Lecture Note on Wireless Communication Engineering I

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- Frequency Band for Radio-wave Communication
- Service in Wireless Communication System
- History and Perspective in Wireless Communication System
- Wireless vs. Wired Communication System
- IMT 2000, 4G Mobile Communication, SDR

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Contents3. Fading Fading mechanism - Gaussian process Envelope/phase distribution Power Spectrum Fading Duration Random FM Noise Correlation

- Rice Fading Distribution
- Parameter estimation

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9. Diversity

- Diversity Techniques
- Diversity Reception
- Multiple Base Station Diversity
- Route Diversity
- Diversity and Adaptive Algorithm
- Space-Time Code

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Basic Electromagnetics Time Line of Electromagnetics Phenomena 		
Time (sec)	Event	Effect
0	``Big Bang''	Four fundamental forces are coupled
10-43	Gravity frozen out	Weak, strong nuclear and EM are still coupled
10 ⁻³⁵	Strong nuclear forces frozen out	Weak nuclear and EM are still coupled
10^{-6}	Protons able to form	The universe is cooling
1	Weak nuclear and EM forces dissociate	Maxwell's Equations are adequate to describe macroscopic field behavior
10^{18}	Maxwell's Equations written	Radio discovered, era of invention in the radio arts
Today	100 years since era of Maxwell	Personal radio communication
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Basic Electromagnetics

• Wave Equation

$$\nabla^2 E = \mu \varepsilon \frac{\partial^2 E}{\partial t^2} \quad \nabla^2 H = \mu \varepsilon \frac{\partial^2 H}{\partial t^2}$$

Variations in space $(\nabla^2 = \partial^2/\partial x^2 + \partial^2/\partial y^2 + \partial^2/\partial z^2)$ and variations in time $(\partial^2/\partial t^2)$ are coupled to each other to generate a wave. Electric (E) and Magnetic (H) fields can propagate with the same velocity of $1/\sqrt{\mu\varepsilon}$.

 μ : permeability, ε : permittivity, material magnetic and electric constants

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