A Mathematically Generated Bessel Function Based Ultrasonic Waveform Tractor Beam for Optimizing Blood Circulation

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The scientist set out to further optimize on a previous Bessel Function approach to improving blood circulation using complex ultrasonic waveform. An algorithm and associated C code was developed to produce a repeating first kind Bessel function. The repetition period of the mathematically generated tractor Bessel function is such that it will produce a tractor beam capable of moving particles of the desired size. The C code also produces a phase shift on the mathematically generated tractor Bessel function, thus producing the "tractor beam" effect pushing particles in a particular direction at a speed determined by the rate of the phase shift. This system was enhanced by adding a second ultrasonic transducer that operates in a push-pull configuration increasing the overall effective delivered power. Instead of a recording of Bessel functions generated by percussion instruments, a mathematically generated tractor beam function is utilized. A custom-made apparatus using plastic tubing, a peristaltic pump, and a pressure measuring gauge was utilized to measure the pressure of simulated blood pumping through it. As in past years, the apparatus was then exposed to the mathematically produced Bessel function tractor beam waveform resulting in a significantly better pressure reduction performance of approximately 9.3%. Due to regulations, no real blood or analogous organic material was used, and thus more formal testing would be required for this device to be used in the medical field with its infinite medical applications. The scientist has once again improved on an already enhanced ultrasonic circulatory therapy system.

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