CONTENT INFORMATION PACKAGE
Next Generation Cinema Technology Test Material

Version 2019-04-16

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Introduction

Technical boundaries are shifting as pioneers pave the path to higher frame rate, higher resolution and high dynamic range advancements. Thus, the creative palette is expanding and with more options comes the underlying question, how will this trend shape the future of digital motion picture content creation?[1] In order to understand how far we can go we need sufficient reference materials to manipulate and experiment with. Understanding the limits of these advances is necessary for motion picture professionals and manufacturers to make informed decisions about the way in which the image will be affected.

Purpose: Producing Suitable Material

The Science and Technology Council, recognizing the need for useful royalty-free motion picture test materials to support the industry's exploration of technology-enabled next-generation cinematic experiences such as higher frame rates (HFR), high brightness (HB) and high dynamic range (HDR) displays, wider color gamut (WCG) and wider shutter angle, conducted a visual test shoot. The Science and Technology Council set out to clearly define the requirements for such test material to the point where a useful set of digital motion picture test materials could be designed, produced and distributed to the industry for research and academic use. Other test material may exist, but that material is not believed to be available to the industry on an unrestricted, royalty-free basis.[2]

Test Shoot Design

Initial planning of this project began in early November 2013 by the Next Generation Cinema Technology working group (NGCT). The Academy of Motion Picture Arts and Sciences' Science and Technology Council created this committee to support the exploration of producing suitable digital test material. The NGCT working group consisted of Academy Council members and staff, cinematographers and other industry experts. In the preceding months of discussions, the NGCT working group agreed on the best practice for generating digital test material. On March 13th 2014 the actual shoot took place on the fourth-floor common area of the Pickford Center for Motion Picture Study and was shot in one day by director Howard Lukk and director of photography David Stump, ASC along with a crew of motion picture professionals. The test shoot utilized two different cameras, a selected range of frame rates and resolution rates, composed as one single scene to be used for repeated passes [see Table 1].

Table #1

Camera: ARRI Alexa Studio XT

Frame Rate	Resolution	Shutter Angle	Shutter Type
24fps	2k	180	ELEC
48fps	2k	180	ELEC
60fps	2k	180	ELEC
120fps	2k	180	ELEC

Camera: Sony F65

Frame Rate	Resolution	Shutter Angle	Shutter Type
24fps	4k	180	MECH
48fps	4k	180	MECH
60fps	4k	180	ELEC
120fps	4k	180	ELEC

VISUAL DESIGN

The visual elements of the test shoot were staged using selected objects with the intention of purposefully testing the limits of contrast, exposure, and panning speed judder. We aimed for a challenging shot that would encompass various reflective surfaces, saturated colors, and a mix of exterior and interior lighting [see Figure 1a and Figure1b]. Furthermore, all the test parameters were contained into a single shot which was repeated in each pass using one camera per sequence mounted onto a motion control rig. It was important to maintain consistency through each pass so much discussion went on about achieving continuity for our production. The entire sequence of the visual test shoot was carefully planned out and a test day was organized to record sample footage to be used for review for the workflow analysis.

Figure 1a. Sculpture--life size lucite nude torso [highlight details], circular chafing dishes [specular highlights], small bright foil center pieces blowing in wind [motion or compression artifacts].

Figure 1b. Stained glass window [contrast ratio, highlight sky exposure], hanging neon sign. Exposure outside is considerably brighter. Daylight/Tungsten interior.

CAMERAS

For our production we shot with the ARRI Alexa Studio XT and the Sony F65. These two cameras were ultimately chosen based on the capabilities required for our test parameters, their common use within the industry and equipment availability. We wanted to capture uncompressed digital data and chose to shoot each camera in its optimal format (ARRI RAW & F65RAW). We used the same Leica Summilux-C 25mm prime lens with each camera.

MOCO SYSTEM

Both cameras were directly mounted onto the same motion control (MOCO) rig in order to maintain precise control needed to keep all shots consistent for analysis. By maintaining the precise control the visual distraction caused by variation in photography would be minimized. General Lift provided a JetRail Dolly motion control system along with the stereo head which was originally designed and used for filming THE HOBBIT. To control the rig, operators used Kuper Controls Motion Control PC. Operator Josh Cushner with assistants Rob Menapace and Jody Holdren carried out initial set-up, programming and oversight of the system. For our production we used three sections of 8ft track, which ran the length of the room [see Figure 2].

The motion control camera system was a simple set-up that moved in the same direction as the lead and came to rest when she did [see Figure 3].

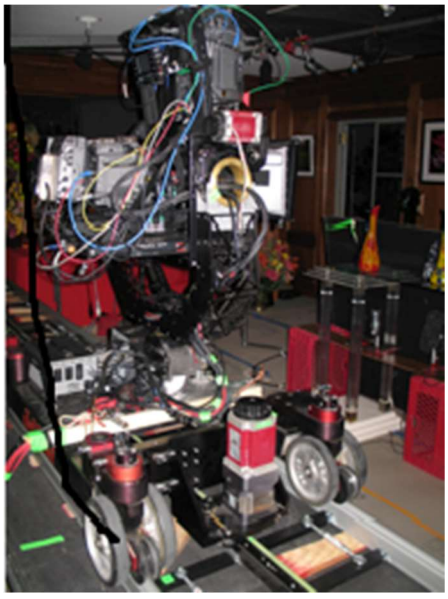


Figure 2. MOCO system & track.

PERFORMANCE

This MOCO system created a specific demand on the actress, Bianca Rusu ‘Goth Girl’, who needed to time her movements to a preprogrammed camera move for each take. An entire day of rehearsal was necessary to ensure her accuracy.

