

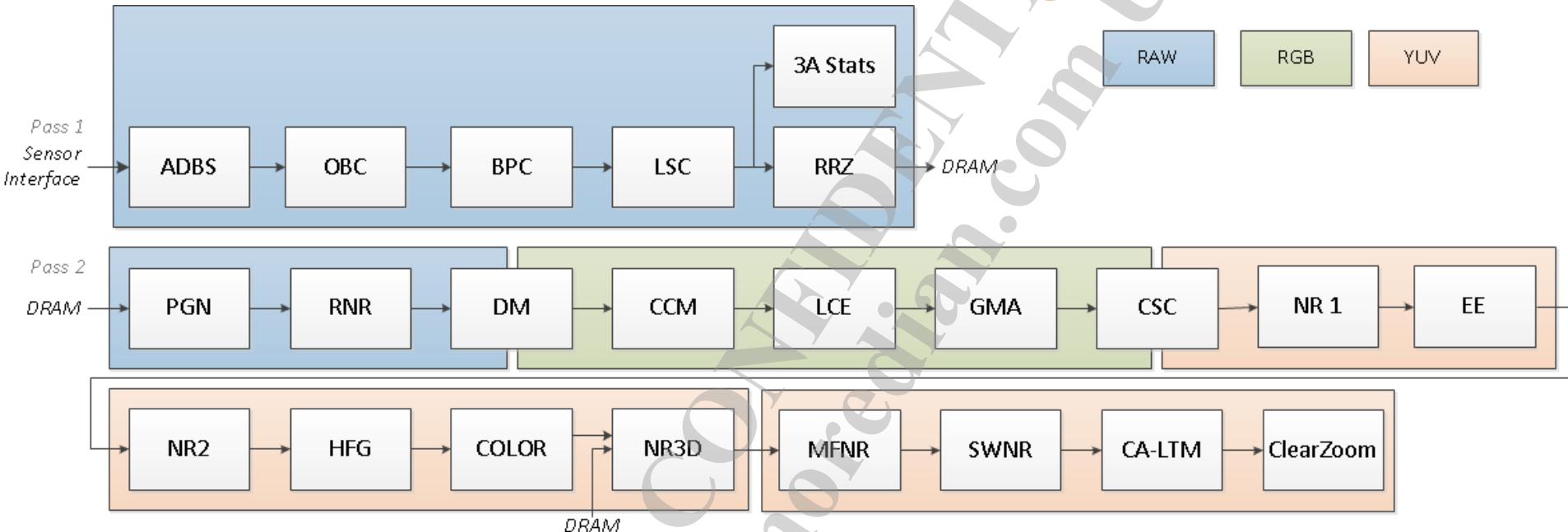


CONFIDENTIAL B

MT6771 Block Diagram



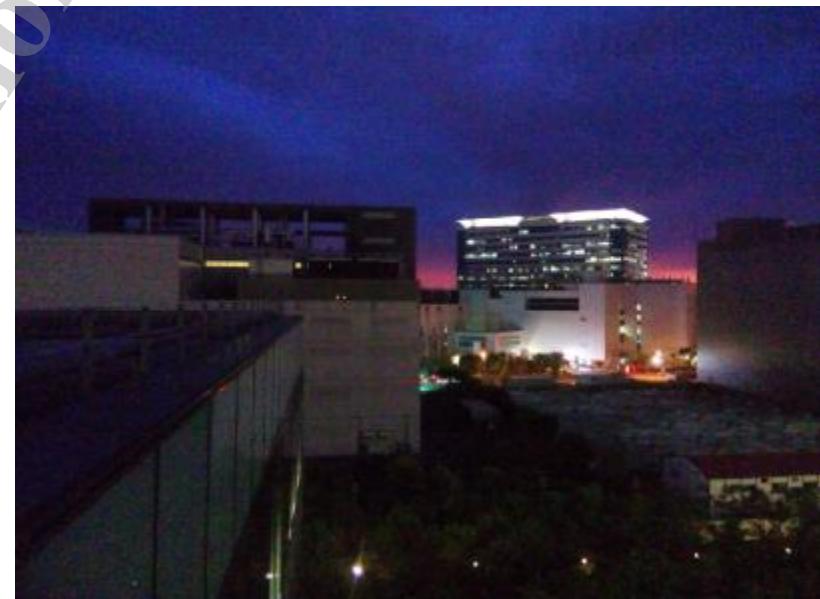
MT6771 Block Diagram



Noise		Tone		Color	
BPC	Bad Pixel Correction & G imbalance	ADBS	Advanced De-Bias	PGN	Pre-gain (WB gain)
NR 1	Noise Reduction 1	OBC	Optical Black Correction	CCM	Color Correction Matrix
NR 2	Noise Reduction 2	LSC	Lens Shading Correction	COLOR	Color Engine
NR2 - ABF	Anti-Blooming Filter	LCE	Local Contrast Enhancement	Morphing	
NR2 - CCR	Chroma Coring	GMA	Gamma Correction	RRZ	Raw Resizer
RNR	Raw Noise Reduction	CA-LTM	Content-Aware Local Tone Mapping	Texture	
HFG	High Frequency Generator	Others		DM	Demosaic
NR3D	Temporal Noise Reduction	3A Stats	3A Statistics	EE	Edge Enhancement
MFNR	Multi-Frame Noise Reduction	CSC	Color Space Conversion	ClearZoom	Clear Zoom
SWNR	SW-based Noise Reduction				

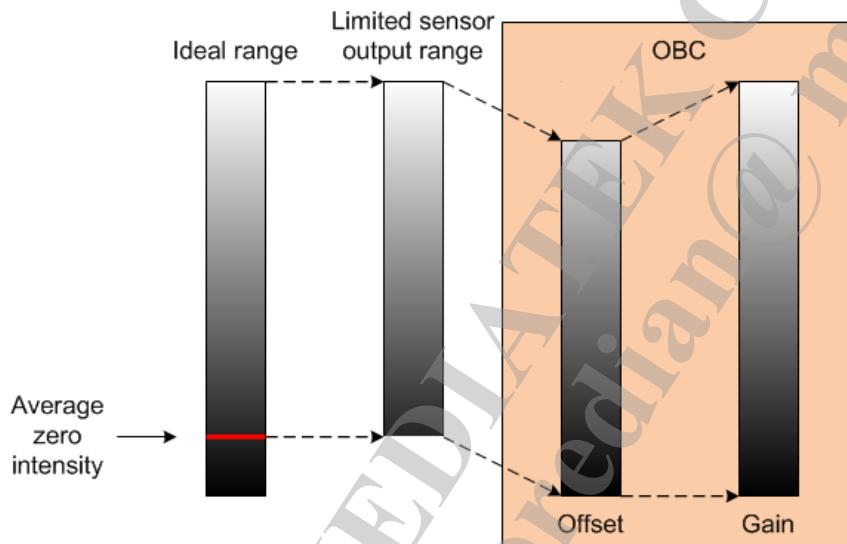
ADBS: Advanced De-Bias

- Purpose
 - Improve sensor linearity for low-light region
- Usage
 - Automatic self-calibration



OBC: Optical Black Correction

- Purpose
 - Calibrate black (zero) intensity and re-scale to full range
- Usage
 - By pre-calibrated model



