# WRAP AROUND MICROSTRIP ANTENNA FOR RADIO CONTROLLED TOYS


BY

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**ANTENNA** a usually metallic device (as a rod or wire) for radiating or receiving free space waves

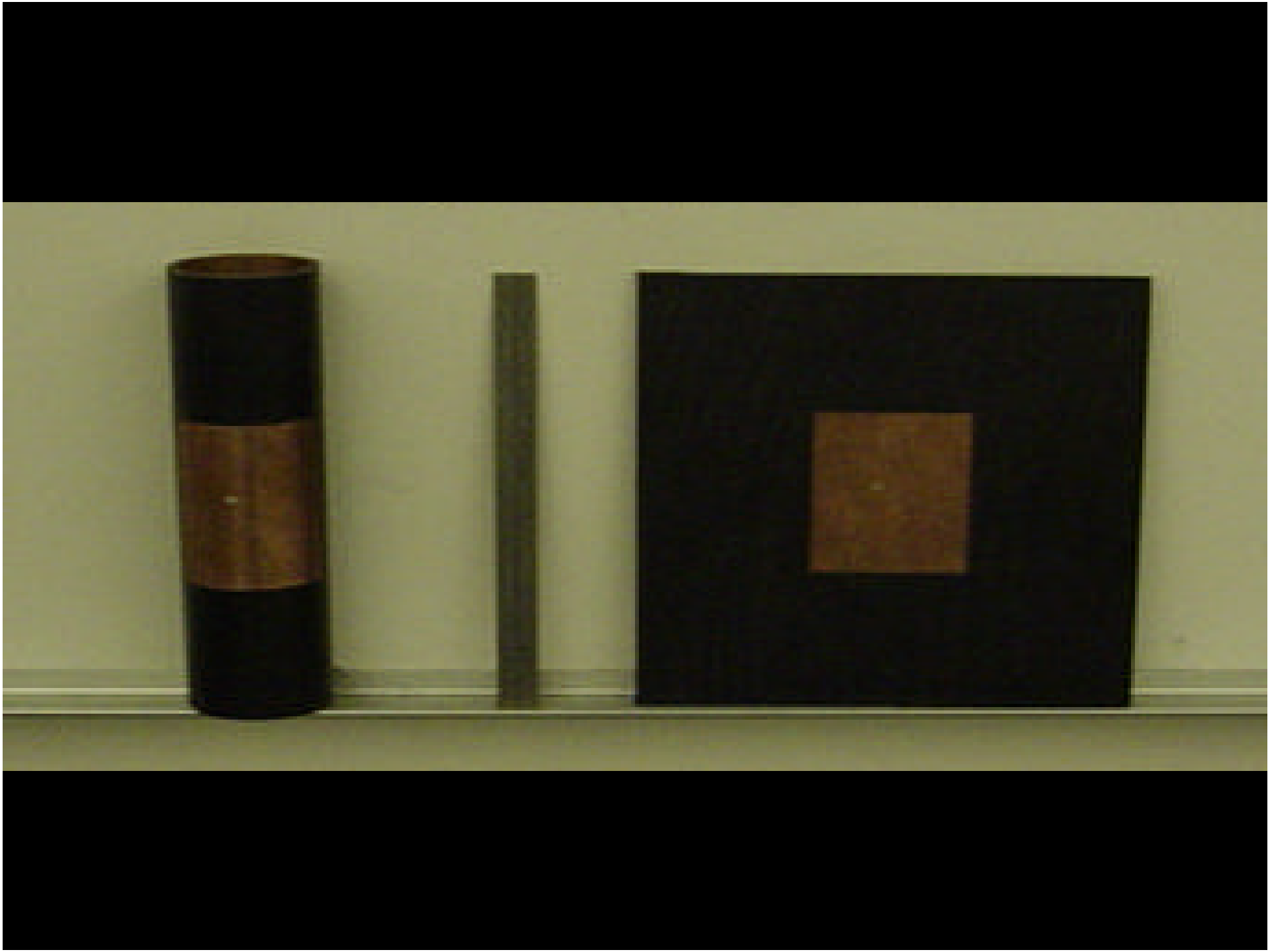
**ANTENNA DIRECTIVITY:** This is defined as the ratio of the radiation intensity in a given direction from the antenna to the radiation intensity averaged over all directions. In other words, directivity is when the antenna is more effective in one direction than in others.

**ANTENNA RADIATION PATTERN:** This is a graphical representation of the radiation characteristics of an antenna as a function of angular direction. The graph is plotted in either polar or rectangular coordinates. It illustrates the performance of the antenna at different angles and directions.

