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Digital Imaging and Communications in Medicine (DICOM)

Supplement 42: MPEG2 Transfer Syntax

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Table of Contents

32	Foreword	ii
33	Scope and Field of Application	i
34	LIMITATIONS OF CURRENT STANDARD	1
35	FORM OF THIS SUPPLEMENT	1
36	A.8.5.4 Multi-frame True Color SC Image IOD Content Constraints	1
37	C.7.6.5 Cine Module.....	2
38	C.7.6.5.1 Cine Attribute Descriptions.....	3
39	C.7.6.5.1.3 Multiplexed Audio.....	3
40	8.2.X MPEG2 MP@ML IMAGE COMPRESSION	4
41	10.X TRANSFER SYNTAX FOR MPEG2 MP@ML IMAGE COMPRESSION	6
42	Annex A (Normative) Transfer Syntax Specifications.....	6
43	A.4.X MPEG2 IMAGE COMPRESSION.....	6
44	Annex X (Normative) - DVD MPEG2 Interchange Profiles.....	7
45	X.1 PROFILE IDENTIFICATION	7
46	X.2 CLINICAL CONTEXT	7
47	X.2.1 Roles and Service Class Options	7
48	X.2.1.1 File Set Creator	8
49	X.2.1.2 File Set Reader.....	8
50	X.2.1.3 File Set Updater.....	8
51	X.3 STD-DVD-MPEG2-MPML AND STD-DVD-SEC-MPEG2-MPML PROFILE CLASSES	9
52	X.3.1 SOP Classes and Transfer Syntaxes	9
53	X.3.2 Physical Medium And Medium Format.....	9
54	X.3.3 Directory Information in DICOMDIR	9
55	X.3.3.1 Additional Keys.....	9
56	X.3.4 Security Parameters	10
57	X.3.5 “Dual-format” (Informative).....	11
58	CID 3000 Audio Channel Source	11

59

60

Foreword

61 This Supplement has been prepared by DICOM Working Group 13 (Visible Light), according to the
62 procedures of the DICOM Committee.

63 This Supplement includes the definition of the MPEG2 MP@ML Transfer Syntax.

64 This Supplement makes changes to the following existing Parts of DICOM:

65 - PS 3.3 Information Object Definitions

66 - PS 3.5 Data Structures and Encoding

67 - PS 3.6 Data Dictionary

68 - PS 3.16 Content Mapping Resource

69

70

Scope and Field of Application

71 This Supplement describes a new transfer syntax that embeds MPEG2 encoding in DICOM.

72 This transfer syntax would typically be used for encoding video sequences, though it is not inherently
73 constrained from encoding other forms of multi-frame pixel data.

74 This transfer syntax uses a MPEG2 lossy compression, with a middle range quality, called Main Profile /
75 Main Level (MP@ML), typically from 4 at 8 Mbit/s, which means respectively 30 Mbytes and 60 Mbytes per
76 minute of video, and does not exceed 15 Mbit/s. The highest rate corresponds to the "Video DVD" quality.

77 The MPEG2 standard compresses video by taking into account the similarity of the frames within a set
78 (Group Of Pictures, GOP), classically of 12 pictures, in addition to "JPEG-like" compression within a frame.
79 The compression ratio is over 30, and is established by the target bit rate to achieve a particular frame
80 rate.

81 LIMITATIONS OF CURRENT STANDARD.

82 For some applications, multi-frame images using the existing encoded transfer syntaxes would not appear
83 to be sufficient for review of video acquired in real-time using digital video equipment. Three functional
84 limitations appeared:

- 85 - Present DICOM transfer syntaxes achieve a limited level of compression, since they do not
86 support interpolation between frames.
- 87 - MPEG2 is popularly used outside the context of DICOM for video compression.

88

89 Two technical considerations have been taken as prerequisites for this standard:

- 90 - The use of MPEG2 only (rather than the older MPEG1, or the emerging MPEG4 / MPEG7 /
91 MPEG21 formats), because of its widespread adoption by consumer market.
- 92 - Selection of only one MPEG2 format in order to give higher priority to the interoperability
93 between different systems as opposed to the image quality for specific application. The
94 MPEG2 Main Profile @ Main Level is chosen because it is the one universally used by
95 consumer electronic equipment. Image quality is superior to that achieved with analogue
96 videotape, however DICOM takes no position on the suitability of a particular compression
97 scheme for any particular clinical purpose.

