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"Tack" ion trap for efficient photon collection[1] GANG SHU, CHEN-KUAN CHOU, NATHAN KURZ, THOMAS NOEL, JOHN WRIGHT, BORIS BLINOV, University of Washington — Efficient photon collection is essential for state detection and entanglement generation in trapped ion quantum computation. Compared with other popular approaches such as refractive optics and optical cavity, reflective optics provides simple solutions with broad optical band but no adverse effect to trapping. Here we present the design and operation of a novel ion trap that incorporates a high numerical aperture metallic spherical mirror as its RF trapping electrode, which enables up to 35% solid angle collection of trapped ion fluorescence. Its movable central needle-shaped electrode allows precise placement of the ion along the optical axis. We show a possible scheme to compensate the spherical mirror's large aberration. Owing to its simple design, the trap structure can be easily adapted for micro-fabrication and integrated into more complex ion trap architectures.

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Chen-Kuan Chou
University of Washington

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