

Fall 2011

# **EE325K Antenna Design Contest**

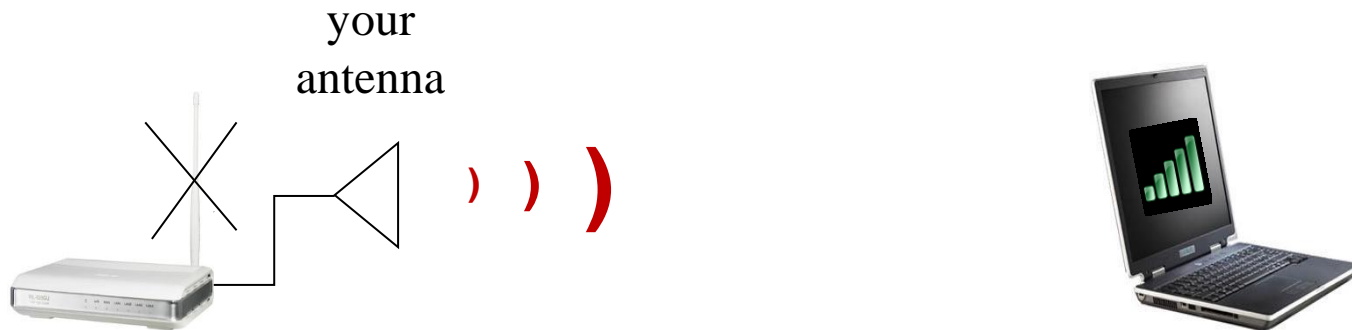
Course Instructor: Prof. Hao Ling

Course TA: Mr. Ickjae Yoon

Dec. 1, 2011

# 1. Design Contest Rules

The objective of this optional design contest is to build a WiFi antenna that, when connected to a router box, gives rise to the highest received power at a distant laptop computer.



DESIGN INFORMATION:

WiFi frequency band = 2.41 – 2.48 GHz

Propagation environment: Indoor, direct line-of-sight (ENS hallway)

$$\mathbf{Final\ Scoring\ Metric} = \frac{\mathbf{Received\ power\ in\ nanoWatts}}{\mathbf{(Max\ dimension\ of\ the\ antenna\ in\ cm + 3.0)}}$$

For example, if you use a monopole of height 3.5 cm and the received signal strength is -40dBm (dB relative to 1 milliWatt), your score will be  $10^{(-4.0)} * 10e6 / (3.5+3.0) = 15.4$ . Notice that in addition to maximizing the received power, the scoring metric penalizes for antenna size.

**CONTEST RULES:** During the contest, each contestant will be allowed 3 minutes to mount the antenna and for the judge to record a power reading on the distant laptop. The highest power level achieved within the allotted time will be used for the power score in the metric.

**Transmitter  
(AUT)**

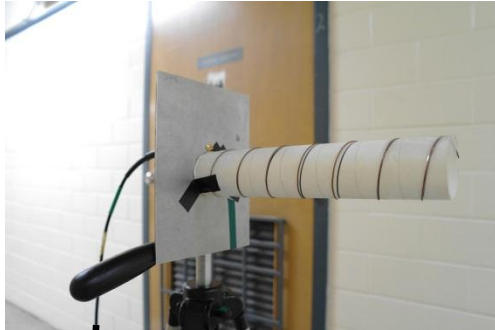


**Receiver  
(laptop)**



# Setup

AUT (Transmits)



Internet Router



Laptop (Receives)

