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**Toward terahertz heterodyne detection with superconducting Josephson junctions** N. BERGEAL, M. MALNOU, C. FEUILLET-PALMA, A. LUO, T. WOLF, J. LESUEUR, ESPCI ParisTech, C. ULYSSE, LPN Marcoussis, P. FEBVRE, LAHC Université de Savoie — 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. SIS 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 nanojunctions and SQUIDs with YBCO thin films [1,2]. In this talk, we will present a study of the high-frequency mixing properties of such junctions up to 400 GHz [3]. Conversion gain has been measured at frequencies spanning the range below and above the characteristic frequency fc = (2e/h)IcRn of the junctions. The transition between two distinct mixing regimes has been clearly evidenced, in good agreement with the prediction of the three ports model.

[1] N. Bergeal et al., Appl. Phys. Lett. 87, 102502 (2005)
[2] N. Bergeal et al., Appl. Phys. Lett. 89, 1112515 (2006)
[3] Luo et al, arXiv:1203.1734 (2012)

Nicolas Bergeal
LPEM ESPCI ParisTech-CNRS

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