

Femto-second laser processing in Boro-Aluminosilicate Glass – a technology platform for the combination of mechanical structures and integrated waveguides

David Bischof^{1,*}, Per Canal¹, Martin Stahel¹, Sven Lämmle¹, Markus Michler¹

¹ OST-Ostschweizer Fachhochschule, Werdenbergstrasse 4, 9471 Buchs (SG)

* David Bischof; phone: +41 58 257 3491; david.bischof@ost.ch

3D printing in glass has experienced a significant boost in the last few years and has established itself in research and industry as a manufacturing process for micro-components. We present a novel technology platform which enables the integration of optical waveguides and mechanical structures in boro-aluminosilicate glass. The manufacturing process uses an ultra-short pulse laser to inscribe the optical waveguide and to micromachine the geometry.

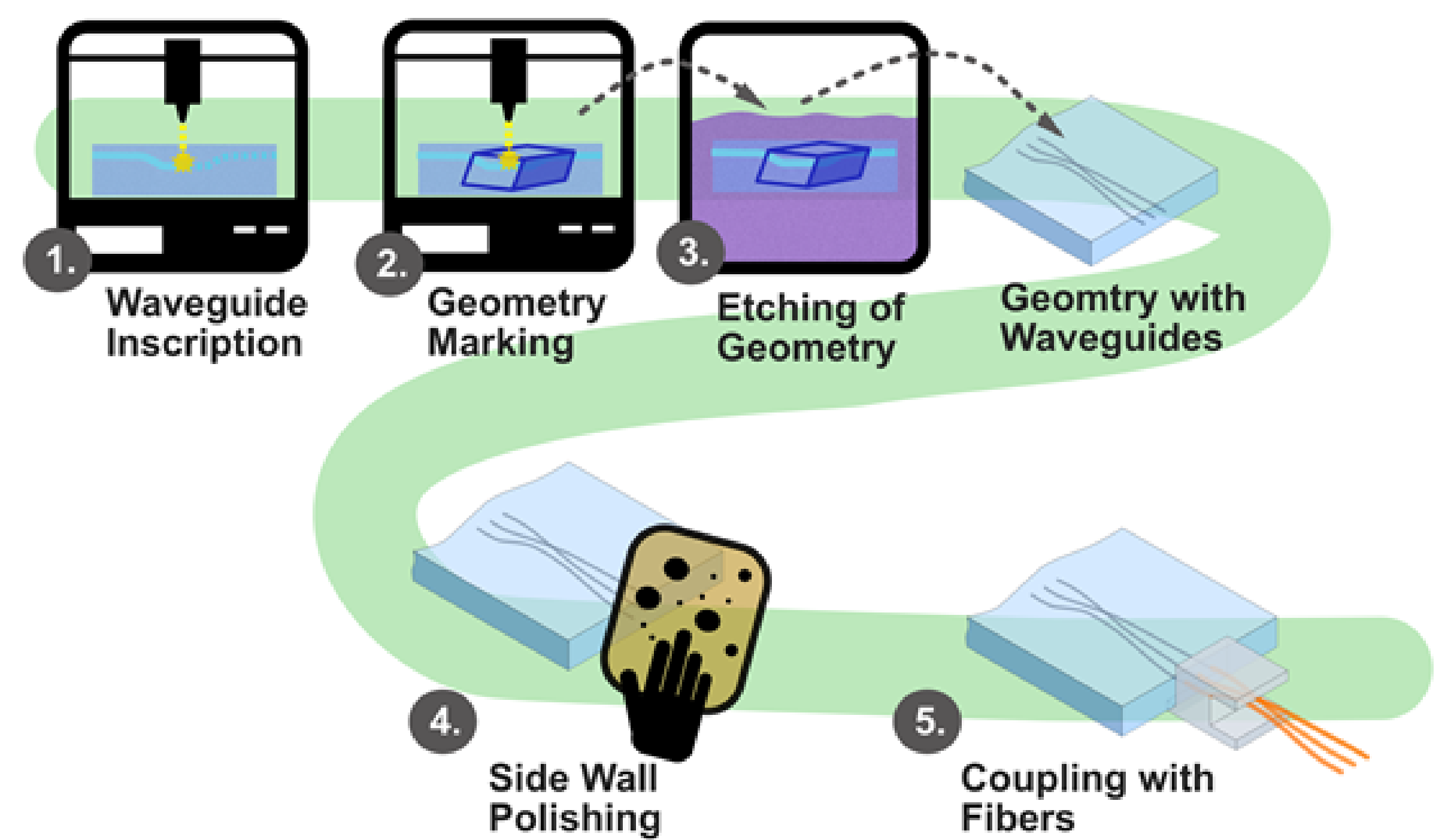


Figure 3: a) Illustration of the manufacturing process flow

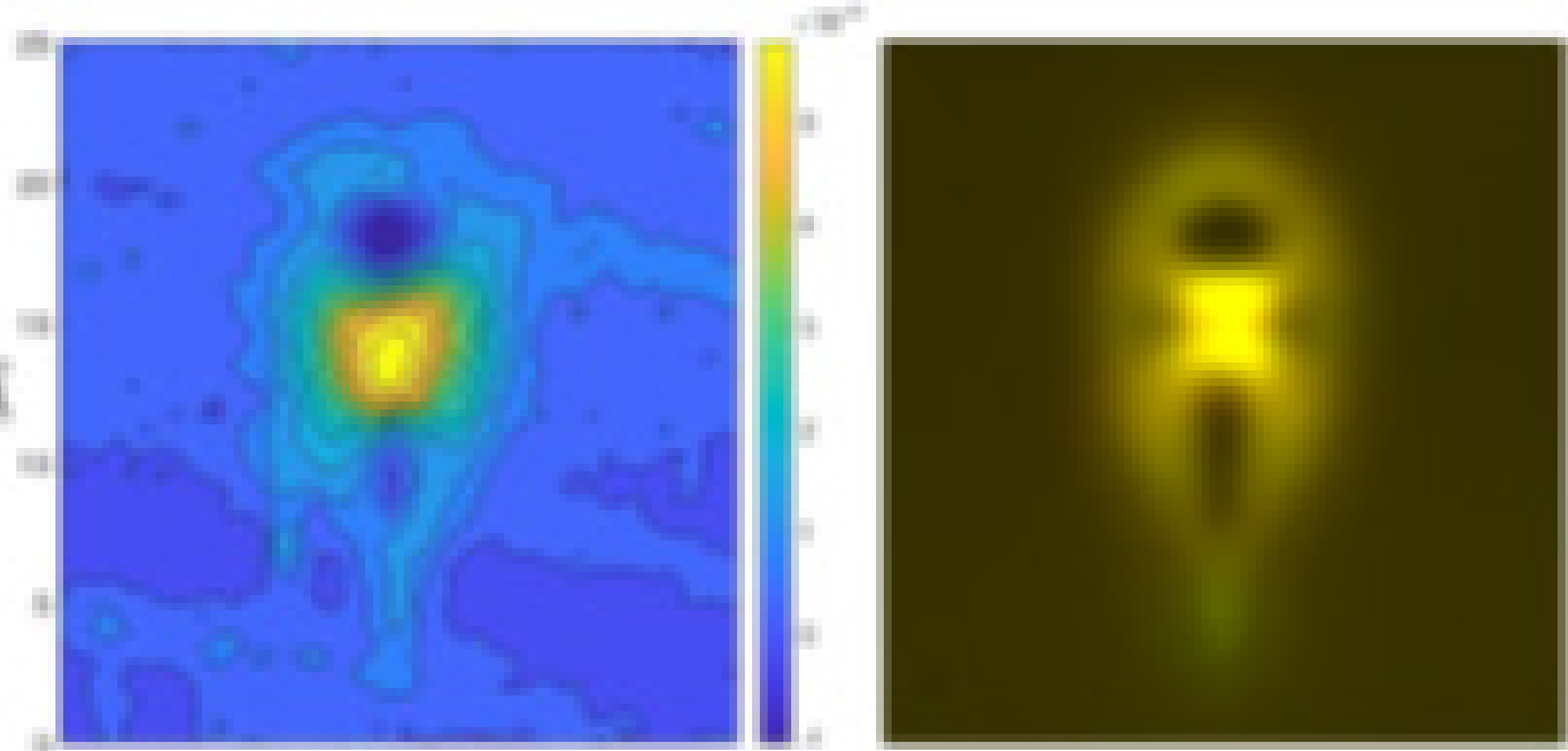


Figure 2: a) refractive index profile and image of the cross section of a WG inscribed by a laser wavelength 1030 nm, rep. rate of 1MHz, pulse duration of 300 fs, pulse energy of ~200 nJ and speed of 4 mm/s.

