Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

**Universal Lower Limit on Vortex Creep in Superconductors** SERENA ELEY, Los Alamos National Laboratory, MASASHI MIURA, Seikei University, BORIS MAIOROV, LEONARDO CIVALE, Los Alamos National Laboratory — In high-temperature superconductors, creep (the rate of thermally-activated vortex motion, $S$) considerably limits the current carrying capacity. The magnitude of $S$ is thought to somehow positively correlate with the Ginzburg number ($Gi$), which depends on the critical temperature ($T_c$) and material-specific length scales. Early measurements of $S$ in iron-based superconductors unveiled rates comparable to $YBa_2Cu_3O_{7-\delta}$, which was puzzling given that $Gi$ is orders of magnitude lower in iron-based superconductors. Here, we report very slow creep in $BaFe_2(As_{0.67}P_{0.33})_2$ films and evince the efficacy of $BaZrO_3$ inclusions in reducing $S$ at high fields. We propose that there is a universal minimum realizable $S \sim Gi^{\frac{1}{2}}(\frac{T}{T_c})$ , and show that it has been achieved in our films, a few other superconductors, and violated by none. This hard constraint has two broad implications: first, the creep problem in high-$T_c$ superconductors cannot be fully eliminated and there is a limit to how much it can be ameliorated, and secondly, we can confidently predict that any yet-to-be-discovered high-$T_c$ superconductor will have fast creep.

Serena Eley
Los Alamos National Laboratory

Date submitted: 28 Oct 2016 Electronic form version 1.4