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Measurement of Ion Damage and Damage Relaxation in Silicon Microdisk Cavities using a Lithium Focused Ion Beam WILLIAM MCGEHEE, THOMAS MICHELS, VLADIMIR AKSYUK, JABEZ MCCLELLAND, CNST, National Institute of Standards and Technology, CENTER FOR NANOSCALE SCIENCE AND TECHNOLOGY COLLABORATION — We selectively damage a silicon microdisk optical cavity using a nanoscale focused ion beam of Li+ to observe the dynamics of ion-induced damage in crystalline silicon at room temperature. The 4 keV ion beam is pulsed at the location of the optical mode in the microdisk cavity, generating silicon interstitial-vacancy (IV) pairs in the cavity. This damage changes the effective path length of the cavity corresponding to GHz-scale shifts of the cavity resonances for a millisecond ion pulse at 1 pA beam current. The ion-induced shift of the cavity resonance is measured spectroscopically and allows for measurement of the ion damage at sub-millisecond timescale. The lithium focused ion beam is a NIST-developed instrument that uses a laser cooled gas of atomic lithium as a high brightness source of photoionizied lithium ions which can be focused to a 50 nm spot.

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