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Microwave photons in a high-impedance Josephson transmission line: dispersion, localization, and interactions. NICHOLAS GRABON, ROMAN KUZMIN, YEN-HSIANG LIN, LONG NGUYEN, NITISH MEHTA, VLADIMIR MANUCHARYAN, University of Maryland-College Park — We have fabricated a "telegraph"-type transmission line using a pair of capacitively coupled chains of tightly-packed Josephson tunnel junctions. Each chain contains over 10k junctions. Elastic scattering of microwaves at the two ends of the chain creates a forest of standing-wave resonances that we detect in a microwave transmission experiment. Analysis of these resonances reveal a 100-fold reduction of the speed of light and a 100-fold enhancement of the wave impedance, both effects being due to the high kinetic inductance of the junctions. We further explore the effects of both Josephson non-linearity and disorder in the junction parameters on the localization and interaction of the photons in our transmission line. Our novel circuit offers multiple intriguing options to explore many-body effects with photons.

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