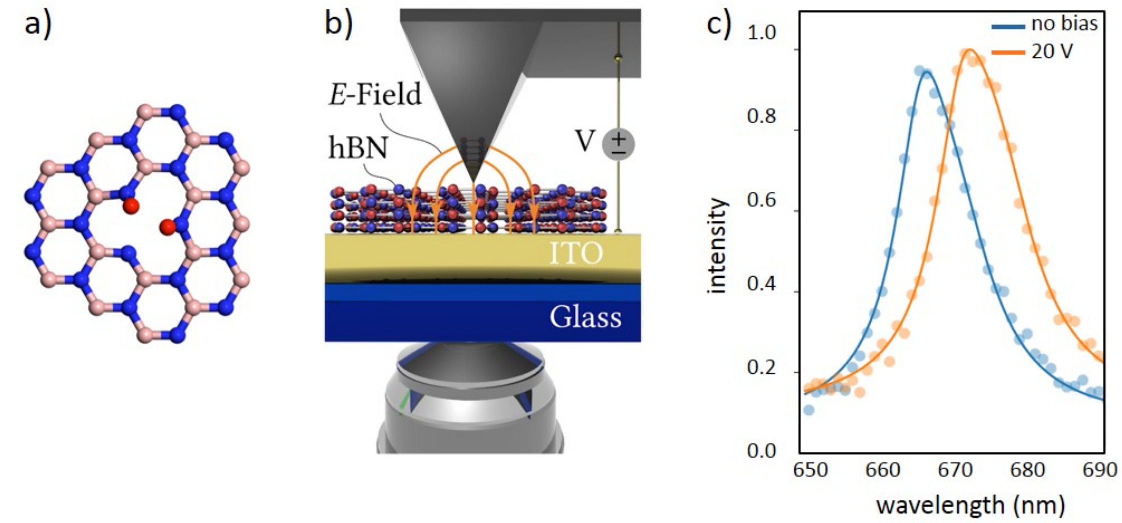
Researchers demonstrate very large electric tuning of a single quantum emitter at room temperature

Bright and tunable solid-state single-photon emitters (SPEs) are required for the realization of scalable quantum photonic technologies. Recently, optically active defects in a two-dimensional material, boron nitride (h-BN), have been extensively studied as bright single-photon emitters with a narrow linewidth and operating at room temperature. The layered nature of h-BN also offers potential advantages for integration in novel opto-electronic hybrid elements including photonic resonators, waveguides, modulator, and detectors. In order to exploit the functionality of such elements a tuning of the emitter's fluorescence line is essential. Tuning via the Stark effect using a static electric field has been suggested for various solid-state emitters, such as quantum dots or color centers in diamond. Researcher from the Institute of Physics of Humboldt-University together with coworkers from the University of Technology in Sydney were now able to demonstrate controlled and reversible Stark tuning of individual emitters in hBN. They used a metallic tip of an atomic force microscope (AFM) to locally select a single emitter and tune it over a record range of up to 5.5 nanometers at room temperature.



a) *Structure of a defect in hexagonal Boron Nitride. b) Schematic of the experiment, where a metallic AFM tip is placed above a single defect emitter and a bias voltage is applied. c) Measured Stark-shift of the narrow fluorescence line.*

Based on their results the researchers suggest building a room-temperature single photon source, which can be tuned electrically in or out of a resonance of a plasmonic resonator. "Such a source would be highly desirable as a reliable non-classical light source for applications in quantum-enhanced sensing and metrology or in quantum key distribution." says Prof. Oliver Benson, who is researcher in **IRIS Adlershof** and leads the Humboldt-team.

Very large and Reversible Stark-Shift Tuning of Single Emitters in Layered Hexagonal Boron Nitride
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