

# SHOOTING FOR HIGH DYNAMIC RANGE IMAGES

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# CONCERNS FOR CINEMATOGRAPHERS WORKING IN HIGHER DYNAMIC RANGE



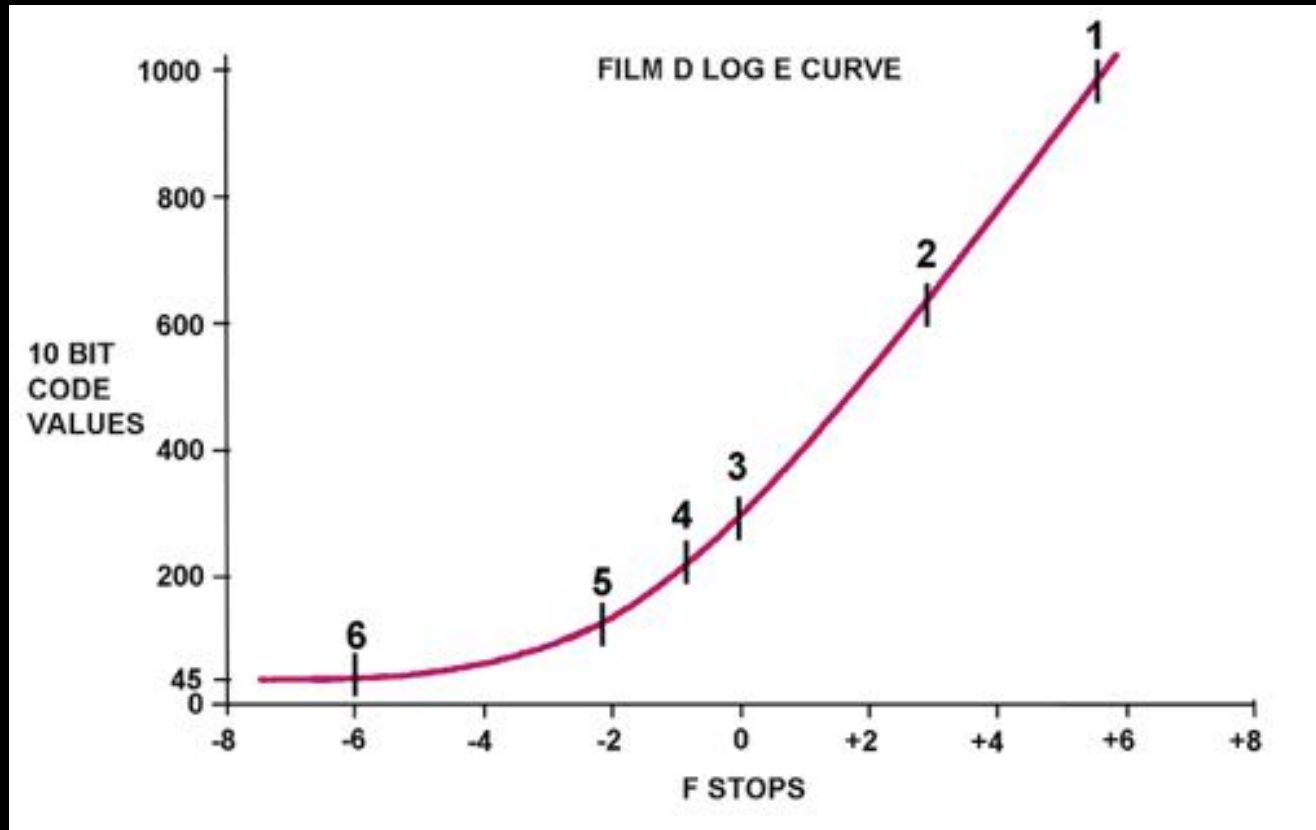
FILM HAS HAD THE ABILITY TO CAPTURE HDR FOR DECADES  
FILM NEGATIVE CAN CAPTURE SCENE TONES OF 13+ STOPS



# LET'S SPOT METER A REAL DAY SCENE



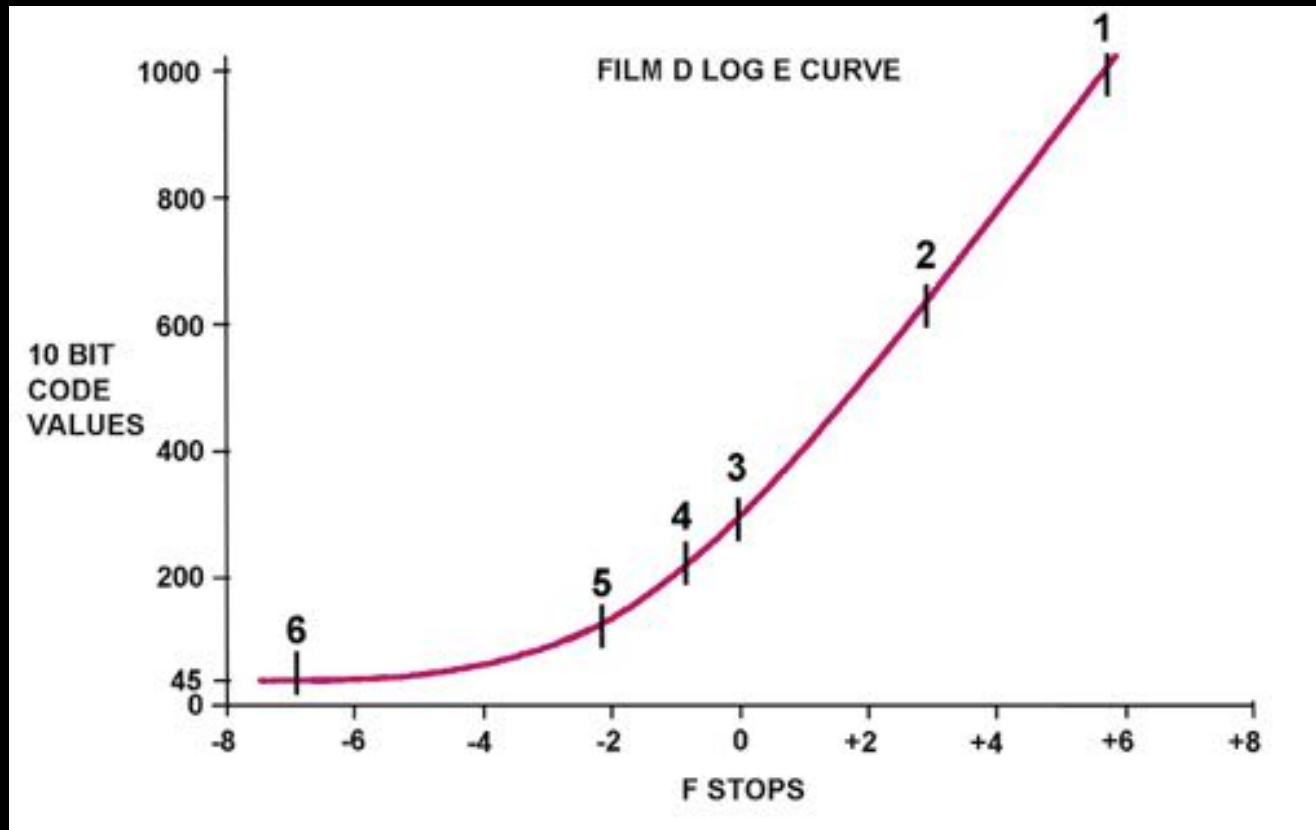
# PLOT OF SCENE LUMINANCE VS 10 BIT CODE VALUES



## LET'S SPOT METER A REAL NIGHT SCENE



# PLOT OF SCENE LUMINANCE VS 10 BIT CODE VALUES



STANDARD DYNAMIC RANGE DISPLAY DEVICE IMAGING PARAMETERS FOR BOTH TV MONITORS AND CINEMA PROJECTION CONSTRAIN THE REPRODUCTION OF HDR IMAGE CAPTURE

