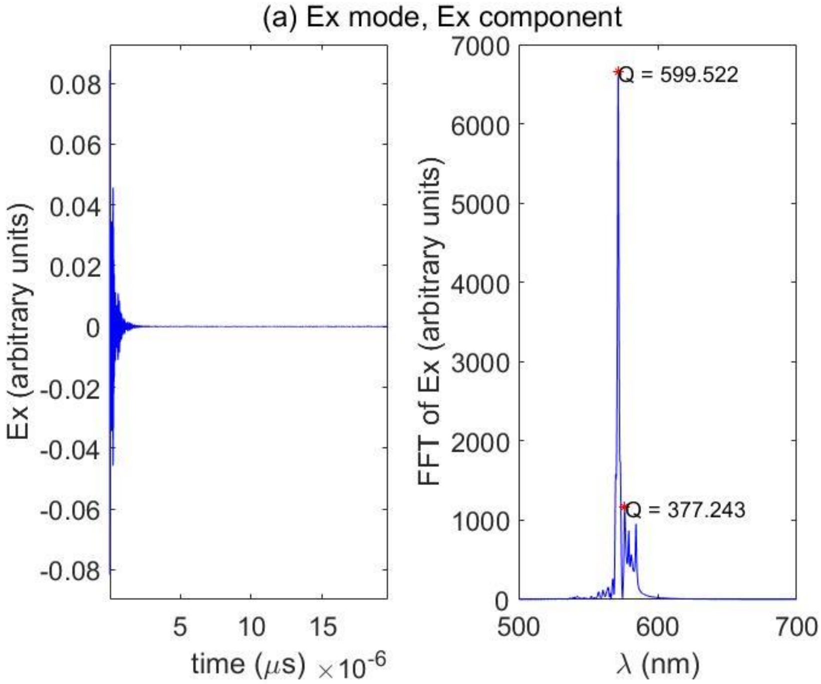
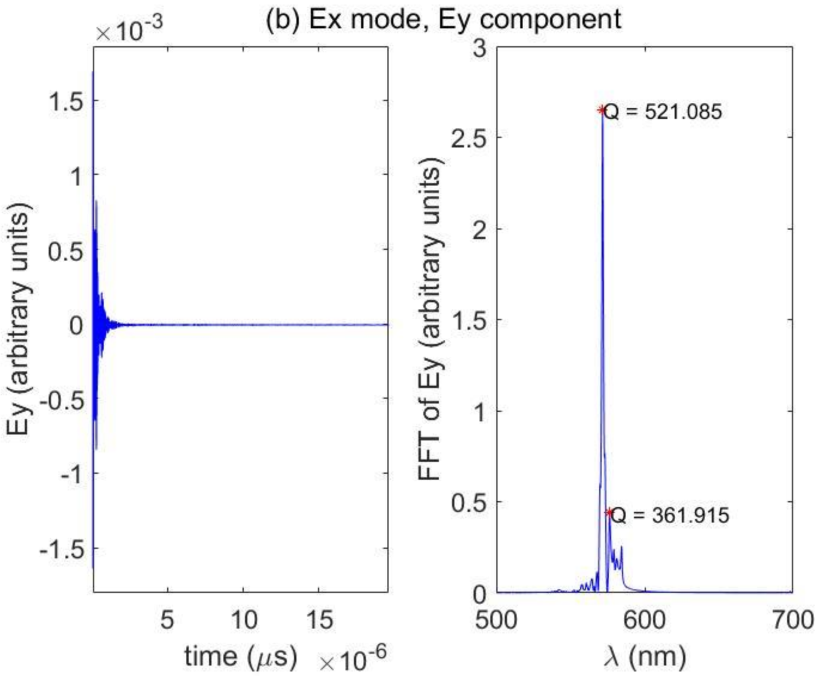
applied sciences