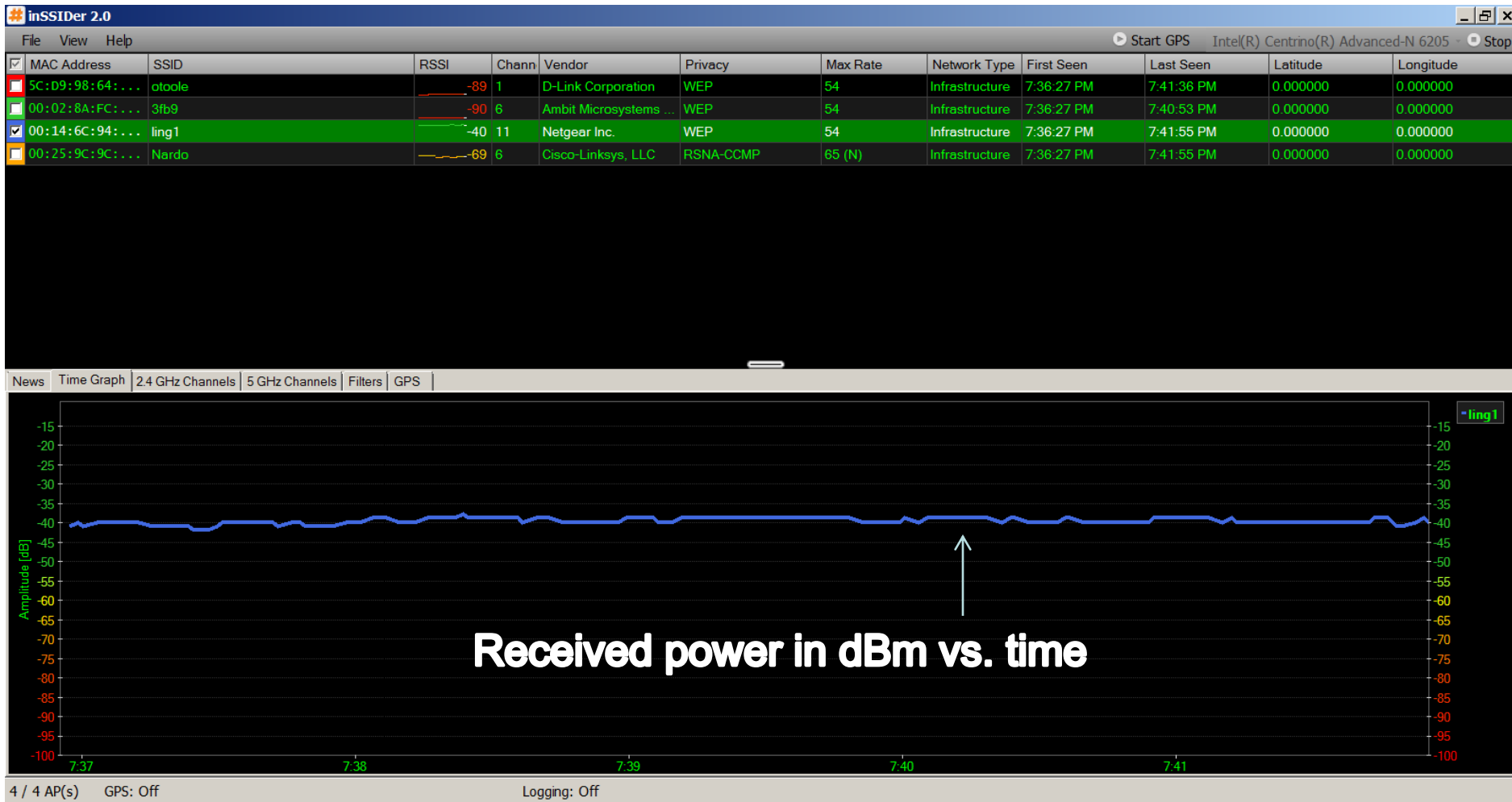


Tool used for recording  
signal strength (in dBm)  
on the laptop:

inSSIDer 2.0

[http://www.metageek.net/  
