iSlide Avalanche Transceiver

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Background

What is an Avalanche Transceiver/Beacon?

What is wrong with the beacons on the market?

[1] Nothing! They work great, however, they are expensive.

Background

Low end beacons
- Search-strip width 30-50 m
- Range 40-50 m
- Examples
- Pieps Freeride
  - Cheap
  - Single antenna
    - Difficult to use
    - No direction indicator
- Tracker2
  - Tripple antenna
    - Very easy to use

Top of the line beacons
- Search-strip width: 50m
- Range: 60-70m
- Examples
- Orthovox S2
  - Detects multiple burials
  - Compass, inclinometer, thermometer

~ $150

~$300

~$450

~$500

Description

- Avalanche Beacon accessory and application for the iPhone
  - A radar-type display indicating the distance and location of multiple buried beacons.
  - Burial depth calculation.
  - Burial time indication.
  - Vital status detection of buried victims.
  - Screen shut-off to reduce power consumption in send mode.
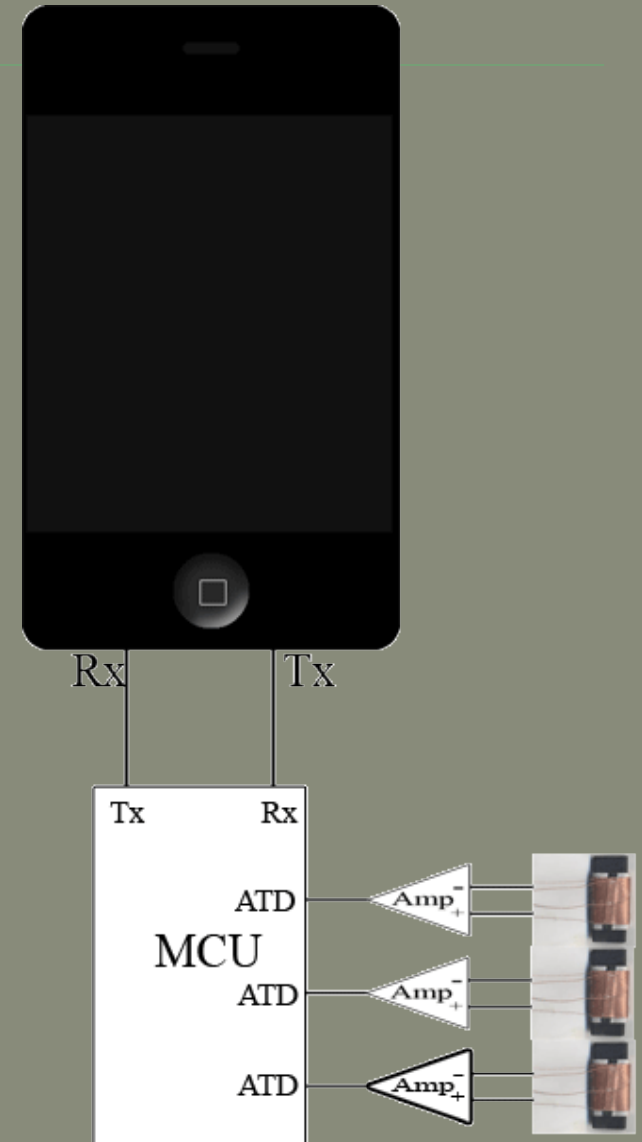
Standards & Scope

- Standards
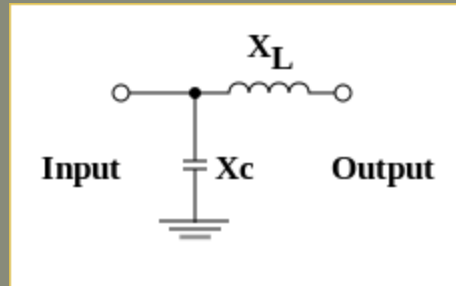 - ASTM F 1491 – 93
  - ETSI EN 300 718

