

## TG Sub-Standard Quantum Limit in Suspended Interferometers Overview

<b>TG Leader</b>	Harald Lück
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### TG Activities

This topical group operates a 10-metre prototype interferometer facility located in the institute for gravitational physics. The 10-m prototype offers an environment with extremely low displacement noise, a large volume in ultra-high vacuum, a highly stable laser with a power of 35 watts, a very stable DC supply network, comprehensive detection of environmental influences, fully digital control infrastructure and sufficient flexibility to quickly change the experimental setup - if necessary.

The first and most important experiment being set up in this facility is a Michelson interferometer, which explores the interferometric standard quantum limit (SQL). To achieve the SQL, the interferometer sensitivity must be limited only by the quantum noise at the measurement frequency. The SQL can be surpassed by exploiting correlations between the amplitude and phase quantum fluctuations of the light inside the interferometer. Different approaches for surpassing the SQL will be tested and analysed.

### TG Competences/Services

- low noise mirror suspensions
- seismic isolation systems (active/passive)
- low noise actuators
- precision interferometry
- shot noise limited photodiodes
- laser stabilisation (amplitude/frequency)
- optical scattering of mirrors
- vacuum out-gassing test chamber
- microscopical investigation of surfaces
- in vacuum seismically isolated platforms

### Involved QF Members

Members	Institution	Relevant Expertise
Harald Lück, Leader	AEI	Next Generation Gravitational Wave Observatories; Sub-Standard Quantum Limit Interferometry
	AEI	Sub-Standard Quantum Limit Interferometry
Matteo Carlassara	AEI	Commissioning of the SQL Interferometer
Michèle Heurs	AEI	Backaction-Evading Techniques
Benno Willke	AEI	Squeezed Light Sources; Advanced Light Sources
David Wu	AEI	Sub-Standard Quantum Limit Interferometry

Sean Leavey	AEI	Sub-Standard Quantum Limit Interferometry, electronics
Jian Liu	AEI	Sub-Standard Quantum Limit Interferometry
Philip Koch	AEI	optics, suspensions
Johannes Lehmann	AEI	mirror suspensions
Robin Kirchhoff	AEI	seismic isolation
Juliane v. Wrangel	AEI	fibre welding, bonding
Janis Wöhler	AEI	thermal noise interferometer
Henning Vahlbruch	AEI	Squeezed states of light
Luise Kranzhoff	AEI	