With openings onto Europe and the world, the *Laboratoire National de métrologie et d'Essais* (LNE, national metrology and testing laboratory – 780 staff) is a major player in research in fundamental metrology on the international stage.

Title:

Post-doctorate in optics: building of a velocity control interferometer system to contribute to the determination of the Planck constant in the framework of a watt balance experiment.

Context:

The LNE is developing a watt balance experiment to determine the Planck constant with a relative uncertainty of less than 1.10^{-8}.

This work, in response to the recommendations of the General Conference on Weights and Measures, will contribute to the evolution of the definitions of the International System of Units and, more particularly, the definitions of the kilogram, volt and ohm.

The experiment consists in comparing mechanical and electrical power, whose value is determined by reference to two macroscopic quantum effects used in electrical metrology, the Josephson Effect and the Quantum Hall Effect.

Abstract:

Measurement is made in two stages, a static phase during which a electromagnetic force is compared to a gravimetric one and a dynamic phase. The electromagnetic force is produced by a current driven in a coil immersed in a induction field produced in the air gap of a magnetic circuit. During the dynamic phase, the coil is moved at constant speed (2mm/s) through the same induction field.

The velocity of the coil is controlled using an interferometer which the applicant will develop and integrate into the watt balance assembly.

The final optical control device will consist of a triple heterodyne fiber optic Michelson interferometer operating in vacuum and using a reference laser (frequency-doubled Nd: YAG laser stabilised on iodine) as well as the related electronics required to activate three piezoelectric actuators fixed to the coil.

The triple interferometer and the piezoelectric actuators must be integrated into the watt balance device taking into account of all the experimental constraints. The aim is to obtain a relative velocity stability of the order of a few 10^{-9} over 100 seconds.

This work initially requires the use of prototypes that have already been researched within the framework of two earlier (phD thesis?)theses, building the control with a single interferometer.
The device will then have to be adapted for simultaneous control of three points on the coil to control unwanted rotations around the two horizontal axes.

Specific skills and knowledge:

The successful candidate will be a Ph.D, or research engineer with three years' experience, in experimental physics and will have an extensive knowledge of optics and interferometry.
Tertiary education must include a strong metrology component to enable understanding of the project's general context and the constraints linked to the target uncertainties.
Skill with Labview is essential.
Good knowledge of automation and electronics are an advantage.
A rigorous approach, intellectual curiosity, an ability to work in a team, imagination and a dynamic attitude are required..

Your application has to be sent, via our website (www.lne.fr) at, the following address : recrut@lne.fr

or by mail :
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