

K5LP MEMC ISSUE DEBUG

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Outline

- Issue
 - Garbage
 - Black screen / video freeze
 - Judder and stutter
 - noise
- Some Information

Garbage

- Bandwidth
 - Arbitration
 - PQC
- MEMC
 - Memory layout change
 - VR360
 - MC CLK ON/OFF
 - VR360
 - CP, 50/60
 - Display Timing change
 - Clock rate >> MEMC phase index
 - Frame Active cut

Garbage - WOSQRTK-11905



Garbage

[MEMC] [FR] in FrameRate Change!!!(239Hz(1127195) -> 1200Hz(224997))
[MEMC] [FR] in FrameRate Change!!!(1206Hz(223798) -> 600Hz(449998))
[MEMC] [FR] in FrameRate Change!!!(597Hz(451997) -> 298Hz(903996))
[MEMC] [FR] in FrameRate Change!!!(298Hz(903995) -> 250Hz(1079995))

[00003581.515788](VCPU1):13385294|[SMT] [DMA.ERR] MEMC HF Pframe PQDC= 0x00000007@Bg=0/MEMC_Bg=0
[00003581.515788](VCPU1):13385298|[SMT] [DMA.ERR]current 90K=322458257@Bg=0/MEMC_Bg=0
[00003591.595785](VCPU1):134628a7|[SMT] [DMA.ERR] MC_LF_DMA_WR_status= 0x00000020@Bg=0/MEMC_Bg=0
[00003591.595785](VCPU1):134628ab|[SMT] [DMA.ERR]MC_HF_DMA_WR_status= 0x00000020@Bg=0/MEMC_Bg=0
[00003591.595785](VCPU1):134628ad|[SMT] [DMA.ERR]current 90K=323365028@Bg=0/MEMC_Bg=0

[00001139.065475](VCPU1):061e21cd|[SMT] [DMA.ERR] DI PQDC= 0x00070000@Bg=0/MEMC_Bg=0
[00001139.065475](VCPU1):061e21d2|[SMT] [DMA.ERR]current 90K=102638028@Bg=0/MEMC_Bg=0

Garbage

```
[00000206.895647](VCPU1):011e3142|[SMT] [DMA.ERR] M-Cap HelpDbg= 0x00040000@Bg=0/MEMC_Bg=0
[00000206.895647](VCPU1):011e3145|[SMT] [DMA.ERR] M-Cap IBuff= 0x00000001@Bg=0/MEMC_Bg=0
[00000206.895647](VCPU1):011e3147|[SMT] [DMA.ERR] M-Cap PQC= 0x00004000@Bg=0/MEMC_Bg=0
[00000206.895647](VCPU1):011e3149|[SMT] [DMA.ERR] M-Disp DbgHelp= 0x00050000@Bg=0/MEMC_Bg=0
[00000206.895647](VCPU1):011e314b|[SMT] [DMA.ERR] M-Disp MPQDC= 0x00270000@Bg=0/MEMC_Bg=0
[00000206.895647](VCPU1):011e314d|[SMT] [DMA.ERR] UZU BufUdf@Bg=0/MEMC_Bg=0
[00000206.895647](VCPU1):011e3150|[SMT] [DMA.ERR]current 90K=18755903@Bg=0/MEMC_Bg=0
[00000206.895647](VCPU1):011e3152|[SMT] [DMA.ERR]UZD Measure= 0x00000000@Bg=0/MEMC_Bg=0
=====
[00000429.955647](VCPU1):025085d5|[SMT] [DMA.ERR] M-Disp MPQDC= 0x00070000@Bg=0/MEMC_Bg=0
[00000429.955647](VCPU1):025085d8|[SMT] [DMA.ERR]current 90K=38831569@Bg=0/MEMC_Bg=0
[00000429.955647](VCPU1):025085da|[SMT] [DMA.ERR]UZD Measure= 0x00000000@Bg=0/MEMC_Bg=0
[00000480.245647](VCPU1):029595db|[SMT] [DMA.ERR] MEMC HF Pframe PQDC= 0x00000007@Bg=0/MEMC_Bg=0
[00000480.245647](VCPU1):029595de|[SMT] [DMA.ERR]current 90K=43357654@Bg=0/MEMC_Bg=0
[00000480.245647](VCPU1):029595df|[SMT] [DMA.ERR]UZD Measure= 0x00000000@Bg=0/MEMC_Bg=0
[00000480.265646](VCPU1):02959b9d|[SMT] [DMA.ERR] MEMC HF lframe PQDC= 0x00070000@Bg=0/MEMC_Bg=0
[00000480.265646](VCPU1):02959ba0|[SMT] [DMA.ERR]current 90K=43359128@Bg=0/MEMC_Bg=0
[00000480.265646](VCPU1):02959ba2|[SMT] [DMA.ERR]UZD Measure= 0x00000000@Bg=0/MEMC_Bg=0
```

