

Abstract Submitted  
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**Tying Knots in DNA with Holographic Optical Tweezers<sup>1</sup>**

MERVYN MILES, DAVID FOSTER, ANNELA SEDDON, Univ of Bristol, DAVID PHILLIPS, Univ of Glasgow, DAVID CARBERRY, None, MILES PADGETT, Univ of Glasgow, MARK DENNIS, Univ of Bristol — It has been demonstrated that holographic optical tweezers can be used to tie a trefoil knot in double-stranded DNA [1]. We have developed an advanced holographic optical tweezers system with several types of intuitive control interfaces [2-5]. It has been used in a range of research projects including the characterization and assembly of structures [6-8]. Here the process of tying increasingly complex knots with holographic tweezers will be described. The DNA is of the order of 50  $\mu$ m in length and is fluorescently labeled, in order that it can be visualized in the optical microscope of the tweezers system. With a knot was tied, the effect of increasing the persistence length of the DNA by partial methylation of the DNA molecule was investigated. 1. Xiaoyan R *et al.* *PRL* **91** (2003) 265506 2. G Gibson *et al.* *Rev Sci Instr* **83** (2012) 113107 3. G Whyte *et al.*, *Optics Exp* **14** (2006) 12497-12502 4. JA Grieve *et al.* *Optics Exp* **17** (2009) 3595-3602 5. C Muhiddin *et al.*, *J Optics* **15** (2013) 075302 6. DB Phillips *et al.* *Nature Photonics* **8** (2014) 400-405 7. OEC Gould *et al.* *Nature Comms* **6** (2015) 10009 8. H Qiu *et al.*, *Science* **352** (2016) 697-701

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