

1	Status	Final Text
2	Date of Last Update	2018/09/04
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5	Submitter Name	QIICR
6	Submission Date	2017/02/26

7	Correction Number CP-1700	
8	Log Summary: Replace use of Derived Pixel Contrast Image/Frame Type Value 4 and Image Derivation with RWVM Quantity Definition Sequence	
9		
10	Name of Standard	
11	PS3.3, PS3.16 2018c	
12	Rationale for Correction:	
13	Image and Frame Type Value 4 were introduced in the Enhanced Multiframe MR IOD to describe the characteristics of processed pixel data, and were reused in subsequent additions to the Enhanced IOD family, including the Parametric Map IOD.	
14		
15	The Real World Value Map mechanism used by these and other IODs was later extended to include a Quantity Definition Sequence, which is a much more robust and extensible means of characterizing the acquired or derived pixel contrast when it can be described as a quantity (as opposed to a derivation method).	
16		
17		
18	Allow Derived Pixel Contrast Image/Frame Type Value 4 to have a non-specific value when Quantity Definition Sequence is present.	
19		
20	Also, the Context Group used in Derivation Code Sequence, CID 7203 Image Derivation, contains many codes that describe the derived quantity, not the derivation process, which were also introduced with the Enhanced Multiframe MR IOD. Remove these and extend the list of derivation description mechanisms. I.e., CID 7203 should describe "how", not "what".	
21		
22		
23	Correction Wording:	

Amend DICOM PS3.3 as follows (changes to existing text are bold and underlined for additions and ~~struckthrough~~ for removals):

## A.75.5.1 Parametric Map Functional Groups Description

For the Derivation Image Functional Group Macro, the Baseline CID for:

- Purpose of Reference Sequence (0040,A170) is CID 7222.
- Derivation Code Sequence (0008,9215) is CID 7203 "Image Derivation".

For the Real World Value Mapping Functional Group Macro, which defines the type of quantity, the method of generation and the units for the pixel values, the Baseline CID for:

- Concept Name Code Sequence of Quantity Definition Sequence (0040,9220) is CID 9000.
- Concept Code Sequence for Concept Name of (G-C1C6, SRT, "Quantity") of Quantity Definition Sequence (0040,9220) is CID 7180 "Abstract Multi-dimensional Image Model Component Semantics".
- Measurement Units Code Sequence (0040,08EA) is CID 7181.

## C.7.6.16.2.6 Derivation Image Macro

Table C.7.6.16-7 specifies the attributes of the Derivation Image Functional Group Macro.

**Table C.7.6.16-7. Derivation Image Macro Attributes**

Attribute Name	Tag	Type	Attribute Description
Derivation Image Sequence	(0008,9124)	2	The set of Images or other composite SOP Instances that were used to derive this frame.  Zero or more Items shall be included in this Sequence.
>Derivation Description	(0008,2111)	3	A text description of how this frame data was derived. See Section C.12.4.1.1 for further explanation.
>Derivation Code Sequence	(0008,9215)	1C	A coded description of how this frame was derived. See C.12.4.1.1 for further explanation.  One or more Items shall be included in this Sequence. More than one Item indicates that successive derivation steps have been applied.  Required if SOP Class UID is not "1.2.840.10008.5.1.4.1.1.2.2" (Legacy Converted Enhanced CT Image Storage) and not "1.2.840.10008.5.1.4.1.1.4.4" (Legacy Converted Enhanced MR Image Storage) and not "1.2.840.10008.5.1.4.1.1.128.1" (Legacy Converted Enhanced PET Image Storage), may be present otherwise.
>>Include Table 8-1			Defined CID 7203 "Image Derivation".
>Source Image Sequence	(0008,2112)	2	The set of Images or other Composite SOP Instances that were used to derive this frame.  Zero or more Items shall be included in this Sequence. See Section C.12.4.1.2 for further explanation.
>>Include Table 10-3			

Attribute Name	Tag	Type	Attribute Description
>>Purpose of Reference Code Sequence	(0040,A170)	1C	Describes the purpose for which the reference is made, that is what role the source image or frame played in the derivation of this image or frame.  Only a single Item shall be included in this Sequence.  Required if SOP Class UID is not "1.2.840.10008.5.1.4.1.1.2.2" (Legacy Converted Enhanced CT Image Storage) and not "1.2.840.10008.5.1.4.1.1.4.4" (Legacy Converted Enhanced MR Image Storage) and not "1.2.840.10008.5.1.4.1.1.128.1" (Legacy Converted Enhanced PET Image Storage), may be present otherwise.
>>>Include Table 8.8-1			Defined CID 7202.

### C.7.6.16.2.11.1.2 Real World Values Mapping Sequence Attributes

The physical units for the real world values obtained from the Sequence Item are given by the Measurement Units Code Sequence (0040,08EA).

The quantity that the real world values represent may be described by the Quantity Definition Sequence (0040,9220), which consists of a list of name-value pairs, in which the coded concept name specifies what aspect of the physical quantity is being described.

