

AMIA 2024
Milwaukee

Thursday, December 5th
4:30 - 5:30 P.M.

Regency D



Morgan Oscar Morel
Video Lab Supervisor
Library of Congress

Demystifying Aspect Ratio and
Forming a Community Consensus

Dave Rice
Archivist
CUNY TV

PRESERVATION OVERVIEW

- What do DAR, PAR, and SAR mean?
- How do these concepts work in practice?
- How do digitization tools implement these concepts?
- Can archivists come up with our own best practices?

ASPECT RATIO BASICS

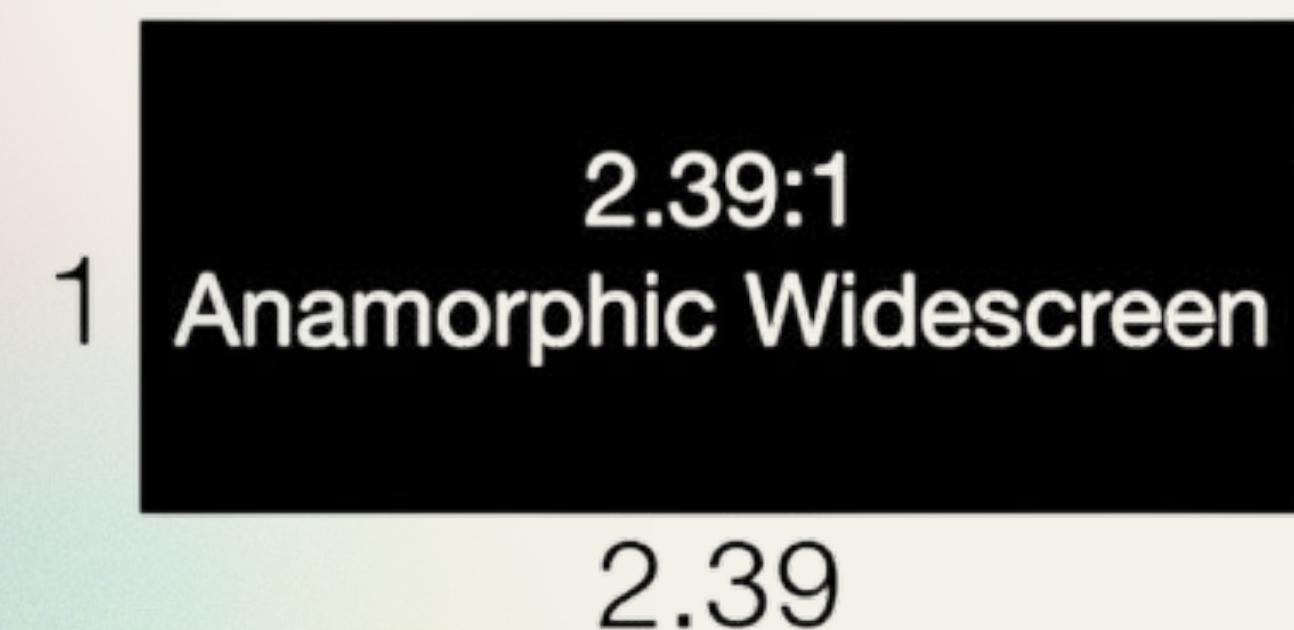
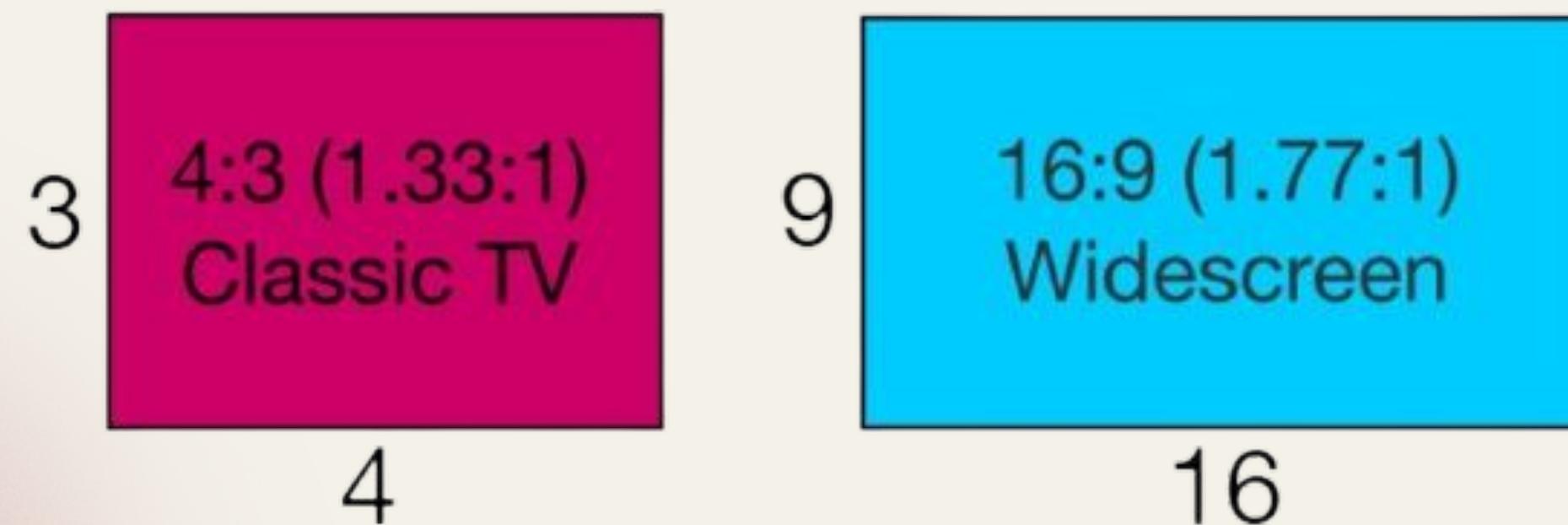


Image Courtesy of Vimeo

ASPECT RATIO BASICS

Up Conversion	Input 4:3	Output 16:9		Down Conversion	Input 16:9	Output 4:3		
PBOX Pillarbox			Displays a 4:3 SD image inside an HD 16:9 frame. Black bars feature on the sides.	LBOX Letterbox			Scales the entire 16:9 HD image into a 4:3 SD frame leaving black bars on the top and bottom.	
ZOOM			Zooms into an SD 4:3 image until it completely fills the HD 16:9 frame. A portion of the top and bottom is lost.	ANAM Anamorphic			Horizontally squeezes the 16:9 HD image into a 4:3 SD frame.	
14:9			A compromise between Pillarbox and Zoom. Minimal black bars with a slight crop on the top and bottom.	CCUT Center Cut			Cuts a 4:3 SD frame from the 16:9 HD image.	
SMART			Incrementally stretches the sides to fit 16:9 without distorting the main action of the 4:3 image.	14:9			A compromise between Letterbox and Center Cut. Minimal black bars with a slight edge crop.	
ANAM Anamorphic			Horizontally stretches the 4:3 SD image into a 16:9 HD frame.	Image from BlackMagic Teranex Manual				

From FADGI'S Significant Properties for Digital Video

Display Aspect Ratio (DAR)

DAR is the ratio between the width and height of the frame at the time of playback. DAR is a metadata field present in most audiovisual containers (though absent in some, including AVI) that is used by playback software and platforms to properly render the width and height of the frame proportionally so that the image is not stretched or narrowed.

Pixel Aspect Ratio (PAR)

PAR is the ratio between the width and the height of each individual pixel that makes up a video frame. Pixels within a frame are all of a uniform size, and while they may be square, they often are not. If the pixels are square, the PAR value is 1:1 or 1, since the width and the height of the pixels are equal to one another.

Storage Aspect Ratio (SAR)

SAR is the width and height of a video frame expressed as a ratio. For example, a video frame with a width of 720 pixels and height of 480 pixels (720x480) would have a SAR of 3:2.

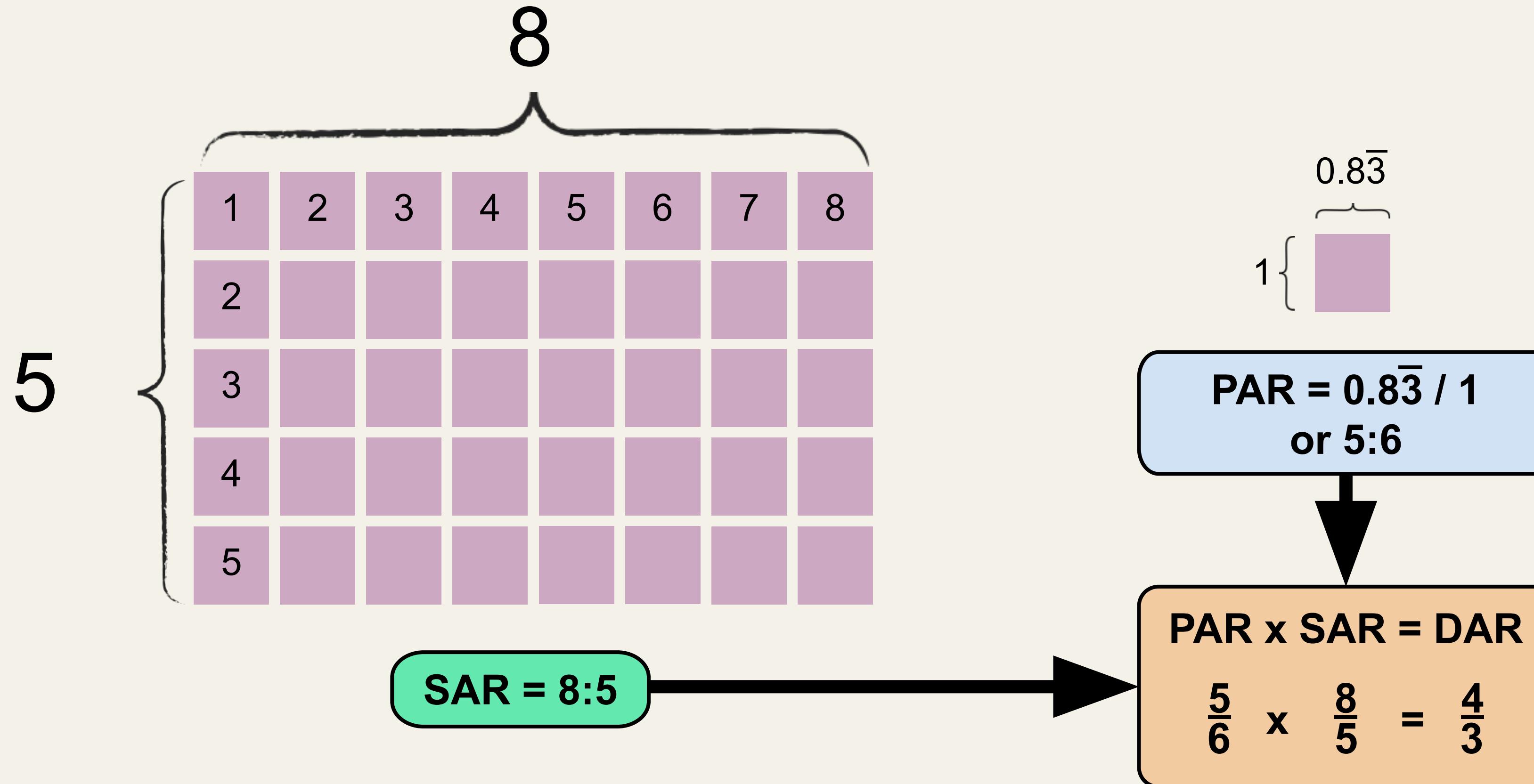
ONE QUICK CLARIFICATION

FFmpeg uses “Sample Aspect Ratio” in place of “Pixel Aspect Ratio”. Thus,

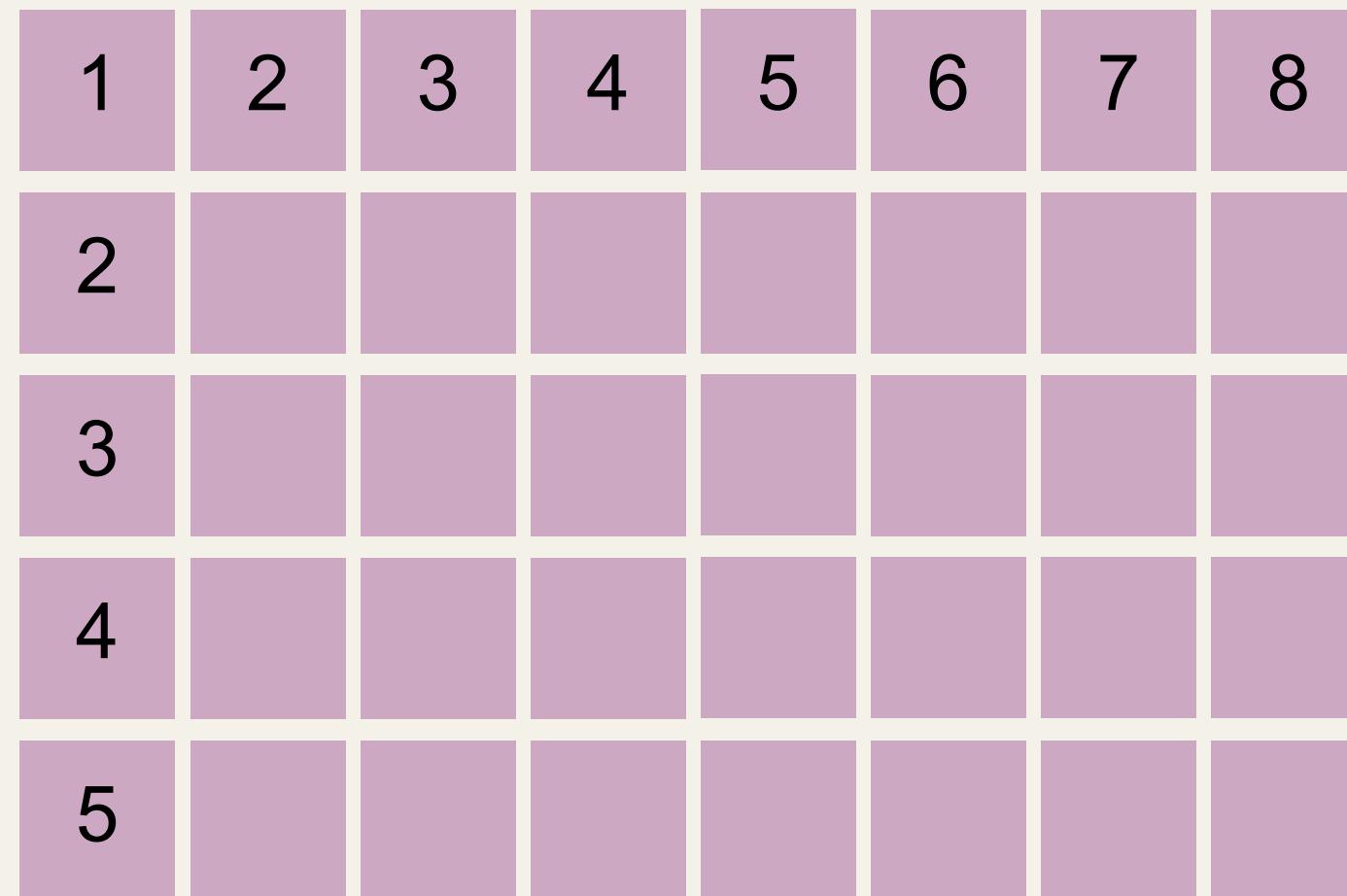
FFmpeg uses SAR to refer to what most people call PAR.



