



**User Manual For  
QMS-1000 Quality Management System  
Document Version 4.0.2.02**

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*Software Version 4.0.2700*

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# 1. Introduction

QMS-1000 Quality Management System is designed for cinema auditorium quality control. It manages the quality of projection and audio by measuring and analyzing the luminance, chromaticity and sound pressure level in the cinema hall. These measurements are used for comparison against benchmark values to ensure that the auditorium is operating in optimum condition. They also enable users to identify poorly calibrated lamps, lamps nearing end of life, projector color problems, defective audio components etc. QMS is an integrated part of the GDC Theatre Management System.

## 1.1 Operating Requirements

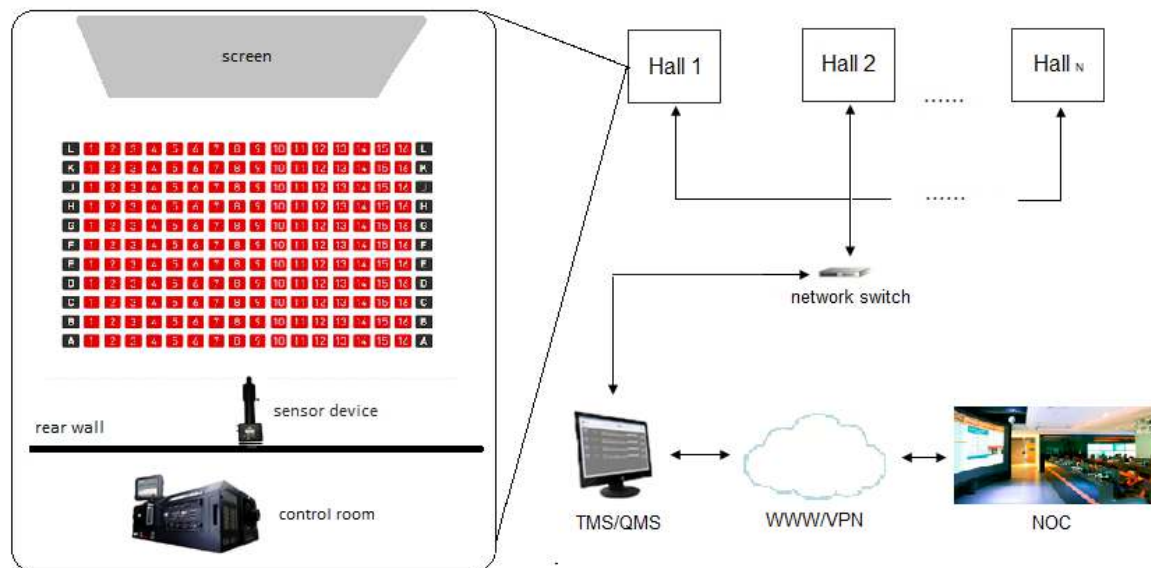
TMS software with QMS-1000 enabled must be installed into the Windows PC before it can work with the QMS-1000 sensor device. There will be a quality tab enabled in TMS software.

Operating Requirements:

- TMS software (with QMS-1000 enabled) installed in Windows PC
- QMS-1000 sensor device, USB Power Adapter, Network Cable
- Sensor device mounting kit

## 1.2 Overall Function

QMS-1000 sensor device must be physically mounted on the rear wall or in the centre location in the cinema hall. It should be setup in a network environment and linked to all digital cinema equipment including the TMS/QMS and NOC.



### Sensor Device:

- Measures the screen brightness, color values and hall sound pressure level.

### TMS/QMS:

- Initializes the testing process, starts playback of standard test contents on server, displays and records the test results.

### GDC-NOC:

- Retrieves and monitors theater QMS tests, exports test results data.

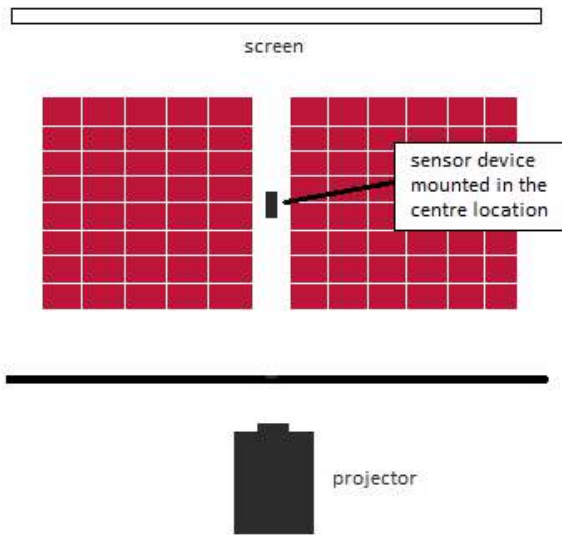
## 1.3 Tests Environment and Benchmark Values

From TMS/QMS, tests are executed and compared against SMPTE standard or optimal projection values. The test results can be saved and send from QMS/TMS to NOC to inform the user that the results are passed, warning or critical levels.

### For SMPTE Standard Test Setup

The sensor device must be physically mounted in the centre location in the cinema hall, sensor location must be set to "center" in TMS/QMS software, and when the test is being carried out, the benchmark values will be fixed to the SMPTE standard values and these values cannot be changed, and the test will be benchmarked according to it.

SMPTE Standard Test Setup



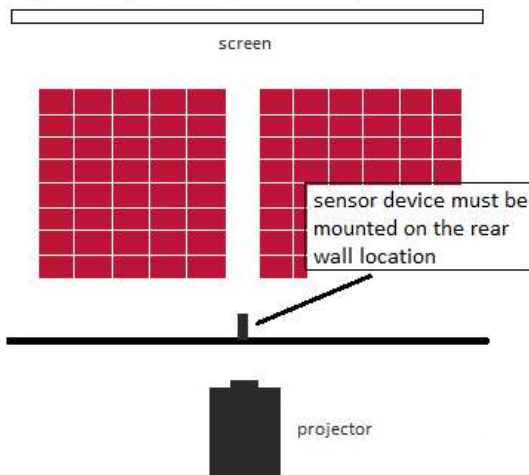
SMPTE Benchmark Values

Checking Item	Benchmark	
Luminance	14 fL	
Pattern 1	0.314	0.351
Pattern 2	0.424	0.547
Pattern 3	0.204	0.360
Pattern 4	0.342	0.154
Pattern 5	0.15	0.06
Pattern 6	0.265	0.69
Pattern 7	0.679	0.32
Channel 1	85 dB	
Channel 2	85 dB	
Channel 3	85 dB	
Channel 4	95 dB	
Channel 5	82 dB	
Channel 6	82 dB	
Channel 7	82 dB	
Channel 8	82 dB	

### For Optimal Projection Values Test Setup

The sensor device must be mounted in the rear location in the cinema hall, sensor location must be set to "rear" in TMS/QMS software when the first test is being carried out, it can be saved and set as the first benchmark values, which are considered as the optimal values and periodically when the test is being run, it could be used to compare against this benchmark values.

Optimal Projection Values Test Setup



Optimal Projection Benchmark Values

Checking Item	Benchmark	
Luminance	36.1 FL	
Pattern 1	0.307	0.341
Pattern 2	0.419	0.564
Pattern 3	0.260	0.309
Pattern 4	0.282	0.219
Pattern 5	0.197	0.124
Pattern 6	0.360	0.605
Pattern 7	0.523	0.490
Channel 1	72.2	dB
Channel 2	72.3	dB
Channel 3	72.4	dB
Channel 4	83.1	dB
Channel 5	69.3	dB
Channel 6	68.9	dB
Channel 7	69.1	dB
Channel 8	69.5	dB

The first test results could be saved and used as benchmark values

## 2. Sensor Device Setup

The sensor device must be installed and calibrated properly physically before it can be used. It must also be added and configured in TMS software.

### 2.1 Packing List

Check and ensure that the sensor device packing list contains items 1 to 3. For mounting kit packing list, the tools may vary. Please check on the packing list in the box to confirm that all items are present.

**Sensor Device Packing List**

No	Name	Quantity	Photo
1	Sensor Device	1	
2	AC Power Adapter and Cable	1	
3	Network Cable	1	



Mounting Kit Packing List

No	Name	Quantity	Photo
1	Directional Mount	1	
2	Secure Board	1	
3	Base Plate	1	
4	Black Screw	1	

## 2.2 Sensor Device Configuration

To setup the sensor device configurations and IP address, connect USB power adapter and network cable to it, and connect the other end of network cable to laptop, load a web browser on a windows PC, enter <http://169.254.1.6> in the address bar and the main page will be loaded.

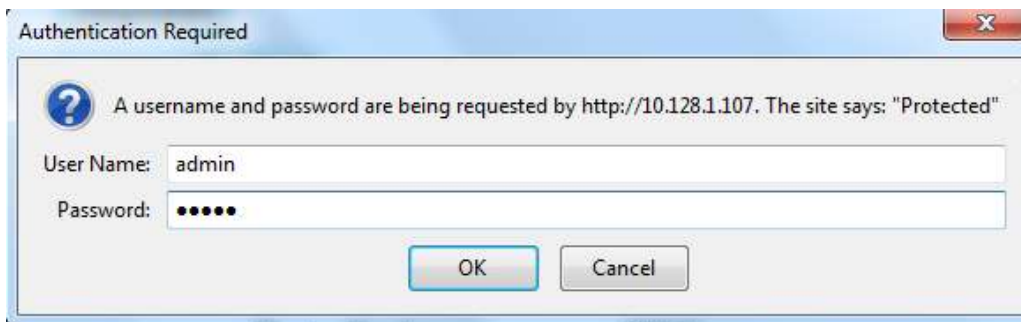
**GDC-Tech SG - Screen 1**

LIVE		LIVE	
Luminance	0.3fL	SPL	61.1dBc
x	0.343		
y	1.136		
CCT	5443K		
Temperature	30.2° C		
Luminance fL	0.3fL		

Auditorium Info	
Theater Name	GDC-Tech SG
Theater Number	486349
Screen Number	1
Comments	LSS-100 configured on 6/30/2012

[Log](#) | [Config](#)

Click the "Config" link to login to the Configuration Page. When prompt, enter the IP address of the sensor, the user name and password (User Name: admin Password: ultra)



From Configuration page, select and click the Check Boxes to show the measured data on SPL, Luminance, Chromaticity and Temperature according to user preference, click "Save User Data" to save settings.

**Web Display Configuration**

Select data source for each row of "light table" and the name to be displayed for that row of data. Enter a string for each column of historic data. Use <br /> to break headers into multiple lines as required.

Light Table			SPL Table	
Data Source	Row Name	Column Name	Column Name	
1: Luminance fL	1: Luminance	1: LIVE	1: LIVE	8:
2: x	2: x	2:	2:	9:
3: y	3: y	3:	3:	10:
4: CCT	4: CCT	4:	4:	11:
5: none	5: Temperature	5:	5:	12:
6: Luminance fL	6: Luminance fL	6:	6:	13:
7: none	7:	7:	7:	14:

SPL daily maximum limit (log in red if exceeded): 100.0

Enter Auditorium Data by keying in the Theater Name, Theatre Number, Screen Number and Comments, click "Save Auditorium Data" to save the settings.

**Auditorium Data**

Theater Name: SG

Theater Number: 486349

Screen Number: 1

Comments: QMS-1000 configured on

Enter Network Configurations data by keying in the Host Name, IP Address, Gateway and Subnet Mask, click "Save IP Config and Reboot" to save settings. **The IP address will need to be noted for entering TMS software later.**

**Network Configuration and Time**

MAC Address: 00:23:FC:06:00:7B

Host Name: SENSOR

IP Address: 10.11.11.12

Gateway: 10.11.12.1

Subnet Mask: 255.255.255.0

After hitting Save, you will need to put the new IP address in your browser if you changed the IP address.

Enter NTP Configuration, and below it, Sensor Hardware information is shown.

**NTP Configuration**

NTP IP Address:

Time Zone Offset from UTC (hours):

Standard Time Abbreviation:

DST (Summer Time) Abbreviation:

DST (Summer Time) Observed:

Serial Number: 0123

Board Revision: C

Firmware Version: 130612

Bootloader Version: 120530




## 2.3 Mounting Sensor Device

Sensor device must be mounted to the center or rear location in the cinema hall. Use the mounting kit provided to mount the sensor device.

Step 1: Secure the Screw, Base Plate and Directional Mount together and assemble them into the base bracket as shown below.

	Parts	Installation Steps	Result
Step 1			

Step 2: Install Sensor Device onto the Secure Board.

	Parts	Installation Steps	Result
Step 2			

Step 3: Install components from Step 1 and 2 together to get the final assembly part.

	Parts	Installation Steps	Result
Step 3			

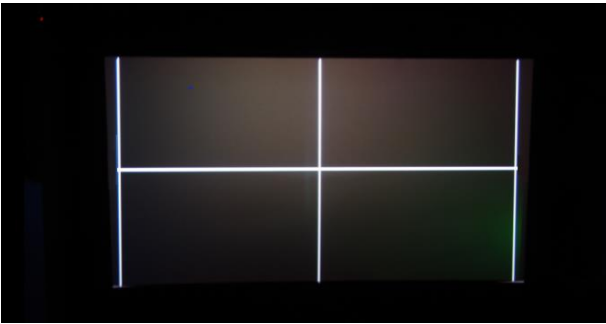
Step 4: Connect the network cable and power cable to the final assembly part.

	Parts	Installation Steps	Result
Step 4			

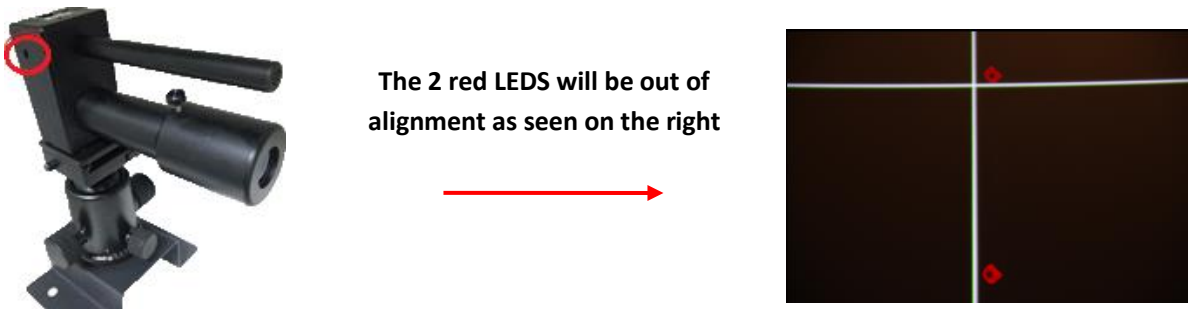
Step 5: Screen Distance Calibration with Sensor Device. Make sure that projector is on and load cross test pattern on projector. On the Touch Screen Panel of projector, select "Control" -> "Test Pattern"-> "Cross Diagram".



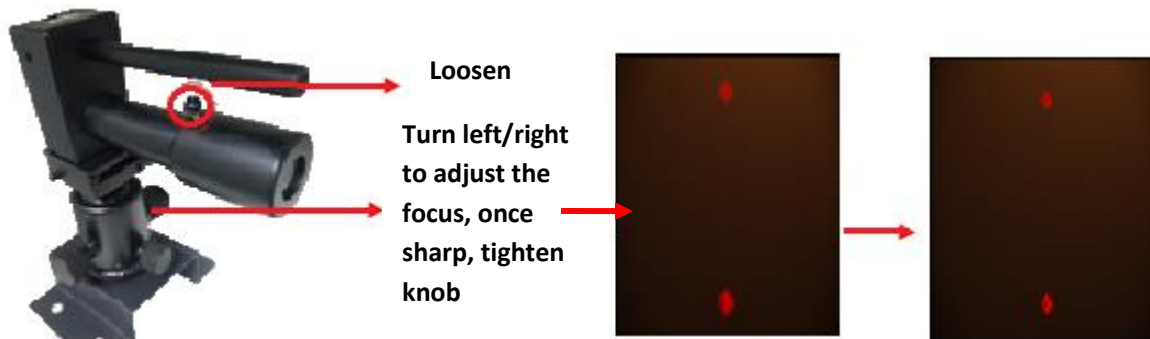
Step 6: After loading test pattern, adjust and make sure that the test pattern fully filled the screen as shown below.