**Note**

1. For example, Cerebral Blood Flow (CBF) may be described by units and quantity as follows:
  - Measurement Units Code Sequence (0040,08EA) = (ml/[100]g/min, UCUM, "milliliter per 100 gram per minute")
  - Quantity Definition Sequence (0040,9220):
    - (G-C1C6, SRT, "Quantity") = (113055, DCM, "Regional Cerebral Blood Flow")
2. For example, the Apparent Diffusion Coefficient (ADC) may be described by units and quantity as follows:
  - Measurement Units Code Sequence (0040,08EA) = (mm2/s, UCUM, "mm2/s")
  - Quantity Definition Sequence (0040,9220):
    - (G-C1C6, SRT, "Quantity") = (113041, DCM, "Apparent Diffusion Coefficient")

Additional information about how the ADC was derived, e.g., the model used, method of fitting and acquisition b-values used, can also be encoded as name-value pairs in the Quantity Definition Sequence (0040,9220). Other diffusion models and quantities are also defined. See the example in PS3.17 Annex EEEE.

The Quantity Definition Sequence (0040,9220) describes only the stored pixel values that are mapped using the Real World Values Mapping, and does not describe derived values from multiple pixels to which the Real World Values Mapping applies.

**Note**

I.e., the mapping is a "point" operation, and as a consequence various modifiers that might be applied to a group of pixels, such as in an ROI, should not be used. E.g., an ROI encoded in a Structured Report using TID 1419 "ROI Measurements" might be the mean or maximum value (e.g., SUVbw mean or SUVbw max), and be encoded with (121401, DCM, "Derivation") = (R-00317, SRT, "Mean") or (G-A437, SRT, "Maximum"), respectively. These would not be appropriate to use within Quantity Definition Sequence (0040,9220), unless the individual pixel values were themselves derived in such a manner, e.g., when multiple images are averaged together. Thus the Content Items used in an SR to describe an ROI might be a superset of the name-value pairs used in Quantity Definition Sequence (0040,9220).

## C.8.12.4.1 Whole Slide Microscopy Image Attribute Descriptions

### C.8.12.4.1.1 Image Type

Image Type (0008,0008) is specified to be Type 1 with the following constraints:

Value 1 shall have a value of ORIGINAL or DERIVED

Value 2 shall have a value of PRIMARY

Value 3 (Image Flavor) shall have the Defined Terms in Table C.8.12.4-2.

**Table C.8.12.4-2. Whole Slide Microscopy Image Flavors**

LOCALIZER	Collected for the purpose of planning or navigating other images.
VOLUME	Set of frames that define a regularly sampled volume
LABEL	Purpose of image is to capture the slide label; any non-label area captured is incidental to that purpose.

Value 4 (Derived Pixel) shall have the Defined Terms specified in Table C.8.12.4-3.

**Table C.8.12.4-3. Whole Slide Microscopy Image Derived Pixels**

NONE	No derivation of pixels (original)
RESAMPLED	Pixels were derived by down sampling a higher resolution image

No additional values shall be present.

## C.8.13.1.1 Enhanced MR Image Module Attribute Description

### C.8.13.1.1.1 Image Type and Frame Type

Image Type (0008,0008) and Frame Type (0008,9007) are not included in this Macro but one or the other is always included in the Module or Macro that invokes this Macro, and they are therefore described here.

In addition to the requirements specified in Section C.8.16.1 Image Type and Frame Type, the following additional requirements and Defined Terms are specified.

...

#### C.8.13.1.1.1.4 Derived Pixel Contrast

Table C.8-81 specifies the Defined Terms for MR additional to those defined in Section C.8.16.1.4 for Value 4 for Image Type (0008,0008) and Frame Type (0008,9007).

**Table C.8-81. MR-Specific Image Type and Frame Type Value 4**

Defined Term Name	Defined Term Description
<del>ADG</del>	<del>Apparent Diffusion Coefficient</del>
<del>DIFFUSION</del>	<del>Diffusion-weighted</del>
<del>DIFFUSION_ANISO</del>	<del>Diffusion Anisotropy</del>
<del>DIFFUSION_ATTNTD</del>	<del>Diffusion Attenuated. Derived by removing the T2 contributions from a Diffusion Weighted image.</del>
<del>DIFFUSION_ISO</del>	<del>Isotropic images derived from Directional Diffusion images</del>
<del>FAT</del>	<del>Fat images derived using Dixon or other techniques</del>

Defined Term Name	Defined Term Description
FAT_FRACTION	<del>Fat Fraction images derived using Dixon or other techniques</del>
FIELD_MAP	<del>Field Map images derived using Dixon or other techniques</del>
IN_PHASE	<del>Water/Fat In Phase images derived using Dixon or other techniques</del>
METABOLITE_MAP	<del>Metabolite Maps from spectroscopy data</del>
NEI	<del>Created through Negative Enhancement Integral operation</del>
OUT_OF_PHASE	<del>Water/Fat Out of phase images derived using Dixon or other techniques</del>
PERFUSION_ASL	<del>Perfusion from an ASL series obtained by subtraction of control and label data</del>
R_COEFFICIENT	<del>R-Coefficient Map (fMRI)</del>
R2_MAP	<del>R2-Map</del>
R2_STAR_MAP	<del>R2* Map images derived using Dixon or other techniques</del>
RHO	<del>Proton Density map</del>
SGM	<del>Signal Change Map</del>
SNR_MAP	<del>Signal to Noise Map</del>
T1_MAP	<del>T1-Map</del>
T2_STAR_MAP	<del>T2* Map images derived using Dixon or other techniques</del>
T2_MAP	<del>T2-Map</del>
TCS	<del>Time Course of Signal</del>
TEMPERATURE	<del>Temperature encoded</del>
VELOCITY	<del>Velocity encoded</del>
WATER	<del>Water images derived using Dixon or other techniques</del>
WATER_FRACTION	<del>Water fraction images derived using Dixon or other techniques</del>

**Note**

This table formerly contained defined terms such as ADC, etc. These have been replaced with the use of QUANTITY and the appropriate coded entry used in Quantity Definition Sequence (0040,9220) of the Real World Value Mapping Functional Group Macro. For former defined terms, see PS3.3 2018c.

