

Noisy Labs

Squeezed Light – Applications and Use Cases

08.10.2024



DPSSL DRIVER FA

1.604

Current (A)

ON

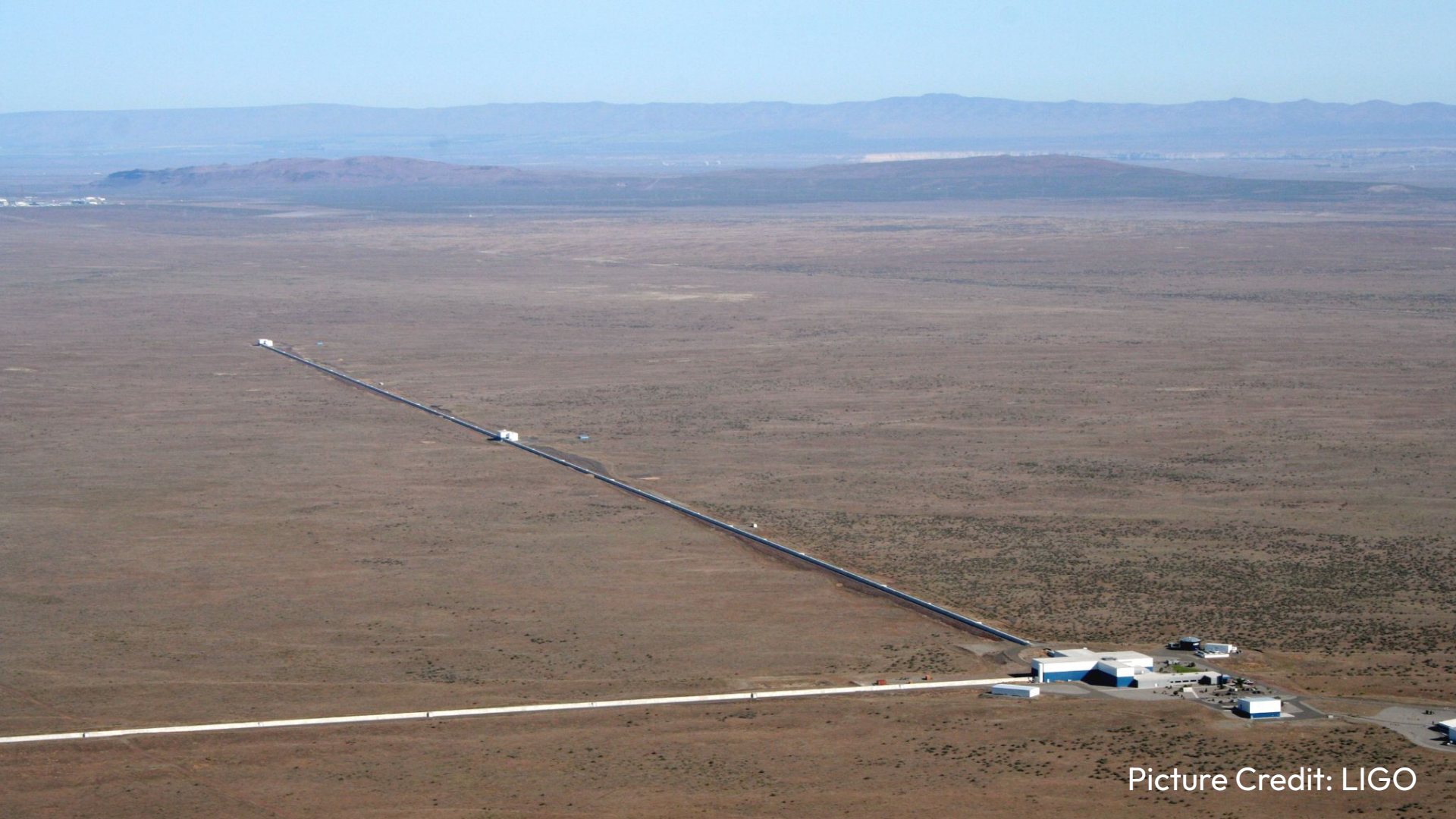
OFF

POWER

STOP

Power
Laser
Alarm

Adjustor



Picture Credit: LIGO

Measurement sensitivity limited by quantum noise

Measurement sensitivity limited by quantum noise

$$\frac{\text{Signal}}{\text{Noise}} \propto \frac{N}{\sqrt{N}}$$

Measurement sensitivity limited by quantum noise

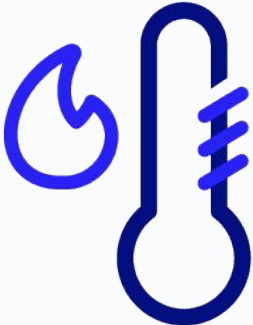
$$\frac{\text{Signal}}{\text{Noise}} \propto \frac{N}{\sqrt{N}}$$

