

# DICOM Correction Proposal

STATUS	Final Text
Date of Last Update	2012/11/07
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Submission date	2010/11/17

Correction Number	CP-1112
Log Summary:	Add SR Structure for ROI Measurements
Name of Standard	PS 3.16-2011
Rationale for Correction:	<p>TID 300 provides a means to record measurements for simple image-related locations, but does not provide a means to encode measurements (e.g., density, flow, or concentration) for multi-dimensional ROIs, such as 3D ROIs defined as isocontours or segmentations, nor to encode statistics for multiple samples of such ROIs, such as over a time series.</p> <p>Statistical properties of populations associated with a measurement have a standard structure (defined in TID 311, invoked from TID 310 Measurement Properties). These are attached as properties of the primary measurement, relating that measurement to some reference population defined by an external authoritative source. Multiple samples can be treated as a population of individual measurements aggregated over an ROI, and additional derived information from multiple measurements need to be defined.</p> <p>This correction includes templates for encoding (multiple) measurements on Planar and Volumetric ROIs, and a template for encoding measurements derived from multiple samples.</p>
Sections of documents affected	PS 3.16 Annex A, D
Correction Wording:	

*Add to PS 3.16, Annex A*

## TID 1410 Planar ROI Measurements

This Template provides a general structure to report one or more measurements for some metric, e.g., density, flow, or concentration, over a planar region of interest in an image. The ROI may be specified by an SCOORD on an image, or by a Segmentation Image.

### TID 1410 Parameters

\$Measurement	Coded term or Context Group for Concept Name of measurement
\$Units	Units for the measurement
\$ModType	Modifier Name for Concept Name of measurement
\$ModValue	Modifier Value for Concept Name of measurement
\$Method	Value for Measurement Method
\$Derivation	Value for Measurement Derivation
\$TargetSite	Value for Anatomic Location of measurement

\$TargetSiteMod	ModifierValue for Anatomic Location of measurement
\$Equation	Coded term or Context Group for the equation or table from which the measurement was derived or computed
\$RefAuthority	Bibliographic reference or authority for statistical properties of a reference population
\$RangeAuthority	Bibliographic reference or authority for the normal range of the measurement
\$DerivationParameter	Coded term or Context Group for Concept Name of a derivation parameter
\$DerivationParameterUnits	Units of derivation parameter

**TID 1410**  
**Planar ROI Measurements**  
**Type: Extensible      Order: Significant**

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (125007, DCM, "Measurement Group")	1	M		
2	>	HAS OBS CONTEXT	TEXT	DT(112039, DCM, "Tracking Identifier")	1	M		
3	>	HAS OBS CONTEXT	UIDREF	EV (112040, DCM, "Tracking Unique Identifier")	1	M		
4	>	HAS OBS CONTEXT	SCoord	EV (111030, DCM, "Image Region")	1	MC	XOR Row 6	GRAPHIC TYPE = not {MULTIPOINT}
5	>>	SELECTED FROM	IMAGE		1	M		
6	>	HAS OBS CONTEXT	IMAGE	EV (121214, DCM, "Referenced Segmentation Frame")	1	MC	XOR Row 4	Reference shall be to a Segmentation Image, with a single value specified in Referenced Frame Number, and with a single value specified in Referenced Segment Number
7	>	HAS PROPERTIES	IMAGE	EV (121233, DCM, "Source image for segmentation")	1	MC	IFF Row 6	
8	>	CONTAINS	IMAGE	EV (121200, DCM, "Illustration of ROI")	1	U		
9	>	CONTAINS	INCLUDE	DTID (1419) ROI Measurements	1-n	M		\$Measurement = \$Measurement \$Units = \$Units \$ModType = \$ModType \$ModValue = \$ModValue \$Method = \$Method \$Derivation = \$Derivation \$TargetSite = \$TargetSite \$TargetSiteMod = \$TargetSiteMod \$Equation = \$Equation \$RefAuthority = \$RefAuthority \$RangeAuthority = \$RangeAuthority \$DerivationParameter = \$DerivationParameter \$DerivationParameterUnits = \$DerivationParameterUnits

