

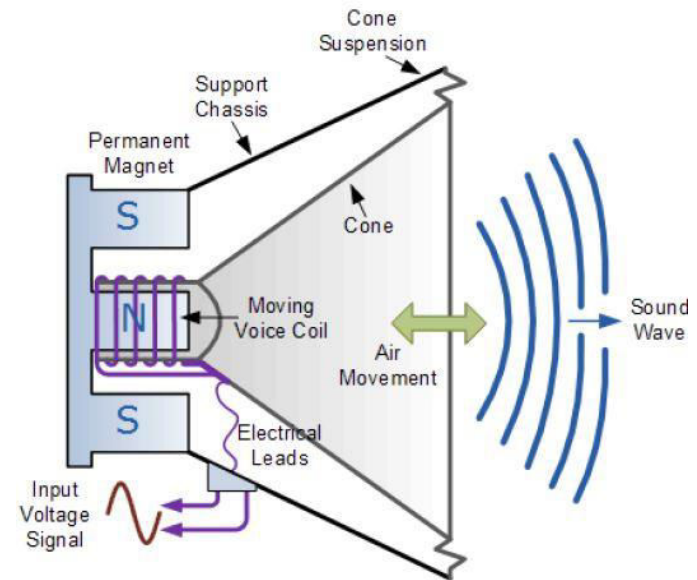
Programming
“Arduino”
SOUND(tone)

Instructor / Facilitator - Alan Rux

flipped classroom
Discussion

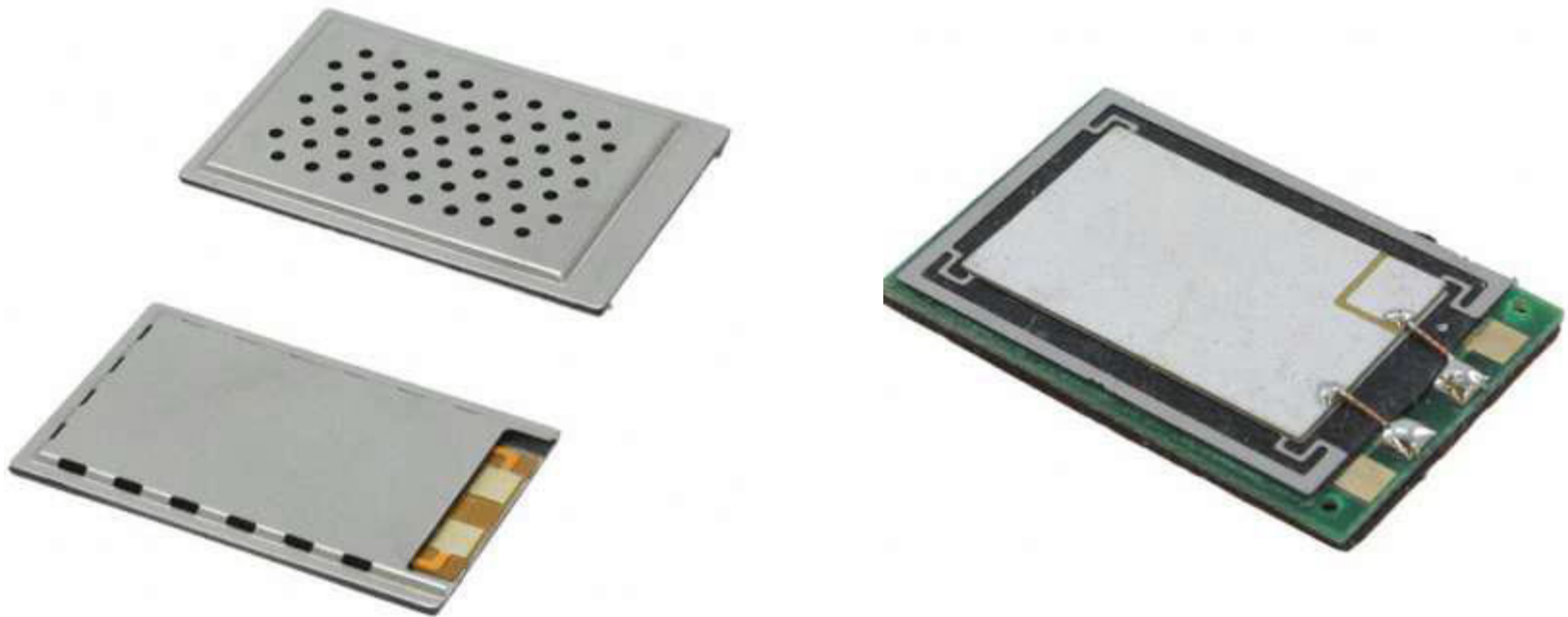
Sound Transducers for project

Moving Coil Loudspeaker



Sound Transducers for project

Piezo Film Audio Speaker



Sound Transducers for project

Moving coil vs. Piezo



Sound Transducers for project **Standard Profile vs. Miniature**



Sound Transducers for project

Impedance ? / Power

- 4 ohms
- 8 ohms
- 16 ohms
- 32 ohms
- 60 ohms
- Piezo ??????
- Working watts (rated)
- Max Power (peak)

