

# 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 Iframe 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

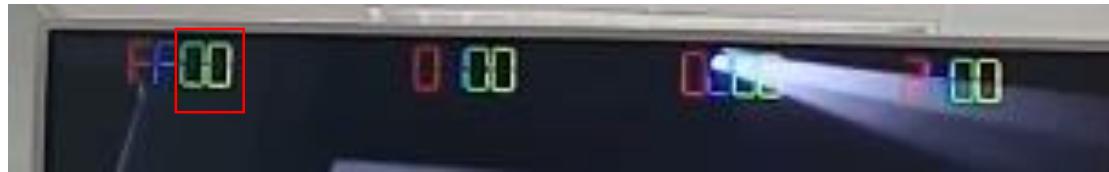
- Problem : audio ok, video black/freeze
- Root cause
  - MEMC
    - 沒解遮黑
      - reg\_blueScreen : B809d060[30]
      - ISR not work :
        - How to test ? >> B809d5fc[28]
    - Scaler
      - 沒解遮黑
        - memc\_out\_bg\_en : B8028100[12]
        - m\_force\_bg :B8028300[1]
    - Others
      - 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

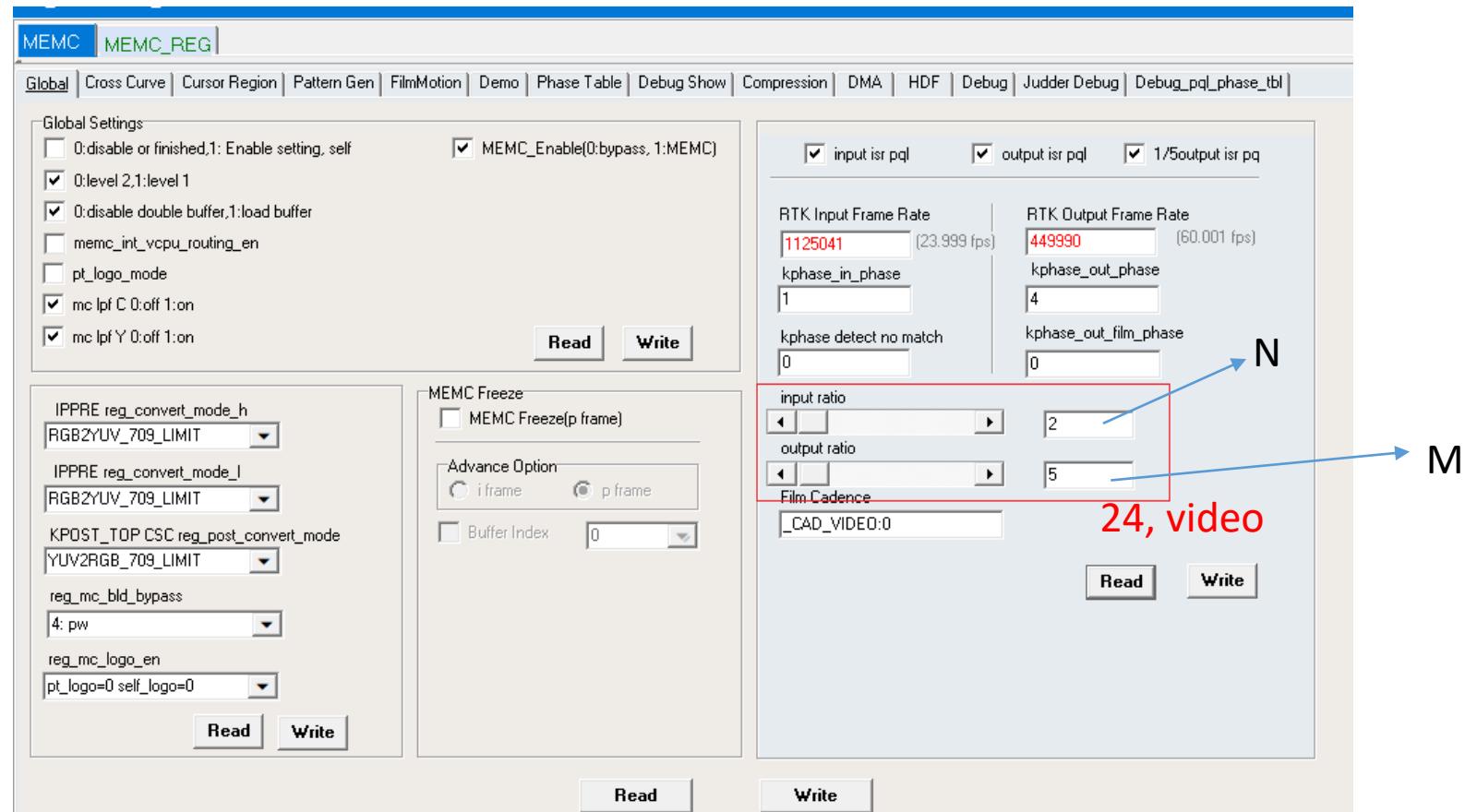
# Judder and stutter

- MEMC
  - Cadence change
  - Scenes Change
  - GlobalFallback



# Judder and stutter

- MEMC
  - N2M



# 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)

| input native | 12 | 15 | 24 | 25 | 30                 | 48 | 50                      | 60         |