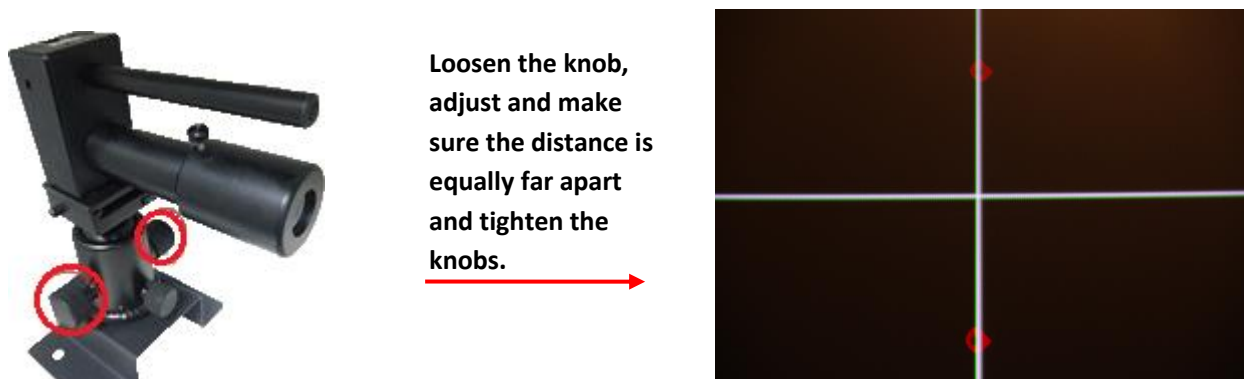
Step 7: Turn on the switch of the LEDS, 2 red LEDS will be projected on screen.



Step 8: Adjust the focus to make it look sharp. Loosen the knob, and turn left/right to adjust the focus, when the display is sharp, tighten the knob.

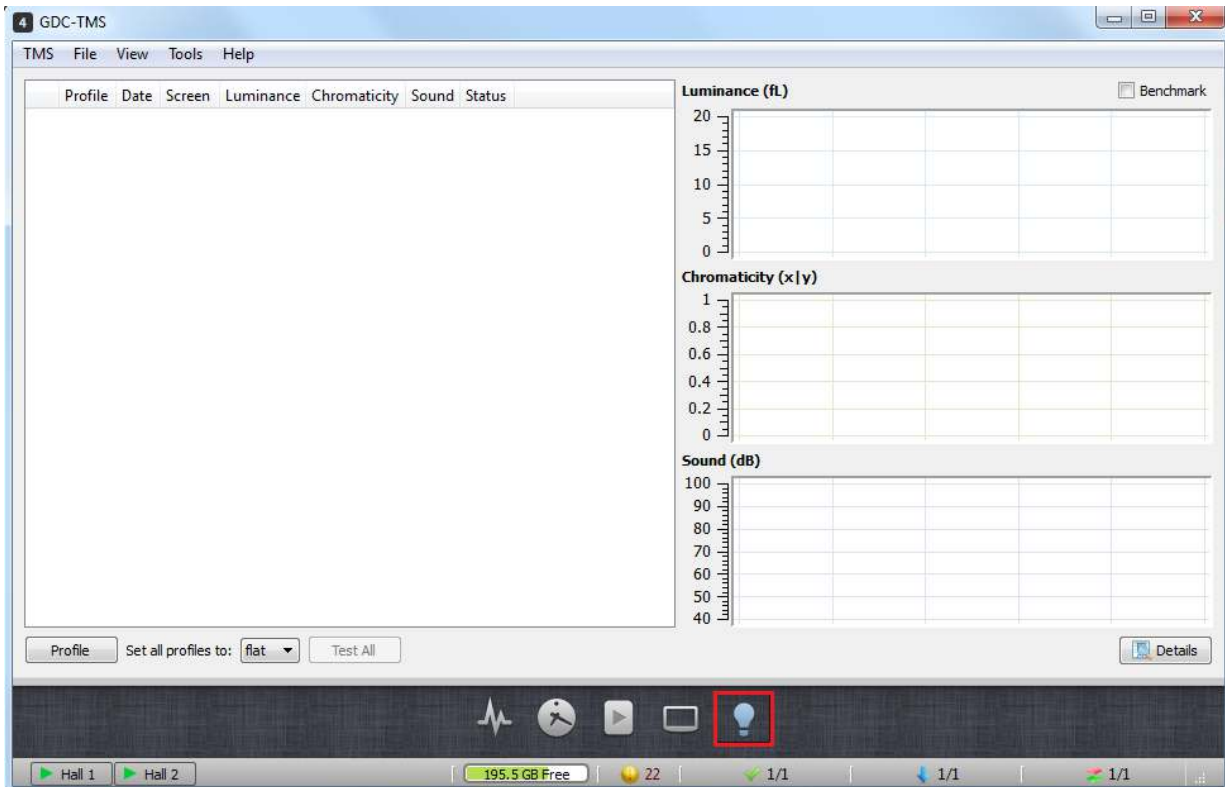


Step 9: Loosen the circle round knob, adjust the knobs and make sure that the distance of the 2 red LEDS is equally far apart as shown below and tighten the knobs.



### 3. TMS Setup

TMS software with QMS-1000 will have a Quality tab in the graphical user interface which allows cinema auditorium quality control.



The supported tests and setup include:

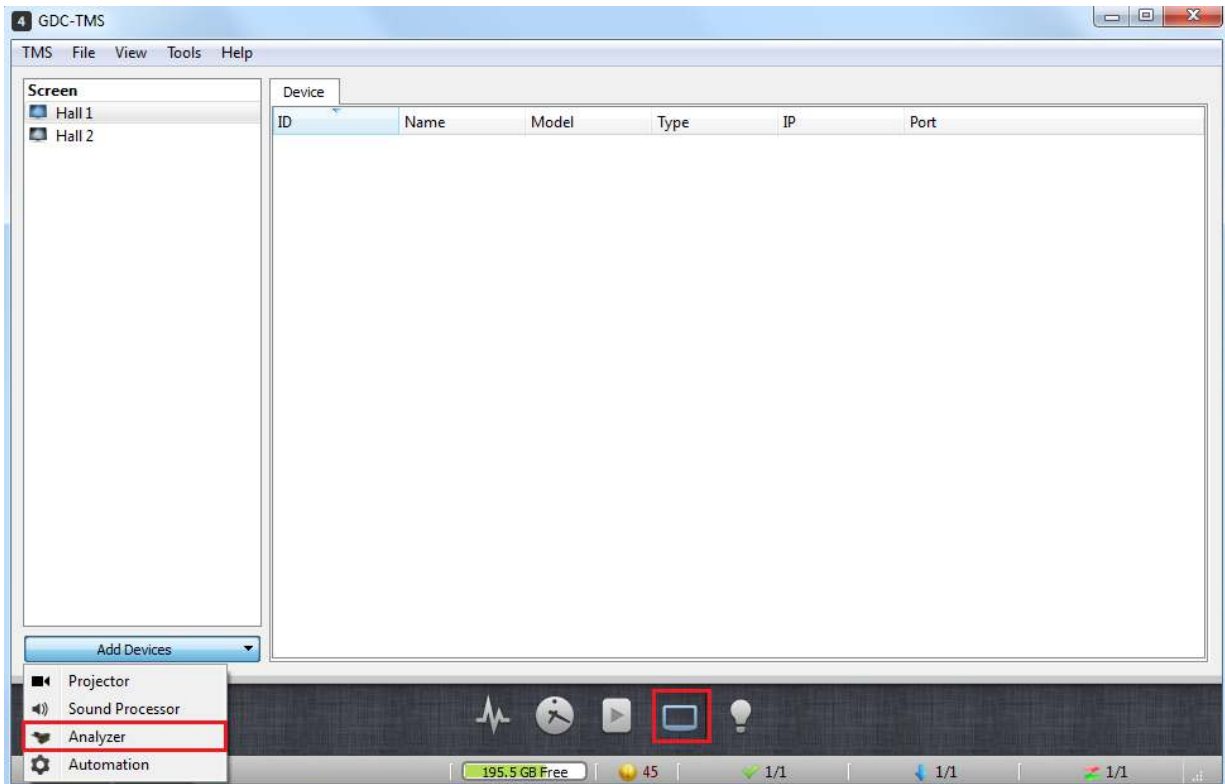
Mode	Single Projector	Dual Projector
2D	Using 1 projector	Using 1 projector
2D		Using 2 projectors
3D	Using 1 projector	Using 2 projectors

The sensor device will need to be added to TMS software, test contents are needed to be ingested into playback servers, and correct naming SPLs must be created in the playback servers.

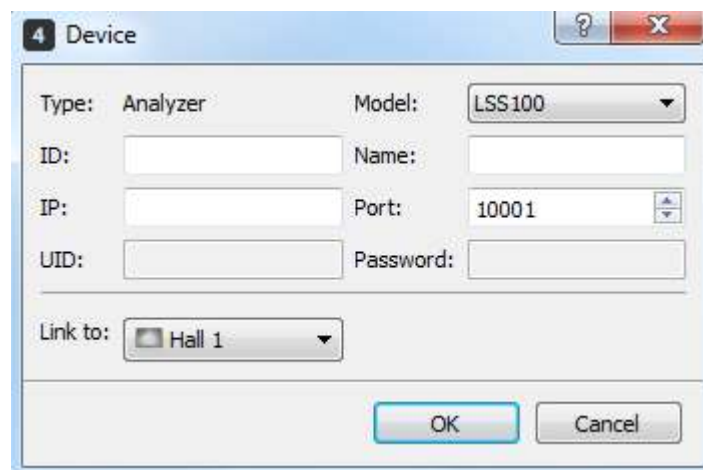


### 3.1 Add Sensor Device to TMS


For sensor device to work with TMS software, it must be added as a device and linked to a screen in TMS. From TMS software, select Screen -> Add Devices -> Analyzer



Select the Device Model, enter the ID, Name, IP address and Port number, and select the Device which linked to the server, and click "OK".



An entry will be shown below that the Analyzer is successfully linked to selected screen.

Device					
ID	Name	Model	Type	IP	Port
01	LS	LSS100	 Analyzer	10.128.1.101	10001

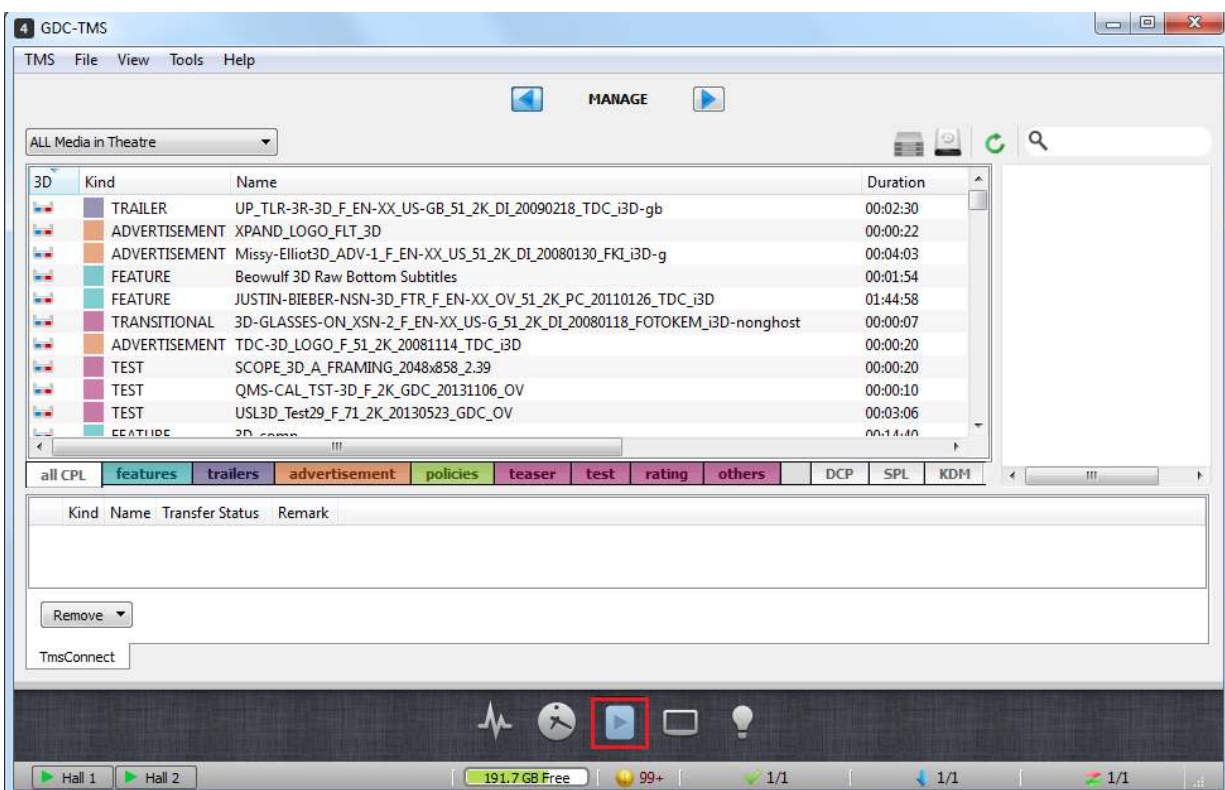
## 3.2 Import and Distribution of Test Contents and KDM

Below table shows all test contents needed in the server. Connect external hard disk drive with contents and ingest all contents into the server.

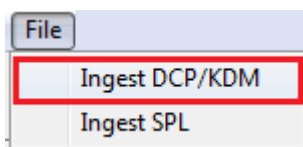
No	Content Name
1	QMS-CAL_TST-2D_F_2K_GDC_20150803_OV
2	QMS-CAL_TST-2D_S_2K_GDC_20150803_OV
3	QMS-CAL_TST-3D_F_2K_GDC_20150803_OV
4	QMS-CAL_TST-3D_S_2K_GDC_20150803_OV
5	QMS-CHK_TST-2D_F_71_2K_GDC_20150803_OV
6	QMS-CHK_TST-2D_S_71_2K_GDC_20150803_OV
7	QMS-CHK_TST-3D_F_71_2K_GDC_20150803_OV
8	QMS-CHK_TST-3D_S_71_2K_GDC_20150803_OV
9	QMS-CHK-DUAL_TST-3D_F_71_2K_GDC_20150803_OV
10	QMS-CHK-DUAL_TST-3D_S_71_2K_GDC_20150803_OV
11	QMS-CHK-DUAL-1_TST-2D_F_71_2K_GDC_20150803_OV
12	QMS-CHK-DUAL-1_TST-2D_S_71_2K_GDC_20150803_OV
13	QMS-CHK-DUAL-2_TST-2D_F_71_2K_GDC_20150803_OV
14	QMS-CHK-DUAL-2_TST-2D_S_71_2K_GDC_20150803_OV

### 3. TMS SETUP

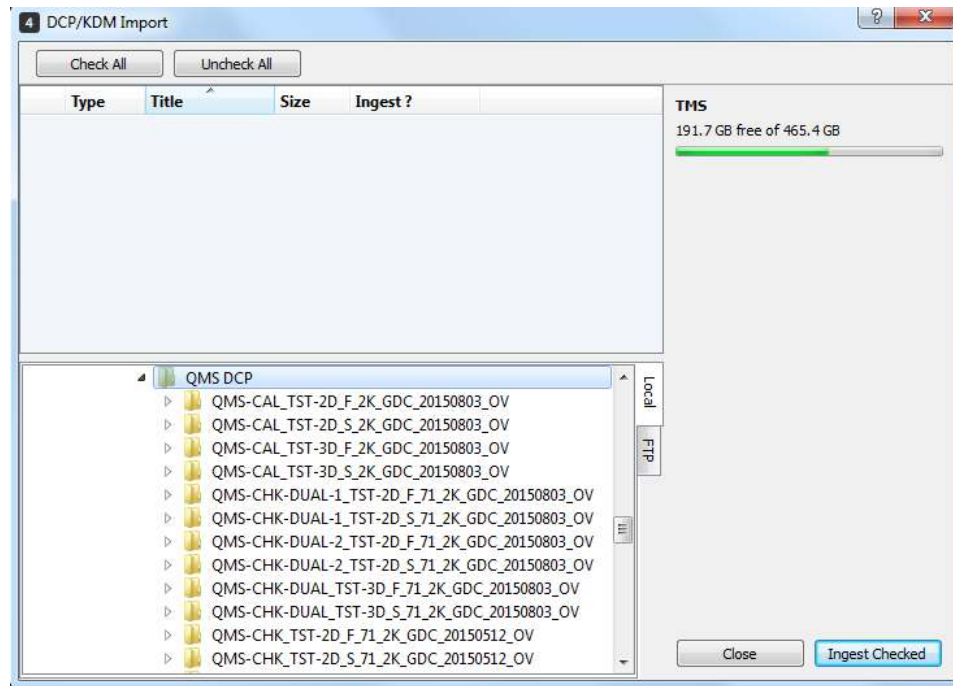
Import test contents into TMS using external Hard Disk Drive. Click the Content Tab to go into the Content Management Interface.




