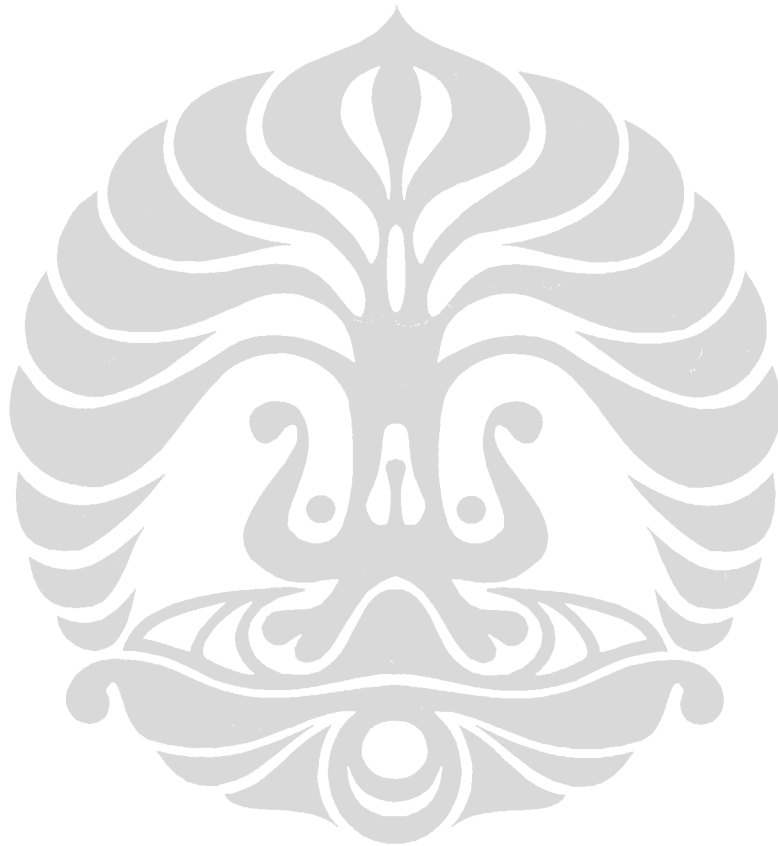


**LAMPIRAN**

**Disain *Solar Cell* Menggunakan PC1D 5.9 dan Grafik EQE Pada Aplikasi**

**Konsep *Up & Down – Conversion***



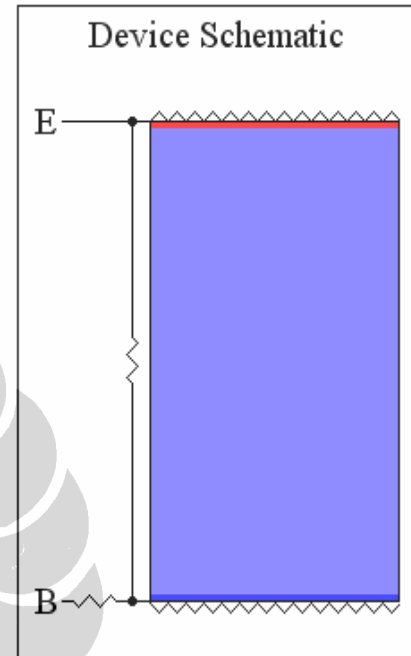
1. Disain *solar cell* dengan aplikasi *up-conversion* menggunakan sumber cahaya sekunder dalam spektrum biru.

**DEVICE**

Device area: 100 cm<sup>2</sup>  
Front surface texture depth: 4 μm  
Rear surface texture depth: 4 μm  
*No surface charge*  
Exterior Front Reflectance: 10%  
Exterior Rear Reflectance: 10%  
*No internal optical reflectance*  
Emitter contact enabled  
Base contact: 5×10<sup>-3</sup> Ω  
Internal conductor: 3×10<sup>-3</sup> S