PAR / DAR / SAR VISUALIZED



PAR / DAR / SAR VISUALIZED



$0.8\bar{3}$

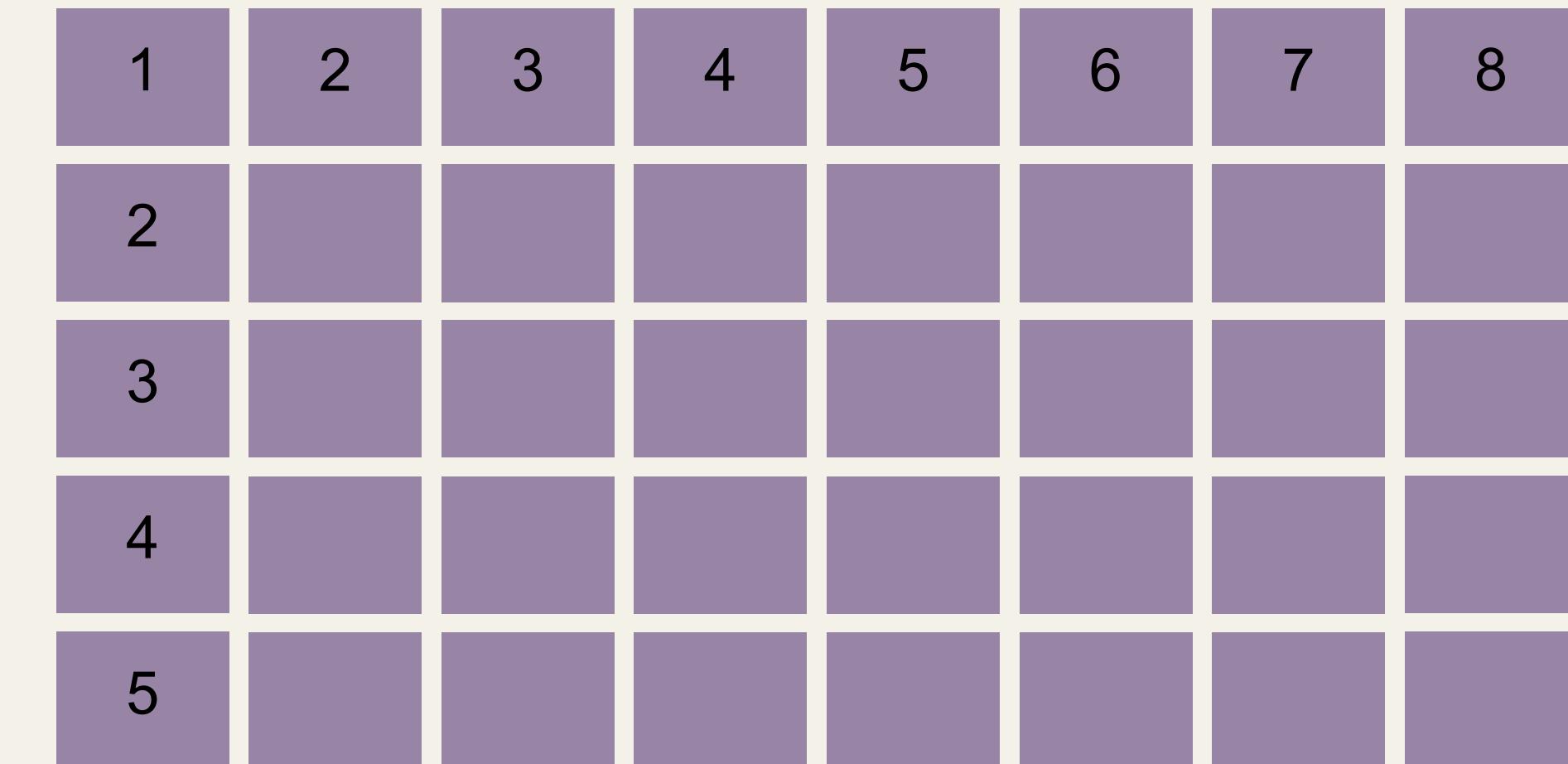
1 { }

SAR = 8:5

PAR = 5:6

DAR = 4:3

SAR × PAR = DAR



SAR = 8:5

PAR = 10:9

DAR = 16:9

$1.\bar{1}$

1 { }

PAR / DAR / SAR VISUALIZED

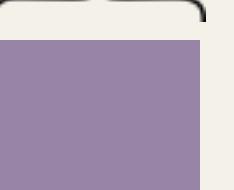


0.90
1 { 

SAR = 720:486
PAR = 10:11
DAR = 4:3

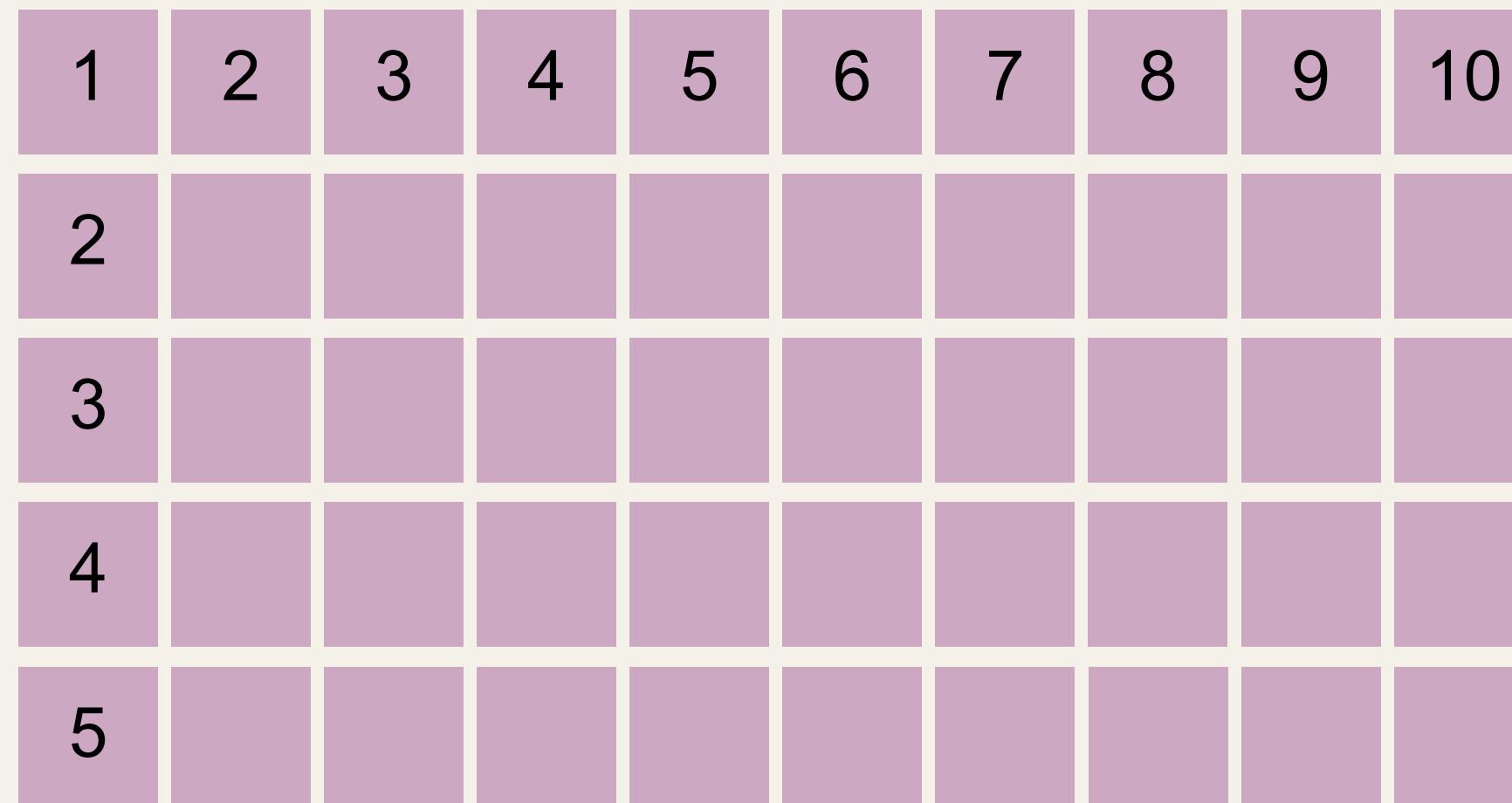
SAR × PAR = DAR



1.21
1 { 

SAR = 720:486
PAR = 40:33
DAR = 16:9

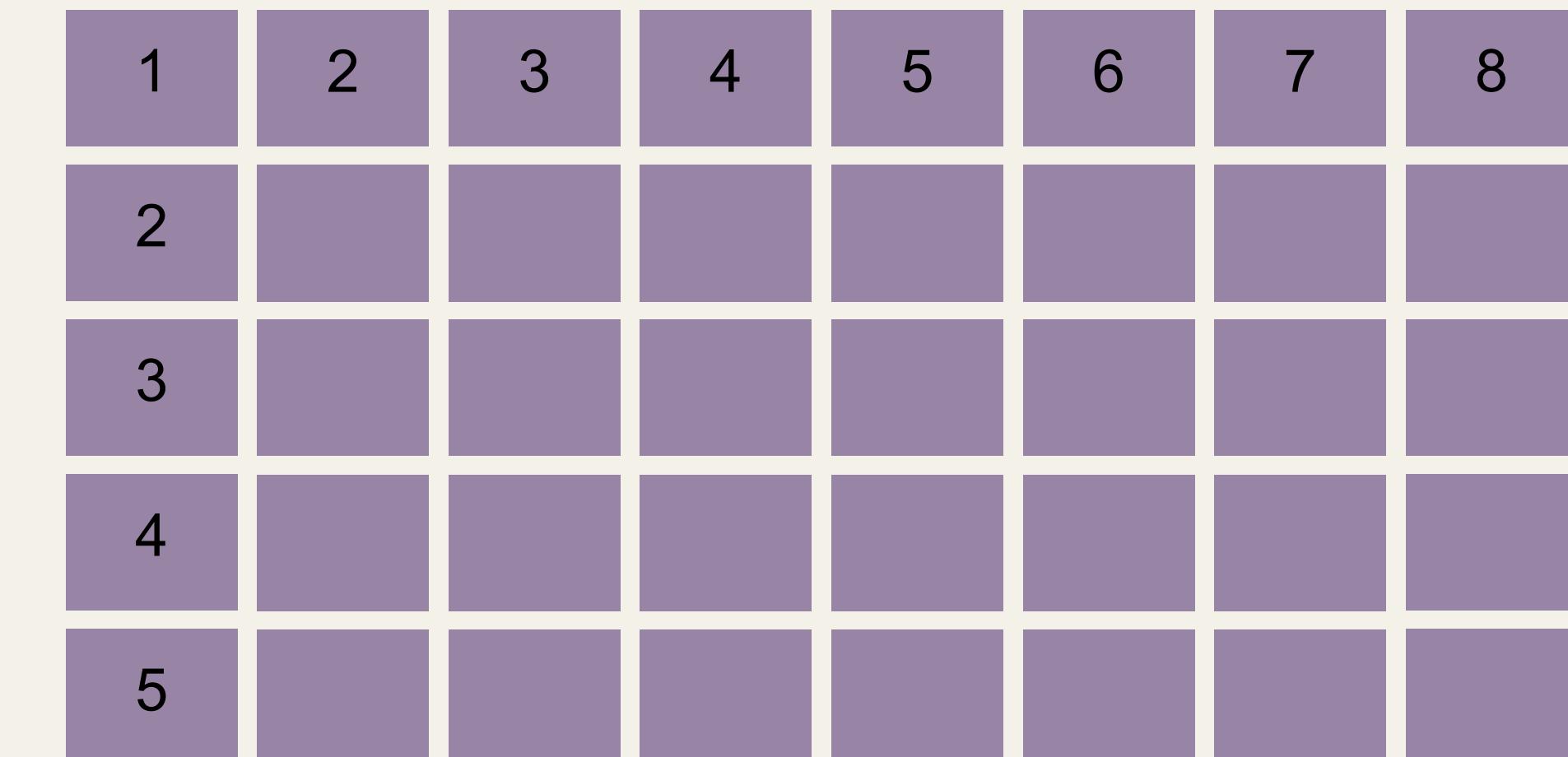
PAR / DAR / SAR VISUALIZED



0.83
1 { [] }

SAR = 10:5
PAR = 5:6
DAR = 16:9

SAR × PAR = DAR



1.11
1 { [] }

SAR = 8:5
PAR = 10:9
DAR = 16:9

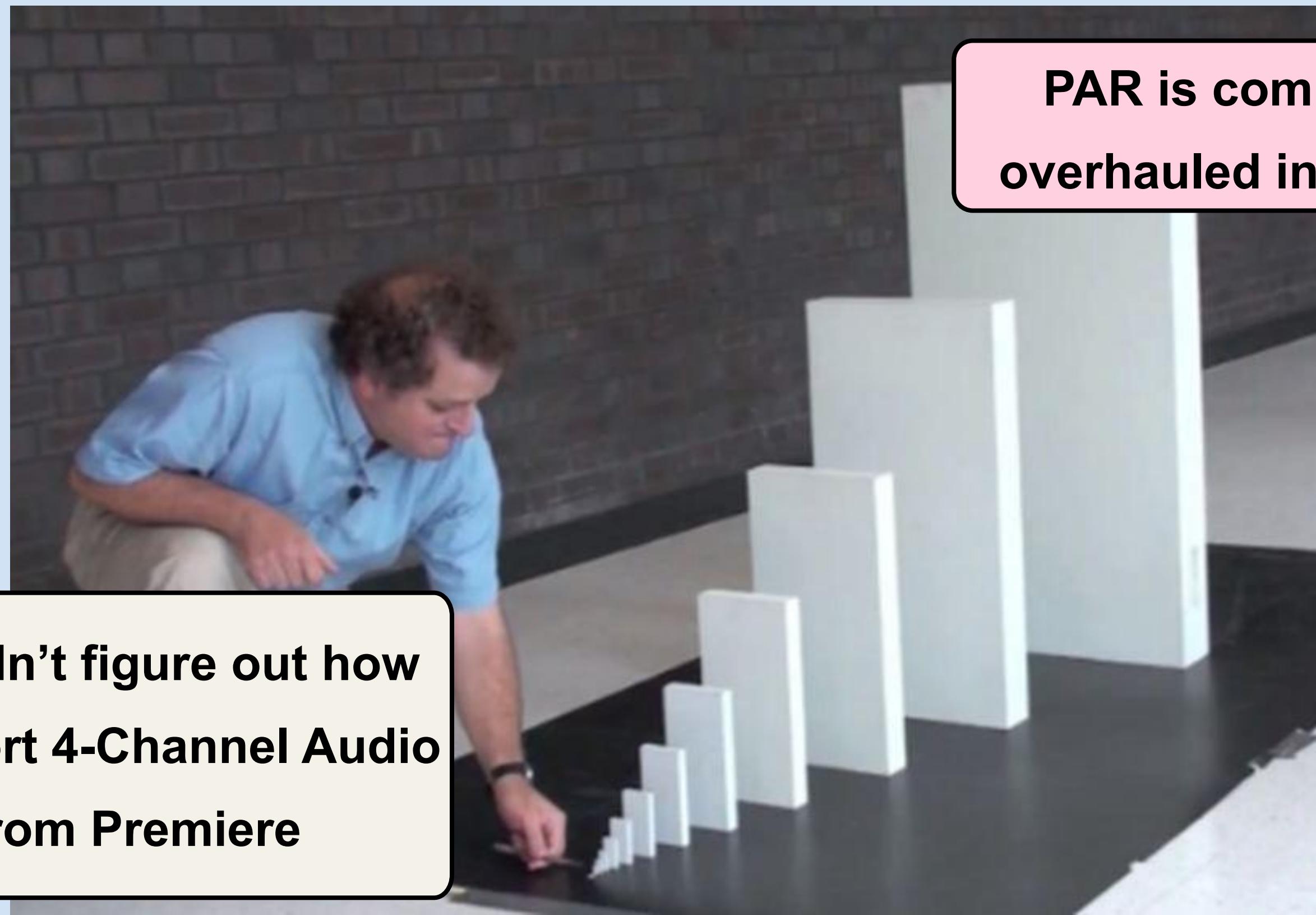
CRITICAL TAKEAWAYS

$$\text{SAR} \times \text{PAR} = \text{DAR}$$

DAR, SAR, and PAR
are technical
metadata fields within
a file

The Storage Aspect
Ratio (SAR) of a file
cannot be changed

Pixel Aspect Ratio
(PAR) can be adjusted
to get your desired
Display Aspect Ratio
(DAR)



**PAR is completely
overhauled in vrecord**

**I couldn't figure out how
to export 4-Channel Audio
from Premiere**

OFFLINE

Unable to export interlaced NTSC from Resolve



Morgan Morel



Posts: 12

Joined: Tue Aug 29, 2017 9:41

pm

Location: Culpeper, VA

Mon Sep 13, 2021 10:17 pm

Hello,

At the moment it is impossible to export interlaced NTSC 29.97 files to MOV from Resolve. This feature would be incredibly useful for archival workflows, where we wish to preserve the interlaced nature of files captured from analog video tapes. Thank you!



A short and simple request

THE CONVERSATION STARTED TO DRIFT

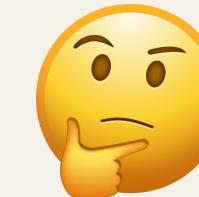
Why don't you just use ProRes?



Why are you working with SD?



**vrecord files have funky aspect ratio
metadata?**



OFFLINE

Re: Unable to export interlaced NTSC from Resolve

Andrew Kolakowski

Posts: 9283

Joined: Tue Sep 11, 2012
10:20 am
Location: Poland

Thu Sep 16, 2021 9:45 am

I just realised that 40/27 is a NTSC frame aspect ratio (720/486).

Problem is that this **is not what you should use in MOV headers.**

MOV headers need pixel aspect ratio (PAR) which later is applied on top of frame aspect to give final display aspect.

For NTSC 4/3 PAR is either:

10/11 for case when you have active picture using 704 lines (you should see few black pixels on the sides).

8/9 if you treat whole 720 lines as active picture

If you use D1 as source then you use 10/11 and also add 8 pixels sides crop flag for clean aperture.

When you open such a file in QT7 then it will properly crop sides and display image at final aspect of:
 $704/480 \times 10/11 = 1.33(3)$

OFFLINE

Re: Unable to export interlaced NTSC from Resolve

Andrew Kolakowski

Posts: 9283

Joined: Tue Sep 11, 2012
10:20 am
Location: Poland

Mon Sep 20, 2021 8:14 pm

Premiere uses "analog" flagging with 704 active lines and 10/11 PAR. There is no way to change it.

Resolve flagging is messed up (unless fixed).

Even if you use 486 then you should not change PARs as those 6 lines should be "forgotten".

As far as I know there were never introduced separate PARs for 486 lines in any specs.

Your value of 9/10 is made up and doesn't really exist.

Andrew then figured out there is
indeed an issue



iamdamosuzuki commented on Sep 20, 2021 • edited

Member ...

Hi, I recently had a convo with somebody on the Black Magic forums about the DAR/PAR/SAR of our files. The dude was a bit curt, but his concern seems to be that we're not using the correct values for these. You can see the post [here](#).

Just to be clear, I'm using PAR to refer to Pixel Aspect Ratio, where a value of 1 would be square pixels. I know that FFmpeg uses SAR (sample aspect ratio) to refer to what others generally called PAR (pixel aspect ratio), but in this post i'm saying PAR is pixel aspect ratio and SAR is (storage aspect ratio)

