Integrated MW Circuits for Rydberg Dressing in Thermal Vapor Cells | 8GS	**Start Date:** September 1st 2015

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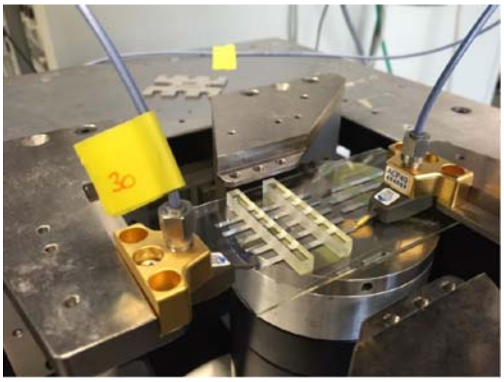

Abstract: The goal of this project is to integrate microwave guiding structures (up to 70 or even 120 GHz) into a thermal vapor cell filled with alkali atoms. Such a cell can on the one hand be used as a sensitive detector with a high spatial and vector resolution for the MW radiation fields produced by the MW circuit. On the other hand MW dressing of Rydberg states can be used to enhance or decrease the sensitivity of the Rydberg atoms to electric fields or to change the interaction between these atoms from a Van-der-Waals type (~1/r^6) to a dipole type (~1/r^3), which can increase the interaction length significantly.
MW dressing offers a unique way to tune the interactions between Rydberg atoms from a pure Van-der-Waals type to a dipole type. This transition should be visible in dephasing rates and interaction properties, including Rydberg blockade effects. Being able to engineer the interaction distance of Rydberg atoms, especially increasing it, allows for higher optical depth per blockade volume at easy to handle temperatures.
The first step is the development of MW feedthroughs based on thin film technology to have full control over the guiding properties. The most promising approach are co-planar waveguides on glass substrates. Tapering allows for impedance matching when crossing the cell walls. This technique is compatible with anodic bonding, our method to seal the cells.
The next step focuses on enhancing the coupling between the atoms and the MWs. Therefore resonant structures for field enhancement will be investigated.
In parallel the possibilities of electric field imaging will be used to compare simulated results for these structures to measurements within the cells.

Recent results:	**Publications:**
• *CP-WG tapers designed and measured* • *Simulations in agreement*	***Design of electrical transmission lines for the measurements in a rubidium vapor cell,*** *Kateryna Guguieva,* *Bachelor Thesis*

Further Collaborators:
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