Discussion

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The main issue of CIS is increase QE and decrease x-talk to get clear image. Uniform QE and X-talk are important about position of sensor. If we measure the QE and X-talk on the center of a chip and the side of a chip, values will be different because of lens. The light propagates normally to the center of a chip. However, the light propagate obliquely to the side of a chip. Therefore, its QE becomes lower and X-talk becomes bigger than the center of a chip. One of the solution is shifted CIS. It leads the light smoothly to the PD region (Fig. 4). However, it’s until has low QE and high X-talk. To solve this problem, we simulated the tilted DTI CIS.

We increased QE 3.80 %p in red, 4.70 %p in green, 0.30 %p in blue, and 2.70 %p in white. Also we decreased X-talk 0.05 %p in red, 0.20 %p in green, and 0.10 %p in blue (Table 1). If we can more focus the light on PD region, QE will be more increase. We can use the tilted DTI CIS on the side of CMOS chip. However, it needs more test by the other views: circuit effect (ex. dark current) and fabrication process for using this CIS structure in real product.

We decreased X-talk. However, Decrements are less (<0.2%) than our goal because the transmittance of the DTI (related to spatial X-talk) and the CF (related to spectral X-talk) didn’t change. It means that the source of the X-talk didn’t change. Therefore, we should change the DTI’s material and the CF material. However, material design is not only optics work. For example, air gap is a best material to DTI. However, implement the air is almost impossible in fabrication with present technology.

The tilted DTI can’t be production. However, we know that material of DIT and CF must be changed to increase QE and decrease X-talk from this result.