98

99 The existing Key Object Selection SOP Class provides a mechanism for referencing individual frames, or
100 multiple frames (such as a video "clip").

101 Audio channel(s), for voice or sound-based physiological information, can be interleaved within the video
102 stream, using the MPEG1 Layer III audio format (MP3).

103 FORM OF THIS SUPPLEMENT

104 This supplement adds a new Transfer Syntax and some extensions to the IOD infrastructure to support its
105 use. It does not introduce any new SOP Classes or IODs and may be used with existing multi-frame SOP
106 Classes that satisfy the constraints of the Transfer Syntax, such as the Multi-frame RGB Secondary
107 Capture Image Storage SOP Class.

108 Other Supplements may address the need for new SOP Classes for specific applications (such as video
109 for gastrointestinal endoscopy).

110 Since this document proposes changes to existing Parts of DICOM, the reader should have a working
111 understanding of the Standard. This proposed Supplement includes a number of Addenda to existing Parts
112 of DICOM:

- 113 - PS 3.3 Addendum: Information Object Definitions
- 114 - PS 3.5 Addendum: Data Structures and Encoding
- 115 - PS 3.6 Addendum: Data Dictionary
- 116 - PS 3.11 Addendum: Media Storage Application Profiles
- 117 - PS 3.16 Addendum: Content Mapping Resource

118

119 *PS 3.3: Add reference to MPEG2 standard in Section 2.*

120 ISO/IEC 13818-1:2000 Information technology -- Generic coding of moving pictures and associated audio
121 information: Systems

122 ISO/IEC 13818-2:2000 Information technology -- Generic coding of moving pictures and associated audio
123 information: Video

124 ISO/IEC 13818-3:1998 Information technology -- Generic coding of moving pictures and associated audio
125 information -- Part 3: Audio

126 ISO/IEC 13818-4:1998 Information technology -- Generic coding of moving pictures and associated audio
127 information -- Part 4: Conformance testing

128 *PS 3.3: Modify Section A.8.5.4, to allow MPEG-specific Photometric Interpretation:*

129 **A.8.5.4 Multi-frame True Color SC Image IOD Content Constraints**

130 ...

131 In the Image Pixel Module, the following constraints apply:

132 - ...

133 - Photometric Interpretation (0028,0004) shall be RGB for uncompressed or lossless
134 compressed transfer syntaxes, **YBR_PARTIAL_420 for MPEG2 transfer syntaxes** and
135 YBR_FULL_422 for **other** lossy compressed transfer syntaxes

136 Note: Future lossless and lossy transfer syntaxes may lead to the need for new definitions and choices for
137 Photometric Interpretation, such as the proposed RCT (Reversible Color Transformation) used in
138 JPEG 2000.

139 ...

140 *PS 3.3: Insert in Section C.7.6.3.1.2, after the definition of YBR_PARTIAL_422:*

141 **YBR_PARTIAL_420** = The same as YBR_PARTIAL_422 except that the C_B and C_R values are sampled
142 horizontally and vertically at half the Y rate and as a result there are four times less C_B and C_R values
143 than Y values, versus twice less for YBR_PARTIAL_422.

144 This Photometric Interpretation is only allowed with Planar Configuration (0028,0006) equal to 0. The C_B
145 and C_R values shall be sampled at the location of the first of the two Y values. For the first Row of Pixels
146 (etc.), the first C_B and C_R samples shall be at the location of the first Y sample. The next C_B and C_R
147 samples shall be at the location of the third Y sample etc. The next Rows of Pixels containing C_B and C_R
148 samples (at the same locations than for the first Row) will be the third etc.

