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The Space Interferometer for Cosmic Evolution (SPICE) Far-IR Probe

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SPICE is a candidate NASA Far-IR Probe mission that could launch in 2032 and address fundamental challenges in our understanding of the universe. The SPICE mission addresses the enduring question, How did we get here? What physical processes drive the evolution of galaxies and their central massive black holes throughout cosmic time? How can we explain the diverse set of planetary system architectures? And how do developing planetary systems evolve chemically and sometimes produce habitable planets? SPICE is a spatio-spectral interferometer designed to image and spectroscopically measure circumstellar disks and many individual distant galaxies to help answer these questions. SPICE offers angular resolution matching that of the Webb telescope but at ten-times longer far-infrared wavelengths (25-400 μm). With cryo-cooled telescopes and state-of-the-art detectors, SPICE's sensitivity is about 10 times that of the Herschel Space Observatory. SPICE can provide a moderate-resolution (R ~ 3000-7000) spectrum in every spatial pixel. These spectra will be rich with information about physical and chemical conditions in the objects studied, as well as the redshifts and distances of galaxies. The SPICE Science Team envisages a Legacy Science program and a Guest Observer program. The Legacy Science program will take about 1 year out of the 5-year minimum mission lifetime, leaving at least four years of observing time open to the community's proposed investigations. In each case the observer will receive calibrated hyperspectral data cubes for analysis.