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| 1 | Status | Letter Ballot |
| 2 | Date of Last Update | 2016/05/25 |
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| 8 | Correction Number CP-1569 | |
| 9 | Log Summary: Define CT Reconstruction Diameter more precisely and correct Enhanced CT illustration | |
| 10 | Name of Standard | |
| 11 | PS3.3 | |
| 12 | Rationale for Correction: | |
| 13 | The single-valued Attribute Reconstruction Diameter (0018,1100) has been present in the Standard since ACR-NEMA 1985, with | |
| 14 | the rather vague definition (never changed) of "Diameter in mm of the region from within which data were used in creating the | |
| 15 | reconstruction of the image. Data can exist outside this region and portions of the patient can exist outside this region". | |
| 16 | Traditionally, for square CT images it has been populated with values such that for Pixel Spacing (0028,0030): | |
| 17 | Pixel Spacing value 1 = row spacing = Reconstruction Diameter (0018,1100) / Rows (0028,0010) | |
| 18 | Pixel Spacing value 2 = col spacing = Reconstruction Diameter (0018,1100) / Columns (0028,0011). | |
| 19 | In otherwords, the circular region defined by Reconstruction Diameter (0018,1100) has been populated as defining the largest circle | |
| 20 | fitting within the square region encoded as the Pixel Data. | |
| 21 | When Supplement 58 added the Enhanced CT Image IOD, additional attributes to describe the reconstructed area were added, as | |
| 22 | well as a figure; that figure incorrectly shows the Reconstruction Diameter defining a circular region that entirely contains the square | |
| 23 | region encoded as the Pixel Data, rather than the other way around. | |
| 24 | By contrast, Supplement 117 added the Enhanced PET Image IOD and illustrated the correct use of Reconstruction Diameter. | |
| 25 | Change the figure to reflect the traditionally usage, and add a more precise definition of Reconstruction Diameter (0018,1100) | |
| 26 | wherever it is already used in the legacy image IODs, consistent with traditional usage. | |
| 27 | Correction Wording: | |

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

C.8.2.1 CT Image Module

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Table C.8-3. CT Image Module Attributes

| Attribute Name | Tag | Type | Attribute Description |
|--|-------------|------|---|
| ... | ... | ... | ... |
| Data Collection Diameter | (0018,0090) | 3 | The diameter in mm of the region over which data were collected |
| Data Collection Center (Patient) | (0018,9313) | 3 | The x, y, and z coordinates (in the patient coordinate system) in mm of the center of the region in which data were collected. See Section C.8.15.3.6.1. |
| Reconstruction Diameter | (0018,1100) | 3 | <p>Diameter in mm of the region from within which data were used in creating the reconstruction of the image. Data may exist outside this region and portions of the patient may exist outside this region.</p> <p><u>The diameter defines a circular region that is entirely contained within the encoded Pixel Data (7FE0.0010), unless the encoded image has been cropped after reconstruction.</u></p> <p>Note</p> <p><u>If not cropped or padded, for square images with square pixels, both values of Pixel Spacing (0028.0030) will be equal and equal to Reconstruction Diameter (0018,1100) / Rows (0028.0010) and Reconstruction Diameter (0018,1100) / Columns (0028.0011).</u></p> |
| Reconstruction Target Center (Patient) | (0018,9318) | 3 | <p>The x, y, and z coordinates (in the patient coordinate system) of the reconstruction center target point as used for reconstruction in mm. See Section C.8.15.3.6.1.</p> <p>Note</p> <p>If the reconstructed image is not magnified or panned the value corresponds with the Data Collection Center (Patient) (0018,9313) attribute.</p> |
| ... | ... | ... | ... |

C.8.3.1 MR Image Module

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Table C.8-4. MR Image Module Attributes

| Attribute Name | Tag | Type | Attribute Description |
|----------------|-----|------|-----------------------|
| ... | ... | ... | ... |

| Attribute Name | Tag | Type | Attribute Description |
|-------------------------|-------------|------|--|
| Reconstruction Diameter | (0018,1100) | 3 | <p>Diameter in mm. of the region from within which data were used in creating the reconstruction of the image. Data may exist outside this region and portions of the patient may exist outside this region.</p> <p><u>The diameter defines a circular region that is entirely contained within the encoded Pixel Data (7FE0,0010), unless the encoded image has been cropped after reconstruction.</u></p> <p>Note</p> <p><u>If not cropped or padded, for square images with square pixels, both values of Pixel Spacing (0028,0030) will be equal and equal to Reconstruction Diameter (0018,1100) / Rows (0028,0010) and Reconstruction Diameter (0018,1100) / Columns (0028,0011).</u></p> |
| ... | ... | ... | ... |