Without OB



With OB

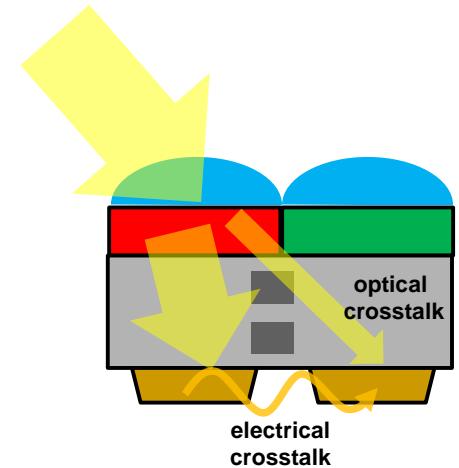
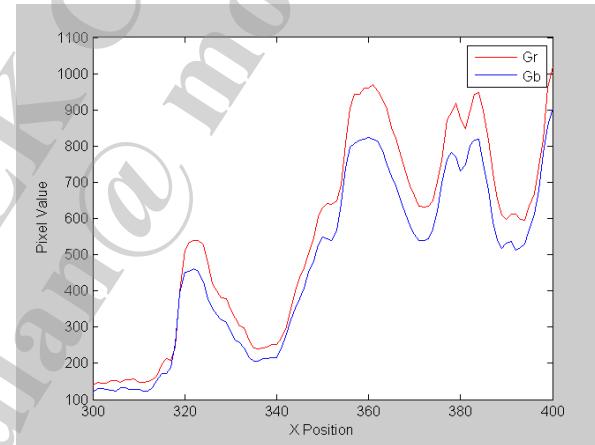
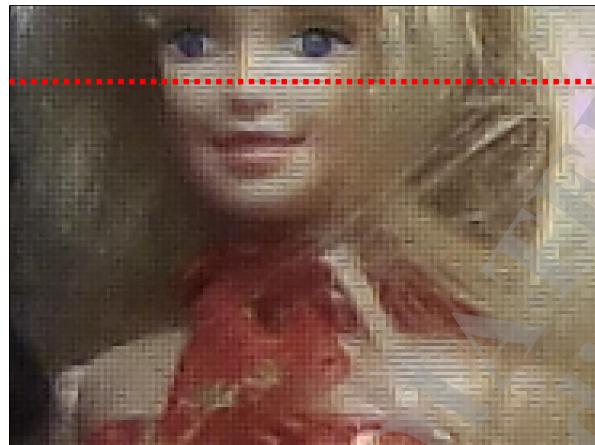
BPC: Bad Pixel Correction

- Purpose
 - Remove bad pixels while keeping most details
- Usage
 - Tuning for different BPC pattern



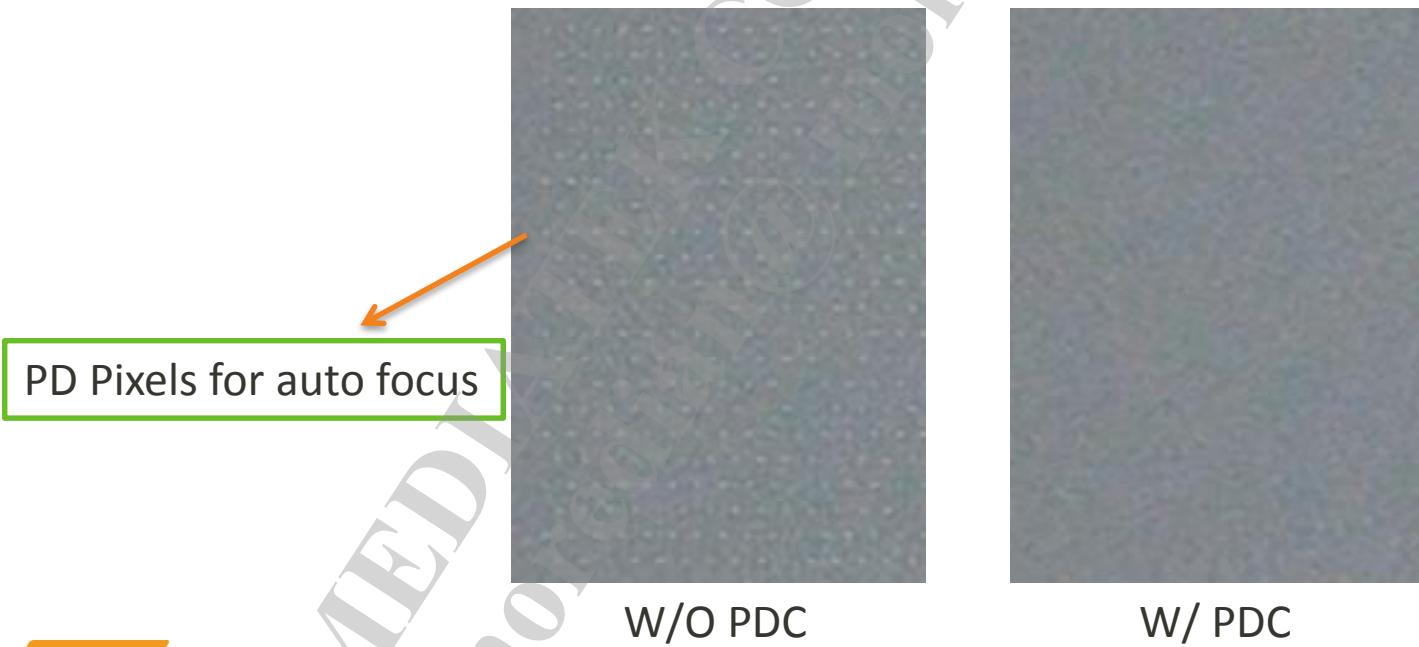
BPC-CT: Gr/Gb Crosstalk

- Purpose
 - Remove maze-like pattern from Gr/Gb difference
- Usage
 - Tuning depends on crosstalk level



BPC-PDC: Phase Difference Pixel Correction

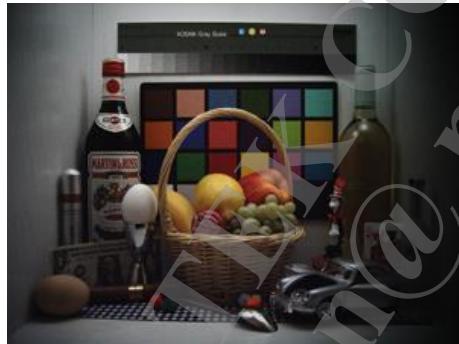
- Purpose
 - Remove PD pixels naturally
- Usage
 - Based on specific PD table to do correction



LSC: Lens Shading Correction

- Purpose
 - LSC compensates shaded images with shading tables
- Usage
 - By pre-calibration model