The argument is that in D1 video files should have the following attributes:

Frame Size: 720x486 / SAR: 720/486

Clean aperture (active video): 704x486

DAR: 4:3

PAR: 10/11

This is what vrecord uses:

Frame Size: 720x486

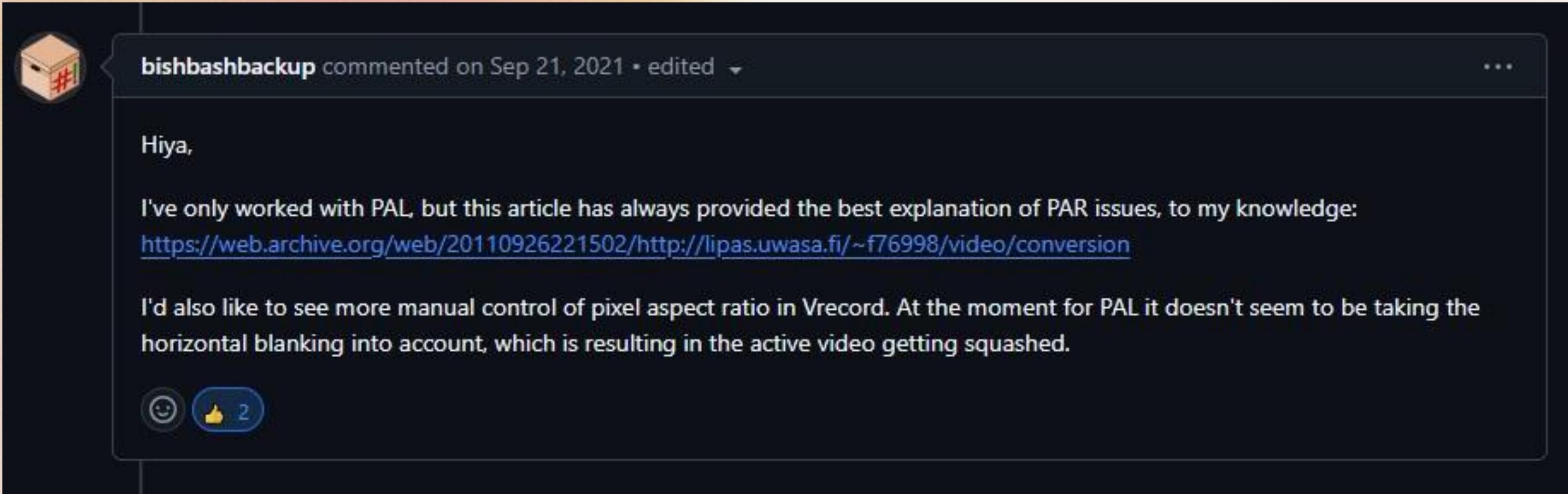
Clean aperture (active video): 720x486

DAR: 4:3

PAR: 9/10

My understanding is that what we're doing is correct because we got a 4:3 DAR, and we have the entire frame as active video since we don't want to crop any potential content and can't control the size of the frame that's coming in from the tapes. Is this correct? Should we have an option to capture the other way?





bishbashbackup commented on Sep 21, 2021 • edited

Hiya,

I've only worked with PAL, but this article has always provided the best explanation of PAR issues, to my knowledge:

<https://web.archive.org/web/20110926221502/http://lipas.uwasa.fi/~f76998/video/conversion>

I'd also like to see more manual control of pixel aspect ratio in Vrecord. At the moment for PAL it doesn't seem to be taking the horizontal blanking into account, which is resulting in the active video getting squashed.

2

Alex Habgood to the rescue

1. Introduction

There is a fair number of mind-blowing, scary oddities and secrets in the world of digital video.

One of the very first a beginner will usually encounter is the fact that [in digitized video data, pixels are often *not* considered "square" in their form](#). In most real-world digital video applications pixels have a width/height ratio – or *aspect ratio*, as it is more conveniently called – that can be something completely different from 1/1!

The second great revelation usually comes when one runs into the concept of [anamorphic 16:9 video](#) for the very first time. If it was initially hard to grasp the idea of pixels changing their shape when displayed in different environments, this one is even more baffling: the very same pixel resolution you have only just learned to associate with 4:3 displays can now suddenly represent another, totally different image geometry. In other words, the pixels have changed their shape again!

Unfortunately, these two are often the *only* things most ordinary people will ever learn about digital video and aspect ratios.

1.1 The dirty little secret revealed

Tutorials and manuals usually tend to keep very quiet and secretive about the finer technical details of digital video, particularly when it comes to aspect ratios.

Even if converting (resampling) video clips to other resolutions *is* discussed, the accompanying explanation is usually troublingly simple: the new frame dimensions are just plain wrong. It is not uncommon that the examples only deal with arbitrarily chosen ("x pixels by y pixels") frame dimensions – not the actual *pixel* aspect ratios – which is usually a good indicator that the writer may not actually take the real image geometry into account.

It is almost as if the whole aspect ratio issue was considered some sort of dirty little secret of the video industry; black magic you could never quite understand. In this case, there is really more to it than meets the eye. Confusing people with incomplete and watered-down explanations does not do anything to help.

Now that you have read this far, it is time to reward your effort with The Third Big Revelation about aspect ratios and frame sizes - the one that will change your life.

Not a single one of the commonly used digital video resolutions exactly represents the actual 4:3 or 16:9 image frame.

Shocking, isn't it? 768×576, 720×576, 704×576, 720×480, 704×480, 640×480... *none* of them is *exactly* 4:3 or 16:9; **not even the ones** that are closest to it.

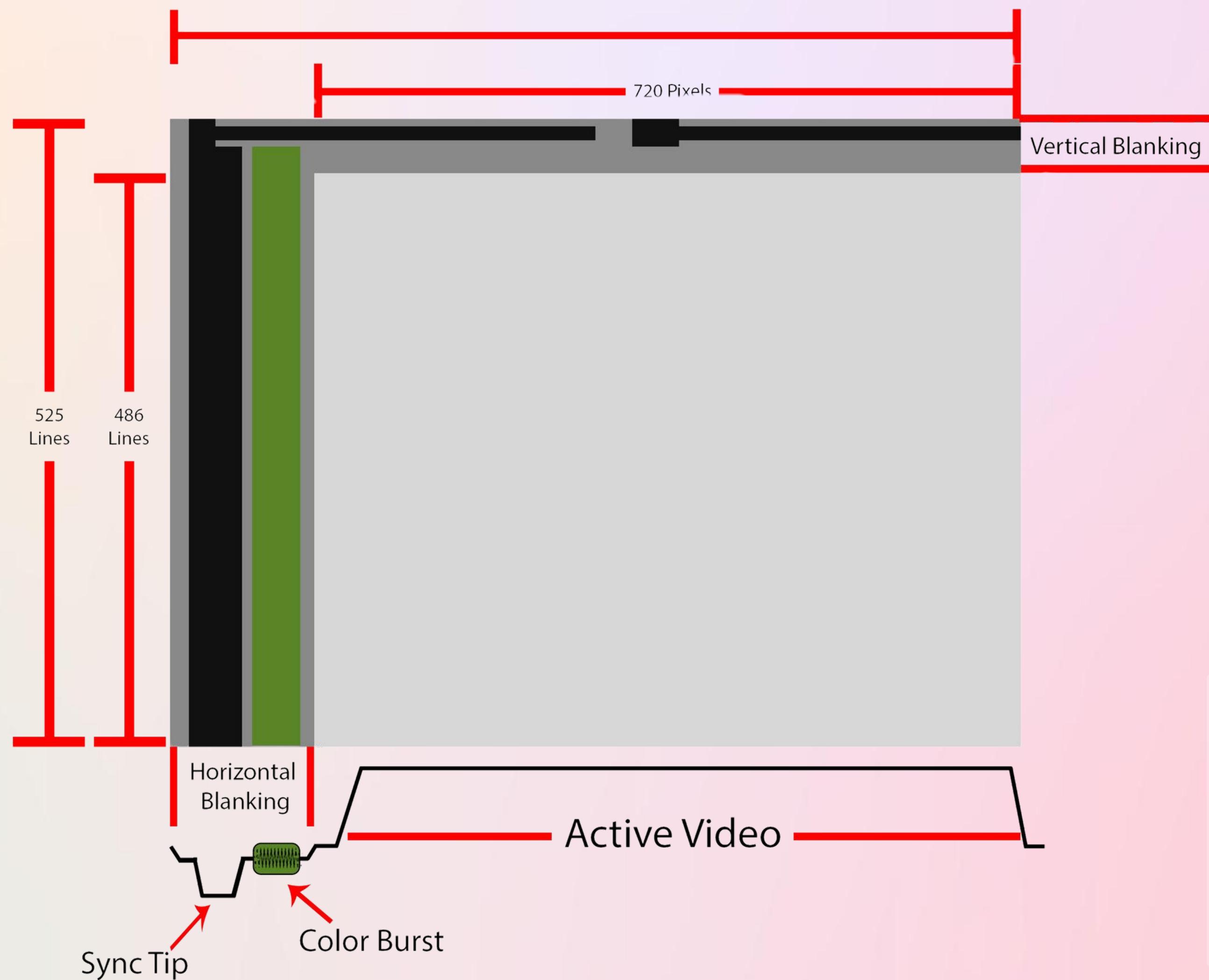
So there. Now you finally know the truth. Let's find out what it actually means.

