

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

**Oscillations of the Magnetoresistance and the Critical Current
in MoGe Thin Films with Hole-arrays in Square Vortex-ice Geometry¹**

MICHAEL LATIMER, *,***, GOLIBJON BERDIYOROV, ****, RALU DIVAN,
IL WOONG JUNG, **, ZHILI XIAO, *,***, FRANCOIS PEETERS, ****, WAI-
KWONG KWOK, * Matr. Sci. Div. Argonne National Lab.*, Center for Nanoscale
Matr. Argonne National Lab.**, Northern Illinois Univ.***, Universiteit Antwer-
pen**** — Resistivity measurements on MoGe thin films containing hole-arrays in
square vortex-ice configuration were carried out to study the formation of a frus-
trated vortex state. MoGe thin films of 20 nm thick were prepared by sputter-
deposition and holes with spacings of 200 nm - 400 nm and diameters from 100 nm
to 300 nm were introduced into them using focused-ion-beam milling. We observed
unusual matching effects: depending on the hole-hole spacing and the experimental
temperature, the pinning enhancement at the half matching field can be stronger
than that at the first matching field, as divulged by the deeper dip in the magnetore-
sistance and the higher peak in the critical current. Computer simulations within
the nonlinear time-dependant Ginzburg-Landau theory reveal an origin of vortex
jamming in the square vortex-ice state, indicating the first experimental realization
of a square vortex-ice.

¹Work supported by the Department of Energy, Office of Science, Office of Basic
Energy Sciences under Contract No. DE-AC02-06CH11357. Nanofabrication done
at the Center for Nanoscale Materials, Argonne National Laboratory.

Michael Latimer
Materials Science Division Argonne National Laboratory &
Department of Physics Northern Illinois University

Date submitted: 18 Nov 2012

Electronic form version 1.4