Shaded



Luma Shade
Corrected

Shaded



Chroma Shade
Corrected

PGN: Pre-Gain

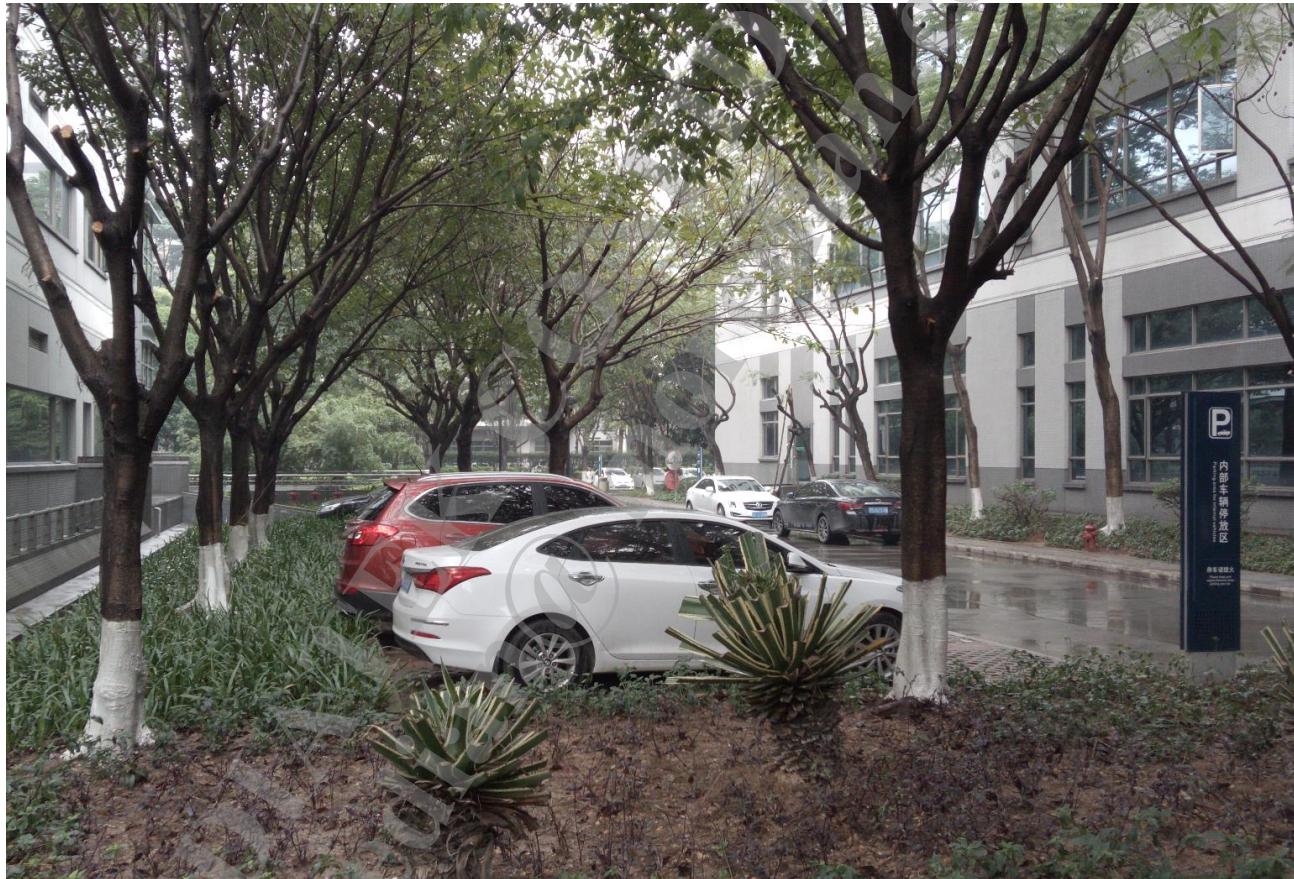
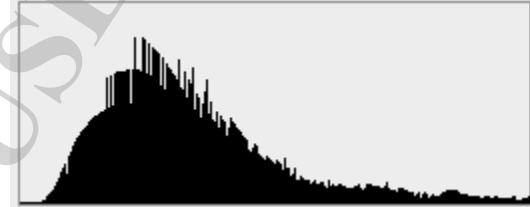
- Purpose
 - Apply AWB gain/flare offset



