Parallel Coupled Patch Antenna Array

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ABSTRACT: - We have been making coupled parallel patch antenna array to develop RFID (radio frequency identification) mat system. With the help of patch antenna array we are going to monitor RFID tags. These tags are placed in slippers or other things of person. Through this mat we can keep information about that person.

INTRODUCTION: -
Patch Antenna: -
A patch antenna (also known as a rectangular micro strip antenna) is a type of radio antenna with a low profile, which can be mounted on a flat surface. It consists of a flat rectangular sheet or "patch" of metal, mounted over a larger sheet of metal called a ground plane. The assembly is usually contained inside a plastic Radom, which protects the antenna structure from damage. Patch antennas are simple to fabricate and easy to modify and customize.

Therefore they are extremely compatible for embedded antennas in handheld wireless devices such as cellular phones, pagers etc.

Advantages: -
1. Light weight and low volume.
2. Low profile planar configuration which can be easily made conformal to host surface.
3. Low fabrication cost, hence can be manufactured in large quantities.
4. Supports both, linear as well as circular polarization.
5. Can be easily integrated with microwave integrated circuits (MICs).
6. Capable of dual and triple frequency operations.
7. Mechanically robust when mounted on rigid surfaces.

Disadvantages: -
1. Narrow bandwidth
2. Low efficiency
3. Low Gain
4. Extraneous radiation from feeds and junctions
5. Poor end fire radiator except tapered slot antennas
6. Low power handling capacity.
7. Surface wave excitation

Feed Techniques: -
1. Micro strip Line Feed
2. Coaxial Feed
3. Aperture Coupled Feed
4. Proximity Coupled Feed
SYSTEM REQUIREMENT AND DESIGN: -
We have to make an array of patch antenna that is parallel coupled. The feed is given to one antenna and that transmit the power that power is received by other neighborhoods antenna and again transmitted. The one antenna received the tag information and transmits to other antenna.

(Schematic of parallel coupled patch antenna array)

Specification for substrate and patch: -

Substrate specification: -

Dielectric constant=1.03

Simulated results: -
Our designed parallel coupled antenna array work at 830MHz. In simulation we are getting -9dB S11 but in practical scenario we are getting -10.69dB. Both graphs are given below.

(Simulated S11 Graph)
Now we are going to couple this antenna with other antenna. The values of S21 and distance for both practical and simulation case are given below in tabulate form:

### S21 with Various Distance

<table>
<thead>
<tr>
<th>S21</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20.40 dB</td>
<td>3 cm</td>
</tr>
<tr>
<td>-24.11 dB</td>
<td>6 cm</td>
</tr>
<tr>
<td>-26.46 dB</td>
<td>6.5 cm</td>
</tr>
<tr>
<td>-30.56 dB</td>
<td>7.5 cm</td>
</tr>
<tr>
<td>-33.16 dB</td>
<td>8.5 cm</td>
</tr>
<tr>
<td>-37.92 dB</td>
<td>More than 30 cm</td>
</tr>
</tbody>
</table>

(For practical)

### S21 with Various Distance (For Separation 6.5 cm)

<table>
<thead>
<tr>
<th>S21</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>-16.23 dB</td>
<td>3 cm</td>
</tr>
<tr>
<td>-20.32 dB</td>
<td>6 cm</td>
</tr>
<tr>
<td>-22.86 dB</td>
<td>6.5 cm</td>
</tr>
<tr>
<td>-29.56 dB</td>
<td>7.5 cm</td>
</tr>
<tr>
<td>-35.32 dB</td>
<td>8.5 cm</td>
</tr>
<tr>
<td>-40.00 dB</td>
<td>More than 30 cm</td>
</tr>
</tbody>
</table>

(For simulation)

We also tried one more scenario in which the antenna are placed face to face with each other in this case the S21 value with separation given below:

### S21 with Various Distance (When Antennas are Facing Each Other)

<table>
<thead>
<tr>
<th>S21</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>-7.71 dB</td>
<td>3 cm</td>
</tr>
<tr>
<td>-8.49 dB</td>
<td>5 cm</td>
</tr>
<tr>
<td>-10.81 dB</td>
<td>7.5 cm</td>
</tr>
<tr>
<td>-11.02 dB</td>
<td>8.5 cm</td>
</tr>
<tr>
<td>-13.16 dB</td>
<td>More than 30 cm</td>
</tr>
</tbody>
</table>

S21 graph with various distance are given below (when antennas are facing each other):
Radiation Pattern of antenna is given below:-

CONCLUSION: -
We made an array of coupled antenna which we can use in RFID (radiofrequency identification) mat. But the S21 value in parallel coupled case is not good so it’s difficult to made RFID mat with this scenario. But the face to face coupling gives the better S21 value so we can use this structure to implement RFID (radiofrequency identification) mat.

REFERENCES