SUPERRADIANCE AND LENSE-THIRRING PRECESSION IN ACOUSTIC BLACK HOLE ANALOGUES

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'Superresonance' is our coinage of the phenomenon of acoustic superradiance that might occur in rotating acoustic black hole analogues. The talk reviews the conceptualization of this phenomenon within the Draining Sink class of two space dimensional analogue gravity models that occur in inviscid, barotropic fluids, in perfect analogy with superradiant scattering in Kerr black holes in physical spacetime. However, real fluids like water have a small non-vanishing viscosity, and the formulation of the acoustic perturbations of such a slightly viscous fluids leads to violation of Lorentz-invariance. The possibility of superradiance in such situations will also be discussed, together with ideas of further refinement derived from cosmology. Next, we discuss the phenomenon of acoustic Lense-Thirring precession associated with the dragging of inertial frames in the Draining Sink models. Finally, we discuss observational accessibility of the frame-dragging phenomenon, given that the virtual phonons constituting the acoustic perturbations have no directionality, implying that it is very hard to conceive of a gyroscope to measure the Lense-Thirring precession. We discuss two approaches, one based on some ideas of condensed matter physics, where a quantum phonon spin might be induced in certain types of crystals through specific spin-phonon interactions, thereby enabling a possibility of constructing a gyroscope. The other approach involves active fluids with bacteria swimming within them, carrying with them an orientation that is affected by acoustic perturbations of the background acoustic spacetime. We briefly describe an ongoing effort to make such a system useful for the detection of acoustic intertial frame dragging.