Black screen / video freeze

- Problem : audio ok, video black/freeze
- Root cause
 - MEMC
 - 沒解遮黑
 - reg_bluescreen : B809d060[30]
 - ISR not work :
 - How to test ? >> B809d5fc[28]
 - Scaler
 - 沒解遮黑
 - memc_out_bg_en : B8028100[12]
 - m_force_bg : B8028300[1]
 - Others
 - Kernel panic etc....

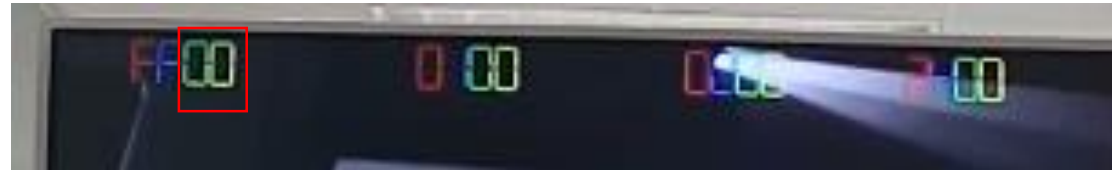
Judder and stutter

- MEMC
 - Cadence change
 - Scenes Change
 - Global Fallback
 - N2M setting
- Power Saving
 - SE Film detection
- Bad-Edit
 - Stream / player
- Frame drop
 - VO
 - M-Domain

Judder and stutter

- MEMC

- Cadence change



- Scenes Change



- Global Fallback



Judder and stutter

- MEMC
- N2M

The screenshot shows the MEMC_REG configuration window with the following sections and settings:

- Global Settings:**
 - ☐ 0: disable or finished, 1: Enable setting, self
 - ☒ MEMC_Enable(0:bypass, 1:MEMC)
 - ☒ 0: level 2, 1: level 1
 - ☒ 0: disable double buffer, 1: load buffer
 - ☐ memc_int_vcpu_routing_en
 - ☐ pt_logo_mode
 - ☒ mc_lpf_C 0: off 1: on
 - ☒ mc_lpf_Y 0: off 1: on
- IPPRE reg_convert_mode_h:** RGB2YUV_709_LIMIT
- IPPRE reg_convert_mode_l:** RGB2YUV_709_LIMIT
- KPOST_TOP CSC reg_post_convert_mode:** YUV2RGB_709_LIMIT
- reg_mc_bld_bypass:** 4: pw
- reg_mc_logo_en:** pt_logo=0 self_logo=0
- MEMC Freeze:**
 - ☐ MEMC Freeze(p frame)
 - Advance Option:** i frame (selected), p frame
 - ☐ Buffer Index: 0
- RTK Input Frame Rate:** 1125041 (23.999 fps)
- RTK Output Frame Rate:** 449990 (60.001 fps)
- kphase_in_phase:** 1
- kphase_out_phase:** 4
- kphase detect no match:** 0
- kphase_out_film_phase:** 0
- input ratio:** 2 (highlighted with a red box and labeled 'N')
- output ratio:** 5 (highlighted with a red box and labeled 'M')
- Film Cadence:** _CAD_VIDEO:0
- 24, video** (red text label)

Buttons: Read, Write (multiple locations)

MEMC Cadence Supported

- Playback USB播: cadence只跟content有關.
- Player播: cadence跟content和player output frame rate有關.
- Mix mode
- SE mode (Power Saving mode)

