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A superconducting flux qubit with tunable tunnel coupling SIMON GUSTAVSSON, JONAS BYLANDER, Massachusetts Institute of Technology, FUMIKI YOSHIHARA, KHALIL HARRABI, The Institute of Physical and Chemical Research (RIKEN), Wako, Saitama 351-0198, Japan, YASUNOBU NAKAMURA, JAW-SHEN TSAI, Nano Electronics Research Laboratories, NEC Corporation, Tsukuba, Ibaraki 305-8501, Japan and RIKEN, Wako, Saitama, Japan, WILLIAM D. OLIVER, MIT Lincoln Laboratory — We present measurements on a superconducting flux qubit where the tunnel coupling Delta can be varied from 0.8 to 4.8 GHz. This allows for both ZZ and XZ qubit-qubit coupling architectures. The device is realized by replacing one of the Josephson junctions in the qubit with an additional loop which forms a dc SQUID. By applying different fluxes in the main loop and in the additional SQUID loop, we can change the qubit energy-level separation and the tunnel coupling independently [1]. This allows us to measure the energy relaxation (T1) and coherence (T2) times of the qubit at different tunnel couplings and operating points. We find that T1 varies between 1-2 us, and a spin-echo T2 decay of 700 ns. We analyze these results in terms of flux noise coupling into the two loops [2]. [1] Paauw et al., PRL 102, 090501 (2009) [2] Yoshihara et al., PRL 97, 167001 (2006)

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