# Nonlinear fiber optics with ultraviolet light and high fields

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**Abstract:**

Kagomé-style hollow-core photonic crystal fiber, filled with noble gases, is transforming nonlinear fiber optics by permitting operation in hitherto inaccessible parameter regimes [1]. The hollow core system can handle extremely high intensities (up to $10^{15}$ W/cm$^2$ has been reached without damage), and offers both ultrabroadband transmission from the IR to the vacuum ultraviolet and pressure-tunable group velocity dispersion, allowing exploration of soliton-driven nonlinear effects.

By adjusting the pressure so that the group velocity dispersion is anomalous at the pump wavelength (800 nm) but normal for shorter wavelengths, soliton-driven dispersive waves can be generated from the visible down to 180 nm in the vacuum UV. Conversion efficiencies as high as 8% have been demonstrated [2].

Alternatively, by lowering the pressure, the dispersion can be made anomalous at all wavelengths longer than e.g. 300 nm, allowing solitons to self-compress to durations of only a few optical cycles, yielding intensities sufficiently high to ionize the gas. This opens up the exciting new opportunity of studying soliton propagation in the presence of a light-induced plasma, and has led to the first observation of a soliton self-frequency blue-shift — akin, though opposite in sign, to the well known Raman-driven soliton self-frequency red-shift [3,4].

In the talk recent developments in the field will be reviewed, particular attention being paid to the generation of short wavelengths and high intensities.

**References:**

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