# HTPC 4K

#### Versie: 8 Augustus 2023

## **Table of Contents**

1 Inleiding en uitgangspunten	4
2 Benodiade software	5
3 Installatie/configuratie Windows 10	6
A Configuratie Nyidia Control Panel	10
5 Software Omschrijving	19
5. Software Offischifying	10
5.1 KOULDSPLATER	10
	10
5.5 MadvR.	
6. Kodi Settings	20
6.1 Kodi interface Settings	20
6.2 Kodi Media Settings	
6.3 Kodi DSplayer 17.7 BetterGUI Settings	
6.4 Kodi Player Other Settings	26
6.5 Kodi System Settings	29
6.6 Kodi Content Scrapers	31
6.6.1. Advanced settings	
6.7 Kodi Remote Control	
6.8 Kodi media shares	
6.9 Kodi network buffers	
7. Using external LAV+XySub Filters	
7.1 Update LAV filters	
7.2 Configuratie LAV filters in Kodi	40
7.3 Configuratie LAV Splitter	
7.4 Configuratie LAV Video Filter	43
7.5 Configuratie LAV Audio Filter	44
7.6 Configuratie LAV Subtitle Filter	45
8. MadVR Configuratie	
8.1.1 Lens Memory rule	
8.1.2 Scaling rules	

8.2 Devices	50
8.3 Projector	51
8.3.1 Screenconfig	53
8.3.2 HDR	55
8.3.3 Calibration	57
8.4 Processing	59
8.5 Scaling	64
8.5.1 Upscaling Refinement	65
8.5.2 Upscaling rules	66
8.5.3 Chroma upscaling van 2160p content	67
8.5.4 Image upscaling 1080p@24fps content naar 2160p	69
8.5.6 Upscaling SD content naar 2160p	76
8.5.7 Image Upscaling 1080p@50/60fps content naar 2160p	
8.5.8 Upscaling 720p@50/60fps content naar 2160p	80
8.5.9 Upscaling HDR content	82
8.6 Rendering	86
8.7 MadVR settings backup	93
8.8 MadVR extra OSD informatie	93
9. RGB video levels	94
10. Performance tests	96
10.1 CPU load	96
10.2 GPU load	97
10.3 Openhardware Monitor	99
11. MadVR finetuning tips	100
12. Overige zaken	
13. Troubleshooting	104
13.1 Geen geluid meer	104
14. HDR	105
14.1 HDR op projectoren	105
14.2 HDR en MadVR	105
15. Madvr en JVC remote control optie 1	108
15.1 Installatie	108
15.2 Configuratie	108
15.3 Testen	109
15.4 Huidige status	

16. Madvr en JVC remote control optie 2	113
17. Windows 10 repair	118
18. Chromapure BT2020 calibratie	119
19. MadVR 3DLUT calibration	120
19.1 Calibrating (3DLUT) for madvr tonemapping SDR with REC709	121
19.2 Calibrating (3DLUT) for madvr tonemapping SDR with BT2020	127
19.3 MadVR 3DLUT settings	128
19.4 Displaycal correction file	129
20. NVIDIA micro stutter issues	130

## **1. Inleiding en uitgangspunten**

- Dit document beschrijft de configuratie van mijn HTPC
- De voornaamste doelstelling is om zowel Full HD (1080P) als UHD (4K al dan niet i.c.m. HDR) content in hoge kwaliteit te kunnen afspelen. Tevens dient HD Ready (720p) en SD content ook nog afgespeeld te kunnen worden.
- Ik gebruik op dit moment een Nvidia Geforce RTX2070 als videokaart, alle GPU gerelateerde settings en MadVR keuzes in deze guide zijn gebaseerd op dit type videokaart.
- Mijn display is een JVC X5000 projector met 4K e-shift technologie.
- Alle niet 4K content wordt geupscaled naar 4K (2160p).
- Alle HDR content (REC 2020) wordt middels tonemapping omgezet naar SDR content (REC2020) aangezien HDR op een projector met 100-150 nits per definitie niet tot een bevredigend resultaat kan leiden (zie ook het HDR hoofdstuk).

## 2. Benodigde software

- Windows 10 Pro english/international 64bit build 1903 May 2019 (oudere versies ondersteunen mijn RTX2070 videokaart niet! Deze versie bevat nvidia driver versie 419.67, met deze versie had ik lipsync issues en daarom draai ik nu met een handmatige geinstalleerd nvidia driver studio versie 461.72.
- Kodi DSPLAYER 17.7 BetterGUI build007
  - <u>http://nakunana24519x.bplaced.net/\_tmp/k-dsp64\_01/KodiSetup-</u> <u>17.7-BETTERGUI007-DSPlayer-x64.zip</u>
- External LAV Filters 0.74.1
- http://nakunana24519x.bplaced.net/\_tmp/k-dsp64\_01/ DirectShowFilters\_x64-004.zip
- MadVR 0.92.17 met daaroverheen gekopieerd de dynamic tone mapping beta (madVRhdrMeasure86.zip) build 169
  - o <u>http://www.madvr.com/</u>
  - o http://madshi.net/madVRhdrMeasure169.zip (voor de beta versie)
  - Merk op dat indien een te lage LAV filter versie gebruik wordt, dit kan resulteren in een incorrect (washed out) beeld qua kleuren i.c.m. de nieuwere madvr beta's.
  - Merk op dat beta versie 113 de laatste beta versie was zonder tijdslimiet. Je kunt er dus voor kiezen om versie 113 te draaien, het loont echter de moeite (kwalitatief hogere HDR naar SDR tonemapping) om voor versie 169 te kiezen. Echter in dat geval dien je de klok van de pc terug te zetten zodat de expiration datum voorlopig niet bereikt wordt. Let op: disable in dit geval eerst de "windows time service" om te voorkomen dat windows 10 alsnog de tijd weer update naar de huidige tijd.
- Asus GPU Tweak II (alleen benodigd voor het tweaken van Asus videokaarten)
  - o <a href="https://www.asus.com/us/site/graphics-cards/gpu-tweak-ii/">https://www.asus.com/us/site/graphics-cards/gpu-tweak-ii/</a>

## **3. Installatie/configuratie Windows 10**

- Gebruik de gratis tool rufus <u>http://rufus.akeo.ie/</u> om een correct werkende bootable USB stick van de windows ISO te maken.
- Indien alleen een windows upgrade (en geen versie installatie) gewenst is kan vanuit de bestaande windows 10 versie de setup.exe van de USB stick gestart worden.
- Installeer Windows 10 Pro (60.000 MB partitie)
- Installeer nvidia video studio driver versie 456.71
- Gebruik gpedit om windows updates te disablen:
  - o Open the Run command (Win + R), in it type: gpedit.msc and press enter
  - Navigate to: Computer Configuration -> Administrative Templates -> Windows Components -> Windows Update
  - Open this and change the Configure Automatic Updates setting to '2 - Notify for download and notify for install'
  - In de recentere versie van Windows 10 werkt dit niet meer, de updates worden toch geforceerd door Micoroft. Om dit te voorkomen heb ik een raspberry pi met pi hole geinstalleerd met de volgende blacklist:

# Blacklist

Add a domain (example.com or sub.example.com)

# Exact blocking

# **Regex & Wildcard blocking**

(^|\.)microsoft\.com\$

(^|\.)windowsupdate\.com\$

- Disable de Windows Update Service voor de zekerheid ook in de windows services
- Turn off firewall
- Turn off messages in Action Center
- User Account Control → Never Notify
- Show all icons in taskbar
- Zet in control panel sounds options de windows geluiden op none
- Configureer TCP/IP settings (192.168.1.39)
- Folder Options  $\rightarrow$  show hidden files
- Maak een gebruiker ronald aan
- Zorg dat deze gebruiker automatisch inlogged
  - o netplwiz



ers Advanced		
Use the list below and to change pa	to grant or deny users access to your co sswords and other settings.	mputer,
Users must <u>e</u> nter a user	name and password to use this compute	er.
Users for this computer:		-
User Name	Group	
Standard User2	Users	
No. 11 No. 1	Administrators	
User-Name	Administrators	
Seve	Administrators	<b>n</b> r <u>o</u> pertie
Password for User-Name	Administrators	n r <u>o</u> pertie
Password for User-Name	Add Remove P	n r <u>o</u> pertie Change
Password for User-Name Password for User-Name To change you Password.	Add Remove P r password, press Ctrl-Alt-Del and select Reset Passwo	r <u>o</u> pertie Change rd

- Wijzig het power schema zodat de pc en het scherm niet vanzelf in slaap modus gaan
- Installeer winscp (voor filetransfer)
- Installeer irfanview (voor screenshots)
- Installeer Open Hardware Monitor (voor monitoring)
- Installeer Madvr en geef de Users groep Full Control rechten op de MadVR folder zodat MadVR zijn settings.bin file kan bijwerken. (read only leidt tot het crashen van MadVR).
- Installeer Kodi
  - Disable PVR addons
  - Disable Music Visualization addons
- Voeg Kodi toe aan het startmenu ( C:/Program Data/Microsoft/Windows/Menu Start/Programs/Startup )
- Zet HDR uit in de windows display settings

←	Settings		-	٥	×
٢	Home	Display			
Fi	ind a setting	Color			
Sys	tem	Night light (on until 6:32 AM)			
Ģ	Display	On			
$\Box$	Notifications & actions	Night light settings			
Ċ	Power & sleep	HDR and advanced color Off			
-	Storage	Learn more about advanced color			
귱	Tablet mode	Scale and layout			
	Multitasking	Change the size of text, apps, and other items			
Ð	Projecting to this PC	300% (Recommended) V			
ж	Shared experiences	Resolution			
0	About	3840 × 2160 (Recommended)			

#### 4. Configuratie Nvidia Control Panel

- Maak een custom resolutie <u>3840x1920@23.976</u>Hz@8bit met Output Dynamic Range op "Full" aan en gebruik deze als default resolutie. Madvr kiest dan tijdens het afspelen van een film de juiste resolutie om de content af te spelen.
- Disable Stereoscopic 3D
- Gebruik GEEN NVIDIA beeldverbeteringen, dit geeft een digitale look en doet de voordelen van MadVR deels teniet.

Change Resolution				
You can adjust the amount of information a	opearing on the s	creen and red	luce flickering.	You can also choose
1. Select the display you would like to MARANTZ JAPAN, IN	change.			
2. Choose the resolution.				
Connector:				
Resolution:	Refresh	rate:		
Ultra HD, HD, SD 4k x 2k, 4096 × 2160 4k x 2k, 3840 × 2160 (native) 4k x 2k, 2560 × 1600 4k x 2k, 2560 × 1440 4k x 2k, 2048 × 1536 4k x 2k, 1920 × 1440 4k x 2k, 1920 × 1200 1080p, 1920 × 1080	<ul> <li>23Hz</li> <li>*</li> </ul>			
Customise				
3. Apply the following settings.				
Use default colour settings				
Use NVIDIA colour settings				
Highest (32-hit)	utput colour dep	v		
Output colour format:	Dutput dynamic ra	ange:		
RGB ~	Full	~		

Description:

The bit depth does not influence "colorfulness" and is instead a measure of how well colors blend together to prevent color banding. Higher bit depths are useful for lossy image processing such as mastering and compression. Presenting an image with at least 8-bits (16 million colors steps plus dithering) involves incredibly small blending that is difficult for human eyes to detect when content is graded correctly. Human beings can see an estimated 10 million colors shades across the visible spectrum. Having a new standard with one billion available color shades sounds great, but it isn't a change likely to make a visible difference. If banding isn't present, our simple human vision cones will perceive the additional steps as being the same continuous colors.

**10-bit output requires the following is checked in** *general settings*:

• use Direct3D 11 for presentation (Windows 7 and newer)

Merk op dat dus voor BT2020 colorspace 10 of 12 bit geen noodzaak is, 8 bit is dus ook mogelijk en kan een verstandige keuze zijn om problemen met HDMI overdracht te voorkomen bij hogere frame rates (60 Hz!). Zelf heb ik echter wel voor 12 bit gekozen zodat ik gebruik kan maken van de optie "report BT.2020 to display" in MadVR, deze optie werkt namelijk niet goed (resulteert in paars beeld) in 8 bit.

Custom 3840 x 2160 at 24Hz (32-bit), progressive				
	Custom 3840 x 2160 at 24Hz (32-bit),	progressive	/ *	
				<i>₽</i>

Edit the existing cust new custom resolution	om resolution. Your display m on.	nay flicker a few times v	when testing a
Display mode (as reported b	y Windows)		
Horizontal pixels:	3840	Vertical lines:	2160
Refresh rate (Hz):	24	Colour depth (bpp):	32 ~
Scan type:	Progressive $\vee$		
⊖ Timiı			
Standard: Mar	nual 🗸		
	Horizontal	Vertical	
Active pixels:	3840	2160	$\overline{\mathcal{A}}$
Front porch (pixels):	1276	8	
Sync width (pixels):	88	10	
Total pixels:	5500	2250	
Polarity:	Positive (+)	Positive (+)	Pixel clock:
Refresh rate:	53.95 KHz	23.976 + Hz	297.0000 MHz
		(23.000 to 25.000)	
		Test	Cancel

• Configureer sound settings (Surround Processor)



• Zet bij de 3D settings de Power Management Mode op "Prefer Maximum Performance".

NVIDIA Control Panel				– 🗆 ×
File Edit Desktop 3D Settings Help				
OBack - O 😘				
Adjust image settings with preview     Manage 3D settings     Configure Surround, PhysX	Manage 3D Settings You can change the global 3D settings and create over	rides for specific programs. The o	verrides will be used automatically each time the specified pr	Restore Defaults
Display Change resolution Adjust desktop colour settings Rotate display	I would like to use the following 3D settings:			
Set Up Digital Audio	Global Settings Program Settings			
Set up multiple displays Steroscopic 3D View rating for games SVdeo Adjust video colour settings Adjust video image settings	Feature Ambient Occlusion Anisotropic filtering Antialiasing - FXAA Antialiasing - Gamma correction Antialiasing - Setting Antialiasing - Setting Antialiasing - Setting DSR - Factors DSR - Factors DSR - Factors DSR - Factors Maximum pre-rendered frames Multi-Frame Sampled AA (MFAA) OpenGL rendering GPU Power management mode Shader Cache	Setting Off Application-controlled Off Application-controlled Application-controlled Off All Off Use the 3D application setting Off Auto-select Prefer maximum performance On		
	Texture filtering - Anisotropic sample optimi	Off	Restore	
OSystem Information	Description:	- frances blac CDI I and avenues hafe	va bha francas ava avaaanad h., bha	~

 Installeer Asus GPU Tweak II en wijzig Gaming Mode (de default) naar OC mode voor meer performance. De kaart blijft hierbij stabiel en wordt ook niet warmer dan pakweg 57 graden.



	/5U5	DUAL-RTX2070 SERIES	Home GPU-Z Tools
I			V 2.0.8.0
	VGA Info	/ISUS X GPU-Z	Live Update
	Name	NVIDIA GeForce RTX 2070	Last check : 2019/11/11
	GPU Technology	TU106 Revision A1 12 nm Die Size 445 mm <sup>2</sup> NVIDIA.	ASUS GPU TweakII GPUTweakII V2.0.8.0
	Release Date BIOS Version	Aug 20, 2018Transistors 10800M 90.06.0B.40.5D	ASUS Live Update Liveupdate V1.0.5.7
	Device ID ROPs 64/14 Shaders	10DE-1F07         Subvendor         ASUS           14         Bus Interface         PCI-Express x16 2.0 @ x16 2.0           2304         Unified         DirectX Support         12 (12_1)	ASUS LED Control No Install
	Pixel Fillrate	106.6 GPixel/s Texture Fillrate 239.8 GTexel/s	DUAL-RTX2070 SERIES
	Memory Type	GDDR6 Bus Width 256 Bit	Driver
	Memory Size	8192 MB BandWidth 448.0 GB/s	Version 419.67
	Driver Version	25.21.14.1967	VBIOS
	GPU Clock	1440 MH Memory 1750 MH Boost 1665 MH	90.06.0B.40.AS08
	Default Clock	1410 MH Memory 1750 MH Boost 1635 MH	
	NVIDIA SLI	Disabled	
	Computing	OpenCL     CUDA     PhysX     DirectCompute	
	Monitor		GPU Tweak II

• Zie screenshot hieronder om de juiste instellingen te kiezen voor het automatisch opstarten van GPU Tweak II zonder dat deze op de voorgrond komt.

<b>/515</b>	DUAL-RTX2070 SERIES Home GPU-Z Tools	<b>o</b> – ×
ľ '		V 2.0.8.0
	Main	
	GPU Tweak II Startup	
	<ul> <li>Automatically start GPU Tweak II when I log on to Windows</li> <li>Minimize GPU Tweak II when it starts</li> </ul>	
	GPU Tweak II Monitor Startup Automatically start GPU Tweak II monitor when I log on to Windo Minimize GPU Tweak II Monitor when it starts	w
	Notification Window OFF ON	
	Language English 🔻	Default
	My Settings	Delault
	Overclocking range enhancement	
	Apply settings each time GPU Tweak II starts	
Monitor	Gl	PU Tweak II

# **5. Software Omschrijving**

#### **5.1 Kodi DSPLAYER**

DSPlayer is a DirectShow-based media player for Kodi Entertainment Center. DSPlayer development is handled through its own branch, which is kept in sync with changes to the official Kodi codebase.

The player is designed to work with or replace the default Kodi media player, DVDPlayer, while offering full integration with the existing Kodi interface. This means all media databases and player controls will function in the same manner as a standard Kodi installation.

DSPlayer is installed on Windows operating systems through custom installation packages, which are made available in conjunction with official releases of Kodi.

#### **5.2 Sanear**

The main benefit of Sanear (onderdeel van Kodi) is eliminating the frame drops that occur due to the framerate of the video (display) clock not perfectly matching the audio clock. This typically happens with 24Hz material that is actually rendered at 23.976 fps. A number of factors including the specific A/V equipment and GPU used can lead to reported framerates that differ by decimal places from the actual rate of consumption by the display. A reported 23.972 fps from the video clock, for example, can lead to one dropped frame per minute. These frame drops are clock corrections called clock jitter.

Sanear syncs the clocks by resampling the audio. The audio stream is unpacked as multichannel PCM and slowed down or sped up by inaudible amounts to match the required composition rate. With Sanear in place, dropped frames should be eliminated or reduced to one per hour at most.

#### 5.3 MadVR

madVR is a high quality video renderer (GPU assisted). features:

- high quality chroma upsampling
- high quality scaling (bicubic, mitchell, lanczos, spline etc)
- high quality YCbCr -> RGB conversion
- gamut & gamma correction for display calibration
- full 16bit processing queue
- final 16bit processing result is dithered down to RGB output bitdepth
- bypasses graphics card's video (damage) algorithms
- all work is done via GPU shaders
- no shortcuts, highest quality has priority over anything else.
- Both 32bit and 64 bit version included.

The quality of madVR with LAV Filters is capable of besting even high-end Blu-ray or UHD players with a capable graphics card and some knowledge of correct setup.

It should offer an immediate advantage over DVDPlayer, where output is done at 8-bits without dithering. madVR offers full 16-bit processing dithered to 10-bits or less.

madVR also comes packaged with advanced scaling algorithms such as Jinc, super-xbr and NNEDI3, which possess less ringing and lower levels of aliasing than traditional resizers.

Its dithered output will produce a more precise image with fewer rounding errors and less overall noise, while its upscaling is capable of rendering a cleaner, sharper image. This should even be apparent with content displayed at its native resolution.

# 6. Kodi Settings

## **6.1 Kodi Interface Settings**

Settings / Interface		22:10
	Look and feel	
Skin	Skin	Estuary
Regional	- Configure skin	Littary
Screensaver	Reset above settings to default	
Other		
Basic		

- Op dit moment gebruik ik de default skin van kodi 17.
- Disable de irritante GUI sounds.

Settings / Interface		22:09
Skin	Language	
	Language	English
Regional	Keyboard layouts	English QWERTY
Screensaver	Unit Formats	
Othor	Region default format	Central Europe
Other	Reset above settings to default	
Basic		
	This category contains an locale / regional settings.	

• Zet de region op Central Europe.

Settings / Interface		22	2:09
Skin Regional	General Screensaver mode Wait time		None
Screensaver	Use visualisation if playing audio		
Other	Reset above settings to default		

• Zet screensaver mode op None.

Settings / Interface		22:10
Skin	Home window	
	Startup window	Home window
Regional	Show RSS news feeds	$\bigcirc$
Screensaver	Reset above settings to default	
Other		
🖉 Basic		

# 6.2 Kodi Media Settings

Settings / Media		9:54
Library	Manage Sources	
	Videos	
General	Music	
Videos	Pictures	
Music	Video Library	
Wasie	Update library on startup	
Pictures	Hide progress of library updates	
	Clean library	
	Export library	
	Import library	
	Music Library	
Expert	Update library on startup	$\bigcirc$

- Laat de library automatisch updaten bij het starten van Kodi
- Verberg de library update progress status

#### 6.3 Kodi DSplayer 17.7 BetterGUI Settings

System info		22:16
Summary	Free memory: 13080MB	
Storage	Screen resolution: 3840x2160@23.98Hz - Fu Operating system: Windows 10 (kernel: Wir	ull screen ndows NT 10.0)
Network	System uptime: 11 Minutes	
Video	Total uptime: 13 Days, 22 Hours, 11 Minut Battery level: 0%	tes and the second s
Hardware		
Privacy policy		
	System CPU usage: 3%	Version info:
	System memory usage: 3268MB / 16348MB - 20%	Build: Kodi 17.7-BETTERGUI006-DSPlayer64 Git:20171126 Compiled: Feb 20 2020

 <u>I New/reworked features (Please read carefully!):</u> Settings -> Player -> DSPlayer -> Activate DSPlayer: Rules management -> ! Helper: Create example player rule Settings -> Player -> DSPlayer -> Activate DSPlayer: Rules management -> Player Rules [Editor]

This replaces the old "VideoPlayer merits" feature which sadly was buggy and not an ideal approach in itself.

