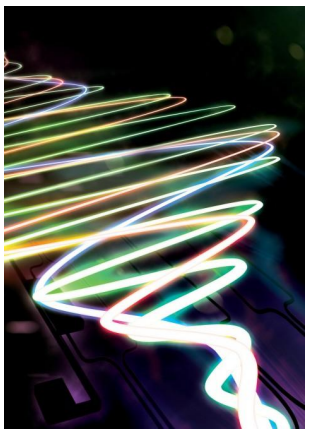
Project proposal
Fabrication of a High Temperature Superconducting Light Emitting Diode (SLED)

Preliminaries: Physics 3 (mandatory), EE or Physics Solid State course (in parallel)

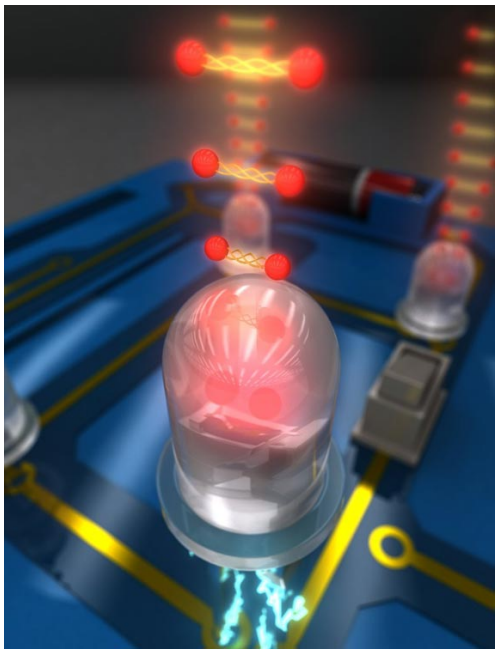
Theoretical background:

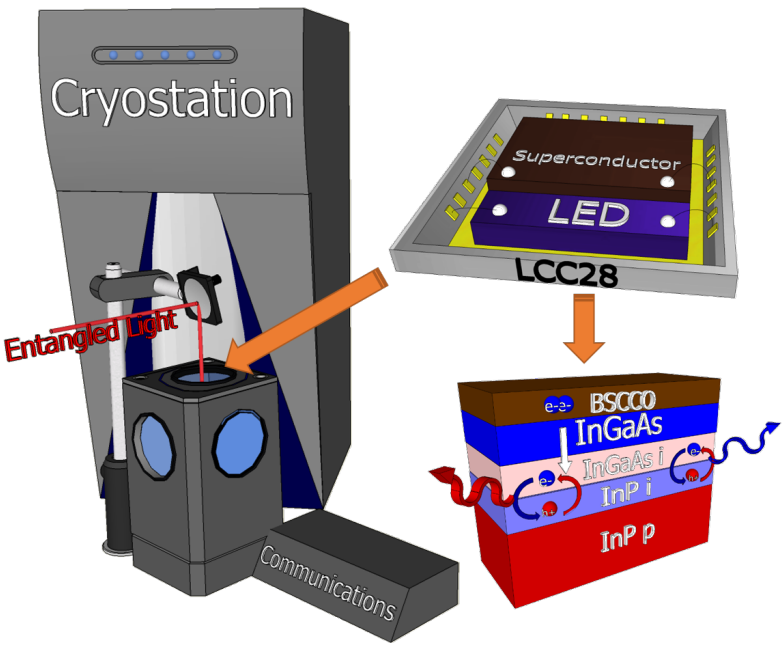


High Temperature Superconducting Light Emitting Diode (SLED) is the combination of an unconventional superconductor (with a high critical temperature Tc>80K) and a light emitting diode. Together, these materials form a unique device capable of producing entangled photons.

The main goal of the project is to fabricate and characterize a superconducting diode. The unique combination of those materials has not been investigated yet. Therefore, students have an opportunity to contribute to the field of superconductors and discover various applications in quantum information and computing. In the conventional electronics, we use electrical or optical wires to communicate between distinct computers. A communication channel and information codding technique limit a transition rate. In the quantum realm, a qubit is the analog of the classical bit, but it is capable to carry much more information. Therefore, for fast information exchange a reliable quantum channel is needed. Such quantum channels can be implemented using a source of entangled photons. Surprisingly, this source can be easily fabricated in laboratory conditions. The device will be characterized in the temperature below 80K (-193°C) with the aid of very sensitive electrical equipment and optical detectors.

Potential applications: The high critical temperature superconductor makes it possible to operate the device with simple cryogenic equipment. If the device is successful, it could be used in various branches of quantum technology.





Additional information:

Laboratory: Ultrafast quantum device lab. Fishbach 251

Supervisor: Prof. Alex Hayat alex.hayat@ee.technion.ac.il