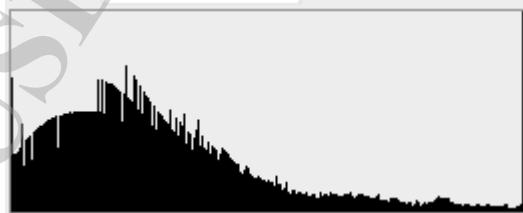
Without AWB gain

With AWB gain

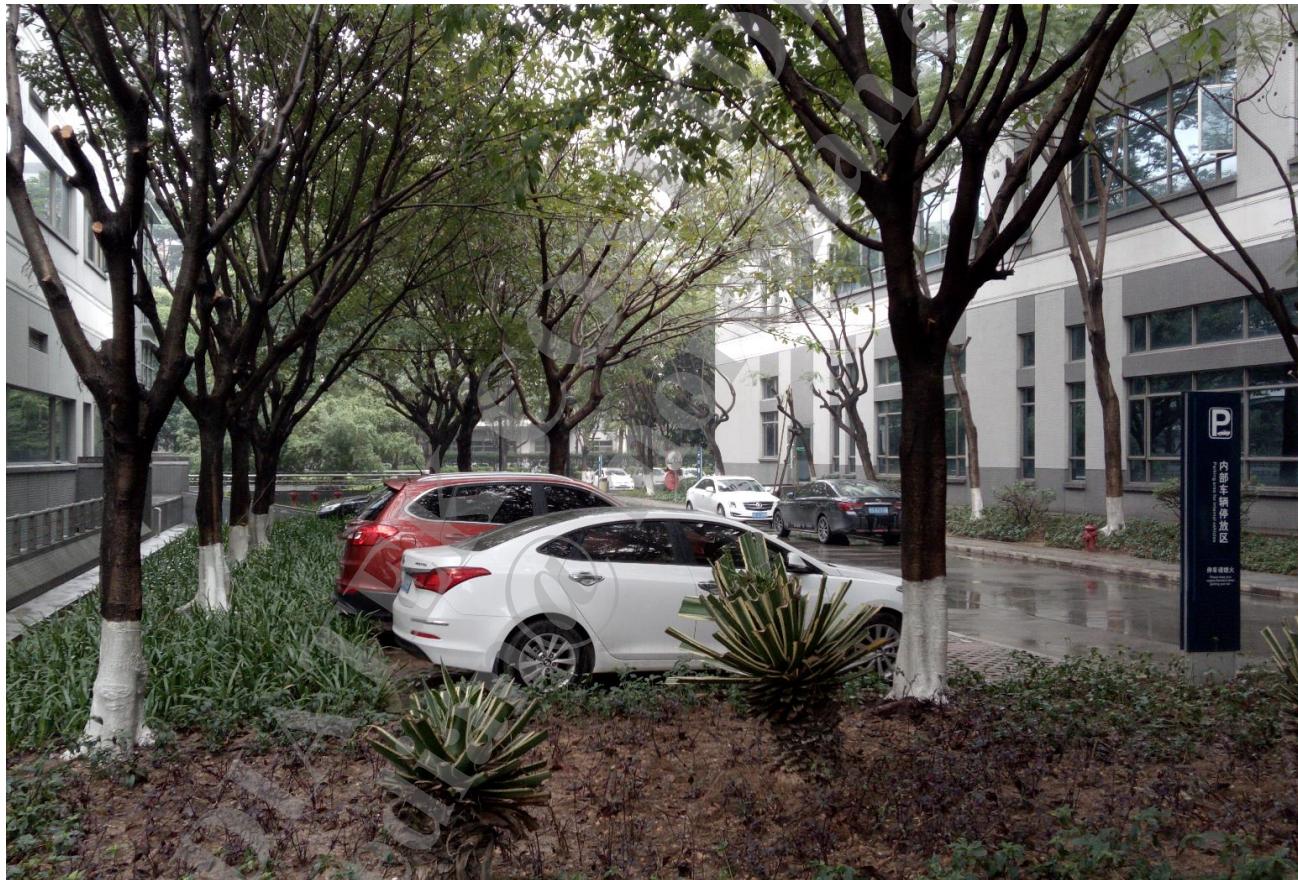
Flare Offset = 0



More lowlight details



Flare Offset = -63



Better contrast

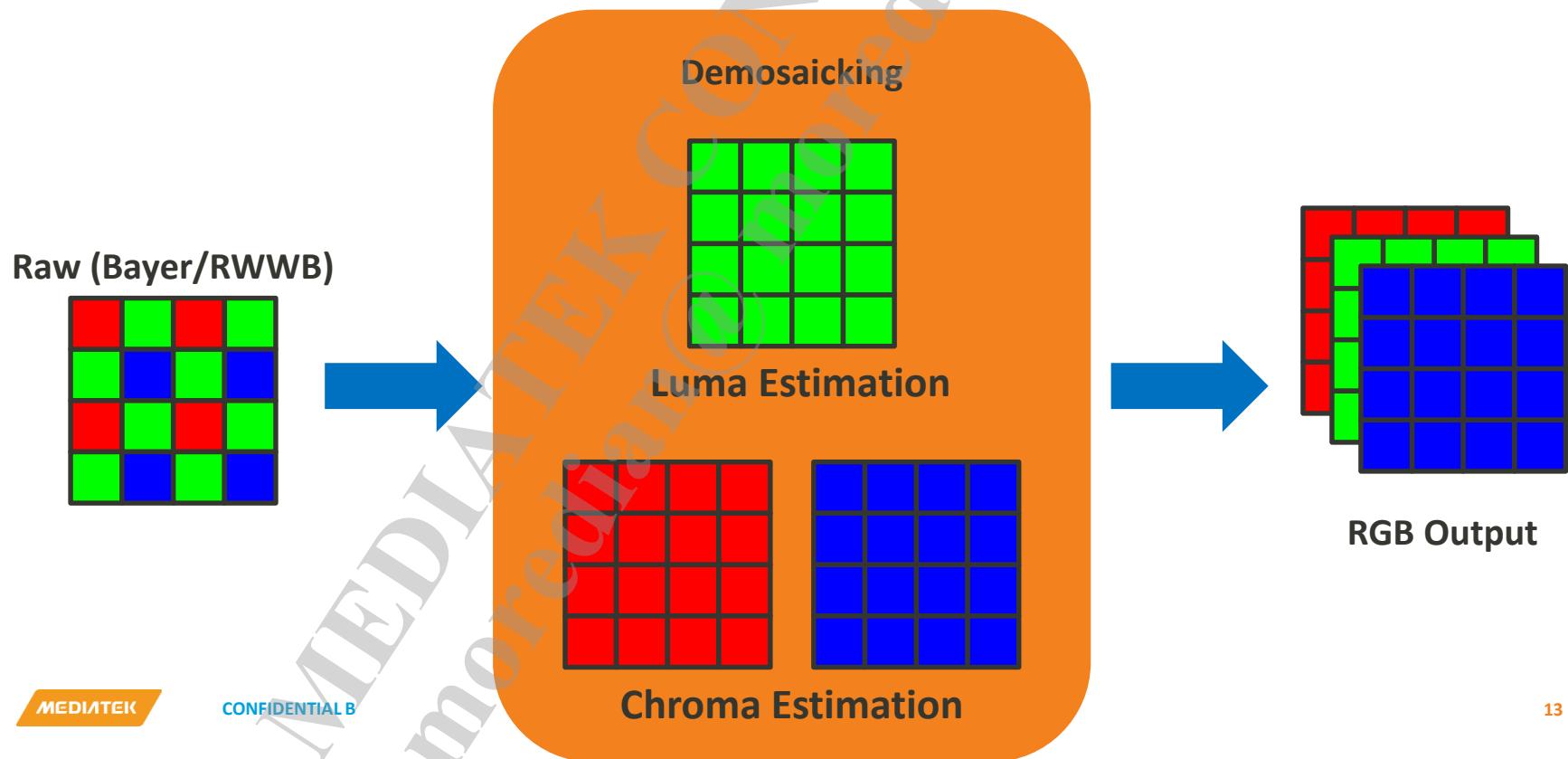
RNR: Raw Domain Noise Reduction

- Purpose
 - Remove noise before CCM/Gamma enhancement



DM: Demosaic

- Purpose
 - Converts raw pattern into three (R/G/B) images with full resolution
 - Raw domain NR/EE



CCM: Color Correction Matrix

- Purpose
 - Convert sensor RGB domain to sRGB (standard RGB) domain



Before 3x3



After 3x3

LCE: Local Contrast Enhancement

- Purpose
 - LTM can enhance dark details without damaging global contrast by using local luminance statistics



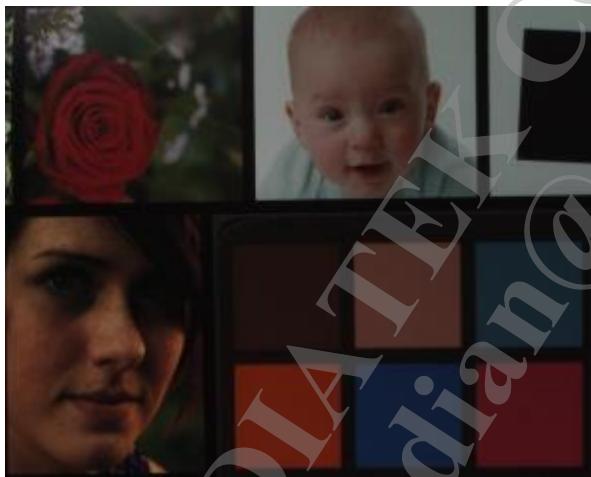
LCE off



LCE on

GMA: Gamma Correction

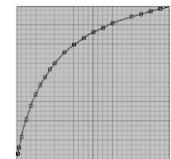
- Purpose
 - Compensate display gamma
 - Expand dynamic range for human preference



Before Gamma



After Gamma



NR1: YUV Noise Reduction 1

- Purpose
 - Reduce luma and chroma noise



Before NR



After NR

EE: Edge Enhancement

- Purpose
 - Boost sharpness level of images



Before EE



After EE

NR2: YUV Noise Reduction 2

- Purpose

- Reduce luma impulse noise and more chroma noise (especially low-f chroma noise)



