

HDTV Technology Review - 2007 Industry Edition



By Rodolfo La Maestra

Distributed by DisplaySearch

Table of Contents

Chapter 1 - H/DTV Implementation

Background Summary (1998-2005).....	23
Original Implementation Plan	23
Original Integrated Tuner Mandate.....	23
Original Cable Agreement	23
 The CableCARD Implementation - Current Situation.....	25
 The Updated Transition Plan (2006 and 2007).....	26
Approved New DTV Deadline	26
Approved Public Education / Emergency Program	26
Cable DTV Downconversion.....	26
Approved DTV Converter Box Budget for Subsidy	27
Converter Box Subsidy Program Updates	27
 DTV Reports and Statistics	29
The Background	29
MVPD Market Growth	30
In-Stat - A Satellite View	30
CEA Study - 20 Million Extra HDTV-Households within 2 Years	31
DTV Sales Doubled 1Q06	31
 Converter Boxes for the Transition	32
The Prototype	32
Energy Consumption Regulation	32
Proposal for Maximum Power Consumption	34
The Quality Concern	35
The Actual Converter Boxes	35
Texas Instruments	36
Samsung	36
LG Electronics.....	36
 Integrated Tuner Mandate Update	37
Updating the Mandate	37
Tuner-less DTVs	38
 DTV Market Penetration	39
CES 2007	39
Unit Sales to Dealers	39
Comparing Market Share of Technologies Between 2004-2007.....	39
LCD Panels	39
LCD Panels Unit Sales to Dealers.....	39
Plasma Panels	39
Plasma Panels Unit Sales to Dealers	40
The Other Technologies	40
Analysis of DTV Market Penetration	40
Direct-View Sets	40
DTV Projections Background	41
Analysis and Projections For 2007/8/9.....	43

Cable Effect on the Digital Transition	44
Analog Cable Discontinuation	44
"Downconversion" and "Material Degradation"	44
The Broadcaster Investment	45
The Dual Carriage.....	46
Summary	46
DTV Consumer Education for the Transition	47
The CEA Effort	47
Government Education Campaign	47
700MHz Public Safety Spectrum.....	48
H/DTV Programming	49

Chapter 2 - DTV Standards

Enhanced AC-3 Audio Standard	50
ACAP Standard	50
Enhanced-VSB (E-VSB) Transmission Mode	50
VC-1 Standard	50
Brazil Adopts Japan's DTV Standard	51
China Creates a New DTV Standard.....	51
A-VSB - Advanced-Vestigial Side-Band.....	52
CES 2007	52
Potential Side Effects.....	54
Private Conference with Samsung	54
Impact Analysis	57
x.v.YCC	58
LG's MPH (Mobile-Pedestrian-Handheld)	59

Chapter 3 - Satellite, Cable, Broadcasting

Satellite

HD Subscriber Volume - the War of Statistics	60
DirecTV	61
The Planned Upgrade	61
2005/6 Update.....	61
2006/7 Update.....	62
Tivo with DirecTV	62
New Satellites	62
Local Programming Expansion	63
DirecTV CES 2007	63
Dish Network (EchoStar).....	65
The Planned Upgrade	65
Voom.....	65
2005/6 Upgrade Update	65
Tivo Sues EchoStar	66
News Corporation Sues EchoStar	66
National Programming Service LLC.....	67
CinemaNow	67
CES 2007	68

Microsoft Partnership	69
-----------------------------	----

Cable

Managing the Progress to Bi-directional	70
Microsoft and CableCARDS	70
Unidirectional CableCARD in a Bi-directional Cable World.....	71
iDCR and DCAS	71
OCAP	72
DOCSIS 3.0	72
ETV	73
OCAP Implementations.....	73
OCHD 2.0.....	74
CES 2007	74
DOCSIS Implementation.....	75
CableCARD Implementation Analysis	76
Multi-Stream CableCARD	79
Cable STB Integration Ban.....	80
Congress Support for DCAS	80
FCC Approved DCAS – Some Integrated Ban Waivers	81
National Cable Service Coverage.....	82
Low Cost “Open Standard” Cable STB.....	82
Switched Digital Video (SDV)	83

