

## 1. Description

AudioGenerator streams data to the audio output (music stream) of an Android device using the user selected function, frequency, and amplitude. Waveforms available are sine, square, and noise. Frequency is selected with multiplier buttons and sliders. Audio output amplitude can be adjusted from 0-100% with the amplitude slider. A numeric readout doubles as a play/pause button. It shows frequency, period, and nearest musical note (based on A=440Hz) for sine and square signals (noise contains an assortment of frequencies). Figure 1 shows the controls and readouts.

Warning. Andriod devices can generate high volumes. Don't do anything foolish.

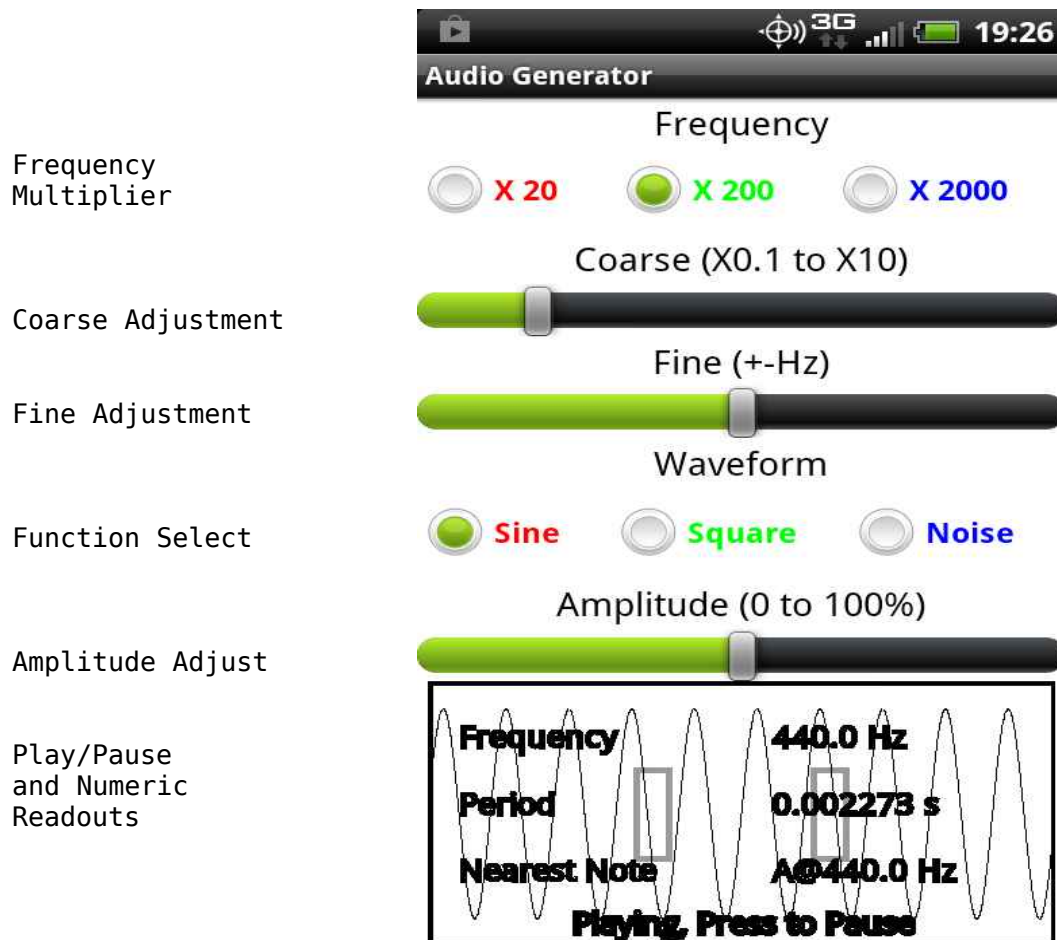


Figure 1. AudioGenerator User Interface

## 2. Operation

Launch the AudioGenerator application. The initial settings are for a sine wave at 440Hz with a 50% amplitude. The Play/Pause button can be pressed and a 440Hz tone will be generated. Pressing the Play/Pause button again will stop the output. Playing or paused, any slider or button can be adjusted to change the frequency, waveform, or amplitude. Note that audio outputs are AC coupled. The output creates a network with external devices such as ear-buds or amplifiers. The interaction with the devices and internal coupling is evident when a square wave is selected. There are several oscilloscope images in section four that show the square wave output at various frequencies. The test setup is shown as well.

## 3. Characteristics

Operating System: Android: Minimum API 9, Gingerbread

Permissions: None

Audio Output Rate: 44100 samples per second

Audio Mode: Monophonic

Frequency Accuracy: 0.2 Hz

Output Amplitude: (Amplitude slider 100%) 35mv pp @10Hz sine, 700mv pp @10Khz sine

These are device and terminating circuit dependent.

