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INTERNSHIP OFFER	
Reference: DPHY-2025-005	Location: Palaiseau
Laboratory: DPHY / SLM	Tel.:
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DESCRIPTION	
Themes: Laser, nonlinear optics,	metrology, quantum optics
Graduation: 🛛 Master 2 🗌 Master 1	Licence Baccalaureate
Title: Quantum interferometer for gas detecti	on
Famous experiments involving optical interferometers for the detection of gravitational waves, or atomic sensors (clocks, gravimeters), show that the use of certain quantum states can significantly improve the sensitivity of fundamental metrology experiments. On the other hand, for remote measurements in difficult environments (with losses, background noise, etc.), quantum optics, often relevant at low photon number, have yet to demonstrate a decisive advantage over classical optics, in which photon fluxes can be made much higher when needed.	
In this context, we propose to study an interferometer including two optical frequency conversion crystals (i.e. twin photon generators), and compare the key parameters under the quantum and classical regimes. The main asset of this non-linear interferometer is to be able to probe an object in the infrared (like a gas showing strong absorption lines), while detecting all the photons in the visible spectrum, where photodetectors are very sensitive.	
The internship will consist in using the current interferometer, which emits at 1.5+4μm when pumped at 1.064 μm by sub-nanosecond laser pulses. The internship will provide an opportunity to perfect laser techniques, non-linear optics (frequency conversion) and quantum optics (correlation measurements, coincidences, etc.).	
The internship may lead to a thesis, consisting in pumping the interferometer at a shorter wavelength and performing wavelength resolved measurements on gases, as well as comparisons with setups owned by academic partners (MPQ lab and LUMIN).	
Note: ONERA is a Zone à Régime Restrictif (ZRR), requiring administrative inquiry and access clearance from the Ministry of Defense, a procedure which can take up to 2 months. Pair work?No	
Type of work:	
⊠ Theory	⊠ Experiments
imes Numerical simulation	⊠ Bibliography
Thesis opportunity: Yes	
Duration: At least: 3 month	ns Up to: 5 months
When: Spring 2025	
CANDIDATE PROFILE	
Knowledge and know-how: Laser, optics, basics of quantum physics	Soft skills: Deft fingers, organized, like to report