Broadcasting

Broadcast Flag	84
Regulatory Fees	84
Must-Carry Multicasting Channels	84
3-in-One TV Tuner	85
Down-Conversion Proposal.....	85
Do You Know Where Your Recording is Tonight?.....	85
Broadcasting Industry Preparing for 1080p Production	86
USDTV	86

Chapter 4 - Internet Protocol TV (IPTV)

Introduction.....	88
What Does IPTV Mean to You?	88
The Camp in Favor of IPTV.....	89
The “Not-so-Fast” Camp	89
Lessons Learned from the HDTV World	90
IPTV Groups.....	91
IPTV - the Numbers	91
Different Methods of HDTV Over IP.....	93
Current/Planned IPTV Market Solutions	94
MatrixStream IPTV Technologies	94
Deployment Diagram.....	95
Some IPTV Implementation Lessons	98
Canby Telecom	98
Hancock Telecom	98
Some Promising Implementations	98
AT&T	98
Cavalier Telephone & TV.....	99
Disney World Resort	99

DOCSIS 3.0 IPTV Implementation.....	99
Falcon Communications.....	100
Minerva Networks/Siemens/Espial.....	101
MyTVPal.com	101
Sasktel	102
Analysis of Information Sasktel does not Advertise	103
Sony Internet TV System.....	104
TAVI 030.....	105
UTStarcom	105
Verizon	105
Analysis of the Verizon Alternative.....	106
Worldwide IPTV solutions.....	106
Xbox 360 IPTV	107
Other Flavors of IPTV	107
Final Thoughts.....	107

Chapter 5 - CRT, SED, OLED, FED, NED, 3DTV

The Technologies

LCD vs. CRT in Europe	108
3DTV	109
Samsung.....	111
SED.....	112
Applied Nanotech	114

Display Manufacturers

Canon.....	114
SED	114
GTT	114
JVC	115
Hitachi.....	115
LG.....	115
Mitsubishi.....	115
OLED	115
Motorola	116
NED	116
Phillips.....	116
RCA.....	116
Samsung.....	116
OLED	116
FED	116
CRT	116
Sony	118
OLED	118
Thomson (RCA).....	119
Toshiba.....	119
SED line	120

Chapter 6 - Digital Light Processing (DLP)

Texas Instruments.....	122
CES 2007	122

TVP9010 HDTV Processor	123
TVP9007 Converter Box	123
Akai	124
Barco	124
BenQ	124
Christie	124
Digital Projection International.....	125
Dwin	126
Hitachi	126
HP	126
InFocus	126
LG	128
Marantz	128
Mitsubishi	129
NEC	131
Nuvision	131
Optoma	132
Panasonic	138
Philips	138
Projectiondesign	138
Radio Shack.....	139
RCA (see Thomson)	139
Runco	139
SAGEM.....	141
Samsung.....	141
Sanyo	144
Sharp.....	145
SIM2 USA	146
Thomson	151
Toshiba	152
Vidikron	155
Viewsonic	157
Vivitek	157
Yamaha.....	158
Zenith.....	158

Chapter 7 - Liquid Crystal on Silicon (LCoS)

Canon	159
Cinetron	159
DreamVison	159
ELCOS	160
Faroudja.....	160
Hitachi	160
JVC (D-ILA)	160
LG	166
Meridian-Faroudja.....	166
MicroDisplay Corporation	168
OMT.....	168
SONY (SXRD).....	169
Syntax/Brilliant	171

Chapter 8 - LCD Projection (FP and RPTV)

Canon	172
Epson	172
Hitachi	175
Mitsubishi	176
Panasonic	177
Sanyo	178
Sony	179
Toshiba	180
Viewsonic	181

Chapter 9 - Plasma Panels

Audiovox	182
Cinemateq	182
Daewoo	182
Dell	182
Dwin	182
Fujitsu / Hitachi	182
HISENSE	183
Hitachi/ Fujitsu	183
HP	185
LG	186
Marantz	189
Maxent	189
Mitsubishi	189
NEC	190
NIKADA	190
Norcent	190
Panasonic	190
Philips	195
Pioneer	196
Runco	200
Samsung	201
Thomson	205
Toshiba	205
Vidikron	205
VIZIO Inc.	206

Chapter 10 - LCD Panels

Akira	208
Asus	208
BenQ	208
Hisense	208
Hitachi	208
HP	209
H&B	210
Humax	210
JVC	210
LG	214
Maxent	217