products/inssider/](http://www.metageek.net/products/inssider/)

# inSSIDer 2.0

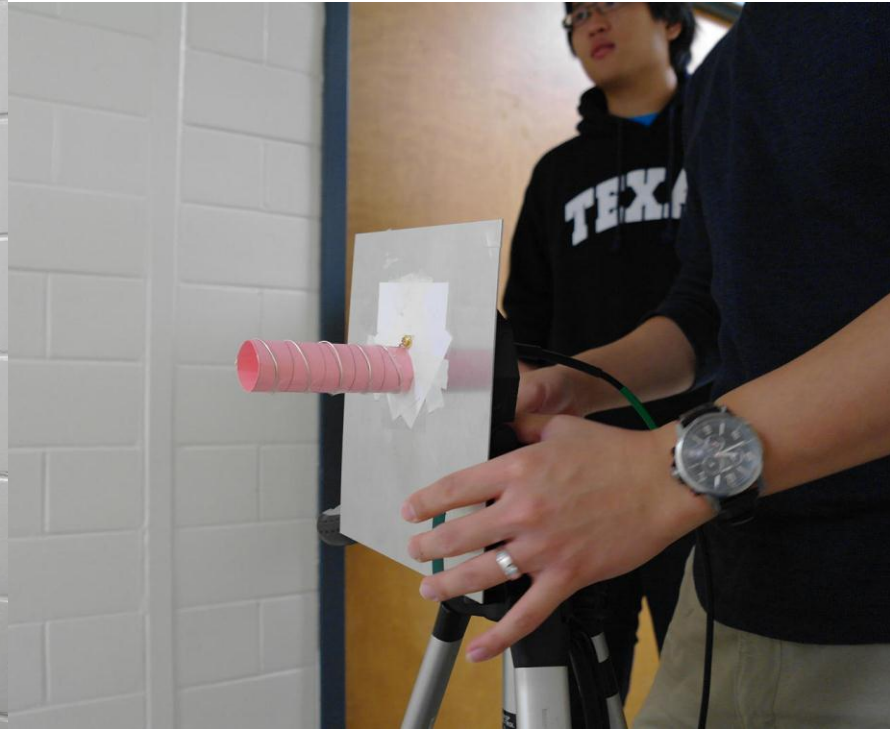
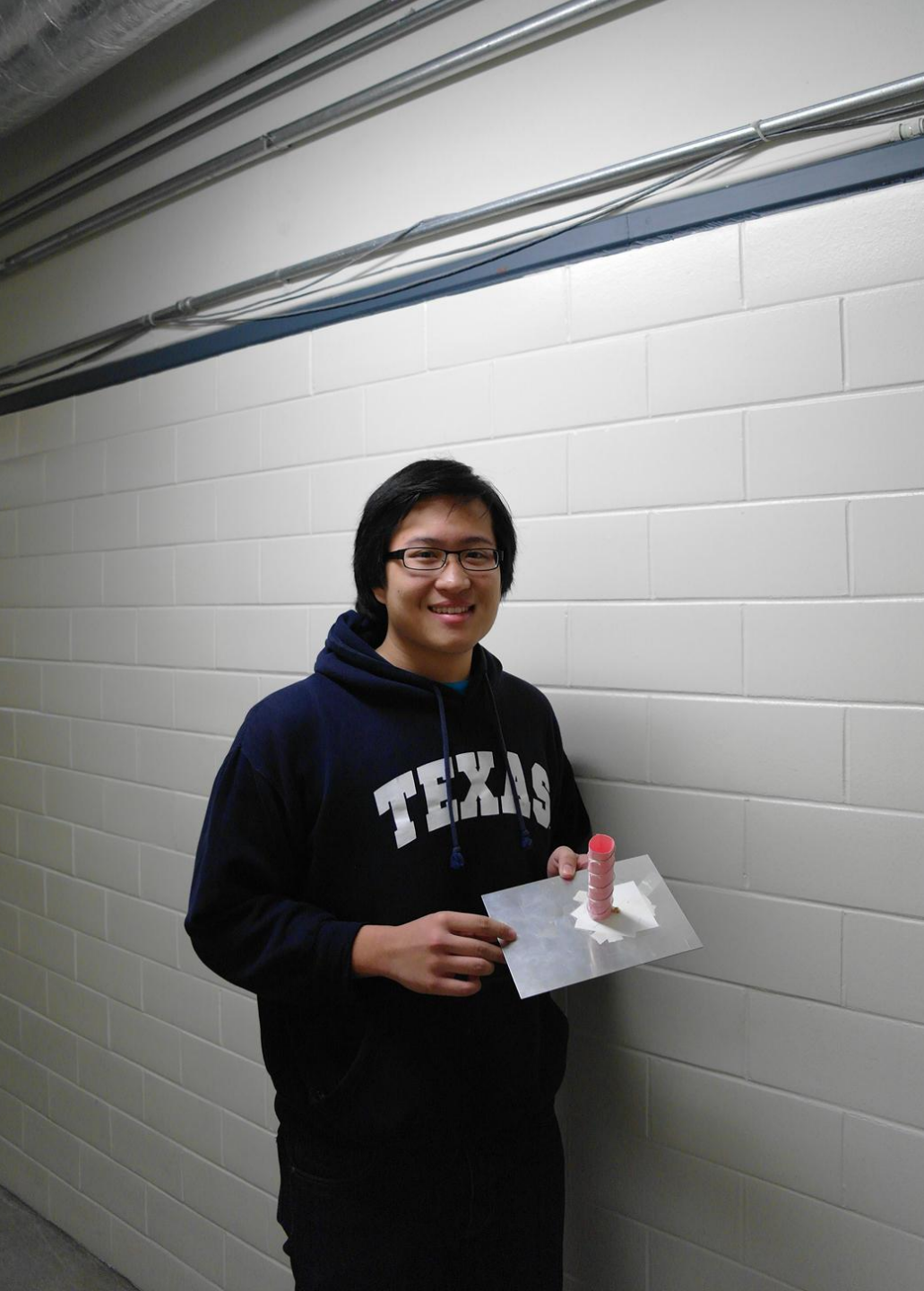


