**Electronics**

Complex electronics is required to run the experimental sequence and control the various components, laser stabilisation and locking to atomic lines, frequency shifting of the lasers, laser amplitude, magnetic trapping, readout of the atom.

**Vacuum chamber / atom trap**

Vacuum technology is heavy and cumbersome. iSense is exploring new bonding technologies to create small glass ultra-high vacuum cells that can be integrated with the hardware required for laser cooling and trapping. Cold atom experiments make extensive use of optical components to generate the cooling and trapping light needed. iSense will integrate these laboratory setups into a small package using ICT.

**Micro-integrated laser systems**

Cold atom interferometers require a range of narrow-line lasers to trap, cool, manipulate and probe the atoms. Semiconductor lasers are small and powerful but require additional external optics to meet the linewidth requirements. iSense develops micro-bench optical modules that will reduce the volume of the lasers by a factor 100–1000.

**Sensor schemes**

Atoms help in a vertical periodic potential are subject to the acceleration of gravity and reside vertically. The measurement of the oscillation frequency gives the value of g. The latter provides input for climate models and has significant impact on scenarios for the future climate. Down to the micro-g level, trapped and cooled atoms are used in atomic gyrosensors (AGS), atomic magnetometers (AM) and atomic accelerometers, which themselves are used to monitor the Earth’s gravity field and water storage.

**Future extensions**

- Blue laser sources
- Integrated waveguides for optical wavelengths (GaAlN, SiC, Polymer, …)
- Integrated optical clocks with earth alkali atoms
- Further shrinkage by using ASIC electronics and micromanufactured vacuum systems...