Development of Numerical Simulation Code for THz-Band Superconducting Hot-Electron Bolometer Mixer Designing

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THz region is an unexplored frequency band in heterodyne sensing technology fields, because a conventional SIS mixer cannot operate due to superconducting Cooper pair breakdown by photon absorption in the THz band. To overcome this obstacle, we are developing an alternative THz-band heterodyne device known as a hot-electron bolometer mixer (HEBM) device, and good laboratory results have already been reported. However, physical mechanisms determining the intermediate bandwidth of the HEBM device are not yet sufficiently understood. Thus we develop a new numerical simulation code to understand physical processes in the HEBM device, which aims to improve the fabrication process for superconducting HEBM microbridges. Because the microbrdge of our HEBM device consists of a coplanar line structure, we numerically model the coplanar line by using FDTD (Finite-Difference-Time-Domain) method. Also, we introduce superconductors into the FDTD simulation code by solving the London equation. In this meeting we will present the preliminary results on the development of the numerical simulation code for the HEBM device.