**FREQUENCY BANDWIDTH:** "The range of frequencies within which the performance of the antenna, with respect to some characteristics, conforms to a specified standard". In other words, it is the range of frequencies at which the antenna is able to perform its duties

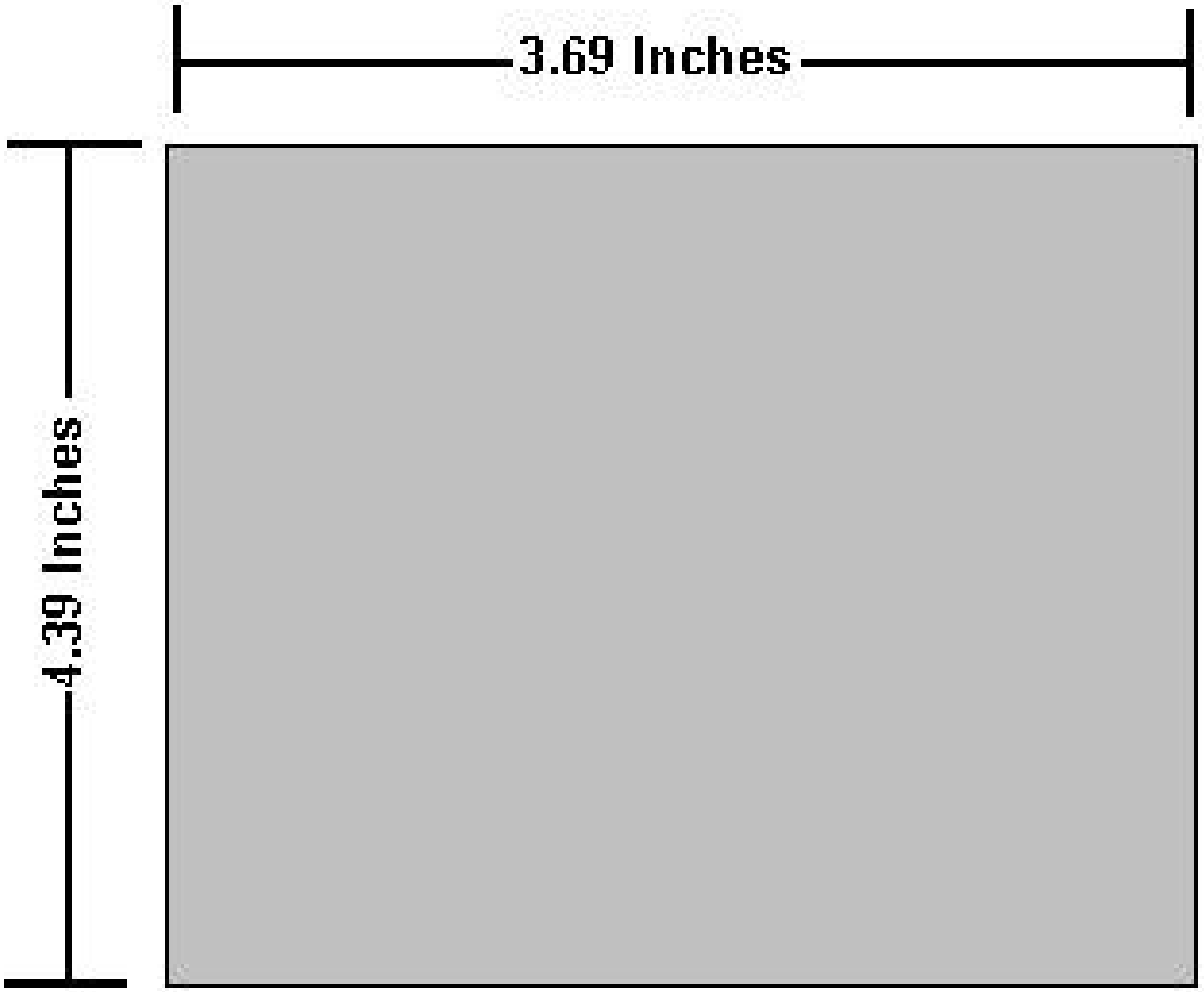
**HALF-POWER BEAMWIDTH:** This is the angle between the two directions in which the radiation intensity is one-half the maximum value of the beam. In most cases, it is range of angles at which the intensity is either maximum or no more than 3dBs less.

**OMNIDIRECTIONAL ANTENNA:** This is an antenna that has little directivity. It is virtually efficient in almost all directions.



# *Goals*

- Create a wraparound patch antenna.
- Maintain acceptable bandwidth
- Preserve Radiation pattern characteristics.
- Test and analyze antennas.


