

Camera Training Center Breda The Netherlands



grass valley

A **BELDEN** BRAND

Jan Paul Campman

- ▢ Training Manager
- ▢ Trainer
- ▢ Acceptance Engineer
- ▢ Demo specialist
- ▢ Web master

- your guide for this INTERACTIVE session.
- **Welcome to the LDX WEB-Training**



This part gives you some more details about the LDX Features

In this session Part 2 New Features

- ♦ LDX “New” Features
- ♦ Features Under development



This part gives you some more details about the LDX Features

In this session Part 2 New Features

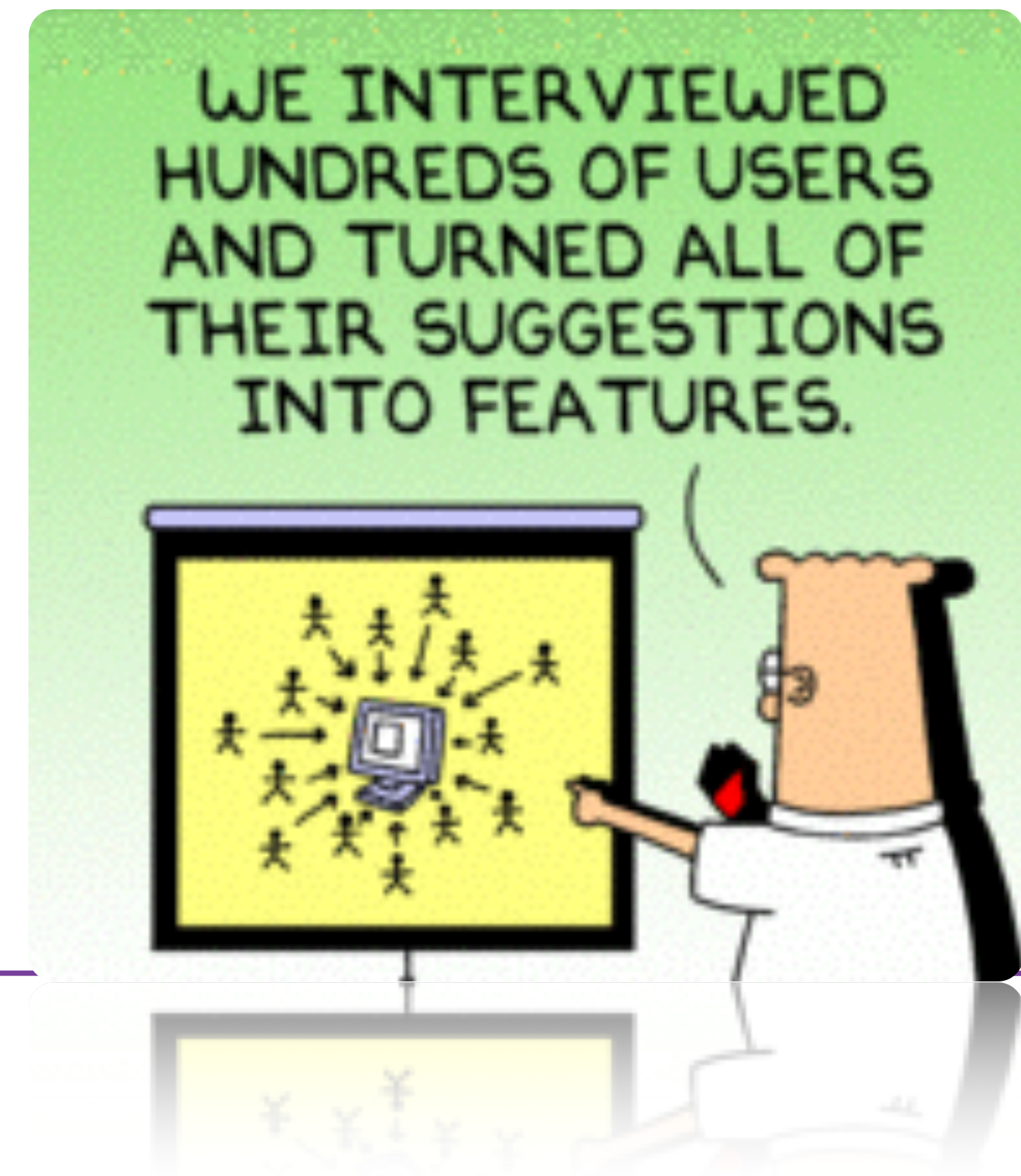
LDX “New” Features

◆ **Features Under development**



LDX Features “New”

- Sensitivity modes
- Correlated Color Temperature CCT
- Power curves: Knee, Gamma, Contrast control , Knee Saturation
- Matrix: Saturation, Color Protect
- Detail: Skin detail, Detail equalizer,
- Pixel corrector, Noise Reducer
- Lens Dependencies: CLASS, Depth of Field DoF indicator



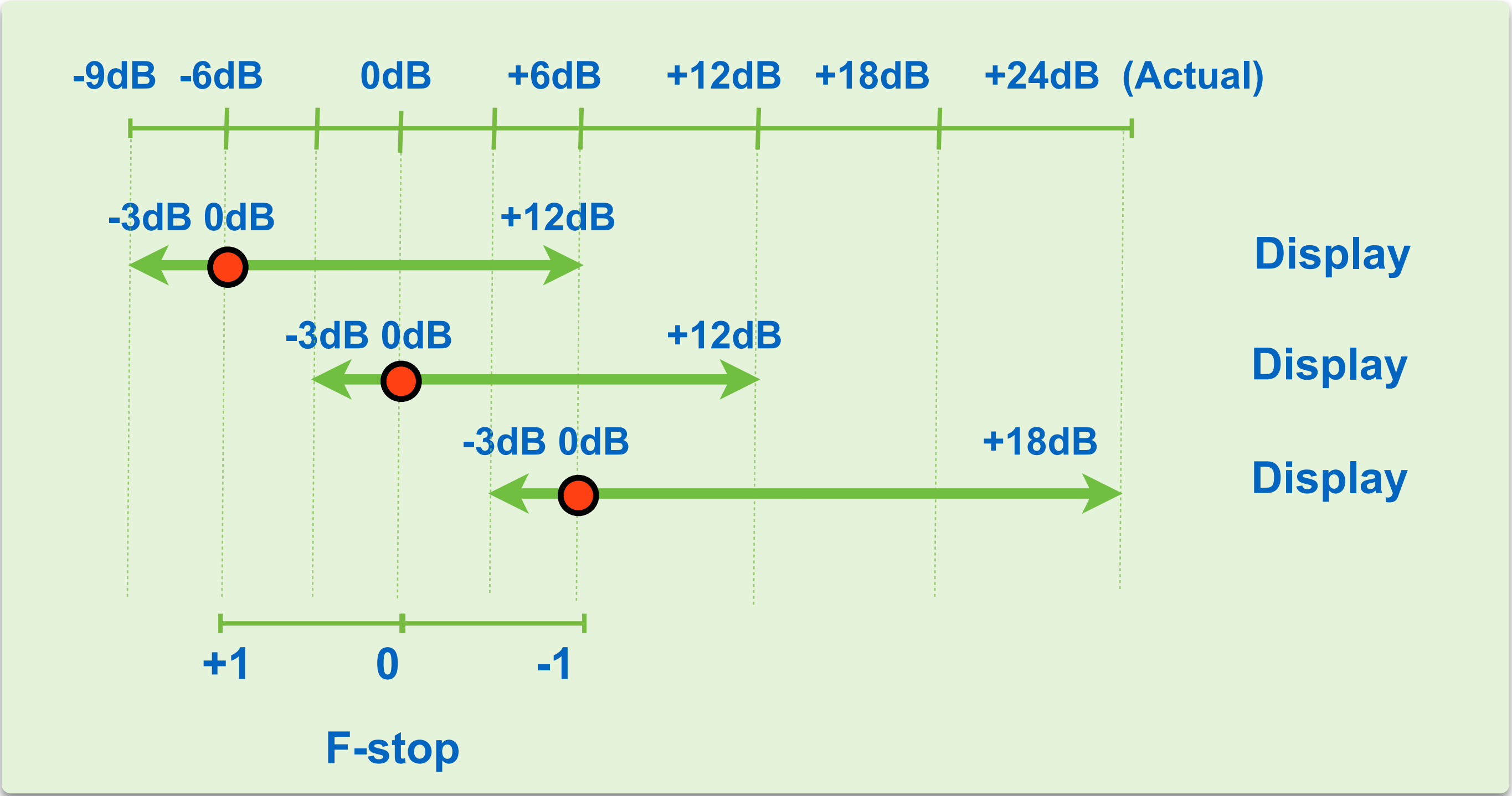
What's New LDX series

part 2 Web Training

Sensitivity Settings

New
LDX Feature

mode	Noise(0dB)	Sensitivity	Stop
HiQ	low (good)	2000 lux	F8
Nom	standard	2000 lux	F11
HighSens	acceptable	2000 lux	F16



Optimized for there own odB position

Example: HiQ only until 300-400% dynamical range but very good S/N values

Sensitivity Settings

The following settings and ranges are in use with the different sensitivity modes :

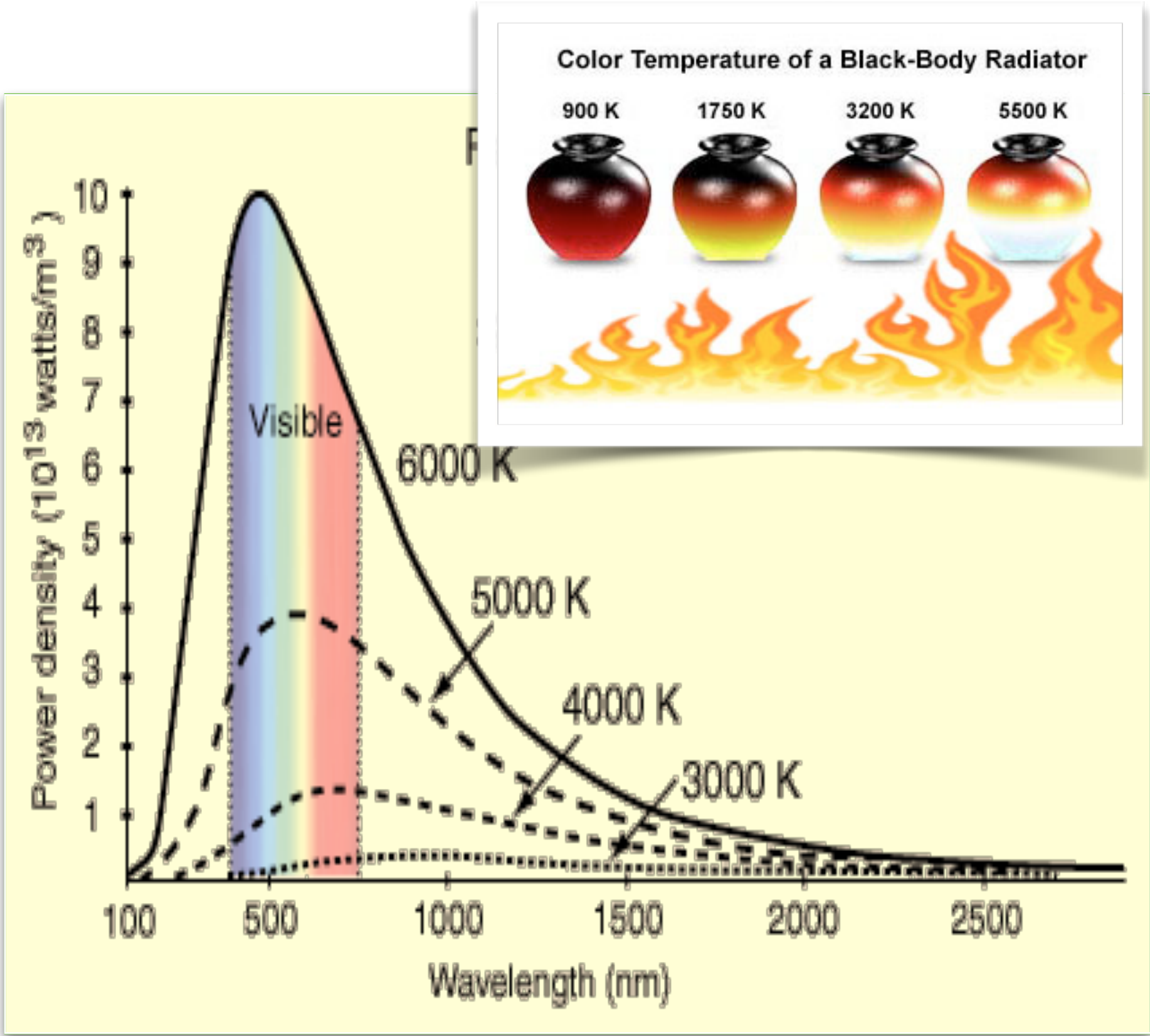
	High Quality mode ¹⁾	Nominal mode	High Sensitivity mode ^{1) 2)}
Basic sensitivity ³⁾	typ. F8 @ 2000 lux	typ. F12 @ 2000 lux	max. F17 @ 2000 lux
Video gain range	-3 .. +12 dB	-3 .. +12 dB	-3 .. +18 dB
Signal-to-noise ratio	64 dB	60 dB	54 dB
Texture representation	Excellent	Very good	Fair
PowerCurves exposure input range (available only in Elite and WorldCam versions)	up to 300%	up to 800%	up to 800%
Exposure time range	down to 1/1000 s	down to 1/1000 s	100 Hz/120 Hz to Nom.

1) Not available in the LDX Flex version.
2) Not available in the LDX Première version.
3) Actual basic sensitivity depends on selected video mode/frame rate.

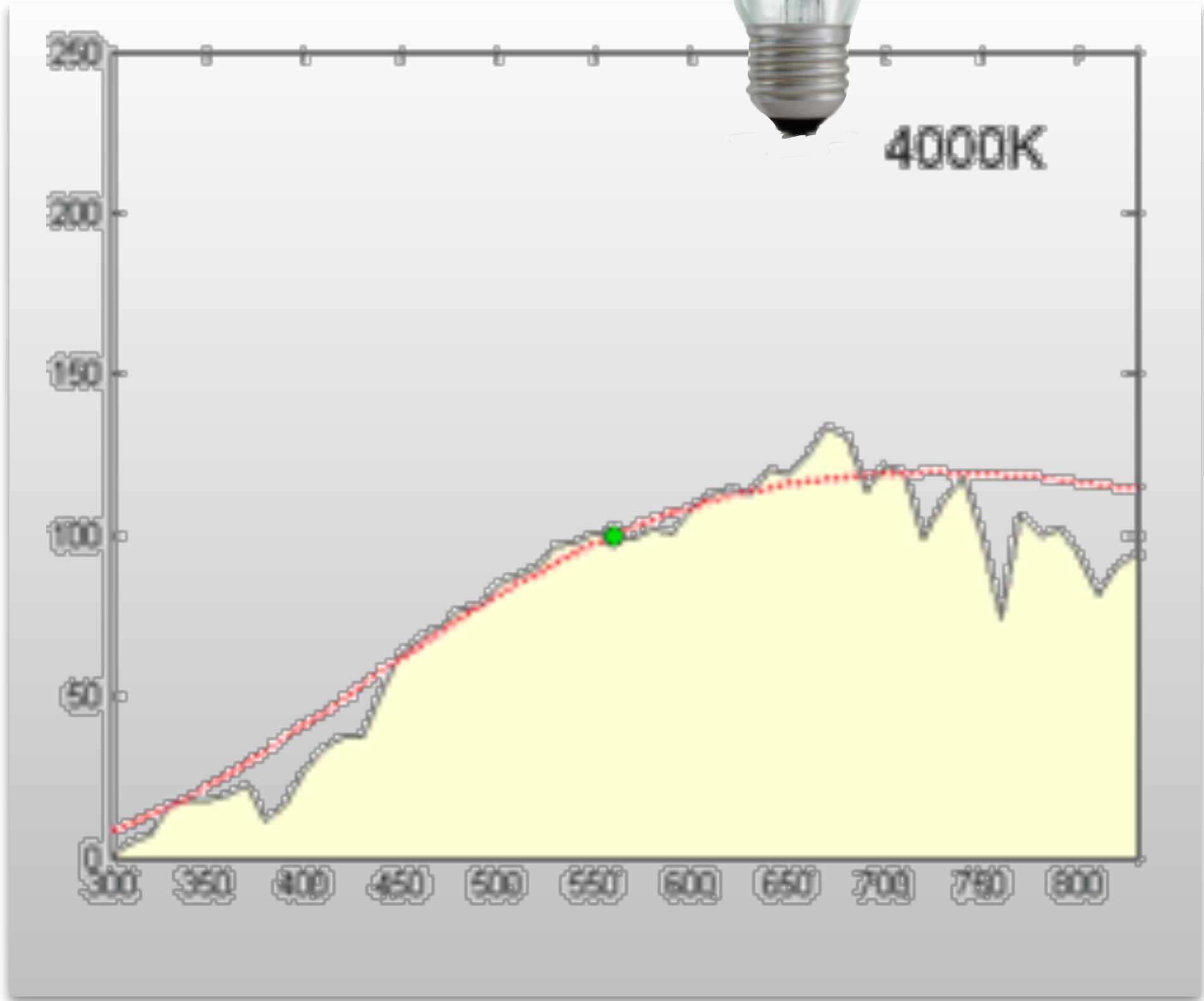
What's New LDX series

part 2 Web Training

Correlated Color Temperature Light and Color Temperature



Black body radiator

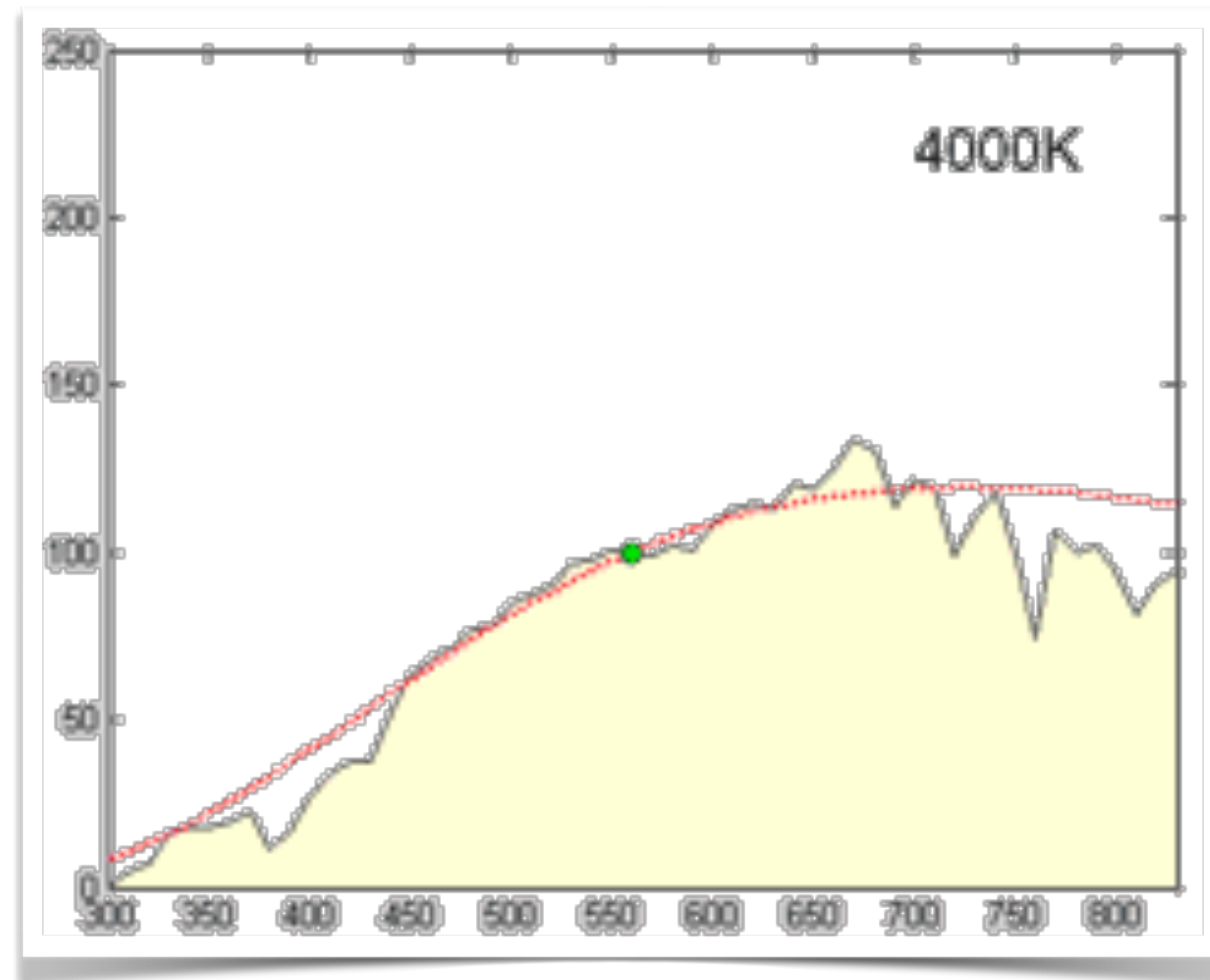


Visible light

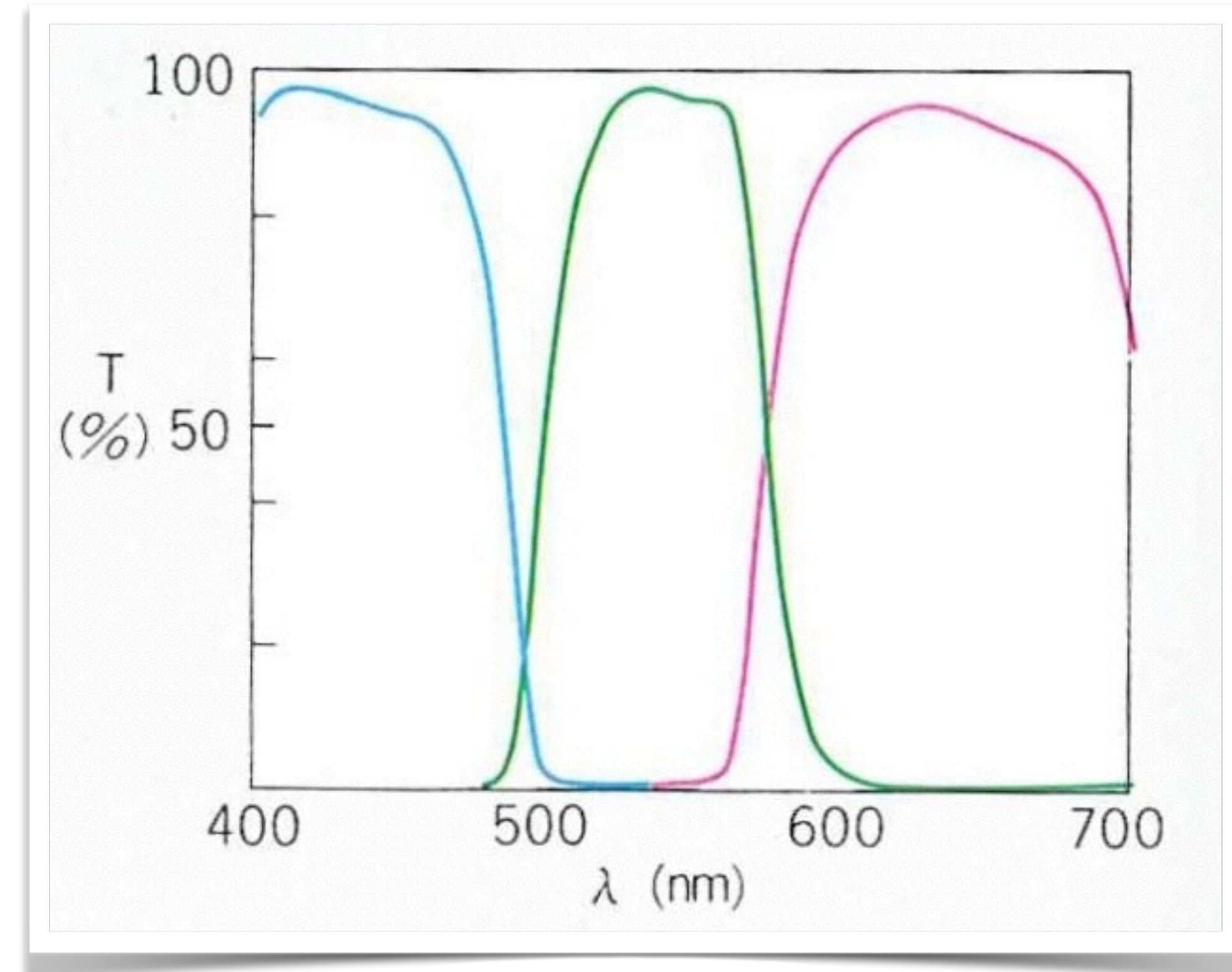
What's New LDX series

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Correlated Color Temperature Light and Color Temperature



