

ANALYZATION OF THE FIRST AND SECOND ORDERS OF RESONANT MODES AROUND METAL-SEMICONDUCTOR-METAL TRILAYER

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ABSTRACT. Electromagnetic fields around metal–semiconductor–metal (MSM) multilayers with a squared island top layer were calculated numerically, and their spectral absorptances were evaluated. The top and bottom metal layers were set to be gold; however, the intermediate semiconductor layer was set to be gallium antimony (GaSb). With a squared island top gold layer, the first peak shifted to a longer wavelength range. Uncharted second peaks emerged from 1.0 to 2.0 μm when the island width was longer than 300 nm. By observing the distributions of the z -directional electric fields at the wavelength of the absorptance peak, it was clarified that the second peak of absorptance was generated by horizontal directional Fabry–Perot interference inside GaSb layer depending on the width of the island. Moreover, the first peak could be described using the LC equivalent circuit model in the condition with wide distance between two islands. However, it was indicated that the LC circuit model needed a correction about capacitance between the upper and ground layer in the condition with narrow distance between two islands.