High Sensitivity Matter-Wave Interferometry and Applications to Large-scale Gravitational

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France is engaged in designing, building and operating a large-scale underground gravitational instrument based on optical and atom interferometry. This effort is coordinated in the framework of the MIGA Equipex project (Matter-wave Interferometric Gravitational Antenna) which involves 18 expert French laboratories in atom interferometry, laser physics, gravitational physics and geophysics, as well as private companies. Within the MIGA project, SYRTE is in charge of the design and realization of the atomic sources and of the coordination of the atom interferometry part, when LP2N is in charge of the whole project. The goal of the proposed project is to test the new key techniques which will be used in the MIGA experiment. We will also theoretically study the optimal implementation of these techniques in a gravitational wave detector such as MIGA.