

Radio Networks M – A.Y. 2014/15 – Prof. Roberto Verdone

Modeling and Design of Radio Networks: Fundamentals, Algorithms, and Protocols

The lecture blocks in red constitute essential background for the course “RadioSystems”

Lecture Block	Title
<u>INT</u>	<u>Introduction</u>
INT.1	Digital Transmission
INT.2	Radio Channel
INT.3	Networks
INT.4	Radio Communication Standards: an Historical Perspective
<u>DTN</u>	<u>Digital Transmission in Noise Limited Systems</u>
DTN.1	Communication Link: System Model
DTN.2	Signal Based Power Control
DTN.3	Link Performance (BER) of M-QASK in AWGN
DTN.4	Link Adaptation
DTN.5	Equalization
DTN.6	FEC, ARQ, HARQ
DTN.7	Link Performance (BLER) and Capacity in AWGN: Physical Layer Abstraction
DTN.8	Radio Resources (Physical Channels)
DTN.9	Assignment of Radio Resources
DTN.10	Link Spectrum Efficiency
DTN.11	Exercises
<u>LRC</u>	<u>Link Level: Radio Channel</u>
LRC.1	Radio Channel Characterization
LRC.2	Large Scale Phenomena
LRC.3	Small Scale Phenomena
LRC.4	Narrowband Mobile Radio Channel
LRC.5	Radio Channel for Short Range Communication Systems
LRC.6	Link Performance in the Presence of Fading
LRC.7	Gilbert-Elliot Model
LRC.8	Area Coverage Probability
LRC.9	Exercises
<u>LCF</u>	<u>Link Level: Countermeasures to Fading</u>
LCF.1	Interleaving
LCF.2	Adaptive Modulation and Coding
LCF.3	Diversity
LCF.4	Link Performance with FEC and Diversity
LCF.5	Exercises
<u>DTI</u>	<u>Digital Transmission in Interference Limited Systems</u>
DTI.1	Communication Link with Interference: System Model
DTI.2	Interference Based Power Control
DTI.3	Linear and Non Linear Demodulation
DTI.4	Link Performance (BER) of M-QASK with Interference
DTI.5	Link Performance (BLER) and Capacity in AWGN with Interference
DTI.6	Link Spectrum Efficiency Revisited
DTI.7	Capture Effect
DTI.8	Link Level Outage Probability with Fading and Interference
DTI.9	Impact on Interference of Countermeasures to Fading
DTI.10	Interference Based Power Control from a Network Level viewpoint
DTI.11	Exercises
<u>MSG</u>	<u>Methods: Stochastic Geometry</u>
MSG.1	Basics of 2D Stochastic Geometry
MSG.2	Application to Area Coverage
MSG.3	Application to Outage Probability with Interference
MSG.4	Exercises
<u>MNG</u>	<u>Methods: Network Graphs</u>
MNG.1	Basics of Graphs
MNG.2	Communication and Interference Graphs
MNG.3	Dijkstra Algorithm
MNG.4	Exercises
<u>NMA</u>	<u>Network Level: Medium Access Control</u>
NMA.1	Fundamentals of Random MAC: Aloha, CSMA
NMA.2	Aloha and S-Aloha in Compact Networks: Throughput Analysis
NMA.3	CSMA in Compact Networks: Throughput Analysis
NMA.4	CSMA in Sparse Networks: Hidden and Exposed Node Problem
NMA.5	Bianchi's Model
NMA.6	Scheduling
NMA.7	Exercises
<u>NMH</u>	<u>Network Level: Multi-Hop Networks</u>
NMH.1	Network Topologies
NMH.2	Topology Control in Mesh Networks
NMH.3	Routing in Multi-Hop Networks
<u>IOT</u>	<u>Internet of Things</u>
IOT.1	Wireless Sensor Networks (802.15.4, 802.15.4a, 802.15.4e)
IOT.2	WiFi (802.11a,b,g,n)
IOT.3	Machine Type Communications (802.11ah)
IOT.2	Internet of Things