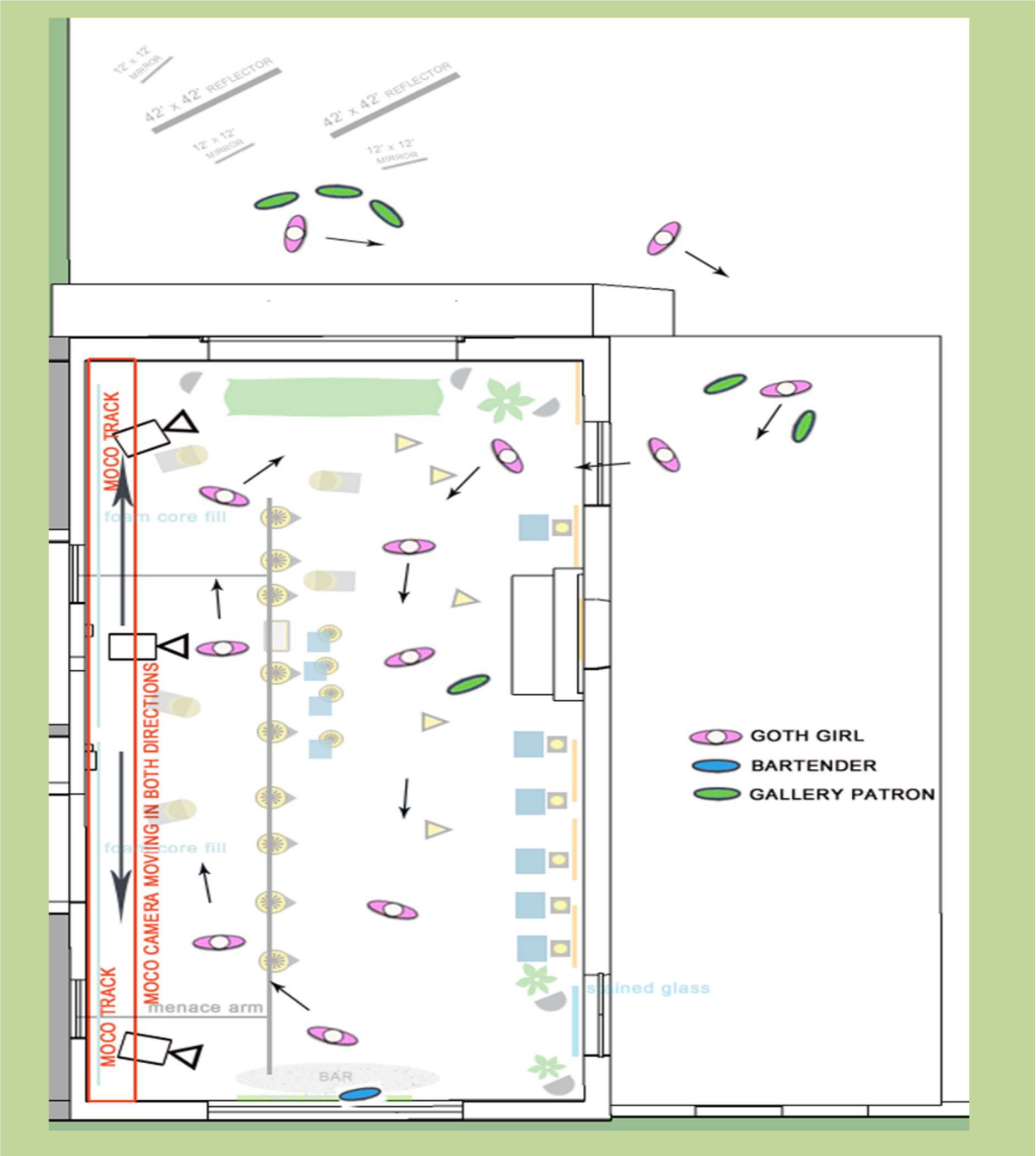


Figure 3. Blocking diagram by Leo Zahn. Staged at the Pickford Center for Motion Picture Study.