## Content Item Descriptions

Rows 2, 3	The Tracking Identifier and Tracking Unique Identifier are defined as a text label or unique identifier (respectively) used for tracking a finding or feature, potentially across multiple reporting objects, over time. As such, they are distinct from the Observation UID (0040,A171), which is unique identifier of the specific Content Item and its subsidiary Content Items that constitute an individual observation, and would be different for different observations on different occasions of the same finding or feature.
Row 6	Referenced Frame Number (0008,1160) is an attribute of the IMAGE Content Item, and shall be present with a single value.  If the Referenced Segmentation SOP Instance has Segmentation Type (0062,0001) value BINARY, it identifies the area of defined (measured) region of interest by pixel values in the referenced frame with value 1. For Segmentation Type value FRACTIONAL, the area is computed by an implementation dependent method.  Frame number shall be specified even if the Segmentation SOP Instance has only a single frame.
Row 7	Identifies the source image that was segmented to identify the ROI, and whose properties are described in this container.
Row 8	This referenced image may contain a “screen shot” illustrating a rendered version of the ROI.

## TID 1411 Volumetric ROI Measurements

This Template provides a general structure to report one or more measurements for some metric, e.g., density, flow, or concentration, over a volumetric region of interest in a set of images or a Frame of Reference. The volumetric ROI may be specified by a set of SCOORDs on an image set representing a volume, by a volumetric Segmentation Image, by a volume defined in a Surface Segmentation, or by a SCOORD3D.

### TID 1411 Parameters

\$Measurement	Coded term or Context Group for Concept Name of measurement
\$Units	Units for the measurement
\$ModType	Modifier Name for Concept Name of measurement
\$ModValue	Modifier Value for Concept Name of measurement
\$Method	Value for Measurement Method
\$Derivation	Value for Measurement Derivation
\$TargetSite	Value for Anatomic Location of measurement
\$TargetSiteMod	ModifierValue for Anatomic Location of measurement
\$Equation	Coded term or Context Group for the equation or table from which the measurement was derived or computed
\$RefAuthority	Bibliographic reference or authority for statistical properties of a reference population
\$RangeAuthority	Bibliographic reference or authority for the normal range of the measurement
\$DerivationParameter	Coded term or Context Group for Concept Name of a derivation parameter
\$DerivationParameterUnits	Units of derivation parameter

**TID 1411**  
**Volumetric ROI Measurements**  
**Type: Extensible      Order: Significant**

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	EV (125007, DCM, "Measurement Group")	1	M		
2	>	HAS OBS CONTEXT	TEXT	DT(112039, DCM, "Tracking Identifier")	1	M		
3	>	HAS OBS CONTEXT	UIDREF	EV (112040, DCM, "Tracking Unique Identifier")	1	M		
4	>	HAS OBS CONTEXT	SCoord	EV (111030, DCM, "Image Region")	1-n	MC	XOR Rows 6, 9	GRAPHIC TYPE = not {MULTIPOINT}
5	>>	SELECTED FROM	IMAGE		1	M		
6	>	HAS OBS CONTEXT	IMAGE	EV (121191, DCM, "Referenced Segment")	1	MC	XOR Rows 4, 9	Reference shall be to a Segmentation Image or Surface Segmentation object, with a single value specified in Referenced Segment Number
7	>	HAS PROPERTIES	IMAGE	EV (121233, DCM, "Source image for segmentation")	1-n	MC	XOR Row 8 and IFF Row 6	
8	>	HAS PROPERTIES	UIDREF	EV (121232, DCM, "Source series for image segmentation")	1	MC	XOR Row 7 and IFF Row 6	
9	>	HAS OBS CONTEXT	SCoord3D	EV (121231, DCM, "Volume Surface")	1	MC	XOR Rows 4, 6	GRAPHIC TYPE = {ELLIPSOID}
10	>	HAS PROPERTIES	IMAGE	EV (121233, DCM, "Source image for segmentation")	1-n	MC	XOR Row 11 and IFF Row 9	
11	>	HAS PROPERTIES	UIDREF	EV (121232, DCM, "Source series for segmentation")	1	MC	XOR Row 10 and IFF Row 9	
12	>	CONTAINS	IMAGE	EV (121200, DCM, "Illustration of ROI")	1-n	U		
13	>	CONTAINS	INCLUDE	DTID (1419) ROI Measurements	1-n	M		\$Measurement = \$Measurement \$Units = \$Units \$ModType = \$ModType \$ModValue = \$ModValue \$Method = \$Method \$Derivation = \$Derivation \$TargetSite = \$TargetSite \$TargetSiteMod = \$TargetSiteMod \$Equation = \$Equation \$RefAuthority = \$RefAuthority \$RangeAuthority = \$RangeAuthority \$DerivationParameter = \$DerivationParameter \$DerivationParameterUnits = \$DerivationParameterUnits

