Study of the superconductor-normal metal interface in hot-electron bolometer mixers

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***Abstract*—During the last few years significant progress has been made in the field of hot-electron bolometer (HEB) mixers. It has been possible to combine a low noise temperature and high stability of phonon-cooled HEBs with an ultrawide gain bandwidth of the diffusion-cooled HEBs in a single device and thus create HEB mixers which offer a noise temperature of 5hv/kB across a 7-GHz band. The essential ingredient of this success is the *in situ* fabrication technology, where the deposition of the gold contacts follows the deposition of the superconducting film without vacuum breaking.**

Despite the evident technological breakthrough, the details of certain physical processes occurring both at the superconductor-normal metal (SN) interface and in the superconducting bridge are not completely understood in terms of their influence on the mixer performance. In particular, it is still unclear to what extent the properties of the SN interface are affected by the deposition temperatures of the superconductor and the normal metal, and also by the time interval elapsed between the deposition processes. We will gain some insight into the matter by studying the behaviour of the superconducting transition as a function of the deposition temperatures and time delay. A better understanding of this issue will allow us to move forward the HEB mixer technology towards new applications.