C.8.4.15 NM Reconstruction Module

Table C.8-15. NM Reconstruction Module Attributes

| Attribute Name | Tag | Type | Attribute Description |
|-------------------------|-------------|------|--|
| ... | ... | ... | |
| Reconstruction Diameter | (0018,1100) | 3 | <p>Diameter, in mm, of the region from within which the data was used in creating the reconstruction of the image. Data may exist outside this region and portions of the patient may exist outside this region.</p> <p><u>The diameter defines a circular region that is entirely contained within the encoded Pixel Data (7FE0,0010), unless the encoded image has been cropped after reconstruction.</u></p> <p>Note</p> <p><u>If not cropped or padded, for square images with square pixels, both values of Pixel Spacing (0028,0030) will be equal and equal to Reconstruction Diameter (0018,1100) / Rows (0028,0010) and Reconstruction Diameter (0018,1100) / Columns (0028,0011).</u></p> |
| ... | ... | ... | ... |

C.8.9.1 PET Series Module

Table C.8-60. PET Series Module Attributes

| Attribute Name | Tag | Type | Attribute Description |
|----------------|-----|------|-----------------------|
| ... | ... | ... | ... |

| Attribute Name | Tag | Type | Attribute Description |
|-------------------------|-------------|------|---|
| Reconstruction Diameter | (0018,1100) | 3 | <p>Diameter, in mm, of the region within which the data was used in creating the reconstruction of the image. Data may exist outside this region and portions of the patient may exist outside this region.</p> <p><u>The diameter defines a circular region that is entirely contained within the encoded Pixel Data (7FE0.0010), unless the encoded image has been cropped after reconstruction.</u></p> <p>Note</p> <p><u>If not cropped or padded, for square images with square pixels, both values of Pixel Spacing (0028,0030) will be equal and equal to Reconstruction Diameter (0018,1100) / Rows (0028,0010) and Reconstruction Diameter (0018,1100) / Columns (0028,0011).</u></p> |
| ... | ... | ... | ... |

C.8.15.3.6 CT Geometry Macro

Table C.8-122. CT Geometry Macro Attributes

| Attribute Name | Tag | Type | Attribute Description |
|--|-------------|------|---|
| CT Geometry Sequence | (0018,9312) | 1 | <p>Contains the attributes defining the CT geometry.</p> <p>Only a single Item shall be included in this Sequence.</p> |
| >Distance Source to Detector | (0018,1110) | 1C | <p>Distance in mm from source to detector center. See Section C.8.15.3.6.1.</p> <p>Note</p> <p>This value is traditionally referred to as Source Image Receptor Distance (SID).</p> <p>Required if Frame Type (0008,9007) Value 1 of this frame is ORIGINAL. May be present otherwise.</p> |
| >Distance Source to Data Collection Center | (0018,9335) | 1C | <p>Distance in mm from source to data collection center. See Section C.8.15.3.6.1.</p> <p>Required if Frame Type (0008,9007) Value 1 of this frame is ORIGINAL. May be present otherwise.</p> |

C.8.15.3.6.1 Relationships Between CT Geometric Attributes (Informative)

In Figure C.8-19 the relationship of the Geometric Attributes within the CT Geometry and CT Reconstruction functional groups is shown. **In this example, the Pixel Data is shown encoding the entire reconstructed region with no outside padding or clipping, and the reconstructed region is illustrated as being square, i.e., the value of Reconstruction Diameter would be the same as both values of Reconstruction Field of View, whichever Attribute is present.** Figure C.8-19, viewed from the front of the gantry (where the table enters the gantry), is informative only and is not meant to represent a standardization of an equipment-based frame of reference.