Kodi DSPlayer now defaults to the default players (VideoPlayer, PAPlayer) like Original Kodi would to avoid all the compatibility issues with Live-TV and media which is not suited for DSPlayer.

To enable DSPlayer, you can now easily add a simple rule via the self explanatory player rules editor.

You can use "! Helper: Create example player rule" to create an example player rule which is a good starting point (read help texts)

Side notes: Using Original Kodi defaults and only selectively creating a simple rule for all your DSPlayer-enabling-needs should be the better way to go and lead to avoiding many incompatibility issues right from the start.

The new approach most likely will be less confusing than the old default "Just use DSPlayer for EVERYTHING" approach which resulted in many people wondering why LiveTV and other stuff did not work correctly anymore.

Settings / Player		8:19
NSPlaver	Activate	DSPlayer: Rules management
	Helper: Create example player rule	
Videos	Player rules [Editor]	
Music		Video Renderer
Disco	Video Renderer	madshi Video Renderer (madVR)
DISCS		
Pictures		Audio Renderer
Language	Audio Renderer	Internal Audio Renderer (Sanear)
	- Device	marantz-AVR (NVIDIA High Definition Audio)
Accessibility	- Exclusive mode	
	- Allow bitstreaming	
🗱 Expert	- Ignore System Channel Mixer	

- Gebruik madVR als video renderer
- Gebruik Sanear als audio renderer, deze geeft minder clock deviation (en dus minder vaak frame drops) dan reclock
- Kies bij Audio Renderer Device je surround processor/receiver
- Gebruik Kodi in exclusive mode

Settings / Player			8:19
DSPlayer	Player rules	4	
	Rule: Use DSPlayer always	Cancel	
	[ ADD NEW PLAYER RULE ]		
🗱 Expert			

Settings	/ Player			8:19
	Player rules			
	! Rule name (Example: MyRule1)	Use DSPlayer always	Close	
	! Player (DSPlayer or VideoPlayer)	DSPlayer		
	! File types (Example: mkv mp4 avi)			
	- File name			
	- Protocols			
	- Video resolution			
	- Video codec			
	- Video aspect ratio			
	- Audio channels			
	- Audio codec			
😫 Expert	- Mimetypes			

- Vul een wildcard "." In voor file types om er zeker van te zijn dat dsplayer voor alle af te spelen formaten gebruikt wordt. De maker van DSplayer 17.7 ontmoedigd dit omwille van compatibiliteits issues met bijv. live TV streaming, maar aangezien ik mijn HTPC alleen gebruik om films af te spelen kies ik ervoor om DSplayer toch weer als default player te configureren.
- DSPlayer uses the madshi Video Renderer. madVR must be installed manually before playback. Configuration is possible during playback by choosing the madVR tray icon from the Windows Taskbar.

#### **6.4 Kodi Player Other Settings**

#### 22:14 Settings / Player DSPlayer Preferred external subtitle language Dutch Videos Use menu audio selector Music Use menu subtitle selector Discs $\bigcirc$ Show stream details from selected splitter Pictures Show Blu-ray titles and Matroska Editions choice dialog Min. Blu-ray title length (min.) Language Accessibility $\bigcirc$ $\bigcirc$ Define visible screen area Reset above settings to default 暮 Expert

- Zet de preferred subtitle language op Dutch
- Enable Move OSD into active video area

Settings / Player		22	2:14
DSPlayer	Display 4:3 videos as	Ν	lormal
	Processing		
Videos	Render method		DXVA
Music	- Enable HQ scalers for scaling above	0 %	
Discs	Allow hardware acceleration - DXVA2		
	Stereoscopic 3D		
Pictures	Playback mode of stereoscopic 3D videos	Ask me	~~
Language	Disable stereoscopic 3D mode when playback ended		
	Teletext		
Accessibility	Activate teletext		$\bigcirc$
Expert	Reset above settings to default		
	Resets all the visible settings to their default values.		

- Zet de Render Method op DXVA.
- Enable allow hardware acceleration DXVA2.

Settings / Player			22:14
DSPlayer		Actions	
	Play next video automatically		
Videos	Skip steps		-30 sec, -10 sec, 10 sec, 30 sec
Music	Skip delay		750 ms 🗸 🔨
Discs		Playback	
	Adjust display refresh rate		Always
Pictures	- Enable with player		Both
Language	Sync playback to display		$\bigcirc$
Accessibility	Minimise black bars		Off VA
	Display 4:3 videos as		Normal
		Processing	
🔅 Expert	Render method		DXVA

#### • Enable Sync Playback to Display

Settings / Player		22:14
DSPlayer	DVD	
	Play DVDs automatically	
Videos	Forced DVD player region	Off VA
Music	Attempt to skip introduction before DVD menu	$\bigcirc$
Discs	Blu-ray	
	Blu-ray region Code	Region B 🛛 🔨 🔨
Pictures	Blu-ray playback mode	Play main movie
Language	Audio CDs	
AN_1124 .	Audio CD insert action	None
Accessibility	Load audio CD information from online service	
	Saved music folder	
Expert	Track naming template	%A/%A - %B/[%N. ][%A - ]%T

- Zet de Blu-ray region code op B.
- Zet de Blu-ray playback mode op Play main movie.

Settings / Player		22:14
DSPlayer	Audio Preferred audio language	Original stream's language
Videos	Prefer default audio streams	
Music	Subtitles	
Discs	Preferred subtitle language	Dutch
	Enable parsing for closed captions	
Pictures	Subtitle position on screen	Fixed
Language	Stereoscopic 3D depth of subtitles	0 🔨
Accessibility	Font to use for text subtitles	arial.ttf
<b>,</b>	- Character set	Default
	- Size	28
🖨 Expert	- Stvle	Bold

• Zet de Preferred audio language op English.

Settings / Player		14:07
DSPlayer	- Colour	White
Videos	Override ASS / SSA subtitles fonts	
Music	Download Services	
IVIUSIC	Languages to download subtitles for	Dutch, English
Discs	Subtitle storage location	Next to the video
Pictures	- Custom subtitle folder	
	Pause when searching for subtitles	
Language	Auto download first subtitle	
Accessibility	Default TV show service	None
	Default movie service	None
🔅 Expert	Reset above settings to default	

• Gebruik de mogelijkheid om ondertitels te downloaden (via Kodi OSD menu). Installeer hiervoor de opensubtitles.org add-on.

#### 6.5 Kodi System Settings

Settings / System		8:21
Display	General	
	Display mode	Full screen #1 🛛 🔨 🔨
Audio	- Resolution	3840x2160p
Input	- Use fullscreen window	
Internet access	- Blank other displays	$\bigcirc$
	- Delay after change of refresh rate	Off 🗸
Power saving	Use limited colour range (16-235)	$\bigcirc$
Add-ons	Stereoscopic 3D	
Logaina	Stereoscopic 3D mode / Current	Disabled
	- Preferred mode	Same as movie
	Calibration	
🖨 Expert	Number of buffers used by graphics driver	3

- Zet display mode op full screen.
- Zorg dat use fullscreen window UIT staat.
- Zet "Use limited colour range (16-235) UIT! Aangezien de videokaart settings op pc levels (0-255) ingestelt staat, zorgt het uit laten van deze setting er namelijk voor dat het kodi menu ook in pc levels wordt gedisplayed waardoor de kleuren in deze menu's blijven kloppen evenals de grijstinten en het zwart nivo. Deze setting heeft GEEN invloed op de afgespeelde content.

Settings / System		8:21
Display	Audio Decoder	
	Audio output device WASAPI: HDMI - marantz-AVR (NVIDIA High Definition	Audio), WASAPI: marantz
Audio	Number of channels	5.1
Input	Output configuration	Optimized
Internet access	Volume control steps	90
	Maintain original volume on downmix	$\bigcirc$
Power saving	Stereo upmix	$\bigcirc$
Add-ons	Resample quality	High
Logging	Threshold for pitch correction	2
	Keep audio device alive	1 Minute
	Send low volume noise	$\bigcirc$
Expert	Select the device to be used for playback of audio that has been decoded such as mp3.	

- Selecteer de surround processor als default audio device, let op dat je het WASAPI device kiest en NIEThet Directsound device. Indien je soms wel en soms geen lipsync issues hebt is de kans groot dat hier per ongeluk voor het Directsound device is gekozen.
- Kies 5.1 als number of channels.
- Zet output configuration op Optimized
- Zet Resample Quality op High.

Settings / System		22:12
Display	GUI sounds	Kodi UI Sounds
A	Audio Passthrough	
Audio	Allow passthrough	
Input	Passthrough output device WASAPI: HDMI - marantz-AVR (NVIDIA High Definition Au	udio), WASAPI:
Internet access	Dolby Digital (AC3) capable receiver	
Deverage	Dolby Digital Plus (E-AC3) capable receiver	$\bigcirc$
Power saving	DTS capable receiver	
Add-ons	TrueHD capable receiver	
Logging	DTS-HD capable receiver	
	Audio DSP	
	Enable audio DSP processing	Never
🔅 Expert	Reset above settings to default	

- Zet GUI sounds op never.
- Selecteer ook voor Audio Passthrough de surround processor als audio device, let wederom op dat je het WASAPI device kiest en NIET het Directsound device. Indien je soms wel en soms geen lipsync issues hebt is de kans groot dat hier per ongeluk voor het Directsound device is gekozen.

# 6.6 Kodi Content Scrapers



- Kodi's movie scraper verwacht een specifieke naamconventie (voorbeelden):
  - o Everest (2015)
  - o Star Wars: The Force Awakens (2015)
- Als scraper voor films gebruik ik de Universal Movie Scraper addon. Deze scraper is welliswaar trager dan de default scraper, maar vind veel meer film titels! Universal Scraper is currently the most customizable scraper by collecting information from the following supported sites: IMDb, TMDb, Rotten Tomatoes, Trakt.tv, OFDb.de, port.hu. This scraper is currently the flagship of the Team-Kodi scrapers. The initial search can be done either on TMDb or IMDb (according to the settings), but following that it can be set field by field that from which site you want that specific information.

Videos Sort by: Nam					
	Set content			<b>~</b>	
_	This directory contains	N	lovies	ок	
L	Choose information provider - Settings	Universal Movie Sc	craper	Cancel	
	Co	ntent scanning options			
	Movies are in separate folders	that match the movie title			
	Scan recursively				
	Exclude path from library upd	ates			

#### **6.6.1. Advanced settings**

Voeg het volgende toe aan advancedsettings.xml (in de Kodi Userdata folder) om dubbele iconen (tijdens een library update) van een film te voorkomen:

<advancedsettings>

<video>

<excludefromscan action="append">

```
<regexp>(?i)[\\/](auxdata|backup|clipinf|playlist|stream|certificate)[\\/]</regexp>
```

<regexp>(?i)movieobject\.bdmv</regexp>

<regexp>(?i)VTS\_\w+.IFO</regexp>

<regexp>(?i)VTS\_\w+.VOB</regexp>

</excludefromscan>

</video>

</advancedsettings>

#### 6.7 Kodi Remote Control

Settings / Services		8:28	
General	Web server		
	Allow remote control via HTTP		
Control	- Port	8080	
UPnP / DLNA	- Username	kodi	
AirPlay	- Password		
	Web interface	Kodi web interface - Chorus2	
Weather	Application control		
	Allow remote control from applications on this system	$\bigcirc$	
	Allow remote control from applications on other systems	$\bigcirc$	
	Reset above settings to default		
😫 Expert			

• Enable remote control via HTTP

#### 6.8 Kodi media shares

NFS client windows 10 werkt niet betrouwbaar genoeg voor streaming via Kodi. Vandaar dat ik de Kodi SMB functionaliteit gebruik om toegang tot de media te verschaffen. Hieronder een voorbeeld van 1 van de shares.

Videos Sort by: Name + 3 / 9			
	Edit video source	<b>\$</b>	
	Enter the paths or browse for the media locations.		
	smb://192.168.1.1/films/films1/	Browse	
		Add	
	Enter a name for this media source.		
	films1		
	OK Cancel		

Videos Sort by: Nan				
	Set content		4	
_	This directory contains	Movies	ок	
	Choose information provider - Settings	Universal Movie Scraper	Cancel	
	Content scanni	ng options		
	Movies are in separate folders that match	the movie title		
	Scan recursively			
	Exclude path from library updates	$\Box$		

```
Relevant gedeelte van smb.conf op mijn linux server:
[global]
     smb passwd file = /etc/samba/smbpasswd
     guest account = ronald
     netbios name = hammie
     workgroup = beestjes
     debug level = 3
     username map = /etc/samba/smbusers
     null passwords = yes
     encrypt passwords = true
     security = user
     public = yes
     panic action = /usr/share/samba/panic-action %d
     passdb backend = smbpasswd
     allow hosts = 192.168.1.
     load printers = yes
     printcap name = cups
     printing = cups
     socket options = TCP_NODELAY S0_RCVBUF=8192 S0_SNDBUF=8192
     mangled names = no #dit is nodig om special characters in film dir namen toe te staan
[films]
path = /films
public = yes
```

only guest = yes
writable = yes

#### **6.9 Kodi network buffers**

Om buffer issues te voorkomen kunnen preventief de netwerk buffer instellingen van Kodi gewijzigd worden. Om dit te doen, creëer de file advancedsettings.xml in de kodi users directory met de volgende inhoud:

<advancedsettings> <network> <buffermode> 1 </buffermode> <readbufferfactor> 4 </readbufferfactor> <cachemembuffersize> 104857600 </cachemembuffersize> </network> </advancedsettings>

#### Buffermode - The "what"

The first Kodi cache setting we're going to look at is the Buffermode. Buffermode controls how Kodi uses the cache during playback. More specifically, it controls which files get buffered. This is the "what files" will get buffered.

It can have four settings:

SETTING	EXPLANATION
0	This is the default value. This buffers all internet filesystems (http, ftp, webdav, etc.)
1	This buffers all filesystems, both Internet and Local
2	Only buffers true Internet file systems (http, etc.)
3	No buffer

#### Readbufferfactor - The "speed"

Readbufferfactor is the setting that controls how quickly Kodi will fill the cache. By default, it is set to "1", which means that Kodi will only look ahead slightly to store what's coming next. Think of this setting as the "speed" in which Kodi fills the buffer.

If your network is unreliable, slow or you have a fair amount of interference in your home, you'll want to increase this value.
The setting value is a multiplier of the default limit. Kodi looks at the average speed that the video will play at. Higher resolution\bitrate videos will stream at a higher speed.

The default setting is usually pretty good. I recommend only a slight increase to 1.5.

If you make the other changes and still have issues, you can change this value to as high as 4. If you have a high amount of RAM in your device, you could go even higher than that.

Basically, you can increase this value as much as you want. Kodi won't crash, but it may end up using all of the bandwidth you have in the device. At that point, you won't see any improvement in increasing the number. You'll also not be able to do *anything* else on your device while you're watching a video.

# 7. Using external LAV+XySub Filters

### 7.1 Update LAV filters

Kodi 17.6 gebruikt intern LAV filters versie 0.71. Updating the internal LAVFilters+XySubFilter is not recommended for multiple reasons.

If you want to be up to date with todays newer versions of LAVFilters + XySubFilter it's in any case \_highly\_ recommended that you switch to external filters by using Kodi DSPlayer "Filters management" setting "Media rules and Filters configuration" while adding just one "Media rule" for all files with setting *File types:* . (just a dot in the File type field) with the external updated versions of LAVFilters (LAV Source Filter, LAV Splitter, LAV Video Decoder, LAV Audio Decoder) + XySubFilter chosen.

Beginning from Kodi 17.6 build006 you can now use the new function under

# Settings -> Player -> DSPlayer -> Filters -> Filters management -> Media rules and Filters configuration -> ! Helper: Create example media rule

This helper creates an example media rule for initial configuration (using external LAVFilters+XySubFilter) which you can then find under "Media rules [Editor]". External LAVFilters+XySubFilter have to be installed/registered on your system!

DSPlayer - stere Videos - filters Music - Medi Discs - Medi	ie system Chaime Miker eo Crossfeed (headphones) Filters s management Media rules ar ia rules ≪ rs configuration	Ind Filters configuration	
Media	x rules		Media rules
Rule: (External) LAVFilters, XySubFilter	(0) Cancel	Priority order	
Add new rule	Guider	Rule name	(External) LAVFilters, XySubFilter
		- File types	Just a simple dot here
		- File name	
		- Video codec	
		- Audio codec	
		- Protocols	
		- Url	0
		Source filter	LAV Splitter Source (lavfsplitter)
		Splitter filter	LAV Splitter (lavf_splitter)
		Video filter	LAV Video Decoder (lavvideodec)
		Audio filter	LAV Audio Decoder (lavaudiodec)
		Subs filter	XySubFilter (xysubfilter)
		Extra filter	
		Shader Id	
		Delete rule	

Quick Install external filters:

External Filters Bundle (LAVFilters x64, XySubFilter x64, AC3Filter x64):

http://nakunana24519x.bplaced.net/\_tmp/k-dsp64\_01/DirectShowFilters\_x64-004.zip

- Create a folder named C:\DirectShowFilters\_x64\ and extract the 4 folders from inside zip file right in this created folder.

- Have a look inside the folders, for example C:\DirectShowFilters\_x64\LAVFilters\_x64\

There you can find easy access files for install/uninstall/registry-clean

- AC3Filter is of course only optional - not everyone needs it

퉬 _ x64 v0.74.1-31 (nightly) 2019-12-20	07.02.2020 19:33	File fo
_a	07.02.2020 19:45	File
🚳 _b Open LAV Splitter Configuration.bat	25.10.2019 19:35	Winde
🚳 _c Open LAV Audio Configuration.bat	25.10.2019 19:34	Winde
🚳 _d Open LAV Video Configuration.bat	25.10.2019 19:35	Winde
🚳 _e RunAsAdmin - INSTALL.bat	25.10.2019 19:59	Winde
🚳 _f RunAsAdmin - UNINSTALL.bat	25.10.2019 19:31	Winde
🚳 _g RunAsAdmin - CLEAN REGISTRY.bat	26.10.2019 02:40	Winde
_h	07.02.2020 19:45	File
🚳 avcodec-lav-58.dll	20.12.2019 03:18	Appli
🚳 avfilter-lav-7.dll	20.12.2019 03:18	Appli

# 7.2 Configuratie LAV filters in Kodi

Settings / Player		22:13
DSPlayer	Filters management	Media rules and Filters configuration
Videos	Helper: Create example media rule (for external LAVFilters+X	ySubFilter)
Music	- Media rules [Editor]	
D:	- Filters configuration	
Discs	Extra Options	
Pictures	Preferred audio codec name	
Language	Preferred external subtitle language	Dutch
Language	Use menu audio selector	
Accessibility	Use menu subtitle selector	
	Show stream details from selected splitter	
🔅 Expert	Show Blu-ray titles and Matroska Editions choice dialog	
	Defines the source of audio & video filters: [Internal filters] Internal LAV Filters and XySubFilter with preconfigured me [Media rules and Filters configuration] Media rules are used to provide in	dia rules for all compatible media. struction on what combination of filters and

- Ensure Media Rules and Filters configuration (external **filters**) is selected from this menu to leverage the externally installed LAV Filters and XySubFilter.
- Merk op dat Direct3D11 gekozen is voor Direct3D presentation (versie 9 is minder efficient en zorgt voor hogere madvr rendertijden.

System info		22:16
Summary	GPU: NVIDIA GeForce RTX 2070 Screen resolution: 3840x2160@23.98Hz - Ful	ll screen
Storage	Direct3D version: DirectX 11.1 (FL 11.1)	
Network	madshi Video Renderer: v0.92.17.0	
Video	Internal LAV Filters: v0.70.2.81	
Hardware	Internal XySubFilter: v3.1.0.747	
Privacy policy		
	System CPU usage: 4%	Version info:
	System memory usage: 3268MB / 16348MB - 20%	Build: Kodi 17.7-BETTERGUI006-DSPlayer64 Git:20171126 Compiled: Feb 20 2020

Maleficent: Mistress of Evil (2019) Adventure / Family / Fantasy	8:30 Ends at: 9:44
	Player process info
Video decoder: HVC1 (DXVA2 Copy-back Direct) (HW) Renderers: Kodi madVR, (i) Sanear Audio Renderer Filters: XySubFilter, LAV Audio Decoder, LAV Video Decoder, LAV Splitter Source Video stream: 3,840x2,160 px, 1.78 AR, 23.976 FPS Audio stream: (1/14) 8 Channels , TrueHD, Oms delay, 24 bits, 48,000 Hz System memory usage: 27% System CPU usage: 51%	
00:44:53 / 01:58:51	

• To confirm the correct filters are being loaded during playback, **press O** while playing any video.

