# Joint Characterization Measurements of Two Independent Heralded Single-Photon Sources

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Scalable photonic quantum networks demand independent heralded single-photon sources that are simultaneously bright, spectrally pure, and mutually indistinguishable. Here, we present a joint characterization of two high-performance heralded sources designed for networked operation. Each source is based on spontaneous parametric down conversion (SPDC) using an engineered nonlinear crystal designed to create separable photon pairs. The two sources are phase- and repetition-rate-locked to one another, enabling pulse-level synchronization and stable interference in fiber-based quantum links. A schematic setup diagram is presented in Fig 1. From individual-source measurements, including Schmidt numbers of 1.0048+/-0.0001 and 1.0018+/-0.0003 (Fig. 1), we predict an inter-source Hong-Ou-Mandel visibility of 0.9966. We further present a benchmark suite directly relevant to quantum networking, including joint spectral intensity, heralded $g(2)(0)$, Hong-Ou-Mandel interference, and the corresponding single-source metrics that determine inter-source compatibility. Together, these results provide a direct assessment of independently engineered sources for high-rate photonic quantum networking.

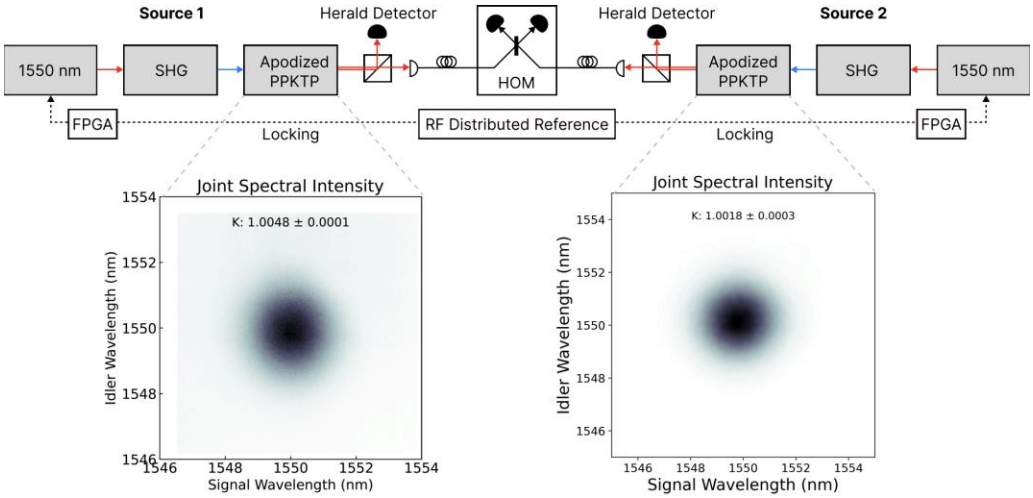


**Fig. 1:** *Schematic of two independent heralded single-photon sources for Hong–Ou–Mandel (HOM) interference. In each source, a 1550 nm mode-locked laser is frequency doubled to 775 nm and pumps an apodized PPKTP crystal for SPDC pair generation. Herald photons are detected, while signal photons interfere at the HOM beam splitter. The sources are phase- and repetition-rate-locked via an RF reference and FPGA control. Lower panels show the measured JSIs and Schmidt numbers.*

## References

[1] N. V. Nardelli, D. V. Reddy, M. Grayson, D. Sorensen, M. J. Stevens, M. D. Mazurek, L. K. Shalm, and T. M. Fortier, e-print arXiv:2510.16230 (2025)