

Table of Contents

OUTLINE OF REPORT	15
ABBREVIATIONS AND DEFINITIONS	17
EXECUTIVE SUMMARY	19
1.0 THE MOBILE TV CHALLENGE	27
1.1 TECHNICAL STANDARDS	27
1.2 BUSINESS AND REGULATORY ISSUES	28
1.3 SELLING MOBILE TV TO CONSUMERS	31
2.0 SPECTRUM AVAILABILITY IN EUROPE POST RRC-06	33
2.1 THE GE-06 PLAN	33
2.2 THE DIGITAL DIVIDEND	34
2.2.1 Austria	35
2.2.2 Belgium	35
2.2.3 Denmark	35
2.2.4 France	36
2.2.5 Germany	37
2.2.6 Italy	38
2.2.7 The Netherlands	39
2.2.8 Norway	39
2.2.9 Spain	40
2.2.10 Sweden	40
2.2.11 Switzerland	40
2.2.12 United Kingdom	41
2.3 KEY SPECTRUM ISSUES	44
2.3.1 Analogue TV switch-off	44
2.3.2 Radio or mobile TV in VHF?	45
2.3.3 Transmitter power levels	45
2.3.4 World Radio Conference 2007 (WRC-07)	46
2.3.5 Harmonised sub-band for DVB-H	46
2.3.6 Interference issues in UHF Bands IV/V	47
2.3.7 The revised 2002 Maastricht Plan	47
2.3.8 Spectrum licensing: Auction or Beauty Contest?	48
2.4 OUTLOOK	49
3.0 THE EUREKA-147 DAB TECHNOLOGY PLATFORM	51
3.1 THE EUREKA-147 DAB FAMILY OF STANDARDS	51
3.2 MOBILE TV VIA EUREKA-147 DAB	51
3.2.1 T-DMB	51
3.2.2 IP based mobile TV	54
3.2.3 T-DMB versus DAB-IP	54
3.2.4 T-DMB/DAB-IP and DVB-H compared	56
3.2.5 Harmonising DAB-IP AND DVB-H	58
3.2.6 T-DMB developments on the horizon	61
3.2.6.1 Coding improvements and statistical multiplexing	61
3.2.6.2 Advanced Modulation Technology	62

3.2.6.3 3D T-DMB Services.....	62
3.2.6.4 DMB MAF.....	63
3.3 DATA TECHNOLOGIES AND APPLICATIONS.....	63
3.3.1 Data transmission via DAB.....	64
3.3.2 Data delivery challenges.....	66
3.3.3 Broadcast Web Sites (BWS).....	66
3.3.4 Slide Show (SLS).....	66
3.3.5 Electronic Programme Guide (EPG).....	68
3.3.6 Transport Protocol Experts Group (TPEG).....	69
3.3.7 Binary Format for Scenes (BIFS).....	70
3.3.8 Java middleware platform.....	71
3.4 CONDITIONAL ACCESS AND DIGITAL RIGHTS MANAGEMENT.....	73
3.5 DAB+ AND ITS IMPLICATIONS.....	73
3.6 T-DMB AND WIBRO.....	74
4.0 TRIALS AND COMMERCIAL SERVICES	75
4.1 CHINA.....	76
4.1.1 DAB update.....	74
4.1.2 Mobile TV in China.....	77
4.1.2.1 Mobile TV standards in China.....	77
4.1.2.2 Service providers.....	78
4.1.2.3 Regulatory issues.....	80
4.1.3 ER viewpoint.....	82
4.2 DENMARK.....	84
4.2.1 DAB update.....	84
4.2.2 Mobile TV in Denmark.....	85
4.2.3 ER viewpoint.....	85
4.3 FRANCE.....	86
4.3.1 DAB update.....	86
4.3.2 Mobile TV in France.....	87
4.3.3 ER viewpoint.....	88
4.4 GERMANY.....	90
4.4.1 DAB update.....	90
4.4.2 Mobile TV in Germany.....	91
4.4.2.1 Mobile Fernsehen Deutschland (MFD).....	91
4.4.2.2 Mi-Friends.....	94
4.4.3 ER viewpoint.....	96
4.5 IRELAND.....	98
4.5.1 DAB update.....	98
4.5.2 Mobile TV in Ireland.....	99
4.5.3 ER viewpoint.....	99
4.6 ITALY.....	100
4.6.1 DAB update.....	100
4.6.2 Mobile TV in Italy.....	101
4.6.3 ER viewpoint.....	102
4.7 THE NETHERLANDS.....	104
4.7.1 DAB update.....	104
4.7.2 Mobile TV in Netherlands.....	105
4.7.3 ER viewpoint.....	106
4.8 NORWAY.....	107
4.8.1 DAB update.....	107
4.8.2 Mobile TV in Norway.....	108
4.8.3 ER viewpoint.....	108