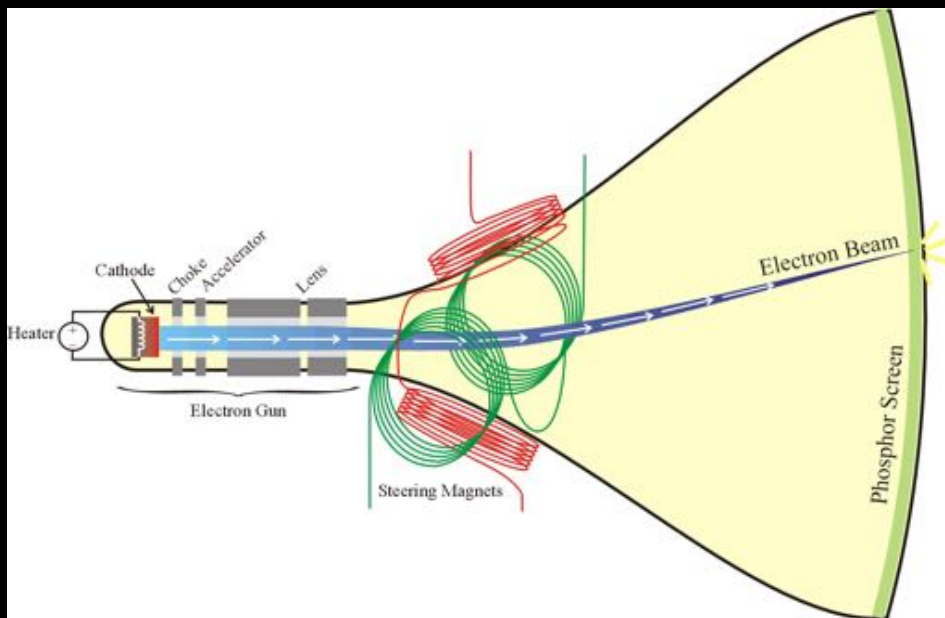
SDR TECHNOLOGY DISPLAYS A LIMITED RANGE OF SCENE TONES USING SCREEN BRIGHTNESS OF BETWEEN 5 FT-LAMBERTS (17 NITS) TO 14 FT-LAMBERTS (48 NITS) FOR PROJECTION (BOTH FILM PRINT AND DIGITAL CINEMA) AT CONTRAST RATIOS BETWEEN 2000:1 AND 4000:1

SDR TECHNOLOGY DISPLAYS ABOUT 75 NITS TO 250 NITS ON CURRENT SDR PRO AND CONSUMER MONITORS (THE AVERAGE IS 100 NITS)

EXCESSIVE SDR DISPLAY BRIGHTNESS LIFTS BLACK AND REDUCES CONTRAST



# STANDARD DYNAMIC RANGE DISPLAY WAS BORN OF CATHODE RAY TUBE (CRT) TECHNOLOGY



# NEW DISPLAY TECHNOLOGY IS NOT LIMITED BY THOSE TRADITIONAL LIMITATIONS OF COLOR AND BRIGHTNESS



NEW GENERATION MONITORS AND DIGITAL PROJECTORS ARE ENGINEERED TO DISPLAY HIGH DYNAMIC RANGE IMAGES AT MUCH BRIGHTER SCREEN LUMINANCE AND CONTRAST LEVELS THAN SDR DISPLAYS

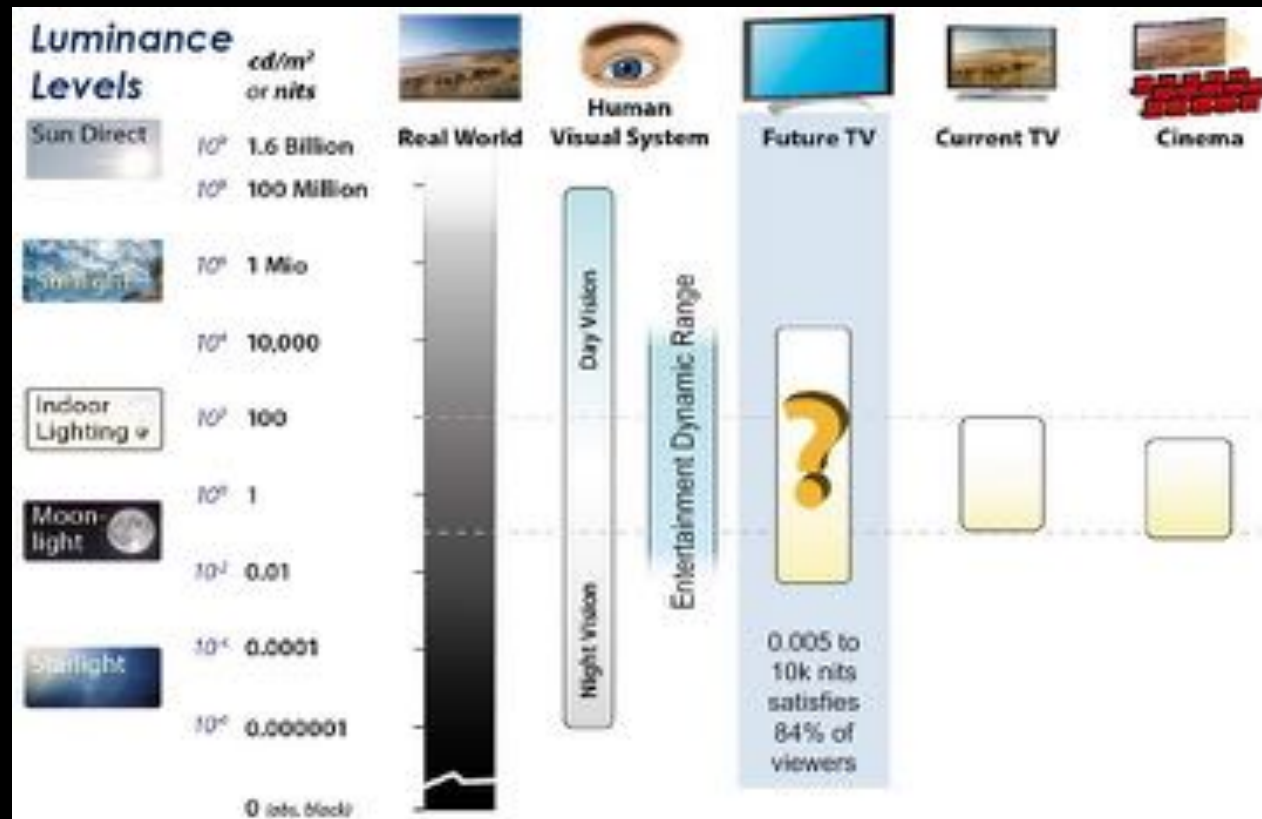
2000 TO 4000 NITS ON DOLBY HDR REFERENCE MONITORS

