

HIMMS and RSNA

IHE

Integrating the Healthcare Enterprise

Display Consistency Test Plan for Image Displays

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1 Introduction

This document is intended for those vendors participating in the IHE demonstration which will supply one or more Image Display Actors as defined in the IHE Technical Framework. This document specifies a number of test cases which allow to assess:

- whether the Image Display is correctly calibrated to the DICOM Grayscale Standard Display Function (GSDF) [1] as required by the Technical Framework,
- whether the display of a set of test images (without presentation states) leads to the expected results, and
- whether the display of a set of test images with presentation states leads to the expected results.

Section 2 describes prerequisites of this test plan, how to set up and perform the test cases, and how to use the Excel spreadsheet that is used to assess the measured results from many of the test cases.

Section 3 is a form to be filled in with the Image Display's test results. If an Image Display application can be operated in different modes that exhibit different behavior, the tests should be run for each mode of operation, and multiple copies of the form in section 3 should be filled in.

You are required to submit the completed form in Section 3 to the project management team.

Please submit via email (preferably) or FAX to:

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Email: maffitd@mir.wustl.edu

Fax: 314-362-6971

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1.1 Acknowledgements

We would like to thank David Clunie (dclunie@dclunie.com) for preparing and providing a set of test images and presentation states. These DICOM images and presentation states were used to create most test cases in section 3.4. The original package can be downloaded from <ftp://medical.nema.org/medical/dicom/rsnademos/display/>.

Since its initial release in 2000, many people have contributed to this test suite by reporting bugs or even providing bug fixes and new test cases (in alphabetical order):

- Jan-Pieter Diender, GEMS IT Applicare (reported bug in “spat” cases)
- Dave Harvey, Medical Connections (reported bug in “disa” cases and small inconsistencies in various test cases)
- Sebastian Hauer, TIANI MedGraph (provided new “spat” cases)
- Gunter Zeilinger, TIANI MedGraph (reported bug in “mlut” cases)

2 Test Procedure for Image Displays

2.1 Prerequisites

The following items are required for performance of the Test Plan:

- a) *Photometer* for measuring the luminance of a softcopy display device and the luminance contribution from reflected ambient light. Suitable devices for this purpose are identified in a separate document entitled “Calibration Tools”. It should be noted that this Test Plan is based on the international system of units (SI). Therefore, luminance measurements in candela per square meter (cd/m^2) are required.
- b) *Image Display Test Cases* consisting of a number of images and presentation states that will be displayed during the execution of the test plan. These are provided as part of the IHE Y2 MESA tools distribution. Note that a small gray ramp has been added to the lower border of most images. This prevents applications from masquerading the test results by computing an automatic VOI window.
- c) *Microsoft Excel 97 Spreadsheet “gsdf_lum.xls”*. This spreadsheet is explained in section 3.4. Also provided as part of the IHE Y2 MESA tools distribution.

2.2 Testing the GSDF Calibration of an Image Display Actor

The *Image Display Test Cases* contain a set of 17 DICOM secondary capture images (512*512 pixel resolution, 8 bits/pixel depth) intended for an assessment of the correct GSDF calibration of a display system. These images are part of the Image Display Test Cases and can be identified by the filenames “ddl_01.dcm” to “ddl_17.dcm”. Each image shows a single box of gray as described in DICOM Part 14 [1]: the measurement field is centered and has a size of 10% of the total number of image pixels (162*162), the background is uniform with a luminance of 20% of the maximum luminance (corresponds to 50% gray). Figure 1 shows one of the test images – the image number referenced by the Excel form (“measured DDL #”) is also displayed in the top left-hand corner.

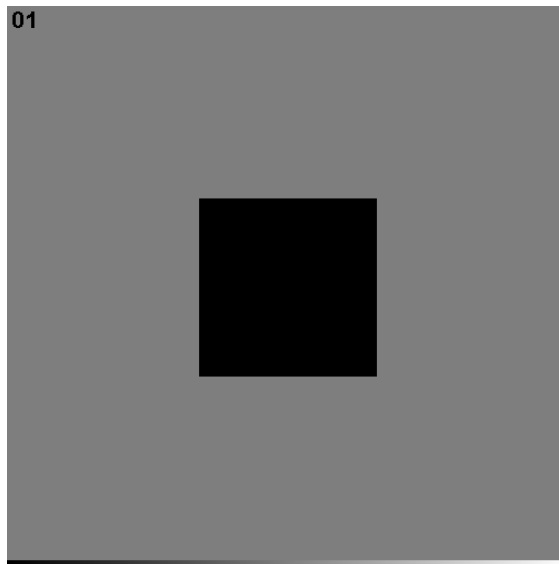


Figure 1: Test image with measurement field

The Excel file “gsdf_lum.xls” contains two tables: the first table is used to enter the measured luminance values and some administrative data, the second one is automatically filled and used for printing the results. Figure 2 shows the “Input” table – the sheet is protected and only the blue fields can be modified.

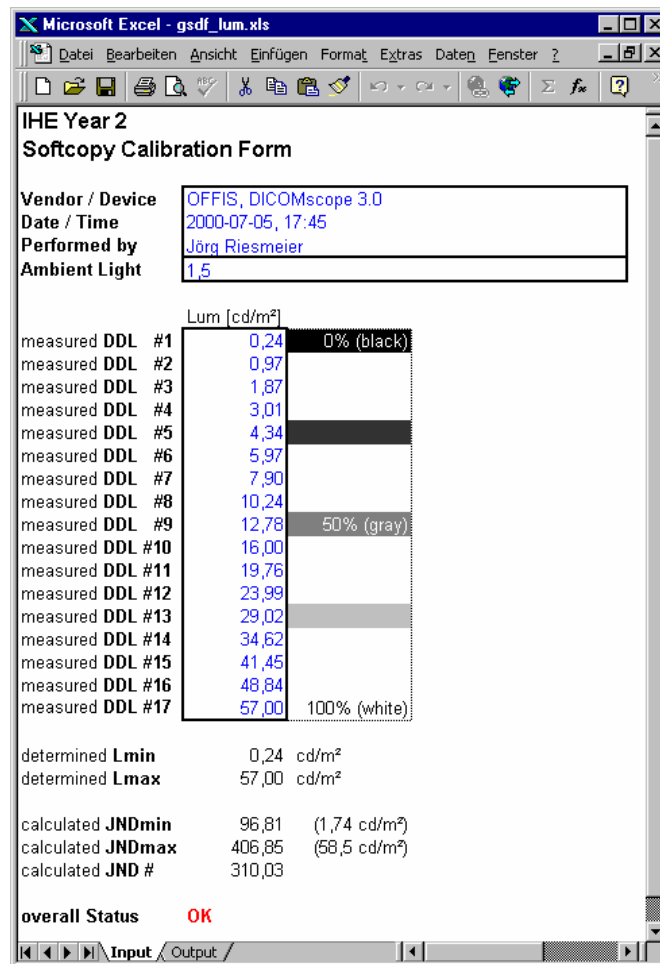


Figure 2: “Input” table of the Excel file for softcopy calibration

Note: The Excel file contains macros which are required for perfect operation, i. e. they should be activated if the user is asked by the application.

2.2.1 Open Excel File and Fill Administrative Data

First you should open the Excel file “gsdf_lum.xls” (activate macros if a requesting dialog appears) and enter the administrative data: Vendor / Device, Date / Time, Performed by.

2.2.2 Load Images, Measure Boxes and Enter Results

Start the DICOM viewer application you want to check for correct GSDF implementation and load the first test image “ddl_01.dcm”. It is very important that the full range of 256 shades of gray is used to display the image. Therefore, the VOI window 128/256 (center/width) is stored in the file (assuming that the VOI LUT transformation has been implemented according to the DICOM standard, PS3.3 [2] section C.11). Additionally, all 256 shades of

gray are used in the gray ramp at the lower end of the image to support viewers which are ignoring the stored settings and initially using an automatically computed window. However, if the viewer does not use the full range of grayscale values, please, make sure that you change the VOI window manually before measuring.

