Quasi-periodic normally hyperbolic invariant tori: existence, persistence and mechanisms of breakdown

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We present a KAM-like theorem in a posteriori format for the existence of real-analytic quasi-periodic normally hyperbolic invariant tori in smooth families of real-analytic dynamical systems. The proof is based on the parameterization method. Moreover, the KAM scheme leads to fast and efficient algorithms of computation of invariant tori, even in cases these objects are about to break. We present several numerical computations that suggest conjectures on some mechanisms of breakdown.