Abstract Submitted
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Nuclear Fusion Blast and Electrode Lifetimes in a PJMIF Reactor[1] Y.C. FRANCIS THIO, F.D. WITHERSPOON, A. CASE, S. BROCKINGTON, E. CRUZ, M. LUNA, HyperJet Fusion Corporation, S.C. HSU, LANL — We present an analysis and numerical simulation of the nuclear blast from the micro-explosion following the completion of the fusion burn for a baseline design of a PJMIF fusion reactor with a fusion gain of 20. The stagnation pressure from the blast against the chamber wall defines the engineering requirement for the structural design of the first wall and the plasma guns. We also present an analysis of the lifetimes of the electrodes of the plasma guns which are exposed to (1) the high current, and (2) the neutron produced by the fusion reactions. We anticipate that the gun electrodes are made of tungsten alloys as plasma facing components reinforced structurally by appropriate steel alloys. Making reasonable assumptions about the electrode erosion rate (100 ng/C transfer), the electrode lifetime limited by the erosion rate is estimated to be between 19 and 24 million pulses before replacement. Based on known neutron radiation effects on structural materials such as steel alloys and plasma facing component materials such as tungsten alloys, the plasma guns are expected to survive some 22 million shots. At 1 Hz, this equal to about 6 months of continuous operation before they need to be replaced.

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