In order to correspond with the instructions contained in DICOM Part 14 the image should be scaled to fit the full screen and the measurement field (gray box) should be on the center of the screen. Then the luminance meter should be used according to the description shipped with the device. The measured value (in cd/m^2) should be entered into the corresponding field in the Excel “Input” table (e. g. “measured DDL #1” for the first image “ddl_001.dcm”). Please also compare the number displayed in the top left-hand corner to avoid mistakes.

The same procedure has to be performed for the other 16 test images. After all 17 measured values have been entered the “overall Status” should be “OK”. Otherwise you have most likely made a mistake.

Depending on the calibration tool the ambient light is measured separately. In this case you need to enter the measured ambient light in the field below the administrative data. Please note that the measurement unit is also candela per square meter.

2.2.3 Print “Output” Page and Assess Deviation from GSDF

After successfully measuring and entering the data the „Output“ page shows the result (see Figure 3).

This page can be printed on standard paper. Since all necessary information is contained on this page there is no need to print the “Input” table.

The table below the administrative data shows the measured luminance values versus the GSDF and the deviation from the standard curve (absolute and percentage values as well as the mean difference and the standard deviation). Unfortunately, no precise formula for an assessment of the deviation can be given. Obviously, deviation from the GSDF should be as small as possible and in any case below 20%. In addition, the curve should be “smooth” and should not show any steps. This is the reason why both curves are shown in a diagram (where the luminance is logarithmically scaled). The 17 measured values are interpolated by a built-in algorithm – though, this has no influence on the original data presented in the table.

**IHE Year 2
Softcopy Calibration Form**

Vendor / Device: OFFIS, DICOMscope 3.0
Date / Time: 2000-07-05, 17:45
Performed by: Jörg Riesmeier
Ambient Light: 1,5

#	DDL	Measured*	GSDf	Difference	
1	0	1,74	1,74	0,00	0%
2	16	2,47	2,49	-0,02	-1%
3	32	3,37	3,43	-0,06	-2%
4	48	4,51	4,59	-0,08	-2%
5	64	5,84	5,98	-0,14	-2%
6	80	7,47	7,65	-0,18	-2%
7	96	9,40	9,63	-0,23	-2%
8	112	11,74	11,96	-0,22	-2%
9	128	14,28	14,69	-0,41	-3%
10	144	17,50	17,87	-0,37	-2%
11	160	21,26	21,57	-0,31	-1%
12	176	25,49	25,85	-0,36	-1%
13	192	30,52	30,79	-0,27	-1%
14	208	36,12	36,47	-0,35	-1%
15	224	42,95	43,00	-0,05	0%
16	240	50,34	50,49	-0,15	0%
17	255	58,50	58,49	0,01	0%
Mean:				-0,19	-1%
Std. Dev.:				0,14	1%

* including Ambient Light

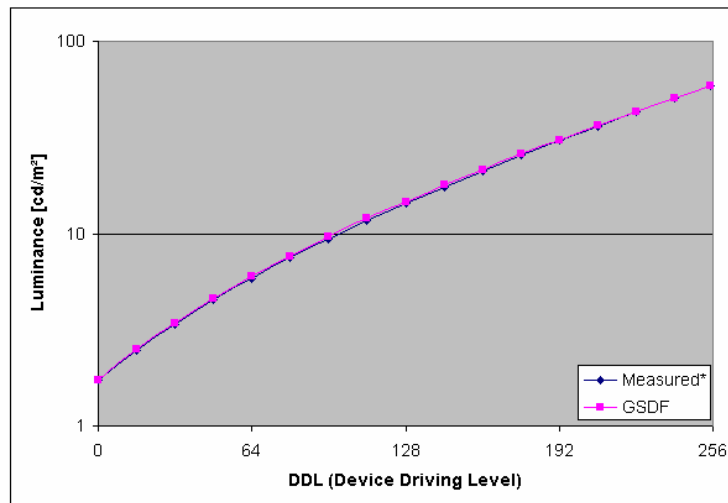


Figure 3: Printed “Output” table of the Excel file for softcopy calibration

2.3 Testing Image Display without Presentation States

This section describes a set of tests for Image Display without Presentation States. Each test consists of an image (“*.dcm”) which should be displayed by the Image Display Actor, a description of the relevant attributes in the Image IOD and a description of the correct resulting display for evaluation purposes.

2.3.1 Modality LUT

This subsection contains tests for the Modality LUT transformation.

Test MLUT_01	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation MONOCHROME2, Rescale Slope 1, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_02 has been removed.

Test MLUT_03	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range 0 to +4095, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, Rescale Slope 1, Rescale Intercept -128
Result	Display should be a normal SMPTE pattern

Test MLUT_04	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range 0 to +4095, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, Rescale Slope 1, Rescale Intercept -1024
Result	Display should be a normal SMPTE pattern

Test MLUT_05	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, high bits 1, Pixel Range 0 to +4095, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, Rescale Slope 1, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_06	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, high bits 1, Pixel Range 0 to +4095, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, Rescale Slope 1, Rescale Intercept -1024
Result	Display should be a normal SMPTE pattern

Test MLUT_07	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 15, Pixel Range 0 to +32767, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, Rescale Slope 1, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_08	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 15, Pixel Range 0 to +32767, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, Rescale Slope 1, Rescale Intercept -1024
Result	Display should be a normal SMPTE pattern

Test MLUT_09	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 16, Pixel Range 0 to +65535, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, Rescale Slope 1, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_10 has been removed.

Test MLUT_11	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, Rescale Slope 1, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_12	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, Rescale Slope 1, Rescale Intercept -1024
Result	Display should be a normal SMPTE pattern

Test MLUT_13	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 16, Pixel Range -32768 to +32767, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTS
Result	Display should be a normal SMPTE pattern

Test MLUT_14	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 16, Pixel Range -32768 to +32767, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, Rescale Slope 1, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_15 has been removed.

Test MLUT_16	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 16, Pixel Range -32768 to +32767, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, Rescale Slope 0.5, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_17 has been removed.

Test MLUT_18	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, Modality LUT Sequence with LUT Descriptor 4096\63488\16, linear LUT value 0 up to 65535 with increment +16
Result	Display should be a normal SMPTE pattern

Test MLUT_19	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME1 (inverted), Modality LUT Sequence with LUT Descriptor 4096\63488\16, linear LUT value 65535 down to 0 with increment -16
Result	Display should be a normal SMPTE pattern

2.3.2 VOI LUT

This subsection contains tests for the VOI LUT transformation. Though presentation states are not part of the tests in this section it is expected that the VOI LUT transformation is implemented according to the DICOM standard, PS3.3 [2] section C.11.

Test VLUT_01	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
Result	Display should be a normal SMPTE pattern

Test VLUT_02	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, Window Center = $2^{(\text{Bits Stored}-1)}$, Window Width = $2^{\text{Bits Stored}}$, i. e. 128/256, i. e. identity
Result	Display should be a normal SMPTE pattern

Test Vlut_03	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range +25 to +75, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, Window Center = 50.5, Window Width = 51
Result	Display should be a normal SMPTE pattern

Test Vlut_04	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, VOI LUT Sequence with LUT Descriptor 256\0\16, linear LUT value 0 up to 65535 with increment +257
Result	Display should be a normal SMPTE pattern

Test Vlut_05	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME1 (inverted), VOI LUT Sequence with LUT Descriptor 256\0\16, linear LUT value 65535 down to 0 with increment -257
Result	Display should be a normal SMPTE pattern

Test Vlut_06	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2
Result	Display should be a normal SMPTE pattern

Test Vlut_07	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs; Window Center = 0, Window Width = 4096, i. e. identity
Result	Display should be a normal SMPTE pattern

Test Vlut_08	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range 25 to +74, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, Window Center = 50, Window Width = 50
Result	Display should be a normal SMPTE pattern

Test VLUT_09	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, VOI LUT Sequence with LUT Descriptor 4096\63488\16, linear LUT value 0 up to 65535 with increment +16
Result	Display should be a normal SMPTE pattern

Test VLUT_10	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, VOI LUT Sequence with LUT Descriptor 4096\06344\16, linear LUT value 65535 down to 0 with increment -16
Result	Display should be a normal SMPTE pattern

Test VLUT_11	
Image	SC image with two gray ramps (with 256/16 shades of gray), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +256, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, 9 different Window Center and Width settings (128/256, 128/1, 128/16, 64/16, 128/32, 32/64, 218/96, 48/96, 128/128)
Result	Lower part of the image should display as many different gray boxes as indicated in the corresponding Window Center and Width Explanation (full range, black and white, 2 gray boxes, 3 gray boxes, 4 gray boxes, 5 gray boxes, 6 gray boxes, 7 gray boxes, 10 gray boxes). NB: If the grayscale correction according to the GSDF is done "in software" it might happen that the number of visible gray boxes differs from that specified above. When using DICOMscope the corection should be switched off in this case.