UP TO 1000 NITS ON SONY AND CANON HDR MONITORS

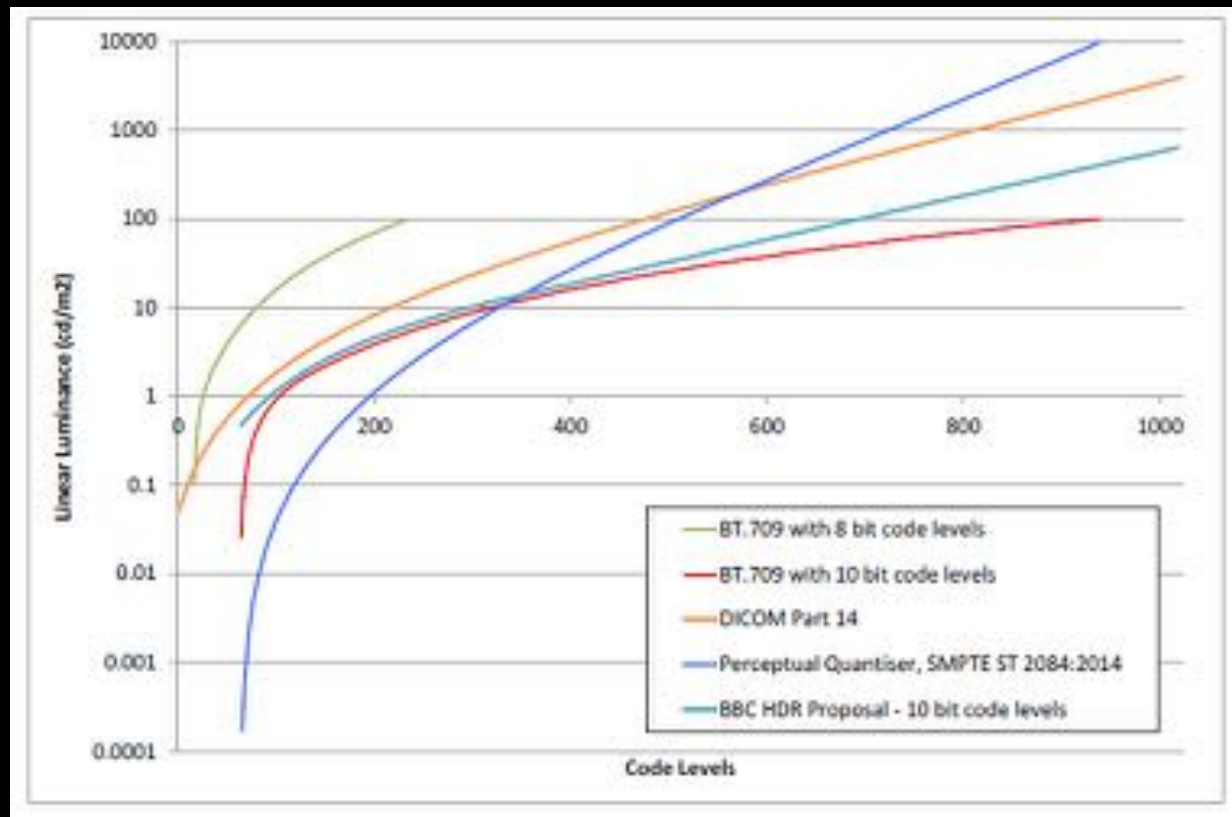
UP TO 1000 NITS ON SOME CONSUMER TELEVISION SETS

108 NITS (32 FT-L) IN DOLBY VISION DIGITAL CINEMAS

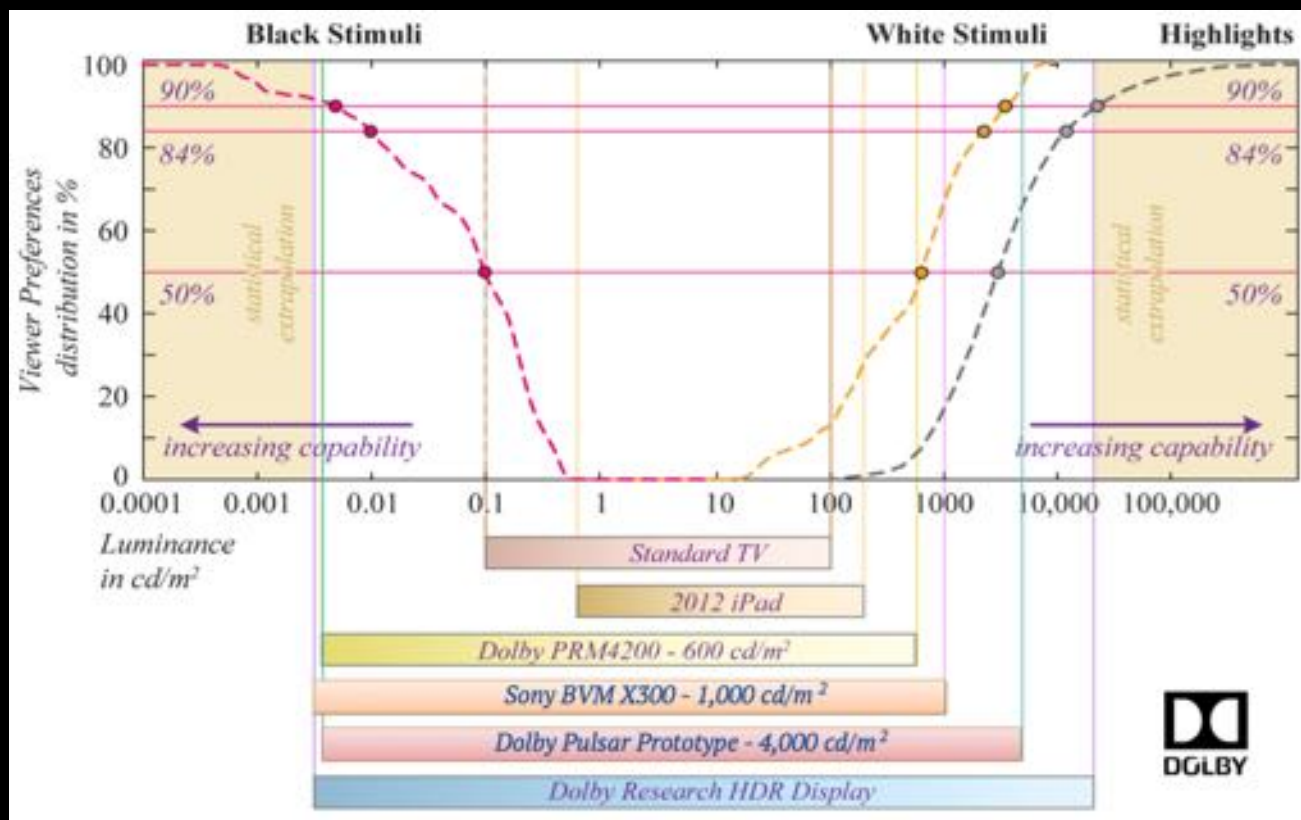
# HIGHER DYNAMIC RANGE DISPLAY IS A COMPLETELY NEW TECHNOLOGY AND DEMANDS NEW WORKFLOW