## 2. Entries

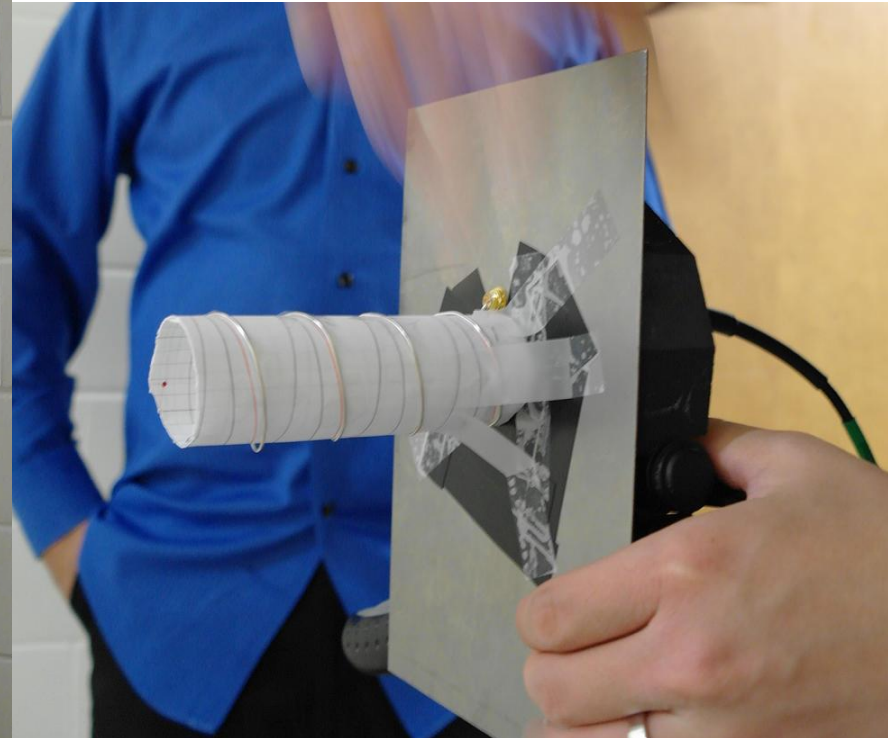
# Helix



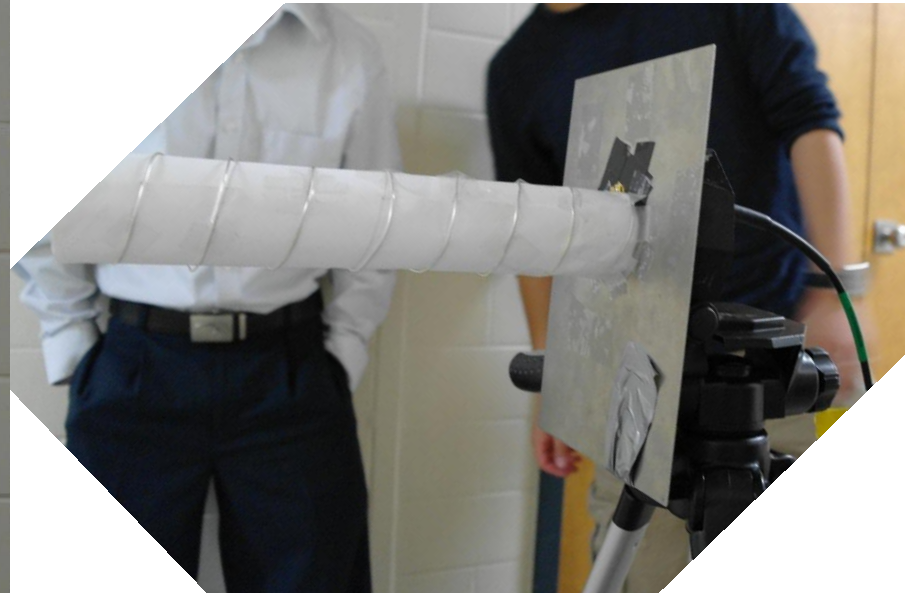
# Helix



# Helix



