CONFIDENTIAL B

Phase Difference Pixels Correction

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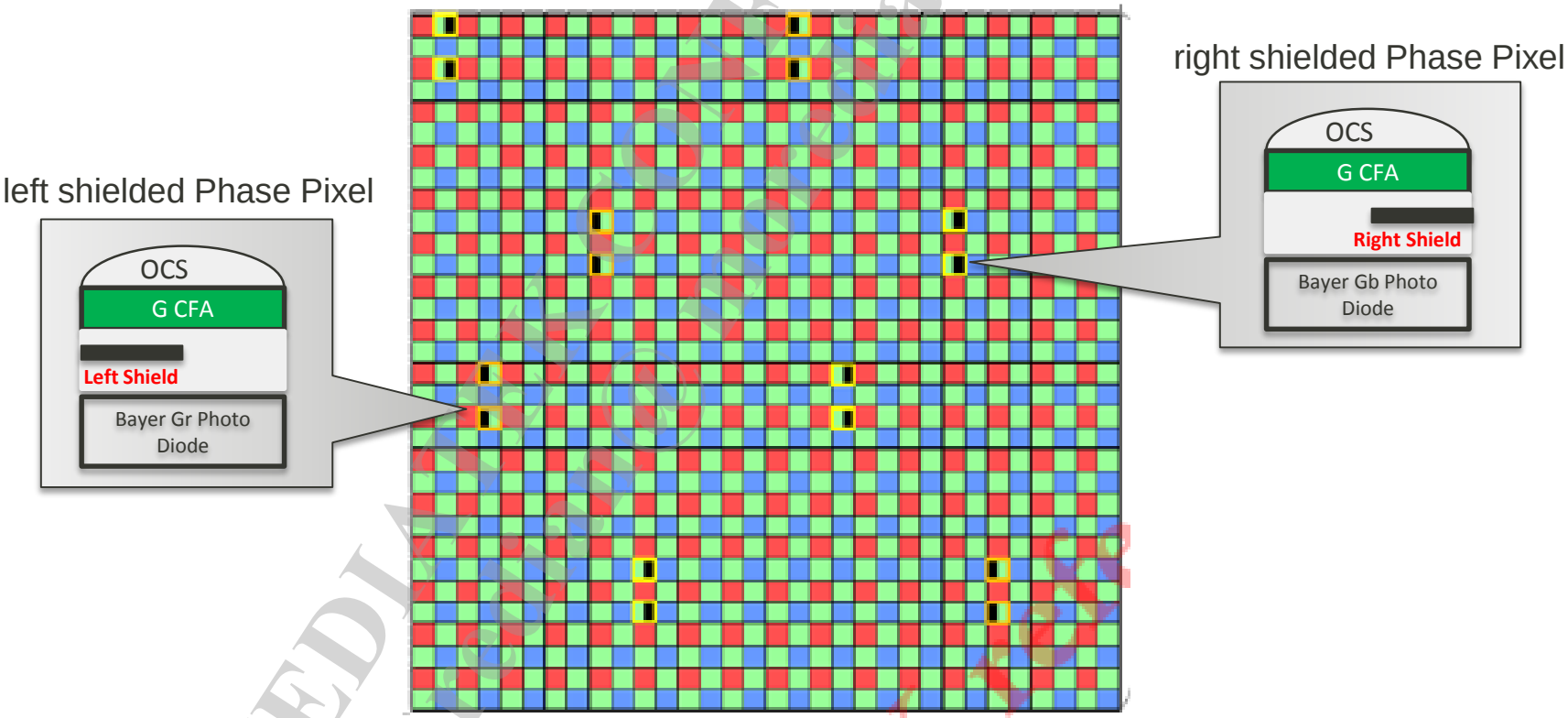
WHAT IS PDC

PDAF Requirement

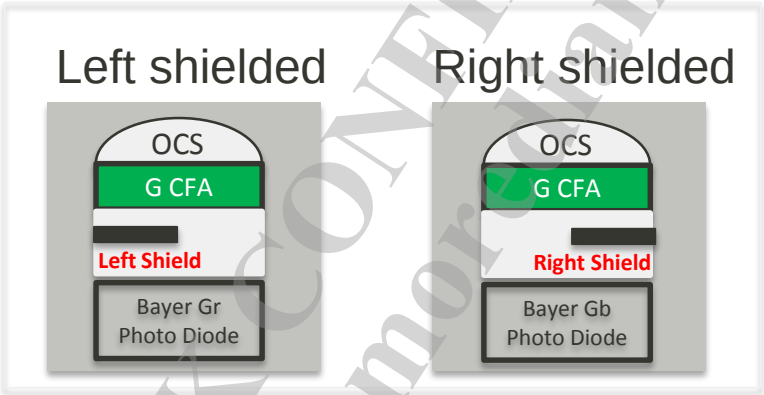
- PDAF capable sensor is equipped with half metal-shielded pixels called "shielded pixel" which is embedded uniformly within regular pixels at a certain ratio.