# 7.3 Configuratie LAV Splitter

Properties	×
LAV Splitter Input Formats	
Preferred Languages Enter your preferred languages as their 3-letter language code Audio: eng	s, comma separated. (Example: "eng,ger,fre")
Subtitles:	
dut,eng	
Default Mode: Subtitles matching the preferred languages, as v Subtitle Selection Mode: Default	vell as "default" and "forced" subtitles will be loaded.
Blu-ray Subtitles (PGS)	Queue Settings
Enable Automatic Forced Subtitle Stream     Deliver only Forced Subtitles	Maximum Queue Memory (MB): 256 💌 Maximum Queue Packets: 350 👻
Demuxer Settings Demux sub-streams separately Remove Audio Decoder on Audio Stream Switch Prefer Audio Stream with the Highest Quality Prefer Audio Streams for the Hearing/Visually Impaired	Format Settings  Enable VC-1 Timestamp Correction  Load Matroska Segments from external files  Network Settings  Stream Analysis Duration: 1000
Enable System Tray Icon	LAV Splitter 0.74.1.31-git
	OK Cancel Apply

Merk op dat:

- De subtitle selection mode op default dient te staan.
- De preferred audio language op engels (eng) staat.
- De preferred subtitle language nederlands (dut) is met als tweede keuze engels (eng).
- de PSG forced subtitle opties uit staan.
- Prefer audio stream with highest quality aan staat.

### 7.4 Configuratie LAV Video Filter

Properties

Settings Threads for Multi-Threading Auto ~	Hardware Acceleration Hardware Decoder to u DXVA2 (copy-back)	Ise: Resolutions → OK SD → HD → UHD (4K) Codecs for HW Decoding
Use Stream Aspect Ratio Settings for Interlaced Video Streams Field Order	Active Decoder: <inac Active Hardware Accele <none> Hardware Device to use</none></inac 	tive>
Auto   Deinterlacing Mode  Auto   V	NVIDIA GeForce RTX DXVA2 requires an act Note that GPUs are list	2070 ~ ive display for GPUs to be available. ted once for each connected display.
Output Formats         8-bit         10-bit           4:2:0         NV12         YV12         P010           4:2:2         YUY2         UYVY         P210           4:4:4         YV24         AYUV         Y410           RGB         RGB32         RGB24	16-bit ☑ P016 ☑ v210 ☑ P216 ☑ v410 ☑ Y416 ☑ RGB48	Hardware/GPU Deinterlacing (CUVID/QS only) Enable Adaptive HW Deinterlacing Output Mode 25p/30p (Film)  50p/60p (Video) Software Deinterlacing Algorithm
RGB Output levels (for YUV -> RGB conver	rsion) Iched (as input) om Dithering	No Software Deinterlacing        Output Mode (YADIF only)        25p/30p (Film)
Enable System Tray Icon		LAV Video Decoder 0.74.1.31

 $\times$ 

• Merk op dat DXVA Copy Back vereist is om zwarte balken te kunnen detecteren, in mijn geval is dit vanwege de plaatsing van mijn projector noodzakelijk om kodi bij 21:9 content het beeld op het doek omhoog te schuiven.

### 7.5 Configuratie LAV Audio Filter

Properties	×
Audio Settings Mixing Formats	
Dynamic Range Compression  Apply DRC on formats that support it (AC3, EAC3) Level:  100% Bitstreaming (S/PDIF, HDMI) Formats  Dolby Digital (AC-3) Dolby Digital (AC-3) Dolby Digital Plus (E-AC3) Dolby Digital Plus (E-AC3) Dolby TrueHD Options Force max DTS-HD rate (not recommended) Fallback to PCM if Bitstreaming is not supported Options Auto A/V Sync correction Convert Output to Standard Channel Layouts Expand Mono to Stereo Expand 6.1 to 7.1 Use Legacy 5.1 channel layout	Audio Delay         Enable Audio Delay         Delay (in ms):       0 →         Output Formats         Select which output formats are available.         The best format is used automatically.         □       16-bit Integer         ☑       32-bit Integer         ☑       32-bit Floating-point         ☑       Use Dithering for 16-bit Output         Enabling all formats will allow untouched /         bitexact output. Only if a format is not compatible with your hard- or software it should be disabled.
Enable System Tray Icon	LAV Audio Decoder 0.74.1.31-git
	OK Cancel Apply

- Enable Auto A/V sync correction
- Enable Use Legacy 5.1 channel layout
- Enable bitstreaming in elk geval voor Dolby Atmos en DTS-X audio tracks, aangezien voor deze formaten de decoding in de surround processor dient te gebeuren.

### 7.6 Configuratie LAV Subtitle Filter

- General Settings	Open
Language:	0 Override placement
[	→ H: 50 → V: 90 →
Text Settings	Only show forced subtitles
Styles	Systray Settings
📝 Force Default	🕅 <u>H</u> ide tray icon
Load when needed 💌	▼ E <u>x</u> ternal

Merk op dat:

- Only show forced subtitles uit staat.
- Force default aan staat.
- Loading op Load when needed staat.
- Er ook een aantal subtitle settings gezet dienen te worden in Settings -> videos (zie screenshot hieronder).

# 8. MadVR Configuratie



#### 8.1 How to configure profile rules

The madVR settings profiling logic is very flexible, but also requires a bit of scripting for best effect. Script language is pretty easy. Basically scripting is expected to be a string of "if", "else if" and "else" statements. Every "if" (or "else if") statement contains of one or more value comparisons and selects one profile to be activated. Each value comparison must be placed in brackets. By using the logical operations "and" or "or" you can check multiple values to create more complex decisions.

Let's look at an example. The following script selects one of 4 profiles, depending on the source dimensions and the frame rate after deinterlacing. I think the script is pretty much self explaining:

```
Code:
```

```
if (srcWidth <= 1050) and (srcHeight <= 768) and (deintFps < 31) "SD
24fps"
else if (srcWidth <= 1050) and (srcHeight <= 768) "SD
60fps"
else if (deintFps < 31) "HD
24fps"
else "HD
60fps"</pre>
```

Supported keywords and operators: Code:

```
if/else statements: "if", "else if", "elseif", "elsif", "else"
logical operators: "and", "or", "&&", "||"
equal check: "==", "="
unequal check: "!=", "<>", "#"
bigger/smaller check: "<", ">", "<=", ">="
boolean "not" operator: "not", "!"
```

Supported numerical values: Code:

<pre>srcWidth, srcHeight according to settings)</pre>	<pre>src width/height (cropping</pre>
croppedSrcWidth, croppedSrcHeight uncroppedSrcWidth, uncroppedSrcHeight AR, uncroppedAR, encodedAR uncropped AR, encoded AR,	<pre>cropped src width/height uncropped src width/height cropped AR (aspect ratio),</pre>
targetWidth, targetHeight (cropping according to settings)	width/height after scaling
<pre>croppedTargetWidth, croppedTargetHeight cropped source</pre>	width/height after scaling
uncroppedTargetWidth, uncroppedTargetHeight uncropped source	width/height after scaling
scalingFactor.x/y	overall scaling factor
fps, deintFps, bitDepth ate after deinterlacing, bitdepth	source frame rate, framer-
displayMode.x/y, refreshRate	display mode information
runtime	movie runtime (in minutes)

Supported boolean values: Code:

4:2:0, 4:2:2, 4:4:4, RGB	which pixel format does the source have?
HDR	is the video HDR?
srcInterlaced	is the source interlaced?

filmMode	is film mode (IVTC) active?
MPEG2, VC-1, h264	which codec is the source encoded in?
fseMode, overlay, windowed	rendering mode
AMD, nVidia, Intel	which GPU manufacturer are we rendering on?
smoothMotion	is smooth motion FRC active?
variableAR	does this video have variable ARs?
hdr	is the video HDR?
Supported string values:	

Supported string values: Code:

mediaPlayer	media player exe file name
filePath, fileName, fileExt	e.g. "c:\movie.mkv", "movie.mkv", "mkv",
wildcards supported	
display	name of the active display device

One more example to show how to use numerical, boolean and string values:  $\ensuremath{\mathsf{Code}}$ :

if ((not 4:2:0) or (AR = 16:9)) and (fileName = "\*horribleSubs\*.mkv") "Weird profile" else "Normal profile"

#### 8.1.1 Lens Memory rule if ( AR < 2.2 ) "16:9" else "21:9"

#### 8.1.2 Scaling rules

If (hdr) and ( AR < 2.2 ) "hdr-16:9" if (hdr) and ( AR <= 2.2 ) "hdr-21:9" if (srcWidth > 1920) "2160p" else if (srcWidth <= 1920) and (srcHeight > 1080) "2160p" else if (deintFps  $\langle = 25 \rangle$  and (srcWidth  $\rangle$  1280) and (srcWidth  $\langle = 1920 \rangle$  and (AR  $\langle 2.2 \rangle$ ) "1080p24-16:9" else if (deintFps <= 25) and (srcWidth > 1280) and (srcWidth <= 1920) and (AR >= 2.2) "1080p24-21:9" else if (deintFps  $\langle = 25 \rangle$ ) and (srcWidth  $\langle = 1280 \rangle$ ) and ((srcHeight > 720)) and (srcHeight <= 1080)) "1080p24" else if (deintFps > 25) and (srcWidth > 1280) and (srcWidth  $\leq = 1920$ ) "1080p60" else if (deintFps > 25) and (srcWidth  $\leq$  1280) and ((srcHeight > 720) and (srcHeight  $\leq$ 1080)) "1080p60" else if (deintFps  $\langle = 25 \rangle$  and (srcWidth  $\rangle$  960) and (srcWidth  $\langle = 1280 \rangle$  "720p24" else if (deintFps <= 25) and (srcWidth <= 960) and ((srcHeight > 540) and (srcHeight <= 720)) "720p24" else if (deintFps > 25) and (srcWidth > 960) and (srcWidth <= 1280) "720p24" else if (deintFps > 25) and (srcWidth  $\leq$  960) and ((srcHeight > 540) and (srcHeight  $\leq$ 720)) "720p24" else if (srcWidth <= 960) and (srcHeight <= 540) "SD"

# 8.2 Devices

madVR settings - "DESKTOP-J42JUH9"	(127.0.	0.1) ×
devices     Harantz -AVR     Second Arrienter	^	Marantz -AVR
		create profile group device name: Marantz -AVR
		device type: Receiver, Processor, Switch Digital Monitor / TV Digital Projector
21:9 ↓		CRT projector CRT monitor / TV unknown
Calibration Calibration Calibration Calibration Calibration		
Calibration     Control     Control	~	
<pre>madVR v0.92.17</pre>	>	OK Cancel Apply

# **8.3 Projector**

madVR settings - "DESKTOP-J42JUH	19" (127.0.0.1)	×
🗙 💼 devices	∧ properties	
Marantz -AVR Constraints - AVR Marantz -AVR Projector properties color & gamma Color & gam	the display expects the following RGB output levels: TV levels (16-235) v the native display bitdepth is: 8 bit v 3D format: none v swap left / right eye	
<ul> <li>Image: Image: Ima</li></ul>	ip control: find projector ip addr: 192.168.1.250 test projector (JW) pause playback when activating a lens memory resume playback when lens memory activation is complete	:)
madVR v0.92.17	OK Cancel	Apply

- Zet RGB output levels op 16-235
- Zet de native display bitdepth op 8 bit (verschil met 10 bit is voor het menselijk oog toch niet zichtbaar en het helpt tevens om problemen bij 60Hz te voorkomen)



#### 4K Display: 2160p23, 2160p24, 2160p25, 2160p29, 2160p30, 2160p50, 2160p59, 2160p60

madVR settings - "DESKTOP-J42JUH9"	' (127.0.0	0.1)				×
Y - C devices	~	color & gamma				
Marantz -AVR     Projector     me properties		brightness:	contrast:	saturation:	hue:	
Color & gamma ✓ ⊡ screenconfg						
screen config		enable gamma pro	cessing			
✓ · 🔁 21:9     Screen config		desired display gamma	a / transfer function:			
✓ - 🔁 hdr		pure power curve	< 2.20 <>			
10.9						
V						
<ul> <li>calibration</li> <li>         ·          ·          í</li></ul>						
Calibration						
calibration						
v · □ processing · ···· () deinterlacing						
Zoom control	~					
<	>					
madVR v0.92.17				OK	Cancel Appl	У

#### 8.3.1 Screenconfig



• Dit geeft de mogelijkheid om het beeld automatisch te laten in of uitzoomen. Ik gebruik dit echter niet meer vanwege het feit dat er films zijn die tijdens de film steeds wisselen van aspect ratio.

madVR settings - "DESKTOP-J42JUH	9" (127.0.0	0.1)	×
Y 💼 devices	~	screen config	
> 🔛 Marantz -AVR			
V C Projector		define visible screen area by cropping masked borders	
in display modes		left: top: right: bottom:	
color & gamma			
✓ i screenconfig			
✓ ☐ 16:9		move OSD into active video area	
Screen config			
✓ · 21:9			
v in bdr		activate lens memory number: 1 $\sim$	
✓ 🗂 16:9			
🔚 🗍 hdr			-
✓ <sup>1</sup> 21:9		anamorphic lens	
i i i i i i i i i i i i i i i i i i i			
Calibration		stretch factor:	
alibration		4 / 3 (ok)	
✓   T T T T T T T T T T T T T T T T T T			
📄 📄 calibration			
v · i processing			
	×		
<u> </u>	>		
madVR v0.92.17		OK Cancel Appl	y

madVR settings - "DESKTOP-J42JUH9" (	(127.0.	0.1)	×
✓	^	screen config	
		left:     top:     right:     bottom:       0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 +	
		activate lens memory number: 2 ~	
		stretch factor: 4 / 3 (ok)	
processing     deinterlacing     zoom control	~		
madVR v0.92.17		OK Cancel Appl	y

#### 8.3.2 HDR

• Zet HDR BT2020 om naar SDR BT2020, rekening houdend met de lichtsterkte van de projector.

madVR settings - "DESKTOP-J42JUHS	פי (127.0.0.1)	×
Y - 🛅 devices	∧ hdr	
Marantz -AVR     Grojector     Forperties     Gisplay modes     Color & gamma     Screenconfig     Gorg 16:9	profile group name: hdr add profile delete profile gr keyboard shortcut to toggle profiles: edit shortcut	oup
✓ · · · · · · · · · · · · · · · · · · ·	profile auto select rules: (dick here for online help	হা 🗸
Screen contig  Screen contig  Addition  Screen control  S	<pre>if ( AR &lt; 2.2 ) "16:9" else "21:9" </pre>	<
madVR v0.92.17	OK Cancel	Apply

madVR settings - "DESKTOP-J42JUH9" (127.	.0.1)	×
Y · 🗋 devices 🔨	hdr	
✓	hdr  let madVR decide  passthrough HDR to display  tone map HDR using pixel shaders  tone map HDR using external 3DLUT  display peak luminance (nits):  color tweaks for fire & explosions: balanced  highlight recovery: Log Low  shadow recovery: Log Low  HSTM: no brightening HSTM: no darkening	lum method:       lum3/4 old ✓       highlight sat:       0.100 ✓         gamut roll-off       R:       75       18       C:       75       18         G:       75       18       M:       75       18         B:       75       18       Y:       75       18         disable luma repair       ✓       use dumb instead of desat 4         mixture:       100       desat 2,3,4 = 0,50,100         strength:       100       100 = normal         desat reduction per source nits (100 = no change):       0 nits 50       100       200       300       400       600       1000       2500         100       100       100       100       100       100       100       100
	Output Network       No       no compr limit:       0       nits       don't add peak nits         dynamic target nits       80       no compr limit:       0       nits       don't add peak nits         dynamic dipping       100       use avgHighlights ceiling:       2.00x          sky strength:       0       max width:       10       min/max hill height:       20       20         No scene cut if M2 <	use custom TM curves       edit custom TM curves         use TM curve:       mars       punch:       5         dip Y:       0       nits         limit HSTM:       0       min       100         brightness equalization       filcker Risk Multiplier:       1         filcker protection:       500       milliseconds         FALL highlight mod:       off       detail threshold:       1
madVR v0.92.17		OK Cancel Apply

- Voor contrast recovery kan gekozen worden uit een aantal HSTM curve's. Op dit moment geef ik de voorkeur aan Log Low
- De predefined Mars TM curve geeft erg mooie resultaten, dit in combinatie met een punch setting van 5
- Lum method op lum3/4 old
- Shadow recovery op low
- Highlight recovery op medium
- Dynamic target nits op ongeveer 2/3 van display peak luminance nits.

### 8.3.3 Calibration

madVR settings - "DESKTOP-J42JUH9	(127.0.0.1)	×
Y 💼 devices	▲ calibration	
Marantz -AVR     Projector     Projector     isplay modes     color & gamma     ····     screenconfig     ····     16:9	profile group name:     add profile     d       calibration     add profile     d       keyboard shortcut to toggle profiles:     edit shortcut	lelete profile group
✓ 21:9	profile auto select rules: (click here	<u>e for online help)</u> 💅
Gelibration     Gelibrati	if (hdr) "BT2020" else "REC709"	∧
madVR v0.92.17	OK Ca	ncel Apply

madVR settings - "DESKTOP-J42JUH9" (127	.0.0.1)			×	
<ul> <li>devices</li> <li>marantz -AVR</li> <li>move Projector</li> <li>properties</li> <li>display modes</li> <li>color &amp; gamma</li> </ul>	<ul> <li>▲ calibration</li> <li>○ disable</li> <li>○ this dis</li> <li>○ calibrat</li> </ul>	calibration controls for this display play is already calibrated the this display by using yCMS			
<ul> <li>✓ ······· screenconing</li> <li>✓ ····································</li></ul>	C:\ProgramData\madVR\madVR 2020-01-12 18-20 0 3127x 0 329y S XYZU II.     X    X				
✓ 🔂 16:9	SMPTE C:	C: (ProgramData (madvk (madvk 2020-01-12 18-20 0.312/X 0.329) S XY2LUI -	×	220 220	
✓ 1:9 Image:	EBU/PAL:		X	<b>3</b>	
Calibration	BT.2020: DCI-P3:		X	<u> </u>	
<pre>calibration</pre>	You don't l	nave to provide a 3dlut file for every gamut. One 3dlut for all gamuts also works BT.2020 to display (Nvidia only)	ok.		
madVR v0.92.17		OK Cancel	App	oly	

madVR settings - "DESKTOP-J42JUH9" (1	127.0.	0.1)			×
✓ - 🚰 Marantz - AVR	^	calibration			
- See identification 1 - See identification 2 - See identification 3 - See identification 4 - See identification 5 - See or Projector - See projector		<ul> <li>disable</li> <li>this disp</li> <li>calibrati</li> <li>calibrati</li> </ul>	calibration controls for this display alay is already calibrated e this display by using yCMS e this display by using external 3DLUT files		
display modes		✓ disable	GPU gamma ramps		
✓		BT. 709: SMPTE C: EBU/PAL: BT. 2020: DCI-P3: You don't h	C: \ProgramData\madVR\DCI-P3.3dlut ave to provide a 3dlut file for every gamut. One 3dlut	For all gamuts also works ok.	
REC709     Eclibration     Collibration     Figure Calibration     Collibration     Collibration	*	☑ report E	IT.2020 to display (Nvidia only)		OK Cancel Anniv
madVR v0.92.17					OK Cancel Apply

### 8.4 Processing





Sommige netflix series hebben een afwijkende aspect ratio waardoor in 16:9 zoom mode er toch kleine zwarte balken onder en boven ontstaan, om te voorkomen dat madvr in 16:9 zoom mode toch de video omhoog gaat schuiven heb ik ervoor gekozen om op basis van aspect ratio te zorgen dat er in 16:9 zoom mode de optie "always shift the image" uit staat.



- Verwijder black bars zodat MadVR onderscheid kan maken tussen 16:9 en cinemascope aspect ratio movies. Black bars zijn namelijk hard encoded op blu-ray, waardoor de aspect ratio altijd 16:9 is en de resolutie altijd 1920x1080, ongeacht of de film zelf in 16:9 of cinemascope formaat is.
- Zoom small black bars away niet gebruiken! Dit kost teveel GPU performance.

madVR settings - "DESKTOP-J42JUH9" (127.0	0.1) ×
identification 3	artifact removal
<ul> <li>identification 5</li> <li>Projector</li> <li>properties</li> <li>display modes</li> <li>color &amp; gamma</li> <li>screenconfig</li> <li>16:9</li> <li>screen config</li> </ul>	✓ reduce banding artifacts          default debanding strength:       Ow       medium       high         strength during fade in/out:       Ow       medium       high         reduce ringing artifacts       reduce dark halos around bright edges, too       (not recommended for Anime)
	reduce compression artifacts       strength:       1       +       quality:       medium          process chroma channels, too
Calibration     Calibration     REC709     Calibration     Figure Calibration	□ reduce random noise strength: 1   ► □ process chroma channels, too
deinterlacing	
madVR v0.92.17	OK Cancel Apply
Artifact removal	

madVR settings - "DESKTOP-J42JUH9" (127.0	.0.1)					×
✓ · i devices	image enhancements					
> - Marantz - AVR						
V C Projector	sharpen edges	1.0	4	÷.		
isplay modes	Crispen edges	1.0	4	÷.		
🗊 color & gamma	thin edges	1.0	4	+		
<ul> <li>✓ - ☐ screenconfig</li> <li>✓ - ☐ 16:9</li> </ul>	🗹 enhance detail	0.3	•	•		
<ul> <li>✓ · · · · · · · · · · · · · · · · · · ·</li></ul>	LumaSharpen	0.65	4	÷.		
V 💼 hdr	AdaptiveSharpen	0.5	4	÷.	🗹 linear light	
	✓ activate anti-bloating ✓ activate anti-ringing	) filter filter	st	rengt	ath: 100% 🗸	
artifact removal	restore defaults					
madVR v0.92.17					OK Cancel Ap	ply

- Image enhancements vind plaats VOOR de (chroma) upscaling en dus direkt op het bron materiaal. Upscaling Refinement vind plaats NA de (chroma) upscaling. Ik kom tot de conclusie dat "crispen edges" en "enhance detail" aanzetten bij beiden het beste resultaat geeft.
- Echter crispen edgesvoor upscaling kost teveel GPU performance en die enable ik daarom alleen NA upscaling bij upscaling refinement. Enhance detail kan wel ongestraft bij beiden gebruikt worden.
- De waarde voor enhance detail heb ik op 0.3 staan voor een in mijn ogen natuurlijk plaatje.