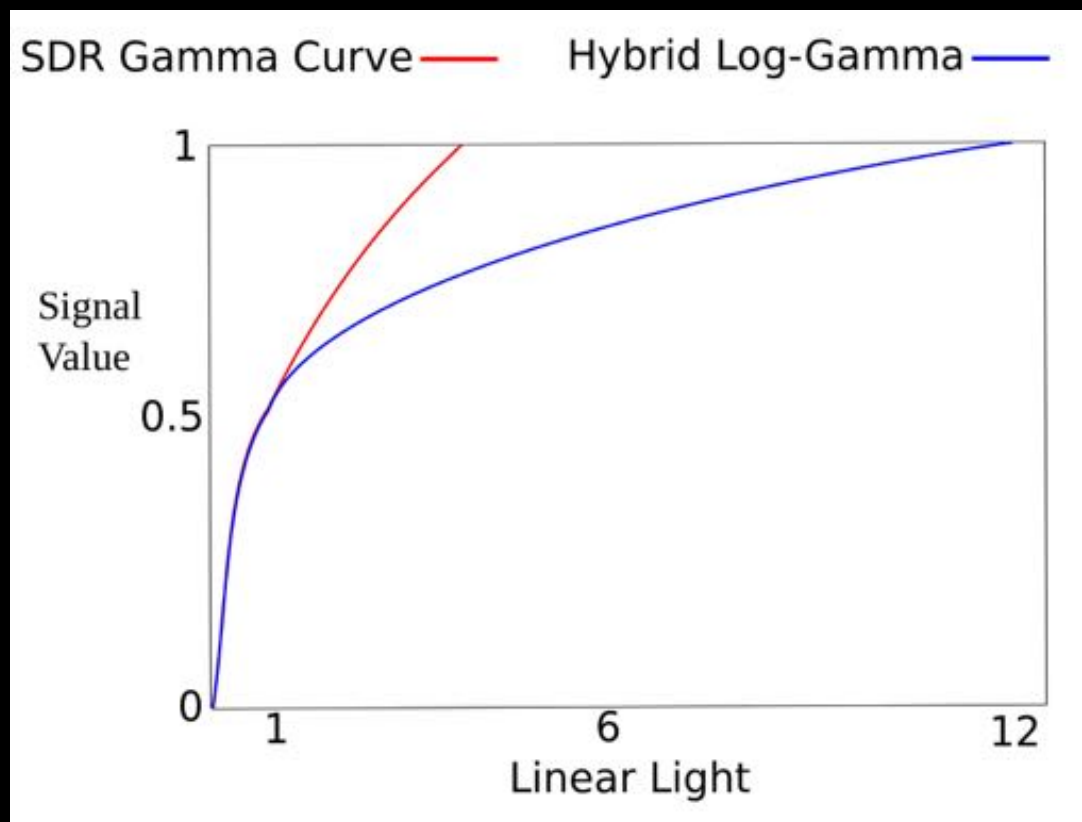
# HIGHER DYNAMIC RANGE DISPLAY REQUIRES NEW EOTF (ELECTRO OPTICAL TRANSFER FUNCTION) ENCODING



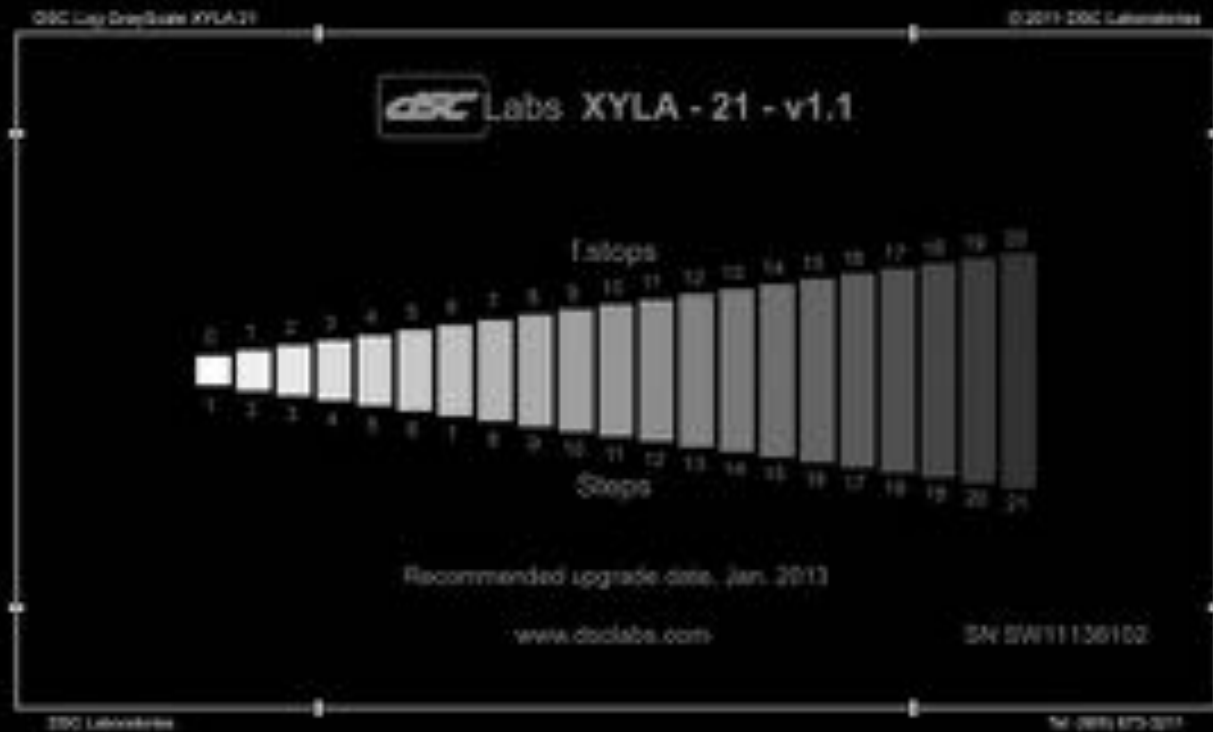
# DOLBY PQ (PERCEPTUAL QUANTIZATION) ENCODING IS USED IN BOTH DOLBYVISION AND HDR 10 SYSTEMS