2. The Connection Between the Analog and the Digital

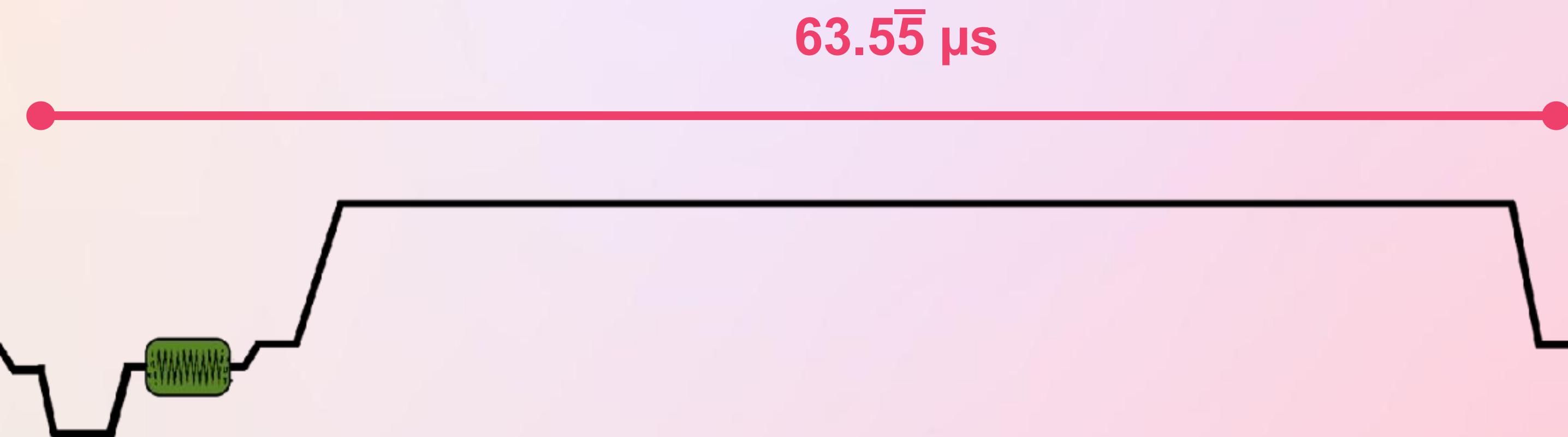
Digital video standards do not live outside the realm of analog world. On the contrary, all commonly used modern (SDTV) digital video standards have their roots in analog soil.

And now, my friend, we are rapidly closing to The Fourth Big Revelation:





HOW
DIGITIZATION
WORKS

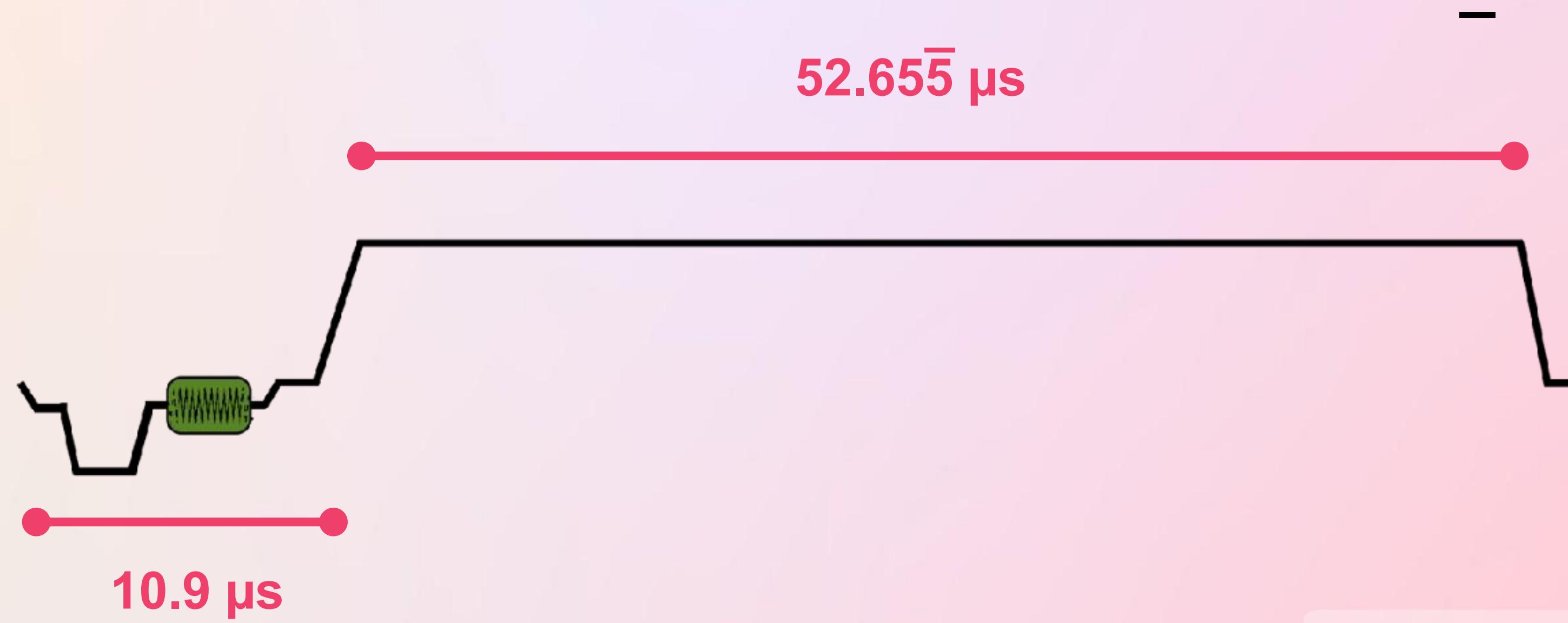


29.97003 fps × 525 lines per frame

$$\frac{30000}{1000} \times 525 = 15734.2657 \text{ lines per second}$$

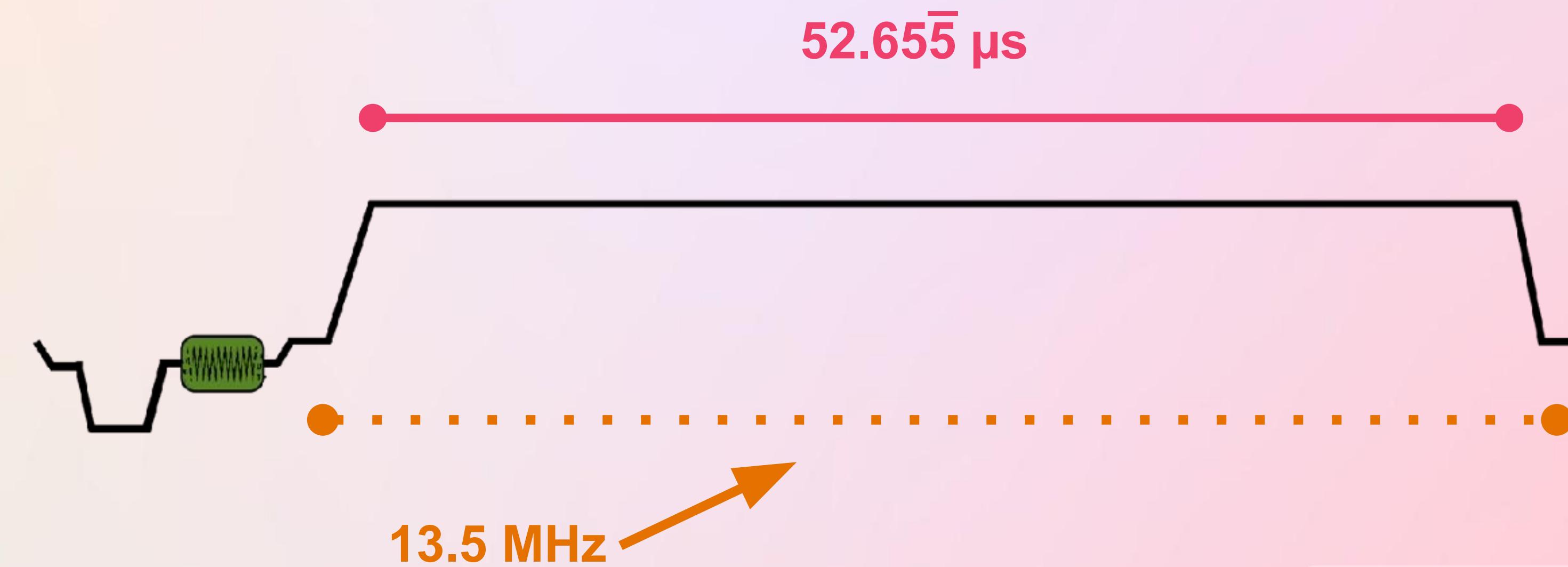
$$\frac{1}{15734.2657} = 63 + \frac{5}{9} \text{ microseconds per line}$$

HOW
DIGITIZATION
WORKS



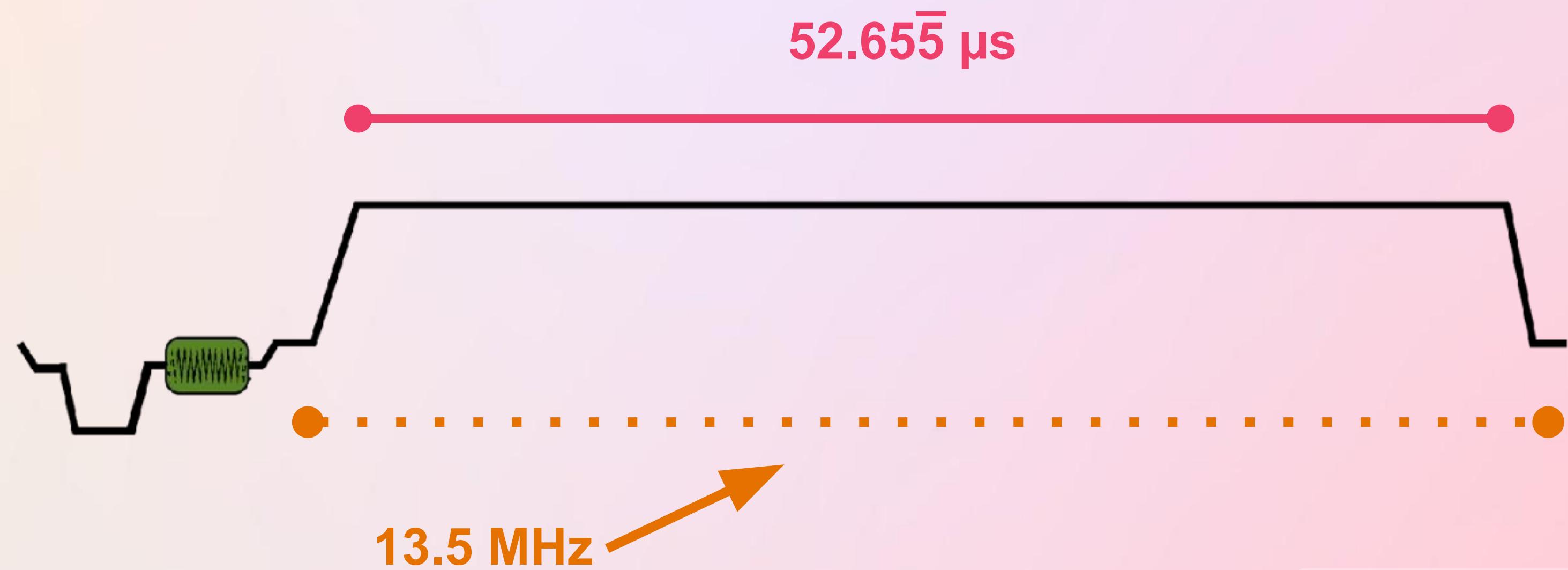
Horizontal Blanking Area is 10.9
Active video is only 52.655 μs
($63.555\mu\text{s} - 10.9\mu\text{s} = 52.655\mu\text{s}$)

HOW
DIGITIZATION
WORKS



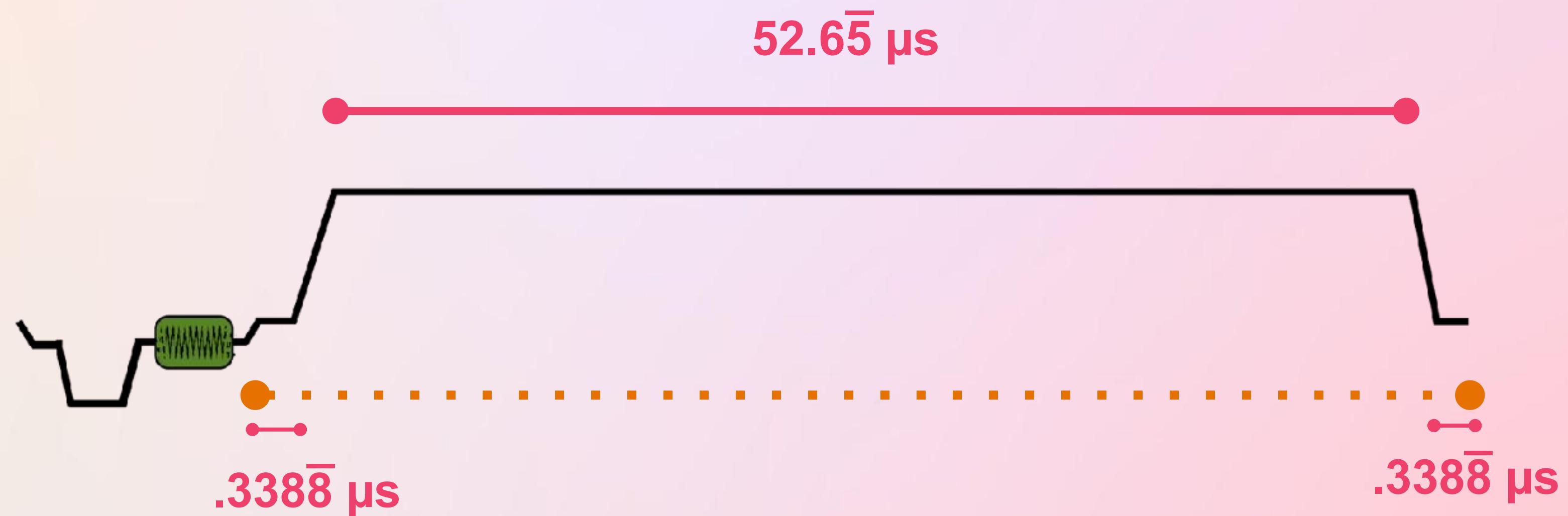
13.5 MHz decided by ITU-R BT.601

HOW
DIGITIZATION
WORKS



$$\frac{.000052655}{\left(\frac{1}{(13,500,000)}\right)} \text{ or } 52.655 \times 13.5 = 710.85$$