## C.8.14.5.1 MR Spectroscopy Description Attribute Description

### C.8.14.5.1.1 Image Type and Frame Type

Image Type (0008,0008) and Frame Type (0008,9007) are not included in this Macro but one or the other is always included in the Module or Macro that invokes this Macro, and they are therefore described here.

In addition to the requirements specified in Section C.8.16.1 Image Type and Frame Type, the following additional requirements and Defined Terms are specified.

...

#### C.8.14.5.1.1.4 Derived Pixel Contrast

See Section C.8.16.1.4 for requirements, but not Defined Terms.

Table C.8-109 specifies the Defined Terms for Value 4 for Image Type (0008,0008) and Frame Type (0008,9007).

**Table C.8-109. MR Spectroscopy Image Type and Frame Type Value 4**

Defined Term Name	Defined Term Description
ADDITION	Created through point by point addition operation

Defined Term Name	Defined Term Description
DIVISION	Created through point by point division operation
MAXIMUM	Created through point by point maximum operation
MEAN	Created through point by point mean operation
MINIMUM	Created through point by point minimum operation
MULTIPLICATION	Created through point by point multiplication operation
STD_DEVIATION	Standard Deviation
SUBTRACTION	Created through point by point subtraction operation
NONE	Not calculated
MIXED	Used only as value in Image Type (0008,0008) if frames within the spectroscopy SOP Instance contain different values for value 4 in their Frame Type (0008,9007) attribute.

## C.8.15.2.1 CT Image Description Attribute Description

### C.8.15.2.1.1 Image Type and Frame Type

In addition to the requirements specified in Section C.8.16.1 Image Type and Frame Type, the following additional requirements and Defined Terms are specified.

These requirements and Defined Terms are also applicable to Frame Type (0008,9007).

...

#### C.8.15.2.1.1.4 Derived Pixel Contrast

Table C.8-116 specifies the Defined Terms for CT additional to those defined in Section C.8.16.1.4 for Value 4 for Image Type (0008,0008) and Frame Type (0008,9007).

**Table C.8-116. Image Type and Frame Type Value 4 for CT**

Defined Term Name	Defined Term Description
FILTERED	An image filter has been applied
MEDIAN	Pixel by pixel median
ENERGY_PROP_WT	Image pixels created through proportional weighting of multiple acquisitions at distinct X-Ray energies.

## C.8.16 Common CT, MR and US Descriptions

This section contains descriptions of Macros and Attributes used in Modules and Functional Group Macros that are common to the Enhanced CT Image, Enhanced MR Images, MR Spectroscopy and Enhanced US Volume IODs.

### C.8.16.1 Image Type and Frame Type

Image Type (0008,0008) and associated Image Type related attributes provide a high level description of a multi-frame SOP Instance. These attributes describe properties that provide key summary information to users of the SOP Instance. Image Type (0008,0008) contains the highest level summary of what is in the SOP Instance.

Frame Type (0008,9007) mirrors the corresponding Image Type attribute and applies to the frame level rather than to the image level.

If more than one value is used by the set of frames for a given Frame Type (0008,9007) attribute value or associated attribute value then the corresponding value of Image Type (0008,0008) or associated attribute shall contain a value of MIXED. This indicates that a mixed set of values exists within the multi-frame SOP Instance.

The value MIXED shall only be used in Image Type (0008,0008) when the corresponding values for the individual frames are not equal. When a value of an attribute is equal for all frames, the same value shall be used for the corresponding value of Image Type (0008,0008). Values 2 and 3 of Image Type (0008,0008) are an exception to the rule for MIXED: Values 2 and 3 may never have the value of MIXED as described in Section C.8.16.1.2 and Section C.8.16.1.3.

Image Type (0008,0008) and Frame Type (0008,9007) shall consist of four values.

### C.8.16.1.4 Derived Pixel Contrast

Value 4 shall be used to indicate derived pixel contrast - generally, contrast created by combining or processing images with the same geometry. Value 4 shall have a value of NONE when Value 1 is ORIGINAL.

**Value 4 may have the value QUANTITY if the derived pixel contrast is described in the Quantity Definition Sequence (0040,9220) of the Real World Value Mapping Functional Group Macro.**

**Note**

If more than one of the following derived types is applicable, then it is up to the generating application to specify the value that best characterizes the derived image.

Value 4 of Image Type (0008,0008) and Value 4 of Frame Type (0008,9007) shall not be zero length unless the SOP Class UID is "1.2.840.10008.5.1.4.1.1.2.2" or "1.2.840.10008.5.1.4.1.1.4.4" or "1.2.840.10008.5.1.4.1.1.128.1" (Legacy Converted).

