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Revision History

Revision	Date	Description
A	Oct 2015	Initial release

Note: There is no Rev. I, O, Q, S, X, or Z per Mil. standards.

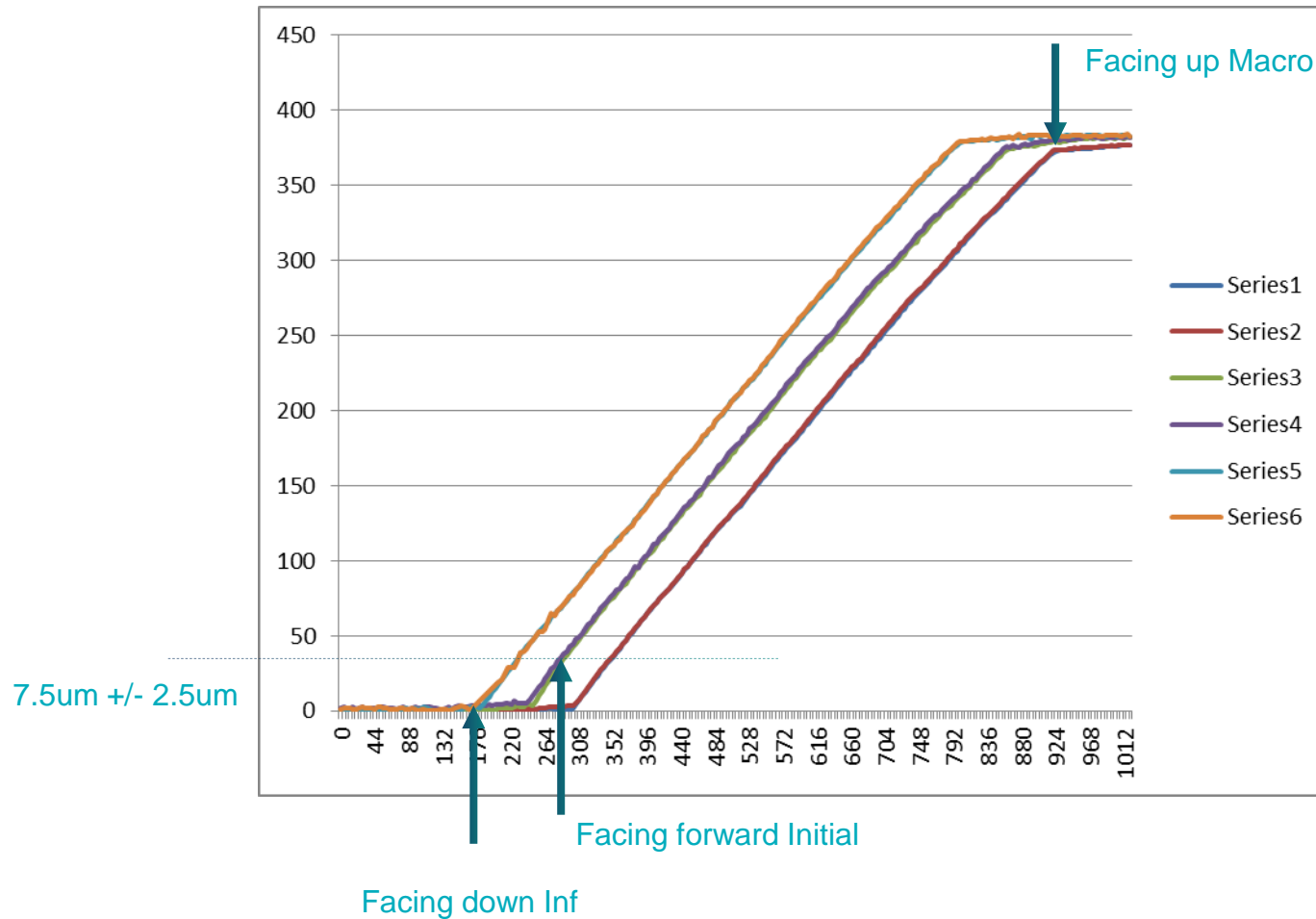
内容

- Camera
 - AF calibration data verification
 - Hysteresis and Ringing test
 - SOP for AF consistency checking
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 - FOSS介绍
 - FOSS如何使能
 - FOSS如何调试
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Camera

Typical Open loop DAC/Distance Diagram



Typical AF OTP data

	Direction	Focus distance
Facing down Infinity DAC code	Facing down	Hyperfocal/5m
Facing up Macro DAC code	Facing up	10cm/7cm
Facing forward Infinity DAC code	Facing forward	Hyperfocal/5m
Facing forward Macro DAC code	Facing forward	10cm/7cm
Initial current DAC code	Facing forward	Value to start moving the lens form infinity to 7.5um +/- 2.5um

-
- The tuning parameter need to be modified according to different type of calibration data.
 - Usually module vendor will provide “Facing forward Infinity DAC code” and “Facing forward Macro DAC code” as AF calibration data.
 - We will explain how to modify these parameters in following slice.

