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Transition to Turbulence in curved pipe AMIRREZA HASHEMI, FRANCIS LOTH, University of Akron, Akron, Ohio — Studies have shown that transitional turbulence in a curved pipe is delayed significantly compared with straight pipes. These analytical, numerical and experimental studies employed a helical geometry that is infinitely long such that the effect of the inlet and outlet can be neglected. The present study examined transition to turbulence in a finite curved pipe with a straight inlet/outlet and a 180 degrees curved pipe with a constant radius of curvature and diameter (D). We have employed the large scale direct numerical simulation (DNS) by using the spectral element method, nek5000, to simulate the flow field within curved pipe geometry with different curvature radii and Reynolds numbers to determine the point of the transition to turbulence. Long extensions for the inlet (5D) and outlet (20D) were used to diminish the effect of the boundary conditions. Our numerical results for radius of curvatures of 1.5D and 5D show transition turbulence is near Re=3000. This is delayed compared with a straight pipe (Re=2200) but still less that observed for helical geometries (Reynolds number less than 5000). Our research aims to describe the critical Reynolds number for transition to turbulence for a finite curved pipe at various curvature radii.

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