- Scope
  - Transmitter
  - Receiver
  - Distance
  - Direction

Hardware & Interface

 AM Antenna (100 KHz – 1710KHz)
 Tunning Capacitors
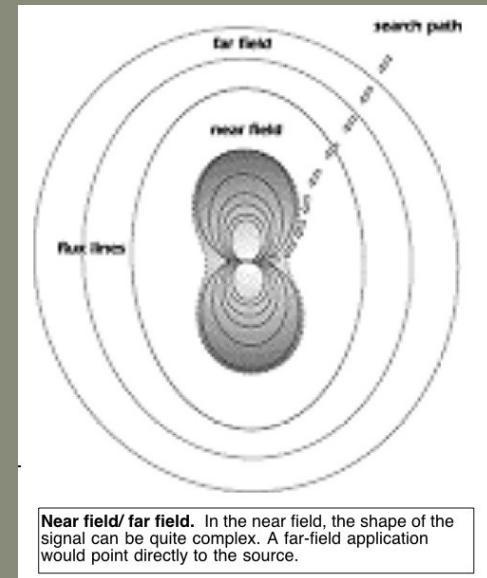 Amplifiers
 ADCs
 Micro Controller (DSP)
 iPhone

Bill of Materials

Part	Source	Unit Cost	Qty.	Total Cost
Pod Breakout	http://shop.kineteka.com/products/92-podbreakout-ipod-iphone-ipad-breakout-board.aspx	$14.99	1-2	~$15-30.00
LeafLabs Maple 32-bit MCU	RobotShop.com	$49.99	1	~$49.99
AM rod antennas	http://www.angelfire.com/electronic2/index1/loopstick.html	$3	3	~$9
Variable Capacitors, Op amps, and oher basic components	ECE Stockroom	--	--	~$15
Apple iPhone	http://www.verizonwireless.com/b2c/splash/iphone.jsp	$649.99	1	~$649.99

Concerns

Location Detection
Near-Field vs. Far-Field
Multiple Antennas

iPhone Interference
455 MHz is a common IF

Near field/ far field. In the near field, the shape of the signal can be quite complex. A far-field application would point directly to the source.