What we do in AF calibration code

- If the macro_dac and infinity_dac in OTP are all measured facing forward, we need to use INFINITY_MARGIN and MACRO_MARGIN to extend the lens moving range to cover facing_down_inf and facing_up_macro scenarios, that is new_step_bound in above code.
- If the macro_dac is measured facing up, and the infinity_dac is measured facing down, then INFINITY_MARGIN and MACRO_MARGIN could be set to 0, since the otp_setp_bound has already considered the facing_down_inf and facing_up_macro scenarios.
- Since the new_step_bound considered the facing_down_inf and facing_up_macro scenarios, the total_step should also be extended to calculate appropriate code_per_step.

```
1  macro_dac = ectrl->eeprom_data.afc.macro_dac;
2  infinity_dac = ectrl->eeprom_data.afc.infinity_dac;
3  otp_step_bound = macro_dac - infinity_dac;
4  /* adjust af_driver_ptr */
5  af_driver_tune->initial_code = infinity_dac - otp_step_bound * INFINITY_MARGIN;
6  new_step_bound = otp_step_bound * (1 + INFINITY_MARGIN + MACRO_MARGIN);
7  af_driver_tune->region_params[0].code_per_step =
8  new_step_bound / (float)total_steps * qvalue;
```

- code_per_step is another important value we need to calibrate, it presents the vcm um/DAC sensitivity. For example, if golden module's code_per_step is 1, then 0.9 means the calibrated module has higher sensitivity than golden, and 1.1 means the calibrated module has lower sensitivity than golden.
- You could see that the new step table is calculated based on the code_per_step

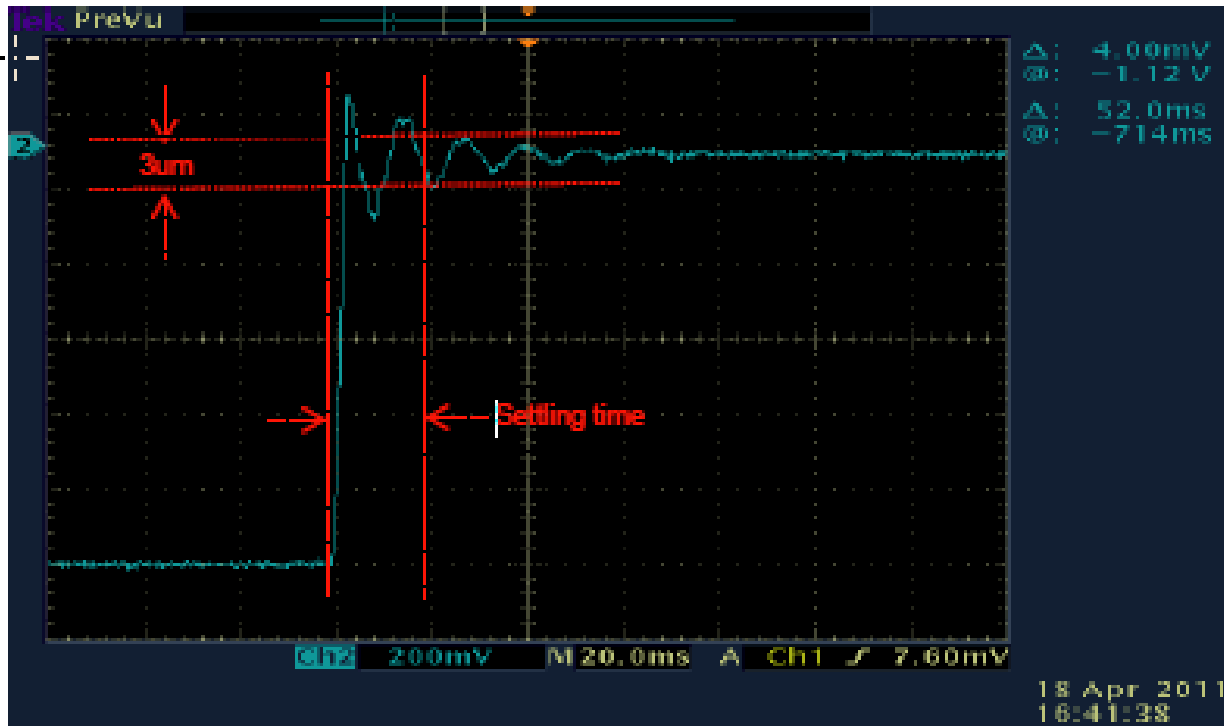
```
16 for (; step_index <= step_boundary; step_index++) {
17     if ( qvalue > 1 && qvalue <= MAX_QVALUE)
18         cur_code = step_index * code_per_step / qvalue;
19     else
20         cur_code = step_index * code_per_step;
21     cur_code += set_info->af_tuning_params.initial_code;
22     if (cur_code < max_code_size){
23         a_ctrl->step_position_table[step_index] =
24             cur_code;
25     } else {
26         for (; step_index <
27             set_info->af_tuning_params.total_steps;
28             step_index++)
29             a_ctrl->
30                 step_position_table[
31                     step_index] =
32                     max_code_size;
33     }
34     CDBG("step_position_table [%d] %d\n", step_index,
35         a_ctrl->step_position_table[step_index]);
36 }
37 }
```