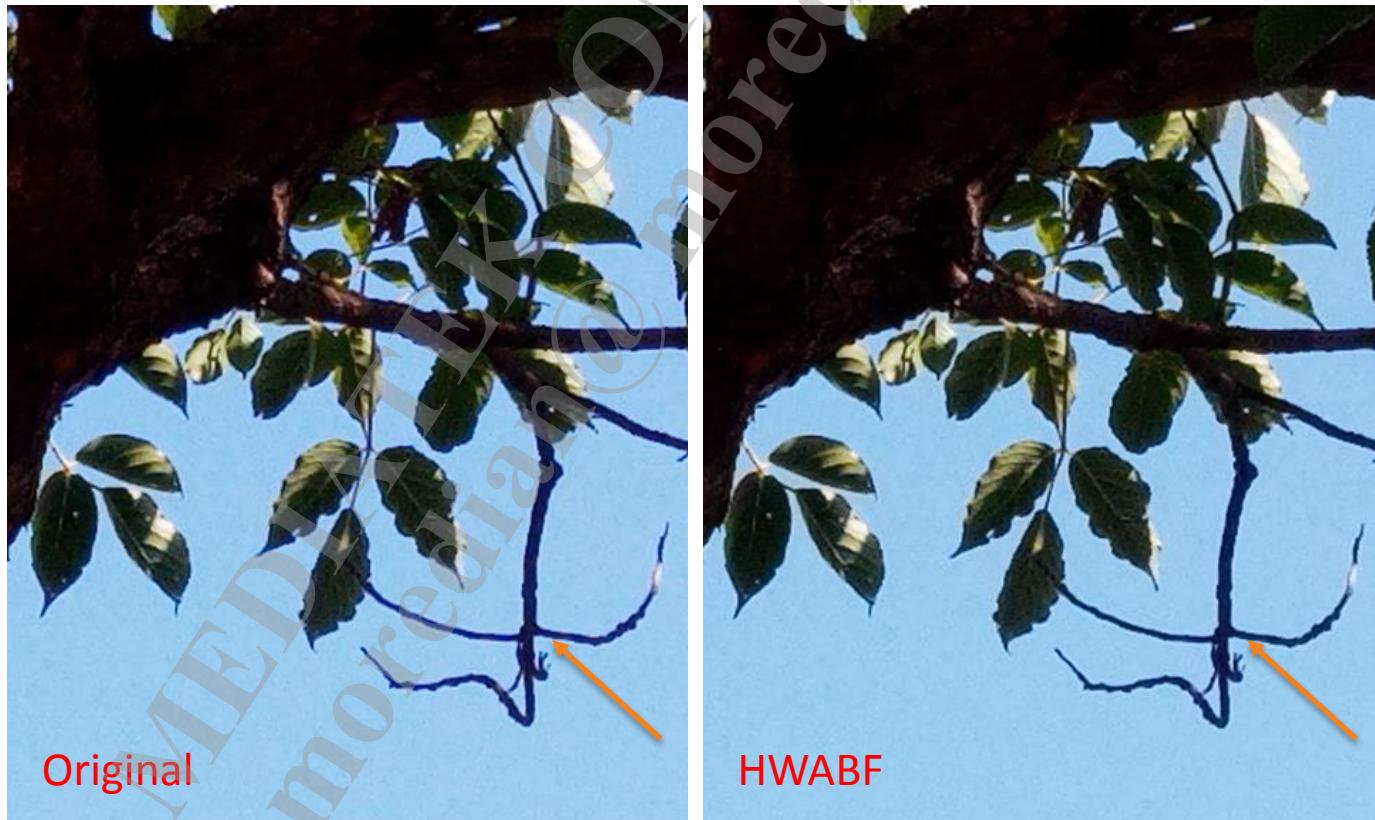
Before ANR2



After ANR2

NR2-ABF: Anti-Blooming Filter

- Purpose
 - Remove blooming effect from sensor



NR2-CCR: Chroma Coring

- Purpose
 - Reduce chroma noise depends on pixels' luminance, saturation value, and hue angle



HFG: High Frequency Generator

- Purpose
 - Add high-f luma noise to generate uniform noise pattern

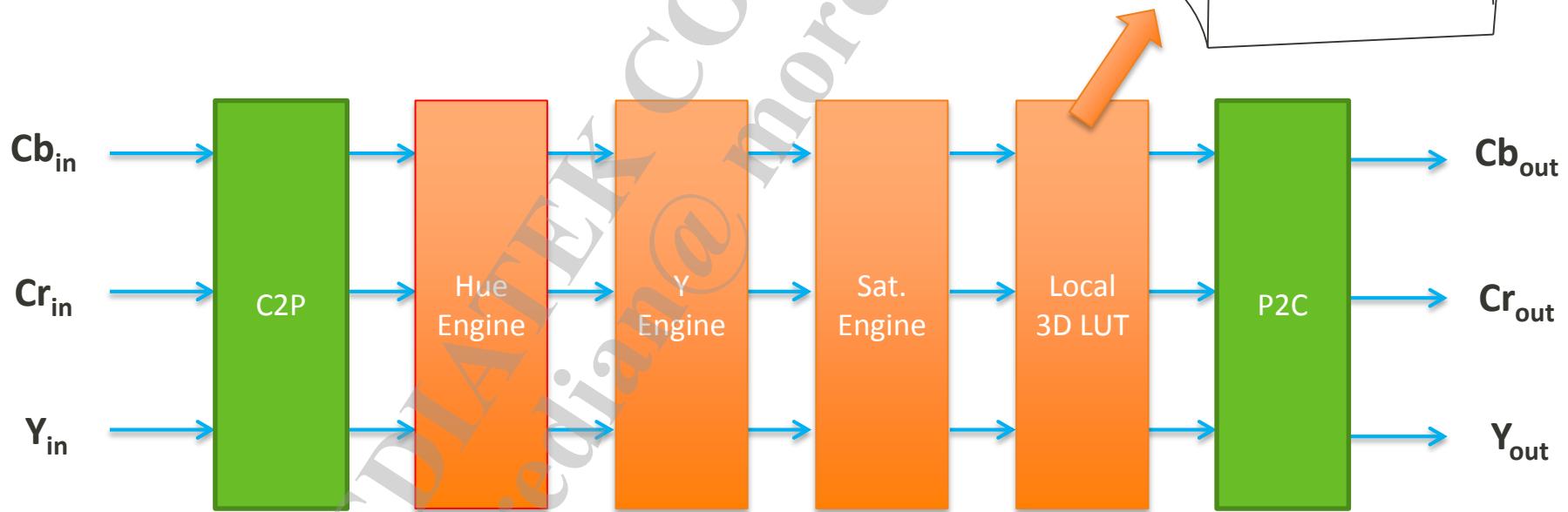
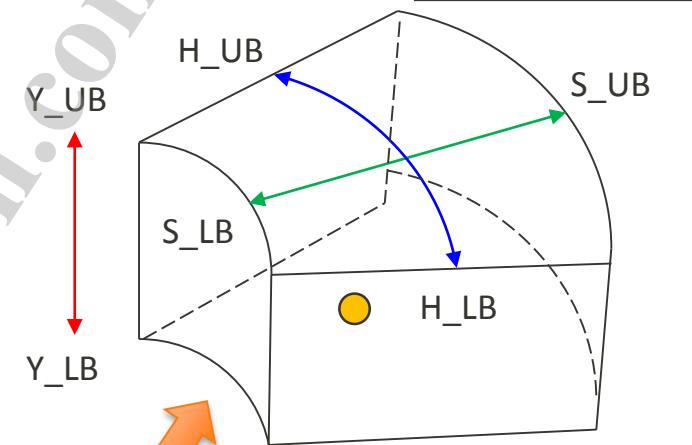


