Solid-state based quantum emitters for their application in quantum information technologies

By Samarth Vadia, PhD student at attocube

The study of solid-state based quantum emitters for their application in quantum information technologies has become a very active area of research in last few years. The optical detection and manipulation of these emitters is a challenge, especially when system has to be scalable. One solution is coupling quantum emitters to cavity because light typically goes through hundreds or thousands of round trips inside a cavity resulting in higher chance of interaction with quantum object and enhancement of detection signal. Additional ability to tune cavity geometry relative to the object would be beneficial for an effective detection [1, 2].

We, at attocube systems, have developed attoDry800 which is a closed-cycle cryostat system integrated with an optical table (Fig. 1). It perfectly suits optical experiments like scanning cavity microscope as it provides low vibration, cryogenic temperature (less than 4K) with maximum optical access. The level of vibration is still too large for high-finesse cavities which can also be flexible for scanning. We are currently working to reduce vibration level using passive and active damping methods and collaborate with our spin-Nano partners to enable high-finesse scanning cavity systems.

References:

[1] R. J. Barbour, et al., "A tunable microcavity", *Journal of Applied Physics 110 053107*, (2011)

[2] M. Mader, et al., "A Scanning Cavity Microscope", *Nature Communications 6 7249*, (2015)

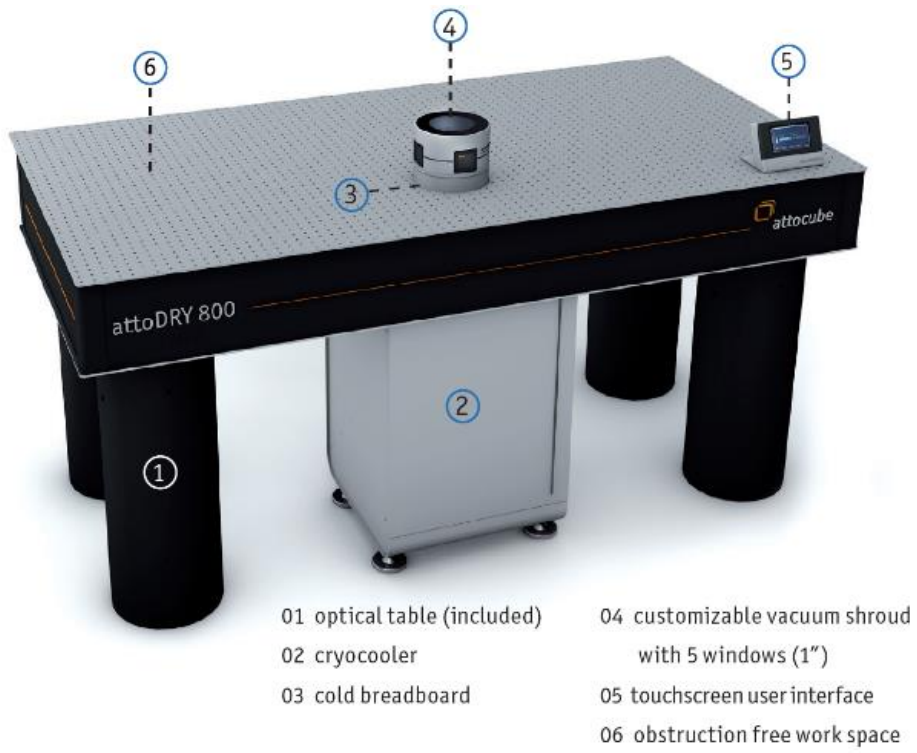

Figure 1: An overview of attoDry800 system.