

Survey on single photon detector needs

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Single photon detectors are being used in a wide variety of applications [1,2,3] and advances in detection efficiency, imaging arrays, waveguide coupled detectors and photon number resolution have been significant in the past several years. To better serve the community with useful metrology services and techniques, the authors have conducted a survey, which mostly took place at the 2024 single photon workshop, to determine the community needs for single photon detectors. The survey included 39 participants, with 20 participants identifying as users, 17 identifying as performing research and development of single photon detectors, 10 vendors and 1 quantum computing utility scale deployment. There was some overlap between these groups.

The questions asked were focused on the metrological needs of the single photon detector community, for example the desired operation wavelength(s), jitter, efficiency and photon number resolution for single photon detectors. Distinction was made between needs for fiber, free-space and waveguide-coupled detectors

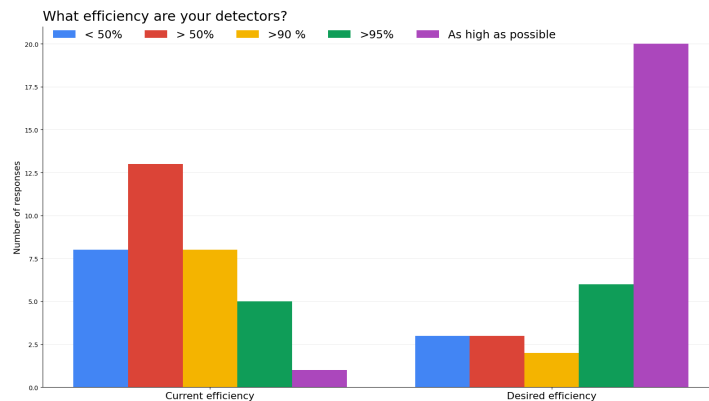


Fig. 1: Example survey results.

The results of the survey show that there is still a gap between the current and desired performance of single photon detectors and detector metrology more generally. For example, there is a large need for metrology of photon number resolving detectors, with almost two thirds of respondents requiring knowledge of the efficiency with which different photon numbers are measured. Additionally, almost one quarter of respondents used waveguide coupled detectors, for which efficiency measurements are significantly less mature. We hope that this survey can illuminate more of these gaps to provide the community with a quantitative analysis of the importance of different detector features.

References

- [1] Couteau, C. *et al. Nat Rev Phys* **5**, 354–363 (2023).
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- [3] Adriana E. Lita *et al.*, *J. Lightwave Technol.* **40**, 7578-7597 (2022)