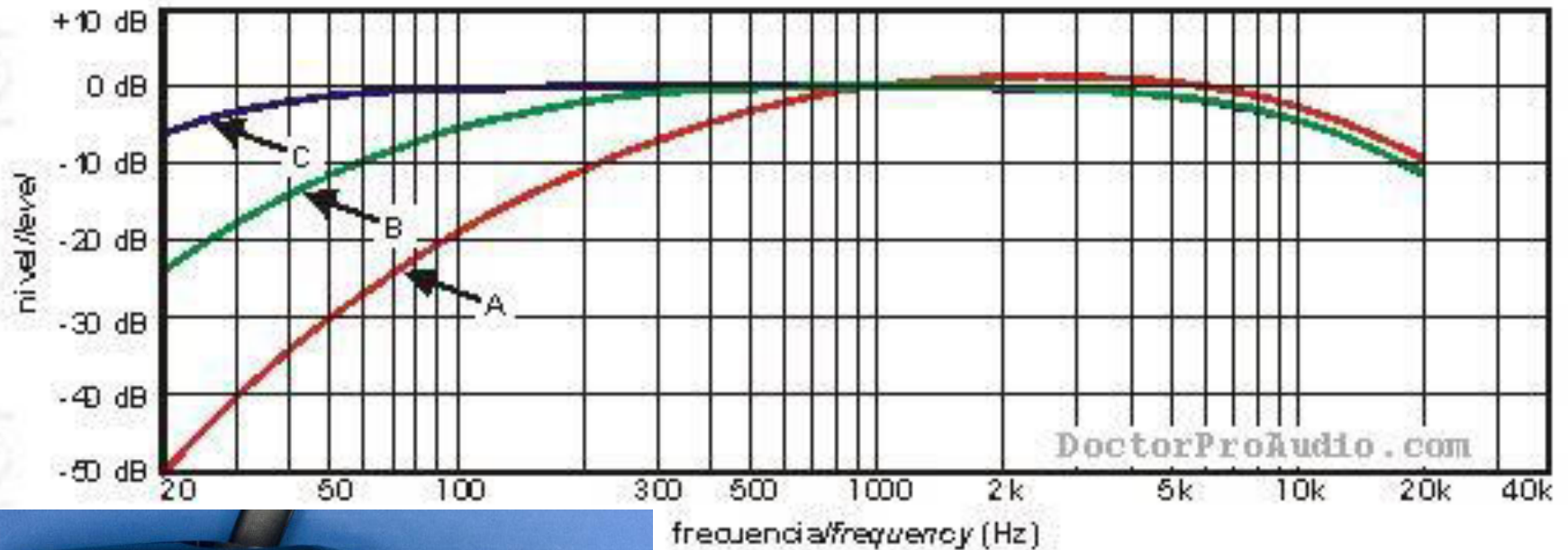
Difference between Buzzers **Piezo vs. Magnetic**



Audible Alarms in Medical Equipment

- **ALARM SYSTEMS**
- **Priority Condition**
- **Audible Alarm Bursting**
- **Characteristics of the Individual Pulses**
- **Optional Melodies**
- **Sound-Level Requirements**
- **Technical Alarm Condition**
- **Reminder Signals**
- **Verbal Alarm Option**
- **What is IEC 60601-1-8?**

A- B- C-Weighted Noise Measurements



General Radio
1651b
Sound Standard

Audible Alarms in Medical Equipment

- **Priority Condition**
 - **Audible Alarm Bursting**
 - **Characteristics of the Individual Pulses**
 - **Optional Melodies**
 - **Sound-Level Requirements**
 - **Reminder Signals**
 - **Verbal Alarm Option**
- **What is IEC 60601-1-8?**

IEC 60601-1-8 is a comprehensive international standard that specifies basic safety and essential performance requirements and tests for alarm systems in medical equipment



- **tone()**
- **noTone()**
- **pitches.h**

DIY Lab. (ADK speaker experiment)

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**Go to Digilent website and download :
DSD-0000363 Measuring Speaker Resonance Lab.
and find the resonance of your speakers.**

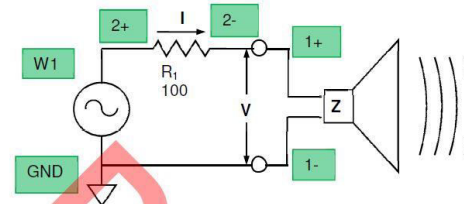
Support Documents:

Doc #	Date	Categories	Description	
502-244	10/15/13	PD	This document is a reference for the Analog Discovery's electrical functions and operations. This reference also provides a description of the hardware's features and limitations.	Download
DSD-0000361	3/16/12	CD	Analog Discovery starter project - 8-bit DAC built from an R2R Resistor Ladder (Draft version)	Download
DSD-0000362	3/16/12	CD	Analog Discovery starter project - Basic band pass filters (Draft version)	Download
DSD-0000363	3/16/12	CD	Analog Discovery starter project - Measuring loudspeaker resonance (Draft version)	Download
DSD-0000364	3/16/12	CD	Analog Discovery starter project - Simple LED drive (Draft version)	Download
DSD-0000365	3/16/12	CD	Analog Discovery starter project - LED drive with pulse width modulation (Draft version)	Download
DSD-0000403	10/11/12	PD	Analog Discovery Pinout Diagram This document describes the pin-out of the Analog Discovery paired with the included 2x15 colored fly-wire.	Download

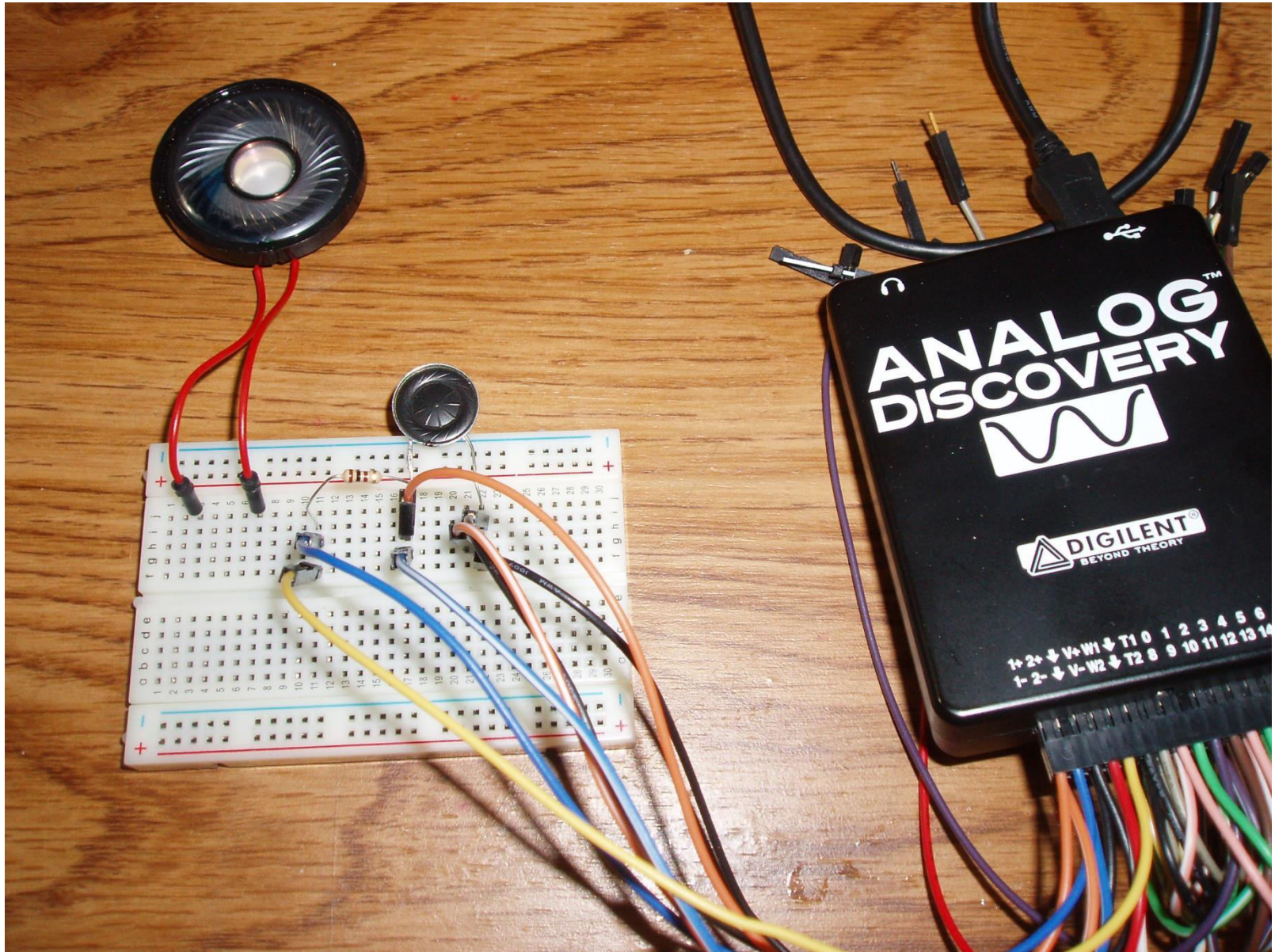


Real Analog Lab Module Measuring Loudspeaker Resonance

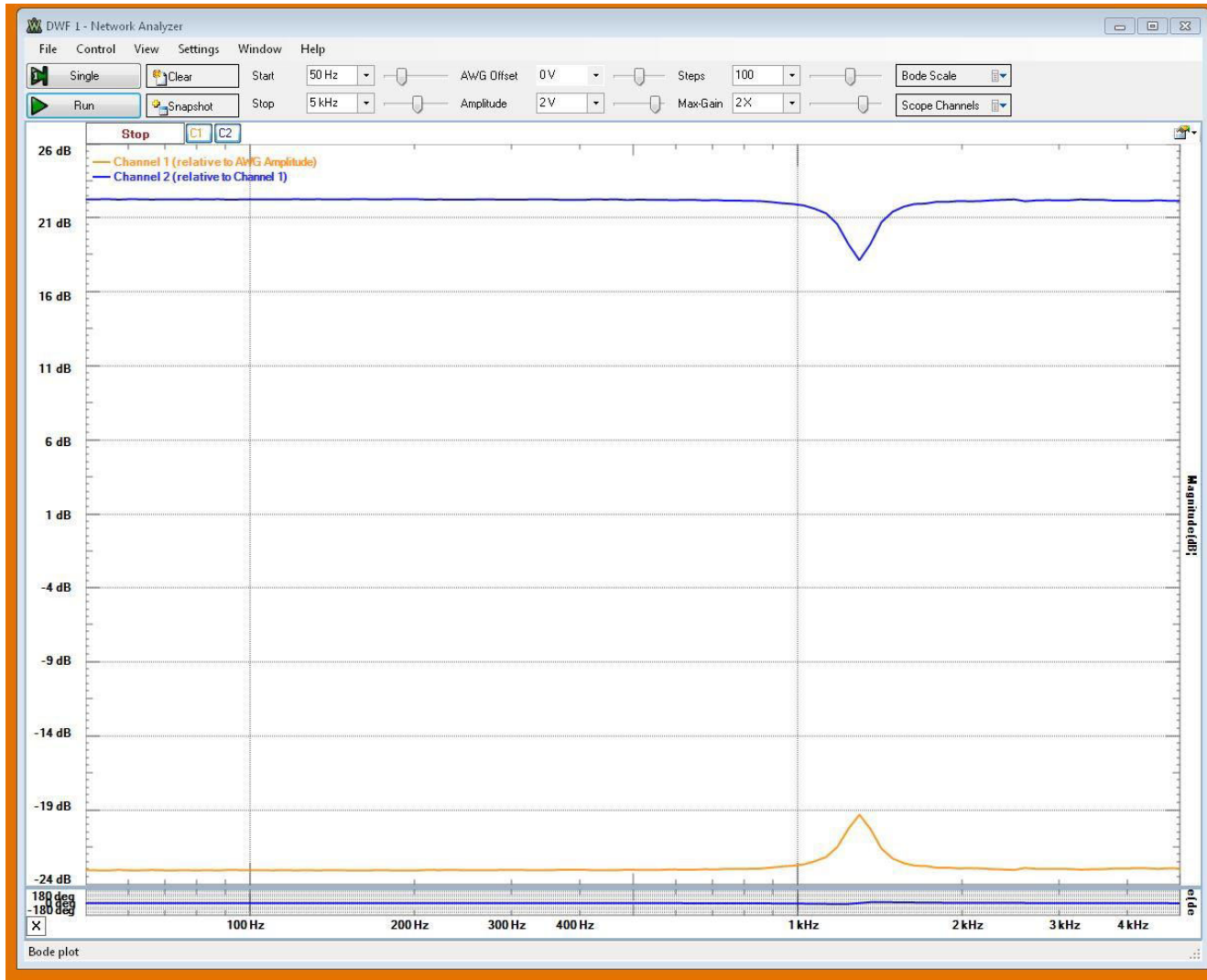
- 1) Build the circuit shown in figure, preferably on your solderless breadboard (note that any small speaker can be used whether or not it is in an enclosed box).



