Why choosing Glass with Low Shading Coefficient (SC) value is better than Low U-value glass in Tropical Country

The total heat gain by a window glass pane is given by the following equation:

Total heat gain (or Relative Heat Gain, RHG)
= Solar Heat + Thermal Heat

What is solar heat?

It is heat generated when the sunlight directly transmits through the window and some is absorbed and re-radiated in and out. It is governed by the glass property Solar Factor (SF) or we call SHGC.

What is thermal heat?

It is the heat transfer through the window, by conduction (temp diff) or convection (air flow). When the sun heats up objects or glass, the heat will be conducted through the window. It is governed by the U-value of the window.

By ASHRAE standard, the RHG formula is written as follow:

RHG = 630 (sunlight energy near earth given by ASHRAE) x SF (or SHGC) + U x 8°C (temp diff in/out)

For example:
Using Clear float glass 6mm (FL 6) VS St. Gobain Solar Control Low- E Glass ET 125 (in short ET 125)

> For FL 6, with sunlight energy = 630, SF = 0.87, U-value = 5.9W/m^{2}K, and temperature difference between indoor and outdoor = 8°

Relative Heat Gain for FL6
= Solar heat + Thermal heat
= (630 × 0.87) + (5.9 × 8)
= 548.1 + 47.2
= 595.3 W

From the sum, we convert into percentage, solar heat contributes 92% whereas thermal heat contribute 8%.

> For St. Gobain Solar control Low-E Glass ET 125, sunlight energy = 630, SF = 0.31, U-value 3.9 W/ m^{2}K and temperature difference between indoor and outdoor = 8°

Relative Heat Gain for ET 125
= Solar heat + Thermal heat
= (630 × 0.31) + (3.9 × 8)
= 195.3 + 31.2
= 226.5 W

From the sum, we convert into percentage, solar heat contributes 86% whereas thermal heat contribute 14%.

Compare both FL6 and ET 125 – RHG reduction
= RHG of FL6 – RHG of ET 125
= 595.3 – 226.5 = 368.8 W / 62%
> Solar contribution = 548.1 - 195.3
= 352.8 or 64%
> Thermal contribution = 47.2 - 31.2
= 15.9 or 34%

The total heat gain has been reduced by 62% switching from FL6 to ET 125. This is mainly due to the 64% contribution from the solar heat reduction.

Hence we should focus on the SHGC value instead of U-value because it is more value you get per money invested. Bear in mind that the U-value of 3.9 is approaching the limit for a single glazing coated glass.

To further reduce the U-value, we need to go to the next level which is DGU. But even we can reduce the U-value to below 2W/m^{2}K or even 1W/m^{2}K with the EXTREME product, the reduction is not significant because we are addressing the averaged 20% of the thermal portion but the cost of investment may increase significantly.

This is because in tropical country like Malaysia, the temperature difference between outdoor and indoor is not big (averaged at 8°C) compared to seasonal countries where temperature difference may vary up to 30°C!