Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Secondary bifurcation of mixed-cross-spirals (MCS) connecting different travelling wave solutions SEBASTIAN ALTMEYER, CHRISTIAN HOFFMANN, Institut für Theoretische Physik, Universität des Saarlandes — We investigated numerically in the Taylor-Couette system secondarily bifurcating structures connecting different helical travelling wave solutions with different azimuthal wave numbers, realized by so-called mixed-cross-spirals (MCS), by solving the full Navier-Stokes equations with a combination of a finite difference and a Galerkin method for fixed axial periodicity lengths. Dynamics, stability, and bifurcation behaviour for counter rotating as well as co-rotating cylinders are presented. These secondarily forward bifurcating, stationary flow states - MCS - solutions can be seen as nonlinear superpositions of the involved pure spiral solutions. E.g for a L3R5-MCS. Thereby, the contribution of the respective spiral component (here a L3-SPI and a R5-SPI to the entire MCS varies continuously with the control parameters. In that notation, the well-studied cross-spirals (CSPI) represent a special case of MCS as they consist of two *mirror-symmetric* spiral components. Moreover the ribbon (RIB) solution (axially standing waves) can be seen as an CSPI with equal mode amplitudes (here 3-RIB). Thereby these MCS can appear in two different ways. They can appear as a bypass solution connecting the *same* SPI branch or they can appear as an interim solution connecting *different* SPI branches.

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Date submitted: 11 Aug 2011 Electronic form version 1.4