Software

- iPhone GUI
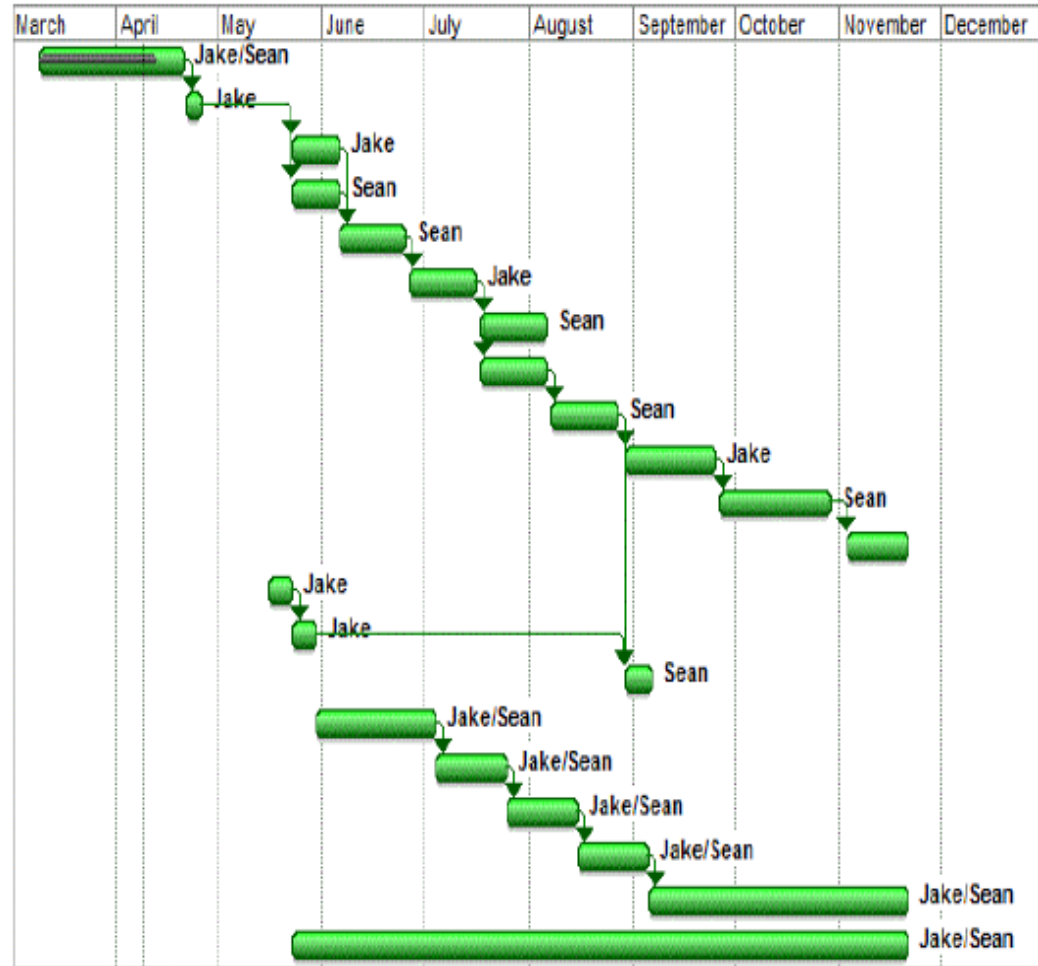 - Option for transmit/send modes
  - Distance and direction

- Device driver
  1 Jailbroken iPhone
  - Treat iPhone as Standard UART serial port
  - App sends handshake message to MCU
  - MCU Receives and strobes serial ground
  - Send message back
  - iPhone can now receive data freely

Schedule & Tasking

	March	April	May	June	July	August	September	October	November	December
Finalize BOM		Jake/Sean								
Order Parts		Jake								
Build Transceiver Circuit (MCU, Antenna's, Analog Circuitry)			Jake							
Tune antenna's to 457 kHz ?			Sean							
Capture incoming 457 kHz signal on oscilloscope				Sean						
Compute distance based on signal strength				Jake						
Compute direction based on incoming cardioid				Sean						
Receive an analog signal at MCU										
Receive the incoming signal at MCU					Sean					
Generate 457 kHz signal						Jake				
Verify outgoing 457 kHz signal on oscilloscope								Sean		
Debug, filter, tune hardware										
Send data to/from iPhone from/to C# program			Jake							
Send data to/from iPhone from/to MCU			Jake							
Send distance and direction to iPhone						Sean				
Software Walking Skeleton				Jake/Sean						
Software Prototype					Jake/Sean					
Software Beta						Jake/Sean				
Software Complete						Jake/Sean				
Software Bells & Whistles								Jake/Sean		
Final Documentation									Jake/Sean	

Milestones

- June 1st
  - Transceiver circuit built (not tested)
  - Tuned Antenna's
  - Send data to and from iPhone using MCU
- August 22nd
  - Receiving standard 457kHz signal
  - Show on scope
  - Compute distance/direction
  - Receive analog signals at MCU
  - Software Prototype

Milestones

- October 1st
  - Generating 457 kHz signal
  - Verified on scope
  - Software Complete
- November 15th
  - Transceiver can transmit and receive, properly interfaces with the iPhone
- Demo Day
  - Hide an iSlide in the grass outside MEB
  - People can take turns finding the hidden iSlide using an iSlide
  - Show that our beacon works with commercial beacon's

References

- http://backcountrysafety.com

- http://students.cs.byu.edu/~css62/avalanche/beacon1.gif