Mitsubishi	218
NIKADA	219
Norcent	219
NUVISION	220
Panasonic	220
Philips	220
Prima	222
Proton	222
Proview	224
Runco	224
Samsung	225
Sanyo	228
Sharp	229
Sony	236
Syntax/Brilliant	241
Thomson (RCA)	243
Toshiba	243
VIZIO Inc.	246
Vidikron	247
Viewsonic	247
Westinghouse	248

Chapter 11 - 1080p HDTV Implementation

Is There a Need For a 1080p Set?	252
Accepting 1080p	252
Deinterlacing 1080i to 1080p	253
An Analogy to Help Understand the Concept	253
Video Processor's Brain	253
Could the Video Processor do Better?	254
The Scaler Alternative	254
Hi-Def DVD Players in a 1080p System	255
Displaying 24fps Film Content Faster	255
24fps Film Converted to Other Formats for Display	255
1080p Compatibility and Connectivity	256
120Hz Under the Covers	257
Optimizing the 1080p System for 1080i Video	258

Chapter 12 - HDTV Tuners / DVRs

AMD	259
AverMedia	259
AVerTVHD MCE A180	259
AVerTVHD Hybrid Express card	261
AVerMedia AVerTVHD Combo PCI-E	262
AVerMedia AVerTVHD Hybrid USB	264
AutummWave	265
AV Toolbox	266
CodexNovus	266
Contemporary Research	268
Digeo	268
Digital Stream	269

DIRECTV	270
CES 2007	271
Sat-Go portable receiver	271
Dish Network	271
2006 line of MPEG-2/MPEG-4 models	271
CES 2007	272
Ezneo	273
Gefen.....	273
Hisense	273
HP	273
Humax.....	273
JVC.....	273
Key Digital.....	273
LG	273
MatrixStream IPTV Technologies	274
Deployment Diagram.....	275
MicroTune.....	277
MIT (Micro Image Technology)	278
Mitsubishi	279
Motorola.....	279
CES 2007	279
MovieBeam	280
Moxi	280
MyDTV45.com.....	280
Netgear	281
Onair Solution	282
Pace	282
PrimeDTV	282
Pro-Brand.....	282
PX Digital Multimedia	282
RCA	282
Samsung.....	283
Scientific Atlanta.....	284
CES 2007	285
Sharp.....	286
Sony.....	286
Sylvania	286
TEAC	286
Thomson	286
Cable STB.....	287
DCI9000.....	287
Satellite STB	287
IP DBI200.....	287
Triple Play Services over Multiple Network Types	288
Tivo	288
USDTV	288
UTStarcom	288
V, Inc	289
Viewsonic	289
Vizio	289
Voom.....	289
Winegard.....	289
Xceive.....	290

Zenith	293
Zoran.....	293

Chapter 13 - High Definition DVD HD DVD and Blu-ray Formats

Background	294
Formats Reconciliation.....	295
Associations of the Formats.....	295
Formats - Companies Support	296
Universal Player.....	297
Samsung.....	297
LG.....	298
The Universal Confusion	298
We Do it For the Consumer	299
Player Interactivity.....	299
Content Protection for Hi Def DVD	300
AACS Down-Res	301
PVP-OPM	302
Gaming	302
How Much does the PS3 Actually Cost?	303
Cables for PS3	304
Console Comparative Speculations	304
Xbox 360	305
Hi-Def DVD Formats Specifications	306
Computing – Hi-Def Laptops.....	307
Toshiba.....	307
Dell	308
Fujitsu	308
HP.....	308
Samsung.....	308
Sony	308
Computer Drives	309
BenQ	309
Dell	310
NEC.....	310
Pioneer	310
Sony	310
Toshiba	310
CES 2007 and Late 2006 Computer Equipment Introductions.....	310
Hitachi	310
HP	311
LaCie	311
LG	311
Niveus Media.....	311
Pioneer.....	312
Samsung.....	313
Sony	313
Toshiba	313
Parts and Chips	314
PC applications for BD	316
Discs.....	316
NME	317

