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A hybrid ion trap in a three-dimensional geometry¹ YE WANG, DAHYUN YUM, KUAN ZHANG, SHUOMING AN, KIHWAN KIM, Center for Quantum Information, IIIS, Tsinghua University, Beijing, P. R. China — We develop a three-dimensional (3D) monolithic ion trap that has the advantages of both 3D geometry, i.e., having a deep confining potential and surface trap, i.e., containing multiple zones for scaling up, no uncertainty between design and manufacture. The trap is fabricated by gold coating on a single layer of alumina plate sculpted by laser-machining technology. The axial trap frequencies are in the range from 230 kHz to 850 kHz with the average dc voltages from 20 V to 75V and the radial frequencies lie in 3 MHz with 3.5W input power of 40 MHz radio-frequency, which is well in agreement with numerical simulations. We successfully load Yb and Ba ions together and report the progress of the hybrid quantum operation with them.

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