6797 CCT ISP tuning guide

MEDIATEK

Check List Q&A

- Is MTK module the same as target phone's?
  - Please provide module information to MTK, if the module is different. (Sensor and lens information)
- JPG parameter is invalid?
  - Please let us know.
- Is SWNR/MNR applied correctly?
  - Compare the images with SWNR/MNR ON and OFF. SWNR/MNR is enabled if these two images are different.

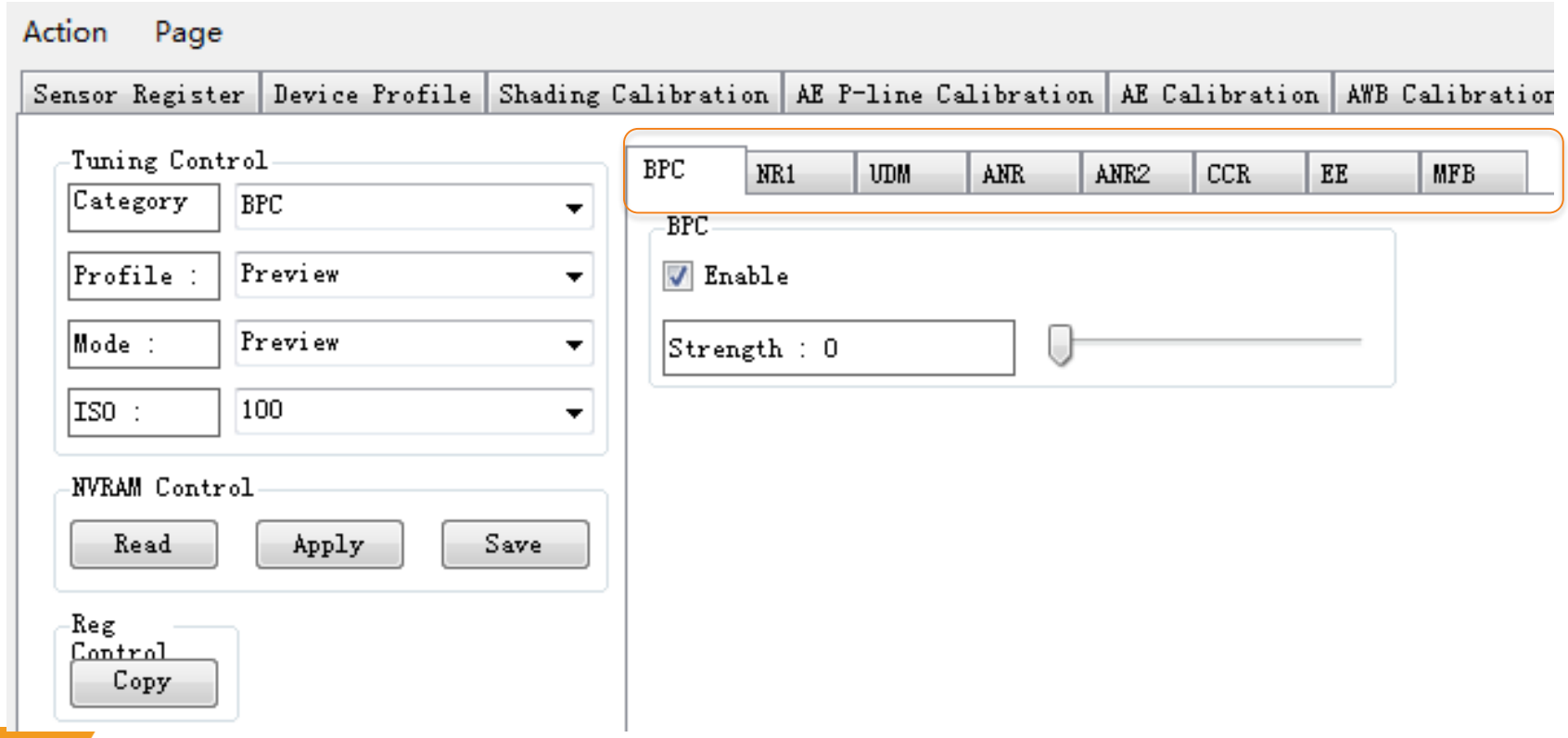
Check List Q&A

- Engineering mode output = Normal mode output?
  - They are not exactly the same. Just make sure they are not different dramatically.
- AE/AF/AWB influence on image quality
  - Make sure 3A has no obvious error.
- Is our scene brighter/darker than target phone?
  - Please send us log, raw, shading table, jpg, and reference phone picture.
  - If they are different, please tell us why shouldn't we make them the same in AE.
- Is our ISO setting similar with target phone's?
  - Please tell us the reason why we shouldn't align p-line with reference phone.
- OB, shading, gamma, CCM tuning finished?
  - Please run basic calibration for these items with CCT.

Overview

使用CCT可以调BPC、NR1(XTalk)、UDM(Demosaic)、ANR、ANR2、CCR、EE和MFB。

影响画面Detail和Noise表现的主要是UDM、ANR、ANR2和EE。



Tuning preparation

原始的参数

1. 可以使用Easy Calibration生成。

   关于Easy Calibration的使用请参考Tool中的文档。

2. 如果方案1无法得到参数，请使用default 参数

Tuning Scene

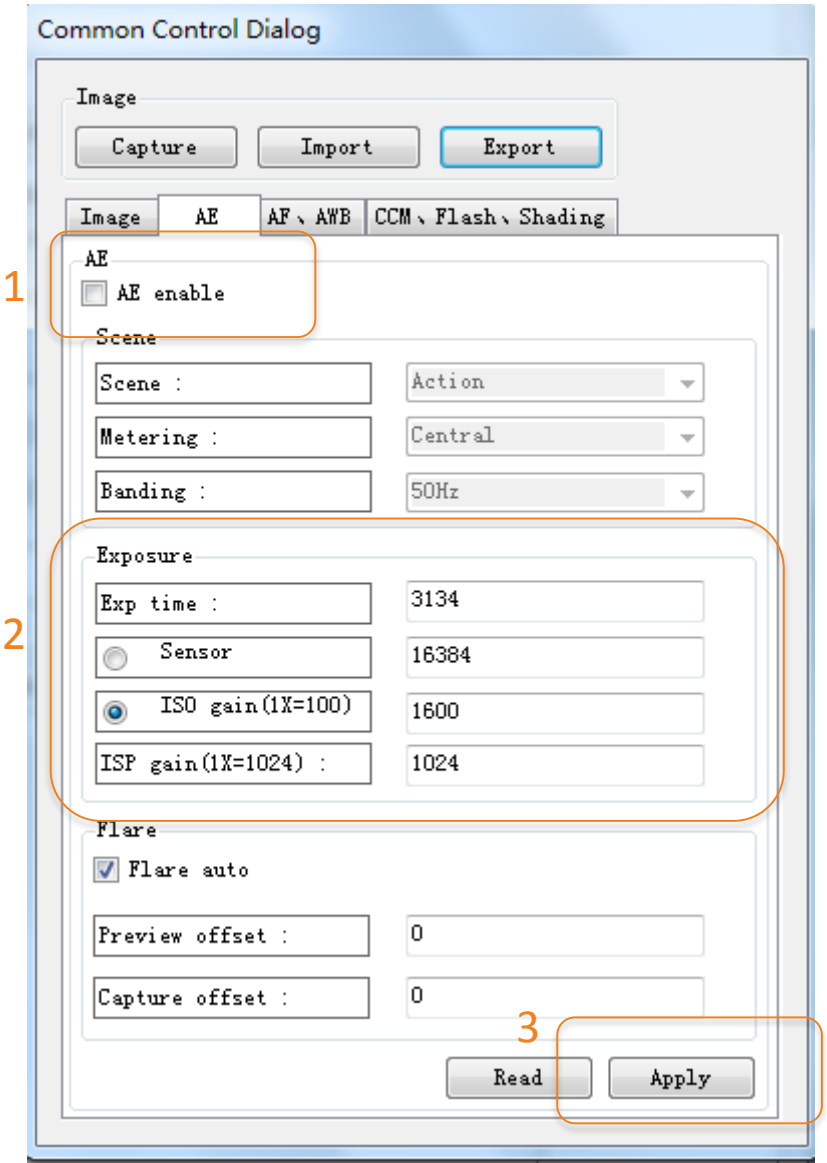
建议场景中包括：

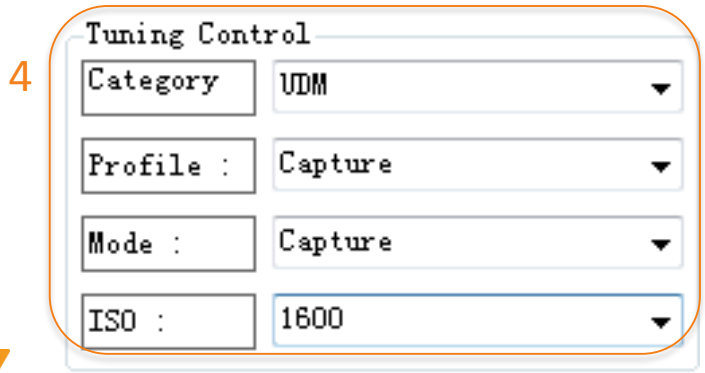
1. 中心区色卡，每个色块相当于平坦区
2. 头发看高频处理。
3. 毛绒娃娃看低频细节
4. 绿叶看纹路。
5. 红花看纹路。