24	25	30	50	60
24_24_(N)	25_25_(N)	24_30_(1112) 25_30_(11112) 30_30_(N)	25_50_(22) 30_50_(122) 50_50_(N)	24_60_(32) 24_60_(2224) 24_60_(3223) 25_60_(32322) 30_60_(22) 50_60_(11112) 60_60_(N)

input native	12	15	24	25	30	48	50	60
12	no	x	22	x	32 3223 2224	44	x	55
15	x	no	x	x	22	x	334	44
24	x	x	no	x	1112	22	11'23	32 3223 2224
25	x	x	x	no	11112	x	22	32322 22224
30	x	x	x	x	no	x	122	22
48	x	x	x	x	x	no	x	1112
50	x	x	x	x	x	x	no	11112
60	x	x	x	x	x	x	x	no

← 1秒幾張(input frame rate)

spec out

spec

1秒有60張, 有30張不同.
所以2張2張重複, 稱cadence 22.
AABBCDD...

↑ 1秒有幾張不同

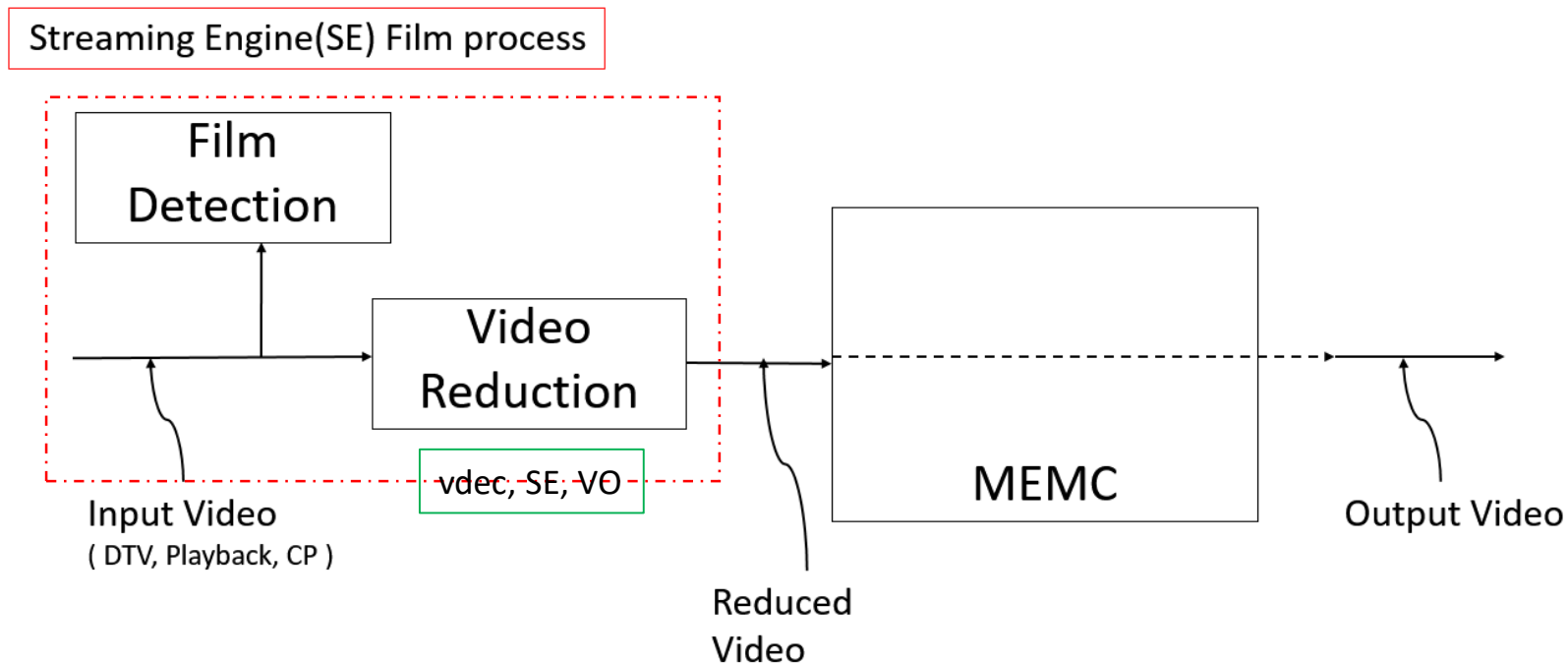
↓ 1秒有24張, 24張都不同.
沒有重複的frame, 也就是沒有cadence, 稱作video.
ABCD...

```
typedef enum{
    _CAD_VIDEO,           //0
    _CAD_22,              //1
    _CAD_32,              //2
    _CAD_32322,           //3
    _CAD_334,             //4
    _CAD_22224,           //5
    _CAD_2224,            //6
    _CAD_3223,            //7
    _CAD_55,              //8
    _CAD_66,              //9
    _CAD_44,              //0xA
    _CAD_1112,            //0xB
    _CAD_11112,           //0xC
    _CAD_122,             //0xD
    _CAD_11i23,           //0xE
    _CAD_321,             //0xF
    _FRC_CADENCE_NUM_,
}FRC_CADENCE_ID;
```