Table C.8-130 specifies the Defined Terms for Value 4 for Image Type (0008,0008) and Frame Type (0008,9007) that are common to CT and MR. Additional Defined Terms are defined in the modality-specific Module and Macro definitions.

**Table C.8-130. Image Type and Frame Type Value 4 Common**

Defined Term Name	Defined Term Description
ADDITION	Created through Pixel by pixel addition operation
DIVISION	Created through Pixel by pixel division operation
MASKED	Created through Pixel by pixel masking operation
MAXIMUM	Created through Pixel by Pixel maximum operation
MEAN	Created through Pixel by pixel mean operation
MINIMUM	Created through Pixel by Pixel minimum operation
<b>MTF</b>	<b>Mean Transit Time</b>
MULTIPLICATION	Created through Pixel by pixel multiplication operation
<b>RGBF</b>	<b>Regional Cerebral Blood Flow (rCBF)</b>
<b>RGBV</b>	<b>Regional Cerebral Blood Volume (rCBV)</b>
RESAMPLED	Pixels have been spatially re-sampled, e.g., MPR
STD_DEVIATION	Standard Deviation
SUBTRACTION	Created through Pixel by pixel subtraction operation
<b>T_TEST</b>	<b>Student's T-Test</b>
<b>TFP</b>	<b>Time To Peak map</b>
<b>Z_SCORE</b>	<b>Z-Score Map</b>
NONE	Not a calculated image
<b>QUANTITY</b>	<b><u>Derived pixel values are a quantity described by Quantity Definition Sequence (0040,9220) of the Real World Value Mapping Functional Group Macro.</u></b>
MIXED	Used only as value in Image Type (0008,0008) if frames within the image SOP Instance contain different values for value 4 in their Frame Type (0008,9007) attribute.

## **C.8.19.2.1 Enhanced XA/XRF Image Module Attribute Description**

### **C.8.19.2.1.1 Image Type and Frame Type**

In addition to the requirements specified in Section C.8.16.1 Image Type, the following additional requirements and Defined Terms are specified.

...

#### **C.8.19.2.1.1.4 Derived Pixel Contrast**

Value 4 of Image Type (0008,0008) and Frame Type (0008,9007) is discussed in Section C.8.16.1.4. The value shall be NONE.

## **C.8.21.1.1 X-Ray 3D Image Module Attribute Description**

### **C.8.21.1.1.1 Image Type and Frame Type**

In addition to the requirements specified in Section C.8.16.1 Image Type, the following additional requirements and Defined Terms are specified.

...

#### **C.8.21.1.1.1.4 Derived Pixel Contrast**

Value 4 of Image Type (0008,0008) and Frame Type (0008,9007) is discussed in Section C.8.16.1.4. The value shall be NONE.

## **C.8.22.3.1 Enhanced PET Image Description Attribute Description**

### **C.8.22.3.1.1 Image Type and Frame Type**

The Image Type Attribute (0008,0008) and Frame Type (0008,9007) identifies important image characteristics in a multiple valued data element. In addition to the requirements specified in Section C.8.16.1 Image Type and Frame Type, the following additional requirements and Defined Terms are specified:

...

#### **C.8.22.3.1.1.4 Derived Pixel Contrast**

Value 4 of Image Type (0008,0008) and Frame Type (0008,9007) is discussed in Section C.8.16.1.4. No additional requirements or Defined Terms.

## **C.8.24.3 Enhanced US Image Module**

### **C.8.24.3.2 Image Type**

...

#### **C.8.24.3.2.4 Derived Pixel Contrast**

Value 4 of Image Type (0008,0008) and Frame Type (0008,9007) is discussed in Section C.8.16.1.4. No additional requirements or Defined Terms.

## **C.8.32.2 Parametric Map Image Module**

...



**Table C.8.32-2. Parametric Map Image Module Attributes**

Attribute Name	Tag	Type	Attribute Description
Image Type	(0008,0008)	1	<p>Image identification characteristics.</p> <p><b>Enumerated Values for Value 1:</b></p> <p><b>DERIVED</b></p> <p><b>Enumerated Values for Value 2:</b></p> <p><b>PRIMARY</b></p> <p>Value 3 shall be Image Flavor, Defined Terms for which are specified in Section C.8.16.1.3.</p> <p>Value 4 shall be Derived Pixel Contrast, common Defined Terms for which are specified in Section C.8.16.1.4 and MR-specific Defined Terms for which are specified in Section C.8.13.1.1.1.4.</p>

Amend DICOM PS3.16 as follows (changes to existing text are bold and underlined for additions and ~~struckthrough~~ for removals):

**CID 7180 Abstract Multi-dimensional Image Model Component Semantics**

Type: Extensible  
Version: ~~20170914~~20180904

**Table CID 7180. Abstract Multi-dimensional Image Model Component Semantics**

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-CT Concept ID	UMLS Concept Unique ID	Units
<i>Include CID 4033 "MR Proton Spectroscopy Metabolites"</i>					
DCM	113063	T1			DT (ms, UCUM, "ms")
DCM	113065	T2			DT (ms, UCUM, "ms")
DCM	113064	T2*			DT (ms, UCUM, "ms")
DCM	113058	Proton Density			
DCM	110800	Spin Tagging Perfusion MR Signal Intensity			
DCM	113070	Velocity encoded			
DCM	113067	Temperature encoded			
DCM	110801	Contrast Agent Angio MR Signal Intensity			
DCM	110802	Time Of Flight Angio MR Signal Intensity			
DCM	110803	Proton Density Weighted MR Signal Intensity			
DCM	110804	T1 Weighted MR Signal Intensity			
DCM	110805	T2 Weighted MR Signal Intensity			
DCM	110806	T2* Weighted MR Signal Intensity			
<i>Include CID 7270 "MR Diffusion Component Semantics"</i>					
<i>Include CID 7271 "MR Diffusion Anisotropy Indices"</i>					

