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A 400 solar mass black hole in the galaxy M82 DHEERAJ PASHAM, Univ of Maryland-College Park, NASA/GSFC & JSI, TOD STROHMAYER, NASA/GSFC, RICHARD MUSHOTZKY, Univ of Maryland-College Park — M82's brightest X-ray source has been thought to be an intermediate-mass black hole (100-10000 $M_{\odot}$) because of its extremely high X-ray luminosity and variability characteristics, although some models suggest that its mass may be only of the order of 20 $M_{\odot}$. The previous mass estimates were based on scaling relations which used X-ray low-frequency characteristic timescales which have large intrinsic uncertainties. In stellar-mass black holes, we know that the high frequency quasi-periodic oscillations that occur in a 3:2 frequency ratio (100-450 Hz) are stable and scale inversely with black hole mass with a reasonably small dispersion. The discovery of such stable oscillations thus potentially offers an alternative and less ambiguous mass determination for intermediate-mass black holes, but has hitherto not been realized. I will discuss the discovery of stable, twin-peak (3:2 frequency ratio) X-ray oscillations from M82 X-1 at the frequencies of 3.32 Hz and 5.07 Hz and how this helps overcome the systematic uncertainties present in previous studies. Assuming we can extend the stellar-mass relationship, we estimate its black hole mass to be 428±105 $M_{\odot}$. I will also discuss future prospects of extending this method to weigh intermediate-mass black holes.

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