To increase the signal-to-noise ratio:

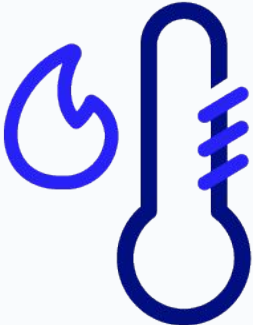
... use more power

... increase measurement time

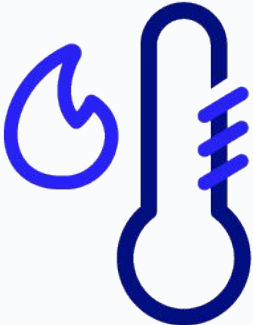
Increasing the power or measurement time creates new problems



Increasing the power or measurement time creates new problems

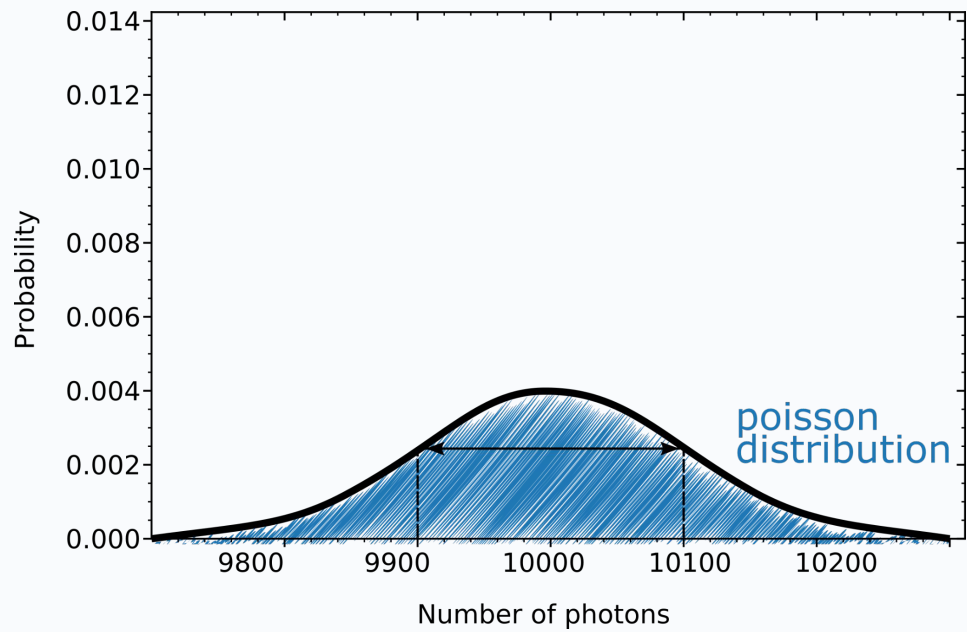


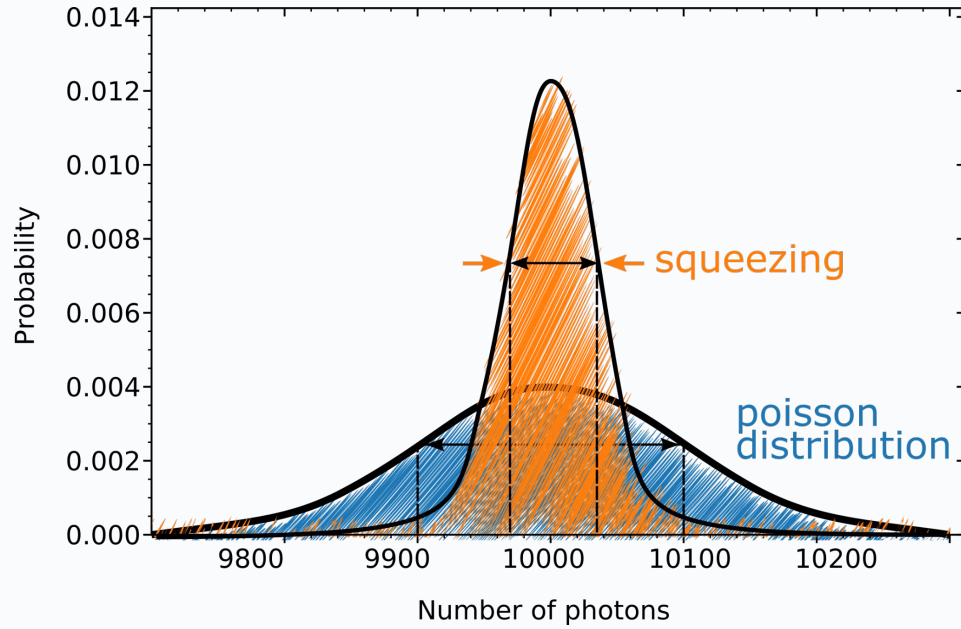
Increasing the power or measurement time creates new problems



How can the sensitivity be increased beyond the quantum limit?

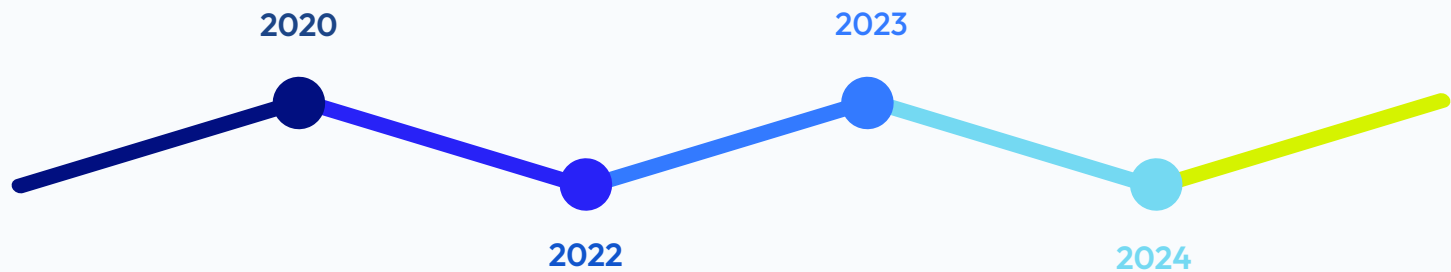
With squeezed light!

