

# PropChar

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### Document Versions:

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## 1 Introduction

PropChar is a tool for calculating the propagation parameters for media with specific electrical and magnetic properties.

## 2 The Theory

The phase velocity of an electromagnetic wave is given by

$$v_{ph} = \frac{1}{\sqrt{\mu_0 \cdot \mu_r \cdot \varepsilon_0 \left( \varepsilon_r - j \frac{\sigma}{\omega} \right)}}$$

The wavelength is

$$\lambda = \frac{v_{ph}}{f}$$

The wave number is

$$k = \frac{2\pi}{\lambda} = \frac{2\pi \cdot f}{v_{ph}} = \frac{\omega}{v_{ph}}$$

and the near field limit is simply the inverse of the wave number:

$$l_{NF} = \frac{v_{ph}}{\omega}$$

That's all !