Non-degenerate parametric amplification with the Josephson ring modulator FLAVIUS SCHACKERT, CHAD RIGETTI, BALEEGH ABDO, Yale University, BENJAMIN HUARD, ENS Paris/ College de France, ARCHANA KAMAL, NICHOLAS MASLUK, LUIGI FRUNZIO, ROBERT J. SCHOELKOPF, MICHEL H. DEVORET, Yale University — We present recent progress in building and operating a new microwave design of the Josephson parametric converter (JPC). The JPC is a parametric microwave amplifier operating close to the quantum limit of noise. The device is based on two microwave resonators coupled to a Josephson ring modulator, which resembles a DC-SQUID but has four junctions instead of two and is biased with half a flux quantum. The non-linearity of the ring modulator is of the form XYZ and involves the minimal number of modes, placing the JPC close to the ideal non-degenerate parametric amplifier. Our new design allows fabrication in a single lithography step, greatly simplifying parameter adjustments from one device generation to the next. It further avoids awkward on-chip crossings between distinct microwave lines.

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