Supplemental Document

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Dynamically reconfigurable topological states in photonic crystals with liquid crystals: supplement

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Dynamically reconfigurable topological states in photonic crystals with liquid crystals:

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Voltage controlled topological router

After analyzing the edge state frequency changes under different refractive indexes, we can design a optical routing controlled by load voltages. The optical router consists of 4 parts, and the structure is shown in Fig. S1a. Take the edge state frequency when the refractive index is 1.5 in Fig. 4c as the source frequency. When the refractive index of all LCs in the optical router is 1.5, the four boundaries are all conductive (see Fig. S1b). When the refractive index of a part of the LCs change to 1.69, such as area A, the boundary state frequency of the two boundaries between this area and other areas will change. At this time, there are only two boundaries for wave transmission (see Fig. S1c). If area A is changed to B, the wave will be conducted along the boundary that is not adjacent to B. When the refractive index of two adjacent areas changes to 1.69, such as area A and B, the edge state frequencies of the three boundaries will change at this time, and there is only one boundary for wave transmission (see Fig. S1d). Similarly, the direction of conduction can be selected by changing the region. When the refractive index of all LCs is 1.69, there is no boundary for wave transmission at this time. Therefore, the wave will propagate a certain distance around and be completely absorbed by the crystal (see Fig. S1e). In summary, this optical router can not only select optical paths but also set the number of optical paths.

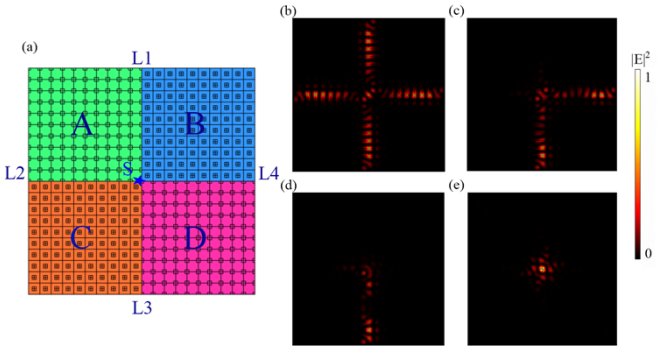

Fig. S1. The electrically-controlled optical router. (a) The optical router is composed of parts A, B, C, and D. Where L1, L2, L3, and L4 are the boundaries for wave propagation, and S is the source. The LC initial refractive index is 1.5. (b) Electric field distribution when the wave can be transferred in all boundaries. (c) The refractive index of the LC in Part A is changed to 1.69, then the frequency of the edge states of L1 and L2 changes, and the wave can only be conducted along L3 and L4. (d) The refractive index of LCs in parts A and B is changed to 1.69, so the wave can only propagate along L3. (e) The refractive index of all LCs is changed to 1.69, and there is no boundary for wave conduction.