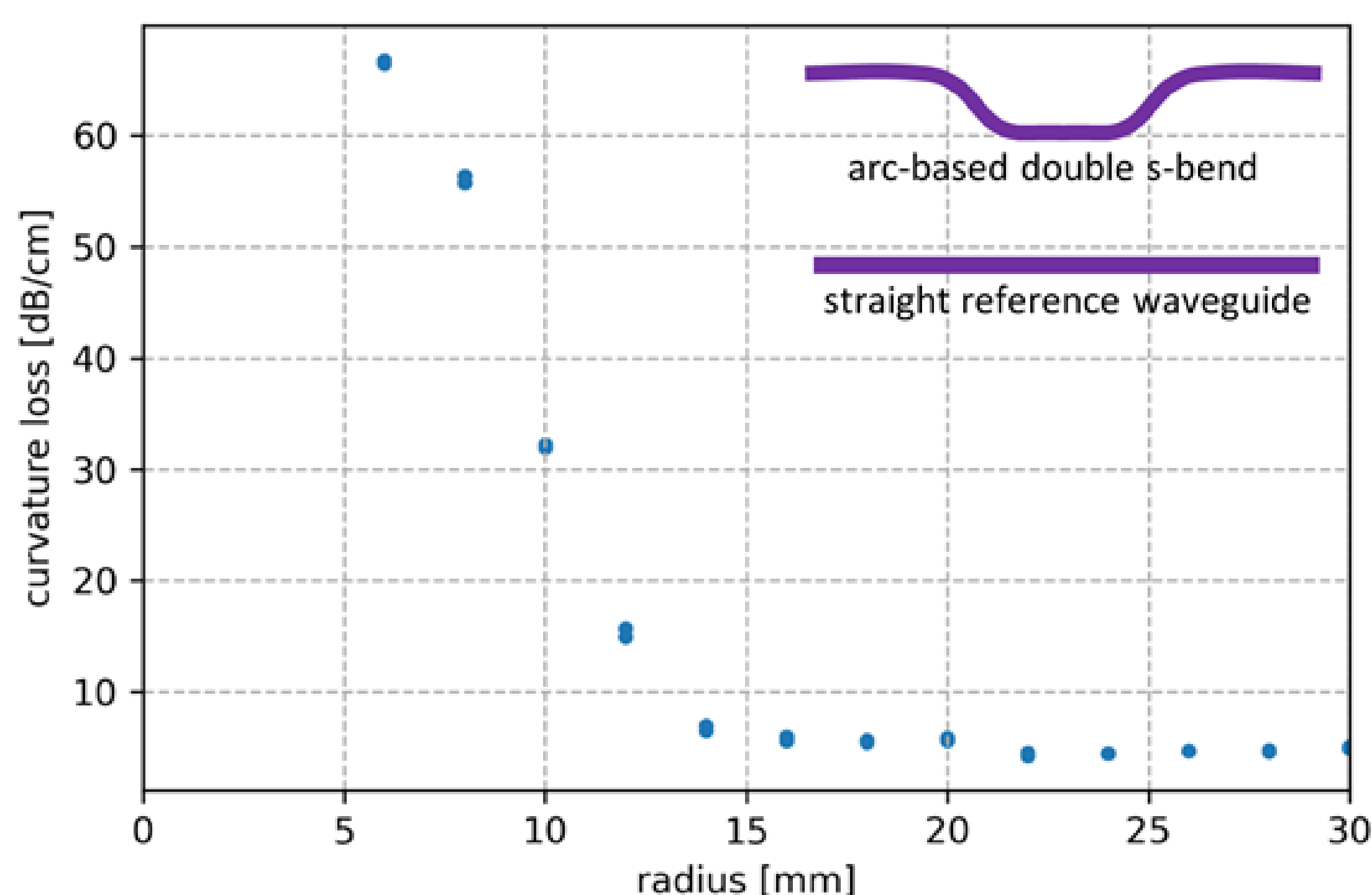


Figure 2: b) Curvature dependent loss of arc-based s-bends

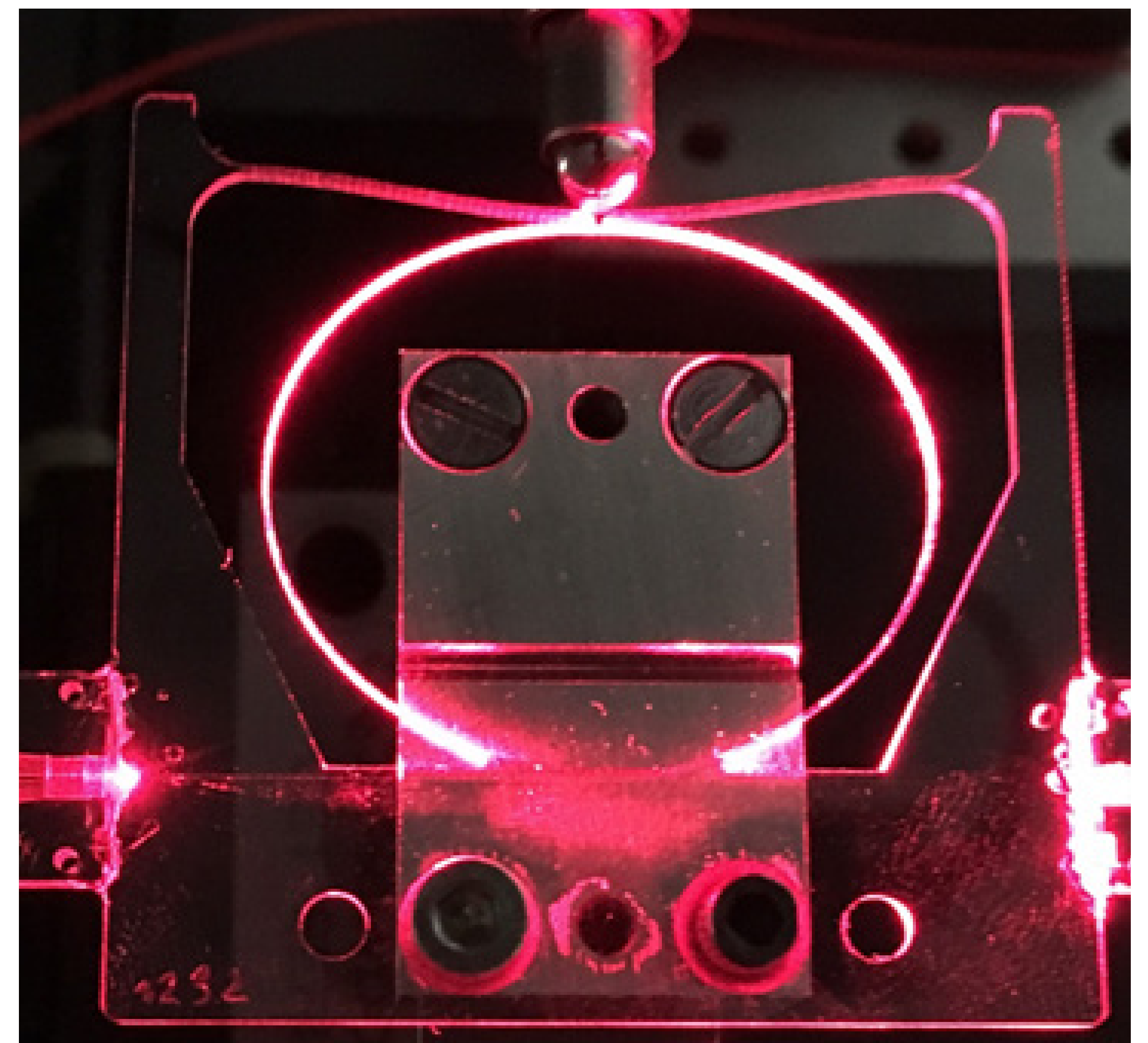


Figure 3: b) Final demonstrator of a mechanical flexure ring with an integrated helical waveguide loop