## Content Item Descriptions

Rows 2, 3	The Tracking Identifier and Tracking Unique Identifier are defined as a text label or unique identifier (respectively) used for tracking a finding or feature, potentially across multiple reporting objects, over time. As such, they are distinct from the Observation UID (0040,A171), which is unique identifier of the specific Content Item and its subsidiary Content Items that constitute an individual observation, and would be different for different observations on different occasions of the same finding or feature.
Row 6	Referenced Segment Number (0062,000B) is an attribute of the IMAGE Content Item, and shall be present with a single value.  If the Referenced SOP Instance is a Segmentation Image, it shall have a defined Frame of Reference. If it has Segmentation Type (0062,0001) value BINARY, it identifies the volume of defined (measured) region of interest by voxel values in the referenced segment with value 1. If it has Segmentation Type value FRACTIONAL, the volume is defined by an implementation dependent method.  If the referenced SOP Instance is a Surface Segmentation, the referenced segment shall constitute a finite volume. It identifies the volume of the defined (measured) region of interest by the interior of the finite volume.  Segment number shall be specified even if the Segmentation SOP Instance has only a single segment.
Rows 7, 10	Identifies the source images that were segmented to identify the ROI, when, for example a subset of images in a series was used.
Rows 8, 11	Identifies the source series of images that were segmented to identify the ROI, when, for example an entire set of images in a series was used.
Row 12	These referenced images may contain “screen shot” illustrating rendered versions of the ROI.

## TID 1419 ROI Measurements

This Template encodes measurements for some metric, e.g., density, flow, or concentration.

### TID 1419 Parameters

\$Measurement	Coded term or Context Group for Concept Name of measurement
\$Units	Units for the measurement
\$ModType	Modifier Name for Concept Name of measurement
\$ModValue	Modifier Value for Concept Name of measurement
\$Method	Value for Measurement Method
\$Derivation	Value for Measurement Derivation
\$TargetSite	Value for Anatomic Location of measurement
\$TargetSiteMod	ModifierValue for Anatomic Location of measurement
\$Equation	Coded term or Context Group for the equation or table from which the measurement was derived or computed
\$RefAuthority	Bibliographic reference or authority for statistical properties of a reference population
\$RangeAuthority	Bibliographic reference or authority for the normal range of the measurement
\$DerivationParameter	Coded term or Context Group for Concept Name of a derivation parameter
\$DerivationParameterUnits	Units of derivation parameter

**TID 1419**  
**ROI Measurements**

**Type: Extensible      Order: Significant**

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	\$Measurement	1-n	M		Units = \$Units
2	>	HAS CONCEPT MOD	CODE	\$ModType	1-n	U		\$ModValue
3	>	HAS CONCEPT MOD	CODE	EV (G-C036, SRT, "Measurement Method")	1	U		\$Method
4	>	HAS CONCEPT MOD	CODE	EV (121401, DCM, "Derivation")	1	U		\$Derivation
5	>	HAS CONCEPT MOD	CODE	EV (G-C0E3, SRT, "Finding Site")	1	U		\$TargetSite
6	>>	HAS CONCEPT MOD	CODE	EV (G-C171, SRT, "Laterality")	1	U		DCID (244) Laterality
7	>>	HAS CONCEPT MOD	CODE	DT (G-A1F8, SRT, "Topographical modifier")	1	U		\$TargetSiteMod
8	>	HAS PROPERTIES	INCLUDE	DTID (310) Measurement Properties	1	U		\$RefAuthority = \$RefAuthority \$RangeAuthority = \$RangeAuthority
9	>	INFERRED FROM	NUM	\$DerivationParameter	1-n	UC	XOR Row 10	\$DerivationParameterUnits
10	>	R-INFERRED FROM	NUM	\$DerivationParameter	1-n	UC	XOR Row 9	\$DerivationParameterUnits
11	>	INFERRED FROM	INCLUDE	DTID (315) Equation or Table	1	UC	XOR Row 12	\$Equation = \$Equation
12	>	INFERRED FROM	TEXT	DCID (228) Equation or Table	1	UC	XOR Row 11	
13	>		INCLUDE	DTID (1000) Quotation	1	U		
14	>	HAS CONCEPT MOD	TEXT	(121050, DCM, "Equivalent Meaning of Concept Name")	1	U		