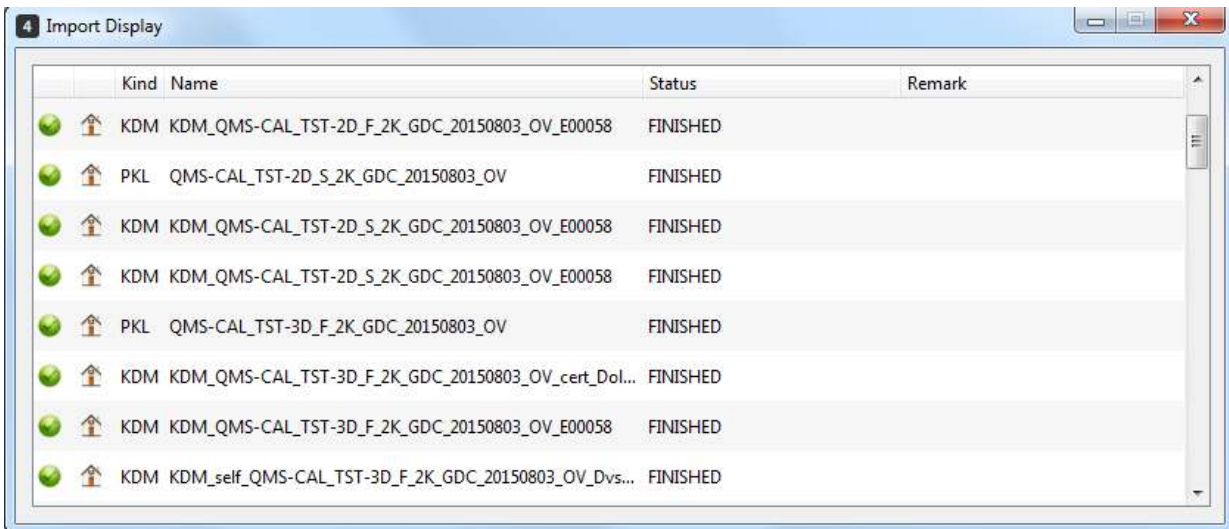
Click File -> Ingest DCP/KDM at the Menu Tab on the top left of the window.



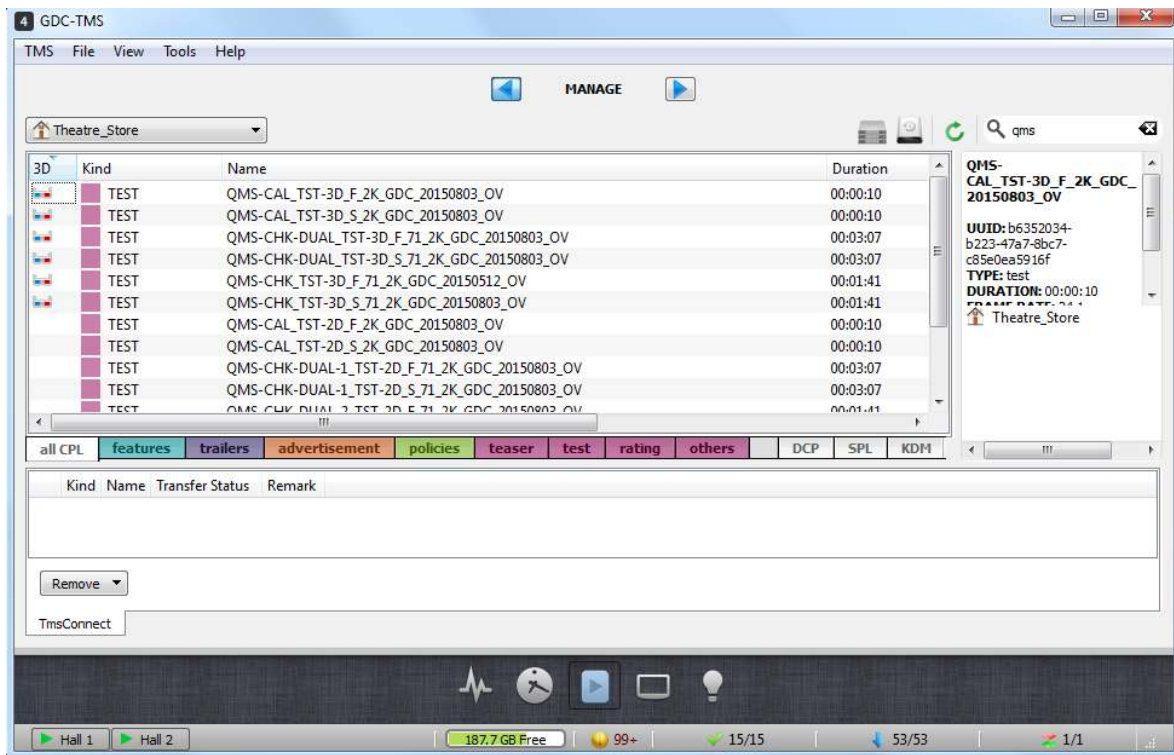
DCP/KDM Import window will pop up. Locate the drive that contains the test contents. Click the DCP, then click “Ingest Checked” button to ingest the test contents.



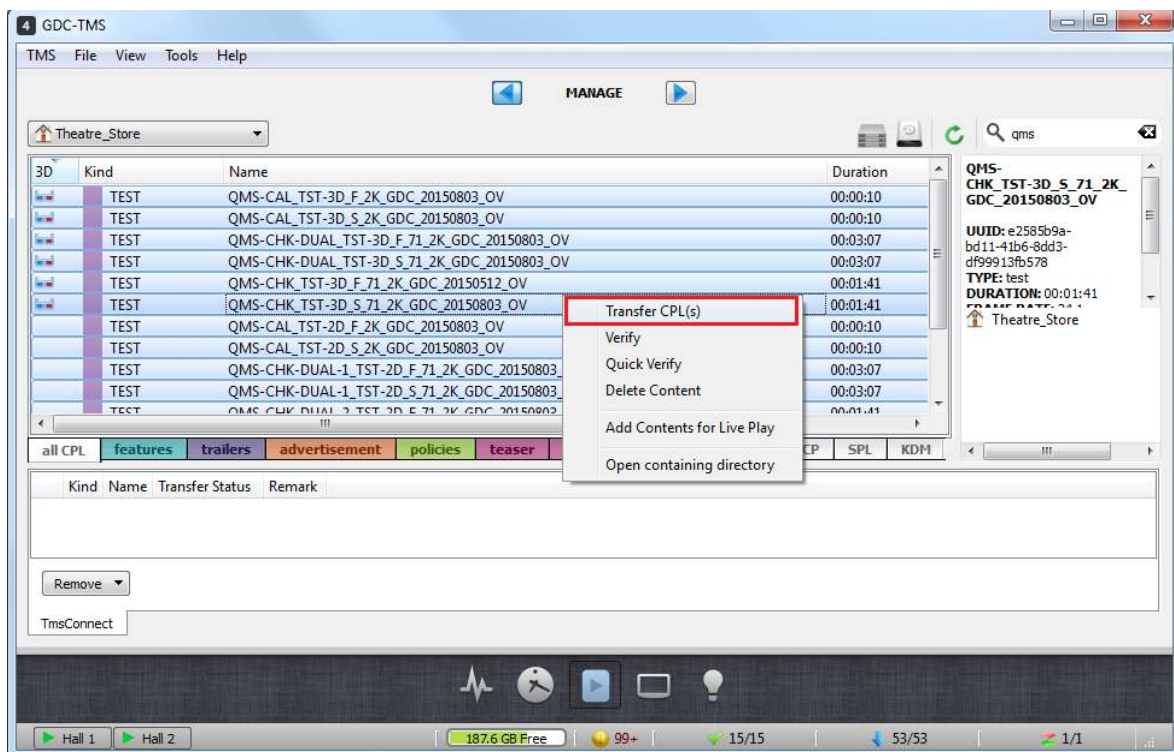
Click the  button at the bottom of TMS window. Import Display window will pop up and show the ingest status of the test contents.



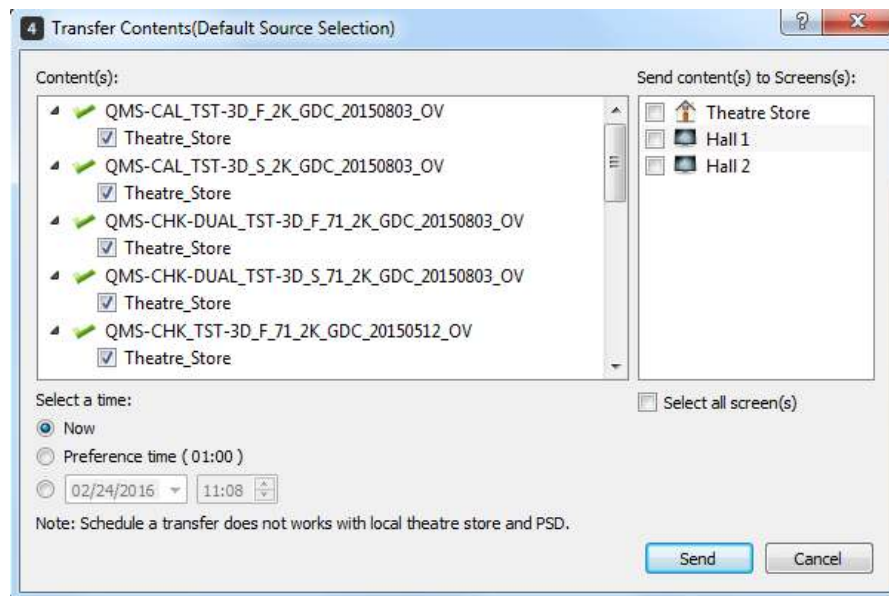
When the ingestion is completed, the content will be added to TMS Theatre\_Store.




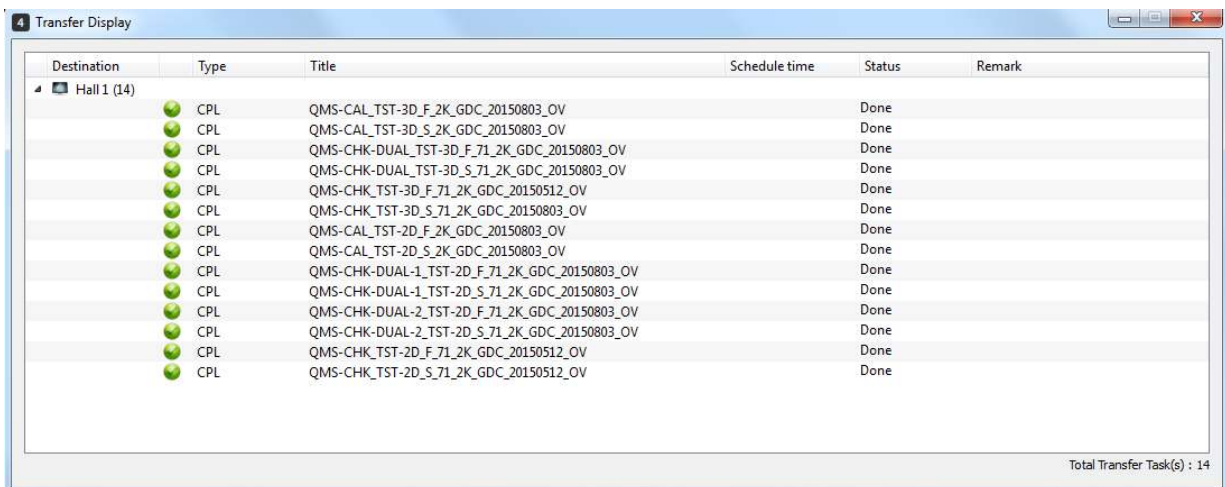
From Theatre\_Store, transfer all the test contents to the server that will run the test. Select test content, right-click and select "Transfer CPL(s)".



In the Content(s) tab, check Theatre\_Store as source and select destination at Send content(s) to Screen(s) tab, then click "Send" button.



Click the  button at the bottom right of TMS window. Transfer Display window will pop up and show the transfer status of the contents that are being transferred from Theatre\_Store to the selected destination.









Once the transfer is completed, the contents will be stored in both Theatre\_Store and the selected server.







**QMS-CAL\_TST-3D\_F\_2K\_GDC\_20150803\_OV**

**UUID:** b6352034-b223-47a7-8bc7-c85e0ea5916f  
**TYPE:** test  
**DURATION:** 00:00:10  
**FRAME RATE:** 24 1  
**ASPECT RATIO:** 1.85  
**FILE SIZE:** 30.38 MB

 Hall 1 



 Theatre\_Store


The contents will not be able to playback without valid KDMs from supplier. The  icon indicates that the needed KDM is not yet available in the testing server.

3D	Kind	Name	Duration
	TEST	QMS-CAL_TST-3D_F_2K_GDC_20150803_OV	00:00:10
	TEST	QMS-CAL_TST-3D_S_2K_GDC_20150803_OV	00:00:10
	TEST	QMS-CHK-DUAL_TST-3D_F_71_2K_GDC_20150803_OV	00:03:07
	TEST	QMS-CHK-DUAL_TST-3D_S_71_2K_GDC_20150803_OV	00:03:07
	TEST	QMS-CHK_TST-3D_F_71_2K_GDC_20150512_OV	00:01:41
	TEST	QMS-CHK_TST-3D_S_71_2K_GDC_20150803_OV	00:01:41
	TEST	QMS-CAL_TST-2D_F_2K_GDC_20150803_OV	00:00:10
	TEST	QMS-CAL_TST-2D_S_2K_GDC_20150803_OV	00:00:10
	TEST	QMS-CHK-DUAL-1_TST-2D_F_71_2K_GDC_20150803_OV	00:03:07
	TEST	QMS-CHK-DUAL-1_TST-2D_S_71_2K_GDC_20150803_OV	00:03:07
	TEST	QMS-CHK-DUAL-2_TST-2D_F_71_2K_GDC_20150803_OV	00:01:41
	TEST	QMS-CHK-DUAL-2_TST-2D_S_71_2K_GDC_20150803_OV	00:01:41
	TEST	QMS-CHK_TST-2D_F_71_2K_GDC_20150512_OV	00:01:41
	TEST	QMS-CHK_TST-2D_S_71_2K_GDC_20150512_OV	00:01:41

**QMS-CAL\_TST-3D\_F\_2K\_GDC\_20150803\_OV**

**UUID:** b6352034-b223-47a7-8bc7-c85e0ea5916f  
**TYPE:** test  
**DURATION:** 00:00:10  
**FRAME RATE:** 24 1  
**ASPECT RATIO:** 1.85  
**FILE SIZE:** 30.38 MB

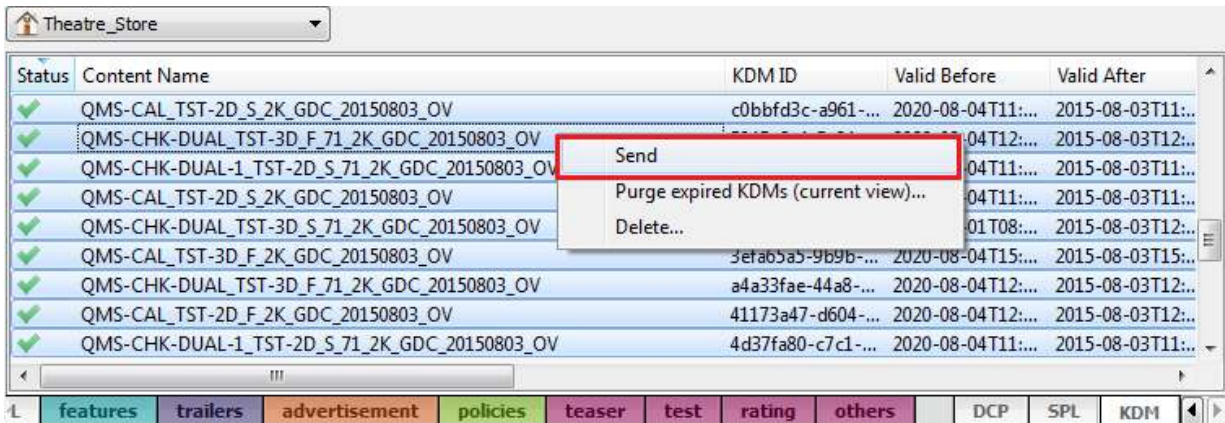
 Hall 1 

 Theatre\_Store

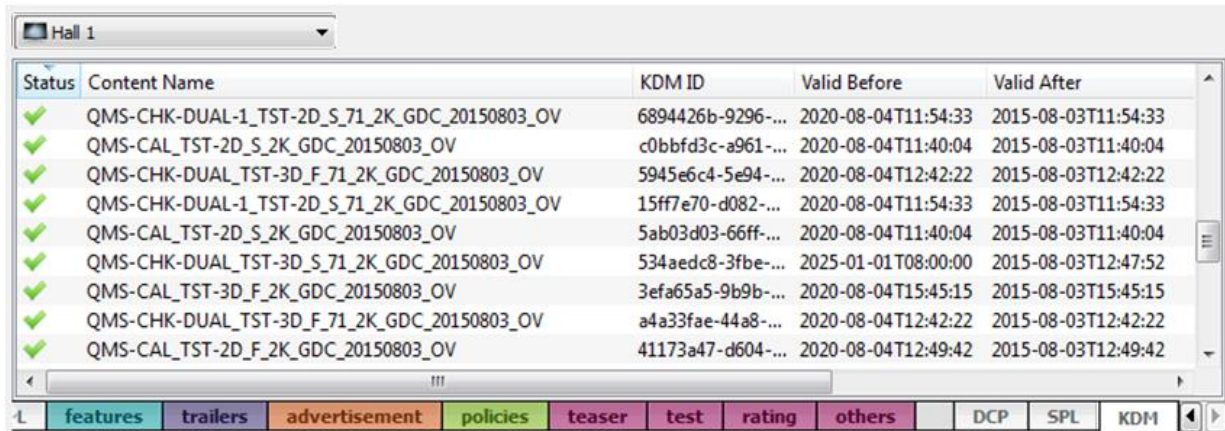
Go to Theare\_Store, the "No" status in Transferred? column indicates that the KDMs in the Theatre\_Store are yet to transfer to their corresponding servers.