3.69 Inches
4.39 Inches

# FEEDING POINT

Constant

$k = (2? )/ ?$

$X = k*w$

Frensal Integral of sine [Si(X)]

$Si(X) = 1.64870$

Conductance

$I = -2 + \cos(X) + Si(X)*X + (\sin(X))/X$

$G1\_ABS = I/(120*? ^{2})$

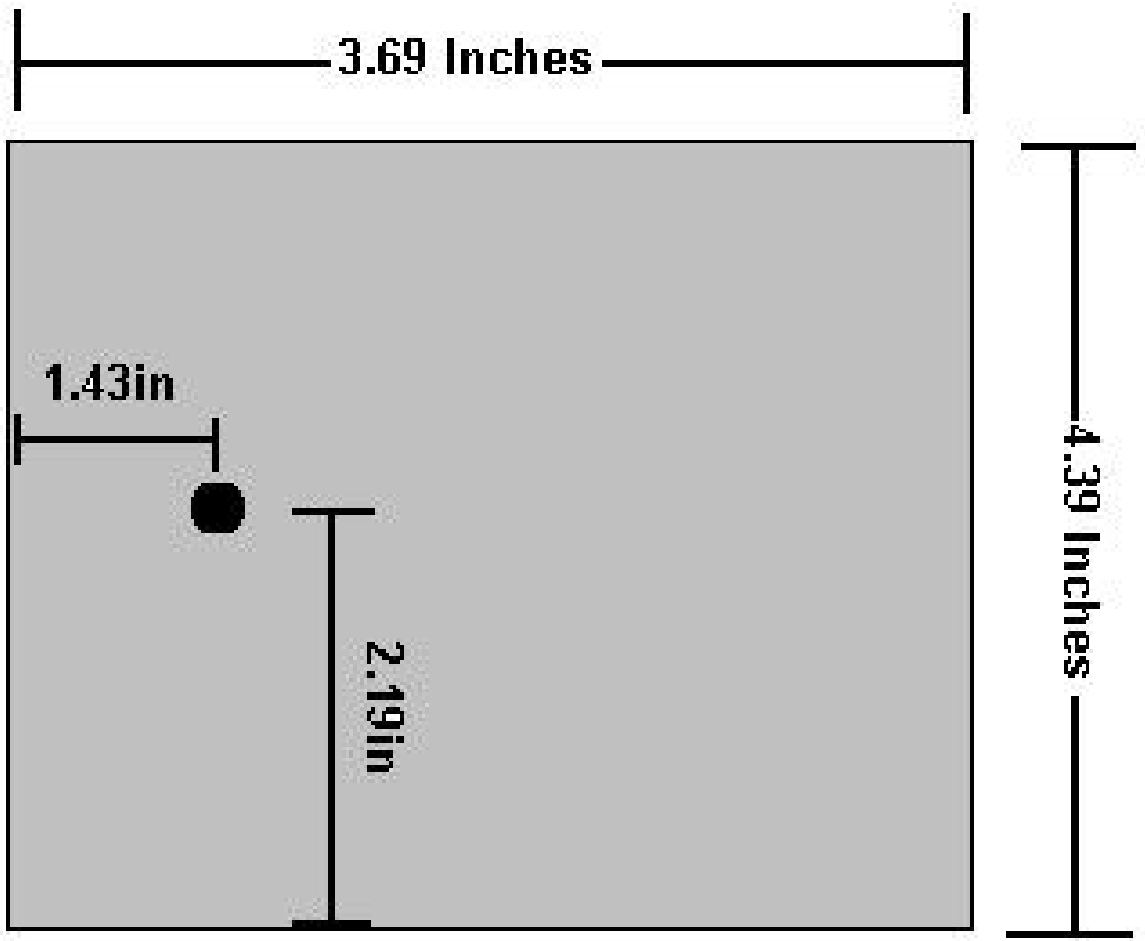
Input Resistance-Desired Impedance

$Rin = 50$

Inset Microstrip Feeding Point Distance

$L0\_ABS = \arccos(\sqrt{Rin*2*G1})*l/pi = 0.036m = 1.43in$