Replace incorrect figure:

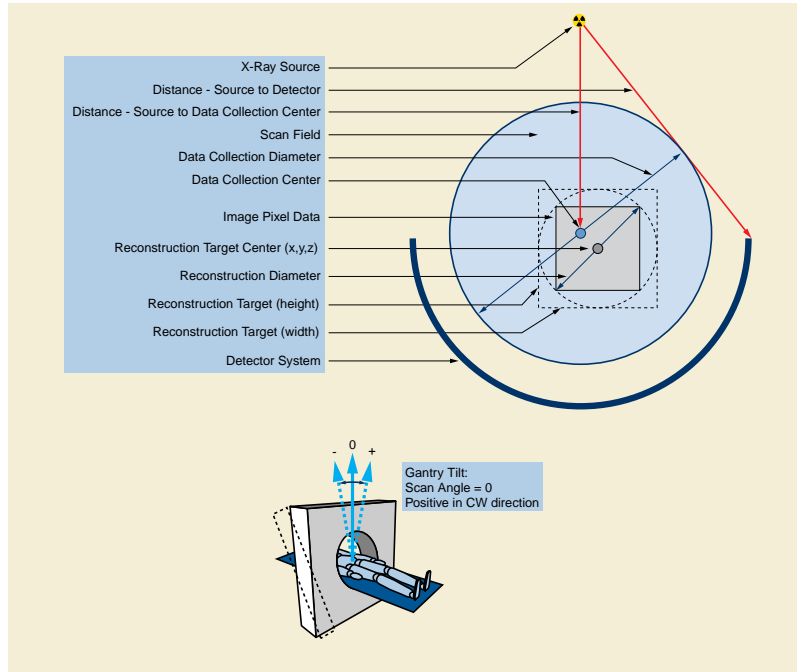


Figure C.8-19. Geometry of CT Acquisition System

with corrected figure:

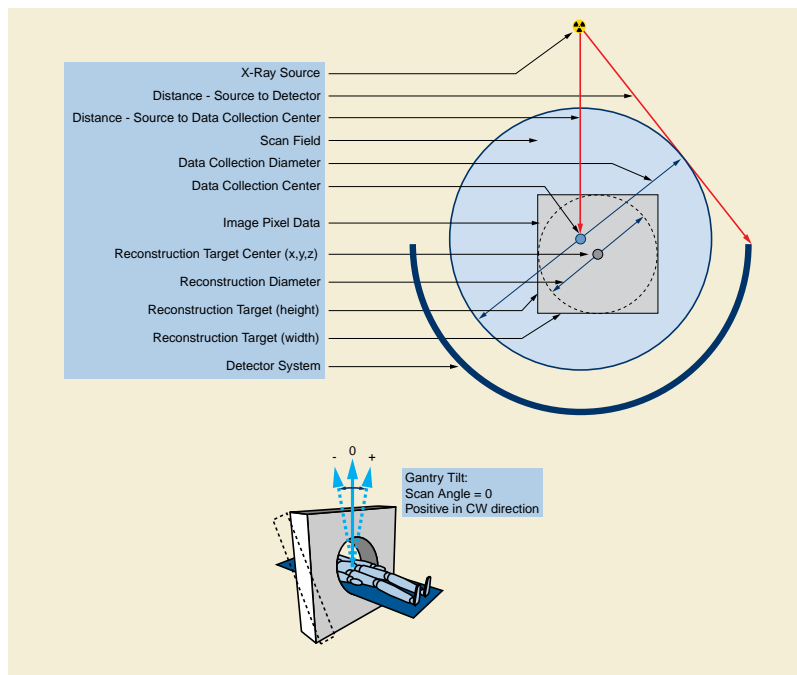


Figure C.8-19. Geometry of CT Acquisition System

C.8.15.3.7 CT Reconstruction Macro

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Table C.8-123. CT Reconstruction Macro Attributes