2.3.3 Modality / VOI LUTs

This subsection contains combined tests for Modality and VOI LUT.

Test XLUT_01	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 128 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, Rescale Slope 2, Rescale Intercept -128, Window Center = 255.5, Window Width = 255
Result	Display should be a normal SMPTE pattern

Test XLUT_02	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 16, Pixel Range 1024 to +65535, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, Rescale Slope 0.125, Rescale Intercept -1024, Window Center = 3136, Window Width = 8064
Result	Display should be a normal SMPTE pattern

2.4 Testing Image Display with Presentation States

This section describes a set of tests for Image Display with Presentation States. Each test consists of an Image (“*.dcm”) and a Presentation State (“*.pre”) which should be displayed by the Image Display Actor (i. e. the presentation state should be applied to the image). For both a description of the relevant attributes is listed as well as a description of the correct resulting display for evaluation purposes.

For some of the test cases a result image (“*.res”) is provided in order to facilitate the decision whether an implementation is correct or not. However, this does not imply that the rendered output has to match *exactly* to be standard compliant (deviations might result from different fonts, divergent visualization of graphic annotations, etc.)

2.4.1 Modality LUT

This subsection contains tests for the Modality LUT transformation.

Test MLUT_P01	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation MONOCHROME2, no LUTs
PState	Rescale Slope 1, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_P02 has been removed.

Test MLUT_P03	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range 0 to +4095, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Rescale Slope 1, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_P04	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range 0 to +4095, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Rescale Slope 1, Rescale Intercept -1024
Result	Display should be a normal SMPTE pattern

Test MLUT_P05	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, high bits 1, Pixel Range 0 to +4095, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Rescale Slope 1, Rescale Intercept 0

Result	Display should be a normal SMPTE pattern
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Test MLUT_P06	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, high bits 1, Pixel Range 0 to +4095, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Rescale Slope 1, Rescale Intercept -1024
Result	Display should be a normal SMPTE pattern

Test MLUT_P07	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 15, Pixel Range 0 to +32767, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Rescale Slope 1, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_P08	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 15, Pixel Range 0 to +32767, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Rescale Slope 1, Rescale Intercept -1024
Result	Display should be a normal SMPTE pattern

Test MLUT_P09	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 16, Pixel Range 0 to +65535, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Rescale Slope 1, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_P10 has been removed.

Test MLUT_P11	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Rescale Slope 1, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_P12	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Rescale Slope 1, Rescale Intercept -1024
Result	Display should be a normal SMPTE pattern

Test MLUT_P13	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 16, Pixel Range -32768 to +32767, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	No LUTS
Result	Display should be a normal SMPTE pattern

Test MLUT_P14	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 16, Pixel Range -32768 to +32767, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Rescale Slope 1, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_P15 has been removed.

Test MLUT_P16	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 16, Pixel Range -32768 to +32767, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Rescale Slope 0.5, Rescale Intercept 0
Result	Display should be a normal SMPTE pattern

Test MLUT_P17 has been removed.

Test MLUT_P18	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Modality LUT Sequence with LUT Descriptor 4096\63488\16, linear LUT value 0 up to 65535 with increment +16
Result	Display should be a normal SMPTE pattern

Test MLUT_P19	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME1 (inverted), no LUTs
PState	Modality LUT Sequence with LUT Descriptor 4096\63488\16, linear LUT value 65535 down to 0 with increment -16
Result	Display should be a normal SMPTE pattern

Test MLUT_P20 has been removed.

Test MLUT_P21 has been removed.

2.4.2 VOI LUT

This subsection contains tests for the VOI LUT transformation.

Test VLUT_P01	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	No LUT
Result	Display should be a normal SMPTE pattern

Test VLUT_P02	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Window Center = $2^{(\text{Bits Stored}-1)}$, Window Width = $2^{\text{Bits Stored}}$, i. e. 128/256, i. e. identity
Result	Display should be a normal SMPTE pattern

Test VLUT_P03	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range +25 to +75, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Window Center = 50.5, Window Width = 51
Result	Display should be a normal SMPTE pattern

Test VLUT_P04	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	VOI LUT Sequence with LUT Descriptor 256\0\16, linear LUT value 0 up to 65535 with

	increment +257
Result	Display should be a normal SMPTE pattern

Test VLUT_P05	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME1 (inverted), no LUTs
PState	VOI LUT Sequence with LUT Descriptor 256\0\16, linear LUT value 65535 down to 0 with increment -257
Result	Display should be a normal SMPTE pattern

Test VLUT_P06	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	absent ... default VOI LUT to identity
Result	Display should be a normal SMPTE pattern

Test VLUT_P07	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Window Center = 0, Window Width = 4096, i. e. identity
Result	Display should be a normal SMPTE pattern

Test VLUT_P08	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range 25 to +74, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Window Center = 50, Window Width = 50
Result	Display should be a normal SMPTE pattern

Test VLUT_P09	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	VOI LUT Sequence with LUT Descriptor 4096\63488\16, linear LUT value 0 up to 65535 with increment +16
Result	Display should be a normal SMPTE pattern

Test Vlut_P10	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	VOI LUT Sequence with LUT Descriptor 4096\63488\16, linear LUT value 65535 down to 0 with increment -16
Result	Display should be a normal SMPTE pattern

Test Vlut_P11	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range +25 to +75, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, inappropriate VOI LUT transform (Window Center 128, Window Width 256)
PState	Appropriate VOI LUT transform (Window Center = 50.5, Window Width = 51)
Result	Display should be a normal SMPTE pattern

Test Vlut_P12	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to 255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, inappropriate VOI LUT transform (Window Center 0, Window Width 128), requiring identity VOI LUT transform
PState	VOI LUT transform not specified so assumed identity
Result	Display should be a normal SMPTE pattern

2.4.3 Presentation LUT

This subsection contains tests for the Presentation LUT transformation.

Test PLUT_P01	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation LUT Shape = IDENTITY
Result	Display should be a normal SMPTE pattern

Test PLUT_P02	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation LUT Shape = INVERSE
Result	Display should be a normal SMPTE pattern

Test PLUT_P03	
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Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation LUT Shape = IDENTITY
Result	Display should be a normal SMPTE pattern

Test PLUT_P04	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME1 (inverted), no LUTs
PState	Presentation LUT Shape = INVERSE
Result	Display should be a normal SMPTE pattern

Test PLUT_P05	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation LUT Sequence with LUT Descriptor 256\0\10, linear LUT value 0 up to 1023 with increment +4
Result	Display should be a normal SMPTE pattern

Test PLUT_P06	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME1 (inverted), no LUTs
PState	Presentation LUT Sequence with LUT Descriptor 256\0\10, linear LUT value 1023 down to 0 with increment -4
Result	Display should be a normal SMPTE pattern

Test PLUT_P07	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation LUT Sequence with LUT Descriptor 4096\63488\16, linear LUT value 0 up to 65535 with increment +16
Result	Display should be a normal SMPTE pattern

Test PLUT_P08	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation LUT Sequence with LUT Descriptor 4096\63488\8, linear LUT value 0 up to 255
Result	Display should be a normal SMPTE pattern

Test PLUT_P09	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, inappropriate Presentation LUT transform (Presentation LUT Shape = INVERSE)
PState	Appropriate Presentation LUT transform (Presentation LUT Shape = IDENTITY)
Result	Display should be a normal SMPTE pattern

2.4.4 Modality / VOI / Presentation LUTs

This subsection contains combined tests for the different LUTs (Modality LUT, VOI LUT, Presentation LUT) in the DICOM transformation pipeline.