|--------------|----|----|----|----|--------------------|----|-------------------------|------------|
| 12           | no | x  | 22 | x  | 32<br>3223<br>2224 | 44 | x                       | 55         |
| 15           | x  | no | x  | x  | 22                 | x  | 334                     | 44         |
| 24           | x  | x  | no | x  | 1112               | 22 | 11'23<br>32322<br>22224 | 32<br>3223 |
| 25           | x  | x  | x  | no | 11112              | x  | 22<br>32322<br>22224    | 32<br>3223 |
| 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... ↓

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

← 1秒幾張(input frame rate)

spec out

spec

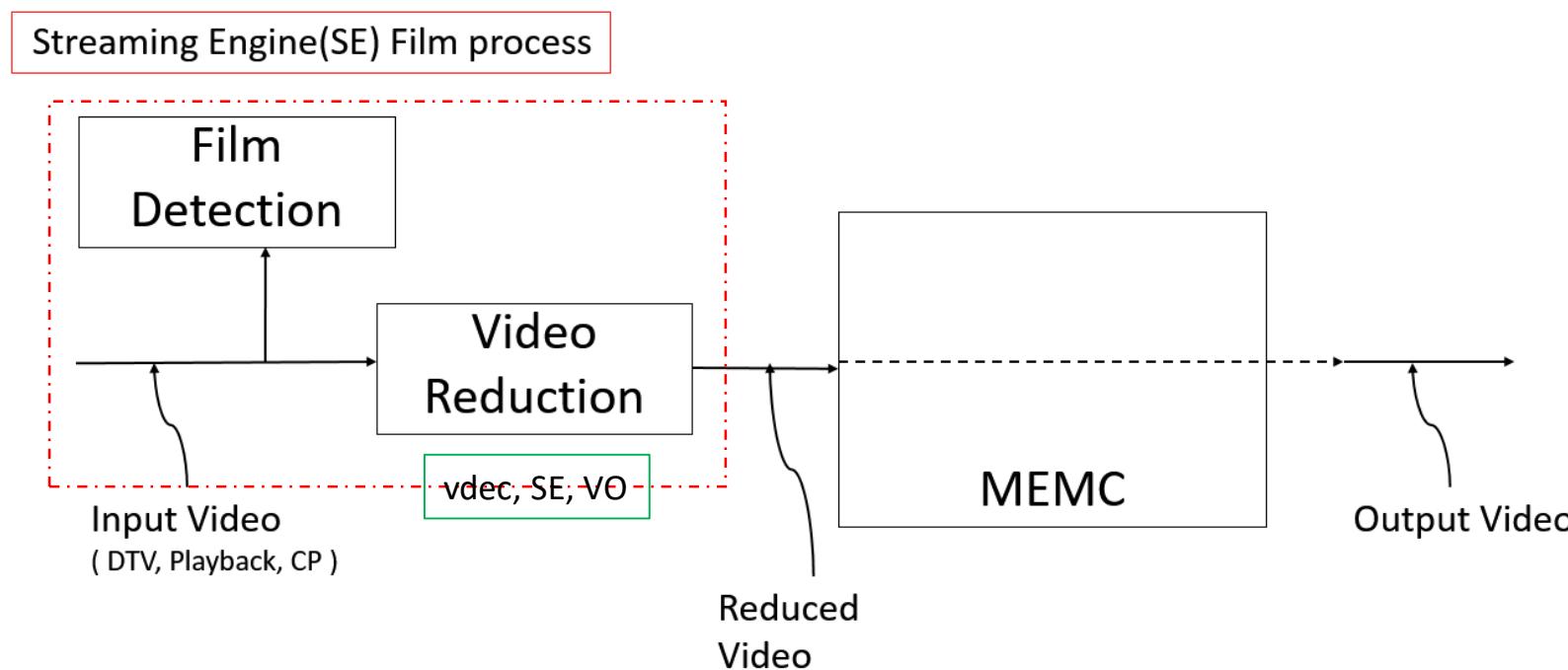
→ 1秒有60張, 有30張不同.  
所以2張2張重複, 稱cadence 22.  
AABBCCDD...