### 8.5 Scaling

Most video is stored using chroma subsampling in a 4:2:0 video format. In simple terms, what this means is that the video is basically stored as a black-and-white "detail" image (luma) with a lower resolution "color" image (chroma) layered on top. This works because the detail image helps to mask the low resolution of the color image that is being layered on top.

So the scaling options in madVR are broken down into three different categories: **Chroma Upscaling**, which is the color layer. **Image Upscaling**, which is the detail (luma) layer.**Image downscaling**, which only applies when the image is being displayed at a lower resolution than the source—1080p content on a 720p display, or in a window on a 1080p display for example.

Chroma upscaling is performed on all videos—it takes the quarter resolution chroma image, and upscales it to the native luma resolution of the video. If there is any further scaling to be performed; whether that is upscaling or downscaling, then the image upscaling/downscaling algorithm is applied to both chroma and luma.

- Voor het kwalitatief beste resultaat is het aan te raden om voor chroma upsampling en image upsampling hetzelfde algoritme te kiezen
- Hoge kwaliteit image upscaling (of downscaling) is belangrijker is (qua subjectieve weergave perceptie) dan dezelfde kwaliteit chroma upscaling. Dit is uiteraard niet van toepassing als er alleen chroma upscaling nodig is.
- If you have a high-quality source (ie. artifact free), then NGU Sharp is likely going to be better.
- On sources with artifacts, NGU Anti-Alias is superior, since it manages to hide certain amounts of artifacts, while NGU Sharp would emphasize them to some degree. Om deze reden kies ik dus voor NGU Anti-Alias als preferred upscaling algoritme.

#### **8.5.1 Upscaling Refinement**

madVR settings - "DESKTOP-J42JUH9" (127.0	0.0.1)		×
× 16:9 ^	upscaling refinement		
v · □ 21:9	sharpen edges	1.0 4 ▶ soften edges 2 4 ▶	
screen config	✓ crispen edges	0.6	
V 16:9	thin edges	1.0 • •	
hdr	enhance detail	0.6 • •	
21:9			
<ul> <li>calibration</li> <li>calibration</li> </ul>	LumaSharpen	0.65 4 >	
E calibration	AdaptiveSharpen	0.5 🔹 🕨 🗹 linear light	
✓ □ BT2020 □ calibration			
processing	activate anti-bloating	g filter strength: 100% 🗸	
······································	activate anti-ringing	filter	
image enhancements			
v i zoom control	SuperPes	3 4 b linear light anti-ringing	
zoom control			
✓ <sup>™</sup> 21:9			
scaling algorithms	O refine the image after	er every ~2x upscaling step	
upscaling refinement	refine the image only	once after upscaling is complete	
···· ··· ··· ··· ··· ··· ··· ··· ··· ·			_
madVR v0.92.17		OK Cancel App	у

- Sharpen edges: [1.0] Only sharpens edges instead of textures like skin or cloth. Avoids sharpening artifacts too much.
- Crispen edges: [1.0] A tamed version of FineSharp, a sharpener originally by Didée that attempts to keep local energy close to the original. Better used with higher quality sources because it sharpens artifacts.
- Thin edges: [1.0] As its name implies. Good for SD Anime or cartoons.
- Enhance detail: [1.0] Sharpens textures like skin or cloth, also sharpens artifacts.
- LumaSharpen: [0.65] Blurs the original pixel with the surrounding pixels and then subtracts the blur. Avoids sharpening artifacts.
- AdaptiveSharpen: [0.5] Tries to sharpen medium sharp edges the most, it avoids sharpening near flat areas and very sharp edges.
- Activate anti-ringing filter: A post process method to reduce ringing that runs after each ringing sharpener.

SuperRes: [3] This is a post process method. use linear light: Ideally use the same method that the source was originally downscaled with when it was mastered

#### **8.5.2 Upscaling rules**



### 8.5.3 Chroma upscaling van 2160p content

madVR settings - "DESKTOP-J42JUH9" (127.0.0.1)				
Calibration	chroma upscaling			
Galibration     Galibrati	chroma upscaling  processing done by GPU texture units: Nearest Neighbor (not recommended) Bilinear  processing done by custom pixel shader code: Cubic Lanczos Spline Jinc Bilateral Reconstruction super-xbr NGU  Anti-Alias, high quality activate anti-ringing filter activate SuperRes filter, strength: 1 +	sharpness hide source artifacts aliasing ringing other artifacts		
madVR v0.92.17	, 	OK Cancel Apply		

• Alleen de Chroma upscaling settings zijn relevant voor dit type content.

madVR settings - "DESKTOP-J42JUH9" (127.0.0.1) ×				
BT2020     BT20     BT2020     BT2020     BT2020     BT2020     BT20     BT2020     BT20     BT2020     BT20     BT2020     BT20     BT20     BT2020     BT20     BT2     BT20     BT20     BT2     BT20     BT2     BT20     BT2     BT20     BT2     BT20     BT2     BT20     BT2     BT2     BT20     BT2     BT2     BT2     BT2	image downscaling image downscaling processing done by GPU texture units: Nearest Neighbor (not recommended) Bilinear processing done by GPU video logic: ringing			
<ul> <li>image enhancements</li> </ul>	<ul> <li>O DXVA2 other artifacts</li> <li>processing done by custom pixel shader code:</li> <li>Cubic</li> <li>Lanczos</li> <li>Spline</li> <li>Jinc</li> <li>SSIM</li> <li>2D - strength: 100% ✓</li> <li>✓ scale in linear light</li> <li>✓ activate anti-ringing filter relaxed ✓</li> <li>activate anti-bloating filter strength: 100% ✓</li> </ul>			
madVR v0.92.17	OK Cancel Apply			

• Image downscaling is niet aan de orde voor dit type content.

madVR settings - "DESKTOP-J42JUH9" (127.0.0.1) ×				
🗊 calibration	<ul> <li>image upscaling</li> </ul>			
processing     deinterlacing     zoom control         ····     16:9         ····     21:9         ····     artifact removal	upscaling: OBilinear ODXVA2 Cubic Lanczos Spline	doubling: Super-xbr NGU Anti-Alias NGU Soft NGU Standard NGU Sharp	sharpness hide source artifacts aliasing ringing other artifacts	
<ul> <li></li></ul>	algorithm quali high let madVR dec	ty: cide	<ul> <li>&lt; luma doubling</li> <li>&lt; luma quadrupling</li> <li>&lt; chroma</li> </ul>	
<ul> <li>image enhancements</li> <li>scaling algorithms</li> <li>scaling</li> <li>scaling</li> <li>scaling</li> <li>forma upscaling</li> <li>image downscaling</li> <li>image upscaling</li> </ul>	activate doubli only if scal only if scal if any (more) s let madVR dec	ing / quadrupling ing factor is 1.2x (or bigger) ing factor is 2.4x (or bigger) icaling needs to be done: cide	<ul> <li>&lt; doubling</li> <li>&lt; quadrupling</li> <li>&lt; upscaling algo</li> <li>&lt; downscaling algo</li> </ul>	
madVR v0.92.17			OK Cancel Ap	ply

• Image upscaling is niet aan de orde voor dit type content.

#### 8.5.4 Image upscaling 1080p@24fps content naar 2160p

Om het onderste uit de kan te halen met mijn RTX2070 videokaart maak ik bij HDR een onderscheid tussen 16:9 en 21:9 materiaal. 21:9 materiaal vereist immers minder processing wegens de zwarte balken en kan daarom in iets hogere settings draaien. Met mijn RTX2070 kaart is high bij 16:9 de hoogst mogelijke setting. Bij 21:9 kan ik echter de very high quality setting kiezen.

madVR settings - "DESKTOP-J42JUH9" (127.0	.0.1)	×
madVR settings - "DESKTOP-J42JUH9" (127.0)	10.1) 1080p24-16:9 profile name: 1080p24-16:9 duplicate profile delete profile keyboard shortcut to activate this profile: edit shortcut command line to execute when this profile is activated: command line to execute when this profile is deactivated:	×
madVR v0.92.17	OK Cancel Apply	

madVR settings - "DESKTOP-J42JUH9" (127.0.0.1)			
madVR settings - "DESKTOP-J42JUH9" (127.0	chroma upscaling         processing done by GPU texture units:         Nearest Neighbor (not recommended)         Bilinear         processing done by custom pixel shader code:         Cubic         Lanczos         Spline         Jinc         Bilateral	× sharpness hide source artifacts aliasing ringing other artifacts	
<ul> <li>interpretation</li> <li>interpretation<td><ul> <li>Jinc</li> <li>Bilateral</li> <li>Reconstruction</li> <li>super-xbr</li> <li>NGU</li> <li>Anti-Alias, high quality </li> <li>activate anti-ringing filter</li> <li>activate SuperRes filter, strength: 3 </li> </ul></td><td></td></li></ul>	<ul> <li>Jinc</li> <li>Bilateral</li> <li>Reconstruction</li> <li>super-xbr</li> <li>NGU</li> <li>Anti-Alias, high quality </li> <li>activate anti-ringing filter</li> <li>activate SuperRes filter, strength: 3 </li> </ul>		
madVR v0.92.17		OK Cancel Apply	

madVR settings - "DESKTOP-J42JUH9" (127	0.0.1)	×
madVR settings - "DESKTOP-J42JUH9" (127	0.0.1) image downscaling processing done by GPU texture units: Nearest Neighbor (not recommended) Bilinear processing done by GPU video logic: CDXVA2 processing done by custom pixel shader code: CO tria	×
<ul> <li>image enhancements</li> <li>image enhancements</li> <li>image enhancements</li> <li>hdr</li> <li>image enhancements</li> <li>scaling algorithms</li> <li>scaling</li> <li>2160p</li> <li>clop</li> <li>droma upscaling</li> <li>image downscaling</li> <li>1080p24-16:9</li> <li>chroma upscaling</li> <li>image downscaling</li> <li>image downscaling</li> <li>image downscaling</li> <li>image downscaling</li> <li>image downscaling</li> <li>image downscaling</li> </ul>	<ul> <li>Cubic</li> <li>Lanczos</li> <li>Spline</li> <li>Jinc</li> <li>SSIM</li> <li>2D - strength: 100% ✓</li> <li>✓ scale in linear light</li> <li>✓ activate anti-ringing filter relaxed ✓</li> <li>☐ activate anti-bloating filter strength: 100% ✓</li> </ul>	
madVR v0.92.17	OK Cancel	Apply

madVR settings - "DESKTOP-J42JUH9" (127	.0.0.1)			$\times$
✓ ·· □ BT2020     ···· □ calibration	image upscaling			
processing     deinterlacing      artifact removal     v      zoom control	upscaling:	doubling:	sharpness	
	OBilinear	O super-xbr	hide source artifacts	
	O DXVA2	NGU Anti-Alias	aliasing	
¥ · 🗀 16:9		O NGU Standard	ringing	
i zoom control			other artifacts	
zoom control	OJinc	0		
✓ ☐ image enhancements	algorithm quality	y:		
image enhancements	high		luma doubling	
✓ · 🚞 hdr	let madVR decide		< luma quadrupling	
image enhancements	let madVR deci	de	< chroma	
✓ · i scaling algorithms				
v i scaiing	activate doublin	g / quadrupling		
chroma upscaling	only if scalin	ng factor is 1.2x (or bigger)	<ul> <li>✓ &lt; doubling</li> </ul>	
···· 🗊 image downscaling	only if scalin	ng factor is 2.4x (or bigger)	v < quadrupling	
✓ ☐ 1080p24-16:9	if any (more) sc	aling needs to be done:		
🗊 chroma upscaling	let madVR deci	de	v < upscaling algo	
image downscaling	let madVR deci	de	downscaling algo	
image upscaling	1			
madVR v0.92.17			OK Cancel A	pply

madVR settings - "DESKTOP-J42JUH9" (127	0.0.1) ×	(
<ul> <li>1080p24-16:9</li> <li>image downscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image downscaling</li> <li>image upscaling</li> </ul>	1080p24-21:9         profile name:         1080p24-21:9         duplicate profile         keyboard shortcut to activate this profile:         edit shortcut         command line to execute when this profile is activated:         command line to execute when this profile is deactivated:	
madVR v0.92.17	OK Cancel Apply	

madVR settings - "DESKTOP-J42JUH9" (127.0.	0.1)	×
madVR settings - "DESKTOP-J42JUH9" (127.0.	0.1)  chroma upscaling  processing done by GPU texture units:  Nearest Neighbor (not recommended)  Nearest Neighbor (not recommended)  Bilinear  processing done by custom pixel shader code:  Cubic  Cubic	×
<ul> <li>Ibsoped</li> <li>Chroma upscaling</li> <li>mage downscaling</li> <li>mage upscaling</li> <li>720p60</li> <li>720p60</li> <li>forma upscaling</li> <li>mage upscaling</li> <li>hdr-21:9</li> <li>chroma upscaling</li> <li>mage upscaling</li> </ul>	<ul> <li>Jinc</li> <li>Bilateral</li> <li>Reconstruction</li> <li>super-xbr</li> <li>NGU</li> <li>Anti-Alias, very high quality </li> <li>activate anti-ringing filter</li> <li>activate SuperRes filter, strength: 3 </li> </ul>	
madVR v0.92.17	OK Cancel Appl	Y
madVR settings - "DESKTOP-J42JUH9" (127.0.	0.1)	×
--	--	----------
image downscaling	image downscaling	
<ul> <li>image upscaling</li> <li>720p24</li> <li>image downscaling</li> <li>image downscaling</li> <li>image upscaling</li> <li>image downscaling</li> <li>image downscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image downscaling</li> <li>image upscaling</li> <li>image downscaling</li> <li>image downscaling</li> <li>image upscaling</li> </ul>	processing done by GPU texture units: sharpness   Nearest Neighbor (not recommended)   Bilinear hide source artifacts   processing done by GPU video logic: ringing   DXVA2 other artifacts   DXVA2 other artifacts   Processing done by custom pixel shader code: other artifacts   Cubic Lanczos   Spline Jinc   SSIM 2D - strength: 100%     2D - strength: 100%   activate anti-ringing filter   relaxed   activate anti-bloating filter	5
image downscaling		
madVR v0.92.17	OK Cance	el Apply

madVR settings - "DESKTOP-J42JUH9" (127.	0.0.1)	×
image upscaling	image upscaling	
720p24     froma upscaling     image downscaling     image upscaling     SD     froma upscaling     image upscaling     image upscaling     image upscaling     image upscaling	upscaling: doubling: Bilinear Super-xbr DXVA2 INGU Anti-Alias Cubic NGU Soft Lanczos NGU Standard Spline NGU Sharp	sharpness hide source artifacts aliasing ringing other artifacts
foroma upscaling     image upscaling     image upscaling	algorithm quality:	< luma doubling
<ul> <li>ZUp60</li> <li>chroma upscaling</li> <li>image downscaling</li> </ul>	let madVR decide $\checkmark$ let madVR decide $\checkmark$	< luma quadrupling < chroma
✓ · · · · · · · · · · · · · · · · · · ·	activate doubling / quadrupling only if scaling factor is 1.2x (or bigger)	< doubling
image downscaling	only if scaling factor is 2.4x (or bigger)	< quadrupling
✓      ✓	It any (more) scaling needs to be done:	< upscaling algo
madVR v0.92.17		OK Cancel Apply

## 8.5.5 Upscaling 720p@24fps content naar 2160p

madVR settings - "DESKTOP-J42JUH9" (1	(.0.0.1)		×
21.9	<ul> <li>chroma upscaling</li> </ul>		
zoom control			
✓ i artifact removal	processing done by GPU texture unit	si sharone	ee.
Y · initial sdr	O Nearest Neighbor (not recomme	ended) bide so	urce artifacte
artifact removal	Bilinear	nide so	irce artifacts
artifact removal	-	aliasing	
✓ · image enhancements	processing done by custom pixel share	ier code: ringing	
🗸 💼 sdr	OCubic	other a	tifacts
image enhancements	OLanczos		
✓ · 🛅 hdr	OSpline		
image enhancements			
	Bilateral		
× · □ 2160p	OReconstruction		
🗊 chroma upscaling	Super-xbr		
···· 📳 image downscaling	(Ingo		
image upscaling	Anti-Alias, high quality	~	
Y · □ 1080p24			
image downscaling	activate anti-ringing filter		
image upscaling	activate SuperRes filter, strength	1 • •	
▼ · 🛅 720p24			
🗊 chroma upscaling	~		
< · · · · · · · · · · · · · · · · · · ·			
madVR v0.92.17		OK	Cancel Apply
madVP sattings "DESKTOP 14211149" (1	0.0.1)		×
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1)		×
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1)		×
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1) image downscaling	24	×
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1) image downscaling processing done by GPU texture unit	s: sharpne	×
madVR settings - "DESKTOP-J42JUH9" (1	0.0.1) image downscaling processing done by GPU texture unit Nearest Neighbor (not recomme	s: sharpne ended) hide so	× ess urce artifacts
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1) image downscaling processing done by GPU texture unit O Nearest Neighbor (not recomme O Bilinear	s: sharpne ended) hide so aliasing	× ess urce artifacts
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1) image downscaling processing done by GPU texture unit O Nearest Neighbor (not recommo O Bilinear processing done by GPU video logic:	s: sharpne ended) hide so aliasing ringing	× ess urce artifacts
madVR settings - "DESKTOP-J42JUH9" (1	0.0.1)  image downscaling  processing done by GPU texture unit  Nearest Neighbor (not recomme Bilinear  processing done by GPU video logic:  DXVA2	s: sharpne ended) hide so aliasing ringing other a	× ess urce artifacts
madVR settings - "DESKTOP-J42JUH9" (1	0.0.1)  image downscaling  processing done by GPU texture unit  Nearest Neighbor (not recomme Bilinear  processing done by GPU video logic:  DXVA2	s: sharpne :nded) hide so aliasing ringing other a	× ess urce artifacts ttifacts
madVR settings - "DESKTOP-J42JUH9" (1	<ul> <li>.0.0.1)</li> <li>image downscaling</li> <li>processing done by GPU texture unit</li> <li>Nearest Neighbor (not recommodel)</li> <li>Bilinear</li> <li>processing done by GPU video logic:</li> <li>DXVA2</li> <li>processing done by custom pixel share</li> </ul>	s: sharpne ended) hide so aliasing ringing other a ler code:	× ess urce artifacts tifacts
madVR settings - "DESKTOP-J42JUH9" (1	<ul> <li>.0.0.1)</li> <li>image downscaling</li> <li>processing done by GPU texture unit</li> <li>Nearest Neighbor (not recomme O Bilinear</li> <li>processing done by GPU video logic:</li> <li>DXVA2</li> <li>processing done by custom pixel share</li> <li>Cubic</li> </ul>	s: sharpne ended) hide so aliasing ringing other a der code:	x ess urce artifacts tifacts
madVR settings - "DESKTOP-J42JUH9" (1	<ul> <li>.0.0.1)</li> <li>image downscaling</li> <li>processing done by GPU texture unit</li> <li>Nearest Neighbor (not recomme Bilinear</li> <li>processing done by GPU video logic:</li> <li>DXVA2</li> <li>processing done by custom pixel share</li> <li>Cubic</li> <li>Lanczos</li> </ul>	s: sharpne :nded) hide so aliasing ringing other a der code:	× ess urce artifacts tifacts
madVR settings - "DESKTOP-J42JUH9" (1	<ul> <li>.0.0.1)</li> <li>image downscaling</li> <li>processing done by GPU texture unit</li> <li>Nearest Neighbor (not recomme Bilinear</li> <li>processing done by GPU video logic:</li> <li>DXVA2</li> <li>processing done by custom pixel share</li> <li>Cubic</li> <li>Lanczos</li> <li>Spline</li> </ul>	s: sharpne :nded) hide so aliasing ringing other a der code:	× ess urce artifacts tifacts
madVR settings - "DESKTOP-J42JUH9" (1	<ul> <li>image downscaling</li> <li>processing done by GPU texture unit</li> <li>Nearest Neighbor (not recomme Bilinear processing done by GPU video logic:</li> <li>DXVA2 processing done by custom pixel share Cubic Lanczos Spline Jinc Danuel</li> </ul>	s: sharpne ended) hide so aliasing ringing other a der code:	× urce artifacts ttifacts
madVR settings - "DESKTOP-J42JUH9" (1	<ul> <li>image downscaling</li> <li>processing done by GPU texture unit</li> <li>Nearest Neighbor (not recomme Bilinear processing done by GPU video logic:</li> <li>DXVA2 processing done by custom pixel share Cubic Lanczos Spline Jinc</li></ul>	s: sharpne ended) hide so aliasing ringing other a ler code:	× urce artifacts
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1)         image downscaling         processing done by GPU texture unit         Nearest Neighbor (not recomme         Bilinear         processing done by GPU video logic:         DXVA2         processing done by custom pixel share         Cubic         Lanczos         Spline         Jinc         Image SSIM	s: sharpne ended) hide so aliasing ringing other a der code:	x urce artifacts tifacts
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1)         image downscaling         processing done by GPU texture unit         Nearest Neighbor (not recomme         Bilinear         processing done by GPU video logic:         DXVA2         processing done by custom pixel share         Cubic         Lanczos         Spline         Jinc         SSIM         2D - strength: 100%	s: sharpne ended) hide so aliasing ringing other a ler code:	x rce artifacts
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1)         image downscaling         processing done by GPU texture unit         Nearest Neighbor (not recomme         Bilinear         processing done by GPU video logic:         DXVA2         processing done by custom pixel share         Cubic         Lanczos         Spline         Jinc         SSIM         2D - strength: 100%         vicale in linear light	s: sharpne ended) hide so aliasing ringing other a ler code:	x rce artifacts tifacts
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1)         image downscaling         processing done by GPU texture unit         Nearest Neighbor (not recomme         Bilinear         processing done by GPU video logic:         DXVA2         processing done by custom pixel share         Cubic         Lanczos         Spline         Jinc         SSIM         2D - strength: 100%         Zactivate anti-ringing filter	s: sharpne ended) hide so aliasing ringing other a ler code:	x rss urce artifacts tifacts
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1)         image downscaling         processing done by GPU texture unit         Nearest Neighbor (not recomme         Bilinear         processing done by GPU video logic:         DXVA2         processing done by custom pixel share         Cubic         Lanczos         Spline         Jinc         SSIM         2D - strength: 100%         Zactivate anti-ringing filter         relativate anti-religing filter	s: sharpne ended) hide so aliasing ringing other a ler code:	x rce artifacts tifacts
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1)         image downscaling         processing done by GPU texture unit         Nearest Neighbor (not recomme         Bilinear         processing done by GPU video logic:         DXVA2         processing done by custom pixel share         Cubic         Lanczos         Spline         Jinc         SSIM         2D - strength: 100%         Zactivate anti-ringing filter         relational relation of the strength	s: sharpne inded) hide so aliasing ringing other a der code:	x ess urce artifacts tifacts
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1)         image downscaling         processing done by GPU texture unit         Nearest Neighbor (not recommed)         Bilinear         processing done by GPU video logic:         DXVA2         processing done by custom pixel share         Cubic         Lanczos         Spline         Jinc         SSIM         2D - strength: 100%         Zactivate anti-ringing filter         relation activate anti-bloating filter	s: sharpne inded) hide so aliasing ringing other a ler code:	x ess urce artifacts tifacts
madVR settings - "DESKTOP-J42JUH9" (1	.0.0.1)         image downscaling         processing done by GPU texture unit         Nearest Neighbor (not recommed)         Bilinear         processing done by GPU video logic:         DXVA2         processing done by custom pixel share         Cubic         Lanczos         Spline         Jinc         SSIM         2D - strength: 100%         zactivate anti-ringing filter         rek	s: sharpne ended) hide so aliasing ringing other a der code:	x ess urce artifacts tifacts