COLOR: Color Engine

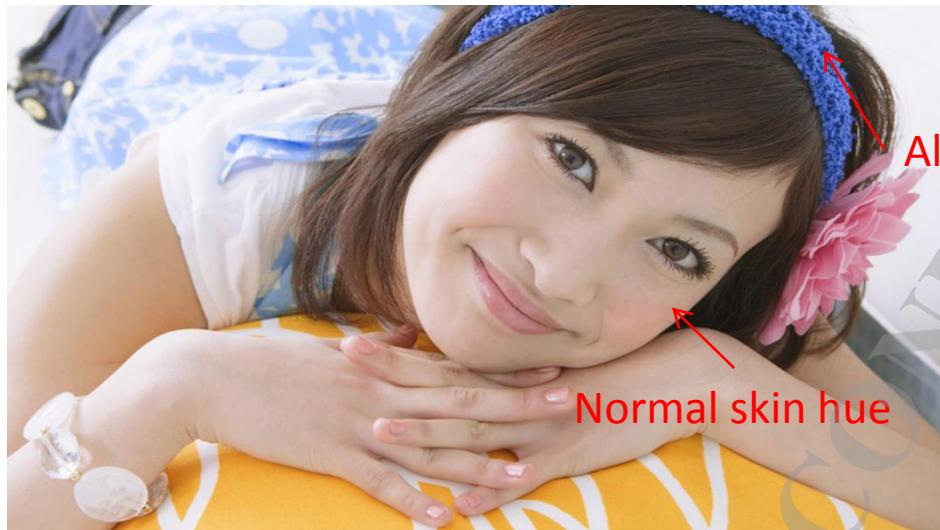
- UB: Upper boundary
- LB: Lower boundary

■ Purpose

- Provide color tuning flexibility in YSH domain with three 3D LUTs



Adaptive Color Tuning by Hue



Partial Hue output



Global Hue output

Input



- Adjustment in **Hue**

Adaptive Color Tuning by Luma



Partial Y output



Global Y output



- Adjustment in **Luma**

Adaptive Color Tuning by Saturation



Partial S output



Global S output

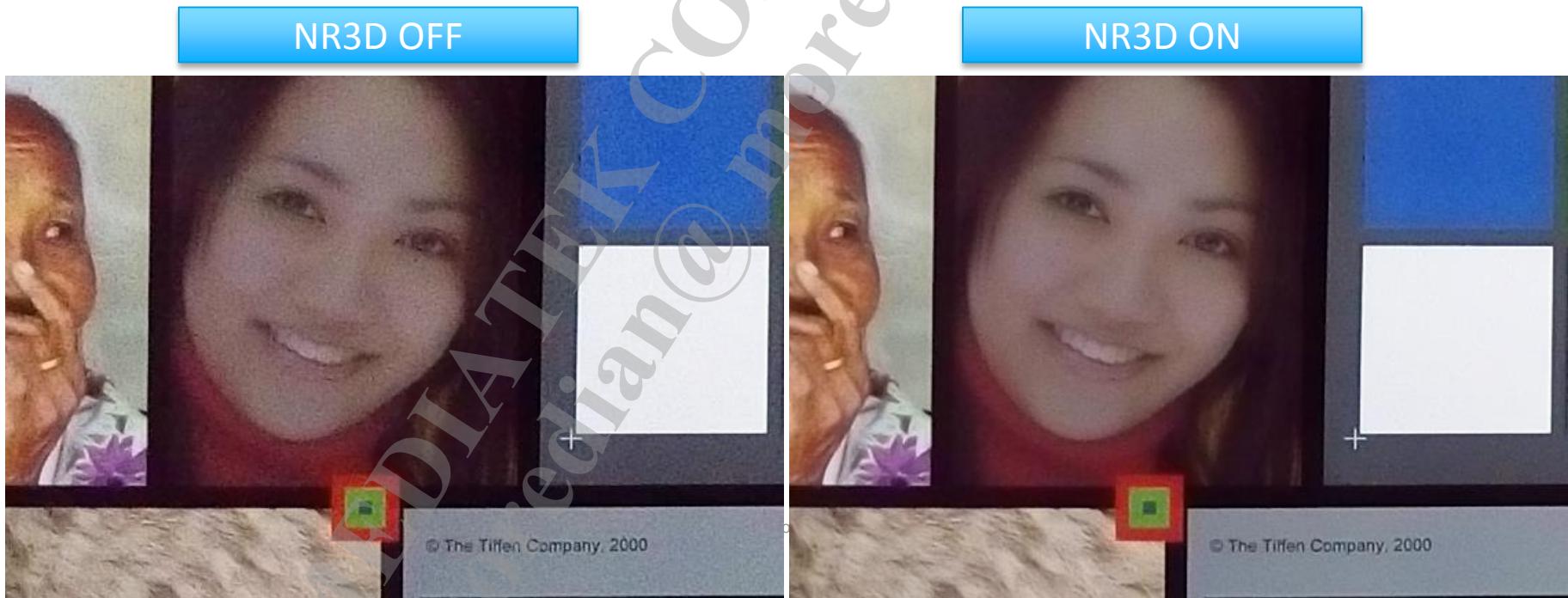


Input

- Adjustment in **Saturation**

NR3D: Temporal Noise Reduction

- Video/preview quality improvement
 - Running noise reduction
 - Frame rate improvement (by increasing ISO gain)