4.9 SWEDEN.....	110
4.9.1 DAB update.....	110
4.9.2 Mobile TV in Sweden.....	111
4.9.3 ER viewpoint.....	111
4.10 SOUTH KOREA.....	113
4.10.1 DAB update.....	113
4.10.2 Mobile TV in South Korea.....	113
4.10.2.1 Licensed broadcasters.....	113
4.10.2.2 Content.....	114
4.10.2.3 Network coverage and regional expansion.....	115
4.10.2.4 Receiver sales and availability.....	117
4.10.2.5 Business model and investment.....	118
4.10.3 ER viewpoint.....	119
4.11 SWITZERLAND.....	120
4.11.1 DAB update.....	120
4.11.2 Mobile TV in Switzerland.....	121
4.11.3 ER viewpoint.....	122
4.12 UNITED KINGDOM.....	123
4.12.1 DAB update.....	123
4.12.2 Mobile TV in the United Kingdom.....	124
4.12.2.1 BT Movio service offering.....	124
4.12.2.2 Consumer feedback.....	125
4.12.3 ER viewpoint.....	126
4.13 OTHER COUNTRIES.....	128
5.0 DAB & T-DMB DATA SERVICES	129
5.1 TYPES OF DATA SERVICES	129
5.2 GLOBAL OVERVIEW OF TPEG SERVICES.....	130
5.3 GERMANY.....	131
5.3.1 TTI Data Services.....	132
5.3.2 Mobile.info.....	133
5.3.3 DIWA.....	135
5.3.4 NewsService Journaline.....	135
5.4 SOUTH KOREA.....	136
5.4.1 Traffic and Travel Information via TPEG.....	136
5.4.2 Broadcast Web Sites.....	139
5.4.3 Electronic Prpgramme Guide (EPG).....	139
5.4.4 KTF Interactive Data Portal.....	139
5.5 UNITED KINGDOM.....	141
5.5.1 BBC trials.....	141
5.5.2 Digital Music Download: Cliq.....	142
5.6 CHINA.....	143
6.0 T-DMB RECEIVERS	145
6.1 OVERVIEW OF T-DMB DEVICES.....	145
6.2 MOBILE PHONES.....	145
6.2.1 Features and trends.....	145
6.2.2 Devices and manufacturers.....	146
6.3 CAR RECEIVERS & SET-TOP-BOXES.....	152
6.3.1 Features and trends.....	152
6.3.2 Devices and manufacturers.....	152
6.4 HANDHELDS.....	154
6.4.1 Features and trends.....	154
6.4.2 Devices and manufacturers.....	154