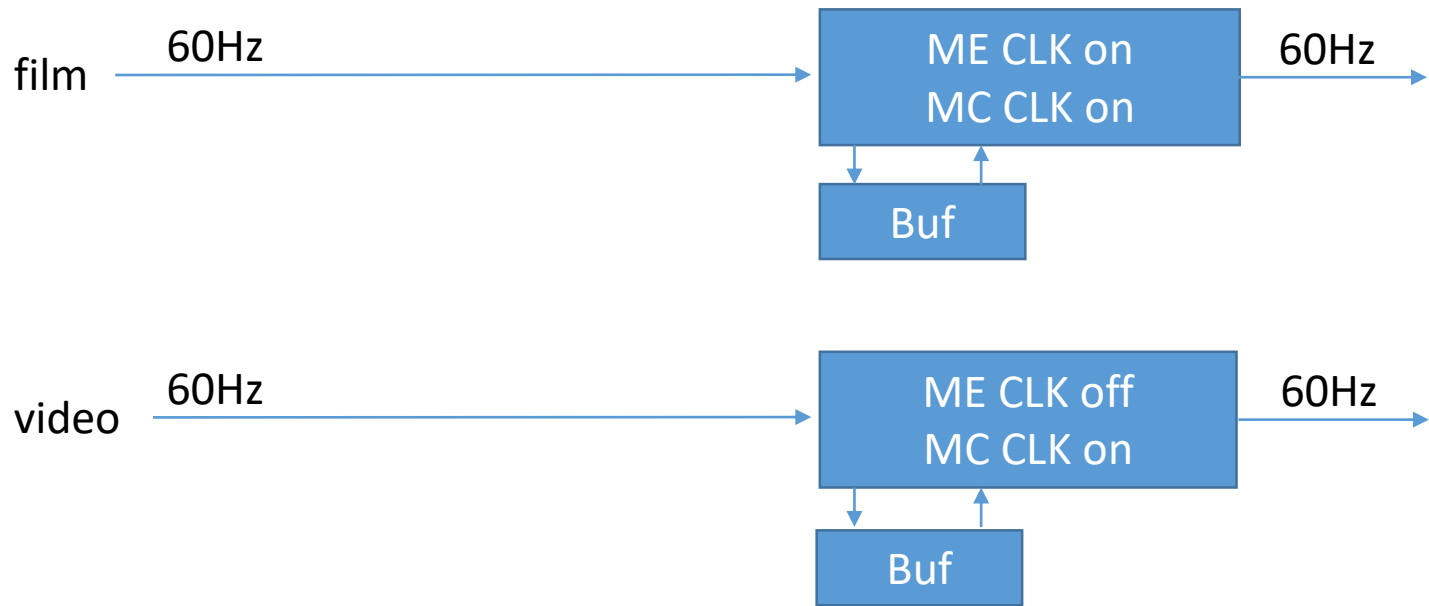
Judder and stutter

- Power Saving
 - SE Film detection

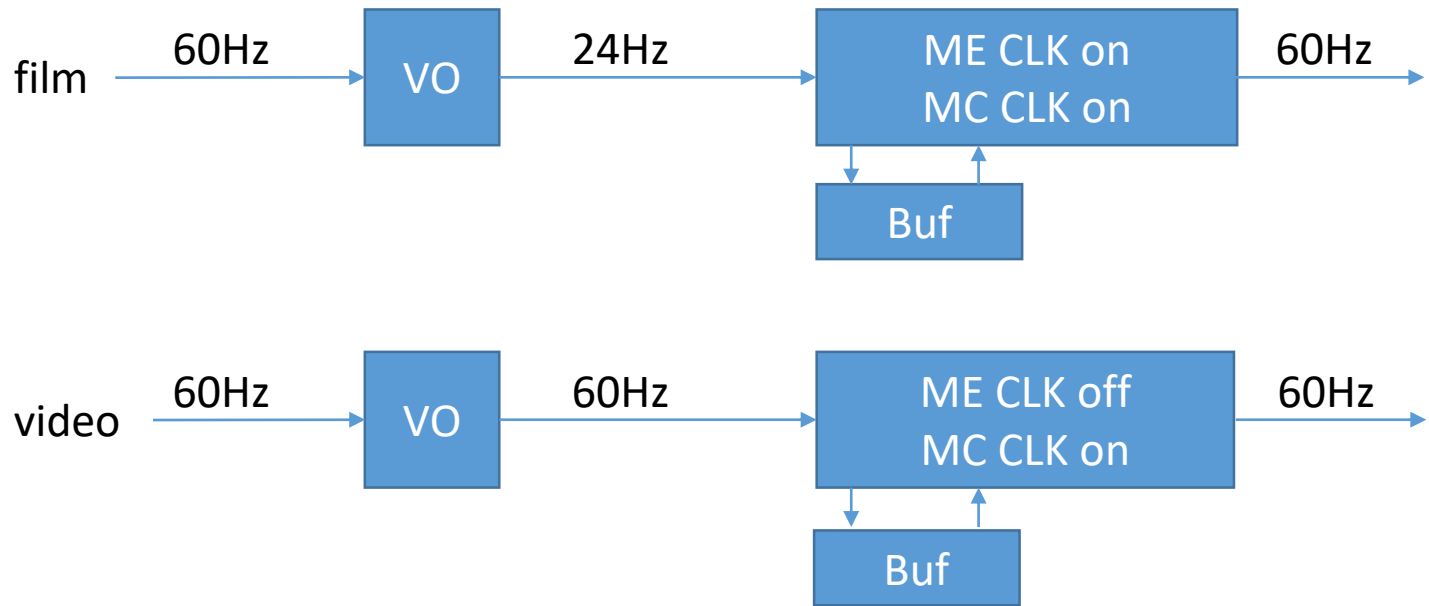
Block Diagram for Power(BW) Saving



HDMI



