Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Shear banding and shear jamming in homogeneously sheared granular material[1] YIQIU ZHAO, Department of Physics, Duke University, Durham, NC, 27708, USA, JONATHAN BARÉS, Laboratoire de Mécanique et Génie Civi, Université de Montpellier, CNRS, Montpellier, 34090, France, HU ZHENG, Department of Geotechnical Engineering, College of Civil Engineering, Tongji University, Shanghai, 200092, China, JOSHUA E. S. SOCOLAR, Department of Physics, Duke University, Durham, NC, 27708, USA — We experimentally study the generation and evolution of a shear band during quasistatic shearing of a 2D granular material using a novel split-bottom Couette apparatus in which a layer of photo-elastic disks rests on a base consisting of 21 independently controllable concentric rings. The rings rotate at different rates to generate a uniform basal shear profile. Previous experiments using this setup [arXiv:1904.10051] showed that a steady localized shear band is generated at sufficiently large strains when the packing fraction is higher than a critical value $\phi_c \approx 0.78$, which lies between the minimum shear jamming density and the isotropic jamming density. In the present work, we focus on the evolution and structure of the shear band. We find that the width of the shear band is independent of the global packing fraction above ϕ_c, and we analyze the spatial variations in the local packing fraction, the force network structure, and the particle flow field throughout the shearing process.

[1]This work was supported by NSF-DMR1206351, NSF-DMS1248071, and NASA NNX15AD38G. H.Z. also received support from NSFC 41672256 and NSFC(Jiangsu)BK20180074.

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Date submitted: 01 Aug 2019 Electronic form version 1.4