Multi-layer Dual Optical Disc	317
Toshiba's Triple-layer Hybrid TWIN Disc Format	317
Recording Media for HD DVD and Blu-ray	318
Sony	319
TDK.....	319
HD DVD ROM	319
BD Discs.....	320
BD-ROM Pre-recorded Media	320
Studio Announcements.....	320
Format Launching.....	320
HD DVD Launch	321
Blu-ray Launch	321
Industry and Content Support – CES 2007	322
Blu-ray Presentation	322
HD DVD Presentation.....	323
Warner's Total Hi Def Disc (Dual Blue Laser Formats)	323
Format Market Penetration – CES 2007.....	324
Titles and Blu-ray Player Sales.....	325
Film Grain Added to HD DVD	326

HD DVD Players/Recorders

Alco.....	328
LG.....	328
Onkyo.....	328
RCA.....	328
Sanyo.....	329
Shinco Electronics	329
Toshiba	329
The Actual Value of the Player	329
Current Toshiba Players:	331
1080p Video Processing in Toshiba Players	331
1080p 24fps Output in Toshiba Players	332
Toshiba Plans for 1080p 24fps	332
New Toshiba Players.....	333

Blu-ray Players/ Recorders

Hitachi	335
JVC	335
LiteOn.....	336
LG.....	336
Mitsubishi.....	338
Panasonic.....	338
Philips.....	339
Pioneer	340
Samsung.....	341
Sharp	344
Sony	345

Formats Implementation Issues

Blu-ray.....	346
HD DVD.....	347

Analysis for the Hi-Def DVD Adopter

Balancing Features	348
1080p Outputs	348
1080p24fps for Film Content Playback	348
The Format Choice - Survey Question.....	349
Audio Claims.....	350
Image Constraint Token (ICT) - Early Adopter Impact.....	351
ICT Token - An Issue Anytime any Place	351
ICT Token - Industry Impact	352
Hybrid Discs	352
Partial Implementation of Features	353
 A Different View of Hi-Def DVD Booths at CES.....	 354
 Asia's Hi-Def DVD Challengers	
China's EVD, HVD, and HDV	355
Taiwan's Forward Versatile Disc (FVD)	355
Versatile Multi-layer Disc - VMD Format	358
 Chapter 14 - HD Video Processors	
Engines for Video Processors	
ABT	359
Gennum Corporation.....	360
Silicon Optix	362
Algolith.....	364
BenQ	364
Calibre	365
Cinetron	365
Denon	365
Digital Projection	365
Epson.....	365
JVC.....	365
Mitsubishi	365
NEC	365
Proview	365
Syntax	365
Toshiba	365
Yamaha.....	366
GEO chip	366
 Video Processors	
Algolith	368
Calibre.....	369
Digital Projection	370
DVDO	371
Faroudja	371
Gefen	371
Lumagen.....	372
NEC.....	373
Pixel Magic (Crystalio II)	373

Chapter 15 - HD Video Cameras

HDV Format	374
AVCHD Format	374
Ambarella	374
Canon	374
Professional Products	374
Consumer Camcorders	376
Hitachi	378
JVC	378
Consumer Products – CES 2007	379
Professional Products	381
Panasonic	382
Panasonic Broadcast	383
Consumer Products	384
Sanyo	386
Samsung	388
Sony	388
Sony High Performance Broadcast	389
Consumer Products	390

Chapter 16 - Screens and HT Equipment

Digital Innovations	395
Dnp	395
D-Box	395
Hillcrest Labs	396
Jasco GE	396
Lightscope	396
Optoma	397
Panamorph	397
Planar Systems	397
Sima	398
Stewart	398
VUTECH	398

Chapter 17 - Digital Connectivity

Networking Standards and Industry Efforts

High-Definition Audio-Video Network Alliance (HANA)	401
Background from 2006 Report	401
January 2007 Update	401
IEEE1394 Over Coaxial	402
IEEE Approves Initial 802.11n Spec	402
IBM Developed Wireless HD Chip	402
Powerline	402
DS2	402
IPTV Home Networks	403
Audio and Video Streaming for Home Networking	403
UDI	403
UWB	404
WiFi-N	404
WirelessHD	405

Chapter 18 - Digital Connectivity – DVI and IEEE1394

DVI.....	408
HDCP	408
Bandwidth, Resolution	408
Auto-configuration	409
DVI-I (integrated).....	409
DVI-D (digital).....	409
DVI-A (analog)	409
Connecting Plugs to Receptacles	410
IEEE1394	410
“a” Standard	410
“b” Standard	410
Connectors	411
DTCP	411
Implementation	411
Connectivity Evolution	411

