Bio-sensing opportunities for quantum-optical emitters

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There has been much recent interest in nitrogen-vacancy (NV) color centers in diamond for quantum optical bio-sensing. A number of bio-sensing applications have been explored and demonstrated. Among the advantages of the NV are excellent photo-stability, low toxicity, and the ability to detect multiple parameters like magnetic and electric fields, and temperature with high precision. The NV may also eventually enable single bio-molecule imaging.

However the NV is not ideal and has some important limitations. In this talk I will review the strengths and weaknesses of the NV center and discuss several other candidate materials. Briefly these include most any material that exhibits optically detected magnetic resonance (ODMR). It also includes rare earth ions in a variety of host crystals, and even other color centers in diamond, like the silicon-vacancy. To provide context, I will also briefly discuss some representative problems in bio-sensing.