

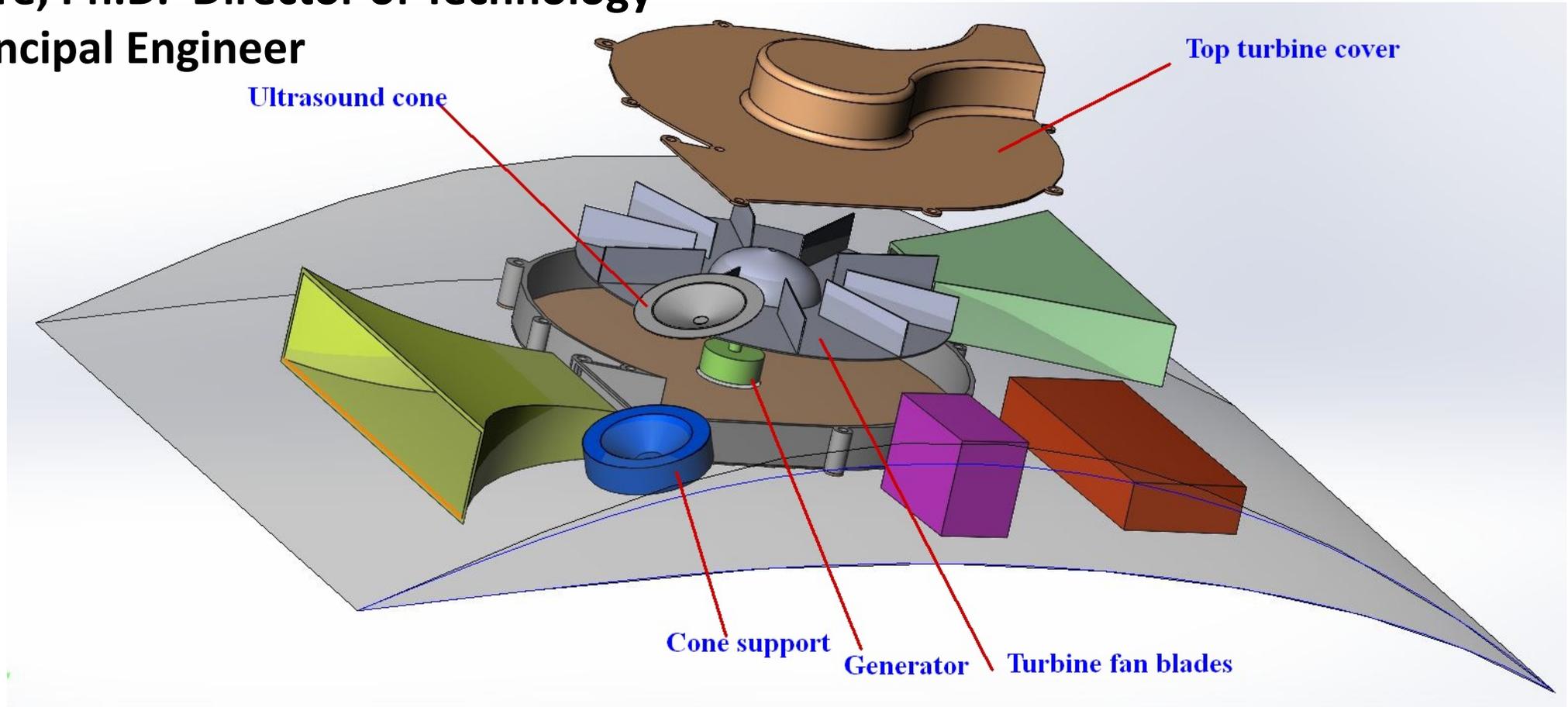
Self-Powered, Self-Standing Ultrasound Emitter for Bat Deterrent

Midé Technology Inc.