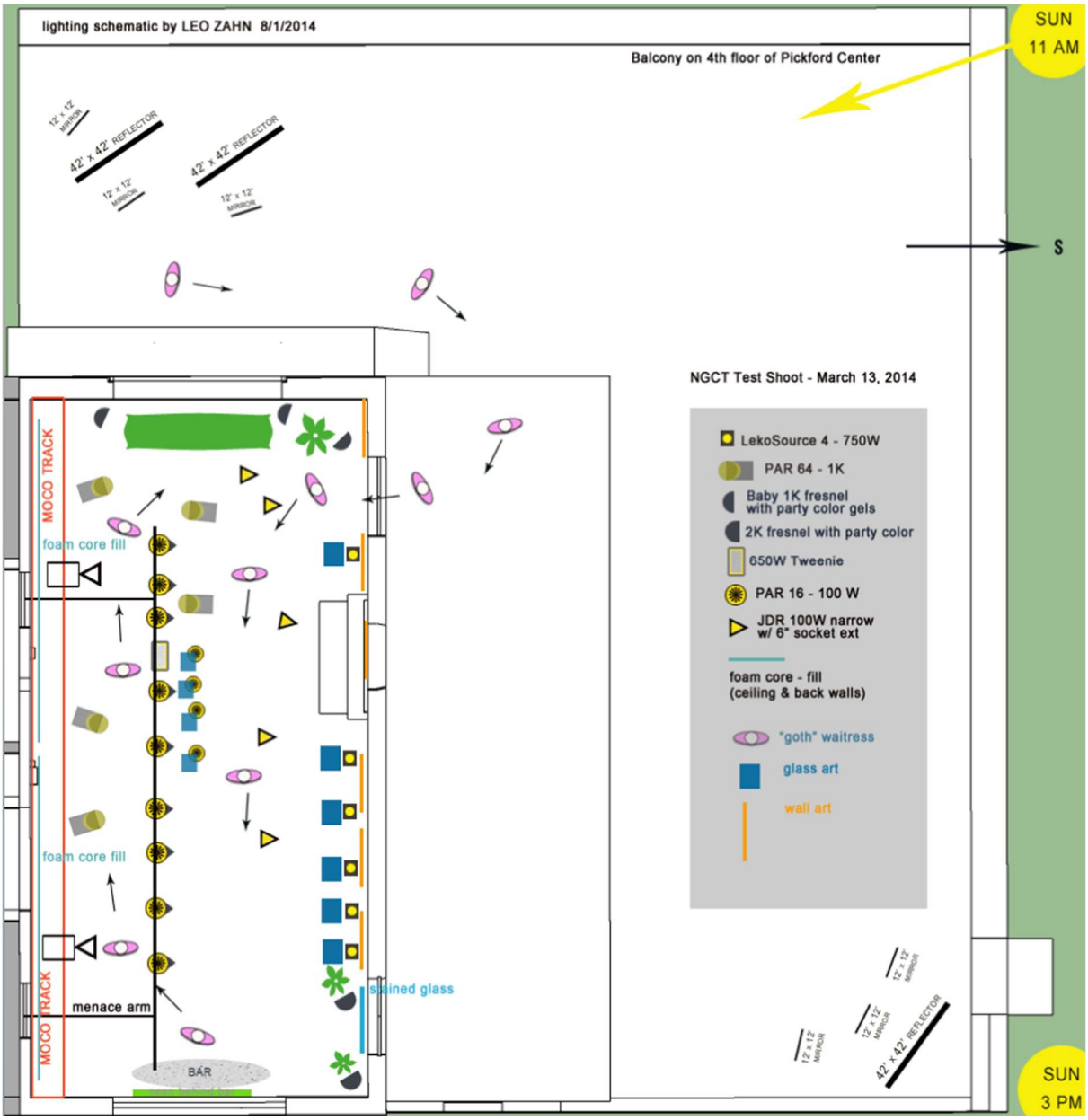


Figure 4. Light diagram by Leo Zahn. Behind-the-scenes photos from the shoot are in the appendix.

LIGHTING

Our approach to lighting the scene was based on mixing un-corrected 3200K tungsten units interior (inside the art gallery) with daylight mirrored, bounced and reflected from outside via large and small mirrors, reflectors and shiny boards [see figure 4]. Bright daylight streamed into the gallery interior through windows and doorways, in the form of pure fill and shafts of bright highlights directed at artwork. The modest lighting package contained more than a dozen PAR 16 100W narrow and JDR100W narrow beam units, a few 1K and 2K fresnels, and half a dozen Source Four Lekos as well as PAR 64 1K cans. Each MOCO pass had the same lighting package and there was no diffusion applied. However, the day exterior light offered a challenging obstacle to maintaining

lighting continuity as the shoot went from morning with hazy conditions to late afternoon with sunny conditions.

NEAR-SET

The footage captured by the ARRI Alexa Studio XT was recorded onto Codex Capture Packs and the Sony F65 used SR Memory cards. Once the media was filled, the raw footage was then cloned into the Codex Vault. Stephen Ceci, a consultant from Codex, used the Vault to archive the raw media to 2 external drives and to LTO 5 tapes (LTFS). In addition, dailies were created using the Codex Vault, which generated ProRes 422 HQ files with 3D LUT & Burn in for each take. Gray Marshall over saw the distribution of the archived materials and dailies to our post-production team.

POST PRODUCTION

The aim of our production was to generate professional looking test material for analysis. Therefore, our focus in post-production was to maintain continuity by performing technical grades that maintain consistency between shots. The Academy Color Encoding System (ACES) was used for management.

COLOR CORRECTION

The grading sessions took place at the Pickford Center for Motion Picture Study by colorist Lou Levinson using Baselight ONE color grading system. The Reference Rendering Transform (RRT) and P3D60 Output Device Transform (ODT) from ACES v1.0 were used to view the ACES files [see Figure 5]. The reference look was established for a cinema environment, using an NEC-800C digital cinema projector calibrated to P3 primaries and with the ACES white point at a luminance of 48 cd/m^2 (chromaticities: x=0.32168 y=0.33767). P3 high dynamic range grade and all Rec. 709 grades used the Dolby PRM-4200 Professional Reference Monitor calibrated to the corresponding setup. With the cinema master as a reference, trim passes were performed for a variety of other display setups, though not all of which have been made available. As stated earlier the intention of these trim passes was to give each take the same appearance but also utilize the brightness to show highlight details. The end results from our post-production process were files graded and ready to be made available.

Graded deliverables that were established and are available are:

Display Primaries	Display Calibration White	Y (cd/m^2)
P3	ACES; x=0.32168 y=0.33767	48 <reference grade>
P3	ACES; x=0.32168 y=0.33767	100
P3	ACES; x=0.32168 y=0.33767	150
P3	ACES; x=0.32168 y=0.33767	200
P3	ACES; x=0.32168 y=0.33767	600
Rec. 709	D65; x=0.3127 y=0.329	100
Rec. 709	D65; x=0.3127 y=0.329	600