Settings:

Frequency: 10Hz to 20KHz (Square wave to 2Khz)

Functions: Sine, Square, Noise

Amplitude: 0 to 100% on Music Stream

Play/Pause

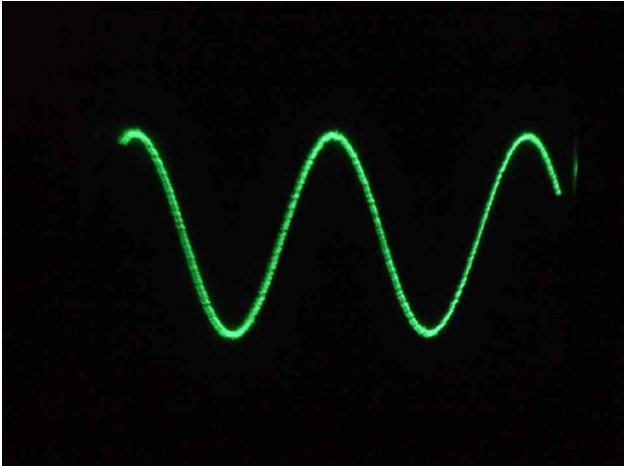
Note Display Range: C = 16.4Hz to B = 7902Hz

Devices Tested: HTC Incredible 2, Google Nexus 7 (2013)

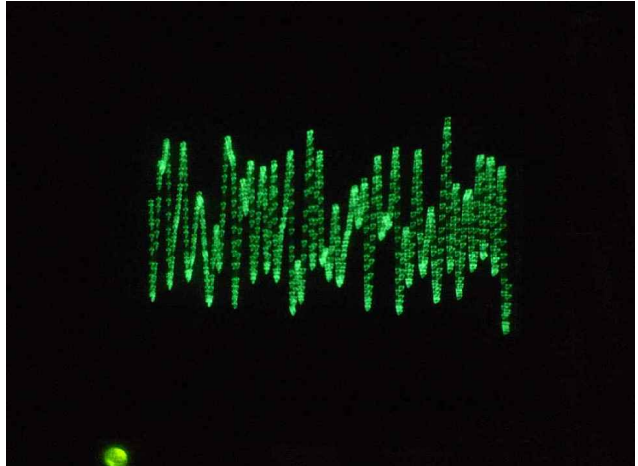
Identity:  $\sin(u)\sin(v) = 1/2[\sin(u-v) + \sin(u+v)]$