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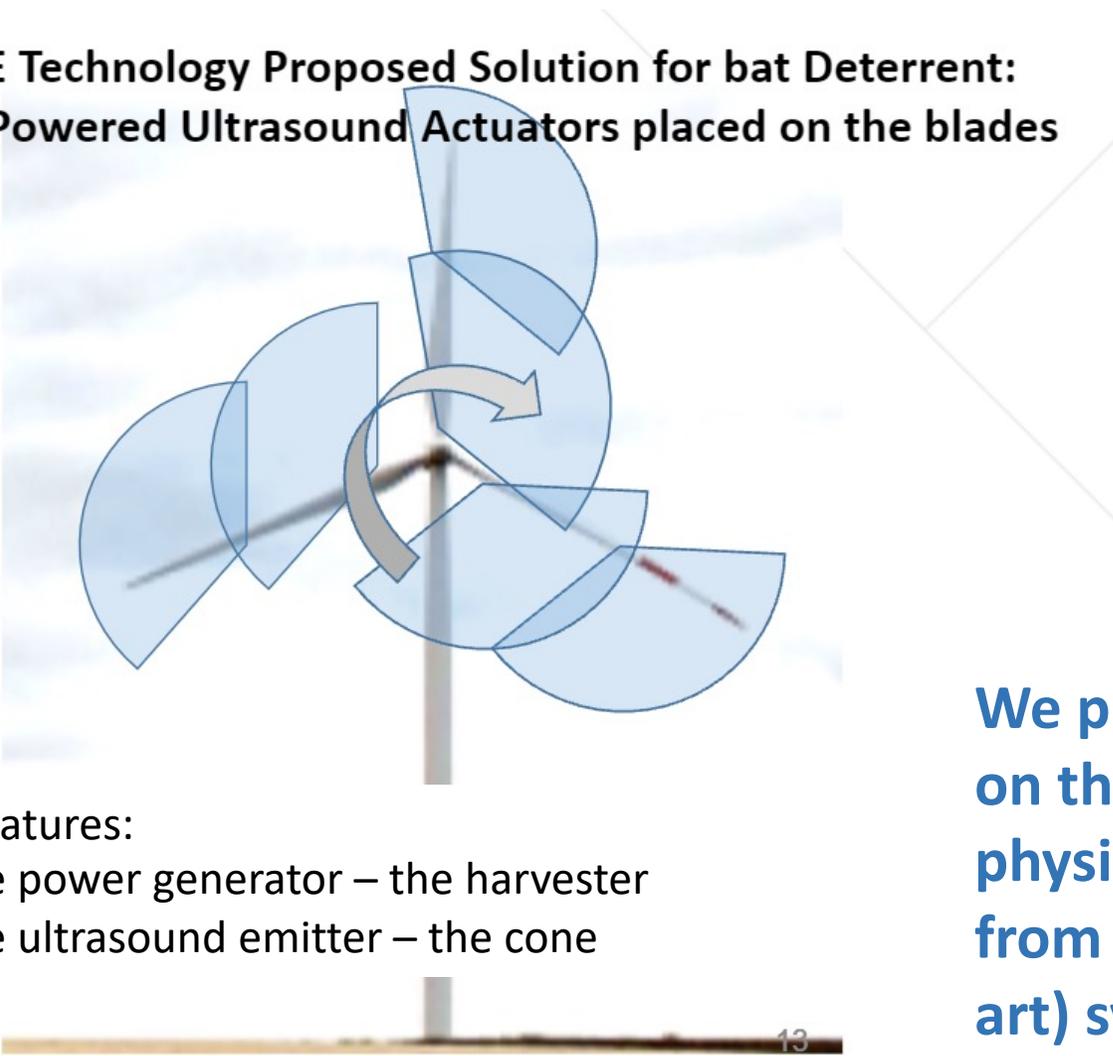
Rob Carter, Principal Engineer

