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Examining an optomechanical analogy to quantum optics in an expanding universe JOSEPH SMIGA, QuICS, University of Maryland, JACOB TAYLOR, QuICS, University of Maryland, JQI, NIST — Unifying quantum mechanics and general relativity is a long-standing problem in physics. The simplest cosmology — the Friedmann-Robertson-Walker-Lemaître (FRW) model — describes a spatially homogeneous and isotropic universe where the scale factor is the only dynamical parameter. Here we consider how quantized electromagnetic fields become entangled with the scale factor in a toy version of the FRW model. A system consisting of a photon, source, and detector is described in such a universe. We also consider a potential optomechanical analogy system that would enable experimental exploration of the effects of photon redshift detection as a quantum backaction on metric variables such as the scale factor.

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