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-CT Concept ID	UMLS Concept Unique ID	Units
Include CID 7272 "MR Diffusion Model Parameters"					
DCM	110807	Field Map MR Signal Intensity			
DCM	110816	T1 Weighted Dynamic Contrast Enhanced MR Signal Intensity			
DCM	110817	T2 Weighted Dynamic Contrast Enhanced MR Signal Intensity			
DCM	110818	T2* Weighted Dynamic Contrast Enhanced MR Signal Intensity			
DCM	110819	Blood Oxygenation Level			
DCM	110820	Nuclear Medicine Projection Activity			
DCM	110821	Nuclear Medicine Tomographic Activity			
DCM	110822	Spatial Displacement X Component			
DCM	110823	Spatial Displacement Y Component			
DCM	110824	Spatial Displacement Z Component			
DCM	110825	Hemodynamic Resistance			
DCM	110826	Indexed Hemodynamic Resistance			
DCM	112031	Attenuation Coefficient			DT ([hnsfU], UCUM, "Hounsfield unit")
DCM	110827	Tissue Velocity			
DCM	110828	Flow Velocity			
SRT	P0-02241	Power Doppler	425704008	C1960437	
DCM	110829	Flow Variance			
DCM	110830	Elasticity			
DCM	110831	Perfusion			
DCM	110832	Speed of sound			
DCM	110833	Ultrasound Attenuation			
DCM	113068	Student's T-test			
DCM	113071	Z-score			
DCM	113057	R-Coefficient			
DCM	126220	R2-Coefficient			
DCM	126221	Chi-square			
DCM	126222	D-W			
DCM	126223	AIC			
DCM	126224	BIC			
DCM	110834	RGB R Component			
DCM	110835	RGB G Component			
DCM	110836	RGB B Component			

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-CT Concept ID	UMLS Concept Unique ID	Units
DCM	110837	YBR FULL Y Component			
DCM	110838	YBR FULL CB Component			
DCM	110839	YBR FULL CR Component			
DCM	110840	YBR PARTIAL Y Component			
DCM	110841	YBR PARTIAL CB Component			
DCM	110842	YBR PARTIAL CR Component			
DCM	110843	YBR ICT Y Component			
DCM	110844	YBR ICT CB Component			
DCM	110845	YBR ICT CR Component			
DCM	110846	YBR RCT Y Component			
DCM	110847	YBR RCT CB Component			
DCM	110848	YBR RCT CR Component			
DCM	110849	Echogenicity			
DCM	110850	X-Ray Attenuation			
DCM	110852	MR signal intensity			
DCM	110853	Binary Segmentation			
DCM	110854	Fractional Probabilistic Segmentation			
DCM	110855	Fractional Occupancy Segmentation			
DCM	126393	R1			DT (/ms, UCUM, "/ms")
DCM	126394	R2			DT (/ms, UCUM, "/ms")
DCM	126395	R2*			DT (/ms, UCUM, "/ms")
DCM	113098	Magnetization Transfer Ratio			DT ({ratio}, UCUM, "ratio")
DCM	126396	Magnetic Susceptibility			DT ({ratio}, UCUM, "ratio")
Include Section CID 4107 "Tracer Kinetic Model Parameters"					
Include Section CID 4108 "Perfusion Model Parameters"					
Include Section CID 4109 "Model-Independent Dynamic Contrast Analysis Parameters"					
DCM	126400	Standardized Uptake Value			
DCM	126401	SUVbw			DT (g/ml{SUVbw}, UCUM, "Standardized Uptake Value body weight")
DCM	126402	SUVl <sub>bm</sub>			DT (g/ml{SUVl <sub>bm</sub> }, UCUM, "Standardized Uptake Value lean body mass (James)")
DCM	126406	SUVl <sub>bm</sub> (James128)			DT (g/ml{SUVl <sub>bm</sub> (James128)}, UCUM, "Standardized Uptake Value lean body mass (James 128 multiplier)")

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-CT Concept ID	UMLS Concept Unique ID	Units
DCM	126405	SUVl <sub>bm</sub> (Janma)			DT (g/ml{SUVl <sub>bm</sub> (Janma)}), UCUM, "Standardized Uptake Value lean body mass (Janma)")
DCM	126403	SUV <sub>bsa</sub>			DT (cm <sup>2</sup> /ml{SUV <sub>bsa</sub> }, UCUM, "Standardized Uptake Value body surface area")
DCM	126404	SUV <sub>ibw</sub>			DT (g/ml{SUV <sub>ibw</sub> }, UCUM, "Standardized Uptake Value ideal body weight")
<i>Include CID 10070 "Radiation Dose Types"</i>					
<b>SRT</b>	<b>T-D008A</b>	<b>Fat</b>	<b>256674009</b>	<b>C0015677</b>	
<b>DCM</b>	<b>129100</b>	<b>Fat fraction</b>			
<b>DCM</b>	<b>129101</b>	<b>Water/fat in phase</b>			
<b>DCM</b>	<b>129102</b>	<b>Water/fat out of phase</b>			
<b>DCM</b>	<b>113054</b>	<b>Negative enhancement integral</b>			
<b>DCM</b>	<b>113059</b>	<b>Signal change</b>			
<b>DCM</b>	<b>113060</b>	<b>Signal to noise</b>			
<b>DCM</b>	<b>113066</b>	<b>Time course of signal</b>			
<b>SRT</b>	<b>C-10120</b>	<b>Water</b>	<b>11713004</b>	<b>C0043047</b>	
<b>DCM</b>	<b>129103</b>	<b>Water fraction</b>			