**Content Item Descriptions**

Row 1	Specifies the metric for which measurements are reported, e.g., density, flow, or concentration. This metric is computed at each sample point (e.g., pixel or voxel) in an ROI (defined in the invoking template), but those individual point measurements are not encoded. Instead, just the summary measurements for the ROI are encoded, and the means of computing a single value is defined in Row 4 Derivation (e.g., mean).
Rows 2,3,4	The HAS CONCEPT MOD items allow the explicit definition of terms for post-coordination of the measurement concept name. Additional post-coordinated modifier terms may be included in a SOP Instance based on this template, in accordance with section 6.2.4, or as defined by templates that invoke this template and explicitly define additional post-coordinated modifiers.
Rows 9, 10	The INFERRED FROM items allow the specification (by-value or by-reference) of numeric values that were used in the derivation of the numeric measurement of Row 1. The nature of the inference is not explicitly conveyed; it may be implicit in the Concept Names of the measurements. Inference by-reference is valid only in SOP Classes that permit the INFERRED FROM relationship by-reference.

Row 14	Equivalent Meaning of Concept Name allows the creating application to specify the preferred composed concept name representing the measurement and the associated post-coordinated concept modifiers. The concept modifiers may include those specified in this template, in a template that invokes this template, or at the option of the creating application in accordance with section 6.2.4. This composed concept name may be rendered by a display application.
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### TID 1420 Measurements Derived From Multiple ROI Measurements

This Template encodes measurements for some metric, e.g., density, flow, or concentration, which are acquired over some defined sampling (e.g., over successive time slots in a dynamic contrast enhanced acquisition).

#### TID 1420 Parameters

\$Measurement	Coded term or Context Group for Concept Name of measurement
\$MeasurementUnits	Units for the measurement
\$ModType	Modifier Name for Concept Name of measurement
\$ModValue	Modifier Value for Concept Name of measurement
\$Method	Value for Measurement Method
\$Derivation	Value for Measurement Derivation
\$TargetSite	Value for Anatomic Location of measurement
\$TargetSiteMod	ModifierValue for Anatomic Location of measurement
\$Equation	Coded term or Context Group for the equation or table from which the measurement was derived or computed
\$RefAuthority	Bibliographic reference or authority for statistical properties of a reference population
\$RangeAuthority	Bibliographic reference or authority for the normal range of the measurement
\$StatisticalRefAuthority	Bibliographic reference or authority for statistical properties of a reference population
\$StatisticalRangeAuthority	Bibliographic reference or authority for the normal range of the measurement
\$DerivationParameter	Coded term or Context Group for Concept Name of a derivation parameter
\$DerivationParameterUnits	Units of derivation parameter

#### TID 1420 Measurements Derived From Multiple ROI Measurements Type: Extensible      Order: Non-Significant

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			NUM	DCID (nnnn2) Measurements Derived From Multiple ROI Measurements	1-n	M		

2	>	R- INFERRED FROM	INCLUDE	DTID (1410) Planar ROI Measurements	1-n	MC	XOR Row 3	\$Measurement = \$Measurement \$Units = \$MeasurementUnits \$ModType = \$ModType \$ModValue = \$ModValue \$Method = \$Method \$Derivation = \$Derivation \$TargetSite = \$TargetSite \$TargetSiteMod = \$TargetSiteMod \$Equation = \$Equation \$RefAuthority = \$RefAuthority \$RangeAuthority = \$RangeAuthority \$DerivationParameter = \$DerivationParameter \$DerivationParameterUnits = \$DerivationParameterUnits
3	>	R- INFERRED FROM	INCLUDE	DTID (1411) Volumetric ROI Measurements	1-n	MC	XOR Row 2	\$Measurement = \$Measurement \$Units = \$MeasurementUnits \$ModType = \$ModType \$ModValue = \$ModValue \$Method = \$Method \$Derivation = \$Derivation \$TargetSite = \$TargetSite \$TargetSiteMod = \$TargetSiteMod \$Equation = \$Equation \$RefAuthority = \$RefAuthority \$RangeAuthority = \$RangeAuthority \$DerivationParameter = \$DerivationParameter \$DerivationParameterUnits = \$DerivationParameterUnits
4	>	HAS PROPERTI ES	INCLUDE	DTID (310) Measurement Properties	1	U		\$RefAuthority = \$RefAuthority \$RangeAuthority = \$RangeAuthority

### Content Item Descriptions

Row 1	Specifies the type of derived measurement reported, e.g., the mean of the individual ROI mean density values. Note that the units may be different from the units in the ROI measurements
Rows 2, 3	The measurement values of each ROI that contributes to the derived measurement, e.g., the mean density within an ROI. These are specified by reference, so as to not have to repeat the ROI information when it contributes to multiple derived measurements (e.g., if both mean and SD of ROI mean density values were specified).