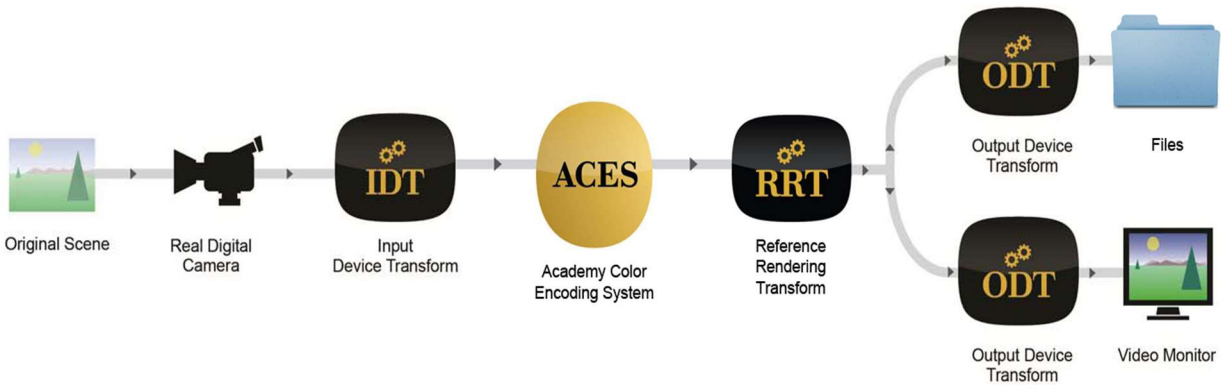


Figure 5. ACES Workflow for the Test Shoot

ACES

The Academy Color Encoding System (ACES) is the product of an industry-wide collaboration spear headed by the Science and Technology Council in response to the industry's growing concerns about digital preservation and the future needs of the world's most visionary filmmakers. ACES is a supporting tool for high-fidelity digital motion picture imagery that is paving the way for expanded creative choices, precisely controlled color management and archive-ready digital masters. For more information please visit http://www.oscars.org/science-technology/council/projects/aces.html .

Summary

This paper has discussed the reasons for which the Science and Technology Council sought to invest in creating royalty-free digital motion picture test materials and the intended use of them. Also described was the design and production process for capturing quality visual reference sources.

Acknowledgements

Special thanks to the many amazing people who contributed to this project. Please see the cast and crew list on page 25.

About the Science and Technology Council

The Academy's Science and Technology Council was created in 2003 in response to the explosion in digital motion picture technology, which continues to transform the production, post-production and exhibition of movies. The Council's activities are focused on industry-wide problem-solving and research projects, preserving the history of motion picture technology, and educating professionals and the public about the role of technology in moviemaking.

Appendix

Visual Test Shoot Camera Specifications

Camera	Sensor	Bit Depth	Recording Format	Recording System
ARRI Alexa Studio XT	35 Format ALEV III CMOS sensor w/dual gain architecture (dga) and Bayer pattern color filter array	12bit	ARRI Raw	Codex Capture Packs
Sony F65	Single sensor, 1-chip Super 35 mm type CMOS	16bit	F65RAW	SR-Memory

Lens Specifications

Lens	Aperture	Close Focus	Focus Rotation	Iris Rotation	Length	Front Diameter
Leica Summilux-C 25mm	T1.4-T22 + fully closed	.31m /1’0”	300°	180°	142mm /5.6”	95mm /3.7”

Test Shoot Information

CAMERA	ROLL	TAKE	FRAME RATE	T STOP	EI	SHUTTER ANGLE	FILE NAME	FRAME RANGE	NOTES
ARRI Alexa Studio XT	Roll C003	take 14	24fps	T 8⅓	EI800	180	C003C006	1888	ND Pancro .3
ARRI Alexa Studio XT	Roll C002	take 7	48fps	T 8¼	EI800	180	C002C007	3928	
ARRI Alexa Studio XT	Roll C002	take 6	60fps	T 8¼	EI800	180	C002C006	4807	
ARRI Alexa Studio XT	Roll C002	take 4	120fps	T 5.6½	EI800	180	C002C004	9604	
SONY F65	Roll B007	take 3	24fps	T 8	EI1000	180	B007C003	2047	mech shutter
SONY F65	Roll B007	take 5	48fps	T 8	EI1600	180	B007C006	4034	mech shutter
SONY F65	Roll B007	take 8	60fps	T 8	EI2000	180	B007C009	4878	
SONY F65	Roll B008	take 15	120fps	T 8	EI4000	180	B008C003	9479	

NOTE: While the 2K (ARRI Alexa) shots varied the aperture and filtration to compensate for the varying frame rates in order to maintain consistent exposure, the 4K (Sony F65) takes were each intentionally shot with the same aperture and no filtration, varying the exposure as a function of frame rate (and resulting exposure time of each frame). Thus, for the 4K material, the 120-fps take is properly exposed, and the slower frame rates (and especially the 24-fps take) were overexposed and clip in the highlights.

(The exposure index [EI] on the F65 was set to compensate for this variation in frame rate and exposure time, but this setting does not actually alter the output of the sensor, merely the metadata attached to the frames for interpretation by downstream postprocessing. The result is that the limits of dynamic range [saturation point and noise floor] effectively shift with frame rate, reflecting that the 24-fps frames [with a shutter time of 1/48 s] received 2⅓ stops [5 times] more exposure than the 120-fps frames [with a shutter time of 1/240 s]. Also, although the 120-fps take was slated as having the EI set to 4000, the actual EI [per the metadata] was 3200, which is apparently the maximum possible on the camera.)

