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Kinetic Inductance Detectors for Far-Infrared Spectroscopy

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The star formation mechanisms at work in the early universe remain one of the major unsolved problems of modern astrophysics. Many of the luminous galaxies present during the period of peak star formation (at redshift of about 2.5) were heavily enshrouded in dust, which makes observing their properties difficult at optical wavelengths. However, a rich variety of spectral lines exist at far-infrared wavelengths that serve as tracers of star formation. Here, we describe a detector system suitable for a balloon-borne spectroscopic intensity mapping experiment at far-infrared wavelengths. The system uses lumped-element kinetic inductance detectors (LEKIDs), which have the potential to achieve high sensitivity and low noise levels. LEKIDs consist of separate capacitive and inductive elements, and use the inductive element as the radiation absorber. We describe the design considerations, fabrication process, and readout scheme for a prototype LEKID array of 1600 pixels.

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