Tuning configuration

调试前设置：

1. Disable AE；
2. 设置Exp time和ISO；
3. 设置结束后点击Apply；
4. Tuning Control部分设置对应的
   Catatory， Profile， Mode以及ISO。





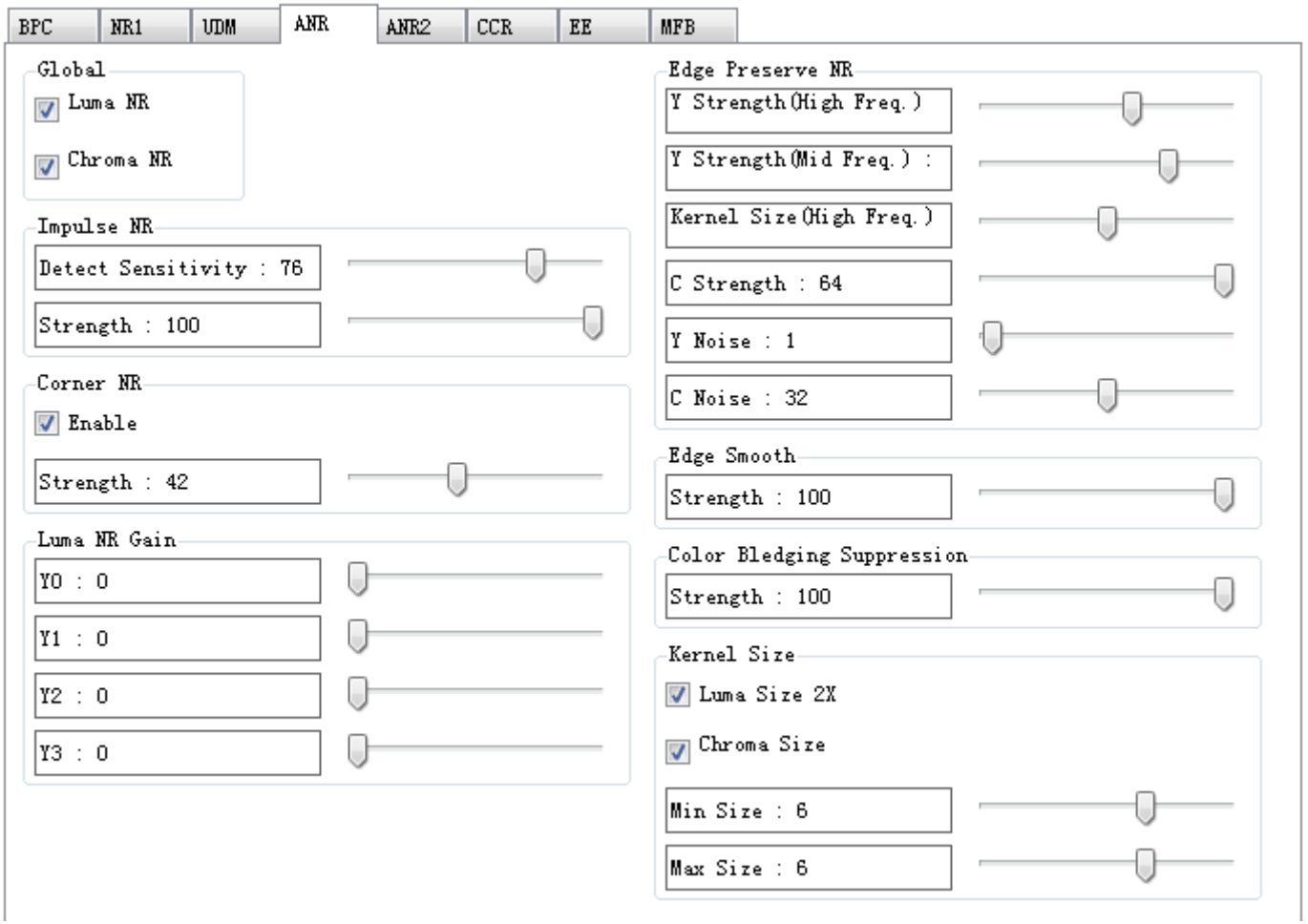
Tuning flow

Tuning flow

1. 先调试画面中心平坦区，在保留一定的细节前提下，让平坦区的Noise表现与target接近，这部分主要调试UDM和ANR；
2. 调试EE，使边缘表现与target接近，这部分主要调试EE和ANR2；
3. 使用Corner NR和Corner EE调试画面四角。

Tuning procedure

首先调试画面中心平坦区，让平坦区的Noise表现与target接近。
影响Noise表现的有UDM中的NR和ANR中的所有参数。

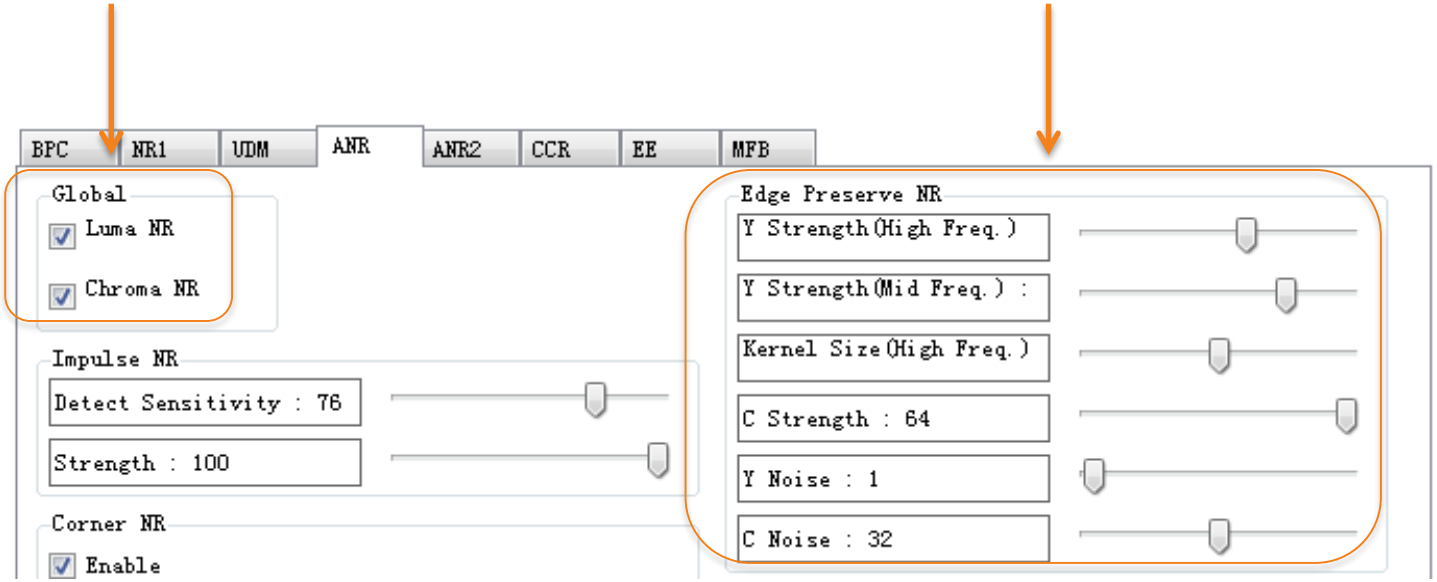


Edge Preserve NR (Luma)

Luma NR针对亮度做denoise，
Chrome NR针对色彩做denoise，
必须勾选才能生效

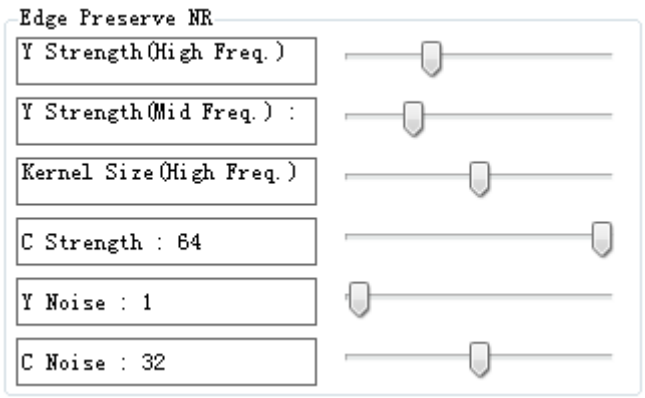
粗调ANR，使用Edge Preserve NR。
1. Y Noise针对Luma Noise，是控制判断Noise的门限，值越大被认为是Noise的pixel越多
2. Y Strength控制NR的强度。

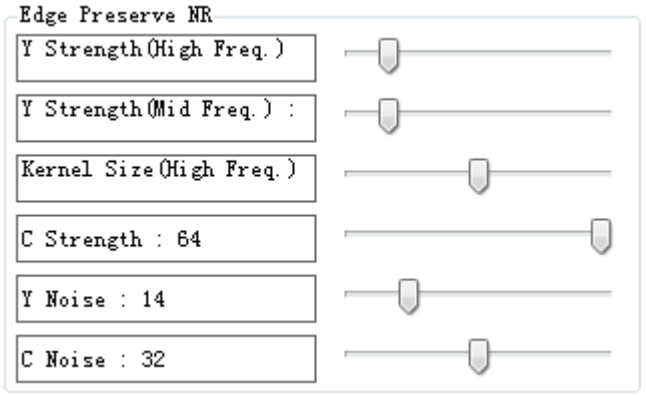
注意：6797上Y Strength越往左拉效果越强。

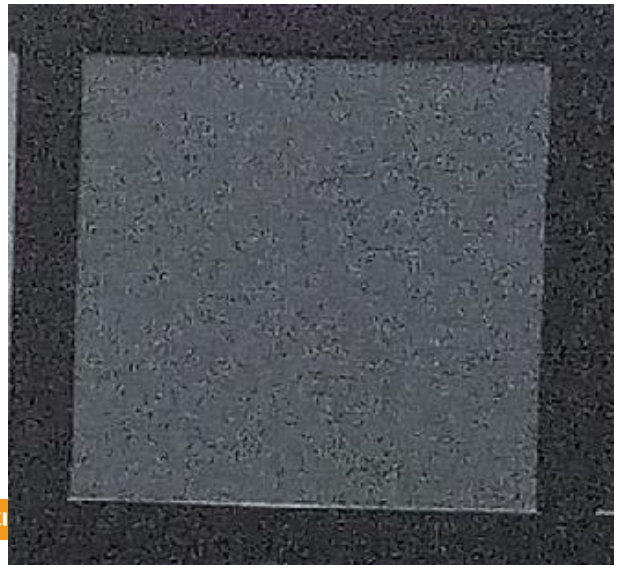


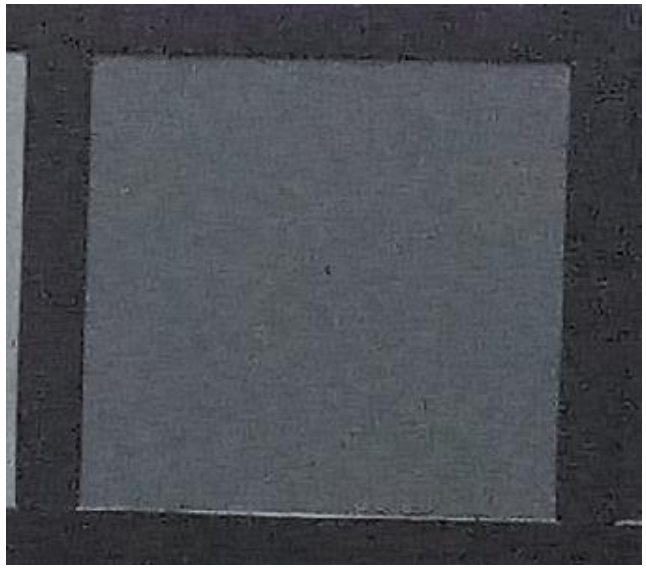
Edge Preserve NR (Luma)

平坦区的Noise通过调大Y Noise和Y Strength可以去除。





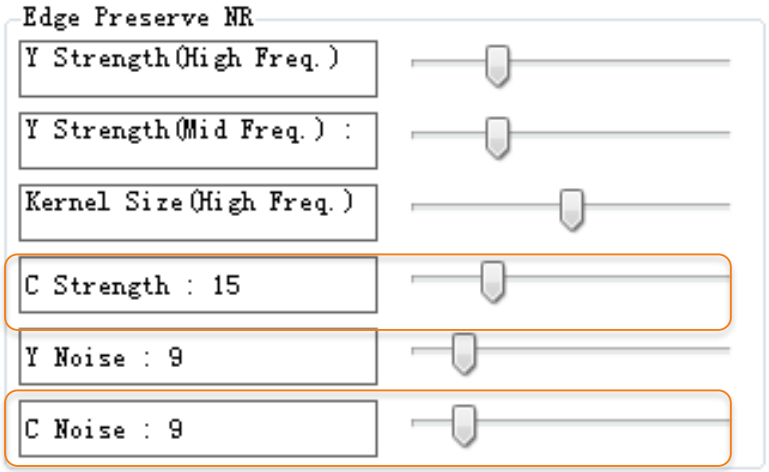




Edge Preserve NR (Color)