(Example: 1x1 PD Sensor, PD Pixels on both Gr and Gb)

PD Pixel Definition

- A Phase information from these left and right shields enables Phase Detection Auto Focus (PDAF) for high-speed auto focus.



(1x1 PD Pixel)

- PD (Phase Difference) based on PDAF image data can be output as a packet different from normal image data during the frame blanking period(e.g. IMX298), or PD Pixels embedded in normal image.

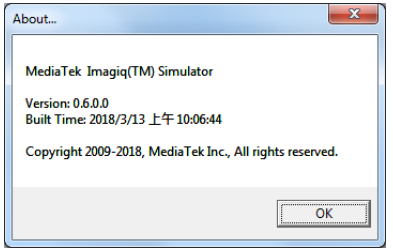
METHOD TO DO PDC

- FUNCTIONAL STEPS
- VERIFY PD PIXEL POSITION

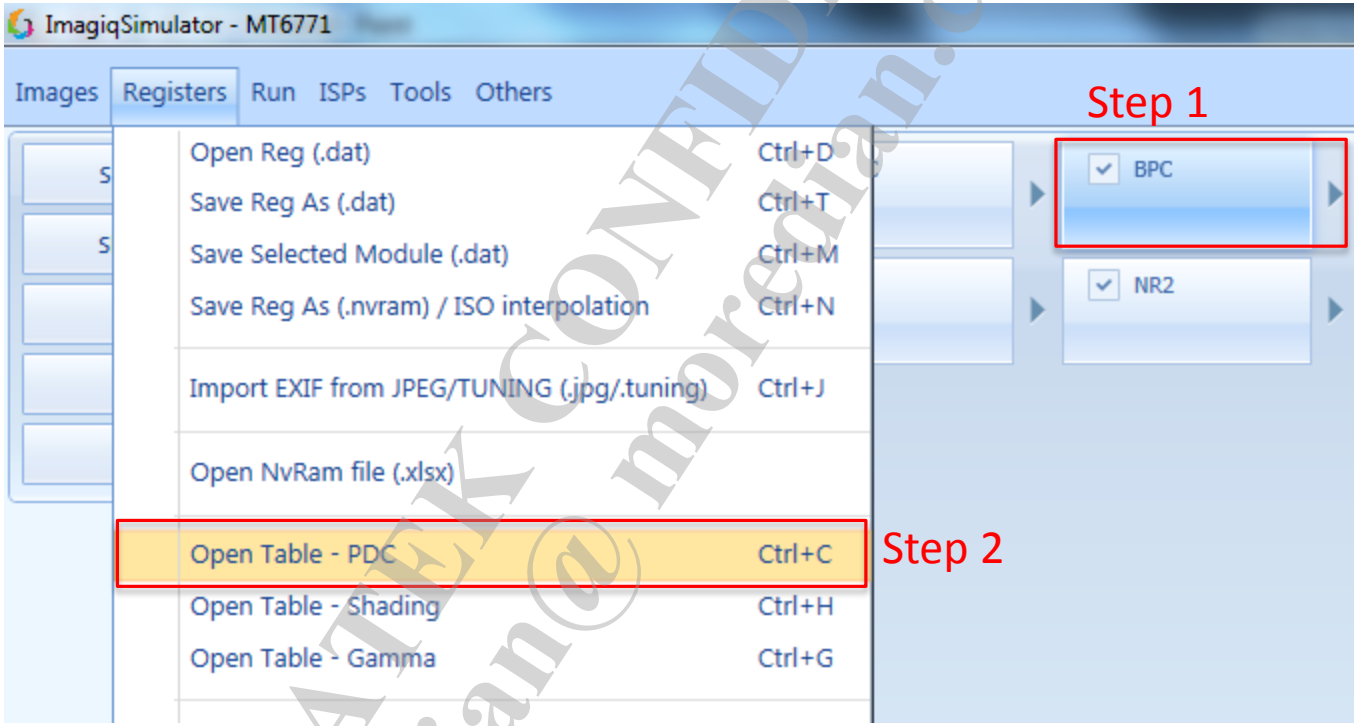
Method to do PDC

- ISP PDC (Phase Difference pixel Correction)
  - Advanced Static Bad Pixel Correction
  - Phase Difference Pixels corrected by MT6757P
- Sensor SPC (Shield Pixel Correction)
  - A shielded pixel requires to have some gain such that the signal level of each shield pixel will be equivalent to a normal pixel.
  - This SPC gain map values should be written by the module vendor within the module calibration process.
  - e.g. IMX298

