

PHYSICAL REVIEW A **96**, 053860 (2017)

## **High-dimensional quantum channel estimation using classical light**

Chemist M. Mabena

*CSIR National Laser Centre, P.O. Box 395, Pretoria 0001, South Africa and School of Physics, University of the Witwatersrand, Johannesburg 2000, South Africa*

Filippus S. Roux

*National Metrology Institute of South Africa, Meiring Naudé Road, Brummeria, Pretoria, South Africa and School of Physics, University of the Witwatersrand, Johannesburg 2000, South Africa*

### **ABSTRACT**

A method is proposed to characterize a high-dimensional quantum channel with the aid of classical light. It uses a single nonseparable input optical field that contains correlations between spatial modes and wavelength to determine the effect of the channel on the spatial degrees of freedom. The channel estimation process incorporates spontaneous parametric up-conversion (sum frequency generation) to perform the necessary measurements.