Prospects for Identifying Near-Extremal Black Holes using LISA

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Extreme Mass Ratio Inspirals (EMRIs) are a very exciting potential source of gravitational waves for the Laser Interferometer Space Antennae (LISA). Previous work has shown that EMRI observations can provide tight constraints on the spin of the central black hole, assuming that the spin parameter is far from near extremal (between 0 and 0.99). Recent work has demonstrated that EMRIs in which the primary black hole is near maximally spinning (near-extremal) show qualitatively different features in their waveforms in the last cycles before plunge. We will describe a model for the gravitational wave emitted from EMRIs in near-extremal black hole systems, as they proceed through the inspiral and then transition onto a plunging trajectory. We then explore how well LISA might be able to measure the parameters for near-extremal systems, if they exist, and hence test for the existence of extremal black holes in the universe. Finally, in the case of EMRIs, we discuss the effect that various types of data gaps have on parameter estimation studies.