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Double-Helix, High-Frequency Gravitational Wave Generator Utilizing Nano Piezoelectric Crystals

Robert M L Baker, Jr.* and Bone Sue Baker

Transportation Sciences Corporation and GravWave LLC, Playa del Rey, California 90293, USA

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The Double-Helix, High-Frequency Gravitational Wave (HFGW) Generator is described that makes use of a newly described nano/quartz-deposited-on-silicon fabrication technique. This new technique suggests that the integration of quartz with silicon may provide a route to fabricate advanced (and much smaller) piezoelectric devices. The laboratory HFGW generator concept is to produce two equal and opposite jerks or force changes at two masses, not produced from centrifugal-force change as is the case with the orbit of pulsar neutron stars, as observed and was the basis for the indirect confirmation of the existence of gravitational waves, but rather by the force change produced by EM micro-electromechanical systems (MEMS). For example the MEMS could be film-bulk acoustic resonators (FBARs). An FBAR is a rather standard oscillator found micro- in almost every cell phone and manufactured by the billions! They involve an oscillating mass that undergoes repeated jerks (force changes as it oscillates) and would be placed in pairs on opposite ribbons of the HFGW generator's double helix windings. Using the new technique an FBAR could have each dimension reduced by a factor of one thousand and, the approximate 50 μm piezoelectric size of conventional FBARs reduced to 5nm for an overall 10^{12} reduction in FBAR size! The number of FBARs is proportional to the inverse cube of a dimension of an FBAR (the smaller the FBAR, the more you can pack in the apparatus). The generated HFGW flux, Wm^{-2}, is proportional to the square of the number of FBARs due to the focusing effect of a string of HFGW sources called "Superradiance." The best fabrication means would be 3D printing of the nano-quartz-crystal FBARs and associated circuits. Estimates of the improvement in Double-Helix flux generation using the new technique are discussed as is its application to global HFGW communication.

Keywords: Gravitational waves, nano-quartz, FBARS, micro-electromechanical systems, high-frequency gravitational waves, 3D printing