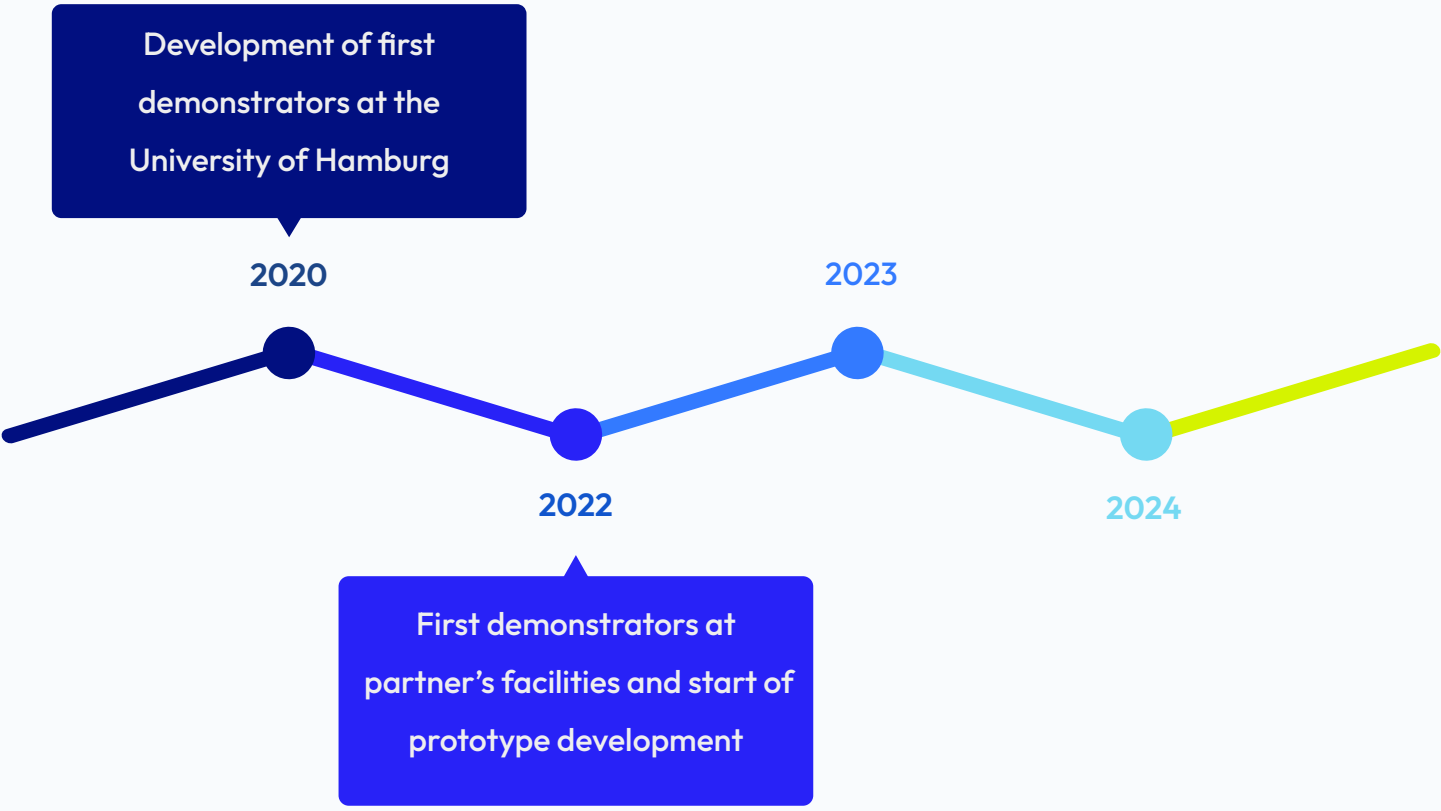


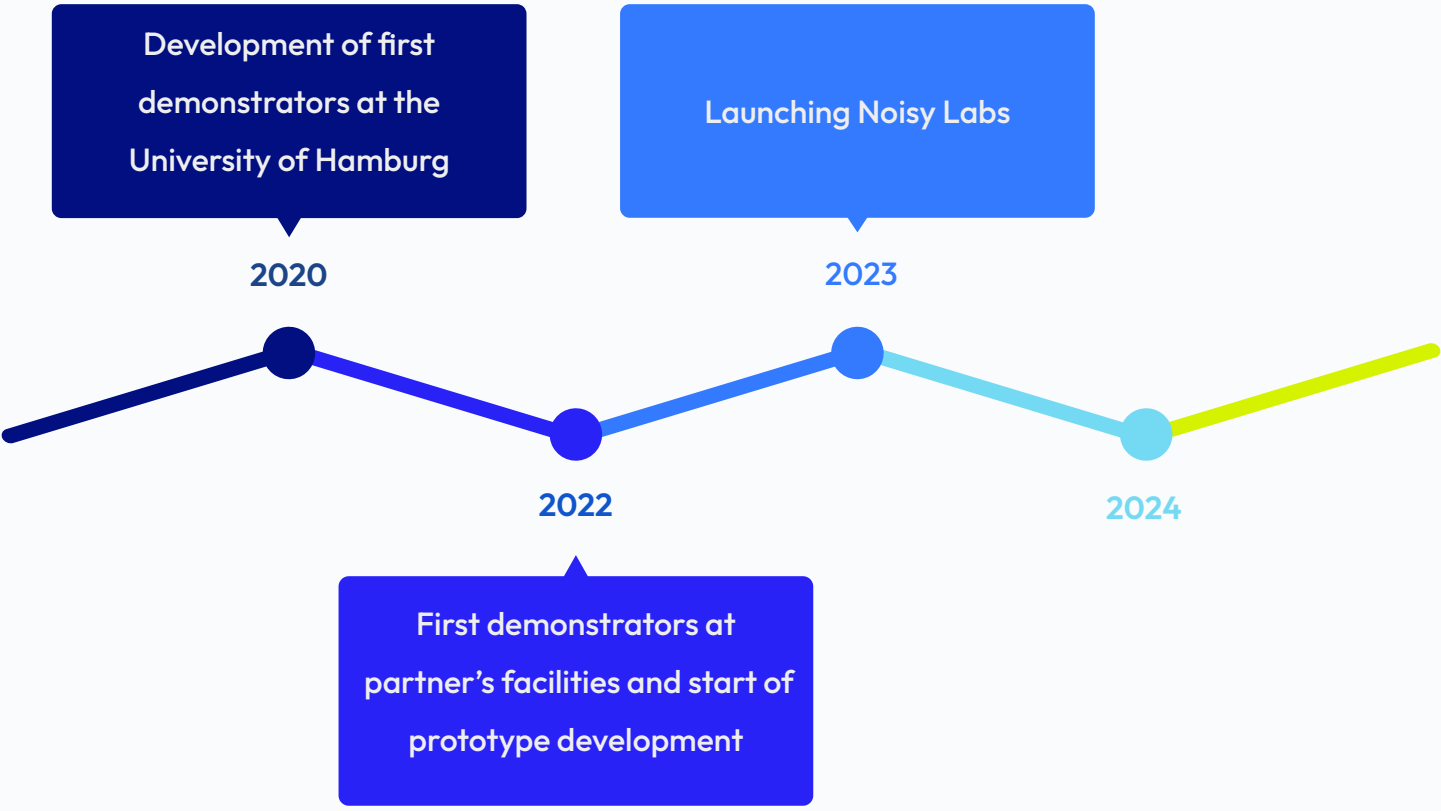


