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An experimental study on merging of two co-axial co-rotating vortex rings JAGANNADHA SATTI, Univesity of Alaska Fairbanks, JIFENG PENG, University of Alaska Fairbanks — The merging of two co-axial, co-rotating vortex rings is studied experimentally. Two laminar vortex rings were generated consecutively from a piston-cylinder apparatus. The two rings propagate in the same direction and the spatial separation between them decreases until they start merging. Special cases of leapfrogging were also observed. Digital particle image velocimetry was used to measure the flow fields. Core sizes, trajectories and circulations were measured for individual rings before the merging, as well as afterwards for the merged ring. At low Reynolds number, the total circulation in the flow is relatively a constant before and after merging. However, at high Reynolds number, the total circulation decreases quickly upon the contact of two vortex ring cores, indicating the transition to a turbulent vortex ring during merging. The circulation of the merged ring later stabilizes at a less level, indicating the merged ring becomes laminar again after shedding some circulation. Comparison between results from this experimental study and previous theoretical and computational studies in the literature are also discussed.

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