# HYBRID LOG GAMMA IS AN OPEN SOURCE ENCODING JOINTLY DEVELOPED BY THE BBC AND NHK NETWORKS

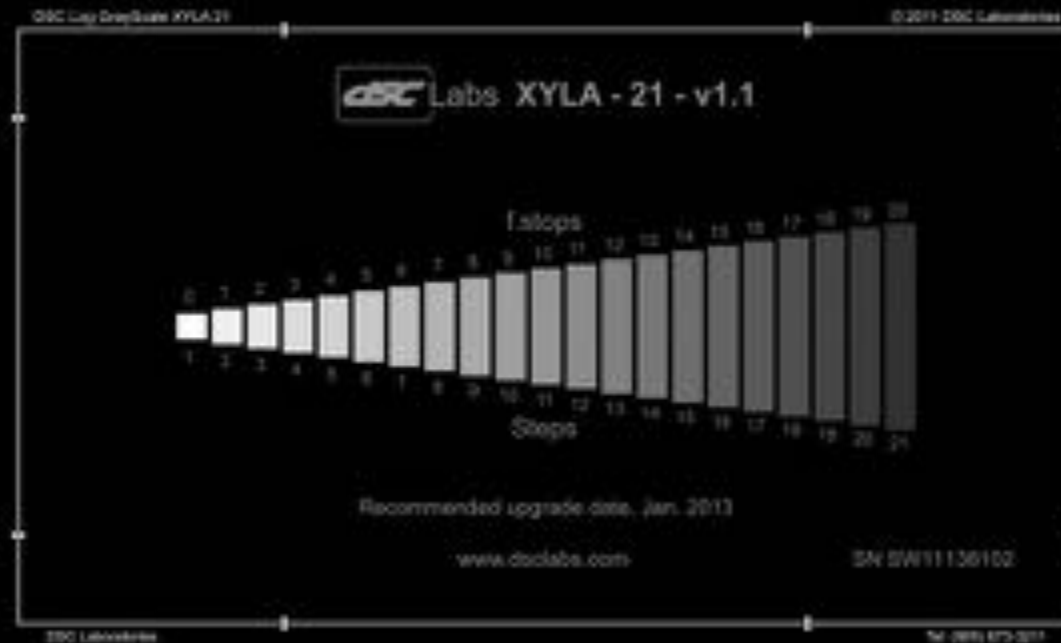


# TEST CHARTS CAN HELP THE CINEMATOGRAPHER TO UNDERSTAND THE NEW RANGE OF BRIGHTNESS

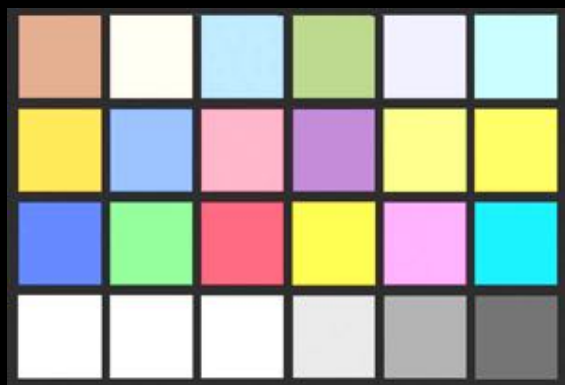




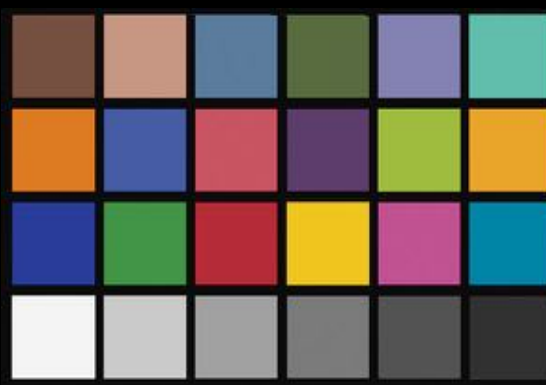
CINEMATOGRAPHERS CAN ACCURATELY MEASURE DYNAMIC RANGE USING THE DSC LABS XYLA 21. WITH A BUILT-IN LIGHT SOURCE, THE XYLA HAS 21 SPECTROPHOTOMETRICALLY NEUTRAL STEPS TO MEASURE 20 STOPS OF DYNAMIC RANGE



IN THE ABSENCE OF A XYLA 21, DYNAMIC RANGE  
CAN BE MEASURED USING MULTIPLE SIDE BE SIDE  
MACBETH CHARTS LIT TO DIFFERENT BRIGHTNESSES



3 STOPS OVER

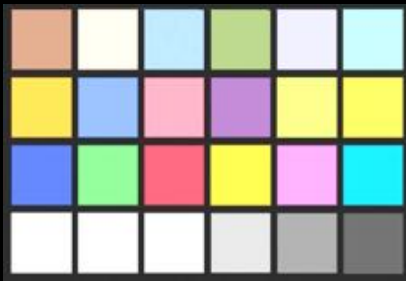


NORMAL

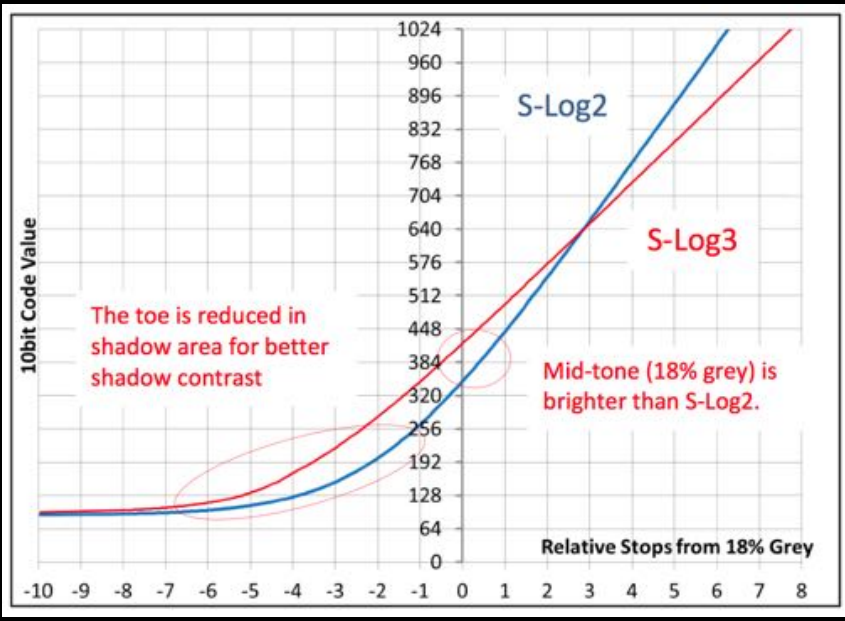
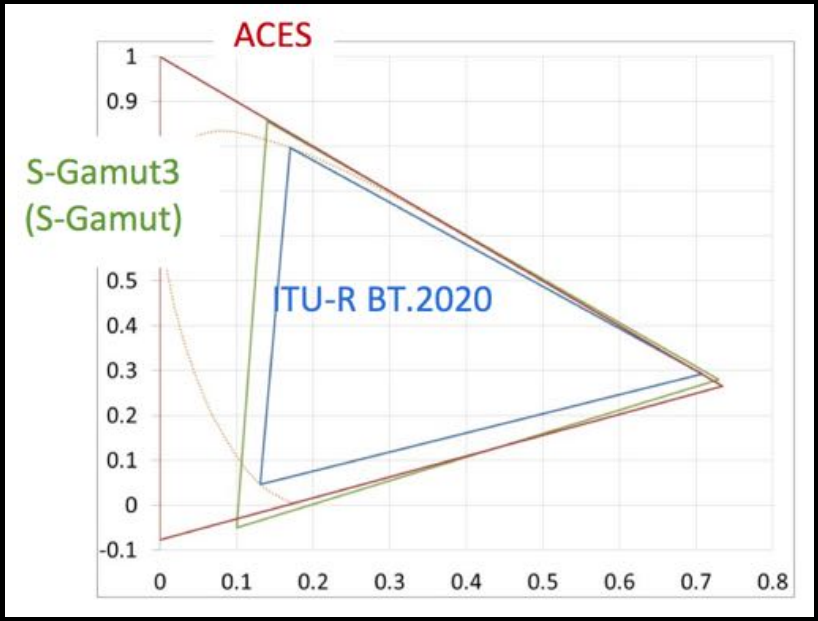


3 STOPS UNDER

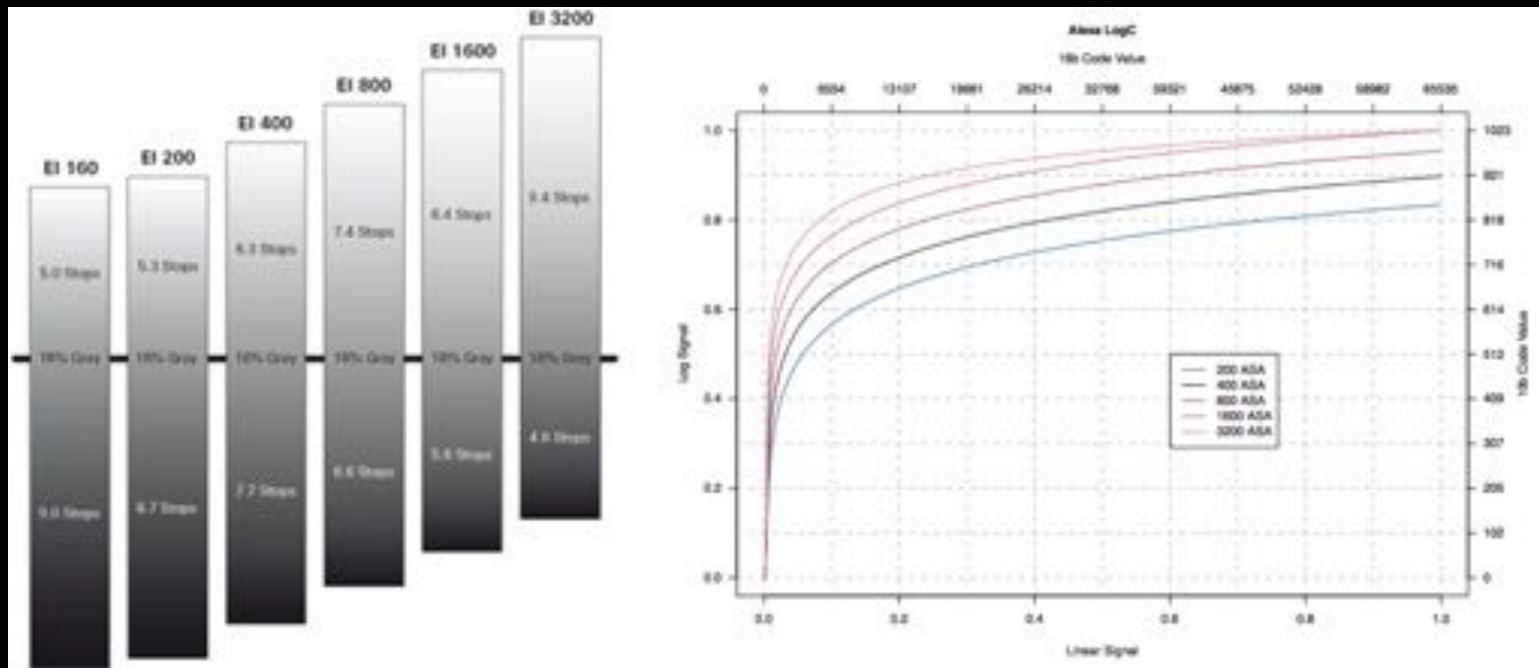
# FLAGS BETWEEN CHARTS AND BESIDE LAMPS WILL HELP YOU TO LIGHT CHARTS TO DIFFERENT LEVELS