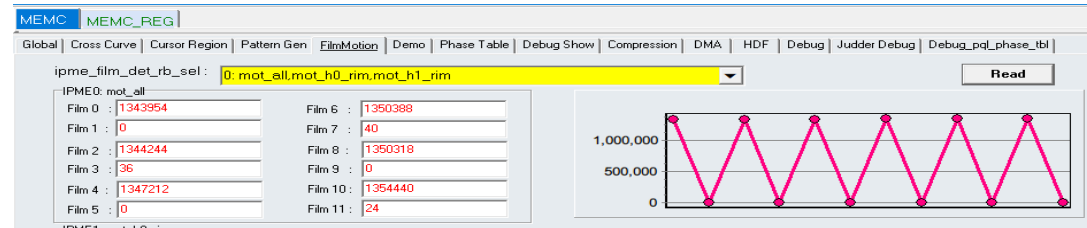
DTV, Playback, CP



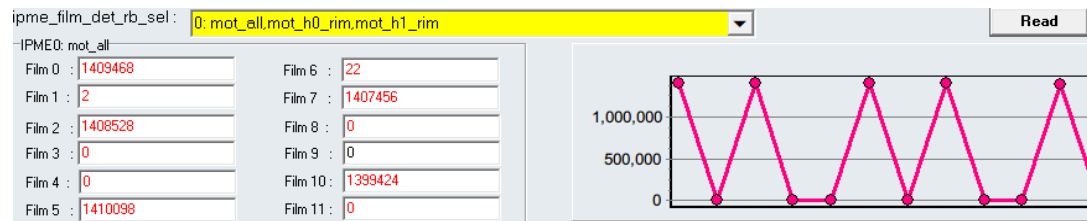
Judder and stutter

- Bad-Edit
 - Stream / player

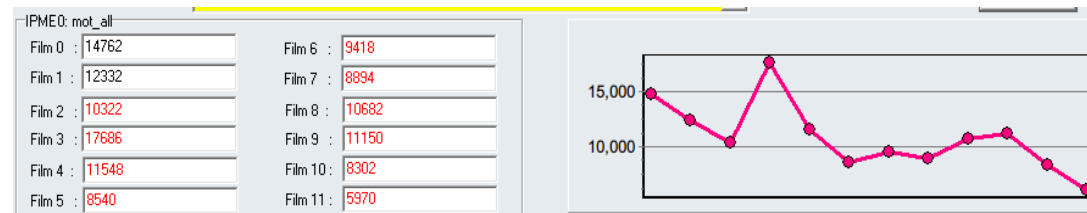
- 22 :



