Shot noise limited optogalvanic vapor cell | 2GS	**Start Date:** November 1st 2014
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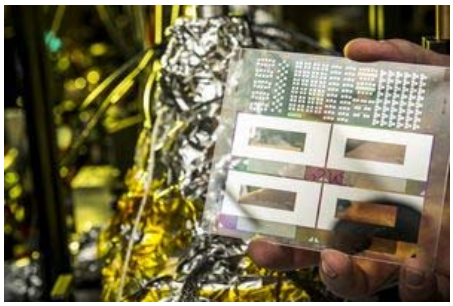

Abstract: The goal of this project is to integrate a shotnoise limited ion current detection into an optogalvanic vapor cell. Such a cell can be used as a sensitive detector for electric and magnetic fields as well as highly excited atoms and molecules. Due to the narrow excitation linewidth for Rydberg states, this sensor is highly selective for different isotopes for atom detection or species in case of molecules, making it well suited for trace gas detection. Thin film technology allows to integrate the required circuit in micron sized pixels. This project combines high resolution spectroscopy with the engineering of integrated highly sensitive current amplification in a chemically challenging environment. We plan to excite Alkali Rydberg atoms in an electrically contacted vapor cell. These atoms are ionized due to collisions with the background gas. A voltage directs these charges towards the electrodes on the inside of the cell, where they will be detected with an amplifier based on thin film technology. Requirements for these amplifiers are among others, that it is low noise, provides a stable amplification under changing environmental conditions and is chemically inert against the content of the cell. Fulfilling all these requirements is a challenging task for engineering. The development of transparent, chemically resistant electrodes would broaden the field of applications and would in combination with anodic bonding allow for small sensors, even down to microscopic cells.
Finally we will demonstrate that these kinds of cells can be used as sensitive, small scale trace gas sensors.

Recent results:	**Publications:**
• *Demonstration of in-cell amplification circuits* • *Signal from <100ppb Rb in N_2*	*A transimpedance amplifier based on a LTPS process operated in alkali vapor* *J. Schmidt, P. Schalberger, H. Baur, R. Löw, T. Pfau, H. Kübler and N. Frühauf* *24th International Workshop on Active-Matrix Flatpanel Displays and Devices (AM-FPD)*

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