-
- For example, if your OTP calibration data are:
 - Facing forward Infinity, focus distance is 5M
 - Facing forward Macro, focus distance is 7cm
 - To cover facing_down_inf and facing_up_macro scenarios
 - set INFINITY_MARGIN to 0.2
 - set MACRO_MARGIN to 0.1
 - Then, the total_step should be calculated as following
 - Using golden module
 - Turn off the AF OTP calibration
 - Set the value of step_boundary bigger enough
 - Using AF_FULL_SWEEP mode to get 5M and 7cm DAC value
 - $\text{total_step} = (5\text{M_DAC} - 7\text{cm_DAC}) * (1 + 0.2 + 0.1)$

Hysteresis and Ringing test

Ringling

- The FV value will not be reliable if the settling time of ringing is long.
- To get rid of ringing influence on FV, we need to fine tune damping or consider adding frame delay.



Method to enable AF_FULL_SWEEP

- Two ways to switch to full sweep algorithm
 - Change AF algorithm header

Variable name	Value	Comment
af_process_type	AF_FULL_SWEEP	
num_steps_between_stat_point	4 (around 2-3 um, so can derive from um/DAC)	In af_tuning_fullsweep_t
frame_delay_norm	2	In af_tuning_fullsweep_t

- Setprop from adb shell

```
adb root
adb wait-for-device
adb remount
adb wait-for-device
adb shell setprop debug.camera.af_fullsweep 1
```