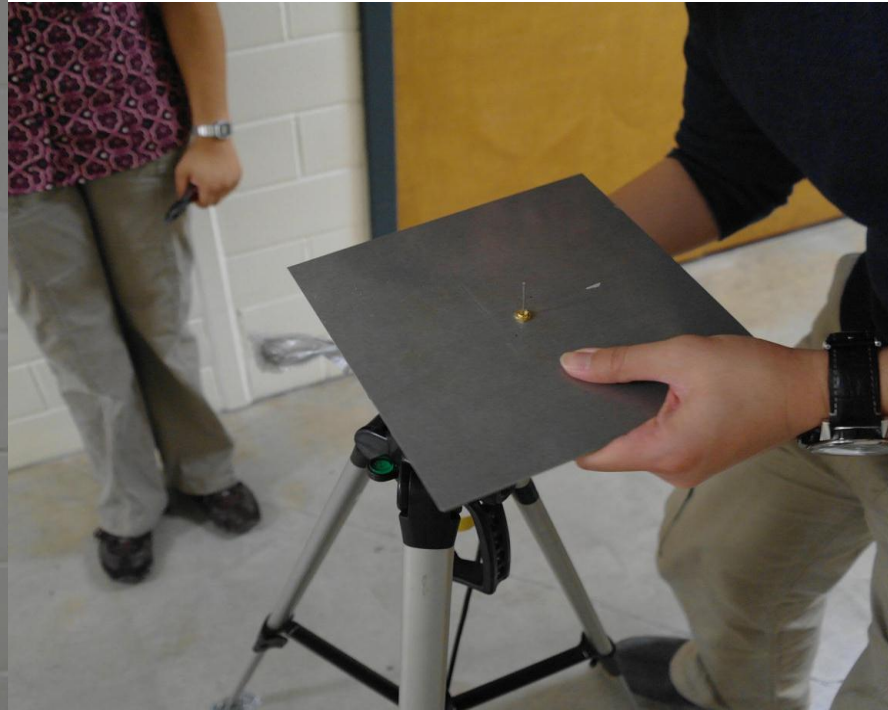
# Helix



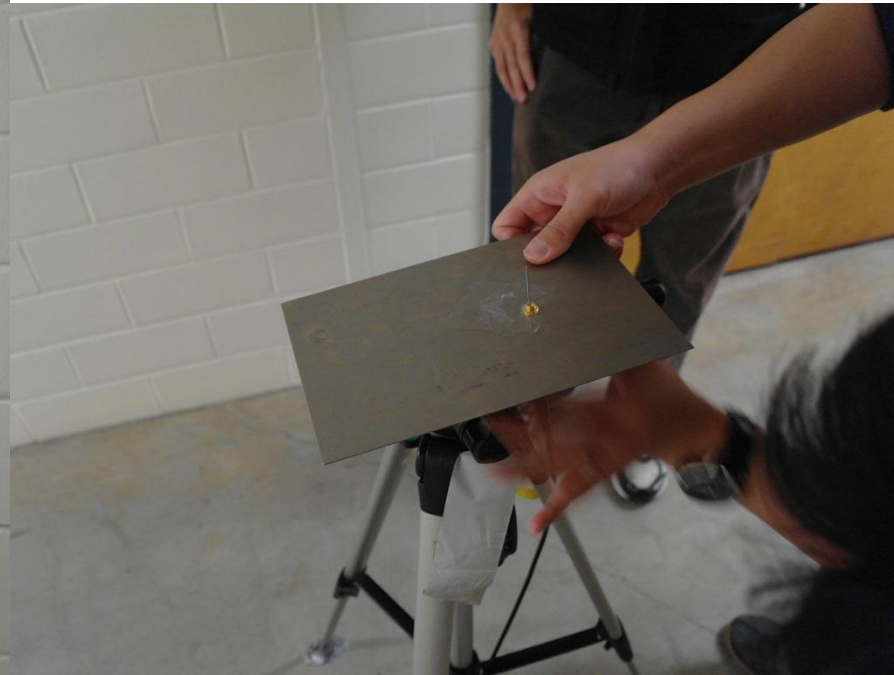
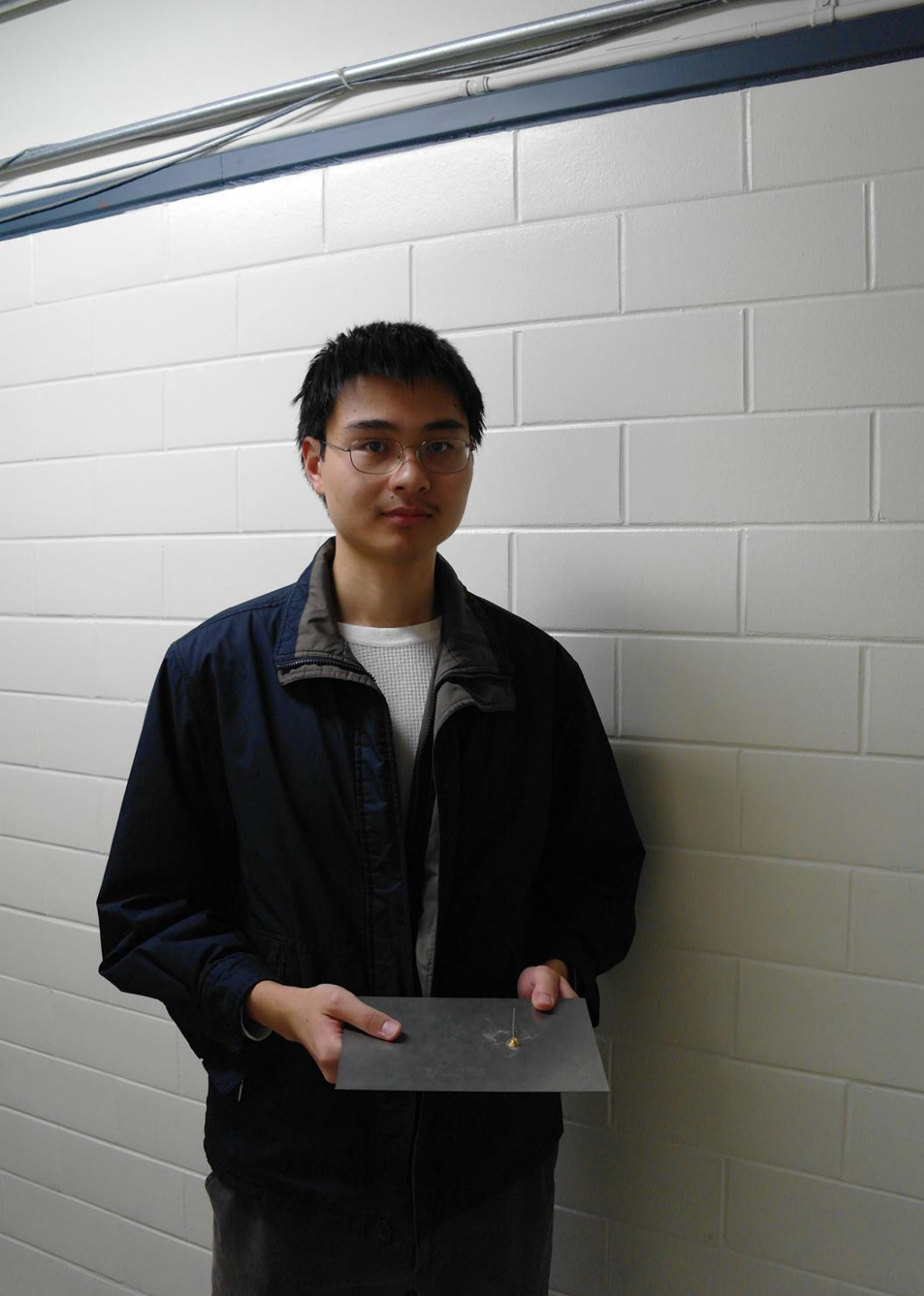
# Coffee Can



