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Supercontinuum Generation in Uniform and Tapered Photonic Crystal Fibers

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Abstract: Supercontinuum generation (SCG) is a striking phenomenon of extreme spectral broadening involving a wealth of beautiful nonlinear physics. The study of SCG and development of today's commercial sources really took off with the invention of the photonic crystal fiber (PCF), in which light can be manipulated by air-hole structuring. SCG is inherently linked to the fundamental field of soliton physics and due to the striking efficiency of SCG in PCFs, researchers have been able to reveal numerous new and important fundamental effects and surprising links with other physical systems. In this work, we describe the underlying mechanisms responsible for SCG in PCFs, and show how the position and power in the spectral edges can be manipulated by tapering the fiber to achieve, e.g., spectra extending into the ultraviolet. This is motivated by the huge commercial potential of blue-extended supercontinuum sources in areas such as fluorescence microscopy.