Slate and Metadata Information

24fps sequence: Slate Info ARRI Alexa Studio XT [example]

TITLE	The Academy NGCT Test
DIRECTOR	Howard Lukk
DIRECTOR OF PHOTOGRAPHY	David Stump, ASC
FPS	24
RESOLUTION	2k
CAMERA	ARRI Alexa Studio XT
SHUTTER ANGLE	180
SHUTTER TYPE	Electronic
FILTER	ND Panchro 0.3
T-STOP	T 8 1/3
EI	800
ROLL	C003
TAKE	14

24fps sequence: Slate Info Sony F65 [example]

TITLE	The Academy NGCT Test
DIRECTOR	Howard Lukk
DIRECTOR OF PHOTOGRAPHY	David Stump, ASC
FPS	24
RESOLUTION	4k
CAMERA	Sony F65
SHUTTER ANGLE	180
SHUTTER TYPE	Mechanical
FILTER	
T-STOP	T 8
EI	1000
ROLL	C003
TAKE	3

Additional Metadata Info

LOCATION	Pickford Center for Motion Picture Study, 4th floor
DATE	March 13, 2014
SHOOT TIME	Sony F65 12:35-1:30pm, Arri Alexa 2:20-4:15pm
DIGITAL FILE NAME	C003C006_140313_R4PZ.ari [example]
FRAME COUNT	[0205903-0209859] 3,956 [example]
RUNTIME	00:01:03:22
MOCO RIG	JetRail Dolly Motion Control System with stereo head
LENS	Leica Summilux-C 25mm prime

File Size of Raw Files Captured

ARRi Alexa Studio XT

CLIP	SIZE
C002C001	78.46 GB
C002C002	71.9 GB
C002C003	78.6 GB
C002C004	70.2 GB
C002C005	43.5 GB
C002C006	34.6 GB
C002C007	28.4 GB
C002C008	26.8 GB
C002C009	1.2 GB
C003C001	22.2 GB
C003C002	20.8 GB
C003C003	17.9 GB
C003C004	18.1 GB
C003C005	5.1 GB
C003C006	32.2 GB
C003C007	14.3 GB
C003C008	47 GB
C003C009	62.3 GB
C003C010	124.6 GB
C003C011	35.2 GB

Sony F65

CLIP	SIZE
B007C001	21.7 GB
B007C002	22.3 GB
B007C003	21.5 GB
B007C004	25.6 GB
B007C005	26.3 GB
B007C006	42.4 GB
B007C007	45 GB
B007C008	612.2 MB
B007C009	51.2 GB
B007C010	21.8 GB
B007C011	25.4 GB
B007C012	25.6 GB
B008C001	30.2 GB
B008C002	29.7 GB
B008C003	49.5 GB
B008C004	18.3 GB
B008C005	50.2 GB
B008C006	54.2 GB

Reference Test Frame

At the beginning of each clip and following the electronic slate, there is a frame (fig 1.) containing a shot of the Macbeth (X-Rite) ColorChecker Color Rendition Chart and a custom designed three-dimensional globe with a 99% reflectance characteristic for white reference and a center black void for black reference.

Information about the Macbeth ColorChecker is readily available online.

Figure 1. Special reference frame included on each clip.

Test Shoot Script

THE AFFAIR written by Randal Kleiser and Dave Stump

I/E. ART GALLERY - DAY 1

On a brightly day lit EXTERIOR TERRACE, well dressed art aficionados mingle, chat, sip Chardonnay and eat cheese.

The CAMERA DOLLIES and PANS into the INTERIOR of the Art Gallery to tour a richly cluttered collection of foreground *objets d'art*, including brightly colored backlit glass sculptures, flower arrangements and wildly colored photographs and paintings.

As we TRACK through the mixture of art and gallery patrons, a very pretty young 'Goth' Girl server dressed in black, with brightly colored hair, decorated with tattoos and piercings, hands out drinks and snacks to the crowd.

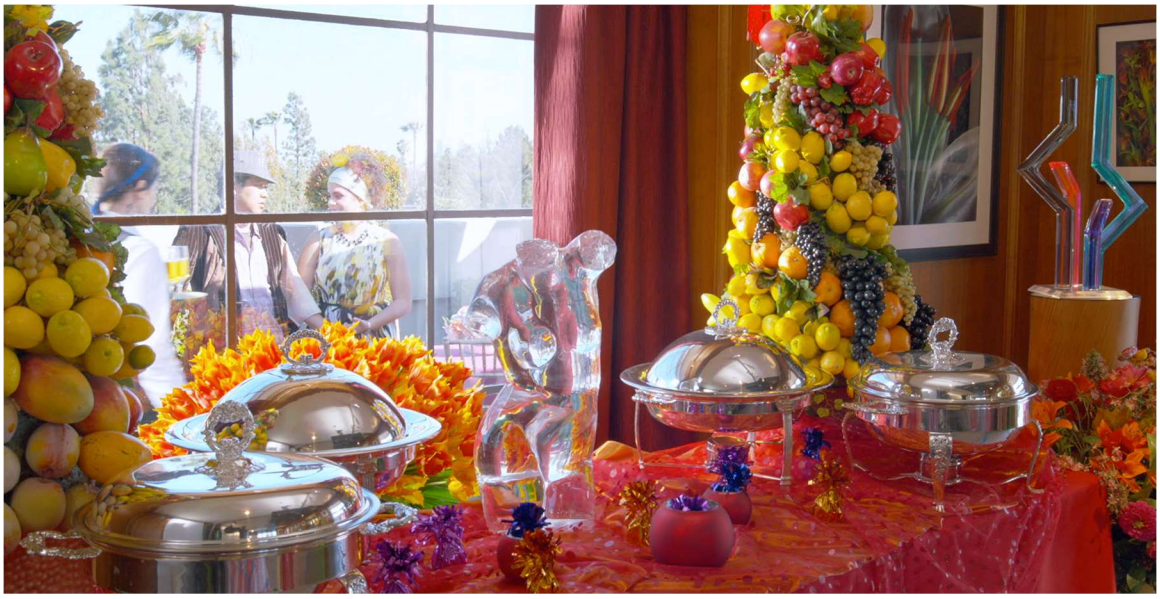
She stops and checks the time as if she is awaiting an appointment. She asks the Manager at the bar if she has finished her duties and he gestures that she is free to leave.

CAMERA CONTINUES TO MOVE LATERALLY BACK THROUGH THE SCENE with lots of foreground details, objects SWEEPING CLOSE PAST CAMERA.

