Abstract Submitted
for the SHOCK19 Meeting of
The American Physical Society

Electrically stimulated high speed microjet for medical applications HWI-CHAN HAM, JACK YOH, Seoul National University — Painless needle-free drug injection can be realized using the principle of energy focusing into an infinitesimal area with underwater spark discharge. The power supply unit charges the capacitor with the energy of 2.2 J, thereby releasing the charged energy upon the focusing point of the water chamber. Consequently, joule heating of the water by dielectric breakdown phenomenon generates the cavitation bubbles, and the liquid drug is accelerated to the speed of sound, being ejected out from a micro sized orifice. The resulting microjet speed of 350 m/s within the response time of 10 s is reached. This fast response time enables the micro volume of liquid jet to penetrate the skin epidermis. We build the rapid repetition cycle of spark discharging so that the device injects microliters of drug at the rate of 10 20 shots per second, thereby the injection volume is controlled. The equivalent power consumption is 60 watts. The device replaces the previously developed laser-driven injector that requires 2200 watts at a much higher cost of operation [Park, et al., Er:YAG laser pulse for small dose splashback-free microjet transdermal drug delivery, Optics Letters, 37(18), pp. 3894-3896, (2012)]

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Date submitted: 26 Feb 2019 Electronic form version 1.4