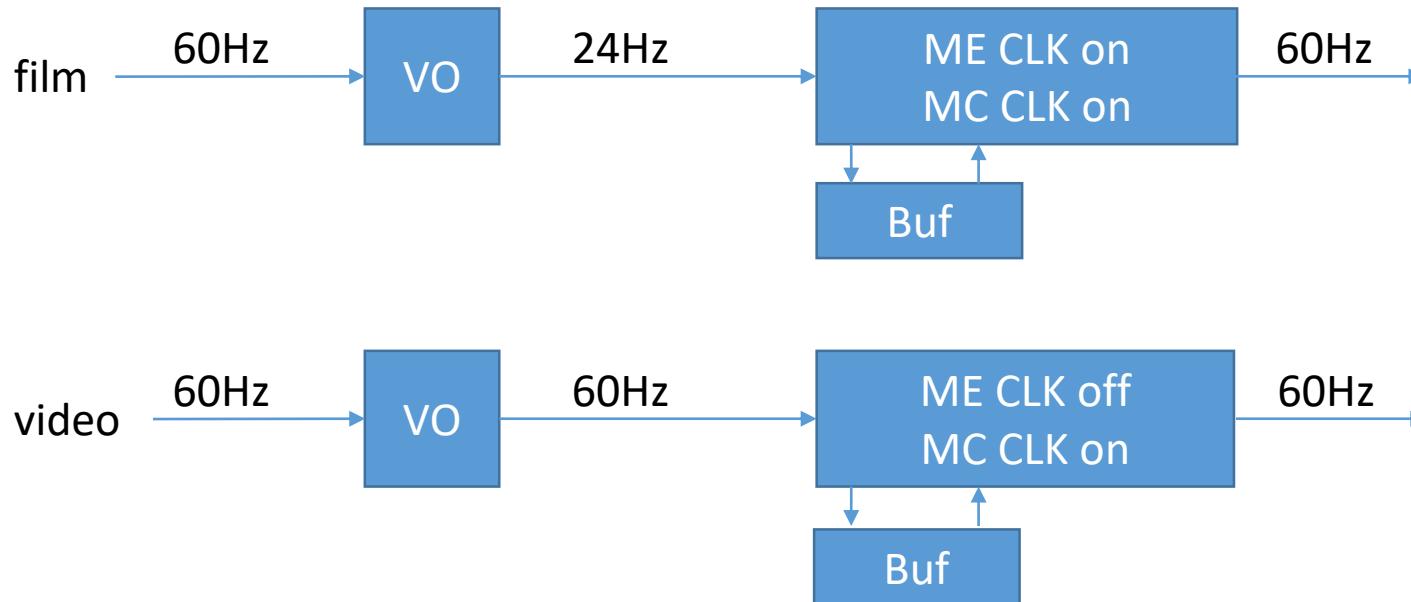
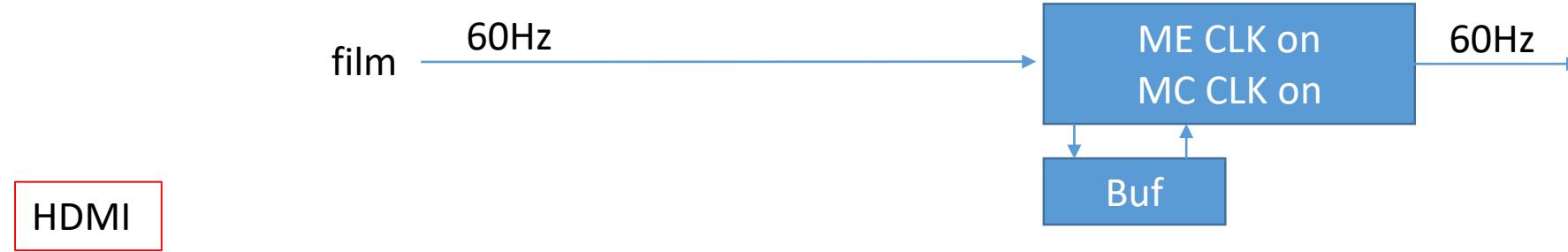
```
typedef enum{
    _CAD_VIDEO,           //0
    _CAD_22,              //1
    _CAD_32,              //2
    _CAD_32322,           //3
    _CAD_334,              //4
    _CAD_22224,           //5
    _CAD_2224,             //6
    _CAD_3223,             //7
    _CAD_55,               //8
    _CAD_66,               //9
    _CAD_44,               //0xA
    _CAD_1112,             //0xB
    _CAD_11112,            //0xC
    _CAD_122,               //0xD
    _CAD_11i23,             //0xE
    _CAD_321,               //0xF
    _FRC_CADENCE_NUM_,      //0x0
} FRC_CADENCE_ID;
```

