

# Time periodic solutions for the full quantum Euler equation

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## Abstract

In this paper, we establish the existence and uniqueness of a time periodic solution to the full compressible quantum Euler equations. First, we prove the existence of time periodic solutions under some smallness assumptions imposed on the external force in a periodic domain by a regularized approximation scheme and the Leray-Schauder degree theory. Then the result is generalized to  $\mathbb{R}^3$  by adapting a limiting method and a diagonal argument. The uniqueness of the time periodic solutions is also given. Compared to classical Euler equations, the third-order quantum spatial derivatives are considered which need some elaborated treatments thereof in obtaining the highest-order energy estimates.

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