**Offres de stages dans le cadre du projet DIM QuanTiP**

**Intitulé du stage :**

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| **Precision spectroscopy of Casimir-Polder molecule-surface interactions** |

**Laboratoire d’accueil :**

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| Laboratoire de Physique des Lasers |

**Responsable du stage :**

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| Athanasios Laliotis (laliotis@univ-paris13.fr) |

**Description de la mission (max 2500 caractères) :**

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| Interactions between neutral but polarizable objects are essential for the cohesion of matter and play a vital role in our understanding of the electromagnetic properties of matter. One paradigm is the Casimir force between two parallel plates, representing a macroscopic manifestation of quantum fluctuations. Closely related are Casimir-Polder (CP) interactions between a dielectric surface and a quantum object (atom or a molecule) that become important in the nanometric regime.  The SAI group of the LPL has developed selective reflection and nanocell spectroscopy as two major methods for probing Casimir-Polder interactions with *excited* state atoms. Using these techniques, the group has pioneered atom-surface interaction studies focusing on temperature effects [A. Laliotis et al., *Nature Communications,* **5**, 4364 (2014)] that allow probing surface polaritons with atoms [J. C de Aquino Carvalho *et al*., *Phys. Rev. Lett.* **131**, 143801, (2023)].  The group has now turned its attention to performing the first precision CP measurements with molecules. Molecule-surface interactions are of fundamental interest allowing us to study the chirality of quantum vacuum and Casimir-Polder anisotropy. The SAI group has probed molecular gases close to dielectric surfaces via selective reflection [J. Lukusa Mudiayi *et al*. *Phys. Rev. Lett.* **127**, 043201 (2021)] or nanocell spectroscopy [G. Garcia-Arellano *et al*. *Nature Communications,* **15**, 1862 (2024)]. These results allow the study of sub-wavelength confined molecules but have not yet provided a CP measurement.  We are now offering an internship on a new project that aims at probing an HF gas confined inside a nanocell. Our theoretical calculations have revealed HF to be the ideal molecule for CP measurements due to its linear geometry, simplicity and strong transitions at 2,5µm. We are looking for a motivated student to participate in the building of the experiment, detect the first spectroscopic signals and probe Casimir-Polder interactions of HF molecules confined in the nanometric regime. The student will work with H. Mouhanna (postdoc). The intern could also be involved in theoretical calculations of HF-surface interactions in collaboration with the theory group of Stefan Scheel (Universität Rostock, Germany). |

**Descriptif du profil recherché (max 1000 caractères) :**

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| We are looking for an applicant with good experimental skills and a theoretical background in atomic or molecular physics and optics. |

**Niveau de qualification demandé :**

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| Stage M2 |

**Durée du stage/contrat**

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| 3-6 months, typically from March till end of July (exact dates flexible) |

**Date prévisionnelle de démarrage**

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| March 2025 |

**Stage rémunéré\* :**

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| YES |

\*Oui obligatoirement pour une durée supérieure à deux mois

**Lieu de réalisation du stage :**

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| Laboratoire de Physique des Lasers |

**Accès et transports :**

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| Train (ligne H), tramway (T8, T11) |