| Attribute Name | Tag | Type | Attribute Description |
|-------------------------------|-------------|------|---|
| CT Reconstruction Sequence | (0018,9314) | 1 | Contains the attributes holding information about the reconstruction techniques used. Only a single Item shall be included in this Sequence. |
| ... | ... | ... | ... |
| >Reconstruction Diameter | (0018,1100) | 1C | The diameter in mm of the region from which data were used in creating the reconstruction of the image. Data may exist outside this region and portions of the patient may exist outside this region. See Section C.8.15.3.6.1. <u>The diameter defines a circular region that is entirely contained within the encoded Pixel Data (7FE0.0010), unless the encoded image has been cropped or padded after reconstruction.</u> Note <u>If not cropped or padded, for square images with square pixels, both values of Pixel Spacing (0028.0030) and Reconstruction Pixel Spacing (0018.9322) will be equal and equal to Reconstruction Diameter (0018.1100) / Rows (0028.0010) and Reconstruction Diameter (0018.1100) / Columns (0028.0011).</u> Required if Frame Type (0008,9007) Value 1 of this frame is ORIGINAL and Reconstruction Field of View (0018,9317) is not present. Otherwise may be present if Frame Type (0008,9007) Value 1 of this frame is DERIVED and Reconstruction Field of View (0018,9317) is not present. |
| >Reconstruction Field of View | (0018,9317) | 1C | The field of view width (x-dimension) followed by height (y-dimension) as used for reconstruction in mm. Note <u>If not cropped or padded, for images with square pixels, both the corresponding values of Pixel Spacing (0028.0030) and Reconstruction Pixel Spacing (0018.9322) will be equal.</u> <u>The first value (adjacent row spacing) will be equal to Reconstruction Diameter (0018.1100) / Rows (0028.0010).</u> <u>The second value (adjacent column spacing) will be equal to Reconstruction Diameter (0018.1100) / Columns (0028.0011).</u> Required if Frame Type (0008,9007) Value 1 of this frame is ORIGINAL and Reconstruction Diameter (0018,1100) is not present. Otherwise may be present if Frame Type (0008,9007) Value 1 of this frame is DERIVED and Reconstruction Diameter (0018,1100) is not present. |
| >Reconstruction Pixel Spacing | (0018,9322) | 1C | Physical distance in the patient between the center of each reconstructed pixel, specified by a numeric pair - adjacent row spacing (delimiter) adjacent column spacing in mm. See Section 10.7.1.3 for further explanation of the value order. Required if Frame Type (0008,9007) Value 1 of this frame is ORIGINAL. May be present otherwise. |
| ... | ... | ... | ... |

C.8.22.5.4 PET Position Macro

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Table C.8.22-14. PET Position Macro Attributes

| Attribute Name | Tag | Type | Attribute Description |
|---|-------------|------|--|
| PET Position Sequence | (0018,9735) | 1 | Contains the attributes defining the PET geometry. Only a single Item shall be included in this Sequence. |
| >Table Position | (0018,9327) | 1C | Relative longitudinal position of acquisition location of this frame in mm from an implementation specific reference point. Shall be relative to the same reference point for all frames in this SOP Instance, but may be different from the reference point in other SOP Instances. Positions as the table moves into the gantry viewed from the front are more negative. Note 1. For contiguous slices reconstructed from multiple detectors one would expect different values for adjacent slices. 2. Lateral positioning or tilting or swiveling are not described. Required if Frame Type (0008,9007) Value 1 of this frame is ORIGINAL. May be present otherwise. |
| >Data Collection Center (Patient) | (0018,9313) | 1C | The x, y, and z coordinates (in the patient coordinate system) in mm of the center of the region in which data were collected. See Section C.8.22.5.4.1. Required if Frame Type (0008,9007) Value 1 equals ORIGINAL. May be present otherwise. |
| >Reconstruction Target Center (Patient) | (0018,9318) | 1C | The x, y, and z coordinates (in the patient coordinate system) of the reconstruction center target point as used for reconstruction in mm. See Section C.8.22.5.4.1. Note If the reconstructed image is not magnified or panned the value corresponds with the Data Collection Center (0018,9313) attribute. Required if Frame Type (0008,9007) Value 1 equals ORIGINAL. May be present otherwise. |

C.8.22.5.4.1 Relationships Between PET Geometric Attributes (Informative)

In Figure C.8.22-1 the relationship of the Geometric Attributes within the PET Geometry and PET Reconstruction functional groups is shown. **In this example, the Pixel Data is shown encoding the entire reconstructed region with no outside padding or clipping, and the reconstructed region is illustrated as being square, i.e., the value of Reconstruction Diameter would be the same as both values of Reconstruction Field of View, whichever Attribute is present.** Figure C.8.22-1, viewed from the front of the gantry (where the table enters the gantry), is informative only and is not meant to represent a standardization of an equipment-based frame of reference.