Graphics Design: N. Dynamite

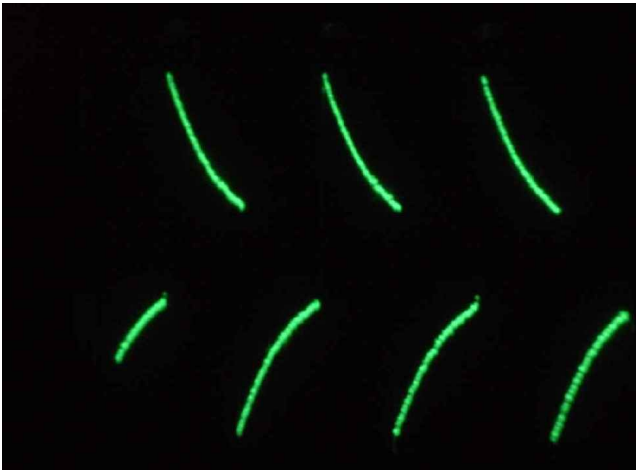
#### 4. Waveforms and Test Setup



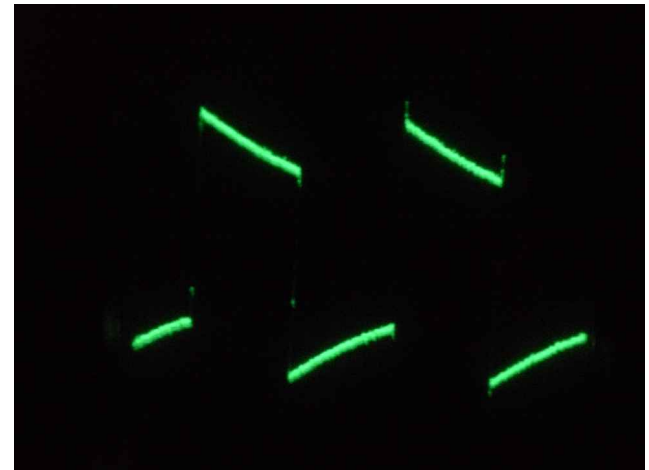
Sine Wave 440Hz



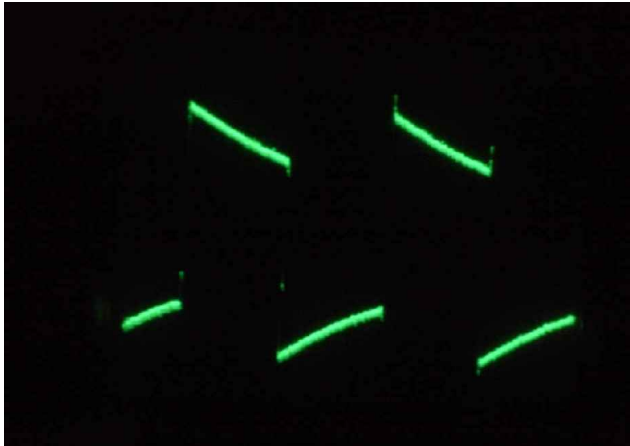
Noise



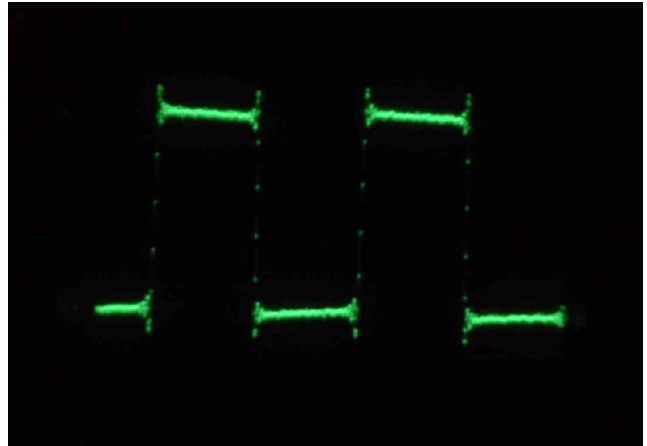
Square Wave 10 Hz



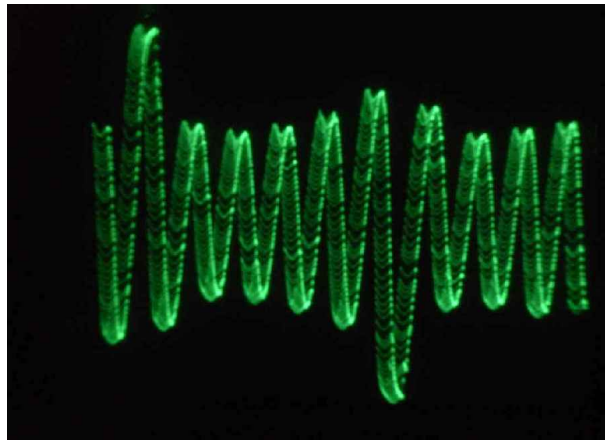
Square Wave 40Hz



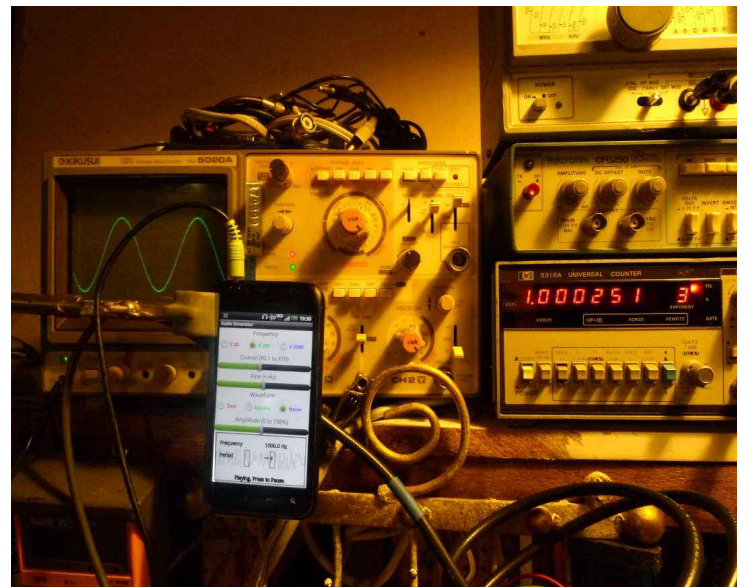
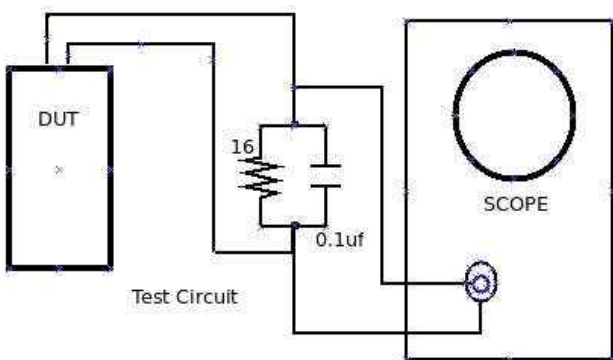
Square Wave 440 Hz



Square Wave 4.4KHz



Square Wave 20KHz



Test Circuit and setup