$W0\_ABS = w/2 = 0.056m = 2.19in$


3.69 Inches
1.43in
2.19in
4.39 Inches

# Alternatives Antennas

## Linear Wire Antenna

- Linear
- Acceptable Radiation Pattern and Bandwidth
- Inexpensive

## Planar Patch Antenna

- Low Profile
- Lightweight
- Robust

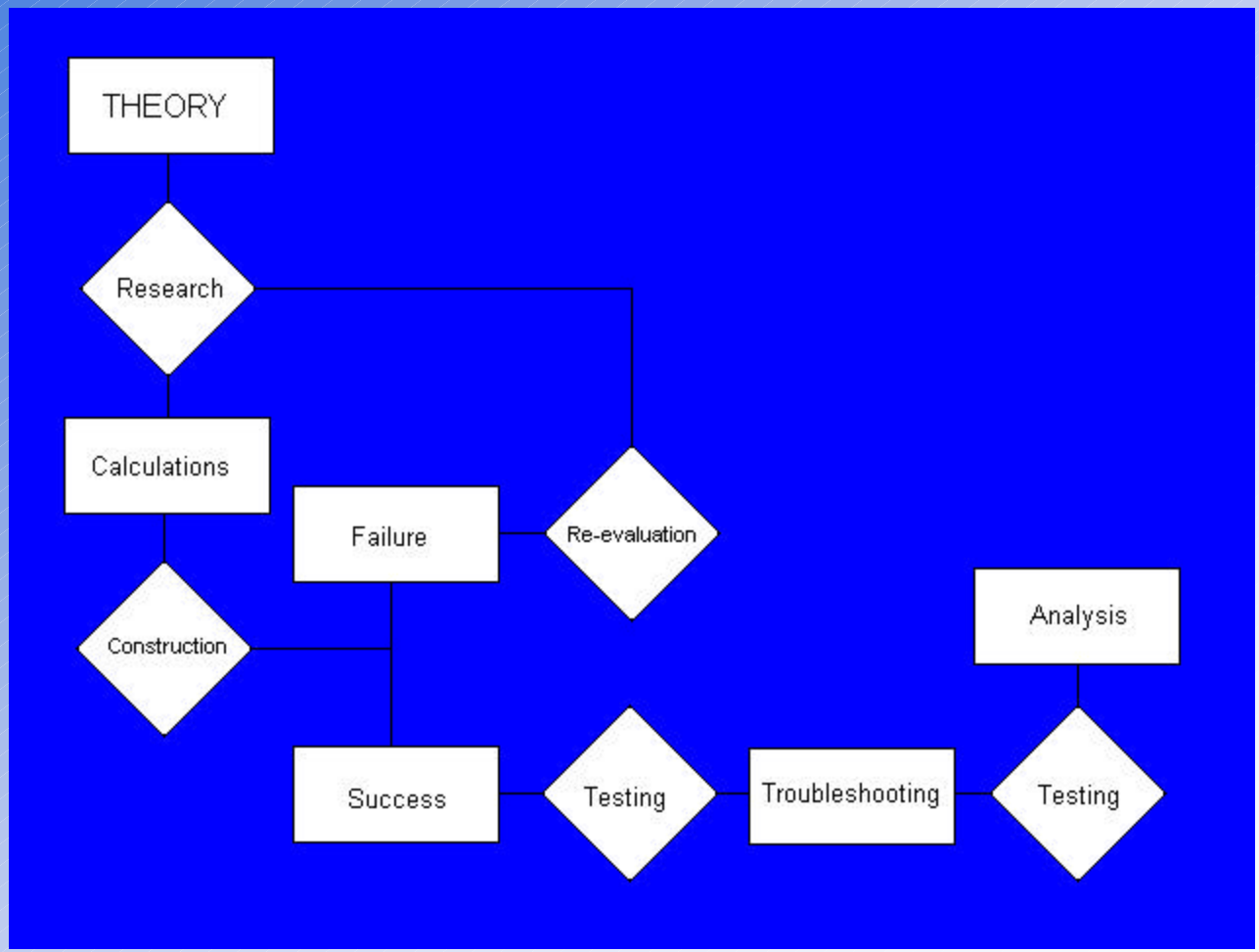
# Key Disadvantages

- Protruding

(Easily Broken)

- Planar (Non-Conformal)

