A New Design Methodology for Genetically Engineered Stochastic Antennas
GA Optimized Stochastic Antennas
GA Optimized Stochastic Antennas
- Continued
Example 1

Source

6.2 cm

6 cm
Example 1 - continued

VSWR vs Frequency

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>VSWR</th>
<th>Zin</th>
</tr>
</thead>
<tbody>
<tr>
<td>1125.000</td>
<td>1.310296</td>
<td>(57.17770, -12.59200)</td>
</tr>
<tr>
<td>1562.000</td>
<td>1.592614</td>
<td>(63.84570, -22.63260)</td>
</tr>
<tr>
<td>1565.000</td>
<td>1.460191</td>
<td>(63.91000, -16.43060)</td>
</tr>
<tr>
<td>1575.000</td>
<td>1.300456</td>
<td>(64.31520, 4.278230)</td>
</tr>
<tr>
<td>1580.000</td>
<td>1.436960</td>
<td>(64.62910, 14.67530)</td>
</tr>
<tr>
<td>1585.000</td>
<td>1.661628</td>
<td>(65.01870, 25.11750)</td>
</tr>
<tr>
<td>1588.000</td>
<td>1.826256</td>
<td>(65.28960, 31.40970)</td>
</tr>
</tbody>
</table>
Example 1 - continued

Frequency = 1.225 GHz

Frequency = 1.575 GHz
Example 2

f = 1225.000  VSWR = 1.283444  Zin = (62.52690, 6.227200)
f = 1575.000  VSWR = 1.457391  Zin = (37.92140, -11.23770)
Example 2 - continued

Frequency = 1.225 GHz

![Graphs showing frequency = 1.225 GHz]

Frequency = 1.575 GHz

![Graphs showing frequency = 1.575 GHz]
GA Optimized Symmetrical Stochastic Dipole Antennas

38% size reduction at 1.225 GHz

$G_{\text{max}} = 2.12 \text{ dB}$

$\text{VSWR}_{\text{min}} = 1.21$
GA Optimized Symmetrical Stochastic Dipole Antennas

- continued

46% size reduction at 1.225 GHz

$G_{\text{max}} = 2.10 \text{ dB}$

$VSWR_{\text{min}} = 1.57$
GA Optimized Symmetrical Stochastic Dipole Antennas

51% size reduction at 1.225 GHz

$G_{\text{max}} = 2.08 \text{ dB}$

$VSWR_{\text{min}} = 1.88$
A Dipole With 6 cm Length at 1.225 GHz

\[ G_{\text{max}} = 1.97 \text{ dB} \]
Circularly Polarized Stochastic Antennas
Circularly Polarized Stochastic Antennas

- Continued
Circularly Polarized Stochastic Antennas

VSWRs calculated with respect to 50 ohms

41% size reduction at 915 MHz

Source #1

Source #2
Circularly Polarized Stochastic Antennas - Continued

915 MHz Example

\[ G_{\text{max}} = 2.09 \text{ dB} \]
Genetically Engineered Credit Card Antenna

16.39 cm

5.9 cm

11.59 cm
Credit Card Antenna – Radiation Patterns

Antenna With Silver Wire

902 MHz

915 MHz

928 MHz

1.40 dB Gain*

1.40 dB Gain*

1.41 dB Gain*

*Note: Gain of crossed half-wave reference dipole is 1.46 dB
Genetically Engineered 915 MHz Credit Card Antenna

Over 75% Reduction in Area Compared With a Half-wave Dipole
Summary

• A new antenna design methodology was developed to achieve multiband performance without loading the antenna structure.

• This design technique has been extended to develop miniature stochastic dipoles with symmetrical structure.

• The design technique has also been successfully applied to optimize circularly polarized miniature crossed stochastic dipoles.

• An application to the design of a miniature 915 MHz circularly polarized credit card RFID tag antenna was considered.