Supporting Information for

Visualizing heterogeneous dipole fields by terahertz light coupling in individual nano-junctions used in transmon qubits

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1. Microscope images of Josephson junction structure

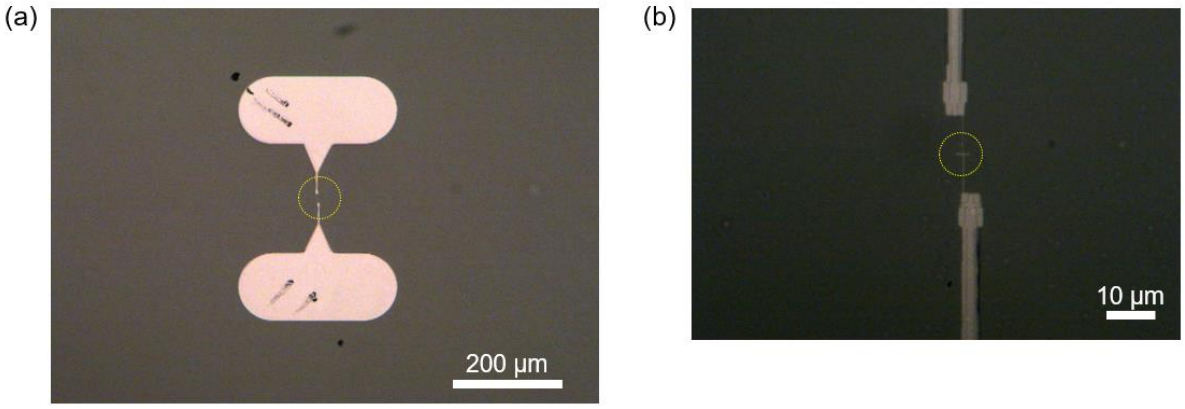

Fig. S1 (a) The test Josephson junction structure viewed with an optical microscope. (b) A higher resolution image of the circled area in (a). SNOM images shown in the main text corresponds to the circled area at the center.

2. THz scanning near-field optical microscopy

Our home-built THzSNOM setup comprises three main equipment: laser, vacuum, and an atomic force microscope (AFM) unit. The laser is a femtosecond ytterbium laser with a pulse energy of 3 μJ, a repetition rate of 1 MHz, and a central laser wavelength of 1030 nm that can generate a bright source of pulsed THz radiation when applied to a nonlinear THz emitting crystal. The AFM is a cantilever-based AFM system. In order to minimize the sample degradation we have store the samples in vacuum before the measurement and typical air exposure time is less than 6 hours during the data acquisition. We have verified that there is no degradation during the data taking. We performed always back to back scans to confirm the same image appearance of the samples measured.