6.5 NOTEBOOKS.....	158
6.5.1 Features and trends.....	158
6.5.2 Devices and manufacturers.....	158
6.6 PORTABLE TVS.....	159
6.6.1 Features and trends.....	159
6.6.2 Devices and manufacturers.....	159
6.7 USB-TYPE DEVICES.....	160
6.7.1 Features and trends.....	160
6.7.2 Devices and manufacturers.....	160
6.8 MISCELLANEOUS DEVICES.....	162
7.0 BROADCAST INFRASTRUCTURE & VENDORS.....	163
7.1 HEAD-END HARDWARE DESCRIPTION.....	163
7.2 RF TRANSMISSION HARDWARE DESCRIPTION.....	169
7.3 VENDOR PROFILES.....	170
7.3.1 Digidia.....	171
7.3.2 Factum Electronics.....	172
7.3.3 OnTimeTek.....	173
7.3.4 Pixtree Technologies, Inc.....	174
7.3.5 Radioscape.....	175
7.3.6 SM CNS.....	177
7.3.7 SomerData Ltd.....	179
7.3.8 VDL.....	173
7.3.9 Harris Corp.....	176
7.3.10 Kathrein-Werke.....	182
7.3.11 KRTnet Corp.....	183
7.3.12 Plisch Nachrichtentechnik.....	184
7.3.13 Radio Frequency Systems.....	185
7.3.14 Rohde & Schwarz.....	186
7.3.15 Sunwoo Communication Co. Ltd.....	187
7.3.16 TeamCast.....	188
7.3.17 Unique Broadband Systems.....	189
8.0 CHIPSET TECHNOLOGY & VENDORS.....	191
8.1 MOBILE TV CHIPSET TECHNOLOGY.....	191
8.1.1 RF Tuner.....	192
8.1.2 Baseband and AV decoding.....	192
8.1.3 Multi-standard chipsets.....	196
8.1.4 RF and baseband integration roadmap.....	198
8.2 VENDOR PROFILES.....	200
8.2.1 Analog Devices Inc.....	201
8.2.2 C+S Technology, Inc.....	202
8.2.3 Corelogic.....	204
8.2.4 EtherWaves.....	206
8.2.5 Frontier Silicon.....	207
8.2.6 FCI Inc.....	209
8.2.7 FutureWaves.....	211
8.2.8 I+C Technology.....	214
8.2.9 Integrant Technologies Inc.....	215
8.2.10 KIES.....	217
8.2.11 LG Electronics.....	218
8.2.12 MagicEyes Digital Co. Ltd.....	219

8.2.13 Mirics Semiconductor.....	220
8.2.14 Nexilion.....	222
8.2.15 PnpNetwork Technologies Inc.....	224
8.2.16 Radioscape.....	225
8.2.17 Samsung Electronics.....	227
8.2.18 Samsung Electro-Mechanics.....	228
8.2.19 Siano Mobile Silicon.....	229
8.2.20 Telechips Inc.....	231
9.0 CONDITIONAL ACCESS, MIDDLEWARE, CONTENT AUTHORIZING & VENDORS	233
9.1 CONDITIONAL ACCESS.....	233
9.1.1 Technology options.....	233
9.1.2 Conditional access vendors.....	233
9.2 MIDDLEWARE PLATFORMS.....	235
9.2.1 Chipset middleware integration.....	235
9.2.2 Middleware vendors.....	235
9.3 CONTENT AUTHORIZING.....	237
10.0 APPENDICES	239
10.1 APPENDIX 1: FREQUENCY BLOCK ASSIGNMENTS.....	239

List of Tables

TABLE E.1 S-DMB AND T-DMB COMPARED.....	21
TABLE E.2 TU MEDIA SHAREHOLDER COMPOSITION.....	22
TABLE E.3 BREAKDOWN OF KOREAN T-DMB RECEIVER INSTALLED BASE BY PRODUCT CATEGORY, AVAILABILITY OF DEVICES AND NUMBERS OF MANUFACTURERS.....	25
TABLE 1.1 MOBILE TV STANDARDS AND OPERATING FREQUENCIES.....	27
TABLE 2.1 SPECTRUM ALLOCATIONS IN VHF BAND III AND UHF BANDS IV/V.....	34
TABLE 2.2 ANALOGUE TV SWITCH-OFF DATES IN EUROPE.....	44
TABLE 3.1 THE EUREKA-147 DAB FAMILY OF STANDARDS.....	52
TABLE 3.2 KEY CHARACTERISTICS OF EUREKA-147 BASED MOBILE TV AND DVB-H COMPARED.....	57
TABLE 3.3 EXAMPLES OF TYPES OF CONTENT DELIVERED VIA THE MOT PROTOCOL.....	64
TABLE 4.1 SUMMARY OF DAB IN CHINA.....	76
TABLE 4.2 SUMMARY OF DAB IN DENMARK.....	84
TABLE 4.3 SUMMARY OF DAB IN FRANCE.....	86
TABLE 4.4 DETAILS OF DIGITAL RADIO TRIALS IN FRANCE.....	87
TABLE 4.5 SUMMARY OF DAB IN GERMANY.....	90
TABLE 4.6 WATCHA-TV CHANNEL CHOICE.....	91
TABLE 4.7 WATCHA-TV TARIFFS.....	92
TABLE 4.8 MFD EQUITY INVESTORS.....	93
TABLE 4.9 CONTENT ON MI-FRIENDS TRIAL IN MUNICH.....	95
TABLE 4.10 SUMMARY OF DAB IN IRELAND.....	98
TABLE 4.11 SUMMARY OF DAB IN ITALY.....	100
TABLE 4.12 SUMMARY OF DAB IN THE NETHERLANDS.....	104
TABLE 4.13 SUMMARY OF DAB IN NORWAY.....	107
TABLE 4.14 SUMMARY OF DAB IN SWEDEN.....	110
TABLE 4.15 SUMMARY OF DAB IN SOUTH KOREA.....	113
TABLE 4.16 T-DMB CONTENT IN SOUTH KOREA.....	115

