Multi-photon, multi-mode polarization entanglement in parametric down-conversion A. Gatti$^1$, R. Zanbrini$^2$, M. San Miguel$^2$ and L. A. Lugato$^1$. $^1$ INFM, Dipartimento di Scienze CC FF MM, Universitá dell’Insubria, Via Valleggio 11, 22100 Como, Italy. $^2$ IMEDEA, Campus Universitat Illes Balears, E-07071 Palma de Mallorca, Spain. 42.50.Dv, 42.65.Lm

abstract We study the quantum properties of the polarization of the light produced in type II spontaneous parametric down-conversion in the framework of a multi-mode model valid in any gain regime. We show that the microscopic polarization entanglement of photon pairs survives in the high gain regime (multi-photon regime), in the form of nonclassical correlation of all the Stokes operators describing polarization degrees of freedom.