



Imago Technical Committee

RESULTS OF THE SURVEY:  
“REQUESTS TO MANUFACTURERS”

V8 191023

## REQUEST TO MANUFACTURERS

Imago Technical Committee

### AIM OF THE SURVEY

This survey originating from the IMAGO Technical Committee (ITC), comes from several overviews of the situation that filmmakers, cinematographers, post-production managers/supervisors, colorists, DIT's, AC's are currently facing. The Digital Age has generated new great tools for cinematographers, but also a never-ending stream of new approaches and solutions. We also anticipate new developments, i.e. in HDR and/or new sensor technology generating wider color spaces with extended or non-Bayer color systems.

With the introduction of new recording files, new software, new cameras, new deBayering processes, "home labs" with limited staff, we see an apparent absence of standardization, along with a need for communication between the players in the field and the manufacturers. Many tools we are using lack the control of texture and sharpness, or is unknown, leading us to fight against the machine.

The ITC has decided to look at these issues from a vantage point of emphasizing solutions to improve the filmmakers' artistic choices. The ITC has prepared a list of requests to be presented to the manufacturers. Before continuing to consolidate these strong links we have established with them, we need more input and insights from our community of cinematographers and other people working in the field of picture creation. This is the primary aim of this survey.

Link for the survey:

[https://www.umfrageonline.com/s/Manufacturers\\_request](https://www.umfrageonline.com/s/Manufacturers_request)

## MEETING AT CAMERIMAGE 2019

Imago Technical Committee

We are pleased to inform you that many camera manufacturers and colour grading companies will follow the ITC's invitation to a panel discussion at Camerimage.

ARRI, SONY, PANAVISION, PANASONIC, CANON, RED & FILMLIGHT confirmed their attendance.

We are still waiting for answers from Blackmagic Design, Digital Vision and SGO Mistika.

They all received the analysis of the survey during IBC.

We hope that it will be the beginning of a fruitful collaboration between Imago and the manufacturers in the future.

We will discuss, without an audience, several selected questions and proposals contained in this survey and imagine together a way to simplify and improve the work of our community.



An important part of the discussion will concern the standardization of terminology as well as workflows issues.

We will keep you informed about the results of this important meeting.

Special thanks to:

- **Katrin Richthofer** Manager (Hochschule für Fernsehen und Film)
- **Ron Johanson** - Cinematographer OAM, ACS - National President of the Australian Cinematographers Society (ACS)
- **All the Presidents of the Associations of Cinematographers**

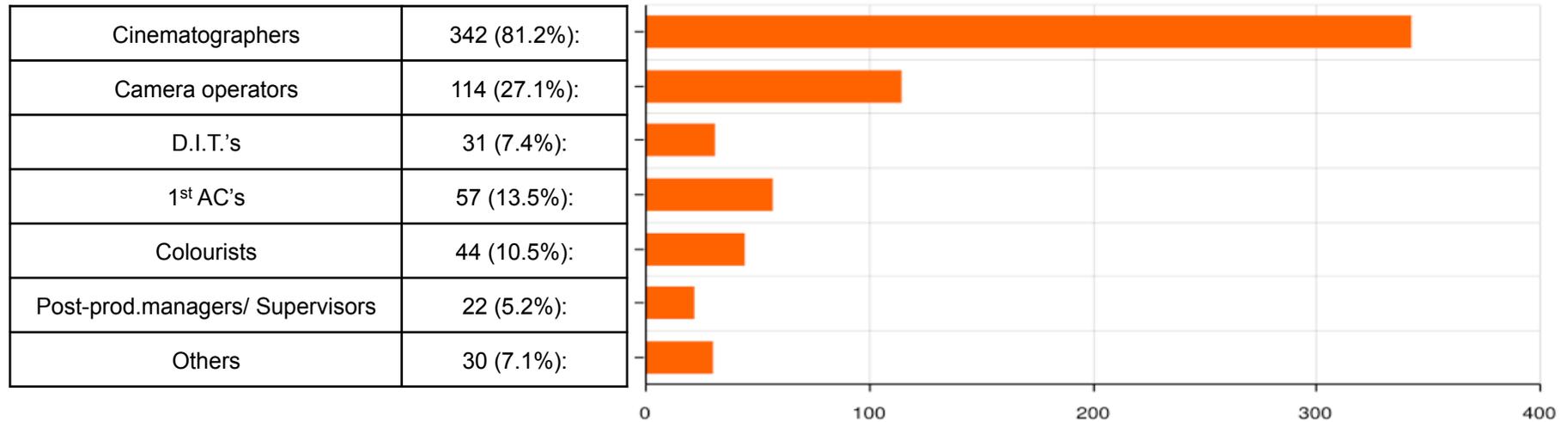
These requests includes several ideas and proposals from the: **ASC Motion Imaging Technology Council**.

So the Imago TC wishes to thank for their contribution:

- **Curtis Clark**, ASC, Chair of the Motion Imaging Technology Council of the ASC
- **David Stump**, ASC
- **Roberto Schaefer**, ASC AIC

The Imago Technical Committee wants to thank  
the **597** participants  
who gave  
**13.691** answers

## PARTICIPANTS PROFESSIONAL BACKGROUNDS



### Others/Details:

Producers

Executive Producer

Directors

Camera consultant

Phantom highspeed operator

Aerial Cinematographer

Dailies / Data Manager

2nd AC's

Editor

Head of DI and color pipeline at a post facility

SFX supervisor

VFX Supervisor

Gaffer

Broadcast Video Engineer

Manufacturer

Camera rental facility

Broadcast research engineer, specialized in colour science and cameras. Now retired

Colour Grading Software Developer, Image and Colour Engineer

Curator of the camera department of the Moscow School of Cinema

Director, professor at the film school

Cinematography teachers



Imago Technical Committee

## **MODULE 1:**

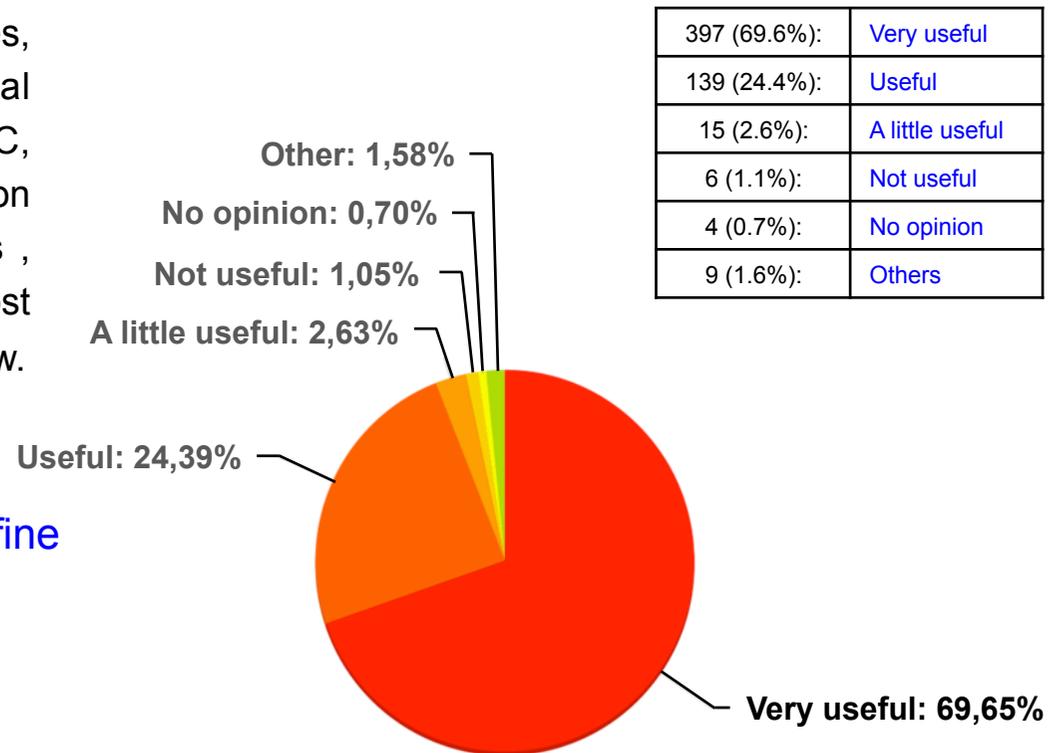
**IMAGO CHECK LISTS  
MANUFACTURERS SAMPLES  
METADATA**

## 1.1 MEANINGS OF WORDS - SEMANTICAL APPROACH

Number of participants: **570**

The ITC thinks that manufacturers (involved in Cameras, accessories, Post, Post softwares, Displays and projectors) and professional associations (Technical Committee of ASC, Technical Committee of Imago, Post-production managers associations, Colorists associations , ...) should meet to define precisely the most common words used at work along the workflow.