Note: adb shell setprop debug.camera.af_fullsweep 0 is to disable full sweep

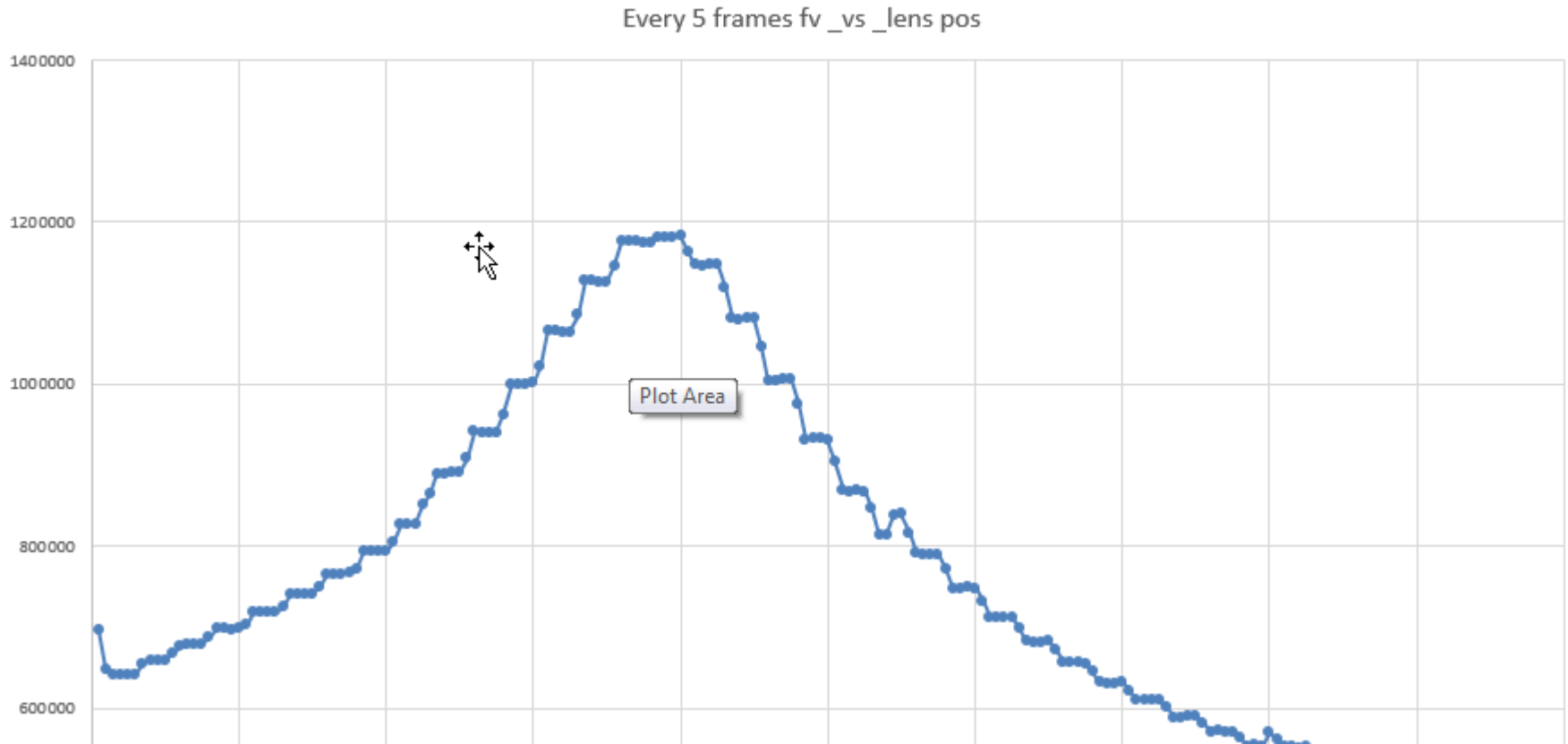
Test scene

- Get FV and corresponding lens position from AF log, and plot the data in excel table.
- Log example:
- af_process_parse_stats: fv: 23035088, fv_norm: 359769 lens_pos: 318, nfocus: 1 cur_luma: 43.000000

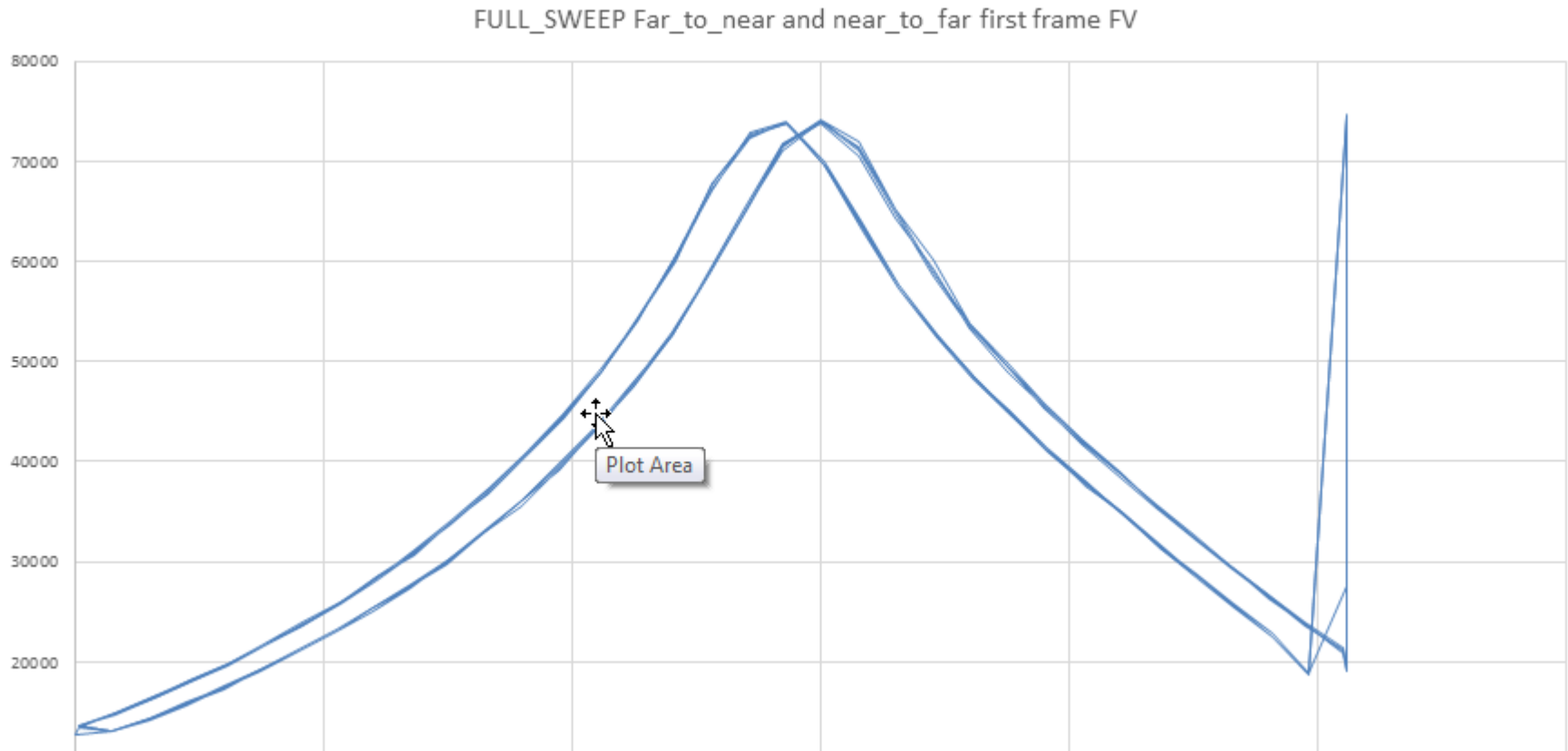
Frame rate	Lux	Exposure time	Frame delay
30fps	Above 1000 lux	1/1000s	2~5
30fps	350 lux	1/30s	2~5
15fps	100 lux	1/15s	2~5

