Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Vortex rings in drop impact on liquid pool JI SAN LEE, SU JI PARK, Dept. Materials Science and Engineering, Pohang University of Science and Technology (POSTECH), Korea, BYUNG MOOK WEON, Schoold of Advanced Materials Science and Engineering, Sungkyunkwan University, Korea, KAMEL FEZZAA, Advanced Photon Source, Argonne National Laboratory, USA, JUNG HO JE, Dept. Materials Science and Engineering, Pohang University of Science and Technology (POSTECH), Korea — Since Thomson and Newall's pioneering work in 19th century, the formation of a vortex ring by drop impact has attracted many scientists over a century because of fundamental interests involved as well as importance in fluid mixing and mass transport process. However, the origin of vorticity and the dynamics of vortex ring are for the most part unexplored and not clearly understood yet. In this study, unprecedented dynamic features of vortex rings in drop impact are unveiled by applying ultrafast X-ray imaging. We reveal that capillary waves contribute to the generation of multiple vortex rings along the wall of the drop. Each ring shows different vorticity, specifically different dependency on Reynolds number. Finally we build up a phase diagram for the multiplicity of vortex rings, which shows a novel analogy with external jetting phenomena in drop impact on liquid pool.

Ji San Lee
Dept. Materials Science and Engineering, Pohang University of Science and Technology (POSTECH), Korea

Date submitted: 01 Aug 2014 Electronic form version 1.4