



Walther-Meißner-Institut

Bayerische Akademie der Wissenschaften



Walther-Meißner-Seminar

Walther-Meißner-Institut, Seminar Room 143

Date: **Special date: Wednesday, 8 August 2018, 13:30 h**

Speaker: **Yuki Nojiri**

Physik-Department, Technische Universität München

*Department of Applied Physics and Physico-Informatics, Keio University,
Hiyoshi 3-14-1, Kohoku, Yokohama 223-8522, Japan*

Title: **2-Input-2-Output Quantum Feedback Amplification and Coherent PID Feedback Control**

Abstract:

Maintaining a certain stable steady-state is an important task among the physicists due to the applications to the quantum memory, quantum sensor, state-generation, etc. But there is a problem: Quantum systems can be easily affected by noises, which lead to fluctuations. One promising approach to counterattack this problem is feedback. To achieve the robust steady-state, a feedback configuration using a proportional-integral-derivative controller (PID controller) is known in the classical world. Thus, following this idea, we suggest and analyze the coherent PID feedback control system to obtain the robust steady-state on the quantum level in this research.

We split this into three steps to achieve the coherent PID feedback control: firstly, we construct the quantum feedback amplifier, secondly, we design the directional coherent active proportional, integral and derivative controller based on this quantum feedback amplifier configuration, and lastly, we establish the general coherent PID feedback control system.

In order to get familiar with this new feedback system, we investigate the coherent P, PI, and PD feedback control system through a concrete example, namely, through cooling an optomechanical system.