reduce this contribution below the noise level taking appropriate measures as limiting the height of the cell and therefore the possible scattering volume for this extra signal.

The angular dependence as well as the absolute intensity of the background radiation found is similar to the surface plasmon radiation. Since its contribution to $C(q,t)$ can be neglected in REDLS as shown elsewhere[11] it can be neglected in WEDLS as well.

Apart from that, the laser beam undergoes multiple back-reflections in the inner region of the prism, which might also have a contribution to the signal and thus to the background or even to the correlation functions measured. In a worst case scenario 10% of the light will be reflected back at the glass-air interface of the prism after the total internal reflection at the glass-gold interface. Of this reflected light only a small portion will not be reflected again by the glass-gold interface and enter the scattering volume either as a secondary evanescent field or under very unfavorable circumstances as a direct beam.

Even if the intensity of the above is only a fraction of the incident field one has to take into account that the height of the scattering volume covered by the leaky waveguide is of the order of 100 nm while in standard cells the height of the scattering volume for these spurious contributions can be of the order of 100-1000 µm depending on scattering angle and cell type used. We showed in ref. 11 that reducing the height of the cell to 100µm and below resolves this problem, the contribution of these spurious beams to the correlation functions is reduced to below the noise level.

B Intensity Enhancement of Leaky Waveguide Modes. At λ=632.8nm intensity enhancements (square of the electric field directly at the interface: $I=E^2$) of up to several 10^3 can be achieved using WEDLS. Practical realizable waveguides with a thickness of d=3.5µm and a refractive index n=1.34 on top of a 38nm gold-film (water subphase) where found by numerical calculations to have intensity enhancements around 2100 (figure 6) in the evanescent part of the waveguide mode.

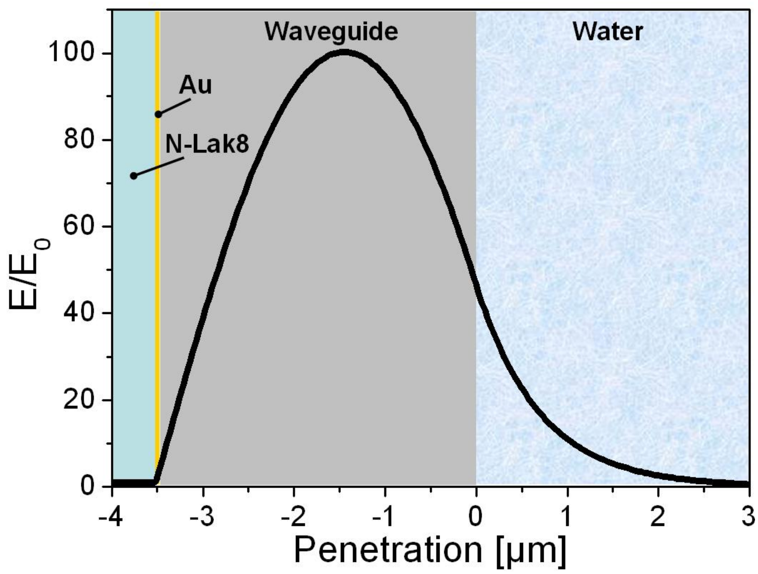

Figure 1 Simulation of the TE0-Mode of a waveguide. Magnitude of the electrical field of the TE0-Mode of a waveguide with refractive index n=1.34 and thickness d=3.5µm on top of a 38nm gold-film (water sub phase)

C Stability of waveguide modes. Figure 7 shows angular reflectivity scans of pure water before (symbols) and after (line) a WEDLS-experiment of the solution of PS-particles dispersed in water. Even after 3 days no shift in the resonance angles can be detected. The waveguides are stable and we can exclude particle adsorption.

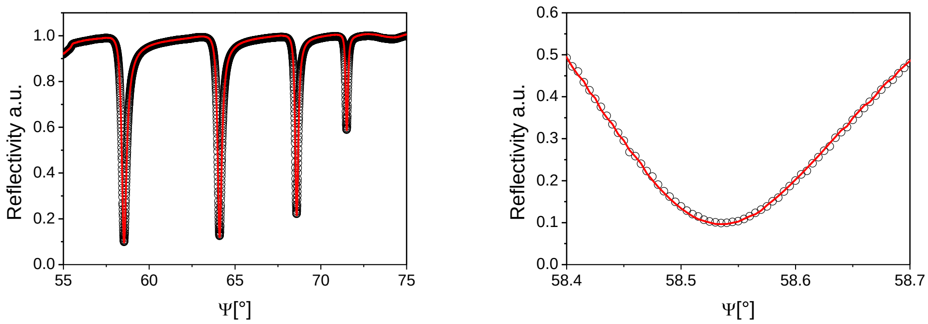

Figure 2 Left: angular reflectivity scans before (symbols) and after (line) a WEDLS-experiment. Right: magnification of the TM4-mode**.**