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Quantum Analogies in the Interaction between Acoustic Waves and Bubble Clouds[1] MIGUEL A. PARRALES, Universidad de Sevilla, JAVIER RODRIGUEZ-RODRIGUEZ, Universidad Carlos III de Madrid — Analogies between quantum mechanical and acoustical propagation phenomena have a great interest in academic research due to their ability to shed light on some complex quantum effects, which are impossible to visualize directly in the macroscopic world. In this talk, we describe a number of these analogies concerning the acoustic behavior of bubble clouds. Firstly, we show that the structure of the collective oscillation modes of a spherical bubble cloud resembles that of the atomic orbitals of a hydrogen atom. Secondly, we present an analogy between some perturbation methods used in quantum-electrodynamics and the computation of the acoustic response of the randomly distributed bubble cloud by considering the contribution to the total scattered pressure of the multiple scattering paths that take place inside the clouds. As an application of this analogy, we obtain the scattering cross-section of a diluted cloud, which remarkably mimics the quantum scattering of an neutron wave when passing through an atomic nucleus. Finally, we numerically reproduce the behavior of an electron in a covalent bond between two hydrogen atoms by simulating the acoustic wave propagation through two neighboring spherical bubble assemblages.

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