



**SUPPLEMENT 23 I**

# **VARIABLE MODALITY LUT SOFTCOPY PRESENTATION STATE**

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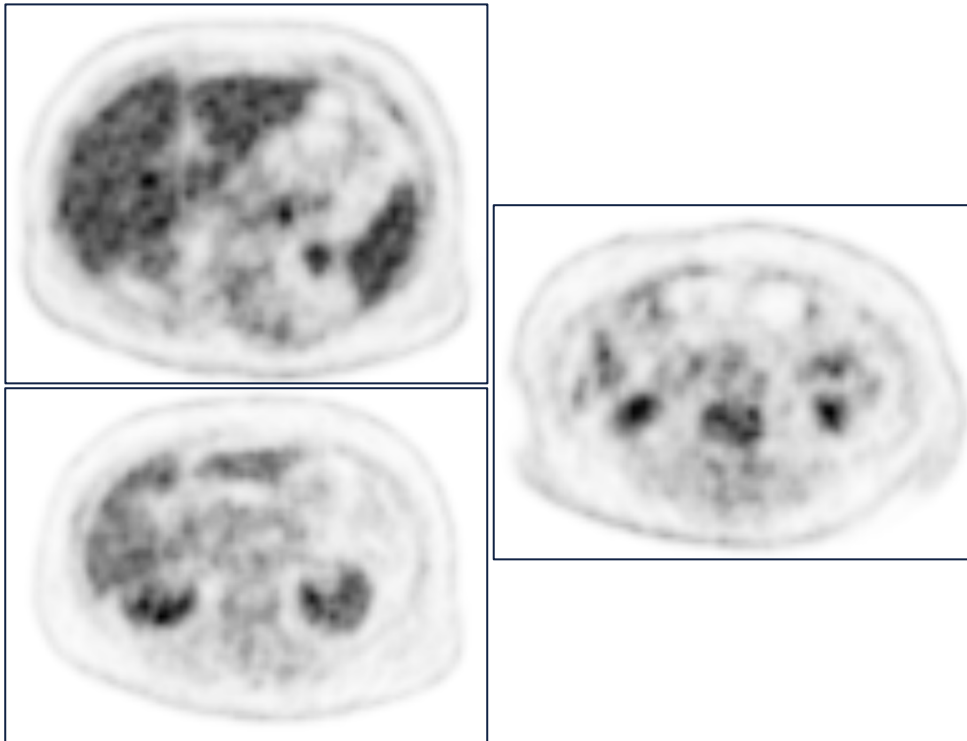
# INTRODUCTION / SCOPE

- PS3.4 N.2.1.1 requires the per image Modality LUT be ignored in the presence of a GSPS object.
- When the dynamic range varies between images, the GSPS creator is forced to render a GSPS object for each image.
- This supplement defines a new SOP Class that allows presentation control of the Modality LUT for each image or frame
- This SOP class may be used for presentation control of output grayscale space or output pseudo-color space.
- See also related discussion: <https://groups.google.com/g/comp.protocols.dicom/c/Nh6gFWHvebg?pli=1>

# PART 4 CONSISTENCY

- PS3.4 N.2 requires either
  - Modality LUT in the image be ignored in the presence of Modality LUT in a GSPS object
  - Modality LUT in the image be ignored in the absence of Modality LUT in a GSPS object
- Either way, the Presentation State Pipeline requires a Modality LUT transformation.
- To avoid breaking the Presentation State Pipeline, a Variable Modality LUT Module had been added with a Modality LUT sequence that allows multiple items (like the Softcopy VOI LUT Module )

# EXAMPLE

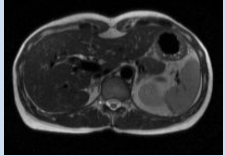


- PET dynamic range varies per image based on tracer concentration, resulting in a varying per-image rescale slope.
- Variable Modality LUT Softcopy Presentation State enables a single object for presentation control.