**REGION 1**

Thickness: 30 μm  
Material modified from si.mat  
Carrier mobilities from internal model  
Dielectric constant: 11.9  
Band gap: 1.124 eV  
Intrinsic conc. at 300 K: 1×10<sup>10</sup> cm<sup>-3</sup>  
Refractive index: 3.58  
Absorption coeff. from si300.abs  
Free carrier absorption enabled  
P-type background doping: 2.6×10<sup>16</sup> cm<sup>-3</sup>  
1st front diff.: N-type, 2.9×10<sup>20</sup> cm<sup>-3</sup> peak  
2nd front diff.: N-type, 5×10<sup>20</sup> cm<sup>-3</sup> peak  
1st rear diff.: P-type, 4×10<sup>20</sup> cm<sup>-3</sup> peak  
*No 2nd rear diffusion*  
Bulk recombination: τ<sub>n</sub> = τ<sub>p</sub> = 7.208 μs  
Front-surface recom.: S model, S<sub>n</sub> = S<sub>p</sub> = 1×10<sup>6</sup> cm/s  
Rear-surface recom.: S model, S<sub>n</sub> = S<sub>p</sub> = 1×10<sup>5</sup> cm/s



( Lanjutan )

### **EXCITATION**

Excitation modified from one-sun.exc

Excitation mode: Transient, 16 timesteps

Temperature: 25°C

Base circuit: Sweep from -0.8 to 0.8 V

*Collector circuit: Zero*

Primary light source enabled

Constant intensity: 0.1 W cm<sup>-2</sup>

Monochrome, wavelength from 450 to 1200 nm

Secondary light source enabled

Constant intensity: 0.1 W cm<sup>-2</sup>

Monochrome, wavelength from 450 to 500 nm

### **RESULTS**

Short-circuit Ib: -3.727 amps

Max base power out: 2.917 watts

Open-circuit Vb: 0.6057 volts

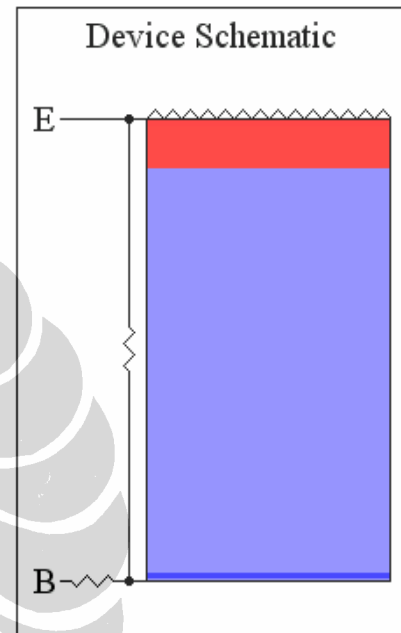
2. Disain *solar cell* dengan aplikasi *down-conversion* menggunakan sumber cahaya sekunder dalam spektrum merah.

**DEVICE**

Device area: 100 cm<sup>2</sup>  
Front surface texture depth: 4 μm  
*No surface charge*  
Exterior Front Reflectance: 10%  
*No Exterior Rear Reflectance*  
Internal optical reflectance enabled  
Front surface optically rough  
Emitter contact enabled  
Base contact: 0.015 Ω  
Internal conductor: 0.3 S

**REGION 1**

Thickness: 30 μm  
Material from si.mat  
Carrier mobilities from internal model  
Dielectric constant: 11.9  
Band gap: 1.124 eV  
Intrinsic conc. at 300 K:  $1 \times 10^{10}$  cm<sup>-3</sup>  
Refractive index from si.inr  
Absorption coeff. from si300.abs  
Free carrier absorption enabled  
P-type background doping:  $1 \times 10^{16}$  cm<sup>-3</sup>  
1st front diff.: N-type,  $2.9 \times 10^{20}$  cm<sup>-3</sup> peak  
2nd front diff.: N-type,  $5 \times 10^{20}$  cm<sup>-3</sup> peak  
1st rear diff.: P-type,  $5 \times 10^{20}$  cm<sup>-3</sup> peak  
*No 2nd rear diffusion*  
Bulk recombination:  $\tau_n = \tau_p = 7.208$  μs  
Front-surface recom.: S model,  $S_n = S_p = 1 \times 10^6$  cm/s  
Rear-surface recom.: S model,  $S_n = S_p = 1 \times 10^5$  cm/s



( Lanjutan )