madVR settings - "DESKTOP-J42JUH9" (12	27.0.	0.1)				×
Y 💼 artifact removal	~	image upscaling				
sdr     sdr     image enhancements     ···		upscaling: Bilinear DXVA2 Cubic Lanczos Spline Jinc	doubling: Super-xbr NGU Anti-Alias NGU Soft NGU Standard NGU Sharp		sharpness hide source artifacts aliasing ringing other artifacts	
Image enhancements     Scaling algorithms     Scaling     Scaling     2160p		algorithm qualit	y:	~	< luma doubling	
for the second sec		let madVR deci let madVR deci	de de	~	< luma quadrupling < chroma	
will chroma upscaling		activate doublin	ng / quadrupling			
····· 🗊 image downscaling		only if scalir	ng factor is 1.2x (or bigger)	~	< doubling	
image upscaling		only if scalir	ng factor is 2.4x (or bigger)	$\sim$	< quadrupling	
Y · C 720p24 ···· E chroma upscaling		if any (more) so	aling needs to be done:			
···· 📄 image downscaling		let madVR deci	de	$\sim$	< upscaling algo	
image upscaling	$\mathbf{v}$	let madVR deci	de	$\sim$	< downscaling algo	
< >						
madVR v0.92.17					OK Cancel Appl	ly

## 8.5.6 Upscaling SD content naar 2160p

madVR settings - "DESKTOP-J42JUH9" (127	0.0.1)	>	<
deinterlacing	chroma upscaling		
<ul> <li>deinterlacing         <ul> <li>artifact removal</li> <li>image enhancements</li> <li>zoom control</li> <li>16:9</li> <li>21:9</li> <li>21:9</li> <li>scaling algorithms</li> <li>scaling</li> <li>2160p</li> <li>arge downscaling</li> <li>arge downscaling</li> <li>1080p24-16:9</li> <li>1080p24-16:9</li> <li>image downscaling</li> <li>image upscaling</li> <li>720p24</li> <li>droma upscaling</li> <li>image downscaling</li> <li>image downscaling</li> <li>image upscaling</li> <li>image ups</li></ul></li></ul>	<pre>chroma upscaling processing done by GPU texture units: Nearest Neighbor (not recommended) Bilinear processing done by custom pixel shader code: Cubic Lanczos Spline Jinc Bilateral Reconstruction super-xbr NGU Anti-Alias, medium quality activate anti-ringing filter activate SuperRes filter, strength: 3 &lt; &gt;</pre>	sharpness hide source artifacts aliasing ringing other artifacts	
SD chroma upscaling	,		
madVR v0.92.17		OK Cancel Apply	

madVR settings - "DESKTOP-J42JUH9" (127.0	.0.1)	X
madVR settings - "DESKTOP-J42JUH9" (127.0	0.1) image downscaling processing done by GPU texture units: O Nearest Neighbor (not recommended) O Bilinear processing done by GPU video logic: O DXVA2 processing done by custom pixel shader code:	× sharpness hide source artifacts aliasing ringing other artifacts
<ul> <li>Chroma upscaling</li> <li>image downscaling</li> <li>image upscaling</li> <li>chroma upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image downscaling</li> <li>image upscaling</li> </ul>	<ul> <li>Cubic</li> <li>Lanczos</li> <li>Spline</li> <li>Jinc</li> <li>SSIM</li> <li>2D - strength: 100% ∨</li> <li>✓ scale in linear light</li> <li>✓ activate anti-ringing filter relaxed ∨</li> <li>activate anti-logating filter relaxed ∨</li> </ul>	
madVR v0.92.17		OK Cancel Apply

madVR settings - "DESKTOP-J42JUH9"	(127.0.	0.1)				×
artifact removal	^	image upscaling				
<ul> <li>image enhancements</li> </ul>						
Y · insdr		upscaling:	doubling:		sharpness	
image enhancements		OBilinear	🔾 super-xbr		hide source artifacts	
ndr		O DXVA2	NGU Anti-Alias			
scaling algorithms		O Cubic	○ NGU Soft		aliasing	
		OLanczos	O NGU Standard		ringing	
✓ · · · · · · · · · · · · · · · · · · ·		◯ Spline	O NGU Sharp		other artifacts	
Chroma upscaling		◯ Jinc				
image downscaling		a la autiliana autoritiana				
image upscaling		algorithm quality	•			
✓ in 1080p24		medium		$\sim$	< luma doubling	
📳 chroma upscaling		let madVR decid	le	$\sim$	< luma quadrupling	
image downscaling		let madVR decid	le	$\sim$	< chroma	
image upscaling			-			
✓ ····································		activate doubling	) / quadrupling			
image dowoscaling		only if scaling	g factor is 1.2x (or bigger)	$\sim$	< doubling	
image downscaling		only if scaling	a factor is 2.4x (or bigger)	~	< quadrupling	
- F chroma upscaling		if any (more) sca	ling needs to be done:			
image downscaling		let madVR decid	le	$\sim$	< upscaling algo	
image upscaling	v	let madVR decid		~	< downscaling algo	
<	>	acting are deed	-		s astronocoling argo	
madVR v0.92.17					OK Cancel A	pply

## 8.5.7 Image Upscaling 1080p@50/60fps content naar 2160p

Г

madVR settings - "DESKTOP-J42JUH9" (127.	0.0.1)		×
sdr 🔨	chroma upscaling		
<ul> <li>image enhancements</li> <li>image enhancements</li> <li>image enhancements</li> <li>scaling algorithms</li> <li>scaling</li> <li>iscaling</li> <li>image downscaling</li> <li>image upscaling</li> </ul>	processing done by GPU texture units: Nearest Neighbor (not recommended) Bilinear processing done by custom pixel shader code: Cubic Lanczos Spline Jinc Bilateral Reconstruction super-xbr NGU Anti-Alias, medium quality activate anti-ringing filter activate SuperRes filter, strength: 1 + +	sharpness hide source artifacts aliasing ringing other artifacts	
madVR v0.92.17		OK Cancel App	у

madVR settings - "DESKTOP-J42JUH9" (127	0.0.1)	×
image enhancements	image downscaling	
<ul> <li>Adr</li> <li>image enhancements</li> <li>scaling algorithms</li> <li>scaling algorithms</li> <li>scaling</li> <li>2160p</li> <li>image downscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image downscaling</li> <li>image upscaling</li> </ul>	processing done by GPU texture units: sharpness   Nearest Neighbor (not recommended) hide source artifacts   Bilinear aliasing   processing done by GPU video logic: ringing   DXVA2 other artifacts   Processing done by custom pixel shader code: other artifacts   Cubic Lanczos   Jinc ssIM   2D - strength: 100%    activate anti-ringing filter relaxed    activate anti-bloating filter strength: 100%	
madVR v0.92.17	OK Cancel App	oly

madVR settings - "DESKTOP-J42JUH9" (	127.0.	0.1)				×
V 🗋 hdr	^	image upscaling				
image enhancements						
scaling algorithms		upscaling:	doubling:		sharpness	
scaling		OBilinear	🔾 super-xbr		hide source artifacts	
chroma unscaling		O DXVA2	NGU Anti-Alias			
image downscaling		O Cubic	○ NGU Soft		allasing	
image upscaling		◯ Lanczos	○ NGU Standard		ringing	
✓ ☐ 1080p24		◯ Spline	O NGU Sharp		other artifacts	
📳 chroma upscaling		◯ Jinc				
···· 📳 image downscaling		algorithm quality	v:			
image upscaling		modium	,.	~	<	
<b>720p24</b>		meulum		•	< Iuma doubling	
impac downscaling		let madVR deci	de	~	< luma quadrupling	
image upscaling		let madVR deci	de	$\sim$	< chroma	
		activate doublin	au a drupling			
chroma upscaling		acuvate doublin				
···· 🗐 image downscaling		let madVR deci	de	~	< doubling	
image upscaling		let madVR deci	de	$\sim$	< quadrupling	
✓ · 📄 1080p60		if any (more) or	pling peeds to be done.			
chroma upscaling		in any (inore) so				
image downscaling		let madVR deci	de	~	< upscaling algo	
	~	let madVR deci	de	$\sim$	< downscaling algo	
< :	>					
madVR v0.92.17					OK Cancel	Apply

## 8.5.8 Upscaling 720p@50/60fps content naar 2160p

Г

madVR settings - "DESKTOP-J42JUH9"	(127.0.	0.1)	×
<ul> <li>scaling algorithms</li> </ul>	^	chroma upscaling	
<ul> <li>scaling</li> <li>2160p</li> <li>image downscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image downscaling</li> <li>image upscaling</li> <li>image downscaling</li> <li>image upscaling</li> </ul>	~	processing done by GPU texture units: sharpness   Nearest Neighbor (not recommended) hide source artifacts   Bilinear aliasing   processing done by custom pixel shader code: ringing   Cubic other artifacts   Lanczos Spline   Jinc Bilateral   Reconstruction super-xbr   NGU Anti-Alias, medium quality   activate anti-ringing filter   activate SuperRes filter, strength:	
madVR v0.92.17		OK Cancel Appl	у

madVR settings - "DESKTOP-J42JUH9" (12)	0.0.1)	×
Scaling	image downscaling	
<ul> <li>2160p</li> <li>image downscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>chroma upscaling</li> <li>image upscaling</li> </ul>	processing done by GPU texture units: sharpness   Nearest Neighbor (not recommended)   Bilinear aliasing   processing done by GPU video logic: ringing   DXVA2 other artifacts   processing done by custom pixel shader code: other artifacts   Cubic Lanczos   Jinc SSIM   2D - strength: 100%    activate anti-ringing filter relaxed    activate anti-bloating filter strength: 100%	
madVR v0.92.17	OK Cancel Apply	

madVR settings - "DESKTOP-J42JUH9" (	127.0	.0.1)				×
	^	image upscaling				
✓ · · · · · · · · · · · · · · · · ·		upscaling: Dilinear DXVA2 Cubic Lanczos Spline Jinc	doubling: super-xbr NGU Anti-Alias NGU Soft NGU Standard NGU Sharp		sharpness hide source artifacts aliasing ringing other artifacts	
chroma upscaling image downscaling	I	algorithm quality: medium		~	< luma doubling	
SD Chroma upscaling		let madVR decide		~	< luma quadrupling < chroma	
image upscaling		activate doubling / q	uadrupling			
<ul> <li>1080p60</li> <li>chroma upscaling</li> </ul>		let madVR decide		~	< doubling	
image downscaling		let madVR decide		~	< quadrupling	
v · · · · · · · · · · · · · · · · · · ·		if any (more) scaling	needs to be done:			
chroma upscaling		let madVR decide		~	< upscaling algo	
image downscaling	~	let madVR decide		$\sim$	< downscaling algo	
madVR v0.92.17		r.			OK Cancel Ap	ply

#### **8.5.9 Upscaling HDR content**

Om het onderste uit de kan te halen met mijn RTX2070 videokaart maak ik bij HDR een onderscheid tussen 16:9 en 21:9 materiaal. 21:9 materiaal vereist immers minder processing wegens de zwarte balken en kan daarom in iets hogere settings draaien. Met mijn RTX2070 kaart is medium bij 16:9 de hoogst mogelijke setting. Bij 21:9 kan ik echter de high quality setting kiezen.

madVR settings - "DESKTOP-J42JUH9" (12	27.0.0.1)	×
<ul> <li>720p24</li> <li>chroma upscaling</li> <li>image downscaling</li> <li>image upscaling</li> <li>image downscaling</li> <li>image downscaling</li> <li>image upscaling</li> </ul>	<ul> <li>hdr-16:9</li> <li>profile name:         <ul> <li>hdr-16:9</li> <li>duplicate profile</li> <li>keyboard shortcut to activate this profile:</li></ul></li></ul>	delete profile
madVR v0.92.17	OK	Cancel Apply

······································	<ul> <li>chroma upscaling</li> </ul>	
image upscaling	processing done by GPU texture units:	sharpness
✓ ······ SD 	O Nearest Neighbor (not recommended)	hide source artifacts
······································	) Bilinear	aliasing
image upscaling	processing done by custom pixel shader code:	ringing
<ul> <li>icopic</li> <li>chroma upscaling</li> <li>image downscaling</li> <li>image upscaling</li> <li>720p60</li> <li>chroma upscaling</li> </ul>	<ul> <li>Cubic</li> <li>Lanczos</li> <li>Spline</li> <li>Jinc</li> <li>Bilateral</li> </ul>	other artifacts
<ul> <li>image downscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>1080p24-21:9</li> </ul>	Reconstruction     super-xbr     NGU     Anti-Alias, medium quality	
	activate SuperRes filter, strength: 2 · ·	

image downscaling       image downscaling         image downscaling       image downscaling         image downscaling       processing done by GPU texture units:         image downscaling       Nearest Neighbor (not recommended)         image downscaling       Bilinear         image downscaling       processing done by GPU video logic:         image downscaling       processing done by cPU video logic:         image downscaling       DXVA2         image downscaling       DXVA2         image downscaling       OLanczos         image downscaling       Spline         image downscaling       Olanc         image downscaling       scale in linear light         activate anti-ringing filter       relaxed         image downscaling       activate anti-bloating filter         image downscaling       strength: 100%         image downscaling       activate anti-bloating filter         image downscaling       Mate anti-bloating filter         im	madVR settings - "DESKTOP-J42JUH9" (127.0	.0.1)	X
madVk v0.92.17 mage constaining   madVk v0.92.17 madVk v0.92.17 magk v0.92.17	image downscaling	image downscaling	
madVR v0.92.17 OK Cancel Apply	SD SD image downscaling image upscaling image upscaling image upscaling image upscaling image upscaling T20p60 forma upscaling image upscaling	processing done by GPU texture units: Nearest Neighbor (not recommended) Bilinear processing done by GPU video logic: DXVA2 processing done by custom pixel shader code: Cubic Lanczos Spline Jinc SSIM 2D - strength: 100% scale in linear light activate anti-ringing filter relaxed activate anti-bloating filter strength: 100%	sharpness hide source artifacts aliasing ringing other artifacts
	madVR v0.92.17		OK Cancel Apply

madVR settings - "DESKTOP-J42JUH9" (12	27.0	0.1)				$\times$
image upscaling	^	image upscaling				
SD chroma upscaling image downscaling image upscaling 1080p60 chroma upscaling image downscaling image downscaling image upscaling 720p60		upscaling: Bilinear DXVA2 Cubic Lanczos Spline Jinc	doubling: Super-xbr NGU Anti-Alias NGU Soft NGU Standard NGU Sharp		sharpness hide source artifacts aliasing ringing other artifacts	
		algorithm quality: medium let madVR decide let madVR decide		<b>~</b> <b>~</b>	< luma doubling < luma quadrupling < chroma	
image upscaling		activate doubling /	quadrupling			
		let madVR decide		~	< doubling	
····· image downscaling		let madVR decide		~	< quadrupling	
·····································		if any (more) scalin	g needs to be done:			
chroma upscaling		let madVR decide		~	< upscaling algo	
image downscaling	~	let madVR decide		~	< downscaling algo	
madVR v0.92.17					OK Cancel Ap	oly

2260p       mage downscaling         image downscaling       mage downscaling         image downscaling       mage downscaling         image downscaling       edit shortcut         image downscaling       command line to execute when this profile is activated:         image downscaling       command line to execute when this profile is deactivated:         image downscaling       command line to execute when this profile is deactivated:         image downscaling       command line to execute when this profile is deactivated:         image downscaling       command line to execute when this profile is deactivated:         image downscaling       command line to execute when this profile is deactivated:         image downscaling       command line to execute when this profile is deactivated:         image downscaling       command line to execute when this profile is deactivated:         image downscaling       command line to execute when this profile is deactivated:         image downscaling       commage downscaling <t< th=""><th>VR settings - "DESKTOP-J42JUH9" (</th><th>(127.0.0.1)</th><th></th><th>×</th></t<>	VR settings - "DESKTOP-J42JUH9" (	(127.0.0.1)		×
R settings - "DESKTOP-J42JUH9" (127.0.0.1)  The settings - "DESKTOP-J42JUH9" (127.0.1)  The settings - "DESKTO	<ul> <li>2160p</li> <li>a chroma upscaling</li> <li>a image downscaling</li> <li>a image upscaling</li> <li>a chroma upscaling</li> <li>b chroma upscaling</li> <li>a chroma upscaling</li> <li>a chroma upscaling</li> <li>b chroma upscaling</li> <li>a chroma upscaling</li> <li>b chroma upscaling</li> <l< td=""><td><ul> <li>hdr-21:9</li> <li>profile name:         <ul> <li>hdr-21:9</li> <li>keyboard shortcut to activate this</li> <li>command line to execute when this</li> <li>command line to execute when this</li> </ul> </li> </ul></td><td>duplicate profile     delete p       profile:     edit shortcut       s profile is activated:     s</td><td>Apply</td></l<></ul>	<ul> <li>hdr-21:9</li> <li>profile name:         <ul> <li>hdr-21:9</li> <li>keyboard shortcut to activate this</li> <li>command line to execute when this</li> <li>command line to execute when this</li> </ul> </li> </ul>	duplicate profile     delete p       profile:     edit shortcut       s profile is activated:     s	Apply
<ul> <li>image downscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image downscaling</li> <li>Spline</li> <li>Jinc</li> <li>Spline</li> <li>Jinc</li> <li>Spliateral</li> <li>Reconstruction</li> <li>super-xbr</li> <li>NGU</li> <li>Anti-Alias, medium quality</li> </ul>	R settings - "DESKTOP-J42JUH9" (127.0.0.1)	oma upscaling		
<ul> <li>✓ - 1 720p60</li> <li>☐ chroma upscaling</li> <li>☐ image dwnscaling</li> <li>☐ image upscaling</li> <li>✓ - 1 hdr-21:9</li> <li>✓ - 1 hdr-21:9</li> </ul>	<ul> <li>image downscaling</li> </ul>	rocessing done by GPU texture units: ) Nearest Neighbor (not recommended) ) Bilinear rocessing done by custom pixel shader code: ) Cubic ) Lanccos ) Spline ) Jinc ) Bilateral ) Reconstruction ) super-xbr ) NGU Anti-Alias, medium quality activate anti-ringing filter ] activate SuperRes filter, strength: 2   •	sharpness hide source artifacts aliasing ringing other artifacts	

madVR settings - "DESKTOP-J42JUH9" (	127.0.0.1)	×
<ul> <li>image downscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image downscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image downscaling</li> <li>image upscaling</li> </ul>	<ul> <li>image downscaling</li> <li>processing done by GPU texture u</li> <li>Nearest Neighbor (not record)</li> <li>Bilinear</li> <li>processing done by GPU video log</li> <li>DXVA2</li> <li>processing done by custom pixel s</li> <li>Cubic</li> <li>Lanczos</li> <li>Spline</li> <li>Jinc</li> <li>SSIM</li> <li>2D - strength: 100%</li> <li>scale in linear light</li> <li>activate anti-ringing filter</li> <li>activate anti-bloating filter</li> </ul>	units: sharpness   mmended) hide source artifacts   aliasing   ijc:   ringing   other artifacts   shader code:   relaxed   strength:   100%   OK   Cancel
nadVR settings - "DESKTOP-J42JUH9" (127.0.0.1)	upscaling	
	taling: doubling: tilinear super-xbr XVA2 ® NGU Anti-Alias Subic NGU Standard on NGU Standard on NGU Sharp inc rithm quality: dium	sharpness hide source artifacts aliasing ringing other artifacts