Do you think that it would be useful to define one common language?



SEE APPENDIX FOR ANSWER TO 1.11 Could you list the most important words that you think should be defined more precisely?

## 1.2 CHECK LISTS

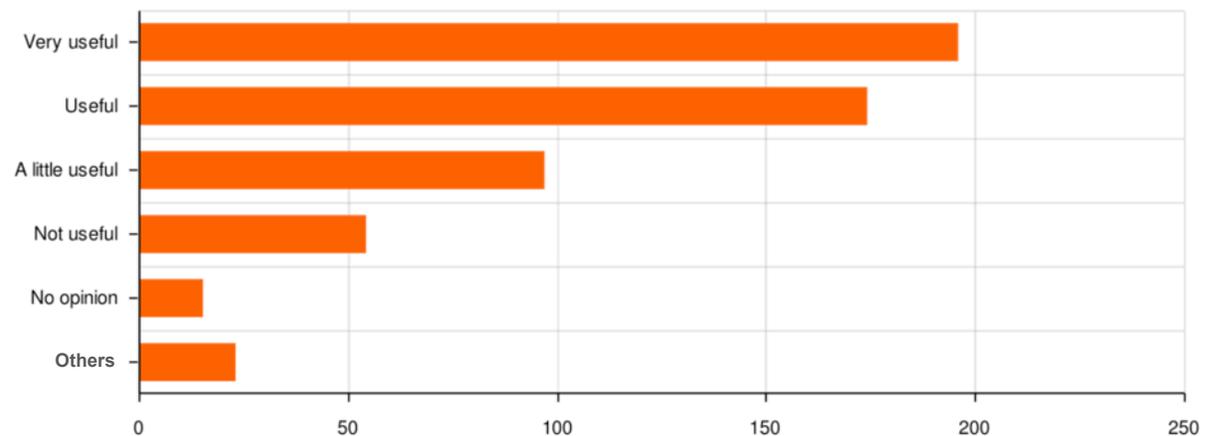
Number of participants: **539**

The ITC suggests that manufacturers should provide simple check lists to set up cameras for three different uses:

- Easy mode (or Point & Go)
- Standard mode
- Advanced mode

How useful do you think that it would be?

196 (36.4%):	Very useful
174 (32.3%):	Useful
174 (32.3%):	A little useful
54 (10.0%):	Not useful
15 (2.8%):	No opinion
23 (4.3%):	Others



SEE APPENDIX FOR ANSWER TO 1.2: other ideas

### 1.3 ADVANCED MENUS

Number of participants: **529**

For the advanced mode, manufacturers should provide access to advanced menus. ITC has listed:

- DeBayer process
- Sharpness/ Detail control for defining the texture of our images in the camera's internal recording process or by imaging from Raw Data in Post.
- Internal color management or color management in post after deBayer.
- Gamma encoding

How useful do you think that it would be?

	very useful (1)		useful (2)		slightly useful (3)		not necessary (4)		indifferent (0)	
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	±
DeBayer process	167x	32,68	187x	36,59	70x	13,70	44x	8,61	43x	1,98 0,94
Sharpness/ Detail contro..	257x	48,86	186x	35,36	37x	7,03	28x	5,32	18x	1,68 0,83
Internal color manageme..	245x	47,39	179x	34,62	45x	8,70	21x	4,06	27x	1,68 0,81
Gamma encoding	237x	46,02	188x	36,50	42x	8,16	20x	3,88	28x	1,68 0,80



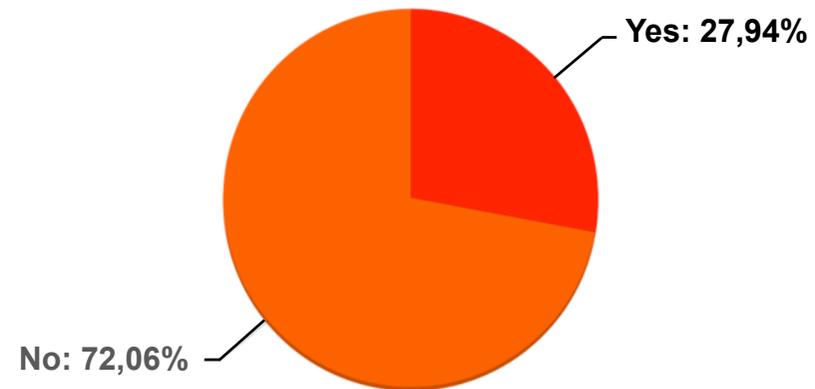
SEE APPENDIX FOR ANSWER TO 1.3: other ideas

## 1.31 ADVANCED MENUS

Number of  
participants: **494**

Would you add other access on specific menus?

138 (27.9%)	Yes
356 (72.1%)	No



SEE APPENDIX FOR ANSWER TO QUESTION 1.3.2: If yes: to which ones?

## 1.4 METADATA

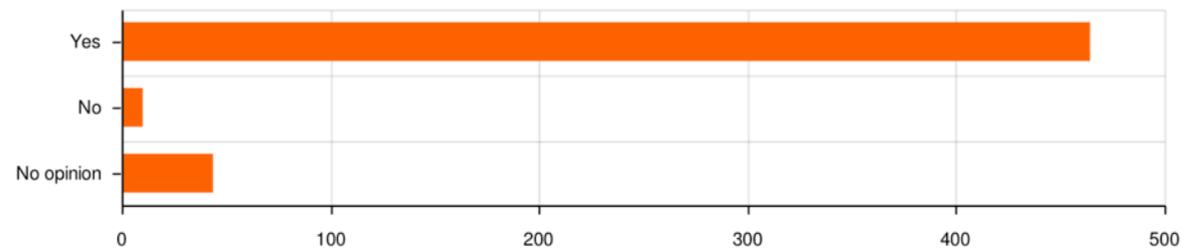
Number of  
participants: **516**

Metadata should have a universal language (referring to SMPTE recommendation RP 210)

Do you think that it will be useful?

- Yes
- No
- No opinion

464 (89.9%):	Yes
10 (1.9%):	No
43 (8.3%):	No opinion



SEE APPENDIX FOR ANSWER TO 1.41: Other ideas

## 1.5.0 REQUESTS OF SAMPLES FROM CAMERA MANUFACTURERS

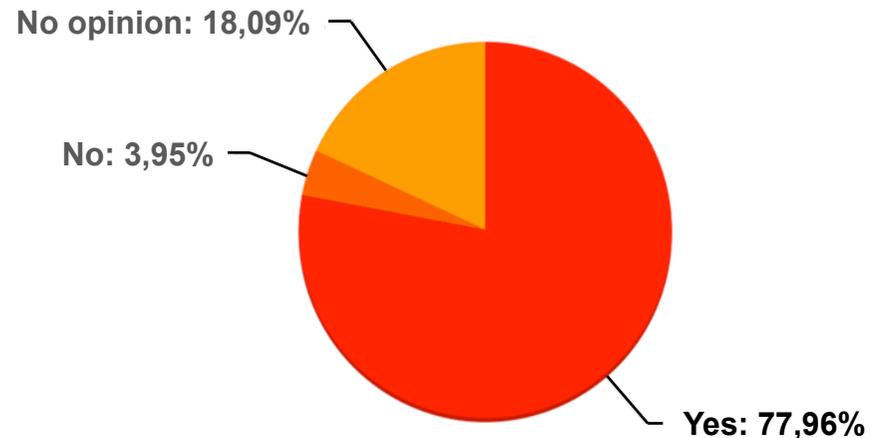
Number of participants: **481**

Non de-Bayered samples & De-Bayered & calibrated samples should be provided by each manufacturer, allowing cinematographers or post technicians to compare SDK's or post production deBayering systems with camera manufacturers reference deBayer systems.

Do you think that it will be useful?