Nov 5th 2021



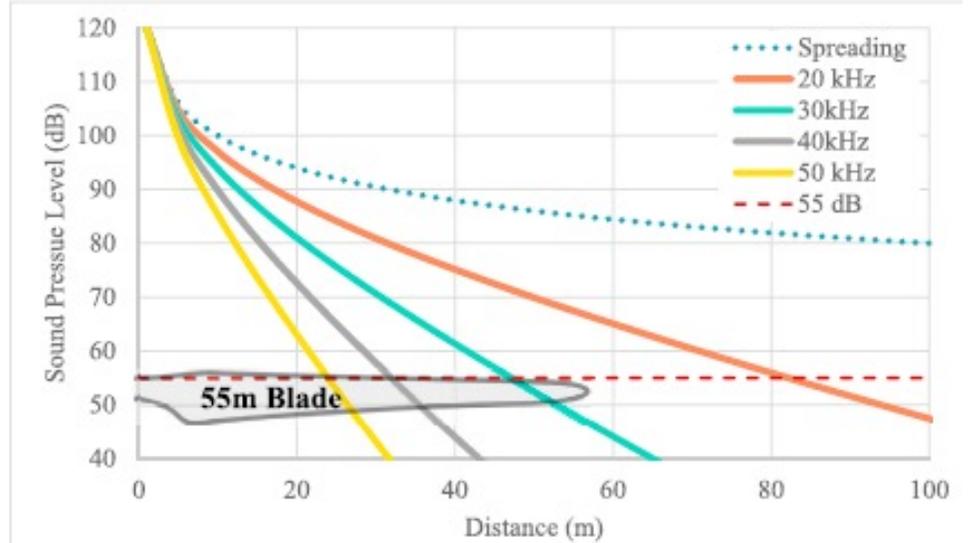
Project and Ambitions

**MIDE Technology Proposed Solution for bat Deterrent:
Self-Powered Ultrasound Actuators placed on the blades**



Key Features:

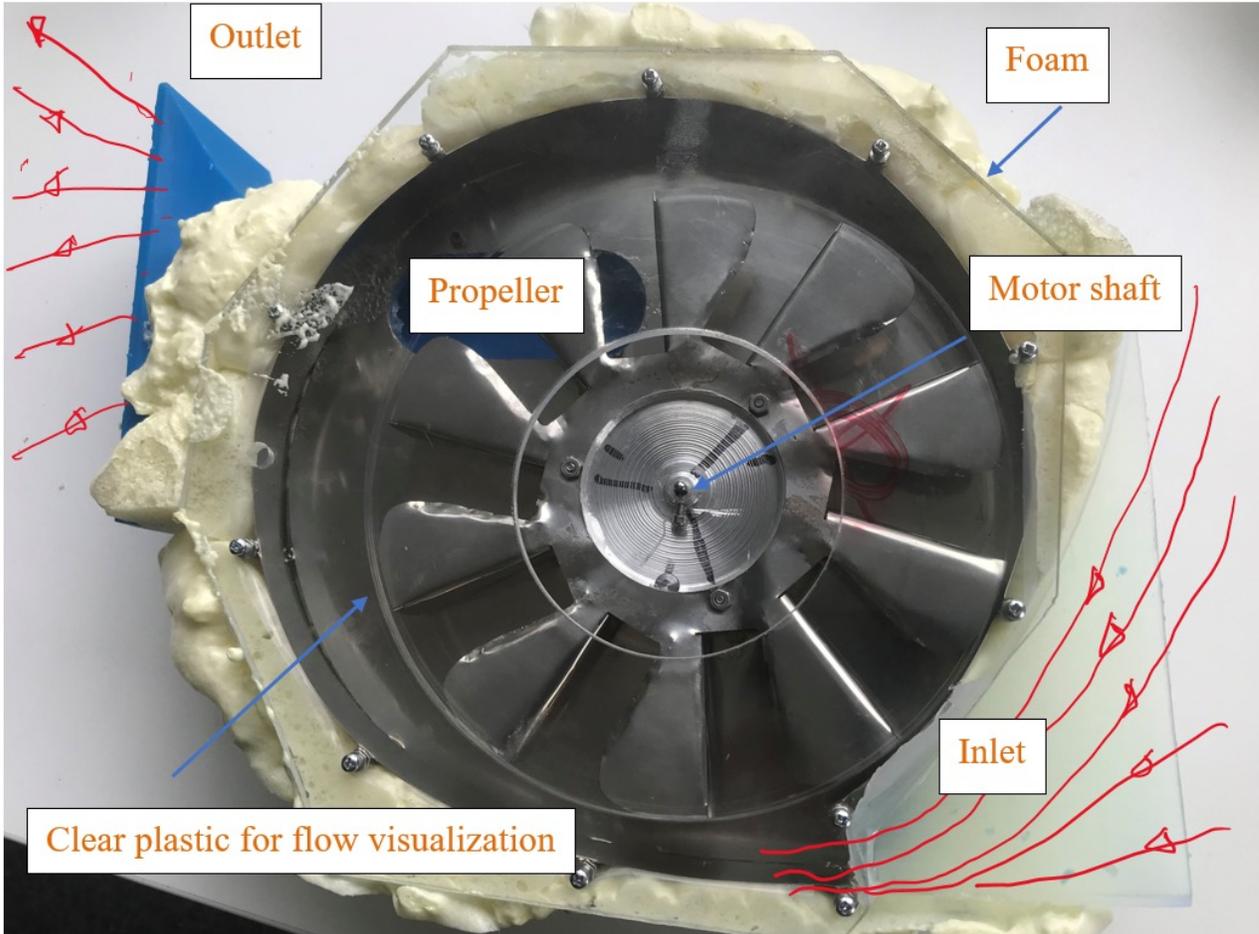
- The power generator – the harvester
- The ultrasound emitter – the cone