Every 5 frames FV vs Lens position

- From this plot, we can see that the 1st FV is different with other 4 frame's FV, we need to check the ring parameters.

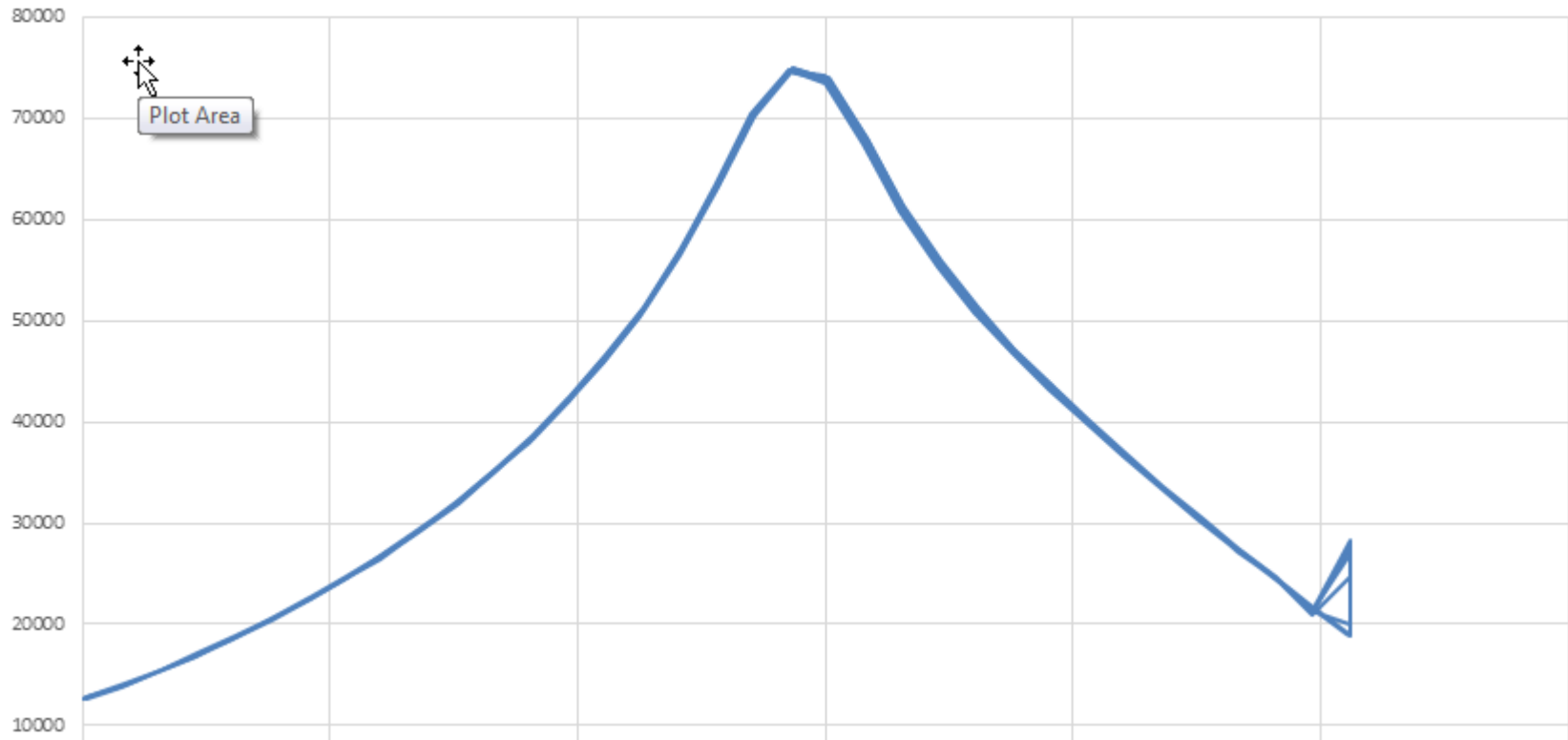


Far_to_near and near_to_far, FV vs Lens position



From this plot, we can see that the far_to_near and near_to_far FV values are mismatch, that means the lens may have Hysteresis problem

Far_to_near and near_to_far, FV vs Lens position



far_to_near and near_to_far FV values are perfect matching.

SOP for AF consistency checking

AF consistency checking

- Using tripod to take image
- Run a set of at least 30 captures of the same scene (retriggering focus every time).
- Checking the image's sharpness, and whether the final lens position are consistent.

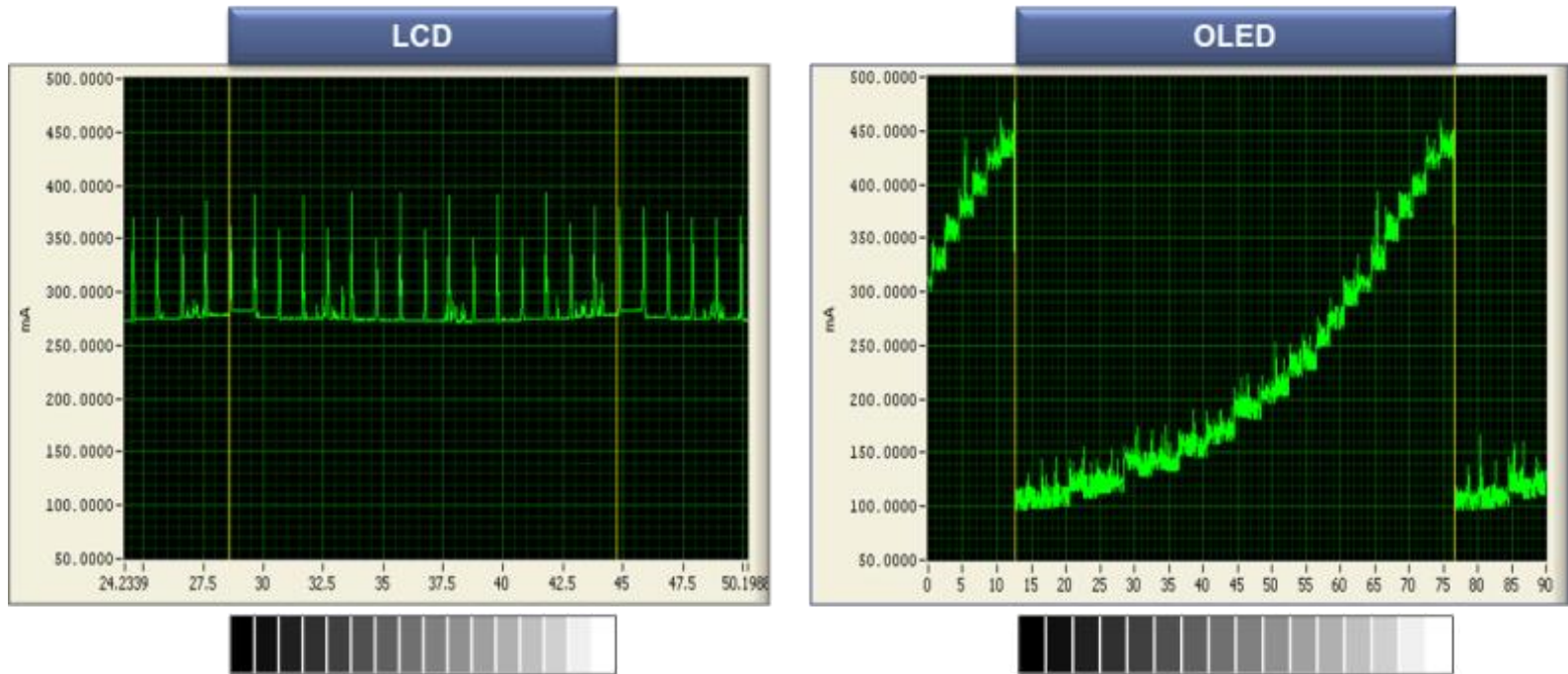
Lux	Distance
1000lux	2M
350lux	2M
20lux	2M
350lux	30cm
350lux	10cm