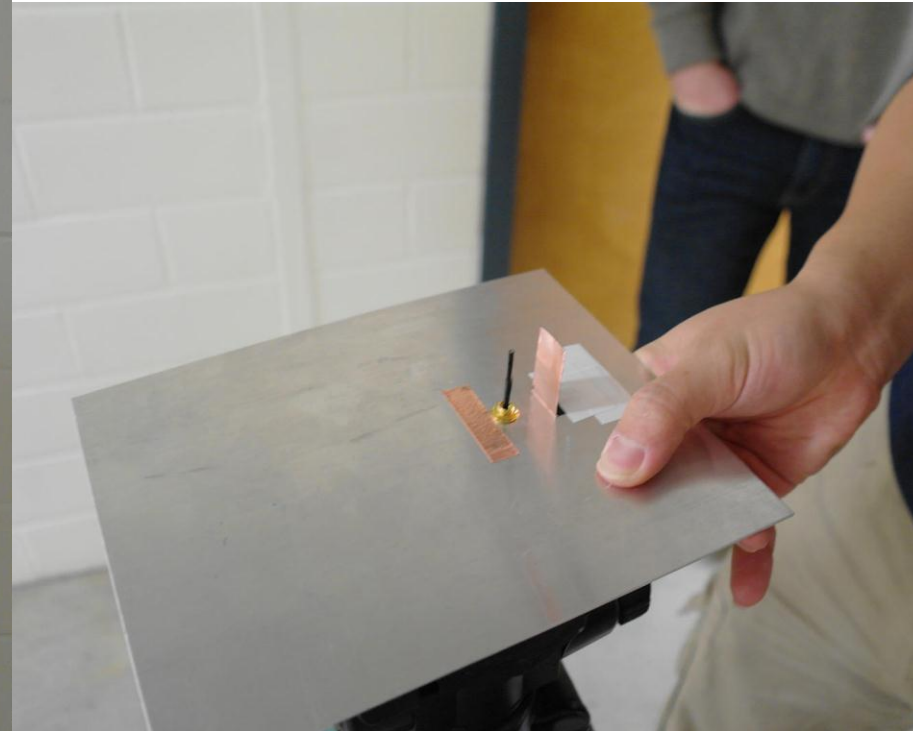
# Monopole



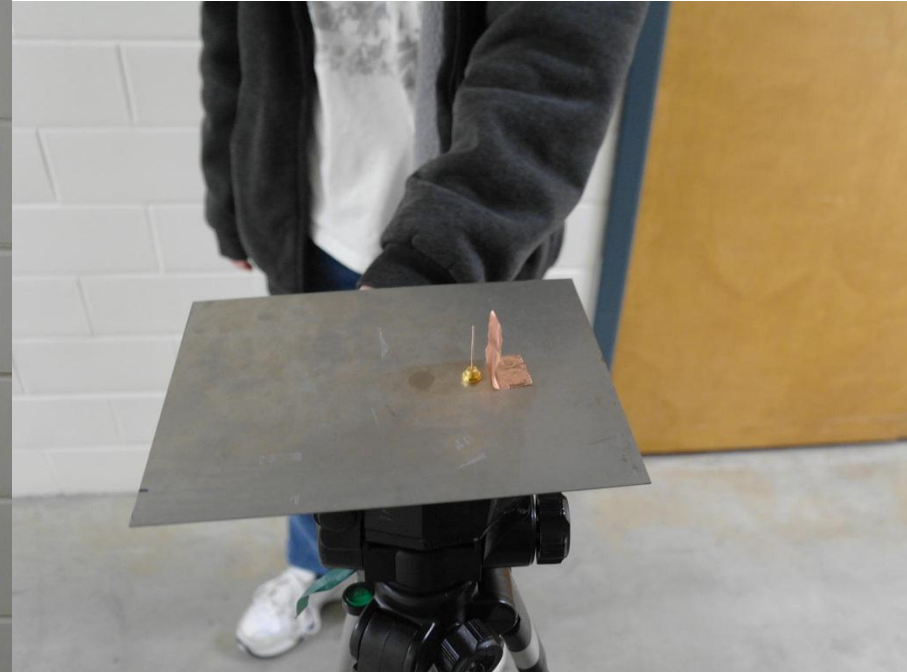
# Monopole



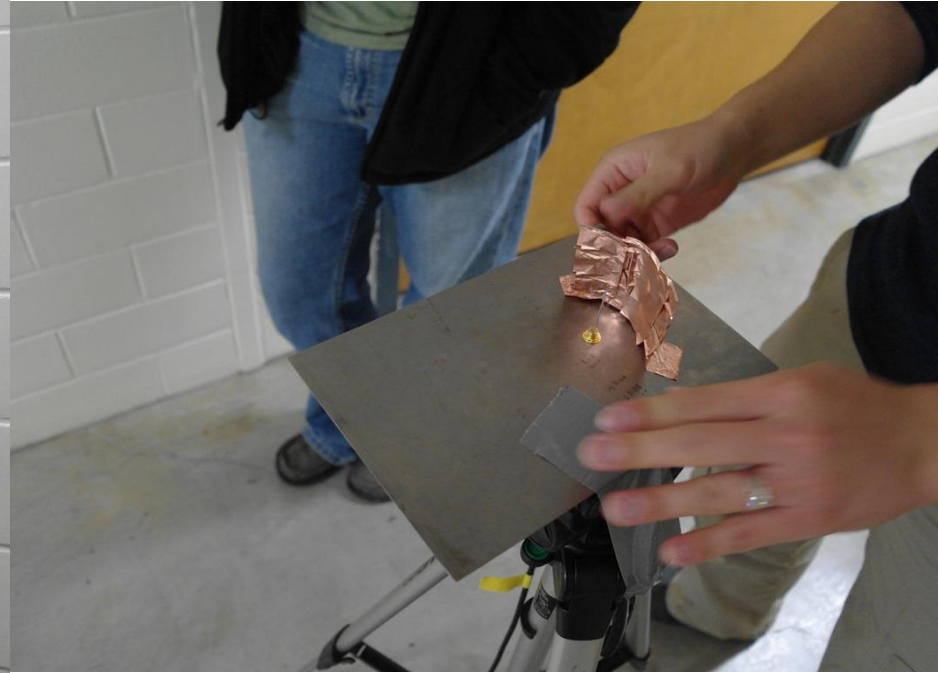
# Monopole with Reflector



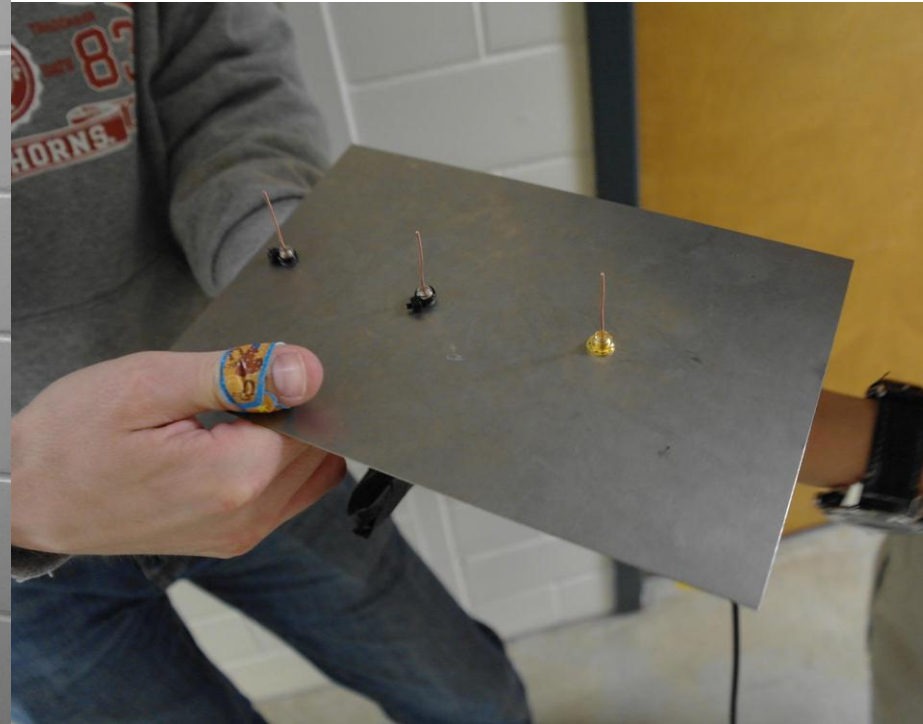
# Monopole with Reflector



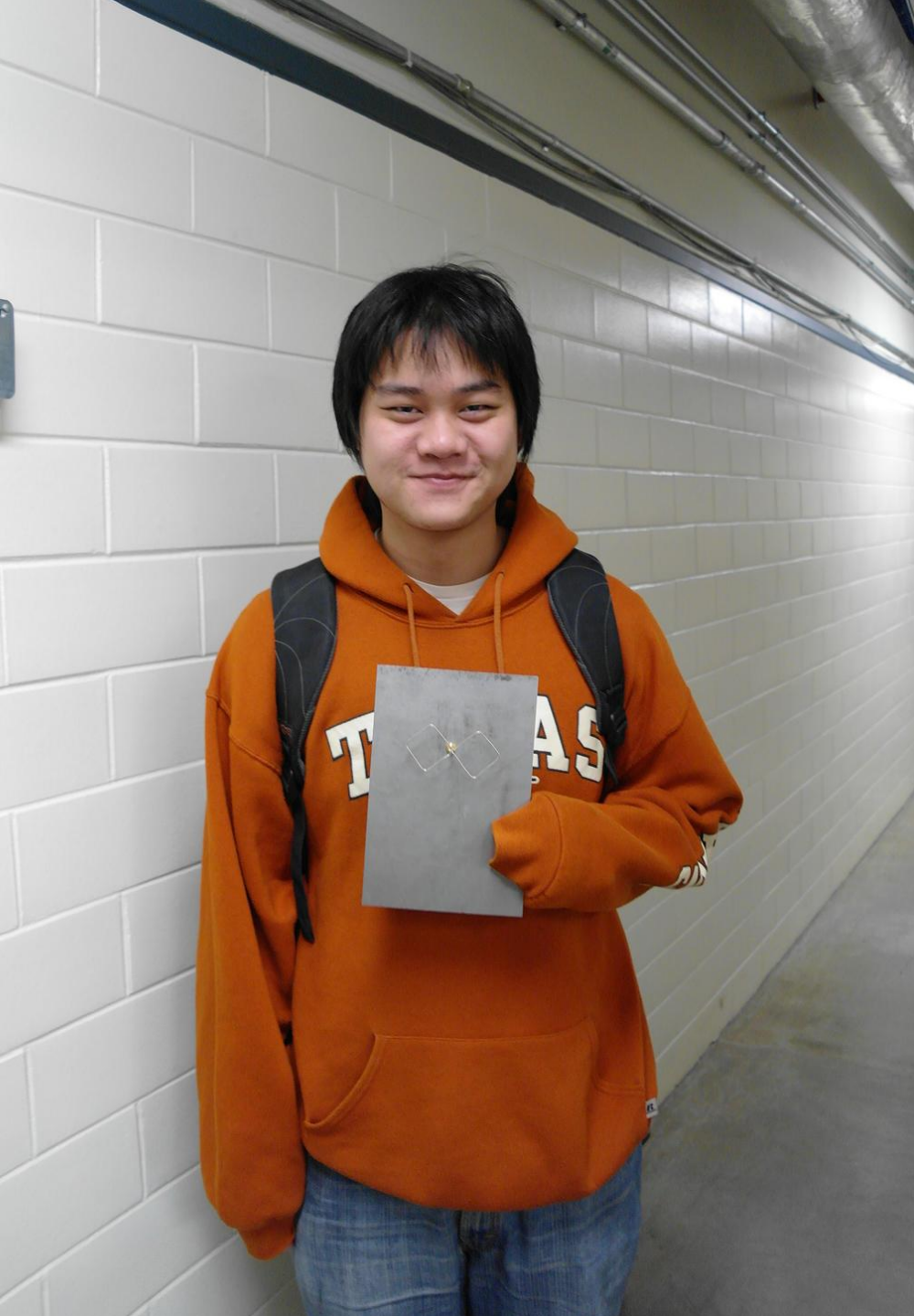
# Monopole with Reflector



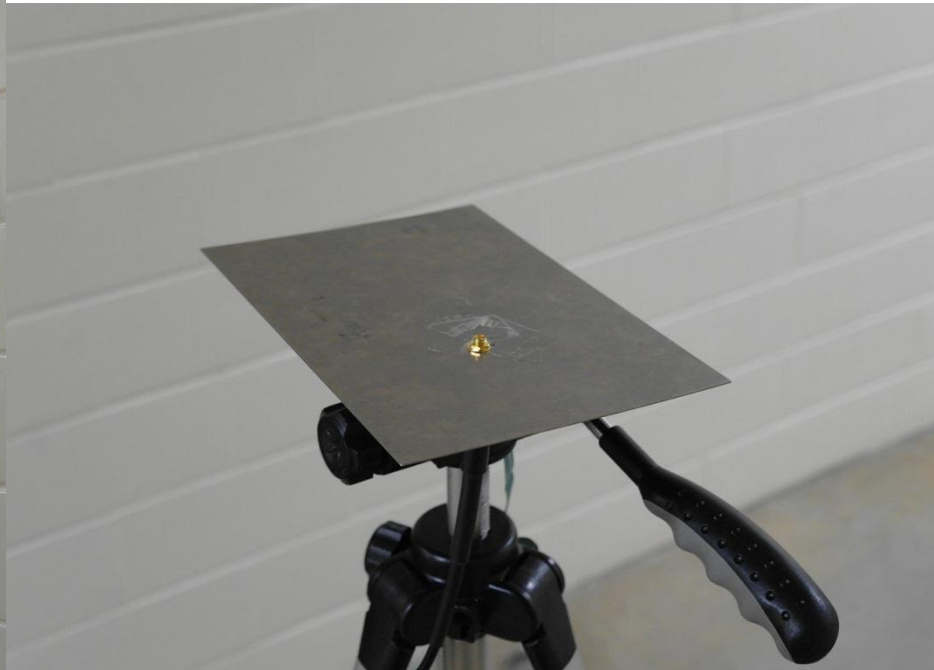
# Monopole Array



# Fancy Wire



# No Antenna!



# 3. Results

Antenna Type	Dimension (cm)	Power (dBm)	Final Score
