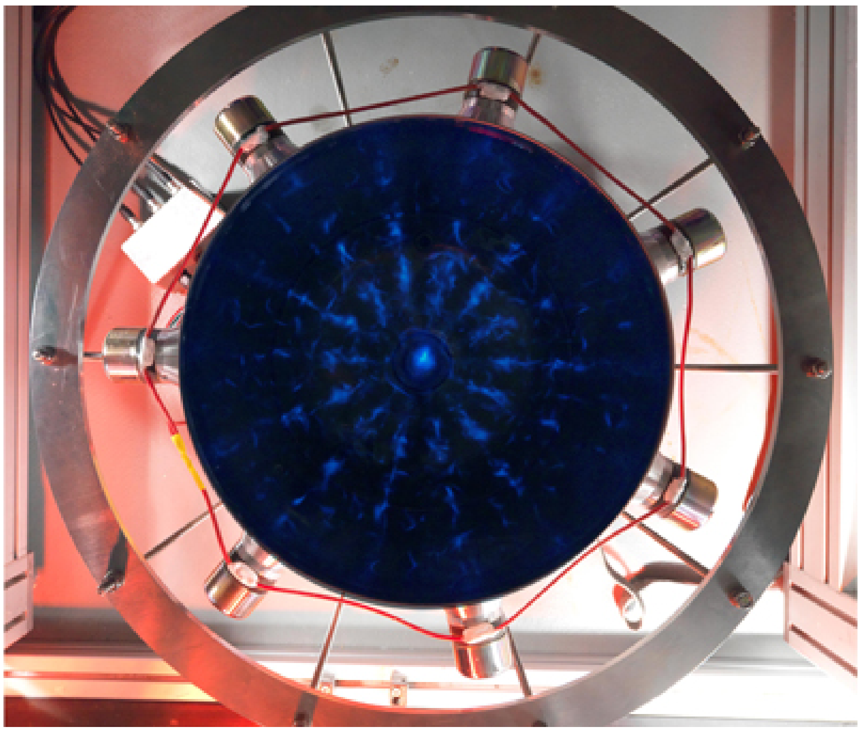
Seeing sound in a new light

November 24 2011

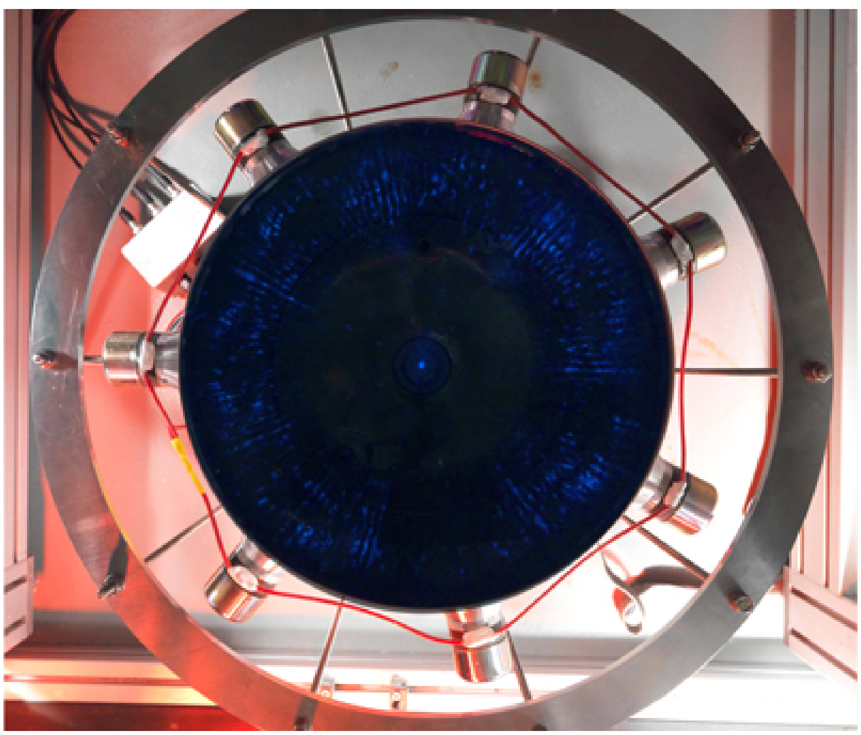


The new NPL reference cavitation vessel in operation, showing cavitating regions as a result of two different ultrasonic frequencies: 44 kHz and 136 kHz.

The National Physical Laboratory Acoustics team has been investigating acoustic cavitation – the formation and implosion of micro cavities, or bubbles, in a liquid caused by the extreme pressure variations of high intensity sound waves – using the new NPL reference vessel and a chemical commonly found at crime scenes.

Cavitation is the process by which bubbles form in a liquid and then rapidly implode following a change in pressure. You can see this clearly when ocean waves impact on the shore, or near a boat's propeller as it glides through the water, or in the presence of high intensity sound. Cavitation is sometimes an undesired effect as it leads to degradation of equipment such as water pumps, but it can also be put to good use, for example in cleaning and medical ultrasound applications.

Sonoluminescence is an emission of light that occurs as the bubbles implode, and is caused by high temperatures inside the bubbles during their collapse. This blue-ish luminescence can be enhanced using luminol - the same chemical used to detect trace amounts of blood at crime scenes - and observed with a standard camera. This enhancement of the effect using luminol is a phenomenon known as 'chemiluminescence'.



NPL scientists are using chemiluminescence to characterise the new NPL reference vessel: a unique facility designed to investigate the nature and location of cavitation at different acoustic frequencies. The presence of the blue light indicates where bubbles are imploding during exposure to the intense sound waves and, therefore, the location of acoustic cavitation.

Provided by National Physical Laboratory

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