
Critical rotation of an annular superfluid Bose gas

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Résumé

We analyze the excitation spectrum of a superfluid Bose-Einstein condensate rotating in a ring trap. We identify two important branches of the spectrum related to outer and inner edge surface modes that lead to the instability of the superfluid. Depending on the initial circulation of the annular condensate, either the outer or the inner modes become first unstable. This instability is crucially related to the superfluid nature of the rotating gas. In particular we point out the existence of a maximal circulation above which the superflow decays spontaneously, which cannot be explained by invoking the average speed of sound.

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