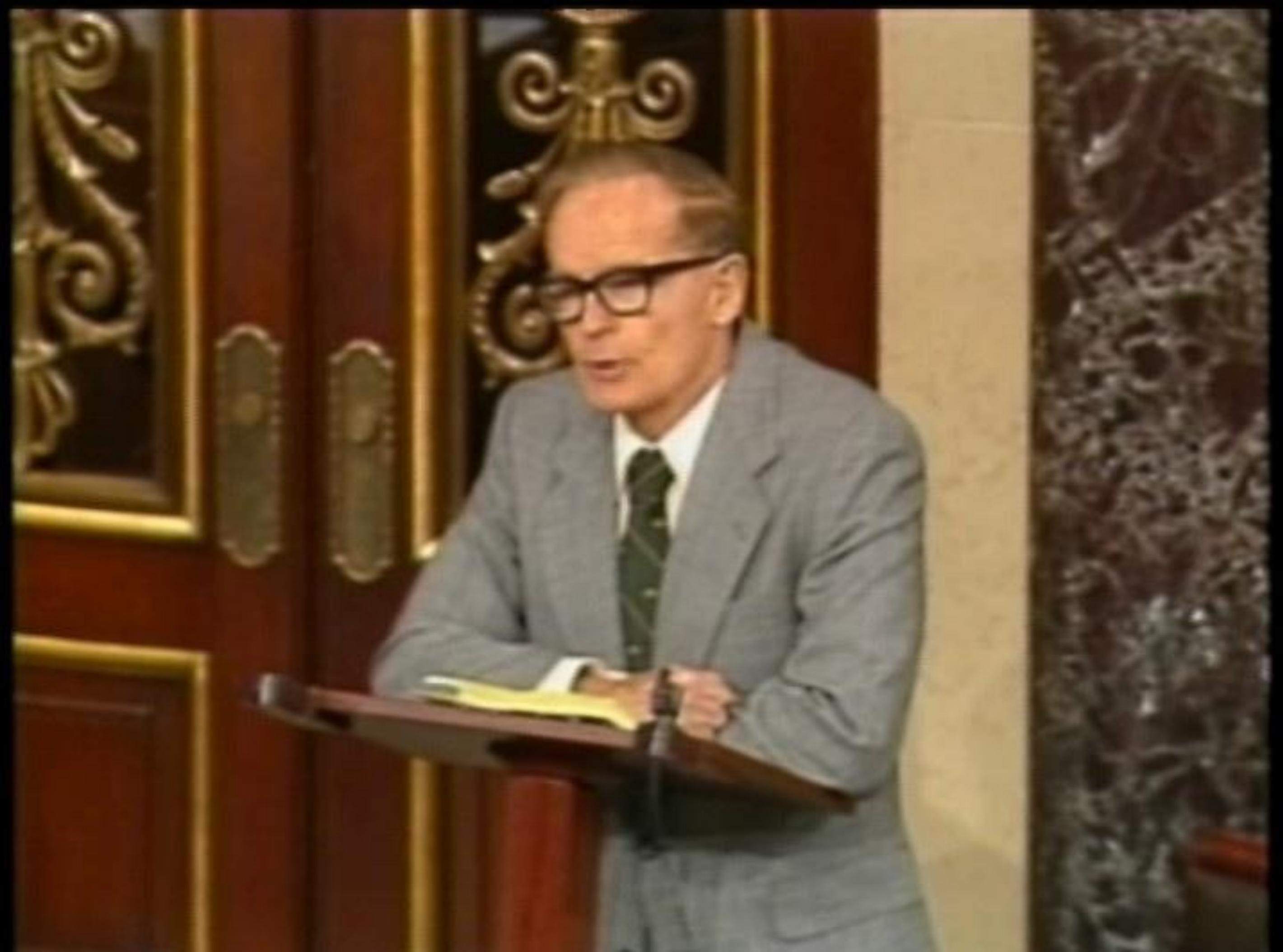
HOW
DIGITIZATION
WORKS



$$52.65 + .338\bar{8} + .338\bar{8} = 53.3\bar{3}$$

$$53.3\bar{3} \times 13.5 = 720$$

HOW
DIGITIZATION
WORKS







The formats related to 525-line systems with a 59.94 ¹ Hz field rate								
sampling matrix		sampling rate (MHz)	pixel aspect ratio (x/y)	sampling matrix width in μ s	actual active picture size		supports interlacing	notes
width	height				width	height		
720	540	ambiguous	1/1	ambiguous	720	540	N	Oddball compromise format. Better to avoid unless you really know what you are doing.
720	486	13.5	4320/4739	53.33333	710.85	486	Y	D1
720	480	13.5	4320/4739	53.33333	710.85	486	Y	DV, DVB, DVD, SVCD ³
711	486	13.5	4320/4739	52.66667	710.85	486	Y	Active picture frame for 525/59.94 systems in ITU-R BT.601-4 pixels.
704	486	13.5	4320/4739	52.14815	710.85	486	Y	
704	480	13.5	4320/4739	52.14815	710.85	486	Y	ATSC, DVD, VCD ³
648	486	12 + 1452/4739 ²	1/1	52.65556	648	486	Y	"True" computer square-pixel resolution (all 486 active scanlines)
640	480	12 + 3/11	4752/4739	52.14815	646+5/22	486	Y	D2: "industry standard" 525/59.94 square-pixel video
640	480	12 + 1452/4739 ²	1/1	52.00549	648	486	Y	"True" computer square-pixel format (cropped)
480	480	9	6480/4739	53.33333	473.9	486	Y	SVCD (2/3 of BT.601 sampling rate)
352	480	6.75	8640/4739	52.14815	355.425	486	Y	DVD
352	240	6.75	4320/4739	52.14815	355.425	243	N	VCD, DVD
320	240	6 + 3/22	4572/4739	52.14815	324	243	N	1/4 of 640×480

¹ 59.94 Hz is only a conventional approximation; the mathematically exact field rate is [60 Hz * 1000/1001](#).

² A calculated sampling rate, represented here only for completeness. Does not exist in actual 525/625 video equipment.

³ Only used for still images.

The formats related to 525-line systems with a 59.94¹ Hz field rate

sampling matrix		sampling rate (MHz)	pixel aspect ratio (x/y)	sampling matrix width in μ s	actual active picture size		supports interlacing	notes
width	height				width	height		
720	540	ambiguous	1/1	ambiguous	720	540	N	Oddball compromise format. Better to avoid unless you really know what you are doing.
720	486	13.5	4320/4739	53.33333	710.85	486	Y	D1
720	480	13.5	4320/4739	53.33333	710.85	480	Y	DV, VHS, DVD, SVCD ³
711	486	13.5	4320/4739	52.66667	710.85	486	Y	Active picture frame for 525/59.94 systems in ITU-R BT.601-4 pixels.
704	486	13.5	4320/4739	52.14815	710.85	486	Y	
704	480	13.5	4320/4739	52.14815	710.85	486	Y	ATSC, DVD, VCD ³
648	486	12 + 1452/4739 ²	1/1	52.65556	648	486	Y	"True" computer square-pixel resolution
640	480	12 + 3/11	4752/4739	52.14815	646+5/22	486	Y	
640	480	12 + 1452/4739 ²	1/1	52.00549	648	486	Y	
480	480	9	6480/4739	53.33333	473.9	486	Y	
352	480	6.75	8640/4739	52.14815	355.425	486	Y	DVD
352	240	6.75	4320/4739	52.14815	355.425	243	N	VCD, DVD
320	240	6 + 3/22	4572/4739	52.14815	324	243	N	1/4 of 640×480

D1 standardized as part
of ITU-R BT.601

¹ 59.94 Hz is only a conventional approximation; the mathematically exact field rate is [60 Hz * 1000/1001](#).

² A calculated sampling rate, represented here only for completeness. Does not exist in actual 525/625 video equipment.

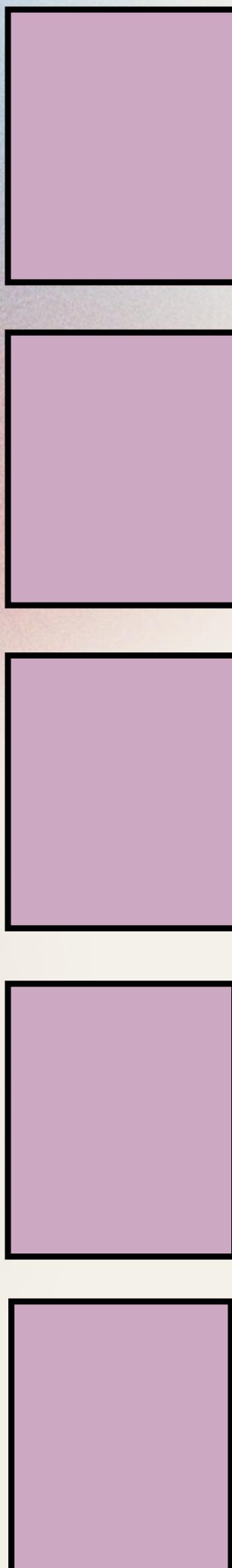
³ Only used for still images.

Prove it With Math

SAR x PAR = DAR

$$\frac{710.85}{486} \times \frac{4320}{4739} = \frac{4}{3}$$

$$\frac{720}{486} \times \frac{4320}{4739} = 1.35049589$$



NTSC Video

PAR = 1/1

OpenCube

PAR = 4320/4739

True D1

PAR = 10/11

new vrecord
Black Magic
Premiere

PAR = 9/10

old vrecord
old SAMMA Solo

PAR = 8/9

DV, DVCAM,
DVCPRO, DVD

More Math

$$\text{SAR} \quad \times \quad \text{PAR} \quad = \quad \text{DAR}$$

$$\frac{710.85}{486} \quad \times \quad \frac{9}{10} \quad = \quad 1.31638889$$

$$\frac{720}{486} \quad \times \quad \frac{9}{10} \quad = \quad \frac{4}{3}$$

PAR of 9/10 makes the entire 720 frame have a DAR of 4/3, but we know this isn't actually correct!

This is how the SAMMA did it,
which we now know is wrong

More Math

$$\text{SAR} \quad \times \quad \text{PAR} \quad = \quad \text{DAR}$$

$$\frac{710.85}{486} \quad \times \quad \frac{10}{11} \quad = \quad 1.32968575$$

$$\frac{720}{486} \quad \times \quad \frac{10}{11} \quad = \quad 1.34680135$$

PAR of 10/11 makes the
710.85 frame with video have
a DAR of very nearly 4/3
(off by 0.003)

More Math

$$\text{SAR} \times \text{PAR} = \text{DAR}$$

$$\frac{710.85}{486} \times \frac{8}{9} = 1.30013717$$

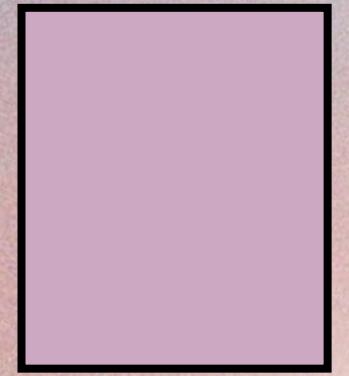
$$\frac{720}{480} \times \frac{8}{9} = \frac{4}{3}$$

8/9 is for DV, which has no blanking on the side and 6 fewer horizontal lines. Thus the full 720x480 frame is 4:3



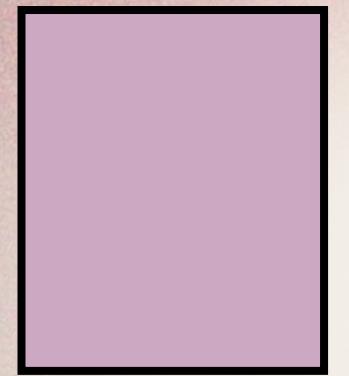
PAR = 1/1

Makes very wide files



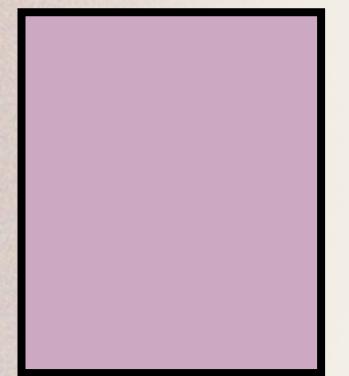
PAR = 4320/4739 → **True D1**

Technical correct but
nobody uses it



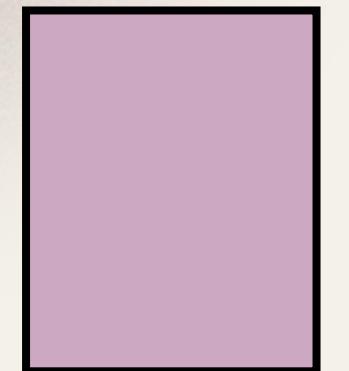
PAR = 10/11 → **new vrecord**
Black Magic
Premiere

Most commonly used in
commercial software



PAR = 9/10 → **old vrecord**
old SAMMA Solo

This shouldn't be
used!



PAR = 8/9 → **DV, DVCAM,**
DVCPRO, DVD

Used only for 720x480
digital video

Forming a Community Consensus

Storage Aspect Ratio and Display Aspect Ratio are just metadata fields

Changing these fields doesn't affect the preservation of the content

How do we form a community consensus about these fields?