Status	Content Name	KDM ID	Valid Before	Valid After	Transferred?
✓	QMS-CHK-DUAL-2_TST-2D_S_71_2K_GDC_20150803_OV	3f3230b7-9f43-...	2020-08-04T12:...	2015-08-03T12:...	No
✓	QMS-CHK-DUAL-1_TST-2D_S_71_2K_GDC_20150803_OV	af60eba6-960d-...	2025-01-01T08:...	2015-08-03T11:...	No
✓	QMS-CHK-DUAL-1_TST-2D_F_71_2K_GDC_20150803_OV	9ee278ae-8294-...	2020-08-04T11:...	2015-08-03T11:...	No
✓	QMS-CAL_TST-3D_S_2K_GDC_20150803_OV	1d2ef06f-6837-4...	2020-08-04T11:...	2015-08-03T11:...	No
✓	QMS-CAL_TST-3D_F_2K_GDC_20150803_OV	45b84787-367a-...	2020-08-04T15:...	2015-08-03T15:...	No
✓	QMS-CAL_TST-2D_F_2K_GDC_20150803_OV	41173a47-d604-...	2020-08-04T12:...	2015-08-03T12:...	No
✓	QMS-CHK_TST-3D_F_71_2K_GDC_20150512_OV	65ecce40-9998-...	2025-01-01T08:...	2015-05-13T16:...	No
✓	QMS-CHK-DUAL_TST-3D_F_71_2K_GDC_20150803_OV	5945e6c4-5e94-...	2020-08-04T12:...	2015-08-03T12:...	No
✓	QMS-CHK-DUAL-2_TST-2D_F_71_2K_GDC_20150803_OV	c863b865-c6ae-...	2020-08-04T12:...	2015-08-03T12:...	No
✓	QMS-CHK-DUAL-1_TST-2D_F_71_2K_GDC_20150803_OV	4a250337-c344-...	2020-08-04T11:...	2015-08-03T11:...	No
✓	QMS-CHK_TST-2D_S_2K_GDC_20150803_OV	5ab03d03-66ff-...	2020-08-04T11:...	2015-08-03T11:...	No
✓	QMS-CHK-DUAL_TST-3D_S_71_2K_GDC_20150803_OV	8aa79b85-c150-...	2020-08-04T12:...	2015-08-03T12:...	No
✓	QMS-CHK-DUAL-1_TST-2D_S_71_2K_GDC_20150803_OV	15ff7e70-d082-...	2020-08-04T11:...	2015-08-03T11:...	No
✓	QMS-CHK-DUAL-2_TST-2D_S_71_2K_GDC_20150803_OV	17762dd0-c6fc-...	2020-08-04T12:...	2015-08-03T12:...	No
✓	QMS-CAL_TST-3D_F_2K_GDC_20150803_OV	a5abd69e-4f13-...	2025-01-01T08:...	2015-08-03T15:...	No

Select the contents that are needed to be sent to the testing server, right-click at the selected contents, click "Send" button to send.



The KDMs will be sent to the designated server without the need of choosing a server.



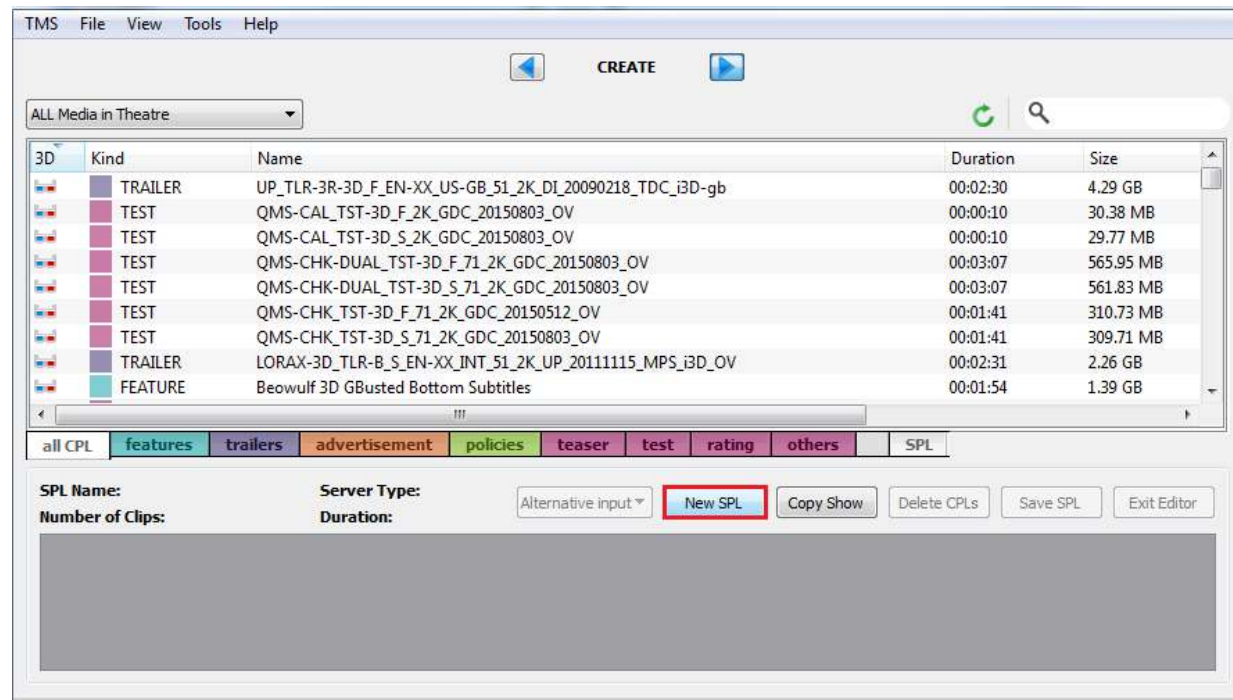


### 3.3 Server Playlist Creation and Transfer

After ingesting contents, Server Play Lists (SPLs) will be needed to be created and transferred to the server. There are 14 SPLs to be created on server.

No	Server Play List Name (SPL)	Content Name
1	QMS-CHK-S	QMS-CHK_TST-2D_S_71_2K_GDC_20150803_OV
2	QMS-CHK-F	QMS-CHK_TST-2D_F_71_2K_GDC_20150803_OV
3	QMS-CHK-3D-S	QMS-CHK_TST-3D_S_71_2K_GDC_20150803_OV
4	QMS-CHK-3D-F	QMS-CHK_TST-3D_F_71_2K_GDC_20150803_OV
5	QMS-CHK-S-DUAL-1	QMS-CHK-DUAL-1_TST-2D_S_71_2K_GDC_20150803_OV
6	QMS-CHK-F-DUAL-1	QMS-CHK-DUAL-1_TST-2D_F_71_2K_GDC_20150803_OV
7	QMS-CHK-S-DUAL-2	QMS-CHK-DUAL-2_TST-2D_S_71_2K_GDC_20150803_OV
8	QMS-CHK-F-DUAL-2	QMS-CHK-DUAL-2_TST-2D_F_71_2K_GDC_20150803_OV
9	QMS-CHK-3D-S-DUAL	QMS-CHK-DUAL_TST-3D_S_71_2K_GDC_20150803_OV
10	QMS-CHK-3D-F-DUAL	QMS-CHK-DUAL_TST-3D_F_71_2K_GDC_20150803_OV
11	QMS-CAL-S	QMS-CAL_TST-2D_S_2K_GDC_20150803_OV
12	QMS-CAL-F	QMS-CAL_TST-2D_F_2K_GDC_20150803_OV
13	QMS-CAL-3D-S	QMS-CAL_TST-3D_S_2K_GDC_20150803_OV
14	QMS-CAL-3D-F	QMS-CAL_TST-3D_F_2K_GDC_20150803_OV

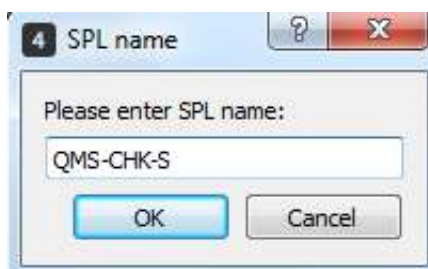
At Content Tab, select Create, and click "New SPL".



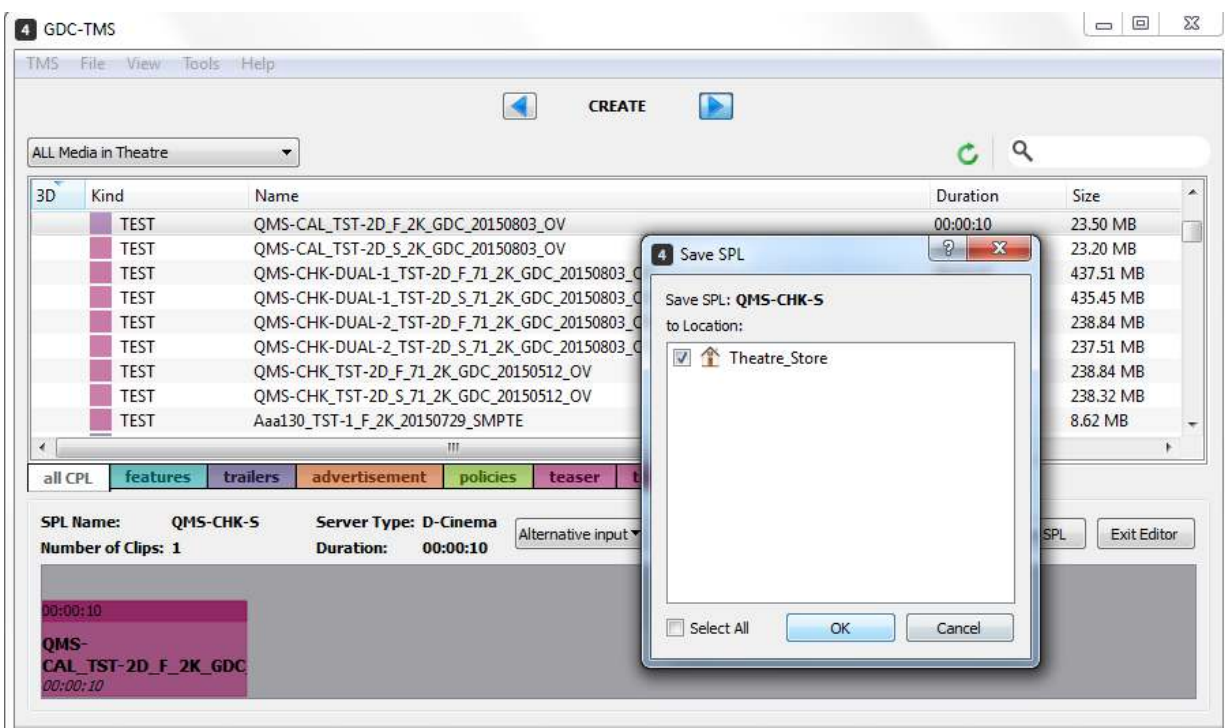
Server Type window will pop up. Click the drop-down menu and select D-Cinema, then click “OK” button.



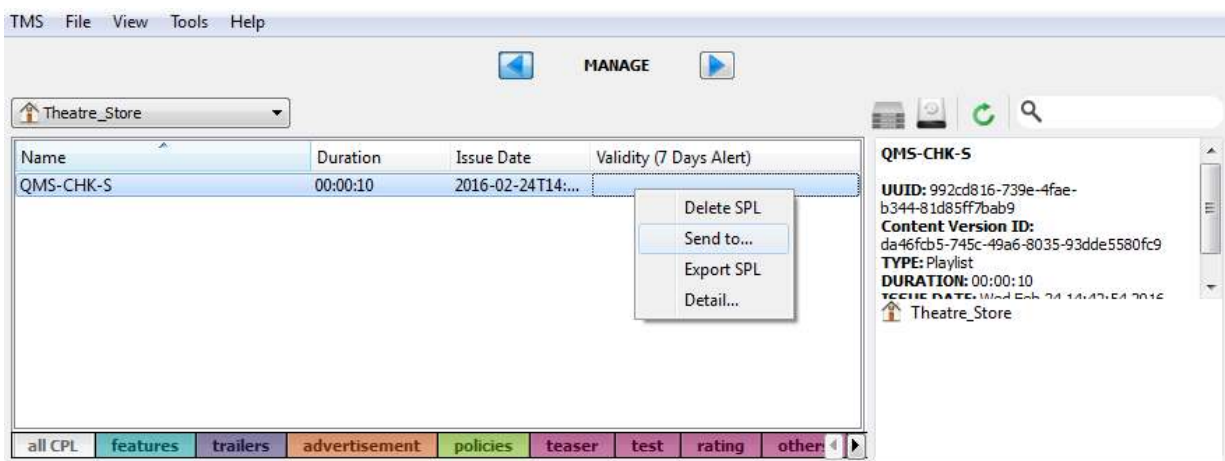
SPL name window will pop up. Enter the corresponding SPL name in the text box, then click “OK” button.



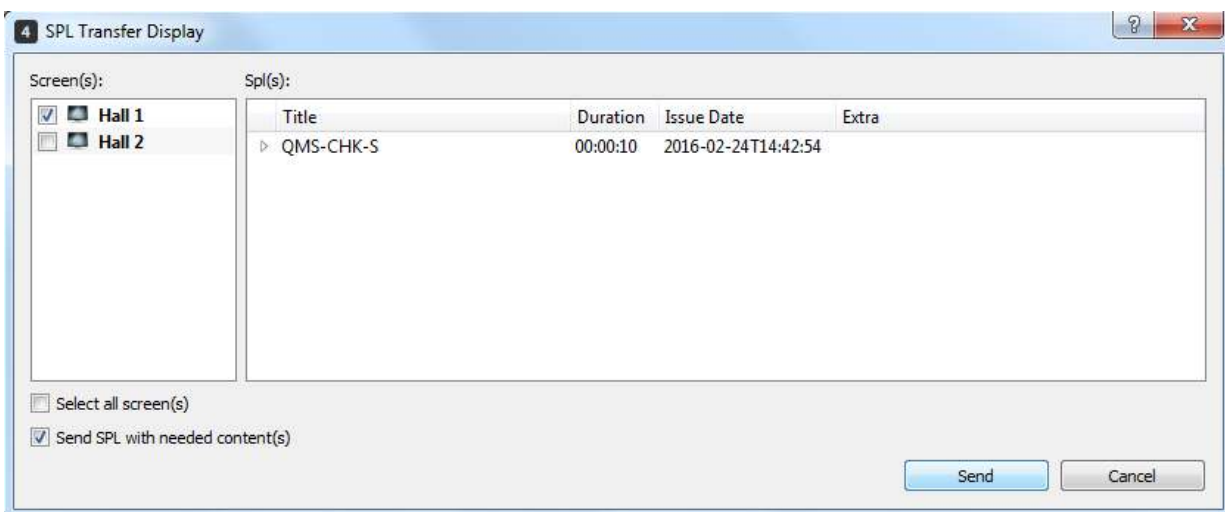
Select contents [QMS-CHK\_TST-2D\_F\_71\_2K\_GDC\_20150803\_OV] and drag into empty column below SPL Name, then click “Save SPL” button. Save SPL window will pop up. Check on Theatre\_Store as the location and click “OK” button to save. The created SPL will be saved into Theatre\_Store.




