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Observing an Event Horizon: (sub)mm Wavelength VLBI of SgrA*[1]

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A long–standing goal in astrophysics is to directly observe the immediate environment of a black hole with angular resolution comparable to the event horizon. Realizing this goal would open a new window on the study of General Relativity in the strong field regime, accretion and outflow processes at the edge of a black hole, the existence of event horizons, and fundamental black hole physics (e.g., spin). Steady long–term progress on improving the capability of Very Long Baseline Interferometry (VLBI) at short wavelengths has now made it extremely likely that this goal will be achieved within the next decade. The most compelling evidence for this is the recent observation, using 1.3mm wavelength VLBI, of Schwarzschild radius scale structure in SgrA*, the compact source of radio, submm, NIR and xrays at the center of the Milky Way. There is now very strong evidence that SgrA* marks the position of a ~ 4 million solar mass black hole, which, due to its proximity and estimated mass, presents us with the largest apparent event horizon size of any black hole candidate in the Universe. By extending the observing wavelength of VLBI to the sub–mm bands, we will achieve angular resolution sufficient to detect strong field GR effects on the appearance of the plasma surrounding the black hole. Short wavelength VLBI can also be used to directly detect signatures of matter spiraling into the black hole with the potential to estimate the periods of orbits close to the event horizon. I will discuss what current VLBI observations of SgrA* tell us about this closest super–massive black hole, describe the exciting potential of future work, and outline plans to assemble a Global submm-VLBI "Event Horizon Telescope".

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