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Influence of the tunneling property on the noise thermometry using a metal-insulator-metal tunnel junction JUNG HWAN PARK, MUSH-TAQ REHMAN, Korea Research Institute of Standards and Science, ZHEONG G. KHIM, Seoul National University, SANG-WAN RYU, Chonnam National University, WOON SONG, YONUK CHONG, Korea Research Institute of Standards and Science — We are developing a noise thermometry setup based on precision RF measurement, where temperature can be inferred from the noise of a tunnel junction as a function of the bias voltage. We measure the electrical noise of an Al-AlO_x-Al tunnel junction around 1 GHz with a bandwidth of a few hundred MHz. In this presentation, as an analysis on the source of error in thermometry, we studied the influence of the junction quality and the inelastic process on the temperature measurement. We compared the noise of an as-fabricated tunnel junction with that of a degraded tunnel junction after thermal cycling. Except for the junction degradation, all measurement environments were kept exactly same. We observed an apparently higher noise value near the zero-bias, which leads to an overestimation of temperature. We present a simple model to describe how the inelastic process in a tunnel junction affects the temperature measurement.

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