### **EXCITATION**

Excitation modified from one-sun.exc

Excitation mode: Transient, 16 timesteps

Temperature: 25°C

Base circuit: Sweep from -0.8 to 0.8 V

*Collector circuit: Zero*

Primary light source enabled

Constant intensity: 0.1 W cm<sup>-2</sup>

Monochrome, wavelength from 450 to 1200 nm

Secondary light source enabled

Constant intensity: 0.1 W cm<sup>-2</sup>

Monochrome, wavelength from 600 to 770 nm

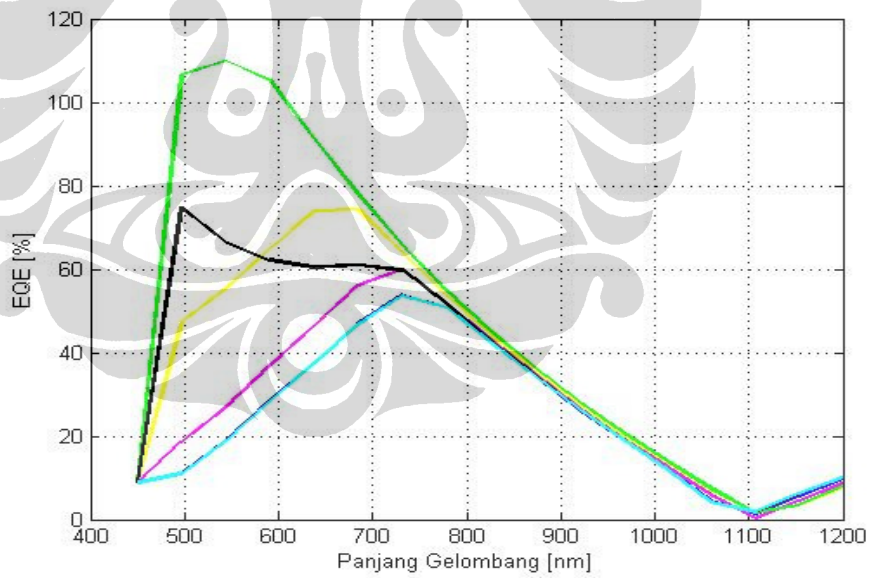
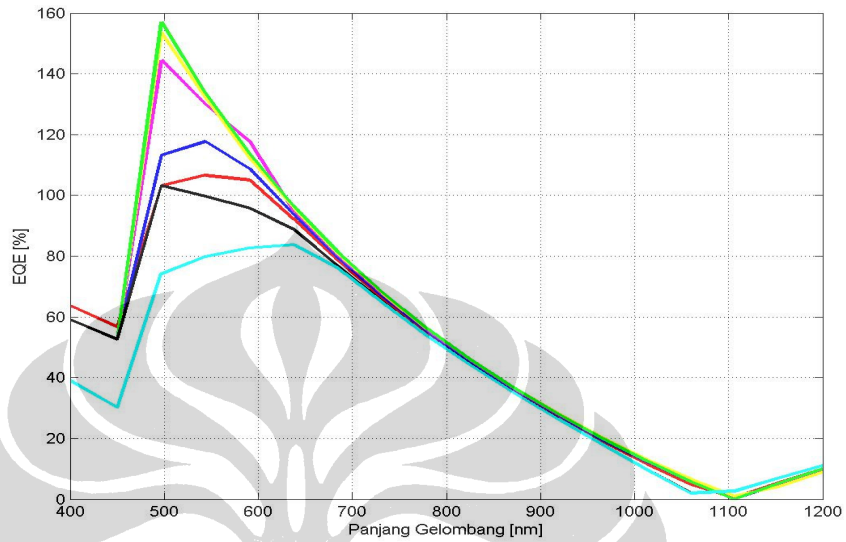
### **RESULTS**

Short-circuit Ib: -2.751 amps

Max base power out: 2.210 watts

Open-circuit Vb: 0.6312 volts

3. Grafik EQE pada solar cell dengan aplikasi konsep *up & down-conversion* menggunakan PC1D 5.9.



- : Kondisi Normal
- : 380 - 400 nm
- : 400 - 500 nm
- : 500 - 600 nm
- : 600 - 770 nm
- : 770 - 1000 nm
- : 1000 - 1200 nm