Dear KC,

Nice to hear from you! Here I would like to answer your questions. First of all, there exist different definitions for various efficiencies:

1. IQE of the whole structure, which is the ratio of photon rate emission in the whole structure to the rate of electron-hole pair supply to the structure through its edges. It is by definition

$$\eta = \frac{q}{j}\int_0^L dz \cdot R^{rad}(z) = j_{rad}/j \quad , \quad j_{rad} = q\int_0^L dz \cdot R^{rad}(z)$$

Here z = 0 and z = L correspond to the left and right edges of the whole heterostructure respectively. This parameter is displayed in the Table of SiLENSe simulation results.

2. IQE of the active region, which is the ration of photon rate emission from the active region of the structure to the rate of electron-hole pair supply to the structure through its edges. It is by definition

$$\eta^{QW} = \frac{q}{j}\int_{\substack{active\\region}} dz \cdot R^{rad}(z)$$

Integration is performed here over the active region specified by user. This parameter is displayed in the Table of SiLENSe simulation results.

3. Quantum yield of the active region (not displayed in the Table of simulation results), which is the ratio of photon rate emission from the active region of the structure to the rate of electron-hole recombination in the active region. It is by definition

$$Y = \int_{\substack{active\\region}} dz \cdot R^{rad}(z) \Big/ \int_{\substack{active\\region}} dz \cdot R(z)$$

4. Injection efficiency, which is the photon rate emission from the active region of the structure to the rate of electron-hole recombination in the active region. It is by definition

$$\eta^{inj} = \frac{q}{j}\int_{\substack{active\\region}} dz \cdot R(z)$$

This parameter is displayed in the Table of SiLENSe simulation results.

It is followed from the above definitions that $\eta^{QW} = \eta^{inj} Y$. Some people refer the quantum yield Y to as IQE. So, care should be taken to understand what people mean. You can see from the above that η^{QW} already includes the injection efficiency.

As for the parameter η , it also includes the total injection efficiency which can be defined as follows $H^{inj} = (j - j_{p\,left} - j_{n\,right})/j$ where $j_{p\,left}$ and $j_{n\,right}$ are the leakage current densities of holes and electrons at the left and right edges of heterostructure, respectively (displayed in the Table of SiLENSe simulation results). Then the total quantum yield Y_{tot} can be determined from the relationship $\eta = H^{inj} Y_{tot}$.

The other parameters displayed in the Table of results have the following relationships:

$$j = j_n + j_{p\,left} = j_p + j_{n\,right} \quad , \quad j_{nrad} = j_{SRH} + j_{Auger}$$
$$j_n = j_{rad} + j_{nrad} + j_{n\,right} \quad , \quad j_p = j_{rad} + j_{nrad} + j_{p\,left}$$

These parameters are related to the whole structure.