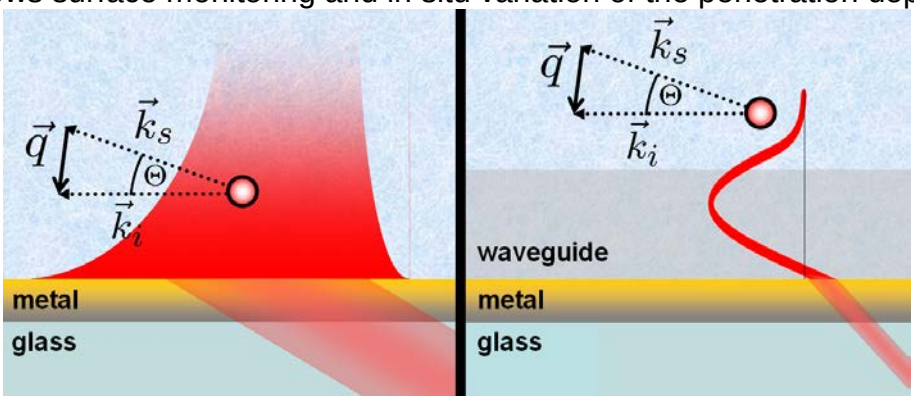
REDLS and WEDLS as new approaches to dynamic light scattering with evanescent waves at solid-liquid interfaces

W. Steffen
[1]*Max Planck Institute for Polymer Research, 55128 Mainz, Germany*

Email: steffen@mpip-mainz.mpg.de

To monitor physical properties, in the near-interface region with high spatial and temporal resolution, demands for powerful experimental techniques. In the last years evanescent waves generated by total internal reflection have attracted a great deal of interest as source of light for dynamic light scattering, because of their strong localization to the interface.
Two recent experimental realizations are reported of dynamic light scattering close to an interface with evanescent waves as sources of light in order to boost the signal and to monitor this interface at the same time.
In Resonance Enhanced Dynamic Light Scattering (REDLS, left picture below) we utilize surface plasmon polaritons as incident electromagnetic field in order to measure relaxation functions with laser power of less than a milliwatt at a predetermined penetration depth [1].
In waveguide enhanced dynamic light scattering, (WEDLS, right picture below) the evanescent part of waveguide modes (see Fig.) offers an even stronger increase in signal, allows surface monitoring and in situ variation of the penetration depth [2].



These techniques allow studying motion of particle close to the interface as well as exploring the dynamics of ultrathin polymer films attached to an interface [3]. The anisotropic behaviour of translational diffusion as well as the rotation of gold nanorods was studied in bulk and close to a solid interface [4].
Studies of the influence of electric fields on the motion close to solid interfaces ar far and few between. In an adapted setup of REDLS we realized to study the motion of charged particle with and without fluorescent marker close to a surface of gold.

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[2] Plum, M.A. et.al, Soft Matter, 7, 1501, (2011)
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[4]Haghighi, M.; Tahir, M. N.; Tremel, W.; Butt, H.-J.; Steffen, W. *The Journal of Chemical Physics* **2013,** 139, (6), 064710-7.