# Judder and stutter

- Power Saving
  - SE Film detection

Block Diagram for Power(BW) Saving

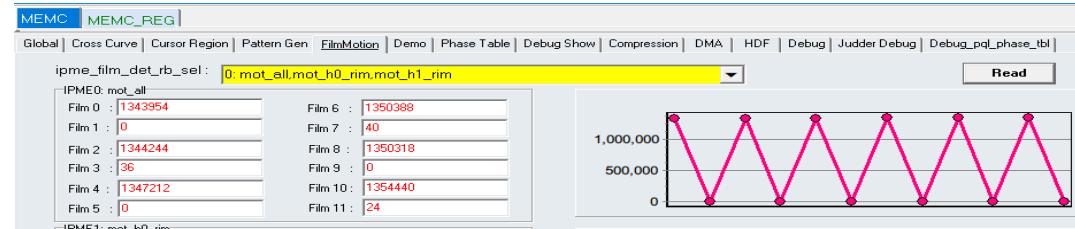




# Judder and stutter

- Bad-Edit
  - Stream / player

- 22 :



- 32 :



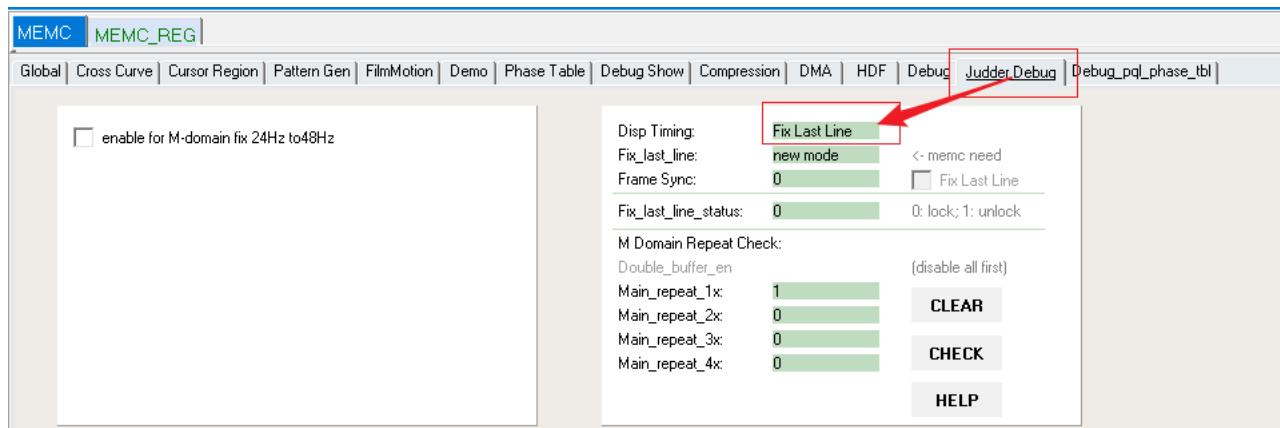
- Video



# Judder and stutter

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

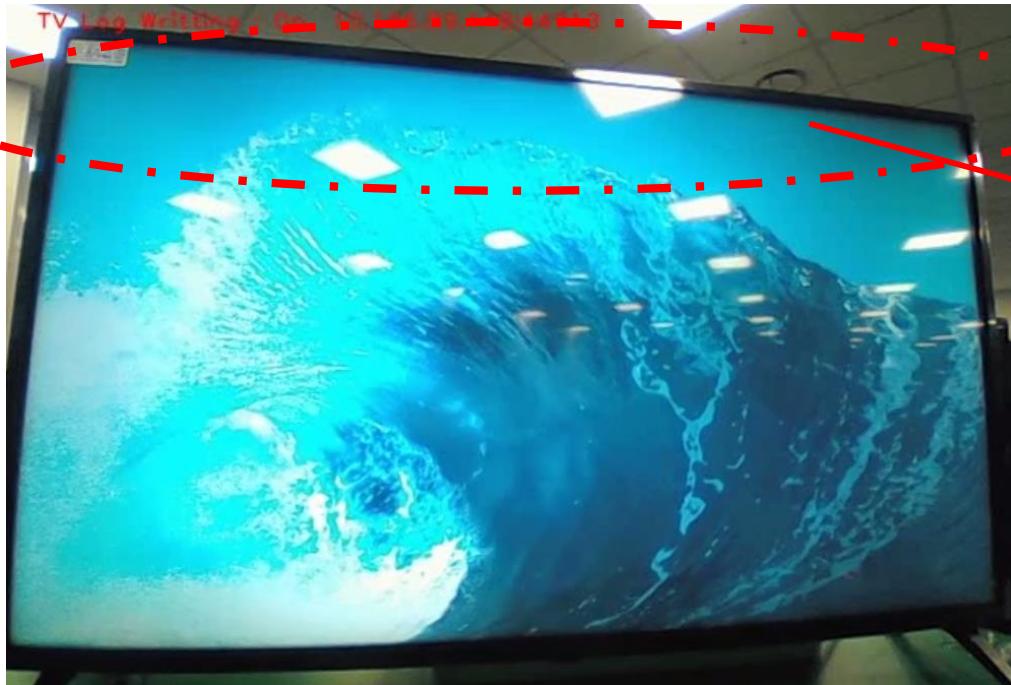
```
[00000073.862962](VCPU1):0141c253|[VO] RptV[1@148][10|10|10|10|11=2]@304@ 0xa2a41070,Bg=0
[00000073.862962](VCPU1):0141c25c|[VO] [6]:[vo]Ch0 ResetMasterPTS 0xffffdfc6, next 0
[00000073.882961](VCPU1):0141c828|[VO] [29]:RRptV[1@148][10|10|10|10|11=2]@303@ 0xa2a41070,Bg=0
[00000073.882961](VCPU1):0141c82f|[VO] [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
```



