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Ultra-precise measurement of the fine-structure constant by the means of atom interferometry and implementation of large-momentum-transfer beam-splitters MANUEL ANDIA, RAPHAEL JANNIN, CLEMENT COURVOISIER, PIERRE CLADE, SAIDA GUELLATI-KHELIFA, FRANCOIS BIRABEN, Laboratoire Kastler Brossel — In our experiment in Paris, we use a Ramsey-Bordé atom interferometer with cold ^{87}Rb atoms, in combination with the technique of Bloch oscillations in an accelerated optical lattice, to measure the recoil velocity v_r in ^{87}Rb. We can then deduce the value of the fine-structure constant α. Such an experimental scheme allows for many kinds of measurements, and in particular has led in 2013 to the proof-of-principle realization of a compact gravimeter based on Bloch oscillations, which can be used for on-board compact gravimeters or gradiometry applications. More recently, attention has been paid to the implementation of a new laser system, motivated by the need of greater laser power in order to reduce some systematic effects and to perform more Bloch oscillations, to further reduce uncertainty on α. Upcoming projects revolve around increasing the sensitivity of the interferometer, which will be done through the Large-Momentum-Transfer Beam-Splitter technique (LMTBS). The first step towards LMTBS will be the implementation of double-diffraction, which makes the interferometer symmetrical by splitting the initial wavepacket into two opposite velocity classes.

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