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Simulation and experiment of low-energy slow extraction at XiPAF

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Extraction by third order resonance in low-energy stage will suffer from strong space charge effect, high beam emittance, high power ripple and so on. Low-energy slow extraction at 10 MeV has been explored theoretically and experimentally at synchrotron of Xi'an Proton Application Facility (XiPAF), which is a compact synchrotron with injection energy of 7 MeV and extraction energy up to 230 MeV. In this paper, simulation and experiment results of slow extraction of 10 MeV intense beam are presented. By using high-order harmonic excitation, the RF-KO slow extraction scheme below resonance is the best choice for slow extraction in low-energy stage with strong space charge effect. Slow extraction experiment is carried out when the maximum incoherent tune shift of space charge reaches -0.06 , during which, quasi-uniform extracted beam and extraction rate around 65% are achieved.

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Footnotes

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