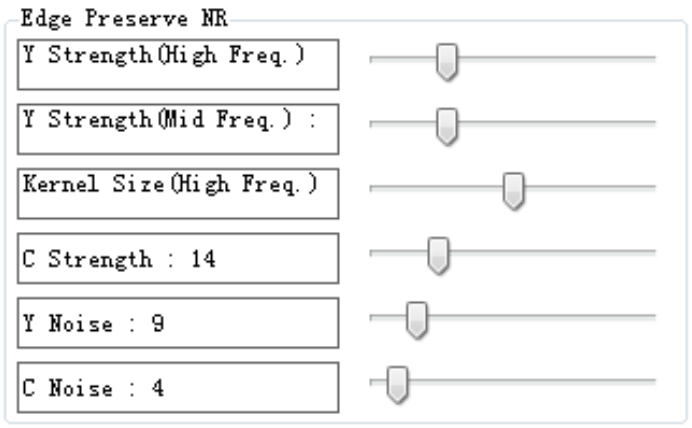
ANR可以针对Chroma Noise进行Denoise操作。
C Noise控制判断为Chroma Noise的门限，C Strength控制Denoise的强度。

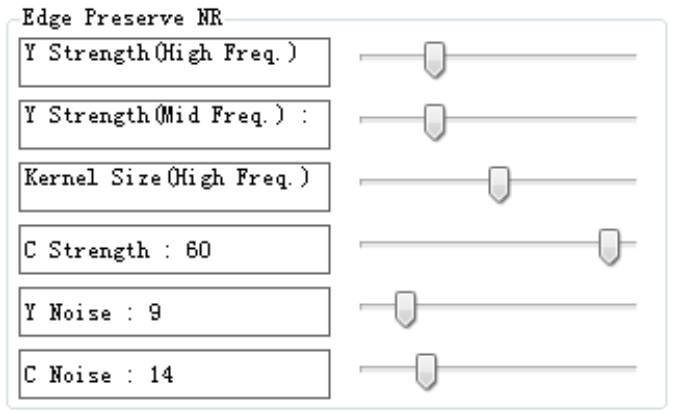
注意：C Noise和C Strength设太强会引起Color Bleeding现象。

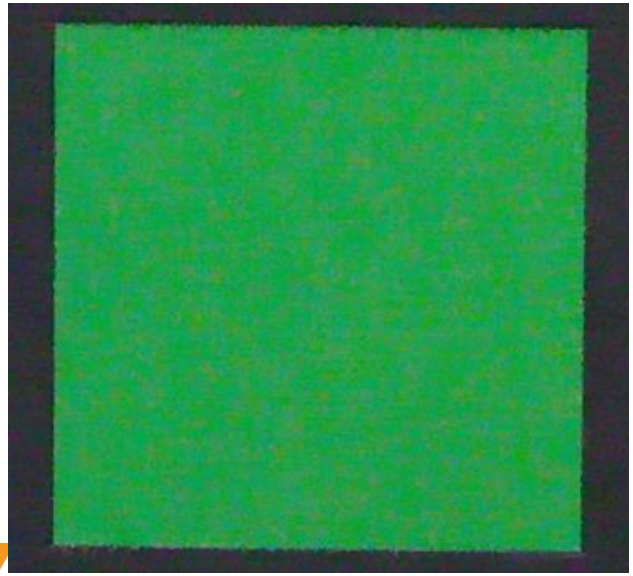


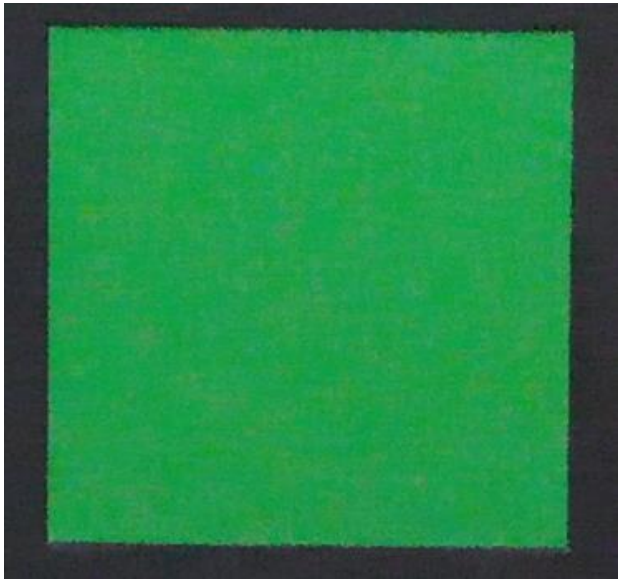
Edge Preserve NR (Color)

提高C Noise和C Strength，可以去除Color Noise。







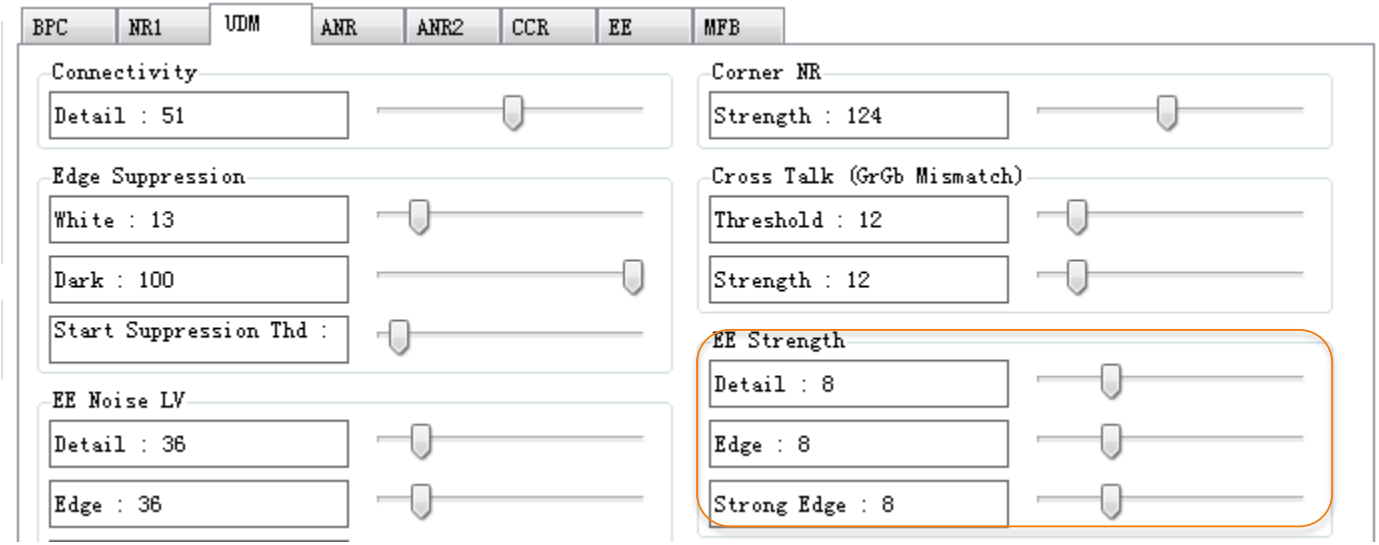


Color Bleeding Suppression

对于Color Bleeding现象，可以使用Color Bleeding Suppression进行抑制。Strength越大表示抑制Color Bleeding的强度越大，同时彩色去噪能力变弱。如果设为最大还不能解决色彩溢色，那要降低C Noise和C Strength。

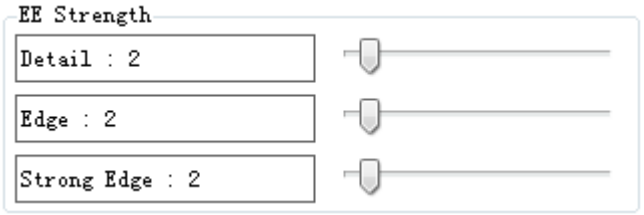
UDM EE Strength

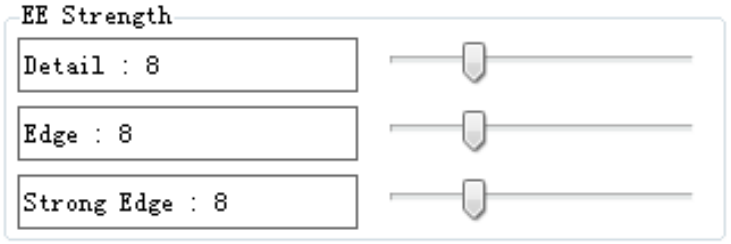
假如调节Y Noise和Y Strength导致细节丢失。可以调节UDM中的EE增加细节。



UDM EE Strength

将EE Strength调大可以增强画面Edge表现。





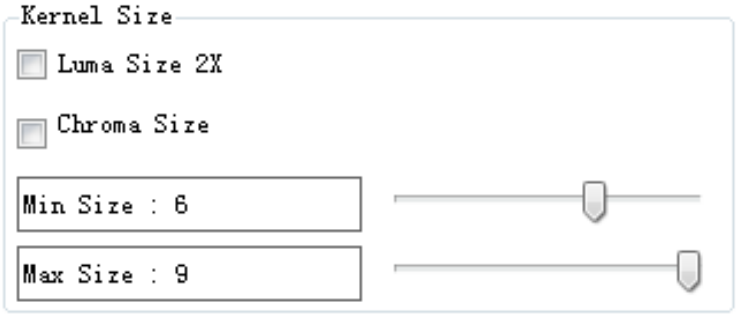
Kernel Size

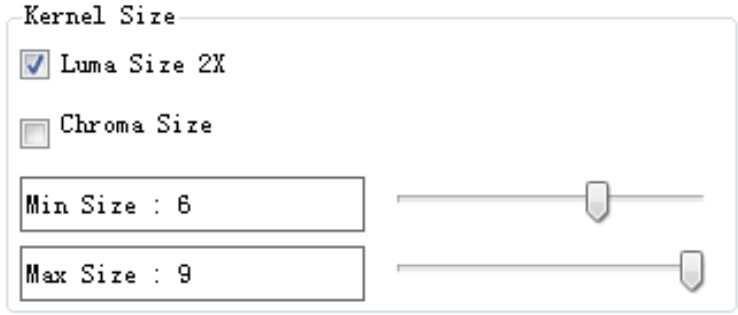
ANR的效果开得太强会导致画面细节的丢失。
可以减弱ANR的强度，增加Kernel Size。
Size越大，NR效果越强。

