Abstract Submitted
for the SHOCK19 Meeting of
The American Physical Society

Measuring strength of materials at very high strain rates using electromagnetically driven expanding cylinders EYAL AVRIEL, ZEV LOVINGER, Rafael Advanced Defense Systems, Haifa, 31021, Israel, RONI NEMIROVSKY, Technion Solid State Institute and Physics Department, Technion, Haifa, 32000, Israel, DANIEL RITTEL, Technion Faculty of Mechanical Engineering, Technion, Haifa, 32000, Israel — In this work we developed a new methodology to measure the strength of materials at very high strain rates, using magnetically driven expanding cylinder experiments by the means of a pulse current generator (PCG). The expansion of the specimen is done using a "pusher" configuration, enabling one cylinder which carries the magnetic load to push out the external tested material, with negligible effects of the current/magnetic field on it. This allows also to test with this technique any material, regardless its conductivity. We use a hybrid analysis methodology to measure and define the yield stress in the tests, using the combination of experimental and numerical analyses. The analysis is conducted at the *forced* stage of acceleration unlike standard expanding ring/cylinder tests in the literature which use the free ?ight stage for the strength analysis. This allows to take advantage of the high rate regime, dominated by the fast rise-time of the PCG and thus to reach very high strain rates. The technique is demonstrated for OFHC copper up to strain rates of $7.5{\cdot}10^4$ sec^{-1} and is compared with other results in the literature for this material.

Zev Lovinger
Rafael Advanced Defense Systems

Date submitted: 28 Feb 2019 Electronic form version 1.4