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Surface Plasmon Polaritons Assisted Transmission in Periodic Superconducting Grating

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Abstract

Transmission properties in periodic superconducting grating, with a dispersive dielectric function governed by system temperature and frequency of incident light, have been numerically studied. Sharp transmittance peaks are observed with a transmission intensity of 100%, which are identified as associated with the formation of symmetric surface plasmon polaritons (SPPs) on the interface between the superconducting grating and the vacuum areas. More than six resonances originating from the SPP assisted transmissions can be sustained by increasing the diameter of the circular superconducting strip to approach the period of the superconducting grating. In addition, there exists a cut-off frequency that is almost independent of the diameter of the superconducting strip. The transmission peaks, as well as the cut-off frequency, are found to be very sensitive to the system temperature, giving rise to wide-ranging tunability of the transmission properties of the superconducting grating.