149 *PS 3.3: Update the Cine Module Section C.7.6.5 to add description of multiplexed audio channels that may
150 be present:*

151 **C.7.6.5 Cine Module**

152 Table C.7-13 specifies the Attributes of a Multi-frame Cine Image.

153 **Table C.7-13**
154 **CINE MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Attribute Description
Preferred Playback Sequencing	(0018,1244)	3	Describes the preferred playback sequencing for a multi-frame image. Enumerated Values: 0 = Looping (1,2...n,1,2,...n,1,2,...n,...) 1 = Sweeping (1,2,...n,n-1,...2,1,2,...n,...)
Frame Time	(0018,1063)	1C	Nominal time (in msec) per individual frame. See C.7.6.5.1.1 for further explanation. Required if Frame Increment Pointer (0028,0009) points to Frame Time.
Frame Time Vector	(0018,1065)	1C	An array that contains the real time increments (in msec) between frames for a Multi-frame image. See C.7.6.5.1.2 for further explanation. Required if Frame Increment Pointer (0028,0009) points to Frame Time Vector.
Start Trim	(0008,2142)	3	The frame number of the first frame of the Multi-frame image to be displayed.
Stop Trim	(0008,2143)	3	The Frame Number of the last frame of a Multi-frame image to be displayed.
Recommended Display Frame Rate	(0008,2144)	3	Recommended rate at which the frames of a Multi-frame image should be displayed in frames/second.
Cine Rate	(0018,0040)	3	Number of frames per second.
Frame Delay	(0018,1066)	3	Time (in msec) from Content Time (0008,0033) to the start of the first frame in a Multi-frame image.
Image Trigger Delay	(0018,1067)	3	Delay time in milliseconds from trigger (e.g., X-ray on pulse) to the first frame of a Multi-frame image.
Effective Duration	(0018,0072)	3	Total time in seconds that data was actually taken for the entire Multi-frame image.
Actual Frame Duration	(0018,1242)	3	Elapsed time of data acquisition in msec per each frame.
<u>Multiplexed Audio Channels Description Code Sequence</u>	<u>(003A,0300)</u>	<u>1C</u>	<u>Description of any multiplexed audio channels. See Section C.7.6.5.1.3. Required if the Transfer Syntax used to encode the multi-frame image contains multiplexed (interleaved) audio channels, such as is possible with MPEG2.</u>

>Channel Identification Code	(003A,0301)	1	<u>A reference to the audio channel as identified within Transfer Syntax encoded bit stream (1 for the main channel, 2 for the second channel and 3 to 9 to the complementary channels).</u>
>Channel Mode	(003A,0302)	1	<u>A coded descriptor qualifying the mode of the channel:</u> <u>Enumerated Values:</u> <u>MONO = 1 signal</u> <u>STEREO = 2 simultaneously acquired (left and right) signals</u>
>Channel Source Sequence	(003A,0208)	1	<u>A coded descriptor of the audio channel source. Only a single Item shall be permitted in this sequence.</u>
>>Include 'Code Sequence Macro' Table 8.8-1.		<u>Defined Context ID Audio Channel Source 3000.</u>	

155

156 **C.7.6.5.1 Cine Attribute Descriptions**

157 ...

158 **C.7.6.5.1.3 Multiplexed Audio**

159 During a video acquisition, audio may be used for voice commentary of what is being observed, as well as
160 to record sound-based physiological information such as Doppler audio.

161 Some Transfer Syntaxes allow for the multiplexing of interleaved audio with video data, and the Attributes
162 of the Cine Module support this encoding paradigm. They are not intended to describe audio acquired
163 simultaneously when it is encoded in other SOP Instances or within Attributes other than Pixel Data
164 (7FE0,0010) of the same SOP Instance.

165 Synchronization between audio and video is assumed to be encoded at the Transfer Syntax level (i.e.
166 within the encoded bit stream).

167 **PS 3.5: Add reference to MPEG2 standard in Section 2.**

168 ISO/IEC 13818-1:2000 Information technology -- Generic coding of moving pictures and associated audio
169 information: Systems

170 ISO/IEC 13818-2:2000 Information technology -- Generic coding of moving pictures and associated audio
171 information: Video

172 ISO/IEC 13818-3:1998 Information technology -- Generic coding of moving pictures and associated audio
173 information -- Part 3: Audio

174 ISO/IEC 13818-4:1998 Information technology -- Generic coding of moving pictures and associated audio
175 information -- Part 4: Conformance testing

176 **PS 3.5: Add the following definitions in Section 4.**

177 **JPEG:** Joint Photographic Experts Group

178 **MPEG:** Moving Picture Experts Group

179 *PS 3.5: Add MPEG2 MP@ML IMAGE COMPRESSION and MP3 Audio in Section 8.*

180 **8.2.X MPEG2 MP@ML IMAGE COMPRESSION**

181
182 DICOM provides a mechanism for supporting the use of MPEG2 MP@ML Image Compression through the
183 Encapsulated Format (see PS 3.3). Annex A defines a Transfer Syntax that references the MPEG2
184 MP@ML Standard.

