Supplementary Information

Estimation of guided power

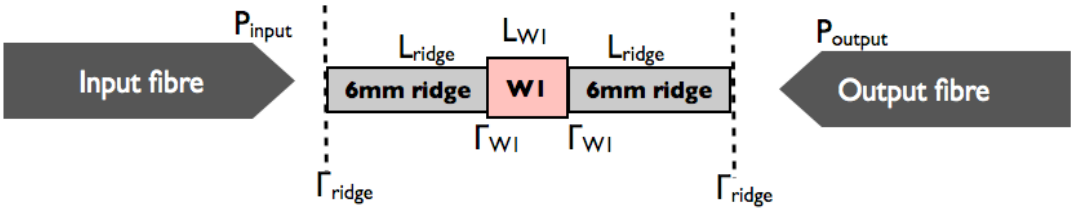

FIG 1 (supplementary). Illustration of the end-fire setup with the photonic crystal W1 waveguide and ridge waveguides to estimate the guided power.

Length of Ridge waveguide on either side	6 mm
Length of PhC W1 waveguide	60 µm
Loss in Ridge waveguide L_{ridge} (measured – best case)	3 dB/cm
Loss in PhC W1 L_{W1} (measured – best case)	24 dB/cm
Coupling fraction at the ridge Γ_{ridge} (measured)	0.13
Coupling fraction at the W1 Γ_{W1} (measured)	0.65
Output laser power P_{input} (measured)	1 mW
Power at the output fibre P_{output} (measured – best case)	4 µW

TABLE 1 (supplementary). Parameters used in the estimation of the guided power

Method 1

The hollow cavities are coupled via a PhC W1 waveguide, which in turn, is coupled with standard ridge waveguides through an endfire set-up as illustrated in the Supplementary Fig. 2. In order to estimate the guided power in the middle of the W1 waveguide, the coupling fractions at the ridge-air interface (Γ_{ridge}) and at the ridge-W1 interface (Γ_{W1}) need to be ascertained. With the use of the parameters listed in the Supplementary Table 1, the guided power is then calculated by using the simple algebraic expression as shown below.

$$P_{W1\_guided} = \sqrt{(P_{W1}L_{W1})}\,\Gamma_{W1}\,\sqrt{(P_{Ridge}L_{Ridge})}\,\Gamma_{Ridge}\,P_{input} \qquad (1)$$

For 1 mW input power, a guided power in the middle of the waveguide is conservatively estimated to be 62 μW.

Method 2

In a symmetric system, the power in the middle of the system would simply be the square root of the product of the input and output powers.

$$P_{W1\_guided} = \sqrt{T}P_{input} = \sqrt{\frac{P_{output}}{P_{input}}}P_{input} = \sqrt{P_{input}P_{output}} \qquad (2)$$

In the experimental set-up, for an output power of 4 μW and input power of 1 mW, the power in the middle is 63 μW, which is in close agreement with the estimation of the previous method. In all the cases, the most conservative value was selected. Therefore the actual trapping powers could only be lower than the reported values in this letter.

Note that equation 2 can be extended to the case of an asymmetric coupling constant, if the experiment can be repeated swapping the input and output ports.

$$P_{W1\_guided} = \sqrt{P^{\rightarrow}_{input}P^{\leftarrow}_{output}} = \sqrt{P^{\rightarrow}_{output}P^{\leftarrow}_{input}} \qquad (3)$$

Where the arrows in the subscripts of P_{input} and P_{output} refer to the direction the experiment is performed, forward, $P^{\rightarrow}_{\_\_}$, or backward, $P^{\leftarrow}_{\_\_}$.