UNI FREIBURG

Physikalisches Institut

Fakultät für Mathematik und Physik
Albert-Ludwigs-Universität Freiburg

Physikalisches Kolloquium

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im Großen Hörsaal

Aktuelle Informationen finden Sie hier:
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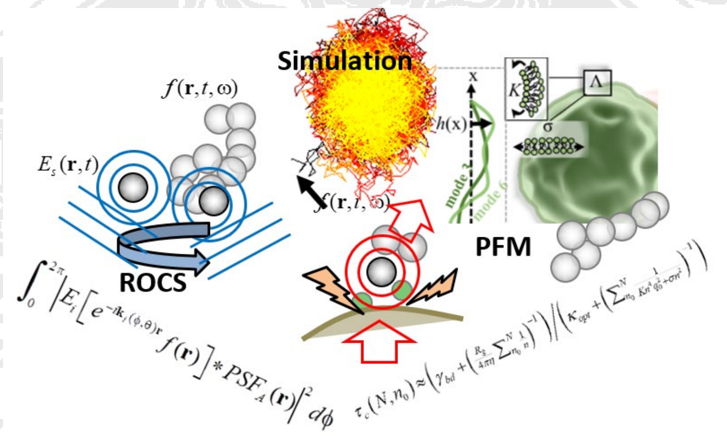

Using Coherent Photons to Hunt Viruses and Predict Particle Uptake

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Oscillations on very small scales can result in completely different oscillation behaviors on large scales. Examples are coupled molecules forming larger structures, or steel beams forming skyscrapers, or, single photons forming coupled wave fields from partially coherent laser illumination.

In this talk I discuss how such interference phenomena can make 100 nm small viruses visible, which diffuse with tremendous speeds around lung cells to find docking sites. Using the ROCS principle I explain how to concert incoming photons and amplified scattered photons $\mathbf{E}_i \cdot \mathbf{E}_s$ generated by virus-like particles $f(\mathbf{r},t,\omega)$ in such a way that their spatio-temporal correlations (coherence) provide high-speed, super-resolution images of virus-infection mechanisms.

Furthermore, I elucidate how the coupling between bacteria-like particles and simplified model cells are investigated by controlling distance and contact with laser traps and MHz interferometric particle tracking from amplified scattered light $\mathbf{E}_i \cdot \mathbf{E}_s$. I show how different cell membrane oscillation modes are changing the thermal position fluctuations of the optically trapped particle $f(\mathbf{r},t,\omega)$ during wrapping and uptake into the membrane. The damping of fluctuation modes predicts the energy costs for particle uptake, which can lead to bacterial infections.