## CID 7203 Image Derivation

Type: Extensible  
 Version: ~~20170405~~20180904

Table CID 7203. Image Derivation

Coding Scheme Designator	Code Value	Code Meaning
DCM	113040	Lossy Compression
<del>DCM</del>	<del>113041</del>	<del>Apparent Diffusion Coefficient</del>
DCM	113042	Pixel by pixel addition
<del>DCM</del>	<del>113043</del>	<del>Diffusion weighted</del>
<del>DCM</del>	<del>113044</del>	<del>Diffusion Anisotropy</del>
<del>DCM</del>	<del>113045</del>	<del>Diffusion Attenuated</del>
DCM	113046	Pixel by pixel division
DCM	113047	Pixel by pixel mask
DCM	113048	Pixel by pixel Maximum
DCM	113049	Pixel by pixel mean
DCM	113050	Metabolite Maps from spectroscopy data
DCM	113051	Pixel by pixel Minimum
<del>DCM</del>	<del>113052</del>	<del>Mean Transit Time</del>
DCM	113053	Pixel by pixel multiplication

Coding Scheme Designator	Code Value	Code Meaning
<b>DCM</b>	<b>413054</b>	<b>Negative Enhancement Integral</b>
<b>DCM</b>	<b>413055</b>	<b>Regional Cerebral Blood Flow</b>
<b>DCM</b>	<b>413056</b>	<b>Regional Cerebral Blood Volume</b>
<b>DCM</b>	<b>413057</b>	<b>R-Coefficient</b>
<b>DCM</b>	<b>413058</b>	<b>Proton Density</b>
<b>DCM</b>	<b>413059</b>	<b>Signal Change</b>
<b>DCM</b>	<b>413060</b>	<b>Signal to Noise</b>
<b>DCM</b>	<b>413061</b>	<b>Standard Deviation</b>
DCM	113062	Pixel by pixel subtraction
<b>DCM</b>	<b>413063</b>	<b>T1</b>
<b>DCM</b>	<b>413064</b>	<b>T2*</b>
<b>DCM</b>	<b>413065</b>	<b>T2</b>
<b>DCM</b>	<b>413066</b>	<b>Time Course of Signal</b>
<b>DCM</b>	<b>413067</b>	<b>Temperature encoded</b>
<b>DCM</b>	<b>413068</b>	<b>Student's T-Test</b>
<b>DCM</b>	<b>413069</b>	<b>Time To Peak</b>
<b>DCM</b>	<b>413084</b>	<b>Tmax</b>
<b>DCM</b>	<b>413070</b>	<b>Velocity encoded</b>
<b>DCM</b>	<b>413071</b>	<b>Z-Score</b>
DCM	113072	Multiplanar reformatting
DCM	113073	Curved multiplanar reformatting
DCM	113074	Volume rendering
DCM	113075	Surface rendering
DCM	113076	Segmentation
DCM	113077	Volume editing
DCM	113078	Maximum intensity projection
DCM	113079	Minimum intensity projection
DCM	113085	Spatial resampling
DCM	113086	Edge enhancement
DCM	113087	Smoothing
DCM	113088	Gaussian blur
DCM	113089	Unsharp mask
DCM	113090	Image stitching
DCM	113091	Spatially-related frames extracted from the volume
DCM	113092	Temporally-related frames extracted from the set of volumes
DCM	113097	Multi-energy proportional weighting
DCM	113093	Polar to Rectangular Scan Conversion
DCM	113131	Extraction of individual subject from group
DCM	128303	OCT B-scan analysis
<b>DCM</b>	<b>129104</b>	<b>Perfusion image analysis</b>
<b>DCM</b>	<b>129105</b>	<b>Diffusion image analysis</b>
<b>DCM</b>	<b>129106</b>	<b>Diffusion tractography</b>

**Note**

This context group contains relatively generic descriptions of image processing, e.g., (129104, DCM, "Perfusion image analysis"). More specific descriptions of the exact derivation method can be expected in the Quantity Definition Sequence (0040,9220) in a Real World Value Map describing pixel values, or the describing numeric measurements from regions of interest, e.g., using CID 4102 "Perfusion Measurement Methods".