Test XLUT_P01	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is MONOCHROME1 (inverted) , no LUTs
PState	Modality LUT Sequence with LUT Descriptor 4096\63488\12, linear LUT value 4095 down to 0 with increment -1; VOI LUT Sequence with LUT Descriptor 4096\0\12, linear LUT value 4095 down to 0 with increment -1; Presentation LUT Sequence with LUT Descriptor 256\0\10, linear LUT value 1023 down to 0 with increment -4
Result	Display should be a normal SMPTE pattern

Test XLUT_P02	
Image	SC image with SMPTE pattern, Bits Allocated 16, Bits Stored 12, Pixel Range -2048 to +2047, Pixel Representation is signed, Photometric Interpretation is monochrom2 , no LUTs
PState	Rescale Slope -2, Rescale Intercept -1; Window Center 0, Window Width 8192; Presentation LUT Shape INVERSE
Result	Display should be a normal SMPTE pattern

Test XLUT_P03	
Image	SC image with two gray ramps (with 256/16 shades of gray), pixel data scrambled by the inverse of the three LUTs stored in the presentation state
PState	Modality LUT Sequence with LUT Descriptor 256\0\8, scrambled LUT data; VOI LUT Sequence with LUT Descriptor 256\0\8, scrambled LUT data; Presentation LUT Sequence with LUT Descriptor 256\0\8, scrambled LUT data
Result	Result on display should look like “xlut_p03.res”

2.4.5 Spatial Transformation

This subsection contains tests for the following spatial transformations: rotation and horizontal flip.

Note: most of these test cases are not displayed correctly with the current release of DICOMscope (version 3.5.1). This “bug” will probably be fixed in a future release of the application (see DICOM CP 287 for details).

Test SPAT_P01	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Image Rotation 0, Image Horizontal Flip N
Result	Display should be a normally oriented SMPTE pattern

Test SPAT_P02	
Image	SC image with SMPTE pattern (rotation 270 degree CW), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Image Rotation 90, Image Horizontal Flip N
Result	Display should be a normally oriented SMPTE pattern

Test SPAT_P03	
Image	SC image with SMPTE pattern (rotation 180 degree CW), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Image Rotation 180, Image Horizontal Flip N
Result	Display should be a normally oriented SMPTE pattern

Test SPAT_P04	
Image	SC image with SMPTE pattern (rotation 90 degree CW), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Image Rotation 270, Image Horizontal Flip N

Result	Display should be a normally oriented SMPTE pattern
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Test SPAT_P05	
Image	SC image with SMPTE pattern (horizontal flipped), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Image Rotation 0, Image Horizontal Flip Y
Result	Display should be a normally oriented SMPTE pattern

Test SPAT_P06	
Image	SC image with SMPTE pattern (horizontal flipped and rotation 270 degrees CW), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Image Rotation 90, Image Horizontal Flip Y
Result	Display should be a normally oriented SMPTE pattern

Test SPAT_P07	
Image	SC image with SMPTE pattern (horizontal flipped and rotation 180 degrees CW), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Image Rotation 180, Image Horizontal Flip Y
Result	Display should be a normally oriented SMPTE pattern

Test SPAT_P08	
Image	SC image with SMPTE pattern (horizontal flipped and rotation 90 degrees CW), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Image Rotation 270, Image Horizontal Flip Y
Result	Display should be a normally oriented SMPTE pattern

Test SPAT_P09	
Image	SC image (Columns 1024, Rows 1024) with 512*512 SMPTE pattern (rotation 270 degree CW), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1024, Displayed Area Bottom Right Hand Corner 512\513, Presentation Pixel Aspect Ratio 1\1, Image Rotation 90, Image Horizontal Flip N
Result	Display should be a normally oriented SMPTE pattern

Test SPAT_P10	
Image	SC image (Columns 1024, Rows 1024) with 512*512 SMPTE pattern (rotation 180 degree CW), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 512\1024, Displayed Area Bottom Right Hand Corner 1\513, Presentation Pixel Aspect Ratio 1\1, Image Rotation 180, Image Horizontal Flip N
Result	Display should be a normally oriented SMPTE pattern

Test SPAT_P11	
Image	SC image (Columns 1024, Rows 1024) with 512*512 SMPTE pattern (rotation 90 degree CW), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 512\513, Displayed Area Bottom Right Hand Corner 1\1024, Presentation Pixel Aspect Ratio 1\1, Image Rotation 270, Image Horizontal Flip N
Result	Display should be a normally oriented SMPTE pattern

Test SPAT_P12	
Image	SC image (Columns 1024, Rows 1024) with 512*512 SMPTE pattern (horizontal flipped), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 512\513, Displayed Area Bottom Right Hand Corner 1\1024, Presentation Pixel Aspect Ratio 1\1, Image Rotation 0, Image Horizontal Flip Y
Result	Display should be a normally oriented SMPTE pattern

Test SPAT_P13	
Image	SC image (Columns 1024, Rows 1024) with 512*512 SMPTE pattern (horizontal flipped and rotation 270 degrees CW), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\513, Displayed Area Bottom Right Hand Corner 512\1024, Presentation Pixel Aspect Ratio 1\1, Image Rotation 90, Image Horizontal Flip Y
Result	Display should be a normally oriented SMPTE pattern

Test SPAT_P14	
Image	SC image (Columns 1024, Rows 1024) with 512*512 SMPTE pattern (horizontal flipped and rotation 180 degrees CW), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1024, Displayed Area Bottom Right Hand Corner 512\513, Presentation Pixel Aspect Ratio 1\1, Image Rotation 180, Image Horizontal Flip Y
Result	Display should be a normally oriented SMPTE pattern

Test SPAT_P15	
Image	SC image (Columns 1024, Rows 1024) with 512*512 SMPTE pattern (horizontal flipped and rotation 90 degrees CW), Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 512\1024, Displayed Area Bottom Right Hand Corner 1\513, Presentation Pixel Aspect Ratio 1\1, Image Rotation 270, Image Horizontal Flip Y
Result	Display should be a normally oriented SMPTE pattern

2.4.6 Displayed Area

This subsection contains tests for the displayed area.

Test DISA_P01	
Image	SC image containing SMPTE pattern (centered), Columns 1280, Rows 900, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 385\195, Displayed Area Bottom Right Hand Corner 896\706, Presentation Pixel Aspect Ratio 1\1
Result	Display should be a normal SMPTE pattern (full screen)

Test DISA_P02	
Image	SC image containing SMPTE pattern (placed in bottom right-hand corner), Columns 1280, Rows 900, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 769\389, Displayed Area Bottom Right Hand Corner 1280\900, Presentation Pixel Aspect Ratio 1\1
Result	Display should be a normal SMPTE pattern (full screen)

Test DISA_P03	
Image	SC image containing SMPTE pattern (magnified by factor 2.0), Columns 1024, Rows 1024, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation Size Mode: MAGNIFY, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 1024\1024, Presentation Pixel Aspect Ratio 1\1, Presentation Pixel Magnification Ratio 0.5
Result	Display should be a normal SMPTE pattern (fixed size: 512*512 pixel)

Test DISA_P04	
Image	SC image containing SMPTE pattern (magnified by factor 2.0 and 3.0 respectively), Columns 1024, Rows 1536, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation Size Mode: TRUE SIZE, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 1024\1536, Presentation Pixel Spacing 0.1302083\0.1953125
Result	Display should be a normal SMPTE pattern (size: 200*200 mm)

Test DISA_P05	
Image	SC image containing SMPTE pattern (height magnified by factor 2.0), Columns 512, Rows 1024, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\1024, Presentation Pixel Aspect Ratio 1\2
Result	Display should be a normal SMPTE pattern (full screen)

2.4.7 Graphic Annotation

This subsection contains tests for all defined graphic types (ELLIPSE, INTERPOLATED, CIRCLE, POINT and POLYLINE).