Display

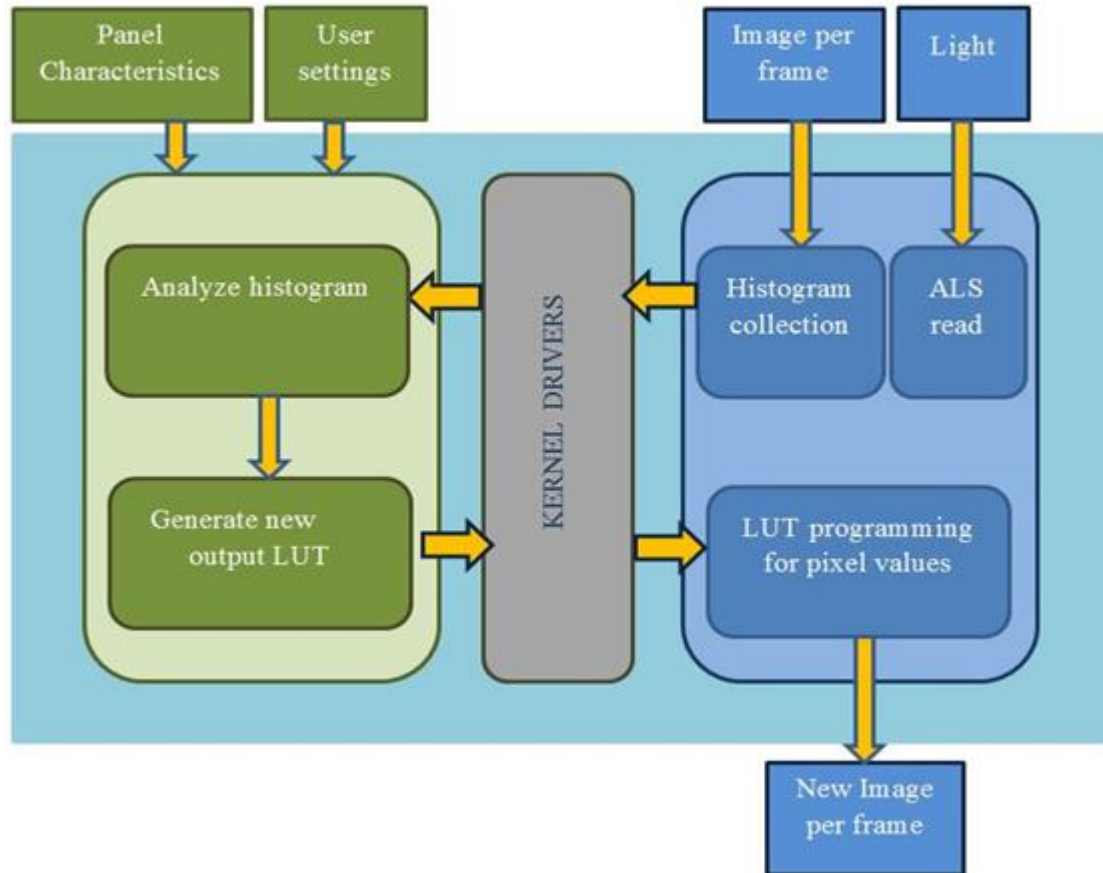
FOSS (Fidelity Optimized Signal Scaling)介绍