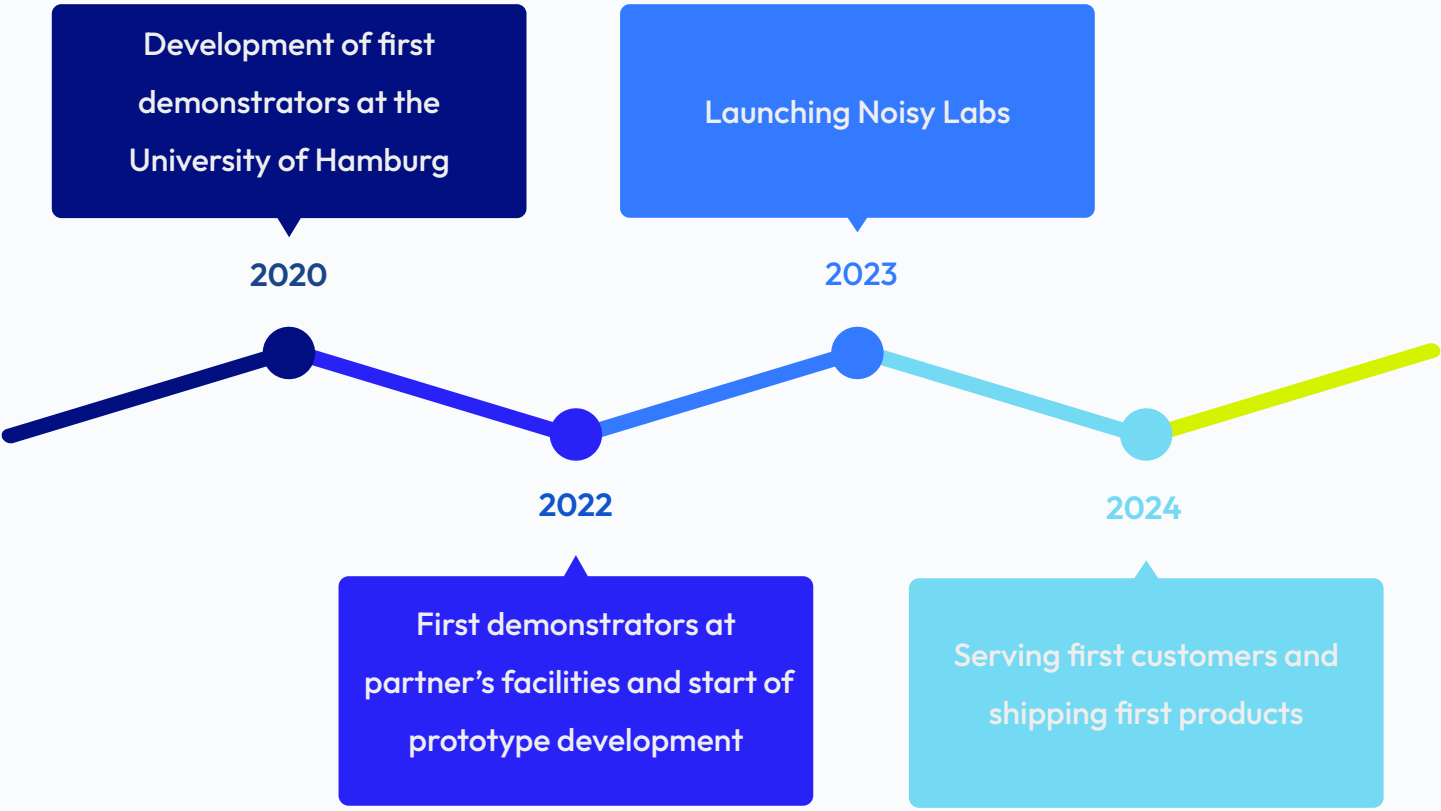
$$\frac{\text{Signal}}{\text{Noise}} \propto \frac{N}{\sqrt{\beta N}}$$