# BLOCK DIAGRAM

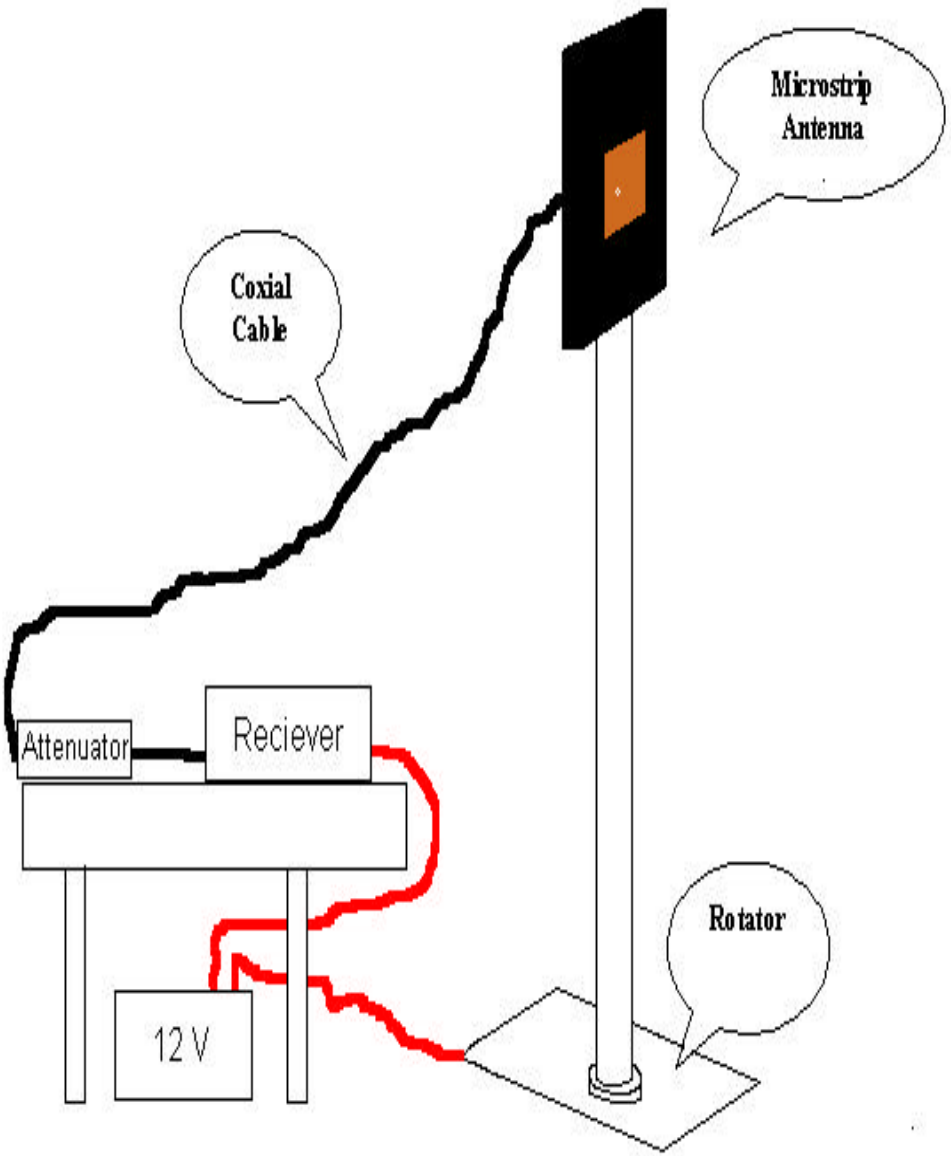


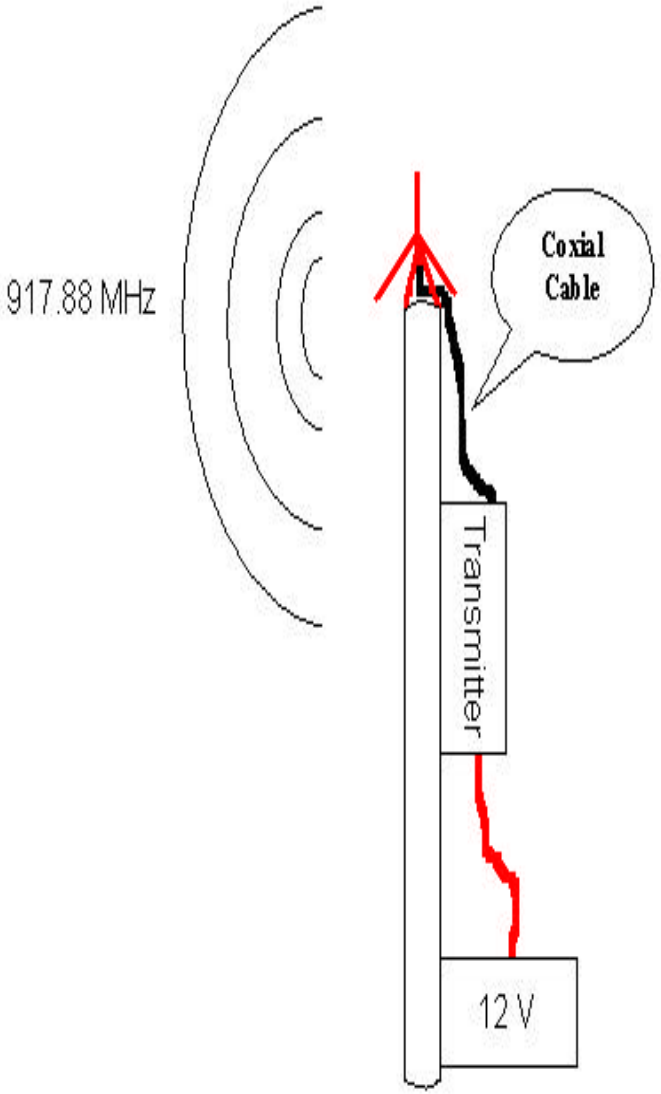
# TESTING APPROACH

- MOUNT ANTENNA ON MAST
- PLACE 917.88MHz TRANSMITTER ON ANOTHER MAST AND PLACE APPROX 50 FEET FROM ANTENNA
- SET RADIO RECIEVER TO 917.88 MHz AND CONNECT TO ATTENUATOR AND ANTENNA
- MEASURE INTENSITY OF RECEIVED SIGNAL BY ADJUSTING THE ATTENUATOR UNTIL IT READS YOUR CHOSEN REFERENCE POINT ON THE RECEIVER'S ANALOG METER (WE USED 3DB AS OUR REFERENCE POINT).
- ROTATE ANTENNA 360 DEGREES IN 15 DEGREE INTERVALS AND TEST INTENSITY (25 MEASUREMENTS) .