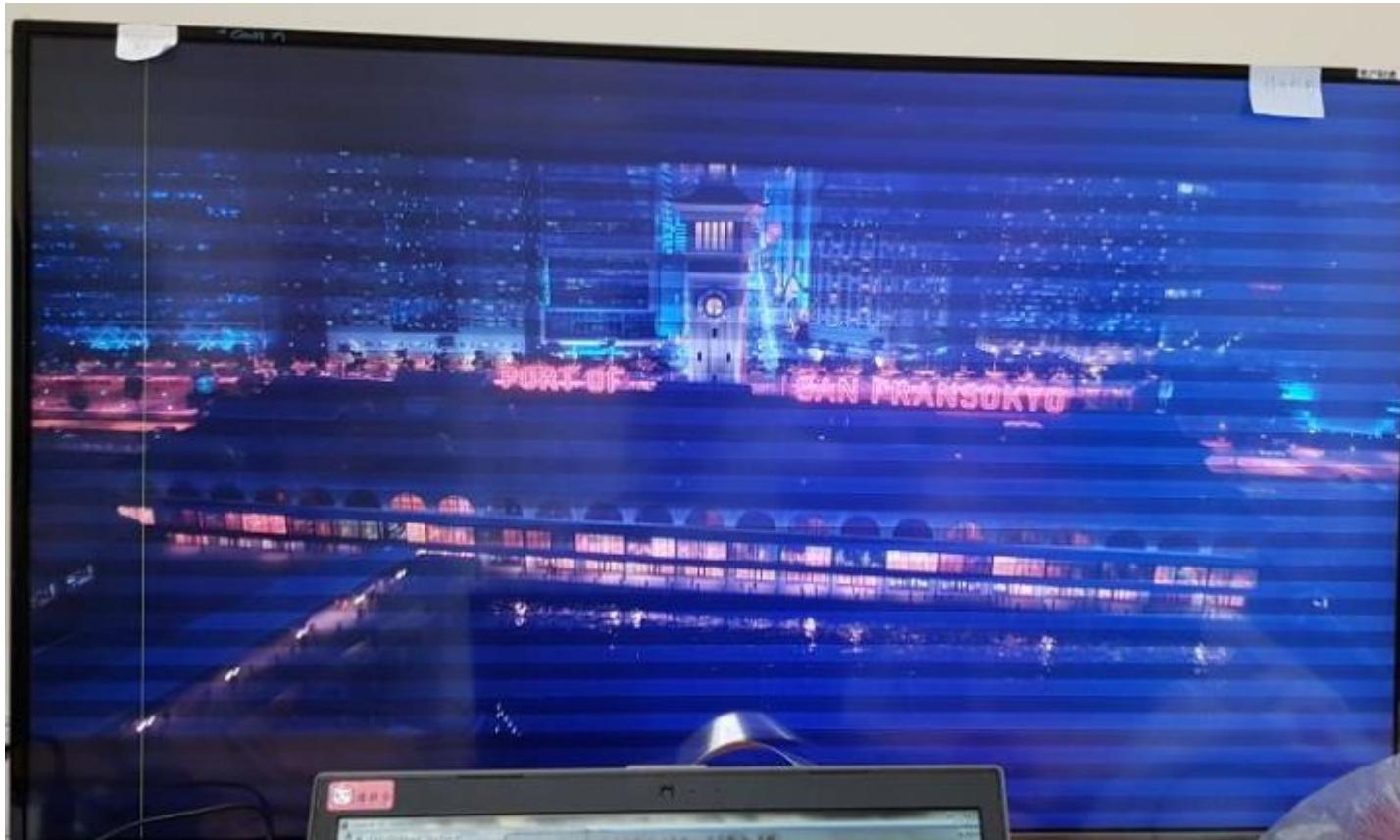
# Noise

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

# NOISE - WOSQRTK-11604



# NOISE - K5LG-1812



# NOISE – 11937



# NOISE - K5LG-1820

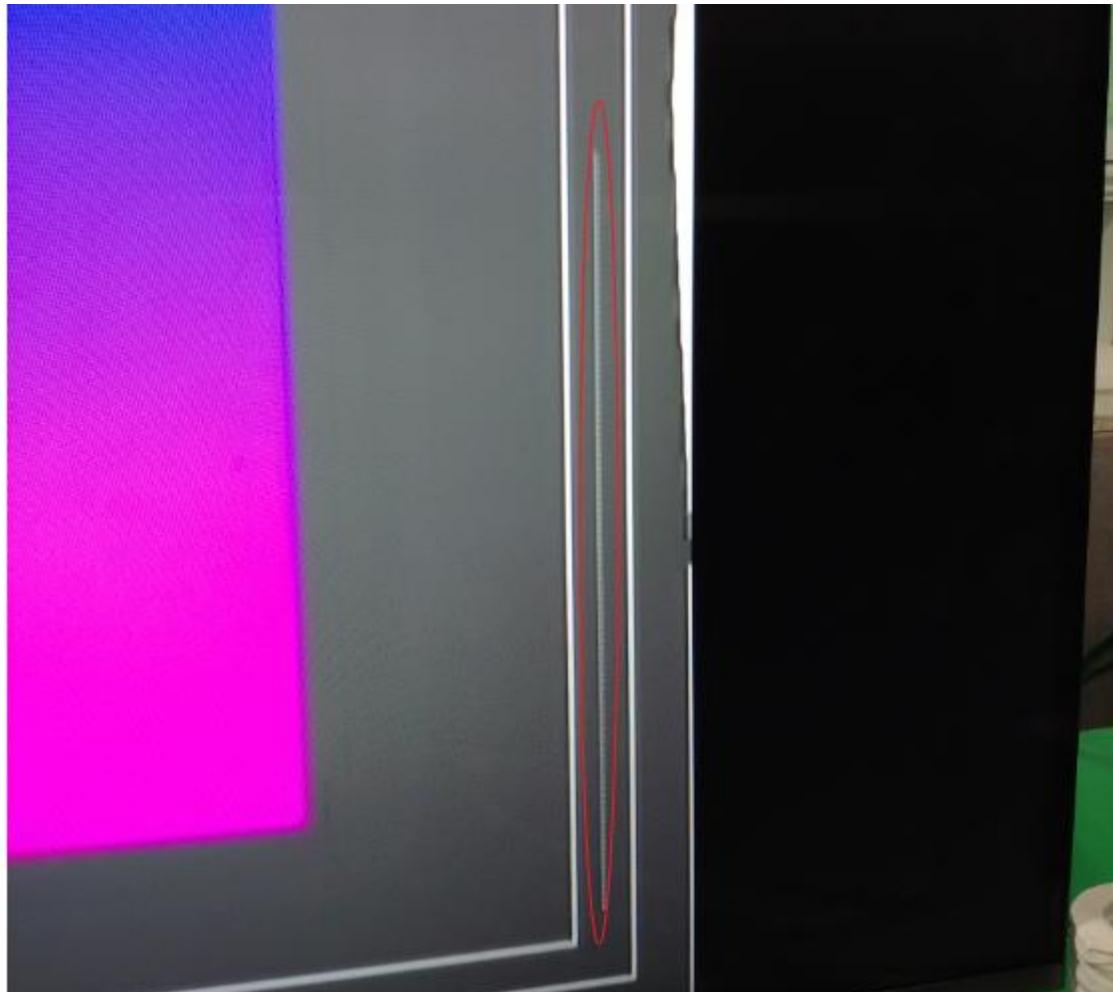


# NOISE - WOSQRTK-12283



# Noise - KTASWKBS-9610

- MC error



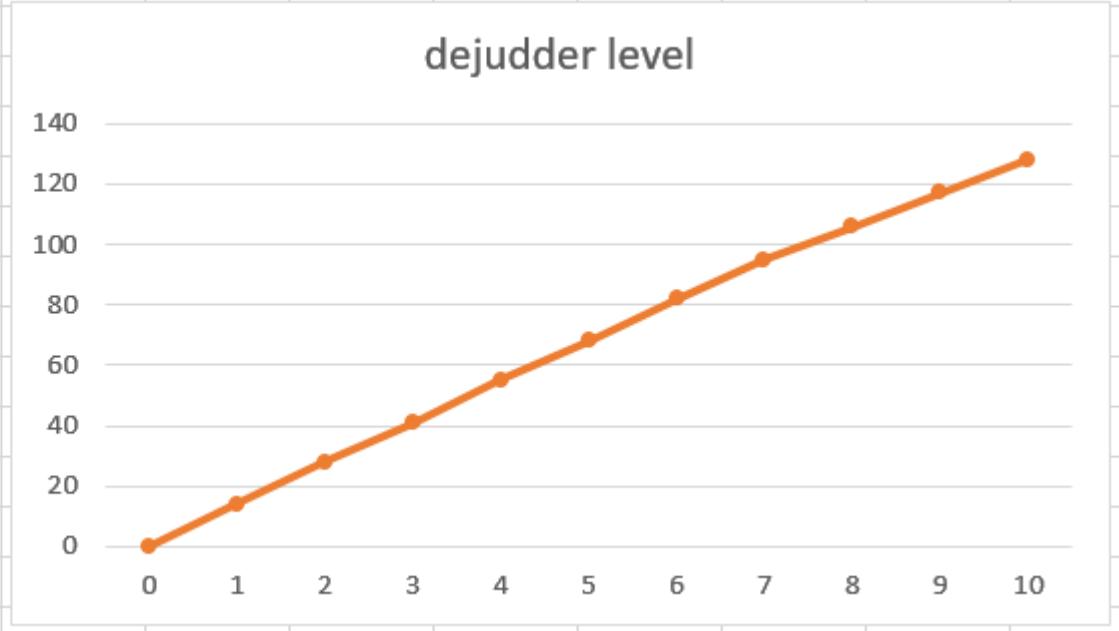
# Some Information

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

# Some information

- De-judder OSD level

| OSD level | dejudder_level (0~128) |
|-----------|------------------------|
| 0         | 0                      |
| 1         | 14                     |
| 2         | 28                     |
| 3         | 41                     |
| 4         | 55                     |
| 5         | 68                     |
| 6         | 82                     |
| 7         | 95                     |
| 8         | 106                    |
| 9         | 117                    |
| 10        | 128                    |



# 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               |          |          |               | CP                   |          |          |               |
|----------------------|----------|----------|---------------|----------------------|----------|----------|---------------|
|                      | ME clock | MC clock | blending mode |                      | ME clock | MC clock | blending mode |
| <b>non game mode</b> |          |          |               | <b>non game mode</b> |          |          |               |
