DICOM Change Proposal

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Change Number CP-2539
Log Summary: Clarify behaviour of LUT operations when modules are absent in presentation state
Name of Standard PS3.3
Rationale for Change: This CP attempts to improve the consistency and linking between different aspects for the reader pursuing the implementation of Grayscale Softcopy Presentation State, especially regarding Modality LUTs and VOI LUTs by: 1. PS3.3 Section C.11.2.1.2.2 incorrectly references PS3.17 instead of PS3.4 for Section N.2. 2. Add the Modality LUT and VOI LUT main aspects and references in PS3.3 Sections C.11.1 and C.11.8 to PS3.4 Section N.2.1.1 and N.2.1.3 respectively to ensure that the implementor does not miss these connections. 3. Add a reference to C.11.6 Softcopy Presentation LUT Module to regarding Presentation LUT operation in Section N.2 in PS3.4 to ensure that the reader doesn't miss this important connection.
Change Wording:

Modify C.11.2.1.2.2 as below (correct a reference)

C.11.2.1.2.2 General Requirements for Window Center and Window Width

The Window Center (0028,1050), Window Width (0028,1051) and VOI LUT Function (0028,1056) Attributes shall be used only for Images with Photometric Interpretation (0028,0004) values of MONOCHROME1 and MONOCHROME2. They have no meaning for other Images.

If multiple values are present in the Window Center (0028,1050) and Window Width (0028,1051) Attributes, both shall have the same number of values and shall be considered as pairs. Multiple values indicate that multiple alternative views may be presented.

If any VOI LUT, specified by the VOI LUT Sequence (0028,3010) Attribute, is included by an Image, a pair of Window Center (0028,1050) and Window Width (0028,1051) values, or the VOI LUT, but not both at the same time, may be applied to the Image for display. Inclusion of both indicates that multiple alternative views may be presented.

If multiple Items are present in VOI LUT Sequence (0028,3010), only one may be applied to the Image for display. Multiple Items indicate that multiple alternative views may be presented.

If the VOI LUT Module is defined in an IOD and if neither VOI LUT Sequence (0028,3010) nor Window Center (0028,1050) and Window Width (0028,1051) are present, then the VOI LUT stage of the grayscale pipeline **~~(described in Section N.2 in PS3.17)~~** **(described in Section N.2 in PS3.4)** is defined to be an identity transformation.

Note

1. This requirement is specified so that IODs that define a particular output space for the grayscale pipeline, such as P-Values, are not in an undefined state when no VOI LUT Sequence (0028,3010) or Window Center (0028,1050) and Window Width (0028,1051) are present.

2. Though the VOI LUT Module, VOI LUT Sequence (0028,3010) and Window Center (0028,1050) and Window Width (0028,1051) Attributes may be optional in a particular IOD, implementations that render images are expected to implement and apply these transformations when they are present in the image, unless overridden by the user, a presentation state, or a hanging protocol, and to allow the user to select which transformation to apply when multiple transformations are present.

Modify C.11.1 as below

C.11.1 Modality LUT Module

Table C.11-1 specifies the Attributes of the Modality LUT Module, which describe the Modality LUT.

Either a Modality LUT Sequence containing a single Item or Rescale Slope and Intercept values shall be present but not both.

Note

This requirement for only a single transformation makes it possible to unambiguously define the input of succeeding stages of the grayscale pipeline such as the VOI LUT.

If the Modality LUT Module (that applies to a Referenced Image) is defined in an IOD such as a Presentation State and if the Modality LUT attributes like Modality LUT Sequence (0028,3000), Rescale Intercept (0028,1052) or Rescale Slope (0028,1053) are not present, the Modality LUT stage of the grayscale pipeline (described in Section N.2 in PS3.4) is defined to be an identity transformation. Any Modality LUT or equivalent Attributes in the Referenced Image will not be used.

Modify C.11.8 as below

C.11.8 Softcopy VOI LUT Module

Table C.11.8-1 specifies the Attributes of the Softcopy VOI LUT Module, which describe the Softcopy VOI LUT. These Attributes have the same meaning and behavior as defined in the Section C.11.2 VOI LUT Module.

Note

If a VOI LUT (that applies to a Referenced Image) is not present, it is assumed to be an identity transformation. Any VOI LUT or equivalent values in the Referenced Image will not be used (described in Section N.2 in PS3.4).

Modify C.11.6 as below

C.11.6 Softcopy Presentation LUT Module

Table C.11.6-1 specifies the Attributes of the Softcopy Presentation LUT Module, which describe the Softcopy Presentation LUT.

Table C.11.6-1. Softcopy Presentation LUT Module Attributes

Attribute Name	Tag	Type	Attribute Description
Presentation LUT Sequence	(2050,0010)	1C	Defines a Sequence of Presentation LUTs. Only a single Item shall be included in this Sequence.

Attribute Name	Tag	Type	Attribute Description
			Required if Presentation LUT Shape (2050,0020) is absent.
>LUT Descriptor	(0028,3002)	1	Specifies the format of the LUT Data in this Sequence. See Section C.11.6.1.1 for further explanation.
>LUT Explanation	(0028,3003)	3	Free form text explanation of the meaning of the LUT.
>LUT Data	(0028,3006)	1	LUT Data in this Sequence.
Presentation LUT Shape	(2050,0020)	1C	Specifies predefined Presentation LUT transformation. Required if Presentation LUT Sequence (2050,0010) is absent. Enumerated Values: **IDENTITY** no further translation necessary, input values are P-Values **INVERSE** output values after inversion are P-Values See Section C.11.6.1.2.

Note

This Module differs from the Presentation LUT Module used in the hardcopy (print) related SOP Classes in that Optical Density is not supported for Presentation LUT Shape (since Optical Density has no meaning for softcopy display devices).

For more information regarding the Presentation LUT operation, see Section N.2 in PS3.4.