From rogue waves to randomness in nonlinear supercontinuum generation

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Abstract

The noise properties of supercontinuum generation continue to be a subject of wide interest within both pure and applied physics. Aside from immediate applications in supercontinuum source development, detailed studies of supercontinuum noise mechanisms have attracted interdisciplinary attention because of links with extreme instabilities in other physical systems, especially the infamous and destructive oceanic rogue waves. The instabilities inherent in supercontinuum generation can also be interpreted in terms of natural links with the general field of random processes. In this contribution we describe recent work where we interpret supercontinuum intensity and phase fluctuations in terms of the physics of rogue wave generation mechanism, and we consider potential applications such as random number generation. We present both experimental and numerical results.