- Yes
- No
- No opinion

375 (78.0%):	Yes
19 (4%):	No
87 (18.1%):	No opinion



SEE APPENDIX FOR ANSWER TO 1.5.0: Other ideas

## 1.5.1 REQUESTS OF SAMPLES FROM CAMERA MANUFACTURERS

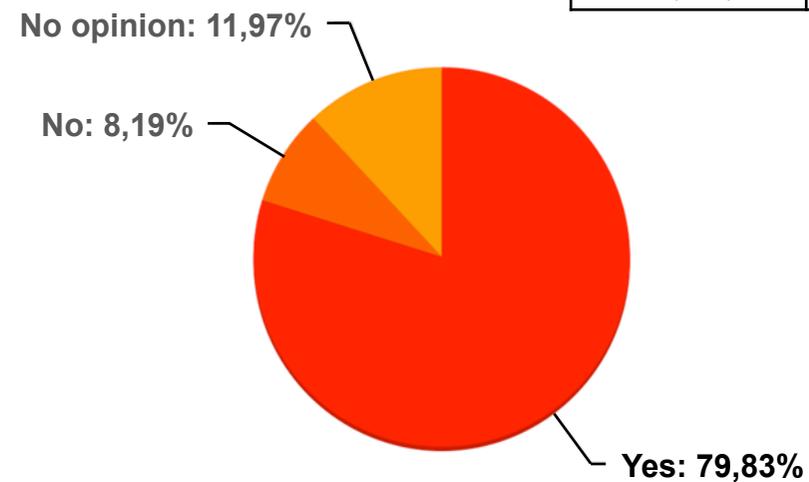
Number of participants: **476**

Samples should be provided with recommended settings of detail enhancement / contour correction (sharpness).

Do you think that it will be useful?

- Yes
- No
- No opinion

380 (79.83%):	Yes
39 (8.2%):	No
57 (12%):	No opinion



SEE APPENDIX FOR ANSWER TO 1.5.1: Other ideas

## 1.6 MEANING OF WORDS: CAMERA AND POST

Number of participants: **480**

Following terms should be clearly defined.

- 1 - Transforms vs Creative luts
- 2 - Medium Density Value (reference for a 18% grey)
- 3 - Latitude of exposure (stops) from underexposure to overexposure that will produce an image in colour and gradation with acceptable noise in the low lights and without clipping in the high lights.
- 4 - Dynamic range: The range of camera exposures from underexposure to overexposure that will produce an image using the full range of the camera's sensor.

Do you agree with these definitions?

	absolutely (1)		mostly (2)		a little (3)		not at all (4)		no opinion (0)			
	Σ	%	Σ	%	Σ	%	Σ	%	Σ	Ø	±	
1 Transforms vs Creative ...	222x	46,93	118x	24,95	53x	11,21	20x	4,23	60x	1,69	0,87	
2 Medium Density Value (r...	290x	61,05	128x	26,95	28x	5,89	9x	1,89	20x	1,46	0,70	
3 Latitude of exposure (st...	345x	72,48	94x	19,75	19x	3,99	9x	1,89	9x	1,34	0,65	
4 Dynamic range: The ran...	358x	75,37	93x	19,58	11x	2,32	4x	0,84	9x	1,27	0,55	



SEE APPENDIX FOR ANSWER TO QUESTION 1.61: If you don't agree with our definitions, could you give a short explanation for those definition(s) you don't agree with?



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## **MODULE 2:**

# IMAGO WORKFLOWS

## 2.1 STANDARDIZED PATH IN SOFTWARES

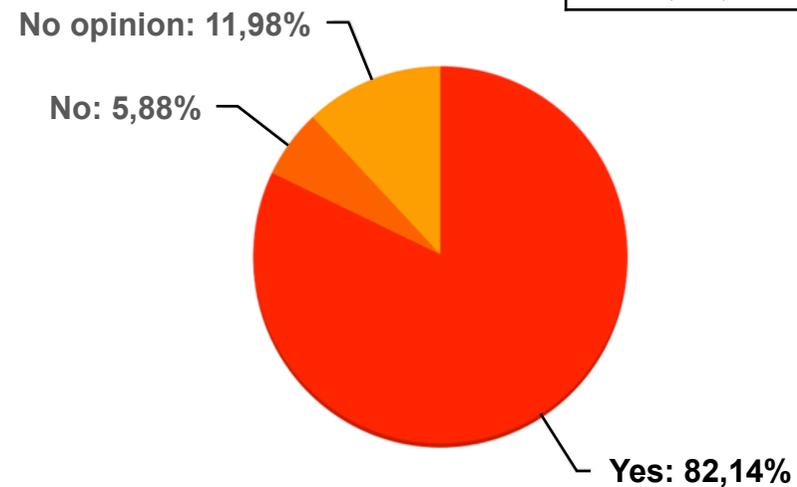
Number of participants: **459**

Requests to grading software/post-production software manufacturers (compositing, CGI, etc) to follow the same standardized path when dealing with recorded files coming directly from shooting.

Do you think that it will be useful?

- Yes
- No
- No opinion

377 (82,1%):	Yes
27 (5,9%):	No
55 (12%):	No opinion



SEE APPENDIX FOR ANSWER TO 2.1: Other ideas

## 2.2.1 PROCESS ORDER

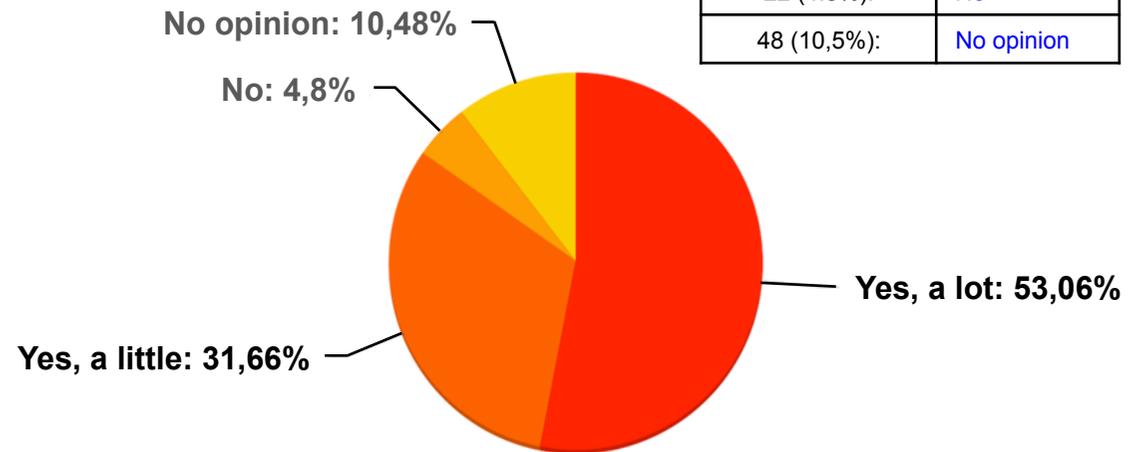
Number of participants: **458**

Proposal to manufacturers to follow an order of process after deBayer/demosaicing like (proposal 1 to 5 - there'll be a chance to change the order in question 2.2.2)

- 1 White Balance
- 2 ISO (related to same stop values between high lights and low lights)
- 3 Detail / contour correction (sharpness)
- 4 Colour space conversion
- 5 Gamma processing

Do you think that it will be useful?

- Yes
- No
- No opinion



## 2.2.2 PROCESS ORDER

Number of participants: **354**

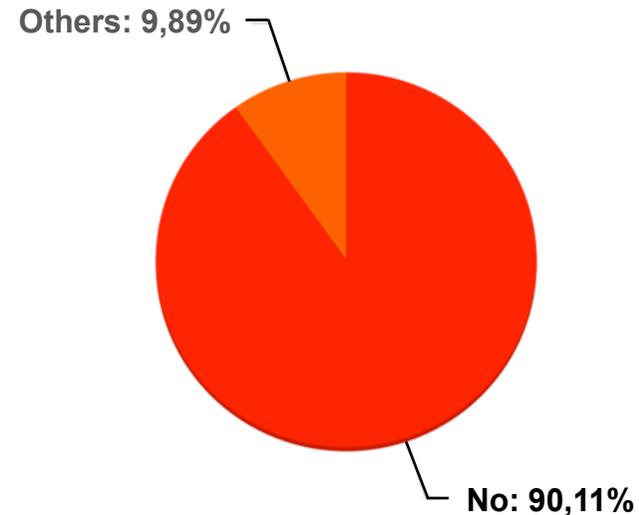
Proposal to manufacturers to follow an order of process after deBayer/demosaicing like (proposal 1 to 5 - there'll be a chance to change the order in question 2.2.2)

- 1 White Balance
- 2 ISO (related to same stop values between high lights and low lights)
- 3 Detail / contour correction (sharpness)
- 4 Colour space conversion
- 5 Gamma processing

Do you want to add other settings?