ISP PDC Functional Steps



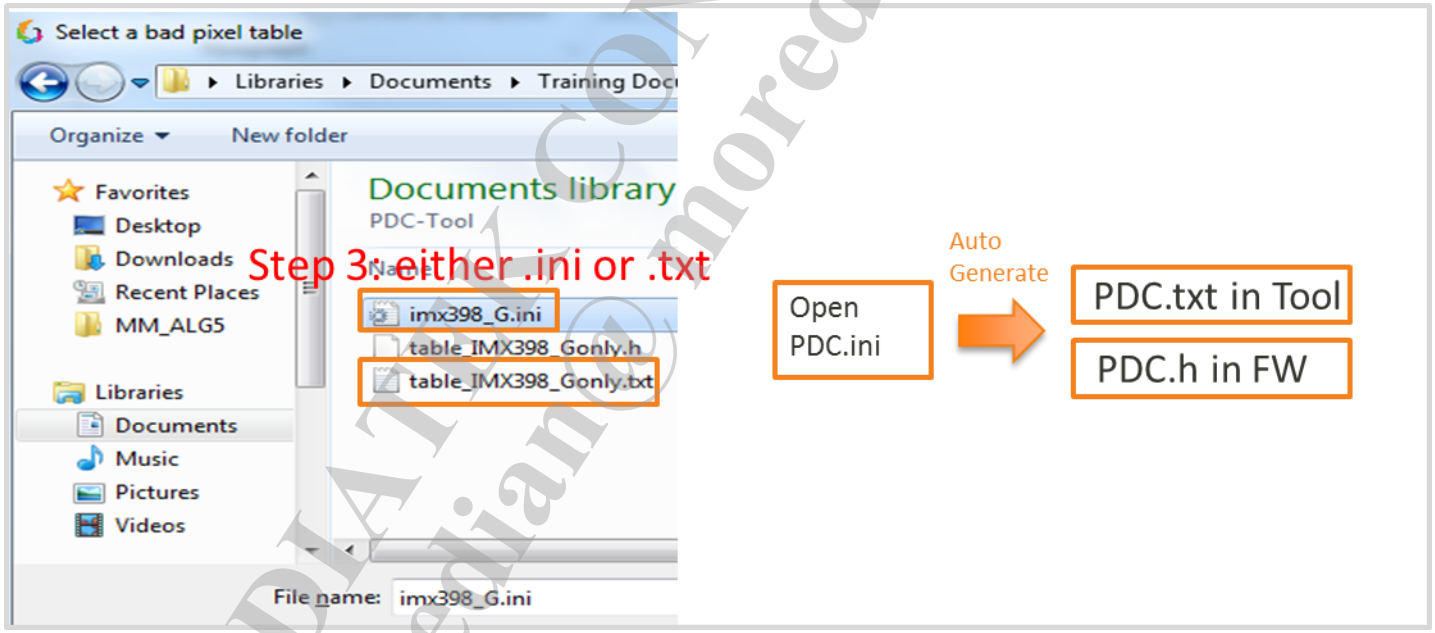
- Step 1: Active BPC module
- Step 2: Open PDC description file in PDC.ini or PDC.txt file type.



Note: A PD Pixel Description File in .ini file type should request to sensor vendor, see also: page 14.

ISP PDC Functional Steps

- Step 3:
  - Opening PDC.ini file is required at the first time, tool would generate a PDC.txt file which could comply with ImadiqSimulator.
  - Next you could open .txt been stored into the same folder as PDC.ini once PDC Table in .txt file type is generated automatically.



