

Abstract Submitted  
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**Multi-resonator circuit QED - Part 2: Generation and detection of NOON states**<sup>1</sup> FRANK WILHELM, fwilhelm@iqc.ca, SETH MERKEL, University of Waterloo — NOON states, states between two modes of light of the form  $|N, 0\rangle + e^{i\phi}|0, N\rangle$  allow for super-resolution interferometry. We show how NOON states can be efficiently produced in circuit quantum electrodynamics using superconducting phase qubits and resonators. We propose a protocol where only one interaction between the two modes is required, creating all the necessary entanglement at the start of the procedure. This protocol makes active use of the first three states of the phase qubits. Additionally, we show how to efficiently verify the success of such an experiment, even for large NOON states, using randomly sampled measurements and semidefinite programming technique. This is more efficient than the full tomography implemented to-date, allowing to reliably verify higher NOON-states. Based on New J. Phys. **12**, 093036 (2010).

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