Add new CID for ROI measurements:

**CID nnnn1      General Region of Interest Measurements**

This context group contains measurements of ROIs.

**Context ID 7464**

**General Region of Interest Measurements**

**Type: Extensible**

**Version: 20121101**

Code Scheme	Code Value	Concept Name
<i>Include CID 3488 Min/Max/Mean</i>		
SRT	R-10047	Standard Deviation
SRT	R-40507	Total
SRT	R-00319	Median
SRT	R-0032E	Mode

**CID nnnn2      Measurements Derived From Multiple ROI Measurements**

**Context ID 7465**

**Measurements Derived From Multiple ROI Measurements**

**Type: Extensible**

**Version: 20121101**

Coding Scheme Designator	Code Value	Code Meaning
INCLUDE CID 226 Population Statistical Descriptors		
INCLUDE CID 227 Sample Statistical Descriptors		

*For reference, existing concept groups:*

**CID 221      Measurement Range Concepts**

**Context ID 221**

**Measurement Range Concepts**

**Type: Extensible**

**Version: 20030327**

Coding Scheme Designator	Code Value	Code Meaning
INCLUDE CID 226 Population Statistical Descriptors		
INCLUDE CID 227 Sample Statistical Descriptors		

**CID 226      Population Statistical Descriptors**

**Context ID 226**

**Population Statistical Descriptors**

**Type: Extensible**

**Version: 2003032720121101**

Coding Scheme Designator	Code Value	Code Meaning
SRT	R-00337	95th Percentile Value of population

SRT	R-00338	90th Percentile Value of population
SRT	R-00346	1 Sigma Upper Value of population
SRT	R-00387	2 Sigma Upper Value of population
SRT	R-00317	Mean – <del>numeric estimation technique</del> <b><u>Value of population</u></b>
SRT	R-00319	Median Value of population
SRT	R-00377	10th Percentile Value of population
SRT	R-00397	5th Percentile Value of population
SRT	R-00347	1 Sigma Lower Value of population
SRT	R-00388	2 Sigma Lower Value of population
DCM	121414	Standard deviation of population
DCM	121417	2 Sigma deviation of population

**Note:** The SNOMED meaning for R-00317 is “Mean – numeric estimation technique”, but in the context of its use here, a more specific meaning has been used.

**CID 227                      Sample Statistical Descriptors**

**Context ID 227**  
**Sample Statistical Descriptors**  
**Type: Extensible                      Version: 20030327**

<b>Coding Scheme Designator</b>	<b>Code Value</b>	<b>Code Meaning</b>
DCM	121415	Percentile Ranking of measurement
DCM	121416	Z-Score of measurement

**CID 3488                      Min/Max/Mean**

This context group contains modifiers that indicate whether the measurement is a minimum, maximum or averaged value.

**Context ID 3488**  
**Min/Max/Mean**  
**Type: Extensible                      Version: 20040614**

<b>Code Scheme</b>	<b>Code Value</b>	<b>Concept Name</b>
SRT	G-A437	Maximum
SRT	R-404FB	Minimum
SRT	R-00317	Mean

<i>Modify PS 3.16, Annex D</i>
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**DICOM Code Definitions**  
**(Coding Scheme Designator “DCM” Coding Scheme Version “01”)**

Code Value	Code Meaning	Definition
...		
<u>121231</u>	<u>Volume Surface</u>	<u>Surface of an identified or measured volume.</u>
<u>121232</u>	<u>Source series for segmentation</u>	<u>Series of image instances used as source data for a segmentation</u>
<u>121233</u>	<u>Source image for segmentation</u>	<u>Image instances used as source data for a segmentation</u>

*Add to PS 3.6, Table A-3*

**Table A-3**  
**CONTEXT GROUP UID VALUES**

Context UID	Context Identifier	Context Group Name
...		
1.2.840.10008.6.1.951	7464	General Region of Interest Measurements
1.2.840.10008.6.1.952	7465	Measurements Derived From Multiple ROI Measurements