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**Impact of a vortex ring on a wall with a circular cutout** JIACHENG

HU, SEAN D. PETERSON, Department of Mechanical and Mechatronics Engineering, University of Waterloo — The rising interests in the development of small-scale energy harvesters have prompted research efforts into fluid interactions with highly deformable materials, with a few studies utilizing vortex rings as the energy source. In particular, Hu et al. (JIMSS, 2014) investigated a vortex ring impacting a concentric deformable annulus and found that a smaller ring appears and propagates away post impact. However, due to the fixture of the structure, the interaction process was not captured. The present study is a follow-up experiment to elucidate the smaller ring formation using a rigid wall with a circular cutout. We observe that the smaller ring is formed out of the induced vorticity at the cutout tip. Furthermore, despite the cutout, the classical vortex ring - wall interaction still occurs, wherein the induced boundary layer on the impact side of the wall ejects secondary and tertiary rings near the wall. Interestingly, when the cutout is shifted off-center, the wall splits the original ring into two portions. The portion that passes through the hole connects with the induced vorticity at the cutout tip, forms a new ring, and propagates away at an angle; the blocked portion follows the classical vortex ring - wall interaction.

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