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Towards Remote Entanglement of Trapped Ions Systems

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Cavity quantum electrodynamics (cQED) with trapped ions are a strong candidate for the implementation of distributive quantum computing [1]. A prerequisite for deterministic control of the ion-photon system is the strong coupling between the atomic ion and the optical cavity. This was recently achieved for the first time at Sussex with an end cap Paul trap with an integrated fibre cavity [2].
To improve the current system, we are in the procress of designing and building a new ion-cavity setup with improved optical access and cavity stability.
We present the preliminary components, design and simulation results of the next generation cQED system. Such will include a reengineered endcap electrode-cavity structure for improved mechanical stability. We propose a novel means of controlling the ion's position that will be achieved by distorting the trapping potential by mechanically altering the positions of the electrodes that provide the RF ground. To this end we present data from a finite element modelling program that simulate the behaviour of the trapping potential under different conditions and model the various secular frequencies of the ion.
Lastly our cQED system will feature modified fibre cavities with integrated mode matching optics comprised of a single mode-GRIN-multimode assembly [3]. Said modified cavities feature a mode matching efficiency of up to 90% (cavity lengths = 400um) and will greatly enhance the coupling of the photons from the cavity into the single mode fibre.

References
[1] H. J. Kimble, Nature 453, 1023 (2008).
[2] H. Takahashi, E. Kassa, C. Christoforou, and M. Keller, arXiv preprint arXiv:1808.04031 (2018).
[3] Gurpreet Kaur Gulati, Matthias Keller Scientific Reports 7, Article number: 5556 (2017)

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