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Study the Transient Gas Flow Through Tubes Applicable to Disruption Mitigation in Tokamaks M. BAKHTIARI, D.G. WHYTE, Univeristy of Wisconsin Madison, P.B. PARKS, General Atomics — Recently the high pressure gas injection and conventional massive gas puffing in recent large tokamaks have been shown to be effective disruption mitigation techniques. Injected gas species usually include pure noble gases, hydrogen, or mixtures of them. In order to study such techniques we have developed a shock capturing code to simulate the transient multicomponent gas flows in a tube taking into account the friction forces from the tube on the flow. Validity of the code was confirmed by the available experimental results and the analytical calculations. For the high pressure gas injections such as those in DIII-D disruption mitigation experiments with directed gas tube it is shown that although the flow in the tube is at first supersonic the flow in the end of tube is eventually subsonic or transonic. It is also shown that injecting a mixture of hydrogen and a high-Z noble gas leads to faster and more effective density and radiation rises. The flow of a gas mixture of 2% of Argon and 98% of Hydrogen shown to be very similar to that of a pure hydrogen. Fast delivery of small amounts of argon would lead to a fast cold front penetration which consequently makes the hydrogen atoms penetration to be faster toward the central regions.

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