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A dispersion-engineered Josephson junction-based travelling wave parametric amplifier with low loss dielectric J. MUTUS, Google Santa Barbara, T. WHITE, I.-C. HOI, UC Santa Barbara, R. BARENDS, Google, Santa Barbara, B. CAMPBELL, UC Santa Barbara, Y. CHEN, Google, Santa Barbara, Z. CHEN, B. CHIARO, UC Santa Barbara, A. FOWLER, Google, Santa Barbara, A. DUNSWORTH, UC Santa Barbara, E. JEFFREY, Google, Santa Barbara, J. KELLY, UC, Santa Barbara, A. MEGRANT, C. NEILL, P.J.J. O'MALLEY, UC Santa Barbara, P. ROUSHAN, Google, Santa Barbara, C. QUINTANA, UC Santa Barbara, D. SANK, Google, Santa Barbara, A. VAINSENCHER, J. WENNER, UC Santa Barbara, J. GAO, NIST, S. CHAUDHURI, Stanford, A.N. CLELAND, UC Santa Barbara, J.M. MARTINIS, University of California and Google, Santa Barbara — Travelling wave parametric amplifiers (TWPAs) promise wide-band performance with high saturation power for amplifying microwave frequency signals. Designing a TWPA requires a careful balance of many parameters in order to approach quantum-limited noise performance with sufficient gain and saturation power. We present a design based on an LC-ladder transmission line of Josephson junctions and parallel plate capacitors using low-loss amorphous silicon dielectric. Crucially, we have inserted $\lambda/4$ resonators at regular intervals along the transmission line in order maintain the phase matching condition between pump, signal and idler in order to increase gain. The design and performance of the device will be presented, demonstrating high-gain, wide bandwidth and high dynamic range.

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