Abstract Submitted
for the DNP15 Meeting of
The American Physical Society

Feasibility of Colliding-beam fast-fission reactor via $^{238}U^{80+}$+$^{238}U^{80+}$ →4 FF+ 5n + 430 MeV beam with suppressed plutonium and direct conversion of fission fragment (FF) energy into electricity and/or Rocket propellant with high specific impulse

BOGDAN MAGLICH, TIM HESTER, California Science & Engineering Corporation (CALSEC), CALSEC COLLABORATION — Uranium-uranium colliding beam experiment[1], used fully ionized $^{238}U^{92+}$ at energy 100GeV→←100 GeV, has measured total σ = 487 b. Reaction rate of colliding beams is proportional to neutron flux-*squared*. First functional Auto-Collider[3−6], a compact Migma IV, 1 m in diameter, had self-colliding deuterons, D^+, of 725 KeV→←725 KeV, resulting in copious production of T and ^{3}He. U+U Autocollider *"EXYDER"* will use strong-focusing magnet[7], which would increase reaction rate by 10^4. 80 times ionized U ions accelerated through 3 MV accelerator, will collide beam 240 MeV→←240 MeV. Reaction is: $^{238}U^{80+}$ + $^{238}U^{80+}$ → 4 FF+ 5n + 430 MeV. Using a simple model[1] fission σ_f ∼ 100 b. Suppression of Pu by a factor of 10^6 will be achieved because NO thermal neutron fission can take place; only fast, 1 -3 MeV, where σ_{abs} is negligible. Direct conversion of 95% of 430 MeV produced is carried by electrically charged FFs which are magnetically funneled for direct conversion of energy of FFs *via* electrostatic decelerators[4, 11]. 90% of 930 MeV is electrically recoverable. Depending on the assumptions, we project electric power density production of 20 to 200 MW_e m^{-3}, equivalent to Thermal 1.3 – 13 $GW_{th}m^{-3}$. If one-half of unburned U is used for propulsion while rest powers system, heavy FF ion mass provides specific impulse Isp=10^6 sec., 10^3 times higher than current rocket engines.

Bogdan Maglich
California Science & Engineering Corporation (CALSEC)

Date submitted: 09 Jul 2015 Electronic form version 1.4