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Controlled photon-photon interactions using Rydberg polaritons[1]

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By coupling a strong optical transition to a highly-excited Rydberg state [1] it is possible to realise giant optical non-linearities [2] and hence strong photon-photon interactions [3-5]. A remaining challenge is to implement an interaction that does not distort the photon mode and hence to realise high-fidelity photonic quantum gates. In this talk we will discuss how to control the photon-photon interact using microwave fields [6] and how this could be used to implement deterministic non-linear optical computation [7].

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[7] D. Paredes-Barato and C. S. Adams, arXiv:1309.7933

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