

# An ESFADOF for temperature profile measurements in the Ocean

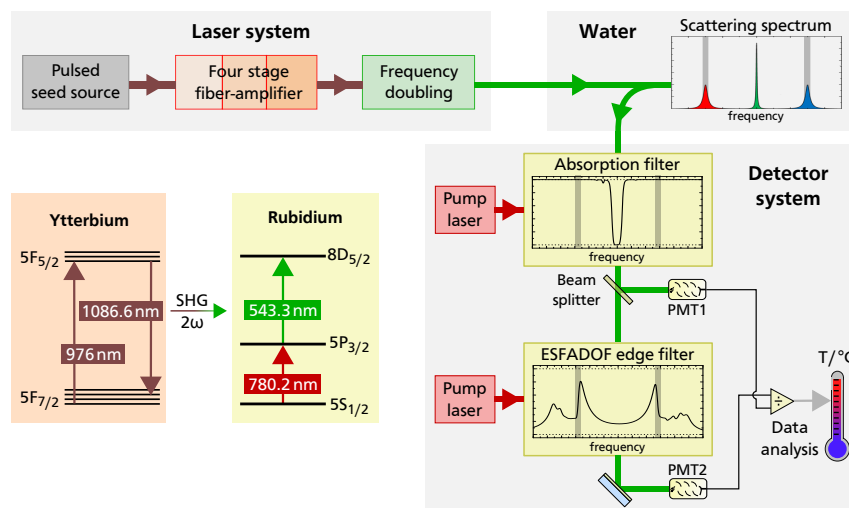
Thomas Walther<sup>1</sup> and David Rupp<sup>1</sup>

<sup>1</sup> Inst. for Applied Physics, TU Darmstadt, Germany

We are developing a Brillouin lidar for the remote measurement of temperature profiles in the Ocean for depths up to approximately 100 m. It is working according to the lidar principle, i.e. a laser pulse is sent into the water and the scattered light is collected. The temperature profile is encoded into the frequency shift due to Brillouin scattering of the back-scattered light. The profile information is extracted via time-of-flight.

Experimentally, the laser pulses are generated by pulsed fiber amplifiers and the frequency shift of the backscattered light is converted into a transmission change of an edge filter as the transmission edges of this filter are positioned roughly where the the frequency shifted Brillouin peaks appear. As an edge filter we employ an ESFADOF (excited state Faraday anomalous dispersion optical filter) based on a Rb cell placed in a strong static magnetic field. The Rb gas is heated to approximately 235 °C and is pumped into the 5 P<sub>3/2</sub> excited state.

In our contribution, we discuss the performance of the filter, the capability of the complete setup including recent results of a field test and give an outlook to an extension of the system in order to measure the salinity and the temperature simultaneously.



**Figure 1.** Principle of our Brillouin lidar. The lasing scheme of the Yb:doped fiber amplifiers, the level scheme of the ESFADOF transitions as well as the overall setup is indicated.

[1] A. Rudolph and Th. Walther, High-transmission excited-state Faraday anomalous dispersion optical filter edge filter based on a Halbach cylinder magnetic-field configuration, *Opt. Lett.* **37**, 4477 (2012).

[2] A. Rudolph and Th. Walther, Laboratory demonstration of a Brillouin lidar to remotely measure temperature profiles of the ocean, *Optics Engineering* **53**, 051407 (2014).