# Supporting information

## Cancer diagnosis using terahertz graphene metasurface based biosensor with dual-resonance response

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In Figure S1(a), we find that there is a red-shift with reduction of transmisson strength for Dip1 and Dip2 when $w_0$=4 μm and simultaneously $w_1$ changes from 6 μm to 2 μm. In ccontrast, there is a blue-shift behavior for Dip1 and Dip2 when $w_0$ is fixed as 2 μm and $w_1$ increases from 2 μm to 6 μm except for Dip2 at $w_0$=2 μm and $w_1$=6 μm. Besides, the transmission window between Dip1 and Dip2 for $w_0$=2 μm is larger than that of $w_0$=4 μm. Therefore, the line width of two rings has a significant influence on the transmission spectea of the graphene metasurface.

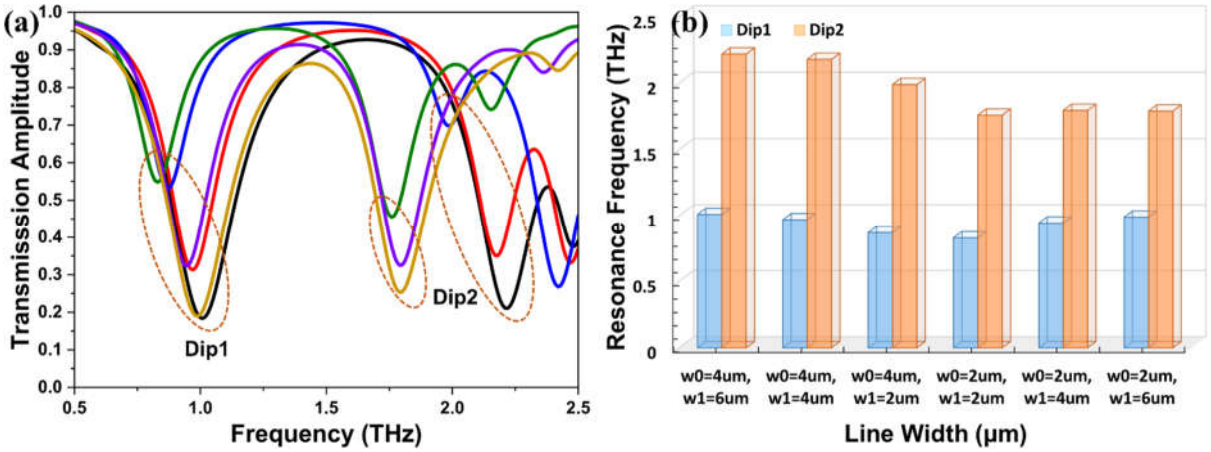


**Figure S1**. (a) Simulated transmission spectra and (b) resonance frequency of the graphene metasurface for different line widths of two graphene rings. Note that black, red, blue, olive, violet, and brown colors are denoted as $w_0$=4 μm, $w_1$=6 μm; $w_0$=4 μm, $w_1$=4 μm; $w_0$=4 μm, $w_1$=2 μm; $w_0$=2 μm, $w_1$=2 μm; $w_0$=2 μm, $w_1$=4 μm; $w_0$=2 μm, $w_1$=6 μm, respectively.

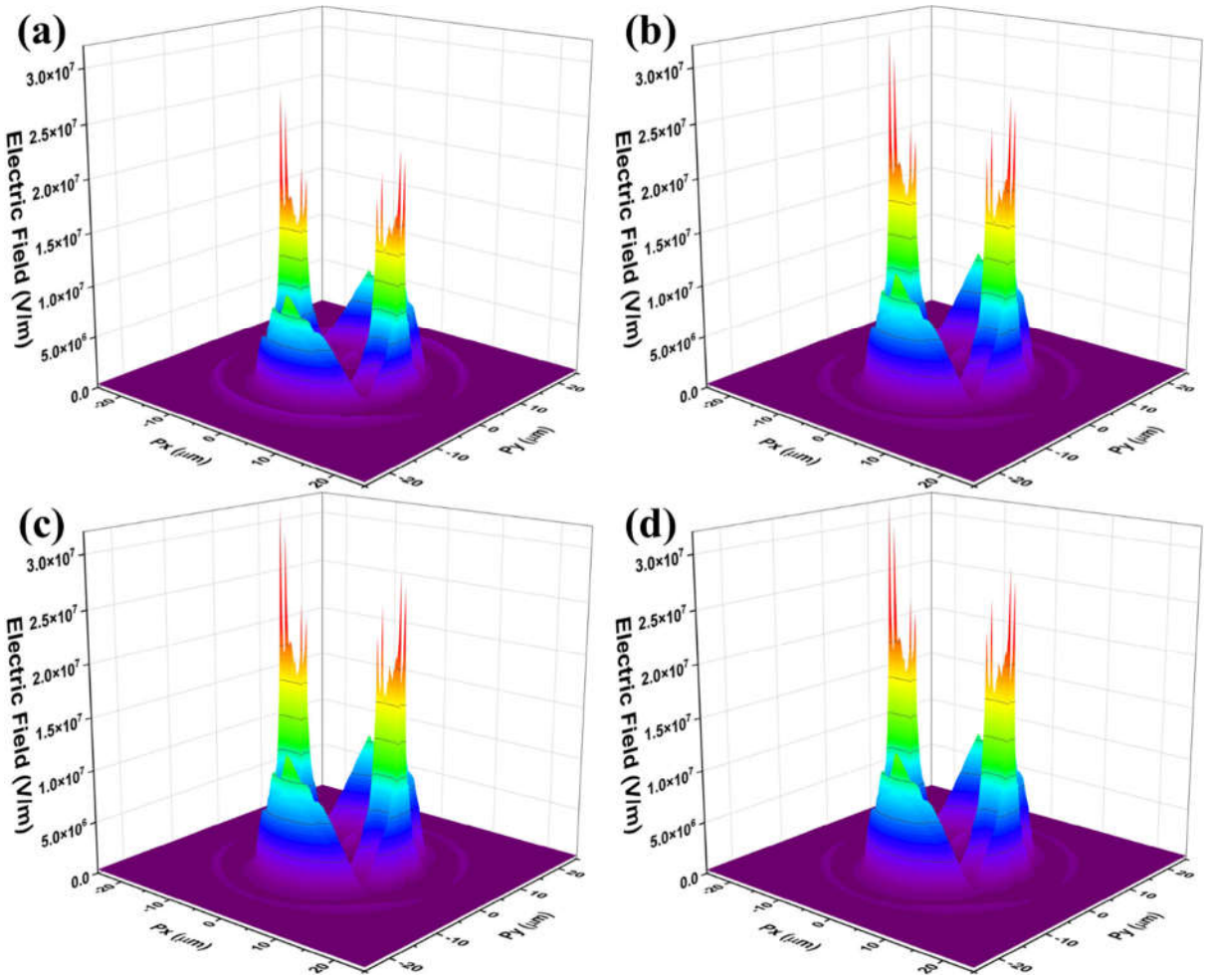


**Figure S2.** The 3D electric field of the graphene metasurface with the carrier density of (a) 1E13 $cm^{-1}$, (b) 3E13 $cm^{-1}$, (c) 5E13 $cm^{-1}$, and (d) 7E13 $cm^{-1}$.