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Demonstration of a low-crosstalk double-side addressing system in a high optical access and XHV blade-trap

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We've designed and built a high-pass optical blade-trap, with the ability to achieve $NA=0.66$ in two laser directions and $NA=0.37$ in the other two. This blade-trap has excellent performance: the vacuum can reach 7×10^{-17} Torr at room temperature, and the Q value of helical can reach 280. Combined with optical and electronic scheme, we demonstrate a low-crosstalk optical double-side addressing scheme and implement MS gate based on symmetrically-configured acousto-optic deflectors (AODs). We employ two 0.4 NA objective lenses in both arms of the Raman laser and obtain a beam waist of $0.93 \pm 0.03 \mu\text{m}$, resulting in a Rabi rate crosstalk as low as 6.32×10^{-4} when the neighboring ion separation is about $5.5 \mu\text{m}$, and realize a 2-qubit MS Gate with fidelity $>90\%$. These technologies combined together provides a promising platform for quantum computing, simulation and networking.

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