185 **Note:** MPEG2 compression is inherently lossy. The context where the usage of lossy compression of medical
186 images is clinically acceptable is beyond the scope of the DICOM Standard. The policies associated with
187 the selection of appropriate compression parameters (e.g. compression ratio) for MPEG2 MP@ML are
188 also beyond the scope of this standard.

189
190 The use of the DICOM Encapsulated Format to support MPEG2 MP@ML compressed pixel data requires
191 that the Data Elements which are related to the Pixel Data encoding (e.g. Photometric Interpretation,
192 Samples per Pixel, Planar Configuration, Bits Allocated, Bits Stored, High Bit, Pixel Representation, Rows,
193 Columns, etc.) shall contain values that are consistent with the characteristics of the compressed data
194 stream, with some specific exceptions noted here. The Pixel Data characteristics included in the MPEG2
195 MP@ML bit stream shall be used to decode the compressed data stream.

196 **Note:** These requirements are specified in terms of consistency with what is encapsulated, rather than in terms
197 of the uncompressed pixel data from which the compressed data stream may have been derived.

198 When decompressing, should the characteristics explicitly specified in the compressed data stream be
199 inconsistent with those specified in the DICOM Data Elements, those explicitly specified in the
200 compressed data stream should be used to control the decompression. The DICOM data elements, if
201 inconsistent, can be regarded as suggestions as to the form in which an uncompressed data set might
202 be encoded.

203
204 The MPEG2 MP@ML bit stream specifies whether or not a reversible or irreversible multi-component
205 (color) transformation, if any, has been applied. If no multi-component transformation has been applied,
206 then the components shall correspond to those specified by the DICOM Attribute Photometric
207 Interpretation (0028,0004). MPEG2 MP@ML applies an irreversible multi-component transformation, so
208 DICOM Attribute Photometric Interpretation (0028,0004) shall be YBR_PARTIAL_420 in the case of multi-
209 component data, and MONOCHROME2 in the case of single component data (even though the MPEG2 bit
210 stream itself is always encoded as three components, one luminance and two chrominance).

211 **Note:** MPEG2 proposes some video formats. Each of the standards specified is used in a different market,
212 including: ITU-R BT.470-2 System M for SD NTSC and ITU-R BT.470-2 System B/G for SD
213 PAL/SECAM. A PAL based system should therefore be based on ITU-BT.470 System B for each of
214 Color Primaries, Transfer Characteristic (gamma) and matrix coefficients and should take a value of 5 as
215 defined on in ISO/IEC 13818-2: 1995 (E).

216
217 The value of Planar Configuration (0028,0006) is irrelevant since the manner of encoding components is
218 specified in the MPEG2 MP@ML standard, hence it shall be set to 0.

219 In summary:

- 220 – Samples per Pixel (0028,0002) shall be 3
- 221 – Photometric Interpretation (0028,0004) shall be YBR_PARTIAL_420

- 222 – Bits Allocated (0028,0100) shall be 8
- 223 – Bits Stored (0028,0101) shall be 8
- 224 – High Bit (0028,0102) shall be 7
- 225 – Pixel Representation (0028,0103) shall be 0
- 226 – Planar Configuration (0028,0006) shall be 0
- 227 – Rows (0028,0010), Columns (0028,0011), Cine Rate (0018,0040) and Frame Time
- 228 (0018,1063) or Frame Time Vector (0018,1065) shall be consistent with the limitations of
- 229 MP@ML, as specified in table 8-x below:

Table 8-x
MPEG2 MP@ML IMAGE TRANSFER SYNTAX ROWS AND COLUMNS ATTRIBUTES

Video Type	Spatial resolution	Frame Rate (see Note 4)	Frame Time (see Note 5)	Maximum Rows	Maximum Columns
525-line NTSC	Full	30	33.33 ms	480	720
625-line PAL	Full	25	40.0 ms	576	720

