Excited state population of a 3D transmon in thermal equilibrium

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We present a systematic study of the excited state population of a 3D transmon qubit at various temperatures. We experimentally demonstrate that the population of the first excited state follows the Maxwell-Boltzmann distribution in the temperature range of 35-150 mK. For bath temperatures below 35 mK, the excited-state population saturates, with an upper-bound estimate of 0.1%. The saturation suggests a qubit effective temperature of approximately 35 mK. The Lincoln Laboratory portion of this work was sponsored by the Assistant Secretary of Defense for Research & Engineering under Air Force Contract number FA8721-05-C-0002. Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the United States Government.

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Date submitted: 15 Nov 2013

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