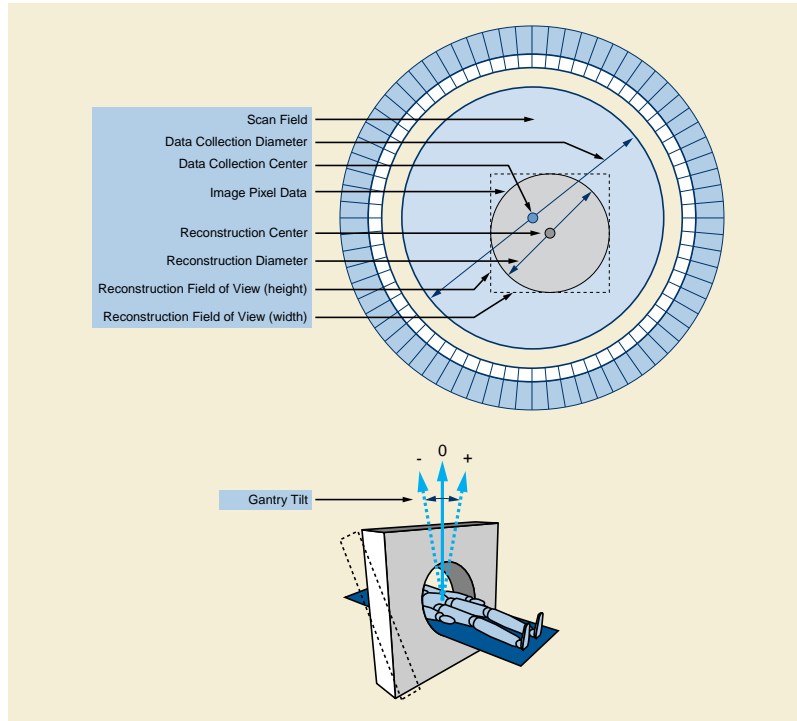


Figure C.8.22-1. Geometry of PET Acquisition System

C.8.22.5.6 PET Reconstruction Macro

Table C.8.22-17 specifies the attributes of the PET Reconstruction Functional Group Macro, which describe the method used to reconstruct this image.

Table C.8.22-17. PET Reconstruction Macro Attributes

| Attribute Name | Tag | Type | Attribute Description |
|-----------------------------|-------------|------|---|
| PET Reconstruction Sequence | (0018,9749) | 1 | Contains the attributes describing the reconstruction process for this frame. Only a single Item shall be included in this Sequence. |
| ... | ... | ... | ... |

| Attribute Name | Tag | Type | Attribute Description |
|-------------------------------|-------------|------|---|
| >Reconstruction Diameter | (0018,1100) | 1C | <p>The diameter in mm of the region from which data were used in creating the reconstruction of the image. Data may exist outside this region and portions of the patient may exist outside this region. See Section C.8.22.5.4.1.</p> <p><u>The diameter defines a circular region that is entirely contained within the encoded Pixel Data (7FE0,0010), unless the encoded image has been cropped after reconstruction.</u></p> <p>Note</p> <p><u>If not cropped or padded, for square images with square pixels, both values of Pixel Spacing (0028,0030) will be equal and equal to Reconstruction Diameter (0018,1100) / Rows (0028,0010) and Reconstruction Diameter (0018,1100) / Columns (0028,0011).</u></p> <p>Required if Frame Type (0008,9007) Value 1 equals ORIGINAL and Reconstruction Field of View (0018,9317) is not present.</p> <p>Otherwise may be present if Frame Type (0008,9007) Value 1 equals DERIVED and Reconstruction Field of View (0018,9317) is not present.</p> |
| >Reconstruction Field of View | (0018,9317) | 1C | <p>The field of view width (x-dimension) followed by height (y-dimension) as used for reconstruction in mm.</p> <p>Note</p> <p><u>If not cropped or padded, for images with square pixels, both the corresponding values of Pixel Spacing (0028,0030) and Reconstruction Pixel Spacing (0018,9322) will be equal.</u></p> <p><u>The first value (adjacent row spacing) will be equal to Reconstruction Diameter (0018,1100) / Rows (0028,0010).</u></p> <p><u>The second value (adjacent column spacing) will be equal to Reconstruction Diameter (0018,1100) / Columns (0028,0011).</u></p> <p>Required if Image Type (0008,9007) Value 1 equals ORIGINAL and Reconstruction Diameter (0018,1100) is not present.</p> <p>Otherwise may be present if Frame Type (0008,9007) Value 1 equals DERIVED and Reconstruction Diameter (0018,1100) is not present.</p> |