Courtesy of Sara Weaver: current state-of-the-art sound delivered by ultrasound transmitters as function of frequency and distance

We plan to develop a device that can be mounted on the blade of a wind turbine to overcome physical limitations on sending ultrasounds far from the nacelle or tower mounted (state-of-the-art) systems. The system will be self-standing and self-powered

The Harvester

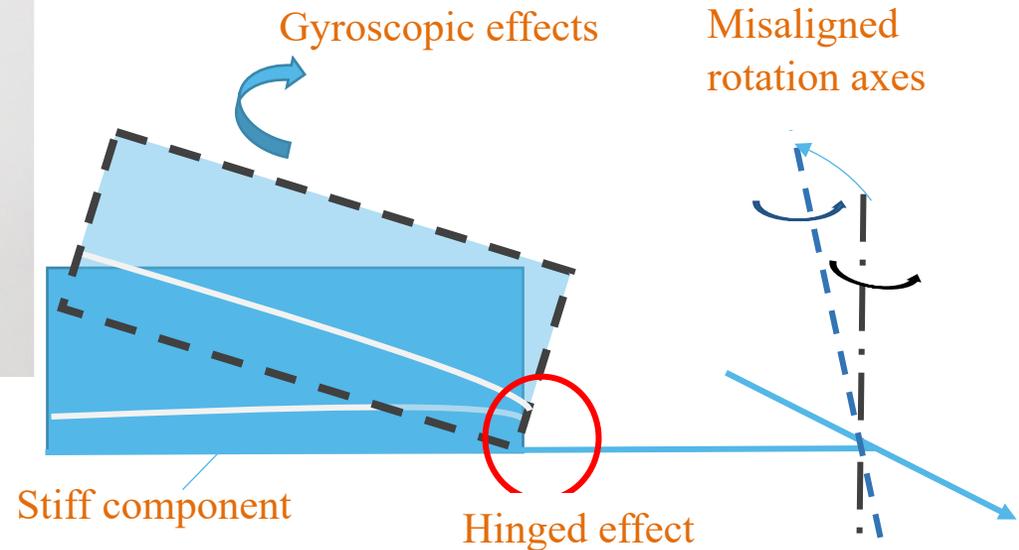


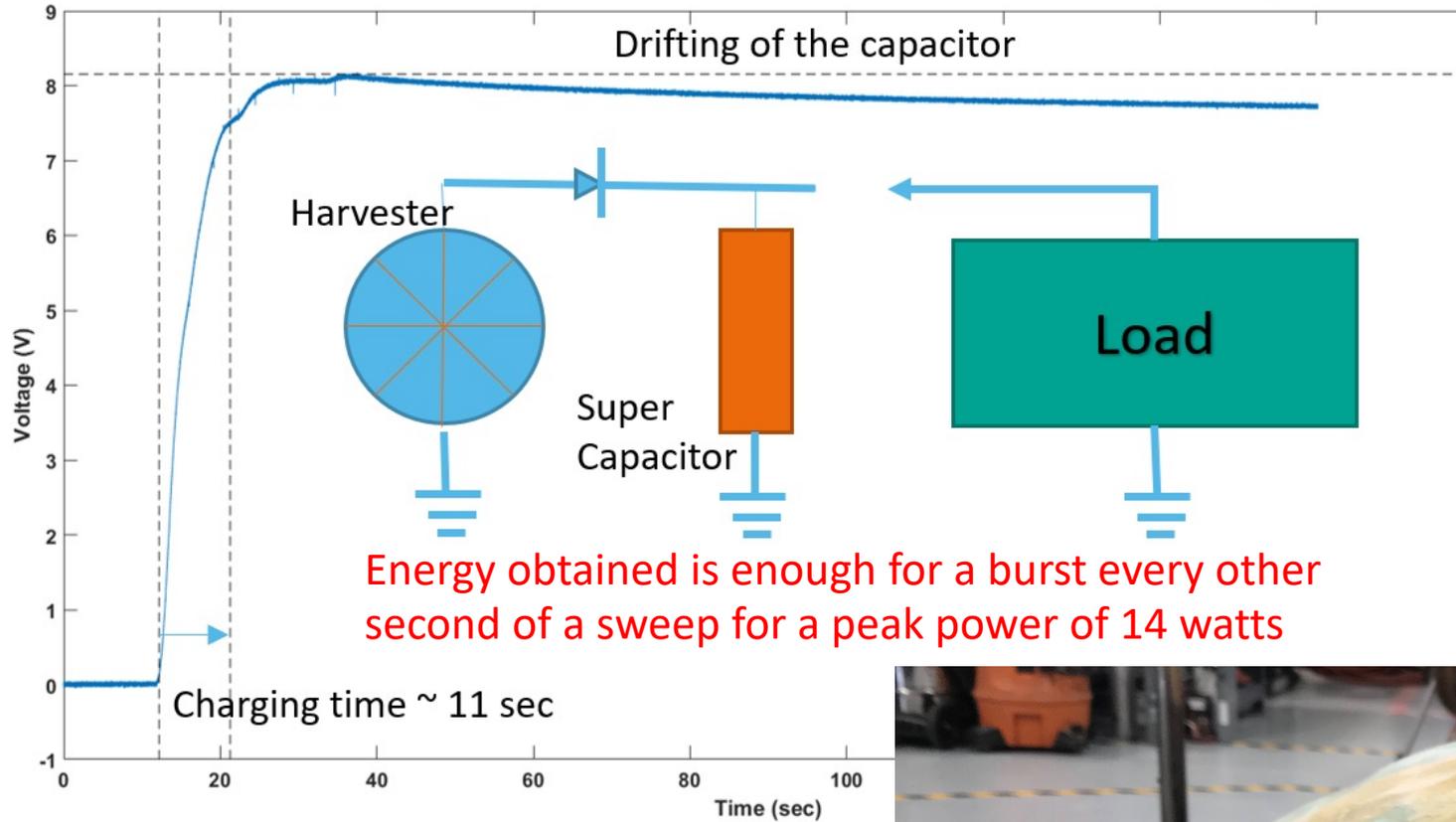
The propeller:

- Light weight
- Complaint to gyroscopic and centrifugal forces
- Easy to fabricate and to change in prototype phase
- Resistant to environment

The generator:

- Robust and capable of high power
- Two bearings to overcome forces

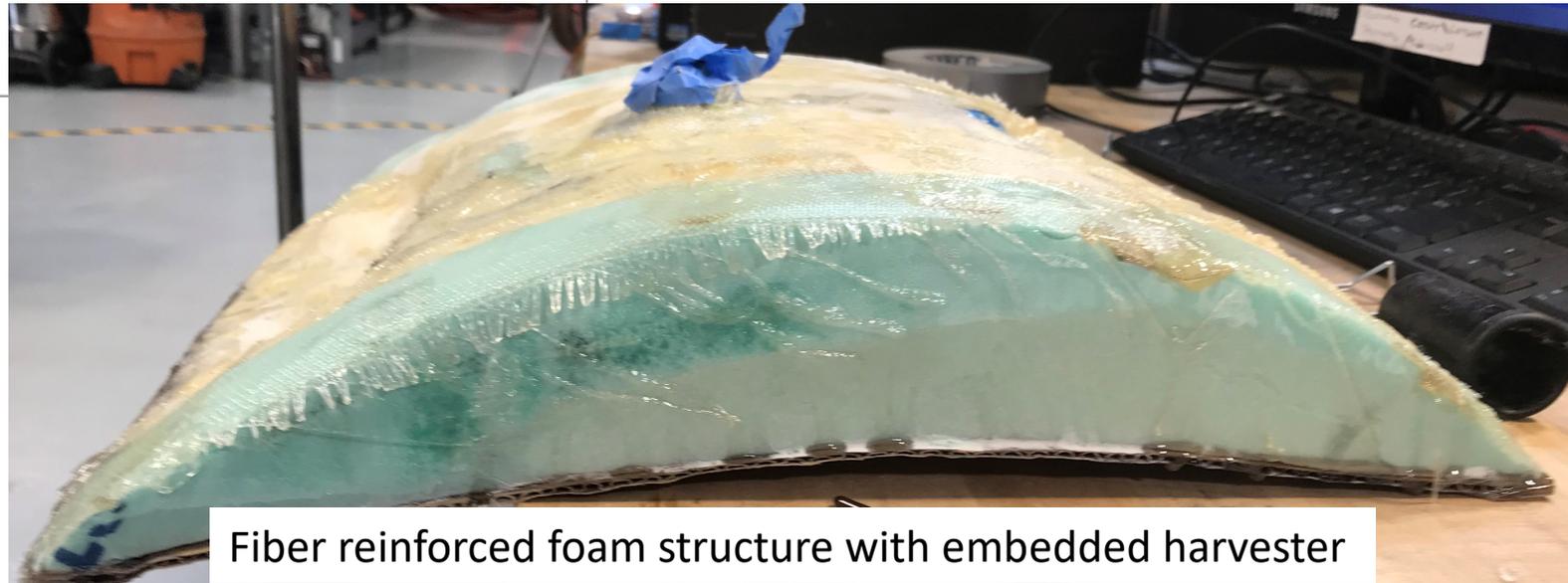




- The harvester has been embedded in the final shape and will be tested to (real) wind conditions
- Our plan is to mount it on the car roof and go at perhaps ½ the speed of the wind blade tip.
- Additional tests are programmed to verify functioning and survivability of high centrifugal forces

The plan is to use a supercapacitor to hold the harvested power and feed the electronics of the piezo emitter.

Supercapacitors should survive better than batteries for continuous charging systems. They are also lightweight when compared