DIY Lab. (ADK speaker experiment)

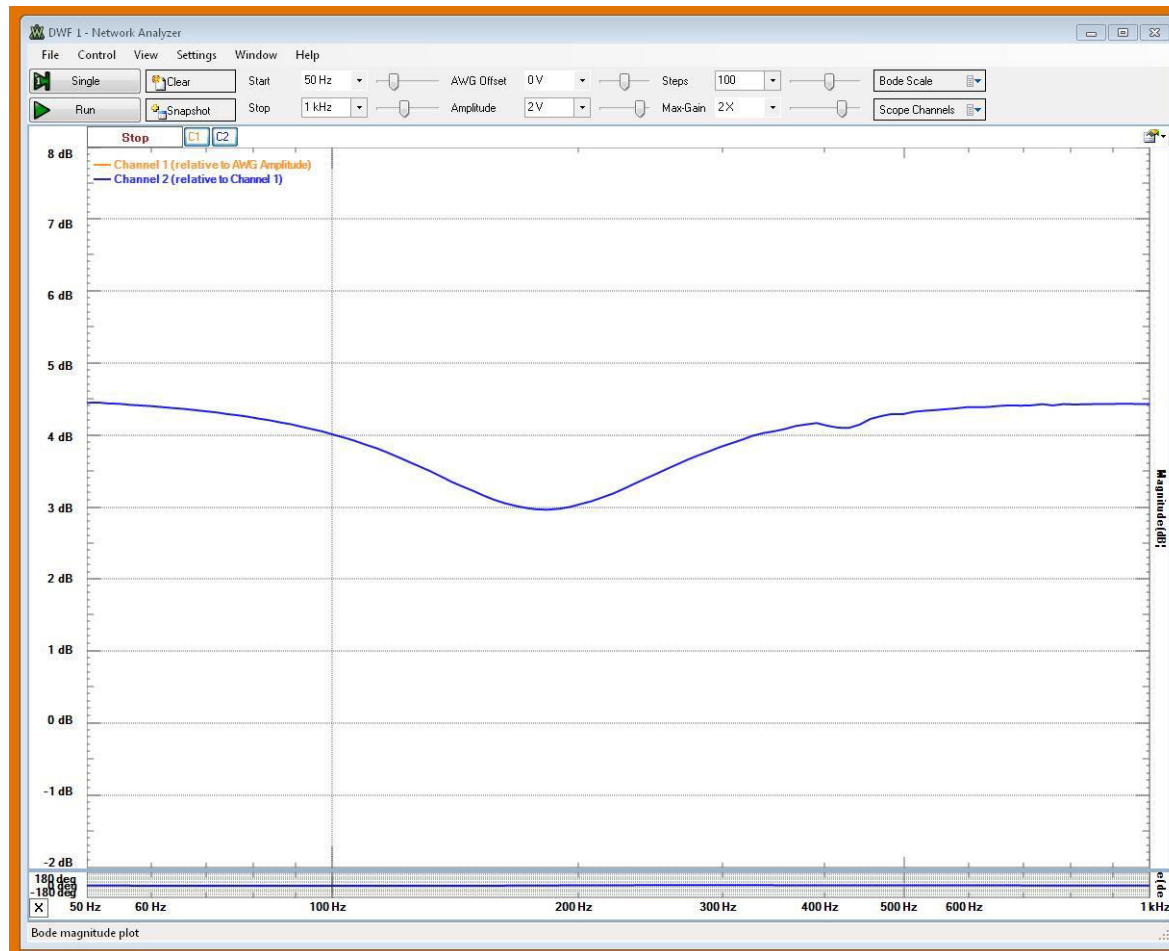


Large Speaker

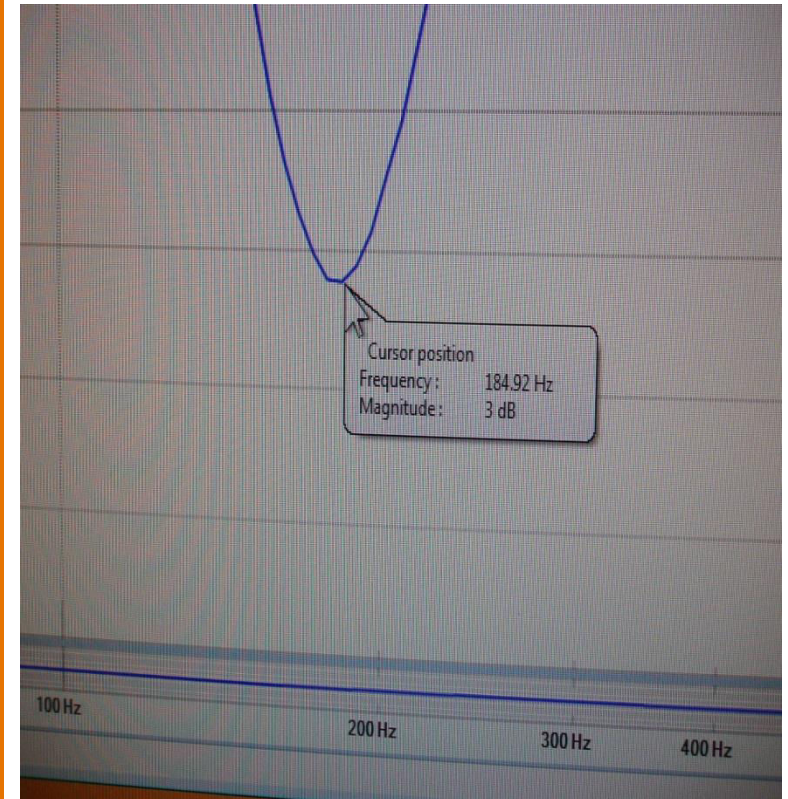
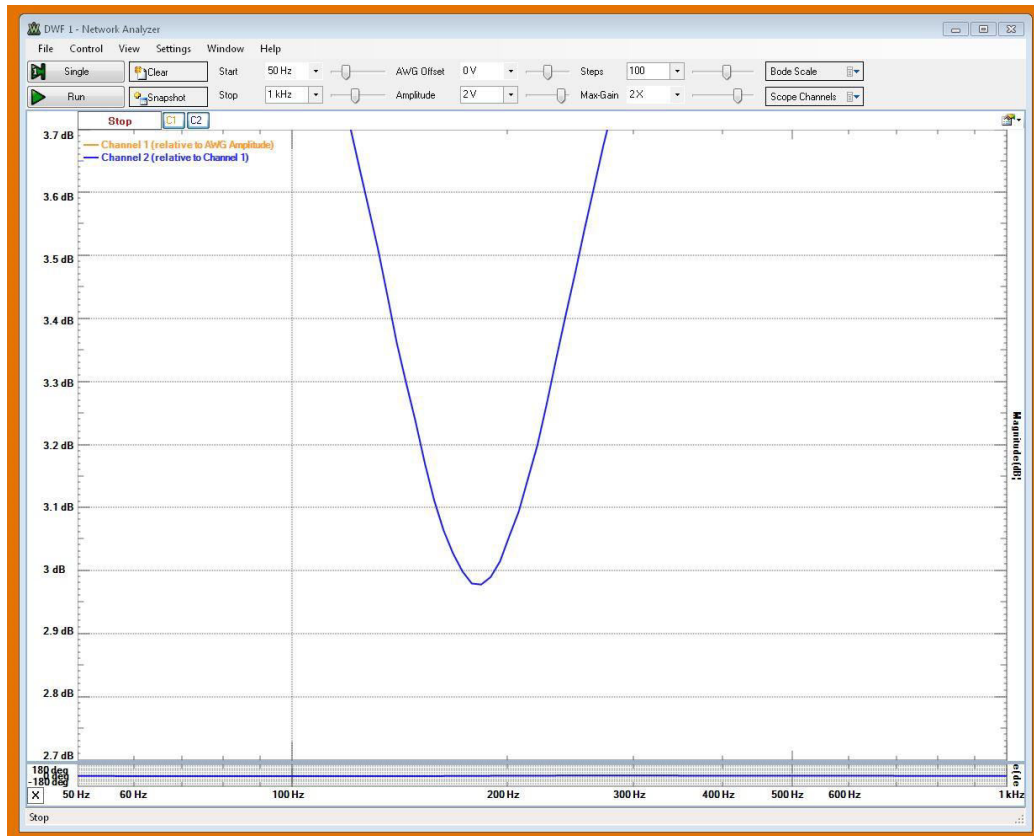


The Digilent website experiment is referencing their Explorer kit and not the Discovery kit. You will have to use the **Bode Plot** function and play around with it. output is in dB and not voltage

