Limitations on building single-photon–resolution detection devices
Pieter Kok Pieter.Kok@jpl.nasa.gov
Quantum Computing Technologies Group, Jet Propulsion Laboratory, California Institute of Technology

abstract Single-photon resolution (SPR) detectors can tell the difference between incoming wave packets of \( n \) and \( n + 1 \) photons. Such devices are especially important for linear optical quantum computing with projective measurements. However, in this paper I show that it is impossible to construct a photodetector with single-photon resolution when we are restricted to single-photon sources, linear optical elements and projective measurements with standard (non-photon-number discriminating) photodetectors. These devices include SPR detectors that sometimes fail to distinguish one- and two-photon inputs, but at the same time indicate this failure.