- 232
- 233 Notes: 1. Although different combinations of values for Rows and Columns values are possible while respecting
- 234 the maximum values listed above, it is recommended that the typical 4:3 ratio of image width to height be
- 235 maintained in order to avoid image deformation by MPEG2 decoders. A common way to maintain the
- 236 ratio of width to height is to pad the image with black areas on either side.
- 237 2. "Half" definition of pictures (240x352 and 288x352 for NTSC and PAL, respectively) are always
- 238 supported by decoders.
- 239 3. MP@ML allows for various different display and pixel aspect ratios, including the use of square pixels,
- 240 and the use of non-square pixels with display aspect ratios of 4:3 and 16:9. DICOM specifies no
- 241 additional restrictions beyond what is provided for in MP@ML. All permutations allowed by MP@ML are
- 242 valid and are require to be supported by all DICOM decoders.
- 243 4. The actual frame rate for NTSC MPEG2 is approximately 29.97 frames/sec.
- 244 5. The nominal Frame Time is supplied for the purpose of inclusion on the DICOM Cine Module
- 245 Attributes, and should be calculated from the actual frame rate.
- 246

247 One fragment shall contain the whole stream.

- 248 Note: If a video stream exceeds the maximum length of one fragment, it may be sent as multiple SOP
- 249 Instances.

250

251 The Basic Offset Table shall be empty (present but zero length).

- 252 Note: The Basic Offset Table is not used because MPEG2 contains its own mechanism for describing
- 253 navigation of frames. To enable decoding of only a part of the sequence, MPEG2 manages a header in
- 254 any group of pictures (GOP) containing a time_code – a 25-bit integer containing the following:
- 255 drop_frame_flag, time_code_hours, time_code_minutes, marker_bit, time_code_seconds and
- 256 time_code_pictures.

257

258 Any audio components present within the MPEG bit stream shall comply with the following restrictions:

- 259 – CBR MPEG-1 LAYER III (MP3) Audio Standard
- 260 – up to 24 bits

1.2.840.10008.1.2.4.100	MPEG2 Main Profile @ Main Level	Transfer Syntax	PS 3.5
-------------------------	---------------------------------	-----------------	--------

286

287

288

PS 3.11: Add new MPEG2 DVD Application Profiles:

289

Annex X (Normative) - DVD MPEG2 Interchange Profiles

290

X.1 PROFILE IDENTIFICATION

291

This Annex defines an Application Profile Class for all multi-frame Media Image Storage SOP Classes compressed with MPEG2.

292

293

Table X.1-1 STD-DVD-MPEG2-MPML and STD-DVD-SEC-MPEG2-MPML Profiles

Application Profile	Identifier	Description
DVD Interchange with MPEG2 MP@ML	STD-DVD-MPEG2-MPML	Handles interchange of multi-frame images as MPEG2 MP@ML compressed video sequences.
Secure DVD Interchange with MPEG2 MP@ML	STD-DVD-SEC-MPEG2-MPML	Handles interchange of multi-frame images as MPEG2 MP@ML compressed video sequences. Offers confidentiality, integrity and, depending on the File-set creator's choice, data origin authentication.

294

295

Equipment claiming conformance to this Application Profile shall list the subset of Media Storage SOP Classes that it supports in its Conformance Statement.

296

297

X.2 CLINICAL CONTEXT

298

This Application Profile Class facilitates the interchange of images data on DVD media. Typical interchange would be between acquisition devices, archives and workstations.

299

300

X.2.1 Roles and Service Class Options

301

This Application Profile Class uses the Media Storage Service Class defined in PS3.4 with the Interchange Option.

302

303

The Application Entity shall support one or more of the roles of File Set Creator (FSC) or File Set Reader (FSR), defined in PS 3.10. The File Set Updater (FSU) role is not defined.

304

305 **X.2.1.1 File Set Creator**

306 The role of File Set Creator shall be used by Application Entities that generate a File Set under this Image
307 Interchange Class of Application Profiles.

308 File Set Creators shall be able to generate the Basic Directory SOP Class in the DICOMDIR file with all
309 the subsidiary Directory Records related to the Image SOP Classes stored in the File Set. The Application
310 Entity acting as a File Set Creator generates a File Set under a STD-DVD-MPEG2-MPML or STD-DVD-
311 SEC-MPEG2-MPML Application Profile.