| 24p                  | 1        | 1        | blending      | 24p                  | 1        | 1        | blending      |
| 25p                  | 1        | 1        | blending      | 25p                  | 1        | 1        | blending      |
| 30p                  | 1        | 1        | blending      | 30p                  | 1        | 1        | blending      |
| 1080 50i/50p         | 1        | 1        | blending      | 1080 50i/50p         | 1        | 1        | blending      |
| 1080 60i/60p         | 1        | 1        | blending      | 1080 60i/60p         | 1        | 1        | blending      |
| 2160 50i/50p         | 0        | 1        | iz            | 2160 50i/50p         | 0        | 0        | iz            |
| 2160 60i/60p         | 0        | 1        | iz            | 2160 60i/60p         | 0        | 0        | iz            |
| <b>game mode</b>     |          |          |               | <b>game mode</b>     |          |          |               |
| 24p                  | 1        | 1        | iz            | 24p                  | 1        | 1        | iz            |
| 25p                  | 1        | 1        | iz            | 25p                  | 1        | 1        | iz            |
| 30p                  | 1        | 1        | iz            | 30p                  | 1        | 1        | iz            |
| 1080 50i/50p         | 1        | 1        | iz            | 1080 50i/50p         | 1        | 1        | iz            |
| 1080 60i/60p         | 1        | 1        | iz            | 1080 60i/60p         | 1        | 1        | iz            |
| 2160 50i/50p         | 0        | 1        | iz            | 2160 50i/50p         | 0        | 0        | iz            |
| 2160 60i/60p         | 0        | 1        | iz            | 2160 60i/60p         | 0        | 0        | iz            |
| <b>PC mode</b>       |          |          |               | <b>VR360</b>         |          |          |               |
| 24p                  | 1        | 1        | iz            | 24p                  | 0        | 1        | pz            |
| 25p                  | 1        | 1        | iz            | 25p                  | 0        | 1        | pz            |
| 30p                  | 1        | 1        | iz            | 30p                  | 0        | 1        | pz            |
| 1080 50i/50p         | 1        | 1        | iz            | 1080 50i/50p         | 0        | 1        | pz            |
| 1080 60i/60p         | 1        | 1        | iz            | 1080 60i/60p         | 0        | 1        | pz            |
| 2160 50i/50p         | 0        | 1        | iz            | 2160 50i/50p         | 0        | 0        | pz            |
| 2160 60i/60p         | 0        | 1        | iz            | 2160 60i/60p         | 0        | 0        | pz            |