ISP PDC Functional Steps

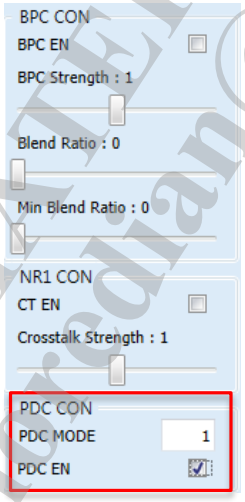
- (optional) Step 4: TO ACTIVE FW, MUST Copy PDC.h content to FW file

  vendor\mediatek\proprietary\custom\mtxxxx\hal\imgsensor\verx\xxxxxx_mipi_raw**camera_bpci_tbl**_xxxxxxmipiraw.h

```
const unsigned int bpci_xsize=9983;
const unsigned int bpci_ysize=0;
const unsigned int pdo_xsize=2239;
const unsigned int pdo_ysize=415;
const unsigned char bpci_array[]={
0x49,0xC0,0x5A,0x00,0x7A,0x11,0x07,0x00,0x01,0x00,0x07,0x40,0x01,0x00,0x07,0x40,
0x01,0x00,0x07,0x40,0x01,0x00,0x07,0x40,0x51,0xC0,0x5E,0x00,0x7A,0x11,0x07,0x00,
0x01,0x00,0x07,0x40,0x01,0x00,0x07,0x40,0x01,0x00,0x07,0x40,0x01,0x00,0x07,0x40,
0x59,0xC0,0x5A,0x00,0x7A,0x11,0x07,0x00,0x01,0x00,0x07,0x40,0x01,0x00,0x07,0x40,
0x01,0x00,0x07,0x40,0x01,0x00,0x07,0x40,0x61,0xC0,0x5E,0x00,0x7A,0x11,0x07,0x00,
0x01,0x00,0x07,0x40,0x01,0x00,0x07,0x40,0x01,0x00,0x07,0x40,0x01,0x00,0x07,0x40,
0x69,0xC0,0x5A,0x00,0x7A,0x11,0x07,0x00,0x01,0x00,0x07,0x40,0x01,0x00,0x07,0x40,
```

(File content Example)

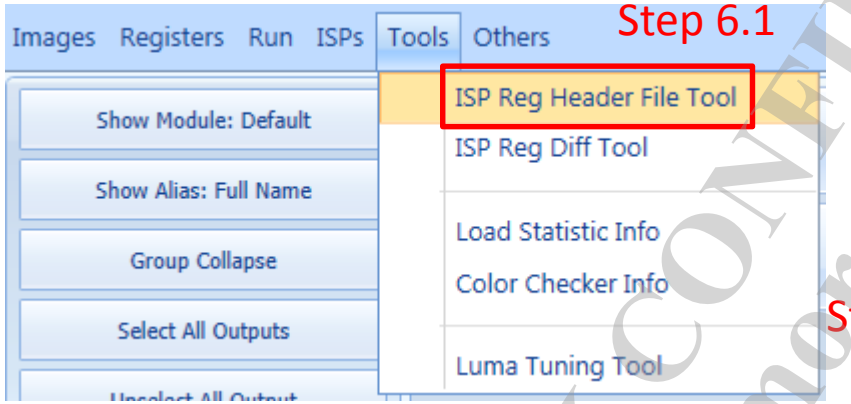
- Step 5: Atviate PDC Enable and select Mode as requirement by following below info.

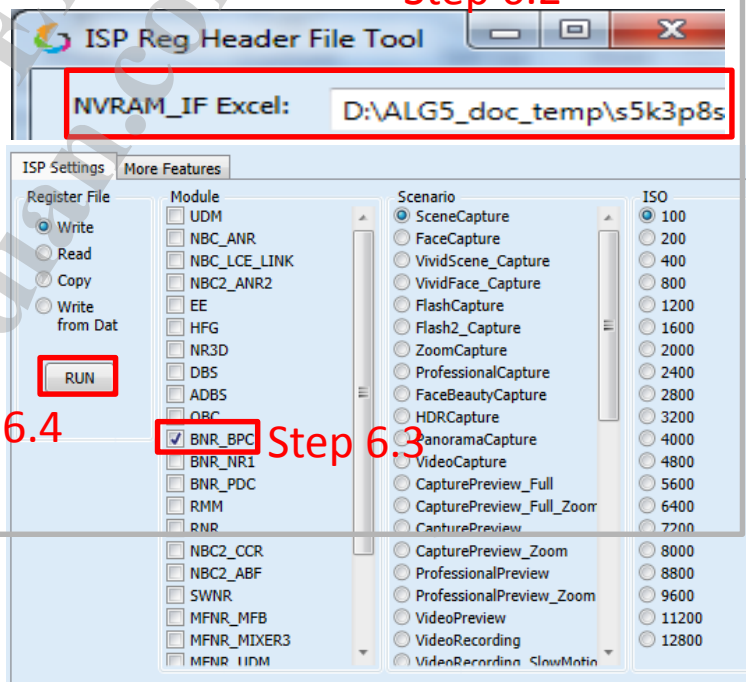


Step 5:
- PDC Enable
- Mode 1

ISP PDC Functional Steps

- Step 6: Update ISP PDC Params.





