Dispersive White Light Supercontiuum Single Z-scan: A new method to determine the two-photon absorption spectrum

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Two-photon absorption (2PA) has attracted many researchers due to its unique potential for those special applications which is not feasible based on linear absorption. Therefore, determining the 2PA coefficient/cross section is of most important.

Many different methods have already been proposed for determining the 2PA coefficient within which the Z-scan technique have been used extensively.[1] In traditional Z-scan method the 2PA coefficient is determined at a Sigle wavelength produced by the laser source employed in the setup. For most 2PA based applications, it is highly required to determine the 2PA spectrum to find out the peak 2PA absorption. To this end, different methods have been proposed:

1- Z-scan using a tunable laser: Applying this method yields to obtain the 2PA spectra via pointby-point which is cumbersome and time-consuming.[2] 2- Using a White light supercontiuum (WLC) source with a series of narrow band filters. This is also a point-by-point measurement which is cumbersome and time-consuming.[3] 3- Using nondispersive WLC Z-scan: in this method it is not feasible to determine the pure degenerate 2PA spectra since both degenerate and non-degenerate processes simultaneously occur.[4] 4- Using dispersive WLC without scan: In this method the obtained 2PA spectrum is although of degenerate nature, it represents the relative, but not the absolute value of the 2PA cross section.[5]

5- Our proposed technique: A unique method, by which the absolute visible-to-near-infrared degenerate 2PA spectra can be determined via performing a dispersive WLC single Z-scan. This technique can be used for a rapid determination of the wavelength-resolved 2PA spectra of any nonlinear medium ranging from semiconductors to organic solutions.[6, 7]

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