5. Conclusions

In conclusion, we used numerical simulations of the nonlinear pulse propagation in Ar-filled hollow core fibers to determine the optimum fiber parameters that maximize the output beam quality, broadening and energy. We have also presented a simple analytical model that allows to calculate the optimum fiber core radius for a pump wavelength between 400 nm and 2 μm, with very good agreement with the model results. Moreover, the regimes where the HCF setup generates a high quality output have been calculated, setting a higher limit in the pump pulse energy across the spectrum when statically-filled HCF compressors are used. We have identified the optimum HCF parameters that enable the efficient use of multi-color pumping schemes. In particular, pumping with both fundamental and second harmonic at 2 μm provides a number of advantages, such as high beam quality, throughput and spectral broadening beyond 2 octaves. The potential application of such supercontinua is the synthesis of high-energy electric fields in the sub-cycle regime.

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