Single electron pumped single photon source | 19GS	**Start Date:** July 1st , 2017
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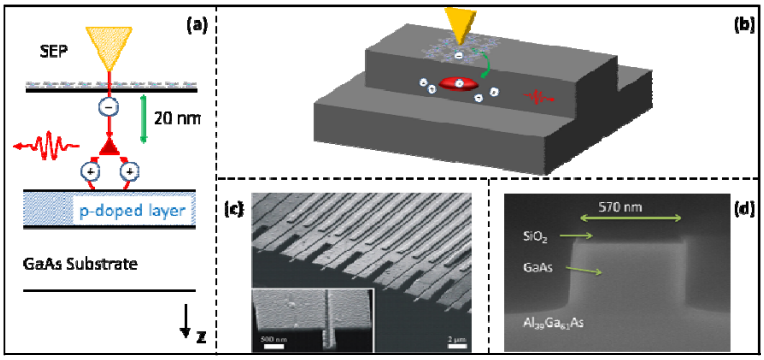

Abstract: In this project we aim to realize an on-demand single-photon source pumped via a single- electron pump (SEP) based on the Coulomb blockade effect. To our knowledge, such a device has never been realized and would have a strong impact as a new metrological standard. The device is built up of a single-electron pump for regulation of the stream of single electrons and a single quantum dot which serves as a single-photon source. The electrons will tunnel into the QD which is fed with holes provided via a p-doped layer (fig. a). The radiative recombination triggered by the injection of a single electron will generate one single photon. The dot will be embedded into a semiconductor waveguide (fig. b and d) so that the emitted photons will be guided with a high coupling efficiency and finally coupled to a fiber for efficient photon collection. The resulting device will be at first a single-photon source triggered by single-carrier injection, so giving a more complex flavor to the definition of "on-demand" single-photon source. This kind of device will be of great interest as a new metrological standard as well as a photon source in high yield quantum information processing. The single-electron pump will be incorporated into the tip of a scanning probe microscope (see figure c), allowing precision placement of the single-electron pump with respect to the quantum dot. As a further development, a molecular "spin aligning" material with a stable magnetic moment at low (helium) temperatures will be added into the single-electron pump. This molecular material will spin polarize the electron injected into the QD which will result in photon emission with a well-defined polarization, feature of great interest for quantum information applications. Specifically, we will employ the [TbPc2] molecule, because of its large magnetic moment and because it can be sublimed intact.