Generation of acoustic vortices using leaky toroidal waveguides and perfect absorbers.

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Acoustic vortices are relevant because they can carry orbital angular momentum. One typical characteristic of the acoustic vortices is the helical dislocation of the wave front which is described by an azimuthal phase dependence exp(im\theta). The integer number m is called the topological charge, corresponding to the order of the vortex, which determines the total phase accumulated in one full annular loop around the propagation axis. Another property of the acoustic vortices is the indeterminate phase and null pressure magnitude at the core of vortices, which is useful for trapping and manipulating particles smaller than wavelength, through controlling and moving position of the central vortex null.

We propose in this stage the numerical and experimental characterization of a prototype working for audible noise based on a leaky waveguide finished by a perfect absorber. By tuning the perfect absorber to work at the resonance frequency of the waveguide, the leaky mode presents the right change of phase to create acoustic vortices.

The stage will be divided in two parts. One part devoted to the theoretical characterization of the system, by using numerical tools as COMSOL. A second part is devoted to design the prototype and characterize it in the anechoic chamber.

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