Centre DE Nanosciences & DE Nanotechnologies

# C2N General Seminar

Friday September 27th 2019 - 10h 00
Amphitheater of C2N

# "Gravitational wave detection: a quantum experiment"


## Pierre-François Cohadon

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Detecting gravitational waves required 4 decades of experimental effort to reach a sensitivity at the h~10-21 level, corresponding to mirror displacements below 10-18 m. Apart from classical noise (seismic noise, thermal noise...), it was realized as soon as in the late 70s that quantum fluctuations of the light field were responsible for the Standard Quantum Limit, a sensitivity limit that second-generation gravitational-wave interferometers such as Advanced Virgo and Advanced LIGO are about to reach. A number of ideas have been considered to beat the SQL: squeezed states of the light field, tailoring the optical response function or taking advantage of EPR correlations between two optical beams.

*Advanced Virgo, a large-scale quantum experiment*

I will present the current status of the interferometers, how squeezed light is now routinely used to increase the range of Advanced Virgo and Advanced LIGO, and how further progress is required for the next generation of large-scale interferometers.

**Pierre-François Cohadon** joined what has become the Optomechanics and Quantum Measurement group at Laboratoire Kastler Brosselin 1996 to start graduate work.
He was involved in the pioneering experiments performed at LKB: demonstration of feedback cooling of a mechanical resonator, demonstration of intracavity radiation pressure cooling, proof-of-principle demonstration of optomechanical correlations... For a few years, he has been involved in the Virgo project for the detection of gravitational waves, where investigatesthe use of squeezing to further increase the sensitivity of Advanced Virgo.

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