We study the splitting of invariant manifolds of whiskered (hyperbolic) tori with two or three frequencies in nearly-integrable Hamiltonian systems. In the two-dimensional case, we consider tori whose frequency ratios are quadratic irrational numbers. We deal with numbers whose continued fractions satisfy certain arithmetic properties which give us 24 cases for consideration. In the three-dimensional case, we consider tori with 3 cubic frequencies with a special attention to the cubic golden number, the real root of $x^3 + x = 1$. We show that the Poincaré-Melnikov method can be applied to establish the existence of homoclinic orbits to the whiskered tori and prove that these homoclinic orbits are transverse. Thereby, we generalize the results obtained by A. Delshams and P. Gutiérrez for the golden number $(\sqrt{5} - 1)/2$ and other few quadratic numbers.

This is a joint work with A. Delshams and P. Gutiérrez.