TABLE 4.17 SUMMARY OF DAB IN SWITZERLAND.....	120
TABLE 4.18 SUMMARY OF DAB IN THE UK.....	123
TABLE 4.19 ANALOGUE AND DAB RECEIVER SALES IN THE UK.....	123
TABLE 4.20 CONTENT OFFERED ON BT MOVIO.....	125
TABLE 4.21 VIRGIN MOBILE RETAIL PRICING.....	125
TABLE 5.1 DATA SERVICES ON BAVARIAN REGIONAL MULTIPLEX.....	132
TABLE 5.2 DATA SERVICES ON MUNICH LOCAL MULTIPLEX.....	133
TABLE 5.3 DATA SERVICES ON NUREMBURG LOCAL MULTIPLEX.....	133
TABLE 5.4 DATA SERVICES ON INGOLSTADT LOCAL MULTIPLEX.....	133
TABLE 5.5 OVERVIEW OF T-DMB DATA SERVICES IN SOUTH KOREA.....	136
TABLE 5.6 OVERVIEW OF TPEG SERVICES LAUNCHED BY KOREAN BROADCASTERS.....	137
TABLE 5.7 COMPARISON OF MAIN TPEG MARKET OPPORTUNITIES.....	138
TABLE 5.8 SERVICES OFFERED BY JOLON DM BROADCASTING, BEIJING.....	143
TABLE 5.9 TTI SERVICES VIA TPEG IN BEIJING.....	144
TABLE 6.1 LIST OF T-DMB MOBILE PHONES & MANUFACTURERS.....	146
TABLE 6.2 LIST OF T-DMB CAR SET-TOP BOXES & MANUFACTURERS.....	152
TABLE 6.3 LIST OF T-DMB CAR RECEIVERS & MANUFACTURERS.....	153
TABLE 6.4 LIST OF T-DMB HANDHELD DEVICES (NON-PHONE) & MANUFACTURERS.....	155
TABLE 6.5 LIST OF T-DMB NOTEBOOKS & MANUFACTURERS.....	159
TABLE 6.6 LIST OF T-DMB PORTABLE TVs & MANUFACTURERS.....	159
TABLE 6.7 LIST OF T-DMB USB-TYPE DEVICES & MANUFACTURERS.....	161
TABLE 6.8 MISCELANNEOUS T-DMB DEVICES & MANUFACTURERS.....	162
TABLE 7.1 EUREKA-147 DAB HEAD-END PRODUCT MATRIX & VENDORS.....	169
TABLE 7.2 EUREKA-147 DAB RF TRANSMISSION PRODUCT MATRIX & VENDORS.....	169
TABLE 7.3 VENDOR PROFILE: DIGIDIA.....	171
TABLE 7.4 VENDOR PROFILE: FACTUM ELECTRONICS.....	172