- No
- Others

319 (90,1%):	No
35 (9,9%):	Others



SEE APPENDIX FOR ANSWER TO 2.2.2: Other settings

## 2.2.2 PROCESS ORDER

Number of participants: **222**

Following terms should be clearly defined.

- 1 - White Balance
- 2 - ISO (related to same stop values between high lights and low lights)
- 3 - Detail / contour correction (sharpness)
- 4 - Colour space conversion
- 5 - Gamma processing

If you want to suggest a different order, which one?

	1.		2.		3.		4.		5.		N/A	
	$\Sigma$	%	$\emptyset$	$\pm$								
White Balance	91x	40,99	78x	35,14	17x	7,66	22x	9,91	10x	4,50	4x	2,00 1,15
ISO (related to same sto...	87x	39,19	96x	43,24	25x	11,26	7x	3,15	5x	2,25	2x	1,85 0,91
Colour space conversion	21x	9,46	20x	9,01	120x	54,05	39x	17,57	19x	8,56	3x	3,07 1,00
Gamma processing	16x	7,21	18x	8,11	32x	14,41	127x	57,21	26x	11,71	3x	3,59 1,04
Detail / contour correct...	5x	2,26	8x	3,62	25x	11,31	24x	10,86	155x	70,14	4x	4,46 0,99



## 2.3 PROCESS ORDER - MEANING

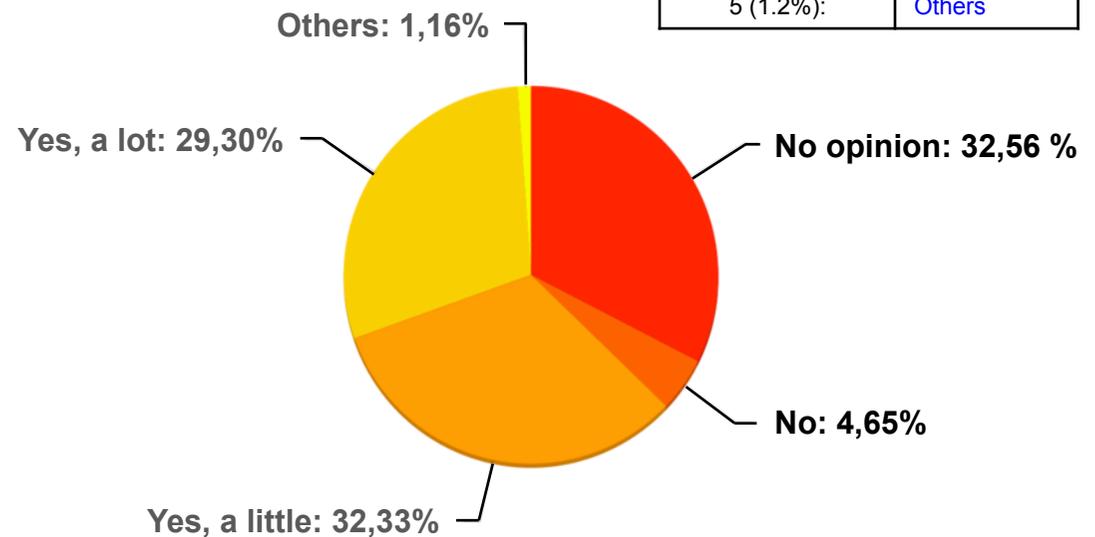
Number of participants: **430**

Proposal from ITC of using the same order (and semantical approach) regarding:

- Conversion to color spaces/Transform
- Conversion to different sizes/aspect ratio.

Do you think that it will be useful?

140 (32.6%):	No opinion
20 (4.6%):	No
139 (32.3%):	Yes, a little
126 (29.3%):	Yes, a lot
5 (1.2%):	Others



SEE APPENDIX FOR ANSWER TO 2.3: Remarks



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## **MODULE 3:**

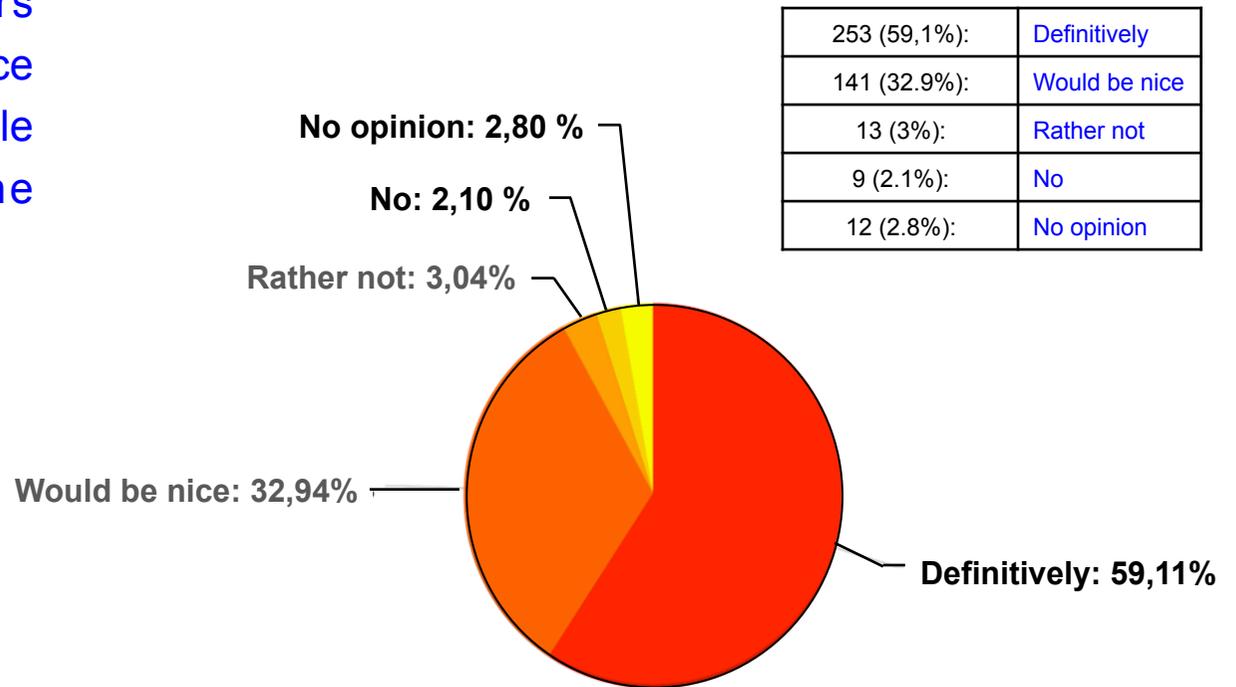
### **IMAGO SCREENING:**

**PRESENTATION / PROJECTION / EXHIBITION,  
INVOLVEMENT OF PROFESSIONALS IN QUALITY /  
STYLE DECISIONS OF SCREENINGS**

### 3.1 MAX. & MIN. BRIGHTNESS LEVELS FOR FUTURE HDR STD

Number of participants: **428**

Do you think that filmmakers, colourists, cinematographers should be involved in the choice for the level of maximum possible brightness delivered in the theaters?