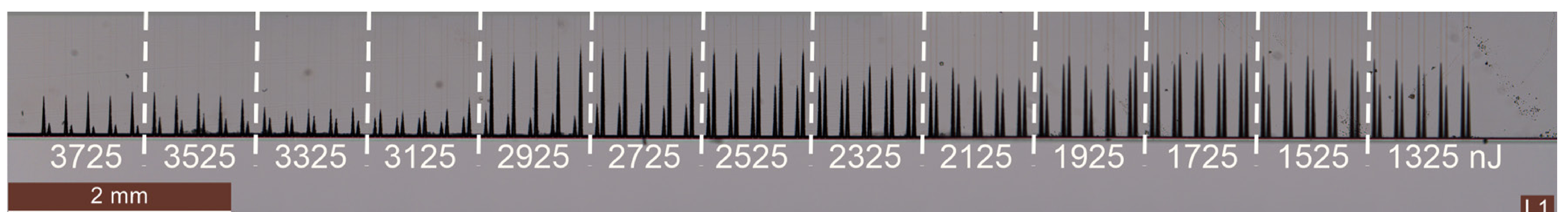


Figure 1: Wet chemical etched laser treated lines (speed 50 mm/s, laser wavelength 1030 nm, pulse duration 5 ps, repetition rate 50 kHz, different laser pulse energies) after 72 h etching in hot potassium hydroxide (8 mol/l, 80°C)