

## **Narrow core standard single mode fiber for supercontinuum generation from graphenebased mode-locked pulses**

### **ABSTRACT**

In this work, a supercontinuum (SC) source is proposed and demonstrated using a highly-doped, 2 m long zirconia-erbium doped fiber (Zr-EDF) with a dopant concentration of 3800 ppm/wt and a narrow core 100 m long single-mode-fiber (SMF). A graphene based saturable absorber (SA) is used as a passive mode-locker, generating pulses with an average output power, pulse energy and peak power of  $\sim 0.9$  mW,  $\sim 69.8$  pJ and  $\sim 83$  W respectively and a repetition rate of 12.9 MHz. This is then amplified using a 140 mW amplifier, giving an output power, pulse energy and peak power of  $\sim 75.0$  mW, 5.8 nJ and  $\sim 6.76$  kW respectively and injected into a 100 m long SMF, to generate an SC output which spans from 1450 to more than 1700 nm, with a pulse width at its full-width-at-half-maximum (FWHM) of 120 fs, 7 times lower than the 840 fs FWHM width of the pulses from the fiber laser. The narrow core SMF performs comparably to longer lengths of standard SMF-28 fibers.

**Keyword:** Supercontinuum; Narrow core single mode fiber; Graphene; Mode-locked fiber laser; Zirconia-based erbium-doped fiber