Visible Light

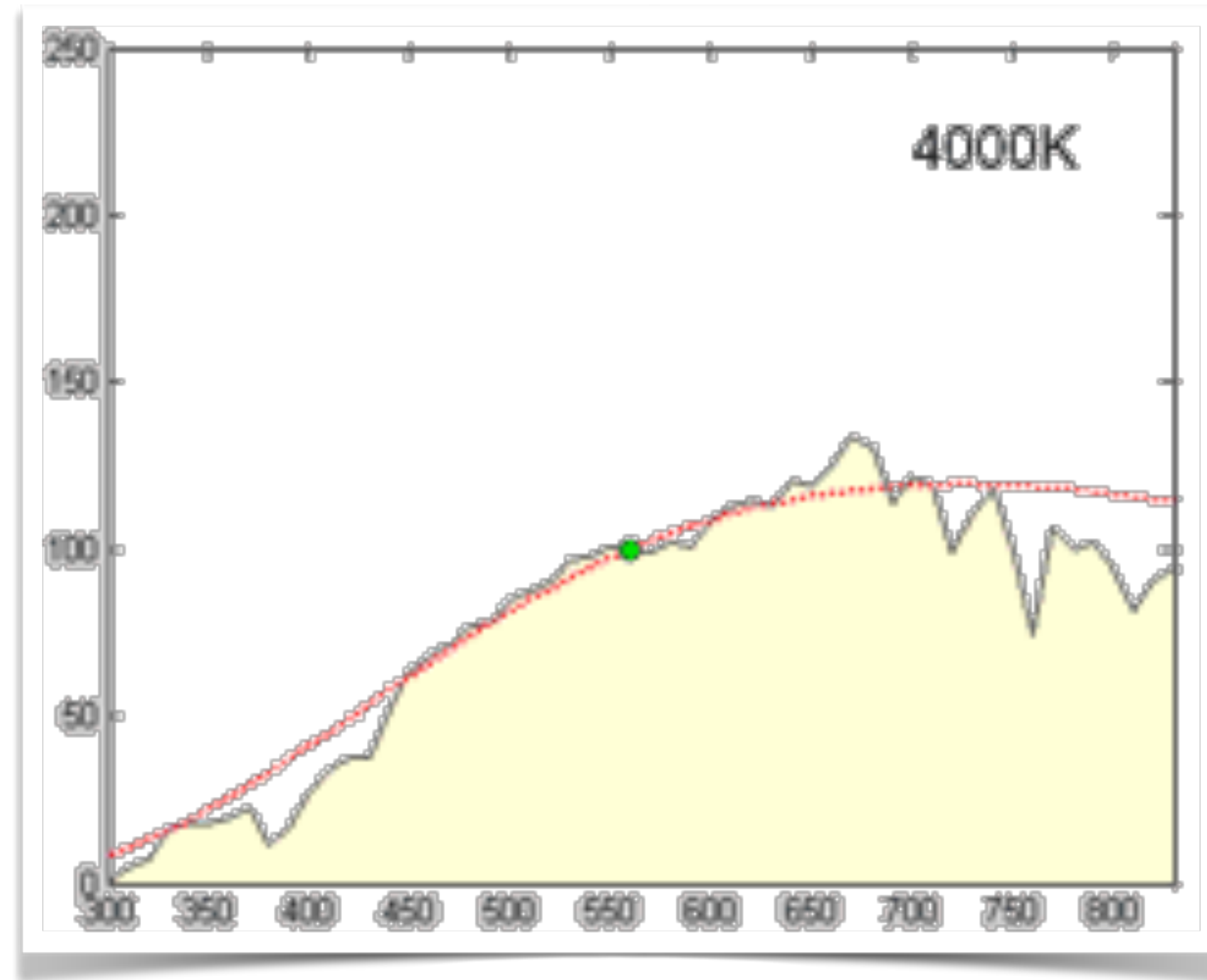


Camera RGB response

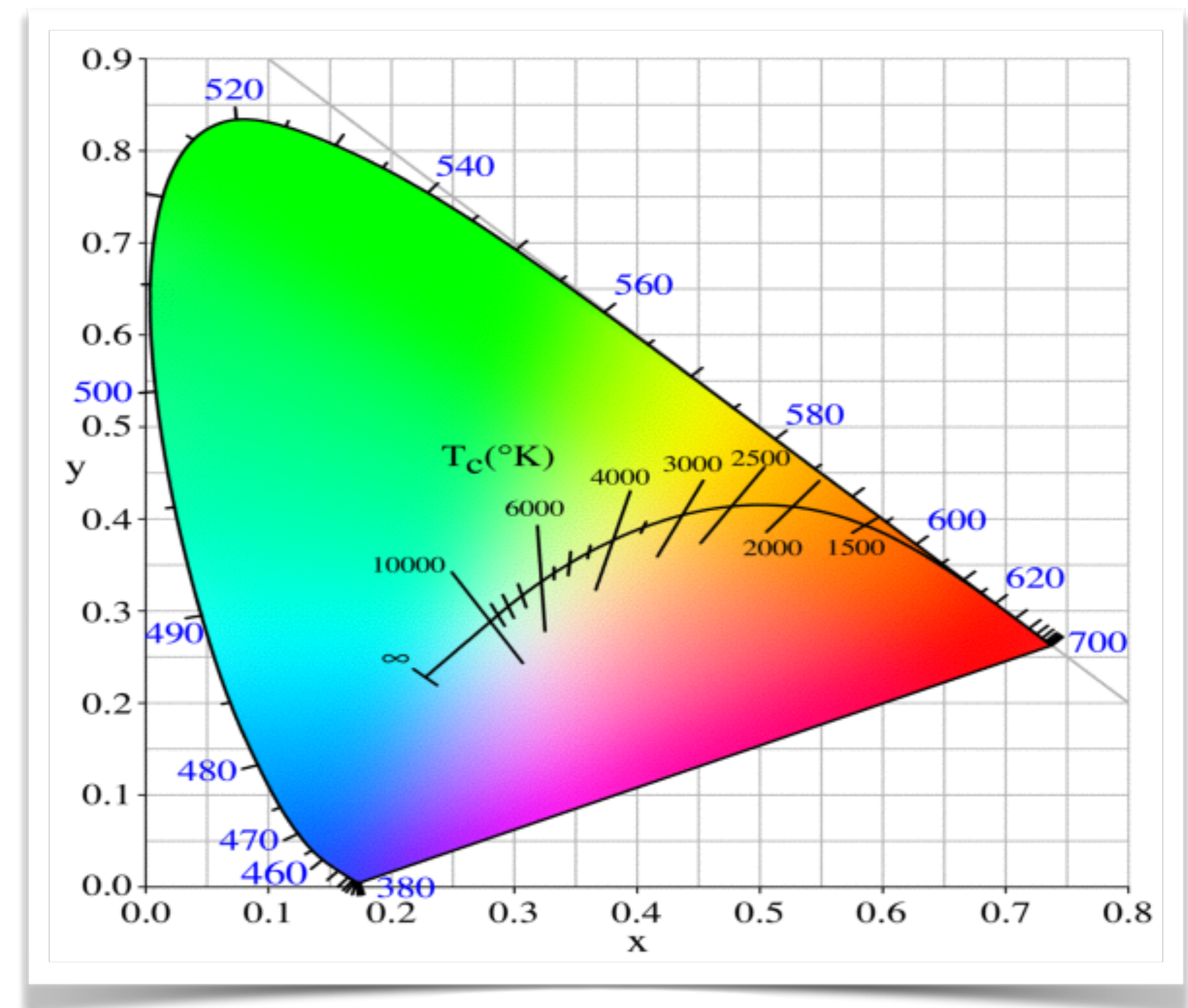
What's New LDX series

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Correlated Color Temperature Light and Color Temperature



Visible Light



Mapped in the x y color triangle

What's New LDX series

part 2 Web Training

Correlated Color Temperature and Tint

Two parameters are necessary to adjust color

There are different ways of adjusting color :

Red Blue Gain. With Green fixed. (common in cameras)

x and y or u and v (physics, colorimetric)

Correlated Color Temperature and Tint (lighting, perceptive)

We use CCT and Tint in LDX

Better communication about camera settings

Matches more with our perception of colors than just camera gains.

CCT and Tint:

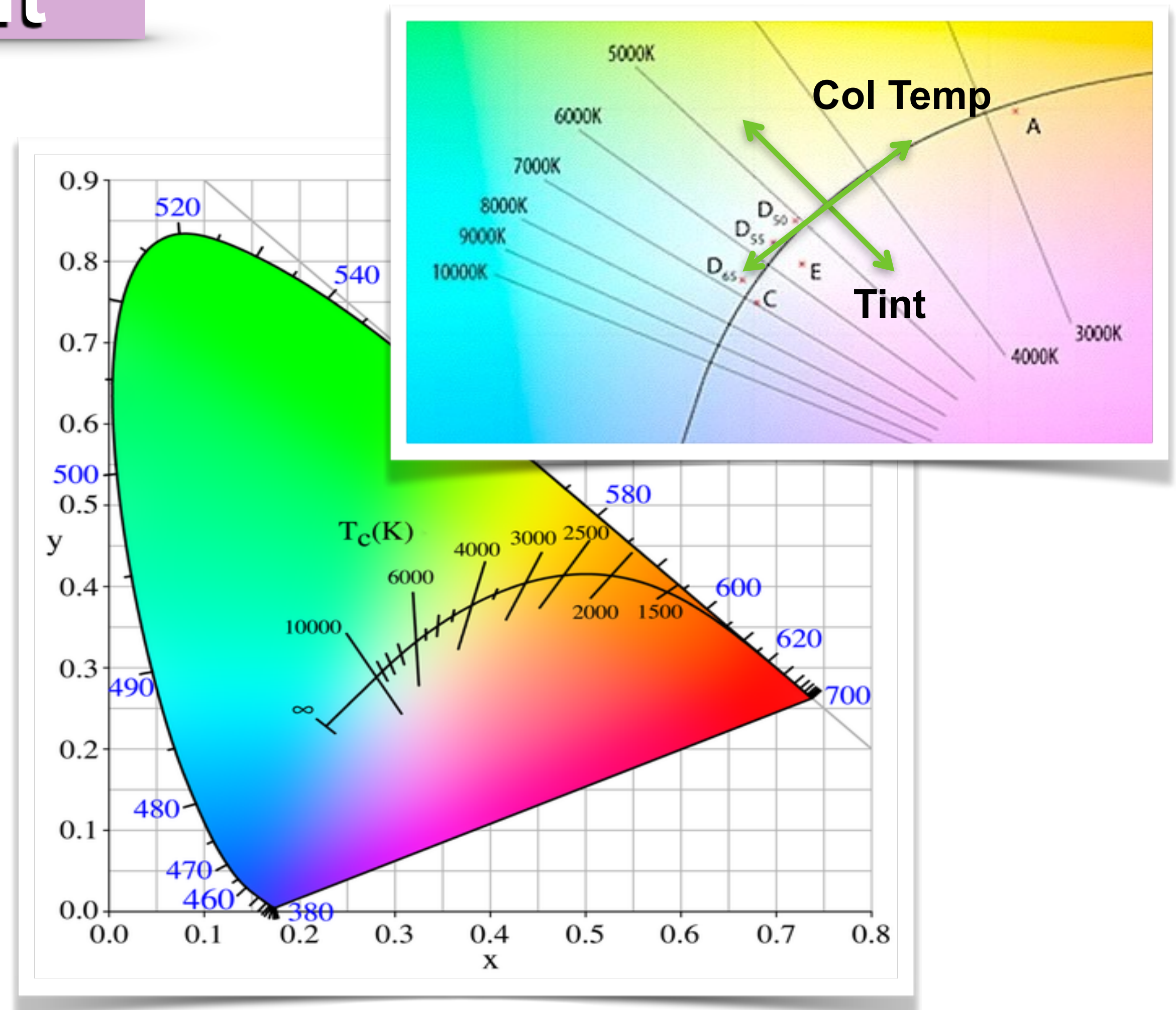
White balance the camera

Determine from camera gains the xy colorpoint

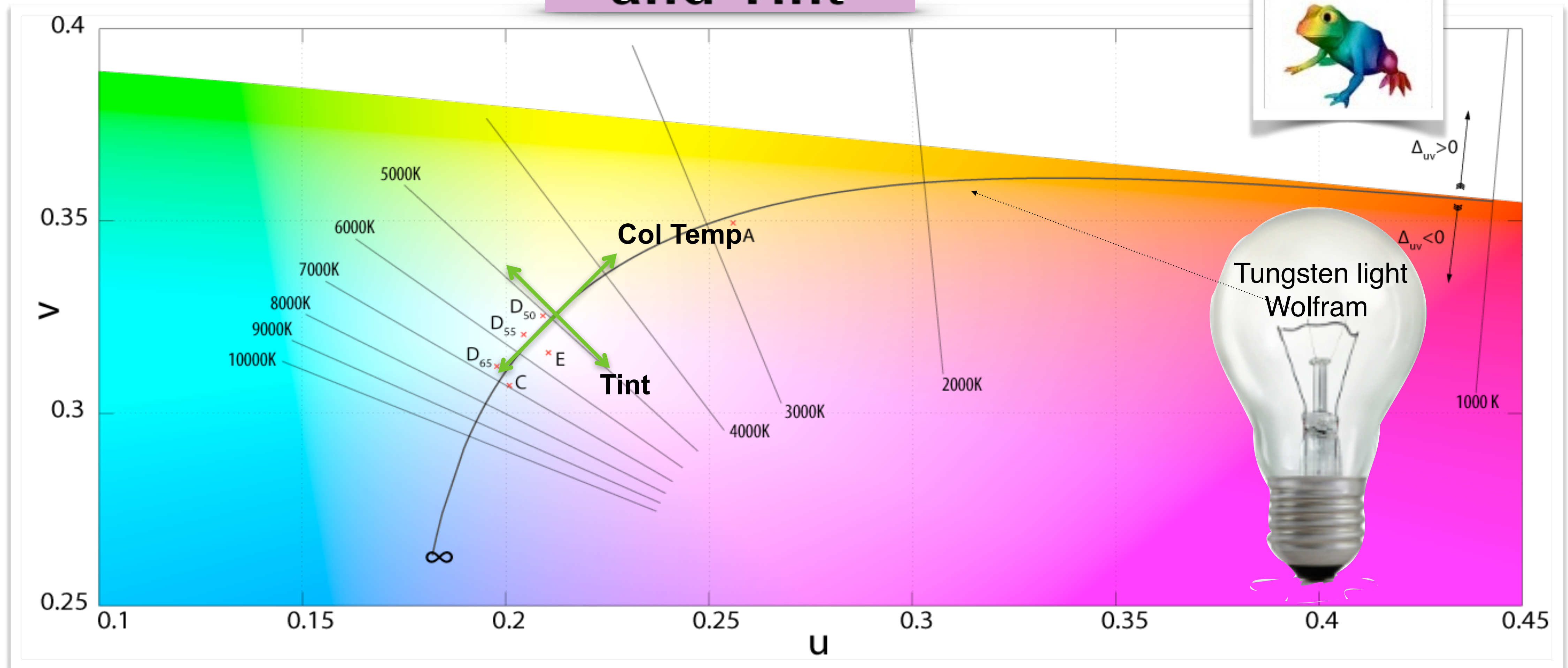
Calculate from x y the CCT and Tint of this whitepoint

