

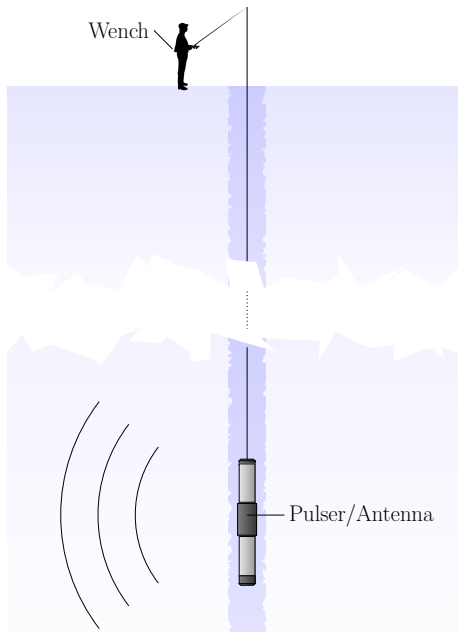


SPICE Hole Pulsing (2018-19 Pole Season)

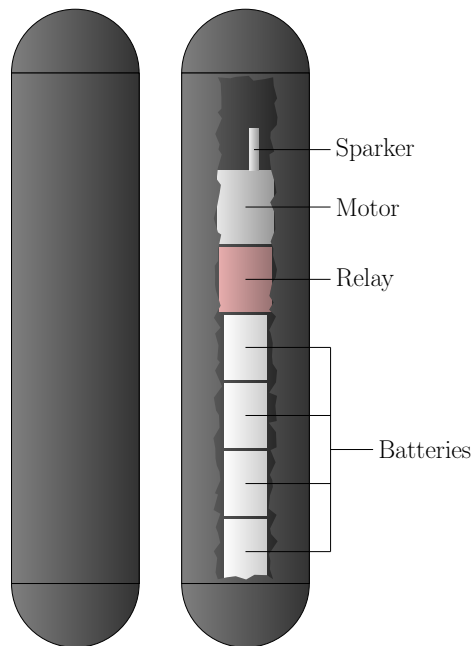
Andrew Shultz
Dave Besson
Alexander (Sasha) Novikov

December 17, 2018

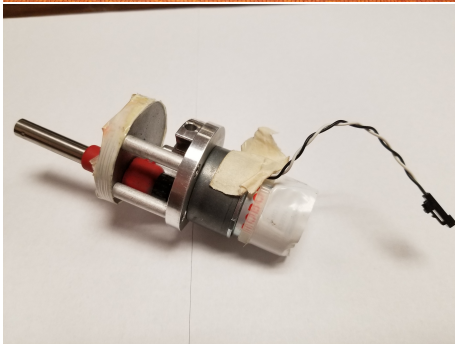
- Plan: Pulse at deep depths in an existing deep hole filled with estisol left over by SPICE.
- Will be accomplished via lowering a pressure vessel loaded with a pulser down the hole using a wench at the surface.
- The aim is to help calibration efforts and ice studies with this data.
- For this pole season we have:
 - 2 pressure vessel types
 - 2 antenna types



Pressure Vessel 1: Nylon (Cable Antenna Not Shown)



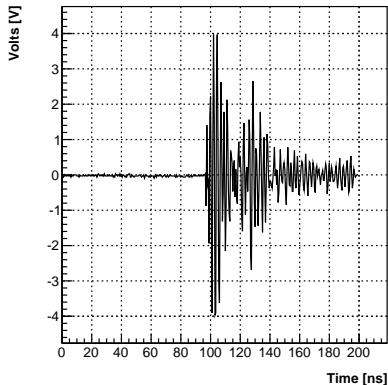
Pulser/Antenna 1: Piezo With N-Type Cable Antenna



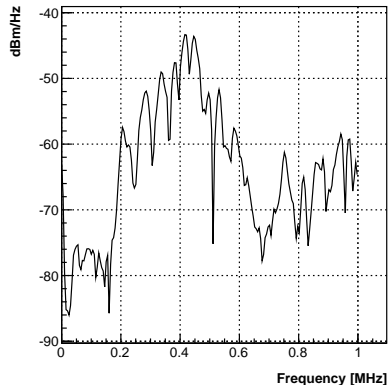
- Uses a piezo grill lighter (sparker) to create EM pulses.
- A motor turning a cylindrical cam clicks the sparker with a temperature and voltage dependent period.
- Not shown is a N-type cable that has been cut and fitted to the end of the sparker. This acts as an antenna for the piezo, it improves both signal amplitude and width, as well as sharpens the frequency distribution.