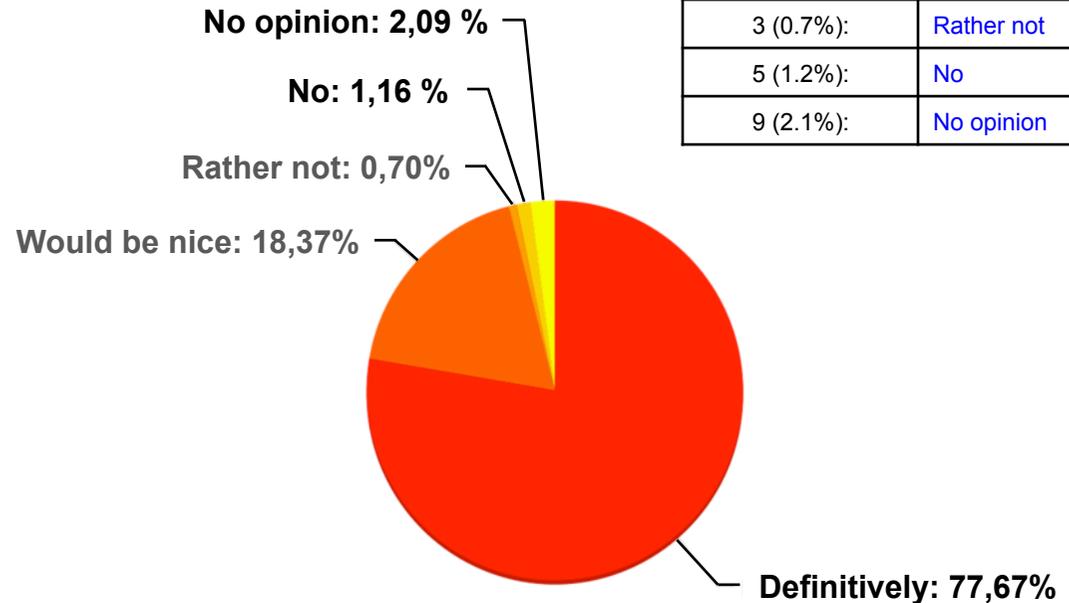
SEE APPENDIX FOR ANSWER TO 2.3: Remarks

### 3.2 SINGLE, UNIQUE HDR STD FOR CINEMA PRESENTATION

Number of participants: **430**

The ITC thinks we need ONE standard for HDR defining a new system with clearly agreed minimum and maximum brightness levels, and that we must avoid emergence of multiple systems, in order to avoid the need for numerous gradings of our work for multiple competing systems.

Would you agree?



334 (77,7%):	Definitively
78 (18.4%):	Would be nice
3 (0.7%):	Rather not
5 (1.2%):	No
9 (2.1%):	No opinion

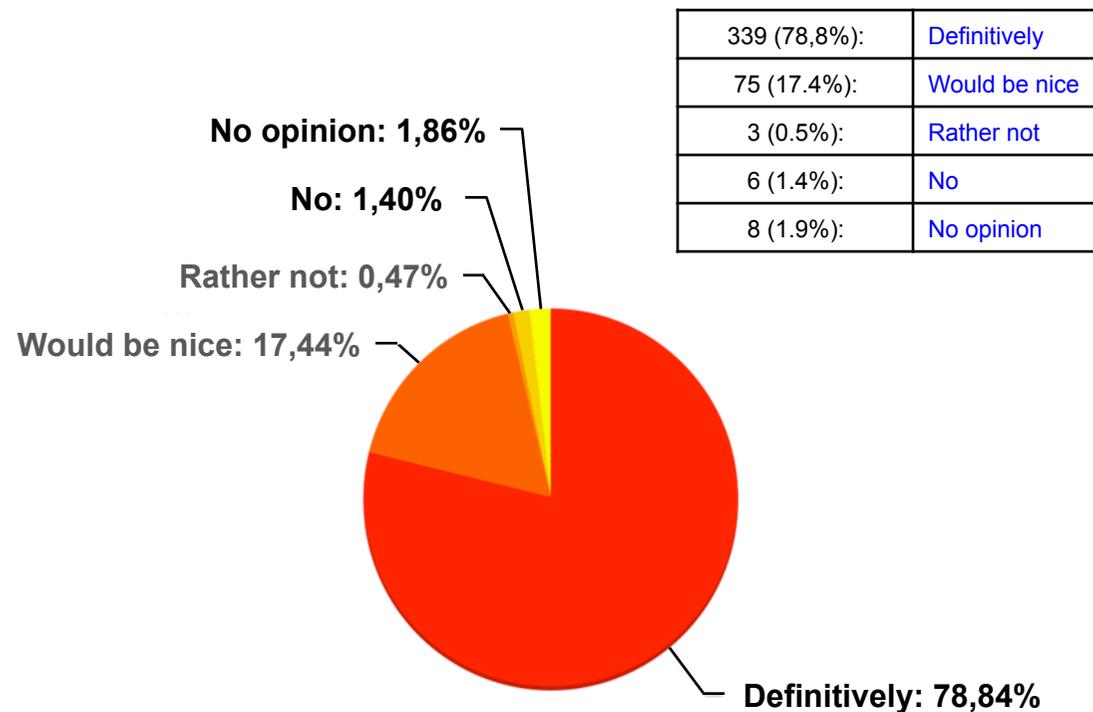
### 3.2a CONTENT PROVIDER (FILMMAKERS) SHOULD CONTINUE TO DETERMINE ACTUAL BRIGHTNESS LEVEL, NOT THE PRESENTING INSTALLATION

Number of participants: **430**

The actual DCP standard allows us to determine, during grading, the exact brightness level and color of each picture element at any given time and a correctly set projector, respecting the standards, will reproduce the exact brightness and color we have decided during grading.

The ITC thinks it is important that a new (HDR) standard will again provide this same level of control to us, and the ITC wants to avoid that our work can be shown differently depending on which competing system it is shown. A new standard should guarantee consistency among all HDR systems.

Would you agree?

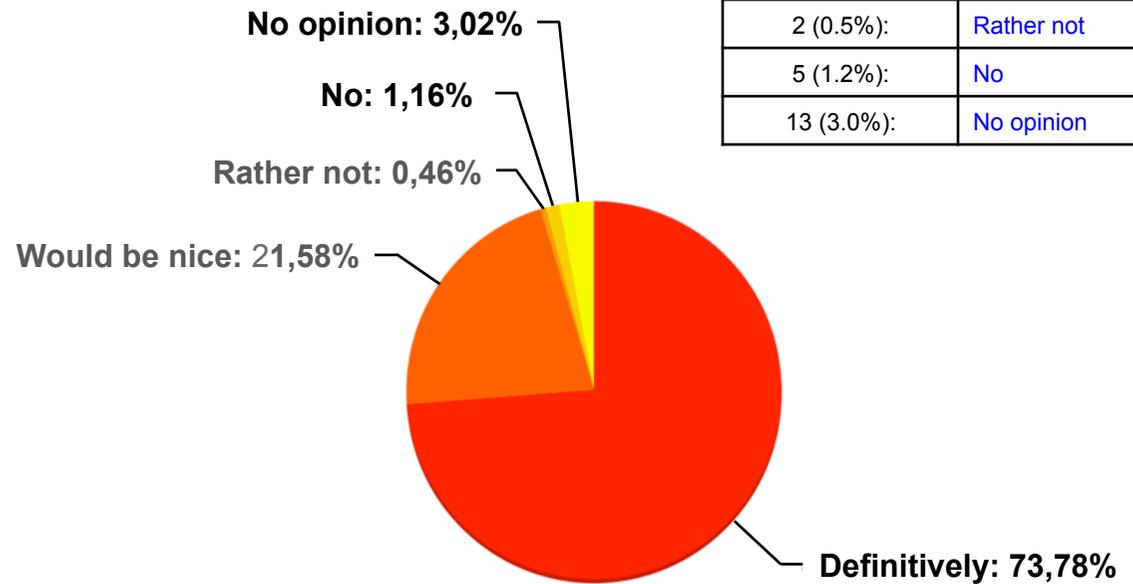


### 3.2b HDR PRESENTATION SYSTEMS BACKWARDS COMPATIBILITY

Number of participants: **431**

Additionally the ITC thinks it is important that new HDR capable cinemas and a new (HDR) standard will provide for backward compatibility. This means that new HDR screens should be capable of showing standard, actually standard (non-HDR) DCP's and that in that case color and brightness shall be like before, so to speak like the movie was graded and yield the same visual result as if it were shown on a legacy, non-HDR digital presentation system.

Would you agree with this demand?





## **MODULE 4:**

### **GENERAL SUGGESTIONS FROM SURVEY RESPONDANTS**

Would you add other topics that should be discussed with manufacturers ?

