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Detecting the Normal Modes of Instability in Rotating Couette Flow of He II HOWARD SNYDER, University of Colorado at Boulder — Several attempts have been make to verify the HVBK equations of He II using the Couette double cylinder experiment. Calculations show that the critical Reynolds number and wave number rapidly approach zero as the temperature is lowered from the lambda-temperature. The wavelength of Taylor cells is predicted to be longer than any reported apparatus when the temperature is below 2.05 K. Yet, all the experimental data have breaks in plots of the torque or attenuation of second sound vs. the Reynolds number. This data spans a large range of parameter space. The breaks occur at the calculated Reynolds number when the calculated wavelength is somewhat shorter than the apparatus i.e. near the lambda temperature. The observed breaks at lower temperatures, down to 1.2 K, are unexplained. We present a method of analyzing second sound resonances that will help solve the problem. If sufficient data is available, the method will verify or reject an assumed form of the disturbance. The analysis is based on a publication of the author in which the propagation of waves in uniformly rotating He II is described. Those procedures are generalized so that they apply to Couette flow. The slopes of the curves of second sound attenuation vs. Reynolds number are calculated for a range of normal modes of both second sound and Taylor cells. The slopes are also calculated below the break points so that end effects can be measured.

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