Large Speaker channel 2, current trace

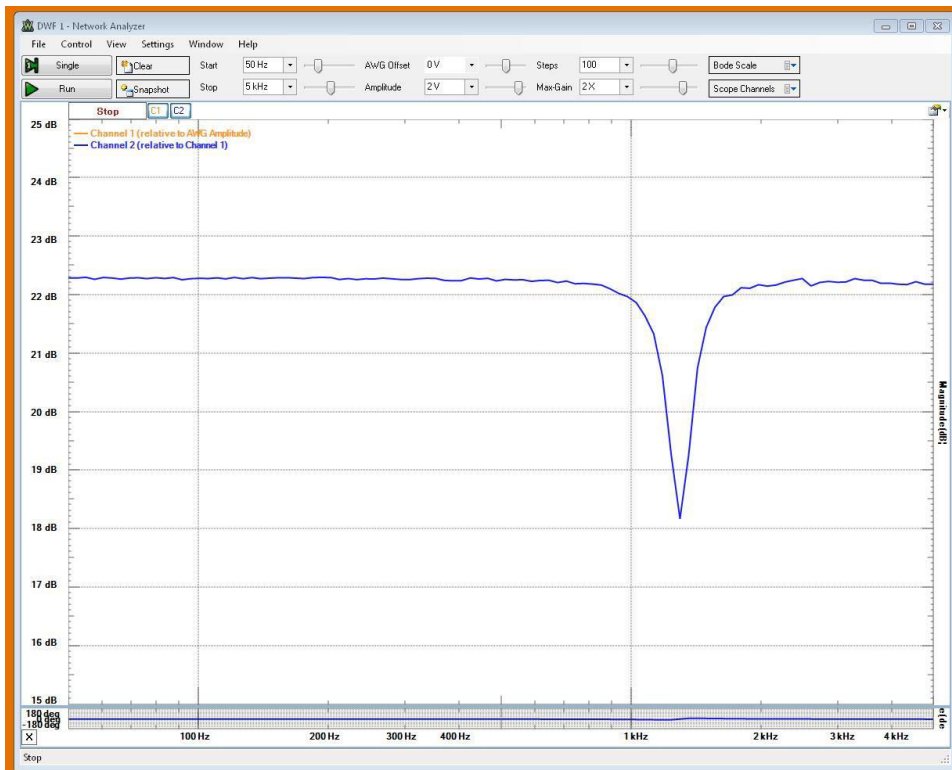


Large Speaker channel 2, current trace Resonance at 184.92 Hz

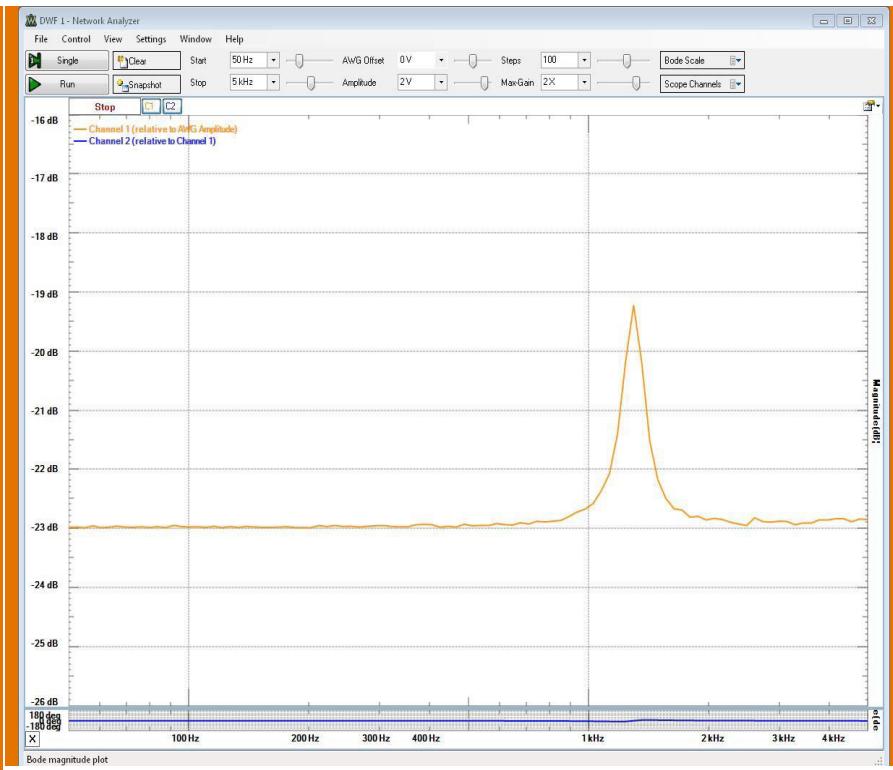


Small Speaker

Current trace channel 2



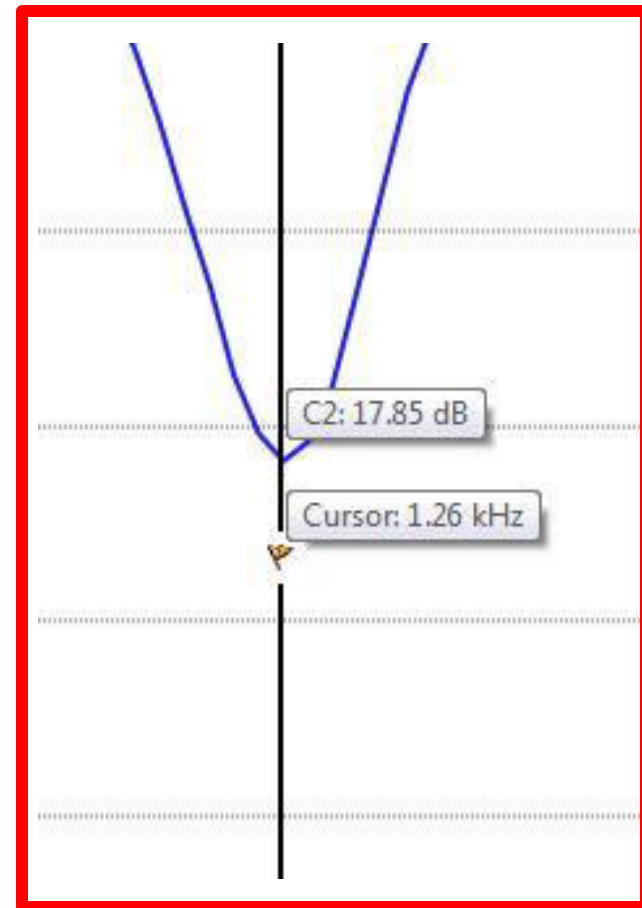
