

Supporting Information for:

Controlling electric and magnetic resonances for ultra-compact nanoantennas with tunable directionality

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3 figures

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Supporting Note 1: Near-field distribution of the higher-order mode

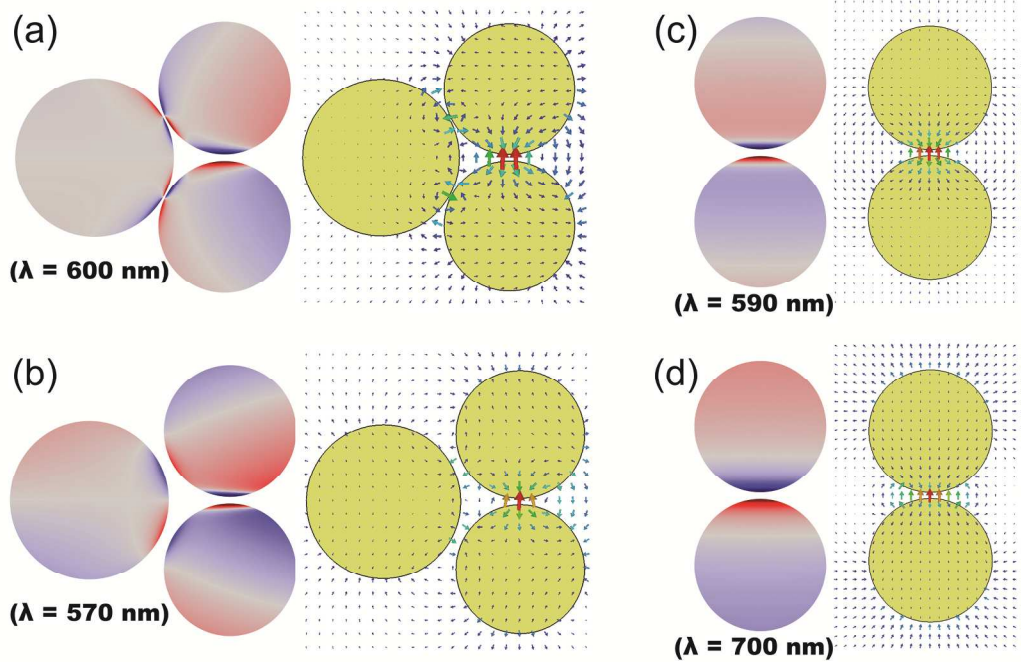


Figure S1. (a-c) Surface charge density and electric field distribution at the higher-order mode wavelengths. (a) Forward-radiation configuration ($h = -4 \text{ nm}$). (b) Backward-radiation configuration ($h = 4 \text{ nm}$). (c) Dimer ($h = \text{infinity}$). Note that in the charge density plot more nodes appear along the dimer axis, compared with the ED mode in (d).

Supporting Note 2: Evolution of directionality from different trimer configurations

(1) Evolution of the best directionality from different trimer configurations.

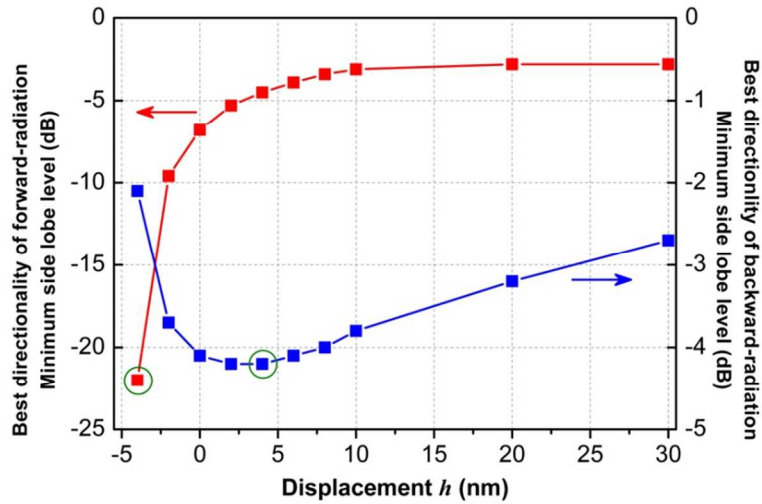


Figure S2. The minimum side lobe level that can be achieved for the forward- and backward-radiation from different trimer configurations. Dots in the circles correspond to the results reported in Figures 2 and 4. Note that for different configurations, the best directionality occurs at different wavelengths (see Tables S1 and S2).

Table S1: Minimum Side Lobe Level (SLL) of Forward Radiation

Displacement h (nm)	Minimum SLL (dB)	Wavelength (nm)
-4	-22	857
-2	-9.6	750
0 (Equilibrium)	-6.8	706
2	-5.3	682
4	-4.5	659
6	-3.9	652
8	-3.4	645
10	-3.1	632
20	-2.8	555
30	-2.8	560

Table S2: Minimum Side Lobe Level (SLL) of Backward Radiation

Displacement h (nm)	Minimum SLL (dB)	Wavelength (nm)
-4	-2.1	984
-2	-3.7	870
0 (Equilibrium)	-4.1	822
2	-4.2	789
4	-4.2	780
6	-4.1	770
8	-4	770
10	-3.8	760
20	-3.2	770
30	-2.7	780

(2) Evolution of directionality from different trimer configurations at 857 and 780 nm.

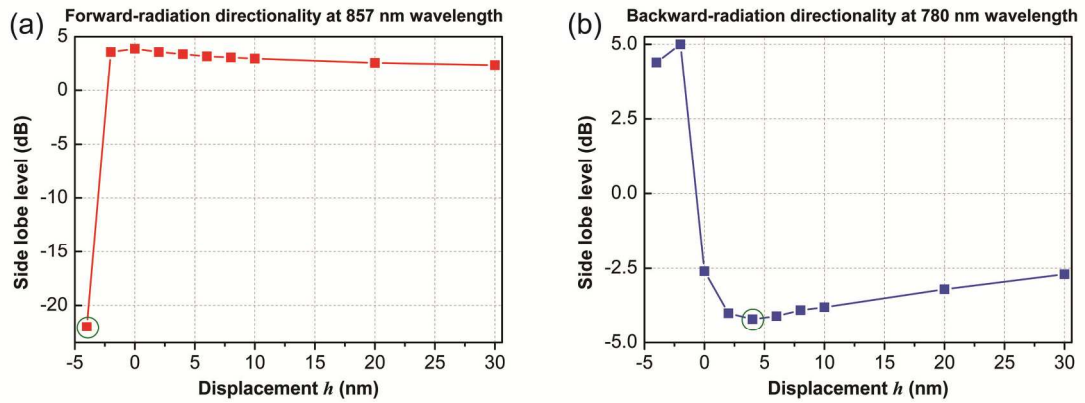


Figure S3. The side lobe level from different trimer configurations at (a) 857 nm wavelength for the forward-radiation, and at (b) 780 nm wavelength for the backward-radiation. Positive values indicate that the main lobe is oriented towards the opposite direction. Dots in the circles correspond to the results reported in Figures 2 and 4.