Go to Contents Tab, manage, locate "QMS-CHK-S" SPL, right-click and select "Send to..."



SPL Transfer Display window will pop up. Check "Send SPL with needed content(s)". Then, check the destination server, then click "Send" button.

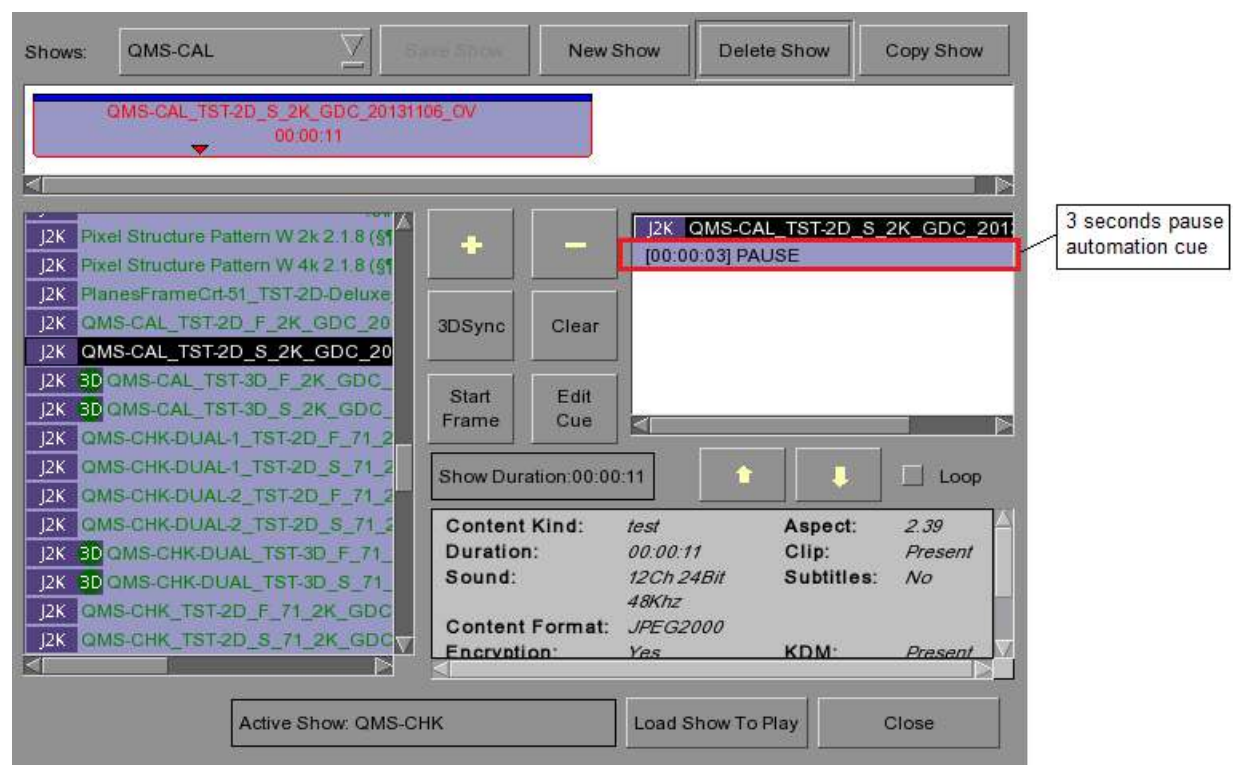


Click the Transfer  icon to check if the SPL is being transferred successfully.



*Note: For the remaining 13 SPLs and contents, follow the same method of creating the first SPL used.*

After all SPLs are created, a 3 seconds pause automation cue has to be added to both SPLs QMS-CAL and QMS-CAL-3D.

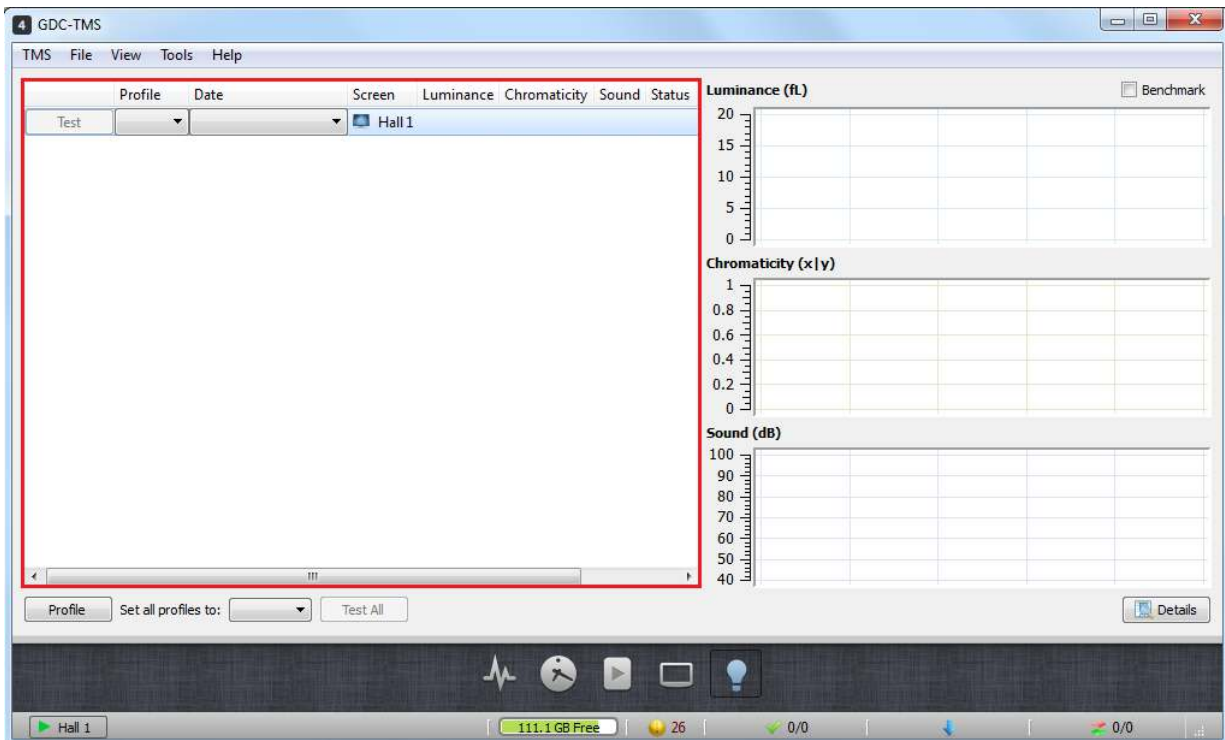


## 3.4 Profile Setup

A new profile has to be created before running a test. There are 4 profiles to be setup.

No	Profile Name	Mode	Aspect Ratio
1	2D_Scope	2D	Scope
2	2D_Flat	2D	Flat
3	3D_Scope	3D	Scope
4	3D_Flat	3D	Flat

Go to Quality tab, click "Profile" which is located at the bottom left of TMS window.



For 2D Scope profile, enter the Profile Name as 2D\_SCOPE, select Mode as 2D, Aspect Ratio as SCOPE, enter the Warning and Critical values for Sound Pressure Level, Luminance and Chromaticity, or else user may also use the default values. Click "Save" button to save the settings.

The screenshot shows a dialog box titled "4 Profile" with a question mark icon and a close button. It contains the following fields and controls:

- Profile Name:** A dropdown menu set to "2D\_SCOPE".
- Mode:** A dropdown menu set to "2D".
- Aspect Ratio:** A dropdown menu set to "SCOPE".
- Tolerance Deviation:** A section containing two columns of settings:
  - Warning:** Sound Pressure Level:  $\pm 1.0$  dB; Luminance:  $\pm 3.0$  fL; Chromaticity:  $\pm 0.006$ .
  - Critical:** Sound Pressure Level:  $\pm 1.0$  dB; Luminance:  $\pm 3.0$  fL; Chromaticity:  $\pm 0.006$ .
- Buttons:** "Save" and "Delete" buttons at the bottom.

For 2D Flat profile, enter the Profile Name as 2D\_FLAT, select Mode as 2D, Aspect Ratio as FLAT, enter the warning and Critical values for Sound Pressure Level, Luminance and Chromaticity, or else user may also use the default values. Click "Save" button to save the settings.

The screenshot shows a dialog box titled "4 Profile" with a question mark icon and a close button. It contains the following fields and controls:

- Profile Name:** A dropdown menu set to "2D\_FLAT".
- Mode:** A dropdown menu set to "2D".
- Aspect Ratio:** A dropdown menu set to "FLAT".
- Tolerance Deviation:** A section containing two columns of settings:
  - Warning:** Sound Pressure Level:  $\pm 1.0$  dB; Luminance:  $\pm 3.0$  fL; Chromaticity:  $\pm 0.006$ .
  - Critical:** Sound Pressure Level:  $\pm 1.0$  dB; Luminance:  $\pm 3.0$  fL; Chromaticity:  $\pm 0.006$ .
- Buttons:** "Save" and "Delete" buttons at the bottom.

For 3D profiles, user needs to create both Scope and Flat profiles. Select Mode 3D, Aspect Ratio, enter the profile name, input the tolerance values for sound pressure level, luminance and chromaticity, then click "Save" button to save.

The image shows two identical 'Profile' dialog boxes side-by-side. The left dialog has 'Profile Name' set to '3D\_SCOPE', 'Mode' set to '3D', and 'Aspect Ratio' set to 'SCOPE'. The right dialog has 'Profile Name' set to '3D\_FLAT', 'Mode' set to '3D', and 'Aspect Ratio' set to 'FLAT'. Both dialogs feature a 'Tolerance Deviation' section with two columns: 'Warning' and 'Critical'. Under 'Warning', the values are: Sound Pressure Level ± 1.0 dB, Luminance ± 3.0 fL, and Chromaticity ± 0.006. Under 'Critical', the values are: Sound Pressure Level ± 1.0 dB, Luminance ± 3.0 fL, and Chromaticity ± 0.006. Each dialog has a 'Save' button and a 'Delete' button at the bottom.

When all 4 profiles, 2D\_SCOPE, 2D\_FLAT, 3D\_SCOPE and 3D\_FLAT are being created, click Profile to check on it.

The image shows a software interface with a table. The table has columns: Test, Profile, Date, Screen, Luminance, Chromaticity, and Sound. The 'Profile' dropdown menu is open, showing options: 2D\_S, 2D...PE, 2D...AT, 3D...PE, and 3D...AT. The 'Screen' column shows 'Hall 1'.

Note:

Recommended Warning Values:

Sound Pressure Level: 0.5dB

Luminance: 1.5FL

Chromaticity: 0.003

Recommended Critical Values:

Sound Pressure Level: 1.0 dB

Luminance: 3.0FL

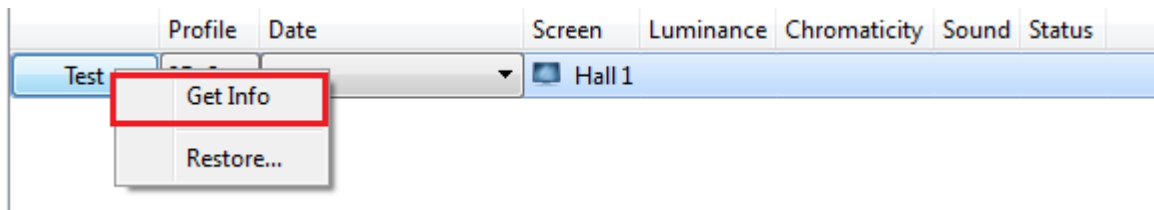
Chromaticity: 0.006



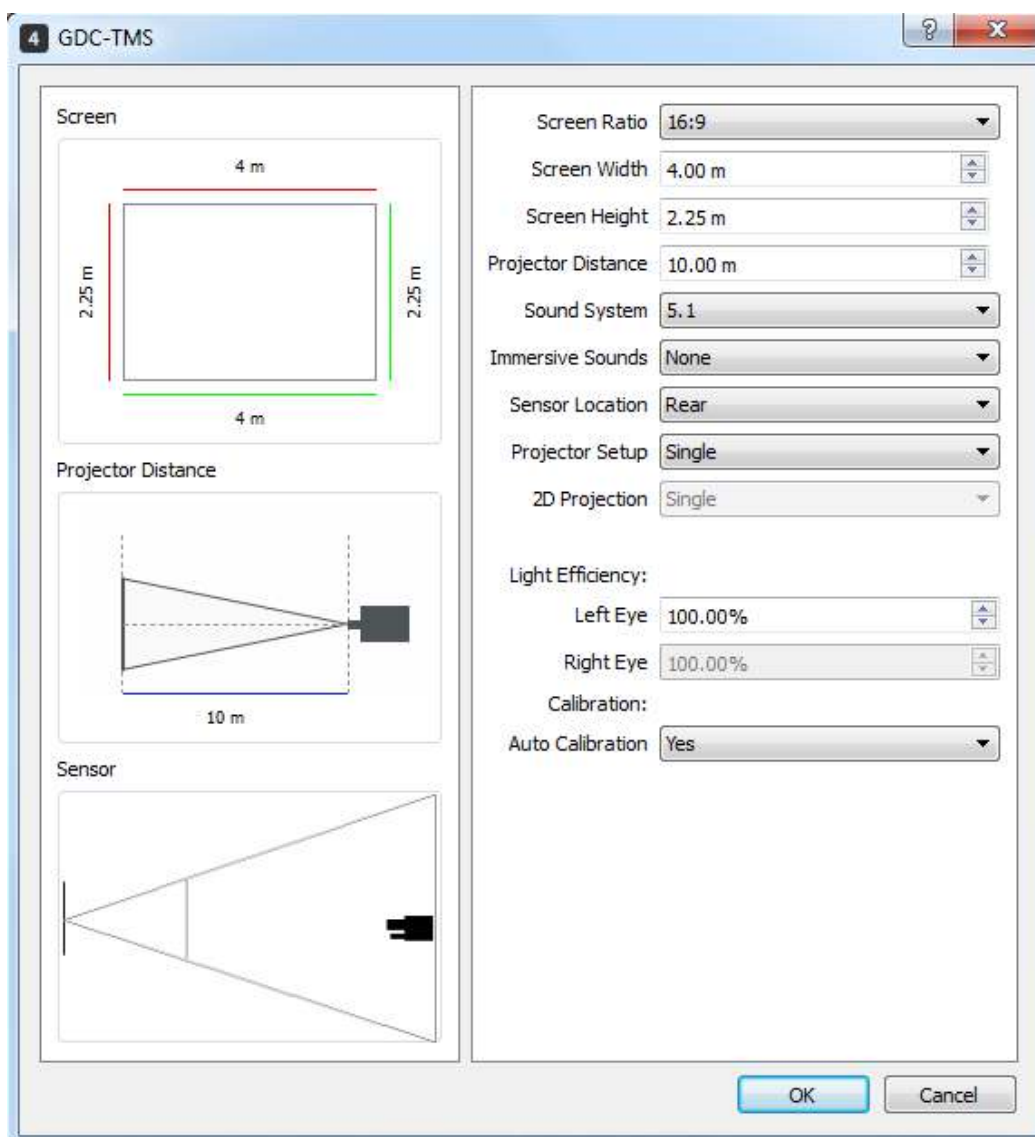
### 3.5 Screen Information

Information of screen, projector and sensor device are needed to be entered in each cinema hall 2D/3D profile.

Right-click Test and click "Get Info"



The auditorium data information window will be loaded.





Enter the Hall Screen information, Projector Distance, select Sound System type, Sensor Location and Projector Setup type.

	Screen Ratio	16:9
	Screen Width	4.00 m
	Screen Height	2.25 m
	Projector Distance	10.00 m
	Sound System	5.1
	Immersive Sounds	Dolby Atmos
Sensor Location		Rear

User should select Sensor installed location, it should be either Center or Rear location depending on initial sensor device physical installations.