312 FSC shall offer the ability to either finalize the physical volume at the completion of the most recent write
313 session (no additional information can be subsequently added to the volume) or to allow multi-session
314 (additional information may be subsequently added to the volume). An FSC may allow packet-writing, if
315 supported by the media and file system specified in the profile.

316 Note: A multiple volume (i.e. a logical volume that can cross multiple physical media) is not supported by this
317 class of Application profile. If a set of Files, e.g., a Study, cannot be written entirely on one physical volume
318 (side of one piece of media), the FSC will create multiple independent DICOM File Sets such that each File
319 Set can reside on a single physical volume (side of a single piece of media) controlled by its individual
320 DICOMDIR file. The user of the FSC can opt to use written labels on the physical volumes to indicate that
321 there is more than one physical volume for this set of files (e.g., a study).

322

323 **X.2.1.2 File Set Reader**

324 The role of File Set Reader shall be used by Application Entities that receive a transferred File Set under
325 the Image Interchange Class of Application Profiles. Typical entities using this role would include image
326 generating systems, display workstations, and archive systems that receive a patient record; e.g.
327 transferred from another institution.

328 File Set Readers shall be able to read the DICOMDIR directory file and all the SOP Instance files defined
329 for this Application Profile, for which a Conformance Statement is made, using all the defined Transfer
330 Syntaxes for the Profile.

331 **X.2.1.3 File Set Updater**

332 The FSU role is not defined for the STD-DVD-MPEG2-MPML and STD-DVD-SEC-MPEG2-MPML profiles.

333 **X.3 STD-DVD-MPEG2-MPML AND STD-DVD-SEC-MPEG2-MPML PROFILE CLASSES**

334 **X.3.1 SOP Classes and Transfer Syntaxes**

335 This Application Profile is based on the Media Storage Service Class with the Interchange Option (see PS
336 3.4).

337 **Table X.3-1**

338 **STD-DVD-MPEG2-MPML and STD-DVD-SEC-MPEG2-MPML SOP Classes and Transfer Syntaxes**

Information Object Definition	Service Object Pair Class UID	Transfer Syntax and UID	FSC Requirement	FSR Requirement
Basic Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian Uncompressed 1.2.840.10008.1.2.1	Mandatory	Mandatory
Multi-frame Composite IODs for which a Media Storage SOP Class is defined in PS 3.4	<i>See PS 3.4</i>	MPEG2 MP@ML Image Compression 1.2.840.10008.1.2.4.100	Defined in Conformance Statement	Mandatory for all SOP Classes defined in Conformance Statement

339
340 The SOP Classes and corresponding Transfer Syntax supported by this Application Profile are specified in
341 the Table X.3-1. The supported Storage SOP Class(es) shall be listed in the Conformance Statement
342 using a table of the same form.

343 **X.3.2 Physical Medium And Medium Format**

344 The STD-DVD-MPEG2-MPML and STD-DVD-SEC-MPEG2-MPML application profiles require any of the
345 120 mm DVD media other than DVD-RAM, as defined in PS 3.12.

346 **X.3.3 Directory Information in DICOMDIR**

347 Conformant Application Entities shall include in the DICOMDIR File the Basic Directory IOD containing
348 Directory Records at the Patient and the subsidiary Study and Series levels, appropriate to the SOP
349 Classes in the File Set.

350 All DICOM files in the File Set incorporating SOP Instances defined for the specific Application Profile shall
351 be referenced by Directory Records.

352 Note: DICOMDIRs with no directory information are not allowed by this Application Profile.

353
354 All implementations shall include the DICOM Media Storage Directory in the DICOMDIR file. There shall
355 only be one DICOMDIR file per File Set. The DICOMDIR file shall be in the root directory of the medium.
356 The Patient ID at the patient level shall be unique for each patient directory record in one File Set.

357 **X.3.3.1 Additional Keys**

358 File Set Creators and Updaters are required to generate the mandatory elements specified in PS 3.3.

359 Table X.3-2 specifies the additional associated keys. At each directory record level other additional data
360 elements can be added, but it is not required that File Set Readers be able to use them as keys. Refer to
361 the Basic Directory IOD in PS 3.3.