# EXAMPLE

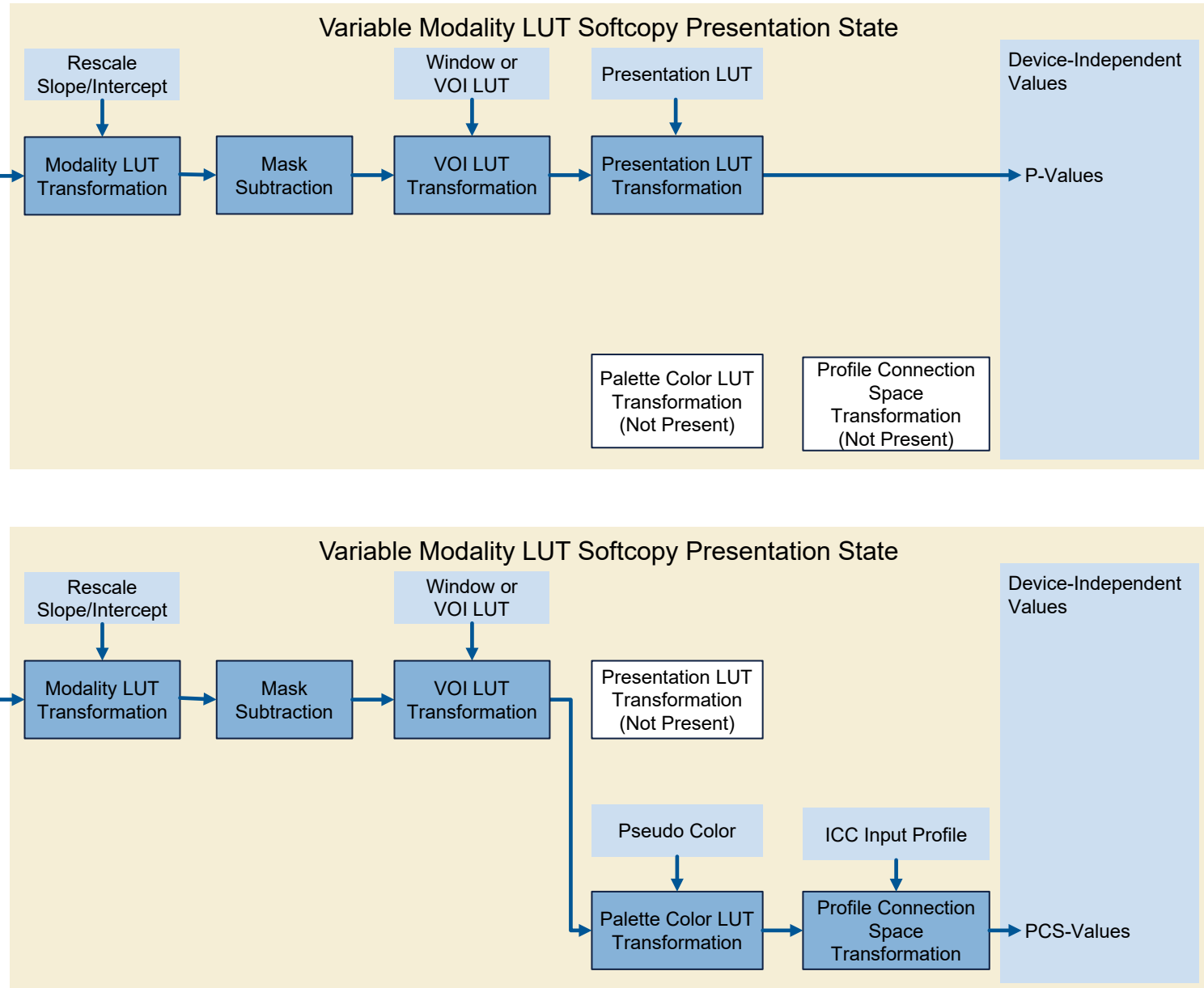
## Grayscale Transformations to a Pseudo-color Reference Image

Referenced Image



(0028,1052) Rescale Intercept = 0  
(0028,1053) Rescale Slope = varies  
(0028,1054) Rescale Type = US  
(0028,0004) Photometric Interpretation: PALETTE COLOR  
(0008,9205) Pixel Presentation: COLOR  
Supplemental Palette Color Lookup Table Module = present  
ICC Profile Module = present

