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High magnetic field phases of the J_1-J_2-J_3 triangular antiferromagnet GIACOMO MARMORINI, TSUTOMU MOMOI, RIKEN — We present a thorough study of the J_1-J_2-J_3 triangular lattice antiferromagnet close to the saturation field, where the magnetic structure is determined by the condensation of magnons. We focus on the case of ferromagnetic J_1, that is particularly rich because frustration effects can allow for magnons of different (commensurate or incommensurate) wave-vectors to condense simultaneously. Our calculation includes an interlayer coupling J_0, that can be taken as small as 10^{-4} (in units of J_1), in which case the system is nearly two-dimensional. Besides the well-known spiral and fan phases, we find a new double-q phase (superposition of two modes), dubbed "01" phase, whose features (including a new type of multiferroic behavior) can be seen as intermediate between the two. Furthermore, in some regions of the parameter space, we show that a dilute gas of magnon can not be stable and phase separation (corresponding to a magnetization jump) is expected. Related to this, we discuss the presence of quantum tricritical points. In the J_1-J_2 model ($J_3 = 0$) bound states of two and three magnons may also appear, but it is an open issue whether or not they form a stable condensate and then give rise to nematic or octupolar order.

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