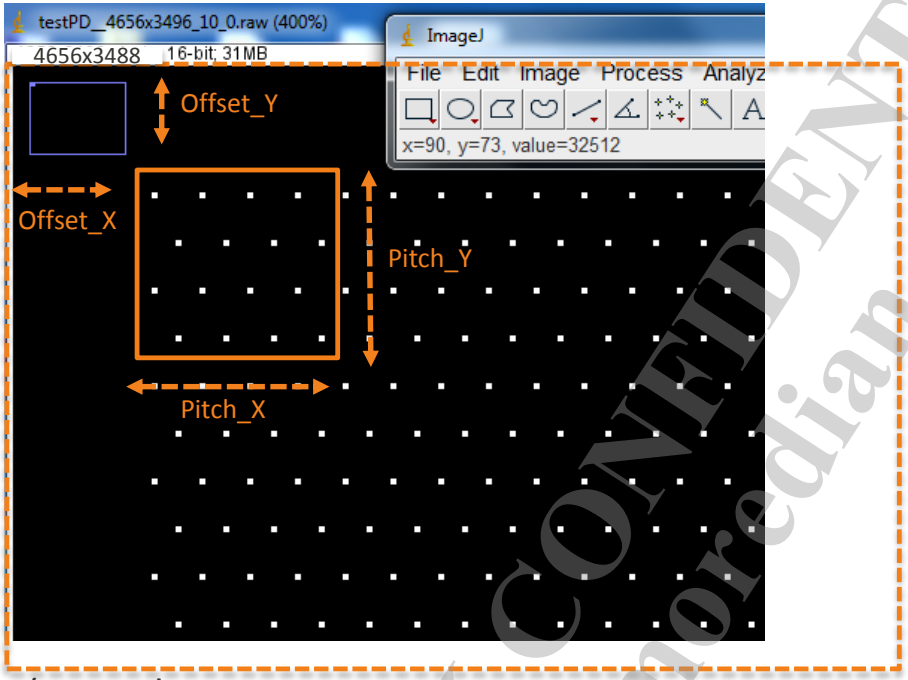
- Ensure it's correct in Reg Header File

```
#define BNR_PDC_0420 /*profile = Capture, sensor mode = Capture, ISO_0;profile = Capture_Capture_ZOOM1, ISO_0;profile =
        .con     ={.bits={.PDC_EN=1, .rsv_1=0, .PDC_CT=0, .rsv_5=0, .PDC_MODE=1, .rsv_10=0, .PDC_OUT=0, .rsv_17=0}},\
```

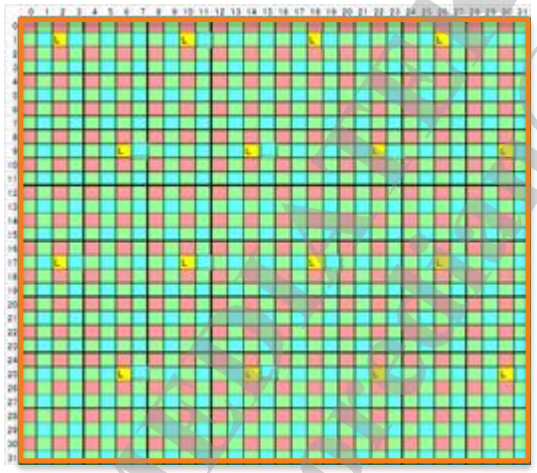
Step 6.5

(Param content Example)

Verify PD Pixel Position



(Example: PD Pixels been specified with white in RAW image)



(Example: PD Pixels on both Gb and B channel in a Block)

```
RAW_WIDTH=4656;
RAW_HEIGHT=3488;
RAW_BITS=10;
RAW_BYTE_ORDER=0;
PD_OFFSET_X=88;
PD_OFFSET_Y=72;
PD_PITCH_X=32;
PD_PITCH_Y=32;
PD_DENSITY_X=8;
PD_DENSITY_Y=16;
PD_BLOCK_NUM_X=140;
PD_BLOCK_NUM_Y=104;
PD_BINNING_TYPE=0;
CALI_PARAM1=20;
CALI_PARAM2=4;
CALI_PARAM3=8;
CALI_PARAM4=8;
CALI_CAPTURE_NUM=10;

PD_POS_L=
[90 73]
[98 73]
[106 73]
[114 73]
[94 81]
[102 81]
[110 81]
[118 81]
[90 89]
[98 89]
[106 89]
[114 89]
[94 97]
[102 97]
[110 97]
[118 97];
```

