Broadband Bowtie Antenna for 2–10 GHz Applications

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BACKGROUND

This work presents the design of a broadband **bowtie antenna** operating in the frequency range from **2 to 10 GHz**. The bowtie architecture has been chosen because of its inherent broadband properties, as it achieves stable radiation patterns and impedance matching over the entire frequency band. Parallel circular transmission lines are used for its power supply. Simulated and measured results demonstrate the antennas ability to operate with high efficiency, making it suitable for radar, communications and sensing applications.

METHODS AND MATERIALS

The architectural configuration of the antenna is characterized by the implementation of a ground plane that undergoes a bending or self-grounded process, resulting in the acquisition of a triangular or V-shape. This process gives rise to the formation of two arms or dipoles that are responsible for the coupling of energy.

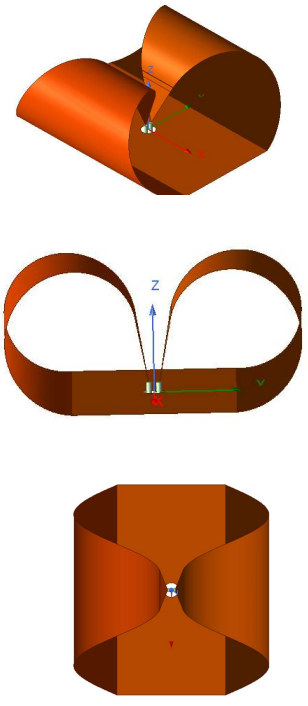

Figure 2: Antenna Architecture

RESULTS

The antenna was simulated in the HFSS software.

Reflection Coefficient

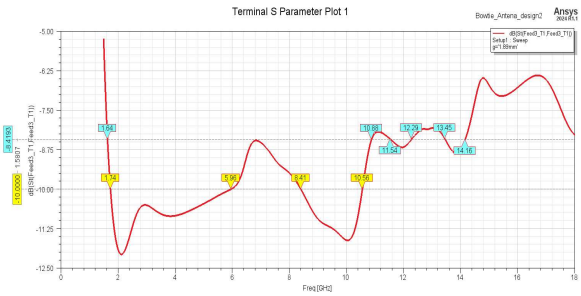

Figure 1: S-parameters

The reflection coefficient (S11) remains below –8.41 dB throughout the operating bandwidth.

Gain Pattern

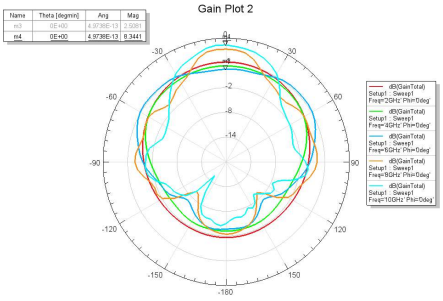

Figure 2. Broadside gain patterns (in dB) at **2, 4, 6, 8, and 10 GHz**

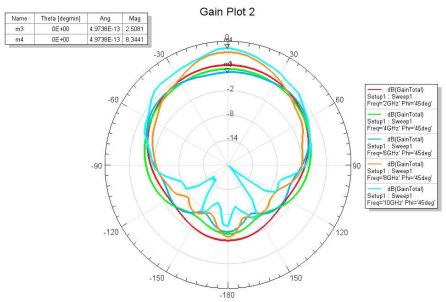

Figure 3: Gain pattern at θ=0, φ=45, at **2, 4, 6, 8, and 10 GHz**.

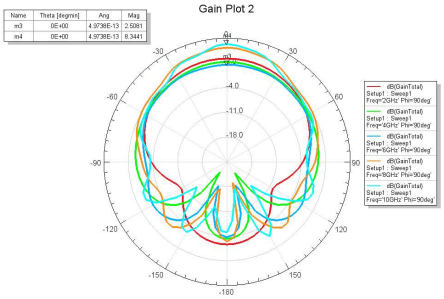

Figure 4: Gain pattern at θ=0º, φ=90º, at **2, 4, 6, 8, and 10 GHz**.

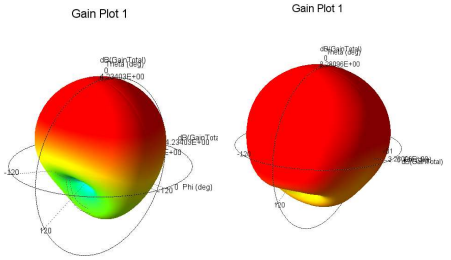

Figure 5: **Total Gain at 2 GHz** Figure 6: **Total Gain at 4 GHz**

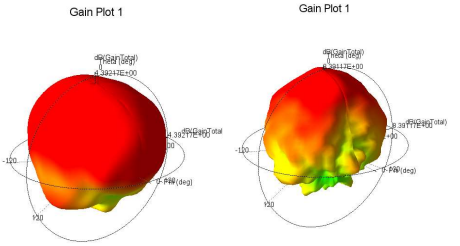

Figure 7: **Total Gain at 6 GHz** Figure 8: **Total Gain at 10 GHz**

The gain was found to be 2.5dB for low frequencies and 8.34dB for high frequencies.

CONCLUSION

- In conclusion, this architecture achieves high bandwidth and stable patterns across most of the band. For future plans it is desirable to optimize the model and examine a dual-polarized version.

ACKNOWLEDGEMENTS

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REFERENCES

[1] J. Yang and A. Kishk, "The self-grounded Bow-Tie antenna," 2011 IEEE International Symposium on Antennas and Propagation (APSURSI), Spokane, WA, USA, 2011, pp. 1452-1455, doi: 10.1109/APS.2011.599656.