

Analysis of a Vertical Half-Wavelength Dipole Antenna in the 40 Meter Band

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INTRODUCTION

DIPOLES are a common antenna design renowned for their simplicity, robustness and high efficiency. While although dipoles are used across a wide number of frequencies, they enjoy significant popularity for HF (frequencies from 3 to 30 MHz), where both omnidirectional transmission and reception are required.

I. IMPEDANCE VARIATION VS FREQUENCY

Sampling data from between 6.3 MHz and 7.7 MHz, the length of the dipole was set to be 48.457% of $\frac{\lambda}{2}$ in order to achieve resonance, which has the form

$$Z_A = R_A + jX_A \quad (1)$$

$$\text{where resonant if reactance } X_A = 0 \quad (2)$$

A. Radiation Resistance R_R

B. Loss Resistances R_L

C. Resonance

II. VSWR VS FREQUENCY

III. RETURN LOSS VS FREQUENCY

IV. RADIATION PATTERN

A. Gain

B. Directivity

C. 3dB beamwidth

V. ANTENNA POLARIZATION

VI. EFFECTS OF REAL GROUNDS

A. Relative Permittivity and Conductivity in Colorado

1) Effects on Gain:

2) Effects on Efficiency:

3) Effects on Impedance:

4) Effects on Radiation Pattern:

VII. EFFECTS OF REAL ANTENNA MATERIALS

VIII. LOSS IN A REAL COAXIAL CABLE

IX. LOSS IN A REAL COAXIAL CABLE

X. ANTENNAS FOR PURCHASE

A.

B.

C. Subsection Heading Here

Subsection text here.

1) Subsubsection Heading Here: Subsubsection text here.

XI. CONCLUSION

The conclusion goes here.

APPENDIX A

PROOF OF THE FIRST ZONKLAR EQUATION

Appendix one text goes here.

APPENDIX B

Appendix two text goes here.

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REFERENCES

- [1] H. Kopka and P. W. Daly, *A Guide to L^AT_EX*, 3rd ed. Harlow, England: Addison-Wesley, 1999.