

ELEC-H415

Modeling A Vehicle-to-Vehicle Communication Channel in an Urban Environment

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Abstract

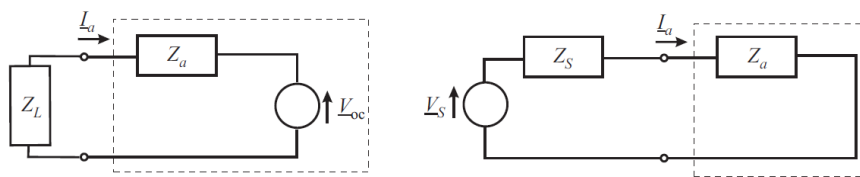
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- 1.1. Problem Statement and Scenario Definition
- 1.2. Project Objectives
- 1.3. Methodology Overview
- 1.4. Report Structure

Step 1: Theoretical Preliminaries

- 2.1. System Parameters
- 2.2. Equivalent Circuits (TX and RX)
- 2.3. Antenna Equivalent Height ($\lambda/2$ Dipole)
- 2.4. Emitted Electric Field in Free Space
- 2.5. Received Signal in Free Space (V_{RX} vs V_{TX})

The equivalent circuit of the Antenna is shown on figure ...



- 3.1. Channel Impulse Response $h(\tau)$
- 3.2. Channel Transfer Function $H(f)$
- 3.3. Narrowband Complex Gain h_{NB}
- 3.4. Received Power P_{RX} and Comparison to Friis Formula
- 3.5. Interpretation of LOS Narrowband Results

Step 3: Full Channel, Narrowband Analysis (Including Reflections)

- 4.1. Multipath Component (MPC) Geometry (Image Theory Approach)
- 4.2. Total Received Voltage (Coherent Sum)
- 4.3. Total Received Power P_{RX} vs Distance d
- 4.4. Rician K Factor Analysis (K vs Distance d)
- 4.5. Path Loss Model Fitting (Local Average Power)
 - 4.5.1. Averaging Methodology
 - 4.5.2. Path Loss Exponent (n) Determination
- 4.6. Shadowing Variability (σ_L) Calculation
- 4.7. Fade Margin and Coverage Range Analysis (50%, 95%, 99% Reliability)
- 4.8. Interpretation of Full Narrowband Results

Step 4: Line-of-Sight (LOS) Channel, Wideband Analysis

Step 5: Full Channel, Wideband Analysis

- 6.1. Physical Impulse Response $h(\tau)$ (Including MPCs)
- 6.2. Wideband Transfer Function $H(f)$ and Frequency Selectivity Analysis
- 6.3. Tapped Delay Line (TDL) Model and Power Delay Profile (PDP)
- 6.4. Interpretation (Delay Spread, Coherence Bandwidth, Comparison to LOS)

- 8.1. Summary of Key Findings and Model Parameters
- 8.2. Discussion on V2V Channel Characteristics
- 8.3. Limitations of the Model
- 8.4. Potential Future Work