Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Implementation of a long leg X-point target divertor in the ARC fusion pilot plant A.Q. KUANG, N.M. CAO, A.J. CREELY, C.A. DENNETT, J. HECLA, H. HOFFMAN, M. MAJOR, J. RUIZ RUIZ, R.A. TINGUELY, E.A. TOLMAN, D. BRUNNER, B. LABOMBARD, B.N. SORBOM, D.G. WHYTE, MIT, P. GROVER, C. LAUGHMAN, MERL — A long leg X-point target divertor geometry in a double null geometry has been implemented in the ARC pilot plant design [1], exploiting ARC's demountable toroidal field (TF) coils and FLiBe immersion blanket, which allow superconducting poloidal field coils to be located inside the TF coils, adequately shielded from neutrons. This new design maintains the original TF coil size, core plasma shape, and attains a tritium breedin ratio ≈1.08. The long leg divertor geometry provides significant advantages. Neutron transport computations indicate a factor of 10 reduction in divertor material neutron damage rate compared to the first wall, easing requirements for high heat flux components. Simulations have shown that long legged divertors are able to maintain a passively stable detachment front that stays in the divertor leg over a wide power window [2], in principle, responding immediately to fast changes in power exhaust. The ARC design exploits this new paradigm for divertor heat flux control: fewer concerns about coping with fast transients and a focus on neutron-tolerant diagnostics to measure and adjust detachment front locations in the outer divertor legs over long timescales. [1] Sorbom, B. N., et al. *Fusion Engineering and Design* 100 (2015) 378-405; [2] Umansky, M. V., et al. *Physics of Plasmas* 24 (2017) 056112.

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Date submitted: 12 Jul 2017 Electronic form version 1.4