- 32 :



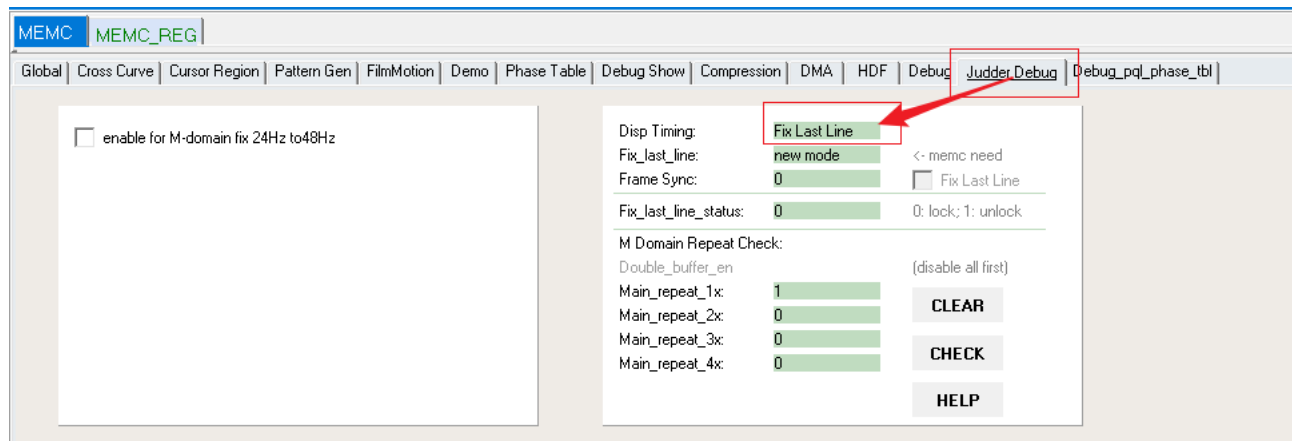
- Video



Judder and stutter

- Frame drop/repeat
 - VO
 - M-Domain
 - Display Timing

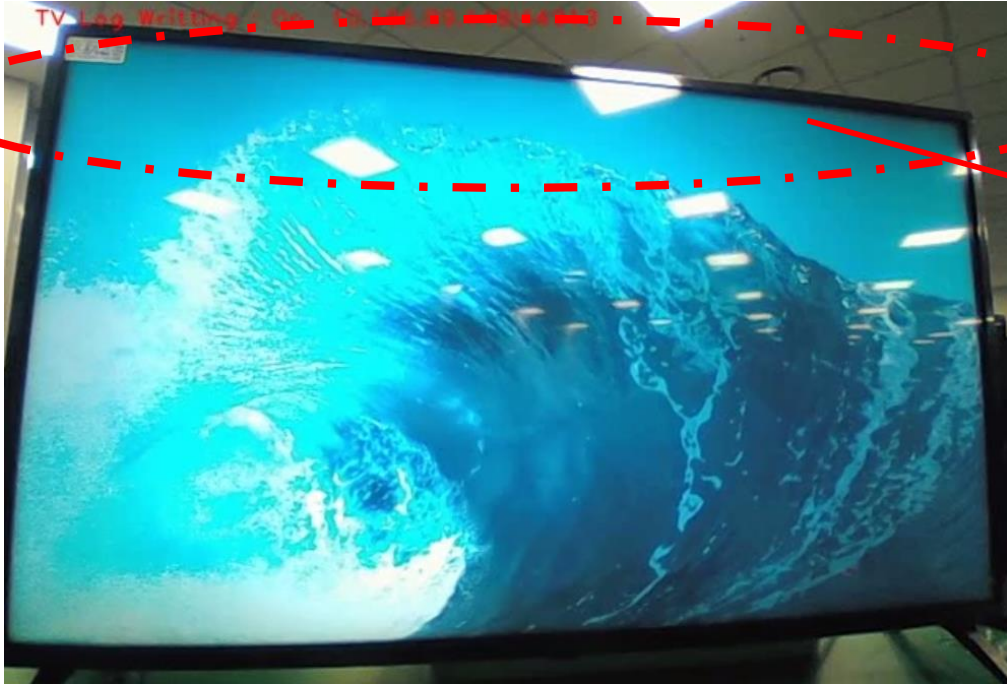
```
[00000073.862962](VCPU1):0141c253|[VO] RptV[1@148][10|10|10|10|11=2]@304@ 0xa2a41070,Bg=0  
[00000073.862962](VCPU1):0141c25c|[VO] [6]:[vo]Ch0 ResetMasterPTS 0xffffdfc6, next 0  
[00000073.882961](VCPU1):0141c828|[VO] [29]:RRptV[1@148][10|10|10|10|11=2]@303@ 0xa2a41070,Bg=0  
[00000073.882961](VCPU1):0141c82f|[VO] [31]:ch0 rpt 34(2)/34,m 0x00000000,d -5100,a 0x00000000(-1172997),n 0x00000000(0)  
[00000073.902960](VCPU1):0141cdf9|[VO] [32]:[DVO]IdxRpt 10|11,Bg=0
```