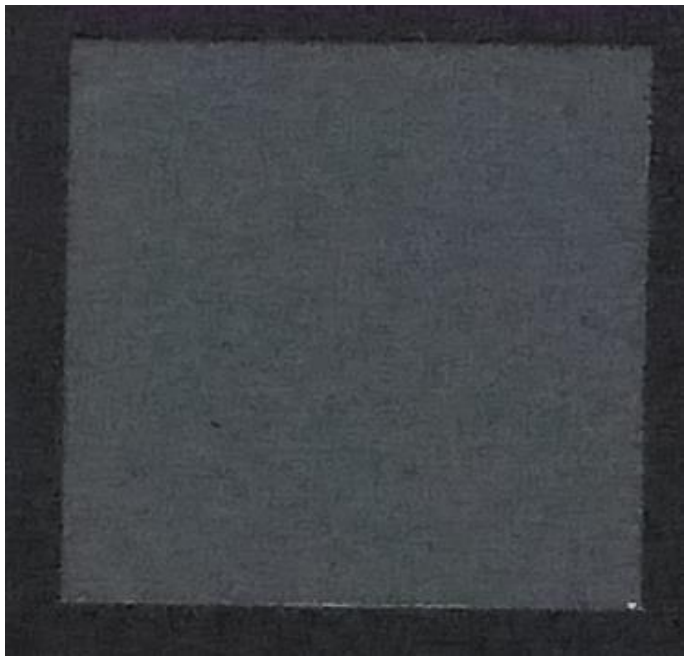
Luma Size 2X针对Luma Noise，勾选才能生效。
Chroma Size针对Chroma Noise，勾选才能生效。
Min Size和Max Size设置了Kernel Size的范围。
注意要让Min Size ≤ Max Size