362 **Table X.3-2**
363 **STD-DVD-MPEG2-MPML and STD-DVD-SEC-MPEG2-MPML Additional DICOMDIR Keys**

Key Attribute	Tag	Directory Record Type	Type	Notes
Patient's Birth Date	(0010,0030)	PATIENT	1C	Required if present in any objects referenced by subordinate records with a non-zero length value.
Patient's Sex	(0010,0040)	PATIENT	1C	Required if present in any objects referenced by subordinate records with a non-zero length value.
Institution Name	(0008,0080)	SERIES	1C	Required if present in any objects referenced by subordinate records with a non-zero length value.
Institution Address	(0008,0081)	SERIES	1C	Required if present in any objects referenced by subordinate records with a non-zero length value.
Performing Physicians' Name	(0008,1050)	SERIES	1C	Required if present in any objects referenced by subordinate records with a non-zero length value.
Image Type	(0008,0008)	IMAGE	1C	Required if present in image object.
Lossy Image Compression Ratio	(0028,2112)	IMAGE	1C	Required if present in image object with a non-zero length value.
Rows	(0028,0010)	IMAGE	1	
Columns	(0028,0011)	IMAGE	1	

364
365 Note: The requirements with respect to the mandatory DICOMDIR keys in PS 3.3 imply that either these
366 attributes are present in the Image IOD, or they are in some other way supplied by the File-set Creator.
367 These attributes are (0010,0020) Patient ID, (0008,0020) Study Date, (0008,0030) Study Time,
368 (0020,0010) Study ID, (0020,0011) Series Number, and (0020,0013) Instance Number.

369
370 **X.3.4 Security Parameters**

371 The STD-DVD-SEC-MPEG2-MPML application profiles require that all DICOM Files in the File-set
372 including the DICOMDIR be Secure DICOM Files encapsulated in accordance with the requirements of the
373 Basic DICOM Media Security Profile as defined in PS 3.15.

374 Note: These Application Profiles do not place any consistency restrictions on the use of the Basic DICOM
375 Media Security Profile with different DICOM Files of one File-set. For example, readers should not
376 assume that all Files in the File-set can be decoded by the same set of recipients. Readers should also
377 not assume that all secure Files use the same approach (hash key or digital signature) to ensure Integrity
378 or carry the same originators' signatures.

379

380 **X.3.5 “Dual-format” (Informative)**

381 It is desirable that consumer DVD players (and computer software for playing conventional DVD movies)
382 be able to play the video data that is encoded on the DICOM DVD. The MPEG2 bit stream that is
383 “encapsulated” by the DICOM Transfer Syntax is potentially re-usable by such applications, if the
384 appropriate UDF structure is created to share the same extent between the DICOM file and the file format
385 and folder structure used by the consumer DVD Video format. Alternatively, the bit stream could be
386 duplicated and both sets of files present on the same piece of media.

387 This profile does not require this, nor specify which approach to take. Specifically, this profile does not
388 require that a DVD Video file and folder structure be present, though it is recommended.

389

390

PS 3.16: Add new context group for audio channel source

391

....

392 **CID 3000 Audio Channel Source**

393

Context ID 3000

394

Audio Channel Source

395

Type: Extensible Version: 20040326

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
DCM	109110	Voice
DCM	109111	Operator's narrative
DCM	109112	Ambient room environment
DCM	109113	Doppler audio
DCM	109114	Phonocardiogram
DCM	109115	Physiological audio signal

396

397

398

PS 3.16: Add definitions to PS 3.16 Annex D

399

....

400

401

Code Value	Code Meaning	Definition	Notes
109110	Voice	The sound of a human's speech, recorded during a procedure.	May include the patient's voice, or the voice of staff present in the room, or an operator's voice (whether for the purpose of recording a narrative accompanying a procedure or not).
109111	Operator's narrative	The voice of a device operator, recorded during a procedure.	
109112	Ambient room environment	The ambient sound recorded during a procedure, which may or may not include voice and other types of sound.	
109113	Doppler audio	The Doppler waveform recorded as an audible signal.	
109114	Phonocardiogram	The sound of the human heart beating.	Such as might be recorded from an electronic stethoscope.
109115	Physiological audio signal	Any sound made by the human body.	May include the sound of the heart, but also sound from other organs, such as bowel sounds or bruits from vessels, or sounds of respiration. Not intended to include voice.

402