

Methods and Algorithms for Radio Channel Assignment

EDITED BY

Robert Leese

*Smith Institute for Industrial Mathematics and System Engineering
and*

St Catherine's College, University of Oxford

and

Stephen Hurley

Department of Computer Science, University of Cardiff

OXFORD
UNIVERSITY PRESS

CONTENTS

Contributors	ix
1 Background	1
<i>Stephen Hurley and Robert Leese</i>	
1.1 Aspects of channel assignment	1
1.2 Trends in radio spectrum management	3
2 Introduction to spectrum management	7
<i>Ryszard Struzak</i>	
2.1 Introduction	7
2.2 Spectrum management	11
2.3 Conclusions	20
3 Meta-heuristics and channel assignment	22
<i>Stephen Hurley and Derek Smith</i>	
3.1 Introduction	22
3.2 General search principles	23
3.3 Literature review	26
3.4 Overview of meta-heuristics	27
3.5 Using meta-heuristics in channel assignment	34
3.6 Improving assignment quality	40
3.7 Summary	44
4 Lower bounds for channel assignment	45
<i>Derek Smith, Stuart Allen, and Stephen Hurley</i>	
4.1 Introduction	45
4.2 Clique bounds	46
4.3 Travelling salesman bounds	48
4.4 Finding cliques and other subgraphs	50
4.5 Mathematical programming	52
4.6 Bounds for fixed spectrum problems	61
4.7 Conclusion	62
5 Channel assignment on infinite sets under frequency–distance constraints	63
<i>Jan van den Heuvel and Colin McDiarmid</i>	
5.1 Introduction	63
5.2 Mathematical background and definitions	65

5.3	Co-channel constraints	66
5.4	General frequency-distance constraints	72
5.5	Co-channel constraints with demands	79
5.6	Assignments on lattices	81
6	Constraint satisfaction	88
	<i>Dave Cohen and Peter Jeavons</i>	
6.1	Introduction	88
6.2	What is a CSP?	88
6.3	Representational issues	92
6.4	Properties of a CSP	101
6.5	Prejudices about CSPs	106
6.6	Conclusion	108
7	Cell and frequency planning	109
	<i>Stuart Allen, Stephen Hurley, and Roger Whitaker</i>	
7.1	Introduction	109
7.2	Problem description	110
7.3	Network requirements	112
7.4	A three-phase algorithm for cell planning	116
7.5	Data sets and results	126
7.6	Concluding remarks	132
8	Economic aspects of radio channel assignment	133
	<i>Robert Leese</i>	
8.1	Introduction	133
8.2	A combined engineering and economic model	134
8.3	Examples	137
8.4	Discussion and possible extensions	141
	Bibliography	143
	Index	151