# SONY F55 AND F65 CAMERAS DELIVER THEIR MAXIMUM DYNAMIC RANGE RECORDED RAW IN REC 2020 COLOR SPACE USING AN S-LOG 2 or S-LOG 3 ENCODING CURVE



# ARRI ALEXA CAMERAS DELIVER THEIR MAXIMUM DYNAMIC RANGE RECORDED RAW AT ISO 800 IN REC 2020 COLOR SPACE USING LOG C ENCODING



DAY EXTERIORS, ESPECIALLY THOSE WITH  
CLOUDS CAN BE CREATIVELY CONTROLLED



IN SCENES THAT SEE VIEW OUT WINDOWS & DOORS WE NOW HAVE A NEW ABILITY TO CONTROL BRIGHTNESS!



BEFORE HIGH DYNAMIC RANGE



AFTER

LOW LIGHT CAN ALSO BE GREAT! IN MANY SCENES BEAUTY HAPPENS BELOW 400 NITS!





**BACKINGS OUTSIDE DOORS AND WINDOWS MUST BE CONTROLLED IN CONTRAST AND HIGHLIGHTS**



# MAKEUP MUST BE BLENDED MORE CAREFULLY



THINGS WE COUNTED ON HIDING IN THE DARK - CABLES,  
SANDBAGS, C STAND FEET, CAN SHOW UP IN HDR



# IMPORTANT LENS CRITERIA FOR SHOOTING HDR - MTF

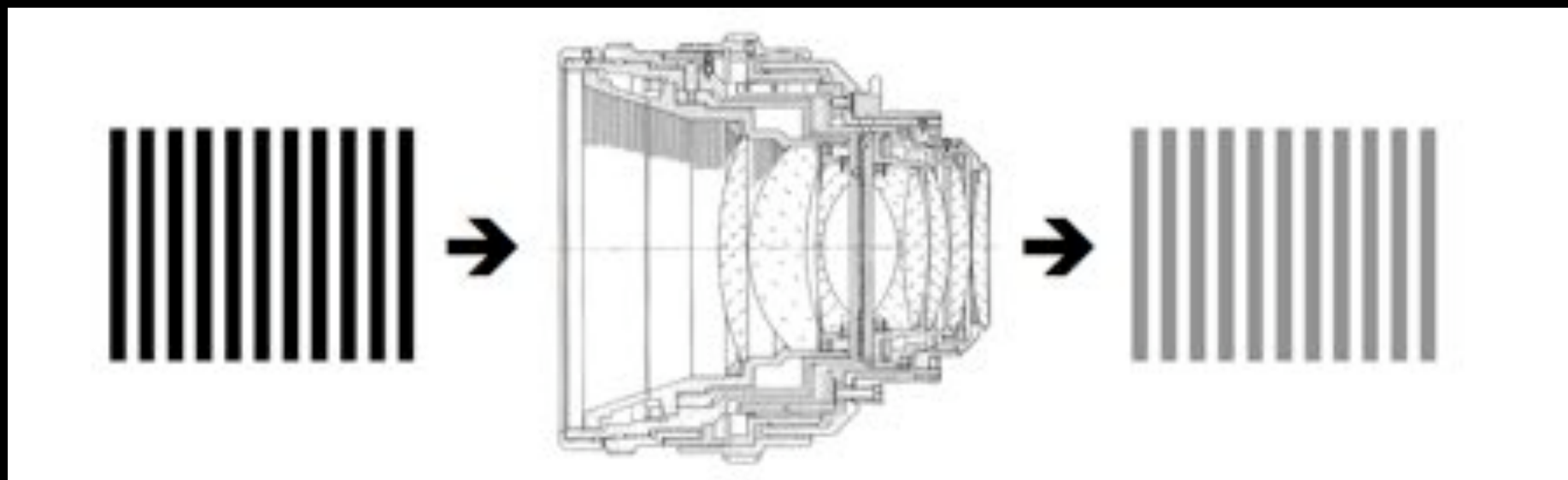
MTF REFERS TO THE MEASUREMENT OF HOW A LENS TRANSFERS SCENE CONTRAST TO AN IMAGER

THE SCENE BEING PHOTOGRAPHED MODULATES IN FREQUENCY AND CONTRAST.

THE LENS ATTEMPTS TO ACCURATELY TRANSFER THAT INFORMATION TO THE SENSOR, BUT THE LENS IS MADE OUT OF GLASS, WHICH HAS A REFRACTIVE INDEX.

THE RATIO OF THE RESULTING REDUCTION IN CONTRAST TO THE ORIGINAL SCENE CONTRAST IS A MATHEMATICAL FUNCTION THAT REFERRED TO AS MTF.

# IMPORTANT LENS CRITERIA FOR SHOOTING HDR - MTF

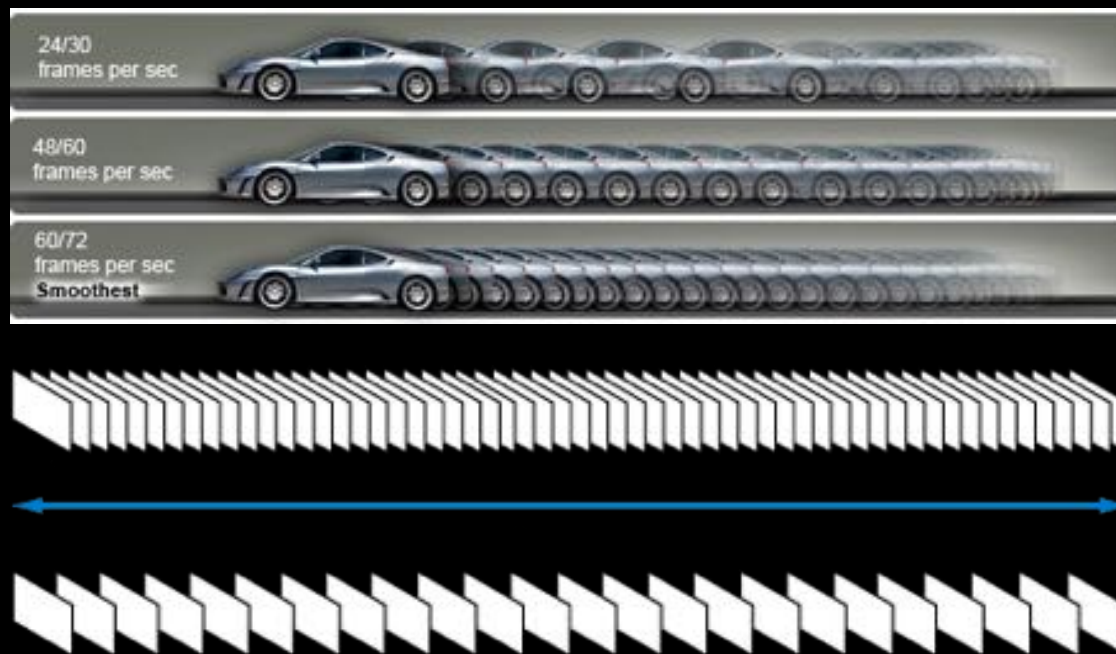


MODULATION

TRANSFER

FUNCTION %

HIGHER BRIGHTNESS DISPLAY CAN INCREASE THE EFFECT OF 24/25P JUDDER, BUT HIGHER FRAME RATE CAPTURE AND DISPLAY LESSENS THE EFFECTS OF 24/25P JUDDER



