

# Linear Optics Interferometry

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## I. INTRODUCTION

Si-Hui can colour code things she adds like this  
And Peter can do it like this  
Let's add comments and questions like this

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## II. MATHEMATICAL BACKGROUND

Mathematical representation for LO networks, and very basic background on quantum optics

## III. OPTICAL ENCODING OF QUANTUM INFORMATION

### A. Single-photons

1. Polarisation
2. Dual-rail
3. Time-bins

### B. Continuous-variables

1. Coherent states
2. Squeezed states

## IV. EFFICIENT CIRCUIT DECOMPOSITIONS OF LINEAR OPTICS NETWORKS

Discuss the Reck et al. decomposition

## V. EXPERIMENTAL IMPLEMENTATION

### A. State preparation

1. Single-photons
2. Bell pairs
3. Coherent states
4. Squeezed states

### B. Linear optics networks

1. Bulk-optics
2. Waveguides
3. Time-bins

Discuss fibre-loop architecture

### C. Measurement

#### 1. Photodetection

Discuss number-resolved and bucket detectors, multiplexed detection, APDs, current micropillar detectors

#### 2. Homodyning

## VI. APPLICATIONS FOR LINEAR OPTICS INTERFEROMETRY

### A. Linear optics quantum computation

### B. Boson-sampling

### C. Quantum metrology

Discuss NOON states - Heisenberg limited

Discuss MORDOR scheme

### D. Encrypted quantum computation

## VII. STATE OF THE ART

Discuss where experiments are at at the moment

## VIII. CONCLUSION

### Acknowledgments