"..." -- Skip Elsheimer, 2024-12-05

Pixel Aspect Ratio

Crop Aspect Ratio

Video Aspect Ratio

Image Aspect Ratio

Frame Aspect Ratio

Native Aspect Ratio

Picture Aspect Ratio

Display Aspect Ratio

Sample Aspect Ratio

Storage Aspect Ratio

Viewing Aspect Ratio

Encoded Aspect Ratio

Projection Aspect Ratio

Pixel Aspect Ratio

Crop Aspect Ratio

Video Aspect Ratio

Image Aspect Ratio

Frame Aspect Ratio

Native Aspect Ratio

Picture Aspect Ratio

Display Aspect Ratio

Sample Aspect Ratio

Storage Aspect Ratio

Viewing Aspect Ratio

Encoded Aspect Ratio

Projection Aspect Ratio



Pixel Aspect Ratio

Crop Aspect Ratio

Video Aspect Ratio

Image Aspect Ratio

Frame Aspect Ratio

Native Aspect Ratio

Picture Aspect Ratio

Display Aspect Ratio

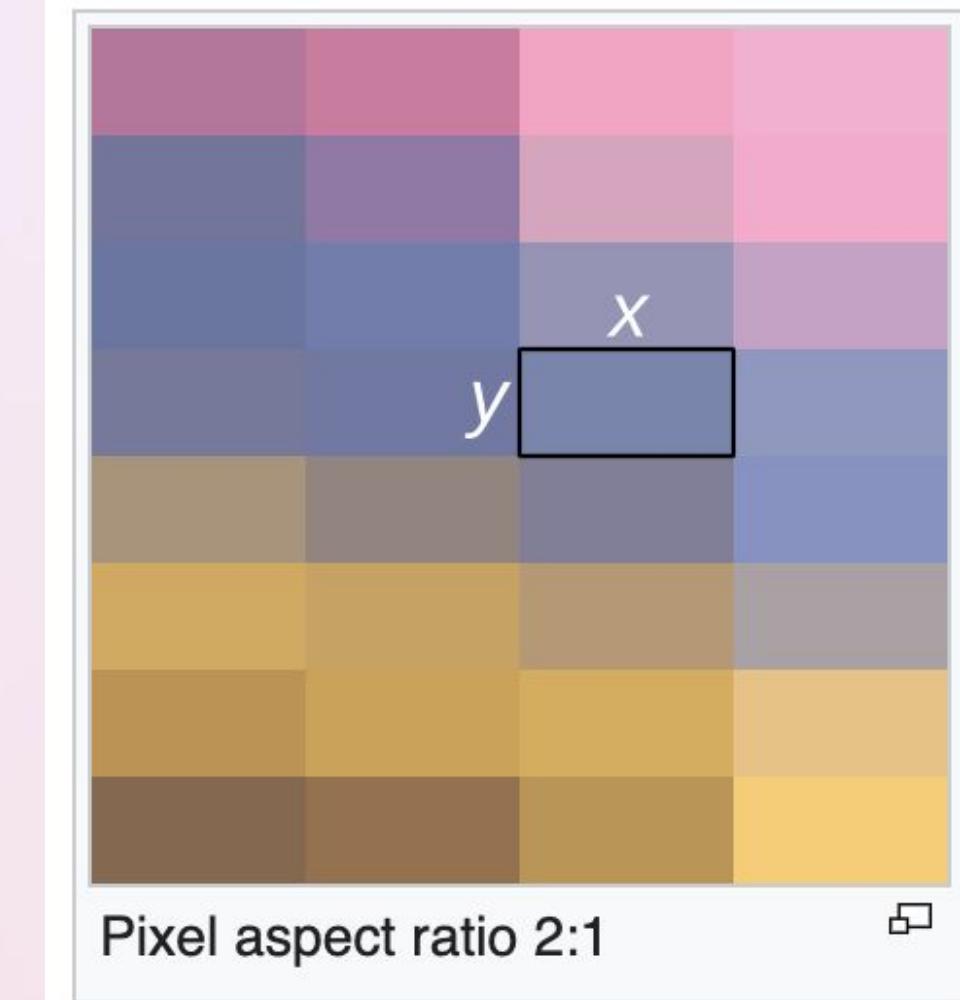
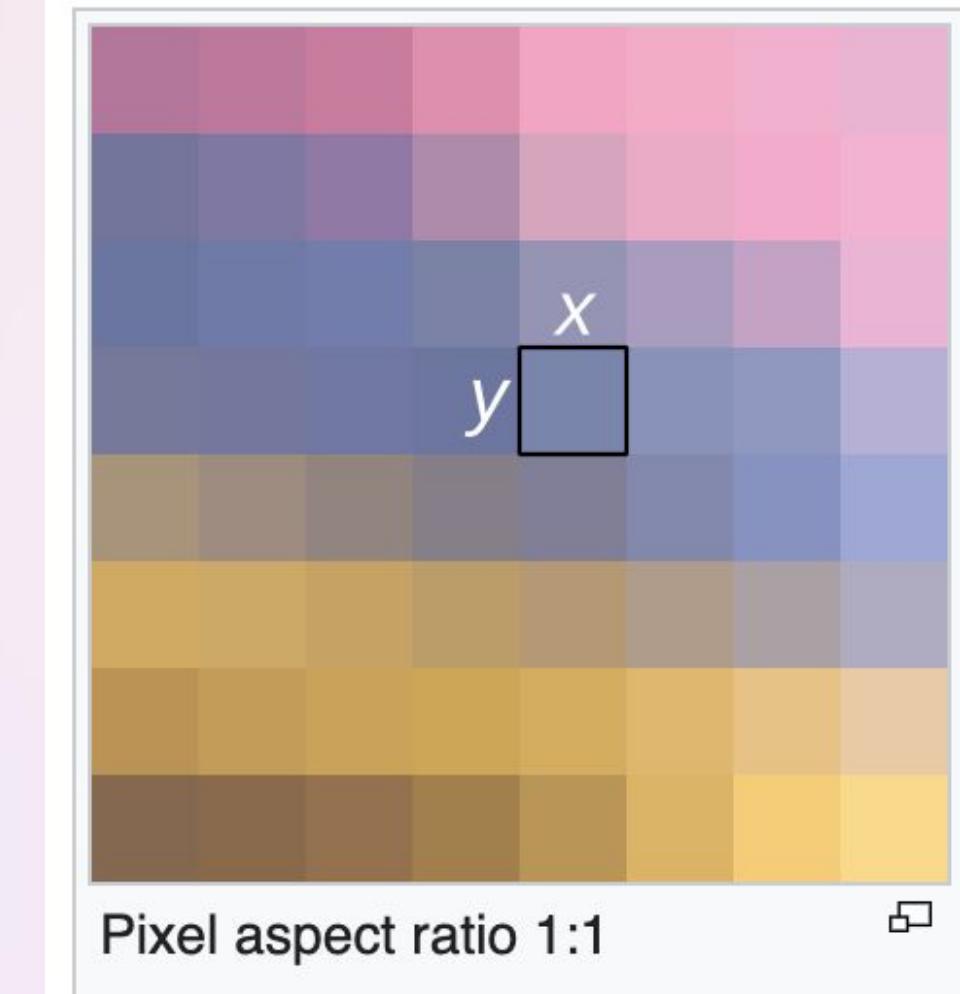
Sample Aspect Ratio

Storage Aspect Ratio

Viewing Aspect Ratio

Encoded Aspect Ratio

Projection Aspect Ratio



Pixel Aspect Ratio -> PAR

Crop Aspect Ratio

Video Aspect Ratio

Image Aspect Ratio

Frame Aspect Ratio

Native Aspect Ratio

Picture Aspect Ratio -> PAR

Display Aspect Ratio

Sample Aspect Ratio

Storage Aspect Ratio

Viewing Aspect Ratio

Encoded Aspect Ratio

Projection Aspect Ratio

Pixel Aspect Ratio

Crop Aspect Ratio

Video Aspect Ratio

Image Aspect Ratio

Frame Aspect Ratio

Native Aspect Ratio

Picture Aspect Ratio

Display Aspect Ratio

Sample Aspect Ratio -> SAR

Storage Aspect Ratio -> SAR

Viewing Aspect Ratio

Encoded Aspect Ratio

Projection Aspect Ratio

Picture Aspect Ratio
aka
Storage Aspect Ratio



Pixel Aspect Ratio
aka
Sample Aspect Ratio



SAR * PAR = DAR



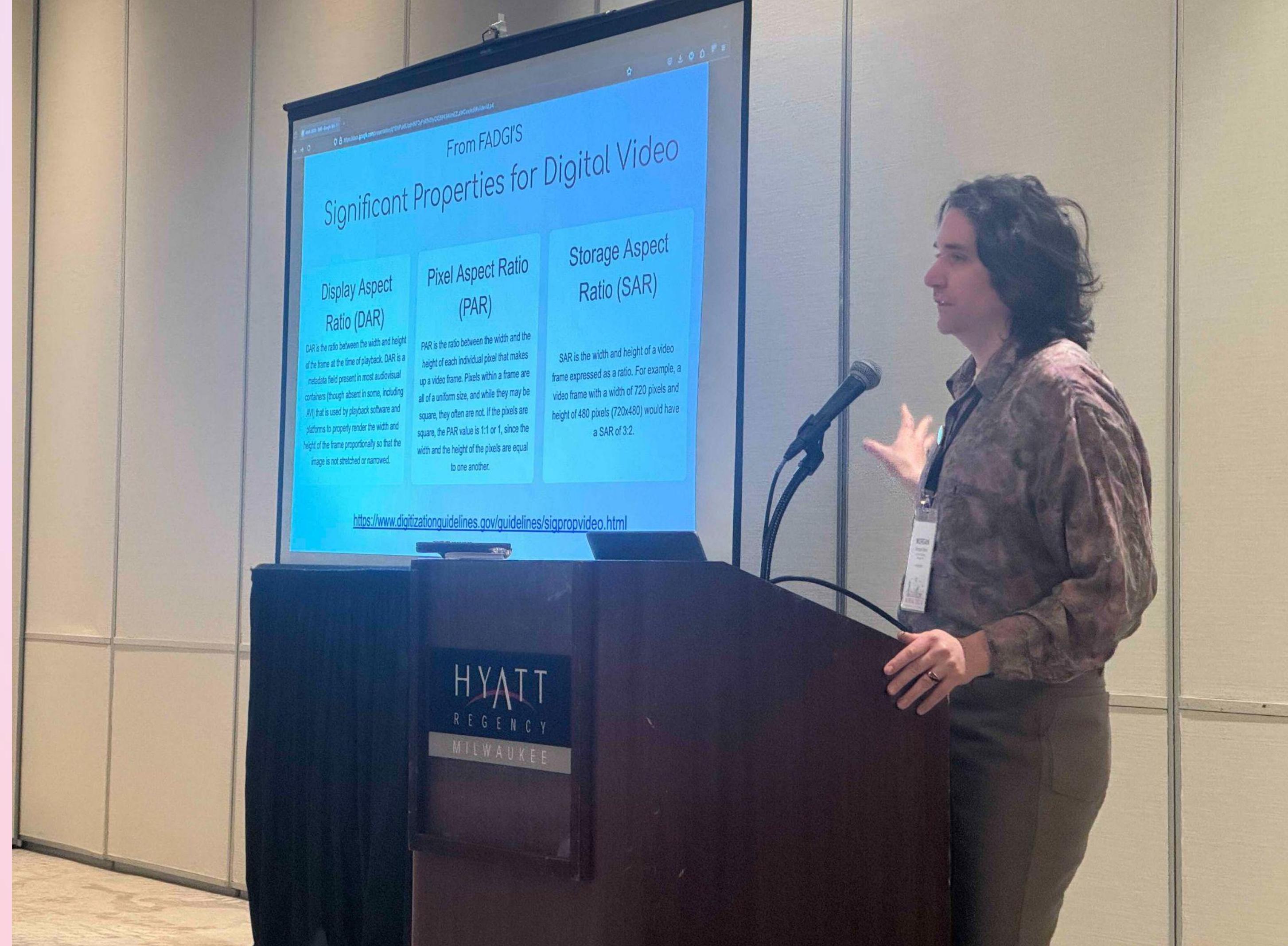
SAR?

*

PAR?

=

DAR?



$$(W/H) * SAR = DAR$$
$$(W/H) / DAR = SAR$$

$$SAR * PAR = DAR$$

$$\begin{aligned} & \text{Storage Aspect Ratio} * \\ & \text{Pixel Aspect Ratio} = \\ & \text{Display Aspect Ratio} \end{aligned}$$

$$\begin{aligned} & (\text{Width} / \text{Height}) * \\ & \text{Sample Aspect Ratio} = \\ & \text{Display Aspect Ratio} \end{aligned}$$
$$\begin{aligned} & (\text{Width} / \text{Height}) / \\ & \text{Display Aspect Ratio} = \\ & \text{Sample Aspect Ratio} \end{aligned}$$

