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Bimodal Hong-Ou-Mandel Interferometry[1] DEEPIKA SUNDARRAMAN, THOMAS GILLISS, CODY LEARY, The College of Wooster — We investigate two-photon Hong-Ou-Mandel interference in several interferometric systems, in which each of the two interfering input photons exist in arbitrary linear superpositions of the first-order Hermite-Gaussian modes HG_{10} and HG_{01}. We find that if both input photons are in balanced superpositions of the HG_{10} and HG_{01} modes, the resulting two-photon interference can be engineered to transform these diagonal Hermite-Gaussian inputs into output modes of the Laguerre Gaussian type, which are entangled with respect to both output path and transverse spatial mode. We show that such two-photon interference effects can occur even if the input photons are prepared with *distinguishable* transverse spatial states.

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