~

~

~

~

<-- chroma

<-- doubling

<-- quadrupling

<-- upscaling algo

<-- downscaling algo

OK Cancel Apply

let madVR decide

¥

activate doubling / quadrupling...

if any (more) scaling needs to be done:

fur-21:9
 droma upscaling
 image downscaling
 image upscaling

madVR v0.92.17

#### **8.6 Rendering**

This section deals with what are mostly performance-related settings, and options that may be required to get the best performance out of your specific graphics card. Unless you are actually experiencing performance issues, most of these settings are best left alone.

madVR settings - "DESKTOP-J42JUH9" (127	.0.0.1)	$\times$
<ul> <li>chroma upscaling</li> <li>image downscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>chroma upscaling</li> <li>image downscaling</li> <li>image upscaling</li> <li>720p60</li> <li>chroma upscaling</li> <li>image downscaling</li> <li>image upscaling</li> <li>rendering</li> <li>rendering</li> <li>general settings</li> </ul>	general settings	
madVR v0.92.17	OK Cancel Appl	y

madVR settings - "DESKTOP-J42JUH9" (127.	0.0.1)	×
<ul> <li>image downscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image upscaling</li> <li>image downscaling</li> <li>image downscaling</li> <li>image upscaling</li>     &lt;</ul>	windowed mode      present several frames in advance     how many video frames shall be presented in advance:  Windowed mode     how many video frames shall be presented in advance: <td< td=""><td></td></td<>	
madVR v0.92.17	OK Cancel Ap	ply

• Make sure to set "how many video frames shall be presented in advance" to "1" in order to avoud micro stutter with some nvidia graphic cards.

madVR settings - "DESKTOP-J42JUH9" (127.	.0.0.1)	×
🦳 🗒 image upscaling 🔥	exclusive mode	
	✓ show seek bar ✓ delay switch to exclusive mode by 3 seconds ✓ present several frames in advance	
image downscaling	how many video frames shall be presented in advance:	
✓ ····································	8 ~	
chroma upscaling     image downscaling	when and how shall the GPU be flushed:	
image upscaling	flush V after intermediate render steps	
✓ ·· 1080p24-21:9 chroma upscaling	flush & wait (sleep) $\ \lor$ after last render step	
image downscaling     image upscaling	don't flush v after copy to backbuffer	
<ul> <li>✓ - hdr-16:9</li> <li>→ E chroma upscaling</li> <li>→ E image downscaling</li> <li>→ E image upscaling</li> </ul>	don't flush v after D3D presentation	
general settings     windowed mode     exclusive mode	,	
madVR v0.92.17	OK Cancel	Apply

• Make sure to set "how many video frames shall be presented in advance" to "1" in order to avoud micro stutter with some nvidia graphic cards.







madVR settings - "DESKTOP-J42JUH9" (127.0	0.0.1)			$\times$
image upscaling 🔨	screenshots			
✓ ☐ 720p60				
E chroma upscaling	create screenshots with a c	ustom zoom factor		
image downscaling	100% view	C EOR/ Minut		
image upscaling	100 % VIEW	0 50 % VIEW		
✓ · _ hdr-21:9	<ul> <li>encoded video size</li> </ul>	200% view		
imper deverseling	0 720p	300% view		
image downscaling	0 1080p	400% view		
1080p24-21:9	2160p	800% view		
chroma upscaling				
image downscaling	use high quality scaling algo	s - image upscaling:	NGU Standard with some added grain	$\sim$
image upscaling	don't draw OSD		-	
✓ i hdr-16:9				
chroma upscaling	✓ don't perform color & gamm	a processing, calibration	n etc	
image downscaling	don't draw subtitles			
image upscaling	don't perform artifact remo	val processing		
general settings	don't perform image enhand	rement processing		
····· 🗐 windowed mode				
exclusive mode	don't perform upscaling refi	nement processing		
🗊 stereo 3d	don't execute custom shade	ers		
smooth motion				
iii dithering				
screenshots				
madVR v0.92.17			OK Cancel Appl	y



- "Compromise in HDR tone & gamut mapping accurracy": don't enable this option, it will result in wrong colors
- Enable compromise on HDR luminance channel quality, deze setting aanzetten resulteert in veel lagere rendertijden. This will only affect the precision of the luminance calculation.
- Dankzij mijn RTX2070 kaart heb ik geen van deze settings nodig, mocht je toch rendertijd willen winnen kies dan bij voorkeur voor de optie "Enable compromise on HDR luminance channel quality", dit geeft een slechts geringe degradatie in beeld kwaliteit met relatief veel winst in de rendertijd.

#### 8.7 MadVR settings backup

MadVR bewaart zijn settings zowel in de file settings.bin als in de registry. Maak voor de zekerheid een backup van beide:

- Bewaar een kopie van de settings.bin (MadVR folder) file.
- Gebruik regedit om HKEY\_CURRENT\_USER\Software\madshi\ te exporteren.

#### 8.8 MadVR extra OSD informatie

- Voor de mensen die een nog wat uitgebreider menu willen in madVR in het OSM (on screen menu) ,maak dan een map aan daar waar MadVR op je pc staat en noem map ShowRenderSteps. Hiermee wordt de informatie in het OSM nog wat uit groter en kun je precies zien hoe de rendertijd wordt opgebouwd ,dit is erg handig om wat mee te tweaken met diversen settings.
- Hetzelfde geldt voor het aanmaken van een map genaamd Showhdrmode voor meer HDR (tonemapping) info.

### 9. RGB video levels

Mijn grootste issue was dat de RGB video levels niet klopten en een washed out beeld gaven. Op verschillende plekken in de keten dient een keuze gemaakt te worden tussen 16-235 of 0-255. Ik had in eerste instantie alles (kodi output settings, kodi internal filter video decoder, madvr, grafische kaart, projector. Ik had alles op 16-235 staan en het beeld bleef washed out. Hieronder staan een aantal mogelijke configuratie, uiteindelijk heb ik gekozen voor de oplossing in het rood gedrukt.

(1) Display wants 0-255. GPU and madVR are consequently also both set to 0-255.

This is the most recommended setup because it doesn't (shouldn't) have any banding problems, and still has all video, desktop and games with correct black/white levels. In this case test patterns need to have black at 0,0,0, obviously.

(2) Display wants 16-235. GPU is set to 16-235. madVR has to be set to 0-255.

This is not recommended, because the GPU stretches the madVR output, probably in 8bit without dithering, so banding could be introduced. However, this is not a big problem for ArgyIICMS. ArgyII still needs to create test patterns with black at 0,0,0. The GPU will then stretch the test patterns from 0-255 to 16-235, so the display will get 16,16,16, although ArgyII rendered 0,0,0. So the levels are correct.

(3) Display wants 16-235. GPU is set to 0-255. madVR is set to 16-235. This is the recommended setup for best image quality if your display can't do 0-255. This setup results in banding-free madVR image quality. However, levels for desktop and games will be incorrect, because desktop and games will render black at 0,0,0, while the display expects black at 16,16,16. This is a problem for ArgyIICMS, because ArgyII will create test patterns with black at 0,0,0, and the display will also receive these at 0,0,0. So basically ArgyII test patterns will have wrong levels, which will screw up the whole calibration.

Proper RGB output levels are necessary when passing from PC to TV color spaces. When sending video via HDMI to a TV, in most cases, color spaces are set as follows (Note: LAV Video RGB settings do not apply):

# (madVR) PC levels (0-255) -> (GPU) Limited Range RGB 16-235 -> (TV) Output as RGB 16-235

madVR expands the source 16-235 signal to full range RGB leaving the conversion back to 16-235 to the graphics card.

If your HTPC is a dedicated Kodi machine, an alternative approach is possible.

Alternative Color Space Configuration:

# (madVR) TV levels (16-235) -> (Kodi) Use limited color range (16-235) -> (GPU) Full Range RGB 0-255 -> (TV) Output as RGB 16-235

In this configuration, the signal remains 16-235 until it reaches the TV avoiding any clipping by the GPU. This is the most pure path with the fewest color range conversions and least amount of added dithering. However, other computer applications will appear over-saturated as a result unless they are also configured to use 16-235 levels. Note: Kodi must be configured under *System -> Video output* to use a limited color range to match madVR.

A final option involves setting your TV to output RGB 0-255 and leaving all settings at full range. madVR expands the source to 0-255 and displays it full range on your television. The TV must first be calibrated while set to full range RGB. The result can vary depending on how well your TV displays whiter-than-white and blacker-than-black values.

*PC Color Space Configuration:* 

# (madVR) PC levels (0-255) -> (GPU) Full Range RGB 0-255 -> (TV) Output as RGB 0-255

## **10. Performance tests**

#### **10.1 CPU load**

- Tijdens het afspelen van een film kan met de "O" toets de gebruikte filters en de CPU performance op het scherm gedisplayed worden.
- Met de tool CPU-Z kun je alle settings van je CPU bekijken Te downloaden op <u>http://www.cpuid.com/softwares/cpu-z.html</u>

Processor		100 I		5575	I secondo a		
Name		AMD	FX-8350				
Code Name	Vish	nera	Max	TDP	125.2 V		IDEI
Package		Socket /	AM3+ (94	42)		T FX	
Technology	32 nm	Core	Voltage	0	.888 V	UNLOCK	10
Specification	AM	ID FX(tm)	-8350 Ei	ght-C	Core Proc	essor	
Family	F	N	1odel	2	9	Stepping	0
Ext. Family	15	Ext. M	Model	2		Revision	OR-C0
Instructions	MMX(+), S x86-64, AM	ISE, SSE2	2, SSE3, 9 5, AVX, X	SSSE OP, I	3, SSE4. FMA3, FI	1, SSE4.2, MA4	SSE4A,
Clocks (Core #	¢0)		Cach	e —			~
Core Speed	1406.19	) MHz	L1 Da	ata	8 x 16	KBytes	4-way
Multiplier	x 7.0 (7	-21)	L1 In	st.	4 x 64	KBytes	2-way
Bus Speed	200.88	MHz	Leve	12	4 x 204	8 KBytes	16-way
HT Link	2209.72	2 MHz	Leve	13	8 ME	Bytes	64-way
			-			2	

#### **10.2 GPU load**

 Bekijk of de GPU belasting van de videokaart geen bottleneck vormt, dit kan met de tool GPU-Z. Te downloaden op <u>https://www.techpowerup.com/gpuz/</u>

Graphics Card	Sensors Valid			
Name	NVIDIA GeForce GTX 750			Lookup
GPU	GM107	Revision	A2	
Technology	28 nm	Die Size	148 mm <sup>2</sup>	
Release Date	Feb 18, 2014	Transistors	1870M	<b>NVIDIA</b>
BIOS Version	82.07.32.00.F6			🛃 🗹 UEFI
Device ID	10DE - 1381	Subvendor	M	SI (1462)
ROPs/TMUs	16 / 32	Bus Interface	PCI-E 2.0	x16@x161.1
Shaders	512 Unified DirectX Support			11.0 / SM5.0
Pixel Fillrate	16.9 GPixel/	s Texture	Fillrate	33.9 GTexel/s
Memory Type	GDDR5 (H	Hynix)	Bus Width	128 Bit
Memory Size	1024 MB Bandwidth		dwidth	80.2 GB/s
Driver Version	10.18.13	.5850 (ForceW	/are 358.50	) / Win7 <mark>64</mark>
GPU Clock	1059 MHz	Memory 1253	MHz B	oost 1137 MHz
Default Clock	1059 MHz	Memory 1253	MHz B	oost 1137 MHz
NVIDIA SLI		Disal	bled	
Computing	OpenCL	CUDA 🔽 F	PhysX 🔽 [	DirectCompute 5.

Graphics Card Sensors	/alidation	
GPU Core Clock	▼ 135.0 MHz	L
GPU Memory Clock	▼ 202.5 MHz	L
GPU Temperature	▼ 44.0 °C	
Fan Speed (%)	▼ 30 %	_
Memory Used	▼ 59 MB	
GPU Load	• 0%	
Memory Controller Load	▼ 1%	
Video Engine Load	• 0%	
Bus Interface Load	• 0%	
Power Consumption	▼ 1.4 % TDP	
PerfCap Reason	✓ Util	
VDDC	▼ 0.9560 V	
<ul> <li>Log to file</li> <li>Continue refreshing this</li> </ul>	Senso screen while GPU-Z	r refresh rate: 0.5 sec 🔹

## **10.3 Openhardware Monitor**

Een mooie alles in een hardware monitor oplossing is de opensource tool Open Hardware Monitor:

## http://openhardwaremonitor.org/

Open Hardware Monitor				2 23
Sensor	Value	Min	Max	
E Voltages	Forde		THUX.	
VBat	3.240 V	3.240 V	3.240 V	
🖃 🖌 Temperatures			-/	
Temperature #1	55.0 °C	42.0 °C	60.0 °C	
Temperature #2	40.0 °C	30.0 °C	45.0 °C	
E-SE Fans	10,0 C	50,0 0	15,0 0	
Ean #1	1880 RPM	1849 RPM	1907 RPM	
E Controls	2000 14 111	201210101	2007 14 177	
Ean Control #1	21	12.1	24	
Fan Control #2	-	-	-	
Fan Control #3	-	-	-	_
AMD EX-8350				_
Bus Speed	201 MHz	201 MHz	201 MHz	
CPU Core #1	4018 MHz	1406 MHz	4018 MHz	
CPU Core #2	4018 MHz	1406 MHz	4018 MHz	
CPU Core #3	4018 MHz	1406 MHz	4018 MHz	
CPU Core #4	4018 MH-	1406 MHz	4018 MH-	
CPU Core #5	4018 MH-	1406 MHz	4018 MH-	
CPU Core #5	4018 MHz	2415 MU+	4010 10112	_
CPU Core #7	4018 MHz	2415 MU-	4010 MH2	=
CPU Core #9	4018 MHz	2415 MU-	4010 MIL-	
	4010 101712	5415 MIRZ	4010 10172	
Core #1 #9	420 °C	22.0.%	50.4.90	_
	45,9 C	55,0 C	J0,4 C	
	40.0.9/	221.9/	74.2.9/	
CPU Casa #1	49,0 %	10 5 9/	74,2 %	_
CPU Core #1	49,2 %	10,5 %	89,2 %	_
CPU Core #2	45,1 %	20,0 %	84,0 %	- 1
CPU Core #3	58,5 %	24,0 %	84,0 %	
CPU Core #4	40,0 %	21,5 %	15,0 %	
CPU Core #5	55,4 %	20,0 %	84,0 %	
CPU Core #6	47,7 %	10,8 %	80,2 %	_
CPU Core #/	55,4 %	15,4 %	70,8 %	
CPU Core #8	43,1 %	20,2 %	69,2 %	
Generic Memory				
Load	25.0.01	24.0.07	27.0.07	
Memory	36,9 %	21,0 %	37,8 %	
E Data	2.0.00	4 7 60	2.0.02	
Used Memory	2,9 GB	1,7 GB	3,0 GB	_
Available Memory	5,0 GB	5,0 GB	6,3 GB	
NVIDIA GeForce GTX 750				
E Clocks				
GPU Core	1058 MHz	0 MHz	1176 MHz	
GPU Memory	2506 MHz	2506 MHz	2506 MHz	
GPU Shader	2117 MHz	0 MHz	2352 MHz	
🖃 💣 Temperatures				
GPU Core	66,0 °C	53,0 °C	78,0 °C	
E Load				
GPU Core	68,0 %	0,0 %	95,0 %	
GPU Memory Controller	23,0 %	0,0 %	36,0 %	
GPU Video Engine	6,0 %	5,0 %	8,0 %	
GPU Memory	66,5 %	55,7 %	67,3 %	
🖃 🕢 🜑 Controls				

## **11. MadVR finetuning tips**

Tijdens het afspelen van een film krijg je met CTRL+J gegevens te zien van MadVR, met CTRL+R reset je de counters van dropped frames. Let op of er tijdens het spelen veel frames gedropped worden.

display 60.00043Hz composition rate 60.000Hz smooth motion off (settings D3D11 fullscreen windowe clock deviation 0.00229% h264, 8 bit, 4:2:0 -> NV12, 8 t movie 23.976 fps (says sou 1 frame repeat every 42.41 movie 1280 544, 2.35:1 (35m touch window from inside chroma > Bicubic100 AR image > Lanczos3 AR	s) d (8 bit) nit, 4:2:0 rce filter) seconds m film)
móvie frame interval 41.71r	ns
primaries BT.709 (best guess) primaries BT.709 (best guess) deinterlacing off (framerate decoder queue 16-16 / 16 subtitle queue 16-16 / 16 upload queue 8-8 / 8 render queue 8-8 / 8	ss) e)
dropped frames 147 delayed frames 0 presentation glitches 710 average stats rendering 49.29ms present 0.61ms max stats (5s) rendering 49.72ms present 1.14ms	

• Let op dat de average frame render time ruim onder de volgende waarden blijven:

24 fps	41,7 ms
25 fps	40 ,0 ms
30 fps	33,3 ms
50 fps	20,0 ms
60 fps	16,7 ms

Gebruik het monitoren van deze waarden als leidraad voor het instellenen finetunen van de madvr scaling instellingen per resolutie/framerate profiel.

- Let tevens op de MadVR routing: wordt er geupscaled of gedownscaled terwijl dit niet de bedoeling is?
- Blijf tijdens het finetunen van MadVR in gedachten houden dat hoge kwaliteit image upscaling (of dowscaling) belangrijker is (qua subjectieve weergave perceptie) dan dezelfde kwaliteit chroma upscaling.

# 12. Overige zaken

Gebruik het XBMC JSON device in irule.



• Als "clean library" heel lang duurt dan is dit te verhelpen door het MyVideo bestend in de Database folder in de Kodi Userdir directory weg te gooien.

ganize 🔻 🛛 🔭 Open	Include in library 👻 Share with 💌	New folder			····
Equaritar	Name	Date modified	Туре	Size	
Deskton	🗿 addon data	21-11-2015 11:32	File folder		
Downloads	Database	28-12-2015 18:20	File folder		
Recent Places	l dsplaver	22-12-2015 20:46	File folder		
	keymans	3-10-2015 5:35	File folder		
Libraries	library	3-10-2015 5:35	File folder		
Documents	Includy Inc	3-10-2015 5:35	File folder		
Music	perprictui_uutu	3-10-2015 5:35	File folder		
Pictures	Thumbhails	3-10-2015 5:35	File folder		
Videos	advancedsettings	21-11-2015 21-25	XMI Document	1 KB	
		28-12-2015 18-22	XML Document	106 KB	
Homegroup	playercorefactory	6-7-2015 14-20	XML Document	1 KB	
	nrofiles	28-12-2015 18-22	XML Document	1 KB	
Computer	ResEeeds	21-11-2015 11:38	XML Document	1 KB	
Local Disk (C:)		29-11-2015 12:13	XML Document	2 KB	
➡ films1 (\\192.168.1.1		10 11 1010 12:10	The bocamene	210	
■ films2 (\\192.168.1.1					
films3 (\\192.168.1.1					
series (\\192.168.1.1)					
concerten (\\192,168					
allerlei (\\192.168.1.1					
fotos (\\192.168.1.1)					
storage (\\192.168.1.					
Network					

Bij het opstarten van Kodi wordt de MyVideo database dan opnieuw aangemaakt, wel moet dan nog even handmatig per library fileshare een edit gedaan worden om opnieuw de scraper in te stellen, bij het opslaan krijg je dan weer de vraag om opnieuw de inhoud te scannen.