Antenna/Pulser 1 Nominal Response

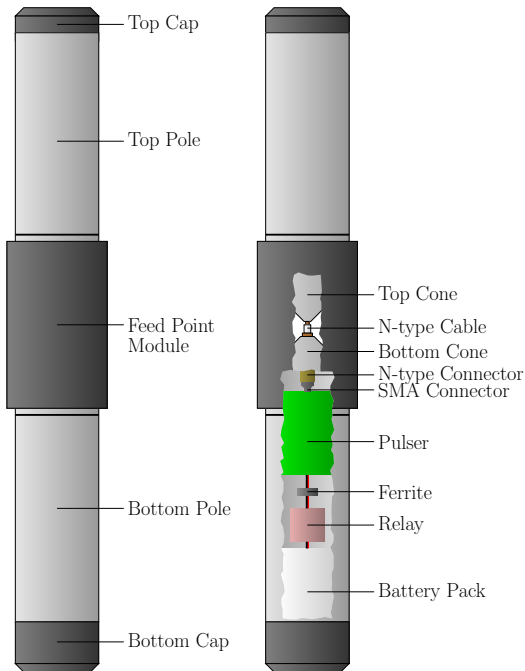
Piezo Waveform



Piezo FFT

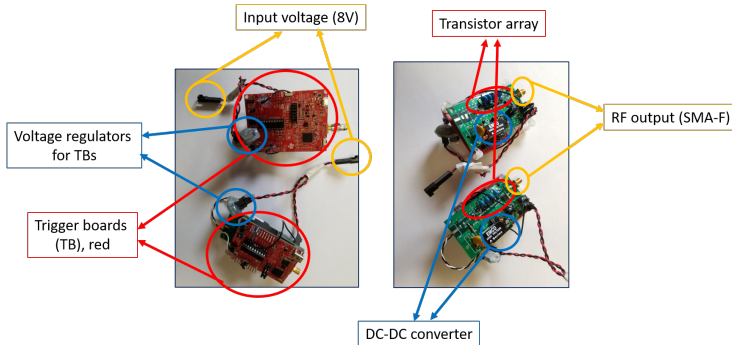


Pressure Vessel 2: Aluminum Bicone Antenna (PVA)



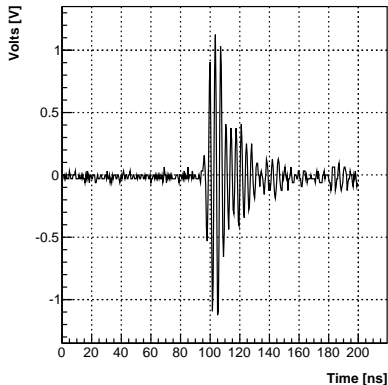
Antenna/Pulser 2: PVA With IDL Pulser

- Instrumentation Design Laboratory (IDL) at KU.
- Uses a triggering board and a DC to DC converter to generate high voltage pulses.
- Highly consistent period at about 1Hz.
- Pulse amplitude decreases with temperature.

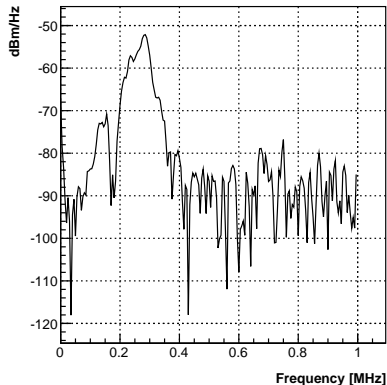


Antenna/Pulser 2 Nominal Response

IDL-1 Waveform

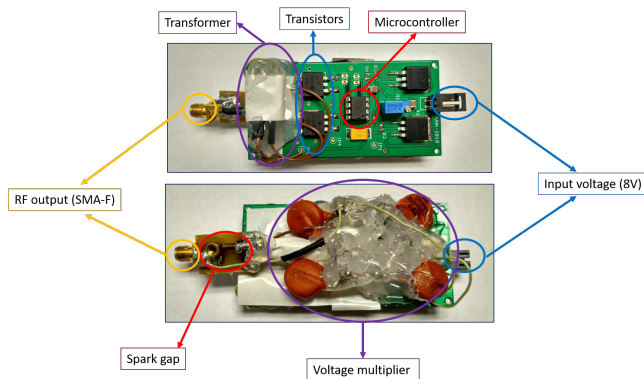


IDL-1 FFT



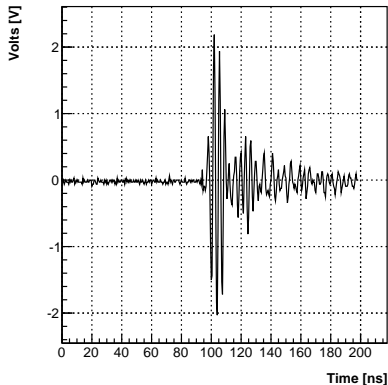
Antenna/Pulser 3: PVA With HVSP

- High Voltage Sparking Pulser (Sasha's Pulser).
- Builds voltage until it is high enough to send electrons across an adjustable air gap.
- Period $\approx 1\text{Hz}$, can increase to integer values of $\approx 1\text{Hz}$ due to changes in spark gap distant with temperature.
- Amplitude is roughly consistent, decreases with temperature but increases with higher period (previous bullet point helps cancel decreases in amplitude).

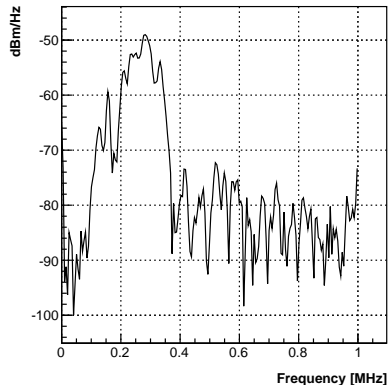


Antenna/Pulser 3 Nominal Response

HVSP-1 Waveform



HVSP-1 FFT



- Dave B. and Ilya K. will be lowering things down a hole that pulse EM between 200-400MHz in the coming weeks.
- Will be updates to come!