

Algorithms for a Precise Determination of the Betatron Tune, R. BARTOLINI, M. GIOVANNOZZI, W. SCANDALE, CERN; A. BAZZANI, DIP. DI MATEMATICA-BOLOGNA; E. TODESCO, INFN-BOLOGNA - In circular accelerators, the betatron tune is measured by analysing a sequence of values of the particle coordinates, sampled over N consecutive turns. Algorithms routinely used for frequency analysis are based either on Fast Fourier Transform, or on Average Phase Advance, computed along the phase space trajectory. More sophisticated algorithms provide very precise estimates of the tune in a limited number of turns. They rely either on analytical interpolations of the Fast Fourier Transform, suggested by Asseo, or on the numerical estimate of the Continuous Fourier Analysis, as proposed by Laskar. We present a critical review of these methods and an estimate of the frequency error as a function of N . We also evaluate with numerical simulation the detrimental effect due to an imperfect knowledge of the turn-by-turn beam position.