• The community Backup add-on is a great way to backup all of your Kodi settings, add-ons, and other related files. It includes options such as automatic scheduled backups, backing up to cloud storage such as Dropbox, and configuring custom backup directories.

# 13. Troubleshooting

#### 13.1 Geen geluid meer

Indien er na het wisselen van de hdmi aansluiting(en) op de video kaart geen geluid meer is, check of in Kodi bij System Audio Output settings nog het WASAPI (en niet DIRECTSOUND!) sound device geselecteerd is.

'I: maran
5.1
Optimized
90
$\bigcirc$
High
2
1 Minute
$\bigcirc$

## **14. HDR**

#### **14.1 HDR op projectoren**

HDR is currently mastered at either 1000 or 4000 "nits" (a brightness measurement). Standard Dynamic Range video is mastered at 100 nits peak brightness. The extra brightness is primarily for highlights while the average picture level brightness should look relatively the same as SDR. And the intention is that there is a much WIDER RANGE between brightest bright and darkest dark. So this means that for a display to handle HDR properly, it has to be capable of much more brightness than traditional displays while maintaining it's blacks at the same. A display can be capable of receiving an HDR signal, but that doesn't mean it will be able to actually display the new brightness range as intended.

The current range of JVC's can manage about 100-150 nits of brightness (possibly more or less depending on screen size), which is significantly less than what HDR is mastered at. In order to try to take some advantage of HDR on the JVC you need to put the projector in it's brightest mode (JVC recommends high lamp with the iris fully open). Even doing this, a good amount of those "HDR highlights" are still going to be clipped. And average brightness scenes can look dim. Setting things to make the average picture level brighter clips even more of the higlights, and at the same time, the high lamp mode with iris fully open raises your black levels. Also, the HDR mode of the JVC makes it so that the auto iris is barely functional. So you are actually decreasing the contrast ratio and dynamic range of the projector in order to try to appreciate some of those HDR highlights.

For these reasons, many people with the JVCs would prefer to be able to view UHD in 4K resolution at 10-bit wide color gamut in SDR. The HD Fury integral allows the user to do that.

Some users have been experimenting with compromises to try to get some benefit of HDR while keeping the black floor acceptable by using low lamp instead of high, or using high lamp with the manual iris closed a few clicks. Some have reported getting really nice images trying HDR on the projector, but they also say that it is still a compromise and prefer to watch some things still in SDR. Having the Integral at least allows the user to have more options to see what works best for them and what they prefer with UHD. For many, keeping one of the JVC's greatest strengths (it's black levels and contrast ratio) is more important viewing a compromised version of HDR with UHD sources.

#### 14.2 HDR en MadVR

Dit is wat Madshi (de MadVR man) roept over HDR (september 2017):

I've just talked to Microsoft and NVidia. And the current situation is as follows:

1) In Windows 10 Creator's Update there's a new option in the OS display settings dialog named "HDR and Advanced Color". If you turn this option off, your TV will always be in switched into SDR mode. If you turn this option on, your TVwill always be switched into HDR mode. Windows does \*not\* support dynamically switching HDR mode on/off while you're playing an HDR movie (or playing an HDR game)! It's currently not supported, and there are no plans to add support for that. Basically Microsoft believes that if you want to use HDR at all, then you want your PC to always drive your TV via HDR mode.

2) If you switch the "HDR and Advanced Color" option off, your TV will always receive SDR from the PC. If you play an HDR movie in this situation with the madVR option "passthrough HDR content to the display" activated, the OS will perform a low quality HDR -> SDR conversion behind madVR's back. Consequently, HDR content will look "ok", but the quality is not really good. SDR content will look "perfect", though.

3) If you switch the "HDR and Advanced Color" option on, your TV will always receive HDR from the PC. If you tell madVR to "passthrough HDR content to the display" in this situation, HDR movies should look "perfect". If you play SDR content in this situation, the OS will convert SDR to HDR behind madVR's back. Consequently, SDR content will look "ok", but it will not be perfect.

4) Currently HDR and fullscreen exclusive mode is a problematic combination atm. It's partially the fault of the OS, partially of the GPU drivers, partially of madVR. It's not clear yet if this will be fixed, or when. Generally, <u>Microsoft</u> wants to get rid of fullscreen exclusive mode. It might suddenly disappear in a future Windows 10 version.

5) <u>Nvidia</u> comes to the rescue of all HTPC users who want perfect quality for both SDR and HDR content: Nvidia's private HDR API allows madVR to dynamically switch the TV into and out of HDR mode, as needed.

6) The current madVR build has a bug where Nvidia's private HDR API is only called properly in the 32bit madVR version, but not in 64bit. This will be fixed in the next build.

7) All post-Creator's-Update <u>Nvidia</u> drivers have a bug which result in madVR being able to switch the TV into HDR mode, but switching the TV back into SDR mode fails. You can work around this by either using Windows 8.1 instead of Windows 10. Or by installing older Nvidia drivers. E.g. with <u>Nvidia</u> driver 376.33 dynamic HDR switching works perfectly fine in Windows 10. Nvidia is aware of the bug in newer drivers and plans to fix that soon.

As it stands right now, for all Windows users who want to do both SDR and HDR playback in perfect quality, I can only recommend Nvidia GPUs, because only Nvidia's private API allows madVR to dynamically switch the TV between SDR <-> HDR. I'm talking to Intel, maybe they will add a private API, too. Unfortunately my AMD contacts have gone silent.

I still recommend Windows 8.1 as the best media play OS right now, as I've done for months. Windows 10 still has many stability issues, furthermore <u>Microsoft</u> is going into a direction which is very bad for HTPC users.

# **15.** Madvr en JVC remote control optie 1

Het is mogelijk om madVR automatisch de JVC X5000 van user mode te laten wisselen ten behoeve van het omschakelen van BT709 naar BT2020 color space (en andere gamma en aperture waarde), zodat tussen het wisselen van SDR naar HDR (tonemapping -> SDR BT2020) content kijken of vice versa we niet steeds handmatig de projector van user mode hoeven laten schakelen.

#### Benodigde software:

- Python 3.5.x (geen hogere versie want deze wordt nog niet ondersteund door windows 10)
- Manni01 JVC Control for MadVR V1.3.zip
  - o <u>https://www.avsforum.com/forum/attachment.php?</u> <u>attachmentid=2392356&d=1524080374</u>
- jvcprojectortools-master.zip
  - o <u>https://github.com/arvehj/jvcprojectortools</u>

#### **15.1 Installatie**

- Installeer eerst pyton in bijvoorbeeld c:\python3
  - Vink de optie aan om python in de PATH variabele op te nemen
- Maak een directory aan c:\arvetool
- Pak de Manni01 JVC Control bestanden uit en kopieer deze naar c:\arvetool
- Pak de Arve tool (jvcprojectortools-master) bestanden uit en kopieer deze ook naar c:\arvetool

#### **15.2 Configuratie**

Edit JVC\_COMMAND.BAT en zorg dat daar het volgende in staat:

@ECHO OFF

C:

CD /arvetool/

TIMEOUT 20

/python3/PYTHON JVC\_%1.PY

• Voer nu jvc\_network.py uit in een dos box en voer het ip adres van de projector in.
Als je een nieuwere projector hebt dan de JVC X5000 pas dan in jvc\_command.py het volgende aan:

Van:

class Model(ReadOnly, Enum):
 """Projector model code"""

DLA\_XC6890 = b'ILAFPJ -- XHP2'

DLA\_X750R\_x005F\_x0

#### Naar bijvoorbeeld:

class Model(ReadOnly, Enum):
 """Projector model code"""
 DLA\_X5500 = b'ILAFPJ - XHR1'

Merk op dat als je jvc\_command.py uitvoer je aan de foutmelding kunt ziet dat het om XHR1 (in geval van een JVC X5500) gaat.

### 15.3 Testen

Nu kunnen we dit eerst handmatig testen op de commandline alvorens madVR te configureren om dit automatisch te doen.

- cd C:\arvetool
- jvc\_command.bat user2
  - o De projector dient nu om te schakelen naar user mode 2
- jvc\_command.bat user1
  - o De projector dient nu terug te schakelen naar user mode 1

Configureer nu madVR om dit automatisch te doen:

devices	SDR-REC709		
properties	profile name:		
display modes	SDR-REC709	duplicate profile	delete profile
	keyboard shortcut to activate this pr	ofile:	
✓ ☐ Calibration	Ctrl+Shift+S	edit shortcut	
SDR-BT2020	command line to execute when this p	rofile is activated:	
SDR-REC709	d:/em/dropbox/install/calibration_to	olkit/jvc/jvcprojectortools-0.0.2/JVC_	COMMAND.BAT USER 1
> In HD Fury Integral	command line to execute when this p	rofile is deactivated:	
scaling algorithms	d:/em/dropbox/install/calibration_to	olkit/jvc/jvcprojectortools-0.0.2/JVC_	COMMAND.BAT USER2
user interface			

Voer als command to activate in:

c:/arvetool/jvc\_command.bat user1

Laat command to deactivate hier leeg, we willen immers na het kijken van SDR content de projector in user1 mode laten staan.

· · indevices	SDR-8T2020		
✓ ■ JVC RS500 IVC RS500 IVC RS500	profile name:		
isplay modes	SDR-BT2020	duplicate profile	delete profile
hdr	keyboard shortcut to activate this	profile:	
····⊫ screen config ✓ · _ Calibration	Ctrl+Shift+H	edit shortcut	
SDR-BT2020	command line to execute when thi	s profile is activated:	
SDR-REC709	d:/em/dropbox/install/calibration	toolkit/jvc/jvcprojectortools-0.0.2/JVC_	COMMAND.BAT USER 2
HD Fury Integral	command line to execute when thi	s profile is deactivated:	
scaling algorithms	d:/em/dropbox/install/calibration_	toolkit/jvc/jvcprojectortools-0.0.2/JVC_	COMMAND.BAT USER 1
• user interface			

Voer als command to activate in: c:/arvetool/jvc\_command.bat user2 Voer als command to deactivate in: c:/arvetool/jvc\_command.bat user1

## **15.4 Huidige status**

Helaas werkt het in de praktijk nog niet, ik krijg deze foutmelding in de event viewer op het moment dat madVR het jvc\_command.bat script aanroept.

General Details			
Fault bucket 11 Event Name: BE Response: Not a Cab Id: 0 Problem signat P1: python.exe P2: 3.5.4150.101 P3: 59891fd7 P4: ucrtbase.dll P5: 10.0.15063.0 P6: af2e320b P7: 0000000000 P8: c0000409 P9: 0000000000 P10:	6427368464, type 5 :X64 available ure: 3 0 0734be 000007		
Log Name:	Application		
Source:	Windows Error Reporting	Logged:	07/10/2018 19:25:29
Event ID:	1001	Task Category:	None
Level:	Information	Keywords:	Classic
User:	N/A	Computer:	DESKTOP-J42JUH9
OpCode:			
More Informatio	n: Event Log Online Help		

## 16. Madvr en JVC remote control optie 2

- Pak Htpccontrol.zip uit en zet de files in c:\htpccontrol\
- Start HtpcControl.exe en vul het madvr pad in bij de settings.

🛃 HTPC Control - Settings			- 🗆 X
MadVR Path	c:\program files\madvr-0.92.17		
Directories			^
			×
Filter			
Store Measurements			
Setting Pages Count			
JVC Delay Sec.		O German	● English
	□ Hide Measure Files	Check for Upda	ates
	□ Delete all Measure Files	□ JVC Lamp Con	trol
	□ Only 'not completed'	Clipping Tool	
	Save	Canc	el

🖳 JVC steuern		-		×
IP Nummer	192.168.1.250 Acknowledgement Response Return ~			
Antwort			^	
	Ausführen Schließe	n	~	

- Vul bij JVC Control het ip adres van de projector in.De rest van de configuratie gebeurd in madVR:

madVR settings - "DESKTOP-J42JUH9" (12	7.0.0.1)	×
✓ · Contraction devices	∧ calibration	
> - Marantz - AVR		
	profile group name:	
Projector	calibration	add profile delete profile group
isplay modes	keyboard shortcut to toggle profiles:	
✓ <sup>™</sup> screenconfig		edit shortcut
Y 🔂 16:9		
screen config	profile auto select rules:	(click here for online help)
✓ · 21:9	if (hdr) "BT2020" else "REC709"	~
v - ☐ hdr		
Y 🛄 16:9		
hdr		
✓ · _ 21:9		
✓ · □ REC709		
calibration		
✓ · □ BT2020		
calibration		
> ·· processing		
> · · · · · · · · · · · · · · · · · · ·		×
	× .	
madVR v0.92.17		OK Cancel Apply

madVR settings - "DESKTOP-J42JUH9" (127	0.0.1)	×
🗸 💼 devices 💦	REC709	
Marantz -AVR Warantz -AVR Wa	profile name:         REC709       duplicate profile         keyboard shortcut to activate this profile:       edit shortcut         command line to execute when this profile is activated:       c:\htpccontrol\htpccontrol.exe /PictureModeUser 1 /Delay:25         command line to execute when this profile is deactivated:	
madVR v0.92.17	OK Cancel App	у

- De delay is nodig om de projector de tijd te geven te HDMI syncen, tijdens het syncen accepteert de projector geen externe commando's.
- Merk op dat deze delay 5 seconden langer is dan bij het schakelen naar BT2020. Dit is proefondervindelijk vastgesteld en noodzakelijk i.v.m. een rare bug in madvr.
- Merk op dat het geen zin heeft om een commando op te geven voor het DEACTIVEREN van een profiel, dit werkt namelijk simpelweg niet (bekende bug MadVR).

madVR settings - "DESKTOP-J42JUH9" (12	7.0.0	0.1)	×
🗸 💼 devices	~	calibration	
> Marantz -AVR			
Y - ↓ TV		O disable calibration controls for this display	
properties		this display is already calibrated	
calibration		O calibrate this display by using vCMS	
display modes			
		Calibrate this display by using external 3DLUT files	
E har		√ disable GPU gamma ramps	
isplay modes			
color & gamma			
v i screenconfig		the display is calibrated to the following primaries / gamut:	
V 💼 16:9		BT.709 V	
🛄 screen config			
V 🛄 21:9		the display is calibrated to the following transfer function / gamma:	
📰 screen config			
✓ · 🛅 hdr		pure power curve V 2.20 V	
Y 🛄 16:9			
hdr			
× · 21:9			
indr			
		report BT. 2020 to display (Nvidia only)	
	<b>Y</b>		
madVR v0.92,17		OK Cancel Ap	ply

madVR settings - "DESKTOP-J42JUH9" (12	7.0.0.1)	×
> - 👪 Marantz - AVR	A BT2020	
<ul> <li>Marantz -AVR</li> <li>TV</li> <li>registration</li> <li>display modes</li> <li>color &amp; gamma</li> <li>hdr</li> <li>color &amp; gamma</li> <li>for properties</li> <li>properties</li> <li>gisplay modes</li> <li>for properties</li> <li>screenconfig</li> <li>for 16:9</li> <li>for 21:9</li> <li>screen config</li> <li>for 21:9</li> <li>screen config</li> <li>for 21:9</li> <li>screen config</li> </ul>	<ul> <li>▲ BT2020</li> <li>profile name:         <ul> <li>BT2020</li> <li>duplicate profile</li> <li>delete profile</li> </ul> </li> <li>keyboard shortcut to activate this profile:             <ul> <li>edit shortcut</li> </ul> <li>command line to execute when this profile is activated:</li></li></ul>	
	V OK Cancel Apply	,

madVR settings - "DESKTOP-J42JUH9" (127.0	.0.1)	×
Y - 🔍 TV 🔥	calibration	
<pre></pre>	<ul> <li>disable calibration controls for this display</li> <li>this display is already calibrated</li> <li>calibrate this display by using vCMS</li> <li>calibrate this display by using external 3DLUT files</li> <li>✓ disable GPU gamma ramps</li> <li>the display is calibrated to the following primaries / gamut:</li> <li>BT.2020 ✓</li> <li>the display is calibrated to the following transfer function / gamma:</li> <li>pure power curve ✓</li> <li>2.40 ✓</li> </ul>	
madVR v0.92.17	OK Cancel App	ly

# 17. Windows 10 repair

De windows 10 repair optie faalt wel eens met een onduidelijke foutmelding. Start in dat geval de command prompt (een van de keuze van windows repair) en voer de volgende commando's uit:

- bootrec.exe /rebuildbcd
- bootrec.exe /fixmbr
- bootrec.exe /fixboot
- chkdsk /r c:

## 18. Chromapure BT2020 calibratie

- In Options, Gamut set the Reference Gamut to 2020 and the Saturations Increments to 25%.
- In Options, Gamma set the Gamma Target to 2.4.
- On the Initial Setup page set the Color Intensity to 50%
- In the Color Management module set the saturation to 50%.
- Use the HDR Report for reporting.

# **19. MadVR 3DLUT calibration**

Inhoud van AVS thread: <u>https://www.avsforum.com/forum/139-display-</u> calibration/1471169-madvr-argyllcms.html (12/12/2019)

### **Required Software**

DisplayCAL

DirectShow video player that can use MadVR (ie. Zoom Player, MPC-HC, etc.)

### **Required Hardware**

An ArgyIICMS supported colorimeter or spectrophotometer

### A. Install ArgylICMS, DisplayCAL, and MadVR

- 1. Extract ArcgyllCMS to a folder of your choice (ie. C:\ArgyllCMS)
- 2. Install DisplayCAL to a folder of your choice
- 3. Extract MadVR to a folder of your choice (ie. C:\MadVR)
- 4. Run 'install.bat' in the MadVR folder as Administrator

# **19.1 Calibrating (3DLUT) for madvr tonemapping SDR with REC709**

### **B. Create MadVR compatible 3DLUT from ArgyllCMS tools 1. Start MadVR Test Pattern Generator**

- 1. Run madTPG.exe from the MadVR install folder
- 2. Enable "use fullscreen"
- 3. Enable "disable VideoLuts"
- 4. Enable "disable 3dlut"

## 2. Start DisplayCAL

### 3. Calibration, Profile, and 3D LUT Generation

- 1. When running DisplayCAL for the first time, a prompt to locate the ArgyIICMS executables directory will be shown, browse to the path where ArgyIICMS is extracted and select the 'bin' folder
- 2. Click 'File' in the menu bar and select 'Choose save path...' then browse to a directory to save calibration/profile files and logs
- 3. \*\*\*Please make sure you read through each Notes section under each tab. These sections contain valuable information and explanation of the settings for each tab\*\*\*
- 4. On the **Display & instrument tab**, Select 'Video 3D LUT for madVR (D65, Rec. 709 / Rec. 1886)' under Settings

Display calibration and characterization Settings Video 3D LUT for madVR (	1 powered by Argyll CMS D65, Rec. 709 / Rec. 1886)	1 2 4 0
Display & Instrument	Calibration Profiling 🐺 3D LUT 🗸	Artification
lisplay	Instrument	
madVR	😌 🚭 i 1 DisplayPro, ColorMunki Display 🗘 Mode LCD (	generic)
White level drift compensation	Black level drift compensation	
You should let the display warm up for a in contact mode, it is a good idea to lear	at least 30 minutes before commencing measurements. If you use your instrument ve it on the display during that time as well.	
If your display is a OLED, Plasma or oth white level drift compensation.	er technology with variable light output depending on picture content, enable	
If your instrument is a spectrometer and to enable instrument black level drift of	d you use it in contact mode on a display with stable black level, you may want ompensation.	
If your instrument is a colorimeter, you Note that some instruments (ColorHug, measurement modes.	should use a correction suitable for your display or display technology type. ColorHug2, K-10, Spyder4/5) may have a correction built into some of their	

On the **Calibation** tab, keep the defaults. If you want to learn more about the effects of selecting different tone curves and gamma, please see chros73 post "

	DisplayCAL 3.1
	DisplayCAL <sup>3</sup>
-	Display calibration and characterization powered by Argyli CMS
· •	Settings 🛛 Video 3D LUT for madVR (D65, Rec. 709 / Rec. 1886) 🔷 ն 🖄 🛈
	Display & instrument Calibration 👥 Profiling 💥 3D LUT 🏑 Verification 🛛
Calibration	eatilize .
	er unge
M interactiv	e display adjustment
Whitepoint	Chromaticity coordinates 🕴 0.3127 C x 0.3290 C y 🎢
White level	As measured
Tone curve	As measured
Calit optio gray curvy color for th	vitation is done by interactively adjusting the display to meet the chosen whitepoint and/or luminance as well as inally creating 1D LUT calibration curves (LUT = Look Up Table) to meet the chosen tone response curve and ensure balance. Note that if during calibration you only want to adjust the display and skip the generation of 1D LUT es, you need to set the tone response curve to "As measured". 1D LUT calibration can not be used for full display r correction, you need to create a IOC device profile or 3D LUT and use them with applications that support them hat purpose. 1D LUT calibration complements profiling and 3D LUT calibration though.
_	Calibrate & profile

5. On the **Profiling** tab, slide the 'Amount of patches' slider to adjust the amount of patterns measured to create the display profile

