

# Fluorescence Lifetime Measurement with High Temporal Resolution through Stimulated Emission

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**Keywords:** Pump-Probe Microscopy, Stimulation Emission, Temporal Resolution, Fluorescence Lifetime, Time-correlated single-photon counting

Stimulation emission (SE) is a versatile nonlinear optical technique that exhibits the novelties of sub-diffraction imaging, detection of “dark” (non-fluorescent) fluorophores, fluorescence imaging at an extended working distance [1-3], coherence gating, ...etc.

In this work, we have demonstrated fluorescence lifetime measurement through stimulation emission (SE) in pump-probe configuration with very high temporal resolution (~4 ps), compared with the temporal resolution (~ 30 ps) of the conventional time-correlated single-photon counting (TCSPC).

Experimentally, the temporal resolution of TCSPC is limited by the electronic jittering in the photon counting detector and the pulsed light source [4]. In the pump-probe measurements, an auto-correlator is configured to control the temporal delay with high precision, which is only limited by the temporal response (jittering) of the synchronizing photodiode. In this way, a temporal resolution of approximately 4 picoseconds is achieved. This technique is well suited for investigating very short lifetime fluorophores. Additionally, its implementation is cost-effective and robust. ATTO647N is used throughout the demonstration.

## References:

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