

frequency. As expected, imaginary effective refractive indices in the case of 150 μm are smaller than those of 260 μm , as shown from transmission spectra in Fig. 7. Therefore, we could confirm that the extracted refractive index corresponded to the zero refractive index at resonant frequency.

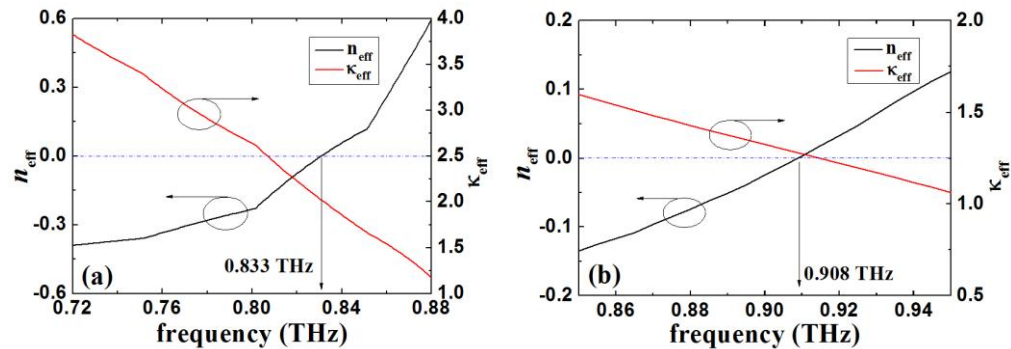


Fig. 8. Extracted effective refractive index of Al films with $a = 260 \mu\text{m}$ (a) and $a = 150 \mu\text{m}$ (b).

3. Conclusion

In conclusion, we numerically and experimentally demonstrated that the effective refractive index of perfect metal film with a periodic split ring resonator array is zero at localized waveguide resonant frequency within a THz frequency range. Accordingly, the zero refractive index effectively accounts for localized waveguide resonant mode properties, thickness independent resonant frequency and spatially static resonant modes.

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