Sensor PD Info

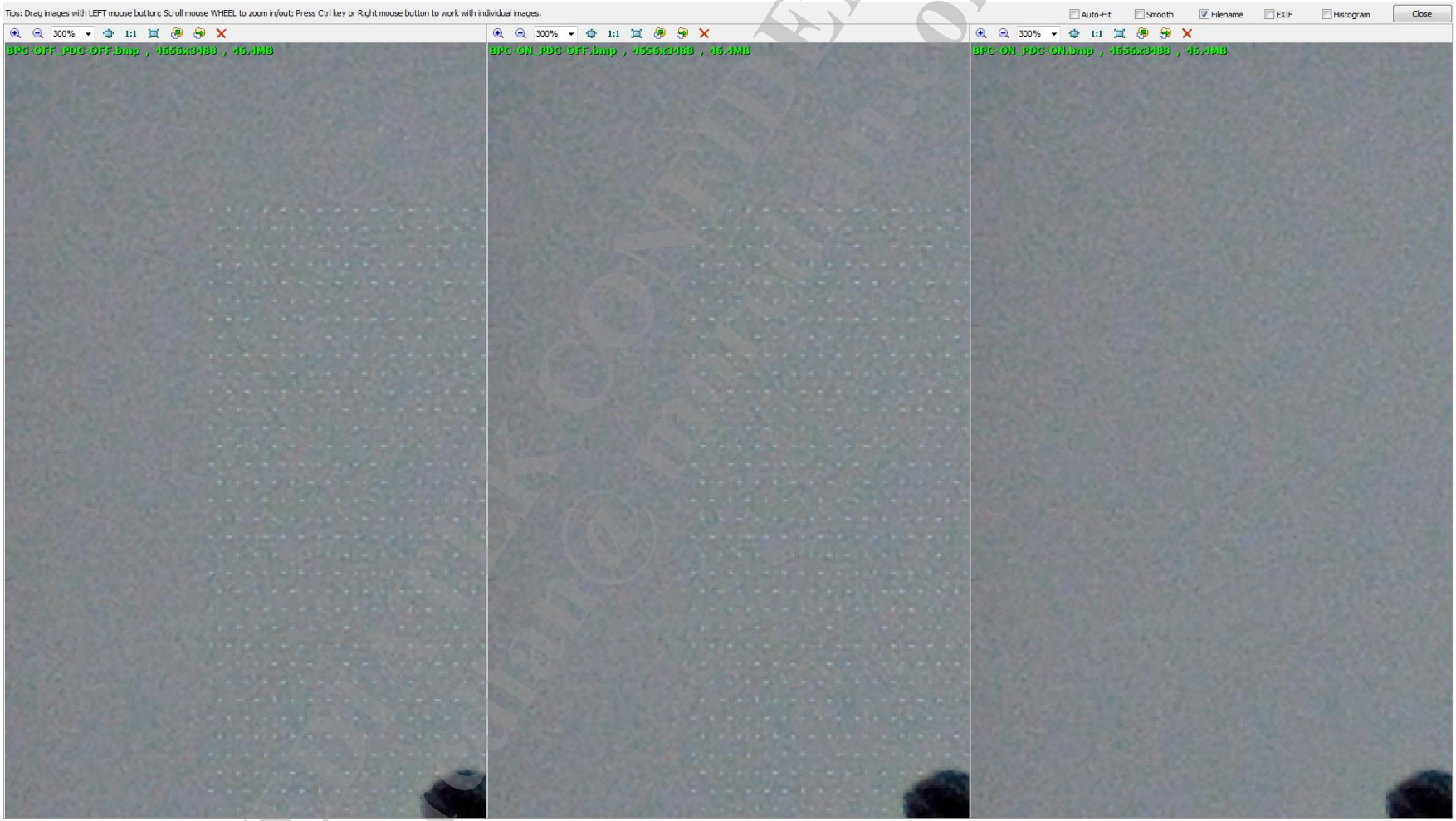
Include all PD Pixel Coordinator of the first Block

(PDC.h Example)