Pixel Aspect Ratio

Crop Aspect Ratio

Video Aspect Ratio

Image Aspect Ratio

Frame Aspect Ratio

Native Aspect Ratio

Picture Aspect Ratio

Display Aspect Ratio

Sample Aspect Ratio

Storage Aspect Ratio

Viewing Aspect Ratio

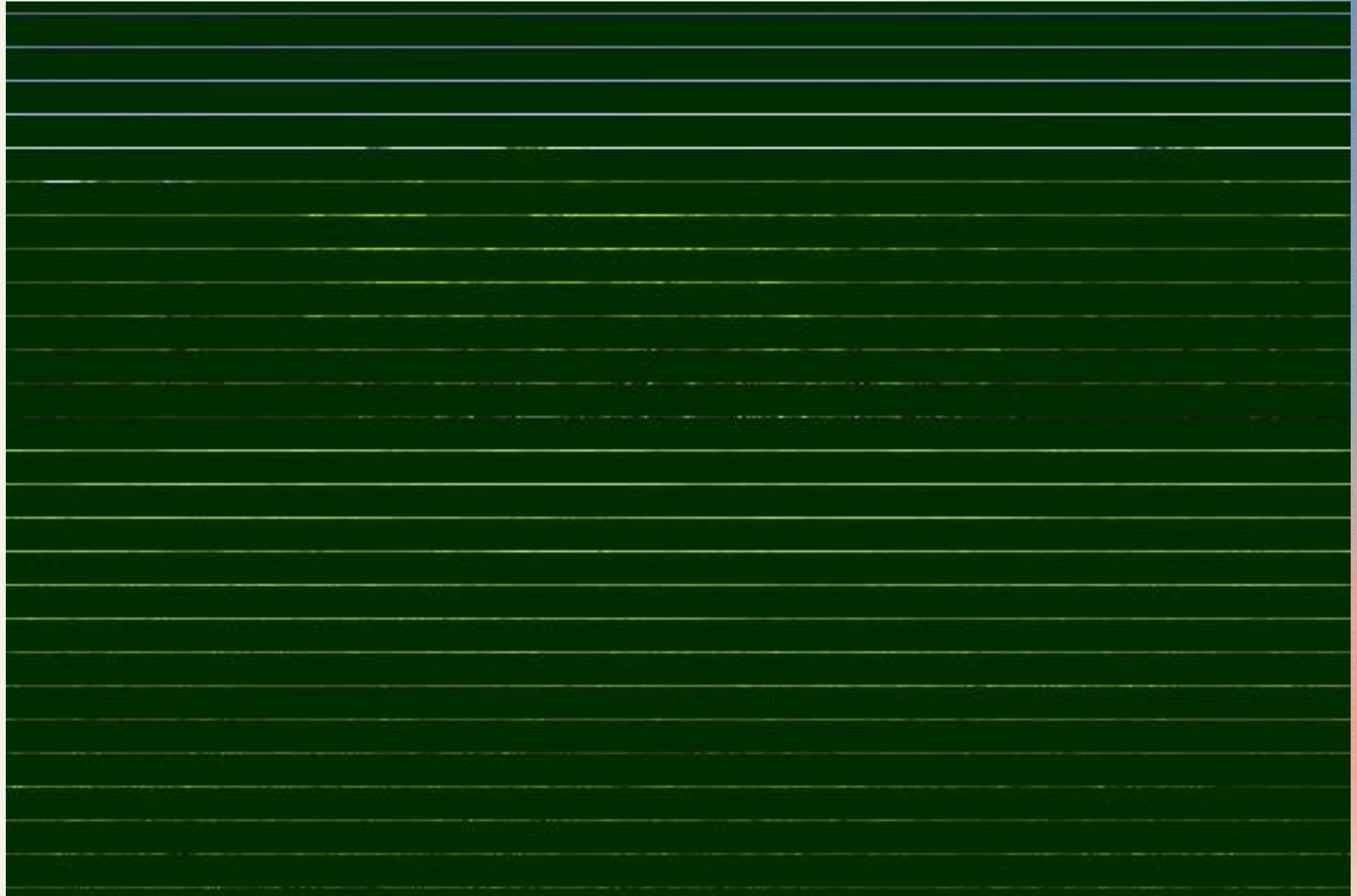
Encoded Aspect Ratio

Projection Aspect Ratio

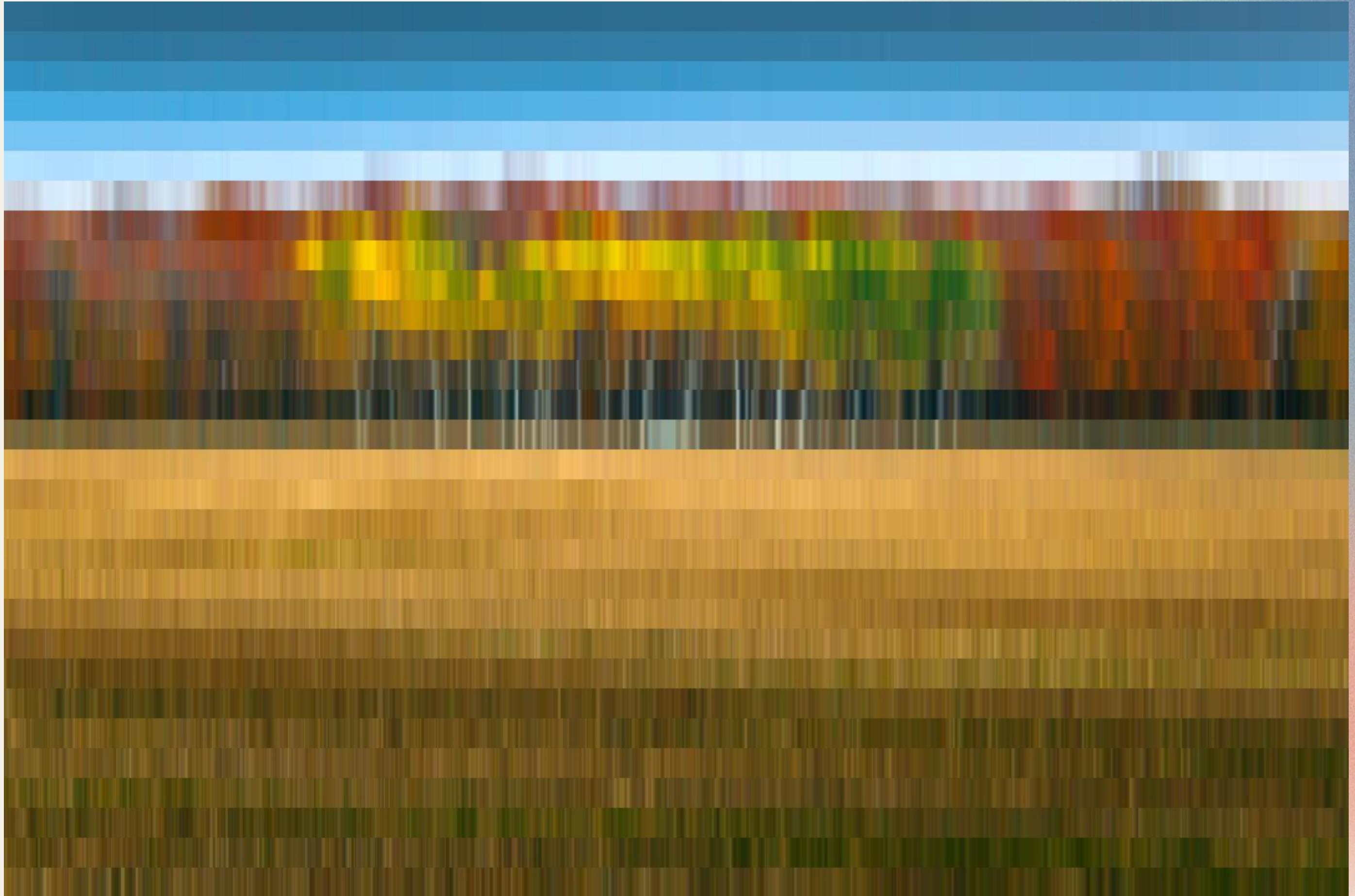
Samples :D



30 scan lines
sampled



30 scan lines
sampled



480 scan lines
sampled



Samples :D



30 samples



40x30 samples

40 samples

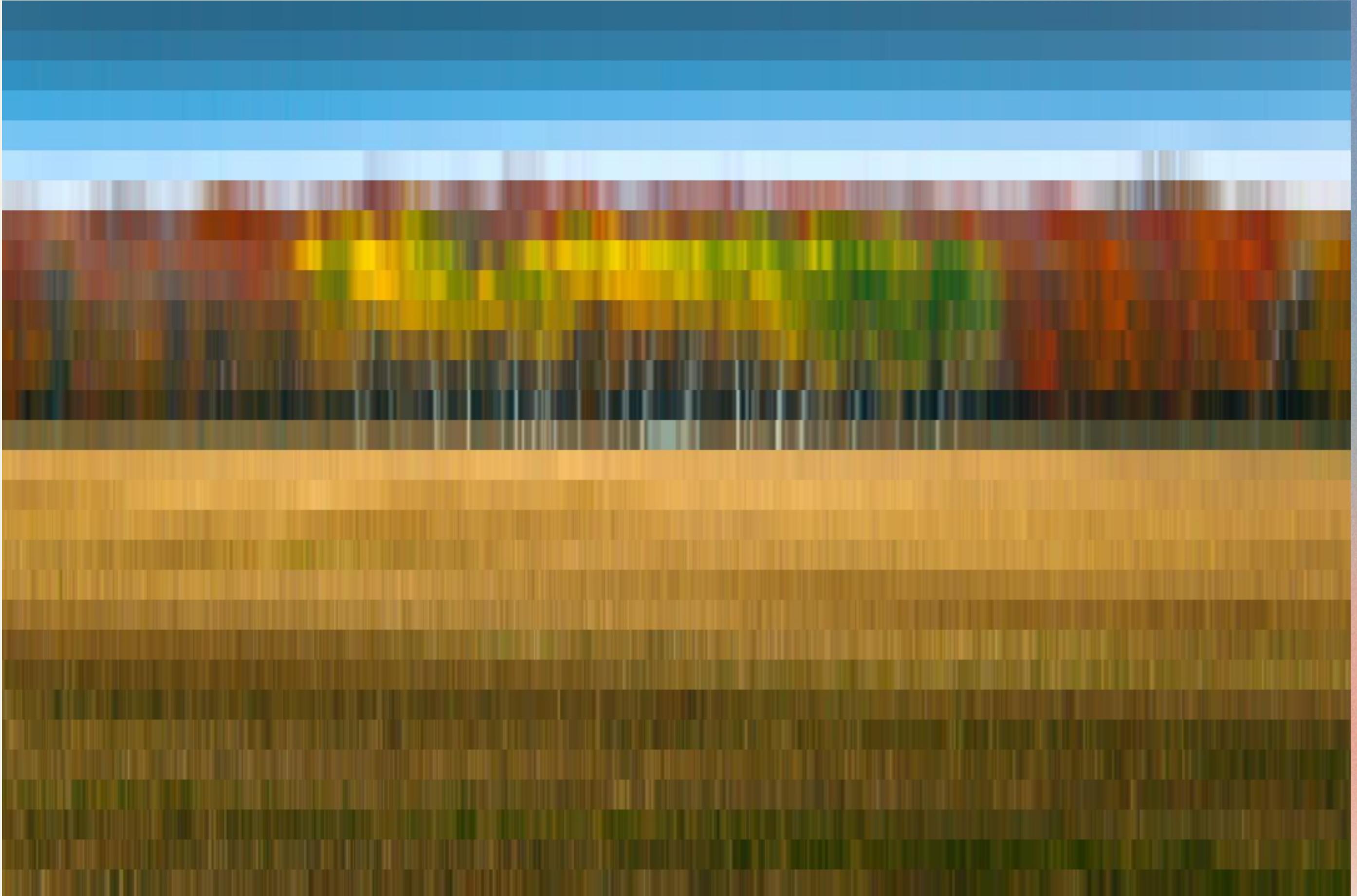
30 samples



40x30 samples
Scaled to 1080x720
Sample aspect ratio of 1/1

40 samples

30 samples



1080x30 samples

Scaled to 1080x720

Sample aspect ratio of 1/27

1080 samples

40x720 samples
Scaled to 1080x720
Sample aspect ratio of 24/1

720 samples

40 samples



Sample Aspect Ratio?

30 samples

40x30 samples

40 samples

30 samples

40x30 samples

sample aspect
ratio denominator

sample aspect
ratio numerator

40 samples

40x30 samples

30 samples

sample aspect ratio denominator

sample aspect ratio numerator

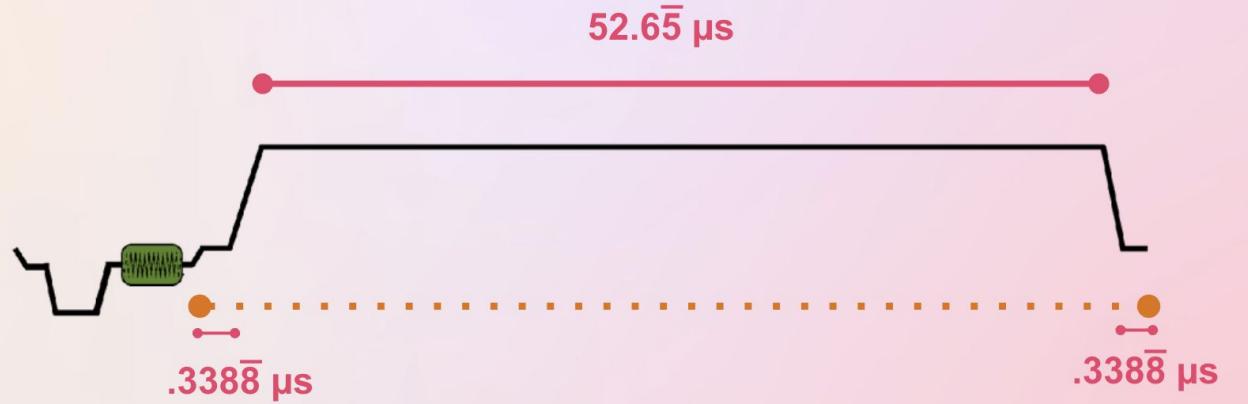
40 samples

Pixel aspect ratio 1:1

Pixel aspect ratio 2:1



30 scan lines
sampled



$$52.65 + .338\bar{8} + .338\bar{8} = 53.3\bar{3}$$
$$53.3\bar{3} \times 13.5 = 720$$

HOW
DIGITIZATION
WORKS

Aspect Ratio in Formats

Aspect Ratio in DV 25

DISP: Display select mode

DISP	Aspect ratio and format	Position
0 0 0	4:3 full format	Not applicable
0 0 1	Reserved	
0 1 0	16:9 full format (squeeze)	Not applicable
0 1 1		
1 1 1	Reserved	

Aspect Ratio in DV25

DISP: Display select mode

DISP	Aspect ratio and format	Position
0 0 0	4:3 full format	Not applicable
0 0 1	Reserved	
0 1 0	16:9 full format (squeeze)	Not applicable
0 1 1		Reserved
1 1 1		

image width	image height	sample aspect ratio width	sample aspect ratio height	display aspect ratio width	display aspect ratio height
(720 /480) *		(8 /9) =		(4 /3)	
(720 /480) *		(32 /27) =		(16 /9)	
(720 /576) *		(16 /15) =		(4 /3)	
(720 /576) *		(64 /45) =		(16 /9)	

Aspect Ratio in Matroska

DisplayWidth	4	0x54B0 -	-	not 0	[desc.]	u * * * * *	Width of the video frames to display. Applies to the video frame after cropping (PixelCrop* Elements). If the DisplayUnit of the same TrackEntry is 0, then the default value for DisplayWidth is equal to PixelWidth - PixelCropLeft - PixelCropRight, else there is no default value.
DisplayHeight	4	0x54BA -	-	not 0	[desc.]	u * * * * *	Height of the video frames to display. Applies to the video frame after cropping (PixelCrop* Elements). If the DisplayUnit of the same TrackEntry is 0, then the default value for DisplayHeight is equal to PixelHeight - PixelCropTop - PixelCropBottom, else there is no default value.
DisplayUnit	4	0x54B2 mand.	-	-	0	u * * * * *	How DisplayWidth & DisplayHeight are interpreted. 0 - pixels, 1 - centimeters, 2 - inches, 3 - display aspect ratio, 4 - unknown

Aspect Ratio in AVI

Video Format Token

```
enum {FORMAT_UNKNOWN, FORMAT_PAL_SQUARE, FORMAT_PAL_CCIR_601,  
      FORMAT_NTSC_SQUARE, FORMAT_NTSC_CCIR_601,...} VIDEO_FORMAT;
```

The format token indicates that a known standard is defined for the following data fields. Those fields must be filled, but their value can be expected to be the defined standard. If the format is defined as FORMAT_UNKNOWN then the fields may contain special values. Known tokens are defined in the table below:

OpenDML AVI File Format Extensions

Version 1.02

OpenDML AVI M-JPEG File Format Subcommittee

Last revision: February 28, 1996

Reformatting: September 1997

Tok en	Stan dard	Ref res	H- tota l	V- tot al	Frame Aspect Ratio	F ra m	F ra m	Pixel Aspect Ratio (derived)
NTS C CCI R 601	NTS C	60	858	525	0x0004 0003 (4:3)	72 0	48 5	2160:194 0
NTS C SQU ARE	NTS C	60	780	525	0x0004 0003 (4:3)	64 0	48 0	1:1
PAL CCI R 601	PAL	50	864	625	0x0004 0003 (4:3)	72 0	57 6	2160:230 4
PAL SQU ARE	PAL	50	944	625	0x0004 0003 (4:3)	76 8	57 6	1:1

Aspect Ratio in QuickTime

Pixel aspect ratio ('pasP')

An extension that specifies the height-to-width ratio of pixels found in the video sample.

