Microstrip Antenna Arrays

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CONTENTS

I. Patch Dimensions at a Given Resonance Frequency

A. Fringing Effects

Fringing fields at the lengths of the patch makes the patch appear to have a greater length than it actually does. This is important since the effective dimensions of the patch affect the resonant frequency. If the physical length of the patch is L, then the effective length, $L_{\texttt{eff}}$, can be written as

$$L_{\texttt{eff}} = L + \Delta L,$$

where ΔL is the additional length on one end of the patch.

The additional length can be related to the width of the patch, W and the effective relative permittivity of the dieletric substrate, $\epsilon_{\texttt{eff}}$, as

$$\frac{\Delta L}{h} = 0.412 \frac{(\epsilon_{\texttt{eff}} + 0.3)\left(\frac{W}{h} + 0.264\right)}{(\epsilon_{\texttt{eff}} - 0.258)\left(\frac{W}{h} + 0.8\right)}. \tag{1}$$

B. Effective Relative Permittivity

To find the effective relative permittivity, we use [1]

$$\epsilon_{\texttt{eff}} = \frac{\epsilon_r + 1}{2} + \frac{\epsilon_r - 1}{2}\left(1 + 12 \cdot \frac{h}{W}\right)^{-1/2}. \tag{2}$$

II. Directivity

A. Source

References

[1] *Effective Dielectric Constant*, 2009. http://referencedesigner.com/books/si/effective-dielectric-constant.php.

III. Source

https://empossible.net/wp-content/uploads/2018/03/Topic-5-Microstrip-Patch-Antenna.pdf