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Article

Tripod-loop Metasurfaces for Terahertz Sensing Applications: a Comparison

Irati Jáuregui-López [1,2], Bakhtiyar Orazbayev [3], Victor Pacheco-Peña [4] and Miguel Beruete [1,2,*]

[1] Antennas Group-TERALAB, Universidad Pública de Navarra (UPNA), 31006 Pamplona, Navarra, Spain; irati.jauregui@unavarra.es
[2] Multispectral Biosensing Group, Navarrabiomed, Complejo Hospitalario de Navarra (CHN), Universidad Pública de Navarra (UPNA), IdiSNA, 31008 Pamplona, Navarra, Spain
[3] Laboratory of Wave Engineering, École Polytechnique Fédérale de Lausanne (EPFL), 1015 Lausanne, Switzerland; bakhtiyar.orazbayev@epfl.ch
[4] School of Mathematics, Statistics and Physics, Newcastle University, Newcastle Upon Tyne, NE1 7RU, UK; Victor.Pacheco-Pena@newcastle.ac.uk
* Correspondence: miguel.beruete@unavarra.es

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Supplementary materials

Polarization dependence

To analyze the sensitivity of the simple tripod metasurface to the polarization of the incident wave we studied the transmission coefficient as a function of the incident polarization angle. This study is carried out for the case of the empty structure (i.e., without using any analyte on top of the metasurfaces). For this study, the polarization angle was varied from 0° to 90° with an increment of 10°. As is shown in Figure S1, the spectral response of the metasurface is largely independent of the polarization angle, which is a very desirable feature for sensing applications.

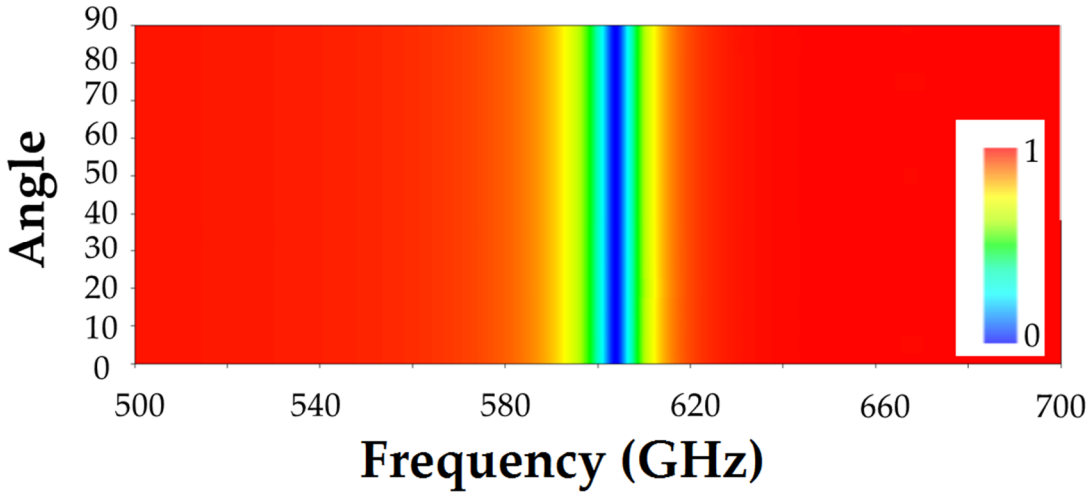

Figure S1. Spectral transmission of the simple tripod metasurface plotted as a function of the polarization angle. The results are shown in a linear scale and for a normal incidence.

Hollow tripod structure: ultrathin-film sensor

As mentioned in the main text, although the hollow tripod structure is capable to detect thicknesses in the order of thousands of nanometers, this simplest version cannot detect thicknesses of a few dozens of nanometers, contrary to the other more complex designs presented.

Figure S1 shows the reflection coefficient when coating the structure with very thin-films, with thicknesses ranging from 5 nm to 25 nm. As observed in the expanded view of the inset, there is not a clear and ordered frequency shift as the analyte thickness increases. Instead of that, we can see that the values corresponding to thicknesses of 20 and 25 nm give rise to identical curves, whose resonances are also at higher frequencies than the curves corresponding to lower thicknesses. These results are because this structure is not sensitive enough to such small changes in the dielectric properties of the surroundings of the structure surface.

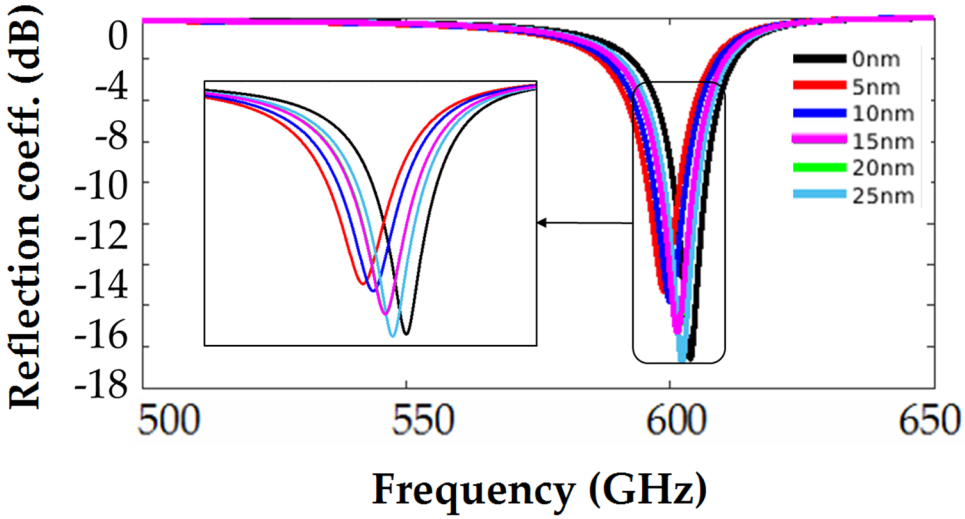

Figure S2. Reflection coefficient for different ultrathin analyte thicknesses: 0 nm (black line), 5 nm (red line), 10 nm (blue line), 15 nm (pink line), 20 nm (green line), and 25 nm (light blue line), for the hollow tripod structure. Inset: expanded view of the resonance shift.