Overview

This is a required extension for MPEG-4 and uncompressed Y'CbCr video formats when non-square pixels are used. It is optional when square pixels are used.

The units of measure for the hSpacing and vSpacing parameters are not specified, as only the ratio matters. The units of measure for height and width must be the same, however.

The following table shows some common pixel aspect ratios.

Description	hSpacing	vSpacing
4:3 square pixels (composite NTSC or PAL)	1	1
4:3 non-square 525 (NTSC)	10	11
4:3 non-square 625 (PAL)	59	54
16:9 analog (composite NTSC or PAL)	4	3
16:9 digital 525 (NTSC)	40	33
16:9 digital 625 (PAL)	118	81
1920x1080 UDTV (per SMPTE 260M, 1992)	112	112

Data fields

Size

An unsigned 32-bit integer holding the size of the pixel aspect ratio atom.

Type

An unsigned 32-bit field.

hSpacing

An unsigned 32-bit integer specifying the horizontal spacing of pixels, such as luma sampling instants for Y'CbCr or YUV video.

vSpacing

An unsigned 32-bit integer specifying the vertical spacing of pixels, such as video picture lines.

Aspect Ratio in QuickTime

2007-09-04

Added

- First public release of complete, updated *QuickTime File Format Specification* with information about atoms and atom types.
- Added licensing information and disclaimer for developers.
- A QuickTime file may now contain a file type compatibility atom. See [File type compatibility atom \('ftyp'\)](#).
- A movie atom may now contain a movie profile atom. See [Movie profile atom \('prfl'\)](#).
- A track atom may now contain a track profile atom. See [Track profile atom \('prfl'\)](#).
- Video sample descriptions may now contain a pixel aspect ratio atom for non-square pixels. See [Pixel aspect ratio \('pasp'\)](#) ('pasp').
- Video sample descriptions may now also contain a color parameter atom. See [Color parameter atom \('colr'\)](#) ('colr').
- Video sample descriptions may now contain a clean aperture atom. See [Clean aperture \('clap'\)](#) ('clap').
- MPEG-4 video and audio sample descriptions may now contain elementary stream descriptor atoms. See [MPEG-4 elementary stream descriptor atom \('esds'\)](#) ('esds') and [MPEG-4 elementary stream descriptor atom \('esds'\)](#) ('esds').

STAR WARS
EPISODE I
THE PHANTOM MENACE

trailer now enhanced for QuickTime 4.
arger image size and full 44kHz Stereo.



[ate for MacOS X Server](#)
[Live Streaming Content Area](#)
[n Source Darwin Streaming Server](#)



QuickTime 4

Overview

Specifications

Showcase

Authoring

Developer

Why does this video has a 3/2
display aspect ratio?

Unspecified aspect ratio
implies square pixels, aka
a sample aspect ratio of 1/1.

Goal: Present video at 4/3 display aspect ratio.

But: Players might inconsistently apply aspect ratio metadata.

So: export access files with a 1/1 sample aspect ratio.

With No Aspect Ratio Metadata



720x480



640x480

A file with no aspect ratio information

ffmpeg

Stream #0:0[0x1]: Video: v210 (v210 / 0x30313276), yuv422p10le(progressive), 320x240, 43008 kb/s, 25 fps, 25 tbr, 12800 tbn (default)

ffprobe

sample_aspect_ratio=N/A
display_aspect_ratio=N/A

A file with aspect ratio information

ffmpeg

Stream #0:0[0x1]: Video: v210 (v210 / 0x30313276), yuv422p10le(progressive), 320x240, 43008 kb/s, SAR 1:1 DAR 4:3, 25 fps, 25 tbr, 12800 tbn (default)

ffprobe

sample_aspect_ratio=1:1
display_aspect_ratio=4:3

MediaInfo and Aspect Ratio

```
$ mediainfo test.avi
```

General

Complete name : test.avi

Format : AVI

Format/Info : Audio Video Interleave

Format settings : BitmapInfoHeader

File size : 853 KiB

Duration : 40 ms

Overall bit rate : 175 Mb/s

Frame rate : 25.000 FPS

Writing application : Lavf61.7.100

Video

ID : 0

Format : YUV

Codec ID : v210

Codec ID/Hint : AJA Video Systems Xena

Duration : 40 ms

Bit rate : 172 Mb/s

Width : 638 pixels

Height : 480 pixels

Display aspect ratio : **4:3**

Frame rate : 25.000 FPS

Color space : YUV

Chroma subsampling : 4:2:2

Code

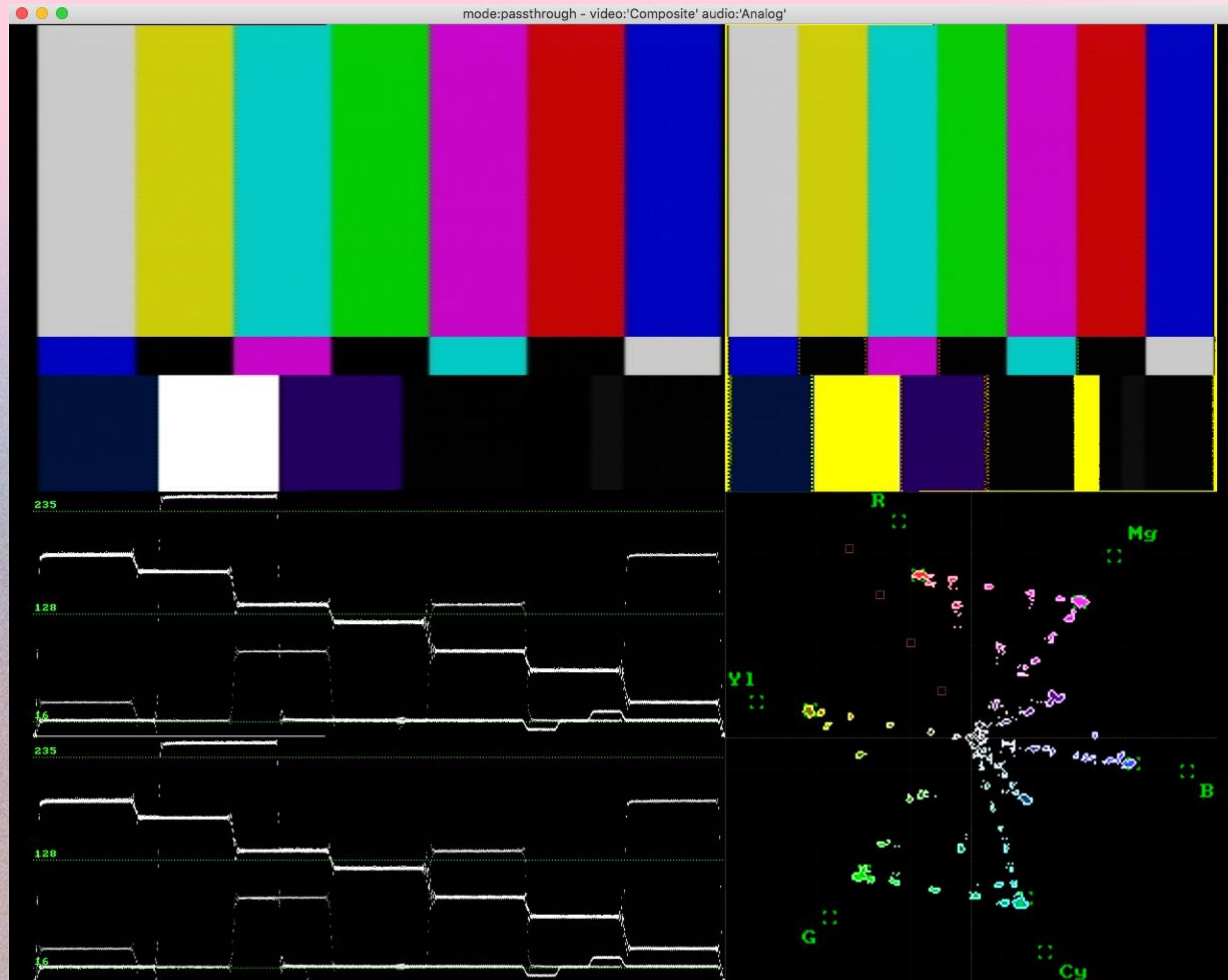
Blame

4158 lines (3922 loc) · 237 KB

Raw



```
3513     void File_Analyze::DisplayAspectRatio_Fill(const Ztring &Value, stream_t StreamKind, StreamPos StreamPos, Parameter_DisplayAspectRatio+1 DARS, bool bForce)
3514     {
3515         if (Value=="")
3516             return;
3517
3518         // String version
3519         Ztring DARS;
3520
3521         if (DAR>=(float)1.23 && DAR<(float)1.27) DARS=_T("5:4");
3522         else if (DAR>=(float)1.30 && DAR<(float)1.37) DARS=_T("4:3");
3523         else if (DAR>=(float)1.45 && DAR<(float)1.55) DARS=_T("3:2");
3524         else if (DAR>=(float)1.55 && DAR<(float)1.65) DARS=_T("16:10");
3525         else if (DAR>=(float)1.65 && DAR<(float)1.70) DARS=_T("5:3");
3526         else if (DAR>=(float)1.74 && DAR<(float)1.82) DARS=_T("16:9");
3527         else if (DAR>=(float)1.82 && DAR<(float)1.88) DARS=_T("1.85:1");
3528         else if (DAR>=(float)2.15 && DAR<(float)2.22) DARS=_T("2.2:1");
3529         else if (DAR>=(float)2.23 && DAR<(float)2.30) DARS=_T("2.25:1");
3530         else if (DAR>=(float)2.30 && DAR<(float)2.37) DARS=_T("2.35:1");
3531         else if (DAR>=(float)2.37 && DAR<(float)2.395) DARS=_T("2.39:1");
3532         else if (DAR>=(float)2.395 && DAR<(float)2.45) DARS=_T("2.40:1");
3533         else
3534             DARS.From_Number(DAR);
3535
3536         DARS.FindAndReplace(_T("."), MediaInfoLib::Config.Language_Get(_T(" Conf")));
3537         if (MediaInfoLib::Config.Language_Get(_T(" Language_IS0639"))==_T("fr") &&
3538             DARS.FindAndReplace(_T(":"), _T("/")));
3539
3540         Fill(StreamKind, StreamPos, Parameter_DisplayAspectRatio+1, DARS, true);
3541     }
```



vrecord &
aspect ratio

initially

720x486

display aspect
ratio of 4/3

Standard	Video Bit Depth	Display Aspect Ratio	Timecode format
NTSC	10 bit	4/3	none rp188vitc rp188vitc2 rp188ltc rp188any
PAL	8 bit	16/9	

Scan timecode types

Input Options

Decklink | DV | Audio | Config

Preferences

Player | MP4 Sidecar | Aspect Ratio | Closed Captioning

Player AspectRatioSettings

Here you can set the sample aspect ratio to use for any display aspect ratio. The recommendation of the vrecord community is the first value of each list. If unset then the recommendation will be used.

NTSC 4/3

NTSC 16/9

PAL 4/3

PAL 16/9

10/11
8/9
9/10
4320/4739

40/33
32/27
6/5
5760/4739

12/11
16/15
128/117

16/11
64/45
512/351

Player AspectRatioSettings

Here you can set the sample aspect ratio to use for any display aspect ratio. The recommendation of the vrecord community is the first value of each list. If unset then the recommendation will be used.

NTSC 4/3

10/11
8/9
9/10
4320/4739

NTSC 16/9

40/33
32/27
6/5
5760/4739

PAL 4/3

12/11
16/15
128/117

PAL 16/9

16/11
64/45
512/351

image width	image height	sample aspect ratio width	sample aspect ratio height	display aspect ratio width	display aspect ratio height
(720 / 486) *		(8 / 9) =		(4 / 3)	
(720 / 480) *		(9 / 10) =		(4 / 3)	
(704 / 480) *		(10 / 11) =		(4 / 3)	
(710.85 / 486) *		(4320 / 4739) =		(4 / 3)	

What's 4/3?

720x486



720x480



704x480



710.85x486



Player AspectRatioSettings

Here you can set the sample aspect ratio to use for any display aspect ratio. The recommendation of the vrecord community is the first value of each list. If unset then the recommendation will be used.

NTSC 4/3

10/11
8/9
9/10
4320/4739

NTSC 16/9

40/33
32/27
6/5
5760/4739

PAL 4/3

12/11
16/15
128/117

PAL 16/9

16/11
64/45
512/351

sample aspect ratio width	sample aspect ratio height	As decimal
(8 / 9) =		0.88888889
(9 / 10) =		0.9
(10 / 11) =		0.90909091
(4320 / 4739) =		0.91158472





10/11



4320/4739



9/10



8/9

A portrait of a woman with blonde hair styled in a voluminous, curly updo. She is wearing a dark, patterned garment with a fur-trimmed collar. The background is solid black, and she is looking slightly downwards and to her left.

8/9

9/10

10/11

4320/4739