Results in last section of appendix



Imago Technical Committee

# APPENDIX



Imago Technical Committee

## **APPENDIX MODULE 1:**

**IMAGO CHECK LISTS  
MANUFACTURERS SAMPLES  
METADATA**

## MEANINGS OF WORDS - SEMANTICAL APPROACH

Number of participants: **158**

### ANSWER TO 1.12. Could you list the most important words that you think should be defined more precisely? 1/3

- Sharpness and Contrast
- Debayer
- Photosite vs Pixel, logarithmic curve, shading, lut-look-CDL's
- Color Space, Gamma, Cine Gamut
- Native sensitivity, spectral response, color retention, working color space, signal to noise ratio
- Resolution, Compression
- "Legal range", "full range" and "extended range"
- LOG, RAW, DETAIL, PIXELS, PHOTOSITES, CONTOUR CORRECTION
- ISO, Sensitivity, Base ISO sensitivity of sensor
- Native white balance, Native ISO
- Dynamic Range & Latitude
- Logarithmic vs Linear
- HDR
- Codecs, s\c-log, Raw, DNG
- Focus, Aperture, Depth of Field, Shutter Speed/Angle, Frame rate, Sensor Calibration, Gamma
- Acceptable noise in shadows / dynamic range / latitude
- Picture profile, paint menu, custom picture, picture style
- Camera movements like Tilt, Pan, Dolly etc
- Zoom shift (drift), breathing
- Monitor contrast ratio, Monitor brightness

## CHECK LISTS

Number of participants: **539**

### ANSWER TO 1.2 Other answers about check lists? 1/2

- It is useful if functions in easy and standard mode do not differ among cameras.
- Ready for broadcast mode, manufacture recommendation mode and advanced-user mode
- Different modes are a great idea, the different range/price point of cameras require different modes. Specifically in long form documentary a sub menu structure much like stills cameras would be very handy. Perhaps under the easy mode there should be a sub menu for portrait, mode sports mode, night mode etc following the stills camera model as symbols are standard and would be helpful for those times on a long for doc where a producer/director decides to pick up the camera, or if your situation changes very quickly.
- Simple fps, shutter speed & Iso + Simple Recording Formats !
- Having an easy, medium, and hard mode may make users feel like they're crippling the functionality of the camera system. Consistent standards would be adequate for learning from.
- Only Easy mode (or Point & Go) and Advanced mode
- There should be one easily attainable basic standard for all applications! You should then have the option to personalize your standards to any extent you wish.
- Not useful for pro users, no need for it, it might add to confusion if not executed well, still in general it sounds like a good idea
- Purely manual set up mode.
- Only 2 modes: standard and advanced. Easy should NOT be included in a professional camera (restore default values in standard mode)
- Very useful as long as the "Standard Mode" could be user defined

## ADVANCED MENUES

Number of participants: **47**

### ANSWER TO 1.3 [Other ideas for advanced menus?](#) 1/3

- When you want to control these above described highly advanced settings terminology like "Engineering Menu" would be a better description than just "Advanced". As a camera manufacturer, suggestion to add warnings like "Are you sure to advance?" / "Altering the following settings will impact the recorded data - a process that is not reversable in post" or alike.
- Color management in post including DeBayer manipulation
- Sensor downsampling
- Color gamut information, preferably in common CIE x y values, Color sampling information, (4:4:4, 4:2:2,... ), Codec bitrate and compression details (Mbps bitrate, 1:XX ration of compression comparint to uncompressed RGB size)
- SIMPLICITY IS THE WORD
- The same or similar trees of the submenus - it would be very useful for the creators and provide more friendly interface
- Part of the problem is the the fight between doing as much as possible in the camera or leaving lots of stuff to post and it is not just a technical issue but a perceived transfer of control and power from the camera crew to the post crew.
- International standardisation of the menus
- ALL settings should be clearly labelled as "Metadata - does not affect the RAW image at all" or "Permanent/Baked-In - this setting changes what you record."
- Possibility to lock image altering options that would be irreversible/destructive
- Manufacturers should allow manual control of color temperature and green/magenta tint in ALL modes of recording.
- Image Size
- De-noising after de-bayer as a metadata in RAW
- An option to fix to the "full quality" preset would be nice
- Need knee and shoulder on standard curve
- Sharpness, Detail, Cut!
- The window-mode or crop sensor should be customisable. To set the exact framesize of of a cropped window should be standard.

## ADVANCED MENUES

Number of participants: **55**

### ANSWER TO 1.3.2 [Would you add other access on specific menus? If yes which one?](#)

- Sensor sensitivity check up and possible recalibration, to see if 800 ASA is up to standards.
- Color gamut information, preferably in common CIE x y values, Color sampling information, (4:4:4, 4:2:2,... ), Codec bitrate and compression details (Mbps bitrate, 1:XX ration of compression comparint to uncompressed RGB size)
- Gamma, color, detail
- False color or some equivalent which reflects both the native recording format that is being recorded to the chip and the selected gamma and the difference between the 2 in terms of levels of exposure.
- The option to "Burn In" a LUT therefore recording a 4K HDR final picture - removing RAW or Log C as an output.
- Ex. frame rates per second, Aspect Ratio, Shutter angle
- Denoise on/off
- A menu dedicated to image post processing:
- If it is a log workflow or ACES
- Applying LUTs in camera, Lut parameters
- ASC CDL inside the camera
- More detailed exposure control, i.e. Defining false color. Standardised tools for exposure control. Data distribution over dynamic range.
- If we record RAW files - the every manufacturer should provide possibility of different scanning modes - full scan or crop in dedicated resolutions
- Gamma
- Engineering menu, i.e. a deeper menu for e.g. calibrating sensors and A/D conversion
- All parameters that have to do with lens control
- Dedicated metadata management. Not only inputs but the ability to see what fields are being actively filled by the camera, eg. to check if lens data is being put into the SDI stream
- DeBayer process
- Quick access to basic configurations

## REQUESTS OF SAMPLES FROM CAMERA MANUFACTURERS

Number of participants: **20**

### ANSWER TO 1.5.0 Samples from camera manufacturers [Do you think that it will be useful? Other ideas?](#) 1/2

- This is something you decide project based, and should be tested during per-production with footage you shot yourself. Self education on how to approach a project should not be based on some basic samples from manufactures. The latter are only helpful for creating an awareness for cinematographers to test this as well for a project.
- Not only sample footage but also spectral response curves should be available from every manufacturer
- Given DoP's learn to interpret samples of non-debayered and debayered frames (like we used to know to interpret negative snippets in conjunction with printing lights).
- Are DoPs taking a look at his raw files on a regular basis? In day to day business one gets by easily without doing so.
- Standardised test plates from all manufacturers, like dynamic range charts, color gamut charts,... preferably in different lighting conditions 5600K / 3200K
- Include sample from all recording formats that are capable from the camera system in question and include lens information.
- It would be even better if samples were available using a standardized test chart / methodology - Like the old Kodak charts.
- Serious consideration given to three sensor cameras that do not require the Bayer process
- A common reference chart?
- Spectral response curves
- Could be useful certainly, but only to proper engineers, or to inveterate knob-twiddlers. So the actual usefulness is debatable

## REQUESTS OF SAMPLES FROM CAMERA MANUFACTURERS

Number of participants: **28**

**ANSWER TO 1.5.1** Samples should be provided with recommended settings of detail enhancement / contour correction (sharpness)? [Other ideas?](#) **1/2**

- And with a flat set-up for comparison
- Maybe sample should contain same color and pattern charts.
- This should be in the manufacture mode setting of a camera. Is contour the same as micro-contrast?
- Samples should be provided with everything turned off.
- Sharpness and contouring should be managed in post with consultation with VFX departments as it interferes with the VFX workflow the most. Where possible the Colorist with guidance from the DP should instigate the level required as a creative decision.
- Camera manuals should indicate which level setting suggests no(zero) detail enhancements for the particular model of camera
- Some form of description on how a particular camera's log curves re-maps real world stops
- One should test the recommended settings and juxtapose them with one's own settings
- It should only be useful when we know all the details of how the sample is made.
- Better do it yourself.
- No recommendations. Just info on what settings were used to achieve sample footage would be adequate.
- Samples need to be accompanied with very specific descriptions of how the various samples were handled
- Samples should also be available with NO detail/contour correction applied.
- Documentation of these functions and features should be thorough and comprehensible.
- Happy with samples in 3 settings: normal, best quality by manufacturer, and as raw as possible
- Absolutely essential. Many years analysing cameras and working out decent sets of settings - many are still in use world-wide.
- Samples should be given with no enhancement (flat, no artificial correction)
- Different recommended settings for different results regarding sharpness. And, of course, we should be given the option to shoot with no sharpness at all, and define that in post more precisely.