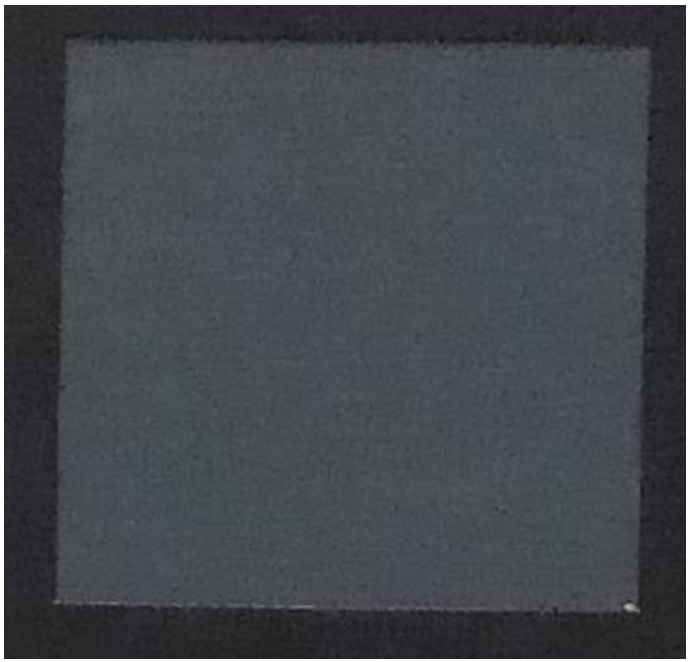
Kernel Size

Kernel Size变大，画面Noise表现比之前要好。









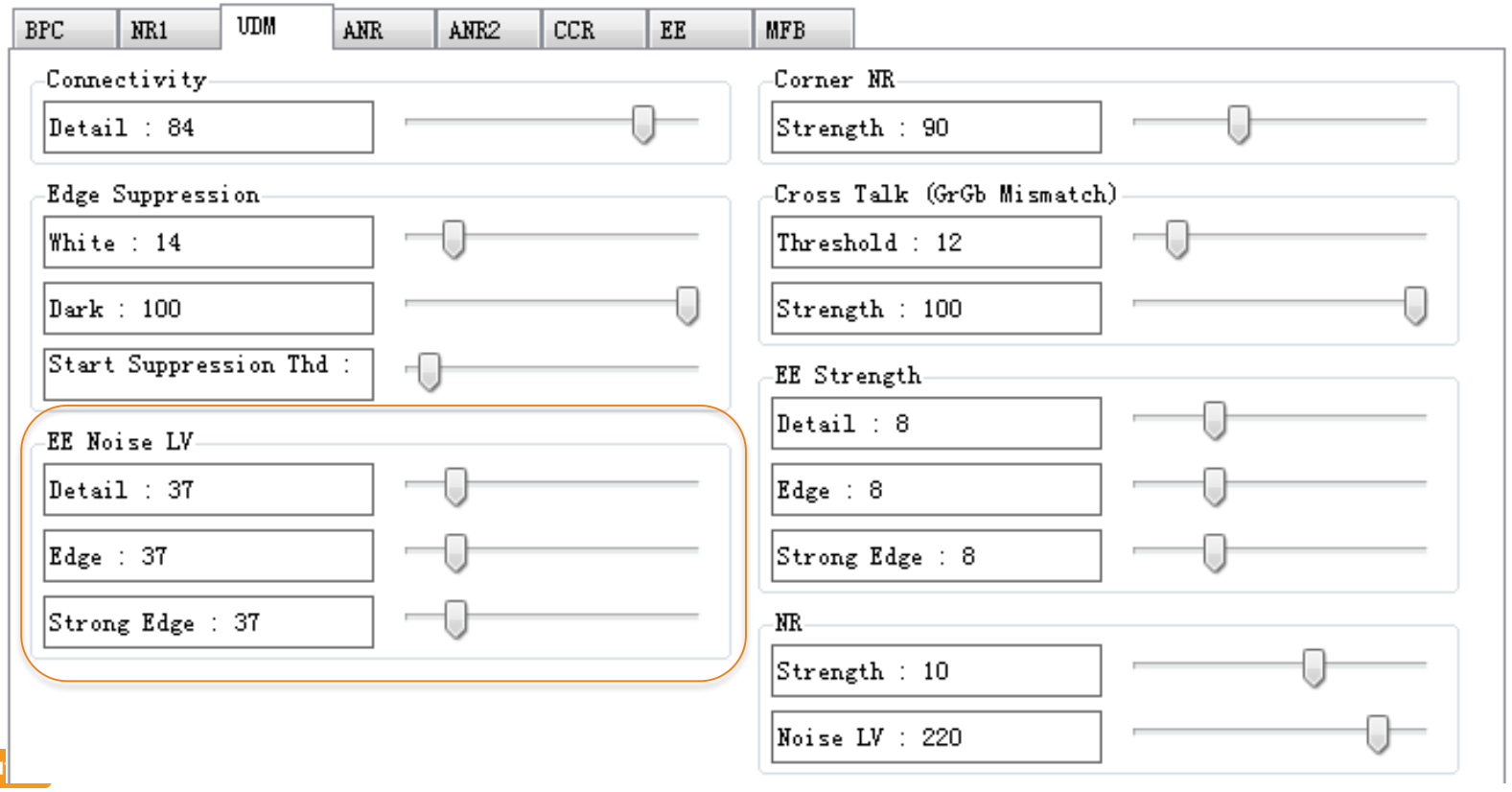
UDM EE Noise LV

UDM部分的EE可以增加图片细节。

EE Noise LV控制EE的门限，大于对应数值的才会做EE。

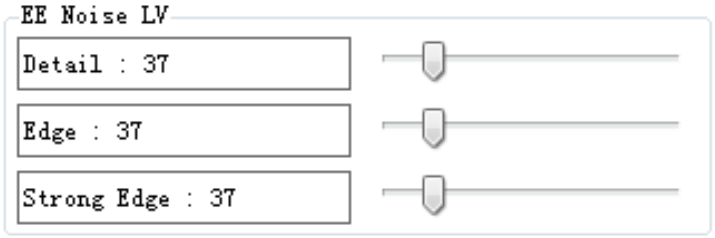
在高ISO情况下，如果UDM的EE门限比较低，可能会产生蠕虫状的Noise。

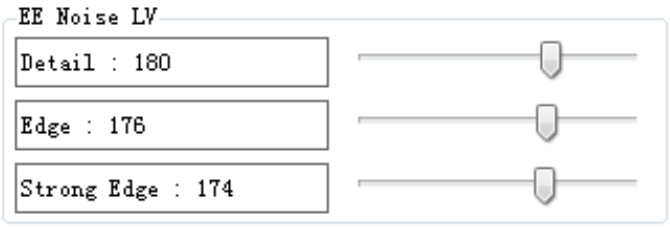
将Noise LV提高消除Noise，但画面会变比之前模糊。

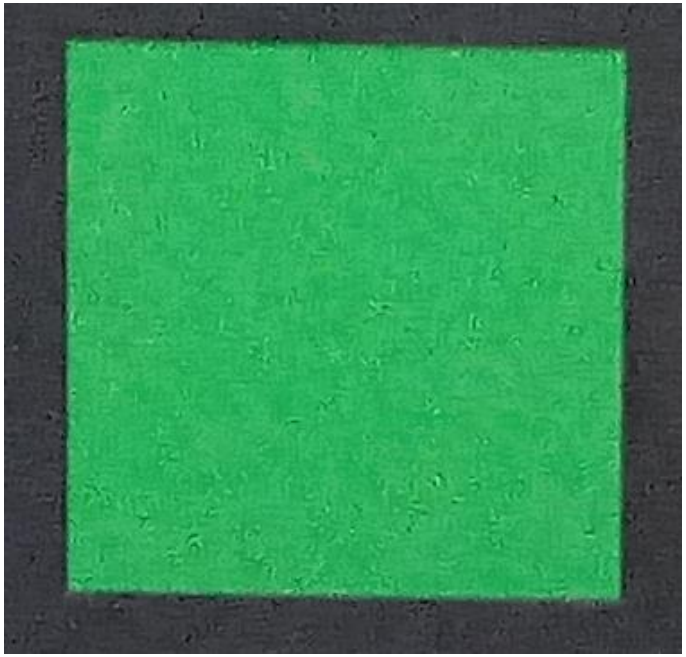


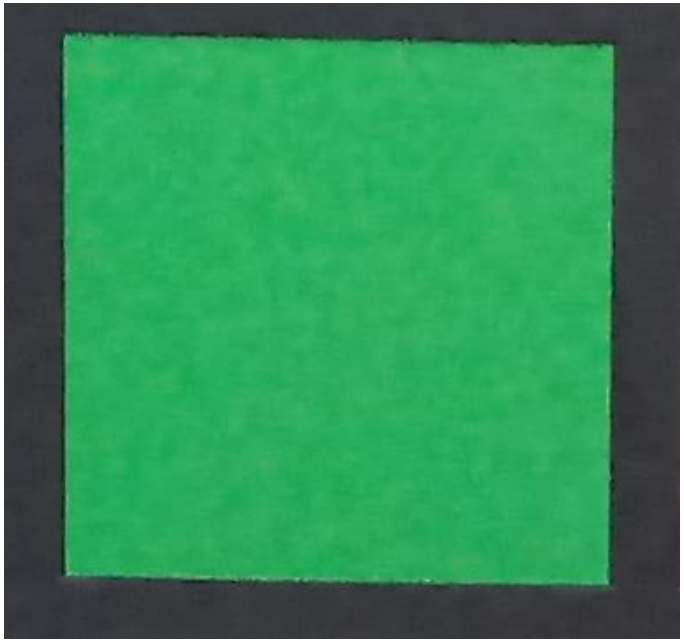
UDM EE Noise LV

EE Noise LV提高了，蠕虫状Noise去除了，但画面比之前要模糊。





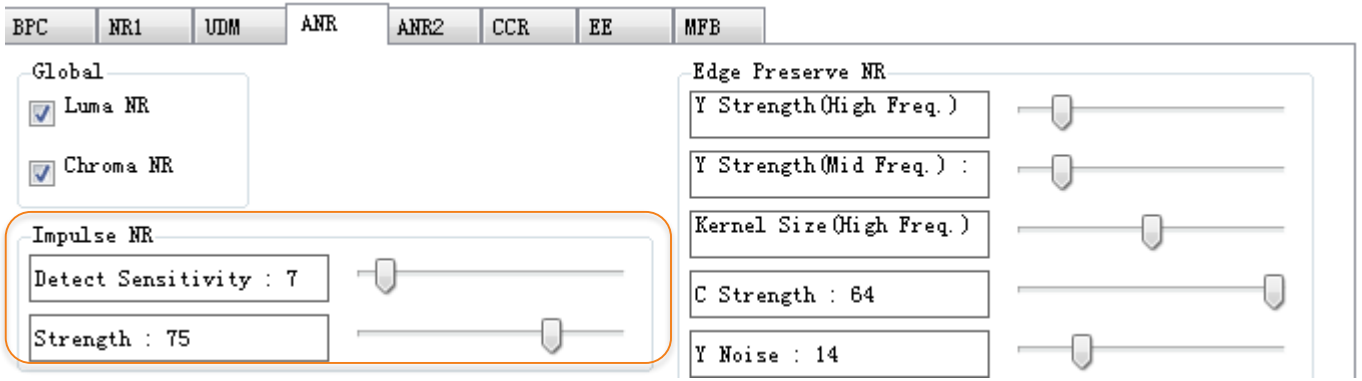


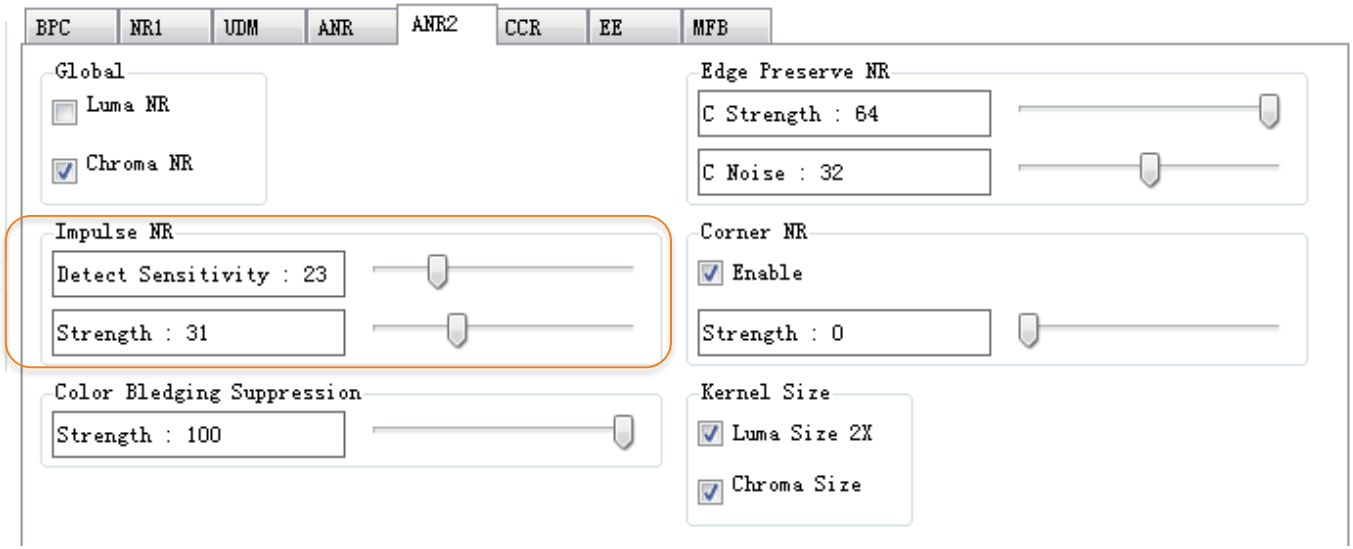


Impulse Noise

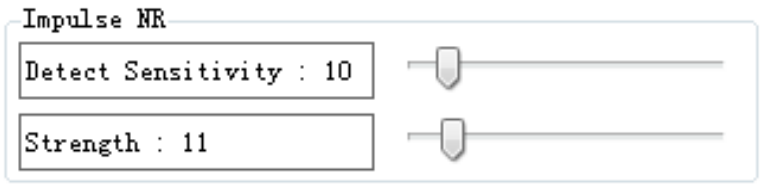
画面中如果存在Impulse Noise，可以调整Detect Sensitivity和Strength去消除。

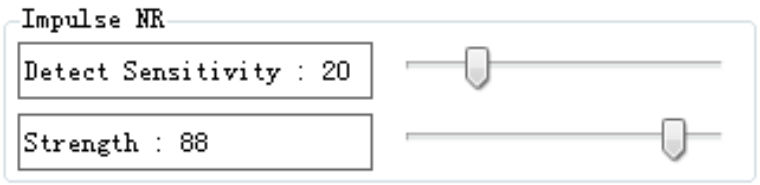
建议优先调整ANR2中的Impulse NR。

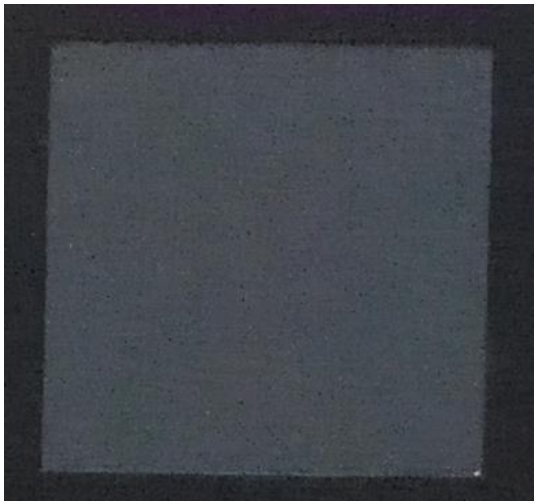


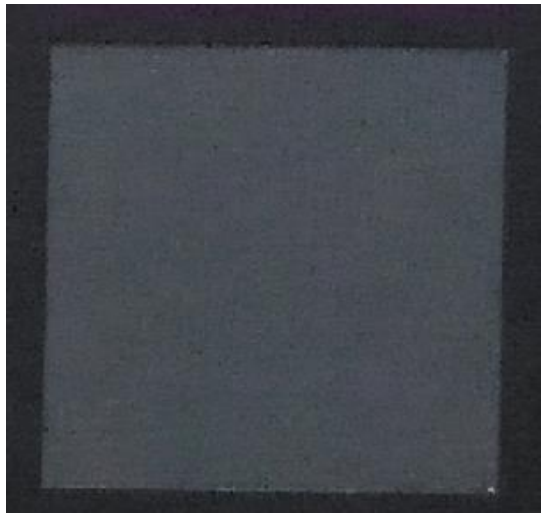


Impulse Noise



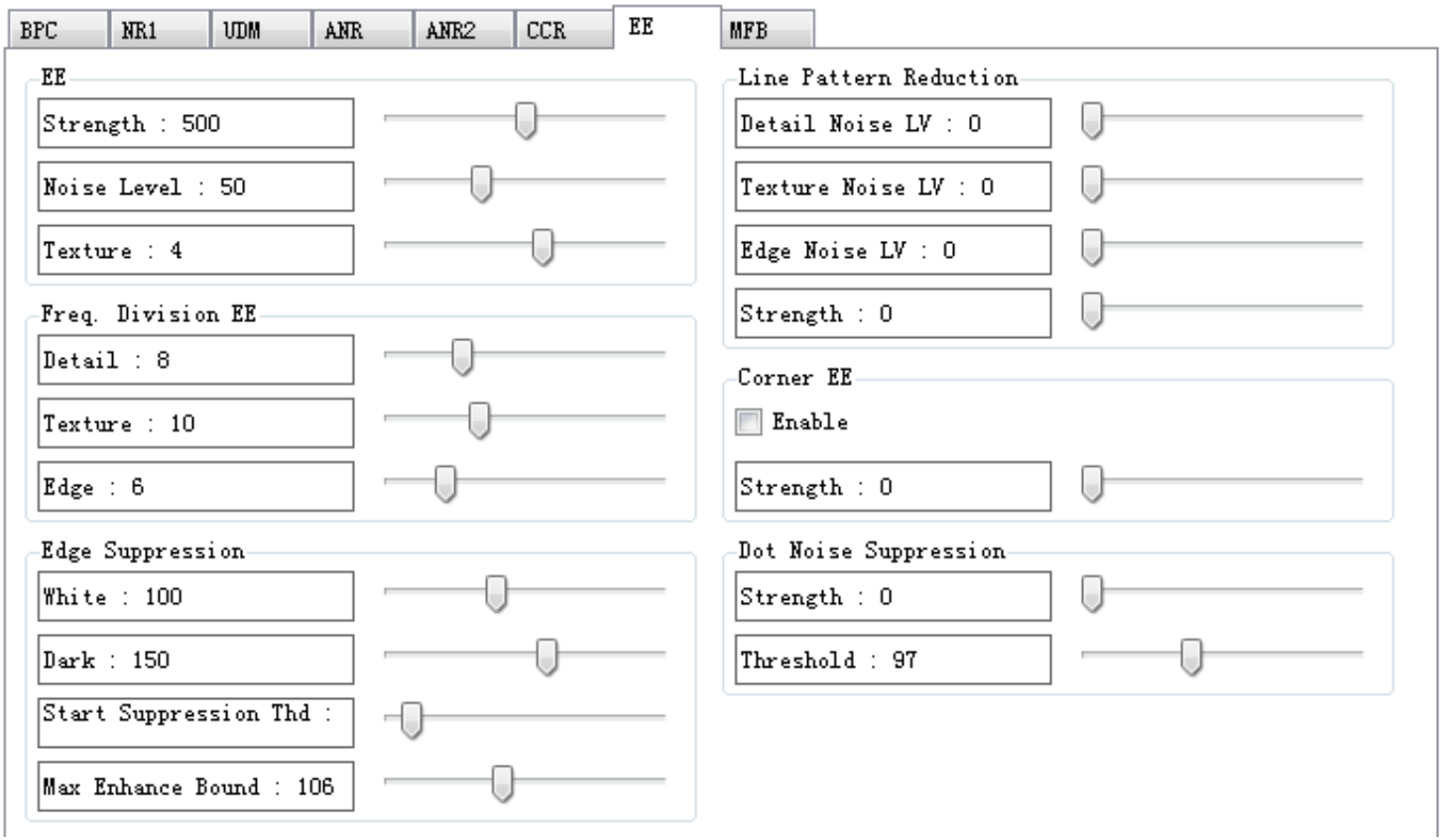






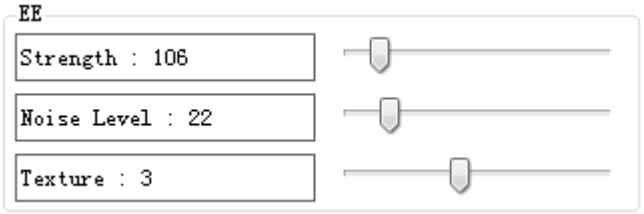
Edge Enhancement

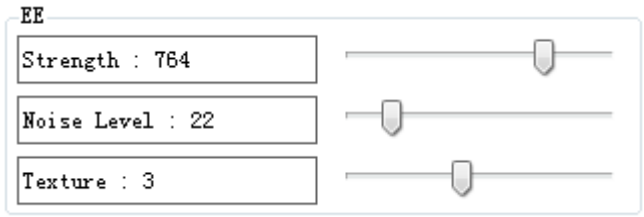
画面中心平坦区Noise表现达到要求后，调试EE，增强边缘表现。
注意EE调试后会有一些Noise产生，再微调ANR2的参数。