**CID 4100 T1 Measurement Methods**

**Type:** Extensible  
**Version:** 20141110

**Table CID 4100. T1 Measurement Methods**

Coding Scheme Designator	Code Value	Code Meaning
DCM	126350	T1 by Multiple Flip Angles
DCM	126351	T1 by Inversion Recovery
DCM	126352	T1 by Fixed Value

**Note****CID 4101 Tracer Kinetic Models**

**Type:** Extensible  
**Version:** 20160316

**Table CID 4101. Tracer Kinetic Models**

Coding Scheme Designator	Code Value	Code Meaning
DCM	126340	Standard Tofts Model
DCM	126341	Extended Tofts Model
DCM	126343	First Pass Leakage Profile (FPLP) Model
DCM	126344	Shutter-Speed Model (SSM)
DCM	126345	Gamma Capillary Transit Time (GCTT) Model
DCM	126346	Adiabatic Tissue Homogeneity (ATH) Model
DCM	126347	Two Compartment Exchange (2CX) Model

**Note****CID 4102 Perfusion Measurement Methods**

**Type:** Extensible  
**Version:** 20141110

**Table CID 4102. Perfusion Measurement Methods**

Coding Scheme Designator	Code Value	Code Meaning
DCM	126300	Perfusion analysis by Stable Xenon CT technique
DCM	126301	Perfusion analysis by IV Iodinated Contrast CT technique
DCM	126302	Perfusion analysis by Arterial Spin Labeling MR technique
DCM	126303	Perfusion analysis by Susceptibility MR technique

**Note****CID 4103 Arterial Input Function Measurement Methods**

**Type:** Extensible  
**Version:** 20141110

**Table CID 4103. Arterial Input Function Measurement Methods**

Coding Scheme Designator	Code Value	Code Meaning
DCM	126360	AIF Ignored
DCM	126361	Population Averaged AIF
DCM	126362	User-defined AIF ROI
DCM	126363	Automatically Detected AIF ROI
DCM	126364	Blind Estimation of AIF

**Note**

The anatomic location relevant to the application of any AIF method is not pre-coordinated in concepts in this Context Group. Typically these would be described by the Finding Site of any related measurements in the appropriate Template.

**CID 4104 Bolus Arrival Time Derivation Methods**

**Type:** Extensible  
**Version:** 20141110

**Table CID 4104. Bolus Arrival Time Derivation Methods**

Coding Scheme Designator	Code Value	Code Meaning
DCM	126373	Temporal Derivative Exceeds Threshold
DCM	126370	Time of Peak Concentration
DCM	126372	Time of Leading Half-Peak Concentration

**Note****CID 4105 Perfusion Analysis Methods**

**Type:** Extensible  
**Version:** 20141110

**Table CID 4105. Perfusion Analysis Methods**

Coding Scheme Designator	Code Value	Code Meaning
DCM	126310	Least Mean Square (LMS) deconvolution
DCM	126311	Singular Value Decomposition (SVD) deconvolution

**Note****CID 4106 Quantitative Methods used for Perfusion And Tracer Kinetic Models**

**Type:** Extensible  
**Version:** 20141110

**Table CID 4106. Quantitative Methods used for Perfusion And Tracer Kinetic Models**

Coding Scheme Designator	Code Value	Code Meaning
Include CID 4100 "T1 Measurement Methods"		
Include CID 4101 "Tracer Kinetic Models"		
Include CID 4102 "Perfusion Measurement Methods"		
Include CID 4103 "Arterial Input Function Measurement Methods"		
Include CID 4104 "Bolus Arrival Time Derivation Methods"		
Include CID 4105 "Perfusion Analysis Methods"		
DCM	126342	Model-free concentration-time quantification

**Note**

- Concepts from this context group may be used in measurement Templates to describe the measurement method of measurement on an ROI.

E.g., NUM (126312, DCM, "Ktrans") = 0.0185 /min; (G-C036, SRT, "Measurement Method") = (126341, DCM, "Extended Tofts Model")

**CID 4107 Tracer Kinetic Model Parameters**

**Type:** Extensible  
**Version:** 20141110

**Table CID 4107. Tracer Kinetic Model Parameters**

Coding Scheme Designator	Code Value	Code Meaning
DCM	126312	Ktrans
DCM	126313	kep
DCM	126314	ve
DCM	126330	tau_m
DCM	126331	vp

**Note**

**CID 4108 Perfusion Model Parameters**

**Type:** Extensible  
**Version:** 20161106

**Table CID 4108. Perfusion Model Parameters**

Coding Scheme Designator	Code Value	Code Meaning
DCM	113055	Regional Cerebral Blood Flow
DCM	126390	Regional Blood Flow
DCM	113056	Regional Cerebral Blood Volume
DCM	126391	Regional Blood Volume
DCM	113052	Mean Transit Time
DCM	113069	Time To Peak
DCM	126392	Oxygen Extraction Fraction
DCM	113084	Tmax



**Note**

**CID 4109 Model-Independent Dynamic Contrast Analysis Parameters**

**Type:** Extensible  
**Version:** 20150916

**Table CID 4109. Model-Independent Dynamic Contrast Analysis Parameters**

Coding Scheme Designator	Code Value	Code Meaning
DCM	126320	IAUC
DCM	126321	IAUC60
DCM	126322	IAUC90
DCM	126323	IAUC180
DCM	126324	IAUCBN
DCM	126325	IAUC60BN
DCM	126326	IAUC90BN
DCM	126327	IAUC180BN
DCM	126370	Time of Peak Concentration
DCM	126372	Time of Leading Half-Peak Concentration
DCM	126371	Bolus Arrival Time
DCM	113069	Time To Peak
DCM	126374	Temporal Derivative Threshold
DCM	126375	Maximum Slope
DCM	126376	Maximum Difference
DCM	126377	Tracer Concentration