Chapter 19 - HDMI – A Digital Interface Solution

HDMI - What This Means to You?	413
HDMI - How was it Created?.....	413
HDCP (High-bandwidth Digital Content Protection)	413
A Quick Summary of the Ancestor (DVI)	414
Do we Need HDMI?.....	414
HDMI Version 1.3 - the Excuses	415
The HDMI Versions	416
HDMI 1.0 (Dec 02) –1.2a (Dec 05)	416
Versions Time Line	416
HDMI 1.3 -Next Gen Performance	417
I Want My Version X.Z.....	417
8-bits per Component?.....	418
HDMI Enables Intelligence.....	418
This is Good Already, why Another Version?	418
HDMI Version 1.3 - Digital Connectivity at its Best.....	419
Double the Bandwidth	419
Deep Color	419
Eliminates Color Banding	420
x.v.YCC.....	420
Greater PC/CE Convergence.....	421
Higher Resolution and Refresh Rates	421
New Mini-connector	422
Lip Sync.....	422
Support for New Advanced Audio Formats.....	422
1.3 Backward Compatible with non-1.3 Equipment? How?	422
Video Processing the Basic 8-bits.....	422
Deep Color and Compatibility	423
HDMI - Audio in HDMI Versions.....	424
Multi-channel Audio does not Like my HDMI Connection!	425
Hi-bit Audio Application to Hi-def DVD Formats	425
Hi Def DVD, Using HDMI for Audio	426

Lip Sync Feature of 1.3	427
Upgrade? For Audio? Again?.....	427
1080p Support - Optional Since Day One	428
1080p Input and Pass-thru Features	429
HDMI - 1080p from Start to End, However	430
Type A and B Connectors (Did You Know a Type B Existed?)	431
Dual Link.....	431
Another Cable for 1.3, or for 1080p?	432
Spend More on Cables?	432
The HDMI Cable	434
Is the Cable Thick? It Has to be Good Then.....	434
Do we Really Need Another Cable for 1.3?.....	434
Qualifying to the Correct Category	435
HDMI Industry Adoption	435
Meeting the HDMI Standard	437
Panellink Cinema (PLC) Partners Program	438
Simply Labs	438
HDMI Compliance Test Specification 1.3a.....	439

Chapter 20 - Digital Connectivity - HDMI Chips

2004 Background	441
Sil 9030 Transmitter	441
Sil 9021 Receiver	441
Sil 9031 Receiver	441
2005 Background	441
Sil 8100 Video Processor	441
Sil 9011 Receiver	441
Update 2005–2006	442
HDMI First Receiver Sil 9033 with v1.2 Specification.....	442
HDMI Receiver IC Support for 1080p	442
HDMI Sil 1930 and 1390 Transmitters	442
HDMI Sil 9023 Receiver	442
Sil 4726 Processor	442
HDMI Sil 9020 Transmitter for HD Cameras.....	443
Sil 8200 Video Processor	443
iTMDs Internal Link Technology, Sil 7170, 7171.....	444
Update 2006-2007.....	444
VastLane HDMI Transmitter.....	444
The VastLane Sil1932-3.....	444
VastLane HDMI 1.3 Receiver Line.....	445
Sil9135 Receiver	445
Sil9125 Receiver	445
VastLane™ HDMI 1.3 Switch Family.....	445
Sil9181	445
Sil9185	445
PinnaClear Family of DTV Input Processors	446
Sil9153	446
Sil9155	446

Chapter 21 - Digital Connectivity - Wired HD Equipment

Belkin	447
Blackmagic Design	447
DS2	448
Gefen	449
Intellon	452
Jasco's GE	452
Parasound	452
Samsung	452
Sharp	453
Sony	454

Chapter 22 - Digital Connectivity - Wireless HD Equipment

Apple	456
Avocent	456
D-Link	457
Gefen	458
HauteSpot Networks Corporation	459
LightPointe	459
MetaLink	460
Netgear	460
Philips	461
Pulse~LINK	461
Ruckus Wireless	462
Samsung	464

