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**Title of the lecture:**
Quantum Limits in Gravitational-Wave and Optomechanics

**Format**:
3 lectures (1h30 each)

**Plan of the lecture**
I. « Introduction » to noise and signal processing

II. A (convenient) quantum model for (multimode) light

III. Quantum phase noise and quantum-limited sensing

IV. Back-action and the Standard Quantum Limit

V. Beyond Quantum Limits

**References**
1. Peter Saulson, *Fundamentals of Inteferometric Gravitational Wave Detection*, Second edition (2005)
2. Charlotte Bond, Daniel Brown, Andreas Freise and Kenneth A. *Strain, Interferometer techniques for gravitational-wave detection*, Living Reviews in Relativity **19**:3 (2016)
3. Roman Schnabel*, Squeezed states of light and their applications in laser interferometers*, Physics Reports **684**, 1 (2017)
4. Yanbei Chen, *Quantum Optomechanics: from Gravitational Wave Detectors to Macroscopic Quantum Mechanics*, Proceedings of Les Houches **2015 Summer School**, Quantum Optomechanics and Nanomechanics, Oxford UP