Sensor Location

- Rear
- Center
- Rear

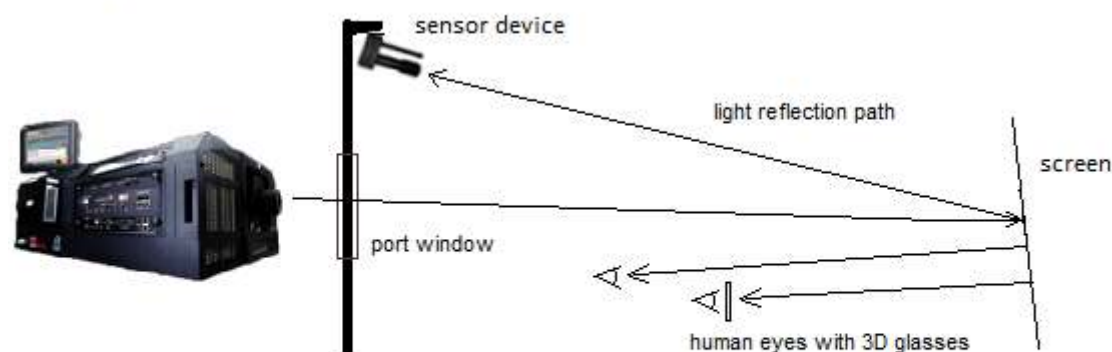
User should select the Single or Dual Projector used.

Projector Setup

- Single
- Single
- Dual

For Light Efficiency, as the sensor device is mounted in the hall, there is no light efficiency factor for 2D. For 3D, user needs to measure the 3D light efficiency value and input into the column for better measurement accuracy.

### Light Efficiency Factor for 2D and 3D



For 2D, the human eyes have a clear view to the screen without any external interference. For 3D, there is less light reflected to the human eyes due to the 3D glasses, and this light efficiency value can be calculated.

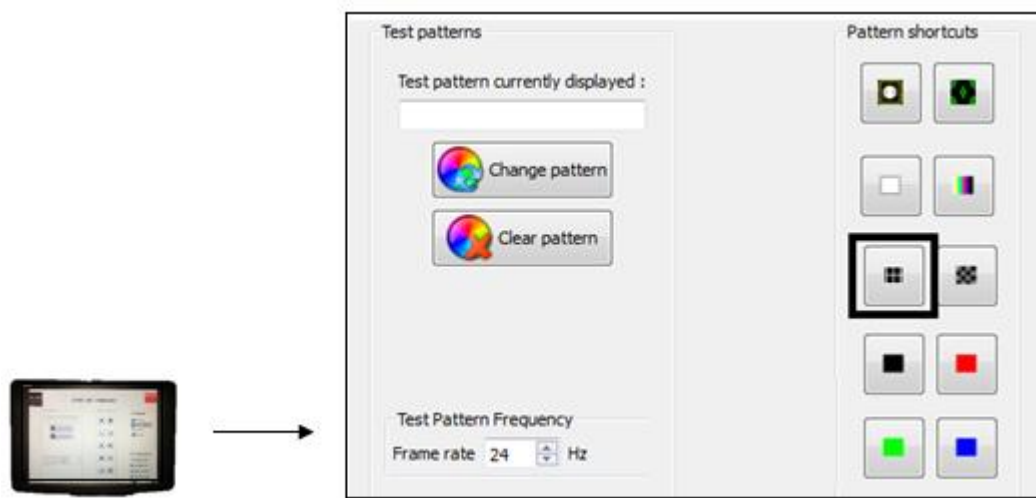
Connect Chroma meter to the mounting stand kit.



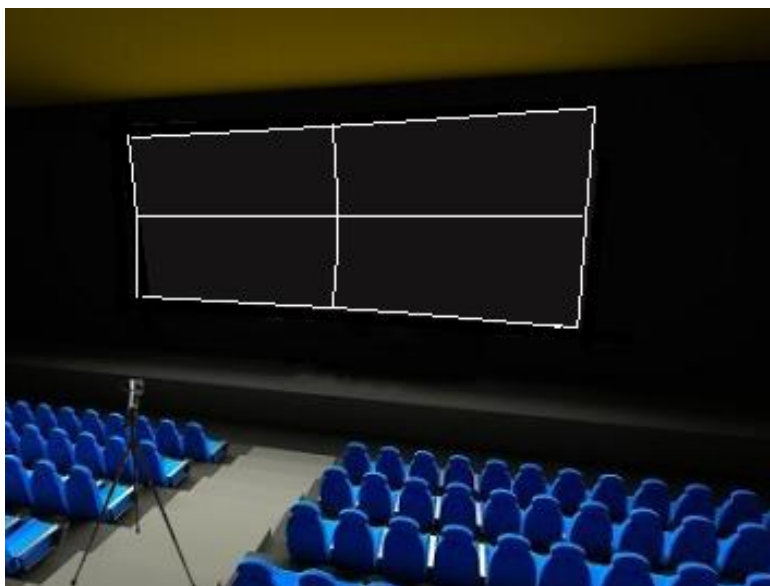
Put the Chroma meter to the centre of the Hall, set the height of it to be around 1.5 metres.



From Barco Projector, select Alignment Test Pattern as shown below, and click the icon to activate it.



Using the projected Test Pattern, look through the Chroma Meter and ensure that it is shooting to the centre of the it. Once it is aligned properly to the centre, lock and secure the Chroma meter to the mounting stand.



Playback Full White Test Pattern from the server and measure the value of the brightness using the Chroma meter, record this value and it will be known as A.



Using the same setup, use a pair of 3D glasses and put it in front of the lens of the Chroma Meter, measure the value of the brightness, record this value and it will be known as B.



To get the 3D Light Efficiency value, it will be B/A. Once calculated, enter this value into the Light Efficiency Column for single projector Setup. Click okay, and it is completed.

Light Efficiency:

Left Eye 41.00% 

Right Eye 41.00% 

*Note: If the setup is using a 3D Dual Projector, select "Dual" projector, use the same method as above to measure the values of the 2D and 3D setup of both the Left (Up) Projector and Right (Lower) Projector, input the values into the Light Efficiency columns.*

## 4. Running Test

### 4.1. 2D Profile - Optimal Projection Benchmark Values

After both 2D and 3D profiles setup are completed and the screen information is entered, user can select a profile and click "Test" button to run a test. For Optimal Projection Values Test, check and ensure that the physical sensor device is mounted on the rear wall in the auditorium, for projector information, the sensor device location must be selected as Rear.

Sound System

Immersive Sounds

**Sensor Location**

Projector Setup

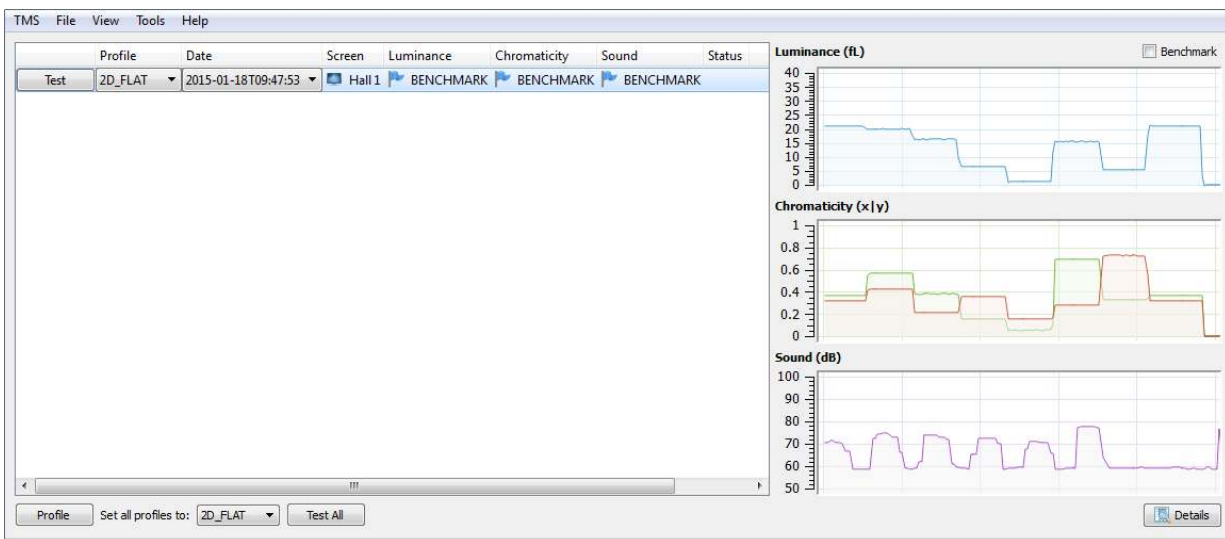
Select 2D\_FLAT profile, click "Test" button to start the test.

	Profile	Date	Screen	Luminance	Chromaticity	Sound	Status
Test	2D_FLAT		Hall 1				

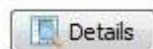
2D\_FLAT  
2D\_SCOPE  
3D\_FLAT  
3D\_SCOPE

When the test is in progress, the results will be updated in real time as shown in the graph on the right.

When the test is completed, the results graph will be created as shown on the right.



Click the "Details" button at the bottom right to toggle the results to display in numerical mode.



#### 4. RUNNING TEST

The results will be displayed in numerical mode.

TMS File View Tools Help							
Test	Profile	Date	Screen	Luminance	Chromaticity	Sound	Status
Test	2D_FLAT	2015-01-18T09:47:53	Hall 1	BENCHMARK	BENCHMARK	BENCHMARK	
Checking Item	Value		Benchmark				
✓ Luminance	20.97 fL		20.97 fL				
✓ Pattern 1	0.316	0.363	0.316	0.363			
✓ Pattern 2	0.420	0.565	0.420	0.565			
✓ Pattern 3	0.210	0.380	0.210	0.380			
✓ Pattern 4	0.356	0.151	0.356	0.151			
✓ Pattern 5	0.150	0.052	0.150	0.052			
✓ Pattern 6	0.277	0.690	0.277	0.690			
✓ Pattern 7	0.725	0.326	0.725	0.326			
✓ Channel 1	70.7 dB		70.7 dB				
✓ Channel 2	74.1 dB		74.1 dB				
✓ Channel 3	73.1 dB		73.1 dB				
✓ Channel 4	72.3 dB		72.3 dB				
✓ Channel 5	70.6 dB		70.6 dB				
✓ Channel 6	77.4 dB		77.4 dB				
✓ Channel 7	59.1 dB		59.1 dB				
✓ Channel 8	58.9 dB		58.9 dB				

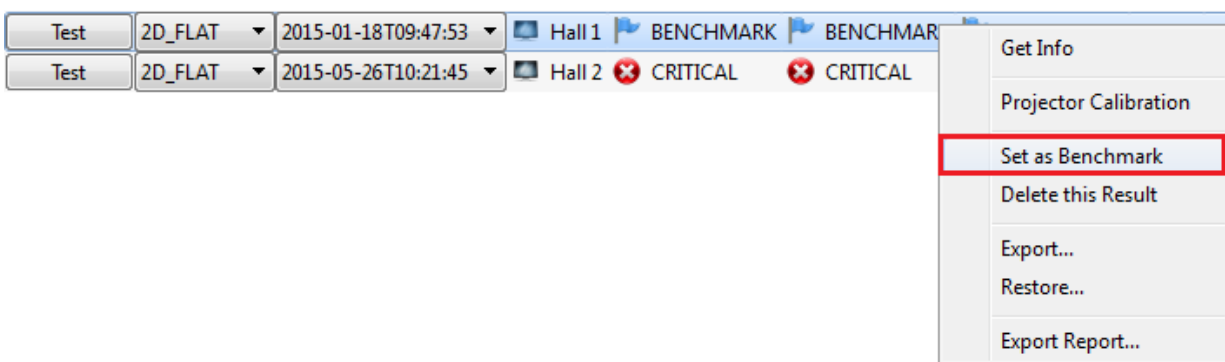
Once the test is completed, the test will check the tolerance deviations initially configured in the profile and indicates that the test is "Pass", "Warning" or "Critical" under their columns.

Test	Profile	Date	Screen	Luminance	Chromaticity	Sound	Status
Test	2D_FLAT	2015-05-26T10:21:45	Hall 1	✓ PASS	✓ PASS	✓ PASS	
Test	2D_FLAT	2015-05-26T10:21:45	Hall 2	✗ CRITICAL	✗ CRITICAL	⚠ WARNING	

A clear comparison between the actual result value and the benchmark is displaced at the right of the window.

Checking Item	Value		Benchmark	
✓ Luminance	20.97 fL		20.97 fL	
✓ Pattern 1	0.316	0.363	0.316	0.363
✓ Pattern 2	0.420	0.565	0.420	0.565
✓ Pattern 3	0.210	0.380	0.210	0.380
✓ Pattern 4	0.356	0.151	0.356	0.151
✓ Pattern 5	0.150	0.052	0.150	0.052
✓ Pattern 6	0.277	0.690	0.277	0.690
✓ Pattern 7	0.725	0.326	0.725	0.326
✓ Channel 1	70.7 dB		70.7 dB	
✓ Channel 2	74.1 dB		74.1 dB	
✓ Channel 3	73.1 dB		73.1 dB	
✓ Channel 4	72.3 dB		72.3 dB	
✓ Channel 5	70.6 dB		70.6 dB	
✓ Channel 6	77.4 dB		77.4 dB	
✓ Channel 7	59.1 dB		59.1 dB	
✓ Channel 8	58.9 dB		58.9 dB	

Right-click entry and click "Set as Benchmark" to set current values as Benchmark values.



Click "OK" to save result as benchmark values.



As initial benchmark values have been saved, click "Test" button again to check current values against it. The list now shows both benchmark values and real time results.

Profile	Date	Screen	Luminance	Chromaticity	Sound	Status
Test	2D_FLAT	2015-01-18T09:47:53	Hall 1	BENCHMARK	BENCHMARK	BENCHMARK
Test	2D_FLAT	2015-05-26T10:21:45	Hall 2	CRITICAL	CRITICAL	WARNING

Checking Item	Value	Benchmark
Luminance	14.57 fL	20.97 fL
Pattern 1	0.321 0.367	0.316 0.363
Pattern 2	0.427 0.566	0.420 0.565
Pattern 3	0.211 0.386	0.210 0.380
Pattern 4	0.367 0.155	0.356 0.151
Pattern 5	0.148 0.051	0.150 0.052
Pattern 6	0.278 0.698	0.277 0.690
Pattern 7	0.741 0.330	0.725 0.326
Channel 1	70.6 dB	70.7 dB
Channel 2	73.7 dB	74.1 dB
Channel 3	73.4 dB	73.1 dB
Channel 4	73.0 dB	72.3 dB
Channel 5	70.9 dB	70.6 dB
Channel 6	77.8 dB	77.4 dB
Channel 7	60.8 dB	59.1 dB
Channel 8	60.5 dB	58.9 dB



## 4.2. 2D Profile - SMPTE Standard Benchmark Values

For 2D Profile - SMPTE Standard Benchmarks, the physical sensor device must be mounted in the centre location in the auditorium and the sensor location column in TMS software must be Center.

Sound System **5.1**

Immersive Sounds **None**

**Sensor Location** **Center**

Projector Setup **Dual**

Select a 2D profile, and click "Test" button to start the test, when the location of sensor is set to center, the benchmark values will automatically be toggled to SMPTE standard benchmark values, these values are fixed and will not be changed.