Development of first
demonstrators at the
University of Hamburg



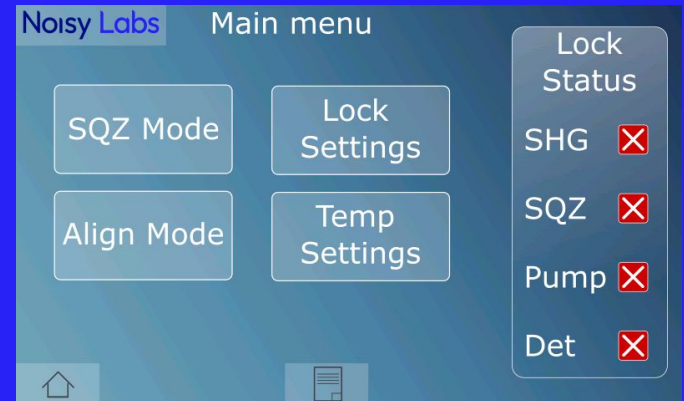






Our Squeeze Laser

- 10 dB squeezing at 1550 nm or 1064 nm
- Continuous wave
- Excellent TEM00 mode
- Locking for squeezed light stabilization
- Intuitive user interface
- Control electronics integrated in 19" rack

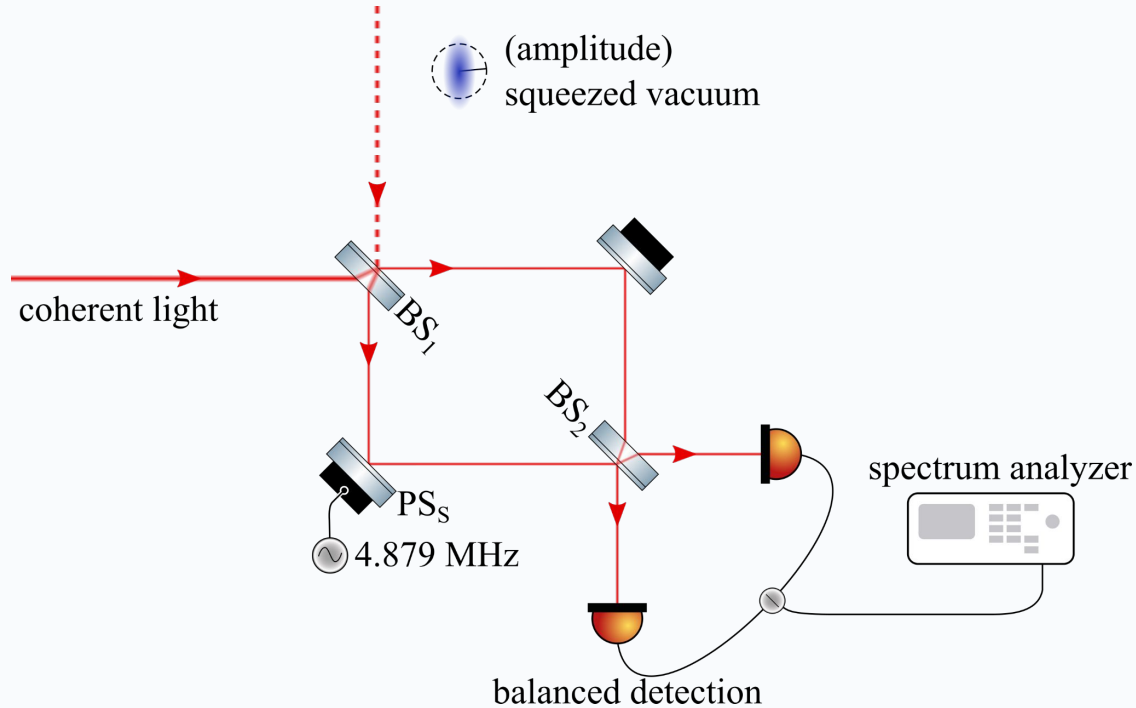