SAMPLE IMAGE

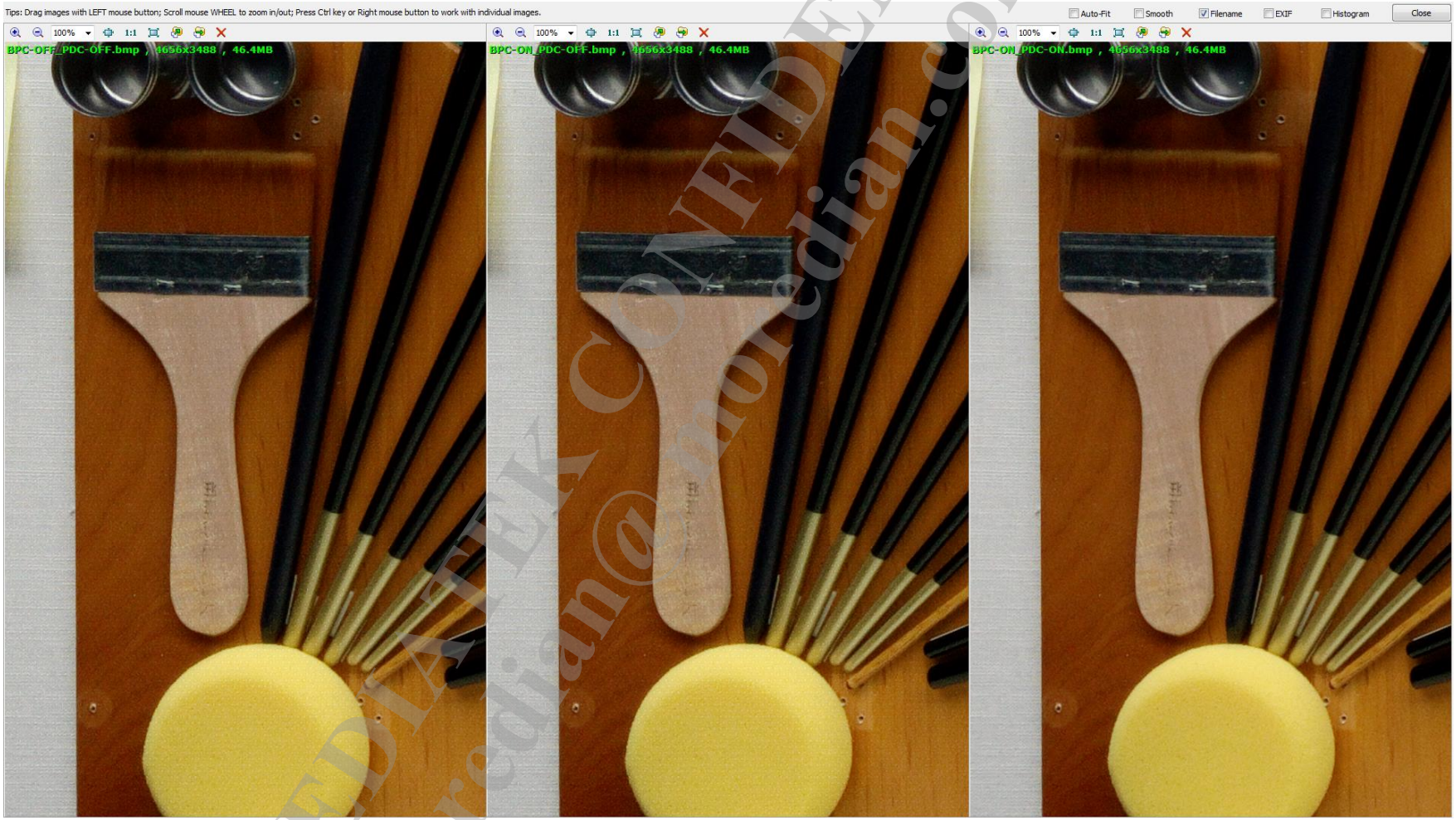
Sample Image

- W/O BPC, W/O PDC
- W/ BPC, W/O PDC
- W/ BPC, W/ PDC

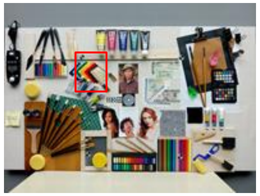


Sample Image

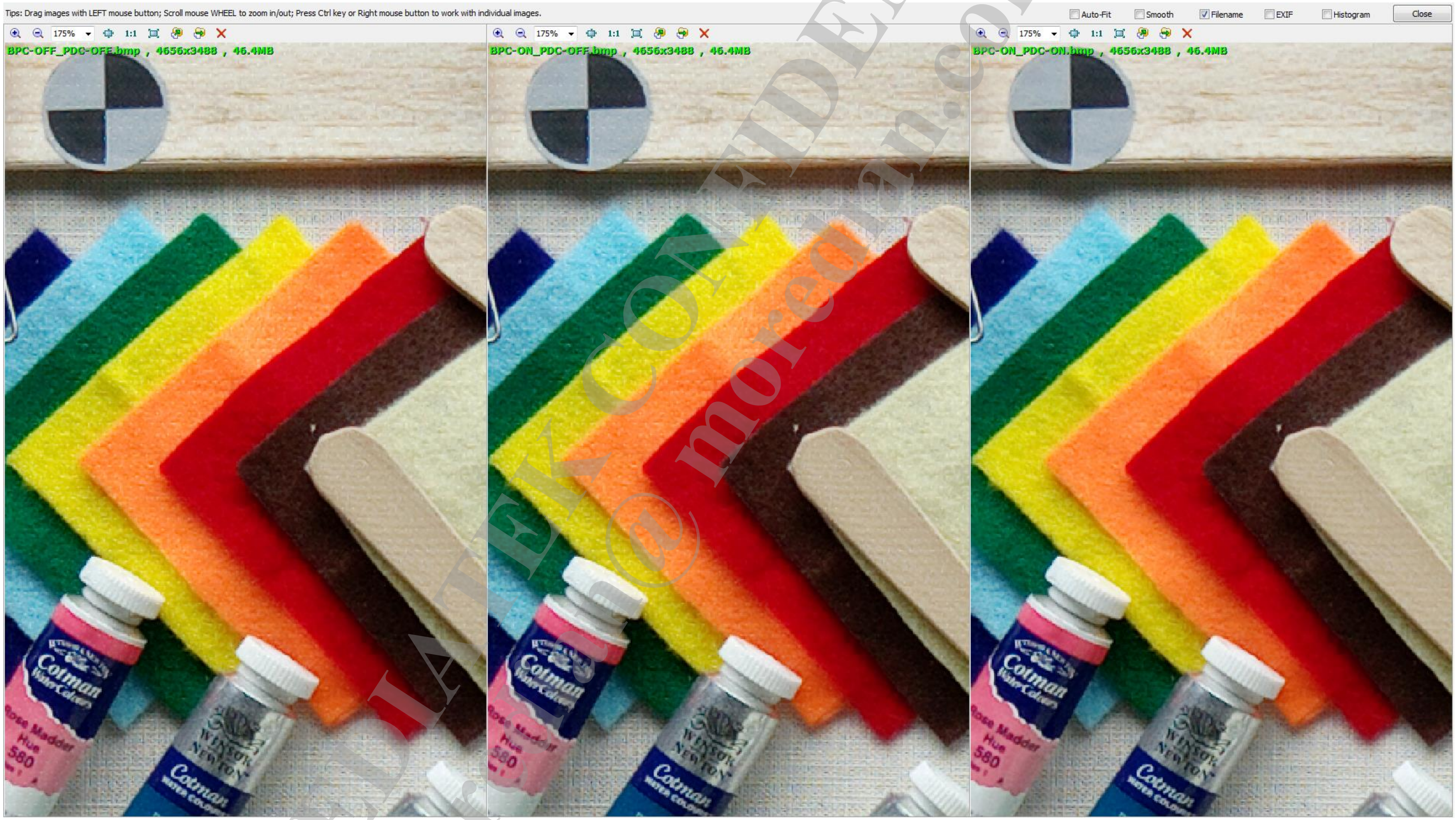
- W/O BPC, W/O PDC
- W/ BPC, W/O PDC
- W/ BPC, W/ PDC



Sample Image



- W/O BPC, W/O PDC
- W/ BPC, W/O PDC
- W/ BPC, W/ PDC



Notes

1. The PDC configuration forbids checking PDC_Enable alone without opening PDC Table.

2. Sensor BIN or ISP BIN would break phase difference information, the Sensor SPC (Shield Pixel Correction) is preferred for the BIN case than ISP PDC.

3. Scenario Tracking Table:

Notes

Scenario Tracking Table:

Tracking Scenario	Preview Crash w/PDC Enable	PDC Not Functional	PDAF Not Functional	Instruction
PDC Table is not loaded	■	■		Step 1~3
PDC Enable is not selected		■	■	Step 5
PDC header in FW is not update		■		Step 4
Improper PDC Table Description		■		Page 14
BIN is activated		■		Note 2 on page 19
ISP Param is not update		■		Step 6

everyday genius