Display & Instrument       Calibration       Profiling       SOLUT       Verification         Profiling settings         Profiling settings         Profile quality       High         Testchart       Auto-optimized       Image: Calibration       Image: Calibration       Image: Calibration         Amount of patches       Estimated measurement time approximately 0 hour(s) 43 minutes       Image: Calibration       Ima	Setting	Video 3D LUT for madVR (D65, Rec. 709 / Rec. 1886)	0 = 2 = 0
Profiling settings         Profile quality       High         Testchart       Auto-optimized       Image: Constraint of patches         Amount of patches       Estimated measurement time approximately 0 hour(s) 43 minutes       Image: Constraint of patches         Profile name       Mdns %Y-Km-Nd Mcb Kwp McB Kck Kcg Mcq-Kpq Kpt       Image: Constraint of patches       Image: Constraint of patches         Profile name       Mdns %Y-Km-Nd Mcb Kwp McB Kck Kcg Mcq-Kpq Kpt       Image: Constraint of Constraint constratin	<b>.</b>	splay & Instrument Calibration Profiling	3D LUT 🗸 Verification
Profile quality       High         Testchart       Auto-optimized         Amount of patches       Estimated measurement time approximately 0 hour(s) 43 minutes         Profile name       Xidns XY-Xm-Xid Xicb Xwp XicB Xick Xicg Xicq-Xipq Xipt madVR 2016-02-02 0.3127x 0.329y S XYZLUT         Image: State of the process of characterizing the display and recording its response in a ICC device profile. The ICC device profile can be used by applications that support ICC color management for full display color correction, and/or it can be used to create a 3D LUT (LUT = Look Up Table) which serves the same purpose for applications that support 3D LUTs.         The amount of patches measured influences the attainable accuracy of the resulting profile. For a reasonable quality 3x matrix and curves based profile, a few dozen patches can be enough if the display has good additive color mixing	Profiling settings		
Testchart       Auto-optimized       Image: Constraint of patches       Image: Constrait of patches       Image: Constraint of patc	Profile quality	High	
Amount of patches       Estimated measurement time approximately 0 hour(s) 43 minutes         Profile name       Kdns %Y-%m-%d %cb %wp %cB %ck %cg %cg-%pq %pt madVR 2016-02-02 0.3127x 0.329y S XYZLUT         Image: Strain S	Testchart	Auto-optimized	🔁 🔚 1553
Profilie name       Estimated measurement time approximately 0 hour(s) 43 minutes         Profile name       %dns %Y-%m-%d %cb %wp %cB %ck %cg %cq-%pq %pt         madVR 2016-02-02 0.3127x 0.3299 \$ XYZLUT       Image: madve measurement time approximately 0 hour(s) 43 minutes         Image: madve measurement time approximately 0 hour(s) 43 minutes       Image: madve measurement time approximately 0 hour(s) 43 minutes         Image: madve measurement time approximately 0 hour(s) 43 minutes       Image: madve measurement time approximately 0 hour(s) 43 minutes         Image: measurement time approximately 0 hour(s) 43 minutes       Image: madve measurement time approximately 0 hour(s) 43 minutes         Image: measurement time approximately 0 hour(s) 43 minutes       Image: measurement time approximately 0 hour(s) 43 minutes         Image: measurement time approximately 0 hour(s) 43 minutes       Image: measurement time approximately 0 hour(s) 43 minutes         Image: measurement time approximately 0 hour(s) 43 minutes       Image: measurement time approximately 0 hour(s) 43 minutes         Image: measurement time approximately 0 hour(s) 42 minutes       Image: measurement time approximately 0 hour(s) 43 minutes         Image: measurement time approximately 0 hour(s) 43 minutes       Image: measurement time approximately 0 hour(s) 43 minutes         Image: measurement time approximately 0 hour(s) 43 minutes       Image: measurement time approximately 0 hour(s) 43 minutes         Image: measurement time approximately 0 hour(s) 43 minutes       Image: measurement t	Amount of patches	· · · · · · · · · · · · · · · · · · ·	
Profile name       Mdns %Y-%m-%d %cb %wp %cB %ck %cg %cq-%pq %pt       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT         ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT       ImadVR 2016-02-02 0.3127x 0.329y S XYZLUT <tr< td=""><td></td><td>Estimated measurement time approximately 0 hour(s) 43 minutes</td><td></td></tr<>		Estimated measurement time approximately 0 hour(s) 43 minutes	
madVR 2016-02-02 0.3127x 0.329y S XYZLUT      Profiling is the process of characterizing the display and recording its response in a ICC device profile. The ICC     device profile can be used by applications that support ICC color management for full display color correction, and/or     it can be used to create a 3D LUT (LUT = Look Up Table) which serves the same purpose for applications that support 3D     LUTs.     The amount of patches measured influences the attainable accuracy of the resulting profile. For a reasonable quality     axi matrix and curves based profile, a few dozen patches can be enough if the display has good additive color mixing	Profile name	Ndns WY-Nm-Nd Nob Nwp NoB Nok Nog Nog-Npg Npt	8 🖬
Profiling is the process of characterizing the display and recording its response in a IOC device profile. The IOC     device profile can be used by applications that support IOC color management for full display color correction, and/or     it can be used to create a 3D LUT (LUT = Look Up Table) which serves the same purpose for applications that support 3D     LUTs.     The amount of patches measured influences the attainable accuracy of the resulting profile. For a reasonable quality     3x3 matrix and curves based profile, a few dozen patches can be enough if the display has good additive color mixing		madVR 2016-02-02 0.3127x 0.329y S XYZLUT	
properties and linearity. Some professional displays fall into that category. If the highest possible accuracy is desired, a LUT-based profile from around several hundred up to several thousand patches is recommended. The "Auto- optimized" testchart setting automatically takes into account the non-linearities and actual response of the display, and should be used for best quality results. With this, you can adjust a slider to choose a compromise between resulting profile accuracy and measurement as well as computation time.	Profiling is t device profi it can be us LUTs. The amount 3x3 matrix a properties a desired, a U	he process of characterizing the display and recording its response in a IC e can be used by applications that support ICC color management for full of d to create a 3D LUT (LUT = Look Up Table) which serves the same purport of patches measured influences the attainable accuracy of the resulting pr nd curves based profile, a few dozen patches can be enough if the displays nd linearity. Some professional displays fall into that category. If the highlys T-based profile from around several hundred up to several thousand patch testchart setting automatically takes into account the non-linearities and ac	C device profile. The ICC display color correction, and/or se for applications that support 3D rofile. For a reasonable quality has good additive color mixing it possible accuracy is hes is recommended. The "Auto- tual response of the display, a compromise between

 On the **3D LUT** tab, verify 'madVR (.3dlut)' is selected as the 3D LUT file format

Deploy o	albration and characterization powered by	Argyl CMS	
Settings	Video 3D LUT for madVR (D65, Rec. 7	09 / Rec. 1806)	0 8 5 5 6
<b>.</b>	eley & Instrument 💦 🔵 College	ion 👖 Putling 🐧	🖉 30 LUT 🖌 Vertication
30 LUT settings			
Create 30 LUT at	har profiling		
Source colompace	Rec 709 ITU-R 81.709		
fone curve	Rec. 1886		
Rendering intent	Absolute colorimetric with white point a	celing 💽	
10 LUT file format	madyR (.3dlut)	0	
input encoding	ng Ty Ada 16-235		
Output encoding	TV R08 16-236		
esie Tuli Ol	00+00+05 (110)		
Choosing th for 3D LUTs become a fis fty). As an ex gamma of a black output to a value be	e right source colonspace and tone respo- and ICC device link profiles, the source or ed part of the overall color transformation ample, ICO video material is usually master cond 2.2-2.4 (energies with tolock output o offsat ON). A split between flag, 1886-lik team ON and ICON.	nee curve longace and tone response curve need junitie ICC device profiles which are the red accorning to the flex. Told standard thet of 100%) or flex. 1688 tone respon- and pure power is also possible by set	to be set in advance and and dynamically on-the- with either a pure gower se curve (ablockule with ting black output offset.
"Absolute" v To accorned accordingly. "Absolute" g the black inv "Relative" gr	e. "relative" gamma ate a non-zero black level of a real display amma results in an actual output at 50% i el a zerol. amma results in an actual output at 50% in	the tone response curve needs to be of sput which doesn't match that of an idea put which matches that of an idealpad p	fiset and scaled fized power curve juniess cover curve.
Rendering in If you have a for the 30 Li scaling" (wh colorapeon o	stant albrated to a different whitepoint than the UT instead, select "Relative colormetric." I the point scaling will prevent clipping in al- hilitepoint is outside of the display gemuit; ay compress or expand the source colors excurses is required.	one mandated by the source obtained Otherwise, select "Absolute obtaining the outure obtaining mode that could have the ability of the selection to use a non- sace to fit within the display gamut (not	e, and want to use that with white point provide the source plorimetric rendering recommended when
colorimetric			

- 7. Note: I use Gamma 2.2 tone curve instead of BT1886.
- 8. Click 'Calibrate & profile' button. The duration of the process will depend on the speed of your meter and the amount of test patterns selected
- 9. Measurement progress bar

nsec 0 msec inst reaction	m
✓ Pause	Cancel
	I Pause

10. After measurement and profile are complete, click the 'Install 3D LUT' button to automatically install the 3D LUT into MadVR. (manual 3D LUT install instructions are below)

	Calibration and profil	ling complete!
	Profile self check $\Delta E$	*76: average 0.46, maximum 4.26, RMS 0.66
	Gamut coverage	Gamut volume
	93.9% sRGB	97.7% sRGB
	66.8% Adobe RGB	67.3% Adobe RGB
	69.1% DCI P3	69.2% DCI P3
	Show profile infor	mation
		Cancel Install 3D LUT
-		

### C. Manually applying the 3D LUT file in MadVR

- 1. Browse to the folder where MadVR was extracted
- 2. Run madHcCtrl.exe
- 3. Right-click the MadVR tray icon and select 'Edit madVR Settings...'
- 4. Expand your display device under the devices node
- 5. Select 'calibration' menu
- 6. Select 'calibrate this display by using an external 3DLUT files'
- 7. Check 'disable GPU gamma ramps'
- 8. For the BT.709 field, browse to the DisplayCAL save location, the profile folder, and select the xxxx.3dlut file

## **19.2 Calibrating (3DLUT) for madvr tonemapping SDR with** BT2020

You must not use the option "Video 3D LUT for madVR HDR (D65 Rec. 2020 / SMPTE 2084 / BT.2390)" as this is literally a HDR 3D LUT. You want to use madVR to tone-map HDR to SDR, so as you stated, you will be using SDR2020 which is NOT an HDR 3D LUT.

Instead, you need to choose "Video 3D LUT for mad VR (D65, Rec. 709 / Rec 1886)".

You can try to do a BT2020 3D LUT for BT.2020 color profile mode on the projector (not recommended for JVC X5000 series, the colors will be incorrect), but you may find that you get posterization in the result. In that case. Instead **make your 3D LUT for DCI-P3 color space**. Also, the projector (JVC X5000) does not exceed DCI-P3 color gamut anyways, so you are not losing any color gamut. Even though movies are mastered to BT.2020 color gamut, none so far use any colors outside the DCI-P3 gamut that I have heard of or seen. Don't forget to use the DCI-P3 color profile in the projector (JVC X5000) when calibrating for DCI-P3. A JVC X5000 DCI-P3 color profile can ben found on AVS forum and then imported to the projector using the autocal software.

Then on the 3D LUT tab, you can select your Tone curve to Gamma 2.2 and your source colorspace to DCI-P3.

This will then generate a 3D LUT for madVR which will go in the Devices -> "your device" -> Calibration tab, in the DCI-P3 slot.

Because we are using "tone map HDR using pixel shaders" this makes an SDR 3D LUT appropriate.

## **19.3 MadVR 3DLUT settings**

Ik doe twee 3DLUT calibraties (metingen), eentje voor REC709 en eentje voor BT2020 source content.

madVR settings - "DESKTOP-J42JUH9" (127.0	2.0.1)	×
Y devices	calibration	
	stafic stars a particular	
- properties	calibration delate profile group	
(E) calibration	aud prone decice prone group	
E color & commo	keyboard shortcut to toggle profiles:	
E bdr	edit shortcut	
✓ · · · · · · · · · · · · · · · · · · ·		
properties	profile auto select rules: (dick here for online help)	
display modes	if (hdr) "BT2020" else "REC709"	
Screenconfig		
· ↓ · · · · · · · · · · · · · · · · · ·		
screen config		
21:9		
× - 🗀 16:9		
📄 hdr		
Y- 21:9		
✓ ← calibration		
- REC709	v	
<		
madVR v0.92.17		OK Cancel Apply
madVR settings - "DESKTOP-J42JUH9" (127.0	0.0.1)	×
> - Marantz - AVR. ^	calibration	
	0.0.0.0	
Calibration	O disable calibration controls for this display	
	O this display is already calibrated	
📳 color & gamma	Calibrate this display by using yCMS	
i- ji hdr	calibrate this display by using external 3DLUT files	
properties	disable GPU gamma ramps	
display modes		
🗊 color & gamma		
screenconfig	BT.709: C:\ProgramData\madVR\BT.709.3dlut	
Screen config	SMPTE C: X	
¥ · 🗀 21:9	FRUPAI:	
screen config		
🗊 hdr	DCI-P3:	
V - 🗀 21:9	You don't have to provide a 3dlut file for every gamut. One 3dlut for all gamuts also works ok.	
Hdr		
V - REC709		
Calibration	report BT 2020 to display. (Nvidia only)	
< >		
madVR v0.92.17		OK Cancel Apply
madvK settings - "DESKTOP-J42JUH9" (127.0	J.U.1)	×
properties ^	calibration	
display modes	Criticable calibration controls for this display	
color & gamma		
hdr		
V I Projector	calibrate this display by using external 3DLUT files	
isplay modes		
🗊 color & gamma	⊡disable GPU gamma ramps	
✓ ☐ screenconfig		
16:9		
v - 21:9	BT.709: 🗙 🔀	
Screen config	SMPTE C:	
✓ - hdr	EBU/PAL:	
hq.	BT.2020:	
¥ 🗋 21:9	DCI-P3: C:\ProgramData\madVR\DCI-P3.3dut	
🖹 hdr		
Calibration	You don't have to provide a 3dlut file for every gamut. One 3dlut for all gamuts also works ok.	
Calibration		
V - C BT2020		
- E calibration	report BT.2020 to display (Nvidia only)	
< >		
		OK Cancel Apply
Mauvik V0.92.17		-+201

### **19.4 Displaycal correction file**

Displaycal correctie files zijn te vinden op:

<u>https://colorimetercorrections.displaycal.net/?</u> get&type=\*&manufacturer\_id=JVC&instrument=\*&html=1

Ik gebruik zelf deze: 'JVC D-ILA Family - Xrite i1 DisplayPro, ColorMunki Display & madVR (GretagMacbeth i1 Pro).ccmx'

Met als inhoud:

CCMX

DESCRIPTOR "JVC D-ILA Family - Xrite i1 DisplayPro, ColorMunki Display & madVR (GretagMacbeth i1 Pro)" KEYWORD "INSTRUMENT" INSTRUMENT "Xrite i1 DisplayPro, ColorMunki Display" KEYWORD "TECHNOLOGY" TECHNOLOGY "Projector" KEYWORD "MANUFACTURER\_ID" MANUFACTURER\_ID "JVC" KEYWORD "MANUFACTURER" MANUFACTURER "JVC D-ILA" KEYWORD "DISPLAY" DISPLAY "JVC D-ILA" KEYWORD "DISPLAY\_TYPE\_BASE\_ID" DISPLAY\_TYPE\_BASE\_ID "1" KEYWORD "DISPLAY\_TYPE\_REFRESH" DISPLAY\_TYPE\_REFRESH "NO" KEYWORD "REFERENCE" REFERENCE "GretagMacbeth i1 Pro" ORIGINATOR "Argyll ccmx" CREATED "Fri Nov 20 16:21:58 2015" KEYWORD "COLOR\_REP" COLOR\_REP "XYZ" NUMBER\_OF\_FIELDS 3 BEGIN DATA FORMAT XYZ\_X XYZ\_Y XYZ\_Z END\_DATA\_FORMAT NUMBER\_OF\_SETS 3 **BEGIN\_DATA** 0.955653 0.0308885 -0.00280638 -0.0262404 0.992673 0.00487496 -0.00154635 -0.00812838 0.958890 END\_DATA

## **20. NVIDIA micro stutter issues**

Note to JVC projector owners with Nvidia GPU

(https://drive.google.com/file/d/1gQZLfJ0w5KT7tBHCKZASSVU8vTnyPe2n/view)

If you have a Nvidia 20xx/30xx video card and you encounter micro stutter while using madVR without actually dropping frames, please try the following:

- In the Nvidia control panel, go to Manage 3D Settings, scroll all the way down and set Vertical Sync to 'On'. You can do this either globally or just for the media player exe.
- In the madVR settings, go to rendering -> general settings, and uncheck 'enable automatic fullscreen exclusive mode'
- In the madVR settings, go to rendering -> windowed mode settings, and set 'how many video frames shall be presented in advance' to 1 or a maximum of 3
- https://forum.doom9.org/showpost.php?p=1871970&postcount=151
- Every Nvidia driver after 388.59 has a faulty updated HD Audio driver in the newer Windows driver installer packages.
- If you want 3D support back in newer drivers like 430.39 from 2019-04-23 and newer, you can try 3D Fix Manager

First thing to verify is that you have Vertical Sync set to ON in Nvidia Control Panel. And Power Management set to Normal or to Adaptive if Normal is not an option.

Also set GPU and CPU queues to 4 in madVR. Present frames in advance to 1, 2, or 3.

### Game Ready Driver (GRD)

Creator Ready Driver (CRD) Studio Driver (SD) Hotfix Driver

•	512.59	2022-04-26	
•	512.59	2022-04-26	
•	512.16	2022-03-29	only for RTX 3090 Ti
•	512.16	2022-03-29	only for RTX 3090 Ti
•	512.15	2022-03-22	D3D9 overlay rendering was broken and now it is disabled
•	512.15	2022-03-22	D3D9 overlay rendering was broken and now it is disabled
•	511.79	2022-02-01	
•	511.65	2022-02-01	
•	511.65	2022-02-01	
•	511.33	2022-01-27	only for RTX 3050
•	511.32	2022-01-27	only for RTX 3050
•	511.23	2022-01-14	
•	511.17	2022-01-11	only for RTX 3080 – new 12GB model
•	511.17	2022-01-11	only for RTX 3080 – new 12GB model
•	511.09	2022-01-04	first SD which is only available as DCH!
•	497.29	2021-12-20	only DCH available!
•	472.47	2021-12-13	Standard is still available!
•	497.09	2021-12-01	only DCH available!
•	496.76	2021-11-16	only DCH available!
•	472.47	2021-11-10	Standard is still available!
•	496.49	2021-10-26	only DCH available!
•	472.39	2021-10-26	Standard is still available!
•	496.13	2021-10-12	only DCH available!
•	472.12	2021-09-20	D3D9 overlay rendering is still broken
•	472.12	2021-09-20	D3D9 overlay rendering is still broken
•	471.96	2021-08-31	
•	471.68	2021-08-10	

•	471.68	2021-08-10	
•	471.41	2021-07-19	
•	471.41	2021-07-19	
•	471.22	2021-07-01	
•	471.11	2021-06-23	
•	471.11	2021-06-22	
•	462.65	2021-06-10	This version or above needed for GeForce RTX 3070 Ti "Includes support for the GeForce RTX 30-series desktop GPUs including the new GeForce RTX 3080 Ti and GeForce RTX 3070 Ti GPUs."
•	466.77	2021-06-10	This version or above needed for GeForce RTX 3070 Ti "Includes support for the GeForce RTX 3080 Ti and GeForce RTX 3070 Ti GPUs" D3D9 overlay rendering is broken
	466.74	2021-06-08	baba overlag rendering is broken
	466.63	2021-06-03	This version or above needed for GeForce RTX 3080 Ti
			"Includes support for the GeForce RTX 3080 Ti GPU"
•	462.65	2021-06-03	This version or above needed for GeForce RTX 3080 Ti "Includes support for the GeForce RTX 3080 Ti GPU" This SD is for some strange reason not for the RTX 3090.
•	466.55	2021-05-25	<u> </u>
•	466.47	2021-05-18	
•	462.59	2021-05-11	
•	466.27	2021-04-29	
•	466.11	2021-04-14	
•	462.31	2021-04-14	
•	465.89	2021-03-30	
•	462.07	2021-03-22	
•	461.92	2021-03-17	
•	461.92	2021-03-16	
•	461.81	2021-03-04	
•	461.72	2021-02-25	This version or above needed for GeForce RTX 3060 "Includes support for the GeForce RTX 3060 GPU"
•	461.72	2021-02-25	This version or above needed for GeForce RTX 3060 "Includes support for the GeForce RTX 3060 GPU"
•	461.51	2021-02-05	
•	461.40	2021-01-26	
•	461.40	2021-01-26	
•	461.33	2021-01-20	
•	461.09	2021-01-07	
•	460.97	2020-12-18	
•	460.89	2020-12-15	
•	460.89	2020-12-15	
•	460.79	2020-12-09	
•	457.51	2020-12-02	This version or above needed for GeForce RTX 3060 Ti "Includes support for the GeForce RTX 3060 Ti GPU"