- 对于LCD 和 OLED 两种不同的panel，为了优化功耗：
 - CABL 适用于LCD panel
 - FOSS 适用于 OLED panel
- 如下图所示，不同类型的panel的功耗表现图：



FOSS (Fidelity Optimized Signal Scaling)介绍 – 续一

- 对于OLED panel 来说，由于没有backlight，故根据显示内容的直方图来重新查表达到降低功耗，如下图所示：



- 请参见：80-NV610-94_A_FOSS_Feature_Description.pdf

FOSS (Fidelity Optimized Signal Scaling) 如何使能

- 对于FOSS功能：
 - 不需要license
 - 在8952 , 8976 , 8996平台上支持。
- 关于如何使能FOSS , 如下：
 - 在build.prop 中 , 设置ro.qualcomm.cabl=2
 - 在build.prop 中 , 设置ro.qualcomm.display.paneltype=1 (for OLED)
- 注意 : ro.qualcomm.display.paneltype=0 is reserved for LCD)

FOSS (Fidelity Optimized Signal Scaling)如何调试

- FOSS debugging
 - 在build.prop 中，添加debug.cabl.logs=1 去查看 FOSS是否使能
 - 在logs中，当FOSS 使能后，会看到关键字 “FOSS feature selected”
 - Backlight值不会改变
 - 当FOSS 处于active时，logs中会显示 “Active Aba features => FOSS”
- 与CABL类似，如果想得到更多信息，比如Histogram，LUT，请设置：
- debug.cabl.logs=2 in build.prop

如何设置模拟的Panel

- 对于某些场景，需要在不接panel的情况下进行测试，故要保证系统能够正常启动。
- 对于video mode panel，由于没有TE 信号，即使不接panel，系统可以正常启动。
- 但对于command mode panel，只有收到 Panel TE信号后，系统才能正常启动。如果不接panel，系统无法正常启动。
- 对于上述，增加了模拟的Software TE，即在没有接panel时，系统可以正常启动。
- 关于此功能的具体实现，可以提case到高通。

如何设置模拟的Panel – 续一

- 对于simulate panel，这里有三种模式，如下：
 - sim - for video mode panel - simulator mode – all host reads are disabled.
 - sim-swte - for command mode panel – simulator mode – all host reads are disabled and no requirement for hardware TE (Terminator card)
 - sim-hwte - for command mode panel – simulator mode – all host reads are disabled except that it still expects TE from the hardware
- 可以使用下面的命令来选择不同的模式
 - fastboot -c "" boot boot.img // 通过command 来传递 对应的模式

如何设置模拟的Panel – 续二

- 举例如下:
- 1 : 首先获取kernel正常启动的log
 - Kernel command line: console=ttyHSL0,115200,n8
androidboot.console=ttyHSL0 androidboot.hardware=qcom user_debug=31
msm_rtb.filter=0x3F ehci-hcd.park=3 androidboot.bootdevice=7824900.sdhci
androidboot.emmc=true androidboot.serialno=14138f45
androidboot.authorized_kernel=true androidboot.baseband=msm
mdss_mdp.panel=1:dsi:0:qcom,mdss_dsi_jdi_1080p_video
- 2 : 然后使用下面命令来配置不同的模式
 - **fastboot -c "console=ttyHSL0,115200,n8 androidboot.console=ttyHSL0
androidboot.hardware=qcom user_debug=31 msm_rtb.filter=0x3F ehci-
hcd.park=3 androidboot.bootdevice=7824900.sdhci androidboot.emmc=true
androidboot.serialno=14138f45 androidboot.authorized_kernel=true
androidboot.baseband=msm mdss_mdp.panel=<POSSIBLE VALUES>" boot
boot.img**

如何设置模拟的Panel – 续三

- 3 : 通过替换 **POSSIBLE VALUES** 来选择不同模式 , 如下

Simulator single DSI video mode panel

- 1:dsi:0:qcom,mdss_dsi_sim_video:1:none#override:sim

Simulator single DSI cmd mode panel with SW TE

- 1:dsi:0:qcom,mdss_dsi_sim_cmd:1:none#override:sim-swte

Simulator dual DSI video mode panel

- 1:dsi:0:qcom,mdss_dsi_sim_video_0:1:qcom,mdss_dsi_sim_video_1#override:sim

Simulator dual DSI cmd mode panel with SW TE

- 1:dsi:0:qcom,mdss_dsi_sim_cmd_0:1:qcom,mdss_dsi_sim_cmd_1#override:sim-swte

Questions?

<https://support.cdmatech.com>