Display CCT and Tint

Display In addition x y to the user



Correlated Color Temperature and Tint



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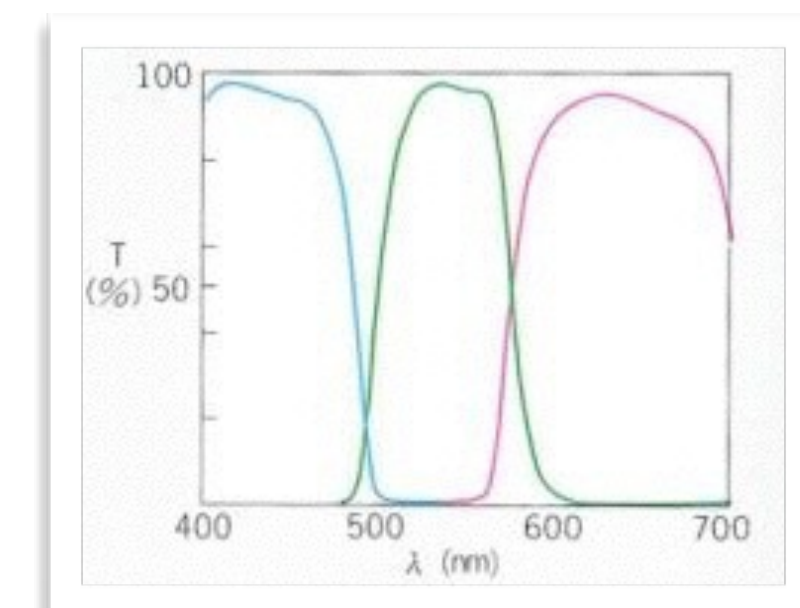
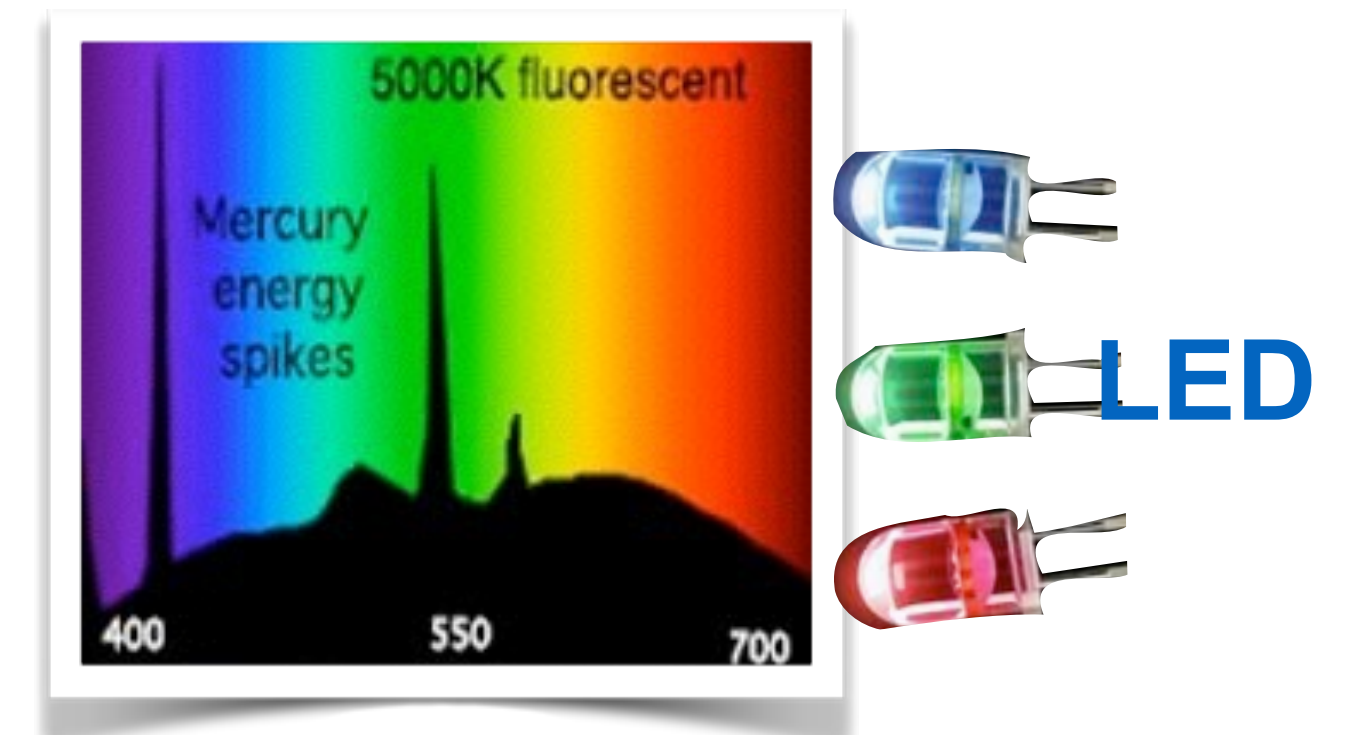
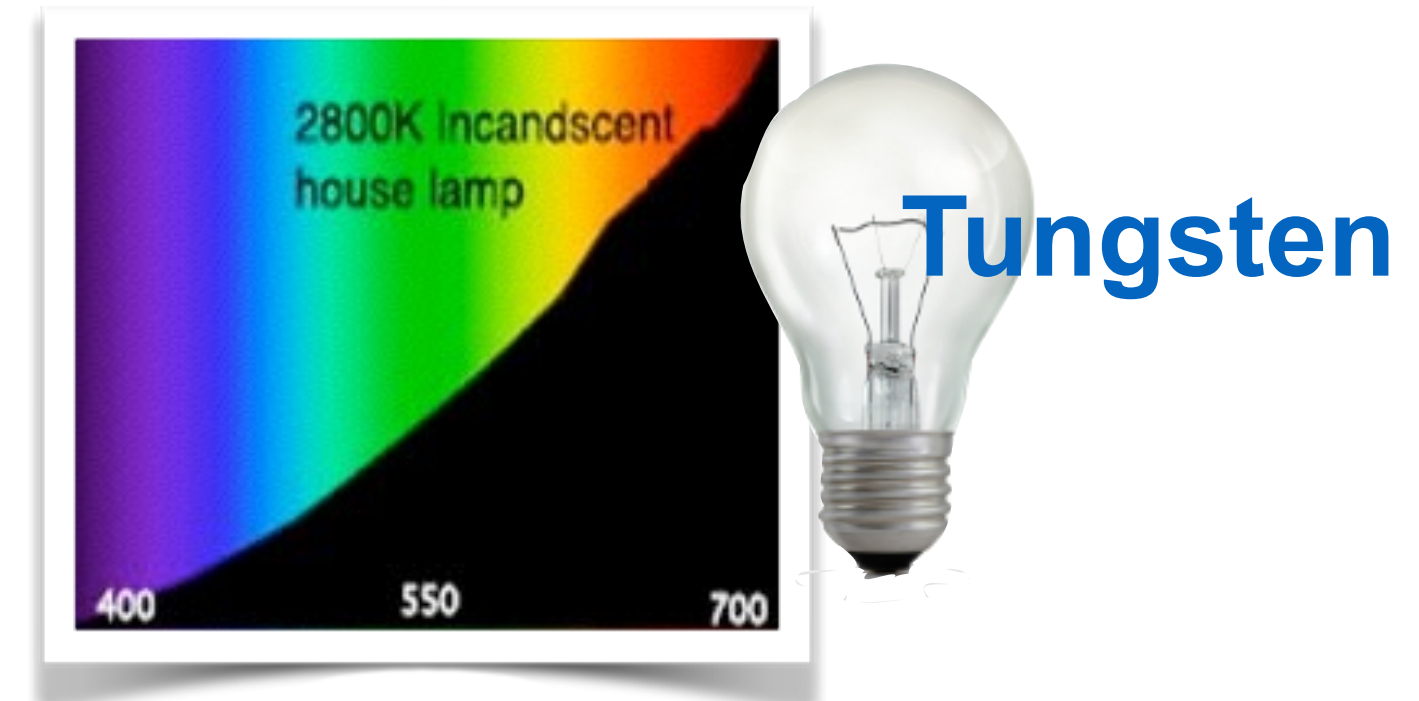
Correlated Color Temperature and Tint

Limitations of Correlated Color Temperature and Tint:

CCT works with predictable light sources (Tungsten, daylight), but can give strange color temperatures for e.g. LED or fluorescent light.

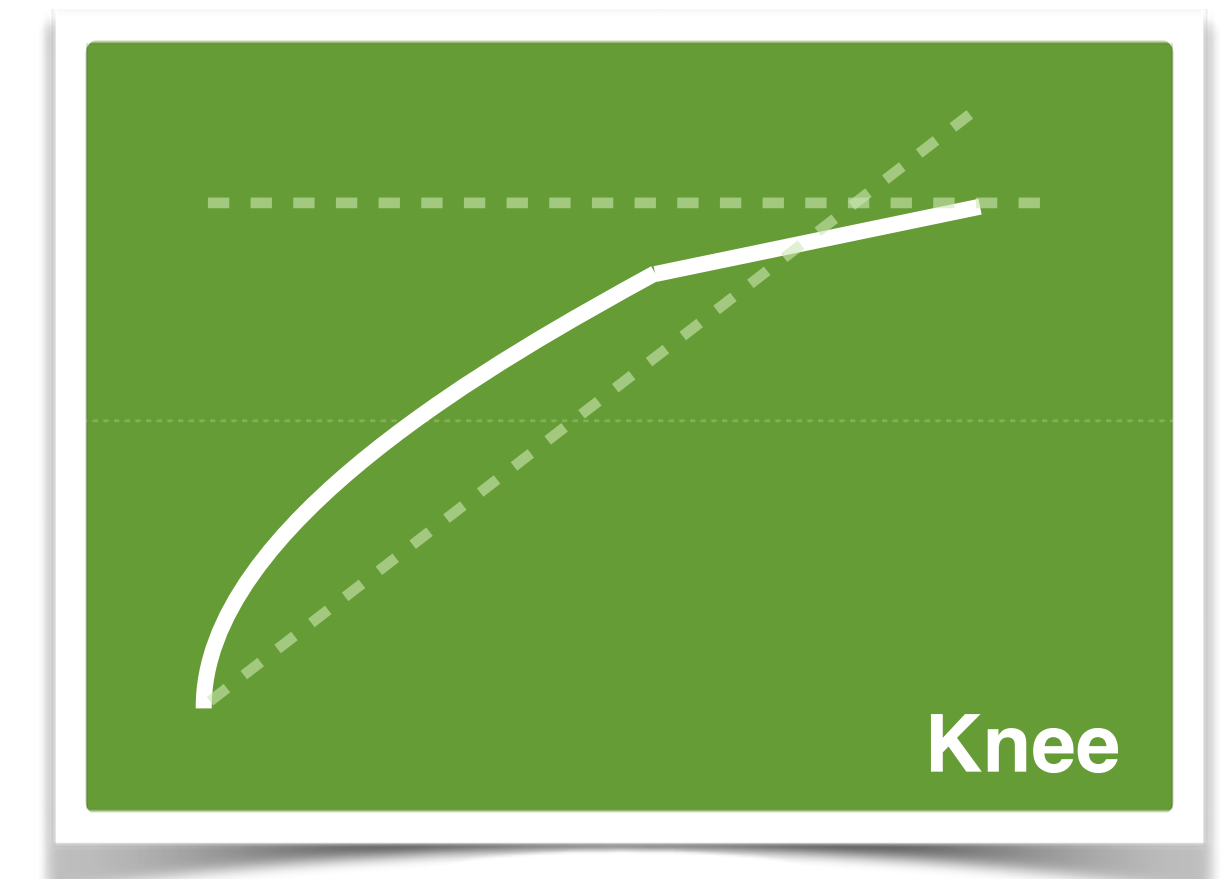
The optical block spectral response is specified accurately, but tolerances can cause some differences between cameras.

A camera is **not** a color temperature meter because of differences in light sources and tolerance in spectral response.



Power Curves Gamma, Contrast, Knee

- ◆ **Gamma:** According TV organizations standard
- ◆ **Gamma variable:** Fine tune gamma Master and RGB
- ◆ **Contrast curves:** Adjust Shadows, Midtones and Highlights
- ◆ **Dynamic range control:** Flexible contrast and highlight compression curves
- ◆ **Knee saturation:** Reduce excessive colors in knee
- ◆ **Knee detail:** Maintain sharpness in knee
- ◆ **Color protect:** Preserve luminance from excessive monochromatic colors



What's New LDX series

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Power Curves

Gamma, Contrast, Knee

New
LDX Feature

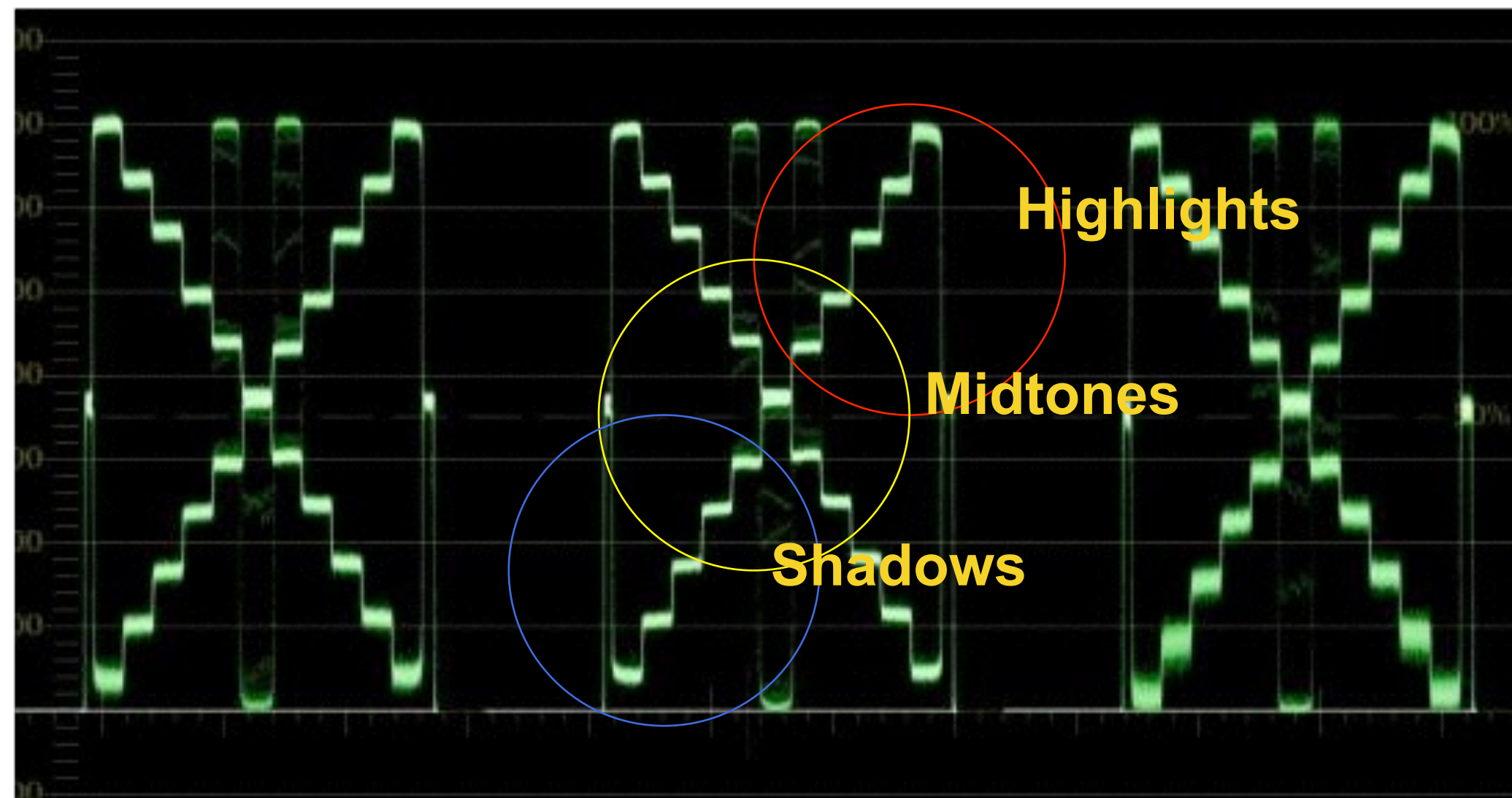
Gamma: Standard ITU709 HDTV curve

- ◆ Other basic curves can be selected
BBC04, BBC05, BBC06, ARD, Linear
- ◆ Variable Master gamma controls
- ◆ Variable RGB gamma controls.
- ◆ Linear for test and special applications



Power Curves

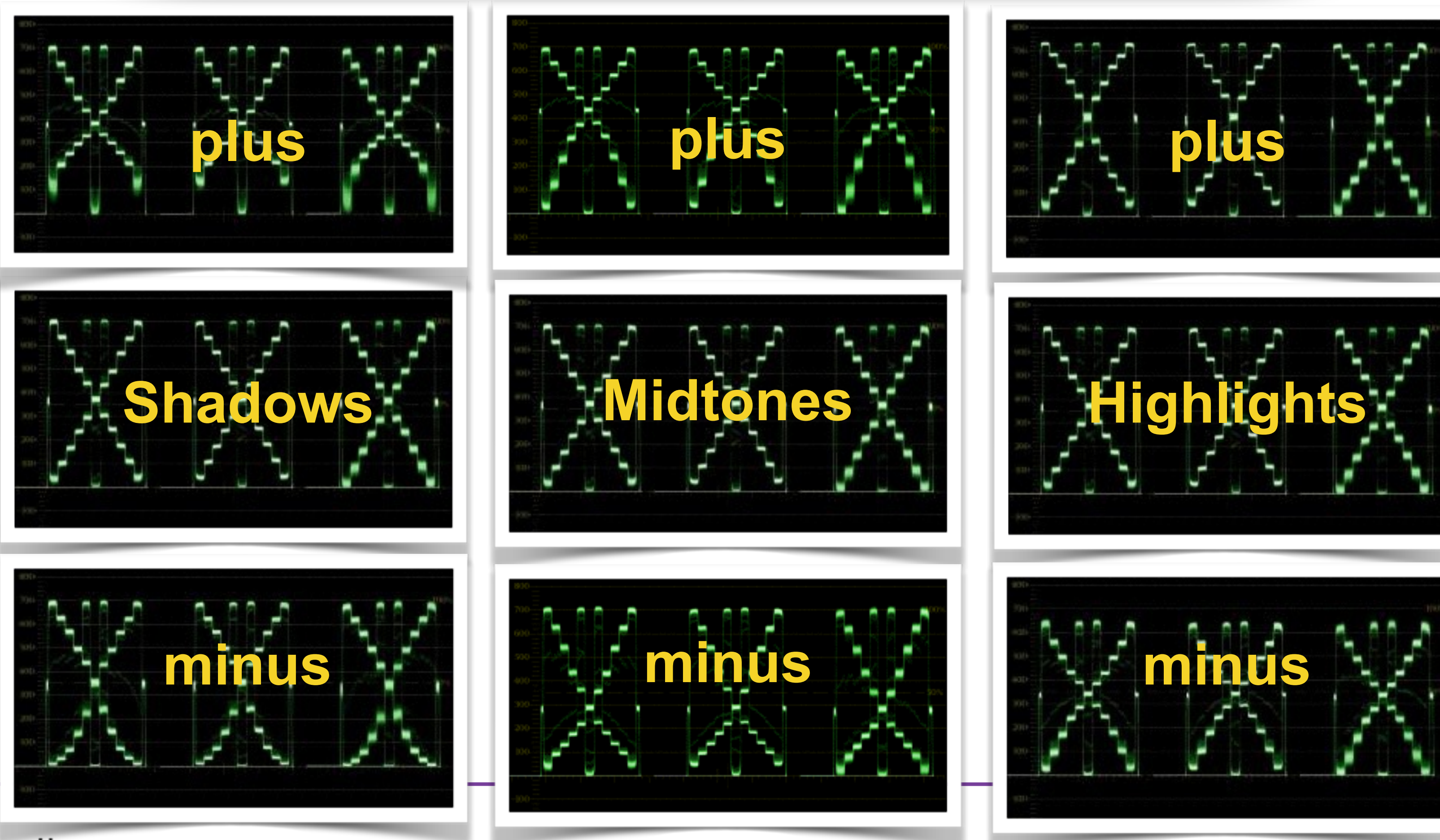
Gamma, Contrast, Knee



- ◆ Emphasize or suppress selected levels of the picture
- ◆ Three Regions of interest: Shadows, Midtones, Highlights
- ◆ Added to the gamma curve
- ◆ Can be switched On and Off

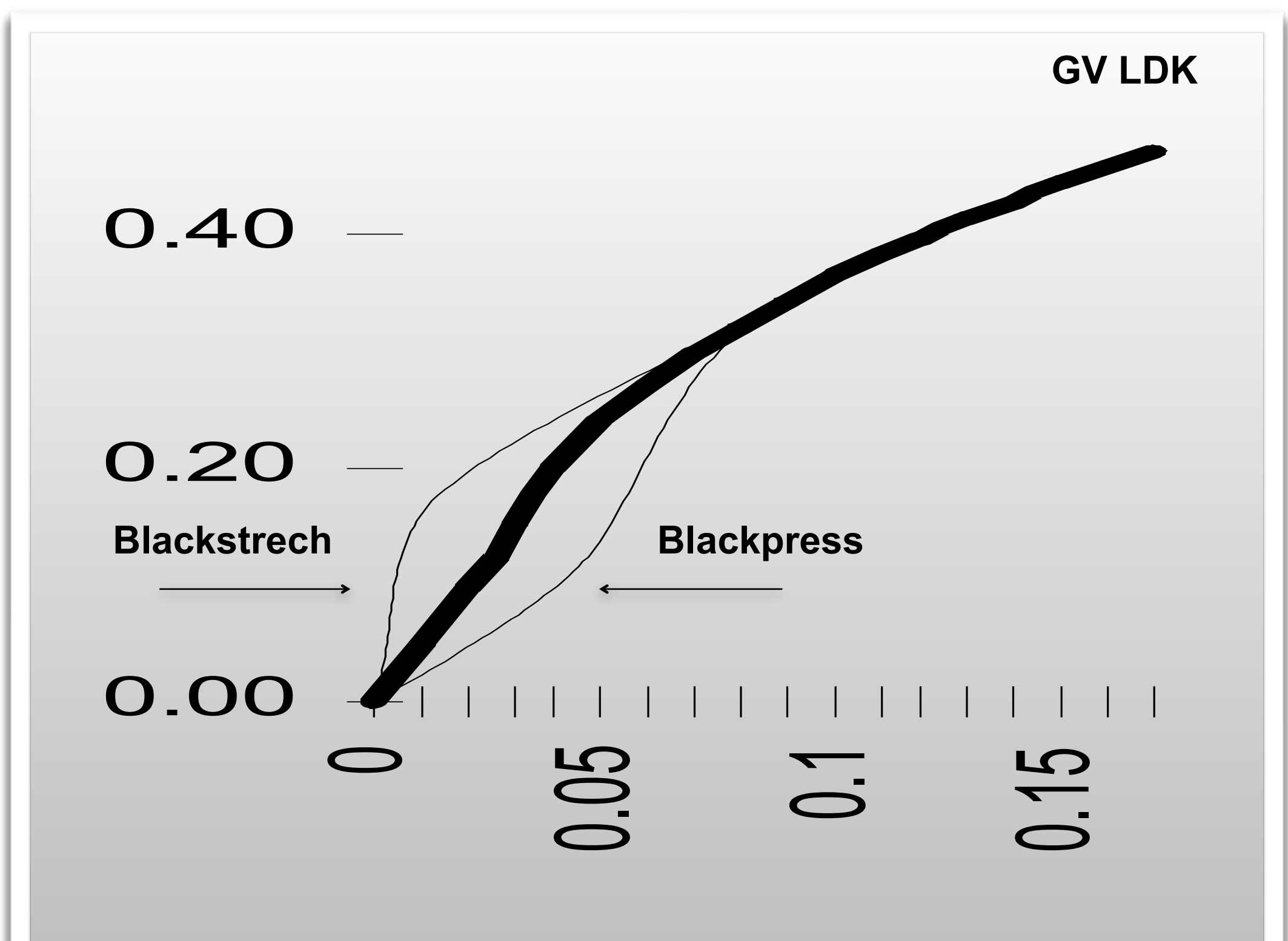
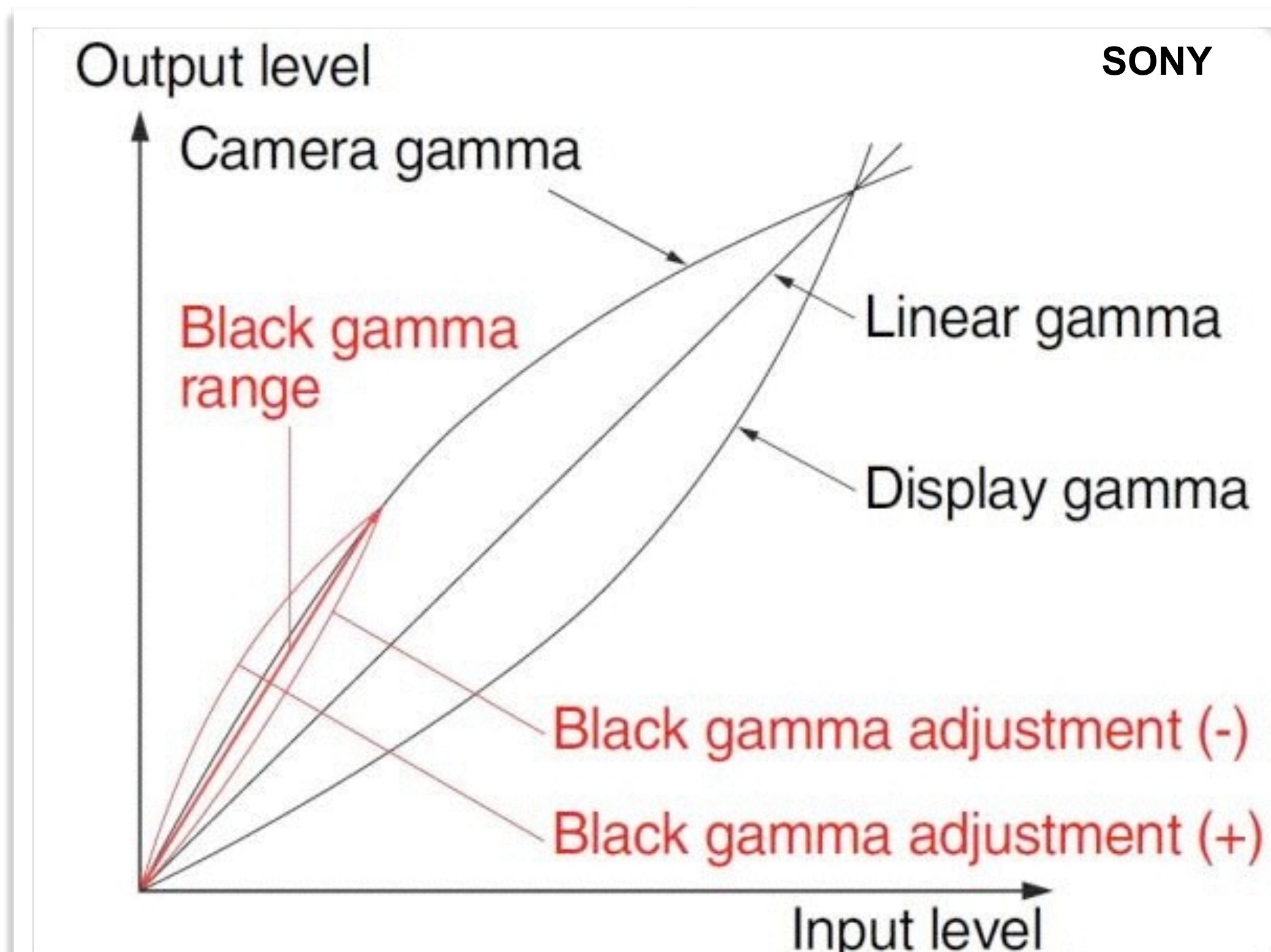
Power Curves