Our 'Goth' Girl hands off her tray and we follow her as she exits the far end of the Gallery into the bright noon day sunlight and exits the scene.

CUT

Generic Scene Description Catalog
NGCT Test Shoot Scene 1 THE AFFAIR



Scene Description	Opening frame: Enter Goth Girl, seen from a window crossing in and serves couple one. EXT./INT/EXT ART GALLERY DAY
Camera Motion	Set to position 1
Visual Description	• Sculpture--life size acrylic lucite female nude torso [highlight details] • Circular chafing dishes [specular highlights] • Small bright foil center pieces blowing in wind [motion or compression artifacts] • Translucent sculptures bottom lit • Framed wall art • Plastic fruit
Comments	Exposure outside is considerably brighter. Daylight interior
Start Time	0:00 seconds

Scene Description	Goth Girl begins cross to 2nd couple
Camera Motion	Follows server to couple #2, PAN Right
Visual Description	• Hanging multicolor mobile art [high contrast]
Comments	
Time	0:12 seconds

Scene Description	Goth Girl starts to come down stage and crosses inside the building to serve lady dressed in sari. Goth Girl stops to talk to lady in sari
Camera Motion	Follows server coming in. Motion control used truck right. Two shot profile. Motion Stop for exchange
Visual Description	• Neon sign on the ground • Vibrant poster • Orange sari [texture] • Multicolor Glass vases under lit
Comments	Bright exterior day light to low light interior.
Time	0:25 seconds

Generic Scene Description Catalog
NGCT Test Shoot Scene 1 THE AFFAIR

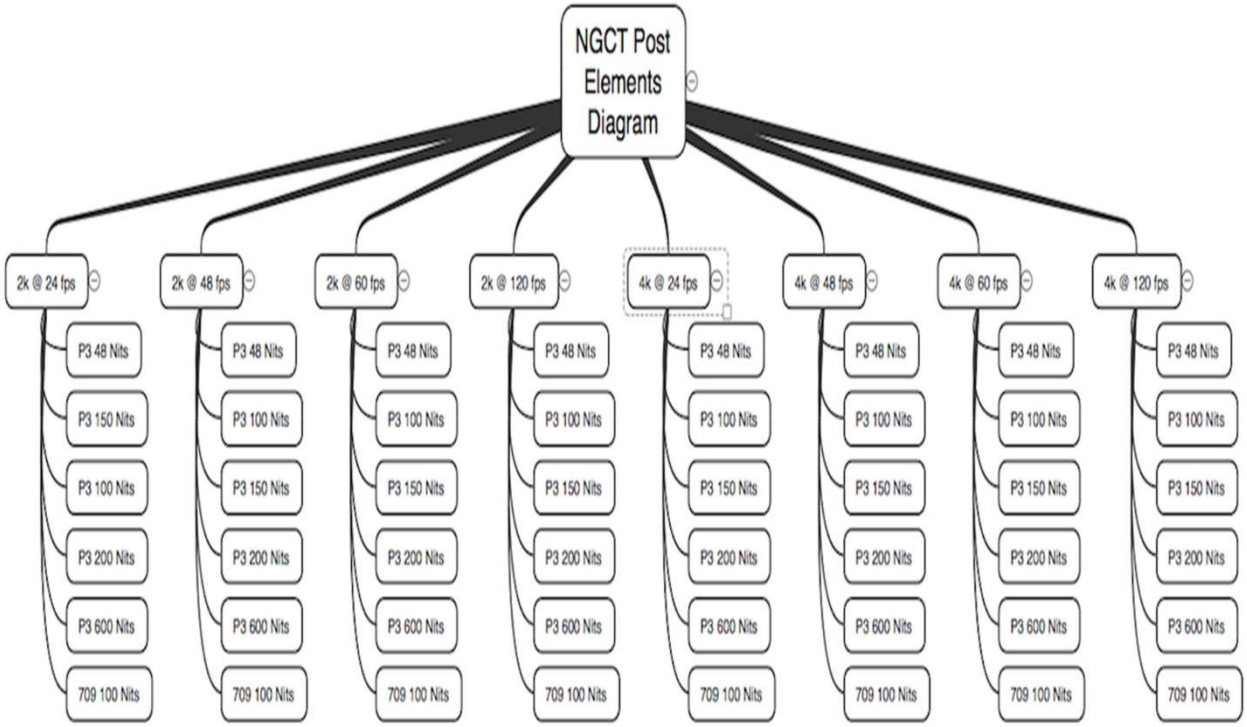
Scene Description	Goth Girl starts towards the bar. Goth Girl stops at bar and speaks to bartender
Camera Motion	Motion control track right [lateral motion stress test] Motion Stop for exchange. Two shot profile
Visual Description	• Hanging Neon sign • Sculpture--life size acrylic lucite male nude torso [highlight details] • Daylights through blinds • Stain glass window [contrast ratio, highlight sky exposure] • Wine glass [specular highlights] • Goth Girl's neck tattoo • Goth Girl's blue streak hair
Comments	Hitch error: Issue with the dolly track, causes bump in shooting
Time	0:35 seconds

Scene Description	Goth Girl crosses back out through the building
Camera Motion	The action is happening closer to the camera. Motion control truck left. Pan left to follow the server.
Visual Description	
Comments	
Time	0:43 seconds

Scene Description	Goth Girl crosses back out through the building and exits
Camera Motion	The action is happening closer to the camera. Motion control truck left. Pan left to follow the server and back to position one.
Visual Description	
Comments	
End Scene	1:04

NGCT Behind-the-scenes photos
Location 4th Floor of the Pickford Center for Motion Picture Study

NGCT DCP Workflow
[Version_3 Aug. 20th 2014]



NGCT DELIVERABLES MATRIX (updated Oct 2014)