ICOM
1
2
4
8
16

# TESTING

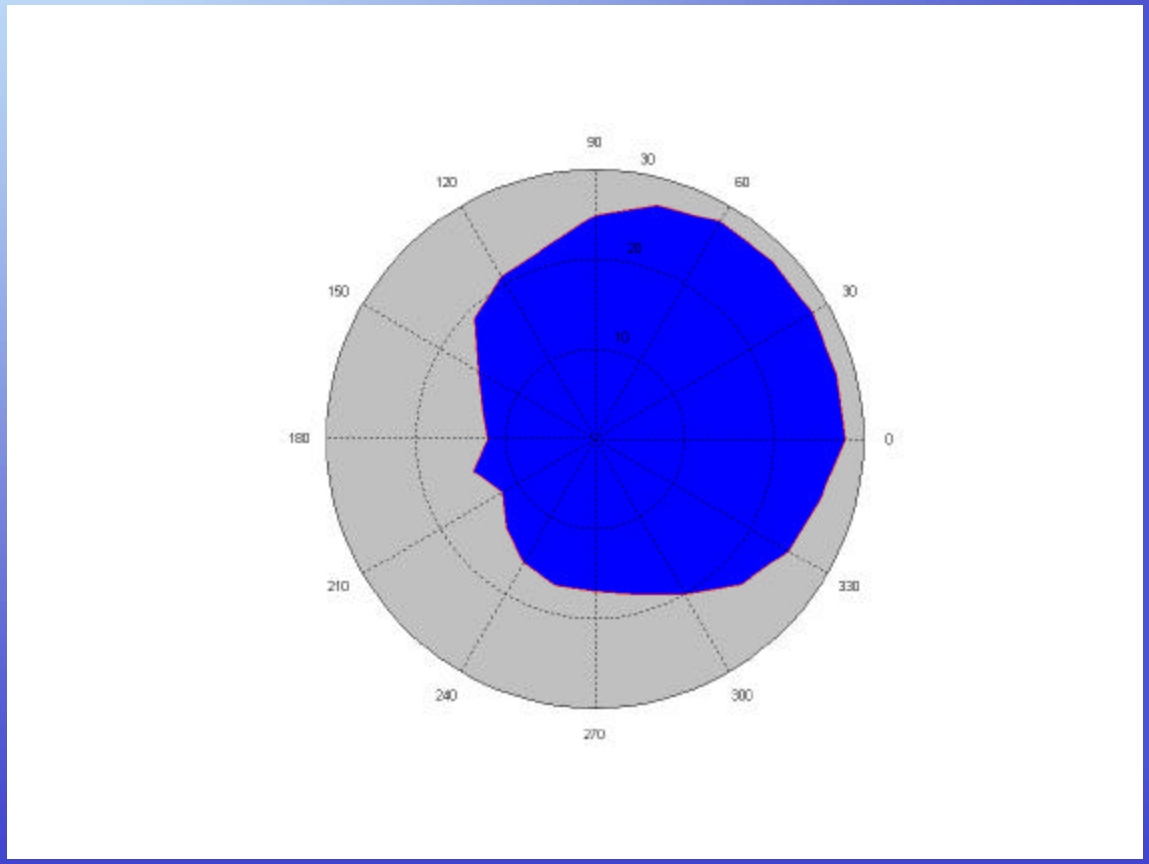

Microstrip Antenna
Coxial Cable
Attenuator
Reciever
Rotator
12 V


917.88 MHz
Coxial Cable
Transmitter
12 V

# PLANAR DATA

| Degrees | Attenuation |
|---|---|
| 0 | 28 |
| 15 | 28 |
| 30 | 28 |
| 45 | 28 |
| 60 | 28 |
| 75 | 27 |
| 90 | 25 |
| 105 | 22 |
| 120 | 21 |
| 135 | 19 |
| 150 | 15 |
| 165 | 13 |
| 180 | 12 |
| 195 | 14 |
| 210 | 12 |
| 225 | 14 |
| 240 | 16 |
| 255 | 17 |
| 270 | 17 |
| 285 | 18 |
| 300 | 20 |
| 315 | 23 |
| 330 | 25 |
| 345 | 26 |
| 360 | 28 |