TABLE 7.5 VENDOR PROFILE: ONTIMETEK.....	173
TABLE 7.6 VENDOR PROFILE: PIXTREE TECHNOLOGIES.....	174
TABLE 7.7 VENDOR PROFILE: RADIOSCAPE.....	175
TABLE 7.8 VENDOR PROFILE: SM CNS CORPORATION.....	177
TABLE 7.9 VENDOR PROFILE: SOMERDATA LTD.....	179
TABLE 7.10 VENDOR PROFILE: VDL.....	180
TABLE 7.11 VENDOR PROFILE: HARRIS CORP.....	181
TABLE 7.12 VENDOR PROFILE: KATHREIN-WERKE.....	182
TABLE 7.13 VENDOR PROFILE: KRTNET CORP.....	183
TABLE 7.14 VENDOR PROFILE: PLISCH NACHRICHTENTECHNIK.....	184
TABLE 7.15 VENDOR PROFILE: RADIO FREQUENCY SYSTEMS.....	185
TABLE 7.16 VENDOR PROFILE: ROHDE & SCHWARZ.....	186
TABLE 7.17 VENDOR PROFILE: SUNWOO COMMUNICATIONS CO. LTD.....	187
TABLE 7.18 VENDOR PROFILE: TEAMCAST	188
TABLE 7.19 VENDOR PROFILE: UNIQUE BROADBAND SYSTEMS	189
TABLE 8.1 RF TUNER PRODUCT MATRIX & VENDORS.....	193
TABLE 8.2 BASEBAND PRODUCT MATRIX & VENDORS.....	195
TABLE 8.3 RF TUNER AND BASEBAND SIP PRODUCT MATRIX & VENDORS.....	199
TABLE 8.4 VENDOR PROFILE: ANALOG DEVICES, INC.....	201
TABLE 8.5 VENDOR PROFILE: C+S TECHNOLOGY INC.....	202
TABLE 8.6 VENDOR PROFILE: CORELOGIC.....	204
TABLE 8.7 VENDOR PROFILE: ETHERWAVES.....	206
TABLE 8.8 VENDOR PROFILE: FRONTIER SILICON.....	207
TABLE 8.9 VENDOR PROFILE: FCI INC.....	209
TABLE 8.10 VENDOR PROFILE: FUTURE WAVES.....	211
TABLE 8.11 VENDOR PROFILE: I+C TECHNOLOGY.....	214

TABLE 8.12 VENDOR PROFILE: INTEGRANT TECHNOLOGIES, INC.....	215
TABLE 8.13 VENDOR PROFILE: KIES.....	217
TABLE 8.14 VENDOR PROFILE: LG ELECTRONICS.....	218
TABLE 8.15 VENDOR PROFILE: MAGICYES DIGITAL CO LTD.....	219
TABLE 8.16 VENDOR PROFILE: MIRICS SEMICONDUCTOR	220
TABLE 8.17 VENDOR PROFILE: NEXILION.....	222
TABLE 8.18 VENDOR PROFILE: PNPNETWORK TECHNOLOGIES, INC.....	224
TABLE 8.19 VENDOR PROFILE: RADIOSCAPE.....	225
TABLE 8.20 VENDOR PROFILE: SAMSUNG ELECTRONICS.....	227
TABLE 8.21 VENDOR PROFILE: SAMSUNG ELECTRO-MECHANICS.....	228
TABLE 8.22 VENDOR PROFILE: SIANO MOBILE SILICON.....	229
TABLE 8.23 VENDOR PROFILE: TELECHIPS, INC.....	231
TABLE 9.1 NET&TV INTERACTIVE CONTENT AUTHORIZING & DELIVERY SOLUTION.....	236
TABLE 10.1 DAB VHF BAND III FREQUENCY BLOCK ASSIGNMENTS.....	237
TABLE 10.2 DAB VHF BAND III FREQUENCY BLOCK ASSIGNMENTS (KOREA ONLY).....	237
TABLE 10.3 DAB UHF L-BAND FREQUENCY BLOCK ASSIGNMENTS.....	238