Please note that the rendered output does not necessarily has to match *exactly* the associated result image in order to be standard compliant (e. g. it is not specified in the DICOM standard how to visualize a POINT or INTERPOLATED line).

Test GRAN_P01	
Image	SC black image
PState	Graphic Type: POLYLINE, Graphic Filled N, Graphic Data (128\256\192\128\320\128\384\256\320\384\192\384\128\256), Graphic Annotation Units PIXEL Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p02.res”

Test GRAN_P02	
Image	SC black image
PState	Graphic Type: POLYLINE, Graphic Filled Y, Graphic Data (128\256\192\128\320\128\384\256\320\384\192\384\128\256), Graphic Annotation Units PIXEL Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p02.res”

Test GRAN_P03	
Image	SC black image
PState	Graphic Type: POLYLINE, Graphic Filled N, Graphic Data (0.25\0.5\0.375\0.25\0.625\0.25\0.75\0.5\0.625\0.75\0.375\0.75\0.25\0.5), Graphic Annotation Units DISPLAY Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p03.res”

Test GRAN_P04	
Image	SC black image
PState	Graphic Type: POLYLINE, Graphic Filled Y, Graphic Data (0.25\0.5\0.375\0.25\0.625\0.25\0.75\0.5\0.625\0.75\0.375\0.75\0.25\0.5), Graphic Annotation Units DISPLAY Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p04.res”

Test GRAN_P05	
Image	SC black image
PState	Graphic Type: INTERPOLATED, Graphic Filled N, Graphic Data (128\256\192\128\320\128\384\256\320\384\192\384\128\256), Graphic Annotation Units PIXEL Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p05.res” (also see note above)

Test GRAN_P06	
Image	SC black image
PState	Graphic Type: INTERPOLATED, Graphic Filled Y, Graphic Data (128\256\192\128\320\128\384\256\320\384\192\384\128\256), Graphic Annotation Units PIXEL Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p06.res” (also see note above)

Test GRAN_P07	
Image	SC black image
PState	Graphic Type: INTERPOLATED, Graphic Filled N, Graphic Data (0.25\0.5\0.375\0.25\0.625\0.25\0.75\0.5\0.625\0.75\0.375\0.75\0.25\0.5), Graphic Annotation Units DISPLAY Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p07.res” (also see note above)

Test GRAN_P08	
Image	SC black image
PState	Graphic Type: INTERPOLATED, Graphic Filled Y, Graphic Data (0.25\0.5\0.375\0.25\0.625\0.25\0.75\0.5\0.625\0.75\0.375\0.75\0.25\0.5), Graphic Annotation Units DISPLAY Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p08.res” (also see note above)

Test GRAN_P09	
Image	SC black image
PState	Graphic Type: CIRCLE, Graphic Filled N, Graphic Data (256\256\384\256), Graphic Annotation Units PIXEL Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p09.res”

Test GRAN_P10	
Image	SC black image
PState	Graphic Type: CIRCLE, Graphic Filled Y, Graphic Data (256\256\384\256), Graphic Annotation Units PIXEL Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p10.res”

Test GRAN_P11	
Image	SC black image
PState	Graphic Type: CIRCLE, Graphic Filled N, Graphic Data (0.5\0.5\0.75\0.5), Graphic Annotation Units DISPLAY Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p11.res”

Test GRAN_P12	
Image	SC black image
PState	Graphic Type: CIRCLE, Graphic Filled N, Graphic Data (0.5\0.5\0.75\0.5), Graphic Annotation Units DISPLAY Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p12.res”

Test GRAN_P13	
Image	SC black image
PState	Graphic Type: ELLIPSE, Graphic Filled N, Graphic Data (128\256\384\256\256\192\256\320), Graphic Annotation Units PIXEL Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p13.res”

Test GRAN_P14	
Image	SC black image
PState	Graphic Type: ELLIPSE, Graphic Filled Y, Graphic Data (128\256\384\256\256\192\256\320), Graphic Annotation Units PIXEL Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p14.res”

Test GRAN_P15	
Image	SC black image
PState	Graphic Type: ELLIPSE, Graphic Filled N, Graphic Data (0.25\0.5\0.75\0.5\0.5\0.375\0.5\0.625), Graphic Annotation Units DISPLAY Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p15.res”

Test GRAN_P16	
Image	SC black image
PState	Graphic Type: ELLIPSE, Graphic Filled Y, Graphic Data (0.25\0.5\0.75\0.5\0.5\0.375\0.5\0.625), Graphic Annotation Units DISPLAY Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p16.res”

Test GRAN_P17	
Image	SC image with five circles (burnt into the pixel data)
PState	Graphic Type: POINT, Graphic Data (128\256, 256\128, 256\256, 256\384, 384\256), Graphic Annotation Units PIXEL Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p17.res”

Test GRAN_P18	
Image	SC image with five circles (burnt into the pixel data)
PState	Graphic Type: POINT, Graphic Data (0.25\0.5, 0.5\0.25, 0.5\0.5, 0.5\0.75, 0.75\0.5), Graphic Annotation Units DISPLAY Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “gran_p18.res”

2.4.8 Text Annotation

This subsection contains tests for textual annotations.

Please note that the rendered output does not necessarily has to match *exactly* the associated result image in order to be standard compliant (e. g. it is not specified in the DICOM standard whether or not and how to show the Bounding Box of a textual annotation; some of the following test cases do show the Bounding Box and some do not).

Test TEAN_P01	
Image	SC black image
PState	Bounding Box Annotation Units PIXEL, Unformatted Text Value “Text in bounding box of correct size”, Bounding Box Top Left Hand Corner 128\128, Bounding Box Bottom Right Hand Corner 320\144, Bounding Box Text Horizontal Justification LEFT Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_p01.res”

Test TEAN_P02	
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Image	SC black image
PState	Bounding Box Annotation Units DISPLAY, Unformatted Text Value “Text in bounding box of correct size”, Bounding Box Top Left Hand Corner 0.25\0.25, Bounding Box Bottom Right Hand Corner 0.625\0.28125, Bounding Box Text Horizontal Justification LEFT Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_p02.res”

Test TEAN_P03	
Image	SC black image
PState	Bounding Box Annotation Units PIXEL, Unformatted Text Value “Too much text too fit in bounding box which isn't very large ...”, Bounding Box Top Left Hand Corner 128\128, Bounding Box Bottom Right Hand Corner 320\144, Bounding Box Text Horizontal Justification LEFT Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_p03.res”

Test TEAN_P04	
Image	SC black image
PState	Bounding Box Annotation Units DISPLAY, Unformatted Text Value “Too much text too fit in bounding box which isn't very large ...”, Bounding Box Top Left Hand Corner 0.25\0.25, Bounding Box Bottom Right Hand Corner 0.625\0.28125 , Bounding Box Text Horizontal Justification LEFT Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_p04.res”

Test TEAN_P05	
Image	SC black image
PState	Bounding Box Annotation Units PIXEL, Unformatted Text Value “Text in bounding box of correct size”, Bounding Box Top Left Hand Corner 128\128, Bounding Box Bottom Right Hand Corner 320\144, Bounding Box Text Horizontal Justification LEFT, Anchor Point Annotation Units PIXEL, Anchor Point 384\256, Anchor Point Visibility N Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_p05.res”

