

# DICOM Correction Proposal

STATUS	Letter Ballot
Date of Last Update	2024/03/21
Person Assigned	Kevin O'Donnell
Submitter Name	Kevin O'Donnell
Submission Date	2023/05/31

Correction Number	CP-2307
Log Summary:	Rationalize and extend Codes and Strings for Filter Material
Name of Standard	PS3.3
Rationale for Correction:	<p>This CP addresses several related issues. Additional modalities are adopting Silver as an x-ray filter material. Many places where Filter Material (0018,7050) appears do not provide a list of Defined Terms. Symmetry between the Defined Terms and CID 10006 X-Ray Filter Materials should be maintained</p> <p>"May be multi-valued" is added in several places/ Since the VM was always 1-n this was previously true and now is called out uniformly.</p> <p>Tin and Tantalum are effectively added to several modules, but as Defined Terms, they were not previously prohibited.</p> <p>MIXED is dropped from CT X-Ray Details Macro and replaced with a note.</p>
Correction Wording:	

*Modify PS 3.3 C.8.2.1 as shown*

## C.8.2.1 CT Image Module

Table C.8-3 specifies the Attributes of the CT Image Module, which describe CT images.

**Table C.8-3. CT Image Module Attributes**

Attribute Name	Tag	Type	Attribute Description
...			
Exposure in $\mu$ As	(0018,1153)	3	<p>The exposure expressed in <math>\mu</math>As, for example calculated from Exposure Time and X-Ray Tube Current.</p> <p>Shall not be present if the corresponding Attribute, Exposure in mAs (0018,9332), is present in Multi-energy CT Acquisition Sequence (0018,9362) and the value of this Attribute is not the same in all Items of the Multi-energy CT Acquisition Sequence (0018,9362).</p>
Filter Type	(0018,1160)	3	<p>Label for the type of filter inserted into the X-Ray beam.</p> <p>Shall not be present if this Attribute is present in Multi-energy CT Acquisition Sequence (0018,9362) and the</p>

Attribute Name	Tag	Type	Attribute Description
			value of this Attribute is not the same in all Items of the Multi-energy CT Acquisition Sequence (0018,9362).
<b>&gt;Filter Material</b>	<b>(0018,7050)</b>	<b>1</b>	<b>The X-Ray absorbing material used in the filter. May be multi-valued.</b>  <b><u>See Annex X “Correspondence of X-Ray Filter Material Codes and Defined Terms” in PS3.16 for Defined Terms.</u></b>
...			
CT Additional X-Ray Source Sequence	(0018,9360)	3	Acquisition parameters for X-Ray sources beyond the primary X-Ray source, which is specified in other Attributes of this Module.  One or more Items are permitted in this Sequence.  Note  This sequence is superseded for multi-energy acquisitions by the Multi-energy CT Acquisition Sequence (0018,9362), however implementations may encounter instances that still use this sequence, in which case Multi-energy CT Acquisition (0018,9361) will be absent or will be set to NO.  Shall not be present if Multi-energy CT Acquisition (0018,9361) is YES.
>KVP	(0018,0060)	1	Peak kilo voltage output of the X-Ray generator used.
>X-Ray Tube Current in mA	(0018,9330)	1	Nominal X-Ray tube current in milliamperes.
>Data Collection Diameter	(0018,0090)	1	The diameter in mm of the region over which data were collected.
>Focal Spot(s)	(0018,1190)	1	Used nominal size of the focal spot in mm.
>Filter Type	(0018,1160)	1	Type of filter(s) inserted into the X-Ray beam.
>Filter Material	(0018,7050)	1	The X-Ray absorbing material used in the filter. <b><u>May be multi-valued.</u></b>  <b><u>See Annex X “Correspondence of X-Ray Filter Material Codes and Defined Terms” in PS3.16 for Defined Terms.</u></b>
...			