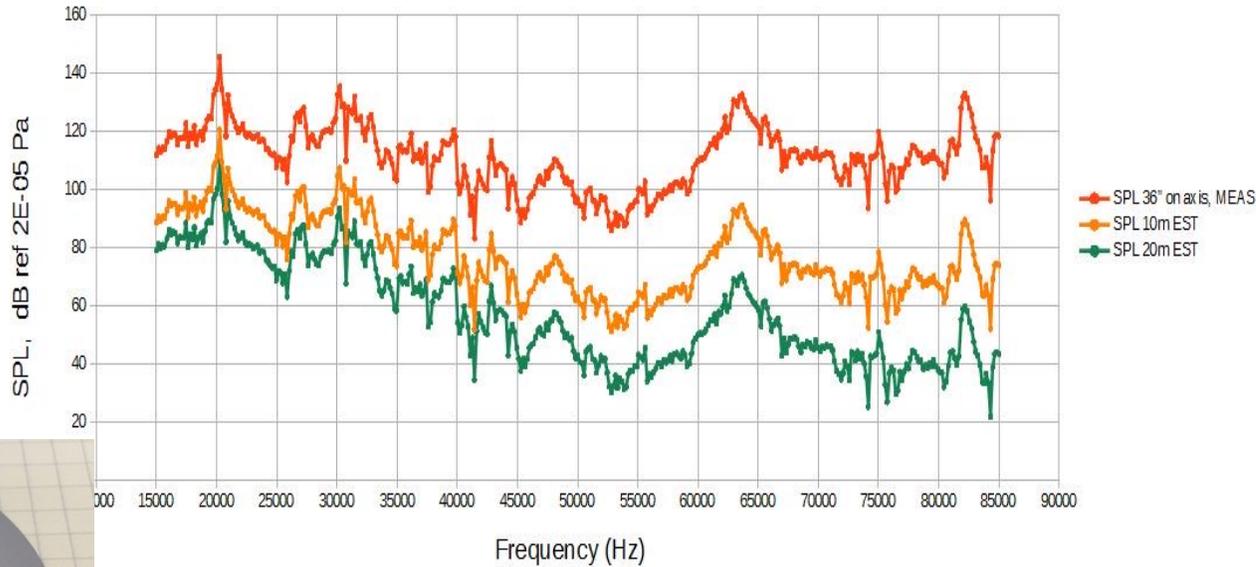


Fiber reinforced foam structure with embedded harvester

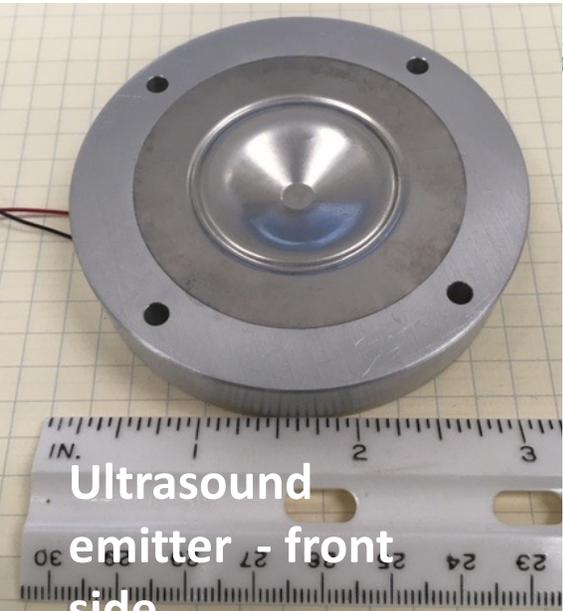
The Ultrasound Emitter

Approximate SPL Spectrum for Bat Deterrent Transducer Proto No. 2 (Cone Material: 0.004 inch Stainless Steel) at 10 and 20 meters

Assumed Conditions: 20 deg C, 50% RH, No Directivity



The fabrication of this cone has been a challenge. We had to reach out of country to make it (Newstamp-Italy)