# Some information

- MEMC – delay time

| 60HZ panel |          |       |            | Game mode |          |       |             | Normal mode |          |       |             |
|------------|----------|-------|------------|-----------|----------|-------|-------------|-------------|----------|-------|-------------|
|            |          | MEMC  |            |           |          | MEMC  |             |             |          | MEMC  |             |
| Input      | V-Timing | Frame | Time (ms)  | Input     | V-Timing | Frame | Time (ms)   | Input       | V-Timing | Frame | Time (ms)   |
| HDMI       | 60p      | 0     | 0          | HDMI      | 60p      | 4     | 66.6666667  | Component   | 60p      | 4     | 66.6666667  |
|            | 60i      | 0     | 0          |           | 60i      | 4     | 66.6666667  |             | 50p      | 4     | 80          |
|            | 50p      | 0     | 0          |           | 50i      | 4     | 80          |             | 50i      | 4     | 80          |
|            | 50i      | 0     | 0          |           | 30p      | 4.5   | 150         |             | 30p      | 4.5   | 150         |
|            | 30p      | 2.5   | 83.3333333 |           | 25p      | 4.5   | 180         |             | 25p      | 4.5   | 180         |
|            | 25p      | 2.5   | 100        |           | 24p      | 3.8   | 158.3333333 |             | 24p      | 3.8   | 158.3333333 |
|            | 24p      | 2.8   | 116.666667 |           | 60p      | 4     | 66.6666667  |             | 60i      | 4     | 66.6666667  |
| Component  | 60p      | 0     | 0          |           | 50p      | 4     | 80          |             | 50i      | 4     | 80          |
|            | 60i      | 0     | 0          |           | 30p      | 4.5   | 150         |             | 30p      | 4.5   | 150         |
|            | 50p      | 0     | 0          |           | 25p      | 4.5   | 180         |             | 25p      | 4.5   | 180         |
|            | 50i      | 0     | 0          |           | 24p      | 4.8   | 200         |             | 24p      | 4.8   | 200         |
|            | 30p      | 2.5   | 83.3333333 |           | 60p      | 4     | 66.6666667  |             | 60i      | 4     | 66.6666667  |
|            | 25p      | 2.5   | 100        |           | 50p      | 4     | 80          |             | 50i      | 4     | 80          |
|            | 24p      | 2.8   | 116.666667 |           | 30p      | 4.5   | 150         |             | 30p      | 4.5   | 150         |
| DTV        | 60p      | 0     | 0          | DTV       | 25p      | 4.5   | 180         | ATV / CVBS  | 24p      | 4.8   | 200         |
|            | 60i      | 0     | 0          |           | 24p      | 4.8   | 200         |             | 60i      | 4     | 66.6666667  |
|            | 50p      | 0     | 0          |           | 60p      | 4     | 66.6666667  |             | 50i      | 4     | 80          |
|            | 50i      | 0     | 0          |           | 60i      | 4     | 66.6666667  |             | 50p      | 4     | 80          |
|            | 30p      | 2.5   | 83.3333333 |           | 50i      | 4     | 80          |             | 50i      | 4     | 80          |
|            | 25p      | 2.5   | 100        |           | 30p      | 4.5   | 150         |             | 30p      | 4.5   | 150         |
|            | 24p      | 2.8   | 116.666667 |           | 25p      | 4.5   | 180         |             | 25p      | 4.5   | 180         |
| ATV / CVBS | 60i      | 0     | 0          |           | 24p      | 4.8   | 200         | USB         | 60i      | 4     | 66.6666667  |
|            | 50i      | 0     | 0          |           | 60p      | 4     | 66.6666667  |             | 50i      | 4     | 80          |
| USB        | 60p      | 2     | 33.3333333 |           | 60i      | 4     | 66.6666667  |             | 50p      | 4     | 80          |
|            | 60i      | 2     | 33.3333333 |           | 50p      | 4     | 80          |             | 50i      | 4     | 80          |
|            | 50p      | 2     | 40         |           | 30p      | 4.5   | 150         |             | 30p      | 4.5   | 150         |
|            | 50i      | 2     | 40         |           | 25p      | 4.5   | 180         |             | 25p      | 4.5   | 180         |
|            | 30p      | 2.5   | 83.3333333 |           | 24p      | 4.8   | 200         |             | 24p      | 4.8   | 200         |
|            | 25p      | 2.5   | 100        |           | 60p      | 4     | 66.6666667  |             | 60p      | 4     | 66.6666667  |
|            | 24p      | 2.8   | 116.666667 |           | 60i      | 4     | 66.6666667  |             | 60i      | 4     | 66.6666667  |

# Test Case

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

# Q & A