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Activated Resonance Systems as Silencers and Sound Absorbers

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A great variety of classical resonance systems is used for sound absorption and attenuation in technical systems. Apart from other requirements such as minimum size, high reliability and low costs the acoustic efficiency can be fulfilled in a wide range. However, the performance is limited and focused on a certain frequency band. These restrictions can significantly be overcome by activation. A very clear system comprises a membrane (mass) and a rear air volume (spring) which can be assembled by using a conventional loudspeaker in front of a cassette. Even the 'passive' system is causing a respectable sound attenuation also at low frequencies. The activation is based on a microphone close to the membrane the signal (according to the exciting sound pressure) of which is linearly amplified and fed back to the loudspeaker. A lot of details have to be considered prior to the real applicability of such an activated resonator. But the remarkable benefits can be documented for numerous practical scenarios. Theoretical and experimental results are based on a sophisticated model of the resonant structure and its acoustic environment. Additionally, several practical challenges, e.g. the presences of turbulent air flow or high temperatures, can be solved by using specific modifications.