## MEANING OF WORDS: CAMERA AND POST

Number of participants: **39**

**ANSWER TO 1.6.1** If you don't agree with our definitions, could you give a short explanation for those definition(s) you don't agree with?

- Transforms seems to me an extremely unintuitive definition. LUT = lookup table - this can be understood. Creative LUT is therefore a logical description that defines the type of LUT. I like the fact that I know it is still (just) a LUT. Not some other thing which I do not know what it is because the name clearly hides it.
- Transforms refers to matrixes that make an image legal for a standard, creative LUT are just a color grade to determine a look
- Every "Transform" is basically a LUT. "Transform" resembles "transcodes" too much and should therefore be avoided. Technical vs. Creative LUTs would be better, where "Technical" dictates the output into a certain color space, e.g. REC709 or 2020
- Your suggestion is using the word "Medium Density Value" instead of 18% grey?
- Latitude of exposure: "acceptable noise" can be very subjective and also different from project to project.
- In the interest of creating a universal term that describes the range of exposure a sensor can capture, Dynamic Range has become popular and should be used rather than Latitude of Exposure which was film sensitometry term.
- Most of your terms are not technically precise.
- Creative LUTs is a better description than transforms.
- In the latitude/DR discussion, consistency of color (saturation, contrast etc) is often overlooked
- LUT's should always stay as LUT's, (no addition, only LUT) especially if the term is well defined as per question one. Understood as what it is, a LUT will be always something added on top of the picture with out change it ... it is like showing the color negative without the orange cast
- Latitude refers to the photo-chemical Film process and not to a a photo-electrical image process, therefore it has no meaning. Dynamic range on the other hand refers to electronic values.
- Dynamic range is absolute, the range from white clipping to just/not quite detectable near black.
- The problem is not about definitions. It's about measurements. Proposal to have an equal Latitude and DR from two different cameras, that have the same figures in their data specs. Today we can find out the real Latitude and DR only after tests. And it's a very rare case, when your own test results match the tech specs.
- And what about Channel noise ?? Blue noise vs Green noise vs Red noise depending on the color balance?



Imago Technical Committee

## **APPENDIX MODULE 2:**

## **IMAGO WORKFLOWS**

## STANDARDIZED PATH IN SOFTWARES

Number of participants: **33**

**ANSWER TO 2.1** Requests to grading software/post-production software manufacturers (compositing, CGI, etc) to follow the same standardized path when dealing with recorded files coming directly from shooting. [Other ideas?](#)

- ITC should define a universal/ standardised approach to setting up and testing a pipeline from lighting a test target to final deliveries.
- There should be a choice. ACES is good but has so many flaws. If you do not permit development of other options even ACES will not get better.
- Wouldn't it be more useful to keep this a creative process that is not standardised, but open for creative possibilities from shooting to post to have your own way of working with you shots and conversions from a post house?
- Not sure this could ever fully be realised as manufacturers will never agree which is the best way although we are sure we could improve workflows
- But care needs to be taken that this standardized process does not hinder the software manufactureres ability to enhance and change the process when new and improved solutions are found. Also the different process order might produce different results, which is not necessarily a bad thing...
- Should be possible on any professional camera label the original camera clip name with some standardized codes, as the DCP name convention it can give more control to avoid losing original material in transcodes for editorial, example: 3 digits for production name code, 3 or 4 digits for reel number, scene label, time base, resolution, etc. It can give to all pipeline the option to read information from any clip directly from the name, get the basic characteristics avoiding time opening metadata in external software. For feature films or documentaries this process can reduce a lot of time in archiving and ordering for editorial
- Encourage ACES adoption
- D.P. should always retaining Control and Authorship of IMAGE all the way to SCREEN !
- This concept may divert from creative ways to accomplish things, but I support it in essence.
- Software should not delete metadata, and it should issue warnings before transcoding or decimating image data
- Again legal/full/extended range syntax mismatch. It's tough to know how each software is dealing with the image, and as such which waveform is the "true" one.
- Simple efficient standards are required.

## PROCESS ORDER

Number of participants: **33**

**ANSWER TO 2.2.1.** `Proposal to manufacturers to follow an order of process after deBayer/  
demaosaicing like (proposal 1 to 5 - there'll be a chance to change the order in question 2.2.2)

Do you want to add other settings?

- HDR
- White balance + tint (green vs magenta) + control of the kelvin degree
- Noise reduction
- Time base and frame rate.
- Image downscaling/downsampling
- Compression
- Correlated color
- Quick personal settings available as one touch!
- False color
- Resolution, frame size
- FPS to timebase relationship ; disabling metadata ; disabling framelines and therefore seeing the whole recorded picture
- Decoding target color space
- Lut
- Data rate (last)
- Shutter
- Black shadings
- Color Adjustment Manual Mode
- Master black
- DeBayer algorithm choices, ie: all sites, nearest neighbor, etc.

## PROCESS ORDER - MEANING

Number of participants: **33**

### ANSWER TO 2.3.

Proposal from ITC of using the same order (and semantical approach) regarding:

Conversion to color spaces/Transform

Conversion to different sizes/aspect ratio.

### Answers from the additional field:

- Be great to actually play with the order. Of course it is highly dependent on the initial software of DeBayer/demosaicing in the first place.
- Creative Color Space CONTROL !
- First aspect ratio, then transcode / converse to different color space, as this can greatly reduce render time
- Different order: 1. bit depth 2. black balance 3. details 4. ISO 5. white balance 6. gamma processing 7. color space conversion



## **4.1 GENERAL SUGGESTIONS FROM SURVEY RESPONDANTS**

Would you add other topics that should be discussed with manufacturers ?

These suggestions don't reflect the opinions of the Imago Technical Committee

## 4.1 GENERAL SUGGESTIONS FROM SURVEY RESPONDANTS 1/6

Number of  
participants: **84**

### Would you add other topics that should be discussed with manufacturers?

- The projection systems ability to cope well with historical and existing recording standards.
- As all the standards of cinematography are based on the perceptual and cognitive characteristics of human vision, it would be interesting to compare these with those presented by camera, projector and screen settings.
- A uniform capture (recording) format across different camera manufactures, so mixing brands becomes less an issue in post
- Standardizing of lens mounts.
- Camera ergonomics, especial handheld and better viewfinders
- Develop different interchangeable sensors for different looks. Have a look at the Feveon Sensor. Don't fool around too much in the camera and make the camera a straightforward tool with clear options as if chosing brushes to paint. There is a tendency to turn cameramen into software - and computer-experts instead of letting the process of camerawork occur in front of the camera through lighting and lensing.
- In the HDR theme, manufacturers will continue to create brighter screens. HDR standard should be able to stretch or retract to full the spectrum from SDR to HDR maintaining the middle grey.
- In camera exposure tools should be based on camera-mode, and show the user where the blacks get crushed, what is medium reference gray and where the white clip. This can be different for ready to broadcast mode, manufacture mode and advanced-user mode. It's not always clear how to interpret all the exposure tools.
- Menu layout standards. In menu's or at leas camera manuals, an explanation of what effect each menu change will have on the recorded picture. Decent camera viewfinders. Edit software that accepts anything and easily cross converts. Plug and play accessories
- Standardise codecs and/OR make sure they work on all NLE's moving forward
- Ergonomics! Speak with DPs, ACs, DITs!