Noise

- DMA setting error
- Repeat setting flow
- VR360 co-buffer

NOISE - WOSQRTK-11604



NOISE - K5LG-1812



NOISE – 11937



NOISE - K5LG-1820



NOISE - WOSQRTK-12283



Noise - KTASKWBS-9610

- MC error

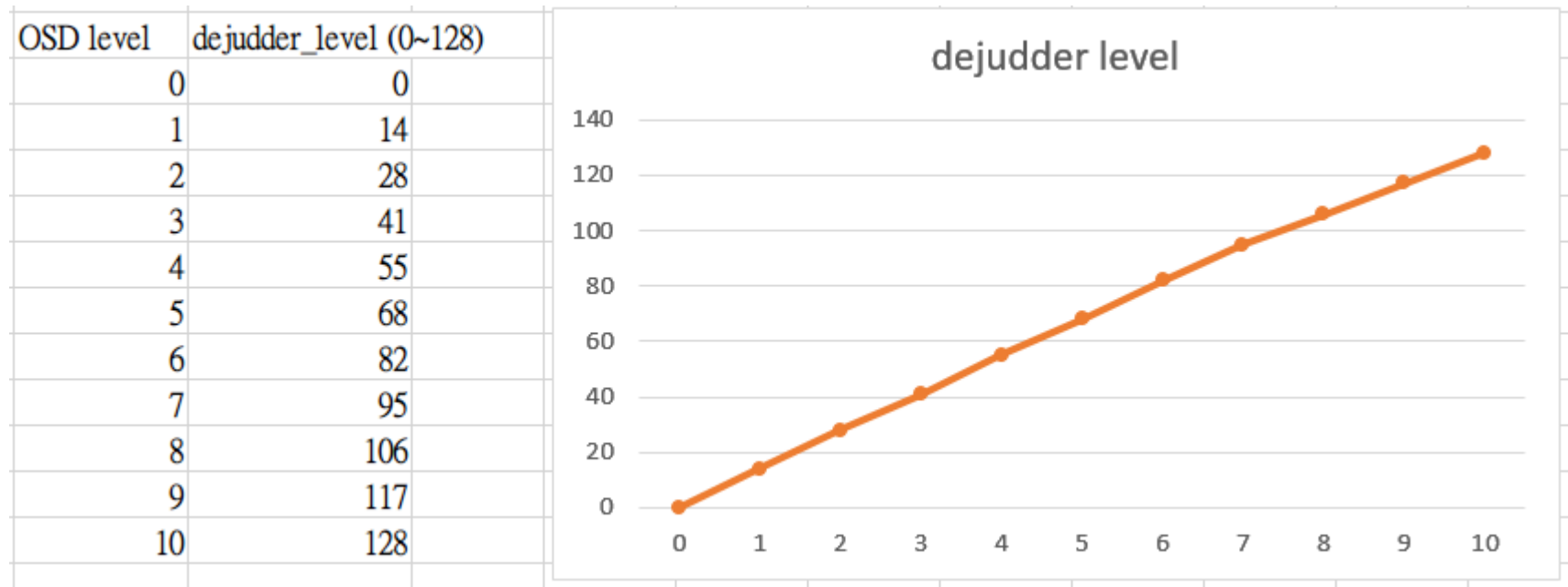


Some Information

- De-judder OSD level
- MEMC CLK ON/OFF Status
- MEMC – delay time
- Test case

Some information

- De-judder OSD level



Some information

- MEMC CLK ON/OFF Status
 - Non_Game
 - CP (ex : Netflix, YouTube)
 - Non-CP
 - Game
 - CP (ex : Netflix, YouTube)
 - Non-CP
 - PC (only HDMI)
 - VR360(playback/Youtube)

Non-CP			
	ME clock	MC clock	blending mode
non game mode			
24p	1	1	blending
25p	1	1	blending
30p	1	1	blending
1080 50i/50p	1	1	blending
1080 60i/60p	1	1	blending
2160 50i/50p	0	1	iz
2160 60i/60p	0	1	iz
game mode			
24p	1	1	iz
25p	1	1	iz
30p	1	1	iz
1080 50i/50p	1	1	iz
1080 60i/60p	1	1	iz
2160 50i/50p	0	1	iz
2160 60i/60p	0	1	iz

CP			
	ME clock	MC clock	blending mode
non game mode			
24p	1	1	blending
25p	1	1	blending
30p	1	1	blending
1080 50i/50p	1	1	blending
1080 60i/60p	1	1	blending
2160 50i/50p	0	0	iz
2160 60i/60p	0	0	iz
game mode			
24p	1	1	iz
25p	1	1	iz
30p	1	1	iz
1080 50i/50p	1	1	iz
1080 60i/60p	1	1	iz
2160 50i/50p	0	0	iz
2160 60i/60p	0	0	iz

	ME clock	MC clock	blending mode
PC mode			
24p	1	1	iz
25p	1	1	iz
30p	1	1	iz
1080 50i/50p	1	1	iz
