Revised Results

EE, 20182327

Lee Jong Geon

The simulation was conducted on 3 structures: d1 was varied from 450 to 550 nm, d2 was varied from 200 to 300 nm, and was varied from 0.5 ° to 6 °. The tilted DTI CIS’ QE and X-talk have negative and positive quadratic relationships with in the region.



Fig. . QE on d2 (y) vs. d1 (x) in the shifted CIS.

The shifted CIS was optimized at d1 = 510 nm and d2 = 230 nm (Fig. 1). A tradeoff occurred between high QE and low X-talk. The X-talk varied < 1%. Therefore, QE was given more weight than X-talk.



Fig. . QE (y) vs. angle (x) in tilted DTI CIS. Filled circle: red, Unfilled circle: green, Square: blue, Diamond: white.

The tilted DTI CIS was optimized at (Fig. 2). We find the point at which maximum QE and minimum X-talk. The X-talk looks constant because it varied < 1%. Therefore, we focus finding at which QE is maximum.



Fig. . QE on d2 (y) vs. d1 (x) in the tilted DTI CIS at .

The tilted DTI CIS was optimized at d1 = 510 nm, d2 = 230 nm, and (Fig. 3). We fixed for find the optimized d1 and d2.

Table . QE and crosstalk of CF for three different CIS.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | **CIS Structure** | | | | | | |
|  | **CF** |  | **Base** |  | **Shifted** |  | **Tilted DTI** |  | **Increment** |
| **QE [%]** | **R** |  | 58.2 |  | 44.5 |  | 48.3 |  | 3.80 |
| **G** |  | 68.0 |  | 59 |  | 63.7 |  | 4.70 |
| **B** |  | 61.6 |  | 59.3 |  | 59.6 |  | 0.30 |
| **W** |  | 66.4 |  | 55.2 |  | 57.9 |  | 2.70 |
|  |  |  |  |  |  |  |  |  |  |
| **Crosstalk [%]** | **R** |  | 1.96 |  | 2.88 |  | 2.83 |  | -0.05 |
| **G** |  | 31.7 |  | 31.6 |  | 31.4 |  | -0.20 |
| **B** |  | 12.7 |  | 13.6 |  | 13.5 |  | -0.10 |

In compared the QE between the shifted CIS and the tilted DTI CIS, QE of all four CFs increased (Table 1). Also, the X-talk decreased to < 0.2%.



(a)

(b)

(c)

(d)

(e)

(f)

Fig. . Power flow of the shifted CIS and the tilted DTI CIS. (a) red, (c) green, and (e) blue pixel of the shifted CIS. Also, (b) red, (d) green, and (f) blue pixel of the tilted DTI CIS.

The DTI led the light move to center of the CISs which is the photo-detector region (Fig. 4). In a tilted DTI CIS, more light can be detected than in the shifted CIS. Also, the tilted design prevents the light leakage more than the shifted CIS.