Fully optical non-magnetic cesium magnetometer

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The development of optical cesium magnetometry at TU Munich was initiated due to the need for high precision and low drift magnetic field sensors for the upcoming panEDM experiment at ILL, France. Since Ramsey measurements have an intrinsic sensitivity for magnetic field effects, careful monitoring of fields and field drifts is a crucial requirement for reaching further nEDM limits. To avoid any field distortions caused by magnetic materials or coils, the sensor developed at TU Munich is non magnetic and based on the Bell-Bloom scheme, taking advantage of an entirely optical approach. The sensor head including the Cs-cell is fiberized, allowing to separate the sensor and readout electronics. By using anti-relaxation coated cells, the need for heating inside the experiment is avoided. Beside the mentioned advantages of being non-magnetic and operated at room temperature, these sensors can be used in a variety of configurations and allow alignment or orientation pumping as well as free precession decay and forced oscillation mode. During a measurement campaign inside the BMSR-2 at PTB Berlin in 2019, a drift stability of less than 100fT after 5minutes was demonstrated. In addition, a free space magnetometer inside high voltage electrodes is currently developed and offers new possibilitites and further insights into the field environment.

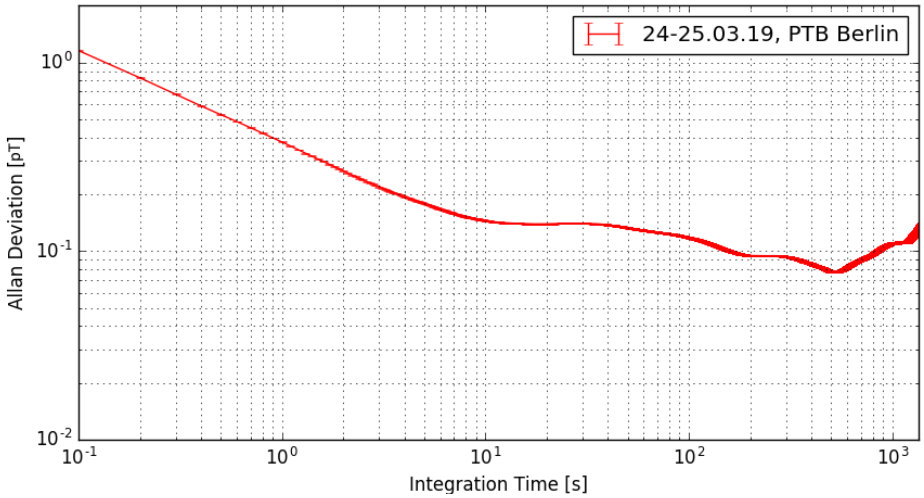

Figure 1. Allan deviation measured at PTB Berlin, demonstrating a stability of less than 100fT using a single sensor.