Gamma, Contrast, Knee



Power Curves

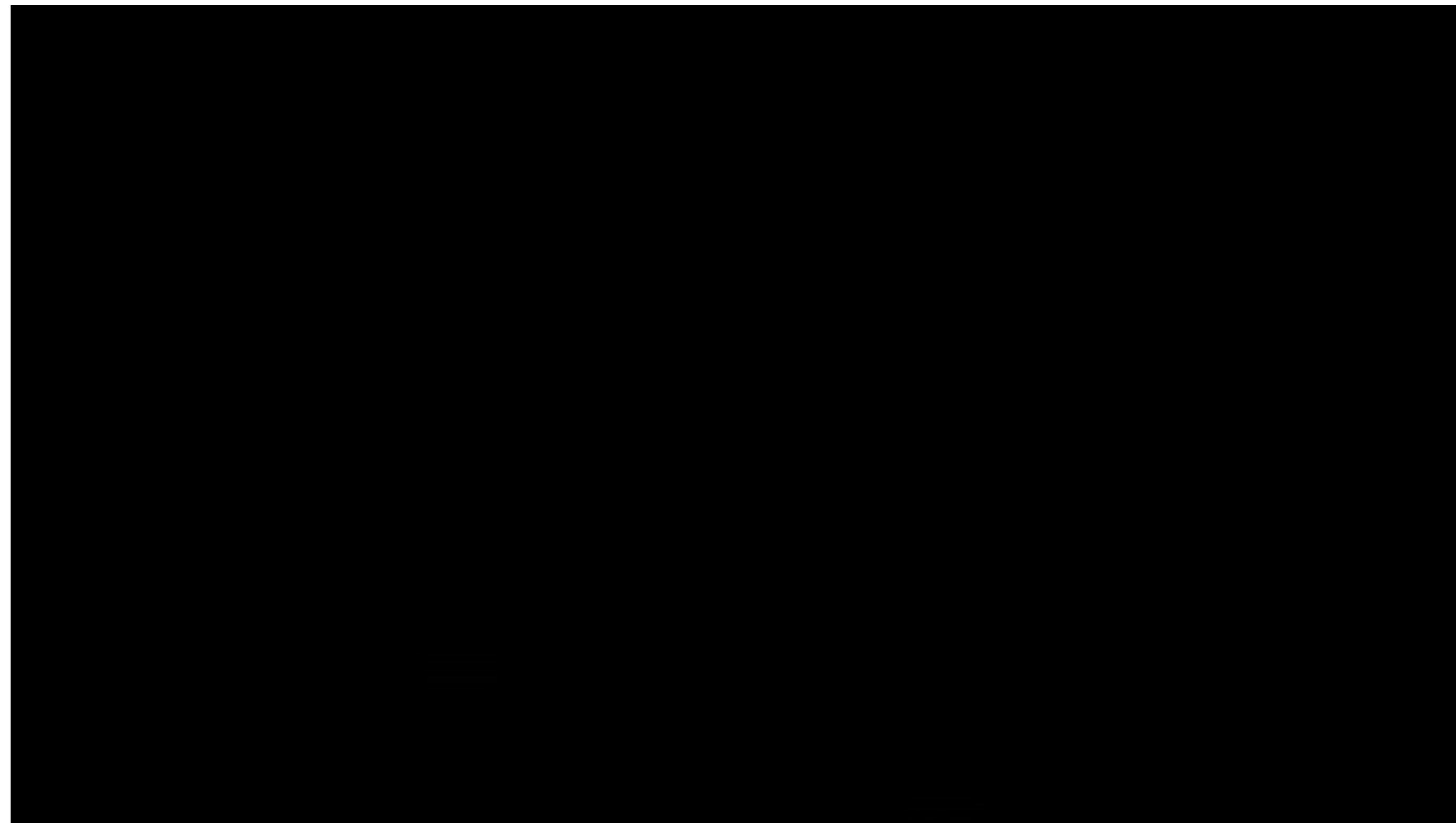
Gamma, Contrast, Knee



Use Powercurves as replacement Black gamma or Blackstreich
Adjust with Shadows in the Contrastcurve

Power Curves

Gamma, Contrast, Knee

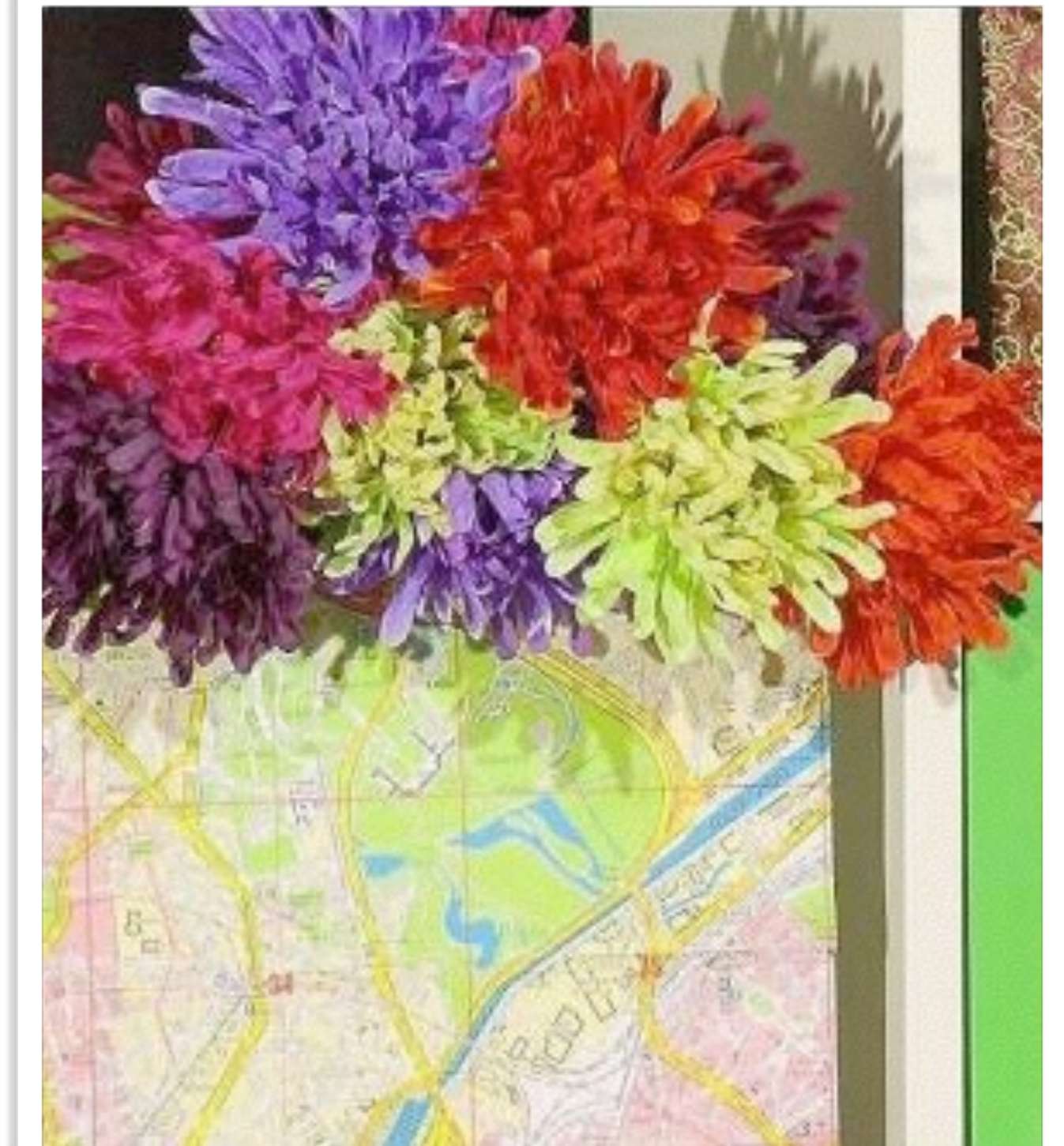


Power Curves

Gamma, Contrast, Knee

Dynamic Range Control, Knee:

- ✦ Map up to 800% exposure in to 100% output range
- ✦ Map the input range of RGB video into 100% video in an artistically convincing way.
- ✦ Take care that colors are properly mapped.
- ✦ Smooth transition curve is replacing the sharp knee point
- ✦ Highlights are mapped with transfer curves,
- ✦ Color corrections with knee saturation
- ✦ Maintain sharpness with knee detail

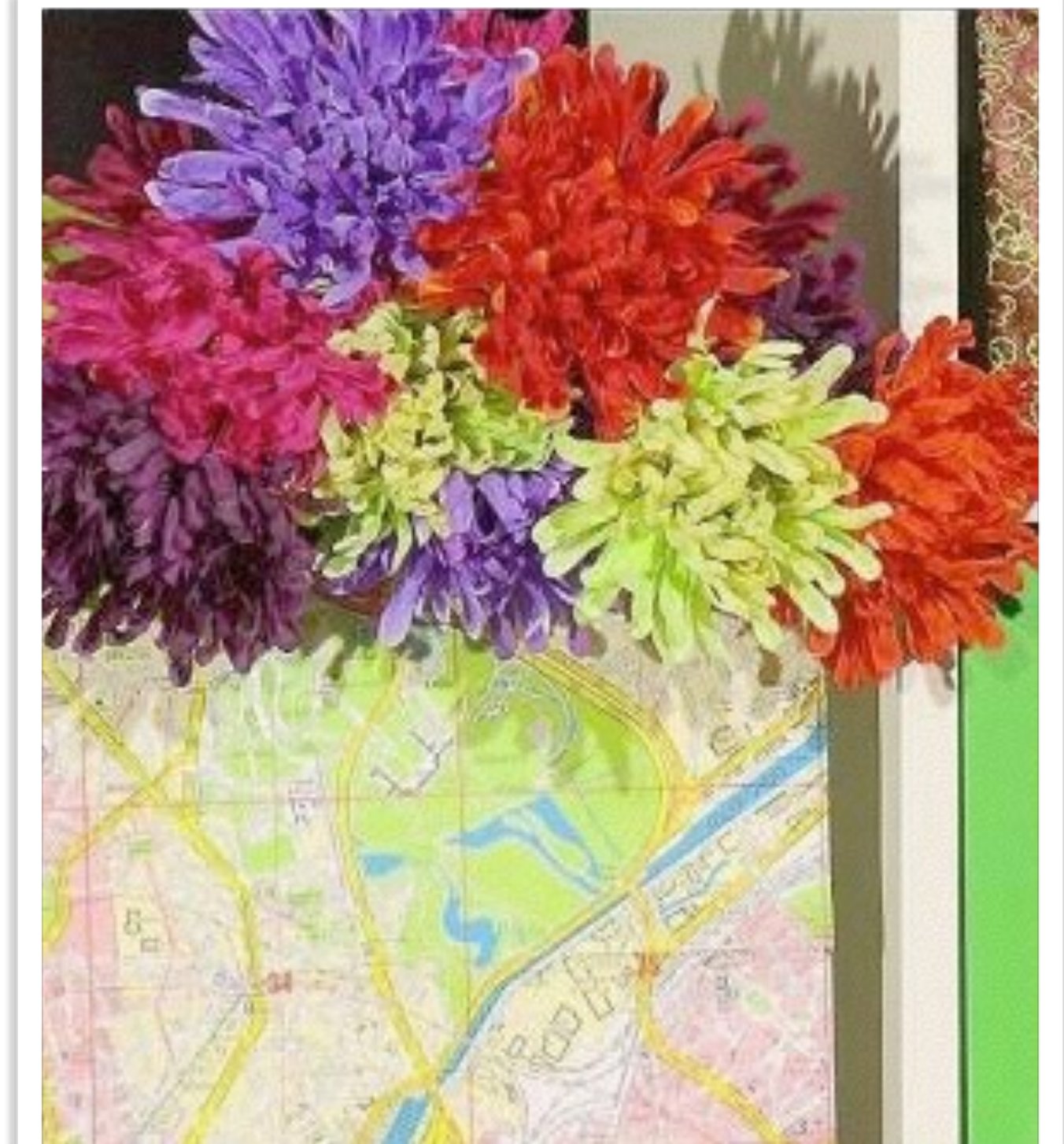


Power Curves

Gamma, Contrast, Knee

Dynamic Range Control, Knee:

- ◆ Low starting point: Similar to Hypergamma
- ◆ High starting point: Similar to Knee
- ◆ Auto knee will compress from linear down to the set curve
- ◆ Control on maximum allowed overexposure and curve
- ◆ The Knee has a very smooth character
- ◆ Compatibility mode for traditional knee

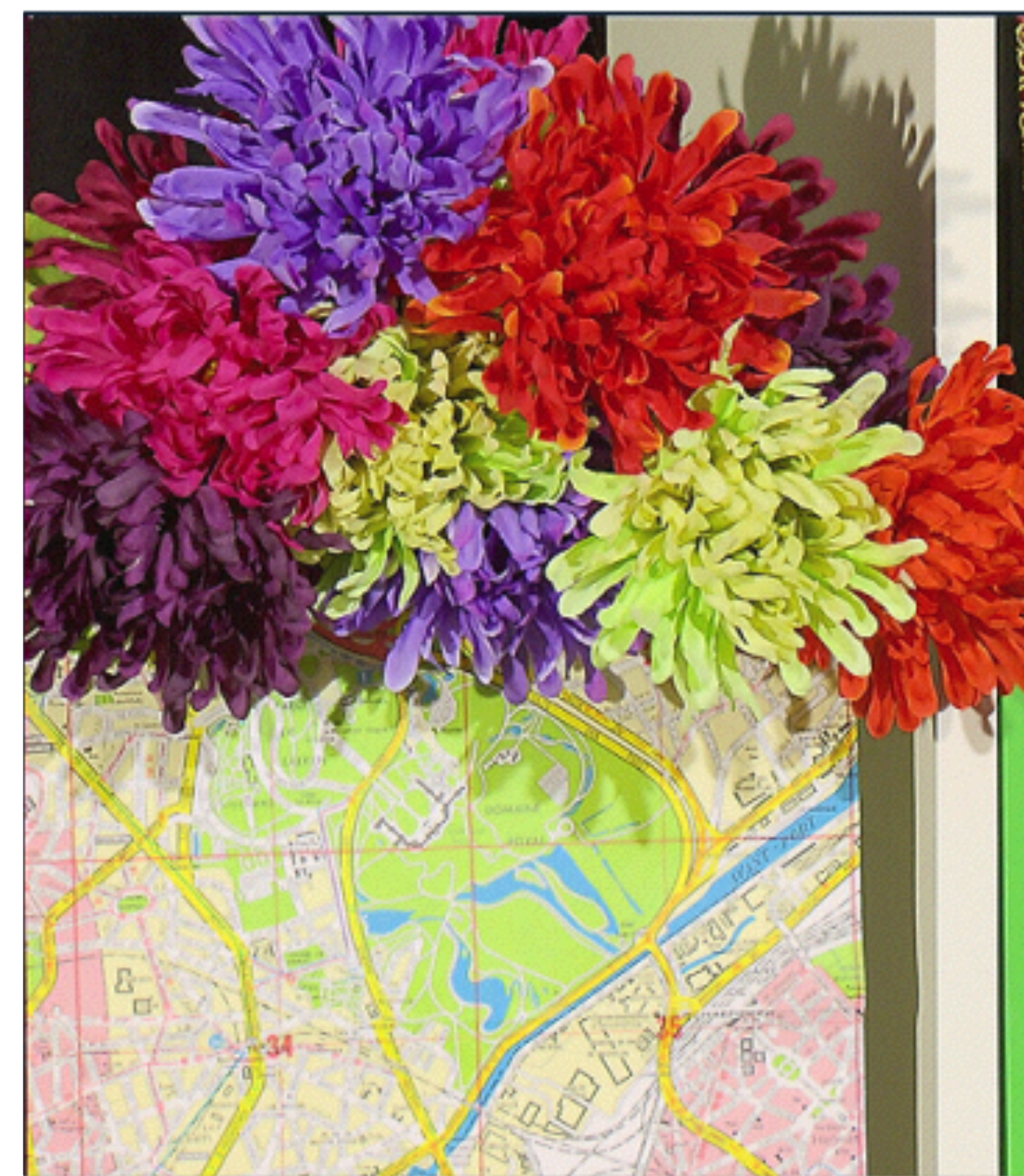


Power Curves

Gamma, Contrast, Knee

Knee functions

- ◆ Knee - Off, Auto, Variable
- ◆ Knee Max in -100%...600%
- ◆ Knee Out – 100%...118%
- ◆ Knee point – 0%...90%
- ◆ Knee Fade – 00...99
- ◆ Knee Out limit -100%...118%
- ◆ Knee Source - NAM, Y
- ◆ Knee Saturation – 00...85
- ◆ White Clip – 85%...109%
- ◆ Knee detail – Off,1,2,3,4