**BUT BEWARE, LURKING AROUND EVERY CORNER,  
THERE IS A BANDIT WAITING TO STEAL YOUR BITS!**



**YOUR HIGH DYNAMIC RANGE  
PROJECT WILL BENEFIT FROM  
MORE BITS, PLAN YOUR WORK  
FLOW CAREFULLY!**

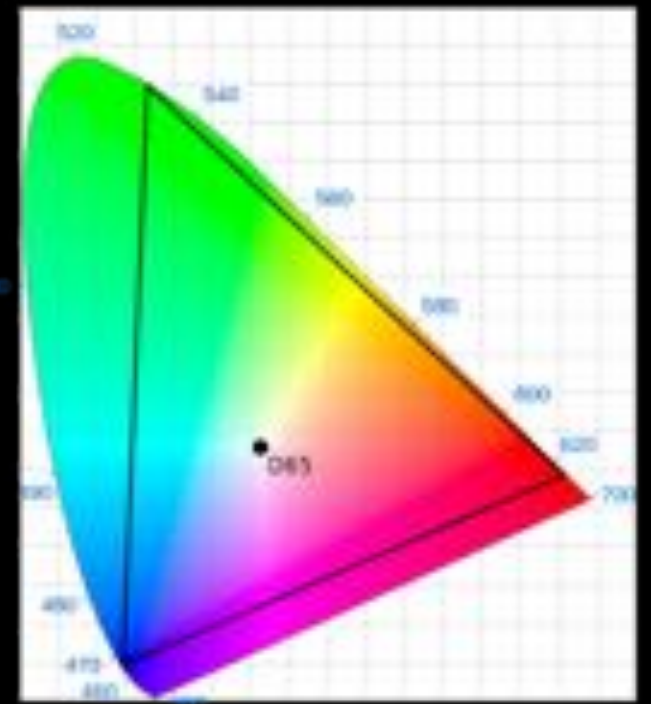
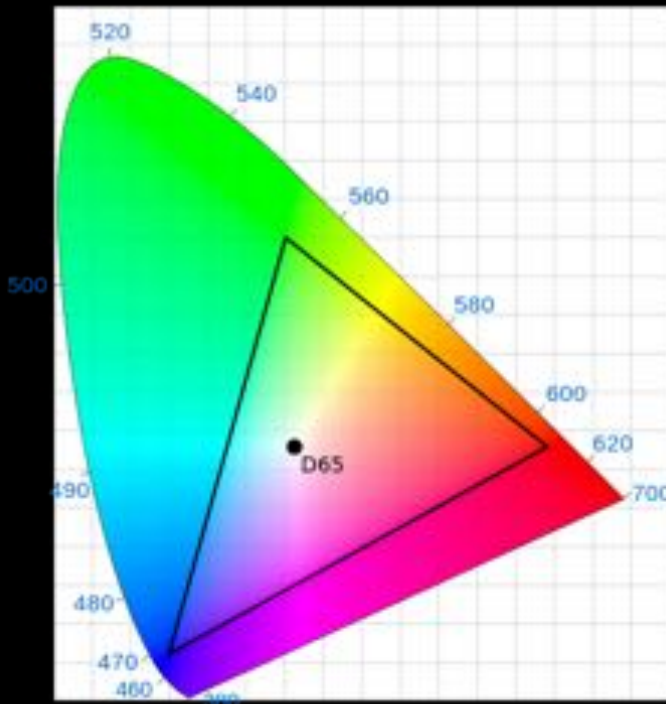
**DON'T LET RESAMPLING STEAL  
YOUR PRECIOUS DATA!**

# HIGH DYNAMIC RANGE IMAGING DEMANDS REC 2020 COLOR SPACE AND 16 BIT FLOATING POINT WORKFLOW

BT REC 709 IS THE DEFAULT BROADCAST COLOR SPACE

TAKE CARE NOT TO RESAMPLE REC 2020 IMAGES TO REC 709!

DOWNSAMPLES ARE NOT REVERSABLE!

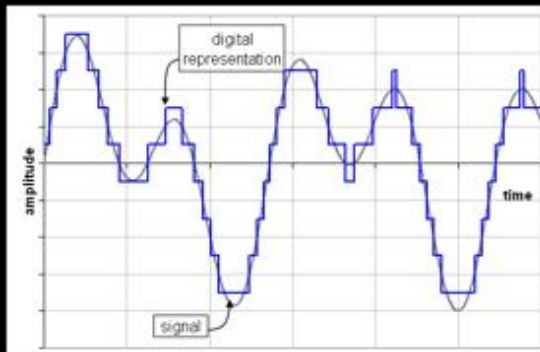




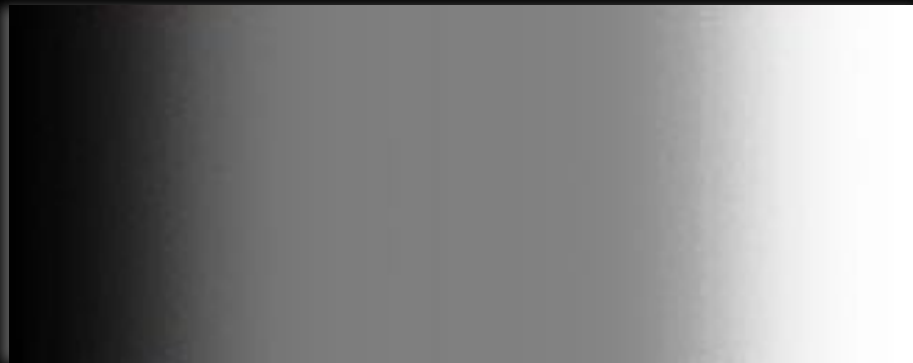
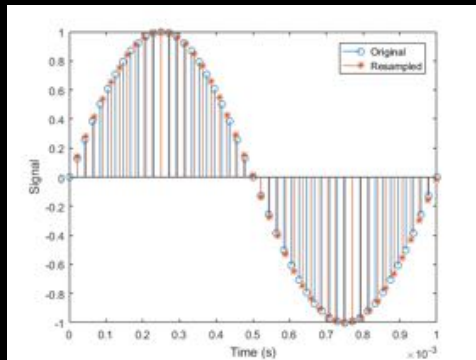
# WORKING AT HIGHER BIT DEPTH MEANS USING NEW TOOLS & TECHNIQUES



