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Temporal Quantum Correlation in Inelastic Light Scattering from Water ANDRE SARAIVA, Univ Fed Rio de Janeiro, MARK KASPERCZYK, Photonics Laboratory, ETH Zurich, FILOMENO DE AGUIAR JUNIOR, Departamento de Fsica, Universidade Federal de Minas Gerais, CASSIANO RABELO, Programa de Ps-Graduao em Engenharia Eltrica, Universidade Federal de Minas Gerais, MARCELO SANTOS, Instituto de Fsica, Universidade Federal do Rio de Janeiro, LUKAS NOVOTNY, Photonics Laboratory, ETH Zurich, ADO JORIO, Departamento de Fsica, Universidade Federal de Minas Gerais — Water is one of the most prevalent chemicals on our planet, an integral part of both our environment and our existence as a species. Yet it is also rich in anomalous behaviors. Here we reveal that liquid water is a novel - yet ubiquitous - source for quantum correlated photon pairs. The photon pairs are produced through Raman scattering, and the correlations arise from the shared quantum of a vibrational mode between the Stokes and anti-Stokes scattering events. We confirm the nonclassical nature of the produced photon pairs by showing that the cross-correlation and autocorrelations of the signals violate a Cauchy-Schwarz inequality by over five orders of magnitude. The unprecedented degree of violating the inequality in pure water, as well as the well-defined polarization properties of the photon pairs, points to its usefulness in quantum information.

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