Resolution/ Frame Rate	DCI P3 48 cd/m²	DCI P3 100 cd/m²	DCI P3 150 cd/m²	DCI P3 200 cd/m²	DCI P3 600 cd/m²	Rec. 709 100 cd/m²	Rec. 709 600 cd/m²
2k @ 24fps	√	√	√	√	√	√	√
2k @ 48fps	√	√	√	√	√	√	√
2k @ 60fps	√	√	√	√	√	√	√
2k @ 120fps	√	√	√	√	√	√	√
4k @ 24fps	√	√	√	√	√	√	√
4k @ 48fps	√	√	√	√	√	√	√
4k @ 60fps	√	√	√	√	√	√	√
4k @ 120fps	√	√	√	√	√	√	√

NGCT Test Shoot Crew & Actor List

Crew	First Name	Last Name
Writer	Randall	Kleiser
Producer	Ralph	Winter
Executive Producer	Garrett	Smith
Director	Howard	Lukk
Managing Director Sci-Tech Council	Andy	Maltz
Assoc Dir Sci-Tech Council	Michael	Sterling
Archivist Sci-Tech Council	Norma	Vega
Unit Production Manager	Matt	Spiegel
1st AD	Adam	Martin
Director of Photography	Dave	Stump
Camera Operator	Leo	Zahn
1st AC	Jim	Thibo
1st AC	Loie	Russell
2nd AC	Tim	Kang
Support Technologist	Joe	di Gennaro
Behind-the-scenes Camera	Stephen	Lighthill
Production Consultant	Loren	Nielsen
Production Coordinator	Christel	Cornilsen
Alexa Tech Support	Stephan Ukas	Bradley
F65 Tech Support	Dan	Perry
F65 Tech Support 2	Michael	Kovacevich
3D Rig Support	Steve	Schklair
3D Rig Support Tech 2	Matt	Battaglia
3D Rig Support Tech 3	Bettina	Martin
3D RigTech/3D Utility	Barclay	Roach
Motion Control Op 1	Rob	Menapace
Motion Control Op 2	Paul	Maples
Motion Control Op 3	Josh	Cushner
DIT/Post Supv	Gray	Marshall
Codex Support	JD	Vandenberghe
Codex Support	Stephen	Ceci
Chief Lighting Tech	Michael Anamal	Off
Asst. Chief Lighting Tech	Chris Sarge	Lewis
Set Lighting Technician	Cris Super	Borgnine
Key Grip	Tom	Browne
Best Boy/Grip	Taylor	Vohs
Additional Best Boy/Grip	Max	Foster

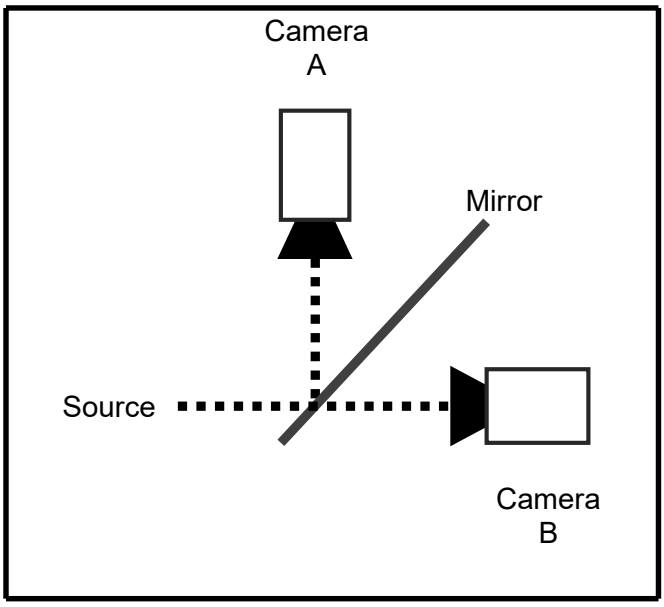
NGCT Test Shoot Crew & Actor List

Crew	First Name	Last Name
Transport/Driver/Swing	Oswald OZ	Colunga
Production Designer	Bill	Creber
Production Designer	John	Muto
Set Decorator	Cloudia	Rebar
Set Dresser 1	Daniel	Gaughn
Set Dresser 2	Chris	Coulier
Set Dresser 3	Christine	Nelson
Set Dresser 4	Jason	Bennett
Set Dresser 5	Tatiana	Lopez
Wardrobe/Costume Stylist	Cynthia	Dixon
Head Makeup Artist	Leonard	Engelman
Hair Stylist	Kath	Blondell
Makeup Asst	Carole	Fontaine
Catering	Chef Robert	Catering
Production Assistant 1 A.M.P.A.S. Staff	Martin	Flores
Production Assistant 2 A.M.P.A.S. Staff	Brian	Bell
Production Assistant 3 A.M.P.A.S. Staff	Ricardo	Rodriguez
Production Assistant 4 A.M.P.A.S. Staff	Brinton	Smith
BEHIND THE SCENES		
BTS Camera	Dru	Mungai
BTS Camera	Matthew	Nauser
BTS Camera	Jean-Paul	Bonneau
BTS Camera	Dan	Marks
BTS Camera	Vadim	Aynbinder

TALENT			
	Role	**First**	**Last**
Lead Actress	Goth Girl	Bianca	Rusu
Lead Actor	Boyfriend	Justice	Nnanna
Supporting actor	Wife	Chelsea	Fryer
Supporting actor	Gallery Manager	Joseph	Nwoko
Background actor	Art Gallery Patron	Rachel	Rivera
Background actor	Art Gallery Patron	Brian	Chin
Background actor	Art Gallery Patron	Kimia	Behpoorina

NGCT High Dynamic Range trial

An additional component of our production involved capturing high dynamic range footage by using a matched pair of Sony F65 cameras mounted onto a 3-D rig [see Figure 1]. For our set-up we had camera A pointed vertically and shooting off a 50/50 semi silvered mirror while camera B was pointed horizontally shooting directly through the mirror. Camera A captured the normal exposure and camera B was used to capture highlight details by using a Formatt IR ND 1.8 filter (6 stop difference). The use of this particular filter was determined after discovery that the reflective surface of the 50/50 mirror was attenuating the IR wavelengths, which would have had a negative impact upon color rendering between the two images. To mechanically align our stereo pair we used the 3ality Stereo Image Processor (SIP) system. However, during post-production a temporal shift between the images was discovered. This anomaly is attributed to a lack of synchronization between the shutters of the two cameras (having nothing to do with genlock). Although much was learned from this trial we intend to repeat this experiment at a later date.