EE Strength

Stength控制EE的强度， Noise Level控制EE的门限， 高于该门限才会做EE。
Texture可以增强纹理区的EE表现。
Strength提高， Edge加强。

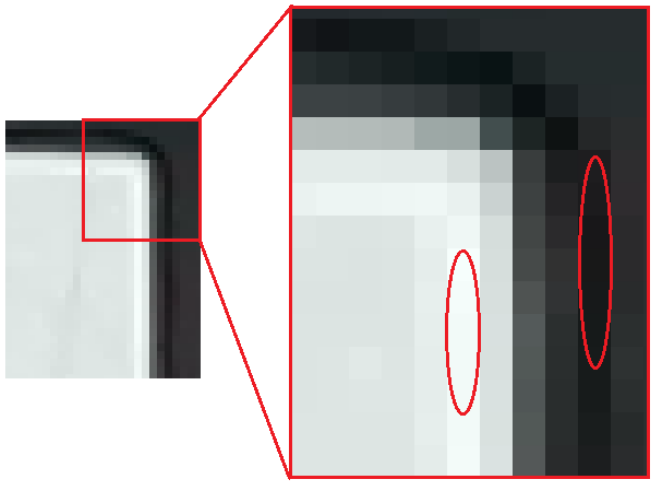




Edge Suppression

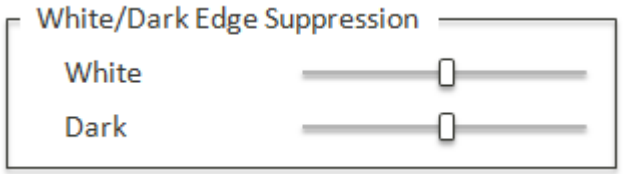
经过EE后，在边缘过渡的地方可能会出现偏亮和偏暗的pixel。
可以通过Edge Suppression来抑制这种现象。
UDM和EE页面的Edge Suppression都可以尝试。

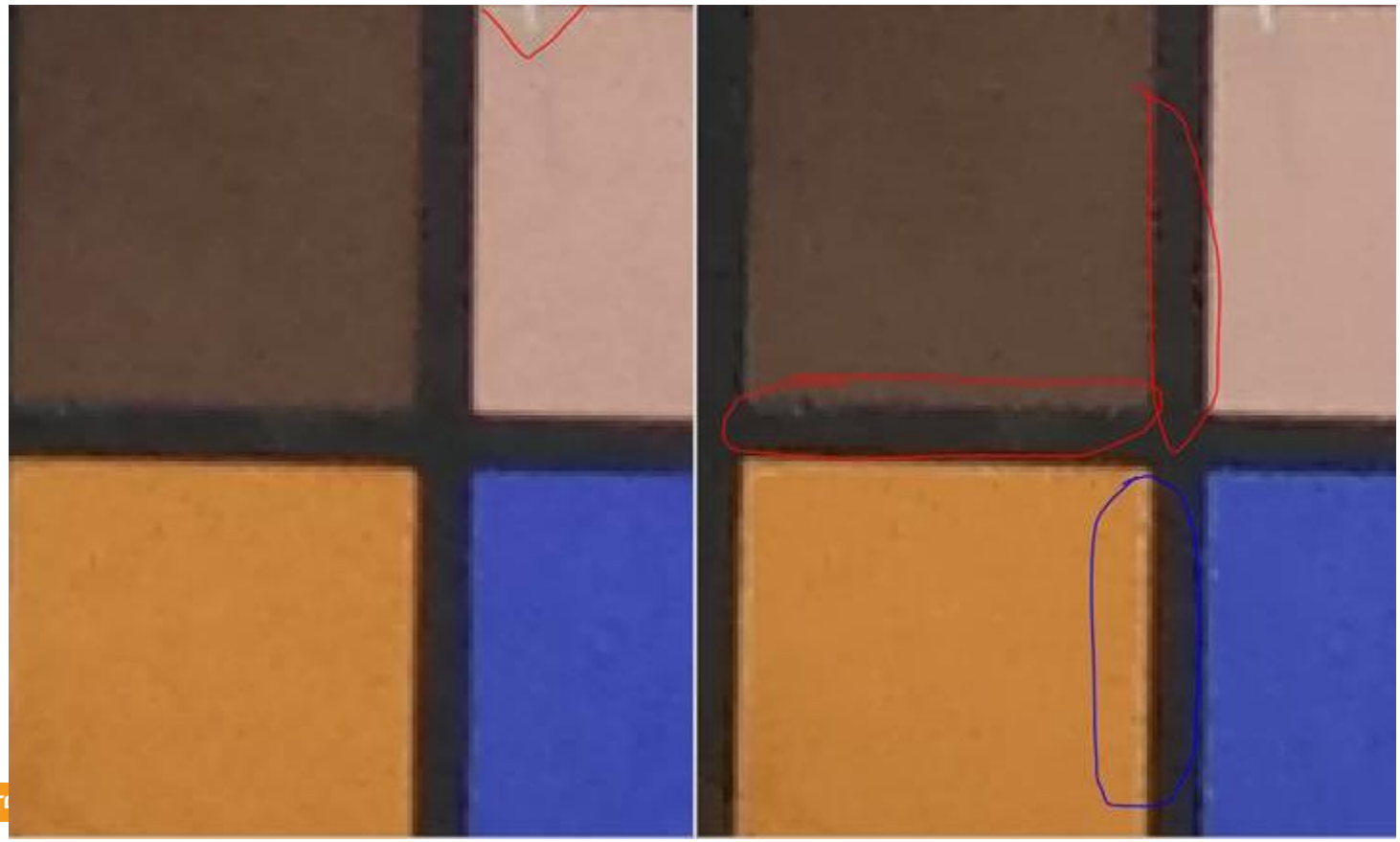
White抑制偏亮pixel的亮度，Dark提高偏暗pixel的亮度。



Edge Suppression(UDM)

下图蓝框，白边稍微明显一些



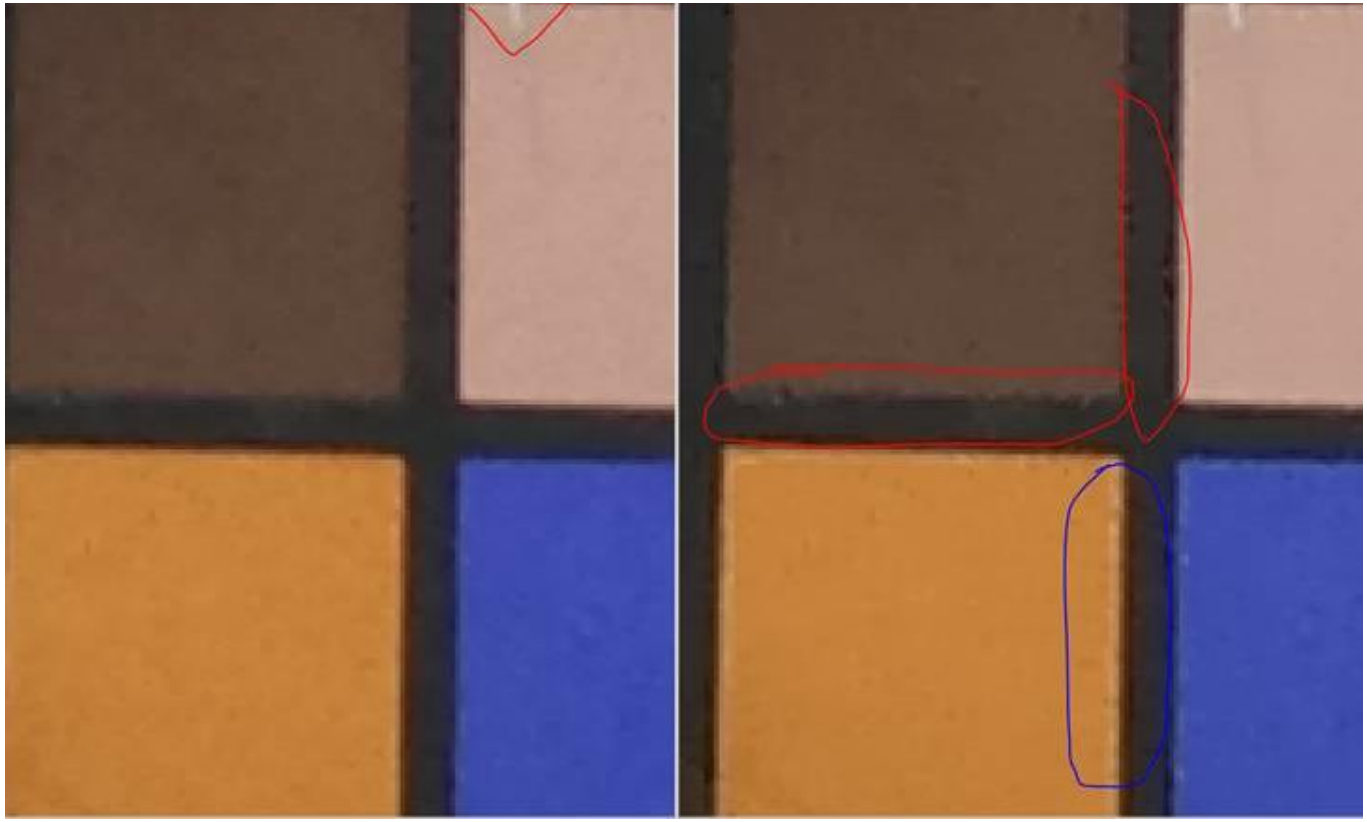


Dirty Edge

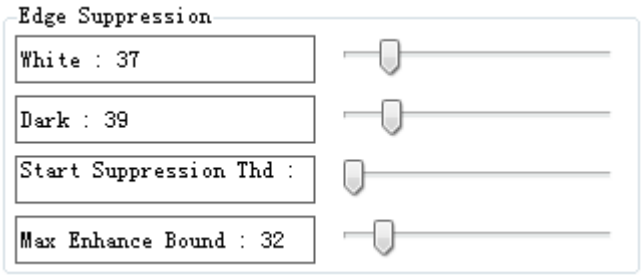
Dirty Edge的改善方法如下：

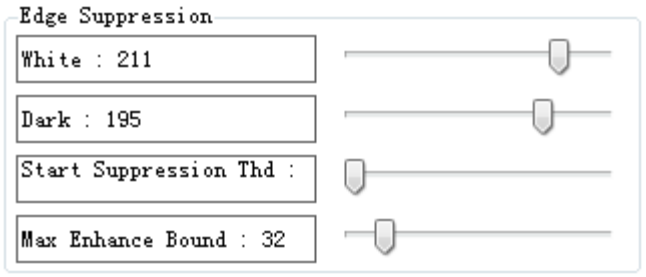
1. 先检查UDM的EE strength和EE 里的strength是否太强，若太大，可以降低一些
2. 高ISO的话，可以将ANR中Edge Smooth的值加大一点。

