

Contents

0.1. Motivation	10
0.2. Problem Formulation	12
0.3. Contribution and Findings	12
0.4. Thesis' Structure	14
I. Background	17
1. System Model	18
1.1. Subject	18
1.1.1. Digital Message Transmission	19
1.1.2. Cellular Communication Networks	26
1.2. Components	40
1.2.1. Channel Model	43
1.2.2. Network Model	54
1.2.3. Limits	59
1.2.4. Performance Metric	60
1.3. Comparison to Other Models in Literature	62
1.4. Model at a Glance	63
2. Scope of The Thesis	65
2.1. Problem Formulation	67
2.2. Provided Work	69
Summary	70
II. User-centric Assignment	71
3. Definition and Analysis	72
3.1. Assignment Classification	73
3.1.1. Network-centric Assignments	73
3.1.2. Optimal User-centric Assignments	73
3.1.3. Partial User-centric Assignments	74
3.2. Probability for User-centric Assignments	75
3.2.1. Lower Bound for Optimal User centric Assignments	75

3.2.2.	Lower Bound for Partial User-centric Assignments	77
3.2.3.	Probability Gain with Partial User-centric Assignments	79
3.3.	Summary and Conclusions	81
4.	Realization Concepts	82
4.1.	Oversized Clustering	84
4.1.1.	Partial Channel Reporting	86
4.1.2.	Impact on Zero Forcing Precoders	87
4.1.3.	Impact on Maximum Ratio Combining Precoders	88
4.1.4.	Dynamic Size of ω -Sets	91
4.1.5.	Simulation Results	92
4.2.	Overlapping Clustering	97
4.2.1.	Cluster Construction	98
4.2.2.	Cluster Assignment	101
4.2.3.	Load Balancing Between Clustering Layers	101
4.2.4.	Simulation Results	104
4.3.	Interference Floor Shaping	108
4.3.1.	Beamforming with Antenna Arrays	111
4.3.2.	Inter Cluster Interference Mitigation	118
4.3.3.	Multi-layer Precoding vs JSMD	122
4.3.4.	Simulation Results	123
	Summary	128
III.	Software Framework	130
5.	Software Description	132
5.1.	Needed Functionality	132
5.2.	Basics of Object Orientated Programming	133
5.3.	Analysis and Design of the Simulation Software	136
5.4.	Network Model	138
5.5.	Simulation Procedures	141
5.5.1.	Antenna Gain	143
5.5.2.	Signal Pathloss	144
5.5.3.	Signal Processing	146
5.5.4.	Signal and Interference Calculation	148
5.6.	Validity Check	148
	Summary	153

IV. Final Statements

154

6. Conclusions

155