Low-Noise Operation of All-Fiber Femtosecond Cherenkov Laser

We investigate the noise properties of a femtosecond all-fiber Cherenkov radiation source with emission wavelength around 600 nm, based on an Yb-fiber laser and a highly-nonlinear photonic crystal fiber. A relative intensity noise as low as - 103 dBC/Hz, corresponding to 2.48 % pulse-to-pulse fluctuation in energy, was observed at the Cherenkov radiation output power of 4.3 mW, or 150 pJ pulse energy. This pulse-to-pulse fluctuation is at least 10.6 dB lower compared to spectrally-sliced supercontinuum sources traditionally used for ultrafast fiberbased generation at visible wavelengths. Low noise makes allfiber Cherenkov sources promising for biophotonics applications such as multi-photon microscopy, where minimum pulse-to-pulse energy fluctuation is required. We present the dependency of the noise figure on both the Cherenkov radiation output power and its spectrum.