# 16 BIT FLOATING POINT WORKFLOW WILL PRESERVE MAXIMUM DYNAMIC RANGE AND COLOR IN IMAGES

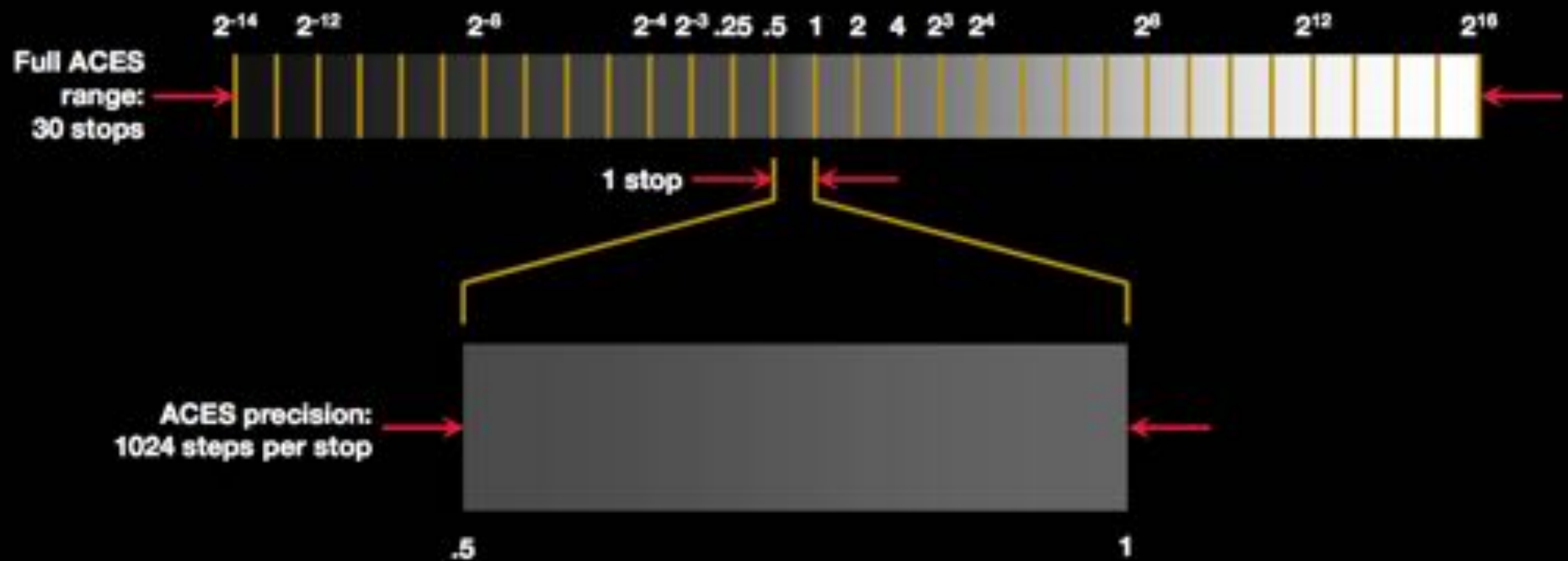


256 Step  
Gray Ramp



Resampling  
Accumulates  
Rounding  
Errors

# OPEN EXR 16 BIT HALF-FLOAT ENCODING PROVIDES FOR 30 STOPS OF RANGE AT A PRECISION OF 1024 STEPS PER STOP OF LIGHT



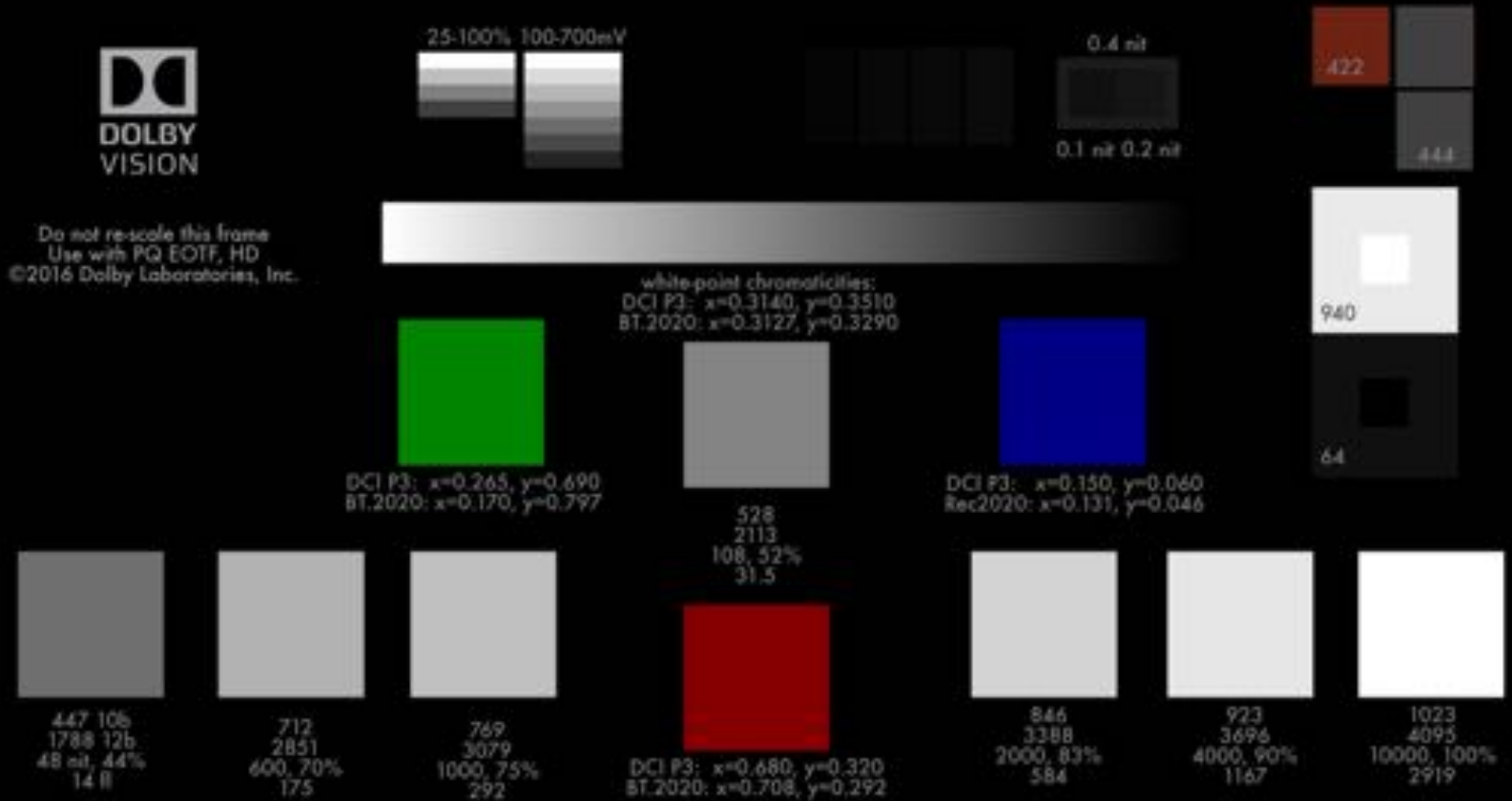
USING AN HDR MONITOR ON SET HELPS INSURE THE RESULTS



# USING AN HDR WAVEFORM VECTORSCOPE SUCH AS THE OMNITEK ULTRA TQ HELPS TO ASSURE CORRECT SIGNAL LEVELS



# HDR TEST FRAMES WILL HELP YOU ALIGN YOUR TOOLS



## IMPORTANT FACTORS TO UNDERSTAND IN CAPTURING HIGH DYNAMIC RANGE IMAGES

WHITE BALANCE EVERY SCENE FOR BEST HIGH DYNAMIC RANGE

USE AN ON SET HDR DISPLAY AND A WAVE FORM THAT IS HDR CAPABLE

PRESERVE AND PROTECT YOUR HIGHLIGHTS AND SHADOWS

RECORD USING A SONY S-LOG 2, S-LOG 3 OR ARRI LOG C ENCODING

RECORD UNCOMPRESSED OR LEAST COMPRESSED SIGNAL POSSIBLE

RECORD 4:4:4, PRO RES XQ, PRO RES HQ, RGB

THANK YOU!

DAVID STUMP ASC