Our high quantum efficiency balanced detectors

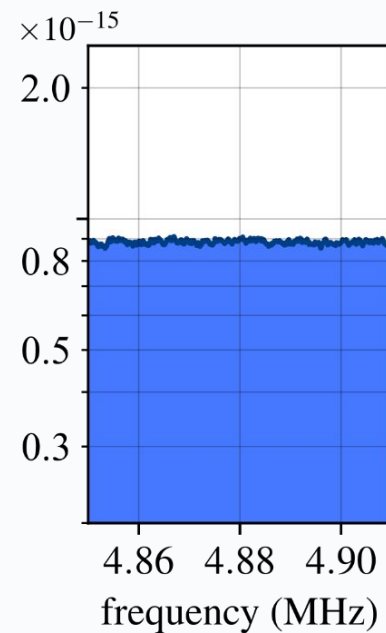
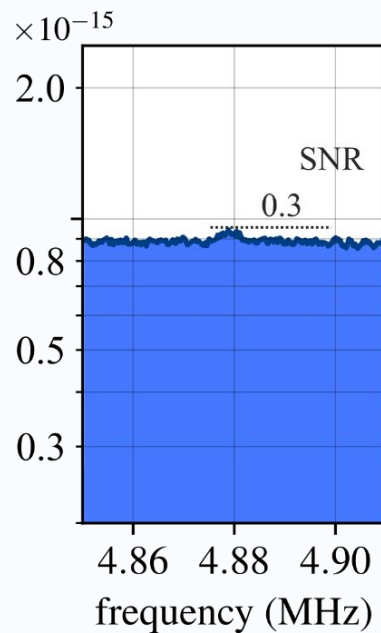
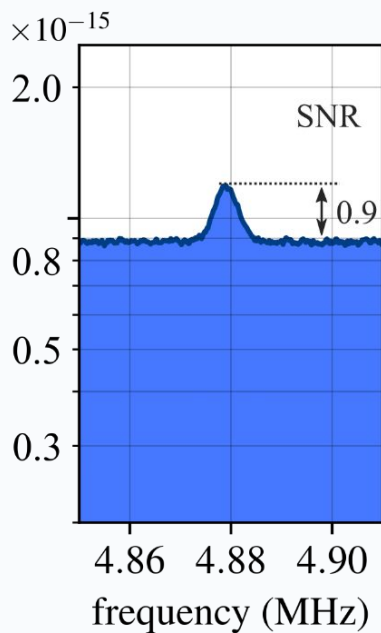
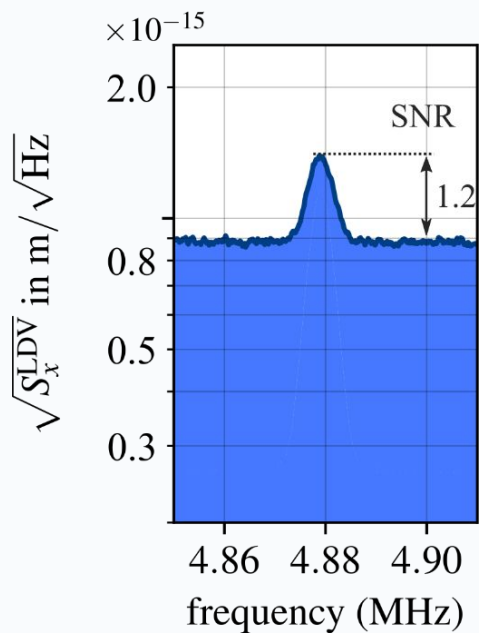
- Quantum efficiency >95 %
- Optimized for 1550 nm or 1064 nm
- 600 nm - 900 nm available soon
- Including demodulation technology
for readout stabilization



