

In-orbit results of the Coupled Dark State Magnetometer aboard the China Seismo-Electromagnetic Satellite

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The Coupled Dark State Magnetometer (CDSM) is an optical scalar magnetometer which is based on two-photon spectroscopy of free alkali atoms [1]. The instrument uses several Coherent Population Trapping (CPT) resonances in parallel to reduce systematic errors caused e.g. by the sensor temperature dependence, the limited stability of the microwave oscillator or varying light intensity. As known so far, CPT is the only effect in optical magnetometry which inherently enables omnidirectional, dead-zone-free measurements. This leads to an all-optical sensor design without double cell units, excitation coils or electromechanical parts [2].

The China Seismo-Electromagnetic Satellite (CSES) investigates natural electromagnetic phenomena and possible applications for earthquake monitoring from space in a polar, sun-synchronous, low Earth orbit. CSES was successfully launched in February 2018 and it is the first demonstration of the CDSM measurement principle in space.

The presentation introduces the instrument design, key performance characteristics and in-orbit results of the CDSM aboard CSES.

[1] R. Lammegger, Method and device for measuring magnetic fields, Patent, WO/2008/151344 (2008).

[2] A. Pollinger, R. Lammegger, W. Magnes, C. Hagen, M. Ellmeier, I. Jernej, M. Leichtfried, C. Kürbisch, R. Maierhofer, R. Wallner, G. Fremuth, C. Amtmann, A. Betzler, M. Delva, G. Prattes and W. Baumjohann, Coupled Dark State Magnetometer for the China Seismo-Electromagnetic Satellite, *Meas. Sci. Technol.* **29**, 095103 (2018).