1080 60i/60p	1	1	iz
2160 50i/50p	0	1	iz
2160 60i/60p	0	1	iz

	ME clock	MC clock	blending mode
VR360			
24p	0	1	pz
25p	0	1	pz
30p	0	1	pz
1080 50i/50p	0	1	pz
1080 60i/60p	0	1	pz
2160 50i/50p	0	0	pz
2160 60i/60p	0	0	pz

Some information

- MEMC – delay time

60HZ panel							
Game mode				Normal mode			
Input	V-Timing	MEMC		Input	V-Timing	MEMC	
		Frame	Time (ms)			Frame	Time (ms)
HDMI	60p	0	0	HDMI	60p	4	66.6666667
	60i	0	0		60i	4	66.6666667
	50p	0	0		50p	4	80
	50i	0	0		50i	4	80
	30p	2.5	83.3333333		30p	4.5	150
	25p	2.5	100		25p	4.5	180
	24p	2.8	116.666667		24p	3.8	158.333333
Component	60p	0	0	Component	60p	4	66.6666667
	60i	0	0		60i	4	66.6666667
	50p	0	0		50p	4	80
	50i	0	0		50i	4	80
	30p	2.5	83.3333333		30p	4.5	150
	25p	2.5	100		25p	4.5	180
	24p	2.8	116.666667		24p	4.8	200
DTV	60p	0	0	DTV	60p	4	66.6666667
	60i	0	0		60i	4	66.6666667
	50p	0	0		50p	4	80
	50i	0	0		50i	4	80
	30p	2.5	83.3333333		30p	4.5	150
	25p	2.5	100		25p	4.5	180
	24p	2.8	116.666667		24p	4.8	200
ATV / CVBS	60i	0	0	ATV / CVBS	60i	4	66.6666667
	50i	0	0		50i	4	80
USB	60p	2	33.3333333	USB	60p	4	66.6666667
	60i	2	33.3333333		60i	4	66.6666667
	50p	2	40		50p	4	80
	50i	2	40		50i	4	80
	30p	2.5	83.3333333		30p	4.5	150
	25p	2.5	100		25p	4.5	180
	24p	2.8	116.666667		24p	4.8	200

Test Case

- LG - Harmony
 - <https://harmony.lge.com:8443/issue/browse/RTKAUDIT-39>

Q & A