LDX Knee



LDK Knee

What's New LDX series

part 2 Web Training

Power Curves

Gamma, Contrast, Knee



Dynamic
LDX Knee



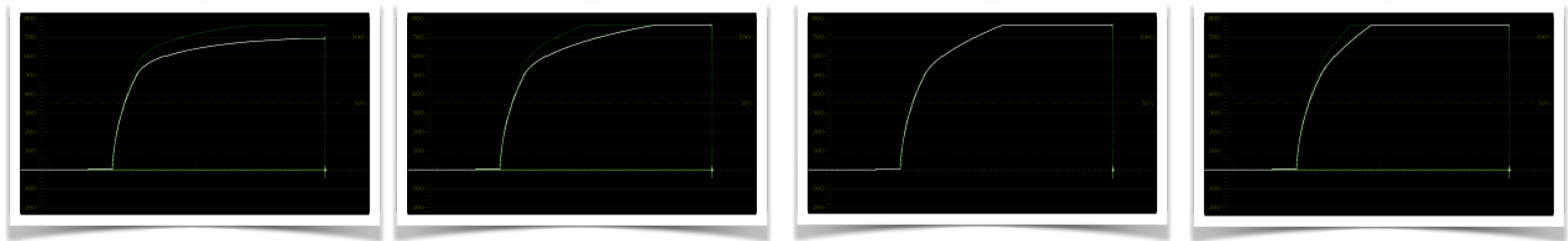
Traditional (LDK)
LDK Knee

Power Curves

Gamma, Contrast, Knee

Dynamic Knee

Fade between Dynamic Knee and Traditional Knee



Fade Knee



Dynamic

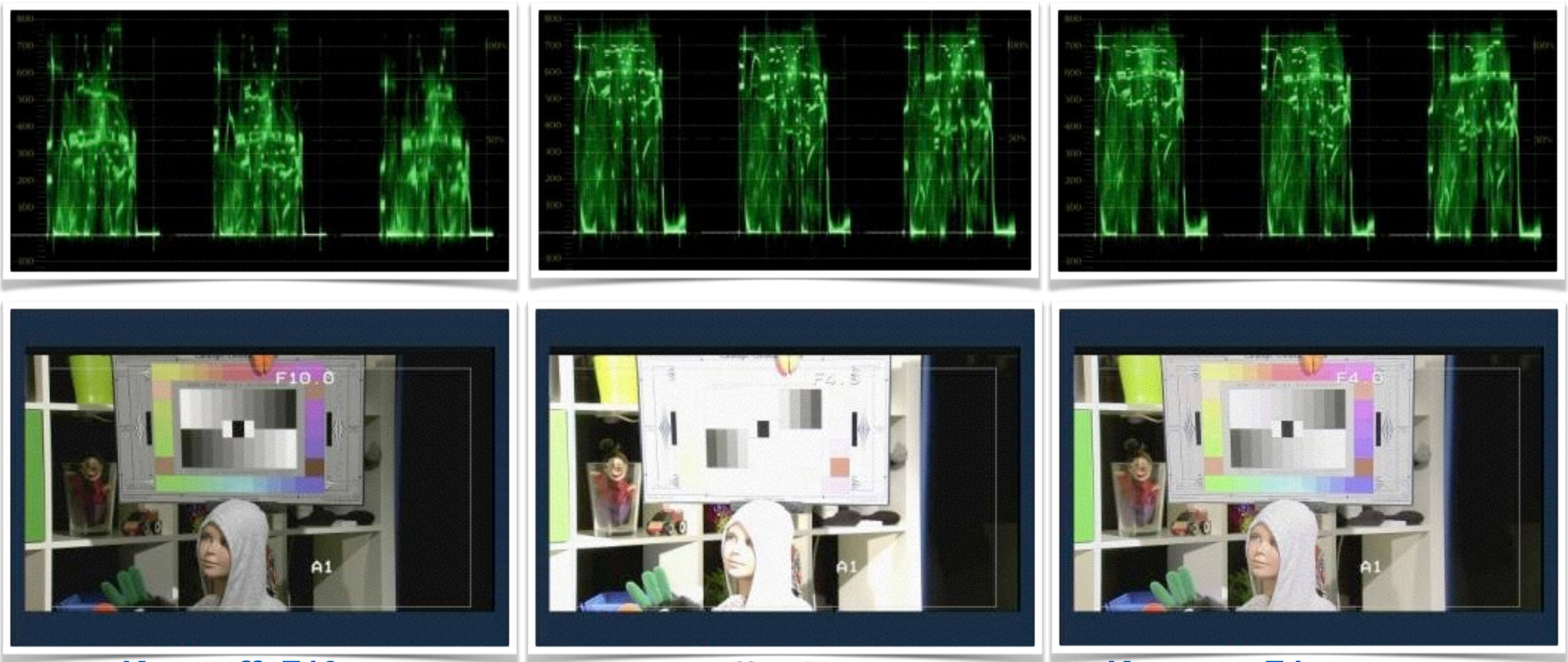
Traditional

Power Curves

Gamma, Contrast, Knee

Dynamic Knee

Pushing the knee to the limits



Knee off, F10

100% exposure

Knee off, F4

626% over exposed

Knee on, F4

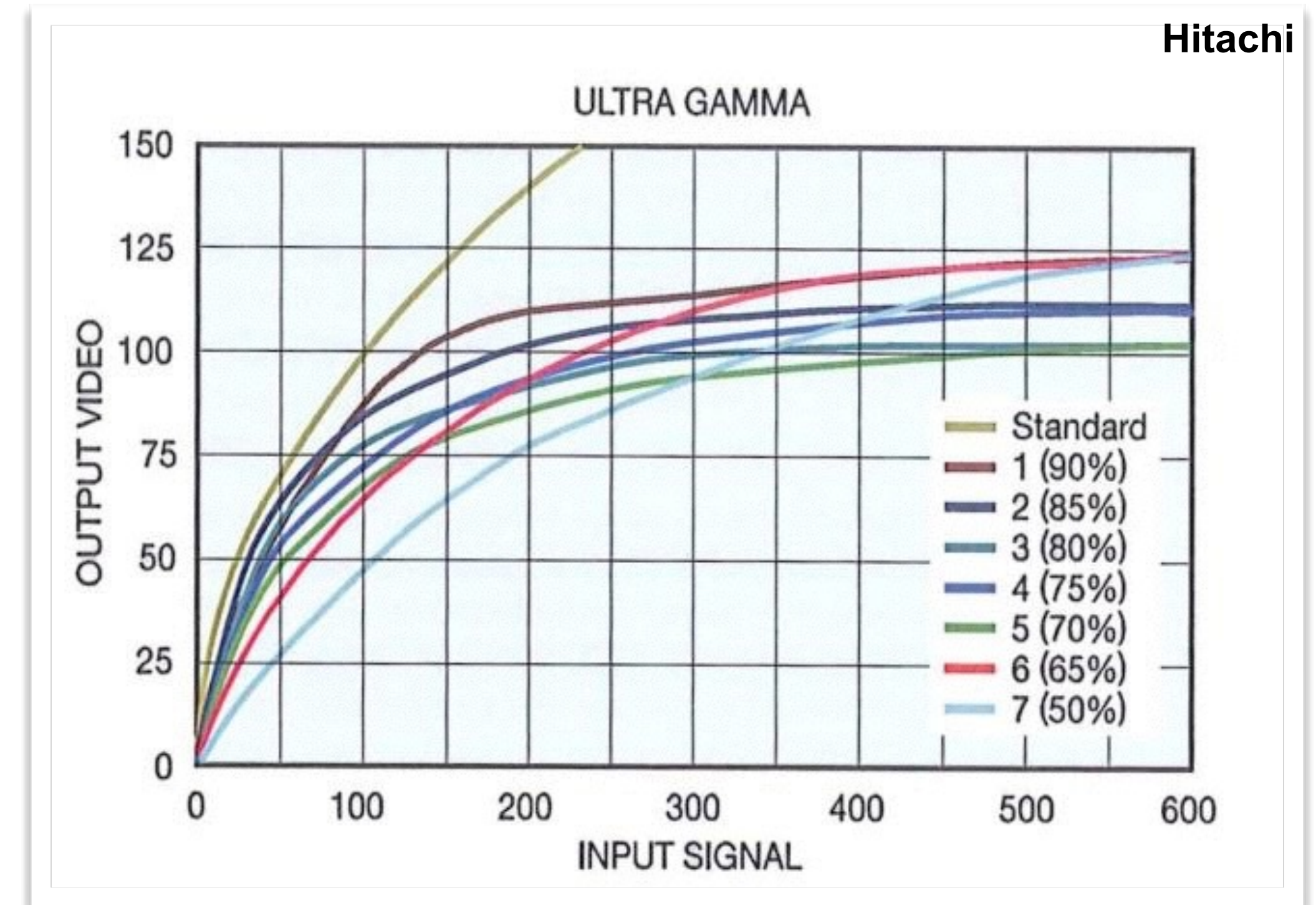
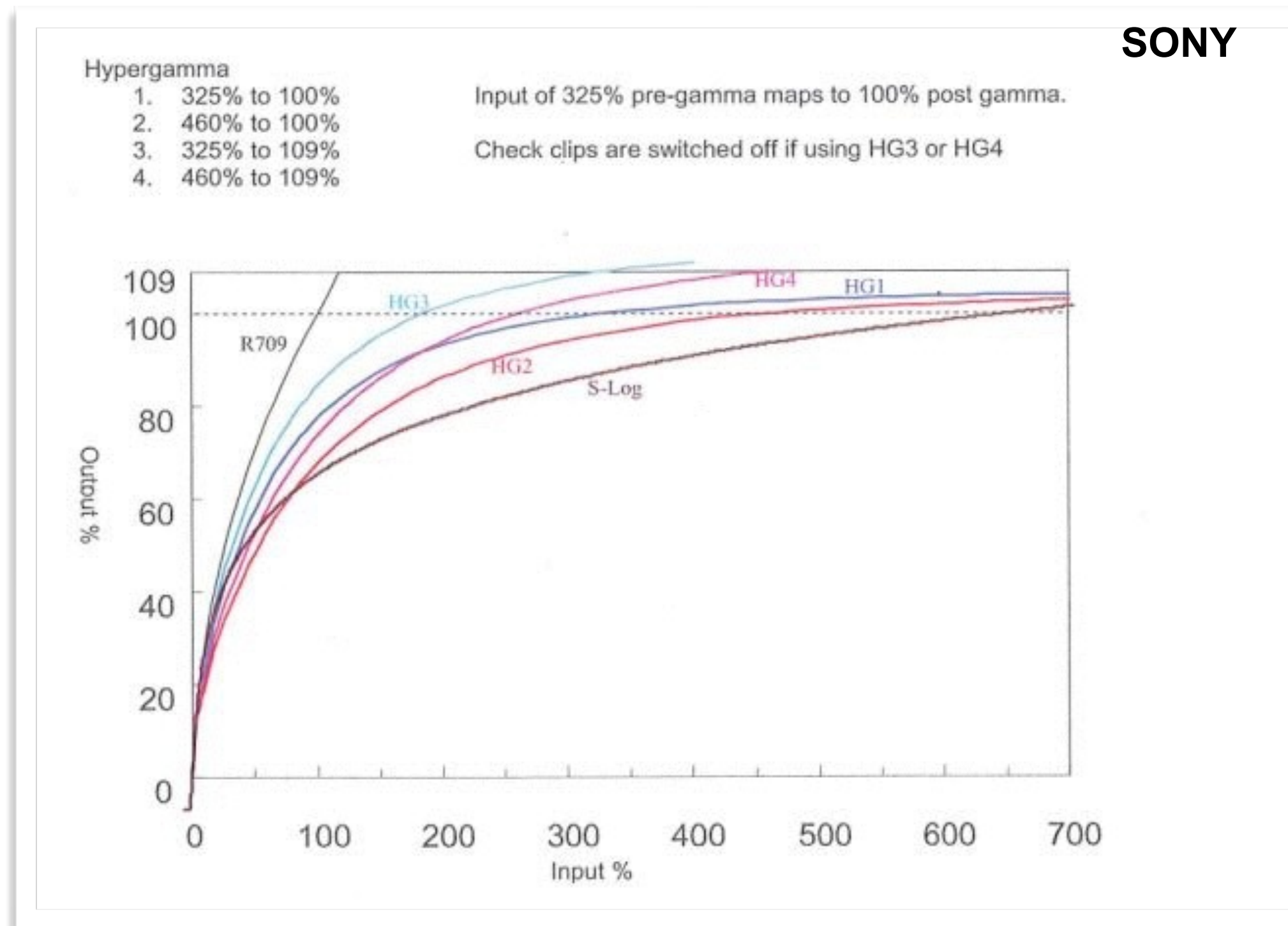
625% over exposure

What's New LDX series

part 2 Web Training

Power Curves

Gamma, Contrast, Knee



**Use Powercurves as replacement for Hypergamma or Ultra gamma
Adjust with Dynamic range control**

What's New LDX series

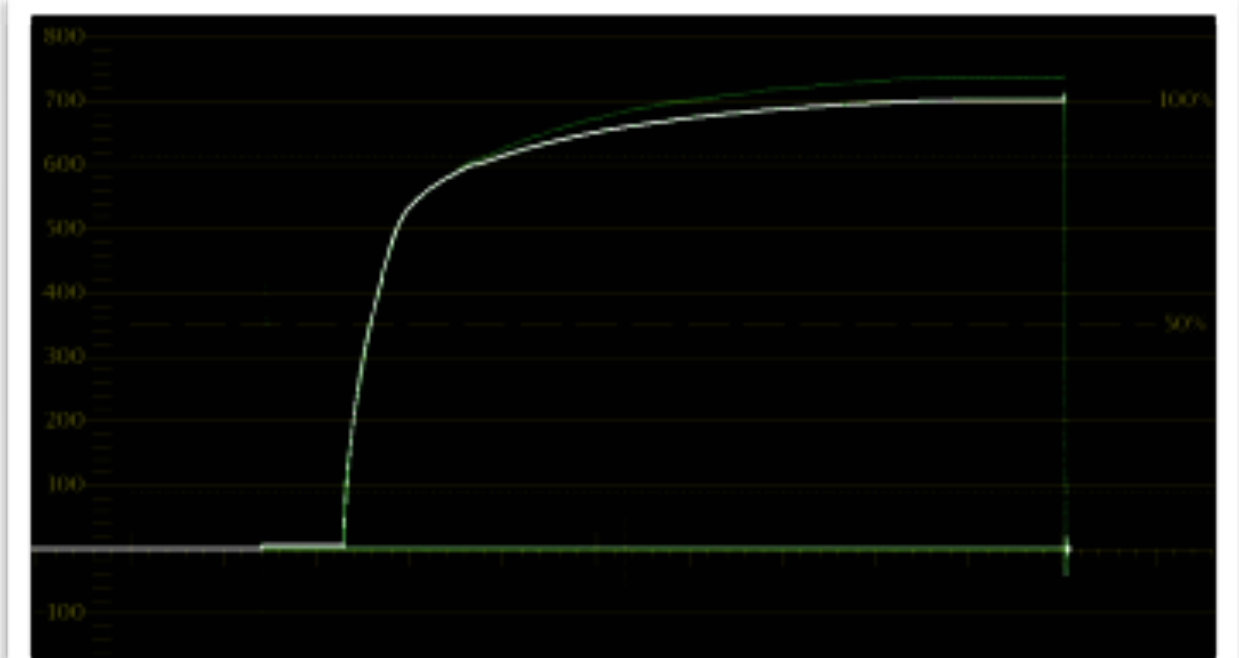
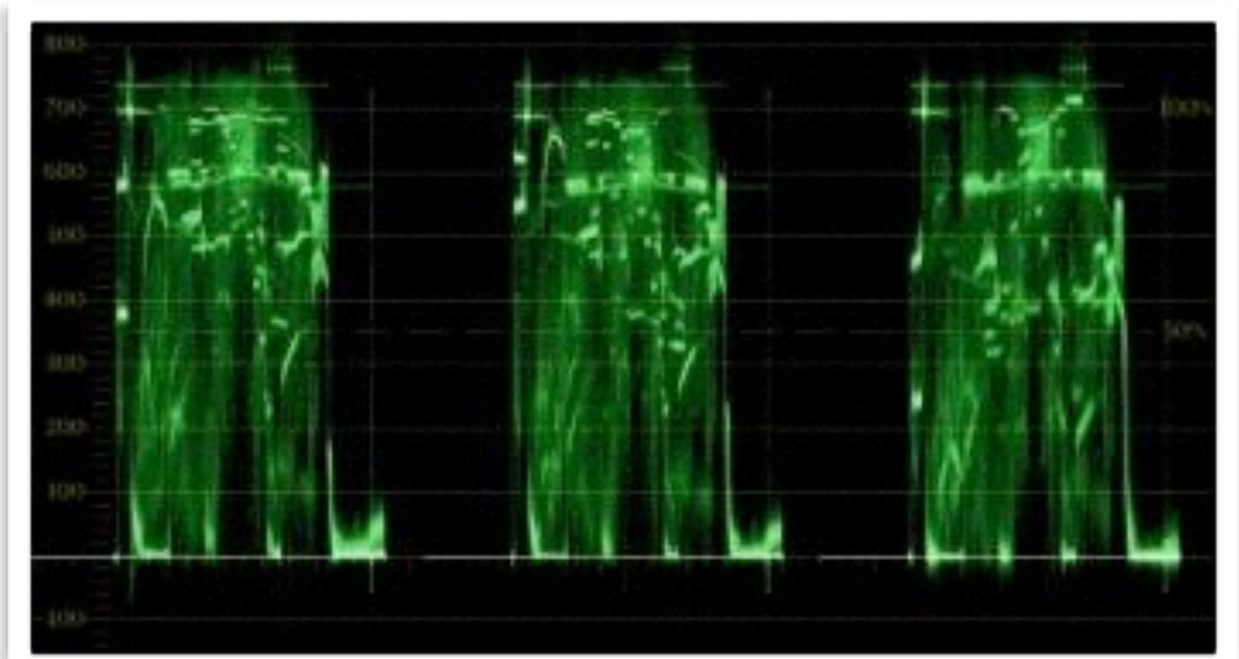
part 2 Web Training

Power Curves

Gamma, Contrast, Knee



625% over exposure

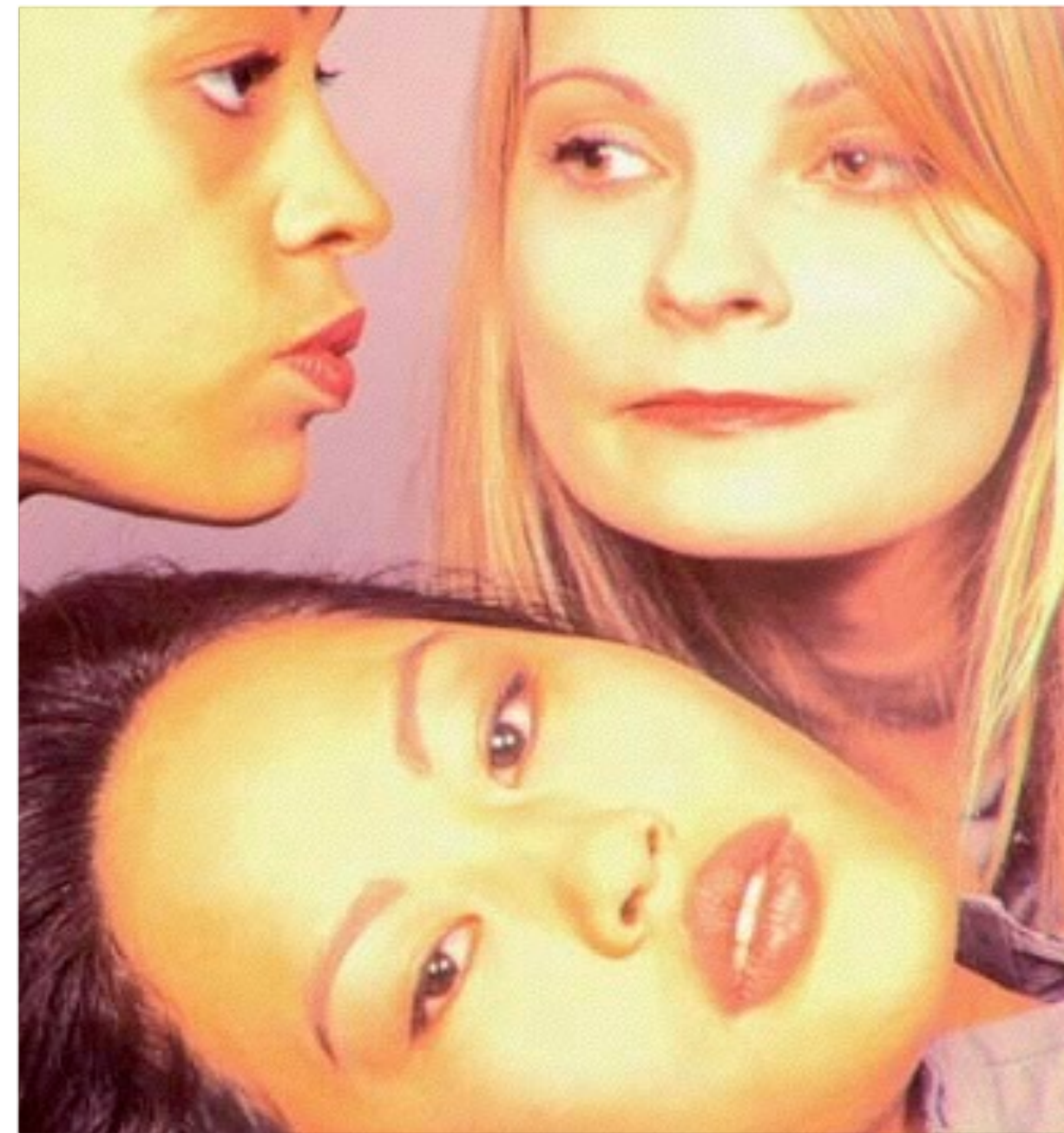


Power Curves

Gamma, Contrast, Knee

Knee Saturation:

Reduce excessive colors when dynamic range control is active.