Chapter 23 - Digital Connectivity - DisplayPort™

DisplayPort Objectives	467
Key Industry Needs for DisplayPort	467
DisplayPort Technical Objectives	468
DisplayPort External Connection Objectives	470
DisplayPort Internal Connection Objectives	471
DisplayPort CE Connection Objectives	472
Content Protection for DisplayPort	473

Chapter 24 - Digital Connectivity Implementation

HDMI

HDMI 1.3 Specification	475
Launching the HDMI 1.3 World Tour	476
HDMI Standard Compliance	478
PanelLink Cinema (PLC) Partners Program	478
Simplex Labs Introduction	478
HDMI Compliance Test Specification 1.3a	478
HDMI Industry Adoption	478
HDMI in 1080p Equipment	479
HDMI Multi-channel Audio	479

DisplayPort™

DisplayPort Company Support	482
AMD	482

Dell.....	482
Genesis	483
Hewlett-Packard	483
Intel	483
Lenovo	483
Nvidia	483
Samsung	483

HDMI and DisplayPort - Reconciling Views

How HDMI Fits into the DisplayPort Picture?	484
The Official Position - HDMI Licensing, LLC	484
Analysis of Additional Feedback from HDMI Licensing.....	485
Other Industry Source – Feedback and Analysis	486
The Compatibility Subject – HDMI’s View	486
<i>Compatibility</i>	486
<i>HDMI Release Schedule</i>	487
<i>Feature Advantages</i>	487
VESA Responds to My Inquiry.....	489
Final Thoughts	490

Chapter 25 - Multi-channel Audio for HD

Legacy Dolby Digital and DTS.....	492
-----------------------------------	-----

DTS-HD Multi-Channel Audio Formats

DTS-HD Master Audio™	492
DTS-HD High Resolution Audio™.....	493
DTS-HD LBR (Low Bit Rate Audio).....	493
A) Blu-ray Secondary Audio.....	493
B) HD DVD DTS Sub Audio	493
DTS Formats Extensions.....	493
Chips for DTS-HD	494

Dolby HD Audio Formats

Dolby Digital Plus™.....	494
Dolby TrueHD™.....	495
Dolby Digital HD Audio - Connectivity	497
Single-Cable Digital Connection.....	497
Multi-channel Analog Connection.....	498
S/PDIF Connection.....	498
Dolby TrueHD and Dolby Digital Plus in A/V Receivers	499
DTS-HD Audio Formats – Connectivity	500
DTS-HD Over HDMI 1.1 and 1.2.....	501
Legacy Discrete Surround Audio in Hi-Def DVD	501
Core Playback from DTS-HD	502
Dolby Digital Playback from TrueHD.....	502
DTS Multi-channel Broadcast Audio Tools	502
Dolby Volume.....	502
HD Audio Formats for Hi-Def DVD Formats – A Summary	502

Analysis	
Why More Audio Formats?	503
Fitting it All in One Disc	504
HDMI Version – Reason for an Upgrade?	504
HD Audio Decoders Steering the Player’s Selection	505
Connectivity Steering the Player’s Selection	505
Pass-Through Bitstream Feature	506
Streaming Pass-through on HD DVD Players	507
Streaming Pass-through on Blu-ray Players	508
Encoder for Legacy Audio Mix	508
Dolby Digital Plus Not Over HDMI 1.1/1.2 (as DTS HD is)	509
Chapter 26 - HD Content Protection	
‘Plug-and-Play’ Cable (MVPD) Agreement	511
Broadcast Flag	513
What is the Flag.....	513
2005 Update of the “Broadcast Flag” Order.....	514
The “ <i>Analog Hole</i> ”	515
2006 Update of the “Broadcast Flag” Order.....	515
2007 Update of the “Broadcast Flag” Order.....	516
Other Technology Alternatives to the Broadcast Flag.....	516
VideoMark™	517
Thomson NexGuard.....	517
MPAA joining DWA	518
Philips and Cinea	518
PVP-OPM	519
Down-res	519
Analysis – Some Loose-ends	522
Reducing Your Consumer Risk	523
Digital Freedom	524
AACS	525
AACS Down-res ICT Token Approved	525
Hollywood and the ICT Token	526
AACS Effectiveness Compromised	526
BD+ Implementation.....	528
HD Content Protection - Combined FCC Regulations.....	529
Glossary of H/DTV Terms	530
About the Author	558