Case 1: for simplification

I derived the following formula for Light Yield if the interior of the chamber is completely covered with SiPM i.e, there is no reflector:

$$LY = PDE_{tile} * FF_{sys} \tag{1}$$

Case 2: f_{sen} gives fraction of surface covered with SiPM

PDE = Photon Detection Efficiency of the SiPM
Reflectance of SiPM = R
Reflectance of Walls = R_{Wall}
Fraction of active area on SiPM = FF_{sys}
If these five quantities are known, we can find light yield.
s = fraction of incident Light reflected by Silicon Photo Multiplier
(This includes both the active as well as inactive part of Silicon assuming inactive part has same refractive

index as active part)
w = fraction of incident Light reflected by Walls
X = fraction of incident Light not reflected by the SiPM

$$s = f_{sen}R \tag{2}$$

$$w = (1 - f_{sen})R_{wall} \tag{3}$$

$$X = f_{sen}FF_{sys}(1 - R) \tag{4}$$

$LCE = [X + X * [s + w] + X * [s * (s + w) + w * [s + w]] + X * [s * (s + w)^2 + w * [s + w]^2] + X * [s * (s + w)^3 + w * [s + w]^3] + ...]$

$$LCE = X * \sum_{r=0}^{\infty} (s + w)^r \tag{5}$$

Under the condition that s+w < 1 and r $\rightarrow$ infinity

$$LCE = \frac{X}{1 - (s + w)} \tag{6}$$

Substituting values for s, w and X,

$$LCE = \frac{f_{sen} FF_{sys}(1-R)}{1-(f_{sen}R + (1-f_{sen})R_{wall})} \tag{7}$$

Note:
If the surface was completely covered with SiPM, as in case 1, i.e., $f_{sen} = 1$
Thus, equation 7 reduces to

$$LCE = FF_{sys} \tag{8}$$

Why is LY independent of Reflectance?
probably because I have not included any absorption effect.