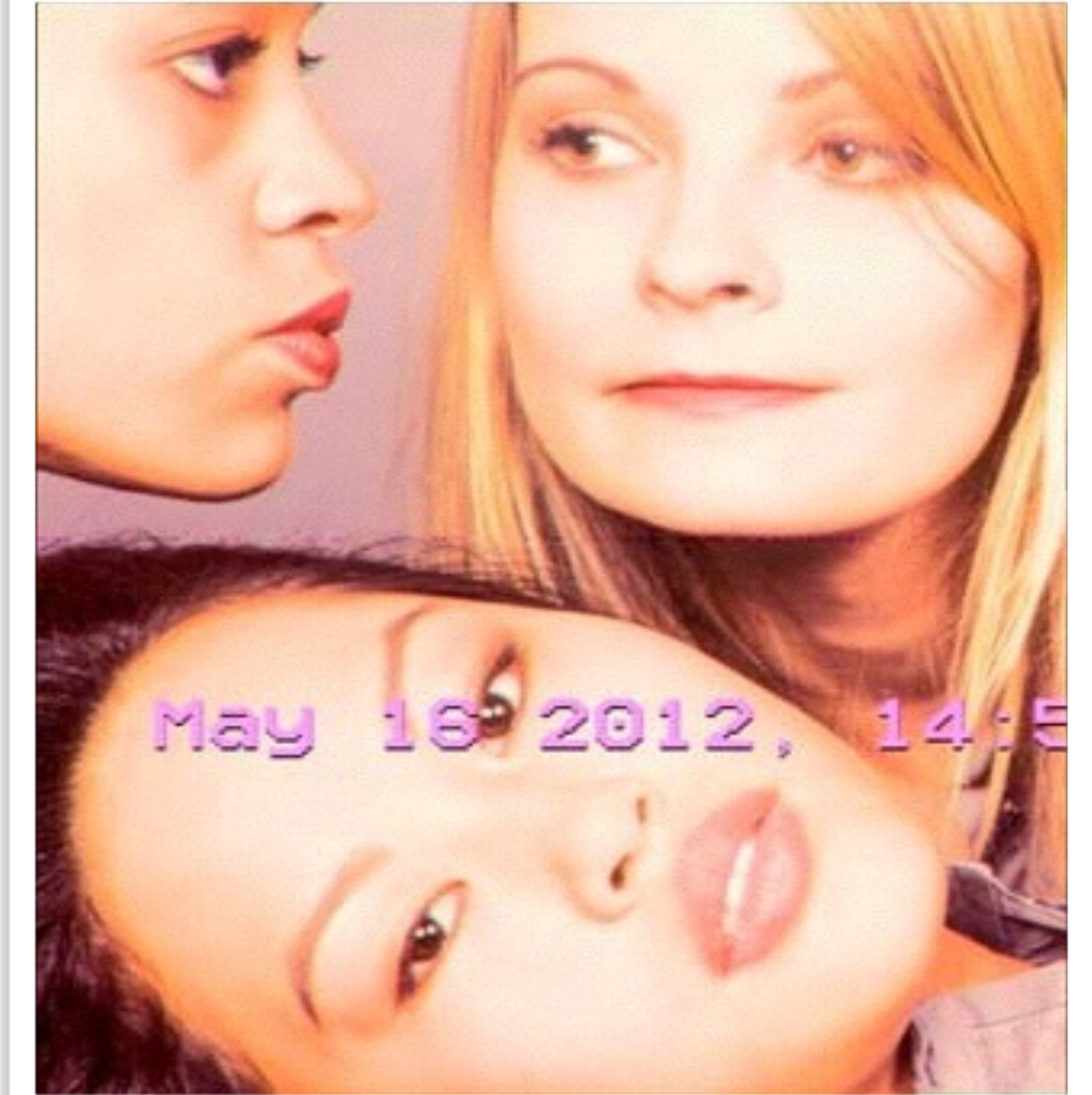


LDK

2 stops overexposed

Knee only

Skin colors go yellow



LDX

2 stops overexposed

Dynamic range control

Desaturation

Matrix

Basics Video / Image processing

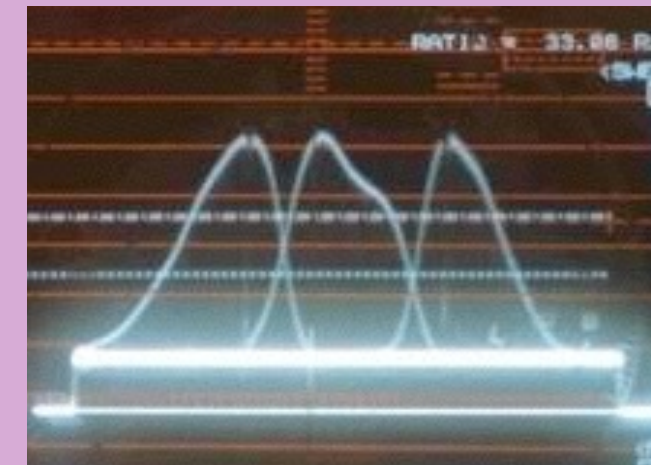
Matrix:

Adding and subtracting R,G or B into each others channels,in such way that the sum of the mixing coefficients remains 1

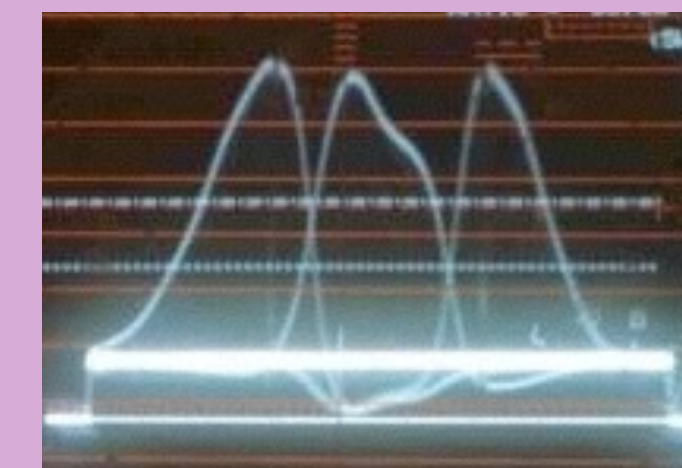
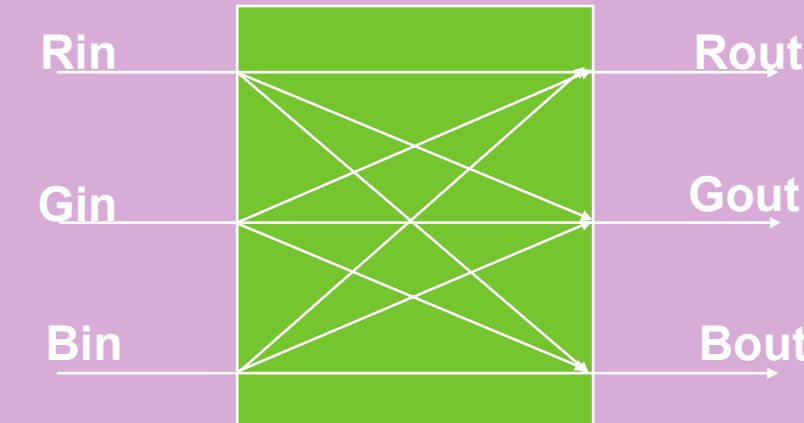
Black, grays and white are not effected,
Only colors have changed after the matrix

Purpose:

Correct the optical color splitter (prism)
Obtain specific color reproduction
(standardization, artistic)



Correct the optical color splitter (prism)
Obtain specific color reproduction
(standardization, artistic)

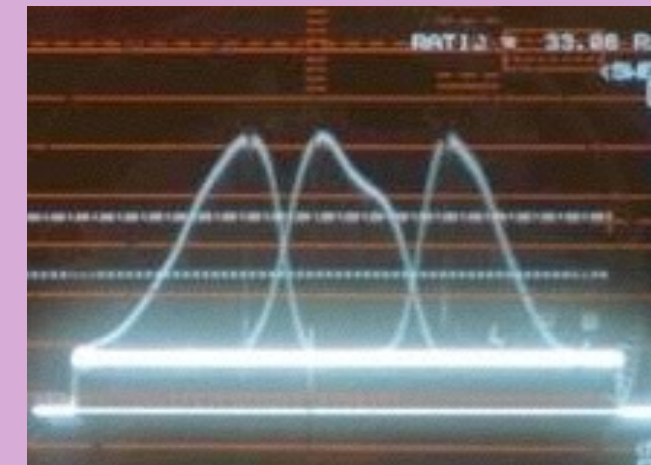


Matrix

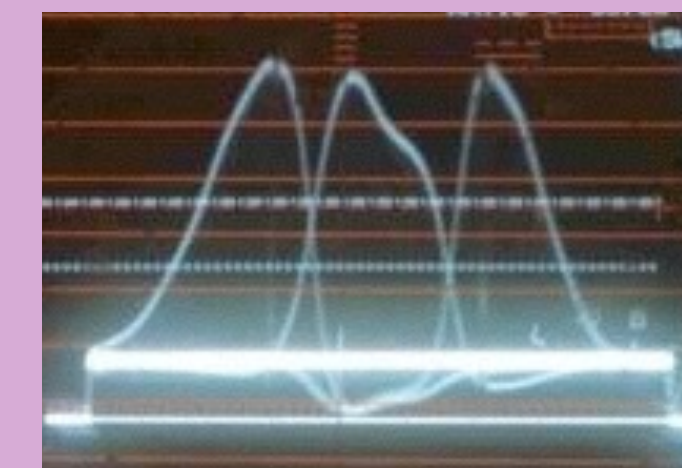
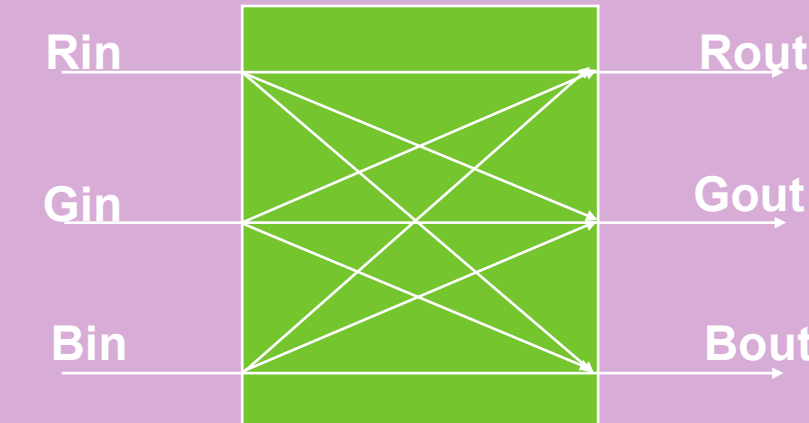
Basics Video / Image processing

Matrix:

- ◆ **Default XGL = Vivid colors**
- ◆ **Other presets:**
 - Skin = Optimized for LDK camera look
 - EBU = Optimized for EBU reference colors
 - BBC = Optimized according BBC
 - CoolFL = Optimized for Fluorescent and Incandescent light mix
 - 1:1 = Matrix off
 - B&W = Black and white
- ◆ **Variable: VAR1, VAR2 (six direction +/- vector adjustment)**
- ◆ **Matrix position:**
 - M/G = Pre Gamma (default)
 - G/M = Post Gamma



Correct the optical color splitter (prism)
Obtain specific color reproduction
(standardization, artistic)



Functional LDX series

part 2 Web Training

Matrix

- Basics Video / Image processing

Matrix:

LDK 8000

Skin
G/M

LDX

XGL
M/G

M/G is Sequence Matrix / Gamma

Gamma:

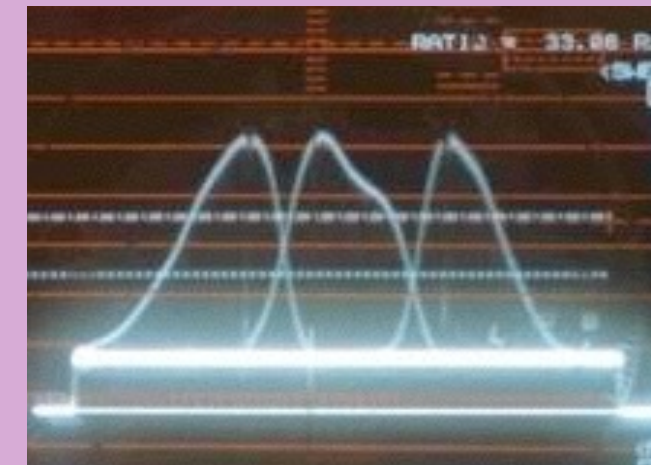
LDK 8000

ARD

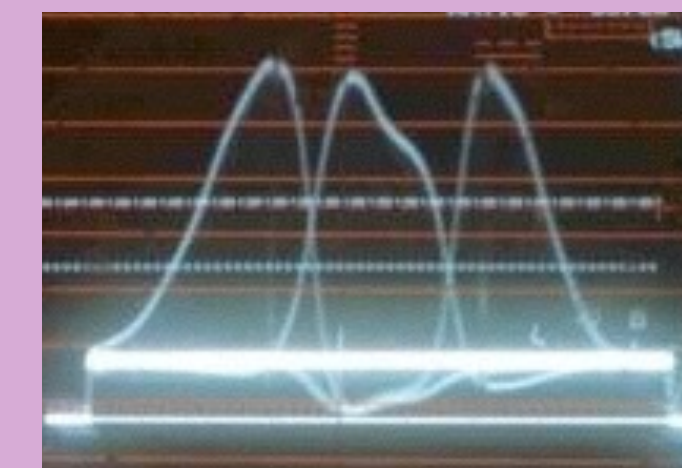
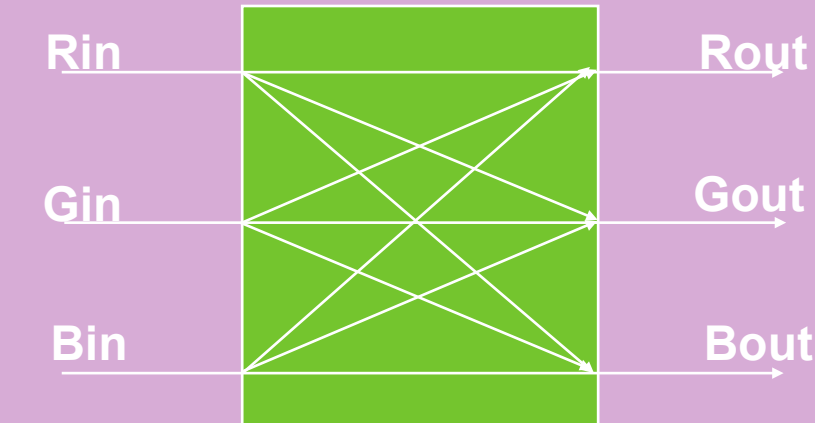
LDX

ITU 709

(CCIR from LDK8000)



Correct the optical color splitter (prism)
Obtain specific color reproduction
(standardization, artistic)



Saturation

Saturation:

Adjustment of the color content in the picture

- Normal setting 100%
- Saturation range from 0% (B&W) to 200% (Very bright colors)
- Saturation is part of the Matrix circuit



0 %



100 %



200 %

What's New LDX series

part 2 Web Training

Color protect

Color Protect

Monochromatic LED and Theatre lights are used in studios and show programs

This typically appears in blue and magenta

Monochromatic lights like Blue LED become dominant when their intensity is high

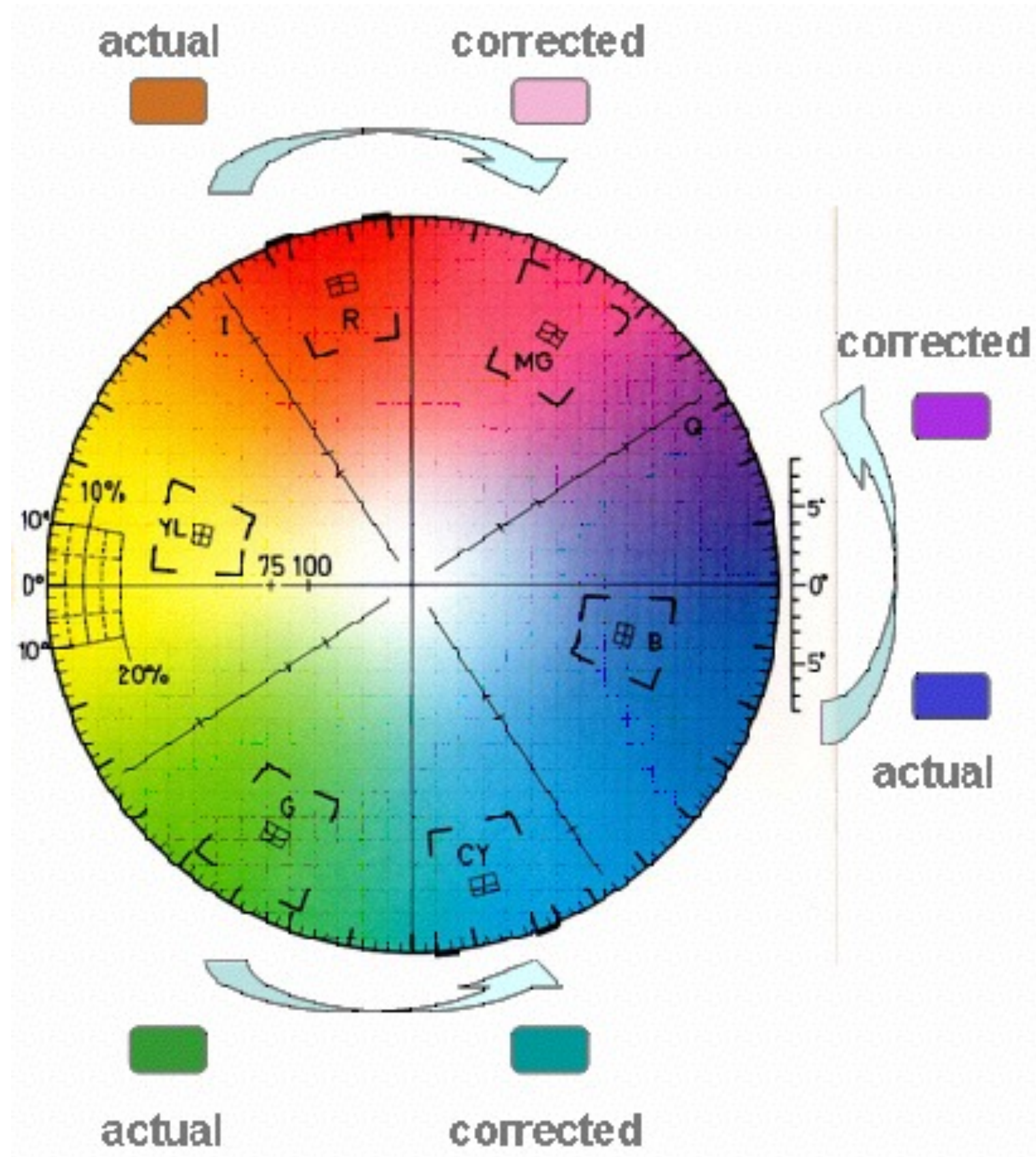
Blue only presents 7% of Luminance according ITU709

The dominance destroys all the luminance content
Resulting in blue over saturated areas with no detail.

Color protect restores Luminance without being effected from Blue



Secondary Color Corrector



16 vector color corrector

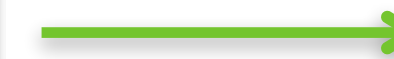
Change colors into other colors

Adjust Hue, Saturation and Luminance

Six different color changes allowed

Independent view via basestation monitoring (fiber)

Adjustable smooth transitions



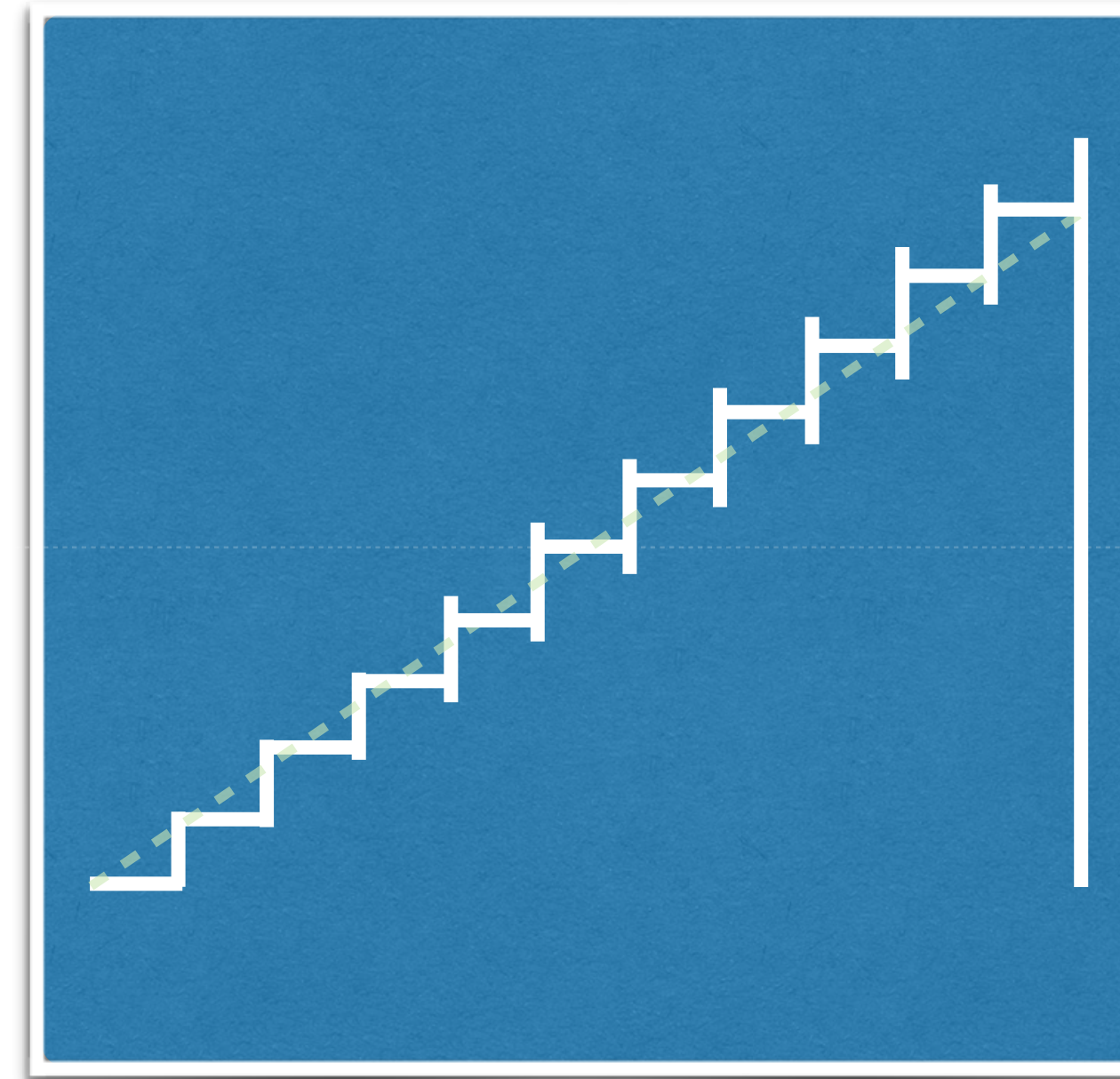
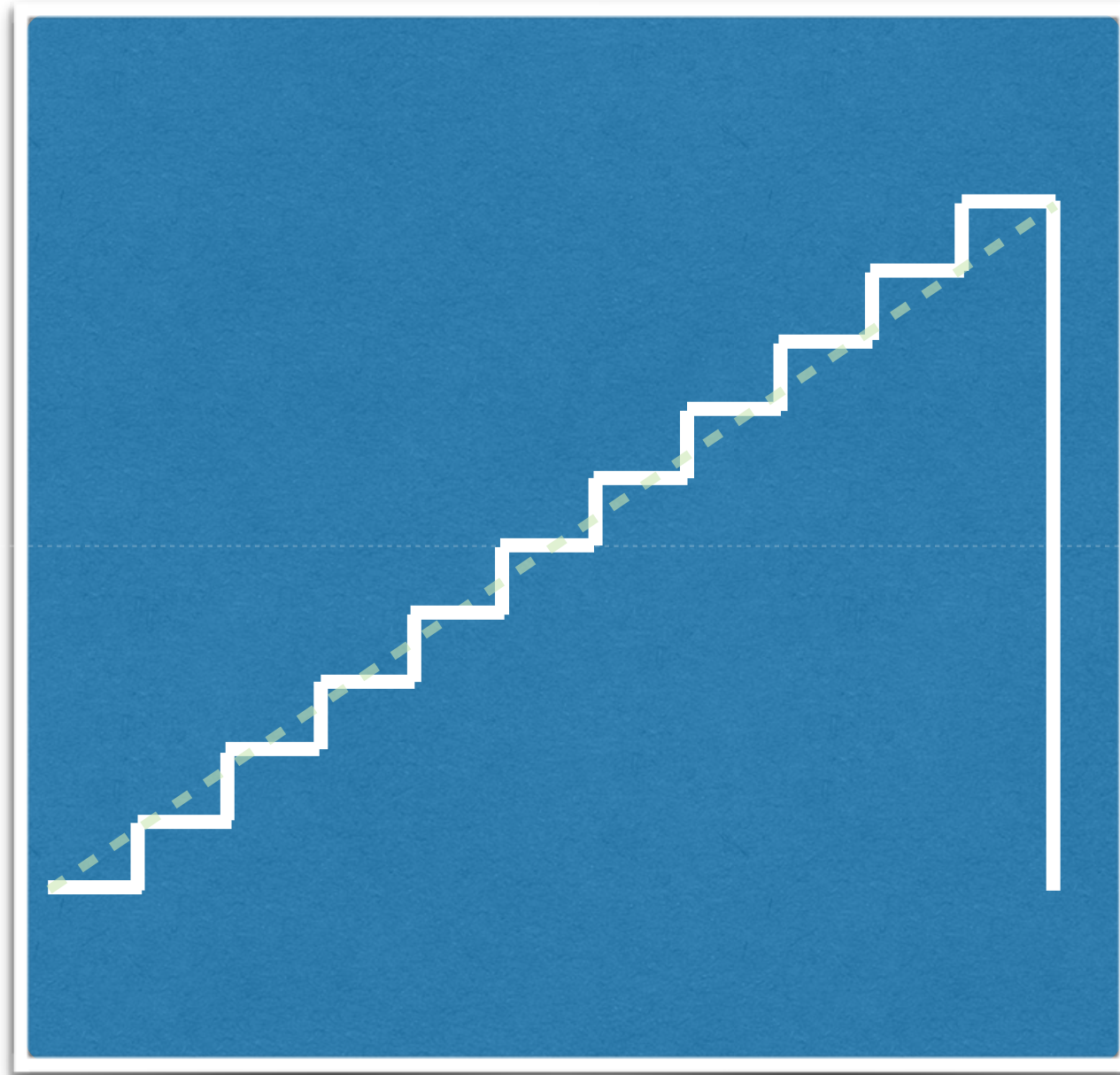
Details



