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## Where photons meet phonons

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### Citation

Buters, F. M. (2017, December 21). *Where photons meet phonons. Casimir PhD Series*. Retrieved from <https://hdl.handle.net/1887/58471>

Version: Not Applicable (or Unknown)

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**Title:** Where photons meet phonons

**Issue Date:** 2017-12-21

## Stellingen

behorende bij het proefschrift

### WHERE PHOTONS MEET PHONONS

1. The advantage of a Fabry-Pérot based optomechanical system with a trampoline resonator over other systems, is the absence of chaotic effects even at high laser power and large mirror displacement.

*Chapter 3 of this thesis*

2. It is preferable to separate the read-out and cooling laser by at least one free spectral range.

*Chapter 5 of this thesis*

3. Although microwave and optical cavities share many features, the ease with which the input polarization can be adjusted, is reserved for optical cavities.

*Chapter 6 of this thesis*

4. Even without the nested resonator design, feedback on the cavity length rather than the laser frequency is preferred.

*Chapter 9 of this thesis*

5. Apart from the device itself, vibration sensitive experiments should not contain high-Q resonators.

*Chapters 7, 9 and 10 of this thesis*

6. In the context of optomechanical cavities, the phrase “nonlinear radiation pressure dynamics” is a tautology.

*Kraus et al.,  
Phys. Rev. Lett. vol. 115 p. 233601, 2015*

7. The work by Serra et al. suggests that also the geometry of the silicon nitride membrane influences the optical absorption for a membrane-in-the-middle system.

*Serra et al.,  
AIP Advances. vol. 6 p. 065004, 2016*

8. The proposal by Xu et al. to cool a harmonic oscillator and simultaneously increase the Q-factor by optomechanical modification seems, from a thermodynamical point of view, impossible.

*Xu et al.,  
Phys. Rev. Lett. vol. 118 p. 223602, 2017*

9. By observing quantum correlations at room temperature, Purdy et al. demonstrate the possibility of quantum optomechanics without the need for cryogenic cooling.

*Purdy et al.,  
Science vol. 356 p. 1265, 2017*

10. The back-action-evading experiment by Hertzberg et al. does not show the critical point of these measurements: how to measure the correct quadrature without knowing the phase of the motion of the resonator.

*Hertzberg et al.,  
Nature Physics vol 6 p. 213, 2010*

11. Professors and PhD students see different aspects of a scientific experiment.

Frank Buters  
Leiden, 21 december 2017