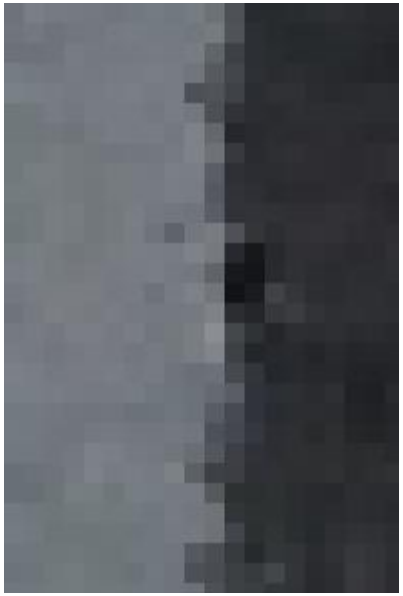
下图红框， edge看起来比较脏



Edge Suppression(EE)



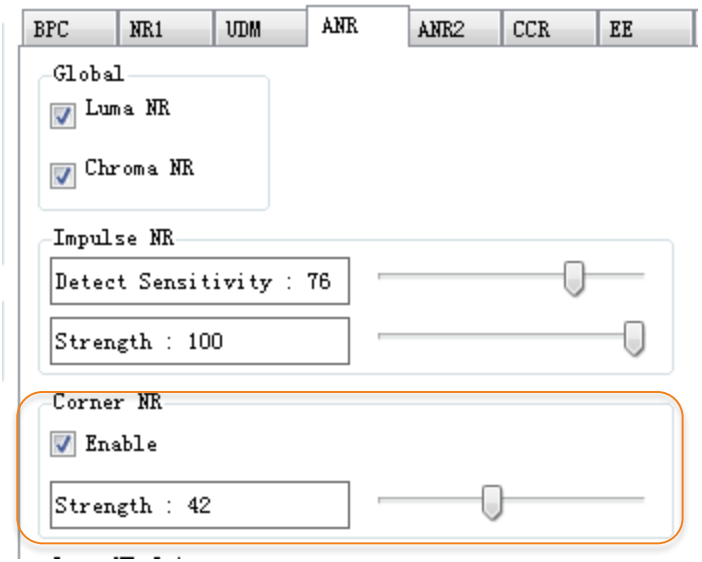


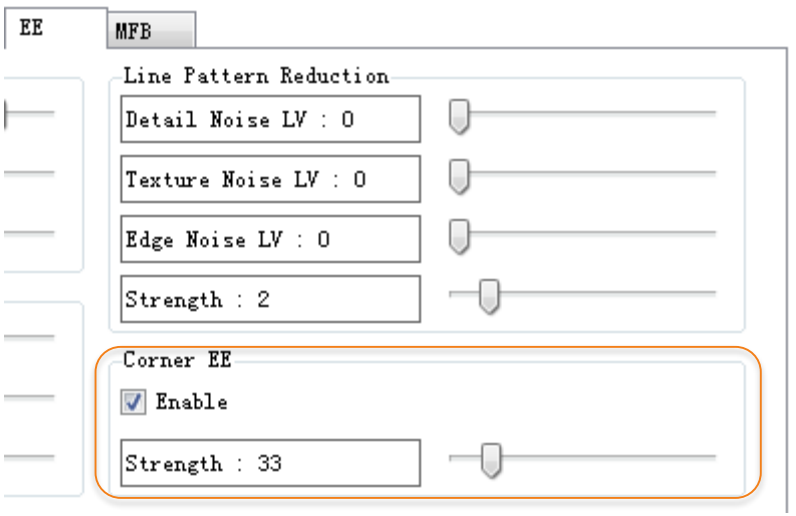


Corner NR

在中心区调试后，开始调试图像四周，先使用Corner NR，对四周做Denoise。Corner NR必须Enable才能生效。

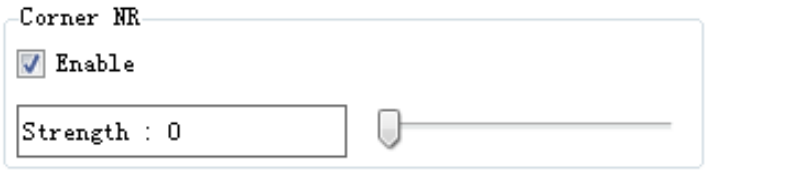
Corner NR调试后再根据需求添加Corner EE。





Corner NR

Corner NR Strength加强，可以去除四周的Noise。



Detail Enhancement

低频细节少，比如毛线球，增加细节的方法有三，但需要tradeoff的是noise是否变多：

1. 降低UDM里EE的noise level的值
2. 增加UDM里EE的strength值
3. 降低ANR里面的Y Noise和提高Y Strength

Noise Reduction v4.1

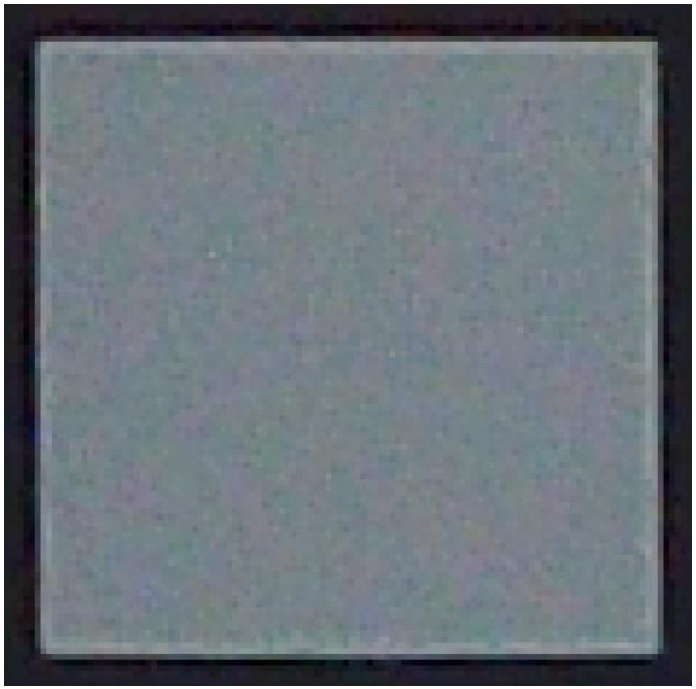
Support Chip

- MT6797

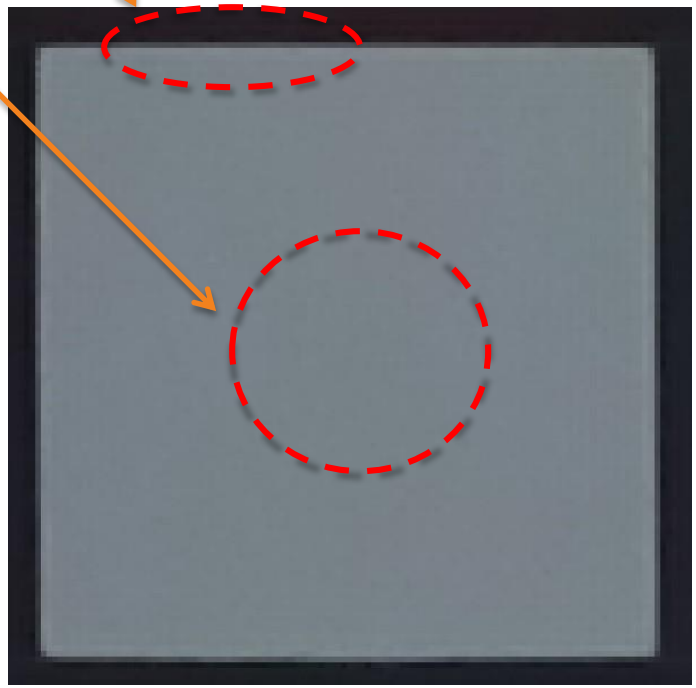
What is Noise Reduction

A function to remove noise and preserve edge while removing noise.

Before Noise Reduction

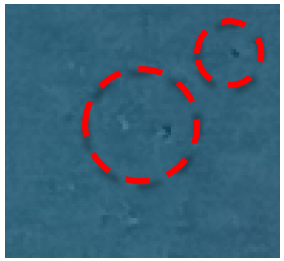


After Noise Reduction

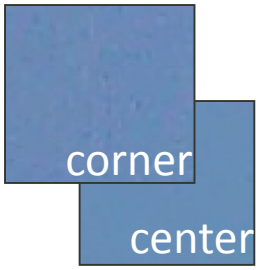


What issue might meet

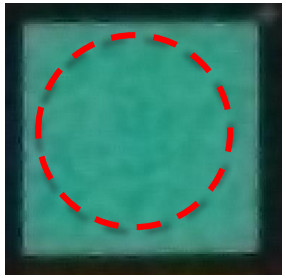
Impulse Noise



Corner Noise



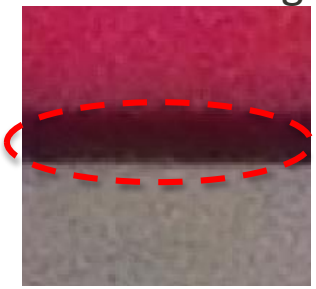
Luma Noise



Detail Lost

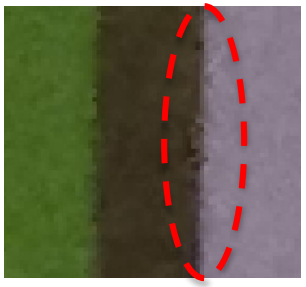
Color Noise

Color Bleeding



Low Frequency Color Noise

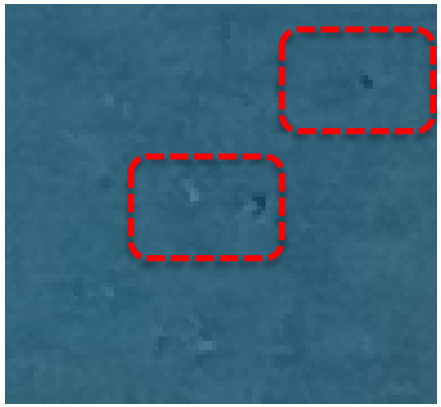
Dirty Edge



Impulse noise

- Target
  - Remove dot and impulse noise

Before



After

BPC (Bad Pixel Correction)

① Set “Strength” to maximum.