MFNR: Multi-Frame Noise Reduction

- Purpose
 - Improve image quality by multi-frame processing



MEDIATEK

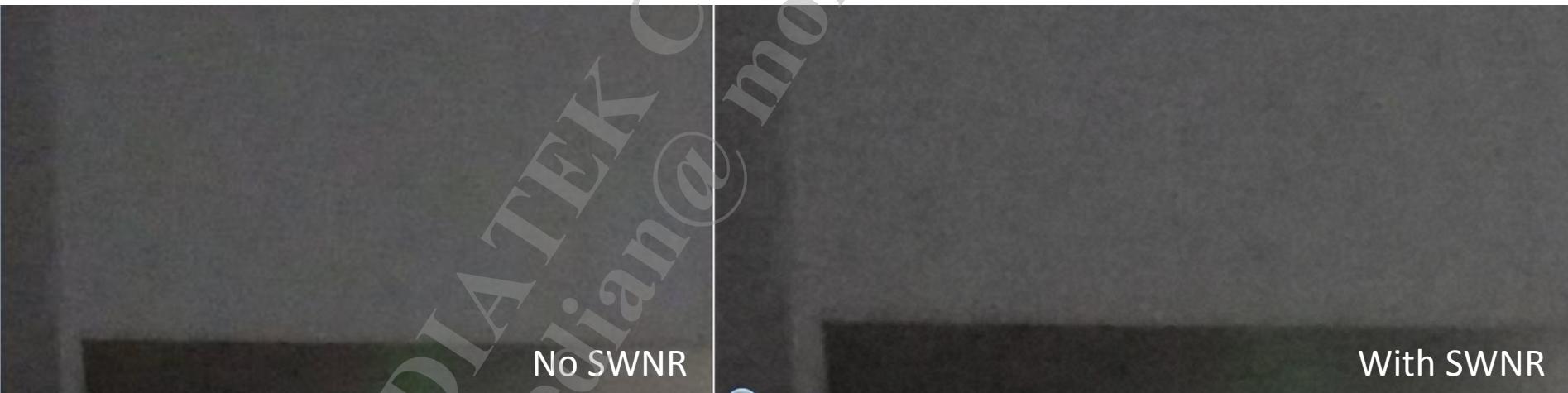
CONFIE

Without MFNR

With MFNR

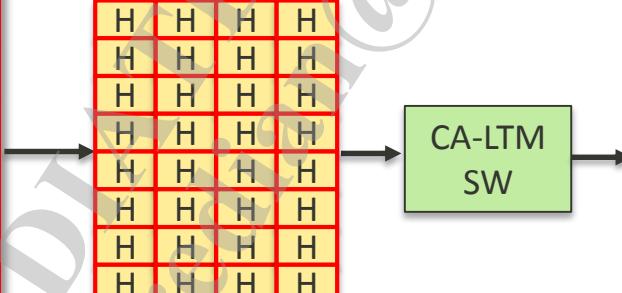
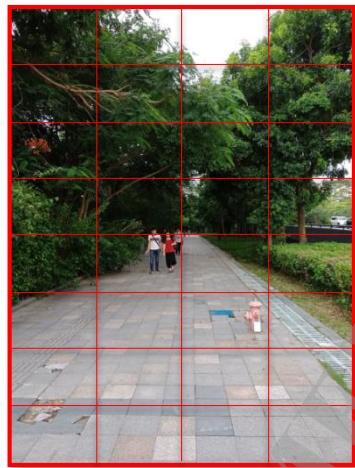
SWNR: SW-based Noise Reduction

- Purpose
 - Reduce very low-f chroma noise
 - Also provide CCR function as NR2-CCR



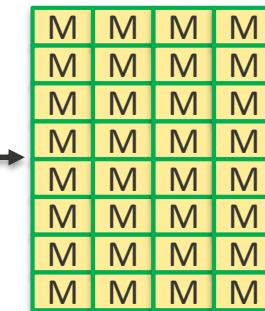
CA-LTM: Content-Aware Local Tone Mapping

- Key features
 - Keep overall luma average
 - Local contrast/detail enhancement
 - Skin/flat region protection
 - No noise boost

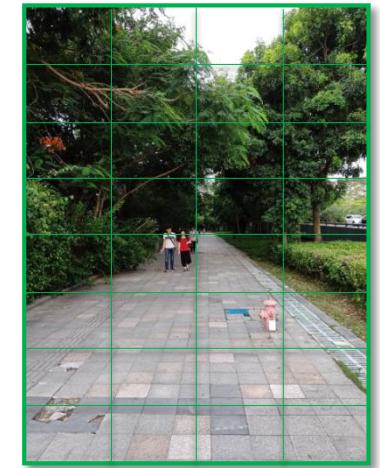


H: Histogram

CA-LTM
SW



M: Mapping Curve



CA-LTM: Content-Aware Local Tone Mapping

Input



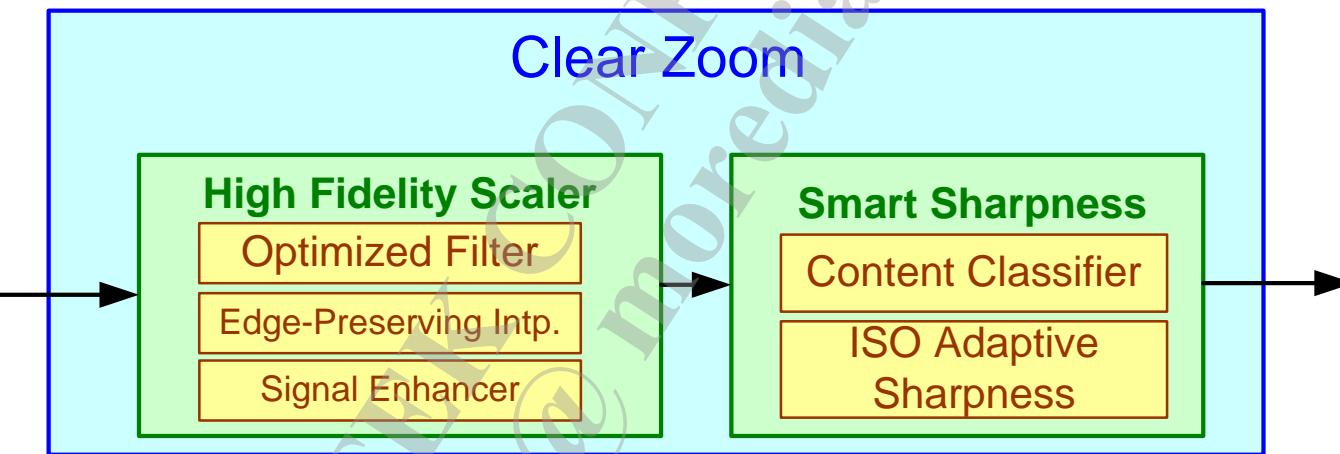
CA-LTM: Content-Aware Local Tone Mapping

CA-LTM



ClearZoom

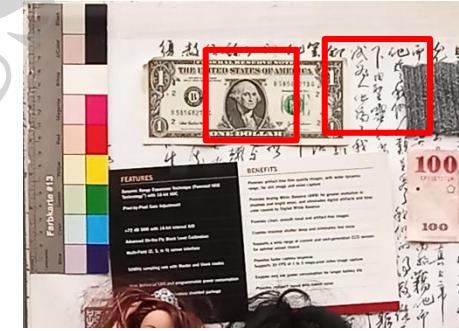
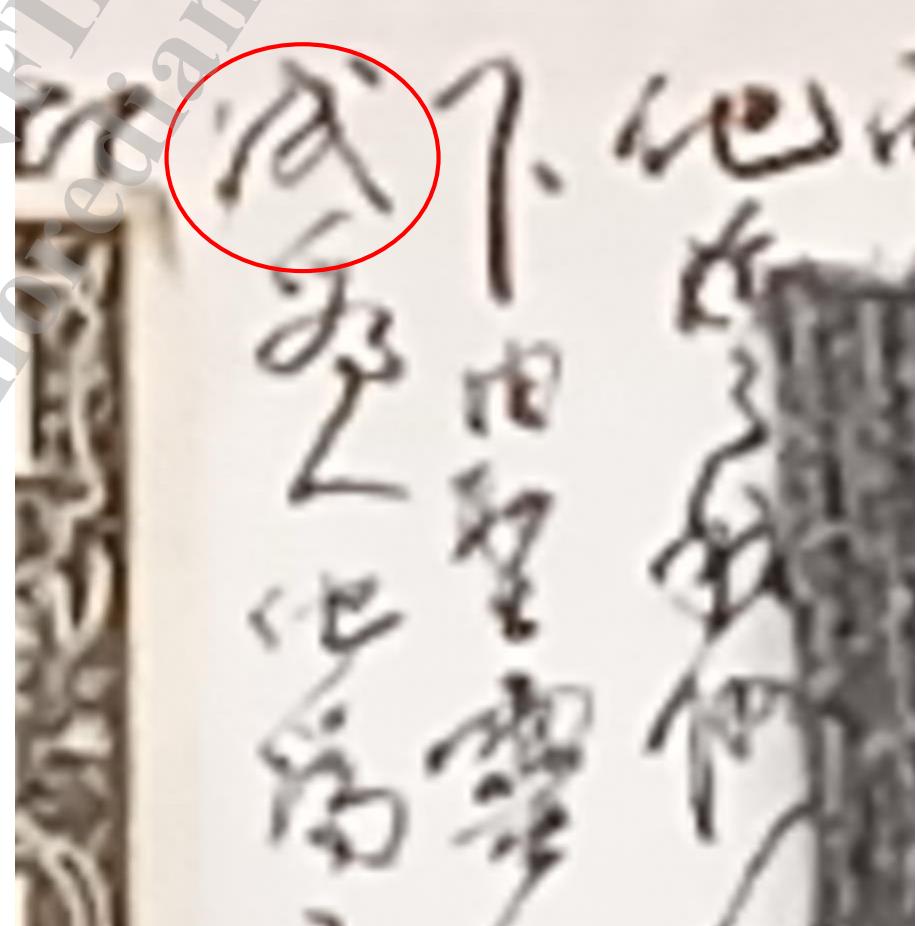
- Combination of **High Fidelity Scaler** and **Smart Sharpness** to achieve best digital zoom IQ