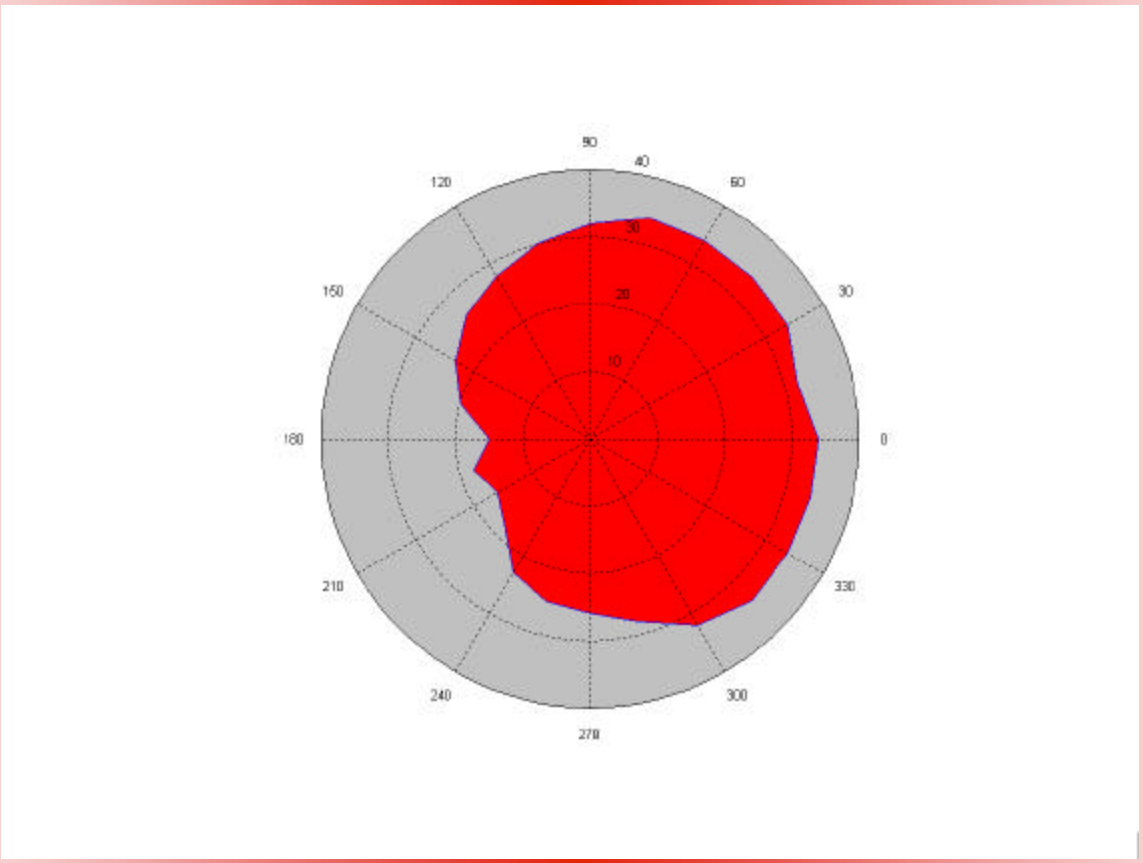
# RADIATION OF PLANAR ANTENNA



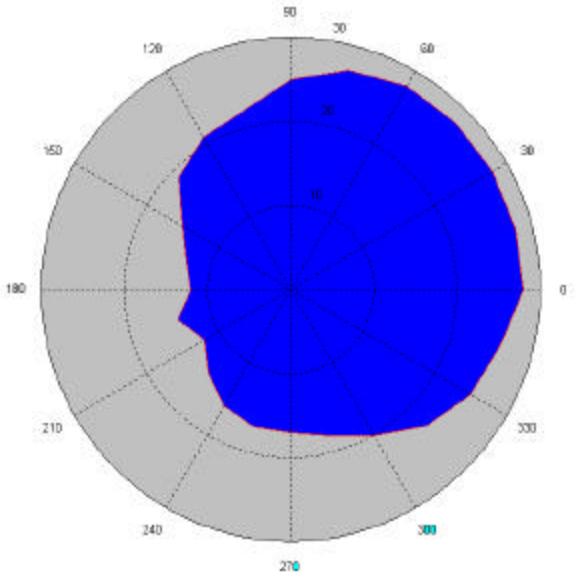
# WRAP AROUND DATA

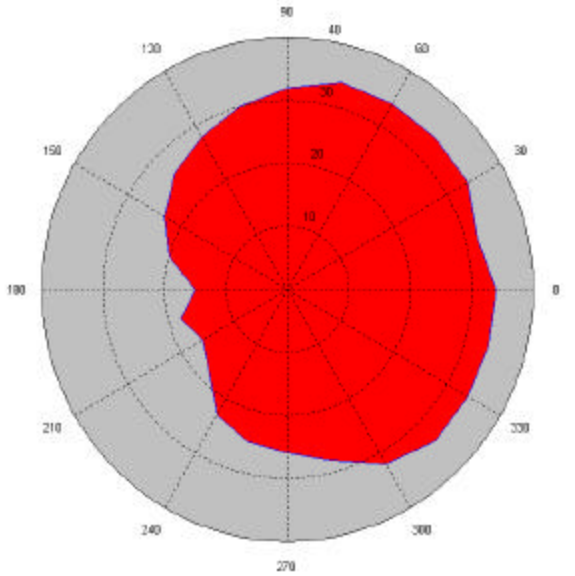
| WRAP AROUND PATCH ANTENNA | |
|---|---|
| 0 | 34 |
| 15 | 32 |
| 30 | 34 |
| 45 | 34 |
| 60 | 34 |
| 75 | 34 |
| 90 | 32 |
| 105 | 30 |
| 120 | 28 |
| 135 | 26 |
| 150 | 23 |
| 165 | 20 |
| 180 | 15 |
| 195 | 18 |
| 210 | 16 |
| 225 | 18 |
| 240 | 23 |
| 255 | 25 |
| 270 | 26 |
| 285 | 28 |
| 300 | 32 |
| 315 | 34 |
| 330 | 34 |
| 345 | 34 |
| 360 | 34 |

# RADIATION OF WRAP AROUND ANTENNA



# In Comparison



# BUDGET

| | Vendor | Product | Price | Amount | Total |
|---|---|---|---|---|---|
| • | McMasters | 4.5” x4 .5” Ceramic Sheet | $08.45 | 1 | $08.45 |
| • | Electric Warehouse | Copper Clad Board | $04.95 | 1 | $04.95 |
| • | Home Depot | 3” ABS Pipe | $12.00 | 1 | $12.00 |
| • | Home Depot | 4” ABS Pipe | $15.00 | 1 | $15.00 |
| • | KH Metals | 12” x 12” Copper Sheet | $08.00 | 8 | $64.00 |
| • | McMasters | 12” x 12” ABS Board | $13.75 | 1 | $13.75 |
| • | Electric Warehouse | Super Glue | $02.95 | 2 | $05.90 |
| • | S & W Plastics | 12” x 12” Acrylic Board | $03.50 | 1 | $03.50 |
| • | S&W Plastics | 3" Acrylic Plastic Pipe | $21.00 | 1 | $21.00 |
| • | KH Metals | 2" U-Bolt | $01.95 | 1 | $01.95 |
| • | KH Metals | 4" U-Bolt | $03.75 | 1 | $03.75 |
| • | Electric Wherehouse | Chassis BNC connectors | $01.35 | 4 | $05.40 |
| | TOTAL | | | | $159.65 |

# Meeting Our Goals

- ✓Came  up with an idea
- ✓Gathered Materials
- ✓Completed Needed Calculations
- ✓Constructed both planar and wrap around antennas
- ✓Conducted experiments & gathering data
- ✓Maintained radiation pattern and directivity