Scar States on Propagation of Sound Wave  
in Stadium-shaped Chaotic Closed Region  

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The scar state, which is one of the essential discoveries in quantum chaos, are found on stationary acoustic wave in chaotic-shaped closed region: stadium billiard. The wave is excited by tiny virtual vibrator inside. The region is 3-dimensional, which consists of 2-dimensional stadium and relatively narrow 1-dimensional thickness. 

At present, a method that is used mainly to acoustic simulation is geometrical acoustics. It assumes that sound propagates like particles. However, geometrical acoustics is impossible to make accurate predictions, because sound has wave-properties such as interference and diffraction. 

In addition, the most advanced areas as the study of the wave is quantum mechanics. There is intensive analogy between acoustic wave and quantum mechanics. Fruitful results can be applied to acoustics, especially in semi-classical sense. The Sabine’s law is also discussed under the wave dynamical approach.

FIG1. Eigen state of quantum stadium  

FIG2. Exited stationary sound wave