TMS File View Tools Help

	Profile	Date	Screen	Luminance	Chromaticity	Sound	Status
Test	2D_FLAT	2015-01-18T09:47:53	Hall 1				
Test	2D_FLAT	2015-05-26T10:21:45	Hall 2				

Checking Item	Value	Benchmark
✓ Luminance	14.57 fL	14.57 fL
✓ Pattern 1	0.321 0.367	0.321 0.367
✓ Pattern 2	0.427 0.566	0.427 0.566
✓ Pattern 3	0.211 0.386	0.211 0.386
✓ Pattern 4	0.367 0.155	0.367 0.155
✓ Pattern 5	0.148 0.051	0.148 0.051
✓ Pattern 6	0.278 0.698	0.278 0.698
✓ Pattern 7	0.741 0.330	0.741 0.330
✓ Channel 1	70.6 dB	70.6 dB
✓ Channel 2	73.7 dB	73.7 dB
✓ Channel 3	73.4 dB	73.4 dB
✓ Channel 4	73.0 dB	73.0 dB
✓ Channel 5	70.9 dB	70.9 dB
✓ Channel 6	77.8 dB	77.8 dB
✓ Channel 7	60.8 dB	60.8 dB
✓ Channel 8	60.5 dB	60.5 dB

Profile Set all profiles to: 2D\_FLAT Test All Graph

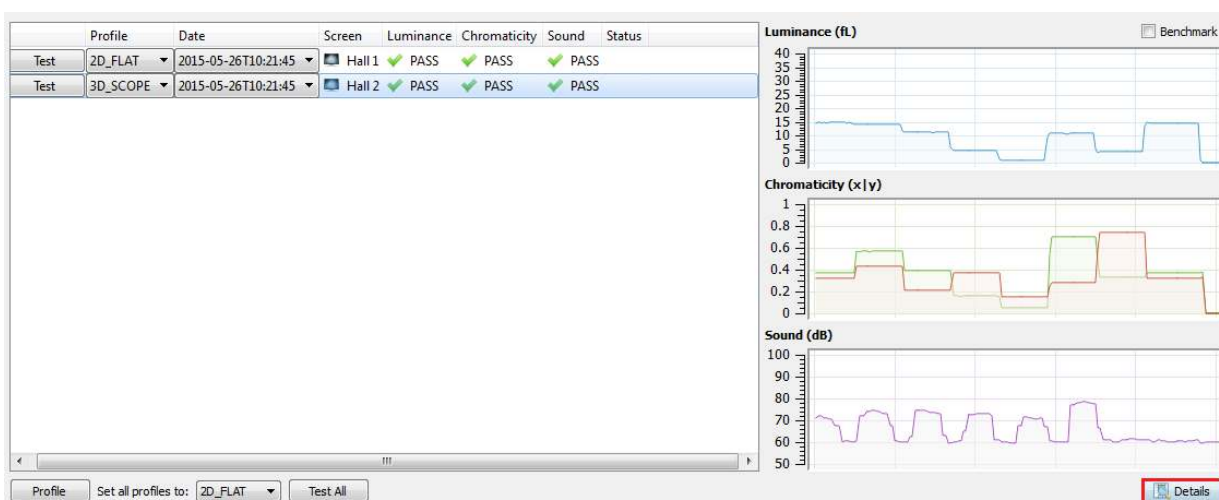
### 4.3. 3D Profile - Optimal Projection Benchmark Values

Select 3D profile and click [Test] to run a test in 3D mode. User does not need to put any 3D glasses over the Chroma Meter, as the light efficiency value has been keyed into the information column earlier.

	Profile	Date	Screen	Luminance	Chromaticity	Sound	Status
Test	2D_FLAT	2015-05-26T10:21:45	Hall 1				
Test	3D_SCOPE	2015-05-26T10:21:45	Hall 2				

2D\_FLAT  
 2D\_SCOPE  
 3D\_FLAT  
 3D\_SCOPE

When the test is completed, the graph will be full, and user can click details to toggle to the numerical mode.



Click details to toggle the results to numerical values.

Profile	Date	Screen	Luminance	Chromaticity	Sound	Status
Test	2D_FLAT	2015-05-26T10:21:45	Hall 1	✓ PASS	✓ PASS	✓ PASS
Test	3D_SCOPE	2015-05-26T10:21:45	Hall 2	✓ PASS	✓ PASS	✓ PASS

Checking Item	Value	Benchmark
✓  Luminance	14.57 fL	20.97 fL
✓  Pattern 1	0.321 0.367	0.316 0.363
✓  Pattern 2	0.427 0.566	0.420 0.565
✓  Pattern 3	0.211 0.386	0.210 0.380
✓  Pattern 4	0.367 0.155	0.356 0.151
✓  Pattern 5	0.148 0.051	0.150 0.052
✓  Pattern 6	0.278 0.698	0.277 0.690
✓  Pattern 7	0.741 0.330	0.725 0.326
✓  Channel 1	70.6 dB	70.7 dB
✓  Channel 2	73.7 dB	74.1 dB
✓  Channel 3	73.4 dB	73.1 dB
✓  Channel 4	73.0 dB	72.3 dB
✓  Channel 5	70.9 dB	70.6 dB
✓  Channel 6	77.8 dB	77.4 dB
✓  Channel 7	60.8 dB	59.1 dB
✓  Channel 8	60.5 dB	58.9 dB

Below the table are buttons: Profile, Set all profiles to: 2D\_FLAT, Test All, and a Graph button.

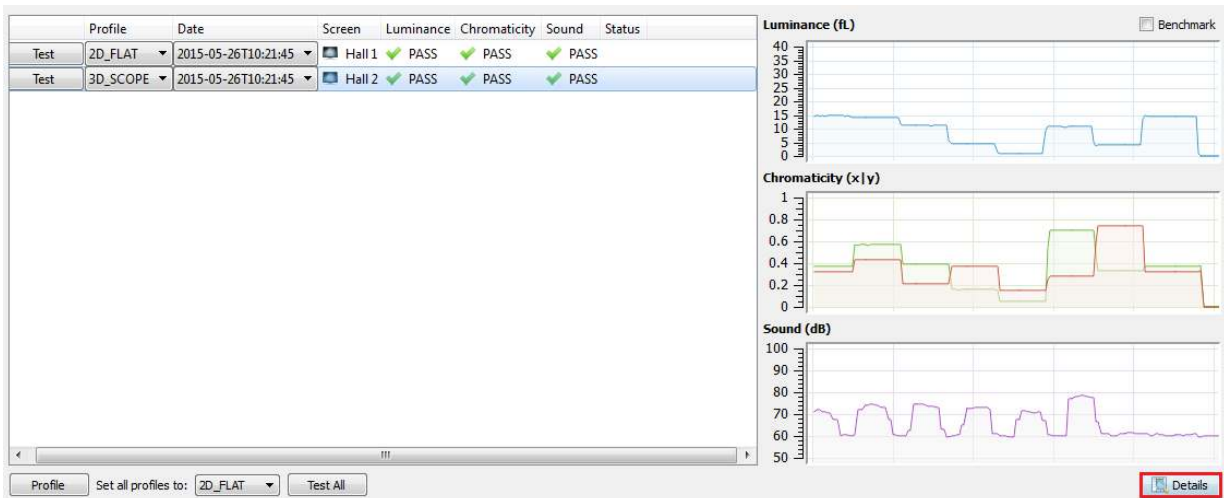
Right-click entry and click "Set as Benchmark" to set current values as Benchmark values.

#### 4. RUNNING TEST

	Profile	Date	Screen	Luminance	Chromaticity	Sound	Status
Test	2D_FLAT		Hall 1				
Test	3D_SCOPE	2015-01-18T09:47:53	Hall 2	BENCHMARK	BENCHMARK	BENCHMARK	

Get Info  
 Projector Calibration  
**Set as Benchmark**  
 Delete this Result  
 Export...  
 Restore...  
 Export Report...

User can click test again to run the test, and the subsequent test will be checked against this benchmark values. It will tell the user that the test is "Pass", "Warning" or "Critical". Click "Details" to view the numerical results of the test.

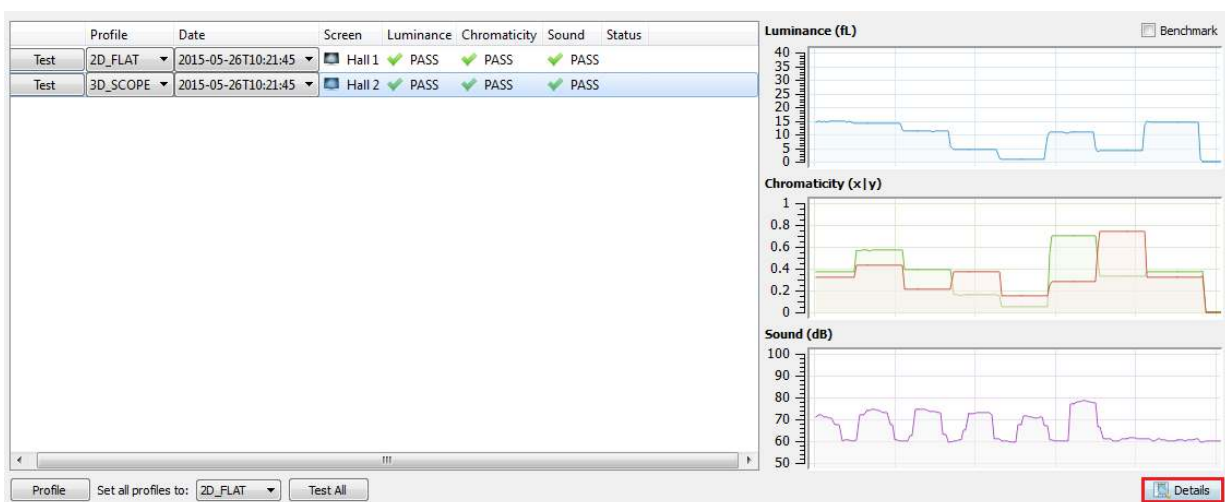


## 4.4. 3D Profile - SMPTE Standard Benchmark Values

To run 3D Profile in Standard Benchmark Values, select a 3D profile and change sensor location to center. The benchmark values will be fixed to SMPTE standard values.

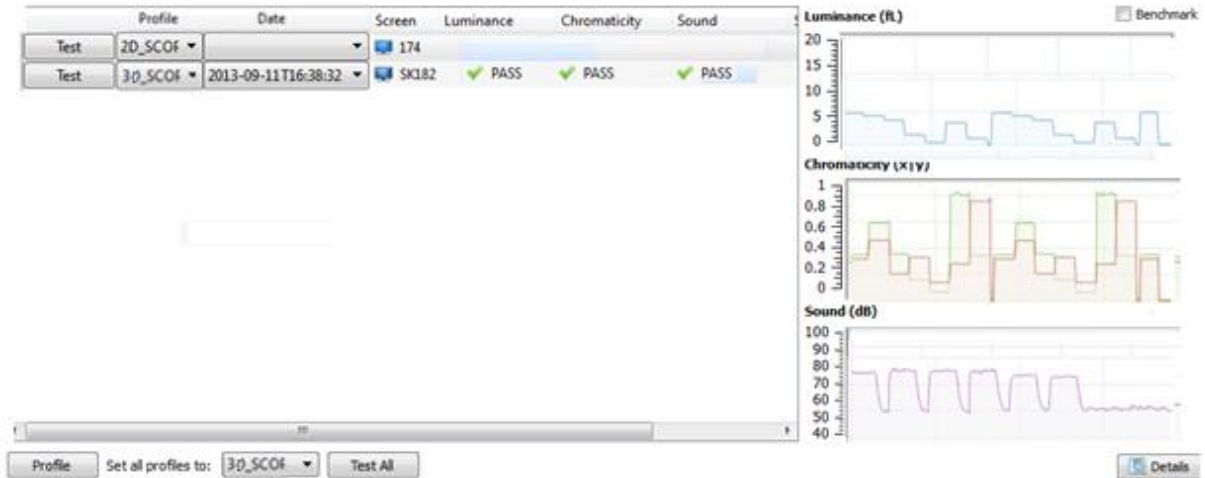
Checking Item	Value	Benchmark
Luminance		7 fL
Pattern 1	0.314	0.351
Pattern 2	0.424	0.547
Pattern 3	0.204	0.360
Pattern 4	0.342	0.154
Pattern 5	0.15	0.06
Pattern 6	0.265	0.69
Pattern 7	0.679	0.32
Channel 1		85 dB
Channel 2		85 dB
Channel 3		85 dB
Channel 4		95 dB
Channel 5		82 dB
Channel 6		82 dB
Channel 7		82 dB
Channel 8		82 dB

When the test is completed, the graph will be full, and user can click details to toggle to the numerical mode.

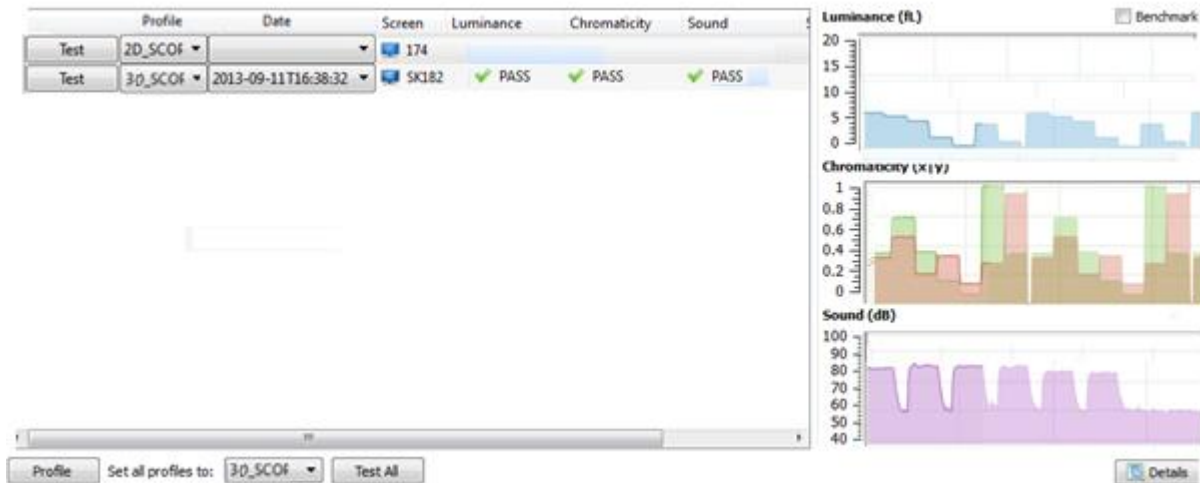


## 4.5 3D Profile Dual Projector Optimal Projection Benchmark Values

Check and ensure that dual projector has been selected in screen information, click Test button to start the test. After test completion, the results and the graph will be updated.



The results below show the full graph of actual results and comparison with benchmarks.



	Profile	Date	Screen	Luminance	Chromaticity	Sound
Test	2D_SCOF		174			
Test	3D_SCOF	2013-09-11T16:38:32	SK182	PASS	PASS	PASS

Checking Item	Value	Benchmark
Luminance	4.779 ftL	4.761 ftL
Pattern 1	0.315 0.346	0.315 0.347
Pattern 2	0.455 0.589	0.455 0.589
Pattern 3	0.200 0.355	0.200 0.354
Pattern 4	0.327 0.158	0.327 0.158
Pattern 5	0.136 0.063	0.136 0.064
Pattern 6	0.277 0.803	0.278 0.809
Pattern 7	0.750 0.342	0.750 0.342
Luminance	4.821 ftL	4.775 ftL
Pattern 1	0.315 0.346	0.315 0.347
Pattern 2	0.454 0.588	0.455 0.589
Pattern 3	0.201 0.354	0.200 0.355
Pattern 4	0.327 0.158	0.327 0.158
Pattern 5	0.136 0.064	0.136 0.063
Pattern 6	0.277 0.803	0.276 0.799
Pattern 7	0.750 0.342	0.750 0.343
Channel 1	74.2 dB	74.2 dB
Channel 2	75.0 dB	75.0 dB
Channel 3	75.0 dB	74.8 dB
Channel 4	74.5 dB	74.6 dB
Channel 5	73.2 dB	73.0 dB
Channel 6	72.6 dB	72.7 dB
Channel 7	61.3 dB	60.1 dB
Channel 8	61.7 dB	59.7 dB

Profile Set all profiles to: 3D\_SCOF Test All Graph

## 5. Automatic Foot Lambert Calibrations

To run test with automatic Foot Lambert (FL) adjustment by QMS, user needs to select "Get Info".

	Profile	Date	Screen	Luminance	Chromaticity	Sound	Status
Test	2D_FLAT		Hall 1				
Test	2D_SCOPE		Hall 2				
	Get Info						
	Restore...						

On Screen information window, select Calibration, set Auto Calibration to Yes.

The screenshot shows the GDC-TMS software window. On the left, there are three diagrams: 'Screen' (a rectangle with dimensions 4 m width and 2.25 m height), 'Projector Distance' (a diagram showing a projector at 10 m distance), and 'Sensor' (a diagram showing a sensor). On the right, there are various settings: Screen Ratio (16:9), Screen Width (4.00 m), Screen Height (2.25 m), Projector Distance (10.00 m), Sound System (5.1), Immersive Sounds (None), Sensor Location (Rear), Projector Setup (Single), 2D Projection (Single), Light Efficiency (Left Eye 100.00%, Right Eye 100.00%), and Calibration (Auto Calibration Yes). The 'Auto Calibration' dropdown is highlighted with a red box. At the bottom right, there are 'OK' and 'Cancel' buttons.