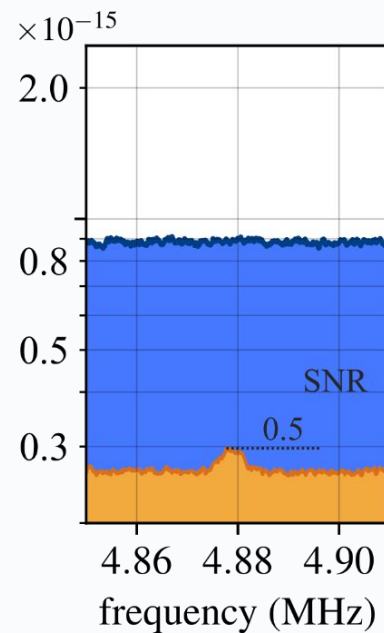
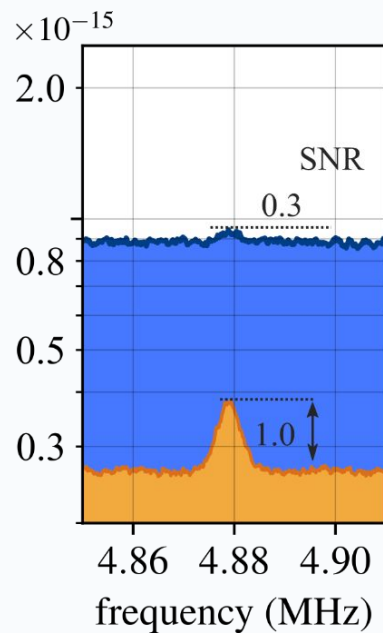
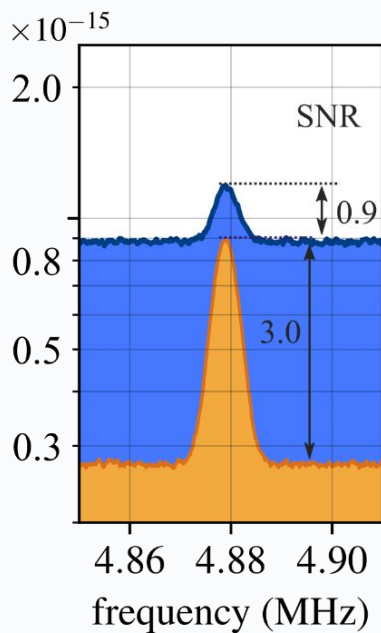
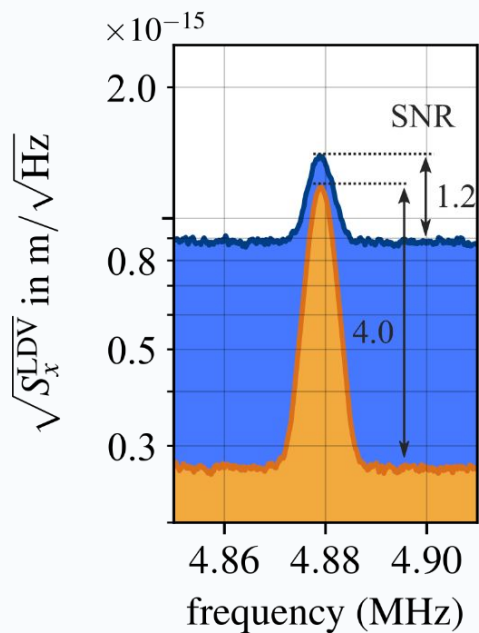
Sub-fm displacement measurement with eye-safe power levels



Sub-fm interferometric displacement measurement



Sub-fm interferometric displacement measurement



More areas of applications

- Biosensing
 - Stimulated Raman Spectroscopy
 - Surface Plasmonic Resonance Sensing
 - Photoacoustic Sensing
 - Mass Photometry
 - Early detection and discrimination of bacteria

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- Biosensing
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 - Photoacoustic Sensing
 - Mass Photometry
 - Early detection and discrimination of bacteria
- Photosensor Calibration
- Interferometry
 - Laser-Doppler-Vibrometry

We look forward to get in
touch with you



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- Integrators and Users
- Development partners
- Manufacturing partners
- International distributors