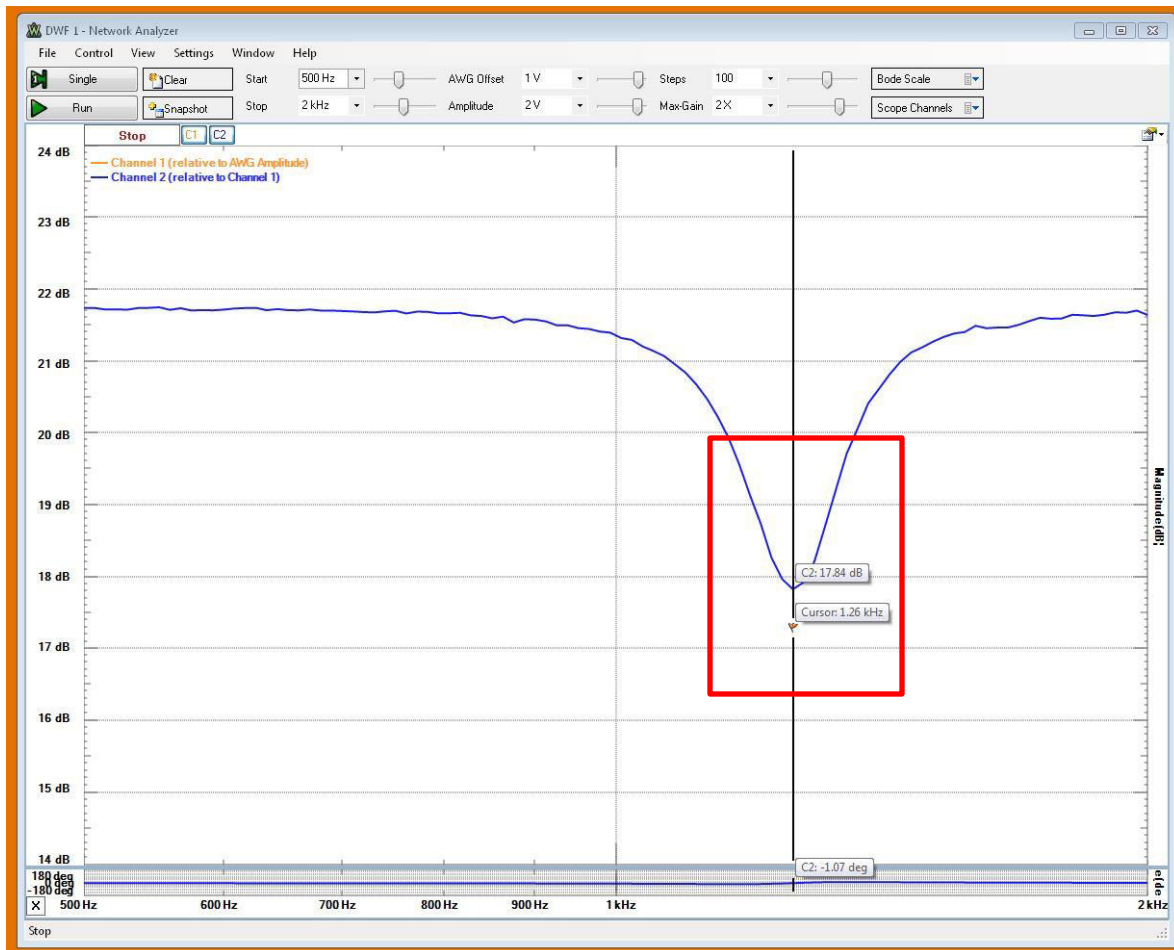
Voltage trace channel 1



Small Speaker

channel 2, current trace

Resonance at 1.26 KHz





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Experienced REAL Learning ?**

Questions ?