Test TEAN_P06	
Image	SC black image
PState	Bounding Box Annotation Units DISPLAY, Unformatted Text Value “Text in bounding box of correct size”, Bounding Box Top Left Hand Corner 0.25\0.25, Bounding Box Bottom Right Hand Corner 0.625\0.28125, Bounding Box Text Horizontal Justification LEFT, Anchor Point Annotation Units DISPLAY, Anchor Point 0.75\0.5, Anchor Point Visibility N Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_p06.res”

Test TEAN_P07	
Image	SC black image
PState	Bounding Box Annotation Units PIXEL, Unformatted Text Value “Text in bounding box of correct size”, Bounding Box Top Left Hand Corner 128\128, Bounding Box Bottom Right Hand Corner 320\144, Bounding Box Text Horizontal Justification LEFT, Anchor Point Annotation Units PIXEL, Anchor Point 384\256, Anchor Point Visibility Y Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_07.res”

Test TEAN_P08	
Image	SC black image
PState	Bounding Box Annotation Units DISPLAY, Unformatted Text Value “Text in bounding box of correct size”, Bounding Box Top Left Hand Corner 0.25\0.25, Bounding Box Bottom Right Hand Corner 0.625\0.28125, Bounding Box Text Horizontal Justification LEFT, Anchor Point Annotation Units DISPLAY, Anchor Point 0.75\0.5, Anchor Point Visibility Y Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_p08.res”

Test TEAN_P09	
Image	SC black image
PState	Unformatted Text Value “Text with anchor point only”, Anchor Point Annotation Units PIXEL, Anchor Point 384\256, Anchor Point Visibility N Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_p09.res”

Test TEAN_P10	
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Image	SC black image
PState	Unformatted Text Value “Text with anchor point only”, Anchor Point Annotation Units DISPLAY, Anchor Point 0.75,0.5, Anchor Point Visibility N Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_p10.res”

Test TEAN_P11	
Image	SC black image
PState	Unformatted Text Value “Text with anchor point only”, Anchor Point Annotation Units PIXEL, Anchor Point 384\256, Anchor Point Visibility Y Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_p11.res”

Test TEAN_P12	
Image	SC black image
PState	Unformatted Text Value “Text with anchor point only”, Anchor Point Annotation Units DISPLAY, Anchor Point 0.75\0.5, Anchor Point Visibility Y Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_p12.res”

Test TEAN_P13	
Image	SC black image
PState	Unformatted Text Value “Left justified, display relative ...” (five lines), Bounding Box Annotation Units DISPLAY, Bounding Box 0.0\0.0 0.5\0.5, Bounding Box Text Horizontal Justification LEFT, Anchor Point Annotation Units PIXEL, Anchor Point 256\256, Anchor Point Visibility Y Unformatted Text Value “Right justified, display relative ...” (five lines), Bounding Box Annotation Units DISPLAY, Bounding Box 0.5\0.0 1.0\0.5, Bounding Box Text Horizontal Justification RIGHT, Anchor Point Annotation Units PIXEL, Anchor Point 256\256, Anchor Point Visibility Y Unformatted Text Value “Centered, image relative text.”, Bounding Box Annotation Units PIXEL, Bounding Box 128\256 384\512, Bounding Box Text Horizontal Justification CENTER Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_p13.res”

Test TEAN_P14	
Image	SC black image
PState	Unformatted Text Value “Normal text at the upper border.” (Bounding Box 1\1, 512\256), “Up-side down text at the lower border.” (512\512, 1\256), “Left rotated text at the left border.” (1\512, 256\1), “Right rotated text at the right border.” (512\1, 256\512); Anchor Point Annotation Units PIXEL, Bounding Box Text Horizontal Justification LEFT Presentation Size Mode: SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1
Result	Result on display should look like “tean_p14.res”

2.4.9 Display Shutter

This subsection contains tests for display shutters. Please note that the shutters do not always exactly match the graphical forms in the images. This is because of different algorithms for drawing circles, lines, etc. and deviations cannot be avoided.

Test DISH_P01	
Image	SC image
PState	Shutter Shape CIRCULAR, Shutter Presentation Value 0 (black), Center of Circular Shutter 256\256, Radius of Circular Shutter 128
Result	Result on display should look like “dish_p01.res”

Test DISH_P02	
Image	SC image
PState	Shutter Shape CIRCULAR, Shutter Presentation Value 65535 (white), Center of Circular Shutter 256\256, Radius of Circular Shutter 128
Result	Result on display should look like “dish_p02.res”

Test DISH_P03	
Image	SC image
PState	Shutter Shape RECTANGULAR, Shutter Presentation Value 0 (black), Shutter Left Vertical Edge 128, Shutter Right Vertical Edge 384, Shutter Upper Horizontal Edge 128, Shutter Lower Horizontal Edge 384
Result	Result on display should look like “dish_p03.res”

Test DISH_P04	
Image	SC image
PState	Shutter Shape RECTANGULAR, Shutter Presentation Value 65535 (white), Shutter Left Vertical Edge 128, Shutter Right Vertical Edge 384, Shutter Upper Horizontal Edge 128, Shutter Lower Horizontal Edge 384
Result	Result on display should look like “dish_p04.res”

Test DISH_P05	
Image	SC image
PState	Shutter Shape POLYGONAL, Shutter Presentation Value 0 (black), Vertices of the Polygonal Shutter (256\128\128\192\128\320\256\384\384\320\384\192)
Result	Result on display should look like “dish_p05.res”

Test DISH_P06	
Image	SC image
PState	Shutter Shape POLYGONAL, Shutter Presentation Value 65535 (white), Vertices of the Polygonal Shutter (256\128\128\192\128\320\256\384\384\320\384\192)
Result	Result on display should look like “dish_p06.res”

Test DISH_P07	
Image	SC image
PState	Shutter Shape BITMAP, Shutter Presentation Value 0 (black), Overlay Columns 512, Overlay Rows 512, Overlay Type G, Overlay Origin 1\1, Overlay Bits Allocated 1, Overlay Position 0
Result	Result on display should look like “dish_p07.res”

Test DISH_P08	
Image	SC image
PState	Shutter Shape BITMAP, Shutter Presentation Value 65535 (white), Overlay Columns 512, Overlay Rows 512, Overlay Type G, Overlay Origin 1\1, Overlay Bits Allocated 1, Overlay Position 0
Result	Result on display should look like “dish_p08.res”

Test DISH_P09	
Image	SC image
PState	Shutter Shape POLYGONAL, Shutter Presentation Value 0 (black), Vertices of the Polygonal Shutter (257\133\233\199\169\169\199\233\133\257\199\281\169\345\233\315\257\381\281\315\345\345\315\281\381\257\315\233\345\169\281\199)
Result	Result on display should look like “dish_p09.res”

Test DISH_P10	
Image	SC image
PState	Shutter Shape POLYGONAL, Shutter Presentation Value 65535 (white), Vertices of the Polygonal Shutter (257\133\233\199\169\169\199\233\133\257\199\281\169\345\233\315\257\381\281\315\345\345\315\281\381\257\315\233\345\169\281\199)
Result	Result on display should look like “dish_p10.res”

2.4.10 Overlays

This subsection contains tests for overlays.

