A quest for the Critical Angular Velocity, Ω_{c1}, and the Landau State in the Supersolid State of hcp ^{4}He

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We have described a transition from the vortex fluid(VF) state into the supersolid(SS) state below T_c[1, 2], and discussed quantized vortex dynamics in the VF state[3]. Furthermore we have shown vortex lines penetration by the extra energy dissipation, which increases in proportion to the DC rotational velocity Ω below T_c[4]. As a natural consequence we ask ourselves, if there is a definite critical angular velocity Ω_{c1} above which quantized vortex lines start to penetrate the solid ^{4}He sample and if there would be a state similar as Landau state where the vortex lines are expelled from the sample. The present paper describes the efforts to study this question.

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