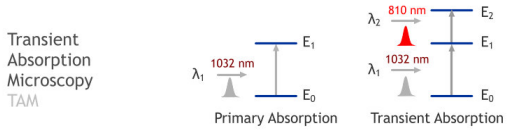
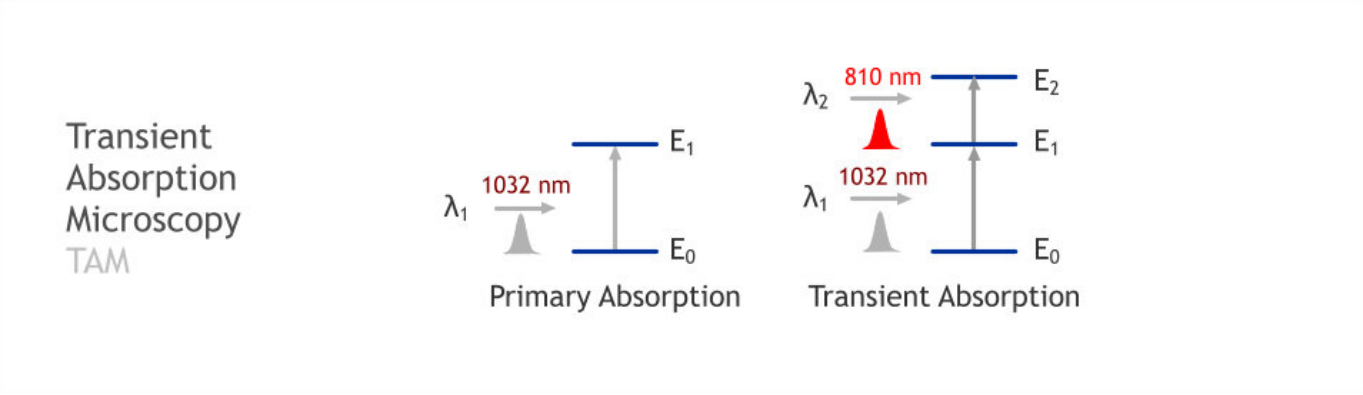
Transient Absorption Microscopy

Label-free Imaging



Transient Absorption Microscopy

Transient absorption microscopy (TAM), also called transient absorption imaging, requires a multiphoton microscope and an ultra-short pulse laser (e.g. picosecond) with two collinear aligned wavelengths. One wavelength is used as the pump (e.g. 1032 nm) and another wavelength as the probe (e.g. 810 nm). A time delay (picosecond range) is required between pump and probe beam. Using the pump-probe method, samples can be directly TAM-imaged with two ultra-short pulse laser trains.



Energy Diagrams of the transient absorption principle (wavelength numbers are only examples).

Transient absorption is the secondary absorption of specific molecules that are already excited by primary absorption. In contrast to primary absorption, which is often concealed in a high background, secondary absorption is performed with little environmental interference.

The differences between transient absorption microscopy and classical imaging and microscopy lie in its high temporal resolution and in its ability to study non-fluorescent molecular species. Therefore, this method belongs to the group of label-free imaging methods.

A common laser setup for TAM consists of two independently tunable OPOs pumped from the same source. An alternative method for transient absorption microscopy is to use a wavelength-tunable two-color laser. Advantage: complexity and footprint are significantly lower. On the other hand, there may be restrictions in flexibility compared to an open OPO system.

APE provides its customers with both possibilities: With the picosecond laser picoEmerald, Signal beam (and Idler beam) and the IR beam (1 µm from the pump laser) are designed to come from one and the same output. They are perfectly overlapping in space and time. The adjustment of the time delay between the IR and the Signal beam is already part of this laser.

As an open variant, an Emerald Engine Duo in combination with Levante Emerald OPO is an alternative choice for all who require more flexibility. A time delay unit, either a fixed or a scanning one – such as scanDelay -, as well as the Electro-Optical Modulator EOM (for the signal modulation) complement the picosecond ultra-short pulse laser setup for transient absorption microscopy.

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