Modify PS 3.3 C.8.7.10 as shown

### C.8.7.10 X-Ray Filtration Module

...

**Table C.8-35a. X-Ray Filtration Macro Attributes**

Attribute Name	Tag	Type	Attribute Description
...			
Filter Material	(0018,7050)	3	<p>The X-Ray absorbing material used in the filter. May be multi-valued.</p> <p><b><u>See Annex X “Correspondence of X-Ray Filter Material Codes and Defined Terms” in PS3.16 for Defined Terms.</u></b></p> <p><b>Defined Terms:</b></p> <p><b>MOLYBDENUM</b>  <b>ALUMINUM</b>  <b>SILVER</b>  <b>COPPER</b>  <b>RHODIUM</b>  <b>NIObIUM</b>  <b>EUROPIUM</b>  <b>LEAD</b></p>
...			

Modify PS 3.3 C.8.15.3.9 as shown

### C.8.15.3.9 CT X-Ray Details Macro

Table C.8-125 specifies the Attributes of the CT X-Ray Details Macro.

**Table C.8-125. CT X-Ray Details Macro Attributes**

Attribute Name	Tag	Type	Attribute Description
CT X-Ray Details Sequence	(0018,9325)	1	<p>Contains the Attributes defining the X-Ray information.</p> <p>If Multi-energy CT Acquisition (0018,9361) is NO or is absent, only a single Item shall be included in this Sequence.</p> <p>If Multi-energy CT Acquisition (0018,9361) is YES, one or more Items shall be included in this Sequence.</p>
...			
>Filter Type	(0018,1160)	1C	<p>Type of filter(s) inserted into the X-Ray beam.</p> <p><b>Defined Terms:</b></p> <p><b>WEDGE</b>  <b>BUTTERFLY</b>  <b>MULTIPLE</b>  <b>FLAT</b>  <b>SHAPED</b>  <b>NONE</b></p> <p>Note</p> <p>Multiple type of filters can be expressed by a combination, e.g., BUTTERFLY+WEDGE.</p>

Attribute Name	Tag	Type	Attribute Description
			Required if Frame Type (0008,9007) Value 1 of this frame is ORIGINAL or Image Type (0008,0008) Value 1 is ORIGINAL. May be present otherwise.
>Filter Material	(0018,7050)	1C	<p>The X-Ray absorbing material used in the filter. May be multi-valued.</p> <p><b><u>See Annex X “Correspondence of X-Ray Filter Material Codes and Defined Terms” in PS3.16 for Defined Terms.</u></b></p> <p><b>Defined Terms:</b></p> <p><b>MOLYBDENUM</b>—  <b>ALUMINUM</b>—  <b>COPPER</b>—  <b>RHODIUM</b>—  <b>NIOBIUM</b>—  <b>EUROPIUM</b>—  <b>LEAD</b>—  <b>MIXED</b>—</p> <p>Note</p> <p><b><u>At least one value is required to be present. If a combination of materials is used, they may be listed using multiple values, or a custom value may be used to represent a proprietary combination of materials. Multiple MIXED may be used to indicate a filter type of complex composition for which listing the individual materials would be excessive or undesirable; it is not intended to mean “unknown”.</u></b></p> <p>Required if Frame Type (0008,9007) Value 1 of this frame is ORIGINAL or Image Type (0008,0008) Value 1 is ORIGINAL, and the value of Filter Type (0018,1160) is other than NONE. May be present otherwise.</p>
...			

Modify PS 3.3 C.8.15.3.11 as shown

### C.8.15.3.11 CT Additional X-Ray Source Macro

Table C.8-126b specifies the Attributes of the CT Additional X-Ray Source Macro. This Sequence may be multi-valued, depending on the number of additional active X-Ray sources. It defines the X-Ray source parameters beyond the basic system.

