Low Frequency Noise Attenuators

Equidistant Chamber Attenuator for Low Frequencies (eCALF)

DESIGN HIGHLIGHTS

Two Orifice Tube Resonator that Provides Low Frequency Broadband Attenuation
Composed of Same Length Chambers
Frequency Tuned by Adjusting Relative Orifice Sizes
Frequency Can be Adjusted Post Fabrication
Can be Used for Dual Purpose Structures that Integrate Tube Resonators
Weight Insensitive to Resonator Size
Simplifies Manufacturing
Can be Manufactured from Various Materials

CUSTOM DESIGN

Custom Resonator Size
Custom Frequency Range
Custom Resonator Shape

SUPERIOR PERFORMANCE

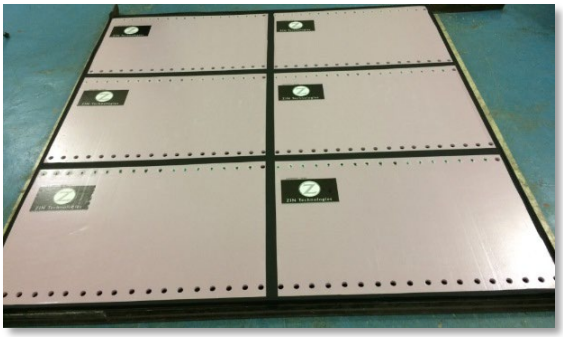
Light Weight Low Frequency Noise Attenuator
Superior Absorption per Weight
Superior Transmission Loss per Weight

PROJECTED LOW FREQUENCY RANGE

20 Hz - 160 Hz

PATENT PENDING

US Patent Application 15/154,155
“Tunable Acoustic Attenuator”



ZIN developed a light weight tube resonator based technology that provides broad band low frequency noise attenuation called eCALF. ZIN has tested eCALF for both absorption and transmission loss and obtained large attenuation levels especially considering the weight of eCALF.

Originally developed as a series of length varying quarter wave resonators to cover broad band frequency, ZIN developed the patent pending eCALF resonators to simplify manufacturing and enable easier access to individual resonator tuning. eCALF is composed of single length tube resonators, which are tuned to a specific frequency by varying the size of one of the two openings within the resonator. A series of these equal length resonators with two openings provides broad band attenuation.

ZIN’s eCALF design allows for a single length tube resonator to cover frequencies, which are proportional to frequencies based on half its length to its full length. This gives potential ranges of 20 Hz - 40 Hz, 40 Hz - 80 Hz, and 40 Hz - 160 Hz. These resonator ranges can be integrated with each other to obtain a broad band 20 Hz 160 Hz range. Individual resonators can be fine tuned post-fabrications by varying the size of one of the openings.

- **ZIN designs low frequency noise attenuators in-house, and can therefore tightly integrate structural, thermal, and acoustic requirements. ZIN designs custom eCALF resonators that offer size, weight, and efficiency advantages over traditional low frequency resonators.**
- **ZIN’s eCALF designs are can attenuate broad low frequency range or be tuned to provide mediation for particular frequency range or even specific frequency. ZIN developed eCALF technology allows flexible design to accommodate structures of various shapes and sizes while providing efficient noise attenuation due to both absorption and transmission loss.**
- **eCALF resonators were originally developed for aerospace applications, such as launch vehicles, but can be tuned for aeronautic applications to attenuate higher frequency noise.**

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