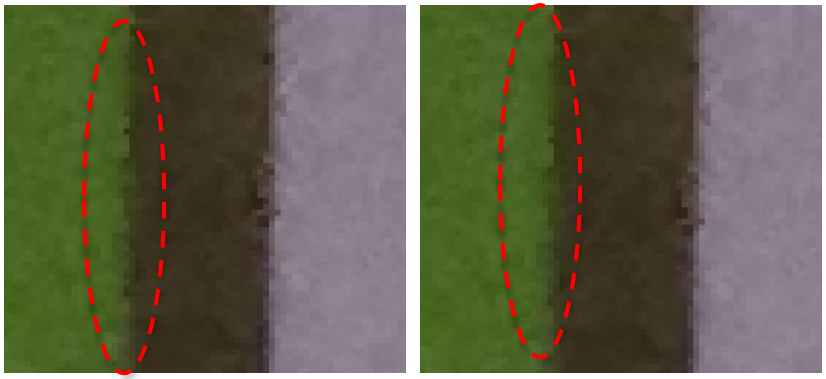
② Move “Detect sensitivity” slider to right, until all impulse noise are disappear.

③ Move “Strength” slider to left to make impulse noise and detail balance.

Edge NR

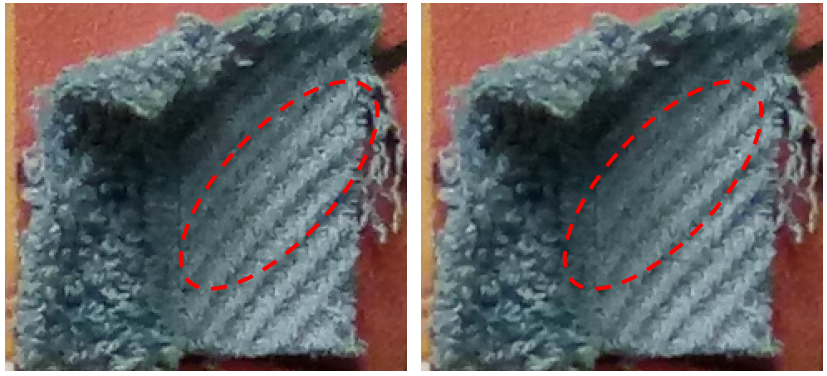
- Target
  - Remove noise without considering edge
  - Make edge more smooth

Effect



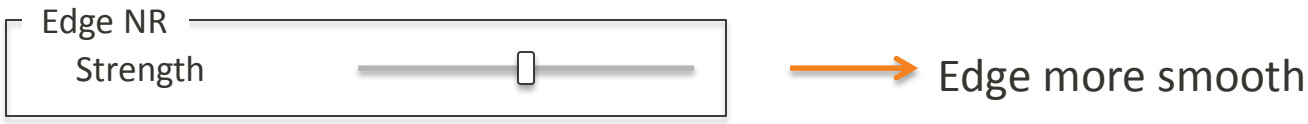
Before　　After

Side Effect



Before　　After

Edge NR



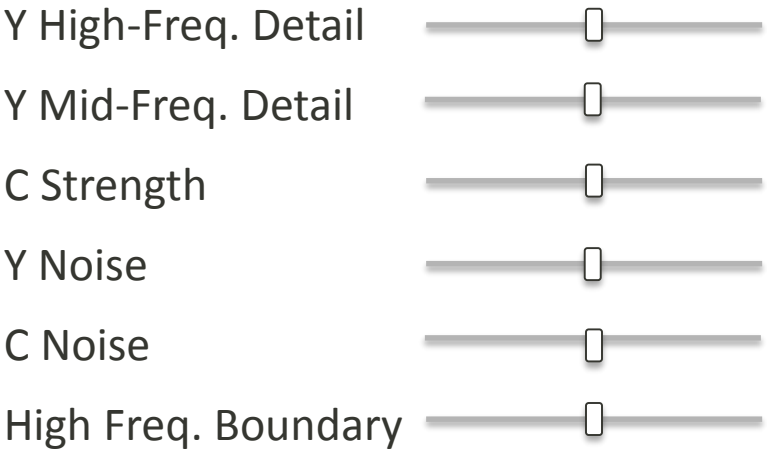
Edge Preserve

- Remove noise and preserve edge

Before

After

Edge Preserve

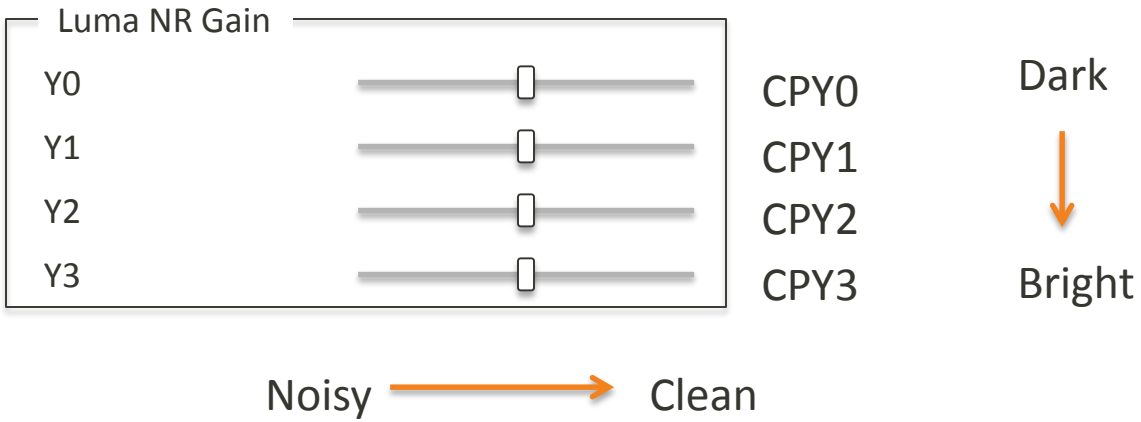


① Set “Detail” to minimum.

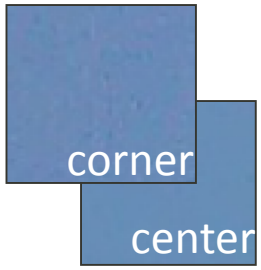
② Move “noise” slider to right, until all noise on flat area are disappear.

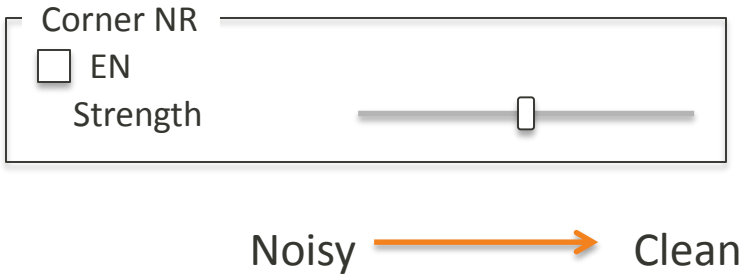
③ Move “Detail” slider to right to make noise and detail balance.

Set different adaptive NR strength for the area with different brightness

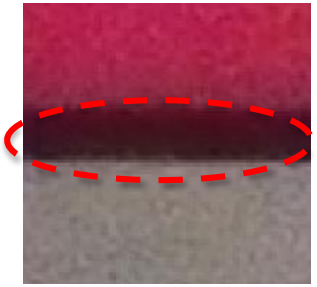


Corner Noise Reduction





Color bleeding

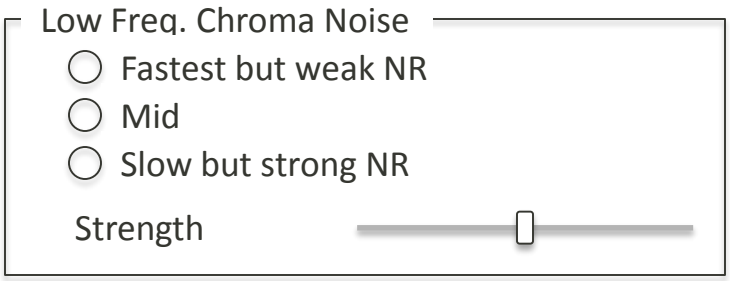


C strength

Less bleeding  More bleeding

Low frequency chroma noise

There are three post NR modules to deal with low frequency chroma noise.

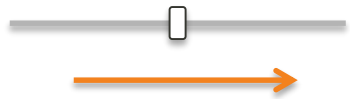


Noisy → Clean

	Speed rank	NR Strength rank
MNR	1	3
Fast SWNR	2	2
SWNR	3	1

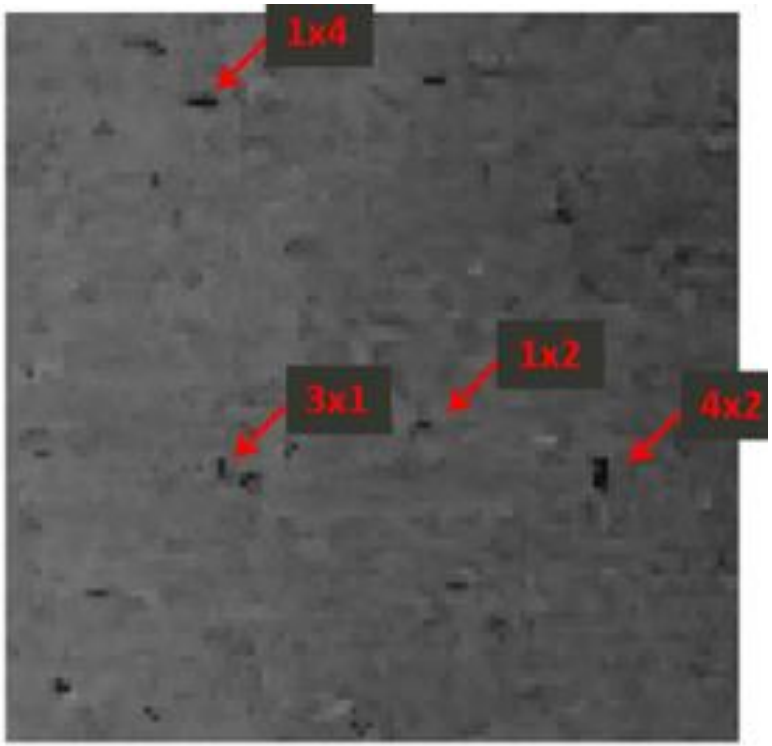
Add High-freq. Detail

Y High-Freq. Detail



What is Impulse Noise

- What is Impulse noise



Edge