First Beam Test Result of RFQ Electron Tune Controller at HIMAC Synchrotron, S. ANO, T. ENDO, K. HATANAKA, T. OKI, <u>K. SATO</u>, RCNP; M. KANAZAWA, K. NODA, NIRS - An equation of motion reduced to Mathieu's Equation was obtained by means of radio-frequency quadrupole (RFQ) electric field applied to the beam circulating in a synchrotron. An analytical solution newly developed [1] is a fairly good approximation to give the characteristic exponent [2] for both a stable region and an unstable region depending on both the frequency and the field strength in a resonant manner. A betatron tune shift in a stable region is expected to compensate the space charge effect of a high-intensity beam. The performance in an unstable region would be applied to the slow extraction because the beam is kicked-out from a separatrix. Performance test of an RFQ device installed at HIMAC synchrotron is being carried out to control a vertical tune value at the injection energy because the space charge self-force of the beam is most effective. The observation shows a tune shift which is comparable to that of the approximate solution. A further investigation, however, is required because the unexpected beam loss still occurs in most cases when the RFQ is turned-on.

[1]   T. Endo et al., Proc. of The XVI RCNP Osaka Int'l Symp. on Multi-GeV High-Performance Accelerators and Related Technology, 12-14 March 1997, Osaka, Japan, pp.238-241.
[2]   Handbook of Mathematical Functions, ed. M. Abramowitz and I.A. Stegun, Dover Publications, Inc., New York, 1970, pp.721-750.