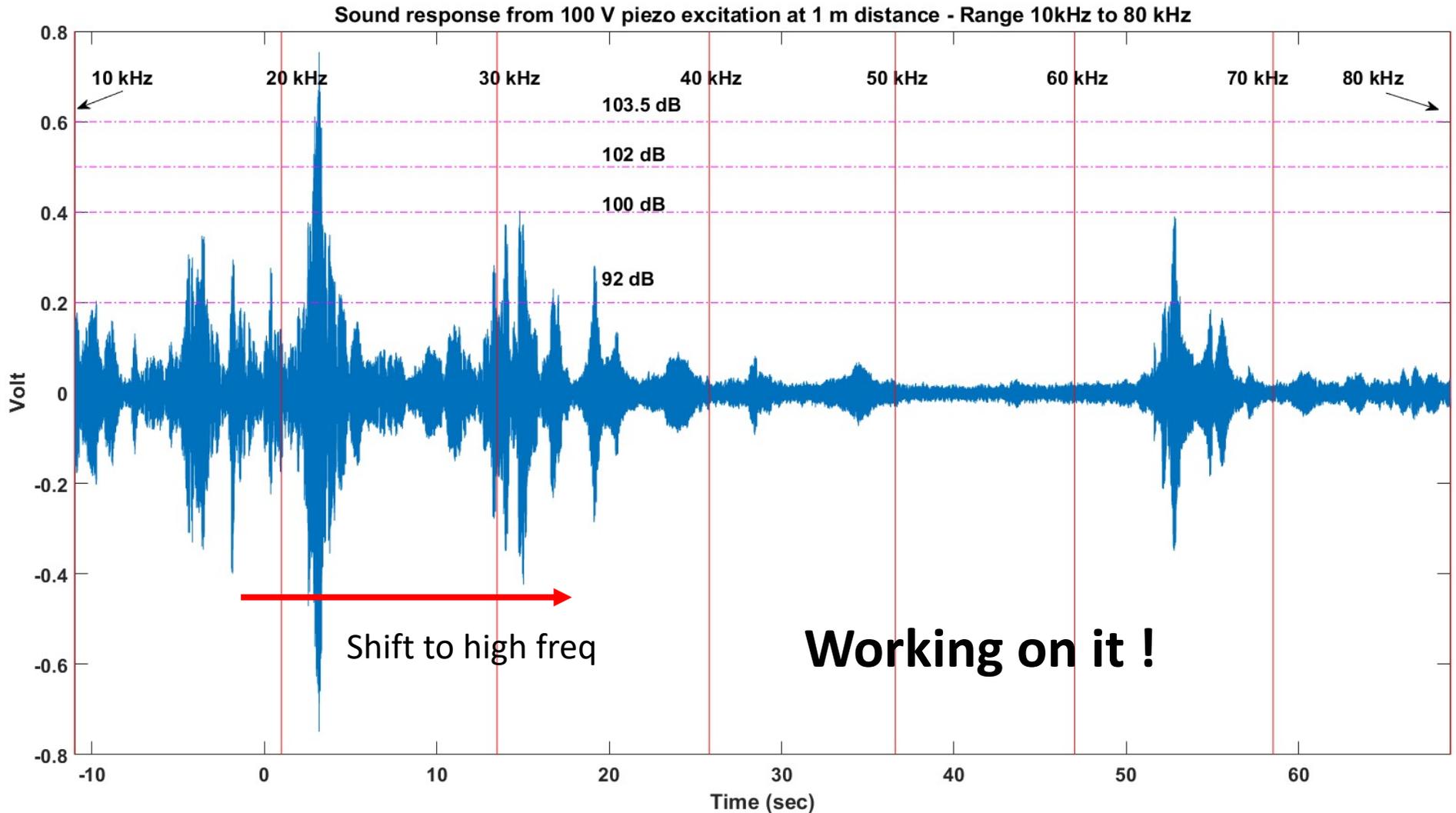
Ultrasound emitter - front side

Although the performances of the emitter are not as predicted, we have high sound pressure level (SPL) when measured according to FEM simulation, which is with a large (infinite) back plate. The problem that we see is the lack of emission in a range between 40 and 60 kHz.



Ultrasound emitter - back side

The Ultrasound Emitter



- . When tried in an arrangement closer to real emitting condition, the SPL was actually lower.
- In current design, the lack of transmission between 40 kHz and 60 kHz is a problem.
- We are trying a quick fix by making a stiffer cone. This should shift the low frequency response into higher spectra

Conclusion and speculative thoughts



- This project has revealed of a great challenge
- We are trying to overcome each design issues
- However, we have learned a great deal of things and we are happy to have reached our current level of performances
- Our goal is still to mount the device in the NREL 2.5 MW turbine of their Colorado campus and proof the concept.
- We agreed with NREL a no cost extension and we plan it on Spring 2022
- Our speculation is: if we got this much power, can we actually think about mounting there a camera and transmit wireless the info? For wildlife protection in general !!!

We make it *possible*