- Usage
 - Zoom for capture/preview/video
 - 4 cell sensor support

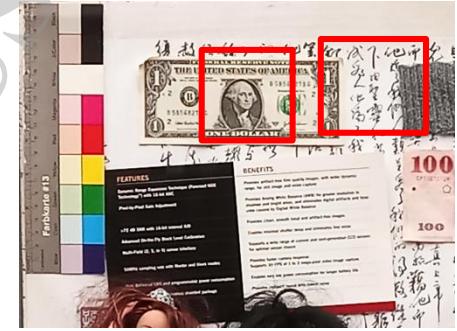
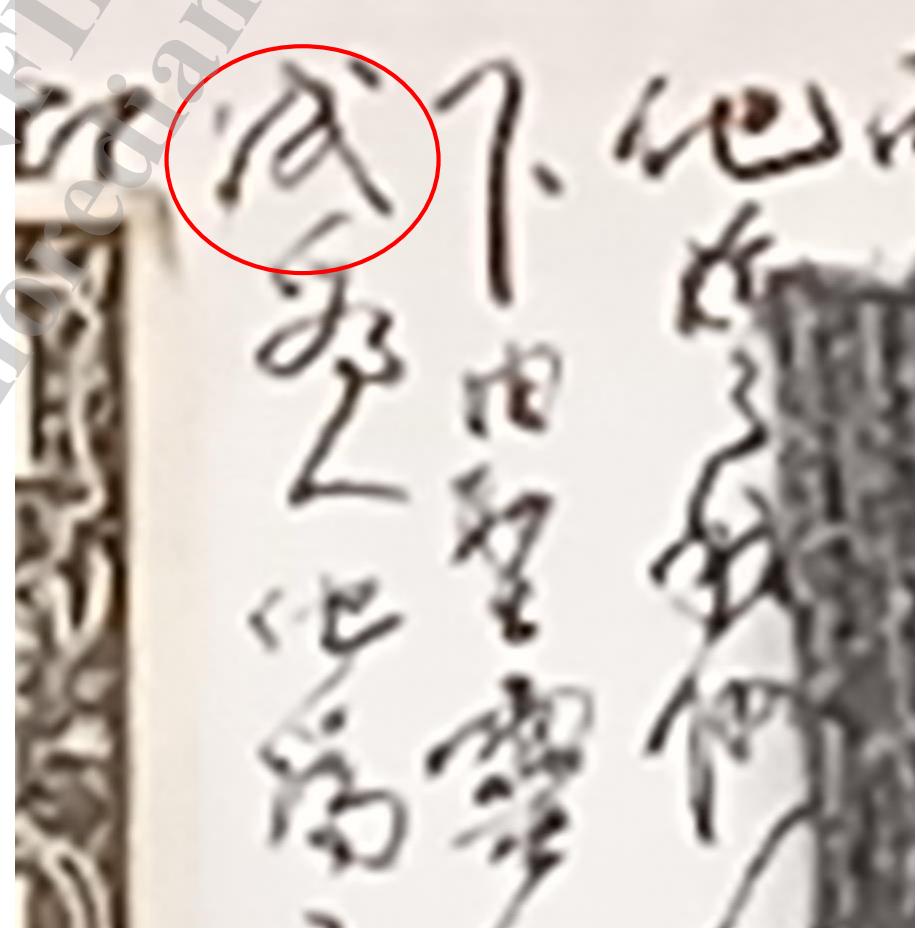
8X Digital Zoom (w/o ClearZoom)

- 100%

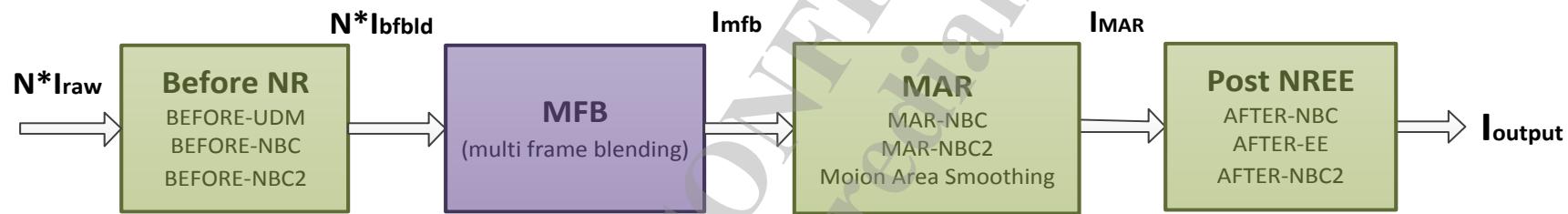


8X Digital Zoom (w/ ClearZoom)

- 100%



MFNR Flow



$N*I_{\text{raw}}$

$N*I_{\text{bfblld}}$

I_{mfb}

I_{MAR}

I_{output}

Input RAW files. In MT6771, $N=2\sim 6$

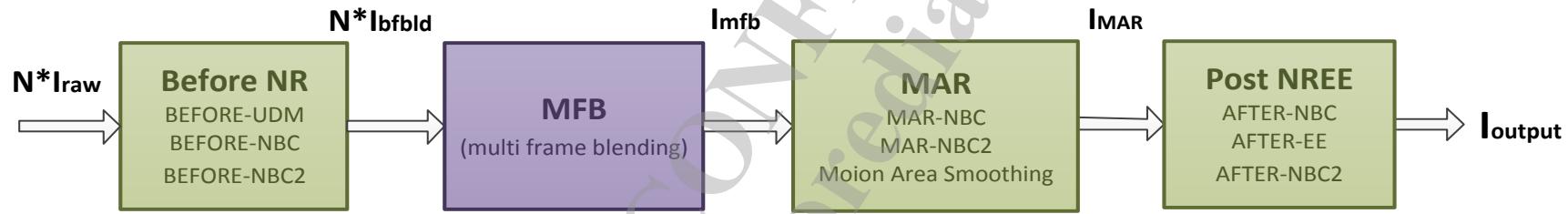
Images prepared to do multi-frame blending

Single blended Image

Image after motion area refinement

Image after post-NR/EE processing

Module Control of Each Stage



Before Stage	Similar as single capture (no EE/ABF/CCR/HFG/COLOR)
MFB	MFB only
MAR	Only NR1/NR2 (no EE/HFG)
Post Stage	NR1/EE/NR2/ABF/CCR/EE/HFG/ COLOR

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