Test OVLY_P01	
Image	<p>SC image, Bits Allocated 16, Bits Stored 12, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs</p> <ul style="list-style-type: none"> • Overlay (6000, XXXX): Overlay Columns 512, Overlay Rows 512, Overlay Type G, Overlay Origin 1\1, Overlay Bits Allocated 16, Overlay Position 15 • Overlay (6002, XXXX): Overlay Columns 512, Overlay Rows 512, Overlay Type G, Overlay Origin 1\1, Overlay Bits Allocated 16, Overlay Position 14 • Overlay (6004, XXXX): Overlay Columns 512, Overlay Rows 512, Overlay Type G, Overlay Origin 1\1, Overlay Bits Allocated 1, Overlay Position 0 • Overlay (6006, XXXX): Overlay Columns 512, Overlay Rows 512, Overlay Type G, Overlay Origin 1\1, Overlay Bits Allocated 1, Overlay Position 0

PState	<ul style="list-style-type: none"> • Overlay (6000, XXXX): Overlay Activation Layer: LAYER1 • Overlay (6002, XXXX): Overlay Activation Layer: LAYER2 • Overlay (6004, XXXX): Overlay Activation Layer: LAYER3 • Overlay (6006, XXXX): Overlay Activation Layer: LAYER4 • Overlay (6008, XXXX): Overlay Columns 512, Overlay Rows 512, Overlay Type G, Overlay Origin 1\1, Overlay Bits Allocated 1, Overlay Position 0, Overlay Activation Layer: LAYER5 • Overlay (600a, XXXX): Overlay Columns 512, Overlay Rows 512, Overlay Type G, Overlay Origin 1\1, Overlay Bits Allocated 1, Overlay Position 0, Overlay Activation Layer: LAYER6
Result	Result on display should look like “ovly_p01.res”

2.4.11 Complex Combination

This subsection contains more complex tests.

Test CPLX_P01	
Image	SC image, Columns 1280, Rows 900, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to +255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, no LUTs
PState	<ul style="list-style-type: none"> • Displayed Area: Presentation Size Mode SCALE TO FIT, Displayed Area Top Left Hand Corner 768\388, Displayed Area Bottom Right Hand Corner 1280\900, Presentation Pixel Aspect Ratio 1\1 • Shutter: Shutter Shape CIRCULAR, Center Of Circular Shutter 644\1024, Radius of Circular Shutter 128, Shutter Presentation Value 0 (black) • Spatial Transformations: Image Rotation 90, Image Horizontal Flip Y • Bounding Box: Annotation Units PIXEL, Unformatted Text Value “Image relative text overlapping shutter”, Bounding Box Top Left Hand Corner 896\516, Bounding Box Bottom Right Hand Corner 912\772, Bounding Box Text Horizontal Justification CENTER • Bounding Box: Annotation Units DISPLAY, Unformatted Text Value “Displayed Area relative text overlapping shutter”, Bounding Box Top Left Hand Corner 869\516, Bounding Box Bottom Right Hand Corner 0.75\0.78125, Bounding Box Text Horizontal Justification LEFT • Graphic Type: POLYLINE, Graphic Filled N, Graphic Data (960\452\960\836\976\836\976\452\960\452), Graphic Annotation Units PIXEL • Graphic Type: POLYLINE, Graphic Filled N, Graphic Data 0.125\0.59375\0.875\0.59375\0.875\0.625\0.125\0.625\0.125\0.59375), Graphic Annotation Units DISPLAY
Result	Result on display should look like “cplx_p01.res”

Test CPLX_P02	
Image	SC multi-frame image containing two “different” SMPTE patterns
PState	<ul style="list-style-type: none"> Shutter: Shutter Shape RECTANGULAR, Shutter Presentation Value 0 (black), Shutter Left Vertical Edge 1, Shutter Right Vertical Edge 1024, Shutter Upper Horizontal Edge 32, Shutter Lower Horizontal Edge 512 <p>Frame #1:</p> <ul style="list-style-type: none"> Displayed Area: Presentation Size Mode SCALE TO FIT, Displayed Area Top Left Hand Corner 513\1, Displayed Area Bottom Right Hand Corner 1024\512, Presentation Pixel Aspect Ratio 1\1 Softcopy VOI LUT Sequence: Window Center = 50.5, Window Width = 51 Bounding Box: Annotation Units PIXEL, Unformatted Text Value “Frame #1”, Bounding Box Top Left Hand Corner 513\1, Bounding Box Bottom Right Hand Corner 1024\128, Bounding Box Text Horizontal Justification LEFT <p>Frame #2:</p> <ul style="list-style-type: none"> Displayed Area: Presentation Size Mode SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 1024\512, Presentation Pixel Aspect Ratio 2\1 Bounding Box: Annotation Units PIXEL, Unformatted Text Value “Frame #2”, Bounding Box Top Left Hand Corner 1\1, Bounding Box Bottom Right Hand Corner 1024\128, Bounding Box Text Horizontal Justification LEFT
Result	Result on display should look like “cplx_p02.res” (2 frames)

Test CPLX_P03	
Image	SC image with SMPTE pattern, Bits Allocated 8, Bits Stored 8, Pixel Range 0 to 255, Pixel Representation is unsigned, Photometric Interpretation is MONOCHROME2, inappropriate VOI LUT transform (Window Center 0, Window Width 128), requiring identity VOI LUT transform
PState	<p>Please note that the presentation state references <i>two</i> image objects.</p> <ul style="list-style-type: none"> Shutter: Shutter Shape RECTANGULAR, Shutter Presentation Value 0 (black), Shutter Left Vertical Edge 1, Shutter Right Vertical Edge 1024, Shutter Upper Horizontal Edge 32, Shutter Lower Horizontal Edge 512 <p>Image #1 (“cplx_p03.dcm”):</p> <ul style="list-style-type: none"> Displayed Area: Presentation Size Mode SCALE TO FIT, Displayed Area Top Left Hand Corner 1\1, Displayed Area Bottom Right Hand Corner 512\512, Presentation Pixel Aspect Ratio 1\1 VOI LUT transform not specified so assumed identity Bounding Box: Annotation Units DISPLAY, Unformatted Text Value “Image #1”, Bounding Box Top Left Hand Corner 0.25\0.0, Bounding Box Bottom Right Hand Corner 0.75\0.25, Bounding Box Text Horizontal Justification CENTER <p>Image #2 (“cplx_p02.dcm”):</p> <ul style="list-style-type: none"> Everything specified in “cplx_p02.pre” Bounding Box: Annotation Units DISPLAY, Unformatted Text Value “Image #2”, Bounding Box Top Left Hand Corner 0.25\0.0, Bounding Box Bottom Right Hand Corner 0.75\0.25, Bounding Box Text Horizontal Justification CENTER

Result	Result on display should look like “cplx_p03.res” for image #1 and “cplx_p02.res” for image #2 (2 frames + centered text “Image #2” at the top of both frames)
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IHE Year 2 Image Display Actors

Test Results

3 Image Display Test Results

Application vendor

Name and software Version of the application

Person filling in this form, place, date

3.1 Image Display without Presentation States

Please specify for each test whether the image has been rendered and displayed as described in chapter 3 (for some tests there is also a result file available). If there are any comments please fill in the comment field. It should be noted that *all* tests should be successful.

3.1.1 Modality LUT

Please specify the test results for the Modality LUT transformation

Success	Test Name	Comments
<input type="checkbox"/>	MLUT_01	
<input type="checkbox"/>	MLUT_03	
<input type="checkbox"/>	MLUT_04	
<input type="checkbox"/>	MLUT_05	
<input type="checkbox"/>	MLUT_06	
<input type="checkbox"/>	MLUT_07	
<input type="checkbox"/>	MLUT_08	

<input type="checkbox"/>	MLUT_09	
<input type="checkbox"/>	MLUT_11	
<input type="checkbox"/>	MLUT_12	
<input type="checkbox"/>	MLUT_13	
<input type="checkbox"/>	MLUT_14	
<input type="checkbox"/>	MLUT_16	
<input type="checkbox"/>	MLUT_18	
<input type="checkbox"/>	MLUT_19	

3.1.2 VOI LUT

Please specify the test results for the VOI LUT transformation

Success	Test Name	Comments
<input type="checkbox"/>	VLUT_01	
<input type="checkbox"/>	VLUT_02	
<input type="checkbox"/>	VLUT_03	
<input type="checkbox"/>	VLUT_04	
<input type="checkbox"/>	VLUT_05	
<input type="checkbox"/>	VLUT_06	
<input type="checkbox"/>	VLUT_07	
<input type="checkbox"/>	VLUT_08	
<input type="checkbox"/>	VLUT_09	
<input type="checkbox"/>	VLUT_09	
<input type="checkbox"/>	VLUT_10	
<input type="checkbox"/>	VLUT_11	

3.1.3 Modality / VOI LUTs

Please specify the test results for the combination of Modality and VOI LUT.

