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Imaging black holes and jets from space

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The images of the shadows of M87 and Sgr A*, taken by the Event Horizon Telescope using the technique of very long baseline interferometry (VLBI) at 230 GHz, have opened up a new window into horizon-scale black hole and accretion science. However, ground-based VLBI is hitting fundamental resolution limits due to the limited size of the Earth and atmospheric corruptions at high frequencies. Space-based VLBI is the inevitable next step towards order-of-magnitude resolution improvements in black hole imaging. SHARP is a space-to-space VLBI array that will consist of three satellites in Medium Earth Orbits, attaining a resolution of ˜3 micro-arcseconds with a fully filled uv-plane at 690 GHz. SHARP images will provide precision measurements of the black hole spacetime, and test of theories of jet launching. The SHARP Experiment (SHARPEx) will demonstrate the space-to-space VLBI technique and provide images of AGN jets at cm wavelengths with unprecedented resolution and fidelity.

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