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Terahertz heterodyne detection with high-Tc superconducting Josephson junctions MAXIME MALNOU, CHERYL FEUILLET-PALMA, ALAN LUO, THOMAS WOLF, LPEM ESPCI-ParisTech CNRS, France, CHRISTIAN ULYSSE, LPN-CNRS, Marcoussis, France, PASCAL FEVBRE, LAHC Université de Savoie, Le Bourget du Lac, France, JEROME LESUEUR, NICOLAS BERGEAL, LPEM ESPCI-ParisTech CNRS, France — The terahertz region of the electromagnetic spectrum [0.3-10THz] has, so far, not been exploited fully due to the lack of suitable sources and detectors. Indeed, THz frequency lies between the frequency range of traditional electronics and photonics where the existing technology cannot be simply extended. Superconductor-insulator-superconductor Niobium tunnel junctions that are currently used as mixing element in heterodyne receivers are intrinsically limited in frequency by the energy gap of Nb and operate only at low temperature (4.2K). An alternative to these devices consists of using High-Tc superconducting receivers. Over the past years, we have developed a new approach based on ion irradiation to make Josephson nano-junctions with YBa2Cu3O7 thin films [1,2]. In this talk we will present the fabrication process we developed and a study of the high-frequency mixing properties of such junctions from 20GHz to 400 GHz [3]. Finally, we will present the ongoing work to build an integrated heterodyne receiver that operates with an on-chip Josephson local oscillator.

[1] N. Bergeal et al. Appl. Phys. Lett. 87, 102502 (2005).
[2] N. Bergeal et al. J. Appl. Phys. 102, 083903 (2007).
[3] M. Malnou et al. Appl. Phys. Lett. 101, 233505 (2012).

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