Why detail correction

Correct for limitation of pixel aperture and lens aperture
User sharpness perception

Details



Detail correction:

Main control is Level will be renamed in future

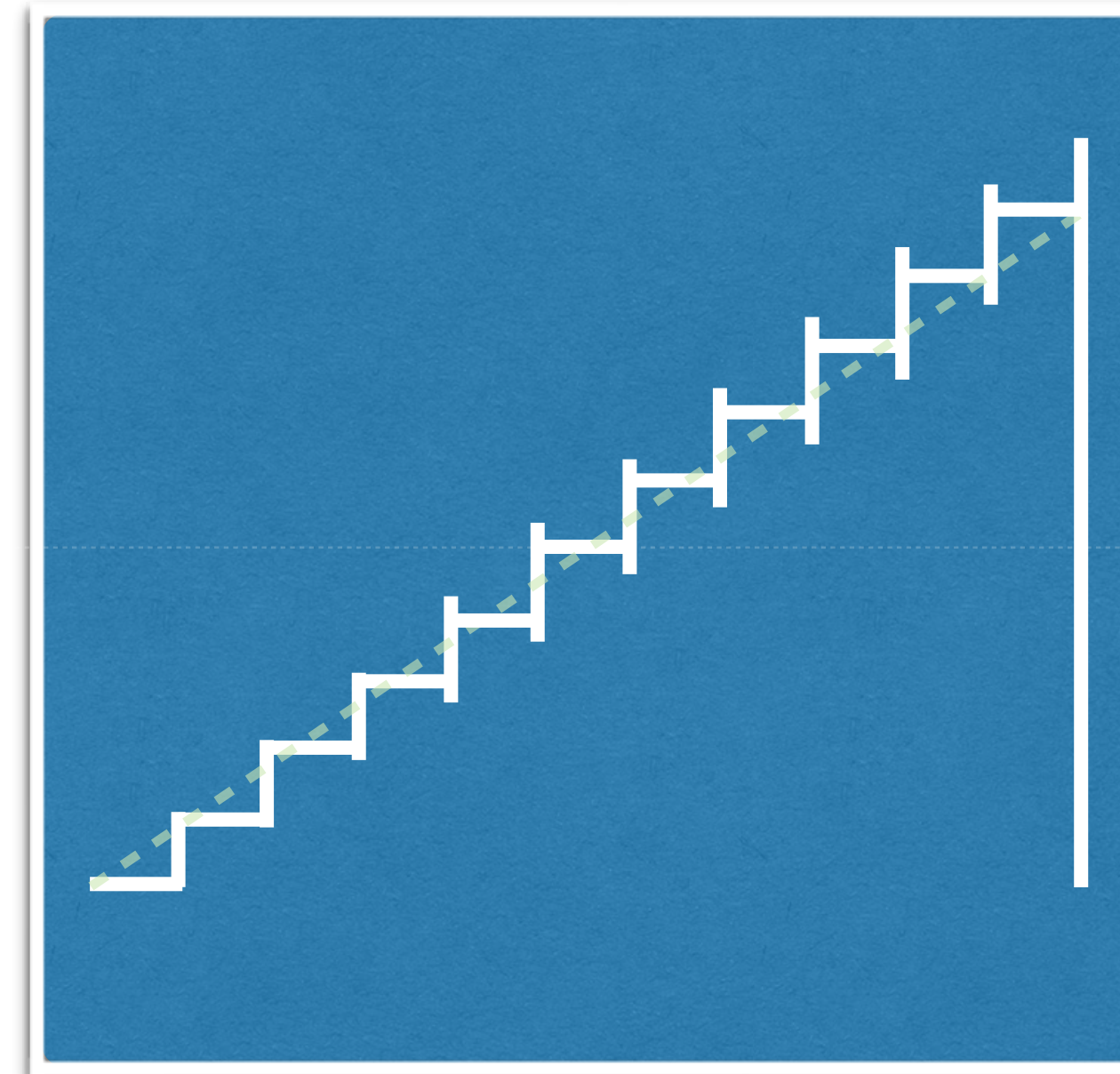
Level (Texture)
Soft detail (Edge)

Details

Detail correction:

Other detail controls:

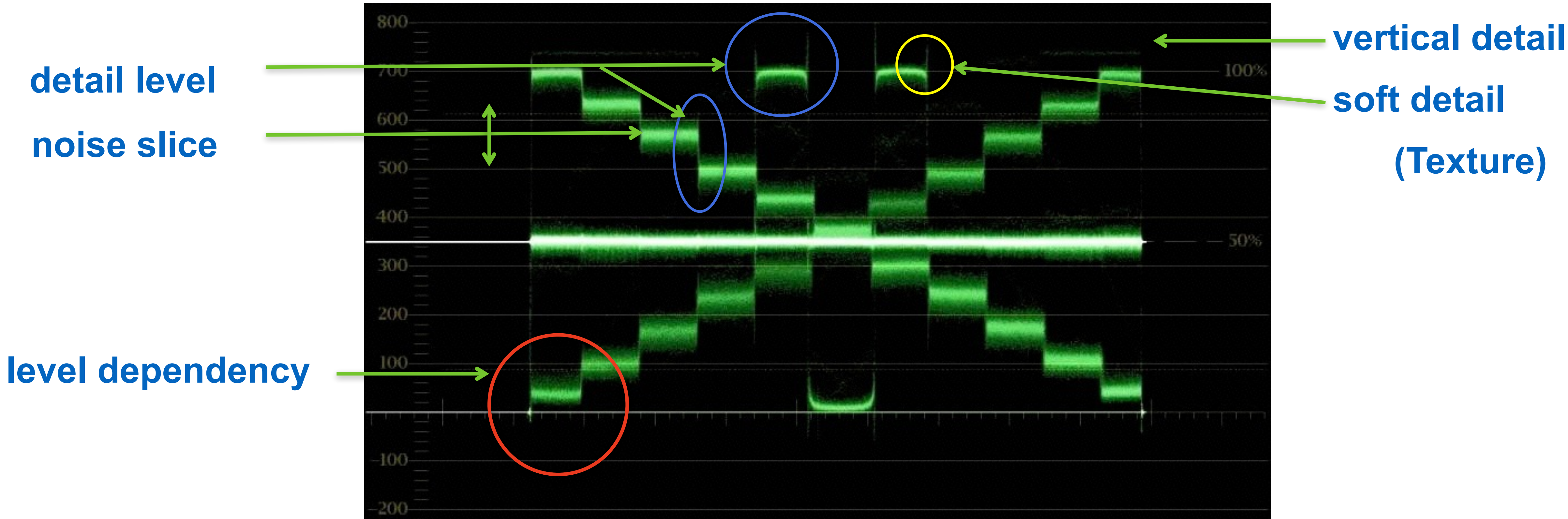
- ◆ Level dependency
- ◆ Noise slice
- ◆ Course / Fine detail
- ◆ Vertical detail
- ◆ Knee detail
- ◆ Soft detail (Texture)



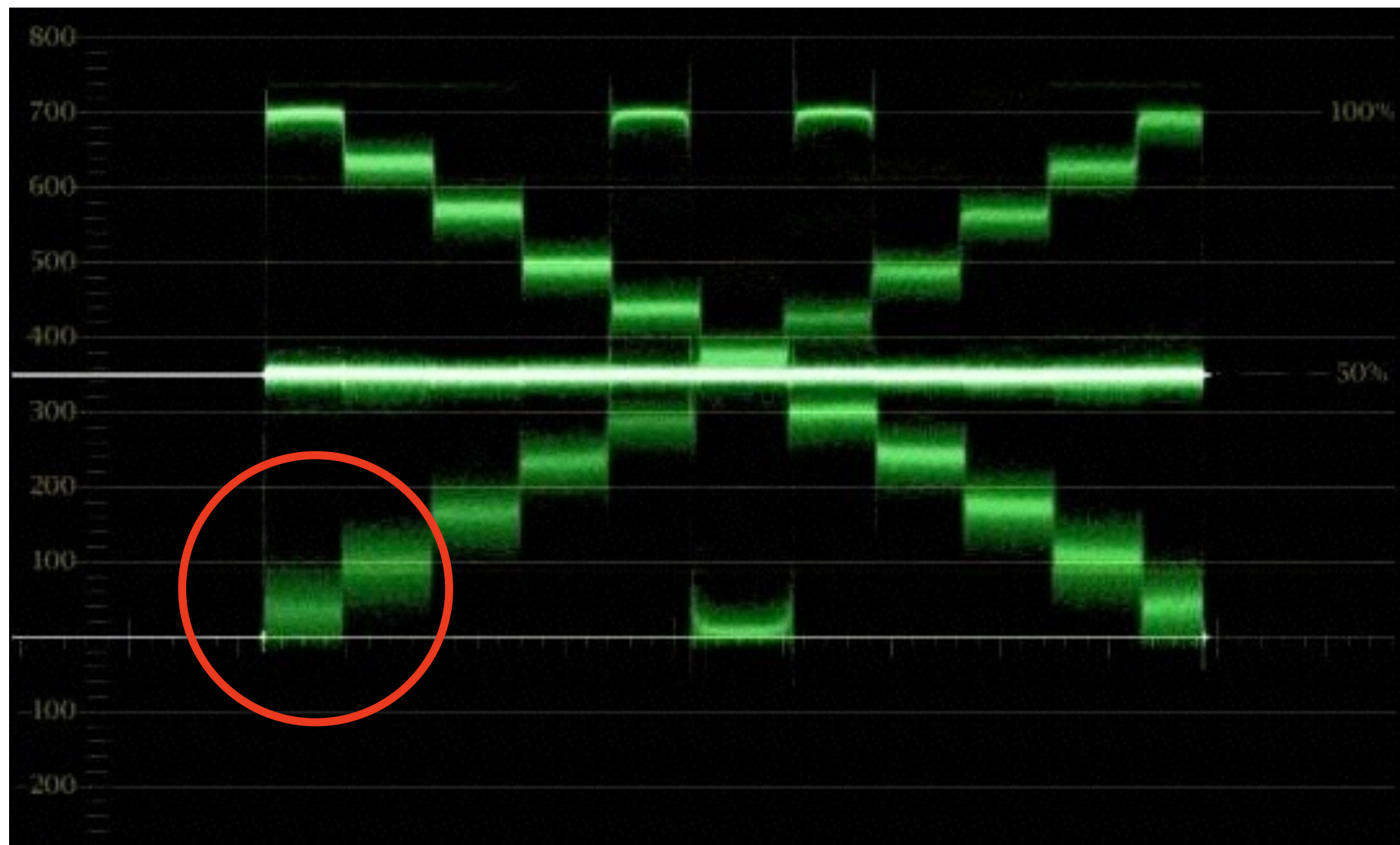
What's New LDX series

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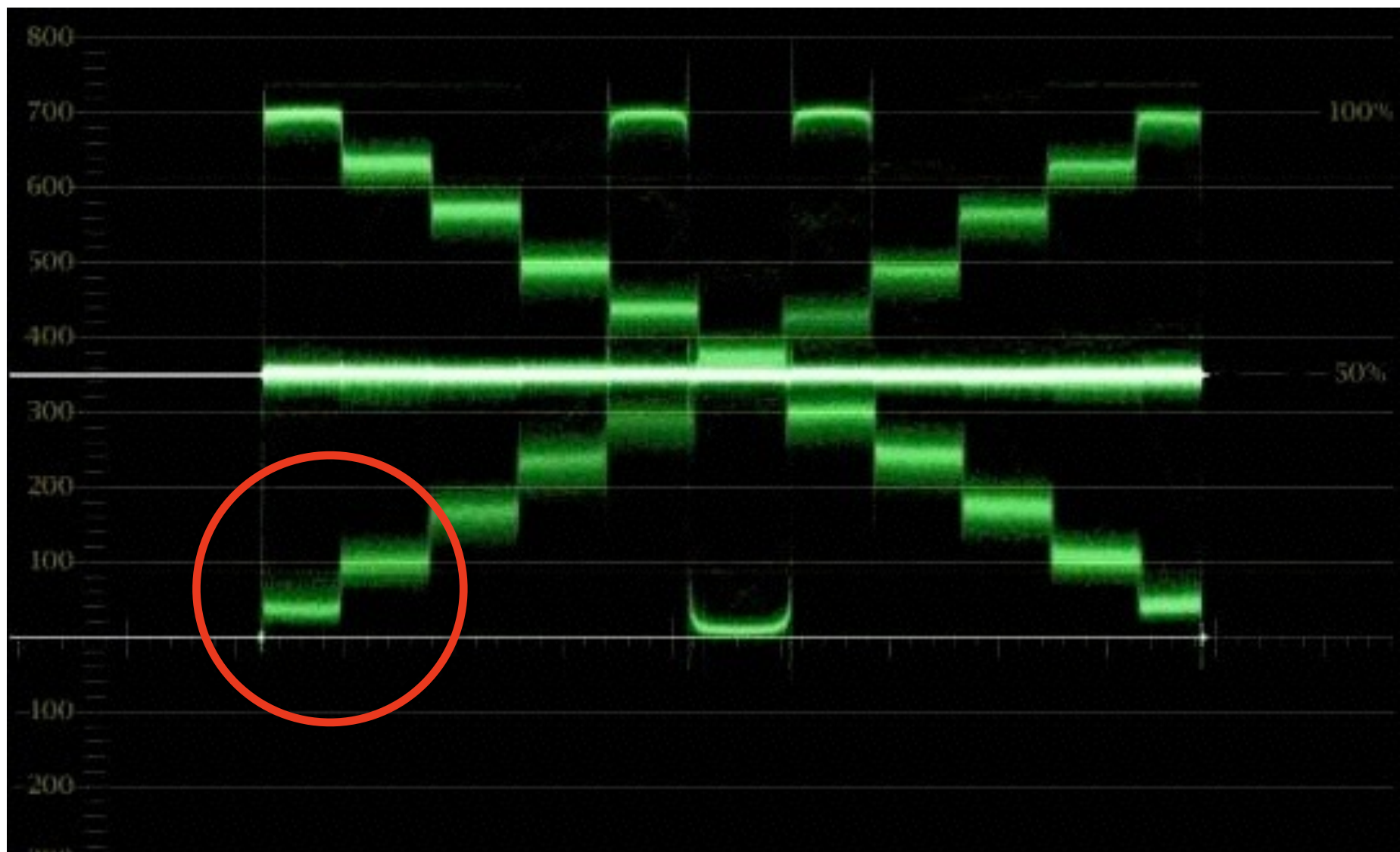
Details



Details



Level dependency
Off



Level dependency
On

Details

Detail equalizer:

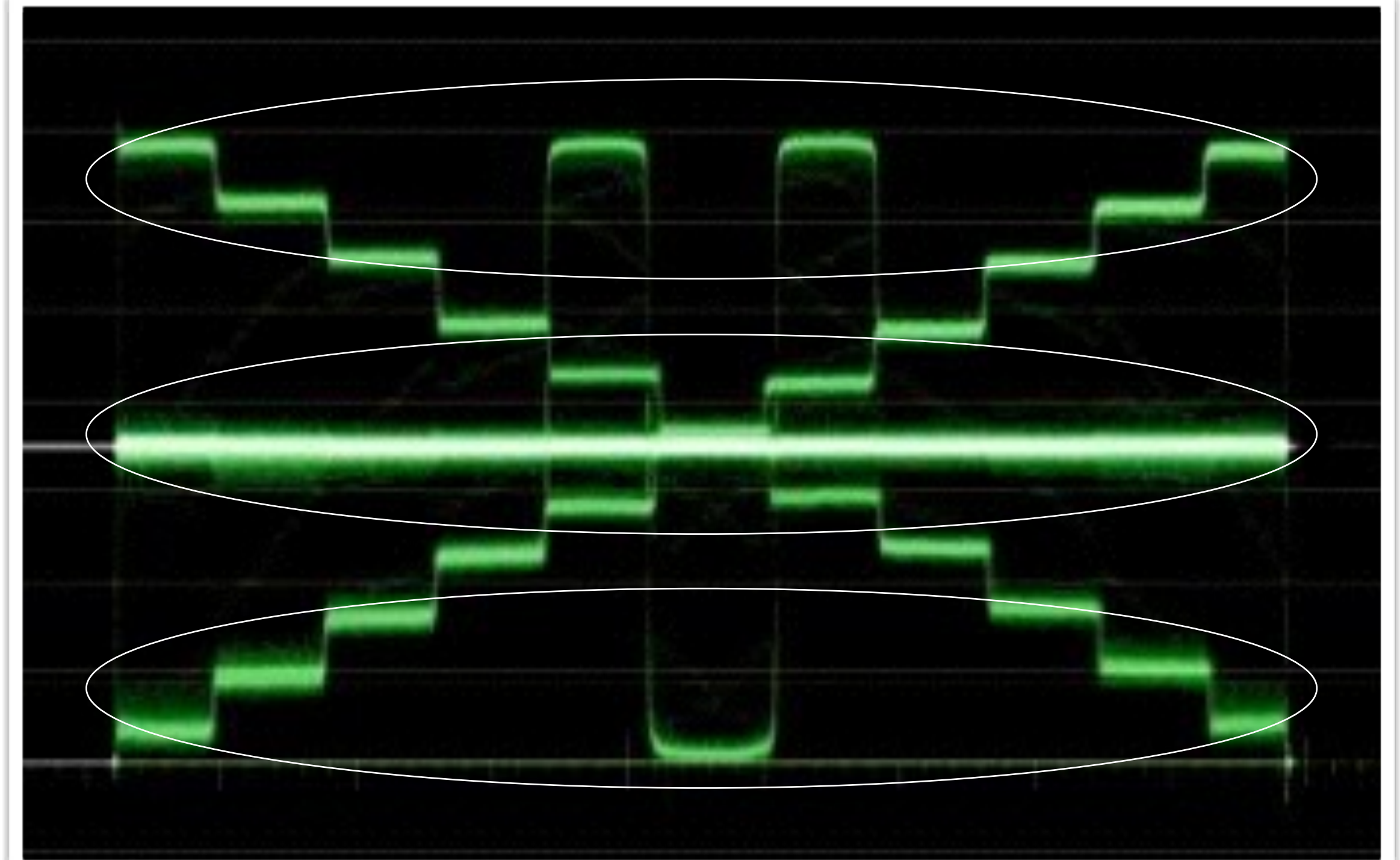
The amount of detail can be adjusted depending on the video level

Three regions of interest:

