Supporting Information

FDTD simulations of the two-way particle buffer chain

We simulated the two-way particle buffer structure using FDTD. Fig. S1(a) shows the transmission spectrum. Resonance modes of two rings couple with each other to form hybrid modes. The field distributions at three selected wavelengths near the second peak are shown in Fig.S1 (b)-(d). In Fig. S1(b), we plot the optical field distribution at a wavelength of 1552.5 nm. It can be seen that the optical fields are mostly concentrated in the top ring. The optical field distribution is plotted in Fig. S1(c) for a wavelength of 1553.2 nm. It can be seen that the rings have similar field intensities. In Fig. S1(d), we plot the field distribution for a wavelength of 1554.5 nm. It can be seen that the fields are mostly concentrated in the bottom ring. The strong variation in the field distribution with wavelength makes it possible to switch trapped particles back and forth between two rings by tuning the wavelength.

The simulated transmission spectrum has a different shape to that measured for the fabricated device (Fig. 3(b)). This is most likely due to differences between the geometries of the fabricated and simulated devices, for example in the widths of the gaps between the rings and the waveguide. We expect, however, that the fabricated device exhibits a field distribution that varies with wavelength in the manner simulated in Fig. S1. This is supported by the results of the optical trapping experiment.

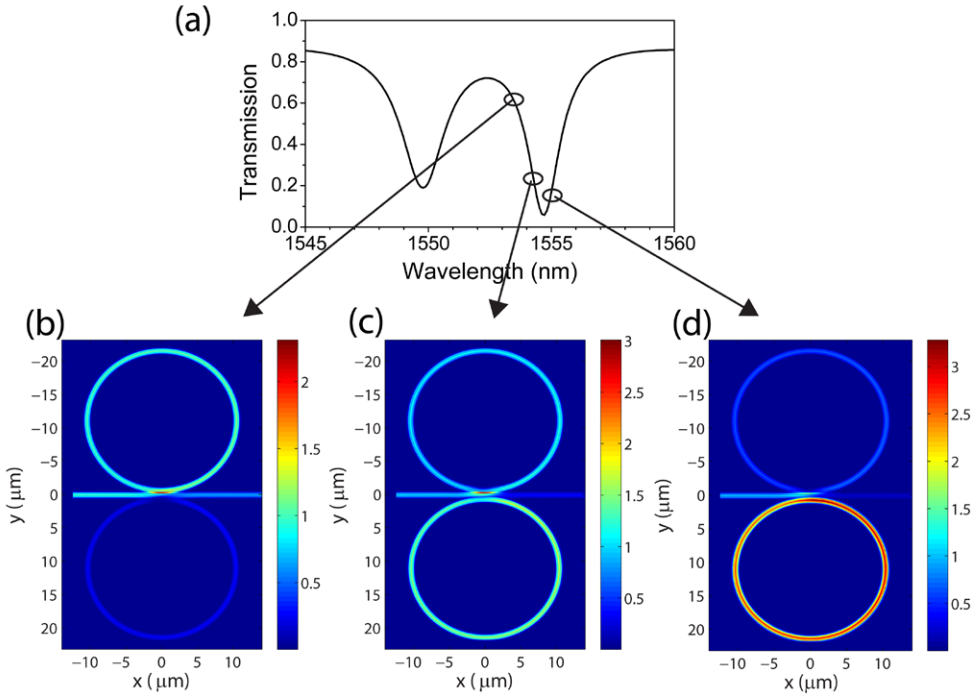

Fig. S1 (a) Transmission spectrum of the two-way buffer, (b-d) Electric field intensity (E^2) distributions for different wavelengths near the resonance

Electronic Supplementary Material (ESI) for Lab on a Chip

Description of the supplemental movies

Supplemental movie 1: Three particles are trapped and circulating on the microring. Two trapped particles are switched back to the bus wavelength after shifting the laser wavelength away from the resonance.

Supplemental movie 2: A trapped particle is delivered from the smaller to the larger ring by tuning the incident wavelength from 1557.9 nm to 1561.2 nm.

Supplemental movie 3: A trapped particle is switched back and forth between the two microrings by tuning the laser wavelength between 1554.5 nm and 1554 nm. The particle circulates twice around the corresponding microring in each step of the trapping process. The particle is released to the bus waveguide by setting the wavelength to 1555.5 nm.