**Note**

(126326, DCM, "IAUC90BN") can be used for DCE-MRI using a Gd-based contrast agent to represent the IAUGC<sub>BN</sub> measurement in the claim of the QIBA DCE MRI Quantification Profile, though the concept itself is not specific to the modality or the contrast agent used. See [https://www.rsna.org/QIBA\\_Protocols\\_and\\_Profiles.aspx](https://www.rsna.org/QIBA_Protocols_and_Profiles.aspx). See also Ng, CS., et al. "Reproducibility of Perfusion Parameters in Dynamic Contrast-Enhanced MRI of Lung and Liver Tumors: Effect on Estimates of Patient Sample Size in Clinical Trials and on Individual Patient Responses." *AJR* 194, no. 2 (February 1, 2010): W134-40. <http://dx.doi.org/10.2214/AJR.09.3116>.

The type of contrast agent and the AIF used for blood normalization may or may not be post-coordinated.

E.g., voxel-wise IAUC<sub>BN</sub> measurements encoded as a parametric map with the quantity defined by the Quantity Definition Sequence (0040,9220) in a Real World Value Map might be encoded as:

(G-C1C6, SRT, "Quantity") = (126326, DCM, "IAUC90BN")

(G-C036, SRT, "Measurement Method") = (126362, DCM, "User-defined AIF ROI")

(123011, DCM, "Contrast Bolus/Agent") = (C-17800, SRT, "Gadolinium")

E.g., an IAUC<sub>BN</sub> measurement for an ROI encoded in a structured report might be encoded as:

NUM (126326, DCM, "IAUC90BN") = 0.230 (UNITS = ({normalized}, UCUM, "normalized"))

>HAS CONCEPT MOD: CODE (G-C036, SRT, "Measurement Method") = (126364, DCM, "Blind Estimation of AIF")

Note that the generic ROI measurement templates do not have the contrast/bolus agent as a parameter; this may be implicit from context, or inherited from the (121058, DCM, "Procedure reported") in the parent template.

## CID 4033 MR Proton Spectroscopy Metabolites

Type: Extensible  
Version: 20160314

Table CID 4033. MR Proton Spectroscopy Metabolites

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-CT Concept ID	UMLS Concept Unique ID
SRT	F-65C50	N-acetylaspartate	115391007	C0067684
SRT	F-61080	Citrate	59351004	C0376259
SRT	F-61620	Choline	65123005	C0008405
SRT	F-61380	Creatine	14804005	C0010286
DCM	113094	Creatine and Choline		
SRT	F-61760	Lactate	83036002	C0376261
SRT	F-63600	Lipid	70106000	C0023779
DCM	113095	Lipid and Lactate		
DCM	113080	Glutamate and glutamine		
SRT	F-64210	Glutamine	25761002	C0017797
SRT	F-64460	Tuarine	10944007	C0039350
SRT	F-61A90	Inositol	72164009	C0021547
DCM	113081	Choline/Creatine Ratio		
DCM	113082	N-acetylaspartate/Creatine Ratio		
DCM	113083	N-acetylaspartate/Choline Ratio		
DCM	113096	Creatine+Choline/Citrate Ratio		

### Note

For the purpose of this context group, where possible, the resonance peak in the spectrum corresponding to a particular metabolite is described using the concept from SNOMED for the substance corresponding to the metabolite. E.g., the code used for "lipid" is the code for "lipid (substance) ", as this concept is effectively post-coordinated by its use in the Metabolite Map Code Sequence (0018,9083) to mean "lipid resonance peaks in MR spectroscopy".

## D DICOM Controlled Terminology Definitions (Normative)

Table D-1. DICOM Controlled Terminology Definitions

Code Value	Code Meaning	Definition	Notes
113054	Negative Enhancement Integral	<del>Values are derived by calculating negative enhancement integral values. The area described by the baseline and the signal loss due to passage of contrast bolus in tissue in a perfusion experiment. Abbreviated NEI or N1.</del>	
113059	Signal Change	<del>Values are derived by calculating signal change values</del> The relative change in signal.	
113060	Signal to Noise	<del>Values are derived by calculating the signal to noise ratio</del> The ratio of the desired signal to the level of noise.	
113066	Time Course of Signal	<del>Values are derived by calculating values based on t</del> The time course of signal.	
<b>129100</b>	<b>Fat fraction</b>	<b>The fraction of fat present, derived using Dixon or other techniques.</b>	

Code Value	Code Meaning	Definition	Notes
<u>129101</u>	<u>Water/fat in phase</u>	<u>Water/Fat In Phase signal, derived using Dixon or other techniques.</u>	
<u>129102</u>	<u>Water/fat out of phase</u>	<u>Water/Fat Out of phase signal, derived using Dixon or other techniques.</u>	
<u>129103</u>	<u>Water fraction</u>	<u>The fraction of water present, derived using Dixon or other techniques.</u>	
<u>129104</u>	<u>Perfusion image analysis</u>	<u>Analysis of perfusion images.</u>	
<u>129105</u>	<u>Diffusion image analysis</u>	<u>Analysis of diffusion images.</u>	
<u>129106</u>	<u>Diffusion tractography</u>	<u>Estimation of the course of fiber tracts by analysis of anisotropic diffusion.</u>	