List of Figures

FIGURE 1.1 FREE-TO-AIR BUSINESS MODEL (WITH TOP-UP ELEMENT)	29
FIGURE 1.2 WHOLESALE MOBILE TV BUSINESS MODEL.....	30
FIGURE 1.3 THE BT MOVIO LOBSTER MOBILE TV PHONE.....	31
FIGURE 3.1 T-DMB PROTOCOL STACK.....	53
FIGURE 3.2 DAB AND T-DMB ON THE SAME EUREKA-147 MULTIPLEX.....	53
FIGURE 3.3 DAB-IP PROTOCOL STACK AS USED BY BT MOVIO.....	55
FIGURE 3.4 EUREKA-147 DAB DATA PROTOCOLS AND ASSOCIATED APPLICATIONS.....	64
FIGURE 3.5 SCREEN SHOT OF THE dDAB ASTRONOMY SLIDE SHOW.....	67
FIGURE 3.6 THE UNIQUE INTERACTIVE DAB EPG.....	68
FIGURE 3.7 TEXT AND IMAGES TRANSMITTED VIA BIFS ON A T-DMB BROADCAST.....	71
FIGURE 3.8 DAB JAVA ARCHITECTURE.....	72
FIGURE 3.9 T-DMB MATE ARCHITECTURE.....	72
FIGURE 4.1 T-DMB SERVICE PROVIDERS AND CHANNEL INFORMATION.....	114
FIGURE 4.2 KBS CONTENT: USER FEEDBACK.....	116
FIGURE 4.3 T-DMB SPECTRUM PLAN IN SOUTH KOREA.....	116
FIGURE 4.4 T-DMB CHANNEL ALLOCATION ACROSS SOUTH KOREA.....	117
FIGURE 4.5 T-DMB MARKET BY DEVICE TYPE.....	118
FIGURE 5.1 BANDWIDTH USED BY TPEG SERVICES (TRIALS) IN EUROPE.....	131
FIGURE 5.2 DFIS BUS-STOP ARRIVAL & DEPARTURE INFORMATION.....	134
FIGURE 5.3 NEWSERVICE JOURNALINE SCREENSHOT.....	135
FIGURE 6.1 SAMSUNG SCH-B-540 T-DMB MOBILE PHONE.....	147
FIGURE 6.2 LG SB410 PRADA T-DMB MOBILE PHONE.....	148
FIGURE 6.3 SAMSUNG SCH-B63 T-DMB MOBILE PHONE.....	148
FIGURE 6.4 SAMSUNG SPH-3100 DOUBLE-FOLDING T-DMB MOBILE PHONE.....	149
FIGURE 6.5 PANTECH IM U210K T-DMB MOBILE PHONE.....	150

FIGURE 6.6 SAMSUNG K60 T-DMB MOBILE PHONE.....	150
FIGURE 6.7 LONGCHEER MP100 T-DMB MOBILE PHONE.....	151
FIGURE 6.8 BELLWAVES LOBSTER 700TV T-DMB MOBILE PHONE.....	151
FIGURE 6.9 GT&T DMB PLENA NT700 T-DMB CAR REVEIVER.....	153
FIGURE 6.10 FINEDRIVE M700D T-DMB CAR RECEIVER.....	154
FIGURE 6.11 E-TEN PATHFINDER T-DMB PMP.....	156
FIGURE 6.12 I-STATION U43 T-DMB PMP FROM DIGITAL FRIENDS.....	156
FIGURE 6.13 REIGNCOM IRIVER B10 T-DMB POCKET TV.....	157
FIGURE 6.14 COWAN A3 T-DMB PMP.....	157
FIGURE 6.15 SAMSUNG NT-Q1U/N101 T-DMB TABLET PC.....	158
FIGURE 6.16 SAMSUNG DMB T750 PORTABLE TV.....	160
FIGURE 6.17 MNBT SD2000 T-DMB USB RECEIVER.....	161
FIGURE 6.18 INFORMARK INV-T1000 T-DMB USB RECEIVER.....	162
FIGURE 6.19 SAMSUNG T-DMB CAMERA PHONE.....	162
FIGURE 7.1 OVERVIEW OF EUREKA-147 DAB & T-DMB BROADCAST INFRASTRUCTURE.....	163
FIGURE 7.2 PAD MULTIPLEXER.....	164
FIGURE 7.3 IP GATEWAY.....	165
FIGURE 7.4 PACKET AND STREAM M ULTIPLXER.....	166
FIGURE 7.5 T-DMB A/V AND BIFS ENCODING.....	167
FIGURE 7.6 T-DMB GATEWAY.....	167
FIGURE 8.1 KEY ELEMENTS OF A MOBILE TV RECEIVER.....	191
FIGURE 8.2 MOBILE TV PHONE BASIC HARDWARE DESIGN.....	191
FIGURE 8.3 MOBILE TV PHONE WITH MULTIMEDIA APPLICATION PROCESSOR.....	193
FIGURE 8.4 MOBILE TV USING STANDARD HIGH-PERFORMANCE DSP.....	194