## Pseudo-color Transformations to a Pseudo-color Reference Image

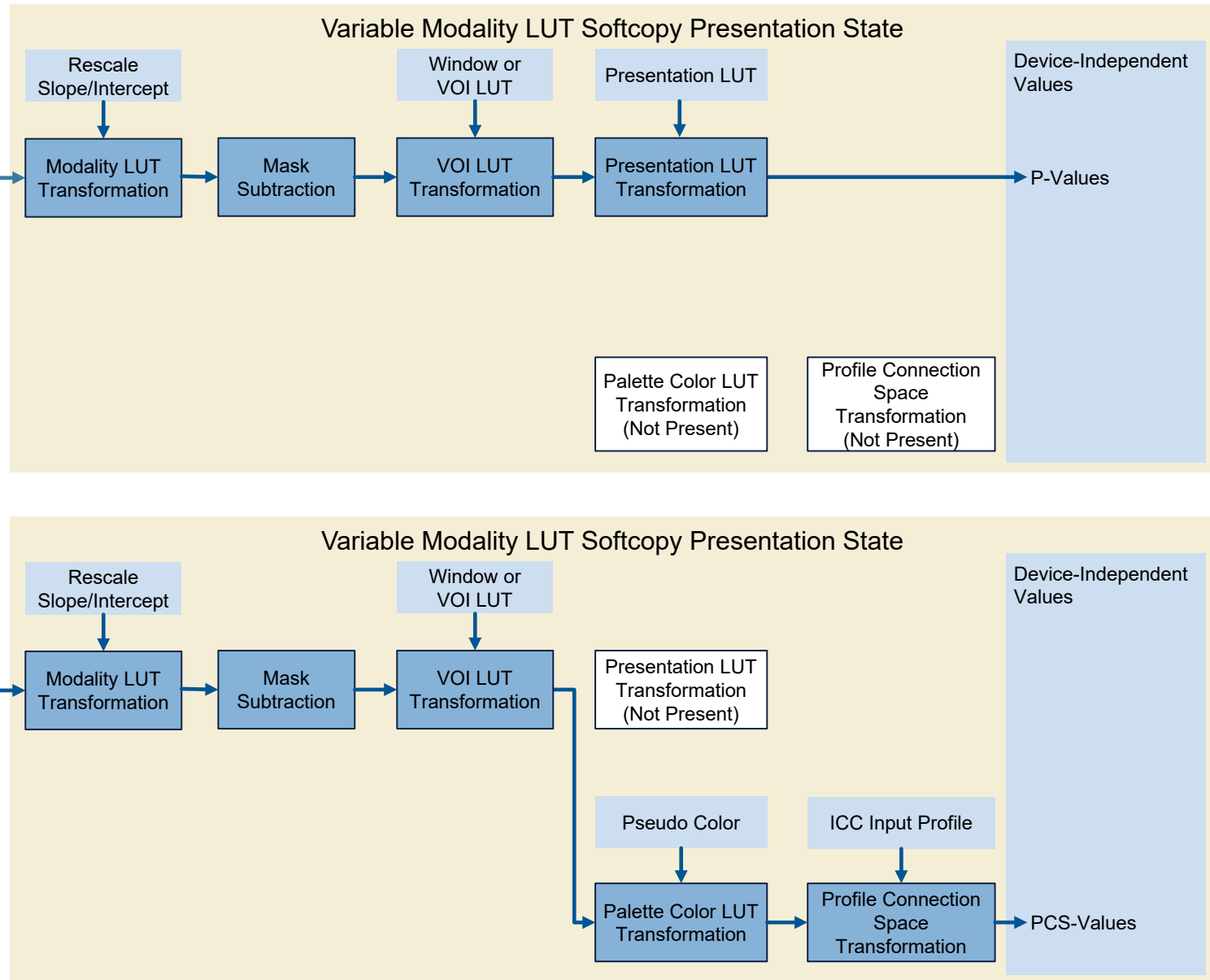


# EXAMPLE

Grayscale Transformations to a Grayscale Reference Image



Pseudo-color Transformations to a Grayscale Reference Image



# CLOSED ITEMS

1. What is an appropriate name for the SOP class presented in this Supplement?  
**Response:**  
SOP Class = Variable Modality LUT Softcopy Presentation State  
Module = Variable Modality LUT Module  
Sequence = Variable Modality LUT Sequence
2. In GSPS, Spatial Transformations apply to all referenced images. Is there interest in including selective and/or multiple spatial transformations (i.e. flip and rotate) in this SOP class?  
**Response:** There is interest, however, WG-06 prefers to not to include selective spatial transformations in the scope of this supplement, as selective/multiple spatial transformations are not related to Modality LUT transformations. Spatial Transformations will be included as they are in the Grayscale Softcopy Presentation State and Pseudo-Color Softcopy Presentation State
3. Should there be a Corresponding Pseudo-Color Softcopy Presentation State? Public comment is sought on this.  
**Response:** Public comment confirms the need for a Pseudo-Color Softcopy option, which has been integrated into this supplement.
  1. Added the Palette Color LUT and ICC Profile modules
  2. Changed the Palette Color LUT, ICC Profile and Softcopy Presentation LUT to conditional
  3. Rename to: “Variable Modality LUT Softcopy Presentation State”
  4. Changes to Part 3 (IOD description) and Part 4 (N.2).

# CHECKLIST ITEMS

- PowerPoint overview - clear/complete for all stages [this](#)
- Open/closed issues - Clear/complete for PC, All closed for LB, All gone for FT [closed for LB](#)
- Add new attributes to Part 15 Annex E (de-identification) as appropriate [NA, only 1 new sequence referencing existing sequences and macros](#)
- Verify content item constraints (Part 16?) [NA](#)
- Confirm PS3.2 has obvious place to record any “shall describe in Conformance Statement” [NA - Conformance requirements for “Softcopy Presentation State Storage” is in Part 4](#)
- Part 18 Annex H [NA](#)
- Update Part 3 Annex F with directory record entries for new IODs [NA \(see F.5.23 Presentation State Directory Record Definition\)](#)