

## **The Spatial Digital Equalizer**

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### **Abstract**

While the sculpted chambers of Carnegie Hall offer an amazing musical experience, small rooms muffle and distort the grandeur of any listening experience. The acoustical properties of the room, such as its size and the material composition of its walls, directly impact the musical experience. Our goal is to demonstrate that using spatial acoustical characterization and digital signal processing to adaptively equalize recorded music, sound quality will become independent of the environment's intrinsic acoustical characteristics. First, a frequency sweep will be transmitted into the room, and the reflected signal, which carries acoustical information about the room, will be collected. An FPGA will be utilized to generate a transfer function of the space. This data will be processed--also using the FPGA--to calibrate audio filters. These filters will pre-process the music with frequency-dependent compensation for the specific acoustic characteristics of the room. This project will immediately provide users with concert-hall-quality music within virtually any space they choose.