

## Noise Thermometry by Measuring Shot Noise of a Tunnel Junction

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We have fabricated tunnel-junction devices consisting of Al-AlO<sub>x</sub>-Al by two angle-evaporation method and have measured shot noise of those devices at 4.2 K in the frequency range of 900 – 1200 MHz. Even though shot noise of a tunnel-junction device shows conventional  $S_I = 2eI$  at high bias voltage, it exhibits temperature and bias voltage dependence at low bias voltage ( $eV \sim k_B T$ ), which can be utilized to construct a noise thermometer. We measured the shot noise of a single junction and fitted the result with theoretical prediction. The inferred temperature from the fitting is compared with a commercially available temperature sensor. In a long term, we plan to operate the thermometer in a wide temperature range of 0.3 – 500 K and to further improve the accuracy and uncertainty. After full development in the future, we expect that the shot noise thermometer can become a practical primary thermometer in wide temperature range.

Keywords: shot noise, tunnel junction, noise thermometer