Analytical Dark Solitary Wave Solutions for the Higher Order Nonlinear Schrödinger Equation with Cubic-quintic Terms

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By means of the coupled amplitude-phase method we find analytical dark solitary wave solutions for the higher order nonlinear Schrödinger equation with cubic-quintic terms describing the effects of quintic nonlinearity on the ultra-short (femtosecond) optical soliton propagation in non-Kerr media. The dark solitary wave solution exists even for the coefficients of quintic terms much larger than those of cubic terms.