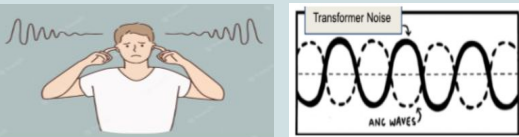


Need

- Intrusive transformer noise in Bossone 604A
- No clinical damage, but hinders productivity and well-being
- Background sounds unconsciously redirect our attention via auditory processing [1]

Objective

Develop a software program to analyze active noise and phase it out via active noise cancellation.



Design Inputs

- Constraints**
- Universal
 - Accessibility of Transformer
- Requirements**
- R1 - Sound Level
 - Reduction of at least 3dB
 - R2 - System Temperature
 - Maintain Temperature of at most 30 Degrees Celsius



Solution

Key Components:

Electret Microphone Amplifier MAX446

- Takes in Raw Sound



Arduino Uno + Software

- Filters and Transforms Raw Sound



Subwoofer

- Outputs New Composite Sound



Computer

- Software Development and Verification

Verification Testing

Verification Test 1 (Frequency Generation Accuracy) - **Pass**

Verification Test 2 (Sound Output Check) - **Pass**

Verification Test 3 (FFT Accuracy) - **Pass**

Verification Test 4 - Software Automation and Integration with Hardware		
<i>Solution Active?</i>	No	Yes
<i>Avg Measured Sound (dBA)</i>	52.4	55.7
<i>Difference from Solution being Non-Active</i>	0	3.3

Verification Test 5 - Component Temperature Check		
<i>Component s</i>	Arduino/ Microphone	Subwoofer
<i>Average Measured Temperature (°C)</i>	23.7	25.6

Conclusion and Societal Impact

Impact:

- Benefits students and researchers in the lab by improving noise exposure
- Design is applicable for different use settings (MRIs, HVAC systems)

Future Plans:

- Improvements to software processing and memory capabilities
- Market for commercial use and patent approval

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References

[1] eLife Sciences Publications, Ltd. (2020, March 20). *Why background noise can be so distracting*. eLife. Retrieved November 28, 2022, from <https://elifesciences.org/digests/52984/why-background-noise-can-be-so-distracting>