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A Variable-Radius, Cryogenically-Formed, Gas-filled Capillary Discharge Waveguide KELLY SWANSON, ANTHONY GONSALVES, Lawrence Berkeley National Laboratory, HANN-SHIN MAO, nLIGHT — Nutronics, TYLER SIPLA, CHRISTOPHER PIERONEK, CARLO BENEDETTI, STEPAN BULANOV, Lawrence Berkeley National Laboratory, NADEZHDA BOBROVA, Keldysh Institute of Applied Mathematics RAS, PAVEL SASOROV, Institute of Physics ASCR, v.v.i. (FZU), ELI-Beamlines Project; Keldysh Institute of Applied Mathematics RAS, GEORG KORN, Institute of Physics ASCR, v.v.i. (FZU), ELI-Beamlines Project, CAMERON GEDDES, CARL SCHROEDER, ERIC ESAREY, Lawrence Berkeley National Laboratory, WIM LEEMANS, Deutsches Elektronen-Synchrotron — We report the development and initial guiding results of a variable-radius, cryogenically-formed, gas-filled capillary discharge waveguide. The channel was created by freezing nitrous oxide gas onto the inner walls of a sapphire capillary such that the channel radius could be adjusted in situ by controlling the freezing process. We demonstrate guiding of low-power laser pulses through a 6 cm-long waveguide with varying channel diameters. Through measurements of the pulse energy transmission, the ability to control the matched spot size with the ice layer thickness was shown with experiments and magnetohydrodynamic simulations. This work was supported by the Director, Office of Science, Office of High Energy Physics, of the U.S. Department of Energy under Contract Nos. DE-AC02-05CH11231 and DE-FG02- 12ER41798, the NSF, and the project High Field Initiative (Grant No. CZ.02.1.01/0.0/0.0/15 003/0000449) from the European Regional Development Fund.

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