**Transmitter (Tx)**

What you would need:

1. Our in-house built transducer
2. Laptop or desktop computer with audio jack output
3. Xli2500 Two-channel 750W power amplifier

**Note:**

The transmitted signal is generated using MATLAB, we first transmit a pure sine at around 17kHz the resonant frequency of our transducer. Secondly, we employ pulse width modulation (PWM) where the ‘1’ bit is twice as long as the ‘0’ bit.

PAB (Tx) MATLAB code

%The transmission consists of two stages: energy harvesting stage and

%communication stage: During the energy harvesting stage we transmit a pure

%sinusoidal signal and during the communication stage we transmit a PWM

%that encodes 1's and 0's (being a 1 twice longer that a 0). Finally, we

%transmit again a pure sinusoidal that will be backscattered by the node.

% Generate purely sinusoidal

f = 15000; %15Khz

Fs = 44100; %Sampling frequency

ts = 1/Fs;

T = 10; % Generate 10 seconds

t = 0:ts:T;

signal = sin(2\*pi\*f.\*t);

%%%%%%%%%%%%%%%%%%%%%%%%

%Generate bits

preamble = [1 0 1 1 0 1 1 1 0 1 0 0 1 0 0 0 1 0 1 0];

bit1 = repmat(1,1,2\*9000);

bit0 = repmat(1,1,9000);

zero = repmat(0,1,9000);

sq = [];

for bit = preamble

if bit == 1

sq = [sq bit1 zero];

elseif bit == 0

sq = [sq bit0 zero];

end

end

%modulated signal

PWM = sq(1:end-length(zero)+1).\*signal;

%%%%%%%%%%%%%%%%%%%%%%%%

%Charge the PAB node and then transmit preamble

sound(signal, Fs);

pause(12) %wait for 12 seconds

sound(PWM, Fs);

pause(12)

sound(signal,Fs)