**Table C.8-126b. CT Additional X-Ray Source Macro Attributes**

Attribute Name	Tag	Type	Attribute Description
CT Additional X-Ray Source Sequence	(0018,9360)	1	<p>Contains the Attributes defining the data acquisition in a multiple X-Ray source system beyond the primary source. The primary X-Ray source is specified in the CT X-Ray Details Sequence.</p> <p>One or more Items shall be included in this Sequence.</p>

Attribute Name	Tag	Type	Attribute Description
>Filter Type	(0018,1160)	1	Type of filter(s) inserted into the X-Ray beam. See Section C.8.15.3.9.
>Filter Material	(0018,7050)	1	The X-Ray absorbing material used in the filter. <b><u>May be multi-valued.</u></b> <b><u>See Annex X “Correspondence of X-Ray Filter Material Codes and Defined Terms” in PS3.16 for Defined Terms.</u></b>

Modify PS 3.3 C.8.21.3.2 as shown

### C.8.21.3.2 X-Ray 3D Angiographic Acquisition Module

Table C.8.21.3.2-1 specifies the Attributes of the X-Ray 3D Angiographic Acquisition Module.

**Table C.8.21.3.2-1. X-Ray 3D Angiographic Acquisition Module Attributes**

Attribute Name	Tag	Type	Attribute Description
X-Ray 3D Acquisition Sequence	(0018,9507)	1	Each Item represents an acquisition context related to one or more reconstructions.  The values of Acquisition Index (0020,9518) may be used as index to Items in this Sequence.  One or more Items shall be included in this Sequence.
...			
>Filter Type	(0018,1160)	1C	Type of filter(s) inserted into the X-Ray beam (e.g., wedges). See Attribute Description in Section C.8.7.10 for Defined Terms.  Note  Multiple type of filters can be expressed by a combination, e.g., BUTTERFLY+WEDGE.  Required if present and consistent in the contributing SOP Instances.
>Filter Material	(0018,7050)	1C	The X-Ray absorbing material used in the filter. May be multi-valued. <del>See Attribute Description in Section C.8.7.10 for Defined Terms.</del>  <b><u>See Annex X “Correspondence of X-Ray Filter Material Codes and Defined Terms” in PS3.16 for Defined Terms.</u></b>  Required if present and consistent in the contributing SOP Instances.
...			

Modify PS 3.3 C.8.21.3.4 as shown

### C.8.21.3.4 Breast Tomosynthesis Acquisition Module

Table C.8.21.3.4-1 specifies the Attributes of the Breast Tomosynthesis Acquisition Module.

**Table C.8.21.3.4-1. Breast Tomosynthesis Acquisition Module Attributes**

Attribute Name	Tag	Type	Attribute Description
X-Ray 3D Acquisition Sequence	(0018,9507)	1	Each Item represents an acquisition context related to one or more reconstructions.  The values of Acquisition Index (0020,9518) may be used as index in this Sequence.  One or more Items shall be included in this Sequence.
>Filter Type	(0018,1160)	1	Type of filter(s) inserted into the X-Ray beam (e.g., wedges). See Attribute Description in Section C.8.7.10 for Defined Terms.
>Filter Material	(0018,7050)	1	The X-Ray absorbing material used in the filter. May be multi-valued. <del>See Attribute Description in Section C.8.7.10 for Defined Terms.</del>  <u>See Annex X “Correspondence of X-Ray Filter Material Codes and Defined Terms” in PS3.16 for Defined Terms.</u>
...			

Modify PS 3.3 C.34.17 as shown

### C.34.17 Performed XA Acquisition Module

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**Table C.34.17-1. Performed XA Acquisition Module Attributes**

Attribute Name	Tag	Type	Attribute Description
Acquisition Protocol Element Sequence	(0018,9920)	2	Parameter values for each Protocol Element in the acquisition protocol. Each item in the sequence describes one Element. Elements are performed in the order of their Protocol Element Number (0018,9921).  See Section C.34.9.1.  Zero or more Items shall be included in this Sequence.
...			
>XA Plane Details Sequence	(0018,11BA)	3	Parameter values for each of the planes (or X-Ray beams) operating simultaneously in the Acquisition Protocol Element. Each item in the sequence describes one plane.  One or more Items are permitted in this Sequence.