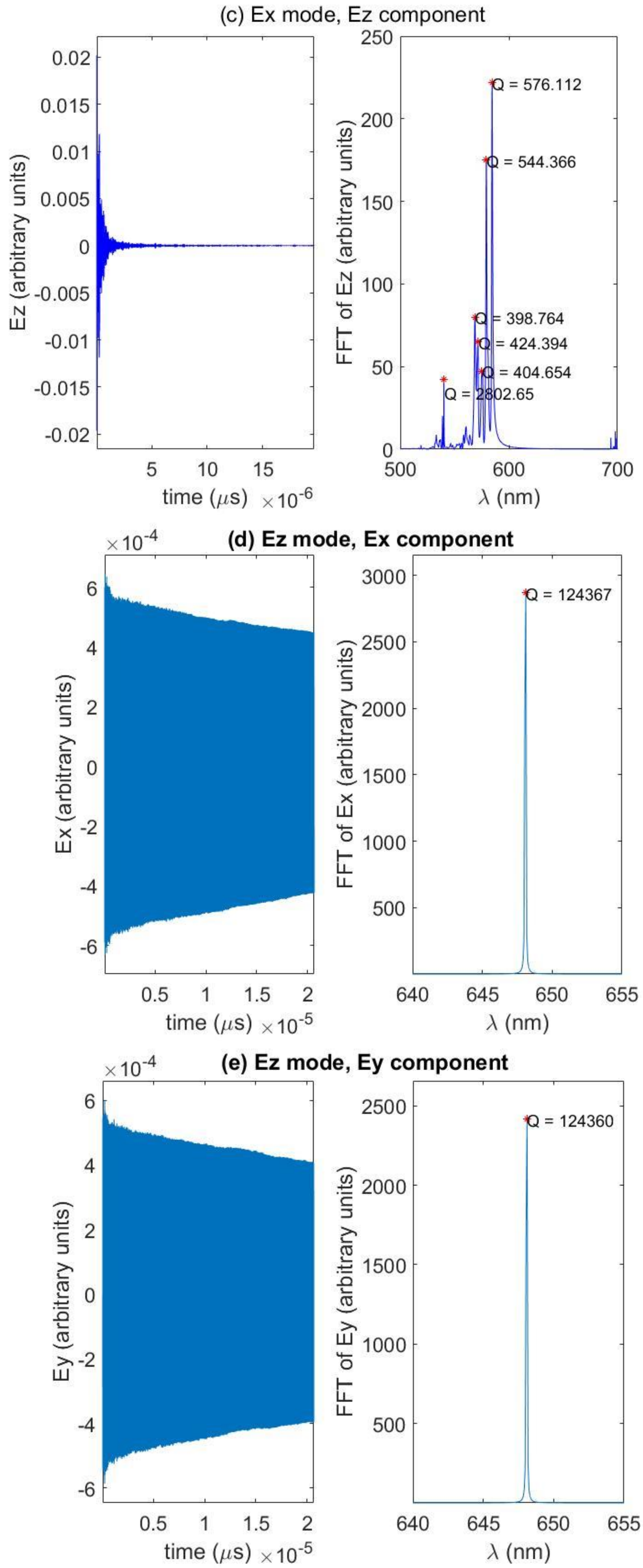
MDPI

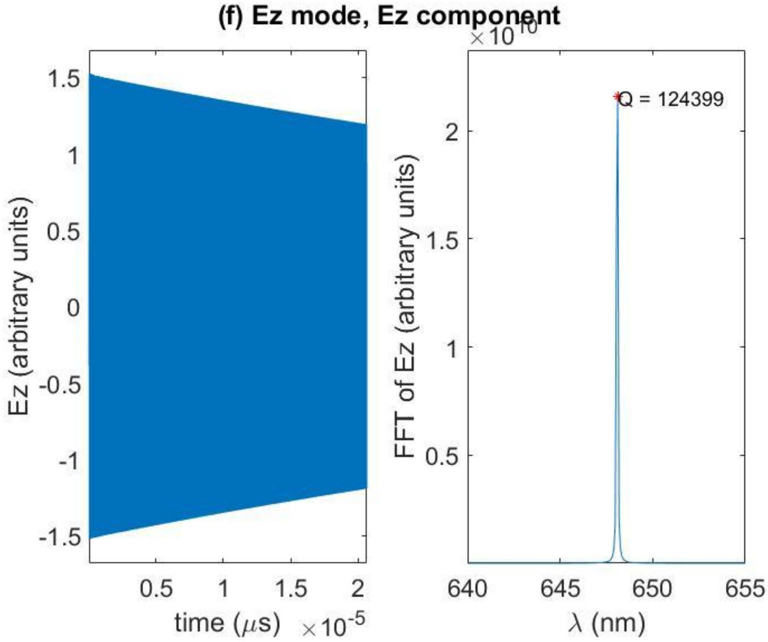
Supplementary Materials:

Figure S1: Amplitude of the electric field (*Ex*, *Ey* and *Ez* component) of *Ex* mode (a-c) and *Ez* mode (d-f) as a function of time and their corresponding fast Fourier transform when defect size *L*=0.25*c*.