Success	Test Name	Comments
<input type="checkbox"/>	XLUT_01	
<input type="checkbox"/>	XLUT_02	

3.2 Image Display with Presentation States

Please specify for each test whether the Image and the applied Presentation State has been rendered and displayed as described in chapter 3. If there are any comments please fill in the comment field. It should be noted that there is no requirement that all tests are successful.

3.2.1 Modality LUT

Please specify the test results for the Modality LUT transformation.

Success	Test Name	Comments
<input type="checkbox"/>	MLUT_P01	
<input type="checkbox"/>	MLUT_P03	
<input type="checkbox"/>	MLUT_P04	
<input type="checkbox"/>	MLUT_P05	
<input type="checkbox"/>	MLUT_P06	
<input type="checkbox"/>	MLUT_P07	
<input type="checkbox"/>	MLUT_P08	
<input type="checkbox"/>	MLUT_P09	
<input type="checkbox"/>	MLUT_P11	
<input type="checkbox"/>	MLUT_P12	
<input type="checkbox"/>	MLUT_P13	
<input type="checkbox"/>	MLUT_P14	
<input type="checkbox"/>	MLUT_P16	
<input type="checkbox"/>	MLUT_P18	
<input type="checkbox"/>	MLUT_P19	

3.2.2 VOI LUT

Please specify the test results for the VOI LUT transformation.

Success	Test Name	Comments
<input type="checkbox"/>	VLUT_P01	
<input type="checkbox"/>	VLUT_P02	
<input type="checkbox"/>	VLUT_P03	
<input type="checkbox"/>	VLUT_P04	
<input type="checkbox"/>	VLUT_P05	
<input type="checkbox"/>	VLUT_P06	
<input type="checkbox"/>	VLUT_P07	
<input type="checkbox"/>	VLUT_P08	
<input type="checkbox"/>	VLUT_P09	
<input type="checkbox"/>	VLUT_P10	
<input type="checkbox"/>	VLUT_P11	
<input type="checkbox"/>	VLUT_P12	

3.2.3 Presentation LUT

Please specify the test results for the Presentation LUT transformation.

Success	Test Name	Comments
<input type="checkbox"/>	PLUT_P01	
<input type="checkbox"/>	PLUT_P02	
<input type="checkbox"/>	PLUT_P03	
<input type="checkbox"/>	PLUT_P04	
<input type="checkbox"/>	PLUT_P05	
<input type="checkbox"/>	PLUT_P06	
<input type="checkbox"/>	PLUT_P07	
<input type="checkbox"/>	PLUT_P08	
<input type="checkbox"/>	PLUT_P09	

3.2.4 Modality / VOI / Presentation LUTs

Please specify the test results for the combination of different LUTs (Modality LUT, VOI LUT, Presentation LUT).

Success	Test Name	Comments
<input type="checkbox"/>	XLUT_P01	
<input type="checkbox"/>	XLUT_P02	
<input type="checkbox"/>	XLUT_P03	

3.2.5 Spatial Transformations

Please specify the test results for the spatial transformations.

Success	Test Name	Comments
<input type="checkbox"/>	SPAT_P01	
<input type="checkbox"/>	SPAT_P02	
<input type="checkbox"/>	SPAT_P03	
<input type="checkbox"/>	SPAT_P04	
<input type="checkbox"/>	SPAT_P05	
<input type="checkbox"/>	SPAT_P06	
<input type="checkbox"/>	SPAT_P07	
<input type="checkbox"/>	SPAT_P08	
<input type="checkbox"/>	SPAT_P09	
<input type="checkbox"/>	SPAT_P10	

<input type="checkbox"/>	SPAT_P11	
<input type="checkbox"/>	SPAT_P12	
<input type="checkbox"/>	SPAT_P13	
<input type="checkbox"/>	SPAT_P14	
<input type="checkbox"/>	SPAT_P15	

3.2.6 Displayed Area

Please specify the test results for the Displayed Area.

Success	Test Name	Comments
<input type="checkbox"/>	DISA_P01	
<input type="checkbox"/>	DISA_P02	
<input type="checkbox"/>	DISA_P03	
<input type="checkbox"/>	DISA_P04	
<input type="checkbox"/>	DISA_P05	

3.2.7 Graphic Annotation

Please specify the test results for the graphic annotations.

Success	Test Name	Comments
<input type="checkbox"/>	GRAN_P01	
<input type="checkbox"/>	GRAN_P02	
<input type="checkbox"/>	GRAN_P03	
<input type="checkbox"/>	GRAN_P04	
<input type="checkbox"/>	GRAN_P05	
<input type="checkbox"/>	GRAN_P06	
<input type="checkbox"/>	GRAN_P07	
<input type="checkbox"/>	GRAN_P08	
<input type="checkbox"/>	GRAN_P09	
<input type="checkbox"/>	GRAN_P10	
<input type="checkbox"/>	GRAN_P11	
<input type="checkbox"/>	GRAN_P12	
<input type="checkbox"/>	GRAN_P13	
<input type="checkbox"/>	GRAN_P14	
<input type="checkbox"/>	GRAN_P15	
<input type="checkbox"/>	GRAN_P16	

<input type="checkbox"/>	GRAN_P17	
<input type="checkbox"/>	GRAN_P18	

3.2.8 Text Annotation

Please specify the test results for the text annotations.

Success	Test Name	Comments
<input type="checkbox"/>	TEAN_P01	
<input type="checkbox"/>	TEAN_P02	
<input type="checkbox"/>	TEAN_P03	
<input type="checkbox"/>	TEAN_P04	
<input type="checkbox"/>	TEAN_P05	
<input type="checkbox"/>	TEAN_P06	
<input type="checkbox"/>	TEAN_P07	
<input type="checkbox"/>	TEAN_P08	
<input type="checkbox"/>	TEAN_P09	
<input type="checkbox"/>	TEAN_P10	
<input type="checkbox"/>	TEAN_P11	
<input type="checkbox"/>	TEAN_P12	
<input type="checkbox"/>	TEAN_P13	
<input type="checkbox"/>	TEAN_P14	

3.2.9 Display Shutter

Please specify the test results for the display shutters.

Success	Test Name	Comments
<input type="checkbox"/>	DISH_P01	
<input type="checkbox"/>	DISH_P02	
<input type="checkbox"/>	DISH_P03	
<input type="checkbox"/>	DISH_P04	
<input type="checkbox"/>	DISH_P05	
<input type="checkbox"/>	DISH_P06	
<input type="checkbox"/>	DISH_P07	
<input type="checkbox"/>	DISH_P08	
<input type="checkbox"/>	DISH_P09	
<input type="checkbox"/>	DISH_P10	

3.2.10 Overlay

Please specify the test results for the overlays.

Success	Test Name	Comments
<input type="checkbox"/>	OVLY_P01	

3.2.11 Complex Combination

Please specify the test results for the complex presentation states.

Success	Test Name	Comments
<input type="checkbox"/>	CPLX_P01	
<input type="checkbox"/>	CPLX_P02	
<input type="checkbox"/>	CPLX_P03	

3.3 General Comments

Please fill in general comments to the “Image Display Test”.

General Comments

4 References

- [1] NEMA Standards Publications PS 3.14-2001, Digital Imaging and Communications in Medicine (DICOM), *Part 14: Grayscale Standard Display Function*, National Electrical Manufacturers Association, Rosslyn, VA, 2001.
- [2] NEMA Standards Publications PS 3.3-2001, Digital Imaging and Communications in Medicine (DICOM), *Part 3: Information Object Definitions*, National Electrical Manufacturers Association, Rosslyn, VA, 2001.