S11 Graphs of the Blade Antenna obtained via a Parameter Sweep using CST.

A CST four parameter sweep simulation was performed on the “blade” style antenna. The parameter variation is shown in Table 1. Figure 1 shows the S11 results of all of the parameters. Figures 2 and 3 fix the panel length, Figures 4-6 fix the width, Figures 7-9 fix the gap value, and Figures 10 and 11 fix the panel height. Figures 12 and 13 highlight curves with particularly good S11 shapes. Figure 13 also highlights the difference between using a panel height of 0.52 m vs 0.50 m.

The next step is to evaluate some of the parameter combinations for RMS error performance in curve fitting the antenna-sky convolution.

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Value 1 (m)</th>
<th>Value 2 (m)</th>
<th>Value 3 (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel Length</td>
<td>0.450</td>
<td>0.475</td>
<td>0.500</td>
</tr>
<tr>
<td>Panel Width</td>
<td>0.625</td>
<td>0.655</td>
<td>0.685</td>
</tr>
<tr>
<td>Panel Gap</td>
<td>0.20</td>
<td>0.22</td>
<td>0.24</td>
</tr>
<tr>
<td>Panel Height</td>
<td>0.50</td>
<td>0.52</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Parameter values for the 3x3x3x2 (54 runs) simulation matrix.

Figure 1. Blade antenna model in CST.
Figure 2. S11 curves of all 54 Variations. The three bundles at the far left of the graph are due to the panel length varying from 0.45 m to 0.50 m. Other bundles near the center frequency are mostly due to panel width variations.

Figure 2. S11 curves with the panel length fixed at 0.475 m. S11 is lower at mid range frequencies but higher at lower frequencies. Width variations results in curve bundles seen at the mid frequencies.

Figure 3. S11 curves with the panel length fixed at 0.500 m. S11 is higher at mid range frequencies but lower at lower frequencies.
Figure 4. S11 curves with the panel width fixed at 0.625 m.

Figure 5. S11 curves with the panel width fixed at 0.655 m.

Figure 6. S11 curves with the panel width fixed at 0.685 m.
Figure 7. S11 curves with the gap fixed at 0.020 m.

Figure 8. S11 curves with the gap fixed at 0.022 m.

Figure 9. S11 curves with the gap fixed at 0.024 m.
Figure 10. S11 curves with the height fixed at 0.50 m.

Figure 11. S11 curves with the height fixed at 0.52 m.
Figure 12. Potentially interesting parameters. Height=0.52 m, Gap=0.24 m, Width=0.685 m. Length ranges from 0.450 m to 0.500 m.

Figure 13. Potentially interesting parameters. Height=0.050 and 0.52 m, Gap=0.24 m, Width=0.685 m. Length ranges from 0.450 m to 0.500 m.