

Table 1. NIST benchmark tests results for 200 sequences of 10^6 bits. For 200 sequences and a significance level $\alpha = 0.01$, the P-value (uniformity of p-values) should be larger than 0.001 and a proportion of 193 test success for the whole benchmark (115 for random excursion (variant) tests) is required to succeed statistical tests. Note: In case of a test producing multiple result outputs, the worst case is shown.

<i>Statistical test</i>	<i>P-value</i>	<i>Proportion</i>	<i>Result</i>
Frequency	0.834308	198/200	Success
Block frequency	0.564639	198/200	Success
Cumulative sums	0.224821	197/200	Success
Runs	0.825505	198/200	Success
Longest run	0.554420	197/200	Success
Rank	0.455937	199/200	Success
FFT	0.068999	196/200	Success
Non overlapping template	0.564639	194/200	Success
Overlapping template	0.788728	199/200	Success
Universal	0.524101	200/200	Success
Approximate entropy	0.978072	199/200	Success
Random excursions	0.074177	117/120	Success
Random excursions variant	0.116519	118/120	Success
Serial	0.816537	199/200	Success
Linear complexity	0.890582	198/200	Success

5. Conclusion

Supercontinuum generation in optical fibres is a complex nonlinear dynamical process, and any noise present on the input field is well-known to generate significant fluctuations in the output spectra. In this paper, we have shown how these fluctuations can be interpreted in a novel fundamental way in terms of the characteristics of random walks, and we have shown an important applications potential of the supercontinuum as a physical random number generator. Our results also suggest new links with broader areas of optics and physics. In particular, for regimes of supercontinuum generation where long tailed intensity distributions are observed near the spectral edges, our results have shown how the statistics can be used to construct Lévy flight like processes. Since these long-tailed statistics correspond to the regime of rogue wave like behavior, our results suggest an important link between the dynamics underlying the generation of rogue waves and Lévy flights. Although we have studied this link in the specific case of an optical nonlinearity, we anticipate that it will hold generally for rogue waves in other systems.

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