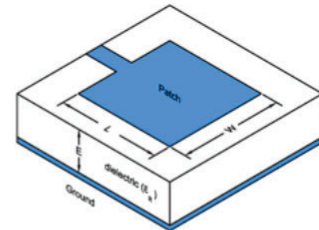




The Single Microstrip Patch Antenna is well studied. As a result, the length and width of the Patch antenna can be calculated by either Online Microstrip Patch Antenna Calculator or experimental formulas [1].

Dielectric Constant	3.6	
Dielectric Height:	0.254	Millimeters
Operation Frequency:	24	GHz
<input type="button" value="Calculate"/>		



Result:

Width: 4.118 mm
Length: 3.206 mm

$$Width = \frac{c}{2f_0\sqrt{\frac{\epsilon_R+1}{2}}}; \quad \epsilon_{eff} = \frac{\epsilon_R+1}{2} + \frac{\epsilon_R-1}{2} \left[\frac{1}{\sqrt{1+12\left(\frac{h}{W}\right)}} \right]$$

$$Length = \frac{c}{2f_0\sqrt{\epsilon_{eff}}} - 0.824h \left(\frac{(\epsilon_{eff}+0.3)\left(\frac{W}{h}+0.264\right)}{(\epsilon_{eff}-0.258)\left(\frac{W}{h}+0.8\right)} \right)$$

Fig.5: Online Microstrip Patch Antenna Calculator and Experimental Formulas

For our design, the Dk is 3.6, Dielectric Height is 0.254 millimeters and the Operation Frequency is 24GHz. According to the Fig.5, the Patch's width is 4.118 mm, the length is 3.206 mm. The patch is still not manufacturable due to the impedance generally greater than 100 Ohms at the edge of patch.

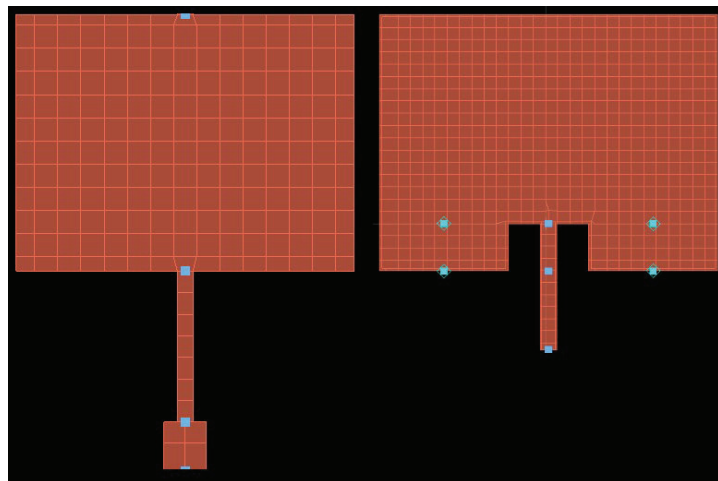


Fig.6: Transmission Line Matching (Left) and Inset Feed (Right)

In other words, the microstrip with impedance greater than 100 Ohm exceed the most PCB manufactures' minimum trace width capability for the substrate we used. Either Transmission Line Matching [2] or Inset Feed [3]