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SINGLE BUBBLE SONOLUMINESCENCE IN MICROGRAVITY

Abstract

Sonoluminescence is a process of creating light from sound as a result of acoustic cavitation. A single bubble of air can be trapped in a sound field and made to grow and collapse. On collapse, at a certain driving pressure, a flash of light is produced. This process then repeats and can be made stable for several days. Despite extensive research, the mechanism and source of this light remains a matter of contention.

The use of a microgravity environment offers the potential to explore new avenues in this topic and expand the known parameter space of Single Bubble Sonoluminescence (SBSL). From theory and observation, there are understood to be shape instabilities in the surface of the bubble during the collapse. These are due to buoyancy and thus are driven by gravity. It is expected that in the absence of gravity, the bubble collapse will be more spherical and will allow for SBSL with a larger equilibrium bubble radius and higher driving pressures than is possible under 1g conditions. This experiment has been performed in parabolic flight experiments and SBSL has been achieved with an increase in flash intensity.

This paper reports the work of a team of students from the International Space University as part of the newly formed Space Payload Laboratory participating in ESA's Drop Your Thesis! 2019 campaign developing an experiment for use in the ZARM 146 m drop tower. SBSL was successfully produced in the drop tower. To our knowledge, this is the first time a sonoluminescence experiment has been performed or reported using a drop tower. This is the first step towards further microgravity experimentation.