Highlights

Midtones

Shadows



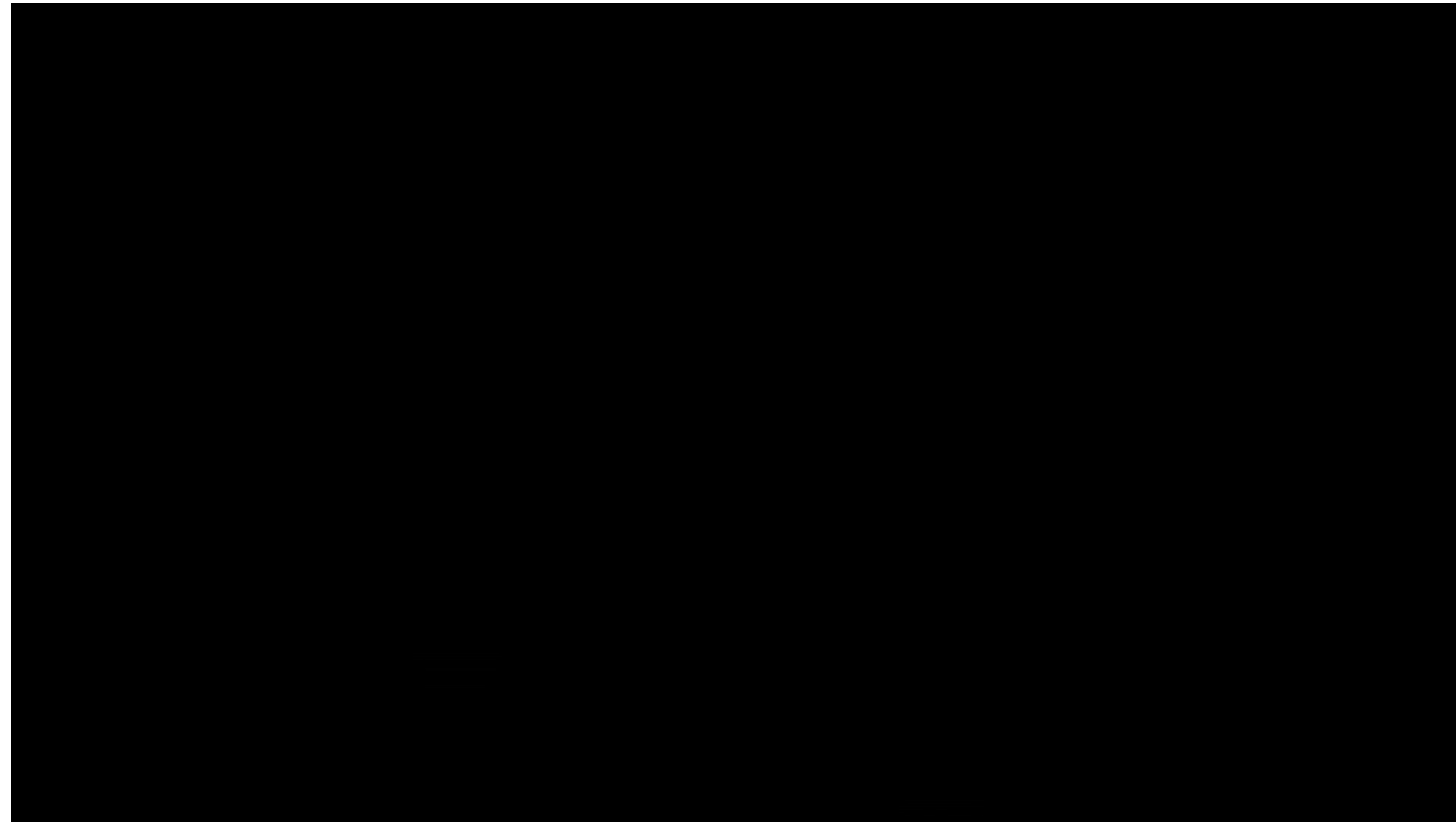
What's New LDX series

part 3 Web Training

Details

Low, Mid, High

New
LDX Feature



Details

Skin detail:

Operators tool to soften or sharpen selected color areas
360° Color range

Adjust detail on selected colors

Three independent Skin memories

Detection remains unchanged over

No need for re-adjustments after

lightning changes

Independent view via basestation (fiber)



Normal detail



Color Selection



Reduced detail
on selected color

Viewfinder Detail

VF processing functions

- ◆ Indicators = Inserts in the VF channel
- ◆ VF monitoring =
YCrCb (color), Y,R, G, -G
- ◆ VF Detail
- ◆ Focus and Sharpness tools
- ◆ Zebra level tool,



What's New LDX series

part 3 Web Training

Viewfinder Detail

New
LDX Feature

The viewfinder channel has fully independent detail adjustment

Viewfinder detail settings:

- Detail - on, off
- Super source (boost)
- Detail level
- Slicer
- Vert detail level
- Course / Fine
- Soft detail – on, off
- Soft detail level



Freeze

Picture is captured in a frame store at the input of the video processing

Camera setup can be done on the frozen picture
(accept lens iris, zoom, focus)



Reverse Scan

Reverse Scan

- ◆ Horizontal
- ◆ Vertical
- ◆ Both



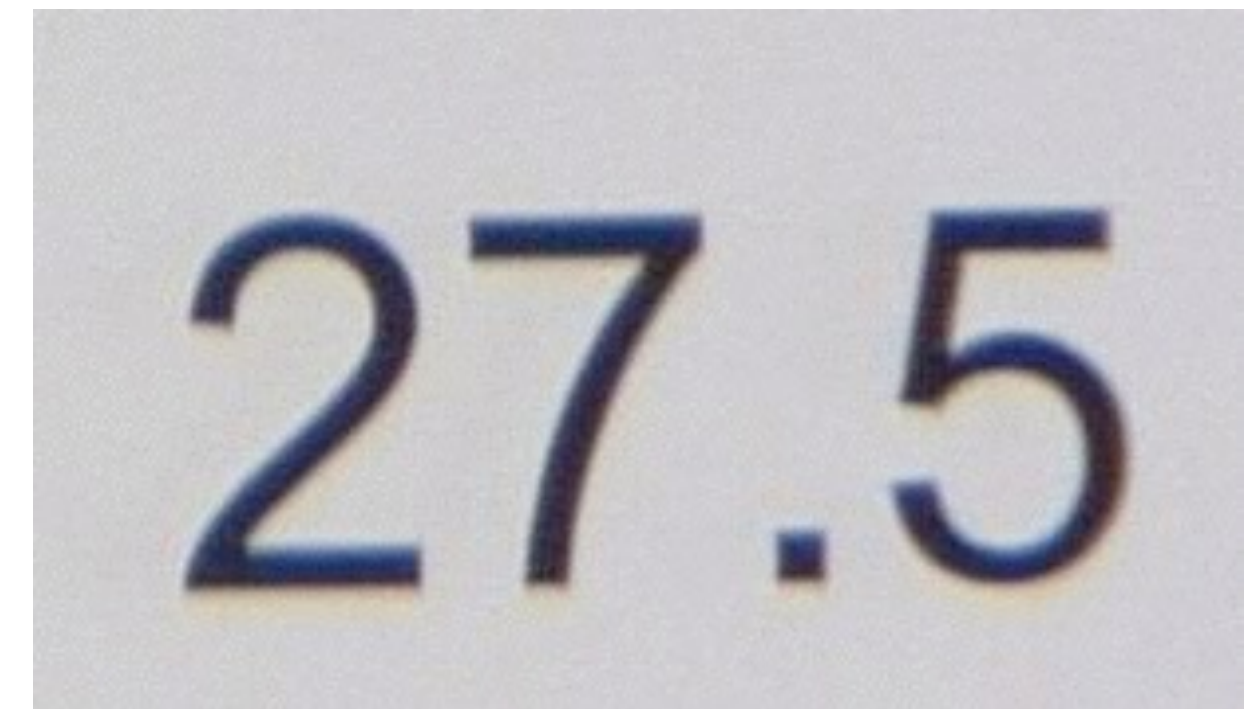
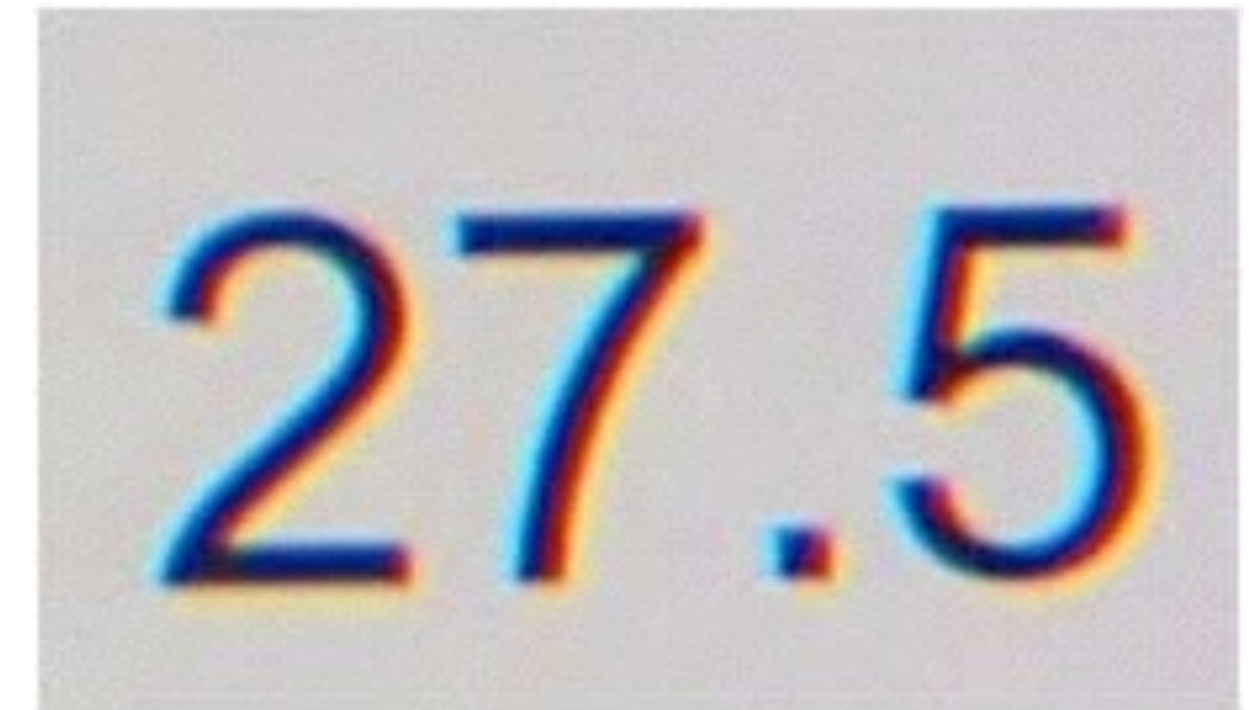
V-Shift

- ◆ Adjustable time shift between picture capture and processing
- ◆ Continuous variable shift up to 1 frame
- ◆ Compensate for screenshot effects on large screens like DLP
- ◆ Compensate delay with other cameras
- ◆ 3D applications



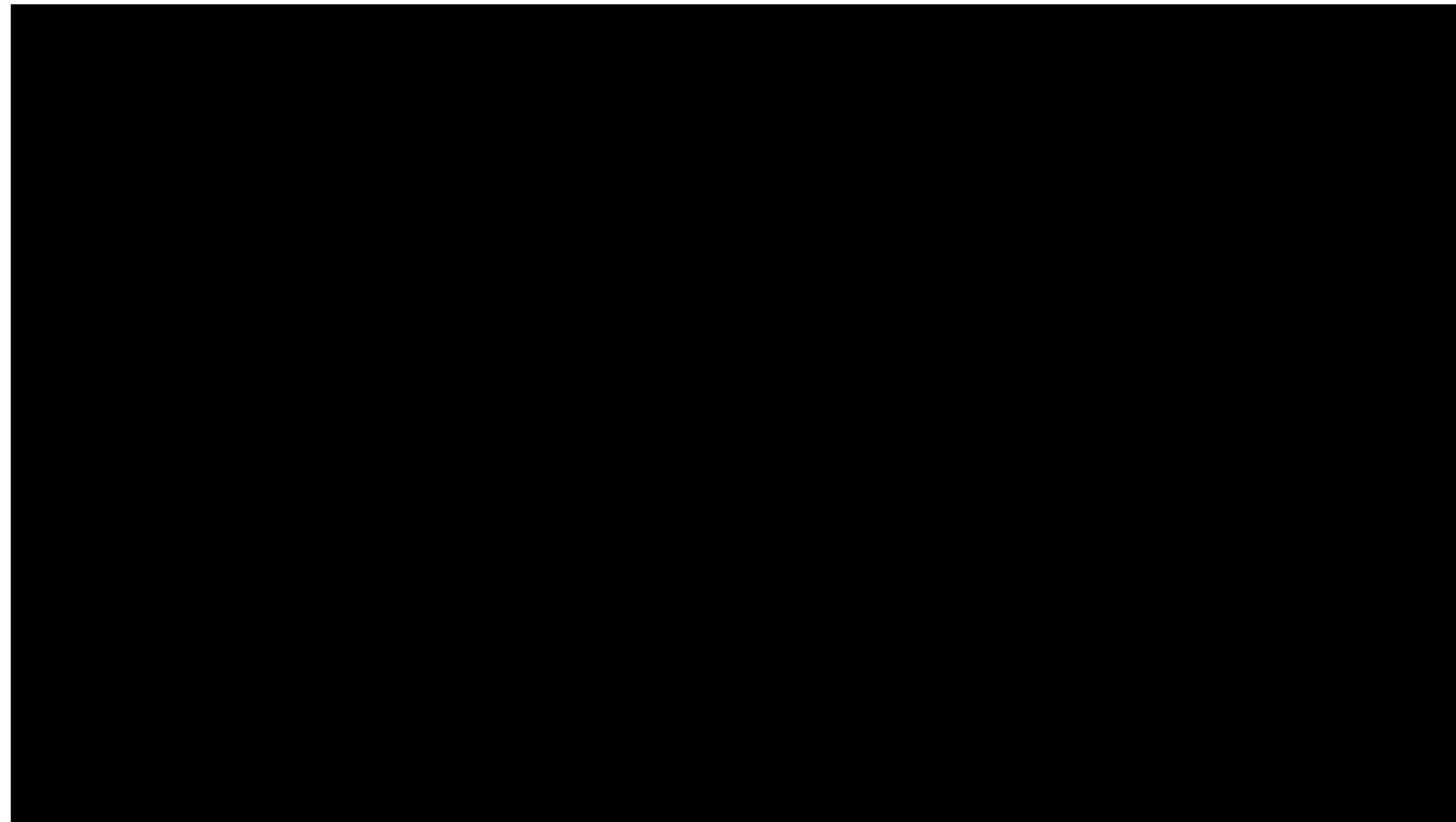
Class (H+V)

Chromatic Lens Aberration Sharpness Solution
Automatic Electronic Correction of lens errors
Correcting for H and V lens registration errors



The lens error information data is initially send from the lens to the camera.
Depending on zoom and focus position the camera electronically corrects for lens errors.
Only for digital lenses with lens error information files. Also known as CAC or ALAC in other cameras types.
SXP support pending

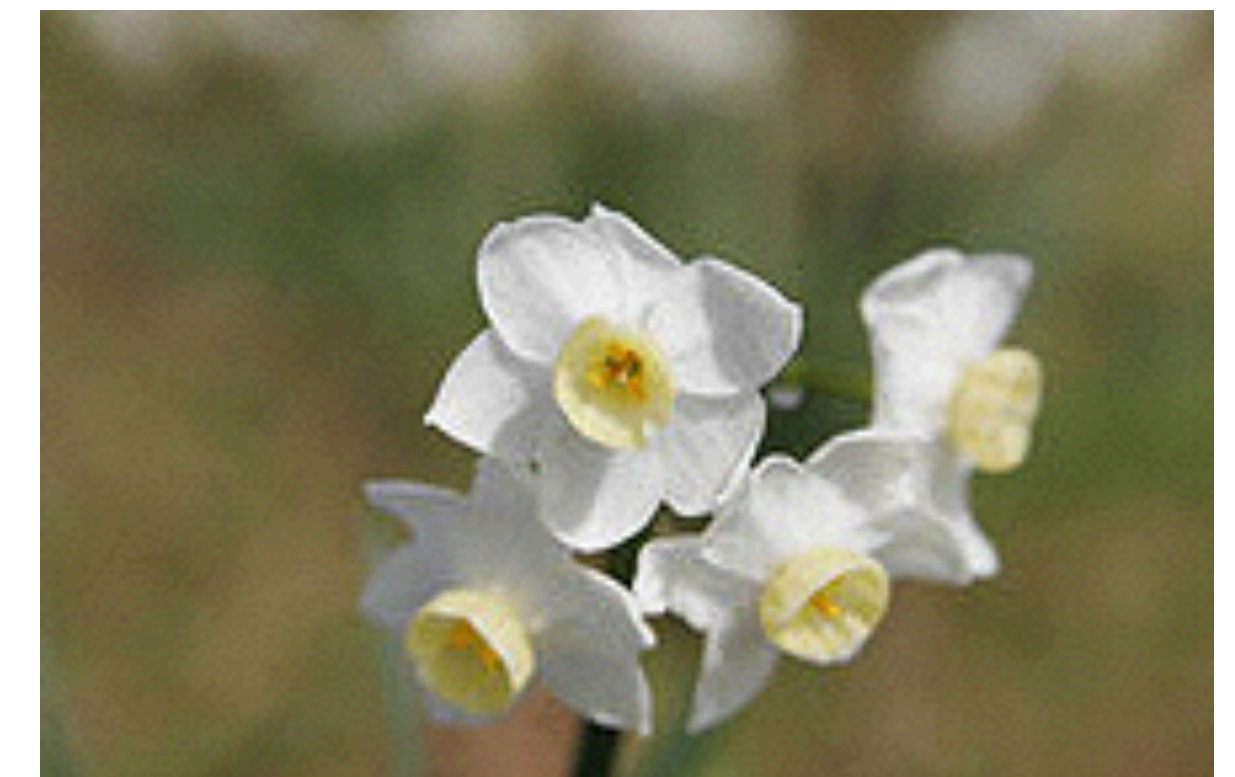
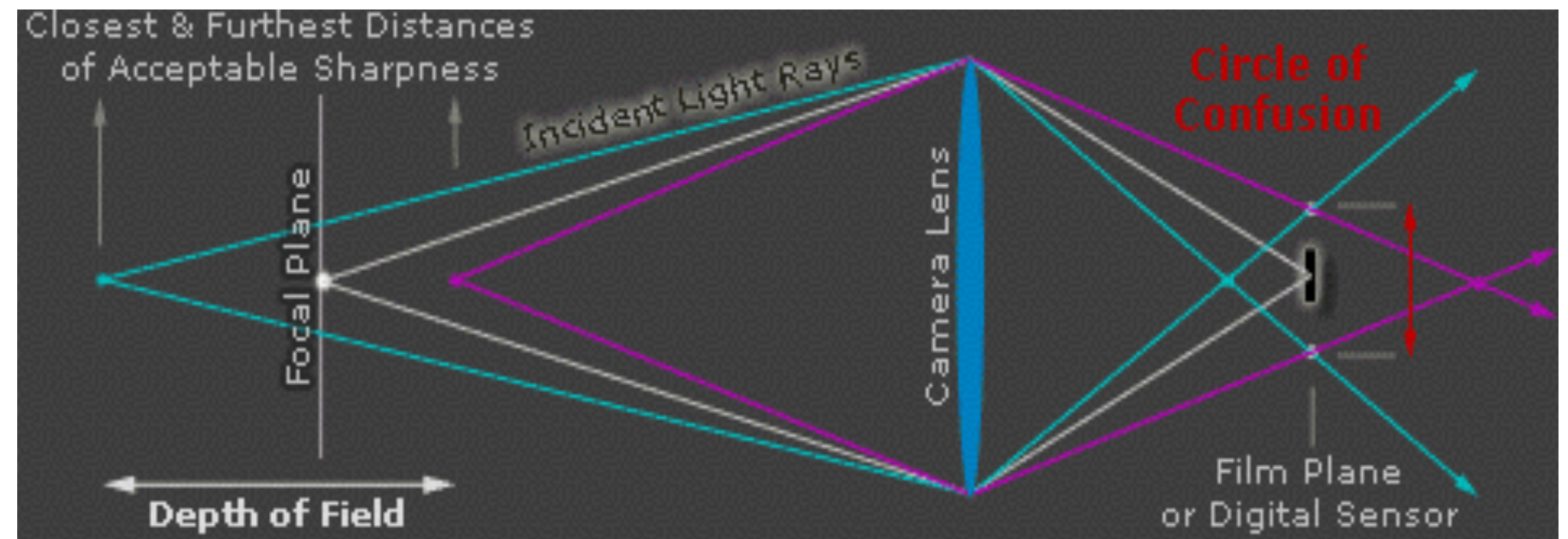
Class (H+V)



Depth of Field indicator

Depth-of-Field: the distance of the camera in which the picture is sharp
Depends on what we call sharp,
determined the circle of confusion. For
5um pixels we can set the CoC for
instance on 10um, covering 2 pixels

We will calculate & display for the user
the min distance, nominal distance and
max distance



Under development (Partly implemented)

Lens dependent controls

- Aperture correction (dependent on iris)
- Skin detail (dependent on zoom, focus)
- Detail follow zoom/focus
- CLASS (zoom, focus, iris) (partly implemented)
- General approach: dependency is described by LUT s and interpolation
F(1.4 2 2.8 4 5.6 8 11 16 and beyond)

Aperture Correction

- Aperture correction corrects the loss of MTF due to lens aperture (and sensor aperture of course)
- Lens aperture is diffraction limited with smaller iris opening (increasing f-number)
- Roughly spoken: lens MTF at 27 MHz 1080i is 100%-5*f-stop
- If the f-stop is known we can increase the aperture correction dynamically following that f-stop
- We will partly compensate the loss of MTF (not fully because of noise amplification)

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