Spatiotemporal dynamics of protein-protein interactions through 2-dimensional pair correlation of 2D-FCCS dynamics

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Cellular responses to external cues are the product of signaling transduction. The basis of all signal transduction events are protein-protein interactions.
We have developed a non-fitting spatiotemporal approach to assess protein protein interactions. We acquired, cross-talk free, imaging dual color fluorescence cross-correlation spectroscopy data [1](Imaging2D-FCCS) of membrane-bound proteins with fast scanning on a conventional confocal microscope. This cross-correlation data, determines the existence of protein-protein interactions at a pixel by pixel level. We then apply a 2 dimensional pair-correlation analysis [2] of the cross-correlation data to map the spatial distribution for the protein interactions in all positions. Lastly the pair correlation distributions were used as the basis to determine diffusion barriers for transient protein-protein interactions maps [3]. This enables us to extend the protein-protein spatial analysis to the temporal dimension. The final protein interaction maps thus contain the information on the directionality, the length in time and the spatial constrains of the protein-protein interactions taking place at the plasma membrane.

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