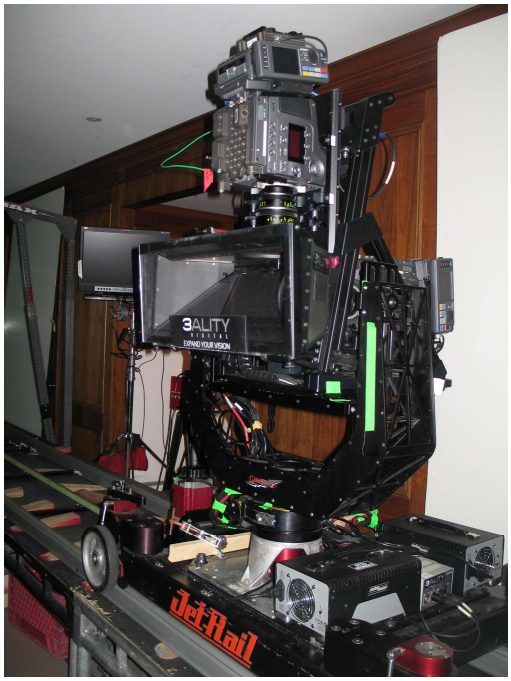


Figure 1. Diagram and photograph showing High Dynamic Range Test Shoot set-up using semi silvered mirror and Sony F65 cameras. Camera A captured normal exposure. Camera B captured highlight details.

Product Specification Sheet
Baselight ONE

Baselight grading software	
Simultaneous grade layers	Unlimited
Simultaneous shapes (windows)	Unlimited
Simultaneous key layers	Unlimited
Plugin support	OFX™
Colour management	Truelight (integrated)
Colour space handling	Linear, log, video
Storage	
Capacity	28TB or 56 TB (optional)
RAID protection	RAID 6
I/O bandwidth	500MB/s
Caching	Automatic, intelligent
Disk management	Auto optimise/defragment
User interface	
UI display	Up to 2048x1536
Control surface	Blackboard 2ONE Also supports Avid Artist Color and Tangent Wave and Element panels
Connectivity	GigE, USB, IEEE1394
Media handling	
Frame size	640x480 to 4096x3112
Input & output file formats	dpx, cin, tga, tiff, mxf, quicktime, video
Playback frame rate	23.98 to 60fps
EDL support	CMX 3600, FLE, AAF, XML, CDL, ALE
Connectivity	GigE, 10GigE (optional), SAN fibre channel (optional)
Grading display	
Output	DVI, VGA (optional SDI monitoring)
Resolution	Up to 2048x1536
Frame rate	23.98p~60i
Truelight	Built-in
Synchronisation	DVI (internal), SDI (external)
Video	
Ingest	HD SDI (10-bit), single/dual link, HD/SD
Playout	HD SDI (10-bit), single/dual link, HD/SD
Formats	720x486~2048x1080
Frame rate	23.98p~60i (psf supported)
Sampling	422, 444, YCrCb/RGB
Machine control	RS422 9-pin I/O
Synchronisation	Internal/external
Software control	Embedded in main app & external app

Product Specification Sheet
Dolby Professional Reference Monitor PRM-4200

LCD Panel
Size: 42 inches diagonal Resolution: 1920 × 1080 pixels Refresh Rate: 120 Hz Viewing Angle: 90° horizontal; 45° left and right from center

Maximum Luminance
CRT Reference mode: 120 cd/m^2 Dynamic Reference mode: 600 cd/m^2 Adjustable from 48 cd/m^2 to 600 cd/m^2

Primaries/Gamut
Rec. 709, SMPTE C, EBU, P3, Custom

Operation Modes
CRT Reference Mode, DYN Mode, LCD Emulation, PDP Emulation, Custom 1 Emulation, Custom 2 Emulation

White Point
D54, D60, D65, D93, Digital Cinema, Custom

Gamma
2.2, 2.4, 2.6, Custom

Video Interfaces
SMPTE 295M, SMPTE 294M, SMPTE 292M, SMPTE 372M, SMPTE 424M, SMPTE 425M

Video Scanning Formats
ITU-R BT.601, SMPTE 293M, ITU-R BT.1358, SMPTE 274M, SMPTE RP211

Video Inputs
Two input connectors, with support for 1.5G and 3G SDI, single and dual link

Video Outputs
Two output connectors, with support for 1.5G and 3G SDI, single and dual link

Line Voltage Compatibility
85–260 VAC, 50–60 Hz

Monitor Dimensions
Width: 1008mm (40 inches)
Height: 677mm (26 inches)
Depth (body): 329 mm (13 inches)

Weight
Weight: 68 kg (150 lbs)

Bibliography

[1] Academy of Motion Picture Arts and Sciences. Science and Technology Council. Next Generation Cinema Technology Working Group. “Introduction to High Frame Rate Test Material Production.” 13 July 2013.

[2] Academy of Motion Picture Arts and Sciences. Science and Technology Council. Next Generation Cinema Technology Working Group. “Project #1: Overview and Planning.” 11 Nov. 2013.