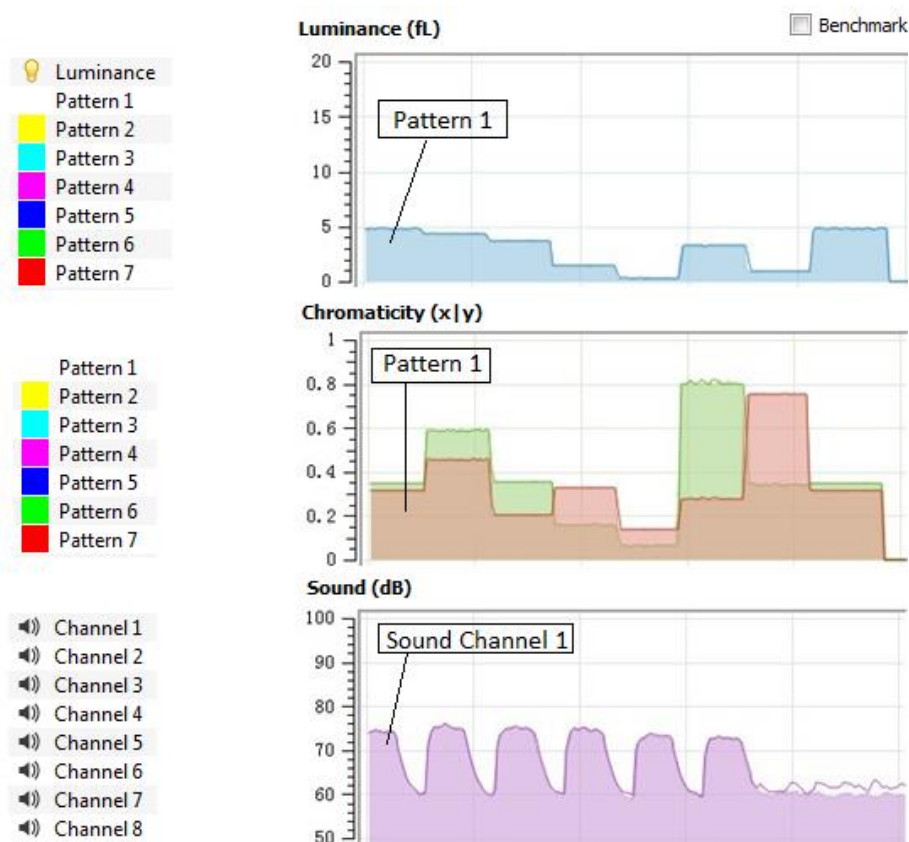
When test has been completed, and auto calibration is set to Yes, if the value of current luminance does not pass the luminance benchmark value, QMS will immediately and automatically run a calibration SPL, and the FL of current projector will be automatically adjusted above benchmark values.



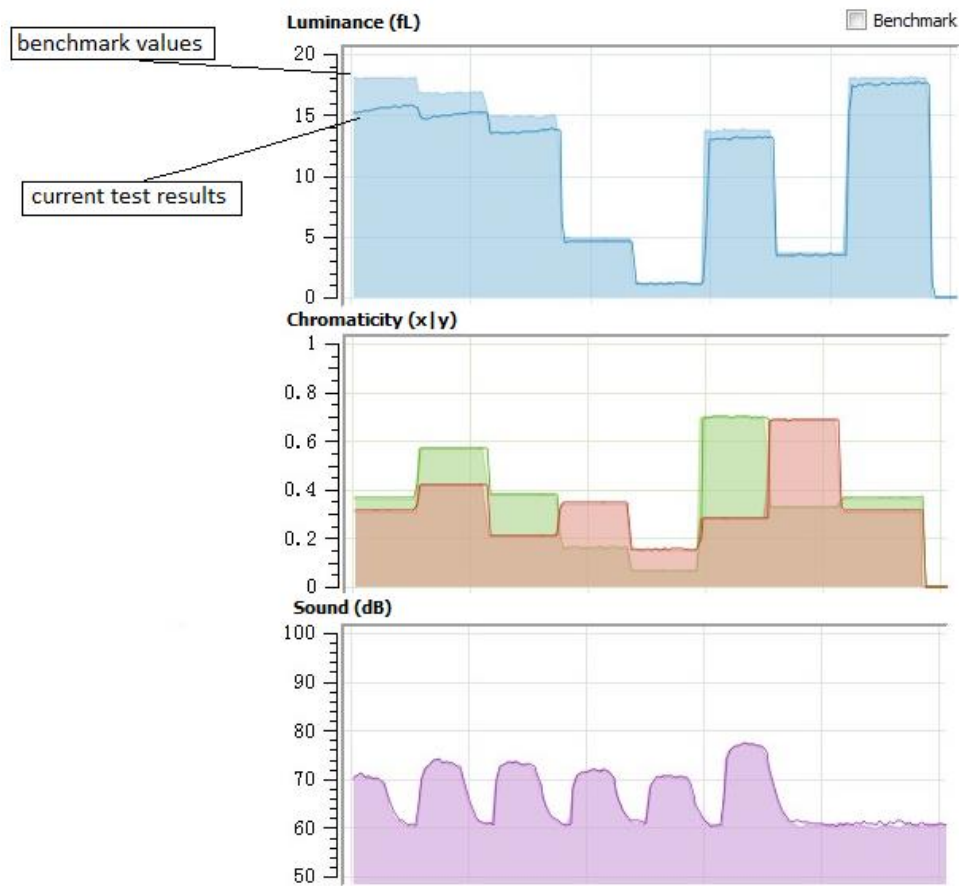
## 6. Results Analysis and Solutions

### 6.1 Results Analysis

By comparing between the actual results and benchmarks values, user can immediately know the result by looking at the details or graphical mode. The user can obtain the result from the pattern on the graph.



From the test results, the user can tell the difference between benchmark values and current test results, and below graph shows the huge difference of the FL in the test results taken after a time lapse.



From the detail test results, the results will be more refined, and the user can immediately note the differences in results and to take the next course of action.

Results that passed Benchmark values

Checking Item	Value	Benchmark	
✓💡 Luminance	14.75 fL	14.33 fL	
✓ Pattern 1	0.312 0.329	0.312 0.329	
✓ Pattern 2	0.447 0.557	0.447 0.557	
✓ Pattern 3	0.203 0.331	0.203 0.331	
✓ Pattern 4	0.325 0.156	0.325 0.156	
✓ Pattern 5	0.148 0.070	0.148 0.070	
✓ Pattern 6	0.279 0.733	0.278 0.733	
✓ Pattern 7	0.693 0.331	0.694 0.332	
✓🔊 Channel 1	68.0 dB	68.2 dB	
✓🔊 Channel 2	68.8 dB	68.9 dB	
✓🔊 Channel 3	68.7 dB	68.7 dB	
✓🔊 Channel 4	68.5 dB	68.9 dB	
✓🔊 Channel 5	67.1 dB	67.1 dB	
✓🔊 Channel 6	66.8 dB	67.0 dB	
✓🔊 Channel 7	60.4 dB	61.7 dB	
✓🔊 Channel 8	59.7 dB	60.0 dB	

Results that are at warning stages of Benchmark values

Checking Item	Value	Benchmark	
✓💡 Luminance	14.76 fL	14 fL	
⚠️ Pattern 1	0.311 0.328	0.314 0.351	
⚠️ Pattern 2	0.447 0.557	0.424 0.547	
⚠️ Pattern 3	0.203 0.330	0.204 0.360	
⚠️ Pattern 4	0.324 0.155	0.342 0.154	
⚠️ Pattern 5	0.148 0.069	0.15 0.06	
⚠️ Pattern 6	0.278 0.733	0.265 0.69	
⚠️ Pattern 7	0.694 0.331	0.679 0.32	
⚠️🔊 Channel 1	68.2 dB	85 dB	
⚠️🔊 Channel 2	69 dB	85 dB	
⚠️🔊 Channel 3	68.8 dB	85 dB	
⚠️🔊 Channel 4	70.6 dB	95 dB	
⚠️🔊 Channel 5	67.3 dB	82 dB	
⚠️🔊 Channel 6	66.9 dB	82 dB	
⚠️🔊 Channel 7	59.6 dB	82 dB	
⚠️🔊 Channel 8	59.4 dB	82 dB	

## 6.2 Solution

User need to take note of the results that are at warning and critical levels, and the need to improve the luminance, chromaticity and sound levels to ensure that audience have the best cinema experience in the cinema hall.

### Luminance

Besides the lamp long running hours, which caused the lamp to degrade and brightness level to drop, there are many causes of brightness problems that caused luminance to decrease. The dust accumulated in the projection room which caused dust on the port window, screen and projector parts including lens, lamp house, deflector, folding mirror, cold mirror and the light pipe etc. User is advised to perform cleaning maintenance quarterly on projector which will improve the overall brightness output on the projector.

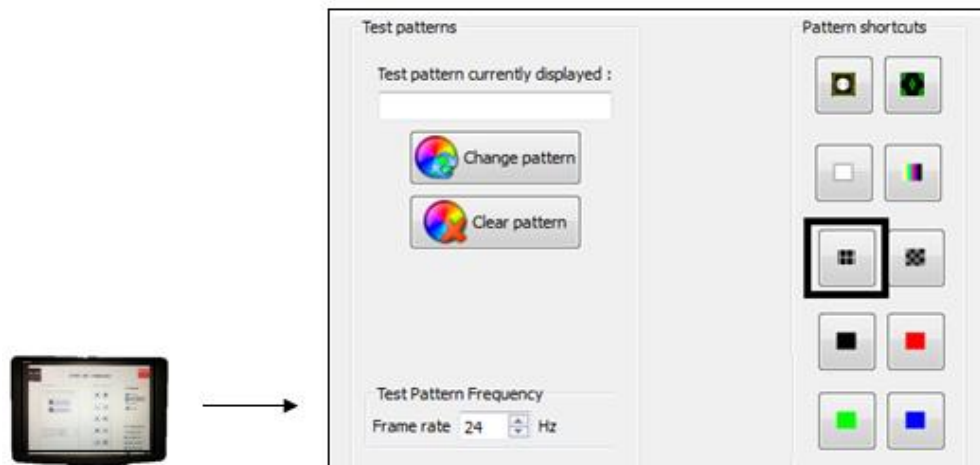


QMS is capable of doing automatic adjustment of the lamp according to the benchmark values when user sets the auto calibration in screen information to Yes, and user does not need to do anything after installing lamp and calibrating the xyz values. When critical values of luminance is reached, QMS will perform auto adjustment to the defined benchmark values.

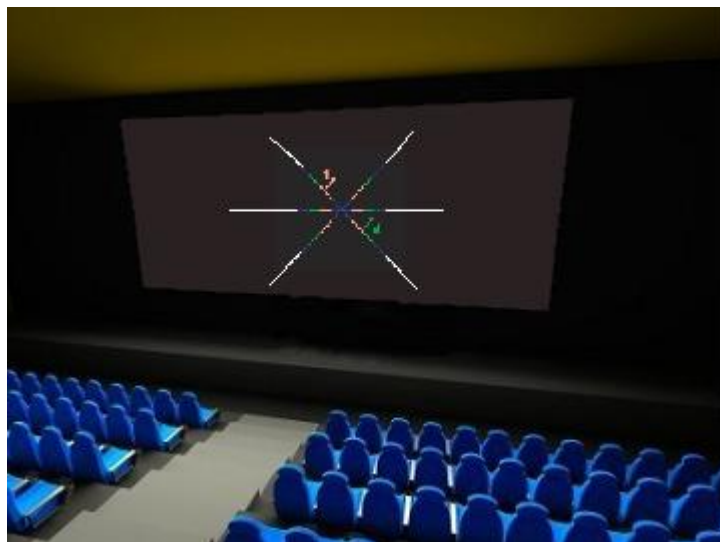
**Chromaticity**

When the values of the projector output values dropped, user should check and retune the color convergence of the light processor in projector and redo color calibrations on projector.

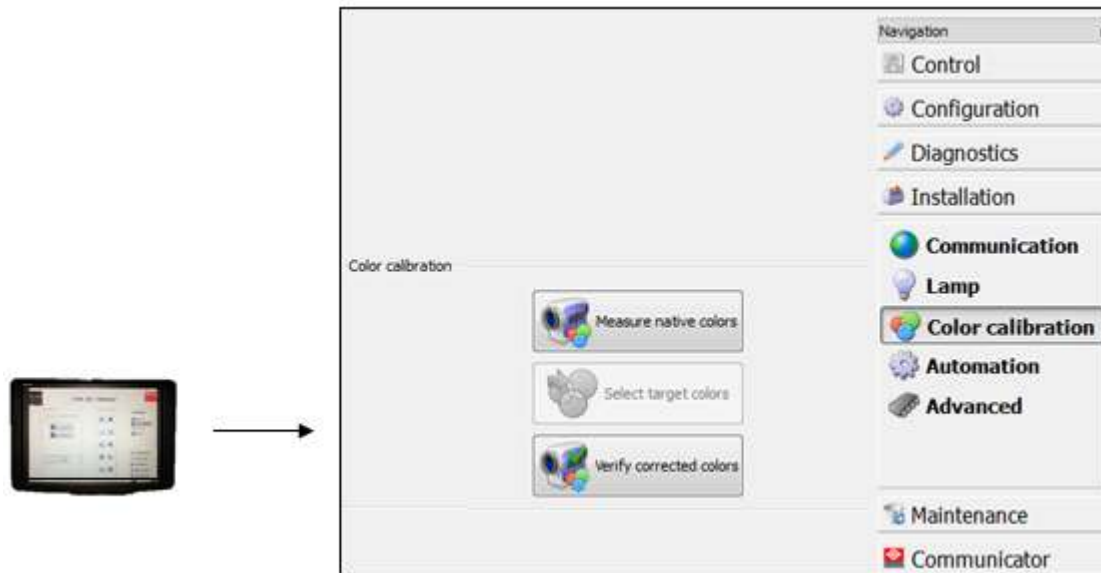
From Touch Panel, select color convergence test pattern and display it on the screen.



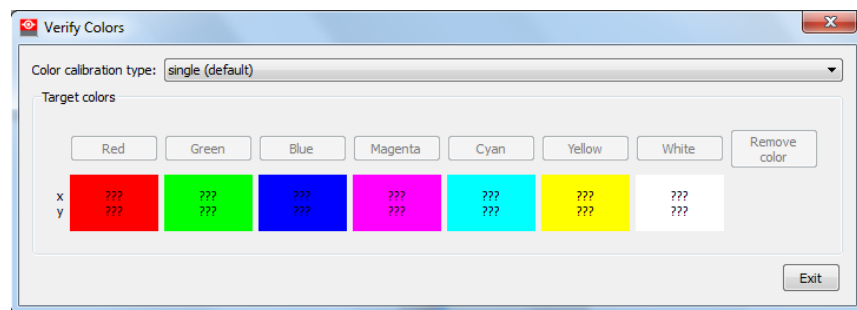
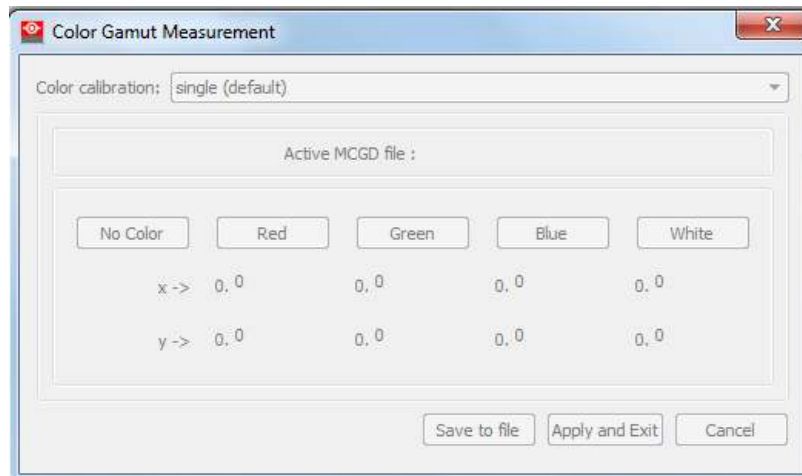
When the test pattern is displayed, the color convergence of red, green and blue on light processor can be checked and retuned.



After convergence is adjusted, user can proceed to redo color calibrations and verifications.



The red, green, blue and white values will have to be measured in the cinema hall using chroma meter and verifications of colors verified to ensure that it passed the 0.006 tolerance values.



### **Sound**

For sound that did not pass requirements, user has to check and trace on the cinema audio processor, amplifiers, speakers, audio cables in the projection room and cinema hall and sound recalibrations maybe necessary.



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