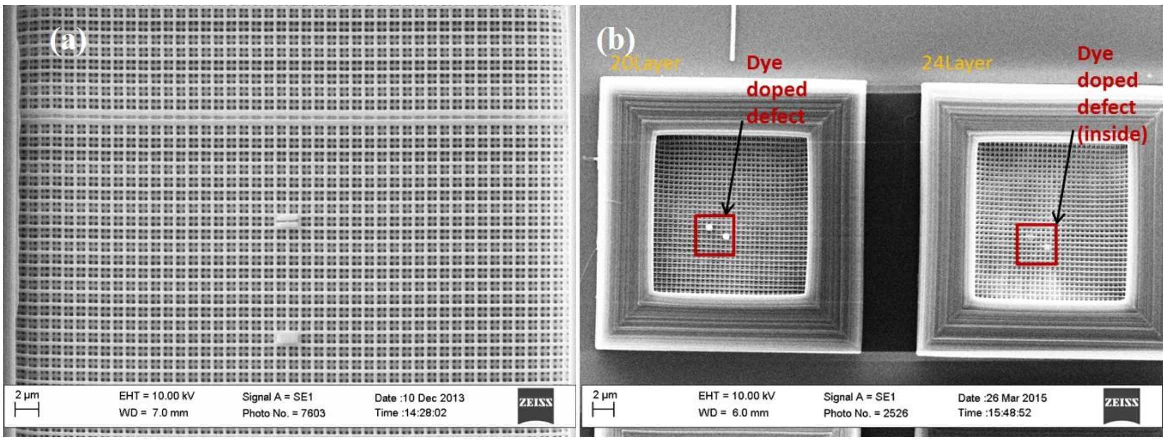



(c) Ex mode, Ez component
Ez (arbitrary units)
time (μs) ×10^-6
FFT of Ez (arbitrary units)
λ (nm)
Q = 576.112
Q = 544.366
Q = 398.764
Q = 424.394
Q = 404.654
Q = 2802.65
(d) Ez mode, Ex component
Ex (arbitrary units)
time (μs) ×10^-5
FFT of Ex (arbitrary units)
λ (nm)
Q = 124367
(e) Ez mode, Ey component
Ey (arbitrary units)
time (μs) ×10^-5
FFT of Ey (arbitrary units)
λ (nm)
Q = 124360



Notice: Wavelength axes in Figure S1 are in unit of nm and not normalized. As we use normalized parameters in the paper, here we provide the value c=335.8nm used in the simulations and the corresponding complete photonic bandgap can then be calculated which is between 590.2nm and 692.4nm. Because of the symmetry between Ex mode and Ey mode, only the results of Ex mode and Ez mode are shown here. As shown in Figure S1 (a-c) and (d-f), no high Q-factor Ex mode is found inside the bandgap when the dipole source is placed in x-axis orientated. Only some low Q-factor modes are observed near the edge. For the high Q-factor Ez mode we can find that its Ez component is about 2500 times larger its Ex and Ey component, which suggests that the Ez mode excited by a z-axis-oriented dipole source is dramatically linear polarized along the z-axis.

Figure S2: Scanning electron microscopy images of the fabricated polymer woodpile structures using the DLW method, (a) with various defects introduced (b) with dye doped defect embedded.



Using the DLW method, we manage to fabricate polymer woodpile templates with various defects. As shown in Figure S2 (a), a line defect and two point defects are fabricated along with the woodpile template. In Figure S2 (b) we show another preliminary work on the fabrication of polymer woodpile structures with light emitters (laser dyes) embedded defects. The template is made of pure polymer using the standard DLW procedure. Then a second exposure is executed using a dye doped photoresist to get the emitters embedded defects. The dye doped defects are designed and introduced at the same height with a 20-layer woodpile, which makes them sit on the top of a 20-layer woodpile on the left of Figure S2 (b) and buried in a woodpile with 24 layers on the right.