## 4.1 GENERAL SUGGESTIONS FROM SURVEY RESPONDANTS 2/6

Number of  
participants: **84**

- From an operators perspective ergonomics and practical use are two very big issues with cameras. It often feels like cameras are designed by engineers and left on a bench during the whole process without an understanding of how it will be used out on location. The positioning of buttons and ability to assign buttons to allow quick and timely changes is very frustrating with some manufacturers.  
Wish to have access to references through my viewfinder quickly without having to go through a ridiculous and needlessly complex menu structure. Raw, Log, LUT, Histogram, False color (which also need standardisation) previous matching frames to name a few. Then quickly changing frame rate or shutter angle .  
Some of the buttons or screens are simply not location friendly. And how on earth can you hot swap cards when the operators head is in front of the door?  
Also be great to discuss standards in terms of sensor cropping for high speed which seems to be creeping in more and more as well as the post production "pushing in ".I think a standard needs to be discussed and set in line with the other parameters.
- Framerate interpolation. Should not be turned on by default on TV's
- We need a screening standard that would look similar and good on as many different screens as possible.
- A relation between brightness of the viewfinder/monitor and the settings of the camera might be useful. Like a blue test screen on a monitor.
- Better positioning of power and SDI connectors.
- A general uniformed language for the elements in the menu. A common name used to identify different gammas and color spaces.
- Camera fan noise, Sensor, built in filter dirt, Menu concepts, easy access to menu points
- Give essential information regarding detail manipulation, spectral response, QE.
- A standardised falsecolor on all cameras. A waveform shows the exact levels. But a falsecolor is different on different cameras. Natural grey is the same, but the falloff, smoothness if you will, to other gradients of grey, is different.
- Minimize file recording formats.
- Making a possibility of recording different frames (aspect ratios)
- Similarly, far more attention to larger more efficient photosites than a race to place more sites on a given size sensor.

## 4.1 GENERAL SUGGESTIONS FROM SURVEY RESPONDANTS 3/6

Number of  
participants: **84**

- DIT's need standardization of hardware and technical nomenclature. There are so many types of proprietary media cards, media readers, cables, and data connectors, which from generation to generation gets obsolete and requesting unending investment. Think of P2, SD, SxS, CF, CFast, Codex, XQD, Memory Stick, Atomos Master Caddy, ... Why not all camera offers one standard media plus connection via cable to computer external SSDs? And why does camera industry does not create our own standard data upgradable connectors/specifications instead of being hostages of Apple or computer manufacturers that each 2 years change from Firewire 400 to 800 to Thunderbolt 1, 2, 3, USB 3.1, it never ends. We also don't have back compability assured. New standards should be forced to offer back compatibility solutions for a determined period.
- Spectral response curves of all sensors
- Clear description and definition of "true" HDR capability, i.e. not temporal exposure bracketing!
- Description of sensor's readout being global or rolling shutter type (or even switchable as in Phantom Flex 4K GS)
- Description of lightfield capability or not
- Clear and uniform definition of spatial vs. temporal compressed recording
- Clear definition of the manufacturer's LOG recording characteristics (are the blacks being lifted to 15 or 30% and the whites reduced to 85 or 75% - which gamma corresponds to this type of LOG recording)
- Clear definition of sensor sensitivity IE at 25 fps and 180° shutter in both 5600K and 3200K, in both LOG and LINEAR recording mode.
- Integration of mechanical shutter or not
- Circle of confusion to be applied in depth-of-field calculations
- Clear definition of recordable and surround view areas
- Matching lens sets for camera model recording area
- More consistent digital lens data. Zeiss XE is awesome but difficult to integrate into a backend. Leica lenses have trouble communicating on the LDS. It should work well, and sometimes it just doesn't. The data should pass down over SDI.  
Also, better metadata over wireless video. Maybe look at what In2core are doing with their Metacoder - surely there's a way to stop rich data from being stripped out?

## 4.1 GENERAL SUGGESTIONS FROM SURVEY RESPONDANTS 4/6

Number of  
participants: **84**

- In brief: less consumer based advertising but more professionals oriented unbiased information.
- Common language and basic standards will result in best understanding for all departments in producing and post. Will result also best quality for audiences in every screen
- Frame rates, including high frame rates. Deciding on a frame rate and shutter in post (from HFR camera source).  
Multi-view, 3D, VR. New forms of compositing.
- A standard way of mapping HDR Content onto SDR projectors/displays utilising state of the art and predictable color appearance models
- Noise reduction
- Optimum sensor size (2K,4K,6k,8k)
- We also need a standard (and durable) system for preserving our digital films
- My opinion is: manufacturers should work on soundlevels camera-fans are doing to the set!
- Standardizing technical terms would be a great asset.
- Nice having technology that allows the cinematographer to maintain more control of the final image as it makes its way through post production without being manipulated away from the original vision of the image.
- Making the cameras more ergonomic and place the buttons and switches more or less at the same place on the different types of cameras.  
Build up of international menu structure and vocabulary.
- We have suffered for decades with shooting to a particular look only to have the post house and/or exhibitor show the finished product at a much different color correction and luminosity. Any progress toward agreement on final 'look' would be very helpful
- Some sort of standard for measuring "K" between all the different codecs, compression etc.
- Standardizing language for camera settings.

## 4.1 GENERAL SUGGESTIONS FROM SURVEY RESPONDANTS 5/6

Number of  
participants: **84**

- Keep it simple. One of the reasons that Alexa has been so successful, is that they kept the menu system and the access to it, simple and logical and fast. There is no time on set to muddle through a deeply layered menu system accessible only through one button. Separate the various manu's (ie ISO, white balance etc) and keep them very accessible and fast to access.
- Motion interpolation settings in displays (especially TVs) should be accessible to users!
- I believe for consumer televisions, the default rate should be 60hz and not 120hz as 60hz is much more similar to the rate that cinematic shows (non- sports or news) were intended to be viewed. I believe the default 120hz rate that many manufacturers use as a default setting is disruptive and disrespectful to the creators of narrative or documentary or cinematic content.
- Get them on a course where they expose and process film stock and get them inspired by that when it comes to standardisation. Films were made and shown from North Pole to South Pole without any trouble for almost 100 years ...
- No Motion Flow / 400hz / frame adding in TV sets  
HDR certified TV sets should follow the same standard like HDR D-Cinema  
HDR D-Cinema projectors should follow and meet the standards in the whole period of life cycle. There is existing problem with D-Cinema right now when the cinema is using too old lamps, and dirty screens. That should not happen.
- Sound volume standard should be set - most of current cinemas are too loud.
- Any setting that may lower the quality of recorded image should be listed in camera's "info" page
- Thought that a non HDR production could perhaps be, to a small extent, scaled into the larger dynamic range of HDR, so that old work won't 'feel' old in comparison. Such a process could of course also lead to unwanted results, but it feels like a shame that all legacy films will be stuck in non HDR if HDR is what the audience will grow used to. Would be good to develop a non work intense way to move SDR material into a semi-HDR space.
- Defining a new standard for DCPs in which the projection settings are baked-in. That would imply that projection manufacturers allow these to override the settings. Too many films are badly projected.

## 4.1 GENERAL SUGGESTIONS FROM SURVEY RESPONDANTS 6/6

Number of  
participants: **84**

- KODAK - We had the standard then and the process was simple yes labour intensive but there was a world wide system in place. Simple - Efficient - Reliable - No Head Ache . Ask the camera manufactures to simplify all the menu and sub menus and keep a standard Just like we have with KODAK.
- Where HDR is concerned. It strikes me that the biggest issue is highlights going crazy (especially when it's left to software to determine what will be displayed at crazy NIT values and what will not).

A simple solution to this would be for HDR to have a 'default white' (so that everything is constrained to conventional, undistracting brightness levels by default), and a 'bright white' (where parts of the image can be SELECTIVELY isolated to extend their highlights up to the full brightness allowed by HDR).

By providing this level of highlight control and protection by default, and limiting that decision making process to just the colorist, there's no risk of an image becoming painful or distracting simply because it's been interpreted by a piece of software or hardware that way.

In an intimate scene in a bedroom, having the windows blow out in intense brightness is clearly going to distract the viewer from what's actually happening in the scene. However, if a character is emerging from a dark cave out into sunlight, having that initial burst of bright light dazzle the audience, can be a powerful tool.

The highlights in HDR are an incredible new tool, but they should only be used when the creative team wishes to use them (for a specific purpose and intent). And as HDR emerges, we need a system that gives us that control - and the simple way to go about it is to simply have a 'default' level, that isn't painful or distracting, and allow the brightness to be selectively ramped up in the color grade

- It has become very confusing how different camera models react to different LED light sources, especially in regards to color reproduction and skin tones. It would be great to shine some light on to the topic and maybe equip cameras with some sort of spectral analyser or to create a quality standard for LED lights, that they have to produce a minimum wide/even spectrum so that they produce comparable results with a wide range of cameras.