helix	10.5	-28	117.399
helix	11.5	-29	86.822
helix	10.8	-33	36.318
monopole with reflector	2.8	-37	34.401
fancy wire	8.7	-34	34.026
monopole with reflector	7.2	-35	31.003
monopole with reflector	2.6	-38	28.302
coffee can	15.5	-33	27.091
monopole	2.8	-39	21.706
monopole	3.3	-39	19.983
helix	27.5	-34	13.053
monopole array	14	-41	4.673
no antenna	0	-50	3.333



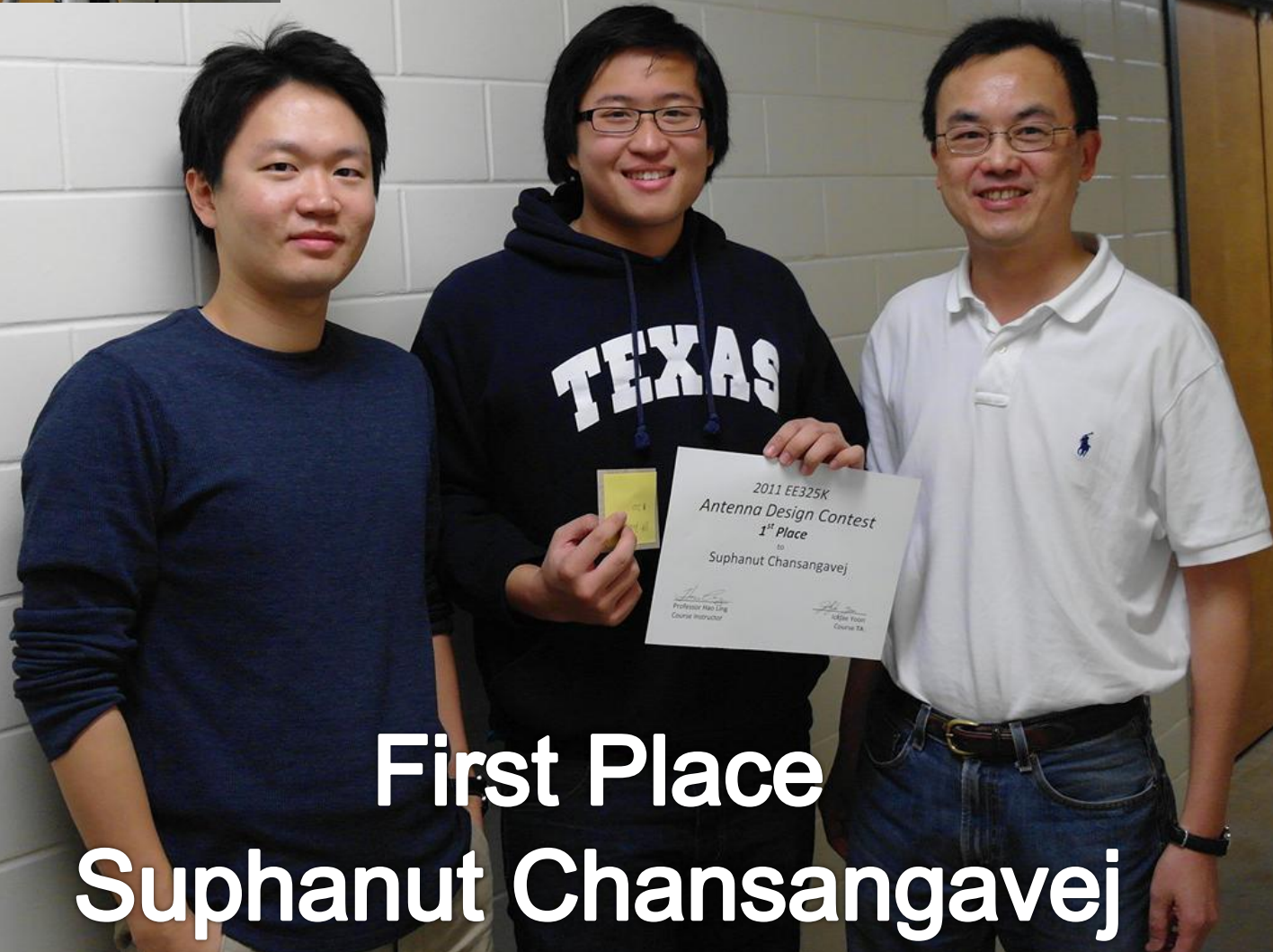
helix  
design



**Second Place**  
**Rodrigo Estrada**



helix  
design



**First Place**  
**Suphanut Chansangavej**

# 4. Required Equipment

- An internet router box. Its antenna must be removable. It needs to be connected to the Internet.
- RF cable (to connect test antenna to router box)
- A laptop with inSSIDer 2.0 software (free download at [www.metageek.net/products/inssider](http://www.metageek.net/products/inssider))