

## **Project: (Kempf)**

### **Aspects of measuring vacuum fluctuations, and quantum optics in few-photon astronomy.**

A) Explain the workings of a quantum optical homodyne detector. Review its utility for measuring fluctuations in the electromagnetic vacuum. Discuss its use for the generating of random numbers.

B) Consider how temporal coherence lengths of light can be measured. What are typical situations where short and where long coherence lengths occur.

C) Consider if, how and for what purpose astronomers may make use of the technologies in A and B.

#### **Literature:**

H.-A. Bachor, T.C. Ralph, A guide to experiments in quantum optics, Wiley-VCH (2004)

D.F. Walls, G. J. Milburn, Quantum Optics, Springer (2007)