Attribute Name	Tag	Type	Attribute Description
			Note A Biplane system is recommended to create two items, one for each plane, even if the parameters of both planes are the same.
...			
>>X-Ray Filter Details Sequence	(0018,11BC)	3	Parameter values for each of the filters inserted simultaneously into the X-Ray beam. Each item in the sequence describes one filter.  One or more Items shall be included in this sequence.
...			
>>>Filter Type	(0018,1160)	3	Type of filter(s) inserted into the X-Ray beam (e.g., wedges).  Defined Terms: <b>STRIP</b> <b>WEDGE</b> <b>BUTTERFLY</b> <b>MULTIPLE</b> <b>FLAT</b> <b>NONE</b>
>>>Filter Material	(0018,7050)	3	The X-Ray absorbing material used in the filter. <b><u>May be multi-valued.</u></b>  <b><u>See Annex X “Correspondence of X-Ray Filter Material Codes and Defined Terms” in PS3.16 for Defined Terms.</u></b>  Defined Terms: <del><b>MOLYBDENUM</b></del> <del><b>ALUMINUM</b></del> <del><b>COPPER</b></del> <del><b>RHODIUM</b></del> <del><b>NIوبيUM</b></del> <del><b>EUROPIUM</b></del> <del><b>LEAD</b></del>
...			

Included for reference Part 16 CID 10006

### CID 10006 X-RAY FILTER MATERIALS

This CID defines X-Ray Filter Material codes which are also associated with Defined Terms in Annex X.

Resources: HTML | FHIR JSON | FHIR XML | IHE SVS XML  
Type: Extensible  
Version: 20190817  
UID: 1.2.840.10008.6.1.539

### Table CID 10006. X-Ray Filter Materials

Coding Scheme Designator	Code Value	Code Meaning	SNOMED-RT ID	UMLS Concept Unique ID
SCT	71128006	Molybdenum	C-15000	C0026402
SCT	12503006	Aluminum	C-12000	C0002367
SCT	66925006	Copper	C-12700	C0009968
SCT	59801003	Rhodium	C-16700	C0035493
SCT	767776000	Niobium		C0028101
SCT	767775001	Europium		C0015180
SCT	88488004	Lead	C-13200	C0023175
SCT	45215009	Tantalum	C-15600	C0039297
SCT	41967008	Silver	C-13700	C0037125
SCT	12597001	Tin	C-13900	C0040238

Add a new Annex X to Part 16 mirroring Annex L

## X Correspondence of X-Ray Filter Material Codes and Defined Terms

This Annex defines a correspondence between the codes used in the X-Ray Filter Material context group (CID 10006) and the Defined Terms for Filter Material (0018,7050) for human use in Table X-1.

**Table X-1. Corresponding Codes and Terms for Human Use**

Coding Scheme Designator	Code Value	Code Meaning	Filter Material	SNOMED-RT ID	UMLS Concept Unique ID
SCT	71128006	Molybdenum	MOLYBDENUM	C-15000	C0026402
SCT	12503006	Aluminum	ALUMINUM	C-12000	C0002367
SCT	66925006	Copper	COPPER	C-12700	C0009968
SCT	59801003	Rhodium	RHODIUM	C-16700	C0035493
SCT	767776000	Niobium	NIOBIUM		C0028101
SCT	767775001	Europium	EUROPIUM		C0015180
SCT	88488004	Lead	LEAD	C-13200	C0023175
SCT	45215009	Tantalum	TANTALUM	C-15600	C0039297
SCT	41967008	Silver	SILVER	C-13700	C0037125
SCT	12597001	Tin	TIN	C-13900	C0040238



