Acceleration Wakefield Modes in a Photonic Band Gap Structure, F. SCARLAT and <u>V. CALIAN</u>, Institute of Atomic Physics, Bucharest, Romania - In this paper the authors formulate and numerically solve the following problem: assessment of the photonic band structure as well as of the spatial distributions of the electric and magnetic fields for particle acceleration purposes. The spatial distribution of the transmitted power and its dependence of the frequency of EM wave which propagate in a period three-dimensional structure made up of cylindrical dielectric rods having a "defect" were computed. The resolution consists of two steps: computation of the photonic band gap structure using a vector extension of the "band theory" and the computation of the 3-D distribution of the wakefields and of power, using an extended approach based on the so-called "collocation method". Finally a proposal for the experimental demonstration of the wakefield acceleration in a photonic band gap structure is given.